

# TA1317AN

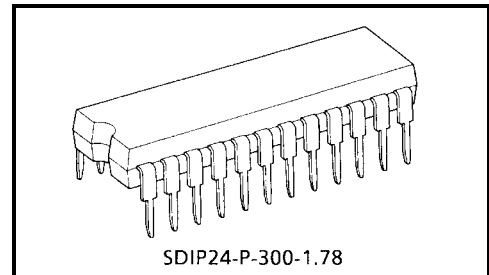
## Deflection Processor IC for TV

TA1317AN is a deflection processor IC for a large and wide picture tube.

TA1317AN incorporates EW, vertical distortion correction circuit and dynamic focus correction circuit. It can control various functions via I<sup>2</sup>C BUS line.

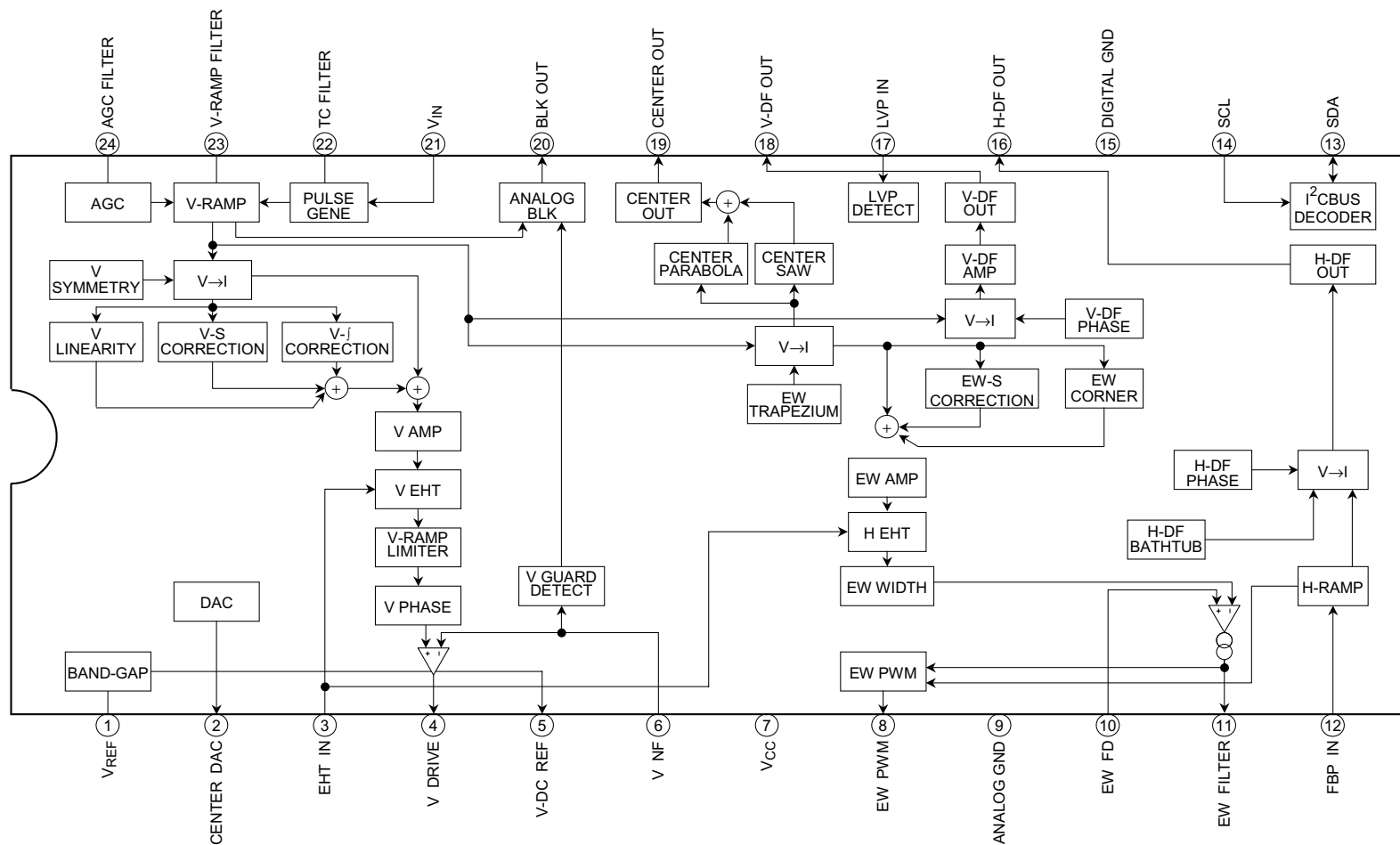
### Features

- Vertical drive (AC/DC-coupling)
- Picture height adjustment
- Vertical shift adjustment
- Vertical symmetry correction
- Vertical linearity correction
- Vertical S correction
- Vertical integral correction
- Vertical/Horizontal EHT compensation
- EW drive (parabola/PWM output)
- Picture width
- EW trapezium correction
- EW parabola correction
- EW corner correction (top only/bottom only/top&bottom)
- EW S correction
- Center curve correction (SAW/PAR)
- Parabola output for horizontal and vertical dynamic focus (H/V output independently)
- Horizontal and vertical dynamic focus phase adjustment
- Horizontal and vertical dynamic focus amplitude adjustment
- Horizontal dynamic focus curve characteristic adjustment
- V-ramp limiter circuit
- Analog blanking output



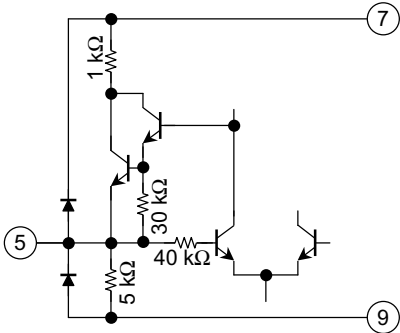
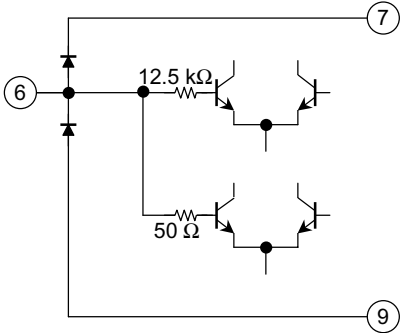
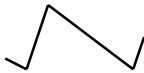
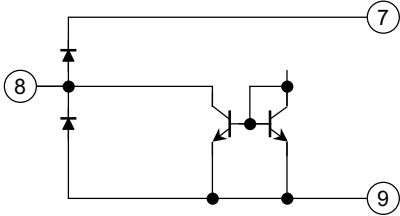
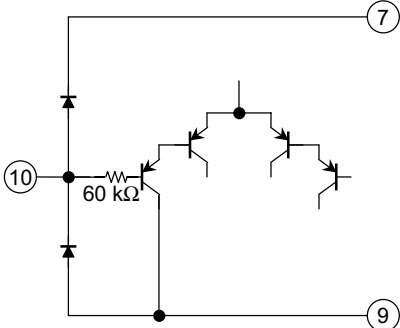
Weight: 1.22 g (typ.)

**Block Diagram**



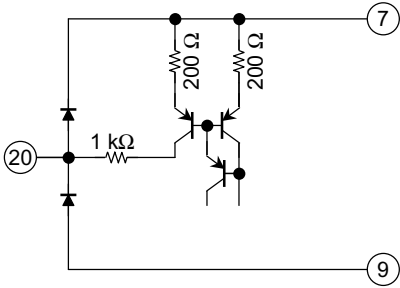
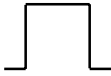
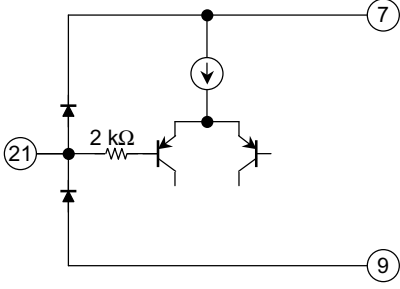
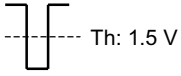
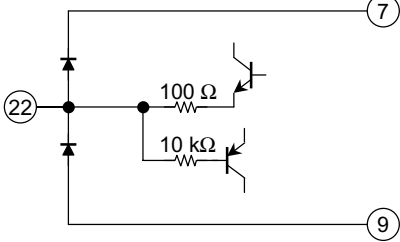
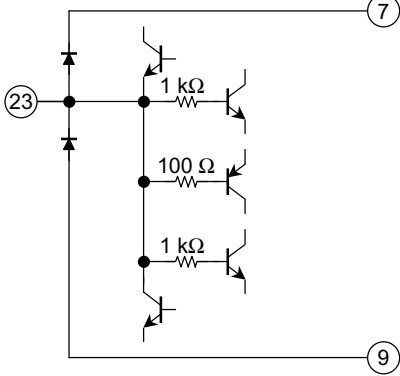
## Pin Functions

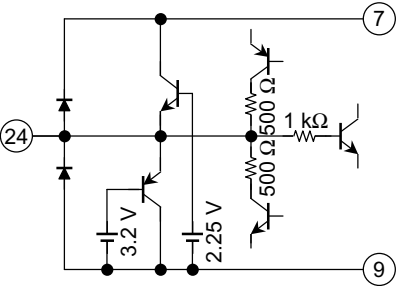
| Pin No. | Pin Name         | Function                                                                                                                                                                                                                                            | Interface Circuit | Input/Output Signal |
|---------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| 1       | V <sub>REF</sub> | Internal reference voltage adjustment pin. If CRT DY has temperature coefficient, it can be cancelled in TV by applying inverse temperature coefficient to this pin. In case of not using, connect 0.01 $\mu$ F capacitor between this pin and GND. |                   | —                   |
| 2       | CENTER DAC       | DAC output pin. When bus write function VD = 0, 2 bit DAC output; VD = 1, 7 bit DAC output. In case of not using, it should be open.                                                                                                                |                   | DC                  |
| 3       | EHT IN           | EHT input pin. In case of not using, connect 0.01 $\mu$ F capacitor between this pin and GND.                                                                                                                                                       |                   | DC                  |
| 4       | V DRIVE          | Vertical output pin                                                                                                                                                                                                                                 |                   | —                   |

| Pin No. | Pin Name        | Function                                                                                                                                                                                                                                                                                                               | Interface Circuit                                                                    | Input/Output Signal                                                                   |
|---------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 5       | V-DC REF        | DC reference voltage output pin when V is DC coupling.<br>In case of not using, it should be open.                                                                                                                                                                                                                     |    | DC                                                                                    |
| 6       | V NF            | Vertical negative feedback input pin.<br>When VD = 0, if pin is 1.2 V (typ.) or below, or 3.7 V (typ.) or higher, returns abnormal detection result to BUS read function (V guard), forcibly setting pin 20 to High. When VD = 1, if pin is 2.4 V (typ.) or below, or 7.4 V (typ.) or higher, abnormality is detected. |   |    |
| 7       | V <sub>CC</sub> | V <sub>CC</sub> pin.<br>Connect 9 V (typ.).                                                                                                                                                                                                                                                                            | —                                                                                    | —                                                                                     |
| 8       | EW PWM          | EW D drive (PWM) output pin. Open collector output.<br>In case of not using, it should be open.                                                                                                                                                                                                                        |  |  |
| 9       | ANALOG GND      | GND pin for analog block                                                                                                                                                                                                                                                                                               | —                                                                                    | —                                                                                     |
| 10      | EW FD           | EW feedback pin                                                                                                                                                                                                                                                                                                        |  |  |

| Pin No. | Pin Name    | Function                                                                                              | Interface Circuit | Input/Output Signal                                   |
|---------|-------------|-------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------|
| 11      | EW FILTER   | Connect phase compensation filter for EW output. EW parabola waveform can be extracted from this pin. |                   | —                                                     |
| 12      | FBP IN      | FBP input pin. In case of not using H-DF and EW-PWM outputs, it should be open.                       |                   | <p>Th: 2.25 V</p> <p>Input frequency: 28 k~45 kHz</p> |
| 13      | SDA         | SDA pin for I <sup>2</sup> C bus                                                                      |                   | <p>Th: 2.25 V</p>                                     |
| 14      | SCL         | SCL pin for I <sup>2</sup> C bus                                                                      |                   | <p>Th: 2.25 V</p>                                     |
| 15      | DIGITAL GND | GND pin for digital block                                                                             | —                 | —                                                     |

| Pin No. | Pin Name   | Function                                                                                                                                                                                                                                                         | Interface Circuit | Input/Output Signal |
|---------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------|
| 16      | H-DF OUT   | Outputs parabola waveform for horizontal dynamic focus. Mask the pulse in horizontal blanking if it is not needed. In case of not using, it should be open.                                                                                                      |                   |                     |
| 17      | LVP IN     | LVP detection pin. Connect reference voltage used to protect deflection circuit against low supply voltage. If this pin is 5.0 V (typ.) or below, returns abnormal detection result to bus read function. In case of not using LVP detection, it should be open. |                   | DC                  |
| 18      | V-DF OUT   | Outputs parabola waveform for vertical dynamic focus. In case of not using, it should be open.                                                                                                                                                                   |                   |                     |
| 19      | CENTER OUT | Outputs center curve correction waveform. Connect this pin to curve correction input pin of horizontal sync IC. In case of not using, it should be open.                                                                                                         |                   |                     |

| Pin No. | Pin Name        | Function                                                                                       | Interface Circuit                                                                    | Input/Output Signal                                                                 |
|---------|-----------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 20      | BLK OUT         | Analog blanking output pin. Open collector output.<br>In case of not using, it should be open. |    |  |
| 21      | V <sub>IN</sub> | Inputs vertical trigger pulse. Notifies subsequent circuit of input fall as trigger.           |    |  |
| 22      | TC FILTER       | Connects filter for generating internal pulse.                                                 |  | —                                                                                   |
| 23      | V-RAMP FILTER   | Connects filter for generating vertical ramp signal.                                           |  | —                                                                                   |

| Pin No. | Pin Name   | Function                                                                                                                                      | Interface Circuit                                                                  | Input/Output Signal |
|---------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---------------------|
| 24      | AGC FILTER | Connects filter used to automatically adjust oscillation amplitude of vertical ramp signal. Can switch AGC sensitivity by BUS write function. |  | —                   |

## Bus Control Map

### Write Mode

Slave Address: 8CH (10001100)

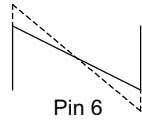
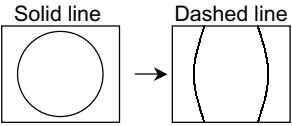
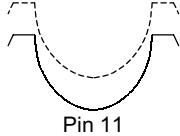
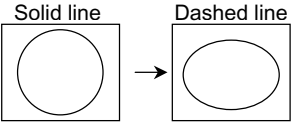
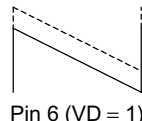
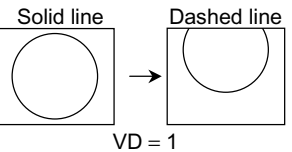
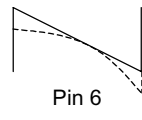
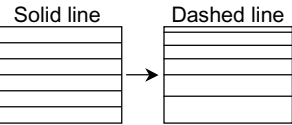
| Sub-Address | D7<br>MSB                | D6 | D5             | D4 | D3                    | D2      | D1             | D0<br>LSB     | Preset<br>MSB | LSB  |
|-------------|--------------------------|----|----------------|----|-----------------------|---------|----------------|---------------|---------------|------|
| 00          | PICTURE HEIGHT           |    |                |    |                       |         |                | VD            | 1000          | 0000 |
| 01          | PICTURE WIDTH1           |    |                |    |                       | V SHIFT |                |               | 1000          | 0000 |
| 02          | V LINEARITY              |    |                |    | V-EHT COMPENSATION    |         |                | 1000          | 0000          |      |
| 03          | ANALOG V-BLK STOP PHASE  |    |                |    | H-EHT COMPENSATION    |         |                | 1000          | 0000          |      |
| 04          | ANALOG V-BLK START PHASE |    |                |    | V-RAMP LIMIT2         |         |                | 1000          | 0000          |      |
| 05          | V CENTERING              |    |                |    |                       |         |                | V-RAMP LIMIT1 | 1000          | 0000 |
| 06          | V-DF PHASE               |    |                |    | V-DF AMPLITUDE        |         |                |               | 1000          | 1000 |
| 07          | H-DF PHASE               |    |                |    | H-DF AMPLITUDE        |         |                |               | 1000          | 1000 |
| 08          | H-DF CURVE               |    |                |    | V INTEGRAL CORRECTION |         |                |               | 1000          | 0000 |
| 09          | V AGC                    |    | V S CORRECTION |    |                       |         |                |               | 1000          | 0000 |
| 0A          | *                        | *  | EW PARABOLA    |    |                       |         |                |               | 1000          | 0000 |
| 0B          | EW TRAPEZIUM             |    |                |    |                       |         |                | V STOP        | 1000          | 0000 |
| 0C          | EW TOP CORNER            |    |                |    | *                     | *       | PICTURE WIDTH2 | 1000          | 0000          |      |
| 0D          | EW BOTTOM CORNER         |    |                |    | *                     | *       | *              | 1000          | 0000          |      |
| 0E          | EW S CORRECTION          |    |                |    | *                     | *       | *              | 1000          | 0000          |      |
| 0F          | EW CORNER                |    |                |    | *                     | *       | *              | 1000          | 0000          |      |
| 10          | CENTER PARABOLA          |    |                |    | CENTER SAW            |         |                |               | 1000          | 1000 |
| 11          | V SYMMETRY               |    |                |    |                       |         |                | 0000          | 0000          |      |

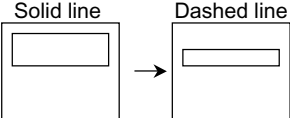
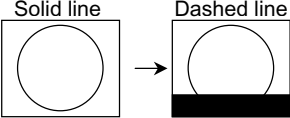
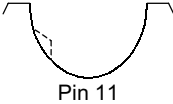
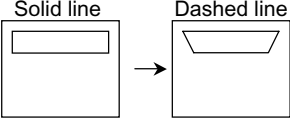
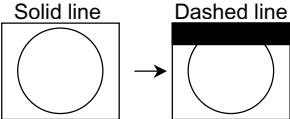
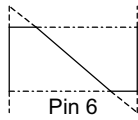
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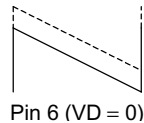
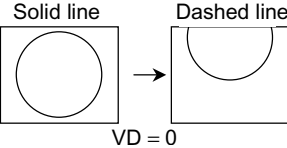
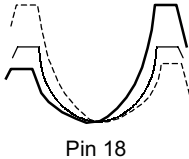
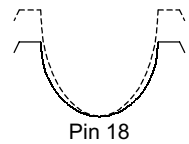
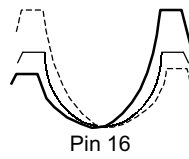
Slave Address: 8DH (10001101)

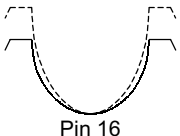
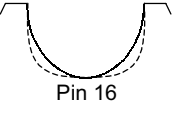
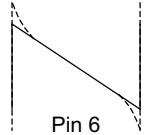
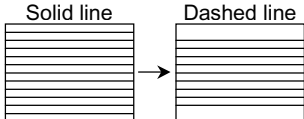
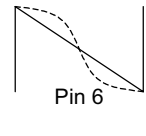
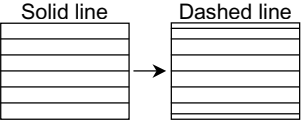
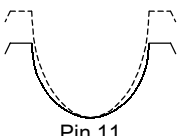
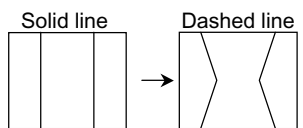
|   | D7<br>MSB | D6   | D5  | D4   | D3      | D2     | D1    | D0<br>LSB |
|---|-----------|------|-----|------|---------|--------|-------|-----------|
| 0 | V DF      | H DF | LVP | V NF | V GUARD | EW OUT | V OUT | POR       |

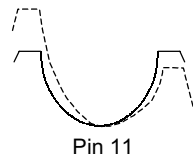
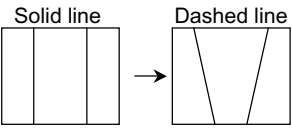
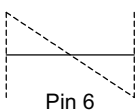
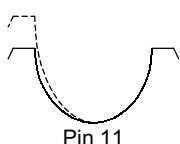
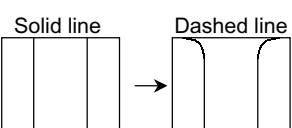
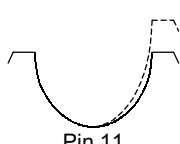
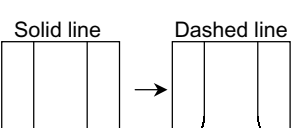
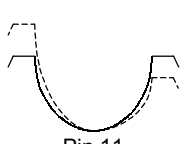
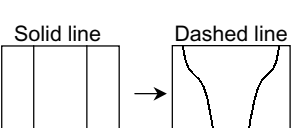
**Bus Control Function**
**Write Mode**

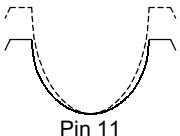
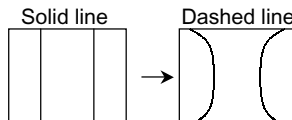
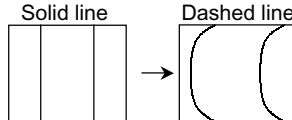
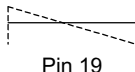
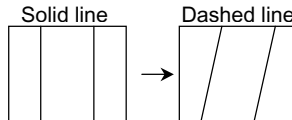
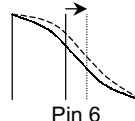
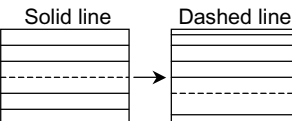
| Register Name/Number of Bits | Function Explanation                                                                                                           | Output Change                                                                         | Picture Change                                                                        | Preset              |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------|
| PICTURE HEIGHT/7             | Adjusts the picture height.<br>0000000: min      1000000: center      1111111: max                                             |    |    | center<br>(1000000) |
| VD/1                         | Changes V-DRIVE mode<br>0: DC-coupling      1: AC-coupling                                                                     | —                                                                                     | —                                                                                     | DC-coupling<br>(0)  |
| PICTURE WIDTH/7              | Adjusts the picture width.<br>0000000: max      1000000: center      1111111: min<br>Sub-address 0C-D0 bit comes LSB.          |    |    | center<br>(1000000) |
| V SHIFT/2                    | Where VD = 0, sets DAC output level of pin 2 is set. Where VD = 1, sets DC level of V-DRIVE is adjusted.<br>00: min<br>11: max |   |   | min<br>(00)         |
| V LINEARITY/5                | Corrects the vertical linearity.<br>00000: min      10000: center      11111: max                                              |  |  | center<br>(10000)   |

| Register Name/Number of Bits | Function Explanation                                                                                                                                                                                       | Output Change                                                                                  | Picture Change                                                                       | Preset            |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------|
| V-EHT COMPENSATION/3         | Adjusts the compensated rate for the V-DRIVE by EHT-IN (pin 3).<br>000: min                      111: max                                                                                                  | <br>Pin 6   |   | min<br>(000)      |
| ANALOG V-BLK STOP PHASE/5    | Sets the analog blanking stop phase on pin 20. Inputs the output from pin 20 to an external BLK-IN of synchronization IC.<br>00000: min                      10000: center                      11111: max | —                                                                                              |   | center<br>(10000) |
| H-EHT COMPENSATION/3         | Adjusts the compensated rate for the EW output by EHT-IN (pin 3).<br>000: min                      111: max                                                                                                | <br>Pin 11  |   | min<br>(000)      |
| ANALOG V-BLK START PHASE/5   | Sets the analog blanking start phase on pin 20. Inputs the output from pin 20 to external BLK-IN of synchronization IC.<br>00000: min                      10000: center                      11111: max   | —                                                                                              |  | center<br>(10000) |
| V-RAMP LIMIT LEVEL/4         | Sets the V-ramp slice level.<br>0000: OFF                      0001: min                      1111: max<br><br>Sub-address 05-D0 bit comes MSB.                                                            | <br>Pin 6 | —                                                                                    | OFF<br>(0000)     |

| Register Name/Number of Bits | Function Explanation                                                                                                                              | Output Change                                                                                         | Picture Change                                                                                                             | Preset           |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------|
| V CENTERING/7                | Where VD = 0, DC level of V-DRIVE is adjusted. Where VD = 1, DAC output level of pin 2 is set.<br>0000000: min<br>1000000: center<br>1111111: max | <br>Pin 6 (VD = 0) | <br>Solid line<br>Dashed line<br>VD = 0 | min<br>(0000000) |
| V-DF PHASE/4                 | Adjusts the phase of vertical dynamic focus output.<br>0000: min                      1000: center                      1111: max                 | <br>Pin 18         | —                                                                                                                          | center<br>(1000) |
| V-DF AMPLITUDE/4             | Adjusts the amplitude of vertical dynamic focus output.<br>0000: min                      1000: center                      1111: max             | <br>Pin 18         | —                                                                                                                          | center<br>(1000) |
| H-DF PHASE/4                 | Adjusts the phase of horizontal dynamic focus output.<br>0000: min                      1000: center                      1111: max               | <br>Pin 16        | —                                                                                                                          | center<br>(1000) |

| Register Name/Number of Bits | Function Explanation                                                                                    | Output Change                                                                                   | Picture Change                                                                                                       | Preset           |
|------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------|
| H-DF AMPLITUDE/4             | Adjusts the amplitude of horizontal dynamic focus output.<br>0000: min      1000: center      1111: max | <br>Pin 16   | —                                                                                                                    | center<br>(1000) |
| H-DF CURVE/4                 | Adjusts the curve characteristic of horizontal dynamic focus output.<br>0000: max      1111: min        | <br>Pin 16   | —                                                                                                                    | max<br>(0000)    |
| V INTEGRAL CORRECTION/4      | Adjusts the vertical integral correction.<br>0000: min      1111: max                                   | <br>Pin 6    | <br>Solid line      Dashed line   | min<br>(0000)    |
| V AGC/2                      | Sets the AGC gain for V-ramp.<br>00: HIGH      11: LOW                                                  | —                                                                                               | —                                                                                                                    | HIGH<br>(00)     |
| V S CORRECTION/6             | Adjusts the vertical S correction.<br>000000: min      100000: center      111111: max                  | <br>Pin 6  | <br>Solid line      Dashed line | min<br>(000000)  |
| EW PARABOLA/6                | Adjusts the amplitude of EW output.<br>000000: min      111111: max                                     | <br>Pin 11 | <br>Solid line      Dashed line | min<br>(000000)  |

| Register Name/Number of Bits | Function Explanation                                                                                                                                                                     | Output Change                                                                                   | Picture Change                                                                                                       | Preset              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------|
| EW TRAPEZIUM/7               | Adjusts the EW trapezium correction.<br>0000000: min      1000000: center      1111111: max<br><br>Note: When this data will be changed, V symmetry characteristic will be also changed. | <br>Pin 11   | <br>Solid line      Dashed line   | center<br>(1000000) |
| V STOP/1                     | Switches over the V-stop mode.<br>0: Normal      1: V stop/BLK stop                                                                                                                      | <br>Pin 6    | —                                                                                                                    | Normal<br>(0)       |
| EW TOP CORNER/5              | Adjusts the EW top corner correction.<br>00000: max      10000: center      11111: min                                                                                                   | <br>Pin 11   | <br>Solid line      Dashed line   | center<br>(10000)   |
| EW BOTTOM CORNER/5           | Adjusts the EW bottom corner correction.<br>00000: max      10000: center      11111: min                                                                                                | <br>Pin 11  | <br>Solid line      Dashed line  | center<br>(10000)   |
| EW S CORRECTION/5            | Adjusts the EW S correction.<br>00000: max      10000: center      11111: min                                                                                                            | <br>Pin 11 | <br>Solid line      Dashed line | center<br>(10000)   |

| Register Name/Number of Bits | Function Explanation                                                                                                                                                                     | Output Change                                                                        | Picture Change                                                                       | Preset               |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------|
| EW CORNER/5                  | Adjusts the EW corner correction.<br>00000: max      10000: center      11111: min                                                                                                       |   |   | center<br>(10000)    |
| CENTER PARABOLA/4            | Adjusts the parabola-component amplitude.<br>0000: max      1000: center      1111: min                                                                                                  |   |   | center<br>(1000)     |
| CENTER SAW/4                 | Adjusts the saw-component amplitude.<br>0000: min      1000: center      1111: max                                                                                                       |   |   | center<br>(1000)     |
| V SYMMETRY/8                 | Corrects the vertical symmetry.<br>00000000: min      10000000: center      11111111: max<br><br>Note: When this data will be changed, EW trapezium characteristic will be also changed. |  |  | center<br>(10000000) |

**Read Mode**

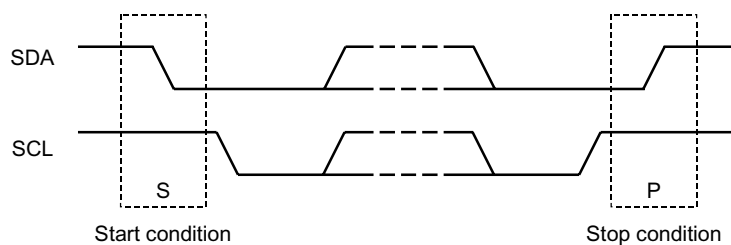
| Register Name/Number of Bits | Function Explanation                                                                                                           |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| V DF/1                       | Vertical dynamic focus output self-check.<br>0: NG (no)                      1: OK (yes)                                       |
| H DF/1                       | Horizontal dynamic focus output self-check.<br>0: NG (no)                      1: OK (yes)                                     |
| LVP/1                        | LVP (low voltage protection) is detected.<br>0: OFF (pin 17 is high)    1: ON (pin 17 is low)                                  |
| V NF/1                       | V-NF input self-check.<br>0: NG (no)                      1: OK (yes)                                                          |
| V GUARD/1                    | Detects abnormality on V-NF input. If abnormal, Pin 20 goes high.<br>0: OFF (normal)              1: ON (abnormal)             |
| EW OUT/1                     | EW output self-check.<br>0: NG (no)                      1: OK (yes)                                                           |
| V OUT/1                      | V-DRIVE output self-check.<br>0: NG (no)                      1: OK (yes)                                                      |
| POR/1                        | Power-on reset.<br>Responds 0 at first reading after power-on, 1 at second reading.<br>0: Resister preset            1: Normal |

## Data Transfer Formats via I<sup>2</sup>C Bus

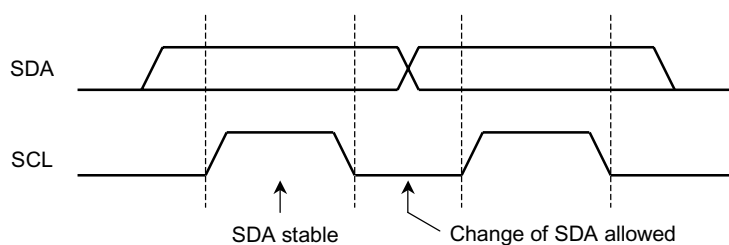
### Slave address

| A6 | A5 | A4 | A3 | A2 | A1 | A0 | W/R |
|----|----|----|----|----|----|----|-----|
| 1  | 0  | 0  | 0  | 1  | 1  | 0  | 0/1 |

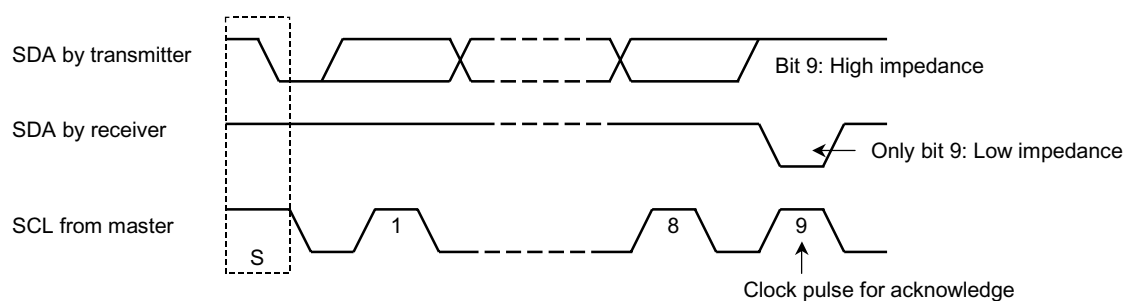
### Start and Stop Condition



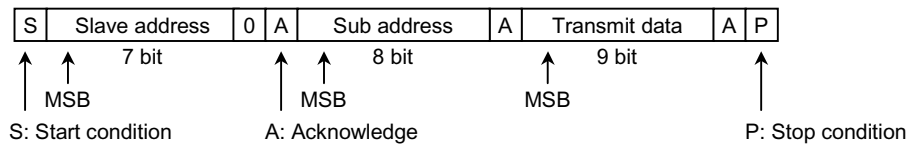
### Bit Transfer



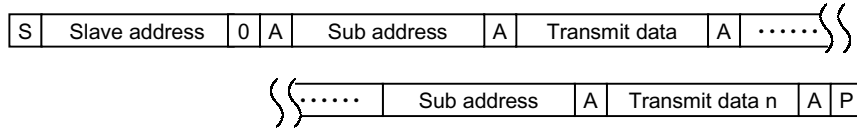
### Acknowledge



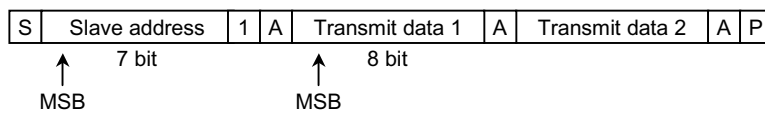
## Data Transmit Format 1



## Data Transmit Format 2



## Data Receive Format



At the moment of the first acknowledge, the master transmitter becomes a master receiver and the slave transmitter. This acknowledge is still generated by this slave.

The Stop condition is generated by the master.

Details are provided in the Philips I<sup>2</sup>C specifications.

## Optional Data Transmit Format: Automatic Increment Mode



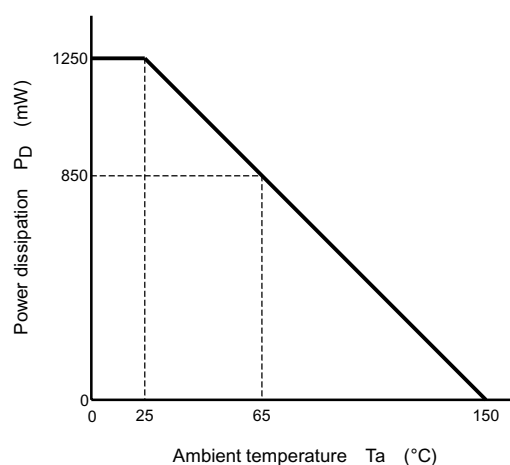
In this transmission method, data is set on automatically incremented sub-address from the specified sub-address.

Purchase of TOSHIBA I<sup>2</sup>C components conveys a license under the Philips I<sup>2</sup>C Patent Rights to use these components in an I<sup>2</sup>C system, provided that the system conforms to the I<sup>2</sup>C Standard Specification as defined by Philips.

## Maximum Ratings (Ta = 25°C)

| Characteristics                  | Symbol             | Rating  | Unit             |
|----------------------------------|--------------------|---------|------------------|
| Power Supply voltage             | V <sub>CCmax</sub> | 12      | V                |
| Input pin signal voltage         | e <sub>inmax</sub> | 9       | V <sub>p-p</sub> |
| Power dissipation                | P <sub>D</sub> (*) | 1250    | mW               |
| Power dissipation reduction rate | 1/θ <sub>ja</sub>  | -10     | mW/°C            |
| Operating temperature            | T <sub>opr</sub>   | -20~65  | °C               |
| Storage temperature              | T <sub>stg</sub>   | -55~150 | °C               |

\*: See the figure below.



**Figure 1 PD – Ta Curve**

## Recommended Operating Conditions

| Characteristics                   | Description  | Min | Typ. | Max | Unit |
|-----------------------------------|--------------|-----|------|-----|------|
| Supply voltage (V <sub>CC</sub> ) | Pin 7        | 8.5 | 9.0  | 9.5 | V    |
| EHT input voltage                 | Pin 3        | 0.0 | —    | 9.0 | V    |
| FBP input amplitude               | Pin 12       | 4.0 | —    | 9.0 | V    |
| FBP input frequency               | Pin 12       | 28  | —    | 45  | kHz  |
| FBP input width                   | Pin 12       | 2.5 | —    | —   | μs   |
| SCL/SDA pull-up voltage           | Pins 13 & 14 | 3.0 | 5.0  | 9.0 | V    |
| LVP input voltage                 | Pin 17       | 0.0 | —    | 9.0 | V    |
| V input amplitude                 | Pin 21       | 3.0 | —    | 9.0 | V    |
| V input frequency                 | Pin 21       | 50  | —    | 120 | Hz   |
| V input width                     | Pin 21       | 2.5 | —    | —   | μs   |
| EW PWM input current              | Pin 8        | —   | —    | 5   | mA   |

**Electrical Characteristics (unless otherwise specified,  $V_{CC} = 9\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )**
**Current dissipation**

| Pin Name | Symbol   | Test Circuit | Min | Typ. | Max | Unit |
|----------|----------|--------------|-----|------|-----|------|
| $V_{CC}$ | $I_{CC}$ | —            | 40  | 50.8 | 62  | mA   |

**Pin voltages**

| Pin No. | Pin Name  | Symbol | Test Circuit | Min  | Typ. | Max  | Unit |
|---------|-----------|--------|--------------|------|------|------|------|
| 1       | $V_{REF}$ | $V_1$  | —            | 4.60 | 4.88 | 5.10 | V    |
| 5       | V -DC REF | $V_5$  | —            | 4.60 | 4.88 | 5.10 | V    |

**AC Characteristics**

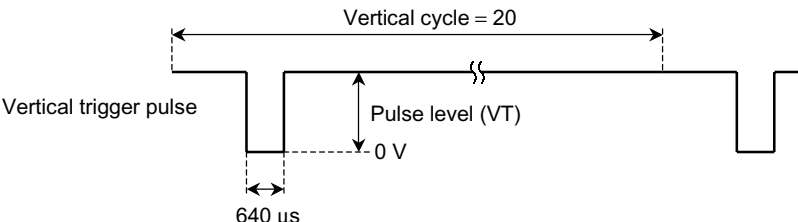
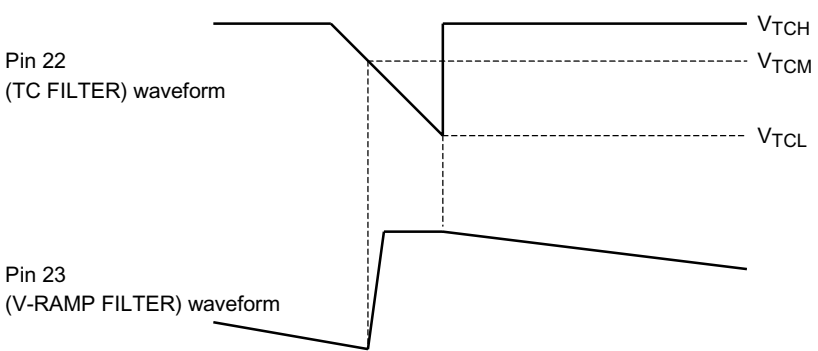
| Characteristics                                              | Symbol        | Test Circuit | Test Condition | Min  | Typ. | Max  | Unit      |
|--------------------------------------------------------------|---------------|--------------|----------------|------|------|------|-----------|
| Vertical trigger input shaped voltage                        | $V_{TH}$      | —            | (Note 1)       | 1.2  | 1.5  | 1.7  | V         |
| Timing pulse output voltage                                  | $V_{TCH}$     | —            | (Note 2)       | 3.90 | 4.10 | 4.30 | V         |
|                                                              | $V_{TCM}$     | —            |                | 2.95 | 3.15 | 3.35 |           |
|                                                              | $V_{TCL}$     | —            |                | 0.97 | 1.07 | 1.17 |           |
| Vertical ramp wave amplitude                                 | $V_{RMP}$     | —            | (Note 3)       | 1.65 | 1.75 | 1.85 | $V_{p-p}$ |
| Vertical drive amplification                                 | GV            | —            | (Note 4)       | 21   | 24   | 27   | dB        |
| Vertical drive output voltage                                | $V_{4H}$      | —            | (Note 5)       | 2.5  | 3.3  | 4.1  | V         |
|                                                              | $V_{4L}$      | —            |                | 0.00 | 0.00 | 0.30 |           |
| Vertical NF signal amplitude                                 | $V_{NFM}$     | —            | (Note 6)       | 1.65 | 1.85 | 2.05 | $V_{p-p}$ |
| Vertical phase adjustment 1 (V shift) change amount          | $V_{DC} (80)$ | —            | (Note 7)       | 3.00 | 3.55 | 4.10 | V         |
|                                                              | $V_{DC} (83)$ | —            |                | 5.65 | 6.20 | 6.75 |           |
|                                                              | $V_{DC}$      | —            |                | 2.30 | 2.65 | 3.00 |           |
| Vertical phase adjustment 2 (V centering) change amount      | $V_{DD} (00)$ | —            | (Note 8)       | 1.64 | 1.82 | 2.00 | V         |
|                                                              | $V_{DD} (FE)$ | —            |                | 2.87 | 3.16 | 3.45 |           |
|                                                              | $V_{DD}$      | —            |                | 1.30 | 1.45 | 1.60 |           |
| Vertical amplitude adjustment (picture height) change amount | $V_{NFL}$     | —            | (Note 9)       | 0.85 | 1.00 | 1.15 | $V_{p-p}$ |
|                                                              | $V_{NFH}$     | —            |                | 2.55 | 2.75 | 2.95 |           |
|                                                              | $V_{NFP}$     | —            |                | 43   | 48   | 53   | %         |
|                                                              | $V_{NFN}$     | —            |                | -53  | -48  | -43  |           |
| Vertical linearity correction (V linearity) change amount    | $V_1 (00)$    | —            | (Note 10)      | 0.90 | 1.06 | 1.22 | $V_{p-p}$ |
|                                                              | $V_2 (00)$    | —            |                | 0.69 | 0.81 | 0.93 |           |
|                                                              | $V_1 (80)$    | —            |                | 0.82 | 0.96 | 1.10 |           |
|                                                              | $V_2 (80)$    | —            |                | 0.77 | 0.91 | 1.05 |           |
|                                                              | $V_1 (F8)$    | —            |                | 0.73 | 0.86 | 0.99 |           |
|                                                              | $V_2 (F8)$    | —            |                | 0.85 | 1.00 | 1.15 |           |
|                                                              | $V_{LIN}$     | —            |                | 9.5  | 10.5 | 12.5 | %         |
| Vertical symmetry (V symmetry) change amount                 | $V_{VT} (00)$ | —            | (Note 11)      | 4.60 | 4.95 | 5.20 | V         |
|                                                              | $V_{VT} (FF)$ | —            |                | 5.40 | 5.70 | 6.00 |           |
|                                                              | $V_{VT}$      | —            |                | 0.67 | 0.76 | 0.85 |           |

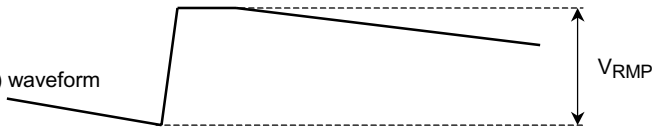
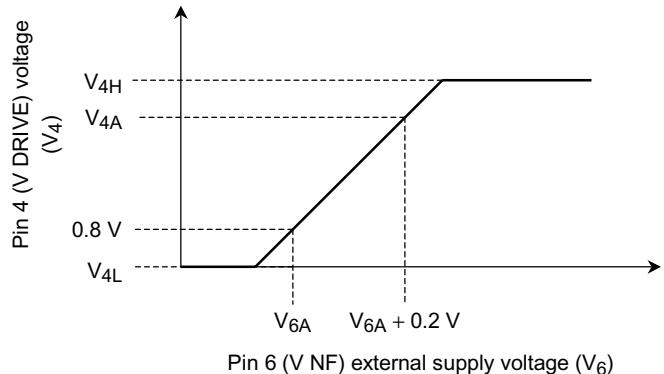
| Characteristics                                                        | Symbol               | Test Circuit | Test Condition | Min   | Typ.  | Max   | Unit             |
|------------------------------------------------------------------------|----------------------|--------------|----------------|-------|-------|-------|------------------|
| Vertical S correction (V S correction) change amount                   | V <sub>S</sub> (80)  | —            | (Note 12)      | 1.92  | 2.26  | 2.60  | V <sub>p-p</sub> |
|                                                                        | V <sub>S</sub> (BF)  | —            |                | 1.27  | 1.50  | 1.73  |                  |
|                                                                        | V <sub>S</sub>       | —            |                | 17    | 21    | 25    | %                |
| Vertical integral correction (V <sub>J</sub> correction) change amount | V <sub>J</sub> (80)  | —            | (Note 13)      | 1.54  | 1.82  | 2.10  | V <sub>p-p</sub> |
|                                                                        | V <sub>J</sub> (8F)  | —            |                | 1.62  | 1.90  | 2.18  |                  |
|                                                                        | V <sub>J</sub>       | —            |                | 3.0   | 4.0   | 5.2   | %                |
| Vertical EHT compensation (V EHT compensation) change amount           | V <sub>E</sub> (80)  | —            | (Note 14)      | 1.58  | 1.86  | 2.14  | V <sub>p-p</sub> |
|                                                                        | V <sub>E</sub> (87)  | —            |                | 1.44  | 1.69  | 1.94  |                  |
|                                                                        | V <sub>EHT</sub>     | —            |                | 8.5   | 10.0  | 11.5  | %                |
| EHT input dynamic range                                                | V <sub>EHL</sub>     | —            | (Note 15)      | 1.9   | 2.4   | 2.9   | V                |
|                                                                        | V <sub>EHH</sub>     | —            |                | 5.9   | 6.4   | 6.9   |                  |
| Horizontal amplitude adjustment (picture width) change amount          | V <sub>EV</sub> (00) | —            | (Note 16)      | 5.20  | 6.15  | 7.10  | V                |
|                                                                        | V <sub>EV</sub> (FC) | —            |                | 1.30  | 1.55  | 1.80  |                  |
|                                                                        | V <sub>EV</sub>      | —            |                | 4.20  | 4.60  | 5.00  |                  |
| Parabola amplitude adjustment (EW parabola) change amount              | V <sub>PB</sub> (00) | —            | (Note 17)      | 0.00  | 0.02  | 0.06  | V <sub>p-p</sub> |
|                                                                        | V <sub>PB</sub> (20) | —            |                | 1.6   | 2.0   | 2.3   |                  |
|                                                                        | V <sub>PB</sub> (3F) | —            |                | 2.8   | 3.3   | 3.8   |                  |
|                                                                        | V <sub>PB</sub>      | —            |                | 2.8   | 3.3   | 3.8   |                  |
| EW top corner correction (EW top corner) change amount                 | V <sub>TC</sub> (00) | —            | (Note 18)      | 2.3   | 2.8   | 3.2   | V <sub>p-p</sub> |
|                                                                        | V <sub>TC</sub> (F8) | —            |                | 0.9   | 1.2   | 1.4   |                  |
|                                                                        | V <sub>TCP</sub>     | —            |                | 32    | 40    | 46    | %                |
|                                                                        | V <sub>TCN</sub>     | —            |                | −46   | −40   | −32   |                  |
| EW bottom corner correction (EW bottom corner) change amount           | V <sub>BC</sub> (00) | —            | (Note 19)      | 2.4   | 2.8   | 3.2   | V <sub>p-p</sub> |
|                                                                        | V <sub>BC</sub> (F8) | —            |                | 0.9   | 1.2   | 1.4   |                  |
|                                                                        | V <sub>BCP</sub>     | —            |                | 32    | 45    | 55    | %                |
|                                                                        | V <sub>BCN</sub>     | —            |                | −52   | −40   | −35   |                  |
| EW corner correction change amount                                     | V <sub>M</sub> (00)  | —            | (Note 20)      | 2.4   | 2.8   | 3.2   | V <sub>p-p</sub> |
|                                                                        | V <sub>M</sub> (F8)  | —            |                | 0.8   | 1.1   | 1.4   |                  |
|                                                                        | V <sub>MP</sub>      | —            |                | 40    | 47    | 57    | %                |
|                                                                        | V <sub>MN</sub>      | —            |                | −52   | −42   | −32   |                  |
| EW S correction change amount                                          | V <sub>S</sub> (00)  | —            | (Note 21)      | 2.2   | 2.6   | 3.0   | V <sub>p-p</sub> |
|                                                                        | V <sub>S</sub> (F8)  | —            |                | 1.0   | 1.4   | 1.6   |                  |
|                                                                        | V <sub>SP</sub>      | —            |                | 28    | 35    | 40    | %                |
|                                                                        | V <sub>SN</sub>      | —            |                | −40   | −32   | −27   |                  |
| EW trapezium correction change amount                                  | V <sub>ET</sub> (00) | —            | (Note 22)      | 2.4   | 2.7   | 3.0   | ms               |
|                                                                        | V <sub>ET</sub> (FE) | —            |                | −3.0  | −2.7  | −2.4  |                  |
|                                                                        | V <sub>ETP</sub>     | —            |                | 11.0  | 13.5  | 16.0  | %                |
|                                                                        | V <sub>ETN</sub>     | —            |                | −16.0 | −13.5 | −11.0 |                  |
| Horizontal EHT compensation (H-EHT compensation) DC change amount      | V <sub>HC</sub> (80) | —            | (Note 23)      | 3.0   | 3.6   | 4.2   | V                |
|                                                                        | V <sub>HC</sub> (87) | —            |                | 4.0   | 4.7   | 5.4   |                  |
|                                                                        | V <sub>HC</sub>      | —            |                | 1.0   | 1.2   | 1.4   |                  |
| Parabola amplitude EHT compensation                                    | EHT (1)              | —            | (Note 24)      | 1.55  | 1.90  | 2.20  | V <sub>p-p</sub> |
|                                                                        | EHT (7)              | —            |                | 1.65  | 2.00  | 2.30  |                  |
|                                                                        | EHT                  | —            |                | 2.7   | 4.0   | 5.3   | %                |

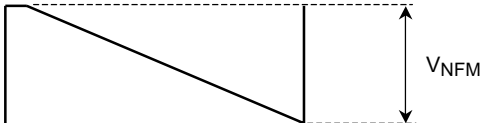
| Characteristics                                                     | Symbol               | Test Circuit | Test Condition | Min  | Typ. | Max  | Unit             |
|---------------------------------------------------------------------|----------------------|--------------|----------------|------|------|------|------------------|
| AGC operating current                                               | V <sub>X</sub> (00)  | —            | (Note 25)      | 20   | 35   | 50   | $\mu$ A          |
|                                                                     | V <sub>X</sub> (40)  | —            |                | 45   | 65   | 85   |                  |
|                                                                     | V <sub>X</sub> (80)  | —            |                | 250  | 340  | 430  |                  |
|                                                                     | V <sub>X</sub> (C0)  | —            |                | 535  | 715  | 895  |                  |
| Sawtooth correction (cent saw)<br>maximum amplitude                 | V <sub>N</sub> (8F)  | —            | (Note 26)      | 4.3  | 5.0  | 5.7  | V <sub>p-p</sub> |
|                                                                     | V <sub>N</sub> (80)  | —            |                | 4.3  | 5.0  | 5.7  |                  |
| Parabola correction (cent par)<br>maximum amplitude                 | V <sub>P</sub> (F8)  | —            | (Note 27)      | 1.9  | 2.2  | 2.5  | V <sub>p-p</sub> |
|                                                                     | V <sub>P</sub> (08)  | —            |                | 1.9  | 2.2  | 2.5  |                  |
| Horizontal DF amplitude adjustment<br>(H DF amp)                    | V <sub>HD</sub> (80) | —            | (Note 28)      | 2.1  | 2.8  | 3.3  | V <sub>p-p</sub> |
|                                                                     | V <sub>HD</sub> (88) | —            |                | 2.4  | 3.1  | 4.0  |                  |
|                                                                     | V <sub>HD</sub> (8F) | —            |                | 2.6  | 3.4  | 4.3  |                  |
|                                                                     | V <sub>HDP</sub>     | —            |                | 7    | 10   | 13   | %                |
|                                                                     | V <sub>HDN</sub>     | —            |                | −15  | −12  | −7   |                  |
| Horizontal DF phase adjustment<br>(H DF phase)                      | T <sub>HD</sub> (08) | —            | (Note 29)      | −6.0 | −4.4 | −2.0 | V <sub>p-p</sub> |
|                                                                     | T <sub>HD</sub> (F8) | —            |                | 2.0  | 4.4  | 6.0  |                  |
|                                                                     | T <sub>HD</sub>      | —            |                | 6.5  | 8.8  | 10.0 |                  |
| Horizontal DF bathtub (H DF curve)<br>adjustment                    | T <sub>HB</sub> (00) | —            | (Note 30)      | 32.0 | 42.0 | 52.0 | $\mu$ s          |
|                                                                     | T <sub>HB</sub> (F0) | —            |                | 21.0 | 31.0 | 41.0 |                  |
|                                                                     | T <sub>HB</sub>      | —            |                | 2.5  | 4.5  | 6.5  |                  |
| Vertical DF amplitude adjustment<br>(V DF amp)                      | V <sub>VD</sub> (80) | —            | (Note 31)      | 2.05 | 2.40 | 2.75 | V <sub>p-p</sub> |
|                                                                     | V <sub>VD</sub> (88) | —            |                | 2.30 | 2.70 | 3.10 |                  |
|                                                                     | V <sub>VD</sub> (8F) | —            |                | 2.55 | 3.00 | 3.45 |                  |
|                                                                     | V <sub>VDP</sub>     | —            |                | 7    | 10   | 13   | %                |
|                                                                     | V <sub>VDN</sub>     | —            |                | −15  | −10  | −7   |                  |
| Vertical DF phase adjustment<br>(V DF phase)                        | T <sub>VD</sub> (08) | —            | (Note 32)      | −2.5 | −2.0 | −1.5 | ms               |
|                                                                     | T <sub>VD</sub> (F8) | —            |                | 1.5  | 2.0  | 2.5  |                  |
|                                                                     | T <sub>VD</sub>      | —            |                | 3.4  | 4.0  | 4.6  |                  |
| LVP detection voltage                                               | V <sub>LVP</sub>     | —            | (Note 33)      | 4.7  | 5.0  | 5.3  | V                |
| Vertical guard detection voltage                                    | V <sub>VGH</sub>     | —            | (Note 34)      | 7.0  | 7.3  | 7.6  | V                |
|                                                                     | V <sub>VGL</sub>     | —            |                | 2.1  | 2.4  | 2.7  |                  |
| Vertical guard detection output current<br>(BLK-OUT output current) | I <sub>20</sub>      | —            | (Note 35)      | 450  | 630  | 750  | $\mu$ A          |
| Vertical centering DAC output voltage<br>1 (V centering)            | V <sub>CA</sub> (00) | —            | (Note 36)      | 0.20 | 0.50 | 0.55 | V                |
|                                                                     | V <sub>CA</sub> (FE) | —            |                | 4.7  | 5.0  | 5.3  |                  |
| Vertical centering DAC output voltage<br>2 (V shift)                | V <sub>CD</sub> (80) | —            | (Note 37)      | 0.20 | 0.60 | 0.80 | V                |
|                                                                     | V <sub>CD</sub> (83) | —            |                | 4.7  | 5.0  | 5.3  |                  |
| Vertical centering change amount in V<br>STOP mode                  | V <sub>Y</sub> (00)  | —            | (Note 38)      | 1.7  | 1.9  | 2.1  | V                |
|                                                                     | V <sub>Y</sub> (80)  | —            |                | 2.25 | 2.50 | 2.75 |                  |
|                                                                     | V <sub>Y</sub> (FE)  | —            |                | 2.7  | 3.0  | 3.3  |                  |
| Vertical NF signal amplitude at DC<br>coupling                      | V <sub>DFB</sub>     | —            | (Note 39)      | 0.85 | 0.95 | 1.05 | V <sub>p-p</sub> |
| Vertical NF center voltage at DC<br>coupling                        | V <sub>C</sub>       | —            | (Note 40)      | 2.25 | 2.50 | 2.75 | V                |

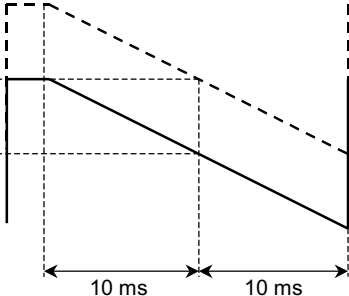
| Characteristics                                                  | Symbol               | Test Circuit | Test Condition | Min  | Typ. | Max  | Unit             |
|------------------------------------------------------------------|----------------------|--------------|----------------|------|------|------|------------------|
| Vertical ramp cut level                                          | V <sub>CHH</sub>     | —            | (Note 41)      | 20.0 | 26.0 | 32.0 | %                |
|                                                                  | V <sub>CLH</sub>     | —            |                | 26.0 | 32.1 | 38.0 |                  |
| Analog blanking phase                                            | BLHL                 | —            | (Note 42)      | 5.05 | 5.90 | 6.75 | ms               |
|                                                                  | BLHM                 | —            |                | 2.30 | 2.70 | 3.10 |                  |
|                                                                  | BLHH                 | —            |                | —    | 0.00 | 0.10 |                  |
|                                                                  | BLLL                 | —            |                | 5.10 | 6.00 | 6.90 |                  |
|                                                                  | BLLM                 | —            |                | 2.05 | 2.40 | 3.00 |                  |
|                                                                  | BLLH                 | —            |                | —    | 0.00 | 0.10 |                  |
| Parabola amplitude adjustment (EW parabola) change amount at PWM | V <sub>PP</sub> (00) | —            | (Note 43)      | 0.00 | 0.02 | 0.06 | V <sub>p-p</sub> |
|                                                                  | V <sub>PP</sub> (20) | —            |                | 1.6  | 2.00 | 2.30 |                  |
|                                                                  | V <sub>PP</sub> (3F) | —            |                | 2.80 | 3.30 | 3.80 |                  |
|                                                                  | V <sub>PP</sub>      | —            |                | 2.80 | 3.30 | 3.80 |                  |

## Test Condition

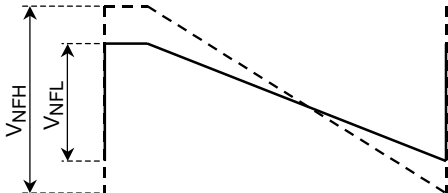
| Note No. | Parameter                             | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                        |
|----------|---------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                       | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                   |
|          |                                       | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                   |
| 1        | Vertical trigger input shaped voltage | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <p>(1) Input vertical trigger pulse (figure below) to pin <math>V_{IN}</math>.</p> <p>(2) Increase vertical trigger pulse level (VT) from 0 V<sub>P-P</sub>. When timing pulse is output to pin 22 (TC FILTER), measure vertical trigger pulse level <math>V_{TH}</math>.</p>  |
| 2        | Timing pulse output voltage           | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <p>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.</p> <p>Pulse level (VT) = 3.0 V</p> <p>(2) Measure pin 22 (TC FILTER) voltages (<math>V_{TCH}</math>, <math>V_{TCM}</math>, <math>V_{TCL}</math>) as shown in the figure below.</p>                           |

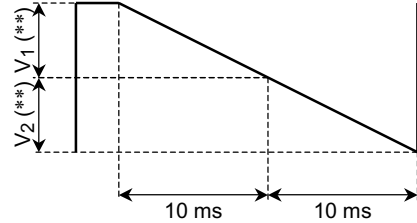
| Note No. | Parameter                    | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                              | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |                              | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3        | Vertical ramp wave amplitude | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <p>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</p> <p>(2) Measure pin 23 (V-RAMP FILTER) amplitude <math>V_{RMP}</math> as shown in the figure below.</p> <p>Pin 23 (V-RAMP FILTER) waveform</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4        | Vertical drive amplification | OFF            | C   | ON  | OFF | B    | ON   | A    | A    | <p>(1) No signal input to pin <math>V_{IN}</math>.</p> <p>(2) Set VD (V-DRIVE mode switch) (sub-address: 00) to AC-Coupling mode (data: 81).</p> <p>(3) Connect external power supply (<math>V_6</math>) to TP6 (V fb).</p> <p>(4) Change external power supply (<math>V_6</math>) until pin 4 (V DRIVE) voltage is 0.8 V. The voltage is made <math>V_{6A}</math>.</p> <p>(5) Measure pin 4 voltage (<math>V_{4A}</math>) when the external power supply voltage is <math>V_{6A} + 0.2\text{ V}</math>.</p> <p>(6) Calculate the drive amplification (GV) using the following formula.</p>  <p>Pin 4 (V DRIVE) voltage (<math>V_4</math>)</p> <p>Pin 6 (V NF) external supply voltage (<math>V_6</math>)</p> $GV = 20 \log \left[ \frac{V_{4A} - 0.8}{0.2} \right]$ |

| Note No. | Parameter                     | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-------------------------------|----------------|-----|-----|-----|------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                               | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          |                               | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 5        | Vertical drive output voltage | OFF            | C   | ON  | OFF | B    | ON   | A    | A    | (1) Measure $V_{4H}$ using the figure for Note 4.<br>(2) Measure $V_{4L}$ using the figure for Note 4.                                                                                                                                                                                                                                                                                                                                                                                                                |
| 6        | Vertical NF signal amplitude  | OFF            | C   | ON  | OFF | B    | ON   | A    | A    | (1) Input vertical trigger pulse to pin $V_{IN}$ .<br>Pulse level ( $V_T$ ) = 3.0 V<br>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).<br>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).<br>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).<br>(5) Set V SHIFT (sub-address: 01) data to 82.<br>(6) Measure Pin 6 (V NF) vertical sawtooth amplitude $V_{NFM}$ .<br><div></div> |

| Note No. | Parameter                                           | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-----------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                     | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          |                                                     | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 7        | Vertical phase adjustment 1 (V shift) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Set V SHIFT (sub-address: 01) to minimum (data: 80) and measure <math>V_{DC}</math> (80) as shown in the figure below.</div><div>(6) Set V SHIFT (sub-address: 01) to maximum (data: 83) and measure <math>V_{DC}</math> (83) as shown in the figure below.</div><div>(7) Calculate change amount <math>V_{DC}</math> using the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div><div></div></div><div><math>V_{DC} = V_{DC} (83) - V_{DC} (80)</math></div></div></div> |

| Note No. | Parameter                                               | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------|---------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                         | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|          |                                                         | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 8        | Vertical phase adjustment 2 (V centering) change amount | ON             | A   | OFF | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin V<sub>IN</sub>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Set V CENTERING (sub-address: 05) to minimum (data: 00) and measure V<sub>DD</sub> (00) as shown in the figure below.</div><div>(6) Set V CENTERING (sub-address: 05) to maximum (data: FE) and measure V<sub>DD</sub> (FE) as shown in the figure below.</div><div>(7) Calculate change amount V<sub>DD</sub> using the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div><div></div></div><div>V<sub>DD</sub> = V<sub>DD</sub> (FE) – V<sub>DD</sub> (00)</div></div></div> |

| Note No. | Parameter                                                    | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|--------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                              | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          |                                                              | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 9        | Vertical amplitude adjustment (picture height) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Set V SHIFT (sub-address: 01) data to 82.</div><div>(6) Set PICTURE HEIGHT (sub-address: 00) to minimum (data: 01) and measure Pin 6 (V NF) amplitude (<math>V_{NFL}</math>).</div><div>(7) Set PICTURE HEIGHT (sub-address: 00) to maximum (data: FF) and measure Pin 6 (V NF) amplitude (<math>V_{NFH}</math>).</div><div>(8) Determine variable ranges (<math>V_{NFP}</math>, <math>V_{NFN}</math>) using the following formulas.</div><div><div>Pin 6<br/>(V NF) waveform</div></div><div><div><math>V_{NFP} = \frac{V_{NFH} - V_{NFM}}{V_{NFM}} \times 100,</math></div><div><math>V_{NFN} = \frac{V_{NFL} - V_{NFM}}{V_{NFM}} \times 100</math></div></div></div> |

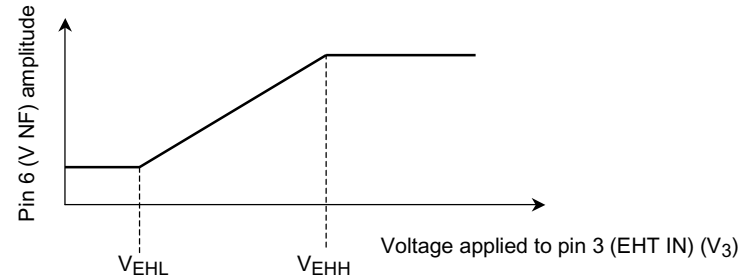
| Note No. | Parameter                                                 | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|-----------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                           | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          |                                                           | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 10       | Vertical linearity correction (V linearity) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin V<sub>IN</sub>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Set V SHIFT (sub-address: 01) data to 82.</div><div>(6) Set V LINEARITY (sub-address: 02) to minimum (data: 00) and measure V<sub>1</sub> (00) and V<sub>2</sub> (00) as shown in the figure below.</div><div>(7) Set V LINEARITY (sub-address: 02) to center (data: 80) and measure V<sub>1</sub> (80) and V<sub>2</sub> (80) as shown in the figure below.</div><div>(8) Set V LINEARITY (sub-address: 02) to maximum (data: F8) and measure V<sub>1</sub> (F8) and V<sub>2</sub> (F8) as shown in the figure below.</div><div>(9) Calculate maximum correction V<sub>LIN</sub> from measured result using the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div><div></div></div><div><math display="block">V_{LIN} = \frac{V_1(00) - V_1(F8) + V_2(F8) - V_2(00)}{2 \times [V_1(80) + V_2(80)]} \times 100</math></div></div></div> |

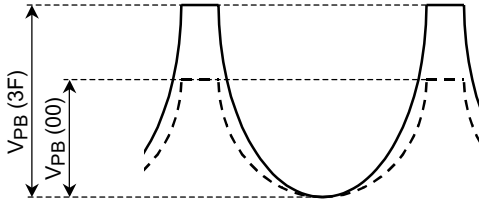
| Note No. | Parameter                                    | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|----------------------------------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                              | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                              | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 11       | Vertical symmetry (V symmetry) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Set V SHIFT (sub-address: 01) data to 82.</div><div>(6) Set V SYMMETRY (sub-address: 11) to minimum (data: 00) and measure Pin 6 (V NF) voltage <math>V_{VT}</math> (00).</div><div>(7) Set V SYMMETRY (sub-address: 11) to maximum (data: FF) and measure Pin 6 (V NF) voltage <math>V_{VT}</math> (FF).</div><div>(8) Calculate change amount <math>V_{VT}</math> using the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div></div><div><math>V_{VT} = V_{VT} (FF) - V_{VT} (00)</math></div></div></div> |

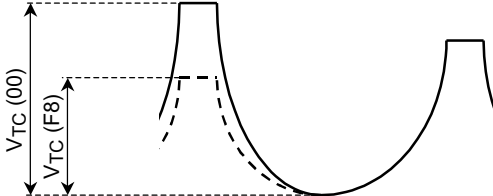
| Note No. | Parameter                                            | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                      | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |                                                      | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 12       | Vertical S correction (V S correction) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin V<sub>IN</sub>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 88).</div><div>(4) Set V SHIFT (sub-address: 01) to 82.</div><div>(5) Set V S CORRECTION (sub-address: 09) to minimum (data: 80) and measure V<sub>S</sub> (80) as shown in the figure below.</div><div>(6) Set V S CORRECTION (sub-address: 09) to maximum (data: BF) and measure V<sub>S</sub> (BF) as shown in the figure below.</div><div>(7) Calculate maximum correction V<sub>S</sub> using measured result and the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div></div><div><math display="block">V_S = \frac{V_S(80) - V_S(8F)}{V_S(80) + V_S(8F)} \times 100</math></div></div></div> |

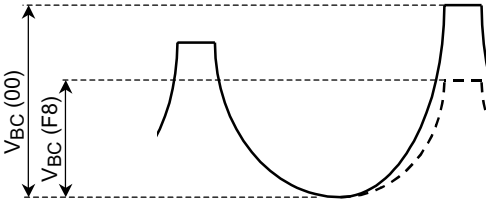
| Note No. | Parameter                                                      | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|----------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          |                                                                | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 13       | Vertical integral correction ( $V_f$ correction) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(4) Set V SHIFT (sub-address: 01) to 82.</div><div>(5) Set V INTEGRAL CORRECTION (sub-address: 08) to minimum (data: 80) and measure <math>V_f</math> (80) as shown in the figure below.</div><div>(6) Set V INTEGRAL CORRECTION (sub-address: 08) to maximum (data: 8F) and measure <math>V_f</math> (8F) as shown in the figure below.</div><div>(7) Calculate maximum correction <math>V_f</math> from measured result using the following formula.</div><div><div><div>Pin 6<br/>(V NF) waveform</div><div><div><math>V_f</math><br/>(8F)</div><div><math>V_f</math><br/>(80)</div></div></div><div><math display="block">V_f = \frac{V_f(8F) - V_f(80)}{V_f(80)} \times 100</math></div></div></div> |

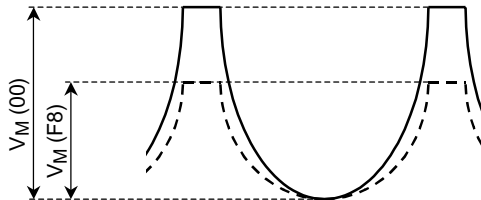
| Note No. | Parameter                                                    | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|--------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                              | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          |                                                              | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 14       | Vertical EHT compensation (V EHT compensation) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | (1) Input vertical trigger pulse to pin V <sub>IN</sub> .<br>Pulse level (VT) = 3.0 V<br>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).<br>(3) Set V SHIFT (sub-address: 01) data to 82.<br>(4) Connect external power supply (DC voltage = 0 V) to pin 3 (EHT IN).<br>(5) Set V-EHT COMPENSATION (sub-address: 02) to minimum (data: 80) and measure Pin 6 (V NF) amplitude V <sub>E</sub> (80).<br>(6) Set V-EHT COMPENSATION (sub-address: 02) to maximum (data: 87) and measure Pin 6 (V NF) amplitude V <sub>E</sub> (87).<br>(7) Calculate change amount V <sub>EHT</sub> using the following formula.<br>$V_{EHT} = \frac{V_E(80) - V_E(87)}{V_E(87)} \times 100$ |

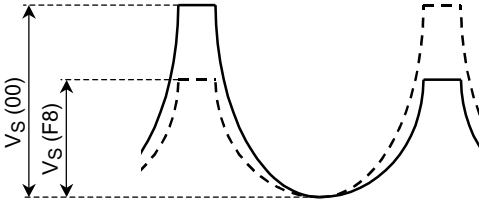
| Note No. | Parameter                                                     | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------|---------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                               | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|          |                                                               | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 15       | EHT input dynamic range                                       | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Set V SHIFT (sub-address: 01) data to 82.</div><div>(4) Connect external power supply <math>V_3</math> to pin 3 (EHT IN).</div><div>(5) Set V-EHT COMPENSATION (sub-address: 02) to maximum (data: 87).</div><div>(6) Change external power supply <math>V_3</math> from 1 to 7 V and monitor Pin 6 (V NF) amplitude.</div><div>(7) When Pin 6 (V NF) amplitude changes, measure <math>V_3</math> voltages <math>V_{EHL}</math> and <math>V_{EHH}</math>.</div></div> <div></div> |
| 16       | Horizontal amplitude adjustment (picture width) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set EW PARABOLA (sub-address: 0A) to minimum (data: 00).</div><div>(3) Set PICTURE WIDTH to maximum ( (sub-address: 01, data: FC) and (sub-address: 0C, data: 81) ) and measure Pin 10 (EW FD) voltage <math>V_{EV}</math> (FC).</div><div>(4) Set PICTURE WIDTH to minimum ( (sub-address: 01, data: 00) and (sub-address: 0C, data: 80) ) and measure Pin 10 (EW FD) voltage <math>V_{EV}</math> (00).</div><div>(5) Calculate change amount <math>V_{EV}</math> using the following formula.<br/><math display="block">V_{EV} = V_{EV}(\text{FC}) - V_{EV}(\text{00})</math></div></div>                                                 |

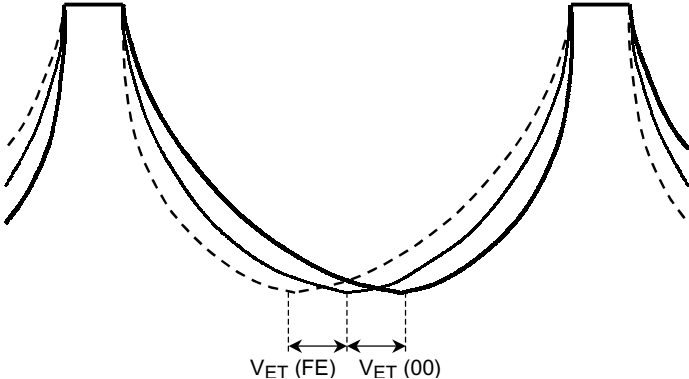
| Note No. | Parameter                                                 | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-----------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                           | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          |                                                           | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 17       | Parabola amplitude adjustment (EW parabola) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set PICTURE WIDTH (sub-address: 01) to maximum (data: FC).</div><div>(3) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(4) Set EW PARABOLA (sub-address: 0A) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_{PB}</math> (00).</div><div>(5) Set EW PARABOLA (sub-address: 0A) to center (data: 20) and measure Pin 10 (EW FD) amplitude <math>V_{PB}</math> (20).</div><div>(6) Set EW PARABOLA (sub-address: 0A) to maximum (data: 3F) and measure Pin 10 (EW FD) amplitude <math>V_{PB}</math> (3F).</div><div>(7) Calculate change amount <math>V_{PB}</math> using the following formula.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math>V_{PB} = V_{PB} (3F) - V_{PB} (00)</math></div></div> |

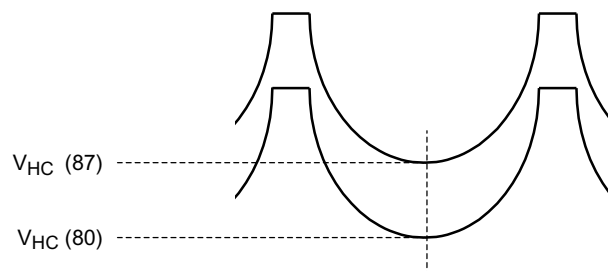
| Note No. | Parameter                                              | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|--------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                        | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                        | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 18       | EW top corner correction (EW top corner) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(3) Set EW PARABOLA (sub-address: 0A) to center (data: 20).</div><div>(4) Set EW TOP CORNER (sub-address: 0C) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_{TC}</math> (00).</div><div>(5) Set EW TOP CORNER (sub-address: 0C) to maximum (data: F8) and measure Pin 10 (EW FD) amplitude <math>V_{TC}</math> (F8).</div><div>(6) Calculate change amounts <math>V_{TCP}</math> and <math>V_{TCN}</math> using the following formulas.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math display="block">V_{TCP} = \frac{V_{TC} (00) - V_{PB} (20)}{V_{PB} (20)} \times 100</math></div><div><math display="block">V_{TCN} = \frac{V_{TC} (F8) - V_{PB} (20)}{V_{PB} (20)} \times 100</math></div></div> |

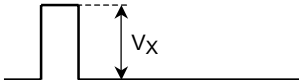
| Note No. | Parameter                                                    | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|--------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                              | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|          |                                                              | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 19       | EW bottom corner correction (EW bottom corner) change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(3) Set EW PARABOLA (sub-address: 0A) to center (data: 20).</div><div>(4) Set EW BTM CORNER (sub-address: 0D) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_{BC}</math> (00).</div><div>(5) Set EW BTM CORNER (sub-address: 0D) to maximum (data: F8) and measure Pin 10 (EW FD) amplitude <math>V_{BC}</math> (F8).</div><div>(6) Calculate change amounts <math>V_{BCP}</math> and <math>V_{BCN}</math> using the following formulas.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math display="block">V_{BCP} = \frac{V_{BC} (00) - V_{PB} (20)}{V_{PB} (20)} \times 100</math></div><div><math display="block">V_{BCN} = \frac{V_{BC} (F8) - V_{PB} (20)}{V_{PB} (20)} \times 100</math></div></div> |

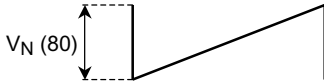
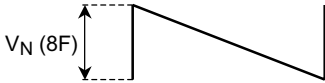
| Note No. | Parameter                          | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------|------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                    | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          |                                    | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 20       | EW corner correction change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(3) Set EW PARABOLA (sub-address: 0A) to center (data: 20).</div><div>(4) Set EW CORNER (sub-address: 0F) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_M</math> (00).</div><div>(5) Set EW CORNER (sub-address: 0F) to maximum (data: F8) and measure Pin 10 (EW FD) amplitude <math>V_M</math> (F8).</div><div>(6) Calculate change amounts <math>V_{MP}</math> and <math>V_{MN}</math> using the following formulas.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math display="block">V_{MP} = \frac{V_M(00) - V_{PB}(20)}{V_{PB}(20)} \times 100</math></div><div><math display="block">V_{MN} = \frac{V_M(F8) - V_{PB}(20)}{V_{PB}(20)} \times 100</math></div></div> |

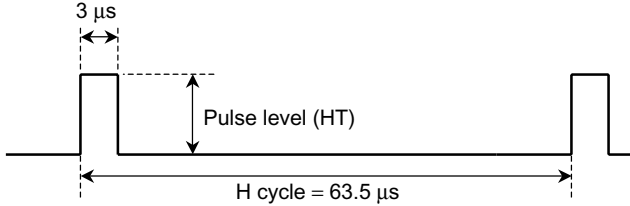
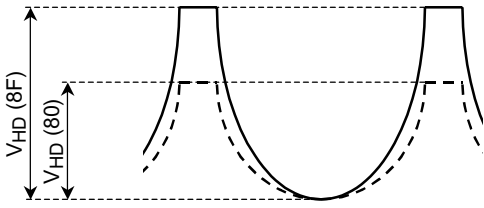
| Note No. | Parameter                     | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                               | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                               | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 21       | EW S correction change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(3) Set EW PARABOLA (sub-address: 0A) to center (data: 20).</div><div>(4) Set S CORRECTION (sub-address: 0E) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_S</math> (00).</div><div>(5) Set S CORRECTION (sub-address: 0E) to maximum (data: F8) and measure Pin 10 (EW FD) amplitude <math>V_S</math> (F8).</div><div>(6) Calculate change amounts <math>V_{SP}</math> and <math>V_{SN}</math> using the following formulas.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math display="block">V_{SP} = \frac{V_S(00) - V_{PB}(20)}{V_{PB}(20)} \times 100</math></div><div><math display="block">V_{SN} = \frac{V_S(F8) - V_{PB}(20)}{V_{PB}(20)} \times 100</math></div></div> |

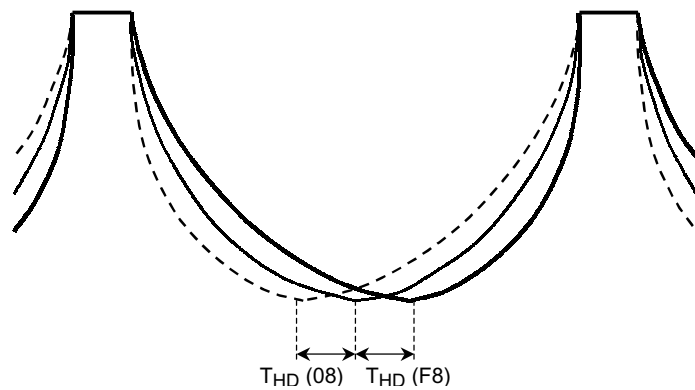
| Note No. | Parameter                             | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------|---------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                       | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          |                                       | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 22       | EW trapezium correction change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div>(1) Input vertical trigger pulse to pin V<sub>IN</sub>.<br/>Pulse level (VT) = 3.0 V</div> <div>(2) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div> <div>(3) Set EW PARABOLA (sub-address: 0A) to maximum (data: 3F).</div> <div>(4) Set EW TRAPEZIUM (sub-address: 0B) to minimum (data: 00) and measure Pin 10 (EW FD) phase V<sub>ET</sub> (00).</div> <div>(5) Set EW TRAPEZIUM (sub-address: 0B) to maximum (data: FE) and measure Pin 10 (EW FD) phase V<sub>ET</sub> (FE).</div> <div>(6) Calculate change amounts V<sub>ETP</sub> and V<sub>ETN</sub> using the following formulas.</div> <div><p>Pin 10 (EW FD) waveform</p><div><math display="block">V_{ETP} = \frac{V_{ET} (FE)}{20} \times 100</math><math display="block">V_{ETN} = \frac{V_{ET} (00)}{20} \times 100</math></div></div> |

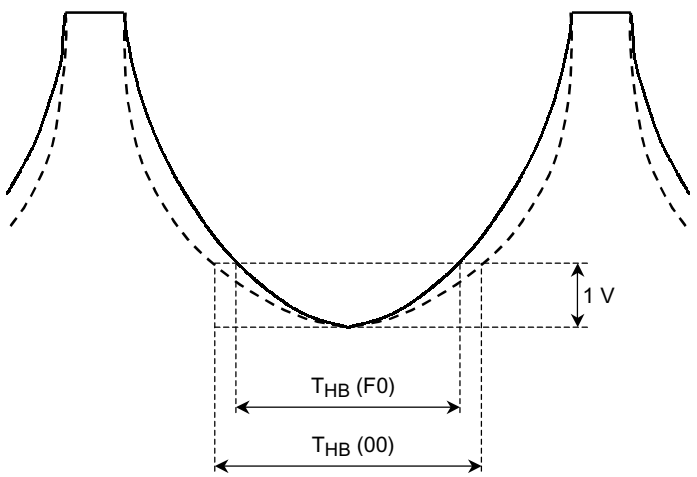
| Note No. | Parameter                                                         | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------|-------------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                   | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|          |                                                                   | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 23       | Horizontal EHT compensation (H-EHT compensation) DC change amount | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Apply external power supply (DC voltage = 1 V) to pin 3 (EHT IN).</div><div>(3) Set H-EHT COMPENSATION (sub-address: 03) to minimum (data: 80) and measure Pin 10 (EW FD) amplitude <math>V_{HC}</math> (80).</div><div>(4) Set H-EHT COMPENSATION (sub-address: 03) to maximum (data: 87) and measure Pin 10 (EW FD) amplitude <math>V_{HC}</math> (87).</div><div>(5) Calculate change amount <math>V_{HC}</math> using the following formula.</div><div><p>Pin 10 (EW FD) waveform</p><p><math>V_{HC} = V_{HC} (87) - V_{HC} (80)</math></p></div></div> |

| Note No. | Parameter                           | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------|-------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                     | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|          |                                     | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 24       | Parabola amplitude EHT compensation | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | (1) Input vertical trigger pulse to pin V <sub>IN</sub> .<br>Pulse level (VT) = 3.0 V<br><br>(2) Apply external power supply V <sub>3</sub> to pin 3 (EHT IN).<br><br>(3) Set EW PARABOLA (sub-address: 0A) to center (data: 20).<br><br>(4) Set external power supply V <sub>3</sub> to 7 V and measure Pin 10 (EW FD) amplitude EHT (7).<br><br>(5) Set external power supply V <sub>3</sub> to 1 V and measure Pin 10 (EW FD) amplitude EHT (1).<br><br>(6) Calculate change amount EHT using the following formula.<br><br>$\text{EHT} = \frac{\text{EHT (7)} - \text{EHT (1)}}{\text{EHT (7)}} \times 100$                                                                                                                                                                                                                     |
| 25       | AGC operating current               | OFF            | B   | ON  | OFF | B    | ON   | A    | B    | (1) Input vertical trigger pulse to pin V <sub>IN</sub> .<br>Pulse level (VT) = 3.0 V<br><br>(2) When V AGC (sub-address: 09) is switched, set data to 00, 40, 80, and C0 and measure the following.<br><br>(3) Connect external power supply 2 V through 2 kΩ to pin 24 (AGC FILTER).<br><br>(4) Monitor pin 24 (AGC FILTER) and measure pulse levels V <sub>X</sub> (00), V <sub>X</sub> (40), V <sub>X</sub> (80), and V <sub>X</sub> (C0) as shown in the figure below.<br><br>(5) Calculate output currents (I <sub>X</sub> (00), I <sub>X</sub> (40), I <sub>X</sub> (80), I <sub>X</sub> (C0) using the following formula.<br><br><div><p>Pin 24 (AGC FILTER) waveform</p></div><br><br>$I_X (**) = \frac{V_X (**)}{2 \text{ k}\Omega}$ |

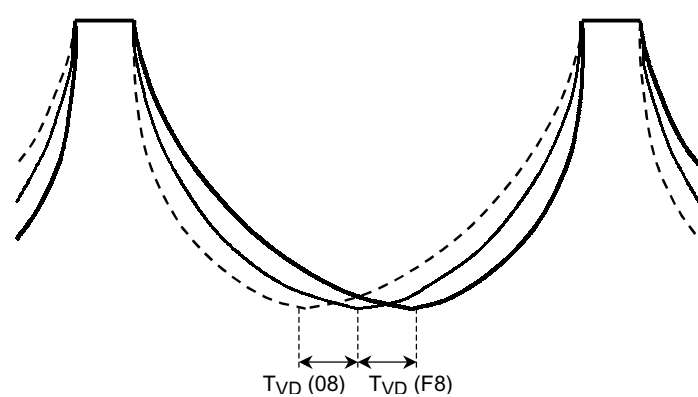
| Note No. | Parameter                                        | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|--------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                  | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                                  | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 26       | Sawtooth correction (cent saw) maximum amplitude | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set CENTER SAW (sub-address: 10) to maximum (data: 8F) and measure pin 19 (CENT OUT) amplitude <math>V_N</math> (8F).</div><div>(3) Set CENTER SAW (sub-address: 10) to minimum (data: 80) and measure pin 19 (CENT OUT) amplitude <math>V_N</math> (80).</div><div><div><div>Pin 19 (CENT OUT) waveform</div></div><div><div>Pin 19 (CENT OUT) waveform</div></div></div></div>             |
| 27       | Parabola correction (cent par) maximum amplitude | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set CENTER PARABOLA (sub-address: 10) to maximum (data: F8) and measure pin 19 (CENT OUT) amplitude <math>V_P</math> (F8).</div><div>(3) Set CENTER PARABOLA (sub-address: 10) to minimum (data: 08) and measure pin 19 (CENT OUT) amplitude <math>V_P</math> (08).</div><div><div><div>Pin 19 (CENT OUT) waveform</div></div><div><div>Pin 19 (CENT OUT) waveform</div></div></div></div> |

| Note No. | Parameter                                     | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|-----------------------------------------------|----------------|-----|-----|-----|------|------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                               | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |                                               | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 28       | Horizontal DF amplitude adjustment (H DF amp) | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <p>(1) Input horizontal trigger pulse (figure below) to pin 12 (FBP IN).<br/>Pulse level (HT) = 4.0 V</p>  <p>(2) Set H-DF CURVE (sub-address: 08) to maximum (data: F0).</p> <p>(3) Set H-DF AMPLITUDE (sub-address: 07) to minimum (data: 80) and measure pin 16 (H-DF OUT) amplitude <math>V_{HD}</math> (80).</p> <p>(4) Set H-DF AMPLITUDE (sub-address: 07) to center (data: 88) and measure pin 16 (H-DF OUT) amplitude <math>V_{HD}</math> (88).</p> <p>(5) Set H-DF AMPLITUDE (sub-address: 07) to maximum (data: 8F) and measure pin 16 (H-DF OUT) amplitude <math>V_{HD}</math> (8F).</p> <p>(6) Calculate change amounts <math>V_{HDP}</math> and <math>V_{HDN}</math> using the following formulas.</p>  <p>Pin 16 (H-DF OUT) waveform</p> $V_{HDP} = \frac{V_{HD} (8F) - V_{HD} (88)}{V_{HD} (88)} \times 100$ $V_{HDN} = \frac{V_{HD} (80) - V_{HD} (88)}{V_{HD} (88)} \times 100$ |

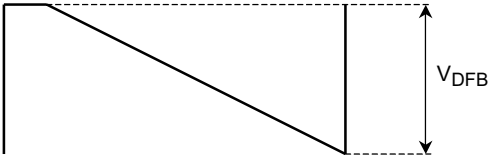
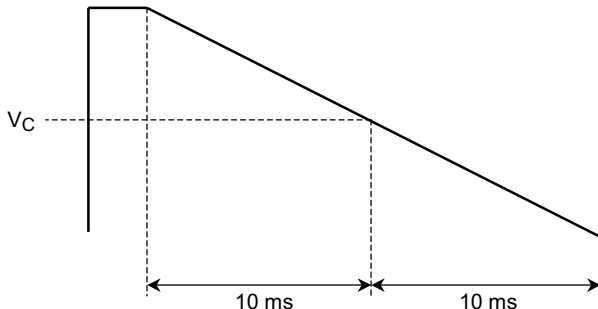
| Note No. | Parameter                                   | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------|---------------------------------------------|----------------|-----|-----|-----|------|------|------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                             | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          |                                             | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 29       | Horizontal DF phase adjustment (H DF phase) | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input horizontal trigger pulse (figure below) to pin 12 (FBP IN).<br/>Pulse level (HT) = 4.0 V</div><div>(2) Set H-DF CURVE (sub-address: 08) to maximum (data: F0).</div><div>(3) Set H-DF PHASE (sub-address: 07) to minimum (data: 08) and measure pin 16 (H-DF OUT) phase T<sub>HD</sub> (08).</div><div>(4) Set H-DF PHASE (sub-address: 07) to maximum (data: F8) and measure pin 16 (H-DF OUT) phase T<sub>HD</sub> (F8).</div><div>(5) Calculate change amount T<sub>HD</sub> using the following formula.</div><div></div><div>Pin 16 (H-DF OUT) waveform</div><div>T<sub>HD</sub> = T<sub>HD</sub> (08) + T<sub>HD</sub> (F8)</div></div> |

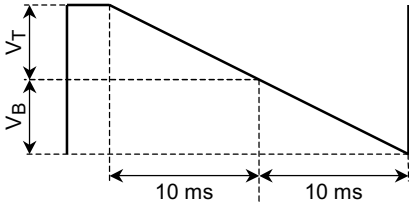
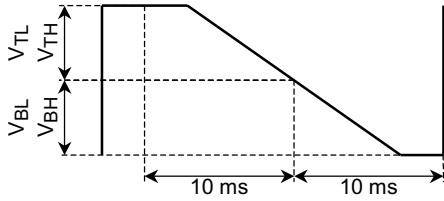
| Note No. | Parameter                                     | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------|-----------------------------------------------|----------------|-----|-----|-----|------|------|------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                               | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|          |                                               | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 30       | Horizontal DF bathtub (H DF curve) adjustment | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input horizontal trigger pulse (figure below) to pin 12 (FBP IN).<br/>Pulse level (HT) = 4.0 V</div><div>(2) Set H-DF AMPLITUDE (sub-address: 07) to maximum (data: 8F).</div><div>(3) Set H-DF CURVE (sub-address: 08) to minimum (data: 00) and measure pin 16 (H-DF OUT) phase T<sub>HB</sub> (00).</div><div>(4) Set H-DF CURVE (sub-address: 08) to maximum (data: F0) and measure pin 16 (H-DF OUT) phase T<sub>HB</sub> (F0).</div><div>(5) Calculate change amount T<sub>HB</sub> using the following formula.</div><div></div><div>Pin 16 (H-DF OUT) waveform</div><div><math display="block">T_{HB} = \frac{T_{HB} (00) - T_{HB} (F0)}{2}</math></div></div> |

| Note No. | Parameter                                   | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|---------------------------------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                             | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|          |                                             | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 31       | Vertical DF amplitude adjustment (V DF amp) | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set V-DF AMPLITUDE (sub-address: 06) to minimum (data: 80) and measure pin 18 (V-DF OUT) amplitude <math>V_{VD}</math> (80).</div><div>(3) Set V-DF AMPLITUDE (sub-address: 06) to center (data: 88) and measure pin 18 (V-DF OUT) amplitude <math>V_{VD}</math> (88).</div><div>(4) Set V-DF AMPLITUDE (sub-address: 06) to maximum (data: 8F) and measure pin 18 (V-DF OUT) amplitude <math>V_{VD}</math> (8F).</div><div>(5) Calculate change amounts <math>V_{VDP}</math> and <math>V_{VDN}</math> using the following formulas.</div></div><div><p>Pin 18 (V-DF OUT) waveform</p><div><math display="block">V_{VDP} = \frac{V_{VD} (80) - V_{VD} (88)}{V_{VD} (88)} \times 100</math><math display="block">V_{VDN} = \frac{V_{VD} (8F) - V_{VD} (88)}{V_{VD} (88)} \times 100</math></div></div></div> |

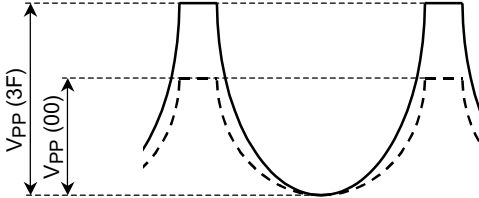
| Note No. | Parameter                                 | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-------------------------------------------|----------------|-----|-----|-----|------|------|------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                           | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|          |                                           | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 32       | Vertical DF phase adjustment (V DF phase) | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set V-DF PHASE (sub-address: 06) to minimum (data: 08) and measure pin 18 (V-DF OUT) phase <math>T_{VD}</math> (08).</div><div>(3) Set V-DF PHASE (sub-address: 06) to maximum (data: F8) and measure pin 18 (V-DF OUT) phase <math>T_{VD}</math> (F8).</div><div>(4) Calculate change amount <math>T_{VD}</math> using the following formula.</div><div></div><div>Pin 18 (V-DF OUT) waveform</div><div><math>T_{VD} = T_{VD} (08) + T_{VD} (F8)</math></div></div> |
| 33       | LVP detection voltage                     | OFF            | B   | ON  | OFF | B    | ON   | B    | A    | <div><div>(1) Connect external supply voltage <math>V_7</math> to TP17 (LVP).</div><div>(2) Decrease external supply voltage <math>V_7</math> from 9 V. When D5 data in Read mode changes from 0 to 1, measure TP17 voltage <math>V_{LVP}</math>.</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 34       | Vertical guard detection voltage          | OFF            | C   | ON  | OFF | B    | ON   | A    | A    | <div><div>(1) Connect external supply voltage <math>V_6</math> to TP6 (V NF).</div><div>(2) Switch to VD (sub-address: 00) to AC-Coupling mode (data: 81).</div><div>(3) Increase external supply voltage <math>V_6</math> from 5.5 V. When D3 data in Read mode changes from 0 to 1, measure TP6 voltage <math>V_{VGH}</math>.</div><div>(4) Decrease external supply voltage <math>V_6</math> from 5.5 V. When D3 data in Read mode changes from 0 to 1, measure TP6 voltage <math>V_{VGL}</math>.</div></div>                                                                                                                                                                        |

| Note No. | Parameter                                                        | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                      |
|----------|------------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                  | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|          |                                                                  | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| 35       | Vertical guard detection output current (BLK-OUT output current) | OFF            | C   | ON  | OFF | B    | ON   | A    | A    | (1) Connect external supply voltage V <sub>6</sub> = 8 V to TP6 (V NF).<br>(2) Measure pin 20 (BLK OUT) voltage V <sub>20</sub> and calculate output current (I <sub>20</sub> ) using the following formula.<br>$I_{20} = \frac{V_{20}}{10 \text{ k}\Omega}$                                                                                                                                                                                                                 |
| 36       | Vertical centering DAC output voltage 1 (V centering)            | OFF            | B   | ON  | OFF | B    | ON   | A    | A    | (1) Set VD (sub-address: 00) to AC-Coupling mode (data: 81).<br>(2) Set V CENTERING (sub-address: 05) to minimum (data: 00) and measure pin 2 (CENTER DAC) voltage V <sub>CA</sub> (00).<br>(3) Set V CENTERING (sub-address: 05) to maximum (data: FE) and measure pin 2 (CENTER DAC) voltage V <sub>CA</sub> (FE).                                                                                                                                                         |
| 37       | Vertical centering DAC output voltage 2 (V shift)                | OFF            | A   | OFF | OFF | B    | ON   | A    | A    | (1) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).<br>(2) Set V SHIFT (sub-address: 01) to minimum (data: 80) and measure pin 2 (CENTER DAC) voltage V <sub>CD</sub> (80).<br>(3) Set V SHIFT (sub-address: 01) to maximum (data: 83) and measure pin 2 (CENTER DAC) voltage V <sub>CD</sub> (83).                                                                                                                                                                 |
| 38       | Vertical centering change amount in V STOP mode                  | ON             | A   | OFF | OFF | B    | ON   | A    | A    | (1) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).<br>(2) Set to V STOP (sub-address: 0B, data: 81).<br>(3) Set V CENTERING (sub-address: 05) to minimum (data: 00) and measure Pin 6 (V NF) voltage V <sub>Y</sub> (00).<br>(4) Set V CENTERING (sub-address: 05) to center (data: 80) and measure Pin 6 (V NF) voltage V <sub>Y</sub> (80).<br>(5) Set V CENTERING (sub-address: 05) to minimum (data: FE) and measure Pin 6 (V NF) voltage V <sub>Y</sub> (FE). |

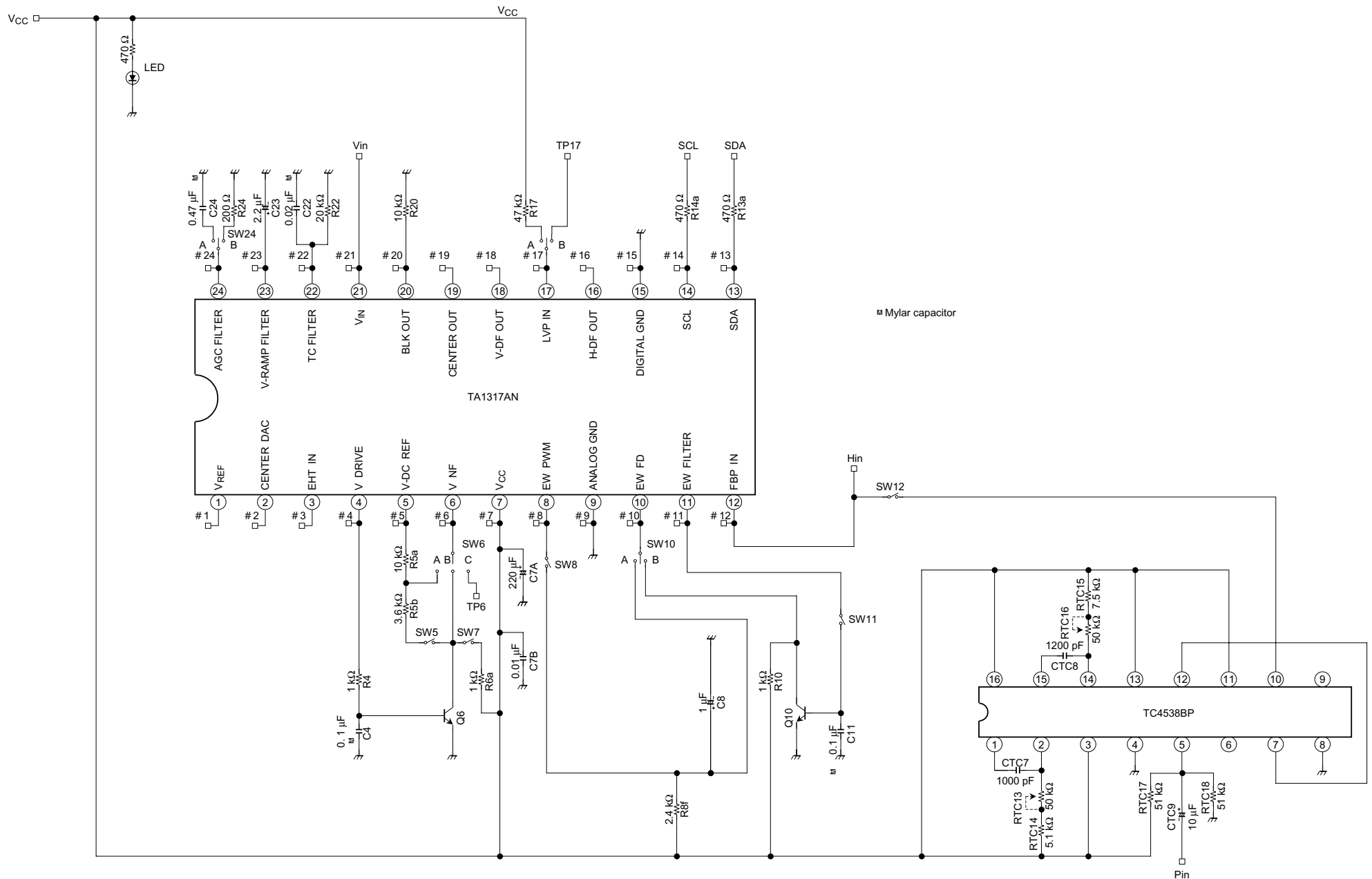
| Note No. | Parameter                                   | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                    |
|----------|---------------------------------------------|----------------|-----|-----|-----|------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                             | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                               |
|          |                                             | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                               |
| 39       | Vertical NF signal amplitude at DC coupling | ON             | A   | OFF | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).</div><div>(3) Measure vertical Pin 6 (V NF) sawtooth width <math>V_{DFB}</math>.</div><div><div>Pin 6<br/>(V NF) waveform</div></div></div>     |
| 40       | Vertical NF center voltage at DC coupling   | ON             | A   | OFF | OFF | B    | ON   | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).</div><div>(3) Measure center voltage <math>V_C</math> as shown in the figure below.</div><div><div>Pin 6<br/>(V NF) waveform</div></div></div> |

| Note No. | Parameter               | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|-------------------------|----------------|-----|-----|-----|------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                         | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          |                         | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 41       | Vertical ramp cut level | ON             | A   | OFF | OFF | B    | ON   | A    | A    | <div><div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 8F).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) Measure amplitudes <math>V_T</math> and <math>V_B</math> as shown in the figure below.</div><div><div><div>Pin 6<br/>(V NF) waveform</div></div><div><div>(6) Set V-RAMP to maximum and measure amplitudes <math>V_{TH}</math> and <math>V_{BH}</math>.<br/>Sub-address 04 data: 87<br/>Sub-address 05 data: 81</div><div><div><div>Pin 6<br/>(V NF) waveform</div></div><div><div>(7) Calculate cut levels using the following formulas.</div><div><div><math display="block">V_{CHL} = \frac{V_T - V_{TL}}{V_T} \times 100,</math><math display="block">V_{CLL} = \frac{V_B - V_{BL}}{V_B} \times 100,</math></div><div><div><math display="block">V_{CHH} = \frac{V_T - V_{TH}}{V_T} \times 100</math><math display="block">V_{CLH} = \frac{V_B - V_{BH}}{V_B} \times 100</math></div></div></div></div></div></div></div></div></div> |

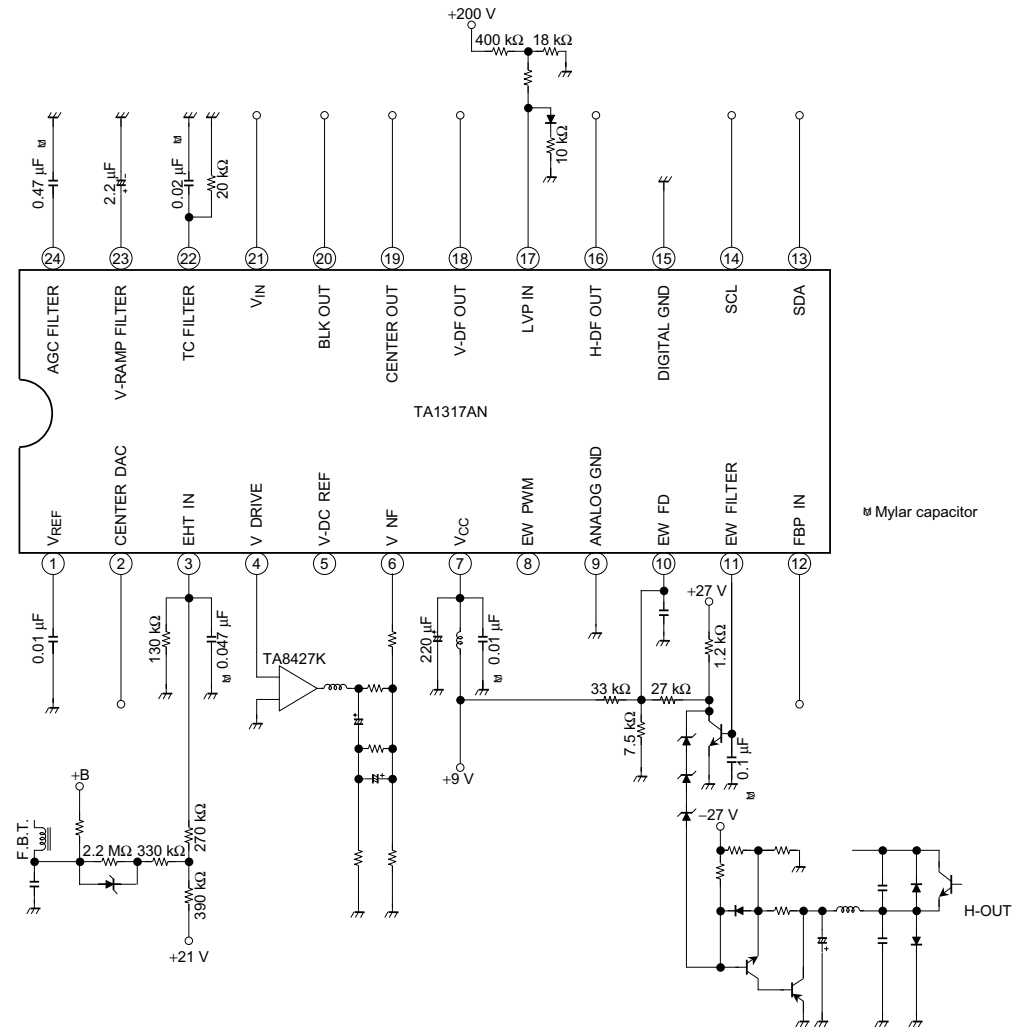
| Note No. | Parameter             | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, V <sub>CC</sub> = 9 V, Ta = 25 ± 3°C, data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------|-----------------------|----------------|-----|-----|-----|------|------|------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                       | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|          |                       | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 42       | Analog blanking phase | ON             | A   | OFF | OFF | B    | ON   | A    | A    | <div><div><div>(1) Input vertical trigger pulse to pin V<sub>IN</sub>.<br/>Pulse level (VT) = 3.0 V</div><div>(2) Set VD (sub-address: 00) to DC-Coupling mode (data: 80).</div><div>(3) Set V INTEGRAL CORRECTION (sub-address: 08) to center (data: 8F).</div><div>(4) Set V S CORRECTION (sub-address: 09) to center (data: A0).</div><div>(5) AS shown in the figure below, measure analog blanking phase in relation to pin 21 (V<sub>IN</sub>) under the following conditions.</div><div>(6) Set ANALOG V-BLK STOP PHASE (sub-address: 03) to minimum (data: 00) and measure blanking phase BLHL.</div><div>(7) Set ANALOG V-BLK STOP PHASE (sub-address: 03) to center (data: 80) and measure blanking phase BLHM.</div><div>(8) Set ANALOG V-BLK STOP PHASE (sub-address: 03) to maximum (data: F8) and measure blanking phase BLHH.</div><div>(9) Set ANALOG V-BLK START PHASE (sub-address: 04) to minimum (data: 00) and measure blanking phase BLLL.</div><div>(10)Set ANALOG V-BLK START PHASE (sub-address: 04) to center (data: 80) and measure blanking phase BLLM.</div><div>(11)Set ANALOG V-BLK START PHASE (sub-address: 04) to maximum (data: F8) and measure blanking phase BLLH.</div></div><div><div><div>Vertical trigger pulse</div><div>Pin 20 (BLK OUT)</div></div><div></div></div></div> |

| Note No. | Parameter                                                        | Test Condition |     |     |     |      |      |      |      | Test Method<br>(unless otherwise specified, $V_{CC} = 9\text{ V}$ , $T_a = 25 \pm 3^\circ\text{C}$ , data = preset values)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------------------------------------------------------------|----------------|-----|-----|-----|------|------|------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          |                                                                  | SW Mode        |     |     |     |      |      |      |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|          |                                                                  | SW5            | SW6 | SW7 | SW8 | SW10 | SW11 | SW17 | SW24 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 43       | Parabola amplitude adjustment (EW parabola) change amount at PWM | OFF            | B   | ON  | ON  | A    | OFF  | A    | A    | <div><div>(1) Input vertical trigger pulse to pin <math>V_{IN}</math>.<br/>Pulse level (<math>V_T</math>) = 3.0 V</div><div>(2) Set PICTURE WIDTH (sub-address: 01) to maximum (data: 8C).</div><div>(3) Apply external power supply (DC voltage = 7 V) to pin 3 (EHT IN).</div><div>(4) Set EW PARABOLA (sub-address: 0A) to minimum (data: 00) and measure Pin 10 (EW FD) amplitude <math>V_{PP}</math> (00).</div><div>(5) Set EW PARABOLA (sub-address: 0A) to center (data: 20) and measure Pin 10 (EW FD) amplitude <math>V_{PP}</math> (20).</div><div>(6) Set EW PARABOLA (sub-address: 0A) to maximum (data: 3F) and measure Pin 10 (EW FD) amplitude <math>V_{PP}</math> (3F).</div><div>(7) Calculate change amount <math>V_{PP}</math> using the following formula.</div><div></div><div>Pin 10 (EW FD) waveform</div><div><math>V_{PP} = V_{PP} (3F) - V_{PP} (00)</math></div></div> |

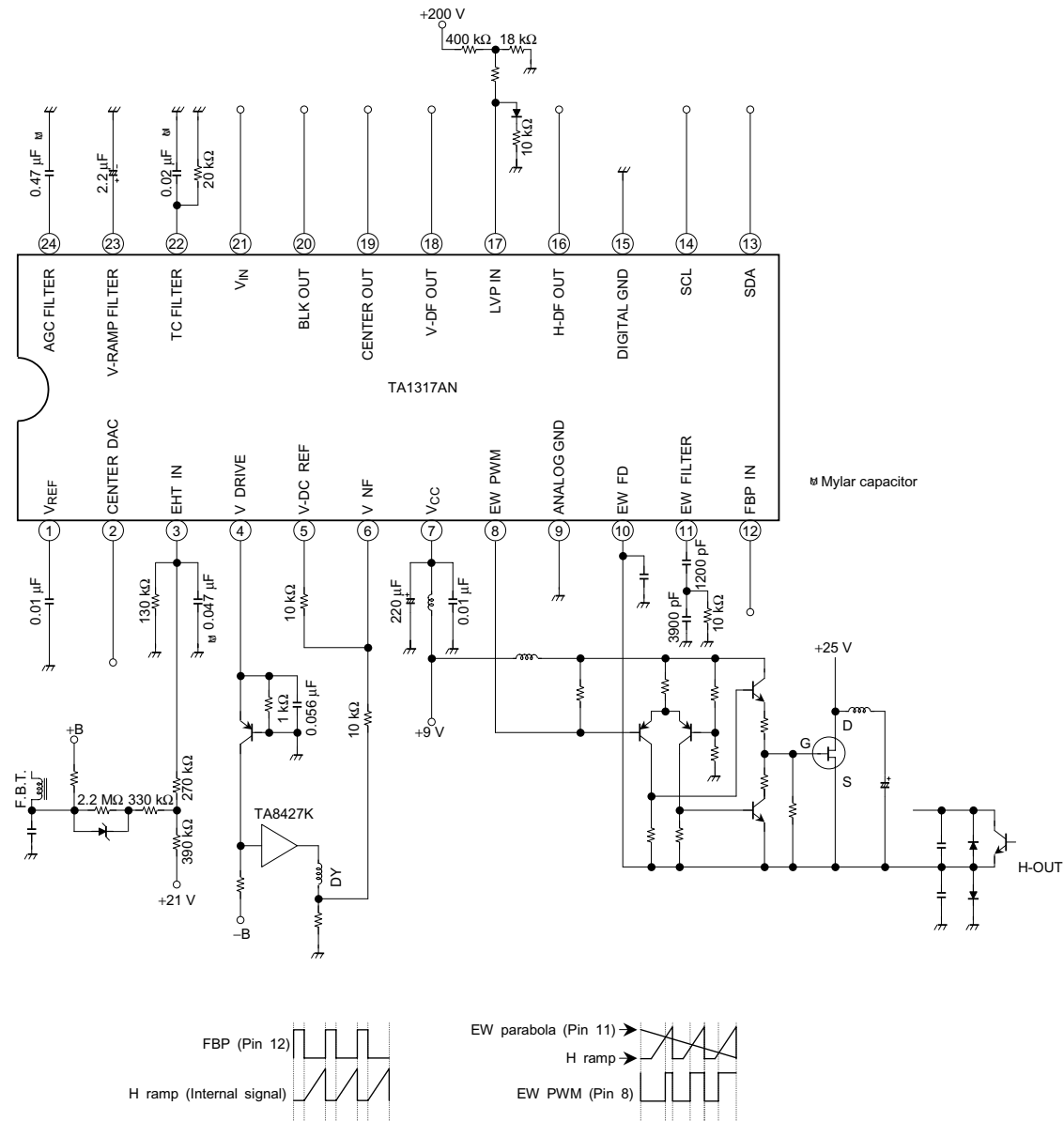
Test Circuit



Application Circuit 1 (V-AC coupling/EW parabola output)



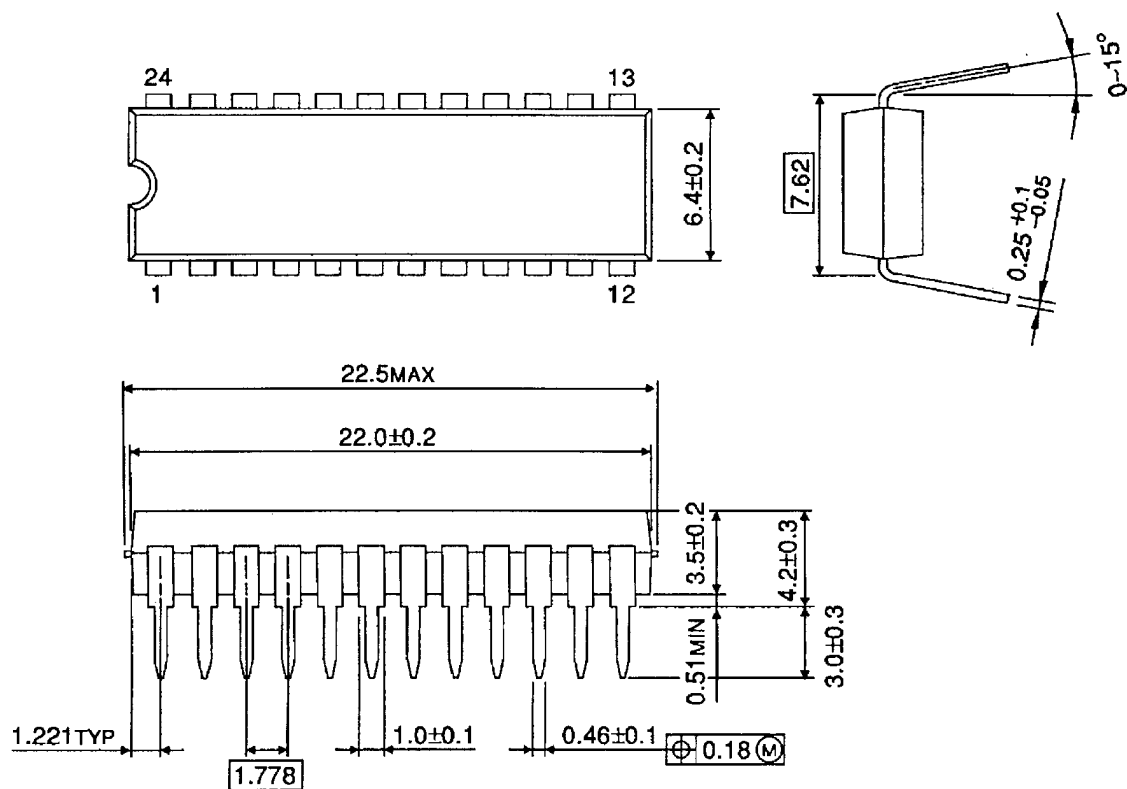
Application Circuit 2 (V-DC coupling/EW PWM output)



## Package Dimensions

SDIP24-P-300-1.78

Unit : mm



Weight: 1.22 g (typ.)

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000707EBA

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