

SANYO

No. 2290C

LC7582,7582E,7582W**LCD Driver****Overview**

The LC7582,7582E,7582W is a general-purpose LCD driver designed for use in electronic tuning frequency display or microcomputer-controlled system applications.

Features

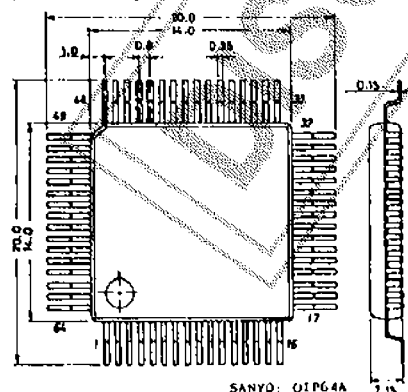
- 53 segments (max.) output (Static display)
- Drive system: 1/1duty (53 segments), 1/2duty (104 segments)
- Data input: 3 serial input pins
- 2 pins for 5-level AD converter (Level meter use, etc.)
- 2 display (DSP) pins for direct display
- INH pin for blanking out display

Absolute Maximum Ratings at $T_a=25^{\circ}\text{C}$, $V_{SS}=0\text{V}$

unit

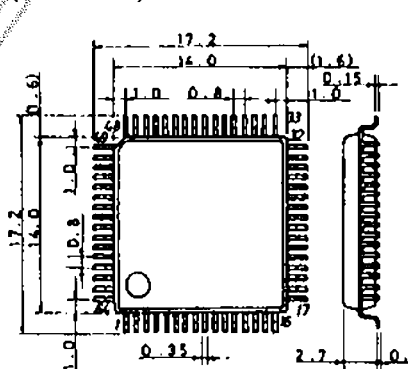
Maximum Supply Voltage	V_{DDmax}	V_{DD}	-0.3 to +7.0	V
	V_{LCD}	V_{LCD}	-0.3 to $V_{DD}+0.3$	V
Input Voltage	$V_{IN(1)}$	CE, CLK, DATA, INH	-0.3 to +7.0	V
	$V_{IN(2)}$	S44 to S47 (Output OFF (Used as AD1, AD2, DSP1, DSP2))	-0.3 to $V_{DD}+0.3$	V
	$V_{IN(3)}$	OSC (Output OFF)	-0.3 to $V_{DD}+0.3$	V
Output Voltage	V_{OUT}	OSC (Output OFF)	-0.3 to $V_{DD}+0.3$	V
Output Current	$I_{OUT(1)}$	S1 to S53	100	μA
	$I_{OUT(2)}$	COM1,2	1.0	mA
Allowable Power Dissipation	P_{dmax}	$T_a=85^{\circ}C$	100	mW
Operating Temperature	T_{opg}		-30 to +85	$^{\circ}C$
Storage Temperature	T_{stg}		-40 to +125	$^{\circ}C$

Case Outline 3057 [LC7582]
(unit: mm)



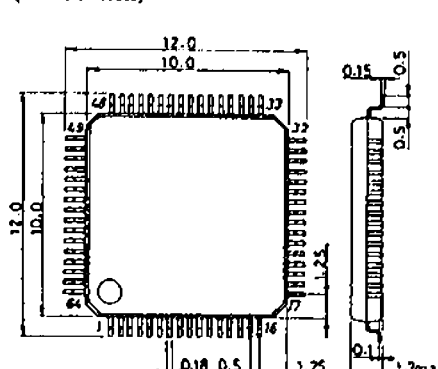
SANYO: QIP64A

Case Outline 3159 [LC7582E]
(unit: mm)



SANYO: QIP64E

Case Outline 3190 [LC7582W]
(unit: mm)



SANYO: SQFP64

Specifications and information herein are subject to change without notice.

SANYO Electric Co., Ltd. Semiconductor Business Headquarters

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Allowable Operating Conditions at Ta=-30 to +85°C, V_{SS}=0V

		Pin	min	typ	max	unit
Supply Voltage	V _{DD}	V _{DD}	3.0		6.5	V
	V _{LCD}	V _{LCD}	3.0		V _{DD}	V
Input "H"-Level Voltage	V _{IH} (1)	INH	0.7V _{DD}		6.5	V
Input "L"-Level Voltage	V _{IL} (1)	"	0	0.3V _{DD}		V
Input "H"-Level Voltage	V _{IH} (2)	S44,S46	0.7V _{DD}		V _{DD}	V
		[Output OFF(DSP1, 0.7V _{DD} DSP2-used mode)]				
Input "L"-Level Voltage	V _{IL} (2)	"	0	0.3V _{DD}		V
Input "H"-Level Voltage	V _{IH} (3)	CE,CLK,DATA	0.8V _{DD}		6.5	V
Input "L"-Level Voltage	V _{IL} (3)	"	0	0.2V _{DD}		V
Recommended External Resistance	R	OSC		51		kohm
Recommended External Capacitance	C	OSC		680		pF
OSC Guaranteed Range	f _{OSC}	OSC	25	50	100	kHz
"L"-Level Clock Pulse Width	t _{DL}	CLK	0.25			usec
"H"-Level Clock Pulse Width	t _{DH}	"	0.25			usec
Setup Time	t _{sup}	CLK,DATA	0.25			usec
Data Hold Time	t _{dh}	"	0.25			usec
Serial Data Pulse Width	t ₁	CE,DATA	1			usec
"	t ₂	CE,CLK	1.25			usec
"	t ₃				1	usec
"	t ₄		4			usec

Electrical Characteristics under Allowable Operating Conditions

		Pin	min	typ	max	unit
Input "H"-Level Current	I _{IH} (1)	CE,CLK,DATA, V _I =6.5V			5	uA
		INH				
Input "L"-Level Current	I _{IL} (1)	"			5	uA
Input "H"-Level Current	I _{IH} (2)	S44,S46			10	uA
Input "L"-Level Current	I _{IL} (2)	"			10	uA
Input "H"-Level Current	I _{IH} (3)	AD1,AD2			10	uA
Input "L"-Level Current	I _{IL} (3)	"			10	uA
Output "H"-Level Voltage	V _{OH} (1)	S1 to S53	I _O =-10uA	V _{DD} -1.0		V
Output "L"-Level Voltage	V _{OL} (1)	"	I _O =10uA		1.0	V
Output "H"-Level Voltage	V _{OH} (2)	COM1,COM2	I _O =-100uA	V _{LCD} -0.6		V
Output "L"-Level Voltage	V _{OL} (2)	"	I _O =100uA		0.6	V

Continued on next page.

LC7582,7582E,7582W

Continued from preceding page.

	Pin	min	typ	max	unit
Center Level Voltage	V_{MID}	$V_{LCD}=6.5V,$ $I_o=100\mu A$	2.65	3.25	3.85 V
"	V_{MID}	$V_{LCD}=3.0V,$ $I_o=100\mu A$	0.9	1.5	2.1 V
1st Step Lighting Voltage	V_{A1}	S45, S47	0.07V _{DD}	0.1V _{DD}	0.13V _{DD} V
2nd	"	V_{A2}	0.17V _{DD}	0.2V _{DD}	0.23V _{DD} V
3rd	"	V_{A3}	0.27V _{DD}	0.3V _{DD}	0.33V _{DD} V
4th	"	V_{A4}	0.37V _{DD}	0.4V _{DD}	0.43V _{DD} V
5th	"	V_{A5}	0.47V _{DD}	0.5V _{DD}	0.53V _{DD} V
Step Voltage Diff.	V_{step}	See Fig.1	0.09V _{DD}	0.1V _{DD}	0.11V _{DD} V
OSC Frequency	f_{osc}	osc	40	50	60 kHz
Supply Current	I_{DD}	R=51kohms, C=680pF			1 mA
"	I_{LCD}	V_{LCD}			2 mA
Hysteresis Voltage	V_H	CE, CLK, DATA	$V_{DD}=5V$	0.3	V

Pin Assignment

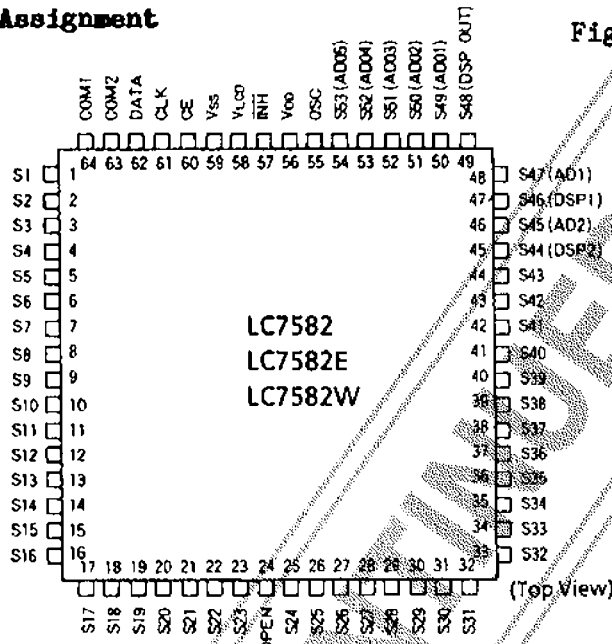
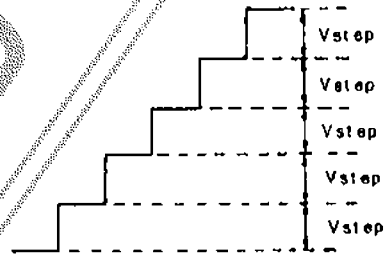
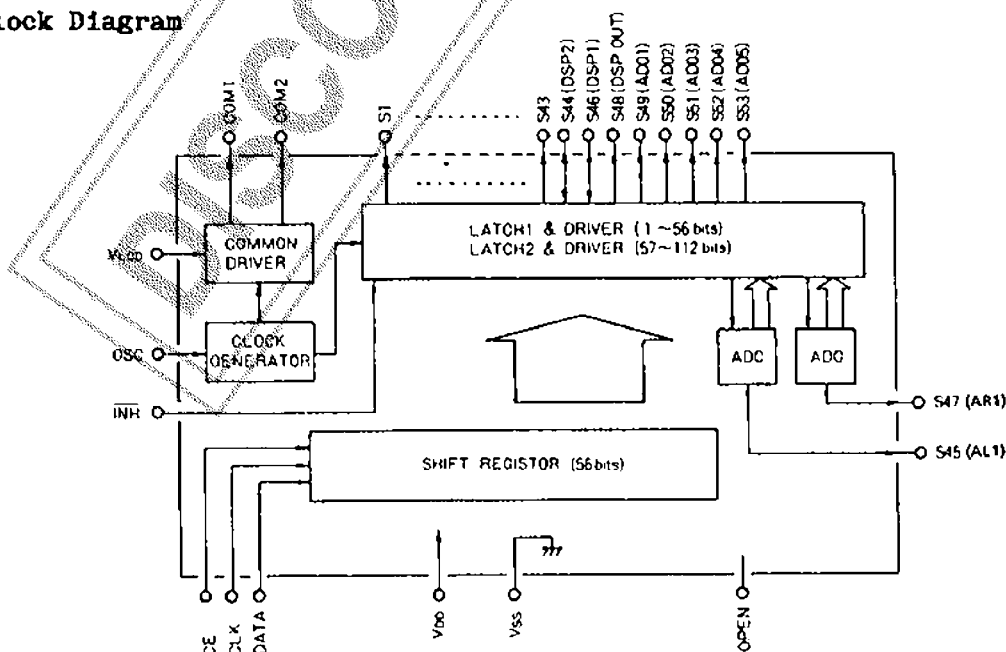


Fig.1 Step Voltage Difference
Input voltage on S45(AD2), S47(AD1)



Block Diagram



Pin Description

- S1 to S43 : Segment output pin
- S46(DSP1),S44(DSP2) : Segment output or DSP input pin
- S47(AD1),S45(AD2) : Segment output or AD input pin
- S48(DSPOUT) : Segment output or DSP output pin
- S49 to S53(ADO1to5) : Segment output or AD output pin
- COM1,2 : Common output pin (COM1 only is used for 1/1duty and in this case COM2 is open.)
- V_{LCD} : LCD bias voltage setting pin
- OSC : OSC pin
- CE,CLK,DATA : Input pin for serial data transfer
- V_{SS},V_{DD} : Power supply pin
- INH : Display blanking input pin (Available for output driver only. Therefore, serial data can be also transferred during unlighting.)
- OPEN : No connection

Data Transfer Mode

- ```

 . 1/1duty

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Transfer direction (56 bits)

[illegible]

- . 1/2duty (When the number of display segments does not exceed 52, transfer data is 56 bits long. Transfer mode is the same as for 1/1 duty. Data of D54 to D106 only cannot be changed.)

Transfer direction (112 bits)

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|----|----|----|----|----|----|----|----|--|--|--|--|--|--|--|--|--|--|-----|-----|-----|-----|-----|----|----|---|
| D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 |  |  |  |  |  |  |  |  |  |  | D49 | D50 | D51 | D52 | D53 | Dp | D0 | 0 |
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|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |
|    |    |    |    |    |    |    |    |  |  |  |  |  |  |  |  |  |  |     |     |     |     |     |    |    |   |

D53, D106: Dummy bit (don't care)

- D<sub>1</sub> to D<sub>53</sub> : Display data (1/1duty) Lighted at "1"  
D<sub>1</sub>to D<sub>106</sub> : Display data (1/2duty) Unlighted at "0"  
(Note) When the AD, DSP functions are selected:  
1/1duty : D46 to D53 ----- Dummy bit (don't care)  
1/2duty : D88 to D106 ----- Dummy bit (don't care)  
DP : Drive mode select bit  
1/2duty at "1"  
1/1duty at "0"  
DQ : AD, DSP function select bit  
AD, DSP function at "1"  
Segment output at "0"  
X : Don't care

(Note) When the AD, DSP functions selected are not used, fix the AD1,AD2,DSP1,DSP2 pins at  $V_{DD}$  or  $V_{SS}$ .

# Sample Transfers

- 1/1 duty

|    |    |    |  |  |  |  |     |     |   |    |   |
|----|----|----|--|--|--|--|-----|-----|---|----|---|
| D1 | D2 | D3 |  |  |  |  | D52 | D53 | 0 | D0 | 0 |
|----|----|----|--|--|--|--|-----|-----|---|----|---|

- 1/2 duty and 52 segments or less

|    |    |    |  |  |  |  |     |     |   |    |   |
|----|----|----|--|--|--|--|-----|-----|---|----|---|
| D1 | D2 | D3 |  |  |  |  | D52 | D53 | 1 | D0 | 0 |
|----|----|----|--|--|--|--|-----|-----|---|----|---|

- 1/2 duty and 52 segments or more

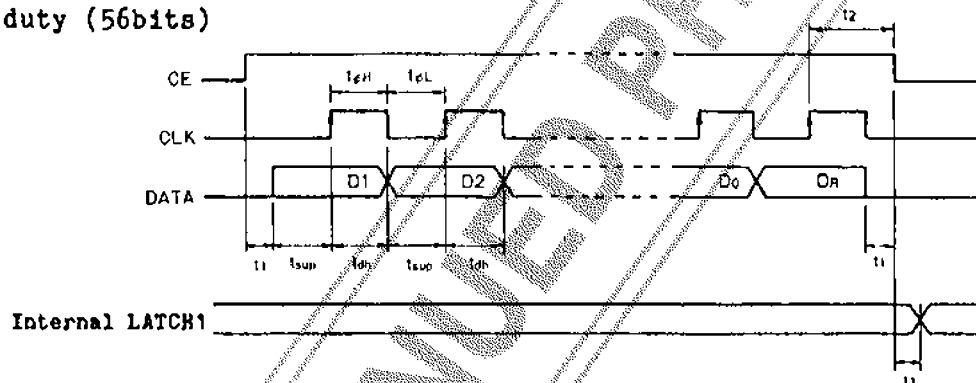
|    |    |    |  |  |  |  |     |     |   |    |   |     |     |     |      |      |   |   |   |
|----|----|----|--|--|--|--|-----|-----|---|----|---|-----|-----|-----|------|------|---|---|---|
| D1 | D2 | D3 |  |  |  |  | D52 | D53 | 1 | D0 | 0 | D54 | D56 | D57 | D105 | D106 | X | X | 1 |
|----|----|----|--|--|--|--|-----|-----|---|----|---|-----|-----|-----|------|------|---|---|---|

(Note) 1/2 duty and 52 segments or less do not allow transfer shown below.

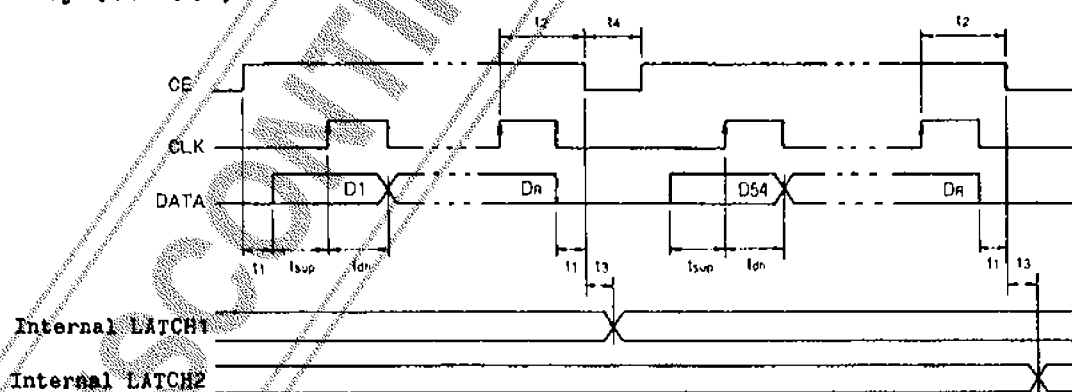
|     |     |     |  |  |  |  |      |      |   |   |   |
|-----|-----|-----|--|--|--|--|------|------|---|---|---|
| D54 | D55 | D56 |  |  |  |  | D105 | D106 | X | X | 1 |
|-----|-----|-----|--|--|--|--|------|------|---|---|---|

## Serial Data

- 1/1 duty (56bits)

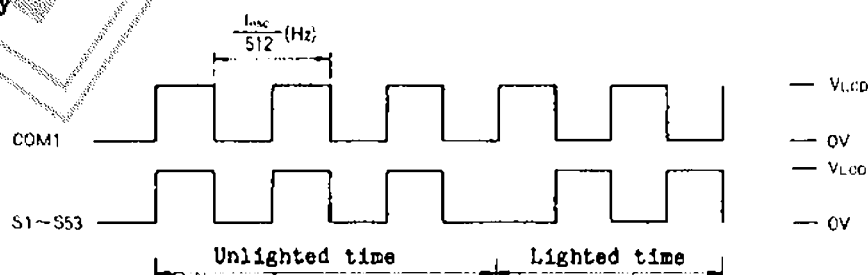


- 1/2 duty (112bits)

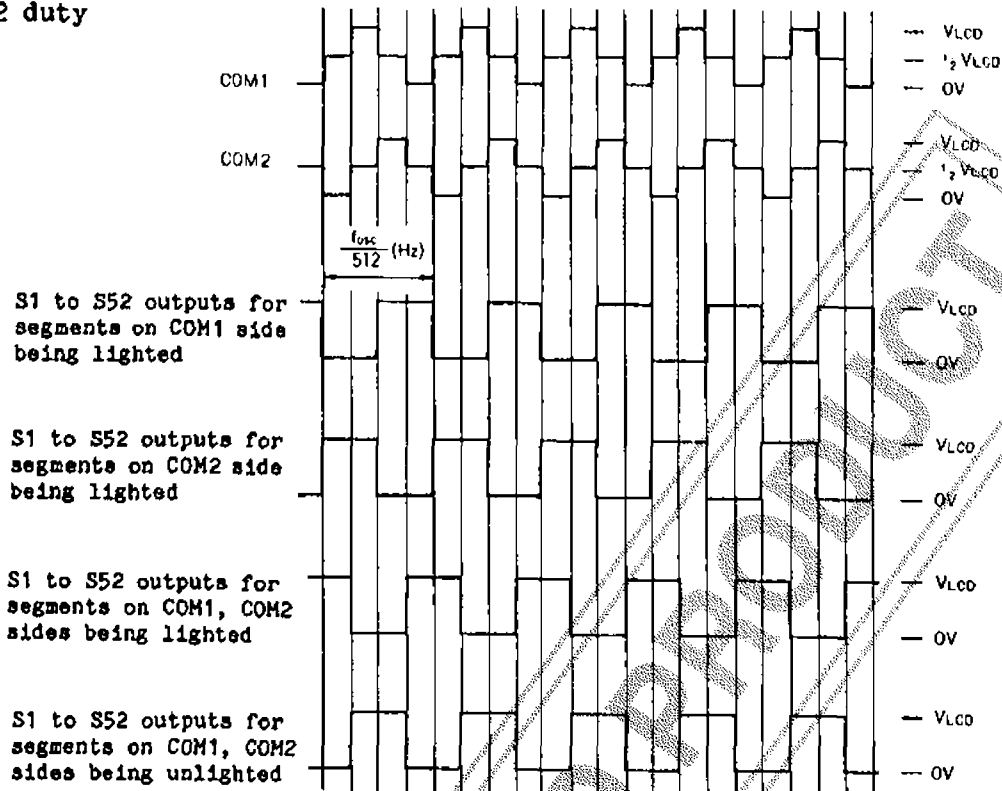


## Output Waveforms

- 1/1 duty



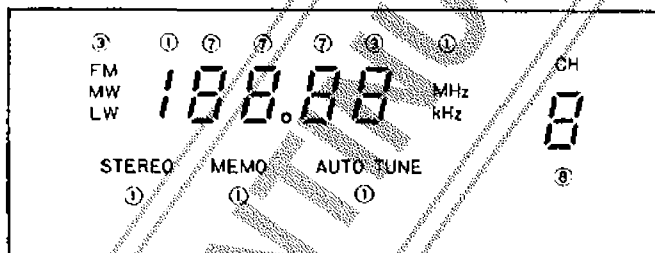
• 1/2 duty



Sample Display

- Static drive (1/1duty) (AD, DSP pins are not used.)

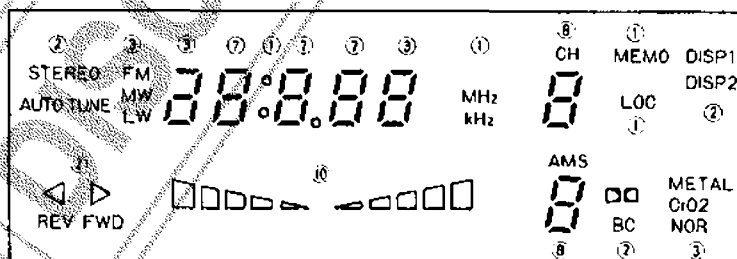
40 segments-used application (Up to 53 segments usable)



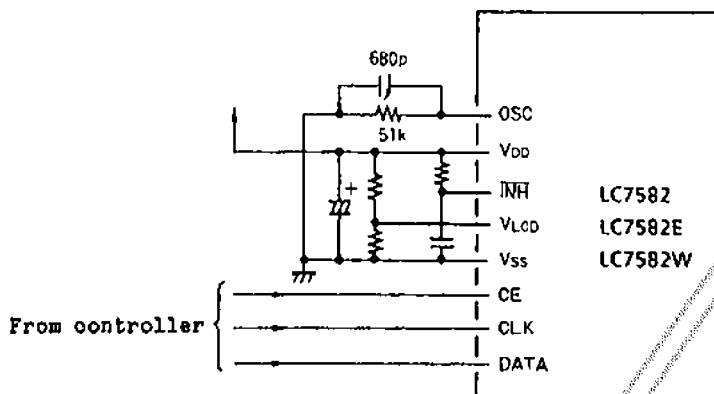
Note: ○ : Number of segments

• 1/2duty drive

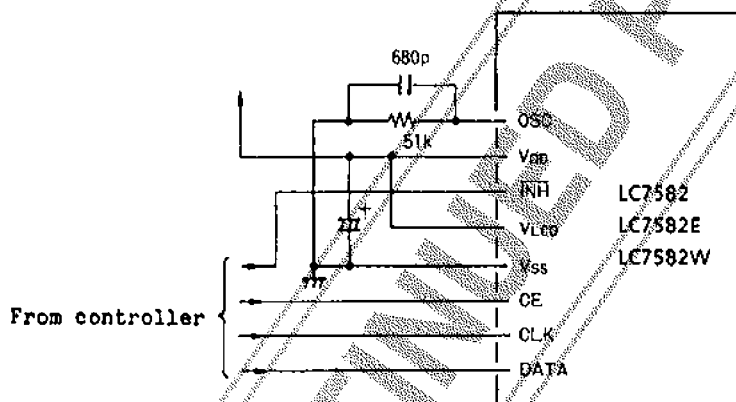
71 segments-used application (Up to 104 segments usable)



Sample Application Circuit 1



Sample Application Circuit 2



Note) The internal display data is indeterminate immediately after  $V_{DD}$  rise. If the display is kept lighted as it is, the display will have no meaning. The display is forced to be unlighted when the  $\overline{INH}$  is at "L" level. Do not release ("H") until the transfer of display data from the controller is completed.

**Correspondence between Transfer (External Input) Data and Output Pin**

(Note) COM1 only is used at 1/1 duty.

| Output pin | 0        |        | 1               |        | COM1 | COM2 |
|------------|----------|--------|-----------------|--------|------|------|
|            | 0        | 1      | 0               | 1      |      |      |
|            | 1/1 duty |        | 1/2 duty        |        |      |      |
| S1         | D1       | D1     | D1              | D1     | ○    |      |
|            |          |        | D2              | D2     |      | ○    |
| S2         | D2       | D2     | D3              | D3     | ○    |      |
|            |          |        | D4              | D4     |      | ○    |
| S3         | D3       | D3     | D5              | D5     | ○    |      |
|            |          |        | D6              | D6     |      | ○    |
| S26        | D26      | D26    | D51             | D51    | ○    |      |
|            |          |        | D52             | D52    |      | ○    |
| S27        | D27      | D27    | D54             | D54    | ○    |      |
|            |          |        | D55             | D55    |      | ○    |
| S28        | D28      | D28    | D56             | D56    | ○    |      |
|            |          |        | D57             | D57    |      | ○    |
| S43        | D43      | D43    | D86             | D86    | ○    |      |
|            |          |        | D87             | D87    |      | ○    |
| S44        | D44      | D44    | D88             | ※DSP 2 | ○    |      |
|            |          |        | D89             |        |      | ○    |
| S45        | D45      | D45    | D90             | ※ALI   | ○    |      |
|            |          |        | D91             |        |      | ○    |
| S46        | D46      | ※DSP 1 | D92             | ※DSP 1 | ○    |      |
|            |          |        | D93             |        |      | ○    |
| S47        | D47      | ※ARI   | D94             | ※ARI   | ○    |      |
|            |          |        | D95             |        |      | ○    |
| S48        | D48      | ※DSPO1 | D96             | ※DSPO1 | ○    |      |
|            |          |        | D97             | ※DSPO2 |      | ○    |
| S49        | D49      | ※ARO1  | D98             | ※ARO1  | ○    |      |
|            |          |        | D99             | ※ALO1  |      | ○    |
| S50        | D50      | ※ARO2  | D100            | ※ARO2  | ○    |      |
|            |          |        | D101            | ※ALO2  |      | ○    |
| S51        | D51      | ※ARO3  | D102            | ※ARO3  | ○    |      |
|            |          |        | D103            | ※ALO3  |      | ○    |
| S52        | D52      | ※ARO4  | D104            | ※ARO4  | ○    |      |
|            |          |        | D105            | ※ALO4  |      | ○    |
| S53        | D53      | ※ARO5  | Always lighting | ※ARO5  | ○    |      |
|            |          |        | Always lighting | ※ALO5  |      | ○    |

**Note**

- . DSP1 : External display input data name. The output is DSP01.
- . DSP01 : External display output data name. The input is DSP1.
- . DSP2 : External display input data name. The output is DSP02.
- . DSP02 : External display output data name. The input is DSP2.
- . ARI : AD converter input data name. The output is ARO1 to 5.
- . ARO1 to 5 : AD converter output data name. The input is ARI.
- . ALI : AD converter input data name. The output is ALO1 to 5.
- . ALO1 to 5 : AD converter output data name. The input is ALI.

## OSC Frequency

When determining the OSC frequency, see below.

Fig. 1 OSC Frequency at OSC Pin vs. CR

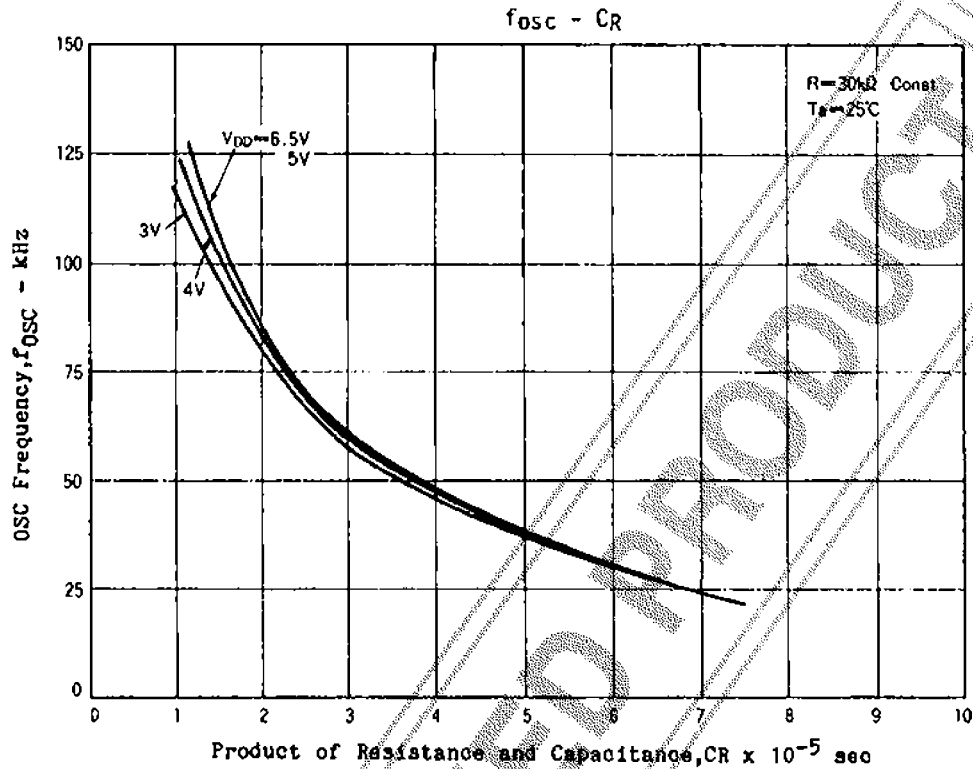
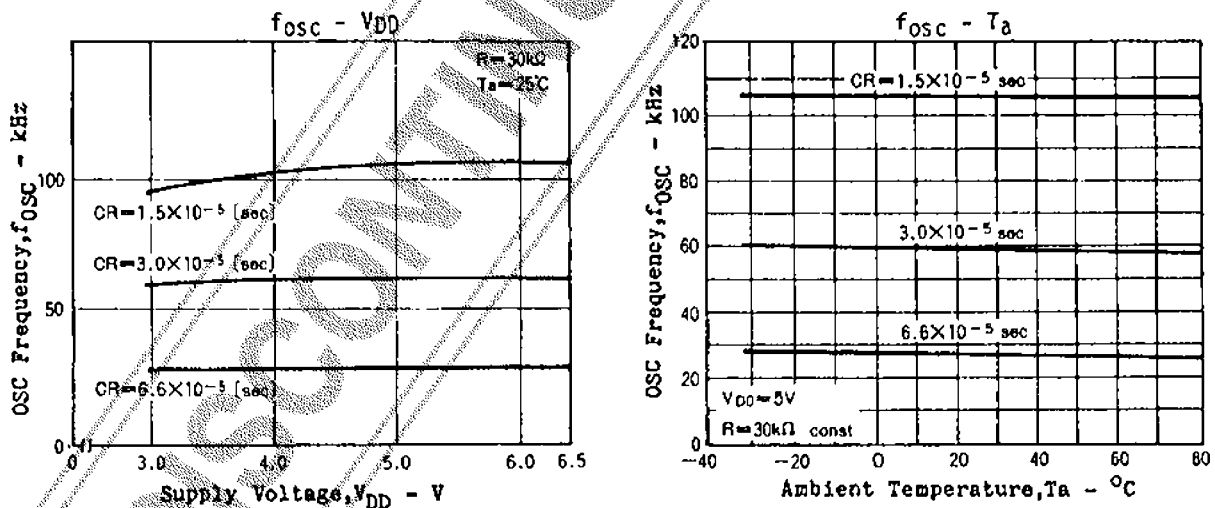


Fig. 2 OSC Frequency at OSC Pin vs.  $V_{DD}$



Recommended external resistor value 10kohms to 100kohms (carbon)

Recommended external capacitor value 330pF to 3300pF

330pF to 820pF (ceramic, temperature coefficient: 0)

1000pF to 3300pF (polyester, temperature coefficient: plus)

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