



**TDA 4092**

# LINEAR INTEGRATED CIRCUIT

PRELIMINARY DATA

## 5 BIT BINARY TO 7-SEGMENT DECODER DRIVER

- ROM MASK OPTION
- STANDARD CONFIGURATION FOR 2 DIGIT 7-SEGMENT LED TO PRESENT THE NUMBERS 1 TO 32
- CONSTANT CURRENT OUTPUT STAGES FOR DIRECT DRIVING OF COMMON ANODE LEDs
- OUTPUT PROVIDED TO DISPLAY THE STAND-BY MODE
- $\overline{AV}$  OUTPUT ACTIVATED WHENEVER PROGRAM 32 IS SELECTED
- TTL COMPATIBLE INPUTS
- 5V SUPPLY VOLTAGE

The TDA 4092 is a monolithic integrated circuit designed to display the program number (1 to 32) in TV or Radio sets in conjunction with voltage or frequency synthesizers. The inputs accept a 5 bit binary code with TTL levels and have internal pull-up.

The outputs can directly drive LED display elements with common anode.

One of these outputs is intended to display the stand-by mode of the set.

No external resistors are required if the LEDs are supplied at 5V.

The LEDs can also be supplied with higher voltage (up to 18V) but in this case a single resistor in series with the LED elements must be used in order to limit the power dissipation of the IC; moreover, a suitable  $R_{ext}$  must be chosen.

The circuit is produced in  $I^2L$  technology and is available in a 24 pin dual in-line plastic package.

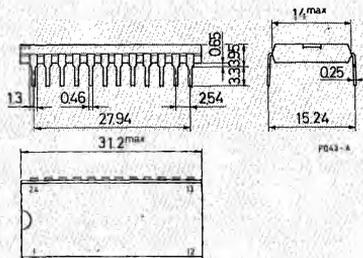
### ABSOLUTE MAXIMUM RATINGS

$V_s$	Supply voltage	10	V
$V_i$	Input voltage	10	V
$V_{O(off)}$	Off state output voltage	20	V
$I_{OL}$	Output current	22	mA
$P_{tot}$	Total power dissipation at $T_{amb} = 55^\circ C$	0.8	W
$T_{stg}, T_j$	Storage and junction temperature	-25 to 150	$^\circ C$
$T_{op}$	Operating temperature	0 to 70	$^\circ C$

ORDERING NUMBER: TDA 4092

### MECHANICAL DATA

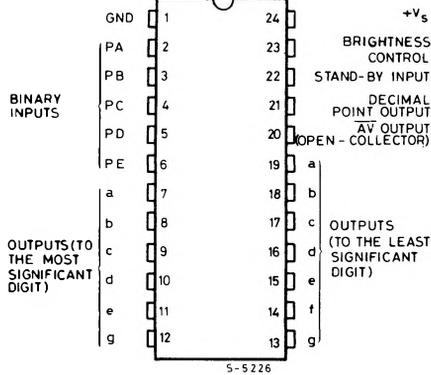
Dimensions in mm



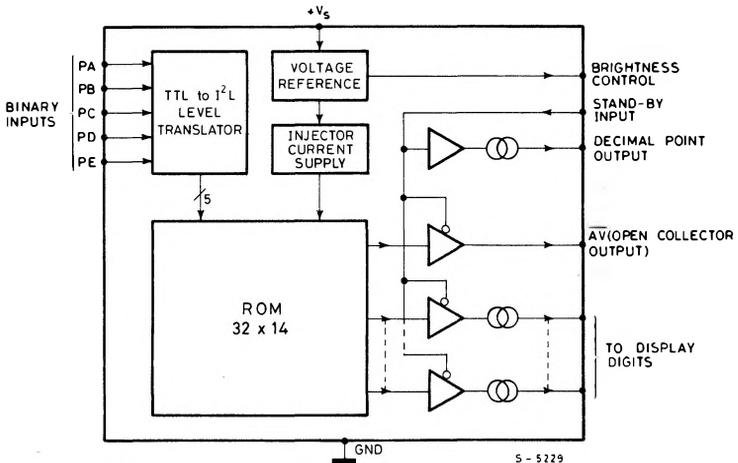


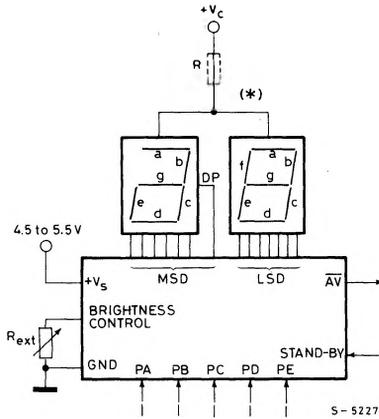
TDA 4092

### CONNECTION DIAGRAM (top view)



### BLOCK DIAGRAM



**APPLICATION CIRCUIT**


(\*) R is necessary only with  $V_c$  greater than 5.5V.

**THERMAL DATA**

$R_{th\ j-amb}$ Thermal resistance junction ambient	max 120 °C/W
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**ELECTRICAL CHARACTERISTICS** ( $V_s = 5V$ ,  $T_{amb} = 25^\circ C$  unless otherwise specified)

Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_s$ Supply voltage		4.5		5.5	V
$I_s$ Quiescent supply current	$V_s = 5.5V$		20	28	mA
$V_{IH}$ High level input voltage	$T_{amb} = 0$ to $70^\circ C$	2			V
$V_{IL}$ Low level input voltage	$T_{amb} = 0$ to $70^\circ C$			0.8	V
$I_{IH}$ High level input current	$T_{amb} = 0$ to $70^\circ C$ $V_s = 5.5V$	$V_{IH} = 2V$		100	nA
$I_{IL}$ Low level input current		$V_{IL} = 0.8V$		-50	-200



TDA 4092

**ELECTRICAL CHARACTERISTICS** (continued)

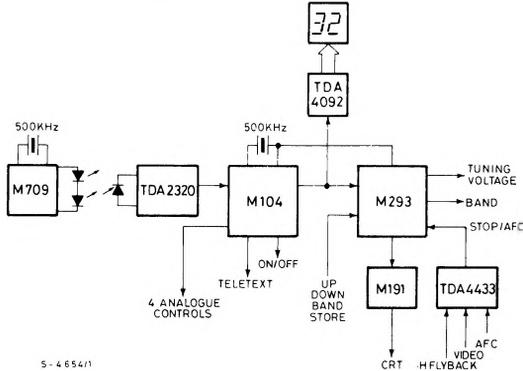
Parameter		Test conditions	Min.	Typ.	Max.	Unit
$V_{out}$	Output voltage	$I_o = 15 \text{ mA}$	2			V
$V_{AV}$	AV output voltage (pin 20)	(All the binary inputs high) $I_{AV} = 1.6 \text{ mA}$		50	260	mV
$I_B$	Pin 23 input current (Brightness control)	$R_{ext} = 3.3 \text{ K}\Omega$		-375		$\mu\text{A}$
		$R_{ext} = 5.6 \text{ K}\Omega$		-225		
$I_o$	Output current (*)	$R_{ext} = 3.3 \text{ K}$	13.5	15	16.5	mA
		$R_{ext} = 5.6 \text{ K}$	8	9	10	
$I_{DP}$	Output current for decimal point (pin 21)(**)			12.5		mA
$\frac{\Delta I_o}{I_o}$	$\Delta V_s$ Segment current stability	$I_o = 15 \text{ mA}$ $V_s = 4.5 \text{ to } 5.5 \text{ V}$		0.2		%

(\*)  $I_o = 40 \cdot I_B$ (\*\*)  $I_{DP}$  is fixed and independent of  $R_{ext}$  value.



## APPLICATION INFORMATION

Fig. 1 - Remote controlled voltage synthesizer (up to 32 stations) for TV and radio



When operating with a supply voltage higher than 5.5V for LED elements, it is necessary to limit the IC power dissipation by means of one external resistance connected in series with the common point of the digits (R in fig. 2).

Unused outputs must be connected to  $V_s$  taking into account the additional power dissipation.

The value of R must be chosen taking into account the worst working conditions.

The maximum number of ON segments is 12 (number 28 displayed), so,

$$R = \frac{V_C - V_D - V_{out \min}}{12 \cdot I_D}$$

$I_D$ , depending on  $R_{ext}$  (see Table of Electrical characteristics), can be fixed to the most suitable value to minimize the power dissipation in the IC. Since the worst condition for the device is with seven outputs active, it follows that:

$$P_{d \text{ out}} = 7 \cdot I_D (V_C - V_D - 7R \cdot I_D) \quad \text{Power dissipation in the output stage}$$

$$P_d = V_s \cdot I_s \text{ max} \quad \text{Power drained from the supply}$$

$$P_{tot} = P_{d \text{ out}} + P_D \quad \text{Total power dissipation}$$

$P_{tot}$  must not exceed the Absolute Maximum Ratings of 800 mW, at  $T_{amb} = 55^\circ\text{C}$ . Otherwise the maximum operating ambient temperature can be fixed by:

$$T_{amb \text{ max}} = T_{j \text{ max}} - R_{th \text{ j-amb}} P_{tot}$$

### Example:

$V_C = 18\text{V}$ ;  $I_D = 10 \text{ mA}$  (fixed by means of  $R_{ext} = 5.6 \text{ K}\Omega$ );  $V_{out \min} = 2\text{V}$ ;  $I_s \text{ max} = 28 \text{ mA}$ ;  
 $T_{j \text{ max}} = 150^\circ\text{C}$ ;  $V_D = 2\text{V}$ ;  $V_s = 5.5\text{V}$ .

Applying the previous formulae, it follows that:  $R \cong 120\Omega$ ;  $P_{d \text{ out}} = 0.532\text{W}$ ;  $P_d = 0.154\text{W}$ ;  
 $P_{tot} = 0.686\text{W}$ ;  $T_{amb \text{ max}} \cong 68^\circ\text{C}$ .

Fig. 2 - Schematic diagram for LED driving.

