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
- 5 V SUPPLY VOLTAGE

DESCRIPTION

The TDA4092 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.

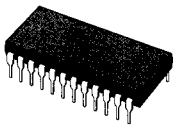
The outputs can directly drive LED display elements with common anode.

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 5 V.

The LEDs can also be supplied with higher voltage (up to 18 V) 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.

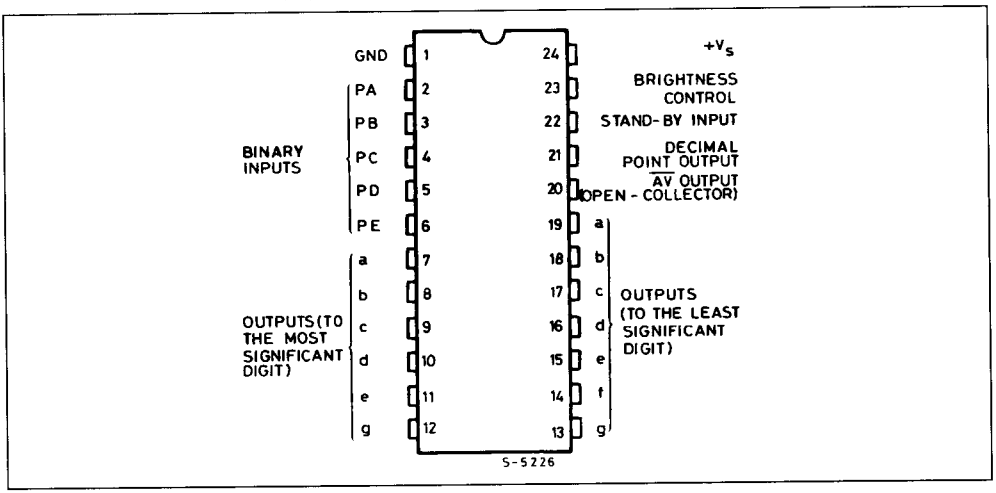
The circuit is produced in I^2L technology and is available in a 24 pin dual in-line plastic package.



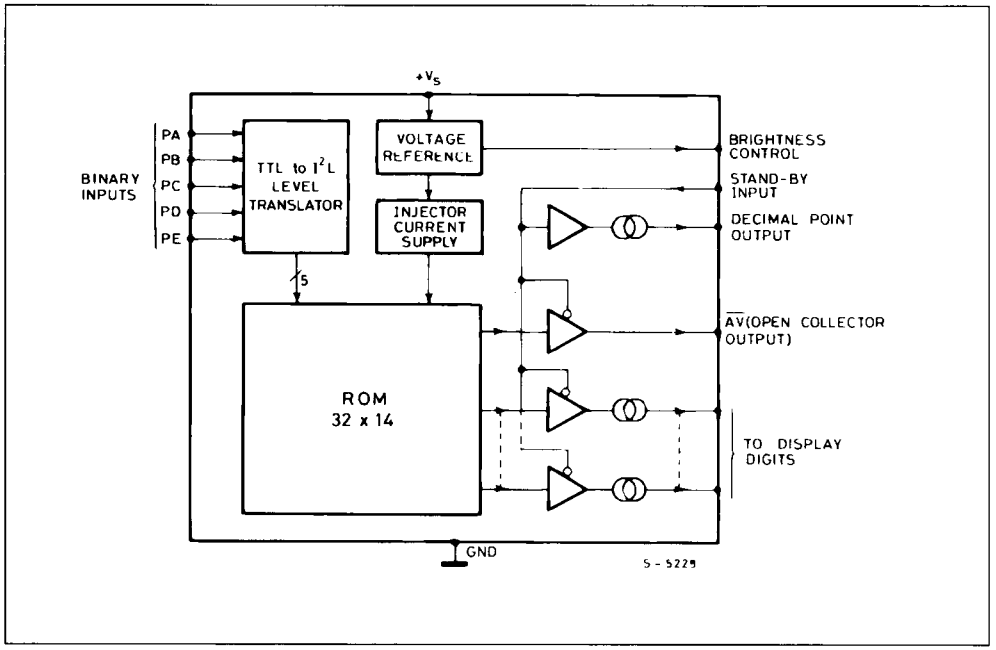
DIP24

ORDER CODE : TDA4092

CONNECTION DIAGRAM (top view)



BLOCK DIAGRAM



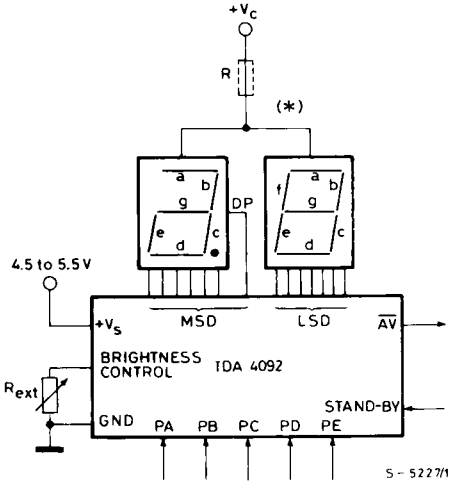
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
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 °C	0.8	W
T_{stg}, T_j	Storage and Junction Temperature	– 25 to 150	°C
T_{op}	Operating Temperature	0 to 70	°C

THERMAL DATA

$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max	120	°C/W

APPLICATION CIRCUIT



(*) R is necessary only with V_C greater than 5.5 V.

ELECTRICAL CHARACTERISTICS (V_s = 5 V, T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
V_S	Supply Voltage			4.5		5.5	V
I_S	Quiescent Supply Current	V_s = 5.5 V			20	28	mA
V_{IH}	High Level Input Voltage	T_{amb} = 0 to 70 °C		2			V
V_{IL}	Low Level Input Voltage	T_{amb} = 0 to 70 °C				0.8	V
I_{IH}	High Level Input Current	T_{amb} = 0 to 70 °C V_S = 5.5 V	V_{IH} = 2 V			– 30	µA
I_{IL}	Low Level Input Current		V_{IL} = 0.8 V		– 50	– 200	µA
V_{out}	Output Voltage	I_o = 15 mA		2			V
V_{AV}	AV Output Voltage (pin 20)	(all the binary inputs high) I_{AV} = 1.6 mA			50	260	mV
I_B	Pin 23 Input Current (brightness control)	R_{ext} = 3.3 KΩ			– 375		µA
		R_{ext} = 5.6 KΩ			– 225		
I_o	Output Current (*)	R_{ext} = 3.3 K		13.5	15	16.5	mA
		R_{ext} = 5.6 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 mA V_s = 4.5 to 5.5 V			0.2		%

(*) I_O = 40 I_B.
(**) I_{DP} is fixed and independent of R_{EXT} value.

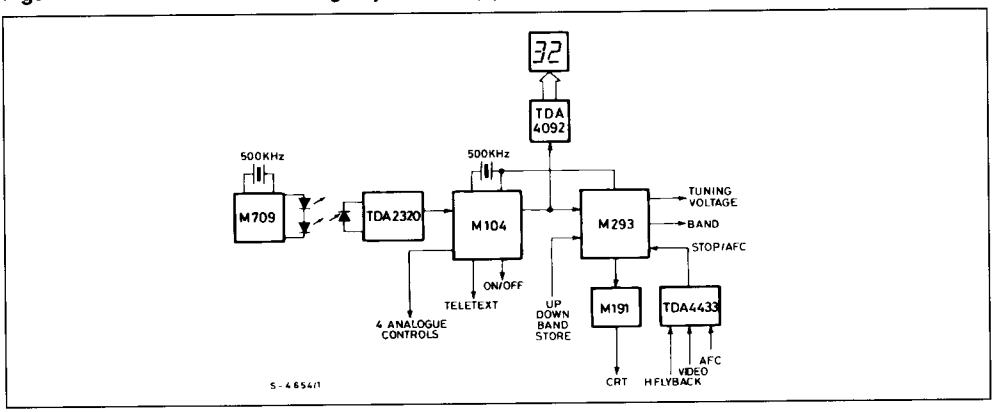
FUNCTION TABLE

Inputs						Number Displayed	Outputs													
							Ten's Digit (MSD)						Unit's Digit (LSD)							
A	B	C	D	E	Standby		a	b	c	d	e	g	a	b	c	d	e	f	g	DP	$\overline{AV}$*
L	L	L	L	L	L	1								On	On						
H	L	L	L	L	L	2							On	On		On	On		On		
L	H	L	L	L	L	3							On	On	On	On			On		
H	H	L	L	L	L	4								On	On			On	On		
L	L	H	L	L	L	5							On		On	On		On	On		
H	L	H	L	L	L	6							On		On	On	On	On	On		
L	H	H	L	L	L	7							On	On	On						
H	H	H	L	L	L	8							On	On	On	On	On	On	On		
L	L	L	H	L	L	9							On	On	On	On		On	On		
H	L	L	H	L	L	10		On	On				On	On	On	On	On	On			
L	H	L	H	L	L	11		On	On					On	On						
H	H	L	H	L	L	12		On	On				On	On		On	On		On		
L	L	H	H	L	L	13		On	On				On	On	On	On			On		
H	L	H	H	L	L	14		On	On					On	On			On	On		
L	H	H	H	L	L	15		On	On				On		On	On		On	On		
H	H	H	H	L	L	16		On	On				On		On	On	On	On	On		
L	L	L	L	H	L	17		On	On				On	On	On						
H	L	L	L	H	L	18		On	On				On	On	On	On	On	On	On		
L	H	L	L	H	L	19		On	On				On	On	On	On		On	On		
H	H	L	L	H	L	20	On	On		On	On	On	On	On	On	On	On	On			
L	L	H	L	H	L	21	On	On		On	On	On		On	On						
H	L	H	L	H	L	22	On	On		On	On	On	On	On		On	On		On		
L	H	H	L	H	L	23	On	On		On	On	On	On	On	On	On			On		
H	H	H	L	H	L	24	On	On		On	On	On		On	On			On	On		
L	L	L	H	H	L	25	On	On		On	On	On	On		On	On		On	On		
H	L	L	H	H	L	26	On	On		On	On	On	On		On	On	On	On	On		
L	H	L	H	H	L	27	On	On		On	On	On	On	On	On						
H	H	L	H	H	L	28	On	On		On	On	On	On	On	On	On	On	On	On		
L	L	H	H	H	L	29	On	On		On	On	On	On	On	On	On		On	On		
H	L	H	H	H	L	30	On	On	On	On		On	On	On	On	On	On	On			
L	H	H	H	H	L	31	On	On	On	On		On		On	On						
H	H	H	H	H	L	32	On	On	On	On		On	On	On		On	On		On		On
X	X	X	X	X	H	None														On	**

H = High L = Low X = Don't care.
* $\overline{AV}$: open collector output.
** $\overline{AV}$ output is "on" whenever the input bits are all high, regardless of the standby input.

APPLICATION INFORMATION

Figure 1 : Remote Controlled Voltage Synthesizer (up to 32 stations) for TV and radio.



When operating with a supply voltage higher than 5.5 V 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).

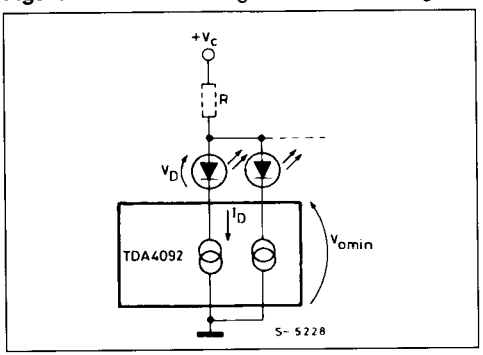
Unused outputs must be connected to V_S taking into account the additional power dissipation.

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,

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

Figure 2 : Schematic Diagram for LED Driving.



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 :

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

$P_d = V_S \cdot I_{s\,max}$ Power drained from the supply

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

P_{tot} must not exceed the Absolute Maximum Ratings of 800 mW, at $T_{amb} = 55$ °C.

Otherwise the maximum operating ambient temperature can be fixed by :

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

Example :

$V_c = 18$ V ; $I_D = 10$ mA (fixed by means of $R_{ext} = 5.6$ KΩ) ; $V_{out\,min} = 2$ V ; $I_{s\,max} = 28$ mA ; $T_{j\,max} = 150$ °C ; $V_D = 2$ V ; $V_S = 5.5$ V.

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