

MM58242 High Voltage Display Driver

General Description

The MM58242 is a monolithic MOS integrated circuit utilizing CMOS metal gate low threshold P and N-channel devices. It is available both in 28-pin molded dual-in-line packages or as dice. The MM58242 is particularly suited for driving high voltage (60V max) vacuum fluorescent (VF) displays (e.g., a 20-digit alphanumeric or dot matrix display).

Applications

- COPS™ or microprocessor-driven displays
- Instrumentation readouts
- Industrial control indicator
- Digital clock, thermostat, counter, voltmeter
- Word processor text displays
- Automotive dashboards

Features

- Direct interface to high voltage display
- Serial data input
- No external resistors required
- Wide display power supply operation
- LSTTL compatible inputs
- Software compatible with NS display driver family
- Compatible with alphanumeric or dot matrix displays
- Display blanking control input
- Simple to cascade

Block Diagram

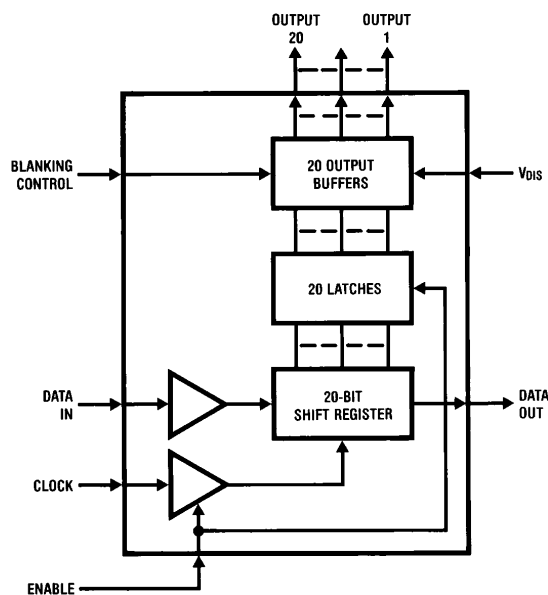


FIGURE 1

TL/F/7924-1

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Voltage at Any Input Pin	$V_{DD} + 0.3V$ to $V_{SS} - 0.3V$
Voltage at Any Display Pin	V_{DD} to $V_{DD} - 62.5V$
$V_{DD} + V_{DIS} $	62.5V
Storage Temperature	-65°C to +150°C
Power Dissipation at +25°C	
Molded DIP Package, Board Mount	2.03W*
Molded DIP Package, Socket Mount	1.83W**
Junction Temperature	130°C
Lead Temperature (Soldering, 10 sec.)	260°C

*Molded DIP Package, Board Mount, $\theta_{JA} = 52^{\circ}\text{C/W}$,
Derate 19.2 mW/ $^{\circ}\text{C}$ above $+25^{\circ}\text{C}$.

**Molded DIP Package, Socket Mount, $\theta_{JA} = 58^{\circ}\text{C/W}$,
Derate 17.2 mW/°C above +25°C.

Operating Conditions

	Min	Max	Units
Supply Voltage (V _{DD})			
V _{SS} = 0V	4.5	5.5	V
Display Voltage (V _{DIS})	−55	−25	V
Temperature Range	−40	+85	°C

DC Electrical Characteristics

$T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 5\text{V} \pm 0.5\text{V}$, $V_{SS} = 0\text{V}$ unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
I _{DD} I _{DIS}	Power Supply Currents	V _{IN} = V _{SS} or V _{DD} , V _{SS} = 0V, V _{DIS} Disconnected V _{DD} = 5.5V, V _{SS} = 0V, V _{DIS} = 55V All Outputs Low			150 10	μA mA
V _{IL} V _{IH}	Input Logic Levels DATA IN, CLOCK ENABLE, BLANK Logic '0' Logic '1'	(Note 1)	2.4		0.8	V V
V _{OL} V _{OH} V _{OH}	Data Output Logic Levels Logic '0' Logic '1' Logic '1'	I _{OUT} = 400 μA I _{OUT} = −10 μA I _{OUT} = −500 μA	V _{DD} −0.5 2.8		0.4	V V V
I _{IN}	Input Currents DATA IN, CLOCK ENABLE, BLANK	V _{IN} = 0V or V _{DD}	−10		10	μA
C _{IN}	Input Capacitance DATA IN, CLOCK ENABLE, BLANK				15	pF
R _{OFF} R _{ON}	Display Output Impedances Output Off (<i>Figure 3a</i>) Output On (<i>Figure 3b</i>)	V _{DD} = 5.5V, V _{SS} = 0V V _{DIS} = −25V V _{DIS} = −40V V _{DIS} = −55V V _{DIS} = −25V V _{DIS} = 40V V _{DIS} = −55V	60 70 80	3.0 2.6 2.3	400 550 650 4.0 3.7 3.4	kΩ kΩ kΩ kΩ kΩ kΩ
V _{DOL}	Display Output Low Voltage	V _{DD} = 5.5V, I _{OUT} = Open Circuit, −55V ≤ V _{DIS} ≤ −25V	V _{DIS}		V _{DIS} + 4	V

Note 1: 74LSTTL $V_{OH} = 2.7V$ @ $I_{OUT} = -400 \mu A$, TTL $V_{OH} = 2.4V$ @ $I_{OUT} = -400 \mu A$.

AC Electrical Characteristics $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{DD} = 5\text{V} \pm 0.5\text{V}$

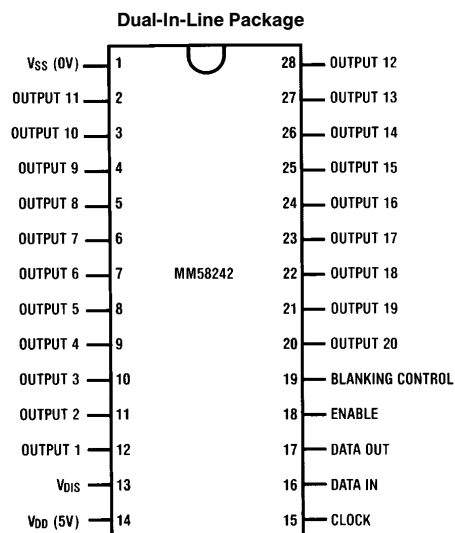
Parameter	Conditions	Min	Typ	Max	Units
Clock Input Frequency, f_C High Time, t_H Low Time, t_L	(Notes 3 and 4)	300 300		800	kHz ns ns
Data Input Set-Up Time, t_{DS} Hold Time, t_{DH}		100 100			ns ns
Enable Input Set-Up Time, t_{ES} Hold Time, t_{EH}	(Note 2)	100 100			ns ns
Data Output CLOCK Low to Data Out Time, t_{CDO}	$C_L = 50\text{ pF}$			500	ns

Note 2: For timing purposes, the signals ENABLE and BLANK can be considered to be totally independent of each other.

Note 3: AC input waveform specification for test purposes: $t_r \leq 20\text{ ns}$, $t_f \leq 20\text{ ns}$, $f = 800\text{ kHz}$, 50% $\pm 10\%$ duty cycle.

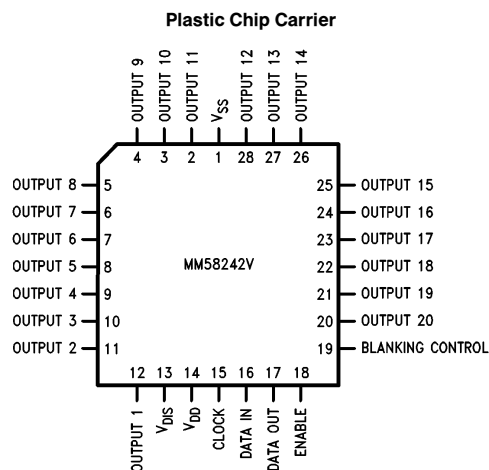
Note 4: Clock input rise and fall times must not exceed $5\text{ }\mu\text{s}$.

Connection Diagrams



Top View
FIGURE 2
Order Number MM58242N
See NS Package Number N28B

TL/F/7924-2



Top View
Order Number MM58242V
See NS Package Number V28A

TL/F/7924-8

Functional Description

This product is specifically designed to drive multiplexed or non-multiplexed high voltage alphanumeric or dot matrix vacuum fluorescent (VF) displays. Character generation is done externally in the microprocessor, with a serial data path to the display driver. The MM58242 uses three signals, DATA IN, CLOCK and ENABLE, where ENABLE acts as an external load signal. Display blanking can be achieved by means of the BLANKING CONTROL input, and a logic '1' will turn off all sections of the display. A block diagram of the MM58242 is shown in Figure 1.

Figure 2 shows the pinout of the MM58242 device, where output 1 (pin 12) is equivalent to bit 1 (i.e., the first bit of data to be loaded into the shift register following ENABLE high). A logic '1' at the input will turn on the corresponding display digit/segment/dot output.

A significant reduction in discrete board components can be achieved by use of the MM58242, because external pull-down resistors are not required. Due to the nature of the output stage, both its on and off impedance values vary as a function of the display voltage applied. However, Figures 3a and 3b show that this output impedance will remain constant for a fixed value of display voltage.

Figure 4 demonstrates the critical timing requirements between CLOCK and DATA IN for the MM58242.

To clear (reset) the display driver at "power on" or any time, the following flushing routine may be used. With the enable signal high, clock in 20 zeroes. Drive the enable signal low and the display will be blank. It is recommended to clear the driver at power on.

In Figure 5, the ENABLE signal acts as an envelope, and only while this signal is at a logic '1' does the circuit accept CLOCK input signals. Data is transferred and shifted in the internal shift register on the rising clock edge, i.e., '0'-'1' transition. When the ENABLE signal goes low, the contents of the shift registers are latched, and the display will show new data. During data transfer, the display will show old data. DATA OUT is also provided on the MM58242 being output on the falling edge. At any time, the display may be blanked under processor control, using the BLANKING CONTROL input.

Figure 6 shows a schematic diagram of a microprocessor-based system where the MM58242 is used to provide the grid drive for a 40-digit 2 line 5×7 multiplexed vacuum fluorescent (VF) display. The anode drive in this example is provided by another member of the high voltage display driver family, namely the MM58248, which does not require an externally generated load signal.

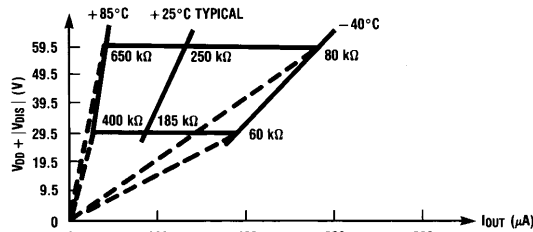


FIGURE 3a. Output Impedance Off

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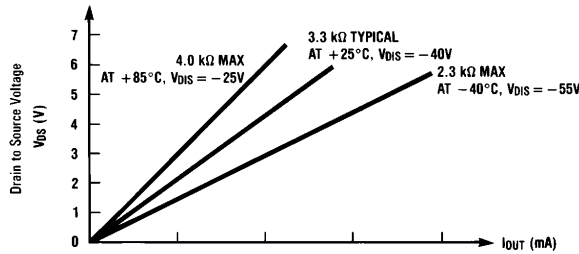
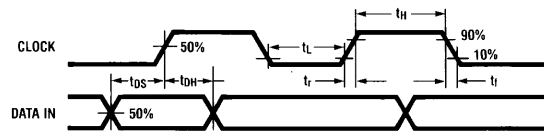


FIGURE 3b. Output Impedance On

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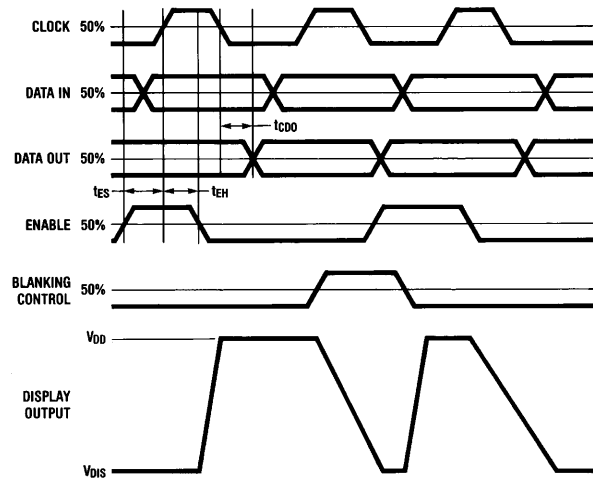
Timing Diagrams



TL/F/7924-5

For the purposes of AC measurement, $V_{IH} = 2.4V$, $V_{IL} = 0.8V$.

FIGURE 4. Clock and Data Timings



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FIGURE 5. MM58242 Timings (Data Format)

Typical Application

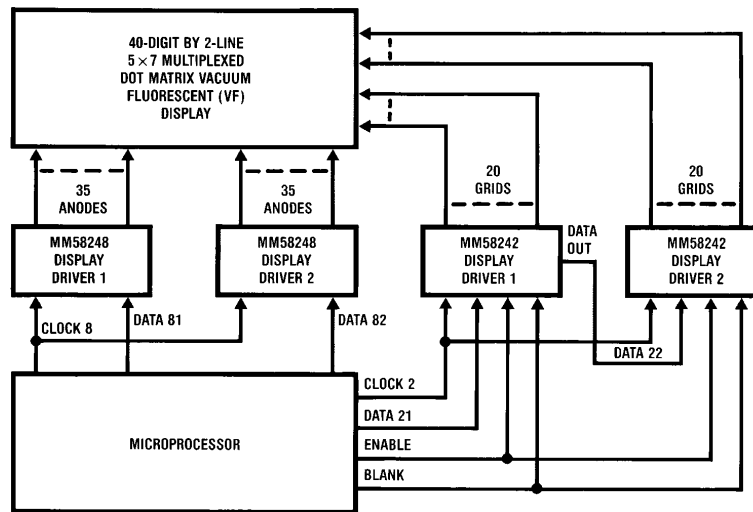
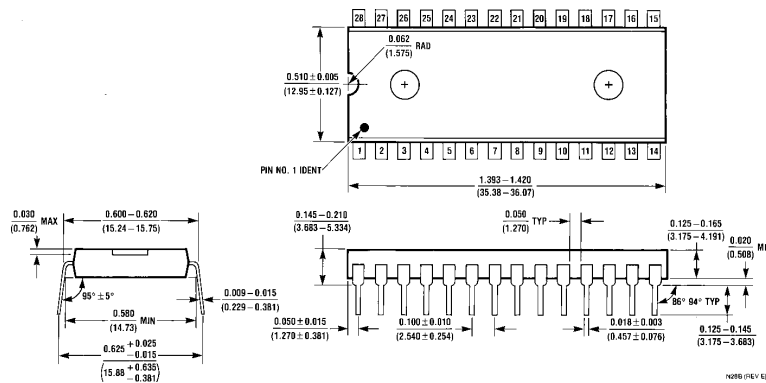
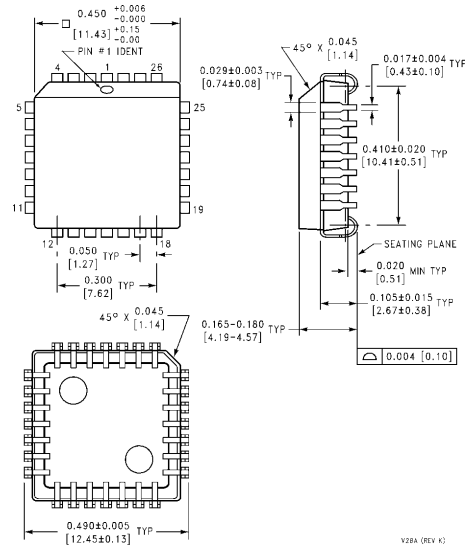


FIGURE 6. Microprocessor-Controlled Word Processor

TL/F/7924-7

Physical Dimensions inches (millimeters)

Molded Dual-In-Line Package (N)
Order Number MM58242N
NS Package Number N28B



Plastic Chip Carrier (V)
Order Number MM58242V
NS Package Number V28A

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National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: onjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408