



September 1992

## MM58241 High Voltage Display Driver

### General Description

The MM58241 is a monolithic MOS integrated circuit utilizing CMOS metal gate low threshold P- and N-channel devices. It is available both in 40-pin molded dual-in-line packages or as dice. The MM58241 is particularly suited for driving high voltage (60V max) vacuum fluorescent (VF) displays (e.g., a 32-digit alphanumeric or dot matrix display).

### Applications

- COPSTM 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

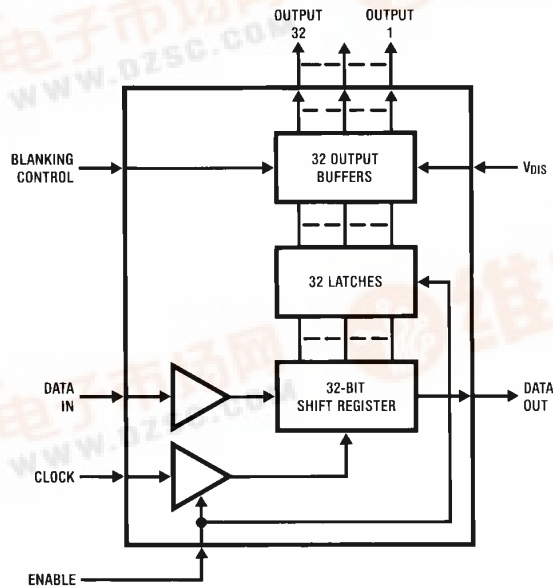


FIGURE 1

TL/F/5600-1

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$f_C$	Clock Input Frequency	(Notes 3 and 4)			800	kHz
$t_H$	High Time		300			ns
$t_L$	Low Time		300			ns
$t_{DS}$	Data Input Set-Up Time		100			ns
$t_{DH}$	Hold Time		100			ns
$t_{ES}$	Enable Input Set-Up Time		100			ns
$t_{EH}$	Hold Time		100			ns
$t_{CDO}$	Data Output CLOCK Low to Data Out Time	$C_L = 50\text{ pF}$			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:  $t_r, t_f \leq 20\text{ ns}$ ,  $f = 800\text{ kHz}$ , 50%  $\pm 10\%$  duty cycle.

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

## Connection Diagrams

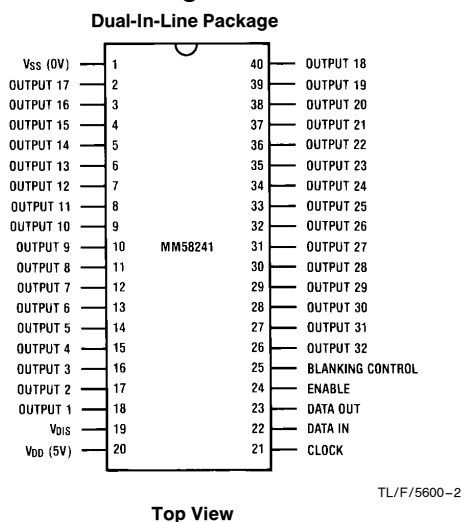


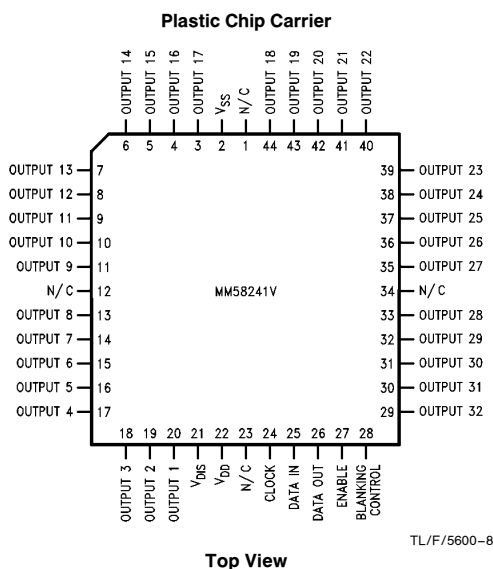
FIGURE 2

Order Number MM58241N or MM58241V  
See NS Package Number N40A or V44A

## 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 MM58241 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 MM58241 is shown in *Figure 1*.

*Figure 2* shows the pinout of the MM58241 device, where output 1 (pin 18) 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 MM58241, 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.

## Functional Description (Continued)

Figure 4 demonstrates the critical timing requirements between CLOCK and DATA IN for the MM58241.

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 32 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 MM58241, 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 MM58241 is used to provide the grid drive for a 32-digit 5 x 7 dot matrix 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.

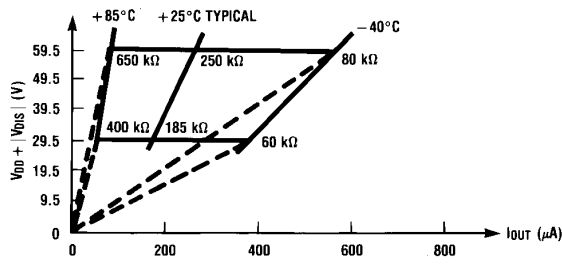


FIGURE 3a. Output Impedance Off

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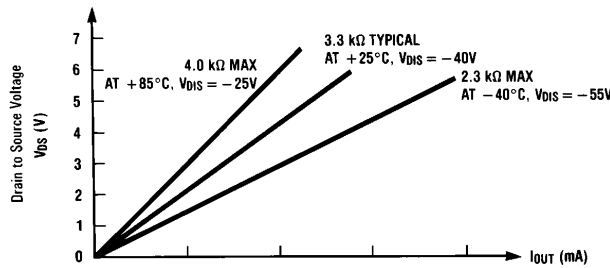
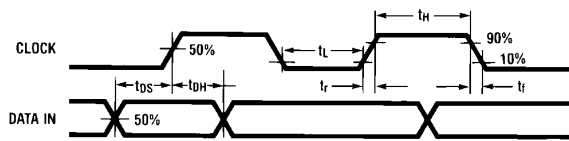


FIGURE 3b. Output Impedance On

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## Timing Diagrams



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

FIGURE 4. Clock and Data Timings

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## Timing Diagrams (Continued)

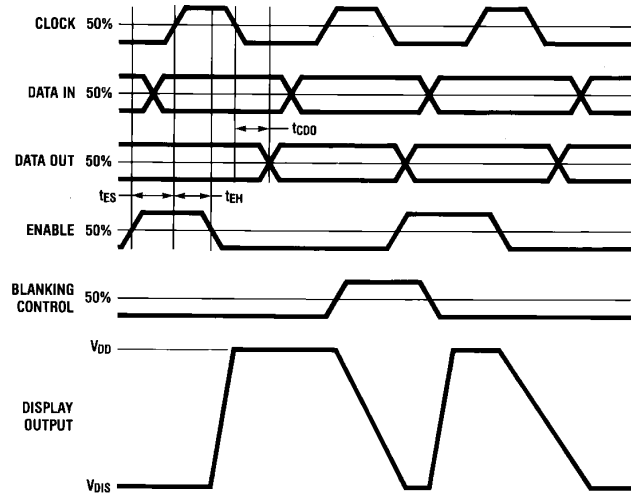


FIGURE 5. MM58241 Timings (Data Format)

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## Typical Application

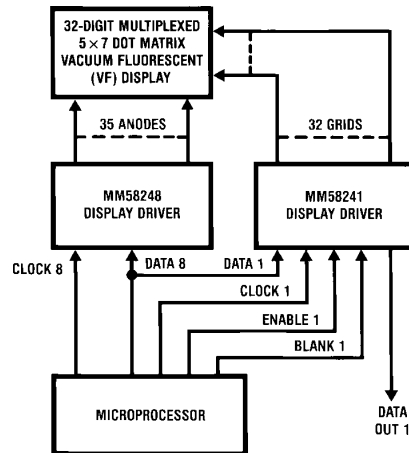
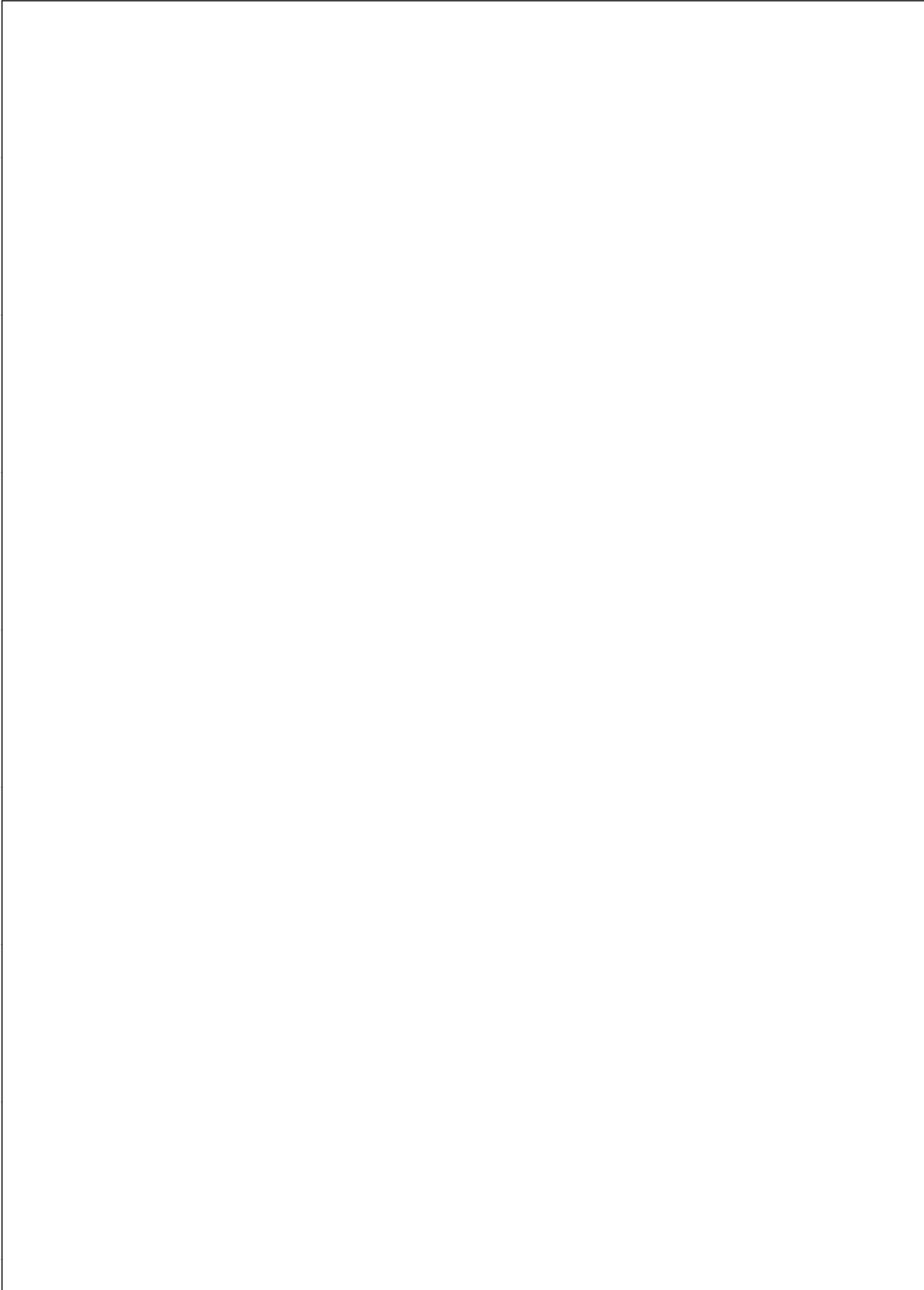
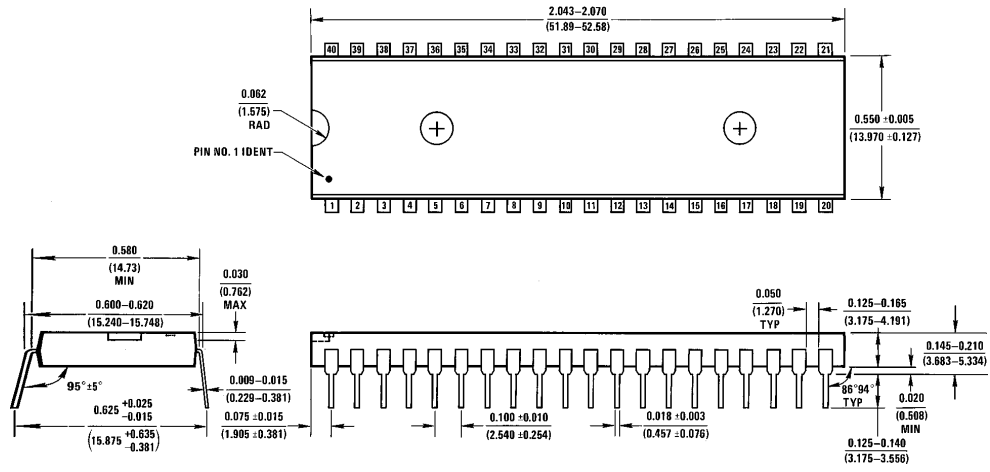


FIGURE 6. Microprocessor-Controlled Word Processor

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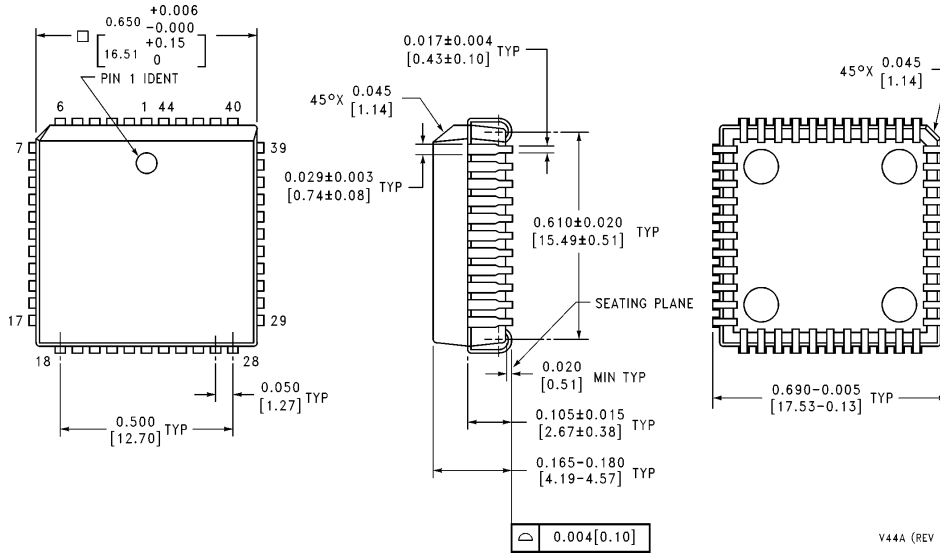
**Physical Dimensions** inches (millimeters)



**Molded Dual-In-Line Package**  
**Order Number MM58241N**  
**NS Package Number N40A**

N40A (REV E)

**Physical Dimensions** inches (millimeters) (Continued)



**Plastic Chip Carrier (V)  
Order Number MM58241V  
NS Package Number V44A**

V44A (REV K)

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