

## MM58342 High Voltage Display Driver

Check for Samples: [MM58342](#)

### 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

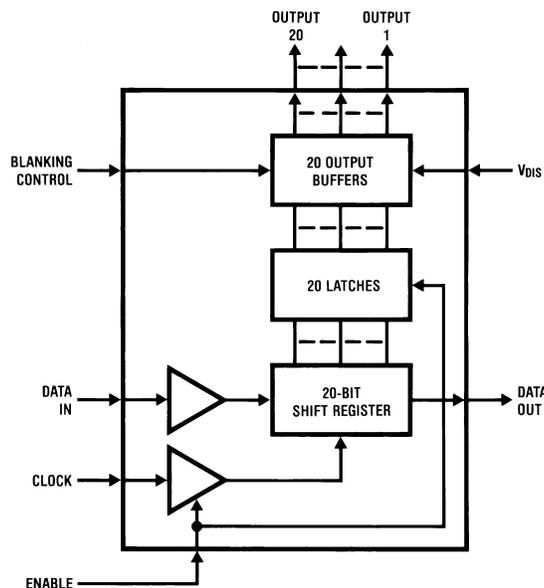
### APPLICATIONS

- COPS™ or Microprocessor-driven Displays
- Instrumentation Readouts
- Industrial Control Indicator
- Digital Clock, Thermostat, Counter, Voltmeter
- Word Processor Text Displays
- Automotive Dashboards

### DESCRIPTION

The MM58342 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 MM58342 is particularly suited for driving high voltage (35V max) vacuum fluorescent (VF) displays (e.g., a 20-digit alphanumeric or dot matrix display).

### Block Diagram



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.



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## Absolute Maximum Ratings<sup>(1)(2)</sup>

Voltage at Any Input Pin		$V_{DD} + 0.3V$ to $V_{SS} - 0.3V$
Voltage at Any Display Pin		$V_{DD}$ to $V_{DD} - 36.5V$
$V_{DD} +  V_{DIS} $		36.5V
Storage Temperature		-65°C to +150°C
Power Dissipation at 25°C	Molded DIP Package, Board Mount	2.03W <sup>(3)</sup>
	Molded DIP Package, Socket Mount	1.83W <sup>(4)</sup>
Junction Temperature		130°C
Lead Temperature (Soldering, 10 sec.)		260°C

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur.

(2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.

(3) Molded DIP Package, Board Mount,  $\theta_{JA} = 52^{\circ}C/W$ , derate 19.2 mW/°C above 25°C.

(4) Molded DIP Package, Socket Mount,  $\theta_{JA} = 58^{\circ}C/W$ , 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 ( $V_{DIS}$ )		-30	-10	V
Temperature Range		-40	+85	°C

## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
$I_{DD}$	Power Supply Currents	$V_{IN} = V_{SS}$ or $V_{DD}$ , $V_{SS} = 0V$ , $V_{DIS}$ Disconnected			150	$\mu A$	
$I_{DIS}$			$V_{DD} = 5.5V$ , $V_{SS} = 0V$ , $V_{DIS} = -30V$ All Outputs Low			10	mA
$V_{IL}$	Input Logic Levels DATA IN, CLOCK ENABLE, BLANK Logic "0"	See <sup>(1)</sup>	2.4		0.8	V	
$V_{IH}$	Logic "1"					V	
$V_{OL}$	Data Output Logic Levels	$I_{OUT} = 400 \mu A$	$V_{DD} - 0.5$		0.4	V	
$V_{OH}$						Logic "1"	V
$V_{OH}$						Logic "1"	$I_{OUT} = -500 \mu A$
$I_{IN}$	Input Currents DATA IN, CLOCK ENABLE, BLANK	$V_{IN} = 0V$ or $V_{DD}$	-10		10	$\mu A$	
$C_{IN}$	Input Capacitance DATA IN, CLOCK ENABLE, BLANK				15	pF	
$R_{OFF}$	Display Output Impedances Output Off (Figure 3)	$V_{DD} = 5.5V$ , $V_{SS} = 0V$ $V_{DIS} = -10V$ $V_{DIS} = -20V$ $V_{DIS} = -30V$	55		250	k $\Omega$	
$R_{ON}$	Output On (Figure 4)		$V_{DIS} = -10V$		700	800	$\Omega$
			$V_{DIS} = -20V$		600	750	$\Omega$
		$V_{DIS} = -30V$		500	680	$\Omega$	
$V_{DOL}$	Display Output Low Voltage	$V_{DD} = 5.5V$ , $I_{OUT} =$ Open Circuit, $-30V \leq V_{DIS} \leq -10V$	$V_{DIS}$		$V_{DIS} + 2$	V	

(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  $+85^{\circ}\text{C}$ ,  $V_{DD} = 5\text{V} \pm 0.5\text{V}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$f_C$	Clock Input Frequency	See <sup>(1)(2)</sup>			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	See <sup>(3)</sup>	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

- (1) AC input waveform specification for test purposes:  $t_r, t_f \leq 20\text{ ns}$ ,  $f = 800\text{ kHz}$ , 50%  $\pm 10\%$  duty cycle.
- (2) Clock input rise and fall times must not exceed  $5\text{ }\mu\text{s}$ .
- (3) For timing purposes, the signals ENABLE and BLANK can be considered to be totally independent of each other.

### Connection Diagrams

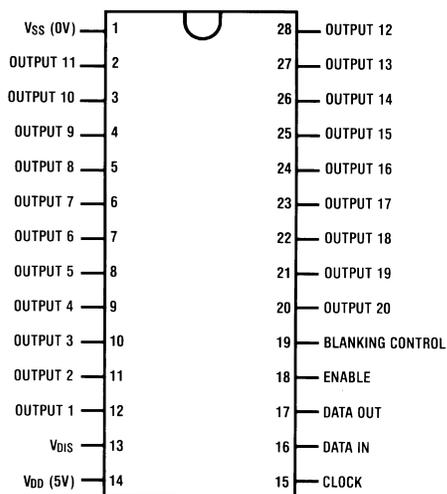


Figure 1. Dual-In-Line Package - Top View

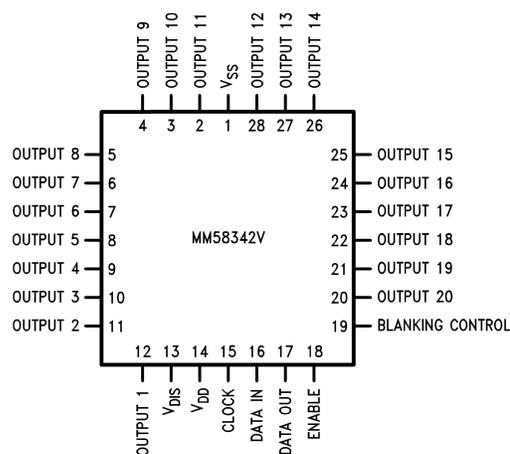


Figure 2. Plastic Chip Carrier - Top View Package PLCC (FN)

## 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 MM58342 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 MM58342 is shown in [Block Diagram](#).

[Figure 1](#) shows the pinout of the MM58342 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.

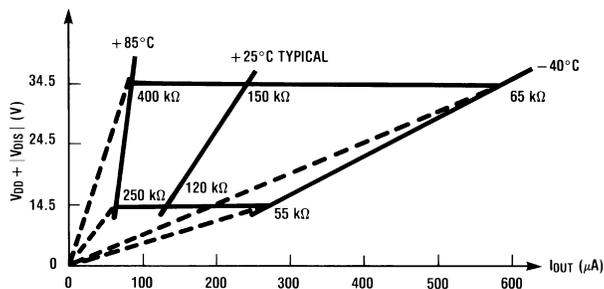
A significant reduction in discrete board components can be achieved by use of the MM58342, because external pull-down resistors are not required. Due to the nature of the output stage, both its on and off impedance values vary as a function of the display voltage applied. However, [Figure 3](#) and [Figure 4](#) show that this output impedance will remain constant for a fixed value of display voltage.

[Figure 5](#) demonstrates the critical timing requirements between CLOCK and DATA IN for the MM58342.

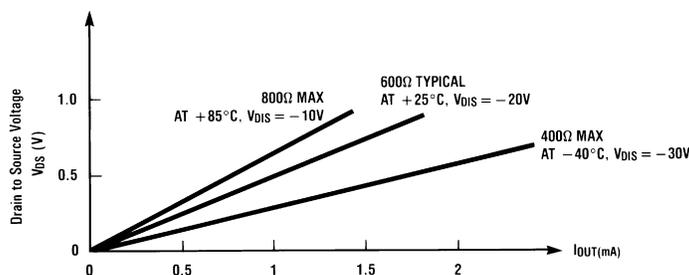
To clear (reset) the display driver at power on or any time, the following flushing routine may be used. With the enable signal high, clock in 20 zeroes. Drive the enable signal low and the display will be blank. It is recommended to clear the driver at power on.

In [Figure 6](#), 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 MM58342 being output on the falling edge. At any time, the display may be blanked under processor control, using the BLANKING CONTROL input.

[Figure 7](#) shows a schematic diagram of a microprocessor-based system where the MM58342 is used to provide the grid drive for a 40-digit 2 line 5 x 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 MM58348, which does not require an extremely generated load signal.



**Figure 3. Output Impedance Off**



**Figure 4. Output Impedance On**

Timing Diagrams

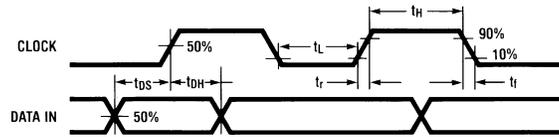


Figure 5. Clock and Data Timings

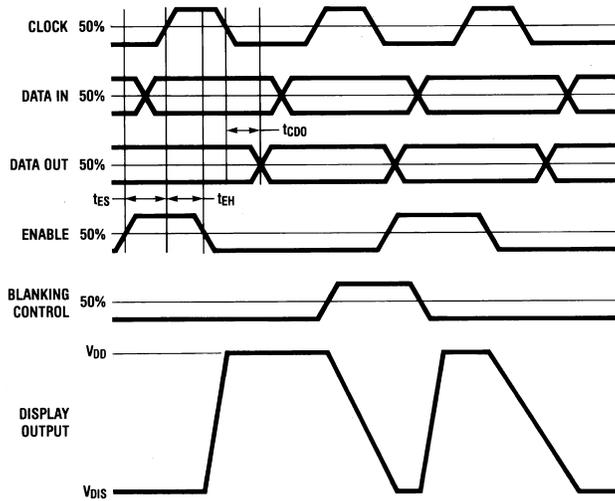


Figure 6. Timings (Data Format)

Typical Application

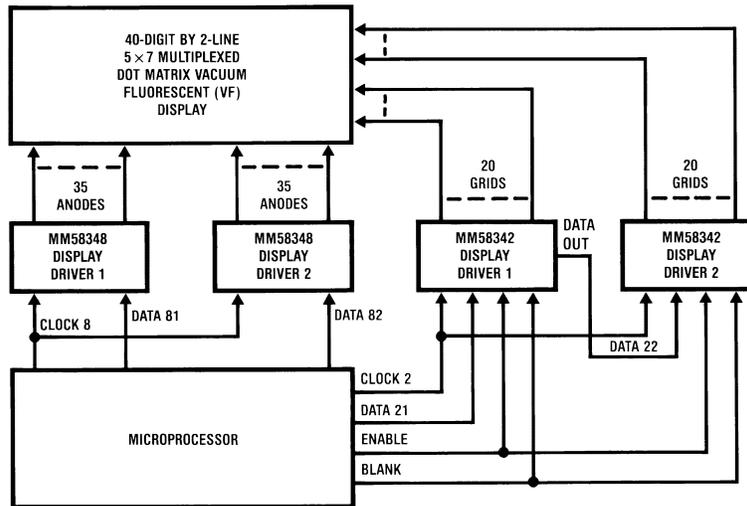


Figure 7. Microprocessor-Controlled Word Processor

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## REVISION HISTORY

Changes from Revision B (April 2013) to Revision C	Page
• Changed layout of National Data Sheet to TI format .....	<a href="#">5</a>

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