

MM5484 16-Segment LED Display Driver

General Description

The MM5484 is a low threshold N-channel metal gate circuit using low threshold enhancement and ion implanted depletion devices. The MM5484 is available in a 22-pin molded package and is capable of driving 16 LED segments. The MM5484 is designed to drive common anode separate cathode LED displays.

Features

- Serial data input
- Wide power supply operation
- 16 output, 15 mA sink capability

- MM5484 is cascadeable
- TTL compatibility
- No load signal required
- Non multiplex display
- 2½ digit capability—MM5484

Applications

- COPSTM or microprocessor displays
- Instrumentation readouts
- Industrial control indicator
- Relay driver

Block and Connection Diagrams

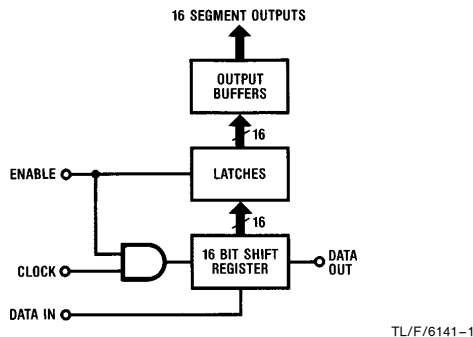
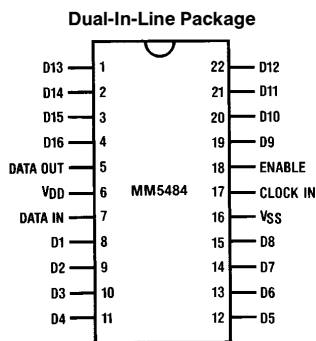


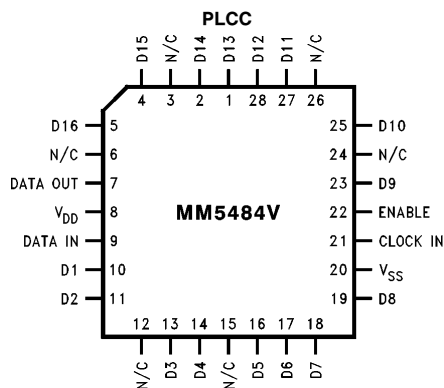
FIGURE 1. MM5484



Top View

Order Number MM5484N
See NS Package Number N22A

TL/F/6141-3



Top View

Order Number MM5484V
See NS Package Number V28A

TL/F/6141-6

COPSTM is a trademark of National Semiconductor Corp.

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at LED Outputs $V_{SS} - 0.5V$ to $V_{SS} + 12V$
 Voltage at Other Pins $V_{SS} - 0.5V$ to $V_{SS} + 10V$

Operating Temperature $-40^{\circ}C$ to $+85^{\circ}C$
 Storage Temperature $-40^{\circ}C$ to $+150^{\circ}C$
 Power Dissipation at $25^{\circ}C$
 Molded DIP Package, board mount 2W*
 Molded DIP Package, socket mount 1.8W**
 *Molded DIP Package, board mount, $\theta_{JA} = 63^{\circ}C/W$,
 derate 15.8m W/ $^{\circ}C$ above $25^{\circ}C$.
 **Molded DIP Package, socket mount, $\theta_{JA} = 69^{\circ}C/W$,
 derate 14.5m W/ $^{\circ}C$ above $25^{\circ}C$.
 Lead Temperature (Soldering, 10 sec.) $300^{\circ}C$

DC Electrical Characteristics $V_{DD} = 4.5V$ to $9V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$ unless otherwise specified

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		4.5		9	V
Supply Current			5	10	mA
Logic One Input High Level V_{IH}		2.4		$V_{DD} + 0.5$	V
Logic Zero Input Low Level V_{IL}		0		0.8	V
Input Current	High or Low Level			± 1	μA
Input Capacitance				7.5	pF

OUTPUTS

Data Output Voltage High Level V_{OH} Low Level V_{OL}	$I_{OUT} = 0.1$ mA $I_{OUT} = -0.1$ mA	$V_{DD} - 0.5$		0.5	V V
Segment Off (Logic Zero on Input)	$V_{OUT} = 12V$ $R_{EXT} = 400\Omega$			50	μA
Output Current Segment On (Logic One on Input) Output Voltage	$I_{OUT} = 15$ mA $V_{DD} \geq 6V$		0.5	1.0	V

AC Electrical Characteristics

(See Figure 3.) $V_{DD} = 4.5V$ to $9V$, $T_A = -40^{\circ}C$ to $+85^{\circ}C$ unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
f_C	Clock Frequency				0.5	MHz
t_h	High Time		0.95			μs
t_l	Low Time		0.95			μs
t_{S1}	Data Setup Time		0.5			μs
t_{H1}	Data Hold Time		0.5			μs
t_{S2}	Enable Setup Time		0.5			μs
t_{H2}	Enable Hold Time		0.5			μs
t_{pd}	Data Out Delay				0.5	μs

Note 1: Under no condition should the power dissipated by the segment driver exceed 50 mW nor the entire chip power dissipation exceed 500 mW.

Note 2: AC input waveform specification for test purpose: $t_r \leq 20$ ns, $t_f \leq 20$ ns, $f = 500$ kHz, 50% $\pm 10\%$ duty cycle.

Note 3: Clock input rise and fall times must not exceed 500 ns.

Functional Description

The MM5484 is designed to drive LED displays directly. Serial data transfer from the data source to the display driver is accomplished with 3 signals, DATA IN, CLOCK and ENABLE. The signal ENABLE acts as an envelope and only while this signal is at a logic '1' do the circuits recognize the clock signal.

While ENABLE is high, data on the serial data input is transferred and shifted in the internal shift register on the rising clock edge, i.e. a logic '0' to logic '1' transition.

When the ENABLE signal goes to a low (logic zero state), the contents of the shift register is latched and the display will show the new data. While new data is being loaded into the SR the display will continue to show the old data.

For the MM5484, data is output from the serial DATA OUT pin on the falling edge of clock so cascading is made simple with race hazards eliminated.

When the chip first powers on, an internal power on reset signal is generated which resets the SR and latches to zero so that the display will be off.

Timing Diagram

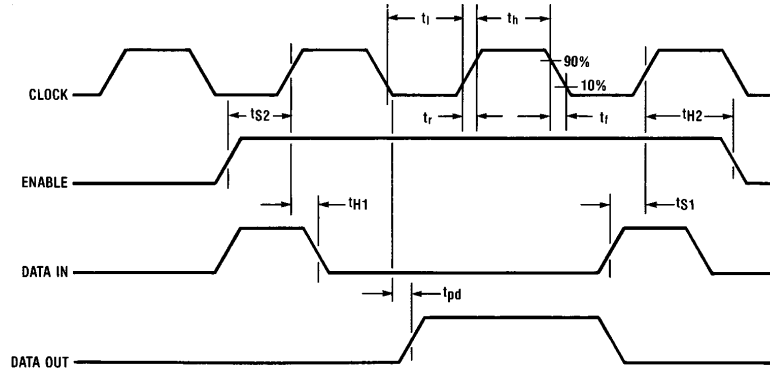
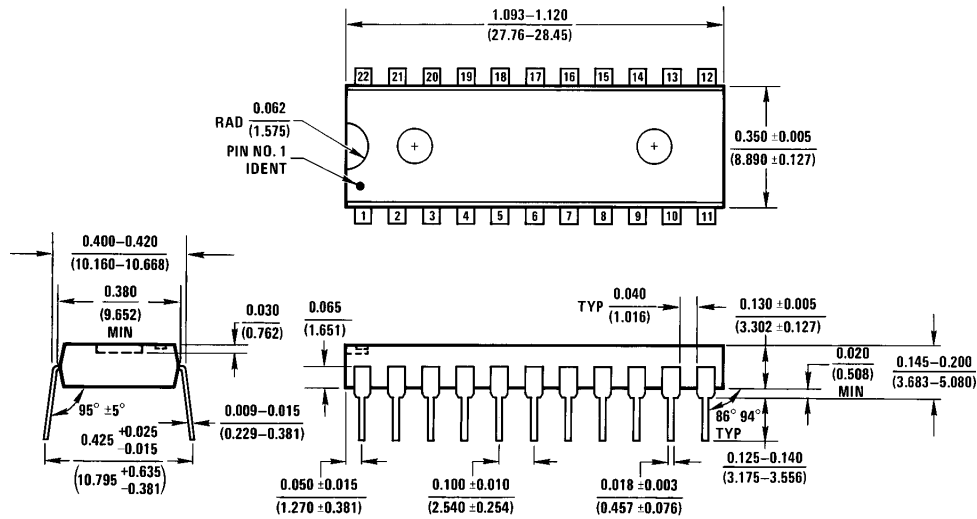


FIGURE 3

TL/F/6141-5

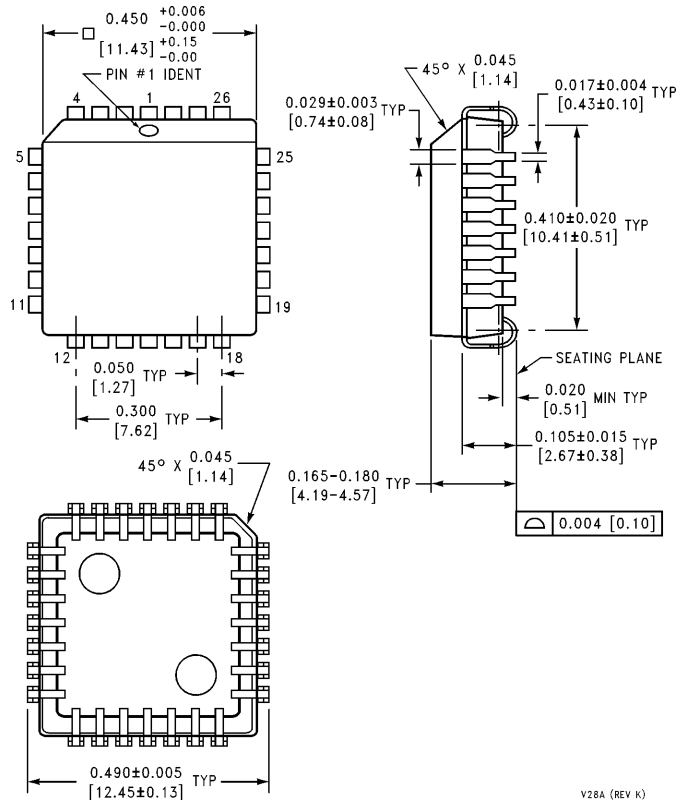
Physical Dimensions inches (millimeters)



Molded Dual-In-Line Package (N)
Order Number MM5484N
NS Package Number N22A

N22A (REV D)

Physical Dimensions inches (millimeters) (Continued)



28-Pin Plastic Leaded Chip Carrier (V)
Order Number MM5484V
NS Package Number V28A

V28A (REV K)

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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: cnjwge@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

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.