

# MM5483 Liquid Crystal Display Driver

## General Description

The MM5483 is a monolithic integrated circuit utilizing CMOS metal-gate low-threshold enhancement mode devices. It is available in a 40-pin molded package. The chip can drive up to 31 segments of LCD and can be cascaded to increase this number. This chip is capable of driving a 4½-digit 7-segment display with minimal interface between the display and the data source.

The MM5483 stores the display data in latches after it is latched in, and holds the data until another load pulse is received.

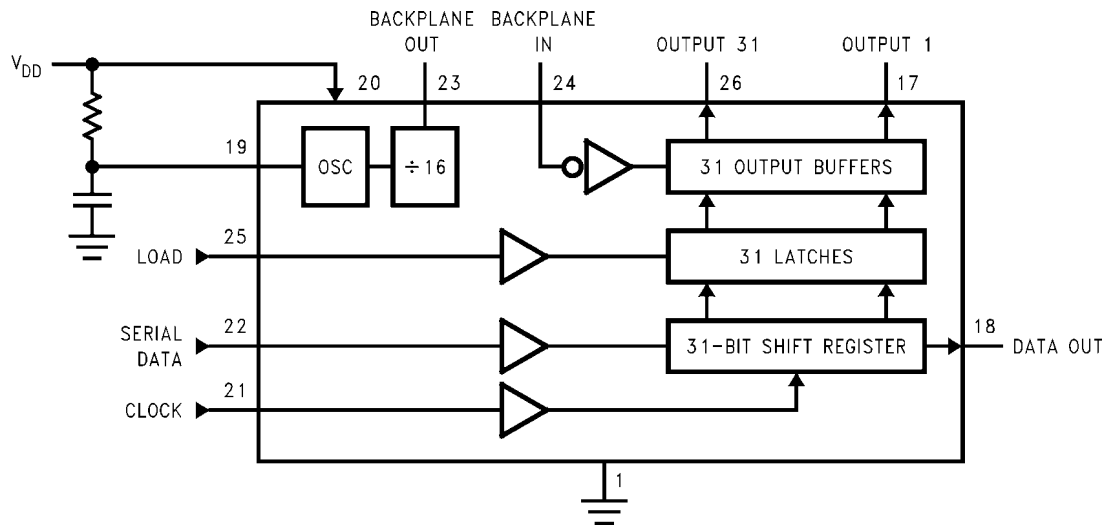
## Features

- Serial data input
- Serial data output
- Wide power supply operation
- TTL compatibility
- 31 segment outputs
- Alphanumeric and bar graph capability
- Cascade capability

## Applications

- COPS™ or microprocessor displays
- Industrial control indicator
- Digital clock, thermometer, counter, voltmeter
- Instrumentation readouts
- Remote displays

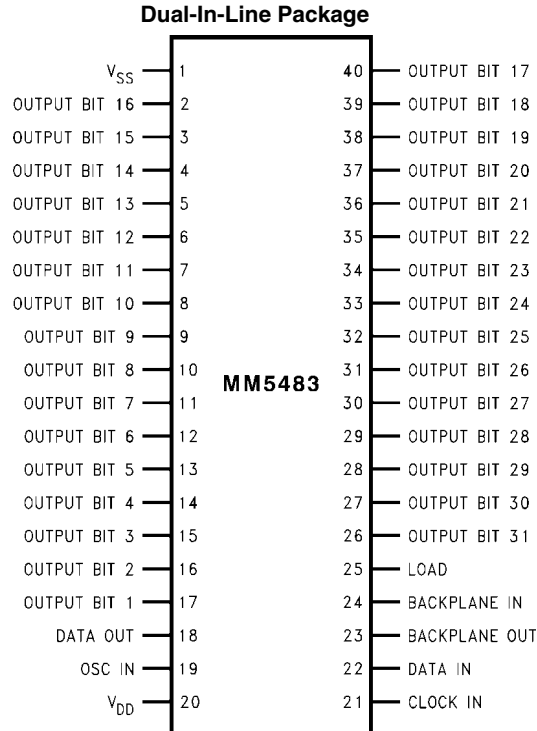
## Block Diagram



614001

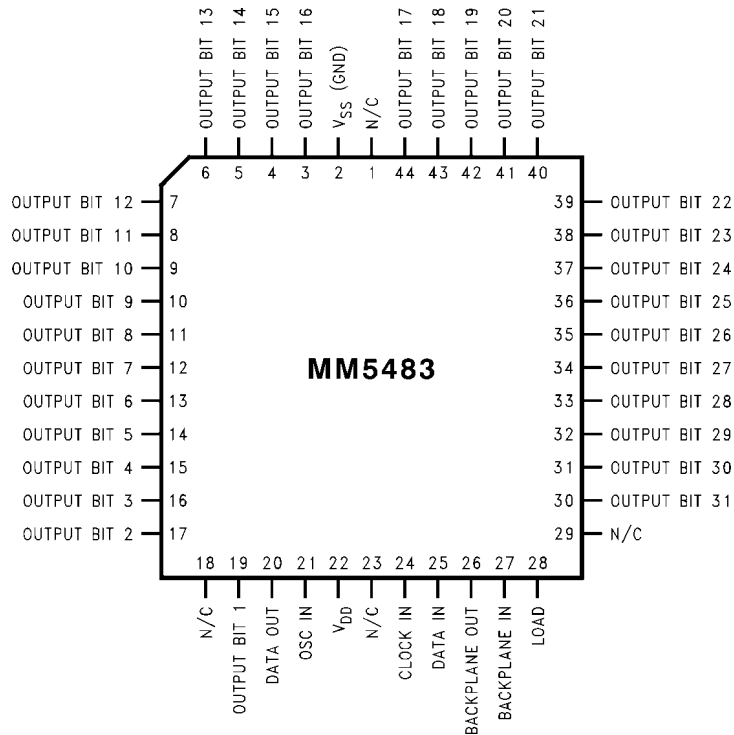
FIGURE 1. MM5483 Block Diagram

# Connection Diagrams



614002

**Top View**  
**Order Number MM5483N**  
**See NS Package Number N40A**



614007

**Order Number MM5483V**  
**See NS Package Number V44A**

**FIGURE 2. Connection Diagrams**

**Absolute Maximum Ratings** (Note 1)

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

|                       |                            |
|-----------------------|----------------------------|
| Voltage at Any Pin    | $V_{SS}$ to $V_{SS} + 10V$ |
| Operating Temperature | -40°C to +85°C             |

|   |                                    |
|---|------------------------------------|
| Storage Temperature                         | -65°C to +150°C                    |
| Power Dissipation                           | 300 mW at +85°C<br>350 mW at +25°C |
| Junction Temperature                        | +150°C                             |
| Lead Temperature<br>(Soldering, 10 seconds) | 300°C                              |

**DC Electrical Characteristics**

$T_A$  within operating range,  $V_{DD} = 3.0V$  to  $10V$ ,  $V_{SS} = 0V$ , unless otherwise specified

| Parameter                                      | Conditions   | Min | Typ | Max | Units   |
|--|--|-----|-----|-----|---------|
| Power Supply                                   |  | 3.0 |     | 10  | V       |
| Average Supply Current, $I_{DD}$               | All Outputs Bits = Open, Data Out = Open,<br>BP_Out = Open, Clock In = 0V,<br>Data In = 0V, Data Load = 0V,<br>Osc In = 0V, BP_In = 32Hz |     |     |     |         |
|  | $V_{DD} = 3.0V$  |     | 1.5 | 2.5 | $\mu A$ |
|  | $V_{DD} = 5.0V$  |     |     | 10  | $\mu A$ |
|  | $V_{DD} = 10.0V$   |     |     | 40  | $\mu A$ |
| Input Voltage Levels                           | Load, Clock, Data  |     |     |     |         |
| Logic "0"                                      | $V_{DD} = 5.0V$  |     |     | 0.9 | V       |
| Logic "1"                                      | $V_{DD} = 5.0V$  | 2.4 |     |     | V       |
| Logic "0"                                      | $V_{DD} = 3.0V$  |     |     | 0.4 | V       |
| Logic "1"                                      | $V_{DD} = 3.0V$  | 2.0 |     |     | V       |
| Output Current Levels<br>Segments and Data Out |  |     |     |     |         |
| Sink   | $V_{DD} = 3.0V$ , $V_{OUT} = 0.3V$   | 20  |     |     | $\mu A$ |
| Source   | $V_{DD} = 3.0V$ , $V_{OUT} = 2.7V$   | 20  |     |     | $\mu A$ |
| BP Out Sink                                    | $V_{DD} = 3.0V$ , $V_{OUT} = 0.3V$   | 320 |     |     | $\mu A$ |
| BP Out Source                                  | $V_{DD} = 3.0V$ , $V_{OUT} = 2.7V$   | 320 |     |     | $\mu A$ |

**AC Electrical Characteristics**

$V_{DD} \geq 4.7V$ ,  $V_{SS} = 0V$  unless otherwise specified

| Symbol    | Parameter                      | Min | Typ | Max | Units |
|-----------|--------------------------------|-----|-----|-----|-------|
| $f_C$     | Clock Frequency, $V_{DD} = 3V$ |     |     | 500 | kHz   |
| $t_{CH}$  | Clock Period High (Notes 2, 3) | 500 |     |     | ns    |
| $t_{CL}$  | Clock Period Low               | 500 |     |     | ns    |
| $t_{DS}$  | Data Set-Up before Clock       | 300 |     |     | ns    |
| $t_{DH}$  | Data Hold Time after Clock     | 100 |     |     | ns    |
| $t_{LW}$  | Minimum Load Pulse Width       | 500 |     |     | ns    |
| $t_{LTC}$ | Load to Clock                  | 400 |     |     | ns    |
| $t_{CDO}$ | Clock to Data Valid            |     | 400 | 750 | ns    |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" specifies conditions of device operation.

**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 300 ns.

**Note 4:** Output offset voltage is  $\pm 50$  mV with  $C_{SEGMENT} = 250$  pF,  $C_{BP} = 8750$  pF.

## Functional Description

A block diagram for the MM5483 is shown in *Figure 1* and a package pinout is shown in *Figure 2*. *Figure 3* shows a possible 3-wire connection system with a typical signal format for *Figure 3*. Shown in *Figure 4*, the load input is an asynchronous input and lets data through from the shift register to the output buffers any time it is high. The load input can be connected to  $V_{DD}$  for 2-wire control as shown in *Figure 5*. In the 2-wire

control mode, 31 bits (or less depending on the number of segments used) of data are clocked into the MM5483 in a short time frame (with less than 0.1 second there probably will be no noticeable flicker) with no more clocks until new information is to be displayed. If data was slowly clocked in, it can be seen to "walk" across the display in the 2-wire mode. An AC timing diagram can be seen in *Figure 6*. It should be noted that data out is not a TTL-compatible output.

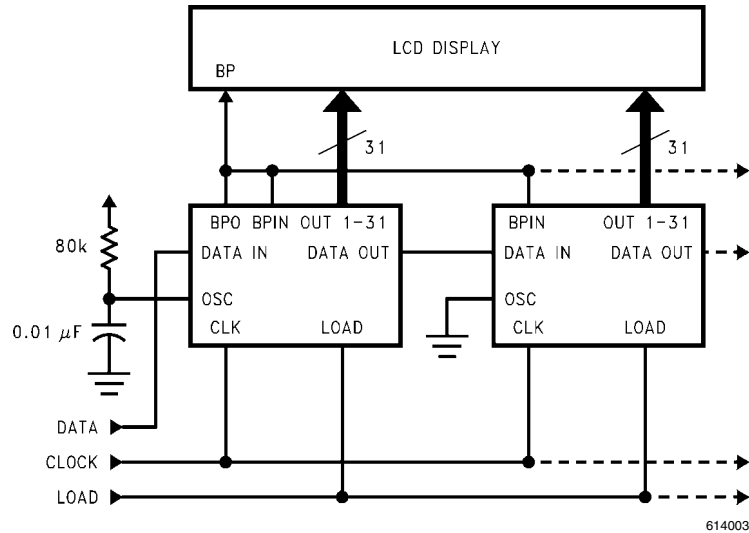


FIGURE 3. Three-Wire Control Mode

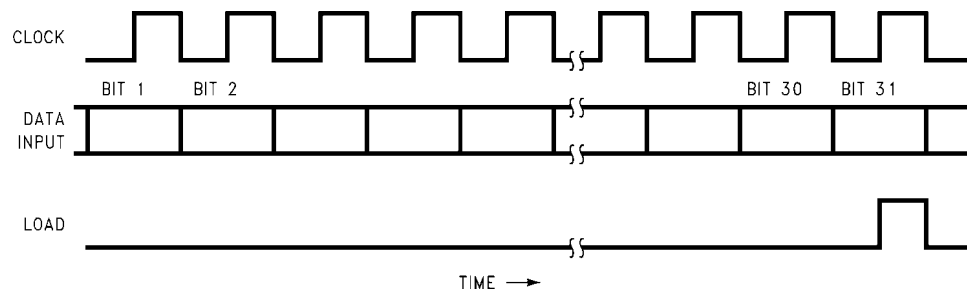


FIGURE 4. Data Format Diagram

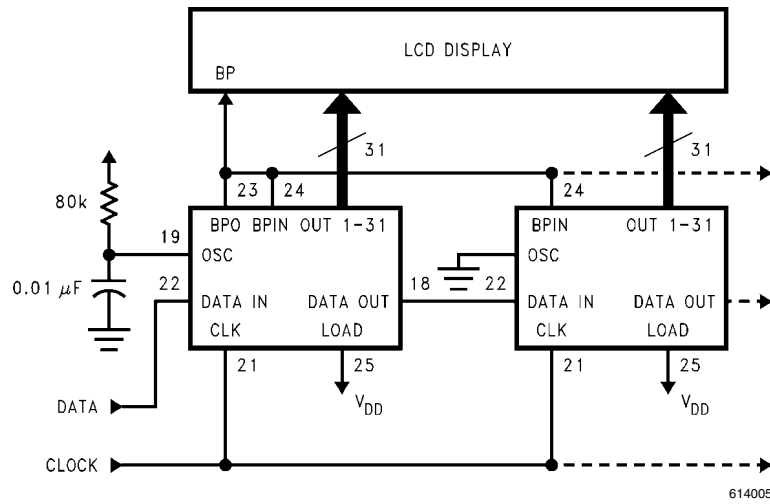


FIGURE 5. Two-Wire Control Mode

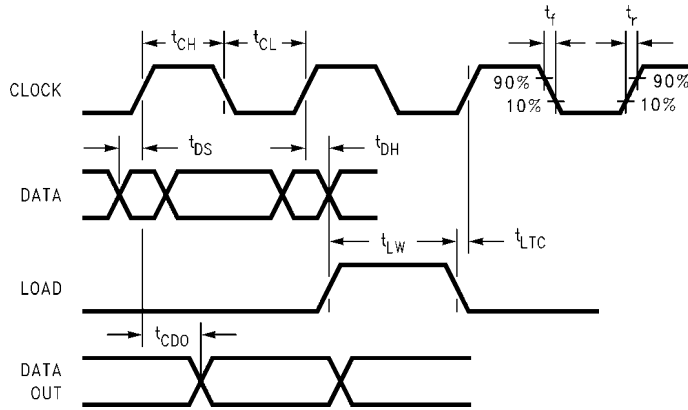
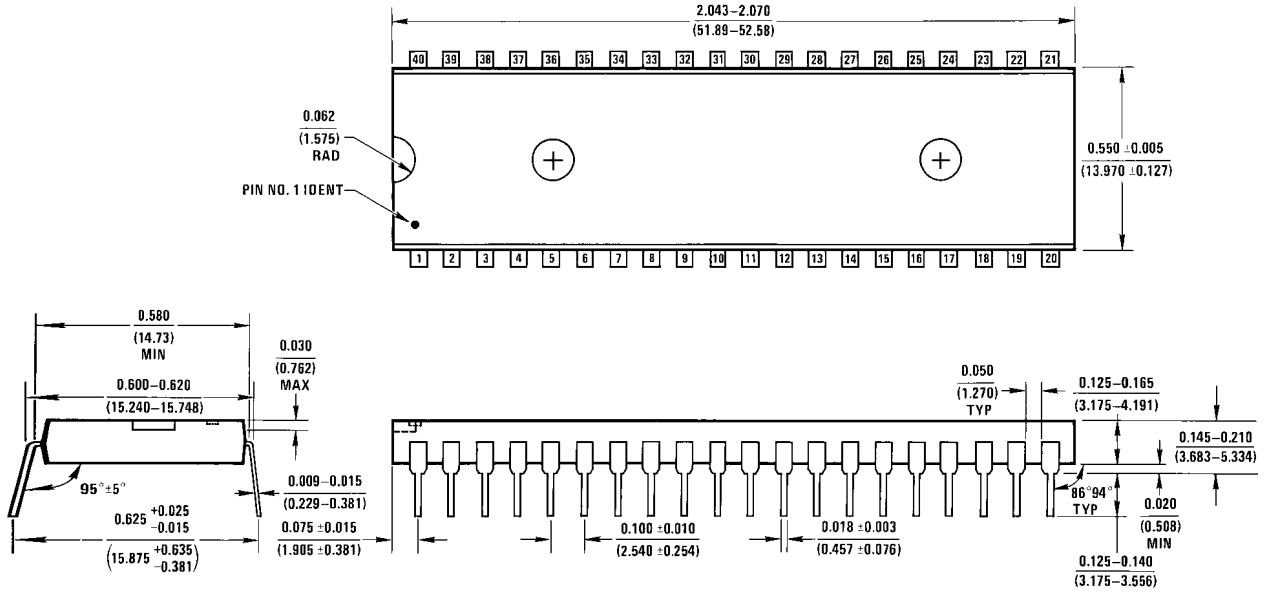


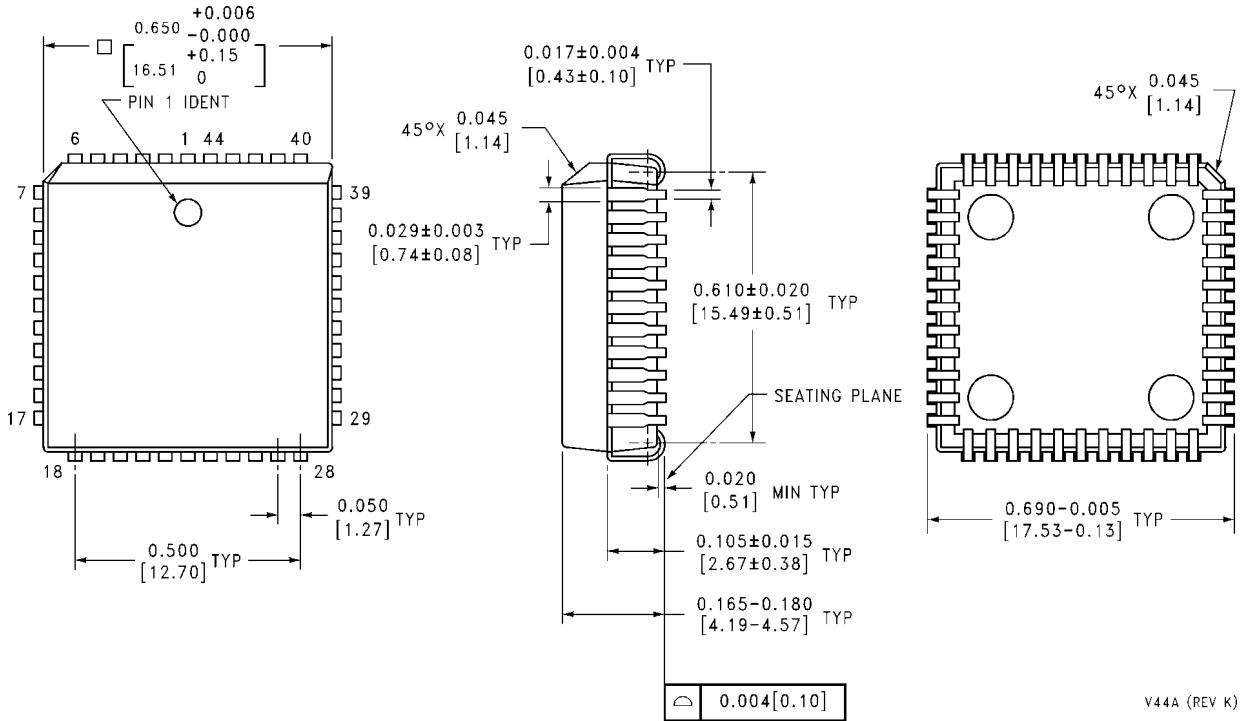
FIGURE 6. Timing Diagram

**Physical Dimensions** inches (millimeters) unless otherwise noted



N40A (REV E)

**Molded Dual-In-Line Package (N)**  
**Order Number MM5483N**  
**NS Package Number N40A**



V44A (REV K)

**Order Number MM5483V**  
**NS Package Number V44A**

# Notes

MM5483

## Notes

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| Switching Regulators           | <a href="http://www.national.com/switchers">www.national.com/switchers</a>     | Distributors            | <a href="http://www.national.com/contacts">www.national.com/contacts</a>           |
| LDOs                           | <a href="http://www.national.com/ldo">www.national.com/ldo</a>                 | Quality and Reliability | <a href="http://www.national.com/quality">www.national.com/quality</a>             |
| LED Lighting                   | <a href="http://www.national.com/led">www.national.com/led</a>                 | Feedback/Support        | <a href="http://www.national.com/feedback">www.national.com/feedback</a>           |
| Voltage Reference              | <a href="http://www.national.com/vref">www.national.com/vref</a>               | Design Made Easy        | <a href="http://www.national.com/easy">www.national.com/easy</a>                   |
| PowerWise® Solutions           | <a href="http://www.national.com/powerwise">www.national.com/powerwise</a>     | Solutions               | <a href="http://www.national.com/solutions">www.national.com/solutions</a>         |
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