National Semiconductor

December 16, 2008

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

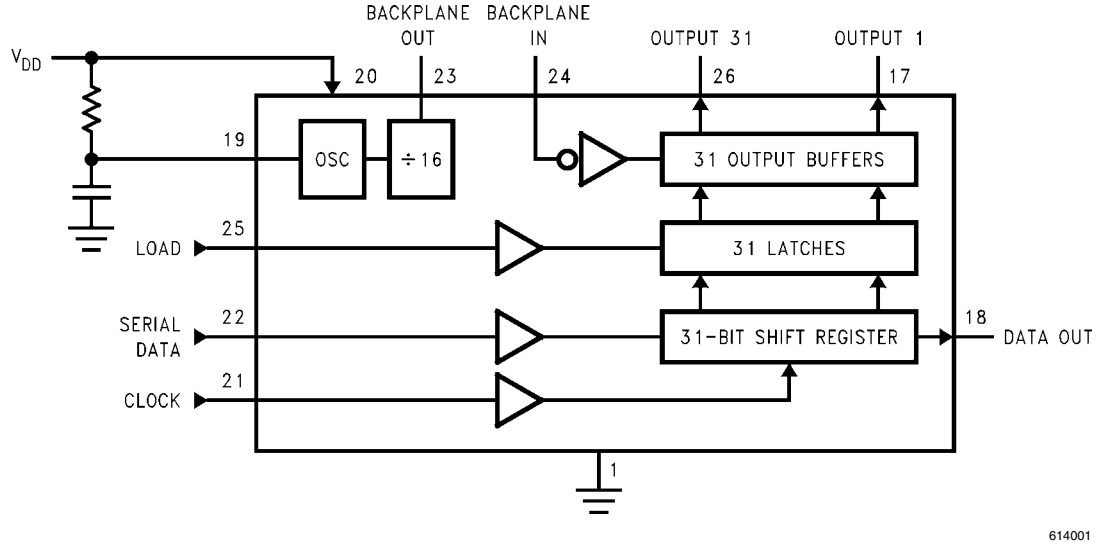
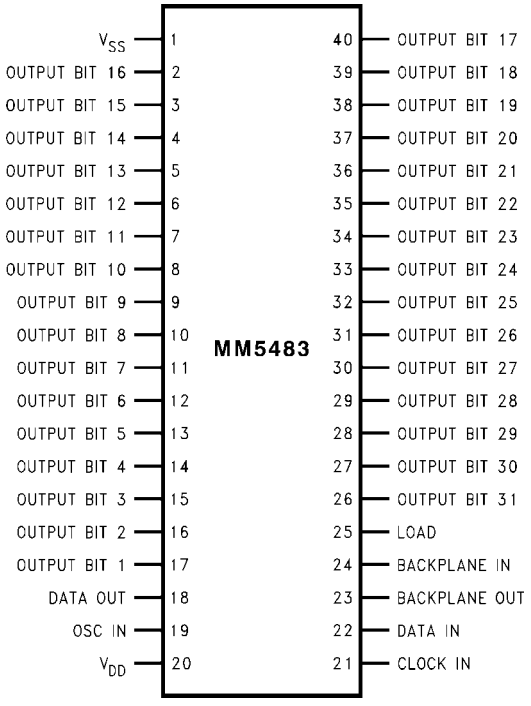


FIGURE 1. MM5483 Block Diagram

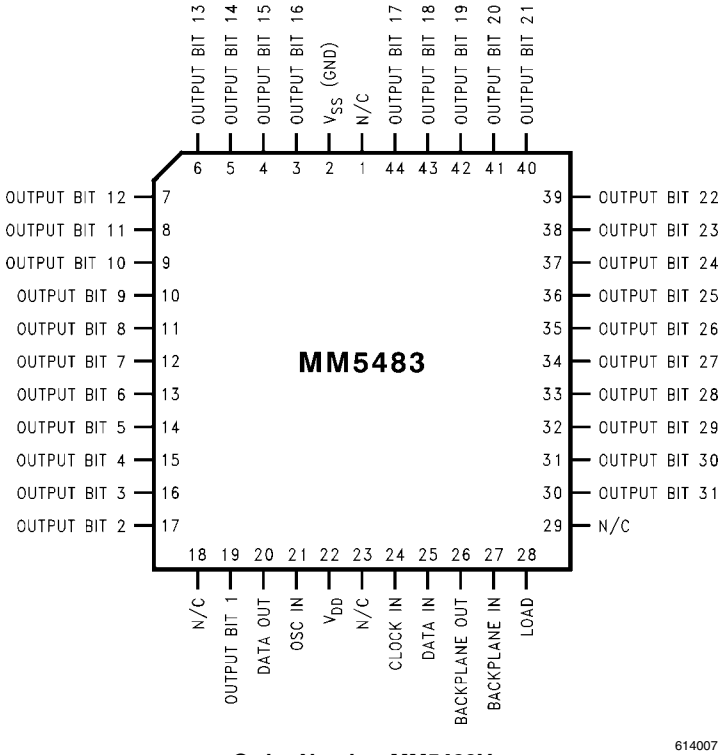
COPS™ is a trademark of National Semiconductor Corporation.

Connection Diagrams

Dual-In-Line Package



Top View
Order Number MM5483N
See NS Package Number N40A



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 350 mW at +25°C
Junction Temperature	+150°C
Lead Temperature (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, BP_Out = Open, Clock In = 0V, Data In = 0V, Data Load = 0V, Osc In = 0V, BP_In = 32Hz				
	V_{DD} = 3.0V		1.5	2.5	µA
	V_{DD} = 5.0V			10	µA
	V_{DD} = 10.0V			40	µA
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 Segments and Data Out					
Sink	V_{DD} = 3.0V, V_{OUT} = 0.3V	20			µA
Source	V_{DD} = 3.0V, V_{OUT} = 2.7V	20			µA
BP Out Sink	V_{DD} = 3.0V, V_{OUT} = 0.3V	320			µA
BP Out Source	V_{DD} = 3.0V, V_{OUT} = 2.7V	320			µA

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% ± 10% duty cycle.

Note 3: Clock input rise and fall times must not excced 300 ms.

Note 4: Output offset voltage is ±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.

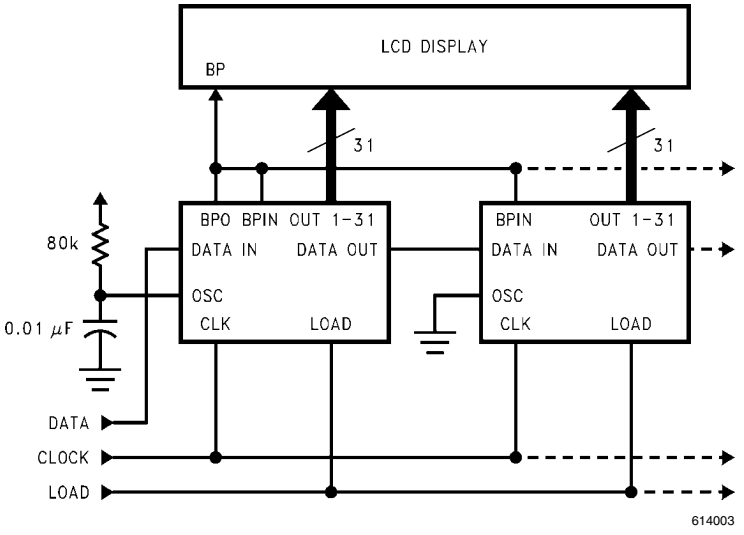


FIGURE 3. Three-Wire Control Mode

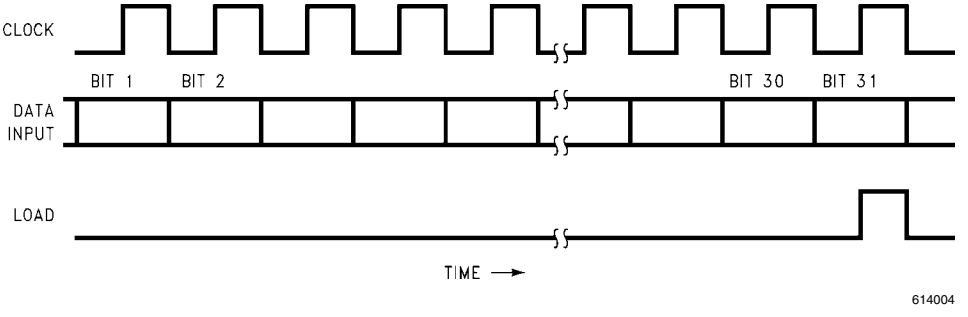


FIGURE 4. Data Format Diagram

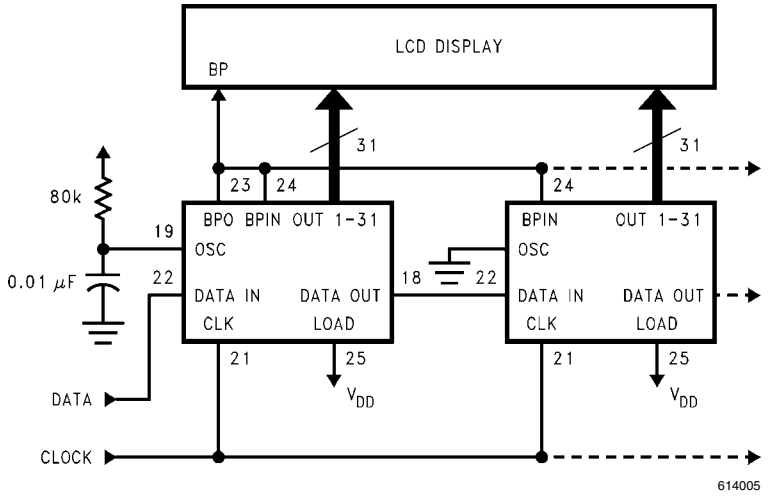


FIGURE 5. Two-Wire Control Mode

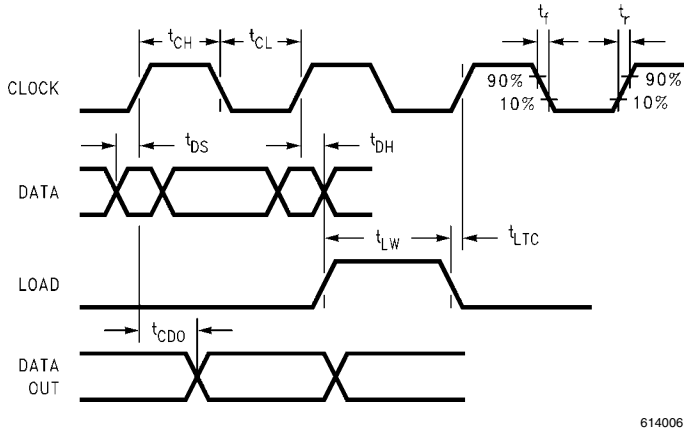
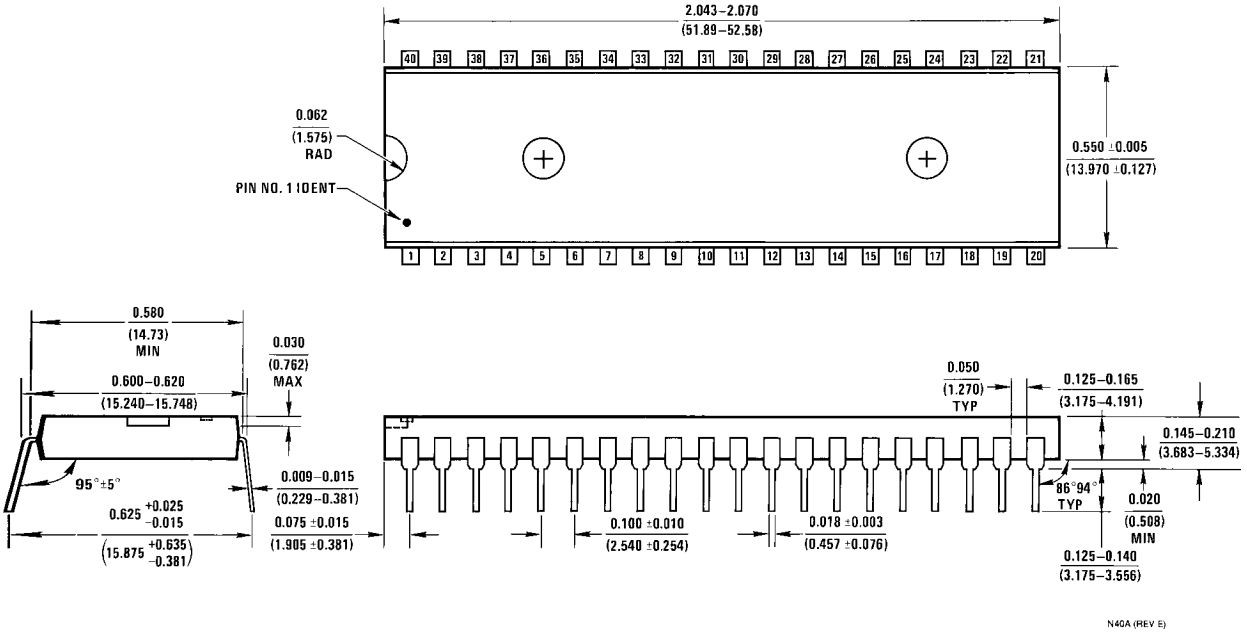
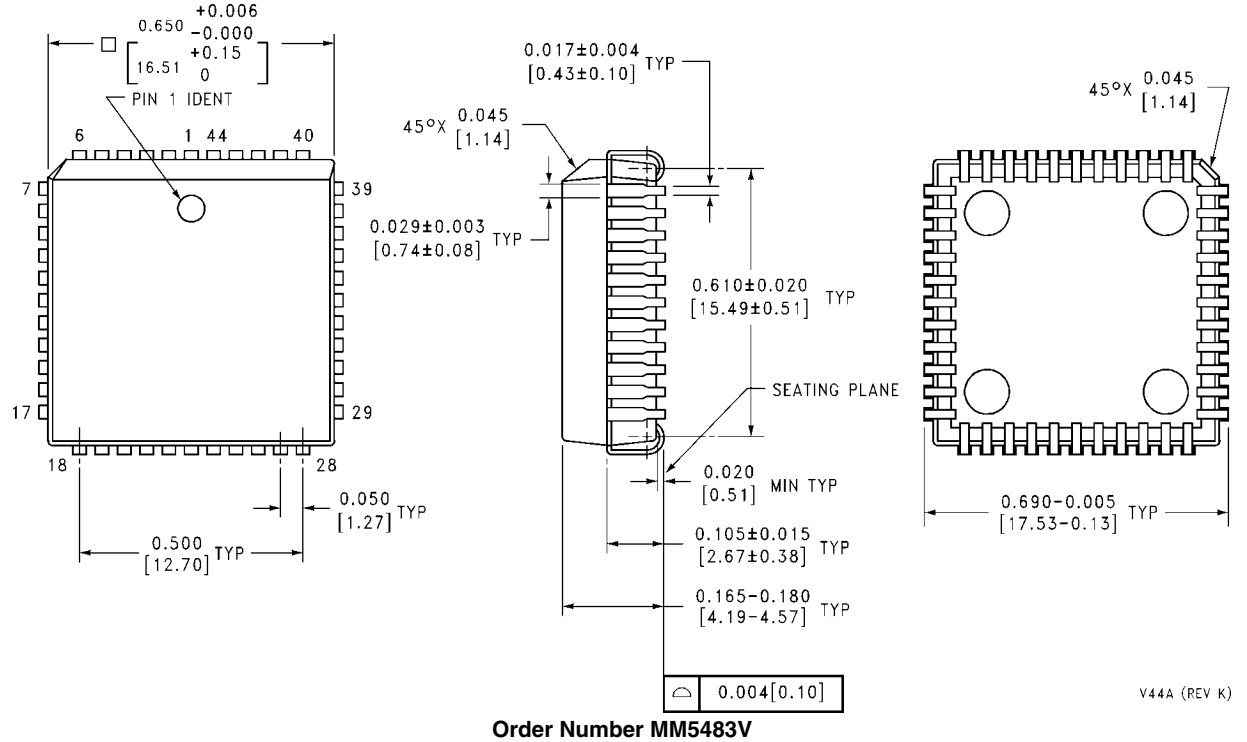


FIGURE 6. Timing Diagram

Physical Dimensions inches (millimeters) unless otherwise noted



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



Order Number MM5483V
NS Package Number V44A

Notes

Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	www.national.com/amplifiers	WEBENCH® Tools	www.national.com/webench
Audio	www.national.com/audio	App Notes	www.national.com/appnotes
Clock and Timing	www.national.com/timing	Reference Designs	www.national.com/refdesigns
Data Converters	www.national.com/adc	Samples	www.national.com/samples
Interface	www.national.com/interface	Eval Boards	www.national.com/evalboards
LVDS	www.national.com/lvds	Packaging	www.national.com/packaging
Power Management	www.national.com/power	Green Compliance	www.national.com/quality/green
Switching Regulators	www.national.com/switchers	Distributors	www.national.com/contacts
LDOs	www.national.com/ldo	Quality and Reliability	www.national.com/quality
LED Lighting	www.national.com/led	Feedback/Support	www.national.com/feedback
Voltage Reference	www.national.com/vref	Design Made Easy	www.national.com/easy
PowerWise® Solutions	www.national.com/powerwise	Solutions	www.national.com/solutions
Serial Digital Interface (SDI)	www.national.com/sdi	Mil/Aero	www.national.com/milaero
Temperature Sensors	www.national.com/tempsensors	Solar Magic®	www.national.com/solarmagic
Wireless (PLL/VCO)	www.national.com/wireless	Analog University®	www.national.com/AU

National Semiconductor Americas Technical Support Center
Email: support@nsc.com
Tel: 1-800-272-9959

National Semiconductor Europe Technical Support Center
Email: europe.support@nsc.com
German Tel: +49 (0) 180 5010 771
English Tel: +44 (0) 870 850 4288

National Semiconductor Asia Pacific Technical Support Center
Email: ap.support@nsc.com

National Semiconductor Japan Technical Support Center
Email: jpn.feedback@nsc.com