

MM74C912

6-Digit BCD Display Controller/Driver

The MM74C912 displays controllers are interface elements, with memory, that drive a 6-digit, 8-segment LED display. The display controllers receive data information through 5 data inputs A, B, C, D and DP, and digit information through 3 address inputs K1, K2 and K3.

The input data is written into the register selected by the address information when CHIP ENABLE, (\overline{CE}), and WRITE ENABLE, (\overline{WE}), are LOW and is latched when either \overline{CE} or \overline{WE} return HIGH. Data hold time is not required. A self-contained internal oscillator sequentially presents the stored data to a decoder where 4 data bits control the format of the displayed character and 1 bit controls the decimal point. The internal oscillator is controlled by a control input labeled OSCILLATOR ENABLE, (\overline{OSE}), which is tied LOW in normal operation. A high level at \overline{OSE} prevents automatic refresh of the display.

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
 - Class Q Military
 - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
 - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

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General Description

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The 7-segment plus decimal point output information directly drives an LED display through high drive (100 mA

typ.) output drivers. The drivers are active when the control pin labeled SEGMENT OUTPUT ENABLE, (\overline{SOE}), is LOW and go into 3-STATE when \overline{SOE} is HIGH. This feature allows for duty cycle brightness control and for disabling the output drivers for power conservation.

The MM74C912 segment decoder converts BCD data into 7-segment format.

All inputs are TTL compatible and do not clamp to the V_{CC} supply.

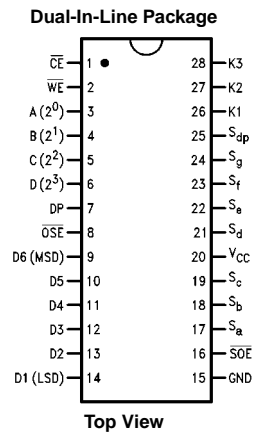
Features

- Direct segment drive (100 mA typ.) 3-STATE
- 6 registers addressed like RAM
- Internal oscillator and scanning circuit
- Direct base drive to digit transistor (20 mA typ.)
- Internal segment decoder
- TTL compatible inputs

Ordering Code:

Order Number	Package Number	Package Description
MM74C912N	N28B	28-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.600" Wide

Connection Diagram



Truth Tables

Input Control

\overline{CE}	Digit Address			\overline{WE}	Operation
	K3	K2	K1		
0	0	0	0	0	Write Digit 1
0	0	0	0	1	Latch Digit 1
0	0	0	1	0	Write Digit 2
0	0	0	1	1	Latch Digit 2
0	0	1	0	0	Write Digit 3
0	0	1	0	1	Latch Digit 3
0	0	1	1	0	Write Digit 4
0	0	1	1	1	Latch Digit 4
0	1	0	0	0	Write Digit 5
0	1	0	0	1	Latch Digit 5
0	1	0	1	0	Write Digit 6
0	1	0	1	1	Latch Digit 6
0	1	1	0	0	Write Null Digit
0	1	1	0	1	Latch Null Digit
0	1	1	1	0	Write Null Digit
0	1	1	1	1	Latch Null Digit
1	X	X	X	X	Disable Writing

X = Don't Care

Output Control

\overline{SOE}	\overline{OSE}	Operation
0	0	Refresh Display
0	1	Stop Oscillator (Note 1)
1	0	Disable Segment Outputs
1	1	Standby Mode

Note 1: Segment drive may exceed maximum display dissipation.

Absolute Maximum Ratings (Note 2)		Operating V_{CC} Range	3V to 6V
(Note 3)		Absolute Maximum (V_{CC})	6.5V
Voltage at Any Pin		Lead Temperature	
Except Inputs	-0.3V to $V_{CC} + 0.3V$	(Soldering, 10 seconds)	260°C
Voltage at Any Input	-0.3V to +15V		
Operating Temperature		Note 2: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Range" they are not meant to imply that the device should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.	
Range (T_A)	-40°C to +85°C	Note 3: All voltages reference to ground.	
Storage Temperature			
Range (T_S)	-65°C to +150°C		
Power Dissipation (P_D)	Refer to $P_{D,MAX}$ vs T_A Graph		

DC Electrical Characteristics

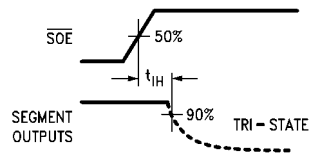
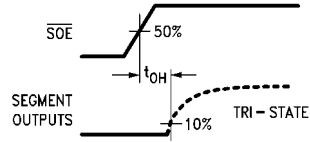
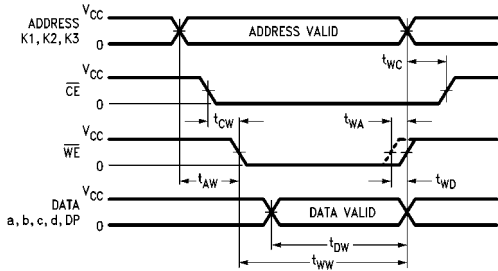
Min/Max limits apply at $40^\circ\text{C} \leq T_J \leq 85^\circ\text{C}$, unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CMOS TO CMOS						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5V$	3.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5V$			1.5	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 5V, V_{IN} = 15V$		0.005	1.0	μA
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 5V, V_{IN} = 0V$	-1.0	-0.005		μA
I_{CC}	Supply Current	$V_{CC} = 5V$, Outputs Open		0.5	2	mA
I_{OUT}	3-STATE Output Current	$V_{CC} = 5V, V_O = 5V$ $V_{CC} = 5V, V_O = 0V$	-10	0.03 -0.03	10	μA
CMOS/LPTTL INTERFACE						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	$V_{CC} - 2.0$			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$			0.8	V
OUTPUT DRIVE						
I_{SH}	High Level Segment Current	$V_{CC} = 5V, V_O = 3.4V$ $T_J = 25^\circ\text{C}$ $T_J = 100^\circ\text{C}$	-60 -40	-100 -60		mA mA
I_{DH}	High Level Digit Current	$V_{CC} = 5V, V_O = 1V$ $T_J = 25^\circ\text{C}$ $T_J = 100^\circ\text{C}$	-10 -7	-20 -15		mA mA
$V_{OUT(1)}$	Logical "1" Output Voltage Any Digit	$V_{CC} = 5V, I_O = -360\mu\text{A}$	4.6			V
$V_{OUT(0)}$	Logical "0" Output Voltage Any Digit	$V_{CC} = 5V, I_O = 360\mu\text{A}$			0.4	V
θ_{JA}	Thermal Resistance	(Note 4)		100		$^\circ\text{C}/\text{W}$

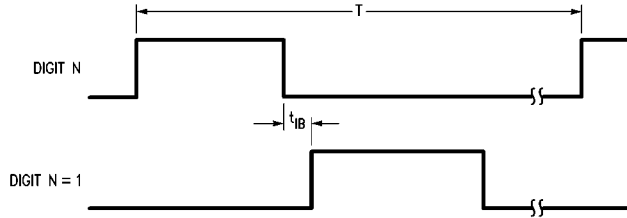
Note 4: θ_{JA} measured in free air with device soldered into printed circuit board.

AC Electrical Characteristics (Note 5)							
$V_{CC} = 5V$, $t_r = t_f = 20$ ns, $C_L = 50$ pF							
Symbol	Parameter	Conditions	Min	Typ	Max	Units	
t_{CW}	Chip Enable to Write	$T_J = 25^\circ C$	35	15		ns	
	Enable Setup Time	$T_J = 125^\circ C$	50	20		ns	
t_{AW}	Address to Write	$T_J = 25^\circ C$	35	15		ns	
	Enable Setup Time	$T_J = 125^\circ C$	50	20		ns	
t_{WW}	Write Enable Width	$T_J = 25^\circ C$	400	225		ns	
		$T_J = 125^\circ C$	450	250		ns	
t_{DW}	Data to Write Enable	Setup Time	$T_J = 25^\circ C$	390	225		ns
			$T_J = 125^\circ C$	430	250		ns
t_{WD}	Write Enable to Data	Hold Time	$T_J = 25^\circ C$	0	-10		ns
			$T_J = 125^\circ C$	0	-15		ns
t_{WA}	Write Enable to Address	Hold Time	$T_J = 25^\circ C$	0	-10		ns
			$T_J = 125^\circ C$	0	-15		ns
t_{WC}	Write Enable to Chip Enable	Hold Time	$T_J = 25^\circ C$	50	30		ns
			$T_J = 125^\circ C$	75	40		ns
t_{1H} , t_{0H}	Logical "1", Logical "0" Levels into 3-STATE	$R_L = 10k$, $T_J = 25^\circ C$		275	500	ns	
		$C_L = 10$ pF, $T_J = 125^\circ C$		325	600	ns	
t_{H1} , t_{H0}	3-STATE to Logical "1" to Logical "0" Level	$R_L = 10k$, $T_J = 25^\circ C$		325	600	ns	
		$C_L = 50$ pF, $T_J = 125^\circ C$		375	700	ns	
t_{iB}	Interdigit Blanking Time	$T_J = 25^\circ C$	5	10		μs	
		$T_J = 125^\circ C$	10	20		μs	
f_{MUX}	Multiplex Scan Frequency	$T_J = 25^\circ C$		350		Hz	
		$T_J = 125^\circ C$		250		Hz	
C_{IN}	Input Capacitance	(Note 6)		5	7.5	pF	
C_{OUT}	3-STATE Output Capacitance	(Note 6)		30	50	pF	
<p>Note 5: AC Parameters are guaranteed by DC correlated testing.</p> <p>Note 6: Capacitance is guaranteed by periodic testing.</p>							

Switching Time Waveforms

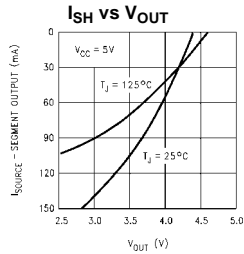


Multiplexing Output Waveforms

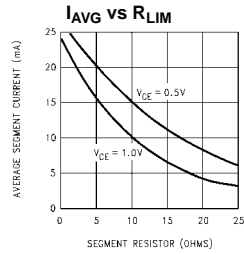


$T = 1/f_{MUX}$

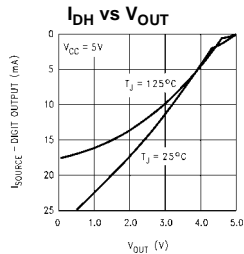
Typical Performance Characteristics



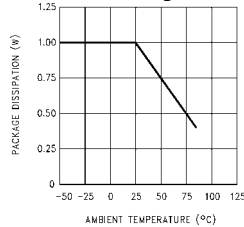
Segment outputs if shorted to ground will exceed maximum power dissipation of the device



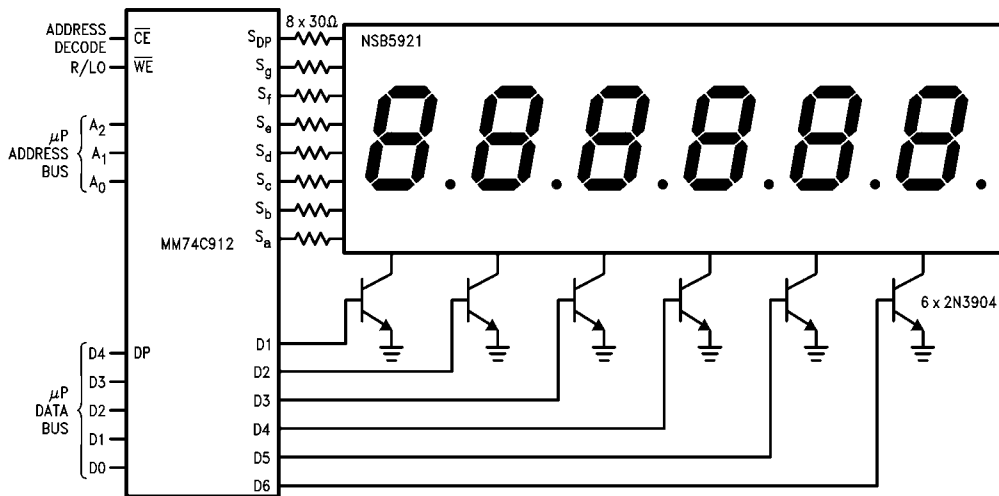
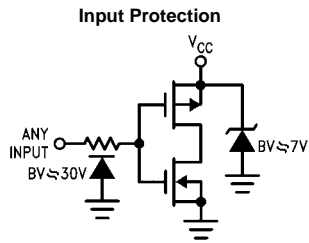
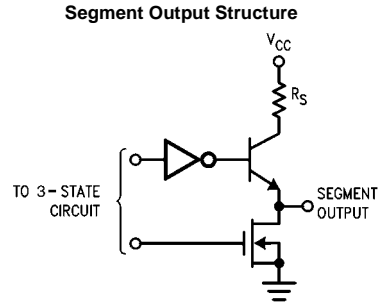
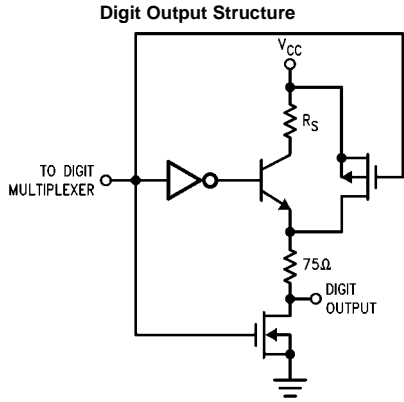
V_{CE} is the saturation voltage of the digit drive transistor.



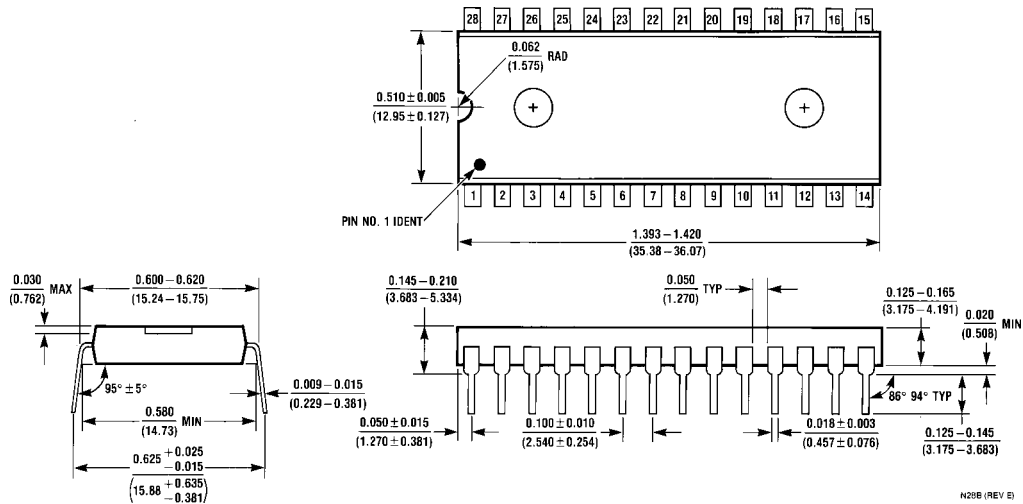
Power Dissipation vs. Temperature for Plastic Packages



Typical Applications



Physical Dimensions inches (millimeters) unless otherwise noted



**28-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.600" Wide
Package Number N28B**

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