

**FAIRCHILD**  
SEMICONDUCTOR™

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## MM74C48 BCD-to-7 Segment Decoder

### General Description

The MM74C48 BCD-to-7 segment decoder is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. Seven NAND gates and one driver are connected in pairs to make binary-coded decimal (BCD) data and its complement available to the seven decoding AND-OR-INVERT gates. The remaining NAND gate and three input buffers provide test-blanking input/ripple-blanking output, and ripple-blanking inputs.

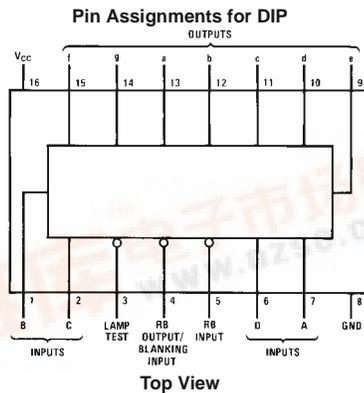
### Features

- Wide supply voltage range: 3.0V to 15V
- Guaranteed noise margin: 1.0V
- High noise immunity:  $0.45 V_{CC}$  (typ.)
- Low power TTL compatibility:  
fan out of 2 driving 74L
- High current sourcing output (up to 50 mA)
- Ripple blanking for leading or trailing zeros (optional)
- Lamp test provision

### Ordering Code:

Order Number	Package Number	Package Description
MM74C48N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

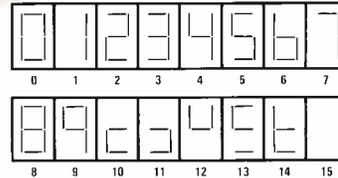
### Connection Diagrams



### Segment Identification



### Numerical Designations and Resultant Displays



MM74C48 BCD-to-7 Segment Decoder



## Truth Table

Decimal or Function	Inputs						BI/RBO (Note 1)	Outputs							Note
	LT	RBI	D	C	B	A		a	b	c	d	e	f	g	
0	H	H	L	L	L	L	H	H	H	H	H	H	L	(Note 2)	
1	H	X	L	L	L	H	H	L	H	H	L	L	L	(Note 2)	
2	H	X	L	L	H	L	H	H	H	L	H	L	H		
3	H	X	L	L	H	H	H	H	H	H	L	L	H		
4	H	X	L	H	L	L	H	L	H	H	L	L	H		
5	H	X	L	H	L	H	H	H	L	H	H	L	H		
6	H	X	L	H	H	L	H	L	L	H	H	H	H		
7	H	X	L	H	H	H	H	H	H	H	L	L	L		
8	H	X	H	L	L	L	H	H	H	H	H	H	H		
9	H	X	H	L	L	H	H	H	H	H	L	L	H		
10	H	X	H	L	H	L	H	L	L	L	H	H	L		
11	H	X	H	L	H	H	H	L	L	H	H	L	L		
12	H	X	H	H	L	L	H	L	H	L	L	L	H		
13	H	X	H	H	L	H	H	H	L	L	H	L	H		
14	H	X	H	H	H	L	H	L	L	L	H	H	H		
15	H	X	H	H	H	H	H	L	L	L	L	L	L		
BI	X	X	X	X	X	X	L	L	L	L	L	L	L	(Note 3)	
RBI	H	L	L	L	L	L	L	L	L	L	L	L	L	(Note 4)	
LT	L	X	X	X	X	X	H	H	H	H	H	H	H	(Note 5)	

H = HIGH Level  
L = LOW Level  
X = Irrelevant

**Note 1:** One BI/RBO is wire-AND logic serving as blanking input (BI) and/or ripple-blanking output (RBO).

**Note 2:** The blanking input (BI) must be open when output functions 0–15 are desired. The ripple-blanking input (RBI) must be HIGH, if blanking of a decimal zero is not desired.

**Note 3:** When a LOW logic level is applied directly to the blanking input (BI), all segment outputs are LOW regardless of the level of any other input.

**Note 4:** When ripple-blanking input (RBI) and inputs A, B, C, and D are at a LOW level with the lamp-test input HIGH, all segment outputs go LOW and the ripple-blanking output (RBO) goes to a LOW level (response condition).

**Note 5:** When the blanking input/ripple-blanking output (BI/RBO) is open and a LOW is applied to the lamp-test input, all segment outputs are HIGH.

**Absolute Maximum Ratings**(Note 6)

Voltage at Any Pin	-0.3V to $V_{CC} + 0.3V$	Absolute Maximum $V_{CC}$	18V
Operating Temperature Range	-40°C to +85°C	Lead Temperature (Soldering, 10 seconds)	260°C
Storage Temperature Range	-65°C to +150°C		
Power Dissipation			
Dual-In-Line	700 mW		
Small Outline	500 mW		
Operating $V_{CC}$ Range	3.0V to 15V		

**Note 6:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The Electrical Characteristics table provides conditions for actual device operation.

**DC Electrical Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS to CMOS</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 5.0V$	3.5			V
		$V_{CC} = 10V$	8.0			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 5.0V$			1.5	V
		$V_{CC} = 10V$			2.0	V
$V_{OUT(1)}$	Logical "1" Output Voltage (RB Output Only)	$V_{CC} = 5.0V, I_O = -10 \mu A$	4.5			V
		$V_{CC} = 10V, I_O = -10 \mu A$	9.0			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 5.0V, I_O = 10 \mu A$			0.5	V
		$V_{CC} = 10V, I_O = 10 \mu A$			1.0	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 15.0V, V_{IN} = 15V$		0.005	1.0	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 15.0V, V_{IN} = 0V$	-1.0	-0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.05	300	$\mu A$
<b>CMOS/LPTTL INTERFACE</b>						
$V_{IN(1)}$	Logical "1" Input Voltage	$V_{CC} = 4.75V$	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	$V_{CC} = 4.75V$			0.8	V
$V_{OUT(1)}$	Logical "1" Output Voltage (RB Output Only)	$V_{CC} = 4.75V, I_O = -50 \mu A$	2.4			V
$V_{OUT(0)}$	Logical "0" Output Voltage	$V_{CC} = 4.75V, I_O = 360 \mu A$			0.4	V
<b>OUTPUT DRIVE (See Family Characteristics Data Sheet)</b>						
$I_{SOURCE}$	Output Source Current (P-Channel) (RB Output Only)	$V_{CC} = 4.75V, V_{OUT} = 0.4V$			-0.80	mA
		$V_{CC} = 10V, V_{OUT} = 0.5V$			-4.0	mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5.0V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	1.75	3.6		mA
		$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	8.0	16		mA
$I_{SOURCE}$	Output Source Current (NPN Bipolar)	$V_{CC} = 5.0V, V_{OUT} = 3.4V$	-20	-50		mA
		$V_{CC} = 5.0V, V_{OUT} = 3.0V$			-65	mA
		$V_{CC} = 10V, V_{OUT} = 8.4V$	-20	-50		mA
		$V_{CC} = 10V, V_{OUT} = 8.0V$			-65	mA

## AC Electrical Characteristics (Note 7)

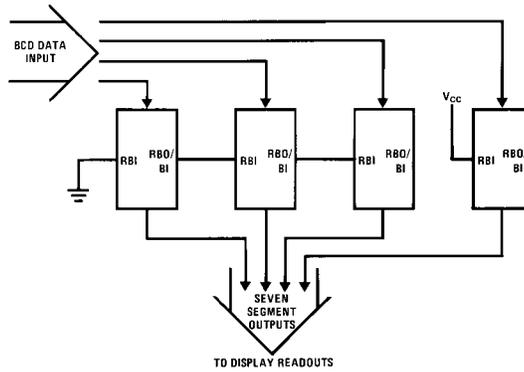
$T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ , unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{pd0}$ , $t_{pd1}$	Propagation Delay to a "1" or "0" on Segment Outputs from Data Inputs	$V_{CC} = 5.0\text{V}$		450	1500	ns
		$V_{CC} = 10\text{V}$		160	500	ns
$t_{pd0}$	Propagation Delay to a "0" on Segment Outputs from RB Input	$V_{CC} = 5.0\text{V}$		500	1600	ns
		$V_{CC} = 10\text{V}$		180	550	ns
$t_{pd0}$	Propagation Delay to a "0" on Segment Outputs from Blanking Input	$V_{CC} = 5.0\text{V}$		350	1200	ns
		$V_{CC} = 10\text{V}$		140	450	ns
$t_{pd1}$	Propagation Delay to a "1" on Segment Outputs from Lamp Test	$V_{CC} = 5.0\text{V}$		450	1500	ns
		$V_{CC} = 10\text{V}$		160	500	ns
$t_{pd1}$	Propagation Delay to a "1" on RB Output from RB Input	$V_{CC} = 5.0\text{V}$		600	2000	ns
		$V_{CC} = 10\text{V}$		250	800	ns
$t_{pd0}$	Propagation Delay to a "0" on RB Output from RB Input	$V_{CC} = 5.0\text{V}$		140	450	ns
		$V_{CC} = 10\text{V}$		50	150	ns

Note 7: AC Parameters are guaranteed by DC correlated testing.

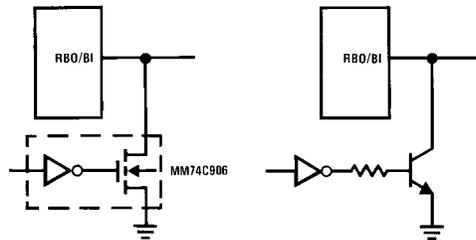
## Typical Applications

### Typical Connection Utilizing the Ripple-Blanking Feature



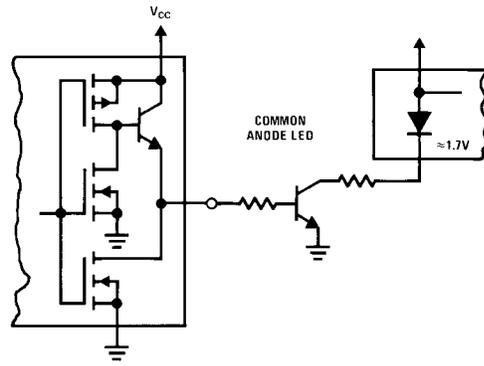
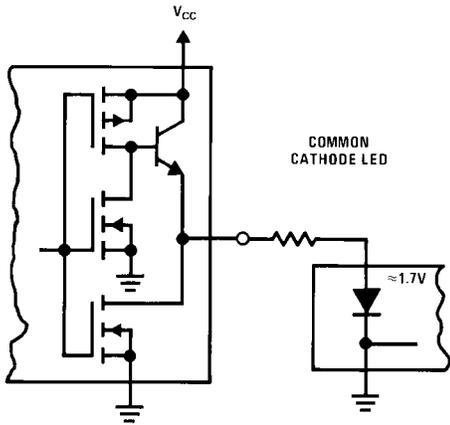
First three stages will blank leading zeros, the fourth stage will not blank zeros.

### Blanking Input Connection Diagram

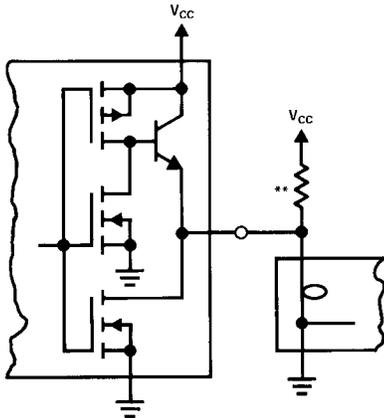


When RBO/BI is forced LOW, all segment outputs are off regardless of the state of any other input condition.

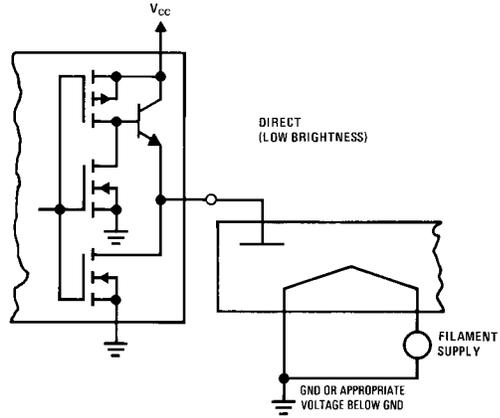
Light Emitting Diode (LED) Readout



Incandescent Readout

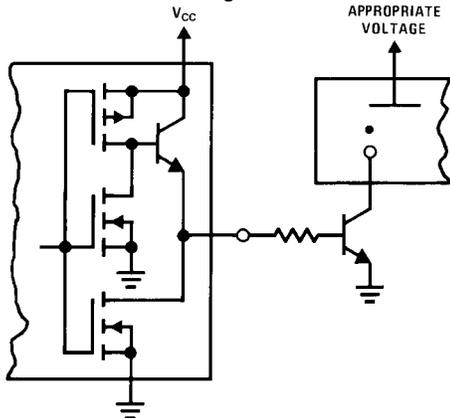


Fluorescent Readout

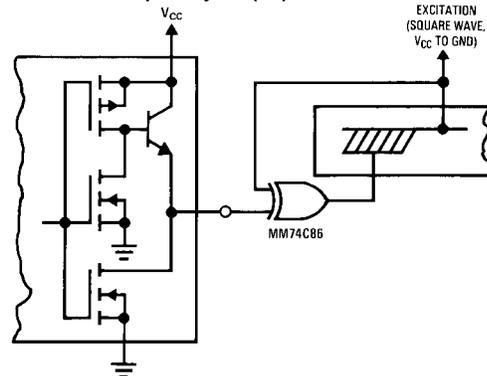


\*\*A filament pre-warm resistor is recommended to reduce filament thermal shock and increase the effective cold resistance of the filament.

Gas Discharge Readout

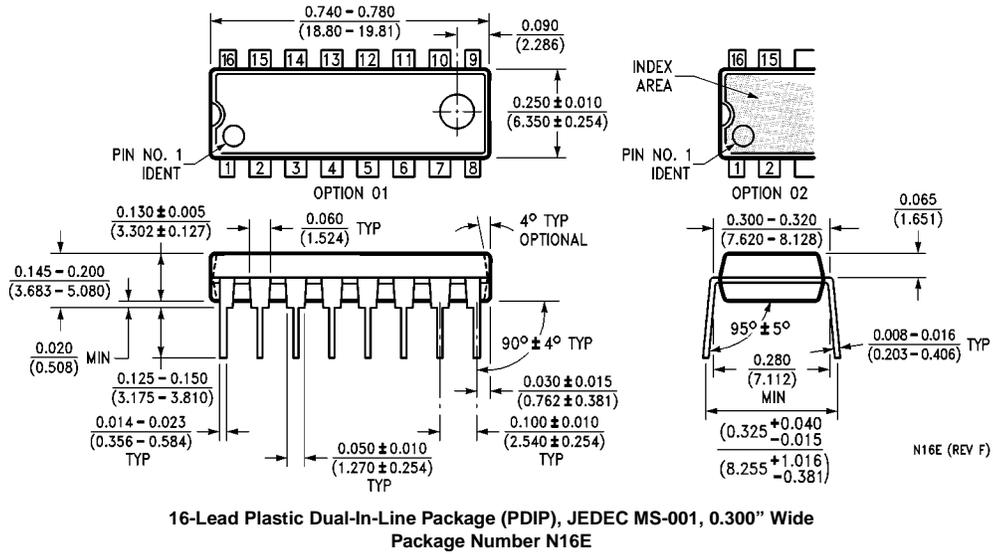


Liquid Crystal (LC) Readout



Direct DC drive of LC's not recommended for life of LC readouts.

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



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