National Semiconductor

January 1992

DM74LS48
BCD to 7-Segment Decoder

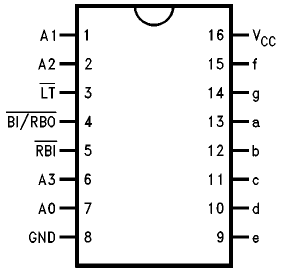
General Description

The 'LS48 translates four lines of BCD (8421) input data into the 7-segment numeral code and provides seven corresponding outputs having pull-up resistors, as opposed to totem pole pull-ups. These outputs can serve as logic signals, with a HIGH output corresponding to a lighted lamp segment, or can provide a 1.3 mA base current to npn lamp driver transistors. Auxiliary inputs provide lamp test, blanking and cascadable zero-suppression functions.

The 'LS48 decodes the input data in the pattern indicated in the Truth Table and the segment identification illustration.

Connection Diagram

Dual-In-Line Package



TL/F/10172–1

Order Number DM74LS48M or DM74LS48N
See NS Package Number M16A or N16E

Absolute Maximum Ratings (Note)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM74LS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameter	DM74LS48			Units
		Min	Nom	Max	
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	High Level Input Voltage	2			V
V_{IL}	Low Level Input Voltage			0.8	V
I_{OH}	High Level Output Current			−50	μA
I_{OL}	Low Level Output Current			6.0	mA
T_A	Free Air Operating Temperature	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I_I = −18 mA			−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} Min, I_{OH} = Max, V_{IL} = Max	2.4			V
I_{OFF}	Output High Current Segment Outputs	V_{CC} = Min, V_O = 0.85V	−1.3			mA
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IH} = Min			0.5	V
		I_{OL} = 2.0 mA, V_{CC} = Min			0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 7V			0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V			20	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V			−0.4	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max, V_O = 0V at $\overline{BI}/\overline{RBO}$ (Note 2)	−0.3		−2	mA
I_{CCH}	Supply Current	V_{CC} = Max, V_{IN} = 4.5V			38	mA

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Switching Characteristics at V_{CC} = 5V and T_A = 25°C

Symbol	Parameter	C_L = 15 pF		Units
		Min	Max	
t_{PLH} t_{PHL}	Propagation Delay Time A_n to a–g		100 100	ns
t_{PLH} t_{PHL}	Propagation Delay Time $\overline{RBI}$ to a–f		100 100	ns

Note: $\overline{LT}$ = HIGH, A_0–A_3 = HIGH.

Numerical Designations—Resultant Displays

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Truth Table

Decimal Or Function	Inputs						Outputs							
	$\overline{LT}$	$\overline{RBI}$	A_3	A_2	A_1	A_0	$\overline{BI/RBO}$	a	b	c	d	e	f	g
0 (Note 1)	H	H	L	L	L	L	H	H	H	H	H	H	H	L
1 (Note 1)	H	X	L	L	L	H	H	L	H	H	L	L	L	L
2	H	X	L	L	H	L	H	H	H	L	H	H	L	H
3	H	X	L	L	H	H	H	H	H	H	H	L	L	H
4	H	X	L	H	L	L	H	L	H	H	L	L	H	H
5	H	X	L	H	L	H	H	H	L	H	H	L	H	H
6	H	X	L	H	H	L	H	L	L	H	H	H	H	H
7	H	X	L	H	H	H	H	H	H	H	L	L	L	L
8	H	X	H	L	L	L	H	H	H	H	H	H	H	H
9	H	X	H	L	L	H	H	H	H	H	L	L	H	H
10	H	X	H	L	H	L	H	L	L	L	H	H	L	H
11	H	X	H	L	H	H	H	L	L	H	H	L	L	H
12	H	X	H	H	L	L	H	L	H	L	L	L	H	H
13	H	X	H	H	L	H	H	H	L	L	H	L	H	H
14	H	X	H	H	H	L	H	L	L	L	H	H	H	H
15	H	X	H	H	H	H	H	L	L	L	L	L	L	L
$\overline{BI}$ (Note 2)	X	X	X	X	X	X	L	L	L	L	L	L	L	L
$\overline{RBI}$ (Note 3)	H	L	L	L	L	L	L	L	L	L	L	L	L	L
$\overline{LT}$ (Note 4)	L	X	X	X	X	X	H	H	H	H	H	H	H	H

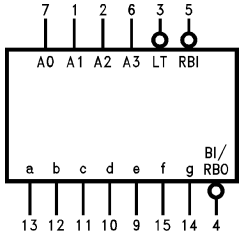
Note 1: $\overline{BI/RBO}$ is wired-AND logic serving as blanking input ($\overline{BI}$) and/or ripple-blanking output ($\overline{RBO}$). The blanking out ($\overline{BI}$) must be open or held at a HIGH level when output functions 0 through 15 are desired, and ripple-blanking input ($\overline{RBI}$) must be open or at a HIGH level if blanking of a decimal 0 is not desired. X = input may be HIGH or LOW.

Note 2: When a LOW level is applied to the blanking input (forced condition) all segment outputs go to a LOW level, regardless of the state of any other input condition.

Note 3: When ripple-blanking input ($\overline{RBI}$) and inputs A_0, A_1, A_2, and A_3 are at LOW level, with the lamp test input at HIGH level, all segment outputs go to a LOW level and the ripple-blanking output ($\overline{RBO}$) goes to a LOW level (response condition).

Note 4: When the blanking input/ripple-blanking output ($\overline{BI/RBO}$) is open or held at a HIGH level, and a LOW level is applied to lamp test input, all segment outputs go to a HIGH level.

Logic Symbol



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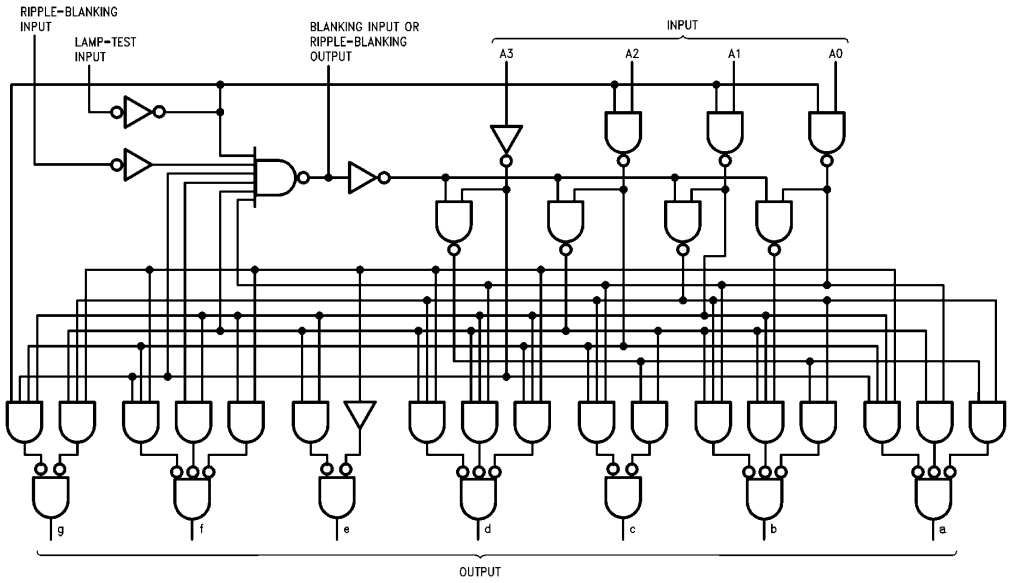
V_{CC} = Pin 16
GND = Pin 8

Logic Diagram



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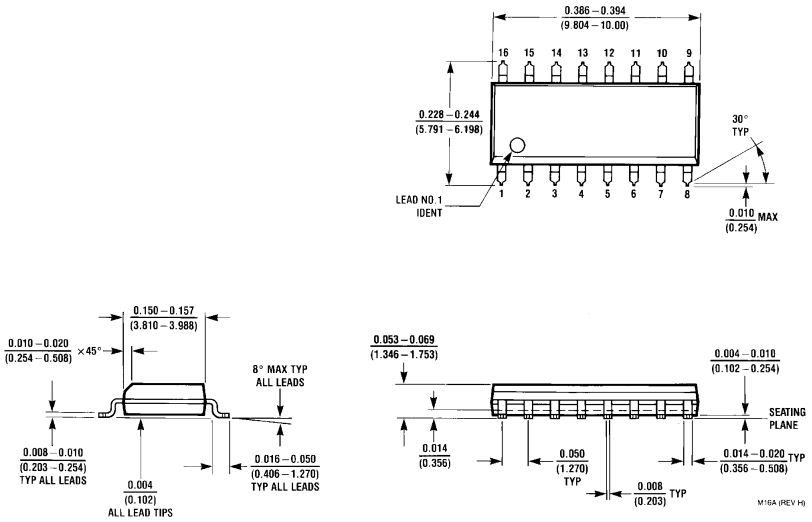
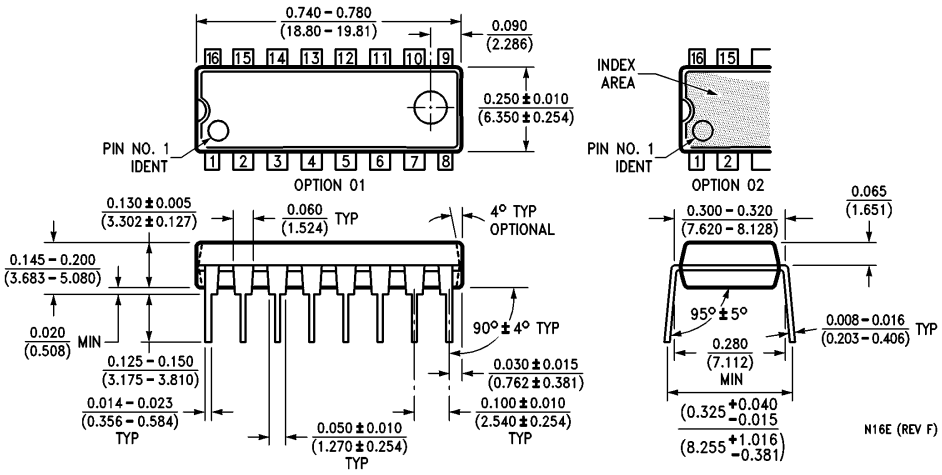
Physical Dimensions inches (millimeters)



16-Lead Small Outline Molded Package (M)
Order Number DM74LS48M
NS Package Number M16A

Physical Dimensions inches (millimeters) (Continued)



16-Lead Molded Dual-In-Line Package (N)
Order Number DM74LS48N
NS Package Number N16E

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