

March 1988

MM54C42/MM74C42 BCD-to-Decimal Decoder

General Description

The MM54C42/MM74C42 one-of-ten decoder is a monolithic complementary MOS (CMOS) integrated circuit constructed with N- and P-channel enhancement transistors. This decoder produces a logical "0" at the output corresponding to a four bit binary input from zero to nine, and a logical "1" at the other outputs. For binary inputs from ten to fifteen all outputs are logical "1".

Features

- Supply voltage range
- Tenth power TTL compatible

3V to 15V
drive 2 LPTTL loads

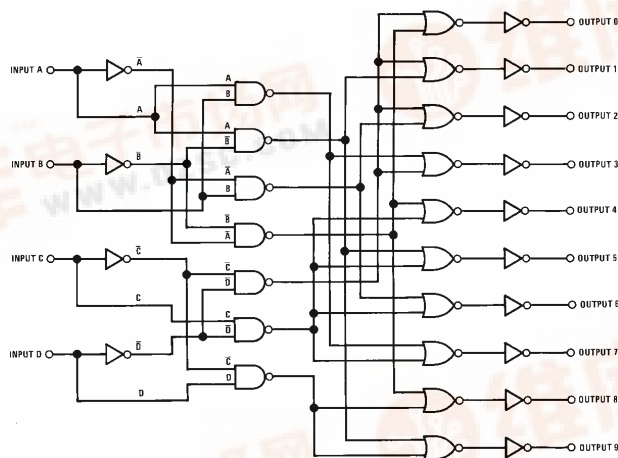
- High noise immunity
- Low power
- Medium speed operation

0.45 V_{CC} (typ.)
50 nW (typ.)
10 MHz (typ.)
with 10V V_{CC}

Applications

- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm systems
- Industrial electronics
- Remote metering
- Computers

Schematic Diagram



TL/F/5882-1

Truth Table

Inputs				Outputs									
D	C	B	A	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	1	1	1	1	1	1	1	1	1
0	0	0	1	1	0	1	1	1	1	1	1	1	1
0	0	1	0	1	1	0	1	1	1	1	1	1	1
0	0	1	1	1	1	1	0	1	1	1	1	1	1
0	1	0	0	1	1	1	1	0	1	1	1	1	1
0	1	0	1	1	1	1	1	1	0	1	1	1	1
0	1	1	0	1	1	1	1	1	1	0	1	1	1
0	1	1	1	1	1	1	1	1	1	1	0	1	1
1	0	0	0	1	1	1	1	1	1	1	1	0	1
1	0	0	1	1	1	1	1	1	1	1	1	1	0
1	0	1	0	1	1	1	1	1	1	1	1	1	1
1	0	1	1	1	1	1	1	1	1	1	1	1	1
1	1	0	0	1	1	1	1	1	1	1	1	1	1
1	1	0	1	1	1	1	1	1	1	1	1	1	1
1	1	1	0	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1



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 (Note 1)	−0.3V to $V_{CC} + 0.3V$
Operating Temperature Range	
MM54C42	−55°C to +125°C
MM74C42	−40°C to +85°C

Storage Temperature Range	−65°C to +150°C
Power Dissipation (P_D)	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating V_{CC} Range	3.0V to 15V
Absolute Maximum V_{CC}	18V
Lead Temperature (Soldering, 10 seconds)	260°C

DC Electrical Characteristics

Min/Max limits apply across temperature range unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
CMOS TO CMOS						
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	V _{CC} = 5.0V, I _O = −10 μA	4.5			V
		V _{CC} = 10V, I _O = −10 μA	9.0			V
V _{OUT(0)}	Logical “0” Output Voltage	V _{CC} = 5.0V, I _O = 10 μA			0.5	V
		V _{CC} = 10V, I _O = 10 μA			1.0	V
I _{IN(1)}	Logical “1” Input Current	V _{CC} = 15V, V _{IN} = 15V			1.0	μA
I _{IN(0)}	Logical “0” Input Current	V _{CC} = 15V, V _{IN} = 0V	−1.0			μA
I _{CC}	Supply Current	V _{CC} = 15V		0.05	300	μA
CMOS/LPTTL INTERFACE						
V _{IN(1)}	Logical “1” Input Voltage	54C, V _{CC} = 4.5V	V _{CC} − 1.5			V
		74C, V _{CC} = 4.75V	V _{CC} − 1.5			V
V _{IN(0)}	Logical “0” Input Voltage	54C, V _{CC} = 4.5V			0.8	V
		74C, V _{CC} = 4.75V			0.8	V
V _{OUT(1)}	Logical “1” Output Voltage	54C, V _{CC} = 4.5V, I _O = −360 μA	2.4			V
		74C, V _{CC} = 4.75V, I _O = −360 μA	2.4			V
V _{OUT(0)}	Logical “0” Output Voltage	54C, V _{CC} = 4.5V, I _O = 360 μA			0.4	V
		74C, V _{CC} = 4.75V, I _O = 360 μA			0.4	V
OUTPUT DRIVE (see 54C/74C Family Characteristics Data Sheet) T _A = 25°C (short circuit current)						
I _{SOURCE}	Output Source Current	V _{CC} = 5.0V, V _{IN(0)} = 0V, V _{OUT} = 0V	−1.75			mA
I _{SOURCE}	Output Source Current	V _{CC} = 10V, V _{IN(0)} = 0V, V _{OUT} = 0V	−8.0			mA
I _{SINK}	Output Sink Current	V _{CC} = 5.0V, V _{IN(1)} = 5.0V, V _{OUT} = V _{CC}	1.75			mA
I _{SINK}	Output Sink Current	V _{CC} = 10V, V _{IN(1)} = 10V, V _{OUT} = V _{CC}	8.0			mA

Note 1: “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 table of “Electrical Characteristics” provides conditions for actual device operation.

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t _{pd}	Propagation Delay Time to Logical “0” or “1”	V _{CC} = 5.0V		200	300	ns
		V _{CC} = 10V		90	140	ns
C _{IN}	Input Capacitance	(Note 2)		5		pF
C _{PD}	Power Dissipation Capacitance	(Note 3)		50		pF

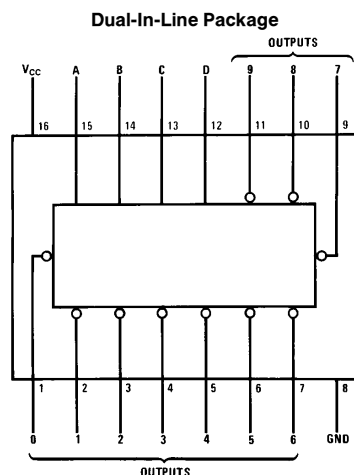
*AC Parameters are guaranteed by DC correlated testing.

Note 1: “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 table of “Electrical Characteristics” provides conditions for actual device operation.

Note 2: Capacitance is guaranteed by periodic testing.

Note 3: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family Characteristics Application Note—AN-90.

Connection Diagram

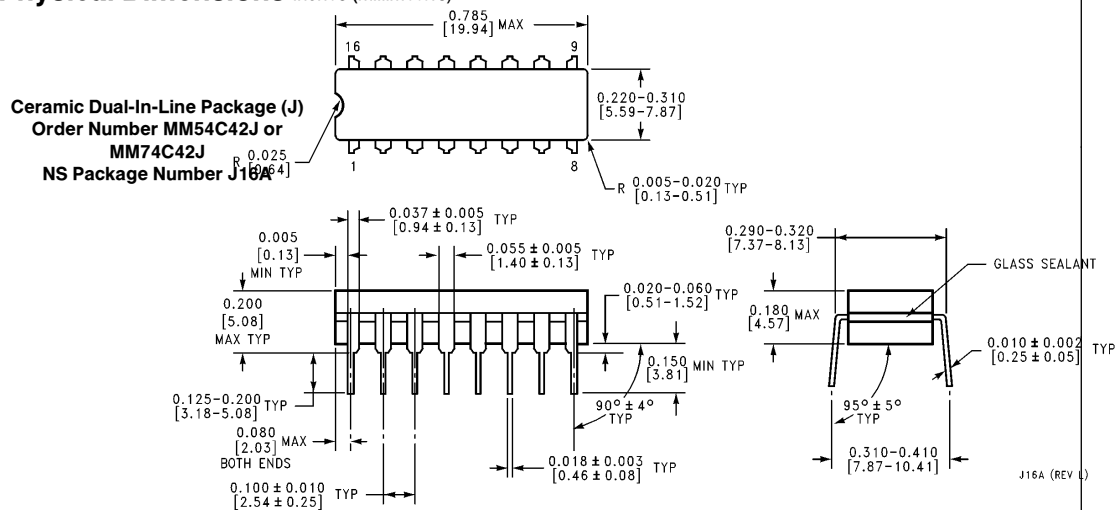


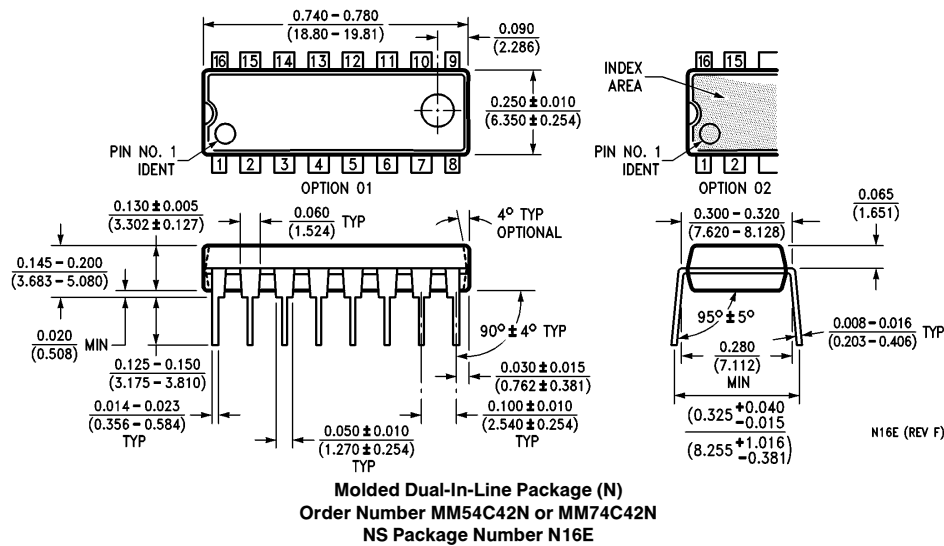
Order Number MM54C42 or MM74C42

TI /F/5882-2

Top View

Physical Dimensions inches (millimeters)



Physical Dimensions inches (millimeters) (Continued)**LIFE SUPPORT POLICY**

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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