

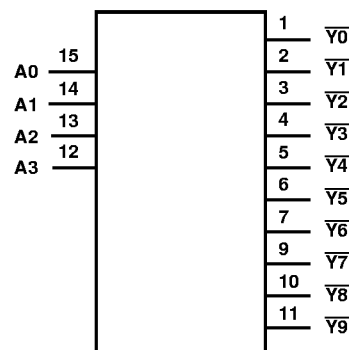
BCD-to-Decimal Decoder (1-to-10)

This device is fully compliant to the requirements of paragraph 1.2.1 of MIL-STD-883.

The CD54HC42F3A and CD54HCT42F3A BCD-to-Decimal decoders utilize silicon-gate CMOS technology to achieve operating speeds similar to LSTTL decoders with the low power consumption of standard CMOS integrated circuits. These devices have the capability of driving 10 LSTTL loads and are compatible with the standard 54LS logic family. One of 10 outputs (low on select) is selected in accordance with the BCD input. Non-valid BCD inputs result in none of the outputs being selected (all outputs are high).

For related information on this device, refer to the commercial data sheet in Harris AnswerFAX.

Functional Diagram



Absolute Maximum Ratings

DC Supply Voltage, V_{CC}
 Voltages Referenced to GND. -0.5V to +7.0V
 DC Input Voltage Range, All Inputs, V_{IN} -0.5V to $V_{CC} + 0.5V$
 DC Output Voltage Range, All Outputs, V_{OUT} . . -0.5V to $V_{CC} + 0.5V$
 DC Input Diode Current, I_{IK}
 For $V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$ $\pm 20mA$
 DC Output Diode Current, I_{OK}
 For $V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$ $\pm 20mA$
 DC Drain Current, Per Output, I_{O1} , for $-0.5V < V_O < V_{CC} + 0.5V$. $\pm 25mA$
 DC V_{CC} or GND Current, I_{CC} $\pm 50mA$

Power Dissipation Per Package, P_D
 $T_A = -55^\circ C$ to $+100^\circ C$ (Package F) 500mW
 $T_A = +100^\circ C$ to $+125^\circ C$ (Package F) Derate Linearly at
 8mW/ $^\circ C$ to 300mW

Operating Temperature Range, T_A
 Package Type F $-55^\circ C$ to $+125^\circ C$
 Storage Temperature, T_{STG} $-65^\circ C$ to $+150^\circ C$
 Lead Temperature (During Soldering)
 At Distance 1/16in. $\pm$ 1/32in. (1.59mm $\pm$ 0.79mm)
 From Case For 10s Max. $+265^\circ C$
 Unit Inserted Into a PC Board (Min Thickness 1/16in., 1.59mm)
 With Solder Contacting Lead Tips Only $+300^\circ C$

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Recommended Operating Conditions

Supply Voltage Range, V_{CC}
 T_A = Full Package Temperature Range
 CD54HC Types. 2V to 6V
 CD54HCT Types 4.5V to 5.5V
 DC Input or Output Voltage, V_{IN} , V_{OUT} 0V to V_{CC}

Operating Temperature Range, T_A $-55^\circ C$ to $+125^\circ C$
 Input Rise and Fall Times, t_R , t_F
 at 2V. 0ns to 1000ns
 at 4.5V 0ns to 500ns
 at 6V. 0ns to 400ns

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DC Electrical Specifications - CD54HC Series

PARAMETERS	SYMBOL	TEST CONDITIONS			T _A = +25°C		T _A = -55°C TO +125°C		UNITS		
		V _{IN} (V)		V _{CC} (V)	MIN	MAX	MIN	MAX			
High Level Input Voltage	V _{IH}			2	1.5	-	1.5	-	V		
				4.5	3.15 (Note 1)	-	3.15 (Note 1)	-	V		
				6	4.2	-	4.2	-	V		
Low Level Input Voltage	V _{IL}			2	-	0.5	-	0.5	V		
				4.5	-	1.35 (Note 1)	-	1.35 (Note 1)	V		
				6	-	1.8	-	1.8	V		
High Level Output Voltage	CMOS Loads	V _{OH}	V _{IL} or V _{IH}	I _O = -20μA	2	1.9	-	1.9	-	V	
					4.5	4.4 (Note 1)	-	4.4 (Note 1)	-	V	
					6	5.9	-	5.9	-	V	
	TTL Loads (Table 1)		V _{IL} or V _{IH}	I _O (mA)							
					-4	4.5	3.98 (Note 1)	-	3.7 (Note 1)	-	V
					-5.2	6	5.48	-	5.2	-	V
Low Level Output Voltage	CMOS Loads	V _{OL}	V _{IL} or V _{IH}	I _O = 20μA	2	-	0.1	-	0.1	V	
					4.5	-	0.1 (Note 1)	-	0.1 (Note 1)	V	
					6	-	0.1	-	0.1	V	
	TTL Loads (Table 1)	V _{IL} or V _{IH}	I _O (mA)								
				4	4.5	-	0.26 (Note 1)	-	0.4 (Note 1)	V	
				5.2	6	-	0.26	-	0.4	V	
Input Leakage Current	I _{IN}	V _{CC} or GND		6	-	±0.1 (Note 1)	-	±1 (Note 1)	μA		
Quiescent Device Current	MSI I _{CC}	V _{CC} or GND	I _{OUT} = 0	6	-	8 (Note 1)	-	160 (Note 1)	μA		

NOTE:

1. These limits are tested 100%.

DC Electrical Specifications - CD54HCT Series

PARAMETERS	SYMBOL	TEST CONDITIONS			T _A = +25°C		T _A = -55°C TO +125°C		UNITS
		V _{IN} (V)		V _{CC} (V)	MIN	MAX	MIN	MAX	
High Level Input Voltage	V _{IH}			4.5	2 (Note 1)	-	2 (Note 1)	-	V
				5.5	2	-	2	-	V
Low Level Input Voltage	V _{IL}			4.5	-	0.8 (Note 1)	-	0.8 (Note 1)	V
				5.5	-	0.8	-	0.8	V

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DC Electrical Specifications - CD54HCT Series (Continued)

PARAMETERS	SYMBOL	TEST CONDITIONS			T _A = +25°C		T _A = -55°C TO +125°C		UNITS
		V _{IN} (V)		V _{CC} (V)	MIN	MAX	MIN	MAX	
High Level Output Voltage	CMOS Loads	V _{OH}	V _{IL} or V _{IH}	I _O = -20μA	4.5	4.4 (Note 1)	-	4.4 (Note 1)	V
	TTL Loads (Table 1)		V _{IL} or V _{IH}	I _O = -4mA	4.5	3.98 (Note 1)	-	3.7 (Note 1)	V
Low Level Output Voltage	CMOS Loads	V _{OL}	V _{IL} or V _{IH}	I _O = 20μA	4.5	-	0.1 (Note 1)	-	0.1 (Note 1)
	TTL Loads (Table 1)		V _{IL} or V _{IH}	I _O = 4mA	4.5	-	0.26 (Note 1)	-	0.4 (Note 1)
Input Leakage Current		I _{IN}	V _{CC} or GND		6	-	±0.1 (Note 1)	-	±1 (Note 1)
Quiescent Device Current	MSI	I _{CC}	V _{CC} or GND	I _{OUT} = 0	6	-	8 (Note 1)	-	160 (Note 1)
Additional Quiescent Device Current Per Input Pin: 1 Unit Load		ΔI _{CC} (Note 2)	V _{CC} - 2.1		4.5 to 5.5	-	360	-	490

NOTES:

- These limits are tested 100%.
- For dual-supply systems theoretical worst case (V_I = 2.4V, V_{CC} = 5.5V), specification is 1.8mA.

HCT INPUT LOAD TABLE

INPUT	UNIT LOAD (NOTE 1)
All	1

NOTE:

- Unit load is ΔI_{CC} limit specified in DC Electrical Specifications Table, e.g., 360μA Max at +25°C.

Table 1. TTL Output Load Characteristics - CD54HC/HCT Series

PARAMETERS	SYMBOL	TEMP	TEST CONDITIONS					LIMITS		UNITS
			HC/HCT			V _{IN}				
						HC	HCT			
			V _{CC}	V _O	I _O	V _{IL} OR V _{IH}	V _{IL} OR V _{IH}	MIN	MAX	
Output High (Source) Current, TTL Load	I _{OH}	+25°C	4.5	3.98	-	0, 4.5	0, 4.5	-4 (Note 1)	-	mA
		-55°C	4.5	3.70	-	0, 4.5	0, 4.5	-4 (Note 1)	-	mA
		+125°C	4.5	3.70	-	0, 4.5	0, 4.5	-4 (Note 1)	-	mA
Output Low (Sink) Current, TTL Load	I _{OL}	+25°C	4.5	0.26	-	0, 4.5	0, 4.5	4 (Note 1)	-	mA
		-55°C	4.5	0.40	-	0, 4.5	0, 4.5	4 (Note 1)	-	mA
		+125°C	4.5	0.40	-	0, 4.5	0, 4.5	4 (Note 1)	-	mA

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Table 1. TTL Output Load Characteristics - CD54HC/HCT Series (Continued)

PARAMETERS	SYMBOL	TEMP	TEST CONDITIONS					LIMITS		UNITS
			HC/HCT			V _{IN}				
						HC	HCT			
			V _{CC}	V _O	I _O	V _{IL} OR V _{IH}	V _{IL} OR V _{IH}	MIN	MAX	
High Level Output Voltage, TTL Load	V _{OH}	+25°C	4.5	-	-4	1.35, 3.15	0.8, 2.0	3.98 (Note 1)	-	V
		-55°C	4.5	-	-4	1.35, 3.15	0.8, 2.0	3.70 (Note 1)	-	V
		+125°C	4.5	-	-4	1.35, 3.15	0.8, 2.0	3.70 (Note 1)	-	V
Low Level Output Voltage, TTL Load	V _{OL}	+25°C	4.5	-	4	1.35, 3.15	0.8, 2.0	-	0.26 (Note 1)	V
		-55°C	4.5	-	4	1.35, 3.15	0.8, 2.0	-	0.40 (Note 1)	V
		+125°C	4.5	-	4	1.35, 3.15	0.8, 2.0	-	0.40 (Note 1)	V

NOTE:

1. These limits are tested 100%.

Switching Speed

(NOTE 1) PARAMETERS	SYMBOL	TEST CONDITIONS	T _A = +25°C				T _A = -55°C TO +125°C				UNITS
			HC		HCT		HC		HCT		
		V _{CC} (V)	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
Propagation Delay Any Input to $\bar{Y}$	t _{PLH} , t _{PHL}	2	-	150	-	-	-	225	-	-	ns
		4.5	-	30 (Note 2)	-	35 (Note 2)	-	45 (Note 2)	-	53 (Note 2)	ns
		6	-	26	-	-	-	38	-	-	ns
Output Transition Times	t _{TLH} , t _{THL}	2	-	75	-	-	-	110	-	-	ns
		4.5	-	15	-	15	-	22	-	22	ns
		6	-	13	-	-	-	19	-	-	ns
Input Capacitance	C _I	-	-	10	-	10	-	10	-	10	pF

NOTES:

1. Switching Parameter: C_L = 50pF, Input t_R, t_F = 6ns.
2. These limits are tested 100%.

Burn-In Test Circuit Connections Use DC II for F3A Burn-In and AC for Life Test. (Note 1)

	DC BURN-IN I			DC BURN-IN II		
DC	OPEN	GROUND	V _{CC} (6V)	OPEN	GROUND	V _{CC} (6V)
CD54HC/HCT42	1-7, 9-11	8, 12-15	16	1-7, 9-11	8	12-16
AC	OPEN	GROUND	1/2 V _{CC} (3V)	V _{CC} (6V)	OSCILLATOR	
					50kHz	25kHz
CD54HC/HCT42	-	8, 12	1-7, 9-11	16	14, 15	13

NOTE:

1. Each pin except V_{CC} and GND will have a resistor of 2kΩ to 47kΩ.