
HD74HC4543

BCD-to-Seven Segment Latch/Decoder/Driver

HITACHI

ADE-205-544 (Z)
1st. Edition
Sep. 2000

Description

This circuit contains a 4-bit latch, BCD-to-7 segment decoder, and 7 output drivers. Data on the input pins flow through to the output when the Latch Disable (LE) is high and is latched on the high to low transition of the LE input. The Phase input (Ph) controls the polarity of the 7 segment outputs. When Ph is low the outputs are true 7 segment, and when Ph is high the outputs are inverted 7 segment. When the Phase input is driven by a liquid crystal display (LCD) backplane waveform the segment pins output the correct segment waveform for proper LCD AC drive voltages.

In addition a Blanking input (BI) is provided, which will blank the display.

Features

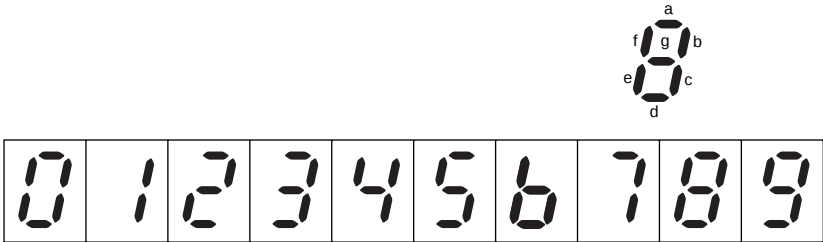
- High Speed Operation: t_{pd} (A, B, C, D to a – g) = 33 ns typ ($C_L = 50$ pF)
- High Output Current: Fanout of 10 LSTTL Loads
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Input Current: 1 μ A max
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)

Function Table

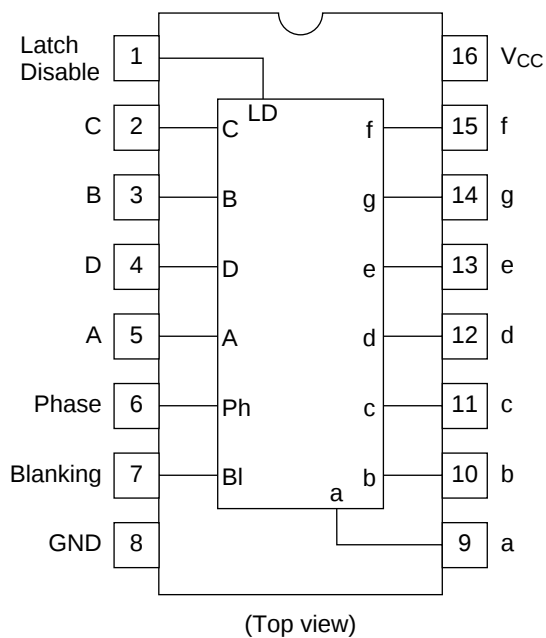
Inputs							Outputs							Display
LD	BI	Ph ^{*1}	D	C	B	A	a	b	c	d	e	f	g	
X	H	L	X	X	X	X	L	L	L	L	L	L	L	Blank
H	L	L	L	L	L	L	H	H	H	H	H	H	L	0
H	L	L	L	L	L	H	L	H	H	L	L	L	L	1
H	L	L	L	L	H	L	H	H	L	H	H	L	H	2
H	L	L	L	L	H	H	H	H	H	H	L	L	H	3
H	L	L	L	H	L	L	L	H	H	L	L	H	H	4
H	L	L	L	H	L	H	H	L	H	H	L	H	H	5
H	L	L	L	H	H	L	H	L	H	H	H	H	H	6
H	L	L	L	H	H	H	H	H	H	L	L	L	L	7
H	L	L	H	L	L	L	H	H	H	H	H	H	H	8
H	L	L	H	L	L	H	H	H	H	H	L	H	H	9
H	L	L	H	L	H	L	L	L	L	L	L	L	L	Blank
H	L	L	H	L	H	H	L	L	L	L	L	L	L	Blank
H	L	L	H	H	L	L	L	L	L	L	L	L	L	Blank
H	L	L	H	H	L	H	L	L	L	L	L	L	L	Blank
H	L	L	H	H	H	L	L	L	L	L	L	L	L	Blank
H	L	L	H	H	H	H	L	L	L	L	L	L	L	Blank
L	L	L	X	X	X	X	*2							*1

Notes: 1. For liquid crystal readouts, apply a square wave to Ph.
For common cathode LED readouts, select Ph = L. For common anode LED readouts, select Ph = H

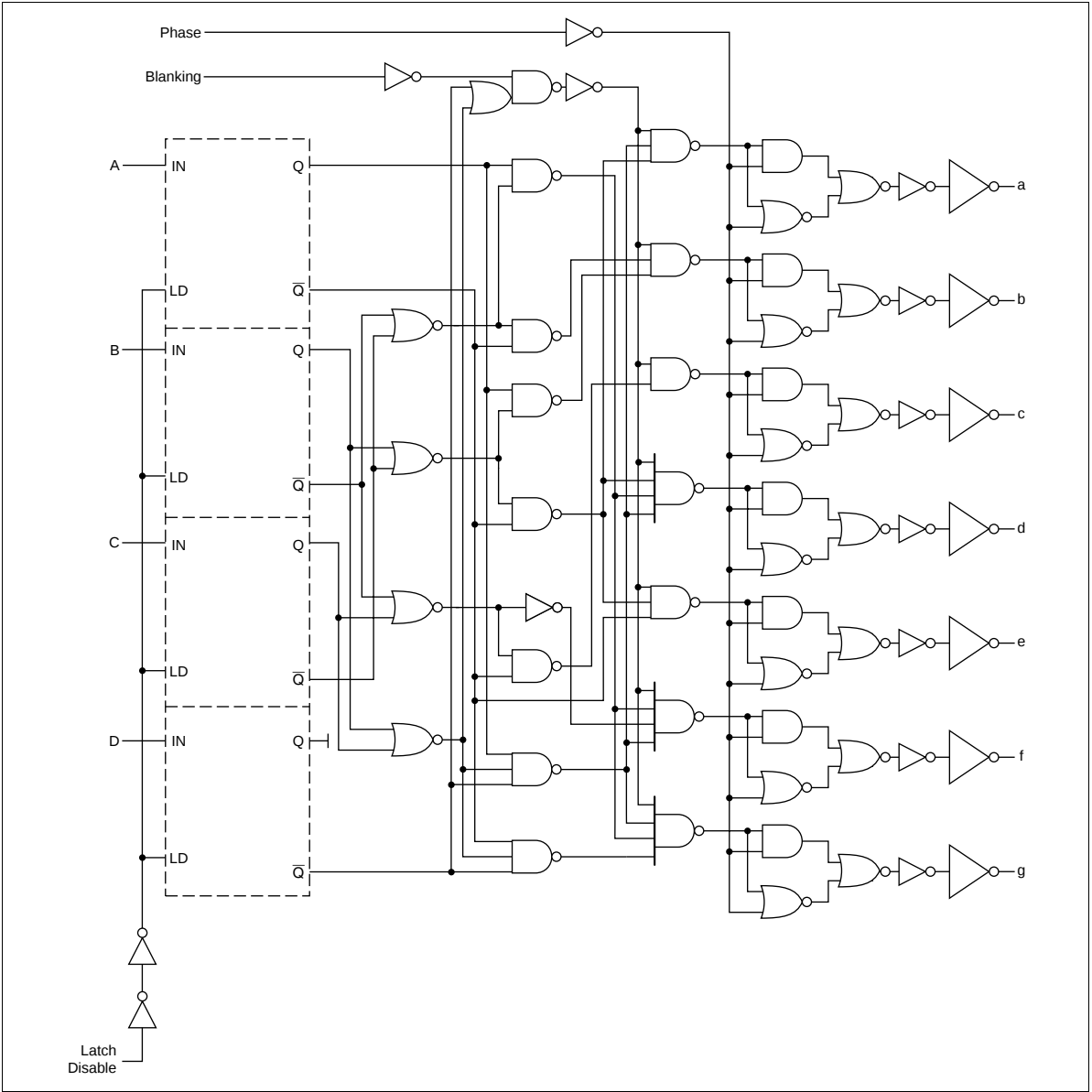
2. Depends upon the BCD coder previously applied when LD = H



Pin Arrangement



Logic Diagram



DC Characteristics

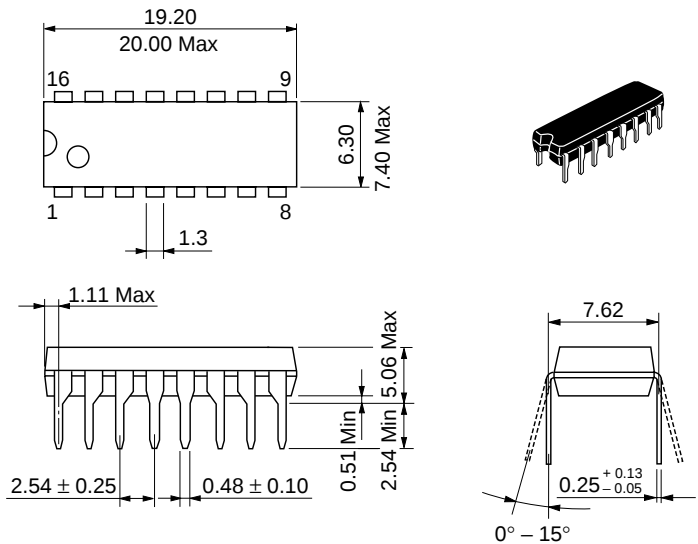
Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = −40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
Output voltage	V _{OH}	2.0	1.9	2.0	—	1.9	—	V	Vin = V _{IH} or V _{IL} I _{OH} = −20 μA	
		4.5	4.4	4.5	—	4.4	—			
		6.0	5.9	6.0	—	5.9	—			
		4.5	4.18	—	—	4.13	—			I _{OH} = −4 mA
		6.0	5.68	—	—	5.63	—			I _{OH} = −5.2 mA
	V _{OL}	2.0	—	0.0	0.1	—	0.1	V	Vin = V _{IH} or V _{IL} I _{OL} = 20 μA	
		4.5	—	0.0	0.1	—	0.1			
		6.0	—	0.0	0.1	—	0.1			
		4.5	—	—	0.26	—	0.33			I _{OL} = 4 mA
		6.0	—	—	0.26	—	0.33			I _{OL} = 5.2 mA
Input current	I _{in}	6.0	—	—	±0.1	—	±1.0	μA	Vin = V _{CC} or GND	
Quiescent supply current	I _{CC}	6.0	—	—	4.0	—	40	μA	Vin = V _{CC} or GND, I _{out} = 0 μA	

AC Characteristics (C_L = 50 pF, Input t_r = t_f = 6 ns)

Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t _{PLH}	2.0	—	—	400	—	500	ns	A, B, C or D to a – g
		4.5	—	33	80	—	100		
		6.0	—	—	68	—	86		
	t _{PLH}	2.0	—	—	300	—	380	ns	Blanking to a – g
		4.5	—	22	60	—	76		
		6.0	—	—	52	—	66		
	t _{PLH}	2.0	—	—	300	—	380	ns	Phase to a – g
		4.5	—	18	60	—	76		
		6.0	—	—	52	—	66		
	t _{PLH}	2.0	—	—	400	—	500	ns	Latch Disable to a – g
		4.5	—	35	80	—	100		
		6.0	—	—	68	—	86		
Pulse width	t _w	2.0	80	—	—	100	—	ns	
		4.5	16	5	—	20	—		
		6.0	14	—	—	17	—		
Setup time	t _{SU}	2.0	100	—	—	125	—	ns	
		4.5	20	2	—	25	—		
		6.0	17	—	—	21	—		
Hold time	t _h	2.0	50	—	—	65	—	ns	
		4.5	10	1	—	13	—		
		6.0	9	—	—	11	—		
Output rise/fall time	t _{TLH}	2.0	—	—	75	—	95	ns	
	t _{THL}	4.5	—	5	15	—	19		
		6.0	—	—	13	—	16		
Input capacitance	C _{in}	—	—	5	10	—	10	pF	

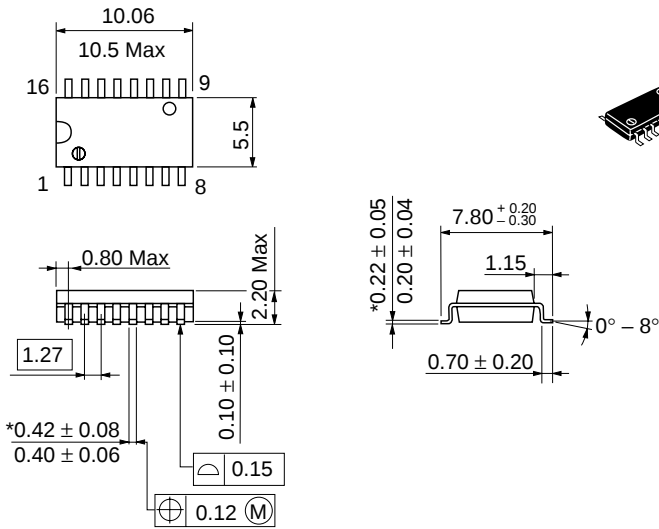
Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

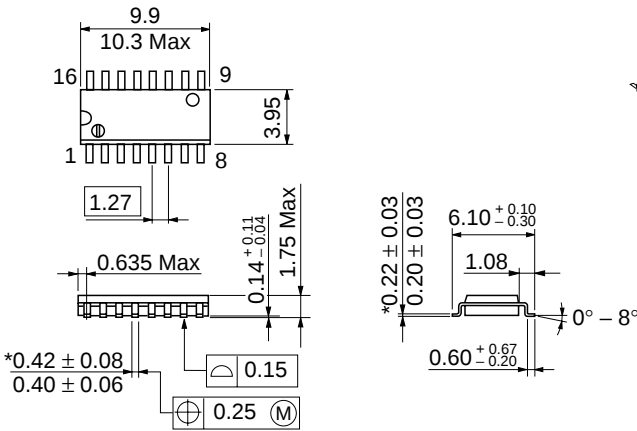
Unit: mm



Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.24 g

*Dimension including the plating thickness
Base material dimension

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.15 g

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