BCD-to-decimal decoder

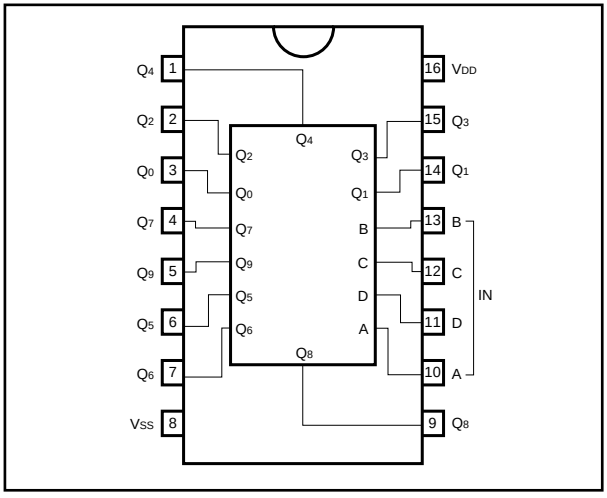
BU4028B

The BU4028B is a decoder which converts BCD signals to decimal signals.
Of the ten outputs Q_0 to Q_9, those corresponding to the A to D input codes are set to “H”, and the others are all set to “L”.
If inputs A to C are used and input D is used as disabled input, the BU4028B can also be used as a 1-of-8 decoder.

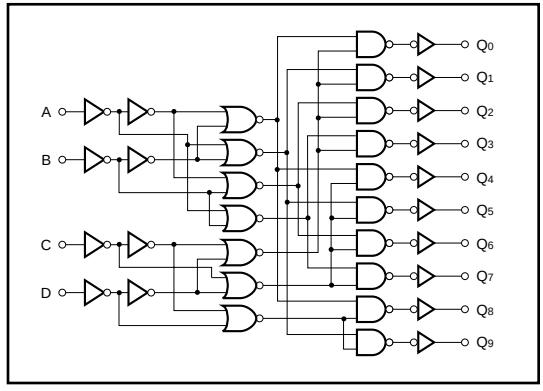
●Features

1) Low power dissipation.
2) Wide range of operating power supply voltages.
3) High input impedance.
4) High fan-out.
5) Direct drive of 2 L-TTL inputs and 1LS-TTL input.

●Block diagram



●Logic circuit diagram



●Truth table

INPUT				OUTPUT									
D	C	B	A	Q_9	Q_8	Q_7	Q_6	Q_5	Q_4	Q_3	Q_2	Q_1	Q_0
L	L	L	L	L	L	L	L	L	L	L	L	L	H
L	L	L	H	L	L	L	L	L	L	L	L	H	L
L	L	H	L	L	L	L	L	L	L	L	H	L	L
L	L	H	H	L	L	L	L	L	L	H	L	L	L
L	H	L	L	L	L	L	L	L	H	L	L	L	L
L	H	L	H	L	L	L	L	H	L	L	L	L	L
L	H	H	L	L	L	L	H	L	L	L	L	L	L
L	H	H	H	L	L	H	L	L	L	L	L	L	L
H	L	L	L	L	H	L	L	L	L	L	L	L	L
H	L	L	H	H	L	L	L	L	L	L	L	L	L
H	L	H	L	L	L	L	L	L	L	L	L	L	L
H	L	H	H	L	L	L	L	L	L	L	L	L	L
H	H	L	L	L	L	L	L	L	L	L	L	L	L
H	H	L	H	L	L	L	L	L	L	L	L	L	L
H	H	H	L	L	L	L	L	L	L	L	L	L	L
H	H	H	H	L	L	L	L	L	L	L	L	L	L

●Absolute maximum ratings (Ta = 25°C, V_{SS} = 0V)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{DD}	– 0.3 ~ + 18	V
Power dissipation	Pd	1000 (DIP)	mW
Operating temperature	Topr	– 40 ~ + 85	°C
Storage temperature	Tstg	– 55 ~ + 150	°C
Input voltage	V_{IN}	– 0.3 ~ V_{DD} + 0.3	V

●Electrical characteristics

DC characteristics (unless otherwise noted, Ta = 25°C, V_{SS} = 0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	V_{DD} (V)	Conditions	Measurement circuit
Input high level voltage	V_{IH}	3.5	—	—	V	5	—	Fig.1
		7.0	—	—		10		
		11.0	—	—		15		
Input low level voltage	V_{IL}	—	—	1.5	V	5	—	Fig.1
		—	—	3.0		10		
		—	—	4.0		15		
Input high level current	I_{IH}	—	—	0.3	µA	15	V_{IH} = 15V	Fig.1
Input low level current	I_{IL}	—	—	– 0.3	µA	15	V_{IL} = 0V	Fig.1
Output high level voltage	V_{OH}	4.95	—	—	V	5	I_O = 0mA	Fig.1
		9.95	—	—		10		
		14.95	—	—		15		
Output low level voltage	V_{OL}	—	—	0.05	V	5	I_O = 0mA	Fig.1
		—	—	0.05		10		
		—	—	0.05		15		
Output high level current	I_{OH}	– 0.16	—	—	mA	5	V_{OH} = 4.6V	Fig.1
		– 0.4	—	—		10	V_{OH} = 9.5V	
		– 1.2	—	—		15	V_{OH} = 13.5V	
Output low level current	I_{OL}	0.44	—	—	mA	5	V_{OL} = 0.4V	FIg.1
		1.1	—	—		10	V_{OL} = 0.5V	
		3.0	—	—		15	V_{OL} = 1.5V	
Static current dissipation	I_{DD}	—	—	1	µA	5	V_I = V_{DD} or GND	—
		—	—	2		10		
		—	—	4		15		

Switching characteristics (Ta = 25°C, C_L = 50pF, V_{SS} = 0V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	V_{DD} (V)	Conditions	Measurement circuit
Output rise time	t_{TLH}	—	180	—	ns	5	—	Fig.2, 3
		—	90	—		10		
		—	65	—		15		
Output fall time	t_{THL}	—	100	—	ns	5	—	Fig.2, 3
		—	50	—		10		
		—	40	—		15		
"L" to "H" propagation delay time	t_{PLH}	—	300	—	ns	5	—	Fig.2, 3
		—	130	—		10		
		—	90	—		15		
"H" to "L" propagation delay time	t_{PHL}	—	300	—	ns	5	—	Fig.2, 3
		—	130	—		10		
		—	90	—		15		
Input capacitance	C_{IN}	—	5	—	pF	—	—	—

●Measurement circuits

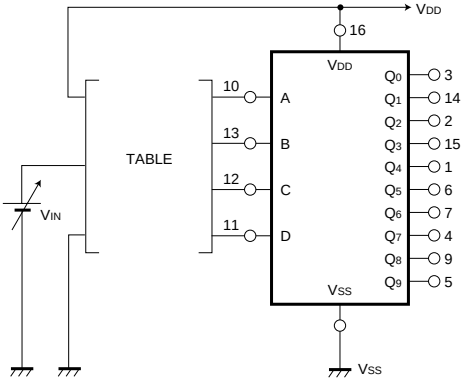
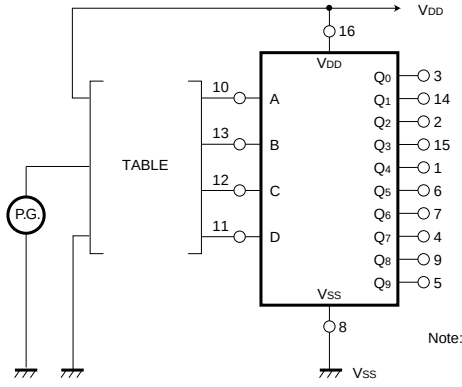


Fig. 1 DC characteristics measurement circuit

TEST NO.	INPUT				OUTPUT	
	A	B	C	D	Pos.	Neg.
1	V_{IN}	V_{SS}	V_{SS}	V_{SS}	Q_1	Q_0
2	V_{SS}	V_{IN}	V_{DD}	V_{SS}	Q_6	Q_4
3	V_{DD}	V_{DD}	V_{IN}	V_{SS}	Q_7	Q_3
4	V_{DD}	V_{SS}	V_{SS}	V_{IN}	Q_9	Q_1
5	V_{SS}	V_{IN}	V_{SS}	V_{SS}	Q_2	Q_0
6	V_{DD}	V_{SS}	V_{IN}	V_{SS}	Q_5	Q_1
7	V_{SS}	V_{SS}	V_{SS}	V_{IN}	Q_8	Q_0
8	V_{SS}	V_{SS}	V_{IN}	V_{SS}	Q_4	Q_0
9	V_{IN}	V_{DD}	V_{SS}	V_{SS}	Q_3	Q_2



Note: Connect C_L = 50pF to each output pin.

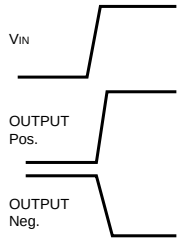


Fig. 2 Switching characteristics measurement circuit

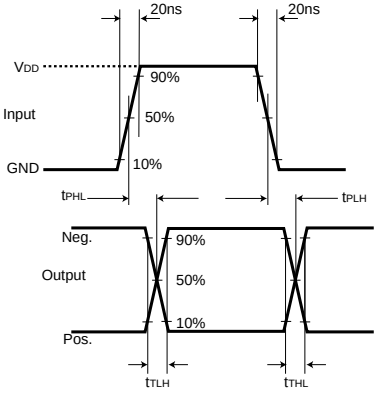


Fig. 3 Switching time test waveform

TEST NO.	INPUT				OUTPUT	
	A	B	C	D	Pos.	Neg.
1	P.G.	V_{SS}	V_{SS}	V_{SS}	Q_1	Q_0
2	V_{SS}	P.G.	V_{DD}	V_{SS}	Q_6	Q_4
3	V_{DD}	V_{DD}	P.G.	V_{SS}	Q_7	Q_3
4	V_{DD}	V_{SS}	V_{SS}	P.G.	Q_9	Q_1
5	V_{SS}	P.G.	V_{SS}	V_{SS}	Q_2	Q_0
6	V_{DD}	V_{SS}	P.G.	V_{SS}	Q_5	Q_1
7	V_{SS}	V_{SS}	V_{SS}	P.G.	Q_8	Q_0
8	V_{SS}	V_{SS}	P.G.	V_{SS}	Q_4	Q_0
9	P.G.	V_{DD}	V_{SS}	V_{SS}	Q_3	Q_2

●Electrical characteristics curve

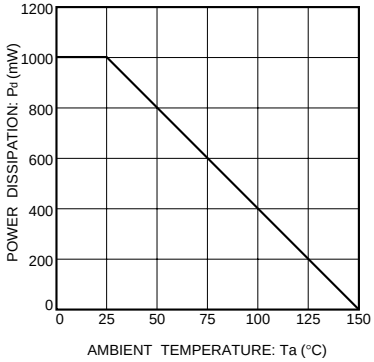
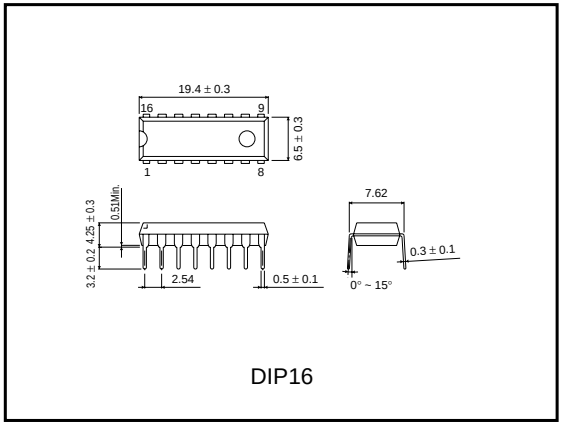


Fig.4 Power dissipation vs. Ta

●External dimensions (Units: mm)



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