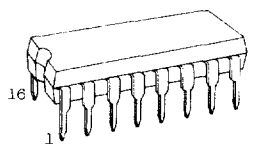
TC74HC4028P/F BCD-TO-DECIMAL DECODER

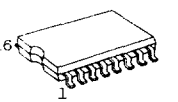
The TC74HC4028 is a high speed CMOS DECIMAL DECODER fabricated with silicon gate C^2MOS technology.
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
A BCD code applied to the four input (A thru D) provides a high level at the selected one of the decimal decoded outputs. A illegal BCD code such as eleven to fifteen gives a low level at all outputs.
The device also can be used as 3-to-8 LINE DECODER, when D input is assigned as a disable input.
The device is useful for code conversion, address decoding, memory selection, demultiplexing, or read out decoding.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES:

- High Speed.....t_{pd}=25ns(Typ.)(V_{CC}=5V)
- Low Power Dissipation.....I_{CC}=4μA(Max.)(Ta=25°C)
- High Noise Immunity.....V_{NIH}=V_{NIL}=28% V_{CC}(Min.)
- Output Drive Capability.....10 LSTTL Loads
- Symmetrical Output Impedance....$|I_{OH}|$=I_{OL}=4mA(Min.)
- Balanced Propagation Delays.....$t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range....$V_{CC(opr)}$=2V ~ 6V
- Pin and Function Compatible with 4028B

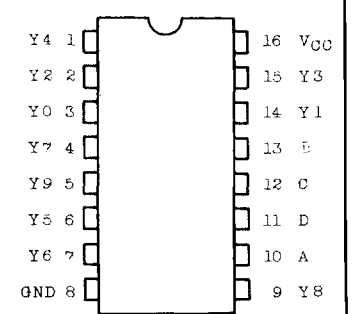


DIP16(3D16A-P)

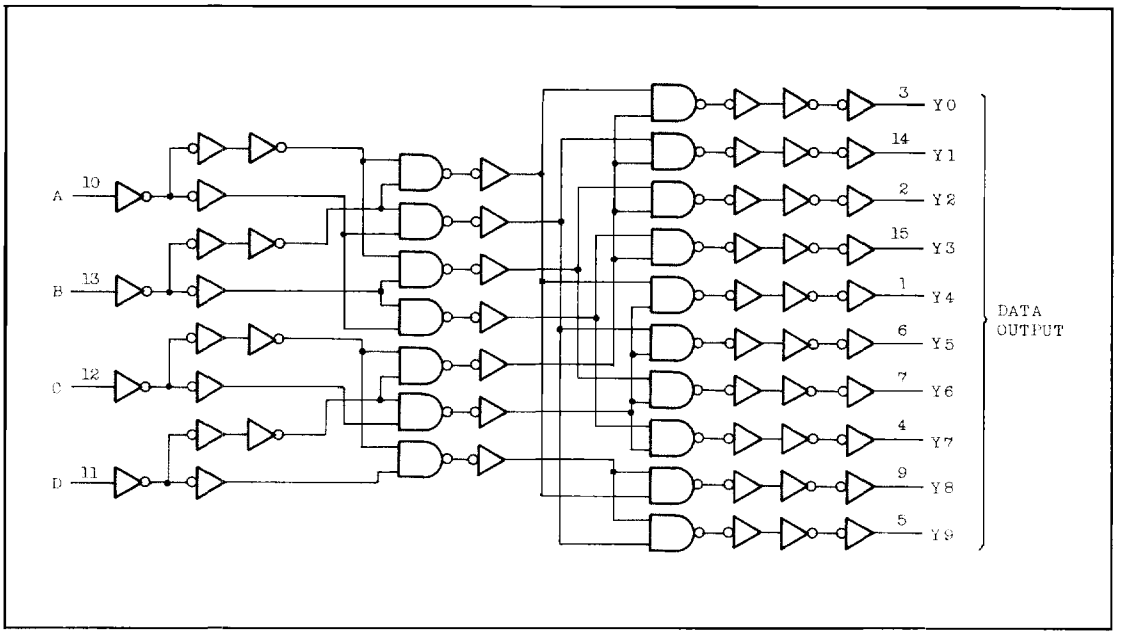


MFP16(F16GC-P)

PIN ASSIGNMENT



LOGIC DIAGRAM



TRUTH TABLE

INPUTS				OUTPUTS										SELECTED OUTPUT
D	C	B	A	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7	Y_8	Y_9	
L	L	L	L	H	L	L	L	L	L	L	L	L	L	Y_0
L	L	L	H	L	H	L	L	L	L	L	L	L	L	Y_1
L	L	H	L	L	L	H	L	L	L	L	L	L	L	Y_2
L	L	H	H	L	L	L	H	L	L	L	L	L	L	Y_3
L	H	L	L	L	L	L	L	H	L	L	L	L	L	Y_4
L	H	L	H	L	L	L	L	L	H	L	L	L	L	Y_5
L	H	H	L	L	L	L	L	L	L	H	L	L	L	Y_6
L	H	H	H	L	L	L	L	L	L	L	H	L	L	Y_7
H	L	L	L	L	L	L	L	L	L	L	L	H	L	Y_8
H	L	L	H	L	L	L	L	L	L	L	L	L	H	Y_9
H	X	H	X	L	L	L	L	L	L	L	L	L	L	NOTE
H	H	X	X	L	L	L	L	L	L	L	L	L	L	NOTE

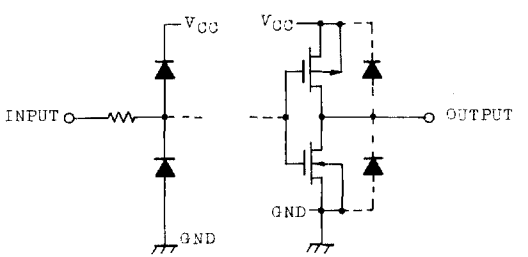
X : Don't care

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	-0.5 ~ 7	V
DC Input Voltage	V_{IN}	-0.5 ~ V_{CC}+0.5	V
DC Output Voltage	V_{OUT}	-0.5 ~ V_{CC}+0.5	V
Input Diode Current	I_{IK}	±20	mA
Output Diode Current	I_{OK}	±20	mA
DC Output Current	I_{OUT}	±25	mA
DC V_{CC}/Ground Current	I_{CC}	±50	mA
Power Dissipation	P_D	500(DIP)*/180(MFP)	mW
Storage Temperature	T_{stg}	-65 ~ 150	°C
Lead Temperature 10sec	T_L	300	°C

* 500mW in the range of Ta=-40°C ~ 65°C. and from Ta=65°C up to 85°C derating factor of -10mW/°C shall be applied until 300mW.

INPUT and OUTPUT EQUIVALENT CIRCUIT



RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	LIMIT	UNIT
Supply Voltage	V_{CC}	2 ~ 6	V
Input Voltage	V_{IN}	0 ~ V_{CC}	V
Output Voltage	V_{OUT}	0 ~ V_{CC}	V
Operating Temperature	Topr	-40 ~ 85	°C
Input Rise and Fall Time	t_r, t_f	0~1000 (V_{CC}=2.0V) 0 ~ 500 (V_{CC}=4.5V) 0 ~ 400 (V_{CC}=6.0V)	ns

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC}	Ta=25°C MIN.	Ta=25°C TYP.	Ta=25°C MAX.	Ta=-40~85°C MIN.	Ta=-40~85°C MAX.	UNIT
High-Level Input Voltage	V_{IH}			2.0	1.5	-	-	1.5	-	V
				4.5	3.15	-	-	3.15	-	
				6.0	4.2	-	-	4.2	-	
Low-Level Input Voltage	V_{IL}			2.0	-	-	0.5	-	0.5	V
				4.5	-	-	1.35	-	1.35	
				6.0	-	-	1.8	-	1.8	
High-Level Output Voltage	V_{OH}	V_{IN}= V_{IH} or V_{IL}	I_{OH}=-20μA	2.0	1.9	2.0	-	1.9	-	V
				4.5	4.4	4.5	-	4.4	-	
				6.0	5.9	6.0	-	5.9	-	
			I_{OH}=-4mA	4.5	4.18	4.31	-	4.13	-	
			I_{OH}=-5.2mA	6.0	5.68	5.80	-	5.63	-	
Low-Level Output Voltage	V_{OL}	V_{IN}= V_{IH} or V_{IL}	I_{OL}=20μA	2.0	-	0.0	0.1	-	0.1	V
				4.5	-	0.0	0.1	-	0.1	
				6.0	-	0.0	0.1	-	0.1	
			I_{OL}=4mA	4.5	-	0.17	0.26	-	0.33	
			I_{OL}=5.2mA	6.0	-	0.18	0.26	-	0.33	
Input Leakage Current	I_{IN}	V_{IN}=V_{CC} or GND		6.0	-	-	±0.1	-	±1.0	μA
Quiescent Supply Current	I_{CC}	V_{IN}=V_{CC} or GND		6.0	-	-	4.0	-	40.0	

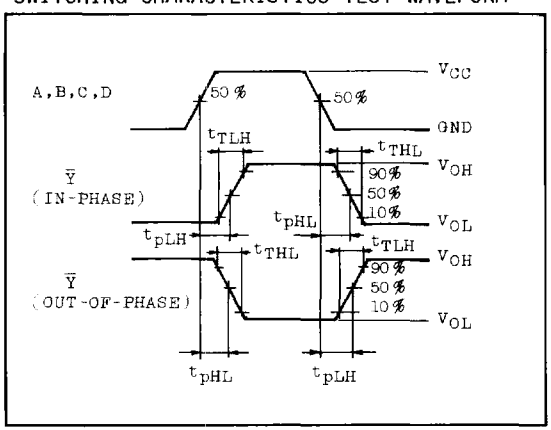
AC ELECTRICAL CHARACTERISTICS (C_L=50pF, Input $t_r=t_f$=6ns)

PARAMETER	SYMBOL	TEST CONDITION		Ta=25°C			Ta=-40~85°C		UNIT
			V_{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}		2.0	-	30	75	-	95	ns
			4.5	-	8	15	-	19	
			6.0	-	7	13	-	16	
Propagation Delay Time (A,B,C,D)	t_{pLH} t_{pHL}		2.0	-	116	225	-	280	
			4.5	-	29	45	-	56	
			6.0	-	25	38	-	48	
Input Capacitance	C_{IN}			-	5	10	-	10	pF
Power Dissipation Capacitance	C_{PD}(1)			-	58	-	-	-	

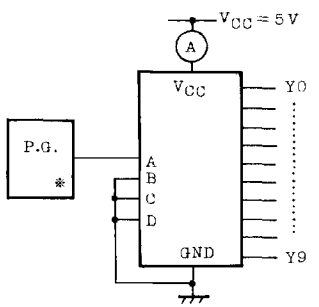
Note (1) C_{PD} is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).
Average operating current can be obtained by the equation hereunder.

$$I_{CC(opr)}=C_{PD}\cdot V_{CC}\cdot f_{IN}+I_{CC}$$

SWITCHING CHARACTERISTICS TEST WAVEFORM



$I_{CC(opr)}$ TEST CIRCUIT



* Input transition time is the same as that in case of switching characteristics test.