TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4028BP, TC4028BF, TC4028BFN

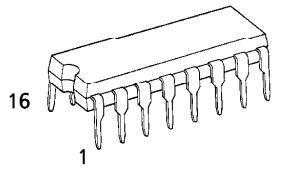
TC4028B BCD – TO – DECIMAL DECODER

TC4028B is a BCD-to-DECIMAL decoder which converts BCD signal into DECIMAL signal.

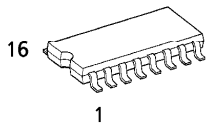
Of ten outputs from Q0 to Q9, one output corresponding to input BCD code goes to the "H" level and all the others remain at the "L" level.

When D is used as inhibit input by use of three input lines from A to C, this decoder can be served as a BINARY-to-OCTAL decoder.

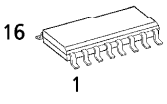
(Note) The JEDEC SOP (FN) is not available in Japan.



P (DIP16-P-300-2.54A)
Weight : 1.00g (Typ.)



F (SOP16-P-300-1.27)
Weight : 0.18g (Typ.)

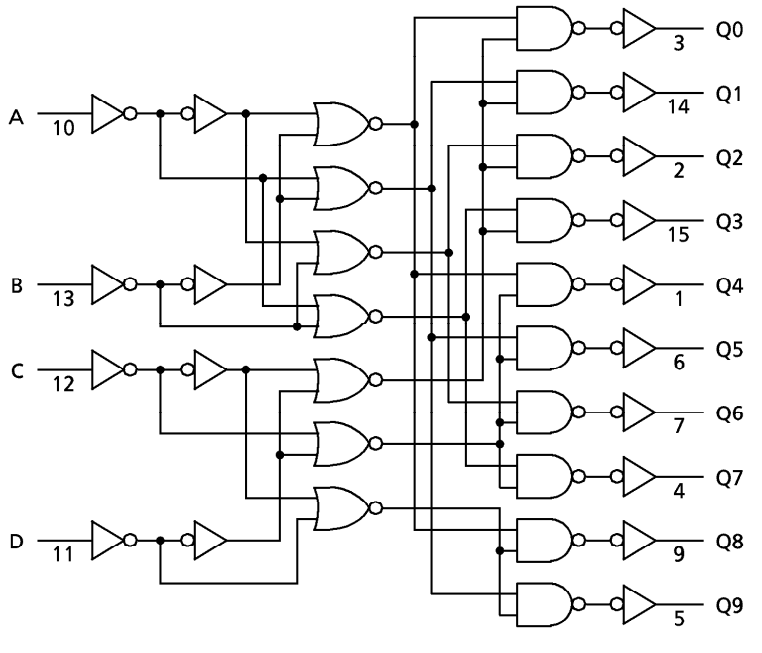


FN (SOL16-P-150-1.27)
Weight : 0.13g (Typ.)

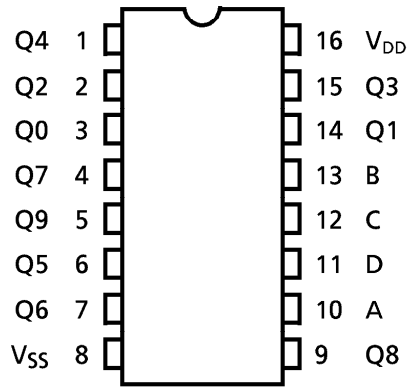
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V_{DD}	$V_{SS}-0.5 \sim V_{SS}+20$	V
Input Voltage	V_{IN}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
Output Voltage	V_{OUT}	$V_{SS}-0.5 \sim V_{DD}+0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T_{opr}	−40~85	°C
Storage Temperature Range	T_{stg}	−65~150	°C

LOGIC DIAGRAM



PIN ASSIGNMENT



TRUTH TABLE

INPUTS				OUTPUTS									
D	C	B	A	Q0	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
L	L	L	L	H	L	L	L	L	L	L	L	L	L
L	L	L	H	L	H	L	L	L	L	L	L	L	L
L	L	H	L	L	L	H	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L
L	H	L	L	L	L	L	L	H	L	L	L	L	L
L	H	L	H	L	L	L	L	L	H	L	L	L	L
L	H	H	L	L	L	L	L	L	L	H	L	L	L
L	H	H	H	L	L	L	L	L	L	L	H	L	L
H	L	L	L	L	L	L	L	L	L	L	L	H	L
H	L	L	H	L	L	L	L	L	L	L	L	L	H
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

H = HIGH LEVEL L = LOW LEVEL

961001EBA2

RECOMMENDED OPERATING CONDITIONS (V_{SS} = 0V)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	V_{DD}		3	—	18	V
Input Voltage	V_{IN}		0	—	V_{DD}	V

STATIC ELECTRICAL CHARACTERISTICS (V_{SS} = 0V)

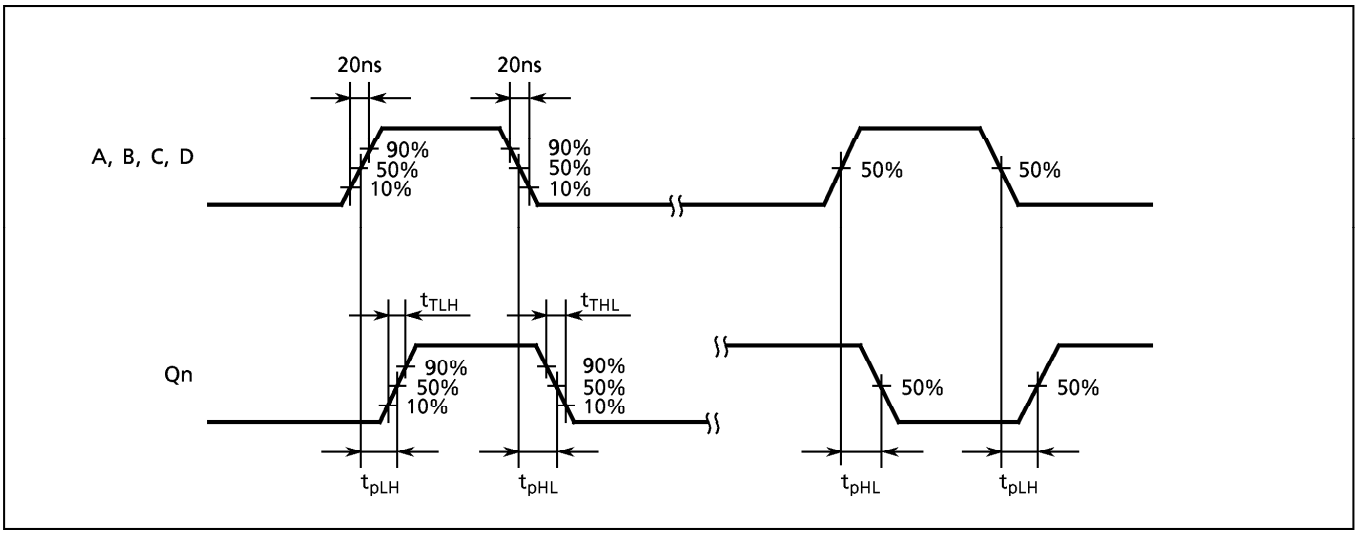
CHARACTERISTIC	SYMBOL	TEST CONDITION	V_{DD} (V)	−40°C MIN.	−40°C MAX.	25°C MIN.	25°C TYP.	25°C MAX.	85°C MIN.	85°C MAX.	UNIT
High-Level Output Voltage	V_{OH}	$\|I_{OUT}\| < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	4.95	—	4.95	5.00	—	4.95	—	V
			10	9.95	—	9.95	10.00	—	9.95	—	
			15	14.95	—	14.95	15.00	—	14.95	—	
Low-Level Output Voltage	V_{OL}	$\|I_{OUT}\| < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	—	0.05	—	0.00	0.05	—	0.05	
			10	—	0.05	—	0.00	0.05	—	0.05	
			15	—	0.05	—	0.00	0.05	—	0.05	
Output High Current	I_{OH}	V_{OH} = 4.6V	5	−0.61	—	−0.51	−1.0	—	−0.42	—	mA
		V_{OH} = 2.5V	5	−2.50	—	−2.10	−4.0	—	−1.70	—	
		V_{OH} = 9.5V	10	−1.50	—	−1.30	−2.2	—	−1.10	—	
		V_{OH} = 13.5V	15	−4.00	—	−3.40	−9.0	—	−2.80	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Output Low Current	I_{OL}	V_{OL} = 0.4V	5	0.61	—	0.51	1.2	—	0.42	—	
		V_{OL} = 0.5V	10	1.50	—	1.30	3.2	—	1.10	—	
		V_{OL} = 1.5V	15	4.00	—	3.40	12.0	—	2.80	—	
		$V_{IN} = V_{SS}, V_{DD}$									
Input High Voltage	V_{IH}	V_{OUT} = 0.5V, 4.5V	5	3.5	—	3.5	2.75	—	3.5	—	V
		V_{OUT} = 1.0V, 9.0V	10	7.0	—	7.0	5.50	—	7.0	—	
		V_{OUT} = 1.5V, 13.5V	15	11.0	—	11.0	8.25	—	11.0	—	
		$\|I_{OUT}\| < 1\mu A$									
Input Low Voltage	V_{IL}	V_{OUT} = 0.5V, 4.5V	5	—	1.5	—	2.25	1.5	—	1.5	
		V_{OUT} = 1.0V, 9.0V	10	—	3.0	—	4.50	3.0	—	3.0	
		V_{OUT} = 1.5V, 13.5V	15	—	4.0	—	6.75	4.0	—	4.0	
		$\|I_{OUT}\| < 1\mu A$									
Input Current "H" Level	I_{IH}	V_{IH} = 18V	18	—	0.1	—	10^{-5}	0.1	—	1.0	μA
Input Current "L" Level	I_{IL}	V_{IL} = 0V	18	—	−0.1	—	-10^{-5}	−0.1	—	−1.0	
Quiescent Supply Current	I_{DD}	$V_{IN} = V_{SS}, V_{DD}$*	5	—	5	—	0.005	5	—	150	
			10	—	10	—	0.010	10	—	300	
			15	—	20	—	0.015	20	—	600	

* All valid input combinations.

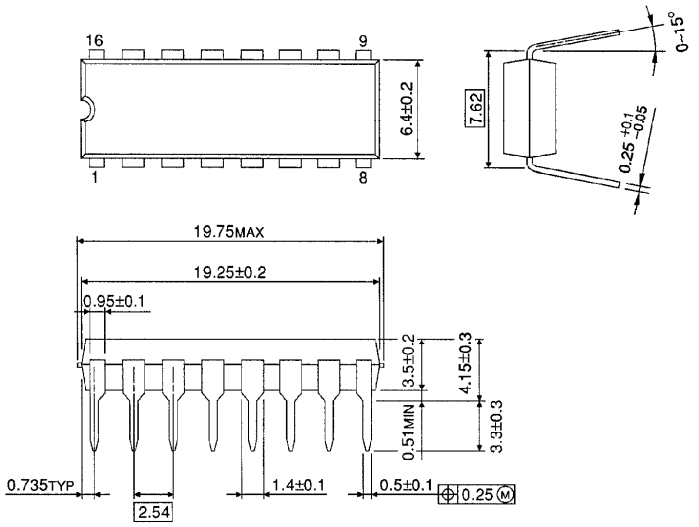
DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, C_L = 50pF)

CHARACTERISTIC	SYMBOL	TEST CONDITION V_{DD}(V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	t_{TLH}	5	—	70	200	ns
		10	—	35	100	
		15	—	30	80	
Output Transition Time (High to Low)	t_{THL}	5	—	70	200	
		10	—	35	100	
		15	—	30	80	
Propagation Delay Time	t_{pLH} t_{pHL}	5	—	110	350	ns
		10	—	55	160	
		15	—	40	120	
Input Capacitance	C_{IN}		—	5	7.5	pF

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS

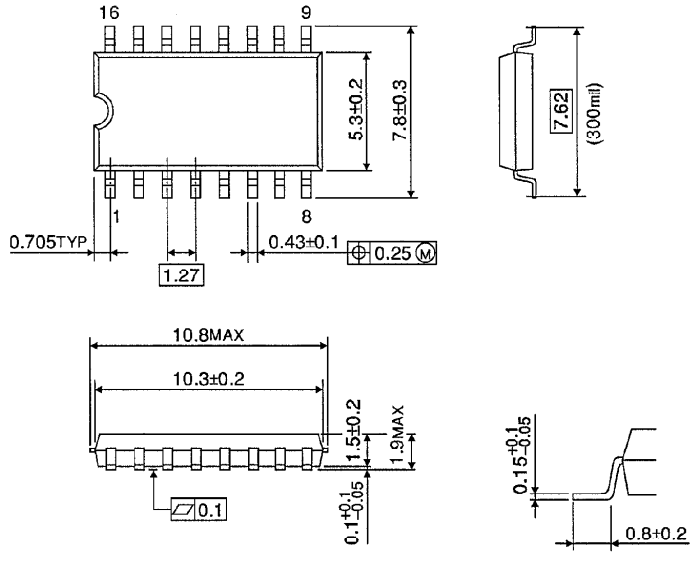


DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A) Unit in mm



Weight : 1.00g (Typ.)

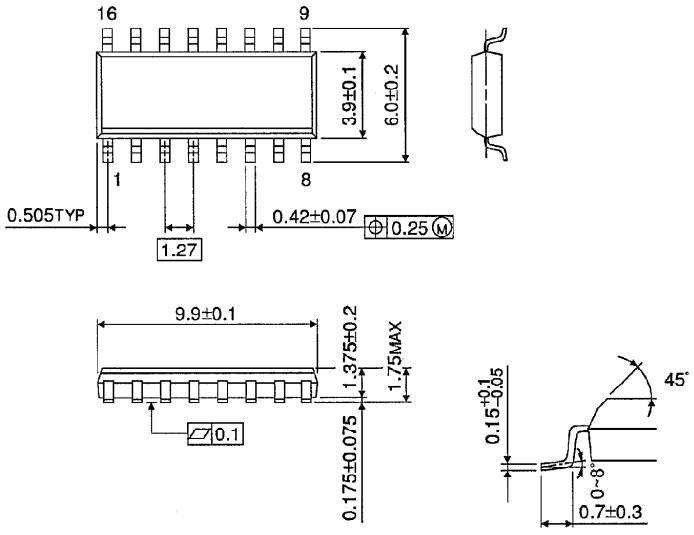
SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27) Unit in mm



Weight : 0.18g (Typ.)

SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150 -1.27) Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)