

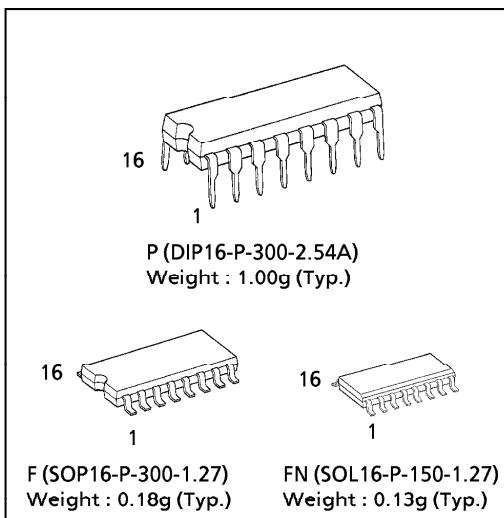
**TC4028BP, TC4028BF, TC4028BFN****TC4028B BCD - TO - DECIMAL DECODER**

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

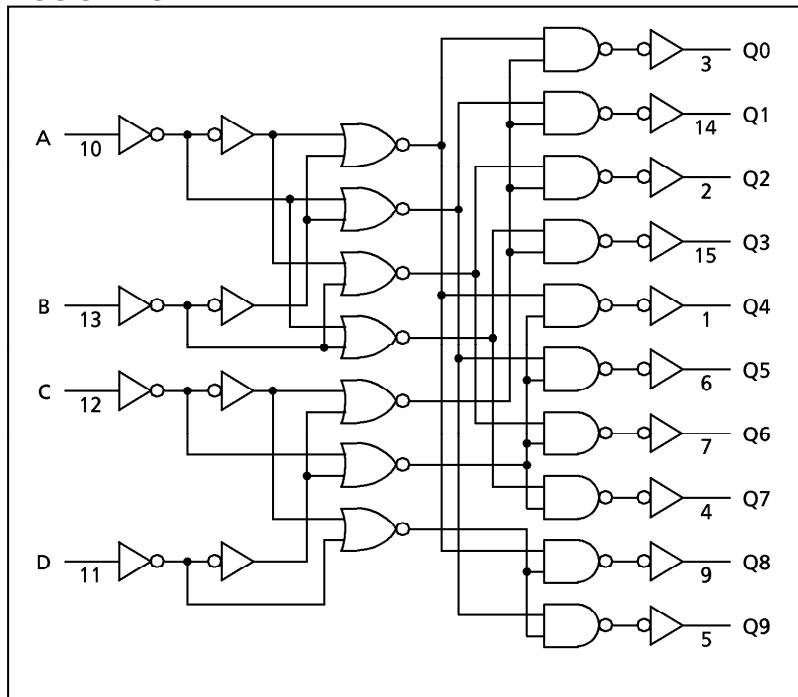
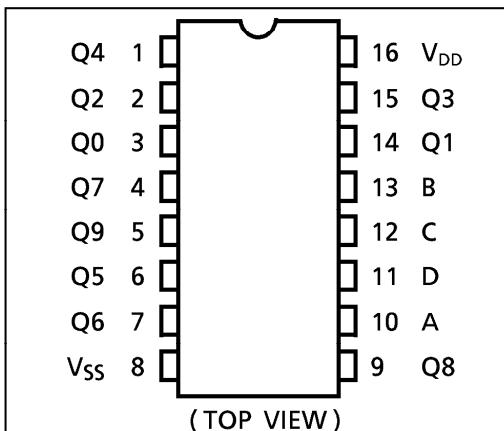
Of ten outputs from Q0 to Q9, one output corresponding to input BCD code goes to the "H" level and all the others remain at the "L" level.

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.

**MAXIMUM RATINGS**

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	V <sub>DD</sub>	V <sub>SS</sub> - 0.5~V <sub>SS</sub> + 20	V
Input Voltage	V <sub>IN</sub>	V <sub>SS</sub> - 0.5~V <sub>DD</sub> + 0.5	V
Output Voltage	V <sub>OUT</sub>	V <sub>SS</sub> - 0.5~V <sub>DD</sub> + 0.5	V
DC Input Current	I <sub>IN</sub>	± 10	mA
Power Dissipation	P <sub>D</sub>	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	T <sub>opr</sub>	- 40~85	°C
Storage Temperature Range	T <sub>stg</sub>	- 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	L	H	L	H	L	L	L	L	L	L	L	L	L
L	L	H	L	L	L	H	L	L	L	L	L	L	L	L
L	L	H	H	L	L	L	H	L	L	L	L	L	L	L
L	H	L	L	L	L	L	L	H	L	L	L	L	L	L
L	H	L	H	L	L	L	L	L	H	L	L	L	L	L
L	H	H	L	L	L	L	L	L	L	H	L	L	L	L
L	H	H	H	L	L	L	L	L	L	L	H	L	L	L
H	L	L	L	L	L	L	L	L	L	L	L	H	L	L
H	L	L	H	L	L	L	L	L	L	L	L	L	L	H
H	L	H	L	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	L
H	H	L	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	L
H	H	H	L	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	L

H = HIGH LEVEL L = LOW LEVEL

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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	SYM-BOL	TEST CONDITION	$V_{DD}$ (V)	- 40°C		25°C			85°C		UNIT	
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.		
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	V	
			10	—	0.05	—	0.00	0.05	—	0.05		
			15	—	0.05	—	0.00	0.05	—	0.05		
Output High Current	$I_{OH}$	$V_{OH} = 4.6V$ $V_{OH} = 2.5V$ $V_{OH} = 9.5V$ $V_{OH} = 13.5V$ $V_{IN} = V_{SS}, V_{DD}$	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA	
			5	-2.50	—	-2.10	-4.0	—	-1.70	—		
			10	-1.50	—	-1.30	-2.2	—	-1.10	—		
			15	-4.00	—	-3.40	-9.0	—	-2.80	—		
Output Low Current	$I_{OL}$	$V_{OL} = 0.4V$ $V_{OL} = 0.5V$ $V_{OL} = 1.5V$ $V_{IN} = V_{SS}, V_{DD}$	5	0.61	—	0.51	1.2	—	0.42	—	mA	
			10	1.50	—	1.30	3.2	—	1.10	—		
			15	4.00	—	3.40	12.0	—	2.80	—		
Input High Voltage	$V_{IH}$	$V_{OUT} = 0.5V, 4.5V$ $V_{OUT} = 1.0V, 9.0V$ $V_{OUT} = 1.5V, 13.5V$ $ I_{OUT}  < 1\mu A$	5	3.5	—	3.5	2.75	—	3.5	—	V	
			10	7.0	—	7.0	5.50	—	7.0	—		
			15	11.0	—	11.0	8.25	—	11.0	—		
Input Low Voltage	$V_{IL}$	$V_{OUT} = 0.5V, 4.5V$ $V_{OUT} = 1.0V, 9.0V$ $V_{OUT} = 1.5V, 13.5V$ $ I_{OUT}  < 1\mu A$	5	—	1.5	—	2.25	1.5	—	1.5	V	
			10	—	3.0	—	4.50	3.0	—	3.0		
			15	—	4.0	—	6.75	4.0	—	4.0		
Input Current	"H" Level	$I_{IH}$	$V_{IH} = 18V$	18	—	0.1	—	$10^{-5}$	0.1	—	1.0	$\mu A$
	"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.

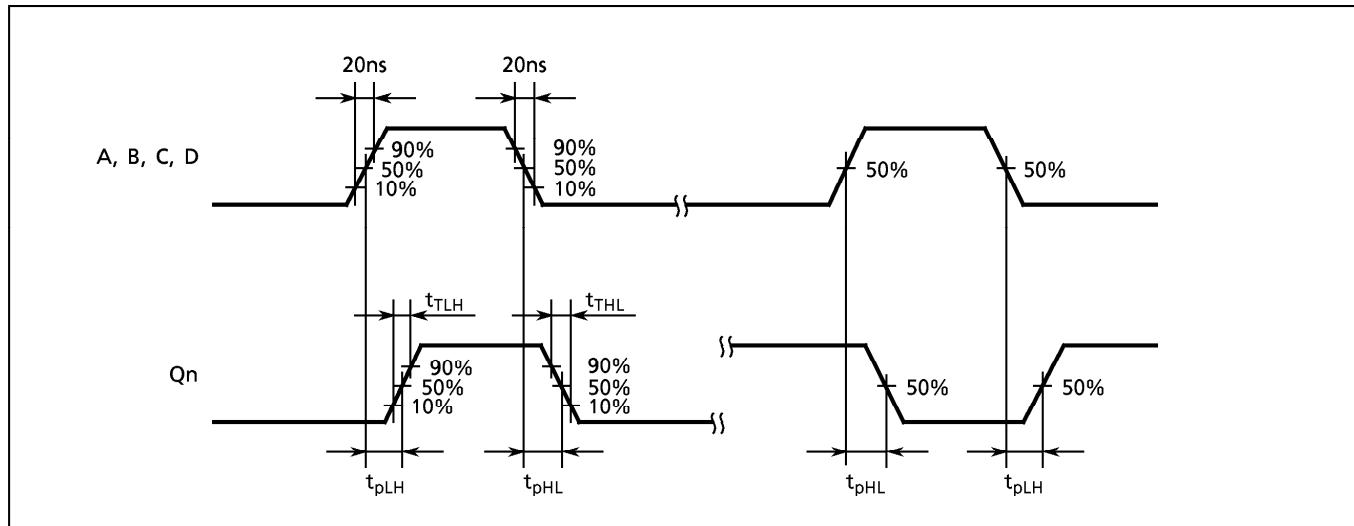
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DYNAMIC ELECTRICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ ,  $V_{ss} = 0\text{V}$ ,  $C_L = 50\text{pF}$ )

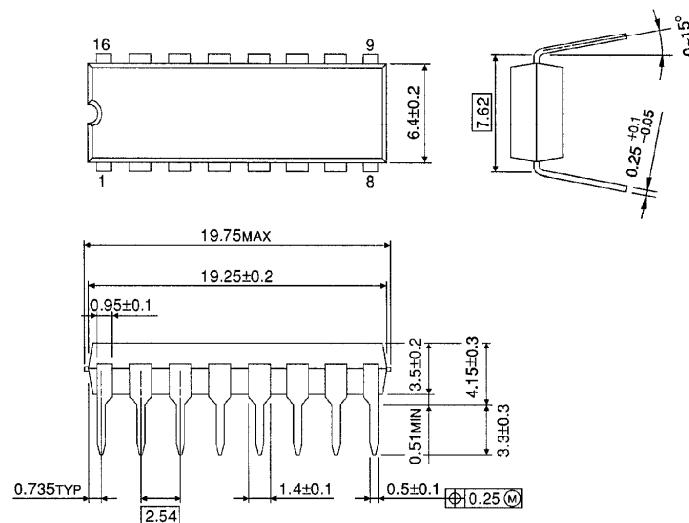
CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{DD}(\text{V})$	MIN.	TYP.	MAX.	UNIT
Output Transition Time (Low to High)	$t_{TLH}$		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time (High to Low)	$t_{THL}$		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Propagation Delay Time	$t_{pLH}$		5	—	110	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)

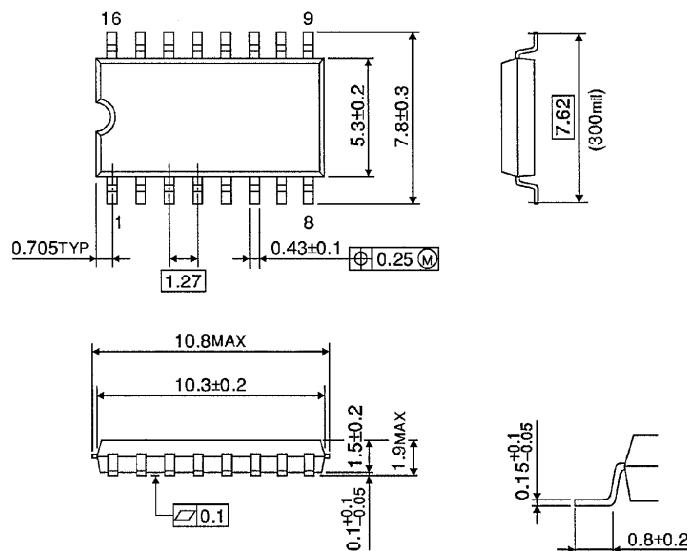
Unit in mm



Weight : 1.00g (Typ.)

## SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

Unit in mm

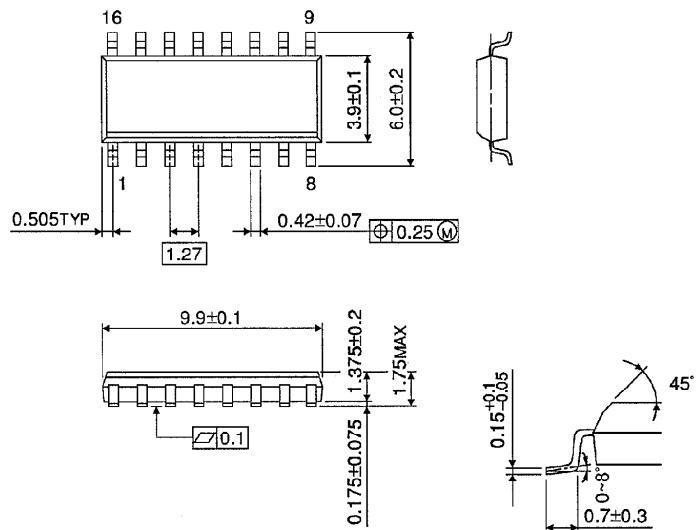


Weight : 0.18g (Typ.)

## 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.)