

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74VHC238F, TC74VHC238FN, TC74VHC238FT

3 - TO - 8 LINE DECODER

The TC74VHC238 is an advanced high speed CMOS 3 - to - 8 DECODER fabricated with silicon gate C²MOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

When the device is enabled, 3 Binary Select inputs (A, B and C) determine which one of the outputs (Y0 - Y7) will go High.

When enable input G1 is held low or either G2A or G2B is held high, decoding function is inhibited and all outputs go Low.

G1 G2A, and G2B inputs are provided to ease cascade connection and for use as an address decoder for memory systems.

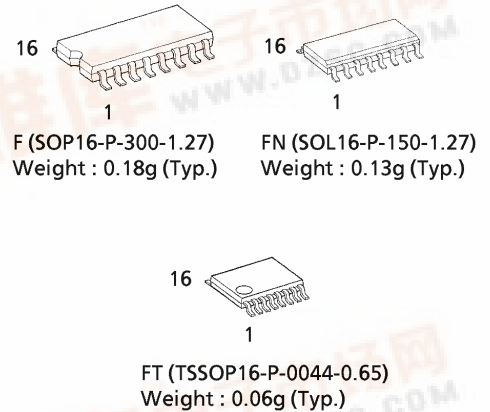
An input protection circuit ensures that 0 to 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up.

This circuit prevents device destruction due to mismatched supply and input voltages.

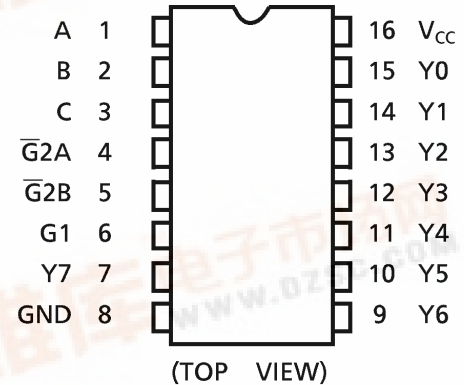
FEATURES :

- High Speed..... $t_{pd} = 5.5ns(typ.)$ at $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(Max.)$ at $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (Min.)$
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC} (opr) = 2V \sim 5.5V$
- Pin and Function Compatible with 74ALS238

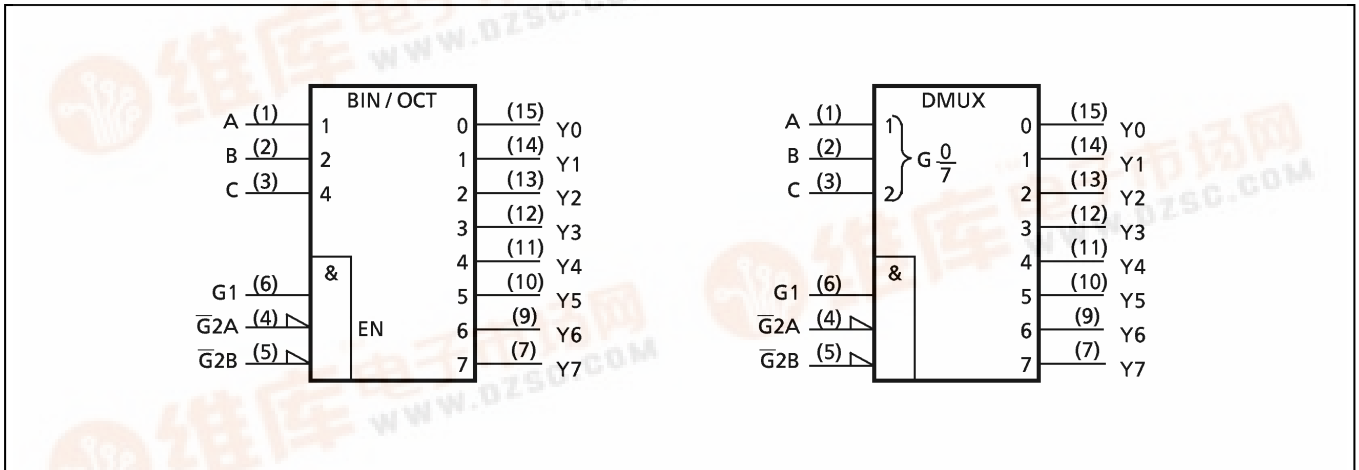
(Note) The JEDEC SOP (FN) is not available in Japan.



PIN ASSIGNMENT



IEC LOGIC SYMBOL



961001EBA2

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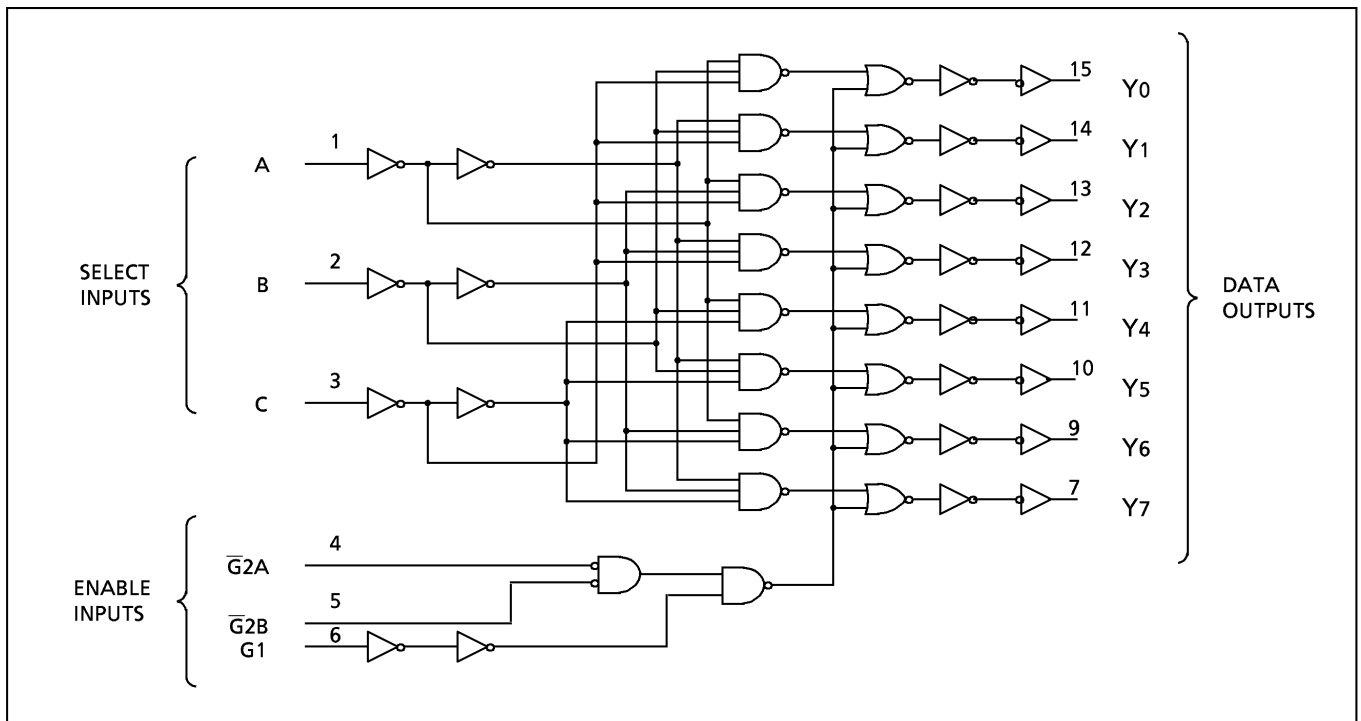


TRUTH TABLE

INPUTS						OUTPUTS								SELECTED OUTPUT
ENABLE			SELECT			Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	
G1	$\overline{G2A}$	$\overline{G2B}$	C	B	A									
L	X	X	X	X	X	L	L	L	L	L	L	L	L	NONE
X	H	X	X	X	X	L	L	L	L	L	L	L	L	NONE
X	X	H	X	X	X	L	L	L	L	L	L	L	L	NONE
H	L	L	L	L	L	H	L	L	L	L	L	L	L	Y0
H	L	L	L	L	H	L	H	L	L	L	L	L	L	Y1
H	L	L	L	H	L	L	L	H	L	L	L	L	L	Y2
H	L	L	L	H	H	L	L	L	H	L	L	L	L	Y3
H	L	L	H	L	L	L	L	L	L	H	L	L	L	Y4
H	L	L	H	L	H	L	L	L	L	L	H	L	L	Y5
H	L	L	H	H	L	L	L	L	L	L	L	H	L	Y6
H	L	L	H	H	H	L	L	L	L	L	L	L	H	Y7

X : Don't Care

LOGIC DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	-0.5~7.0	V
DC Input Voltage	V_{IN}	-0.5~7.0	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}	±75	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	-65~150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V_{CC}	2.0~5.5	V
Input Voltage	V_{IN}	0~5.5	V
Output Voltage	V_{OUT}	0~ V_{CC}	V
Operating Temperature	T_{opr}	-40~85	°C
Input Rise and Fall Time	dt / dv	0~100 ($V_{CC} = 3.3 \pm 0.3V$) 0~20 ($V_{CC} = 5 \pm 0.5V$)	ns / V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		UNIT	
				MIN.	TYP.	MAX.	MIN.	MAX.		
High - Level Input Voltage	V_{IH}		2.0	1.50	—	—	1.50	—	V	
			3.0~ 5.5	$V_{CC} \times 0.7$	—	—	$V_{CC} \times 0.7$	—		
Low - Level Input Voltage	V_{IL}		2.0	—	—	0.50	—	0.50	V	
			3.0~ 5.5	—	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$		
High - Level Output Voltage	V_{OH}	$V_{IN} =$ V_{IH} or V_{IL}	$I_{OH} = -50\mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
			4.5	4.4	4.5	—	4.4	—		
			$I_{OH} = -4\text{mA}$ $I_{OH} = -8\text{mA}$	3.0	2.58	—	—	2.48	—	
4.5	3.94	—		—	3.80	—				
Low - Level Output Voltage	V_{OL}	$V_{IN} =$ V_{IH} or V_{IL}	$I_{OL} = 50\mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
			4.5	—	0.0	0.1	—	0.1		
			$I_{OL} = 4\text{mA}$ $I_{OL} = 8\text{mA}$	3.0	—	—	0.36	—	0.44	
4.5	—	—		0.36	—	0.44				
Input Leakage Current	I_{IN}	$V_{IN} = 5.5V$ or GND	0~5.5	—	—	±0.1	—	±1.0	μA	
Quiescent Supply Current	I_{CC}	$V_{IN} = V_{CC}$ or GND	5.5	—	—	4.0	—	40.0		

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$)

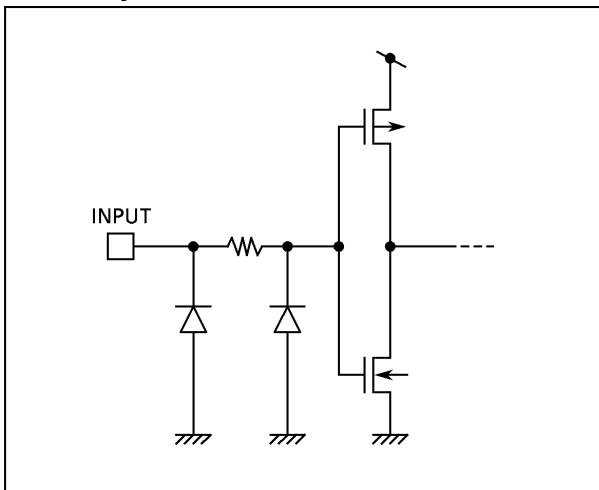
PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = - 40~85°C		UNIT
		V _{CC} (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time (A, B, C - Y)	t _{pLH} t _{pHL}	3.3 ± 0.3	15	—	8.0	12.3	1.0	14.5	ns
			50	—	10.5	15.8	1.0	18.0	
		5.0 ± 0.5	15	—	5.5	8.1	1.0	9.5	
			50	—	7.0	10.1	1.0	11.5	
Propagation Delay Time (G 1 - Y)	t _{pLH} t _{pHL}	3.3 ± 0.3	15	—	8.1	12.8	1.0	15.0	
			50	—	10.6	16.3	1.0	18.5	
		5.0 ± 0.5	15	—	5.4	8.1	1.0	9.5	
			50	—	6.9	10.1	1.0	11.5	
Propagation Delay Time (\bar{G} 2 - Y)	t _{pLH} t _{pHL}	3.3 ± 0.3	15	—	8.1	12.3	1.0	14.5	
			50	—	10.6	15.8	1.0	18.0	
		5.0 ± 0.5	15	—	5.7	8.1	1.0	9.5	
			50	—	7.2	10.1	1.0	11.5	
Input Capacitance	C _{IN}			—	4	10	—	10	pF
Power Dissipation Capacitance	C _{PD}	(Note 1)		—	37	—	—	—	

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

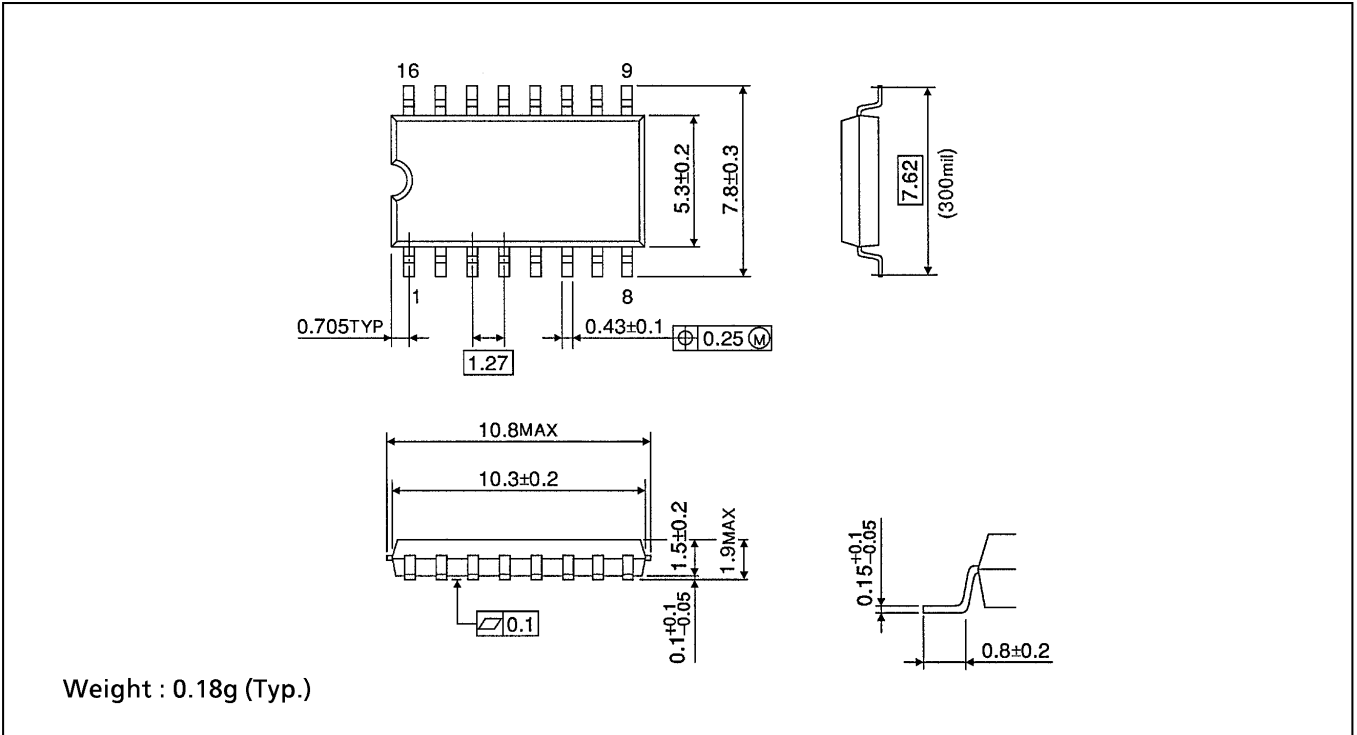
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

INPUT EQUIVALENT CIRCUIT



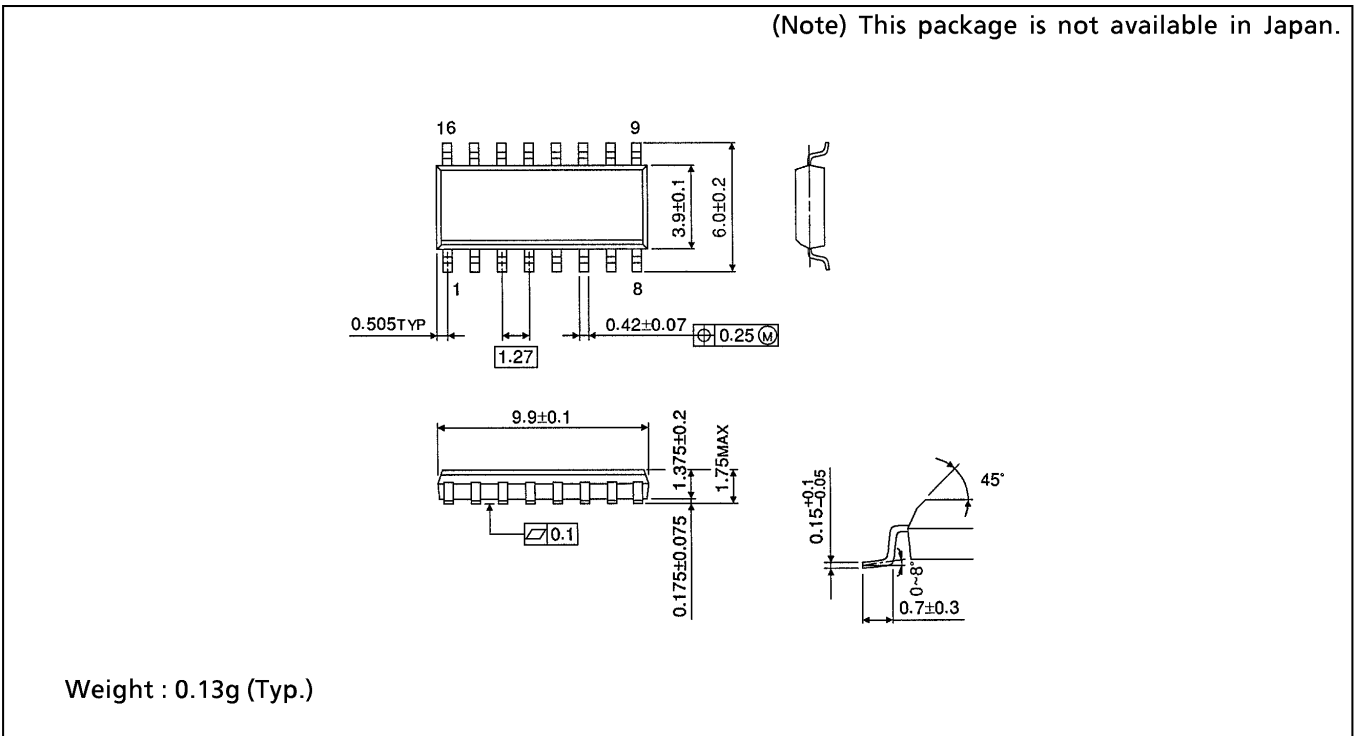
SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

Unit in mm



SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOP16-P-150-1.27)

Unit in mm



TSSOP 16PIN OUTLINE DRAWING (TSSOP16-P-0044-0.65)

Unit in mm

