TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

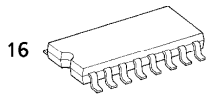
TC74VHC257F, TC74VHC257FN, TC74VHC257FS, TC74VHC257FT

QUAD 2 - CHANNEL MULTIPLEXER (3 - STATE)

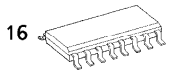
The TC74VHC257 is an advanced high speed CMOS MULTIPLEXER fabricated with silicon gate C²MOS technology.
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
It is composed of four independent 2 - channel multiplexers with common SELECT and $\overline{\text{OUTPUTENABLE}}$ ($\overline{\text{OE}}$).
If $\overline{\text{OE}}$ is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled.
Conversely, when SELECT is high, "B" data inputs are enabled.
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 :

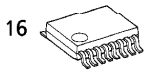
- High Speed ..... t_{pd} = 3.6ns(typ.) at V_{CC} = 5V
- Low Power Dissipation ..... I_{CC} = 4μA(Max.) at Ta = 25°C
- High Noise Immunity ..... $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays ..... $t_{pLH} \simeq t_{pHL}$
- Wide Operating Voltage Range ..... V_{CC} (opr) = 2V ~ 5.5V
- Low Noise ..... V_{OLP} = 0.8V (Max.)
- Pin and Function Compatible with 74ALS257



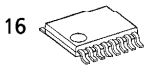
F (SOP16-P-300-1.27)
Weight : 0.18g (TYP.)



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

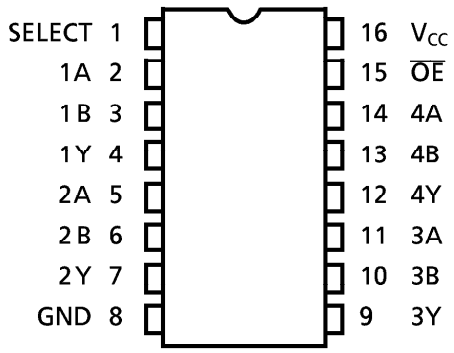


FS (SSOP16-P-225-0.65B)
Weight : 0.07g (TYP.)



FT (TSSOP16-P-0044-0.65)
Weight : 0.06g (TYP.)

PIN ASSIGNMENT



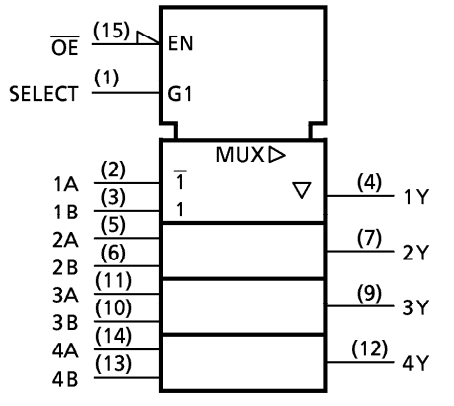
(TOP VIEW)

TRUTH TABLE

INPUTS				OUTPUTS
$\overline{\text{OE}}$	SELECT	A	B	
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

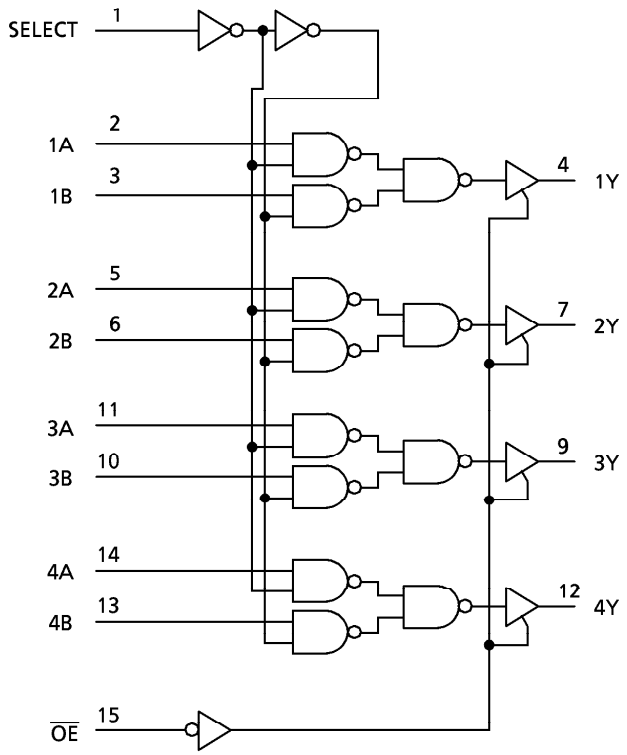
X : Don't Care
Z : High Impedance

IEC LOGIC



961001EBA2

SYSTEM DIAGRAM



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}	±50	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 ± 0.3V) 0~20 (V_{CC} = 5 ± 0.5V)	ns / V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	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	1.50	−	−	1.50	−	V
				3.0~5.5	V_{CC} × 0.7	−	−	V_{CC} × 0.7	−	
Low - Level Input Voltage	V_{IL}			2.0	−	−	0.50	−	0.50	V
				3.0~5.5	−	−	V_{CC} × 0.3	−	V_{CC} × 0.3	
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50μA	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} = −4mA	3.0	2.58	−	−	2.48	−	
			I_{OH} = −8mA	4.5	3.94	−	−	3.80	−	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	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} = 4mA	3.0	−	−	0.36	−	0.44	
			I_{OL} = 8mA	4.5	−	−	0.36	−	0.44	
3 - State Output Off - State Current	I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		5.5	−	−	±0.25	−	±2.50	μA
Input Leakage Current	I_{IN}	V_{IN} = 5.5V or GND		0~5.5	−	−	±0.1	−	±1.0	
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-Y)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	5.8	9.3	1.0	11.0	ns
				50	—	8.3	12.8	1.0	14.5	
			5.0 ± 0.5	15	—	3.6	5.9	1.0	7.0	
				50	—	5.1	7.9	1.0	9.0	
Propagation Delay Time (SELECT-Y)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	7.0	11.0	1.0	13.0	
				50	—	9.5	14.5	1.0	16.5	
			5.0 ± 0.5	15	—	4.0	6.8	1.0	8.0	
				50	—	5.5	8.8	1.0	10.0	
3-State Output Enable Time	t_{pZL} t_{pZH}	RL = 1kΩ	3.3 ± 0.3	15	—	6.7	10.5	1.0	12.5	
				50	—	9.2	14.0	1.0	16.0	
			5.0 ± 0.5	15	—	3.6	6.8	1.0	8.0	
				50	—	5.1	8.8	1.0	10.0	
3-State Output Disable Time	t_{pLZ} t_{pHZ}	RL = 1kΩ	3.3 ± 0.3	50	—	8.6	12.0	1.0	13.5	
			5.0 ± 0.5	50	—	5.7	7.9	1.0	9.0	
Input Capacitance	C_{IN}				—	4	10	—	10	pF
Output Capacitance	C_{OUT}				—	6	—	—	—	
Power Dissipation Capacitance	C_{pd}	Note (1)			—	23	—	—	—	

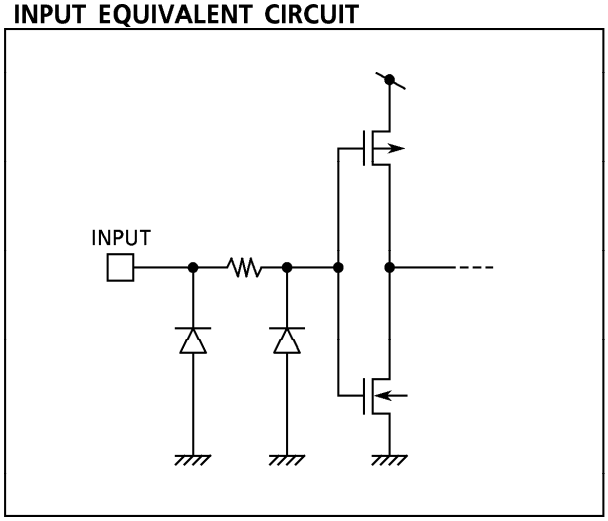
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.
Average operating current can be obtained by the equation:

$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 4 \text{ (per bit)}$$

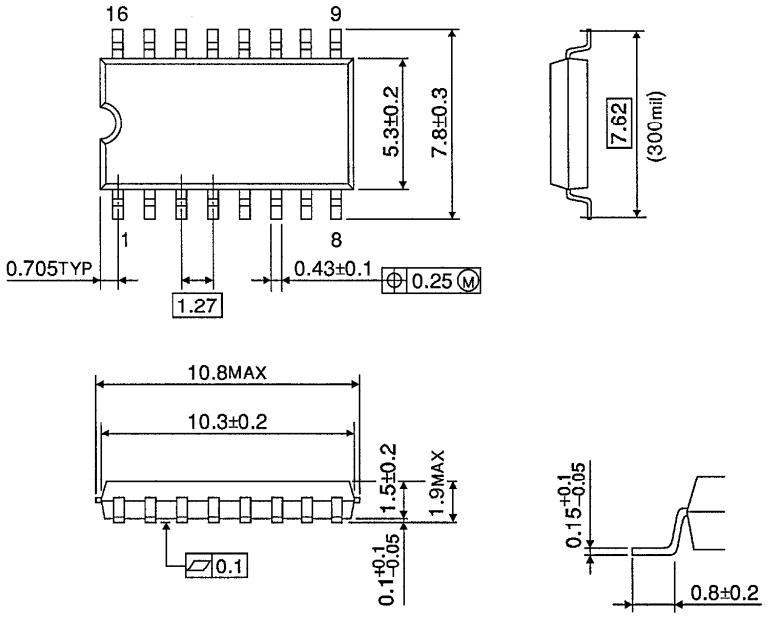
NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION		Ta = 25°C		UNIT
			V_{CC} (V)	TYP.	MAX.	
Quiet Output Maximum Dynamic V_{OL}	V_{OLP}	C_L = 50pF	5.0	0.3	0.8	V
Quiet Output Minimum Dynamic V_{OL}	V_{OLV}	C_L = 50pF	5.0	−0.3	−0.8	V
Minimum High Level Dynamic Input Voltage	V_{IHD}	C_L = 50pF	5.0	—	3.5	V
Maximum Low Level Dynamic Input Voltage	V_{ILD}	C_L = 50pF	5.0	—	1.5	V

INPUT EQUIVALENT CIRCUIT

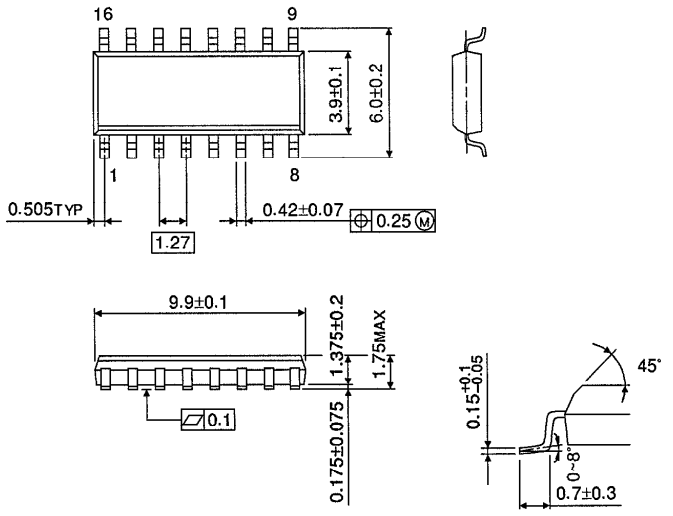


SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27) Unit in mm



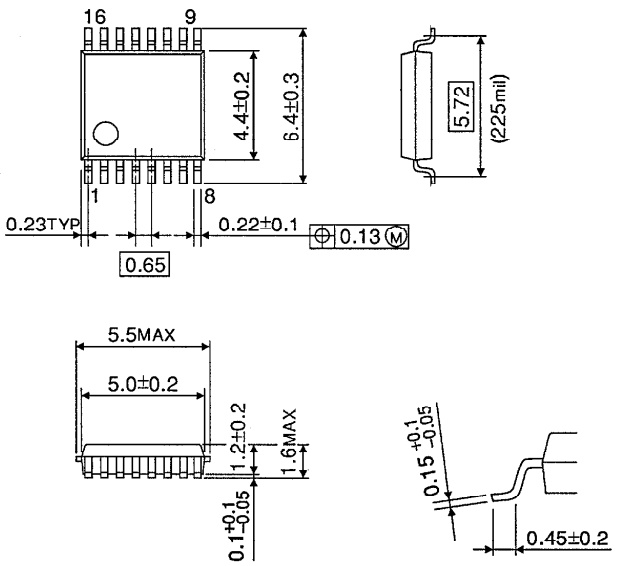
Weight : 0.18g (TYP.)

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



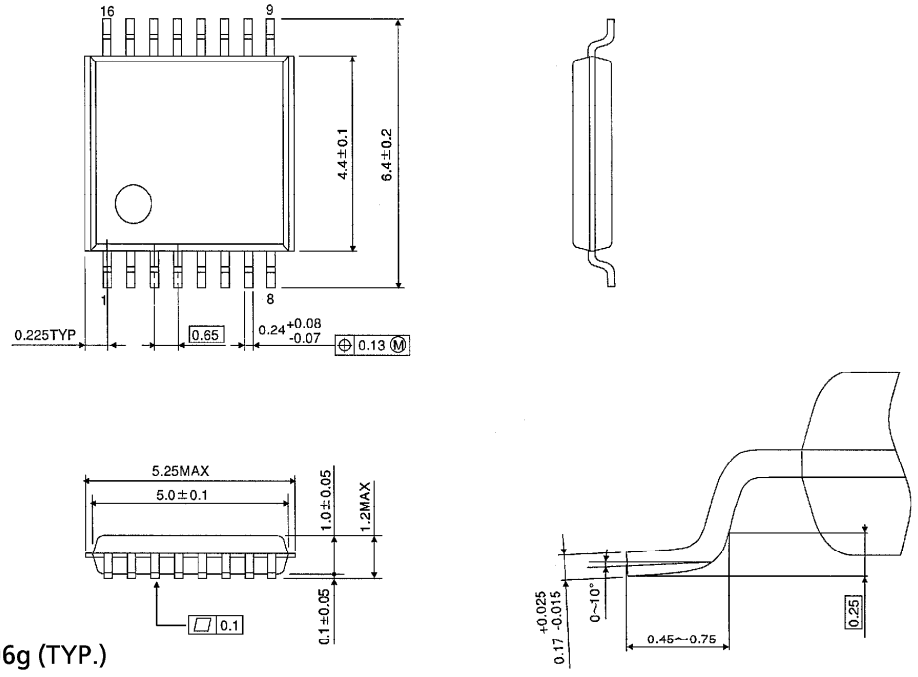
Weight : 0.13g (TYP.)

SSOP 16PIN OUTLINE DRAWING (SSOP16-P-225-0.65B) Unit in mm



Weight : 0.07g (TYP.)

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



Weight : 0.06g (TYP.)