

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

## TC74AC257P,TC74AC257F TC74AC258P,TC74AC258F

TC74AC257P/F 2-Channel Multiplexer (3-state)

TC74AC258P/F 2-Channel Multiplexer  
(3-state,inverting)

The TC74AC257 and TC74AC258 are advanced high speed CMOS MULTIPLEXERS fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

They achieve the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

Each is composed of four independent 2-channel multiplexers with common SELECT and OUTPUT ENABLE ( $\overline{OE}$ ).

The TC74AC257 is a non-inverting multiplexer, while the TC74AC258 is an inverting.

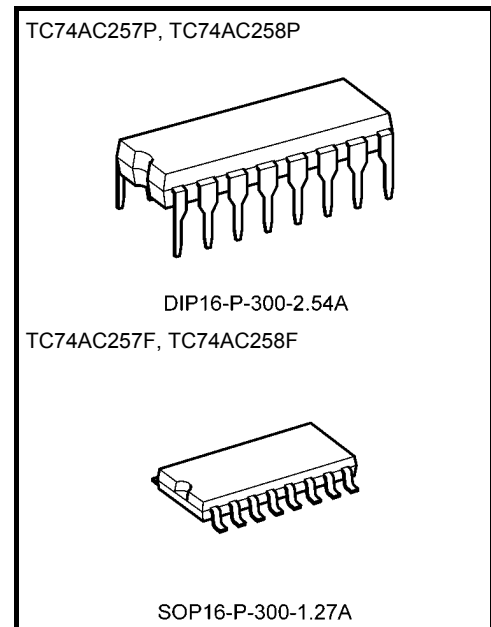
If  $\overline{OE}$  is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled.

Conversely, when SELECT is high, "B" data inputs are enabled.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Features

- High speed:  $t_{pd} = 3.6 \text{ ns (typ.)}$  at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 8 \mu\text{A (max)}$  at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 24 \text{ mA (min)}$   
Capability of driving  $50 \Omega$  transmission lines.
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range:  $V_{CC} \text{ (opr)} = 2 \sim 5.5 \text{ V}$
- Pin and function compatible with 74F257/258

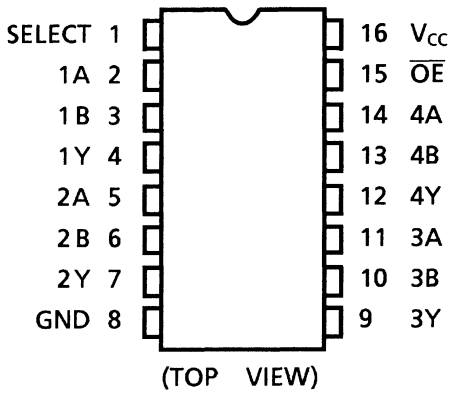


Weight

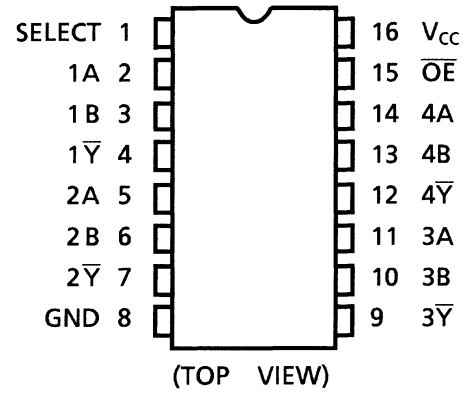
DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

Pin Assignment

TC74AC257

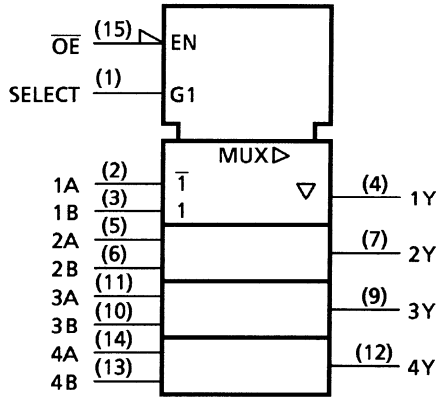


TC74AC258

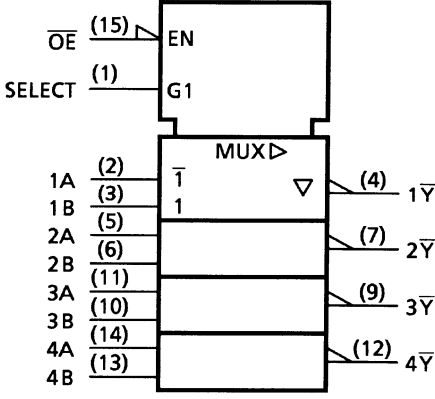


IEC Logic Symbol

TC74AC257



TC74AC258



Truth Table

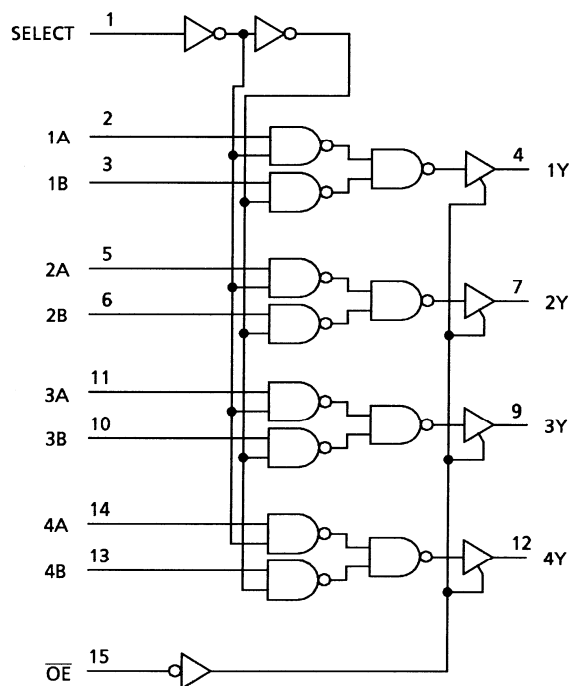
Inputs				Outputs	
OE	SELECT	A	B	Y (257)	Y-bar (258)
H	X	X	X	Z	Z
L	L	L	X	L	H
L	L	H	X	H	L
L	H	X	L	L	H
L	H	X	H	H	L

X: Don't care

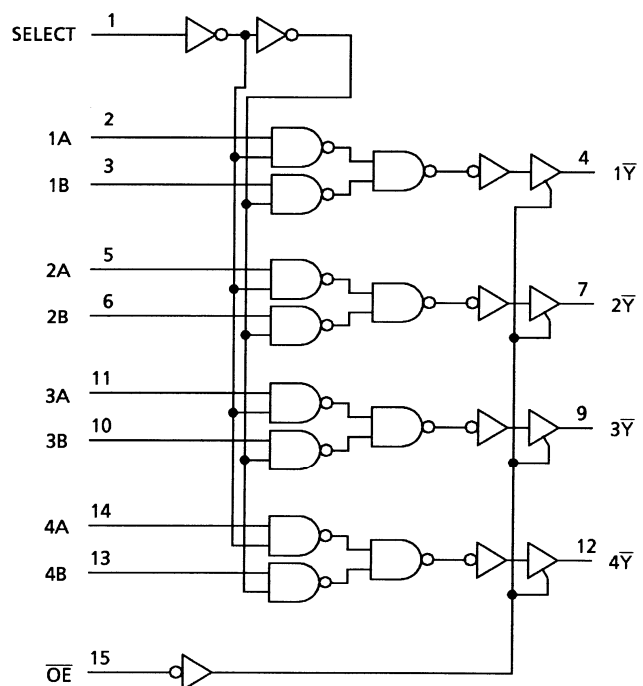
Z: High impedance

## System Diagram

**TC74AC257**



**TC74AC258**



## Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5~7.0	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	$I_{OK}$	±50	mA
DC output current	$I_{OUT}$	±50	mA
DC $V_{CC}$ /ground current	$I_{CC}$	±100	mA
Power dissipation	$P_D$	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	$T_{stg}$	-65~150	°C

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of  $T_a = -40\sim 65^\circ\text{C}$ . From  $T_a = 65$  to  $85^\circ\text{C}$  a derating factor of -10 mW/°C should be applied up to 300 mW.

## Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	2.0~5.5	V
Input voltage	$V_{IN}$	0~ $V_{CC}$	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 ( $V_{CC} = 3.3 \pm 0.3$ V) 0~20 ( $V_{CC} = 5 \pm 0.5$ V)	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.  
Unused inputs must be tied to either VCC or GND.

## Electrical Characteristics

## DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C				Ta = -40~85°C		Unit
				V <sub>CC</sub> (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V <sub>IH</sub>	—		2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V
Low-level input voltage	V <sub>IL</sub>	—		2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	V
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -50 μA	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 <sub>OH</sub> = -4 mA	3.0	2.58	—	—	2.48	—	
				I <sub>OH</sub> = -24 mA	4.5	3.94	—	—	3.80	
		I <sub>OH</sub> = -75 mA (Note)	5.5	—	—	—	3.85	—		
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 μA	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 <sub>OL</sub> = 12 mA	3.0	—	—	0.36	—	0.44	
				I <sub>OL</sub> = 24 mA	4.5	—	—	0.36	—	
		I <sub>OL</sub> = 75 mA (Note)	5.5	—	—	—	—	1.65		
3-state output off-state current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND		5.5	—	—	±0.5	—	±5.0	μA
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	8.0	—	80.0	μA

Note: This spec indicates the capability of driving 50  $\Omega$  transmission lines.

One output should be tested at a time for a 10 ms maximum duration.

## AC Characteristics ( $C_L = 50 \text{ pF}$ , $R_L = 500 \Omega$ , input: $t_r = t_f = 3 \text{ ns}$ )

Characteristics	Symbol	Test Condition	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			$T_a = -40 \sim 85^\circ\text{C}$		Unit
				Min	Typ.	Max	Min	Max	
Propagation delay time (A, B-Y, $\bar{Y}$ )	$t_{pLH}$	—	$3.3 \pm 0.3$	—	7.0	14.3	1.0	16.3	ns
	$t_{pHL}$		$5.0 \pm 0.5$	—	4.7	7.5	1.0	8.5	
Propagation delay time (SELECT-Y, $\bar{Y}$ )	$t_{pLH}$	—	$3.3 \pm 0.3$	—	8.6	17.2	1.0	19.6	ns
	$t_{pHL}$		$5.0 \pm 0.5$	—	5.5	9.1	1.0	10.4	
Output enable time	$t_{pZL}$	—	$3.3 \pm 0.3$	—	7.3	14.0	1.0	16.0	ns
	$t_{pHZ}$		$5.0 \pm 0.5$	—	5.0	7.9	1.0	9.0	
Output disable time	$t_{pLZ}$	—	$3.3 \pm 0.3$	—	5.6	9.6	1.0	11.0	ns
	$t_{pHZ}$		$5.0 \pm 0.5$	—	5.1	7.9	1.0	9.0	
Input capacitance	$C_{IN}$	—	—	—	5	10	—	10	pF
Output capacitance	$C_{OUT}$	—	—	—	10	—	—	—	pF
Power dissipation capacitance	$C_{PD}$ (Note)	—	—	—	28	—	—	—	pF

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

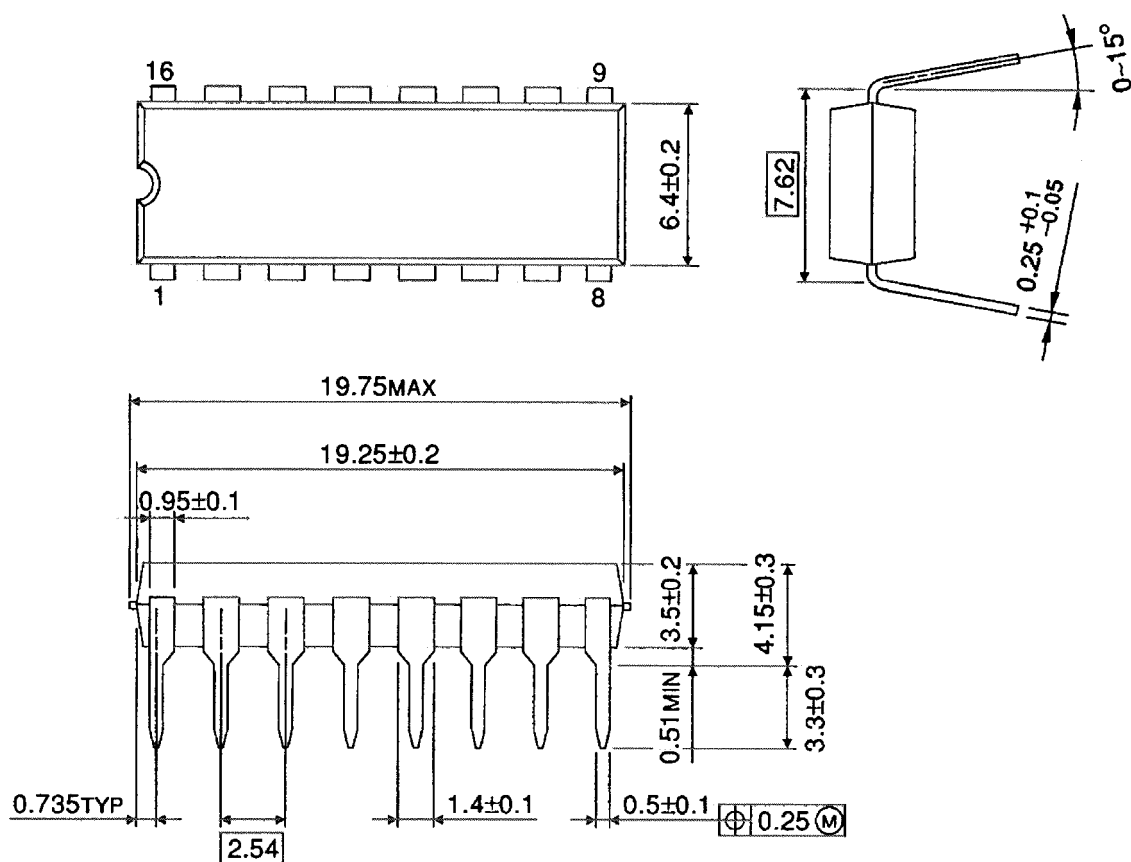
Average operating current can be obtained by the equation:

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

## Package Dimensions

DIP16-P-300-2.54A

Unit : mm

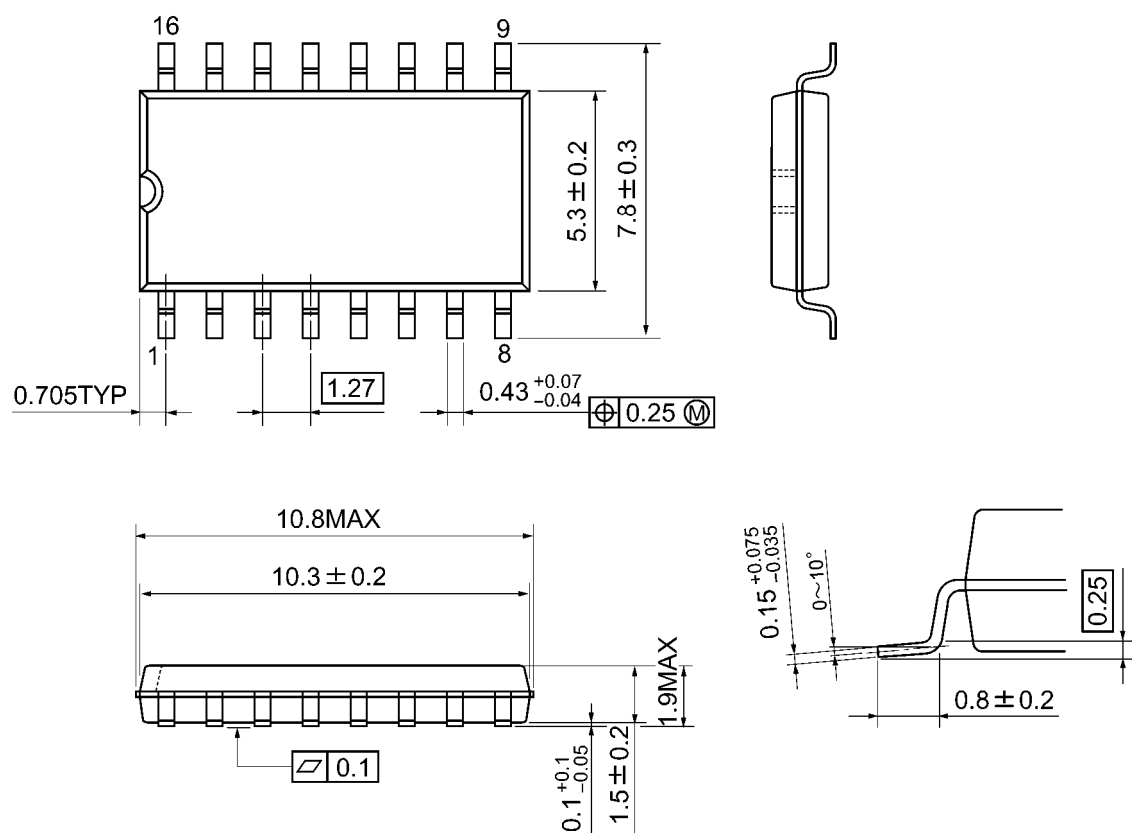


Weight: 1.00 g (typ.)

## Package Dimensions

SOP16-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

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