TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC257AP, TC74HC257AF

Quad 2-Channel Multiplexer (3-state)

The TC74HC257A is high speed CMOS MULTIPLEXER fabricated with silicon gate $\mathrm{C}^2\mathrm{MOS}$ technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

It is composed of four independent 2-channel multiplexers with common SELECT and OUTPUT ENABLE (OE).

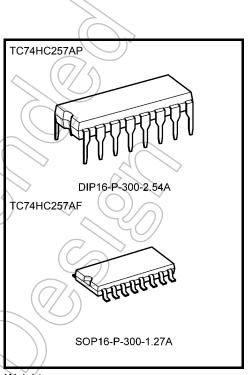
If OE is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled.

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: $t_{pd} = 10 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu A \text{ (max)}$ at $T_a = 25 \text{°C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Output drive capability: 15 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 6 \text{ mA (min)}$
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: V_{CC} (opr) = 2 to 6 V
- Pin and function compatible with 74LS257

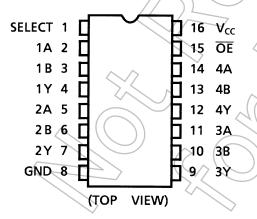


Weight

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

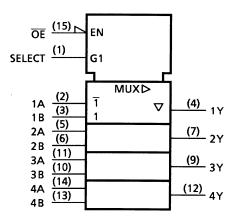
: 0.18 g (typ.)

Pin Assignment



Start of commercial production 1986-11

IEC Logic Symbol



Truth Table

	Output			
ŌE	SELECT	АВ		Υ
Н	Х	Х	Х	Z
L	L	L	Х	L
L	∟	Η	X	H
L	Н	Х	L	L
L	Н	Х	Н	Н

X: Don't care

Z: High impedance

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	Vcc	-0.5 to 7	V
DC input voltage	VIN	-0.5 to V _{CC} + 0.5	V
DC output voltage	V _{OUT}	-0.5 to V _{CC} + 0.5	V
Input diode current	lık	±20	mA
Output diode current	lok	±20	mA
DC output current	1907	±35	mA
DC V _{CC} /ground current	loc	±75	mA
Power dissipation	PD	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	T _{stg}	-65 to 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 Ta = $-40 \text{ to } 65^{\circ}\text{C}$. From Ta = $65 \text{ to } 85^{\circ}\text{C}$ a derating factor of $-10 \text{ mW}/^{\circ}\text{C}$ shall be applied until 300 mW.

Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V _{CC}	2 to 6	V
Input voltage	V _{IN}	0 to V _{CC}	V
Output voltage	V _{OUT}	0 to V _{CC}	V
Operating temperature	T _{opr}	-40 to 85	°C
		0 to 1000 (V _{CC} = 2.0 V)	
Input rise and fall time	t _r , t _f	0 to 500 (V _{CC} = 4.5 V)	ns
		0 to 400 (V _{CC} = 6.0 V)))

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

Electrical Characteristics

DC Characteristics

				- \ / /	-/-/	\rightarrow		-//~	\	
Characteristics	Symbol	Test Condition		Ta = 25°C		Ta = 40 to 85°C		Unit		
		\mathcal{A}		VCC (V)	Min	Тур. (Max	Min	Max	
				2.0	1.50			1.50	_	
High-level input voltage	V_{IH}		- 7	4.5	3.15	(/ / <)) —	3.15	_	V
			20	6.0	4.20		/	4.20	_	
Laurelaurel Samuel				2.0	_ \	//-	0.50	_	0.50	
Low-level input voltage	V_{IL}			4.5	1	//-	1.35	_	1.35	V
				6.0		_	1.80	_	1.80	
	V _{OH} V _{IN} or	(2.0	1.9	2.0	_	1.9	_	
		V _{IN} = V _{IH} or V _{IL}	$I_{OH} = -20 \mu A$	4.5	4.4	4.5	_	4.4	_	
High-level output voltage			<	6.0	5.9	6.0	_	5.9	_	V
			I _{OH} = -6 mA	4.5	4.18	4.31	_	4.13	_	
	(/-		$I_{OH} = -7.8 \text{ mA}$	6.0	5.68	5.80	_	5.63	_	
	V _{OL} V _{IN} = V _{IH} or V _I			2.0	_	0.0	0.1	_	0.1	
			$I_{OL} = 20 \mu A$	4.5	_	0.0	0.1	_	0.1	
Low-level output voltage		V _{IN} = V _{IH} or V _{IL}		6.0	_	0.0	0.1	_	0.1	V
✓	5	$\langle \rangle$	$I_{OL} = 6 \text{ mA}$	4.5	_	0.17	0.26	_	0.33	
		4	$I_{OL} = 7.8 \text{ mA}$	6.0	_	0.18	0.26	_	0.33	
3-state off leak current	loz	$V_{IN} = V_{IH} \text{ or } V_{IL}$ $V_{OUT} = V_{CC} \text{ or GND}$		6.0	_	_	±0.5	_	±5.0	μΑ
Input leakage current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	_	_	±0.1	_	±1.0	μА
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	_	_	4.0	_	40.0	μА



AC Characteristics (input: $t_r = t_f = 6$ ns)

Characteristics	Test C		condition		Ta = 25°C			Ta = -40 to 85°C		Unit
			CL (pF)	V _{CC} (V)	Min	Тур.	Max	Min	Max	
				2.0	_	20	60	_	75	
Output transition time	t _{TLH}	_	50	4.5	_	6 <	12	_	15	ns
	t _{THL}			6.0	_	5	10	_	13	
				2.0	_	45	100) P	125	
			50	4.5	_	13	20	/_	25	
Propagation delay time	t_{pLH}			6.0	<\	1(//	/ 17)	_	21	ns
$(A, B-Y, \overline{Y})$	t_{pHL}	_		2.0	->	62	140	_	175	115
			150	4.5	_((18	> 28	_	35	
				6.0)15	24		30	
				2.0 <	1(-)	45	100	H	125	
			50	4.5	\ _	13	20	2-/	25	
Propagation delay time	t_{pLH}			6.0	$\langle \hat{\gamma} \rangle$	11	17 (21	ns
(SELECT-Y, \overline{Y})	t_{pHL}		/	2.0		62	140	4	175	110
			150	4.5	_	18	28	50	35	
			4(6.0	_	15	24	_	30	
	^t pZL R _L	$R_L = 1k\Omega$		2.0	_	40	110	_	140	
			50	4.5	_	(12	22	_	28	
3-state output enable				6.0		10	19	_	24	ns
time				2.0	_ `	57	150	_	190	110
			150	4.5	\ \	//17	30	_	38	
			/	6.0		14	26	_	33	
0 -1-11	t_pLZ	((5)		2.0	_	28	140	_	175	
3-state output disable time	t _{pHZ}	$R_L = 1k\Omega$	50	4.5	\rangle –	14	28	_	35	ns
	фпи	// \(\)		6.0	_	13	24	_	30	
Input capacitance	CIN	<u> </u>	- (7)	7	_	5	10	_	10	pF
Output capacitance	Соит		- / <u>/</u>	<i>기</i>	_	10	_	_	_	pF
Power dissipation capacitance	C _{PD} (Note)				_	47	_	_	_	pF

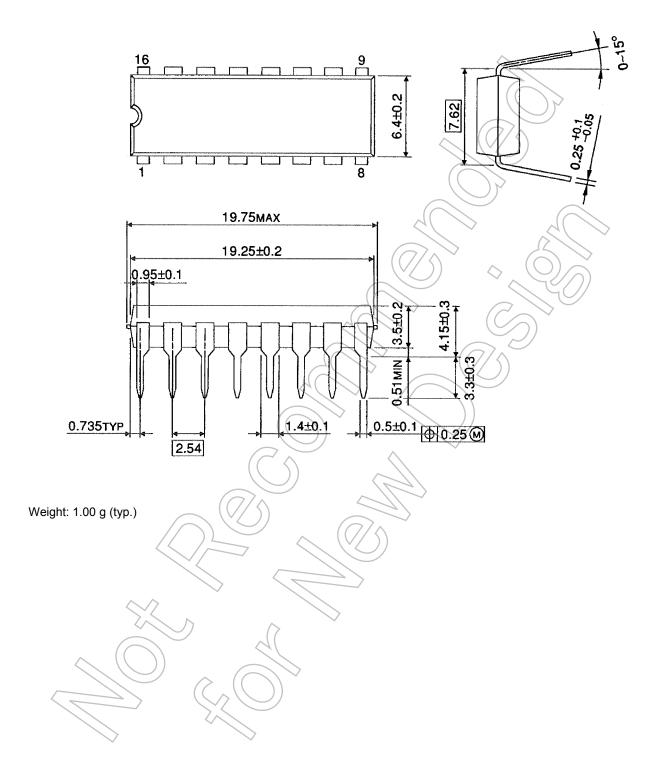
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

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

Package Dimensions

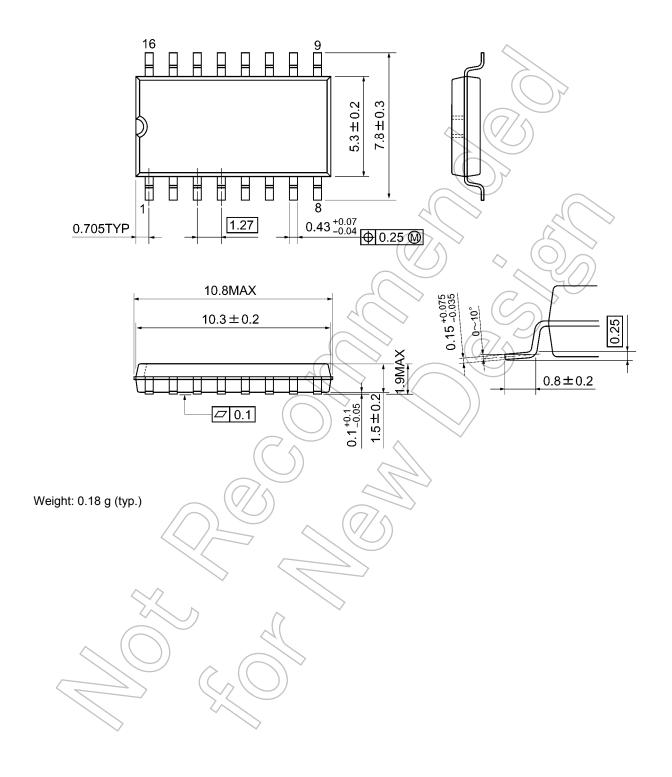
DIP16-P-300-2.54A Unit: mm



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Package Dimensions

SOP16-P-300-1.27A Unit: mm



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