TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC153AP,TC74HC153AF,TC74HC153AFN
TC74HC253AP,TC74HC253AF,TC74HC253AFN

TC74HC153AP/AF/AFN Dula 4-Channe Multiplexer

TC74HC253AP/AF/AFN Dual 4-Channel Multiplexer with 3-State Output

Note: xxxFN (JEDEC SOP) is not available in Japan.

The TC74HC153A and TC74HC253A are high speed CMOS DUAL 4-CHANNEL MULTIPLEXERs fabricated with silicon gate C^2MOS technology.

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

The TC74HC153A has standard outputs, while the TC74HC253A has 3-state outputs.

Input data (1C0~1C2, 2C0~2C3) are selected by the two address inputs, A and B.

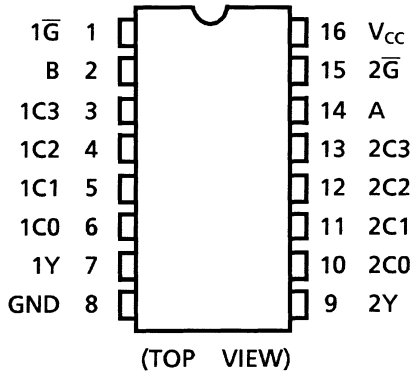
Separate strobe inputs ($1\overline{G}$, $2\overline{G}$) are provided for each of the two four-line sections. They can be used to inhibit the data outputs. The output of the HC153A is set low, and the HC253A output is set to the high impedance state, when the strobe inputs are low.

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

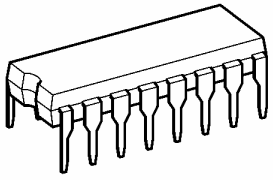
Features

- High speed: t_{pd} = 12 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 μA (max) at Ta = 25°C
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL}$ = 4 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 74LS153, 74LS253

Pin Assignment

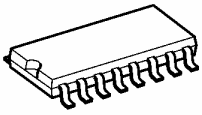


TC74HC153AP, TC74HC253AP

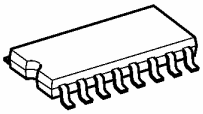


DIP16-P-300-2.54A

TC74HC153AF, TC74HC253AF

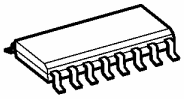


SOP16-P-300-1.27A



SOP16-P-300-1.27

TC74HC153AFN, TC74HC253AFN



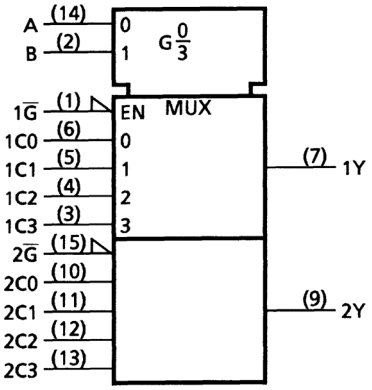
SOL16-P-150-1.27

Weight

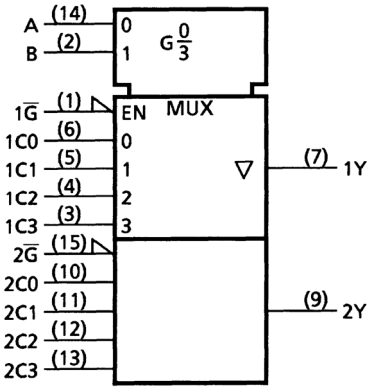
DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)
SOP16-P-300-1.27	: 0.18 g (typ.)
SOL16-P-150-1.27	: 0.13 g (typ.)

IEC Logic Symbol

TC74HC153A



TC74HC253A



Truth Table

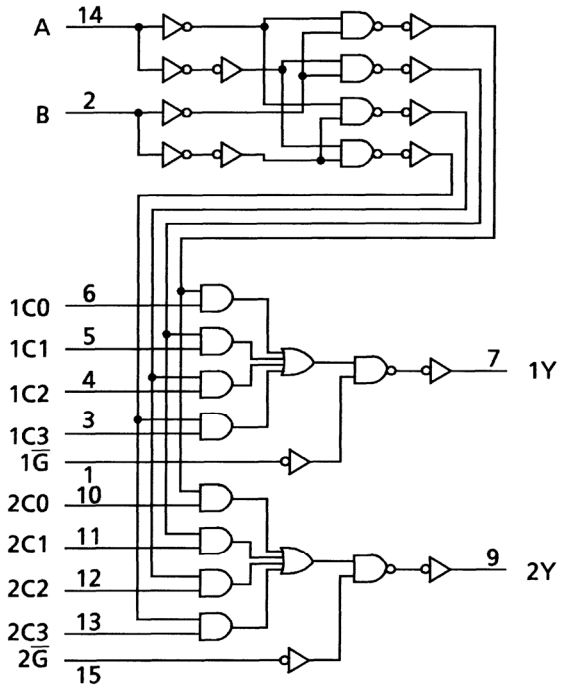
Select Inputs		Data Inputs				Strobe	Outputs Y	
B	A	C0	C1	C2	C3	$\overline{G}$	HC153A	HC253A
X	X	X	X	X	X	H	L	Z
L	L	L	X	X	X	L	L	L
L	L	H	X	X	X	L	H	H
L	H	X	L	X	X	L	L	L
L	H	X	H	X	X	L	H	H
H	L	X	X	L	X	L	L	L
H	L	X	X	H	X	L	H	H
H	H	X	X	X	L	L	L	L
H	H	X	X	X	H	L	H	H

X: Don't care

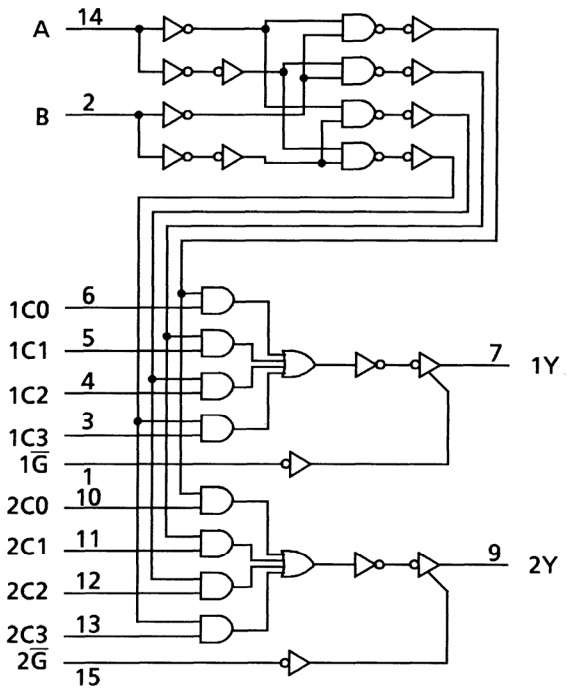
Z: High impedance

System Diagram

TC74HC153A



TC74HC253A



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	−0.5 to 7	V
DC input voltage	V_{IN}	−0.5 to V_{CC} + 0.5	V
DC output voltage	V_{OUT}	−0.5 to 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	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.

Note 2: 500 mW in the range of Ta = −40 to 65°C. From Ta = 65 to 85°C a derating factor of −10 mW/°C shall be applied until 300 mW.

Recommended Operating Conditions (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}	−40~85	°C
Input rise and fall time	t_r, t_f	0 to 1000 (V_{CC} = 2.0 V) 0 to 500 (V_{CC} = 4.5 V) 0 to 400 (V_{CC} = 6.0 V)	ns

Note: The recommended operating conditions are required 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 to 85°C		Unit
				V_{CC} (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—		2.0	1.50	—	—	1.50	—	V
				4.5	3.15	—	—	3.15	—	
				6.0	4.20	—	—	4.20	—	
Low-level input voltage	V_{IL}	—		2.0	—	—	0.50	—	0.50	V
				4.5	—	—	1.35	—	1.35	
				6.0	—	—	1.80	—	1.80	
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −20 μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
			I_{OH} = −4 mA	4.5	4.18	4.31	—	4.13	—	
			I_{OH} = −5.2 mA	6.0	5.68	5.80	—	5.63	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 20 μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
			I_{OL} = 4 mA	4.5	—	0.17	0.26	—	0.33	
			I_{OL} = 5.2 mA	6.0	—	0.18	0.26	—	0.33	
3-state output off-state current	I_{OZ} (Note)	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		6.0	—	—	±0.5	—	±5.0	μA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		6.0	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		6.0	—	—	4.0	—	40.0	μA

Note: TC74HC253A only

AC Characteristics (CL = 15 pF, VCC = 5 V, Ta = 25°C, input: tr = tf = 6 ns)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	t_{TLH} t_{THL}	—	—	4	8	ns
Propagation delay time (Cn-Y)	t_{pLH} t_{pHL}	—	—	12	19	ns
Propagation delay time (A, B-Y)	t_{pLH} t_{pHL}	—	—	17	26	ns
Propagation delay time ($\overline{G}$-Y) (Note 1)	t_{pLH} t_{pHL}	—	—	8	16	ns
3-state output enable time ($\overline{G}$-Y) (Note 2)	t_{pZL} t_{pZH}	R_L = 1 kΩ	—	9	16	ns

Note 1: For TC74HC153A only

Note 2: For TC74HC253A only

AC Characteristics (C_L = 50 pF, input: $t_r = t_f$ = 6 ns)

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
Output transition time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time (Cn-Y)	t_{pLH} t_{pHL}	—	2.0	—	48	115	—	145	ns
			4.5	—	15	23	—	29	
			6.0	—	12	20	—	25	
Propagation delay time (A, B-Y)	t_{pLH} t_{pHL}	—	2.0	—	68	150	—	190	ns
			4.5	—	20	30	—	38	
			6.0	—	16	26	—	33	
Propagation delay time ($\overline{G}$-Y) (Note 2)	t_{pLH} t_{pHL}	—	2.0	—	31	95	—	120	ns
			4.5	—	11	19	—	24	
			6.0	—	9	16	—	20	
3-state output enable time ($\overline{G}$-Y) (Note 3)	t_{pZL} t_{pZH}	R_L = 1 kΩ	2.0	—	36	100	—	125	ns
			4.5	—	12	20	—	25	
			6.0	—	9	17	—	21	
3-state output disable time ($\overline{G}$-Y) (Note 3)	t_{pLZ} t_{pHZ}	R_L = 1 kΩ	2.0	—	22	115	—	145	ns
			4.5	—	13	23	—	29	
			6.0	—	11	20	—	25	
Input capacitance	C_{IN}	—		—	5	10	—	10	pF
Power dissipation capacitance	C_{PD} (Note 1)	TC74HC153A		—	58	—	—	—	pF
		TC74HC253A		—	59	—	—	—	

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:

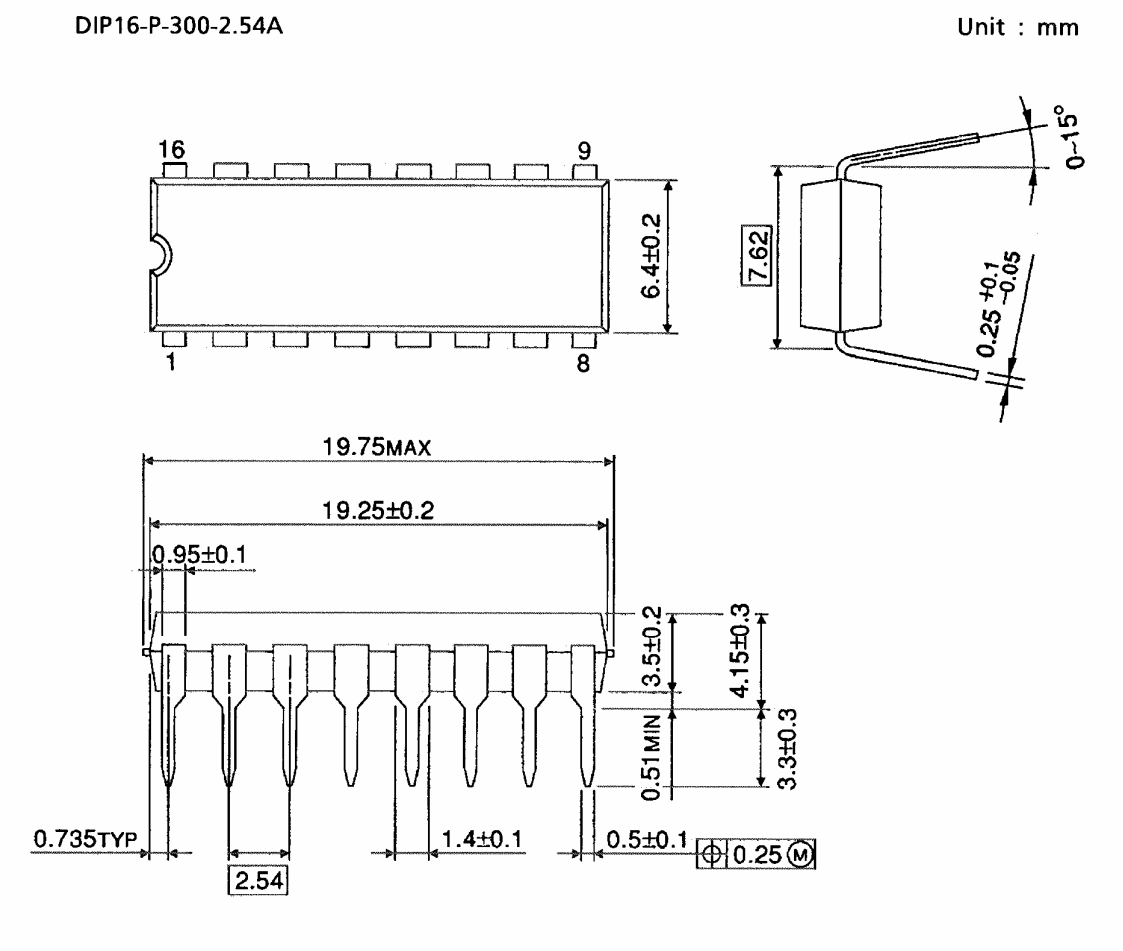
$$I_{CC}\ (opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Note 2: For TC74HC153A only

Note 3: For TC74HC253A only

Package Dimensions

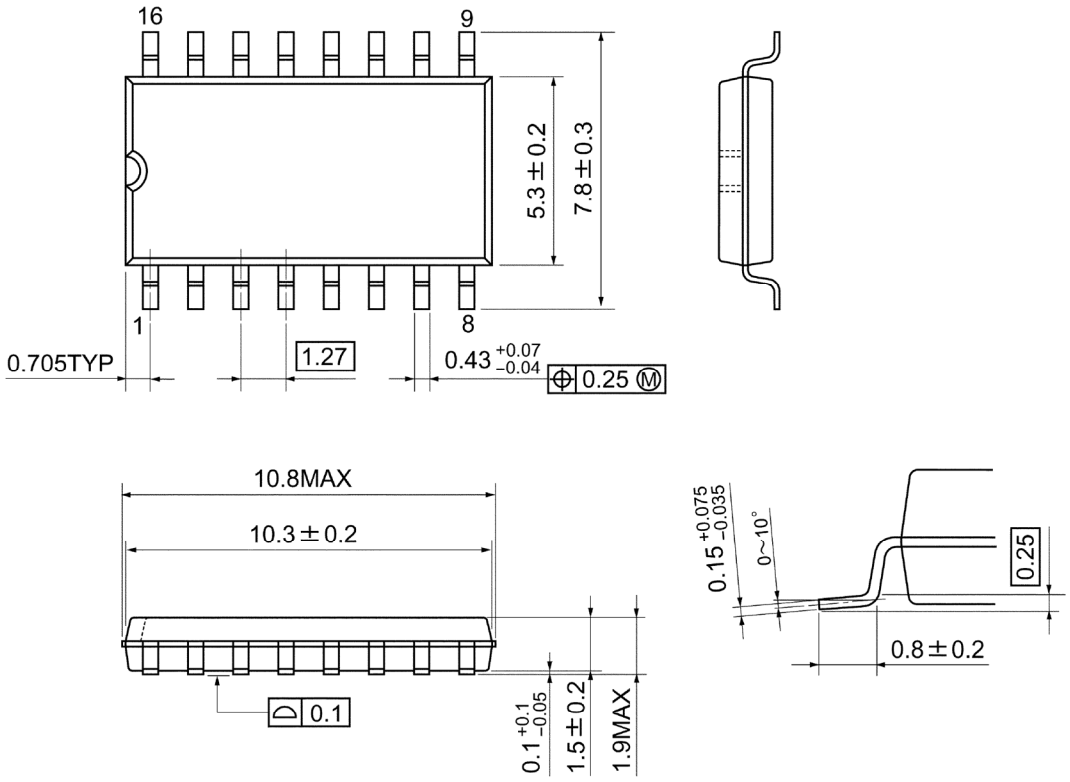
DIP16-P-300-2.54A Unit : mm



Weight: 1.00 g (typ.)

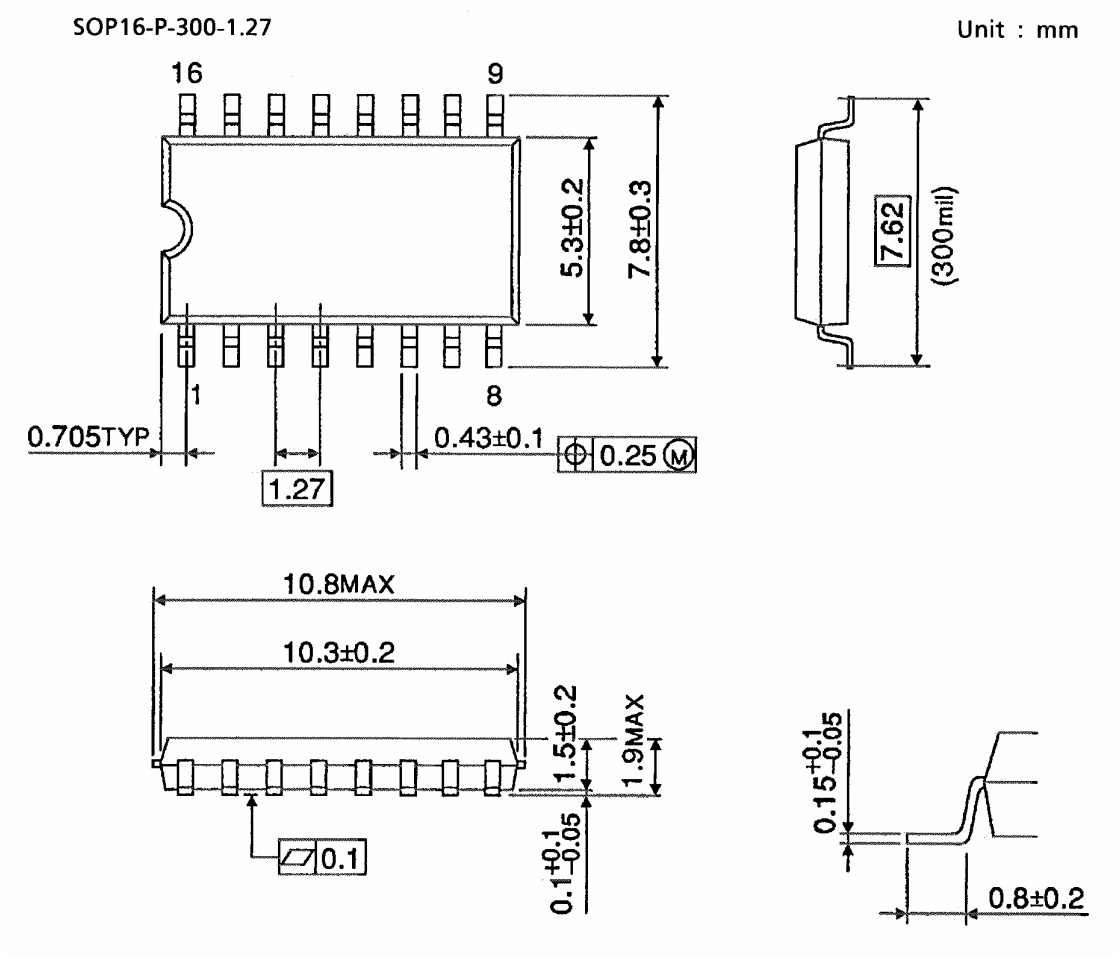
Package Dimensions

SOP16-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

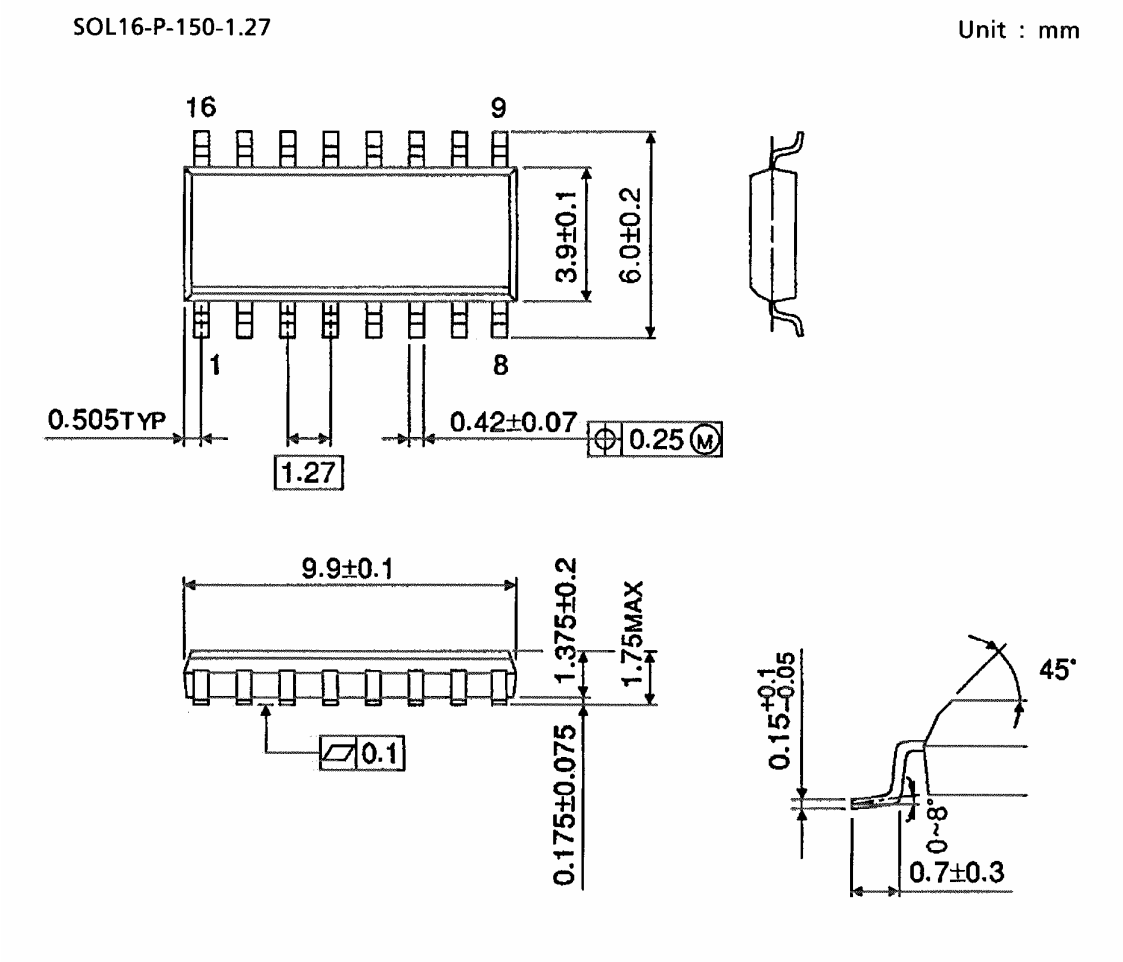
Package Dimensions



Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL16-P-150-1.27 Unit : mm



Note: This package is not available in Japan.

Weight: 0.13 g (typ.)

Note: Lead (Pb)-Free Packages

DIP16-P-300-2.54A SOP16-P-300-1.27A SOL16-P-150-1.27

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