TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74LCX257F,TC74LCX257FN,TC74LCX257FT

Low-Voltage Quad 2-Channel Multiplexer (3-state) with 5-V Tolerant Inputs and Outputs

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

The TC74LCX257F/FN/FT is a high-performance CMOS multiplexer. Designed for use in 3.3-V systems, it achieves high-speed operation while maintaining the CMOS low-power dissipation.

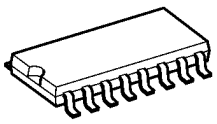
The device is designed for low-voltage (3.3 V) V_{CC} applications, but it could be used to interface to 5-V supply environment for inputs.

It is composed of four independent 2-channel multiplexers with common select and $\overline{OE}$.

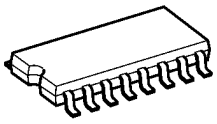
If $\overline{OE}$ is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled. Conversely, when SELECT is high, "B" data inputs are enabled.

All inputs are equipped with protection circuits against static discharge.

TC74LCX257F

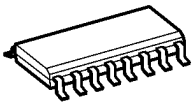


SOP16-P-300-1.27A



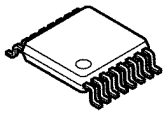
SOP16-P-300-1.27

TC74LCX257FN



SOL16-P-150-1.27

TC74LCX257FT



TSSOP16-P-0044-0.65A

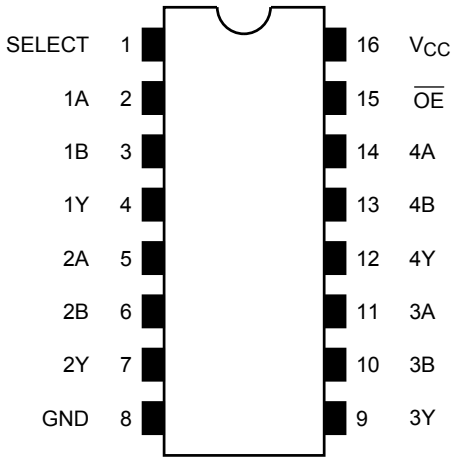
Weight

SOP16-P-300-1.27A	: 0.18 g (typ.)
SOP16-P-300-1.27	: 0.18 g (typ.)
SOL16-P-150-1.27	: 0.12 g (typ.)
TSSOP16-P-0044-0.65A	: 0.06 g (typ.)

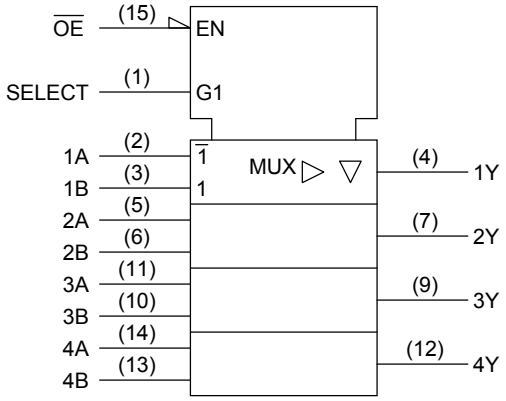
Features

- Low-voltage operation: V_{CC} = 2.0 to 3.6 V
- High-speed operation: t_{pd} = 6.0 ns (max) (V_{CC} = 3.0 to 3.6 V)
- Output current: $|I_{OH}|/I_{OL}$ = 24 mA (min) (V_{CC} = 3.0 V)
- Latch-up performance: ±500 mA
- Available in JEDEC SOP, JEITA SOP and TSSOP
- Power-down protection provided on all inputs and outputs
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 257 type

Pin Assignment (top view)



IEC Logic Symbol



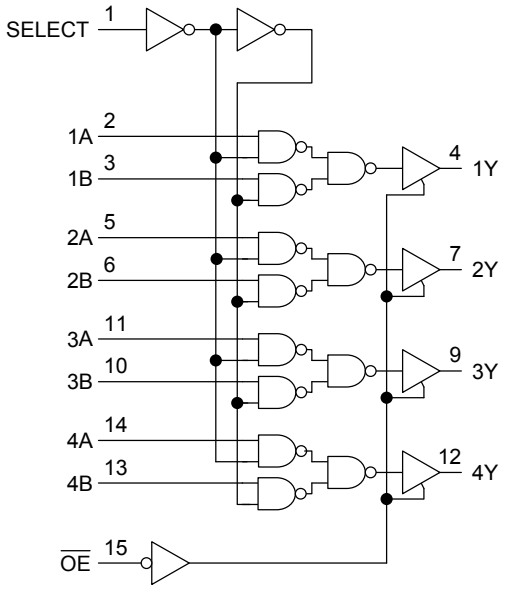
Truth Table

Inputs				Outputs
$\overline{OE}$	SELECT	A	B	Y
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

System Diagram



Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	−0.5 to 7.0	V
DC input voltage	V_{IN}	−0.5 to 7.0	V
DC output voltage	V_{OUT}	−0.5 to 7.0 (Note 2)	V
		−0.5 to V_{CC} + 0.5 (Note 3)	
Input diode current	I_{IK}	−50	mA
Output diode current	I_{OK}	±50 (Note 4)	mA
DC output current	I_{OUT}	±50	mA
Power dissipation	P_D	180	mW
DC V_{CC}/ground current	I_{CC}/I_{GND}	±100	mA
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: Output in OFF state

Note 3: High or low state. I_{OUT} absolute maximum rating must be observed.

Note 4: $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

Recommended Operating Conditions (Note 1)

Characteristics	Symbol	Rating	Unit
Power supply voltage	V_{CC}	2.0 to 3.6	V
		1.5 to 3.6 (Note 2)	
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to 5.5 (Note 3)	V
		0 to V_{CC} (Note 4)	
Output current	I_{OH}/I_{OL}	±24 (Note 5)	mA
		±12 (Note 6)	
Operating temperature	T_{opr}	−40 to 85	°C
Input rise and fall time	dt/dv	0 to 10 (Note 7)	ns/V

Note 1: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

Note 2: Data retention only

Note 3: Output in OFF state

Note 4: High or low state

Note 5: V_{CC} = 3.0 to 3.6 V

Note 6: V_{CC} = 2.7 to 3.0 V

Note 7: V_{IN} = 0.8 to 2.0 V, V_{CC} = 3.0 V

Electrical Characteristics

DC Characteristics (Ta = –40 to 85°C)

Characteristics		Symbol	Test Condition		V_{CC} (V)	Min	Max	Unit
Input voltage	H-level	V_{IH}	—		2.7 to 3.6	2.0	—	V
	L-level	V_{IL}	—		2.7 to 3.6	—	0.8	
Output voltage	H-level	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = –100 μA	2.7 to 3.6	V_{CC} –0.2	—	V
				I_{OH} = –12 mA	2.7	2.2	—	
				I_{OH} = –18 mA	3.0	2.4	—	
				I_{OH} = –24 mA	3.0	2.2	—	
	L-level	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 100 μA	2.7 to 3.6	—	0.2	
				I_{OL} = 12 mA	2.7	—	0.4	
				I_{OL} = 16 mA	3.0	—	0.4	
				I_{OL} = 24 mA	3.0	—	0.55	
Input leakage current		I_{IN}	V_{IN} = 0 to 5.5 V		2.7 to 3.6	—	±5.0	μA
3-state output OFF state current		I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = 0 to 5.5 V		2.7 to 3.6	—	±5.0	μA
Power-off leakage current		I_{OFF}	V_{IN}/V_{OUT} = 5.5 V		0	—	10.0	μA
Quiescent supply current		I_{CC}	V_{IN} = V_{CC} or GND		2.7 to 3.6	—	10.0	μA
			V_{IN}/V_{OUT} = 3.6 to 5.5 V		2.7 to 3.6	—	±10.0	
Increase in Icc per input		ΔI_{CC}	V_{IH} = V_{CC} – 0.6 V		2.7 to 3.6	—	500	

AC Characteristics (Ta = –40 to 85°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Min	Max	Unit
Propagation delay time (A, B-Y)	t_{pLH} t_{pHL}	Figure 1, Figure 2	2.7	—	6.5	ns
			3.3 ± 0.3	1.5	6.0	
Propagation delay time (SELECT-Y)	t_{pLH} t_{pHL}	Figure 1, Figure 2	2.7	—	8.5	ns
			3.3 ± 0.3	1.5	7.0	
Output enable time	t_{pZL} t_{pZH}	Figure 1, Figure 3	2.7	—	8.5	ns
			3.3 ± 0.3	1.5	7.0	
Output disable time	t_{pLZ} t_{pHZ}	Figure 1, Figure 3	2.7	—	6.0	ns
			3.3 ± 0.3	1.5	5.5	
Output to output skew	t_{osLH} t_{osHL}	(Note)	2.7	—	—	ns
			3.3 ± 0.3	—	1.0	

Note: Parameter guaranteed by design.
($t_{osLH} = |t_{pLHm} - t_{pLHn}|$, $t_{osHL} = |t_{pHLm} - t_{pHLn}|$)

Dynamic Switching Characteristics (Ta = 25°C, input: $t_r = t_f = 2.5$ ns, $C_L = 50$ pF, $R_L = 500\ \Omega$)

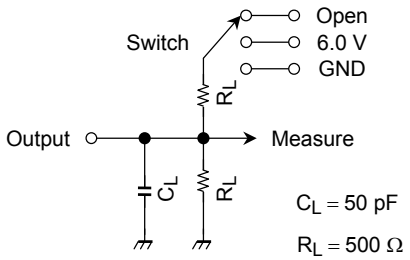
Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Quiet output maximum dynamic V_{OL}	V_{OLP}	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V
Quiet output minimum dynamic V_{OL}	$\|V_{OLV}\|$	V_{IH} = 3.3 V, V_{IL} = 0 V	3.3	0.8	V

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	V_{CC} (V)	Typ.	Unit
Input capacitance	C_{IN}	—	3.3	7	pF
Output capacitance	C_{OUT}	—	3.3	8	pF
Power dissipation capacitance	C_{PD}	f_{IN} = 10 MHz (Note)	3.3	25	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:
$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

AC Test Circuit



Parameter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	6.0 V
t_{pHZ}, t_{pZH}	GND

Figure 1

AC Waveform

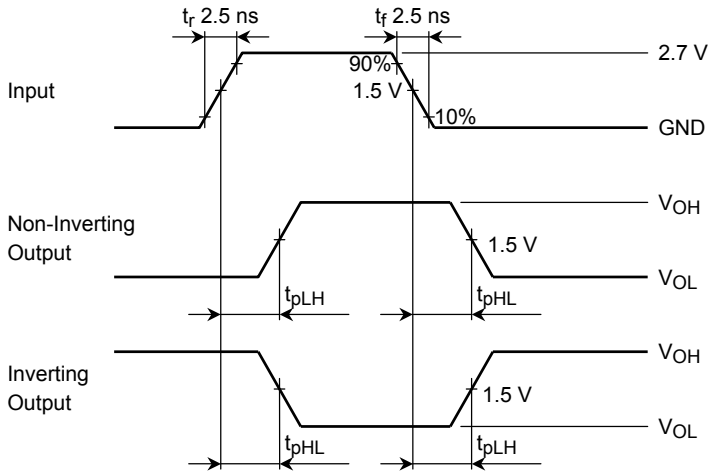


Figure 2 t_{pLH}, t_{pHL}

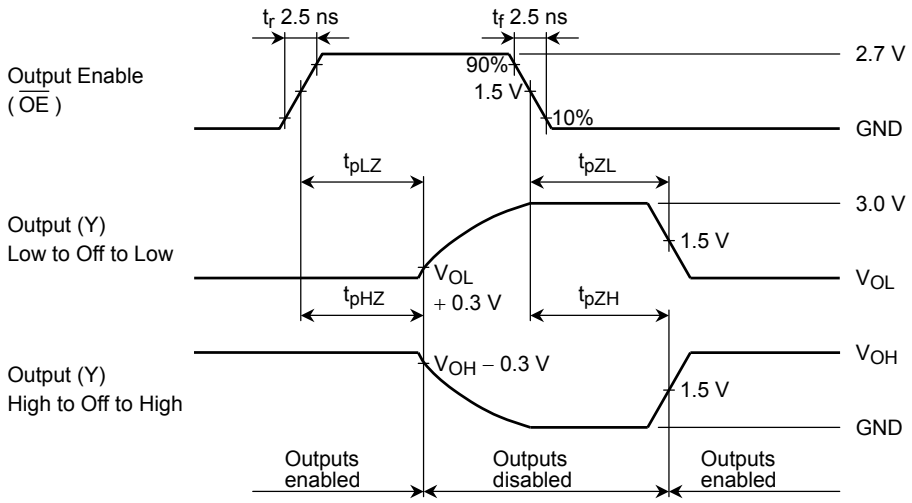
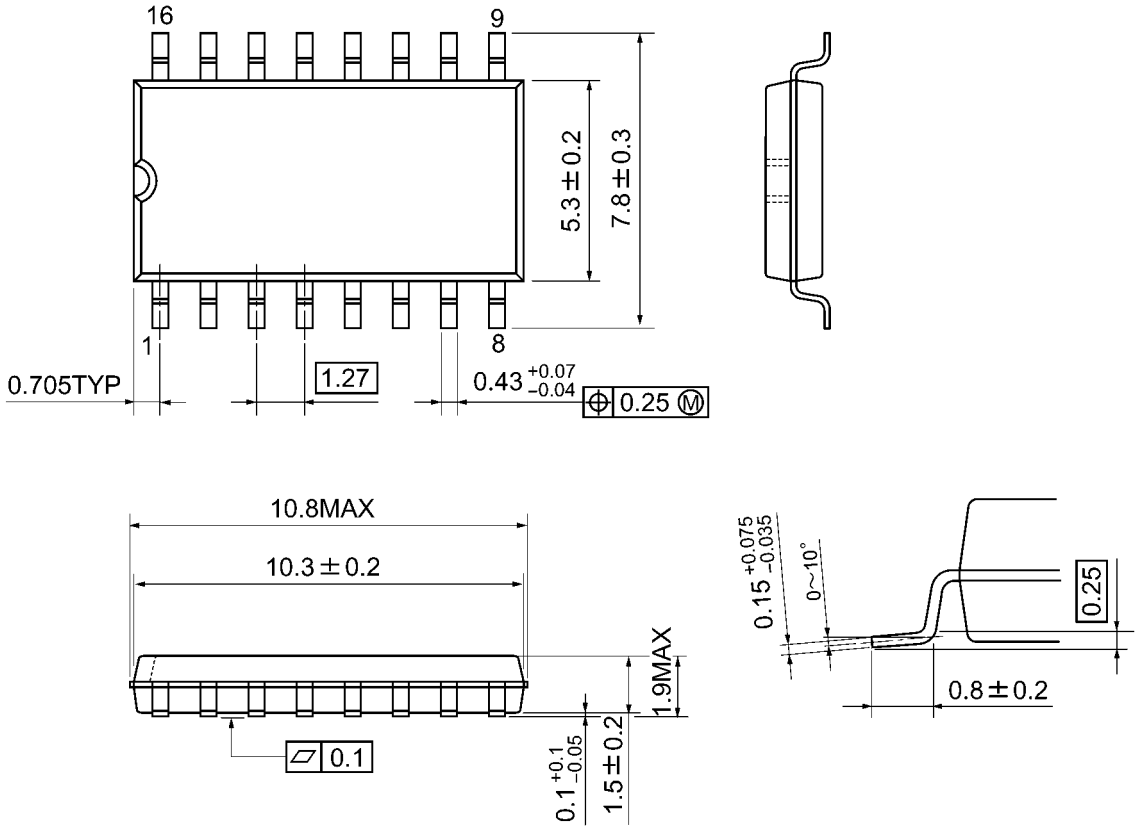


Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

Package Dimensions

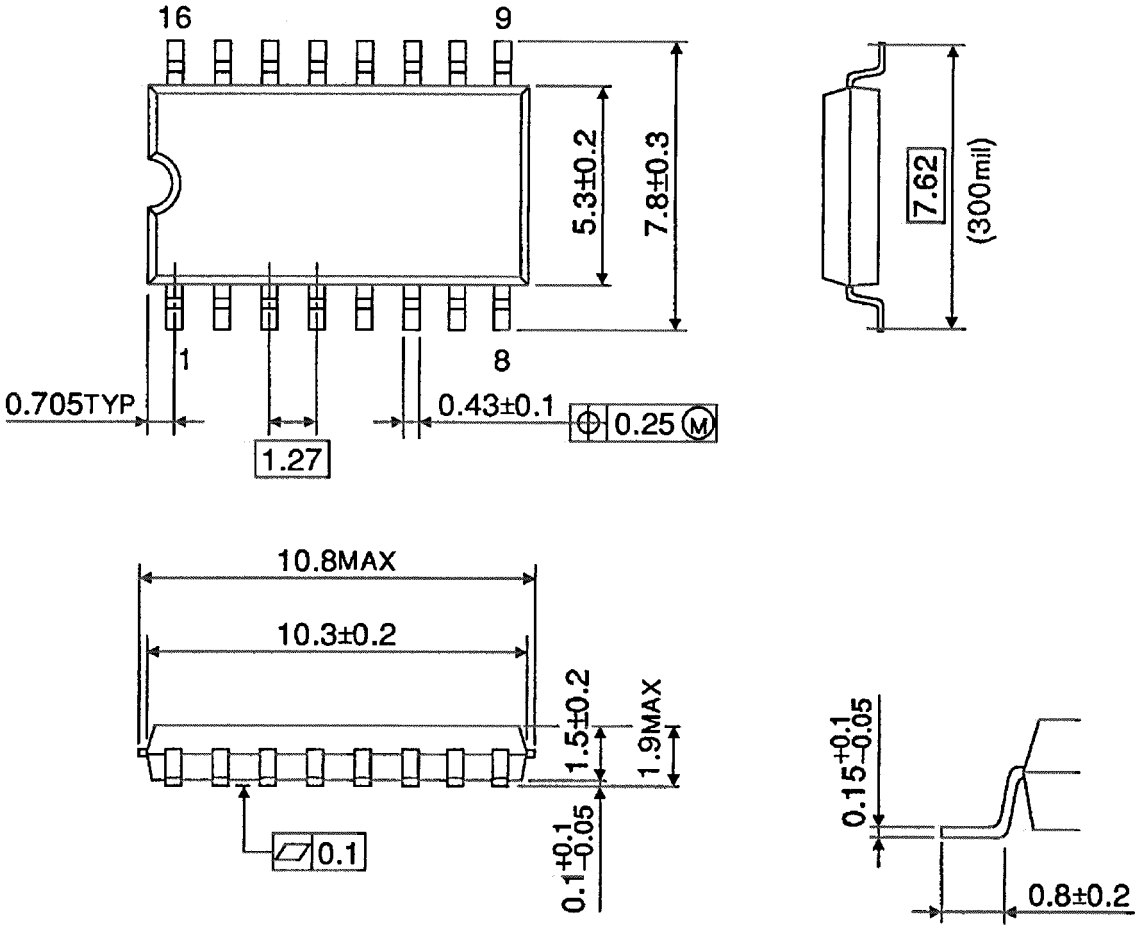
SOP16-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

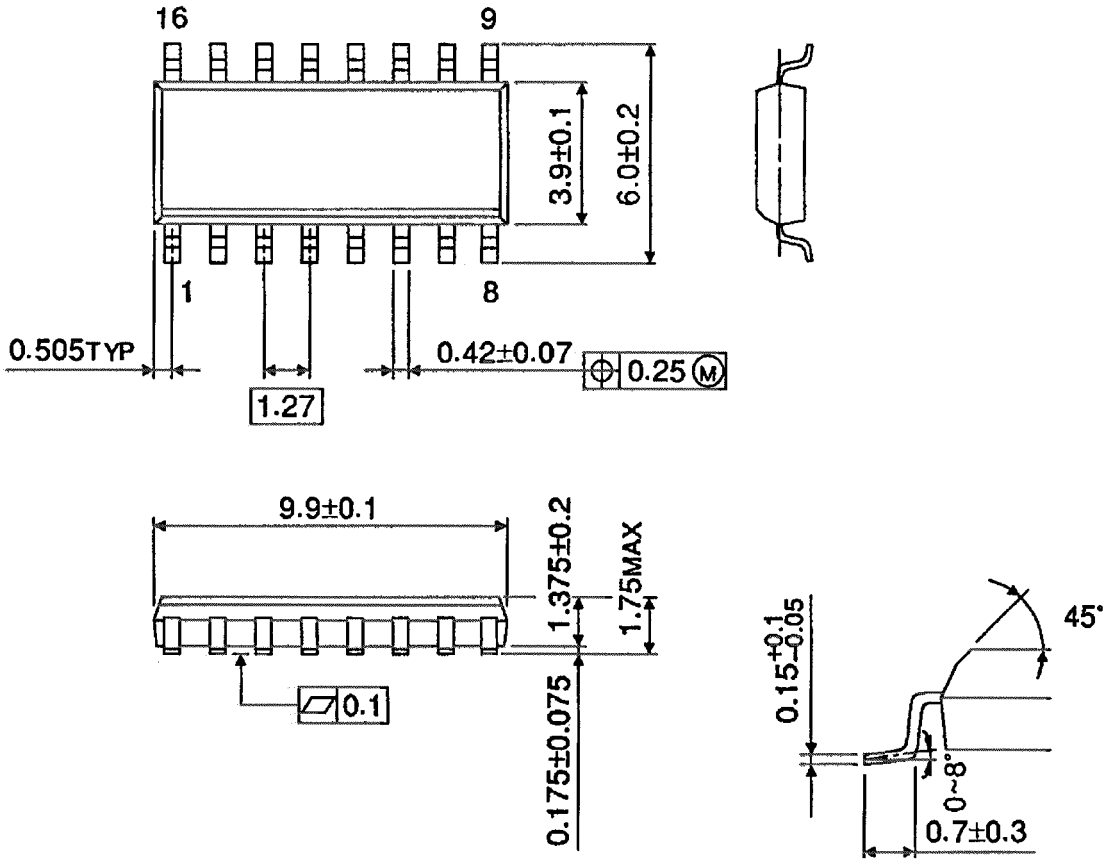
SOP16-P-300-1.27 Unit : mm



Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL16-P-150-1.27 Unit : mm

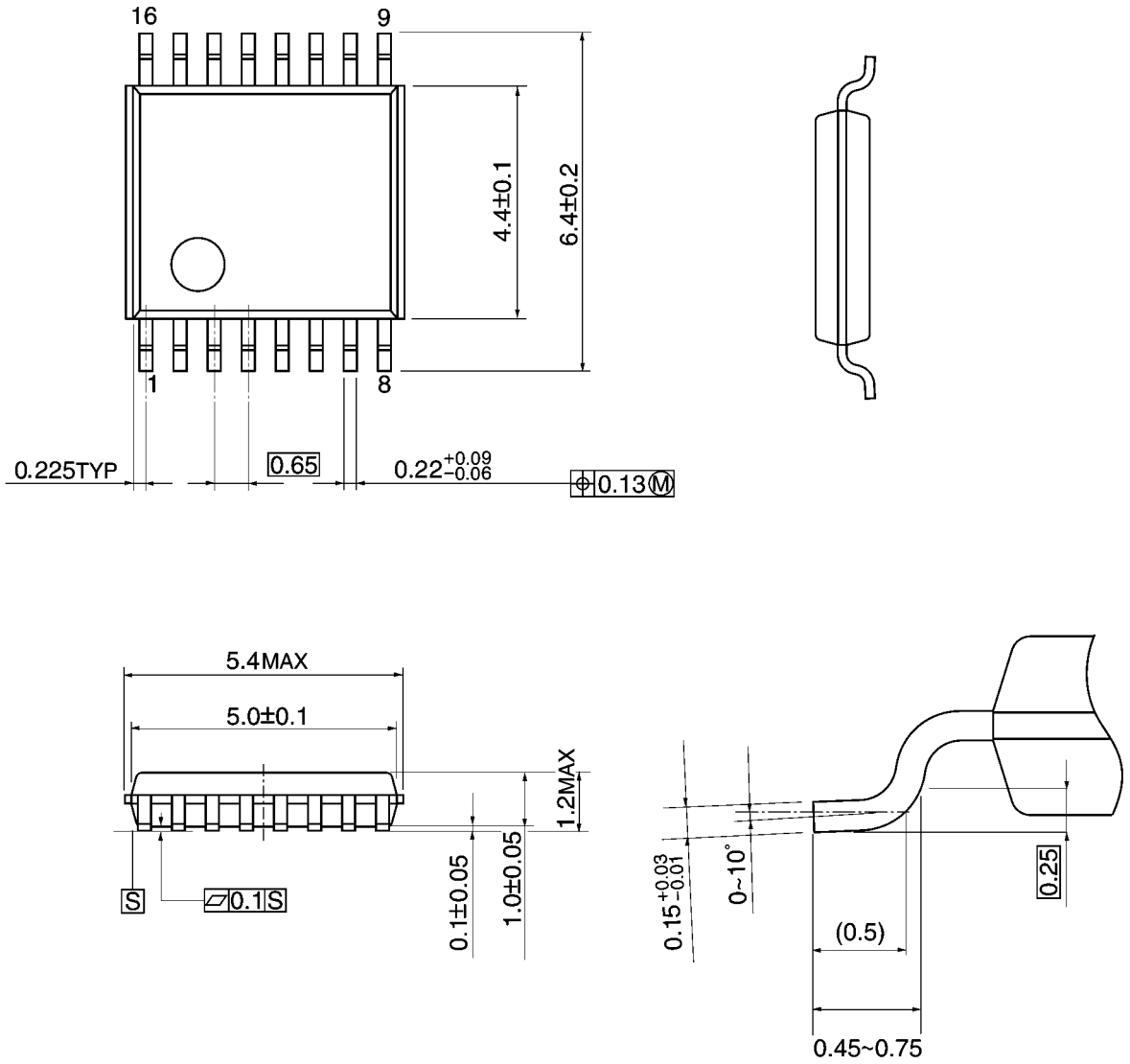


Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP16-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

Note: Lead (Pb)-Free Packages

SOP16-P-300-1.27A SOL16-P-150-1.27 TSSOP16-P-0044-0.65A

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