TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHCT08AF,TC74VHCT08AFN,TC74VHCT08AFT,TC74VHCT08AFK

Quad 2-Input AND Gate

The TC74VHCT08A is an advanced high speed CMOS 2-INPUT AND GATE fabricated with silicon gate C^2MOS technology.

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

The input voltage are compatible with TTL output voltage.

This device may be used as a level converter for interfacing 3.3 V to 5 V system.

Input protection and output circuit ensure that 0 to 5.5 V can be applied to the input and output (Note) pins without regard to the supply voltage. These structure prevents device destruction due to mismatched supply and input/output voltages such as battery back up, hot board insertion, etc.

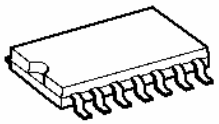
Note: V_{CC} = 0 V

Features

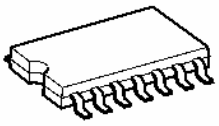
- High speed: t_{pd} = 5.0 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 2 μA (max) at Ta = 25°C
- Compatible with TTL outputs: V_{IL} = 0.8 V (max)
  V_{IH} = 2.0 V (min)
- Power down protection is provided on all inputs and outputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Low noise: V_{OLP} = 0.8 V (max)
- Pin and function compatible with the 74 series (74AC/HC/F/ALS/LS etc.) 08 type.

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

TC74VHCT08AF

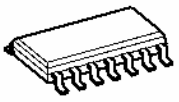


SOP14-P-300-1.27A



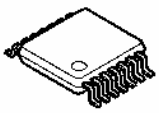
SOP14-P-300-1.27

TC74VHCT08AFN



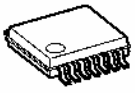
SOL14-P-150-1.27

TC74VHCT08AFT



TSSOP14-P-0044-0.65A

TC74VHCT08AFK

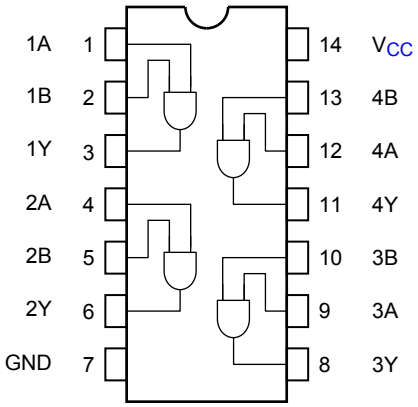


VSSOP14-P-0030-0.50

Weight

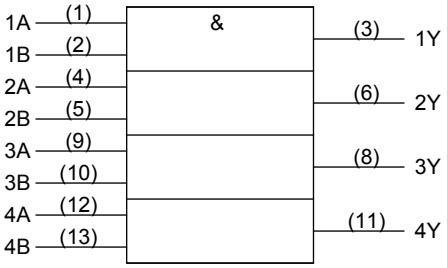
SOP14-P-300-1.27A	: 0.18 g (typ.)
SOP14-P-300-1.27	: 0.18 g (typ.)
SOL14-P-150-1.27	: 0.12 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)
VSSOP14-P-0030-0.50	: 0.02 g (typ.)

Pin Assignment



(top view)

IEC Logic Symbol



Truth Table

A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating		Unit
Supply voltage range	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}	−20		mA
Output diode current	I_{OK}	±20	(Note 4)	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 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: V_{CC} = 0 V

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
Supply voltage	V_{CC}	4.5 to 5.5		V
Input voltage	V_{IN}	0 to 5.5		V
Output voltage	V_{OUT}	0 to 5.5	(Note 2)	V
		0 to V_{CC}	(Note 3)	
Operating temperature	T_{opr}	−40 to 85		°C
Input rise and fall time	dt/dV	0 to 20		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: V_{CC} = 0 V

Note 3: High or low state.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		V_{CC} (V)	Ta = 25°C			Ta = −40 to 85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—		4.5 to 5.5	2.0	—	—	2.0	—	V
Low-level input voltage	V_{IL}	—		4.5 to 5.5	—	—	0.8	—	0.8	V
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50 μA	4.5	4.40	4.50	—	4.40	—	V
			I_{OH} = −8 mA	4.5	3.94	—	—	3.80	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50 μA	4.5	—	0.0	0.1	—	0.1	V
			I_{OL} = 8 mA	4.5	—	—	0.36	—	0.44	
Input leakage current	I_{IN}	V_{IN} = 5.5 V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} or GND		5.5	—	—	2.0	—	20.0	μA
	I_{CCT}	Per input: V_{IN} = 3.4 V Other input: V_{CC} or GND		5.5	—	—	1.35	—	1.50	mA
Output leakage current	I_{OPD}	V_{OUT} = 5.5 V		0	—	—	0.5	—	5.0	μA

AC Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = −40 to 85°C		Unit
			V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}	—	5.0 ± 0.5	15	—	5.0	6.9	1.0	8.0	ns
				50	—	5.5	7.9	1.0	9.0	
Input capacitance	C_{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C_{PD}	(Note)			—	18	—	—	—	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:

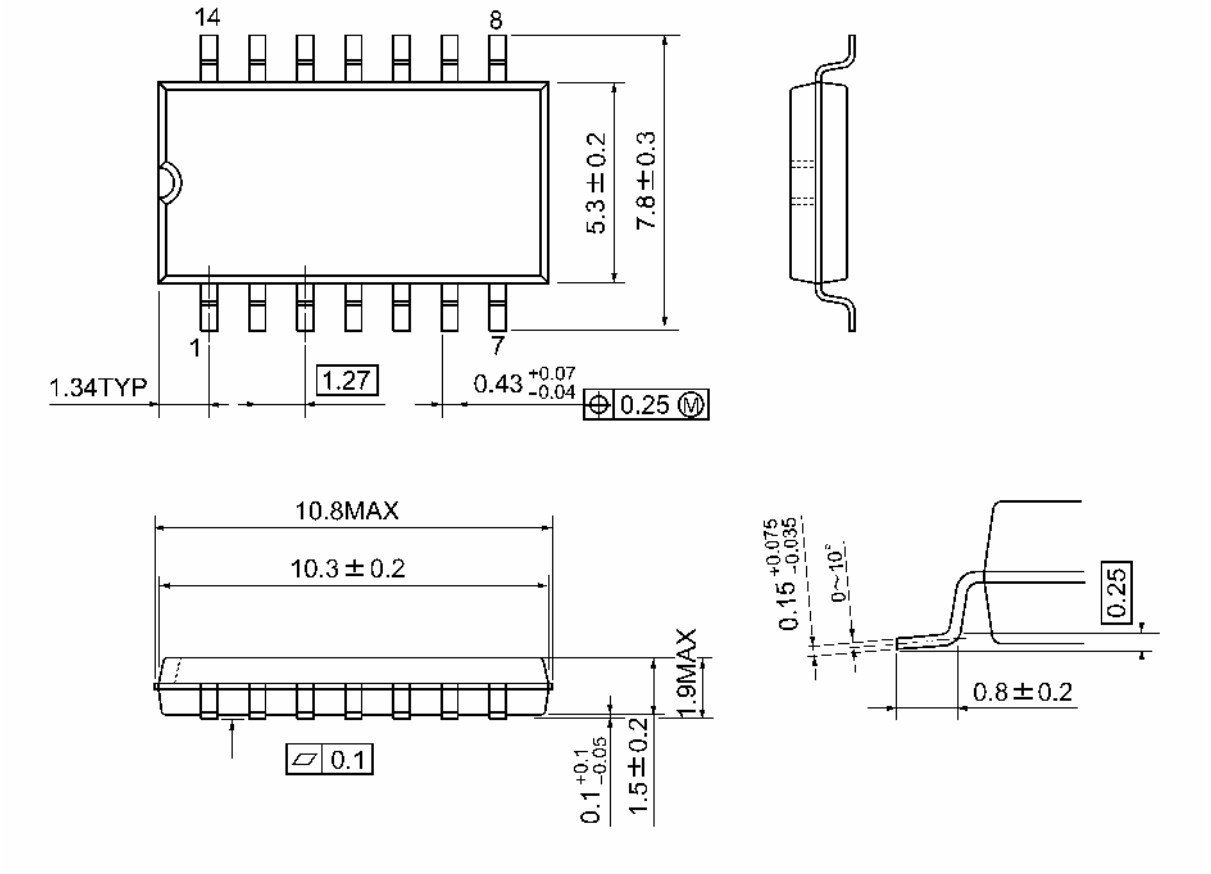
$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per gate)}$$

Noise Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			V_{CC} (V)	Typ.	Max	
Quiet output maximum dynamic V_{OL}	V_{OLP}	C_L = 50 pF	5.0	0.4	0.8	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	C_L = 50 pF	5.0	−0.4	−0.8	V
Minimum high level dynamic input voltage	V_{IHD}	C_L = 50 pF	5.0	—	2.0	V
Maximum low level dynamic input voltage	V_{ILD}	C_L = 50 pF	5.0	—	0.8	V

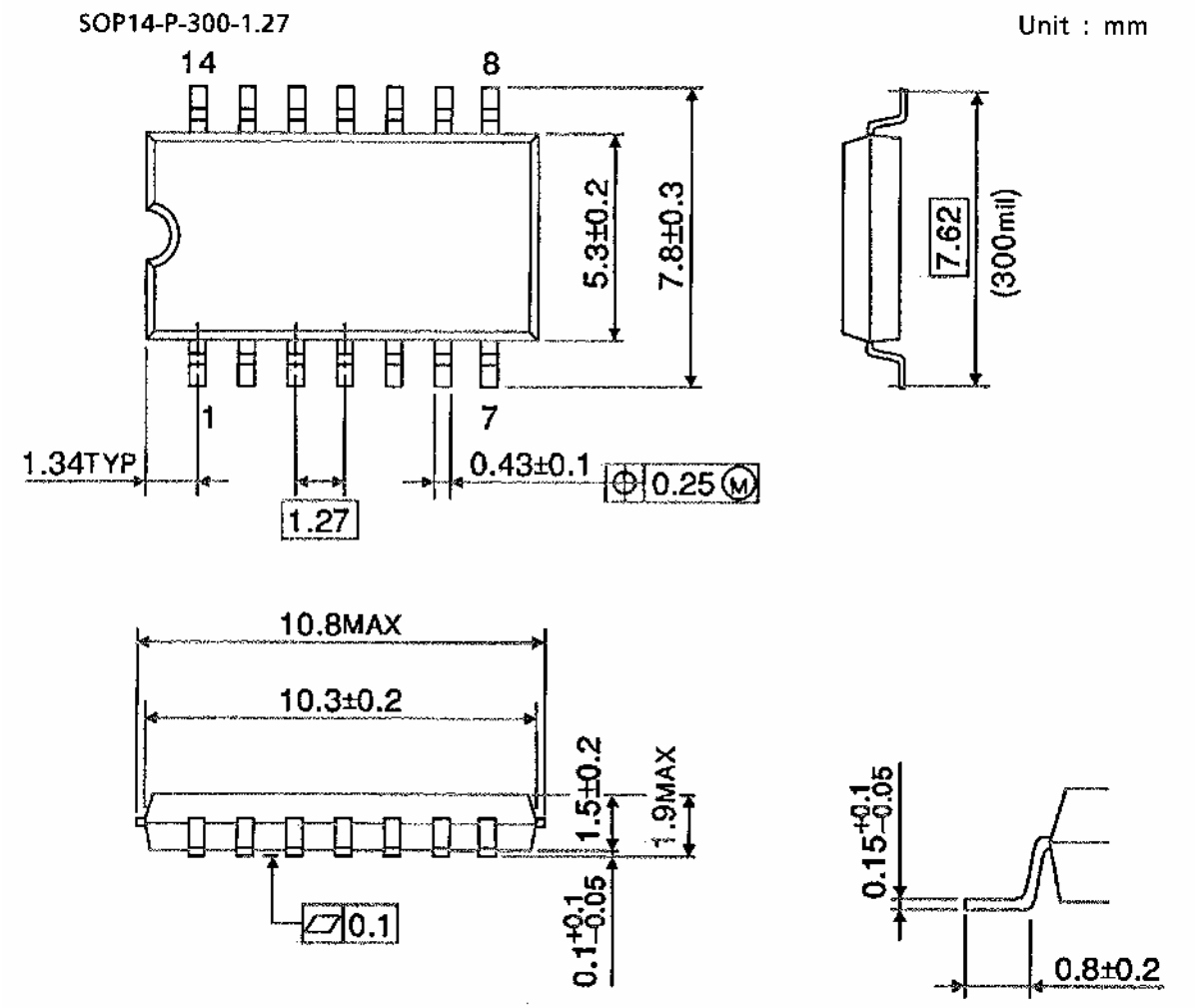
Package Dimensions

SOP14-P-300-1.27A Unit: mm



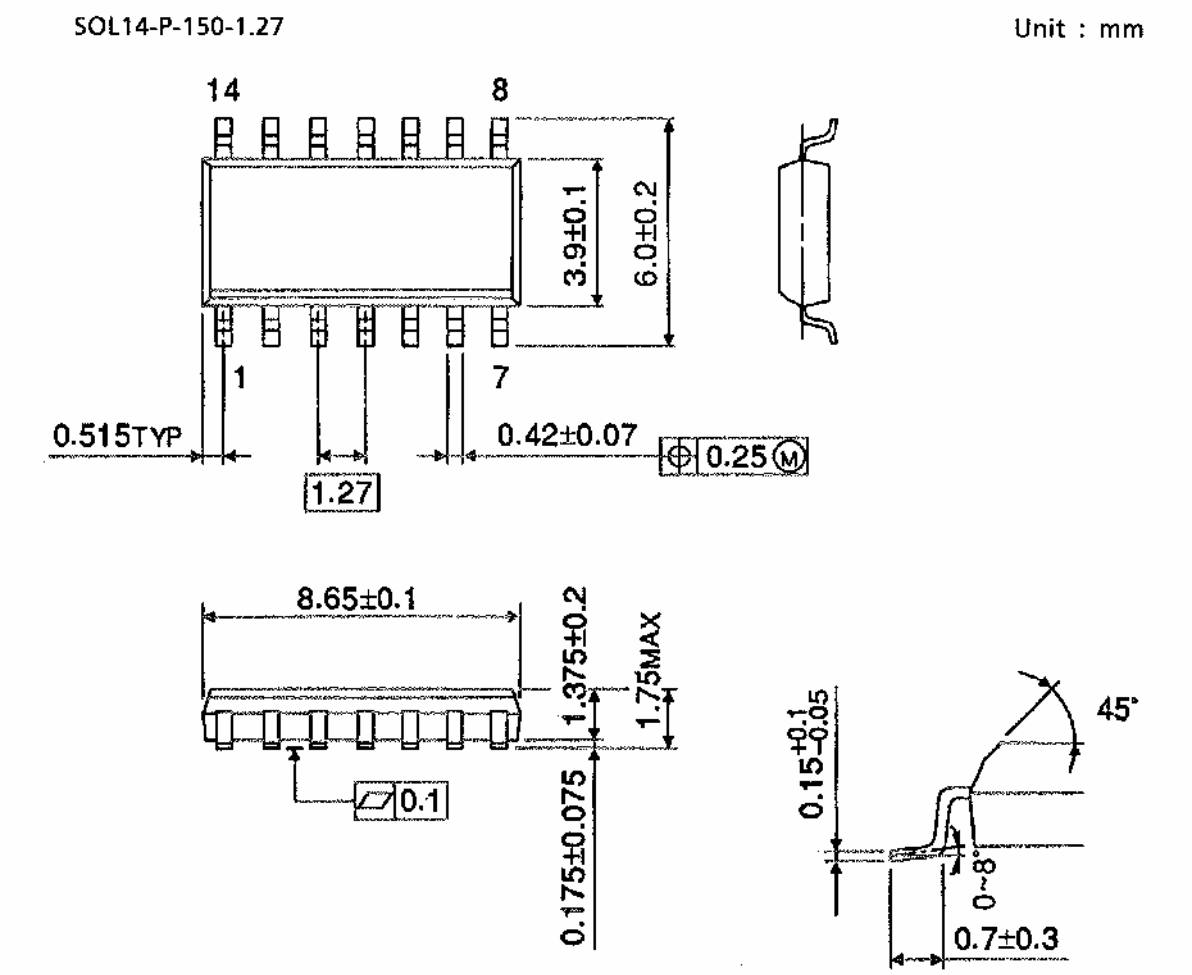
Weight: 0.18 g (typ.)

Package Dimensions



Weight: 0.18 g (typ.)

Package Dimensions (Note)

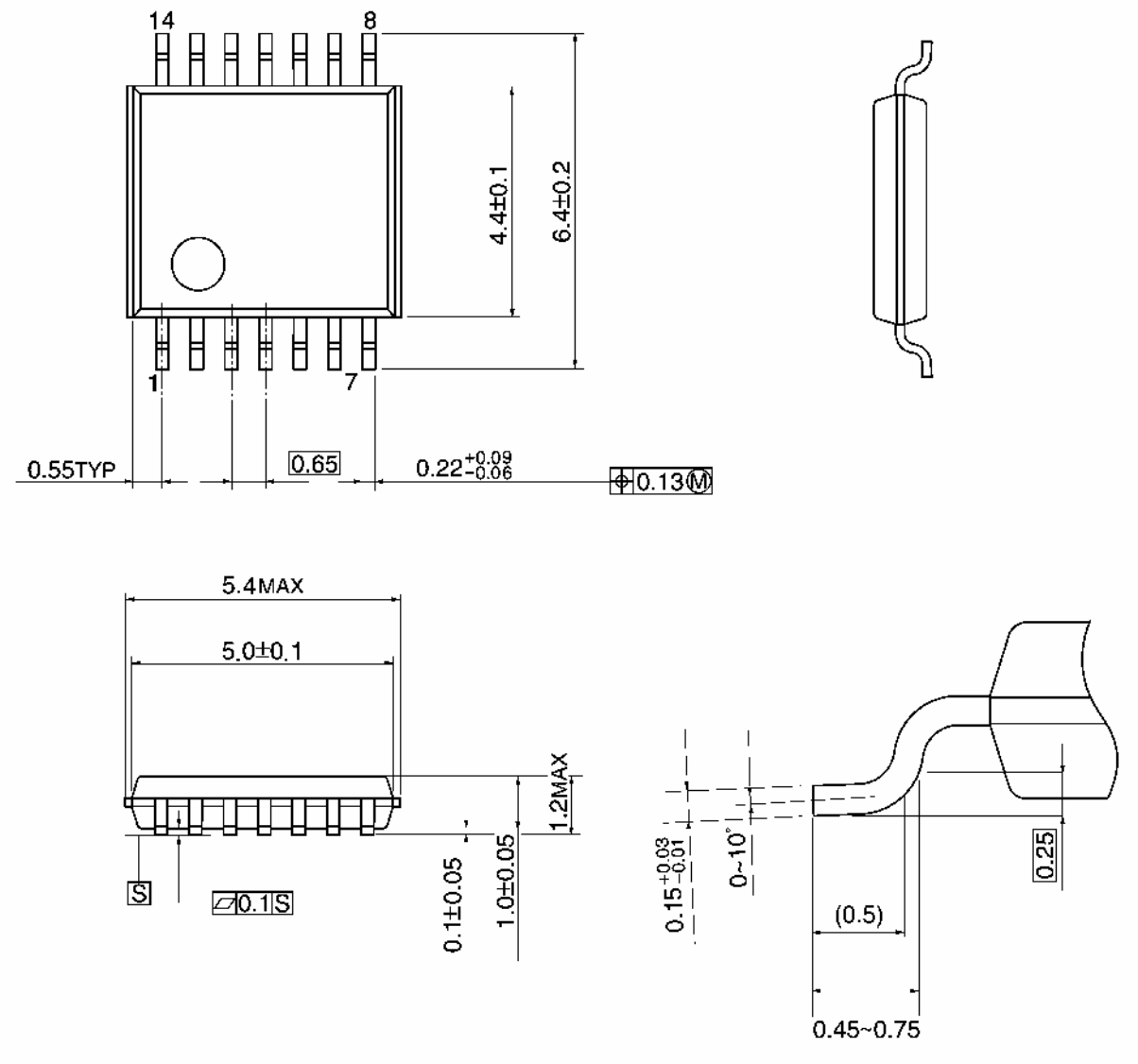


Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

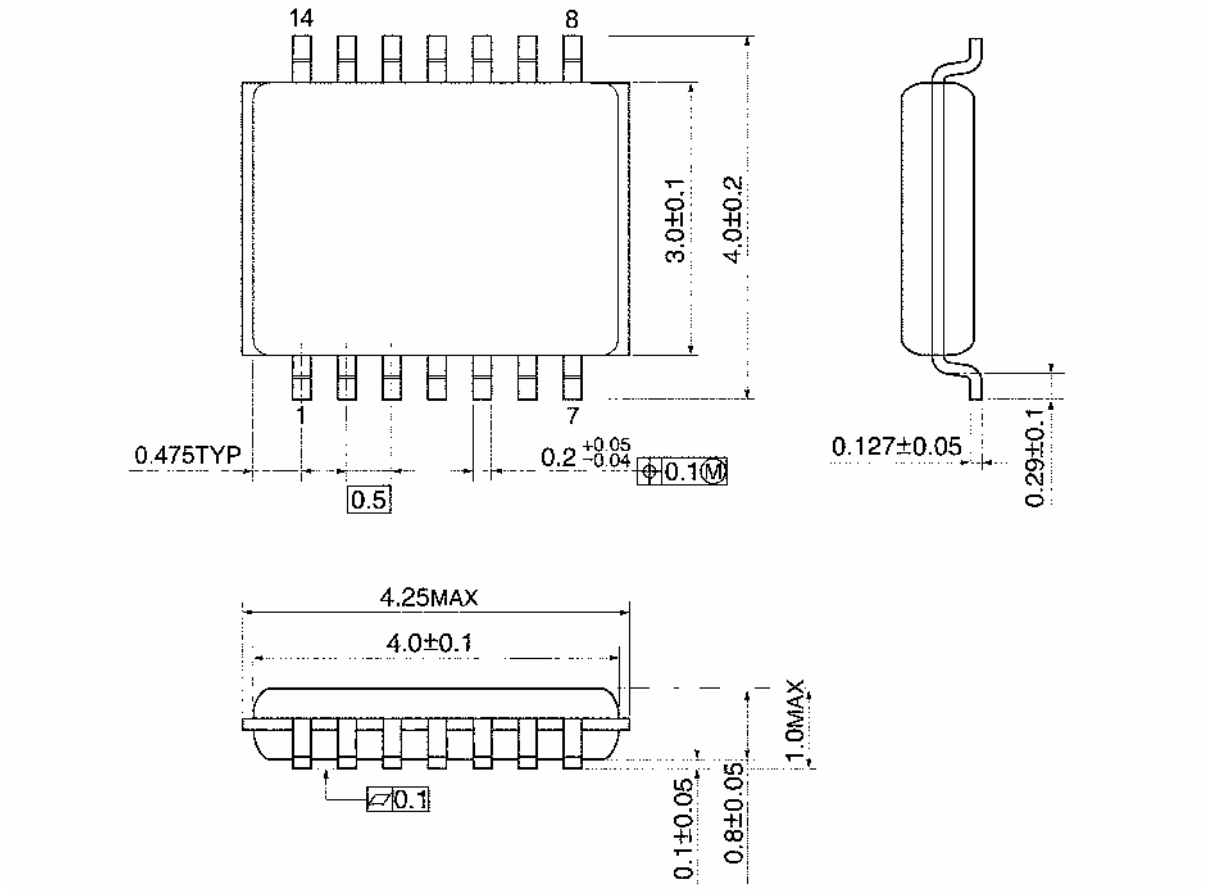
TSSOP14-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

Package Dimensions

VSSOP14-P-0030-0.50 Unit: mm



Weight: 0.02 g (typ.)

Note: Lead (Pb)-Free Packages

SOP14-P-300-1.27A SOL14-P-150-1.27 TSSOP14-P-0044-0.65A VSSOP14-P-0030-0.50

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