

TC74VHC14F, TC74VHC14FN, TC74VHC14FT, TC74VHC14FK

Hex Schmitt Inverter

The TC74VHC14 is an advanced high speed CMOS SCHMITT INVERTER fabricated with silicon gate C²MOS technology.

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

Pin configuration and function are the same as the TC74VHC04 but the inputs have hysteresis and with its schmitt trigger function, the TC74VHC14 can be used as a line receivers which will receive slow input signals.

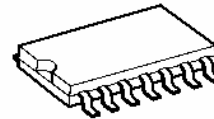
An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features

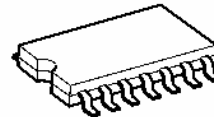
- High speed: $t_{pd} = 5.5 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 2 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC (opr)} = 2 \text{ V to } 5.5 \text{ V}$
- Low noise: $V_{OLP} = 0.8 \text{ V (max)}$
- Pin and function compatible with 74ALS14

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

TC74VHC14F



SOP14-P-300-1.27A



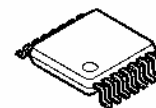
SOP14-P-300-1.27

TC74VHC14FN



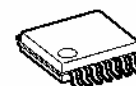
SOL14-P-150-1.27

TC74VHC14FT



TSSOP14-P-0044-0.65A

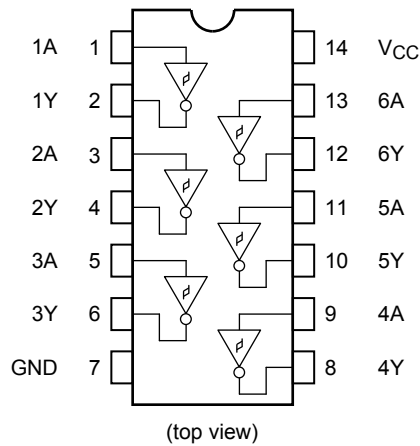
TC74VHC14FK



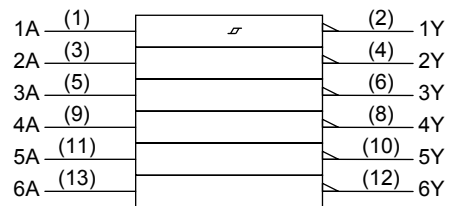
VSSOP14-P-0030-0.50

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



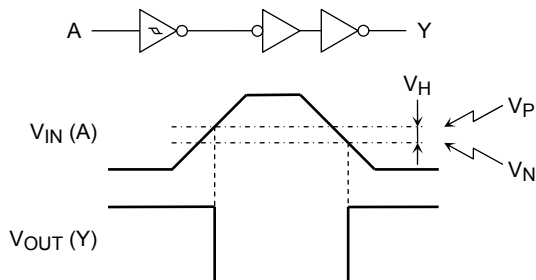
IEC Logic Symbol



Truth Table

A	Y
L	H
H	L

System Diagram, Waveform



Absolute Maximum Ratings (Note)

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 $V_{CC} + 0.5$	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	180	mW
Storage temperature	T_{stg}	-65 to 150	$^{\circ}C$

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

Recommended Operating Conditions (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	°C

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

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } 85^\circ\text{C}$		Unit		
				Min	Typ.	Max	Min	Max			
Positive threshold voltage	V_P	—	3.0	—	—	2.20	—	2.20	V		
			4.5	—	—	3.15	—	3.15			
			5.5	—	—	3.85	—	3.85			
Negative threshold voltage	V_N	—	3.0	0.90	—	—	0.90	—	V		
			4.5	1.35	—	—	1.35	—			
			5.5	1.65	—	—	1.65	—			
Hysteresis voltage	V_H	—	3.0	0.30	—	1.20	0.30	1.20	V		
			4.5	0.40	—	1.40	0.40	1.40			
			5.5	0.50	—	1.60	0.50	1.60			
High-level output voltage	V_{OH}	$V_{IN} = V_{IL}$	$I_{OH} = -50 \mu\text{A}$		2.0	1.9	2.0	—	1.9	V	
			$I_{OH} = -4 \text{ mA}$		3.0	2.9	3.0	—	2.9		
			$I_{OH} = -8 \text{ mA}$		4.5	4.4	4.5	—	4.4		
			$I_{OH} = -8 \text{ mA}$		3.0	2.58	—	—	2.48		—
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH}$	$I_{OL} = 50 \mu\text{A}$		2.0	—	0.0	0.1	—	V	
			$I_{OL} = 4 \text{ mA}$		3.0	—	—	0.36	—		0.44
			$I_{OL} = 8 \text{ mA}$		4.5	—	—	0.36	—		0.44
			$I_{OL} = 8 \text{ mA}$		3.0	—	—	0.36	—		0.44
Input leakage current	I_{IN}	$V_{IN} = 5.5 \text{ V or GND}$	0 to 5.5	—	—	± 0.1	—	± 1.0	μA		
Quiescent supply current	I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	2.0	—	20.0	μA		

AC Characteristics (input: $t_r = t_f = 3 \text{ ns}$)

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}	—	3.3 ± 0.3	15	—	8.3	12.8	1.0	15.0	ns
				50	—	10.8	16.3	1.0	18.5	
	5.0 ± 0.5		15	—	5.5	8.6	1.0	10.0		
			50	—	7.0	10.6	1.0	12.0		
Input capacitance	C _{IN}	—	—	4	10	—	10	pF		
Power dissipation capacitance	C _{PD}	(Note)	—	21	—	—	—	pF		

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

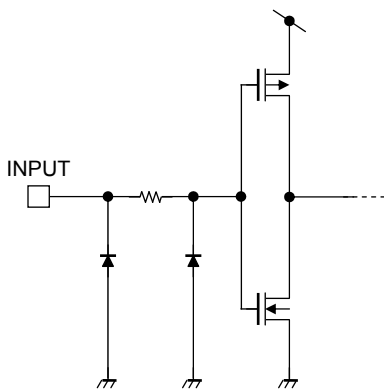
Average operating current can be obtained by the equation:

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6 \text{ (per gate)}$$

Noise Characteristics (input: $t_r = t_f = 3 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			V _{CC} (V)	Typ.	Limit	
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	—	3.5	V
Maximum low level dynamic input voltage	V _{ILD}	C _L = 50 pF	5.0	—	1.5	V

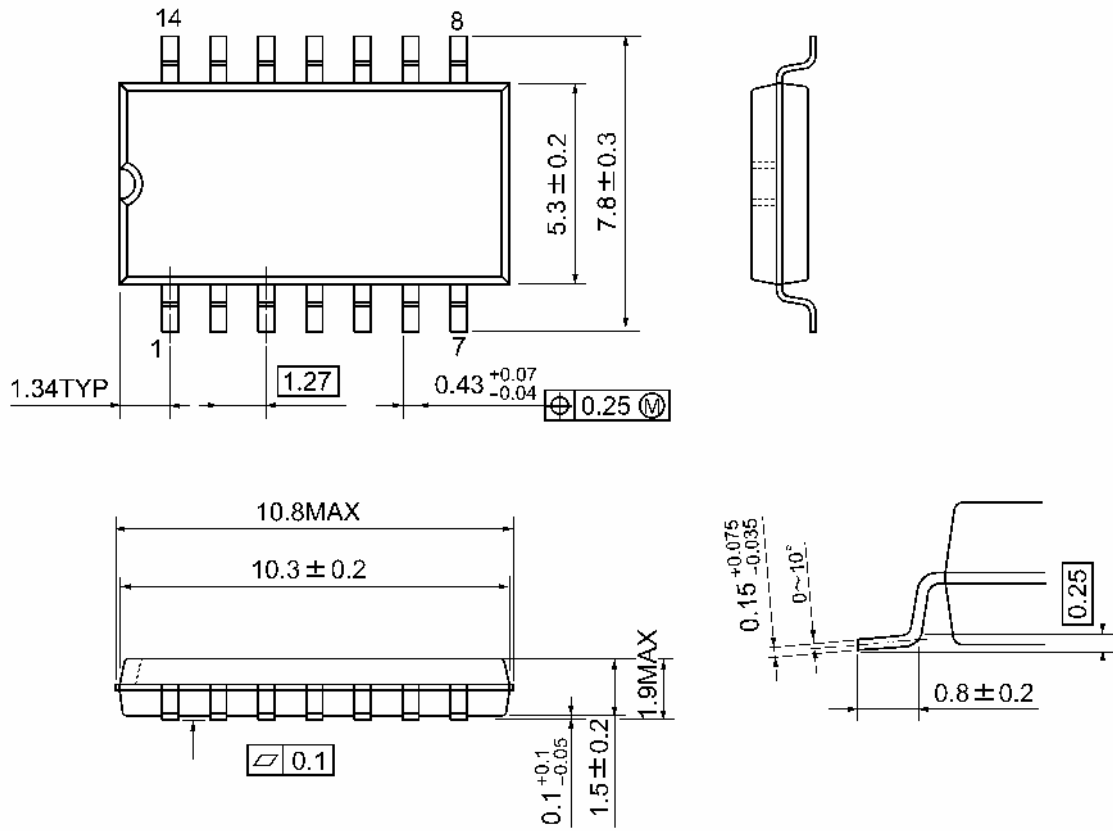
Input Equivalent Circuit



Package Dimensions

SOP14-P-300-1.27A

Unit: mm

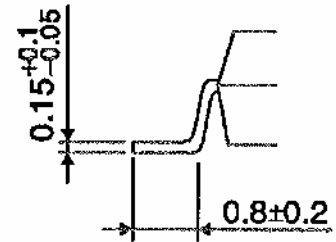
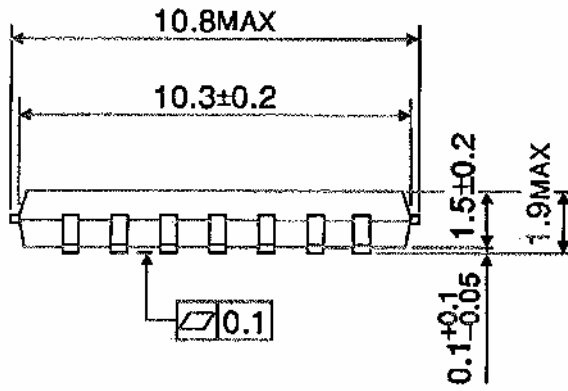
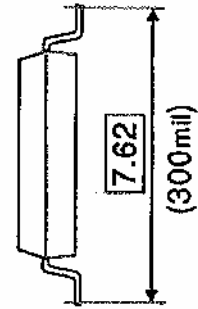
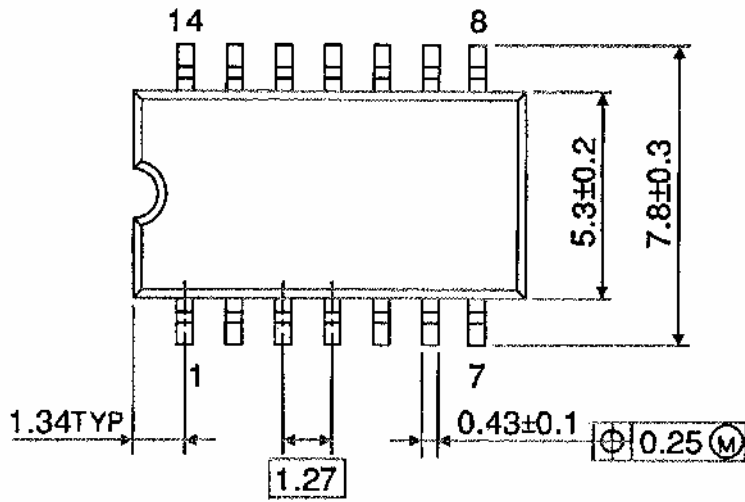


Weight: 0.18 g (typ.)

Package Dimensions

SOP14-P-300-1.27

Unit : mm

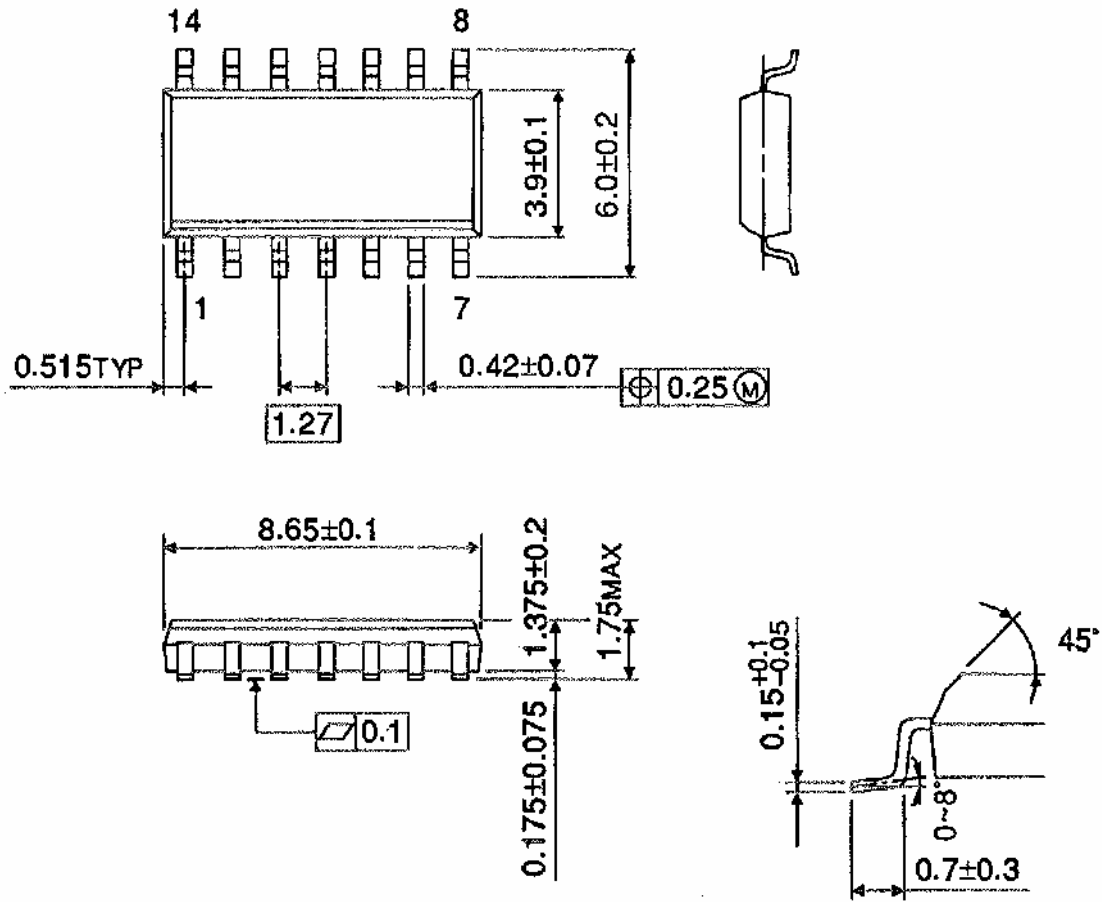


Weight: 0.18 g (typ.)

Package Dimensions (Note)

SOL14-P-150-1.27

Unit : mm



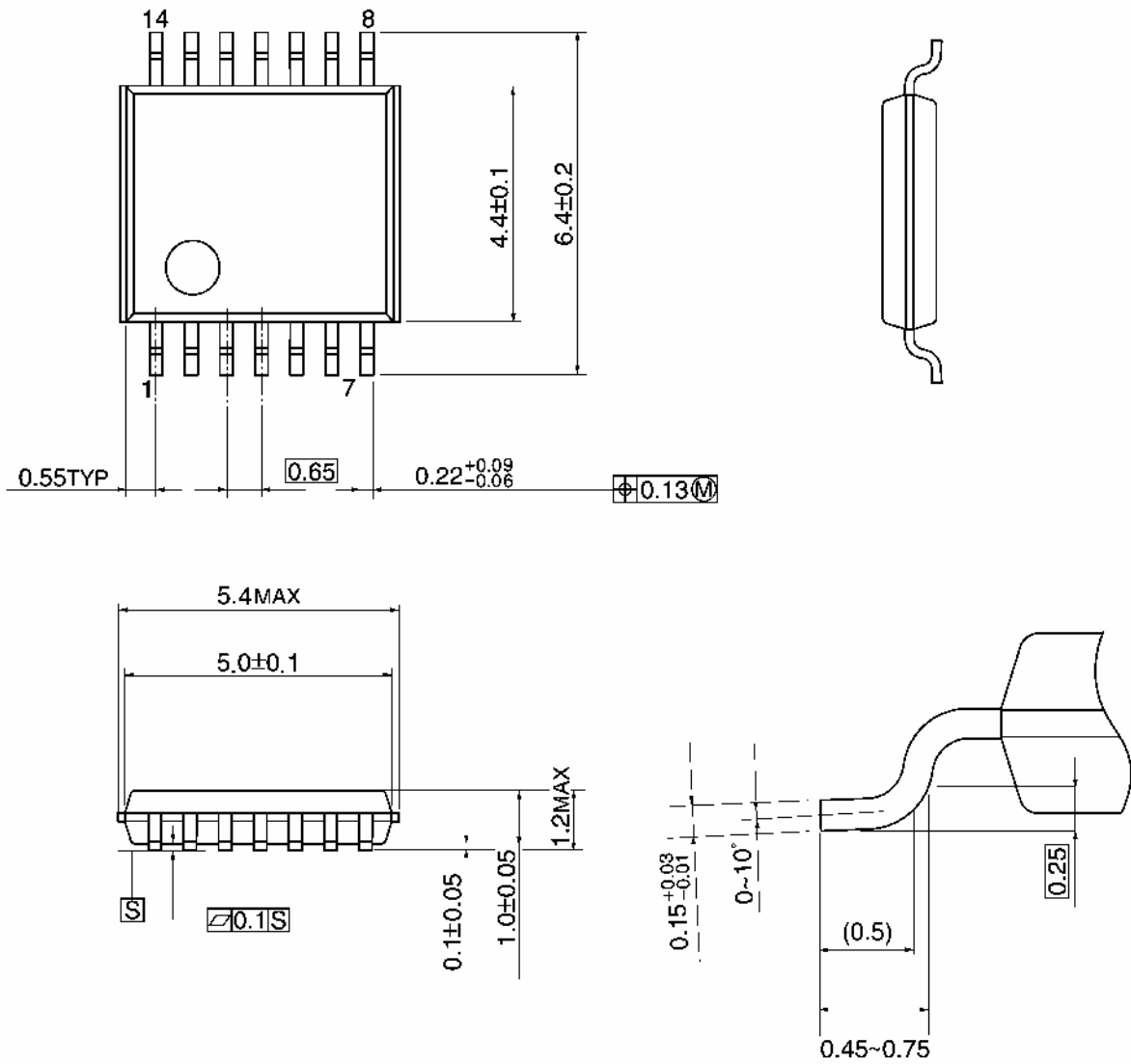
Note: This package is not available in Japan.

Weight: 0.12 g (typ.)

Package Dimensions

TSSOP14-P-0044-0.65A

Unit: mm

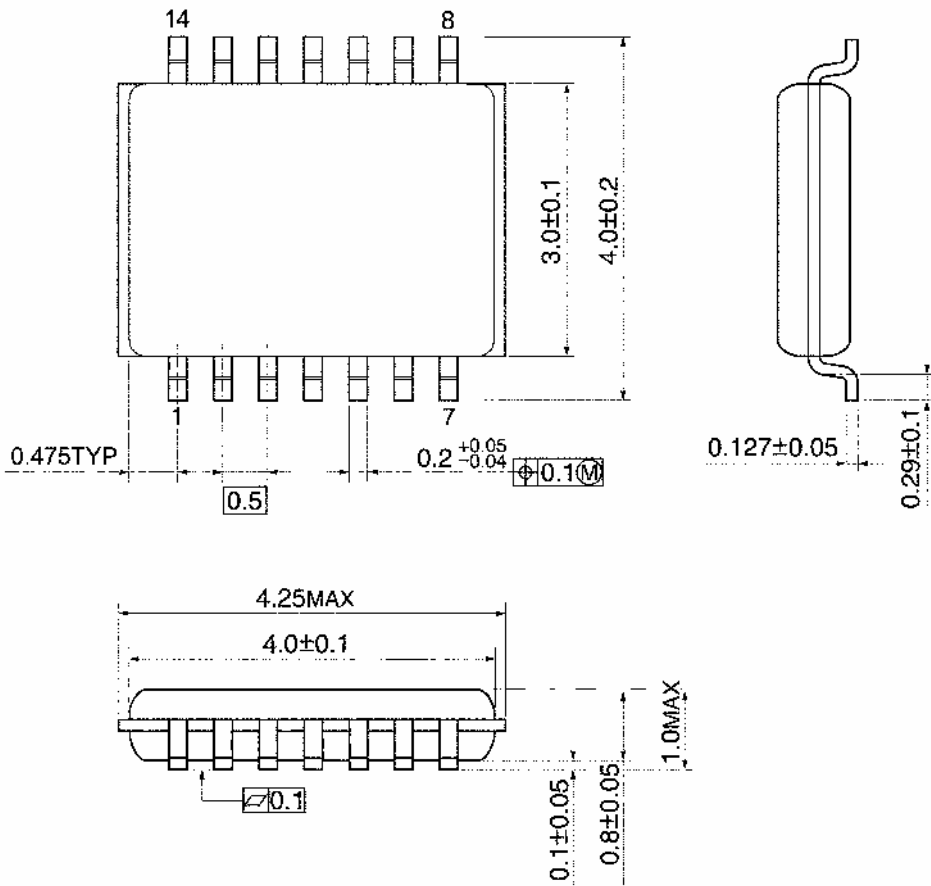


Weight: 0.06 g (typ.)

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****RESTRICTIONS ON PRODUCT USE**

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