

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHC240F, TC74VHC240FW, TC74VHC240FT, TC74VHC240FK TC74VHC244F, TC74VHC244FW, TC74VHC244FT, TC74VHC244FK

Octal Bus Buffer

TC74VHC240F/FW/FT/FK
Inverted, 3-State Outputs

TC74VHC244F/FW/FT/FK
Non-Inverted, 3-State Outputs

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

The TC74VHC240 and 244 are advanced high speed CMOS OCTAL BUS BUFFERS fabricated with silicon gate C²MOS technology.

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

The 74VHC240 is an inverting 3-state buffer having two active-low output enables. The TC74VHC244 is a non-inverting 3-state buffer, and has two active-low output enables.

These devices are designed to be used with 3-state memory address drivers, etc.

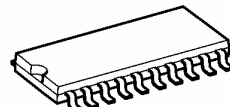
An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input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

Features

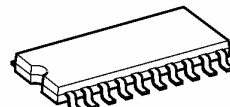
- High speed: $t_{pd} = 3.9 \text{ ns (typ.)}$ at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (min)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC (opr)} = 2 \text{ to } 5.5 \text{ V}$
- Low noise: $V_{OLP} = 0.9 \text{ V (max)}$
- Pin and function compatible with 74ALS240/244

Weight	
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)
TSSOP20-P-0044-0.65A	: 0.08 g (typ.)
VSSOP20-P-0030-0.50	: 0.03 g (typ.)

TC74VHC240F, TC74VHC244F

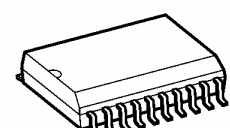


SOP20-P-300-1.27A



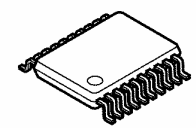
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TC74VHC240FW, TC74VHC244FW



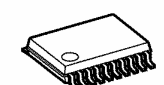
SOL20-P-300-1.27

TC74VHC240FT, TC74VHC244FT



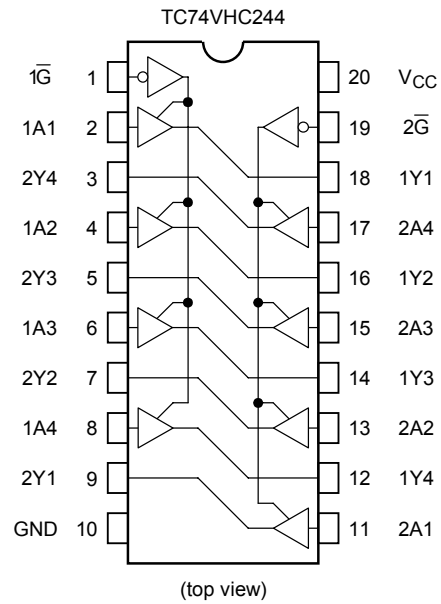
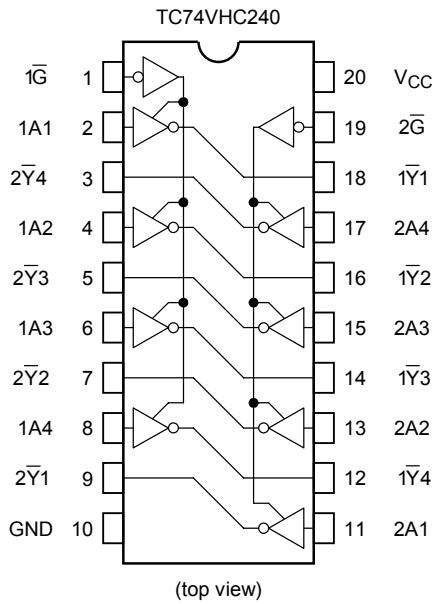
TSSOP20-P-0044-0.65A

TC74VHC240FK, TC74VHC244FK

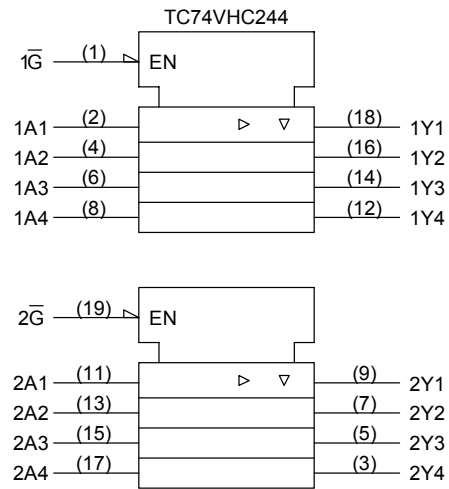
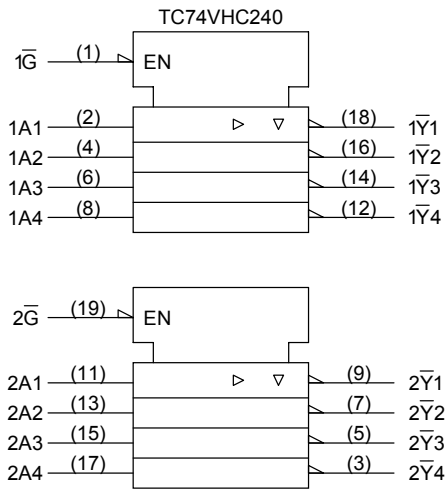


VSSOP20-P-0030-0.50

Pin Assignment



Logic Symbol



Truth Table

Inputs		Outputs	
\overline{G}	A_n	Y_n	\overline{Y}_n
L	L	L	H
L	H	H	L
H	X	Z	Z

X: Don't care

Z: High impedance

Y_n : TC74VHC244

\overline{Y}_n : TC74VHC240

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}	± 75	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	$^{\circ}C$
Input rise and fall time	dt/dv	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V)	ns/V

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 3.0 to 5.5	1.50 V _{CC} × 0.7	— —	— —	1.50 V _{CC} × 0.7	— —	V
Low-level input voltage	V _{IL}	—		2.0 3.0 to 5.5	— —	— —	0.50 V _{CC} × 0.3	— —	0.50 V _{CC} × 0.3	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	— — —	1.9 2.9 4.4	— — —	V
			I _{OH} = -4 mA	3.0	2.58	—	—	2.48	—	
			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	2.0 3.0 4.5	— — —	0.0 0.0 0.0	0.1 0.1 0.1	— — —	0.1 0.1 0.1	V
			I _{OL} = 4 mA	3.0	—	—	0.36	—	0.44	
			I _{OL} = 8 mA	4.5	—	—	0.36	—	0.44	
3-state output off-state current	I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND		5.5	—	—	±0.25	—	±2.50	μA
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	—	—	4.0	—	40.0	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 (TC74VHC240)	t_{pLH}	—	3.3 ± 0.3	15	—	5.3	7.5	1.0	9.0	ns
				50	—	7.8	11.0	1.0	12.5	
	5.0 ± 0.5		15	—	3.6	5.5	1.0	6.5		
			50	—	5.1	7.5	1.0	8.5		
Propagation delay time (TC74VHC244)	t_{pLH}	—	3.3 ± 0.3	15	—	5.8	8.4	1.0	10.0	ns
				50	—	8.3	11.9	1.0	13.5	
	5.0 ± 0.5		15	—	3.9	5.5	1.0	6.5		
			50	—	5.4	7.5	1.0	8.5		
3-state output enable time	t_{pZL}	R _L = 1 kΩ	3.3 ± 0.3	15	—	6.6	10.6	1.0	12.5	ns
				50	—	9.1	14.1	1.0	16.0	
	5.0 ± 0.5		15	—	4.7	7.3	1.0	8.5		
			50	—	6.2	9.3	1.0	10.5		
3-state output disable time	t_{pLZ}	R _L = 1 kΩ	3.3 ± 0.3	50	—	10.3	14.0	1.0	16.0	ns
				50	—	6.7	9.2	1.0	10.5	
t_{pHZ}	5.0 ± 0.5		50	50	—	6.7	9.2	1.0	10.5	
					—	6.7	9.2	1.0	10.5	
Output to output skew	t_{osLH}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns
				50	—	—	1.0	—	1.0	
t_{osHL}	5.0 ± 0.5		50	50	—	—	1.0	—	1.0	
					—	—	1.0	—	1.0	
Input capacitance	C _{IN}	—	—	—	4	10	—	10	pF	
Output capacitance	C _{OUT}	—	—	—	6	—	—	—	pF	
Power dissipation capacitance (Note 2)	C _{PD}	TC74VHC240	—	—	17	—	—	—	pF	
		TC74VHC244	—	—	19	—	—	—		

Note 1: Parameter guaranteed by design.

$$t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|$$

Note 2: 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:

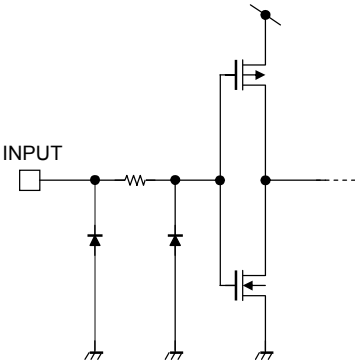
$$I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 \text{ (per bit)}$$

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

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	0.5 (0.6)	0.8 (0.9)	V
Quiet output minimum dynamic V _{OL}	V _{OLV}	C _L = 50 pF	5.0	-0.5 (-0.6)	-0.8 (-0.9)	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

Note: The value in () only applies to JEDEC SOP (FW) devices.

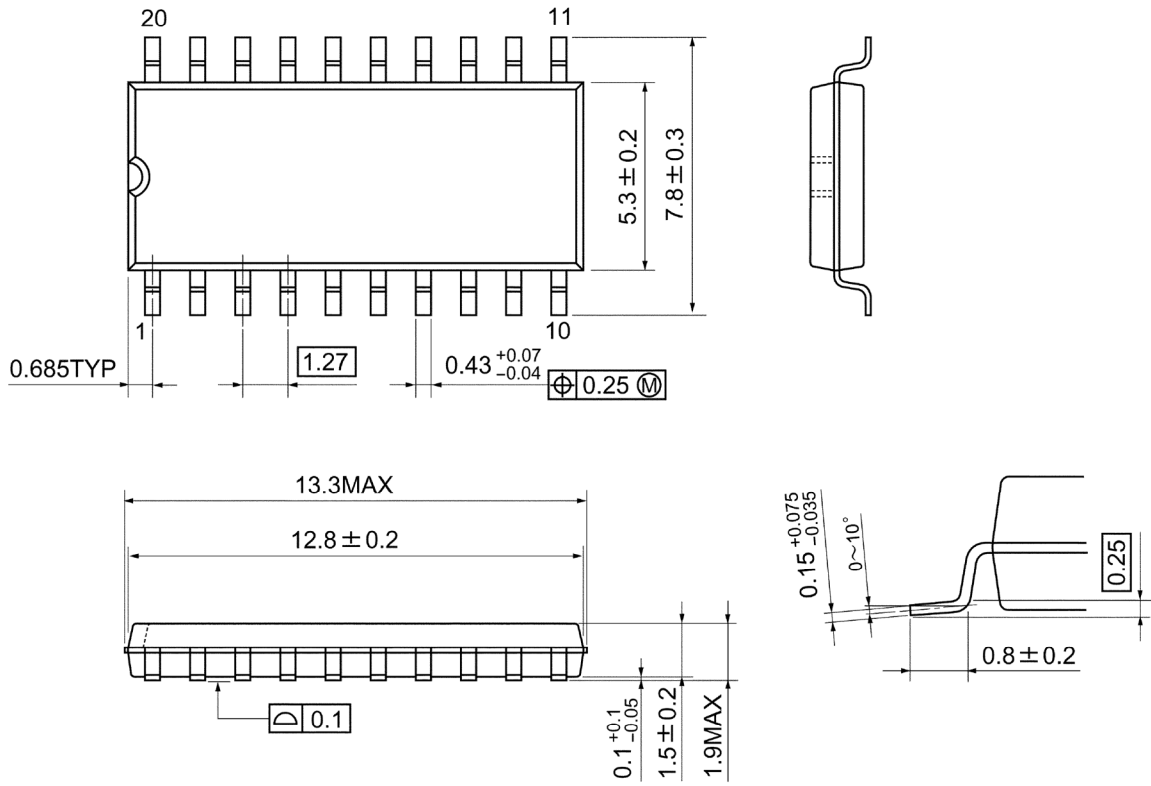
Input Equivalent Circuit



Package Dimensions

SOP20-P-300-1.27A

Unit: mm

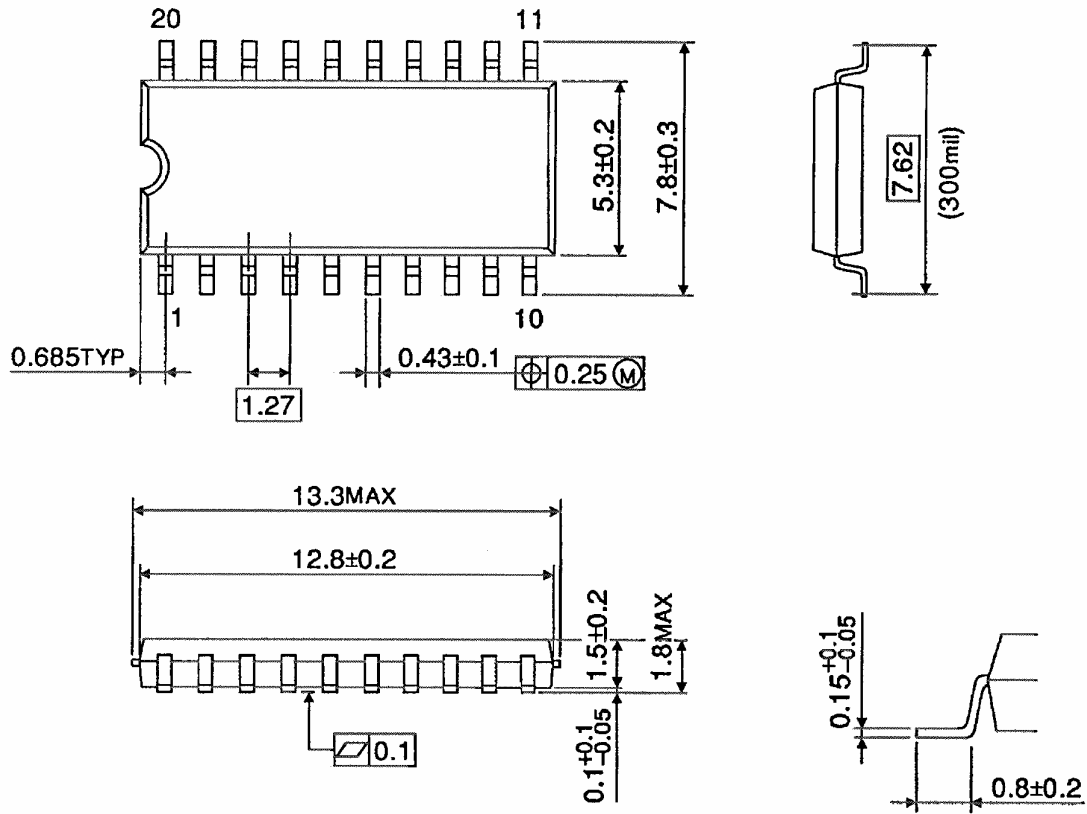


Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm

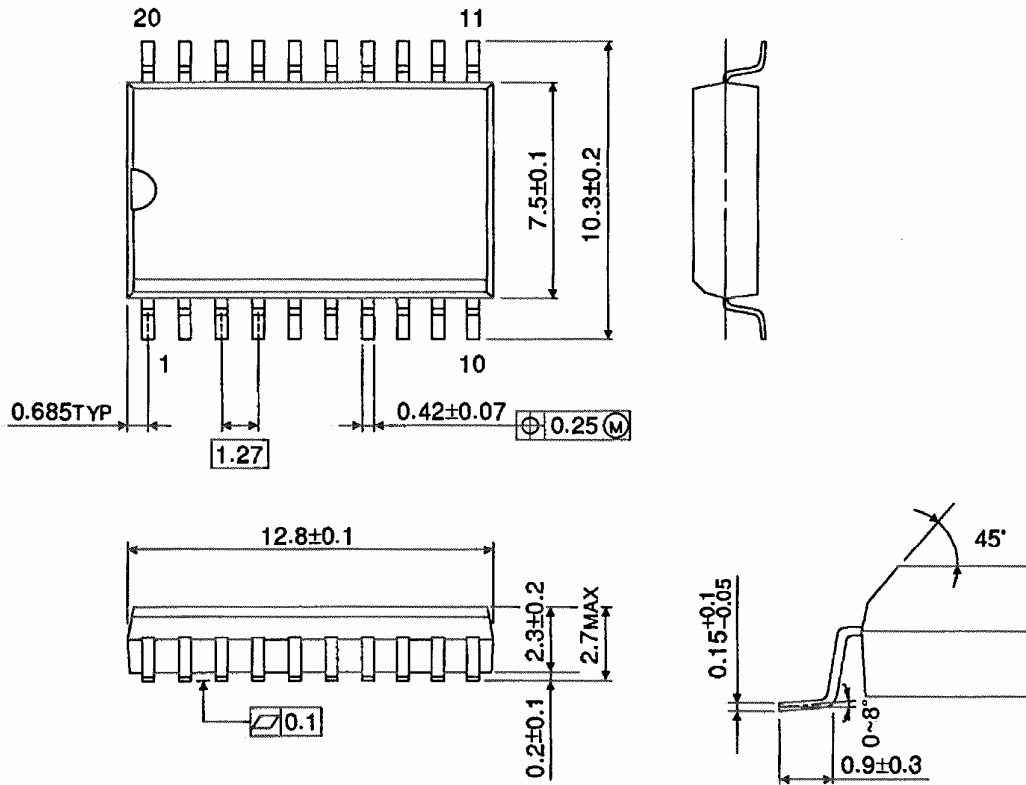


Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm



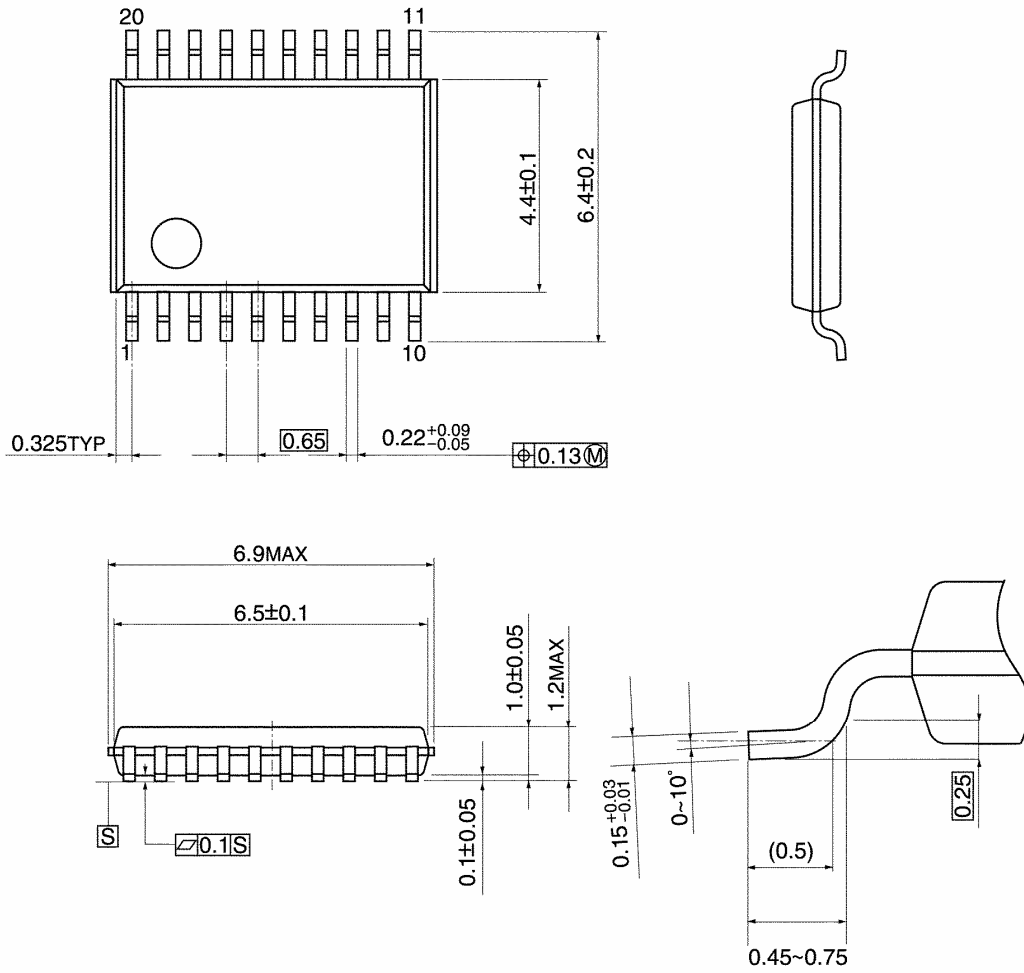
Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm

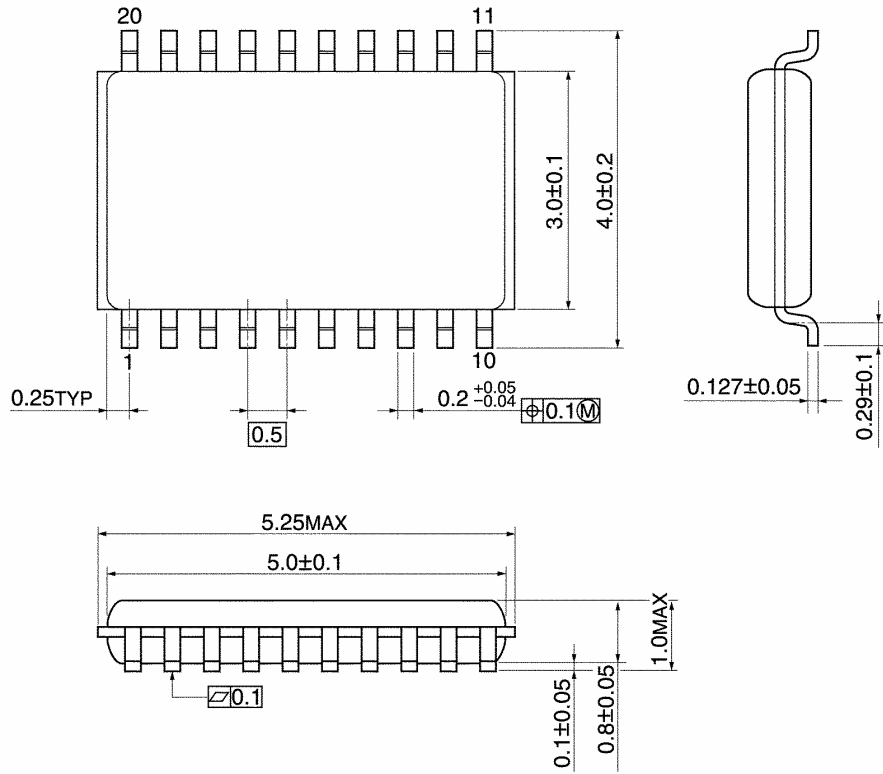


Weight: 0.08 g (typ.)

Package Dimensions

VSSOP20-P-0030-0.50

Unit: mm



Weight: 0.03 g (typ.)

Note: Lead (Pb)-Free Packages

SOP20-P-300-1.27A TSSOP20-P-0044-0.65A VSSOP20-P-0030-0.50

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