

## TC74VHCT245AF, TC74VHCT245AFW, TC74VHCT245AFT, TC74VHCT245AFK

### Octal Bus Transceiver

The TC74VHCT245A is an advanced high speed CMOS OCTAL BUS TRANSCEIVER fabricated with silicon gate C<sup>2</sup>MOS technology. It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It is intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

The enable input ( $\bar{G}$ ) can be used to disable the device so that the busses are effectively isolated.

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: Output in off-state

### Features (Note)

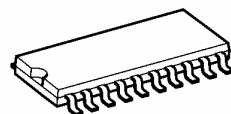
- High speed:  $t_{pd} = 4.9 \text{ ns}$  (typ.) at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 4 \mu\text{A}$  (max) at  $T_a = 25^\circ\text{C}$
- Compatible with TTL outputs:  $V_{IL} = 0.8 \text{ V}$  (max)  
 $V_{IH} = 2.0 \text{ V}$  (min)
- Power down protection is provided on all inputs and outputs
- Balanced propagation delays:  $t_{PLH} \approx t_{PHL}$
- Low noise:  $V_{OLP} = 1.6 \text{ V}$  (max)
- Pin and function compatible with the 74 series (74AC/HC/F/ALS/LS etc.) 245 type.

Note: Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.  
All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.

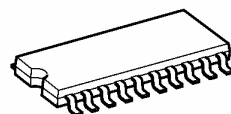
Weight	
SOP20-P-300-1.27A	: 0.22 g (typ.)
SOP20-P-300-1.27	: 0.22 g (typ.)
SOL20-P-300-1.27	: 0.46 g (typ.)
TSSOP20-P-0044-0.65A	: 0.08 g (typ.)
VSSOP20-P-0030-0.50	: 0.03 g (typ.)

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

TC74VHCT245AF

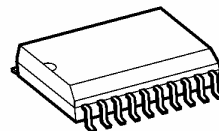


SOP20-P-300-1.27A



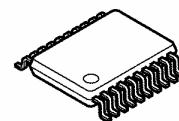
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TC74VHCT245AFW



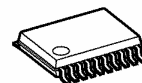
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TC74VHCT245AFT



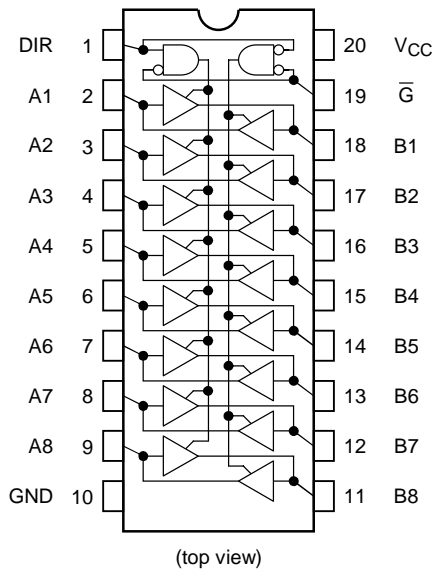
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TC74VHCT245AFK

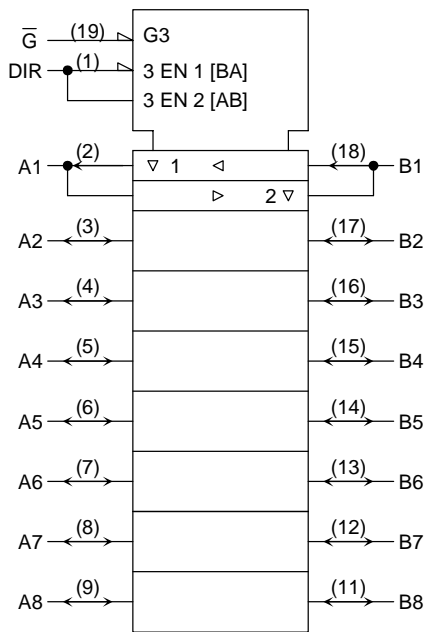


VSSOP20-P-0030-0.50

Pin Assignment



IEC Logic Symbol



Truth Table

Inputs		Function		Output
$\overline{G}$	DIR	A Bus	B Bus	
L	L	Output	Input	A = B
L	H	Input	Output	B = A
H	X	Z		Z

X: Don't care

Z: High impedance

**Absolute Maximum Ratings (Note 1)**

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5 to 7.0	V
DC input voltage (DIR, $\bar{G}$ )	$V_{IN}$	-0.5 to 7.0	V
DC bus I/O voltage	$V_{I/O}$	-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	$I_{OK}$	$\pm 20$ (Note 4)	mA
DC output current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 75$	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: 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
Supply voltage	$V_{CC}$	4.5 to 5.5	V
Input voltage (DIR, $\bar{G}$ )	$V_{IN}$	0 to 5.5	V
Bus I/O voltage	$V_{I/O}$	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: Output in off-state

Note 3: High or low state

## Electrical Characteristics

## DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = −40 to 85°C		Unit	
				V <sub>CC</sub> (V)	Min	Typ.	Max	Min		Max
High-level input voltage	V <sub>IH</sub>	—		4.5 to 5.5	2.0	—	—	2.0	—	V
Low-level input voltage	V <sub>IL</sub>	—		4.5 to 5.5	—	—	0.8	—	0.8	V
High-level output voltage	V <sub>OH</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = −50 μA	4.5	4.4	4.5	—	4.4	—	V
			I <sub>OH</sub> = −8 mA	4.5	3.94	—	—	3.80	—	
Low-level output voltage	V <sub>OL</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 50 μA	4.5	—	0.0	0.1	—	0.1	V
			I <sub>OL</sub> = 8 mA	4.5	—	—	0.36	—	0.44	
3-state output off-state current	I <sub>OZ</sub>	V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>OUT</sub> = V <sub>CC</sub> or GND		5.5	—	—	±0.25	—	±2.50	μA
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = 5.5 V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		5.5	—	—	4.0	—	40.0	μA
	I <sub>CCT</sub>	Per input: V <sub>IN</sub> = 3.4 V Other input: V <sub>CC</sub> or GND		5.5	—	—	1.35	—	1.50	mA
Output leakage current	I <sub>OPD</sub>	V <sub>OUT</sub> = 5.5 V		0	—	—	0.5	—	5.0	μA

AC Characteristics (input: t<sub>r</sub> = t<sub>f</sub> = 3 ns)

Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = −40 to 85°C		Unit
			V <sub>CC</sub> (V)	C <sub>L</sub> (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t <sub>pLH</sub>	—	5.0 ± 0.5	15	—	4.9	7.7	1.0	8.5	ns
	t <sub>pHL</sub>			50	—	5.4	8.7	1.0	9.5	
3-state output enable time	t <sub>pZL</sub>	R <sub>L</sub> = 1 kΩ	5.0 ± 0.5	15	—	9.4	13.8	1.0	15.0	ns
	t <sub>pZH</sub>			50	—	9.9	14.8	1.0	16.0	
3-state output disable time	t <sub>pLZ</sub> t <sub>pHZ</sub>	R <sub>L</sub> = 1 kΩ	5.0 ± 0.5	50	—	10.1	15.4	1.0	16.5	ns
Output to output skew	t <sub>osLH</sub> t <sub>osHL</sub>	(Note 1)	5.0 ± 0.5	50	—	—	1.0	—	1.0	ns
Input capacitance	C <sub>I</sub> N	DIR, $\overline{G}$			—	4	10	—	10	pF
Bus input capacitance	C <sub>I</sub> /O	An, Bn			—	13	—	—	—	pF
Power dissipation capacitance	C <sub>PD</sub>	(Note 2)			—	16	—	—	—	pF

Note 1: Parameter guaranteed by design.

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

Note 2: C<sub>PD</sub> 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:  $t_r = t_f = 3 \text{ ns}$ ) (Note)**

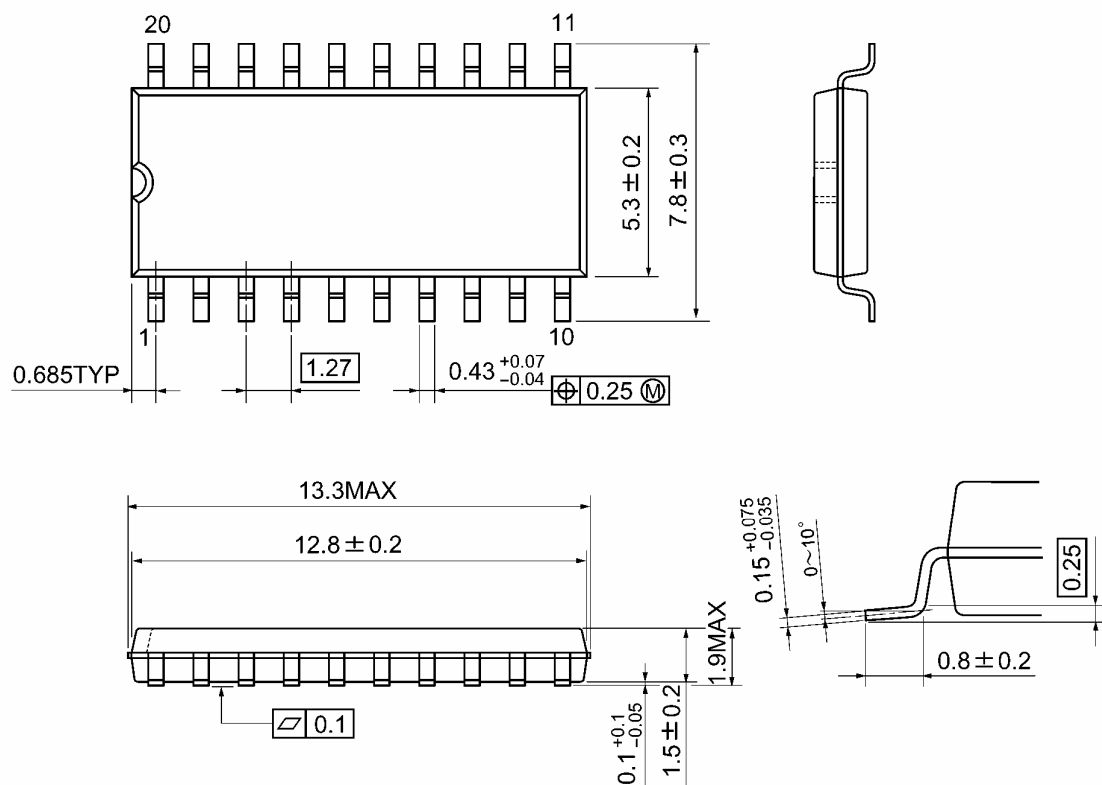
Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			V <sub>CC</sub> (V)	Typ.	Limit	
Quiet output maximum dynamic V <sub>OL</sub>	V <sub>OLP</sub>	C <sub>L</sub> = 50 pF	5.0	1.1 (1.2)	1.5 (1.6)	V
Quiet output minimum dynamic V <sub>OL</sub>	V <sub>OLV</sub>	C <sub>L</sub> = 50 pF	5.0	-1.1 (-1.2)	-1.5 (-1.6)	V
Minimum high level dynamic input voltage	V <sub>IHD</sub>	C <sub>L</sub> = 50 pF	5.0	—	2.0	V
Maximum low level dynamic input voltage	V <sub>ILD</sub>	C <sub>L</sub> = 50 pF	5.0	—	0.8	V

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

## Package Dimensions

SOP20-P-300-1.27A

Unit: mm

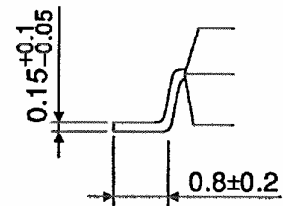
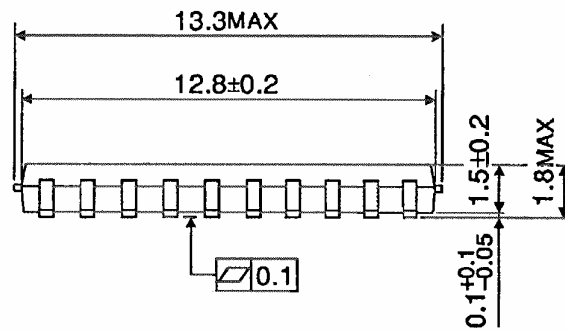
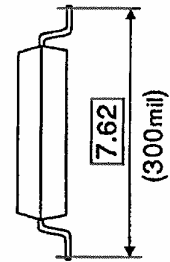


Weight: 0.22 g (typ.)

SOP20-P-300-1.27

Diagram illustrating the mechanical dimensions of the 20-pin package. The package is shown in a side view with dimensions in millimeters (mm).

- Pin 1 is located at the bottom left corner.
- Pin 20 is located at the top left corner.
- Pin 11 is located at the top right corner.
- Pin 10 is located at the bottom right corner.
- Overall width:  $7.8 \pm 0.3$  mm.
- Overall height:  $5.3 \pm 0.2$  mm.
- Pin pitch (distance between adjacent pins):  $0.685$  TYP mm.
- Distance from the left edge to the center of Pin 1:  $1.27$  mm.
- Distance from the center of Pin 1 to the center of Pin 10:  $0.43 \pm 0.1$  mm.
- Distance from the center of Pin 10 to the right edge:  $0.25$  mm (indicated with a circled M).



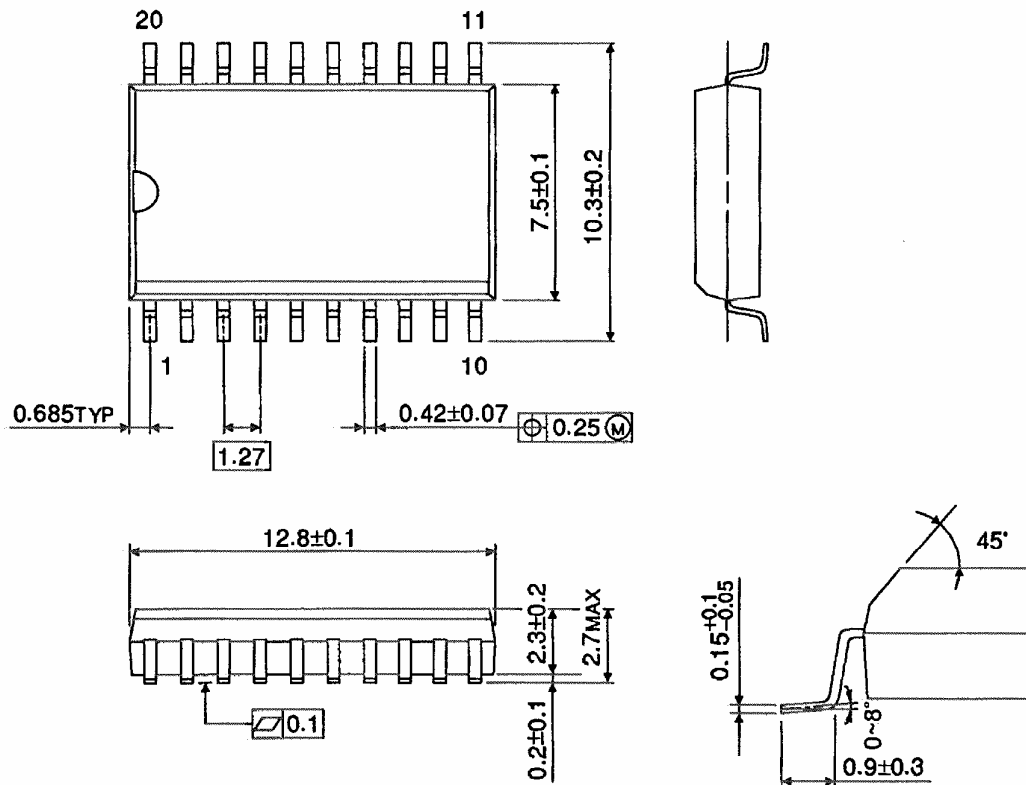
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## Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm



Note: This package is not available in Japan.

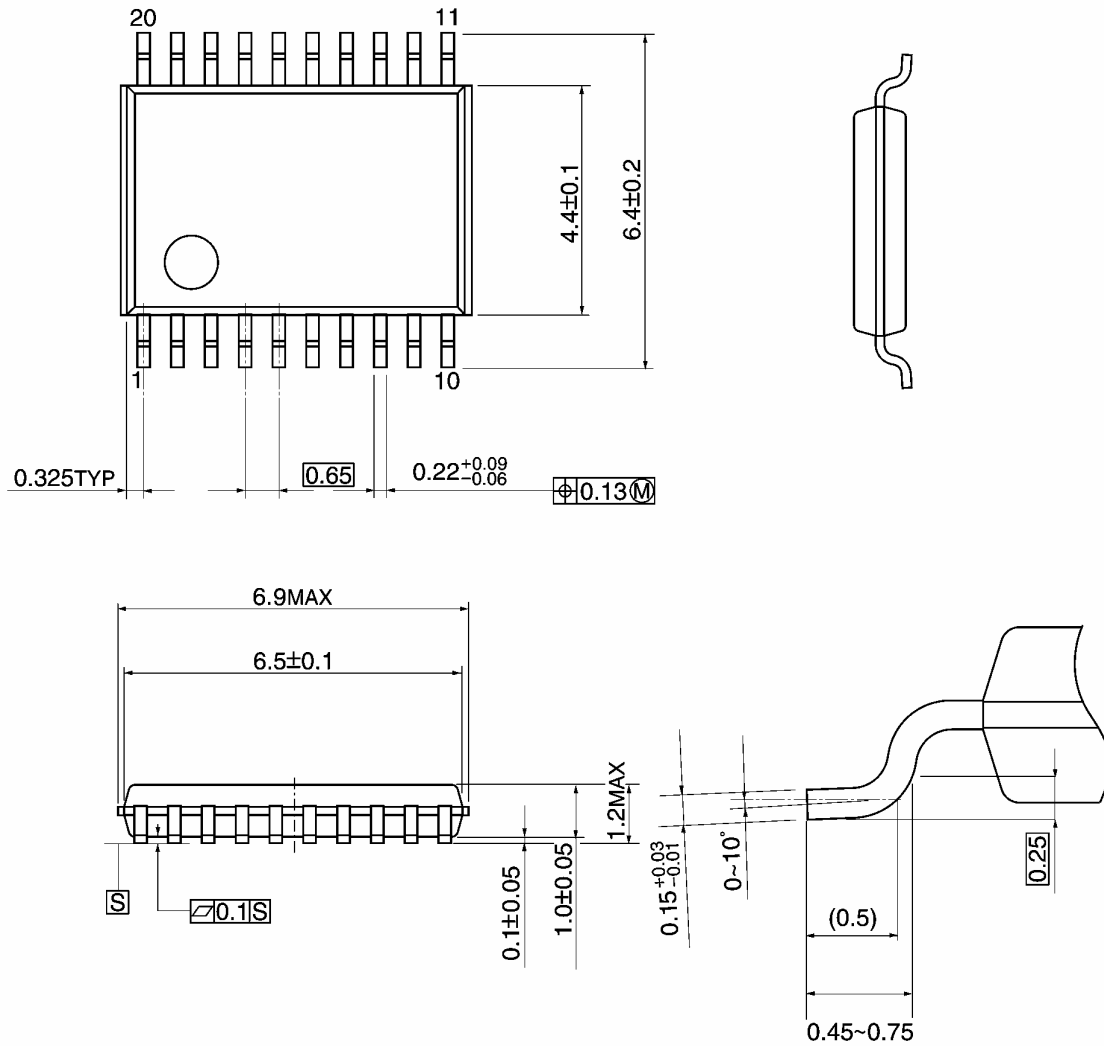
Weight: 0.46 g (typ.)



## Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm

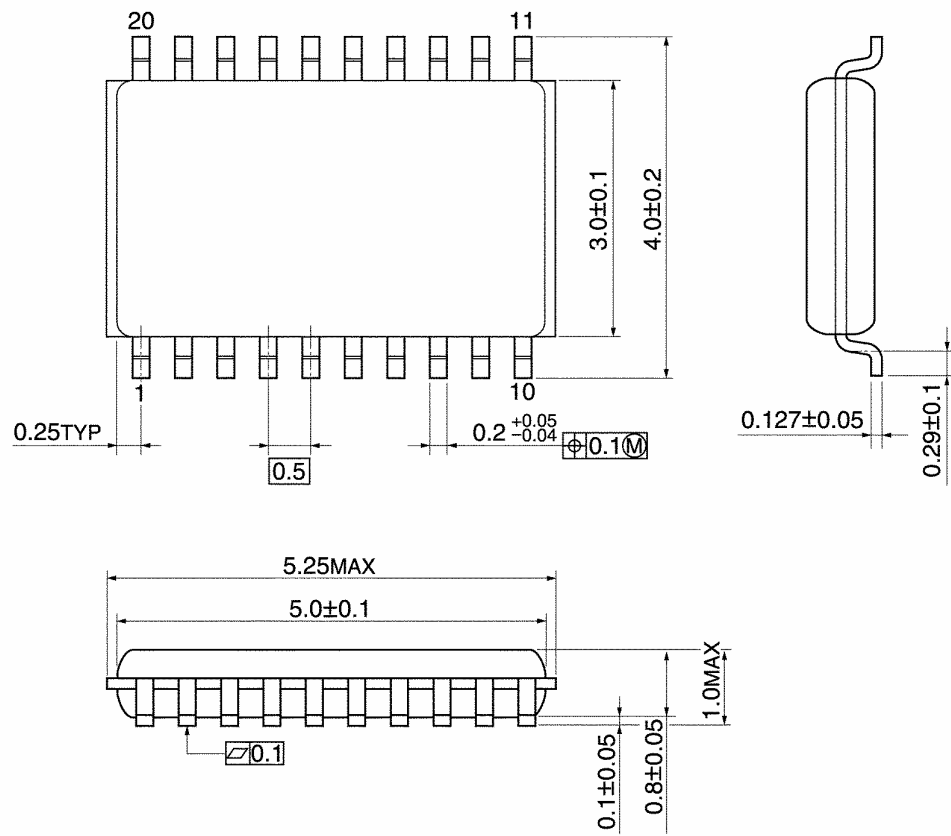


Weight: 0.08 g (typ.)

## 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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