

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

## TC74AC245P,TC74AC245F,TC74AC245FW,TC74AC245FT TC74AC640P,TC74AC640F,TC74AC640FW,TC74AC640FT

### Octal Bus Transceiver

TC74AC245P/F/FW/FT 3-State, Non-Inverting

TC74AC640P/F/FW/FT 3-State, Inverting

The TC74AC245, 640 are advanced high speed CMOS OCTAL BUS TRANSCEIVERS fabricated with silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

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

They are 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 ( $\overline{G}$ ) can be used to disable the device so that the busses are effectively isolated.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Features (Note 1)(Note 2)

- High speed:  $t_{pd} = 3.9 \text{ ns (typ.)}$  at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 8 \mu\text{A (max)}$  at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Symmetrical output impedance:  
 $|I_{OH}| = |I_{OL}| = 24 \text{ mA (min)}$   
Capability of driving  $50 \Omega$  transmission lines.
- Balanced propagation delays:  $t_{PLH} \approx t_{PHL}$
- Wide operating voltage range:  $V_{CC} \text{ (opr)} = 2 \text{ V to } 5.5 \text{ V}$
- Pin and function compatible with 74F245/640

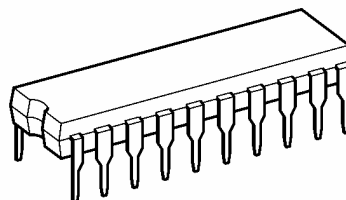
Note 1: Do not apply a signal to any bus terminal when it is in the output mode. Damage may result.

Note 2: All floating (high impedance) bus terminals must have their input levels fixed by means of pull up or pull down resistors.

Weight	
DIP20-P-300-2.54A	: 1.30 g (typ.)
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.)

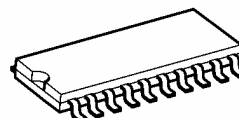
Note: xxxFW (JEDEC SOP) is not available in Japan.

TC74AC245P, TC74AC640P

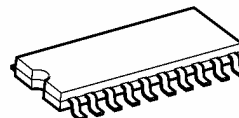


DIP20-P-300-2.54A

TC74AC245F, TC74AC640F

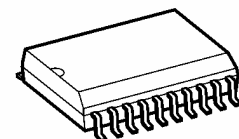


SOP20-P-300-1.27A



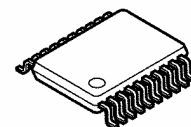
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TC74AC245FT, TC74AC640FT



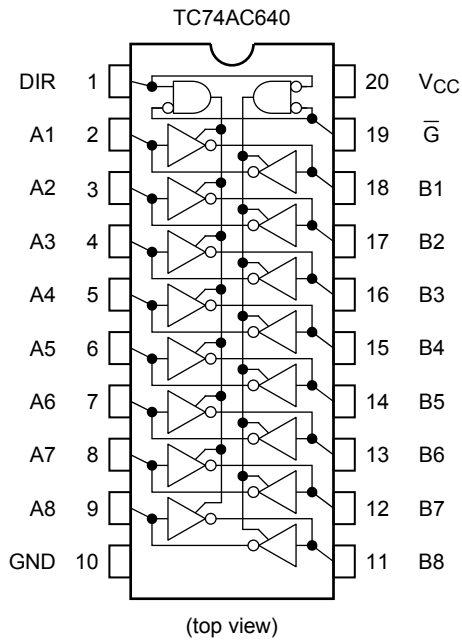
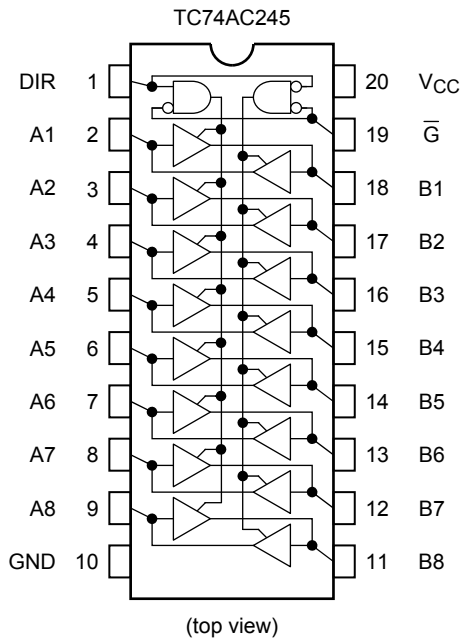
SOL20-P-300-1.27

TC74AC245FT, TC74AC640FT

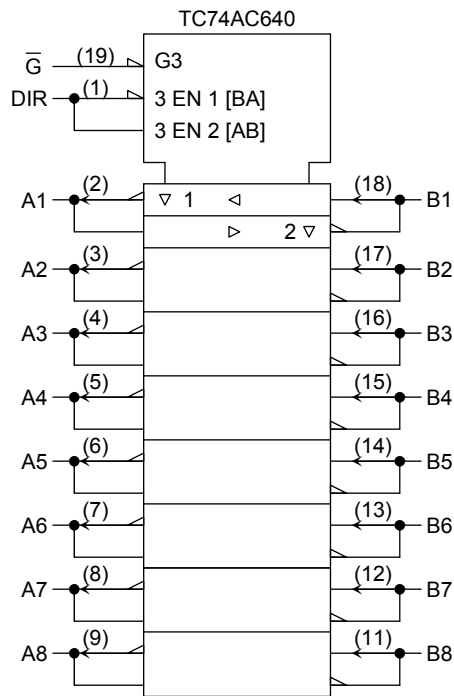
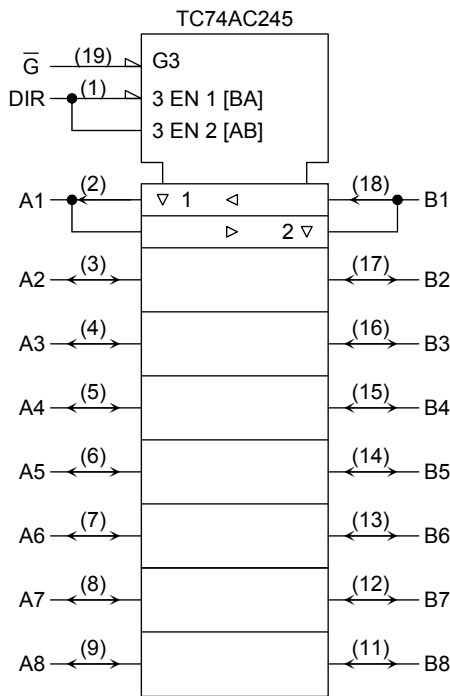


TSSOP20-P-0044-0.65A

**Pin Assignment**



**IEC Logic Symbol**



## Truth Table

Inputs		Function		Outputs	
$\overline{G}$	DIR	A Bus	B Bus	AC245	AC640
L	L	Output	Input	$A = B$	$A = \overline{B}$
L	H	Input	Output	$B = A$	$B = \overline{A}$
H	X	Z		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	$V_{IN}$	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 50$	mA
DC output current	$I_{OUT}$	$\pm 50$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 200$	mA
Power dissipation	$P_D$	500 (DIP) (Note 2)/180 (SOP/TSSOP)	mW
Storage temperature	$T_{stg}$	-65 to 150	°C

Note1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note2: 500 mW in the range of  $T_a = -40^{\circ}\text{C}$  to  $65^{\circ}\text{C}$ . From  $T_a = 65^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  a derating factor of  $-10\text{ mW}/^{\circ}\text{C}$  should be applied up to 300 mW.

## Operating Range (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	2.0 to 5.5	V
Input voltage	$V_{IN}$	0 to $V_{CC}$	V
Output voltage	$V_{OUT}$	0 to $V_{CC}$	V
Operating temperature	$T_{opr}$	-40 to 85	°C
Input rise and fall time	$dt/dV$	0 to 100 ( $V_{CC} = 3.3 \pm 0.3\text{ V}$ ) 0 to 20 ( $V_{CC} = 5 \pm 0.5\text{ V}$ )	ns/V

Note: The operating range is required to ensure the normal operation of the device. Unused inputs and bus inputs must be tied to either  $V_{CC}$  or GND. Please connect both bus inputs and the bus outputs with  $V_{CC}$  or GND when the I/O of the bus terminal changes by the function. In this case, please note that the output is not short-circuited.

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Condition		V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to 85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V <sub>IH</sub>	—		2.0 3.0 5.5	1.50 2.10 3.85	— — —	— — —	1.50 2.10 3.85	— — —	V
Low-level input voltage	V <sub>IL</sub>	—		2.0 3.0 5.5	— — —	— — —	0.50 0.90 1.65	— — —	0.50 0.90 1.65	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	2.0	1.9	2.0	—	1.9	—	V
				3.0	2.9	3.0	—	2.9	—	
				4.5	4.4	4.5	—	4.4	—	
			I <sub>OH</sub> = -4 mA I <sub>OH</sub> = -24 mA I <sub>OH</sub> = -75 mA (Note)	3.0	2.58	—	—	2.48	—	
				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	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I <sub>OL</sub> = 12 mA I <sub>OL</sub> = 24 mA I <sub>OL</sub> = 75 mA (Note)	3.0	—	—	0.36	—	0.44	
				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	—	—	±0.5	—	±5.0	µA
Input leakage current	I <sub>IN</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND		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	—	—	8.0	—	80.0	µA

Note: This spec indicates the capability of driving 50 Ω transmission lines.

One output should be tested at a time for a 10 ms maximum duration.

**AC Characteristics ( $C_L = 50 \text{ pF}$ ,  $R_L = 500 \Omega$ , input:  $t_r = t_f = 3 \text{ ns}$ )**

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit
			V <sub>CC</sub> (V)	Min	Typ.	Max	Min	Max
Propagation delay time (Note 2)	t <sub>pLH</sub>	—	3.3 ± 0.3	—	7.0	10.9	1.0	12.4
	t <sub>pHL</sub>		5.0 ± 0.5	—	5.0	7.5	1.0	8.5
Propagation delay time (Note 3)	t <sub>pLH</sub>	—	3.3 ± 0.3	—	6.4	10.0	1.0	11.4
	t <sub>pHL</sub>		5.0 ± 0.5	—	4.8	7.0	1.0	8.0
Output enable time	t <sub>pZL</sub>	—	3.3 ± 0.3	—	9.3	15.3	1.0	17.4
	t <sub>pZH</sub>		5.0 ± 0.5	—	7.1	10.5	1.0	12.0
Output disable time	t <sub>pLZ</sub>	—	3.3 ± 0.3	—	7.1	11.4	1.0	13.0
	t <sub>pHZ</sub>		5.0 ± 0.5	—	5.9	8.7	1.0	10.0
Input capacitance	C <sub>IN</sub>	DIR, $\overline{G}$	—	—	5	10	—	10
Bus input capacitance	C <sub>I/O</sub>	A <sub>n</sub> , B <sub>n</sub>	—	—	13	—	—	—
Power dissipation capacitance (Note 1)	C <sub>PD</sub>	TC74AC245	—	—	38	—	—	pF
		TC74AC640	—	—	36	—	—	

Note 1: 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:

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

Note 2: For TC74AC245 only

Note 3: For TC74AC640 only

## Package Dimensions

DIP20-P-300-2.54A

Unit : mm

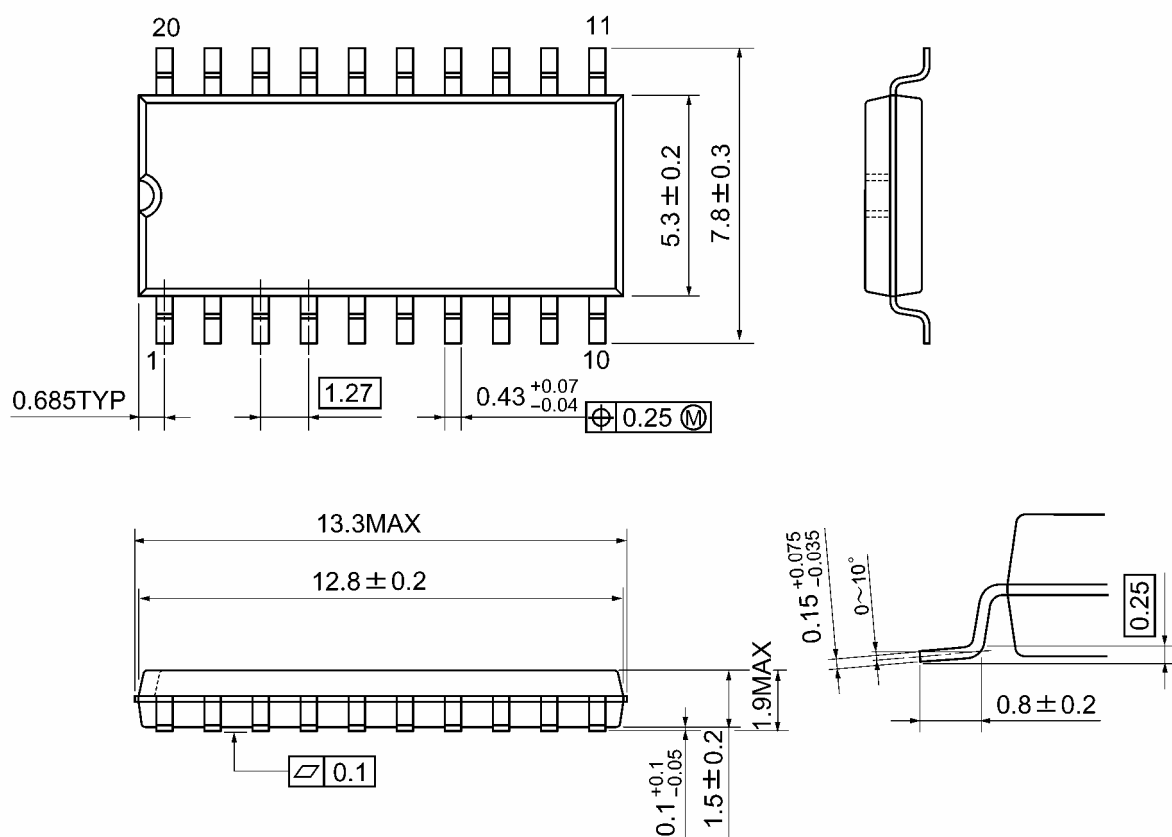


Weight: 1.30 g (typ.)

## Package Dimensions

SOP20-P-300-1.27A

Unit: mm

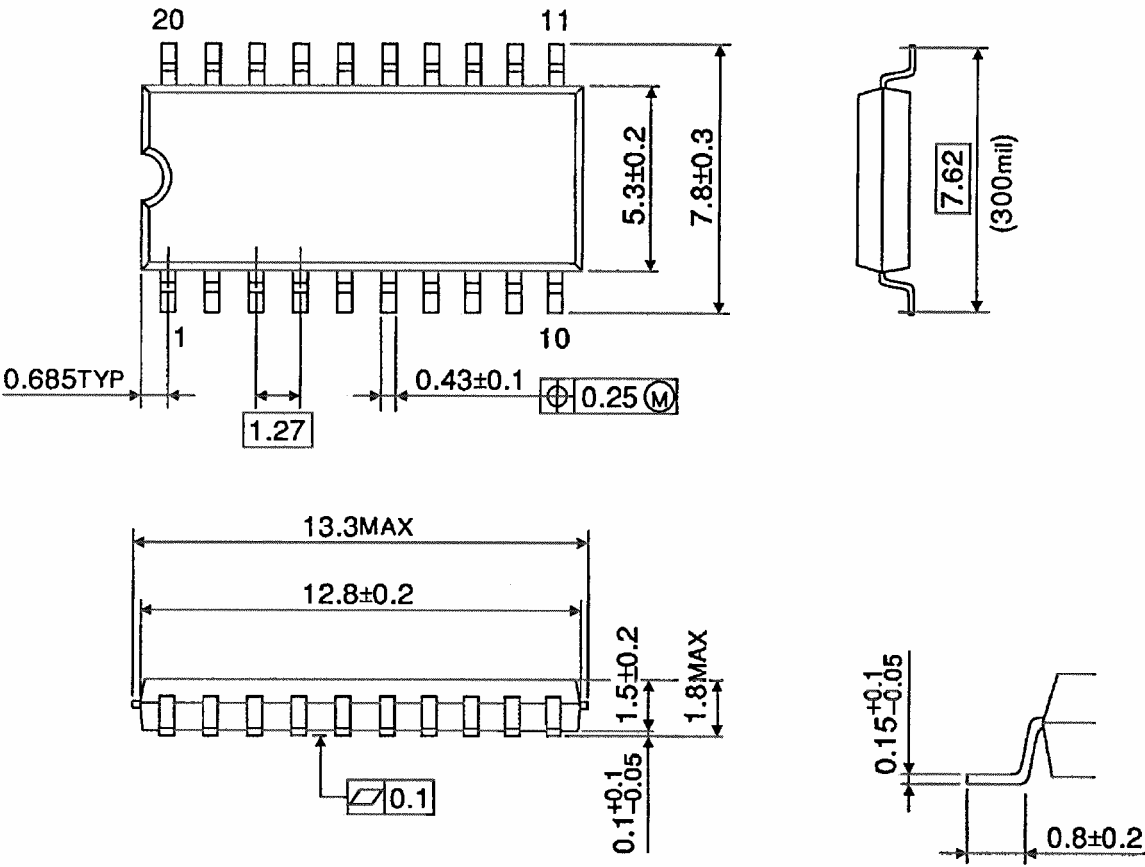


Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm



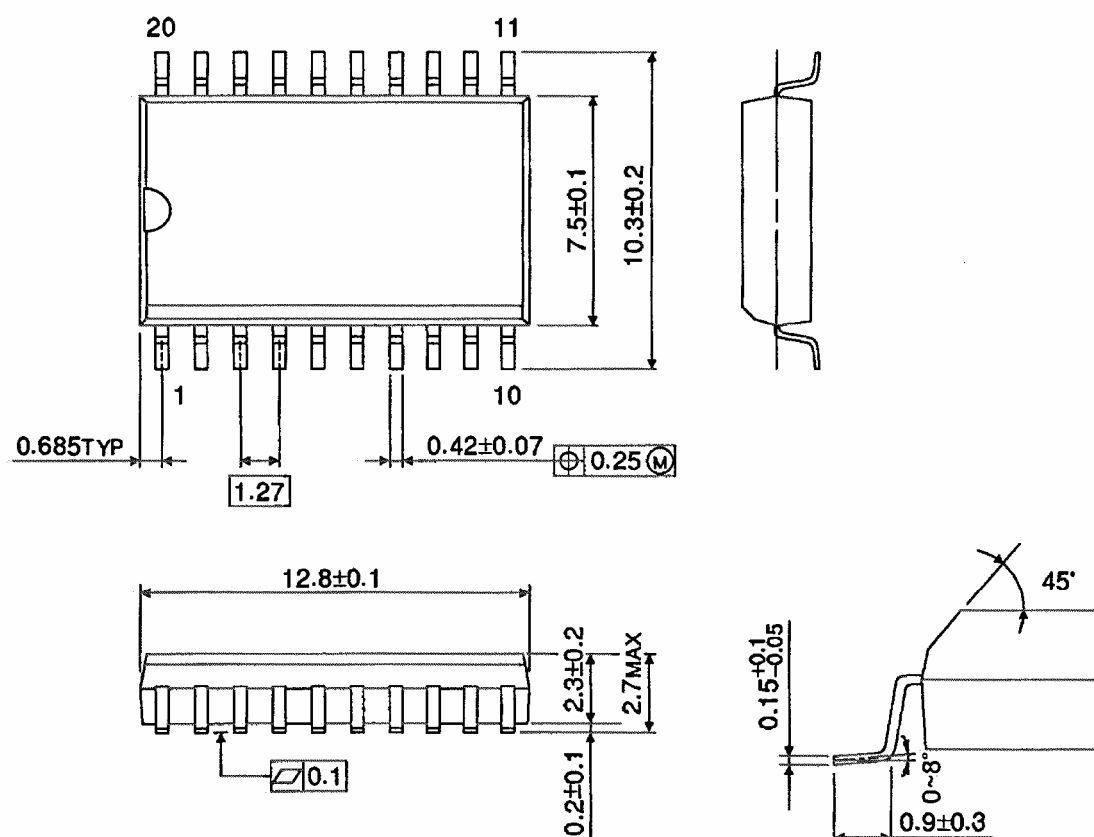
Weight: 0.22 g (typ.)



## Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm



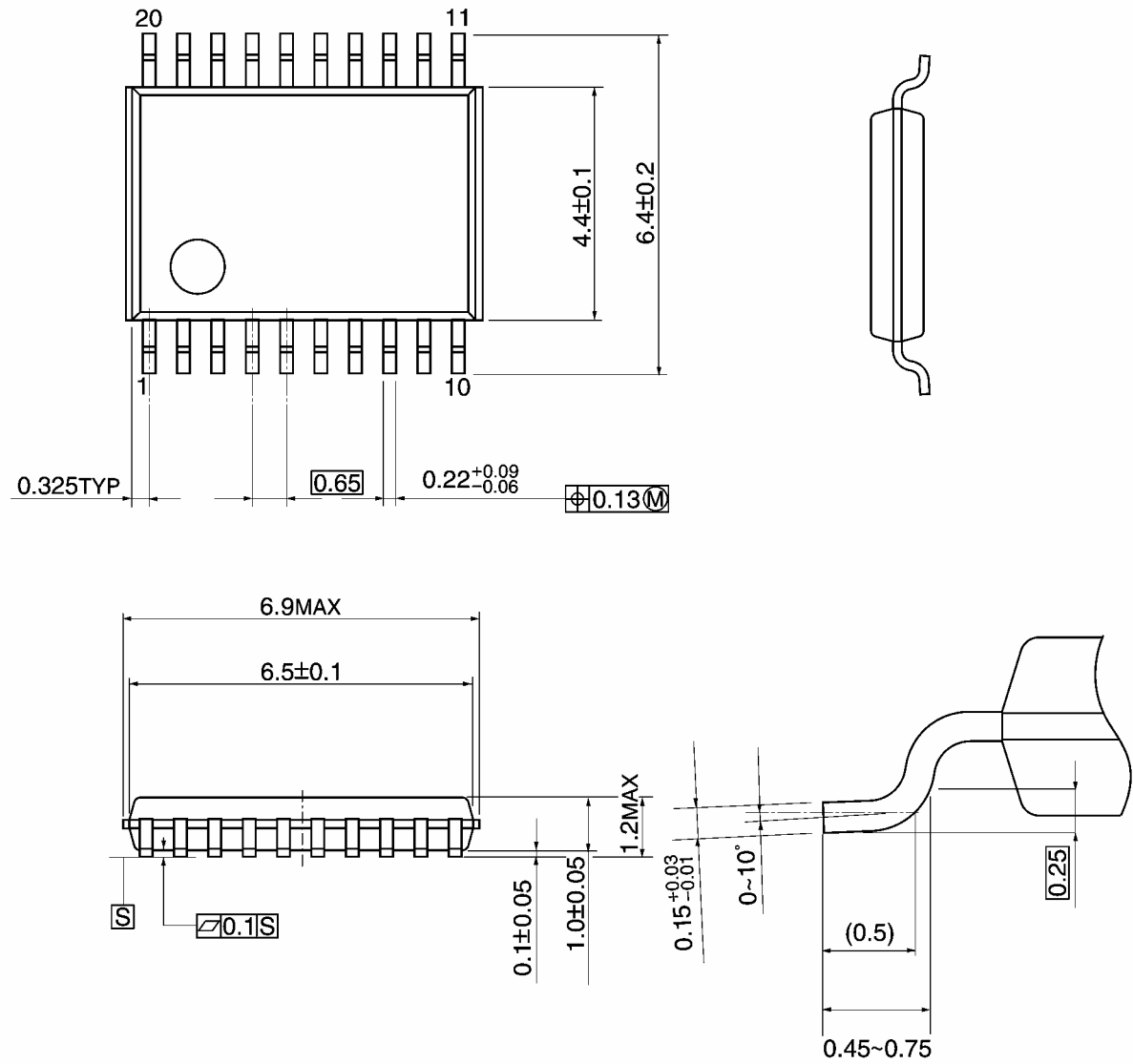
Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A

Unit: mm



Weight: 0.08 g (typ.)

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20070701-EN

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