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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

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

The TC74AC245, 640 are advanced high speed CMOS OCTAL BUS TRANSCEIVERs fabricated with silicon gate and double-layer metal wiring C^2MOS 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 ns (typ.) at V_{CC} = 5 V

- Low power dissipation: I_{CC} = 8 μA (max) at Ta = 25°C

- High noise immunity: V_{NIH} = V_{NIL} = 28% V_{CC} (min)

- Symmetrical output impedance:
  $|I_{OH}|$ = I_{OL} = 24 mA (min)
  Capability of driving 50 Ω transmission lines.

- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$

- Wide operating voltage range: V_{CC} (opr) = 2 V to 5.5 V

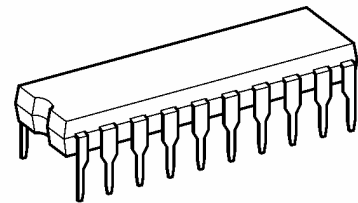- Pin and function compatible with 74F245/640

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.)
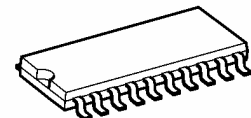TSSOP20-P-0044-0.65A : 0.08 g (typ.)

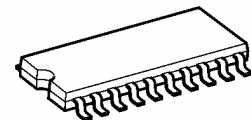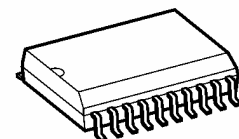TC74AC245P, TC74AC640P

DIP20-P-300-2.54A

TC74AC245F, TC74AC640F
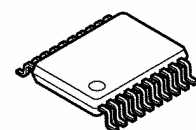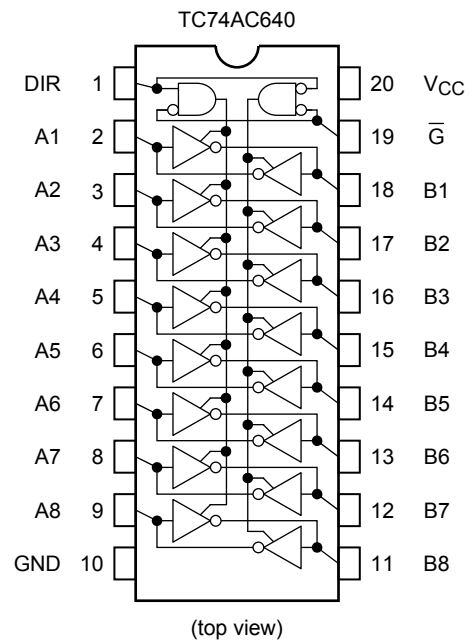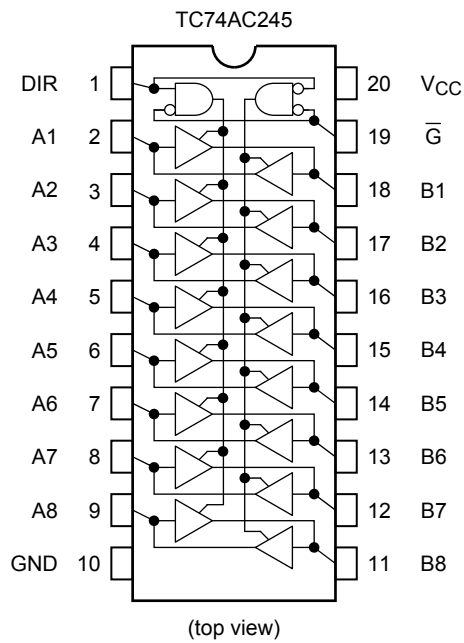

SOP20-P-300-1.27A

SOP20-P-300-1.27

TC74AC245FW, TC74AC640FW

SOL20-P-300-1.27

TC74AC245FT, TC74AC640FT

TSSOP20-P-0044-0.65A

Pin Assignment

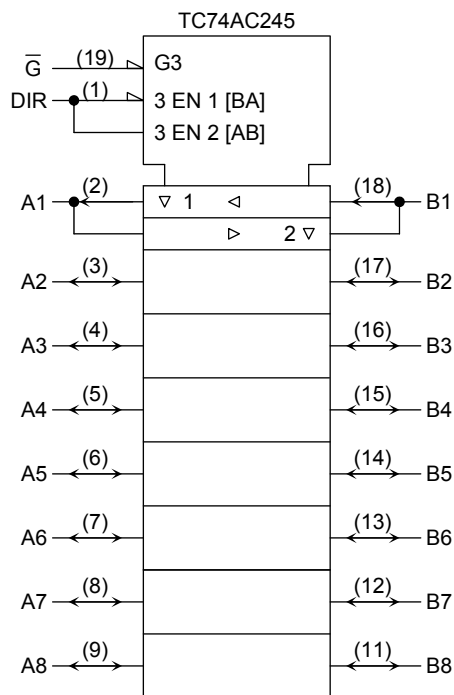TC74AC245

DIR	1		20	V_{CC}

TC74AC245 (top view)

TC74AC640 (top view)

IEC Logic Symbol

TC74AC245

TC74AC640
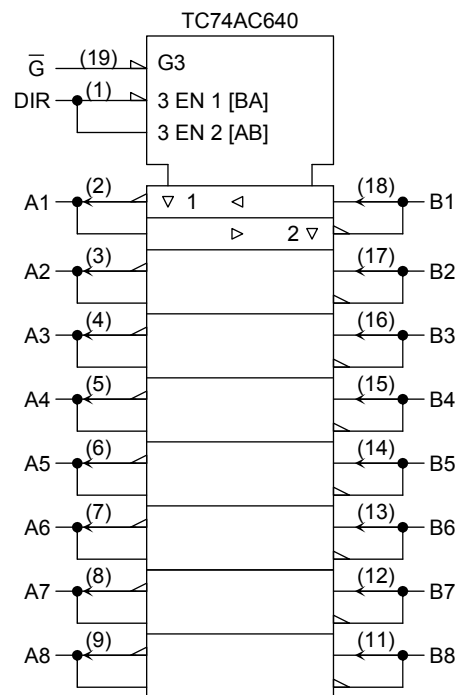
Truth Table

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}	±20	mA
Output diode current	I_{OK}	±50	mA
DC output current	I_{OUT}	±50	mA
DC V_{CC}/ground current	I_{CC}	±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 Ta = −40°C to 65°C. From Ta = 65°C to 85°C a derating factor of −10 mW/°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 ± 0.3 V) 0 to 20 (V_{CC} = 5 ± 0.5 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 VCC or GND. Please connect both bus inputs and the bus outputs with VCC 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_{CC} (V)	Ta = 25°C			Ta = −40 to 85°C		Unit
					Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—		2.0	1.50	—	—	1.50	—	V
				3.0	2.10	—	—	2.10	—	
				5.5	3.85	—	—	3.85	—	
Low-level input voltage	V_{IL}	—		2.0	—	—	0.50	—	0.50	V
				3.0	—	—	0.90	—	0.90	
				5.5	—	—	1.65	—	1.65	
High-level output voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −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_{OH} = −4 mA	3.0	2.58	—	—	2.48	—	
			I_{OH} = −24 mA	4.5	3.94	—	—	3.80	—	
			I_{OH} = −75 mA (Note)	5.5	—	—	—	3.85	—	
Low-level output voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 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_{OL} = 12 mA	3.0	—	—	0.36	—	0.44	
			I_{OL} = 24 mA	4.5	—	—	0.36	—	0.44	
			I_{OL} = 75 mA (Note)	5.5	—	—	—	—	1.65	
3-state output off-state current	I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		5.5	—	—	±0.5	—	±5.0	µA
Input leakage current	I_{IN}	V_{IN} = V_{CC} or GND		5.5	—	—	±0.1	—	±1.0	µA
Quiescent supply current	I_{CC}	V_{IN} = V_{CC} 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 pF, R$_L$ = 500 Ω, input: t$_r$ = t$_f$ = 3 ns)

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

Note 1: 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:

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

Note 2: For TC74AC245 only

Note 3: For TC74AC640 only

Package Dimensions

DIP20-P-300-2.54A

Unit : mm

20   11

6.4±0.2

1   10

7.62

0~15°

0.25 +0.1 -0.05

25.1 MAX

24.6±0.2

0.95±0.1

3.5±0.2

4.15±0.3

0.51 MIN

3.3±0.3

0.87 TYP

1.4±0.1

0.5±0.1

⊕ 0.25 Ⓜ

2.54
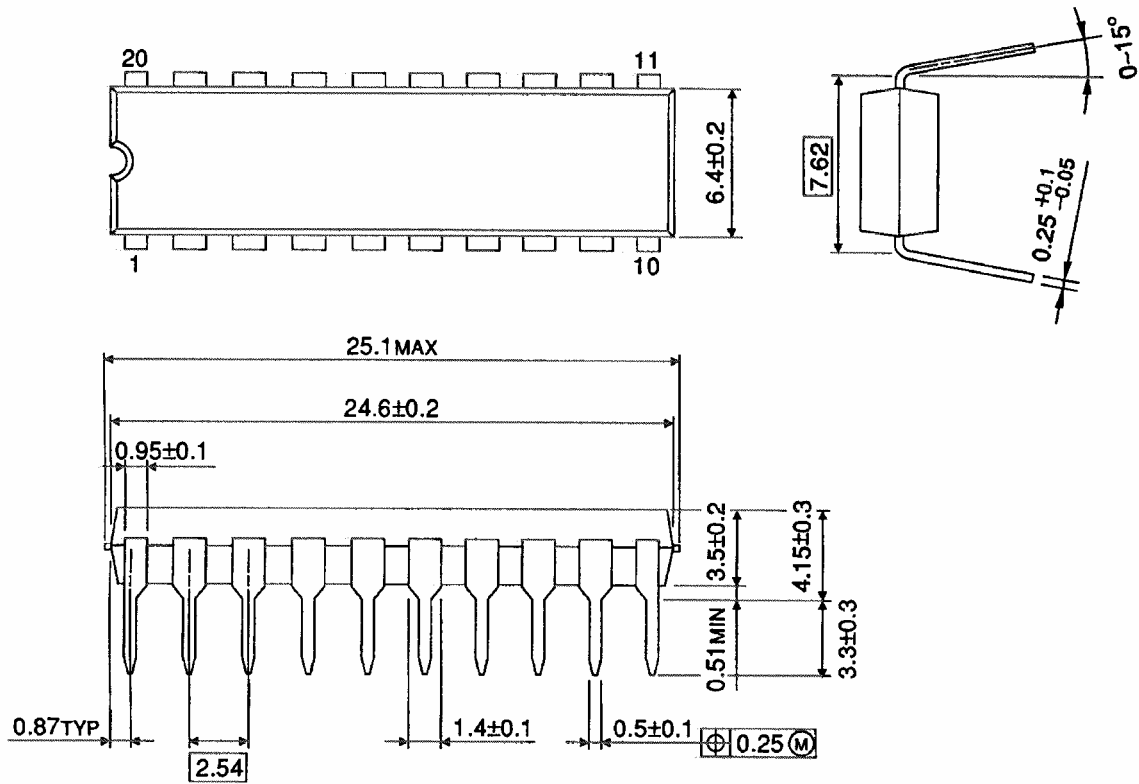
Weight: 1.30 g (typ.)

Package Dimensions

SOP20-P-300-1.27A   Unit: mm

20   11

5.3 ± 0.2
7.8 ± 0.3

1   10

0.685TYP   1.27   0.43 $^{+0.07}_{-0.04}$ ⊕ 0.25 Ⓜ

13.3MAX

12.8 ± 0.2

1.9MAX

▱ 0.1

0.1 $^{+0.1}_{-0.05}$

1.5 ± 0.2

0.15 $^{+0.075}_{-0.035}$

0 ~ 10°

0.25

0.8 ± 0.2
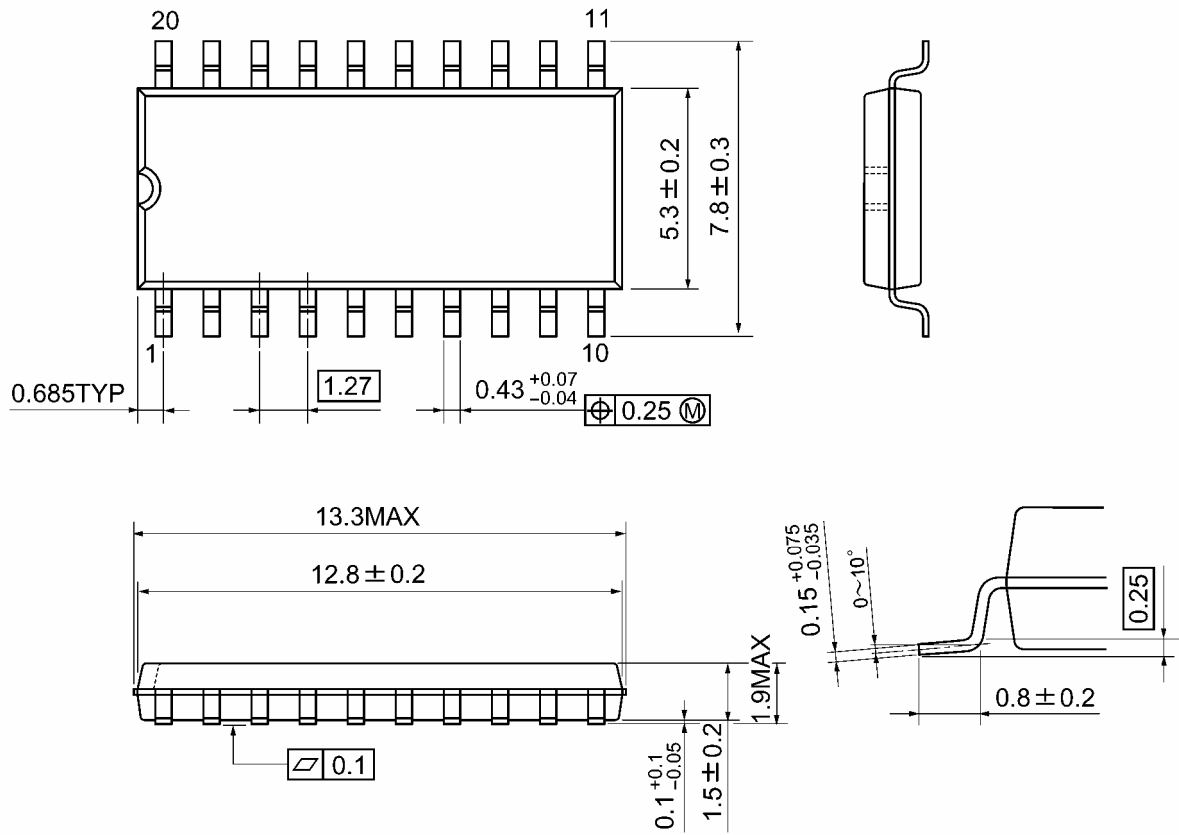
Weight: 0.22 g (typ.)

Package Dimensions

SOP20-P-300-1.27

Unit : mm
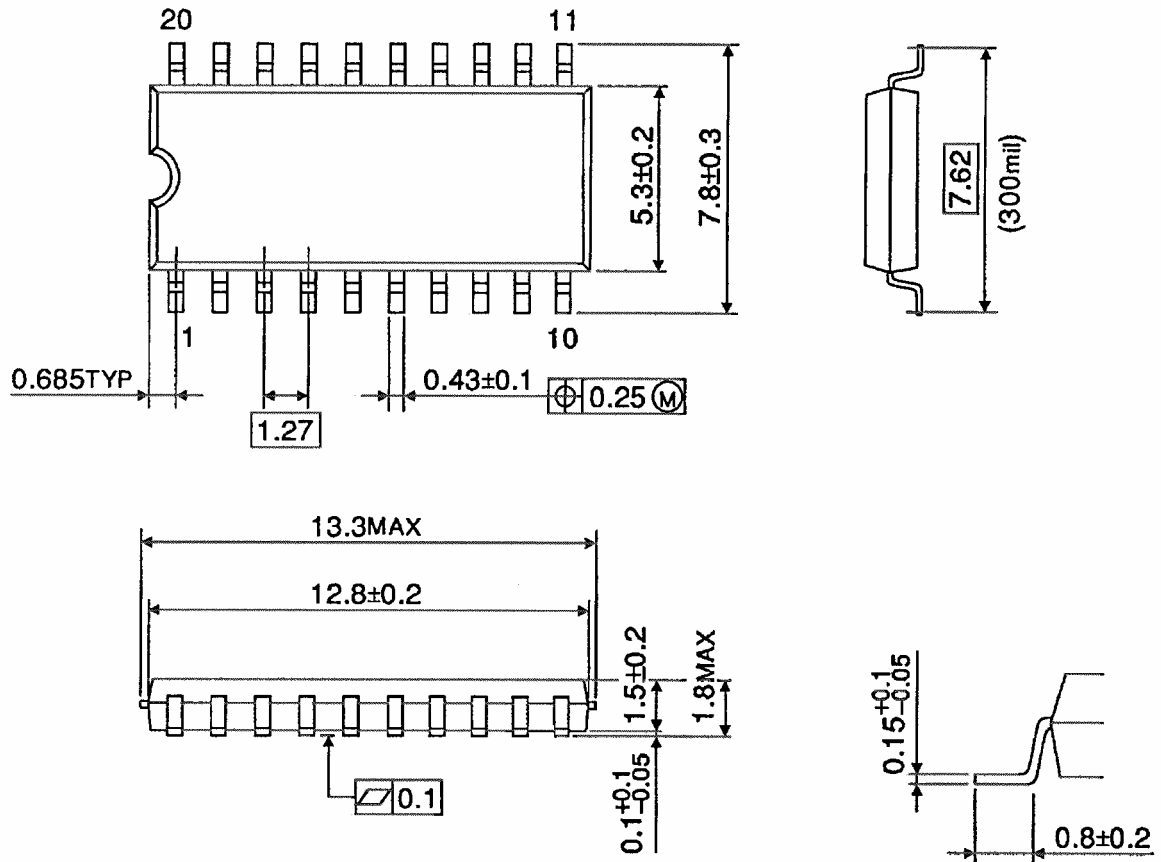
Weight: 0.22 g (typ.)

Package Dimensions (Note)

SOL20-P-300-1.27

Unit : mm
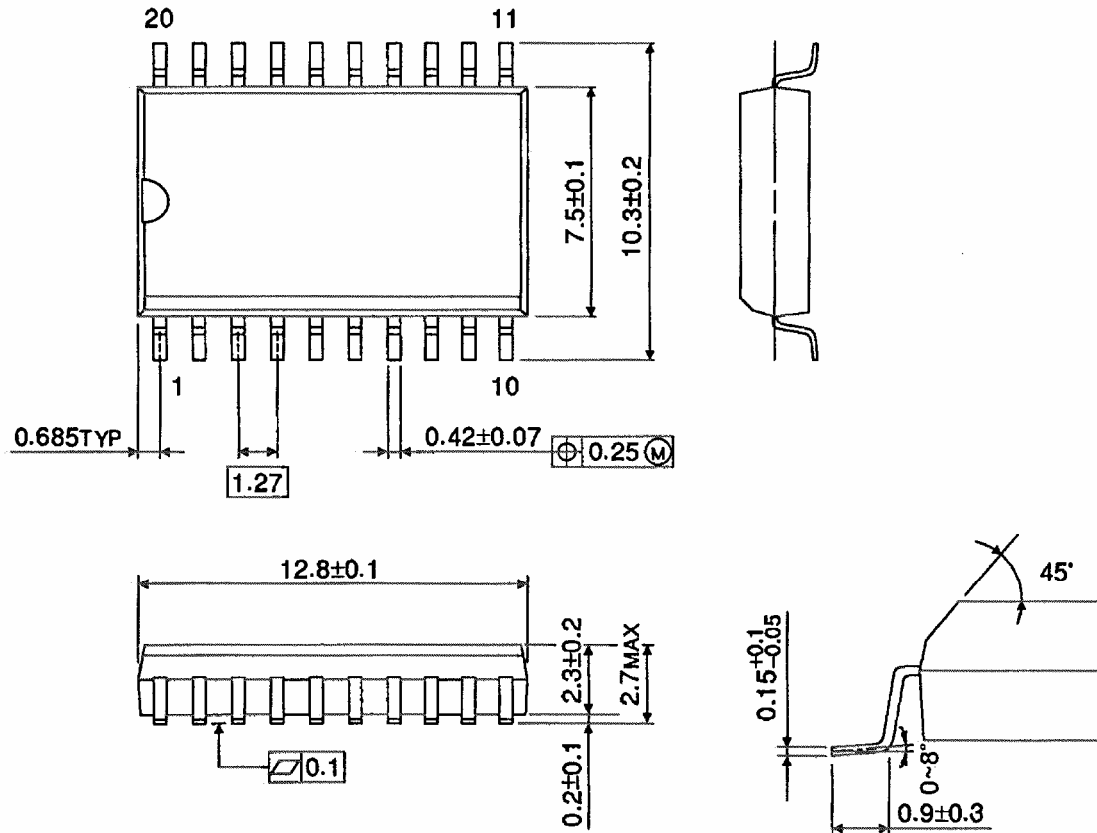
Note: This package is not available in Japan.

Weight: 0.46 g (typ.)

Package Dimensions

TSSOP20-P-0044-0.65A   Unit: mm
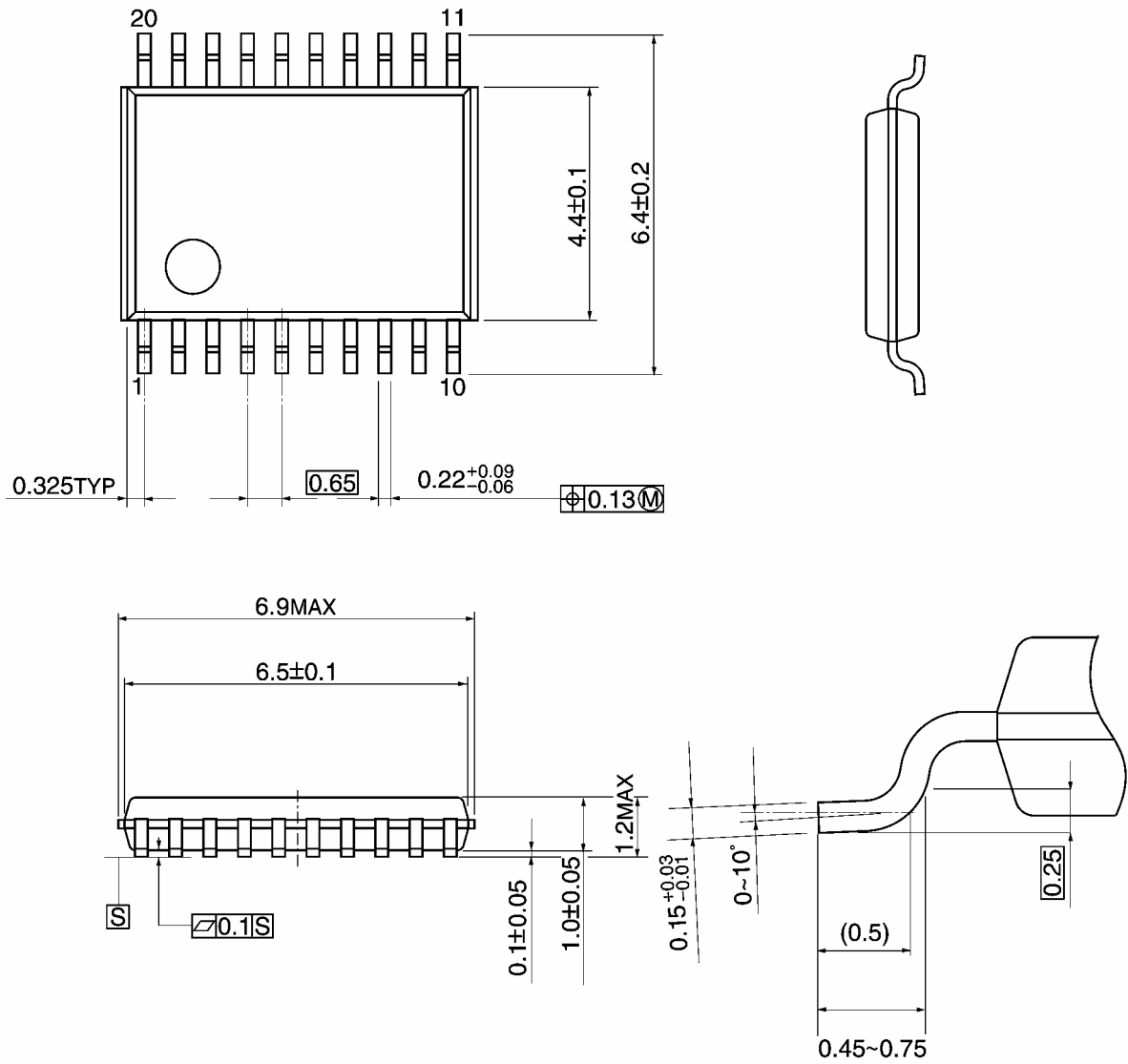
Weight: 0.08 g (typ.)

RESTRICTIONS ON PRODUCT USE