

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC74ACT245P, TC74ACT245F, TC74ACT245FW, TC74ACT245FT**  
**TC74ACT640P, TC74ACT640F, TC74ACT640FW, TC74ACT640FT**

**OCTAL BUS TRANSCEIVER**

**TC74ACT245P/F/FW/FT 3-STATE, NON-INVERTING**  
**TC74ACT640P/F/FW/FT 3-STATE, INVERTING**

(Note) The JEDEC SOP (FW) is not available in Japan.

The TC74ACT245 and 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.

These devices may be used as a level converter for interfacing TTL or NMOS to High Speed CMOS. The inputs are compatible with TTL, NMOS and CMOS output voltage levels.

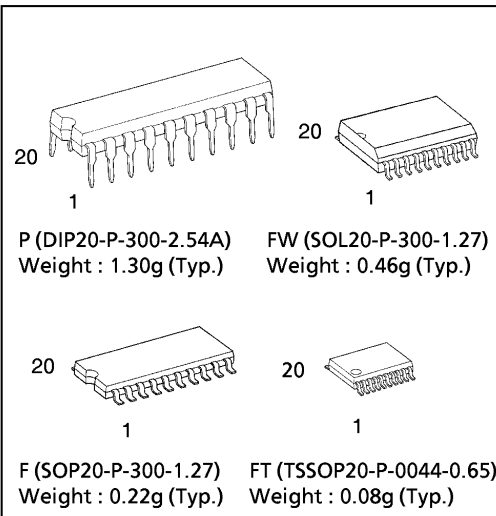
They are intended for two-way asynchronous communication between data busses. The direction of data transmission is determined by the level of the DIR input.

The enable input ( $\bar{G}$ ) 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:**

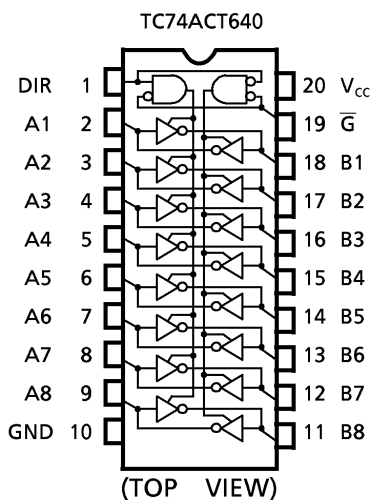
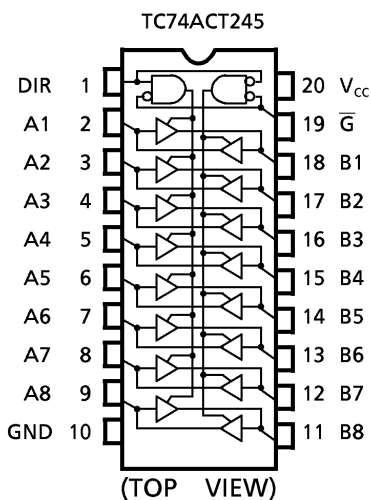
- High Speed.....  $t_{pd} = 4.7ns(typ.)$  at  $V_{CC} = 5V$
- Low Power Dissipation.....  $I_{CC} = 8\mu A(Max.)$  at  $T_a = 25^\circ C$
- Compatible with TTL outputs....  $V_{IL} = 0.8V(Max.)$   
 $V_{IH} = 2.0V(Min.)$
- Symmetrical Output Impedance...  $|I_{OH}| = I_{OL} = 24mA(Min.)$   
 Capability of driving 50Ω transmission lines.
- Balanced Propagation Delays....  $t_{pLH} \approx t_{pHL}$
- Pin and Function Compatible with 74F245/640



**APPLICATION NOTES**

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

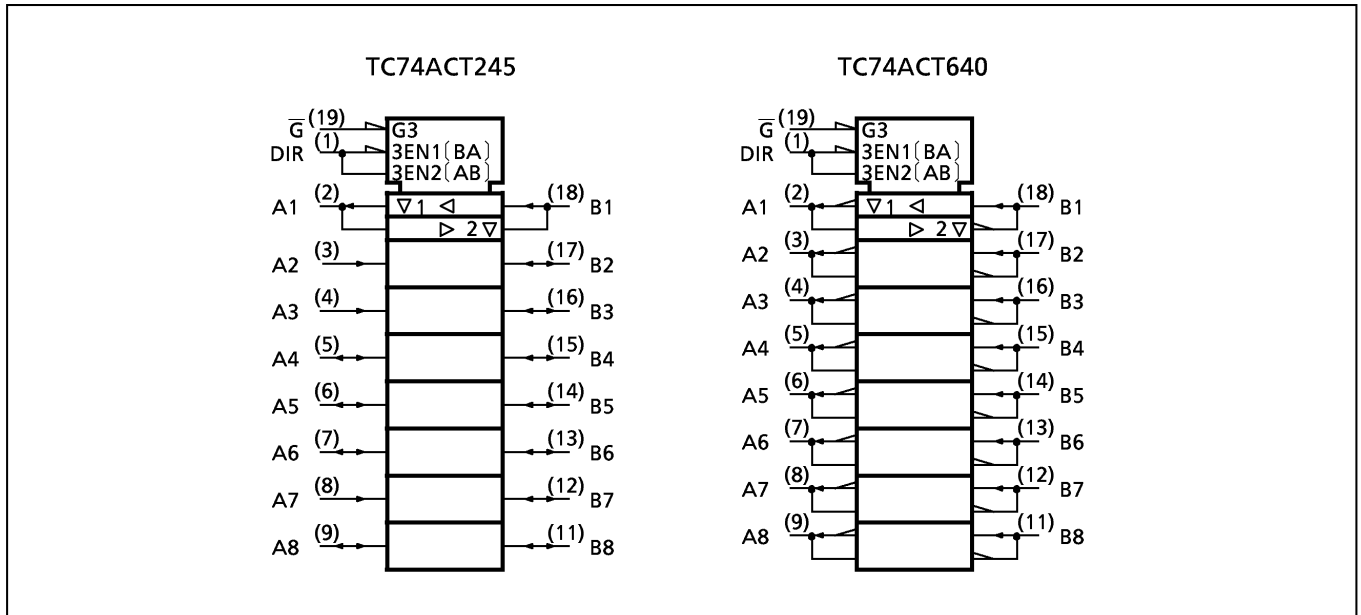
**PIN ASSIGNMENT**



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IEC LOGIC SYMBOL



TRUTH TABLE

| INPUTS    |     | FUNCTION       |        | OUTPUTS |               |
|-----------|-----|----------------|--------|---------|---------------|
| $\bar{G}$ | DIR | A BUS          | B BUS  | ACT245  | ACT640        |
| L         | L   | OUTPUT         | INPUT  | A = B   | A = $\bar{B}$ |
| L         | H   | INPUT          | OUTPUT | B = A   | B = $\bar{A}$ |
| H         | X   | High Impedance |        | Z       | Z             |

X : Don't Care  
Z : High Impedance

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- The information contained herein is subject to change without notice.

**ABSOLUTE MAXIMUM RATINGS**

| PARAMETER                   | SYMBOL    | VALUE                        | UNIT |
|-----------------------------|-----------|------------------------------|------|
| Supply Voltage Range        | $V_{CC}$  | -0.5~7.0                     | V    |
| DC Input Voltage            | $V_{IN}$  | -0.5~ $V_{CC} + 0.5$         | V    |
| DC Output Voltage           | $V_{OUT}$ | -0.5~ $V_{CC} + 0.5$         | 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)* / 180 (SOP/TSSOP) | mW   |
| Storage Temperature         | $T_{stg}$ | -65~150                      | °C   |

\*500mW in the range of  $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$ . 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 300mW.

**RECOMMENDED OPERATING CONDITIONS**

| PARAMETER                | SYMBOL    | VALUE       | UNIT   |
|--------------------------|-----------|-------------|--------|
| Supply Voltage           | $V_{CC}$  | 4.5~5.5     | V      |
| Input Voltage            | $V_{IN}$  | 0~ $V_{CC}$ | V      |
| Output Voltage           | $V_{OUT}$ | 0~ $V_{CC}$ | V      |
| Operating Temperature    | $T_{opr}$ | -40~85      | °C     |
| Input Rise and Fall Time | $dt / dV$ | 0~10        | ns / V |

**DC ELECTRICAL CHARACTERISTICS**

| PARAMETER                            | SYMBOL   | TEST CONDITION   | $V_{CC}$<br>(V)   | $T_a = 25^{\circ}\text{C}$ |               |                  | $T_a = -40 \sim 85^{\circ}\text{C}$ |                     | UNIT |
|--------------------------------------|----------|--|-------------------|----------------------------|---------------|------------------|-------------------------------------|---------------------|------|
|                                      |          |  |                   | MIN.                       | TYP.          | MAX.             | MIN.                                | MAX.                |      |
| High - Level Input Voltage           | $V_{IH}$ |  | 4.5<br>}<br>5.5   | 2.0                        | —             | —                | 2.0                                 | —                   | V    |
| Low - Level Input Voltage            | $V_{IL}$ |  | 4.5<br>}<br>5.5   | —                          | —             | 0.8              | —                                   | 0.8                 | V    |
| High - Level Output Voltage          | $V_{OH}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OH} = -50\mu\text{A}$<br>$I_{OH} = -24\text{mA}$<br>$I_{OH} = -75\text{mA}^*$ | 4.5<br>4.5<br>5.5 | 4.4<br>3.94<br>—           | 4.5<br>—<br>— | —<br>—<br>—      | 4.4<br>3.80<br>3.85                 | —<br>—<br>—         | V    |
| Low - Level Output Voltage           | $V_{OL}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$I_{OL} = 50\mu\text{A}$<br>$I_{OL} = 24\text{mA}$<br>$I_{OL} = 75\text{mA}^*$    | 4.5<br>4.5<br>5.5 | —<br>—<br>—                | 0.0<br>—<br>— | 0.1<br>0.36<br>— | —<br>—<br>—                         | 0.1<br>0.44<br>1.65 | V    |
| 3 - State Output Off - State Current | $I_{OZ}$ | $V_{IN} = V_{IH}$ or $V_{IL}$<br>$V_{OUT} = V_{CC}$ 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               |      |
| Quiescent Supply Current             | $I_{CC}$ | $V_{IN} = V_{CC}$ or GND   | 5.5               | —                          | —             | 8.0              | —                                   | 80.0                |      |
|                                      | $I_C$    | PER INPUT : $V_{IN} = 3.4\text{V}$<br>OTHER INPUT : $V_{CC}$ or GND  | 5.5               | —                          | —             | 1.35             | —                                   | 1.5                 | mA   |

\* : This spec indicates the capability of driving 50Ω transmission lines.  
One output should be tested at a time for a 10ms maximum duration.

AC ELECTRICAL CHARACTERISTICS (  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$ , Input  $t_r = t_f = 3\text{ns}$  )

| PARAMETER                     | SYMBOL              | TEST CONDITION | Ta = 25°C           |      |      | Ta = -40~85°C |      | UNIT |
|-------------------------------|---------------------|----------------|---------------------|------|------|---------------|------|------|
|                               |                     |                | V <sub>CC</sub> (V) | MIN. | TYP. | MAX.          | MIN. |      |
| Propagation Delay Time*       | t <sub>pLH</sub>    |                | 5.0 ± 0.5           | —    | 5.0  | 8.0           | 1.0  | ns   |
|                               | t <sub>pHL</sub>    |                | 5.0 ± 0.5           | —    | 5.0  | 8.0           | 1.0  |      |
| Propagation Delay Time**      | t <sub>pLH</sub>    |                | 5.0 ± 0.5           | —    | 5.7  | 8.5           | 1.0  |      |
|                               | t <sub>pHL</sub>    |                | 5.0 ± 0.5           | —    | 5.7  | 8.5           | 1.0  |      |
| Output Enable Time            | t <sub>pZL</sub>    |                | 5.0 ± 0.5           | —    | 7.3  | 12.3          | 1.0  |      |
|                               | t <sub>pZH</sub>    |                | 5.0 ± 0.5           | —    | 7.3  | 12.3          | 1.0  |      |
| Output Disable Time           | t <sub>pLZ</sub>    |                | 5.0 ± 0.5           | —    | 6.3  | 9.7           | 1.0  |      |
|                               | t <sub>pHZ</sub>    |                | 5.0 ± 0.5           | —    | 6.3  | 9.7           | 1.0  |      |
| Input Capacitance             | C <sub>IN</sub>     | DIR, $\bar{G}$ | —                   | 5    | 10   | —             | 10   | pF   |
| Bus Input Capacitance         | C <sub>I/O</sub>    | An, Bn         | —                   | 13   | —    | —             | —    |      |
| Power Dissipation Capacitance | C <sub>PD</sub> (1) | TC74ACT245     | —                   | 38   | —    | —             | —    |      |
|                               |                     | TC74ACT640     | —                   | 43   | —    | —             | —    |      |

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 :

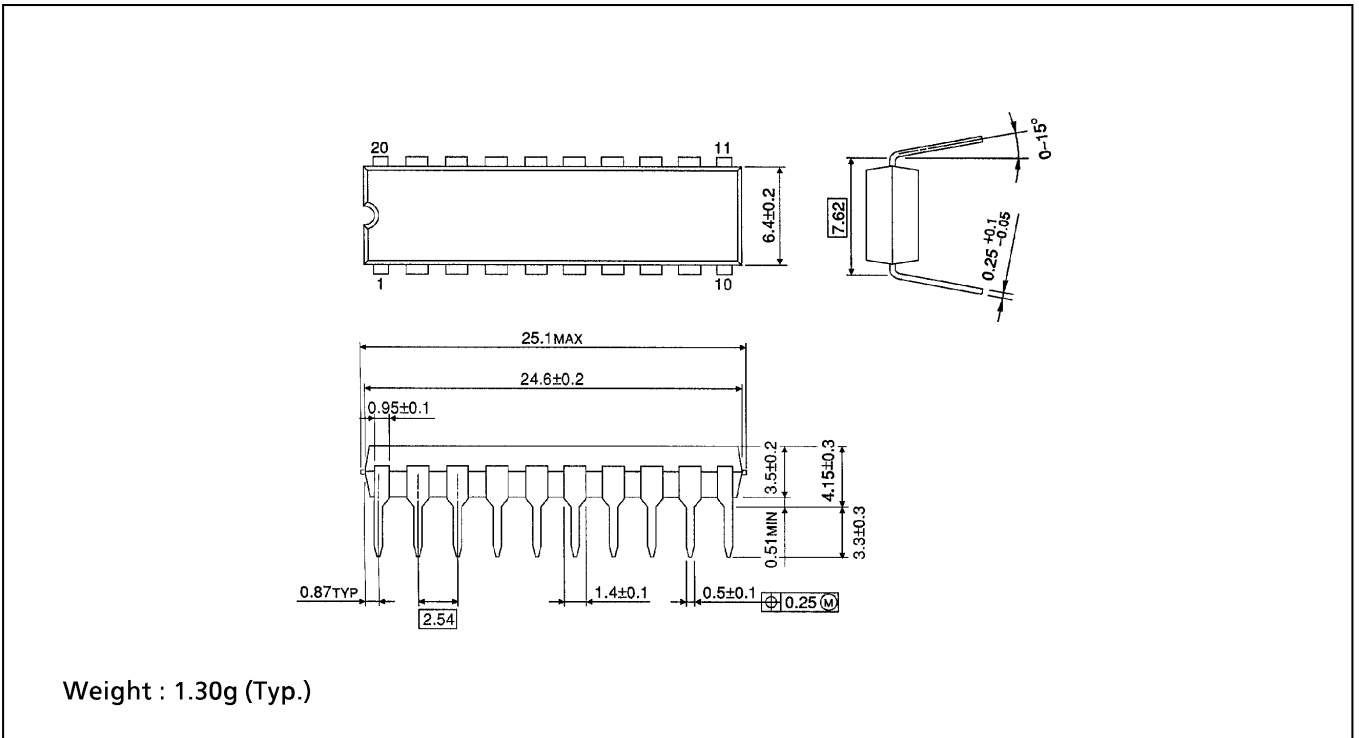
$$I_{CC}(\text{opr.}) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8 (\text{per bit})$$

(2) \* for TC74ACT245 only

\*\* for TC74ACT640 only

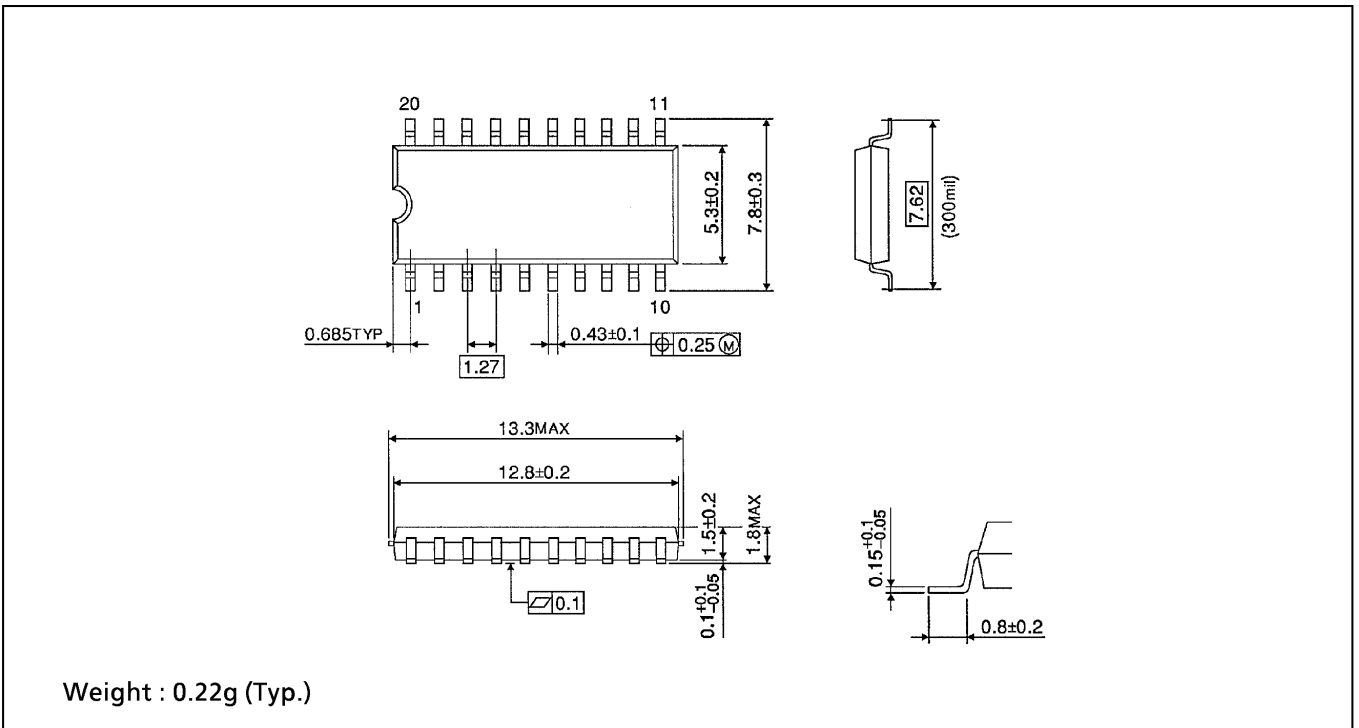
**DIP 20PIN OUTLINE DRAWING (DIP20-P-300-2.54A)**

Unit in mm



**SOP 20PIN (200mil BODY) OUTLINE DRAWING (SOP20-P-300-1.27)**

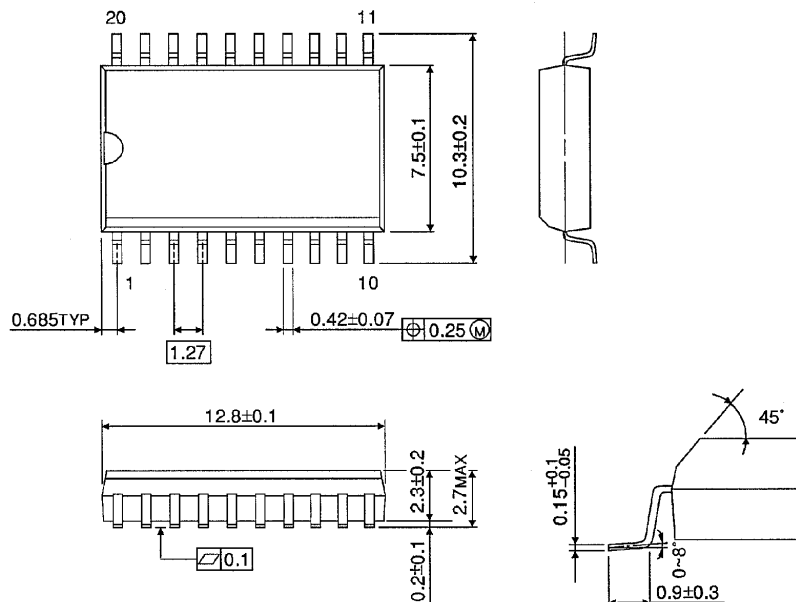
Unit in mm



**SOP 20PIN (300mil BODY) OUTLINE DRAWING (SOL20-P-300-1.27)**

Unit in mm

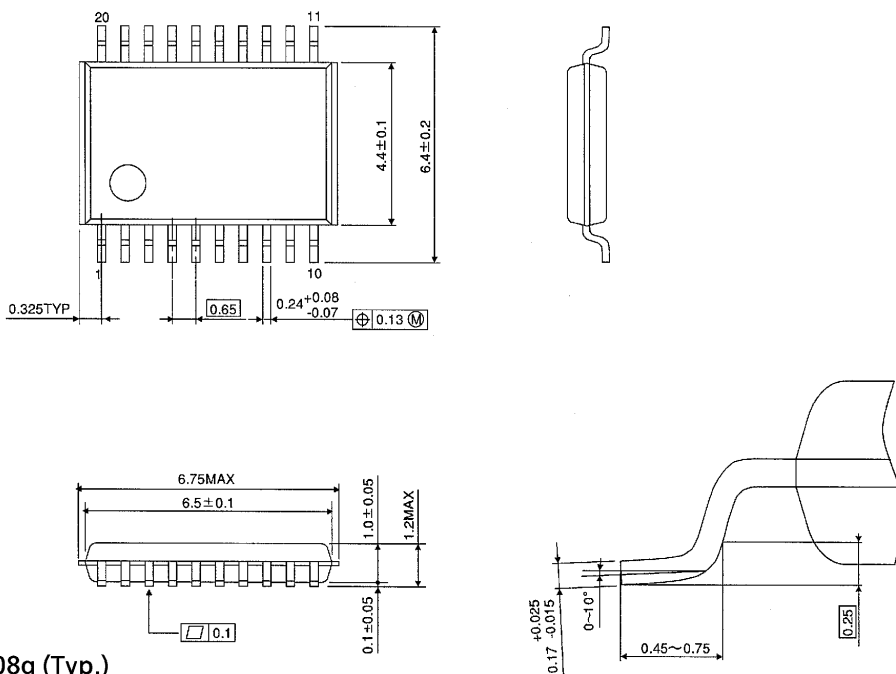
(Note) This package is not available in Japan.



Weight : 0.46g (Typ.)

**TSSOP 20PIN OUTLINE DRAWING (TSSOP20-P-0044-0.65)**

Unit in mm



Weight : 0.08g (Typ.)