

TOSHIBA BIPOLAR DIGITAL IC SILICON MONOLITHIC

TD62930P, TD62930F

THREE-CHANNEL SMALL-SIGNAL IGBT GATE DRIVER

The TD62930P and TD62930F are drivers using 5 V-signal input to output the signals required to drive IGBT gates.

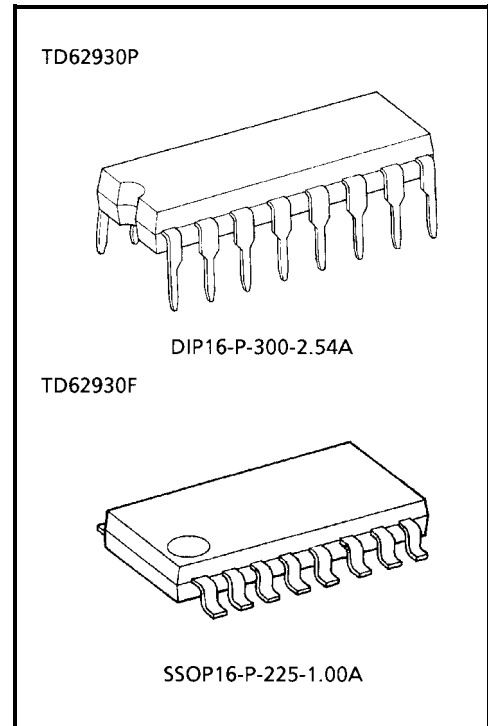
TD62930P / F is the most suitable for low-side drive of a miniature IGBT to use for inverter for the household electric appliances mainly.

The outputs are separated into high-side and low-side outputs. This separation simplifies the IGBT gate on / off timing control. Two output signals are assigned for one input signal.

The high-side output is high-level for high-level input, and high impedance for low-level input. The low-side output is high impedance for high-level input, and low-level for low-level input.

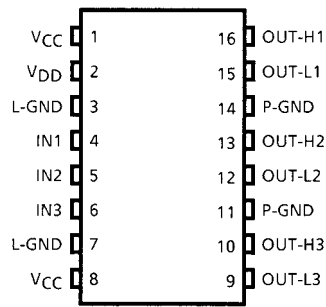
FEATURES

- Power supply voltage (maximum rating)
 High-voltage block power supply voltage $V_{CC} = 30\text{ V}$
 Low-voltage block power supply voltage $V_{DD} = 7\text{ V}$
- Output current (maximum rating)
 High-side peak current $I_{OUT} = -0.4\text{ A (max)}$
 Low-side peak current $I_{OUT} = 0.4\text{ A (max)}$
- Input-output response speed $t_{pHL}, t_{pLH} \leq 1\ \mu\text{s (max)}$
- Package : DIP16 / SSOP16 (1.00 mm pitch)

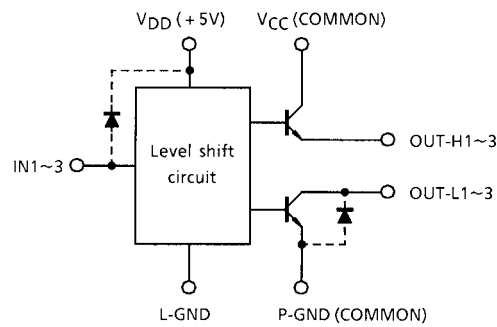


Weight
 DIP16-P-300-2.54A : 1.11 g (Typ.)
 SSOP16-P-225-1.00A : 0.14 g (Typ.)

PIN ASSIGNMENT (TOP VIEW)



INTERNAL EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No. | PIN NAME | FUNCTION |
|------------|-----------------|---|
| 1, 8 | V _{CC} | 30 V supply pins |
| 2 | V _{DD} | 5 V supply pin |
| 3, 7 | L-GND | Ground pins for 5 V supply |
| 4, 5, 6 | IN1~3 | Input pins for 5 V output control signals |
| 11, 14 | P-GND | Ground pins for 30 V supply |
| 9, 12, 15 | OUT-L1~3 | Low-side output pins |
| 10, 13, 16 | OUT-H1~3 | High-side output pins |

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | PIN / PACKAGE | SYMBOL | RATING | UNIT |
|--------------------------------|-----------------|---------------------------|----------------------------|--------|
| Power Supply Voltage | V _{CC} | V _{CC} | 30 | V |
| Power Supply Voltage | V _{DD} | V _{DD} | 7 | V |
| Input Voltage | IN1~3 | V _{IN} | -0.5~V _{DD} + 0.5 | V |
| Output Voltage | OUT-H1~3 | V _{OUT (H)} | 0~20 (Ta = -20~85°C) | V |
| | | | 0~30 (Ta = -20~70°C) | |
| | OUT-L1~3 | V _{OUT (L)} | -0.5~20 (Ta = -20~85°C) | V |
| | | | -0.5~30 (Ta = -20~70°C) | |
| High-level Output Peak Current | OUT-H1~3 | I _{OPH} (Note 1) | -0.4 | A / ch |
| Low-level Output Peak Current | OUT-L1~3 | I _{OPL} (Note 1) | +0.4 | A / ch |
| Operating Frequency | IN1~3 | f | 25 | kHz |
| Power Dissipation | DIP16 | P _{D1} (Note 2) | 1.47 (FREE AIR) | W |
| | SSOP16 | P _{D2} (Note 2) | 0.78 (ON PCB) | W |
| Operating Ambient Temperature | | T _{opr} | -20~85 | °C |
| Storage Temperature | | T _{stg} | -55~150 | °C |

Note 1: Output pin current

The pulse width of the output pin current at peak is ≤ 1 μs, 300 pps.

Note 2: When ambient temperature exceeds 25°C

Derate the power dissipation of DIP-type devices at 11.76 mW / 1°C (device only) and

Derate the power dissipation of SMD-type devices at 6.24 mW / 1°C (mounted on the board).

RECOMMENDED OPERATING CONDITIONS (Unless otherwise specified, Ta = -20 to 70°C)

| CHARACTERISTIC | | PIN | SYMBOL | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|----------------------------|------------|-----------------|------------------|--|-----|------|-------|------|
| Input Voltage | High level | IN1~3 | V _{IH} | V _{CC} = 15 V, V _{DD} = 4.5~5.5 V | 3.5 | — | — | V |
| | Low level | | V _{IL} | | — | — | 1.0 | |
| Input Current | High level | IN1~3 | I _{IH} | V _{CC} = 15 V, V _{DD} = 4.5~5.5 V | — | — | 5 | mA |
| | Low level | | I _{IL} | | — | — | -5 | |
| Input Power Supply Voltage | | V _{CC} | V _{CC} | | 10 | 15 | 25 | V |
| | | V _{DD} | V _{DD} | | 4.5 | 5.0 | 5.5 | |
| Output Current | | OUT-H1~3 | IOH (DC) | V _{CC} = 20 V, V _{DD} = 4.5 V | — | — | -0.1 | A |
| | | | IOH (Peak) | | — | — | -0.35 | |
| | | OUT-L1~3 | IOL (DC) | V _{CC} = 20 V, V _{DD} = 4.5 V | — | — | 0.1 | |
| | | | IOL (Peak) | | — | — | 0.35 | |
| Operating Temperature | | | T _{opr} | V _{CC} = 30 V, V _{DD} = 5.5 V | -20 | 25 | 70 | °C |
| | | | | V _{CC} = 20 V, V _{DD} = 5.5 V | -20 | 25 | 85 | |

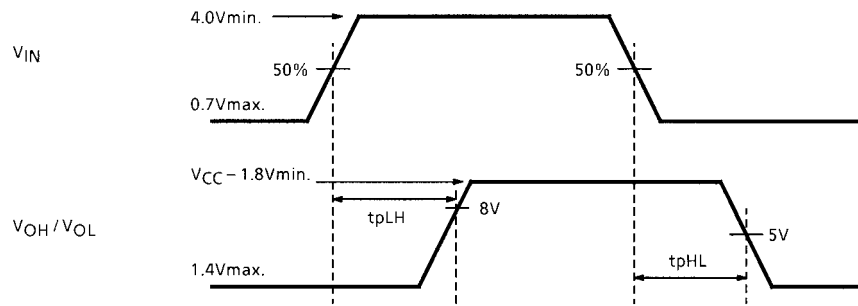
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta = -20 to 70°C)

| CHARACTERISTIC | | PIN | SYMBOL | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|--------------------------------|------------|-----------------|--------------------|---|-----------------------|-----------------------|-----------------------|------|
| Input Current | High level | IN1~3 | I _{IH} | V _{CC} = 15 V, V _{IN} = 5 V | 0.1 | 0.2 | 0.4 | mA |
| | Low level | | I _{IL} | V _{CC} = 15 V, V _{IN} = 0 V | — | 0 | — | |
| Output Voltage | High level | OUT-H1~3 | V _{OH} | V _{CC} = 15 V, V _{IH} = 5 V, R _{LH} = 100 Ω | V _{CC} - 4.0 | V _{CC} - 1.9 | V _{CC} - 1.0 | V |
| | Low level | OUT-L1~3 | V _{OL} | V _{CC} = 15 V, V _{IL} = 0 V, R _{LL} = 100 Ω | 0.3 | 0.5 | 2.5 | |
| Dissipation Current 1 | | V _{DD} | I _{DDL} | V _{DD} = 5.5 V, V _{IH} = 0 V, Ta = 25°C | — | 1.5 | 3.0 | mA |
| | | | | V _{DD} = 5.5 V, V _{IH} = 0 V, Ta = -20~85°C | — | — | 3.5 | |
| | | | I _{DDH} | V _{DD} = 5.5 V, V _{IH} = 5 V, Ta = 25°C | — | 1.8 | 3.5 | |
| | | | | V _{DD} = 5.5 V, V _{IH} = 5 V, Ta = -20~85°C | — | — | 4.0 | |
| Dissipation Current 2 | | V _{CC} | I _{CCL} | V _{CC} = 30 V, V _{DD} = 5.5 V, V _{IH} = 0 V, Ta = 25°C | — | 10.2 | 15.0 | mA |
| | | | | V _{CC} = 30 V, V _{DD} = 5.5 V, V _{IH} = 0 V | — | — | 18.0 | |
| | | | I _{CCH} | V _{CC} = 30 V, V _{DD} = 5.5 V, V _{IH} = 5 V, Ta = 25°C | — | 7.5 | 11.0 | |
| | | | | V _{CC} = 30 V, V _{DD} = 5.5 V, V _{IH} = 5 V | — | — | 14.0 | |
| Operating Power Supply Voltage | | V _{CC} | V _{CCopr} | | 10 | — | 30 | V |

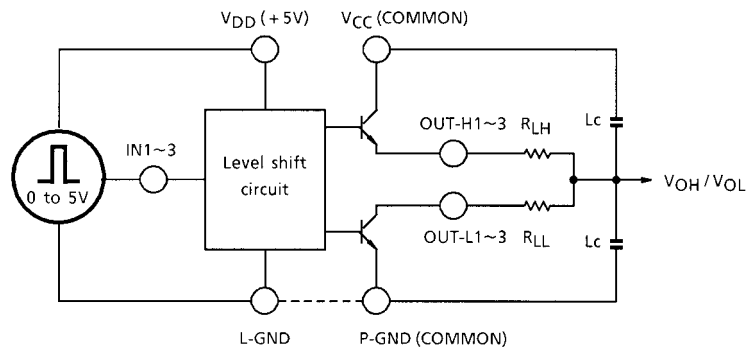
SWITCHING CHARACTERISTICS (Unless otherwise specified, Ta = -20~70°C)

| CHARACTERISTIC | | PIN | SYMBOL | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|-------------------------------|------------|----------|------------------|--|-----|------|------|------|
| Output Propagation Delay Time | High level | OUT-H1~3 | t _{PLH} | V _{DD} = 5.0 V, V _{CC} = 15 V, R _{LH} = R _{LL} = 100 Ω, V _{IN} = 0.7 to 4 V | — | 0.25 | 1.00 | μs |
| | Low level | OUT-L1~3 | t _{PHL} | V _{DD} = 5.0 V, V _{CC} = 15 V, R _{LH} = R _{LL} = 100 Ω, V _{IN} = 4 to 0.7 V | — | 0.25 | 1.00 | |

SWITCHING WAVEFORM



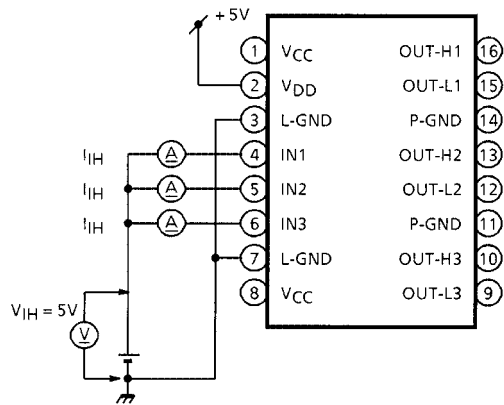
PROPAGATION DELAY TIME TEST CIRCUIT



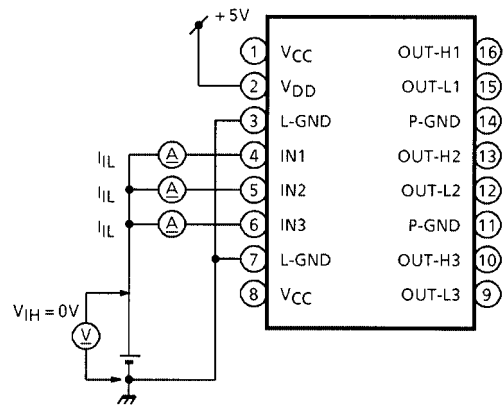
Toshiba recommends connecting load resistors as in the above diagram, utilizing the independence of the high-level and low-level sides of this IC.

TEST CIRCUIT

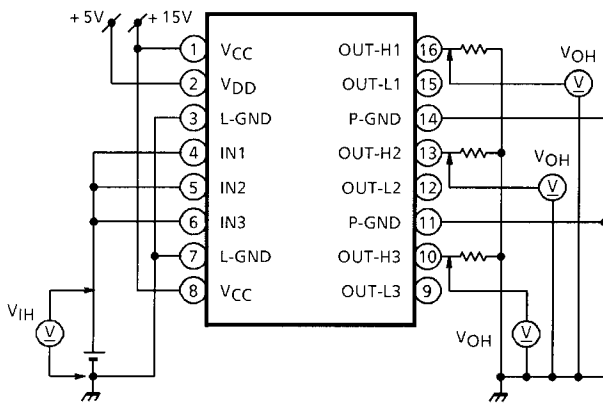
(1) I_{IH}



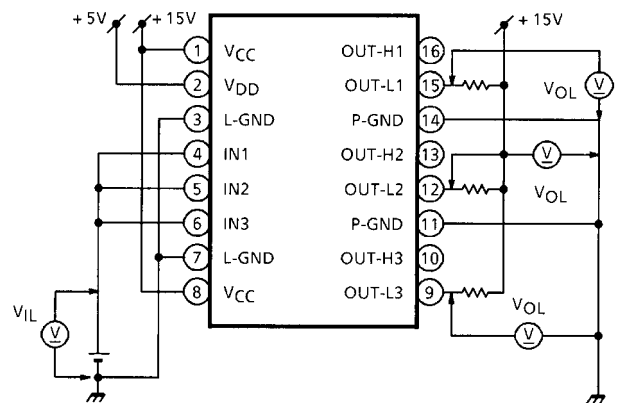
(2) I_{IL}



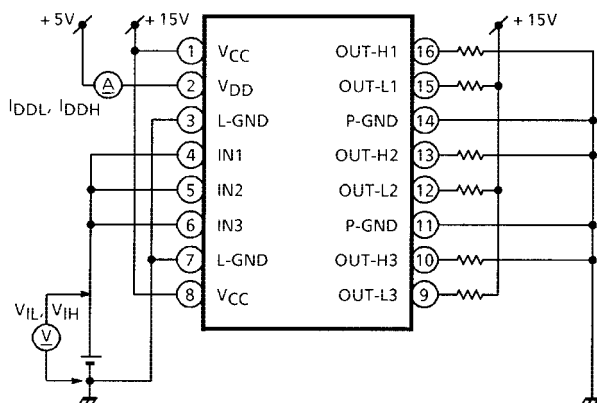
(3) V_{IH}, V_{OH}



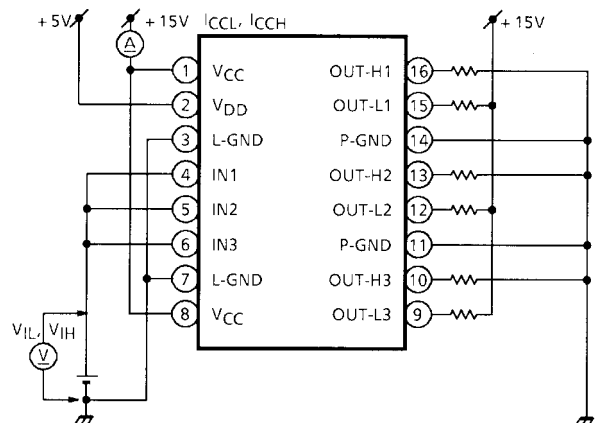
(4) V_{IL}, V_{OL}



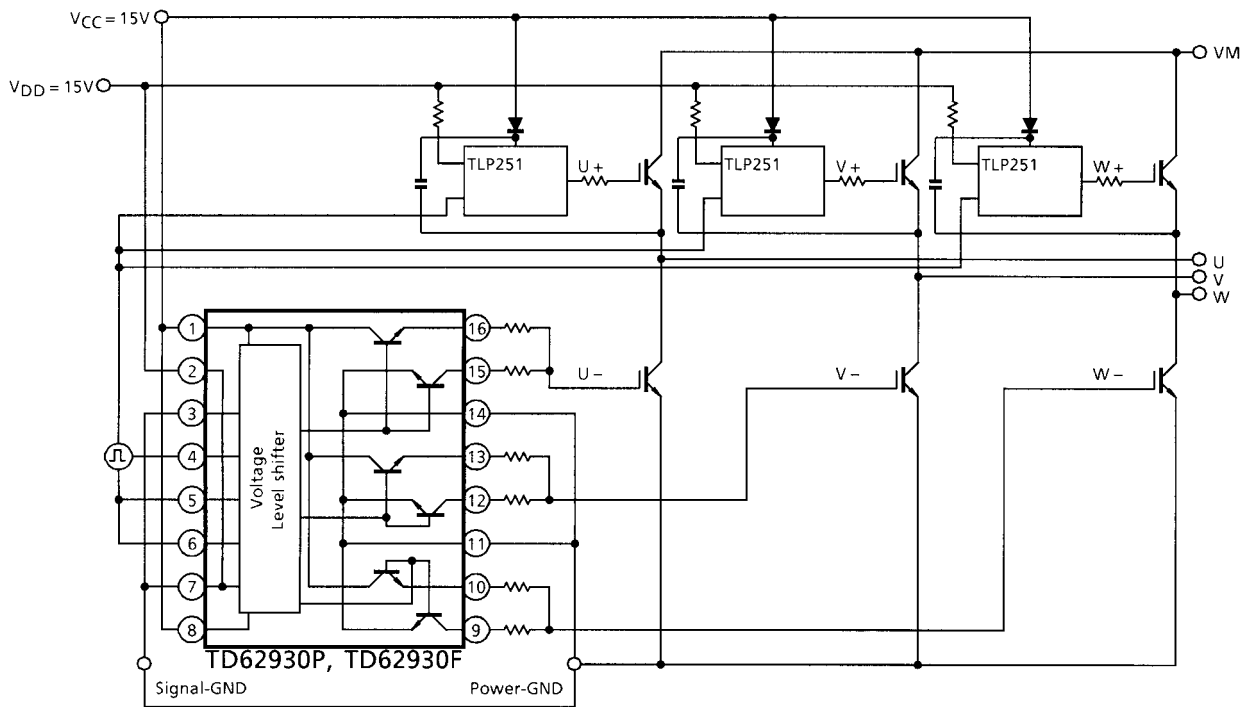
(5) I_{DDL}, I_{DDH}



(6) I_{cCL}, I_{cCH}



APPLICATION CIRCUIT



PRECAUTIONS for USING

This IC does not integrate protection circuits such as overcurrent and overvoltage protectors.

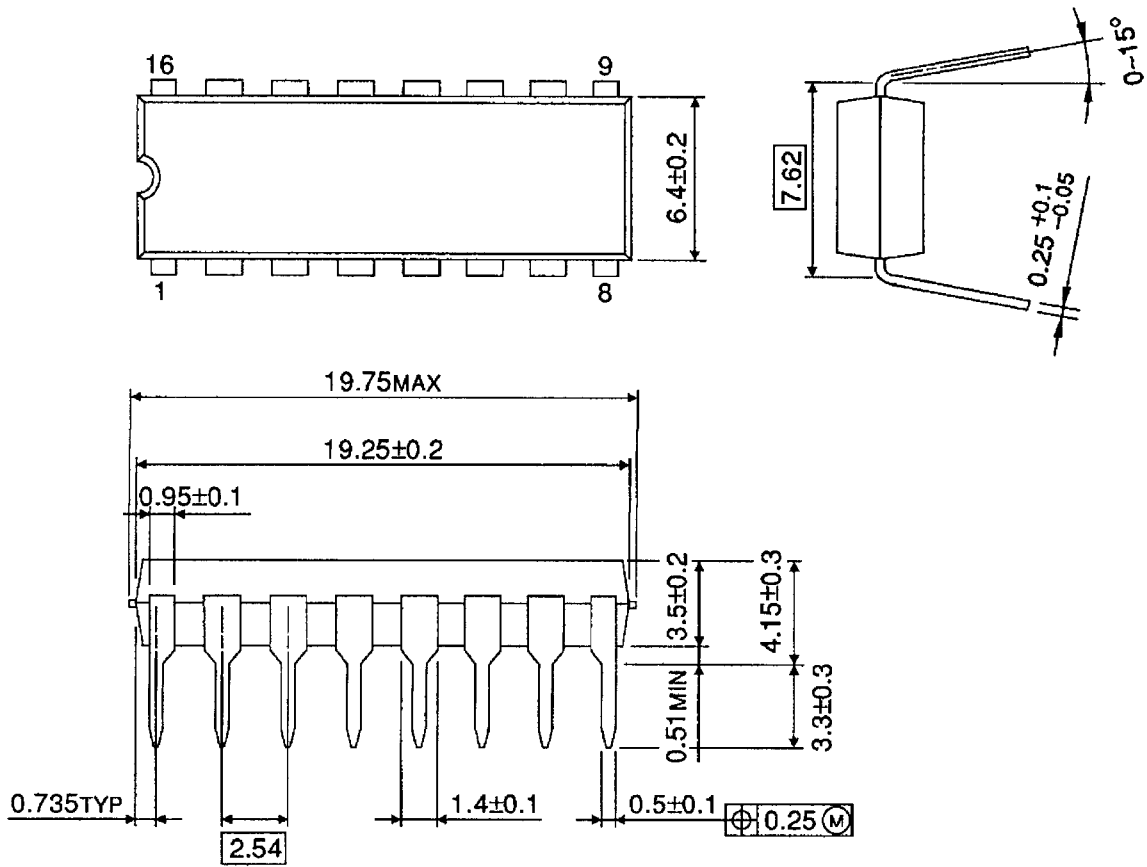
Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC.

Utmost care is necessary in the design of the output line, VCC and GND (L-GND, P-GND) line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit: mm

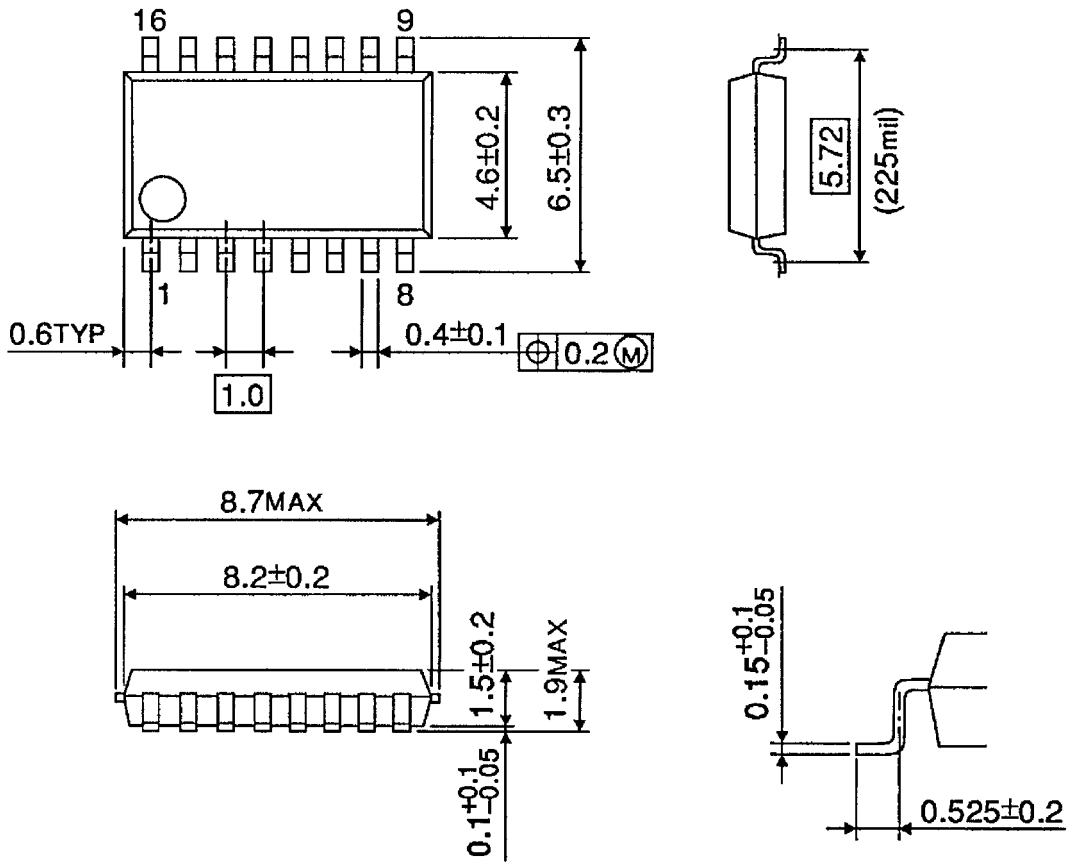


Weight: 1.11 g (Typ.)

PACKAGE DIMENSIONS

SSOP16-P-225-1.00A

Unit: mm



Weight: 0.14 g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.