

# TD62301P, TD62301F, TD62302P, TD62302F

## 7CH LOW SATURATION SINK DRIVER

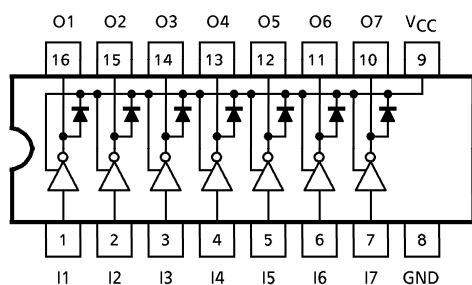
The TD62301P/F and TD62302P/F are comprised of seven NPN low saturation drivers.

All units feature integral clamp diodes for switching inductive loads. Applications include relay, hammer, lamp and LED drive in low voltage system.

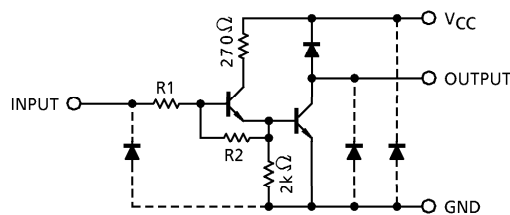
### FEATURES

- Low saturation output  $V_{CE(sat)} = 0.7V$  (Max.)
- Output rating (single output) 15V (Min.) / 200mA (Max.)
- High DC transfer ratio 1000 (Min.)
- Output clamp diodes
- Input register : TD62301P/F  $R1 = 2k\Omega$ ,  $R2 = 20k\Omega$   
: TD62302P/F  $R1 = 8.4k\Omega$ ,  $R2 = 15k\Omega$
- Inputs compatible with TTL and 3~6V CMOS
- Package type-P : DIP-16 pin
- Package type-F : SOP-16 pin

### PIN CONNECTION (TOP VIEW)



### SCHEMATICS (EACH DRIVER)



TD62301P :  $R1 = 2k\Omega$ ,  $R2 = 20k\Omega$   
TD62302P :  $R1 = 8.4k\Omega$ ,  $R2 = 15k\Omega$

(Note) The input and output parasitic diodes cannot be used as clamp diodes.

961001EBA2

- TOSHIBA is continually working to improve the quality and the 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 observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product 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 products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control 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.

**MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ )

| CHARACTERISTIC              | SYMBOL        | RATING                   | UNIT             |
|-----------------------------|---------------|--------------------------|------------------|
| Supply Voltage              | $V_{CC}$      | $-0.5 \sim 15$           | V                |
| Output Sustaining Voltage   | $V_{CE(SUS)}$ | $-0.5 \sim V_{CC} + 0.5$ | V                |
| Output Current              | $I_{OUT}$     | 200                      | mA / ch          |
| Input Voltage               | $V_{IN}$      | $-0.5 \sim 15$           | V                |
| Input Current               | $I_{IN}$      | 15                       | mA               |
| Clamp Diode Reverse Voltage | $V_R$         | 15                       | V                |
| Clamp Diode Forward Current | $I_F$         | 200                      | mA               |
| Power Dissipation           | P             | 1.0                      | W                |
|                             | F             | 0.625 (Note)             |                  |
| Operating Temperature       | P             | $-30 \sim 75$            | $^\circ\text{C}$ |
|                             | F             | $-40 \sim 85$            |                  |
| Storage Temperature         | $T_{stg}$     | $-55 \sim 150$           | $^\circ\text{C}$ |

(Note) On Glass Epoxy PCB ( $30 \times 30 \times 1.6\text{mm}$  Cu 50%)**RECOMMENDED OPERATING CONDITIONS** ( $T_a = -40 \sim 85^\circ\text{C}$  and  $T_a = -30 \sim 75^\circ\text{C}$  for Type-P)

| CHARACTERISTIC              | SYMBOL         | CONDITION                                       | MIN. | TYP. | MAX.     | UNIT |
|-----------------------------|----------------|-------------------------------------------------|------|------|----------|------|
| Supply Voltage              | $V_{CC}$       |                                                 | 3    | —    | 6        | V    |
| Output Current              | P<br>$I_{OUT}$ | DC 1 Circuit                                    | 0    | —    | 180      | mA   |
|                             |                | $T_{pw} = 25\text{ms}$ , Duty = 50%, 4 Circuits | 0    | —    | 150      |      |
| Input Voltage               | $V_{IN}$       |                                                 | —    | —    | $V_{CC}$ | V    |
| Clamp Diode Reverse Voltage | $V_R$          |                                                 | —    | —    | $V_{CC}$ | V    |
| Clamp Diode Forward Current | $I_F$          |                                                 | —    | —    | 180      | mA   |
| Power Dissipation           | P<br>$P_D$     |                                                 | —    | —    | 0.44     | W    |
|                             | F              | (Note)                                          | —    | —    | 0.325    |      |

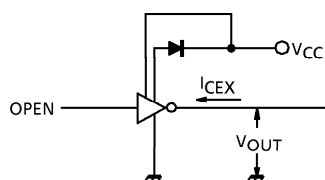
(Note) On Glass Epoxy PCB ( $30 \times 30 \times 1.6\text{mm}$  Cu 50%)

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

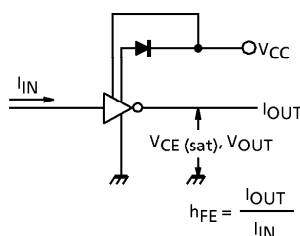
| CHARACTERISTIC              |           |              | SYMBOL                | TEST CIR-<br>CUIT | TEST CONDITION                                                            | MIN. | TYP. | MAX. | UNIT      |
|-----------------------------|-----------|--------------|-----------------------|-------------------|---------------------------------------------------------------------------|------|------|------|-----------|
| Output Leakage Current      |           |              | I <sub>CEX</sub>      | 1                 | V <sub>CC</sub> = 6V, V <sub>OUT</sub> = 6V<br>Ta = 50°C                  | —    | —    | 7    | μA        |
|                             |           |              |                       |                   | V <sub>CC</sub> = 6V, V <sub>OUT</sub> = 6V<br>Ta = 25°C                  | —    | —    | 1    |           |
| Output Saturation Voltage   |           |              | V <sub>CE (sat)</sub> | 2                 | V <sub>CC</sub> = 5V, I <sub>IN</sub> = 0.14mA<br>I <sub>OUT</sub> = 70mA | —    | —    | 0.5  | V         |
|                             |           |              |                       |                   | V <sub>CC</sub> = 5V, I <sub>IN</sub> = 0.3mA<br>I <sub>OUT</sub> = 150mA | —    | —    | 0.7  |           |
| DC Current Transfer Ratio   |           |              | h <sub>FE</sub>       | 2                 | V <sub>CC</sub> = 5V, V <sub>OUT</sub> = 2V<br>I <sub>OUT</sub> = 120mA   | 1000 | 2000 | —    |           |
| Input Current               | Output On | TD62301P / F | I <sub>IN (ON)</sub>  | 3                 | V <sub>CC</sub> = 5V, V <sub>IN</sub> = 2.4V<br>I <sub>OUT</sub> = 120mA  | —    | —    | 0.60 | mA        |
|                             |           | TD62302P / F |                       |                   |                                                                           | —    | —    | 0.14 |           |
| Input Voltage               | Output On | TD62301P / F | V <sub>IN (ON)</sub>  | 4                 | V <sub>CC</sub> = 5V, I <sub>IN</sub> = 0.2mA<br>I <sub>OUT</sub> = 120mA | —    | —    | 2.3  | V         |
|                             |           | TD62302P / F |                       |                   |                                                                           | —    | —    | 4.0  |           |
| Clamp Diode Forward Voltage |           |              | V <sub>F</sub>        | 5                 | I <sub>F</sub> = 120mA                                                    | —    | —    | 2.0  | V         |
| Supply Current              |           |              | I <sub>CC</sub>       | 6                 | I <sub>F</sub> = 120mA                                                    | —    | 15   | 22   | mA / Gate |
| Input Capacitance           |           |              | C <sub>IN</sub>       | —                 | V <sub>IN</sub> = 0, f = 1MHz                                             | —    | 15   | —    | pF        |
| Turn-On Delay               |           |              | t <sub>ON</sub>       | 7                 | V <sub>CC</sub> = 6V, R <sub>L</sub> = 33Ω<br>C <sub>L</sub> = 15pF       | —    | 0.1  | —    | μs        |
| Turn-Off Delay              |           |              | t <sub>OFF</sub>      |                   |                                                                           | —    | 0.2  | —    | μs        |

## TEST CIRCUIT

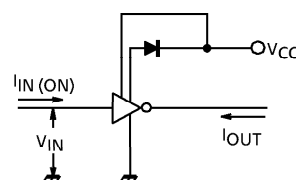
### 1. $I_{CEX}$



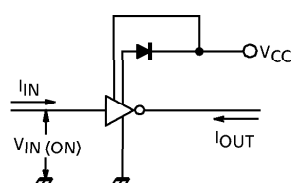
### 2. $h_{FE}$ , $V_{CE(sat)}$



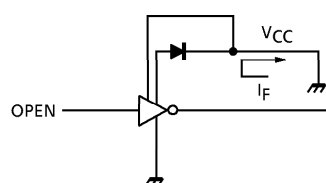
### 3. $I_{IN(ON)}$



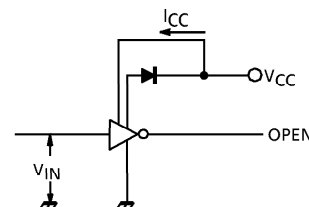
### 4. $V_{IN(ON)}$



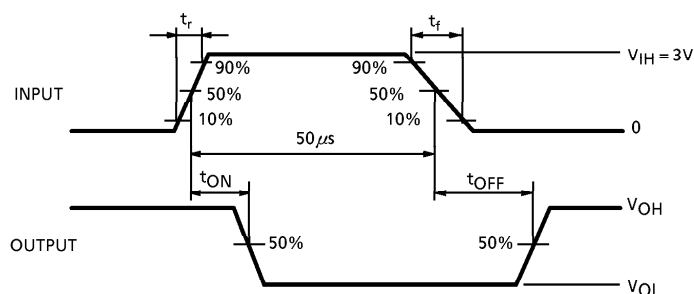
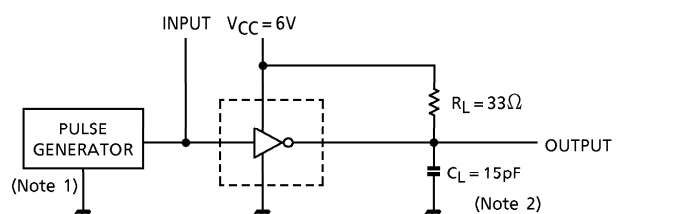
### 5. $V_F$



### 6. $I_{CC}$



### 7. $t_{ON}$ , $t_{OFF}$



(Note 1) Pulse Width 50μs

Duty Cycle 10%

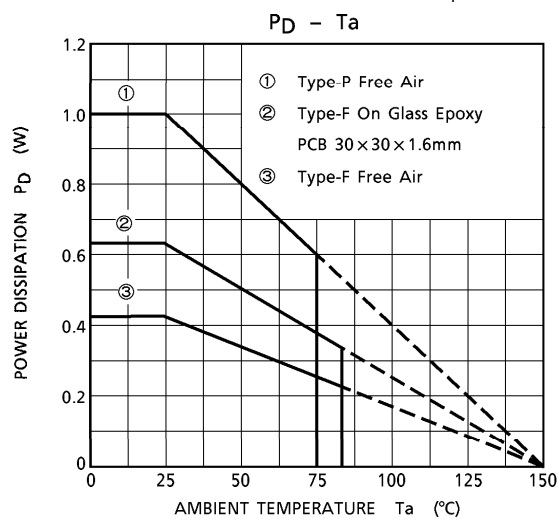
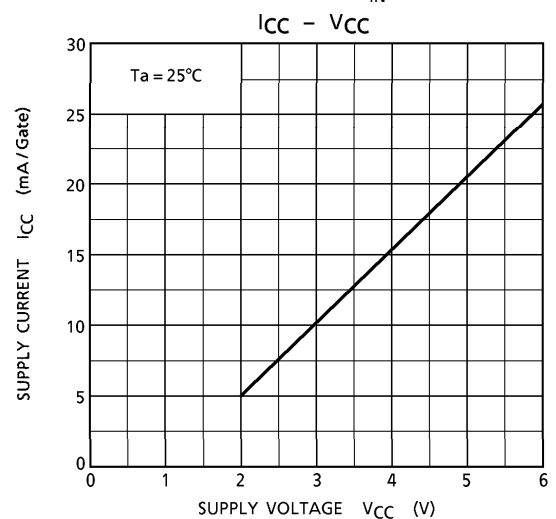
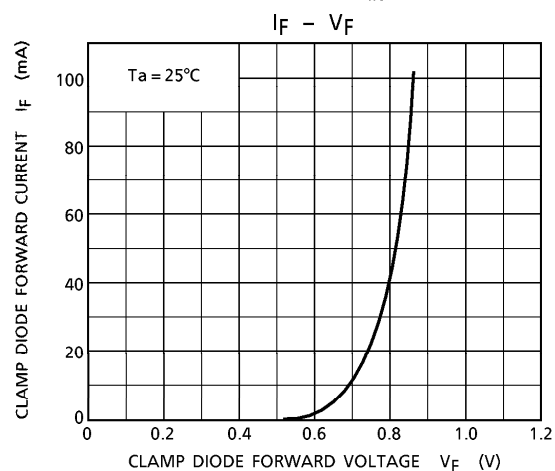
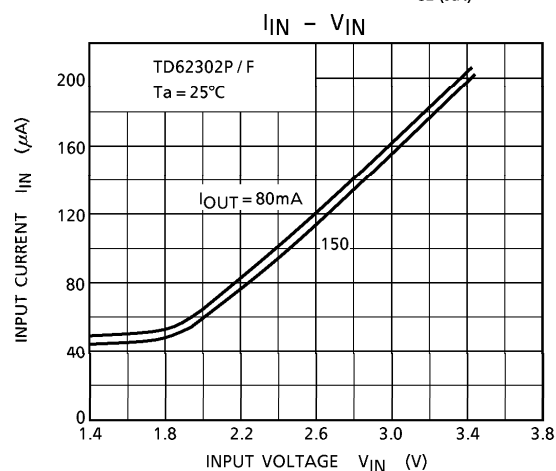
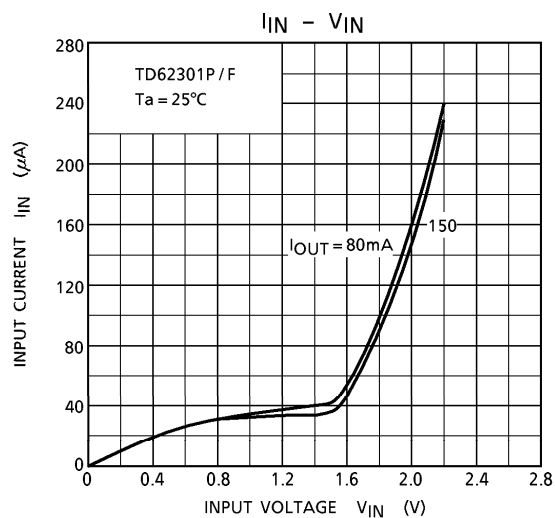
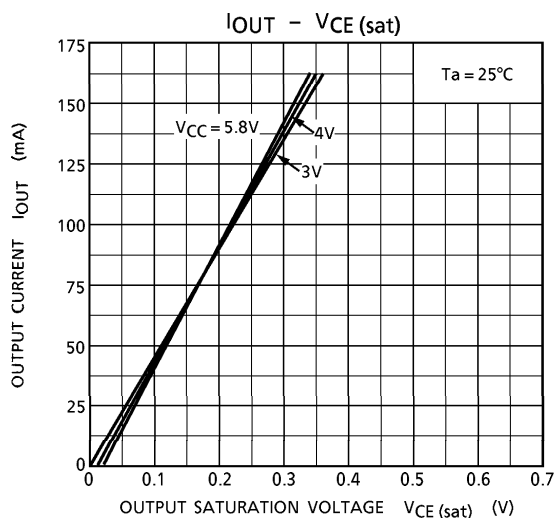
Output Impedance 50Ω

$t_r \leq 5ns$ ,  $t_f \leq 10ns$

(Note 2)  $C_L$  includes probe and jig capacitance.

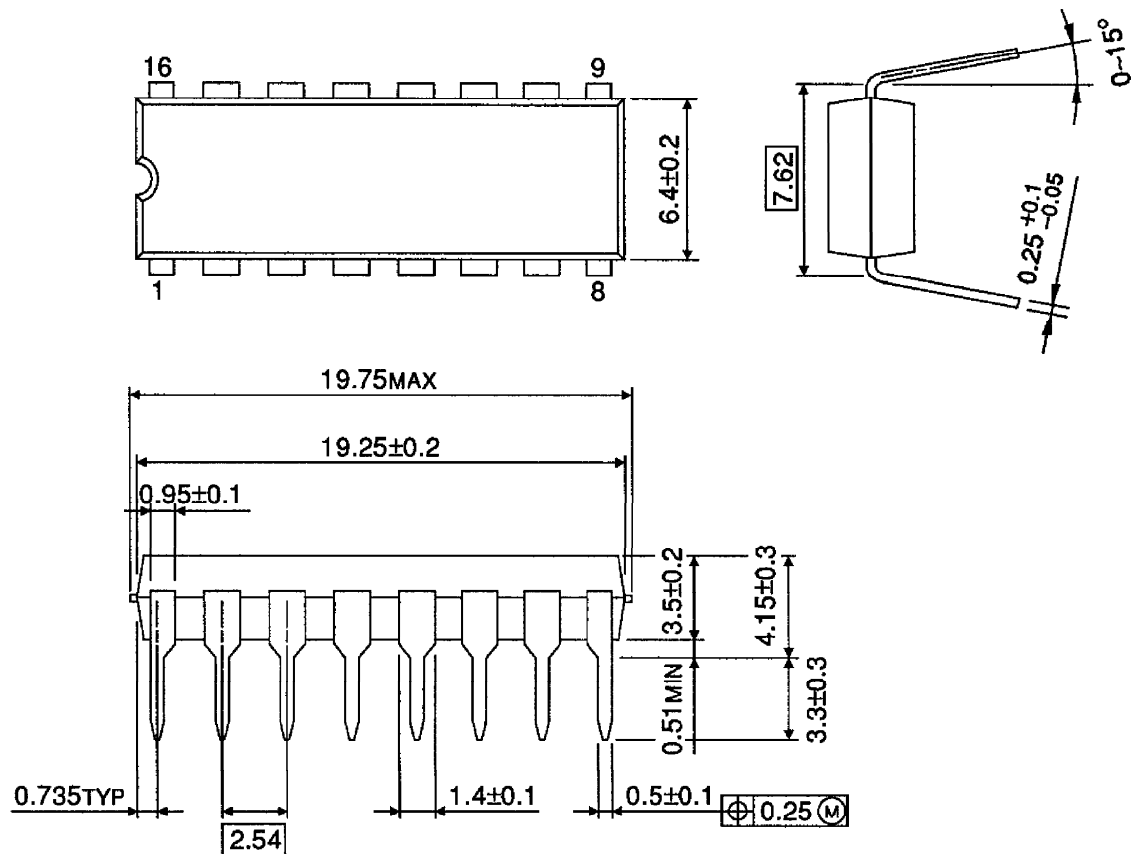
## PRECAUTIONS for USING

Utmost care is necessary in the design of the output line,  $V_{CC}$  and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.



**OUTLINE DRAWING**  
DIP16-P-300-2.54A

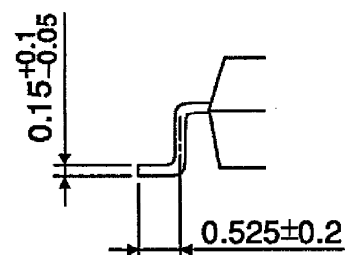
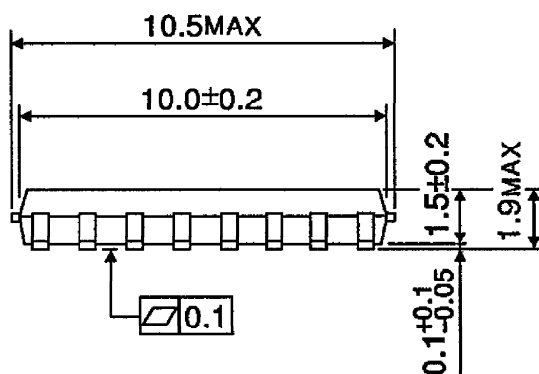
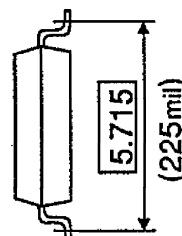
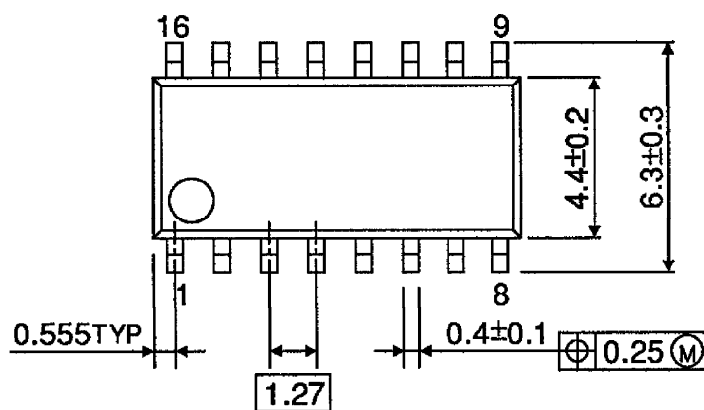
Unit : mm



Weight : 1.11g (Typ.)

**OUTLINE DRAWING**  
SOP16-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)