

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

# TD62306P, TD62306F

## 6CH LOW SATURATION SINK DRIVER

The TD62306P, TD62306F are comprised of six NPN low saturation drivers.

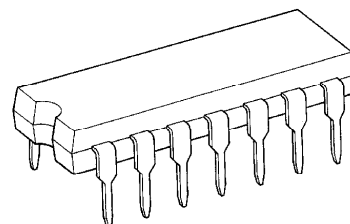
All units feature integral clamp diodes for switching inductive loads and protective diodes against a negative input voltage.

Applications include relay, hammer, lamp and LED driver.

### FEATURES

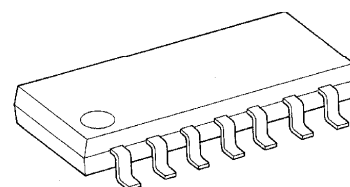
- Low saturation output voltage :  $V_{CE(sat)} = 0.6V$  (Max.)  
@ $I_{OUT} = 120mA$
- Output rating (single output) 20V (Min.) / 150mA (Max.)
- Inputs compatible with 5~15V PMOS, CMOS
- Input protective diodes against a negative input voltage
- Package type-P : DIP-14 pin
- Package type-F : SOP-14 pin

TD62306P



DIP14-P-300-2.54

TD62306F

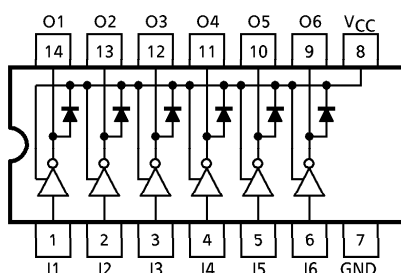


SOP14-P-225-1.27

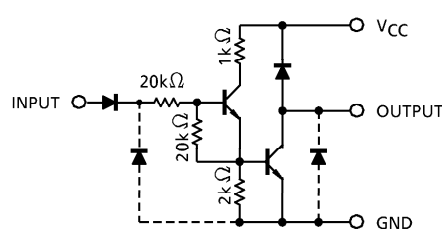
### Weight

DIP14-P-300-2.54 : 1.11g (Typ.)  
SOP14-P-225-1.27 : 0.16g (Typ.)

### PIN CONNECTION (TOP VIEW)



### SCHEMATICS (EACH DRIVER)



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

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**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC              |   | SYMBOL                | RATING                      | UNIT    |
|-----------------------------|---|-----------------------|-----------------------------|---------|
| Supply Voltage              |   | V <sub>CC</sub>       | – 0.5~20                    | V       |
| Output Sustaining Voltage   |   | V <sub>CE (SUS)</sub> | – 0.5~V <sub>CC</sub> + 0.5 | V       |
| Output Current              |   | I <sub>OUT</sub>      | 150                         | mA / ch |
| Input Voltage               |   | V <sub>IN</sub>       | – 37~20                     | V       |
| Input Current               |   | I <sub>IN</sub>       | 1.5                         | mA      |
| Clamp Diode Reverse Voltage |   | V <sub>R</sub>        | 20                          | V       |
| Clamp Diode Forward Current |   | I <sub>F</sub>        | 120                         | mA      |
| Power Dissipation           | P | P <sub>D</sub>        | 1.0                         | W       |
|                             | F |                       | 0.625 (Note)                |         |
| Operating Temperature       | P | T <sub>opr</sub>      | – 30~75                     | °C      |
|                             | F |                       | – 40~85                     |         |
| Storage Temperature         |   | T <sub>stg</sub>      | – 55~150                    | °C      |

(Note) On Glass Epoxy PCB (50×50×1.6mm Cu 30%)

**RECOMMENDED OPERATING CONDITIONS** (Ta = – 40 ~ 85°C for Type-F and Ta = – 30 ~ 75°C for Type-P)

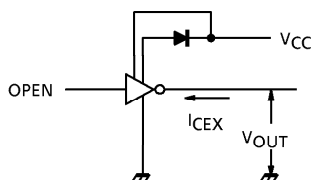
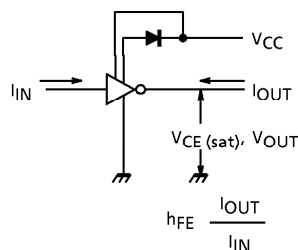
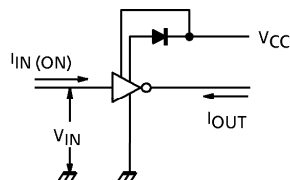
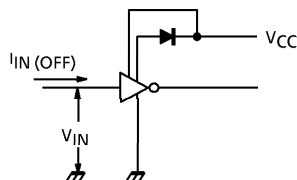
| CHARACTERISTIC              | SYMBOL           | CONDITION                                      | MIN.   | TYP. | MAX.            | UNIT    |
|-----------------------------|------------------|------------------------------------------------|--------|------|-----------------|---------|
| Supply Voltage              | V <sub>CC</sub>  | —                                              | 4.75   | —    | 18              | V       |
| Output Current              | I <sub>OUT</sub> | DC 1 Circuit                                   | 0      | —    | 120             | mA / ch |
|                             |                  | T <sub>pw</sub> = 25ms, Duty = 10%, 6 Circuits | 0      | —    | 100             |         |
| Input Voltage               | V <sub>IN</sub>  | —                                              | – 35   | —    | V <sub>CC</sub> | V       |
| Clamp Diode Reverse Voltage | V <sub>R</sub>   | —                                              | —      | —    | 18              | V       |
| Clamp Diode Forward Current | I <sub>F</sub>   | —                                              | —      | —    | 120             | mA      |
| Power Dissipation           | P                | P <sub>D</sub>                                 | —      | —    | 0.44            | W       |
|                             | F                |                                                | (Note) | —    | 0.325           |         |

(Note) On Glass Epoxy PCB (50×50×1.6mm Cu 30%)

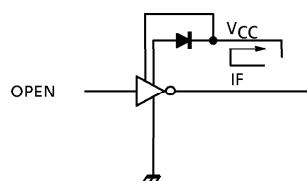
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

| CHARACTERISTIC                    |            | SYMBOL        | TEST CIR-CUIT | TEST CONDITION                                        |           | MIN. | TYP. | MAX. | UNIT      |
|-----------------------------------|------------|---------------|---------------|-------------------------------------------------------|-----------|------|------|------|-----------|
| Output Leakage Current            | P          | $I_{CEX}$     | 1             | $V_{CC} = 18V$<br>$V_{OUT} = 18V$                     | Ta = 75°C | —    | —    | 100  | $\mu A$   |
|                                   | F          |               |               |                                                       | Ta = 85°C | —    | —    | 100  |           |
| Output Saturation Voltage         |            | $V_{CE(sat)}$ | 2             | $V_{CC} = 5V$ , $I_{IN} = 0.2mA$<br>$I_{OUT} = 120mA$ |           | —    | 0.45 | 0.6  | V         |
| DC Forward Current Transfer Ratio |            | $h_{FE}$      | 2             | $V_{CC} = 5V$ , $V_{OUT} = 2V$<br>$I_{OUT} = 120mA$   |           | 1000 | —    | —    | —         |
| Input Current                     | Output On  | $I_{IN(ON)}$  | 3             | $V_{IN} = 5V$ , $I_{OUT} = 120mA$                     |           | —    | 0.16 | 0.23 | mA        |
|                                   | Output Off | $I_{IN(OFF)}$ | 4             | $V_{IN} = 15V$ , $I_{OUT} = 120mA$                    |           | —    | 0.66 | 0.94 |           |
| Clamp Diode Forward Voltage       |            | $V_F$         | 5             | $I_F = 120mA$                                         |           | —    | 1.25 | 1.6  | V         |
| Supply Current                    | Output On  | $I_{CC(ON)}$  | 6             | $V_{CC} = V_{IN} = 5V$                                |           | —    | 4.0  | 6.0  | mA / Gate |
|                                   | Output Off | $I_{CC(OFF)}$ | 6             | $V_{CC} = V_{IN} = 15V$                               |           | —    | 14.0 | 22   |           |
| Turn-On Delay                     |            | $t_{ON}$      | 7             | $V_{CC} = 18V$ , $R_L = 150\Omega$<br>$C_L = 15pF$    |           | —    | 0.1  | —    | $\mu s$   |
| Turn-Off Delay                    |            | $t_{OFF}$     |               |                                                       |           | —    | 0.8  | —    | $\mu s$   |

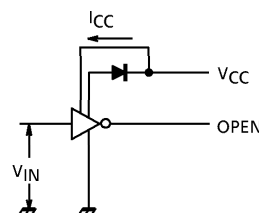
## TEST CIRCUIT

1.  $I_{CEX}$ 2.  $h_{FE}$ ,  $V_{CE(sat)}$ 3.  $I_{IN(ON)}$ 4.  $I_{IN(OFF)}$ 

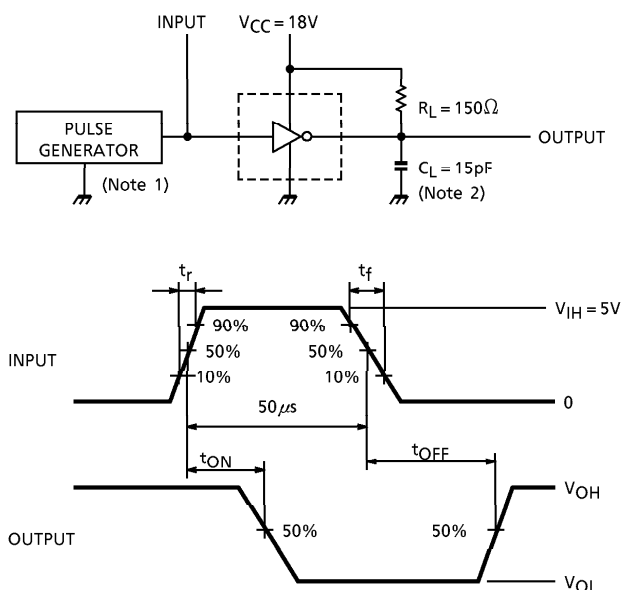
5.  $V_F$



6.  $I_{CC}$



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

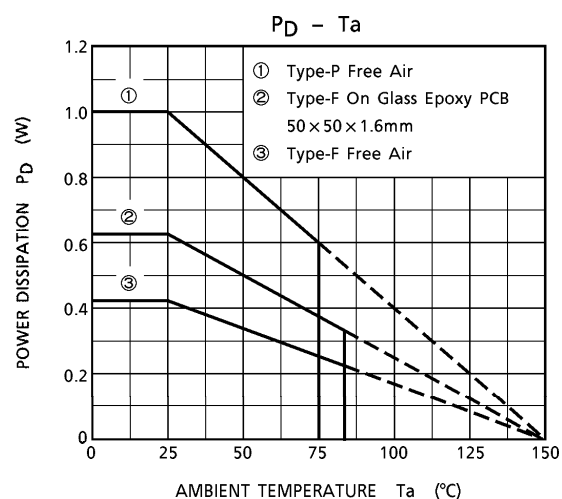
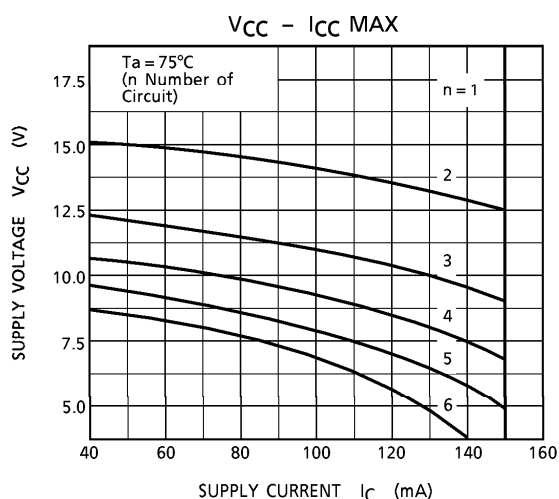
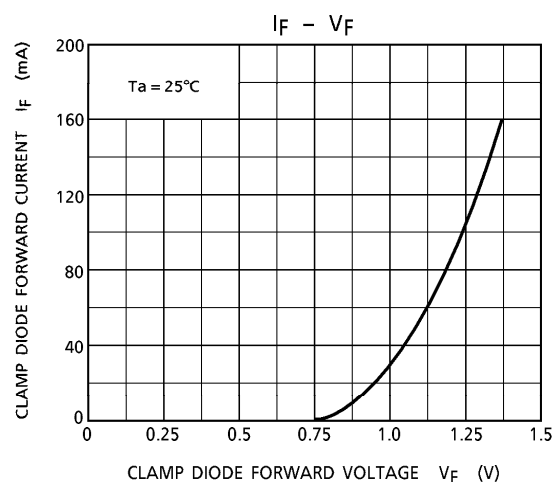
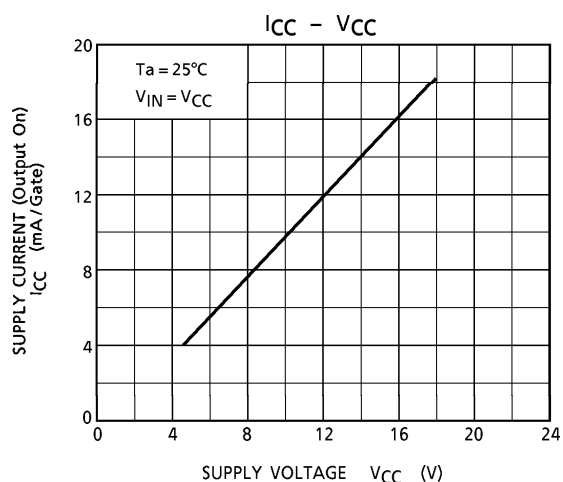
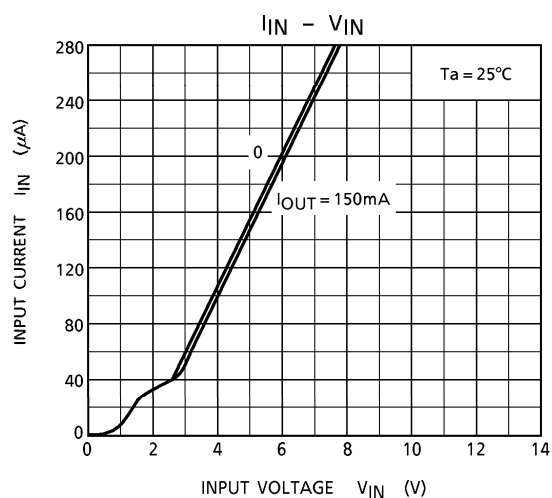
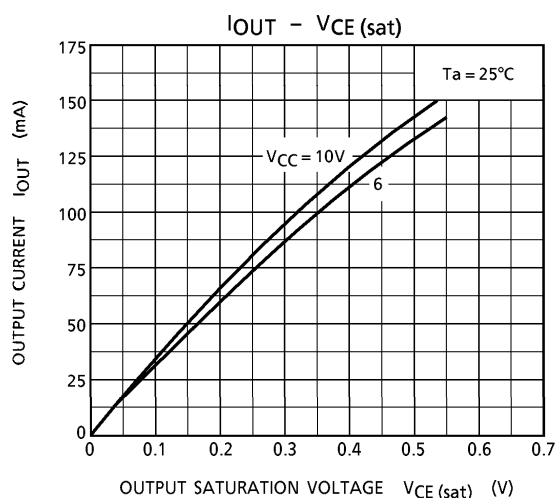


(Note 1) Pulse Width  $50\mu s$ , Duty Cycle 10%  
Output Impedance  $50\Omega$ ,  $t_r \leq 5ns$ ,  $t_f \leq 10ns$

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

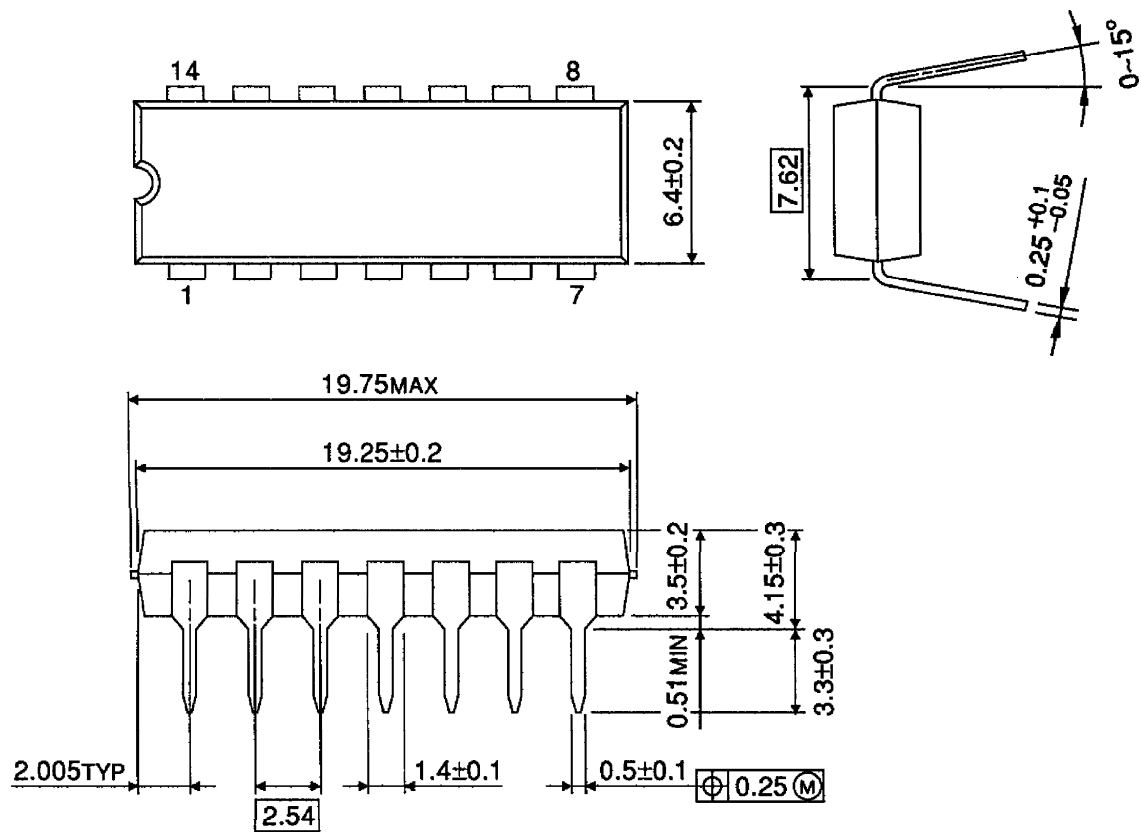
#### PRECAUTIONS for USING

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**  
DIP14-P-300-2.54

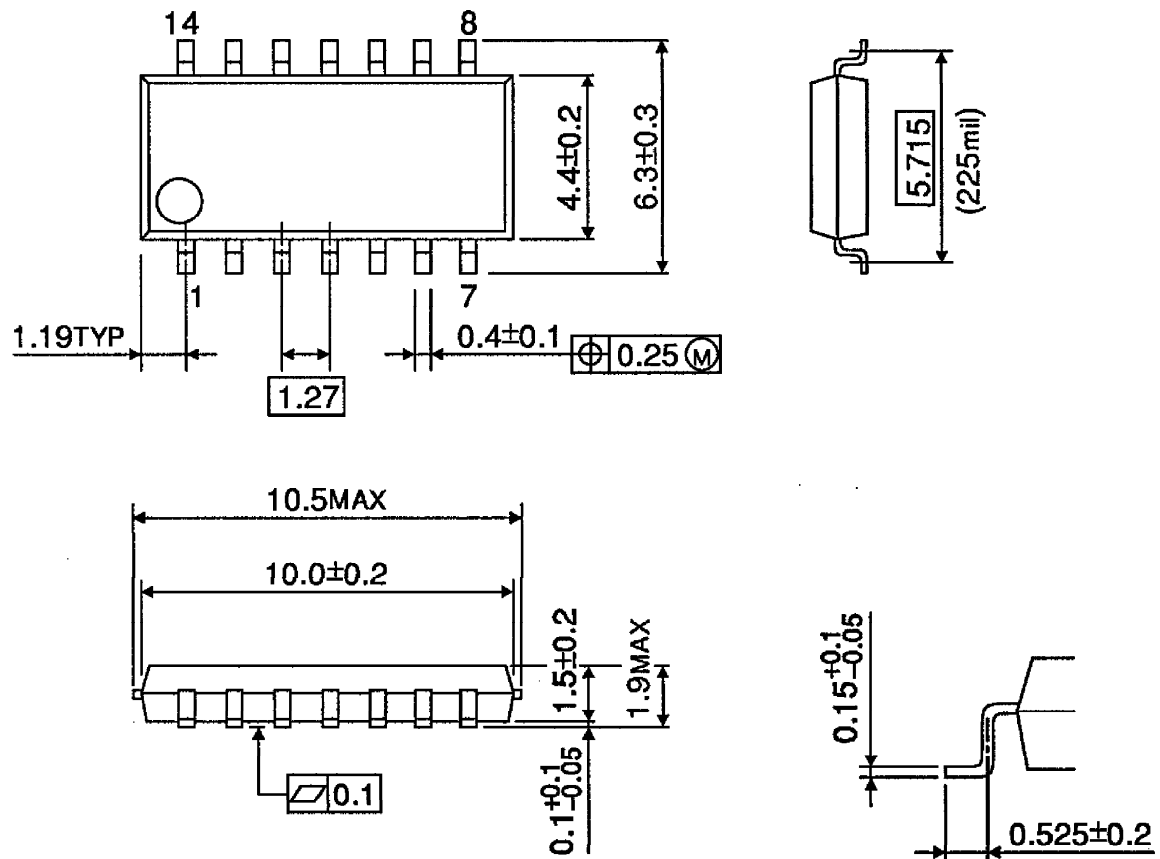
Unit : mm



Weight : 1.11g (Typ.)

**OUTLINE DRAWING**  
SOP14-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)