

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

## TD62386AP, TD62386AF, TD62387AP TD62387AF, TD62388AP, TD62388AF

### 8 CH LOW INPUT ACTIVE DARLINGTON SINK DRIVER

The TD62386AP, TD62386AF, TD62387AP, TD62387AF and TD62388AP, TD62388AF are non-inverting transistor arrays, which are comprised of eight NPN darlington output stages and PNP input stages.

All units feature integral clamp diodes for switching inductive loads.

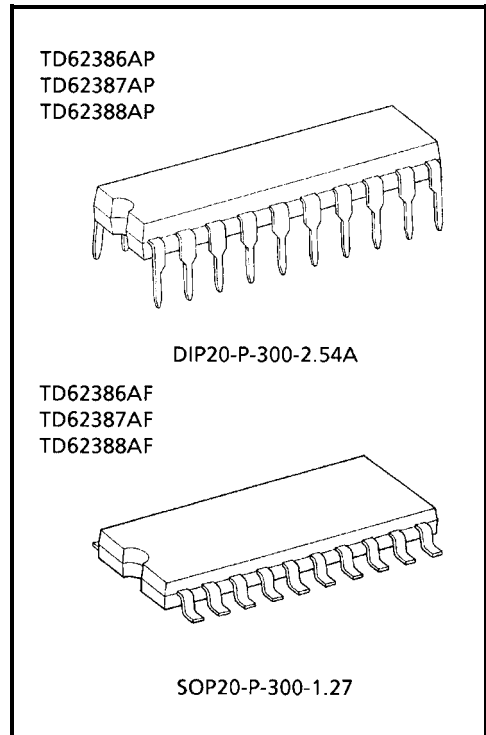
These devices are Low Level input active drivers and are suitable for operations with TTL, 5 V CMOS and 5 V Microprocessor which have sink current output drivers.

Applications include relay, hammer, lamp and LED driver.

### FEATURES

- Output current (single output) 500 mA (Max)
- High sustaining voltage 50 V (Min)
- Output clamp diodes
- Low level active input
- Standard supply voltage
- Inputs compatible with TTL and 5 V CMOS
- Package type-AP: DIP-20 pin
- Package type-AF: SOP-20 pin

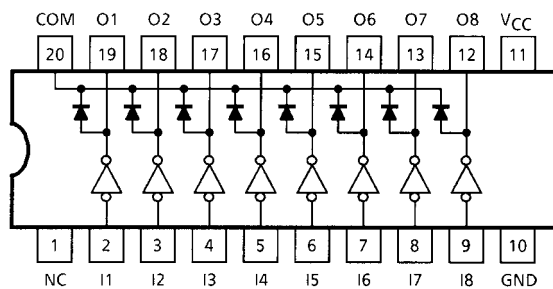
| TYPE                 | $V_{IN(ON)}$            |
|----------------------|-------------------------|
| TD62386AP, TD62386AF | -20 V~ $V_{CC} - 2.8$ V |
| TD62387AP, TD62387AF | 0 V~ $V_{CC} - 3.7$ V   |
| TD62388AP, TD62388AF |                         |



#### Weight

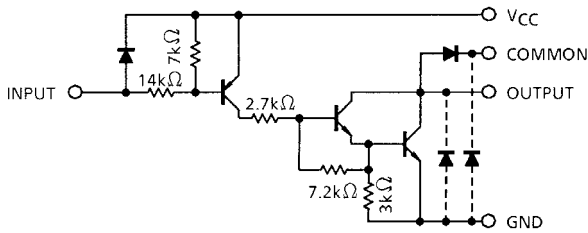
DIP20-P-300-2.54A : 2.25 g (Typ.)  
SOP20-P-300-1.27 : 0.25 g (Typ.)

### PIN CONNECTION (TOP VIEW)

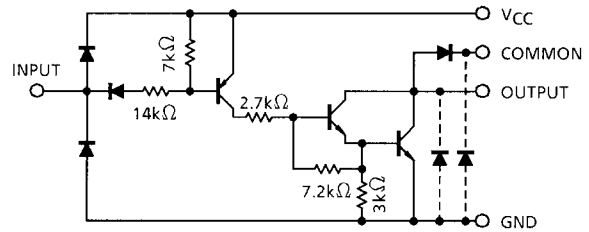


## SCHEMATICS (EACH DRIVER)

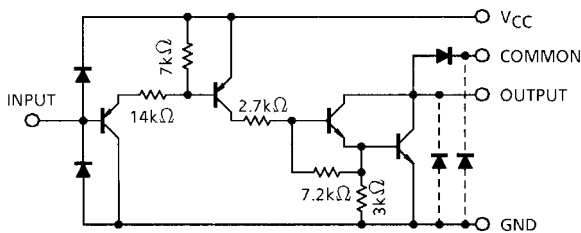
TD62386AP,TD62386AF



TD62387AP, TD62387AF



TD62388AP,TD62388AF



Note: The output parasitic diode cannot be used as clamp diodes.

## MAXIMUM RATINGS

| CHARACTERISTIC              | SYMBOL            | RATING              | UNIT         |
|-----------------------------|-------------------|---------------------|--------------|
| Supply Voltage              | $V_{CC}$          | -0.5~7.0            | V            |
| Output Sustaining Voltage   | AP                | $V_{CE(SUS)}$       | -0.5~50      |
|                             | AF                |                     | -0.5~35      |
| Output Current              | $I_{OUT}$         | 500                 | mA / ch      |
| Input Voltage               | $V_{IN}$ (Note 1) | -22~ $V_{CC} + 0.5$ | V            |
|                             | $V_{IN}$ (Note 2) | -0.5~7              |              |
| Input Current               | $I_{IN}$          | -10                 | mA           |
| Clamp Diode Reverse Voltage | $V_R$             | 50                  | V            |
| Clamp Diode Forward Current | $I_F$             | 500                 | mA           |
| Power Dissipation           | AP                | $P_D$ (Note 3)      | 1.38         |
|                             | AF                |                     | 1.0 (Note 4) |
| Operating Temperature       | $T_{opr}$         | -40~85              | °C           |
| Storage Temperature         | $T_{stg}$         | -55~150             | °C           |

Note 1: TD62386AP, TD62386AF only

Note 2: TD62387AP, TD62387AF, TD62388AP, TD62388AF only

Note 3: Delated above 25°C in the proportion of 11.7 mW / °C (AP-Type), 7.7 mW / °C (F, AF-Type).

Note 4: On PCB (50 × 50 × 1.6 mm Cu 40% Glass Epoxy)

## RECOMMENDED OPERATING CONDITIONS (Ta = -40~85°C)

| CHARACTERISTIC              |  | SYMBOL                | CONDITION   | MIN | TYP. | MAX             | UNIT       |
|-----------------------------|--|-----------------------|---|-----|------|-----------------|------------|
| Supply Voltage              |  | V <sub>CC</sub>       | —   | 4.5 | 5.0  | 5.5             | V          |
| Output Sustaining Voltage   |  | V <sub>CE (SUS)</sub> | —   | 0   | —    | 50              | V          |
| Output Current              |  | I <sub>OUT</sub>      | T <sub>pw</sub> = 25 ms, Duty = 10%<br>8 Circuits | 0   | —    | 270             | mA /<br>ch |
| Input Voltage               | TD62386AP<br>TD62386AF                           | V <sub>IN</sub>       | —   | -20 | —    | V <sub>CC</sub> | V          |
|                             | TD62387AP<br>TD62387AF<br>TD62388AP<br>TD62388AF |                       | —   | 0   | —    | 5.5             |            |
| Clamp Diode Reverse Voltage |  | V <sub>R</sub>        | —   | —   | —    | 50              | V          |
| Clamp Diode Forward Current |  | I <sub>F</sub>        | —   | —   | —    | 400             | mA         |
| Power Dissipation           | AP   | P <sub>D</sub>        | —   | —   | —    | 0.52            | W          |
|                             | AF   |                       | (Note 1)  | —   | —    | —               |            |

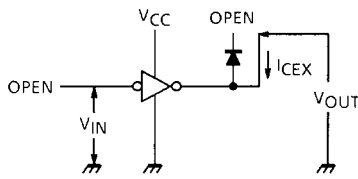
Note 1: On Glass Epoxy PCB (50 × 50 × 1.6 mm Cu 40%)

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

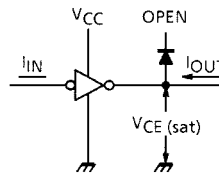
| CHARACTERISTIC              |  | SYMBOL                | TEST CIR-CUIT | TEST CONDITION   | MIN | TYP.  | MAX                      | UNIT |
|-----------------------------|--|-----------------------|---------------|--|-----|-------|--------------------------|------|
| Output Leakage Current      |  | I <sub>CEX</sub>      | 1             | V <sub>CC</sub> = 5.5 V, I <sub>IN</sub> = 0<br>V <sub>OUT</sub> = 50 V, Ta = 85°C                   | —   | —     | 100                      | μA   |
| Output Saturation Voltage   |  | V <sub>CE (sat)</sub> | 2             | V <sub>CC</sub> = 4.5 V,<br>V <sub>IN</sub> = V <sub>IN (ON)</sub> MAX.<br>I <sub>OUT</sub> = 350 mA | —   | 1.4   | 2.0                      | V    |
| Input Current               | Output On  | I <sub>IN (ON)</sub>  | 3             | V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0.4 V<br>V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = -20 V | —   | -0.32 | -0.45                    | mA   |
|                             | Output Off                                       | I <sub>IN (OFF)</sub> | 4             | —  | —   | —     | -4.0                     |      |
| Input Voltage (Output on)   | TD62386AP<br>TD62386AF                           | V <sub>IN (ON)</sub>  | 5             | —  | —   | —     | V <sub>CC</sub><br>- 2.8 | V    |
|                             | TD62387AP<br>TD62387AF<br>TD62388AP<br>TD62388AF |                       |               | —  | —   | —     | V <sub>CC</sub><br>- 3.7 |      |
| Clamp Diode Reverse Current |  | I <sub>R</sub>        | 6             | V <sub>R</sub> = 50 V, Ta = 25°C<br>V <sub>R</sub> = 50 V, Ta = 85°C                                 | —   | —     | 50<br>100                | μA   |
| Clamp Diode Forward Voltage |  | V <sub>F</sub>        | 7             | I <sub>F</sub> = 350 mA<br>I <sub>F</sub> = 280 mA   | —   | —     | 2.0<br>1.8               |      |
| Supply Current              |  | I <sub>CC (ON)</sub>  | 8             | V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = 0   | —   | 17    | 22                       | mA   |
|                             |  | I <sub>CC (OFF)</sub> |               | V <sub>CC</sub> = 5.5 V, V <sub>IN</sub> = V <sub>CC</sub>   | —   | —     | 100                      |      |
| Turn-On Delay               |  | t <sub>ON</sub>       | 9             | V <sub>CC</sub> = 5 V, V <sub>OUT</sub> = 50 V<br>R <sub>L</sub> = 125Ω, C <sub>L</sub> = 15 pF      | —   | 0.1   | —                        | μs   |
| Turn-Off Delay              |  | t <sub>OFF</sub>      |               |  | —   | —     | 3                        |      |

## TEST CIRCUIT

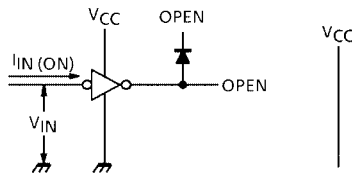
### 1. $I_{CEX}$



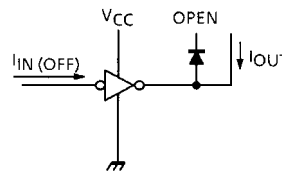
### 2. $V_{CE(sat)}$



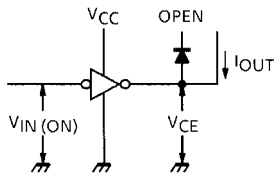
### 3. $I_{IN(ON)}$



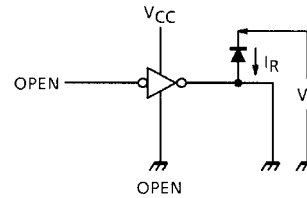
### 4. $I_{IN(OFF)}$



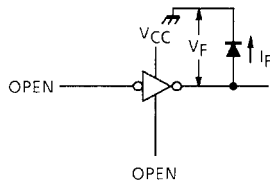
### 5. $V_{IN(ON)}$



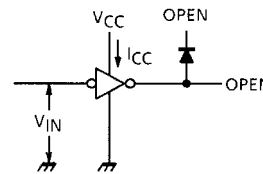
### 6. $I_R$



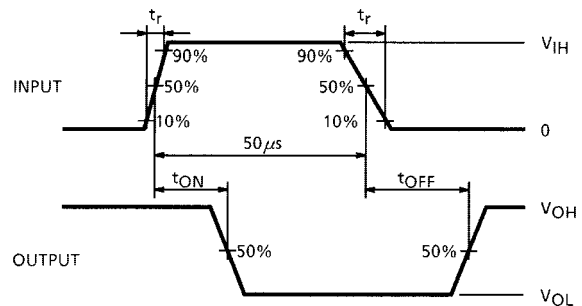
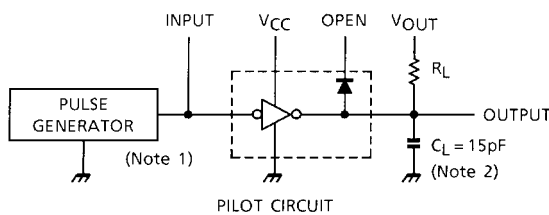
### 7. $V_F$



### 8. $I_{CC}$



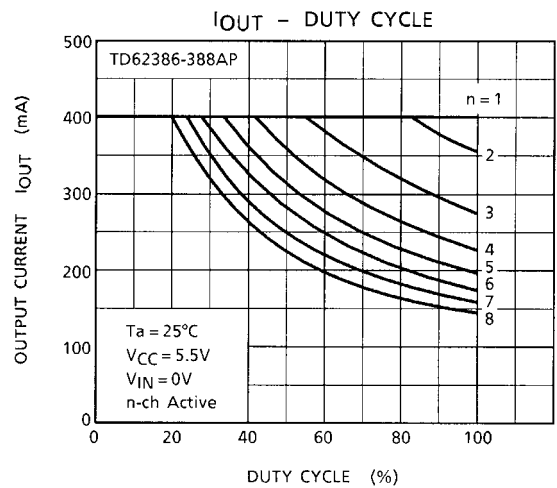
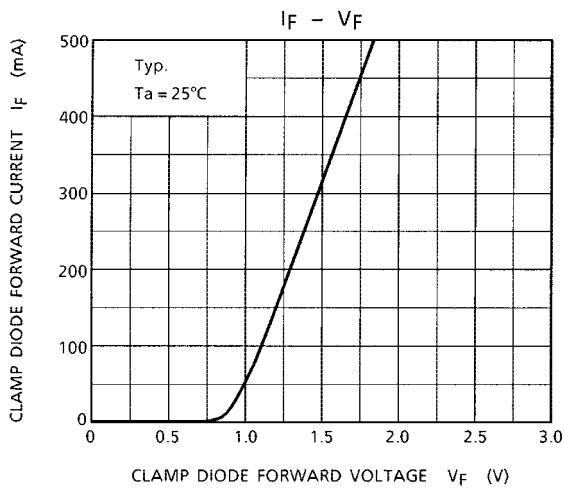
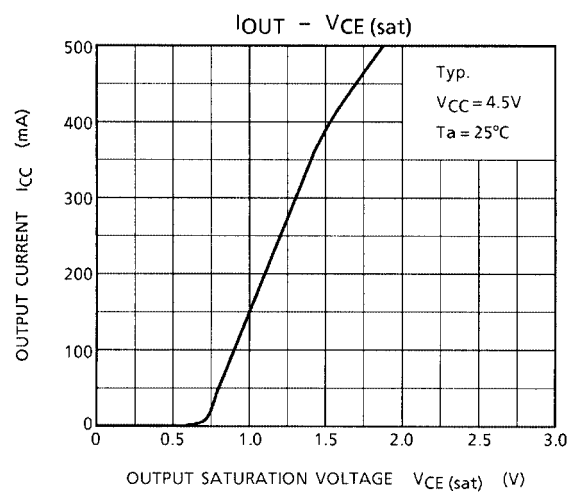
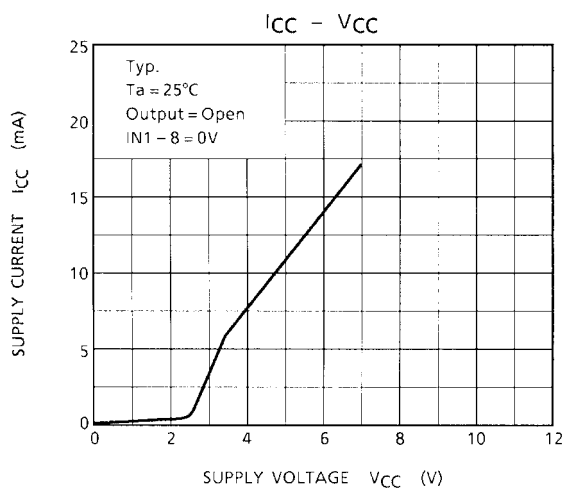
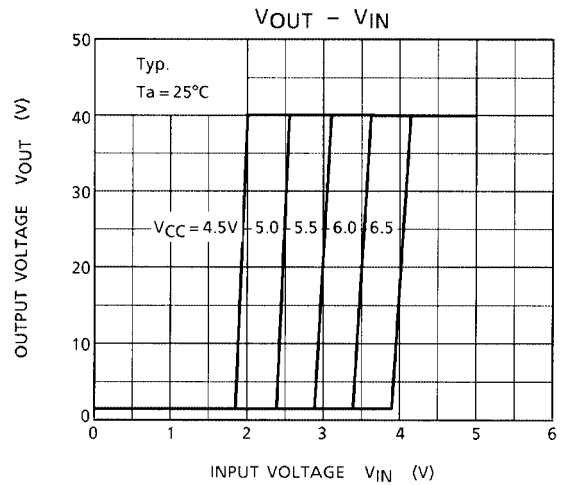
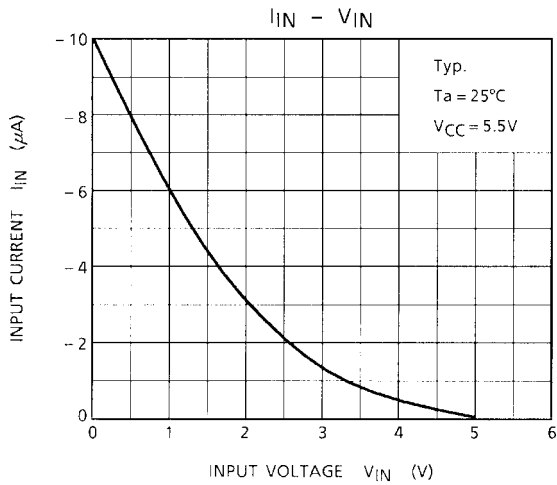
### 9. $t_{ON}, t_{OFF}$

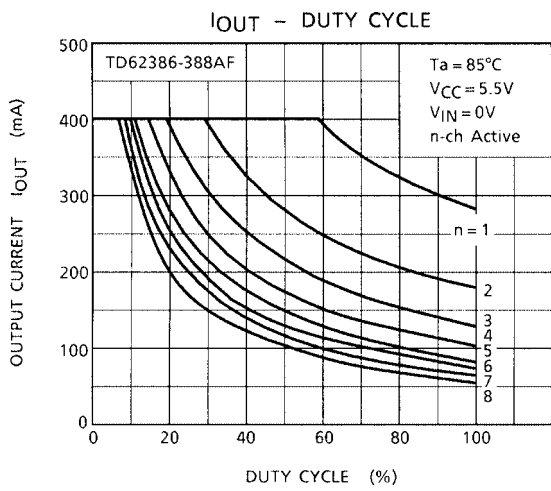
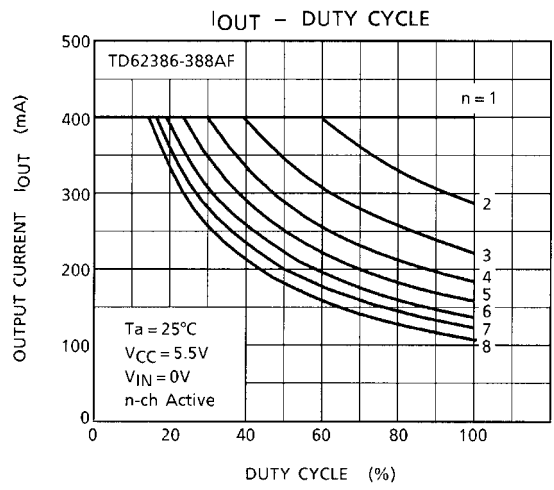
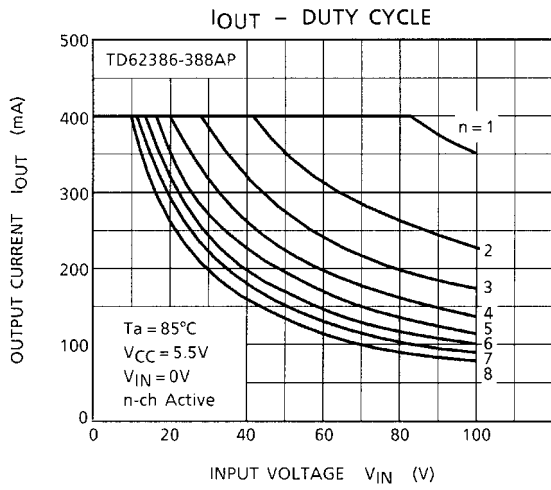


Note 1: Pulse Width 50  $\mu$ s, Duty Cycle 10%  
Output Impedance 50  $\Omega$ ,  $t_r \leq 5$  ns,  $t_f \leq 10$  ns  
Note 2:  $C_L$  includes probe and jig capacitance.

## 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, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.

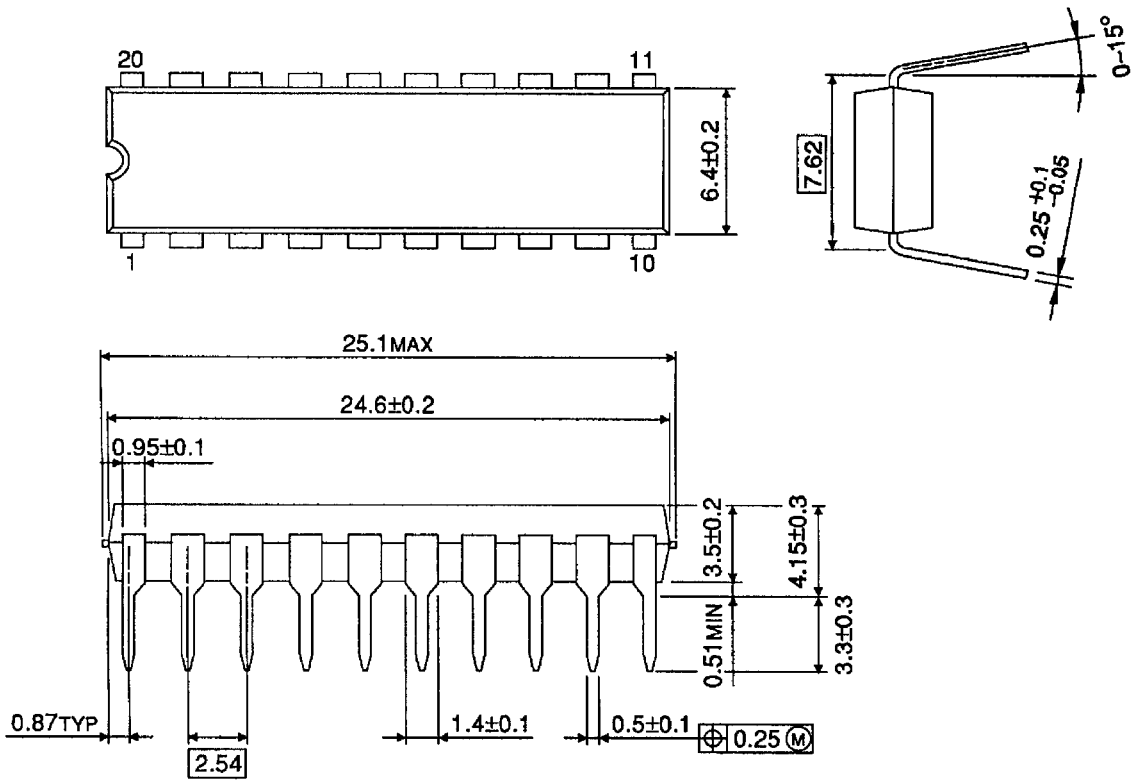




## PACKAGE DIMENSIONS

DIP20-P-300-2.54A

Unit: mm

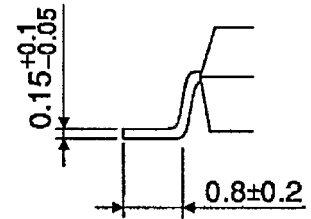
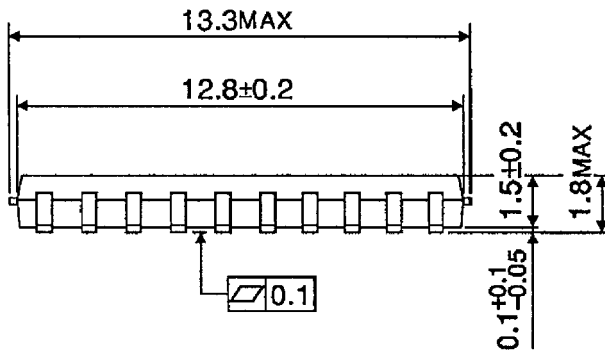
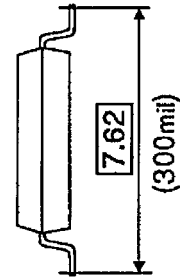
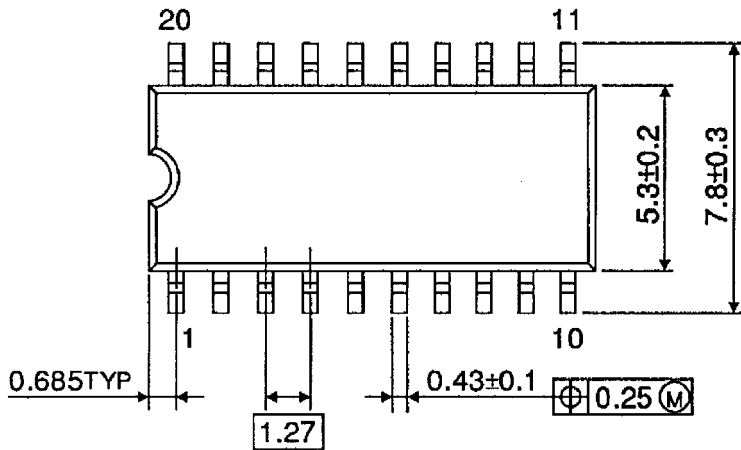


Weight: 2.25 g (Typ.)

**PACKAGE DIMENSIONS**

SOP20-P-300-1.27

Unit: mm



Weight: 0.25 g (Typ.)



**RESTRICTIONS ON PRODUCT USE**

000707EBA

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