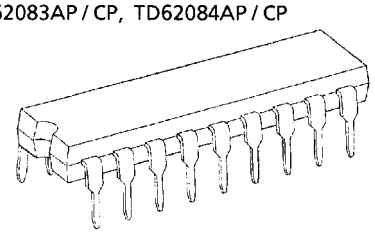
TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TD62081AP,TD62081CP,TD62081F,TD62081AF,TD62082AP,TD62082CP**
**TD62082F,TD62082AF,TD62083AP,TD62083CP,TD62083F,TD62083AF**
**TD62084AP,TD62084CP,TD62084F,TD62084AF**

# 8CH DARLINGTON SINK DRIVER

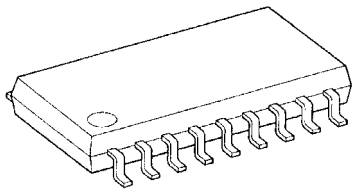
The TD62081AP / CP / F / AF Series are high−voltage, high−current darlington drivers comprised of eight NPN darlington pairs.
All units feature integral clamp diodes for switching inductive loads.
Applications include relay, hammer, lamp and display (LED) drivers.

TD62081AP / CP, TD62082AP / CP
TD62083AP / CP, TD62084AP / CP



DIP18-P-300-2.54D

TD62081F / AF, TD62082F / AF
TD62083F / AF, TD62084F / AF



SOP18-P-375-1.27

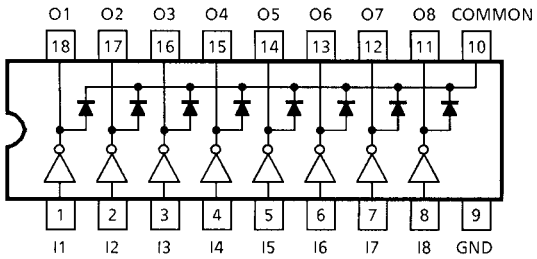
Weight
DIP18−P−300−2.54D : 1.478 g (Typ.)
SOP18−P−375−1.27 : 0.41 g (Typ.)

## FEATURES

- Output current (single output)
  500 mA (Max.) (TD62081AP / F / AF series)
  400 mA (Max.) (TD62081CP series)
- High sustaining voltage output
  35 V (Min.) (TD62081F series)
  50 V (Min.) (TD62081AP / AF series)
  100 V (Min.) (TD62081CP series)
- Output clamp diodes
- Inputs compatible with various types of logic.
- Package type−AP, CP : DIP−18 pin
- Package type−F, AF : SOP−18 pin

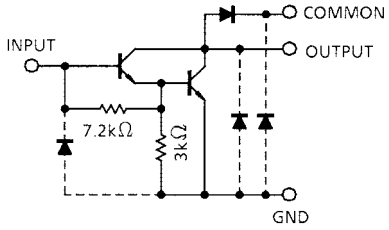
| TYPE | INPUT BASE RESISTOR | DESIGNATION |
|---|---|---|
| TD62081AP / CP / F / AF | External | General Purpose |
| TD62082AP / CP / F / AF | 10.5−kΩ + 7 V Zenner diode | 14~25 V PMOS |
| TD62083AP / CP / F / AF | 2.7 kΩ | TTL, 5 V CMOS |
| TD62084AP / CP / F / AF | 10.5 kΩ | 6~15 V PMOS, CMOS |

## PIN CONNECTION (TOP VIEW)

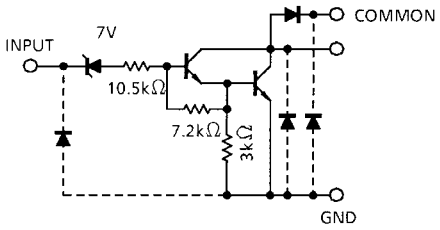


## SCHEMATICS (EACH DRIVER)

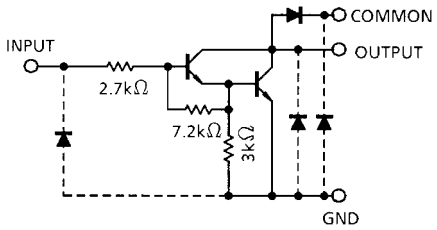
TD62081AP / CP / F / AF



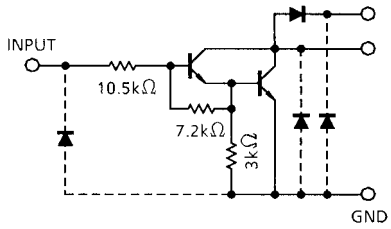

TD62082AP / CP / F / AF




TD62083AP / CP / F / AF




TD62084AP / CP / F / AF




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

## MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | | SYMBOL | RATING | UNIT |
|---|---|---|---|---|
| Output Sustaining Voltage | AP, AF | $V_{CE\ (SUS)}$ | −0.5~50 | V |
| | CP | | −0.5~100 | |
| | F | | −0.5~35 | |
| Output Current | | $I_{OUT}$ | 500 | mA / ch |
| | CP | | 400 | |
| Input Voltage | | $V_{IN}$ (Note 1) | −0.5~30 | V |
| Input Current | | $I_{IN}$ (Note 2) | 25 | mA |
| Clamp Diode Reverse Voltage | AP, AF | $V_R$ | 50 | V |
| | CP | | 100 | |
| | F | | 35 | |
| Clamp Diode Forward Current | | $I_F$ | 500 | mA |
| | CP | | 400 | |
| Power Dissipation | AP, CP | $P_D$ | 1.47 | W |
| | F, AF | | 0.96 | |
| Operating Temperature | | $T_{opr}$ | −40~85 | °C |
| Storage Temperature | | $T_{stg}$ | −55~150 | °C |

Note 1: Except TD62081AP / CP / F / AF
Note 2: Only TD62081AP / CP / F / AF

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

| CHARACTERISTIC | | SYMBOL | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Output Sustaining Voltage | AP, AF | $V_{CE\ (SUS)}$ | | 0 | — | 50 | V |
| | CP | | | 0 | — | 100 | |
| | F | | | 0 | — | 35 | |
| Output Current | AP, CP | $I_{OUT}$ | $T_{pw}$ = 25 ms, Duty = 10% 8 Circuits | 0 | — | 347 | mA / ch |
| | | | $T_{pw}$ = 25 ms, Duty = 50% 8 Circuits | 0 | — | 123 | |
| | F, AF | | $T_{pw}$ = 25 ms, Duty = 10% 8 Circuits | 0 | — | 268 | |
| | | | $T_{pw}$ = 25 ms, Duty = 50% 8 Circuits | 0 | — | 90 | |
| Input Voltage | Except TD62081AP / CP / F / AF | $V_{IN}$ | | 0 | — | 30 | V |
| Input Voltage (Output On) | TD62082AP / CP / F / AF | $V_{IN\ (ON)}$ | | 14 | — | 30 | V |
| | TD62083AP / CP / F / AF | | | 3.5 | — | 30 | |
| | TD62084AP / CP / F / AF | | | 8 | — | 30 | |
| Input Voltage (Output Off) | TD62082AP / CP / F / AF | $V_{IN\ (OFF)}$ | | 0 | — | 7.4 | V |
| | TD62083AP / CP / F / AF | | | 0 | — | 0.5 | |
| | TD62084AP / CP / F / AF | | | 0 | — | 1.0 | |
| Input Current | Only TD62081AP / CP / F / AF | $I_{IN}$ | | 0 | — | 5 | mA |
| Clamp Diode Reverse Voltage | AP, AF | $V_R$ | | — | — | 50 | V |
| | CP | | | — | — | 100 | |
| | F | | | — | — | 35 | |
| Clamp Diode Forward Current | | $I_F$ | | — | — | 400 | mA |
| | CP | | | — | — | 320 | |
| Power Dissipation | AP, CP | $P_D$ | | — | — | 0.52 | W |
| | F, AF | | | — | — | 0.4 | |

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

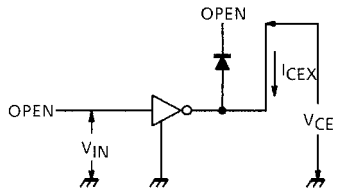
| CHARACTERISTIC | | | SYMBOL | TEST CIR-CUIT | TEST CONDITION | | MIN | TYP. | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| Output Leakage Current | | AP, AF | $I_{CEX}$ | 1 | $V_{CE}$ = 50 V | Ta = 25°C | — | — | 50 | μA |
| | | CP | | | $V_{CE}$ = 100 V | | | | | |
| | | F | | | $V_{CE}$ = 35 V | | | | | |
| | | AP, AF | | | $V_{CE}$ = 50 V | Ta = 85°C | — | — | 100 | |
| | | CP | | | $V_{CE}$ = 100 V | | | | | |
| | | F | | | $V_{CE}$ = 35 V | | | | | |
| | TD62082 | AP, AF | | | $V_{CE}$ = 50 V | $V_{IN}$ = 6 V | — | — | 500 | |
| | | CP | | | $V_{CE}$ = 100 V | | | | | |
| | | F | | | $V_{CE}$ = 35 V | | | | | |
| | TD62084 | AP, AF | | | $V_{CE}$ = 50 V | $V_{IN}$ = 1 V | — | — | 500 | |
| | | CP | | | $V_{CE}$ = 100 V | | | | | |
| | | F | | | $V_{CE}$ = 35 V | | | | | |
| Collector−Emitter Saturation Voltage | | | $V_{CE\ (sat)}$ | 2 | $I_{OUT}$ = 350 mA, $I_{IN}$ = 500 μA | | — | 1.3 | 1.6 | V |
| | | | | | $I_{OUT}$ = 200 mA, $I_{IN}$ = 350 μA | | — | 1.1 | 1.3 | |
| | | | | | $I_{OUT}$ = 100 mA, $I_{IN}$ = 250 μA | | — | 0.9 | 1.1 | |
| Input Current | | TD62082AP / CP / F / AF | $I_{IN\ (ON)}$ | 2 | $V_{IN}$ = 17 V | | — | 0.82 | 1.25 | mA |
| | | TD62083AP / CP / F / AF | | | $V_{IN}$ = 3.85 V | | — | 0.93 | 1.35 | |
| | | TD62084AP / CP / F / AF | | | $V_{IN}$ = 5 V | | — | 0.35 | 0.5 | |
| | | | | | $V_{IN}$ = 12 V | | — | 1.0 | 1.45 | |
| | | | $I_{IN\ (OFF)}$ | 4 | $I_{OUT}$ = 500 μA, Ta = 85°C | | 50 | 65 | — | μA |
| Input Voltage (Output On) | | TD62082AP / CP / F / AF | $V_{IN\ (ON)}$ | 5 | $V_{CE}$ = 2 V, $I_{OUT}$ = 300 mA | | — | — | 13 | V |
| | | TD62083AP / CP / F / AF | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 200 mA | | — | — | 2.4 | |
| | | | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 250 mA | | — | — | 2.7 | |
| | | | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 300 mA | | — | — | 3.0 | |
| | | TD62084AP / CP / F / AF | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 125 mA | | — | — | 5.0 | |
| | | | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 200 mA | | — | — | 6.0 | |
| | | | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 275 mA | | — | — | 7.0 | |
| | | | | | $V_{CE}$ = 2 V, $I_{OUT}$ = 350 mA | | — | — | 8.0 | |
| DC Current Transfer Ratio | | | $h_{FE}$ | 2 | $V_{CE}$ = 2 V, $I_{OUT}$ = 350 mA | | 1000 | — | — | |
| Clamp Diode Reverse Current | | | $I_R$ | 6 | Ta = 25°C | (Note) | — | — | 50 | μA |
| | | | | | Ta = 85°C | (Note) | — | — | 100 | |
| Clamp Diode Forward Voltage | | | $V_F$ | 7 | $I_F$ = 350 mA | | — | — | 2.0 | V |
| | | CP | | | $I_F$ = 280 mA | | — | — | 1.8 | |
| Input Capacitance | | | $C_{IN}$ | — | | | — | 15 | — | pF |

Note: $V_R = V_R$ MAX.

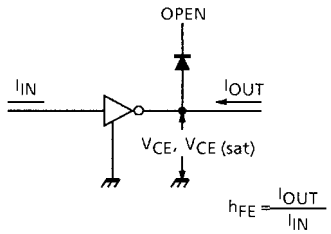
| CHARACTERISTIC | | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN | TYP. | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| Turn-On Delay | AP, AF | $t_{ON}$ | 8 | $R_L$ = 125 Ω, $V_{OUT}$ = 50 V | — | 0.1 | — | μA |
| | CP | | | $R_L$ = 312 Ω, $V_{OUT}$ = 100 V | — | 0.1 | — | |
| | F | | | $R_L$ = 87.5 Ω, $V_{OUT}$ = 35 V | — | 0.1 | — | |
| Turn-Off Delay | AP, AF | $t_{OFF}$ | | $R_L$ = 125 Ω, $V_{OUT}$ = 50 V | — | 0.2 | — | |
| | CP | | | $R_L$ = 312 Ω, $V_{OUT}$ = 100 V | — | 3.0 | — | |
| | F | | | $R_L$ = 87.5 Ω, $V_{OUT}$ = 35 V | — | 0.2 | — | |

## TEST CIRCUIT

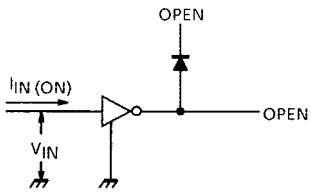
**1. $I_{CEX}$**



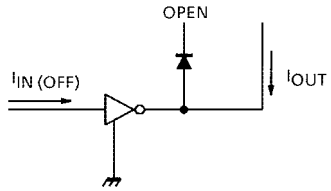

**2. $V_{CE\ (sat)}$, $h_{FE}$**



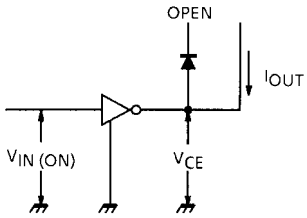

**3. $I_{IN\ (ON)}$**



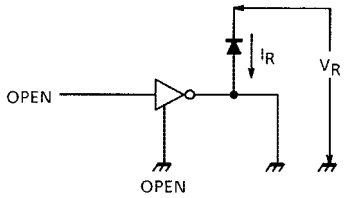

**4. $I_{IN\ (OFF)}$**



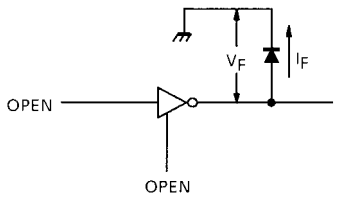

**5. $V_{IN\ (ON)}$**



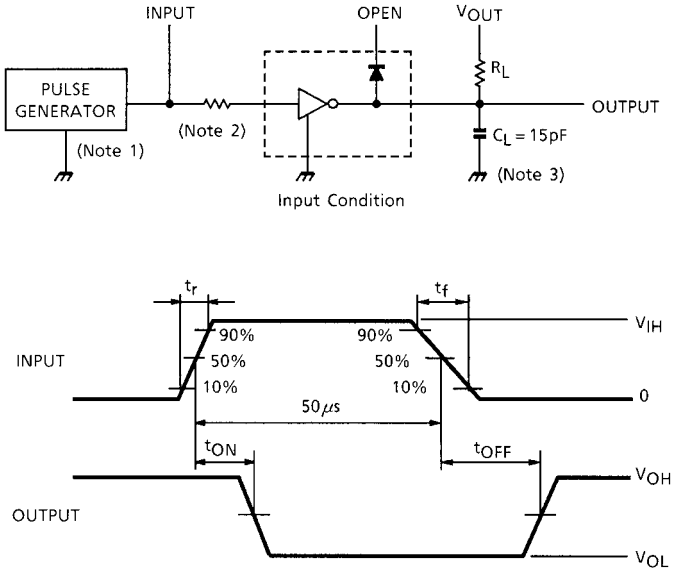

**6. $I_R$**




**7. $V_F$**



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




Note 1: Pulse Width 50 μs, Duty Cycle 10%
Output Impedance 50 Ω, $t_r \leq 5$ ns, $t_f \leq 10$ ns

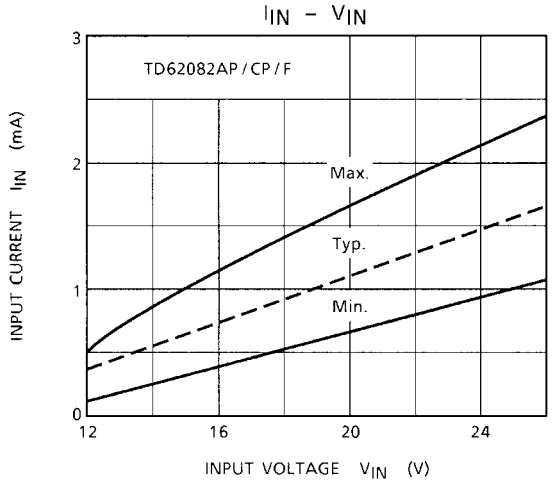
Note 2: See below.
INPUT CONDITION

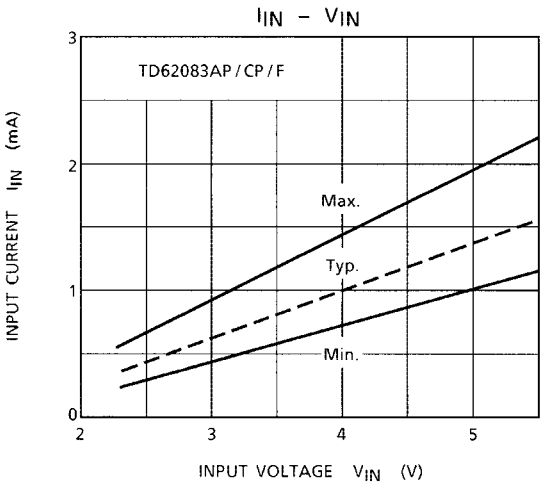
| TYPE NUMBER | R1 | $V_{IH}$ |
|---|---|---|
| TD62081AP / CP / F / AF | 2.7 kΩ | 3 V |
| TD62082AP / CP / F / AF | 0 Ω | 13 V |
| TD62083AP / CP / F / AF | 0 Ω | 3 V |
| TD62084AP / CP / F / AF | 0 Ω | 8 V |

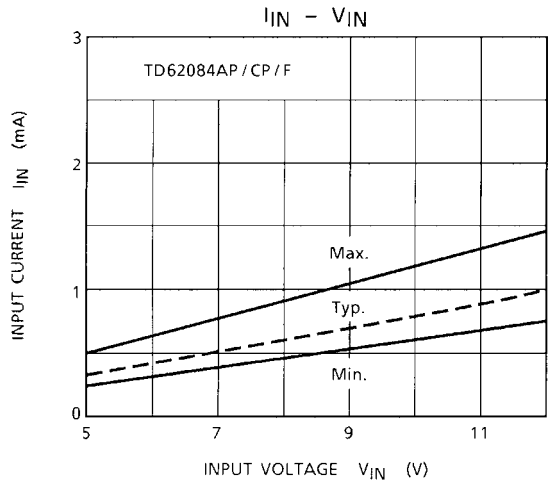
Note 3: $C_L$ includes probe and jig capacitance

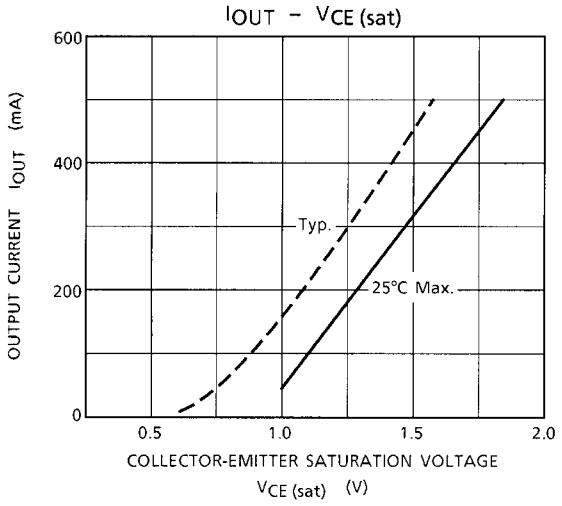
## PRECAUTIONS for USING

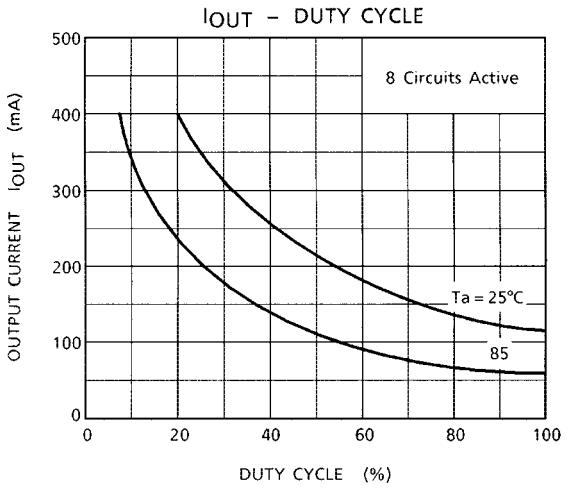
This IC does not include built-in protection circuits for excess current or overvoltage.
If this IC is subjected to excess current or overvoltage, it may be destroyed.
Hence, the utmost care must be taken when systems which incorporate this IC are designed.
Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short−circuit between outputs, air contamination fault, or fault by improper grounding.

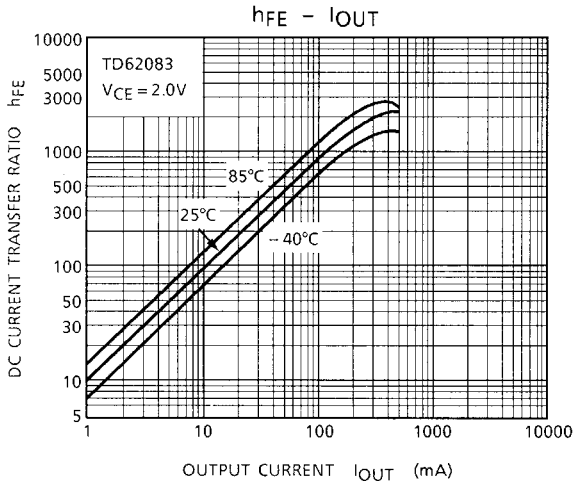

$I_{IN}$ – $V_{IN}$
TD62082AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT $I_{IN}$ (mA)
INPUT VOLTAGE $V_{IN}$ (V)
0
1
2
3
12
16
20
24

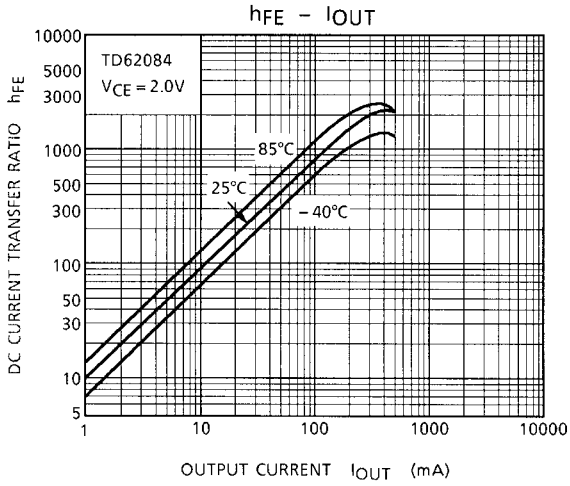

$I_{IN}$ – $V_{IN}$
TD62083AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT $I_{IN}$ (mA)
INPUT VOLTAGE $V_{IN}$ (V)
0
1
2
3
2
3
4
5

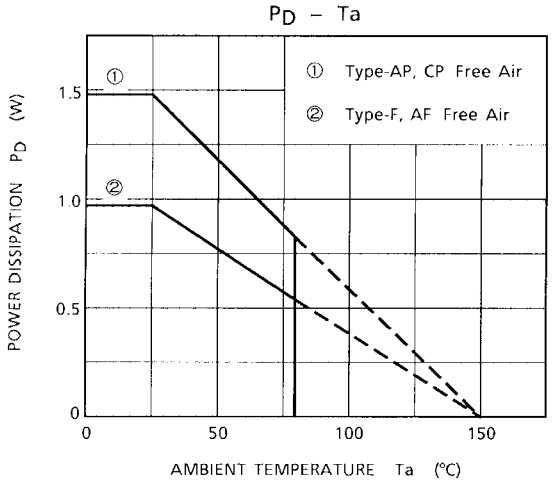

$I_{IN}$ – $V_{IN}$
TD62084AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT $I_{IN}$ (mA)
INPUT VOLTAGE $V_{IN}$ (V)
0
1
2
3
5
7
9
11


$I_{OUT}$ – $V_{CE\ (sat)}$
Typ.
25°C Max.
OUTPUT CURRENT $I_{OUT}$ (mA)
COLLECTOR-EMITTER SATURATION VOLTAGE
$V_{CE\ (sat)}$ (V)
0
200
400
600
0.5
1.0
1.5
2.0


$I_{OUT}$ – DUTY CYCLE
8 Circuits Active
Ta = 25°C
85
OUTPUT CURRENT $I_{OUT}$ (mA)
DUTY CYCLE (%)
0
100
200
300
400
500
0
20
40
60
80
100

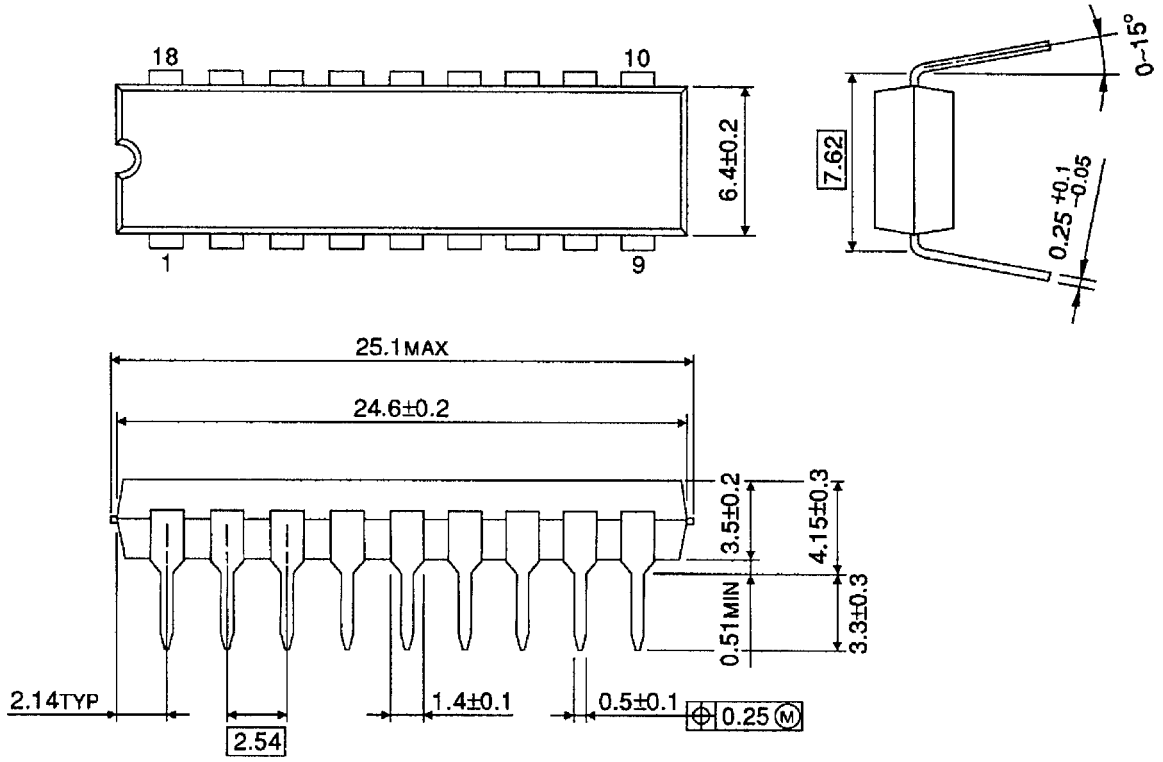

$h_{FE}$ – $I_{OUT}$
TD62083
$V_{CE}$ = 2.0V
85°C
25°C
– 40°C
DC CURRENT TRANSFER RATIO $h_{FE}$
OUTPUT CURRENT $I_{OUT}$ (mA)
10000
5000
3000
1000
500
300
100
50
30
10
5
1
10
100
1000
10000


$h_{FE}$ – $I_{OUT}$
TD62084
$V_{CE}$ = 2.0V
85°C
25°C
– 40°C
DC CURRENT TRANSFER RATIO $h_{FE}$
OUTPUT CURRENT $I_{OUT}$ (mA)
10000
5000
3000
1000
500
300
100
50
30
10
5
1
10
100
1000
10000


$P_D$ – Ta
① Type-AP, CP Free Air
② Type-F, AF Free Air
POWER DISSIPATION $P_D$ (W)
AMBIENT TEMPERATURE Ta (°C)
1.5
1.0
0.5
0
0
50
100
150

## PACKAGE DIMENSIONS

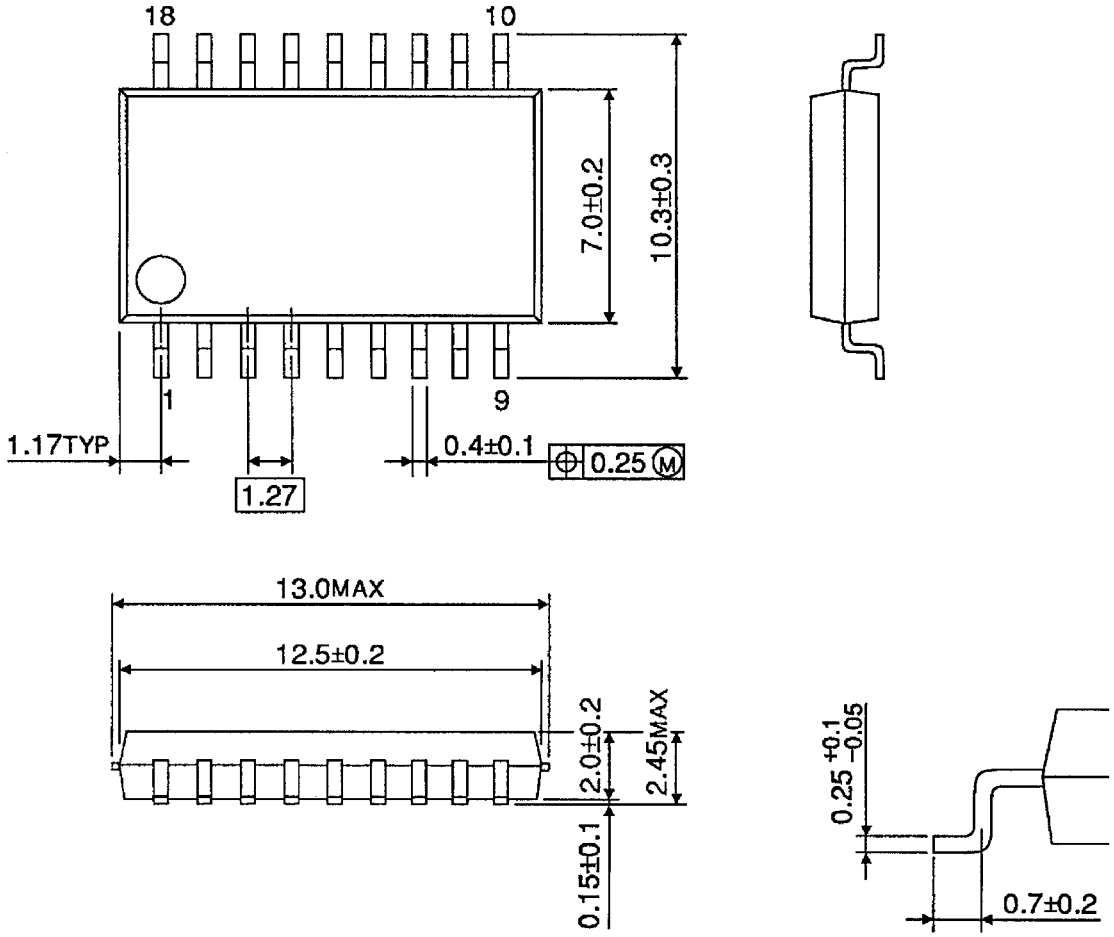
DIP18−P−300−2.54D Unit : mm




Weight: 1.478 g (Typ.)

## PACKAGE DIMENSIONS

SOP18−P−375−1.27 Unit : mm




Weight: 0.41 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..
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