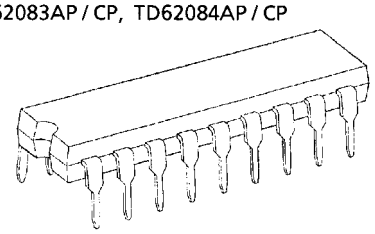
TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

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

8CH DARLINGTON SINK DRIVER

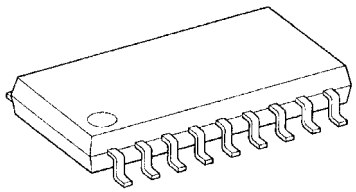
The TD62081AP / CP / F / AF Series are high−voltage, high−current darlington drivers comprised of eight NPN darlington pairs.
All units feature integral clamp diodes for switching inductive loads.
Applications include relay, hammer, lamp and display (LED) drivers.

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

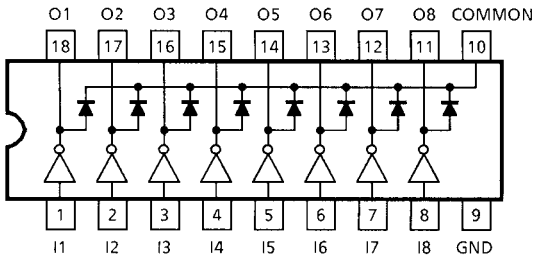
Weight
DIP18−P−300−2.54D : 1.478 g (Typ.)
SOP18−P−375−1.27 : 0.41 g (Typ.)

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

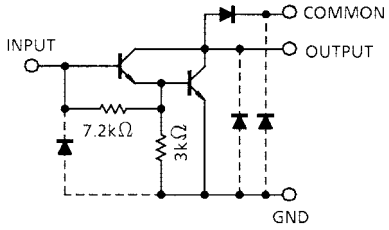
TYPE	INPUT BASE RESISTOR	DESIGNATION
TD62081AP / CP / F / AF	External	General Purpose
TD62082AP / CP / F / AF	10.5−kΩ + 7 V Zenner diode	14~25 V PMOS
TD62083AP / CP / F / AF	2.7 kΩ	TTL, 5 V CMOS
TD62084AP / CP / F / AF	10.5 kΩ	6~15 V PMOS, CMOS

PIN CONNECTION (TOP VIEW)

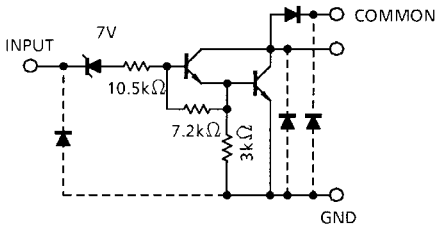


SCHEMATICS (EACH DRIVER)

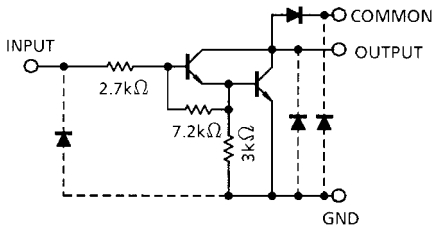
TD62081AP / CP / F / AF



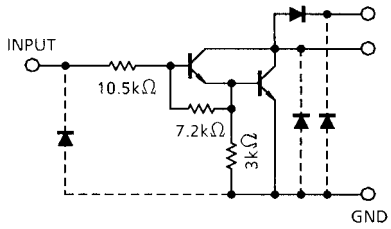
TD62082AP / CP / F / AF



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)

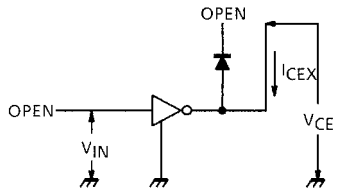
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
Output Leakage Current		AP, AF	I_{CEX}	1	V_{CE} = 50 V	Ta = 25°C	—	—	50	μA
		CP			V_{CE} = 100 V					
		F			V_{CE} = 35 V					
		AP, AF			V_{CE} = 50 V	Ta = 85°C	—	—	100	
		CP			V_{CE} = 100 V					
		F			V_{CE} = 35 V					
	TD62082	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.

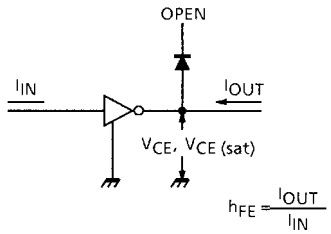
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Turn-On Delay	AP, AF	t_{ON}	8	R_L = 125 Ω, V_{OUT} = 50 V	—	0.1	—	μA
	CP			R_L = 312 Ω, V_{OUT} = 100 V	—	0.1	—	
	F			R_L = 87.5 Ω, V_{OUT} = 35 V	—	0.1	—	
Turn-Off Delay	AP, AF	t_{OFF}		R_L = 125 Ω, V_{OUT} = 50 V	—	0.2	—	
	CP			R_L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

TEST CIRCUIT

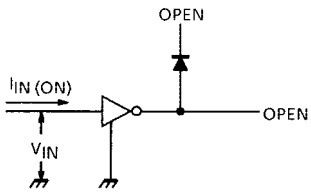
1. I_{CEX}



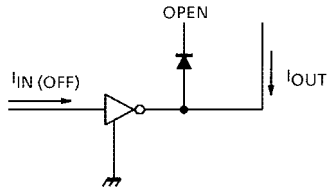
2. $V_{CE\ (sat)}$, h_{FE}



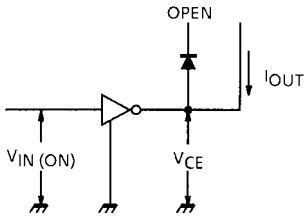
3. $I_{IN\ (ON)}$



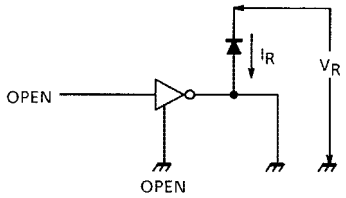
4. $I_{IN\ (OFF)}$



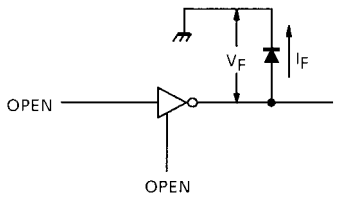
5. $V_{IN\ (ON)}$



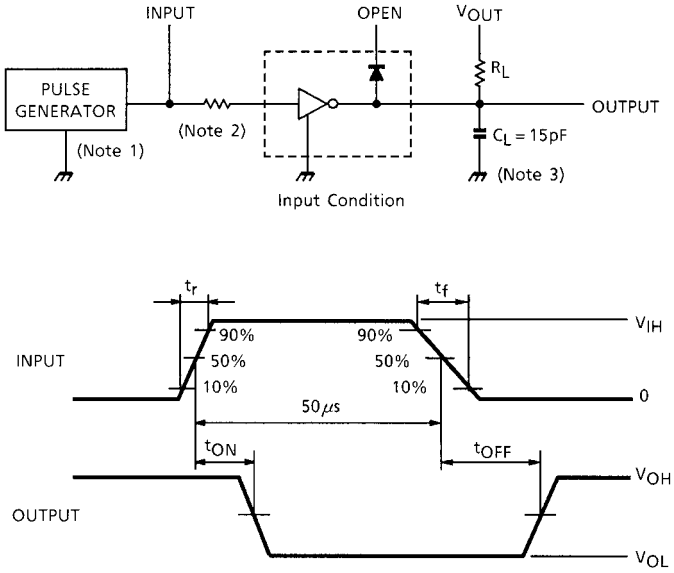
6. I_R



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

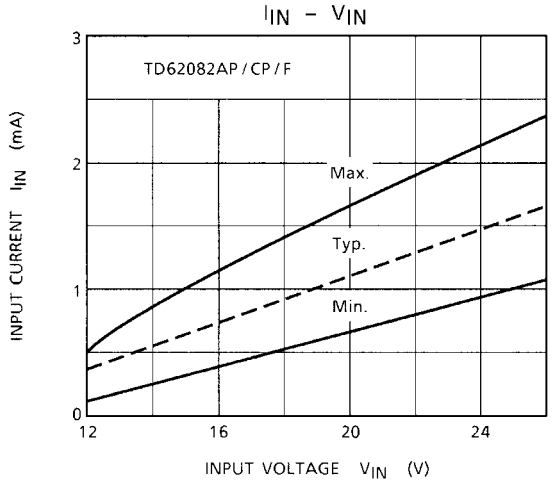
Note 2: See below.
INPUT CONDITION

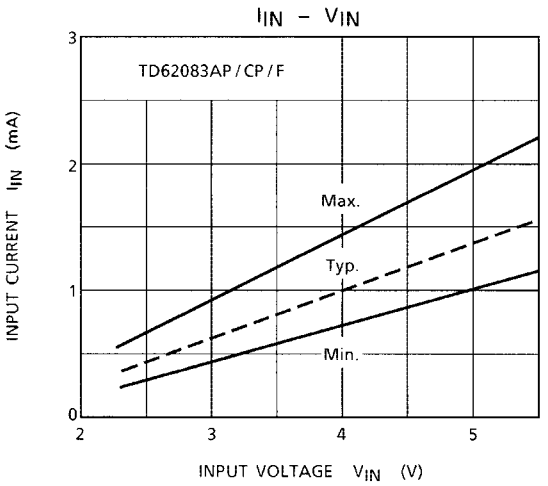
TYPE NUMBER	R1	V_{IH}
TD62081AP / CP / F / AF	2.7 kΩ	3 V
TD62082AP / CP / F / AF	0 Ω	13 V
TD62083AP / CP / F / AF	0 Ω	3 V
TD62084AP / CP / F / AF	0 Ω	8 V

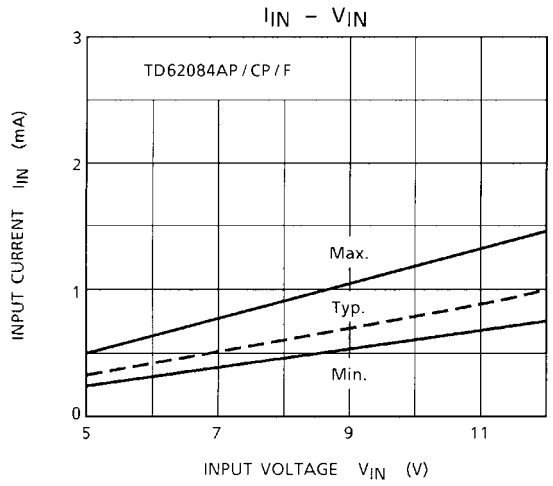
Note 3: C_L includes probe and jig capacitance

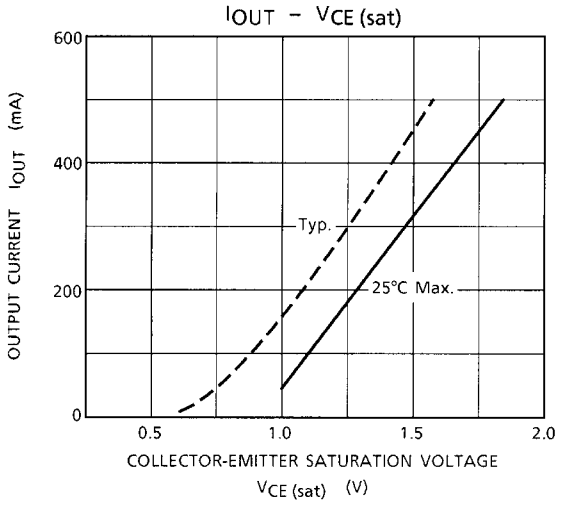
PRECAUTIONS for USING

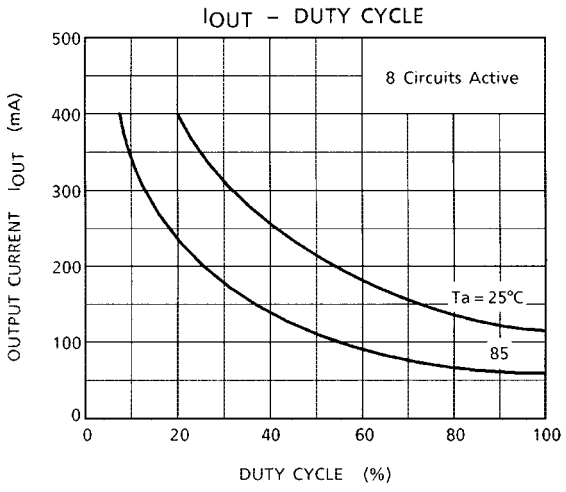
This IC does not include built-in protection circuits for excess current or overvoltage.
If this IC is subjected to excess current or overvoltage, it may be destroyed.
Hence, the utmost care must be taken when systems which incorporate this IC are designed.
Utmost care is necessary in the design of the 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.

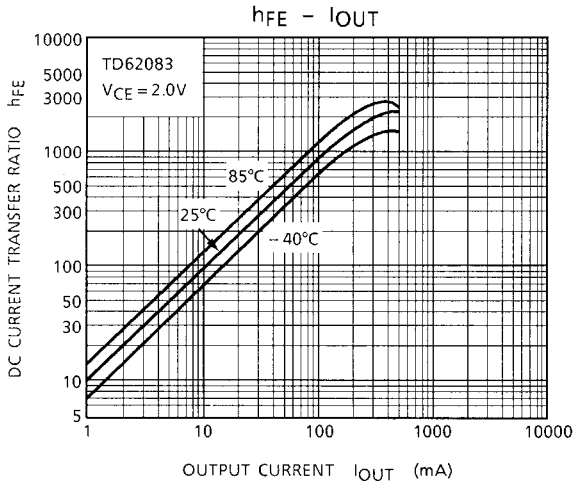

I_{IN} – V_{IN}
TD62082AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
0
1
2
3
12
16
20
24

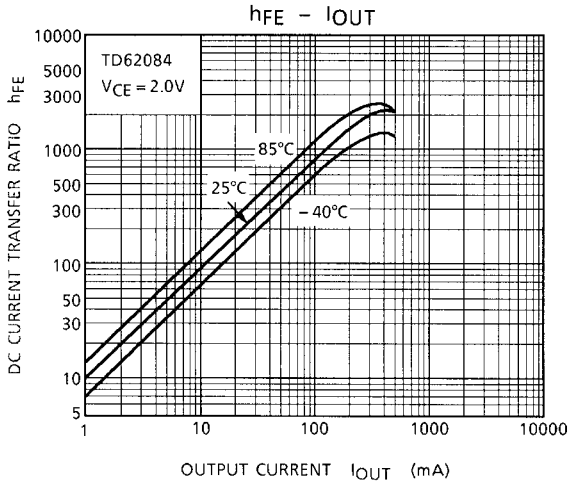

I_{IN} – V_{IN}
TD62083AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
0
1
2
3
2
3
4
5

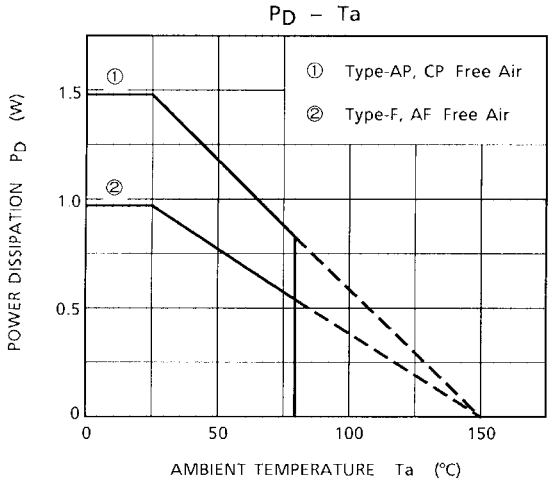

I_{IN} – V_{IN}
TD62084AP / CP / F
Max.
Typ.
Min.
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
0
1
2
3
5
7
9
11


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

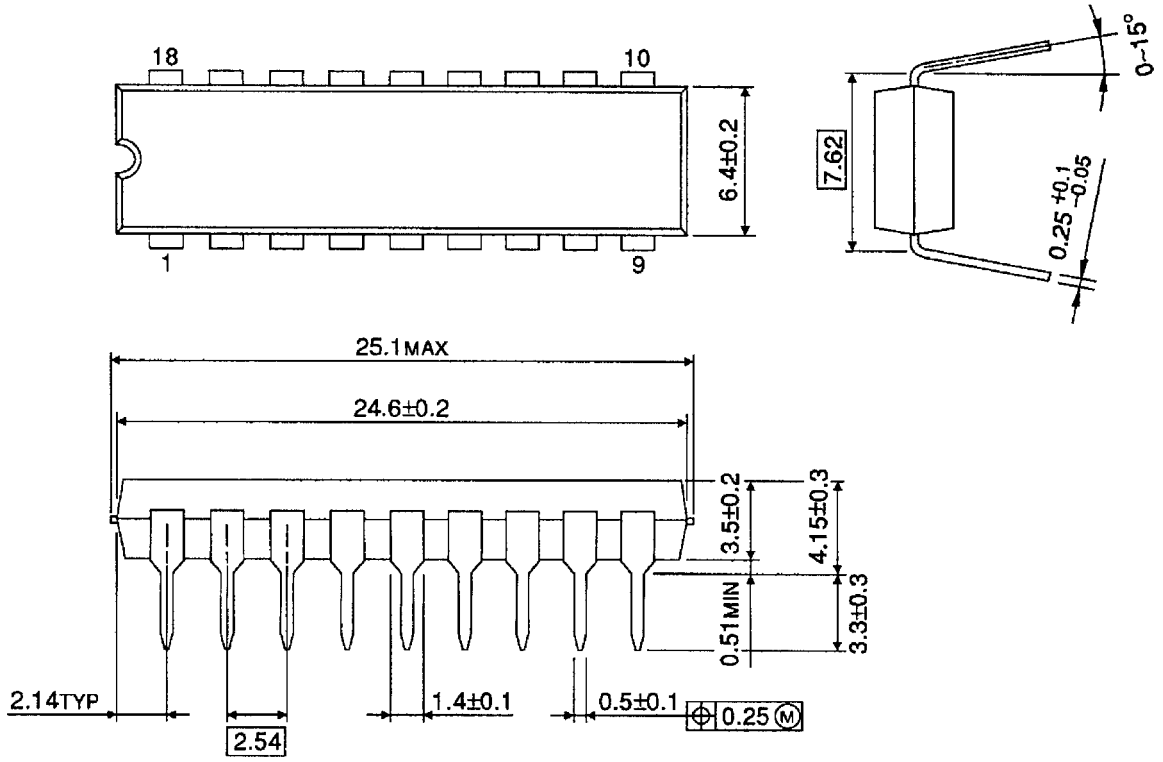

h_{FE} – I_{OUT}
TD62083
V_{CE} = 2.0V
85°C
25°C
– 40°C
DC CURRENT TRANSFER RATIO h_{FE}
OUTPUT CURRENT I_{OUT} (mA)
10000
5000
3000
1000
500
300
100
50
30
10
5
1
10
100
1000
10000


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

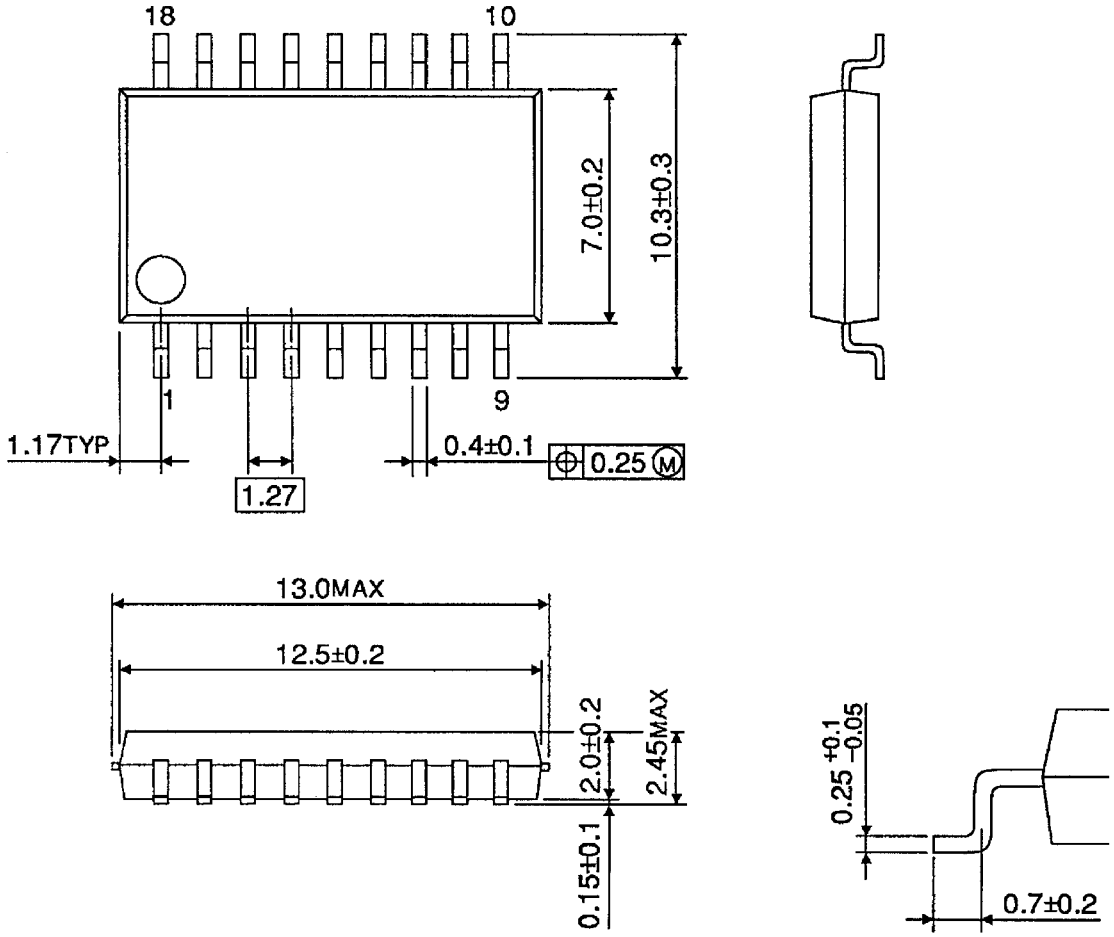
DIP18−P−300−2.54D Unit : mm



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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