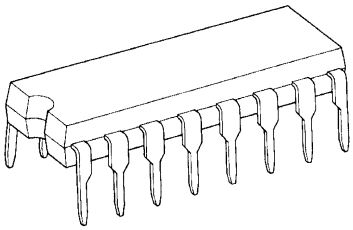
TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62003PA,TD62003APA,TD62004PA,TD62004APA

7CH DARLINGTON SINK DRIVER

The TD62003PA / APA Series are high−voltage, high−current darlington drivers comprised of seven NPN darlington pairs. All units feature integral clamp diodes for switching inductuve loads. Applications include relay, hammer, lamp and display (LED) drivers.



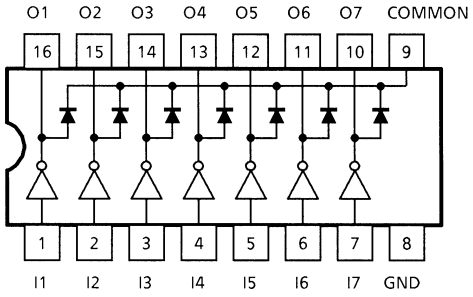
DIP16-P-300-2.54A

Weight: 1.11g (Typ.)

FEATURES

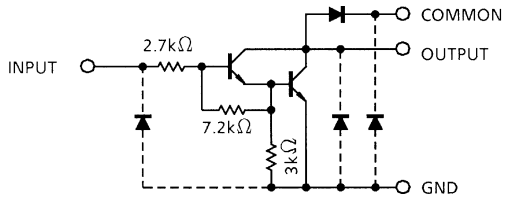
- Output current (single output) 500 mA (Max.)
- High sustaining voltage output
  35 V (Min.) (TD62003PA series)
  50 V (Min.) (TD62003APA series)
- Output clamp diodes
- Inputs compatible with various types of logic.
  TD62003PA, APA R_{IN} = 2.7 kΩ
  TD62004PA, APA R_{IN} = 10.5 kΩ
- Package DIP−16 pin

PIN CONNECTION (TOP VIEW)

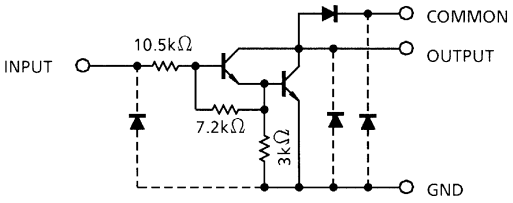


SCHEMATICS (EACH DRIVER)

TD62003PA / APA



TD62004PA / APA



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	PA	$V_{CE\ (SUS)}$	−0.5~35	V
	APA		−0.5~50	
Output Current		I_{OUT}	500	mA / ch
Input Voltage		V_{IN}	−0.5~30	V
Clamp Diode Reverse Voltage	PA	V_R	35	V
	APA		50	
Clamp Diode Forward Current		I_F	500	mA
Power Dissipation		P_D	1.47	W
Operating Temperature	PA	T_{opr}	−30~75	°C
	APA		−40~85	
Storage Temperature		T_{stg}	−55~150	°C

RECOMMENDED OPERATING CONDITIONS
(Ta = −40~85°C for Type−APA and Ta = −30~75°C for Type−PA)

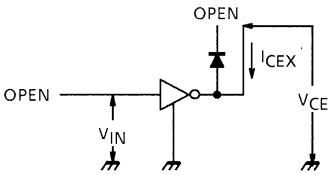
CHARACTERISTIC		SYMBOL	CONDITION		MIN	TYP.	MAX	UNIT
Output Sustaining Voltage	PA	$V_{CE\ (SUS)}$			0	—	35	V
	APA				0	—	50	
Output Current	PA	I_{OUT}	T_{pw} = 25 ms 7 Circuits	Duty = 10%	0	—	370	mA / ch
				Duty = 50%	0	—	140	
	APA			Duty = 10%	0	—	400	
				Duty = 50%	0	—	170	
Input Voltage		V_{IN}			0	—	24	V
	TD62003	$V_{IN\ (ON)}$	I_{OUT} = 400 mA, h_{FE} = 800		2.8	—	24	V
	TD62004				6.2	—	24	
	TD62003	$V_{IN\ (OFF)}$			0	—	0.7	V
	TD62004				0	—	1.0	
Clamp Diode Reverse Voltage	PA	V_R			—	—	35	V
	APA				—	—	50	
Clamp Diode Forward Current		I_F			—	—	350	mA
Power Dissipation		P_D	Ta = 85°C		—	—	0.52	W

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

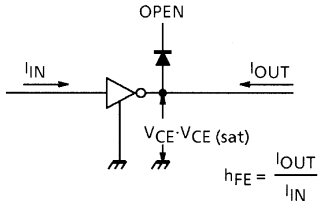
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
Output Leakage Current	APA	I_{CEX}	1	V_{CE} = 50 V, Ta = 25°C		—	—	50	μA
				V_{CE} = 50 V, Ta = 85°C		—	—	100	
	PA			V_{CE} = 35 V, Ta = 25°C		—	—	50	
				V_{CE} = 35 V, Ta = 75°C		—	—	100	
Collector−Emitter Saturation Voltage		$V_{CE\ (sat)}$	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	
DC Current Transfer Ratio		h_{FE}	2	V_{CE} = 2 V, I_{OUT} = 350 mA		1000	—	—	
Input Current (Output On)	TD62003	$I_{IN\ (ON)}$	3	V_{IN} = 2.4 V, I_{OUT} = 350 mA		—	0.4	0.7	mA
	TD62004			V_{IN} = 9.5 V, I_{OUT} = 350 mA		—	0.8	1.3	
	PA	$I_{IN\ (OFF)}$	4	I_{OUT} = 500 μA, Ta = 75°C		50	65	—	μA
	APA			I_{OUT} = 500 μA, Ta = 85°C		50	65	—	
Input Voltage (Output On)	TD62003	$V_{IN\ (ON)}$	5	V_{CE} = 2 V, h_{FE} = 800	I_{OUT} = 350 mA	—	—	2.6	V
					I_{OUT} = 200 mA	—	—	2.0	
	TD62004				I_{OUT} = 350 mA	—	—	4.7	
					I_{OUT} = 200 mA	—	—	4.4	
Clamp Diode Reverse Current	APA	I_R	6	V_R = 50 V, Ta = 25°C		—	—	50	μA
				V_R = 50 V, Ta = 85°C		—	—	100	
	PA			V_R = 35 V, Ta = 25°C		—	—	50	
				V_R = 35 V, Ta = 75°C		—	—	100	
Clamp Diode Forward Voltage		V_F	7	I_F = 350 mA		—	—	2.0	V
Input Capacitance		C_{IN}	—			—	15	—	pF
Turn−On Delay	PA	t_{ON}	8	V_{OUT} = 35 V, R_L = 85 Ω, C_L = 15 pF		—	0.1	—	μs
	APA			V_{OUT} = 50 V, R_L = 125 Ω, C_L = 15 pF		—	0.1	—	
Turn−Off Delay	PA	t_{OFF}	8	V_{OUT} = 35 V, R_L = 85 Ω, C_L = 15 pF		—	0.2	—	
	APA			V_{OUT} = 50 V, R_L = 125 Ω, C_L = 15 pF		—	0.2	—	

TEST CIRCUIT

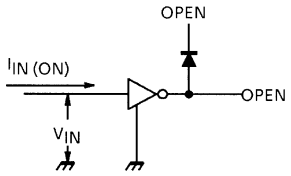
1. I_{CEX}



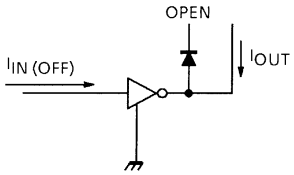
2. $V_{CE\ (sat)}$, h_{FE}



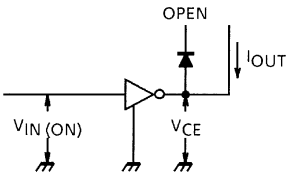
3. $I_{IN\ (ON)}$



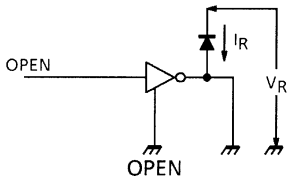
4. $I_{IN\ (OFF)}$



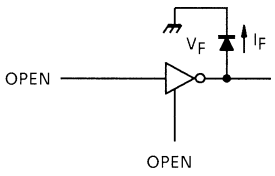
5. $V_{IN\ (ON)}$



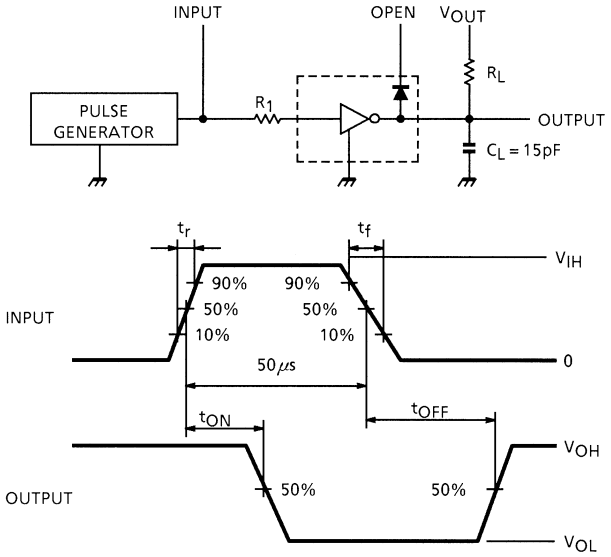
6. I_R



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

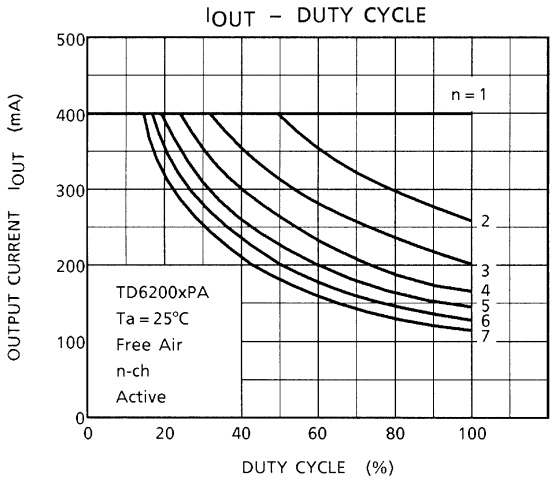
INPUT CONDITION

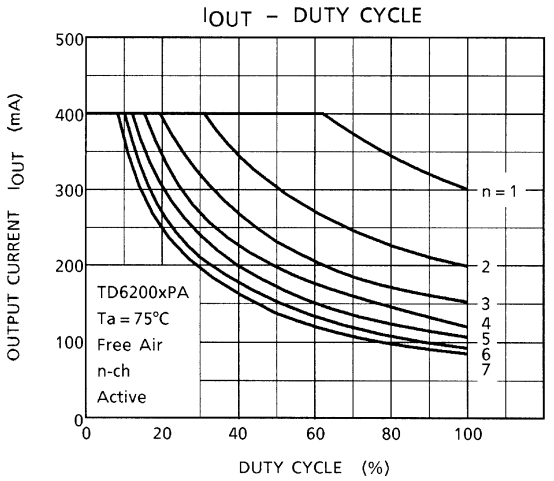
TYPE NUMBER	R_I	V_{IH}
TD620003PA / APA	0	3 V
TD620004 / APA	0	8 V

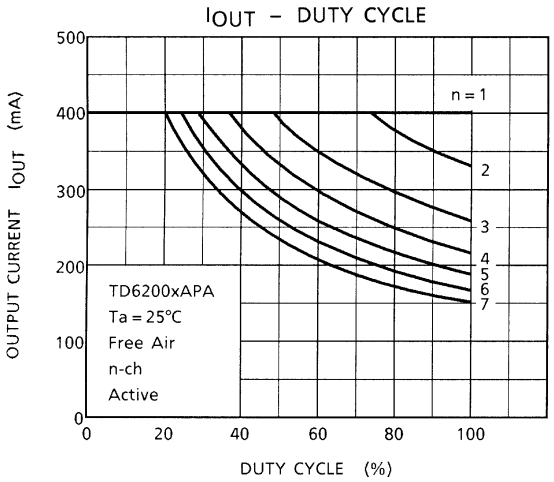
Note 3: C_L includes probe and jig capacitance

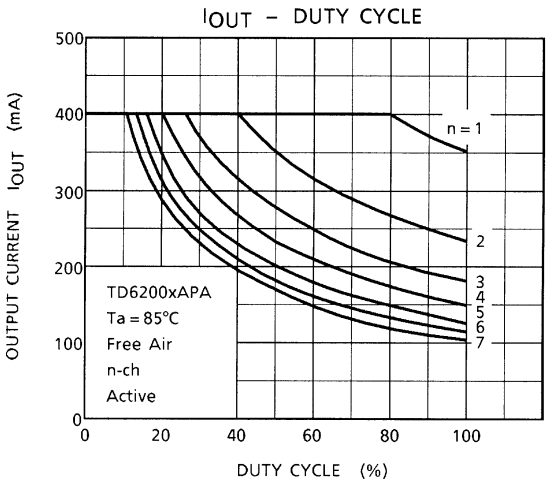
PRECAUTIONS for USING

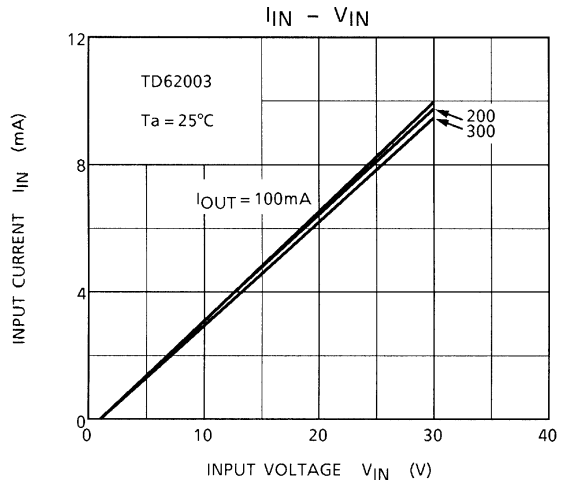
This IC does not include built-in protection circuits for excess current or overvoltage.
If this IC is subjected to excess current or overvoltage, it may be destroyed.
Hence, the utmost care must be taken when systems which incorporate this IC are designed.Utmost care is necessary in the design of the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

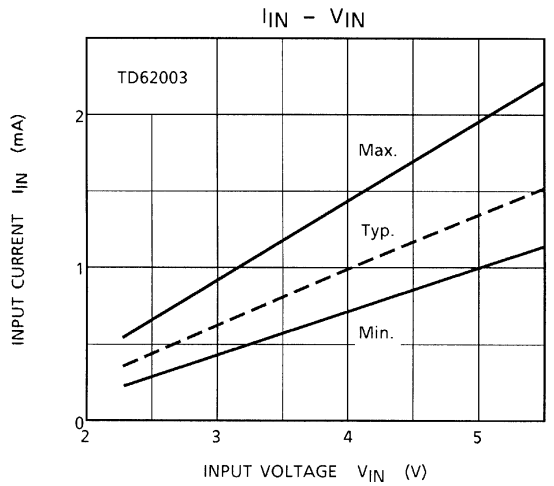

I_{OUT} – DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
TD6200xPA
Ta = 25°C
Free Air
n-ch
Active


I_{OUT} – DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
TD6200xPA
Ta = 75°C
Free Air
n-ch
Active

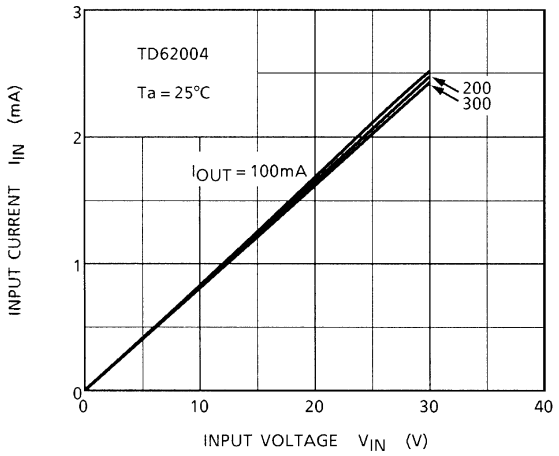

I_{OUT} – DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
TD6200xAPA
Ta = 25°C
Free Air
n-ch
Active


I_{OUT} – DUTY CYCLE
OUTPUT CURRENT I_{OUT} (mA)
DUTY CYCLE (%)
n = 1
2
3
4
5
6
7
TD6200xAPA
Ta = 85°C
Free Air
n-ch
Active

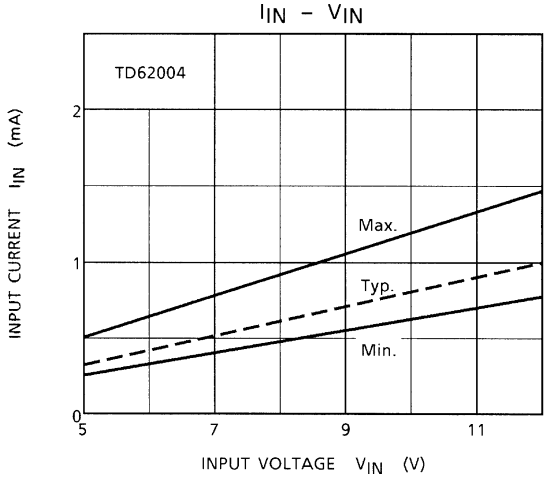

I_{IN} – V_{IN}
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
TD62003
Ta = 25°C
I_{OUT} = 100mA
200
300


I_{IN} – V_{IN}
INPUT CURRENT I_{IN} (mA)
INPUT VOLTAGE V_{IN} (V)
TD62003
Max.
Typ.
Min.

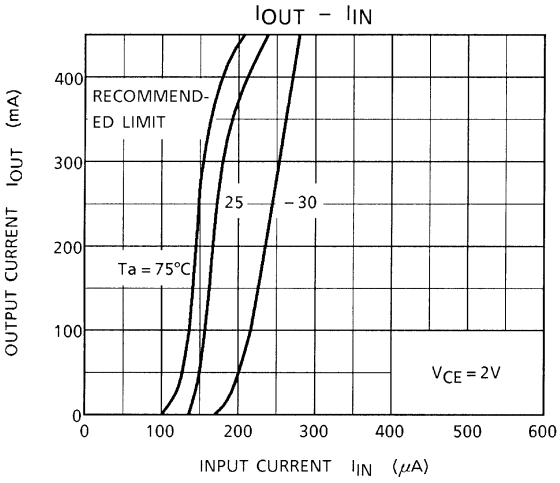
I_{IN} – V_{IN}



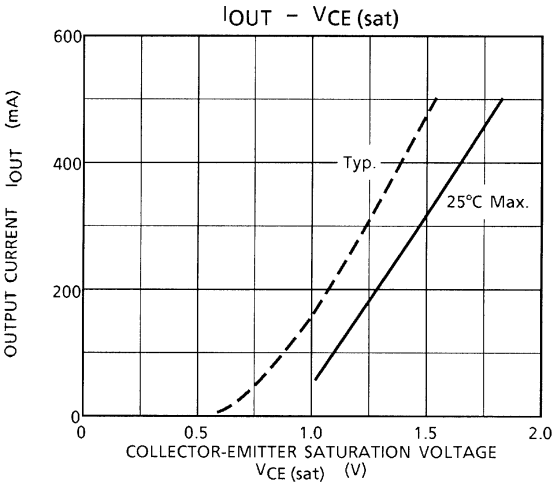
I_{IN} – V_{IN}



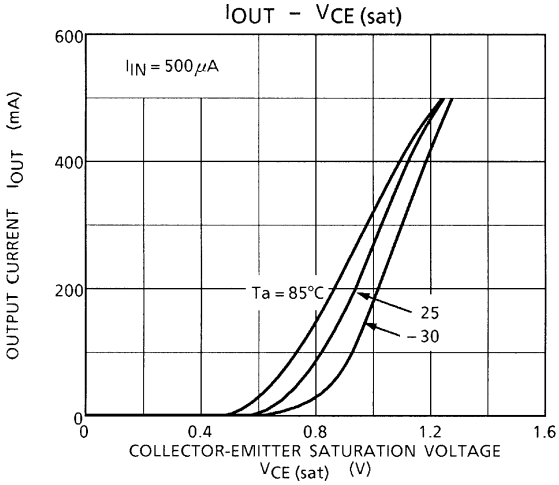
I_{OUT} – I_{IN}



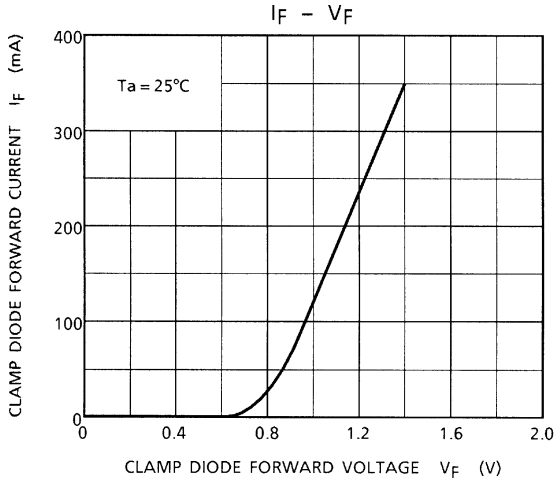
I_{OUT} – $V_{CE\ (sat)}$

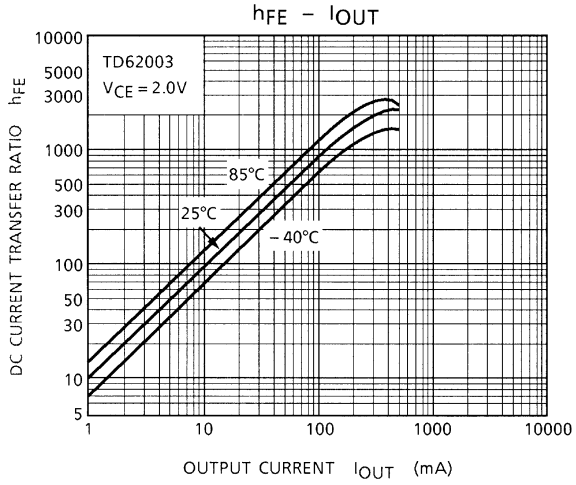


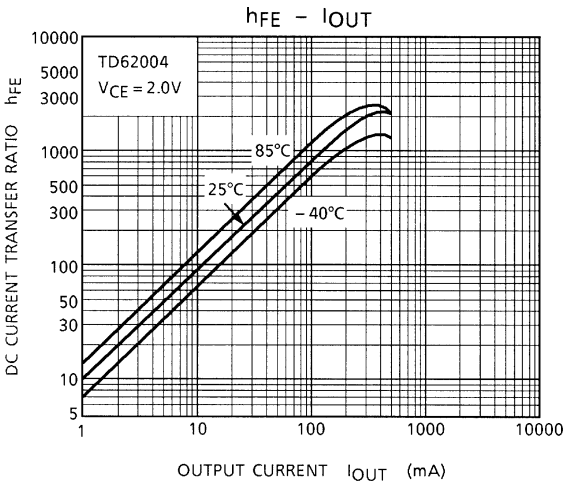
I_{OUT} – $V_{CE\ (sat)}$

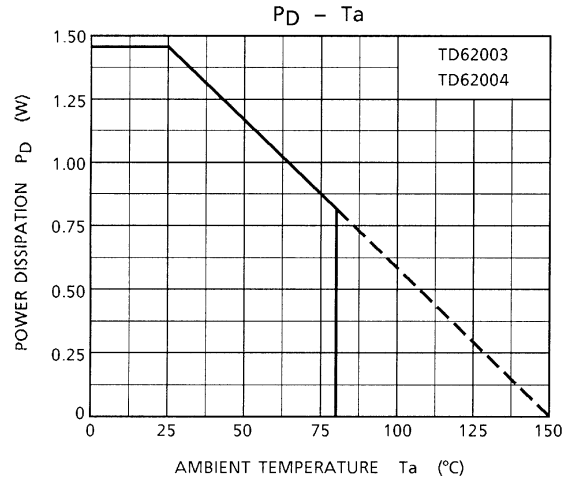


I_F – V_F



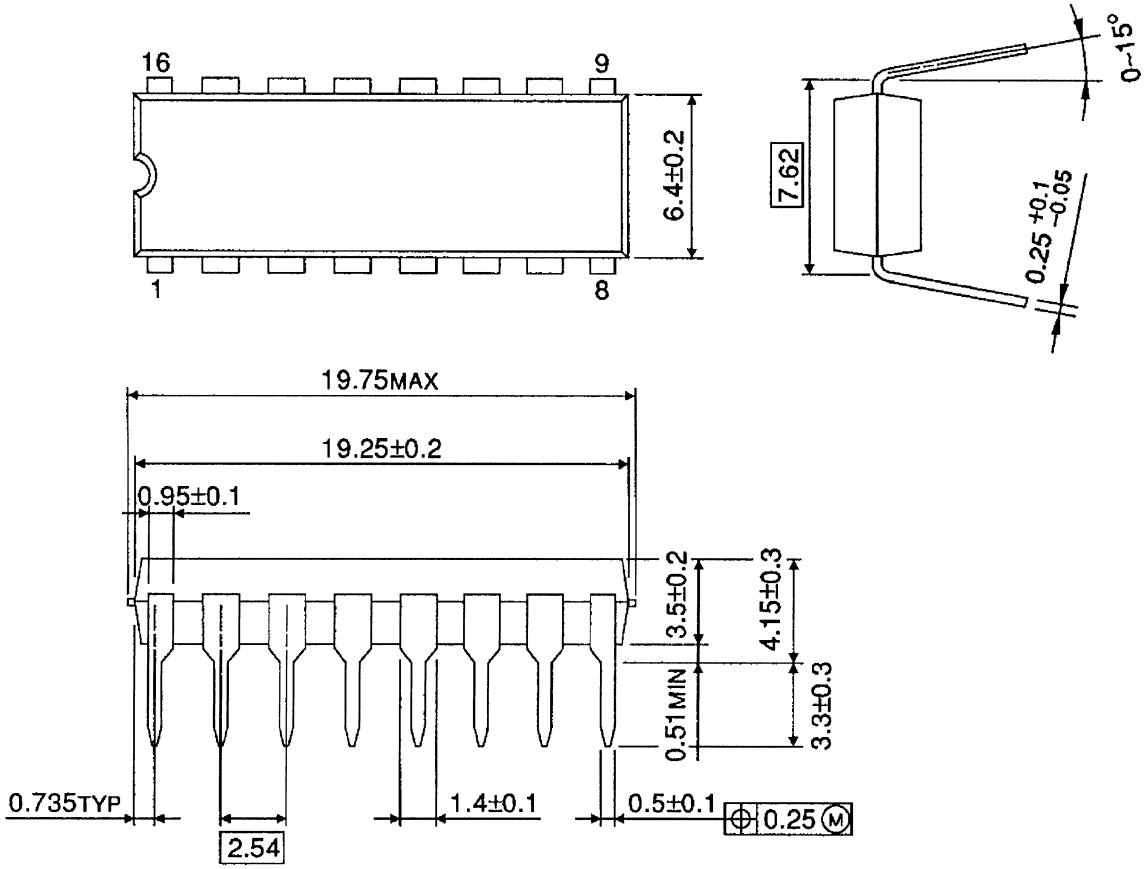

h_{FE} – I_{OUT}
TD62003
V_{CE} = 2.0V
85°C
25°C
– 40°C
DC CURRENT TRANSFER RATIO h_{FE}
OUTPUT CURRENT I_{OUT} (mA)
10000
5000
3000
1000
500
300
100
50
30
10
5
1
10
100
1000
10000


h_{FE} – I_{OUT}
TD62004
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
TD62003
TD62004
POWER DISSIPATION P_D (W)
AMBIENT TEMPERATURE Ta (°C)
1.50
1.25
1.00
0.75
0.50
0.25
0
0
25
50
75
100
125
150

PACKAGE DIMENSIONS

DIP16−P−300−2.54A Unit : mm



Weight: 1.11 g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

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  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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