

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62001P, TD62001AP, TD62001F, TD62001AF, TD62002P, TD62002AP, TD62002F, TD62002AF, TD62003P, TD62003AP, TD62003F, TD62003AF, TD62004P, TD62004AP, TD62004F, TD62004AF

7CH DARLINGTON SINK DRIVER

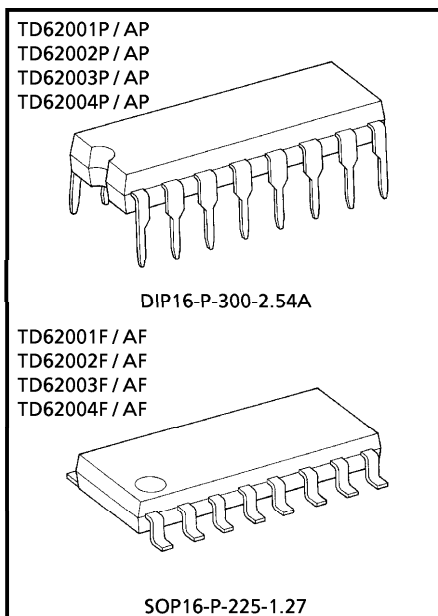
The TD62001P/AP/F/AF Series are high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs.

All units feature integral clamp diodes for switching inductive loads.

Applications include relay, hammer, lamp and display (LED) drivers.

FEATURES

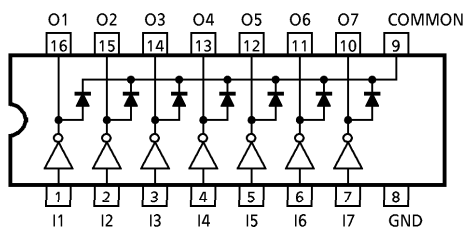
- Output current (single output) 500mA MAX.
- High sustaining voltage output
35V MIN. (TD62001P/F Series)
50V MIN. (TD62001AP/AF Series)
- Output clamp diodes
- Inputs compatible with various types of logic
- Package Type-P, AP : DIP-16pin
- Package Type-F, AF : SOP-16pin



Weight
 DIP16-P-300-2.54A : 1.11g (Typ.)
 SOP16-P-225-1.27 : 0.16g (Typ.)

TYPE	INPUT BASE RESISTOR	DESIGNATION
TD62001P/AP/F/AF	External	General Purpose
TD62002P/AP/F/AF	10.5-kΩ + 7V Zener diode	14~25V PMOS
TD62003P/AP/F/AF	2.7kΩ	TTL, 5V CMOS
TD62004P/AP/F/AF	10.5kΩ	6~15V PMOS, CMOS

PIN CONNECTION (TOP VIEW)

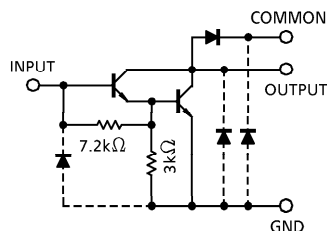


961001EBA2

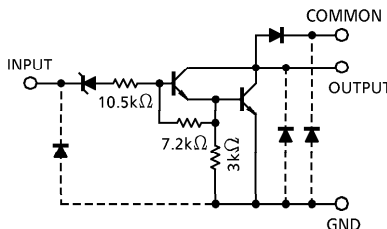
- TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product 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 products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.
- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

SCHEMATICS (EACH DRIVER)

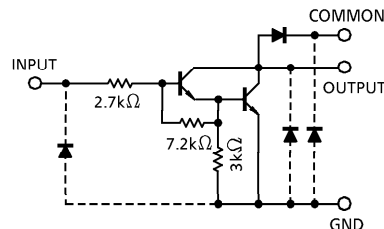
TD62001P / AP / F / AF



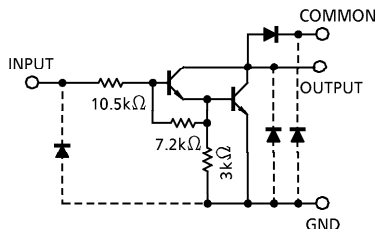
TD62002P / AP / F / AF



TD62003P / AP / F / AF



TD62004P / AP / 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	P, F	V _{CE (SUS)}	- 0.5~35	V
	AP, AF		- 0.5~50	
Output Current		I _{OUT}	500	mA / ch
Input Voltage		V _{IN} (Note 1)	- 0.5~30	V
Input Current		I _{IN} (Note 2)	25	mA
Clamp Diode Reverse Voltage	P, F	V _R	35	V
	AP, AF		50	
Clamp Diode Forward Current		I _F	500	mA
Power Dissipation	P	P _D	1.0	W
	AP		1.47	
	F, AF		0.54 / 0.625 (Note 3)	
Operating Temperature	P	T _{opr}	- 30~75	°C
	AP, F, AF		- 40~85	
Storage Temperature		T _{stg}	- 55~150	°C

(Note 1) Except TD62001P / AP / F / AF

(Note 2) Only TD62001P / AP / F / AF

(Note 3) On glass epoxy PCB (30×30×1.6mm Cu 50%)

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

CHARACTERISTIC		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Sustaining Voltage	P, F	V _{CE(SUS)}		0	—	35	V	
	AP, AF			0	—	50		
Output Current	AP	I _{OUT}	T _{pw} = 25ms 7 Circuits Ta = 85°C Tj = 120°C	Duty = 10%	0	—	370	mA / ch
				Duty = 50%	0	—	130	
	P			Duty = 10%	0	—	295	
				Duty = 50%	0	—	95	
	F, AF			Duty = 10%	0	—	233	
				Duty = 50%	0	—	70	
Input Voltage	Except TD62001P / AP / F / AF	V _{IN}		0	—	24	V	
Input Voltage (Output On)	TD62002	V _{IN(ON)}	I _{OUT} = 400mA h _{FE} = 800	14.5	—	24	V	
	TD62003			2.8	—	24		
	TD62004			6.2	—	24		
Input Voltage (Output Off)	TD62001	V _{IN(OFF)}		0	—	0.6	V	
	TD62002			0	—	7.4		
	TD62003			0	—	0.7		
	TD62004			0	—	1.0		
Input Current	Only TD62001	I _{IN}		0	—	10	mA	
Clamp Diode Reverse Voltage	P, F	V _R		—	—	35	V	
	AP, AF			—	—	50		
Clamp Diode Forward Current		I _F		—	—	350	mA	
Power Dissipation	P	P _D	Ta = 85°C	—	—	0.6	W	
	AP			—	—	0.76		
	AF, F			(Note) Ta = 85°C	—	—		0.325

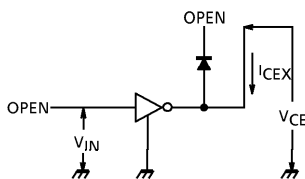
(Note) On glass epoxy PCB (30×30×1.6mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Ta = 25°C unless otherwise noted)

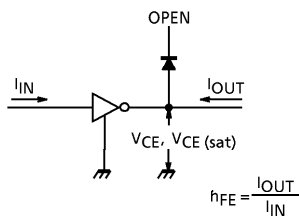
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Leakage Current	AP, AF	ICEX	1	VCE = 50V, Ta = 25°C	—	—	50	μA	
				VCE = 50V, Ta = 85°C	—	—	100		
	F			VCE = 35V, Ta = 25°C	—	—	50		
				VCE = 35V, Ta = 85°C	—	—	100		
	P			VCE = 35V, Ta = 25°C	—	—	50		
				VCE = 35V, Ta = 75°C	—	—	100		
Collector-Emitter Saturation Voltage		VCE (sat)	2	IOUT = 350mA, IIN = 500μA	—	1.3	1.6	V	
				IOUT = 200mA, IIN = 350μA	—	1.1	1.3		
				IOUT = 100mA, IIN = 250μA	—	0.9	1.1		
DC Current Transfer Ratio		hFE	2	VCE = 2V, IOUT = 350mA	1000	—	—		
Input Current (Output On)	TD62002	IIN (ON)	3	VIN = 20V, IOUT = 350mA	—	1.1	1.7	mA	
	TD62003			VIN = 2.4V, IOUT = 350mA	—	0.4	0.7		
	TD62004			VIN = 9.5V, IOUT = 350mA	—	0.8	1.2		
Input Current (Output Off)	P	IIN (OFF)	4	IOUT = 500μA, Ta = 75°C	50	65	—	μA	
	AP, F, AF			IOUT = 500μA, Ta = 85°C	50	65	—		
Input Voltage (Output On)	TD62002	VIN (ON)	5	VCE = 2V hFE = 800	IOUT = 350mA	—	—	13.7	V
					IOUT = 200mA	—	—	11.4	
	TD62003				IOUT = 350mA	—	—	2.6	
					IOUT = 200mA	—	—	2.0	
	TD62004				IOUT = 350mA	—	—	4.7	
					IOUT = 200mA	—	—	4.4	
Clamp Diode Reverse Current	AP, AF	IR	6	VR = 50V, Ta = 25°C	—	—	50	μA	
				VR = 50V, Ta = 85°C	—	—	100		
	F			VR = 35V, Ta = 25°C	—	—	50		
				VR = 35V, Ta = 85°C	—	—	100		
	P			VR = 35V, Ta = 25°C	—	—	50		
				VR = 35V, Ta = 75°C	—	—	100		
Clamp Diode Forward Voltage		VF	7	IF = 350mA	—	—	2.0	V	
Input Capacitance		CIN	—		—	15	—	pF	
Turn-On Delay	P, F	tON	8	VOUT = 35V, RL = 87.5Ω CL = 15pF	—	0.1	—	μs	
	AP, AF			VOUT = 50V, RL = 125Ω CL = 15pF	—	0.1	—		
Turn-Off Delay	P, F	tOFF	8	VOUT = 35V, RL = 87.5Ω CL = 15pF	—	0.2	—		
	AP, AF			VOUT = 50V, RL = 125Ω CL = 15pF	—	0.2	—		

TEST CIRCUIT

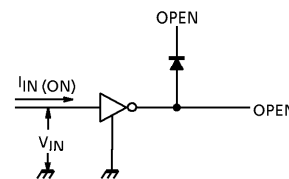
1. I_{CEX}



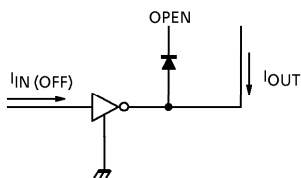
2. $V_{CE(sat)}$, h_{FE}



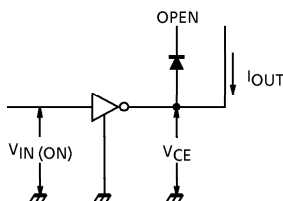
3. $I_{IN(ON)}$



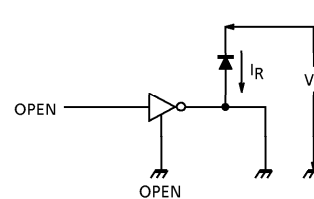
4. $I_{IN(OFF)}$



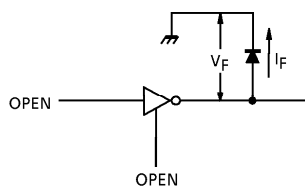
5. $V_{IN(ON)}$



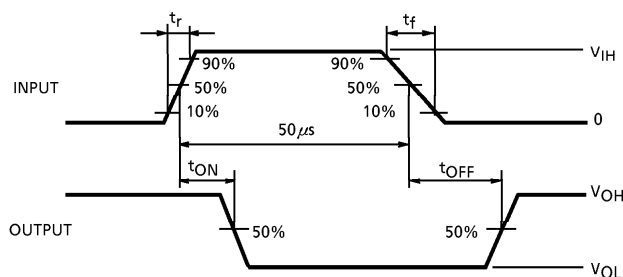
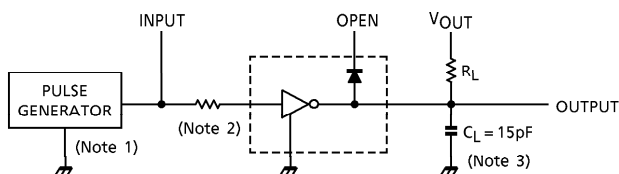
6. I_R



7. V_F



8. t_{ON} , t_{OFF}



(Note 1) Pulse width $50\mu s$, duty cycle 10%
Output impedance 50Ω , $t_r \leq 5ns$, $t_f \leq 10ns$

(Note 2) See below

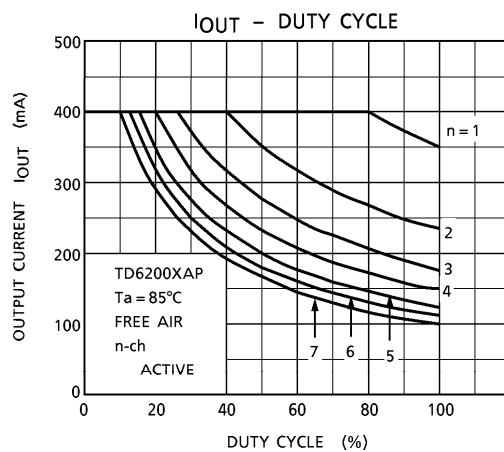
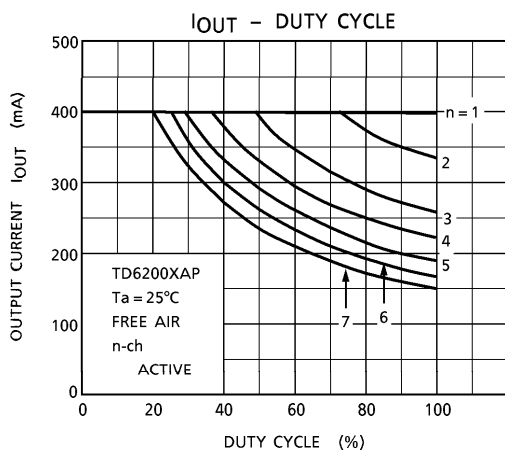
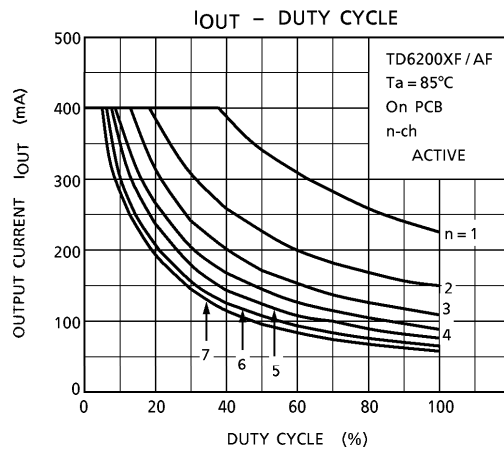
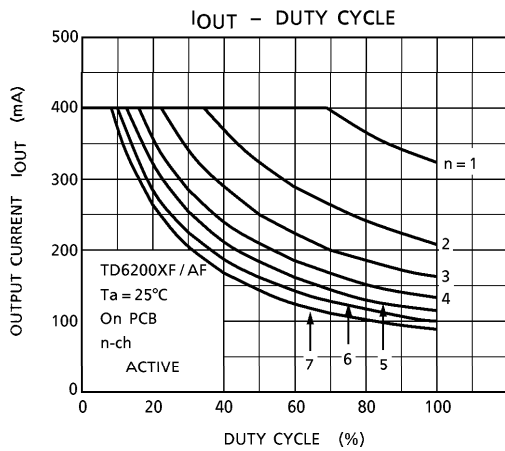
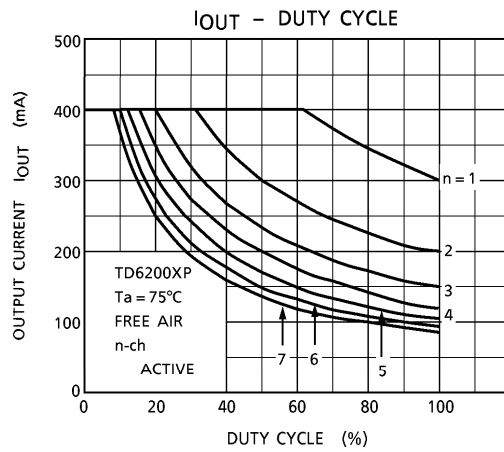
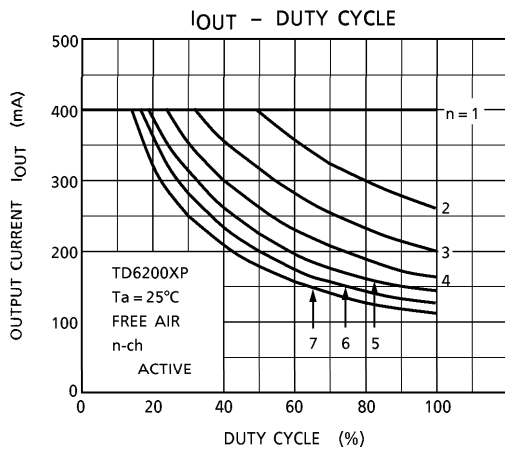
INPUT CONDITION

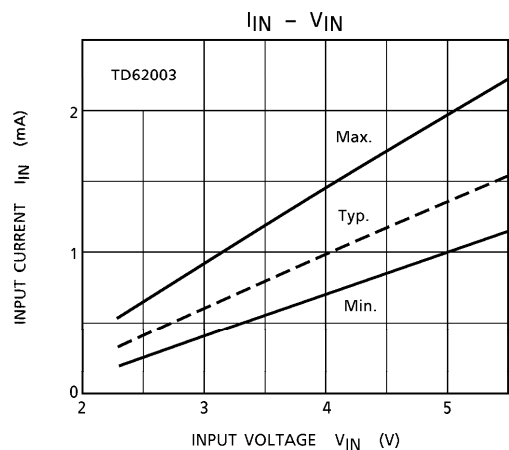
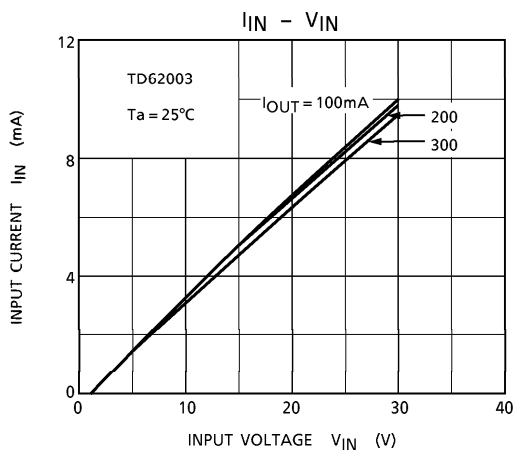
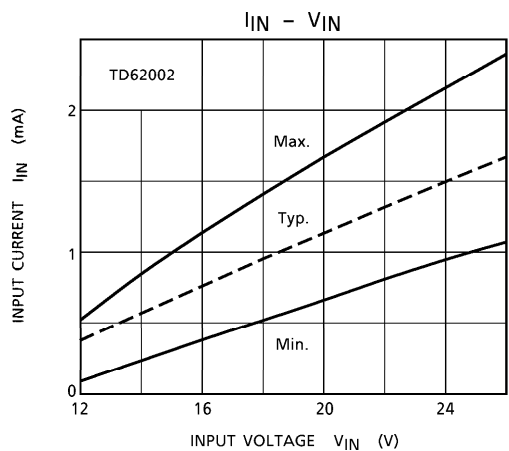
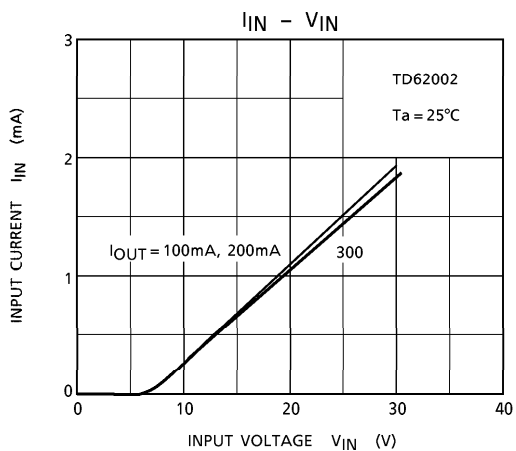
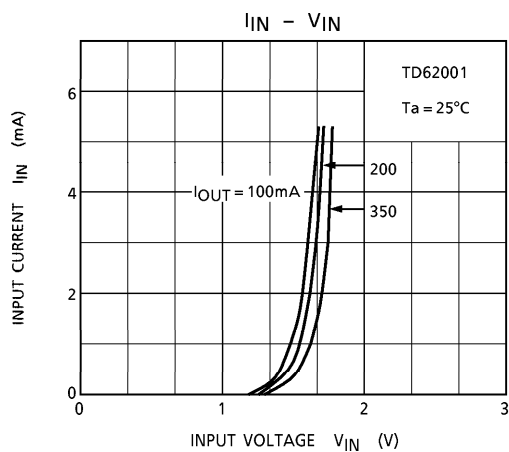
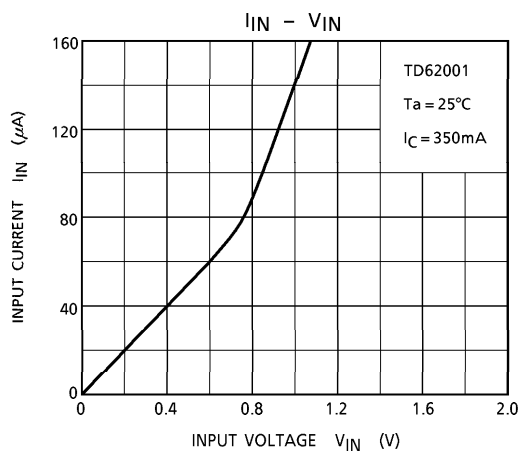
TYPE NUMBER	R1	V_{IH}
TD62001P / AP / F / AF	$2.7k\Omega$	3V
TD62002P / AP / F / AF	0	13V
TD62003P / AP / F / AF	0	3V
TD62004P / AP / F / AF	0	8V

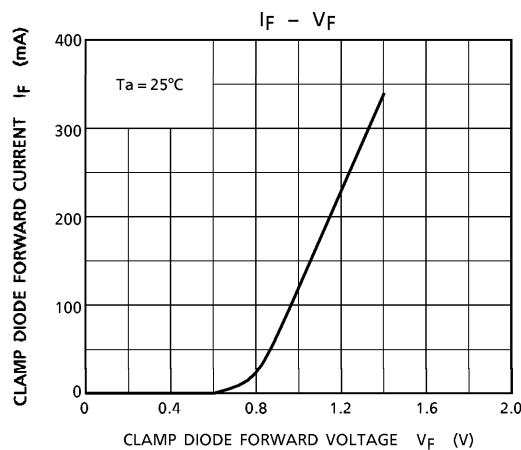
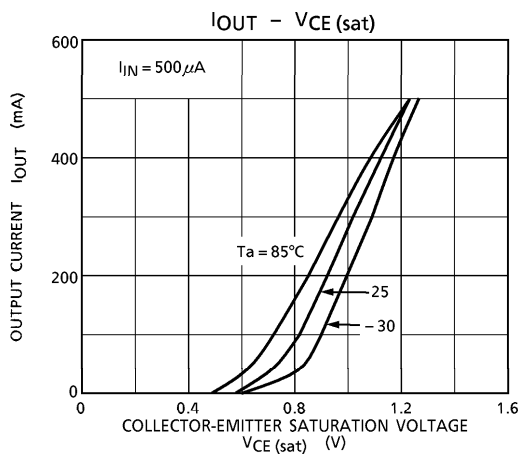
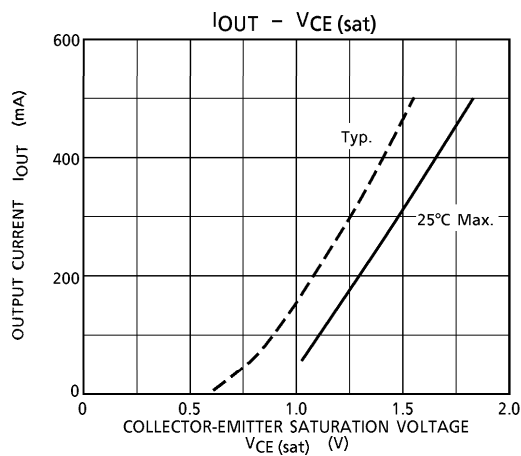
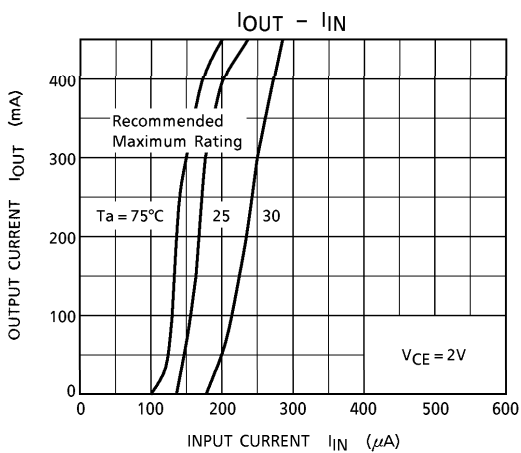
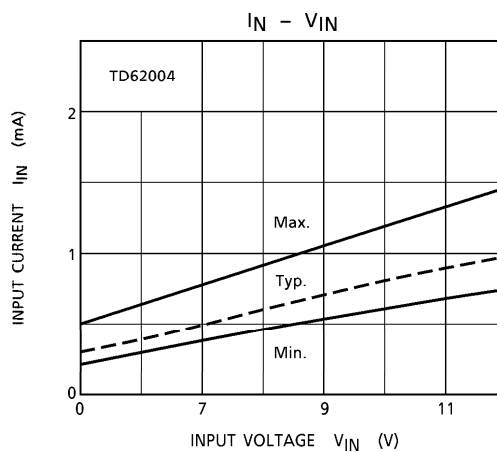
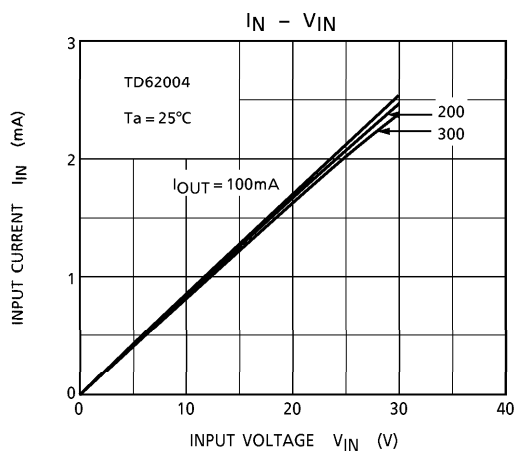
(Note 3) C_L includes probe and jig capacitance.

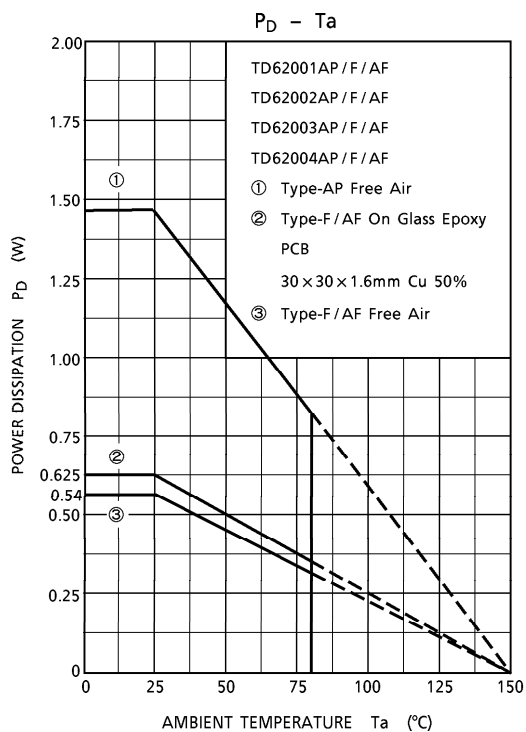
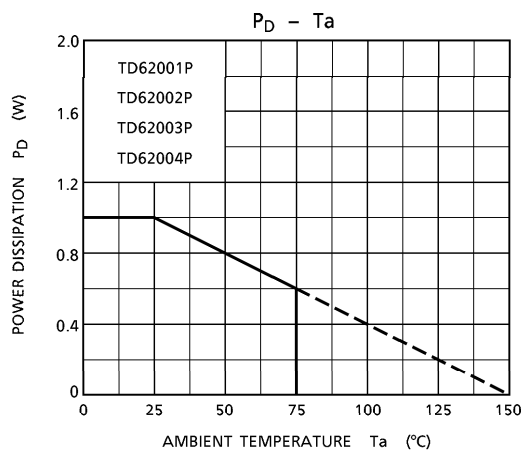
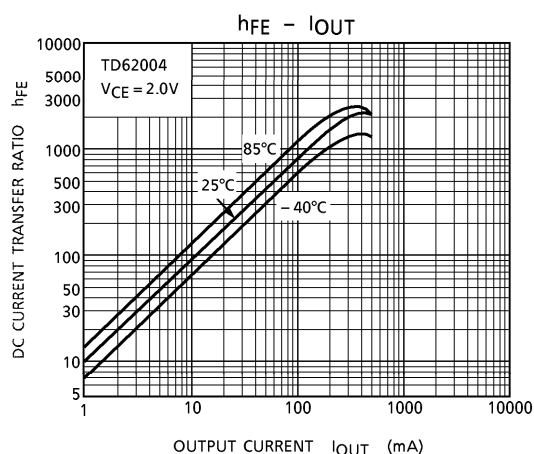
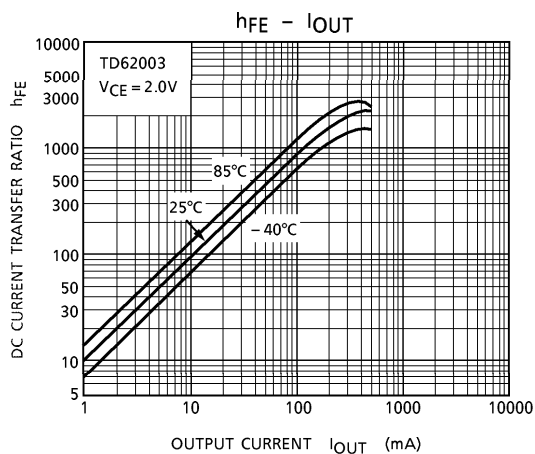
PRECAUTIONS for USING

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.



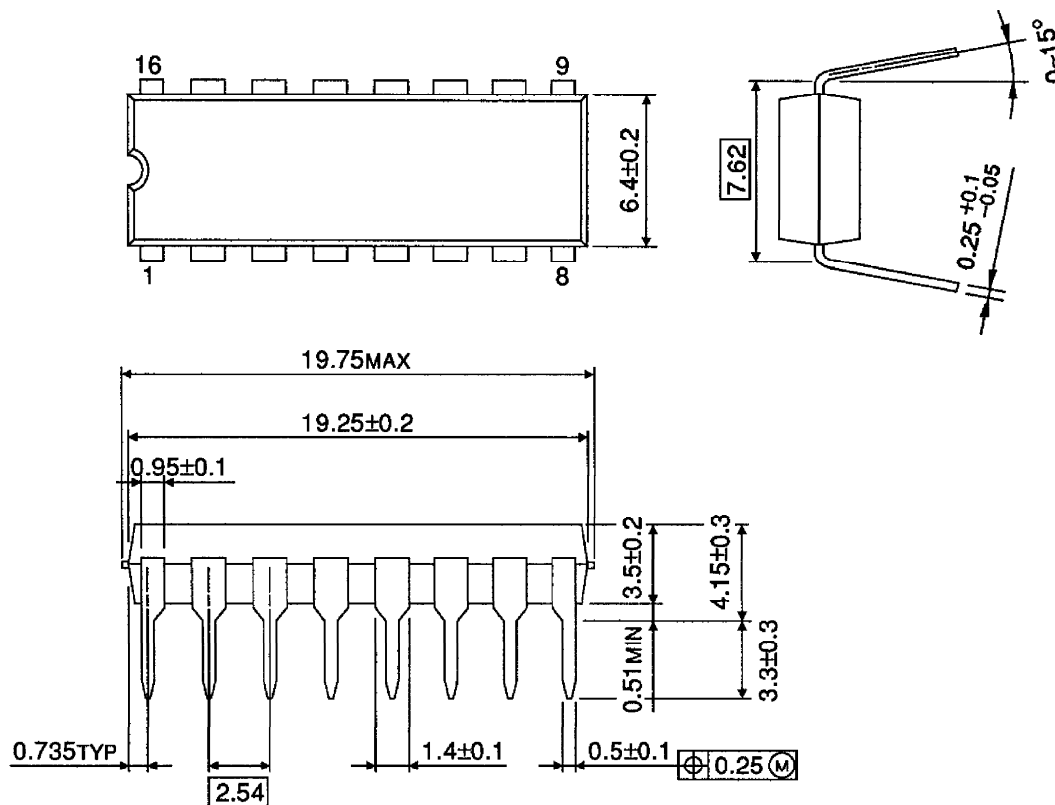






OUTLINE DRAWING
DIP16-P-300-2.54A

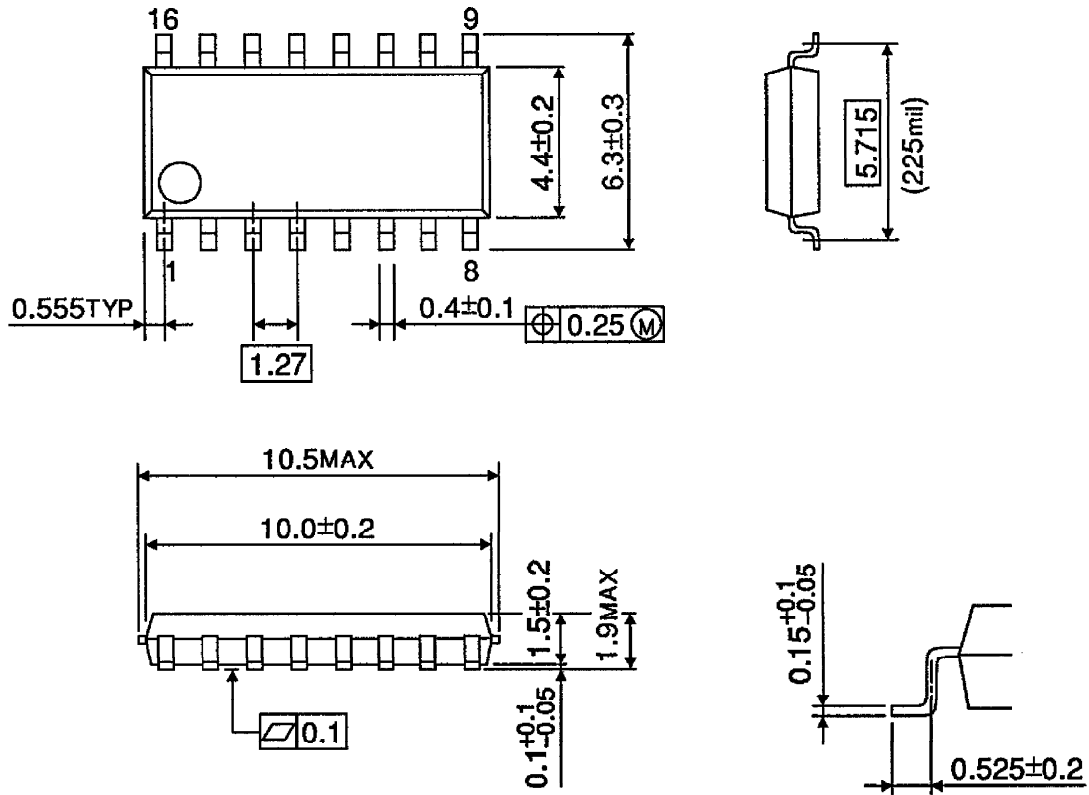
Unit : mm



Weight : 1.11g (Typ.)

OUTLINE DRAWING
SOP16-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)