

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**

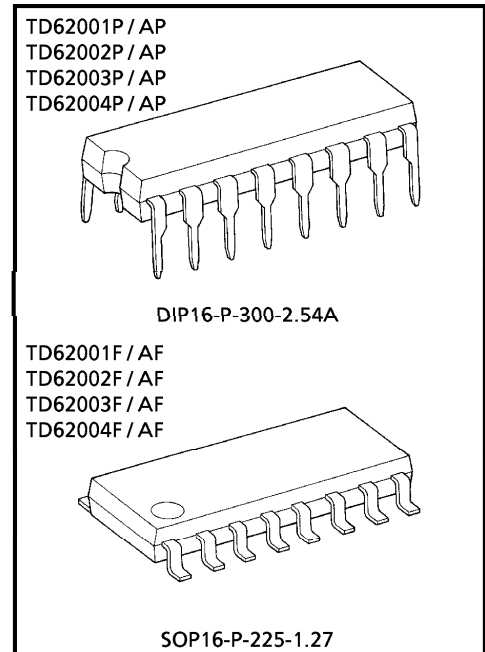
The TD62001P/AP/F/AF Series are high-voltage, high-current darlington drivers comprised of seven NPN darlington pairs.

All units feature integral clamp diodes for switching inductive loads.

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

**FEATURES**

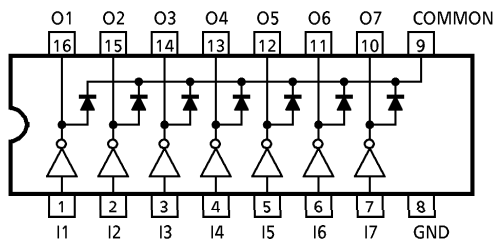
- Output current (single output) 500mA MAX.
- High sustaining voltage output  
35V MIN. (TD62001P/F Series)  
50V MIN. (TD62001AP/AF Series)
- Output clamp diodes
- Inputs compatible with various types of logic
- Package Type-P, AP : DIP-16pin
- Package Type-F, AF : SOP-16pin



**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)**

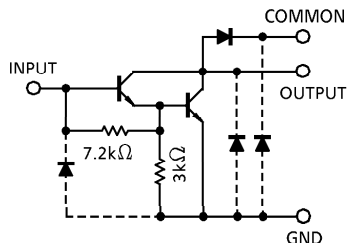


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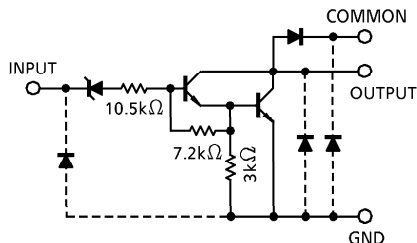
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**SCHEMATICS (EACH DRIVER)**

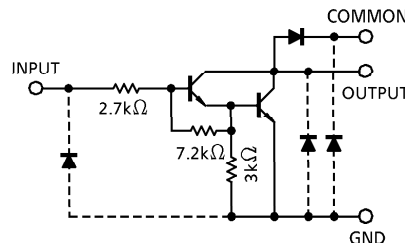
**TD62001P / AP / F / AF**



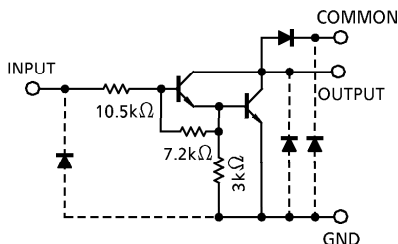
**TD62002P / AP / F / AF**



**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 <sub>CE (SUS)</sub>	- 0.5~35	V
	AP, AF		- 0.5~50	
Output Current		I <sub>OUT</sub>	500	mA / ch
Input Voltage		V <sub>IN</sub> (Note 1)	- 0.5~30	V
Input Current		I <sub>IN</sub> (Note 2)	25	mA
Clamp Diode Reverse Voltage	P, F	V <sub>R</sub>	35	V
	AP, AF		50	
Clamp Diode Forward Current		I <sub>F</sub>	500	mA
Power Dissipation	P	P <sub>D</sub>	1.0	W
	AP		1.47	
	F, AF		0.54 / 0.625 (Note 3)	
Operating Temperature	P	T <sub>opr</sub>	- 30~75	°C
	AP, F, AF		- 40~85	
Storage Temperature		T <sub>stg</sub>	- 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 <sub>CE (SUS)</sub>		0	—	35	V	
	AP, AF			0	—	50		
Output Current	AP	I <sub>OUT</sub>	T <sub>pw</sub> = 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 <sub>IN</sub>		0	—	24	V	
Input Voltage (Output On)	TD62002	V <sub>IN (ON)</sub>	I <sub>OUT</sub> = 400mA h <sub>FE</sub> = 800	14.5	—	24	V	
	TD62003			2.8	—	24		
	TD62004			6.2	—	24		
Input Voltage (Output Off)	TD62001	V <sub>IN (OFF)</sub>		0	—	0.6	V	
	TD62002			0	—	7.4		
	TD62003			0	—	0.7		
	TD62004			0	—	1.0		
Input Current	Only TD62001	I <sub>IN</sub>		0	—	10	mA	
Clamp Diode Reverse Voltage	P, F	V <sub>R</sub>		—	—	35	V	
	AP, AF			—	—	50		
Clamp Diode Forward Current		I <sub>F</sub>		—	—	350	mA	
Power Dissipation	P	P <sub>D</sub>	Ta = 85°C	—	—	0.6	W	
	AP			—	—	0.76		
	AF, F			(Note) Ta = 85°C	—	—		0.325

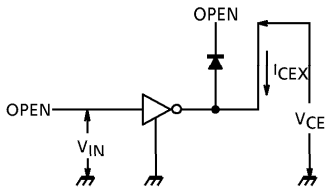
(Note) On glass epoxy PCB (30×30×1.6mm Cu 50%)

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

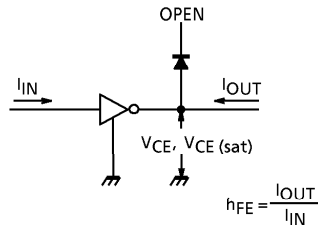
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Leakage Current	AP, AF	I <sub>CEX</sub>	1	V <sub>CE</sub> = 50V, Ta = 25°C	—	—	50	μA	
	F			V <sub>CE</sub> = 50V, Ta = 85°C	—	—	100		
				V <sub>CE</sub> = 35V, Ta = 25°C	—	—	50		
				V <sub>CE</sub> = 35V, Ta = 85°C	—	—	100		
				P	V <sub>CE</sub> = 35V, Ta = 25°C	—	—		50
	V <sub>CE</sub> = 35V, Ta = 75°C				—	—	100		
Collector-Emitter Saturation Voltage		V <sub>CE (sat)</sub>	2	I <sub>OUT</sub> = 350mA, I <sub>IN</sub> = 500μA	—	1.3	1.6	V	
				I <sub>OUT</sub> = 200mA, I <sub>IN</sub> = 350μA	—	1.1	1.3		
				I <sub>OUT</sub> = 100mA, I <sub>IN</sub> = 250μA	—	0.9	1.1		
DC Current Transfer Ratio		h <sub>FE</sub>	2	V <sub>CE</sub> = 2V, I <sub>OUT</sub> = 350mA	1000	—	—		
Input Current (Output On)	TD62002	I <sub>IN (ON)</sub>	3	V <sub>IN</sub> = 20V, I <sub>OUT</sub> = 350mA	—	1.1	1.7	mA	
	TD62003			V <sub>IN</sub> = 2.4V, I <sub>OUT</sub> = 350mA	—	0.4	0.7		
	TD62004			V <sub>IN</sub> = 9.5V, I <sub>OUT</sub> = 350mA	—	0.8	1.2		
Input Current (Output Off)	P	I <sub>IN (OFF)</sub>	4	I <sub>OUT</sub> = 500μA, Ta = 75°C	50	65	—	μA	
	AP, F, AF			I <sub>OUT</sub> = 500μA, Ta = 85°C	50	65	—		
Input Voltage (Output On)	TD62002	V <sub>IN (ON)</sub>	5	V <sub>CE</sub> = 2V h <sub>FE</sub> = 800	I <sub>OUT</sub> = 350mA	—	—	13.7	V
					I <sub>OUT</sub> = 200mA	—	—	11.4	
	TD62003				I <sub>OUT</sub> = 350mA	—	—	2.6	
					I <sub>OUT</sub> = 200mA	—	—	2.0	
	TD62004				I <sub>OUT</sub> = 350mA	—	—	4.7	
					I <sub>OUT</sub> = 200mA	—	—	4.4	
Clamp Diode Reverse Current	AP, AF	I <sub>R</sub>	6	V <sub>R</sub> = 50V, Ta = 25°C	—	—	50	μA	
	F			V <sub>R</sub> = 50V, Ta = 85°C	—	—	100		
				V <sub>R</sub> = 35V, Ta = 25°C	—	—	50		
				V <sub>R</sub> = 35V, Ta = 85°C	—	—	100		
				P	V <sub>R</sub> = 35V, Ta = 25°C	—	—		50
	V <sub>R</sub> = 35V, Ta = 75°C				—	—	100		
Clamp Diode Forward Voltage		V <sub>F</sub>	7	I <sub>F</sub> = 350mA	—	—	2.0	V	
Input Capacitance		C <sub>IN</sub>	—		—	15	—	pF	
Turn-On Delay	P, F	t <sub>ON</sub>	8	V <sub>OUT</sub> = 35V, R <sub>L</sub> = 87.5Ω C <sub>L</sub> = 15pF	—	0.1	—	μs	
	AP, AF			V <sub>OUT</sub> = 50V, R <sub>L</sub> = 125Ω C <sub>L</sub> = 15pF	—	0.1	—		
Turn-Off Delay	P, F	t <sub>OFF</sub>	8	V <sub>OUT</sub> = 35V, R <sub>L</sub> = 87.5Ω C <sub>L</sub> = 15pF	—	0.2	—		
	AP, AF			V <sub>OUT</sub> = 50V, R <sub>L</sub> = 125Ω C <sub>L</sub> = 15pF	—	0.2	—		

**TEST CIRCUIT**

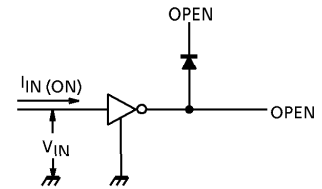
1.  $I_{CEX}$



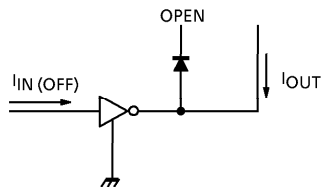
2.  $V_{CE(sat)}$ ,  $h_{FE}$



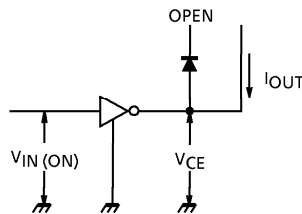
3.  $I_{IN(ON)}$



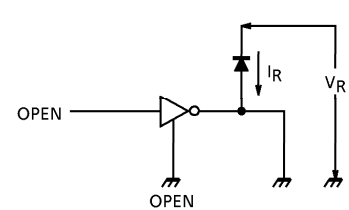
4.  $I_{IN(OFF)}$



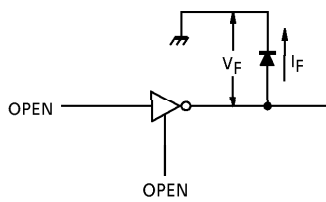
5.  $V_{IN(ON)}$



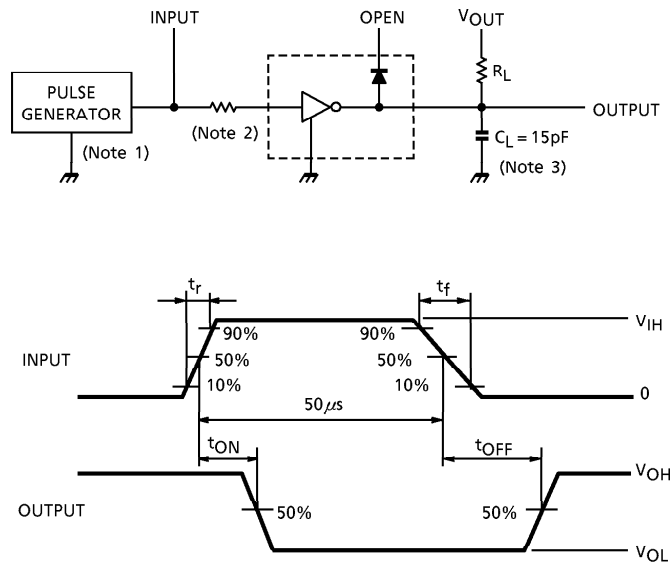
6.  $I_R$



7.  $V_F$



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



- (Note 1) Pulse width  $50\mu s$ , duty cycle 10%  
Output impedance  $50\Omega$ ,  $t_r \leq 5ns$ ,  $t_f \leq 10ns$
- (Note 2) See below

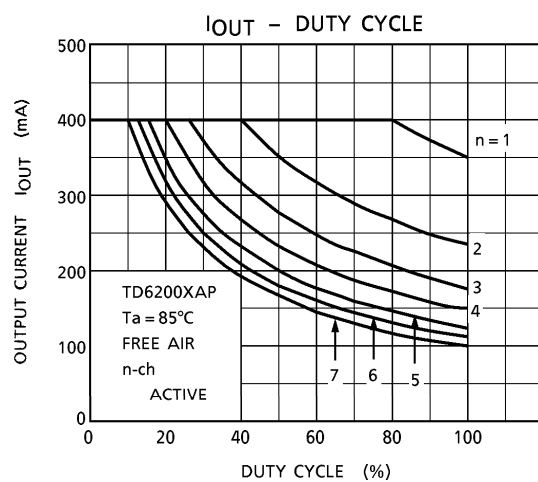
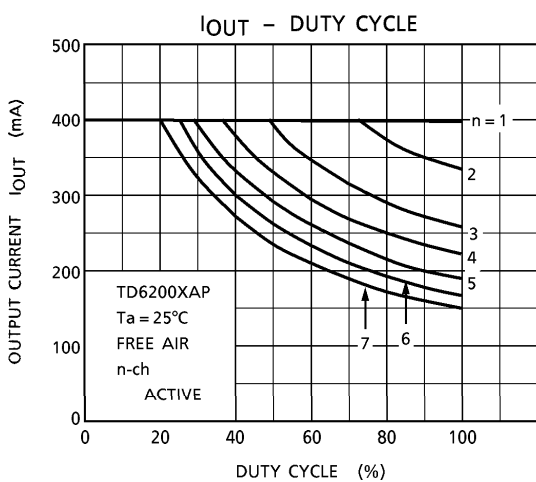
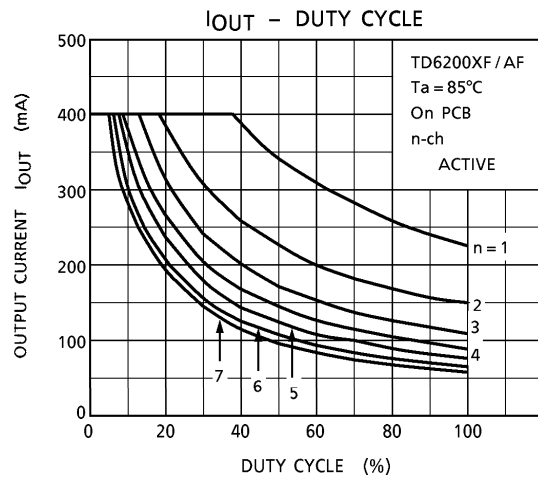
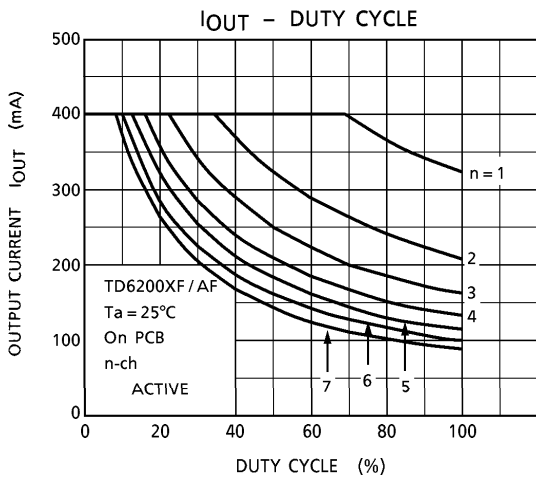
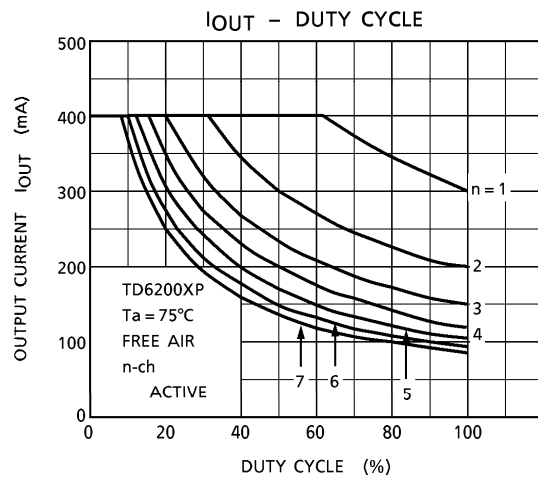
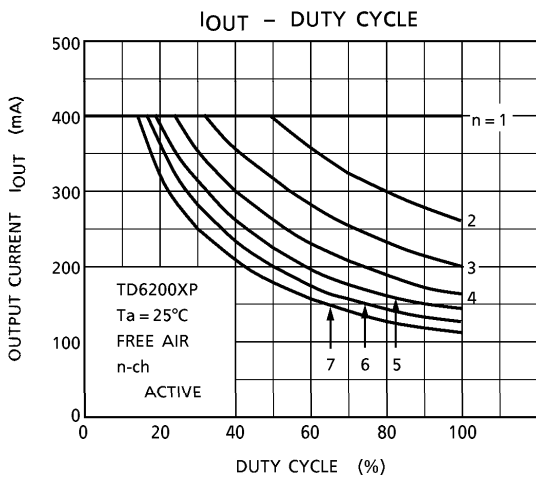
INPUT CONDITION

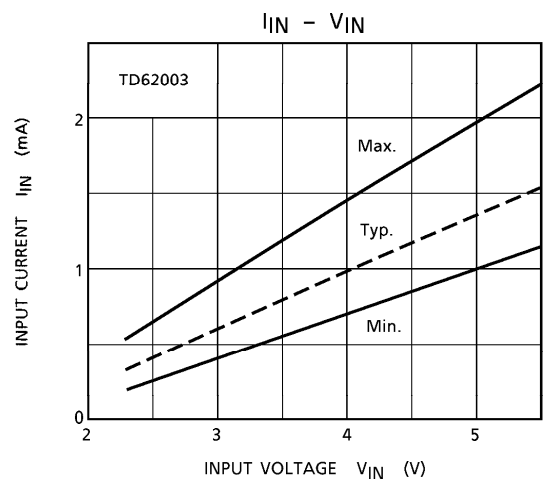
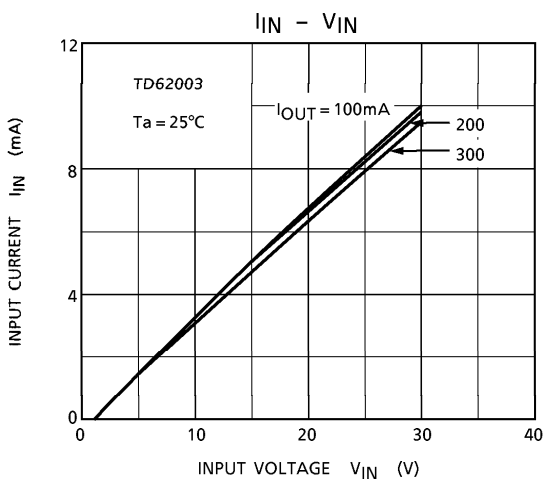
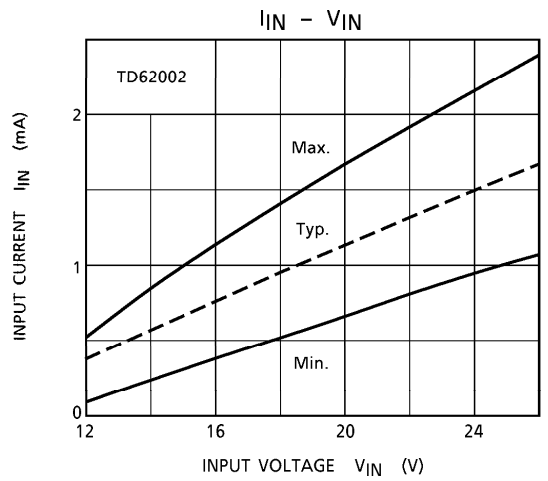
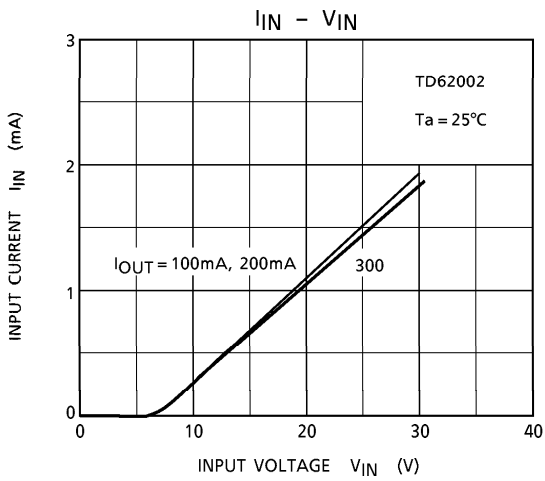
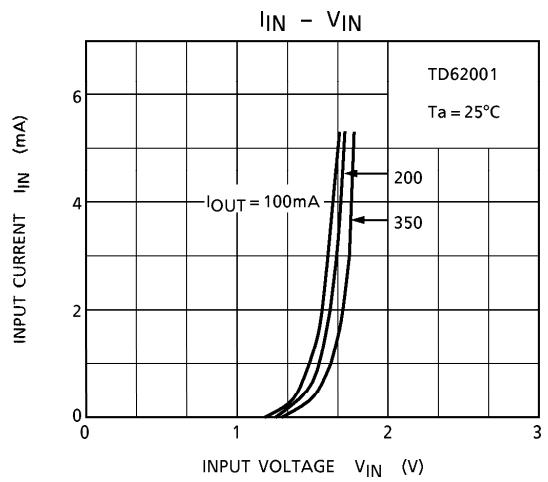
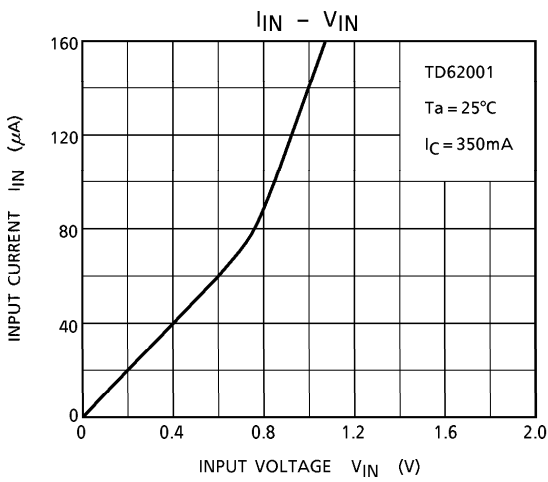
TYPE NUMBER	R1	$V_{IH}$
TD62001P / AP / F / AF	$2.7k\Omega$	3V
TD62002P / AP / F / AF	0	13V
TD62003P / AP / F / AF	0	3V
TD62004P / AP / F / AF	0	8V

- (Note 3)  $C_L$  includes probe and jig capacitance.

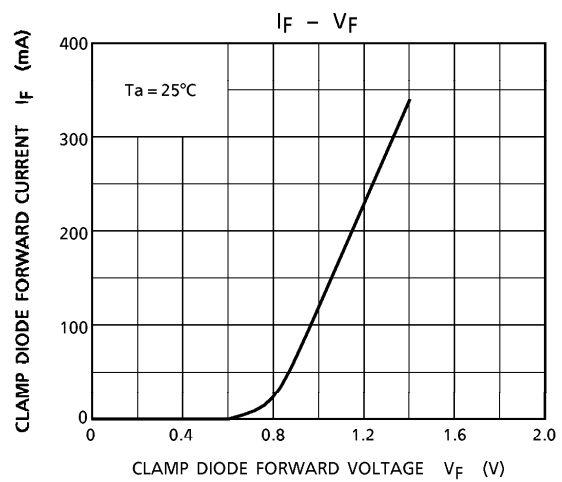
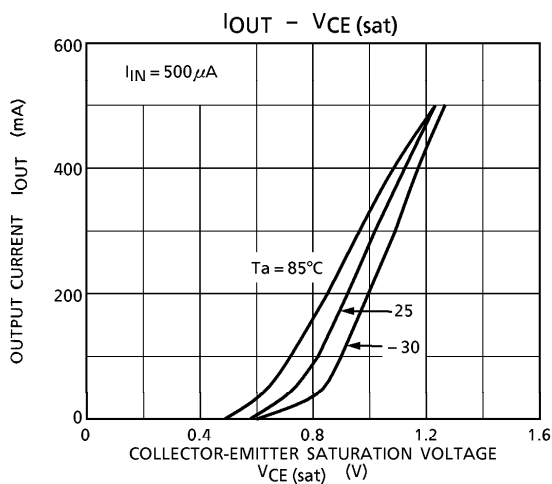
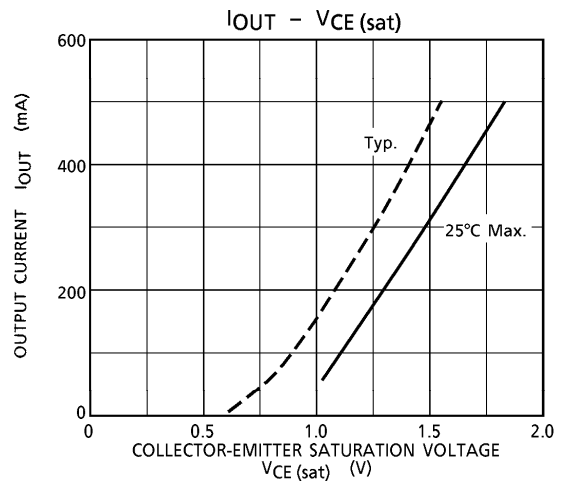
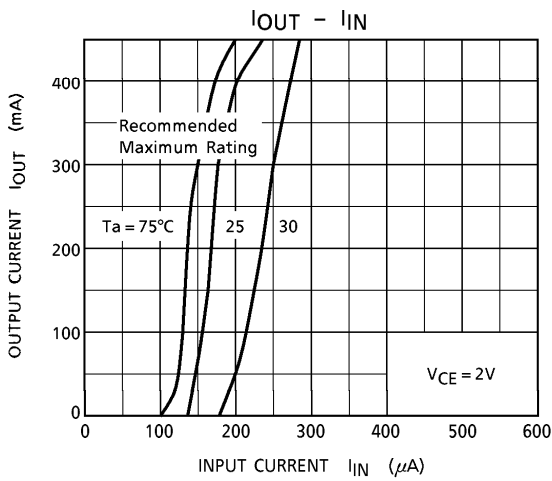
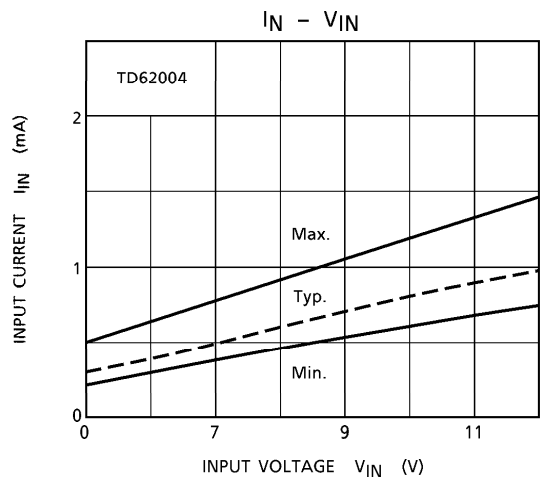
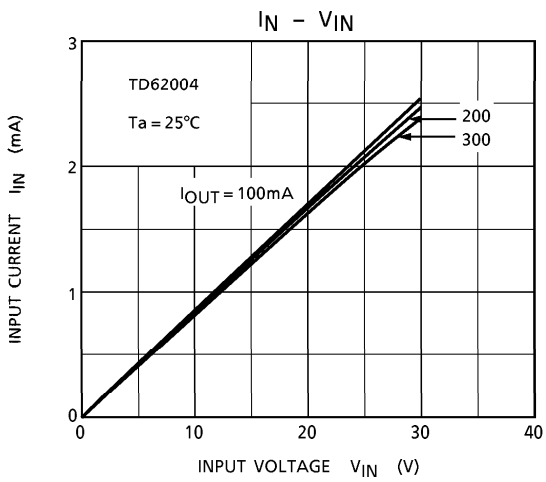
PRECAUTIONS for USING

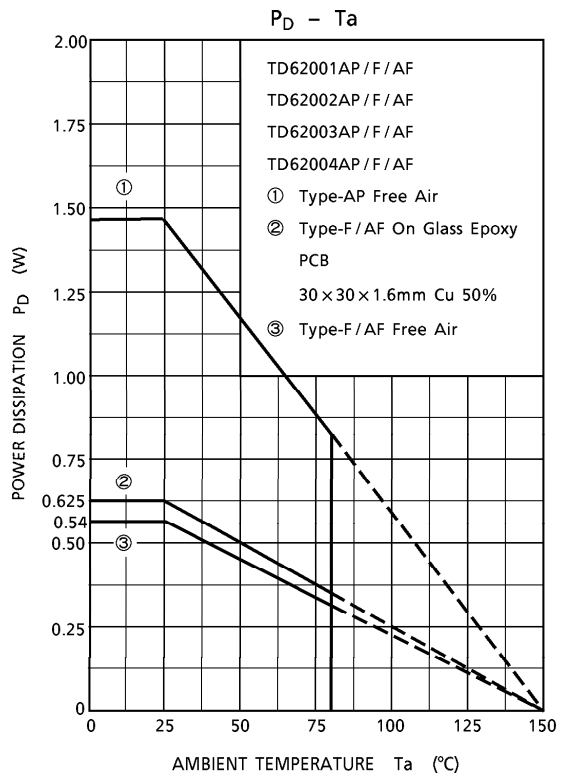
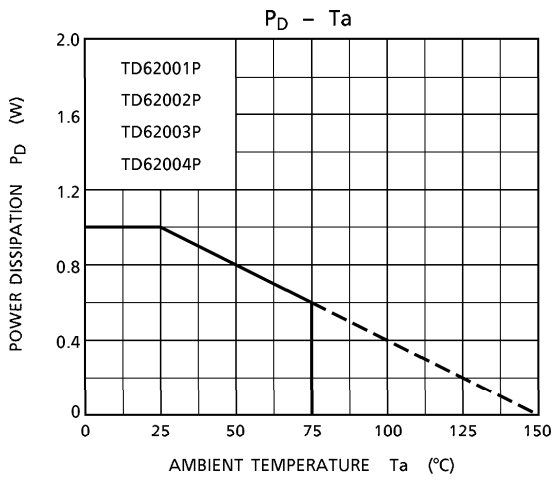
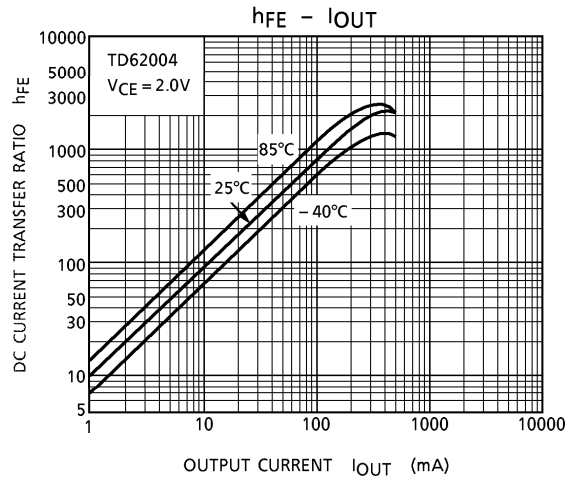
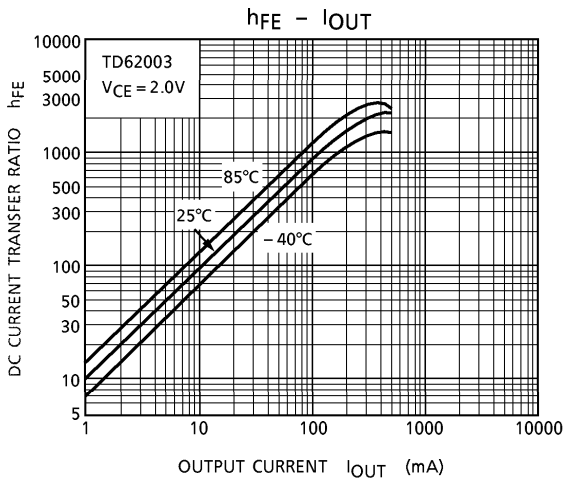
Utmost care is necessary in the design of the output line, COMMON and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.





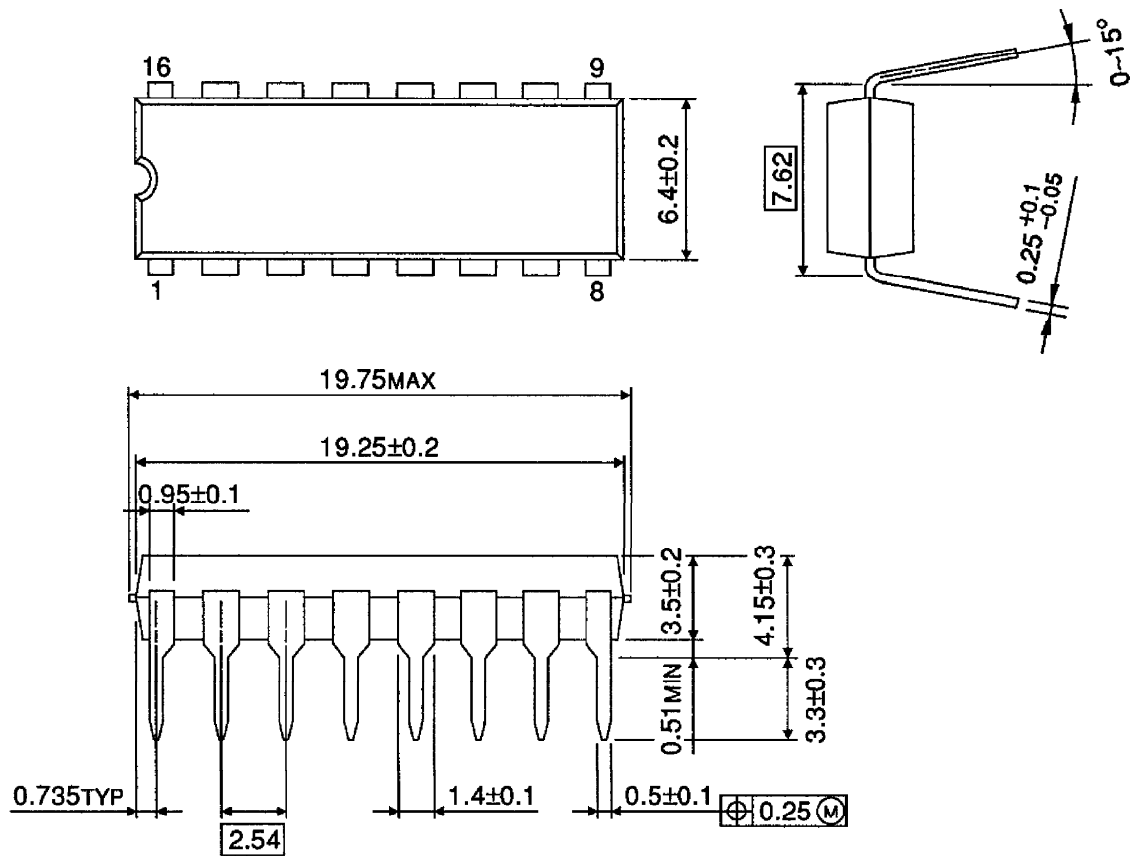






**OUTLINE DRAWING**  
DIP16-P-300-2.54A

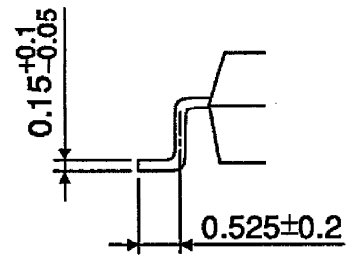
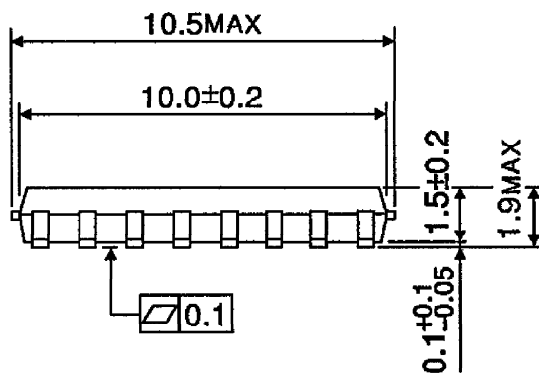
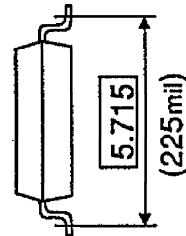
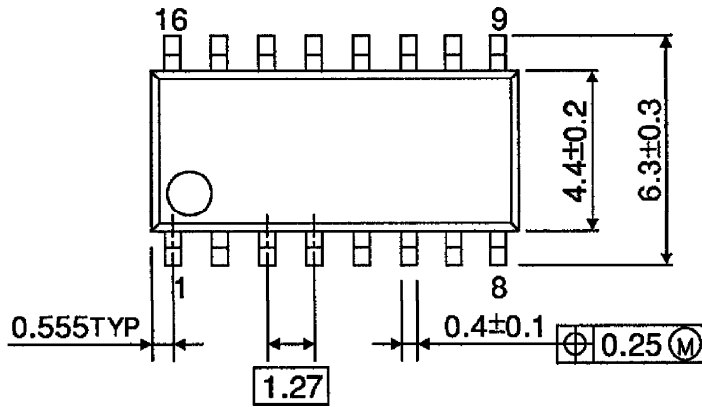
Unit : mm



Weight : 1.11g (Typ.)

**OUTLINE DRAWING**  
SOP16-P-225-1.27

Unit : mm



Weight : 0.16g (Typ.)