

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

## TD62301P,TD62301F,TD62302P,TD62302F

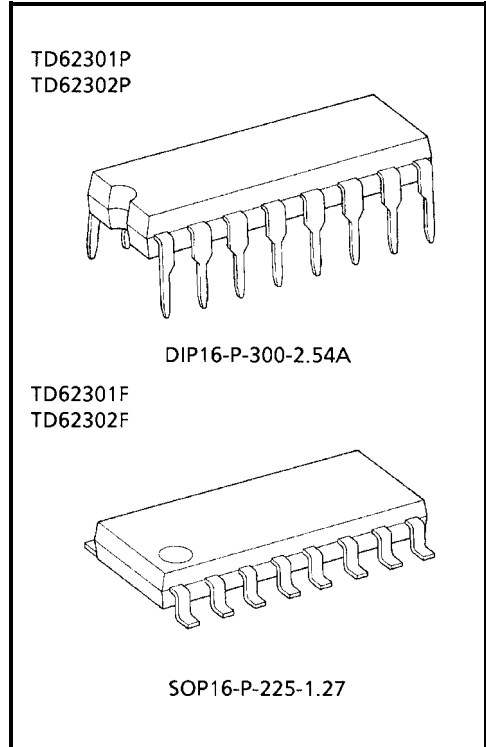
### 7CH LOW SATURATION SINK DRIVER

The TD62301P / F and TD62302P / F are comprised of seven NPN low saturation drivers.

All units feature integral clamp diodes for switching inductive loads. Applications include relay, hammer, lamp and LED drive in low voltage system.

### FEATURES

- Low saturation output  $V_{CE(sat)} = 0.7\text{ V (Max.)}$
- Output rating (single output) 15 V (Min.) / 200 mA (Max.)
- High DC transfer ratio 1000 (Min.)
- Output clamp diodes
- Input register : TD62301P / F  $R1 = 2\text{ k}\Omega$ ,  $R2 = 20\text{ k}\Omega$   
: TD62302P / F  $R1 = 8.4\text{ k}\Omega$ ,  $R2 = 15\text{ k}\Omega$
- Inputs compatible with TTL and 3~6 V CMOS
- Package type-P: DIP-16 pin
- Package type-F: SOP-16 pin

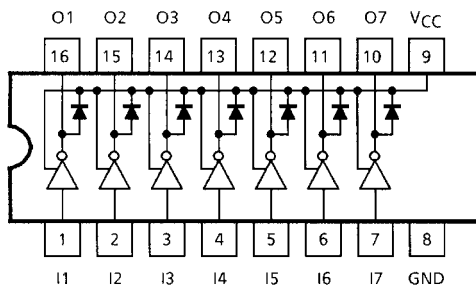


Weight

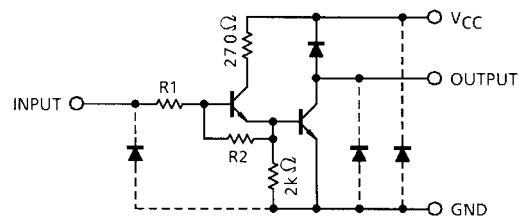
DIP16-P-300-2.54A : 1.11 g (Typ.)

SOP16-P-225-1.27 : 0.16 g (Typ.)

### PIN CONNECTION (TOP VIEW)



### SCHEMATICS (EACH DRIVER)



TD62301P :  $R1 = 2\text{ k}\Omega$ ,  $R2 = 20\text{ k}\Omega$

TD62302P :  $R1 = 8.4\text{ k}\Omega$ ,  $R2 = 15\text{ k}\Omega$

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

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTICS		SYMBOL	RATING	UNIT
Supply Voltage		V <sub>CC</sub>	-0.5~15	V
Output Sustaining Voltage		V <sub>CE (SUS)</sub>	-0.5~V <sub>CC</sub> + 0.5	V
Output Current		I <sub>OUT</sub>	200	mA / ch
Input Voltage		V <sub>IN</sub>	-0.5~15	V
Input Current		I <sub>IN</sub>	15	mA
Clamp Diode Reverse Voltage		V <sub>R</sub>	15	V
Clamp Diode Forward Current		I <sub>F</sub>	200	mA
Power Dissipation	P	P <sub>D</sub>	1.0	W
	F		0.625 (Note)	
Operating Temperature	P	T <sub>opr</sub>	-30~75	°C
	F		-40~85	
Storage Temperature		T <sub>stg</sub>	-55~150	°C

Note: On Glass Epoxy PCB (30 × 30 × 1.6 mm 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
Supply Voltage		V <sub>CC</sub>		3	—	6	V
Output Current	P	I <sub>OUT</sub>	DC 1 Circuit	0	—	180	mA
			T <sub>pw</sub> = 25 ms, Duty = 50%, 4 Circuits	0	—	150	
Input Voltage		V <sub>IN</sub>		—	—	V <sub>CC</sub>	V
Clamp Diode Reverse Voltage		V <sub>R</sub>		—	—	V <sub>CC</sub>	V
Clamp Diode Forward Current		I <sub>F</sub>		—	—	180	mA
Power Dissipation	P	P <sub>D</sub>		—	—	0.44	W
	F		(Note)	—	—	0.325	

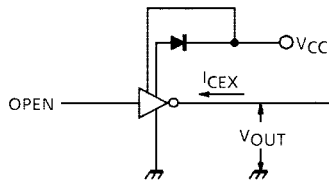
Note: On Glass Epoxy PCB (30 × 30 × 1.6 mm Cu 50%)

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

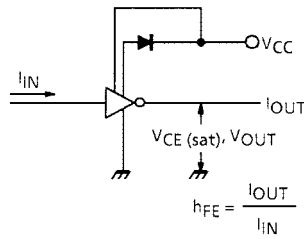
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Output Leakage Current			I <sub>CEX</sub>	1	V <sub>CC</sub> = 6 V, V <sub>OUT</sub> = 6 V, Ta = 50°C	—	—	7	μA
					V <sub>CC</sub> = 6 V, V <sub>OUT</sub> = 6 V, Ta = 25°C	—	—	1	
Output Saturation Voltage			V <sub>CE (sat)</sub>	2	V <sub>CC</sub> = 5 V, I <sub>IN</sub> = 0.14 mA I <sub>OUT</sub> = 70 mA	—	—	0.5	V
					V <sub>CC</sub> = 5 V, I <sub>IN</sub> = 0.3 mA I <sub>OUT</sub> = 150 mA	—	—	0.7	
DC Current Transfer Ratio			h <sub>FE</sub>	2	V <sub>CC</sub> = 5 V, V <sub>OUT</sub> = 2 V I <sub>OUT</sub> = 120 mA	1000	2000	—	
Input Current	Output On	TD62301P / F	I <sub>IN (ON)</sub>	3	V <sub>CC</sub> = 5 V, V <sub>IN</sub> = 2.4 V I <sub>OUT</sub> = 120 mA	—	—	0.60	mA
		TD62302P / F				—	—	0.14	
Input Voltage	Output On	TD62301P / F	V <sub>IN (ON)</sub>	4	V <sub>CC</sub> = 5 V, I <sub>IN</sub> = 0.2 mA I <sub>OUT</sub> = 120 mA	—	—	2.3	V
		TD62302P / F				—	—	4.0	
Clamp Diode Forward Voltage			V <sub>F</sub>	5	I <sub>F</sub> = 120 mA	—	—	2.0	V
Supply Current			I <sub>CC</sub>	6	I <sub>F</sub> = 120 mA	—	15	22	mA / Gate
Input Capacitance			C <sub>IN</sub>	—	V <sub>IN</sub> = 0, f = 1 MHz	—	15	—	pF
Turn-On Delay			t <sub>ON</sub>	7	V <sub>CC</sub> = 6 V, R <sub>L</sub> = 33 Ω C <sub>L</sub> = 15 pF	—	0.1	—	μs
Turn-Off Delay			t <sub>OFF</sub>			—	0.2	—	μs

## TEST CIRCUIT

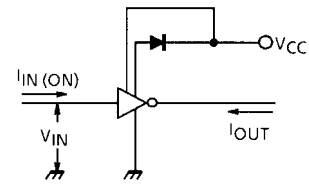
### 1. $I_{CEX}$



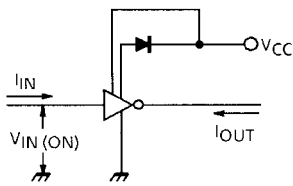
### 2. $h_{FE}$ , $V_{CE(sat)}$



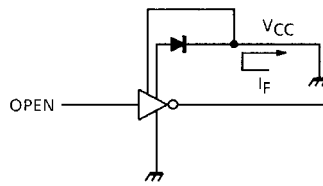
### 3. $I_{IN(ON)}$



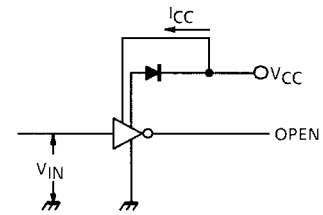
### 4. $V_{IN(ON)}$



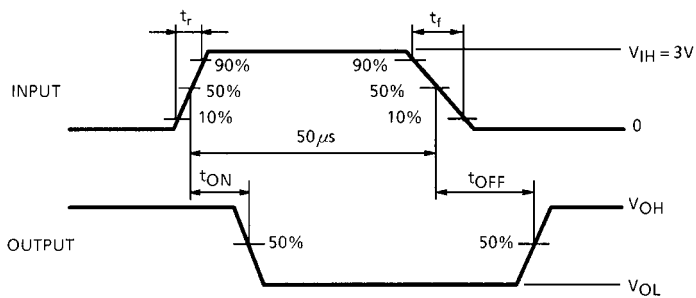
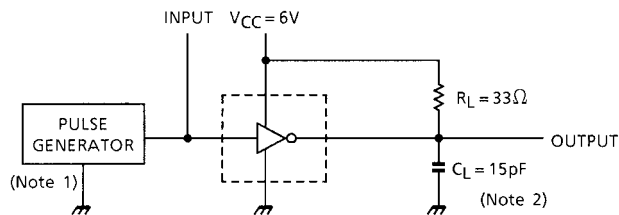
### 5. $V_F$



### 6. $I_{CC}$



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



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

Note 2:  $C_L$  includes probe and jig capacitance.

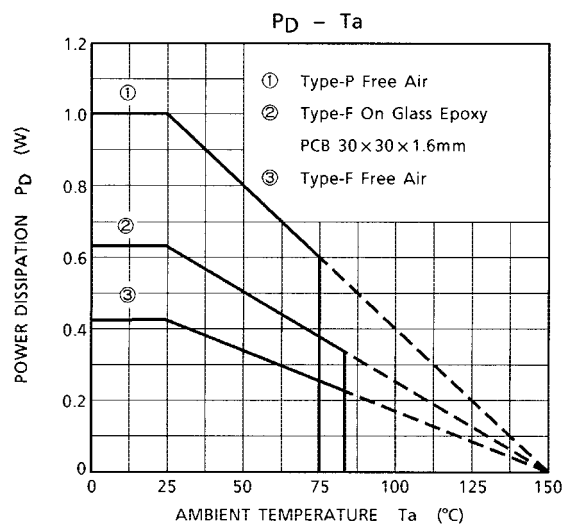
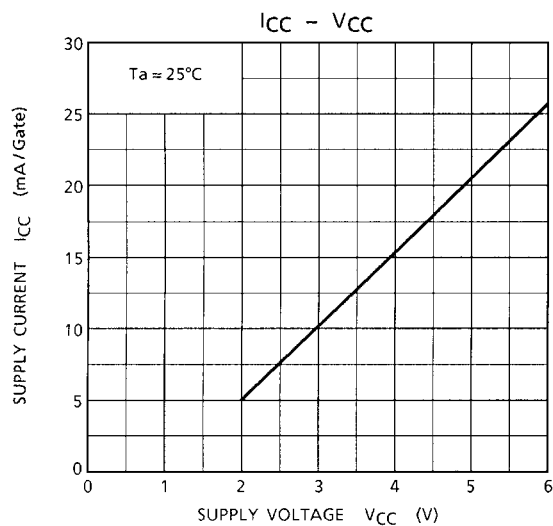
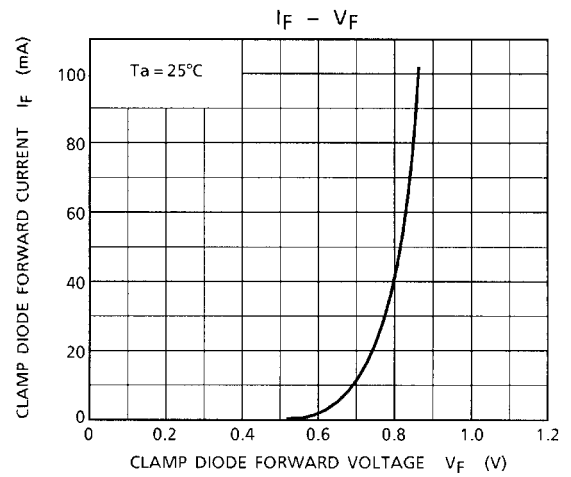
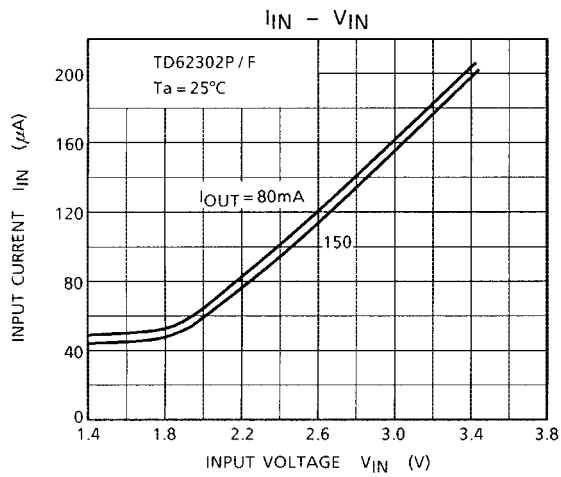
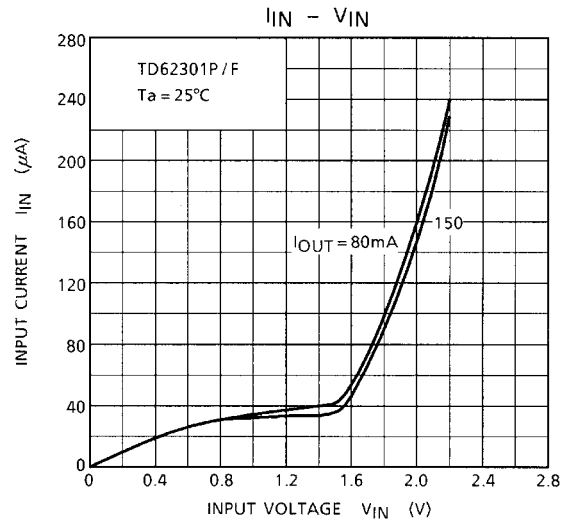
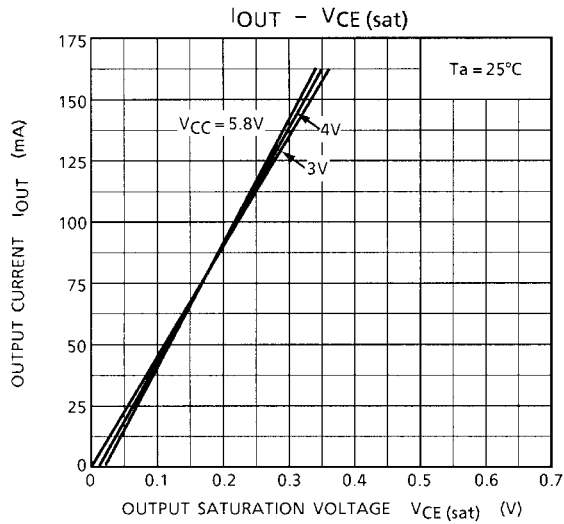
## PRECAUTIONS for USING

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.

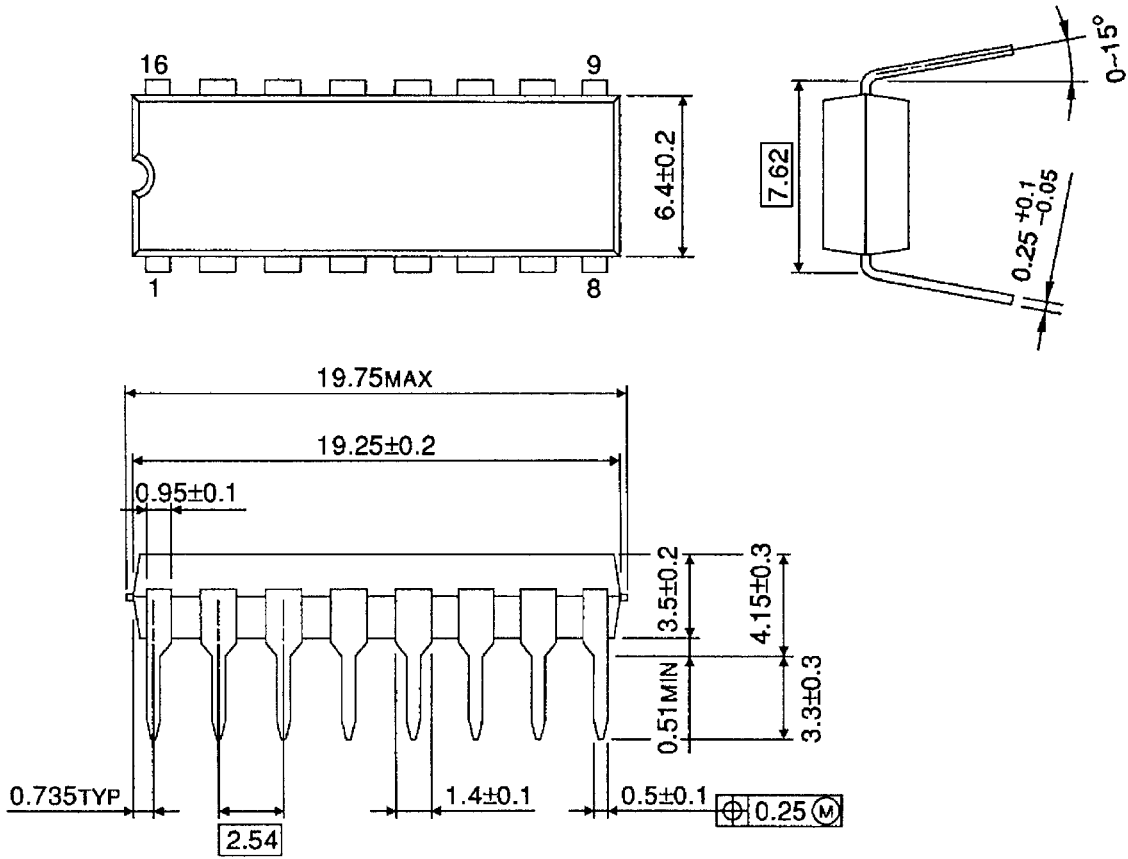
Utmost care is necessary in the design of the output line, VCC and GND line since IC may be destroyed due to short-circuit between outputs, air contamination fault, or fault by improper grounding.



## PACKAGE DIMENSIONS

DIP16-P-300-2.54A

Unit : mm

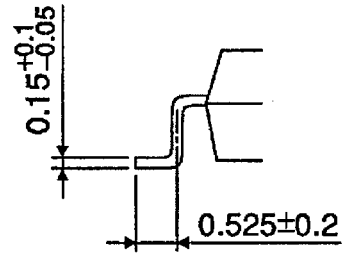
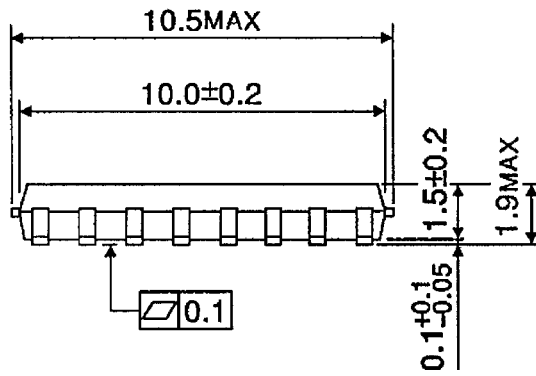
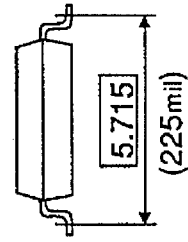
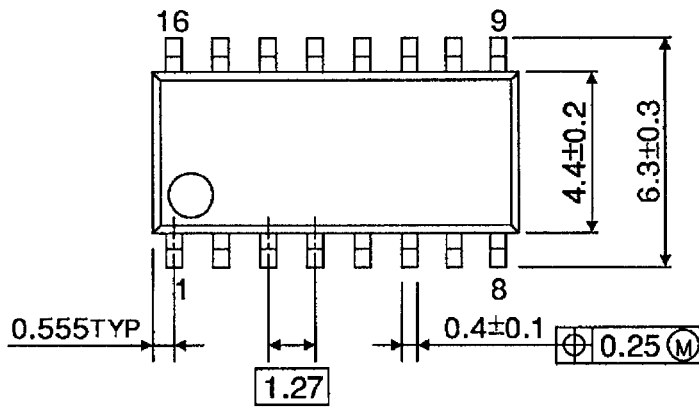


Weight: 1.11 g (Typ.)

## PACKAGE DIMENSIONS

SOP16-P-225-1.27

Unit : mm



Weight: 0.16 g (Typ.)

**RESTRICTIONS ON PRODUCT USE**

000707EBA

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