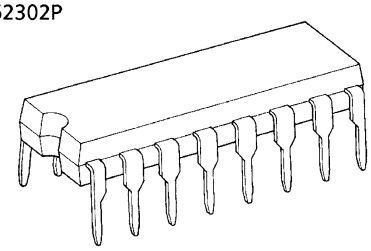
TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TD62301P,TD62301F,TD62302P,TD62302F

7CH LOW SATURATION SINK DRIVER

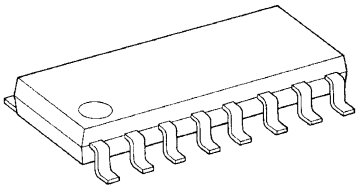
The TD62301P / F and TD62302P / F are comprised of seven NPN low saturation drivers.
All units feature integral clamp diodes for switching inductive loads. Applications include relay, hammer, lamp and LED drive in low voltage system.

TD62301P
TD62302P



DIP16-P-300-2.54A

TD62301F
TD62302F



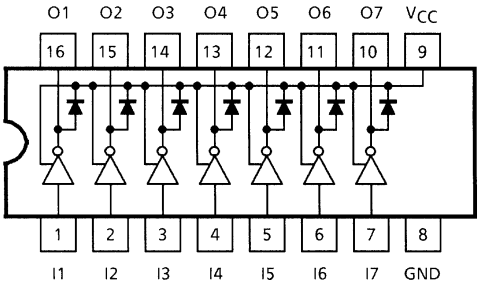
SOP16-P-225-1.27

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

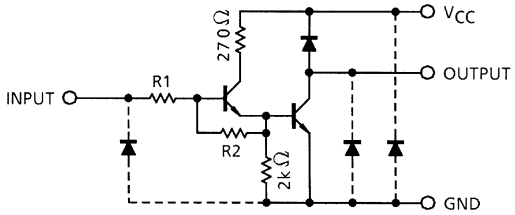
FEATURES

- Low saturation output $V_{CE\ (sat)}$ = 0.7 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 kΩ, R2 = 20 kΩ
  : TD62302P / F R1 = 8.4 kΩ, R2 = 15 kΩ
- Inputs compatible with TTL and 3~6 V CMOS
- Package type−P: DIP−16 pin
- Package type−F: SOP−16 pin

PIN CONNECTION (TOP VIEW)



SCHEMATICS (EACH DRIVER)



TD62301P : R1 = 2kΩ, R2 = 20kΩ
TD62302P : R1 = 8.4kΩ, R2 = 15kΩ

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_{CC}	−0.5~15	V
Output Sustaining Voltage		$V_{CE\ (SUS)}$	−0.5~V_{CC} + 0.5	V
Output Current		I_{OUT}	200	mA / ch
Input Voltage		V_{IN}	−0.5~15	V
Input Current		I_{IN}	15	mA
Clamp Diode Reverse Voltage		V_R	15	V
Clamp Diode Forward Current		I_F	200	mA
Power Dissipation	P	P_D	1.0	W
	F		0.625 (Note)	
Operating Temperature	P	T_{opr}	−30~75	°C
	F		−40~85	
Storage Temperature		T_{stg}	−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_{CC}		3	—	6	V
Output Current		I_{OUT}	DC 1 Circuit	0	—	180	mA
	P		T_{pw} = 25 ms, Duty = 50%, 4 Circuits	0	—	150	
Input Voltage		V_{IN}		—	—	V_{CC}	V
Clamp Diode Reverse Voltage		V_R		—	—	V_{CC}	V
Clamp Diode Forward Current		I_F		—	—	180	mA
Power Dissipation	P	P_D		—	—	0.44	W
	F		(Note)	—	—	0.325	

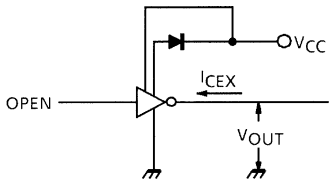
Note: On Glass Epoxy PCB (30 × 30 × 1.6 mm Cu 50%)

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

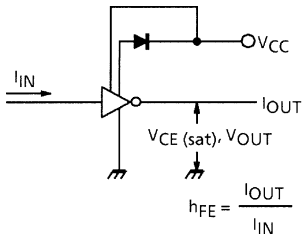
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Output Leakage Current			I_{CEX}	1	V_{CC} = 6 V, V_{OUT} = 6 V, Ta = 50°C	—	—	7	μA
					V_{CC} = 6 V, V_{OUT} = 6 V, Ta = 25°C	—	—	1	
Output Saturation Voltage			$V_{CE\ (sat)}$	2	V_{CC} = 5 V, I_{IN} = 0.14 mA I_{OUT} = 70 mA	—	—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

TEST CIRCUIT

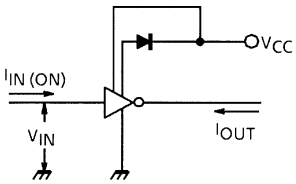
1. I_{CEX}



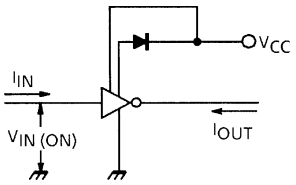
2. h_{FE}, $V_{CE\ (sat)}$



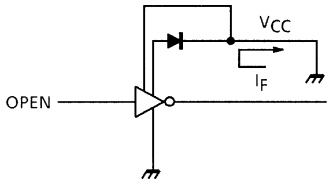
3. $I_{IN\ (ON)}$



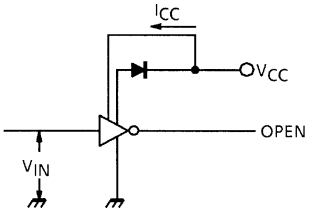
4. $V_{IN\ (ON)}$



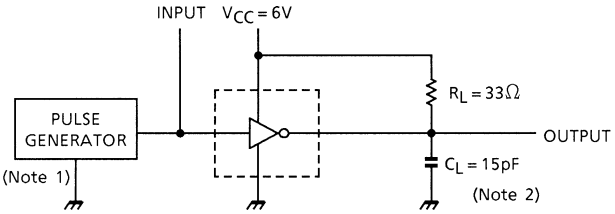
5. V_F

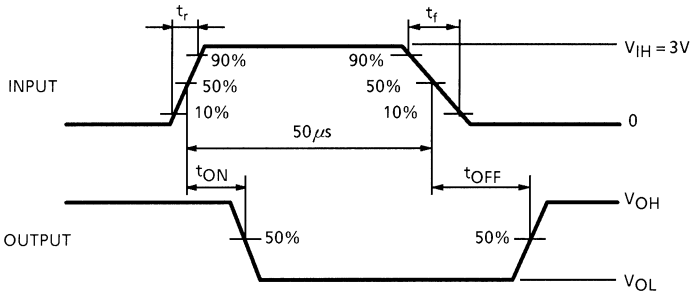


6. I_{CC}



7. t_{ON}, t_{OFF}



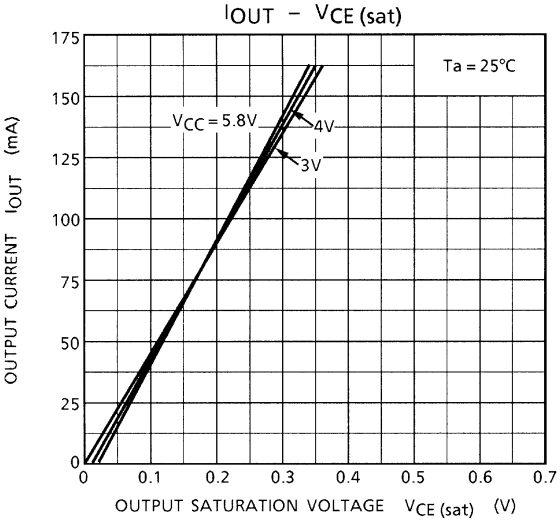


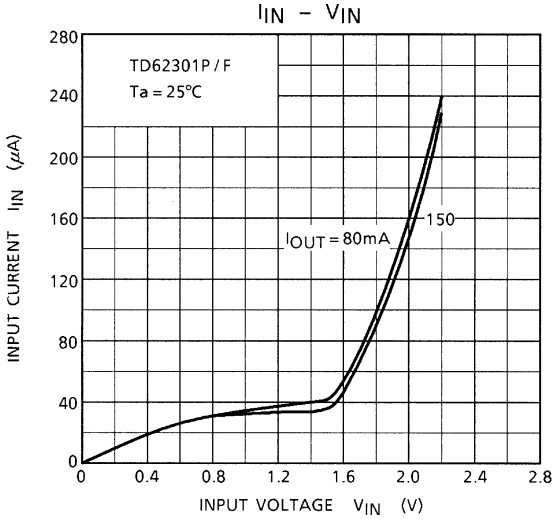
Note 1: Pulse Width 50 μs, Duty Cycle 10% Output Impedance 50 Ω, tr ≤ 5 ns, tf ≤ 10 ns

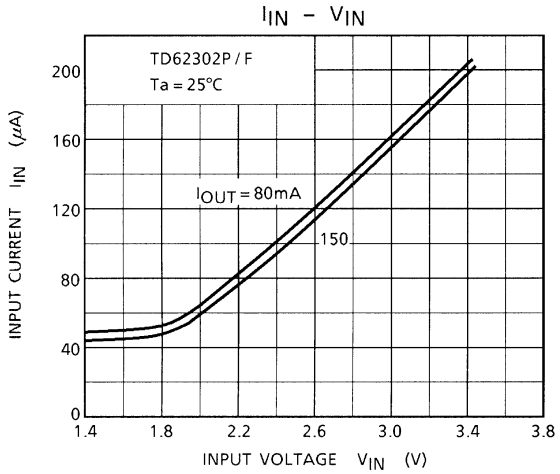
Note 2: CL includes probe and jig capacitance.

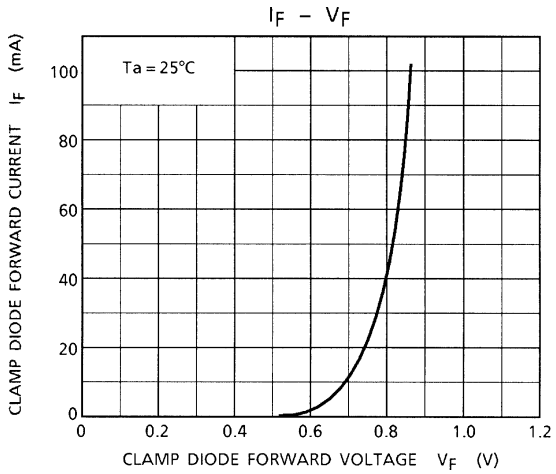
PRECAUTIONS for USING

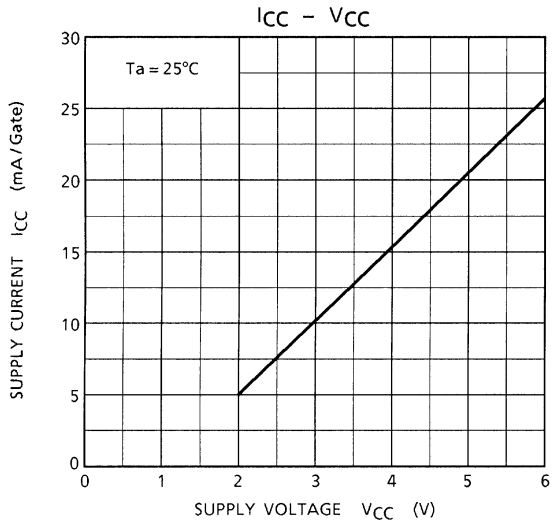
This IC does not include built-in protection circuits for excess current or overvoltage.
If this IC is subjected to excess current or overvoltage, it may be destroyed.
Hence, the utmost care must be taken when systems which incorporate this IC are designed.
Utmost care is necessary in the design of the output line, V_{CC} and GND line since IC may be destroyed due to short−circuit between outputs, air contamination fault, or fault by improper grounding.

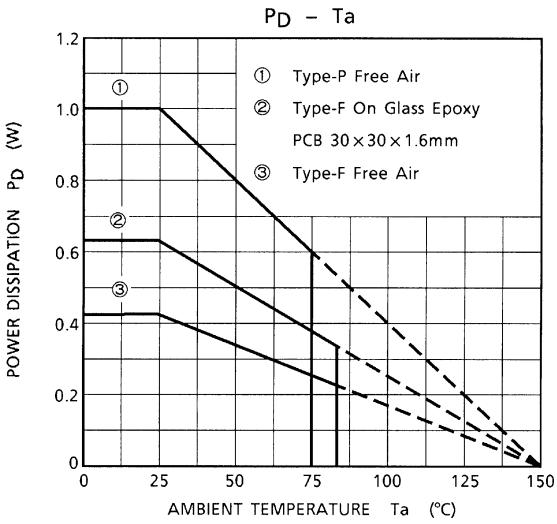

I_{OUT} – $V_{CE\,(sat)}$
Ta = 25°C
V_{CC} = 5.8V
4V
3V
OUTPUT CURRENT I_{OUT} (mA)
OUTPUT SATURATION VOLTAGE $V_{CE\,(sat)}$ (V)
0 25 50 75 100 125 150 175
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7


I_{IN} – V_{IN}
TD62301P / F
Ta = 25°C
I_{OUT} = 80mA
150
INPUT CURRENT I_{IN} (μA)
INPUT VOLTAGE V_{IN} (V)
0 40 80 120 160 200 240 280
0 0.4 0.8 1.2 1.6 2.0 2.4 2.8


I_{IN} – V_{IN}
TD62302P / F
Ta = 25°C
I_{OUT} = 80mA
150
INPUT CURRENT I_{IN} (μA)
INPUT VOLTAGE V_{IN} (V)
0 40 80 120 160 200
1.4 1.8 2.2 2.6 3.0 3.4 3.8

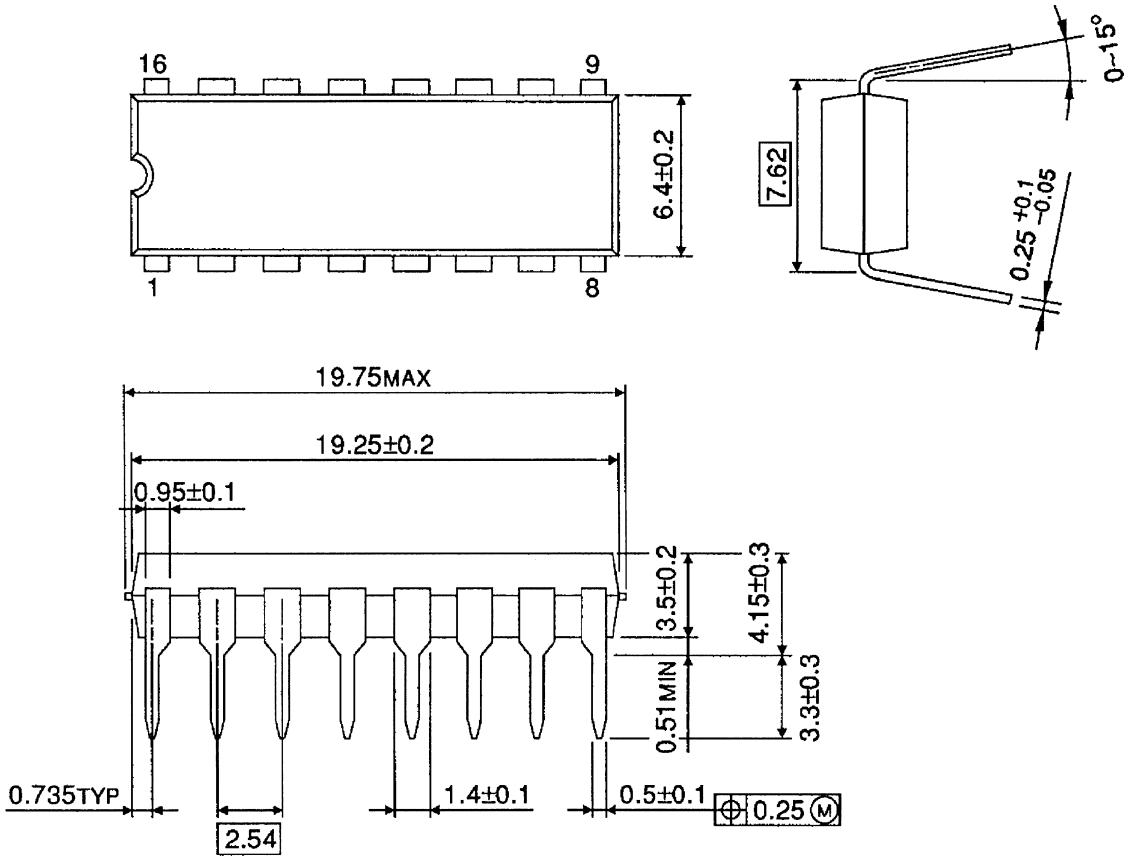

I_F – V_F
Ta = 25°C
CLAMP DIODE FORWARD CURRENT I_F (mA)
CLAMP DIODE FORWARD VOLTAGE V_F (V)
0 20 40 60 80 100
0 0.2 0.4 0.6 0.8 1.0 1.2


I_{CC} – V_{CC}
Ta = 25°C
SUPPLY CURRENT I_{CC} (mA/Gate)
SUPPLY VOLTAGE V_{CC} (V)
0 5 10 15 20 25 30
0 1 2 3 4 5 6


P_D – Ta
① Type-P Free Air
② Type-F On Glass Epoxy
PCB 30×30×1.6mm
③ Type-F Free Air
POWER DISSIPATION P_D (W)
AMBIENT TEMPERATURE Ta (°C)
0 0.2 0.4 0.6 0.8 1.0 1.2
0 25 50 75 100 125 150

PACKAGE DIMENSIONS

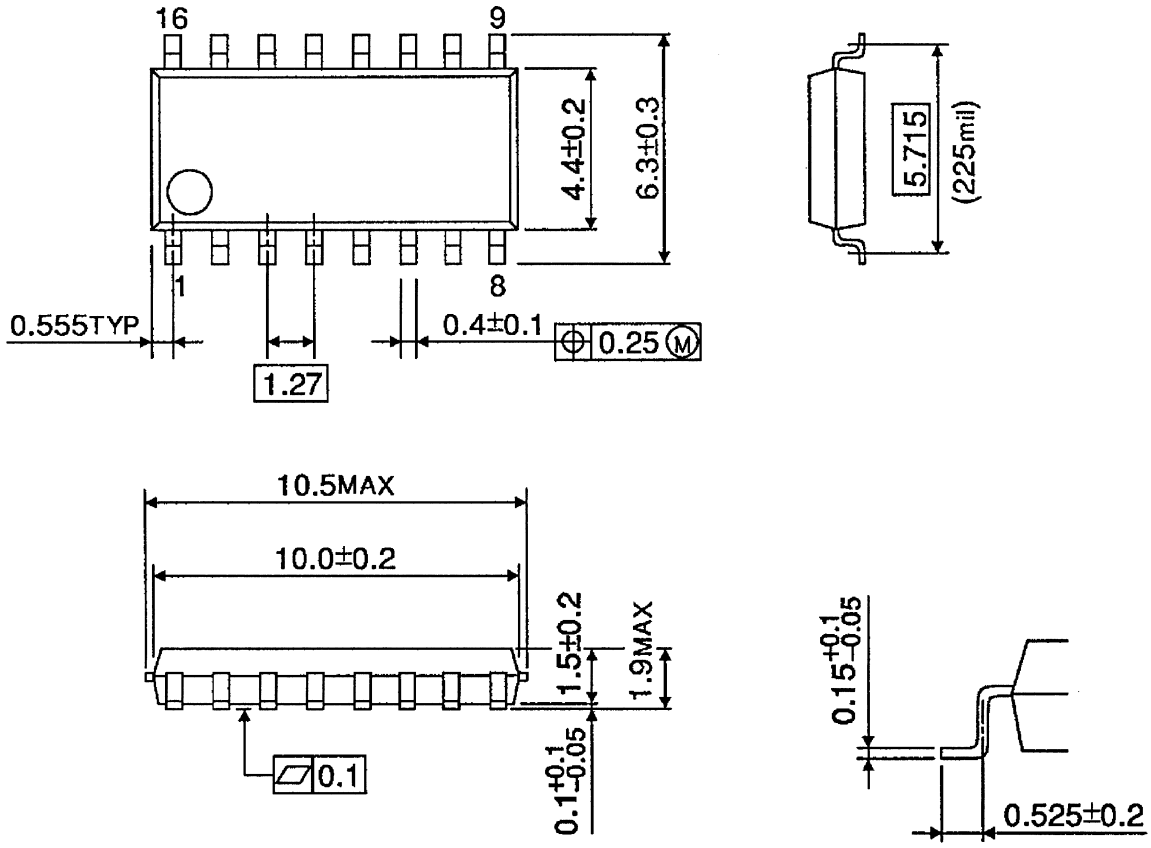
DIP16−P−300−2.54A Unit : mm



Weight: 1.11 g (Typ.)

PACKAGE DIMENSIONS

SOP16−P−225−1.27 Unit : mm



Weight: 0.16 g (Typ.)

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