

TOSHIBA BIPOLAR DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

## TD62601P,TD62601F,TD62602P,TD62602F TD62603P,TD62603F,TD62604P,TD62604F

### 6CH THRESHOLD FREE DRIVER

#### TD62601P, TD62601F INVERTER

#### TD62602P, TD62602F INVERTER / OPEN COLLECTOR

#### TD62603P, TD62603F NON-INVERTER

#### TD62604P, TD62604F NON-INVERTER / OPEN COLLECTOR

The TD62601P, TD62601F series are threshold free drivers which are comprised of six NPN transistor output stages and comparator input stages.

The TD62601P, TD62601F series are pin compatible with CMOS 4049B and 4050B type except  $V_{ref}$  terminal.

$V_{ref}$  is set at  $1/2 V_{CC}$  with internal resistors and it is changeable using external resistors.

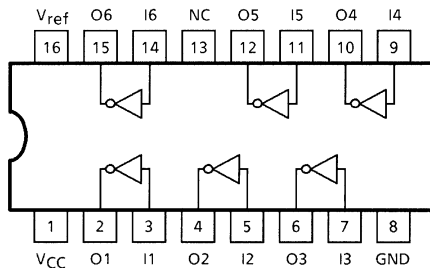
Applications include relay, hammer, lamp and display (LED) drivers.

### FEATURES

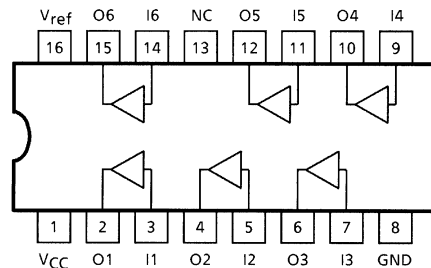
- Wide supply voltage range  $V_{CC} = 4\sim 18\text{ V}$
- $V_{ref} = 1/2 V_{CC}$  @16 pin is non-connected
- Pin compatible with CMOS logic 4049B, 4050B type  
TD62601P, TD62601F (4049B type)  
TD62602P, TD62602F (4049B type open-collector)  
TD62603P, TD62603F (4050B type)  
TD62604P, TD62604F (4050B type open-collector)
- Package type-P : DIP-16 pin
- Package type-F : SOP-16 pin

### PIN CONNECTION (TOP VIEW)

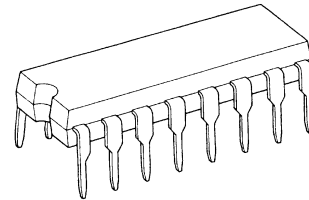
TD62601P, TD62601F, TD62602P, TD62602F



TD62603P, TD62603F, TD62604P, TD62604F

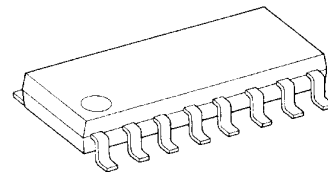


TD62601P, TD62602P  
TD62603P, TD62604P



DIP16-P-300-2.54A

TD62601F, TD62602F  
TD62603F, TD62604F



SOP16-P-225-1.27

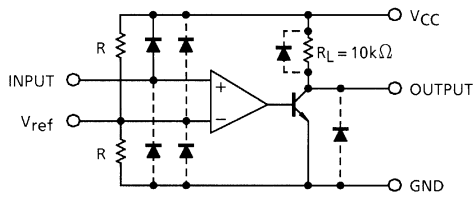
#### Weight

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

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

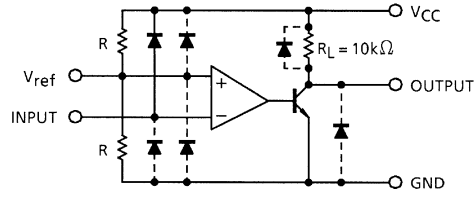
## SCHEMATICS (EACH DRIVER)

TD62601P, TD62601F, TD62602P, TD62602F



TD62601P, TD62601F : With  $R_L$   
TD62602P, TD62602F : Without  $R_L$

TD62603P, TD62603F, TD62604P, TD62604F



TD62603P, TD62603F : With  $R_L$   
TD62604P, TD62604F : Without  $R_L$

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

## ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		$V_{CC}$	20	V
Output Sustaining Voltage		$V_{OUT}$	-0.5~20	V
Output Current		$I_{OUT}$	10	mA / ch
Input Voltage		$V_{IN}$	-0.5~ $V_{CC} + 0.5$	V
Power Dissipation	P	$P_D$ (Note 2)	1.0	W
	F		0.625 (Note 1)	
Operating Temperature		$T_{opr}$	-40~85	°C
Storage Temperature		$T_{stg}$	-55~150	°C

Note 1: On PCB (30 × 30 × 1.6 mm Cu 50%)

Note 2: Delated above 25°C in the proportion of 8.0 mW / °C (P Type), 5.0 mW / °C (F Type).

## RECOMMENDED OPERATING CONDITIONS (Ta = -40~85°C, V<sub>CC</sub> = 0 V)

CHARACTERISTIC		SYMBOL	CONDITION	MIN	TYP.	MAX	UNIT
Supply Voltage		$V_{CC}$	—	4.0	—	18	V
Output Sustaining Voltage	62602P, 62602F	$V_{OUT}$	—	0	—	18	V
	62604P, 62604F						
Output Current		$I_{OUT}$	$V_{CC} = 5\text{ V}$	0	—	8	mA / ch
Input Voltage		$V_{IN}$	—	0	—	$V_{CC}$	V
REF, Input Voltage		$V_{ref}$	$T_a = 25^\circ\text{C}$	0.4	—	$V_{CC} - 1.6$	V
Power Dissipation	P	$P_D$	—	—	—	0.36	W
	F		On PCB	—	—	0.325	

**ELECTRICAL CHARACTERISTICS (Ta = 25°C)**

CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Input Voltage	"H" Level		$V_{IH}$	—	—	$V_{ref} + 0.1$	—	—	V
	"L" Level		$V_{IL}$	—	—	—	—	$V_{ref} - 0.1$	
Output Current	"H" Level	TD62602P TD62602F TD62604P TD62604F	$I_{OH}$	—	$V_{CC} = 4.5V, V_O = 18V$	—	—	10	$\mu A$
Output Voltage	"H" Level	TD62601P TD62601F TD62603P TD62603F	$V_{OH}$	—	$V_{CC} = 4.5V,$ $I_O = -10 \mu A$	4.0	—	—	V
	"L" Level		$V_{OL}$	—	$V_{CC} = 4.5V, I_O = 8 mA$	—	0.1	0.4	
Input Current	"H" Level		$I_{IH}$	—	—	—	—	2	$\mu A$
	"L" Level		$I_{IL}$	—	—	—	-0.2	-1.5	
Vref Terminal Voltage			$V_{ref} (OUT)$	—	—	$1/2 V_{CC} - 0.1$	—	$1/2 V_{CC} + 0.1$	V
Vref Resistor			$R_{ref}$	—	—	3.5	5	6.5	k $\Omega$
			$I_{CC}$	—	—	—	—	12	mA
Supply Current		TD62601P TD62601F TD62603P TD62603F	$I_{CCL}$	—	—	—	—	27	mA
Turn-On Delay			$t_{ON}$	—	$V_{CC} = 5V, V_{OUT} = 18V$ $R_L = 2 k\Omega$	—	0.5	—	$\mu s$
Turn-Off Delay			$t_{OFF}$	—		—	0.2	—	

**PRECAUTIONS for USING**

This IC does not integrate protection circuits such as overcurrent and overvoltage protectors.

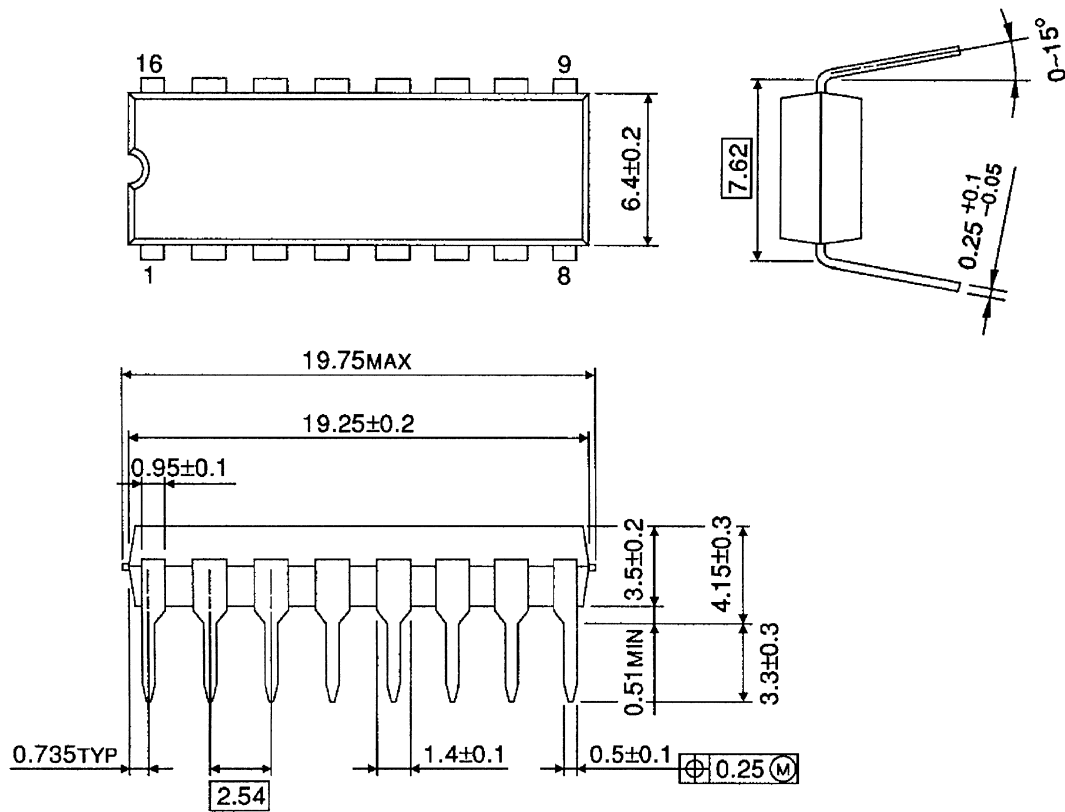
Thus, if excess current or voltage is applied to the IC, the IC may be damaged. Please design the IC so that excess current or voltage will not be applied to the IC.

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

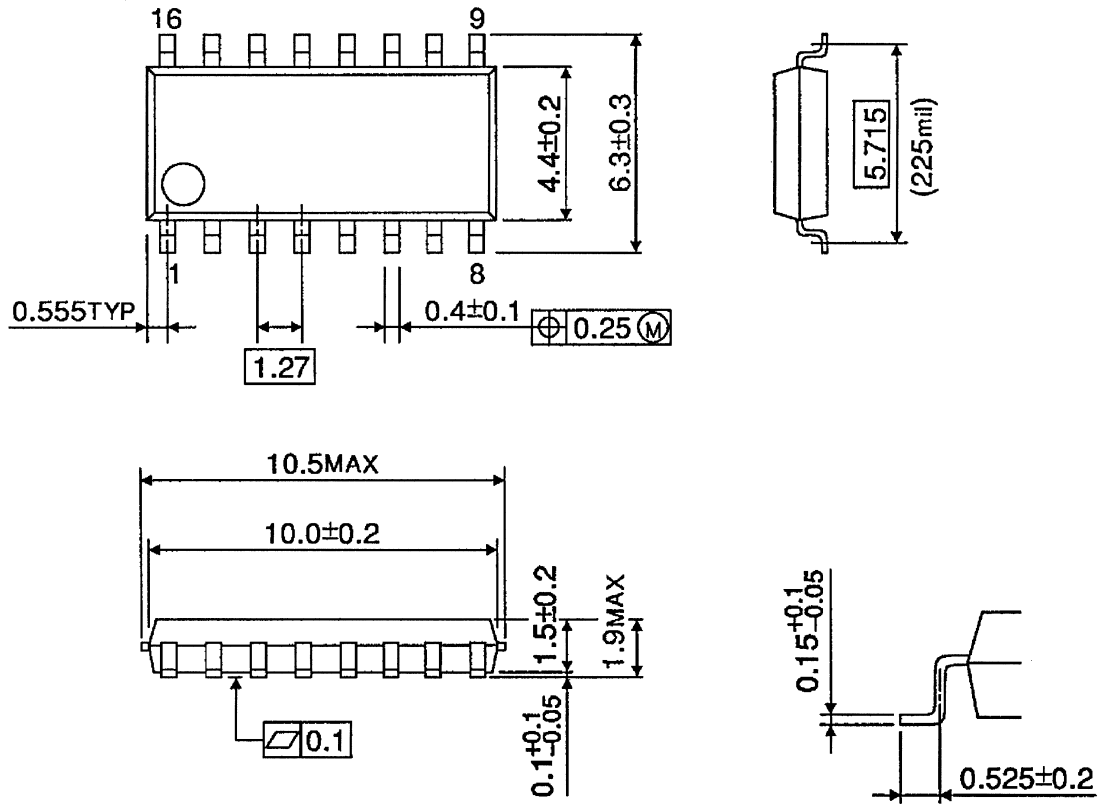


Weight: 1.11 g (typ.)

## PACKAGE DIMENSIONS

SOP16-P-225-1.27

Unit: mm



Weight: 0.16 g (typ.)

## Notes on Contents

### Equivalent Circuits

The equivalent circuit diagrams may be simplified or some parts of them may be omitted for explanatory purposes.

## IC Usage Considerations

### Notes on Handling of ICs

- (1) The absolute maximum ratings of a semiconductor device are a set of ratings that must not be exceeded, even for a moment. Do not exceed any of these ratings.  
Exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.
- (2) Use an appropriate power supply fuse to ensure that a large current does not continuously flow in case of over current and/or IC failure. The IC will fully break down when used under conditions that exceed its absolute maximum ratings, when the wiring is routed improperly or when an abnormal pulse noise occurs from the wiring or load, causing a large current to continuously flow and the breakdown can lead smoke or ignition. To minimize the effects of the flow of a large current in case of breakdown, appropriate settings, such as fuse capacity, fusing time and insertion circuit location, are required.
- (3) If your design includes an inductive load such as a motor coil, incorporate a protection circuit into the design to prevent device malfunction or breakdown caused by the current resulting from the inrush current at power ON or the negative current resulting from the back electromotive force at power OFF. IC breakdown may cause injury, smoke or ignition.  
Use a stable power supply with ICs with built-in protection functions. If the power supply is unstable, the protection function may not operate, causing IC breakdown. IC breakdown may cause injury, smoke or ignition.
- (4) Do not insert devices in the wrong orientation or incorrectly.  
Make sure that the positive and negative terminals of power supplies are connected properly. Otherwise, the current or power consumption may exceed the absolute maximum rating, and exceeding the rating(s) may cause the device breakdown, damage or deterioration, and may result injury by explosion or combustion.  
In addition, do not use any device that is applied the current with inserting in the wrong orientation or incorrectly even just one time.
- (5) Carefully select external components (such as inputs and negative feedback capacitors) and load components (such as speakers), for example, power amp and regulator.  
If there is a large amount of leakage current such as input or negative feedback condenser, the IC output DC voltage will increase. If this output voltage is connected to a speaker with low input withstand voltage, overcurrent or IC failure can cause smoke or ignition. (The over current can cause smoke or ignition from the IC itself.) In particular, please pay attention when using a Bridge Tied Load (BTL) connection type IC that inputs output DC voltage to a speaker directly.

**Points to Remember on Handling of ICs****(1) Heat Radiation Design**

In using an IC with large current flow such as power amp, regulator or driver, please design the device so that heat is appropriately radiated, not to exceed the specified junction temperature ( $T_j$ ) at any time and condition. These ICs generate heat even during normal use. An inadequate IC heat radiation design can lead to decrease in IC life, deterioration of IC characteristics or IC breakdown. In addition, please design the device taking into consideration the effect of IC heat radiation with peripheral components.

**(2) Back-EMF**

When a motor rotates in the reverse direction, stops or slows down abruptly, a current flows back to the motor's power supply due to the effect of back-EMF. If the current sink capability of the power supply is small, the device's motor power supply and output pins might be exposed to conditions beyond maximum ratings. To avoid this problem, take the effect of back-EMF into consideration in system design.

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