

TOSHIBA Bipolar Digital Integrated Circuit  
Silicon Monolithic

# TD62S050AFM

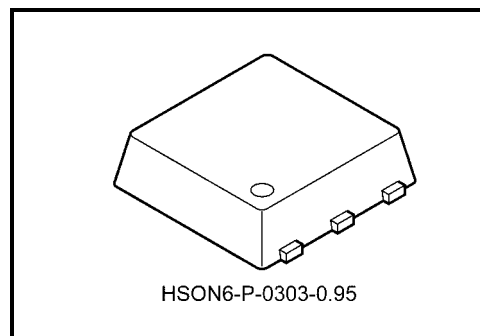
## 1-Channel Darlington Sink-Current Driver

The TD62S050AFM is a 1-channel inverting NPN Darlington sink-current driver. The driver incorporates output clamp diodes used to clamp the counter electromotive force which is generated when driving an inductive load, and an input resistor which limits base current.

The driver is optimal for driving relays and LEDs. When using the driver, pay attention to the thermal conditions.

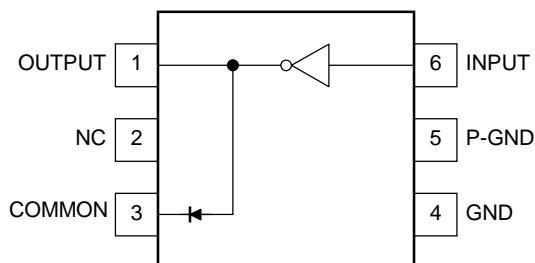
### Features

- Ultra-small HSON6 package with heat sink on rear
- High output withstand voltage:  $V_{CE(SUS)} = 50\text{ V (min)}$
- Large output current:  $I_{OUT} = 500\text{ mA (max)}$
- DC current amplification ratio:  $h_{FE} = 1000\text{ (min)}$
- Built-in input resistor:  $R_{IN} = 2.7\text{ k}\Omega$
- Input signal: High Level Active
- Built-in output clamp diodes

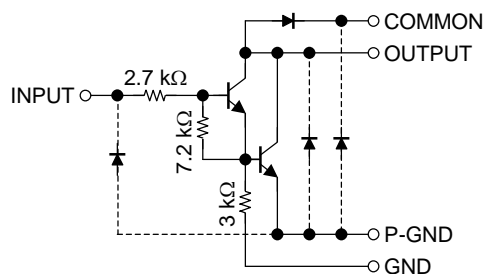


Weight: 0.017 g (typ.)

### Pin Connection (top view)



### Basic Circuit Diagram



Note 1: Diodes shown using dotted lines are parasitic. Do not use them.

Note 2: When using the driver, connect the P-GND pin to the GND pin.

Note 3: When using the driver, connect the P-GND pin to the heat sink on the rear of the package.

## Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Collector-emitter voltage	V <sub>CEO</sub>	50	V
Output withstand voltage	V <sub>CE (SUS)</sub>	50	V
Output current	I <sub>OUT</sub>	500	mA
Input voltage	V <sub>IN</sub>	-0.5~30	V
Clamp diode reverse voltage	V <sub>R</sub>	50	V
Clamp diode forward current	I <sub>F</sub>	500	mA
Power dissipation	P <sub>D</sub> (Note 4)	0.78	W
Saturated thermal resistance	R <sub>th (j-a)</sub> (Note 4)	160	°C/W
	R <sub>th (j-c)</sub> (Note 5)	25	
Operating temperature	T <sub>opr</sub>	-40~85	°C
Storage temperature	T <sub>stg</sub>	-55~150	°C

Note 4: 114.3 × 76.2 × 1.6 mm glass epoxy film substrate Cu heat dissipation pattern 100 mm<sup>2</sup>

Note 5: When an infinite heat sink is mounted.

## Recommended Operating Condition (Ta = -40~85°C)

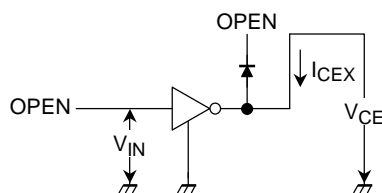
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Output withstand voltage		V <sub>CEO</sub>	—	0	—	50	V
Output current		I <sub>OUT</sub>	Ta = 60°C, T <sub>J</sub> = 105°C	—	—	220	mA
Input voltage		V <sub>IN</sub>	—	0	—	24	V
Input voltage	Output ON	V <sub>IN (ON)</sub>	I <sub>OUT</sub> = 400 mA, h <sub>FE</sub> = 800	2.8	—	24	V
	Output OFF	V <sub>IN (OFF)</sub>	—	0	—	0.7	
Clamp diode reverse voltage		V <sub>R</sub>	—	—	—	50	V
Clamp diode forward current		I <sub>F</sub>	—	—	—	350	mA

## Electrical Characteristics (Ta = 25°C)

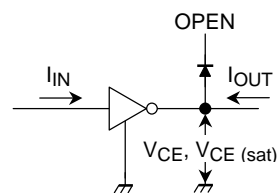
Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output leakage current		I <sub>CEX</sub>	1	V <sub>CE</sub> = 50 V, V <sub>IN</sub> = OPEN	—	—	10	μA
Output saturation voltage		V <sub>CE (sat)</sub>	2	I <sub>OUT</sub> = 300 mA, I <sub>IN</sub> = 500 μA	—	1.1	1.3	V
				I <sub>OUT</sub> = 200 mA, I <sub>IN</sub> = 350 μA	—	1.0	1.2	
DC current amplification ratio		h <sub>FE</sub>	2	V <sub>CE</sub> = 2.0 V, I <sub>OUT</sub> = 350 mA	1000	—	—	
Input current	Output ON	I <sub>IN (ON)</sub>	3	V <sub>IN</sub> = 2.4 V, I <sub>OUT</sub> = 350 mA	—	0.4	0.7	mA
Input voltage	Output ON	V <sub>IN (ON)</sub>	4	V <sub>CE</sub> = 2 V, I <sub>OUT</sub> = 350 mA	—	—	2.6	V
	Output ON			h <sub>FE</sub> = 800, I <sub>OUT</sub> = 200 mA	—	—	2.2	
Clamp diode leakage current		I <sub>R</sub>	5	V <sub>R</sub> = 50 V	—	—	10	μA
Clamp diode forward voltage		V <sub>F</sub>	6	I <sub>F</sub> = 350 mA	—	1.6	2.0	V
Turn-on delay		t <sub>ON</sub>	7	V <sub>OUT</sub> = 50 V, R <sub>L</sub> = 125 Ω, C <sub>L</sub> = 15 pF	—	0.02	—	μs
Turn-off delay		t <sub>OFF</sub>			—	1.0	—	

## Test Circuit

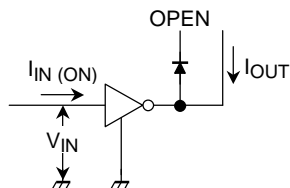
### 1. $I_{CEX}$



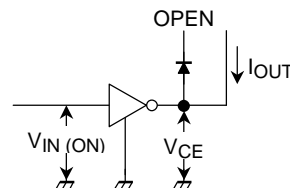
### 2. $V_{CE(sat)}$ , $h_{FE}$



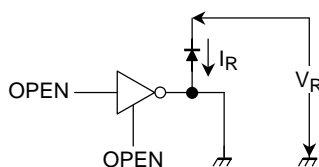
### 3. $I_{IN(ON)}$



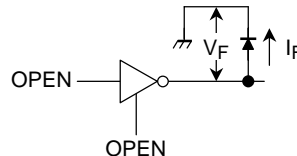
### 4. $V_{IN(ON)}$



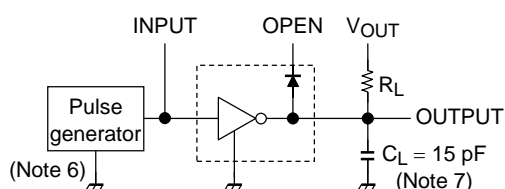
### 5. $I_R$



### 6. $V_F$

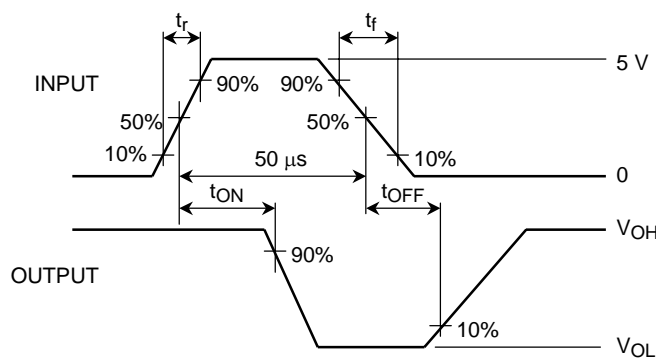


### 7. $t_{ON}$ , $t_{OFF}$



Note 6: Pulse width 50  $\mu$ s, Duty cycle 10%  
Output impedance 50  $\Omega$ ,  $t_r \leq 5$  ns,  $t_f \leq 10$  ns

Note 7:  $C_L$  includes probe and jig capacitance.



## Caution on Application

- The device does not include protectors such as an overcurrent protector and an overvoltage protector. Applying excessive current or voltage may damage the device. Thus, design with great care to prevent excessive current or voltage from being applied to the device. The device may also be damaged by short-circuits between outputs and power supply/ground. Take care when designing output, VCC and GND line.
- Be sure to mount the device in the correct orientation. Make sure that the positive and negative power supply pins are connected the right way round. Otherwise, the absolute maximum current and power dissipation ratings may be exceeded and the device may break down or undergo performance degradation, causing it to catch fire or explode, and resulting in injury.

**Package Dimensions**

Weight: 0.017 g (typ.)

Technical drawing of a mechanical part. The drawing shows a top view and a side view. The top view is a rectangle with a width of 10 mm and a height of 5 mm. The side view is a rectangle with a width of 10 mm and a height of 5 mm. The part has a central rectangular feature with a width of 10 mm and a height of 5 mm. The central feature is filled with diagonal hatching. The top view shows the central feature as a rectangle with a width of 10 mm and a height of 5 mm. The side view shows the central feature as a rectangle with a width of 10 mm and a height of 5 mm. The dimensions 10 mm and 5 mm are indicated by arrows and text.

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