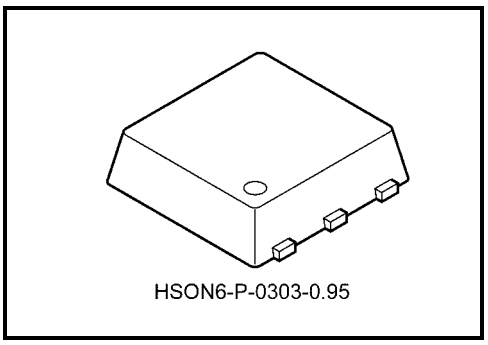
TOSHIBA Bipolar Digital Integrated Circuit
Silicon Monolithic

TD62S051AFM

1-Channel Darlington Sink-Current Driver

The TD62S051AFM is a 1-channel noninverting sink-current driver with a PNP transistor at the first stage and a NPN Darlington transistor at the second stage.
The driver incorporates output clamp diodes used to clamp the counter electromotive force which is generated when driving an inductive load. Because the driver operates by source input current, it is optimal for interfacing with sink-current driven general-purpose CMOS logic ICs and microprocessors. Also it is optimal for driving relays and LEDs. When using the driver, pay attention to the thermal conditions.

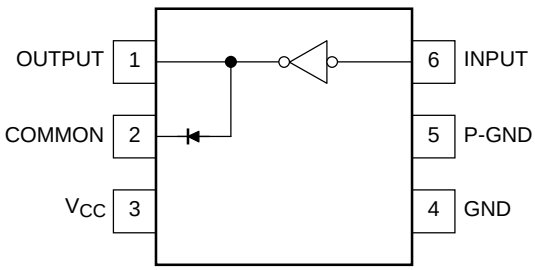


Weight: 0.017 g (typ.)

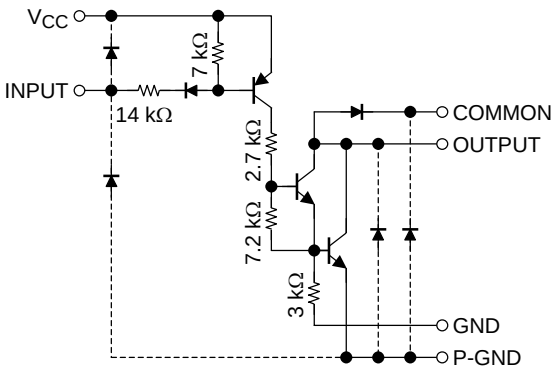
Features

- Ultra-small HSON6 package with heat sink on rear
- High output withstandard voltage: $V_{CE\ (SUS)}$ = 50 V (min)
- Large output current: I_{OUT} = 500 mA (max)
- Built-in input resistor: R_{IN} = 14 kΩ
- Input signal: Low Level Active
- Built-in output clamp diodes

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
Supply voltage	V_{CC}	−0.5~7.0	V
Collector-emitter voltage	V_{CEO}	50	V
Output withstand voltage	$V_{CE\ (SUS)}$	50	V
Output current	I_{OUT}	500	mA
Input voltage	V_{IN}	−0.5~7.0	V
Input current	I_{IN}	−10	mA
Clamp diode reverse voltage	V_R	50	V
Clamp diode forward current	I_F	500	mA
Power dissipation	P_D (Note 4)	0.78	W
Saturated thermal resistance	$R_{th\ (j\text{-}a)}$ (Note 4)	160	°C/W
	$R_{th\ (j\text{-}c)}$ (Note 5)	25	
Operating temperature	T_{opr}	−40~85	°C
Storage temperature	T_{stg}	−55~150	°C

Note 4: 114.3 × 76.2 × 1.6 mm glass epoxy film substrate Cu heat dissipation pattern 100 mm^2

Note 5: When an infinite heat sink is mounted.

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

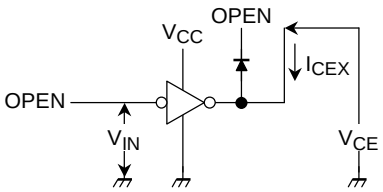
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Supply voltage	V_{CC}	—	4.5	5.0	5.5	V
Output withstand voltage	V_{CEO}	—	0	—	50	V
Output current	I_{OUT}	Ta = 60°C, T_j = 105°C	—	—	180	mA
Input voltage	V_{IN}	—	0	—	5.5	V
Clamp diode reverse voltage	V_R	—	—	—	50	V
Clamp diode forward current	I_F	—	—	—	400	mA

Electrical Characteristics (Ta = 25°C)

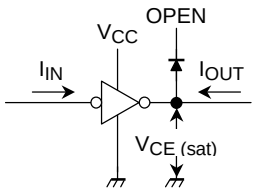
Characteristics		Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output leakage current		I_{CEX}	1	V_{CC} = V_{IN} = 5.5 V, V_{OUT} = 50 V	—	—	10	μA
Output saturation voltage		$V_{CE\ (sat)}$	2	V_{CC} = 4.5 V, V_{IN} = 0 V, I_{OUT} = 350 mA	—	1.4	1.6	V
				V_{CC} = 4.5 V, V_{IN} = 0 V, I_{OUT} = 180 mA	—	1.3	1.5	
Input voltage	Output ON	$I_{IN\ (ON)}$	3	V_{CC} = 5.5 V, V_{IN} = 0.4 V	—	−0.32	−0.45	mA
	Output OFF	$I_{IN\ (OFF)}$	4	V_{CC} = 5.5 V, V_{IN} = 5.5 V	—	—	−4.0	μA
Input voltage		$V_{IN\ (ON)}$	5	V_{CC} = 4.5 V, I_{OUT} = 350 mA	—	—	V_{CC} − 3.7	V
Clamp diode leakage current		I_R	6	V_R = 50 V	—	—	10	μA
Clamp diode forward voltage		V_F	7	I_F = 350 mA	—	—	2.0	V
Power dissipation		$I_{CC\ (ON)}$	8	V_{CC} = 5.5 V, V_{IN} = 0 V	—	—	2.5	mA
		$I_{CC\ (OFF)}$		V_{CC} = 5.5 V, V_{IN} = V_{CC}	—	—	100	μA
Turn-on delay		t_{ON}	9	V_{CC} = 5 V, V_{OUT} = 50 V, R_L = 125 Ω, C_L = 15 pF	—	0.2	—	μs
Turn-off delay		t_{OFF}			—	3.5	—	

Test Circuit

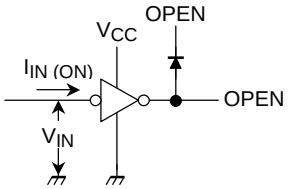
1. I_{CEX}



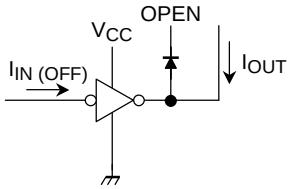
2. $V_{CE\ (sat)}$



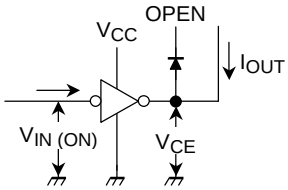
3. $I_{IN\ (ON)}$



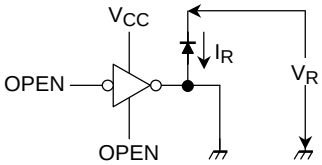
4. $I_{IN\ (OFF)}$



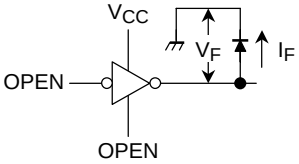
5. $V_{IN\ (ON)}$



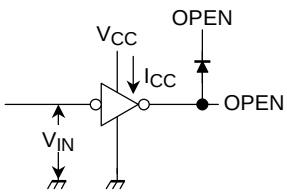
6. I_R



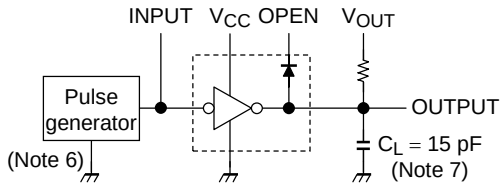
7. V_F

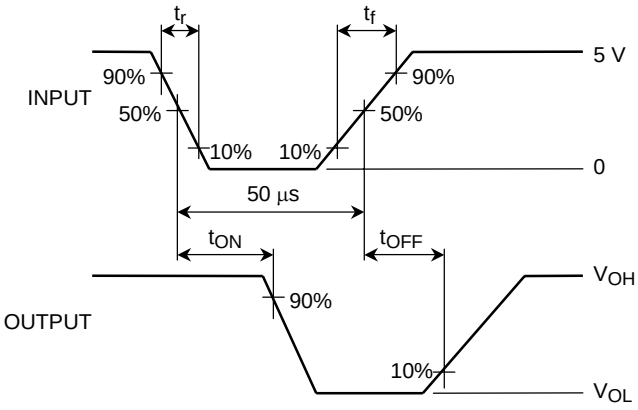


8. I_{CC}



9. t_{ON}, t_{OFF}





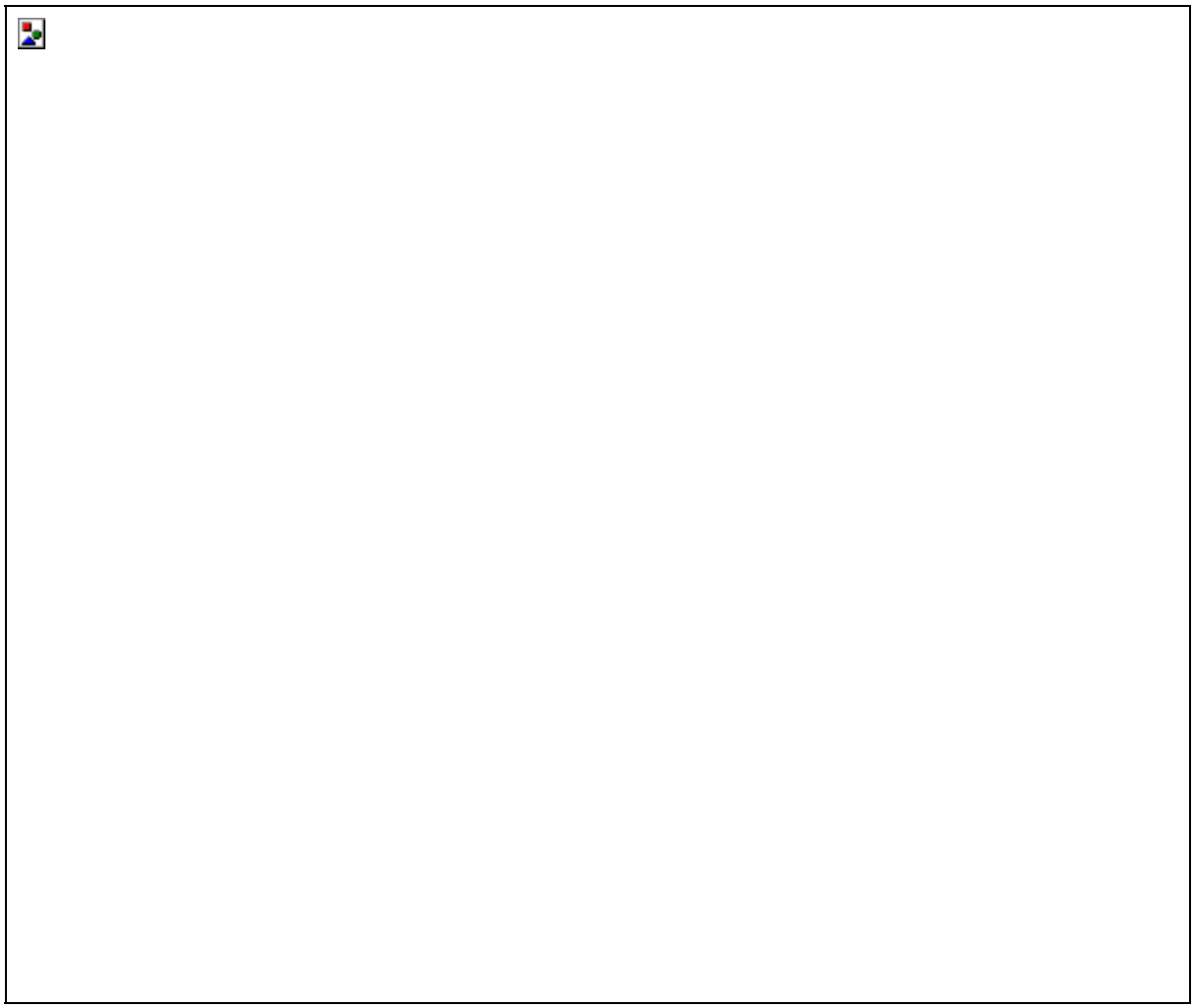
Note 6: Pulse width 50 μs, Duty cycle 10%
Output impedance 50 Ω, $t_r \leqq 5$ ns, $t_f \leqq 10$ ns

Note 7: C_L includes probe and jig capacitance.

Caution on Application

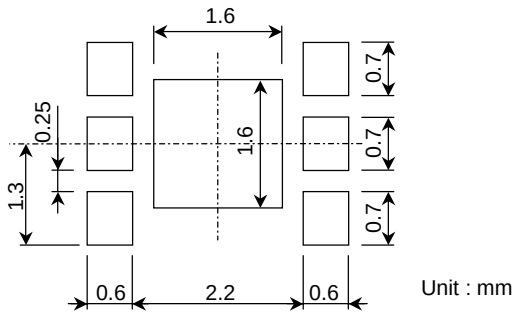
1. The device does not include protectors such as an overcurrent protector and an overvoltage protector. Applying excessive current or voltage may damage the device.
   Thus, design with great care to prevent excessive current or voltage from being applied to the device. The device may also be damaged by short-circuits between outputs and power supply/ground.
   Take care when designing output, V_{CC} and GND line.
2. 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

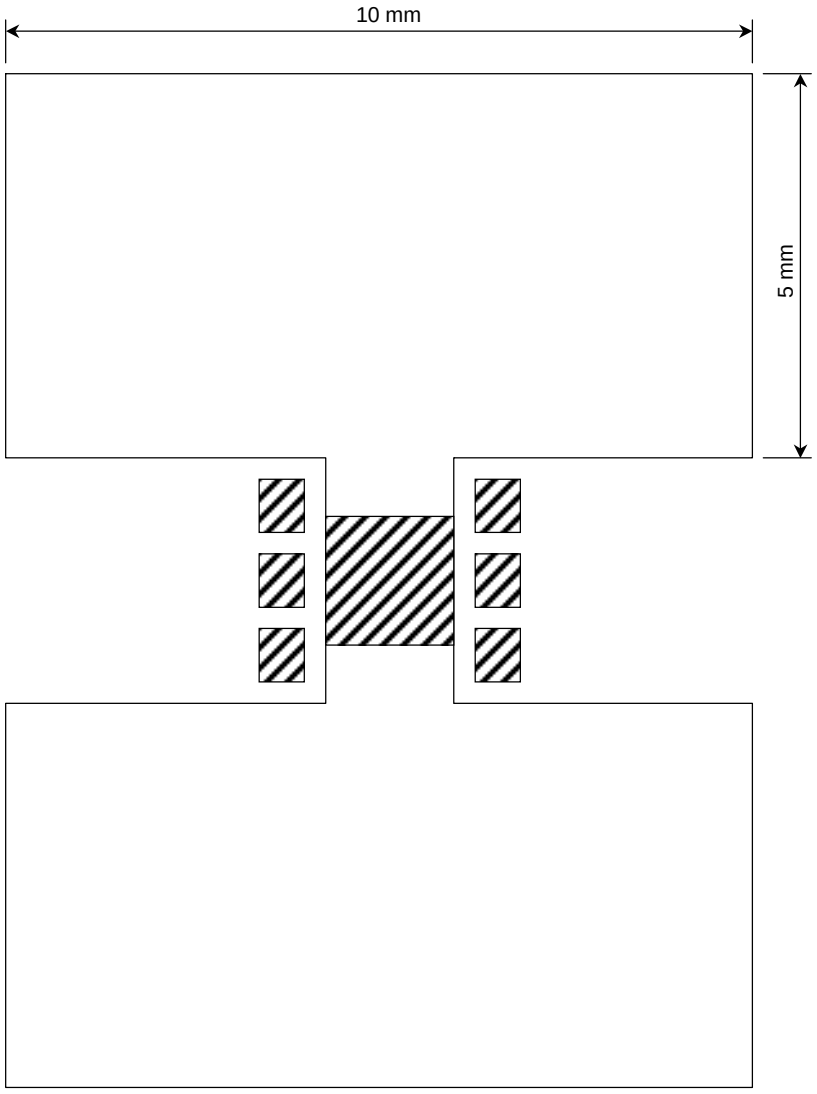


Weight: 0.017 g (typ.)

Preliminary land pattern



Preliminary PCB trace dimension



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