

TOSHIBA Power Transistor Module  
Silicon NPN Triple Diffused Type (Darlington power transistor 4 in 1)

MP4015

High Power Switching Applications.  
Hammer Drive, Pulse Motor Drive.  
Inductive Load Switching.

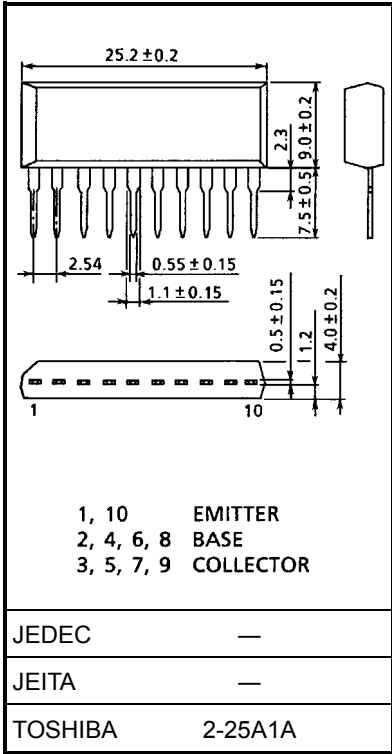
- Small package by full molding (SIP 10 pin)
- High collector power dissipation (4 devices operation)  
:  $P_T = 4\text{ W}$  ( $T_a = 25^\circ\text{C}$ )
- High collector current:  $I_C\text{ (DC)} = 5\text{ A (max)}$
- High DC current gain:  $h_{FE} = 1000\text{ (min)}$  ( $V_{CE} = 4\text{ V}$ ,  $I_C = 3\text{ A}$ )
- Zener diode included between collector and base.
- Unclamped inductive load energy:  $E_{S/B} = 100\text{ mJ (min)}$

Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	55	V
Collector-emitter voltage		$V_{CEO}$	$60 \pm 10$	V
Emitter-base voltage		$V_{EBO}$	6	V
Collector current	DC	$I_C$	5	A
	Pulse	$I_{CP}$	8	
Continuous base current		$I_B$	0.5	A
Collector power dissipation (1 device operation)		$P_C$	2.0	W
Collector power dissipation (4 devices operation)		$P_T$	4.0	W
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

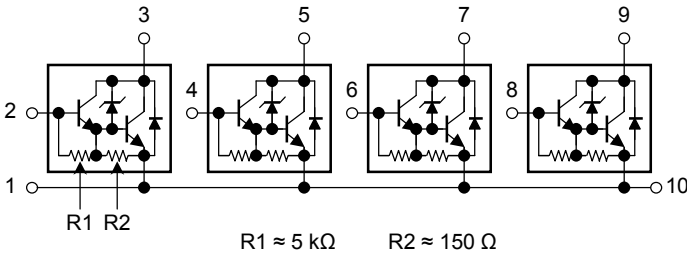
Industrial Applications

Unit: mm



Weight: 2.1 g (typ.)

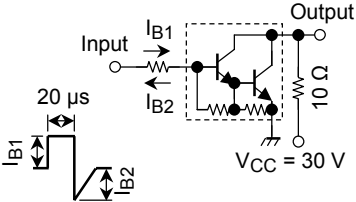
Array Configuration

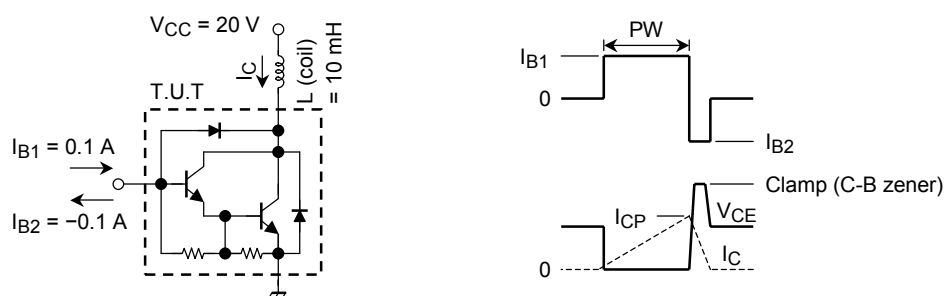


## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices operation, $T_a = 25^\circ\text{C}$ )	$\Sigma R_{th(j-a)}$	31.3	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	$T_L$	260	$^\circ\text{C}$

## Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

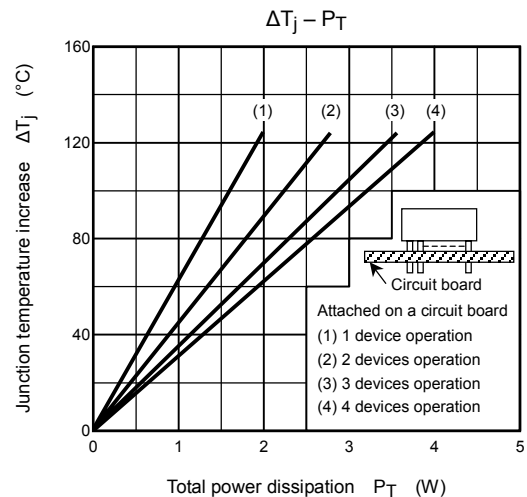
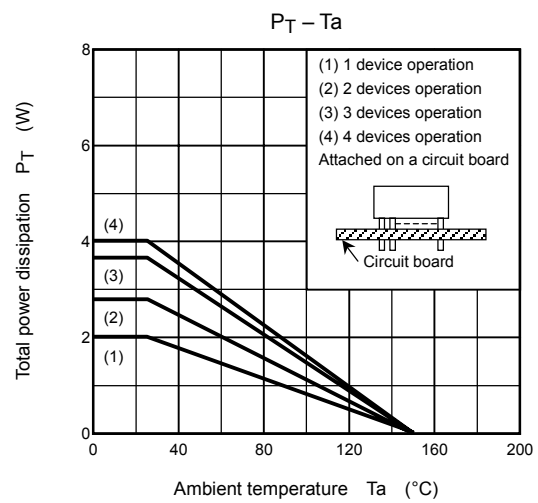
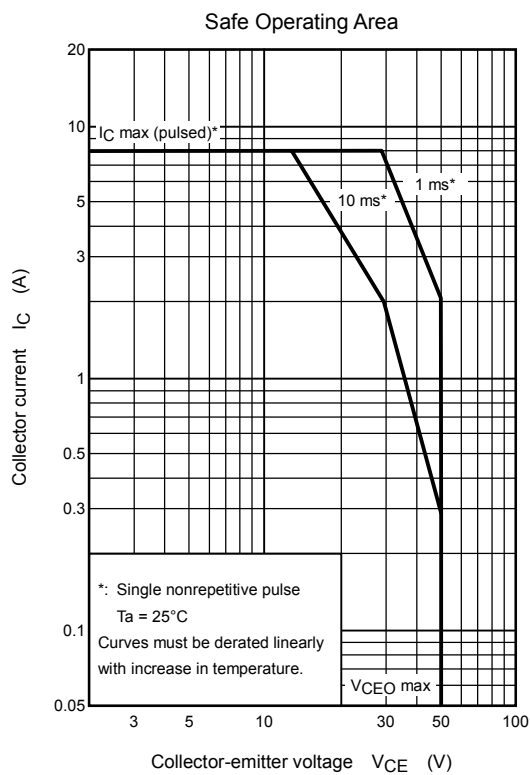
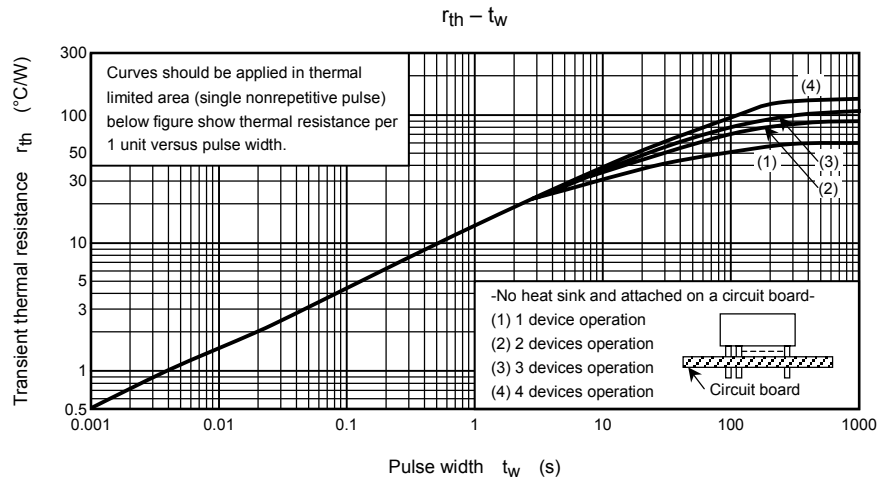
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = 45\text{ V}, I_E = 0\text{ A}$	—	—	10	$\mu\text{A}$
Collector cut-off current		$I_{CEO}$	$V_{CE} = 45\text{ V}, I_B = 0\text{ A}$	—	—	10	$\mu\text{A}$
Emitter cut-off current		$I_{EBO}$	$V_{EB} = 6\text{ V}, I_C = 0\text{ A}$	0.3	—	10	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = 10\text{ mA}, I_E = 0\text{ A}$	50	—	70	V
DC current gain		$h_{FE(1)}$	$V_{CE} = 4\text{ V}, I_C = 1\text{ A}$	1000	—	—	—
		$h_{FE(2)}$	$V_{CE} = 4\text{ V}, I_C = 3\text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE(sat)(1)}$	$I_C = 1\text{ A}, I_B = 4\text{ mA}$	—	0.9	1.4	V
		$V_{BE(sat)(2)}$	$I_C = 3\text{ A}, I_B = 10\text{ mA}$	—	1.3	2.0	
	Base-emitter	$V_{BE(sat)}$	$I_C = 1\text{ A}, I_B = 4\text{ mA}$	—	1.6	2.0	
Base-emitter voltage		$V_{BE}$	$V_{CE} = 4\text{ V}, I_B = 3\text{ A}$	—	1.8	2.5	V
Transition frequency		$f_T$	$V_{CE} = 3\text{ V}, I_C = 0.5\text{ A}$		7	—	MHz
Collector output capacitance		$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	44	—	pF
Switching time	Turn-on time	$t_{on}$	 $I_{B1} = -I_{B2} = 10\text{ mA}, \text{ duty cycle} \leq 1\%$	—	0.6	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	4.2	—	
	Fall time	$t_f$		—	2.3	—	
Unclamped inductive load energy		$E_{S/B}$	Refer to Figure 1	100	—	—	mJ



Note 1: Pulse width adjusted for desired  $I_{CP}$  ( $I_{CP} = 4.48\text{ A min}$ )

Note 2:  $E_{S/B} = \frac{1}{2} L \cdot I_{CP}^2$

**Figure 1 Measurement Circuit of Unclamped Inductive Load Energy  $E_{S/B}$**



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