

TOSHIBA Power Transistor Module
Silicon NPN Triple Diffused Type (Four Darlington Power Transistors in One)

MP4015

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

- Small package by full molding (SIP 10 pins)
- High collector power dissipation (4-device operation)
: $P_T = 4 \text{ W}$ ($T_a = 25^\circ\text{C}$)
- High collector current: I_C (DC) = 5 A (max)
- High DC current gain: $h_{FE} = 1000$ (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)

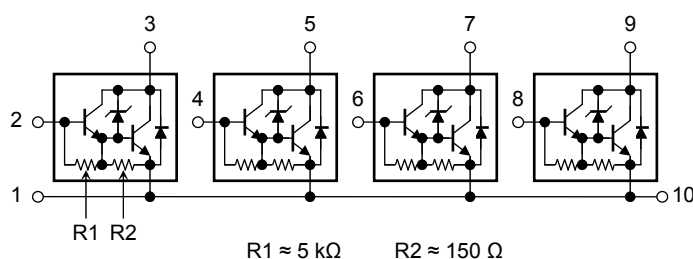
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	55	V
Collector-emitter voltage		V_{CEO}	60 ± 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-device operation)		P_T	4.0	W
Junction temperature		T_j	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

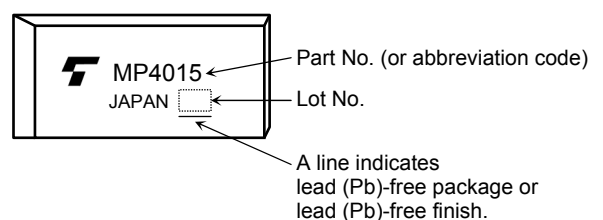
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Array Configuration

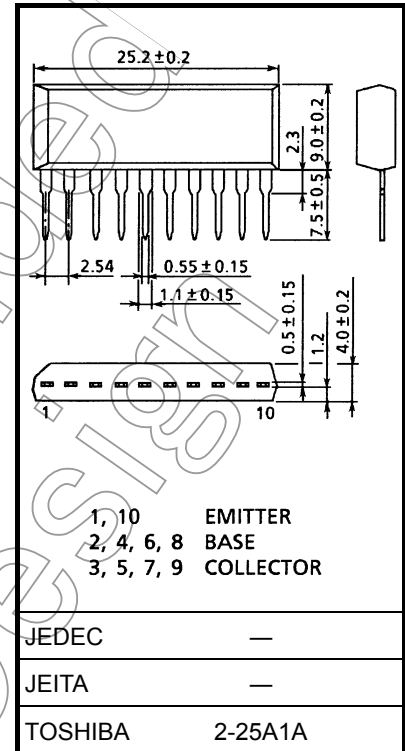


Marking



Industrial Applications

Unit: mm

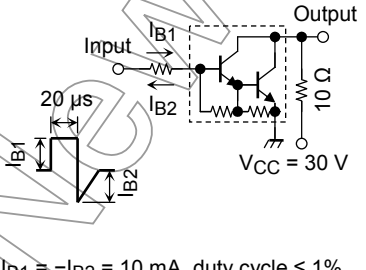


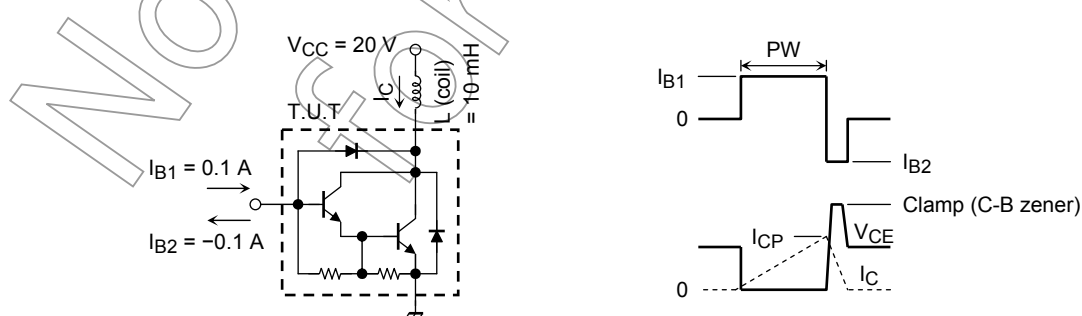
Weight: 2.1 g (typ.)

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from junction to ambient (4-device 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 ($T_a = 25^\circ\text{C}$)

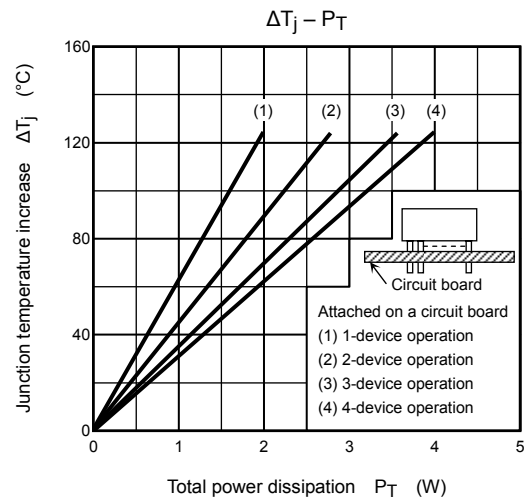
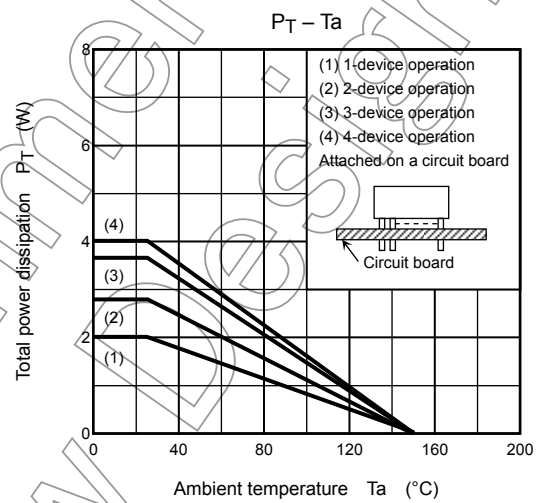
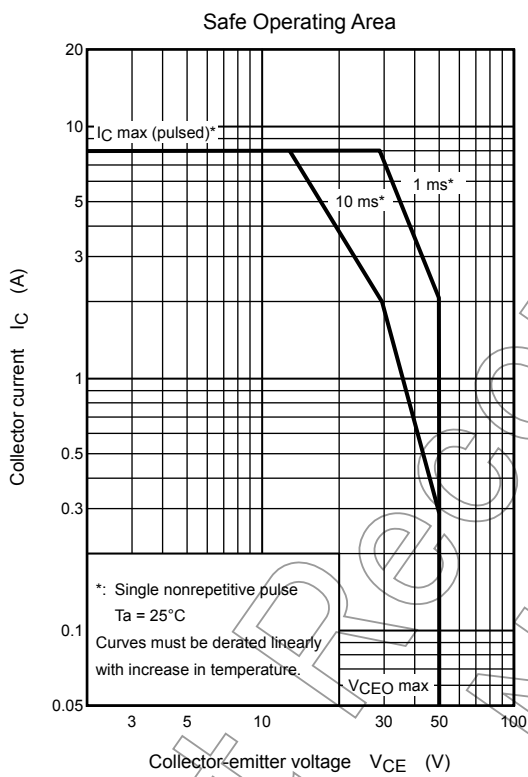
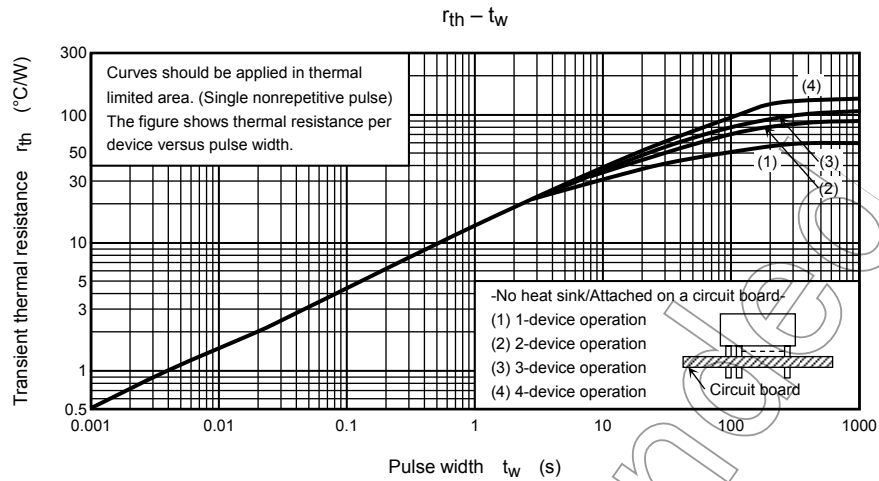
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = 45\text{ V}, I_E = 0\text{ A}$	—	—	10	μA
Collector cut-off current		I_{CEO}	$V_{CE} = 45\text{ V}, I_B = 0\text{ A}$	—	—	10	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = 6\text{ V}, I_C = 0\text{ A}$	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}		—	0.6	—	μs
	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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