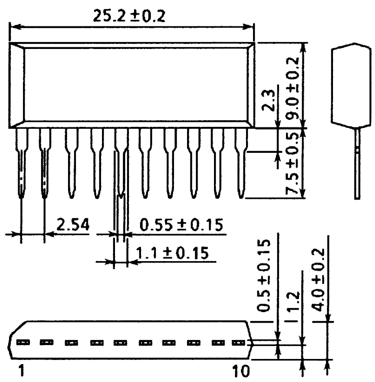
TOSHIBA Power Transistor Module
Silicon NPN Triple Diffused Type (Four Darlington Power Transistors in One)

MP4015

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

Industrial Applications

Unit: mm



1, 10 EMITTER
2, 4, 6, 8 BASE
3, 5, 7, 9 COLLECTOR

JEDEC	—
JEITA	—
TOSHIBA	2-25A1A

Weight: 2.1 g (typ.)

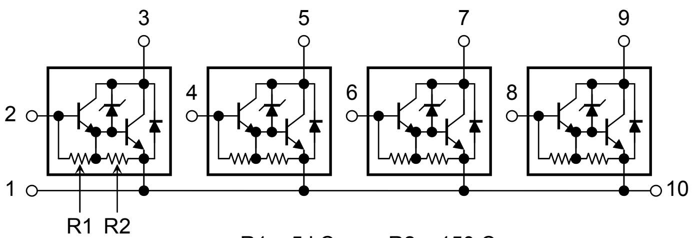
- Small package by full molding (SIP 10 pins)
- High collector power dissipation (4-device operation)
  : P_T = 4 W (Ta = 25°C)
- High collector current: $I_{C\ (DC)}$ = 5 A (max)
- High DC current gain: h_{FE} = 1000 (min) (V_{CE} = 4 V, I_C = 3 A)
- Zener diode included between collector and base.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

Absolute Maximum Ratings (Ta = 25°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	°C
Storage temperature range		T_{stg}	−55 to 150	°C

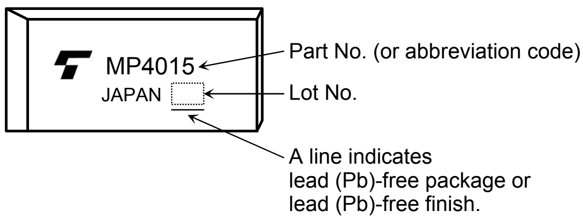
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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



R1 ≈ 5 kΩ R2 ≈ 150 Ω

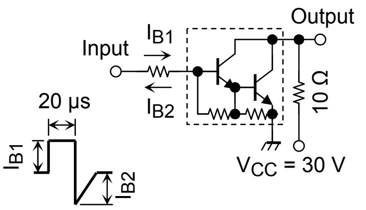
Marking

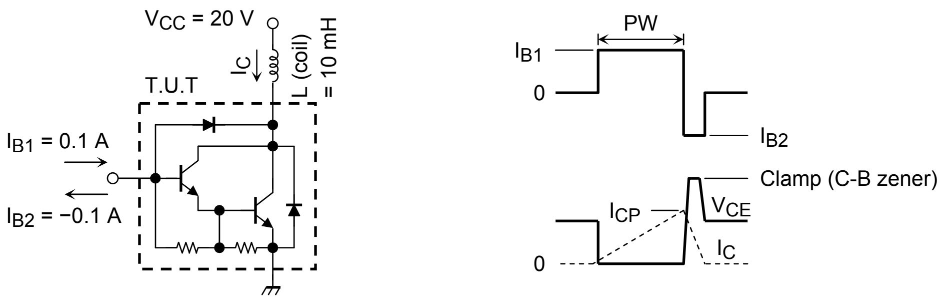


Thermal Characteristics

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

Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 45 V, I_E = 0 A	—	—	10	μA
Collector cut-off current		I_{CEO}	V_{CE} = 45 V, I_B = 0 A	—	—	10	μA
Emitter cut-off current		I_{EBO}	V_{EB} = 6 V, I_C = 0 A	0.3	—	10	mA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	I_C = 10 mA, I_E = 0 A	50	—	70	V
DC current gain		$h_{FE\ (1)}$	V_{CE} = 4 V, I_C = 1 A	1000	—	—	—
		$h_{FE\ (2)}$	V_{CE} = 4 V, I_C = 3 A	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE\ (sat)\ (1)}$	I_C = 1 A, I_B = 4 mA	—	0.9	1.4	V
		$V_{BE\ (sat)\ (2)}$	I_C = 3 A, I_B = 10 mA	—	1.3	2.0	
	Base-emitter	$V_{BE\ (sat)}$	I_C = 1 A, I_B = 4 mA	—	1.6	2.0	
Base-emitter voltage		V_{BE}	V_{CE} = 4 V, I_B = 3 A	—	1.8	2.5	V
Transition frequency		f_T	V_{CE} = 3 V, I_C = 0.5 A		7	—	MHz
Collector output capacitance		C_{ob}	V_{CB} = 10 V, I_E = 0 A, f = 1 MHz	—	44	—	pF
Switching time	Turn-on time	t_{on}	 $I_{B1} = -I_{B2}$ = 10 mA, duty cycle ≤ 1%	—	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

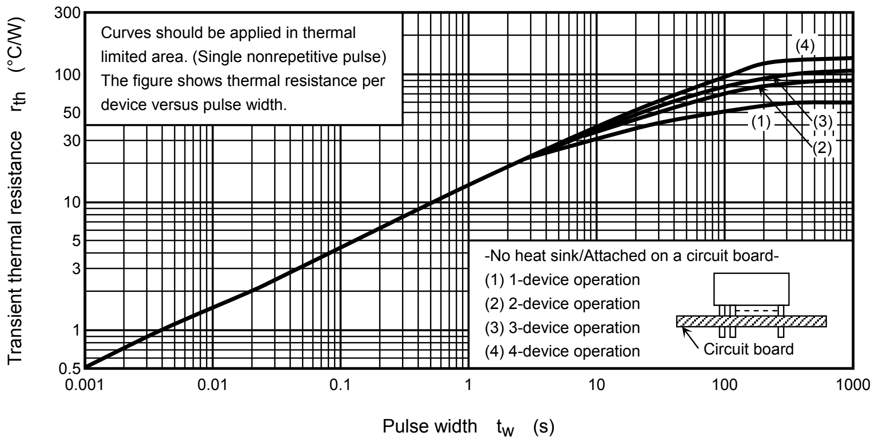


Note 1: Pulse width adjusted for desired I_{CP} (I_{CP} = 4.48 A min)

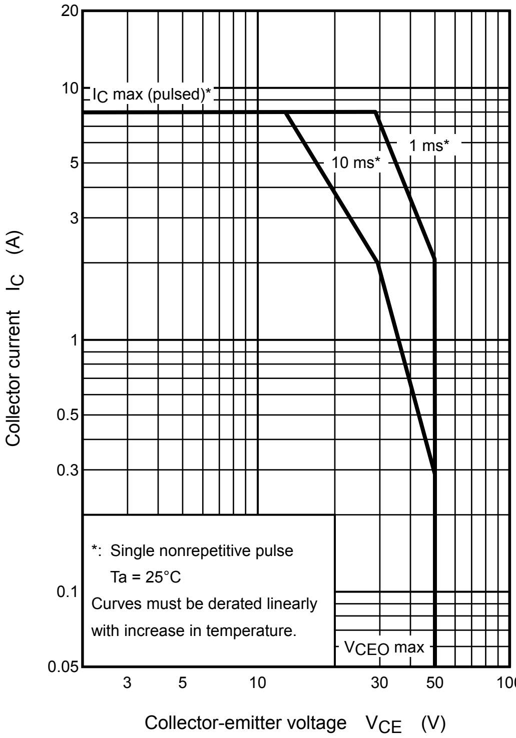
Note 2: $E_{S/B} = \frac{1}{2} L \cdot I_{CP}{}^2$

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

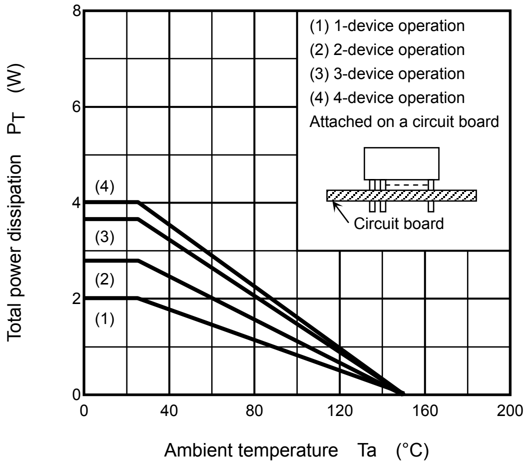
$r_{th} – t_w$



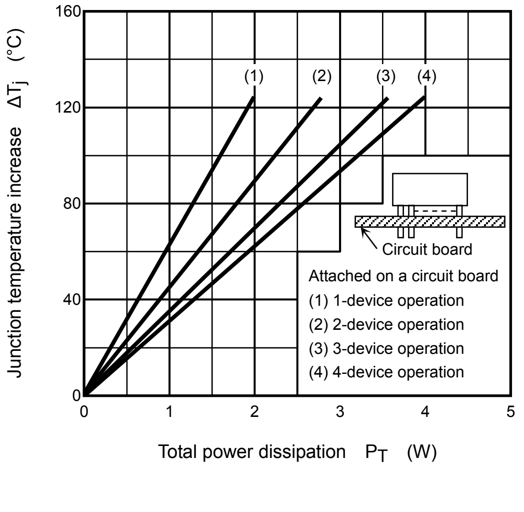
Safe Operating Area



$P_T – Ta$



$\Delta T_j – P_T$



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