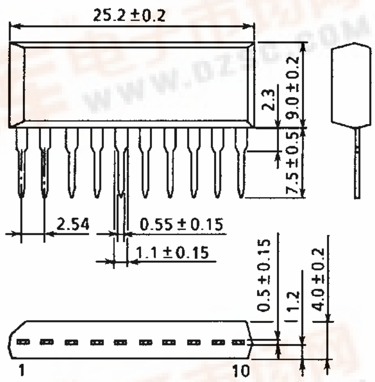
TOSHIBA Power Transistor Module
Silicon NPN Triple Diffused Type (Darlington power transistor 4 in 1)

MP4015

Industrial Applications

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

Unit: mm



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

JEDEC	―
JEITA	―
TOSHIBA	2-25A1A

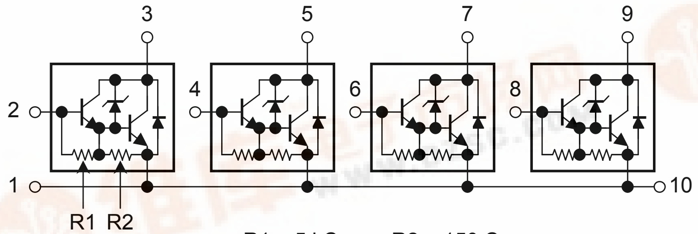
Weight: 2.1 g (typ.)

- Small package by full molding (SIP 10 pin)
- High collector power dissipation (4 devices 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)

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 devices operation)		P_T	4.0	W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Array Configuration

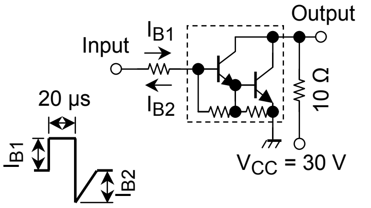


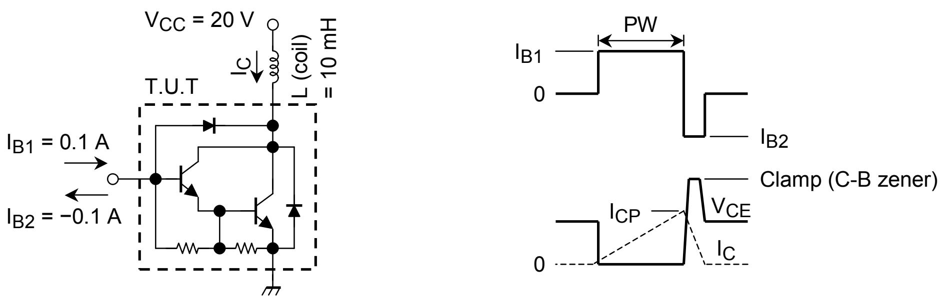
R1 ≈ 5 kΩ R2 ≈ 150 Ω

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices 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)

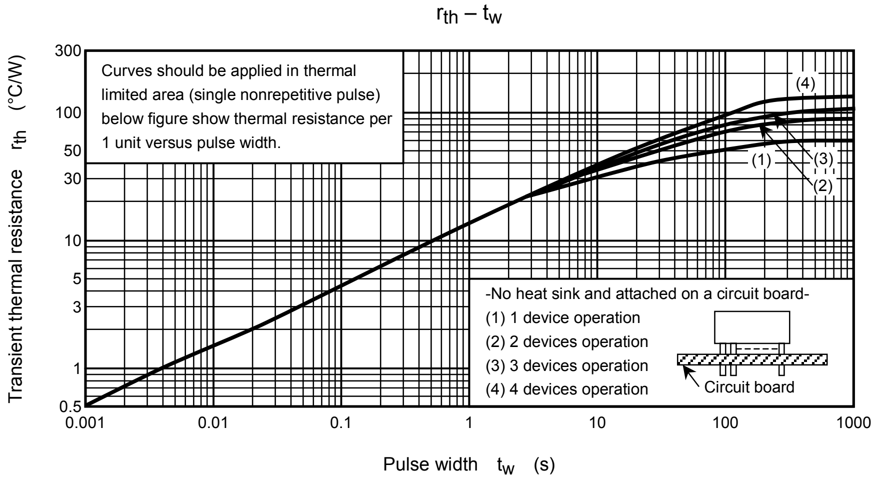
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 45 V, I_E = 0 A	—	—	10	μA
Collector cut-off current		I_{CEO}	V_{CE} = 45 V, I_B = 0 A	—	—	10	μA
Emitter cut-off current		I_{EBO}	V_{EB} = 6 V, I_C = 0 A	0.3	—	10	mA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	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}		—	0.6	—	μs
	Storage time	t_{stg}		—	4.2	—	
	Fall time	t_f	$I_{B1} = -I_{B2}$ = 10 mA, duty cycle ≤ 1%	—	2.3	—	
Unclamped inductive load energy		$E_{S/B}$	Refer to Figure 1	100	—	—	mJ

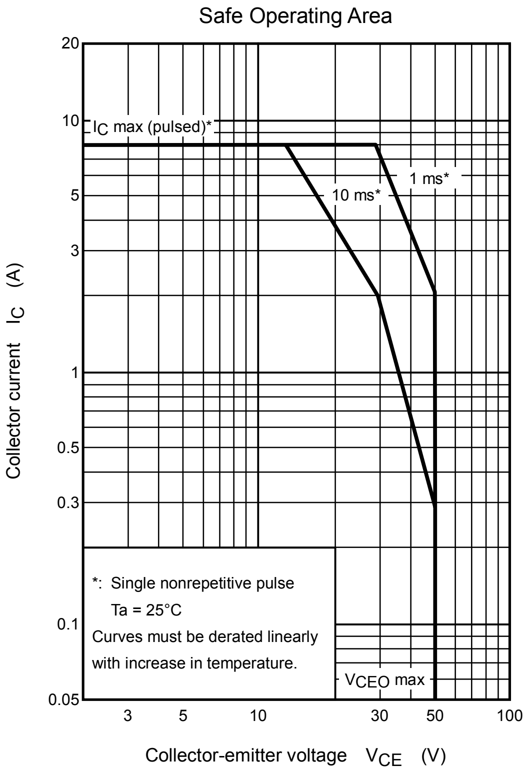


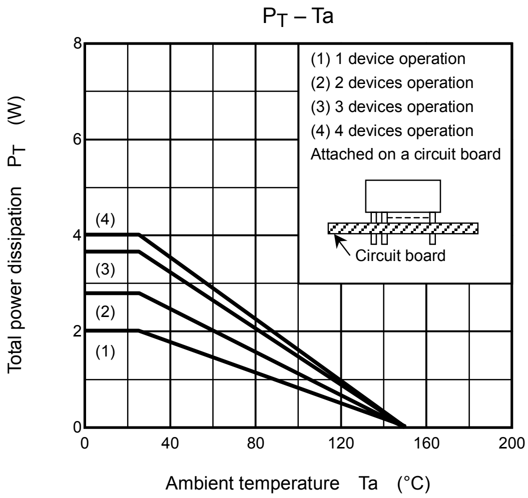
Note 1: Pulse width adjusted for desired I_{CP} (I_{CP} = 4.48 A min)

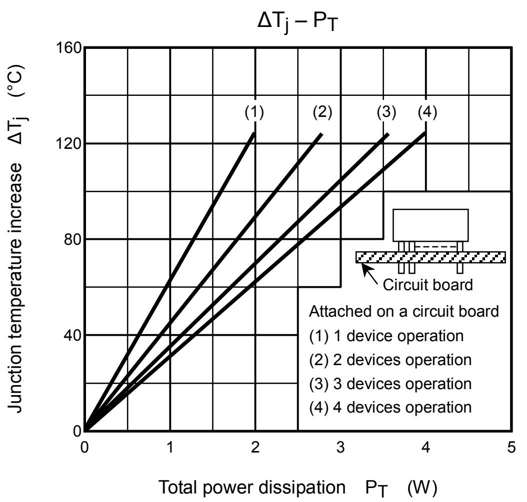
Note 2: $E_{S/B} = \frac{1}{2} L \cdot I_{CP}{}^2$

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


rth – tw
Curves should be applied in thermal limited area (single nonrepetitive pulse) below figure show thermal resistance per 1 unit versus pulse width.
Transient thermal resistance rth (°C/W)
Pulse width tw (s)
-No heat sink and attached on a circuit board-
(1) 1 device operation
(2) 2 devices operation
(3) 3 devices operation
(4) 4 devices operation
Circuit board


Safe Operating Area
IC max (pulsed)*
10 ms*
1 ms*
*: Single nonrepetitive pulse
Ta = 25°C
Curves must be derated linearly with increase in temperature.
VCEO max
Collector current IC (A)
Collector-emitter voltage VCE (V)


PT – Ta
(1) 1 device operation
(2) 2 devices operation
(3) 3 devices operation
(4) 4 devices operation
Attached on a circuit board
Circuit board
Total power dissipation PT (W)
Ambient temperature Ta (°C)


ΔTj – PT
Circuit board
Attached on a circuit board
(1) 1 device operation
(2) 2 devices operation
(3) 3 devices operation
(4) 4 devices operation
Junction temperature increase ΔTj (°C)
Total power dissipation PT (W)

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