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

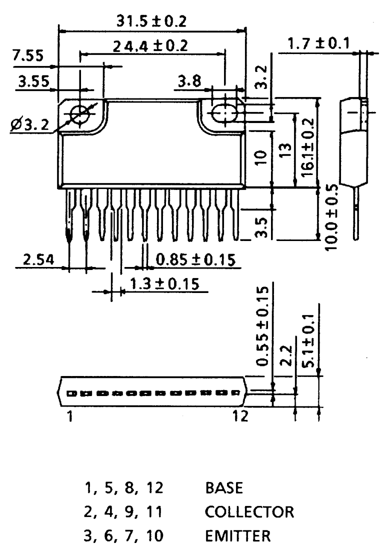
MP4508

High Power Switching Applications.

Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

Industrial Applications

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-32B1B

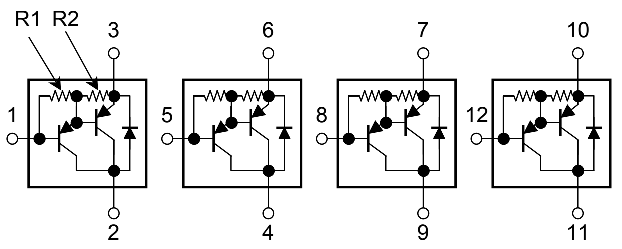
Weight: 6.0 g (typ.)

- Package with heat sink isolated to lead (SIP 12 pin)
- High collector power dissipation (4 devices operation)
  : P_T = 5 W (Ta = 25°C)
- High collector current: $I_{C\ (DC)}$ = −5 A (max)
- High DC current gain: h_{FE} = 1000 (min) (V_{CE} = −3 V, I_C = −3 A)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	−100	V
Collector-emitter voltage		V_{CEO}	−100	V
Emitter-base voltage		V_{EBO}	−5	V
Collector current	DC	I_C	−5	A
	Pulse	I_{CP}	−8	
Continuous base current		I_B	−0.1	A
Collector power dissipation (1 device operation)		P_C	3.0	W
Collector power dissipation (4 devices operation)	Ta = 25°C	P_T	5.0	W
	Tc = 25°C		25	
Isolation voltage		V_{Isol}	1000	V
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Array Configuration

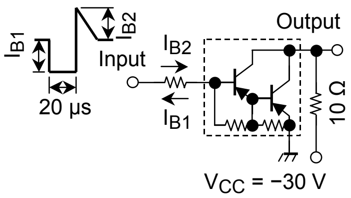


R1 ≈ 5 kΩ, R2 ≈ 120 Ω

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices operation, Ta = 25°C)	$\Sigma R_{th\ (j\text{-}a)}$	25	°C/W
Thermal resistance of junction to case (4 devices operation, Tc = 25°C)	$\Sigma R_{th\ (j\text{-}c)}$	5.0	°C/W
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	T_L	260	°C

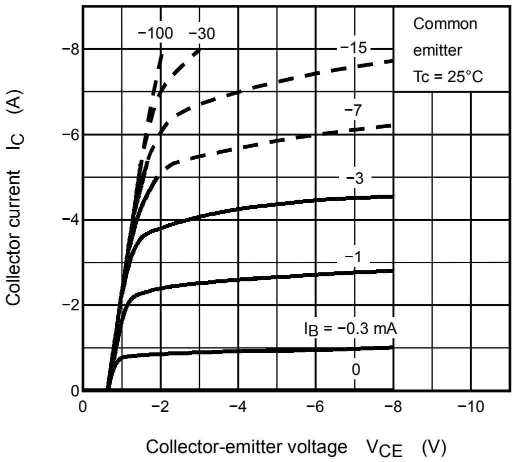
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = -100$ V, $I_E = 0$ A	—	—	−10	μA
Collector cut-off current		I_{CEO}	$V_{CE} = -100$ V, $I_B = 0$ A	—	—	−10	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = -5$ V, $I_C = 0$ A	−0.3	—	−2.0	mA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	$I_C = -1$ mA, $I_E = 0$ A	−100	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)\ CEO}$	$I_C = -30$ mA, $I_B = 0$ A	−100	—	—	V
DC current gain		$h_{FE\ (1)}$	$V_{CE} = -3$ V, $I_C = -0.5$ A	1000	—	—	—
		$h_{FE\ (2)}$	$V_{CE} = -3$ V, $I_C = -3$ A	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE\ (sat)}$	$I_C = -3$ A, $I_B = -12$ mA	—	—	−2.0	V
	Base-emitter	$V_{BE\ (sat)}$	$I_C = -3$ A, $I_B = -12$ mA	—	—	−2.5	
Transition frequency		f_T	$V_{CE} = -3$ V, $I_C = -0.5$ A	3	—	—	MHz
Collector output capacitance		C_{ob}	$V_{CB} = -50$ V, $I_E = 0$ A, f = 1 MHz	—	40	—	pF
Switching time	Turn-on time	t_{on}		—	0.5	—	μs
	Storage time	t_{stg}		—	3.0	—	
	Fall time	t_f	$-I_{B1} = I_{B2} = 12$ mA, duty cycle ≤ 1%	—	2.0	—	

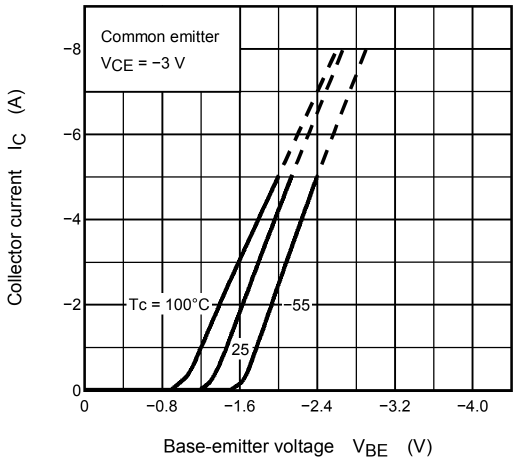
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward current	I_{FM}	—	—	—	5	A
Surge current	I_{FSM}	t = 1 s, 1 shot	—	—	8	A
Forward voltage	V_F	$I_F = 1$ A, $I_B = 0$ A	—	—	2.0	V
Reverse recovery time	t_{rr}	$I_F = 5$ A, $V_{BE} = 3$ V, $dI_F/dt = 50$ A/μs	—	1.0	—	μs
Reverse recovery charge	Q_{rr}		—	8	—	μC

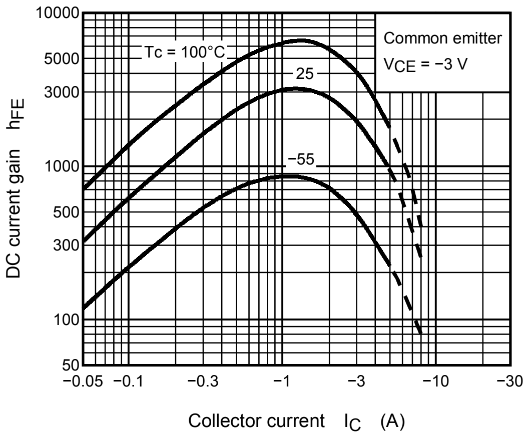
$I_C – V_{CE}$



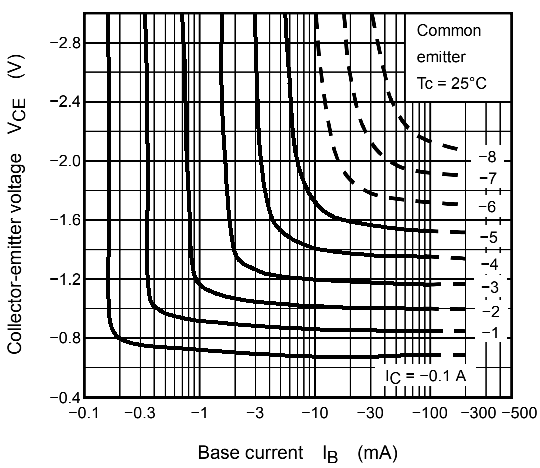
$I_C – V_{BE}$



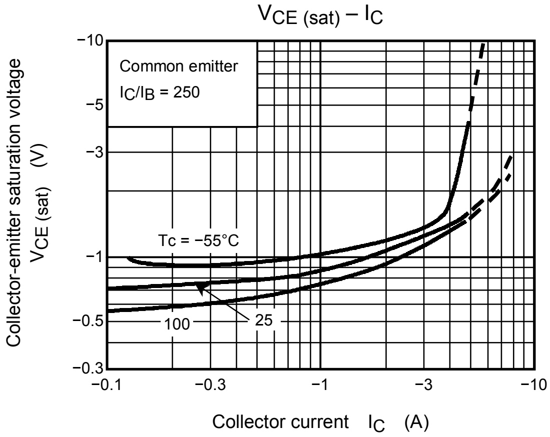
$h_{FE} – I_C$



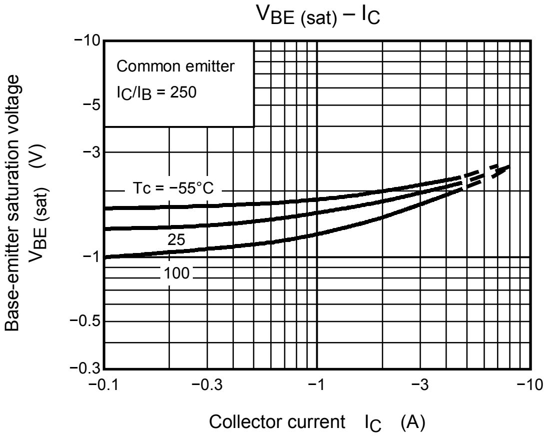
$V_{CE} – I_B$

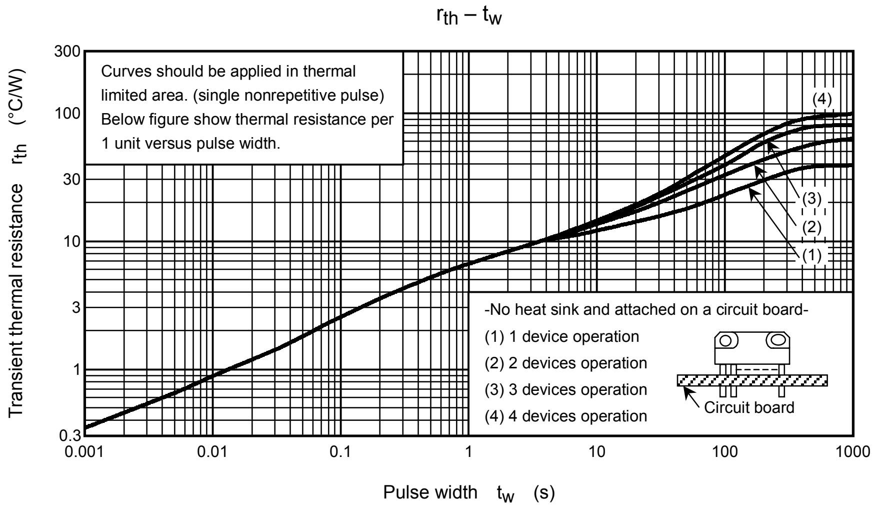


$V_{CE\ (sat)} – I_C$

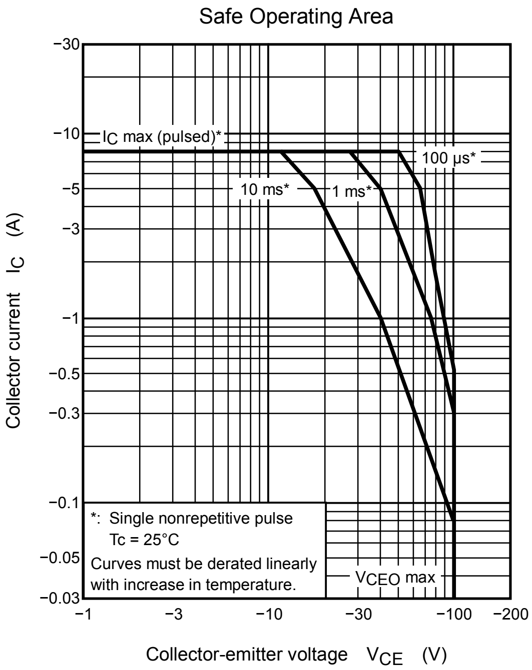


$V_{BE\ (sat)} – I_C$

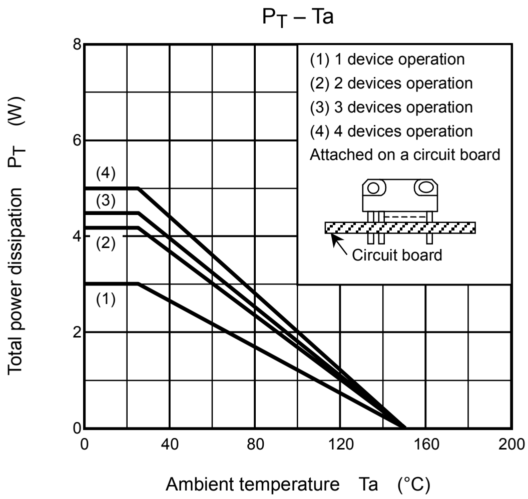




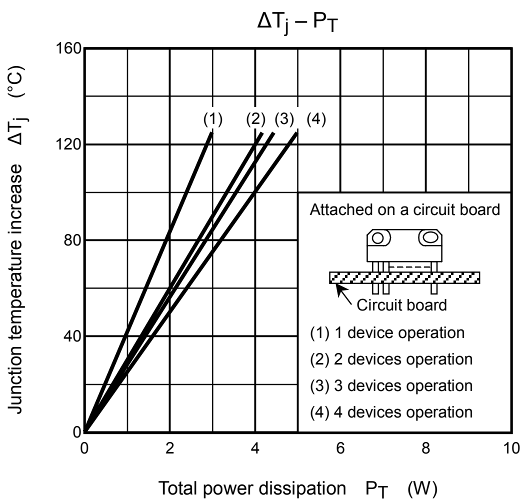
$r_{th} – t_w$
Curves should be applied in thermal limited area. (single nonrepetitive pulse) Below figure show thermal resistance per 1 unit versus pulse width.
-No heat sink and attached on a circuit board-
(1) 1 device operation
(2) 2 devices operation
(3) 3 devices operation
(4) 4 devices operation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



Safe Operating Area
I_C max (pulsed)*
100 μs*
10 ms*
1 ms*
*: Single nonrepetitive pulse
Tc = 25°C
Curves must be derated linearly with increase in temperature.
V_{CEO} max
Collector current I_C (A)
Collector-emitter voltage V_{CE} (V)



$P_T – Ta$
(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 P_T (W)
Ambient temperature Ta (°C)



$\Delta T_j – P_T$
Attached on a circuit board
Circuit board
(1) 1 device operation
(2) 2 devices operation
(3) 3 devices operation
(4) 4 devices operation
Junction temperature increase ΔT_j (°C)
Total power dissipation P_T (W)

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