TOSHIBA Power Transistor Module Silicon Triple Diffused Type
(Four Darlington Power Transistors inOne)

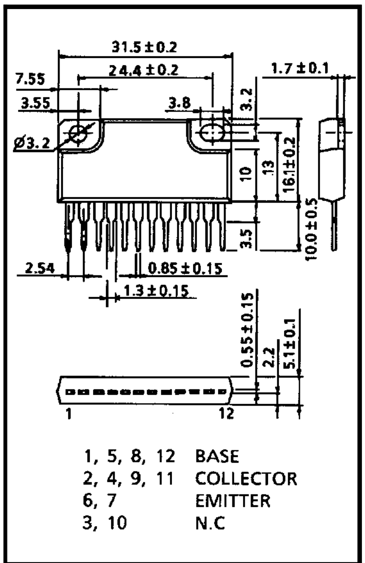
MP4507

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

- Package with heat sink isolated to lead (SIP 12 pins)
- High collector power dissipation (4-device 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)

Industrial Applications

Unit: mm



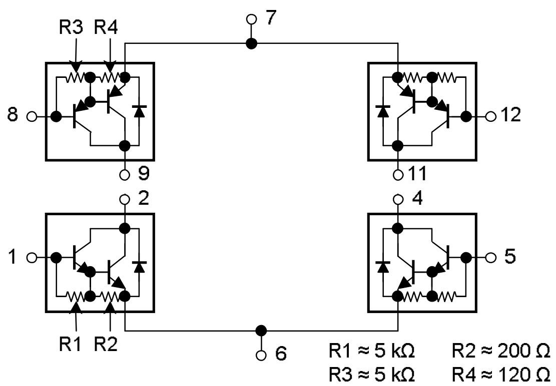
JEDEC	―
JEITA	―
TOSHIBA	2-32B1C

Weight: 6.0 g (typ.)

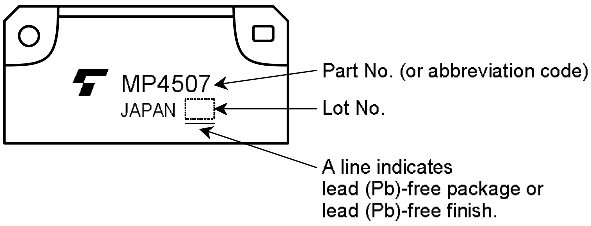
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating		Unit
			NPN	PNP	
Collector-base voltage		V_{CBO}	100	−100	V
Collector-emitter voltage		V_{CEO}	100	−100	V
Emitter-base voltage		V_{EBO}	5	−5	V
Collector current	DC	I_C	5	−5	A
	Pulse	I_{CP}	8	−8	
Continuous base current		I_B	0.1	−0.1	A
Collector power dissipation (1-device operation)		P_C	3.0		W
Collector power dissipation (4-device operation)	Ta = 25°C	P_C	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



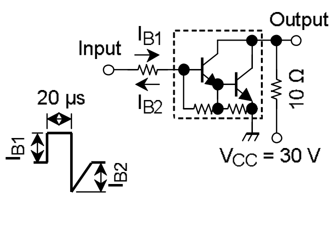
Marking



Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance fromchannel to ambient (4 devices operation, Ta = 25°C)	$\Sigma R_{th\ (j\text{-}a)}$	25	°C/W
Thermal resistance from channel 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

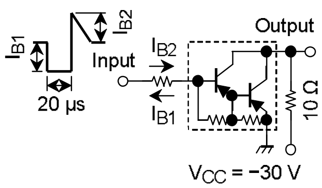
Electrical Characteristics (Ta = 25°C) (NPN transistor)

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

Electrical Characteristics (Ta = 25°C) (PNP transistor)

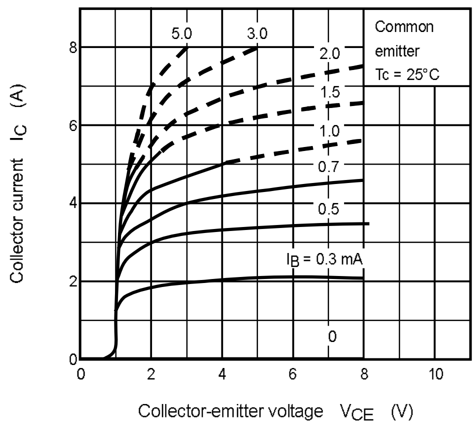
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = −100 V, I_E = 0 A	—	—	−10	μA
Collector cut-off current		I_{CEO}	V_{CE} = −100 V, I_B = 0 A	—	—	−10	μA
Emitter cut-off current		I_{EBO}	V_{EB} = −5 V, I_C = 0 A	−0.3	—	−2.0	mA
Collector-base breakdown 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)

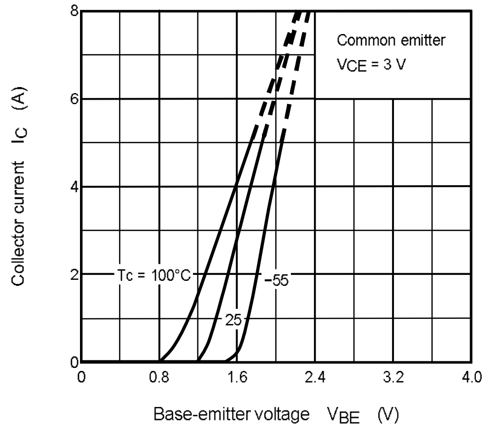
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward current	I_{FM}	—	—	—	5	A
Surge current	I_{FSM}	t = 1 s, 1 shot	—	—	8	A
Forward voltage	V_F	I_F = 1 A, I_B = 0 A	—	—	2.0	V
Reverse recovery time	t_{rr}	I_F = 5 A, V_{BE} = 3 V, dI_F/dt = −50 A/μs	—	1.0	—	μs
Reverse recovery charge	Q_{rr}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

(NPN transistor)

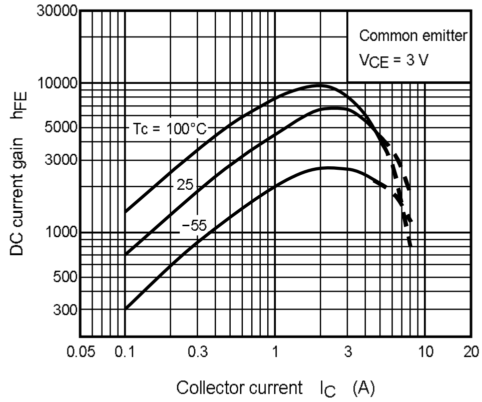
$I_C – V_{CE}$



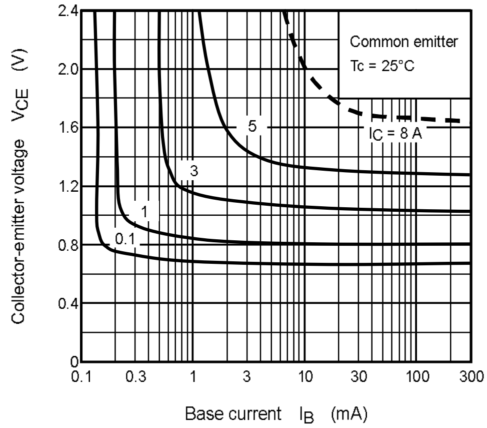
$I_C – V_{BE}$



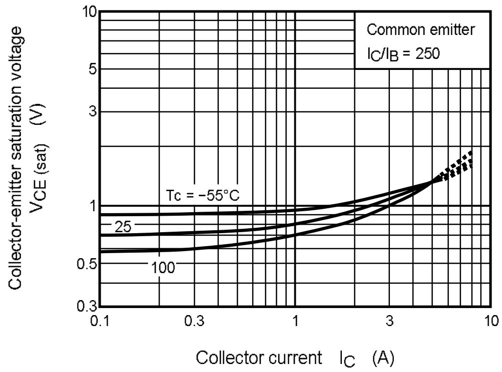
$h_{FE} – I_C$



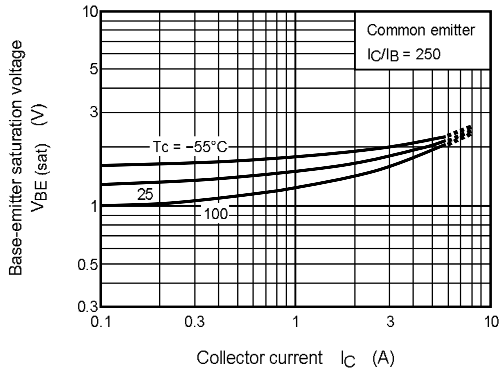
$V_{CE} – I_B$



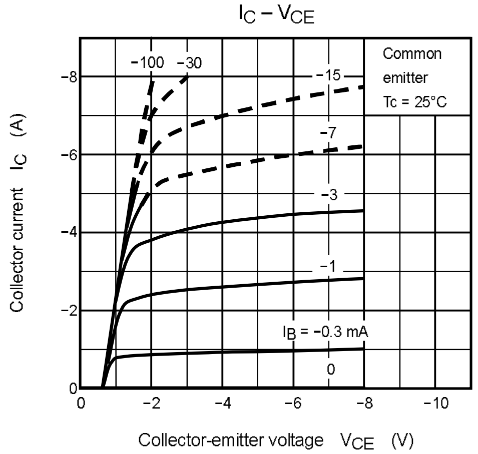
$V_{CE\ (sat)} – I_C$

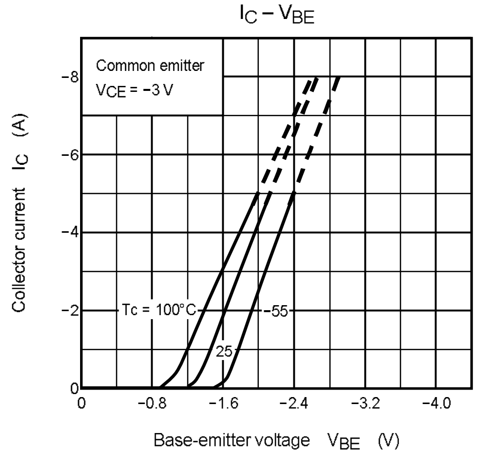


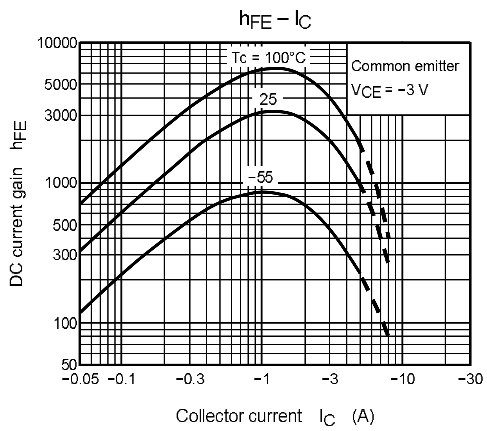
$V_{BE\ (sat)} – I_C$

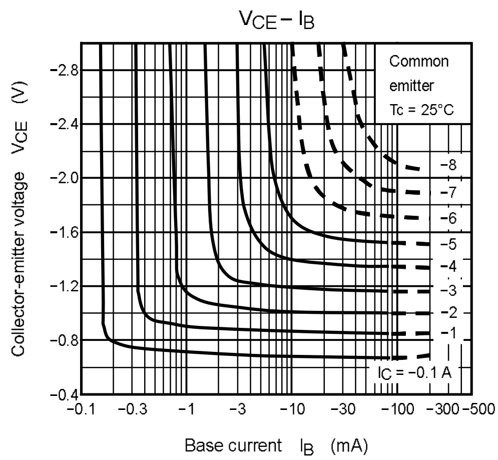


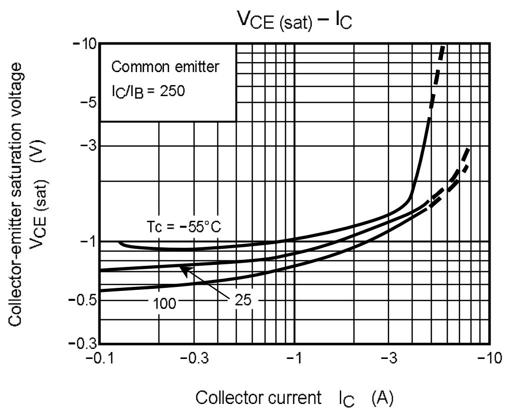
(PNP transistor)

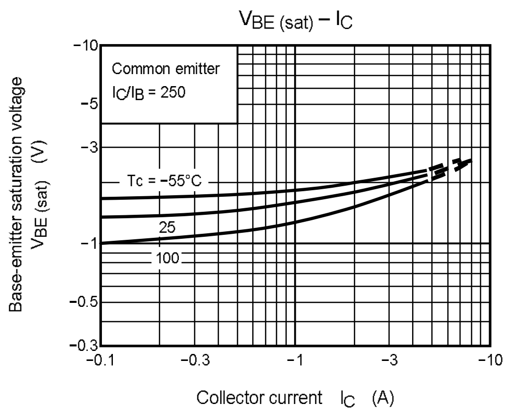


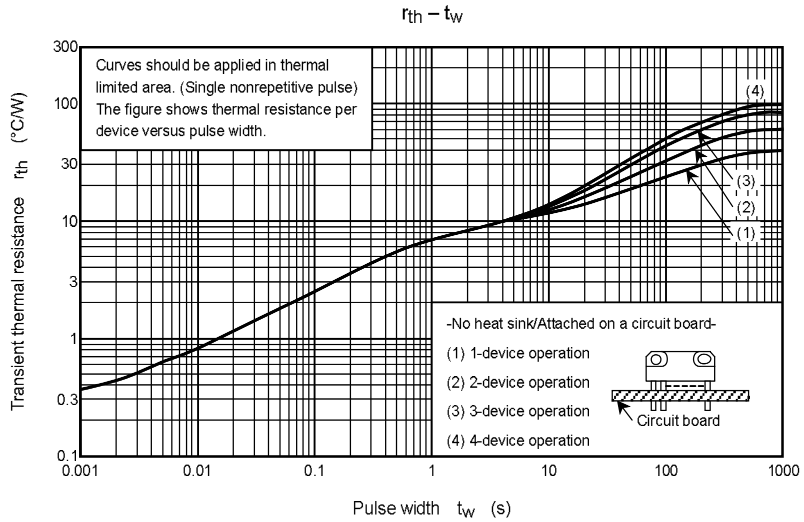


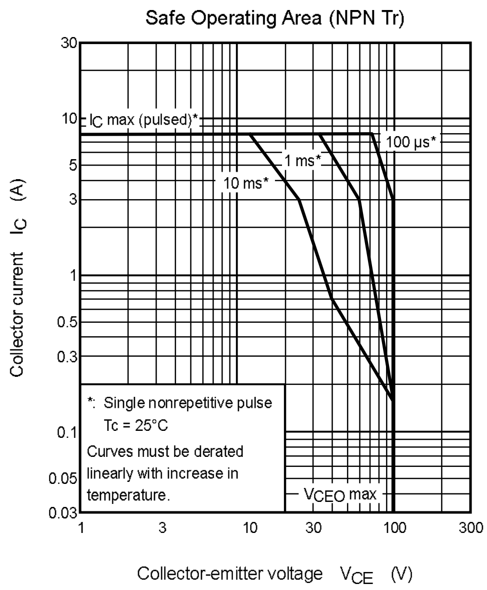


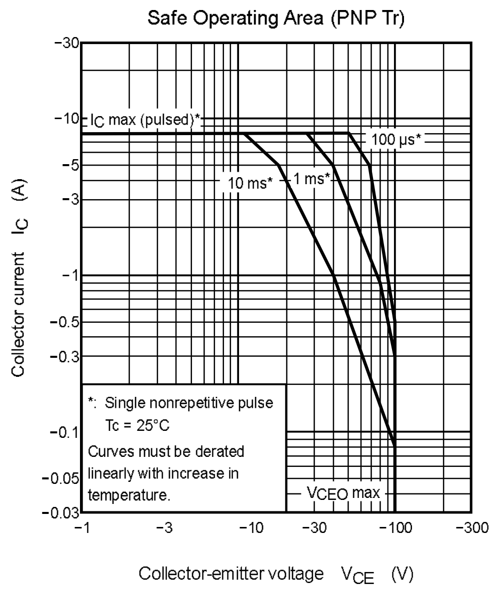







rth – tw
Curves should be applied in thermal limited area. (Single nonrepetitive pulse) The figure shows thermal resistance per device versus pulse width.
-No heat sink/Attached on a circuit board-
(1) 1-device operation
(2) 2-device operation
(3) 3-device operation
(4) 4-device operation
Circuit board
Transient thermal resistance rth (°C/W)
Pulse width tw (s)


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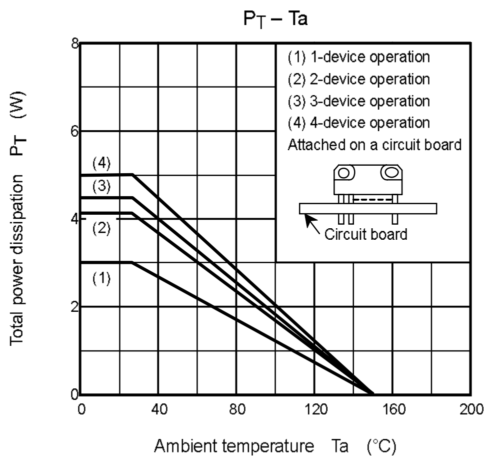
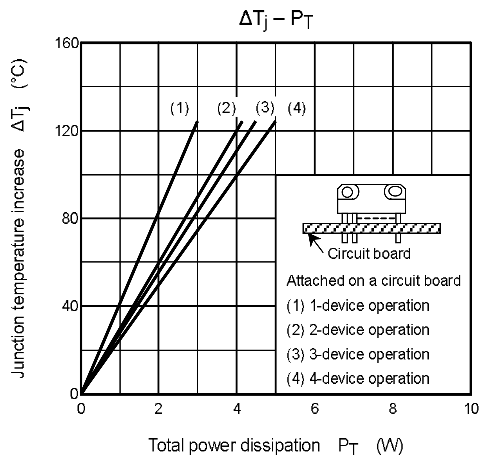

PT – Ta
(1) 1-device operation
(2) 2-device operation
(3) 3-device operation
(4) 4-device operation
Attached on a circuit board
Circuit board
Total power dissipation PT (W)
Ambient temperature Ta (°C)


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

RESTRICTIONS ON PRODUCT USE

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