

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

# MP4507

## High Power Switching Applications

Hammer Drive, Pulse Motor Drive and Inductive  
Load Switching

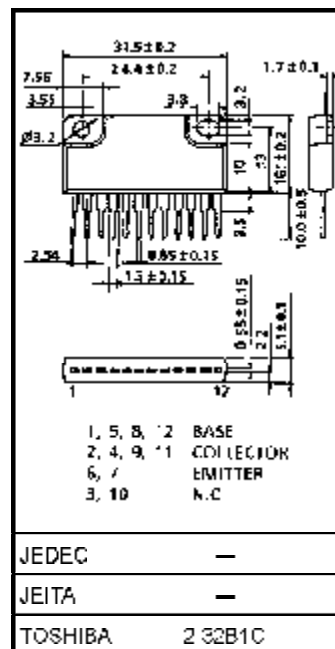
- Package with heat-sink isolated to lead (SIP 12 pins)
- High collector power dissipation (1-device operation)  
:  $P_C = 5 \text{ W}$  ( $T_a = 25^\circ\text{C}$ )
- High collector current:  $I_C(\text{DC}) = -5 \text{ A}$  (max)
- High DC current gain:  $h_{FE} = 1000$  (min) ( $V_{CE} = 10 \text{ V}$ ,  $I_C = -3 \text{ A}$ )

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

Characteristics		Symbol	Rating		Unit
			NPN	PNP	
Collector-base voltage		$V_{CB0}$	100	-100	V
Collector-emitter voltage		$V_{CE0}$	100	-100	V
Emitter base voltage		$V_{EB0}$	5	-5	V
Collector current	DC	$I_C$	5	-5	A
	Pulse	$I_{CP}$	3	-3	
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)	$T_a = 25^{\circ}\text{C}$	$P_C$	5.0		W
	$T_c = 25^{\circ}\text{C}$		25		
Isolation voltage		$V_{iso}$	1000		V
Junction temperature		$T_j$	150		$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150		$^{\circ}\text{C}$

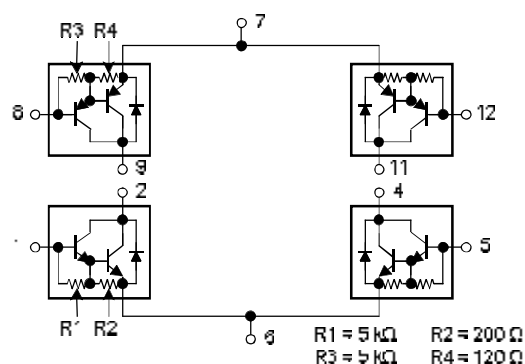
Industrial Applications

Unit: mm

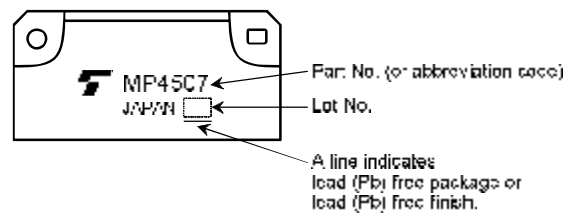


Weight: 6.0 g (typ.)

## Array Configuration



## Marking

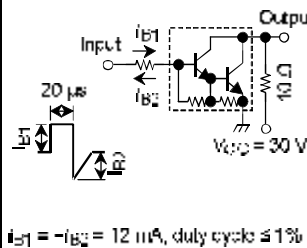


## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from channel to ambient (4 devices operation, $T_a = 25^\circ\text{C}$ )	$\Delta R_{\theta JA}$	25	$^\circ\text{C/W}$
Thermal resistance from channel to case (4 devices operation, $T_c = 25^\circ\text{C}$ )	$\Delta R_{\theta JC}$	5.0	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	$T_L$	280	$^\circ\text{C}$

## Electrical Characteristics ( $T_a = 25^\circ\text{C}$ ) (NPN transistor)

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

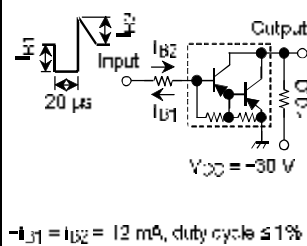


Emitter-Collector Diode Ratings and Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward current	$I_{FM}$	—	—	—	5	A
Surge current	$I_{FSM}$	$t = 1 \text{ s, 1 shot}$	—	—	8	A
Forward voltage	$V_F$	$I_F = 1 \text{ A, } I_S = 0 \text{ A}$	—	—	2.0	V
Reverse recovery time	$t_r$	$I_F = 5 \text{ A, } V_{S_2} = -3 \text{ V, } dI_F/dt = -50 \text{ A}/\mu\text{s}$	—	1.0	—	$\mu\text{s}$
Reverse recovery charge	$Q_r$		—	8	—	$\mu\text{C}$

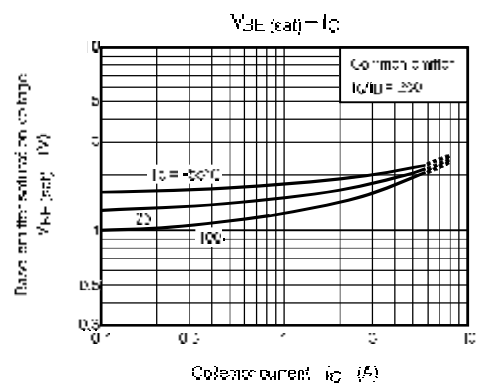
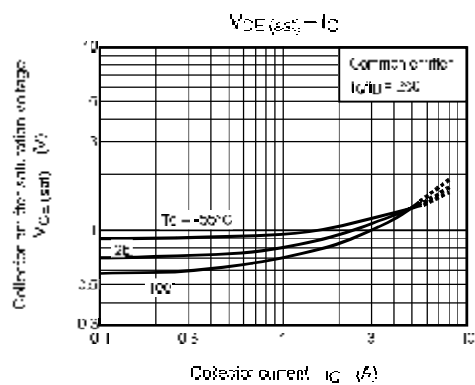
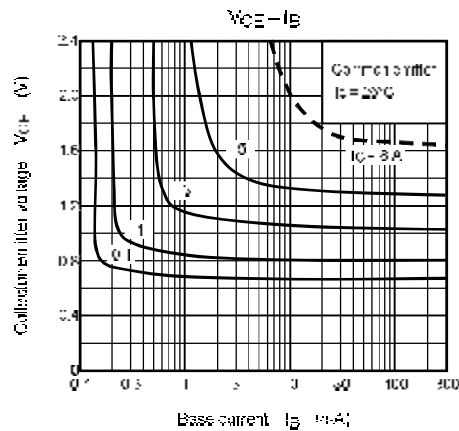
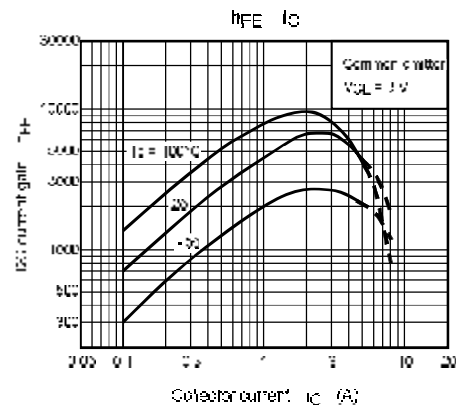
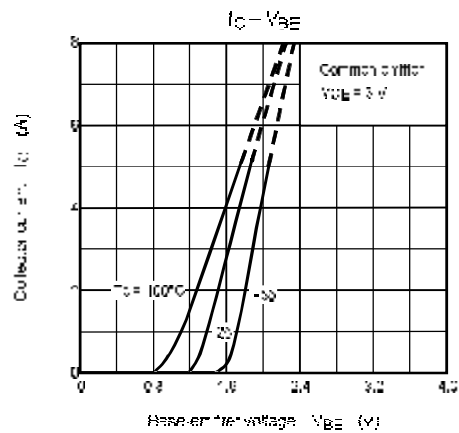
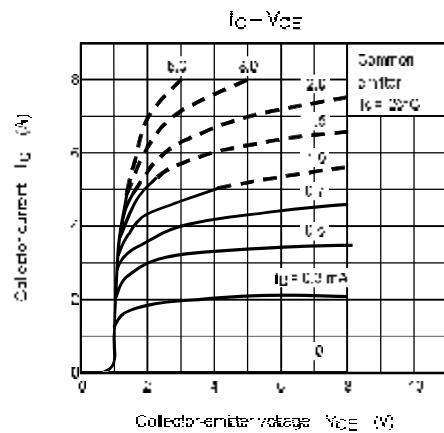
Electrical Characteristics ( $T_a = 25^\circ\text{C}$ ) (PNP transistor)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{C_{CO}}$	$V_{CE} = -100 \text{ V, } I_E = 0 \text{ A}$	—	—	-10	$\mu\text{A}$
Collector cut-off current	$I_{C_{EO}}$	$V_{CE} = -100 \text{ V, } I_B = 0 \text{ A}$	—	—	-10	$\mu\text{A}$
Emitter cut-off current	$I_{E_{CO}}$	$V_{EB} = -5 \text{ V, } I_C = 0 \text{ A}$	-0.3	—	-2.0	mA
Collector-base breakdown voltage	$V_{(BR)CBO}$	$I_C = -1 \text{ mA, } I_E = 0 \text{ A}$	-100	—	—	V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -30 \text{ mA, } I_E = 0 \text{ A}$	-100	—	—	V
DC current gain	$h_{FE(1)}$	$V_{CE} = -3 \text{ V, } I_C = -0.5 \text{ A}$	1000	—	—	—
	$h_{FE(2)}$	$V_{CE} = -3 \text{ V, } I_C = -3 \text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$I_C = -3 \text{ A, } I_B = -12 \text{ mA}$	—	—	-2.0	V
	Base-emitter	$I_C = -3 \text{ A, } I_B = -12 \text{ mA}$	—	—	-2.5	
Transition frequency	$f_T$	$V_{CE} = -3 \text{ V, } I_C = -0.5 \text{ A}$	3	—	—	MHz
Collector output capacitance	$C_{op}$	$V_{CE} = -50 \text{ V, } I_E = 0 \text{ A, } f = 1 \text{ MHz}$	—	40	—	pF
Switching time	Turn-on time	$t_{on}$	—	0.5	—	$\mu\text{s}$
	Storage time	$t_{stg}$	—	3.0	—	
	Fall time	$t_f$	—	2.0	—	

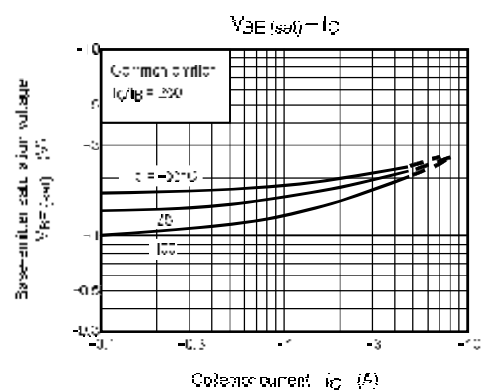
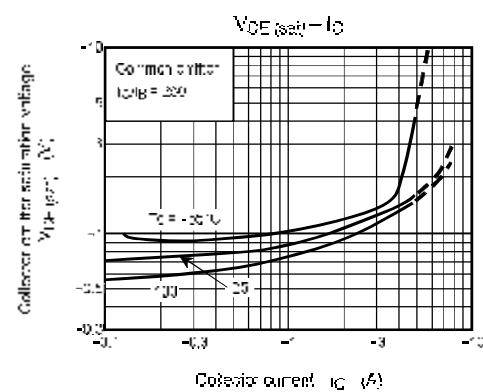
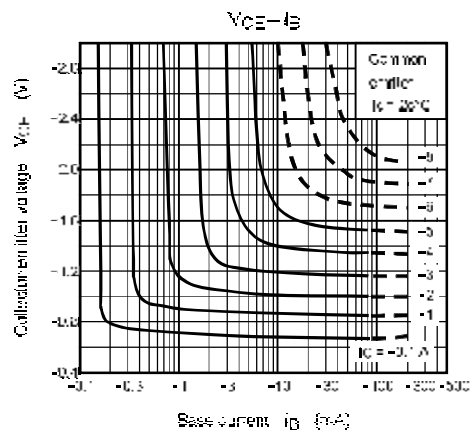
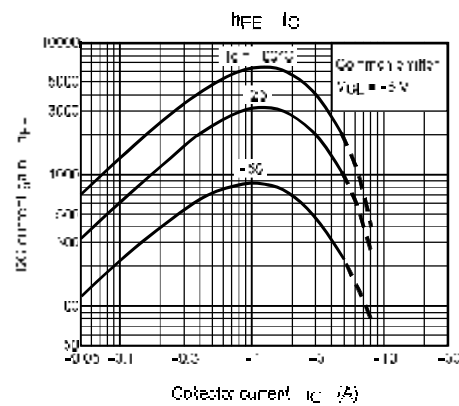
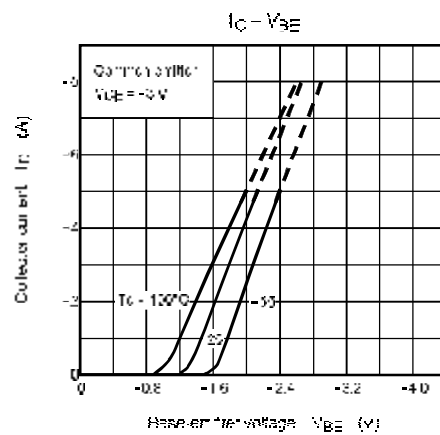
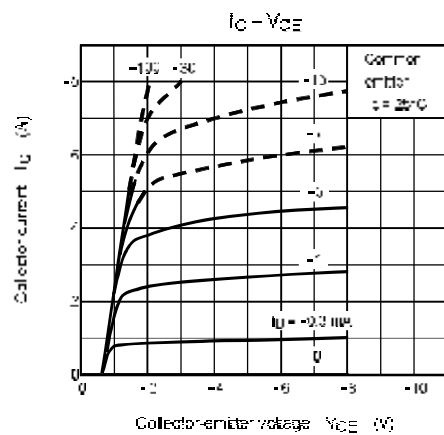
Emitter-Collector Diode Ratings and Characteristics ( $T_a = 25^\circ\text{C}$ )

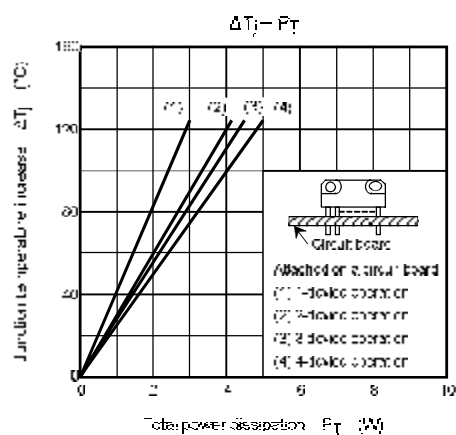
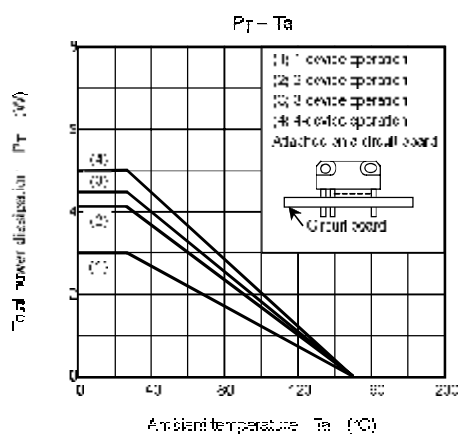
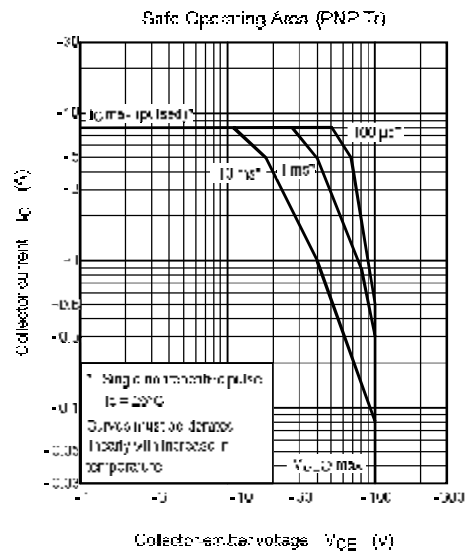
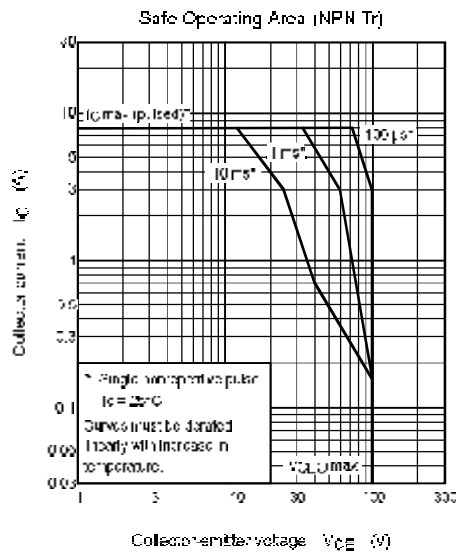
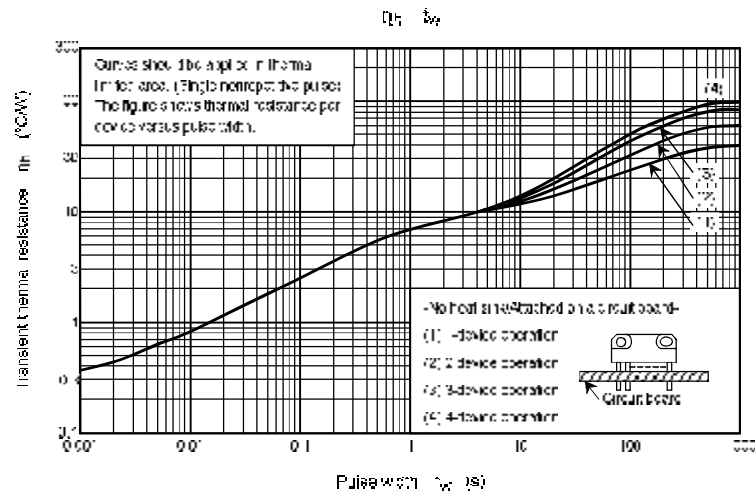
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Surge current	$I_{FSM}$	$t = 1 \text{ s, 1 shot}$	—	—	8	A
Forward voltage	$V_F$	$I_F = 1 \text{ A, } I_S = 0 \text{ A}$	—	—	2.0	V
Reverse recovery time	$t_r$	$I_F = 5 \text{ A, } V_{S_2} = 3 \text{ V, } dI_F/dt = -50 \text{ A}/\mu\text{s}$	—	1.0	—	$\mu\text{s}$
Reverse recovery charge	$Q_r$		—	8	—	$\mu\text{C}$

(NPN transistor)



(PNP transistor)





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