

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

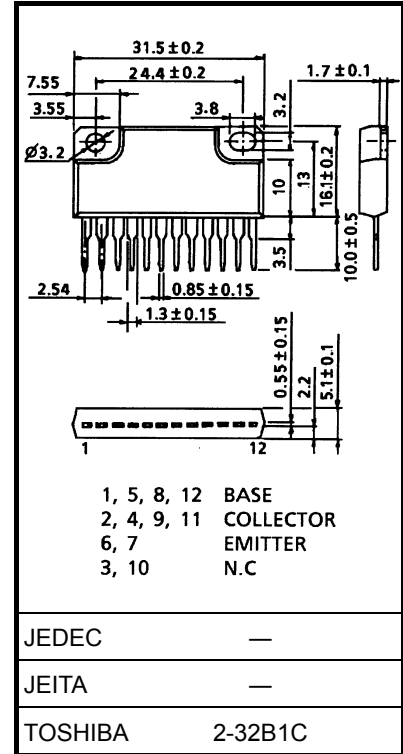
- Package with heat sink isolated to lead (SIP 12 pins)
- High collector power dissipation (4-device operation)
: $P_T = 5 \text{ W}$ ($T_a = 25^\circ\text{C}$)
- High collector current: $I_C \text{ (DC)} = \pm 5 \text{ A}$ (max)
- High DC current gain: $h_{FE} = 1000$ (min) ($V_{CE} = \pm 3 \text{ V}$, $I_C = \pm 3 \text{ A}$)

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_{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)	$T_a = 25^\circ\text{C}$	P_C	5.0		W
	$T_c = 25^\circ\text{C}$		25		
Isolation voltage		V_{Isol}	1000		V
Junction temperature		T_j	150		$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150		$^\circ\text{C}$

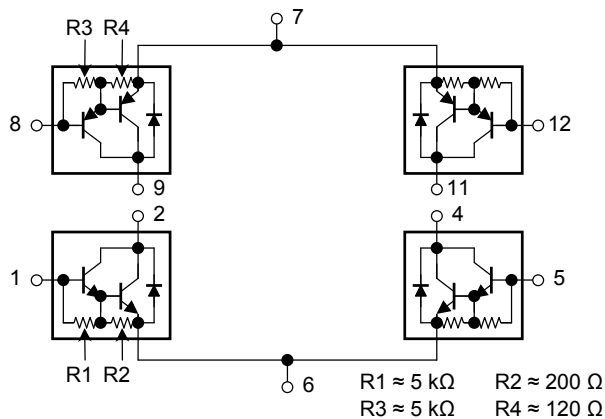
Industrial Applications

Unit: mm

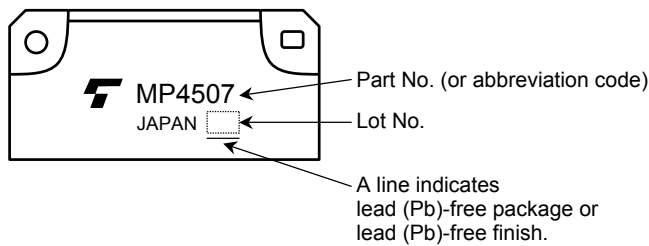


Weight: 6.0 g (typ.)

Array Configuration



Marking



Thermal Characteristics

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

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

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = 100\text{ V}, I_E = 0\text{ A}$	—	—	10	μA
Collector cut-off current		I_{CEO}	$V_{CE} = 100\text{ V}, I_B = 0\text{ A}$	—	—	10	μA
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		$V_{(BR)CEO}$	$I_C = 30\text{ mA}, I_B = 0\text{ A}$	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	$V_{CE(sat)}$	$I_C = 3\text{ A}, I_B = 12\text{ mA}$	—	—	2.0	V
	Base-emitter	$V_{BE(sat)}$	$I_C = 3\text{ A}, I_B = 12\text{ mA}$	—	—	2.5	
Transition frequency		f_T	$V_{CE} = 3\text{ V}, I_C = 0.5\text{ A}$	3	—	—	MHz
Collector output capacitance		C_{ob}	$V_{CB} = 50\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	40	—	pF
Switching time	Turn-on time	t_{on}	<p>$I_{B1} = -I_{B2} = 12\text{ mA}, \text{duty cycle} \leq 1\%$</p>	—	0.5	—	μs
	Storage time	t_{stg}		—	3.0	—	
	Fall time	t_f		—	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}	$t = 1 \text{ s}, 1 \text{ shot}$	—	—	8	A
Forward voltage	V_F	$I_F = 1 \text{ A}, I_B = 0 \text{ A}$	—	—	2.0	V
Reverse recovery time	t_{rr}	$I_F = 5 \text{ A}, V_{BE} = -3 \text{ V}, dI_F/dt = -50 \text{ A}/\mu\text{s}$	—	1.0	—	μs
Reverse recovery charge	Q_{rr}		—	8	—	μC

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

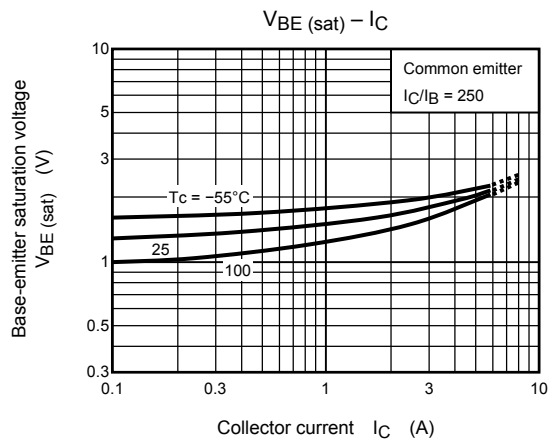
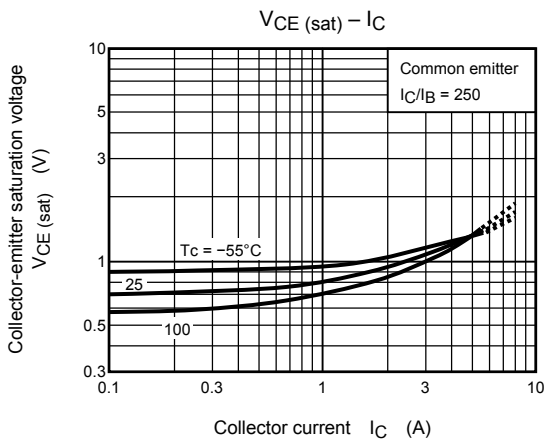
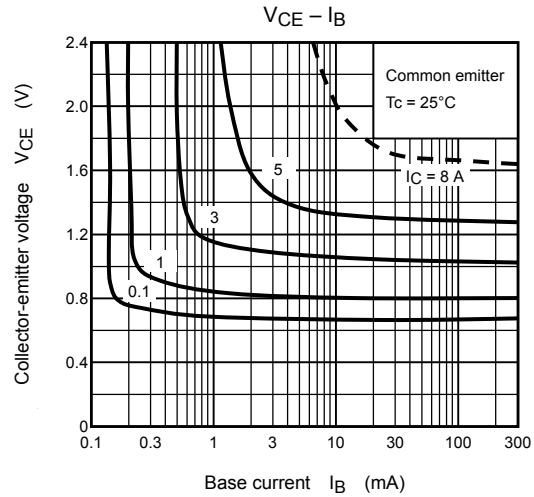
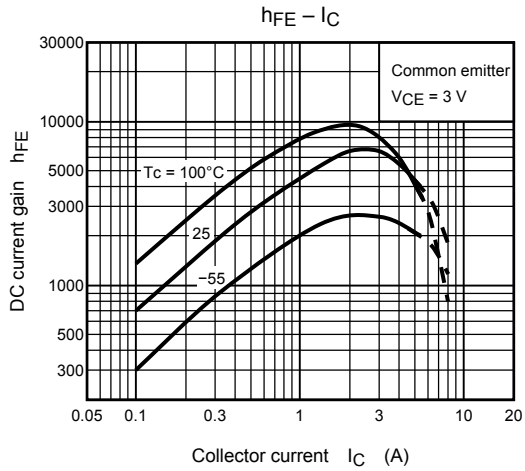
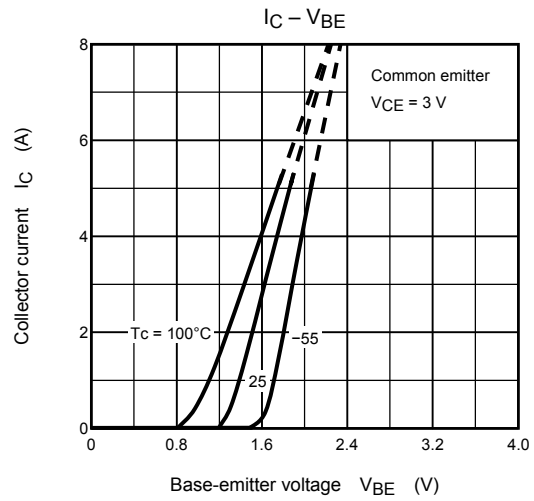
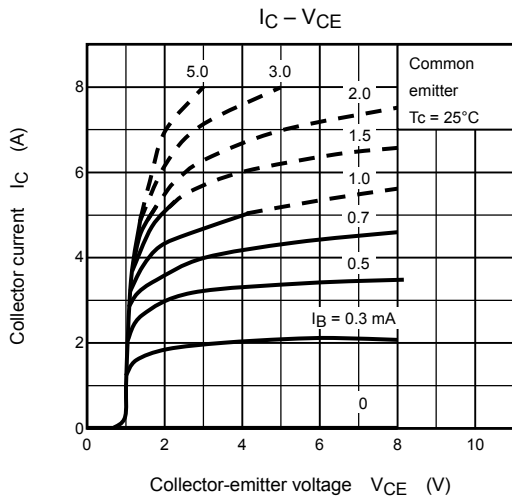
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Collector cut-off current	I_{CBO}	$V_{CB} = -100 \text{ V}, I_E = 0 \text{ A}$	—	—	-10	μA	
Collector cut-off current	I_{CEO}	$V_{CE} = -100 \text{ V}, I_B = 0 \text{ A}$	—	—	-10	μA	
Emitter cut-off current	I_{EBO}	$V_{EB} = -5 \text{ V}, I_C =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

$-I_{B1} = I_{B2} = 12 \text{ mA}, \text{ duty cycle} \leq 1\%$

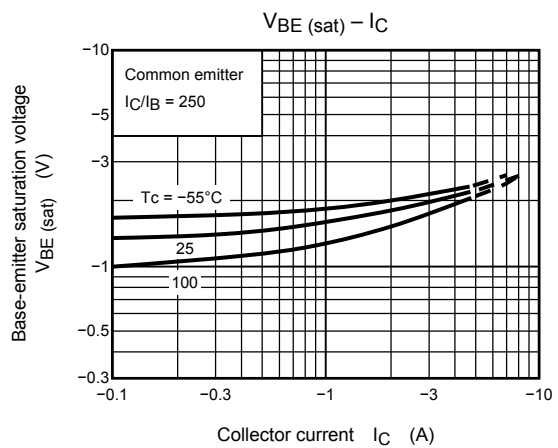
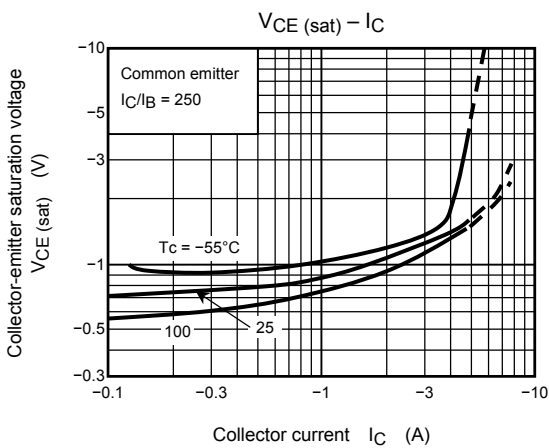
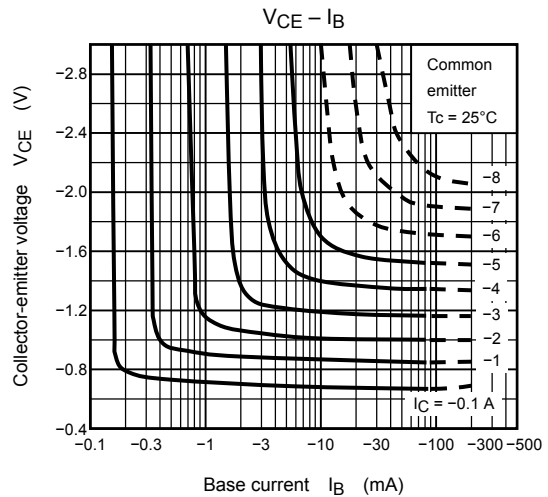
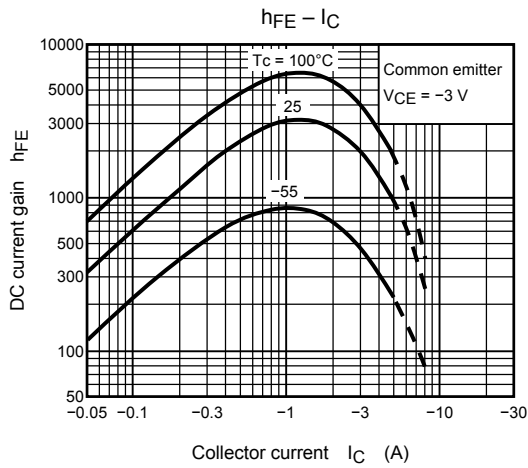
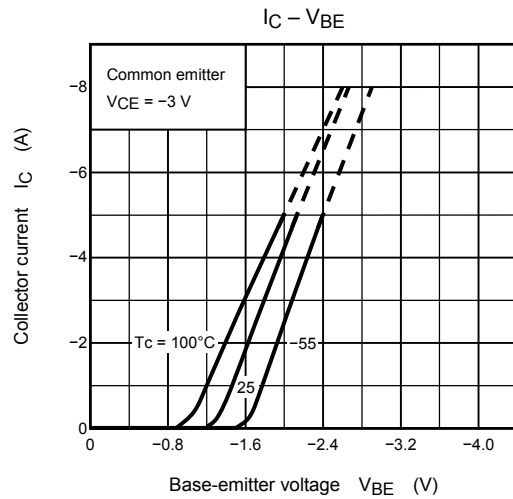
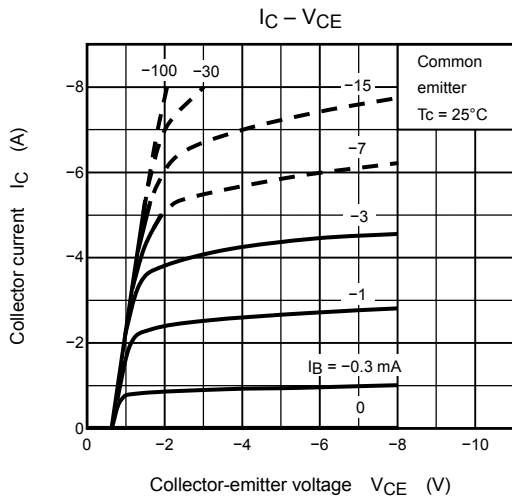
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

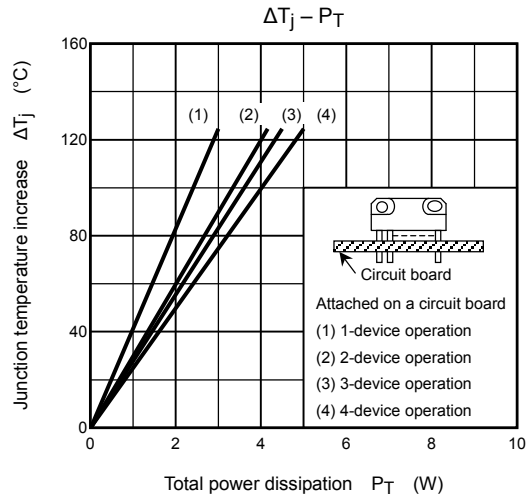
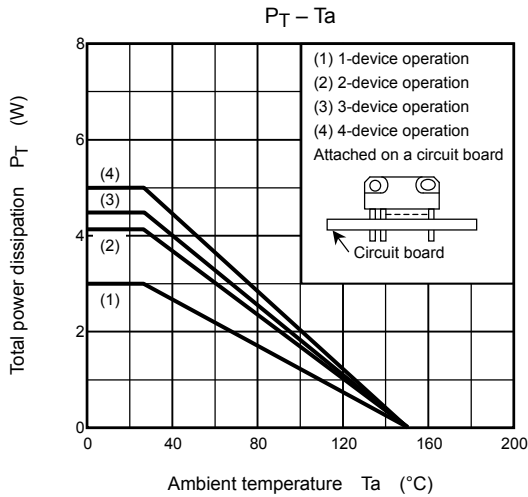
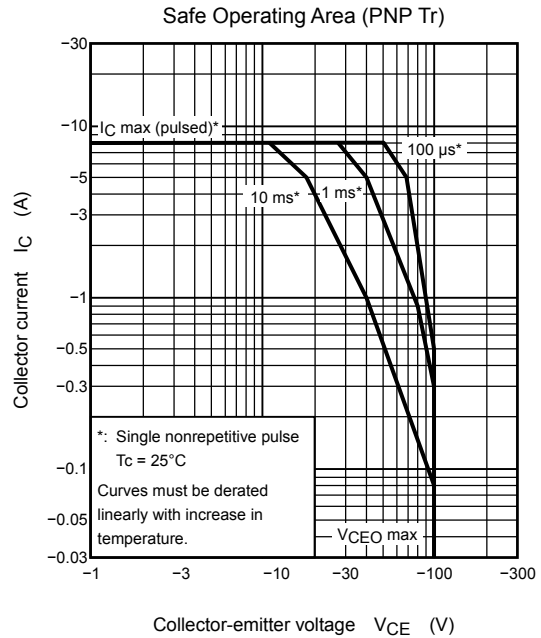
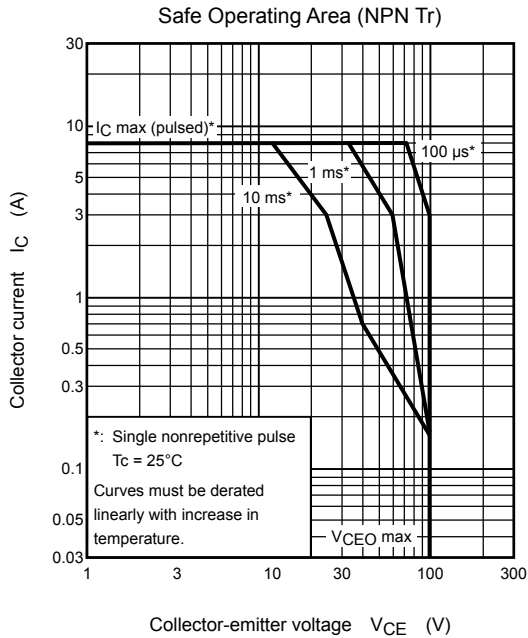
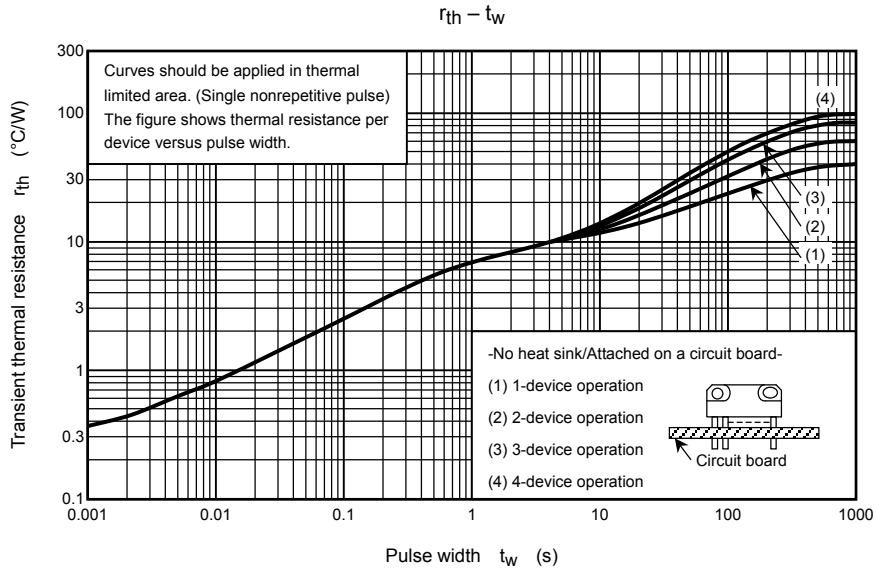
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward current	I_{FM}	—	—	—	5	A
Surge current	I_{FSM}	$t = 1 \text{ s}, 1 \text{ shot}$	—	—	8	A
Forward voltage	V_F	$I_F = 1 \text{ A}, I_B = 0 \text{ A}$	—	—	2.0	V
Reverse recovery time	t_{rr}	$I_F = 5 \text{ A}, V_{BE} = 3 \text{ V}, dI_F/dt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

(NPN transistor)



(PNP transistor)





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