

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

# MP4501

## High Power Switching Applications.

## Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

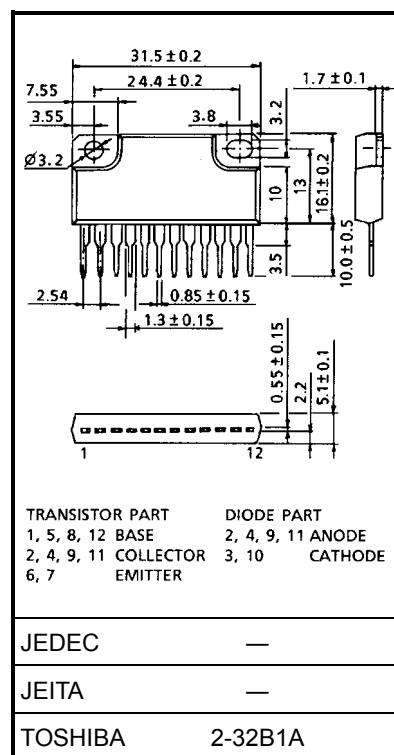
- Package with heat sink isolated to lead (SIP 12 pin)
- High collector power dissipation (4 devices operation)  
:  $P_T = 5 \text{ W}$  ( $T_a = 25^\circ\text{C}$ )
- High collector current:  $I_C (\text{DC}) = 3 \text{ A}$  (max)
- High DC current gain:  $hFE = 2000$  (min) ( $V_{CE} = 2 \text{ V}$ ,  $I_C = 1.5 \text{ A}$ )
- Diode included for absorbing fly-back voltage.

### Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		$V_{CBO}$	120	V
Collector-emitter voltage		$V_{CEO}$	100	V
Emitter-base voltage		$V_{EBO}$	6	V
Collector current	DC	$I_C$	3	A
	Pulse	$I_{CP}$	6	
Continuous base current		$I_B$	0.5	A
Collector power dissipation (1 device operation)		$P_C$	3.0	W
Collector power dissipation (4 devices operation)	$T_a = 25^\circ\text{C}$	$P_T$	5.0	W
	$T_c = 25^\circ\text{C}$		25	
Isolation voltage		$V_{Isol}$	1000	V
Junction temperature		$T_j$	150	°C
Storage temperature range		$T_{stg}$	-55 to 150	°C

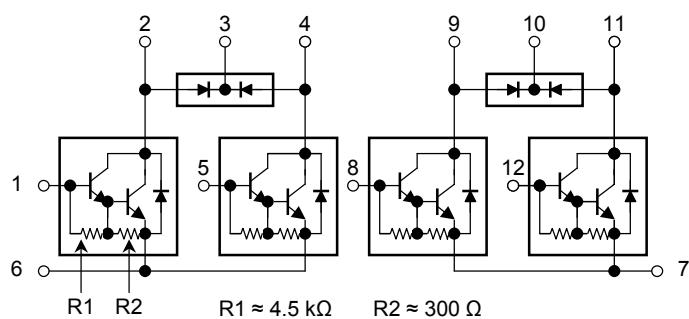
## Industrial Applications

Unit: mm



Weight: 6.0 g (typ.)

## Array Configuration



## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices operation, $T_a = 25^\circ\text{C}$ )	$\Sigma R_{\text{th}} (\text{j-a})$	25	$^\circ\text{C/W}$
Thermal resistance of junction to case (4 devices operation, $T_c = 25^\circ\text{C}$ )	$\Sigma R_{\text{th}} (\text{j-c})$	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 ( $T_a = 25^\circ\text{C}$ )

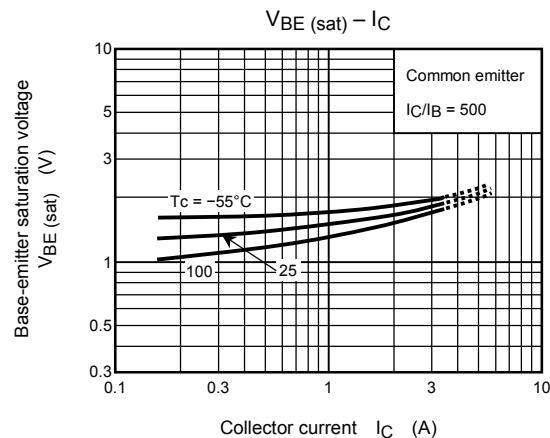
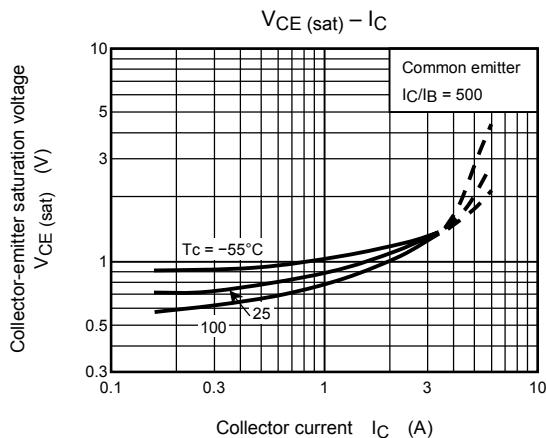
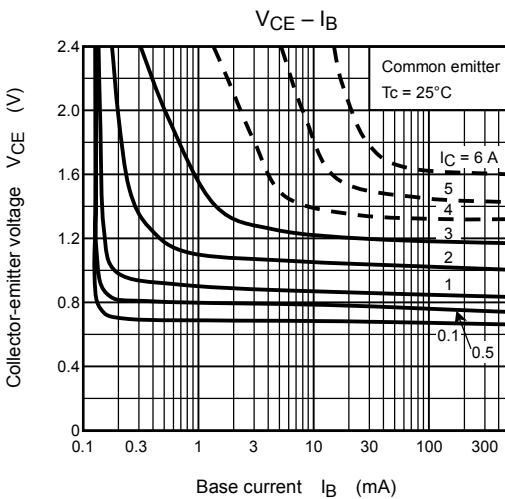
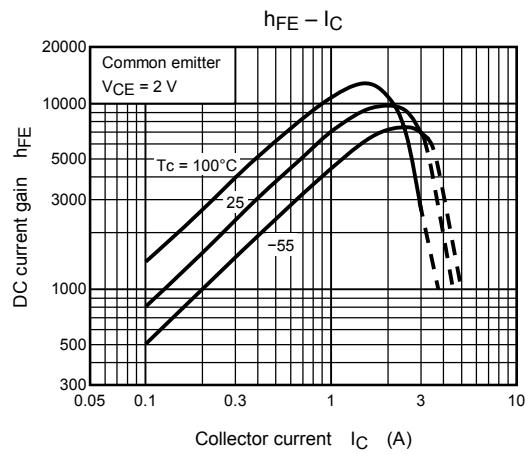
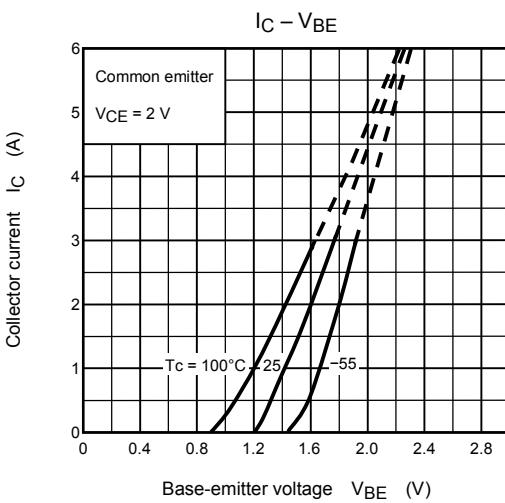
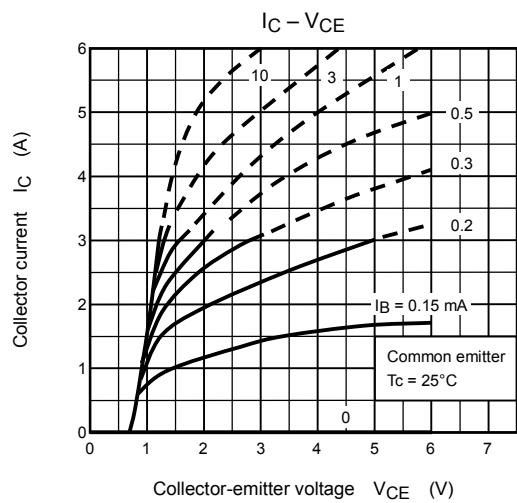
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{\text{CBO}}$	$V_{\text{CB}} = 120 \text{ V}, I_E = 0 \text{ A}$	—	—	10	$\mu\text{A}$
Collector cut-off current	$I_{\text{CEO}}$	$V_{\text{CE}} = 100 \text{ V}, I_B = 0 \text{ A}$	—	—	10	$\mu\text{A}$
Emitter cut-off current	$I_{\text{EBO}}$	$V_{\text{EB}} = 6 \text{ V}, I_C = 0 \text{ A}$	0.5	—	2.5	$\text{mA}$
Collector-base breakdown voltage	$V_{(\text{BR}) \text{ CBO}}$	$I_C = 1 \text{ mA}, I_E = 0 \text{ A}$	120	—	—	$\text{V}$
Collector-emitter breakdown voltage	$V_{(\text{BR}) \text{ CEO}}$	$I_C = 10 \text{ mA}, I_B = 0 \text{ A}$	100	—	—	$\text{V}$
DC current gain	$h_{\text{FE}} (1)$	$V_{\text{CE}} = 2 \text{ V}, I_C = 1.5 \text{ A}$	2000	—	15000	—
	$h_{\text{FE}} (2)$	$V_{\text{CE}} = 2 \text{ V}, I_C = 3 \text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$V_{\text{CE}} (\text{sat})$	$I_C = 1.5 \text{ A}, I_B = 3 \text{ mA}$	—	—	1.5
	Base-emitter	$V_{\text{BE}} (\text{sat})$	$I_C = 1.5 \text{ A}, I_B = 3 \text{ mA}$	—	—	2.0
Transition frequency	$f_T$	$V_{\text{CE}} = 2 \text{ V}, I_C = 0.5 \text{ A}$	—	60	—	$\text{MHz}$
Collector output capacitance	$C_{\text{ob}}$	$V_{\text{CB}} = 10 \text{ V}, I_E = 0 \text{ A}, f = 1 \text{ MHz}$	—	30	—	$\text{pF}$
Switching time	Turn-on time	$t_{\text{on}}$				
	Storage time	$t_{\text{stg}}$	$\mu\text{s}$			
	Fall time	$t_f$				

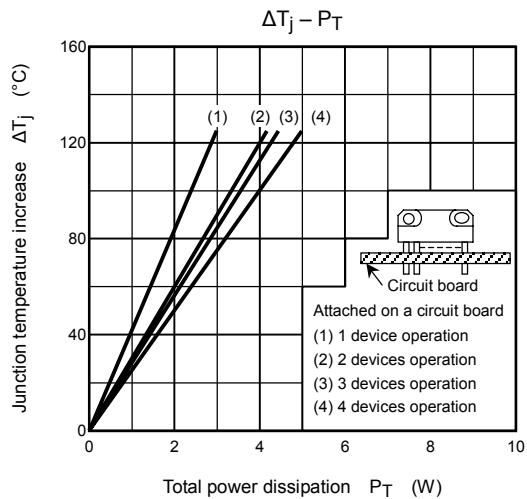
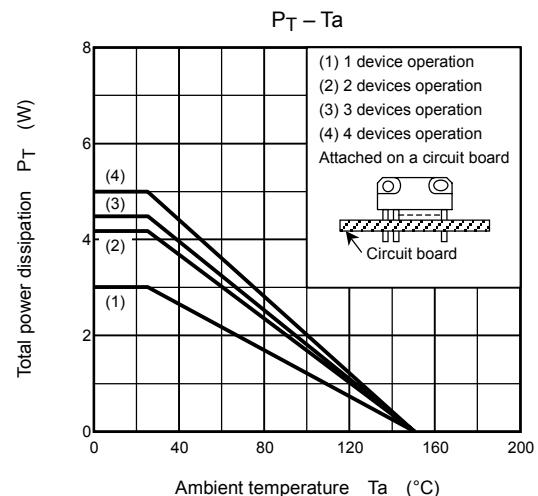
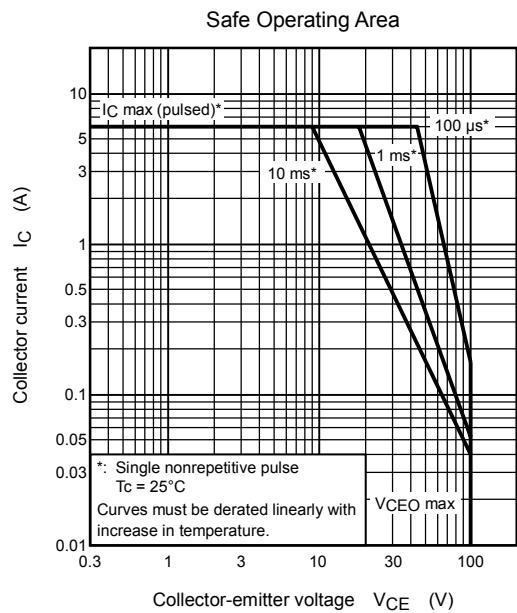
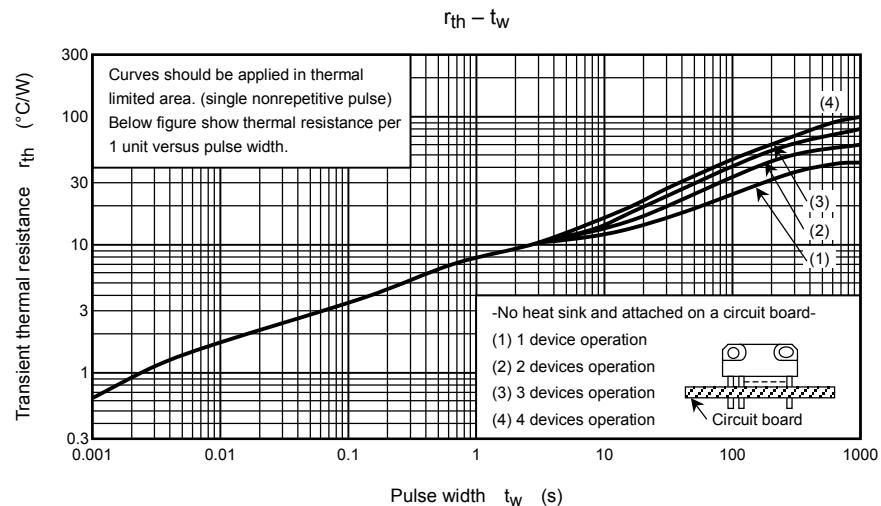
Emitter-Collector Diode Ratings and Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	$I_{\text{FM}}$	—	—	—	3	$\text{A}$
Surge current	$I_{\text{FSM}}$	$t = 1 \text{ s}, 1 \text{ shot}$	—	—	6	$\text{A}$
Forward voltage	$V_F$	$I_F = 1 \text{ A}, I_B = 0 \text{ A}$	—	1.2	1.8	$\text{V}$
Reverse recovery time	$t_{\text{rr}}$	$I_F = 3 \text{ A}, V_{\text{BE}} = -3 \text{ V}, dI_F/dt = -50 \text{ A}/\mu\text{s}$	—	1.0	—	$\mu\text{s}$
Reverse recovery charge	$Q_{\text{rr}}$		—	5	—	$\mu\text{C}$

**Flyback-Diode Rating and Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	$I_{FM}$	—	—	—	3	A
Reverse current	$I_R$	$V_R = 120 \text{ V}$	—	—	0.4	$\mu\text{A}$
Reverse voltage	$V_R$	$I_R = 100 \mu\text{A}$	120	—	—	V
Forward voltage	$V_F$	$I_F = 0.5 \text{ A}$	—	—	1.8	V





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