

TOSHIBA Power Transistor Module Silicon NPN Epitaxial Type  
(Four Darlington Power Transistor in One)

# MP4301

## High Power Switching Applications

Hammer Drive, Pulse Motor Drive and Inductive Load Switching

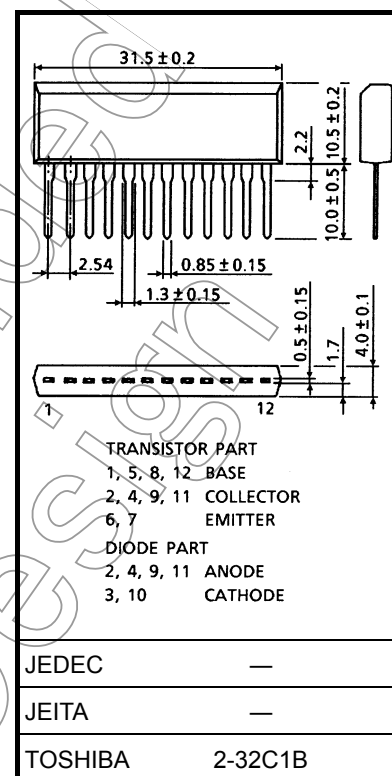
- Small package by full molding (SIP 12 pin)
- High collector power dissipation (4 devices operation)  
:  $P_T = 4.4 \text{ W}$  ( $T_a = 25^\circ\text{C}$ )
- High collector current:  $I_C$  (DC) = 3 A (max)
- High DC current gain:  $h_{FE} = 2000$  (min) ( $V_{CE} = 2 \text{ V}$ ,  $I_C = 1.5 \text{ A}$ )

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

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	A
Continuous base current		$I_B$	0.5	A
Collector power dissipation (1-device operation)		$P_C$	2.2	W
Collector power dissipation (4-device operation)		$P_T$	4.4	W
Junction temperature		$T_j$	150	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to 150	$^\circ\text{C}$

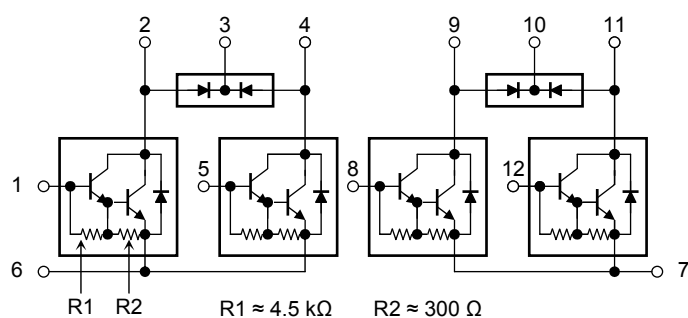
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.  
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm

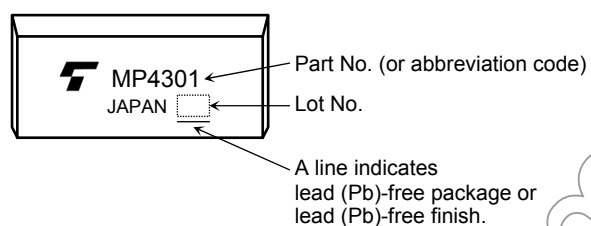


Weight: 3.9 g (typ.)

## Array Configuration



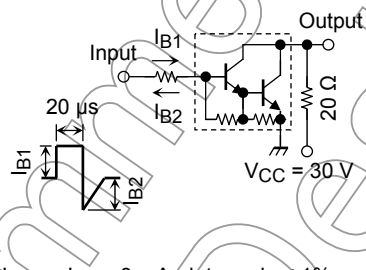
## Marking



## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from junction to ambient (4-device operation, $T_a = 25^\circ\text{C}$ )	$\Sigma R_{th(j-a)}$	28.4	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	$T_L$	260	$^\circ\text{C}$

## Electrical Characteristics (Ta = 25°C)

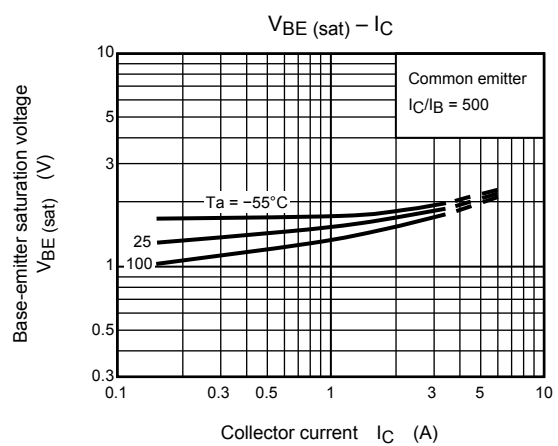
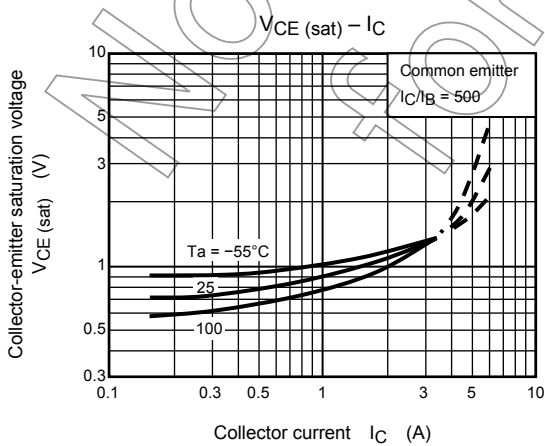
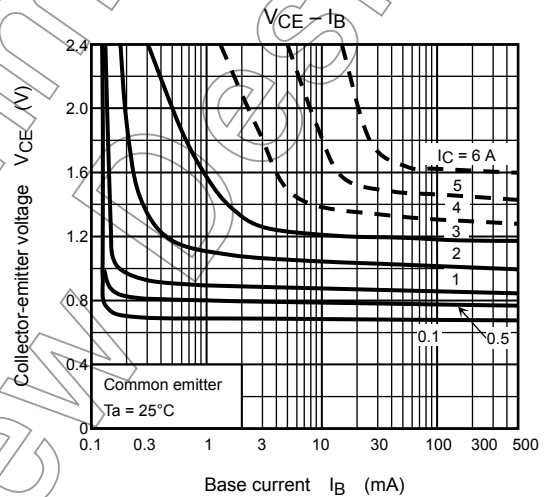
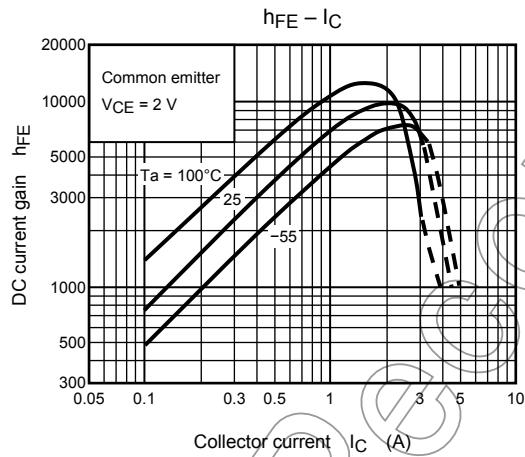
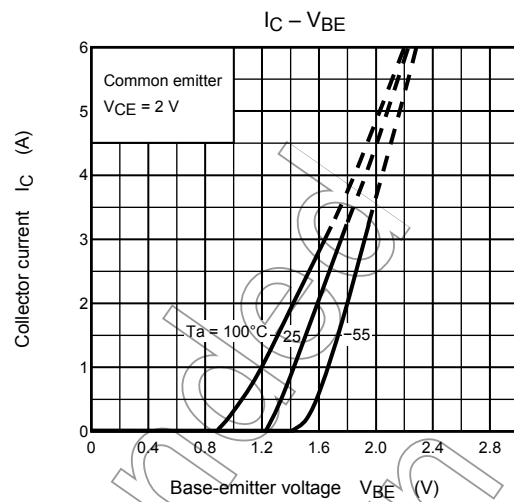
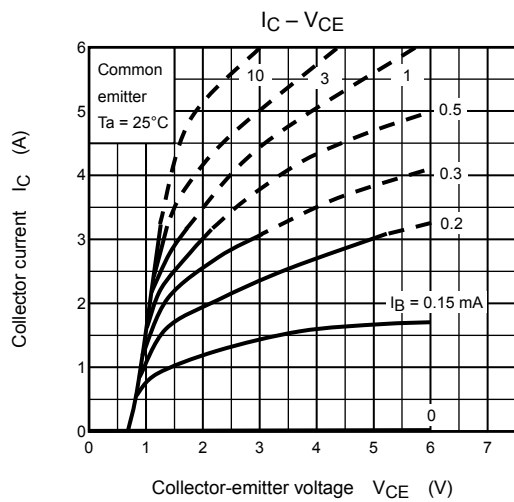
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = 120\text{ V}, I_E = 0\text{ A}$	—	—	10	$\mu\text{A}$
Collector cut-off current		$I_{CEO}$	$V_{CE} = 100\text{ V}, I_B = 0\text{ A}$	—	—	10	$\mu\text{A}$
Emitter cut-off current		$I_{EBO}$	$V_{EB} = 6\text{ V}, I_C = 0\text{ A}$	0.5	—	2.5	mA
Collector-base breakdown voltage		$V_{(BR) CBO}$	$I_C = 1\text{ mA}, I_E = 0\text{ A}$	120	—	—	V
Collector-emitter breakdown voltage		$V_{(BR) CEO}$	$I_C = 10\text{ mA}, I_B = 0\text{ A}$	100	—	—	V
DC current gain		$h_{FE} (1)$	$V_{CE} = 2\text{ V}, I_C = 1.5\text{ A}$	2000	—	15000	—
		$h_{FE} (2)$	$V_{CE} = 2\text{ V}, I_C = 3\text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE(sat)}$	$I_C = 1.5\text{ A}, I_B = 3\text{ mA}$	—	—	1.5	V
	Base-emitter	$V_{BE(sat)}$	$I_C = 1.5\text{ A}, I_B = 3\text{ mA}$	—	—	2.0	
Transition frequency		$f_T$	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	—	60	—	MHz
Collector output capacitance		$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	30	—	pF
Switching time	Turn-on time	$t_{on}$		—	0.3	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	2.0	—	
	Fall time	$t_f$		—	0.4	—	

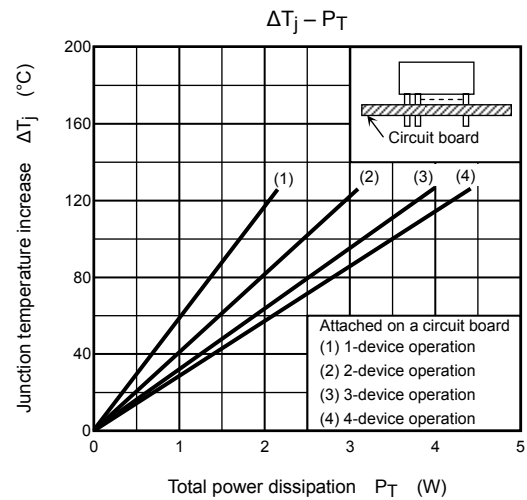
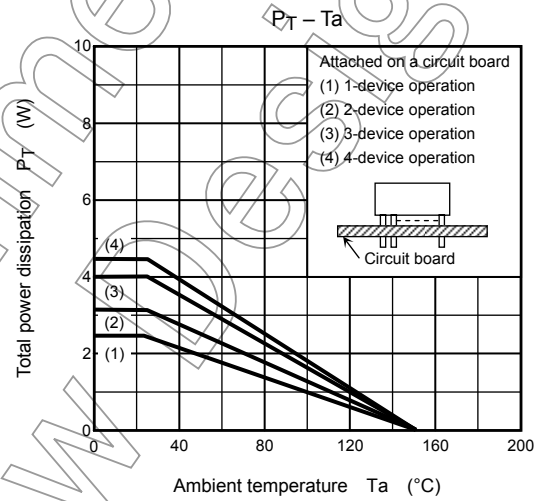
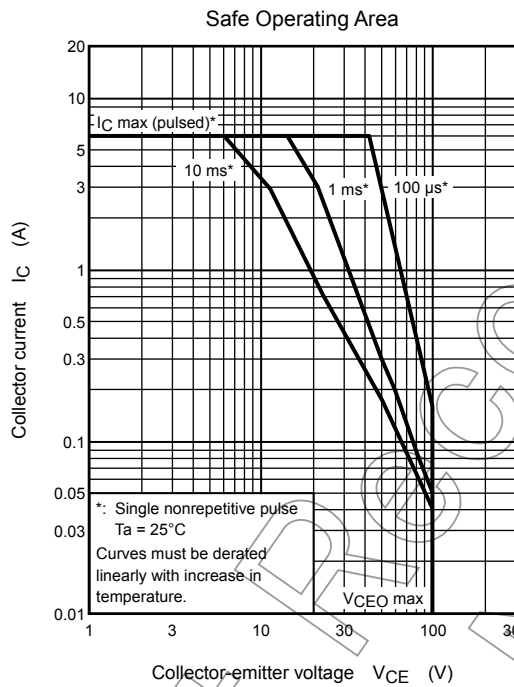
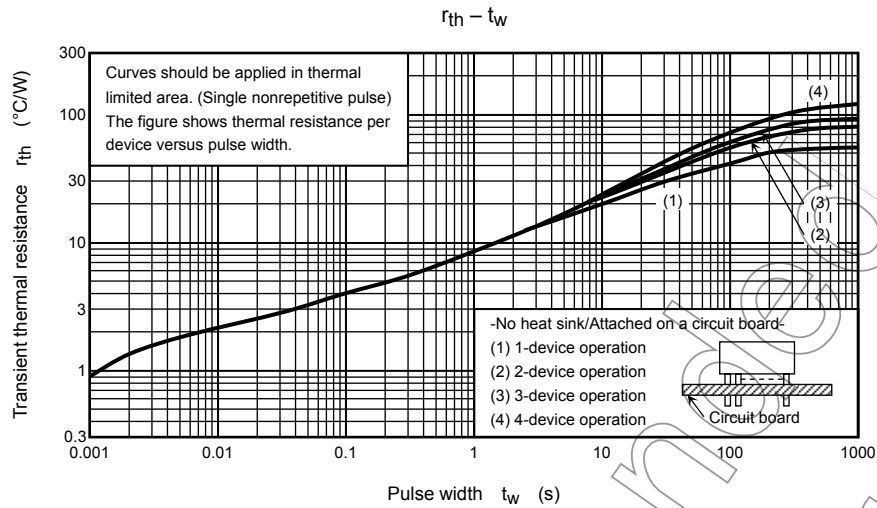
## Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

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

## Flyback-Diode Ratings 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	$V_R$	$I_R = 100\text{ }\mu\text{A}$	120	—	—	V
Forward voltage	$V_F$	$I_F = 0.5\text{ A}$	—	—	1.8	V





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