

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) ($V_{CE} = 2 \text{ V}$, $I_C = 1.5 \text{ A}$)

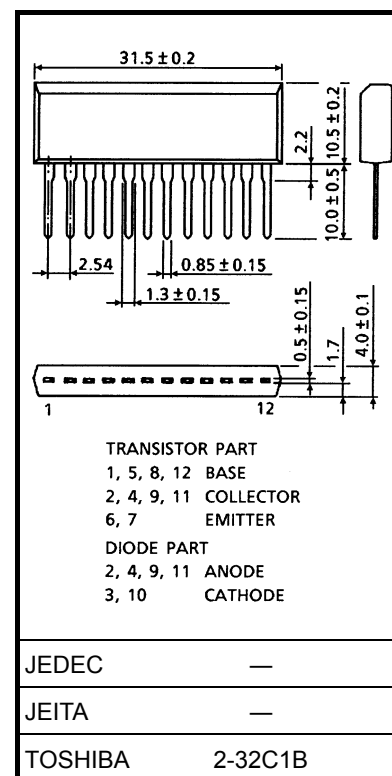
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

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	
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.

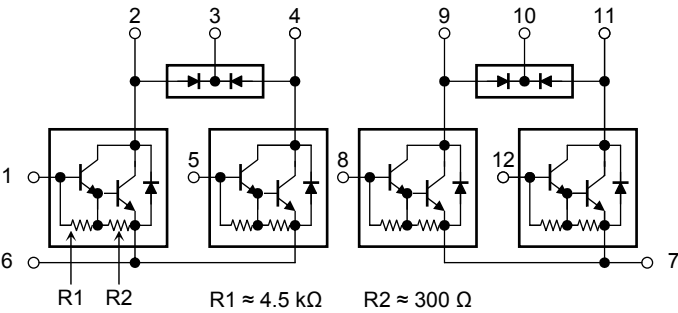
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Unit: mm

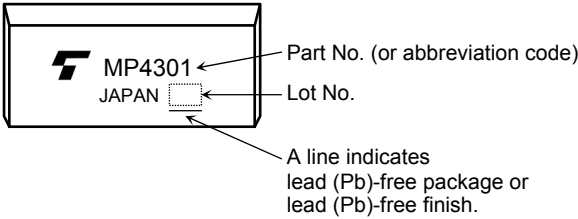


Weight: 3.9 g (typ.)

Array Configuration



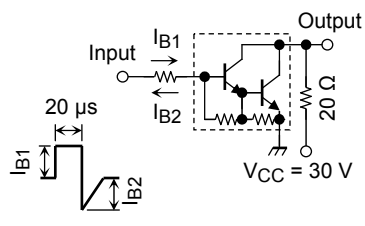
Marking



Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from junction to ambient (4-device operation, Ta = 25°C)	$\Sigma R_{th(j-a)}$	28.4	°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)

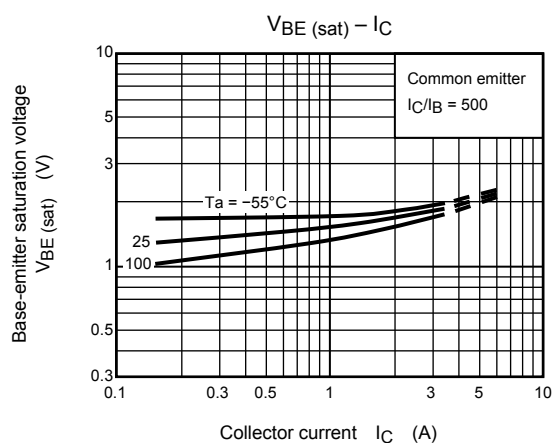
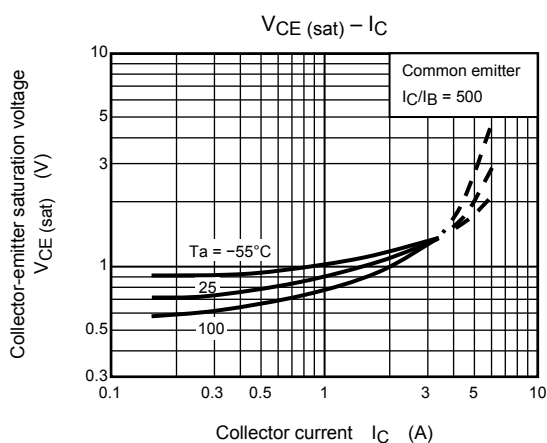
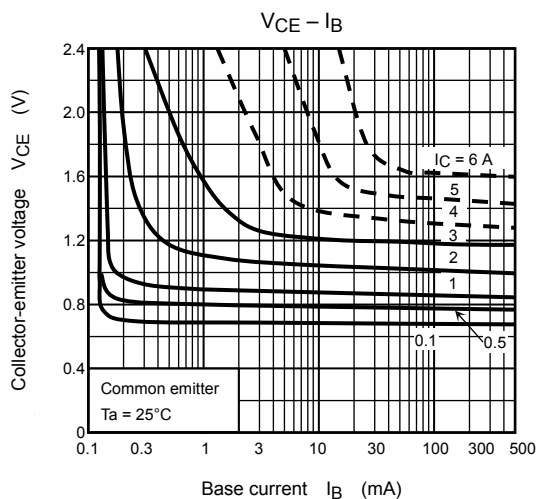
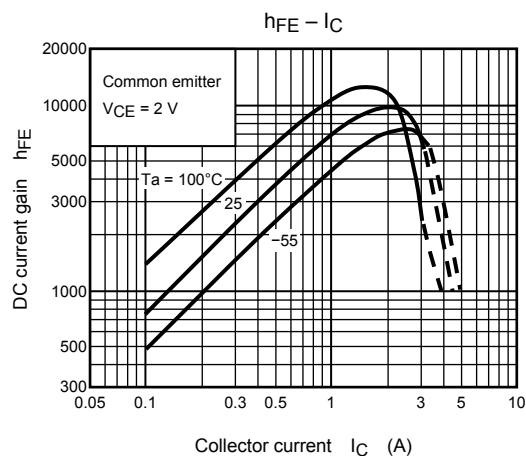
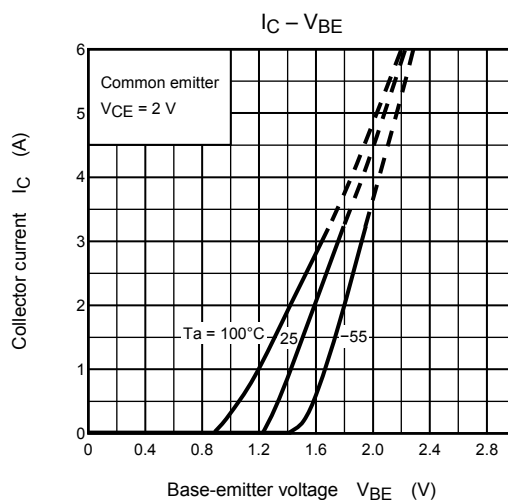
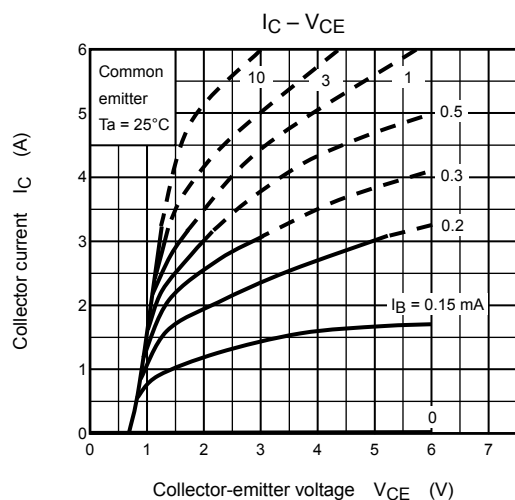
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = 120\text{ V}, I_E = 0\text{ A}$	—	—	10	μA
Collector cut-off current		I_{CEO}	$V_{CE} = 100\text{ V}, I_B = 0\text{ A}$	—	—	10	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = 6\text{ V}, I_C = 0\text{ A}$	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}	 <p>$I_{B1} = -I_{B2} = 3\text{ mA}, \text{ duty cycle} \leq 1\%$</p>	—	0.3	—	μs
	Storage time	t_{stg}		—	2.0	—	
	Fall time	t_f		—	0.4	—	

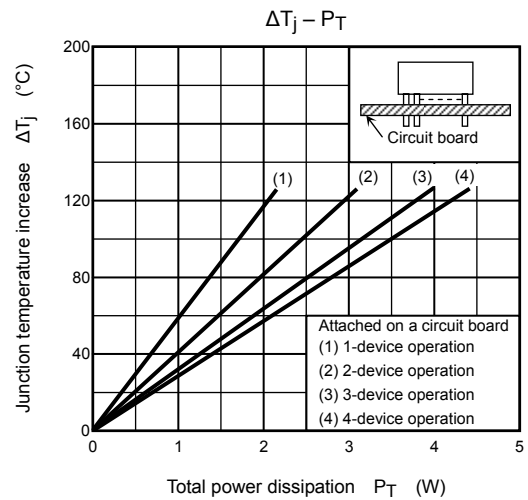
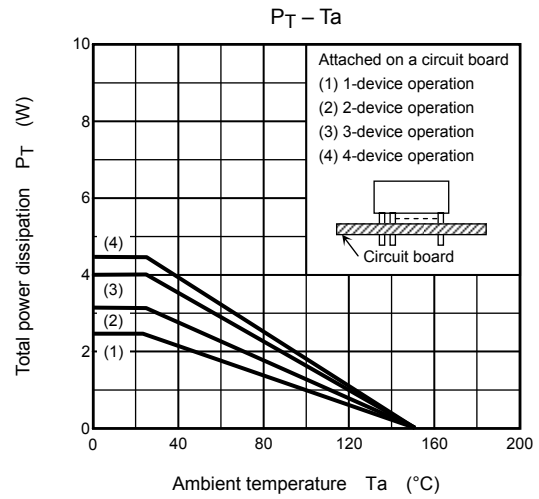
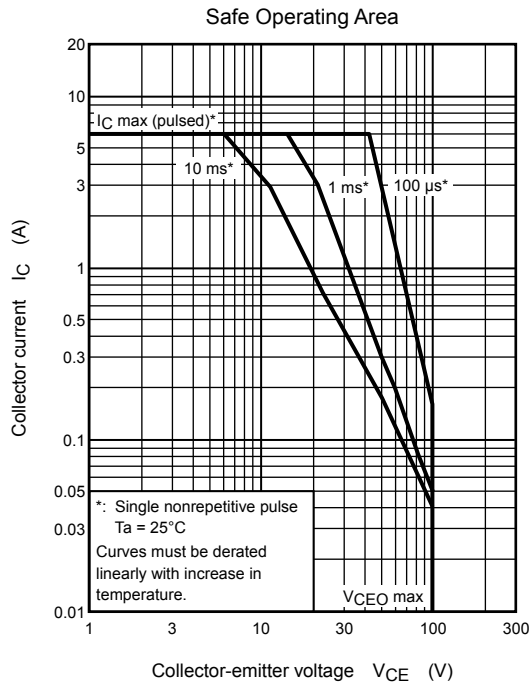
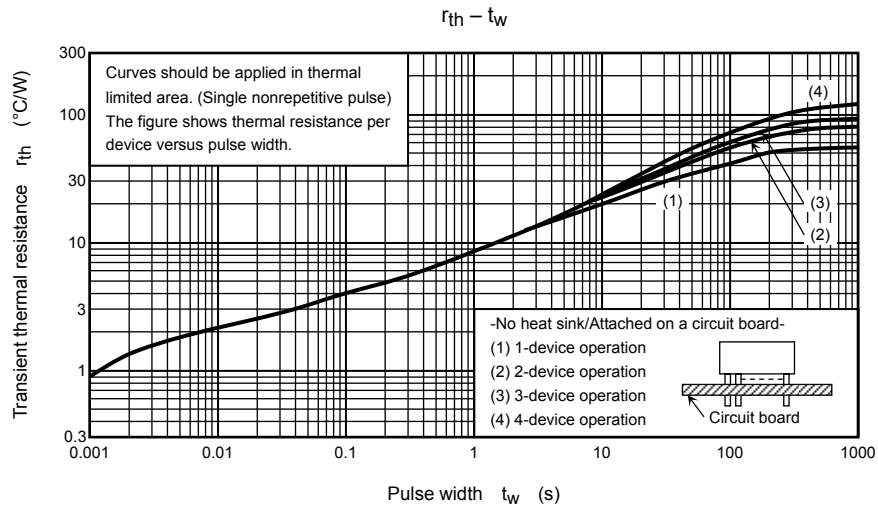
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

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	—	μs
Reverse recovery charge	Q_{rr}		—	5	—	μC

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	μA
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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