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

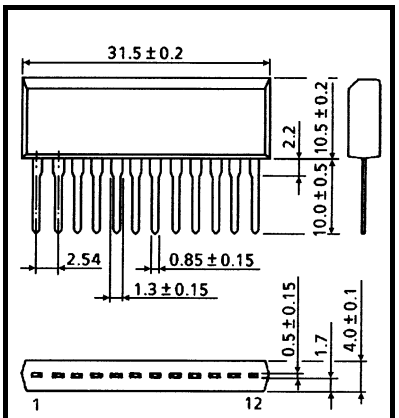
MP4301

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 W (Ta = 25°C)
- High collector current: $I_{C\ (DC)}$ = 3 A (max)
- High DC current gain: h_{FE} = 2000 (min) (V_{CE} = 2 V, I_C = 1.5 A)

Unit: mm



TRANSISTOR PART
1, 5, 8, 12 BASE
2, 4, 9, 11 COLLECTOR
6, 7 EMITTER
DIODE PART
2, 4, 9, 11 ANODE
3, 10 CATHODE

JEDEC	—
JEITA	—
TOSHIBA	2-32C1B

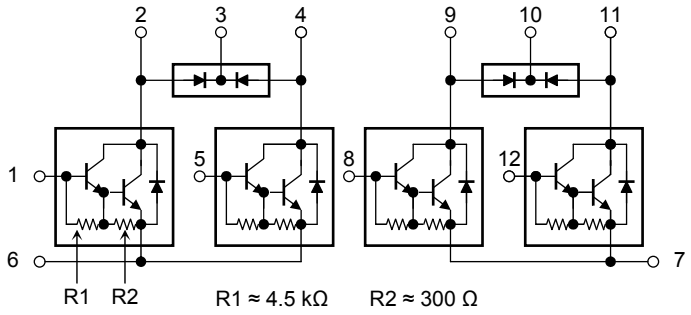
Weight: 3.9 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

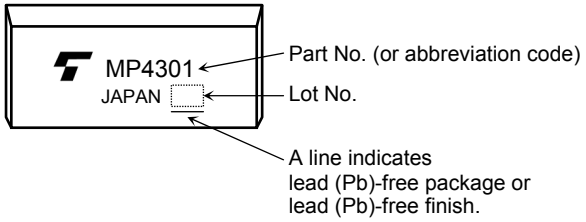
Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	120	V
Collector-emitter voltage		V_{CEO}	100	V
Emitter-base voltage		V_{EBO}	6	V
Collector current	DC	I_C	3	A
	Pulse	I_{CP}	6	
Continuous base current		I_B	0.5	A
Collector power dissipation (1-device operation)		P_C	2.2	W
Collector power dissipation (4-device operation)		P_T	4.4	W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	−55 to 150	°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).

Array Configuration



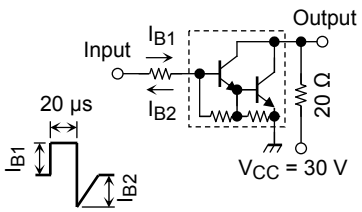
Marking



Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from junction to ambient (4-device operation, Ta = 25°C)	$\Sigma R_{th\ (j\text{-}a)}$	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 V, I_E = 0 A	—	—	10	μA
Collector cut-off current		I_{CEO}	V_{CE} = 100 V, I_B = 0 A	—	—	10	μA
Emitter cut-off current		I_{EBO}	V_{EB} = 6 V, I_C = 0 A	0.5	—	2.5	mA
Collector-base breakdown voltage		$V_{(BR)\ CBO}$	I_C = 1 mA, I_E = 0 A	120	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)\ CEO}$	I_C = 10 mA, I_B = 0 A	100	—	—	V
DC current gain		$h_{FE\ (1)}$	V_{CE} = 2 V, I_C = 1.5 A	2000	—	15000	—
		$h_{FE\ (2)}$	V_{CE} = 2 V, I_C = 3 A	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE\ (sat)}$	I_C = 1.5 A, I_B = 3 mA	—	—	1.5	V
	Base-emitter	$V_{BE\ (sat)}$	I_C = 1.5 A, I_B = 3 mA	—	—	2.0	
Transition frequency		f_T	V_{CE} = 2 V, I_C = 0.5 A	—	60	—	MHz
Collector output capacitance		C_{ob}	V_{CB} = 10 V, I_E = 0 A, f = 1 MHz	—	30	—	pF
Switching time	Turn-on time	t_{on}		—	0.3	—	μs
	Storage time	t_{stg}		—	2.0	—	
	Fall time	t_f	I_{B1} = −I_{B2} = 3 mA, duty cycle ≤ 1%	—	0.4	—	

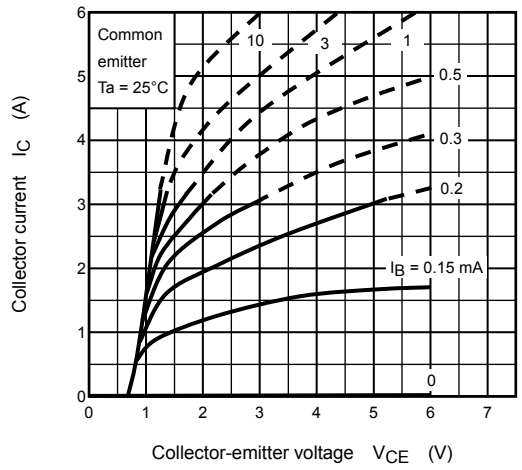
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

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

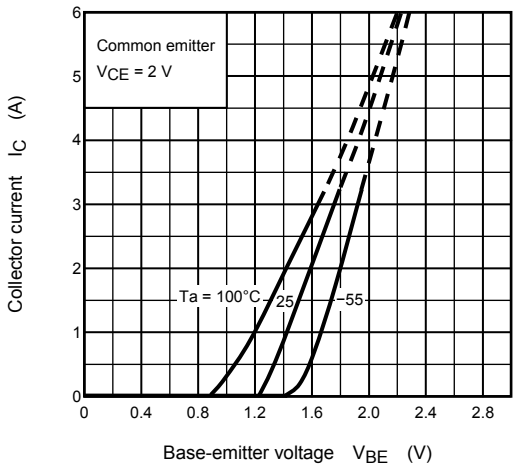
Flyback-Diode Ratings and Characteristics (Ta = 25°C)

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

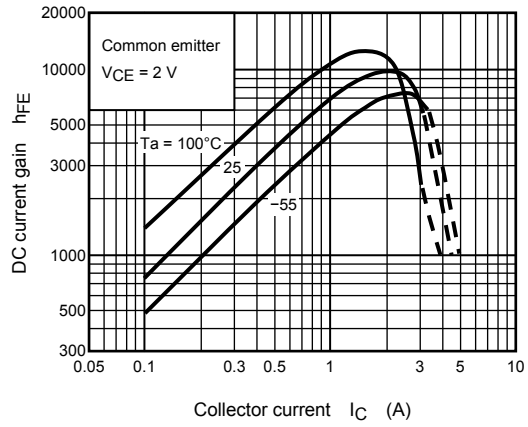
$I_C - V_{CE}$



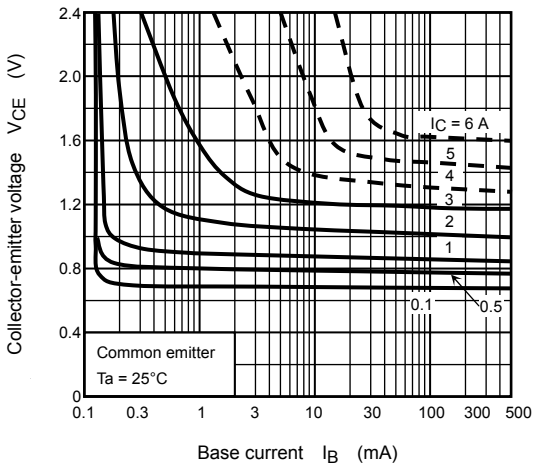
$I_C - V_{BE}$



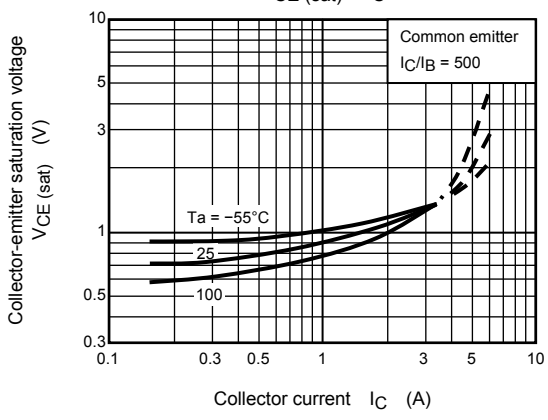
$h_{FE} - I_C$



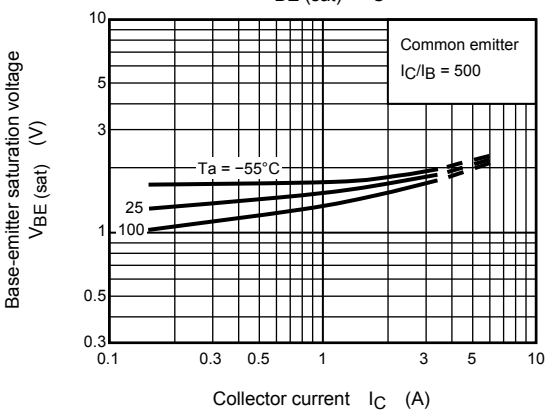
$V_{CE} - I_B$



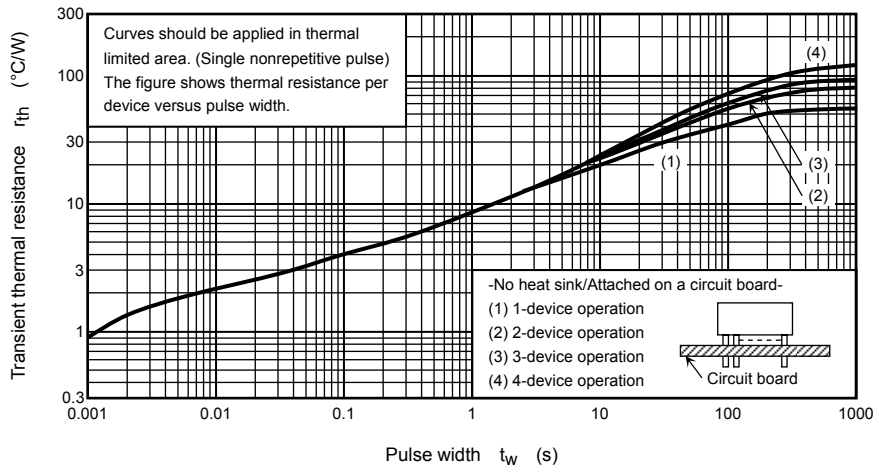
$V_{CE\ (sat)} - I_C$



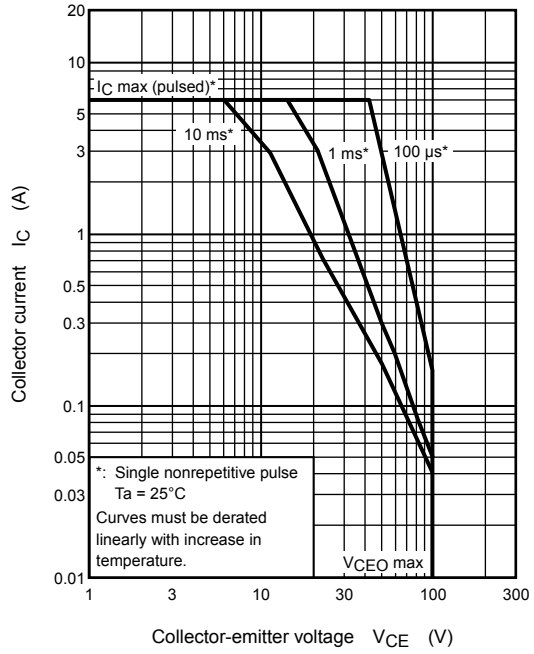
$V_{BE\ (sat)} - I_C$



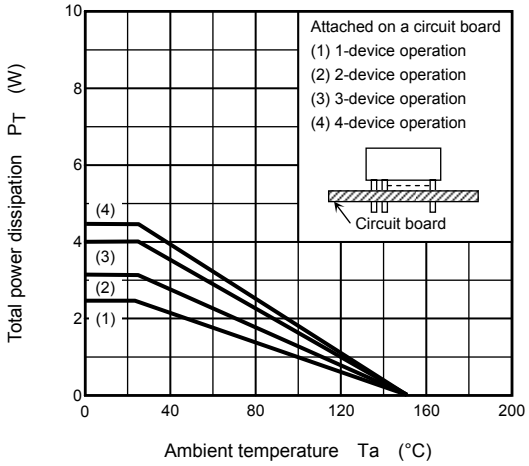
$r_{th} - t_w$



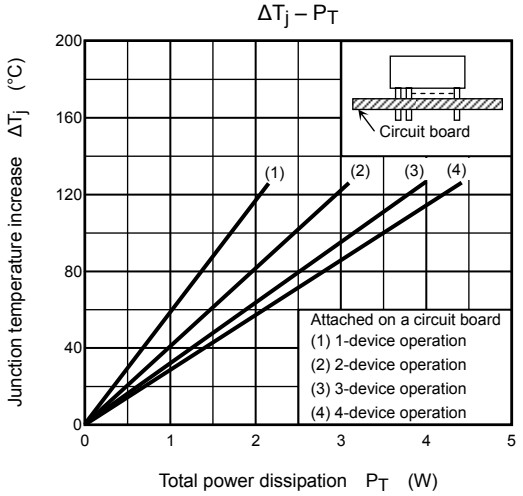
Safe Operating Area



$P_T - Ta$



$\Delta T_j - P_T$



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20070701-EN

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