

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

# MP4304

High Power Switching Applications.

Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

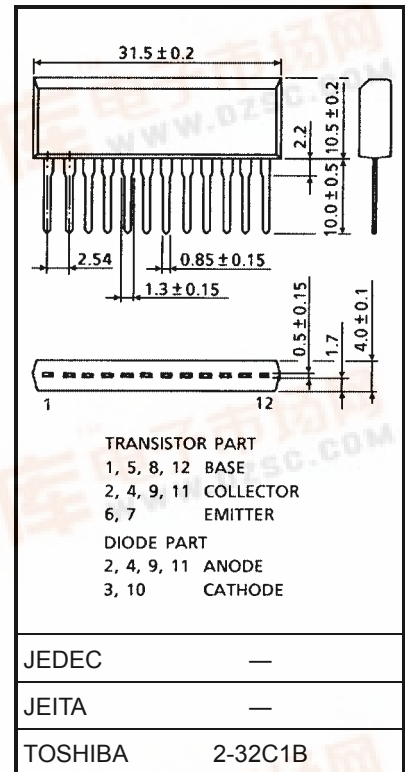
Industrial Applications

Unit: mm

- 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:  $I_C \text{ (DC)} = 3 \text{ A (max)}$
- High DC current gain:  $h_{FE} = 600 \text{ (min)}$  ( $V_{CE} = 2 \text{ V}$ ,  $I_C = 1 \text{ A}$ )

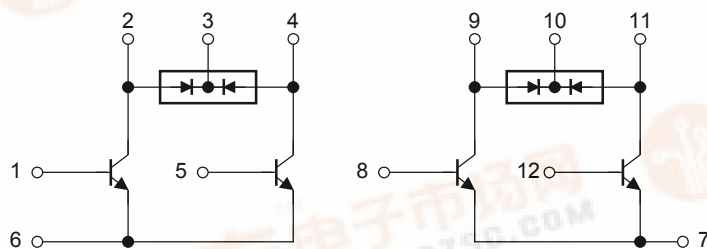
## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	80	V
Collector-emitter voltage	$V_{CEO}$	80	V
Emitter-base voltage	$V_{EBO}$	7	V
Collector current	DC	$I_C$	3
	Pulse	$I_{CP}$	5
Continuous base current	$I_B$	0.5	A
Collector power dissipation (1 device operation)	$P_C$	2.2	W
Collector power dissipation (4 devices operation)	$P_T$	4.4	W
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55 to 150	$^\circ\text{C}$



Weight: 3.9 g (typ.)

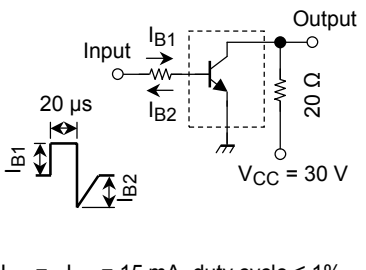
## Array Configuration



**Thermal Characteristics**

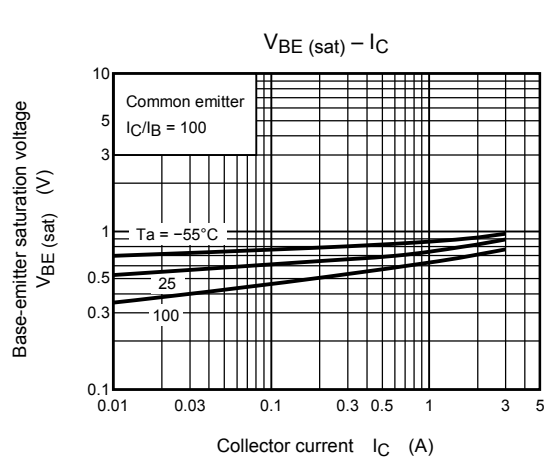
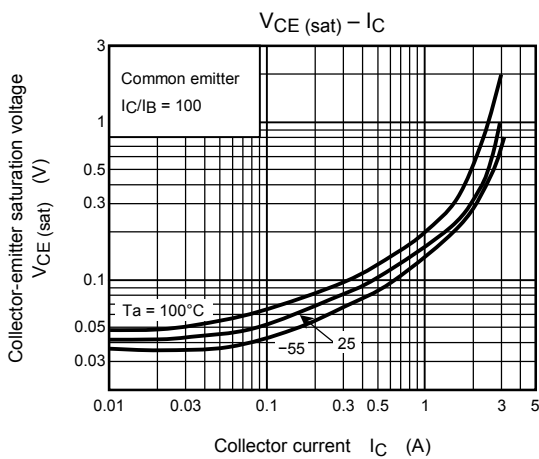
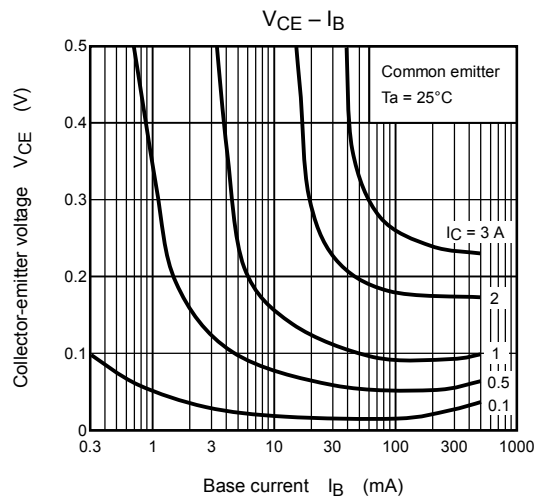
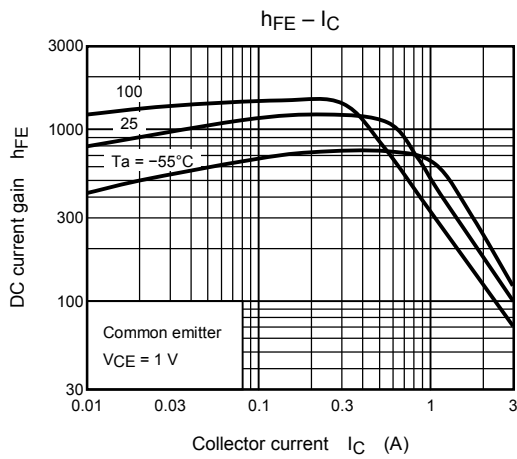
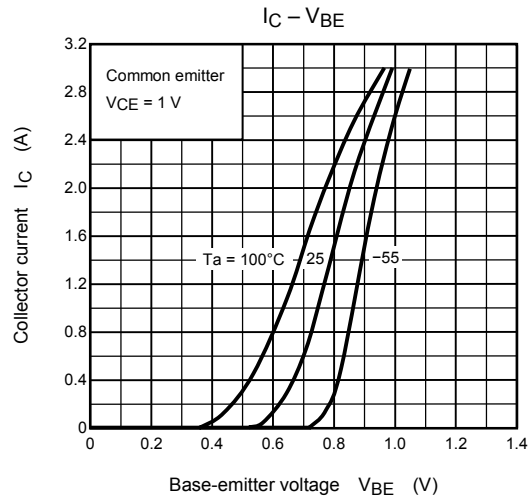
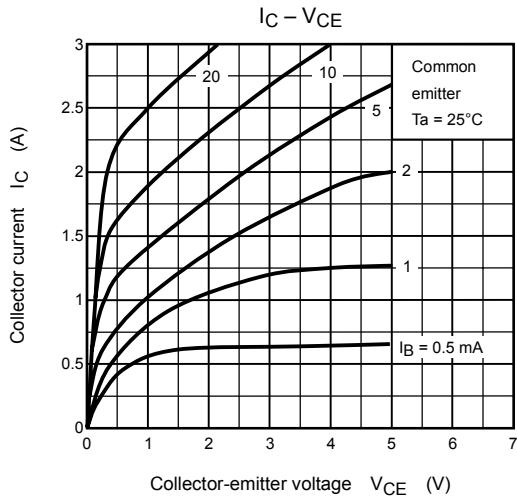
Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices operation, Ta = 25°C)	$\Sigma R_{th(j-a)}$	28.4	°C/W
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	T <sub>L</sub>	260	°C

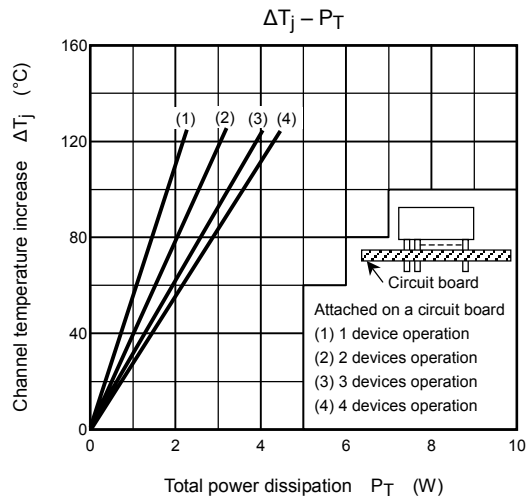
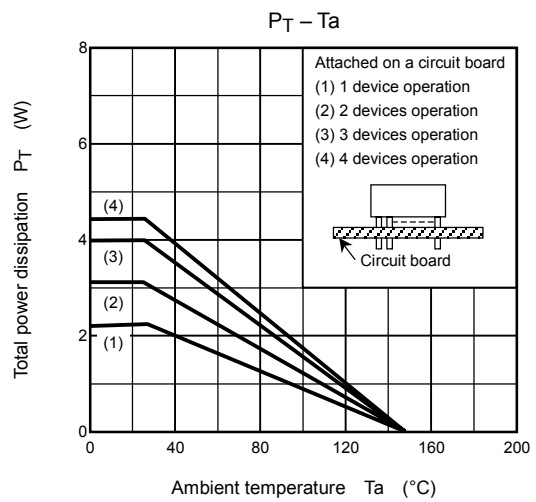
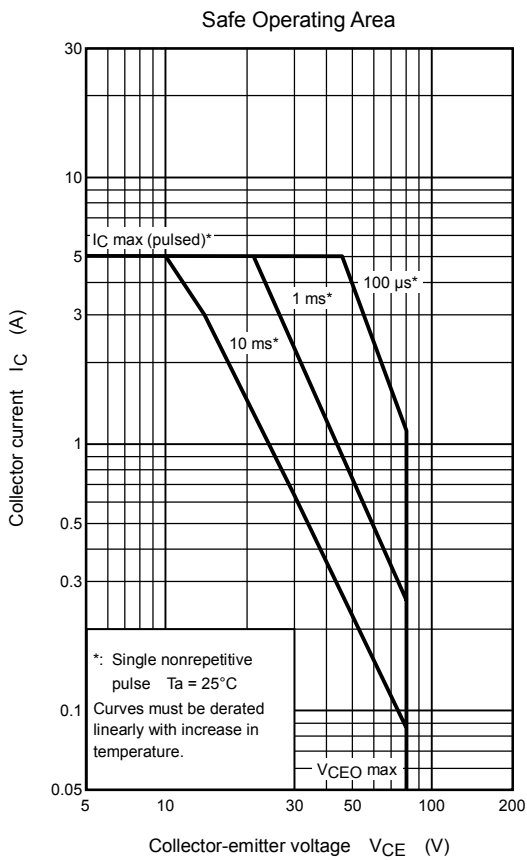
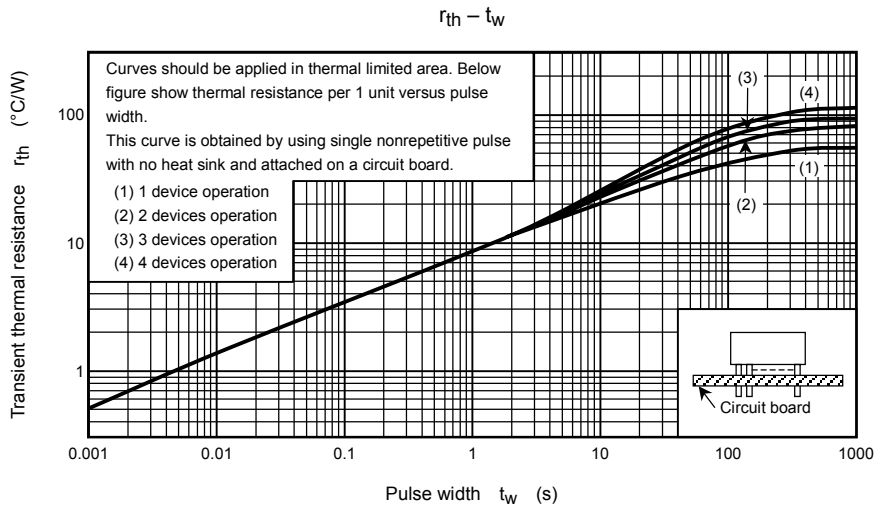
**Electrical Characteristics (Ta = 25°C)**

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I <sub>CBO</sub>	V <sub>CB</sub> = 80 V, I <sub>E</sub> = 0 A	—	—	10	μA
Emitter cut-off current		I <sub>EBO</sub>	V <sub>EB</sub> = 7 V, I <sub>C</sub> = 0 A	—	—	10	μA
Collector-base breakdown voltage		V <sub>(BR) CBO</sub>	I <sub>C</sub> = 1 mA, I <sub>E</sub> = 0 A	80	—	—	V
Collector-emitter breakdown voltage		V <sub>(BR) CEO</sub>	I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0 A	80	—	—	V
DC current gain		h <sub>FE</sub> (1)	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 1 A	600	—	—	—
		h <sub>FE</sub> (2)	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 2 A	150	—	—	
Saturation voltage	Collector-emitter	V <sub>CE (sat)</sub>	I <sub>C</sub> = 1.5 A, I <sub>B</sub> = 15 mA	—	0.25	0.5	V
	Base-emitter	V <sub>BE (sat)</sub>	I <sub>C</sub> = 1.5 A, I <sub>B</sub> = 15 mA	—	—	1.2	
Transition frequency		f <sub>T</sub>	V <sub>CE</sub> = 2 V, I <sub>C</sub> = 0.1 A	—	85	—	MHz
Collector output capacitance		C <sub>ob</sub>	V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 A, f = 1 MHz	—	50	—	pF
Switching time	Turn-on time	t <sub>on</sub>	 <p>I<sub>B1</sub> = -I<sub>B2</sub> = 15 mA, duty cycle ≤ 1%</p>	—	0.4	—	μs
	Storage time	t <sub>stg</sub>		—	2.6	—	
	Fall time	t <sub>f</sub>		—	1.3	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	I <sub>FM</sub>	—	—	—	3	A
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 80 V	—	—	0.4	μA
Reverse voltage	V <sub>R</sub>	I <sub>R</sub> = 100 μA	80	—	—	V
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 1 A	—	—	1.5	V





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