

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

# MP4006

High Power Switching Applications.

Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

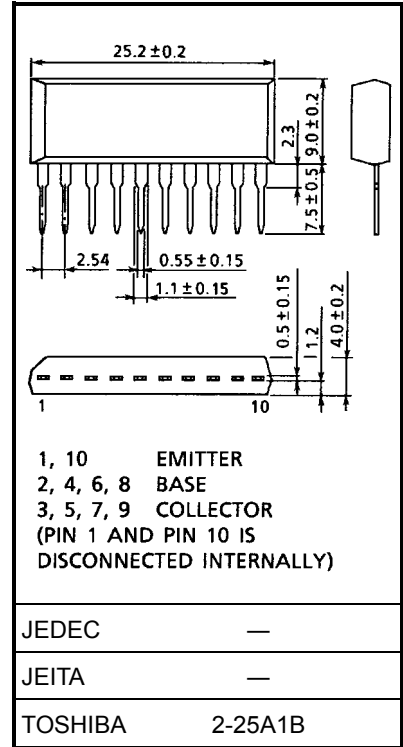
- Small package by full molding (SIP 10 pin)
- High collector power dissipation (4 devices operation)  
:  $I_C$  (DC) =  $\pm 2$  A (max)
- High DC current gain:  $h_{FE} = 2000$  (min) ( $V_{CE} = \pm 2$  V,  $I_C = \pm 1$  A)

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

Characteristics	Symbol	Rating		Unit	
		NPN	PNP		
Collector-base voltage	$V_{CBO}$	80	-80	V	
Collector-emitter voltage	$V_{CEO}$	80	-80	V	
Emitter-base voltage	$V_{EBO}$	8	-8	V	
Collector current	DC	$I_C$	2	-2	A
	Pulse	$I_{CP}$	3	-3	
Continuous base current	$I_B$	0.5	-0.5	A	
Collector power dissipation (1 device operation)	$P_C$	2.0		W	
Collector power dissipation (4 devices operation)	$P_T$	4.0		W	
Junction temperature	$T_j$	150		$^\circ\text{C}$	
Storage temperature range	$T_{stg}$	-55 to 150		$^\circ\text{C}$	

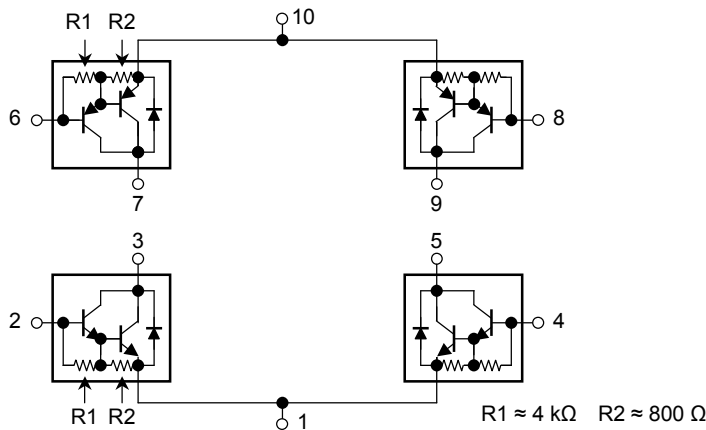
Industrial Applications

Unit: mm



Weight: 2.1 g (typ.)

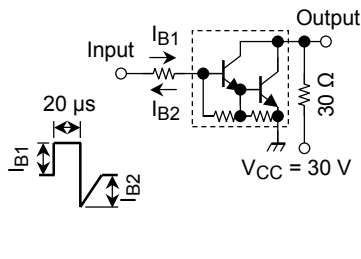
### Array Configuration



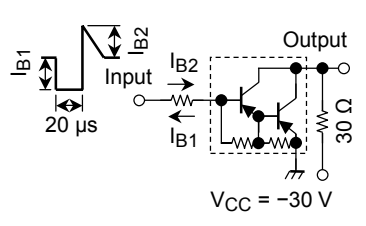
## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of junction to ambient (4 devices operation, $T_a = 25^\circ\text{C}$ )	$\Sigma R_{th(j-a)}$	31.3	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	$T_L$	260	$^\circ\text{C}$

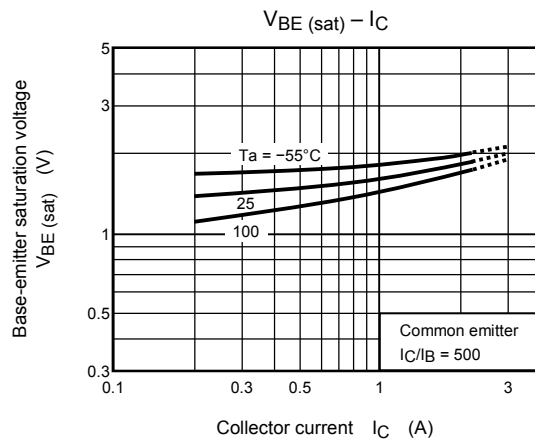
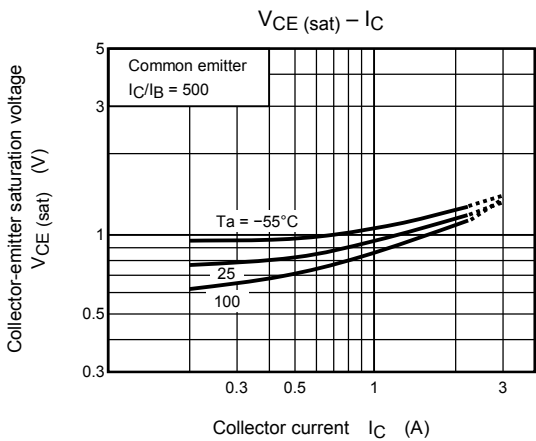
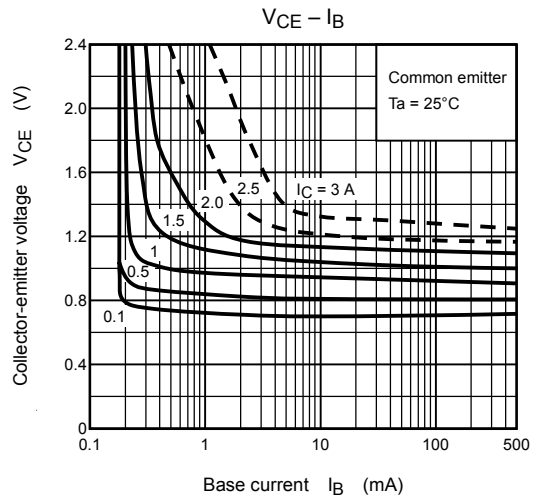
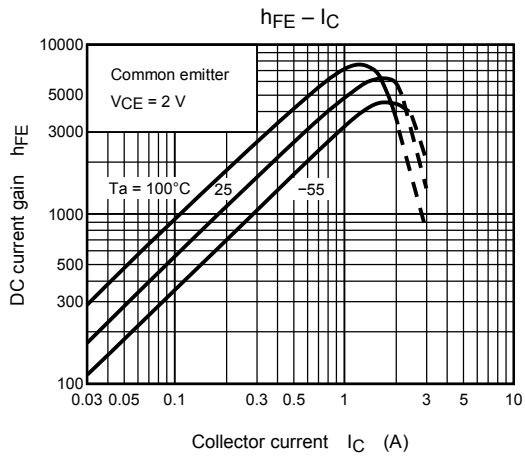
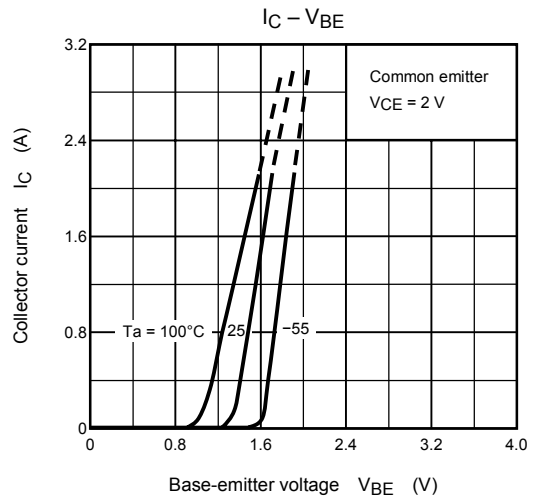
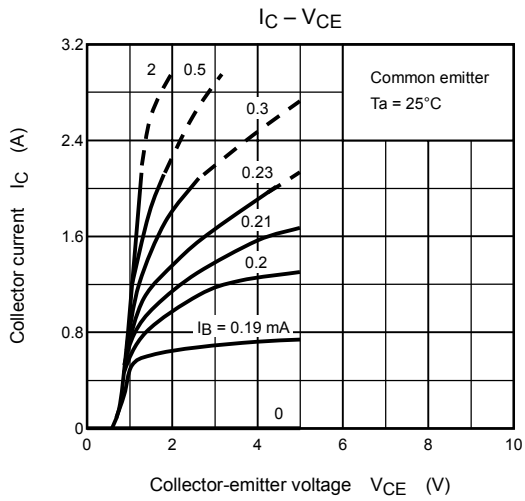
## Electrical Characteristics ( $T_a = 25^\circ\text{C}$ ) (NPN transistor)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = 80\text{ V}, I_E = 0\text{ A}$	—	—	10	$\mu\text{A}$
Collector cut-off current		$I_{CEO}$	$V_{CE} = 80\text{ V}, I_B = 0\text{ A}$	—	—	10	$\mu\text{A}$
Emitter cut-off current		$I_{EBO}$	$V_{EB} = 8\text{ V}, I_C = 0\text{ A}$	0.8	—	4.0	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = 1\text{ mA}, I_E = 0\text{ A}$	80	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0\text{ A}$	80	—	—	V
DC current gain		$h_{FE}$	$V_{CE} = 2\text{ V}, I_C = 1\text{ A}$	2000	—	—	—
Saturation voltage	Collector-emitter	$V_{CE(sat)}$	$I_C = 1\text{ A}, I_B = 1\text{ mA}$	—	—	1.5	V
	Base-emitter	$V_{BE(sat)}$	$I_C = 1\text{ A}, I_B = 1\text{ mA}$	—	—	2.0	
Transition frequency		$f_T$	$V_{CE} = 2\text{ V}, I_C = 0.5\text{ A}$	—	100	—	MHz
Collector output capacitance		$C_{ob}$	$V_{CB} = 10\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	20	—	pF
Switching time	Turn-on time	$t_{on}$	 <p><math>I_{B1} = -I_{B2} = 1\text{ mA}, \text{duty cycle} \leq 1\%</math></p>	—	0.4	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	4.0	—	
	Fall time	$t_f$		—	0.6	—	

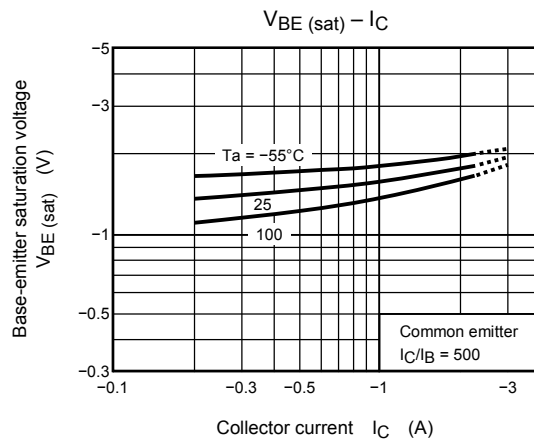
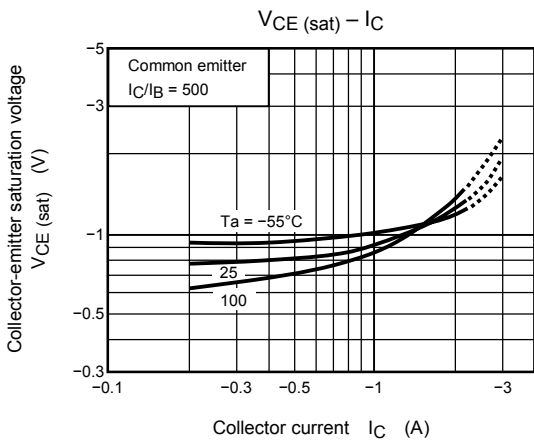
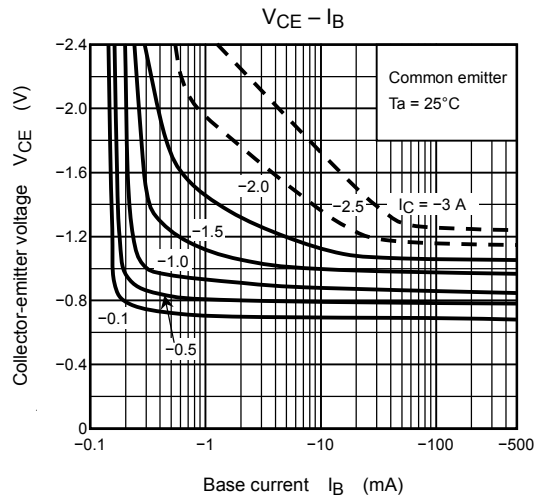
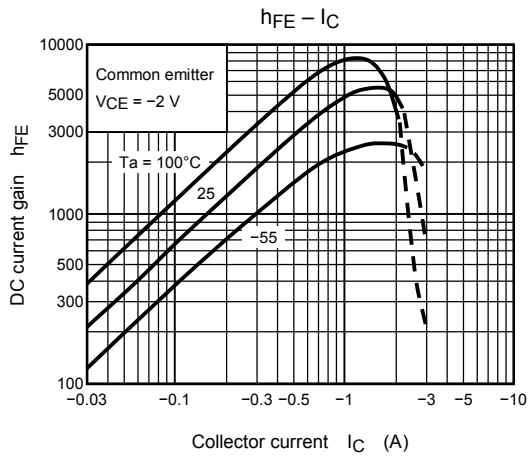
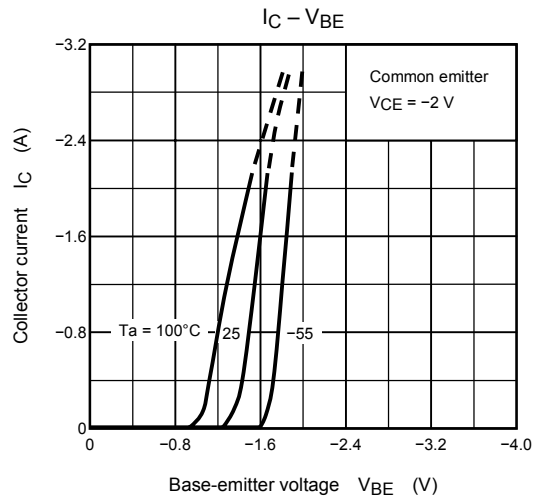
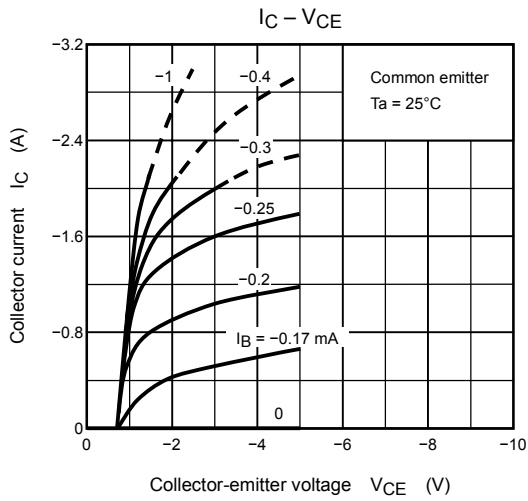
## Electrical Characteristics (Ta = 25°C) (PNP transistor)

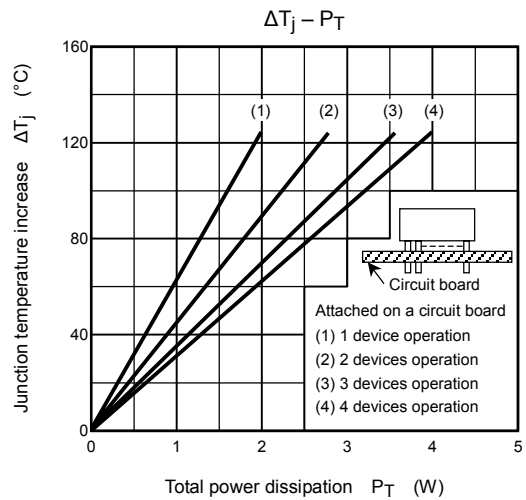
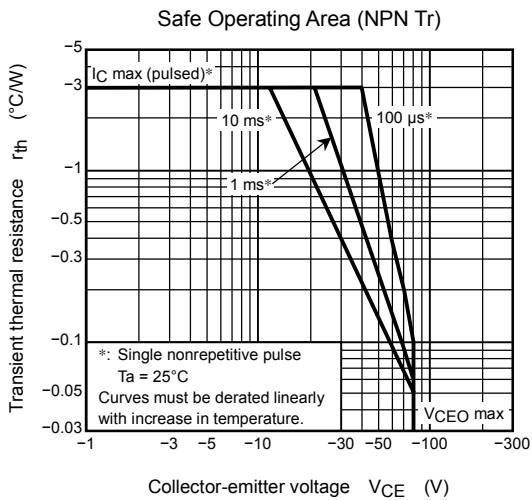
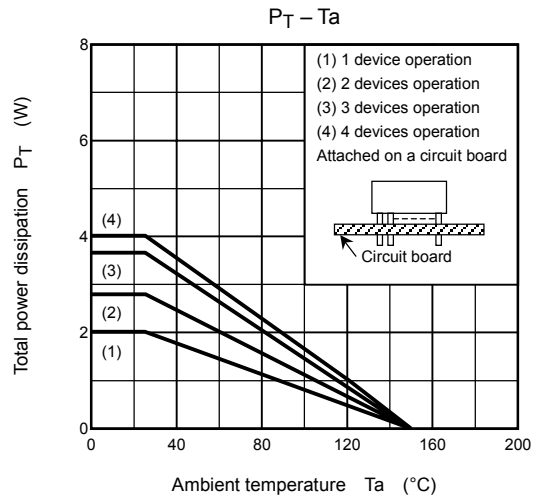
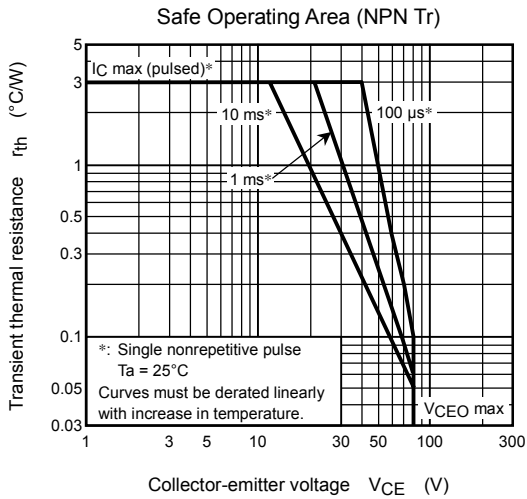
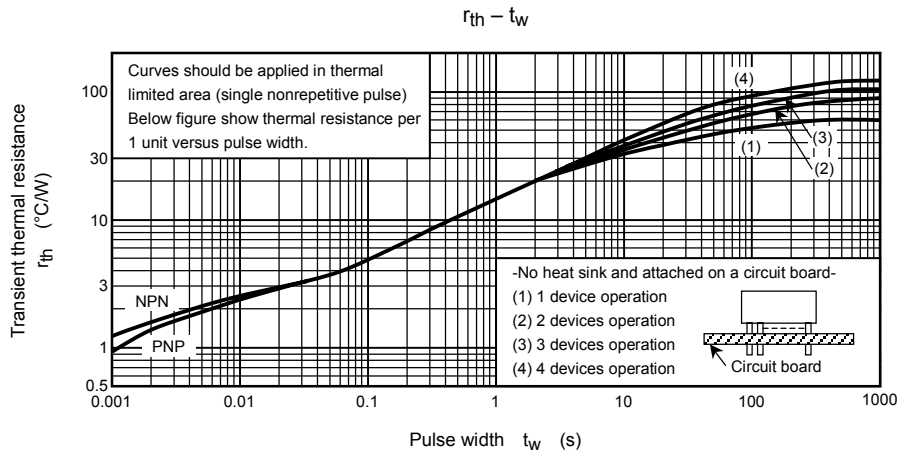
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		$I_{CBO}$	$V_{CB} = -80\text{ V}, I_E = 0\text{ A}$	—	—	-10	$\mu\text{A}$
Collector cut-off current		$I_{CEO}$	$V_{CE} = -80\text{ V}, I_B = 0\text{ A}$	—	—	-10	$\mu\text{A}$
Emitter cut-off current		$I_{EBO}$	$V_{EB} = -8\text{ V}, I_C = 0\text{ A}$	-0.8	—	-4.0	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = -1\text{ mA}, I_E = 0\text{ A}$	-80	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0\text{ A}$	-80	—	—	V
DC current gain		$h_{FE}$	$V_{CE} = -2\text{ V}, I_C = -1\text{ A}$	2000	—	—	—
Saturation voltage	Collector-emitter	$V_{CE(sat)}$	$I_C = -1\text{ A}, I_B = -1\text{ mA}$	—	—	-1.5	V
	Base-emitter	$V_{BE(sat)}$	$I_C = -1\text{ A}, I_B = -1\text{ mA}$	—	—	-2.0	
Transition frequency		$f_T$	$V_{CE} = -2\text{ V}, I_C = -0.5\text{ A}$	—	50	—	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 style="text-align: center;"><math>V_{CC} = -30\text{ V}</math></p> <p style="text-align: center;"><math>-I_{B1} = I_{B2} = 1\text{ mA}, \text{duty cycle} \leq 1\%</math></p>	—	0.4	—	$\mu\text{s}$
	Storage time	$t_{stg}$		—	2.0	—	
	Fall time	$t_f$		—	0.4	—	

## (NPN transistor)



**(PNP transistor)**





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