

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

MP4005

High Power Switching Applications.
Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

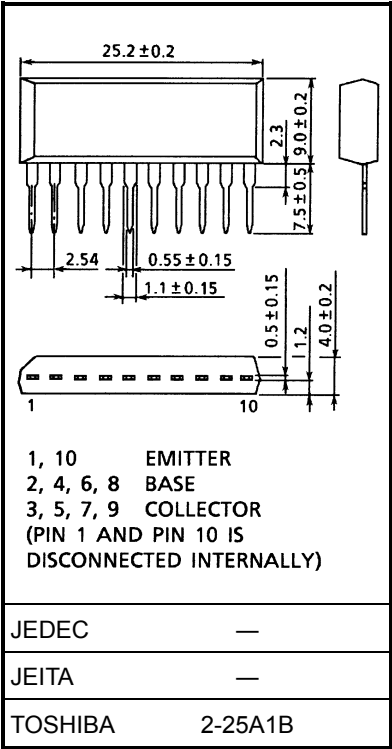
- Small package by full molding (SIP 10 pin)
- High collector power dissipation (4 devices operation)
: $P_T = 4\text{ W}$ ($T_a = 25^\circ\text{C}$)
- High collector current: $I_C(\text{DC}) = \pm 4\text{ A}$ (max)
- High DC current gain: $h_{FE} = 2000$ (min) ($V_{CE} = \pm 2\text{ V}$, $I_C = \pm 1\text{ A}$)

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

Characteristics		Symbol	Rating		Unit
			NPN	PNP	
Collector-base voltage		V_{CBO}	100	-100	V
Collector-emitter voltage		V_{CEO}	80	-80	V
Emitter-base voltage		V_{EBO}	5	-5	V
Collector current	DC	I_C	4	-4	A
	Pulse	I_{CP}	6	-6	
Continuous base current		I_B	0.4	-0.4	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

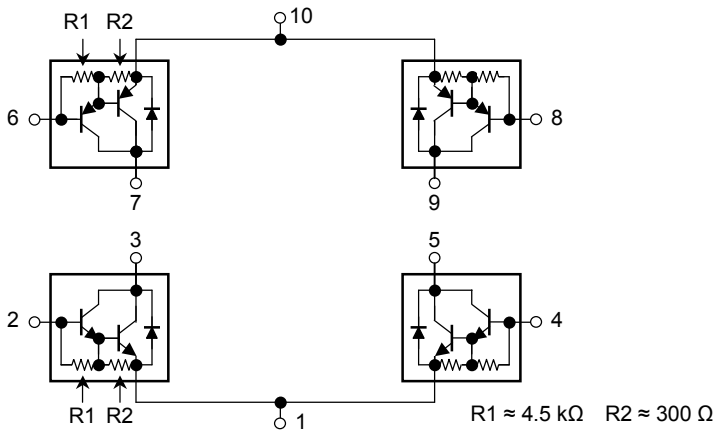
Unit: mm



Weight: 2.1 g (typ.)

(Pin 1 and pin 10 is disconnected internally)

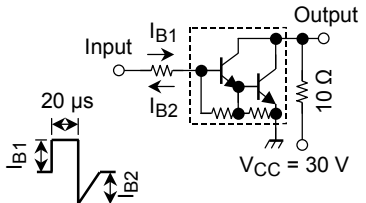
Array Configuration



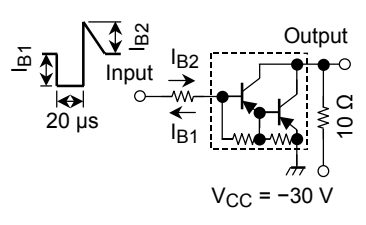
Thermal Characteristics

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	$^\circ\text{C}$

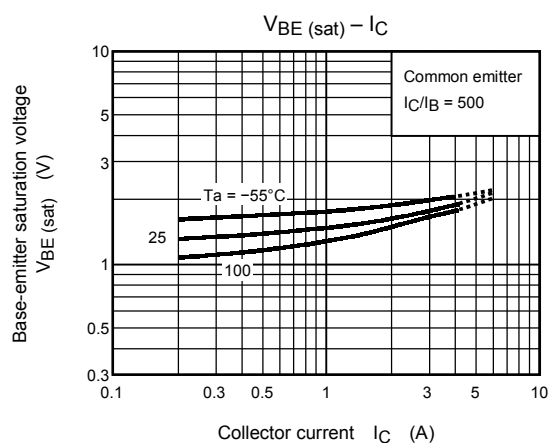
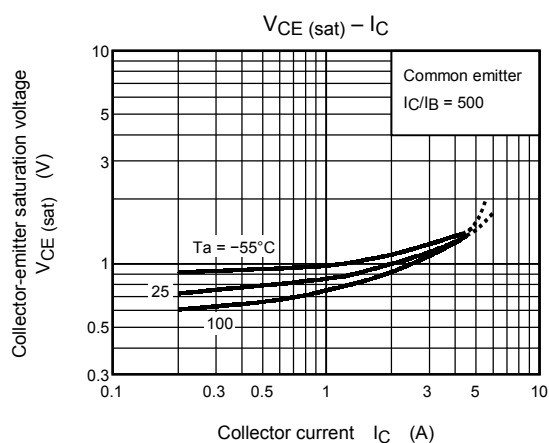
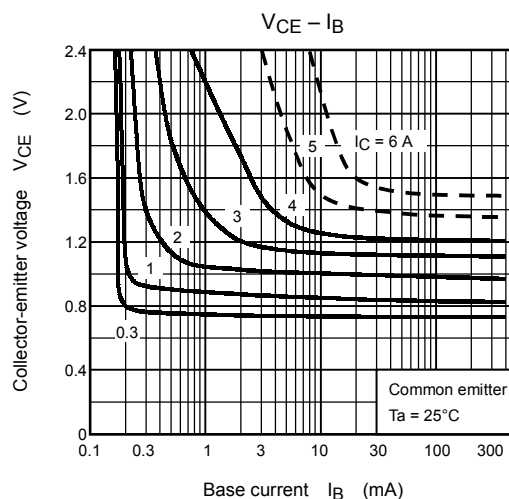
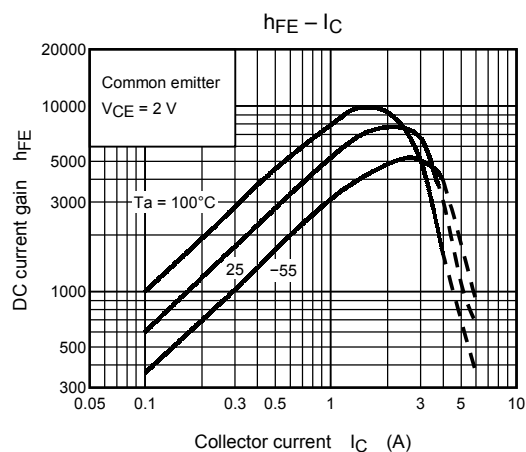
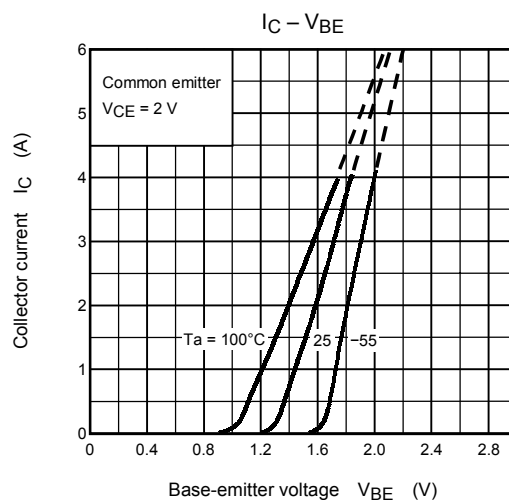
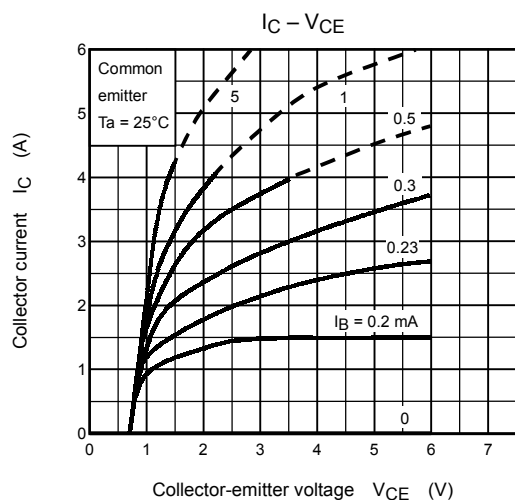
Electrical Characteristics ($T_a = 25^\circ\text{C}$) (NPN transistor)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = 100\text{ V}, I_E = 0\text{ A}$	—	—	20	μA
Collector cut-off current		I_{CEO}	$V_{CE} = 80\text{ V}, I_B = 0\text{ A}$	—	—	20	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = 5\text{ V}, I_C = 0\text{ A}$	0.5	—	2.5	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = 1\text{ mA}, I_E = 0\text{ A}$	100	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = 10\text{ mA}, I_B = 0\text{ A}$	80	—	—	V
DC current gain		$h_{FE(1)}$	$V_{CE} = 2\text{ V}, I_C = 1\text{ A}$	2000	—	—	—
		$h_{FE(2)}$	$V_{CE} = 2\text{ V}, I_C = 3\text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE(sat)}$	$I_C = 3\text{ A}, I_B = 6\text{ mA}$	—	—	1.5	V
	Base-emitter	$V_{BE(sat)}$	$I_C = 3\text{ A}, I_B = 6\text{ mA}$	—	—	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}	 $I_{B1} = -I_{B2} = 6\text{ mA}$, duty cycle $\leq 1\%$	—	0.2	—	μs
	Storage time	t_{stg}		—	1.5	—	
	Fall time	t_f		—	0.6	—	

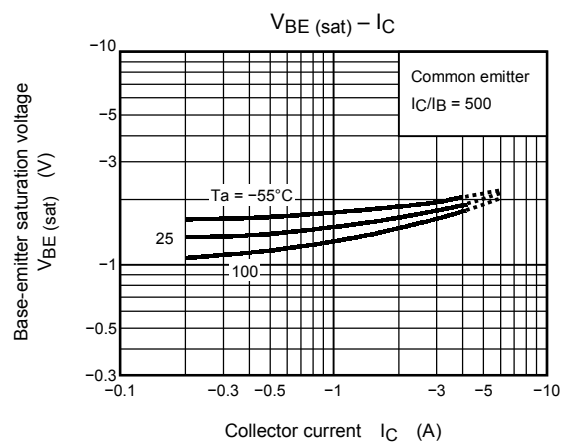
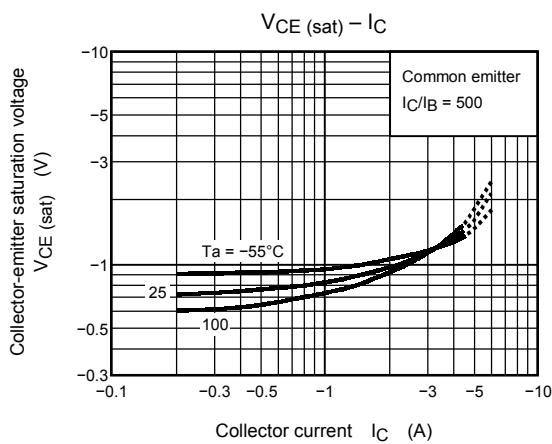
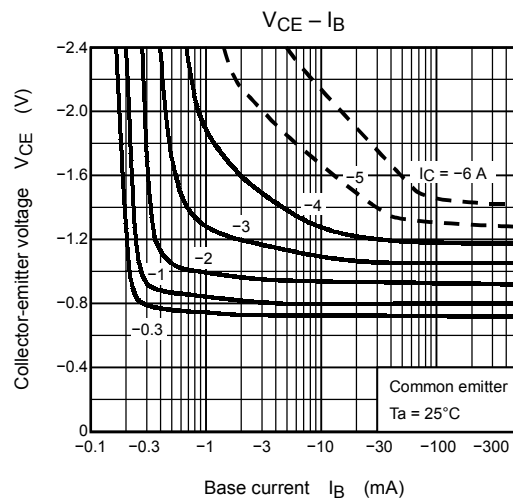
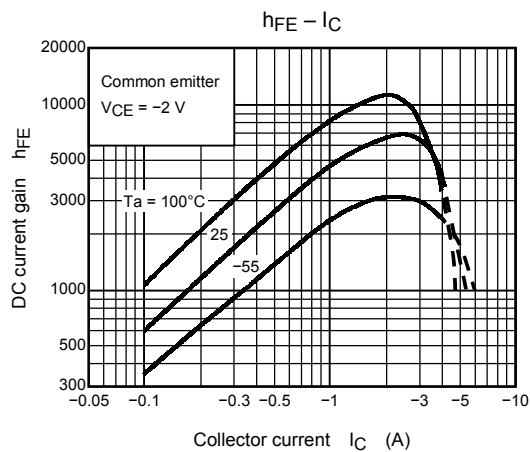
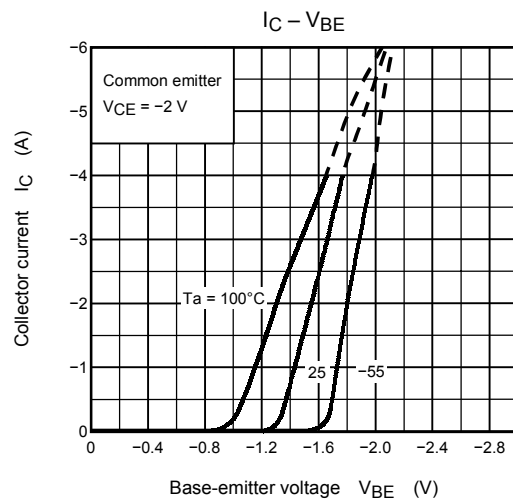
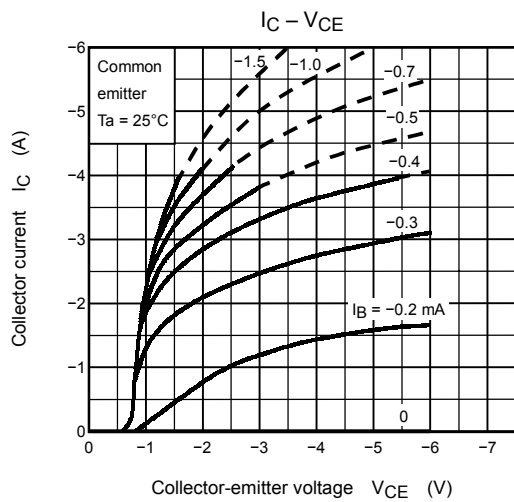
Electrical Characteristics (Ta = 25°C) (PNP transistor)

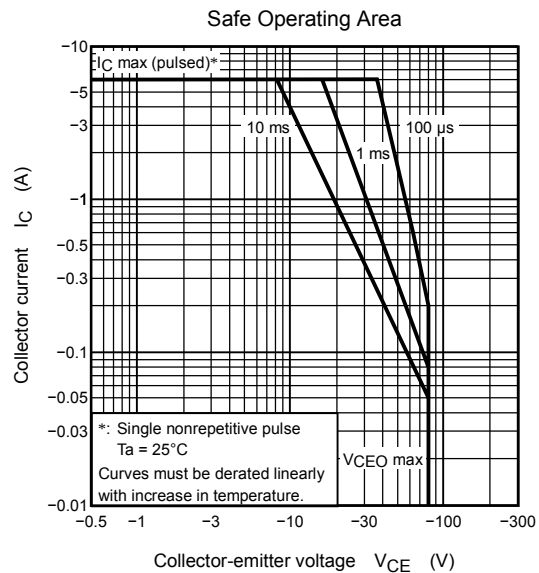
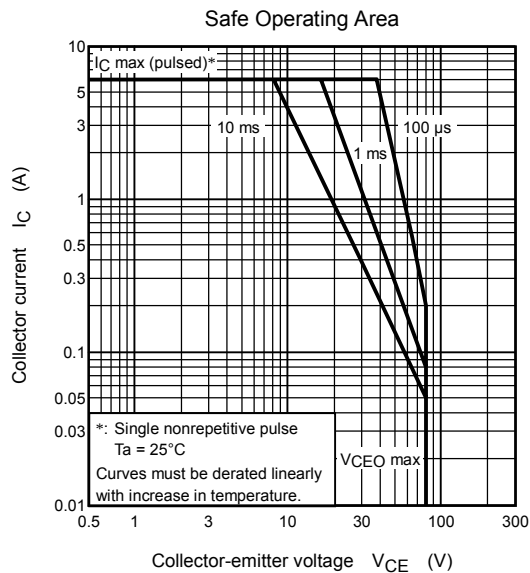
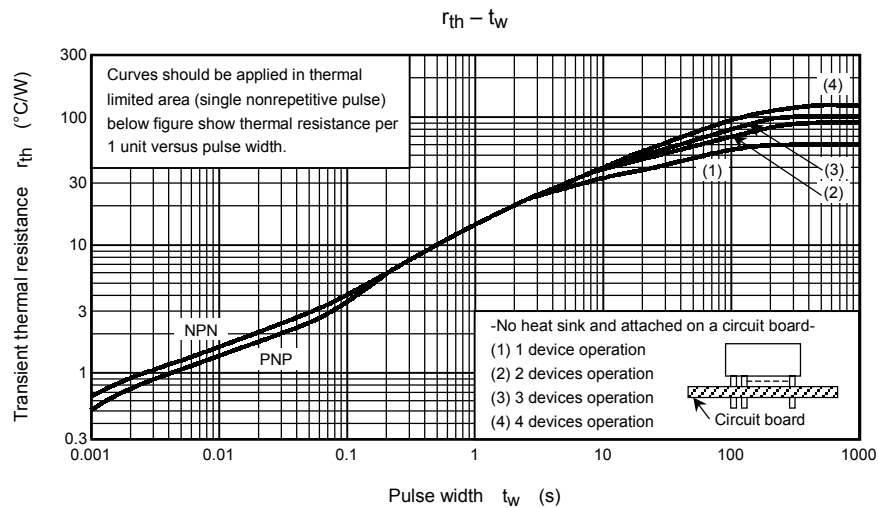
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = -100 \text{ V}, I_E = 0 \text{ A}$	—	—	-20	μA
Collector cut-off current		I_{CEO}	$V_{CE} = -80 \text{ V}, I_B = 0 \text{ A}$	—	—	-20	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = -5 \text{ V}, I_C = 0 \text{ A}$	-0.5	—	-2.5	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = -1 \text{ mA}, I_E = 0 \text{ A}$	-100	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10 \text{ mA}, I_B = 0 \text{ A}$	-80	—	—	V
DC current gain		$h_{FE(1)}$	$V_{CE} = -2 \text{ V}, I_C = -1 \text{ A}$	2000	—	—	—
		$h_{FE(2)}$	$V_{CE} = -2 \text{ V}, I_C = -3 \text{ A}$	1000	—	—	
Saturation voltage	Collector-emitter	$V_{CE(sat)}$	$I_C = -3 \text{ A}, I_B = -6 \text{ mA}$	—	—	-1.5	V
	Base-emitter	$V_{BE(sat)}$	$I_C = -3 \text{ A}, I_B = -6 \text{ mA}$	—	—	-2.0	
Transition frequency		f_T	$V_{CE} = -2 \text{ V}, I_C = -0.5 \text{ A}$	—	40	—	MHz
Collector output capacitance		C_{ob}	$V_{CB} = -10 \text{ V}, I_E = 0 \text{ A}, f = 1 \text{ MHz}$	—	55	—	pF
Switching time	Turn-on time	t_{on}	 $-I_{B1} = I_{B2} = 6 \text{ mA}, \text{ duty cycle } \leq 1\%$	—	0.15	—	μs
	Storage time	t_{stg}		—	0.80	—	
	Fall time	t_f		—	0.40	—	

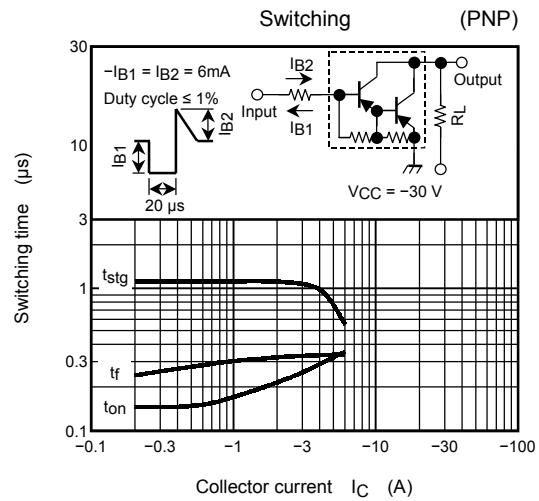
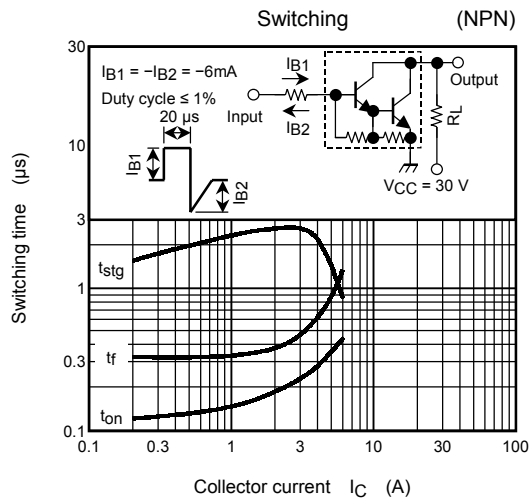
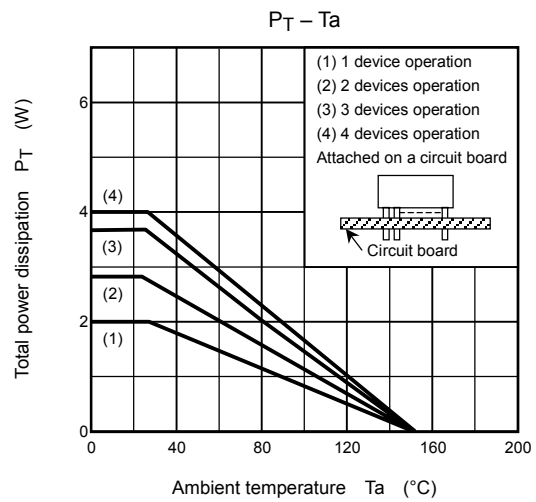
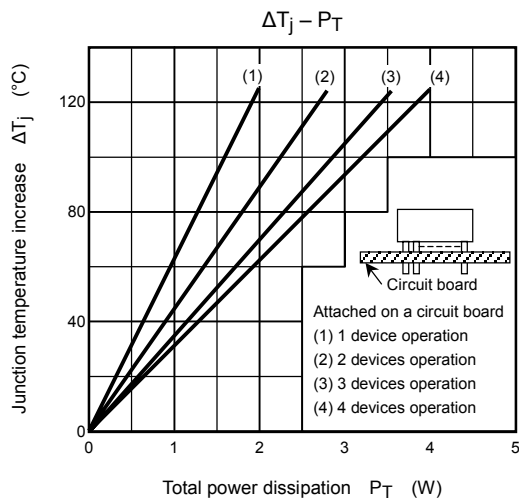
(NPN transistor)



(PNP transistor)







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