

TOSHIBA Power Transistor Module Silicon PNP Epitaxial Type
(Four Darlingtons Power Transistors in One)

MP4305

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: $I_C (\text{DC}) = -5 \text{ A}$ (max)
- High DC current gain: $h_{FE} = 2000$ (min) ($V_{CE} = -5 \text{ V}$, $I_C = -3 \text{ A}$)
- Diode included for absorbing fly-back voltage

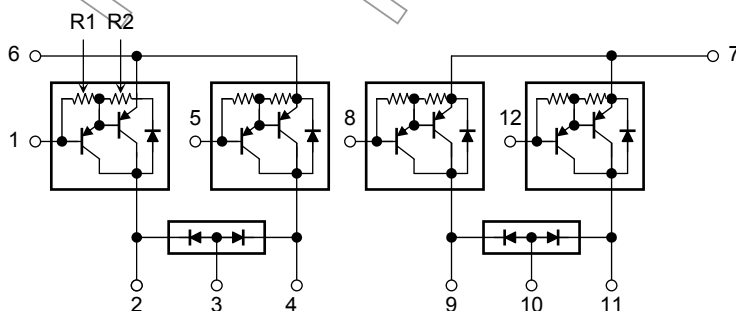
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics		Symbol	Rating	Unit
Collector-base voltage		V_{CBO}	-100	V
Collector-emitter voltage		V_{CEO}	-100	V
Emitter-base voltage		V_{EBO}	-6	V
Collector current	DC	I_C	-5	A
	Pulse	I_{CP}	-8	
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).

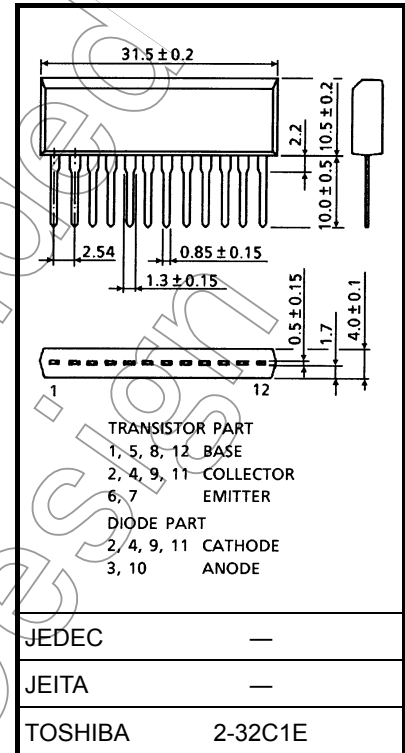
Array Configuration



$R1 \approx 4.5 \text{ k}\Omega$ $R2 \approx 300 \Omega$

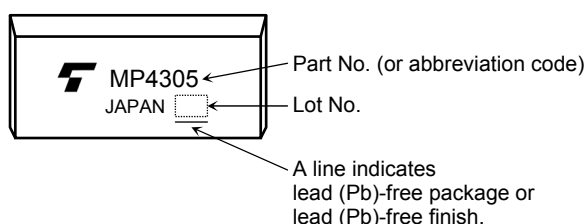
Industrial Applications

Unit: mm



Weight: 3.9 g (typ.)

Marking



Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance from junction to ambient (4-device operation, $T_a = 25^\circ\text{C}$)	$\Sigma R_{th(j-a)}$	28.4	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	T_L	260	$^\circ\text{C}$

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

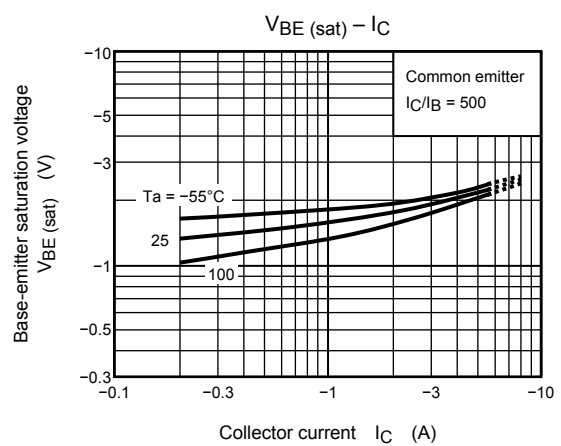
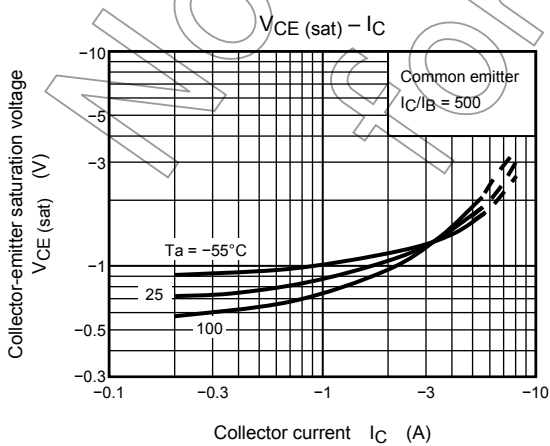
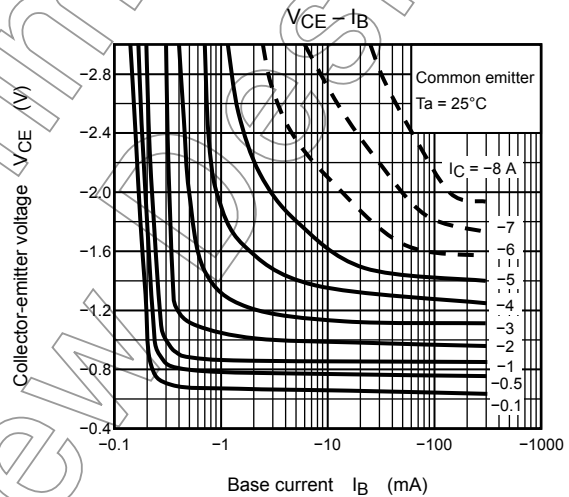
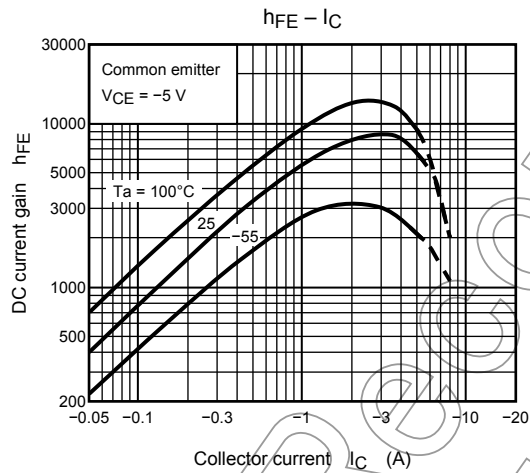
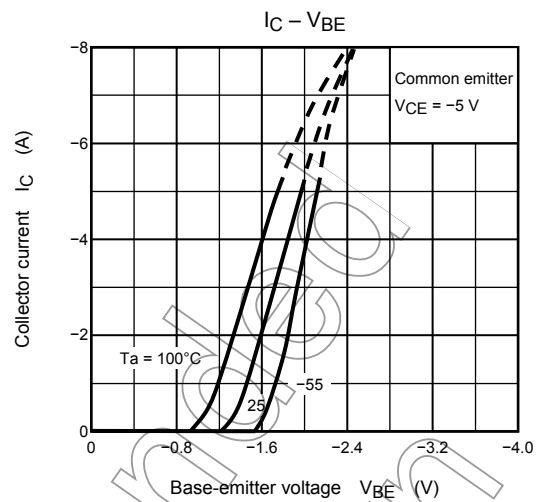
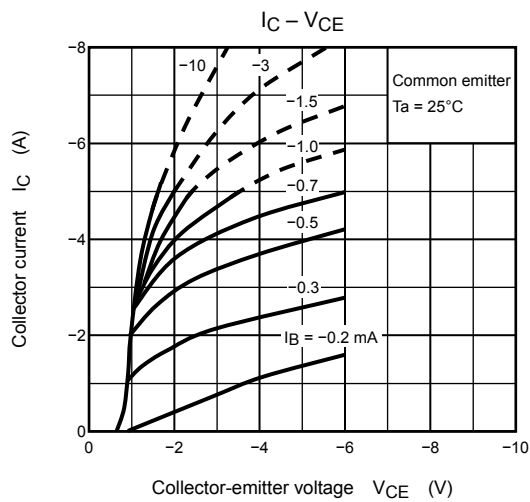
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	$V_{CB} = -100\text{ V}, I_E = 0\text{ A}$	—	—	-10	μA
Collector cut-off current		I_{CEO}	$V_{CE} = -100\text{ V}, I_B = 0\text{ A}$	—	—	-10	μA
Emitter cut-off current		I_{EBO}	$V_{EB} = -6\text{ V}, I_C = 0\text{ A}$	-0.6	—	-2.0	mA
Collector-base breakdown voltage		$V_{(BR)CBO}$	$I_C = -1\text{ mA}, I_E = 0\text{ A}$	-100	—	—	V
Collector-emitter breakdown voltage		$V_{(BR)CEO}$	$I_C = -10\text{ mA}, I_B = 0\text{ A}$	-100	—	—	V
DC current gain		$h_{FE(1)}$	$V_{CE} = -5\text{ V}, I_C = -3\text{ A}$	2000	—	15000	—
		$h_{FE(2)}$	$V_{CE} = -5\text{ V}, I_C = -5\text{ A}$	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}	<p>I_{B1} I_{B2} $20\text{ }\mu\text{s}$ $10\text{ }\Omega$ $V_{CC} = -30\text{ V}$</p> <p>— $I_{B1} = I_{B2} = 6\text{ mA}$, duty cycle $\leq 1\%$</p>	—	0.3	—	μs
	Storage time	t_{stg}		—	2.0	—	
	Fall time	t_f		—	0.4	—	

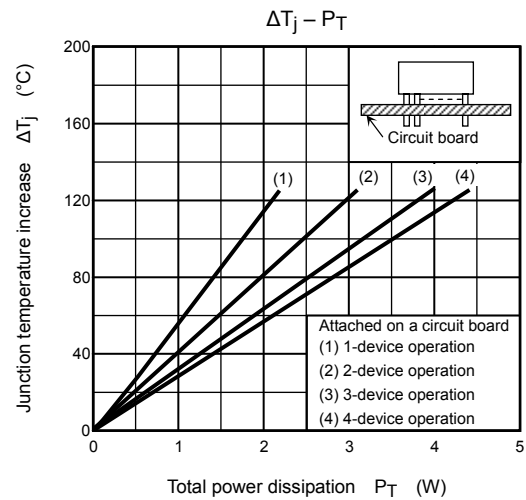
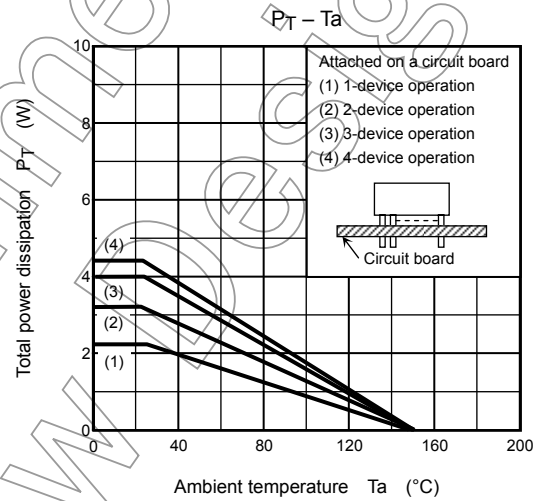
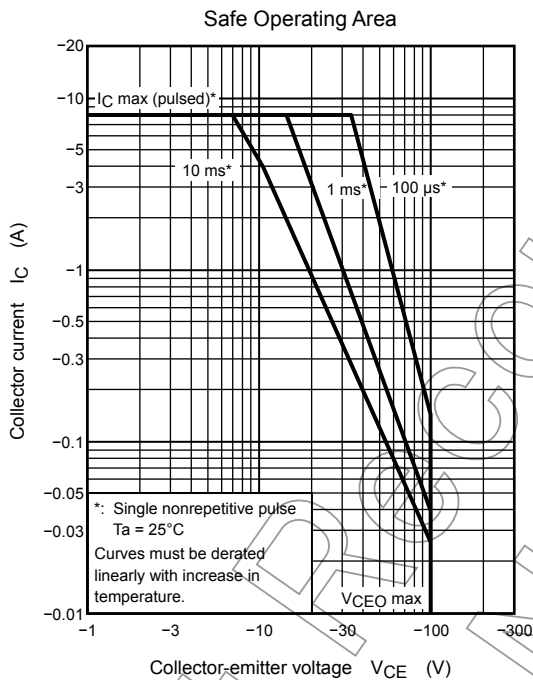
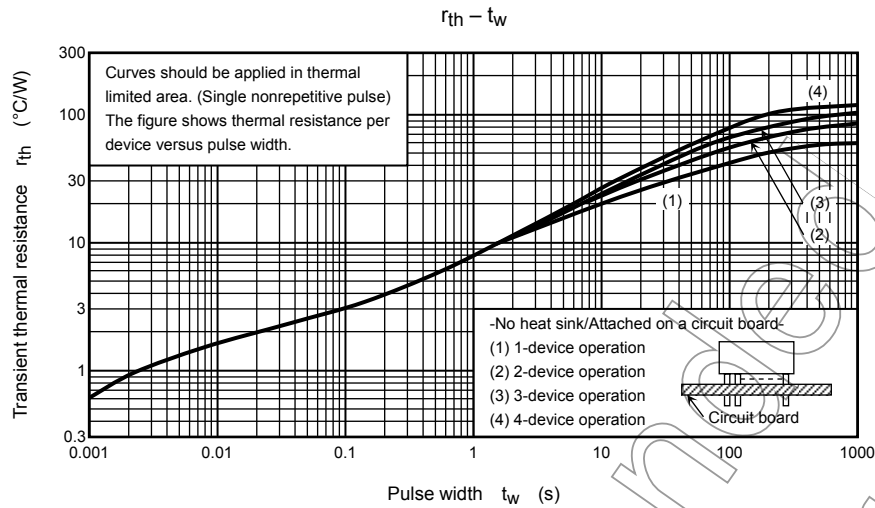
Emitter-Collector Diode Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	I_{FM}	—	—	—	3	A
Surge current	I_{FSM}	$t = 1 \text{ s, 1 shot}$	—	—	6	A
Forward voltage	V_F	$I_F = 1 \text{ A, } I_B = 0 \text{ A}$	—	—	2.0	V
Reverse recovery time	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}		—	8	—	μC

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	I_{FM}	—	—	—	3	A
Reverse current	I_R	$V_R = 110 \text{ V}$	—	—	0.4	μA
Reverse voltage	V_R	$I_R = 100 \mu\text{A}$	100	—	—	V
Forward voltage	V_F	$I_F = 1 \text{ A}$	—	—	1.5	V





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