

TOSHIBA POWER TRANSISTOR MODULE SILICON NPN & PNP EPITAXIAL TYPE (DARLINGTON POWER TRANSISTOR 4 IN 1)

MP4503

HIGH POWER SWITCHING APPLICATIONS.

HAMMER DRIVE, PULSE MOTOR DRIVE AND INDUCTIVE LOAD SWITCHING.

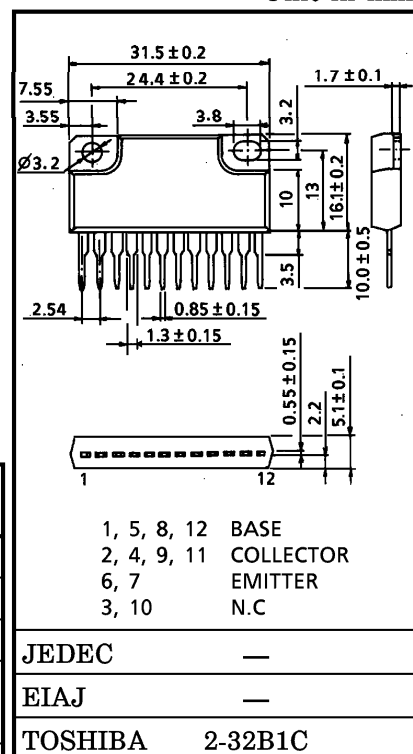
- Package with Heat Sink Isolated to Lead (SIP 12 Pin)
- High Collector Power Dissipation (4 Devices Operation)
: $P_T = 5W$ ($T_a = 25^\circ C$)
- High Collector Current : I_C (DC) = $\pm 4A$ (Max.)
- High DC Current Gain : $h_{FE} = 2000$ (Min.)
($V_{CE} = \pm 2V$, $I_C = \pm 1A$)

MAXIMUM RATINGS ($T_a = 25^\circ C$)

CHARACTERISTIC		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	3.0		W
Collector Power Dissipation (4 Devices Operation)	T _a = 25°C	P _T	5.0		W
	T _c = 25°C		25		
Isolation Voltage		V _{Isol}	1000		V
Junction Temperature		T _j	150		°C
Storage Temperature Range		T _{stg}	−55~150		°C

INDUSTRIAL APPLICATIONS

Unit in mm

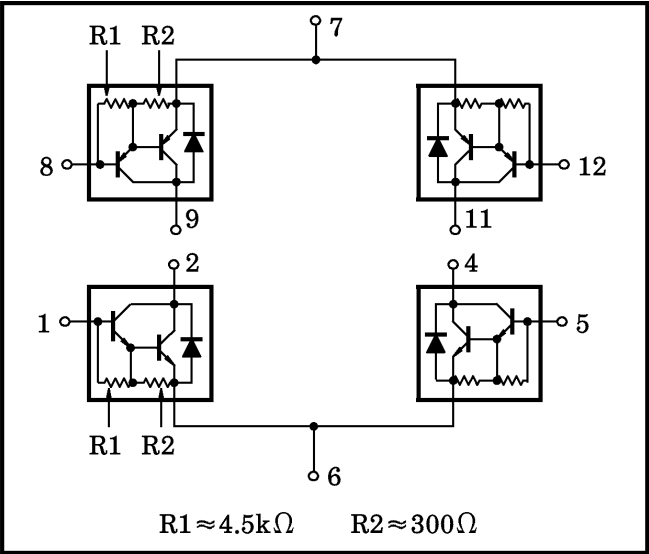


Weight : 6.0g

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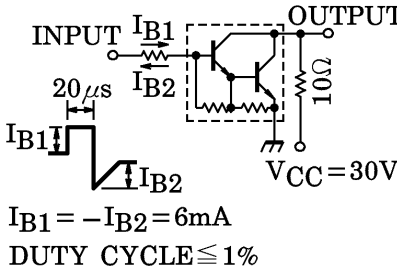
ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Junction to Ambient (4 Devices Operation, Ta=25°C)	$\Sigma R_{th(j-a)}$	25	°C / W
Thermal Resistance of Junction to Case (4 Devices Operation, Tc=25°C)	$\Sigma R_{th(j-c)}$	5.0	°C / W
Maximum Lead Temperature for Soldering Purposes (3.2mm from Case for 10s)	T _L	260	°C

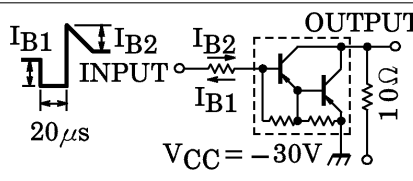
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$) (NPN TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		I_{CBO}	$V_{CB} = 100\text{V}, I_E = 0$	—	—	20	μA
Collector Cut-off Current		I_{CEO}	$V_{CE} = 80\text{V}, I_B = 0$	—	—	20	μA
Emitter Cut-off Current		I_{EBO}	$V_{EB} = 5\text{V}, I_C = 0$	0.5	—	2.5	mA
Collector-Base Breakdown Voltage		$V_{(BR) CBO}$	$I_C = 1\text{mA}, I_E = 0$	100	—	—	V
Collector-Emitter Breakdown Voltage		$V_{(BR) CEO}$	$I_C = 10\text{mA}, I_B = 0$	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	$V_{CE} (\text{sat})$	$I_C = 3\text{A}, I_B = 6\text{mA}$	—	—	1.5	V
	Base-Emitter	$V_{BE} (\text{sat})$	$I_C = 3\text{A}, I_B = 6\text{mA}$	—	—	2.0	
Transition Frequency		f_T	$V_{CE} = 2\text{V}, I_C = 0.5\text{A}$	—	60	—	MHz
Collector Output Capacitance		C_{ob}	$V_{CB} = 10\text{V}, I_E = 0, f = 1\text{MHz}$	—	30	—	pF
Switching Time	Turn-on Time	t_{on}	 INPUT I_{B1} I_{B2} $20\mu\text{s}$ I_{B1} I_{B2} $V_{CC} = 30\text{V}$ 10Ω OUTPUT $I_{B1} = -I_{B2} = 6\text{mA}$ DUTY CYCLE $\leq 1\%$	—	0.2	—	μs
	Storage Time	t_{stg}		—	1.5	—	
	Fall Time	t_f		—	0.6	—	

EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

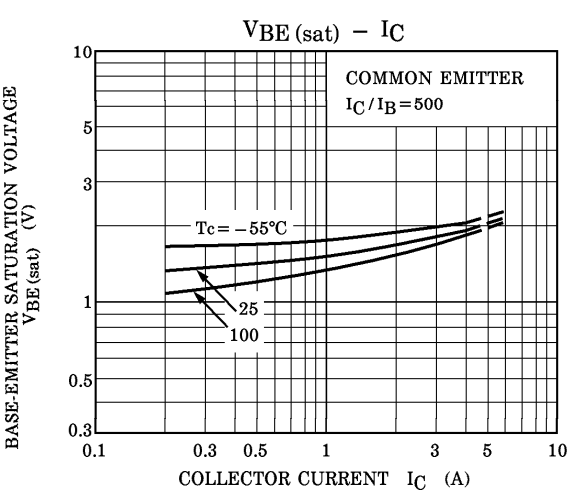
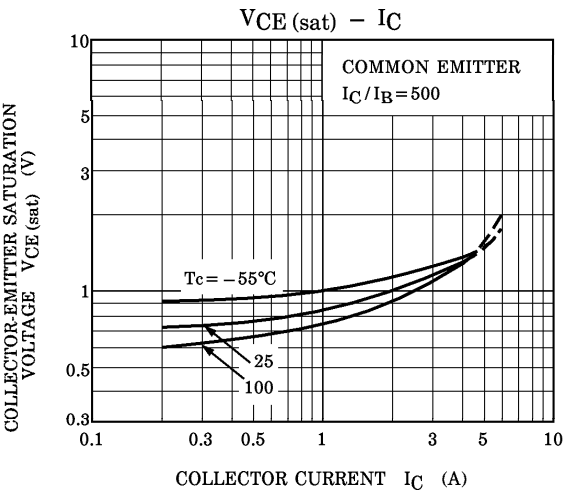
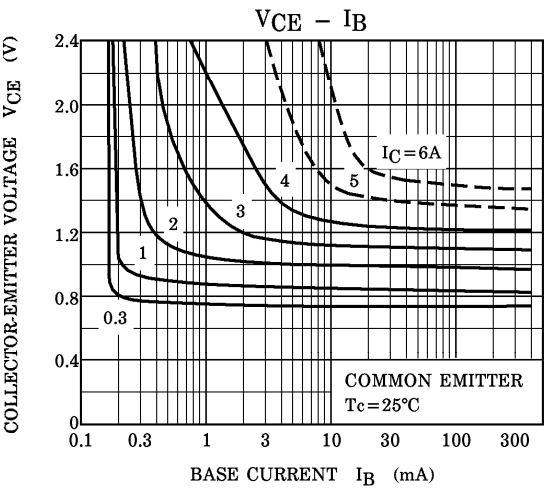
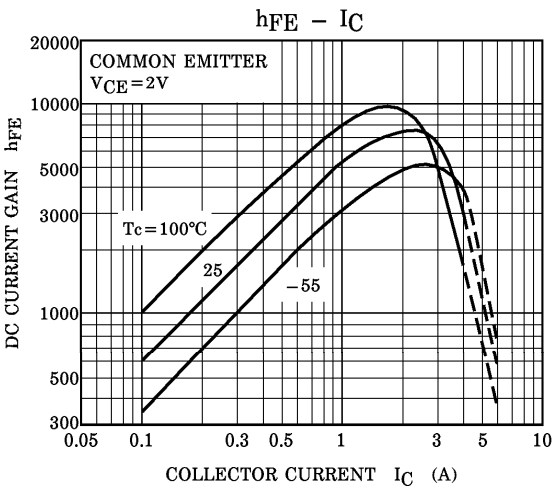
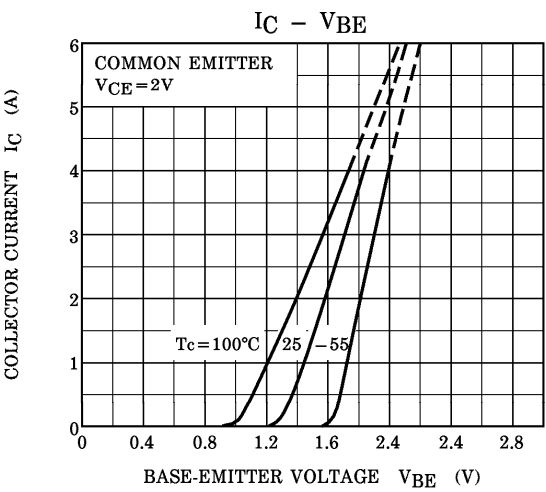
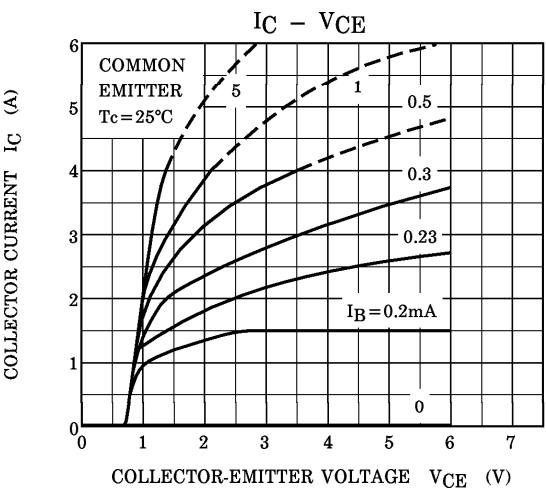
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Current	I_{FM}	—	—	—	4	A
Surge Current	I_{FSM}	$t = 1\text{s}, 1 \text{ shot}$	—	—	6	A
Forward Voltage	V_F	$I_F = 1\text{A}, I_B = 0$	—	—	2.0	V
Reverse Recovery Time	t_{rr}	$I_F = 4\text{A}, V_{BE} = -3\text{V},$	—	1.0	—	μs
Reverse Recovery Charge	Q_{rr}	$dI_F / dt = -50\text{A} / \mu\text{s}$	—	8	—	μC

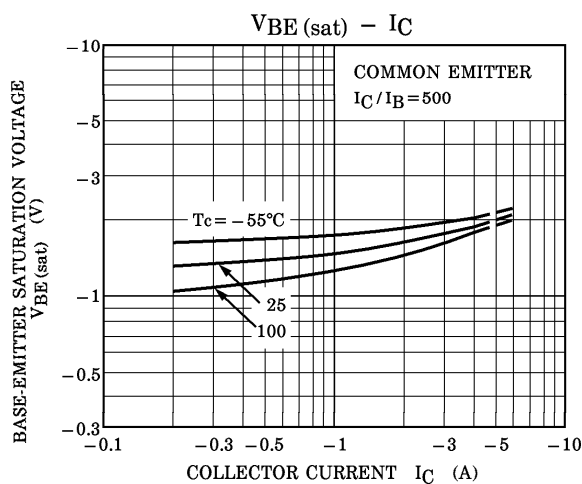
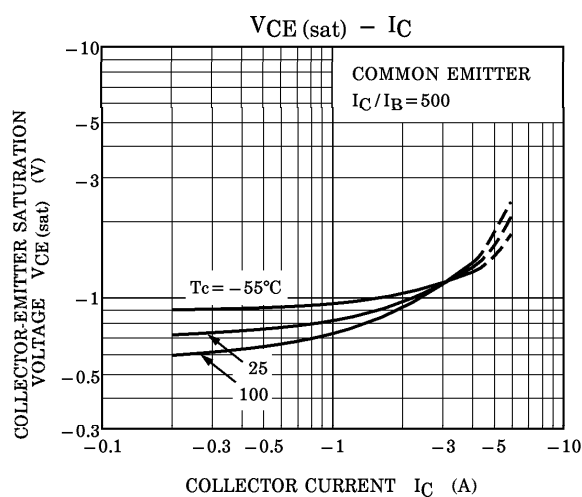
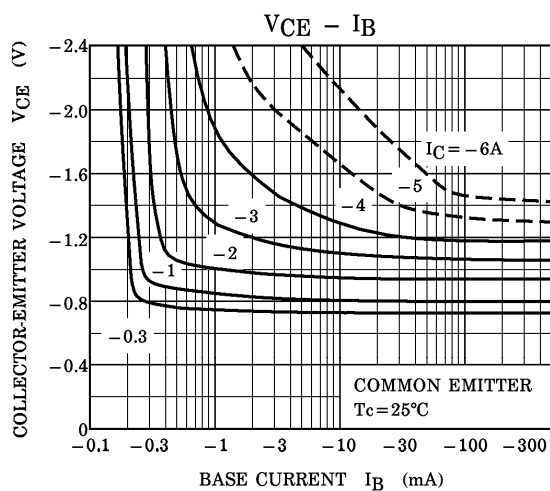
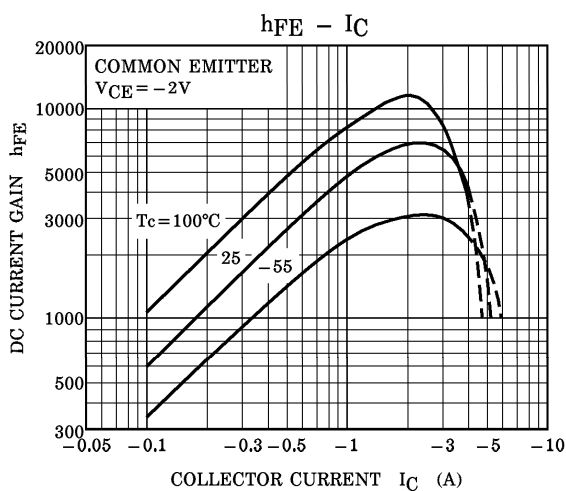
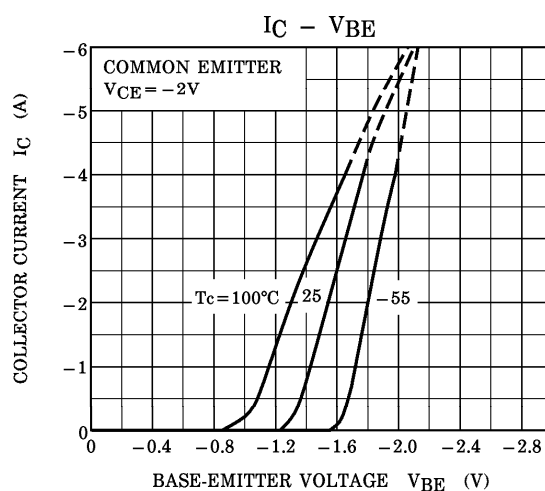
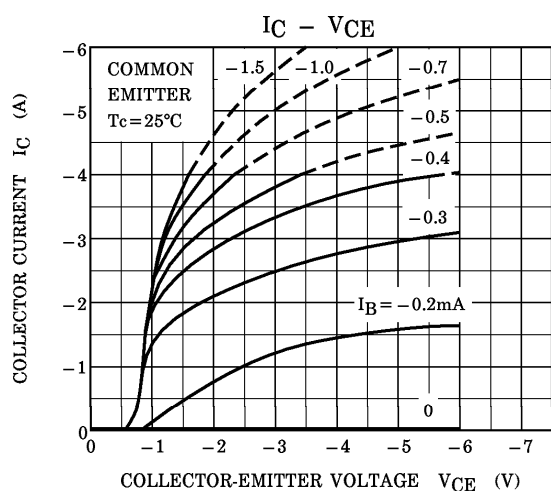
ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$) (PNP TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		I_{CBO}	$V_{CB} = -100\text{V}$, $I_E = 0$	—	—	-20	μA
Collector Cut-off Current		I_{CEO}	$V_{CE} = -80\text{V}$, $I_B = 0$	—	—	-20	μA
Emitter Cut-off Current		I_{EBO}	$V_{EB} = -5\text{V}$, $I_C = 0$	-0.5	—	-2.5	mA
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	$I_C = -1\text{mA}$, $I_E = 0$	-100	—	—	V
Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	$I_C = -10\text{mA}$, $I_B = 0$	-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}	$V_{CB} = -10\text{V}$, $I_E = 0$, $f = 1\text{MHz}$	—	55	—	pF
Switching Time	Turn-on Time	t_{on}		—	0.15	—	μs
	Storage Time	t_{stg}		—	0.80	—	
	Fall Time	t_f		—	0.40	—	

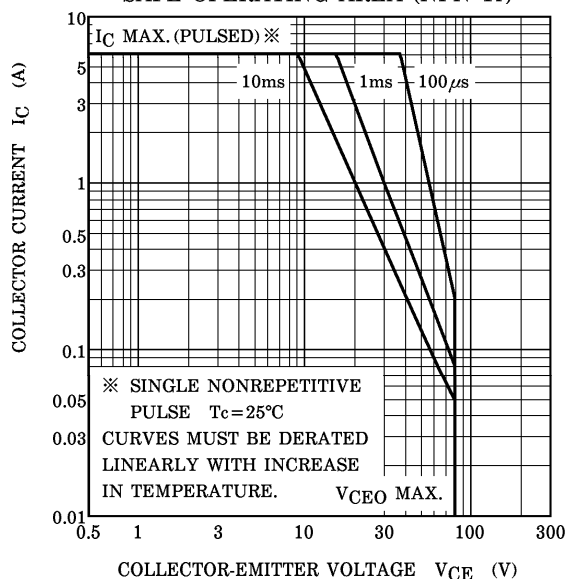
EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Forward Current	I_{FM}	—	—	—	4	A
Surge Current	I_{FSM}	$t = 1\text{s}$, 1 shot	—	—	6	A
Forward Voltage	V_F	$I_F = 1\text{A}$, $I_B = 0$	—	—	2.0	V
Reverse Recovery Time	t_{rr}	$I_F = 4\text{A}$, $V_{BE} = 3\text{V}$,	—	1.0	—	μs
Reverse Recovery Charge	Q_{rr}	$dI_F / dt = -50\text{A} / \mu\text{s}$	—	8	—	μC





SAFE OPERATING AREA (NPN Tr)



SAFE OPERATING AREA (PNP Tr)

