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

MP4503

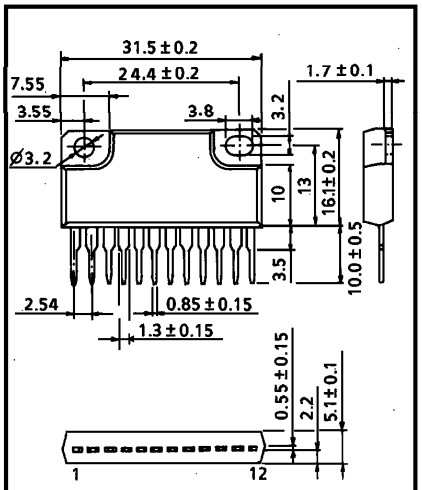
HIGH POWER SWITCHING APPLICATIONS.

HAMMER DRIVE, PULSE MOTOR DRIVE AND INDUCTIVE LOAD SWITCHING.

INDUSTRIAL APPLICATIONS

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

Unit in mm



1, 5, 8, 12	BASE
2, 4, 9, 11	COLLECTOR
6, 7	EMITTER
3, 10	N.C

JEDEC	—
EIAJ	—
TOSHIBA	2-32B1C

Weight : 6.0g

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING NPN	RATING PNP	UNIT
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	A
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)	Ta = 25°C	P_T	5.0		W
	Tc = 25°C		25		
Isolation Voltage		V_{Isol}	1000		V
Junction Temperature		T_j	150		°C
Storage Temperature Range		T_{stg}	−55~150		°C

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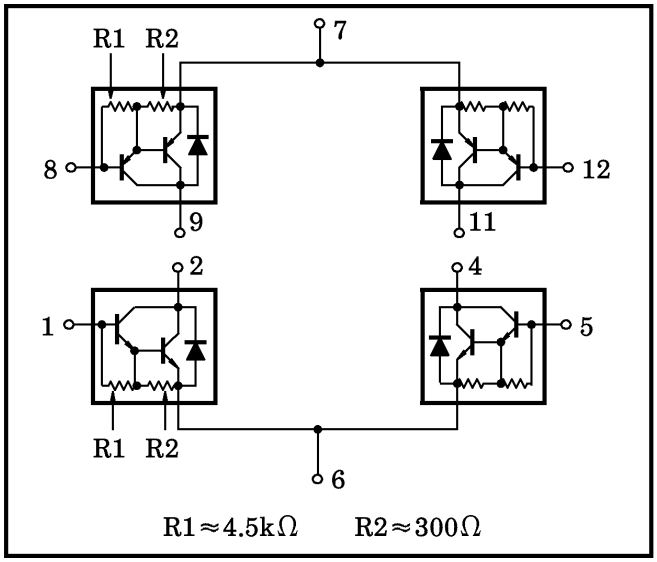
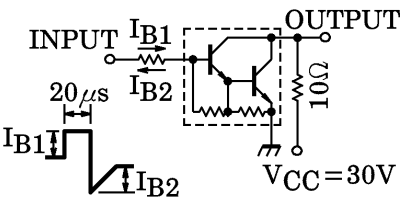
ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

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

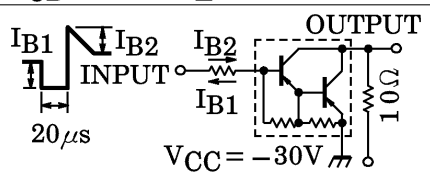
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (NPN TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		I_{CBO}	V_{CB} = 100V, I_E = 0	—	—	20	μA
Collector Cut-off Current		I_{CEO}	V_{CE} = 80V, I_B = 0	—	—	20	μA
Emitter Cut-off Current		I_{EBO}	V_{EB} = 5V, I_C = 0	0.5	—	2.5	mA
Collector-Base Breakdown Voltage		$V_{(BR)\,CBO}$	I_C = 1mA, I_E = 0	100	—	—	V
Collector-Emitter Breakdown Voltage		$V_{(BR)\,CEO}$	I_C = 10mA, I_B = 0	80	—	—	V
DC Current Gain		$h_{FE\,(1)}$	V_{CE} = 2V, I_C = 1A	2000	—	—	
		$h_{FE\,(2)}$	V_{CE} = 2V, I_C = 3A	1000			
Saturation Voltage	Collector-Emitter	$V_{CE\,(sat)}$	I_C = 3A, I_B = 6mA	—	—	1.5	V
	Base-Emitter	$V_{BE\,(sat)}$	I_C = 3A, I_B = 6mA	—	—	2.0	
Transition Frequency		f_T	V_{CE} = 2V, I_C = 0.5A	—	60	—	MHz
Collector Output Capacitance		C_{ob}	V_{CB} = 10V, I_E = 0, f = 1MHz	—	30	—	pF
Switching Time	Turn-on Time	t_{on}	 $I_{B1} = -I_{B2}$ = 6mA DUTY CYCLE ≦ 1%	—	0.2	—	μs
	Storage Time	t_{stg}		—	1.5	—	
	Fall Time	t_f		—	0.6	—	

EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

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

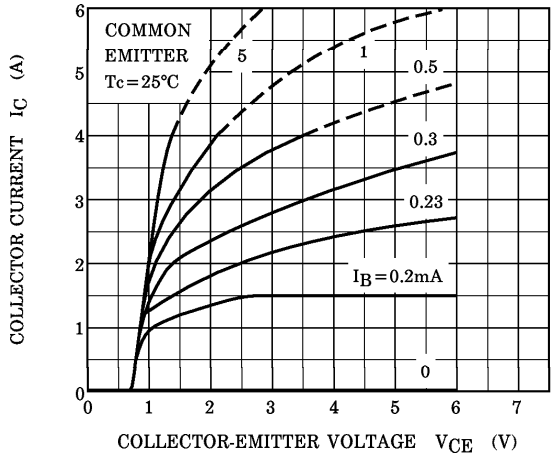
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (PNP TRANSISTOR)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		I_{CBO}	$V_{CB}=-100V$, $I_E=0$	—	—	−20	μA
Collector Cut-off Current		I_{CEO}	$V_{CE}=-80V$, $I_B=0$	—	—	−20	μA
Emitter Cut-off Current		I_{EBO}	$V_{EB}=-5V$, $I_C=0$	−0.5	—	−2.5	mA
Collector-Base Breakdown Voltage		$V_{(BR)\,CBO}$	$I_C=-1mA$, $I_E=0$	−100	—	—	V
Collector-Emitter Breakdown Voltage		$V_{(BR)\,CEO}$	$I_C=-10mA$, $I_B=0$	−80	—	—	V
DC Current Gain		$h_{FE\,(1)}$	$V_{CE}=-2V$, $I_C=-1A$	2000	—	—	
		$h_{FE\,(2)}$	$V_{CE}=-2V$, $I_C=-3A$	1000			
Saturation Voltage	Collector-Emitter	$V_{CE\,(sat)}$	$I_C=-3A$, $I_B=-6mA$	—	—	−1.5	V
	Base-Emitter	$V_{BE\,(sat)}$	$I_C=-3A$, $I_B=-6mA$	—	—	−2.0	
Transition Frequency		f_T	$V_{CE}=-2V$, $I_C=-0.5A$	—	40	—	MHz
Collector Output Capacitance		C_{ob}	$V_{CB}=-10V$, $I_E=0$, f=1MHz	—	55	—	pF
Switching Time	Turn-on Time	t_{on}		—	0.15	—	μs
	Storage Time	t_{stg}		—	0.80	—	
	Fall Time	t_f	$-I_{B1}=I_{B2}=6mA$, DUTY CYCLE≦1%	—	0.40	—	

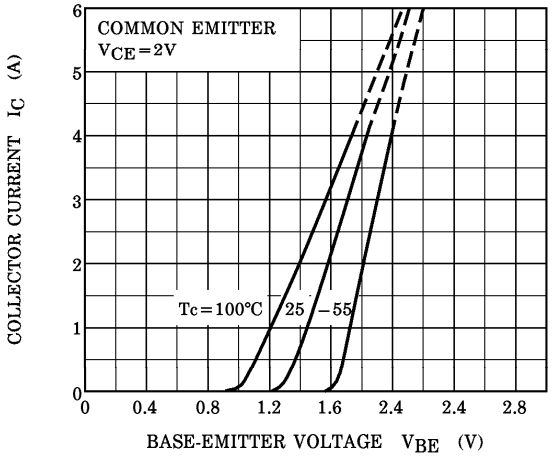
EMITTER-COLLECTOR DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

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

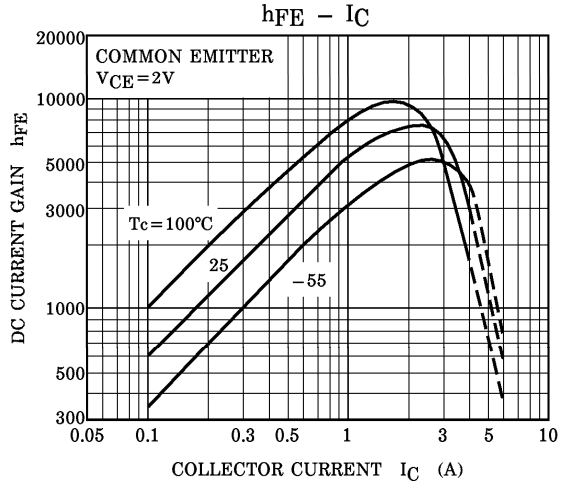
$I_C - V_{CE}$



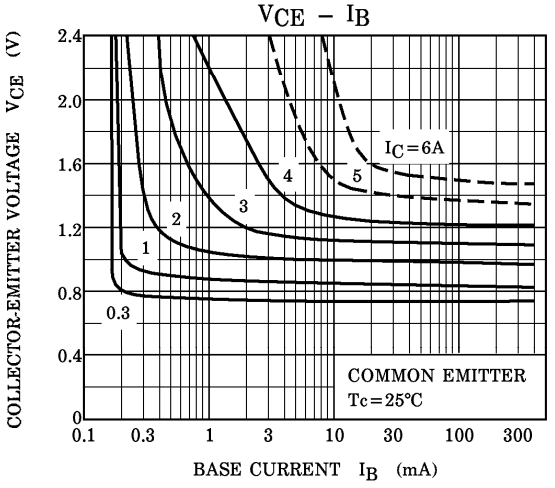
$I_C - V_{BE}$



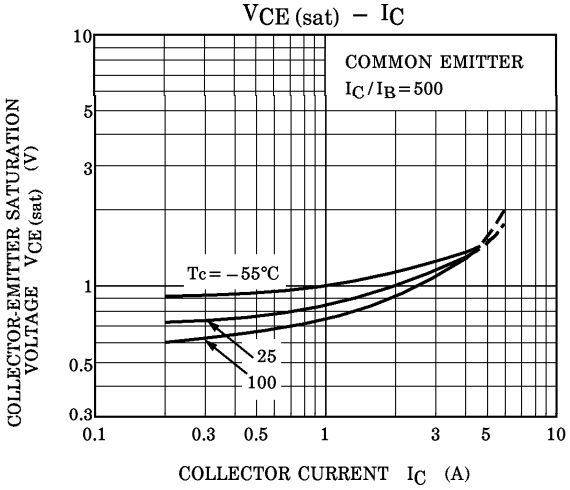
$h_{FE} - I_C$



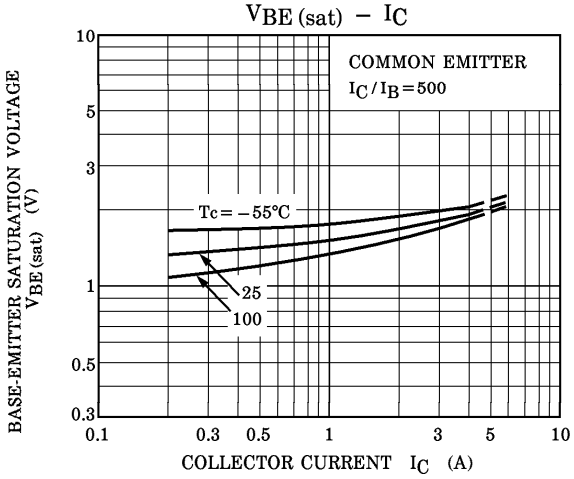
$V_{CE} - I_B$



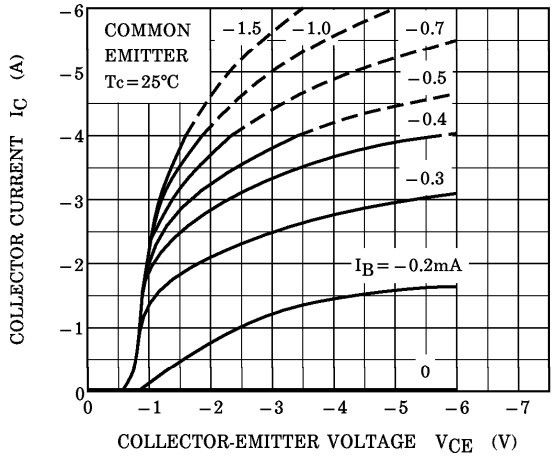
$V_{CE\,(sat)} - I_C$



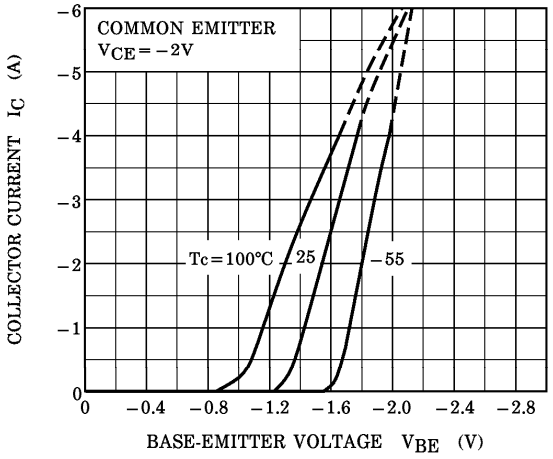
$V_{BE\,(sat)} - I_C$



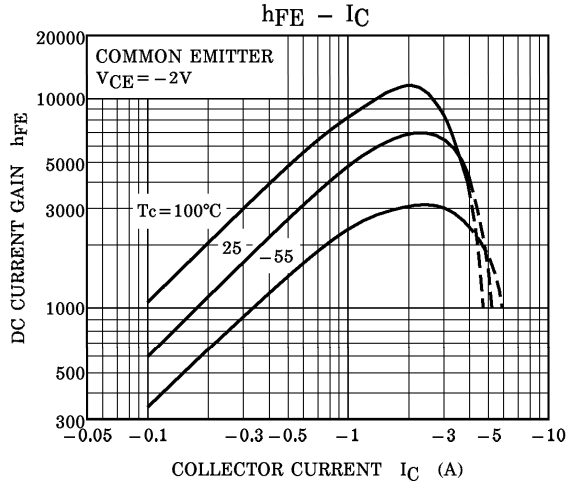
$I_C - V_{CE}$



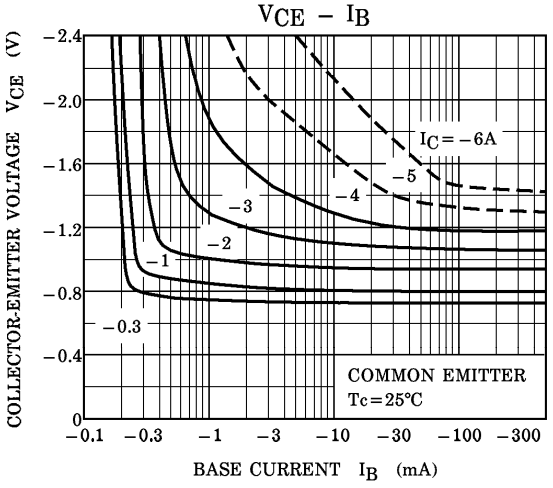
$I_C - V_{BE}$



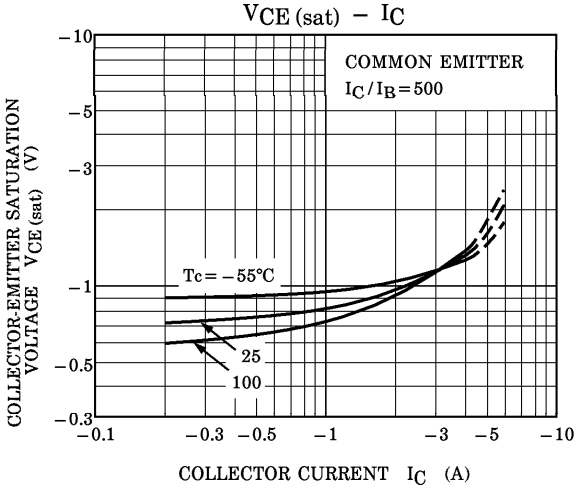
$h_{FE} - I_C$



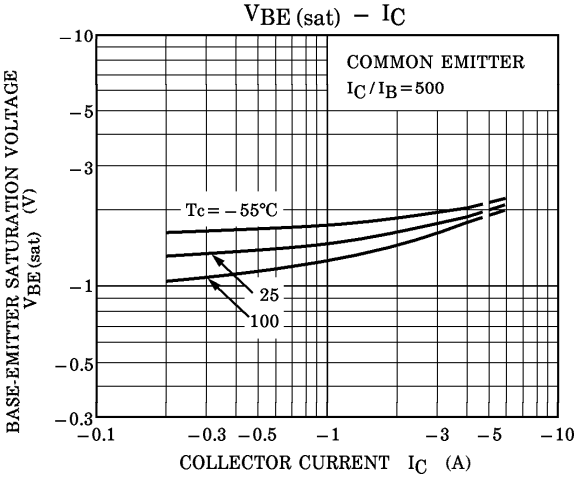
$V_{CE} - I_B$



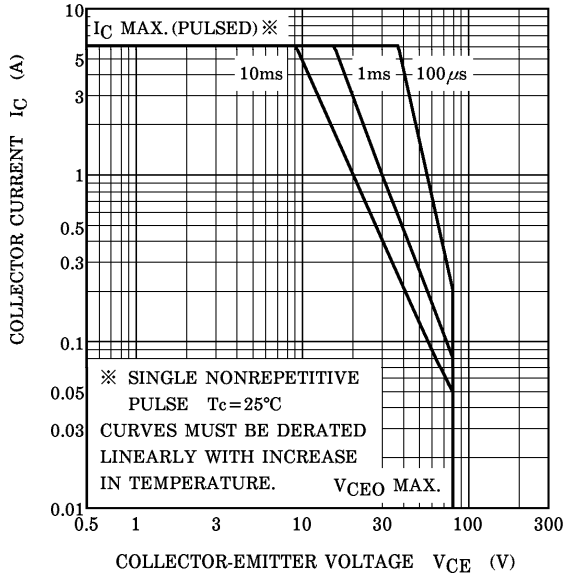
$V_{CE\,(sat)} - I_C$



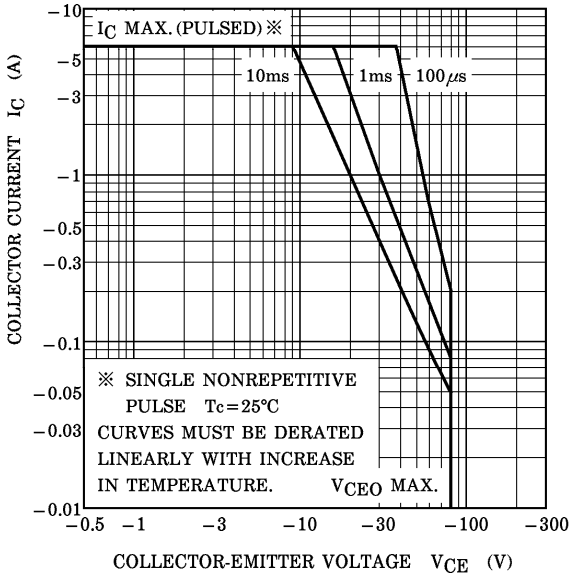
$V_{BE\,(sat)} - I_C$



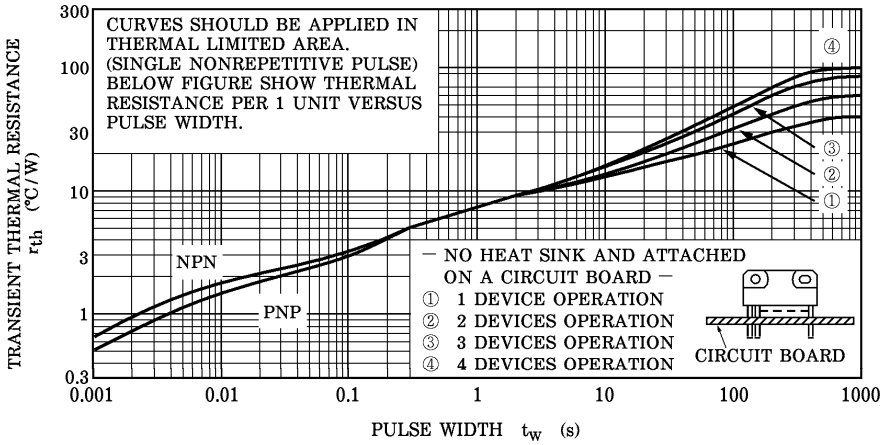
SAFE OPERATING AREA (NPN Tr)



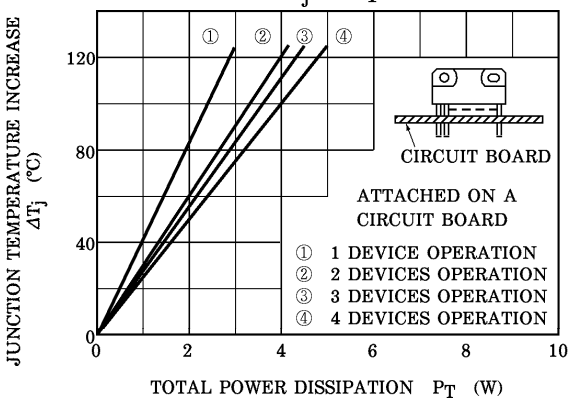
SAFE OPERATING AREA (PNP Tr)



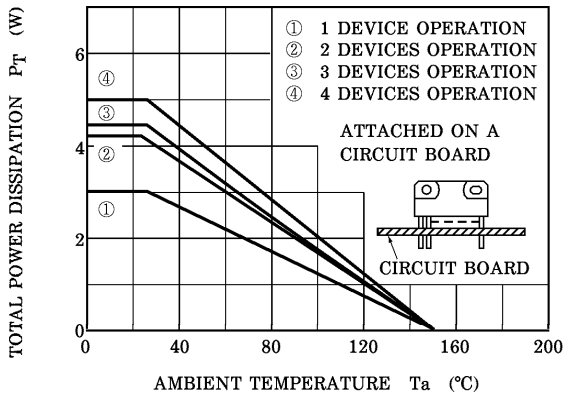
$r_{th} - t_w$



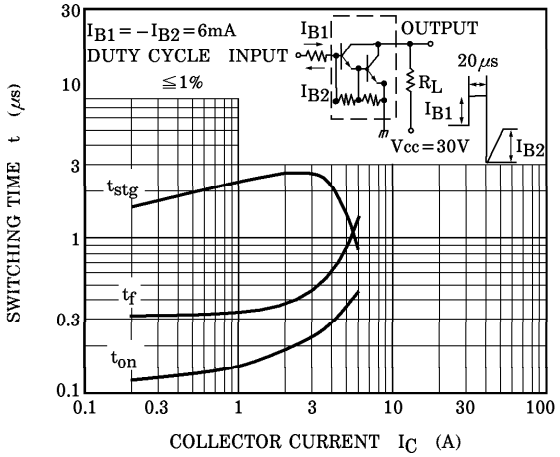
$\Delta T_j - P_T$



$P_T - Ta$



スイッチング特性 (NPN)



スイッチング特性 (PNP)