

# PNP SILICON HIGH-POWER TRANSISTORS

General Purpose use in amplifier and switching applications.

## FEATURES:

- \*DC Current Gain Specified- 1.0 to 30 A
- \* Low Collector-Emitter Saturation Voltage -  
 $V_{CE(sat)} = 0.75 \text{ V (Max.) @ } I_C = 10 \text{ A - 2N4398, 2N4399}$   
 $V_{CE(sat)} = 1.0 \text{ V (Max.) @ } I_C = 10 \text{ A - 2N5745}$
- \* Complements to NPN 2N5301,2N5302,2N5303

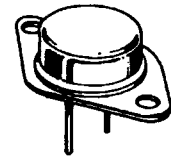
Boca Semiconducotor Corp.  
BSC

PNP  
2N4398  
2N4399  
2N5745

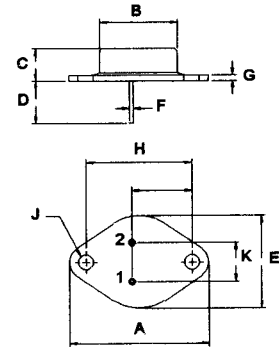
20, 30 AMPERE  
PNP SILICON  
POWER TRANSISTORS  
40-80 Volts  
200 Watts

## MAXIMUM RATINGS

Characteristic	Symbol	2N4398	2N4399	2N5745	Unit
Collector-Emitter Voltage	$V_{CBO}$	40	60	80	V
Collector-Emitter Voltage	$V_{CEO}$	40	60	80	V
Emitter-Base Voltage	$V_{EB}$	5.0			V
Collector Current-Continuous -Peak	$I_C$	30 50	30 50	20 50	A
Base current - Continuous - Peak	$I_B$	7.5 15			A
Total Power Dissipation @ $T_c=25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	200 1.15			W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	- 65 to +200			$^\circ\text{C}$



TO-3



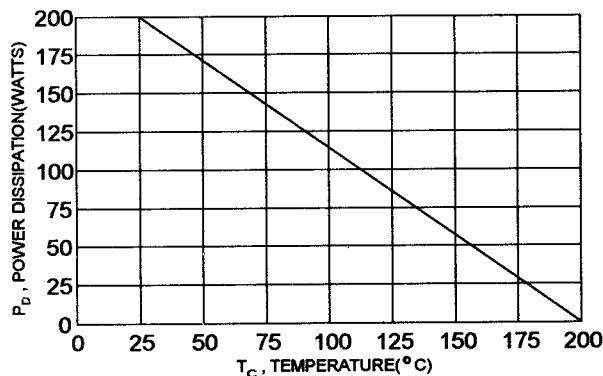
PIN 1.BASE  
2.EMITTER  
COLLECTOR(CASE)

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	0.875	$^\circ\text{C/W}$

DIM	MILLIMETERS	
	MIN	MAX
A	38.75	39.96
B	19.28	22.23
C	7.96	9.28
D	11.18	12.19
E	25.20	26.67
F	0.92	1.09
G	1.38	1.62
H	29.90	30.40
I	16.64	17.30
J	3.88	4.36
K	10.67	11.18

FIGURE -1 POWER DERATING



**ELECTRICAL CHARACTERISTICS** (  $T_c = 25^\circ\text{C}$  unless otherwise noted )

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector - Emitter Sustaining Voltage (1) ( $I_c = 200 \text{ mA}$ , $I_B = 0$ )	2N4398 2N4399 2N5745	$V_{CEO(sus)}$	40 60 80	V
Collector Cutoff Current ( $V_{CE} = 40 \text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 60 \text{ V}$ , $I_B = 0$ ) ( $V_{CE} = 80 \text{ V}$ , $I_B = 0$ )	2N4398 2N4399 2N5745	$I_{CEO}$	5.0 5.0 5.0	mA
Collector Cutoff Current ( $V_{CE} = 40 \text{ V}$ , $V_{BE(off)} = 1.5 \text{ V}$ ) ( $V_{CE} = 60 \text{ V}$ , $V_{BE(off)} = 1.5 \text{ V}$ ) ( $V_{CE} = 80 \text{ V}$ , $V_{BE(off)} = 1.5 \text{ V}$ ) ( $V_{CE} = 30 \text{ V}$ , $V_{BE(off)} = 1.5 \text{ V}$ , $T_c = 150^\circ\text{C}$ ) ( $V_{CE} = 80 \text{ V}$ , $V_{BE(off)} = 1.5 \text{ V}$ , $T_c = 150^\circ\text{C}$ )	2N4398 2N4399 2N5745 2N4398, 2N4399 2N5745	$I_{CEX}$	5.0 5.0 5.0 10 10	mA mA
Emitter Cutoff Current ( $V_{EB} = 5.0 \text{ V}$ , $I_c = 0$ )	All Types	$I_{EBO}$	5.0	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_c = 1.0 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 10 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 15 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 20 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 30 \text{ A}$ , $V_{CE} = 4.0 \text{ V}$ )	All Types 2N5745 2N4398, 2N4399 2N5745 2N4398, 2N4399	$h_{FE}$	40 15 15 5.0 5.0	60 60
Collector-Emitter Saturation Voltage ( $I_c = 10 \text{ A}$ , $I_B = 1.0 \text{ A}$ ) ( $I_c = 15 \text{ A}$ , $I_B = 1.5 \text{ A}$ ) ( $I_c = 20 \text{ A}$ , $I_B = 2.0 \text{ A}$ ) ( $I_c = 20 \text{ A}$ , $I_B = 4.0 \text{ A}$ ) ( $I_c = 30 \text{ A}$ , $I_B = 6.0 \text{ A}$ )	2N4398, 2N4399 2N5745 2N4398, 2N4399 2N5745 2N4398, 2N4399 2N5745 2N4398, 2N4399	$V_{CE(sat)}$	0.75 1.0 1.0 1.5 2.0 2.0 4.0	V
Base-Emitter Saturation Voltage ( $I_c = 10 \text{ A}$ , $I_B = 1.0 \text{ A}$ ) ( $I_c = 15 \text{ A}$ , $I_B = 1.5 \text{ A}$ ) ( $I_c = 20 \text{ A}$ , $I_B = 2.0 \text{ A}$ ) ( $I_c = 20 \text{ A}$ , $I_B = 4.0 \text{ A}$ )	2N4398, 2N4399 2N5745 2N4398, 2N4399 2N5745 2N4398, 2N4399 2N5745	$V_{BE(sat)}$	1.6 1.7 1.85 2.0 2.5 2.5	V
Base-Emitter On Voltage ( $I_c = 10 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 15 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ ) ( $I_c = 20 \text{ A}$ , $V_{CE} = 4.0 \text{ V}$ ) ( $I_c = 30 \text{ A}$ , $V_{CE} = 4.0 \text{ V}$ )	2N5745 2N4398, 2N4399 2N5745 2N4398, 2N4399	$V_{BE(on)}$	1.5 1.7 2.5 3.0	V

(1) Pulse Test: Pulse width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

**ELECTRICAL CHARACTERISTICS (  $T_C = 25^\circ\text{C}$  unless otherwise noted )**

Characteristic	Symbol	Min	Max	Unit
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**DYNAMIC CHARACTERISTICS**

Current-Gain-Bandwidth Product (2) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	2N4398, 2N4399 2N5745	$f_T$	4.0 2.0	MHz
Small-Signal Current Gain ( $I_C = 1.0\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ KHz}$ )		$h_{fe}$	40	

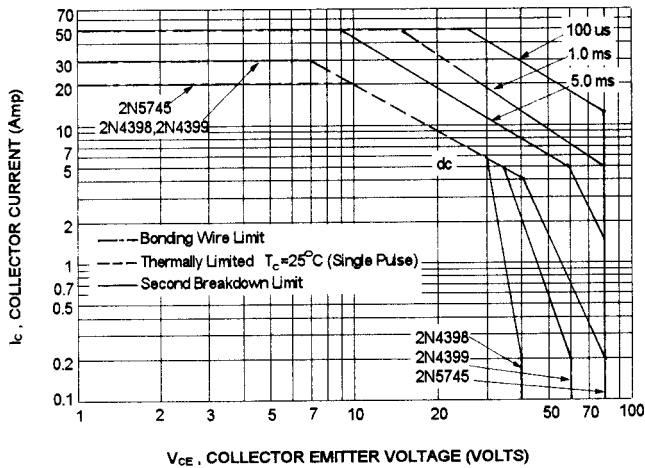
**SWITCHING CHARACTERISTICS**

Rise Time	$V_{CC} = 30\text{ V}$ $I_C = 10.0\text{ A}$	2N4398, 2N4399 2N5745	$t_r$	0.4 1.0	us
Storage Time	$I_{B1} = I_{B2} = 1.0\text{ A}$ $t_p = 0.1\text{ ms}$ Duty Cycle $\leq 2.0\%$	2N4398, 2N4399 2N5745	$t_s$	1.5 2.0	us
Fall Time		2N4398, 2N4399 2N5745	$t_f$	0.6 1.0	us

(1) Pulse Test: Pulse width = 300 us , Duty Cycle  $\leq 2.0\%$

(2)  $f_T = |h_{fe}| \cdot f_{test}$

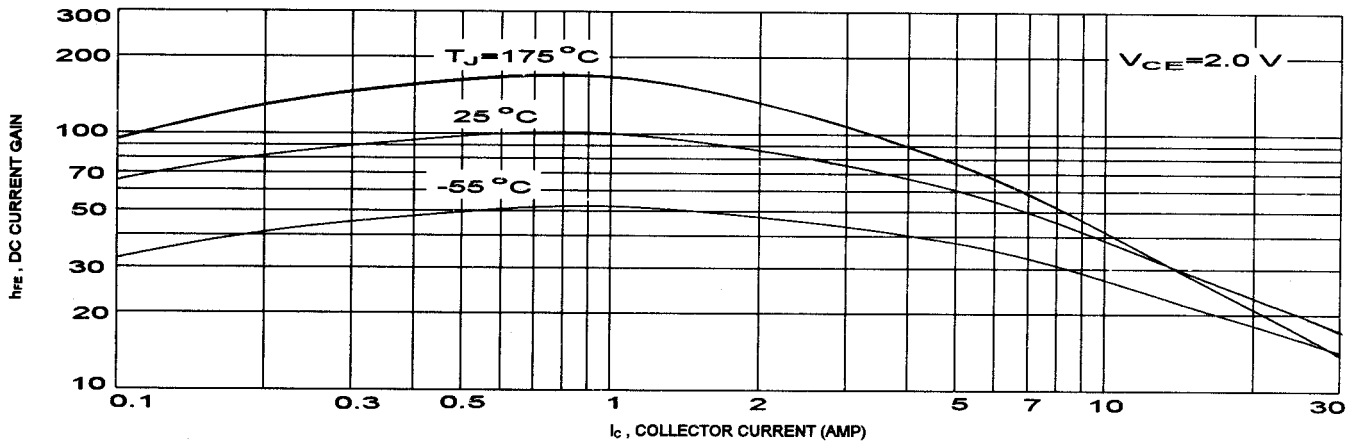
**ACTIVE REGION SAFE OPERATING AREA (SOA)**



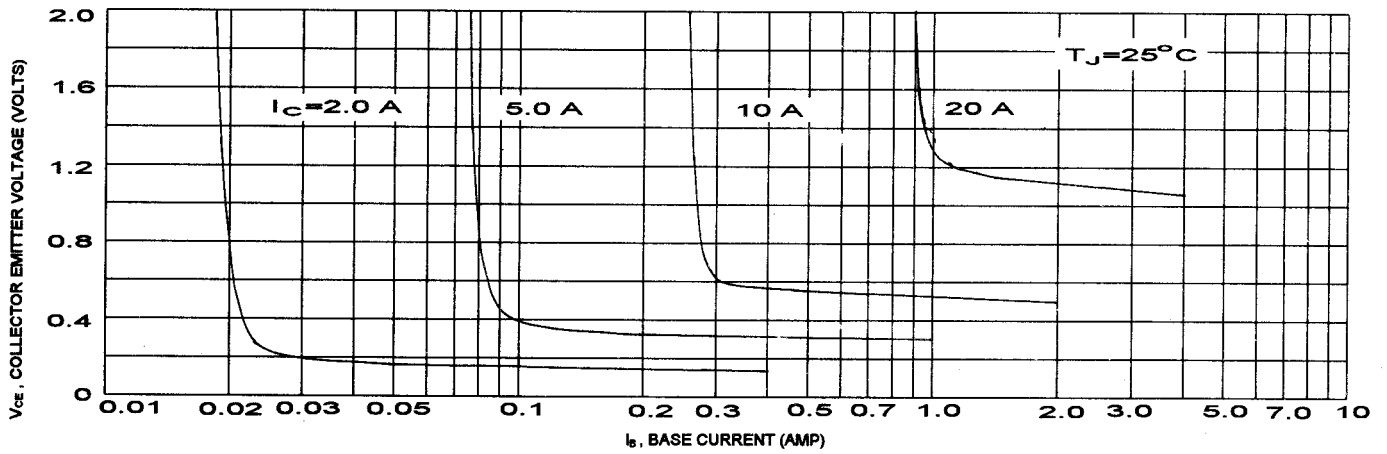
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation than curves indicate.

The data of SOA curve is base on  $T_{J(PK)} = 200^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(PK)} < 200^\circ\text{C}$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

DC CURRENT GAIN



COLLECTOR SATURATION REGION



"ON" VOLTAGES

