

## SWITCHMODE SERIES NPN POWER TRANSISTORS

... designed for use in high-voltage, high-speed, power switching applications such as switching regulator's, inverters, and conveter.

### FEATURES:

\*Collector-Emitter Sustaining Voltage-

$$V_{CEO(sus)} = 400 \text{ V (Min)}$$

\* Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 0.7 \text{ V (Max.) @ } I_C = 5.0 \text{ A, } I_B = 0.5 \text{ A}$$

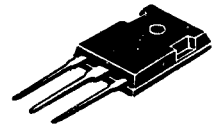
\* Switching Time -  $t_f = 0.7 \text{ us (Max.) @ } I_C = 5.0 \text{ A}$

**NPN**  
**2SC2938**

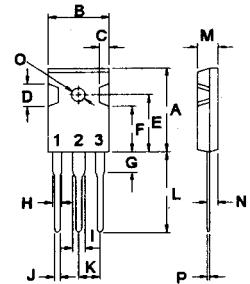
**10 AMPERE**  
**SILICON POWER**  
**TRANSISTORS**  
**400 VOLTS**  
**100 WATTS**

### MAXIMUM RATINGS

Characteristic	Symbol	2SC2938	Unit
Collector-Emitter Voltage	$V_{CEO}$	400	V
Collector-Base Voltage	$V_{CBO}$	500	V
Emitter-Base Voltage	$V_{EBO}$	7.0	V
Collector Current - Continuous	$I_C$	10	A
- Peak	$I_{CM}$	20	
Base current	$I_B$	4.0	A
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	100	W
Derate above $25^\circ\text{C}$		0.8	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$



**TO-247(3P)**



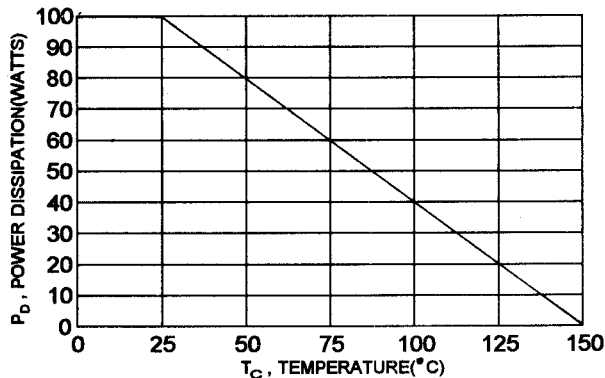
PIN 1.BASE  
2.COLLECTOR  
3.EMITTER

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance Junction to Case	$R_{\theta jc}$	1.25	$^\circ\text{C/W}$

DIM	MILLIMETERS	
	MIN	MAX
A	20.63	22.38
B	15.38	16.20
C	1.90	2.70
D	5.10	6.10
E	14.81	15.22
F	11.72	12.84
G	4.20	4.50
H	1.82	2.46
I	2.92	3.23
J	0.89	1.53
K	5.26	5.66
L	18.50	21.50
M	4.68	5.36
N	2.40	2.80
O	3.25	3.65
P	0.55	0.70

FIGURE -1 POWER DERATING



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

Characteristic	Symbol	Min	Max	Unit
----------------	--------	-----	-----	------

**OFF CHARACTERISTICS**

Collector-Emitter Sustaining Voltage ( $I_C = 100\text{ mA}$ , $I_B = 0$ )	$V_{CE(sus)}$	400		V
Collector Cutoff Current ( $V_{CE} = 320\text{ V}$ , $I_B = 0$ )	$I_{CEO}$		100	$\mu\text{A}$
Collector Cutoff Current ( $V_{CB} = 500\text{ V}$ , $I_E = 0$ )	$I_{CBO}$		100	$\mu\text{A}$
Emitter Cutoff Current ( $V_{EB} = 7.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$		1.0	mA

**ON CHARACTERISTICS (1)**

DC Current Gain ( $I_C = 5.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 10\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )	hFE	15 8.0		
Collector-Emitter Saturation Voltage ( $I_C = 4.0\text{ A}$ , $I_B = 400\text{ mA}$ )	$V_{CE(sat)}$		0.7	V
Base-Emitter Saturation Voltage ( $I_C = 4.0\text{ A}$ , $I_B = 400\text{ mA}$ )	$V_{BE(sat)}$		1.5	V

**DYNAMIC CHARACTERISTICS**

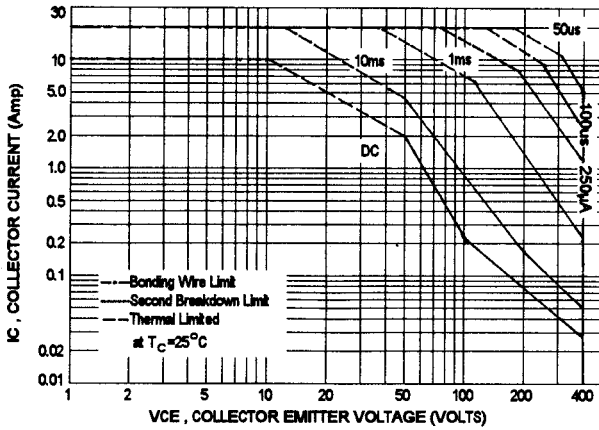
Current-Gain-Bandwidth Product ( $I_C = 1.0\text{ A}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$f_T$	5.0		MHz
--	-------	-----	--	-----

**SWITCHING CHARACTERISTICS**

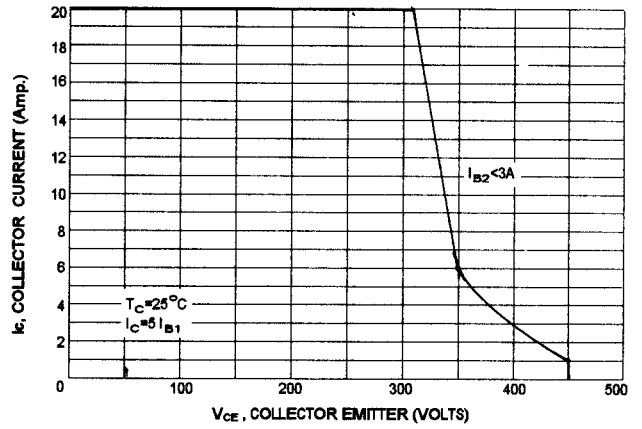
On Time	$V_{CC} = 200\text{ V}$ , $I_C = 5.0\text{ A}$ $I_{B1} = -I_{B2} = 1.0\text{ A}$ $R_L = 40\text{ ohm}$	$t_{on}$	1.0	$\mu\text{s}$
Storage Time		$t_s$	3.0	$\mu\text{s}$
Fall Time		$t_f$	0.7	$\mu\text{s}$

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

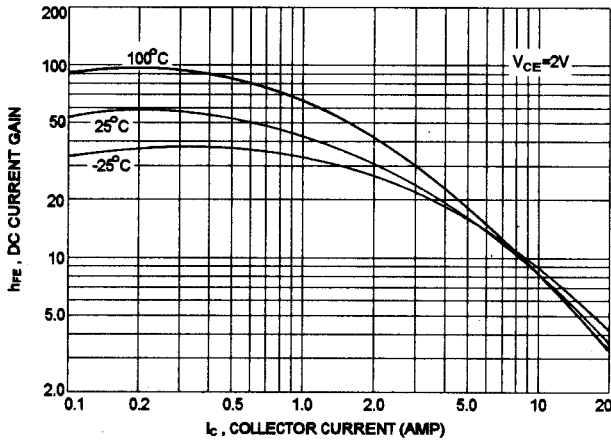
SAFE OPERATING AREA



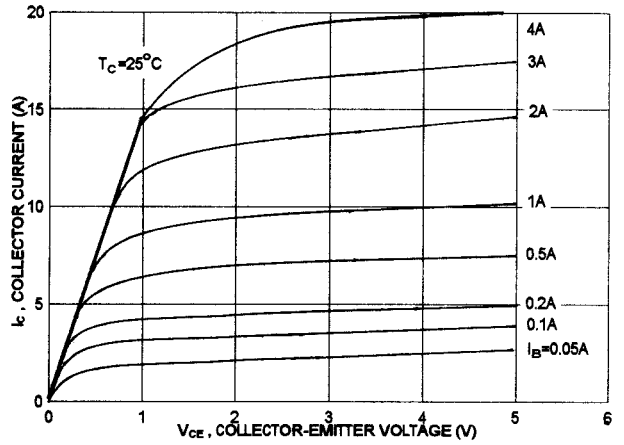
REVERSE BIASE SAFE OPERATING AREA



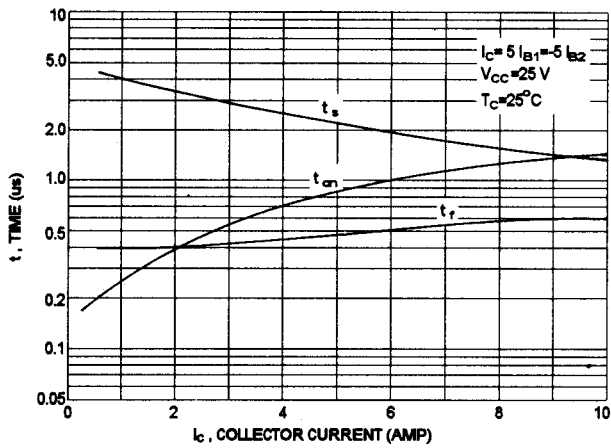
DC CURRENT GAIN



IC - Vce



SWITCHING TIME



COLLECTOR SATURATION REGION

