

## SWITCHMODE SERIES NPN POWER TRANSISTORS

... designed for use in high-voltage, high-speed, power switching in inductive circuit, they are particularly suited for 115 and 220 V switchmode applications such as switching regulator's, inverters, DC -DC and conveter

### FEATURES:

\*Collector-Emitter Sustaining Voltage-

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

\* Collector-Emitter Saturation Voltage -

$$V_{CE(sat)} = 1.0 \text{ V (Max.) @ } I_C = 4.0 \text{ A, } I_B = 0.8 \text{ A}$$

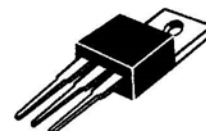
\* Switching Time -  $t_f = 1.0 \text{ us (Max.) @ } I_C = 5.0 \text{ A}$

**NPN**  
**2SC3039**

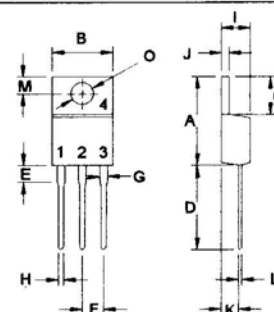
**7.0 AMPERE**  
**SILICON POWER**  
**TRANSISTORS**  
**400 VOLTS**  
**50 WATTS**

### MAXIMUM RATINGS

| Characteristic                                                                        | Symbol            | 2SC3039     | 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<br>- Peak                                              | $I_C$<br>$I_{CM}$ | 7.0<br>14   | A                        |
| Base current                                                                          | $I_B$             | 3.0         | A                        |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 50<br>0.4   | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{STG}$    | -55 to +150 | $^\circ\text{C}$         |



**TO-220**

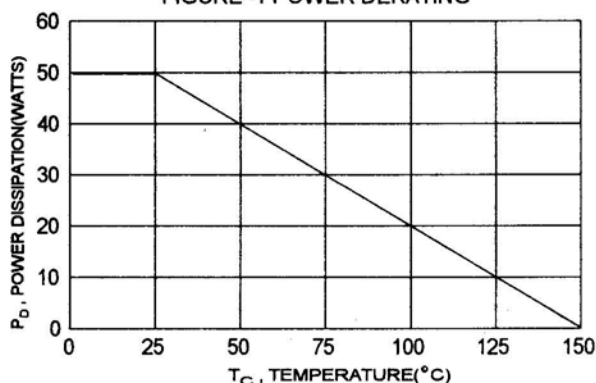


PIN 1.BASE  
2.COLLECTOR  
3.EMITTER  
4.COLLECTOR(CASE)

### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max | Unit               |
|-------------------------------------|-----------------|-----|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 2.5 | $^\circ\text{C/W}$ |

**FIGURE -1 POWER DERATING**



| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 14.68       | 16.00 |
| B   | 9.78        | 10.42 |
| C   | 5.02        | 6.60  |
| D   | 13.00       | 14.62 |
| E   | 3.10        | 4.19  |
| F   | 2.41        | 2.67  |
| G   | 1.10        | 1.67  |
| H   | 0.69        | 1.01  |
| I   | 3.21        | 4.98  |
| J   | 1.14        | 1.40  |
| K   | 2.20        | 3.30  |
| L   | 0.28        | 0.61  |
| M   | 2.48        | 3.00  |
| O   | 3.50        | 4.00  |

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

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

## OFF CHARACTERISTICS

|                                                                                                                          |                |     |    |               |
|--------------------------------------------------------------------------------------------------------------------------|----------------|-----|----|---------------|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 7.0\text{ A}$ , $I_{B1} = 1.4\text{ A}$ , $L = 50\text{ }\mu\text{H}$ ) | $V_{CEO(sus)}$ | 400 |    | V             |
| Collector-Base Breakdown Voltage<br>( $I_C = 1.0\text{ mA}$ , $I_E = 0$ )                                                | $V_{(BR)CBO}$  | 500 |    | V             |
| Collector-Emitter Breakdown Voltage<br>( $I_C = 5.0\text{ mA}$ , $I_B = 0$ )                                             | $V_{(BR)CEO}$  | 400 |    | V             |
| Emitter-Base Breakdown Voltage<br>( $I_E = 1.0\text{ mA}$ , $I_C = 0$ )                                                  | $V_{(BR)EBO}$  | 7.0 |    | V             |
| Collector Cutoff Current<br>( $V_{CB} = 400\text{ V}$ , $I_E = 0$ )                                                      | $I_{CBO}$      |     | 10 | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )                                                        | $I_{EBO}$      |     | 10 | $\mu\text{A}$ |

## ON CHARACTERISTICS (1)

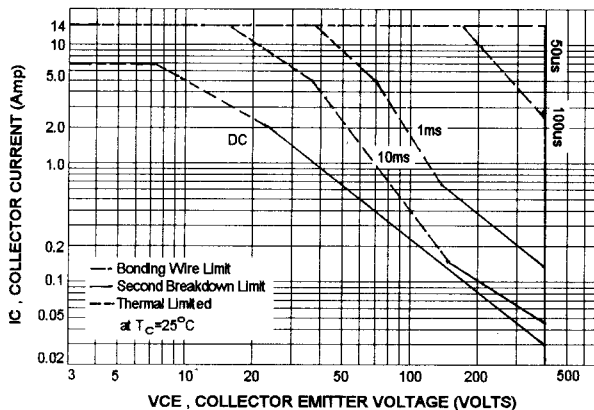
|                                                                                                                             |                         |           |     |   |
|-----------------------------------------------------------------------------------------------------------------------------|-------------------------|-----------|-----|---|
| DC Current Gain<br>( $I_C = 0.8\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_C = 4.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ ) | $h_{FE(2)}$<br>$h_{FE}$ | 15<br>8.0 | 50  |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 4.0\text{ A}$ , $I_B = 800\text{ mA}$ )                                    | $V_{CE(sat)}$           |           | 1.0 | V |
| Base-Emitter Saturation Voltage<br>( $I_C = 4.0\text{ A}$ , $I_B = 800\text{ mA}$ )                                         | $V_{BE(sat)}$           |           | 1.5 | V |

## SWITCHING CHARACTERISTICS

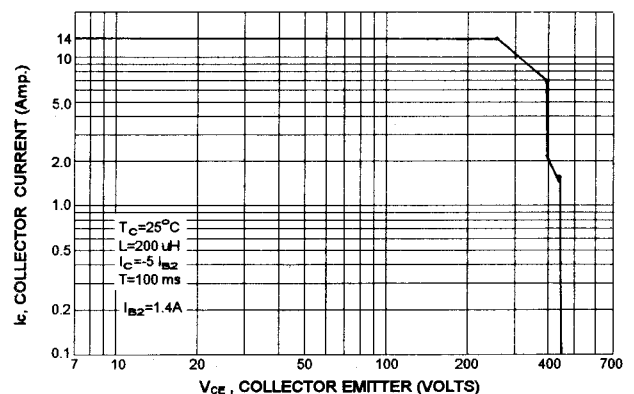
|              |                                                                                                                 |          |     |               |
|--------------|-----------------------------------------------------------------------------------------------------------------|----------|-----|---------------|
| On Time      | $V_{CC} = 200\text{ V}$ , $I_C = 5.0\text{ A}$<br>$I_{B1} = -I_{B2} = 1.0\text{ A}$<br>$R_L = 40\text{ }\Omega$ | $t_{on}$ | 1.0 | $\mu\text{s}$ |
| Storage Time |                                                                                                                 | $t_s$    | 2.5 | $\mu\text{s}$ |
| Fall Time    |                                                                                                                 | $t_f$    | 1.0 | $\mu\text{s}$ |

(1) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ ,\*  $h_{FE(2)}$  Classification: L : 15 — 30 ; M : 20 — 40 ; N : 30 — 50

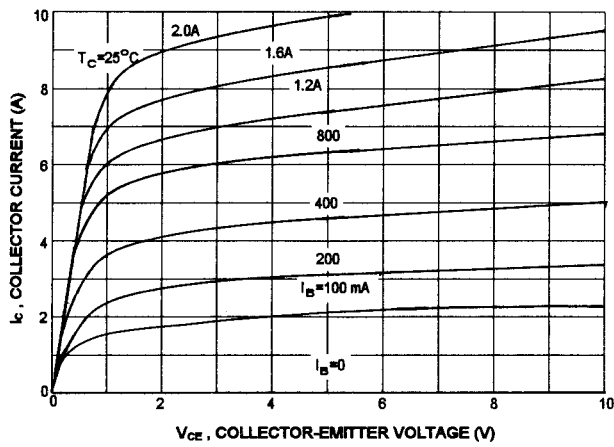
SAFE OPERATING AREA



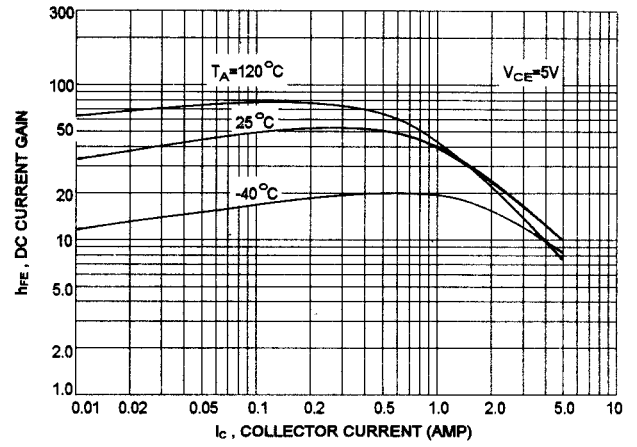
REVERSE BIAS SAFE OPERATING AREA



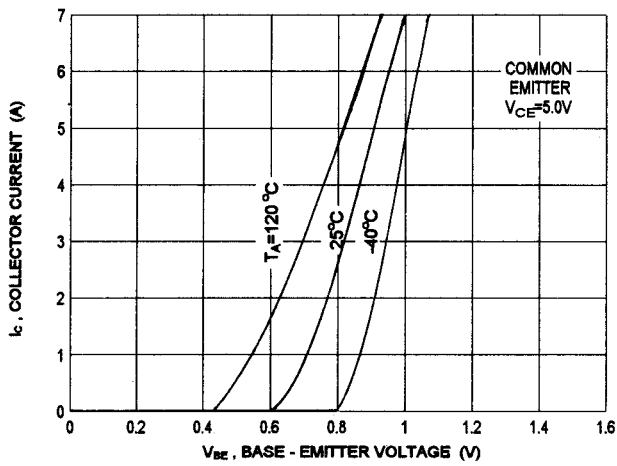
$I_C - V_{CE}$



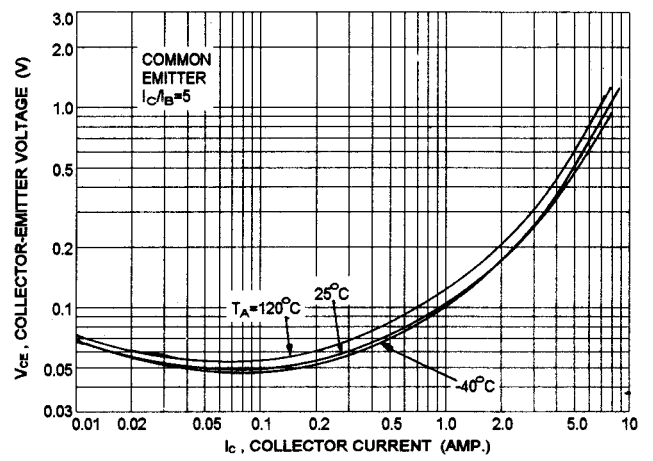
DC CURRENT GAIN



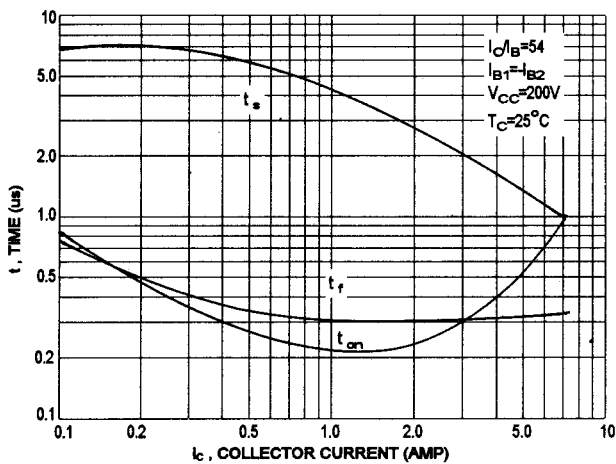
$I_C - V_{BE}$



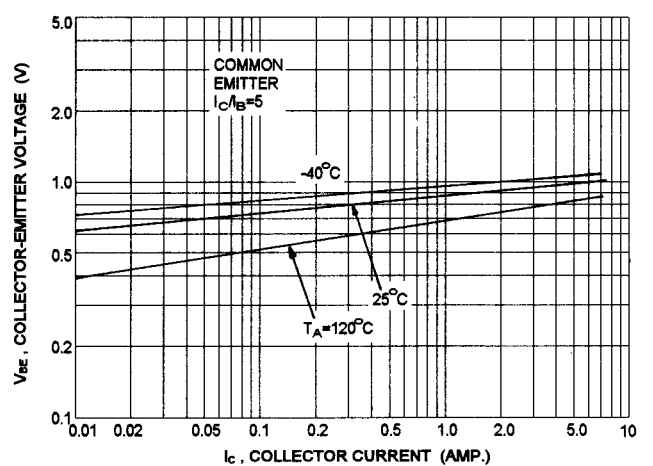
$V_{CE} - I_C$



SWITCHING TIME



$V_{BE} - I_C$



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