

## NPN SILICON POWER TRANSISTORS

...designed for use in TV horizontal deflection output applications

### FEATURES:

- \* Low Collector-Emitter Saturation Voltage  
 $V_{CE(sat)} = 1.0V(\text{Max}) @ I_C = 4.0A, I_B = 0.4A$
- \* DC Current Gain  
 $hFE = 30-150 @ I_C = 1.0A$
- \* Large Collector Current Capability

**NPN**  
**2SC2233**

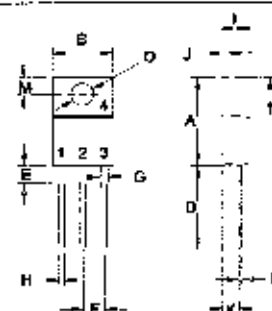
**4.0 AMPERE**  
**SILICON POWER**  
**TRANSISTORS**  
**60 VOLTS**  
**40 WATTS**

### MAXIMUM RATINGS

| Characteristic                                                                        | Symbol            | 2SC2233     | Unit                     |
|---------------------------------------------------------------------------------------|-------------------|-------------|--------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEO}$         | 60          | V                        |
| Collector-Base Voltage                                                                | $V_{CBO}$         | 200         | V                        |
| Emitter-Base Voltage                                                                  | $V_{EBO}$         | 5.0         | V                        |
| Collector Current - Continuous<br>- Peak                                              | $I_C$<br>$I_{CM}$ | 4.0<br>10   | A                        |
| Base current                                                                          | $I_B$             | 2.0         | A                        |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 40<br>0.32  | 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

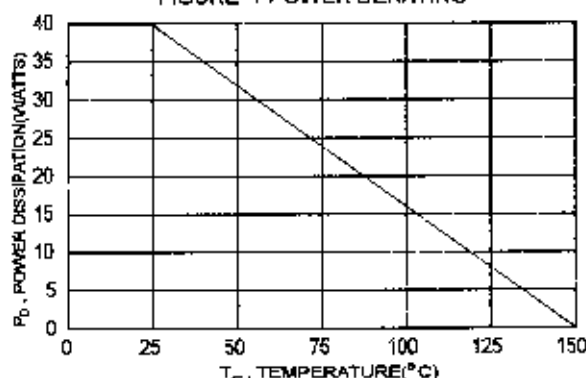


PIN 1: BASE  
 2: COLLECTOR  
 3: EMITTER  
 4: COLLECTOR (CASE)

### THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max   | Unit               |
|-------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 3.125 | $^\circ\text{C/W}$ |

FIGURE -1 POWER DERATING



| DIM | MILLIMETERS |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 14.68       | 15.31 |
| B   | 9.78        | 10.42 |
| C   | 5.01        | 6.52  |
| D   | 13.08       | 14.62 |
| E   | 3.57        | 4.07  |
| F   | 2.42        | 3.66  |
| G   | 1.12        | 1.36  |
| H   | 0.72        | 0.96  |
| I   | 4.22        | 4.96  |
| J   | 1.14        | 1.36  |
| K   | 2.20        | 2.97  |
| L   | 0.33        | 0.55  |
| M   | 2.48        | 2.98  |
| Q   | 3.70        | 3.90  |

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

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

**OFF CHARACTERISTICS**

|                                                                     |           |     |    |               |
|---------------------------------------------------------------------|-----------|-----|----|---------------|
| Collector-Emitter Voltage<br>( $I_C = 50\text{ mA}$ , $I_B = 0$ )   | $V_{CE0}$ | 60  |    | V             |
| Emitter-Base Voltage<br>( $I_B = 1.0\text{ mA}$ , $I_C = 0$ )       | $V_{EB0}$ | 5.0 |    | V             |
| Collector Cutoff Current<br>( $V_{CB} = 170\text{ V}$ , $I_E = 0$ ) | $I_{CBO}$ |     | 10 | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )   | $I_{EBO}$ |     | 10 | $\mu\text{A}$ |

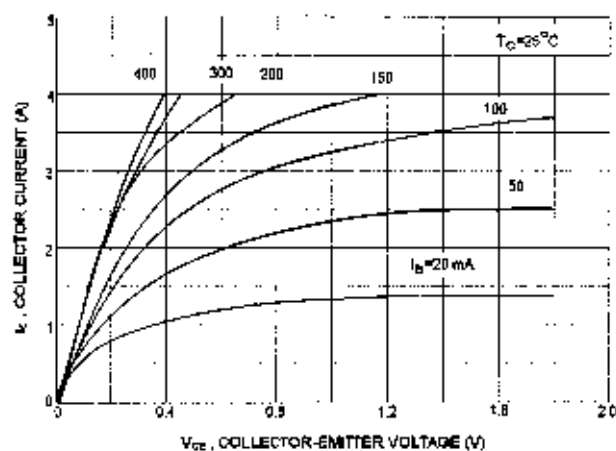
**ON CHARACTERISTICS (1)**

|                                                                                                                             |               |          |     |   |
|-----------------------------------------------------------------------------------------------------------------------------|---------------|----------|-----|---|
| DC Current Gain<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ )<br>( $I_C = 4.0\text{ A}$ , $V_{CE} = 5.0\text{ V}$ ) | $h_{FE}$      | 30<br>20 | 150 |   |
| Collector-Emitter Saturation Voltage<br>( $I_C = 4.0\text{ A}$ , $I_B = 400\text{ mA}$ )                                    | $V_{CE(sat)}$ |          | 1.0 | V |
| Base-Emitter Saturation Voltage<br>( $I_C = 4.0\text{ A}$ , $I_B = 400\text{ mA}$ )                                         | $V_{BE(sat)}$ |          | 1.5 | V |

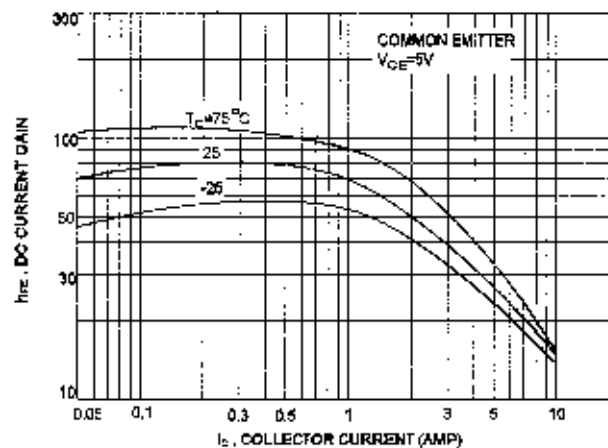
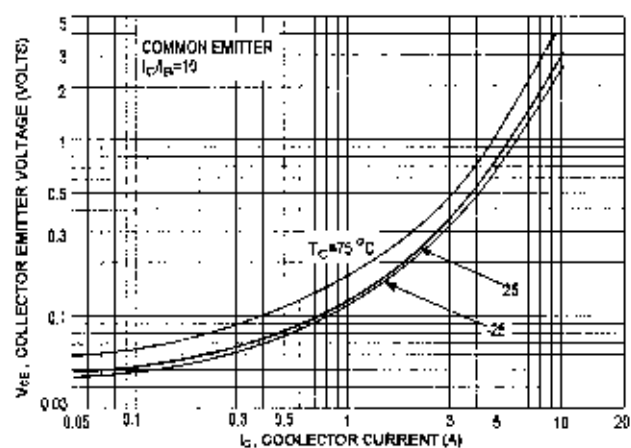
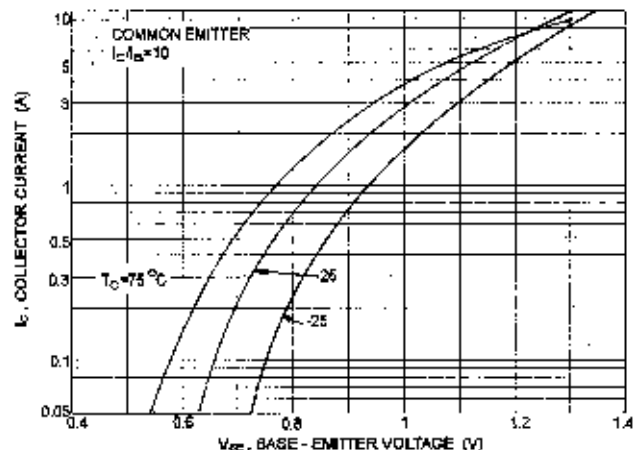
**DYNAMIC CHARACTERISTICS**

|                                                                                                             |       |     |  |     |
|-------------------------------------------------------------------------------------------------------------|-------|-----|--|-----|
| Current-Gain-Bandwidth Product<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ ) | $f_T$ | 5.0 |  | MHz |
|-------------------------------------------------------------------------------------------------------------|-------|-----|--|-----|

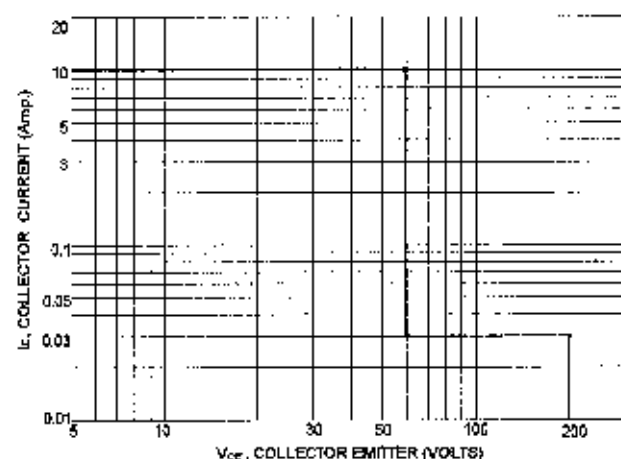
(1) Pulse Test: Pulse Width  $\approx 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

$I_C - V_{CE}$ 

DC CURRENT GAIN

 $V_{CE(sat)} - I_C$  $I_C - V_{BE}$ 

SAFE OPERATING AREA

 $V_{CE(sat)} - I_B$ 