

NPN SILICON POWER TRANSISTORS

...designed for the output stage of 25W to 35W AF power amplifier

FEATURES:

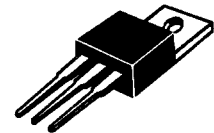
- * Low Collector-Emitter Saturation Voltage
 $V_{CE(sat)} = 2.0V(\text{Max}) @ I_C = 4.0A, I_B = 0.4A$
- * DC Current Gain
 $hFE = 40-320 @ I_C = 1.0A$
- * Complementary to NPN 2SB633

**NPN
2SD613**

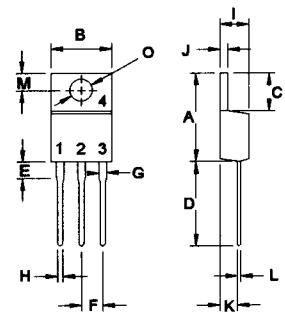
**6 AMPERE
POWER
TRANSISTORS
85 VOLTS
40 WATTS**

MAXIMUM RATINGS

| Characteristic | Symbol | 2SD613 | Unit |
|---|-------------------|-------------|--------------------------|
| Collector-Emitter Voltage | V_{CEO} | 85 | V |
| Collector-Base Voltage | V_{CBO} | 100 | V |
| Emitter-Base Voltage | V_{EBO} | 6.0 | V |
| Collector Current - Continuous - Peak | I_C I_{CM} | 6.0 10 | A |
| Base current | I_B | 3.0 | A |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 40 0.32 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ |



TO-220



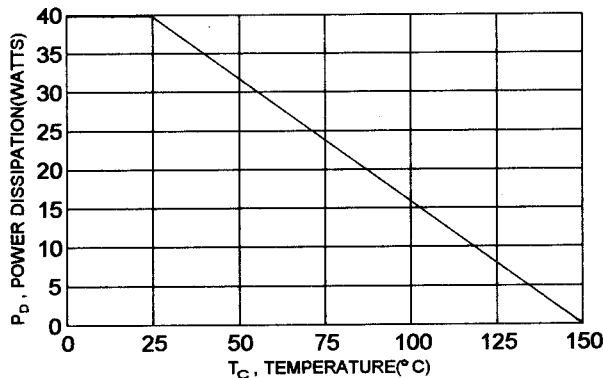
PIN 1.BASE
2.COLLECTOR
3.EMITTER
4.COLLECTOR(CASE)

THERMAL CHARACTERISTICS

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

| DIM | MILLIMETERS | |
|-----|-------------|-------|
| | MIN | MAX |
| A | 14.68 | 15.31 |
| B | 9.78 | 10.42 |
| C | 5.01 | 6.52 |
| D | 13.06 | 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 | 4.98 |
| J | 1.14 | 1.38 |
| K | 2.20 | 2.97 |
| L | 0.33 | 0.55 |
| M | 2.48 | 2.98 |
| O | 3.70 | 3.90 |

FIGURE -1 POWER DERATING



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

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

OFF CHARACTERISTICS

| | | | | |
|---|---------------|-----|-----|---------------|
| Collector-Emitter Breakdown Voltage ($I_C = 50\text{ mA}$, $I_B = 0$) | $V_{(BR)CEO}$ | 85 | | V |
| Collector-Base Breakdown Voltage ($I_C = 5.0\text{ mA}$, $I_E = 0$) | $V_{(BR)CBO}$ | 100 | | V |
| Emitter-Base Breakdown Voltage ($I_E = 5.0\text{ mA}$, $I_C = 0$) | $V_{(BR)EBO}$ | 6.0 | | V |
| Collector Cutoff Current ($V_{CB} = 40\text{ V}$, $I_E = 0$) | I_{CBO} | | 100 | μA |
| Emitter Cutoff Current ($V_{EB} = 4.0\text{ V}$, $I_C = 0$) | I_{EBO} | | 100 | μA |

ON CHARACTERISTICS (1)

| | | | | |
|---|-------------------------|----------|-----|---|
| DC Current Gain ($I_C = 1.0\text{ A}$, $V_{CE} = 5.0\text{ V}$) * ($I_C = 3.0\text{ A}$, $V_{CE} = 5.0\text{ V}$) | $h_{FE(2)}$ h_{FE} | 40 20 | 320 | |
| Collector-Emitter Saturation Voltage ($I_C = 4.0\text{ A}$, $I_B = 400\text{ mA}$) | $V_{CE(sat)}$ | | 2.0 | V |
| Base-Emitter On Voltage ($I_C = 1.0\text{ A}$, $V_{CE} = 5.0\text{ V}$) | $V_{BE(on)}$ | | 1.5 | V |

DYNAMIC CHARACTERISTICS

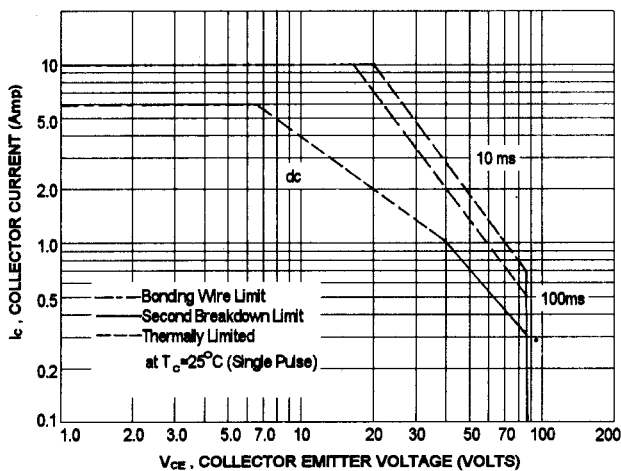
| | | | | |
|---|-------|-----|--|-----|
| Current-Gain-Bandwidth Product ($I_C = 1.0\text{ A}$, $V_{CE} = 5.0\text{ V}$, $f = 1.0\text{ MHz}$) | f_T | 5.0 | | MHz |
|---|-------|-----|--|-----|

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

* $h_{FE(2)}$ Classification :

| | | | | | | | | | | | |
|----|---|----|----|---|-----|-----|---|-----|-----|---|-----|
| 40 | C | 80 | 60 | D | 120 | 100 | E | 200 | 160 | F | 320 |
|----|---|----|----|---|-----|-----|---|-----|-----|---|-----|

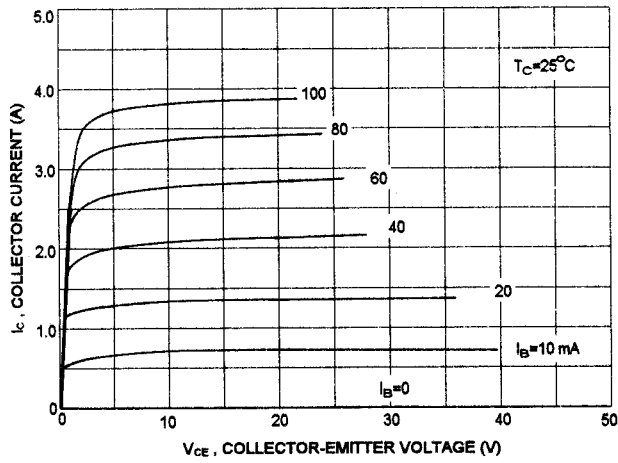
ACTIVE-REGION SAFE OPERATING AREA (SOA)



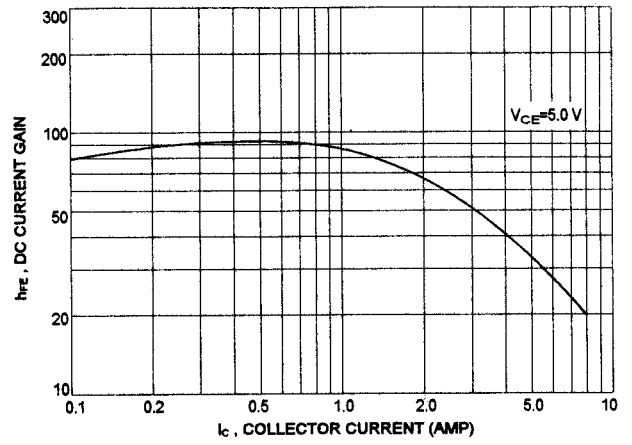
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater dissipation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

The data of SOA is base on $T_{J(PK)} = 150^\circ\text{C}$; T_c is variable depending on conditions. second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(PK)} \leq 150^\circ\text{C}$. At high case temperatures, thermal limitation will reduce the power that can be handled to value less than the limitations imposed by second breakdown.

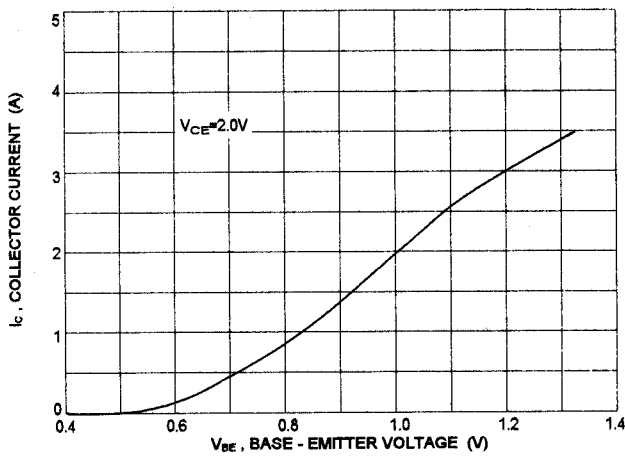
Ic - Vce



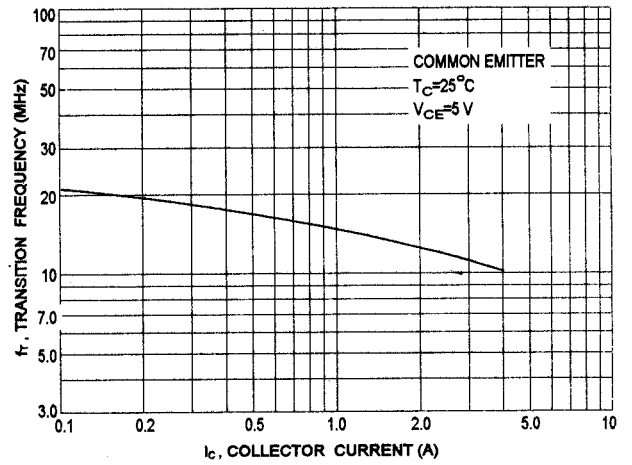
DC CURRENT GAIN



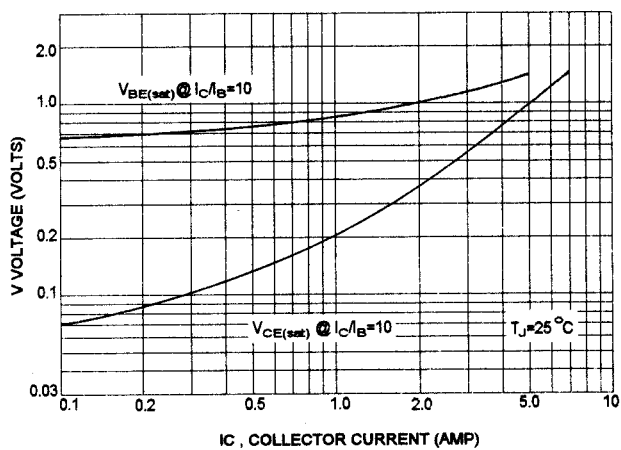
Ic - Vbe



fT - Ic



"ON" VOLTAGES



CAPACITANCES

