

# HIGH POWER NPN SILICON POWER TRANSISTORS

General-purpose linear amplifiers, series pass regulators and inductive switching Applications.

## FEATURES:

\* Low Collector-Emitter Saturation Voltage-

$$V_{CE(SAT)} = 4.0 \text{ V (Max.) @ } I_C = 30 \text{ A, } I_B = 6.0 \text{ A -- 2N3771}$$

$$V_{CE(SAT)} = 4.0 \text{ V (Max.) @ } I_C = 20 \text{ A, } I_B = 4.0 \text{ A -- 2N3772}$$

Boca Semiconductor Corp.

BSC

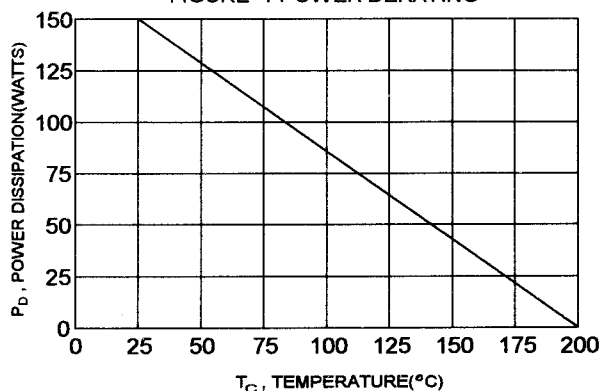
## MAXIMUM RATINGS

| Characteristic                                                                        | Symbol            | 2N3771       | 2N3772    | Unit                     |
|---------------------------------------------------------------------------------------|-------------------|--------------|-----------|--------------------------|
| Collector-Emitter Voltage                                                             | $V_{CEO}$         | 40           | 60        | V                        |
| Collector-Emitter Voltage                                                             | $V_{CEX}$         | 50           | 80        | V                        |
| Collector-Base Voltage                                                                | $V_{CBO}$         | 50           | 100       | V                        |
| Emitter-Base Voltage                                                                  | $V_{EBO}$         | 5            | 7         | V                        |
| Collector Current-Continuous<br>-Peak                                                 | $I_C$<br>$I_{CM}$ | 30<br>30     | 20<br>3C  | A                        |
| Base Current-Continuous<br>-Peak                                                      | $I_B$<br>$I_{BM}$ | 7.5<br>15    | 5.0<br>15 | A                        |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 150<br>0.857 |           | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                   | $T_J, T_{STG}$    | - 65 to +200 |           | $^\circ\text{C}$         |

## THERMAL CHARACTERISTICS

| Characteristic                      | Symbol          | Max  | Unit               |
|-------------------------------------|-----------------|------|--------------------|
| Thermal Resistance Junction to Case | $R_{\theta jc}$ | 1.17 | $^\circ\text{C/W}$ |

FIGURE -1 POWER DERATING

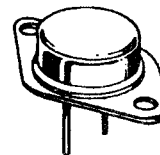


NPN

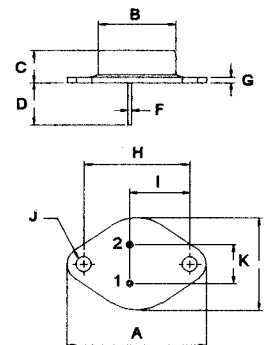
2N3771

2N3772

20 AND 30 AMPE  
NPN SILICON  
POWER TRANSISTORS  
40 and 60 VOLTS  
150 WATTS



TO-3



PIN 1.BASE  
2.EMITTER  
COLLECTOR(CASE)

| 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 |

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

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

**OFF CHARACTERISTICS**

|                                                                                                                                                     |                  |                |            |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|------------|----|
| Collector - Emitter Sustaining Voltage (1)<br>( $I_C = 200\text{ mA}$ , $I_B = 0$ )                                                                 | 2N3771<br>2N3772 | $V_{CE(sus)}$  | 40<br>60   | V  |
| Collector - Emitter Sustaining Voltage<br>( $I_C = 0.2\text{ A}$ , $V_{BE(off)} = 1.5\text{ V}$ , $R_{BE} = 100\text{ Ohms}$ )                      | 2N3771<br>2N3772 | $V_{CEX(sus)}$ | 50<br>80   | V  |
| Collector Cutoff Current<br>( $V_{CE} = 30\text{ V}$ , $I_B = 0$ )<br>( $V_{CE} = 50\text{ V}$ , $I_B = 0$ )                                        | 2N3771<br>2N3772 | $I_{CEO}$      | 10<br>10   | mA |
| Collector Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ )<br>( $V_{CE} = 100\text{ V}$ , $V_{BE(off)} = 1.5\text{ V}$ ) | 2N3771<br>2N3772 | $I_{CEV}$      | 2.0<br>5.0 | mA |
| Collector Cutoff Current<br>( $V_{CE} = 50\text{ V}$ , $I_E = 0$ )<br>( $V_{CE} = 100\text{ V}$ , $I_E = 0$ )                                       | 2N3771<br>2N3772 | $I_{CBO}$      | 2.0<br>5.0 | mA |
| Emitter Cutoff Current<br>( $V_{EB} = 5.0\text{ V}$ , $I_C = 0$ )<br>( $V_{EB} = 7.0\text{ V}$ , $I_C = 0$ )                                        | 2N3771<br>2N3772 | $I_{EBO}$      | 5.0<br>5.0 | mA |

**ON CHARACTERISTICS (1)**

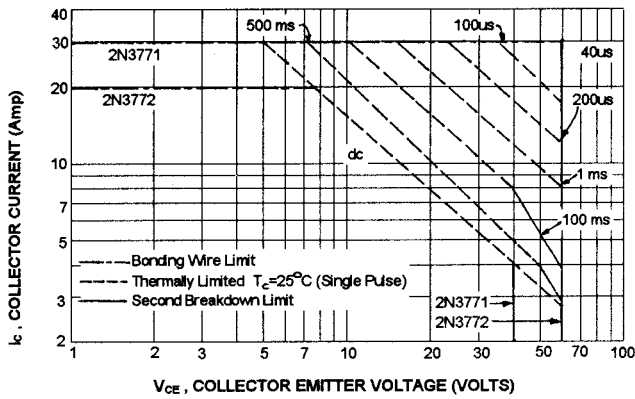
|                                                                                                                                                                                                                                                |                                      |               |                          |          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------|--------------------------|----------|
| DC Current Gain<br>( $I_C = 15\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 10\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 30\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 20\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )            | 2N3771<br>2N3772<br>2N3771<br>2N3772 | $h_{FE}$      | 15<br>15<br>5.0<br>5.0   | 60<br>60 |
| Collector - Emitter Saturation Voltage<br>( $I_C = 15\text{ A}$ , $I_B = 1.5\text{ A}$ )<br>( $I_C = 10\text{ A}$ , $I_B = 1.0\text{ A}$ )<br>( $I_C = 30\text{ A}$ , $I_B = 6.0\text{ A}$ )<br>( $I_C = 20\text{ A}$ , $I_B = 4.0\text{ A}$ ) | 2N3771<br>2N3772<br>2N3771<br>2N3772 | $V_{CE(sat)}$ | 2.0<br>1.4<br>4.0<br>4.0 | V        |
| Base - Emitter On Voltage<br>( $I_C = 15\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )<br>( $I_C = 10\text{ A}$ , $V_{CE} = 4.0\text{ V}$ )                                                                                                            | 2N3771<br>2N3772                     | $V_{BE(on)}$  | 2.7<br>2.2               | V        |

**DYNAMIC CHARACTERISTICS**

|                                                                                                                  |       |     |     |
|------------------------------------------------------------------------------------------------------------------|-------|-----|-----|
| Current Gain - Bandwidth Product (2)<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 4.0\text{ V}$ , $f = 50\text{ KHz}$ ) | $f_T$ | 0.2 | MHz |
|------------------------------------------------------------------------------------------------------------------|-------|-----|-----|

(1) Pulse Test: Pulse width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ (2)  $f_T = |h_{fe}| \cdot f_{test}$

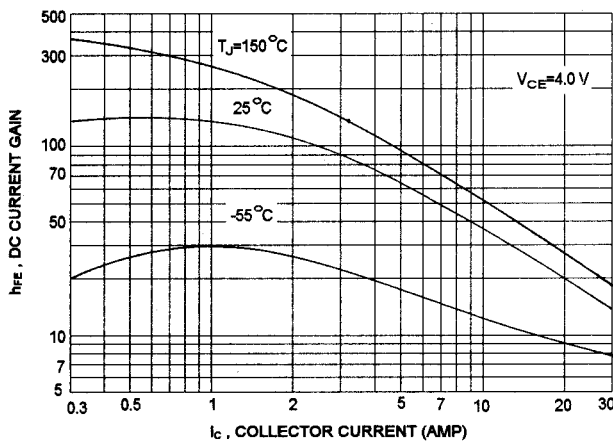
### ACTIVE-REGION SAFE OPERATING AREA (SOA)



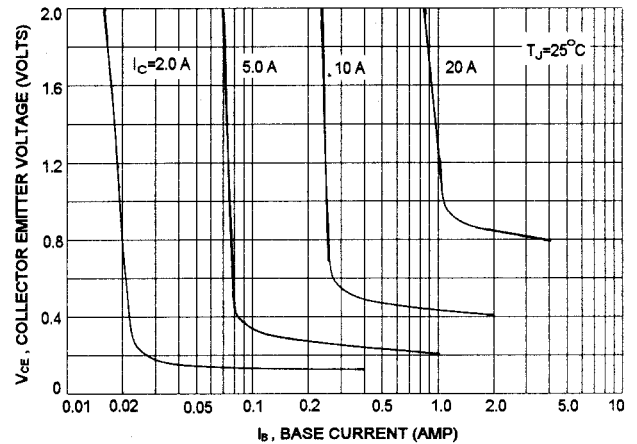
There are two limitation on the power handling ability of a transistor: average junction temperature and second breakdown safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater 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  $T_{J(PK)} \leq 200^\circ\text{C}$ . At high case temperatures, thermal limitation will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

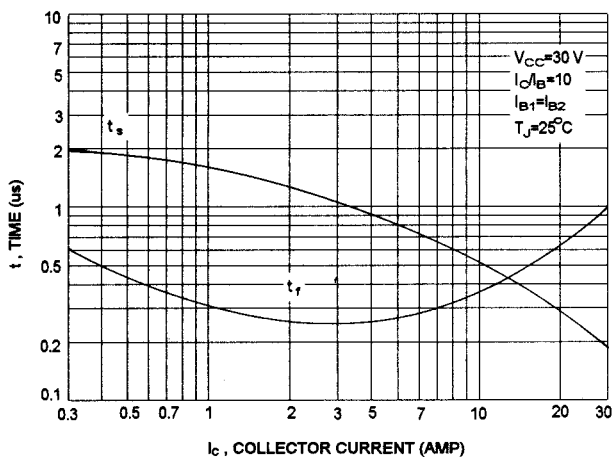
### DC CURRENT GAIN



### COLLECTOR SATURATION REGION



### TURN-OFF TIME



### CAPACITANCES

