

# Switch-mode Series NPN Silicon Power Transistor

## BUV22

This device is designed for high speed, high current, high power applications.

### Features

- High DC Current Gain:  
 $h_{FE} \text{ min} = 20 \text{ at } I_C = 10 \text{ A}$
- Low  $V_{CE(sat)}$ ,  $V_{CE(sat)}$   
 $\text{max} = 1.0 \text{ V at } I_C = 10 \text{ A}$
- Very Fast Switching Times:  
 $T_F \text{ max} = 0.35 \mu\text{s at } I_C = 20 \text{ A}$
- Pb-Free Package is Available\*

### MAXIMUM RATINGS

| Symbol            | Rating                                                               | Value      | Unit             |
|-------------------|----------------------------------------------------------------------|------------|------------------|
| $V_{CEQ(SUS)}$    | Collector-Emitter Voltage                                            | 250        | Vdc              |
| $V_{CBO}$         | Collector-Base Voltage                                               | 300        | Vdc              |
| $V_{EBO}$         | Emitter-Base Voltage                                                 | 7          | Vdc              |
| $V_{CEX}$         | Collector-Emitter Voltage ( $V_{BE} = -1.5 \text{ V}$ )              | 300        | Vdc              |
| $V_{CER}$         | Collector-Emitter Voltage ( $R_{BE} = 100 \Omega$ )                  | 290        | Vdc              |
| $I_C$<br>$I_{CM}$ | Collector-Current – Continuous<br>– Peak ( $PW \leq 10 \text{ ms}$ ) | 40<br>50   | Adc<br>Apk       |
| $I_B$             | Base-Current Continuous                                              | 8          | Adc              |
| $P_D$             | Total Device Dissipation @ $T_C = 25^\circ\text{C}$                  | 250        | W                |
| $T_J, T_{stg}$    | Operating and Storage Junction<br>Temperature Range                  | -65 to 200 | $^\circ\text{C}$ |

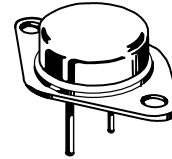
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Symbol        | Characteristics                      | Max | Unit               |
|---------------|--------------------------------------|-----|--------------------|
| $\theta_{JC}$ | Thermal Resistance, Junction-to-Case | 0.7 | $^\circ\text{C/W}$ |

\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, [SOLDDRRM/D](#).

**40 AMPERES  
NPN SILICON POWER  
METAL TRANSISTOR  
250 VOLTS – 250 WATTS**



TO-204AE (TO-3)  
CASE 197A

### MARKING DIAGRAM



BUV22 = Device Code  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week  
MEX = Country of Origin

### ORDERING INFORMATION

| Device | Package             | Shipping         |
|--------|---------------------|------------------|
| BUV22G | TO-204<br>(Pb-Free) | 100 Units / Tray |

### DISCONTINUED (Note 1)

|       |        |                  |
|-------|--------|------------------|
| BUV22 | TO-204 | 100 Units / Tray |
|-------|--------|------------------|

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

# BUV22

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

| Symbol                              | Characteristic                                                                                                                                                                           | Min | Max         | Unit |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|------|
| <b>OFF CHARACTERISTICS</b> (Note 2) |                                                                                                                                                                                          |     |             |      |
| $V_{CE(sus)}$                       | Collector-Emitter Sustaining Voltage<br>( $I_C = 200\text{ mA}$ , $I_B = 0$ , $L = 25\text{ mH}$ )                                                                                       | 250 | –           | Vdc  |
| $I_{CEX}$                           | Collector Cutoff Current at Reverse Bias<br>( $V_{CE} = 300\text{ V}$ , $V_{BE} = -1.5\text{ V}$ )<br>( $V_{CE} = 300\text{ V}$ , $V_{BE} = -1.5\text{ V}$ , $T_C = 125^\circ\text{C}$ ) |     | 3.0<br>12.0 | mAdc |
| $I_{CEO}$                           | Collector-Emitter Cutoff Current<br>( $V_{CE} = 200\text{ V}$ )                                                                                                                          | –   | 3.0         | mAdc |
| $V_{EBO}$                           | Emitter-Base Reverse Voltage<br>( $I_E = 50\text{ mA}$ )                                                                                                                                 | 7   | –           | V    |
| $I_{EBO}$                           | Emitter-Cutoff Current<br>( $V_{EB} = 5\text{ V}$ )                                                                                                                                      | –   | 1.0         | mAdc |

## SECOND BREAKDOWN

|           |                                                                                                                                                                |            |  |     |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|-----|
| $I_{S/b}$ | Second Breakdown Collector Current with base forward biased<br>( $V_{CE} = 20\text{ V}$ , $t = 1\text{ s}$ )<br>( $V_{CE} = 140\text{ V}$ , $t = 1\text{ s}$ ) | 12<br>0.15 |  | Adc |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--|-----|

## ON CHARACTERISTICS (Note 2)

|               |                                                                                                                                        |          |            |     |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------|----------|------------|-----|
| $h_{FE}$      | DC Current Gain<br>( $I_C = 10\text{ A}$ , $V_{CE} = 4\text{ V}$ )<br>( $I_C = 20\text{ A}$ , $V_{CE} = 4\text{ V}$ )                  | 20<br>10 | 60         |     |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage<br>( $I_C = 10\text{ A}$ , $I_B = 1\text{ A}$ )<br>( $I_C = 20\text{ A}$ , $I_B = 2.5\text{ A}$ ) |          | 1.0<br>1.5 | Vdc |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage<br>( $I_C = 40\text{ A}$ , $I_B = 4\text{ A}$ )                                                        |          | 1.5        | Vdc |

## DYNAMIC CHARACTERISTICS

|       |                                                                                                          |     |  |     |
|-------|----------------------------------------------------------------------------------------------------------|-----|--|-----|
| $f_T$ | Current Gain — Bandwidth Product<br>( $V_{CE} = 15\text{ V}$ , $I_C = 2\text{ A}$ , $f = 4\text{ MHz}$ ) | 8.0 |  | MHz |
|-------|----------------------------------------------------------------------------------------------------------|-----|--|-----|

## SWITCHING CHARACTERISTICS (Resistive Load)

|          |              |                                                                                                             |      |               |
|----------|--------------|-------------------------------------------------------------------------------------------------------------|------|---------------|
| $t_{on}$ | Turn-on Time | ( $I_C = 20\text{ A}$ , $I_{B1} = I_{B2} = 2.5\text{ A}$ ,<br>$V_{CC} = 100\text{ V}$ , $R_C = 5\ \Omega$ ) | 0.8  | $\mu\text{s}$ |
| $t_s$    | Storage Time |                                                                                                             | 2.0  |               |
| $t_f$    | Fall Time    |                                                                                                             | 0.35 |               |

2. Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

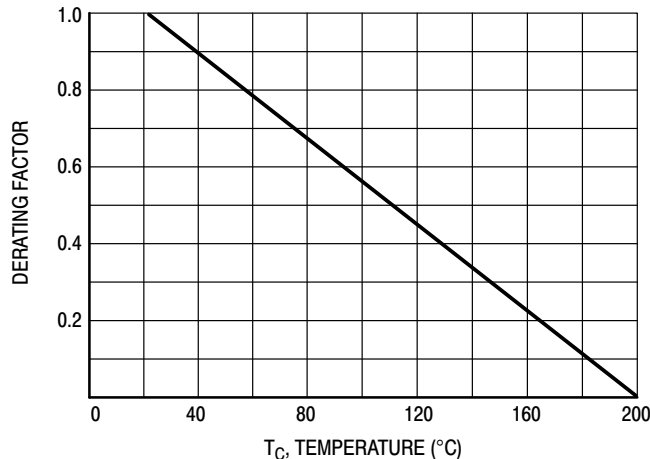


Figure 1. Power Derating

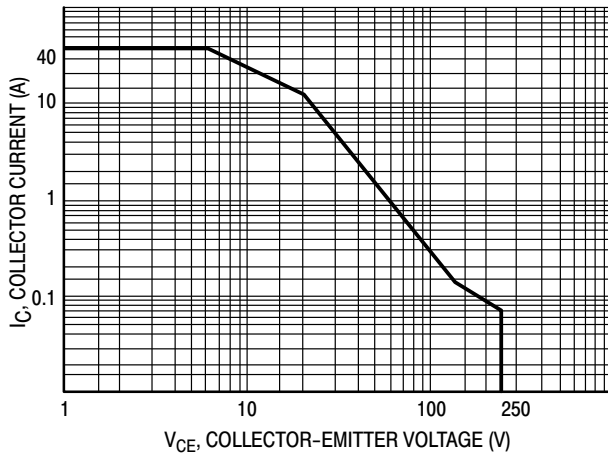


Figure 2. Active Region Safe Operating Area

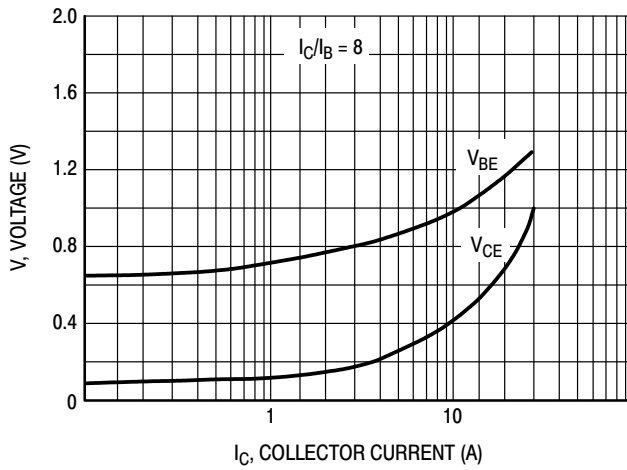


Figure 3. "On" Voltages

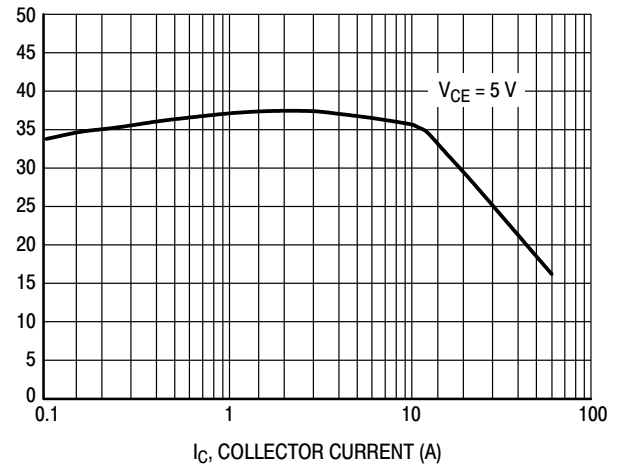


Figure 4. DC Current Gain

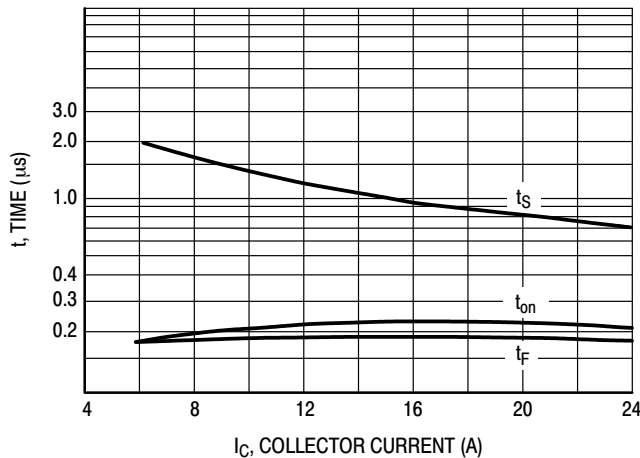


Figure 5. Resistive Switching Performance

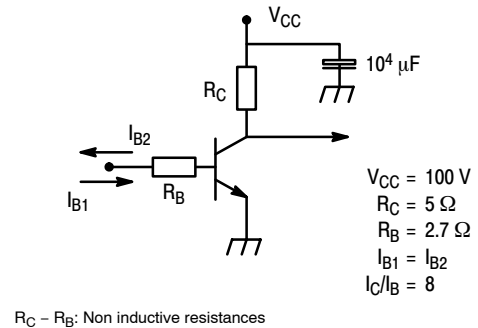
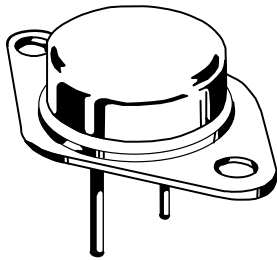


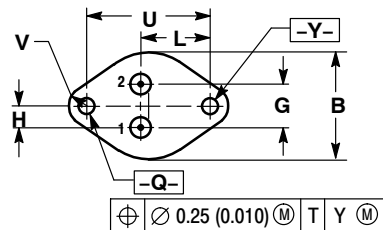
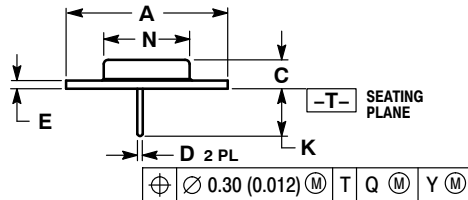
Figure 6. Switching Times Test Circuit



SCALE 1:1

TO-204 (TO-3)  
CASE 197A-05  
ISSUE K

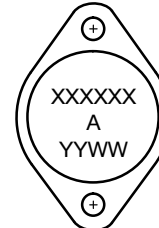
DATE 21 FEB 2000



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 1.530  | REF   | 38.86       | REF   |
| B   | 0.990  | 1.050 | 25.15       | 26.67 |
| C   | 0.250  | 0.335 | 6.35        | 8.51  |
| D   | 0.057  | 0.063 | 1.45        | 1.60  |
| E   | 0.060  | 0.070 | 1.53        | 1.77  |
| G   | 0.430  | BSC   | 10.92       | BSC   |
| H   | 0.215  | BSC   | 5.46        | BSC   |
| K   | 0.440  | 0.480 | 11.18       | 12.19 |
| L   | 0.665  | BSC   | 16.89       | BSC   |
| N   | 0.760  | 0.830 | 19.31       | 21.08 |
| Q   | 0.151  | 0.165 | 3.84        | 4.19  |
| U   | 1.187  | BSC   | 30.15       | BSC   |
| V   | 0.131  | 0.188 | 3.33        | 4.77  |

GENERIC  
MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
YY = Year  
WW = Work Week

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:  
PIN 1. BASE  
2. EMITTER  
CASE: COLLECTOR

STYLE 2:  
PIN 1. EMITTER  
2. BASE  
CASE: COLLECTOR

STYLE 3:  
PIN 1. GATE  
2. SOURCE  
CASE: DRAIN

STYLE 4:  
PIN 1. ANODE = 1  
2. ANODE = 2  
CASE: CATHODES

|                  |               |                                                                                                                                                                                     |
|------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| DESCRIPTION:     | TO-204 (TO-3) | PAGE 1 OF 1                                                                                                                                                                         |

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