

BUV22

Switch-mode Series NPN Silicon Power Transistor

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

Features

- High DC Current Gain:
 $h_{FE} \text{ min} = 20$ 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

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

THERMAL CHARACTERISTICS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

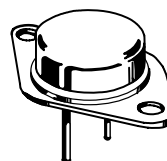
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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**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 |
|--------|---------------------|------------------|
| BUV22 | TO-204 | 100 Units / Tray |
| BUV22G | TO-204 (Pb-Free) | 100 Units / Tray |

BUV22

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

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

OFF CHARACTERISTICS (Note 1)

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

SECOND BREAKDOWN

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

ON CHARACTERISTICS (Note 1)

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

DYNAMIC CHARACTERISTICS

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

SWITCHING CHARACTERISTICS (Resistive Load)

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

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

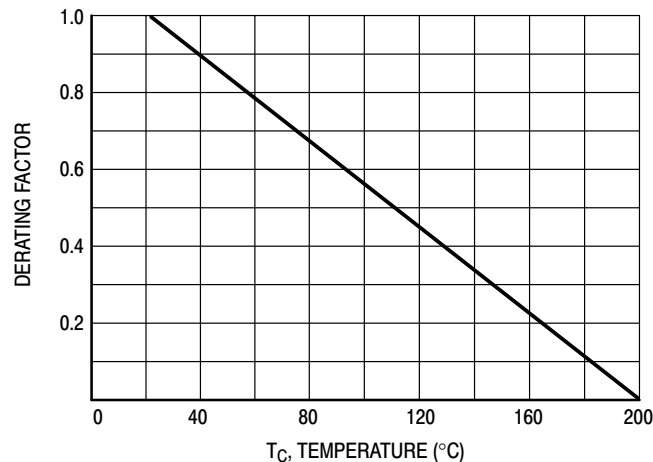


Figure 1. Power Derating

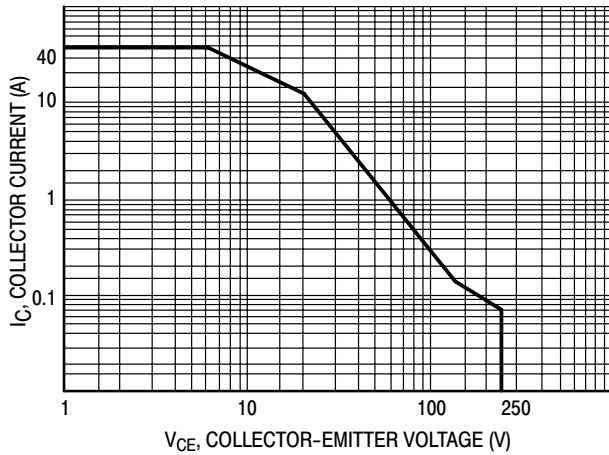


Figure 2. Active Region Safe Operating Area

There are two limitations 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 the curves indicate.

The data of Figure 2 is based on $T_C = 25^\circ\text{C}$; $T_{J(pk)}$ is variable depending on power level. Second breakdown limitations do not derate the same as thermal limitations.

At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

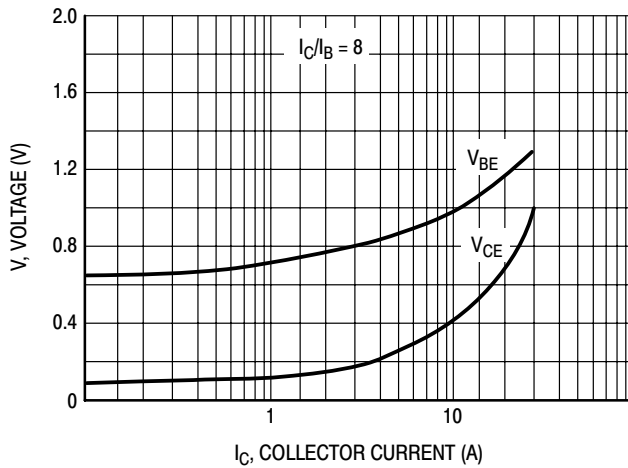


Figure 3. "On" Voltages

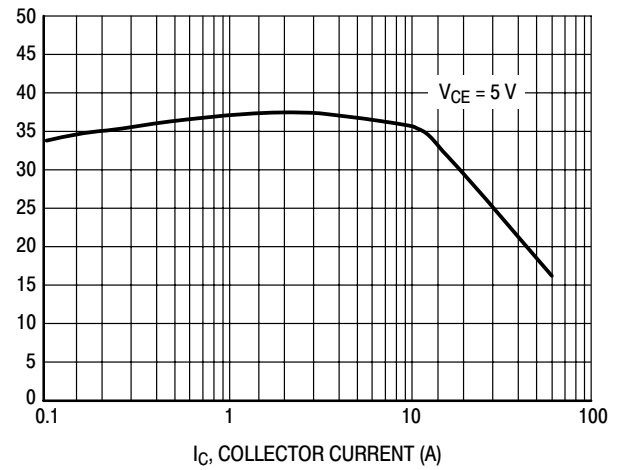


Figure 4. DC Current Gain

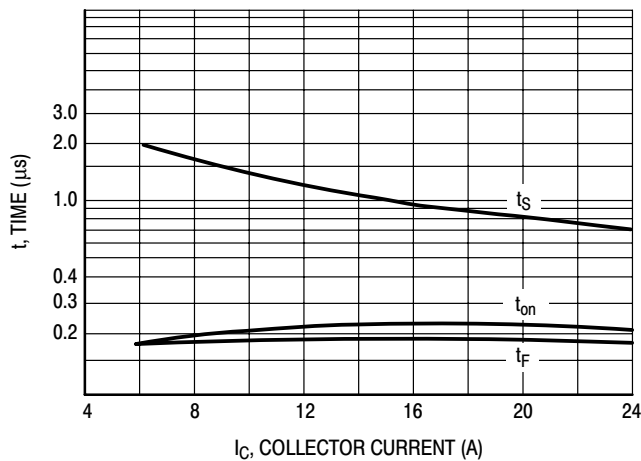


Figure 5. Resistive Switching Performance

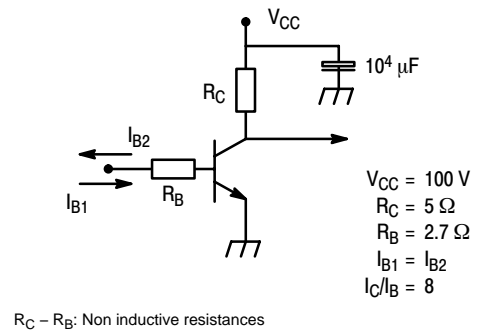
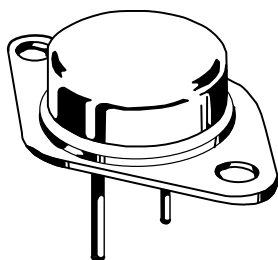


Figure 6. Switching Times Test Circuit

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

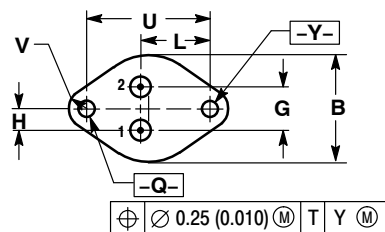
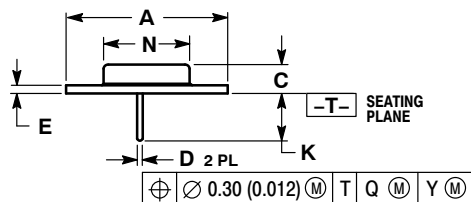
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SCALE 1:1

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

DATE 21 FEB 2000

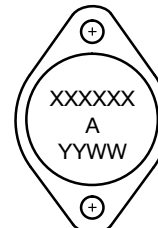


NOTES:

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.

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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| NEW STANDARD: | | |
| DESCRIPTION: | TO-204 (TO-3) | PAGE 1 OF 2 |

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