

SWITCHMODE™ Series

NPN Silicon Power Transistor

... designed for high speed, high current, high power applications.

- High DC current gain:
 $h_{FE} \text{ min} = 20 \text{ at } I_C = 25 \text{ A}$
 $= 10 \text{ at } I_C = 50 \text{ A}$
- Low $V_{CE(sat)}$:
 $V_{CE(sat)} \text{ max.} = 0.6 \text{ V at } I_C = 25 \text{ A}$
 $= 0.9 \text{ V at } I_C = 50 \text{ A}$
- Very fast switching times:
 $T_F = 0.25 \mu\text{s at } I_C = 50 \text{ A}$

MAXIMUM RATINGS

| Rating | Symbol | BUV20 | BUV60 | Unit |
|--|----------------|------------|-------|------------------|
| Collector–Emitter Voltage | $V_{CEO(sus)}$ | 125 | | Vdc |
| Collector–Base Voltage | V_{CBO} | 160 | 260 | Vdc |
| Emitter–Base Voltage | V_{EBO} | 7 | | Vdc |
| Collector–Emitter Voltage ($V_{BE} = -1.5 \text{ V}$) | V_{CEX} | 160 | 260 | Vdc |
| Collector–Emitter voltage ($R_{BE} = 100 \Omega$) | V_{CER} | 150 | 260 | Vdc |
| Collector–Current — Continuous — Peak ($PW \leq 10 \text{ ms}$) | I_C | 50 | | Adc |
| | I_{CM} | 60 | | Apk |
| Base–Current continuous | I_B | 10 | | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ | P_D | 250 | | Watts |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to 200 | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | BUV20 | BUV60 | Unit |
|--------------------------------------|---------------|-------|-------|--------------------|
| Thermal Resistance, Junction to Case | θ_{JC} | 0.7 | | $^\circ\text{C/W}$ |

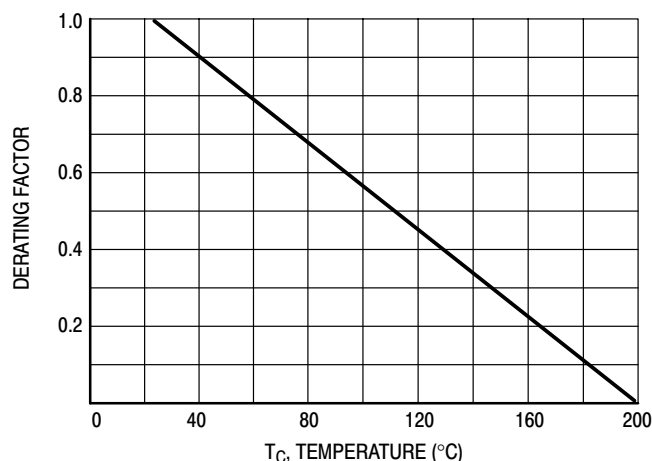
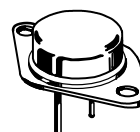


Figure 1. Power Derating

BUV20
BUV60

50 AMPERES
NPN SILICON
POWER
METAL TRANSISTOR
125 VOLTS
250 WATTS



CASE 197A-05
TO-204AE
(TO-3)

BUV20 BUV60

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

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

OFF CHARACTERISTICS¹

| | | | | | |
|--|-------------------------|----------------|-----|-----------|------|
| Collector–Emitter Sustaining Voltage ($I_C = 200\text{ mA}$, $I_B = 0$, $L = 25\text{ mH}$) | BUV20, BUV60 | $V_{CEO(sus)}$ | 125 | | Vdc |
| Collector Cutoff Current at Reverse Bias ($V_{CE} = 140\text{ V}$, $V_{BE} = -1.5\text{ V}$) ($V_{CE} = 140\text{ V}$, $V_{BE} = -1.5\text{ V}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 260\text{ V}$, $V_{BE} = -1.5\text{ V}$) | BUV20 BUV20 BUV60 | I_{CEX} | | 3.0 12 | mAdc |
| Collector–Emitter Cutoff Current ($V_{CE} = 100\text{ V}$) | BUV20 | I_{CEO} | | 3.0 | mAdc |
| Emitter–Base Reverse Voltage ($I_E = 50\text{ mA}$) | BUV20, BUV60 | V_{EBO} | 7 | | V |
| Emitter–Cutoff Current ($V_{EB} = 5\text{ V}$) | BUV20, BUV60 | I_{EBO} | | 1.0 | mAdc |

SECOND BREAKDOWN

| | | | | | |
|---|-----------|-----------|--|--|-----|
| Second Breakdown Collector Current with base forward biased ($V_{CE} = 20\text{ V}$, $t = 1\text{ s}$) ($V_{CE} = 40\text{ V}$, $t = 1\text{ s}$) | $I_{S/b}$ | 12 1.5 | | | Adc |
|---|-----------|-----------|--|--|-----|

ON CHARACTERISTICS¹

| | | | | | |
|---|-------------------------|---------------|----------|-------------------|-----|
| DC Current Gain ($I_C = 25\text{ A}$, $V_{CE} = 2\text{ V}$) ($I_C = 50\text{ A}$, $V_{CE} = 4\text{ V}$) | BUV20 BUV20 | h_{FE} | 20 10 | 60 – | |
| Collector–Emitter Saturation Voltage ($I_C = 25\text{ A}$, $I_B = 2.5\text{ A}$) ($I_C = 50\text{ A}$, $I_B = 5\text{ A}$) | BUV20 BUV20 | $V_{CE(sat)}$ | | 0.6 1.2 | Vdc |
| Base–Emitter Saturation Voltage ($I_C = 50\text{ A}$, $I_B = 5\text{ A}$) ⁰ | BUV20 | $V_{BE(sat)}$ | | 2.0 | Vdc |
| Collector–Emitter Saturation Voltage ($I_C = 25\text{ A}$, $I_B = 1.25\text{ A}$) ($I_C = 50\text{ A}$, $I_B = 5\text{ A}$) ($I_C = 60\text{ A}$, $I_B = 7.5\text{ A}$) | BUV60 BUV60 BUV60 | $V_{CE(sat)}$ | | 0.9 0.9 1.2 | Vdc |
| Base–Emitter Saturation Voltage ($I_C = 50\text{ A}$, $I_B = 5\text{ A}$) ($I_C = 60\text{ A}$, $I_B = 7.5\text{ A}$) | BUV60 BUV60 | $V_{BE(sat)}$ | | 1.6 1.8 | 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 | $(I_C = 50\text{ A}$, $I_{B1} = I_{B2} = 5\text{ A}$, $V_{CC} = 30\text{ V}$, $R_C = 0.6\ \Omega$) | t_{on} | | 1.5 | μs |
| Storage Time | | t_s | | 1.2 | |
| Fall Time | | t_f | | 0.25 | |

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

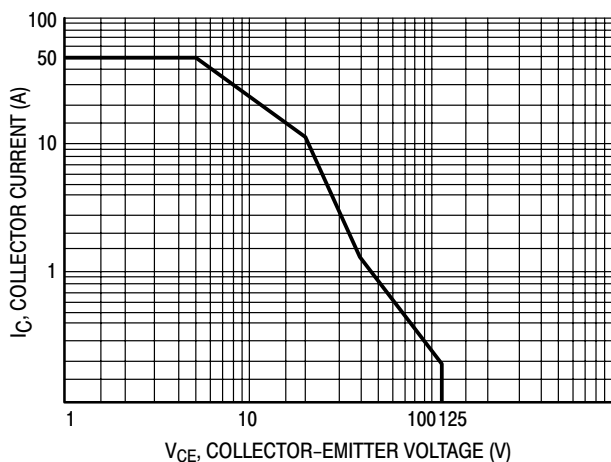


Figure 2. Active Region Safe Operating Area

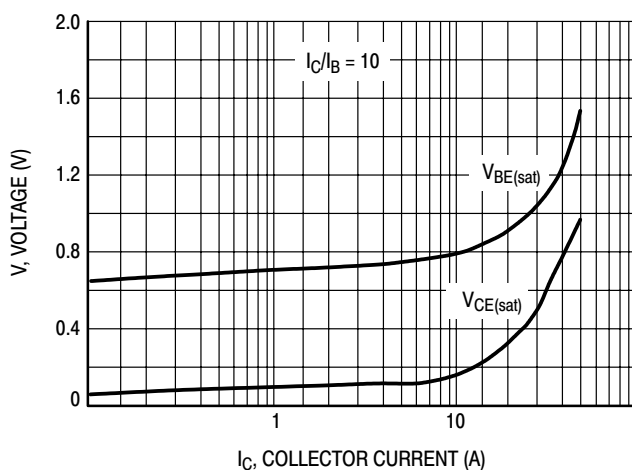


Figure 3. "On" Voltages

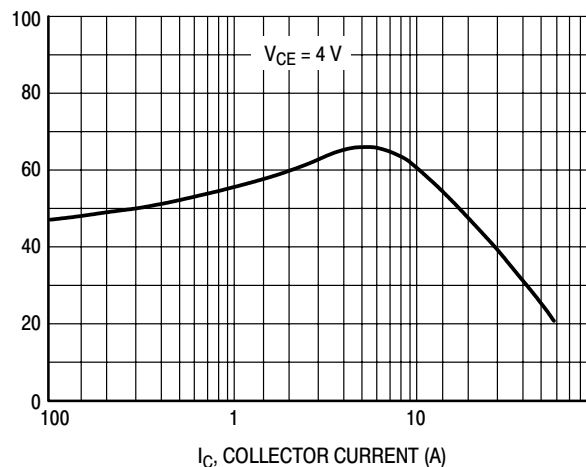


Figure 4. DC Current Gain

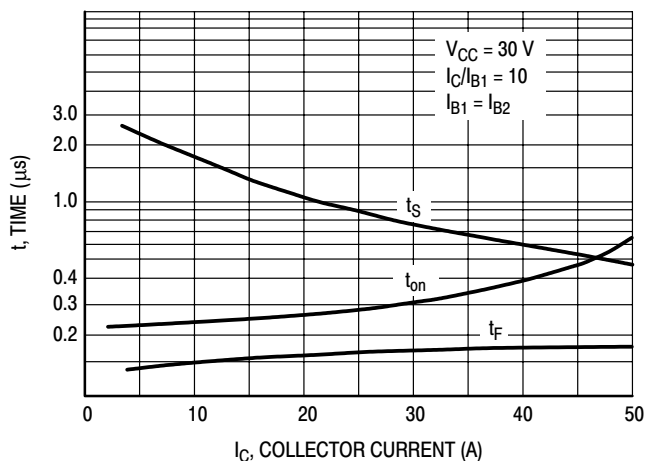


Figure 5. Resistive Switching Performance

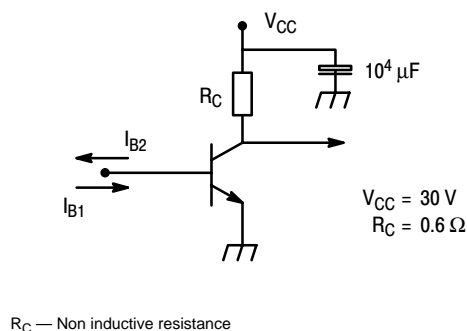
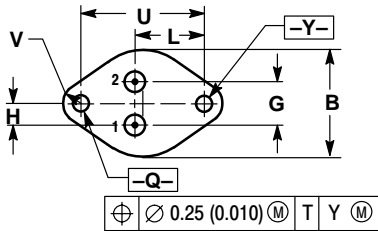
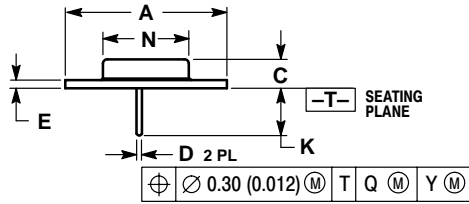


Figure 6. Switching Times Test Circuit

BUV20 BUV60

PACKAGE DIMENSIONS


TO-204AE (TO-3) CASE 197A-05 ISSUE J



- 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 |

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