

8961726 TEXAS INSTR (OPTO)

62C 36649

D

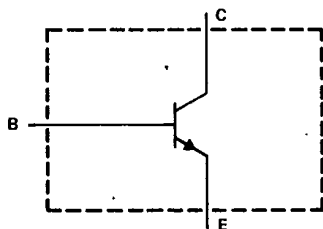
BUX48, BUX48A  
N-P-N SILICON POWER TRANSISTORS

T-33-15

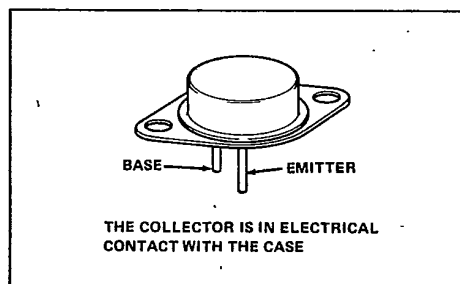
OCTOBER 1982 - REVISED OCTOBER 1984

- 175 W at 25°C Case Temperature
- 15 A Continuous Collector Current
- 30 A Peak Collector Current
- Series Features High-Voltage and Peak Current Ratings, Low Saturation Voltages, and a High Degree of Electrical Robustness
- Designed for Switching-Mode Power Supplies, CRT Scanning, Inverters, and Other Industrial Applications Where Rapid Switching of Inductive - Loads is Necessary

## device schematic



TO-3 PACKAGE



## absolute maximum ratings at 25°C case temperature (unless otherwise noted)

|                                                                   | BUX48           | BUX48A |
|-------------------------------------------------------------------|-----------------|--------|
| Collector-emitter voltage ( $V_{BE} = -2.5$ V)                    | 850 V           | 1000 V |
| Collector-emitter voltage ( $R_{BE} = 10 \Omega$ )                | 850 V           | 1000 V |
| Collector-emitter voltage ( $I_B = 0$ )                           | 400 V           | 450 V  |
| Continuous collector current                                      | 15 A            |        |
| Peak collector current (see Note 1)                               | 30 A            |        |
| Nonrepetitive accidental peak surge current                       | 55 A            |        |
| Continuous base current                                           | 4 A             |        |
| Peak base current (see Note 1)                                    | 20 A            |        |
| Continuous device dissipation at (or below) 25°C case temperature | 175 W           |        |
| Operating junction temperature                                    | -65°C to 200 °C |        |

NOTE 1: These values apply for  $t_W \leq 5$  ms, duty cycle  $\leq 10\%$ .

BD, BDW, BDW, BU, BUX, BUY Devices

8961726 TEXAS INSTR (OPT0)

62C 36650 D

**BUX48, BUX48A**  
**N-P-N SILICON POWER TRANSISTOR**

T-33-15

electrical characteristics at 25°C case temperature (unless otherwise noted)

| PARAMETER     | TEST CONDITIONS                                                                   | BUX48 |     |     | BUX48A |     |     | UNIT |
|---------------|-----------------------------------------------------------------------------------|-------|-----|-----|--------|-----|-----|------|
|               |                                                                                   | MIN   | TYP | MAX | MIN    | TYP | MAX |      |
| $V_{(BR)EBO}$ | $I_E = 50 \text{ mA}$ , $I_C = 0 \text{ A}$                                       | 7     |     | 30  | 7      |     | 30  | V    |
| $V_{CE(sus)}$ | $I_C = 200 \text{ mA}$ , $L = 25 \text{ mH}$ , See Note 2                         | 400   |     |     | 450    |     |     | V    |
| $I_{CEX}$     | $V_{CE} = 850 \text{ V}$ , $V_{BE} = -2.5 \text{ V}$                              |       |     | 0.2 |        |     |     | mA   |
|               | $V_{CE} = 1000 \text{ V}$ , $V_{BE} = -2.5 \text{ V}$                             |       |     |     |        |     | 0.2 |      |
|               | $V_{CE} = 850 \text{ V}$ , $V_{BE} = -2.5 \text{ V}$ , $T_C = 125^\circ\text{C}$  |       |     | 2   |        |     |     |      |
|               | $V_{CE} = 1000 \text{ V}$ , $V_{BE} = -2.5 \text{ V}$ , $T_C = 125^\circ\text{C}$ |       |     |     |        |     | 2   |      |
| $I_{CER}$     | $V_{CE} = 850 \text{ V}$ , $R_{BE} = 10 \Omega$                                   |       |     | 0.5 |        |     |     | mA   |
|               | $V_{CE} = 850 \text{ V}$ , $R_{BE} = 10 \Omega$                                   |       |     |     |        |     | 0.5 |      |
|               | $V_{CE} = 850 \text{ V}$ , $R_{BE} = 10 \Omega$ , $T_C = 125^\circ\text{C}$       |       |     | 4   |        |     |     |      |
|               | $V_{CE} = 1000 \text{ V}$ , $R_{BE} = 10 \Omega$ , $T_C = 125^\circ\text{C}$      |       |     |     |        |     | 4   |      |
| $I_{EBO}$     | $V_{EB} = 5 \text{ V}$ , $I_E = 0 \text{ A}$                                      |       |     | 1   |        |     | 1   | mA   |
| $V_{CE(sat)}$ | $I_C = 10 \text{ A}$ , $I_B = 2 \text{ A}$                                        |       |     | 1.5 |        |     |     | V    |
|               | $I_C = 15 \text{ A}$ , $I_B = 3 \text{ A}$                                        |       |     | 5   |        |     |     |      |
|               | $I_C = 8 \text{ A}$ , $I_B = 1.6 \text{ A}$                                       |       |     |     |        |     | 1.5 |      |
|               | $I_C = 12 \text{ A}$ , $I_B = 2.4 \text{ A}$                                      |       |     |     |        |     | 5   |      |
| $V_{BE(sat)}$ | $I_C = 10 \text{ A}$ , $I_B = 2 \text{ A}$                                        |       |     | 1.6 |        |     |     | V    |
|               | $I_C = 6 \text{ A}$ , $I_B = 1.6 \text{ A}$                                       |       |     |     |        |     | 1.6 |      |
| $f_T$         | $V_{CE} = 10 \text{ V}$ , $I_C = 0.5 \text{ A}$ , See Note 3                      |       |     | 10  |        |     | 10  | MHz  |
| $C_{obo}$     | $V_{CB} = 20 \text{ V}$ , $I_C = 0 \text{ A}$ , $f = 0.1 \text{ MHz}$             |       |     | 150 |        |     | 150 | pF   |

NOTES: 2. These parameters must be measured using pulse techniques,  $t_W = 5 \text{ ms}$ , duty cycle  $\leq 2\%$ .3. To obtain  $f_T$ , the  $|h_{fe}|$  response is extrapolated at the rate of  $-6 \text{ dB}$  per octave from  $f = 1 \text{ MHz}$  to the frequency at which  $|h_{fe}| = 1$ .

## thermal characteristics

| PARAMETER       | MIN | TYP | MAX | UNIT               |
|-----------------|-----|-----|-----|--------------------|
| $R_{\theta JC}$ |     |     | 1   | $^\circ\text{C/W}$ |

## resistive-load switching characteristics at 25°C case temperature (unless otherwise noted)

| PARAMETER | TEST CONDITIONS                                                                                                         | BUX48 |     |     | BUX48A |     |     | UNIT          |
|-----------|-------------------------------------------------------------------------------------------------------------------------|-------|-----|-----|--------|-----|-----|---------------|
|           |                                                                                                                         | MIN   | TYP | MAX | MIN    | TYP | MAX |               |
| $t_{on}$  | $I_C = 10 \text{ A}$ , $V_{CC} = 150 \text{ V}$ , $I_{B1} = 2 \text{ A}$ ,<br>$I_{B2} = -2 \text{ A}$ , See Figure 1    |       |     | 1   |        |     |     | $\mu\text{s}$ |
| $t_s$     |                                                                                                                         |       |     | 3   |        |     |     | $\mu\text{s}$ |
| $t_f$     |                                                                                                                         |       |     | 0.8 |        |     |     | $\mu\text{s}$ |
| $t_{on}$  | $I_C = 8 \text{ A}$ , $V_{CC} = 150 \text{ V}$ , $I_{B1} = 1.6 \text{ A}$ ,<br>$I_{B2} = -1.6 \text{ A}$ , See Figure 1 |       |     |     |        |     | 1   | $\mu\text{s}$ |
| $t_s$     |                                                                                                                         |       |     |     |        |     | 3   | $\mu\text{s}$ |
| $t_f$     |                                                                                                                         |       |     |     |        |     | 0.8 | $\mu\text{s}$ |

## inductive-load switching characteristics at 100°C case temperature (unless otherwise noted)

| PARAMETER | TEST CONDITIONS                                                                                                                            | BUX48 |     |     | BUX48A |     |     | UNIT          |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|-----|--------|-----|-----|---------------|
|           |                                                                                                                                            | MIN   | TYP | MAX | MIN    | TYP | MAX |               |
| $t_s$     | $I_C = 10 \text{ A}$ , $V_{CC} = 300 \text{ V}$ , $I_{B1} = 2 \text{ A}$ ,<br>$V_B = -5 \text{ V}$ , $L_B = 3 \mu\text{H}$ , See Figure 2  |       |     | 5   |        |     |     | $\mu\text{s}$ |
| $t_f$     | $I_C = 8 \text{ A}$ , $V_{CC} = 300 \text{ V}$ , $I_{B1} = 1.6 \text{ A}$ ,<br>$V_B = -5 \text{ V}$ , $L_B = 3 \mu\text{H}$ , See Figure 2 |       |     | 0.4 |        |     |     | $\mu\text{s}$ |
| $t_s$     |                                                                                                                                            |       |     |     |        |     | 5   | $\mu\text{s}$ |
| $t_f$     |                                                                                                                                            |       |     |     |        |     | 0.4 | $\mu\text{s}$ |

BD, BDW, BDW, BDX, BU, BUX, BUY Devices

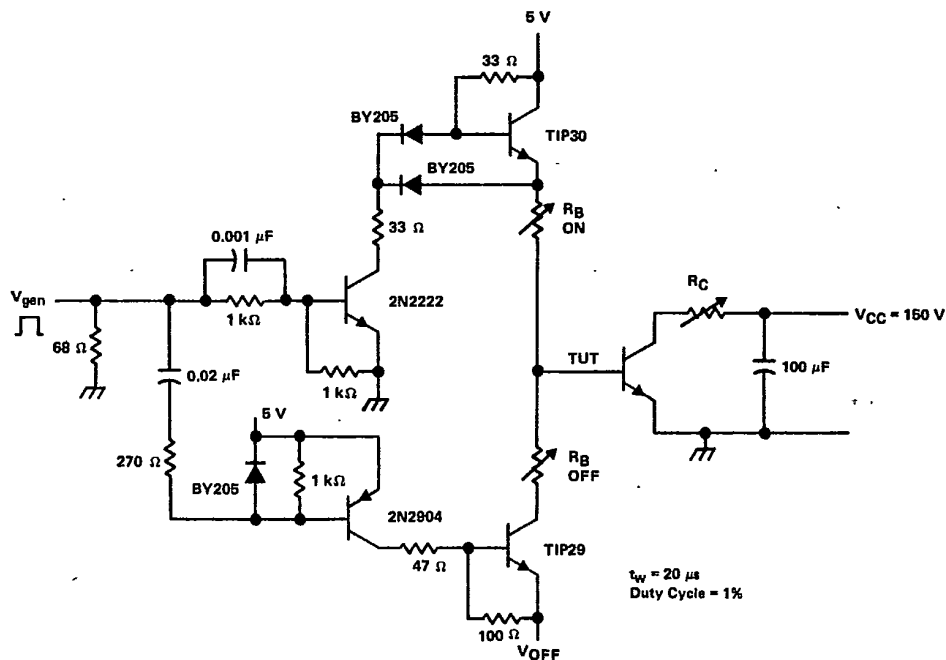
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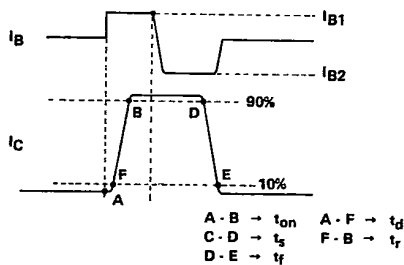
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N-P-N SILICON POWER TRANSISTORS

T-33-15

## PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



CURRENT WAVEFORMS

FIGURE 1. RESISTIVE-LOAD SWITCHING



BD, BDW, BDX, BU, BUX, BUY Devices

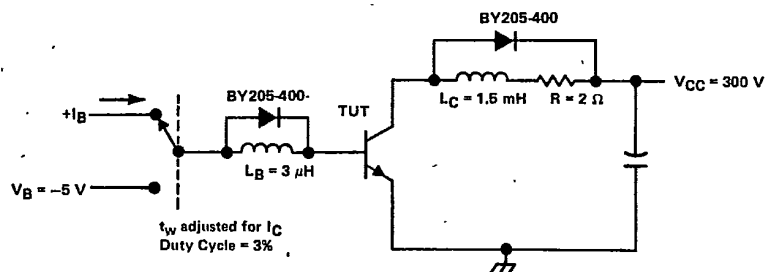
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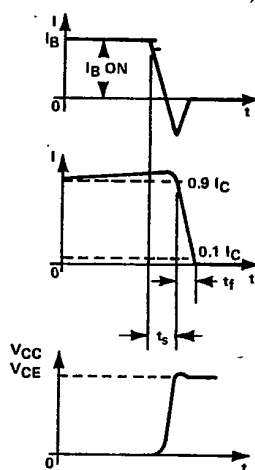
BUX48, BUX48A  
N-P-N SILICON POWER TRANSISTORS

T-33-15

## PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE AND CURRENT WAVEFORMS

- NOTES: A. The  $V_{gen}$  waveform is supplied by a generator with the following characteristics:  $t_r \leq 15$  ns,  $t_f \leq 15$  ns,  $Z_{out} = 50 \Omega$ ,  $t_W = 20 \mu$ s, duty cycle  $\leq 2\%$ .  
 B. Waveforms are monitored on an oscilloscope with the following characteristics:  $t_r \leq 15$  ns,  $R_{in} \geq 10$  M $\Omega$ ,  $C_{in} \leq 11.5$  pF.  
 C. Resistors must be noninductive types.

FIGURE 2. INDUCTIVE-LOAD SWITCHING

BD, BDW, BDX, BU, BUX, BUY Devices

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T-33-15

## TYPICAL CHARACTERISTICS

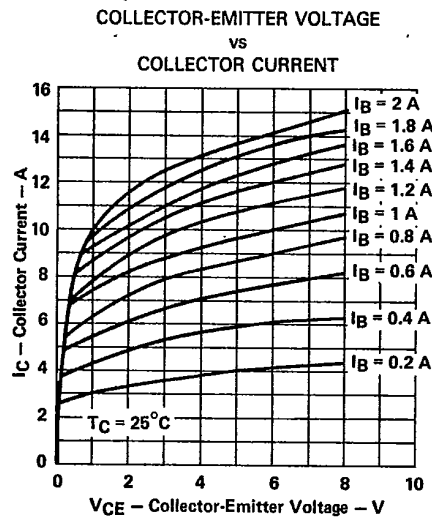


FIGURE 3

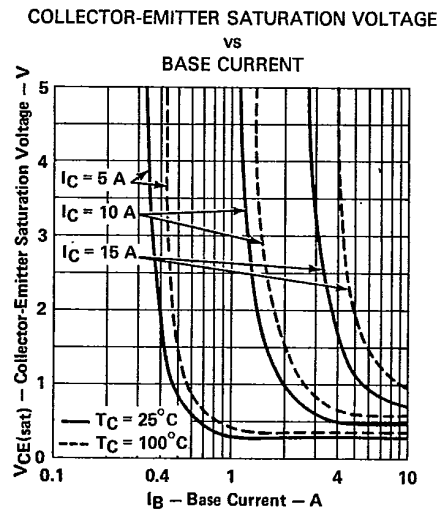


FIGURE 4

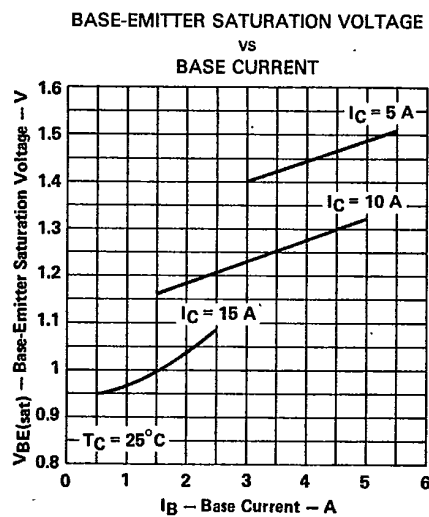


FIGURE 5

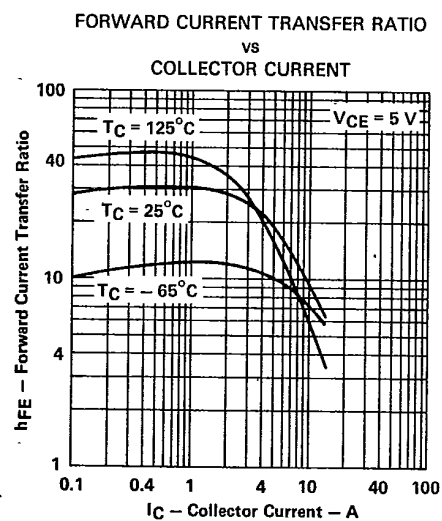


FIGURE 6

BD, BDW, BDX, BU, BUX, BUY Devices

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N-P-N SILICON POWER TRANSISTORS

T-33-15

## TYPICAL CHARACTERISTICS

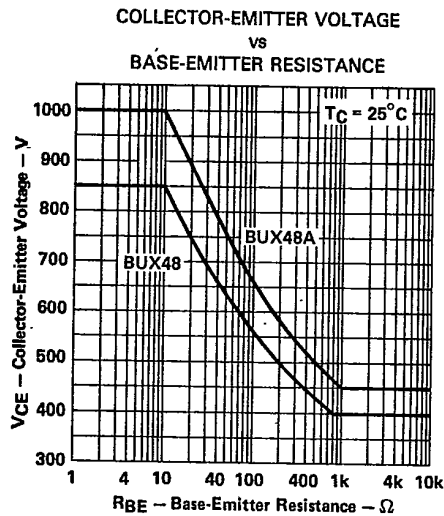


FIGURE 7

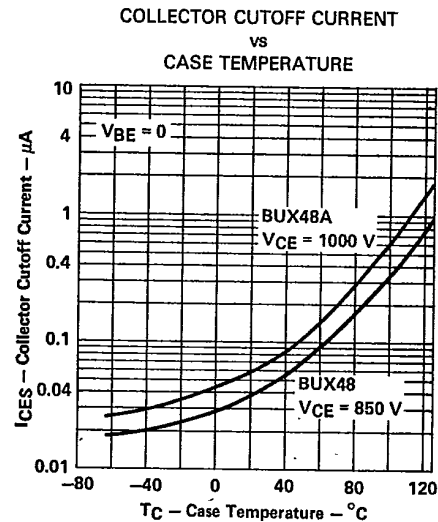


FIGURE 8

## MAXIMUM SAFE OPERATING AREA

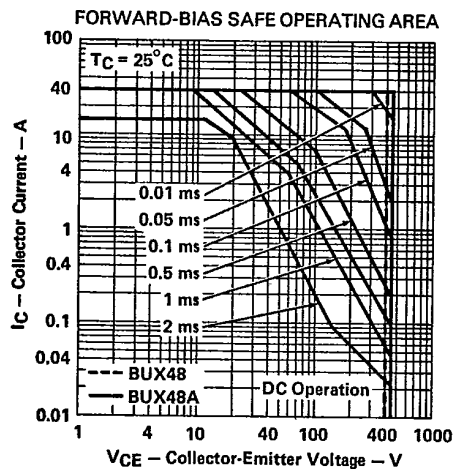


FIGURE 9

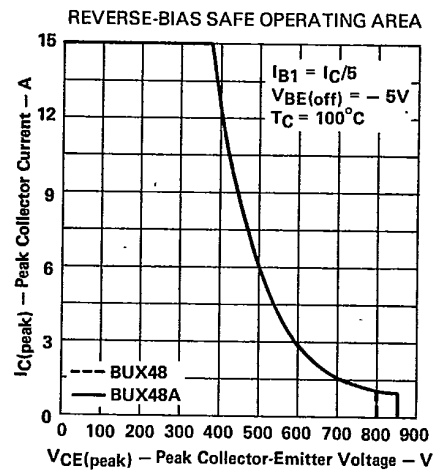


FIGURE 10

BD, BDW, BDY, BU, BUX, BUY Devices

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T-33-15

## MAXIMUM SAFE OPERATING AREA

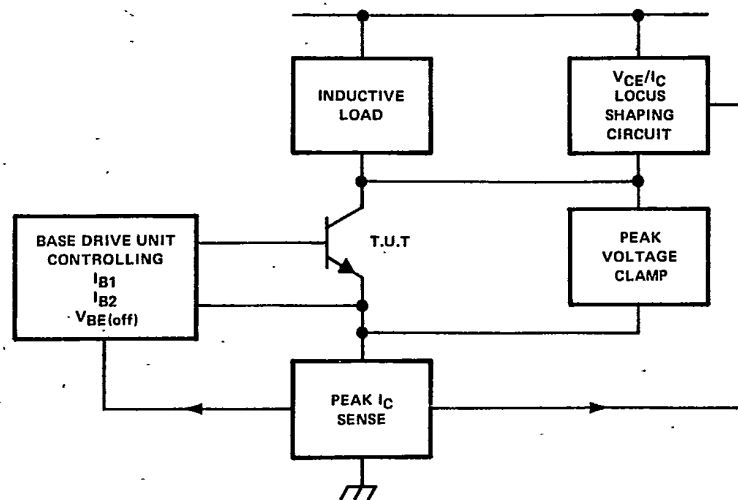


FIGURE 11. TEST CIRCUIT FOR POWER-DOWN TRANSIENT

## THERMAL INFORMATION

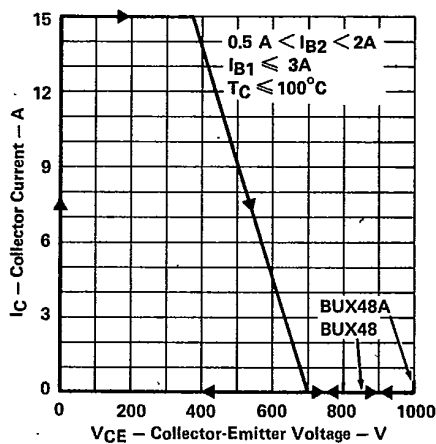
LIMITING CONDITION  
FOR POWER-DOWN TRANSIENT

FIGURE 12

## DISSIPATION DERATING CURVE

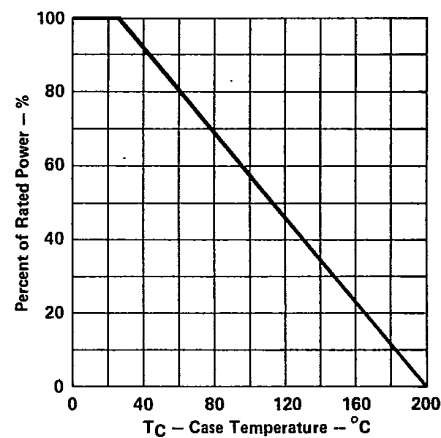


FIGURE 13