

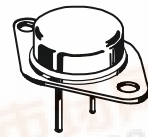
**BUV21**

**SWITCHMODE Series  
NPN Silicon Power Transistor**

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

- High DC current gain:  
hFE min. = 20 at IC = 12 A
  - Low VCE(sat), VCE(sat) max. = 0.6 V at IC = 8 A
- Very fast switching times:  
TF max. = 0.4 μs at IC = 25 A

40 AMPERES  
NPN SILICON  
POWER  
METAL TRANSISTOR  
200 VOLTS  
250 WATTS



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

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	VCEO(sus)	200	Vdc
Collector-Base Voltage	VCBO	250	Vdc
Emitter-Base Voltage	VEBO	7	Vdc
Collector-Emitter Voltage (VBE = -1.5 V)	VCEX	250	Vdc
Collector-Emitter Voltage (RBE = 100 Ω)	VCER	240	Vdc
Collector-Current — Continuous	IC	40	Adc
— Peak (pw ≤ 10 ms)	ICM	50	Apk
Base-Current continuous	IB	8	Adc
Total Power Dissipation @ TC = 25°C	PD	150	Watts
Operating and Storage Junction Temperature Range	TJ, Tstg	-65 to 200	°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θJC	0.7	°C/W

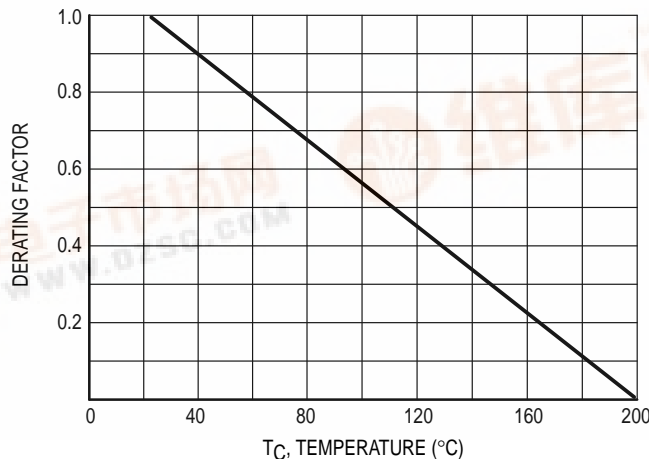


Figure 1. Power Derating

**BUV21****ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS<sup>1</sup>**

Collector–Emitter Sustaining Voltage ( $I_C = 200\text{ mA}$ , $I_B = 0$ , $L = 25\text{ mH}$ )	$V_{CEO(sus)}$	200		Vdc
Collector Cutoff Current at Reverse Bias: ( $V_{CE} = 250\text{ V}$ , $V_{BE} = -1.5\text{ V}$ ) ( $V_{CE} = 250\text{ V}$ , $V_{BE} = -1.5\text{ V}$ , $T_C = 125^\circ\text{C}$ )	$I_{CEX}$		3.0 12.0	mAdc
Collector–Emitter Cutoff Current ( $V_{CE} = 160\text{ V}$ )	$I_{CEO}$		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
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**ON CHARACTERISTICS<sup>1</sup>**

DC Current Gain ( $I_C = 12\text{ A}$ , $V_{CE} = 2\text{ V}$ ) ( $I_C = 25\text{ A}$ , $V_{CE} = 4\text{ V}$ )	$h_{FE}$	20 10	60	
Collector–Emitter Saturation Voltage ( $I_C = 12\text{ A}$ , $I_B = 1.2\text{ A}$ ) ( $I_C = 25\text{ A}$ , $I_B = 3\text{ A}$ )	$V_{CE(sat)}$		0.6 1.5	Vdc
Base–Emitter Saturation Voltage ( $I_C = 25\text{ A}$ , $I_B = 3\text{ A}$ )	$V_{BE(sat)}$		1.5	Vdc

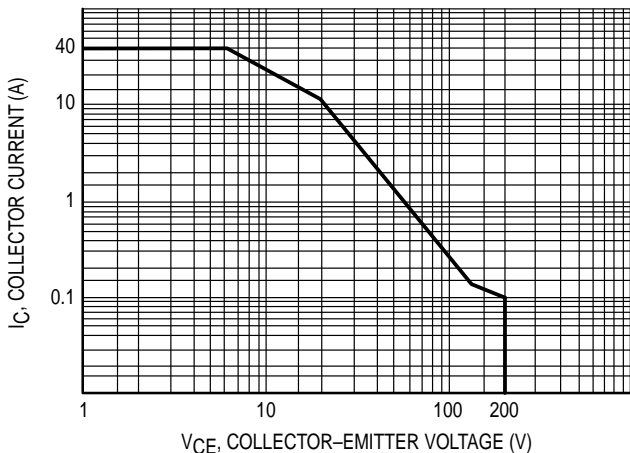
**DYNAMIC CHARACTERISTICS**

Current Gain – Bandwidth Product ( $V_{CE} = 15\text{ V}$ , $I_C = 2\text{ A}$ , $f = 4\text{ MHz}$ )	$f_T$	8.0		MHz
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**SWITCHING CHARACTERISTICS (Resistive Load)**

Turn-on Time	$(I_C = 25\text{ A}$ , $I_{B1} = I_{B2} = 3\text{ A}$ , $V_{CC} = 100\text{ V}$ , $R_C = 4\ \Omega$ )	$t_{on}$	1.0	$\mu\text{s}$
Storage Time		$t_s$	1.8	
Fall Time		$t_f$	0.4	

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

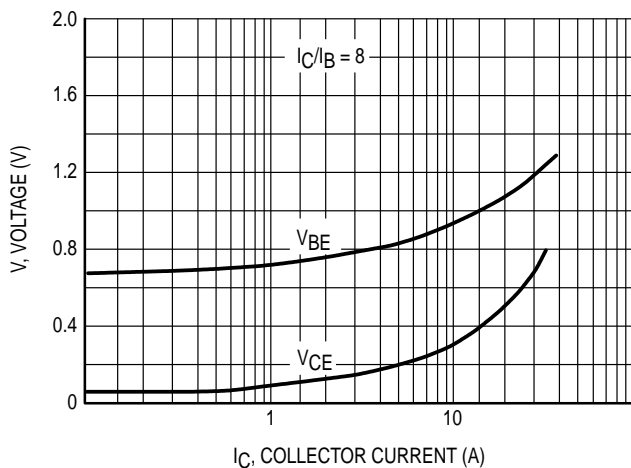


**Figure 2. Active Region Safe Operating Area**

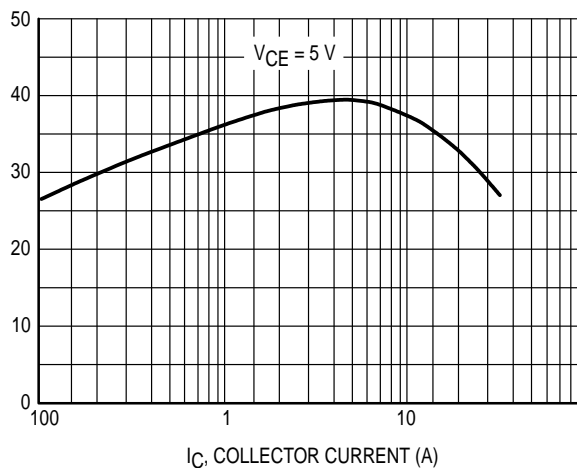
There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation i.e., the transistor must not be subjected to greater 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.

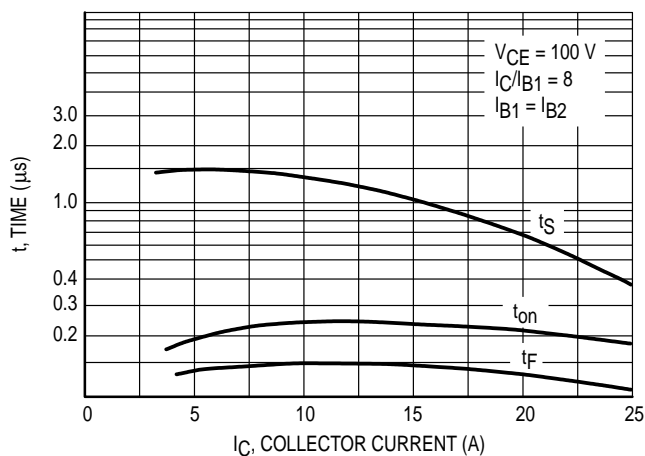
At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.



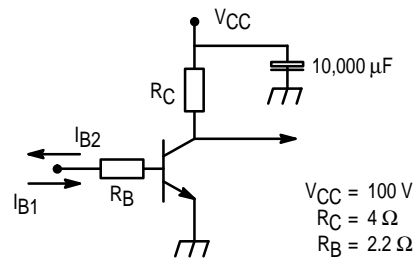
**Figure 3. "On" Voltages**



**Figure 4. DC Current Gain**



**Figure 5. Resistive Switching Performance**

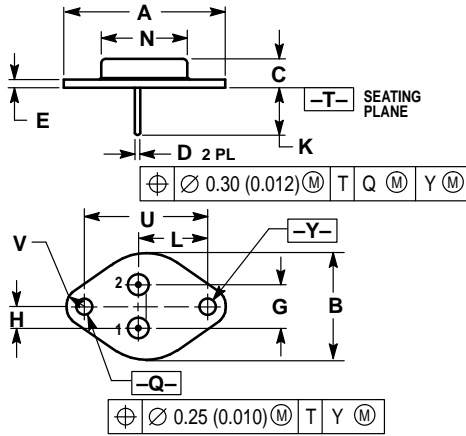


$R_C - R_B$ : Non inductive resistances

$V_{CC} = 100\text{ V}$   
 $R_C = 4\ \Omega$   
 $R_B = 2.2\ \Omega$

**Figure 6. Switching Times Test Circuit**

PACKAGE DIMENSIONS



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

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

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

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