BUV20

SWITCHMODE™ Series NPN Silicon Power Transistor

SWITCHMODE series NPN silicon power transistors are designed for high speed, high current, high power applications.

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

MAXIMUM RATINGS

Rating	Symbol	BUV20	BUV60	Unit
Collector−Emititer 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 V)	V_{CEX}	160	260	Vdc
Collector−Emitter voltage (R_{BE} = 100 Ω)	V_{CER}	150	260	Vdc
Collector−Current — Continuous — Peak (PW ≤ 10 ms)	I_C I_{CM}	50 60		Adc Apk
Base−Current continuous	I_B	10		Adc
Total Power Dissipation @ T_C = 25°C	P_D	250		Watts
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to 200		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	BUV20	BUV60	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.7		°C/W

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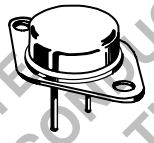
50 AMPERES
NPN SILICON POWER
METAL TRANSISTOR
125 VOLTS, 250 WATTS



CASE 197A−05
TO−204AE
(TO−3)

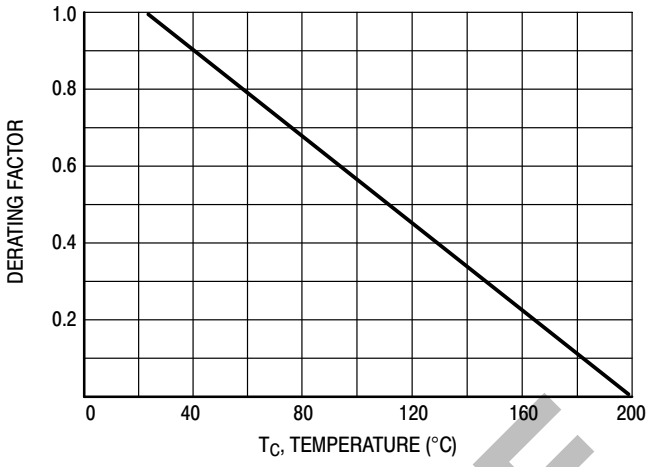


Figure 1. Power Derating

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS[1]					
Collector−Emitter Sustaining Voltage (I_C = 200 mA, I_B = 0, L = 25 mH)	BUV20, BUV60	$V_{CEO(sus)}$	125		Vdc
Collector Cutoff Current at Reverse Bias (V_{CE} = 140 V, V_{BE} = − 1.5 V) (V_{CE} = 140 V, V_{BE} = − 1.5 V, T_C = 125°C) (V_{CE} = 260 V, V_{BE} = − 1.5 V)	 BUV20 BUV20 BUV60	I_{CEX}		 3.0 12	mAdc
Collector−Emitter Cutoff Current (V_{CE} = 100 V)	BUV20	I_{CEO}		3.0	mAdc
Emitter−Base Reverse Voltage (I_E = 50 mA)	BUV20, BUV60	V_{EBO}	7		V
Emitter−Cutoff Current (V_{EB} = 5 V)	BUV20, BUV60	I_{EBO}		1.0	mAdc
SECOND BREAKDOWN					
Second Breakdown Collector Current with base forward biased (V_{CE} = 20 V, t = 1 s) (V_{CE} = 40 V, t = 1 s)		$I_{S/b}$	 12 1.5		Adc
ON CHARACTERISTICS[1]					
DC Current Gain (I_C = 25 A, V_{CE} = 2 V) (I_C = 50 A, V_{CE} = 4 V)	 BUV20 BUV20	h_{FE}	 20 10	 60 −	
Collector−Emitter Saturation Voltage (I_C = 25 A, I_B = 2.5 A) (I_C = 50 A, I_B = 5 A)	 BUV20 BUV20	$V_{CE(sat)}$		 0.6 1.2	Vdc
Base−Emitter Saturation Voltage (I_C = 50 A, I_B = 5 A)0	 BUV20	$V_{BE(sat)}$		 2.0	Vdc
Collector−Emitter Saturation Voltage (I_C = 25 A, I_B = 1.25 A) (I_C = 50 A, I_B = 5 A) (I_C = 60 A, I_B = 7.5 A)	 BUV60 BUV60 BUV60	$V_{CE(sat)}$		 0.9 0.9 1.2	Vdc
Base−Emitter Saturation Voltage (I_C = 50 A, I_B = 5 A) (I_C = 60 A, I_B = 7.5 A)	 BUV60 BUV60	$V_{BE(sat)}$		 1.6 1.8	Vdc
DYNAMIC CHARACTERISTICS					
Current Gain — Bandwidth Product (V_{CE} = 15 V, I_C = 2 A, f = 4 MHz)		f_T	8.0		MHz

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
SWITCHING CHARACTERISTICS (Resistive Load)					
Turn−on Time	(I_C = 50 A, I_{B1} = I_{B2} = 5 A, V_{CC} = 30 V, R_C = 0.6 Ω)	t_{on}		1.5	μs
Storage Time		t_s		1.2	
Fall Time		t_f		0.25	

[1] Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

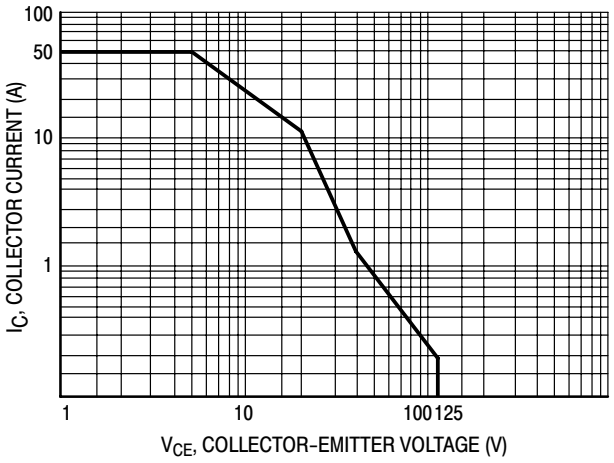


Figure 2. Active Region Safe Operating Area

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 $T_C = 25°C$. $T_{J(pk)}$ 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.

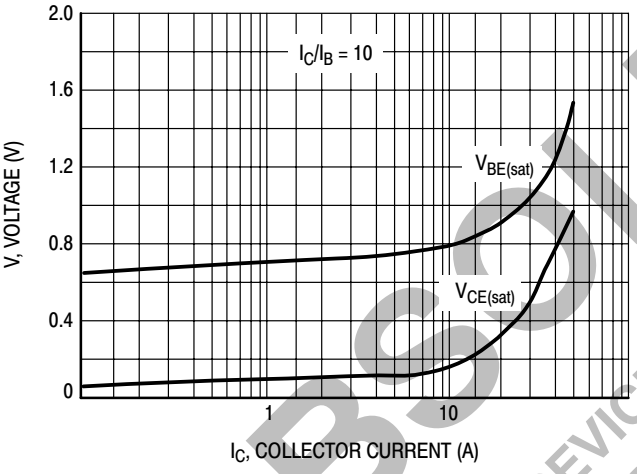


Figure 3. “On” Voltages

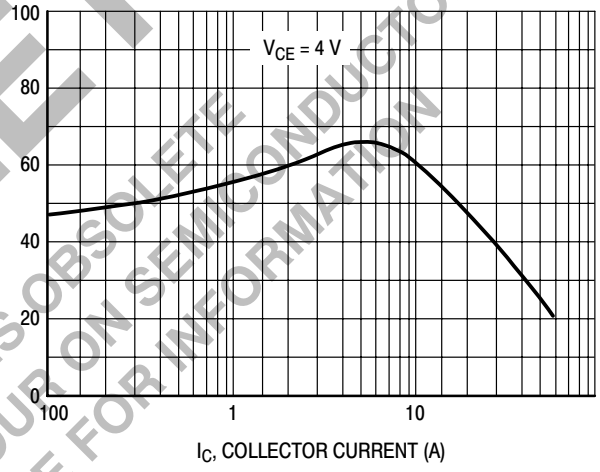


Figure 4. DC Current Gain

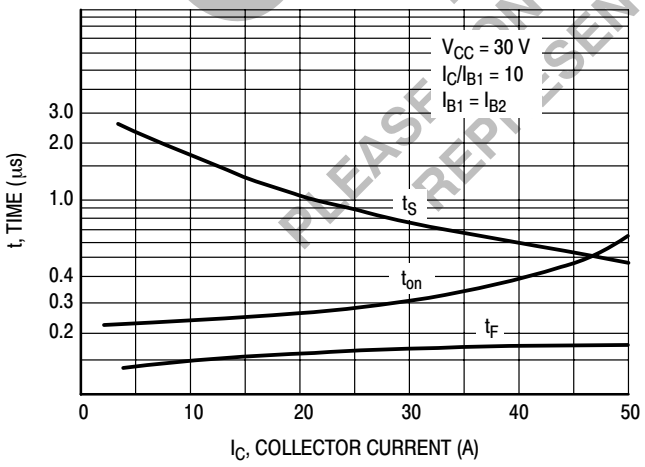
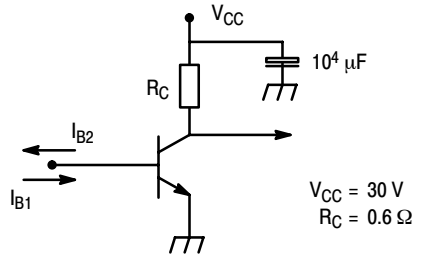


Figure 5. Resistive Switching Performance

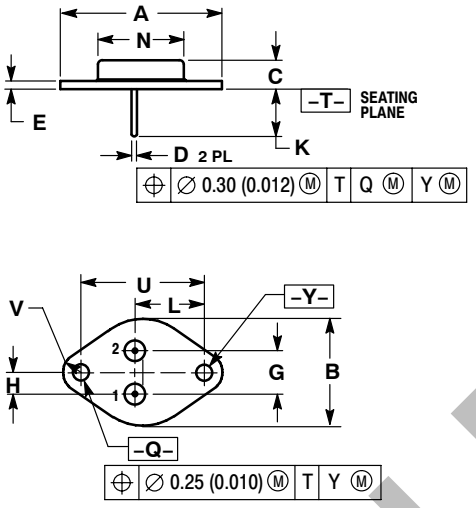


R_C — Non inductive resistance

Figure 6. Switching Times Test Circuit

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.

	INCHES		MILLIMETERS	
DIM	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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