BUV21

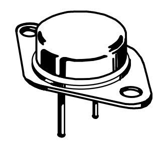
SWITCHMODE Series
NPN Silicon Power Transistor

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

- High DC current gain:
  h_{FE} min. = 20 at I_C = 12 A
- Low $V_{CE(sat)}$, $V_{CE(sat)}$ max. = 0.6 V at I_C = 8 A

Very fast switching times:
TF max. = 0.4 µs at I_C = 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	$V_{CEO(sus)}$	200	Vdc
Collector–Base Voltage	V_{CBO}	250	Vdc
Emitter–Base Voltage	V_{EBO}	7	Vdc
Collector–Emitter Voltage (V_{BE} = –1.5 V)	V_{CEX}	250	Vdc
Collector–Emitter Voltage (R_{BE} = 100 Ω)	V_{CER}	240	Vdc
Collector–Current — Continuous — Peak (pw ≤ 10 ms)	I_C I_{CM}	40 50	Adc Apk
Base–Current continuous	I_B	8	Adc
Total Power Dissipation @ T_C = 25°C	P_D	150	Watts
Operating and Storage Junction Temperature Range	T_J, T_{stg}	–65 to 200	°C

THERMAL CHARACTERISTICS

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

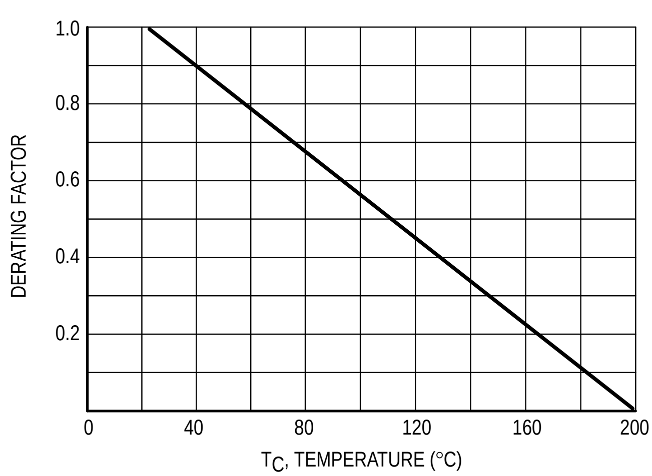


Figure 1. Power Derating

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REV 7

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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)	$V_{CEO(sus)}$	200		Vdc
Collector Cutoff Current at Reverse Bias:	I_{CEX}			mAdc
(V_{CE} = 250 V, V_{BE} = –1.5 V)			3.0	
(V_{CE} = 250 V, V_{BE} = –1.5 V, T_C = 125°C)			12.0	
Collector–Emitter Cutoff Current (V_{CE} = 160 V)	I_{CEO}		3.0	mAdc
Emitter–Base Reverse Voltage (I_E = 50 mA)	V_{EBO}	7		V
Emitter–Cutoff Current (V_{EB} = 5 V)	I_{EBO}		1.0	mAdc
SECOND BREAKDOWN				
Second Breakdown Collector Current with base forward biased	$I_{S/b}$			Adc
(V_{CE} = 20 V, t = 1 s)		12		
(V_{CE} = 140 V, t = 1 s)		0.15		
ON CHARACTERISTICS[1]				
DC Current Gain	h_{FE}			
(I_C = 12 A, V_{CE} = 2 V)		20	60	
(I_C = 25 A, V_{CE} = 4 V)		10		
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 12 A, I_B = 1.2 A)			0.6	
(I_C = 25 A, I_B = 3 A)			1.5	
Base–Emitter Saturation Voltage (I_C = 25 A, I_B = 3 A)	$V_{BE(sat)}$		1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current Gain – Bandwidth Product (V_{CE} = 15 V, I_C = 2 A, f = 4 MHz)	f_T	8.0		MHz
SWITCHING CHARACTERISTICS (Resistive Load)				
Turn-on Time (I_C = 25 A, I_{B1} = I_{B2} = 3 A, V_{CC} = 100 V, R_C = 4 Ω)	t_{on}		1.0	μs
Storage Time (I_C = 25 A, I_{B1} = I_{B2} = 3 A, V_{CC} = 100 V, R_C = 4 Ω)	t_s		1.8	μs
Fall Time (I_C = 25 A, I_{B1} = I_{B2} = 3 A, V_{CC} = 100 V, R_C = 4 Ω)	t_f		0.4	μs

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

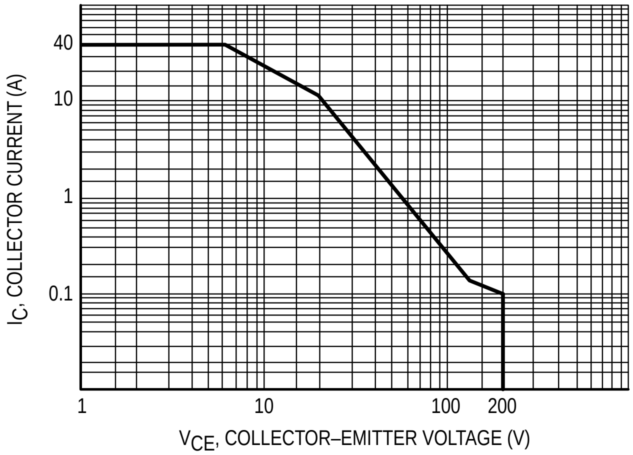


Figure 2. Active Region Safe Operating Area

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.

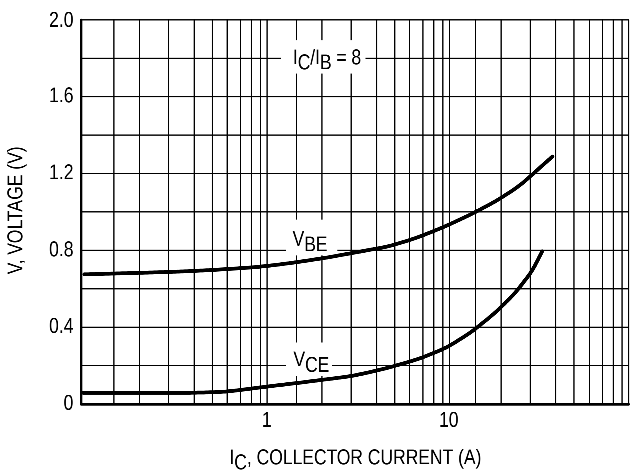


Figure 3. “On” Voltages

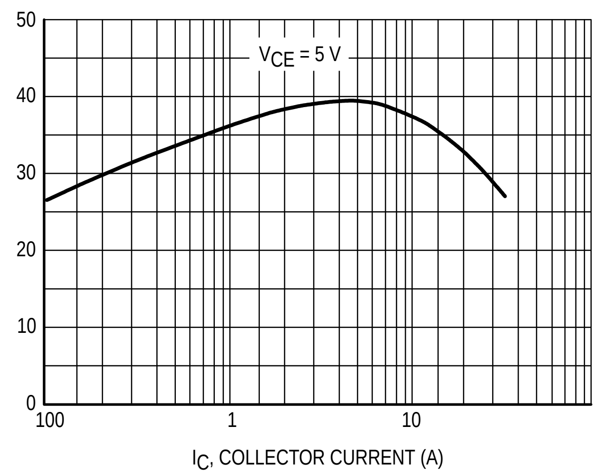


Figure 4. DC Current Gain

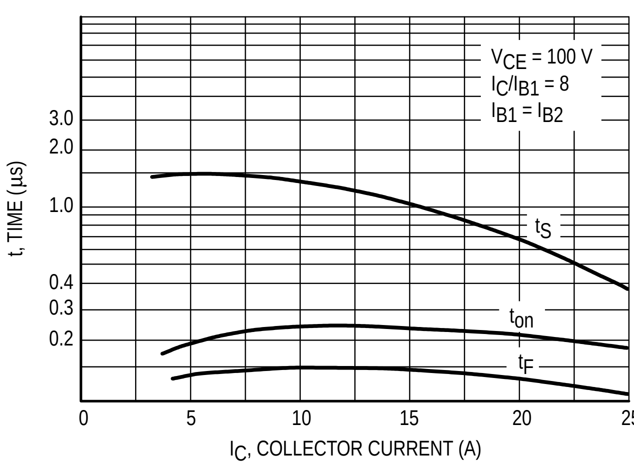


Figure 5. Resistive Switching Performance

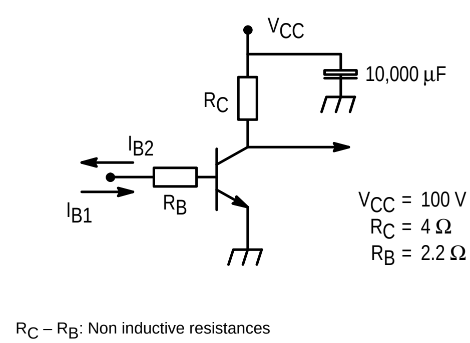
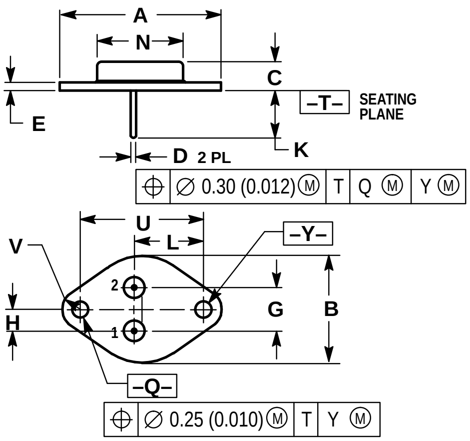


Figure 6. Switching Times Test Circuit

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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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