MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

NPN
BD311
PNP
BD312

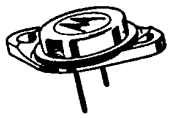
COMPLEMENTARY SILICON HIGH-POWER TRANSISTORS

. . . designed for high quality amplifiers operating up to 60 Watts into 4 ohm load.

- High DC Current Gain
- Excellent Safe Operating Area
- High Current Gain — Bandwidth Product — Typical
  f_T = 4.0 MHz @ I_C = 0.5 A

10 AMPERE COMPLEMENTARY SILICON POWER TRANSISTORS

60 VOLTS
115 WATTS



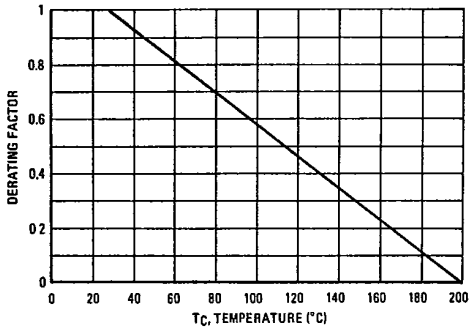
MAXIMUM RATINGS

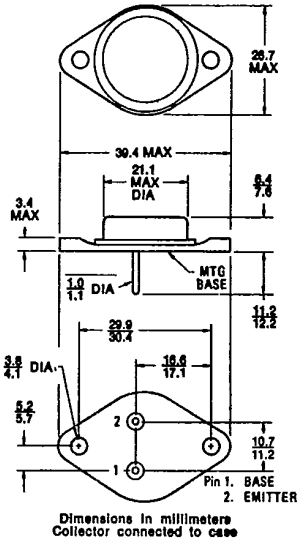
Rating	Symbol	BD311/312	Unit
Collector-Emitter Voltage	V_{CEO}	60	Vdc
Collector-Base Voltage	V_{CB}	60	Vdc
Emitter-Base Voltage	V_{EB}	5.0	Vdc
Collector Current — Continuous Peak	I_C	10 20	Adc
Base Current	I_B	4.0	Adc
Total Device Dissipation @ T_C = 25 °C Derate above 25 °C	P_D	115 0.658	Watts W/°C
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}	1.52	°C/W

FIGURE 1 — POWER DERATING





Dimensions in millimeters
Collector connected to case

CASE 11
TO-3

3

BD311 NPN, BD312 PNP

T-33-13

T-33-23

ELECTIRCAL CHARACTERISTICS* (T_C = 25 °C unless otherwise noted)

Characteristic	Symbol	Min.	Max.	Unit.
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage[1] (I_C = 200 mAdc, I_B = 0)	$V_{CEO(sus)}$	60		Vdc
Collector-Base Cutoff Current (V_{CB} = Rated V_{CB}, I_E = 0)	I_{CBO}		1.0	mAdc
Emitter-Base Cutoff Current (V_{BE} = 7.0 Vdc, I_C = 0)	I_{EBO}		1.0	mAdc
ON CHARACTERISTICS[1]				
DC Current Gain (I_C = 5.0 Vdc, V_{CE} = 4.0 Vdc) (I_C = 10 Adc, V_{CE} = 4.0 Vdc)	H_{FE}	25 5		–
Collector-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.5 Adc)	$V_{CE(sat)}$		1.0	Vdc
Base-Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.5 Adc)	$V_{BE(sat)}$		1.8	Vdc
Base-Emitter On Voltage (I_C = 5.0 Adc, V_{CE} = 4.0 Vdc)	$V_{BE(on)}$		1.5	Vdc
DYNAMIC CHARACTERISTICS[1]				
Current-Gain — Bandwidth Product[2] (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f_{test} = 1.0 MHz)	f_T	4.0		MHz
SECOND BREAKDOWN				
Second Breakdown Collector Current (V_{CE} = 39 Vdc, t = 0.5 sec.) (V_{CE} = 50 Vdc, t = 0.5 sec.)	$I_{S/B}$	2.95 0.60		Adc

[1] Pulse test: Pulse width ≤ 300 μs, Duty Cycle ≥ 2%

[2] $f_T = |h_{fe}| \cdot f_{test}$

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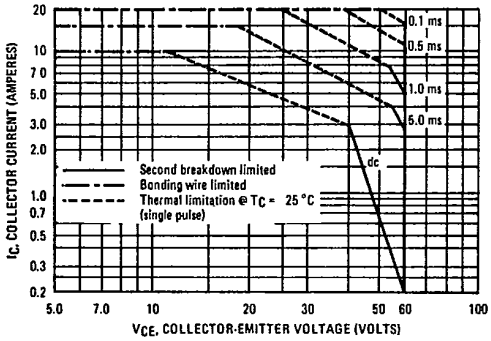
FIGURE 2 – ACTIVE REGION SAFE OPERATING AREA



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.
Second breakdown pulse limits are valid for duty cycles to 10%.

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

BD311 NPN, BD312 PNP

T-33-13

T-33-23

PNP DEVICE
BD312

NPN DEVICE
BD311

FIGURE 3 – DC CURRENT GAIN

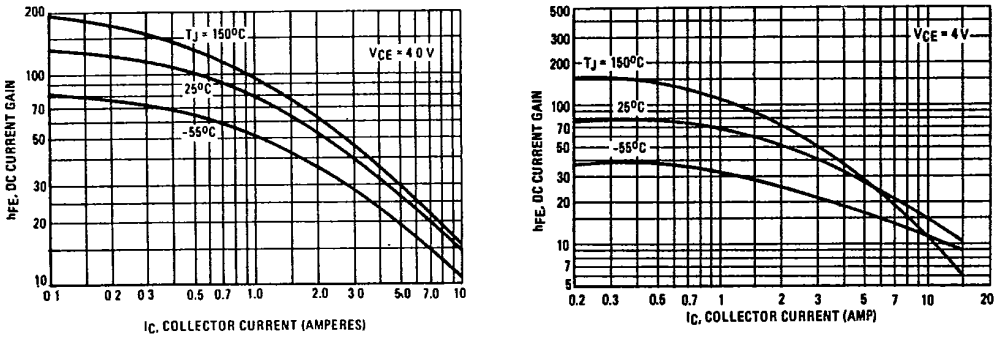
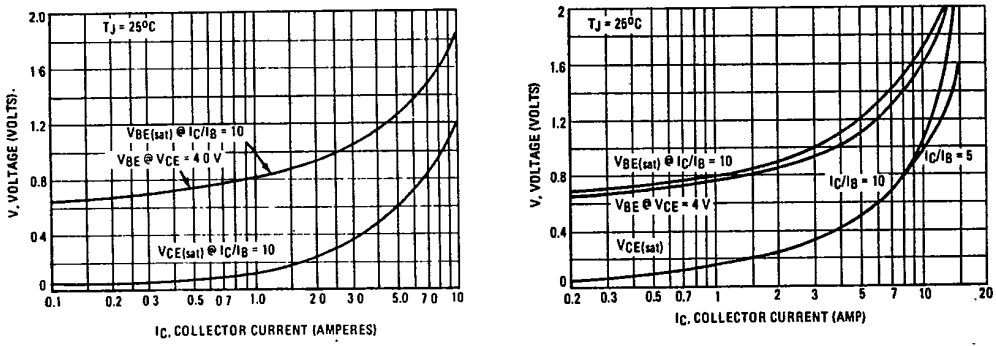


FIGURE 4 – "ON" VOLTAGES



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