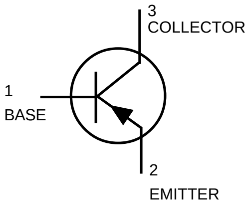
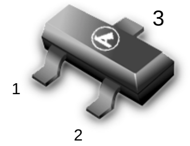
General Purpose Transistors

PNP Silicon

BCW69LT1
BCW70LT1





CASE 318–08, STYLE 6
SOT–23 (TO–236AB)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	– 45	Vdc
Emitter–Base Voltage	V_{EBO}	– 5.0	Vdc
Collector Current — Continuous	I_C	– 100	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR– 5 Board, (1) T_A = 25°C Derate above 25°C	P_D	225 1.8	mW mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (2) T_A = 25°C Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J , T_{stg}	–55 to +150	°C

DEVICE MARKING

BCW69LT1 = H1; BCW70LT1 = H2,

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (I_C = –2.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	– 45	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = –100 µAdc, V_{EB} = 0)	$V_{(BR)CES}$	– 50	—	Vdc
Emitter–Base Breakdown Voltage (I_E = –10 µAdc, I_C = 0)	$V_{(BR)EBO}$	– 5.0	—	Vdc
Collector Cutoff Current	I_{CEO}			
(V_{CE} = –20 Vdc, I_E = 0)		—	– 100	nAdc
(V_{CE} = –20 Vdc, I_E = 0 , T_A = 100°C)		—	– 10	µAdc

1. FR– 5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

BCW69LT1 BCW70LT1

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS				
DC Current Gain	h_{FE}			—
(I_C= –2.0 mAdc, V_{CE} = –5.0 Vdc) BCW69LT1		120	260	
BCW70LT1		215	500	
Collector–Emitter Saturation Voltage (I_C = – 10 mAdc, I_B = –0.5 mAdc)	$V_{CE(sat)}$	—	– 0.3	Vdc
Base–Emitter On Voltage (I_C = – 2.0 mAdc, V_{CE} = – 5.0Vdc)	$V_{BE(on)}$	– 0.6	– 0.75	Vdc
SMALL–SIGNAL CHARACTERISTICS				
Output Capacitance (I_E= 0 V_{CB} = –10Vdc, f = 1.0 MHz)	C_{obo}	—	7.0	pF
Noise Figure (V_{CE} = – 5.0 Vdc, I_C = – 0.2 mAdc, R_S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	N_F	—	10	dB

TYPICAL NOISE CHARACTERISTICS

(V_{CE} = – 5.0 Vdc, T_A = 25°C)

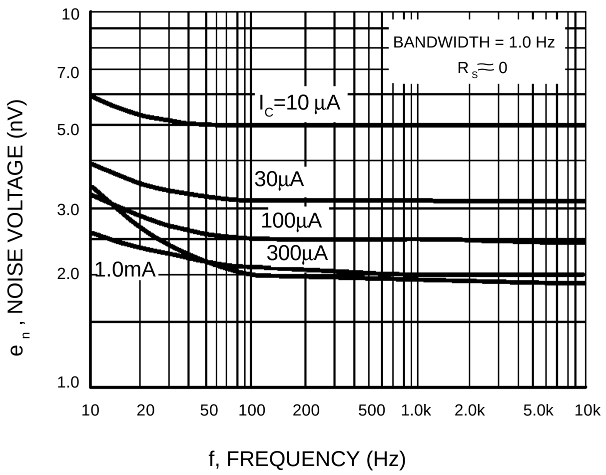


Figure 1. Noise Voltage

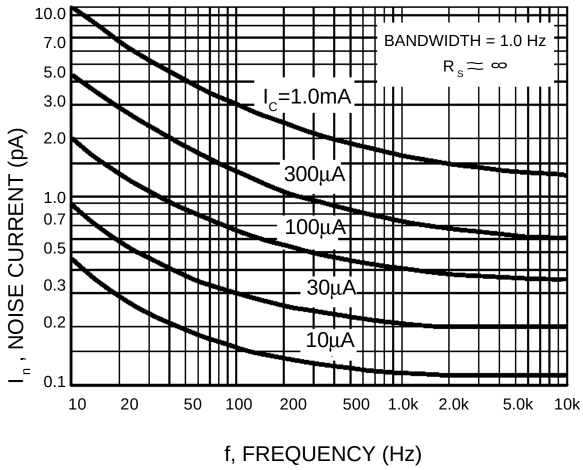


Figure 2. Noise Current

NOISE FIGURE CONTOURS

(V_{CE} = – 5.0 Vdc, T_A = 25°C)

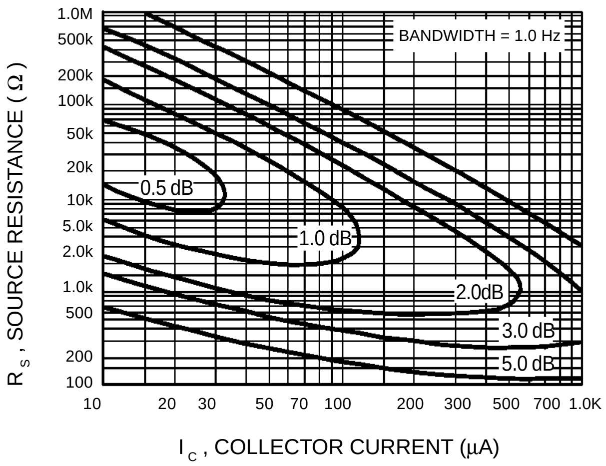


Figure 3. Narrow Band, 100 Hz

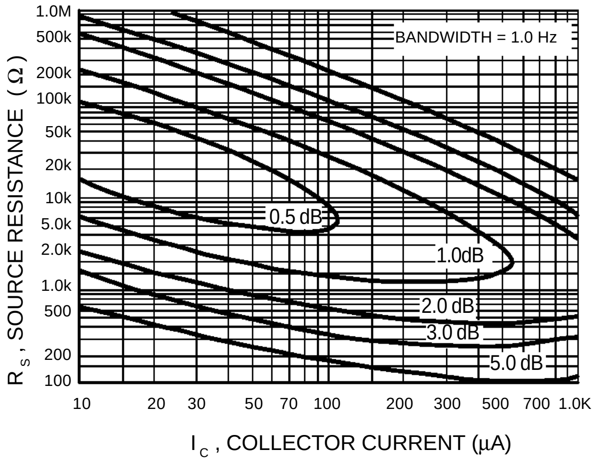


Figure 4. Narrow Band, 1.0 kHz

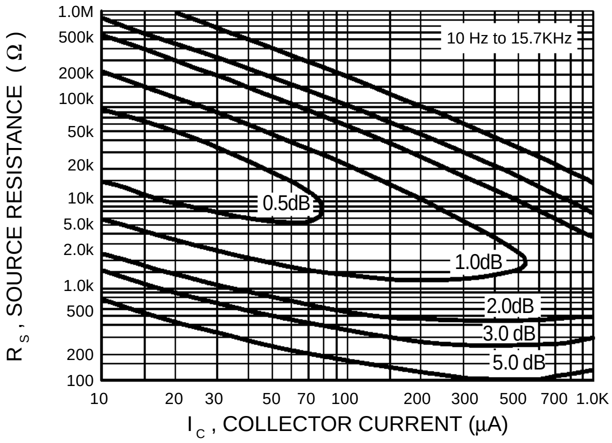


Figure 5. Wideband

Noise Figure is Defined as:

$$NF = 20 \log_{10} \left(\frac{e_n^{2} + 4KTR_S + I_n^{2} R_S^{2}}{4KTR_S} \right)^{1/2}$$

e_n = Noise Voltage of the Transistor referred to the input. (Figure 3)
I_n = Noise Current of the Transistor referred to the input. (Figure 4)
K = Boltzman's Constant (1.38 x 10^{-23} j/°K)
T = Temperature of the Source Resistance (°K)
R_s = Source Resistance (Ω)

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TYPICAL STATIC CHARACTERISTICS

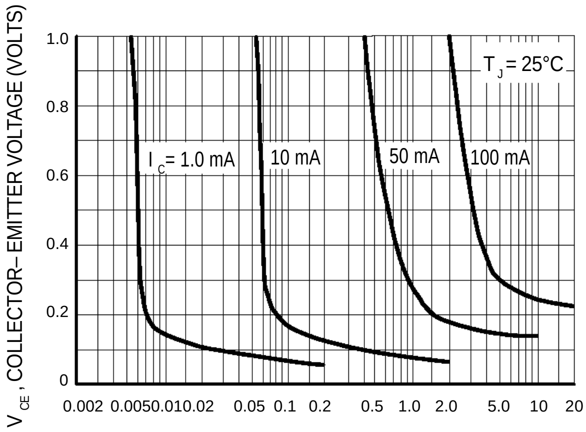

Figure 6. Collector Saturation Region

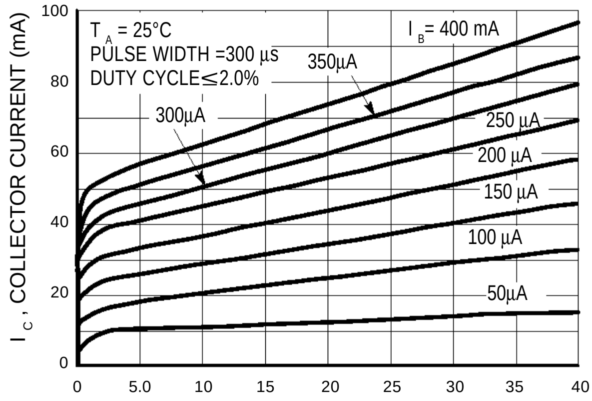

Figure 7. Collector Characteristics

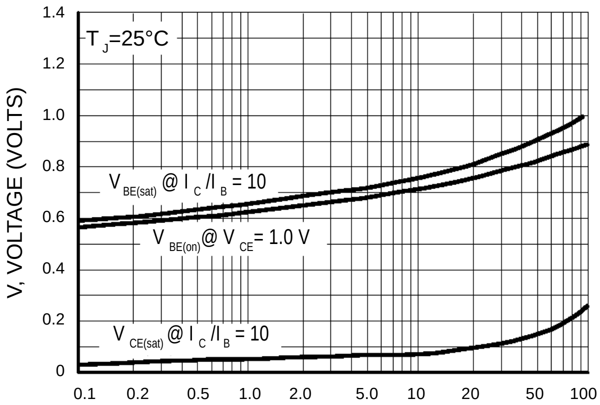

Figure 10. “On” Voltages

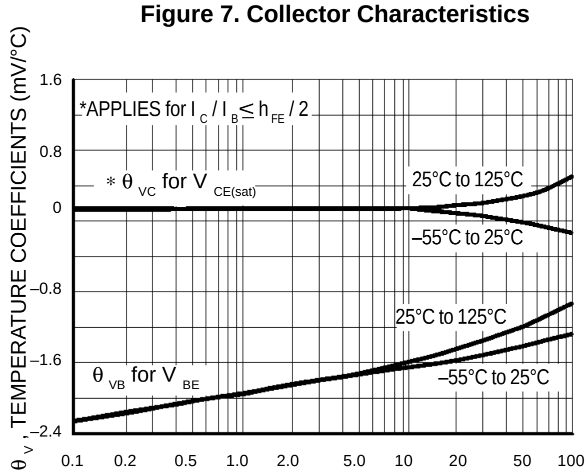

Figure 11. Temperature Coefficients

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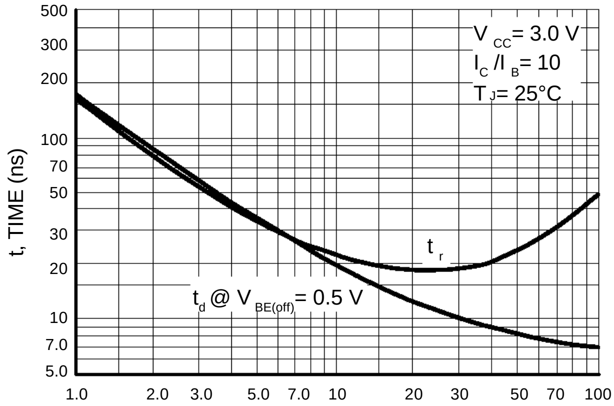
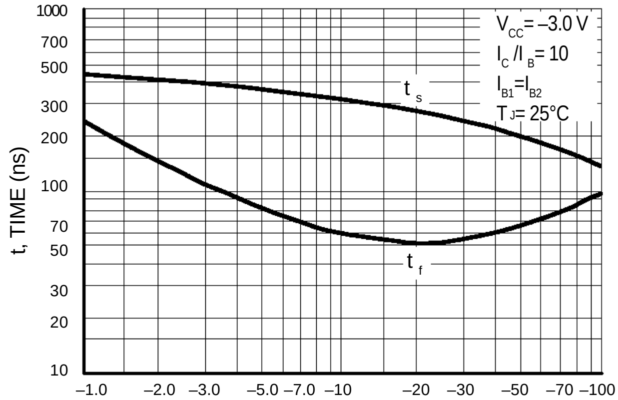
TYPICAL DYNAMIC CHARACTERISTICS



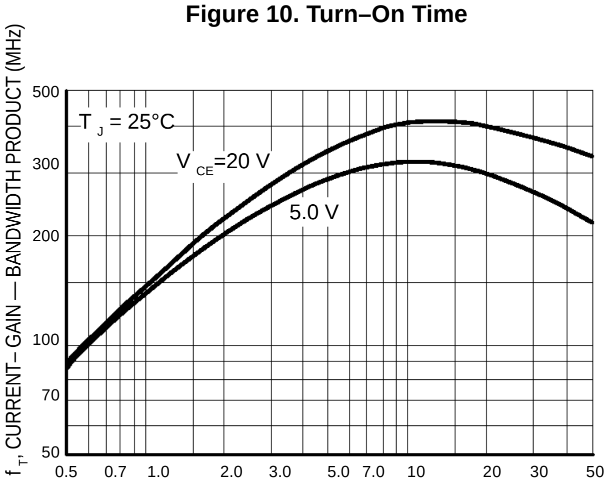
I C , COLLECTOR CURRENT (mA)

Figure 10. Turn–On Time



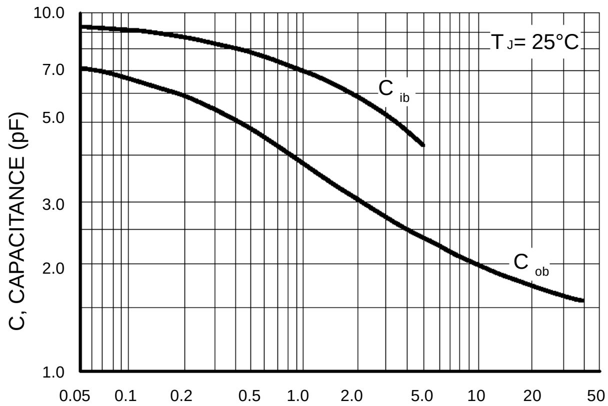
I C , COLLECTOR CURRENT (mA)

Figure 11. Turn–Off Time



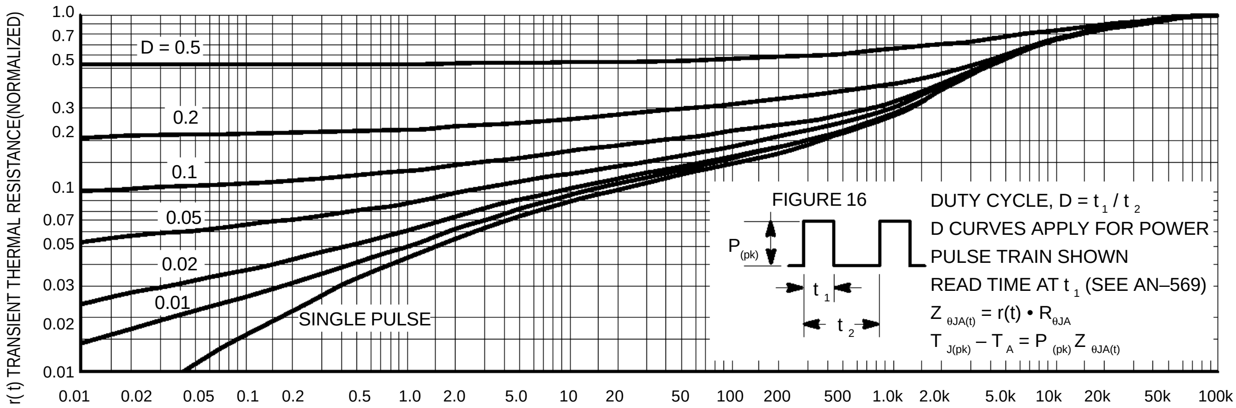
I C , COLLECTOR CURRENT (mA)

Figure 12. Current–Gain — Bandwidth Product



V R , REVERSE VOLTAGE (VOLTS)

Figure 13. Capacitance



t, TIME (ms)

Figure 14. Thermal Response

BCW69LT1 BCW70LT1

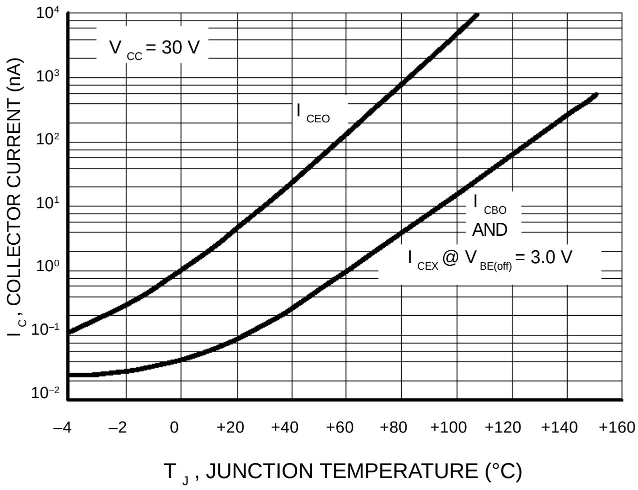


Figure 15. Typical Collector Leakage Current

DESIGN NOTE: USE OF THERMAL RESPONSE DATA

A train of periodical power pulses can be represented by the model as shown in Figure 16. Using the model and the device thermal response the normalized effective transient thermal resistance of Figure 14 was calculated for various duty cycles.

To find $Z_{\theta JA(t)}$, multiply the value obtained from Figure 14 by the steady state value $R_{\theta JA}$.

Example:

Dissipating 2.0 watts peak under the following conditions:

t_1 = 1.0 ms, t_2 = 5.0 ms. (D = 0.2)

Using Figure 14 at a pulse width of 1.0 ms and D = 0.2, the reading of r(t) is 0.22.

The peak rise in junction temperature is therefore

$\Delta T = r(t) \times P_{(pk)} \times R_{\theta JA} = 0.22 \times 2.0 \times 200 = 88°C$.

For more information, see AN–569.