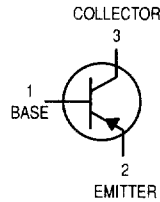
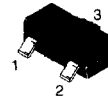


**General Purpose Transistors**  
PNP Silicon



**BCW29LT1**  
**BCW30LT1**



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

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	-32	Vdc
Collector-Base Voltage	$V_{CBO}$	-32	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) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total Device Dissipation Alumina Substrate, (2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

**DEVICE MARKING**

BCW29LT1 = C1; BCW30LT1 = C2

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

Characteristic	Symbol	Min	Max	Unit
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**OFF CHARACTERISTICS**

Collector-Emitter Breakdown Voltage ( $I_C = -2.0 \text{ mAdc}, I_E = 0$ )	$V_{(BR)CEO}$	-32	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = -100 \mu\text{Adc}, V_{EB} = 0$ )	$V_{(BR)CES}$	-32	—	Vdc
Collector-Base Breakdown Voltage ( $I_C = -10 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)CBO}$	-32	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = -10 \mu\text{Adc}, I_C = 0$ )	$V_{(BR)EBO}$	-5.0	—	Vdc
Collector Cutoff Current ( $V_{CB} = -32 \text{ Vdc}, I_E = 0$ ) ( $V_{CB} = -32 \text{ Vdc}, I_E = 0, T_A = 100^\circ\text{C}$ )	$I_{CBO}$	—	-100 -10	nAdc $\mu\text{Adc}$

- FR-5 =  $1.0 \times 0.75 \times 0.062 \text{ in.}$
- Alumina =  $0.4 \times 0.3 \times 0.024 \text{ in. 99.5\% alumina.}$

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

Characteristic	Symbol	Min	Max	Unit
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = -2.0 \text{ mA dc}$ , $V_{CE} = -5.0 \text{ V dc}$ )	BCW29	120	260	—
	BCW30	215	500	—
Collector–Emitter Saturation Voltage ( $I_C = -10 \text{ mA dc}$ , $I_B = -0.5 \text{ mA dc}$ )	$V_{CE(\text{sat})}$	—	-0.3	Vdc
Base–Emitter On Voltage ( $I_C = -2.0 \text{ mA dc}$ , $V_{CE} = -5.0 \text{ V dc}$ )	$V_{BE(\text{on})}$	-0.6	-0.75	Vdc
<b>SMALL–SIGNAL CHARACTERISTICS</b>				
Output Capacitance ( $E = 0$ , $V_{CB} = -10 \text{ V dc}$ , $f = 1.0 \text{ MHz}$ )	$C_{obo}$	—	7.0	pF
Noise Figure ( $I_C = -0.2 \text{ mA dc}$ , $V_{CE} = -5.0 \text{ V dc}$ , $R_S = 2.0 \text{ k}\Omega$ , $f = 1.0 \text{ kHz}$ , $BW = 200 \text{ Hz}$ )	NF	—	10	dB

TYPICAL NOISE CHARACTERISTICS

( $V_{CE} = -5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

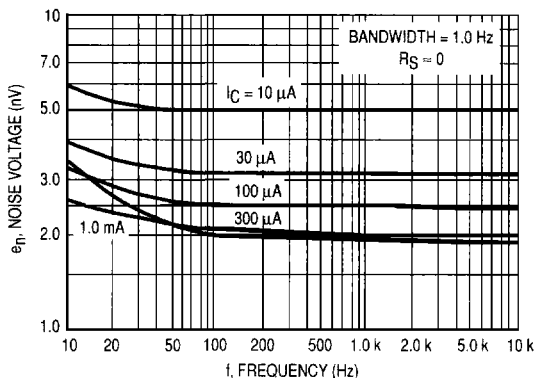


Figure 1. Noise Voltage

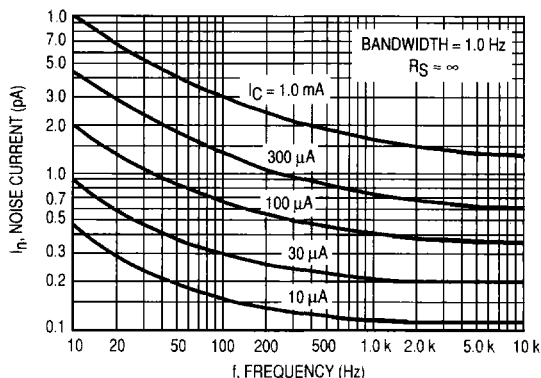


Figure 2. Noise Current

NOISE FIGURE CONTOURS

( $V_{CE} = -5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

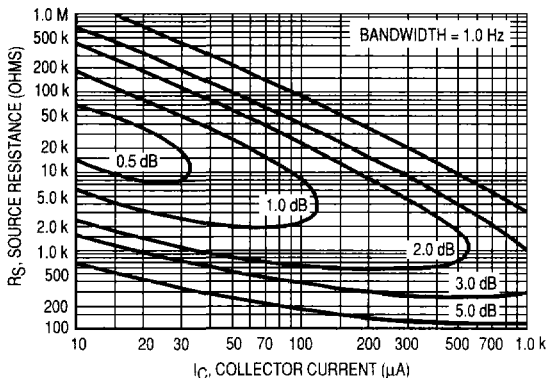


Figure 3. Narrow Band, 100 Hz

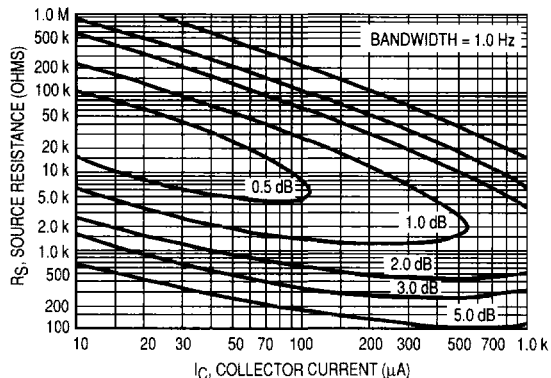


Figure 4. Narrow Band, 1.0 kHz

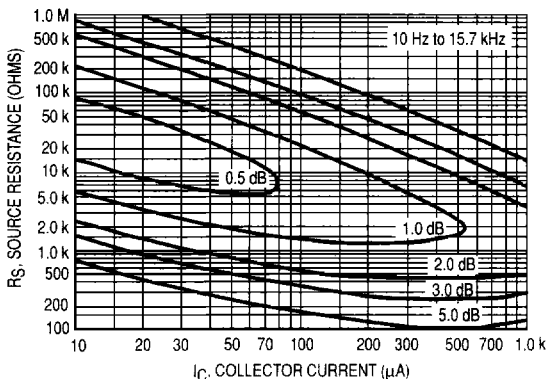


Figure 5. Wideband

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 ( $1.38 \times 10^{-23} \text{ J}^\circ\text{K}$ )

$T$  = Temperature of the Source Resistance ( $^\circ\text{K}$ )

$R_S$  = Source Resistance (Ohms)

TYPICAL STATIC CHARACTERISTICS

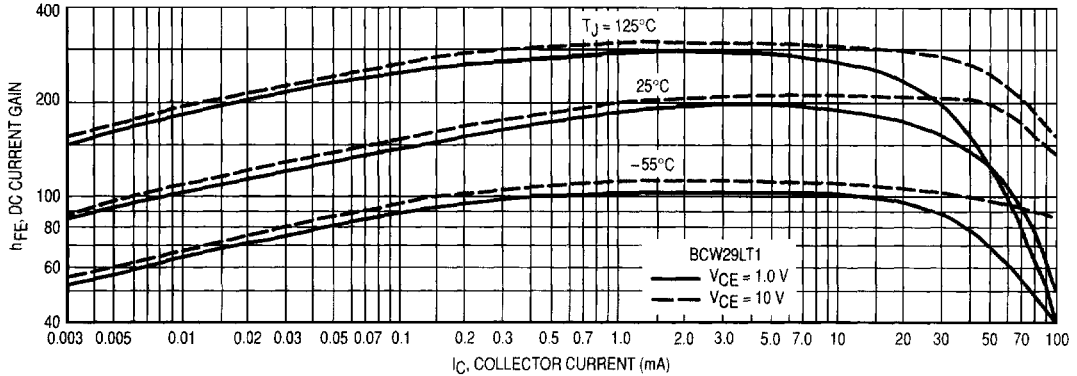


Figure 6. DC Current Gain

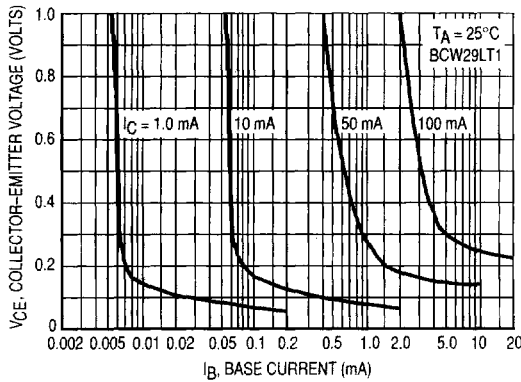


Figure 7. Collector Saturation Region

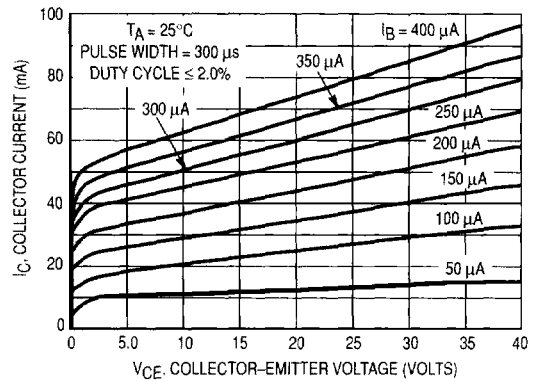


Figure 8. Collector Characteristics

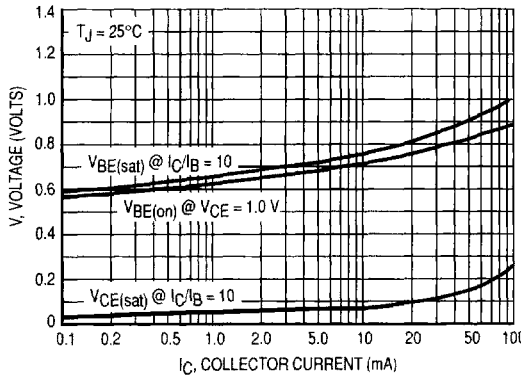


Figure 9. "On" Voltages

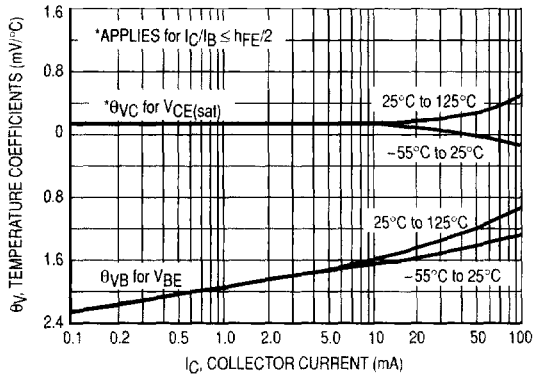


Figure 10. Temperature Coefficients

TYPICAL DYNAMIC CHARACTERISTICS

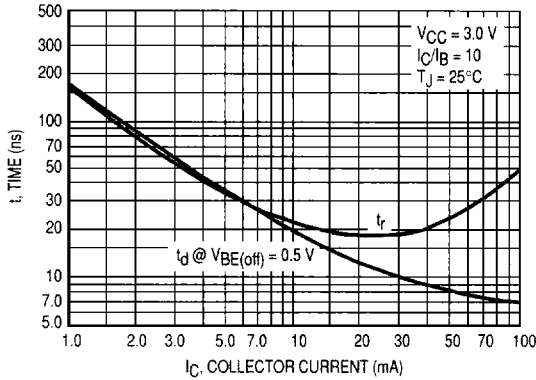


Figure 11. Turn-On Time

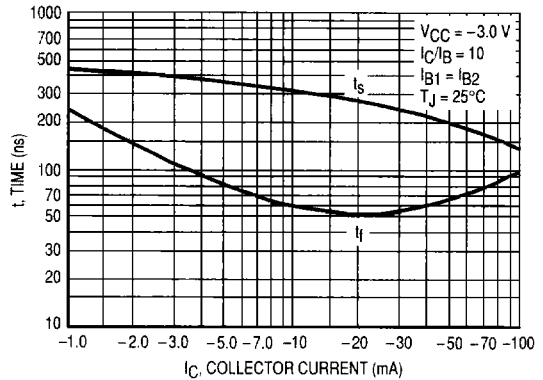


Figure 12. Turn-Off Time

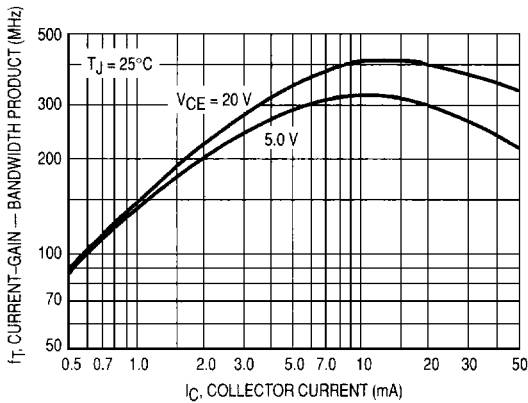


Figure 13. Current-Gain — Bandwidth Product

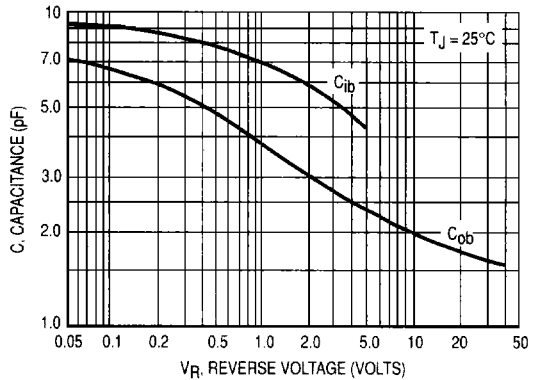


Figure 14. Capacitance

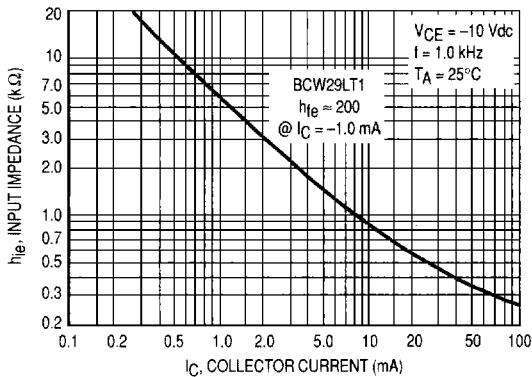


Figure 15. Input Impedance

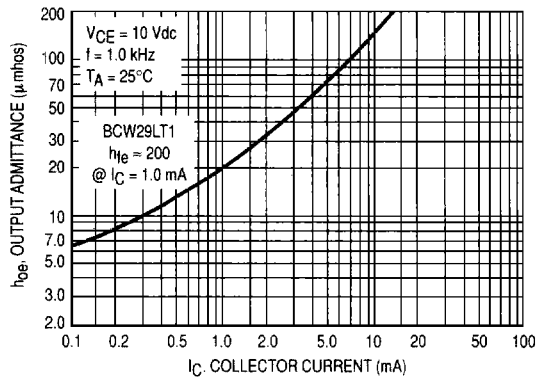


Figure 16. Output Admittance

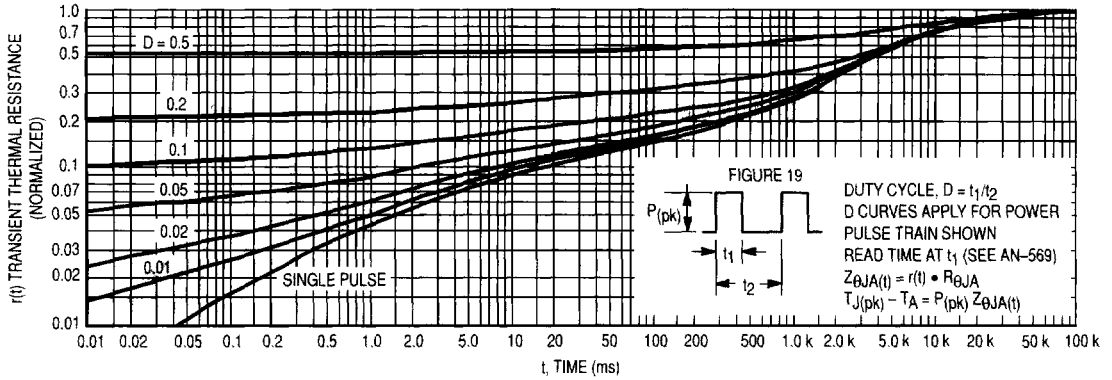


Figure 17. Thermal Response

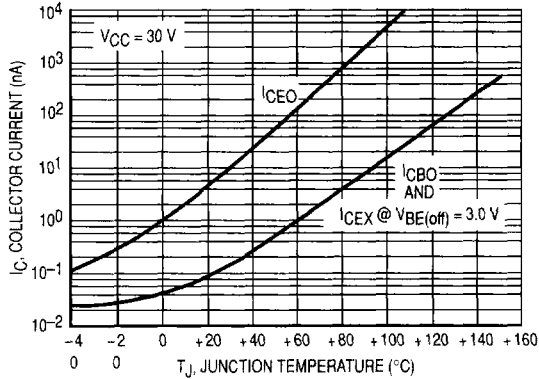


Figure 18. Typical Collector Leakage Current

**DESIGN NOTE: USE OF THERMAL RESPONSE DATA**

A train of periodical power pulses can be represented by the model as shown in Figure 19. Using the model and the device thermal response the normalized effective transient thermal resistance of Figure 17 was calculated for various duty cycles.

To find  $Z_{\theta JA}(t)$ , multiply the value obtained from Figure 17 by the steady state value  $R_{\theta JA}$ .

Example:

The BCW29LT1 is dissipating 2.0 watts peak under the following conditions:

$$t_1 = 1.0 \text{ ms}, t_2 = 5.0 \text{ ms} (D = 0.2)$$

Using Figure 17 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  $\Delta T = r(t) \times P(pk) \times R_{\theta JA} = 0.22 \times 2.0 \times 200 = 88^\circ\text{C}$ .

For more information, see AN-569.