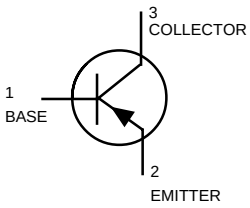
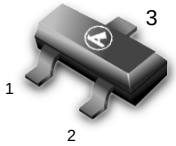
General Purpose Transistors

PNP Silicon

LBCW69LT1G
LBCW70LT1G





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

Featrues

We declare that the material of product compliance with RoHS requirements.

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	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (2) T_A = 25°C	P_D	300	mW
Derate above 25°C		2.4	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

LBCW69LT1G = H1; LBCW70LT1G= 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.

LBCW69LT1G LBCW70LT1G

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

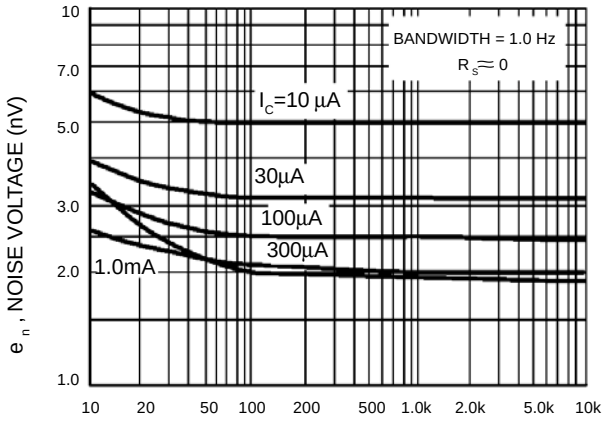
Ordering Information

Device	Marking	Shipping
LBCW69LT1G	H1	3000/Tape&Reel
LBCW69LT3G	H1	10000/Tape&Reel
LBCW70LT1G	H2	3000/Tape&Reel
LBCW70LT3G	H2	10000/Tape&Reel

LBCW69LT1G LBCW70LT1G

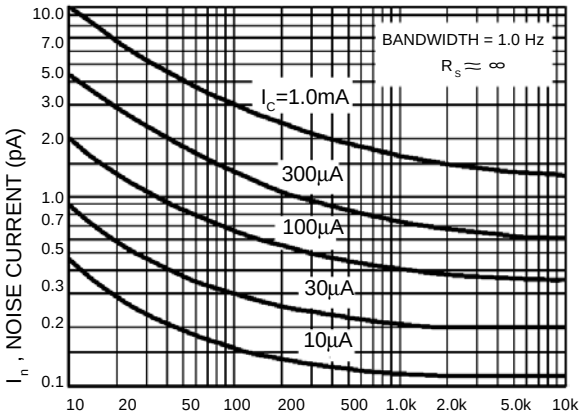
TYPICAL NOISE CHARACTERISTICS

(V_{CE} = – 5.0 Vdc, T_A = 25°C)



f, FREQUENCY (Hz)

Figure 1. Noise Voltage

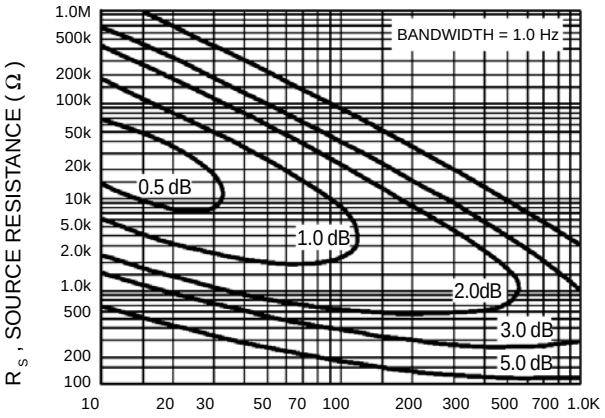


f, FREQUENCY (Hz)

Figure 2. Noise Current

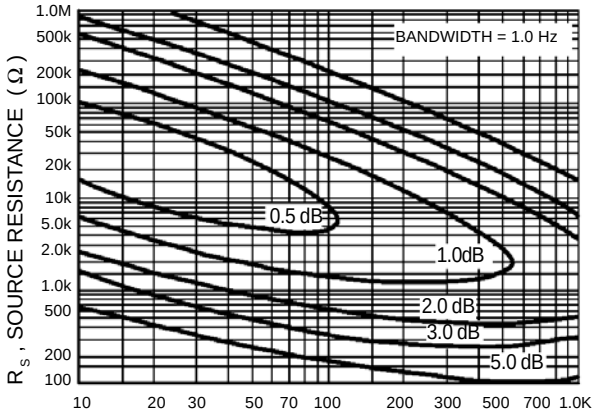
NOISE FIGURE CONTOURS

(V_{CE} = – 5.0 Vdc, T_A = 25°C)



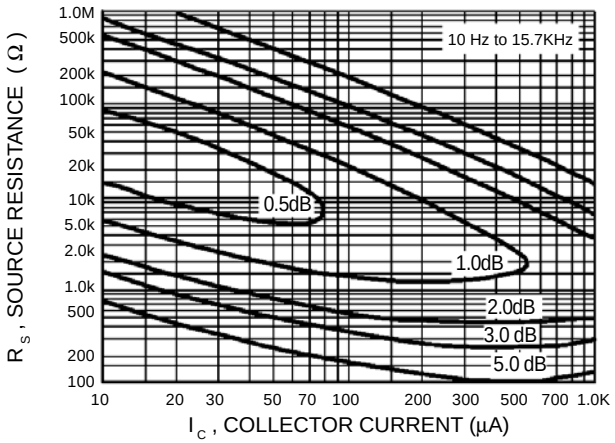
I_C, COLLECTOR CURRENT (µA)

Figure 3. Narrow Band, 100 Hz



I_C, COLLECTOR CURRENT (µA)

Figure 4. Narrow Band, 1.0 kHz



I_C, COLLECTOR CURRENT (µA)

Figure 5. Wideband

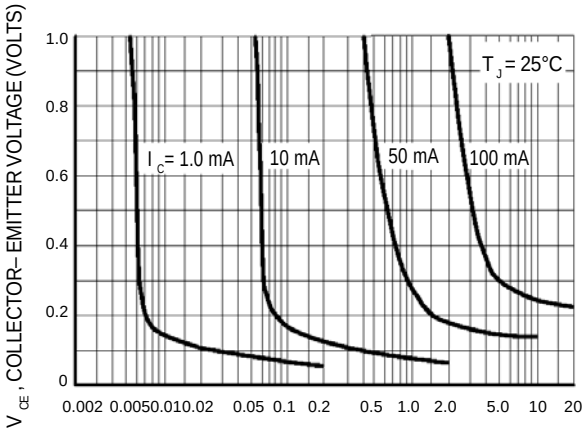
Noise Figure is Defined as:

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

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)

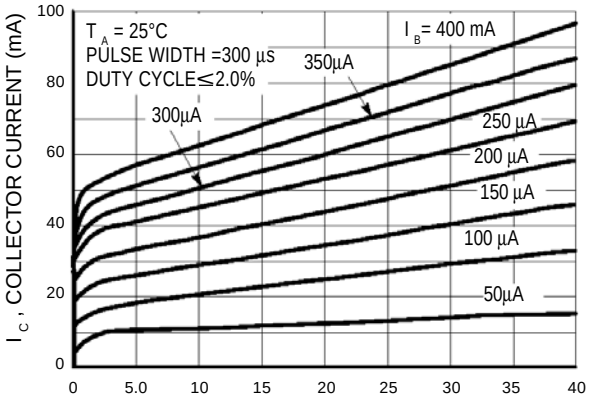
LBCW69LT1G LBCW70LT1G

TYPICAL STATIC CHARACTERISTICS



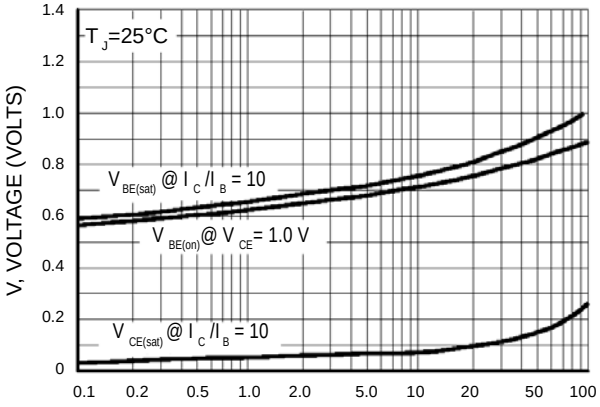
I_B, BASE CURRENT (mA)

Figure 6. Collector Saturation Region



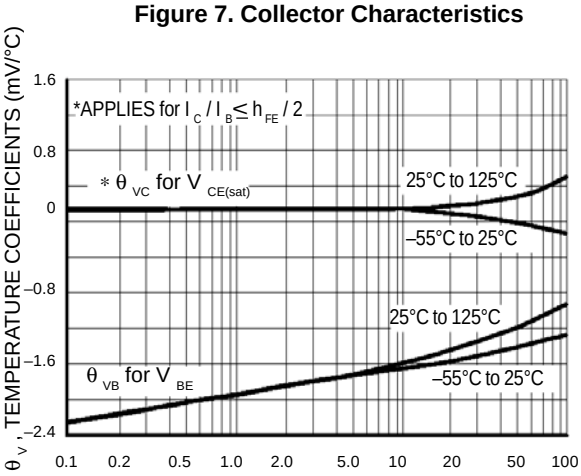
V_{CE}, COLLECTOR–EMITTER VOLTAGE (VOLTS)

Figure 7. Collector Characteristics



I_C, COLLECTOR CURRENT (mA)

Figure 10. "On" Voltages



I_C, COLLECTOR CURRENT (mA)

Figure 11. Temperature Coefficients

LBCW69LT1G LBCW70LT1G

TYPICAL DYNAMIC CHARACTERISTICS

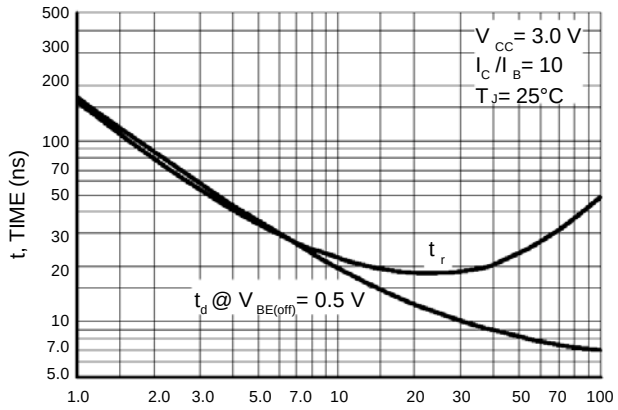


Figure 10. Turn–On Time

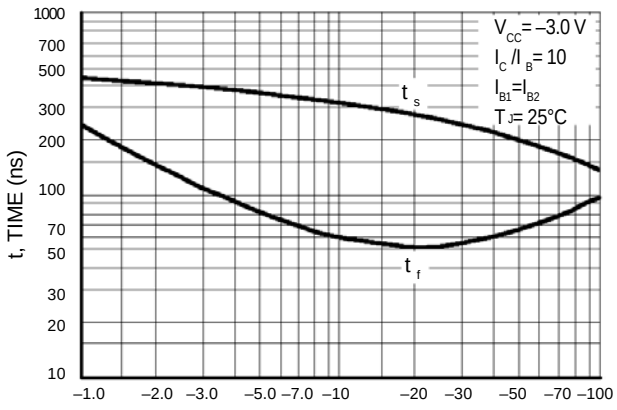


Figure 11. Turn–Off Time

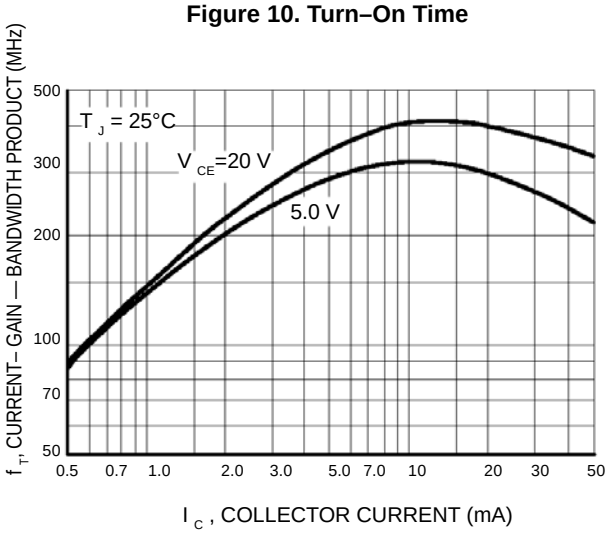


Figure 12. Current–Gain — Bandwidth Product

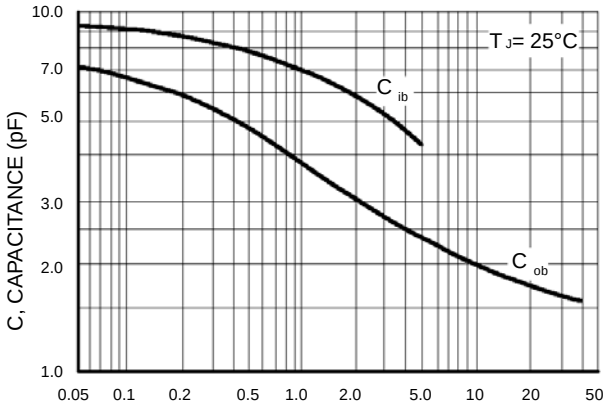


Figure 13. Capacitance

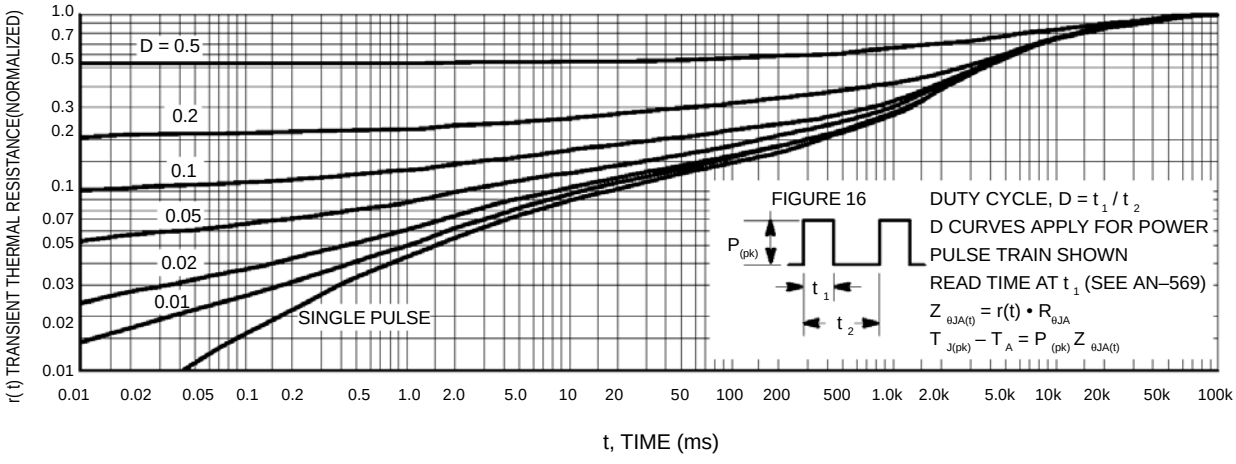


Figure 14. Thermal Response

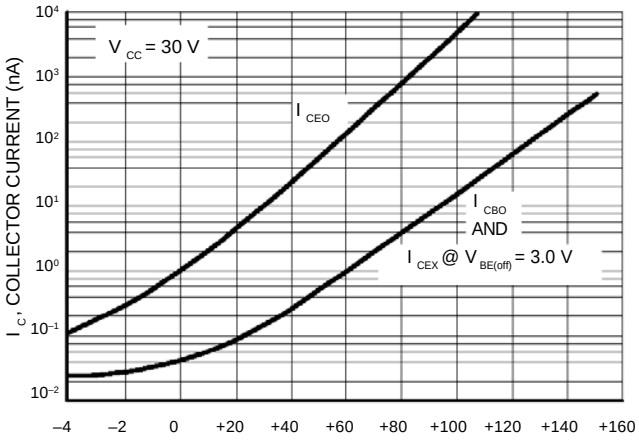


Figure 15. Typical Collector Leakage Current

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)

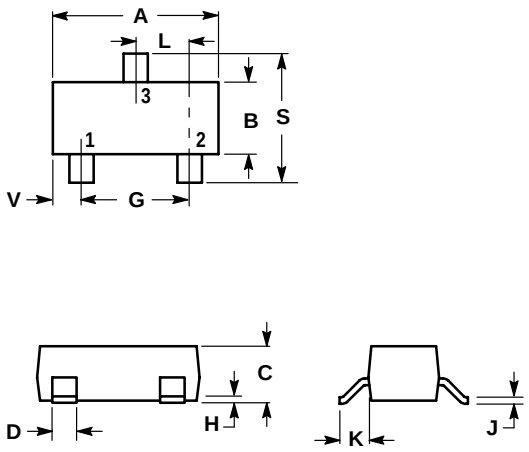
Using Figure 14 at a pulse width of 1.0 ms and D = 0.2, the reading of r(t) is 0.22.

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.

SOT–23



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60