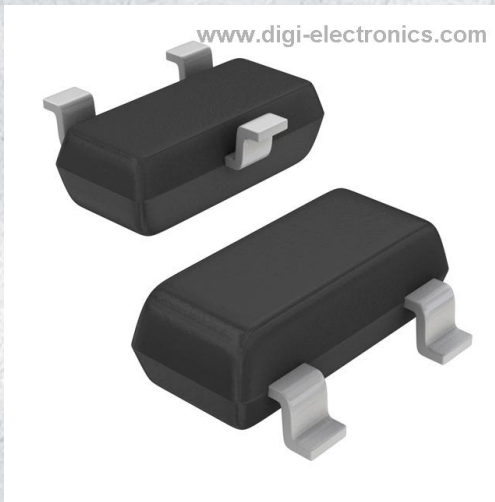


# BCW33LT1G Datasheet



<https://www.DiGi-Electronics.com>

DiGi Electronics Part Number	BCW33LT1G-DG
Manufacturer	<a href="#">onsemi</a>
Manufacturer Product Number	BCW33LT1G
Description	TRANS NPN 32V 0.1A SOT23-3
Detailed Description	Bipolar (BJT) Transistor NPN 32 V 100 mA 300 mW Surface Mount SOT-23-3 (TO-236)



Tel: +00 852-30501935

RFQ Email: [Info@DiGi-Electronics.com](mailto:Info@DiGi-Electronics.com)

DiGi is a global authorized distributor of electronic components.

## Purchase and inquiry

Manufacturer Product Number:

BCW33LT1G

Series:

-

Transistor Type:

NPN

Voltage - Collector Emitter Breakdown (Max):

32 V

Current - Collector Cutoff (Max):

100nA (ICBO)

Power - Max:

300 mW

Operating Temperature:

-55°C ~ 150°C (TJ)

Package / Case:

TO-236-3, SC-59, SOT-23-3

Base Product Number:

BCW33

Manufacturer:

onsemi

Product Status:

Active

Current - Collector (Ic) (Max):

100 mA

Vce Saturation (Max) @ Ib, Ic:

250mV @ 500µA, 10mA

DC Current Gain (hFE) (Min) @ Ic, Vce:

420 @ 2mA, 5V

Frequency - Transition:

-

Mounting Type:

Surface Mount

Supplier Device Package:

SOT-23-3 (TO-236)

## Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0095

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

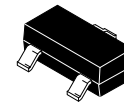
EAR99



# General Purpose Transistor

## NPN Silicon

# BCW33LT1G, SBCW33LT1G



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

### Features

- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS

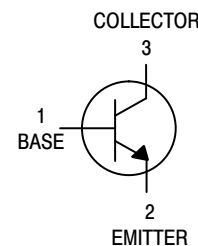
Rating	Symbol	Value	Unit
Collector – Emitter Voltage	$V_{CEO}$	32	Vdc
Collector – Base Voltage	$V_{CBO}$	32	Vdc
Emitter – Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current – Continuous	$I_C$	100	mA <sub>dc</sub>

### THERMAL CHARACTERISTICS

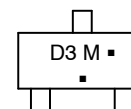
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate (Note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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
2. Alumina =  $0.4 \times 0.3 \times 0.024$  in. 99.5% alumina.



### MARKING DIAGRAM



- D3 = Specific Device Code  
M = Date Code\*  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

### ORDERING INFORMATION

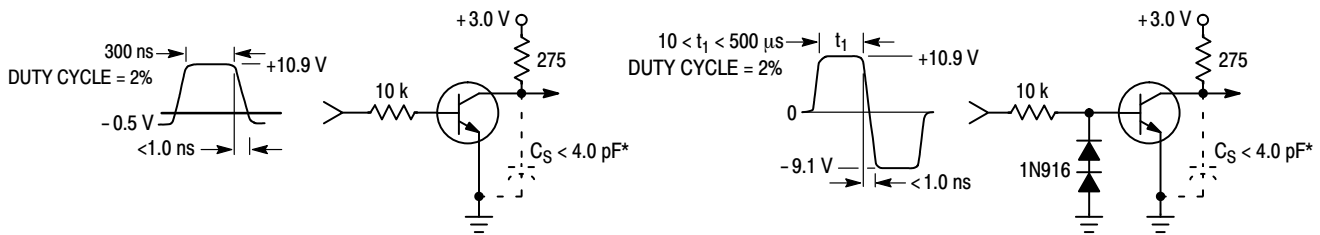
Device	Package	Shipping <sup>†</sup>
BCW33LT1G	SOT-23 (Pb-Free)	3,000/Tape & Reel
SBCW33LT1G	SOT-23 (Pb-Free)	3,000/Tape & Reel
BCW33LT3G	SOT-23 (Pb-Free)	10,000/Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, [BRD8011/D](#).

**BCW33LT1G, SBCW33LT1G****ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector - Emitter Breakdown Voltage ( $I_C = 2.0\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	32	-	Vdc
Collector - Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{Adc}$ , $I_B = 0$ )	$V_{(BR)CBO}$	32	-	Vdc
Emitter - Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )	$V_{(BR)EBO}$	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	nAdc $\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>				
DC Current Gain ( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	hFE	420	800	-
Collector - Emitter Saturation Voltage ( $I_C = 10\text{ mAdc}$ , $I_B = 0.5\text{ mAdc}$ )	$V_{CE(sat)}$	-	0.25	Vdc
Base - Emitter On Voltage ( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )	$V_{BE(on)}$	0.55	0.70	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	-	4.0	pF
Noise Figure ( $V_{CE} = 5.0\text{ Vdc}$ , $I_C = 0.2\text{ mAdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	-	10	dB

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

**EQUIVALENT SWITCHING TIME TEST CIRCUITS**

\*Total shunt capacitance of test jig and connectors

Figure 1. Turn-On Time

Figure 2. Turn-Off Time

# BCW33LT1G, SBCW33LT1G

## TYPICAL NOISE CHARACTERISTICS

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

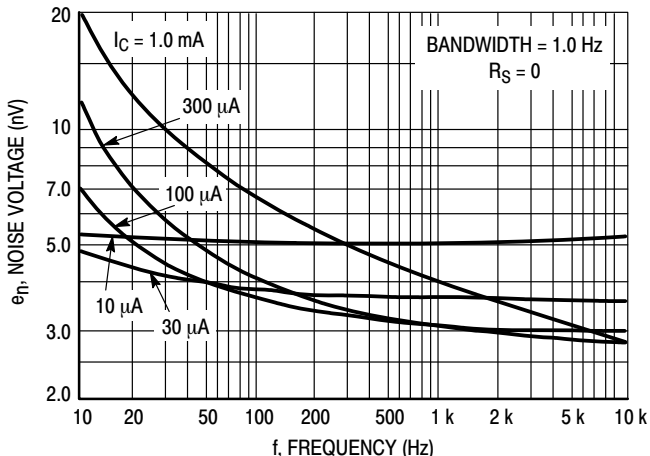


Figure 3. Noise Voltage

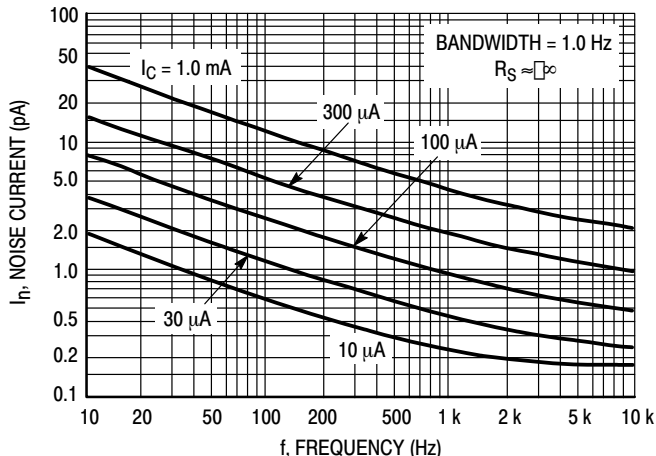


Figure 4. Noise Current

## NOISE FIGURE CONTOURS

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

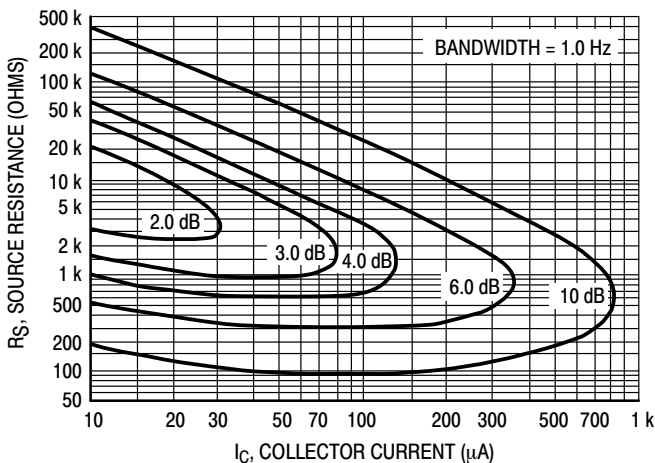


Figure 5. Narrow Band, 100 Hz

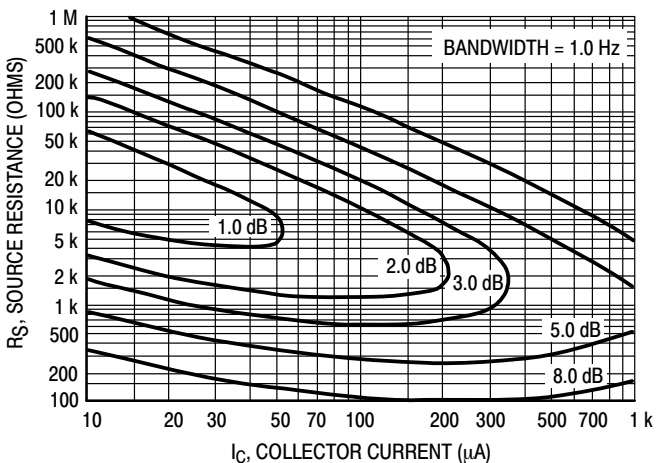


Figure 6. Narrow Band, 1.0 kHz

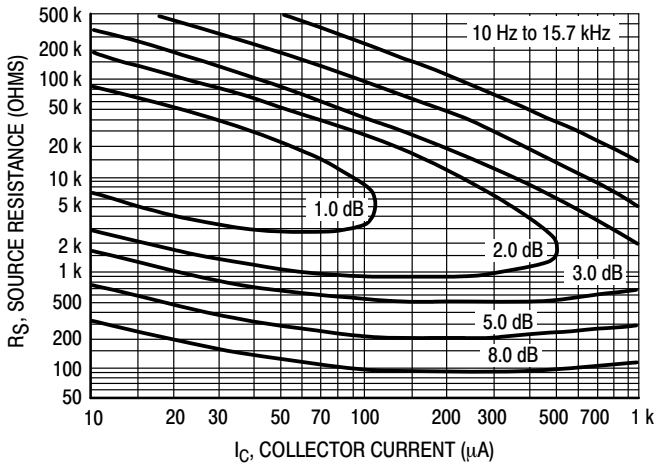


Figure 7. Wideband

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 ( $1.38 \times 10^{-23}$  j/°K)

$T$  = Temperature of the Source Resistance (°K)

$R_S$  = Source Resistance (Ohms)

# BCW33LT1G, SBCW33LT1G

## TYPICAL STATIC CHARACTERISTICS

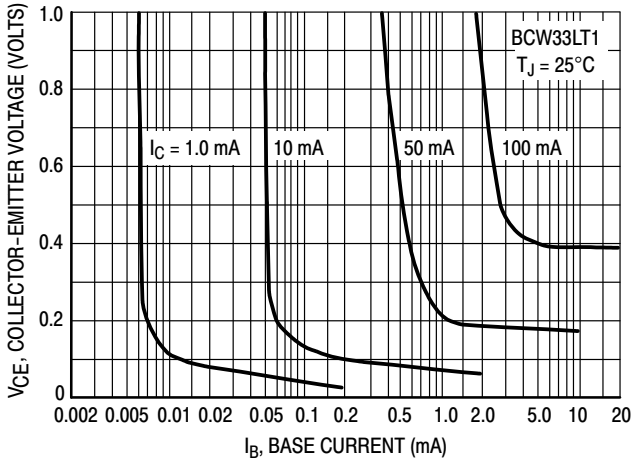


Figure 8. Collector Saturation Region

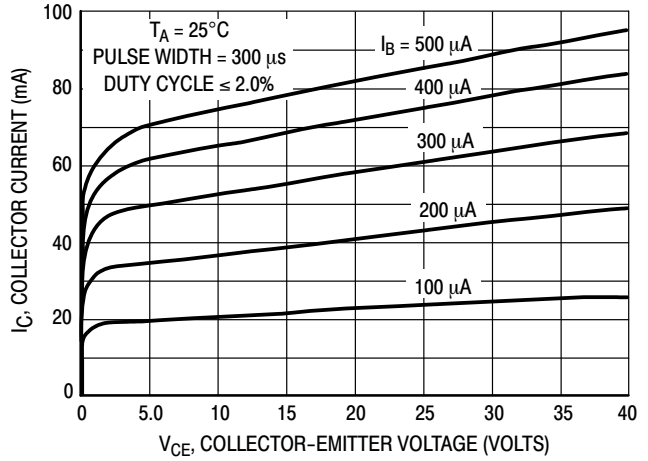


Figure 9. Collector Characteristics

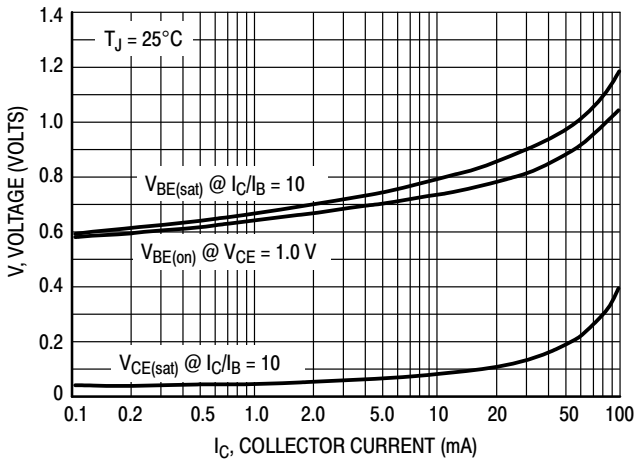


Figure 10. "On" Voltages

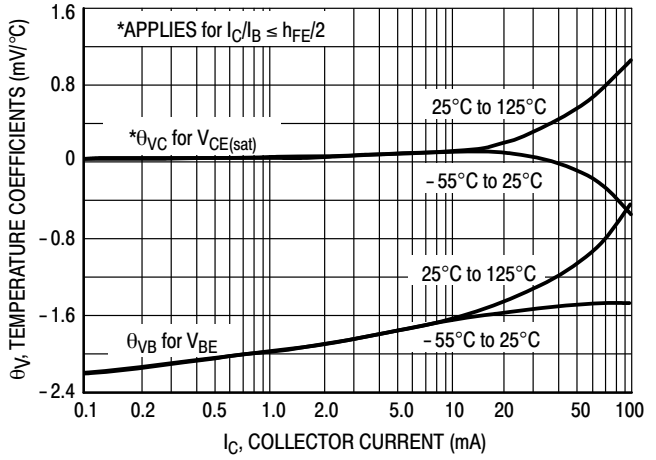


Figure 11. Temperature Coefficients

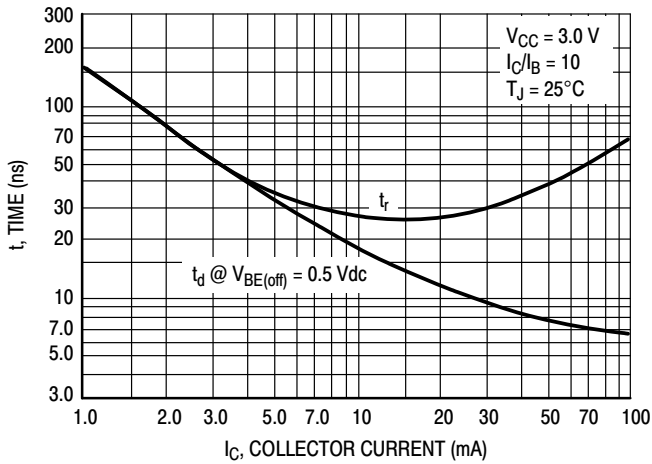


Figure 12. Turn-On Time

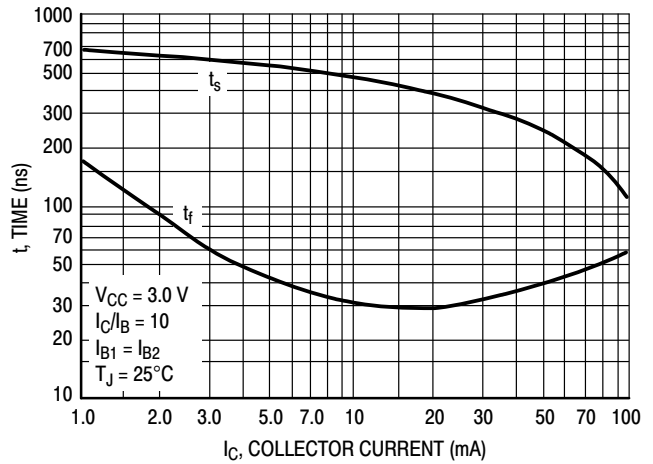


Figure 13. Turn-Off Time

# BCW33LT1G, SBCW33LT1G

## TYPICAL DYNAMIC CHARACTERISTICS

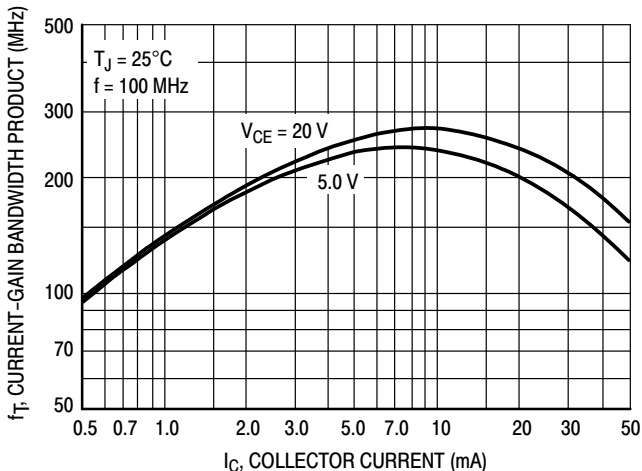


Figure 14. Current-Gain — Bandwidth Product

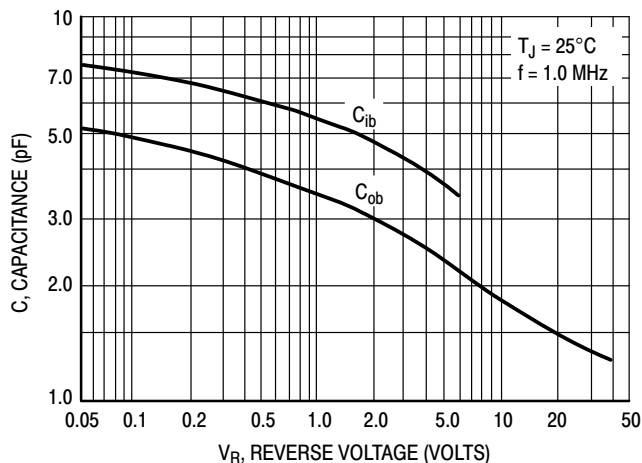


Figure 15. Capacitance

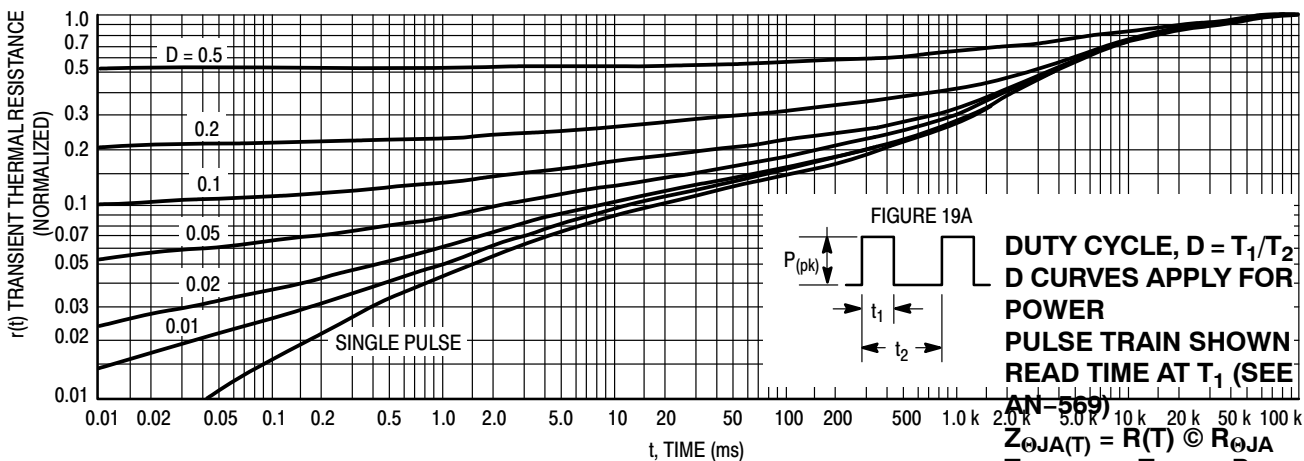


Figure 16. Thermal Response

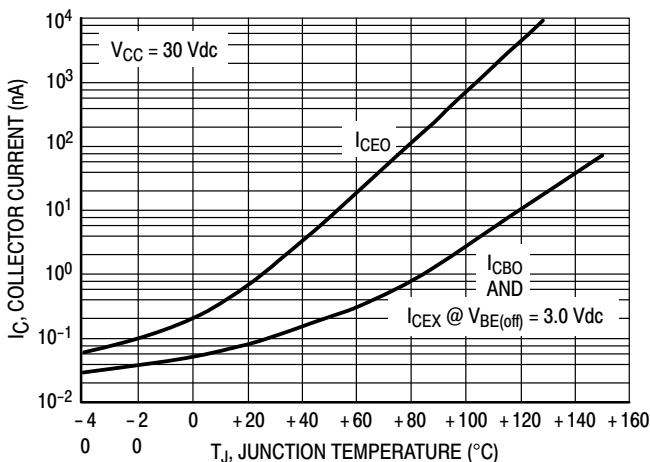


Figure 16A.

### DESIGN NOTE: USE OF THERMAL RESPONSE DATA

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

To find  $Z_{\theta JA}(t)$ , multiply the value obtained from Figure 16 by the steady state value  $R_{\theta JA}$ .

Example:

The MPS3904 is dissipating 2.0 watts peak under the following conditions:

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

Using Figure 16 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.



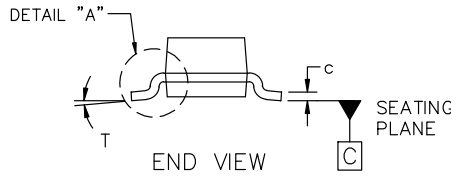
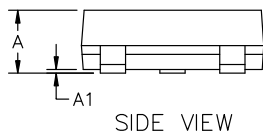
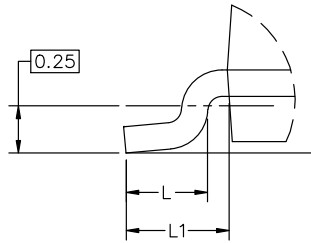
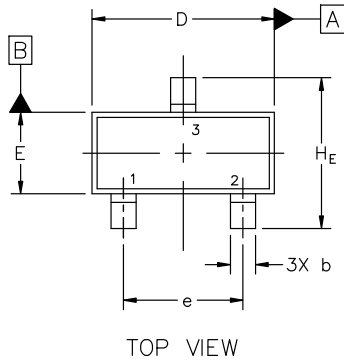
**MECHANICAL CASE OUTLINE  
PACKAGE DIMENSIONS**



SCALE 4:1

**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
CASE 318  
ISSUE AU

DATE 14 AUG 2024

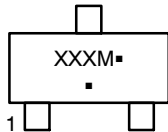


MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

NOTES:

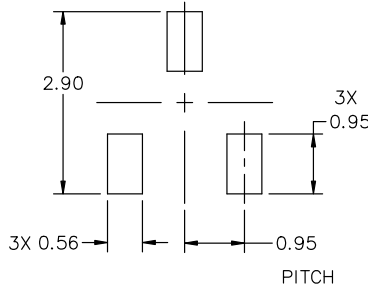
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**STYLES ON PAGE 2**

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<b>DESCRIPTION:</b>	<b>SOT-23 (TO-236) 2.90x1.30x1.00 1.90P</b>	<b>PAGE 1 OF 2</b>

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**SOT-23 (TO-236) 2.90x1.30x1.00 1.90P**  
**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

STYLE 1 THRU 5:  
 CANCELLED

STYLE 6:  
 PIN 1. BASE  
 2. EMITTER  
 3. COLLECTOR

STYLE 7:  
 PIN 1. EMITTER  
 2. BASE  
 3. COLLECTOR

STYLE 8:  
 PIN 1. ANODE  
 2. NO CONNECTION  
 3. CATHODE

STYLE 9:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 10:  
 PIN 1. DRAIN  
 2. SOURCE  
 3. GATE

STYLE 11:  
 PIN 1. ANODE  
 2. CATHODE  
 3. CATHODE-ANODE

STYLE 12:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. ANODE

STYLE 13:  
 PIN 1. SOURCE  
 2. DRAIN  
 3. GATE

STYLE 14:  
 PIN 1. CATHODE  
 2. GATE  
 3. ANODE

STYLE 15:  
 PIN 1. GATE  
 2. CATHODE  
 3. ANODE

STYLE 16:  
 PIN 1. ANODE  
 2. CATHODE  
 3. CATHODE

STYLE 17:  
 PIN 1. NO CONNECTION  
 2. ANODE  
 3. CATHODE

STYLE 18:  
 PIN 1. NO CONNECTION  
 2. CATHODE  
 3. ANODE

STYLE 19:  
 PIN 1. CATHODE  
 2. ANODE  
 3. CATHODE-ANODE

STYLE 20:  
 PIN 1. CATHODE  
 2. ANODE  
 3. GATE

STYLE 21:  
 PIN 1. GATE  
 2. SOURCE  
 3. DRAIN

STYLE 22:  
 PIN 1. RETURN  
 2. OUTPUT  
 3. INPUT

STYLE 23:  
 PIN 1. ANODE  
 2. ANODE  
 3. CATHODE

STYLE 24:  
 PIN 1. GATE  
 2. DRAIN  
 3. SOURCE

STYLE 25:  
 PIN 1. ANODE  
 2. CATHODE  
 3. GATE

STYLE 26:  
 PIN 1. CATHODE  
 2. ANODE  
 3. NO CONNECTION

STYLE 27:  
 PIN 1. CATHODE  
 2. CATHODE  
 3. CATHODE

STYLE 28:  
 PIN 1. ANODE  
 2. ANODE  
 3. ANODE

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