

# General Purpose Transistor

## NPN Silicon

### BCW65ALT1G, BCW65CLT1G

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

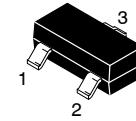
| Symbol    | Rating                         | Value | Unit |
|-----------|--------------------------------|-------|------|
| $V_{CEO}$ | Collector – Emitter Voltage    | 32    | Vdc  |
| $V_{CBO}$ | Collector – Base Voltage       | 60    | Vdc  |
| $V_{EBO}$ | Emitter – Base Voltage         | 5.0   | Vdc  |
| $I_C$     | Collector Current – Continuous | 800   | mAdc |

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.

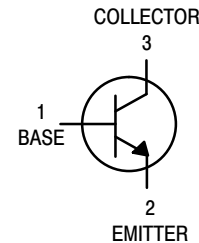
#### THERMAL CHARACTERISTICS

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

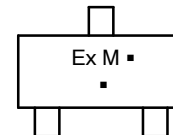
- FR-5 =  $1.0 \times 0.75 \times 0.062$  in.
- Alumina =  $0.4 \times 0.3 \times 0.024$  in 99.5% alumina.



SOT-23  
CASE 318  
STYLE 6



#### MARKING DIAGRAMS



Ex = Device Code  
 x = A or C  
 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†         |
|------------|---------------------|-------------------|
| BCW65ALT1G | SOT-23<br>(Pb-Free) | 3,000/Tape & Reel |
| BCW65CLT1G | SOT-23<br>(Pb-Free) | 3,000/Tape & Reel |

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

# BCW65ALT1G, BCW65CLT1G

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

| Symbol | Characteristic | Min | Typ | Max | Unit |
|--------|----------------|-----|-----|-----|------|
|--------|----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|               |                                                                                                                                              |        |        |          |                         |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|----------|-------------------------|
| $V_{(BR)CEO}$ | Collector–Emitter Breakdown Voltage<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )                                                                | 32     | –      | –        | Vdc                     |
| $V_{(BR)CES}$ | Collector–Emitter Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{Adc}$ , $V_{EB} = 0$ )                                                    | 60     | –      | –        | Vdc                     |
| $V_{(BR)EBO}$ | Emitter–Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )                                                            | 5.0    | –      | –        | Vdc                     |
| $I_{CES}$     | Collector Cutoff Current<br>( $V_{CE} = 32\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CE} = 32\text{ Vdc}$ , $I_E = 0$ , $T_A = 150^\circ\text{C}$ ) | –<br>– | –<br>– | 20<br>20 | nAdc<br>$\mu\text{Adc}$ |
| $I_{EBO}$     | Emitter Cutoff Current<br>( $V_{EB} = 4.0\text{ Vdc}$ , $I_C = 0$ )                                                                          | –      | –      | 20       | nAdc                    |

### ON CHARACTERISTICS

|               |                                                                                                                                                                                                                                                                    |                                      |                  |                    |     |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------|--------------------|-----|
| $h_{FE}$      | DC Current Gain<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 10\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 100\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 2.0\text{ Vdc}$ ) | BCW65ALT1<br>35<br>75<br>100<br>35   | –<br>–<br>–<br>– | –<br>–<br>250<br>– | –   |
| $h_{FE}$      | DC Current Gain<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 10\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 100\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )<br>( $I_C = 500\text{ mAdc}$ , $V_{CE} = 2.0\text{ Vdc}$ ) | BCW65CLT1<br>80<br>180<br>250<br>100 | –<br>–<br>–<br>– | –<br>–<br>630<br>– | –   |
| $V_{CE(sat)}$ | Collector–Emitter Saturation Voltage<br>( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )<br>( $I_C = 100\text{ mAdc}$ , $I_B = 10\text{ mAdc}$ )                                                                                                               | –<br>–                               | 0.7<br>0.3       | –<br>–             | Vdc |
| $V_{BE(sat)}$ | Base–Emitter Saturation Voltage<br>( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ )                                                                                                                                                                            | –                                    | –                | 2.0                | Vdc |

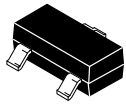
### SMALL–SIGNAL CHARACTERISTICS

|           |                                                                                                                                                    |     |   |    |     |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----|---|----|-----|
| $f_T$     | Current–Gain — Bandwidth Product<br>( $I_C = 20\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                   | 100 | – | –  | MHz |
| $C_{obo}$ | Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                              | –   | – | 12 | pF  |
| $C_{ibo}$ | Input Capacitance<br>( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )                                                              | –   | – | 80 | pF  |
| NF        | Noise Figure<br>( $V_{CE} = 5.0\text{ Vdc}$ , $I_C = 0.2\text{ mAdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | –   | – | 10 | dB  |

### SWITCHING CHARACTERISTICS

|           |                                                                          |   |   |     |    |
|-----------|--------------------------------------------------------------------------|---|---|-----|----|
| $t_{on}$  | Turn–On Time<br>( $I_{B1} = I_{B2} = 15\text{ mAdc}$ )                   | – | – | 100 | ns |
| $t_{off}$ | Turn–Off Time<br>( $I_C = 150\text{ mAdc}$ , $R_L = 150\text{ }\Omega$ ) | – | – | 400 | ns |

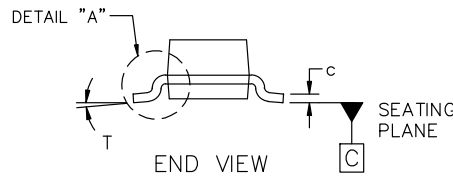
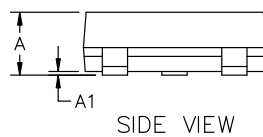
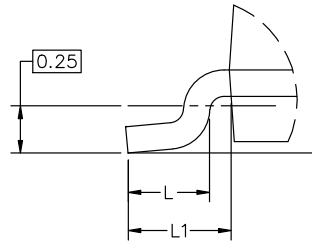
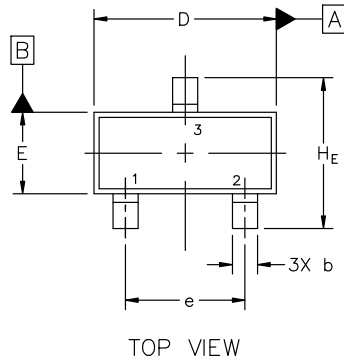
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.



SCALE 4:1

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

DATE 14 AUG 2024

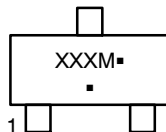


| MILLIMETERS |      |      |      |
|-------------|------|------|------|
| DIM         | MIN  | NOM  | MAX  |
| A           | 0.89 | 1.00 | 1.11 |
| A1          | 0.01 | 0.06 | 0.10 |
| b           | 0.37 | 0.44 | 0.50 |
| c           | 0.08 | 0.14 | 0.20 |
| D           | 2.80 | 2.90 | 3.04 |
| E           | 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:

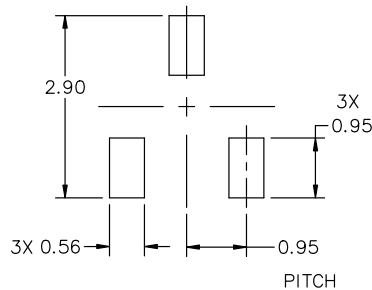
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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.



RECOMMENDED  
MOUNTING FOOTPRINT

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

STYLES ON PAGE 2

|                  |                                      |                                                                                                                                                                                     |
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**CASE 318**  
**ISSUE AU**

DATE 14 AUG 2024

|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

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