

## Features

- $BV_{CEO} > -45V, -60V \text{ \& } -80V$
- $I_C = -1A$  High Continuous Collector Current
- $I_{CM} = -2A$  Peak Pulse Current
- 2W Power Dissipation
- Low Saturation Voltage  $V_{CE(sat)} < -500mV \text{ @ } -0.5A$
- Gain Groups 10 and 16
- Complementary NPN Types: BCP54, 55 and 56
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

## Mechanical Data

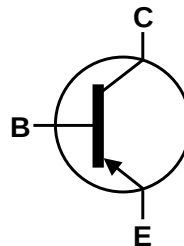
- Case: SOT223
- Case Material: Molded Plastic. "Green" Molding Compound; UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish - Matte Tin Plated Leads; Solderable per MIL-STD-202, Method 208 (63)
- Weight: 0.112 grams (Approximate)

## Applications

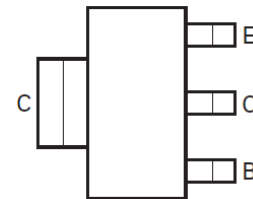
- Medium Power Switching or Amplification Applications
- AF Driver and Output Stages



Top View



Device Symbol

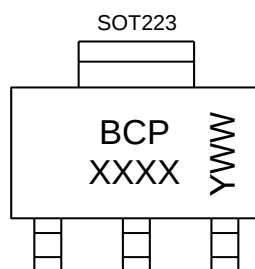

 Top View  
Pin-Out

## Ordering Information (Notes 4 & 5)

| Product    | Compliance | Marking                                                                                                    | Reel size (inches) | Tape width (mm) | Quantity per reel |
|------------|------------|------------------------------------------------------------------------------------------------------------|--------------------|-----------------|-------------------|
| BCP51TA    | AEC-Q101   | BCP 51                                                                                                     | 7                  | 12              | 1,000             |
| BCP5110TA  | AEC-Q101   | BCP 5110                                                                                                   | 7                  | 12              | 1,000             |
| BCP5116TA  | AEC-Q101   | BCP 5116                                                                                                   | 7                  | 12              | 1,000             |
| BCP5116TC  | AEC-Q101   | BCP 5116                                                                                                   | 13                 | 12              | 4,000             |
| BCP52TA    | AEC-Q101   | BCP 52                                                                                                     | 7                  | 12              | 1,000             |
| BCP5210TA  | AEC-Q101   | BCP 5210                                                                                                   | 7                  | 12              | 1,000             |
| BCP5216TA  | AEC-Q101   | BCP 5216                                                                                                   | 7                  | 12              | 1,000             |
| BCP53TA    | AEC-Q101   | BCP 53                                                                                                     | 7                  | 12              | 1,000             |
| BCP53QTA   | Automotive | BCP 53                                                                                                     | 7                  | 12              | 1,000             |
| BCP5310TA  | AEC-Q101   | BCP 5310                                                                                                   | 7                  | 12              | 1,000             |
| BCP5316TA  | AEC-Q101   | BCP 5316                                                                                                   | 7                  | 12              | 1,000             |
| BCP5316QTA | Automotive | Refer to <a href="http://diodes.com/datasheets/BCP5316Q.pdf">http://diodes.com/datasheets/BCP5316Q.pdf</a> |                    |                 |                   |
| BCP5316TC  | AEC-Q101   | BCP 5316                                                                                                   | 13                 | 12              | 4,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
  4. Automotive products are AEC-Q101 qualified and are PPAP capable. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified. For more information, please refer to [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

## Marking Information



BCP = Product Type Marking Code, Line 1  
 XXXX = Product Type Marking Code, Line 2 as follows:

|                |                |                |
|----------------|----------------|----------------|
| BCP51 = 51     | BCP52 = 52     | BCP53 = 53     |
| BCP5110 = 5110 | BCP5210 = 5210 | BCP5310 = 5310 |
| BCP5116 = 5116 | BCP5216 = 5216 | BCP5316 = 5316 |

YWW = Date Code Marking  
 Y or  $\bar{Y}$  = Last Digit of Year (ex: 5= 2015)  
 WW or  $\bar{WW}$  = Week Code (01-53)

## Absolute Maximum Ratings (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic               | Symbol           | BCP51 | BCP52 | BCP53 | Unit |
|------------------------------|------------------|-------|-------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | -45   | -60   | -100  | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | -45   | -60   | -80   | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | -5    |       |       | V    |
| Continuous Collector Current | I <sub>C</sub>   | -1    |       |       | A    |
| Peak Pulse Collector Current | I <sub>CM</sub>  | -2    |       |       |      |
| Continuous Base Current      | I <sub>B</sub>   | -100  |       |       | mA   |
| Peak Pulse Base Current      | I <sub>BM</sub>  | -200  |       |       |      |

## Thermal Characteristics (@T<sub>A</sub> = +25°C, unless otherwise specified.)

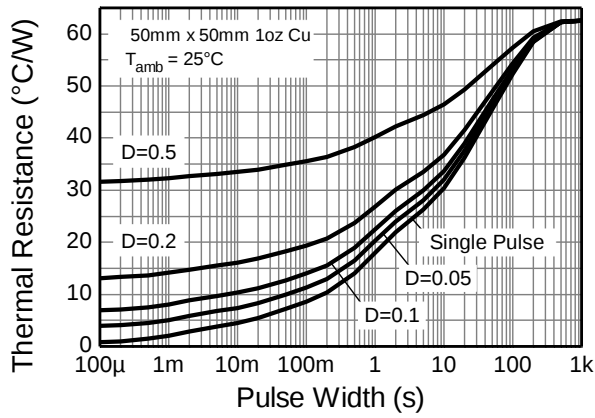
| Characteristic                                   | Symbol                            | Value       | Unit |
|--------------------------------------------------|-----------------------------------|-------------|------|
| Power Dissipation (Note 6)                       | P <sub>D</sub>                    | 2           | W    |
| Thermal Resistance, Junction to Ambient (Note 6) | R <sub>θJA</sub>                  | 62          | °C/W |
| Thermal Resistance, Junction to Leads (Note 7)   | R <sub>θJL</sub>                  | 19.4        | °C/W |
| Operating and Storage Temperature Range          | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C   |

## ESD Ratings (Note 8)

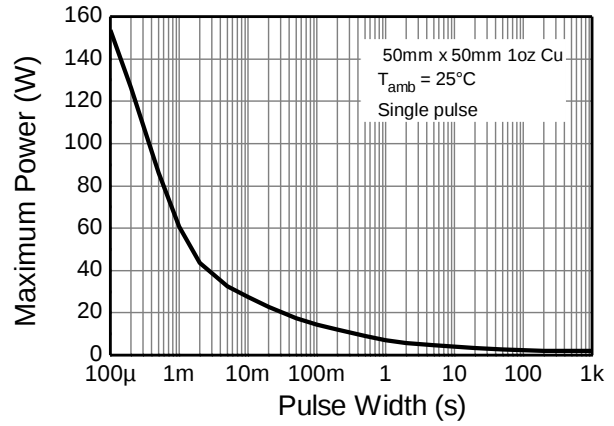
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--------------------------------------------|---------|-------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge - Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
6. For a device mounted with the collector lead on 50mm x 50mm 1oz copper that is on a single-sided 1.6mm FR4 PCB; device is measured under still air conditions whilst operating in steady-state.
  7. Thermal resistance from junction to solder-point (at the end of the collector lead).
  8. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

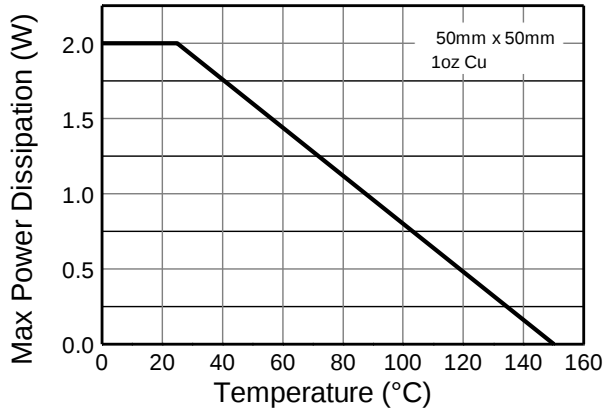
## Thermal Characteristics and Derating Information



**Transient Thermal Impedance**



**Pulse Power Dissipation**



**Derating Curve**

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                                 |              | Symbol               | Min            | Typ         | Max           | Unit | Test Condition                                                                                                                                   |
|------------------------------------------------|--------------|----------------------|----------------|-------------|---------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | BCP51        | BV <sub>CBO</sub>    | -45            | —           | —             | V    | I <sub>C</sub> = -100μA                                                                                                                          |
|                                                | BCP52        |                      | -60            |             |               |      |                                                                                                                                                  |
|                                                | BCP53        |                      | -100           |             |               |      |                                                                                                                                                  |
| Collector-Emitter Breakdown Voltage (Note 9)   | BCP51        | BV <sub>CEO</sub>    | -45            | —           | —             | V    | I <sub>C</sub> = -10mA                                                                                                                           |
|                                                | BCP52        |                      | -60            |             |               |      |                                                                                                                                                  |
|                                                | BCP53        |                      | -80            |             |               |      |                                                                                                                                                  |
| Emitter-Base Breakdown Voltage                 |              | BV <sub>EBO</sub>    | -5             | —           | —             | V    | I <sub>E</sub> = -10μA                                                                                                                           |
| Collector Cut-Off Current                      |              | I <sub>CBO</sub>     | —              | —           | -0.1<br>-20   | μA   | V <sub>CB</sub> = -30V<br>V <sub>CB</sub> = -30V, T <sub>A</sub> = +150°C                                                                        |
| Emitter Cut-Off Current                        |              | I <sub>EBO</sub>     | —              | —           | -20           | nA   | V <sub>EB</sub> = -4V                                                                                                                            |
| Static Forward Current Transfer Ratio (Note 9) | All Versions | h <sub>FE</sub>      | 25<br>40<br>25 | —<br>—<br>— | —<br>250<br>— | —    | I <sub>C</sub> = -5mA, V <sub>CE</sub> = -2V<br>I <sub>C</sub> = -150mA, V <sub>CE</sub> = -2V<br>I <sub>C</sub> = -500mA, V <sub>CE</sub> = -2V |
|                                                | 10 gain grp  |                      | 63             | —           | 160           |      | I <sub>C</sub> = -150mA, V <sub>CE</sub> = -2V                                                                                                   |
|                                                | 16 gain grp  |                      | 100            | —           | 250           |      | I <sub>C</sub> = -150mA, V <sub>CE</sub> = -2V                                                                                                   |
| Collector-Emitter Saturation Voltage (Note 9)  |              | V <sub>CE(sat)</sub> | —              | —           | -0.5          | V    | I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA                                                                                                  |
| Base-Emitter Turn-On Voltage (Note 9)          |              | V <sub>BE(on)</sub>  | —              | —           | -1.0          | V    | I <sub>C</sub> = -500mA, V <sub>CE</sub> = -2V                                                                                                   |
| Transition Frequency                           |              | f <sub>T</sub>       | 150            | —           | —             | MHz  | I <sub>C</sub> = -50mA, V <sub>CE</sub> = -10V<br>f = 100MHz                                                                                     |
| Output Capacitance                             |              | C <sub>obo</sub>     | —              | —           | 25            | pF   | V <sub>CB</sub> = -10V, f = 1MHz                                                                                                                 |

Note: 9. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

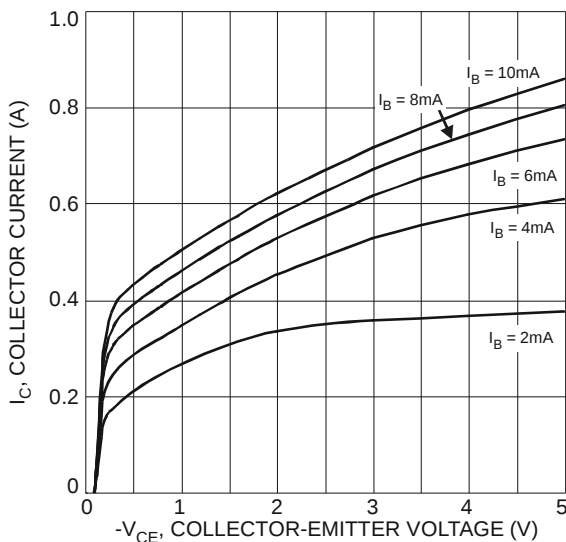


Fig. 1 Typical Collector Current vs. Collector-Emitter Voltage

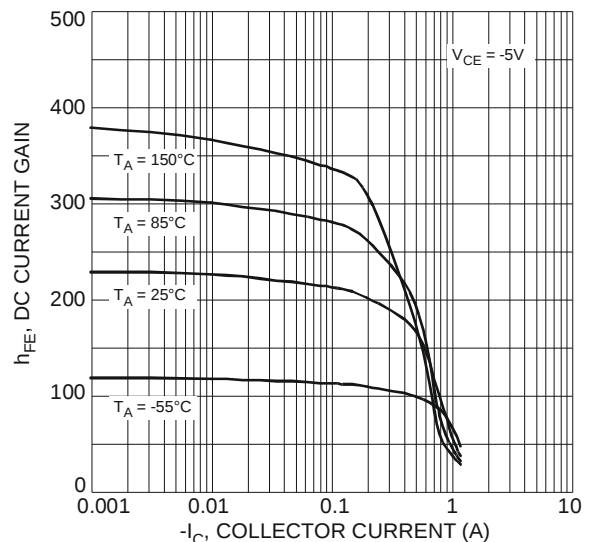


Fig. 2 Typical DC Current Gain vs. Collector Current

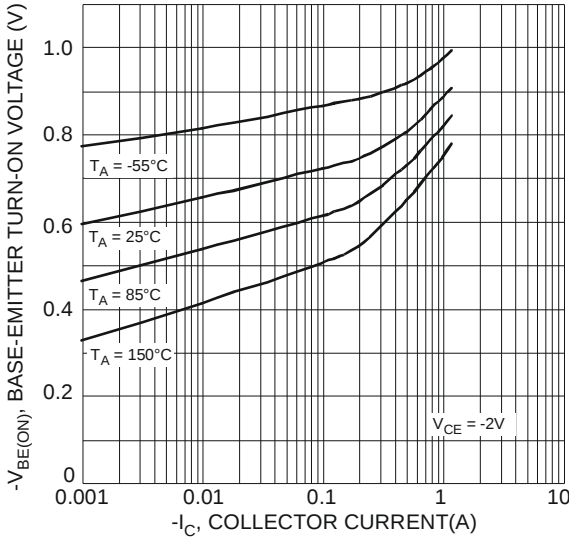


Fig 3 Typical Base-Emitter Turn-On Voltage vs. Collector Current

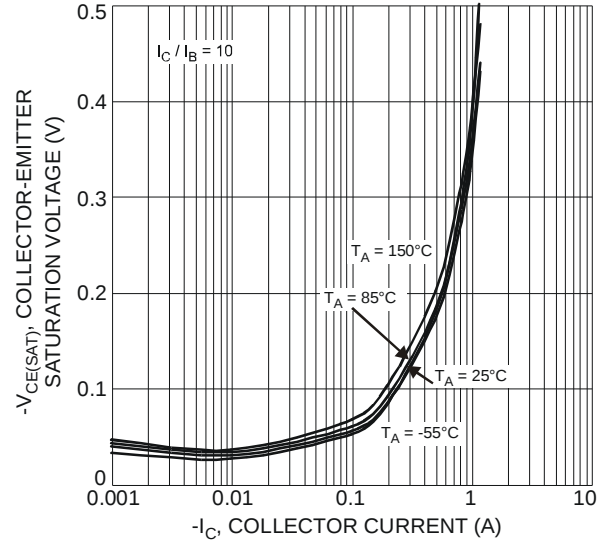


Fig. 4 Typical Collector-Emitter Saturation Voltage vs. Collector Current

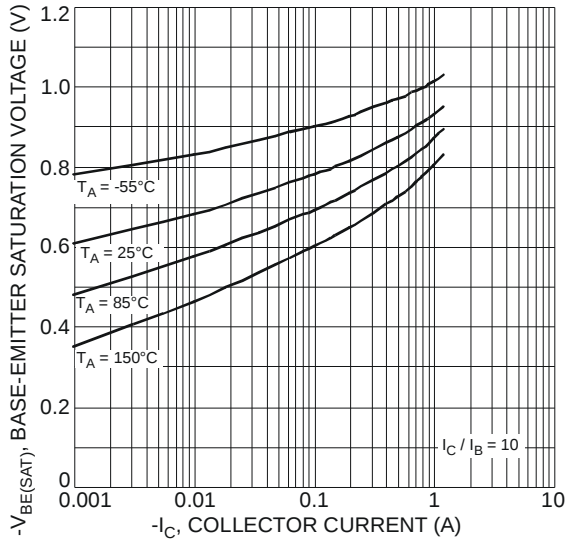


Fig. 5 Typical Base-Emitter Saturation Voltage vs. Collector Current

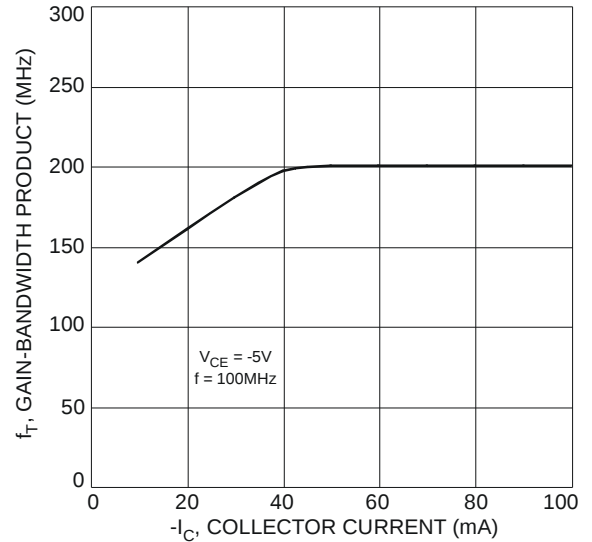


Fig. 6 Typical Gain-Bandwidth Product vs. Collector Current

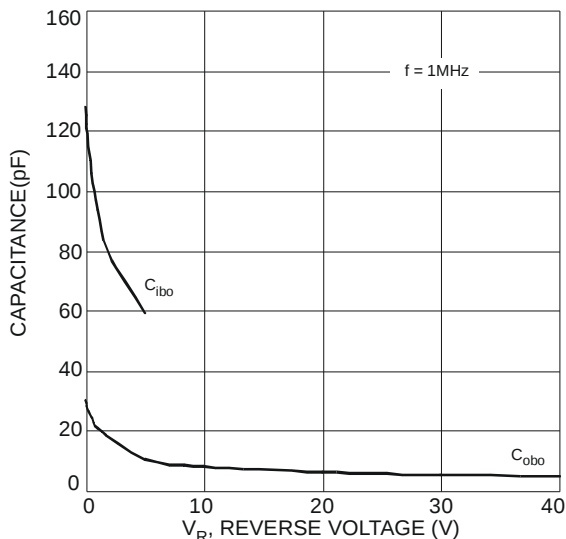
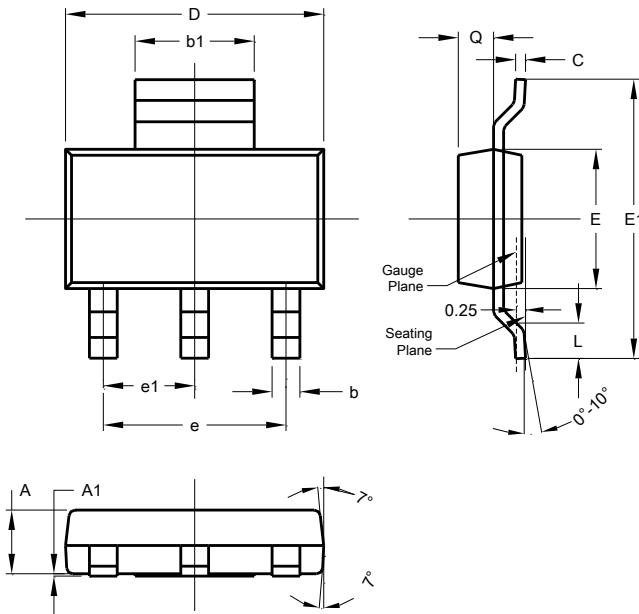


Fig. 7 Typical Capacitance Characteristics

## Package Outline Dimensions

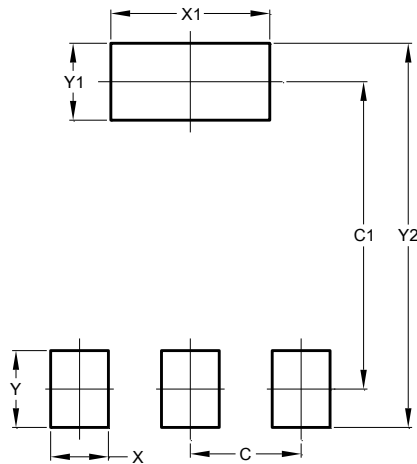
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| SOT223               |       |      |      |
|----------------------|-------|------|------|
| Dim                  | Min   | Max  | Typ  |
| A                    | 1.55  | 1.65 | 1.60 |
| A1                   | 0.010 | 0.15 | 0.05 |
| b                    | 0.60  | 0.80 | 0.70 |
| b1                   | 2.90  | 3.10 | 3.00 |
| C                    | 0.20  | 0.30 | 0.25 |
| D                    | 6.45  | 6.55 | 6.50 |
| E                    | 3.45  | 3.55 | 3.50 |
| E1                   | 6.90  | 7.10 | 7.00 |
| e                    | -     | -    | 4.60 |
| e1                   | -     | -    | 2.30 |
| L                    | 0.85  | 1.05 | 0.95 |
| Q                    | 0.84  | 0.94 | 0.89 |
| All Dimensions in mm |       |      |      |

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 2.30          |
| C1         | 6.40          |
| X          | 1.20          |
| X1         | 3.30          |
| Y          | 1.60          |
| Y1         | 1.60          |
| Y2         | 8.00          |

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