

**60V NPN DARLINGTON TRANSISTOR IN SOT23**
**Description**

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of automotive applications.

**Features**

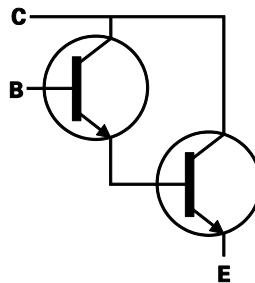
- $BV_{CEO} > 60V$
- Darlington Transistor  $h_{FE} > 10k$  @ 100mA for High Gain
- $I_C = 500mA$  High Continuous Collector Current
- Complementary Darlington PNP Type: BCV46
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP Capable (Note 4)**

**Mechanical Data**

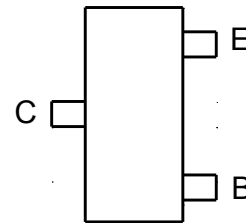
- Case: SOT23
- Case Material: Molded Plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 Ⓜ3
- Weight 0.008 grams (Approximate)



Top View



Device Symbol

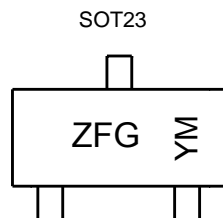


Top View Pin-Out

**Ordering Information (Notes 4 & 5)**

Part Number	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
BCV47QTA	Automotive	ZFG	7	8	3,000
BCV47QTC	Automotive	ZFG	13	8	10,000

- 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> 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. 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>.

**Marking Information**


ZFG = Product Type Marking Code  
 YM = Date Code Marking  
 Y or  $\bar{Y}$  = Year (ex: E = 2017)  
 M or  $\bar{M}$  = Month (ex: 9 = September)

**Date Code Key**

Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Code	E	F	G	H	I	J	K	L	M	N	O	P

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

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

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V <sub>CBO</sub>	80	V
Collector-Emitter Voltage	V <sub>CEO</sub>	60	V
Emitter-Base Voltage	V <sub>EBO</sub>	10	V
Continuous Collector Current	I <sub>C</sub>	500	mA
Peak Pulse Current	I <sub>CM</sub>	800	mA
Base Current	I <sub>B</sub>	100	mA

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

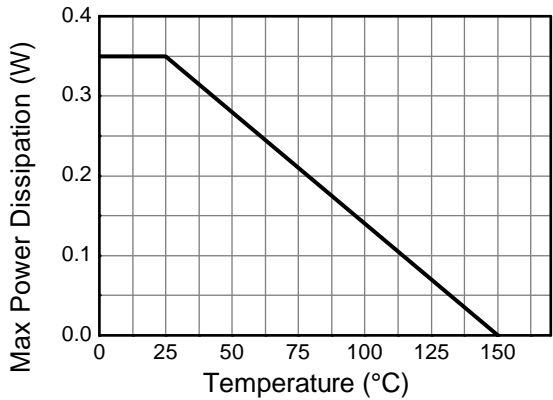
Characteristic	Symbol	Value	Unit
Power Dissipation	P <sub>D</sub>	(Note 6) 310	mW
		(Note 7) 350	
Thermal Resistance, Junction to Ambient	R <sub>θJA</sub>	(Note 6) 403	°C/W
		(Note 7) 357	
Thermal Resistance, Junction to Leads	R <sub>θJL</sub>	350	°C/W
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +150	°C

**ESD Ratings** (Note 9)

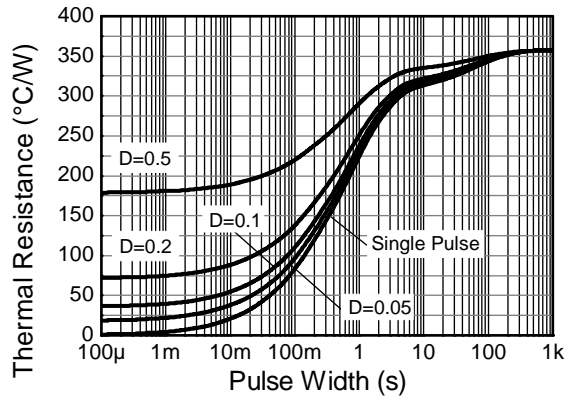
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	2,000	V	2
Electrostatic Discharge - Machine Model	ESD MM	200	V	B

- Notes:
6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper in still air condition; the device is measured when operating in a steady-state condition.
  7. Same as note (6), except the device is mounted on 15mm x 15mm FR4 PCB.
  8. Thermal resistance from junction to solder-point (at the end of the leads).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

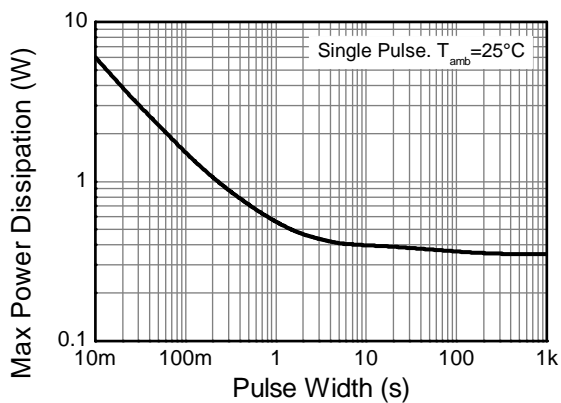
**Thermal Characteristics and Derating Information** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Derating Curve**



**Transient Thermal Impedance**



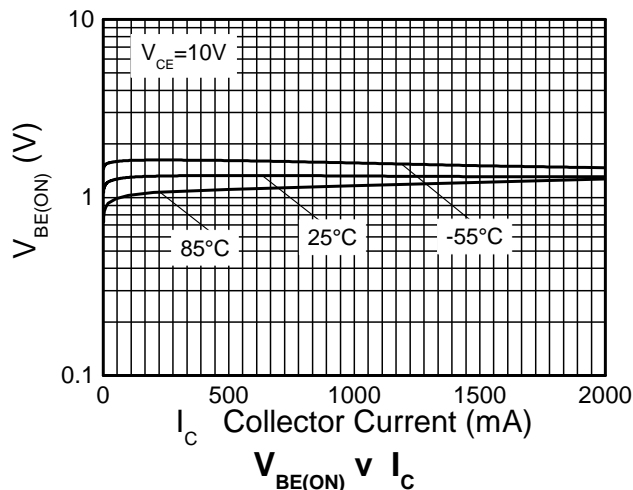
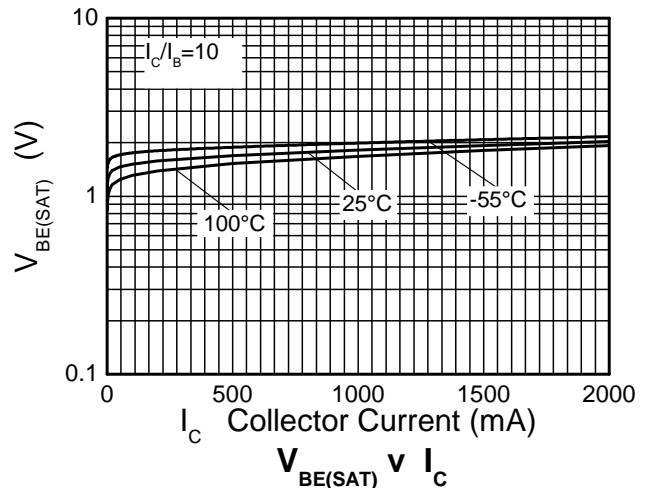
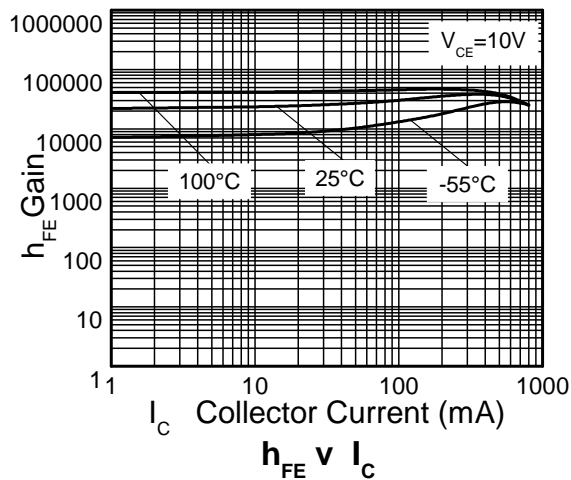
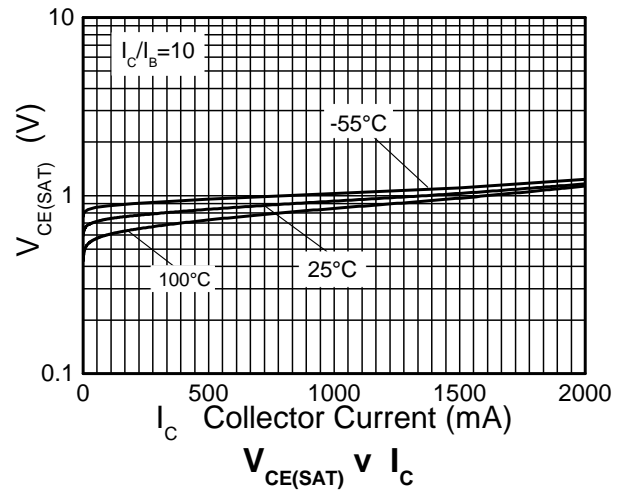
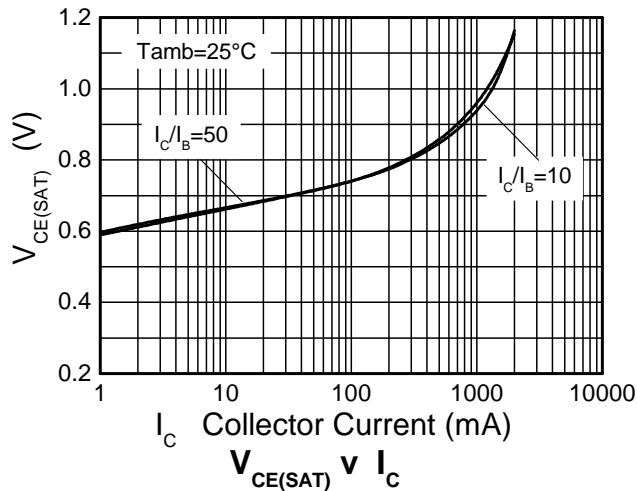
**Pulse Power Dissipation**

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
<b>OFF CHARACTERISTICS</b>						
Collector-Base Breakdown Voltage	$BV_{CBO}$	80	—	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	60	—	—	V	$I_{CEO} = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	10	—	—	V	$I_{EBO} = 10\mu\text{A}$
Collector cut-off current	$I_{CBO}$	—	<1	100	nA	$V_{CB} = 60\text{V}$
		—	—	10	$\mu\text{A}$	$V_{CB} = 60\text{V}, T_A = +150^\circ\text{C}$
Emitter-base Cut-off Current	$I_{EBO}$	—	<1	100	nA	$V_{EB} = 4\text{V}$
<b>ON CHARACTERISTICS (Note 10)</b>						
Static Forward Current Transfer Ratio	$h_{FE}$	2,000 4,000 10,000 2,000	—	—	—	$I_C = 100\mu\text{A}, V_{CE} = 1\text{V}$ $I_C = 10\text{mA}, V_{CE} = 5\text{V}$ $I_C = 100\text{mA}, V_{CE} = 5\text{V}$ $I_C = 500\text{mA}, V_{CE} = 5\text{V}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	—	—	1.0	V	$I_C = 100\text{mA}, I_B = 0.1\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	—	—	1.5	V	$I_C = 100\text{mA}, I_B = 0.1\text{mA}$
<b>SMALL SIGNAL CHARACTERISTICS (Note 10)</b>						
Transition Frequency	$f_T$	—	170	—	MHz	$I_C = 50\text{mA}, V_{CE} = 5\text{V}, f = 20\text{MHz}$
Output Capacitance	$C_{obo}$	—	3.5	—	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$

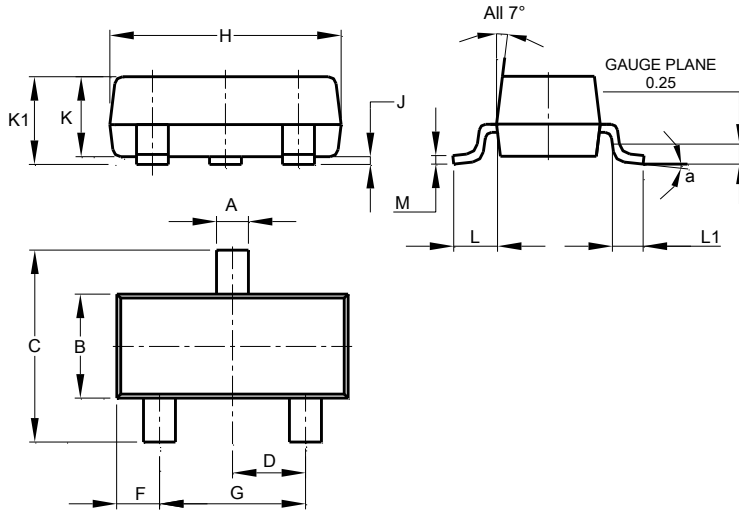
Note: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



## Package Outline Dimensions

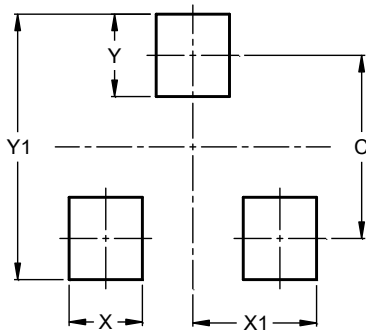
Please see <http://www.diodes.com/package-outlines.html> for the latest version.



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.890	1.00	0.975
K1	0.903	1.10	1.025
L	0.45	0.61	0.55
L1	0.25	0.55	0.40
M	0.085	0.150	0.110
a	0°	8°	--
All Dimensions in mm			

## Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
Y1	2.9