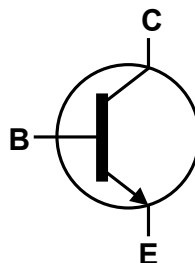


**NPN SURFACE MOUNT SMALL SIGNAL TRANSISTOR IN SOT23**
**Features**

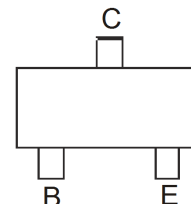
- Ideally Suited for Automatic Insertion
- Complementary PNP Types Available (BC856 – BC858)
- For switching and AF Amplifier Applications
- **Totally Lead-Free & Fully RoHS compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **Qualified to AEC-Q101 Standards for High Reliability**
- **PPAP capable (Note 4)**



Top View



Device Symbol


 Top View  
Pin-Out

**Mechanical Data**

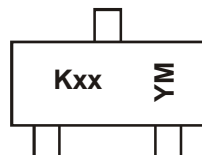
- Case: SOT23
- Case material: molded plastic, "Green" molding compound
- UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – Matte Tin Plated Leads, Solderable per MIL-STD-202, Method 208 ③
- Weight: 0.008 grams (Approximate)

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

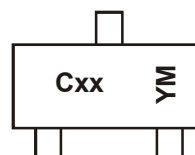
| Product      | Compliance | Marking   | Reel size (inches) | Quantity per reel |
|--------------|------------|-----------|--------------------|-------------------|
| BC846A-7-F   | AEC-Q101   | K1Q       | 7                  | 3,000             |
| BC846AQ-7-F  | Automotive | K1Q       | 7                  | 3,000             |
| BC846B-7-F   | AEC-Q101   | K1R / C1R | 7                  | 3,000             |
| BC846BQ-7-F  | Automotive | K1R       | 7                  | 3,000             |
| BC846B-13-F  | AEC-Q101   | K1R / C1R | 13                 | 10,000            |
| BC846BQ-13-F | Automotive | K1R       | 13                 | 10,000            |
| BC847A-7-F   | AEC-Q101   | K1Q       | 7                  | 3,000             |
| BC847AQ-7-F  | Automotive | K1Q       | 7                  | 3,000             |
| BC847A-13-F  | AEC-Q101   | K1Q       | 13                 | 10,000            |
| BC847B-7-F   | AEC-Q101   | K1R / C1R | 7                  | 3,000             |
| BC847BQ-7-F  | Automotive | K1R       | 7                  | 3,000             |

| Product     | Compliance | Marking   | Reel size (inches) | Quantity per reel |
|-------------|------------|-----------|--------------------|-------------------|
| BC847B-13-F | AEC-Q101   | K1R / C1R | 13                 | 10,000            |
| BC847C-7-F  | AEC-Q101   | K1M       | 7                  | 3,000             |
| BC847CQ-7-F | Automotive | K1M       | 7                  | 3,000             |
| BC847C-13-F | AEC-Q101   | K1M       | 13                 | 10,000            |
| BC848A-7-F  | AEC-Q101   | K1Q       | 7                  | 3,000             |
| BC848B-7-F  | AEC-Q101   | K1R       | 7                  | 3,000             |
| BC848B-13-F | AEC-Q101   | K1R       | 13                 | 10,000            |
| BC848C-7-F  | AEC-Q101   | K1M       | 7                  | 3,000             |
| BC848CQ-7-F | Automotive | K1M       | 7                  | 3,000             |

- 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**


K = SAT (Shanghai Assembly / Test site)  
 xx = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)



C = CAT (Chengdu Assembly / Test site)  
 xx = Product Type Marking Code  
 YM = Date Code Marking  
 Y = Year (ex: Y = 2011)  
 M = Month (ex: 9 = September)

**Date Code Key**

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|------|------|------|------|------|------|------|------|------|
| Code | X    | Y    | Z    | A    | B    | C    | D    | E    |

| 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   |

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

| Characteristic               |              | Symbol           | Value | Unit |
|------------------------------|--------------|------------------|-------|------|
| Collector-Base Voltage       | BC846        | V <sub>CBO</sub> | 80    | V    |
|                              | BC847        |                  | 50    |      |
|                              | BC848        |                  | 30    |      |
| Collector-Emitter Voltage    | BC846        | V <sub>CEO</sub> | 65    | V    |
|                              | BC847        |                  | 45    |      |
|                              | BC848        |                  | 30    |      |
| Emitter-Base Voltage         | BC846, BC847 | V <sub>EBO</sub> | 6.0   | V    |
|                              | BC848        |                  | 5.0   |      |
| Continuous Collector Current |              | I <sub>C</sub>   | 100   | mA   |
| Peak Collector Current       |              | I <sub>CM</sub>  | 200   | mA   |
| Peak Emitter Current         |              | I <sub>EM</sub>  | 200   | mA   |

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

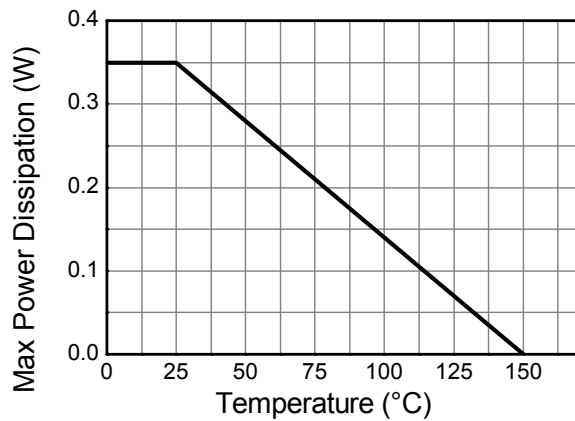
| Characteristic                          |          | Symbol                            | Value       | Unit |
|-----------------------------------------|----------|-----------------------------------|-------------|------|
| Power Dissipation                       | (Note 6) | P <sub>D</sub>                    | 310         | mW   |
|                                         | (Note 7) |                                   | 350         |      |
| Thermal Resistance, Junction to Ambient | (Note 6) | R <sub>θJA</sub>                  | 403         | °C/W |
|                                         | (Note 7) |                                   | 357         |      |
| Thermal Resistance, Junction to Leads   | (Note 8) | R <sub>θJL</sub>                  | 350         | °C/W |
| Operating and Storage Temperature Range |          | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C   |

**ESD Ratings** (Note 9)

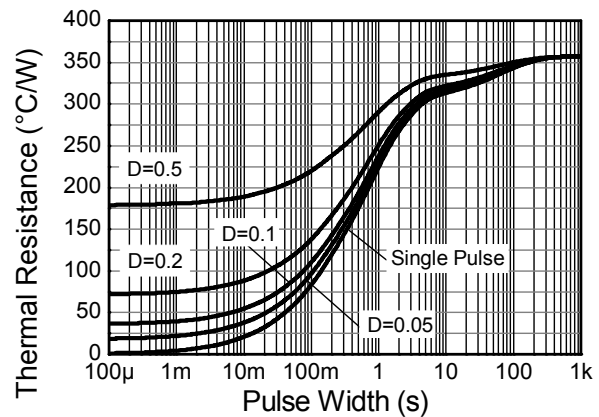
| Characteristic                             | Symbol  | Value   | Unit | JEDEC Class |
|--------------------------------------------|---------|---------|------|-------------|
| Electrostatic Discharge - Human Body Model | ESD HBM | ≥ 8,000 | V    | 3B          |
| Electrostatic Discharge - Machine Model    | ESD MM  | ≥ 400   | V    | C           |

- Notes:
6. For the device mounted on minimum recommended pad layout FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
  7. For the device mounted on 15mm x 15mm x 1.6mm FR4 PCB with high coverage of single sided 1oz copper, in still air conditions.
  8. Thermal resistance from junction to solder-point (at the end of the leads).
  9. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

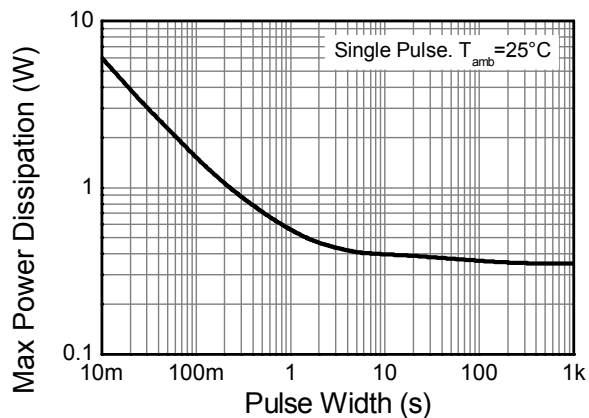
## Thermal Characteristics and Derating Information



**Derating Curve**



**Transient Thermal Impedance**



**Pulse Power Dissipation**

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

| Characteristic                                 |                          | Symbol               | Min | Typ                  | Max | Unit | Test Condition                                                                        |
|------------------------------------------------|--------------------------|----------------------|-----|----------------------|-----|------|---------------------------------------------------------------------------------------|
| Collector-Base Breakdown Voltage               | BC846                    | BV <sub>CBO</sub>    | 80  | —                    | —   | V    | I <sub>C</sub> = 10μA                                                                 |
|                                                | BC847                    |                      | 50  |                      |     |      |                                                                                       |
|                                                | BC848                    |                      | 30  |                      |     |      |                                                                                       |
| Collector-Emitter Breakdown Voltage (Note 10)  | BC846                    | BV <sub>CEO</sub>    | 65  | —                    | —   | V    | I <sub>C</sub> = 10mA                                                                 |
|                                                | BC847                    |                      | 45  |                      |     |      |                                                                                       |
|                                                | BC848                    |                      | 30  |                      |     |      |                                                                                       |
| Emitter-Base Breakdown Voltage                 | BC846 / BC847            | BV <sub>EBO</sub>    | 6   | —                    | —   | V    | I <sub>E</sub> = 1μA                                                                  |
|                                                | BC848                    |                      | 5   |                      |     |      |                                                                                       |
| Collector Cutoff Current                       |                          | I <sub>CBO</sub>     | —   | —                    | —   | μA   | V <sub>CB</sub> = 40V                                                                 |
|                                                |                          |                      |     |                      | —   |      | V <sub>CB</sub> = 30V, T <sub>A</sub> = +150°C                                        |
| Collector Emitter Cutoff Current               | BC846                    | I <sub>CES</sub>     | —   | —                    | 15  | nA   | V <sub>CE</sub> = 80V                                                                 |
|                                                | BC847                    |                      |     |                      | 15  |      | V <sub>CE</sub> = 50V                                                                 |
|                                                | BC848                    |                      |     |                      | 15  |      | V <sub>CE</sub> = 30V                                                                 |
| Small Signal Current Gain (Note 10)            | BC846A / BC847A / BC848A | h <sub>fe</sub>      | —   | 200                  | —   | —    | I <sub>C</sub> = 2.0mA, V <sub>CE</sub> = 5V<br>f=1.0kHz                              |
|                                                | BC846B / BC847B / BC848B |                      |     | 330                  |     |      |                                                                                       |
|                                                | BC847C / BC848C          |                      |     | 600                  |     |      |                                                                                       |
| Input Impedance (Note 10)                      | BC846A / BC847A / BC848A | h <sub>ie</sub>      | —   | 2.7                  | —   | kΩ   |                                                                                       |
|                                                | BC846B / BC847B / BC848B |                      |     | 4.5                  |     |      |                                                                                       |
|                                                | BC847C / BC848C          |                      |     | 8.7                  |     |      |                                                                                       |
| Output Admittance (Note 10)                    | BC846A / BC847A / BC848A | h <sub>oe</sub>      | —   | 18                   | —   | μS   |                                                                                       |
|                                                | BC846B / BC847B / BC848B |                      |     | 30                   |     |      |                                                                                       |
|                                                | BC847C / BC848C          |                      |     | 60                   |     |      |                                                                                       |
| Reverse Voltage Transfer Ratio (Note 10)       | BC846A / BC847A / BC848A | h <sub>re</sub>      | —   | 1.5x10 <sup>-4</sup> | —   | —    |                                                                                       |
|                                                | BC846B / BC847B / BC848B |                      |     | 2x10 <sup>-4</sup>   |     |      |                                                                                       |
|                                                | BC847C / BC848C          |                      |     | 3x10 <sup>-4</sup>   |     |      |                                                                                       |
| DC Current Gain (Note 10)                      | BC846A / BC847A / BC848A | h <sub>FE</sub>      | 110 | 180                  | 220 | —    | I <sub>C</sub> = 2.0mA, V <sub>CE</sub> = 5V                                          |
|                                                | BC846B / BC847B / BC848B |                      | 200 | 290                  | 450 |      |                                                                                       |
|                                                | BC847C / BC848C          |                      | 420 | 520                  | 800 |      |                                                                                       |
| Collector-Emitter Saturation Voltage (Note 10) |                          | V <sub>CE(sat)</sub> | —   | 90                   | 250 | mV   | I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.5mA                                         |
|                                                |                          |                      |     | 200                  | 600 |      | I <sub>C</sub> = 100mA, I <sub>B</sub> = 5.0mA                                        |
| Base-Emitter Turn-On Voltage(Note 10)          |                          | V <sub>BE(on)</sub>  | 580 | 660                  | 700 | mV   | I <sub>C</sub> = 2mA, V <sub>CE</sub> = 5V                                            |
|                                                |                          |                      | -   | —                    | 770 |      | I <sub>C</sub> = 10mA, V <sub>CE</sub> = 5V                                           |
| Base-Emitter Saturation Voltage(Note 10)       |                          | V <sub>BE(sat)</sub> | —   | 700                  | —   | mV   | I <sub>C</sub> = 10mA, I <sub>B</sub> = 0.5mA                                         |
|                                                |                          |                      |     | 900                  |     |      | I <sub>C</sub> = 100mA, I <sub>B</sub> = 5mA                                          |
| Output Capacitance                             |                          | C <sub>obo</sub>     | —   | 3                    | —   | pF   | V <sub>CB</sub> = 10V, f = 1.0MHz                                                     |
| Transition Frequency                           |                          | f <sub>T</sub>       | 100 | 300                  | —   | MHz  | V <sub>CE</sub> = 5V, I <sub>C</sub> = 10mA, f = 100MHz                               |
| Noise Figure                                   |                          | NF                   | —   | 2                    | 10  | dB   | V <sub>CE</sub> =5V, I <sub>C</sub> =200μA<br>R <sub>S</sub> =2kΩ, f=1kHz<br>Δf=200Hz |

Note: 10. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%

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

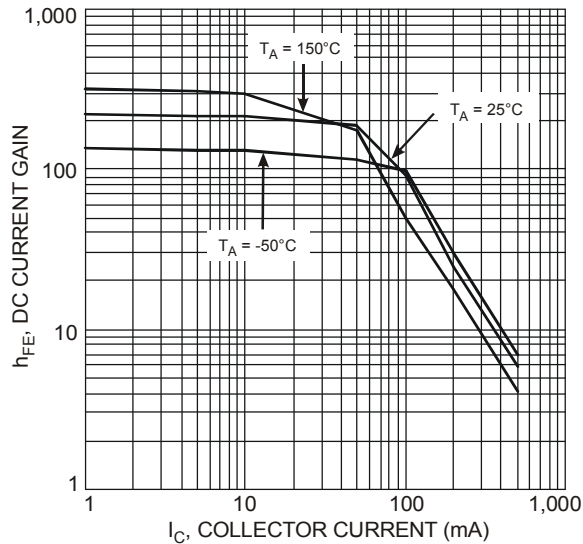


Figure 1 Typical DC Current Gain vs. Collector Current

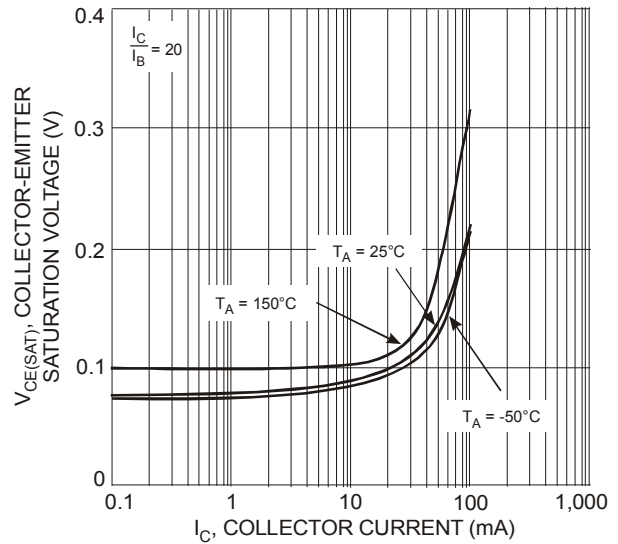


Figure 2 Typical Collector-Emitter Saturation Voltage vs. Collector Current

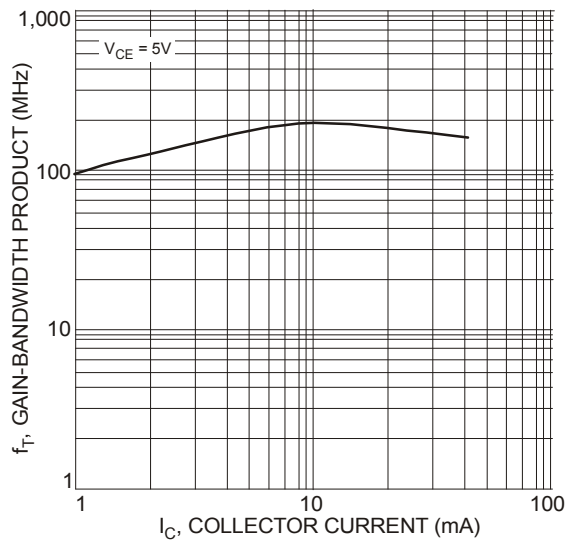
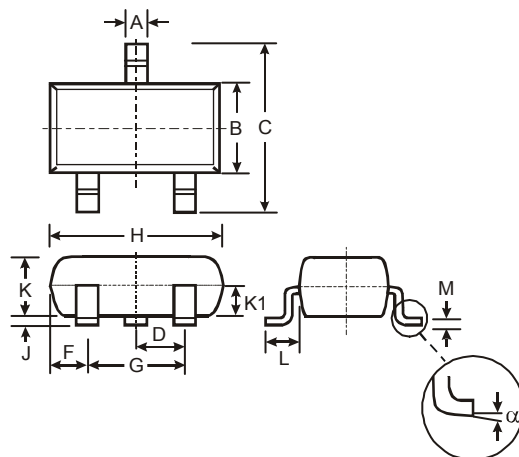


Figure 3 Typical Gain-Bandwidth Product vs. Collector Current

## Package Outline Dimensions

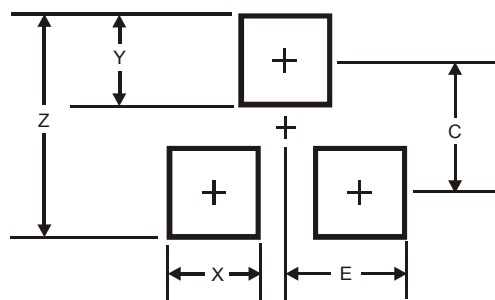
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



| 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                    | 0.903 | 1.10 | 1.00  |
| K1                   | -     | -    | 0.400 |
| L                    | 0.45  | 0.61 | 0.55  |
| M                    | 0.085 | 0.18 | 0.11  |
| $\alpha$             | 0°    | 8°   | -     |
| 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) |
|------------|---------------|
| Z          | 2.9           |
| X          | 0.8           |
| Y          | 0.9           |
| C          | 2.0           |
| E          | 1.35          |

**IMPORTANT NOTICE**

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

**LIFE SUPPORT**

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2013, Diodes Incorporated

[www.diodes.com](http://www.diodes.com)

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9