

## Description

This Bipolar Junction Transistors (BJT) is designed to meet the stringent requirements of Automotive Applications.

## Features

- $BV_{CEO} > -60V$
- $I_C = -2A$  High Continuous Collector Current
- $R_{CE(SAT)} = 250m\Omega$  for a Low Equivalent On-Resistance
- Sidewall Tin Plating for Wettable Flanks in AOI
- $P_D$  Up to 2.47W for Power Demanding Applications
- Low Profile 0.6mm High Package for Thin 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)**

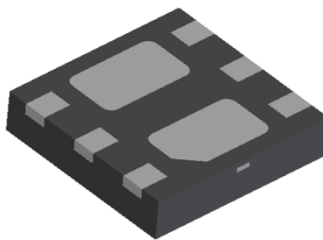
## Mechanical Data

- Case: U-DFN2020-6 (SWP) (Type A) with Sidewall Plating
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish — Matte Tin, Solderable per MIL-STD-202, Method 208③
- Weight: 0.0065 grams (Approximate)

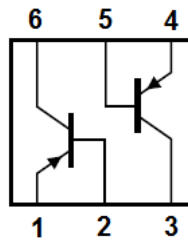
## Application

- Matrix LED Lighting
- Power Management

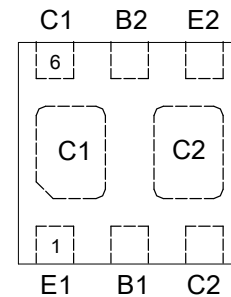
U-DFN2020-6 (SWP) (Type A)



Bottom View



Device Symbol



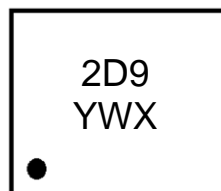
Top View  
Pin-Out

## Ordering Information (Note 5)

| Part Number     | Marking | Reel Size (inches) | Tape Width (mm) | Quantity Per Reel |
|-----------------|---------|--------------------|-----------------|-------------------|
| ZXTP56060FDBQ-7 | 2D9     | 7                  | 8               | 3,000             |

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
  2. See <https://www.diodes.com/quality/lead-free/> 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 <https://www.diodes.com/quality/>.
  5. For packaging details, go to our website at <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

## Marking Information



2D9 = Product Type Marking Code  
 Y = Year: 0~9  
 W = Week: A~Z: 1~26 week;  
 a~z: 27~52 week; z represents  
 52 and 53 week  
 X = A~Z: Internal code

**Absolute Maximum Ratings – Q1 & Q2** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic               | Symbol           | Value | Unit |
|------------------------------|------------------|-------|------|
| Collector-Base Voltage       | V <sub>CBO</sub> | -60   | V    |
| Collector-Emitter Voltage    | V <sub>CEO</sub> | -60   | V    |
| Emitter-Base Voltage         | V <sub>EBO</sub> | -7    | V    |
| Continuous Collector Current | I <sub>C</sub>   | -2    | A    |
| Peak Pulse Collector Current | I <sub>CM</sub>  | -3    | A    |
| Base Current                 | I <sub>B</sub>   | -300  | mA   |
| Peak Base Current            | I <sub>BM</sub>  | -1    | A    |

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

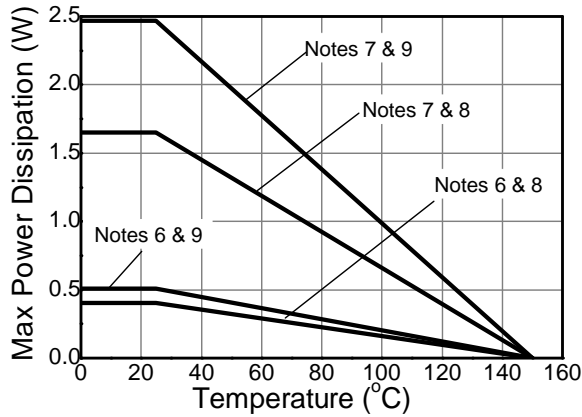
| Characteristic                          | Symbol                            | Value       | Unit |
|---|-----------------------------------|-------------|------|
| Power Dissipation                       | (Notes 6 & 8)                     | 405         | mW   |
|   | (Notes 6 & 9)                     | 510         |      |
|   | (Notes 7 & 8)                     | 1650        |      |
|   | (Notes 7 & 9)                     | 2470        |      |
| Thermal Resistance, Junction to Ambient | (Notes 6 & 8)                     | 308         | °C/W |
|   | (Notes 6 & 9)                     | 245         |      |
|   | (Notes 7 & 8)                     | 76          |      |
|   | (Notes 7 & 9)                     | 51          |      |
| Thermal Resistance, Junction to Lead    | R <sub>θJL</sub>                  | 18          | °C/W |
| Operating and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C   |

**ESD Ratings** (Note 11)

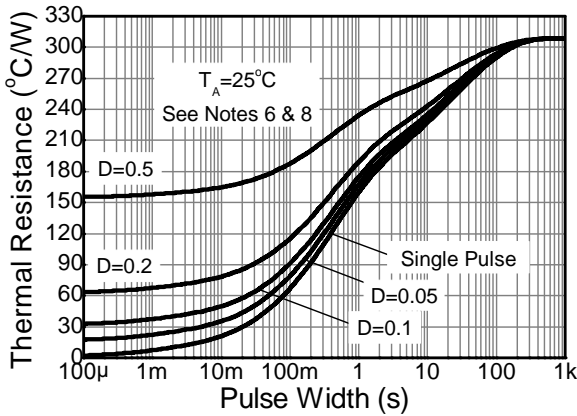
| Characteristic                             | Symbol  | Value | Unit | JEDEC Class |
|--|---------|-------|------|-------------|
| Electrostatic Discharge – Human Body Model | ESD HBM | 4,000 | V    | 3A          |
| Electrostatic Discharge – Machine Model    | ESD MM  | 400   | V    | C           |

- Notes:
6. For a device mounted with the exposed collector pads on minimum recommended pad layout that is on a single-sided 1.6mm FR-4 PCB; device is measured under still air conditions whilst operating in a steady-state.
  7. Same as note (6), except the device is mounted with the collector pad on 28mm x 28mm (8cm<sup>2</sup>) 2oz copper.
  8. For a dual device with one active die.
  9. For dual device with 2 active die running at equal power.
  10. Thermal resistance from junction to solder-point (on the exposed collector pads).
  11. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

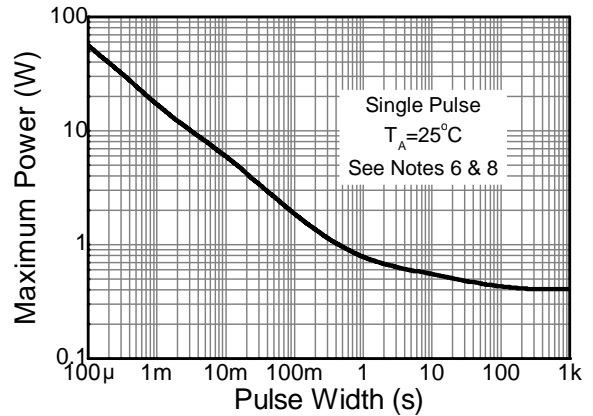
**Thermal Characteristics and Derating Information**



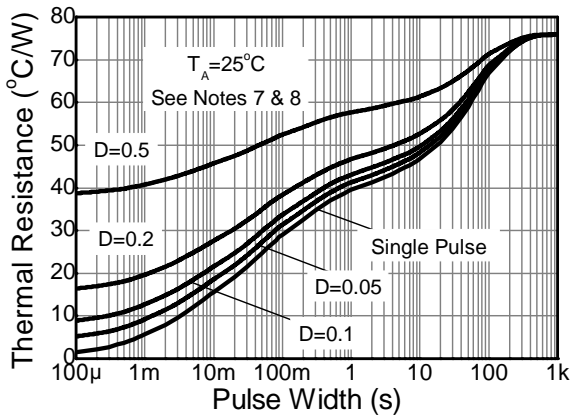
**Derating Curve**



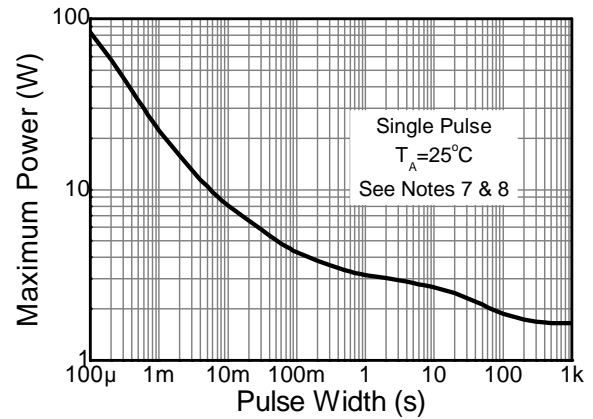
**Transient Thermal Impedance**



**Pulse Power Dissipation**



**Transient Thermal Impedance**



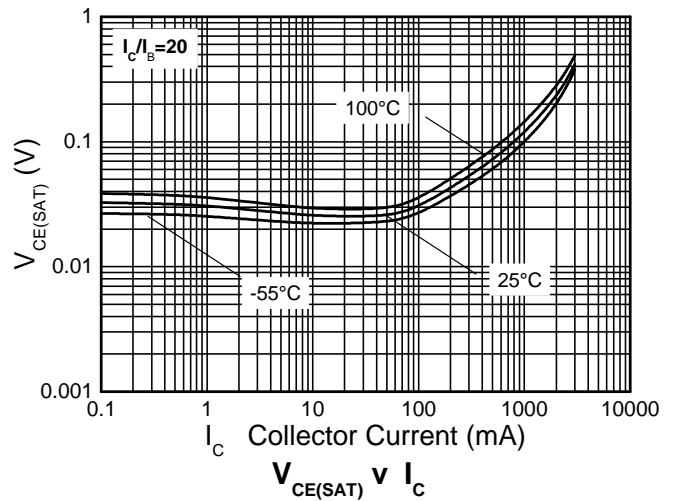
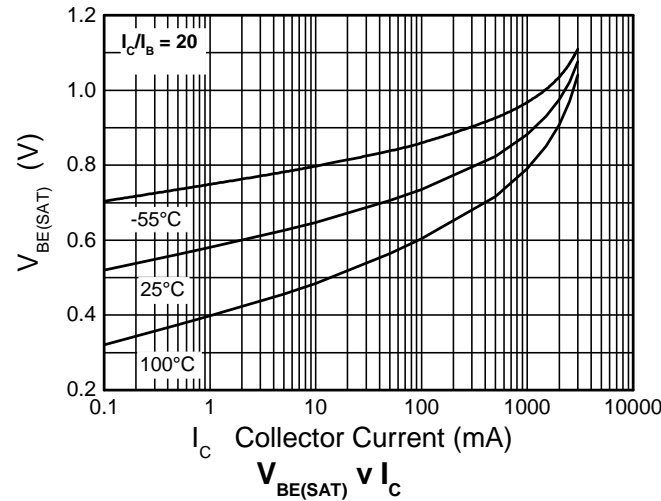
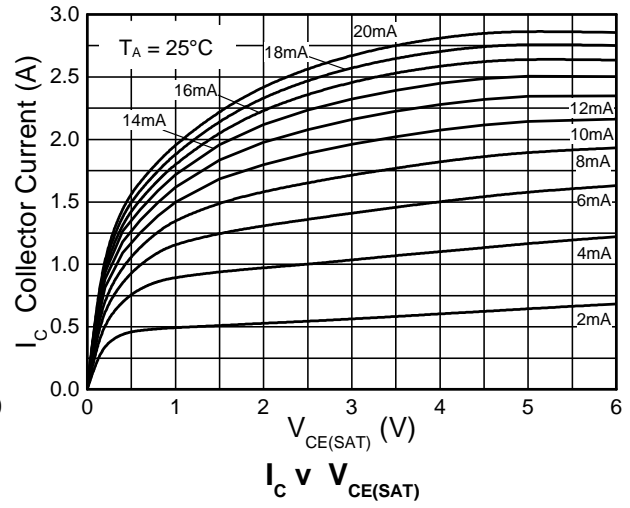
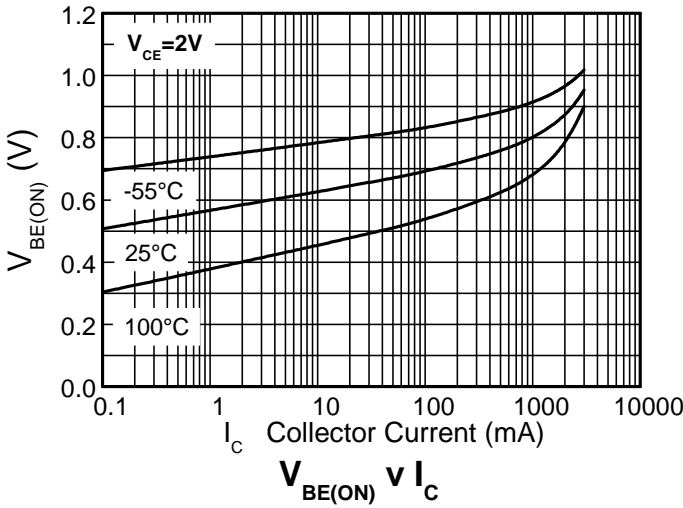
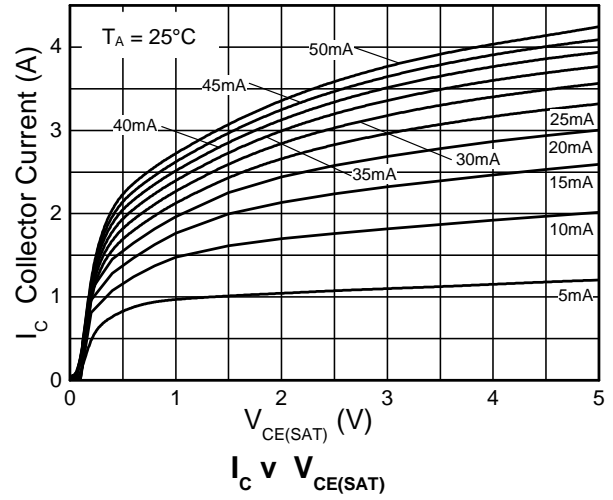
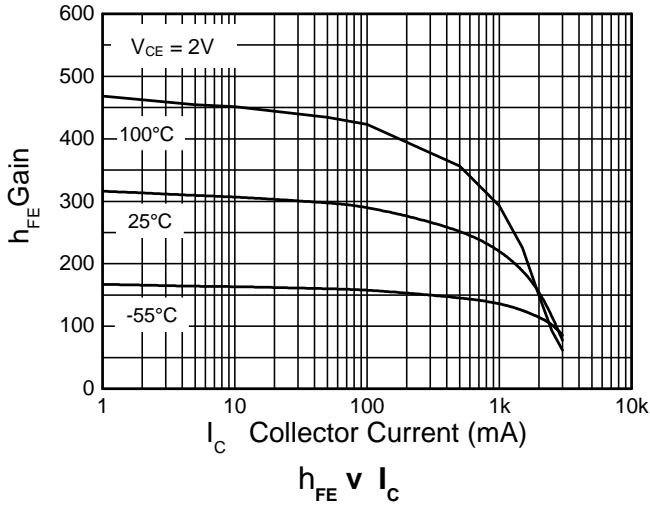
**Pulse Power Dissipation**

**Electrical Characteristics – Q1 & Q2** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

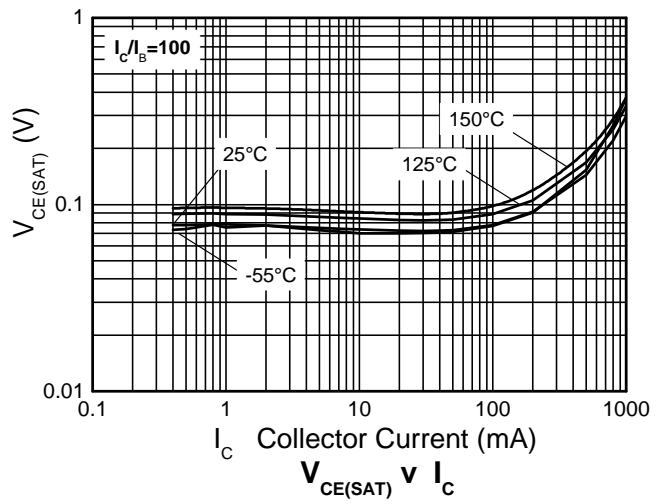
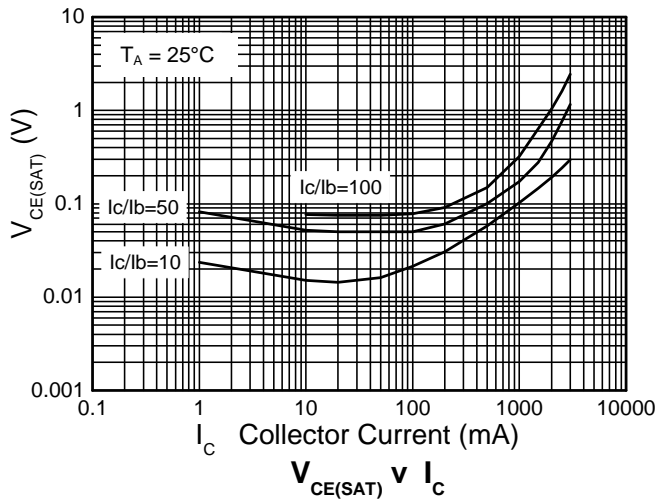
| Characteristic                                 | Symbol               | Min | Typ | Max   | Unit | Test Conditions  |
|--|----------------------|-----|-----|-------|------|--|
| Collector-Base Breakdown Voltage               | BV <sub>CB0</sub>    | -60 | —   | —     | V    | I <sub>C</sub> = -100μA  |
| Collector-Emitter Breakdown Voltage (Note 12)  | BV <sub>CEO</sub>    | -60 | —   | —     | V    | I <sub>C</sub> = -10mA   |
| Emitter-Base Breakdown Voltage                 | BV <sub>EBO</sub>    | -7  | —   | —     | V    | I <sub>E</sub> = -100μA  |
| Collector-Base Cutoff Current                  | I <sub>CB0</sub>     | —   | —   | -100  | nA   | V <sub>CB</sub> = -48V, I <sub>E</sub> = 0   |
|  |                      | —   | —   | -50   | μA   | V <sub>CB</sub> = -48V, I <sub>E</sub> = 0, T <sub>A</sub> = +150°C                        |
| Emitter-Base Cutoff Current                    | I <sub>EBO</sub>     | —   | —   | -100  | nA   | V <sub>EB</sub> = -5.6V, I <sub>C</sub> = 0  |
| DC Current Gain (Note 12)                      | h <sub>FE</sub>      | 170 | —   | —     | —    | V <sub>CE</sub> = -2V, I <sub>C</sub> = -100mA   |
|  |                      | 140 | —   | —     |      | V <sub>CE</sub> = -2V, I <sub>C</sub> = -500mA   |
|  |                      | 110 | —   | —     |      | V <sub>CE</sub> = -2V, I <sub>C</sub> = -1A  |
|  |                      | 50  | —   | —     |      | V <sub>CE</sub> = -2V, I <sub>C</sub> = -2A  |
| Collector-Emitter Saturation Voltage (Note 12) | V <sub>CE(SAT)</sub> | —   | —   | -120  | mV   | I <sub>C</sub> = -500mA, I <sub>B</sub> = -50mA  |
|  |                      | —   | —   | -250  |      | I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA   |
|  |                      | —   | —   | -420  |      | I <sub>C</sub> = -0.7A, I <sub>B</sub> = -7mA  |
|  |                      | —   | —   | -450  |      | I <sub>C</sub> = -2A, I <sub>B</sub> = -200mA  |
| Equivalent On-Resistance (Note 12)             | R <sub>CE(SAT)</sub> | —   | —   | 250   | mΩ   | I <sub>E</sub> = -1A, I <sub>B</sub> = -50mA   |
| Base-Emitter Saturation Voltage (Note 12)      | V <sub>BE(SAT)</sub> | —   | —   | -1    | V    | I <sub>C</sub> = -0.5A, I <sub>B</sub> = -50mA   |
|  |                      | —   | —   | -1    |      | I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA   |
|  |                      | —   | —   | -1.25 |      | I <sub>C</sub> = -2A, I <sub>B</sub> = -200mA  |
| Base-Emitter Turn-on Voltage (Note 12)         | V <sub>BE(ON)</sub>  | —   | —   | -0.9  | V    | V <sub>CE</sub> = -2V, I <sub>C</sub> = -0.5A  |
| Turn-On Time                                   | t <sub>ON</sub>      | —   | 90  | —     | ns   | I <sub>C</sub> = -1A, I <sub>B1</sub> = -I <sub>B2</sub> = 50mA;<br>T <sub>A</sub> = +25°C |
| Delay Time                                     | t <sub>D</sub>       | —   | 10  | —     | ns   |  |
| Rise Time                                      | t <sub>R</sub>       | —   | 80  | —     | ns   |  |

Note: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



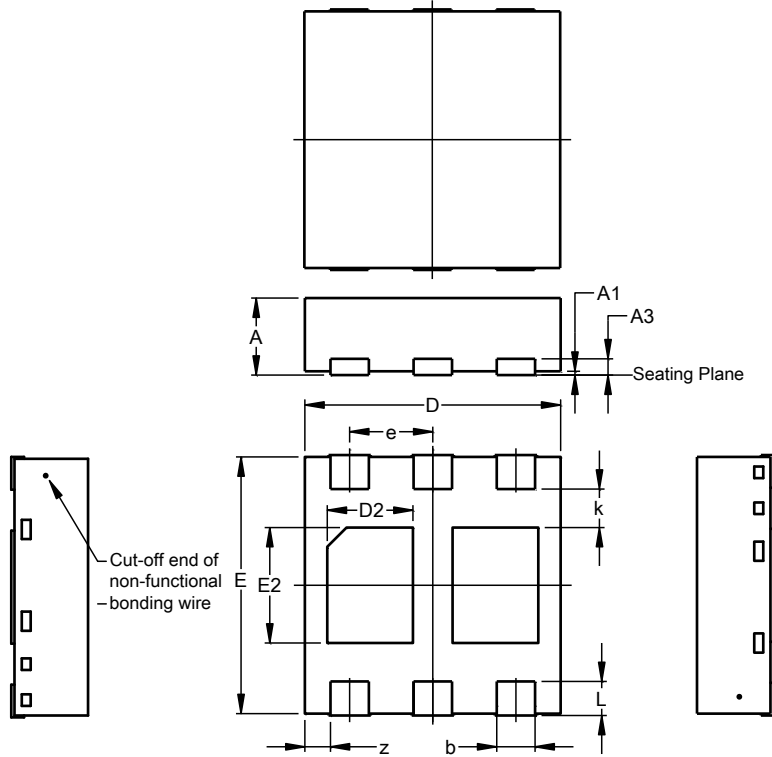
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Package Outline Dimensions**

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

**U-DFN2020-6 (SWP) (Type A)**

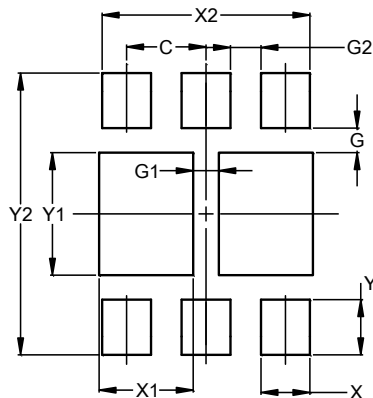


| U-DFN2020-6 (SWP)<br>(Type A) |         |      |       |
|-------------------------------|---------|------|-------|
| Dim                           | Min     | Max  | Typ   |
| A                             | 0.55    | 0.65 | 0.60  |
| A1                            | 0.00    | 0.05 | 0.03  |
| A3                            | --      | --   | 0.127 |
| b                             | 0.25    | 0.35 | 0.30  |
| D                             | 1.95    | 2.05 | 2.00  |
| D2                            | 0.57    | 0.77 | 0.67  |
| E                             | 1.95    | 2.05 | 2.00  |
| E2                            | 0.80    | 1.00 | 0.90  |
| e                             | 0.65BSC |      |       |
| k                             | 0.30BSC |      |       |
| L                             | 0.22    | 0.32 | 0.27  |
| z                             | 0.20BSC |      |       |
| All Dimensions in mm          |         |      |       |

**Suggested Pad Layout**

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

**U-DFN2020-6 (SWP) (Type A)**



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 0.650         |
| G          | 0.200         |
| G1         | 0.210         |
| G2         | 0.250         |
| X          | 0.400         |
| X1         | 0.770         |
| X2         | 1.700         |
| Y          | 0.450         |
| Y1         | 1.000         |
| Y2         | 2.300         |

**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 © 2018, Diodes Incorporated

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



Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)  
Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)