

## 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)**

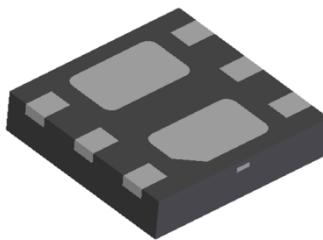
## Mechanical Data

- 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)

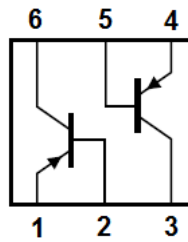
## Application

- Matrix LED Lighting
- Power Management

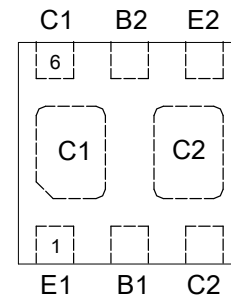
U-DFN2020-6 (SWP) (Type A)



Bottom View



Device Symbol



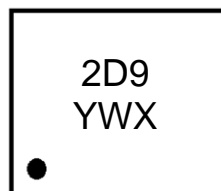
Top View  
Pin-Out

## 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.)

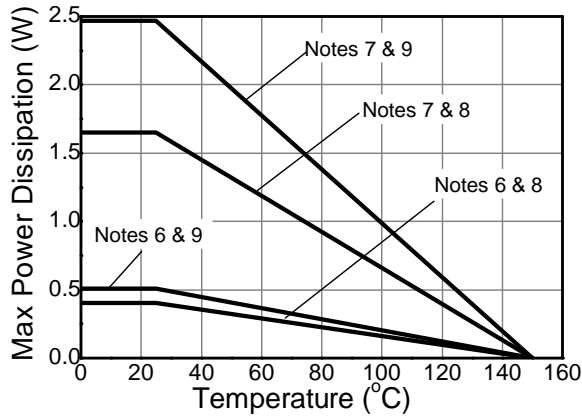
Characteristic		Symbol	Value	Unit
Power Dissipation	(Notes 6 & 8)	P <sub>D</sub>	405	mW
	(Notes 6 & 9)		510	
	(Notes 7 & 8)		1650	
	(Notes 7 & 9)		2470	
Thermal Resistance, Junction to Ambient	(Notes 6 & 8)	R <sub>θJA</sub>	308	°C/W
	(Notes 6 & 9)		245	
	(Notes 7 & 8)		76	
	(Notes 7 & 9)		51	
Thermal Resistance, Junction to Lead	(Note 10)	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)

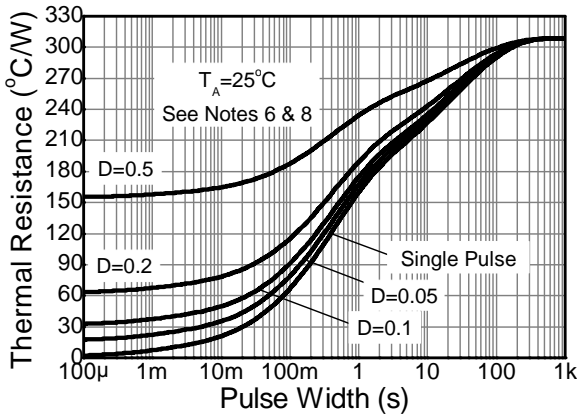
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

- 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.

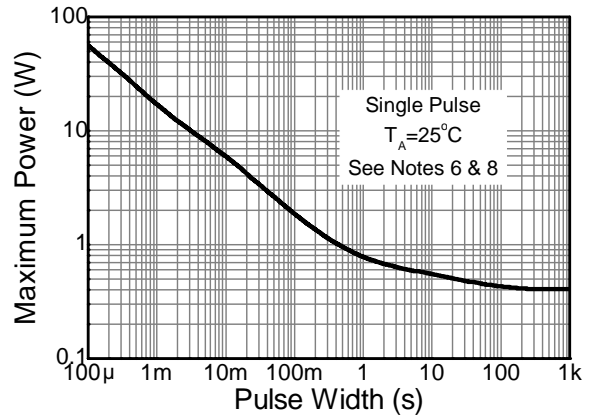
**Thermal Characteristics and Derating Information**



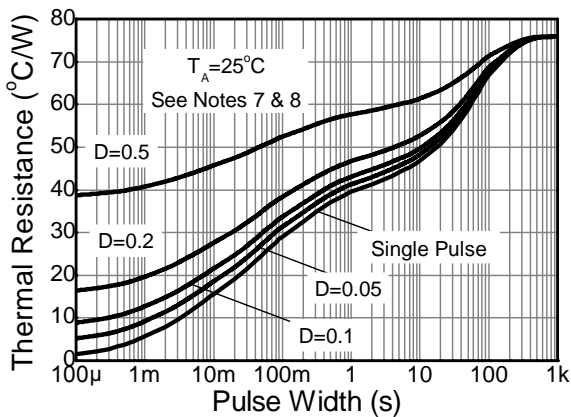
**Derating Curve**



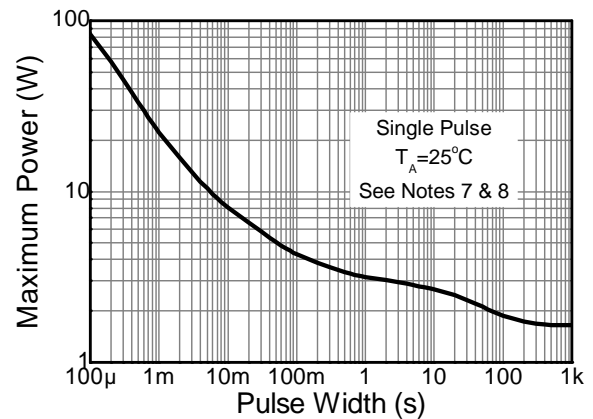
**Transient Thermal Impedance**



**Pulse Power Dissipation**



**Transient Thermal Impedance**



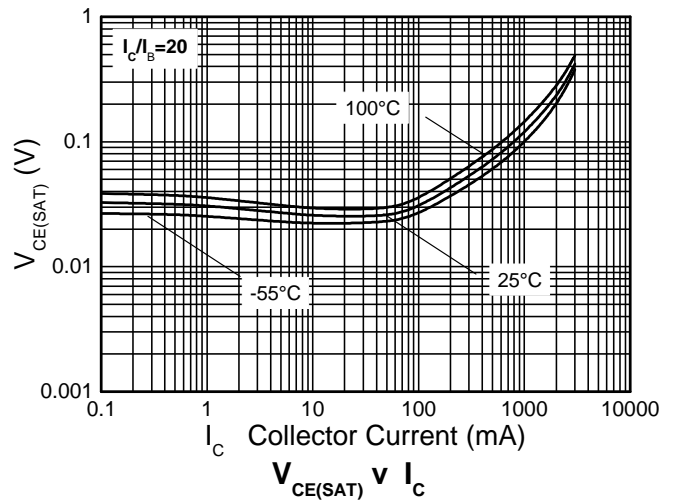
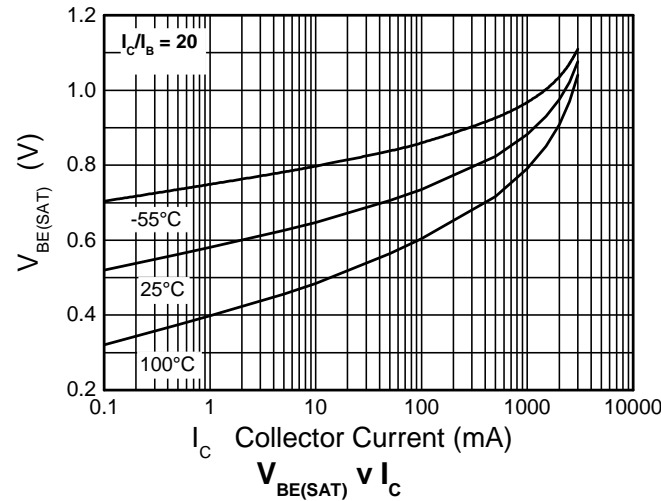
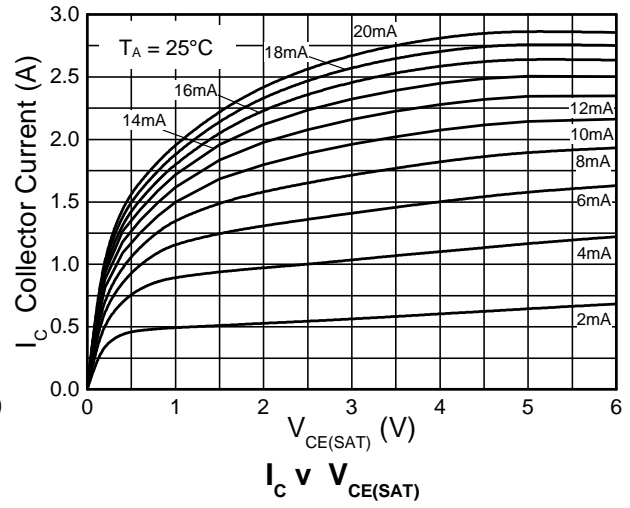
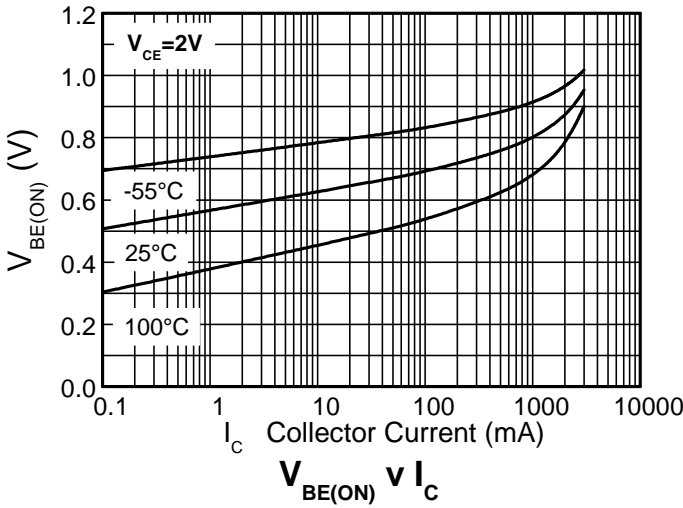
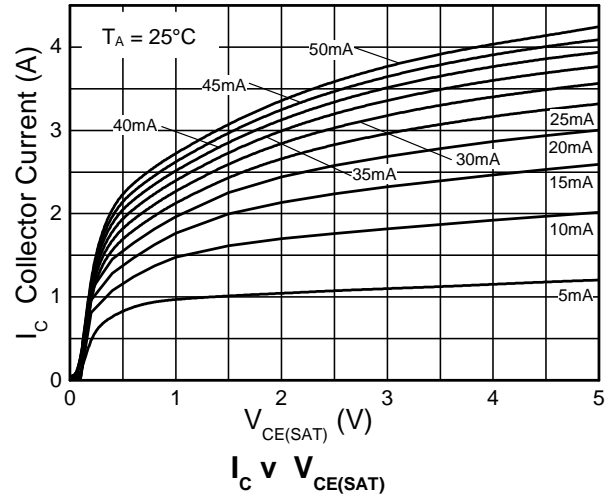
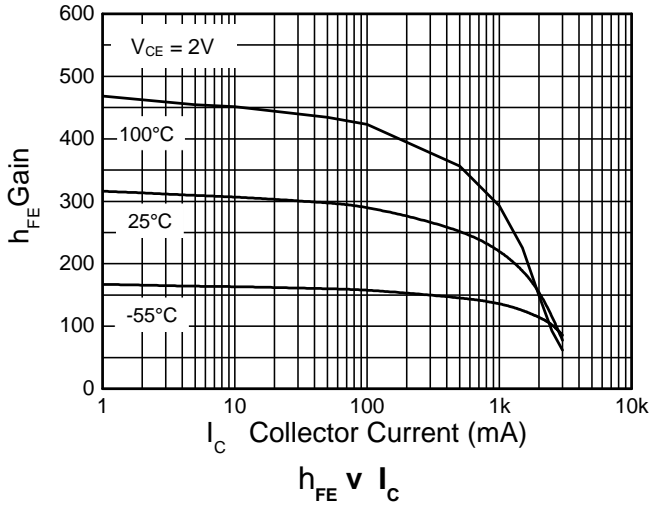
**Pulse Power Dissipation**

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

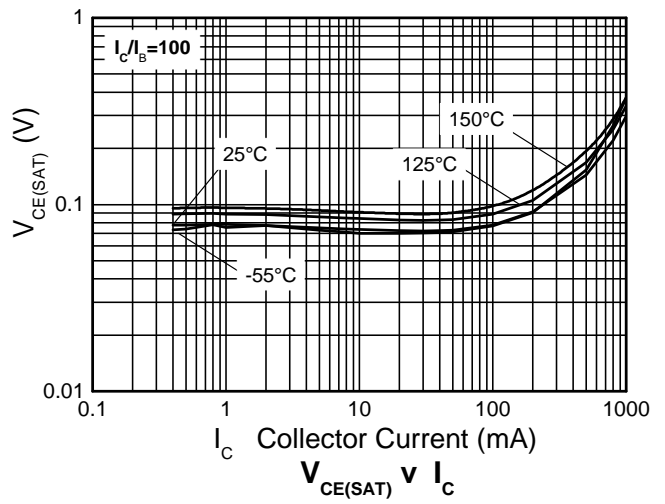
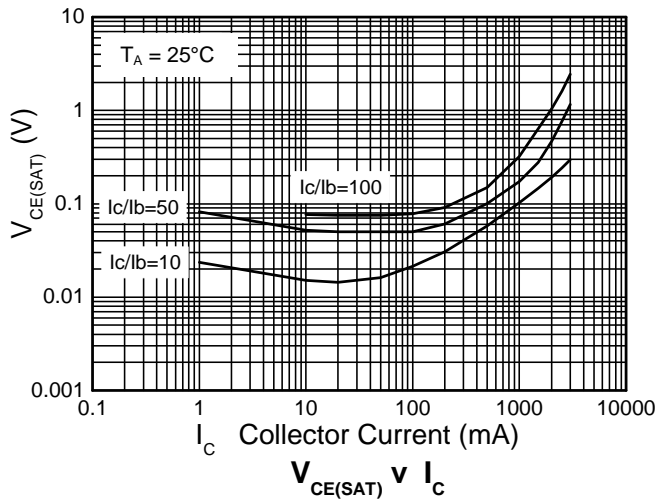
Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	-60	—	—	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	-60	—	—	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	—	—	V	I <sub>E</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; 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.)



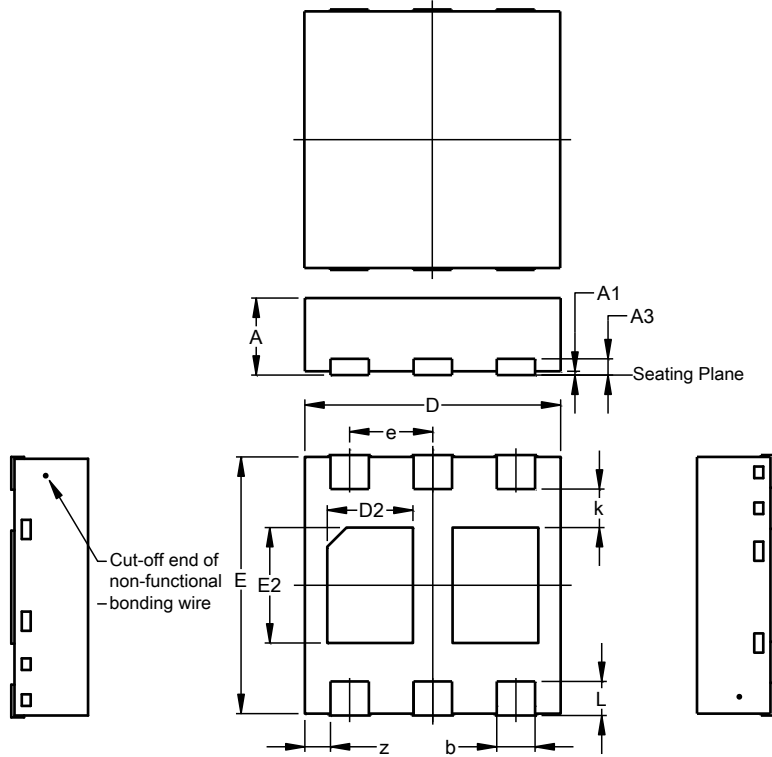
**Typical Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)



**Package Outline Dimensions**

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

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

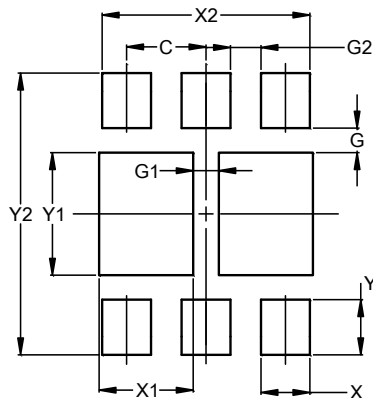


U-DFN2020-6 (SWP) (Type A)			
Dim	Min	Max	Typ
A	0.55	0.65	0.60
A1	0.00	0.05	0.03
A3	--	--	0.127
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.57	0.77	0.67
E	1.95	2.05	2.00
E2	0.80	1.00	0.90
e	0.65BSC		
k	0.30BSC		
L	0.22	0.32	0.27
z	0.20BSC		
All Dimensions in mm			

**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

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