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
- $R_{CE(sat)}$ = 250mΩ 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)**
- **The ZXTP56060FDBQ is suitable for automotive applications requiring specific change control; this part is AEC-Q101 qualified, PPAP capable, and manufactured in IATF16949 certified facilities.**
  https://www.diodes.com/quality/product-definitions/

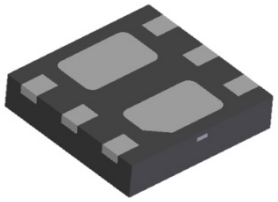
Mechanical Data

- 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 208 e3
- Weight: 0.0065 grams (Approximate)

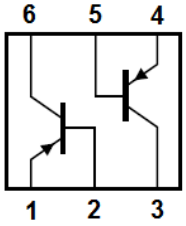
Application

- Matrix LED Lighting
- Power Management

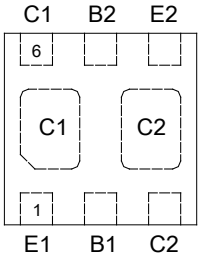
U-DFN2020-6 (SWP) (Type A)



Bottom View



Device Symbol



Top View
Pinout

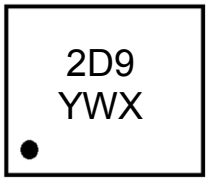
Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity Per Reel
ZXTP56060FDBQ-7	2D9	7	8	3000
ZXTP56060FDBQ-13R	2D9	13	8	10,000

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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information

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



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_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	-60	V
Collector-Emitter Voltage	V_{CEO}	-60	V
Emitter-Base Voltage	V_{EBO}	-7	V
Continuous Collector Current	I_C	-2	A
Peak Pulse Collector Current	I_{CM}	-3	A
Base Current	I_B	-300	mA
Peak Base Current	I_{BM}	-1	A

Thermal Characteristics (@T_A = +25°C, unless otherwise specified.)

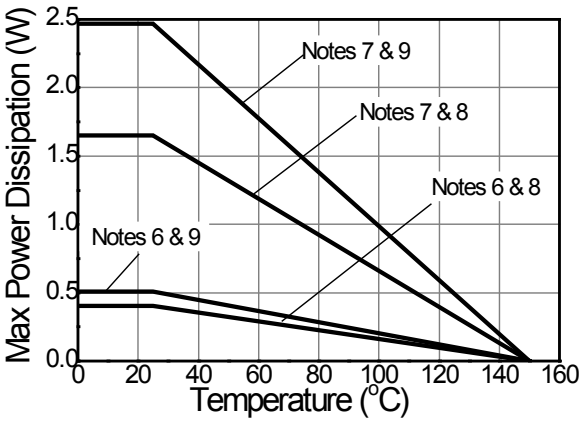
Characteristic		Symbol	Value	Unit
Power Dissipation	(Notes 5 & 7)	P_D	405	mW
	(Notes 5 & 8)		510	
	(Notes 6 & 7)		1650	
	(Notes 6 & 8)		2470	
Thermal Resistance, Junction to Ambient	(Notes 5 & 7)	$R_{\theta JA}$	308	°C/W
	(Notes 5 & 8)		245	
	(Notes 6 & 7)		76	
	(Notes 6 & 8)		51	
Thermal Resistance, Junction to Lead	(Note 9)	$R_{\theta JL}$	18	°C/W
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 10)

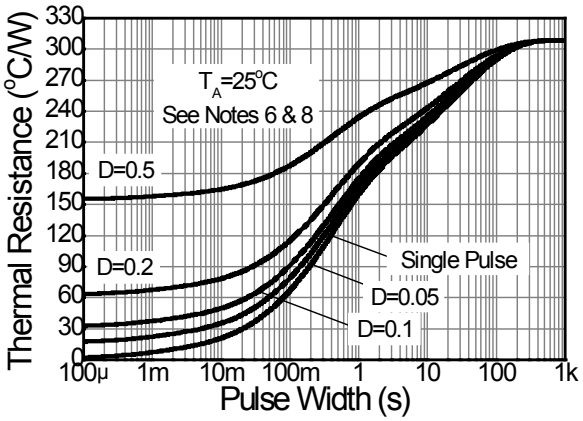
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge – Human Body Model	ESD HBM	4000	V	3A
Electrostatic Discharge – Machine Model	ESD MM	400	V	C

Notes:
5. 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.
6. Same as Note 5, except the device is mounted with the collector pad on 28mm × 28mm (8cm^2) 2oz copper.
7. For a dual device with one active die.
8. For dual device with two active die running at equal power.
9. Thermal resistance from junction to solder-point (on the exposed collector pads).
10. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

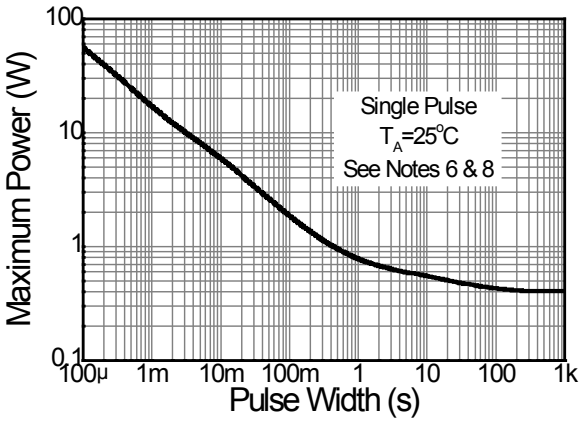
Thermal Characteristics and Derating Information



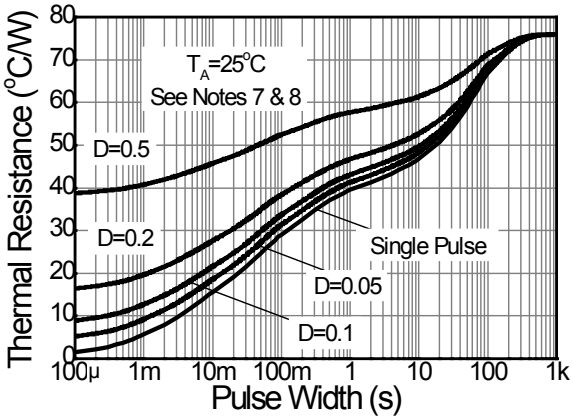
Derating Curve



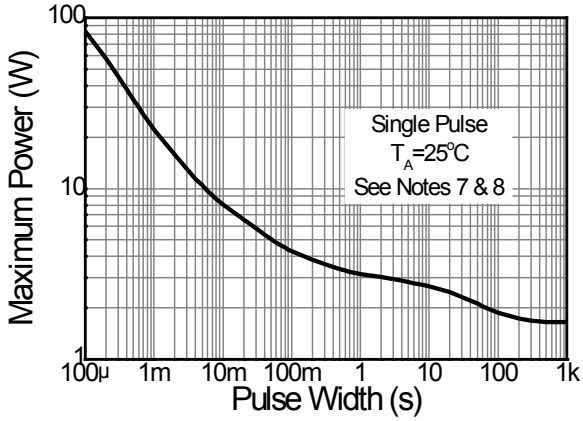
Transient Thermal Impedance



Pulse Power Dissipation



Transient Thermal Impedance



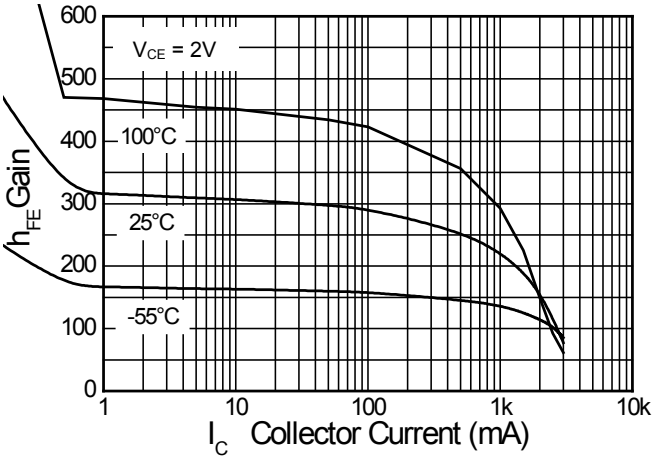
Pulse Power Dissipation

Electrical Characteristics – Q1 & Q2 (@T_A = +25°C, unless otherwise specified.)

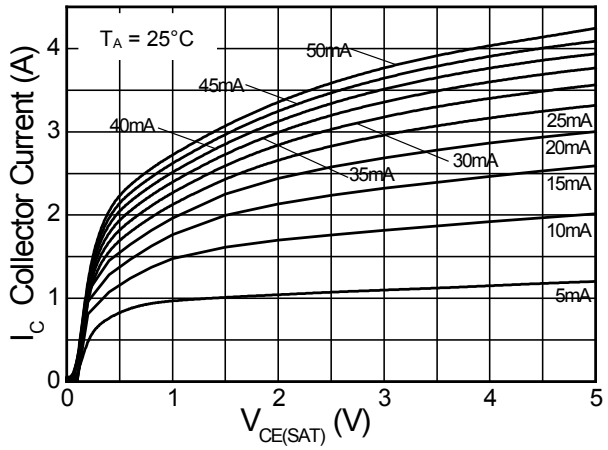
Characteristic	Symbol	Min	Typ	Max	Unit	Test Conditions
Collector-Base Breakdown Voltage	BV_{CBO}	-60	—	—	V	I_C = -100µA
Collector-Emitter Breakdown Voltage (Note 11)	BV_{CEO}	-60	—	—	V	I_C = -10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	-7	—	—	V	I_E = -100µA
Collector-Base Cutoff Current	I_{CBO}	—	—	-100	nA	V_{CB} = -48V, I_E = 0
		—	—	-50	µA	V_{CB} = -48V, I_E = 0, T_A = +150°C
Emitter-Base Cutoff Current	I_{EBO}	—	—	-100	nA	V_{EB} = -5.6V, I_C = 0
DC Current Gain (Note 11)	h_{FE}	170	—	—	—	V_{CE} = -2V, I_C = -100mA
		140	—	—		V_{CE} = -2V, I_C = -500mA
		110	—	—		V_{CE} = -2V, I_C = -1A
		50	—	—		V_{CE} = -2V, I_C = -2A
Collector-Emitter Saturation Voltage (Note 11)	$V_{CE(sat)}$	—	—	-120	mV	I_C = -500mA, I_B = -50mA
		—	—	-250		I_C = -1A, I_B = -50mA
		—	—	-420		I_C = -0.7A, I_B = -7mA
		—	—	-450		I_C = -2A, I_B = -200mA
Equivalent On-Resistance (Note 11)	$R_{CE(sat)}$	—	—	250	mΩ	I_E = -1A, I_B = -50mA
Base-Emitter Saturation Voltage (Note 11)	$V_{BE(sat)}$	—	—	-1	V	I_C = -0.5A, I_B = -50mA
		—	—	-1		I_C = -1A, I_B = -50mA
		—	—	-1.25		I_C = -2A, I_B = -200mA
Base-Emitter Turn-on Voltage (Note 11)	$V_{BE(on)}$	—	—	-0.9	V	V_{CE} = -2V, I_C = -0.5A
Turn-On Time	t_{on}	—	90	—	ns	I_C = -1A, I_{B1} = -I_{B2} = 50mA; T_A = +25°C
Delay Time	t_d	—	10	—	ns	
Rise Time	t_r	—	80	—	ns	

Note: 11. Measured under pulsed conditions. Pulse width ≤ 300µs. Duty cycle ≤2%.

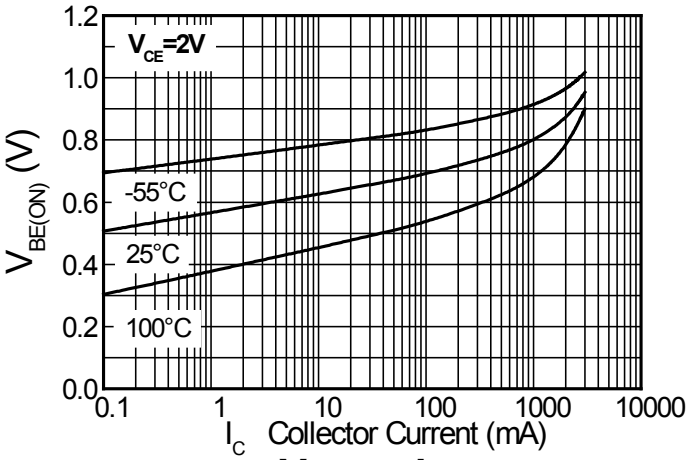
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



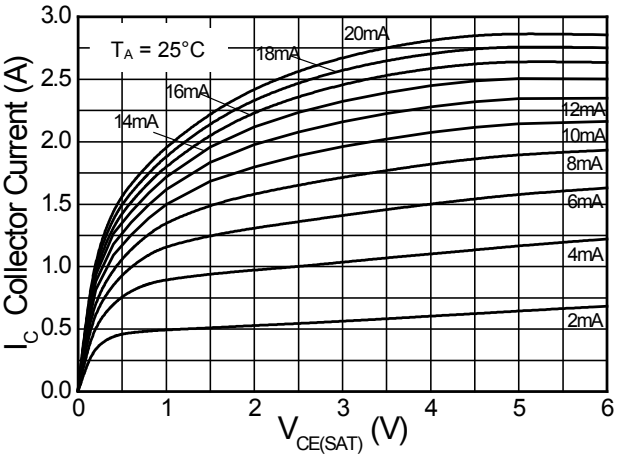
h_{FE} v I_C



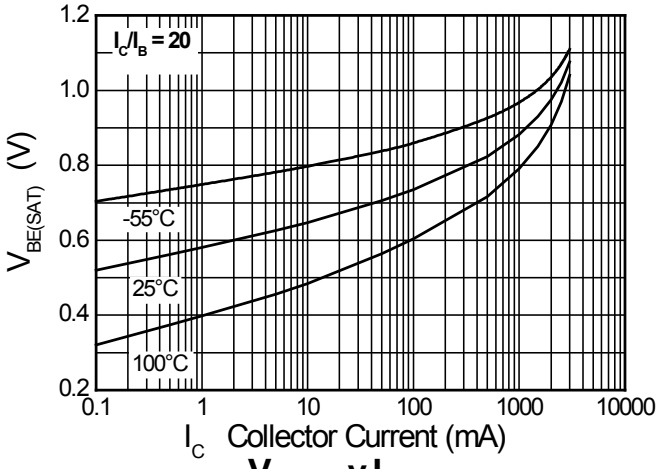
I_C v $V_{CE(SAT)}$



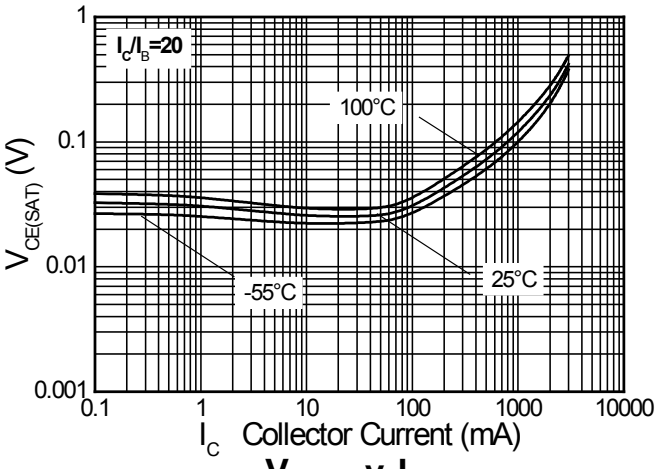
$V_{BE(ON)}$ v I_C



I_C v $V_{CE(SAT)}$

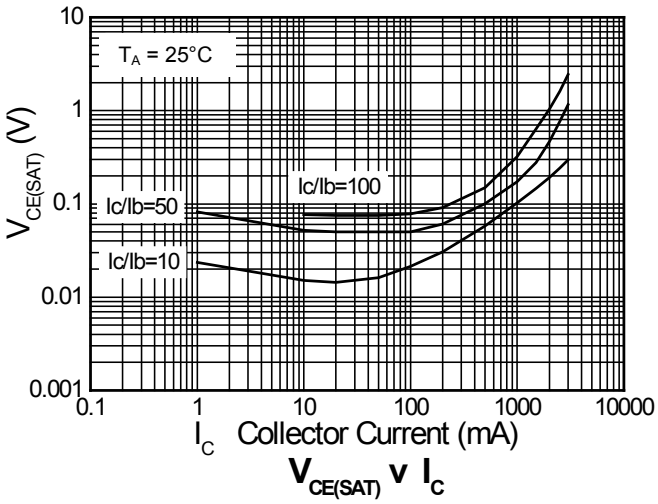


$V_{BE(SAT)}$ v I_C

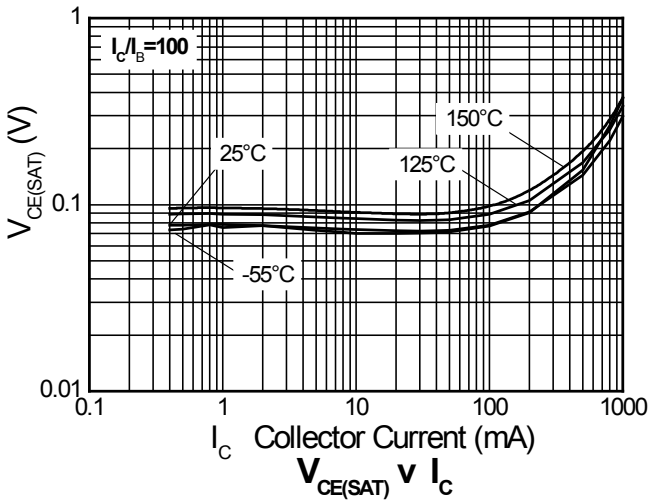


$V_{CE(SAT)}$ v I_C

Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



$V_{CE(SAT)}$ v I_C

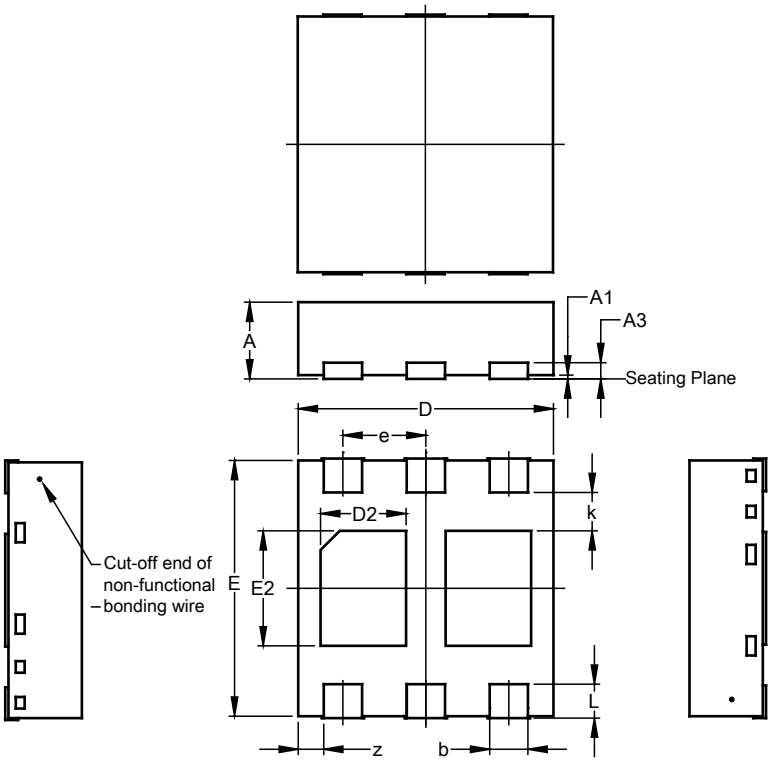


$V_{CE(SAT)}$ v I_C

Package Outline Dimensions

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

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

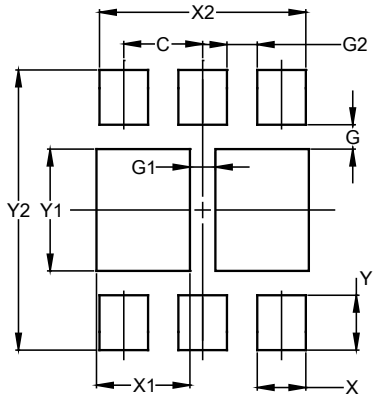


U-DFN2020-6 (SWP) (Type A)			
Dim	**Min**	**Max**	**Typ**
A	0.55	0.65	0.60
A1	0.00	0.05	0.03
A3	--	--	0.127
b	0.25	0.35	0.30
D	1.95	2.05	2.00
D2	0.57	0.77	0.67
E	1.95	2.05	2.00
E2	0.80	1.00	0.90
e	0.65BSC		
k	0.30BSC		
L	0.22	0.32	0.27
z	0.20BSC		
All Dimensions in mm			

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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