12V NPN LOW SATURATION TRANSISTOR IN DFN2020-3

Features

- BV_{CEO} > 12V
- h_{FE} Specified up to 6A for High Current Gain Hold Up
- Low Profile 0.62mm High Package for Thin Applications
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please refer to the related automotive grade (Q-suffix) part. A listing can be found at https://www.diodes.com/products/automotive/automotive-products/.**
- **This part is qualified to JEDEC standards (as references in AEC-Q) for High Reliability. https://www.diodes.com/quality/product-definitions/**

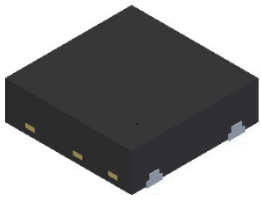
Mechanical Data

- Package: W-DFN2020-3
- Nominal Package Height: 0.62mm
- Package 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: 0.01 grams (Approximate)

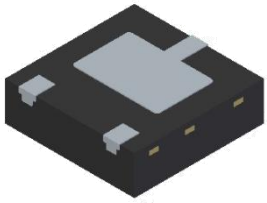
Applications

- DC-DC converters
- Charging circuits
- DC motor drivers
- Power switches

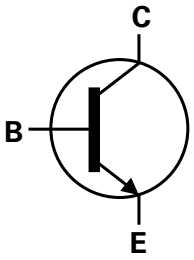
W-DFN2020-3/SWP (Type A)



Top View



Bottom View



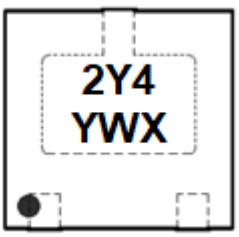
Device Symbol

Ordering Information (Note 4)

Orderable Part Number	Package	Marking	Reel Size (inches)	Tape Width (mm)	Packing	
					Qty.	Carrier
DXTN58012DJAW-7	W-DFN2020-3/SWP (Type A)	2Y4	7	8	3,000	Reel

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



2Y4 = Product Type Marking Code
Y = Year: 0 to 9
W = Week: A to Z: 1 to 26 Week;
a to z: 27 to 52 Week; z Represents 52 and 53 Week
X = A to Z: Internal Code

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Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Parameter	Symbol	Limit	Unit
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	12	
Emitter-Base Voltage	V_{EBO}	8	
Peak Pulse Current	I_{CM}	8	A
Continuous Collector Current (Note 6)	I_C	6	A
Continuous Collector Current (Note 5)	I_C	4	A
Base Current	I_B	500	mA

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

Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	695	mW
	(Note 6)		1.75	W
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	180	°C/W
	(Note 6)		71	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 7)

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: 5. For a device mounted on FR-4 substrate PC board, with exposed collector pad mounted on 5mm x 5mm; 2oz copper. Device is measured under still air conditions whilst operating in a steady state.
6. Same as Note (5) except the exposed collector pad is mounted on 25mm x 25mm 2oz copper.
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

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Thermal Characteristics and Derating Information

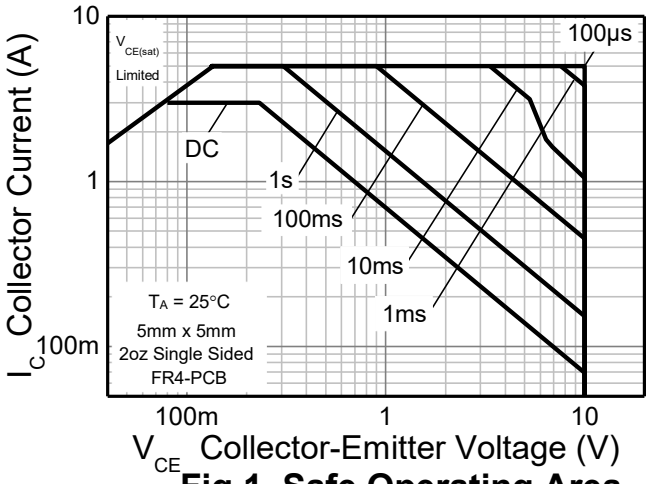


Fig.1 Safe Operating Area

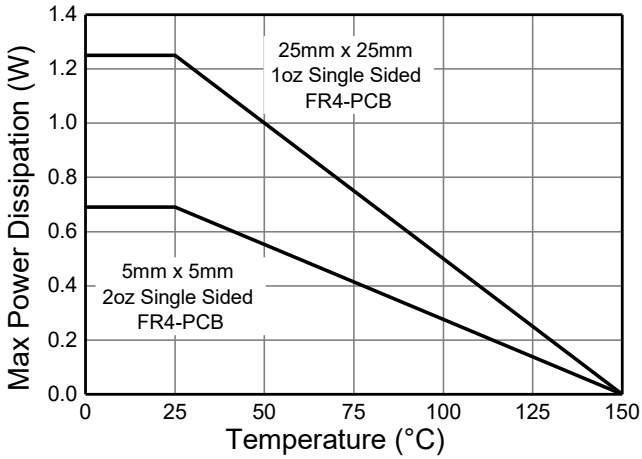


Fig.2 Derating Curve

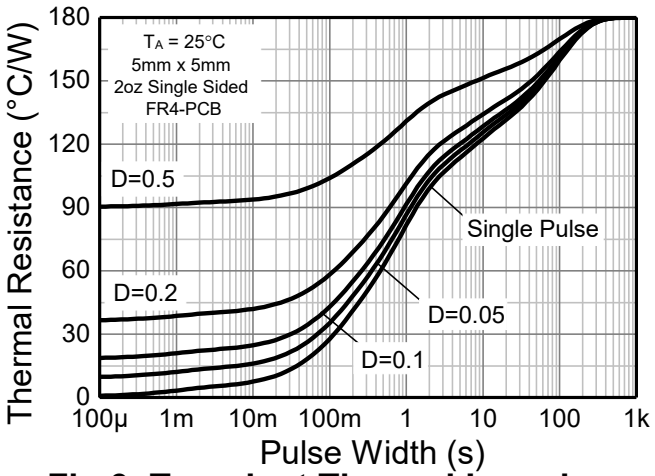


Fig.3 Transient Thermal Impedance

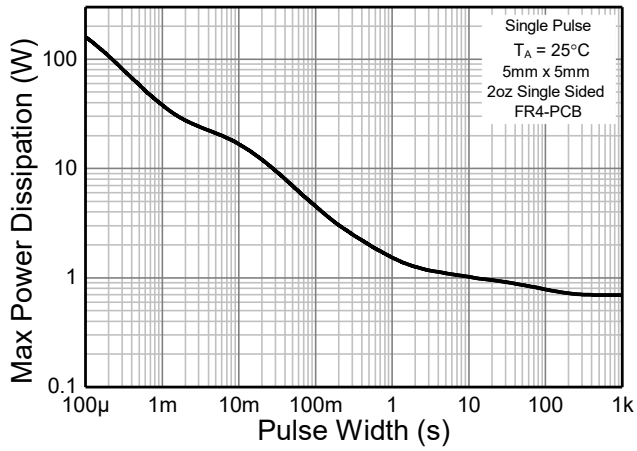


Fig.4 Pulse Power Dissipation

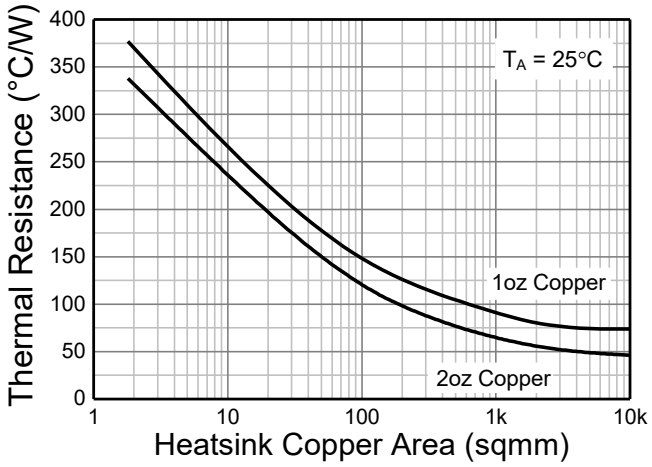


Fig.5 Thermal Resistance vs. Copper Area

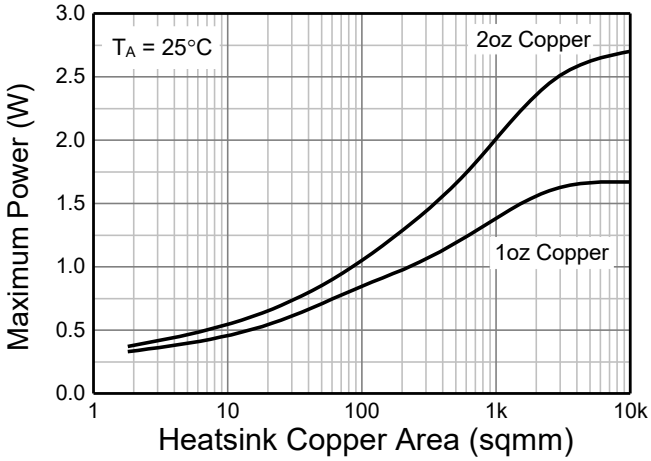


Fig.6 Max Power Dissipation vs. Copper Area

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	40	—	—	V	I_C = 100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	12	—	—	V	I_C = 10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	8	—	—	V	I_E = 100μA
Collector Emitter Cutoff Current	I_{CES}	—	—	100	nA	V_{CES} = 32V
Collector Cutoff Current	I_{CBO}	—	—	100	nA	V_{CB} = 40V
Emitter Cutoff Current	I_{EBO}	—	—	100	nA	V_{EB} = 6.4V
Static Forward Current Transfer Ratio (Note 8)	h_{FE}	325	575	—	—	I_C = 100mA, V_{CE} = 2V
		300	530	—		I_C = 1A, V_{CE} = 2V
		275	490	—		I_C = 3A, V_{CE} = 2V
		200	430	—		I_C = 6A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 8)	$V_{CE(sat)}$	—	42	55	mV	I_C = 1A, I_B = 10mA
		—	65	85		I_C = 2A, I_B = 20mA
		—	90	110		I_C = 3A, I_B = 30mA
		—	90	120		I_C = 4A, I_B = 200mA
		—	130	175		I_C = 6A, I_B = 300mA
Base-Emitter Turn-On Voltage (Note 8)	$V_{BE(on)}$	—	0.8	0.9	V	I_C = 4A, V_{CE} = 2V
		—	0.85	0.95		Ic = 6A, V_{CE} = 2V
Base-Emitter Saturation Voltage (Note 8)	$V_{BE(sat)}$	—	0.95	1.05	V	I_C = 4A, I_B = 200mA
			1.0	1.2	V	I_C = 6A, I_B = 300mA
Input Capacitance	C_{ibo}	—	125	—	pF	V_{EB} = 0.5V, f = 1MHz
Output Capacitance	C_{obo}	—	55	—	pF	V_{CB} = 10V, f = 1MHz
Transition Frequency	f_T	—	100	—	MHz	V_{CE} = 5V, I_C = 100mA, f = 100MHz
Delay Time	t_d	—	20	—	ns	V_{CC} = 9V, I_C = 2A, I_{B1} = -I_{B2} = 0.1A
Rise Time	t_r	—	60	—		
Turn-On Time	t_{on}	—	80	—		
Storage Time	t_s	—	180	—		
Fall Time	t_f	—	12	—		
Turn-Off Time	t_{off}	—	190	—		

Note: 8. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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

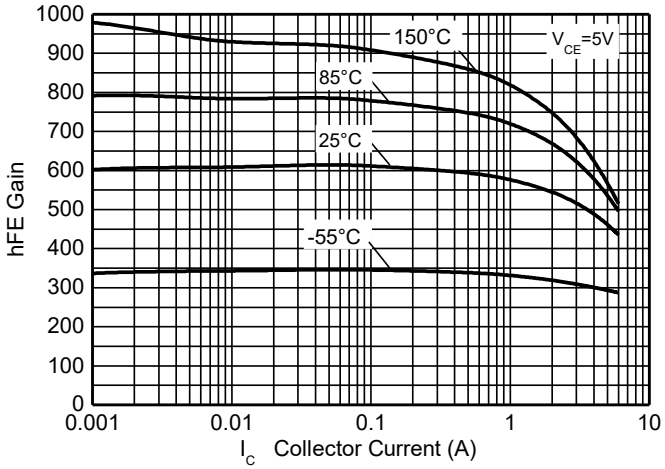


Fig. 7 hFE v I_C

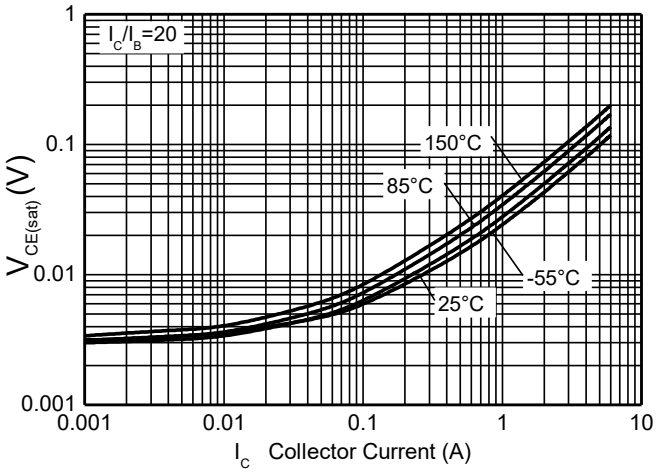


Fig. 8 $V_{CE(sat)}$ v I_C

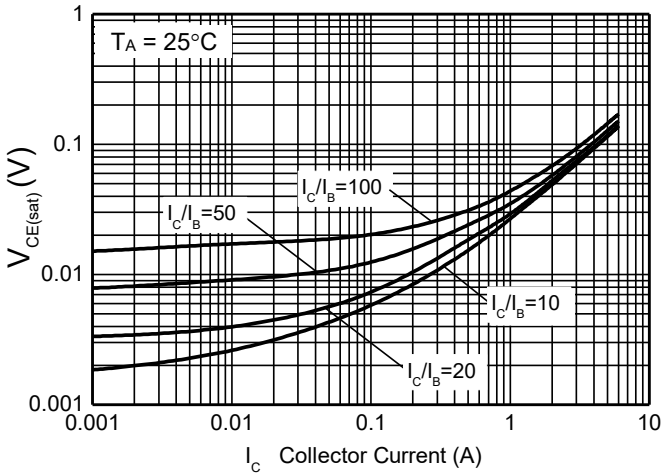


Fig. 9 $V_{CE(sat)}$ v I_C

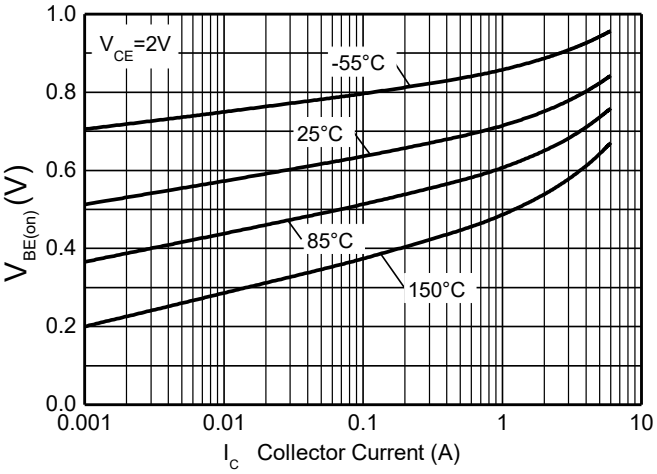


Fig. 10 $V_{BE(on)}$ v I_C

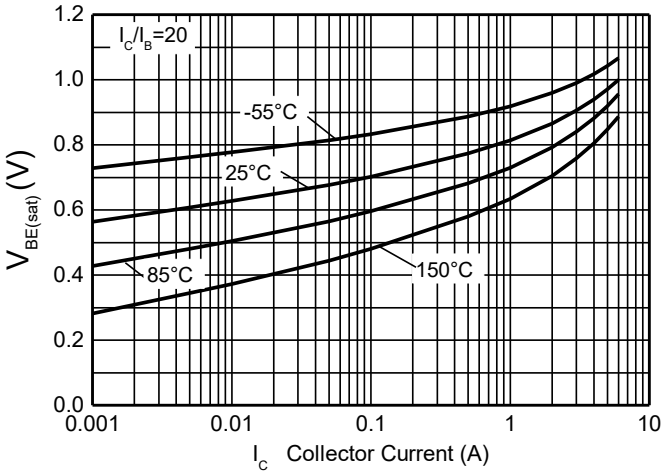


Fig. 11 $V_{BE(sat)}$ v I_C

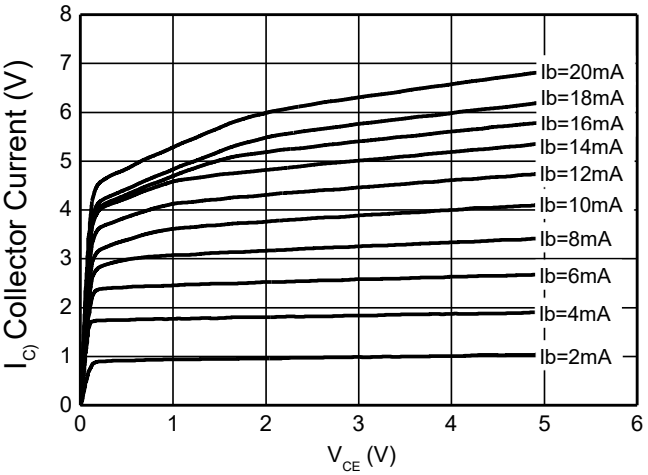


Fig. 12 I_C v V_{CE}

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

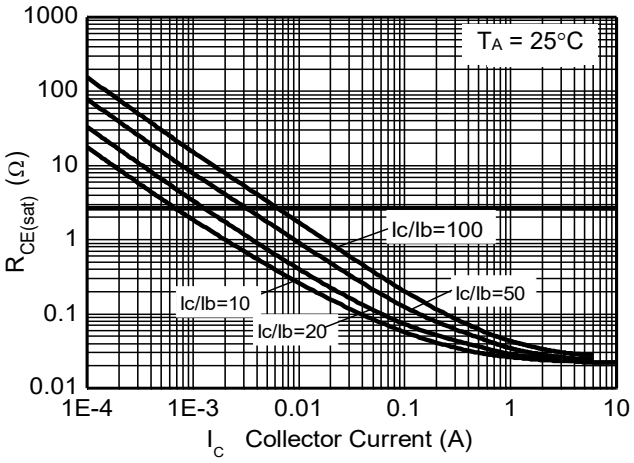


Fig. 13 $R_{CE(sat)}$ v I_C

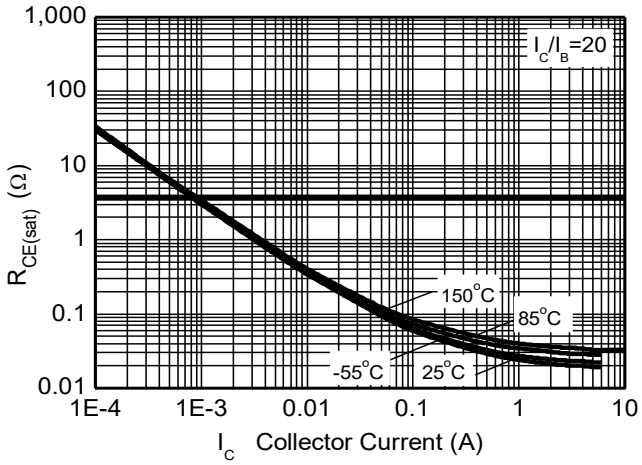


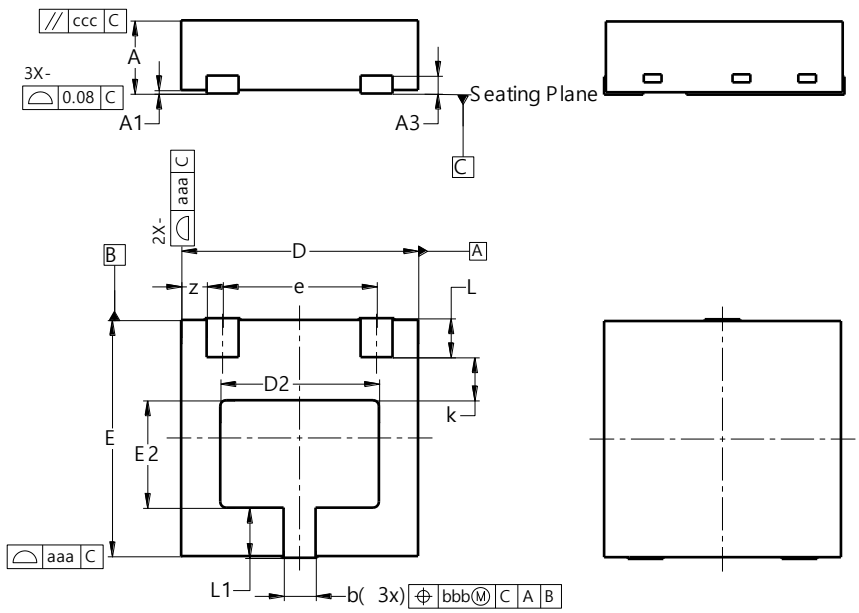
Fig. 14 $R_{CE(sat)}$ v I_C

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Package Outline Dimensions

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

W-DFN2020-3/SWP (Type A)

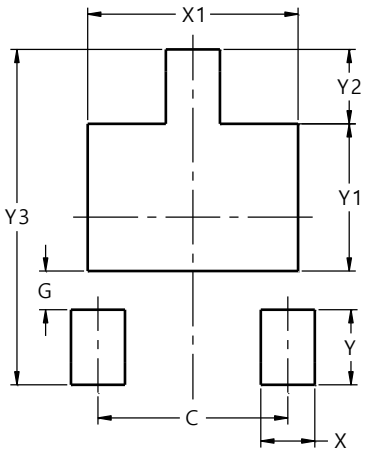


W-DFN2020-3/SWP (Type A)			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.67	0.62
A1	0.00	0.05	0.03
A3	0.100	--	0.152
b	0.22	0.32	0.27
D	1.95	2.05	2.00
D2	1.24	1.44	1.34
E	1.95	2.05	2.00
E2	0.81	1.01	0.91
e	--	--	1.30
k	--	--	0.365
L	0.28	0.38	0.33
L1	0.375	0.475	0.425
z	--	--	0.215
aaa	0.25		
bbb	0.10		
ccc	0.10		
All Dimensions in mm			

Suggested Pad Layout

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

W-DFN2020-3/SWP (Type A)



Dimensions	Value (in mm)
C	1.300
G	0.265
X	0.370
X1	1.440
Y	0.515
Y1	1.010
Y2	0.510
Y3	2.300

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