60V NPN LOW SATURATION TRANSISTOR IN U-DFN2020-3

Features

- BV_{CEO} > 60V
- h_{FE} Specified up to 6A for High Current Gain Hold Up
- 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)**
- **For automotive applications requiring specific change control (i.e.: parts qualified to AEC-Q100/101/200, 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

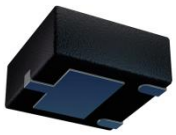
- Case: U-DFN2020-3 (Type B)
- Nominal Package Height: 0.6mm
- Case Material: Molded Plastic. "Green" Molding Compound. UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu, Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.01 grams (Approximate)

Applications

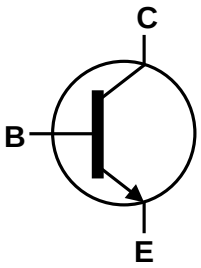
- DC-DC Converters
- Charging Circuits
- Motor Control
- Power Switches

U-DFN2020-3 (Type B)

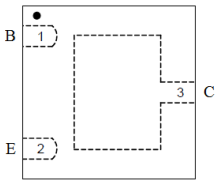
Top View



Bottom View



Device Symbol



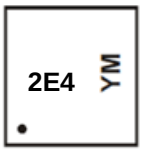
Top View
Pin-Out

Ordering Information (Note 4)

Part Number	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
DXTN5860DFDB-7	2E4	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. For packaging details, go to our website at https://www.diodes.com/design/support/packaging/diodes-packaging/.

Marking Information



2E4= Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: G = 2019)
M = Month (ex: 9 = September)

Date Code Key

Year	2019	2020	2021	2022	2023	2024	2025	2026
Code	G	H	I	J	K	L	M	N

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

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

Parameter	Symbol	Limit	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	60	
Emitter-Base Voltage	V_{EBO}	6	
Peak Pulse Current	I_{CM}	7	A
Continuous Collector Current	I_C	6	

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

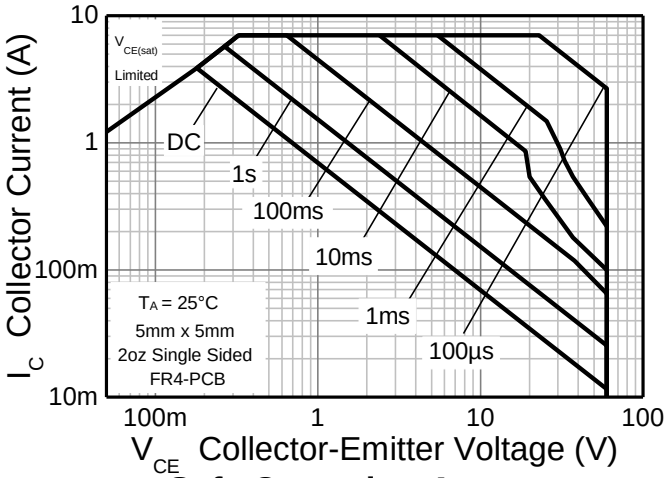
Characteristic		Symbol	Value	Unit
Power Dissipation	(Note 5)	P_D	0.69	W
	(Note 6)		1.25	
Thermal Resistance, Junction to Ambient	(Note 5)	$R_{\theta JA}$	180	°C/W
	(Note 6)		100	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 to +150	°C

ESD Ratings (Note 7)

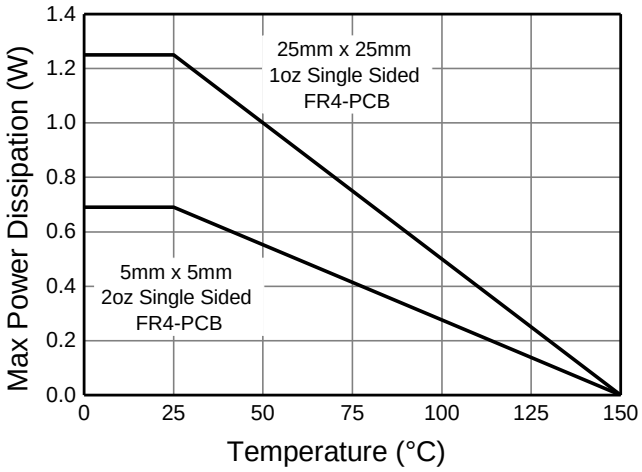
Characteristic	Symbol	Value	Unit	JEDEC Class
Electrostatic Discharge - Human Body Model	ESD HBM	4,000	V	3A
Electrostatic Discharge - Machine Model	ESD MM	400	V	C

Notes:
5. For a device mounted with the exposed collector on 5mm x 5mm 2oz copper on single sided FR4 PCB; device is measured under still air conditions whilst operating in the steady state.
6. Same as Note (5) except the exposed collector pad is mounted on 25mm x 25mm 1oz copper.
7. Refer to JEDEC specification JESD22-A114 and JESD22-A115.

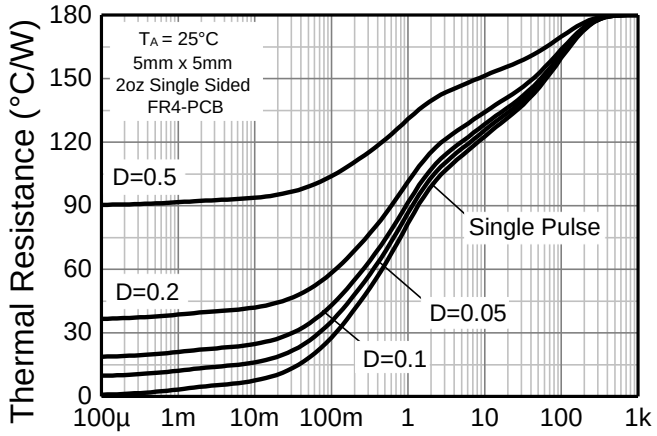
Thermal Characteristics and Derating Information



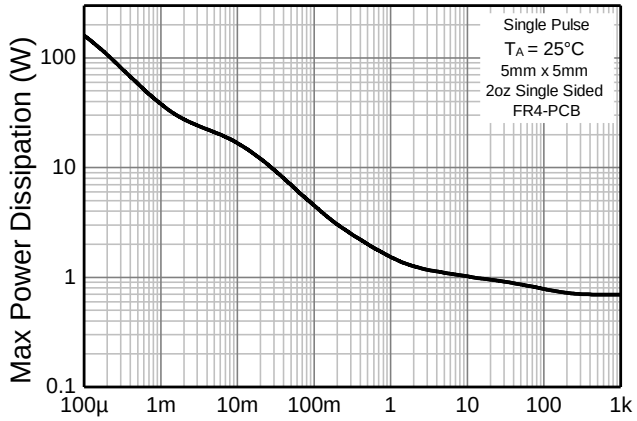
Safe Operating Area



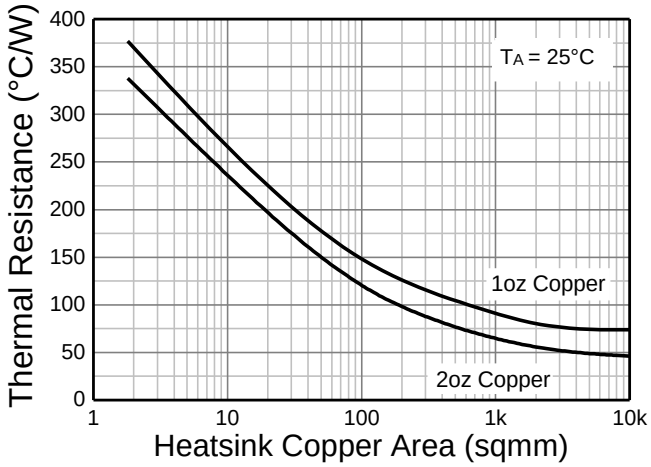
Derating Curve



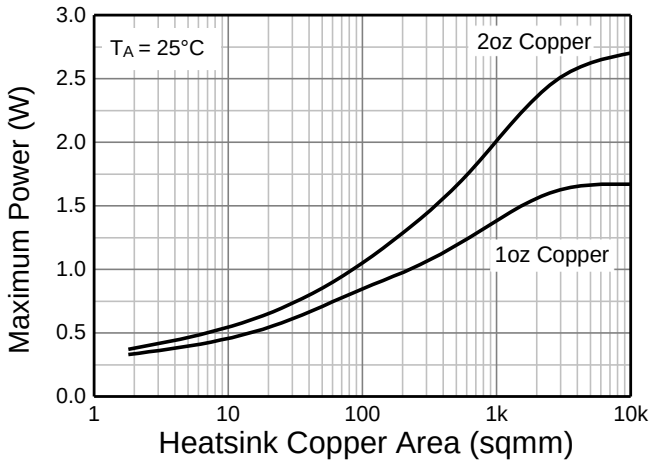
Transient Thermal Impedance



Pulse Power Dissipation



Thermal Resistance vs. Copper Area



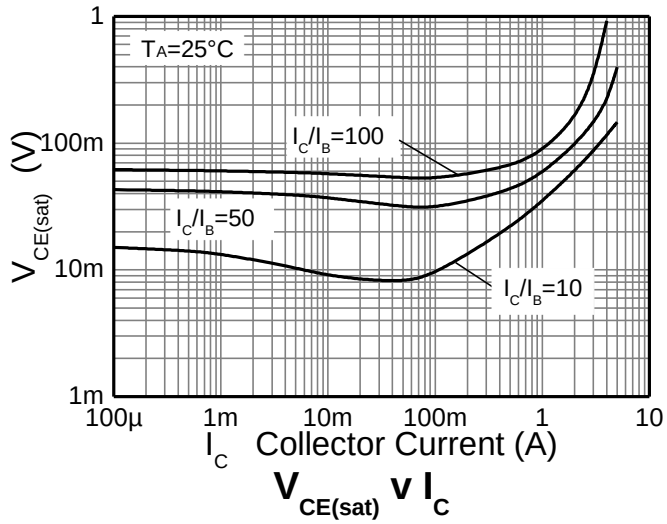
Max Power Dissipation vs. Copper Area

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

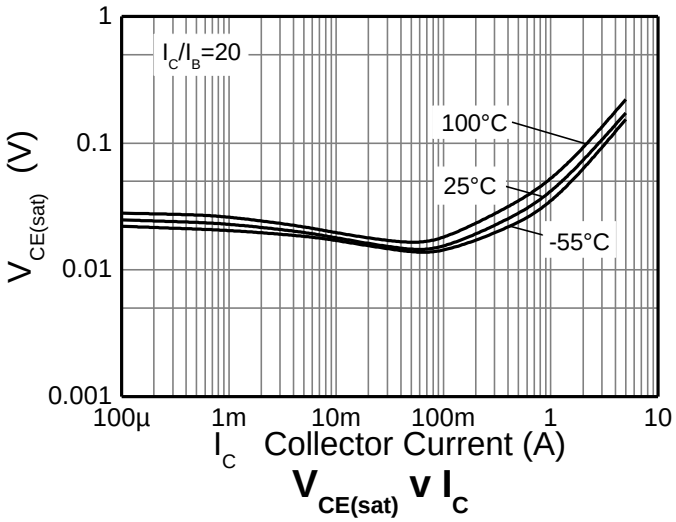
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	60	—	—	V	I_C = 100μA
Collector-Emitter Breakdown Voltage (Note 8)	BV_{CEO}	60	—	—	V	I_C = 10mA
Emitter-Base Breakdown Voltage	BV_{EBO}	6	—	—	V	I_E = 100μA
Collector Cutoff Current	I_{CBO}	—	—	100	nA	V_{CB} = 60V
Emitter Cutoff Current	I_{EBO}	—	—	100	nA	V_{EB} = 5V
Collector Emitter Cutoff Current	I_{CES}	—	—	100	nA	V_{CES} = 48V
Static Forward Current Transfer Ratio (Note 8)	h_{FE}	280	430	—	—	I_C = 500mA, V_{CE} = 2V
		260	410	—		I_C = 1A, V_{CE} = 2V
		170	325	—		I_C = 2A, V_{CE} = 2V
		30	70	—		I_C = 6A, V_{CE} = 2V
Collector-Emitter Saturation Voltage (Note 8)	$V_{CE(sat)}$	—	22	30	mV	I_C = 0.5A, I_B = 50mA
		—	45	60		I_C = 1A, I_B = 50mA
		—	95	130		I_C = 1A, I_B = 10mA
		—	175	230		I_C = 2A, I_B = 20mA
		—	110	250		I_C = 3A, I_B = 150mA
		—	120	200		I_C = 4A, I_B = 400mA
		—	230	315		I_C = 6A, I_B = 300mA
Base-Emitter Turn-On Voltage (Note 8)	$V_{BE(on)}$	—	0.75	0.9	V	I_C = 2A, V_{CE} = 2V
Base-Emitter Saturation Voltage (Note 8)	$V_{BE(sat)}$	—	0.75	0.9	V	I_C = 1A, I_B = 10mA
			0.97	1.1		I_C = 6A, I_B = 300mA
Output Capacitance	C_{obo}	—	23	30	pF	V_{CB} = 10V, f = 1MHz
Transition Frequency	f_T	—	115	—	MHz	V_{CE} = 10V, I_C = 100mA, f = 100MHz
Delay Time	t_d	—	22	—	ns	V_{CC} = 9V, I_C = 2A I_{B1} = -I_{B2} = 0.1A
Rise Time	t_r	—	90	—		
Turn-On Time	t_{on}	—	112	—		
Storage Time	t_s	—	390	—		
Fall Time	t_f	—	90	—		
Turn-Off Time	t_{off}	—	480	—		

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

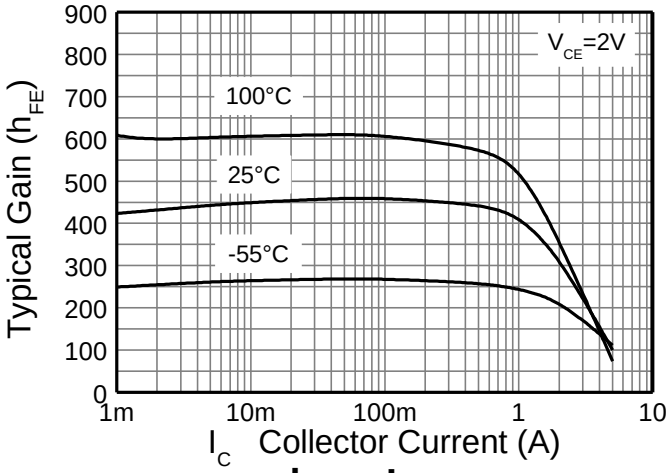
Typical Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)



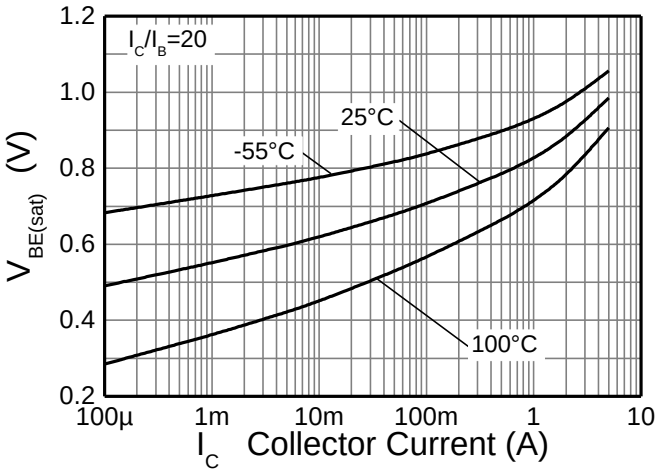
$V_{CE(sat)}$ v I_C



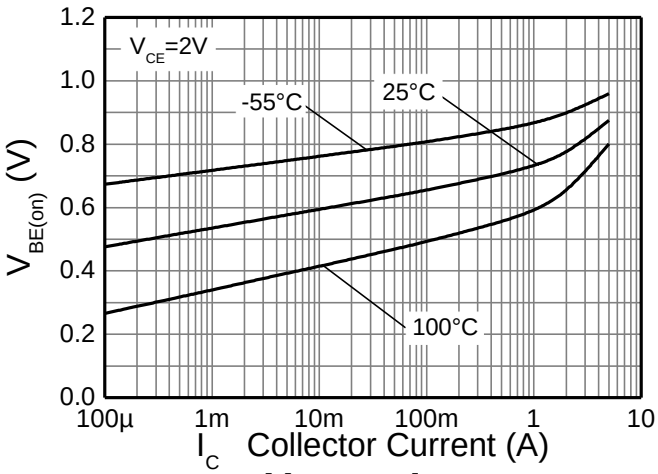
$V_{CE(sat)}$ v I_C



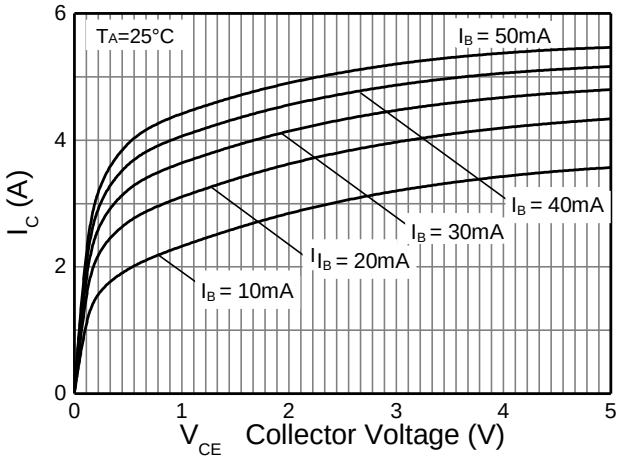
h_{FE} v I_C



$V_{BE(sat)}$ v I_C



$V_{BE(on)}$ v I_C

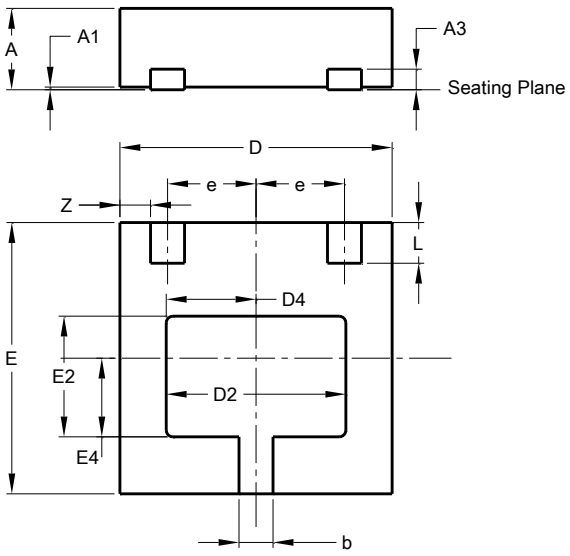


I_C v V_{CE}

Package Outline Dimensions

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

U-DFN2020-3 (Type B)

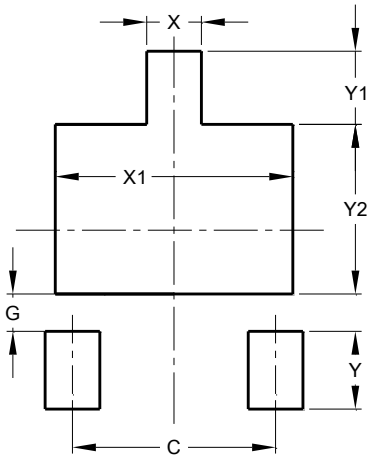


U-DFN2020-3 (Type B)			
Dim	**Min**	**Max**	**Typ**
A	0.57	0.63	0.60
A1	0.00	0.05	0.02
A3	—	—	0.152
b	0.20	0.30	0.25
D	1.950	2.075	2.00
D2	1.22	1.42	1.32
D4	0.56	0.76	0.66
E	1.950	2.075	2.00
E2	0.79	0.99	0.89
E4	0.48	0.68	0.58
e	—	—	0.65
L	0.25	0.35	0.30
Z	—	—	0.225
All Dimensions in mm			

Suggested Pad Layout

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

U-DFN2020-3 (Type B)



Dimensions	Value (in mm)
C	1.300
G	0.240
X	0.350
X1	1.520
Y	0.500
Y1	0.470
Y2	1.090

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