

**20V COMPLEMENTARY LOW SATURATION TRANSISTORS**
**Description**

This Bipolar Junction Transistor (BJT) is designed to meet the stringent requirements of automotive applications.

**Applications**

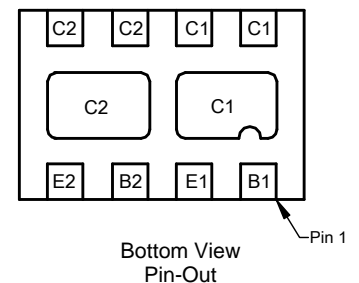
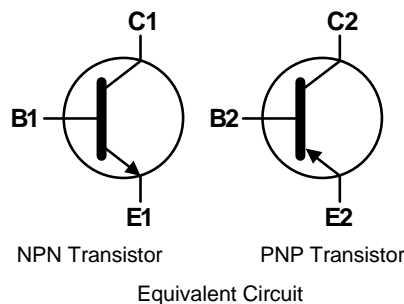
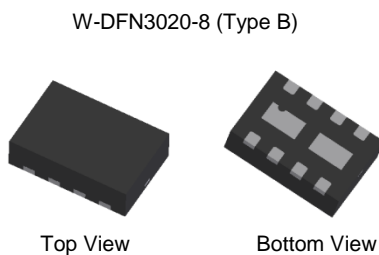
- DC-DC Converters
- Charging Circuits
- Power Switches
- Motor Control
- LED Backlighting Circuits
- Portable Applications

**Mechanical Data**

- Case: W-DFN3020-8 (Type B)
- 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
- Weight: 0.013 grams (Approximate)

**Features**

- NPN Transistor
  - $BV_{CEO} > 20V$
  - $I_C = 4.5A$  Continuous Collector Current
  - Low Saturation Voltage (150mV Max @ 1A)
  - $R_{SAT} = 47m\Omega$  for a Low Equivalent On-Resistance
- PNP Transistor
  - $BV_{CEO} > -20V$
  - $I_C = -3.5A$  Continuous Collector Current
  - Low Saturation Voltage (-220mV Max @ -1A)
  - $R_{SAT} = 64m\Omega$  for a Low Equivalent On-Resistance
- $h_{FE}$  Characterized up to 6A for High Current Gain Hold Up
- Low Profile 0.8mm High Package for Thin Applications
- $R_{\theta JA}$  Efficient, 40% Lower than SOT26
- 6mm<sup>2</sup> Footprint, 50% Smaller than TSOP6 and SOT26
- **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)**


**Ordering Information** (Notes 4 & 5)

Product	Compliance	Marking	Reel Size (inches)	Tape Width (mm)	Quantity per Reel
ZXTC6718MCQ-7	Automotive	DB2	7	8	3,000

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) 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 [http://www.diodes.com/quality/product\\_compliance\\_definitions/](http://www.diodes.com/quality/product_compliance_definitions/).
  5. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**

W-DFN3020-8 (Type B)



DB2 = Product type marking code

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

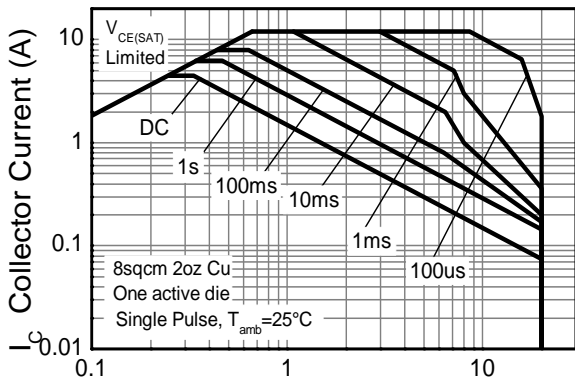
Characteristic		Symbol	NPN	PNP	Unit
Collector-Base Voltage		V <sub>CBO</sub>	40	-25	V
Collector-Emitter Voltage		V <sub>CEO</sub>	20	-20	V
Emitter-Base Voltage		V <sub>EBO</sub>	7	-7	V
Peak Pulse Current		I <sub>CM</sub>	12	-6	A
Continuous Collector Current	(Notes 6 & 9)	I <sub>C</sub>	4.5	-3.5	A
Continuous Collector Current	(Notes 7 & 9)		5	-3.8	
Base Current		I <sub>B</sub>	1		A

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

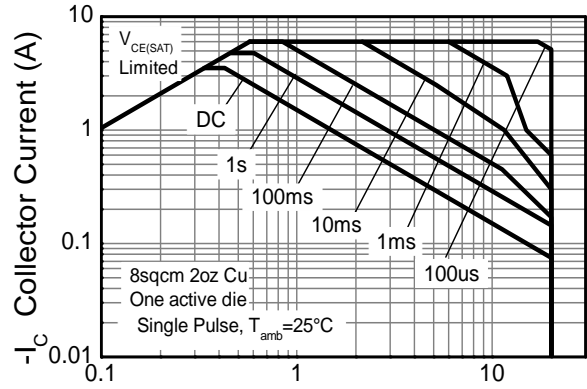
Characteristic		Symbol	NPN	PNP	Unit
Power Dissipation Linear Derating Factor	(Notes 6 & 9)	P <sub>D</sub>	1.5	12	W mW/°C
	(Notes 7 & 9)		2.45		
	(Notes 8 & 9)		1.13		
	(Notes 8 & 10)		8		
Thermal Resistance, Junction to Ambient	(Notes 6 & 9)	R <sub>θJA</sub>	13.6	83.3	°C/W
	(Notes 7 & 9)		51.0		
	(Notes 8 & 9)		111		
	(Notes 8 & 10)		73.5		
Thermal Resistance, Junction to Lead	(Notes 9 & 11)	R <sub>θJL</sub>	17.1		
Operating and Storage Temperature Range		T <sub>J</sub> , T <sub>STG</sub>	-55 to +150		°C

- Notes:
6. For a dual device surface mounted on 28mm x 28mm (8cm<sup>2</sup>) FR4 PCB with high coverage of single sided 2 oz copper, in still air conditions; the device is measured when operating in a steady-state condition. The heatsink is split in half with the exposed collector pads connected to each half.
  7. Same as Note (6), except the device is measured at t < 5 sec.
  8. Same as Note (6), except the device is surface mounted on 31mm x 31mm (10cm<sup>2</sup>) FR4 PCB with high coverage of single sided 1oz copper.
  9. For a dual device with one active die.
  10. For dual device with 2 active die running at equal power.
  11. Thermal resistance from junction to solder-point (on the exposed collector pads).

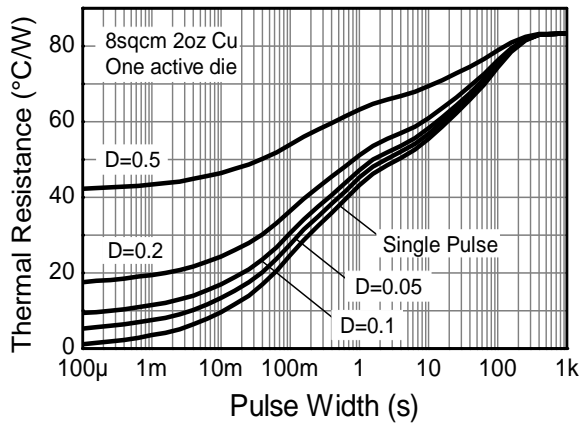
**Thermal Characteristics and Derating Information**



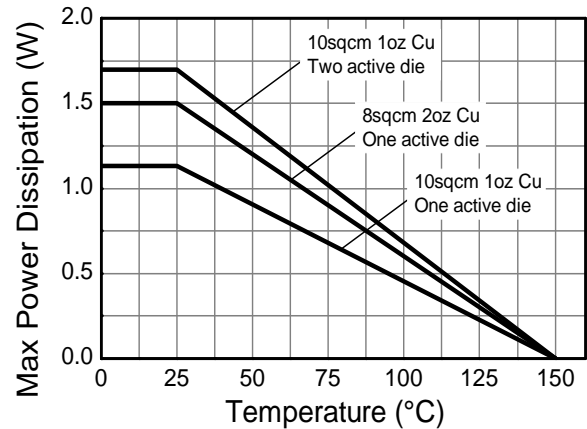
**NPN Safe Operating Area**



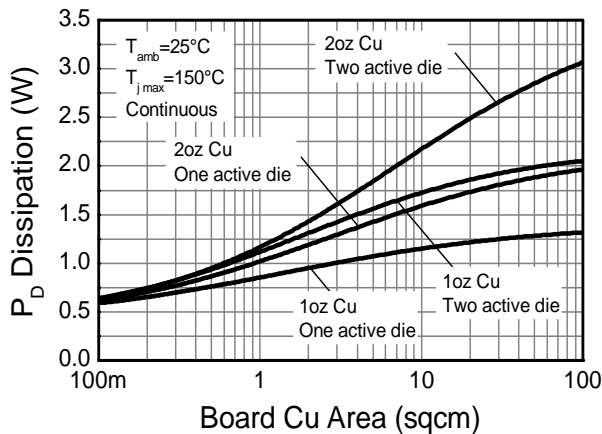
**PNP Safe Operating Area**



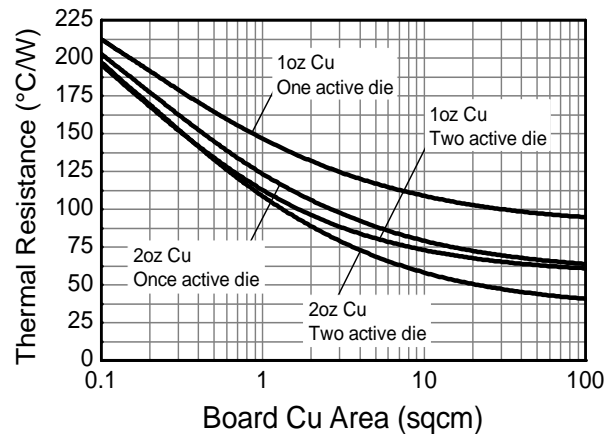
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



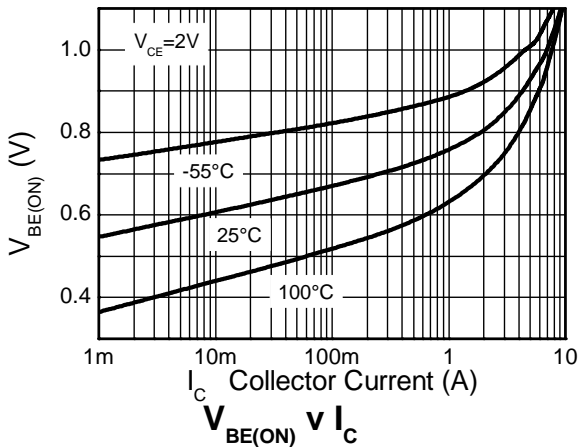
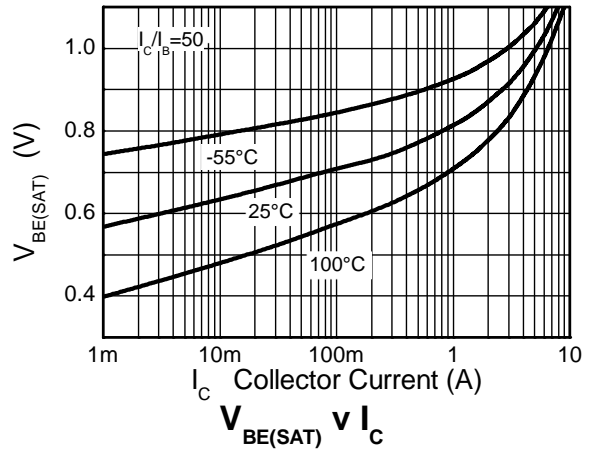
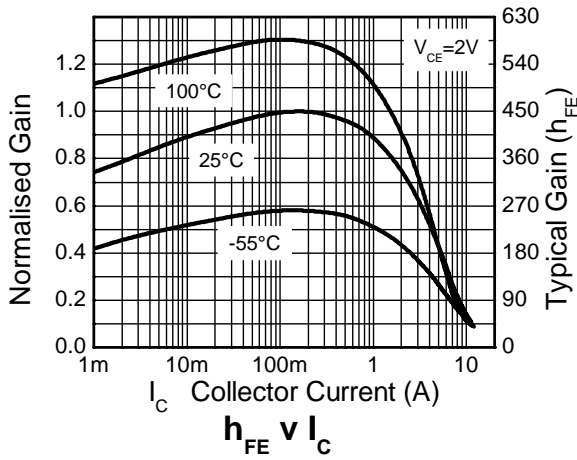
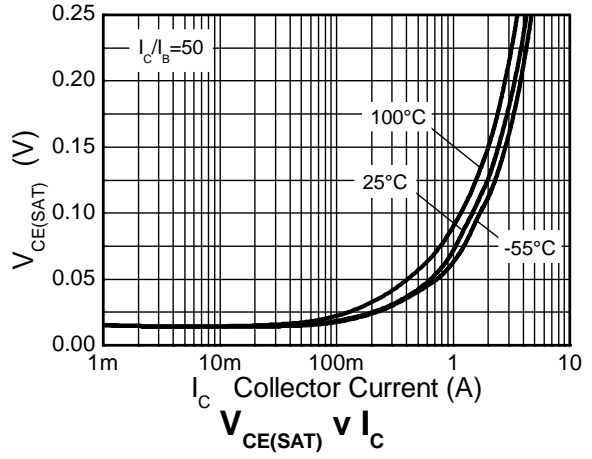
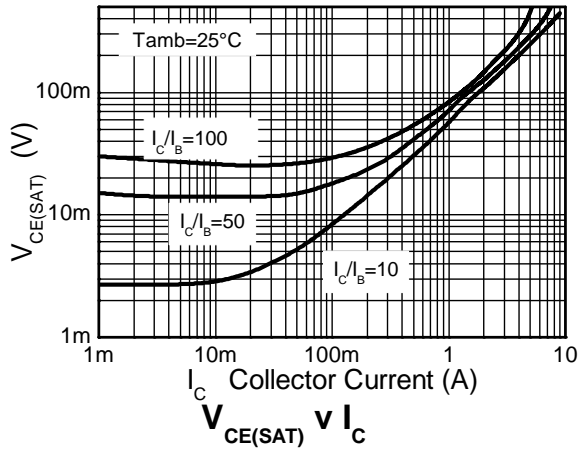
**Thermal Resistance v Board Area**

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	40	100	—	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 12)	$BV_{CEO}$	20	27	—	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	8.2	—	V	$I_E = 100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	—	—	100	nA	$V_{CB} = 30\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	—	100	nA	$V_{EB} = 6\text{V}$
Collector Emitter Cutoff Current	$I_{CES}$	—	—	100	nA	$V_{CE} = 16\text{V}$
Static Forward Current Transfer Ratio (Note 12)	$h_{FE}$	200 300 200 100	400 450 360 180	—	—	$I_C = 10\text{mA}, V_{CE} = 2\text{V}$ $I_C = 200\text{mA}, V_{CE} = 2\text{V}$ $I_C = 2\text{A}, V_{CE} = 2\text{V}$ $I_C = 6\text{A}, V_{CE} = 2\text{V}$
Collector-Emitter Saturation Voltage (Note 12)	$V_{CE(SAT)}$	—	8 90 115 190 210	15 150 135 250 300	mV	$I_C = 0.1\text{A}, I_B = 10\text{mA}$ $I_C = 1\text{A}, I_B = 10\text{mA}$ $I_C = 2\text{A}, I_B = 50\text{mA}$ $I_C = 3\text{A}, I_B = 100\text{mA}$ $I_C = 4.5\text{A}, I_B = 125\text{mA}$
Base-Emitter Turn-On Voltage (Note 12)	$V_{BE(ON)}$	—	0.88	0.97	V	$I_C = 4.5\text{A}, V_{CE} = 2\text{V}$
Base-Emitter Saturation Voltage (Note 12)	$V_{BE(SAT)}$	—	0.98	1.07	V	$I_C = 4.5\text{A}, I_B = 125\text{mA}$
Output Capacitance	$C_{OBO}$	—	23	30	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Transition Frequency	$f_T$	100	140	—	MHz	$V_{CE} = 10\text{V}, I_C = 50\text{mA}, f = 100\text{MHz}$
Turn-On Time	$t_{ON}$	—	170	—	ns	$V_{CC} = 10\text{V}, I_C = 3\text{A}$
Turn-Off Time	$t_{OFF}$	—	400	—	ns	$I_{B1} = -I_{B2} = 10\text{mA}$

Note: 12. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

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

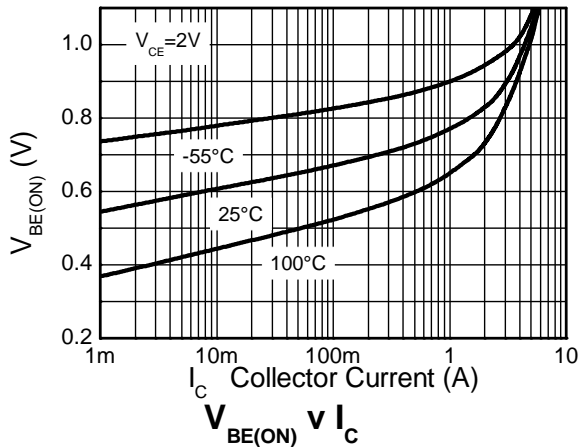
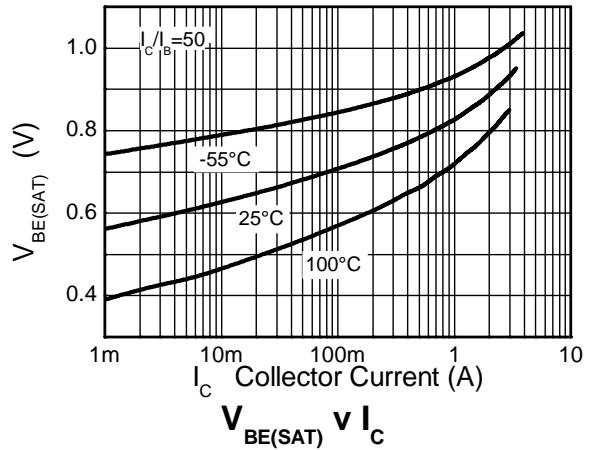
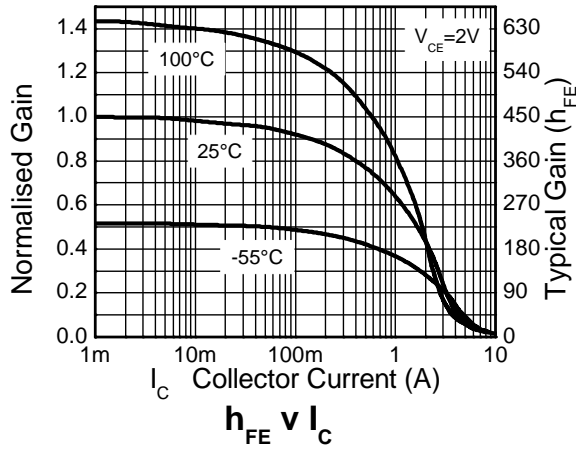
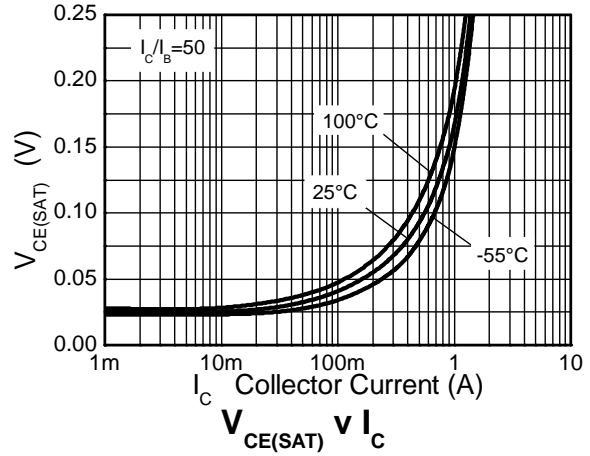
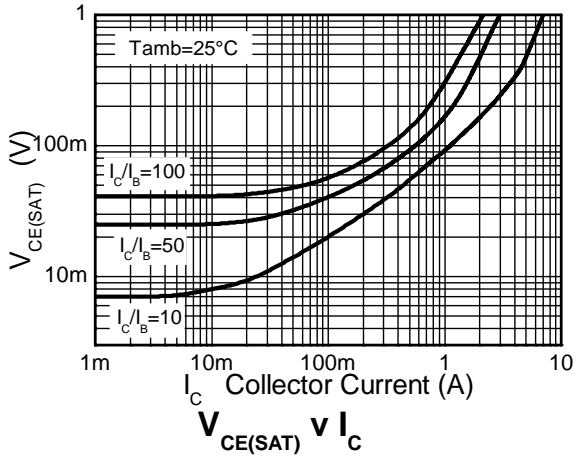


**PNP - Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ , unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	-25	-35	—	V	$I_C = -100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 12)	$BV_{CEO}$	-20	-25	—	V	$I_C = -10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	-7	-8.5	—	V	$I_E = -100\mu\text{A}$
Collector Cutoff Current	$I_{CBO}$	—	—	-100	nA	$V_{CB} = -20\text{V}$
Emitter Cutoff Current	$I_{EBO}$	—	—	-100	nA	$V_{EB} = -6\text{V}$
Collector Emitter Cutoff Current	$I_{CES}$	—	—	-100	nA	$V_{CES} = -16\text{V}$
Static Forward Current Transfer Ratio (Note 12)	$h_{FE}$	300 300 150 15	475 450 230 30	—	—	$I_C = -10\text{mA}, V_{CE} = -2\text{V}$ $I_C = -100\text{mA}, V_{CE} = -2\text{V}$ $I_C = -2\text{A}, V_{CE} = -2\text{V}$ $I_C = -6\text{A}, V_{CE} = -2\text{V}$
Collector-Emitter Saturation Voltage (Note 12)	$V_{CE(SAT)}$	—	-19 -170 -190 -240 -225	-30 -220 -250 -350 -300	mV	$I_C = -0.1\text{A}, I_B = -10\text{mA}$ $I_C = -1\text{A}, I_B = -20\text{mA}$ $I_C = -1.5\text{A}, I_B = -50\text{mA}$ $I_C = -2.5\text{A}, I_B = -150\text{mA}$ $I_C = -3.5\text{A}, I_B = -350\text{mA}$
Base-Emitter Turn-On Voltage (Note 12)	$V_{BE(ON)}$	—	-0.87	-0.95	V	$I_C = -3.5\text{A}, V_{CE} = -2\text{V}$
Base-Emitter Saturation Voltage (Note 12)	$V_{BE(SAT)}$	—	-1.01	-1.12	V	$I_C = -3.5\text{A}, I_B = -350\text{mA}$
Output Capacitance	$C_{OBO}$	—	21	30	pF	$V_{CB} = -10\text{V}, f = 1\text{MHz}$
Transition Frequency	$f_T$	150	180	—	MHz	$V_{CE} = -10\text{V}, I_C = -50\text{mA},$ $f = 100\text{MHz}$
Turn-On Time	$t_{ON}$	—	40	—	ns	$V_{CC} = -10\text{V}, I_C = -1\text{A}$
Turn-Off Time	$t_{OFF}$	—	670	—	ns	$I_{B1} = -I_{B2} = -10\text{mA}$

Note: 12. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

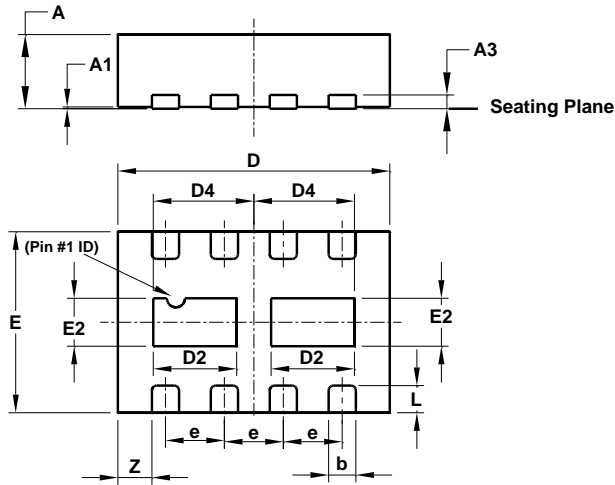
**PNP - Typical Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)



**Package Outline Dimensions**

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

**W-DFN3020-8 (Type B)**

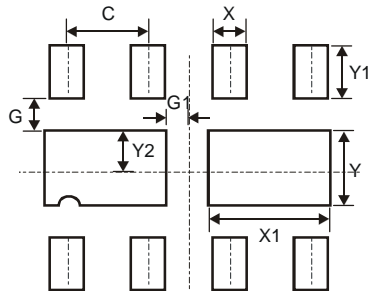


W-DFN3020-8 (Type B)			
Dim	Min	Max	Typ
A	0.77	0.83	0.80
A1	0	0.05	0.02
A3	-	-	0.15
b	0.25	0.35	0.30
D	2.95	3.075	3.00
D2	0.82	1.02	0.92
D4	1.01	1.21	1.11
e	-	-	0.65
E	1.95	2.075	2.00
E2	0.43	0.63	0.53
L	0.25	0.35	0.30
Z	-	-	0.375
All Dimensions in mm			

**Suggested Pad Layout**

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

**W-DFN3020-8 (Type B)**



Dimensions	Value (in mm)
C	0.650
G	0.285
G1	0.090
X	0.400
X1	1.120
Y	0.730
Y1	0.500
Y2	0.365



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