

**COMPLEMENTARY 15V NPN & 12V PNP LOW SATURATION TRANSISTOR**

**Features**

**NPN Transistor**

- $BV_{CEO} > 15V$
- $I_C = 4.5A$  Continuous Collector Current
- Low Saturation Voltage (100mV max @ 1A)
- $R_{SAT} = 45m\Omega$  for a low equivalent On-Resistance

**PNP Transistor**

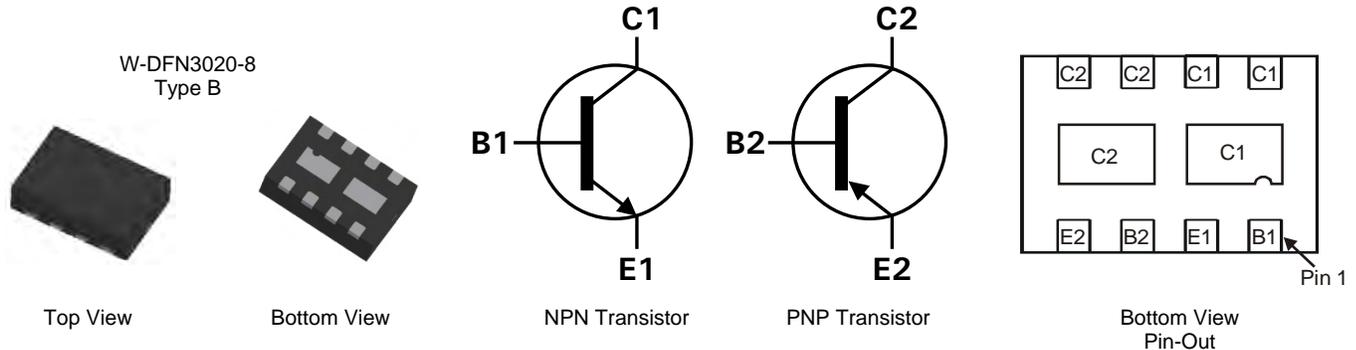
- $BV_{CEO} > -12V$
- $I_C = -4A$  Continuous Collector Current
- Low Saturation Voltage (-140mV max @ -1A)
- $R_{SAT} = 60m\Omega$  for a low equivalent On-Resistance
- $h_{FE}$  characterized up to 12A for high current gain hold up
- Low profile 0.8mm high package for thin applications
- $R_{\theta JA}$  efficient, 40% lower than SOT26
- 6mm<sup>2</sup> footprint, 50% smaller than TSOP6 and SOT26
- **Lead-Free Finish; 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: W-DFN3020-8 Type B
- Nominal package height: 0.8mm
- 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: 0.013 grams (approximate)

**Applications**

- DC – DC Converters
- Charging circuits
- Power switches
- Motor control
- LED Backlighting circuits
- Portable applications



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

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTC6717MCTA	AEC-Q101	DA1	7	8	3,000
ZXTC6717MCQTA	Automotive	DA1	7	8	3,000

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See <http://www.diodes.com> 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. Automotive, AEC-Q101 and standard products are electrically and thermally the same, except where specified.
  5. For packaging details, go to our website at <http://www.diodes.com>

**Marking Information**



DA1 = Product type Marking Code  
Dot denotes Pin 1

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

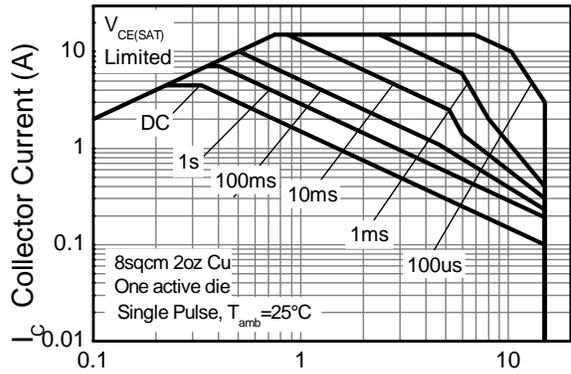
Characteristic	Symbol	NPN	PNP	Unit
Collector-Base Voltage	V <sub>CBO</sub>	40	-20	V
Collector-Emitter Voltage	V <sub>CEO</sub>	15	-12	V
Emitter-Base Voltage	V <sub>EBO</sub>	7	-7	V
Peak Pulse Current	I <sub>CM</sub>	15	-12	A
Continuous Collector Current	(Notes 6 & 9)	4.5	-4	A
	(Notes 7 & 9)	5	-4.45	
Base Current	I <sub>B</sub>	1		A

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

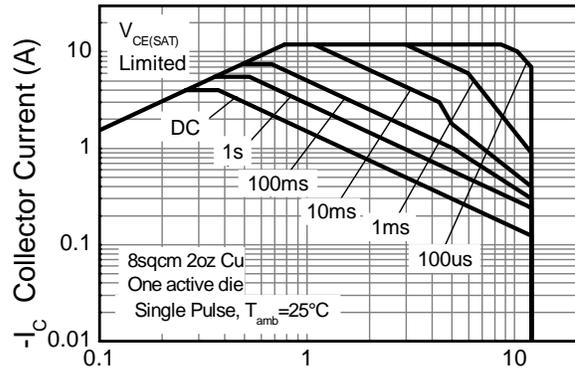
Characteristic	Symbol	NPN	PNP	Unit
Power Dissipation Linear Derating Factor	(Notes 6 & 9)	1.5 12		W mW/°C
	(Notes 7 & 9)	2.45 19.6		
	(Notes 8 & 9)	1.13 8		
	(Notes 8 & 10)	1.7 13.6		
Thermal Resistance, Junction to Ambient	(Notes 6 & 9)	83.3		°C/W
	(Notes 7 & 9)	51.0		
	(Notes 8 & 9)	111		
	(Notes 8 & 10)	73.5		
Thermal Resistance, Junction to Lead	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).

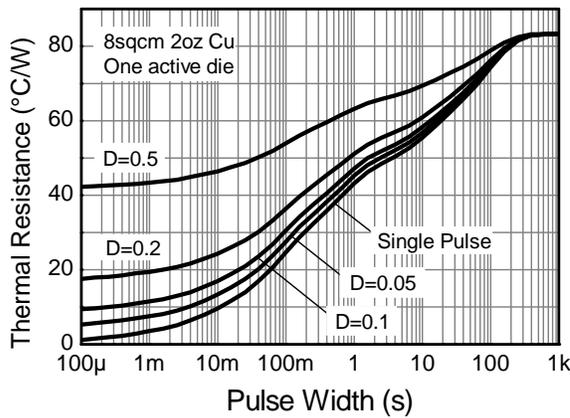
**Thermal Characteristics and Derating Information**



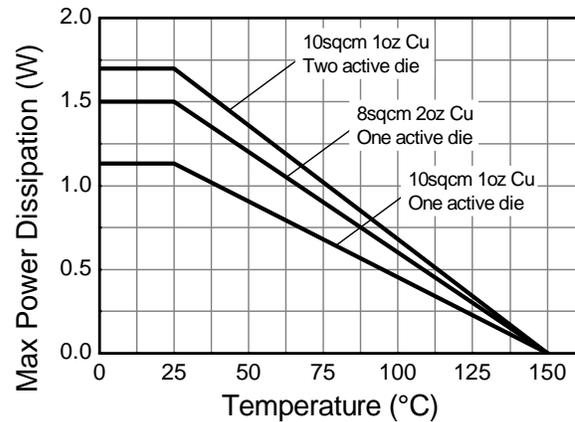
$V_{CE}$  Collector-Emitter Voltage (V)  
**NPN Safe Operating Area**



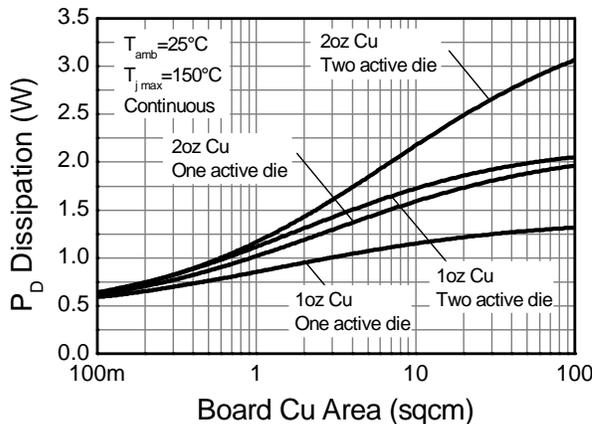
$-V_{CE}$  Collector-Emitter Voltage (V)  
**PNP Safe Operating Area**



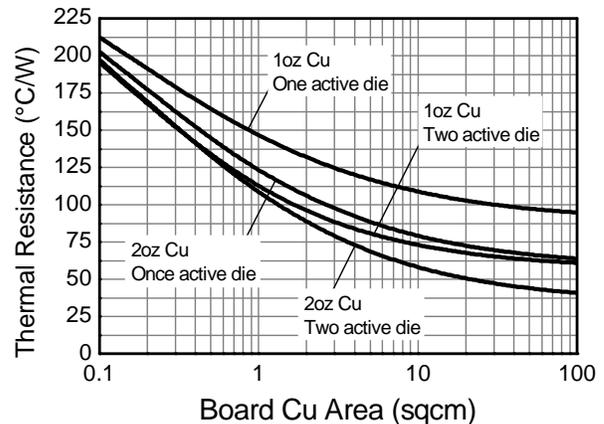
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



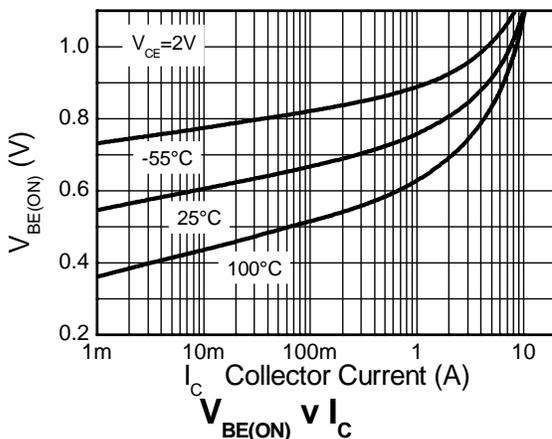
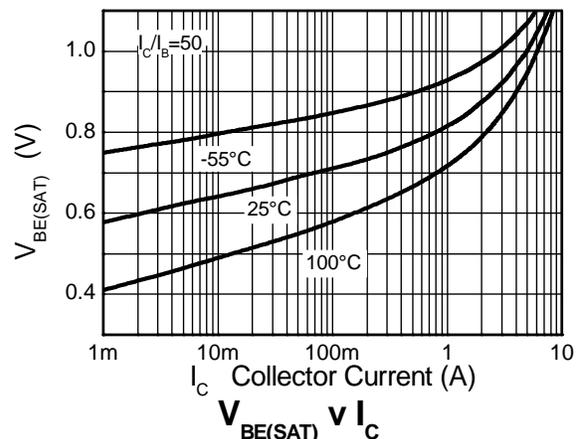
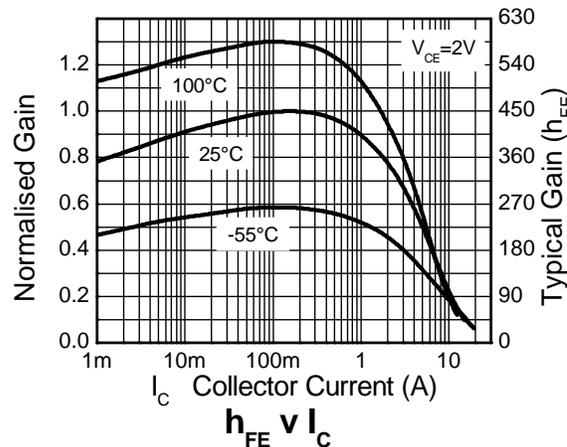
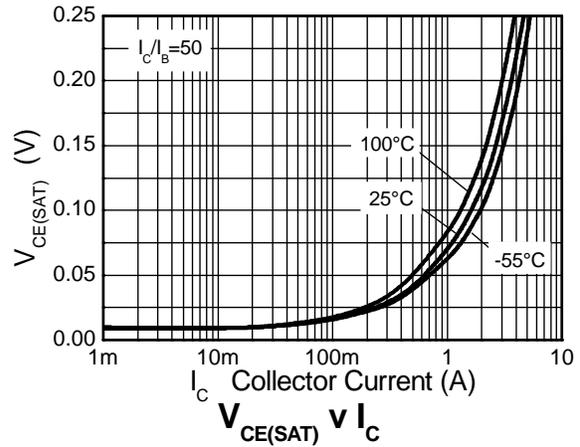
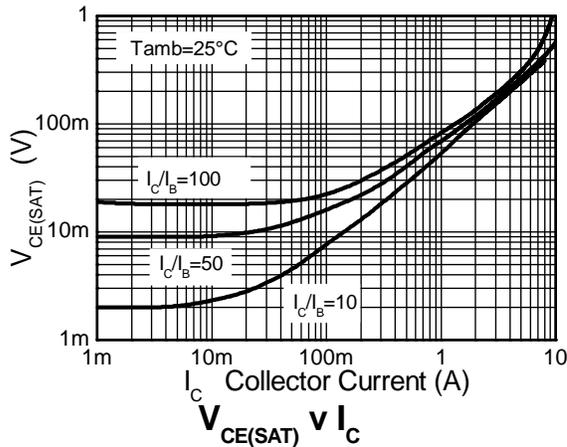
**Thermal Resistance v Board Area**

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	40	70	-	V	$I_C = 100\mu A$
Collector-Emitter Breakdown Voltage (Note 12)	$BV_{CEO}$	15	18	-	V	$I_C = 10mA$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	7	8.2	-	V	$I_E = 100\mu A$
Collector Cutoff Current	$I_{CBO}$	-	-	100	nA	$V_{CB} = 30V$
Emitter Cutoff Current	$I_{EBO}$	-	-	100	nA	$V_{EB} = 6V$
Collector Emitter Cutoff Current	$I_{CES}$	-	-	100	nA	$V_{CE} = 12V$
Static Forward Current Transfer Ratio (Note 12)	$h_{FE}$	200 300 200 150 -	415 450 320 240 80	- - - - -	-	$I_C = 10mA, V_{CE} = 2V$ $I_C = 200mA, V_{CE} = 2V$ $I_C = 3A, V_{CE} = 2V$ $I_C = 5A, V_{CE} = 2V$ $I_C = 12A, V_{CE} = 2V$
Collector-Emitter Saturation Voltage (Note 12)	$V_{CE(sat)}$	-	8 70 165 240 200	14 100 200 310 -	mV	$I_C = 0.1A, I_B = 10mA$ $I_C = 1A, I_B = 10mA$ $I_C = 3A, I_B = 50mA$ $I_C = 4.5A, I_B = 50mA$ $I_C = 4.5A, I_B = 100mA$
Base-Emitter Turn-On Voltage (Note 12)	$V_{BE(on)}$	-	0.88	0.96	V	$I_C = 4.5A, V_{CE} = 2V$
Base-Emitter Saturation Voltage (Note 12)	$V_{BE(sat)}$	-	0.94	1.05	V	$I_C = 4.5A, I_B = 50mA$
Output Capacitance	$C_{obo}$	-	30	40	pF	$V_{CB} = 10V, f = 1MHz$
Transition Frequency	$f_T$	80	120	-	MHz	$V_{CE} = 10V, I_C = 50mA, f = 100MHz$
Turn-on Time	$t_{on}$	-	120	-	ns	$V_{CC} = 10V, I_C = 1A$
Turn-off Time	$t_{off}$	-	160	-	ns	$I_{B1} = I_{B2} = 10mA$

Notes: 12. Measured under pulsed conditions. Pulse width  $\leq 300\mu s$ . Duty cycle  $\leq 2\%$ .

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

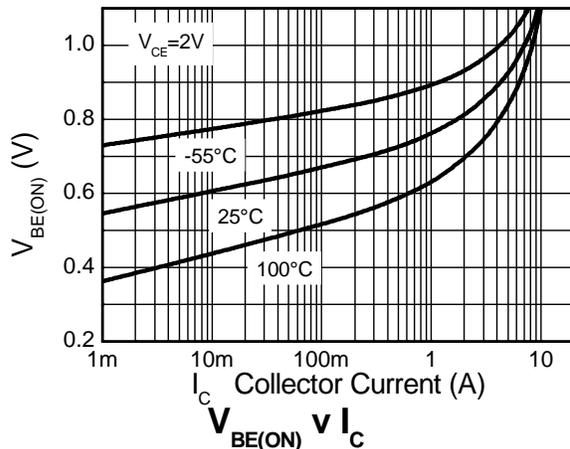
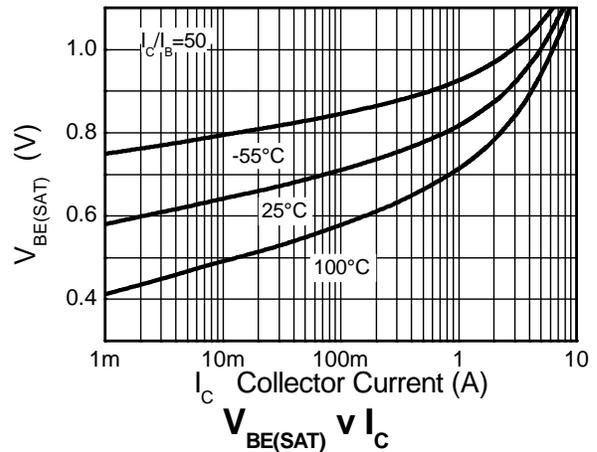
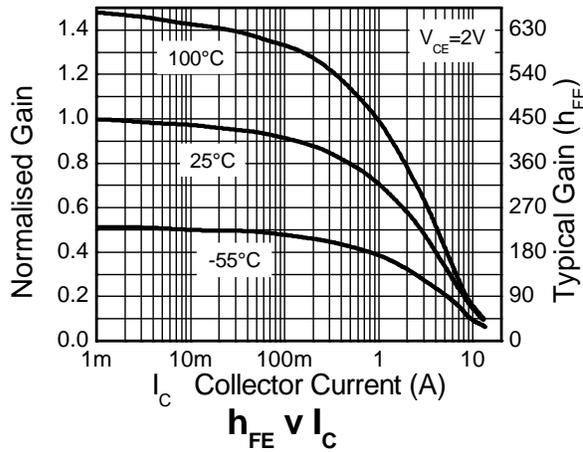
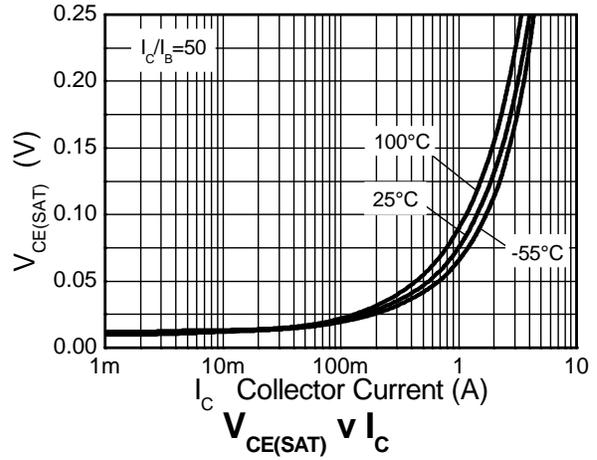
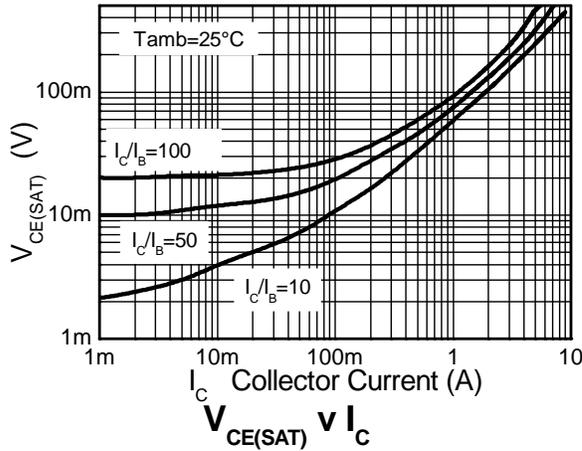


**PNP - Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-20	-35	-	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	-12	-25	-	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	-8.5	-	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CBO</sub>	-	-	-100	nA	V <sub>CB</sub> = -16V
Emitter Cutoff Current	I <sub>EBO</sub>	-	-	-100	nA	V <sub>EB</sub> = -6V
Collector Emitter Cutoff Current	I <sub>CES</sub>	-	-	-100	nA	V <sub>CES</sub> = -10V
Static Forward Current Transfer Ratio (Note 12)	h <sub>FE</sub>	300	475	-	-	I <sub>C</sub> = -10mA, V <sub>CE</sub> = -2V
		300	450	-		I <sub>C</sub> = -100mA, V <sub>CE</sub> = -2V
		180	275	-		I <sub>C</sub> = -2.5A, V <sub>CE</sub> = -2V
		60	100	-		I <sub>C</sub> = -8A, V <sub>CE</sub> = -2V
		45	70	-		I <sub>C</sub> = -10A, V <sub>CE</sub> = -2V
Collector-Emitter Saturation Voltage (Note 12)	V <sub>CE(sat)</sub>	-	-10	-17	mV	I <sub>C</sub> = -0.1A, I <sub>B</sub> = -10mA
		-	-100	-140		I <sub>C</sub> = -1A, I <sub>B</sub> = -10mA
		-	-100	-150		I <sub>C</sub> = -1.5A, I <sub>B</sub> = -50mA
		-	-195	-300		I <sub>C</sub> = -3A, I <sub>B</sub> = -50mA
		-	-240	-310		I <sub>C</sub> = -4A, I <sub>B</sub> = -150mA
Base-Emitter Turn-On Voltage (Note 12)	V <sub>BE(on)</sub>	-	-0.87	-0.96	V	I <sub>C</sub> = -4A, V <sub>CE</sub> = -2V
Base-Emitter Saturation Voltage (Note 12)	V <sub>BE(sat)</sub>	-	-0.97	-1.07	V	I <sub>C</sub> = -4A, I <sub>B</sub> = -150mA
Output Capacitance	C <sub>obo</sub>	-	21	30	pF	V <sub>CB</sub> = -10V, f = 1MHz
Transition Frequency	f <sub>T</sub>	100	110	-	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz
Turn-on Time	t <sub>on</sub>	-	70	-	ns	V <sub>CC</sub> = -6V, I <sub>C</sub> = -2A
Turn-off Time	t <sub>off</sub>	-	130	-	ns	I <sub>B1</sub> = I <sub>B2</sub> = -50mA

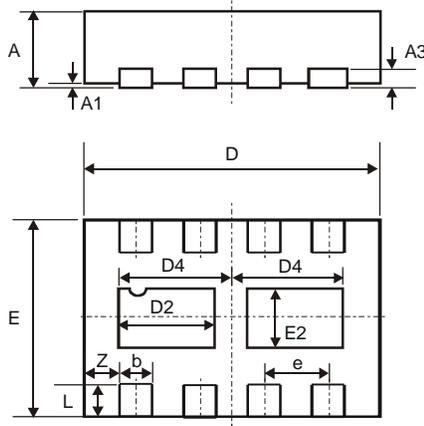
Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



## Package Outline Dimensions

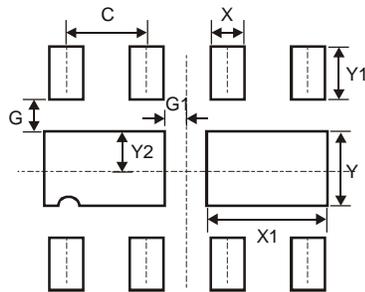
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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 AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.



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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