

COMPLEMENTARY 40V HIGH PERFORMANCE TRANSISTOR

Features

NPN Transistor

- $BV_{CEO} > 40V$
- $I_C = 3A$ Continuous Collector Current
- Low Saturation Voltage (500mV max @ 1A)
- $R_{SAT} = 195m\Omega$ for a low equivalent On-Resistance

PNP Transistor

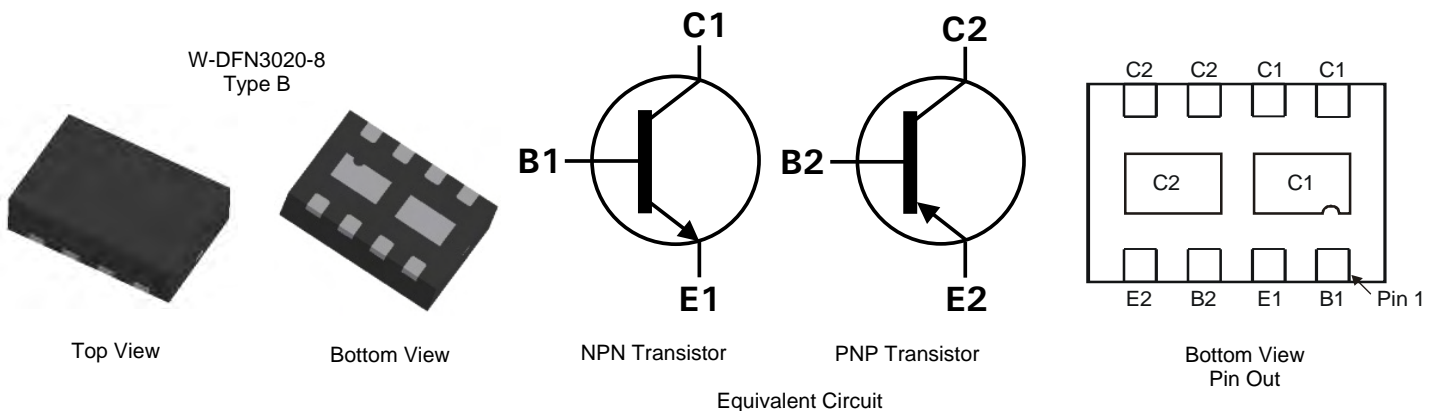
- $BV_{CEO} > -40V$
- $I_C = -3A$ Continuous Collector Current
- Low Saturation Voltage (-500mV max @ -1A)
- $R_{SAT} = 350m\Omega$ for a low equivalent On-Resistance
- h_{FE} characterized up to 2A for high current gain hold up
- Low profile 0.8mm high package for thin applications
- $R_{\theta JA}$ efficient, 40% lower than SOT26
- 6mm² 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)**

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
- LED Backlighting circuits
- Motor control
- Portable applications

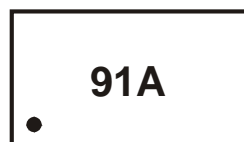


Ordering Information (Note 5)

Product	Compliance	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTC4591AMCTA	AEC-Q101	91A	7	8	3,000
ZXTC4591AMCQTA	Automotive	91A	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> 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



91A = Product type marking code
Top view, dot denotes pin 1

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

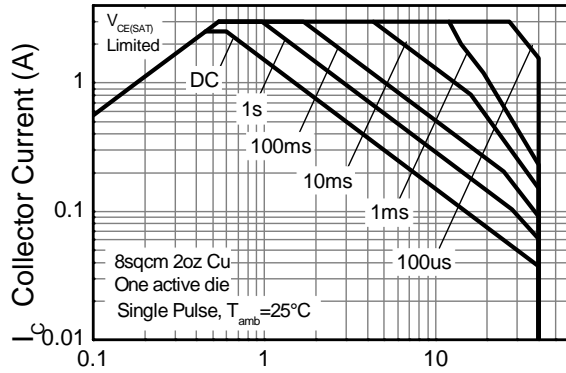
Parameter	Symbol	NPN	PNP	Unit
Collector-Base Voltage	V _{CBO}	40	-40	V
Collector-Emitter Voltage	V _{CEO}	40	-40	
Emitter-Base Voltage	V _{EBO}	7	-7	
Peak Pulse Current	I _{CM}	3	-3	A
Continuous Collector Current	(Notes 6 & 9)	2	-1.5	
		(Notes 7 & 9)	2.5	
Base Current	I _B	300		mA

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

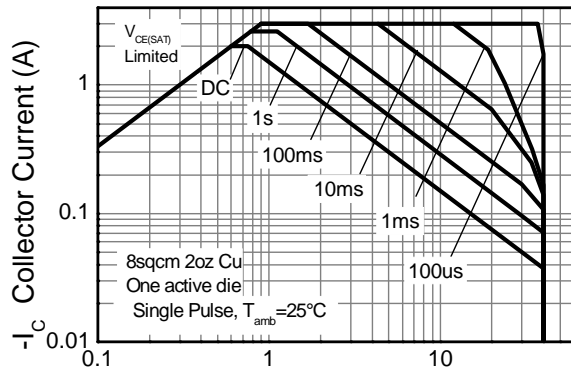
Characteristic	Symbol	NPN	PNP	Unit
Power Dissipation Linear Derating Factor	P _D		1.5	W mW/°C
			12	
			2.45	
			19.6	
			1.13	
Thermal Resistance, Junction to Ambient	R _{θJA}		8	°C/W
			1.7	
			13.6	
			83.3	
Thermal Resistance, Junction to Lead	R _{θJL}		51.0	°C/W
			111	
			73.5	
Operating and Storage Temperature Range	T _J , T _{STG}	-55 to +150		°C

- Notes:
6. For a dual device surface mounted on 28mm x 28mm (8cm²) 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 (10cm²) 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 pad).

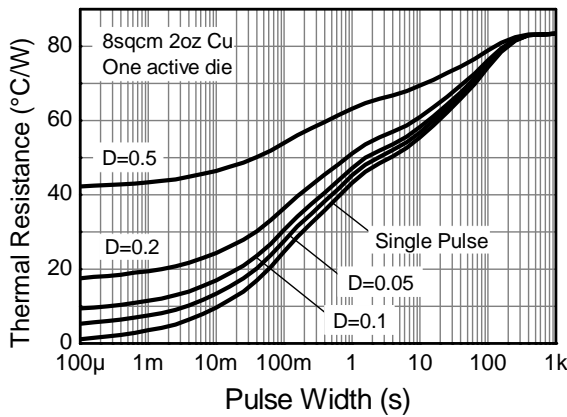
Thermal Characteristics and Derating Information



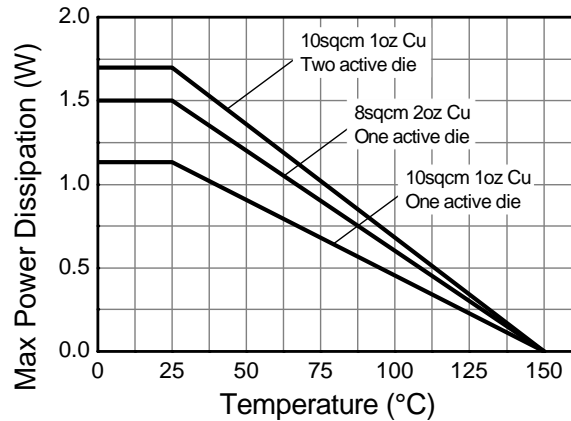
V_{CE} Collector-Emitter Voltage (V)
NPN Safe Operating Area



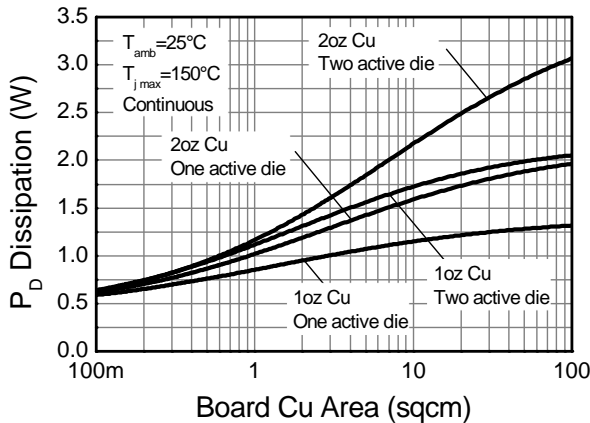
$-V_{CE}$ Collector-Emitter Voltage (V)
PNP Safe Operating Area



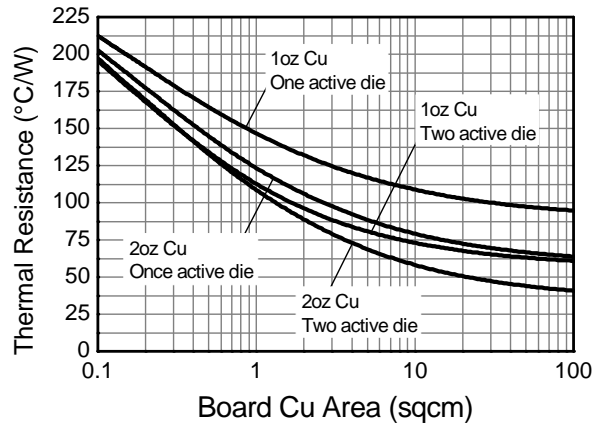
Transient Thermal Impedance



Derating Curve



Power Dissipation v Board Area



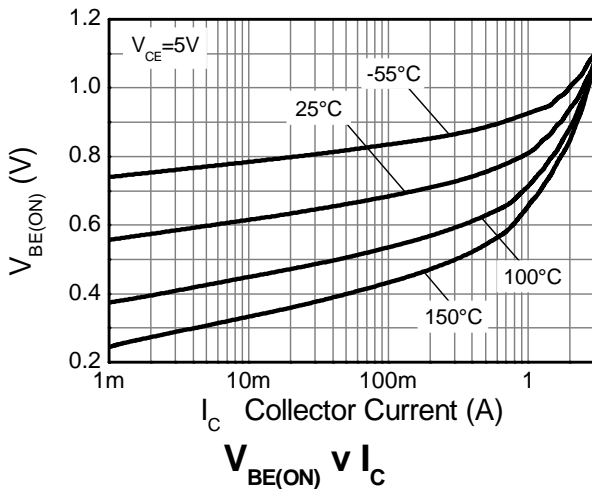
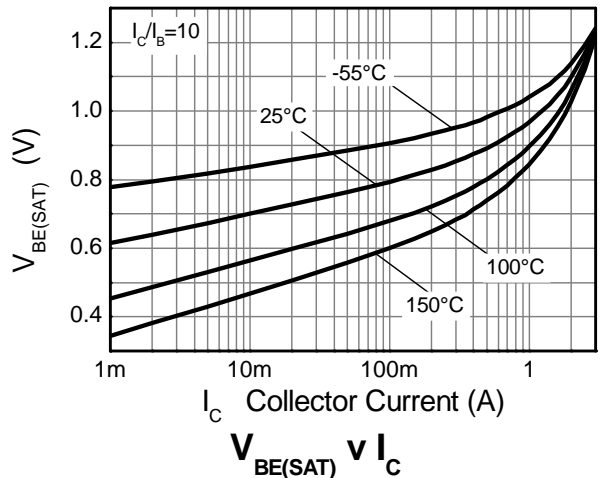
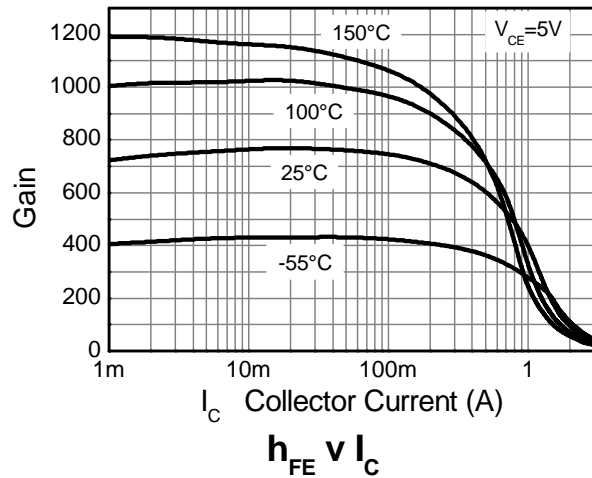
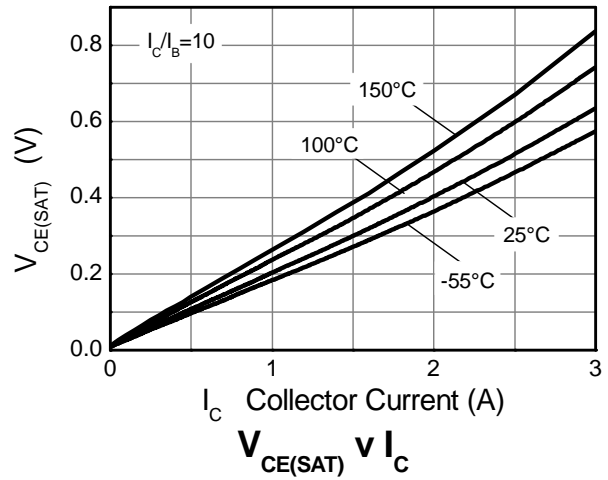
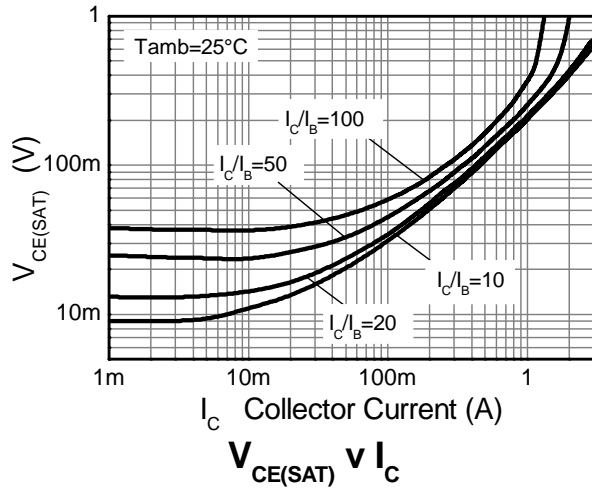
Thermal Resistance v Board Area

NPN - Electrical Characteristics (@T_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 12)	BV _{CEO}	40	-	-	V	I _C = 10mA
Emitter-Base Breakdown Voltage	BV _{EBO}	7	-	-	V	I _E = 100μA
Collector Cutoff Current	I _{CBO}	-	-	100	nA	V _{CB} = 30V
Emitter Cutoff Current	I _{EBO}	-	-	100	nA	V _{EB} = 4V
Collector Emitter Cutoff Current	I _{CES}	-	-	100	nA	V _{CE} = 30V
Static Forward Current Transfer Ratio (Note 12)	h _{FE}	300 300 200 35	- - - -	- 900 - -	-	I _C = 1mA, V _{CE} = 5V I _C = 500mA, V _{CE} = 5V I _C = 1A, V _{CE} = 5V I _C = 2A, V _{CE} = 5V
Collector-Emitter Saturation Voltage (Note 12)	V _{CE(sat)}	-	-	300 500	mV	I _C = 0.5A, I _B = 50mA I _C = 1A, I _B = 100mA
Base-Emitter Turn-On Voltage (Note 12)	V _{BE(on)}	-	-	1.0	V	I _C = 1A, V _{CE} = 5V
Base-Emitter Saturation Voltage (Note 12)	V _{BE(sat)}	-	-	1.1	V	I _C = 1A, I _B = 100mA
Output Capacitance	C _{obo}	-	-	10	pF	V _{CB} = 10V, f = 1MHz
Transition Frequency	f _T	150	-	-	MHz	V _{CE} = 10V, I _C = 50mA, f = 100MHz

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

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

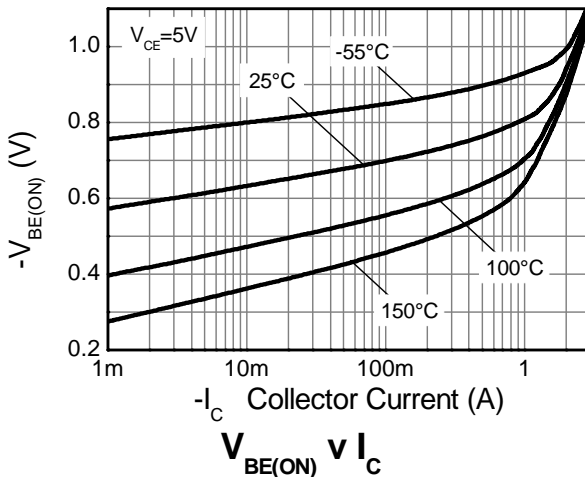
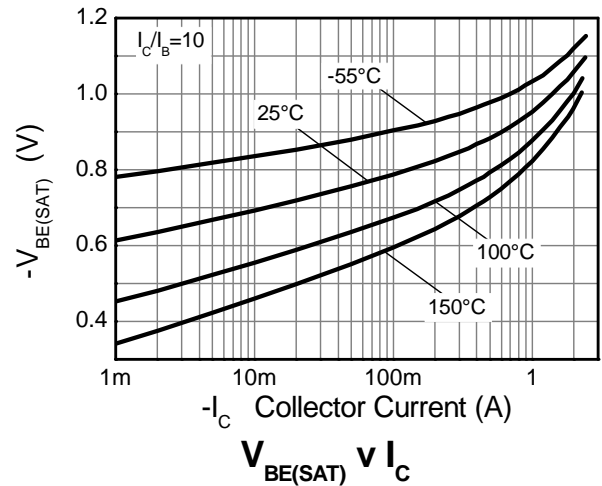
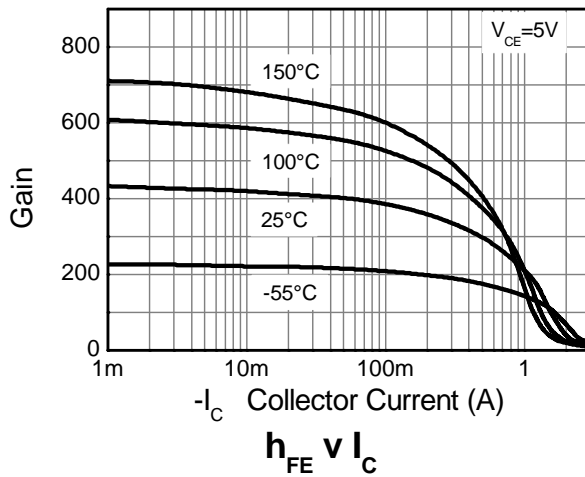
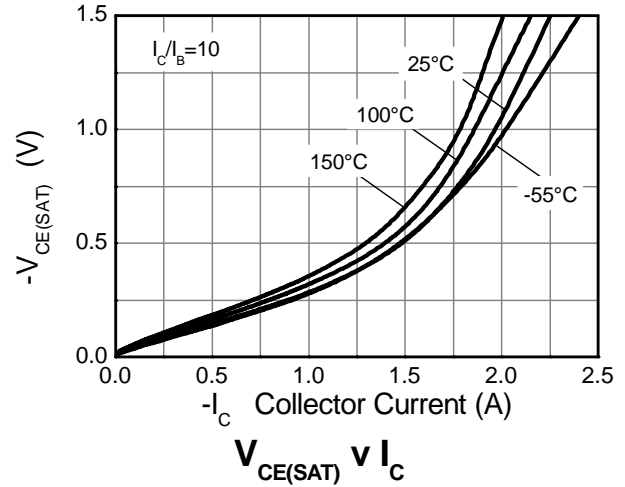
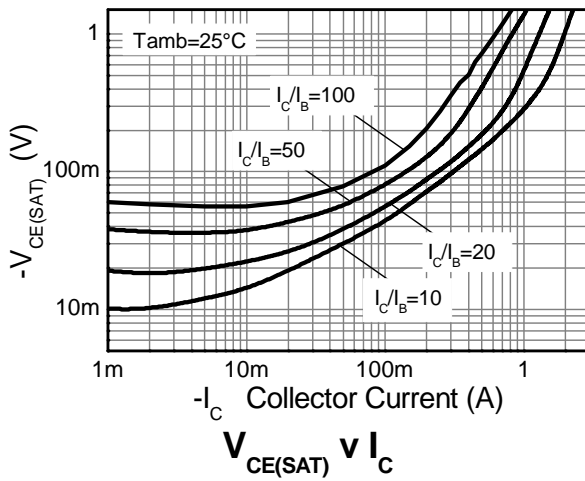


PNP - Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV _{CB0}	-40	-	-	V	I _C = -100μA
Collector-Emitter Breakdown Voltage (Note 12)	BV _{CEO}	-40	-	-	V	I _C = -10mA
Emitter-Base Breakdown Voltage	BV _{EBO}	-7	-	-	V	I _E = -100μA
Collector Cutoff Current	I _{CBO}	-	-	-100	nA	V _{CB} = -30V
Emitter Cutoff Current	I _{EBO}	-	-	-100	nA	V _{EB} = -4V
Collector Emitter Cutoff Current	I _{CES}	-	-	-100	nA	V _{CE} = -30V
Static Forward Current Transfer Ratio (Note 12)	h _{FE}	300	-	-	-	I _C = -1mA, V _{CE} = -5V
		300	-	800		I _C = -100mA, V _{CE} = -5V
		250	-	-		I _C = -500mA, V _{CE} = -5V
		160	-	-		I _C = -1A, V _{CE} = -5V
		30	-	-		I _C = -2A, V _{CE} = -5V
Collector-Emitter Saturation Voltage (Note 12)	V _{CE(sat)}	-	-	-200	mV	I _C = -0.1A, I _B = -1mA
		-	-	-350		I _C = -0.5A, I _B = -20mA
		-	-	-500		I _C = -1.0A, I _B = -100mA
Base-Emitter Turn-On Voltage (Note 12)	V _{BE(on)}	-	-	-1.0	V	I _C = -1A, V _{CE} = -5V
Base-Emitter Saturation Voltage (Note 12)	V _{BE(sat)}	-	-	-1.1	V	I _C = -1A, I _B = -50mA
Output Capacitance	C _{obo}	-	-	10	pF	V _{CB} = -10V, f = 1MHz
Transition Frequency	f _T	150	-	-	MHz	V _{CE} = -10V, I _C = -50mA, f = 100MHz

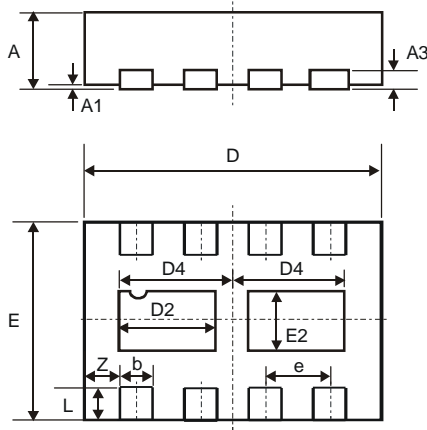
Notes: 12. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

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



Package Outline Dimensions

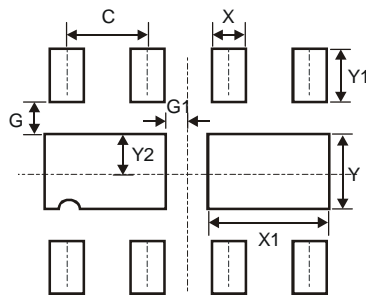
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.



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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