

**COMPLEMENTARY 40V HIGH PERFORMANCE TRANSISTOR**

**Features and Benefits**

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

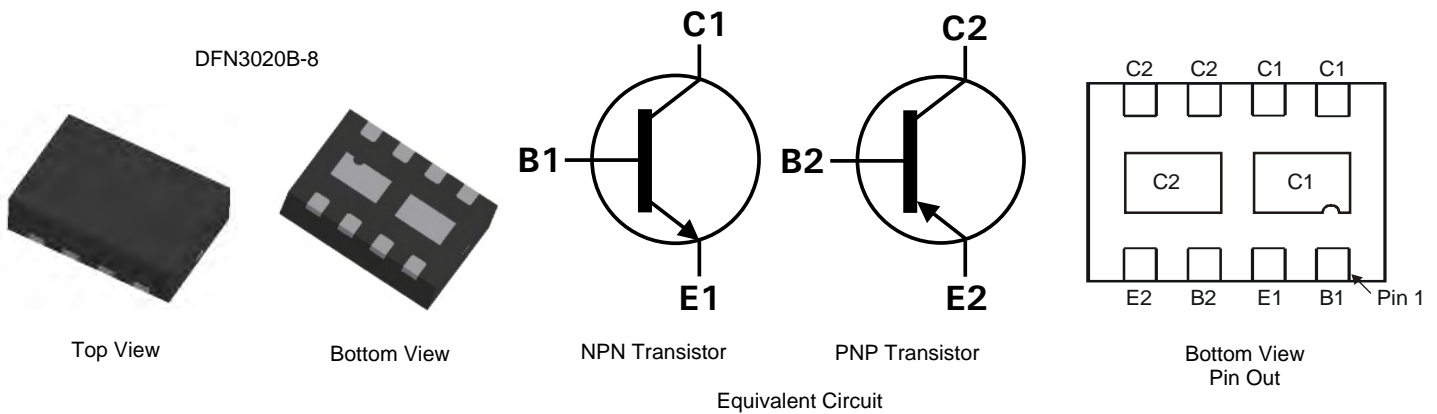
- $BV_{CEO} > -40V$
- $I_C = -3A$  Continuous Collector Current
- Low Saturation Voltage (-500mV max @ -1A)
- $R_{SAT} = 350m\Omega$  for a low equivalent On-Resistance
- $h_{FE}$  characterized up to 2A for high current gain hold up
- Low profile 0.8mm high package for thin applications
- $R_{\theta JA}$  efficient, 40% lower than SOT26
- 6mm<sup>2</sup> footprint, 50% smaller than TSOP6 and SOT26
- **Lead-Free, RoHS Compliant (Note 1)**
- **Halogen and Antimony Free. "Green" Device (Note 2)**
- **Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

- Case: DFN3020B-8
- Case material: Molded Plastic. "Green" Molding Compound.
- Terminals: Pre-Plated NiPdAu leadframe.
- Nominal package height: 0.8mm
- UL Flammability Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Weight: 0.013 grams (approximate)

**Applications**

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

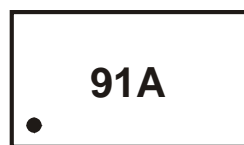


**Ordering Information** (Note 3)

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTC4591AMCTA	91A	7	8	3000

- Notes:
1. No purposefully added lead.
  2. Diodes Inc's "Green" Policy can be found on our website at <http://www.diodes.com>
  3. 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** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

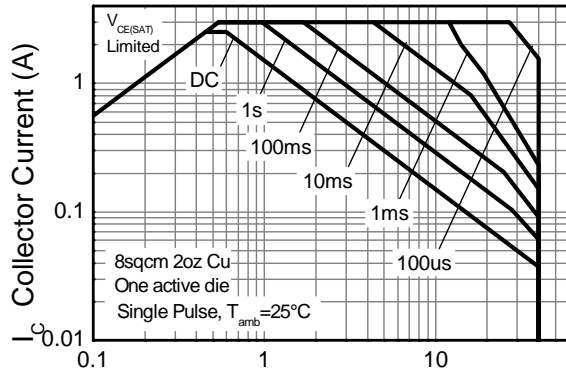
Parameter	Symbol	NPN	PNP	Unit
Collector-Base Voltage	$V_{CB0}$	40	-40	V
Collector-Emitter Voltage	$V_{CE0}$	40	-40	
Emitter-Base Voltage	$V_{EB0}$	5	-5	
Peak Pulse Current	$I_{CM}$	3	-3	A
Continuous Collector Current	(Notes 4 & 7)	2	-1.5	
	(Notes 5 & 7)	2.5	-2	
Base Current	$I_B$	300		mA

**Thermal Characteristics** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

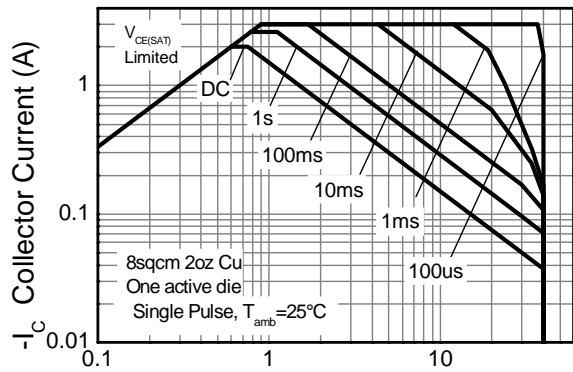
Characteristic	Symbol	NPN	PNP	Unit
Power Dissipation Linear Derating Factor	$P_D$	(Notes 4 & 7)		W mW/°C
		(Notes 5 & 7)		
		(Notes 6 & 7)		
		(Notes 6 & 8)		
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 4 & 7)		°C/W
		(Notes 5 & 7)		
		(Notes 6 & 7)		
		(Notes 6 & 8)		
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	(Notes 7 & 9)		°C
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150		°C

- Notes:
- 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.
  - Same as note (3), except the device is measured at  $t < 5$  sec.
  - Same as note (3), except the device is surface mounted on 31mm x 31mm (10cm<sup>2</sup>) FR4 PCB with high coverage of single sided 1oz copper.
  - For a dual device with one active die.
  - For dual device with 2 active die running at equal power.
  - Thermal resistance from junction to solder-point (at the end of the collector lead).

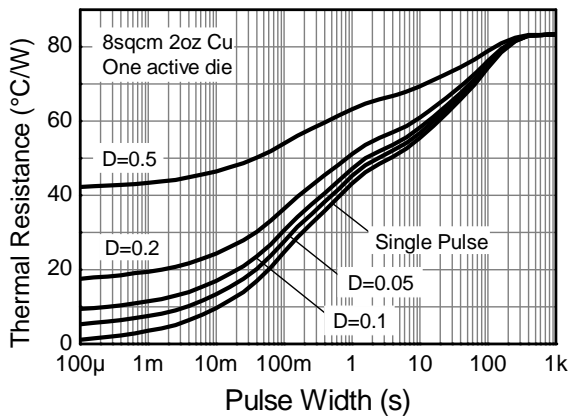
**Thermal Characteristics**



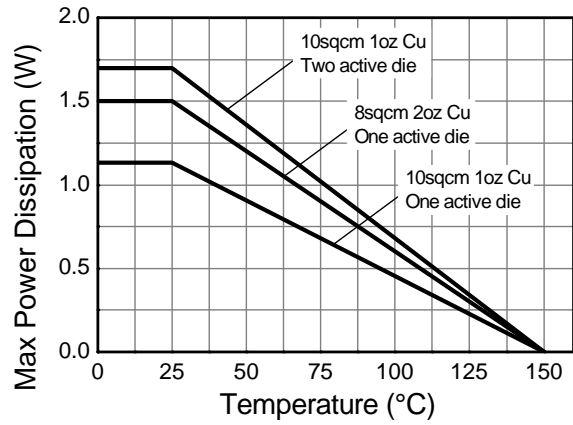
$V_{CE}$  Collector-Emitter Voltage (V)  
**NPN Safe Operating Area**



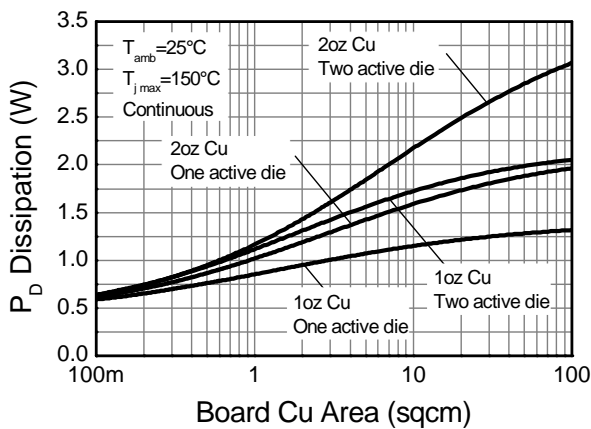
$-V_{CE}$  Collector-Emitter Voltage (V)  
**PNP Safe Operating Area**



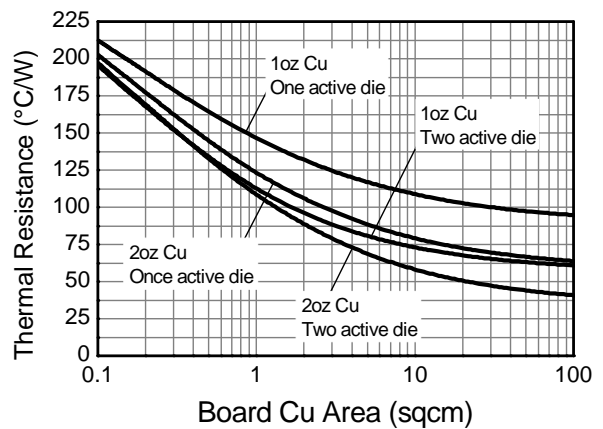
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



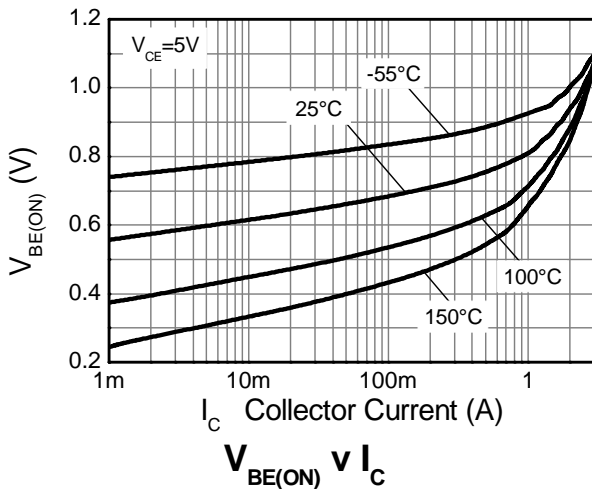
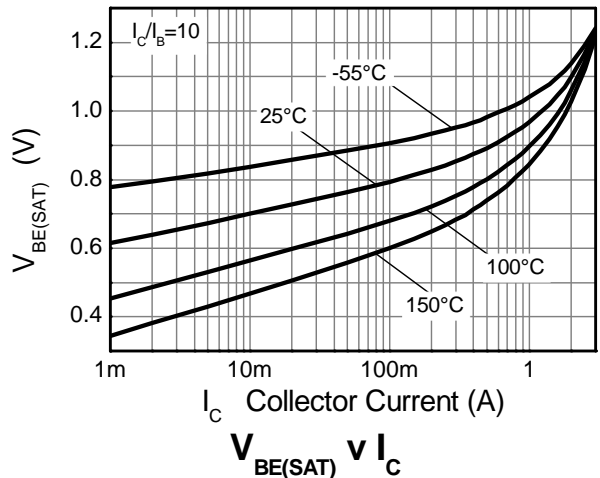
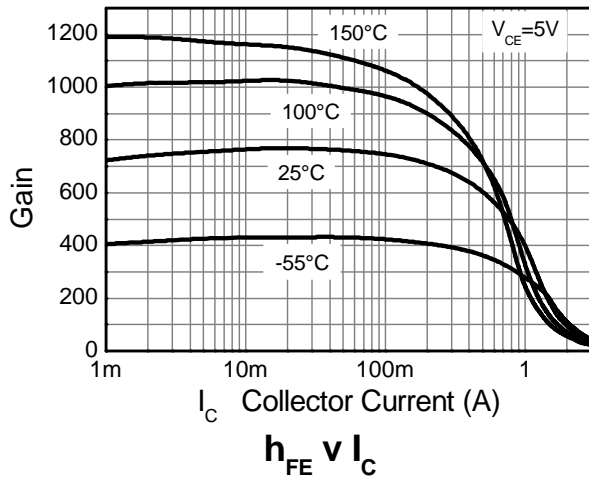
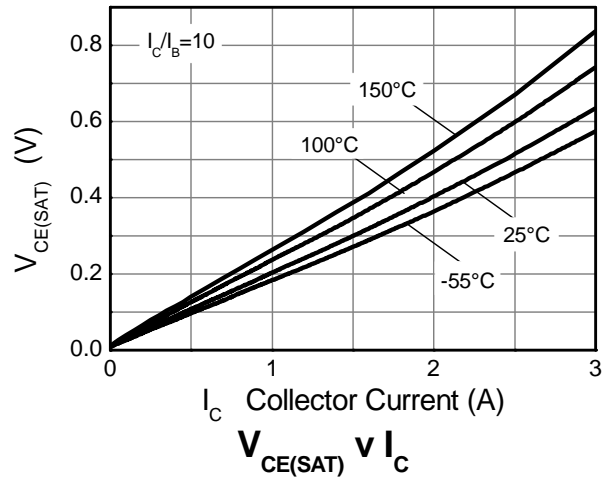
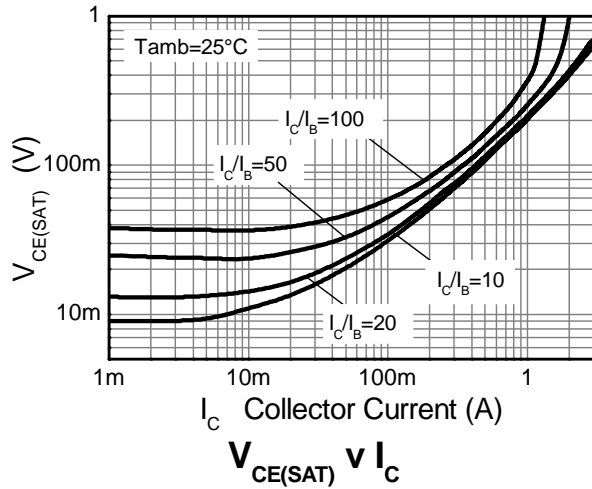
**Thermal Resistance v Board Area**

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	$BV_{CBO}$	40	-	-	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 10)	$BV_{CEO}$	40	-	-	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	$BV_{EBO}$	5	-	-	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	$V_{EB} = 4\text{V}$
Collector Emitter Cutoff Current	$I_{CES}$	-	-	100	nA	$V_{CE} = 30\text{V}$
Static Forward Current Transfer Ratio (Note 10)	$h_{FE}$	300	-	-	-	$I_C = 1\text{mA}, V_{CE} = 5\text{V}$
		300	-	900		$I_C = 500\text{mA}, V_{CE} = 5\text{V}$
		200	-	-		$I_C = 1\text{A}, V_{CE} = 5\text{V}$
		35	-	-		$I_C = 2\text{A}, V_{CE} = 5\text{V}$
Collector-Emitter Saturation Voltage (Note 10)	$V_{CE(sat)}$	-	-	300 500	mV	$I_C = 0.5\text{A}, I_B = 50\text{mA}$ $I_C = 1\text{A}, I_B = 100\text{mA}$
Base-Emitter Turn-On Voltage (Note 10)	$V_{BE(on)}$	-	-	1.0	V	$I_C = 1\text{A}, V_{CE} = 5\text{V}$
Base-Emitter Saturation Voltage (Note 10)	$V_{BE(sat)}$	-	-	1.1	V	$I_C = 1\text{A}, I_B = 100\text{mA}$
Output Capacitance	$C_{obo}$	-	-	10	pF	$V_{CB} = 10\text{V}, f = 1\text{MHz}$
Transition Frequency	$f_T$	150	-	-	MHz	$V_{CE} = 10\text{V}, I_C = 50\text{mA}, f = 100\text{MHz}$

Notes: 10. Measured under pulsed conditions. Pulse width  $\leq 300\mu\text{s}$ . Duty cycle  $\leq 2\%$ .

**NPN - Typical Electrical Characteristics**

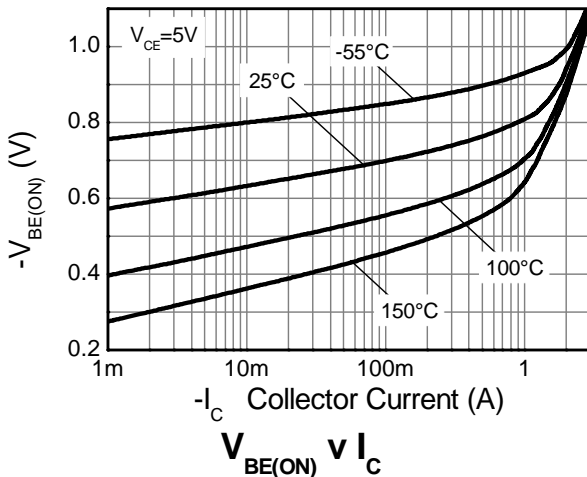
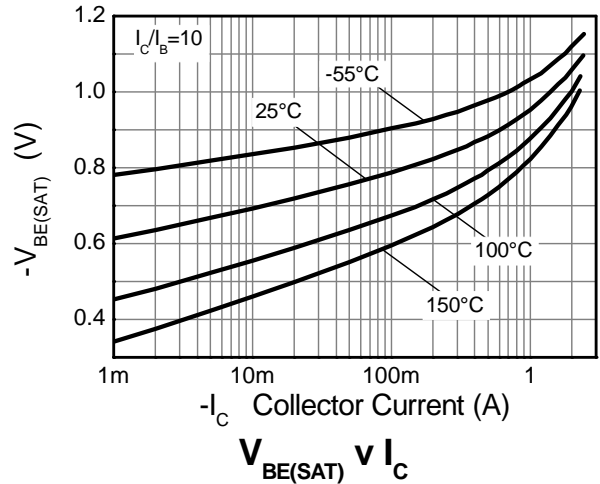
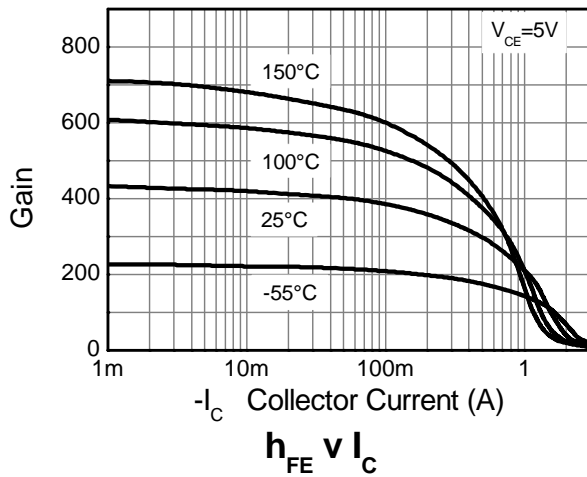
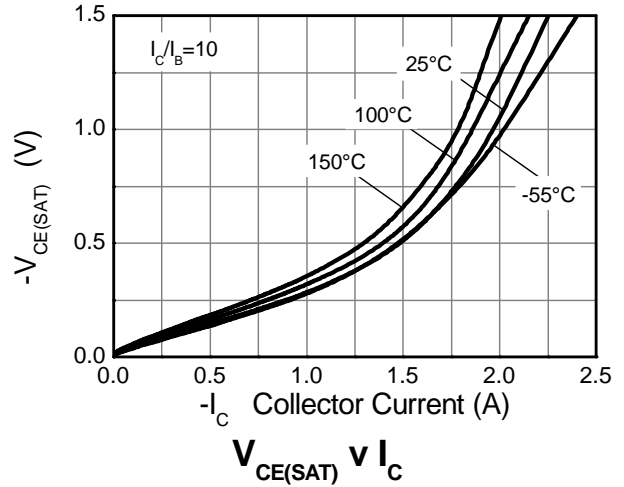
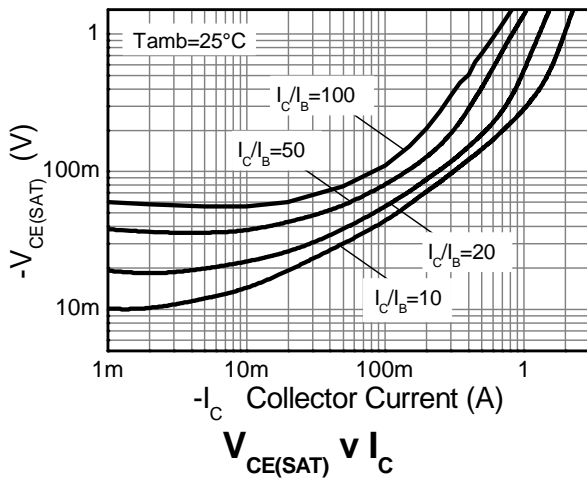


**PNP - Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

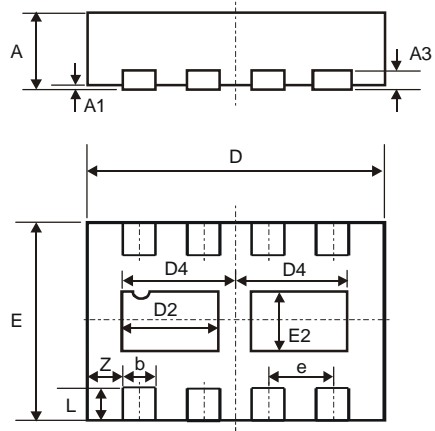
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CB0</sub>	-40	-	-	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 11)	BV <sub>CEO</sub>	-40	-	-	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-5	-	-	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CB0</sub>	-	-	-100	nA	V <sub>CB</sub> = -30V
Emitter Cutoff Current	I <sub>EBO</sub>	-	-	-100	nA	V <sub>EB</sub> = -4V
Collector Emitter Cutoff Current	I <sub>CES</sub>	-	-	-100	nA	V <sub>CE</sub> = -30V
Static Forward Current Transfer Ratio (Note 11)	h <sub>FE</sub>	300	-	-	-	I <sub>C</sub> = -1mA, V <sub>CE</sub> = -5V
		300	-	800		I <sub>C</sub> = -100mA, V <sub>CE</sub> = -5V
		250	-	-		I <sub>C</sub> = -500mA, V <sub>CE</sub> = -5V
		160	-	-		I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
		30	-	-		I <sub>C</sub> = -2A, V <sub>CE</sub> = -5V
Collector-Emitter Saturation Voltage (Note 11)	V <sub>CE(sat)</sub>	-	-	-200	mV	I <sub>C</sub> = -0.1A, I <sub>B</sub> = -1mA
		-	-	-350		I <sub>C</sub> = -0.5A, I <sub>B</sub> = -20mA
		-	-	-500		I <sub>C</sub> = -1.0A, I <sub>B</sub> = -100mA
Base-Emitter Turn-On Voltage (Note 11)	V <sub>BE(on)</sub>	-	-	-1.0	V	I <sub>C</sub> = -1A, V <sub>CE</sub> = -5V
Base-Emitter Saturation Voltage (Note 11)	V <sub>BE(sat)</sub>	-	-	-1.1	V	I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA
Output Capacitance	C <sub>obo</sub>	-	-	10	pF	V <sub>CB</sub> = -10V, f = 1MHz
Transition Frequency	f <sub>T</sub>	150	-	-	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz

Notes: 11. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

**PNP - Typical Electrical Characteristics**

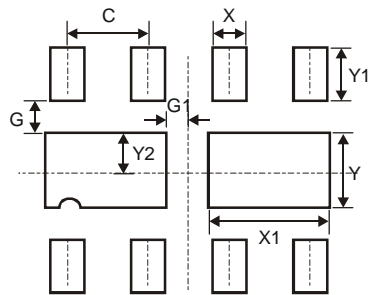


**Package Outline Dimensions**



DFN3020B-8			
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**



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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