





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

### **Features**

### **NPN Transistor**

- BV<sub>CEO</sub> > 15V
- I<sub>C</sub> = 4.5A Continuous Collector Current
- Low Saturation Voltage (100mV max @ 1A)
- R<sub>SAT</sub> = 45mΩ for a low equivalent On-Resistance

#### **PNP Transistor**

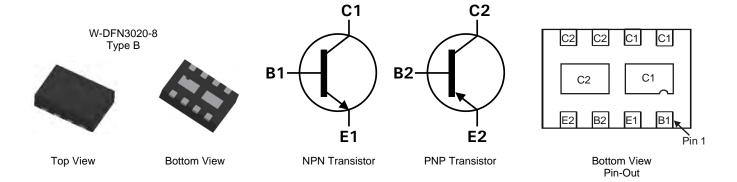
- BV<sub>CEO</sub> > -12V
- I<sub>C</sub> = -4A Continuous Collector Current
- Low Saturation Voltage (-140mV max @ -1A)
- $R_{SAT} = 60 \text{m}\Omega$  for a low equivalent On-Resistance
- h<sub>FE</sub> characterized up to 12A for high current gain hold up
- Low profile 0.8mm high package for thin applications
- R<sub>0JA</sub> 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
- 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:

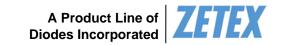
- 1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
- 2. See http://www.diodes.com for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 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** (@ $T_A = +25^{\circ}C$ , unless otherwise specified.)

Characteristic	Symbol	NPN	PNP	Unit	
Collector-Base Voltage		$V_{CBO}$	40	-20	V
Collector-Emitter Voltage		$V_{CEO}$	15	-12	V
Emitter-Base Voltage		$V_{EBO}$	7	-7	V
Peak Pulse Current		I <sub>CM</sub>	15	-12	Α
Continuous Collector Current	(Notes 6 & 9)	1-	4.5	-4	Λ
(Notes 7 & 9)		IC	5	-4.45	^
Base Current		l <sub>Β</sub>	1		A

# Thermal Characteristics ( $@T_A = +25^{\circ}C$ , unless otherwise specified.)

Characteristic	Symbol	NPN	PNP	Unit	
	(Notes 6 & 9)		1.5 12 2.45 19.6 1.13 8		W mW/°C
Power Dissipation	(Notes 7 & 9)				
Linear Derating Factor	(Notes 8 & 9)	P <sub>D</sub>			
	(Notes 8 & 10)		1.7 13.6		
	(Notes 6 & 9)		83.3		
The amount Designation to Amphieur	(Notes 7 & 9)	_ [	51.0		
Thermal Resistance, Junction to Ambient	(Notes 8 & 9)	$R_{\theta JA}$	111		°C/W
	(Notes 8 & 10)		73.5		
Thermal Resistance, Junction to Lead (Notes 9 & 11)		$R_{ heta JL}$	17.1		
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>STG</sub>	-55 to +1	50	°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.

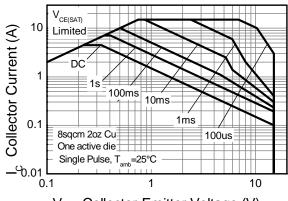
  7. Same as note (6), except the device is measured at t <5 sec.

  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.

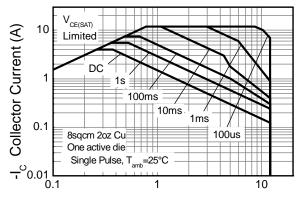
- 9. For a dual device with one active die.
- 10. For dual device with 2 active die running at equal power.
  11. Thermal resistance from junction to solder-point (on the exposed collector pads).



### Thermal Characteristics and Derating Information

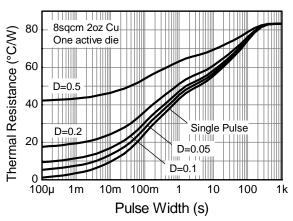


V<sub>CF</sub> Collector-Emitter Voltage (V)

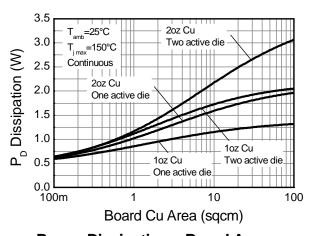


-V<sub>CF</sub> Collector-Emitter Voltage (V)

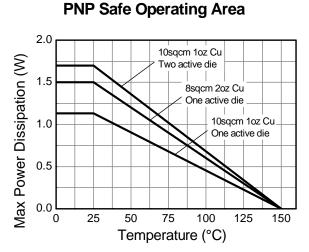
# **NPN Safe Operating Area**



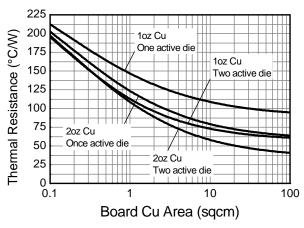
**Transient Thermal Impedance** 



**Power Dissipation v Board Area** 

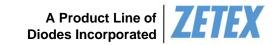


## **Derating Curve**



Thermal Resistance v Board Area





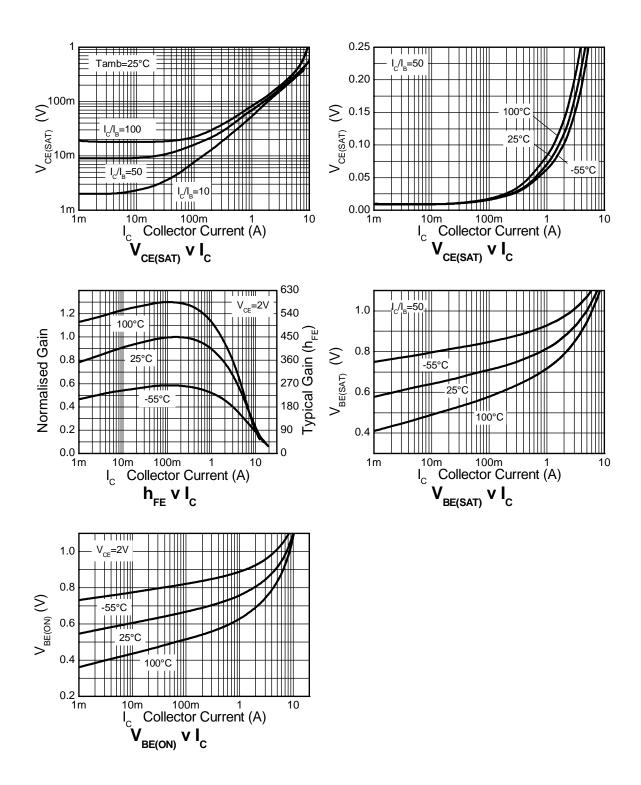
# NPN - Electrical Characteristics (@TA = +25°C, unless otherwise specified.)

Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	40	70	-	V	$I_{C} = 100 \mu A$
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	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 <sub>CBO</sub>	-	-	100	nA	V <sub>CB</sub> = 30V
Emitter Cutoff Current	I <sub>EBO</sub>	-	-	100	. nA	$V_{EB} = 6V$
Collector Emitter Cutoff Current	I <sub>CES</sub>	-	-	100	nA	V <sub>CE</sub> = 12V
Static Forward Current Transfer Ratio (Note 12)	h <sub>FE</sub>	200 300 200 150	415 450 320 240 80	- - - -	-	$\begin{split} & I_{C} = 10 \text{mA}, \ V_{CE} = 2 \text{V} \\ & I_{C} = 200 \text{mA}, \ V_{CE} = 2 \text{V} \\ & I_{C} = 3 \text{A}, \ V_{CE} = 2 \text{V} \\ & I_{C} = 5 \text{A}, \ V_{CE} = 2 \text{V} \\ & I_{C} = 12 \text{A}, \ V_{CE} = 2 \text{V} \end{split}$
Collector-Emitter Saturation Voltage (Note 12)	VCE(sat)	-	8 70 165 240 200	14 100 200 310	mV	$\begin{split} &I_{C}=0.1\text{A},\ I_{B}=10\text{mA}\\ &I_{C}=1\text{A},\ I_{B}=10\text{mA}\\ &I_{C}=3\text{A},\ I_{B}=50\text{mA}\\ &I_{C}=4.5\text{A},\ I_{B}=50\text{mA}\\ &I_{C}=4.5\text{A},\ I_{B}=100\text{mA} \end{split}$
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 <sub>CB</sub> = 10V. f = 1MHz
Transition Frequency	f⊤	80	120	-	MHz	$V_{CE} = 10V, I_{C} = 50mA,$ f = 100MHz
Turn-on Time	t <sub>on</sub>	-	120	-	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 1A
Turn-off Time	t <sub>off</sub>	-	160	-	ns	$I_{B1} = I_{B2} = 10 \text{mA}$

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



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







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

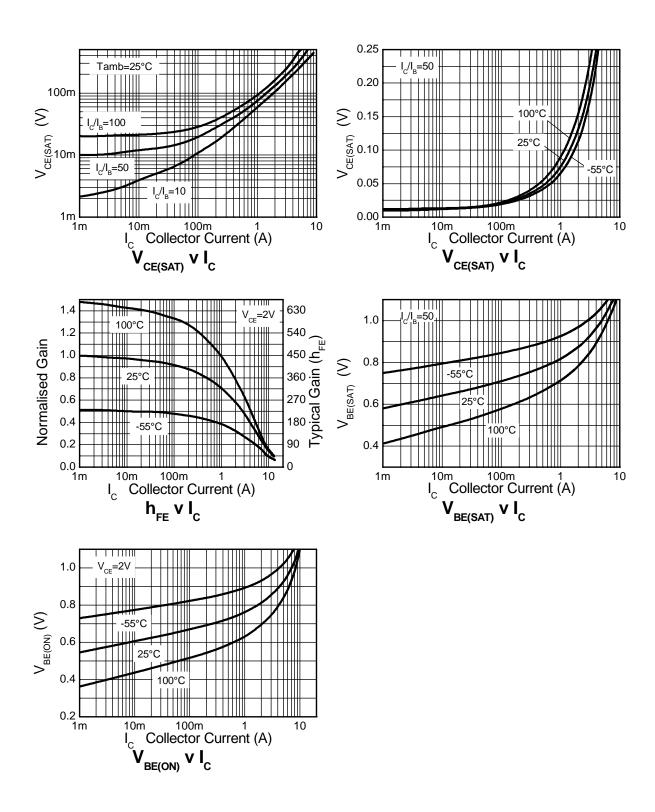
Characteristic	Symbol	Min	Тур	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-20	-35	-	V	$I_{C} = -100 \mu A$
Collector-Emitter Breakdown Voltage (Note 12)	BV <sub>CEO</sub>	-12	-25	-	V	$I_C = -10 \text{mA}$
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	-8.5	-	V	$I_E = -100 \mu A$
Collector Cutoff Current	I <sub>CBO</sub>	-	-	-100	nA	V <sub>CB</sub> = -16V
Emitter Cutoff Current	I <sub>EBO</sub>	-	-	-100	. nA	$V_{EB} = -6V$
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>	300 300 180 60 45	475 450 275 100 70		-	$I_{C}$ = -10mA, $V_{CE}$ = -2V $I_{C}$ = -100mA, $V_{CE}$ = -2V $I_{C}$ = -2.5A, $V_{CE}$ = -2V $I_{C}$ = -8A, $V_{CE}$ = -2V $I_{C}$ = -10A, $V_{CE}$ = -2V
Collector-Emitter Saturation Voltage (Note 12)	VCE(sat)		-10 -100 -100 -195 -240	-17 -140 -150 -300 -310	mV	$I_C = -0.1A$ , $I_B = -10mA$ $I_C = -1A$ , $I_B = -10mA$ $I_C = -1.5A$ , $I_B = -50mA$ $I_C = -3A$ , $I_B = -50mA$ $I_C = -4A$ , $I_B = -150mA$
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	$V_{CE} = -10V, I_{C} = -50mA,$ f = 100MHz
Turn-on Time	t <sub>on</sub>	-	70	-	ns	$V_{CC} = -6V, I_{C} = -2A$
Turn-off Time	t <sub>off</sub>	-	130	-	ns	$I_{B1} = I_{B2} = -50 \text{mA}$

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





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

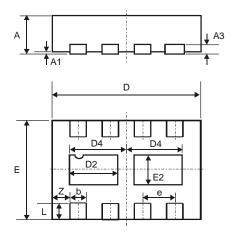






# **Package Outline Dimensions**

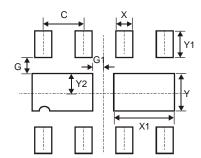
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.



W-DFN3020-8						
Type B						
Dim	Dim Min Max Typ					
Α	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			
е	-	-	0.65			
Е	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)
С	0.650
G	0.285
G1	0.090
Х	0.400
X1	1.120
Υ	0.730
Y1	0.500
Y2	0.365





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