

**ZXTNS618MC**

**20V NPN LOW SATURATION TRANSISTOR AND  
40V, 1A SCHOTTKY DIODE COMBINATION**

**Features and Benefits**

**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
- $h_{FE}$  characterized up to 6A for high current gain hold up

**Schottky Diode**

- $BV_R > 40V$
- $I_{FAV} = 3A$  Average Peak Forward Current
- Low  $V_F < 500mV$  (@1A) for reduced power loss
- Fast switching due to Schottky barrier

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)**

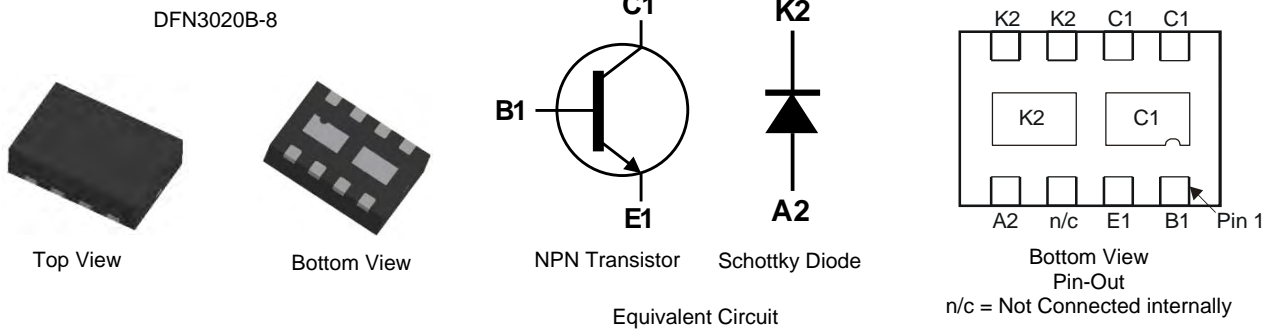
**Qualified to AEC-Q101 Standards for High Reliability**

**Mechanical Data**

- Case: DFN3020B-8
- Case Material: Molded Plastic, "Green" Molding Component
- 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
- Mobile phones
- Motor control
- Portable applications



**Ordering Information (Note 3)**

Product	Marking	Reel size (inches)	Tape width (mm)	Quantity per reel
ZXTNS618MCTA	BS1	7	8	3000

- Notes:
1. No purposefully added lead.
  2. Diodes Inc's "Green" Policy can be found on our website <http://www.diodes.com>
  3. For packaging details, go to our website <http://www.diodes.com>

**Marking Information**



BS1 = Product type marking code  
Top view, dot denotes pin 1

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

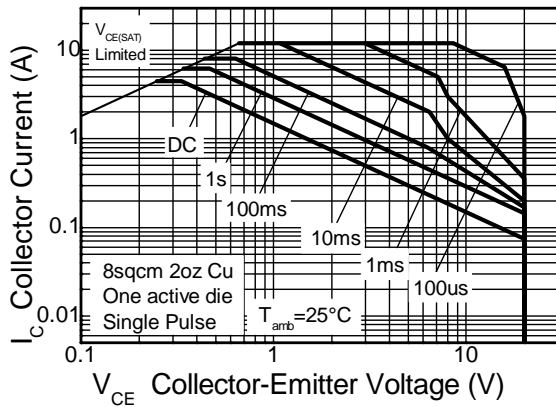
Parameter	Symbol	Limit	Unit
Collector-Base Voltage	$V_{CBO}$	40	V
Collector-Emitter Voltage	$V_{CEO}$	20	
Emitter-Base Voltage	$V_{EBO}$	7	
Peak Pulse Current	$I_{CM}$	12	A
Continuous Collector Current	(Notes 4 and 7)	4.5	
	(Notes 5 and 7)	5	
Base Current	$I_B$	1	

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

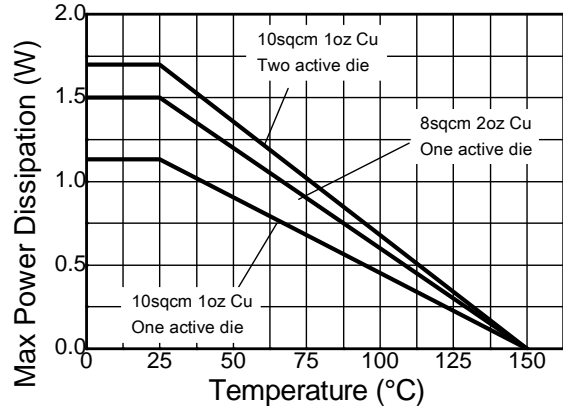
Characteristic	Symbol	Value	Unit	
Power Dissipation Linear Derating Factor	$P_D$	1.5	W mW/ $^\circ\text{C}$	
		(Notes 4 & 7)		12
		(Notes 5 & 7)		2.45
		(Notes 6 & 7)		19.6
		(Notes 6 & 8)		1.13
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	8	$^\circ\text{C}/\text{W}$	
		(Notes 6 & 8)		1.7
		(Notes 4 & 7)		13.6
		(Notes 5 & 7)		83.3
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	(Notes 6 & 7)	51.0	
		(Notes 6 & 8)	111	
Operating and Storage Temperature Range	$T_J, T_{STG}$	17.1	$^\circ\text{C}$	
		-55 to +150		

- Notes:
4. 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 and cathode pads connected to each half.
  5. Same as note (4), except the device is measured at  $t < 5$  sec.
  6. Same as note (4), except the device is surface mounted on 31mm x 31mm (10cm<sup>2</sup>) FR4 PCB with high coverage of single sided 1oz copper.
  7. For a dual device with one active die.
  8. For dual device with 2 active die running at equal power.
  9. Thermal resistance from junction to solder-point (on the exposed collector pad).

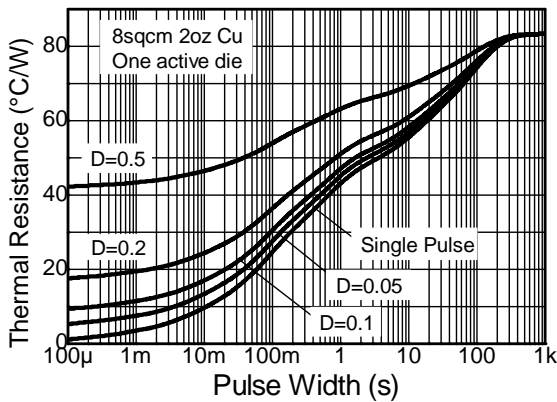
**NPN - Thermal Characteristics**



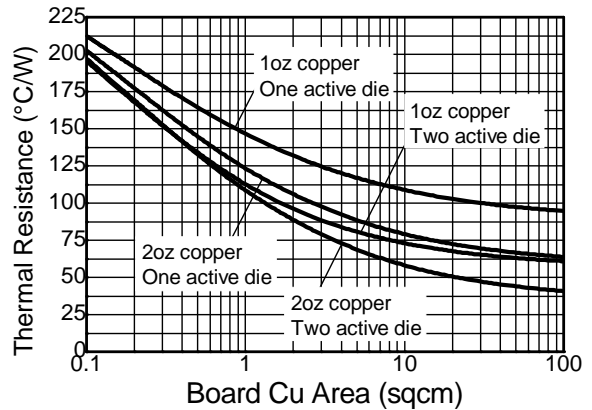
**Safe Operating Area**



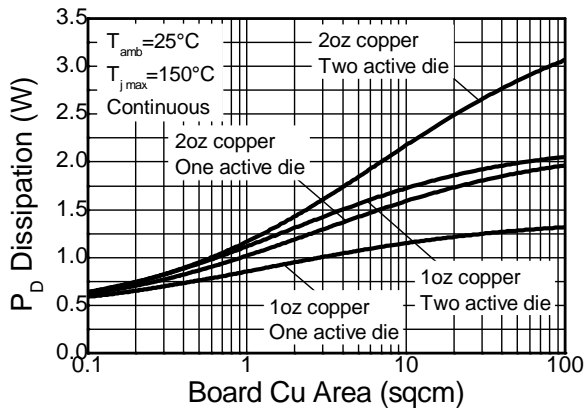
**Derating Curve**



**Transient Thermal Impedance**



**Thermal Resistance v Board Area**



**Power Dissipation v Board Area**

**Schottky - Maximum Ratings** @  $T_A = 25^\circ\text{C}$  unless otherwise specified

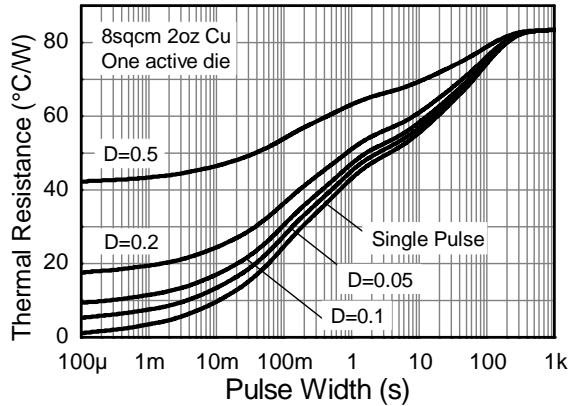
Parameter	Symbol	Limit	Unit	
Continuous Reverse Voltage	$V_R$	40	V	
Continuous Forward Current	$I_F$	1.85	A	
Repetitive Peak Forward Current	$I_{FRM}$	D = 0.5 Pulse width $\leq 300\mu\text{s}$		3
Non-Repetitive Peak Forward Surge Current		$t \leq 100\mu\text{s}$		12
	$t \leq 10\text{ms}$	7		

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

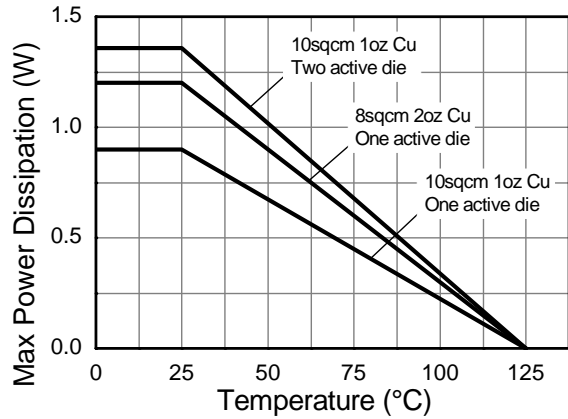
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	$P_D$	(Notes 10 & 13)	1.2
		(Notes 11 & 13)	12
		(Notes 12 & 13)	2
		(Notes 12 & 14)	20
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 10 & 13)	0.9
		(Notes 11 & 13)	9
		(Notes 12 & 13)	1.36
		(Notes 12 & 14)	13.6
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	20.2	$^\circ\text{C}/\text{W}$
Storage Temperature Range	$T_{STG}$	-55 to +150	$^\circ\text{C}$
Maximum Junction Temperature	$T_J$	125	

- Notes:
10. 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 cathode and collector pads connected to each half.
  11. Same as note (10), except the device is measured at  $t < 5$  sec.
  12. Same as note (10), except the device is surface mounted on 31mm x 31mm (10cm<sup>2</sup>) FR4 PCB with high coverage of single sided 1oz copper.
  13. For a dual device with one active die.
  14. For a dual device with 2 active die running at equal power.
  15. Thermal resistance from junction to solder-point (on the exposed cathode pad).

**Schottky - Thermal Characteristics**



**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



**Thermal Resistance v Board Area**

**ZXTNS618MC**

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

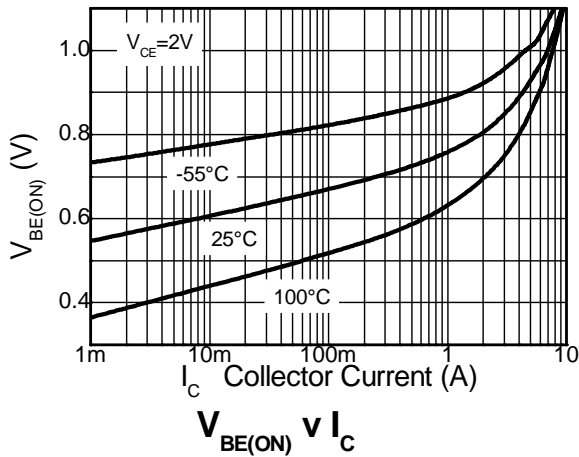
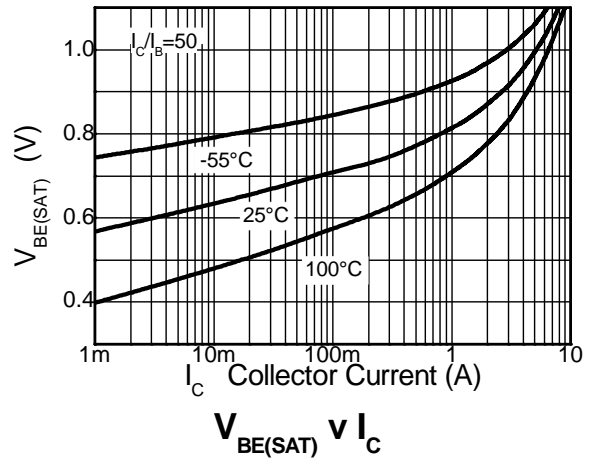
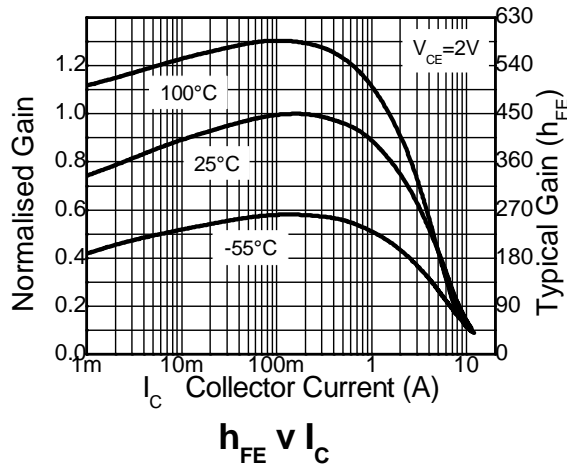
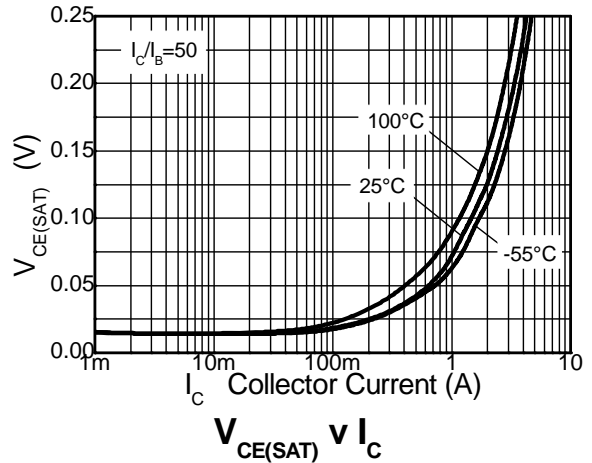
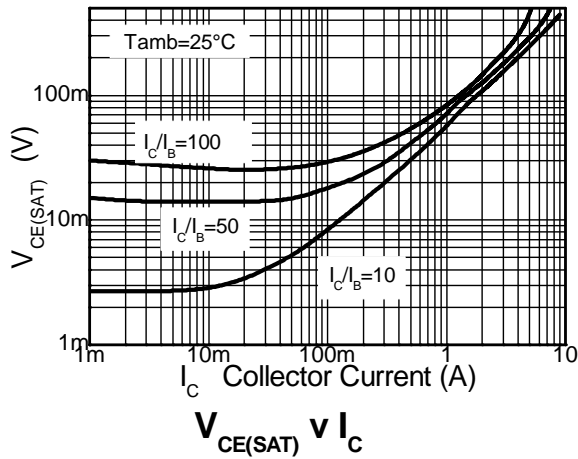
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	40	100	-	V	I <sub>C</sub> = 100μA
Collector-Emitter Breakdown Voltage (Note 16)	BV <sub>CEO</sub>	20	27	-	V	I <sub>C</sub> = 10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	7	8.2	-	V	I <sub>E</sub> = 100μA
Collector Cutoff Current	I <sub>CBO</sub>	-	-	100	nA	V <sub>CB</sub> = 32V
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> = 16V
Static Forward Current Transfer Ratio (Note 16)	h <sub>FE</sub>	200	400	-	-	I <sub>C</sub> = 10mA, V <sub>CE</sub> = 2V
		300	450	-		I <sub>C</sub> = 200mA, V <sub>CE</sub> = 2V
		200	360	-		I <sub>C</sub> = 2A, V <sub>CE</sub> = 2V
		100	180	-		I <sub>C</sub> = 6A, V <sub>CE</sub> = 2V
Collector-Emitter Saturation Voltage (Note 16)	V <sub>CE(sat)</sub>	-	8	15	mV	I <sub>C</sub> = 0.1A, I <sub>B</sub> = 10mA
		-	90	150		I <sub>C</sub> = 1A, I <sub>B</sub> = 10mA
		-	115	135		I <sub>C</sub> = 2A, I <sub>B</sub> = 50mA
		-	190	250		I <sub>C</sub> = 3A, I <sub>B</sub> = 100mA
		-	210	300		I <sub>C</sub> = 4.5A, I <sub>B</sub> = 125mA
Base-Emitter Turn-On Voltage (Note 16)	V <sub>BE(on)</sub>	-	0.88	-0.97	V	I <sub>C</sub> = 4.5A, V <sub>CE</sub> = 2V
Base-Emitter Saturation Voltage (Note 16)	V <sub>BE(sat)</sub>	-	0.98	-1.07	V	I <sub>C</sub> = 4.5A, I <sub>B</sub> = 125mA
Output Capacitance	C <sub>obo</sub>	-	23	30	pF	V <sub>CB</sub> = 10V, f = 1MHz
Transition Frequency	f <sub>T</sub>	100	140	-	MHz	V <sub>CE</sub> = 10V, I <sub>C</sub> = 50mA, f = 100MHz
Turn-on Time	t <sub>on</sub>	-	170	-	ns	V <sub>CC</sub> = 10V, I <sub>C</sub> = 3A
Turn-off Time	t <sub>off</sub>	-	400	-	ns	I <sub>B1</sub> = I <sub>B2</sub> = 10mA

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Breakdown Voltage	BV <sub>R</sub>	40	60	-	V	I <sub>R</sub> = -300μA
Forward Voltage (Note 16)	V <sub>F</sub>	-	240	270	mV	I <sub>F</sub> = 50mA
		-	265	290		I <sub>F</sub> = 100mA
		-	305	340		I <sub>F</sub> = 250mA
		-	355	400		I <sub>F</sub> = 500mA
		-	390	450		I <sub>F</sub> = 750mA
		-	425	500		I <sub>F</sub> = 1000mA
		-	495	600		I <sub>F</sub> = 1500mA
		-	420	-		I <sub>F</sub> = 1000mA, T <sub>A</sub> = 100°C
Reverse Current	I <sub>R</sub>	-	50	100	μA	V <sub>R</sub> = 30V
Diode Capacitance	C <sub>D</sub>	-	25	-	pF	V <sub>R</sub> = 25V, f = 1MHz
Reverse Recovery Time	t <sub>rr</sub>	-	12	-	Ns	switched from I <sub>F</sub> = 500mA to I <sub>R</sub> = 500mA Measured at I <sub>R</sub> = 50mA

Notes: 16. Measured under pulsed conditions. Pulse width ≤ 300μs. Duty cycle ≤ 2%.

**NPN - Typical Electrical Characteristics**



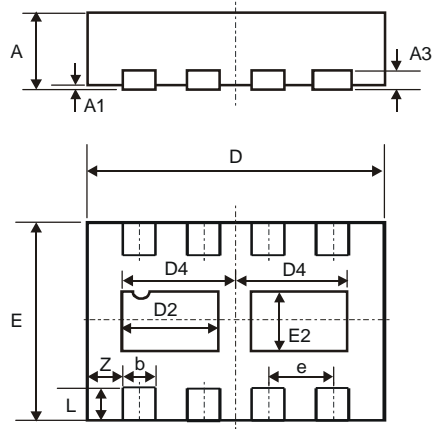
**Schottky - Typical Electrical Characteristics**





**ZXTNS618MC**

**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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