

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

6mm² footprint, 50% smaller than TSOP6 and SOT26

Lead-Free, RoHS Compliant (Note 1)

Halogen and Antimony Free. "Green" Device (Note 2)

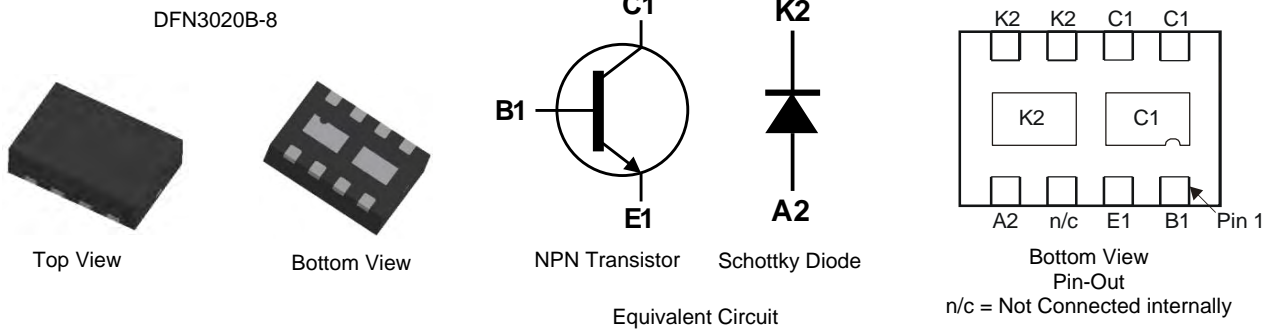
Qualified to AEC-Q101 Standards for High Reliability

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

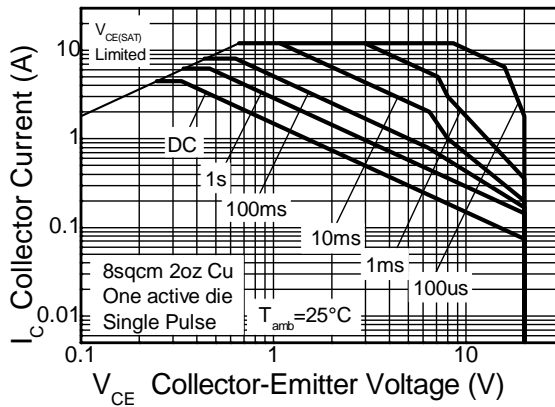
Parameter	Symbol	Limit	Unit
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	20	
Emitter-Base Voltage	V_{EBO}	7	
Peak Pulse Current	I_{CM}	12	A
Continuous Collector Current	(Notes 4 and 7)	4.5	
	(Notes 5 and 7)	5	
Base Current	I_B	1	

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

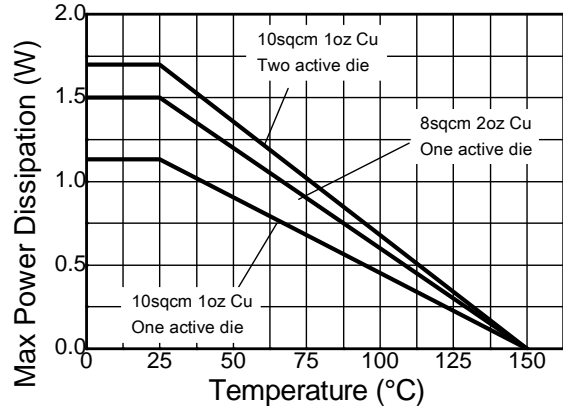
Characteristic	Symbol	Value	Unit	
Power Dissipation Linear Derating Factor	P_D	1.5	W mW/°C	
		(Notes 4 & 7)		12
		(Notes 5 & 7)		2.45
		(Notes 6 & 7)		19.6
		(Notes 6 & 8)		1.13
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	8	°C/W	
		(Notes 6 & 8)		1.7
		(Notes 4 & 7)		13.6
		(Notes 5 & 7)		83.3
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	51.0	°C/W	
(Notes 6 & 7)	111			
(Notes 6 & 8)	73.5			
Thermal Resistance, Junction to Lead	(Note 9)	$R_{\theta JL}$	17.1	
Operating and Storage Temperature Range	T_J, T_{STG}	-55 to +150	°C	

- Notes:
4. 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 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 (10cm²) 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).

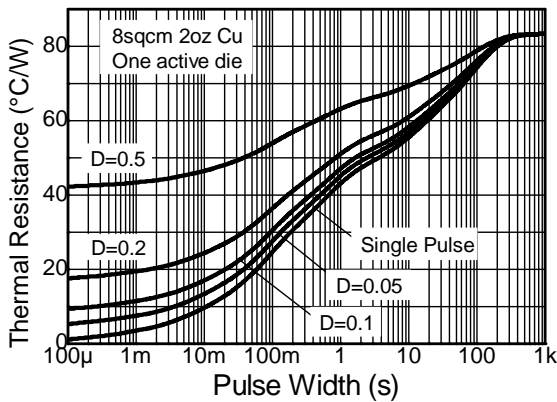
NPN - Thermal Characteristics



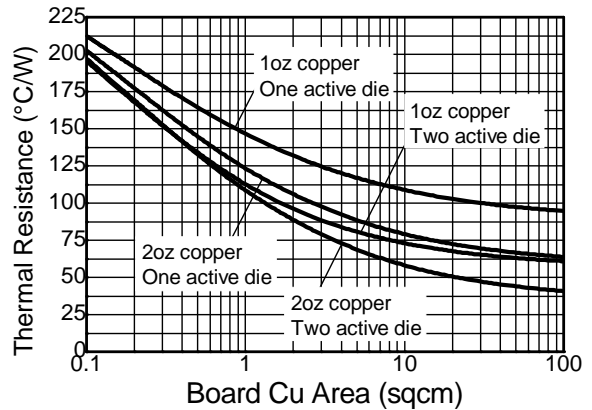
Safe Operating Area



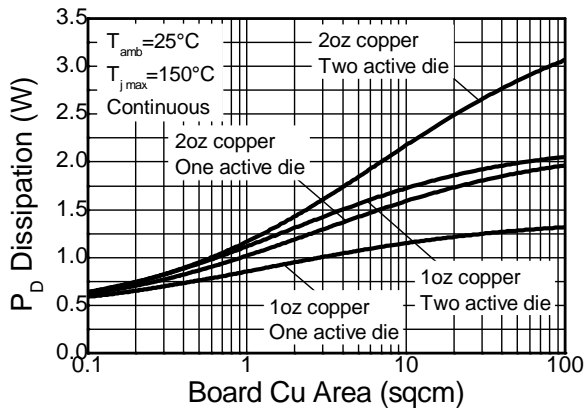
Derating Curve



Transient Thermal Impedance



Thermal Resistance v Board Area



Power Dissipation v Board Area

ZXTNS618MC

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

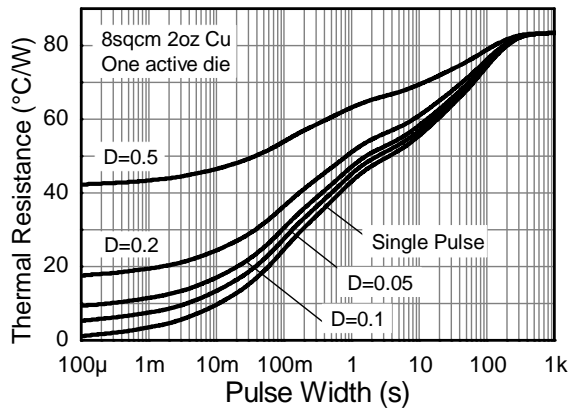
Parameter	Symbol	Limit	Unit	
Continuous Reverse Voltage	V_R	40	V	
Continuous Forward Current	I_F	1.85	A	
Repetitive Peak Forward Current	I_{FRM}	D = 0.5 Pulse width $\leq 300\mu\text{s}$		3
Non-Repetitive Peak Forward Surge Current		$t \leq 100\mu\text{s}$		12
	$t \leq 10\text{ms}$	7		

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

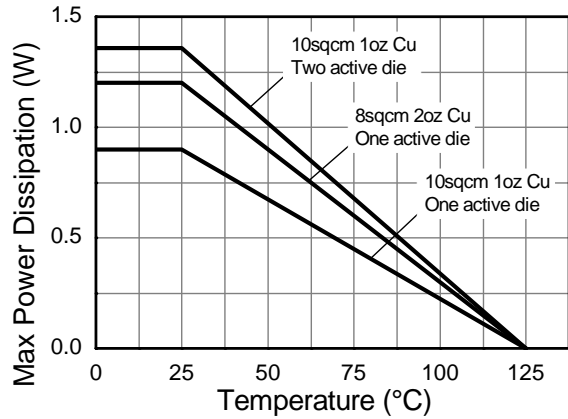
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P_D	(Notes 10 & 13)	1.2
		(Notes 11 & 13)	12
		(Notes 12 & 13)	2
		(Notes 12 & 14)	20
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 10 & 13)	0.9
		(Notes 11 & 13)	9
		(Notes 12 & 13)	1.36
		(Notes 12 & 14)	13.6
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 (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 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 (10cm²) 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

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NPN - Electrical Characteristics @T_A = 25°C unless otherwise specified

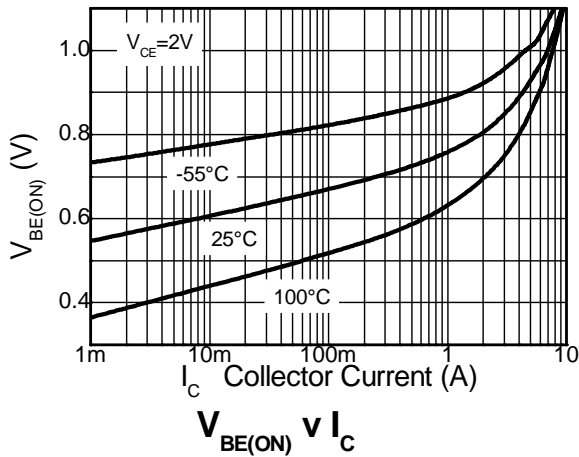
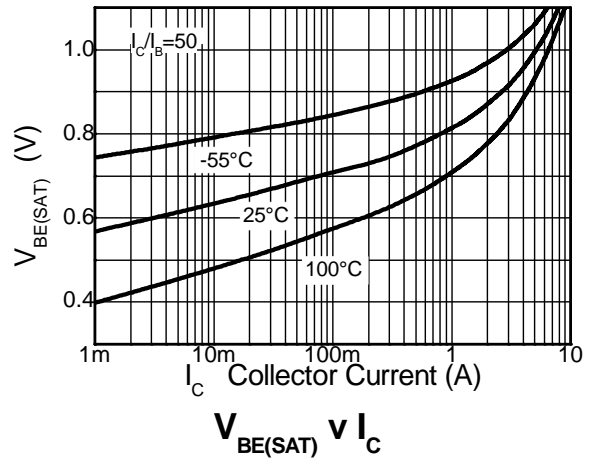
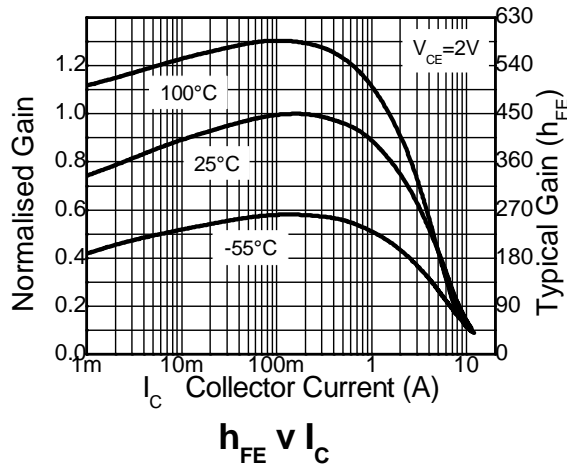
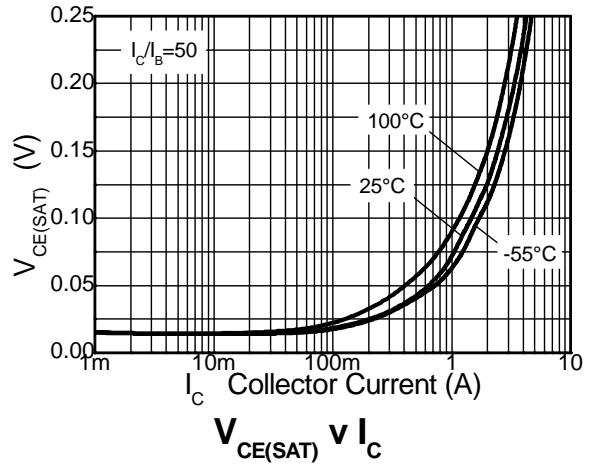
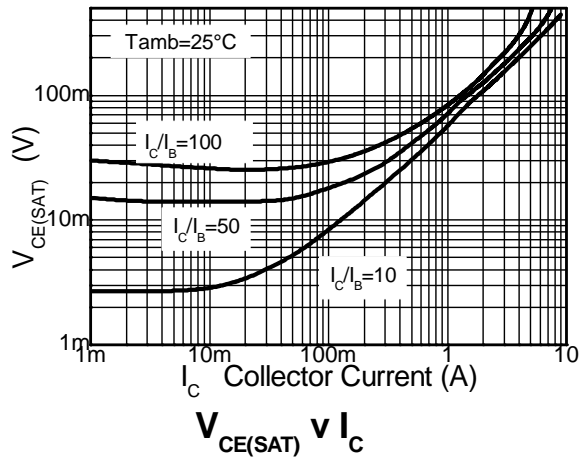
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV _{CBO}	40	100	-	V	I _C = 100μA
Collector-Emitter Breakdown Voltage (Note 16)	BV _{CEO}	20	27	-	V	I _C = 10mA
Emitter-Base Breakdown Voltage	BV _{EBO}	7	8.2	-	V	I _E = 100μA
Collector Cutoff Current	I _{CBO}	-	-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

Schottky - Electrical Characteristics @T_A = 25°C unless otherwise specified

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

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

NPN - Typical Electrical Characteristics

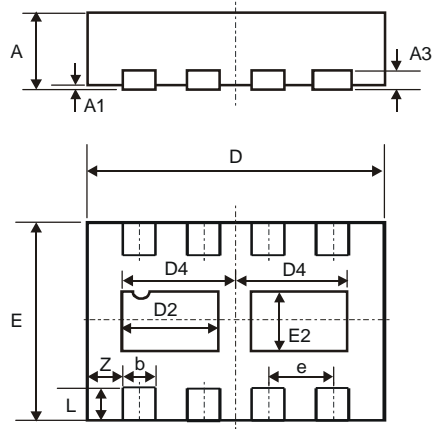


Schottky - Typical Electrical Characteristics



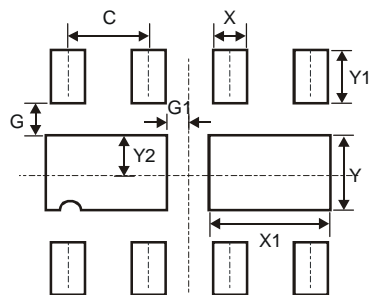
ZXTNS618MC

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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