

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)

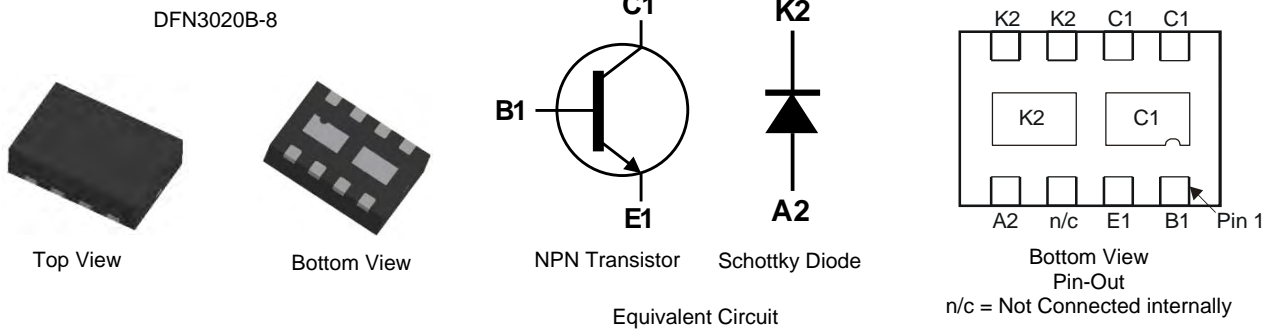
Qualified to AEC-Q101 Standards for High Reliability

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

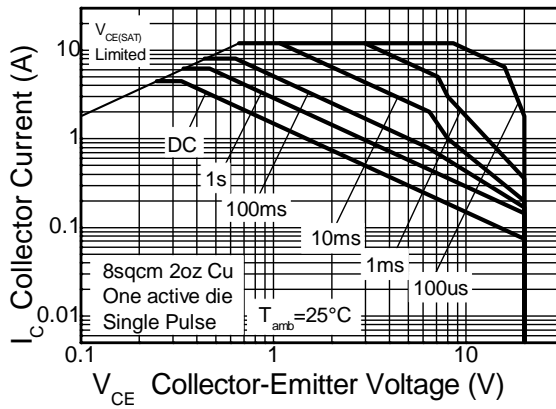
Parameter	Symbol	Limit	Unit
Collector-Base Voltage	V_{CBO}	40	V
Collector-Emitter Voltage	V_{CEO}	20	
Emitter-Base Voltage	V_{EBO}	7	
Peak Pulse Current	I_{CM}	12	A
Continuous Collector Current	(Notes 4 and 7)	4.5	
	(Notes 5 and 7)	5	
Base Current	I_B	1	

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

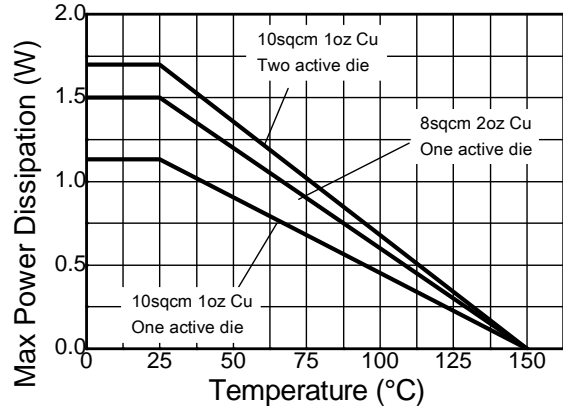
Characteristic	Symbol	Value	Unit	
Power Dissipation Linear Derating Factor	P_D	1.5	W mW/ $^\circ\text{C}$	
		(Notes 4 & 7)		12
		(Notes 5 & 7)		2.45
		(Notes 6 & 7)		19.6
		(Notes 6 & 8)		1.13
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	8	$^\circ\text{C}/\text{W}$	
		(Notes 6 & 8)		1.7
		(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 (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).

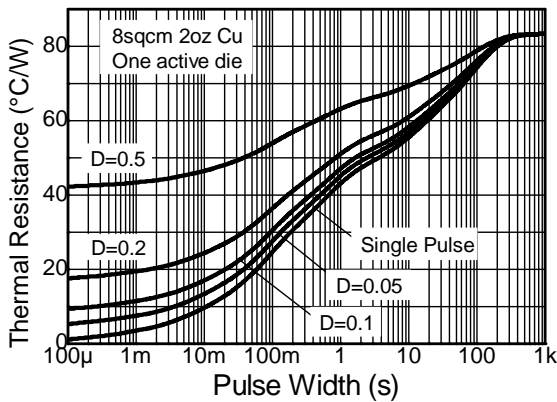
NPN - Thermal Characteristics



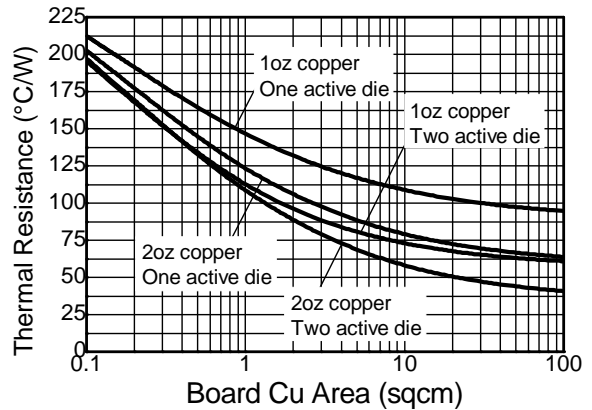
Safe Operating Area



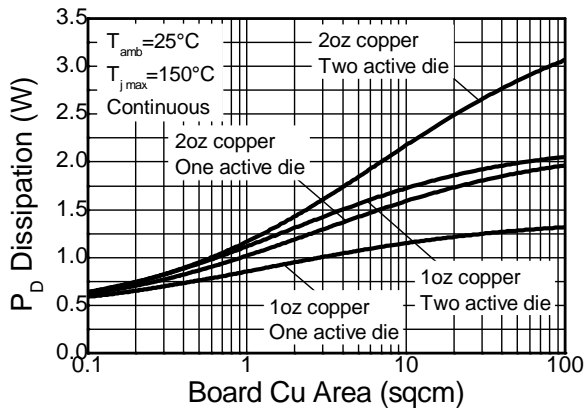
Derating Curve



Transient Thermal Impedance



Thermal Resistance v Board Area



Power Dissipation v Board Area

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

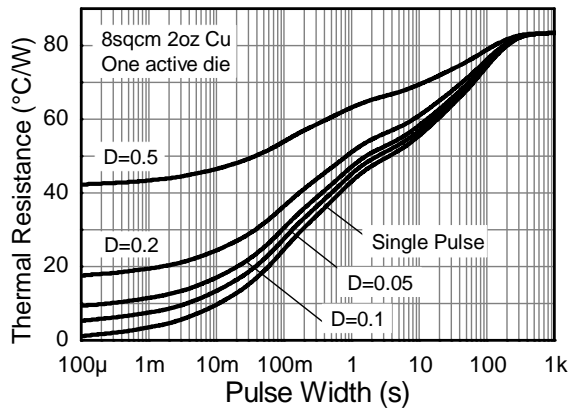
Parameter	Symbol	Limit	Unit	
Continuous Reverse Voltage	V_R	40	V	
Continuous Forward Current	I_F	1.85	A	
Repetitive Peak Forward Current	I_{FRM}	D = 0.5 Pulse width $\leq 300\mu\text{s}$		3
Non-Repetitive Peak Forward Surge Current		$t \leq 100\mu\text{s}$		12
	$t \leq 10\text{ms}$	7		

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

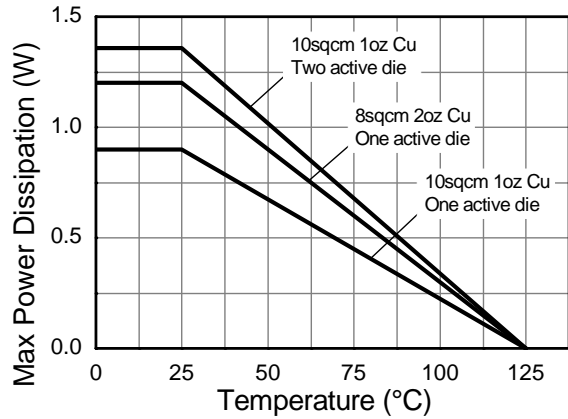
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	P_D	(Notes 10 & 13)	1.2
		(Notes 11 & 13)	12
		(Notes 12 & 13)	2
		(Notes 12 & 14)	20
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 10 & 13)	0.9
		(Notes 11 & 13)	9
		(Notes 12 & 13)	1.36
		(Notes 12 & 14)	13.6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

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

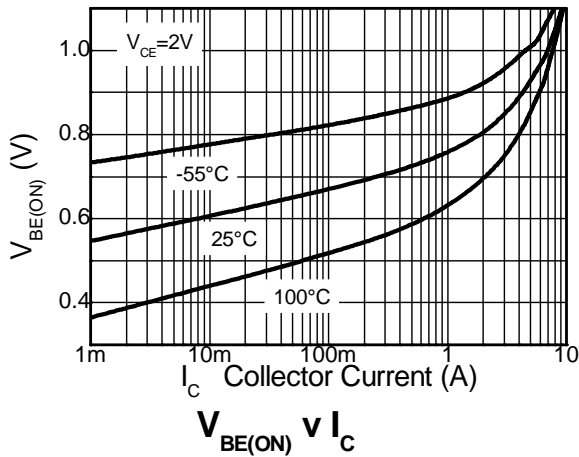
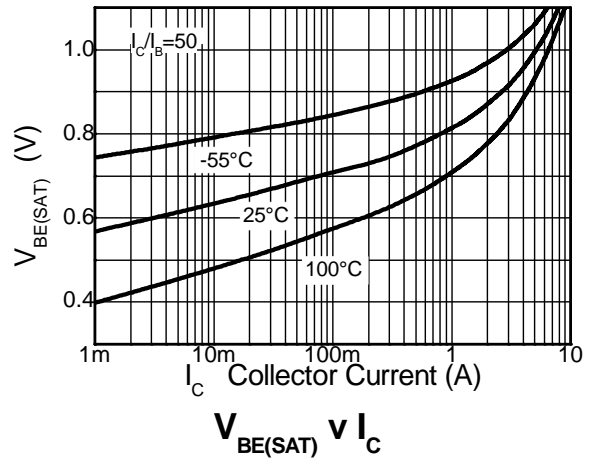
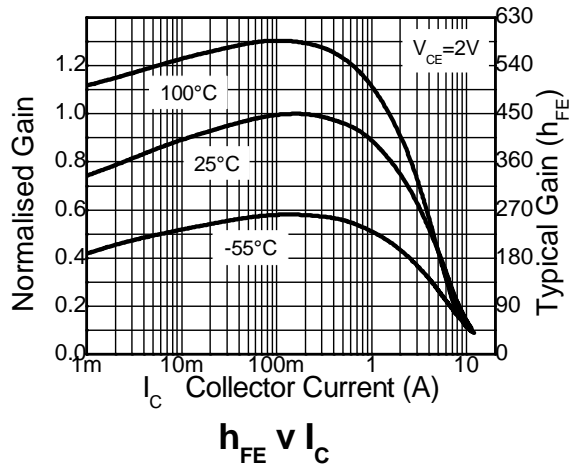
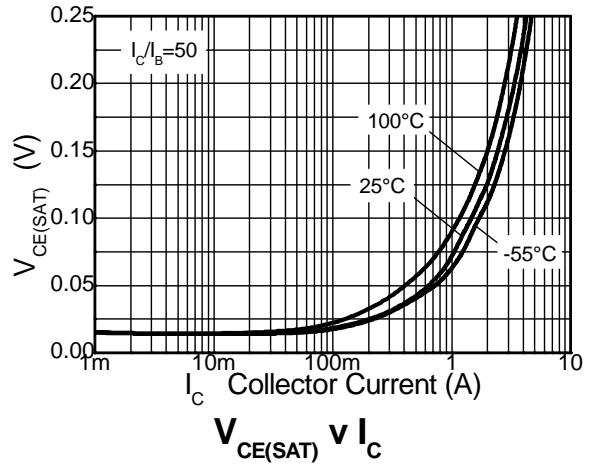
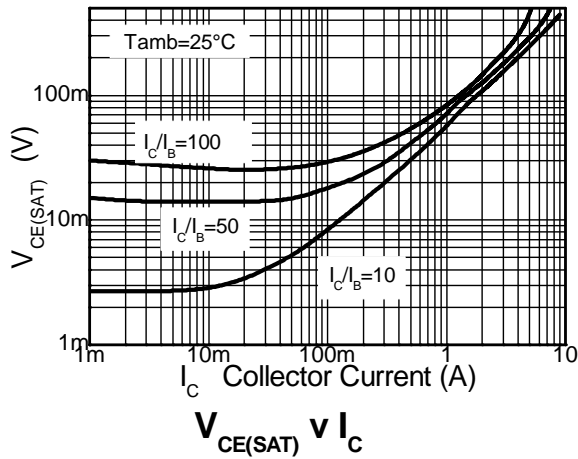
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV_{CBO}	40	100	-	V	$I_C = 100\mu\text{A}$
Collector-Emitter Breakdown Voltage (Note 16)	BV_{CEO}	20	27	-	V	$I_C = 10\text{mA}$
Emitter-Base Breakdown Voltage	BV_{EBO}	7	8.2	-	V	$I_E = 100\mu\text{A}$
Collector Cutoff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

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

Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Breakdown Voltage	BV_R	40	60	-	V	$I_R = -300\mu\text{A}$
Forward Voltage (Note 16)	V_F	-	240	270	mV	$I_F = 50\text{mA}$
		-	265	290		$I_F = 100\text{mA}$
		-	305	340		$I_F = 250\text{mA}$
		-	355	400		$I_F = 500\text{mA}$
		-	390	450		$I_F = 750\text{mA}$
		-	425	500		$I_F = 1000\text{mA}$
		-	495	600		$I_F = 1500\text{mA}$
		-	420	-		$I_F = 1000\text{mA}, T_A = 100^\circ\text{C}$
Reverse Current	I_R	-	50	100	μA	$V_R = 30\text{V}$
Diode Capacitance	C_D	-	25	-	pF	$V_R = 25\text{V}, f = 1\text{MHz}$
Reverse Recovery Time	t_{rr}	-	12	-	Ns	switched from $I_F = 500\text{mA}$ to $I_R = 500\text{mA}$ Measured at $I_R = 50\text{mA}$

Notes: 16. Measured under pulsed conditions. Pulse width $\leq 300\mu\text{s}$. Duty cycle $\leq 2\%$.

NPN - Typical Electrical Characteristics



Schottky - Typical Electrical Characteristics



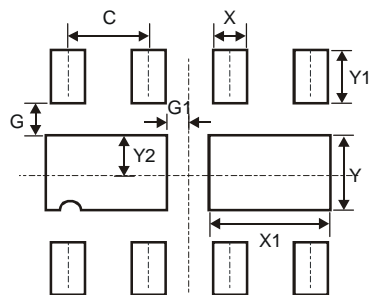
ZXTNS618MC

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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