

**ZXTPS720MC**

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

**Features and Benefits**

**PNP Transistor**

- $BV_{CEO} > -40V$
- $I_C = -3A$  Continuous Collector Current
- Low Saturation Voltage (-220mV max @ -1A)
- $R_{SAT} = 104m\Omega$  for a low equivalent On-Resistance
- $h_{FE}$  characterized up to -3A for high current gain hold up

**Schottky Diode**

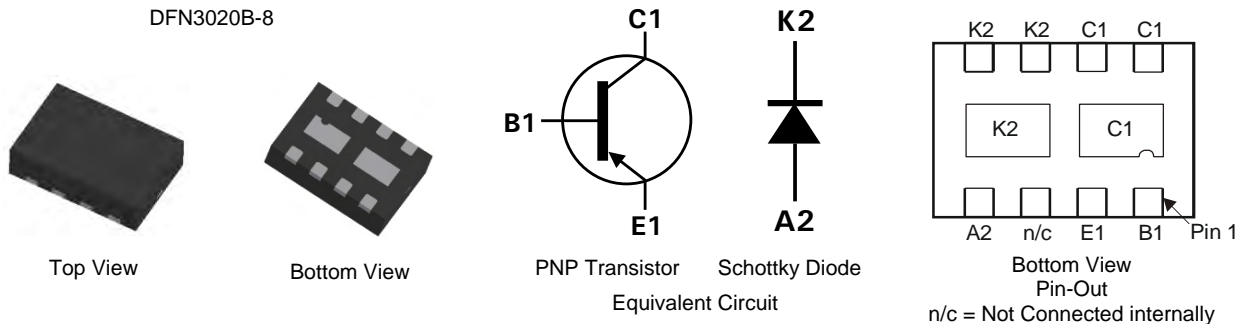
- $BV_R > 40V$
- $I_{FAV} = 3A$  Average Peak Forward Current
- Low  $V_F < 500mV$  (@1A) for reduced power loss
- Fast switching due to Schottky barrier
- Low profile 0.8mm high package for thin applications
- $R_{\theta JA}$  efficient, 40% lower than SOT26
- 6mm<sup>2</sup> footprint, 50% smaller 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
ZXTPS720MCTA	3S1	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**



3S1 = Product type marking code  
Top view, dot denotes pin 1

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

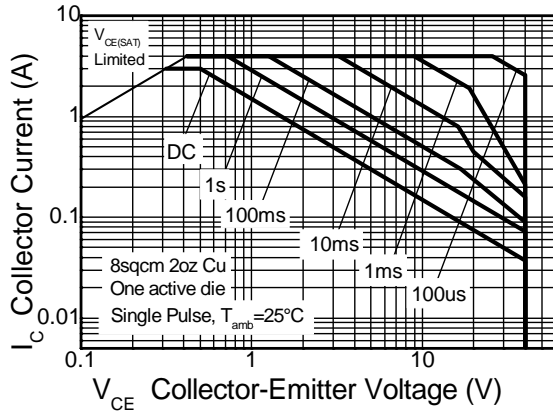
Parameter	Symbol	Limit	Unit
Collector-Base Voltage	$V_{CBO}$	-50	V
Collector-Emitter Voltage	$V_{CEO}$	-40	
Emitter-Base Voltage	$V_{EBO}$	-7	
Peak Pulse Current	$I_{CM}$	-4	A
Continuous Collector Current	(Notes 4 and 7)	-3	
	(Notes 5 and 7)	-3.4	
Base Current	$I_B$	-1	

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

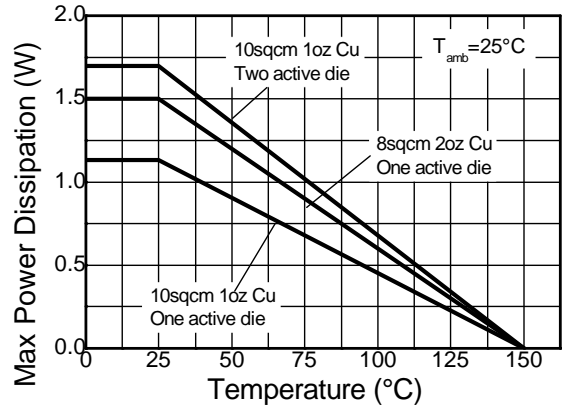
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	$P_D$	1.5	W mW/°C
		12	
		2.45	
		19.6	
		1.13	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	8	°C/W
		1.7	
		13.6	
		83.3	
		51.0	
Thermal Resistance, Junction to Lead	$R_{\theta JL}$	111	°C
		73.5	
Operating and Storage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

- Notes:
4. For a dual device surface mounted on 28mm x 28mm (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).

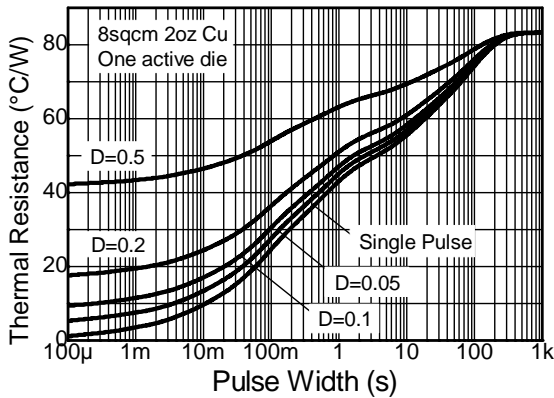
**PNP - Thermal Characteristics**



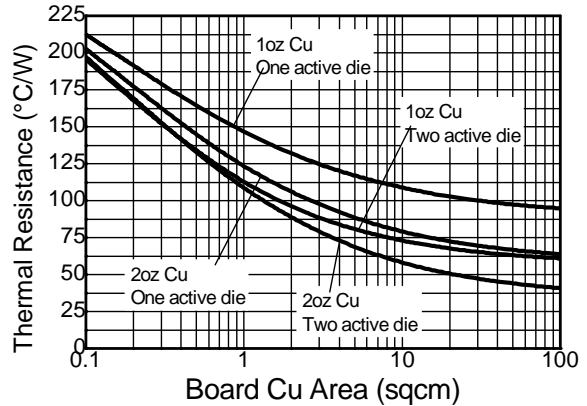
**Safe Operating Area**



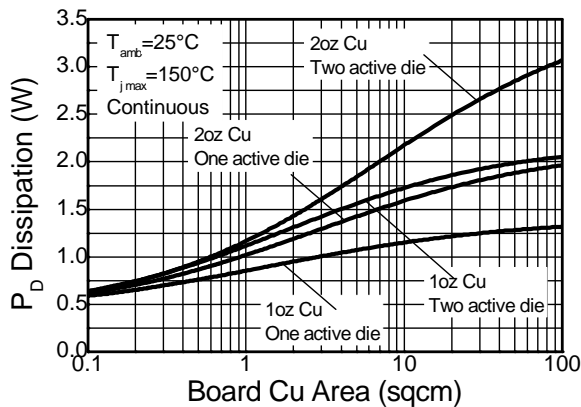
**Derating Curve**



**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

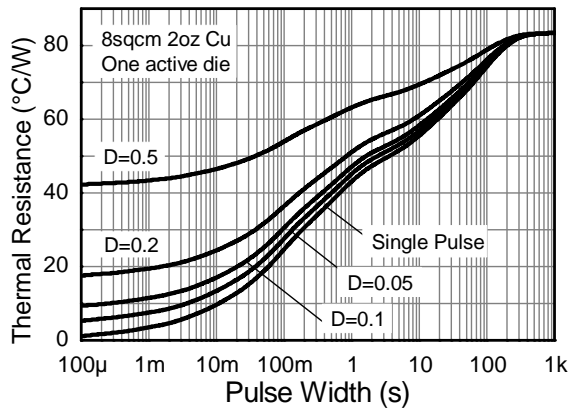
Parameter	Symbol	Limit	Unit	
Continuous Reverse Voltage	$V_R$	40	V	
Continuous Forward Current	$I_F$	1.85	A	
Repetitive Peak Forward Current	$I_{FRM}$	3		
Non-Repetitive Peak Forward Surge Current	$I_{FSM}$	$t \leq 100\mu\text{s}$		12
		$t \leq 10\text{ms}$		7

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

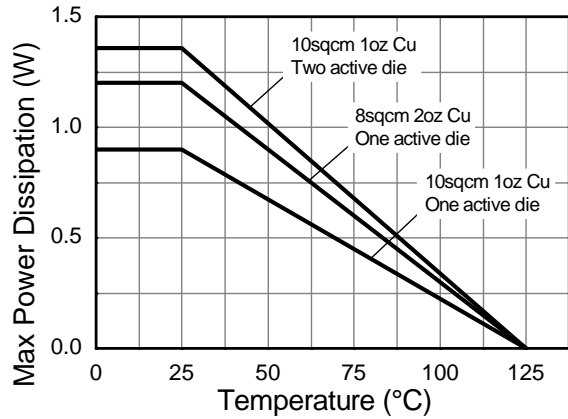
Characteristic	Symbol	Value	Unit
Power Dissipation Linear Derating Factor	$P_D$	(Notes 10 & 13)	1.2
		(Notes 11 & 13)	12
		(Notes 12 & 13)	2
		(Notes 12 & 14)	20
		(Notes 12 & 14)	0.9
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	(Notes 10 & 13)	9
		(Notes 11 & 13)	1.36
		(Notes 12 & 13)	13.6
		(Notes 12 & 14)	83.3
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 dual device with 2 active die running at equal power.
  15. Thermal resistance from junction to solder-point (on the exposed cathode pad).

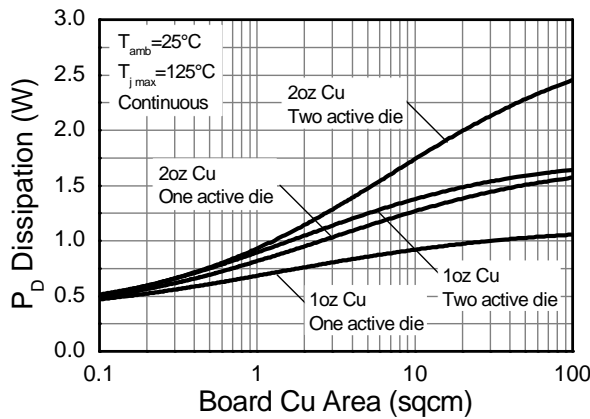
**Schottky - Thermal Characteristics**



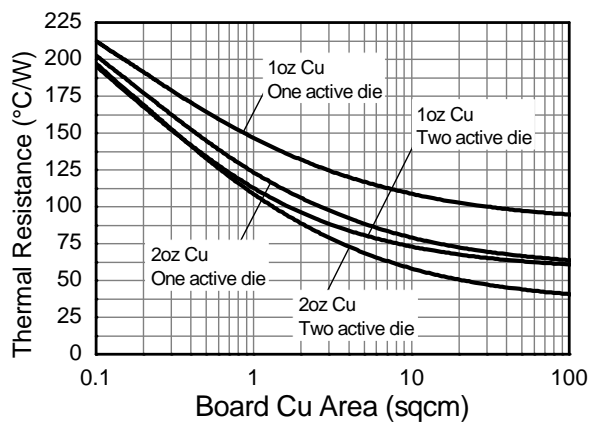
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



**Thermal Resistance v Board Area**

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

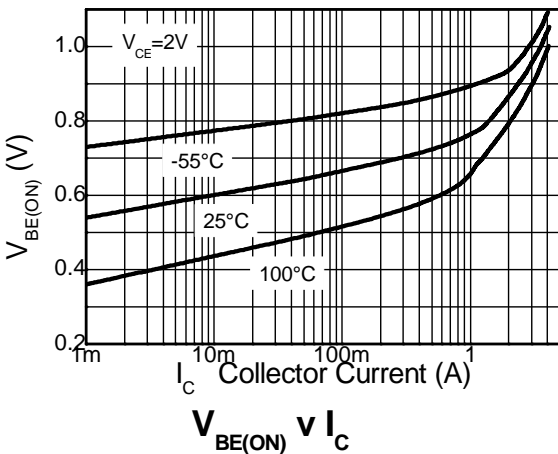
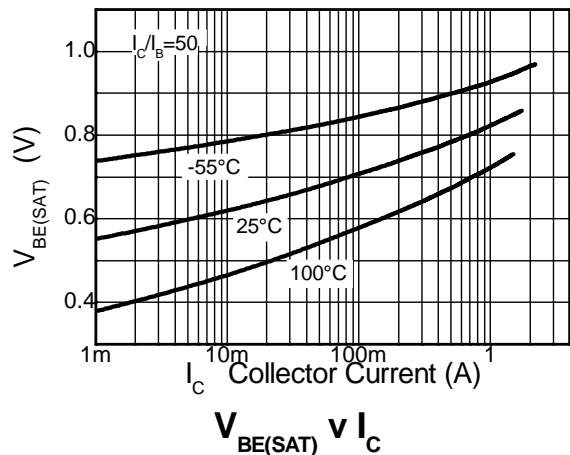
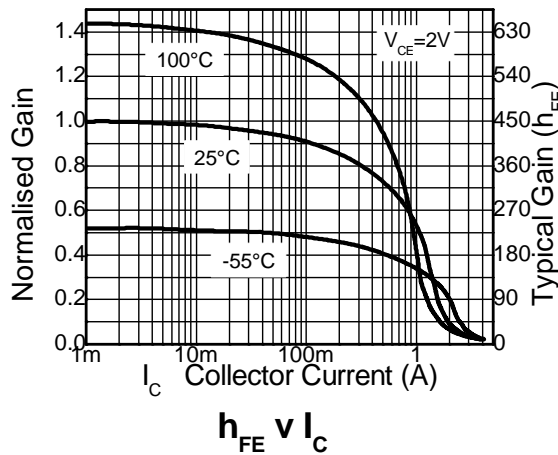
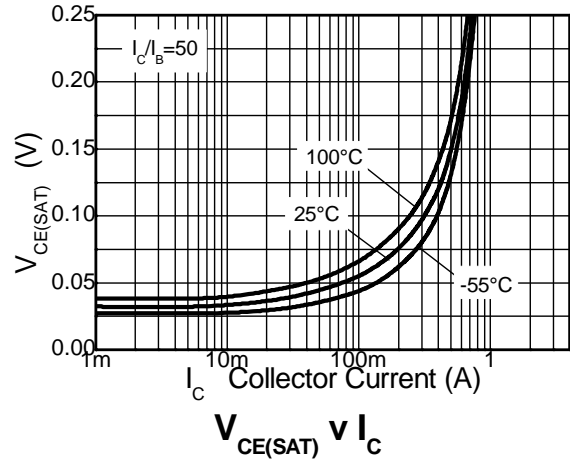
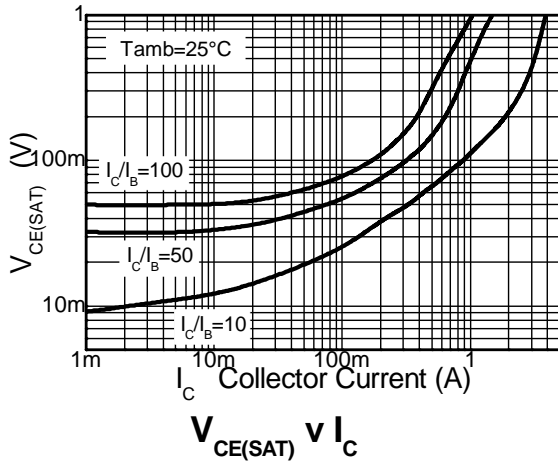
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Collector-Base Breakdown Voltage	BV <sub>CBO</sub>	-50	-80	-	V	I <sub>C</sub> = -100μA
Collector-Emitter Breakdown Voltage (Note 16)	BV <sub>CEO</sub>	-40	-70	-	V	I <sub>C</sub> = -10mA
Emitter-Base Breakdown Voltage	BV <sub>EBO</sub>	-7	-8.5	-	V	I <sub>E</sub> = -100μA
Collector Cutoff Current	I <sub>CBO</sub>	-	-	-100	nA	V <sub>CB</sub> = -40V
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> = -32V
Static Forward Current Transfer Ratio (Note 16)	h <sub>FE</sub>	300	480	-	-	I <sub>C</sub> = -10mA, V <sub>CE</sub> = -2V
		300	450	-		I <sub>C</sub> = -100mA, V <sub>CE</sub> = -2V
		180	290	-		I <sub>C</sub> = -1A, V <sub>CE</sub> = -2V
		60	130	-		I <sub>C</sub> = -1.5A, V <sub>CE</sub> = -2V
		12	22	-		I <sub>C</sub> = -3A, V <sub>CE</sub> = -2V
Collector-Emitter Saturation Voltage (Note 16)	V <sub>CE(sat)</sub>	-	-25	-40	mV	I <sub>C</sub> = -0.1A, I <sub>B</sub> = -10mA
		-	-150	-220		I <sub>C</sub> = -1A, I <sub>B</sub> = -50mA
		-	-195	-300		I <sub>C</sub> = -1.5A, I <sub>B</sub> = -100mA
		-	-210	-300		I <sub>C</sub> = -2A, I <sub>B</sub> = -200mA
		-	-260	-370		I <sub>C</sub> = -2.5A, I <sub>B</sub> = -250mA
Base-Emitter Turn-On Voltage (Note 16)	V <sub>BE(on)</sub>	-	-0.89	-0.95	V	I <sub>C</sub> = -2.5A, V <sub>CE</sub> = -2V
Base-Emitter Saturation Voltage (Note 16)	V <sub>BE(sat)</sub>	-	-0.97	-1.05	V	I <sub>C</sub> = -2.5A, I <sub>B</sub> = -250mA
Output Capacitance	C <sub>obo</sub>	-	19	25	pF	V <sub>CB</sub> = -10V, f = 1MHz
Transition Frequency	f <sub>T</sub>	150	190	-	MHz	V <sub>CE</sub> = -10V, I <sub>C</sub> = -50mA, f = 100MHz
Turn-on Time	t <sub>on</sub>	-	40	-	ns	V <sub>CC</sub> = -15V, I <sub>C</sub> = -0.75A
Turn-off Time	t <sub>off</sub>	-	435	-	ns	I <sub>B1</sub> = I <sub>B2</sub> = -15mA

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

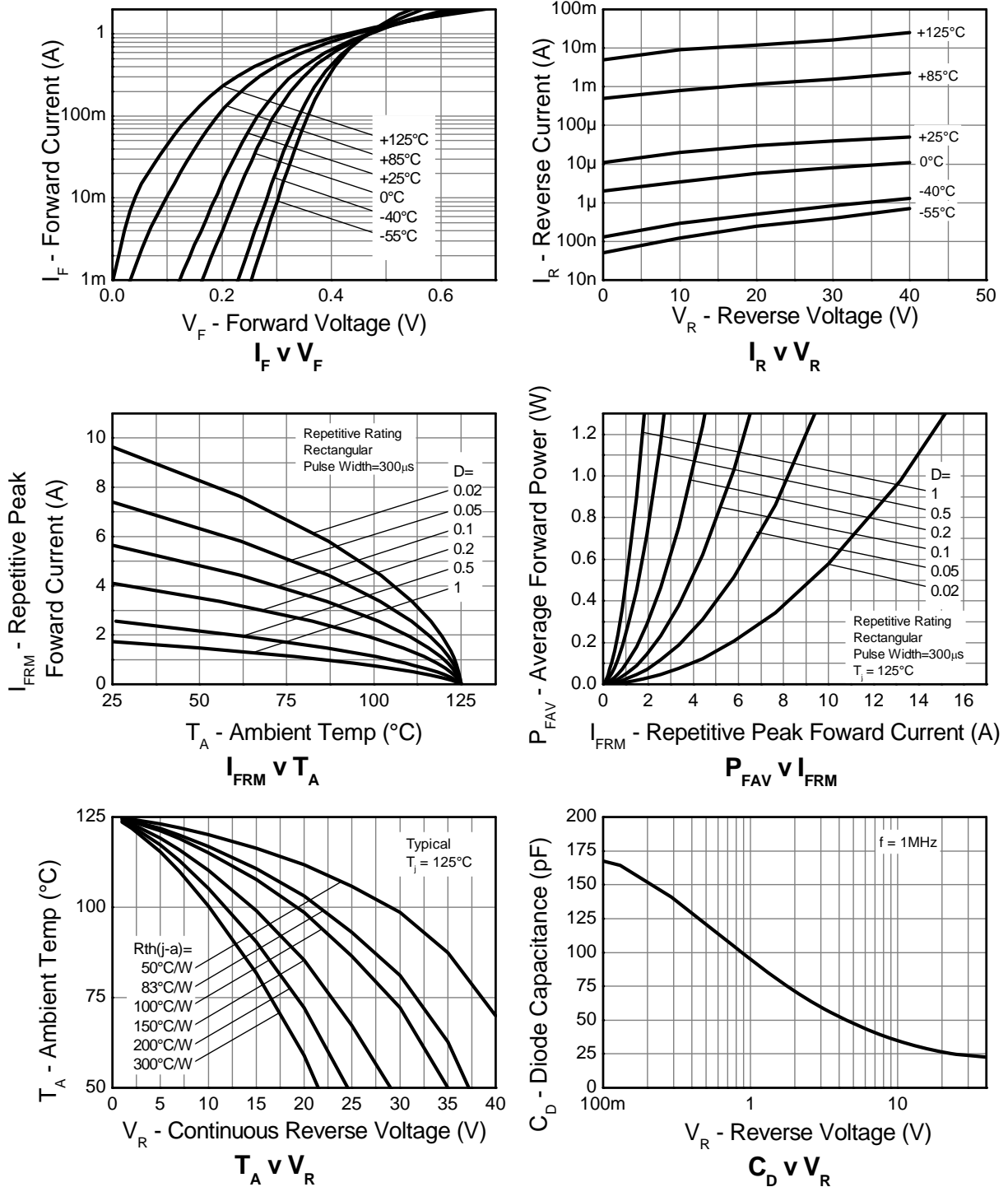
Characteristic	Symbol	Min	Typ	Max	Unit	Test Condition
Reverse Breakdown Voltage	BV <sub>R</sub>	40	60	-	V	I <sub>R</sub> = -300μA
Forward Voltage (Note 16)	V <sub>F</sub>	-	240	270	mV	I <sub>F</sub> = 50mA
		-	265	290		I <sub>F</sub> = 100mA
		-	305	340		I <sub>F</sub> = 250mA
		-	355	400		I <sub>F</sub> = 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%.

**PNP - Typical Electrical Characteristics**



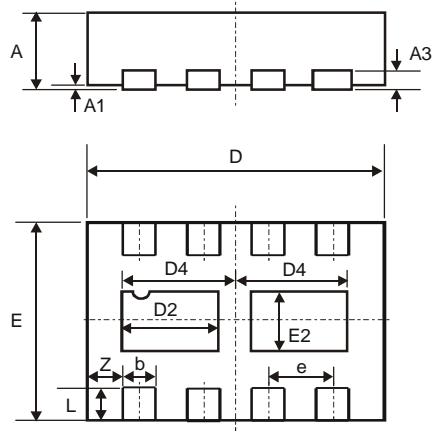
**Schottky - Typical Electrical Characteristics**





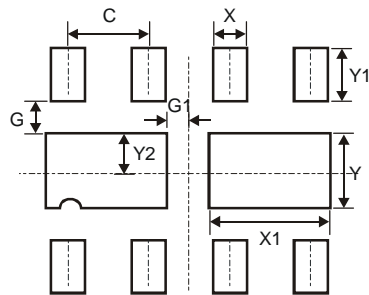
**ZXTPS720MC**

**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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