

**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**

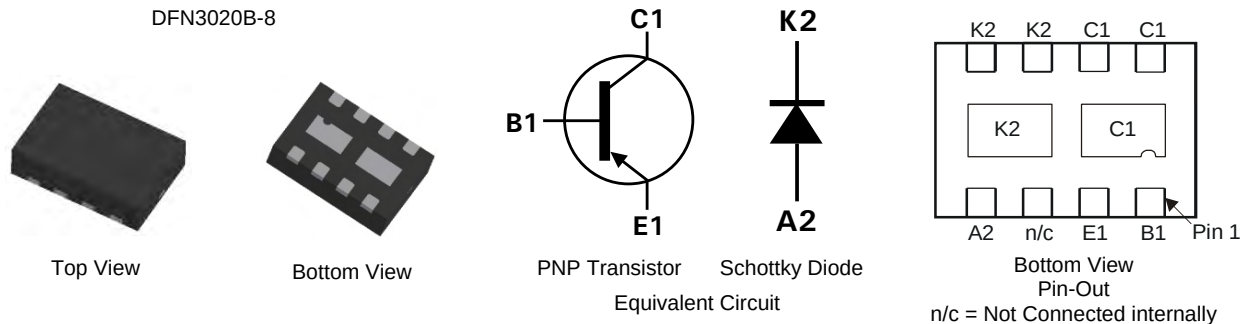
- $BV_R > 40V$
- $I_{FAV} = 3A$  Average Peak Forward Current
- Low  $V_F < 500mV$  (@ $1A$ ) for reduced power loss
- Fast switching due to Schottky barrier
- Low profile 0.8mm high package for thin applications
- $R_{\theta JA}$  efficient, 40% lower than SOT26
- $6mm^2$  footprint, 50% smaller than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

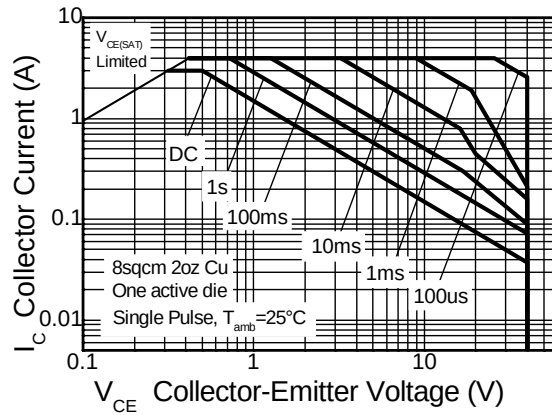
| Parameter                    | Symbol    | Limit | Unit |
|------------------------------|-----------|-------|------|
| Collector-Base Voltage       | $V_{CBO}$ | -50   | V    |
| Collector-Emitter Voltage    | $V_{CEO}$ | -40   |      |
| Emitter-Base Voltage         | $V_{EBO}$ | -7    |      |
|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

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

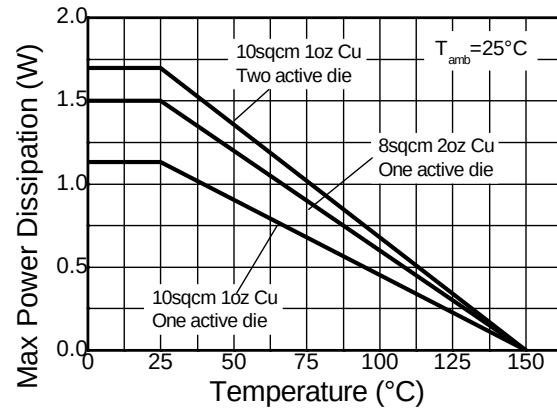
| Characteristic                              | Symbol          | Value       | Unit                      |
|---------------------------------------------|-----------------|-------------|---------------------------|
| Power Dissipation<br>Linear Derating Factor | $P_D$           | 1.5         | W<br>mW/ $^\circ\text{C}$ |
|                                             |                 | 12          |                           |
|                                             |                 | 2.45        |                           |
|                                             |                 | 19.6        |                           |
|                                             |                 | 1.13        |                           |
| Thermal Resistance, Junction to Ambient     | $R_{\theta JA}$ | 8           | $^\circ\text{C/W}$        |
|                                             |                 | 1.7         |                           |
|                                             |                 | 13.6        |                           |
|                                             |                 | 83.3        |                           |
|                                             |                 | 51.0        |                           |
| Thermal Resistance, Junction to Lead        | $R_{\theta JL}$ | 111         | $^\circ\text{C/W}$        |
|                                             |                 | 73.5        |                           |
|                                             |                 | 17.1        |                           |
| Operating and Storage Temperature Range     | $T_J, T_{STG}$  | -55 to +150 | $^\circ\text{C}$          |

- 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).

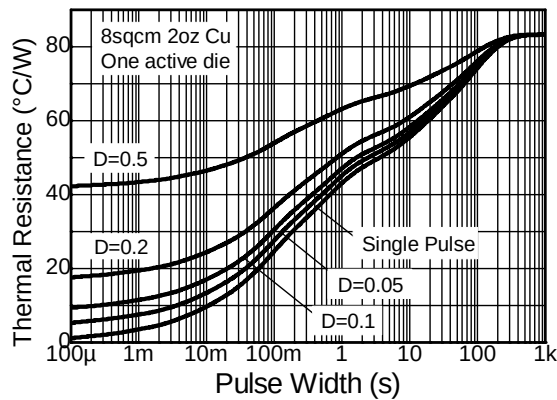
## PNP - Thermal Characteristics



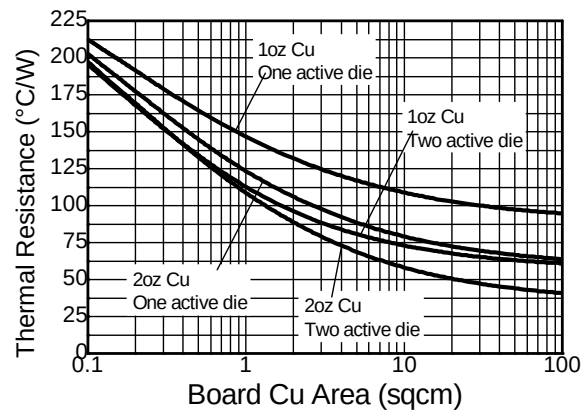
**Safe Operating Area**



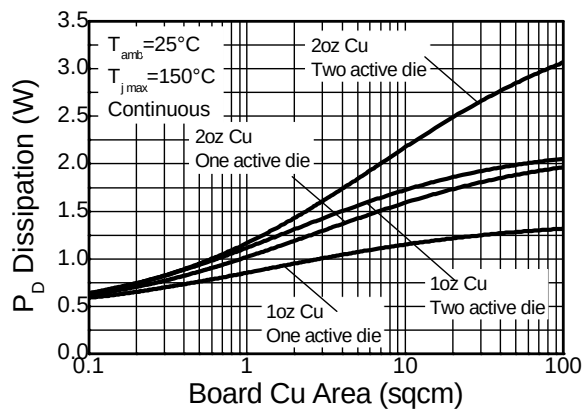
**Derating Curve**



**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

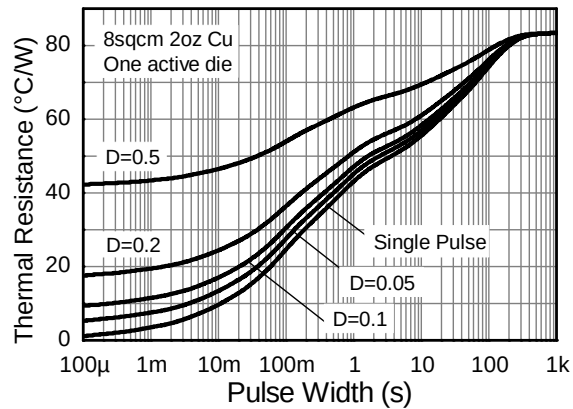
| Parameter                                 |                                                | Symbol    | Limit | Unit |
|-------------------------------------------|------------------------------------------------|-----------|-------|------|
| Continuous Reverse Voltage                |           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

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

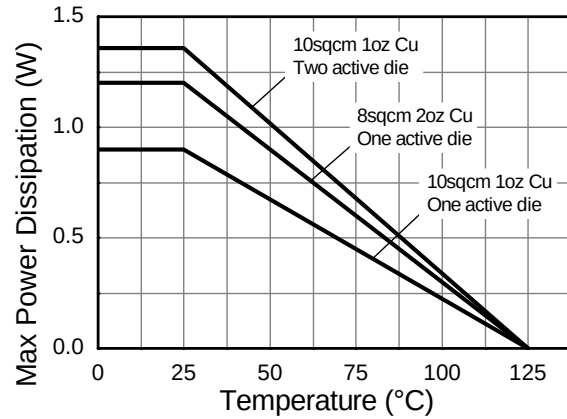
| Characteristic                              |                 | Symbol          | Value       | Unit                      |
|---------------------------------------------|-----------------|-----------------|-------------|---------------------------|
| Power Dissipation<br>Linear Derating Factor | (Notes 10 & 13) | $P_D$           | 1.2         | W<br>mW/ $^\circ\text{C}$ |
|                                             | (Notes 11 & 13) |                 | 12          |                           |
|                                             | (Notes 12 & 13) |                 | 2           |                           |
|                                             | (Notes 12 & 14) |                 | 20          |                           |
|                                             | (Notes 12 & 14) |                 | 0.9         |                           |
| Thermal Resistance, Junction to Ambient     | (Notes 10 & 13) | $R_{\theta JA}$ | 9           | $^\circ\text{C/W}$        |
|                                             | (Notes 11 & 13) |                 | 1.36        |                           |
|                                             | (Notes 12 & 13) |                 | 13.6        |                           |
|                                             | (Notes 12 & 14) |                 | 83.3        |                           |
| Thermal Resistance, Junction to Lead        | (Note 15)       | $R_{\theta JL}$ | 51.0        | $^\circ\text{C}$          |
| Storage Temperature Range                   |                 | $T_{STG}$       | 111         |                           |
| Maximum Junction Temperature                |                 | $T_J$           | 73.5        |                           |
|                                             |                 |                 | 20.2        |                           |
|                                             |                 |                 | -55 to +150 |                           |
|                                             |                 |                 | 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).

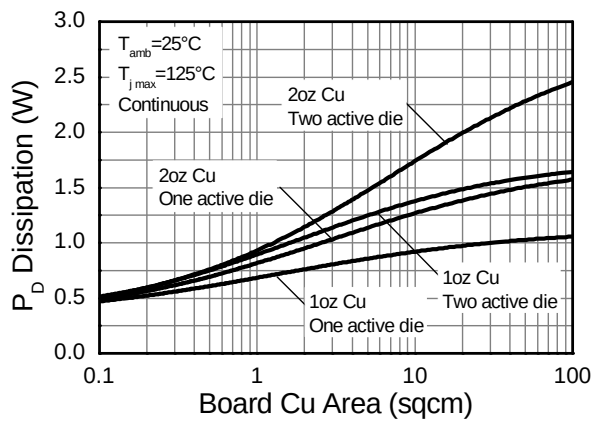
## Schottky - Thermal Characteristics



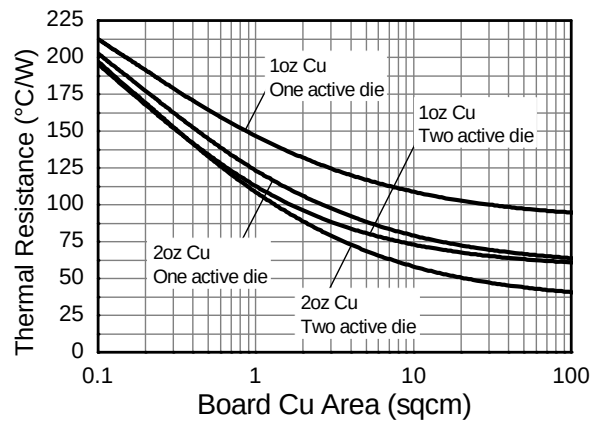
**Transient Thermal Impedance**



**Derating Curve**



**Power Dissipation v Board Area**



**Thermal Resistance v Board Area**

**ZXTPS720MC**
**PNP - Electrical Characteristics** @T<sub>A</sub> = 25°C unless otherwise specified

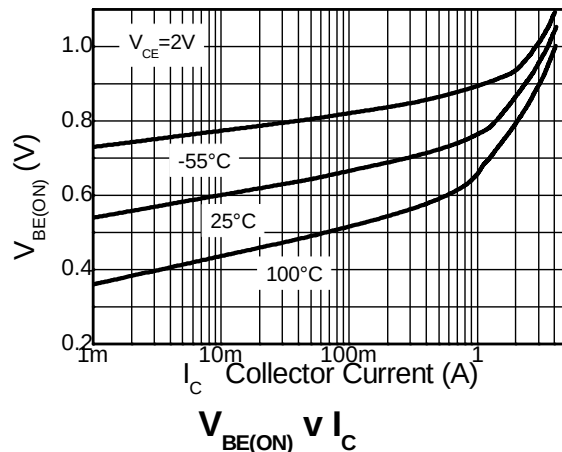
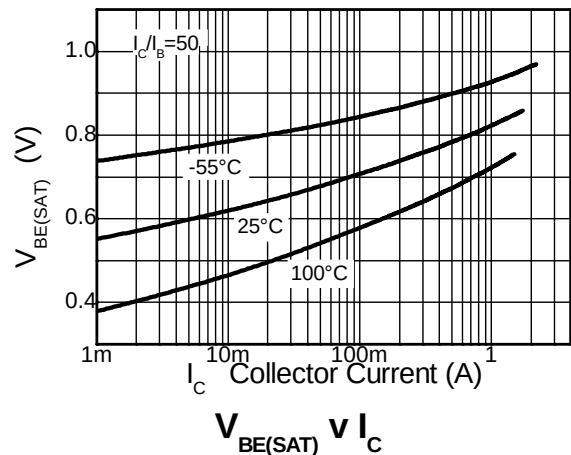
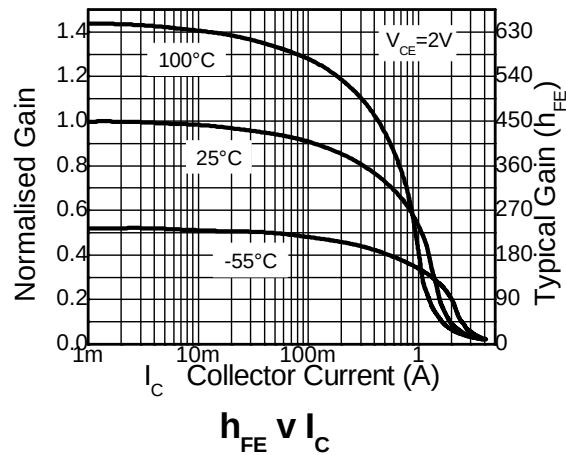
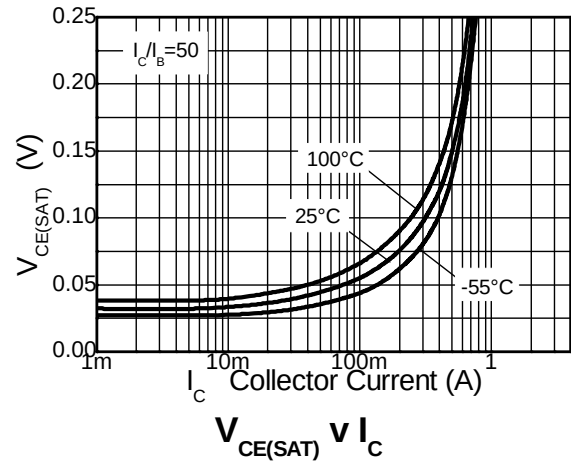
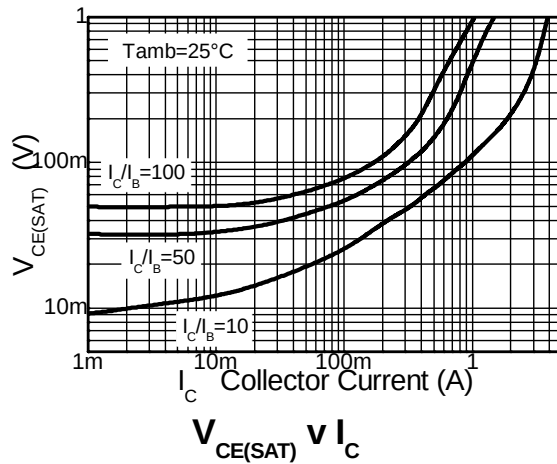
| Characteristic                                  | Symbol               | Min | Typ   | Max   | Unit | Test Condition                                             |
|-------------------------------------------------|----------------------|-----|-------|-------|------|------------------------------------------------------------|
| 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

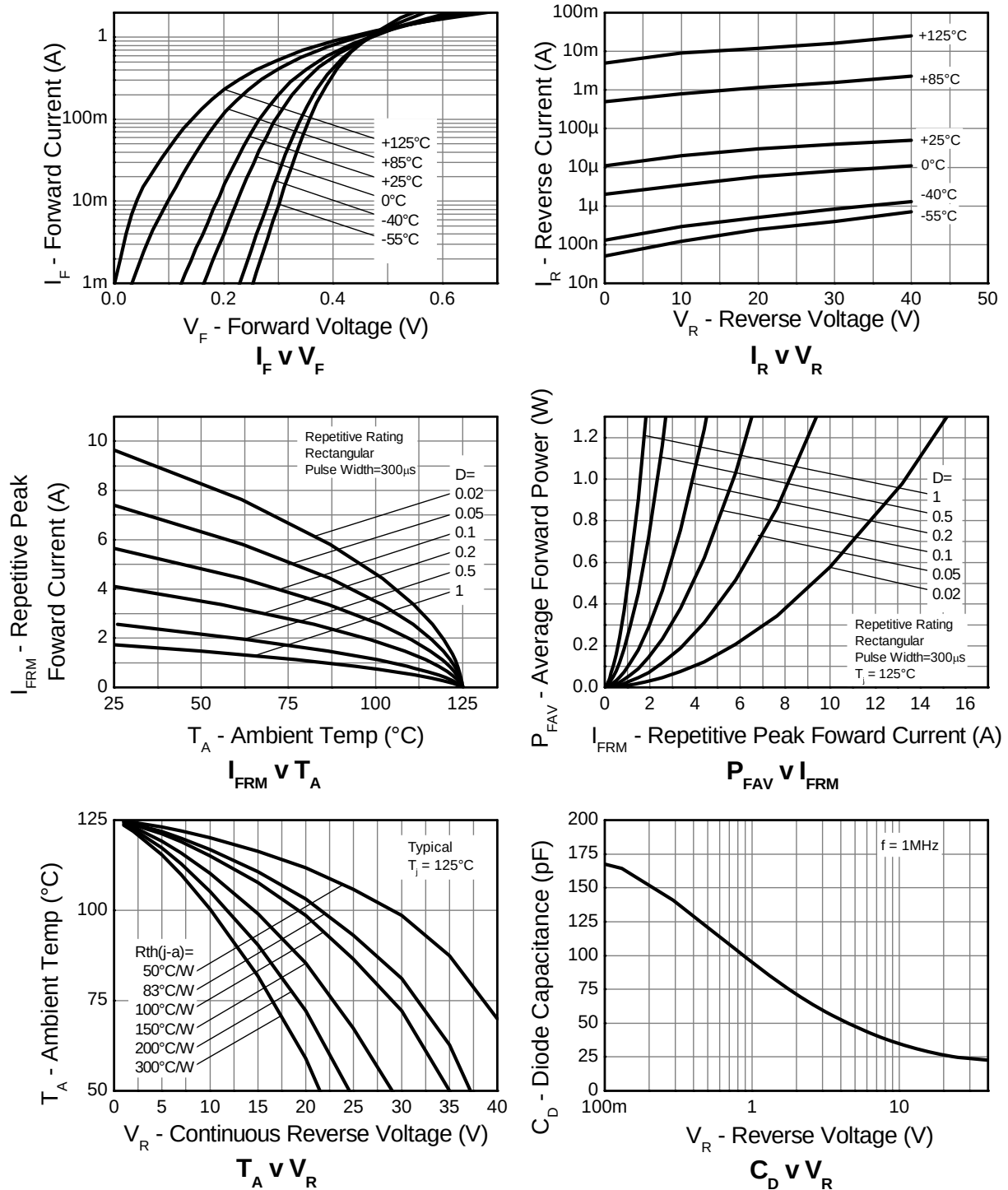
| Characteristic            | Symbol          | Min | Typ | Max | Unit | Test Condition                                                                                         |
|---------------------------|-----------------|-----|-----|-----|------|--------------------------------------------------------------------------------------------------------|
| 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<br>I <sub>F</sub> = 500mA to I <sub>R</sub> = 500mA<br>Measured at I <sub>R</sub> = 50mA |

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

## PNP - Typical Electrical Characteristics

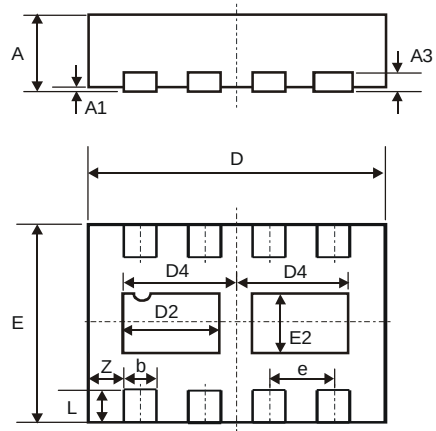


## Schottky - Typical Electrical Characteristics



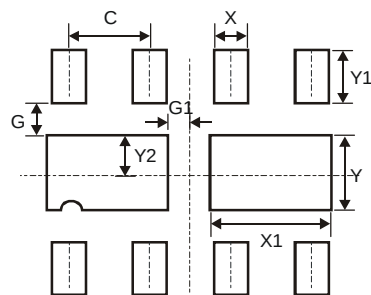


## Package Outline Dimensions



| 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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