

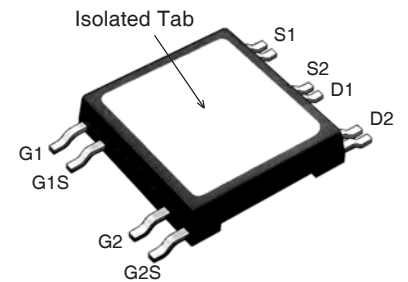
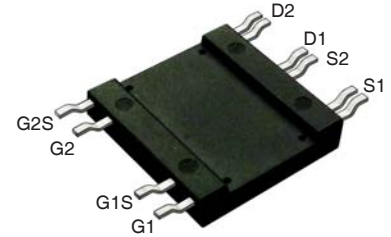
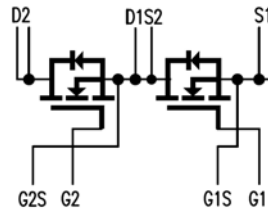
**Polar3™ HiperFET™  
Power MOSFET**
**MMIX2F60N50P3**

$$V_{DSS} = 500V$$

$$I_{D25} = 30A$$

$$R_{DS(on)} \leq 120m\Omega$$

**(Electrically Isolated Tab)**

 N-Channel Enhancement Mode  
 Avalanche Rated  
 Fast Intrinsic Rectifier

 G = Gate      D = Drain  
 S = Source

| Symbol        | Test Conditions  | Maximum Ratings  |                  |
|---------------|--|------------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 500              | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 500              | V                |
| $V_{GSS}$     | Continuous   | $\pm 30$         | V                |
| $V_{GSM}$     | Transient  | $\pm 40$         | V                |
| $I_{D25}$     | $T_C = 25^\circ\text{C}$   | 30               | A                |
| $I_{DM}$      | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 150              | A                |
| $I_A$         | $T_C = 25^\circ\text{C}$   | 30               | A                |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$   | 1                | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 35               | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$   | 320              | W                |
| $T_J$         |  | -55 ... +150     | $^\circ\text{C}$ |
| $T_{JM}$      |  | 150              | $^\circ\text{C}$ |
| $T_{stg}$     |  | -55 ... +150     | $^\circ\text{C}$ |
| $T_L$         | Maximum Lead Temperature for Soldering                                   | 300              | $^\circ\text{C}$ |
| $T_{SOLD}$    | 1.6 mm (0.062in.) from Case for 10s                                      | 260              | $^\circ\text{C}$ |
| $V_{ISOL}$    | 50/60 Hz, 1 Minute   | 2500             | V~               |
| $F_C$         | Mounting Force   | 50..200 / 11..45 | N/lb             |
| <b>Weight</b> |  | 8                | g                |

**Features**

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Substrate
  - Excellent Thermal Transfer
  - Increased Temperature and Power Cycling Capability
  - High Isolation Voltage (2500V~)
- Fast Intrinsic Rectifier
- Avalanche Rated
- Low  $R_{DS(ON)}$  and  $Q_G$
- Low Package Inductance

**Advantages**

- High Power Density
- Easy to Mount
- Space Savings

**Applications**

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|---|-----------------------|------|--------------------------|
|              |   | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$   | 500                   |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$   | 3.0                   |      | 5.0 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$  |                       |      | $\pm 100$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>Note 2, $T_J = 125^\circ\text{C}$   |                       |      | 25 $\mu\text{A}$<br>2 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 30A$ , Note 1                                     |                       |      | 120 m $\Omega$           |

| Symbol  | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)   | Characteristic Values |      |                    |
|---|---|-----------------------|------|--------------------|
|   |   | Min.                  | Typ. | Max.               |
| $g_{fs}$                                      | $V_{DS} = 20\text{V}, I_D = 30\text{A}$ , Note 1  | 35                    | 60   | S                  |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | } $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$  |                       | 6250 | pF                 |
|   |   |                       | 680  | pF                 |
|   |   |                       | 5    | pF                 |
| $R_{Gi}$                                      | Gate Input Resistance   |                       | 1.0  | $\Omega$           |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | } <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 30\text{A}$<br>$R_G = 1\Omega$ (External) |                       | 18   | ns                 |
|   |   |                       | 16   | ns                 |
|   |   |                       | 37   | ns                 |
|   |   |                       | 8    | ns                 |
| $Q_{g(on)}$<br>$Q_{gs}$<br>$Q_{gd}$           | } $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 30\text{A}$   |                       | 96   | nC                 |
|   |   |                       | 28   | nC                 |
|   |   |                       | 26   | nC                 |
| $R_{thJC}$<br>$R_{thCS}$<br>$R_{thJA}$        |   |                       | 0.39 | $^\circ\text{C/W}$ |
|   |   | 0.05                  |      | $^\circ\text{C/W}$ |
|   |   | 30                    |      | $^\circ\text{C/W}$ |

**Source-Drain Diode**

| Symbol                           | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                         | Characteristic Values |      |               |
|----------------------------------|---|-----------------------|------|---------------|
|                                  |   | Min.                  | Typ. | Max.          |
| $I_S$                            | $V_{GS} = 0\text{V}$  |                       |      | 60 A          |
| $I_{SM}$                         | Repetitive, Pulse Width Limited by $T_{JM}$   |                       |      | 240 A         |
| $V_{SD}$                         | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.4 V         |
| $t_{rr}$<br>$I_{RM}$<br>$Q_{RM}$ | } $I_F = 30\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |                       |      | 250 ns        |
|                                  |   |                       | 11   | A             |
|                                  |   |                       | 1.0  | $\mu\text{C}$ |

**Notes:**

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{DSS}$  measurement.

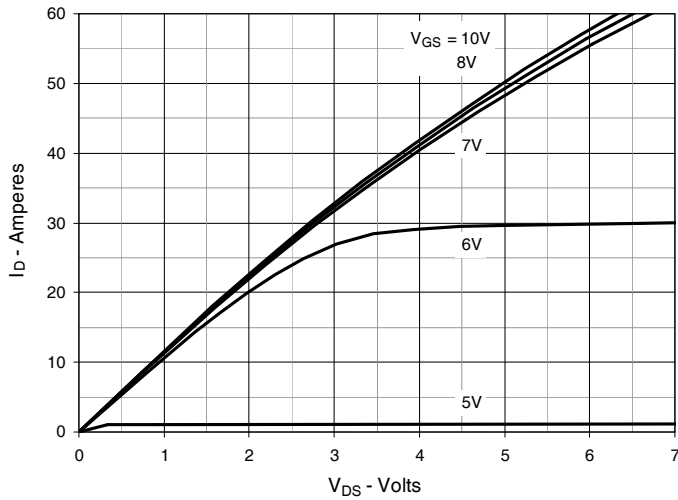
**PRELIMINARY TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

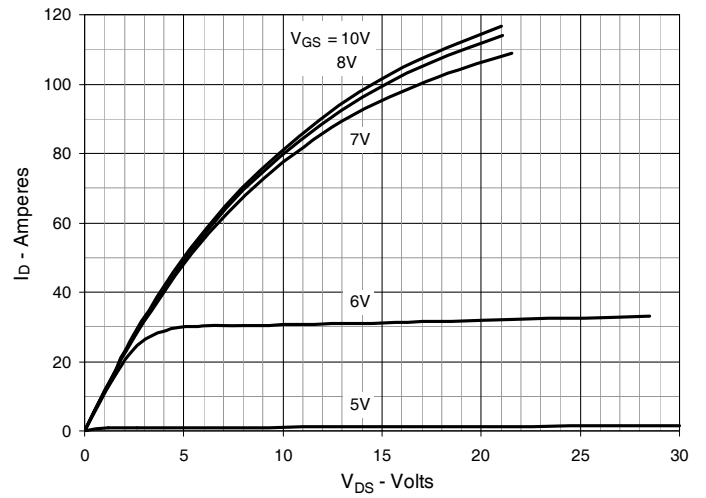
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2  
4,860,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2  
4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

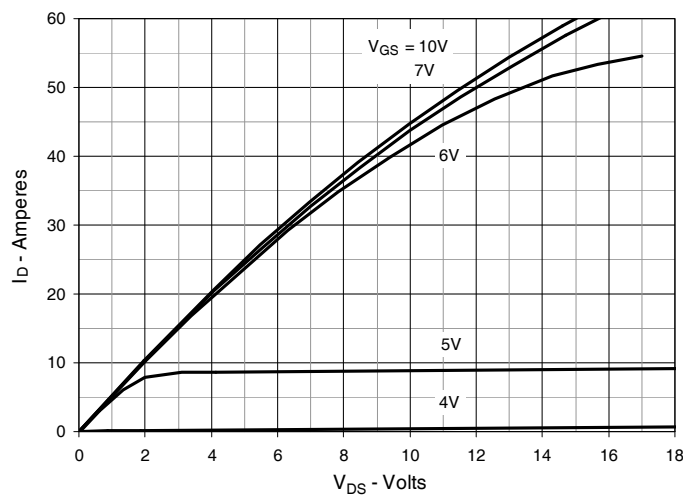
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



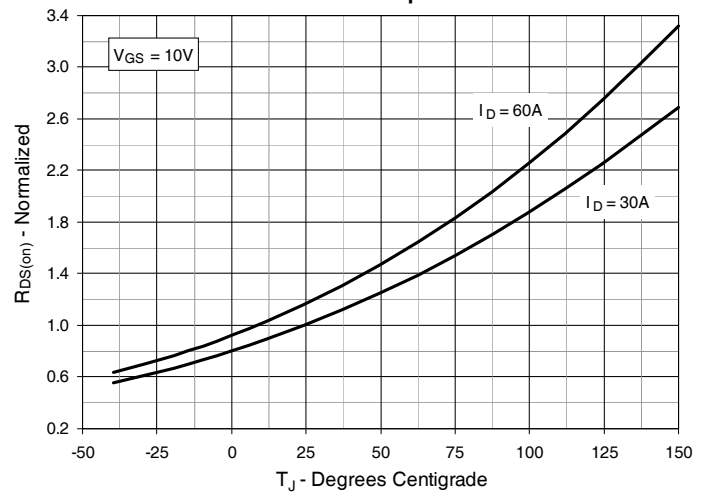
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



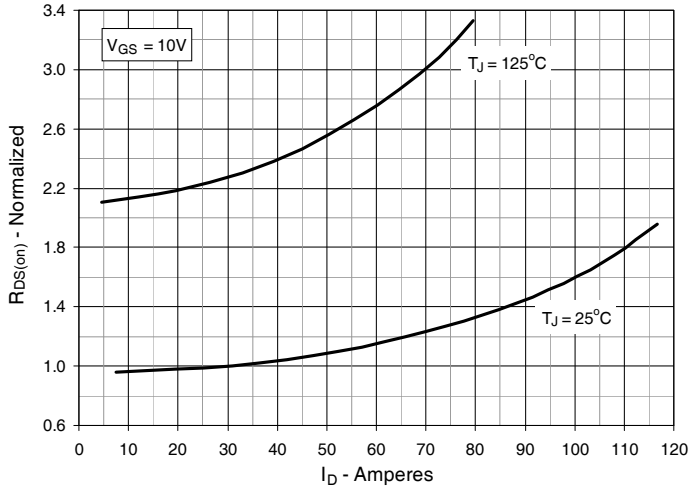
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



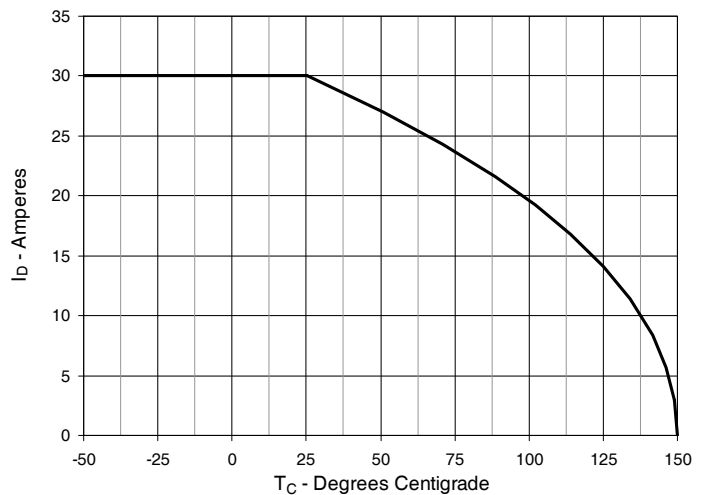
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 30A$  Value vs. Junction Temperature**



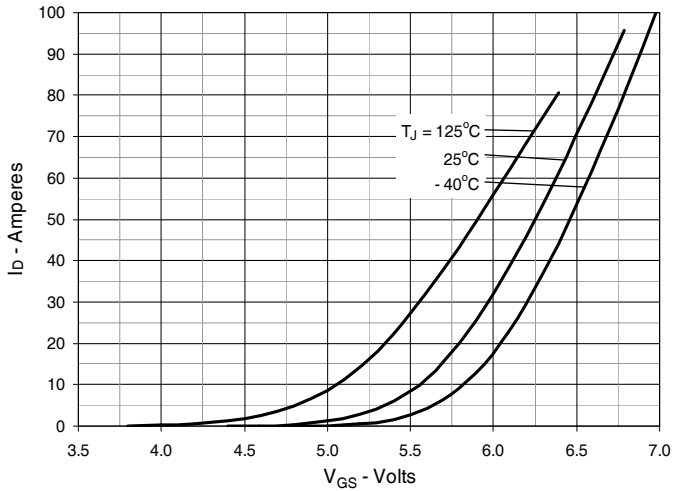
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 30A$  Value vs. Drain Current**



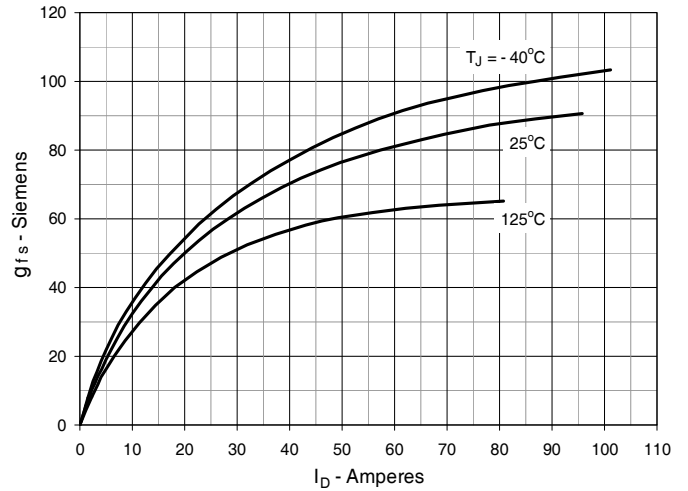
**Fig. 6. Maximum Drain Current vs. Case Temperature**



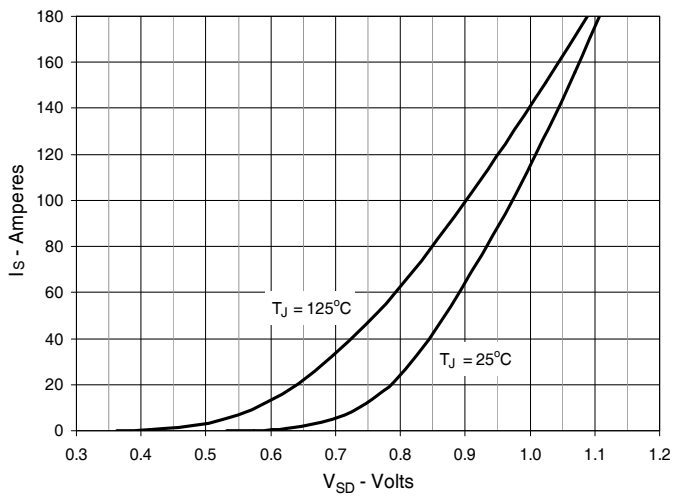
**Fig. 7. Input Admittance**



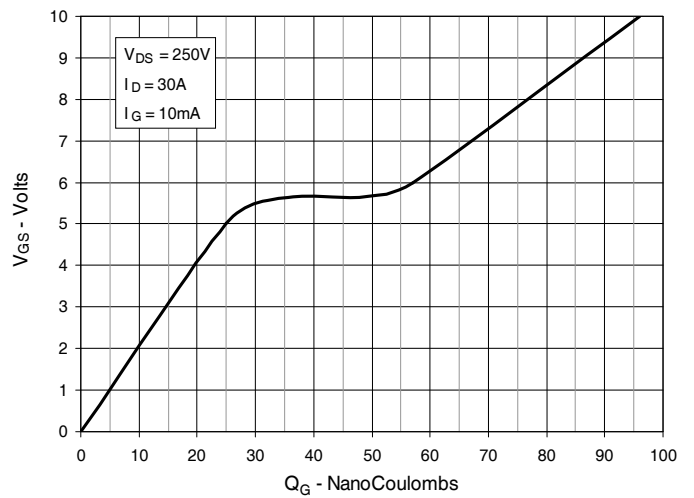
**Fig. 8. Transconductance**



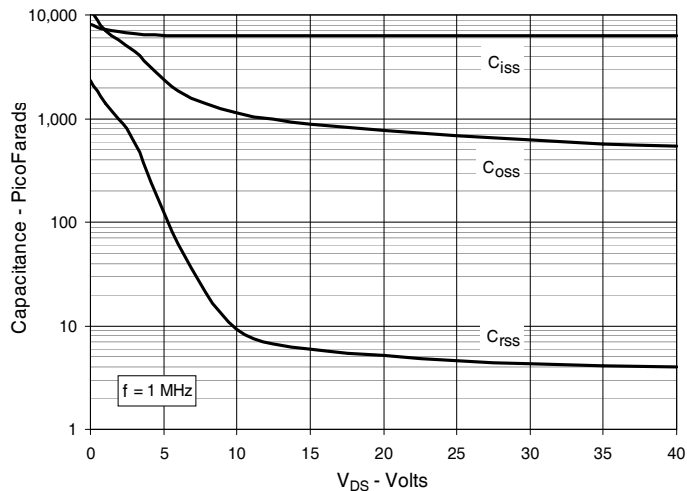
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Forward-Bias Safe Operating Area**

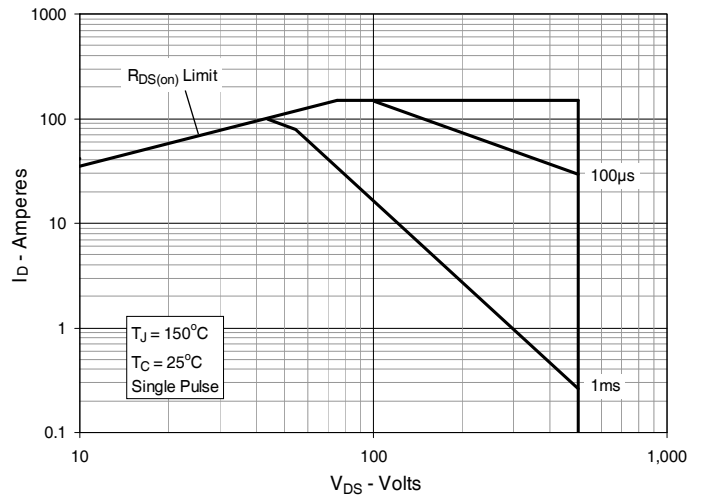
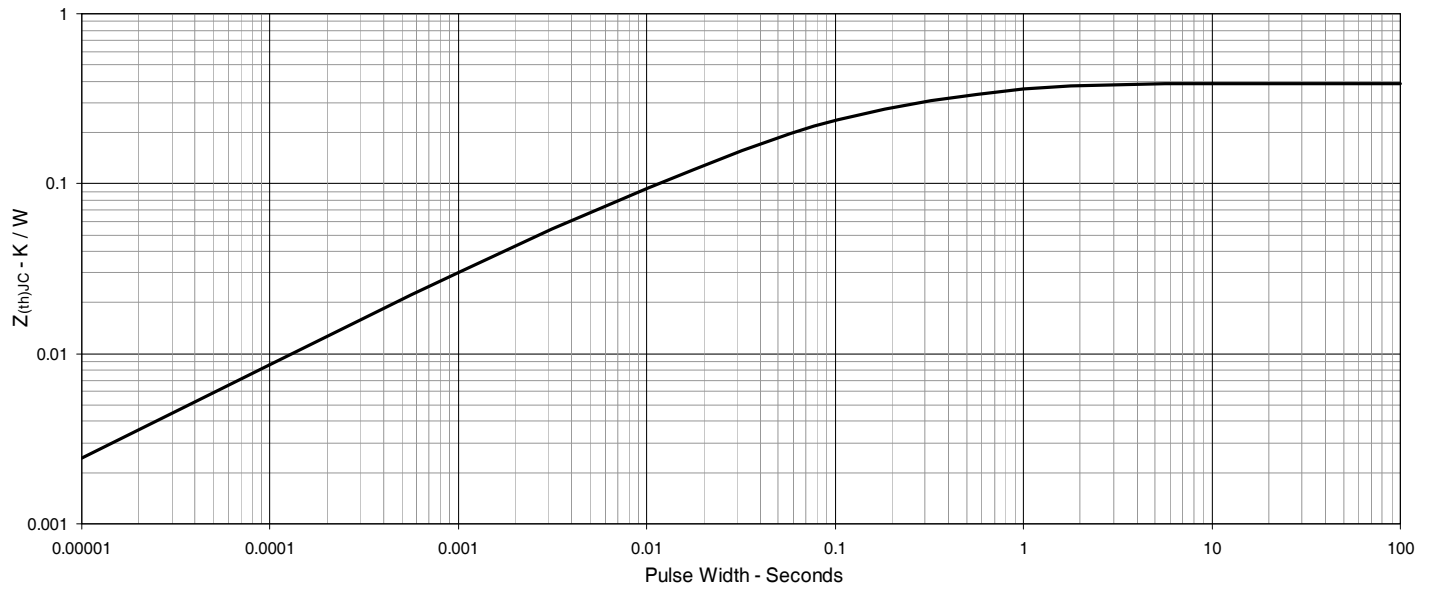
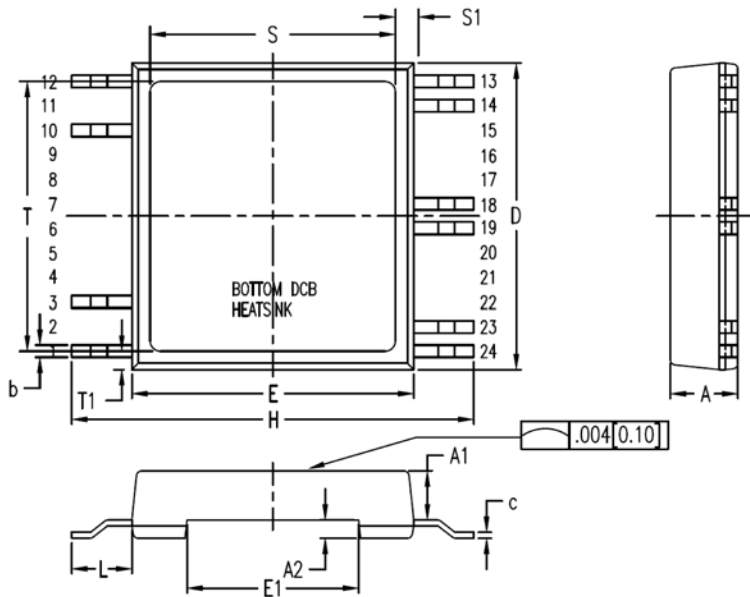
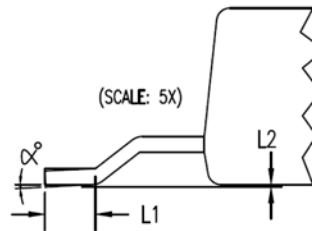
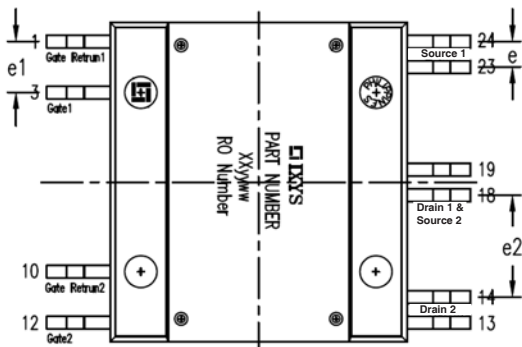


Fig. 13. Maximum Transient Thermal Impedance



**SMPD OUTLINE**


| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .209     | .224  | 5.30        | 5.70  |
| A1  | .154     | .161  | 3.90        | 4.10  |
| A2  | .055     | .063  | 1.40        | 1.60  |
| b   | .035     | .045  | 0.90        | 1.15  |
| c   | .018     | .026  | 0.45        | 0.65  |
| D   | .976     | .994  | 24.80       | 25.25 |
| E   | .898     | .915  | 22.80       | 23.25 |
| E1  | .543     | .559  | 13.80       | 14.20 |
| e   | .079 BSC |       | 2.00 BSC    |       |
| e1  | .157 BSC |       | 4.00 BSC    |       |
| e2  | .315 BSC |       | 8.00 BSC    |       |
| H   | 1.272    | 1.311 | 32.30       | 33.30 |
| L   | .181     | .209  | 4.60        | 5.30  |
| L1  | .051     | .067  | 1.30        | 1.70  |
| L2  | .000     | .006  | 0.00        | 0.15  |
| S   | .748     | .807  | 19.00       | 20.50 |
| S1  | .039     | .079  | 1.00        | 2.00  |
| T   | .826     | .886  | 21.00       | 22.50 |
| T1  | .039     | .079  | 1.00        | 2.00  |
| α   | 0        | 4°    | 0           | 4°    |





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