

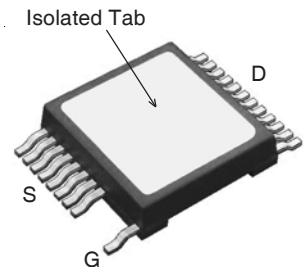
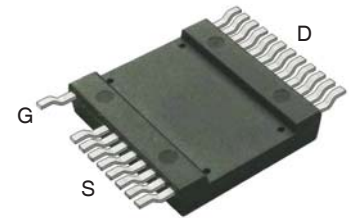
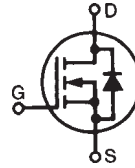
# HiperFET™ Power MOSFET Q3-Class

(Electrically Isolated Tab)

N-Channel Enhancement Mode  
Fast Intrinsic Rectifier

## MMIX1F44N100Q3

$$\begin{aligned}
 V_{DSS} &= 1000V \\
 I_{D25} &= 30A \\
 R_{DS(on)} &\leq 245m\Omega \\
 t_{rr} &\leq 300ns
 \end{aligned}$$



G = Gate      D = Drain  
S = Source

| Symbol        | Test Conditions  | Maximum Ratings  |                  |
|---------------|--|------------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 1000             | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 1000             | 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 $T_{JM}$               | 110              | A                |
| $I_A$         | $T_C = 25^\circ\text{C}$   | 44               | A                |
| $E_{AS}$      | $T_C = 25^\circ\text{C}$   | 4                | J                |
| $dv/dt$       | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 50               | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$   | 694              | W                |
| $T_J$         |  | -55 ... +150     | $^\circ\text{C}$ |
| $T_{JM}$      |  | 150              | $^\circ\text{C}$ |
| $T_{stg}$     |  | -55 ... +150     | $^\circ\text{C}$ |
| $T_L$         | 1.6mm (0.062 in.) from Case for 10s                                      | 300              | $^\circ\text{C}$ |
| $T_{SOLD}$    | Plastic Body 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~)
- Low Intrinsic Gate Resistance
- Low Package Inductance
- Fast Intrinsic Rectifier
- Low  $R_{DS(on)}$  and  $Q_G$

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- DC-DC Converters
- Battery Chargers
- Switch-Mode and Resonant-Mode Power Supplies
- DC Choppers
- Temperature and Lighting Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values |      |                          |
|--------------|---|-----------------------|------|--------------------------|
|              |   | Min.                  | Typ. | Max.                     |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 3mA$   | 1000                  |      | V                        |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 8mA$   | 3.5                   |      | 6.5 V                    |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$  |                       |      | $\pm 200$ nA             |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$           |                       |      | 50 $\mu\text{A}$<br>3 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 22A$ , Note 1                                     |                       |      | 245 m $\Omega$           |

| Symbol  | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)   | Characteristic Values |      |  |
|---|---|-----------------------|------|--|
|   |   | Min.                  | Typ. | Max.   |
| $g_{fs}$                                      | $V_{DS} = 20\text{V}, I_D = 22\text{A}$ , Note 1  | 26                    | 43   | S  |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$           | } $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$  |                       | 13.6 | nF   |
|   |   |                       | 1046 | pF   |
|   |   |                       | 86   | pF   |
| $R_{Gi}$                                      | Gate Input Resistance   |                       | 0.12 | $\Omega$                                     |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | } <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 22\text{A}$<br>$R_G = 0.5\Omega$ (External) |                       | 48   | ns   |
|   |   |                       | 30   | ns   |
|   |   |                       | 66   | ns   |
|   |   |                       | 28   | ns   |
| $Q_{g(on)}$<br>$Q_{gs}$<br>$Q_{gd}$           | } $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 22\text{A}$   |                       | 264  | nC   |
|   |   |                       | 76   | nC   |
|   |   |                       | 110  | nC   |
| $R_{thJC}$<br>$R_{thCS}$                      |   |                       | 0.05 | $0.18^\circ\text{C/W}$<br>$^\circ\text{C/W}$ |

**Source-Drain Diode**

| Symbol                           | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)                         | Characteristic Values |      |               |
|----------------------------------|---|-----------------------|------|---------------|
|                                  |   | Min.                  | Typ. | Max.          |
| $I_S$                            | $V_{GS} = 0\text{V}$  |                       |      | 44 A          |
| $I_{SM}$                         | Repetitive, Pulse Width Limited by $T_{JM}$   |                       |      | 176 A         |
| $V_{SD}$                         | $I_F = I_S, V_{GS} = 0\text{V}$ , Note 1  |                       |      | 1.4 V         |
| $t_{rr}$<br>$Q_{RM}$<br>$I_{RM}$ | } $I_F = 22\text{A}, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |                       |      | 300 ns        |
|                                  |   |                       | 2.1  | $\mu\text{C}$ |
|                                  |   |                       | 16.2 | A             |

Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

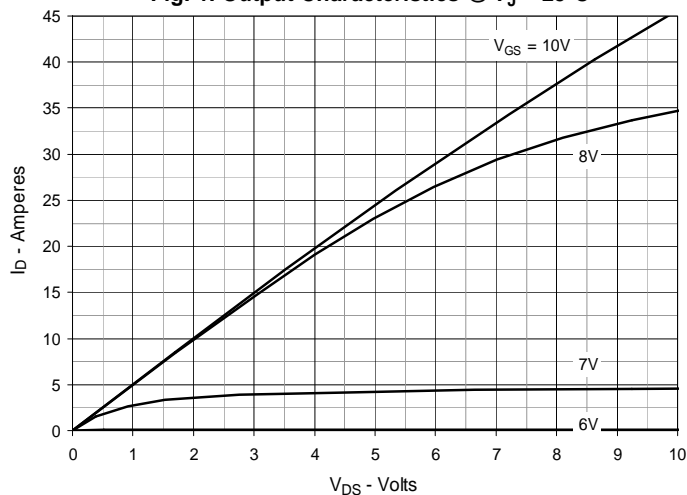
**ADVANCE TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

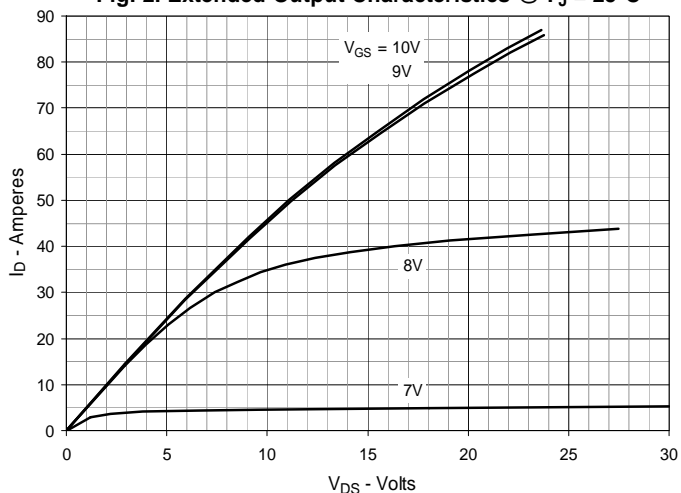
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|   |           |           |           |           |              |              |              |              |              |             |
|---|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered            | 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 |
| by one or more of the following U.S. patents: | 4,850,072 | 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    |             |

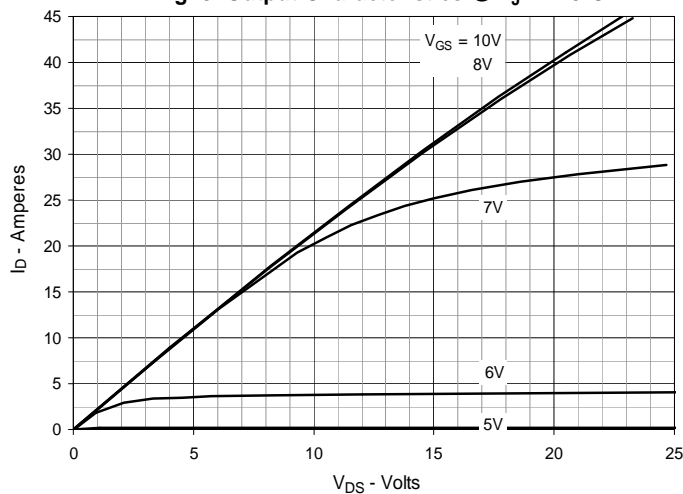
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



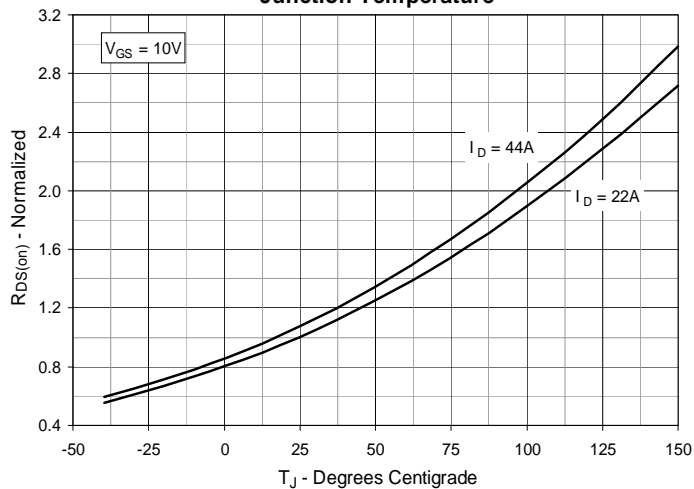
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



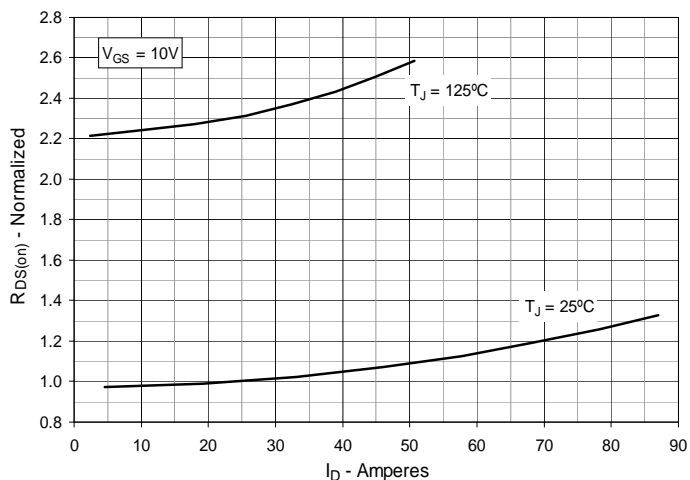
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



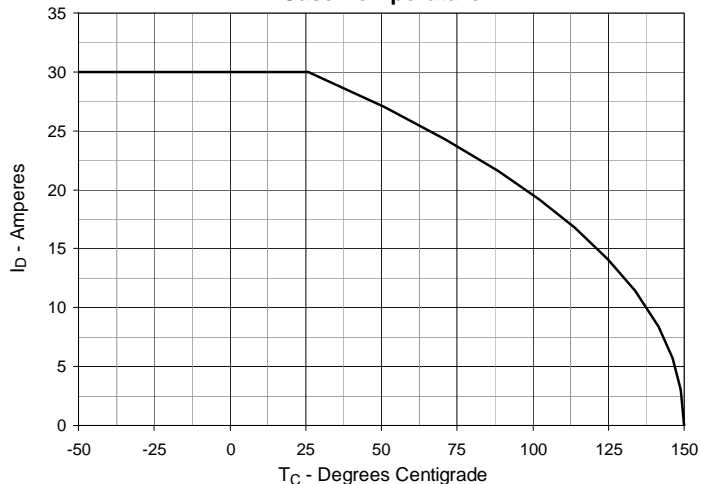
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Junction Temperature**



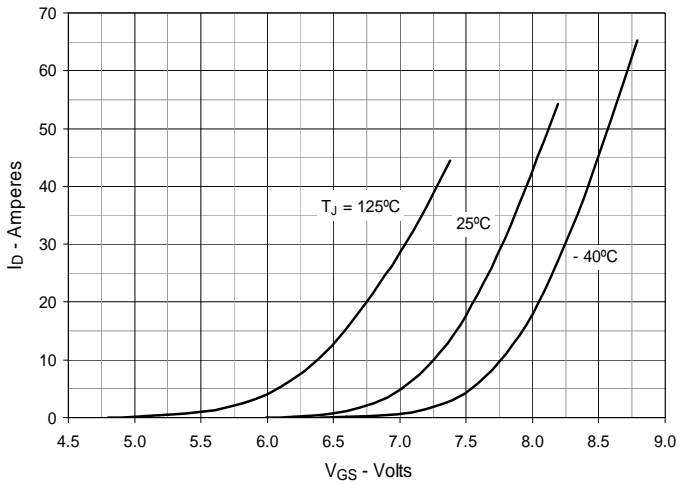
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 22\text{A}$  Value vs. Drain Current**



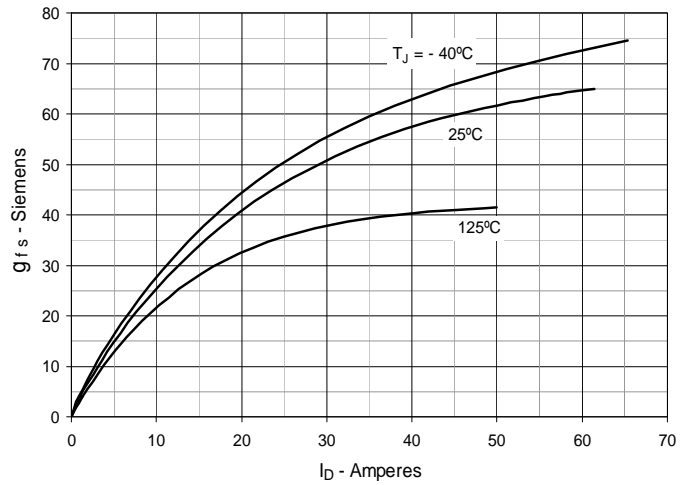
**Fig. 6. Maximum Drain Current vs. Case Temperature**



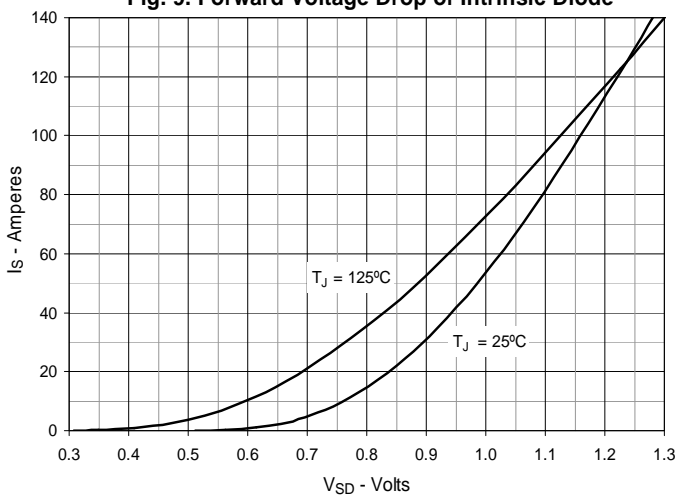
**Fig. 7. Input Admittance**



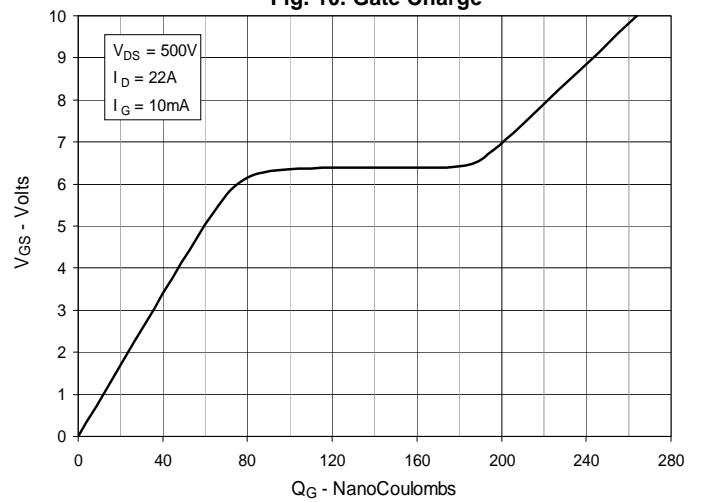
**Fig. 8. Transconductance**



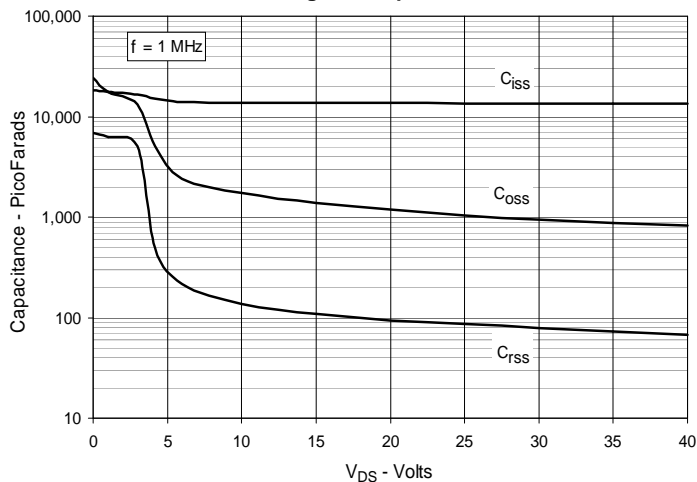
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

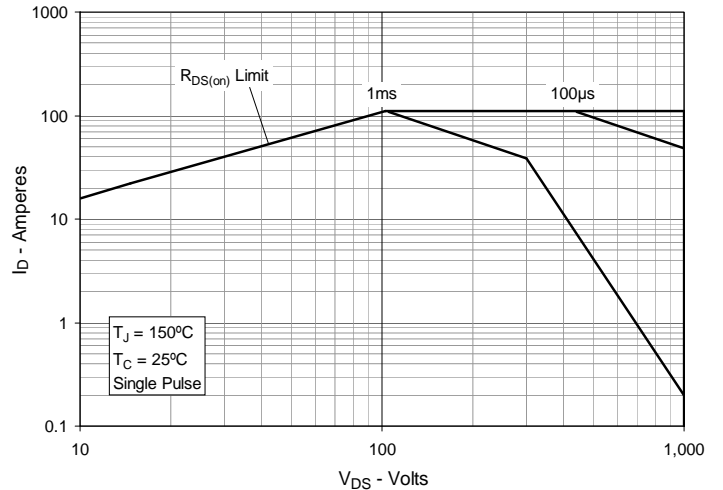
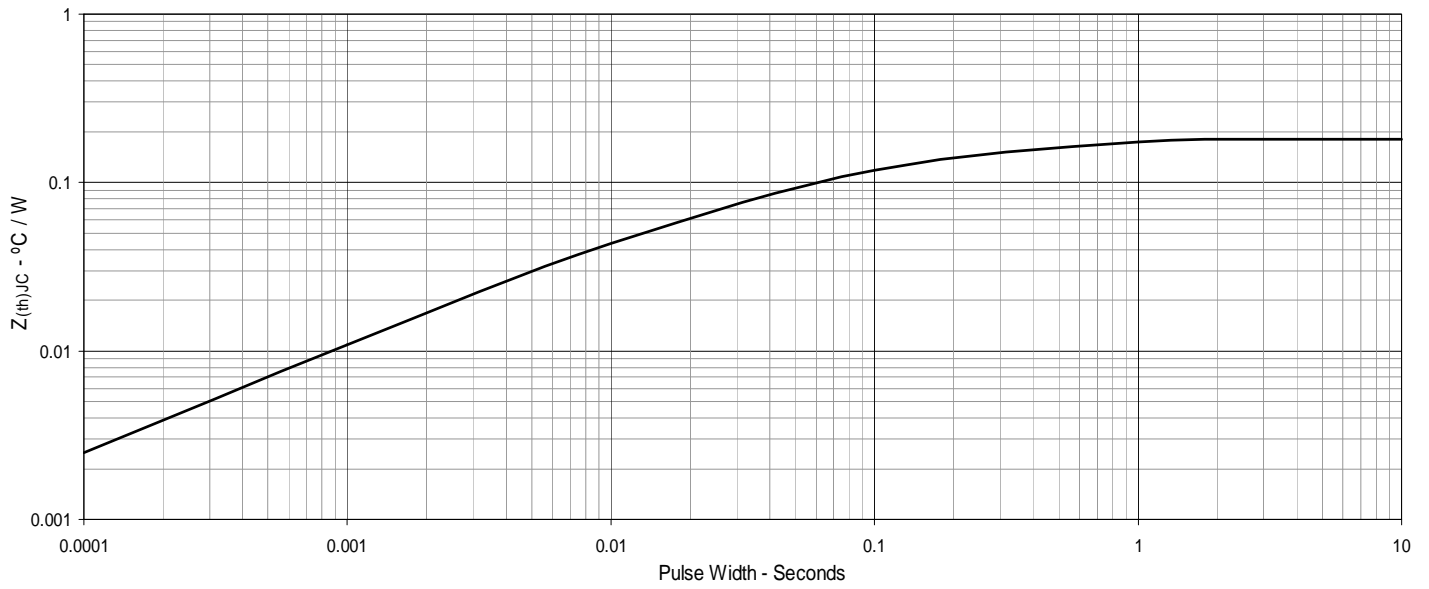
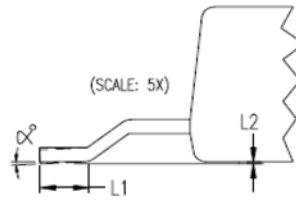
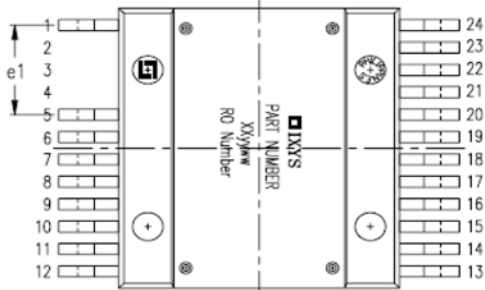
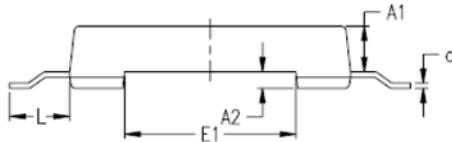
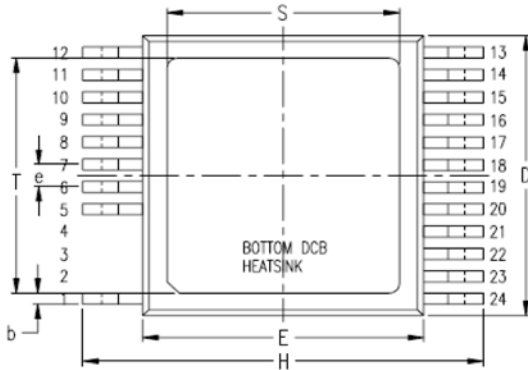


Fig. 13. Maximum Transient Thermal Impedance





| 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  | .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   | .736     | .760  | 18.70       | 19.30 |
| T   | .815     | .839  | 20.70       | 21.30 |
| ∅   | 0        | 4'    | 0           | 4'    |

**PIN: 1 = Gate**  
**5-12 = Source**  
**13-24 = Drain**



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