

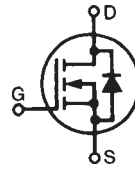
# Polar™ Power MOSFET

## HiPerFET™

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode

# IXFH24N90P

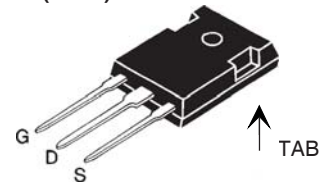
## IXFT24N90P



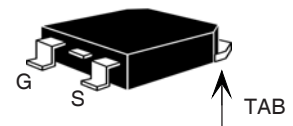
$$\begin{aligned} V_{DSS} &= 900V \\ I_{D25} &= 24A \\ R_{DS(on)} &\leq 420m\Omega \\ t_{rr} &\leq 300ns \end{aligned}$$

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 900             | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 900             | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 30$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 40$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 24              | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , pulse width limited by $T_{JM}$               | 48              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 12              | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 1               | J                |
| $dV/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 15              | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 660             | 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             | $^\circ\text{C}$ |
| $T_{SOLD}$ | Plastic body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$      | Mounting torque (TO-247)                                                 | 1.13/10         | Nm/lb.in.        |
| Weight     | TO-247                                                                   | 6               | g                |
|            | TO-268                                                                   | 4               | g                |

TO-247 (IXFH)



TO-268 (IXFT)



G = Gate      D = Drain  
S = Source    TAB = Drain

### Features

- International standard packages
- Avalanche Rated
- Low package inductance
- Fast intrinsic diode

### Advantages

- Easy to mount
- Space savings
- High power density

### Applications:

- Switched-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.           |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                                 | 900                   |      | V              |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 1mA$                                             | 3.5                   |      | 6.5 V          |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 200$ nA   |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$                                                          |                       |      | 25 $\mu A$     |
|              | $V_{GS} = 0V$ $T_J = 125^\circ\text{C}$                                     |                       |      | 2 mA           |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 420 m $\Omega$ |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)                                                                          | Characteristic Values |      |                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                                    | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                         | 10                    | 16   | S                      |
| $R_{Gi}$     | Gate input resistance                                                                                                                              |                       | 1.1  | $\Omega$               |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                   |                       | 7200 | pF                     |
| $C_{oss}$    |                                                                                                                                                    |                       | 490  | pF                     |
| $C_{rss}$    |                                                                                                                                                    |                       | 60   | pF                     |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$<br>$R_G = 2\Omega$ (External) |                       | 46   | ns                     |
| $t_r$        |                                                                                                                                                    |                       | 40   | ns                     |
| $t_{d(off)}$ |                                                                                                                                                    |                       | 68   | ns                     |
| $t_f$        |                                                                                                                                                    |                       | 38   | ns                     |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                   |                       | 130  | nC                     |
| $Q_{gs}$     |                                                                                                                                                    |                       | 50   | nC                     |
| $Q_{gd}$     |                                                                                                                                                    |                       | 58   | nC                     |
| $R_{thJC}$   | (TO-247)                                                                                                                                           |                       |      | $0.19^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                    | 0.25                  |      | $^\circ\text{C/W}$     |

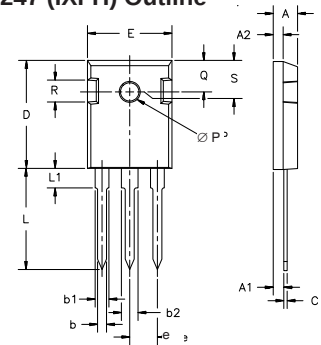
| Source-Drain Diode                                   |                                                                                                       | Characteristic Values |      |               |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
| $T_J = 25^\circ\text{C}$ unless otherwise specified) |                                                                                                       | Min.                  | Typ. | Max.          |
| $I_S$                                                | $V_{GS} = 0\text{V}$                                                                                  |                       |      | 24 A          |
| $I_{SM}$                                             | Repetitive, pulse width limited by $T_{JM}$                                                           |                       |      | 96 A          |
| $V_{SD}$                                             | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                           |                       |      | 1.5 V         |
| $t_{rr}$                                             | $I_F = 12\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$ |                       |      | 300 ns        |
| $Q_{RM}$                                             |                                                                                                       | 1.1                   |      | $\mu\text{C}$ |
| $I_{RM}$                                             |                                                                                                       | 11                    |      | A             |

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

## PRELIMINARY TECHNICAL INFORMATION

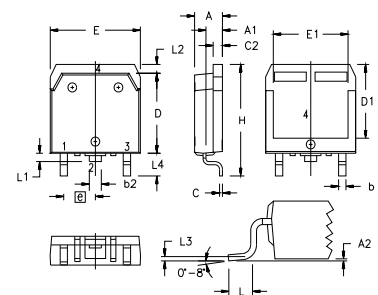
The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right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

## TO-247 (IXFH) Outline



| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113   | .123  |
| C              | .4         | .8    | .016   | .031  |
| D              | 20.80      | 21.46 | .819   | .845  |
| E              | 15.75      | 16.26 | .610   | .640  |
| e              | 5.20       | 5.72  | 0.205  | 0.225 |
| L              | 19.81      | 20.32 | .780   | .800  |
| L <sub>1</sub> |            | 4.50  |        | .177  |
| ØP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |
| S              | 6.15       | BSC   | .242   | BSC   |

## TO-268 Outline

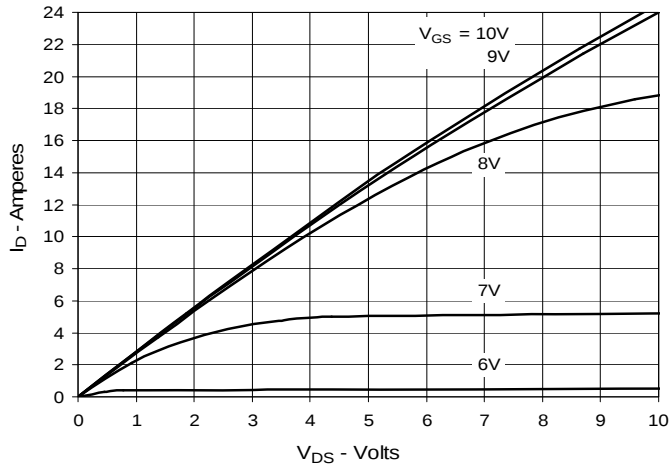


| SYM            | INCHES |      | MILLIMETERS |       |
|----------------|--------|------|-------------|-------|
|                | MIN    | MAX  | MIN         | MAX   |
| A              | .193   | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106   | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001   | .010 | 0.02        | 0.25  |
| b              | .045   | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075   | .083 | 1.90        | 2.10  |
| C              | .016   | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057   | .063 | 1.45        | 1.60  |
| D              | .543   | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488   | .500 | 12.40       | 12.70 |
| E              | .624   | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .524   | .535 | 13.30       | 13.60 |
| e              | .215   | BSC  | 5.45        | BSC   |
| H              | .736   | .752 | 18.70       | 19.10 |
| L              | .094   | .106 | 2.40        | 2.70  |
| L <sub>1</sub> | .047   | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039   | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010   | BSC  | 0.25        | BSC   |
| L <sub>4</sub> | .150   | .161 | 3.80        | 4.10  |

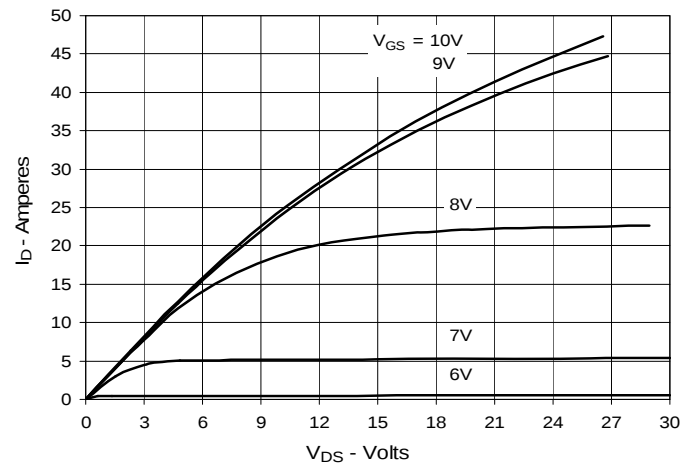
IXYS reserves the right to change limits, test conditions, and dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
|                                                                                  | 4,850,072 | 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    |             |

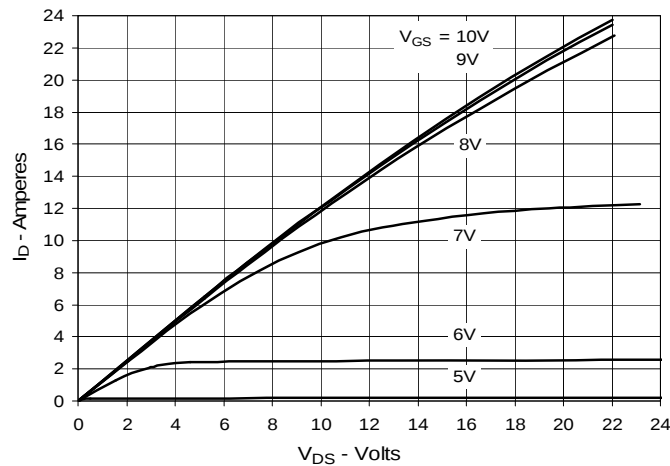
**Fig. 1. Output Characteristics**  
**@ 25°C**



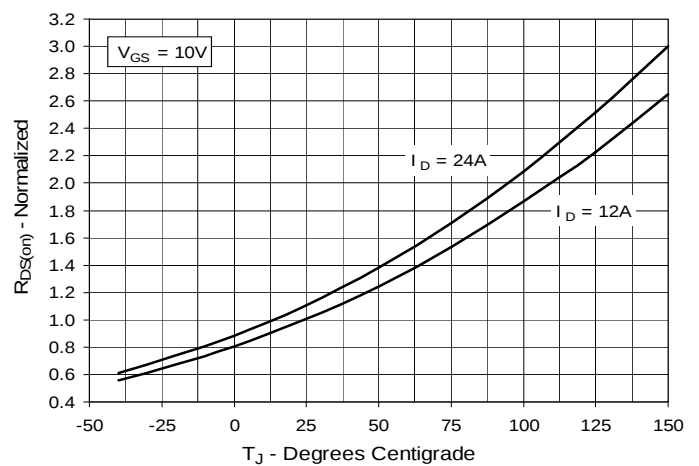
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



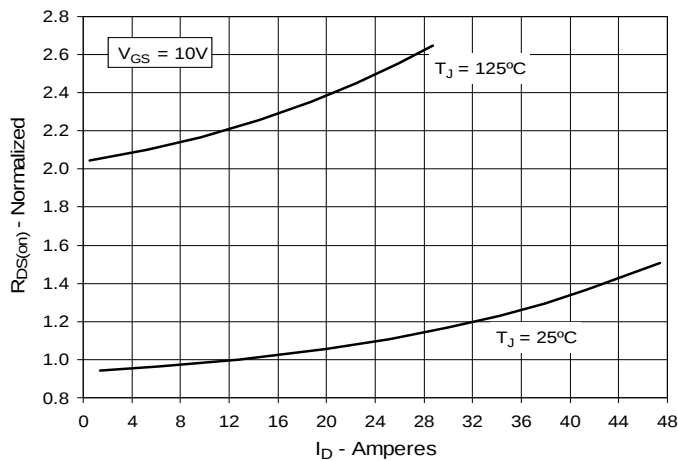
**Fig. 3. Output Characteristics**  
**@ 125°C**



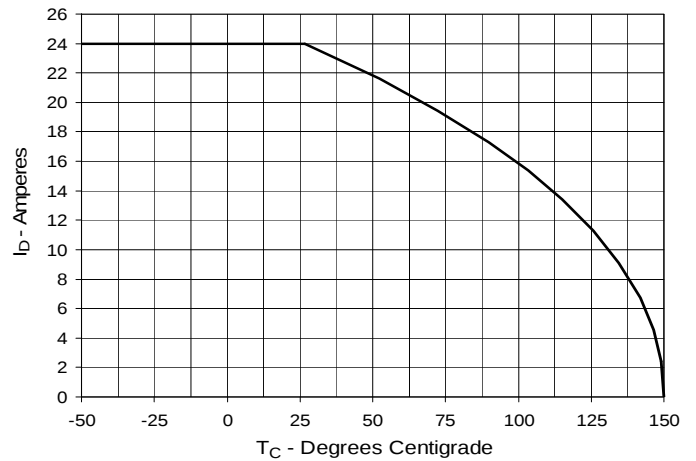
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 12A$  Value**  
**vs. Junction Temperature**



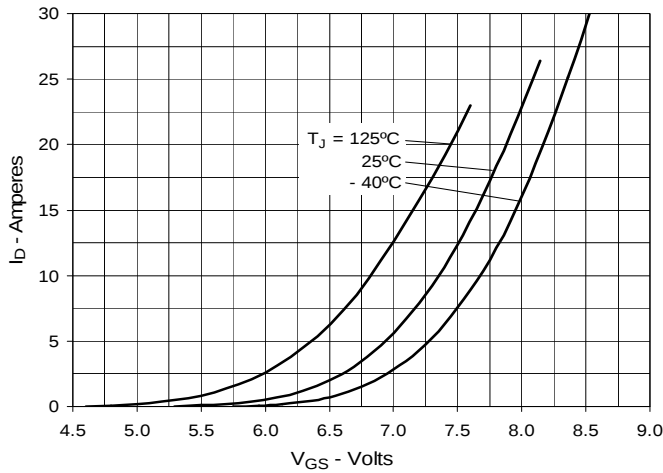
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 12A$  Value**  
**vs. Drain Current**



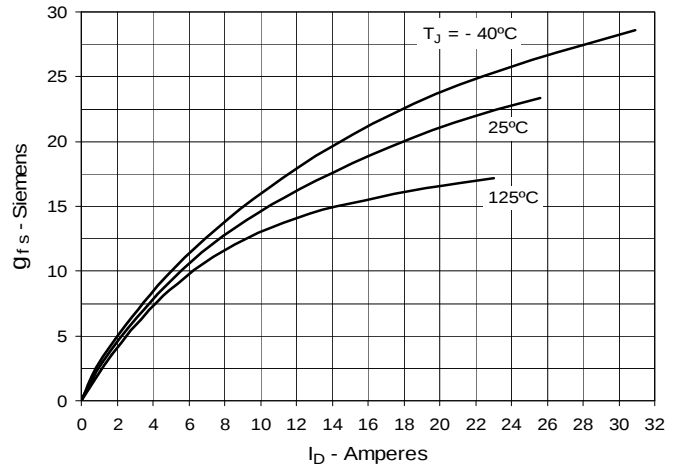
**Fig. 6. Maximum Drain Current vs.**  
**Case Temperature**



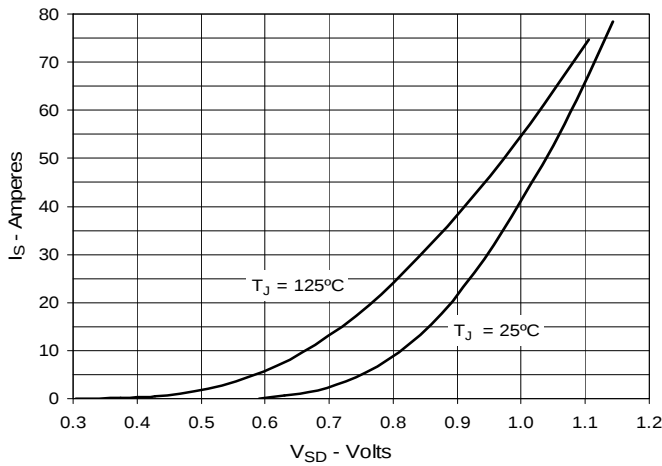
**Fig. 7. Input Admittance**



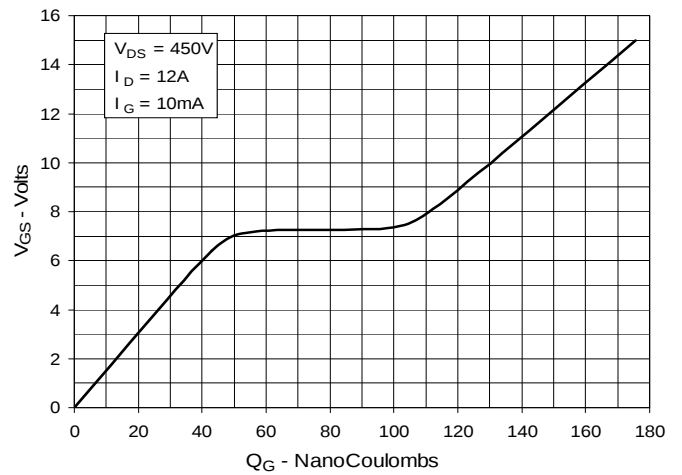
**Fig. 8. Transconductance**



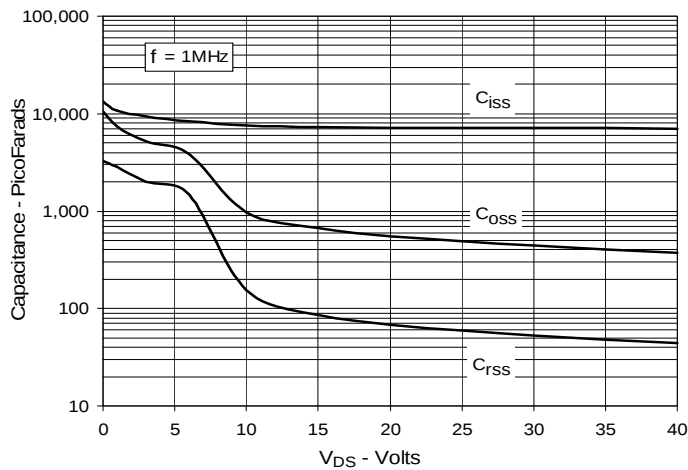
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



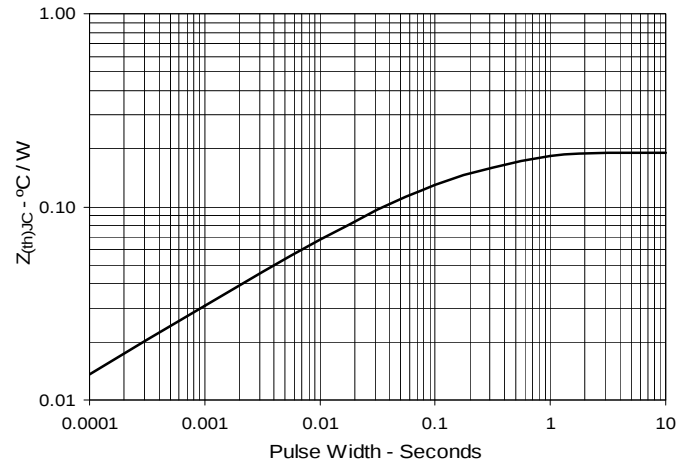
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



**Fig. 12. Maximum Transient Thermal Impedance**





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