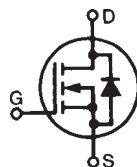


# High Voltage Power MOSFET

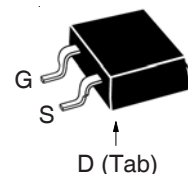
## IXTA3N120HV

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



$$\begin{aligned} V_{DSS} &= 1200V \\ I_{D25} &= 3A \\ R_{DS(on)} &\leq 4.5\Omega \end{aligned}$$

TO-263



G = Gate      D = Drain  
S = Source    Tab = Drain

| Symbol     | Test Conditions                                                          | Maximum Ratings |                  |
|------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                          | 1200            | V                |
| $V_{DGR}$  | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 1200            | V                |
| $V_{GSS}$  | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$  | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$  | $T_C = 25^\circ\text{C}$                                                 | 3               | A                |
| $I_{DM}$   | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 12              | A                |
| $I_A$      | $T_C = 25^\circ\text{C}$                                                 | 3               | A                |
| $E_{AS}$   | $T_C = 25^\circ\text{C}$                                                 | 700             | mJ               |
| $dv/dt$    | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ\text{C}$ | 5               | V/ns             |
| $P_D$      | $T_C = 25^\circ\text{C}$                                                 | 200             | 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             | $^\circ\text{C}$ |
| Weight     |                                                                          | 2.5             | g                |

### Features

- High Voltage Package
- Fast Intrinsic Diode
- Avalanche Rated
- Molding Epoxies meet UL 94 V-0 Flammability Classification
- High Blocking Voltage

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- High Voltage Power Supplies
- Capacitor Discharge Applications
- Pulse Circuits

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                             | Min.                  | Typ. | Max.               |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 1mA$                                                 | 1200                  |      | V                  |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                        | 2.5                   |      | 5.0 V              |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA       |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 25 $\mu A$<br>1 mA |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 4.5 $\Omega$       |

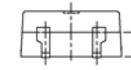
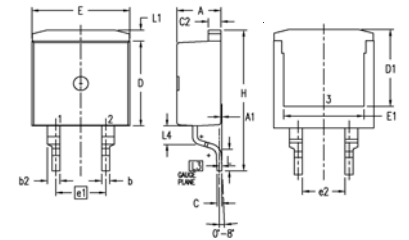
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                          | Characteristic Values |      |                         |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                                      | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 20\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                           | 1.5                   | 2.6  | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                                     |                       | 1100 | pF                      |
| $C_{oss}$    |                                                                                                                                                      |                       | 110  | pF                      |
| $C_{rss}$    |                                                                                                                                                      |                       | 40   | 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>$R_G = 4.7\Omega$ (External) |                       | 17   | ns                      |
| $t_r$        |                                                                                                                                                      |                       | 15   | ns                      |
| $t_{d(off)}$ |                                                                                                                                                      |                       | 32   | ns                      |
| $t_f$        |                                                                                                                                                      |                       | 18   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                                     |                       | 42   | nC                      |
| $Q_{gs}$     |                                                                                                                                                      |                       | 8    | nC                      |
| $Q_{gd}$     |                                                                                                                                                      |                       | 21   | nC                      |
| $R_{thJC}$   |                                                                                                                                                      |                       |      | 0.62 $^\circ\text{C/W}$ |

## Source-Drain Diode

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |       |
|----------|-----------------------------------------------------------------------------|-----------------------|------|-------|
|          |                                                                             | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$                                                        |                       |      | 3 A   |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                 |                       |      | 12 A  |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                 |                       |      | 1.5 V |
| $t_{rr}$ | $I_F = I_S$ , $-di/dt = 100\text{A}/\mu\text{s}$ , $V_R = 100\text{V}$      |                       | 700  | ns    |

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

## TO-263 (HV) Outline



PIN: 1 - Gate  
2 - Source  
3 - Drain

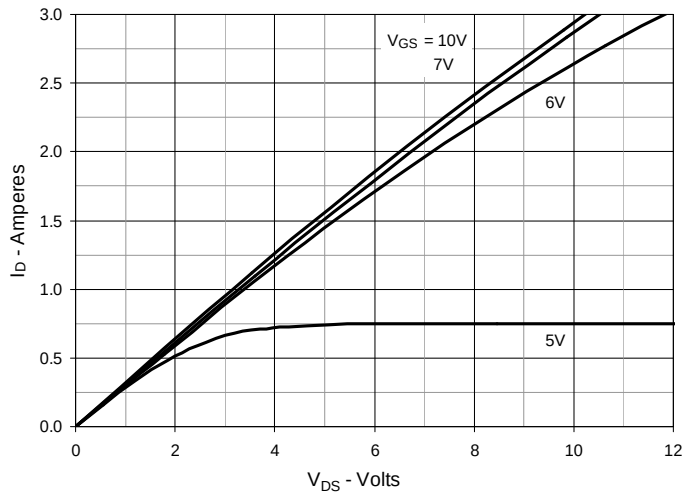
| SYM  | INCHES |      | MILLIMETER |       |
|------|--------|------|------------|-------|
|      | MIN    | MAX  | MIN        | MAX   |
| A    | .170   | .185 | 4.30       | 4.70  |
| A1   | .000   | .008 | 0.00       | 0.20  |
| A2   | .091   | .098 | 2.30       | 2.50  |
| b    | .028   | .035 | 0.70       | 0.90  |
| b2   | .046   | .054 | 1.18       | 1.38  |
| C    | .018   | .024 | 0.45       | 0.60  |
| C2   | .049   | .055 | 1.25       | 1.40  |
| D    | .354   | .370 | 9.00       | 9.40  |
| D1   | .311   | .327 | 7.90       | 8.30  |
| E    | .386   | .402 | 9.80       | 10.20 |
| E1   | .307   | .323 | 7.80       | 8.20  |
| e1   | .200   | BSC  | 5.08       | BSC   |
| (e2) | .163   | .174 | 4.13       | 4.43  |
| H    | .591   | .614 | 15.00      | 15.60 |
| L    | .079   | .102 | 2.00       | 2.60  |
| L1   | .039   | .055 | 1.00       | 1.40  |
| L3   | .010   | BSC  | 0.254      | BSC   |
| (L4) | .071   | .087 | 1.80       | 2.20  |

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

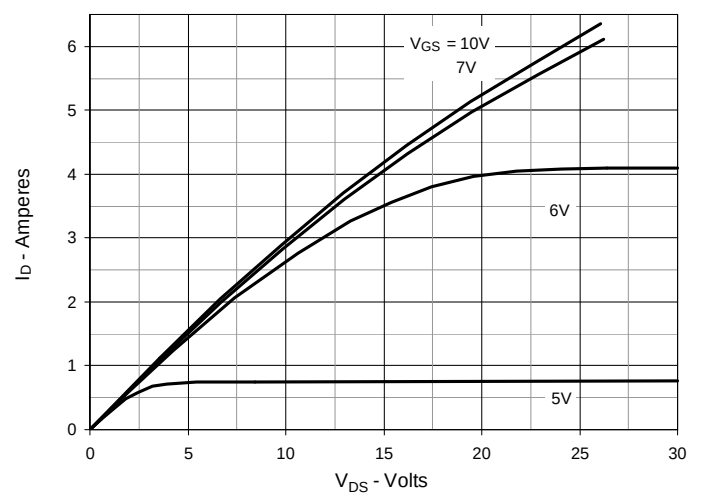
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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 | 7,157,338 B2 |
| 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    |              |

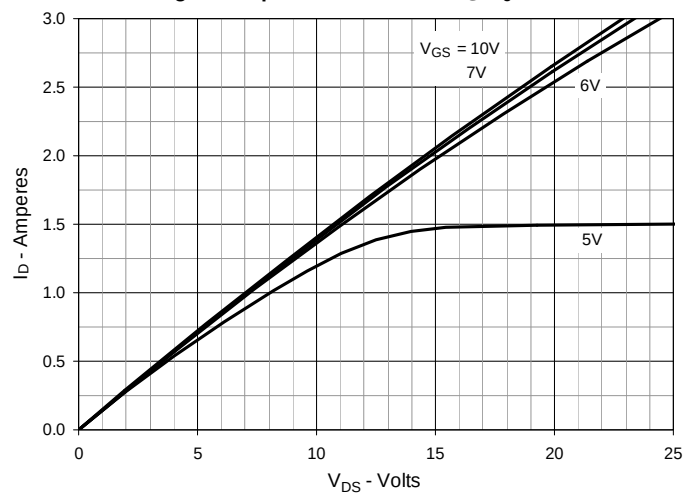
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



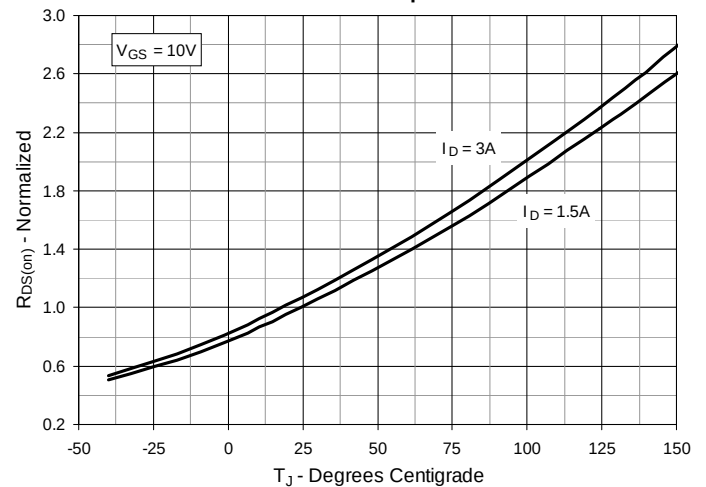
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



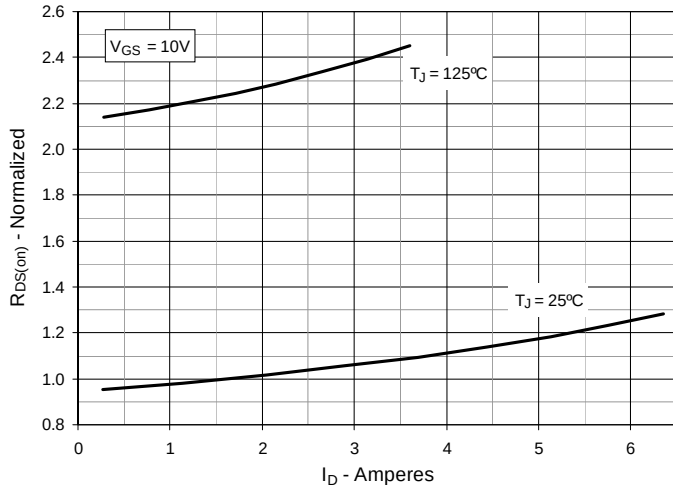
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



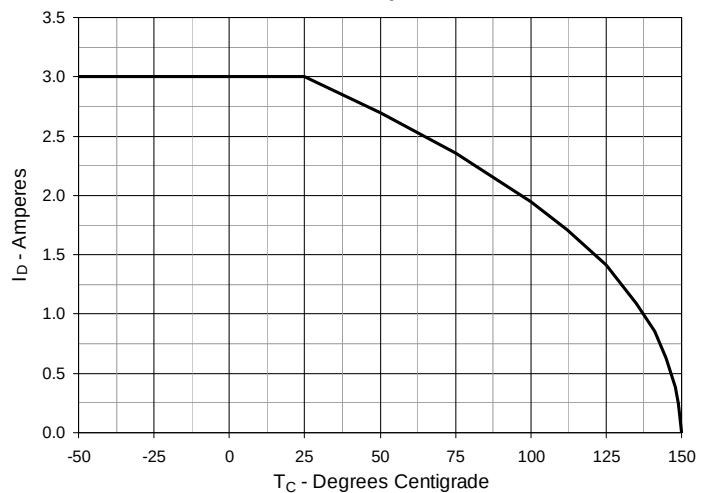
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 1.5\text{A}$  Value vs. Junction Temperature**



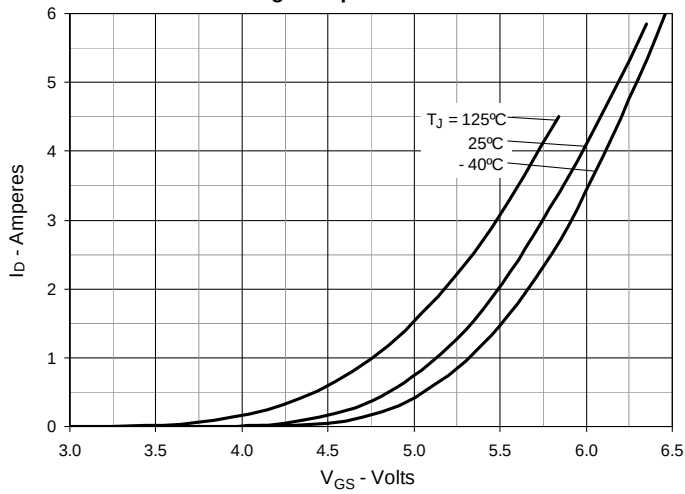
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 1.5\text{A}$  Value vs. Drain Current**



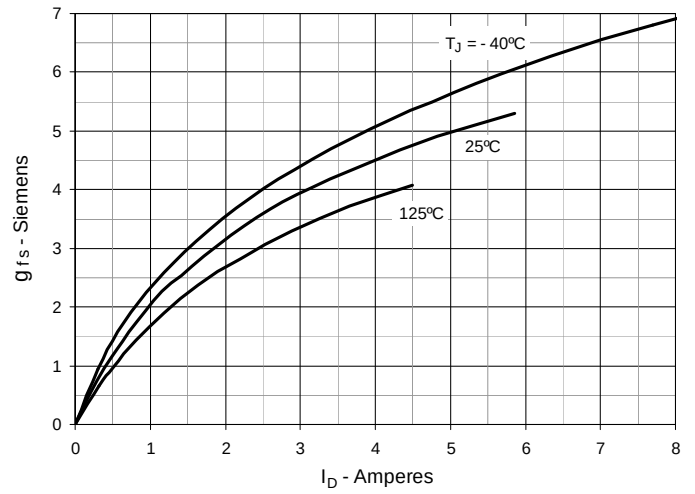
**Fig. 6. Maximum Drain Current vs. Case Temperature**



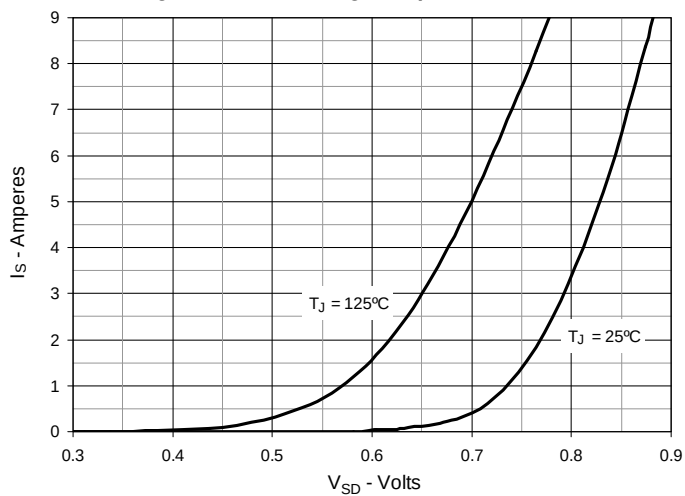
**Fig. 7. Input Admittance**



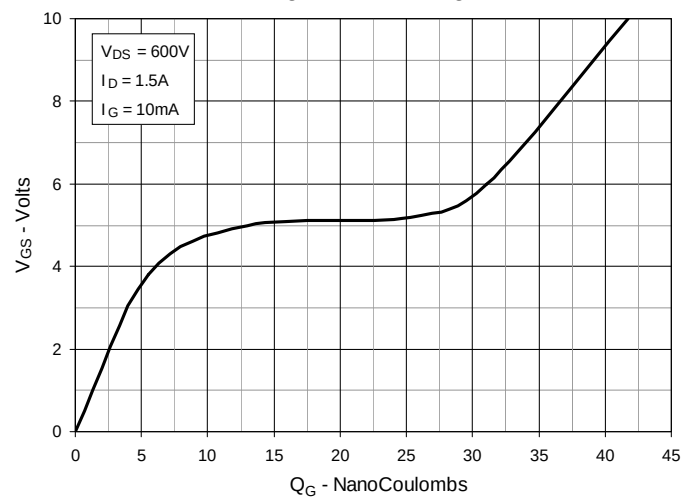
**Fig. 8. Transconductance**



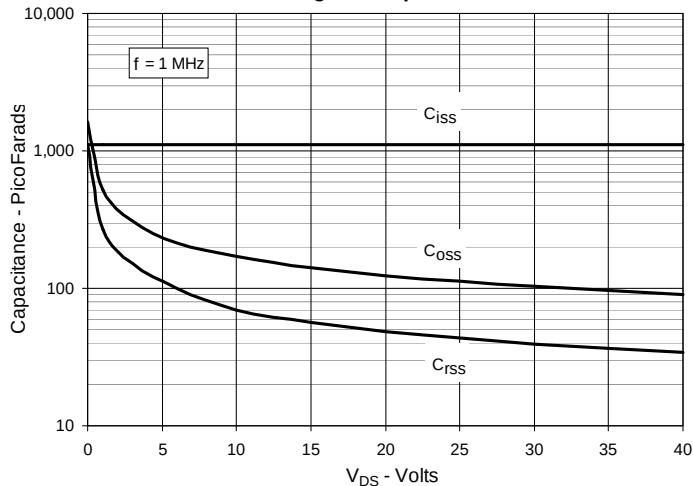
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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

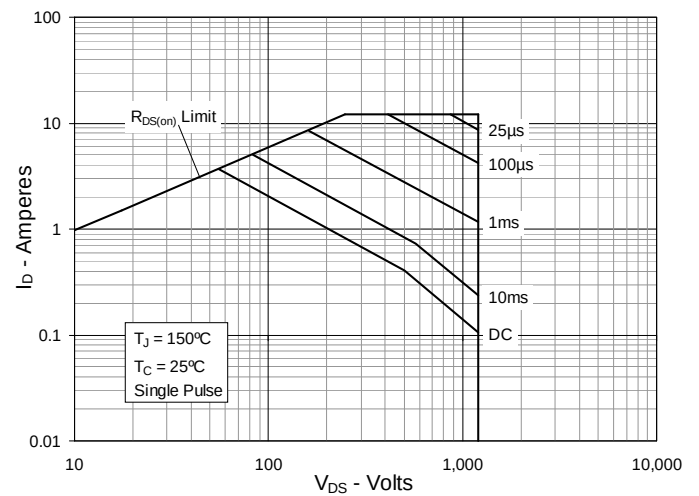
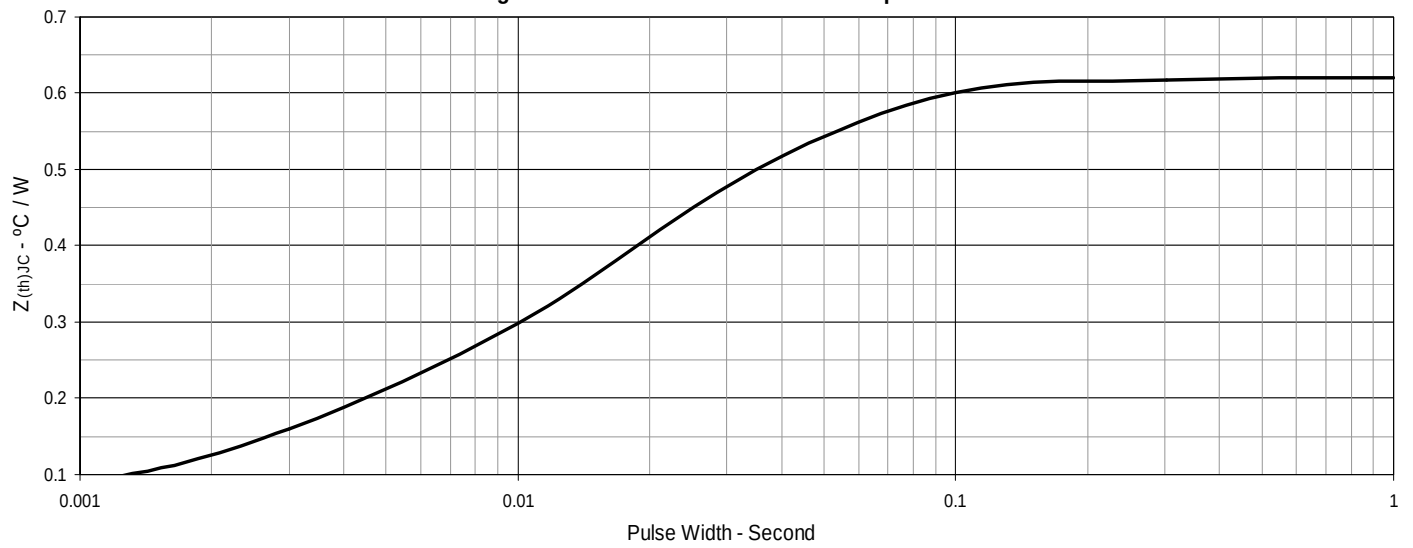


Fig. 13. Maximum Transient Thermal Impedance





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