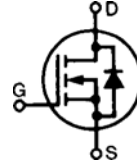


## High Voltage Power MOSFETs

### IXTH3N120

N-Channel Enhancement Mode  
Avalanche Rated, High dv/dt

Preliminary Data Sheet



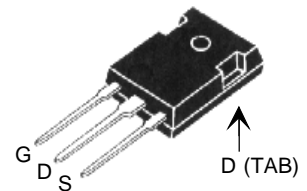
$$V_{DSS} = 1200 \text{ V}$$

$$I_{D25} = 3 \text{ A}$$

$$V_{DS(on)} = 4.5 \text{ } \Omega$$

| Symbol        | Test Conditions  | Maximum Ratings |             |                  |
|---------------|--|-----------------|-------------|------------------|
| $V_{DSS}$     | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$   | 3N120           | 1200        | V                |
|               |  | 3N110           | 1100        | V                |
| $V_{DGR}$     | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GS} = 1 \text{ M}\Omega$   | 3N120           | 1200        | V                |
|               |  | 3N110           | 1100        | V                |
| $V_{GS}$      | 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                |
| $I_{AR}$      | $T_C = 25^\circ\text{C}$   |                 | 3           | A                |
| $E_{AR}$      | $T_C = 25^\circ\text{C}$   |                 | 20          | mJ               |
| $E_{AS}$      |  |                 | 700         | mJ               |
| $dv/dt$       | $I_S \leq I_{DM}$ , $di/dt \leq 100 \text{ A}/\mu\text{s}$ , $V_{DD} \leq V_{DSS}$ ,<br>$T_J \leq 150^\circ\text{C}$ , $R_G = 2 \text{ } \Omega$ |                 | 5           | V/ns             |
| $P_D$         | $T_C = 25^\circ\text{C}$   |                 | 150         | W                |
| $T_J$         |  |                 | -55 to +150 | $^\circ\text{C}$ |
| $T_{JM}$      |  |                 | 150         | $^\circ\text{C}$ |
| $T_{stg}$     |  |                 | -55 to +150 | $^\circ\text{C}$ |
| $T_L$         | 1.6 mm (0.063 in) from case for 10 s   |                 | 300         | $^\circ\text{C}$ |
| $M_d$         | Mounting torque  |                 | 1.13/10     | Nm/lb.in.        |
| <b>Weight</b> |  |                 | 6           | g                |

TO-247



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

#### Features

- International standard packages
- Low  $R_{DS(on)}$
- Rated for unclamped inductive load switching (UIS)
- Molding epoxies meet UL 94 V-0 flammability classification

#### Advantages

- Easy to mount
- Space savings
- High power density

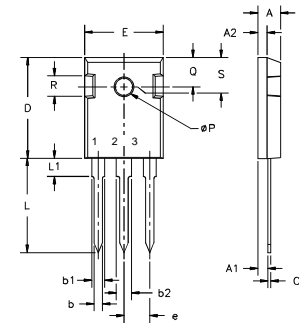
| Symbol       | Test Conditions   | Characteristic Values                                   |                           |                      |
|--------------|---|---|---------------------------|----------------------|
|              |   | $(T_J = 25^\circ\text{C}$ , unless otherwise specified) |                           |                      |
|              |   | min.  | typ.                      | max.                 |
| $V_{DSS}$    | $V_{GS} = 0 \text{ V}$ , $I_D = 1 \text{ mA}$           | 1200  |                           | V                    |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250 \text{ } \mu\text{A}$    | 2.5   |                           | 4.5 V                |
| $I_{GSS}$    | $V_{GS} = \pm 20 \text{ V}_{DC}$ , $V_{DS} = 0$         |   |                           | $\pm 100 \text{ nA}$ |
| $I_{DSS}$    | $V_{DS} = 0.8 V_{DSS}$                                  |   | $T_J = 25^\circ\text{C}$  | 25 $\mu\text{A}$     |
|              | $V_{GS} = 0 \text{ V}$                                  |   | $T_J = 125^\circ\text{C}$ | 1 mA                 |
| $R_{DS(on)}$ | $V_{GS} = 10 \text{ V}$ , $I_D = 0.5 I_{D25}$<br>Note 1 |   |                           | 4.5 $\Omega$         |

| Symbol                    | Test Conditions  | Characteristic Values                               |      |         |
|---------------------------|--|---|------|---------|
|                           |  | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |         |
|                           |  | min.  | typ. | max.    |
| <b>g<sub>fs</sub></b>     | V <sub>DS</sub> = 10 V; I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Note 1   | 1.5   | 2.2  | S       |
| <b>C<sub>iss</sub></b>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25 V, f = 1 MHz   |   | 1050 | 1300 pF |
| <b>C<sub>oss</sub></b>    |  |   | 100  | 125 pF  |
| <b>C<sub>rss</sub></b>    |  |   | 25   | 50 pF   |
| <b>t<sub>d(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub><br>R <sub>G</sub> = 4.7 Ω (External), |   | 17   | ns      |
| <b>t<sub>r</sub></b>      |  |   | 15   | ns      |
| <b>t<sub>d(off)</sub></b> |  |   | 32   | ns      |
| <b>t<sub>f</sub></b>      |  |   | 18   | ns      |
| <b>Q<sub>g(on)</sub></b>  | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 0.5 • V <sub>DSS</sub> , I <sub>D</sub> = 0.5 • I <sub>D25</sub>                                       |   | 39   | nC      |
| <b>Q<sub>gs</sub></b>     |  |   | 9    | nC      |
| <b>Q<sub>gd</sub></b>     |  |   | 22   | nC      |
| <b>R<sub>thJC</sub></b>   |  |   | 0.8  | K/W     |
| <b>R<sub>thCK</sub></b>   |  | 0.25  |      | K/W     |

| Symbol                | Test Conditions   | Characteristic Values                               |      |       |
|-----------------------|---|---|------|-------|
|                       |   | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |       |
|                       |   | min.  | typ. | max.  |
| <b>I<sub>S</sub></b>  | V <sub>GS</sub> = 0 V   |   |      | 3 A   |
| <b>I<sub>SM</sub></b> | Repetitive; pulse width limited by T <sub>JM</sub>                          |   |      | 12 A  |
| <b>V<sub>SD</sub></b> | I <sub>F</sub> = I <sub>S</sub> , V <sub>GS</sub> = 0 V, Note 1             |   |      | 1.5 V |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = I <sub>S</sub> , -di/dt = 100 A/μs, V <sub>R</sub> = 100 V |   | 700  | ns    |

Notes: 1. Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

### TO-247 AD Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

| 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  |
| L1             |            | 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   |

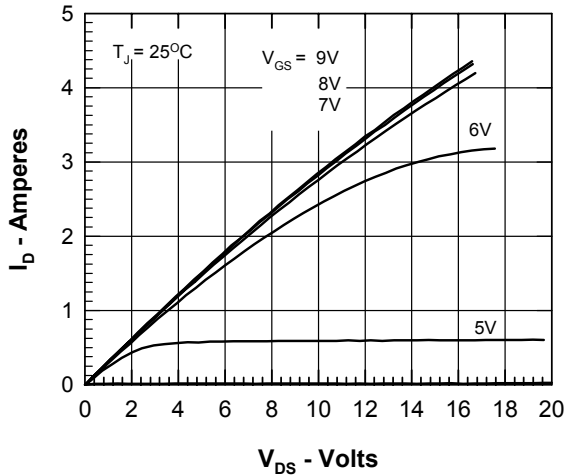


Fig.1 Output Characteristics @  $T_J = 25^\circ\text{C}$

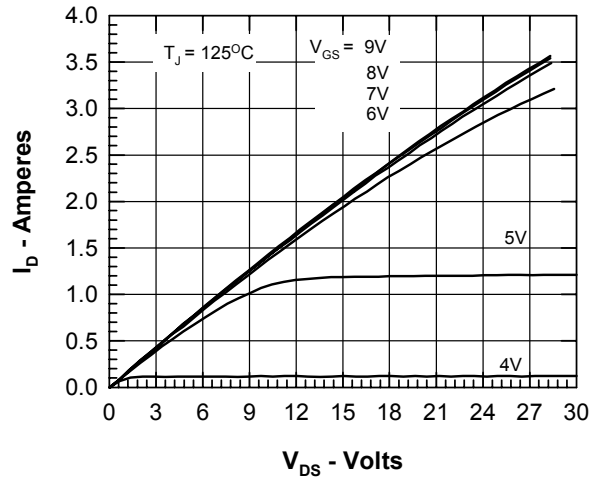


Fig. 2 Output Characteristics @  $T_J = 125^\circ\text{C}$

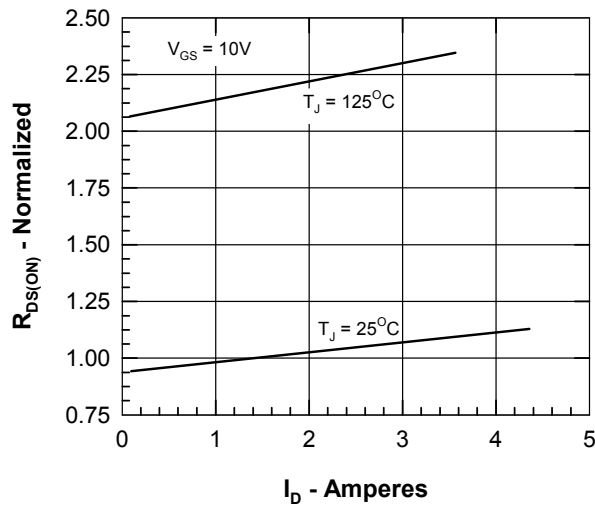


Fig. 3  $R_{DS(on)}$  vs. Drain Current

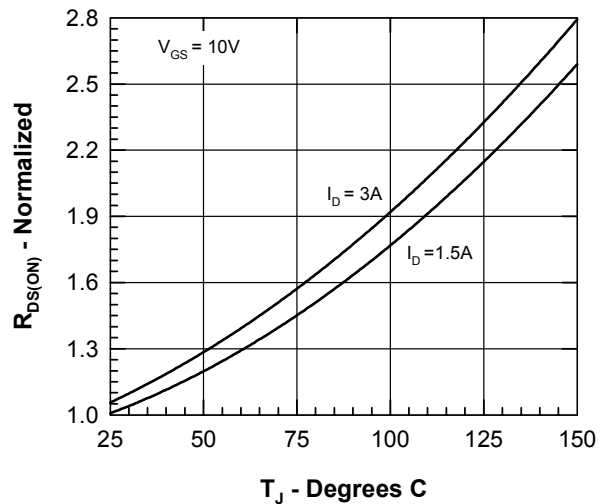


Fig. 4 Temperature Dependence of Drain to Source Resistance

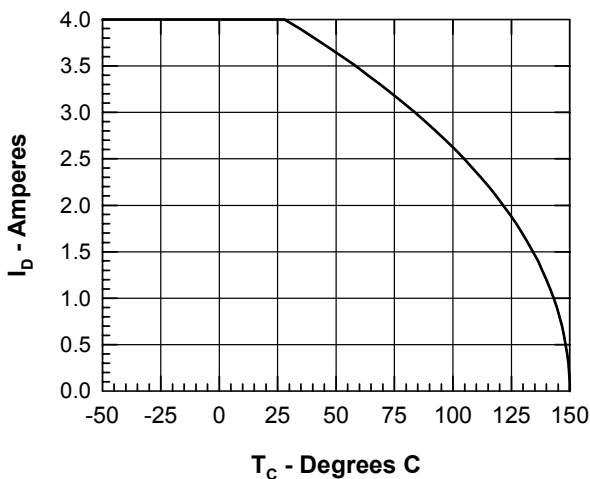


Fig.5 Drain Current vs. Case Temperature

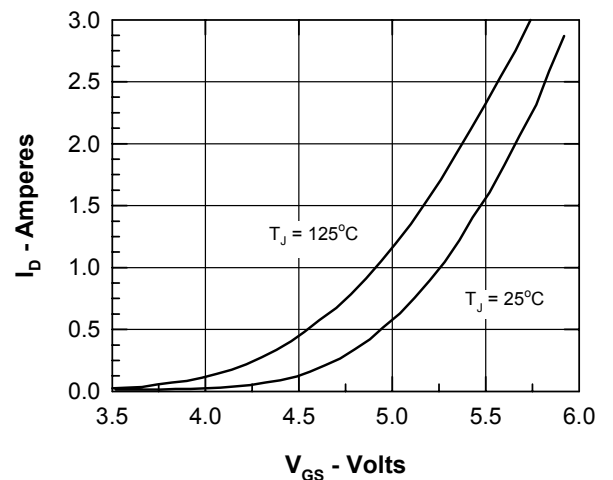


Fig. 6 Drain Current vs Gate Source Voltage

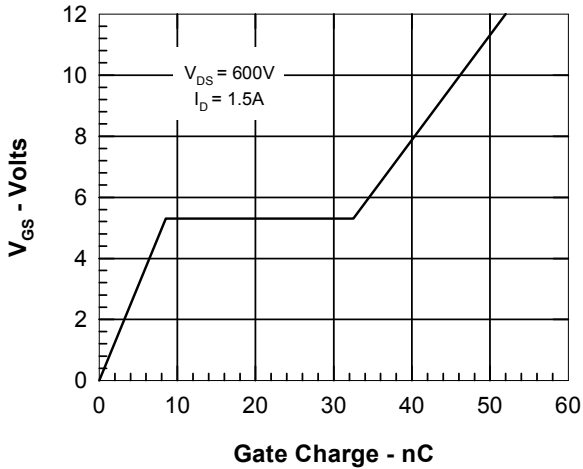


Fig. 7 Gate Charge Characteristic Curve

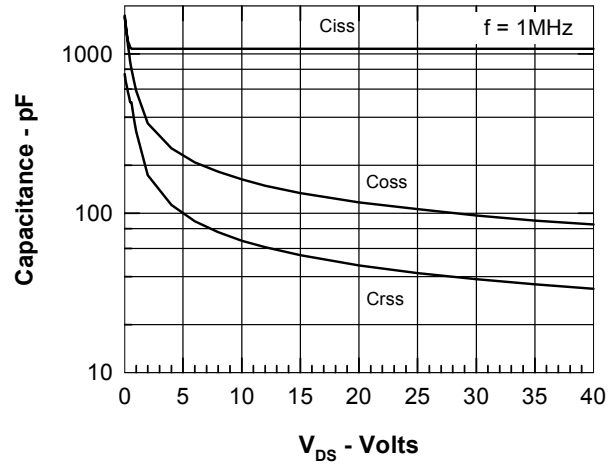


Fig. 8 Capacitance Curves

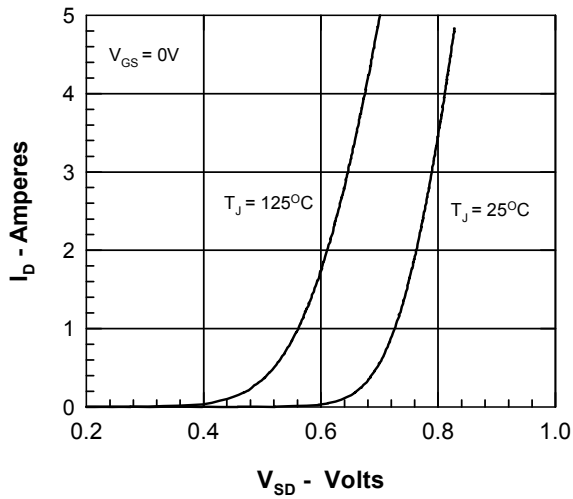


Fig. 9 Drain Current vs Drain to Source Voltage

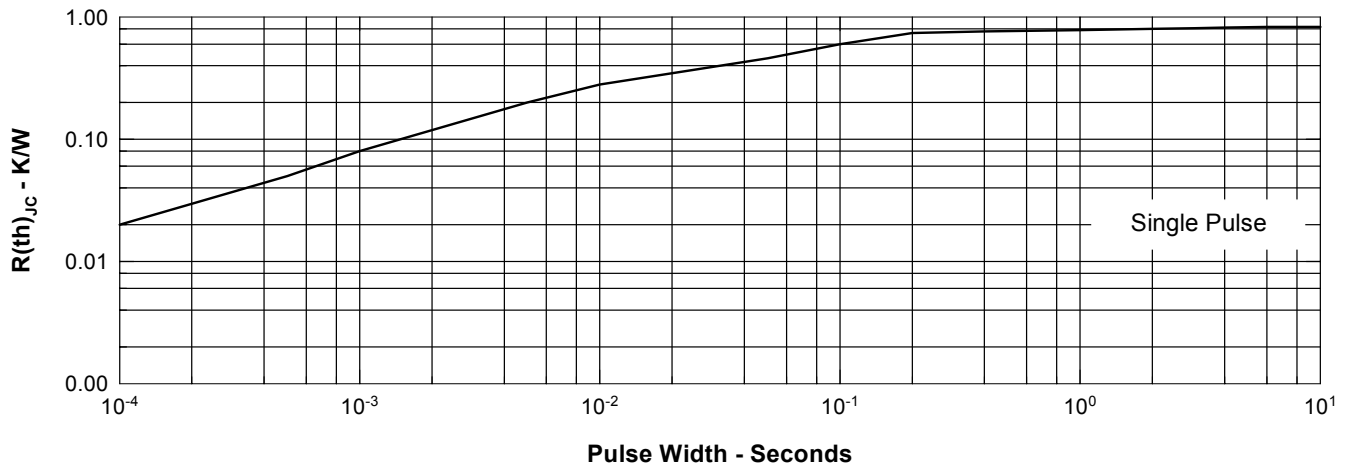


Fig. 10 Transient Thermal Impedance

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

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4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343