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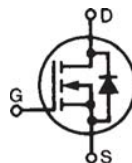
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# Linear™ Power MOSFET w/ Extended FBSOA

## IXTH24N50L



N-Channel Enhancement Mode  
Avalanche Rated

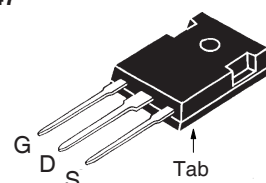
$$V_{DSS} = 500V$$

$$I_{D25} = 24A$$

$$R_{DS(on)} \leq 300m\Omega$$

| Symbol        | Test Conditions   | Maximum Ratings |            |
|---------------|---|-----------------|------------|
| $V_{DSS}$     | $T_J = 25^\circ C$ to $150^\circ C$                       | 500             | V          |
| $V_{DGR}$     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$ | 500             | V          |
| $V_{GSS}$     | Continuous  | $\pm 30$        | V          |
| $V_{GSM}$     | Transient   | $\pm 40$        | V          |
| $I_{D25}$     | $T_C = 25^\circ C$  | 24              | A          |
| $I_{DM}$      | $T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$      | 50              | A          |
| $I_A$         | $T_C = 25^\circ C$  | 12              | A          |
| $E_{AS}$      | $T_C = 25^\circ C$  | 1.5             | J          |
| $P_D$         | $T_C = 25^\circ C$  | 400             | W          |
| $T_J$         |   | -55 ... +150    | $^\circ C$ |
| $T_{JM}$      |   | 150             | $^\circ C$ |
| $T_{stg}$     |   | -55 ... +150    | $^\circ C$ |
| $T_L$         | 1.6mm (0.062in.) from Case for 10s                        | 300             | $^\circ C$ |
| $T_{sold}$    | Plastic Body for 10 seconds                               | 260             | $^\circ C$ |
| $M_d$         | Mounting Torque   | 1.13 / 10       | Nm/lb.in.  |
| <b>Weight</b> |   | 6               | g          |

TO-247



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

### Features

- Designed for Linear Operation
- International Standard Package
- Avalanche Rated
- Molding Epoxy Meets UL94 V-0 Flammability Classification

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Programmable Loads
- Current Regulators
- DC-DC Converters
- Battery Chargers
- DC Choppers
- Temperature and Lighting Controls

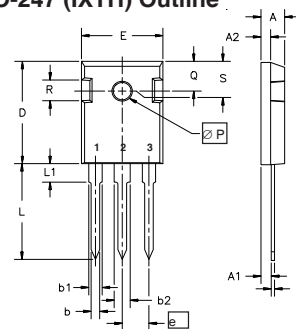
| Symbol       | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                           |
|--------------|---|-----------------------|------|---------------------------|
|              |   | Min.                  | Typ. | Max.                      |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                      | 500                   |      | V                         |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 250\mu A$                                  | 3.5                   |      | 6.0 V                     |
| $I_{GSS}$    | $V_{GS} = \pm 30V$ , $V_{DS} = 0V$                                    |                       |      | $\pm 100$ nA              |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$                                    |                       |      | 50 $\mu A$<br>500 $\mu A$ |
|              | $T_J = 125^\circ C$   |                       |      |                           |
| $R_{DS(on)}$ | $V_{GS} = 20V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                   |                       |      | 300 m $\Omega$            |

# IXYS

# IXTH24N50L

| 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  | 3                     | 7    | 11 S               |
| $C_{iss}$    | $V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$   |                       | 2500 | pF                 |
| $C_{oss}$    |  |                       | 400  | pF                 |
| $C_{rss}$    |  |                       | 100  | pF                 |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 15\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$<br>$R_G = 4.7\Omega$ (External) |                       | 35   | ns                 |
| $t_r$        |  |                       | 85   | ns                 |
| $t_{d(off)}$ |  |                       | 110  | ns                 |
| $t_f$        |  |                       | 75   | ns                 |
| $Q_{g(on)}$  | $V_{GS} = 20\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 0.5 \cdot I_{D25}$   |                       | 160  | nC                 |
| $Q_{gs}$     |  |                       | 30   | nC                 |
| $Q_{gd}$     |  |                       | 50   | nC                 |
| $R_{thJC}$   |  |                       | 0.31 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |  | 0.21                  |      | $^\circ\text{C/W}$ |

### TO-247 (IXTH) Outline



Terminals: 1 - Gate  
2 - Drain  
3 - Source

| 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  |
| ∅P             | 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   |

### Safe-Operating-Area Specification

| Symbol | Test Conditions   | Characteristic Values |      |      |
|--------|---|-----------------------|------|------|
|        |   | Min.                  | Typ. | Max. |
| SOA    | $V_{DS} = 400\text{V}, I_D = 0.5\text{A}, T_C = 60^\circ\text{C}$ | 200                   |      | W    |

### Source-Drain Diode

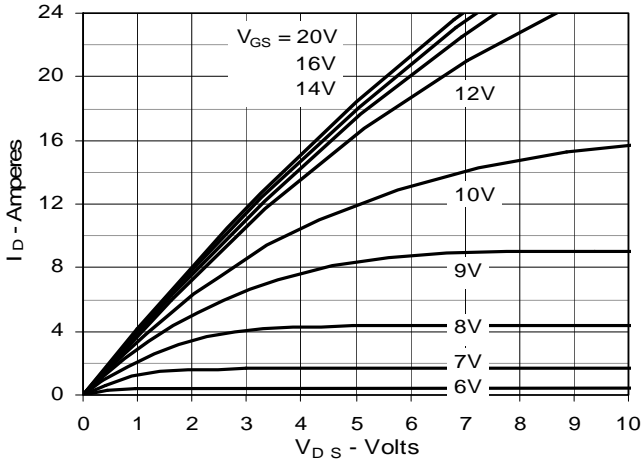
| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)              | Characteristic Values |      |       |
|----------|--|-----------------------|------|-------|
|          |  | Min.                  | Typ. | Max.  |
| $I_S$    | $V_{GS} = 0\text{V}$   |                       |      | 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 |
| $t_{rr}$ | $I_F = I_S, -di/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GS} = 0\text{V}$ |                       | 500  | ns    |

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

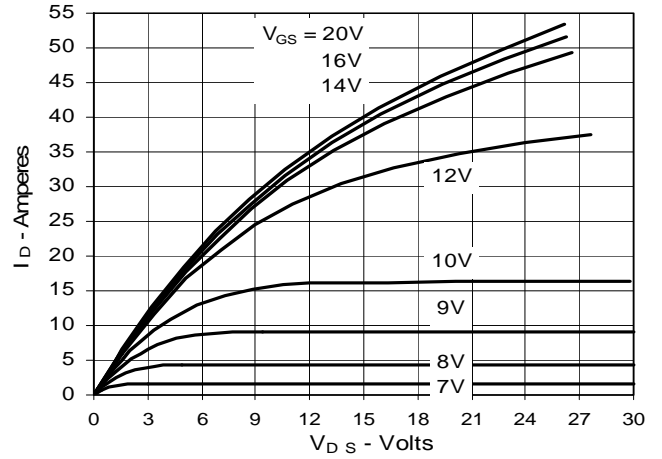
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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  
4,850,072 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

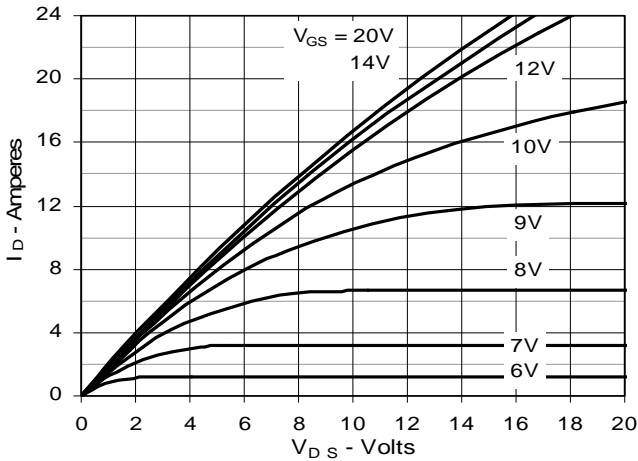
**Fig. 1. Output Characteristics**  
@  $T_J = 25^\circ\text{C}$



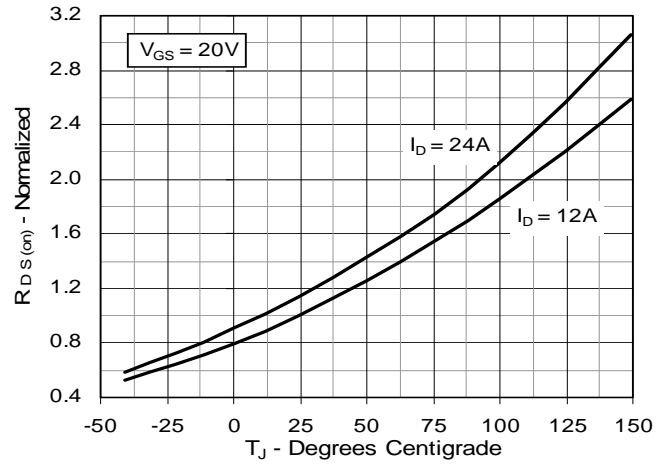
**Fig. 2. Extended Output Characteristics**  
@  $T_J = 25^\circ\text{C}$



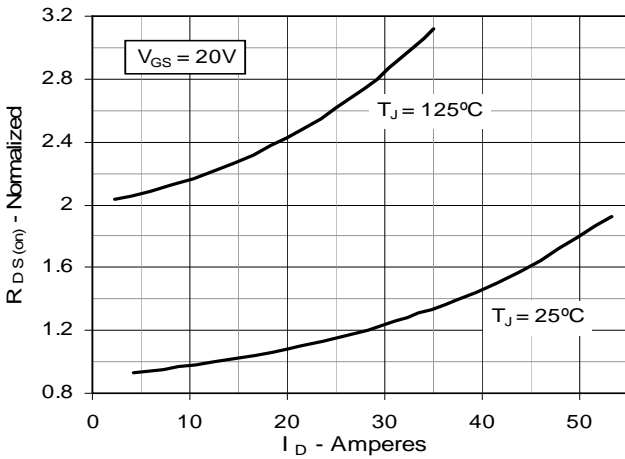
**Fig. 3. Output Characteristics**  
@  $T_J = 125^\circ\text{C}$



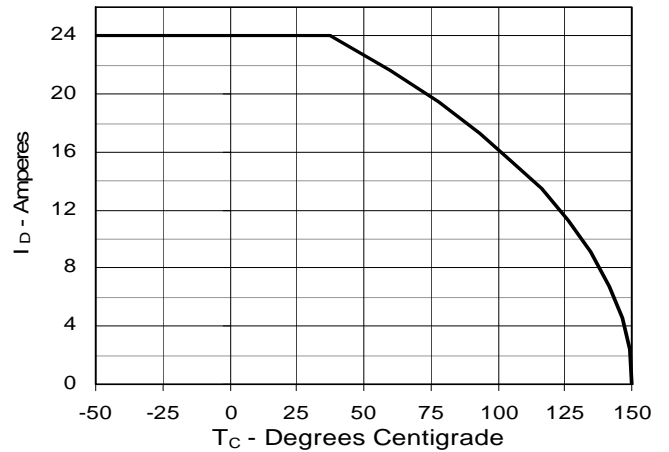
**Fig. 4.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs. Junction Temperature**



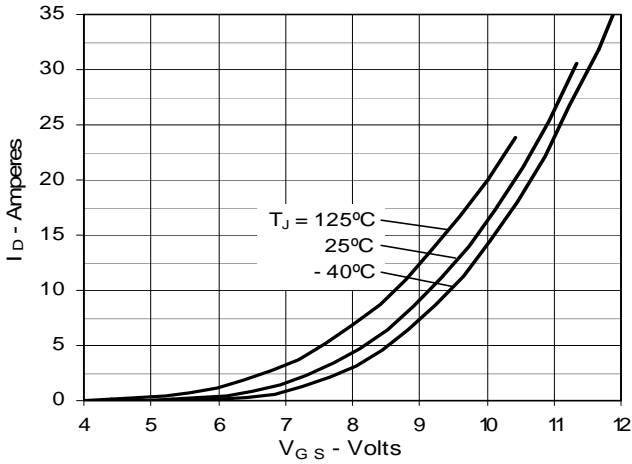
**Fig. 5.  $R_{DS(on)}$  Normalized to 0.5  $I_{D25}$  Value vs.  $I_D$**



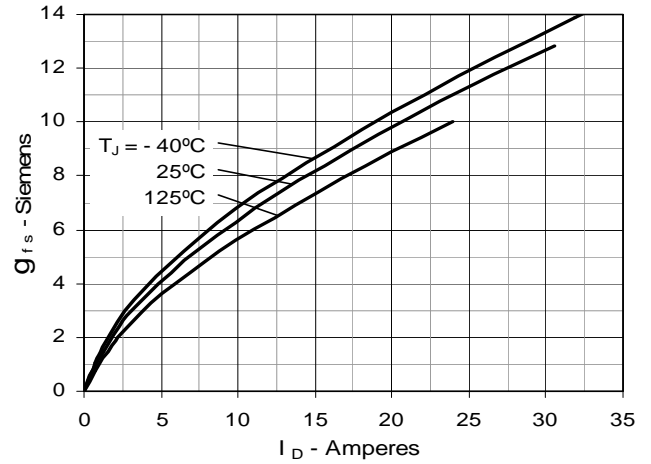
**Fig. 6. Drain Current vs. Case Temperature**



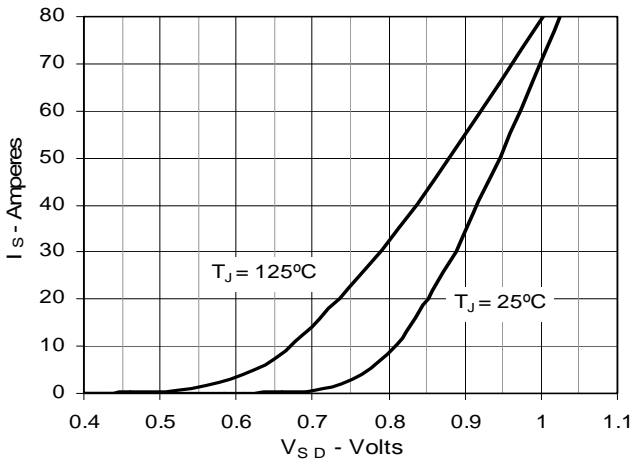
**Fig. 7. Input Admittance**



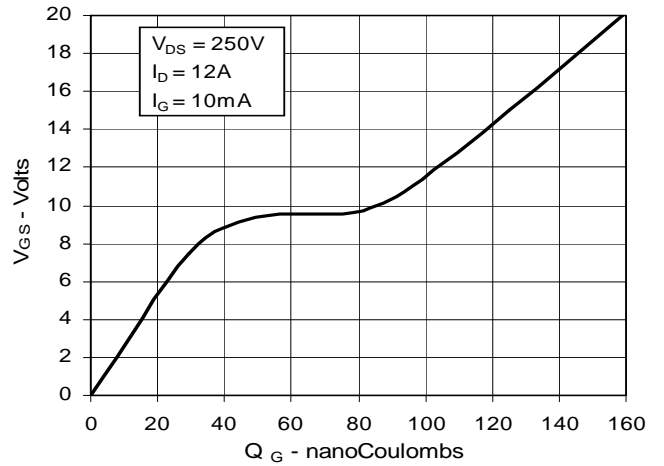
**Fig. 8. Transconductance**



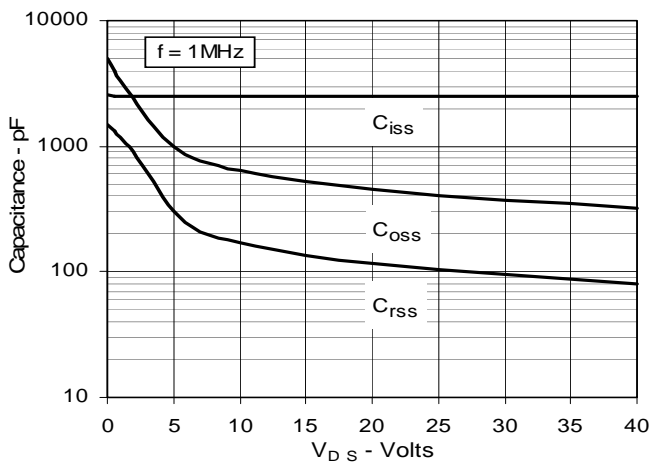
**Fig. 9. Source Current vs. Source-To-Drain Voltage**



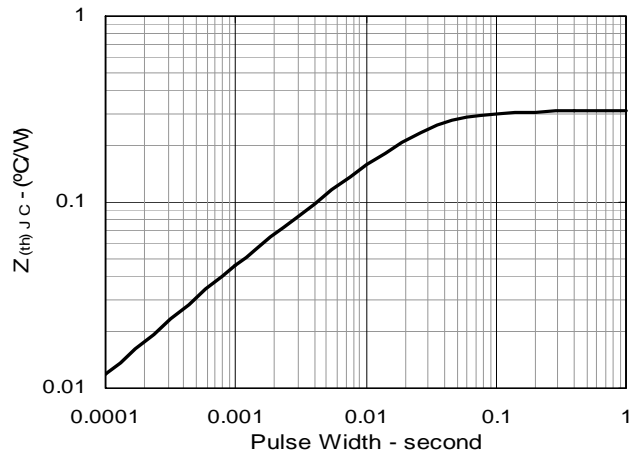
**Fig. 10. Gate Charge**



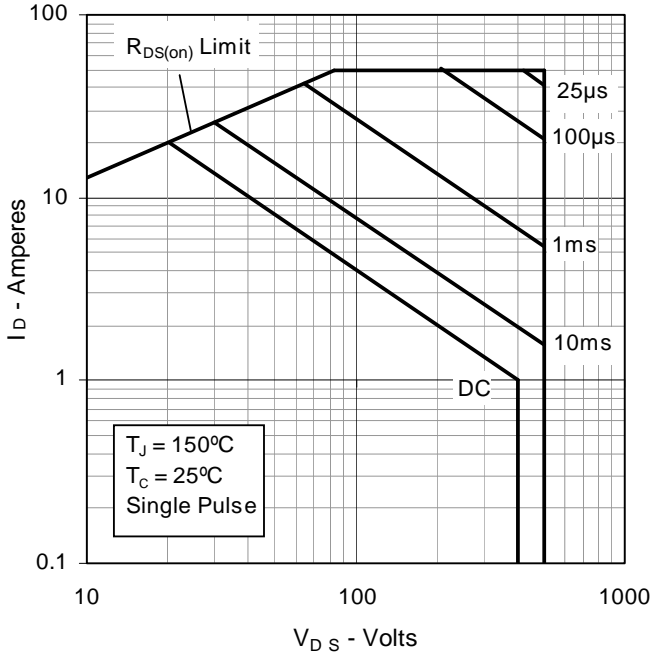
**Fig. 11. Capacitance**



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



**Fig. 13. Forward-Bias Safe Operating Area @  $T_C = 25^\circ\text{C}$**



**Fig. 14. Forward-Bias Safe Operating Area @  $T_C = 60^\circ\text{C}$**

