IXYS

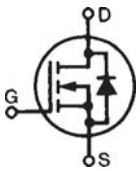
Preliminary Technical Information

# Linear Power MOSFET With Extended FBSOA

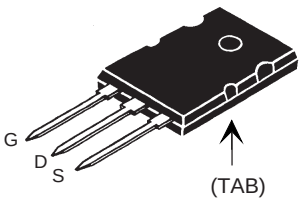
## IXTK46N50L
## IXTX46N50L

N-Channel Enhancement Mode

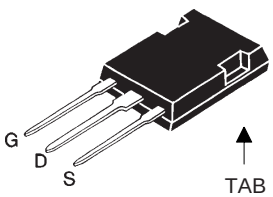
$V_{DSS}$ = 500 V
$I_{D25}$ = 46 A
$R_{DS(on)}$ ≤ 0.16 Ω




**TO-264 (IXTK)**




**PLUS247 (IXTX)**




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

| Symbol | Test Conditions | | Maximum Ratings | |
|---|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 150°C | | 500 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C; $R_{GS}$ = 1 MΩ | | 500 | V |
| $V_{GS}$ | Continuous | | ±30 | V |
| $V_{GSM}$ | Transient | | ±40 | V |
| $I_{D25}$ | $T_C$ = 25°C | | 46 | A |
| $I_{DM}$ | $T_C$ = 25°C, pulse width limited by $T_{JM}$ | | 100 | A |
| $I_{AR}$ | $T_C$ = 25°C | | 46 | A |
| $E_{AR}$ | $T_C$ = 25°C | | 60 | mJ |
| $E_{AS}$ | | | 1.5 | J |
| $P_D$ | $T_C$ = 25°C | | 700 | W |
| $T_J$ | | | -55 to +150 | °C |
| $T_{JM}$ | | | 150 | °C |
| $T_{stg}$ | | | -55 to +150 | °C |
| $T_L$ | 1.6 mm (0.063 in) from case for 10 s | | 300 | °C |
| $T_{SOLD}$ | Plastic body for 10 s | | 260 | °C |
| $M_d$ | Mounting torque | (TO-264) | 1.13/10 | Nm/lb.in. |
| $F_c$ | Mounting force | (PLUS247™) | 20...120/4.5...27 | N/lb. |
| **Weight** | PLUS247 | | 6 | g |
| | TO-264 | | 10 | g |

| Symbol | Test Conditions | | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) Min. | Typ. | Max. | |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 1 mA | | 500 | | | V |
| $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA | | 3 | | 6 | V |
| $I_{GSS}$ | $V_{GS}$ = ±30 V, $V_{DS}$ = 0 V | | | | ±200 | nA |
| $I_{DSS}$ | $V_{DS}$ = $V_{DSS}$ | $T_J$ = 25°C | | | 50 | μA |
| | $V_{GS}$ = 0 V | $T_J$ = 125°C | | | 1 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 20 V, $I_D$ = 0.5 $I_{D25}$, Note 1 | | | | 0.16 | Ω |

### Features

- Designed for linear operation
- International standard package
- Unclamped Inductive switching (UIS) rated
- Molding epoxies meet UL 94 V-0 flammability classification

### Applications

- Programmable loads
- Current regulators
- DC-DC converters
- Battery chargers
- DC choppers
- Temperature and lighting controls

### Advantages

- Easy to mount
- Space savings
- High power density

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

| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 10 V; $I_D$ = 0.5 • $I_{D25}$, Note 1 | 7 | 10 | 13 | S |
| $C_{iss}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 25 V, f = 1 MHz | | 7000 | | pF |
| $C_{oss}$ | | | 900 | | pF |
| $C_{rss}$ | | | 170 | | pF |
| $t_{d(on)}$ | $V_{GS}$ = 15 V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ $R_G$ = 2 Ω (External), | | 40 | | ns |
| $t_r$ | | | 50 | | ns |
| $t_{d(off)}$ | | | 80 | | ns |
| $t_f$ | | | 42 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 15 V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 260 | | nC |
| $Q_{gs}$ | | | 85 | | nC |
| $Q_{gd}$ | | | 125 | | nC |
| $R_{thJC}$ | | | | 0.18 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

**Safe Operating Area Specification**

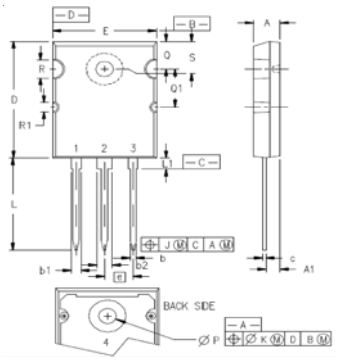
| Symbol | Test Conditions | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| SOA | $V_{DS}$ = 400 V, $I_D$ = 0.6 A, $T_C$ = 90°C | 240 | | | W |

**Source-Drain Diode**

| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0 V | | | 46 | A |
| $I_{SM}$ | Repetitive; pulse width limited by $T_{JM}$ | | | 100 | A |
| $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0 V, Note 1 | | | 1.5 | V |
| $t_{rr}$ | $I_F$ = $I_S$, -di/dt = 100 A/µs, $V_R$ = 100V | | 600 | | ns |

Note 1: Pulse test, t < 300 µs, duty cycle, d ≤ 2 %

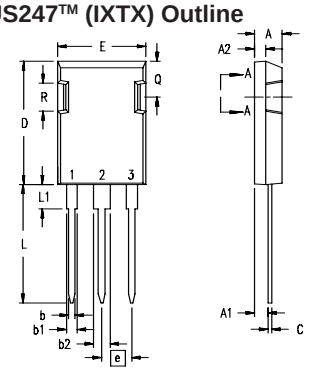
**TO-264 (IXTK) Outline**




1 – GATE
2, 4 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .185 | .209 | 4.70 | 5.31 |
| A1 | .102 | .118 | 2.59 | 3.00 |
| b | .037 | .055 | 0.94 | 1.40 |
| b1 | .087 | .102 | 2.21 | 2.59 |
| b2 | .110 | .126 | 2.79 | 3.20 |
| c | .017 | .029 | 0.43 | 0.74 |
| D | 1.007 | 1.047 | 25.58 | 26.59 |
| E | .760 | .799 | 19.30 | 20.29 |
| e | .215BSC | | 5.46 BSC | |
| J | .000 | .010 | 0.00 | 0.25 |
| K | .000 | .010 | 0.00 | 0.25 |
| L | .779 | .842 | 19.79 | 21.39 |
| L1 | .087 | .102 | 2.21 | 2.59 |
| ØP | .122 | .138 | 3.10 | 3.51 |
| Q | .240 | .256 | 6.10 | 6.50 |
| Q1 | .330 | .346 | 8.38 | 8.79 |
| ØR | .155 | .187 | 3.94 | 4.75 |
| ØR1 | .085 | .093 | 2.16 | 2.36 |
| S | .243 | .253 | 6.17 | 6.43 |

**PLUS247™ (IXTX) Outline**



Terminals: 1 - Gate
2 - Drain (Collector)
3 - Source (Emitter)
4 - Drain (Collector)

| Dim. | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|---|---|---|---|---|
| A | 4.83 | 5.21 | .190 | .205 |
| $A_1$ | 2.29 | 2.54 | .090 | .100 |
| $A_2$ | 1.91 | 2.16 | .075 | .085 |
| b | 1.14 | 1.40 | .045 | .055 |
| $b_1$ | 1.91 | 2.13 | .075 | .084 |
| $b_2$ | 2.92 | 3.12 | .115 | .123 |
| C | 0.61 | 0.80 | .024 | .031 |
| D | 20.80 | 21.34 | .819 | .840 |
| E | 15.75 | 16.13 | .620 | .635 |
| e | 5.45 BSC | | .215 BSC | |
| L | 19.81 | 20.32 | .780 | .800 |
| L1 | 3.81 | 4.32 | .150 | .170 |
| Q | 5.59 | 6.20 | .220 | 0.244 |
| R | 4.32 | 4.83 | .170 | .190 |

**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.

**Fig. 1. Output Characteristics @ 25ºC**

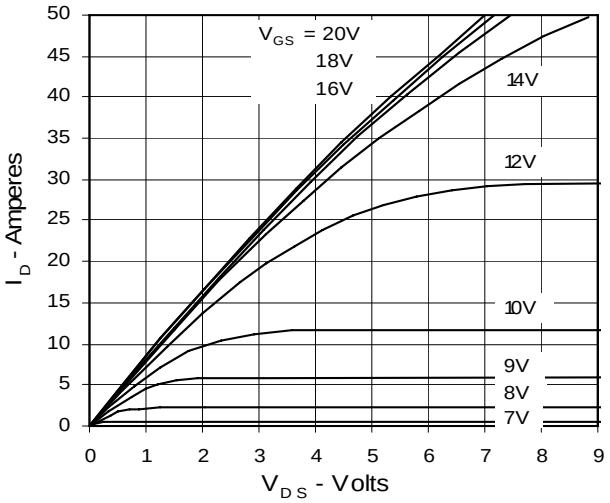



**Fig. 2. Extended Output Characteristics @ 25ºC**

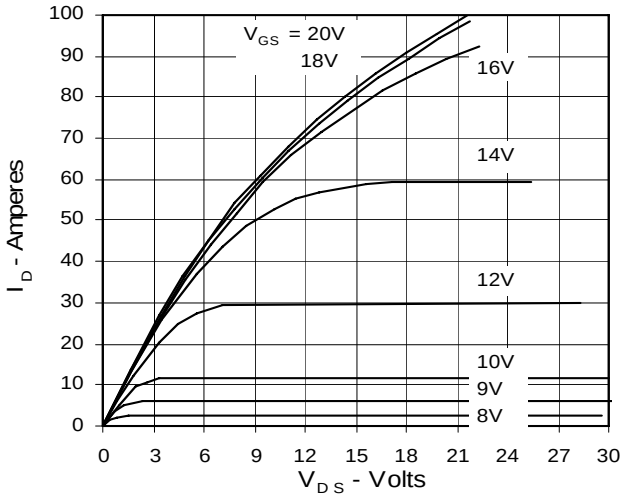



**Fig. 3. Output Characteristics @ 125ºC**

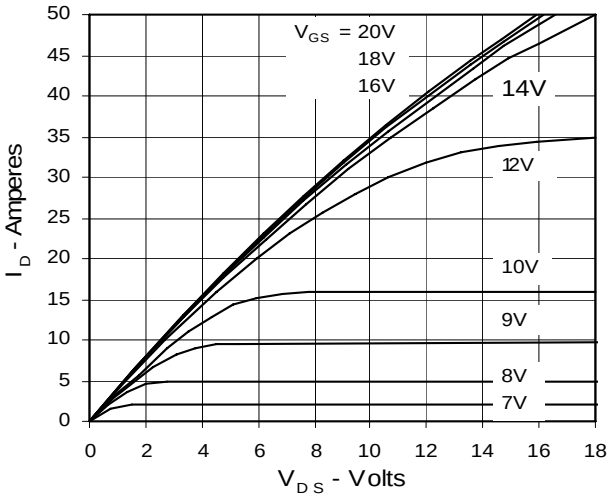



**Fig. 4. $R_{DS(on)}$ Normalized to 0.5 $I_{D25}$ Value vs. Junction Temperature**

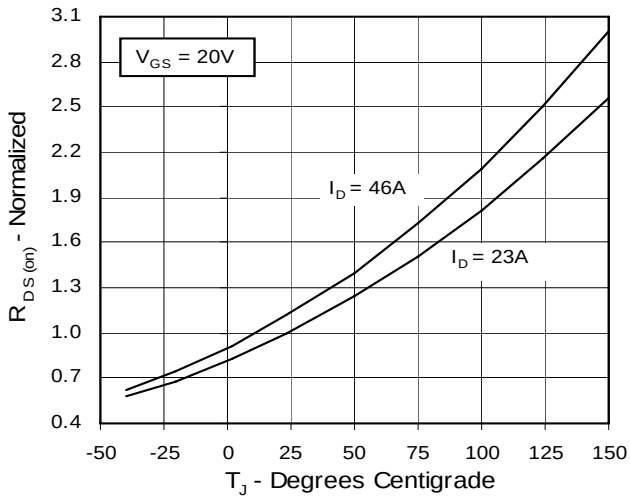



**Fig. 5. $R_{DS(on)}$ Normalized to 0.5 $I_{D25}$ Value vs. $I_D$**

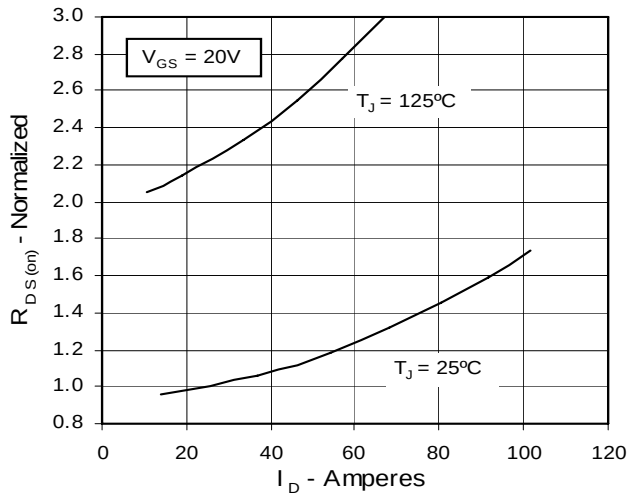



**Fig. 6. Drain Current vs. Case Temperature**

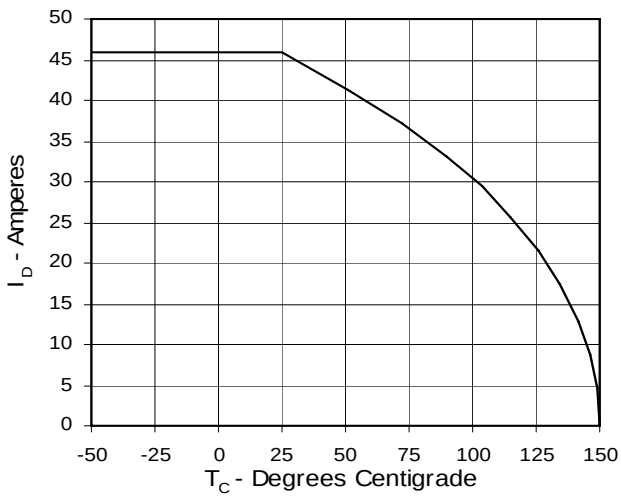


**Fig. 7. Input Admittance**

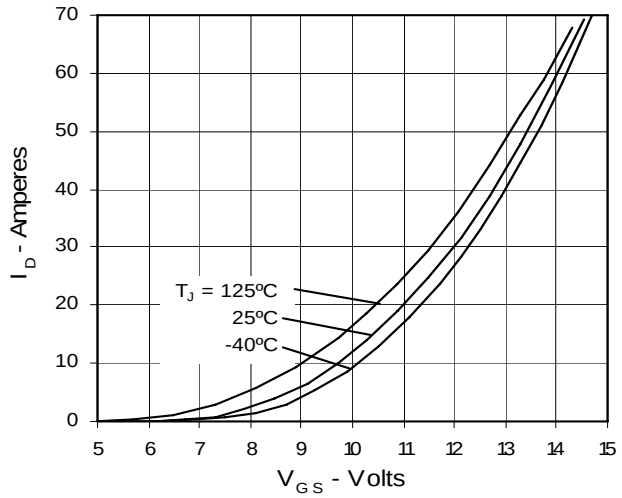



**Fig. 8. Transconductance**

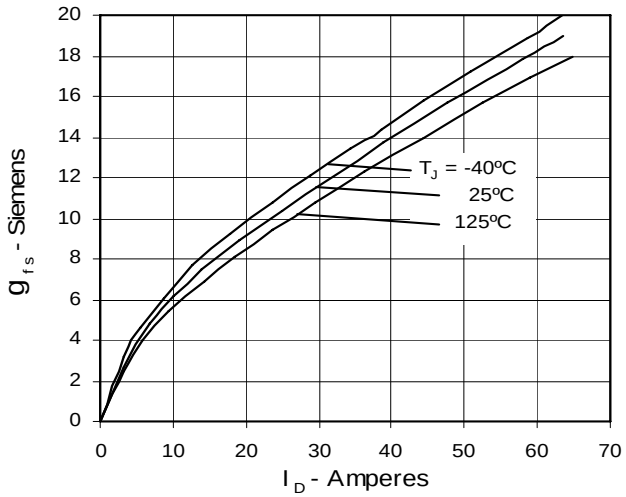



**Fig. 9. Source Current vs. Source-To-Drain Voltage**

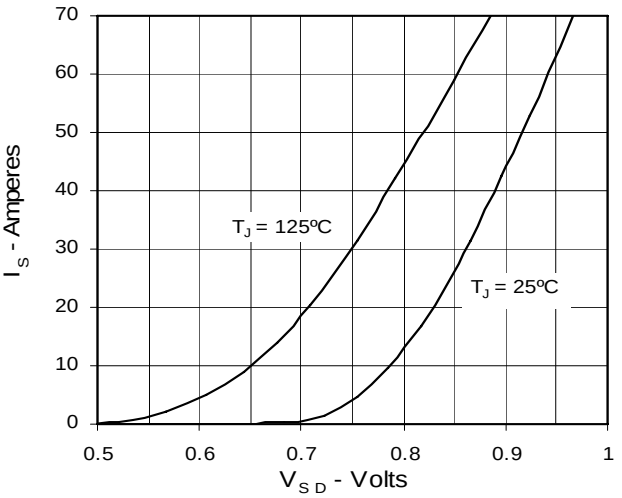



**Fig. 10. Gate Charge**

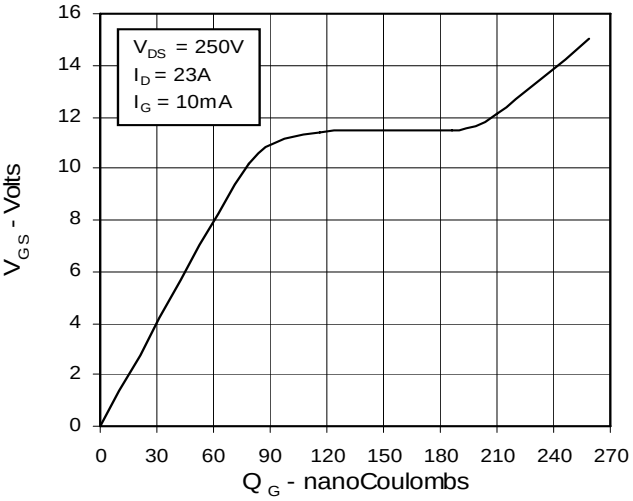



**Fig. 11. Capacitance**

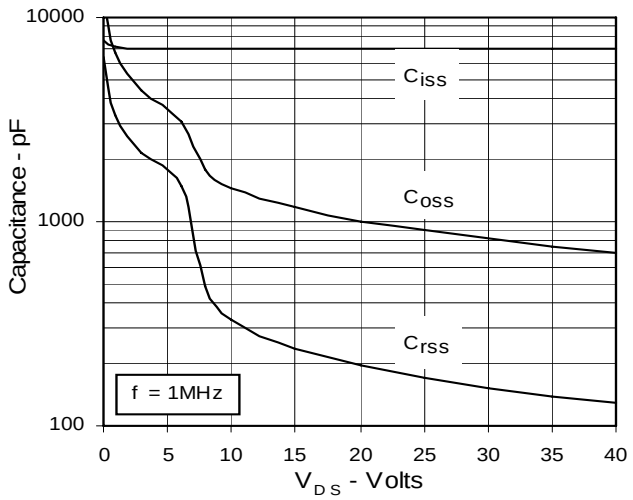


**Fig. 12. Forward-Bias Safe Operating Area @ $T_C$ = 25ºC**

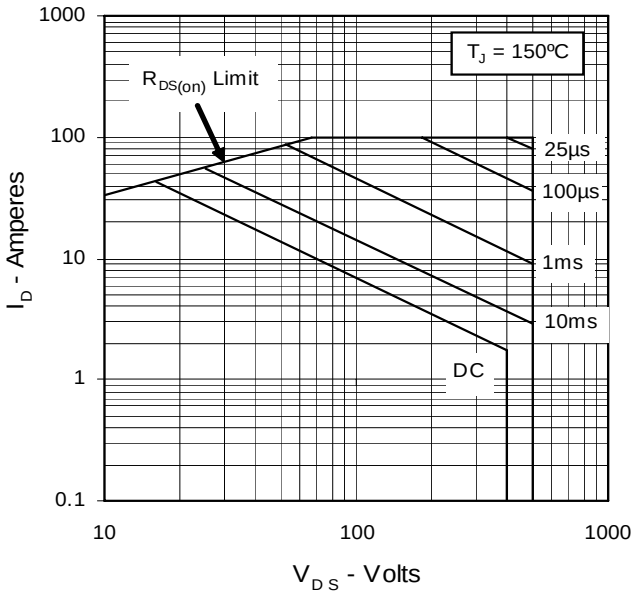



**Fig. 13. Forward-Bias Safe Operating Area @ $T_C$ = 90ºC**

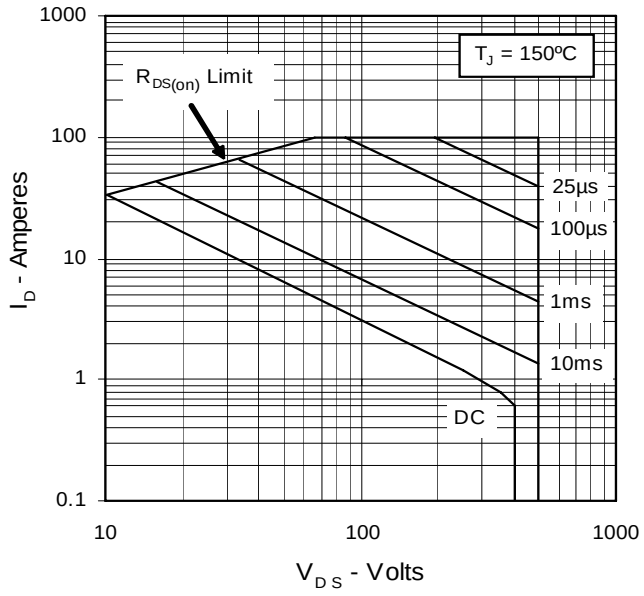



**Fig. 14. Maximum Transient Thermal Impedance**