IXYS

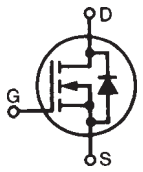
Advance Technical Information

# GigaMOS™ Power MOSFET

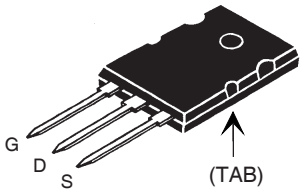
# IXFK170N20T
# IXFX170N20T

$V_{DSS}$ = 200V
$I_{D25}$ = 170A
$R_{DS(on)}$ ≤ 11mΩ
$t_{rr}$ ≤ 200ns

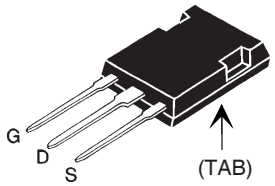
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Diode




**TO-264 (IXFK)**




**PLUS247 (IXFX)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSS}$ | $T_J$ = 25°C to 175°C | 200 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 175°C, $R_{GS}$ = 1MΩ | 200 | V |
| $V_{GSS}$ | Continuous | ± 20 | V |
| $V_{GSM}$ | Transient | ± 30 | V |
| $I_{D25}$ | $T_C$ = 25°C | 170 | A |
| $I_{L(RMS)}$ | External Lead Current Limit | 160 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 470 | A |
| $I_A$ | $T_C$ = 25°C | 40 | A |
| $E_{AS}$ | $T_C$ = 25°C | 3 | J |
| $P_D$ | $T_C$ = 25°C | 1150 | W |
| dV/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 175°C$ | 20 | V/ns |
| $T_J$ | | -55 ... +175 | °C |
| $T_{JM}$ | | 175 | °C |
| $T_{stg}$ | | -55 ... +175 | °C |
| $T_L$ | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 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 | TO-264 | 10 | g |
| | PLUS247 | 6 | g |

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 3mA | 200 | | | V |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 4mA | 2.5 | | 5.0 | V |
| $I_{GSS}$ | $V_{GS}$ = ± 20V, $V_{DS}$ = 0V | | | ± 200 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$= 0V | | | 50 | μA |
| | $T_J$ = 150°C | | | 3 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 60A, Note 1 | | | 11 | mΩ |

**Features**

- International Standard Packages
- High Current Handling Capability
- Fast Intrinsic Diode
- Avalanche Rated
- Low $R_{DS(on)}$

**Advantages**

- Easy to Mount
- Space Savings
- High Power Density

**Applications**

- Synchronous Recification
- DC-DC Converters
- Battery Chargers
- Switched-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC Motor Drives
- Uninterruptible Power Supplies
- High Speed Power Switching Applications

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 10V, $I_D$ = 60A, Note 1 | 85 | 140 | | S |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 19.6 | | nF |
| $C_{oss}$ | | | 1870 | | pF |
| $C_{rss}$ | | | 135 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 33 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 28 | | ns |
| $t_{d(off)}$ | $R_G$ = 1Ω (External) | | 80 | | ns |
| $t_f$ | | | 22 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 265 | | nC |
| $Q_{gs}$ | | | 86 | | nC |
| $Q_{gd}$ | | | 67 | | nC |
| $R_{thJC}$ | | | | 0.13 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

**Source-Drain Diode**

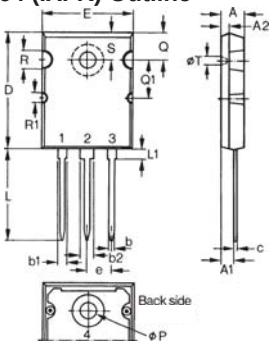
| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $I_S$ | $V_{GS}$ = 0V | | | 170 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 680 | A |
| $V_{SD}$ | $I_F$ = 60A, $V_{GS}$ = 0V, Note 1 | | | 1.3 | V |
| $t_{rr}$ | $I_F$ = 80A, -di/dt = 100A/μs | | | 200 | ns |
| $Q_{RM}$ | $V_R$ = 75V, $V_{GS}$ = 0V | | 0.59 | | μC |
| $I_{RM}$ | | | 9.80 | | A |

Note 1: Pulse Test, t ≤ 300μs; Duty Cycle, d ≤ 2%.

**ADVANCE TECHNICAL INFORMATION**

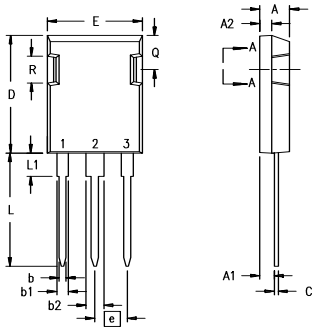
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

**TO-264 (IXFK) Outline**




| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 4.82 | 5.13 | .190 | .202 |
| A1 | 2.54 | 2.89 | .100 | .114 |
| A2 | 2.00 | 2.10 | .079 | .083 |
| b | 1.12 | 1.42 | .044 | .056 |
| b1 | 2.39 | 2.69 | .094 | .106 |
| b2 | 2.90 | 3.09 | .114 | .122 |
| c | 0.53 | 0.83 | .021 | .033 |
| D | 25.91 | 26.16 | 1.020 | 1.030 |
| E | 19.81 | 19.96 | .780 | .786 |
| e | 5.46 BSC | | .215 BSC | |
| J | 0.00 | 0.25 | .000 | .010 |
| K | 0.00 | 0.25 | .000 | .010 |
| L | 20.32 | 20.83 | .800 | .820 |
| L1 | 2.29 | 2.59 | .090 | .102 |
| P | 3.17 | 3.66 | .125 | .144 |
| Q | 6.07 | 6.27 | .239 | .247 |
| Q1 | 8.38 | 8.69 | .330 | .342 |
| R | 3.81 | 4.32 | .150 | .170 |
| R1 | 1.78 | 2.29 | .070 | .090 |
| S | 6.04 | 6.30 | .238 | .248 |
| T | 1.57 | 1.83 | .062 | .072 |

**PLUS 247™ (IXFX) Outline**




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

| Dim. | Millimeter Min. | Max. | Inches Min. | 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 |

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

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

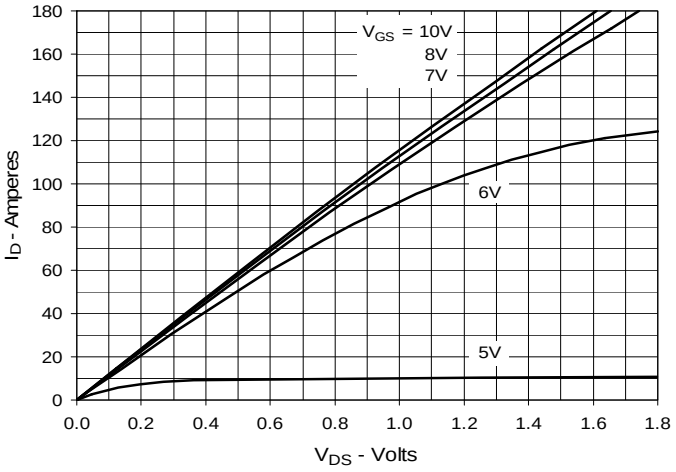



**Fig. 2. Extended Output Characteristics @ 25ºC**

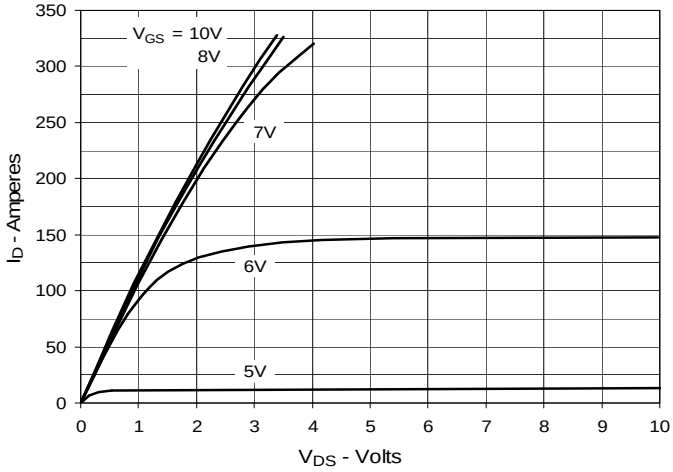



**Fig. 3. Output Characteristics @ 150ºC**

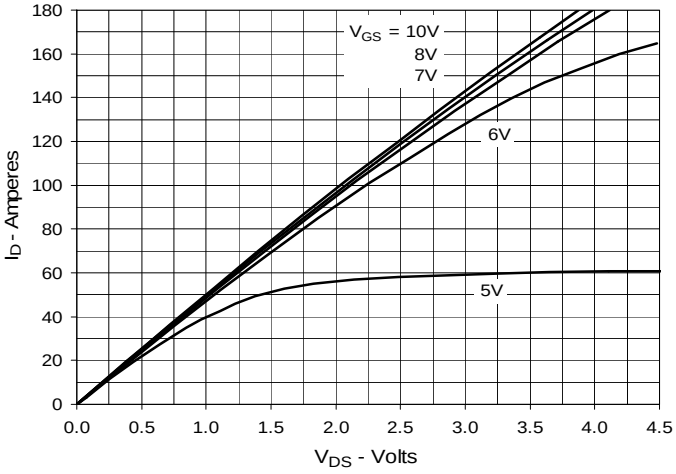



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 85A Value vs. Junction Temperature**

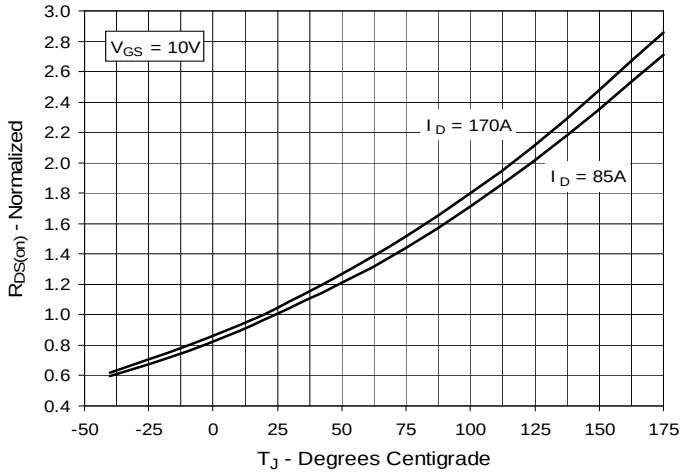



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 85A Value vs. Drain Current**

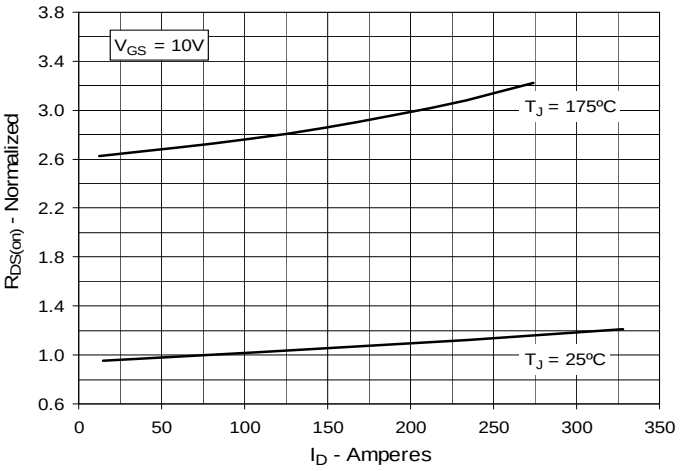



**Fig. 6. Drain Current vs. Case Temperature**

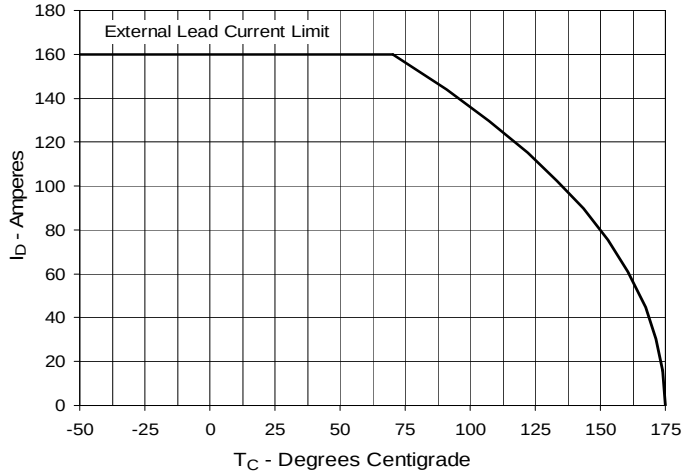


**Fig. 7. Input Admittance**

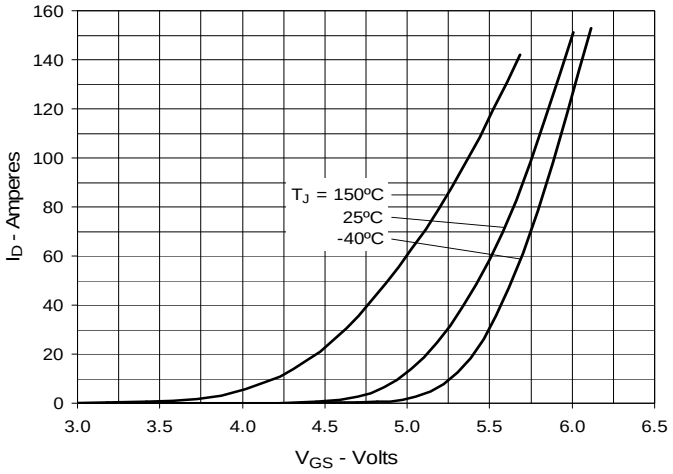



**Fig. 8. Transconductance**

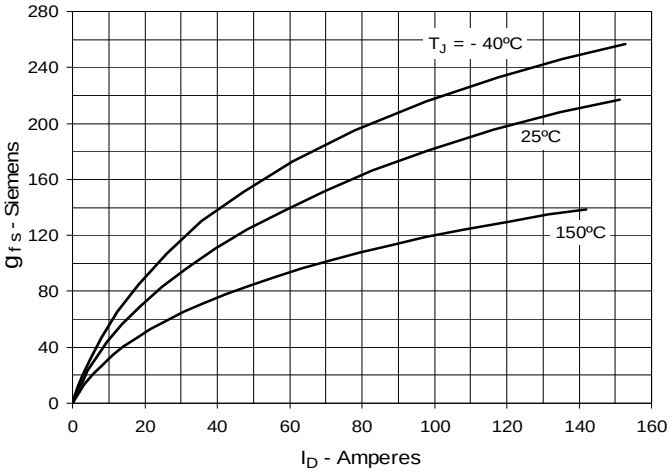



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

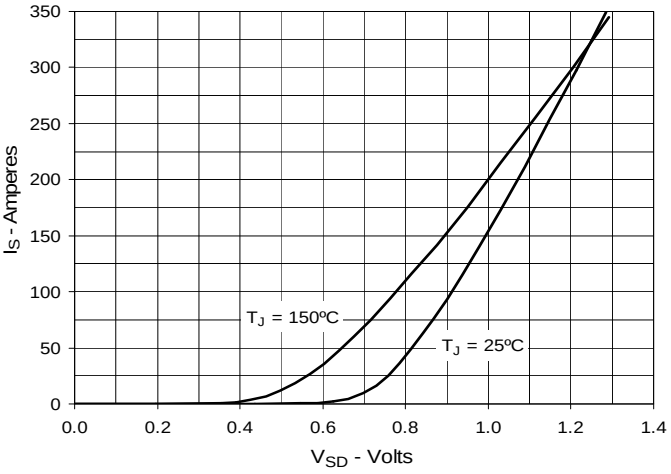



**Fig. 10. Gate Charge**

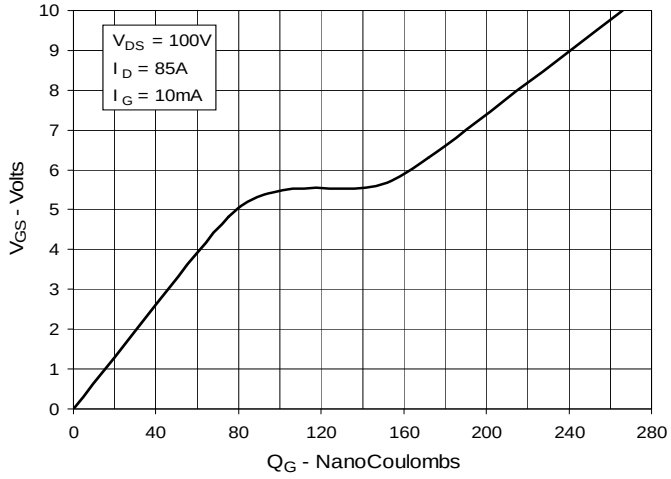



**Fig. 11. Capacitance**

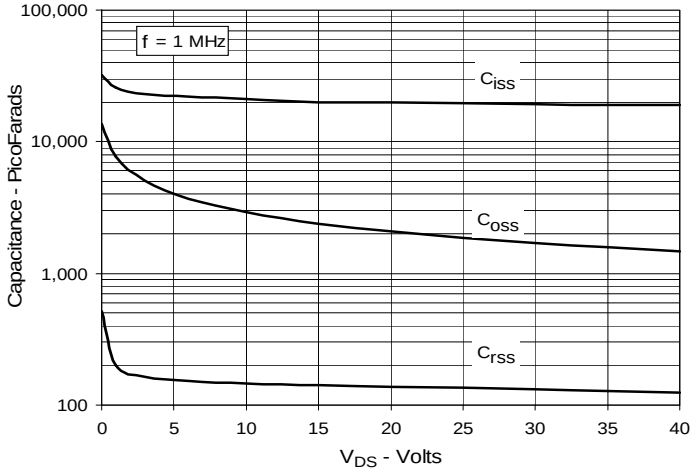



**Fig. 12. Forward-Bias Safe Operating Area**

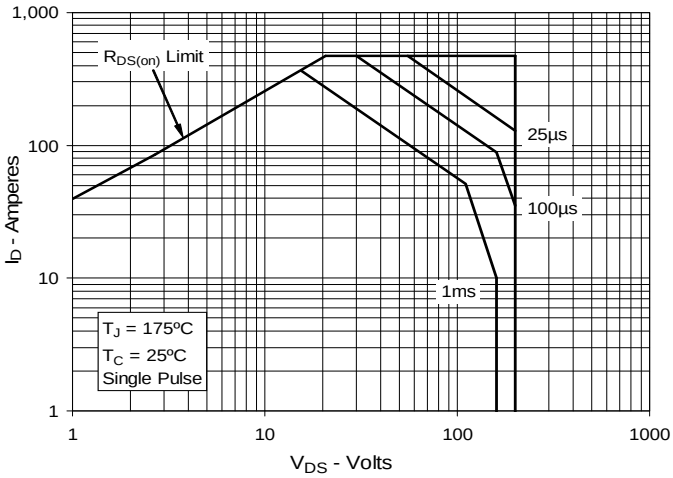


**Fig. 13. Maximum Transient Thermal Impedance**