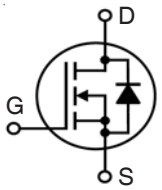
# IXYS

## X3-Class HiPerFET™ Power MOSFET

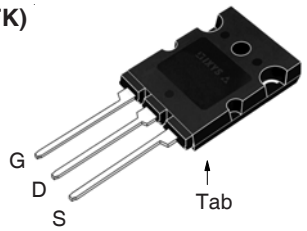
## IXFK300N20X3
## IXFX300N20X3

$V_{DSS}$ = 200V
$I_{D25}$ = 300A
$R_{DS(on)}$ ≤ 4mΩ

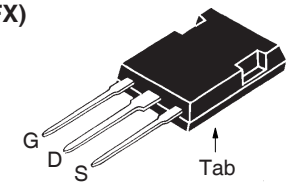
N-Channel Enhancement Mode
Avalanche Rated




**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 150°C | 200 | V |
| $V_{DGR}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 200 | V |
| $V_{GSS}$ | Continuous | ±20 | V |
| $V_{GSM}$ | Transient | ±30 | V |
| $I_{D25}$ | $T_C$ = 25°C (Chip Capability) | 300 | A |
| $I_{L(RMS)}$ | External Lead Current Limit | 160 | A |
| $I_{DM}$ | $T_C$ = 25°C, Pulse Width Limited by $T_{JM}$ | 700 | A |
| $I_A$ | $T_C$ = 25°C | 150 | A |
| $E_{AS}$ | $T_C$ = 25°C | 3.5 | J |
| dv/dt | $I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$ | 50 | V/ns |
| $P_D$ | $T_C$ = 25°C | 1250 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case 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 |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$, $I_D$ = 8mA | 2.5 | | 4.5 | V |
| $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | | | ±200 | nA |
| $I_{DSS}$ | $V_{DS} = V_{DSS}$, $V_{GS}$ = 0V | | | 25 | μA |
| | $T_J$ = 125°C | | | 1.5 | mA |
| $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D = 0.5 \bullet I_{D25}$, Note 1 | | | 4 | mΩ |

### Features

- International Standard Packages
- Low $R_{DS(ON)}$ and $Q_G$
- Avalanche Rated
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

| 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 | 80 | 135 | | S |
| $R_{Gi}$ | Gate Input Resistance | | 1.8 | | Ω |
| $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 23.8 | | nF |
| $C_{oss}$ | | | 4.0 | | nF |
| $C_{rss}$ | | | 3.2 | | pF |
| | **Effective Output Capacitance** | | | | |
| $C_{o(er)}$ | Energy related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 1640 | | pF |
| $C_{o(tr)}$ | Time related; $V_{GS}$ = 0V, $V_{DS}$ = 0.8 • $V_{DSS}$ | | 5640 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 44 | | ns |
| $t_r$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 43 | | ns |
| $t_{d(off)}$ | $R_G$ = 1Ω (External) | | 184 | | ns |
| $t_f$ | | | 13 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = 10V, $V_{DS}$ = 0.5 • $V_{DSS}$, $I_D$ = 0.5 • $I_{D25}$ | | 375 | | nC |
| $Q_{gs}$ | | | 117 | | nC |
| $Q_{gd}$ | | | 94 | | nC |
| $R_{thJC}$ | | | | 0.10 | °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 | | | 300 | A |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$ | | | 1200 | A |
| $V_{SD}$ | $I_F$ = 100A, $V_{GS}$ = 0V, Note 1 | | | 1.4 | V |
| $t_{rr}$ | $I_F$ = 150A, -di/dt = 100A/μs | | 172 | | ns |
| $Q_{RM}$ | $V_R$ = 100V | | 1.1 | | μC |
| $I_{RM}$ | | | 12.8 | | A |

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

**Fig. 1. Output Characteristics @ $T_J$ = 25°C**

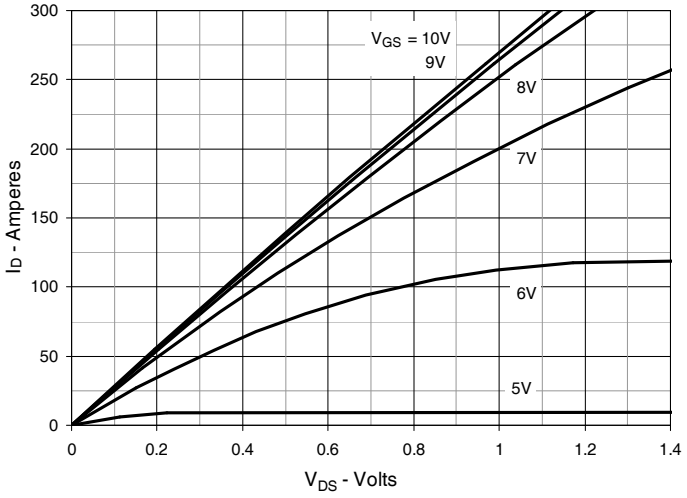



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25°C**

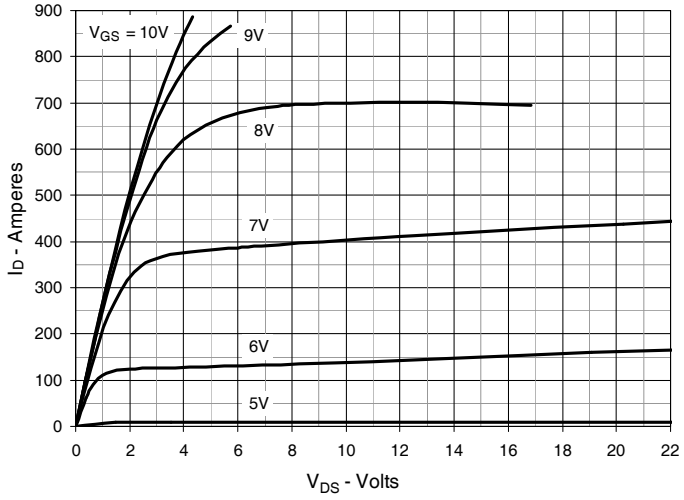



**Fig. 3. Output Characteristics @ $T_J$ = 125°C**

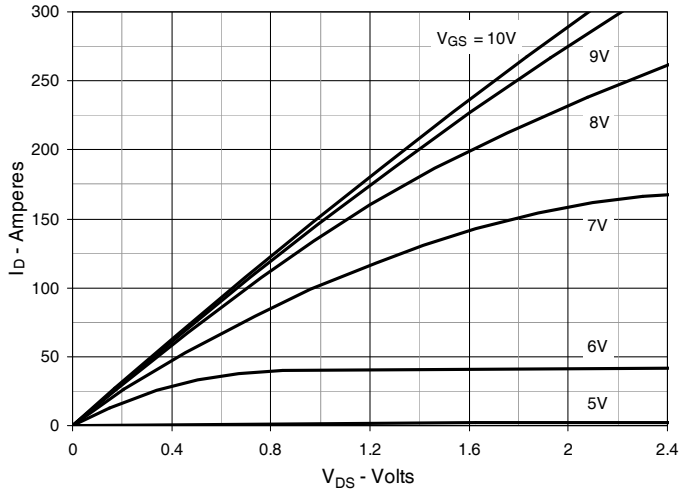



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 150A Value vs. Junction Temperature**

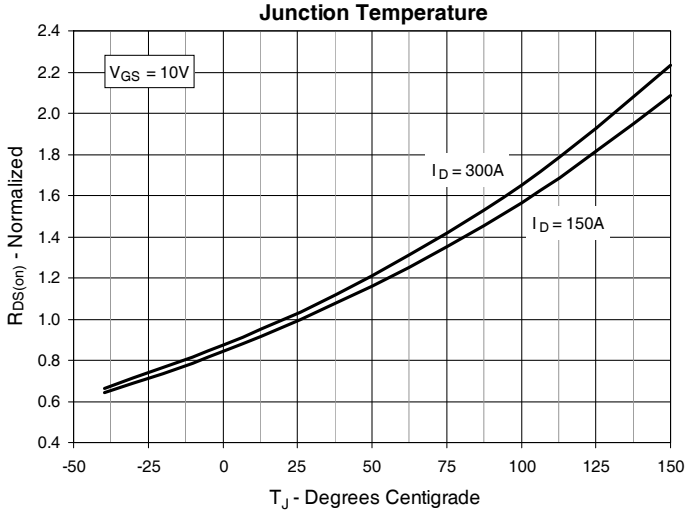



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 150A Value vs. Drain Current**

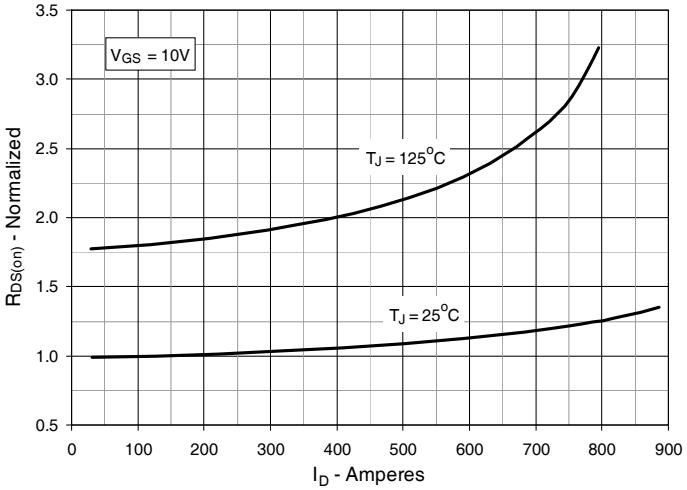



**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

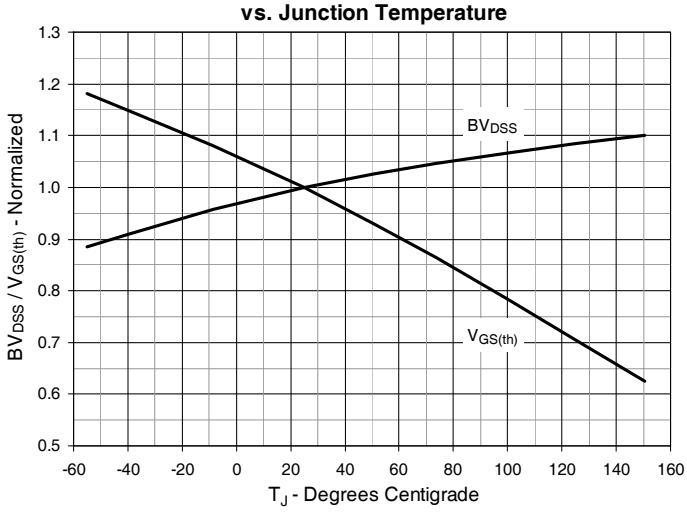


**Fig. 7. Maximum Drain Current vs. Case Temperature**

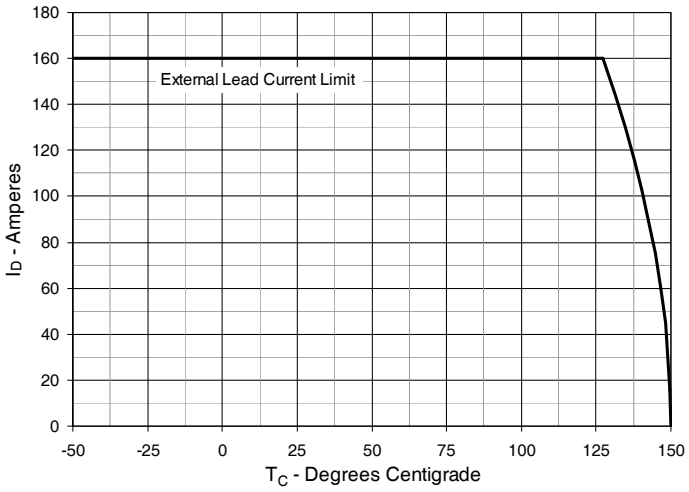



**Fig. 8. Input Admittance**

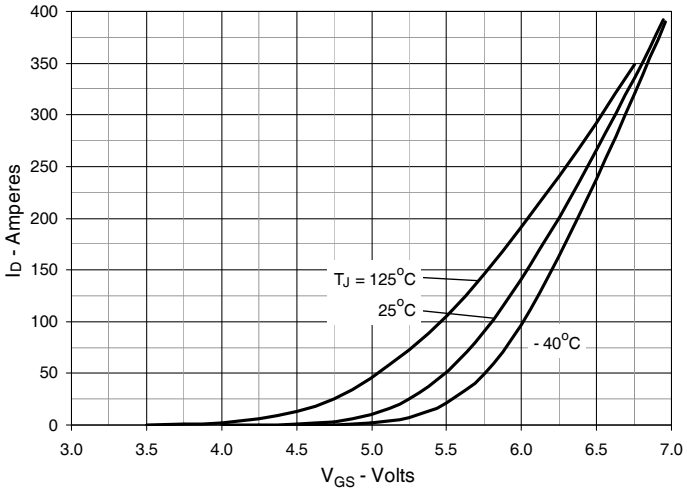



**Fig. 9. Transconductance**

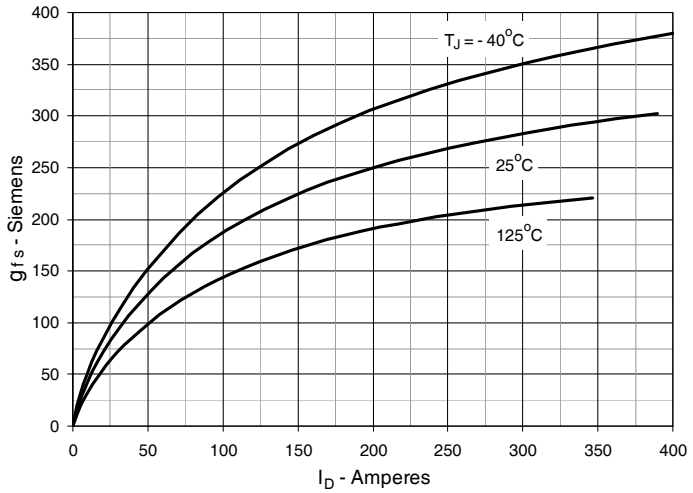



**Fig. 10. Forward Voltage Drop of Intrinsic Diode**

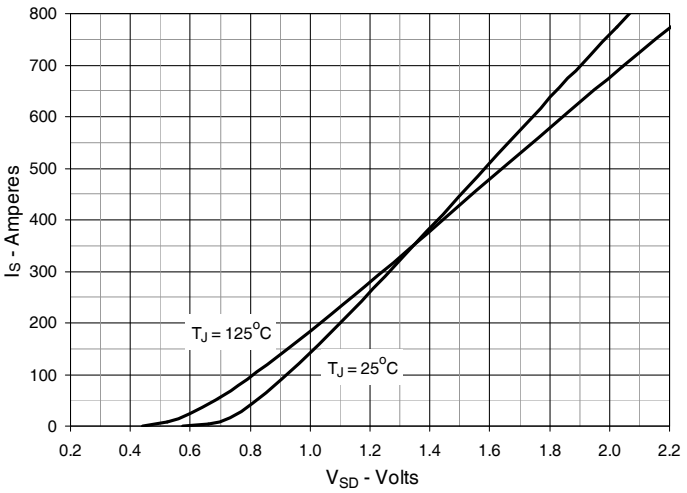



**Fig. 11. Gate Charge**

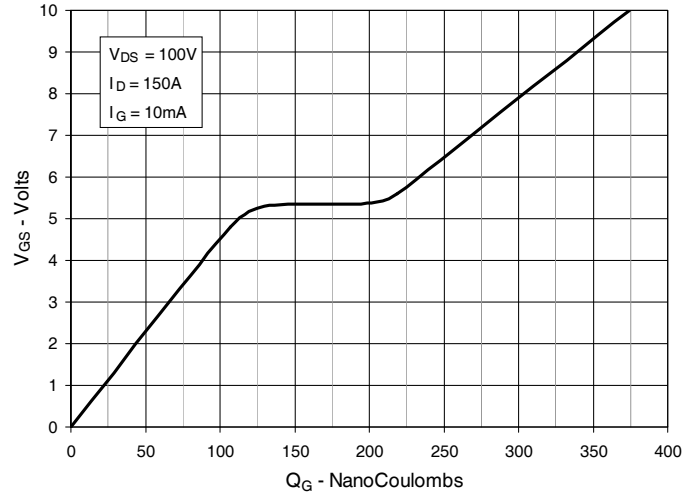



**Fig. 12. Capacitance**

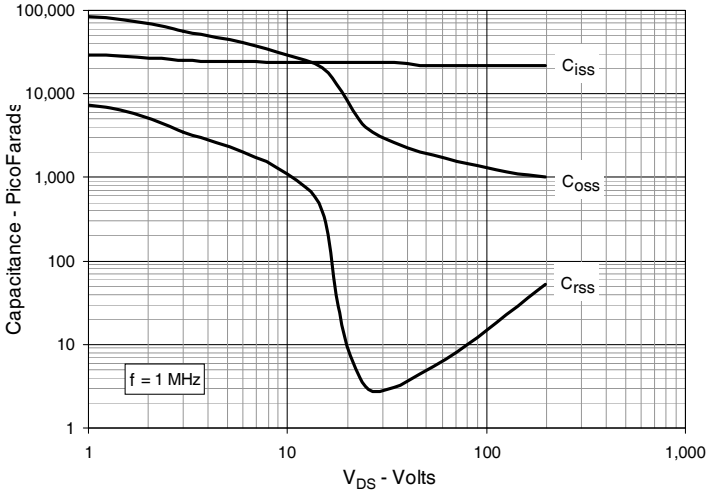


**Fig. 13. Output Capacitance Stored Energy**

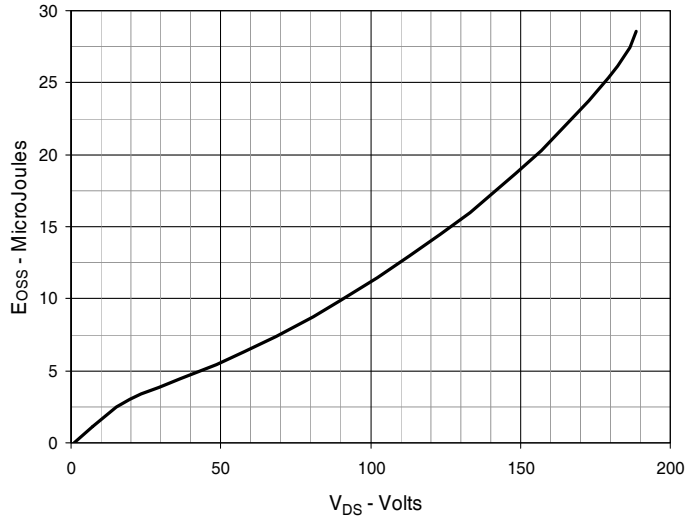



**Fig. 14. Forward-Bias Safe Operating Area**

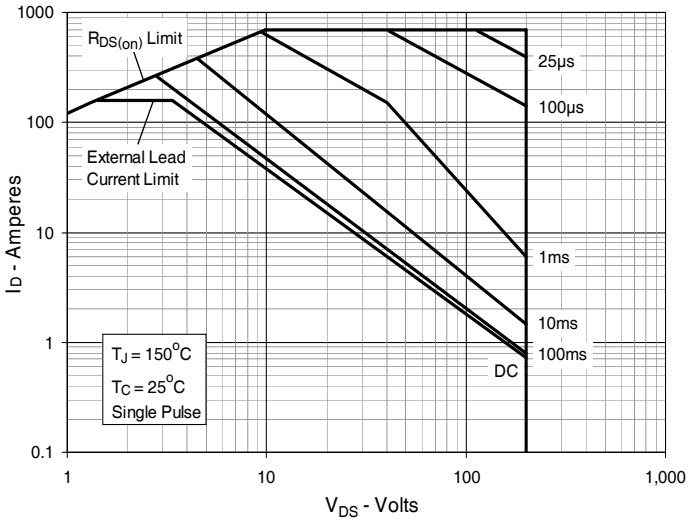
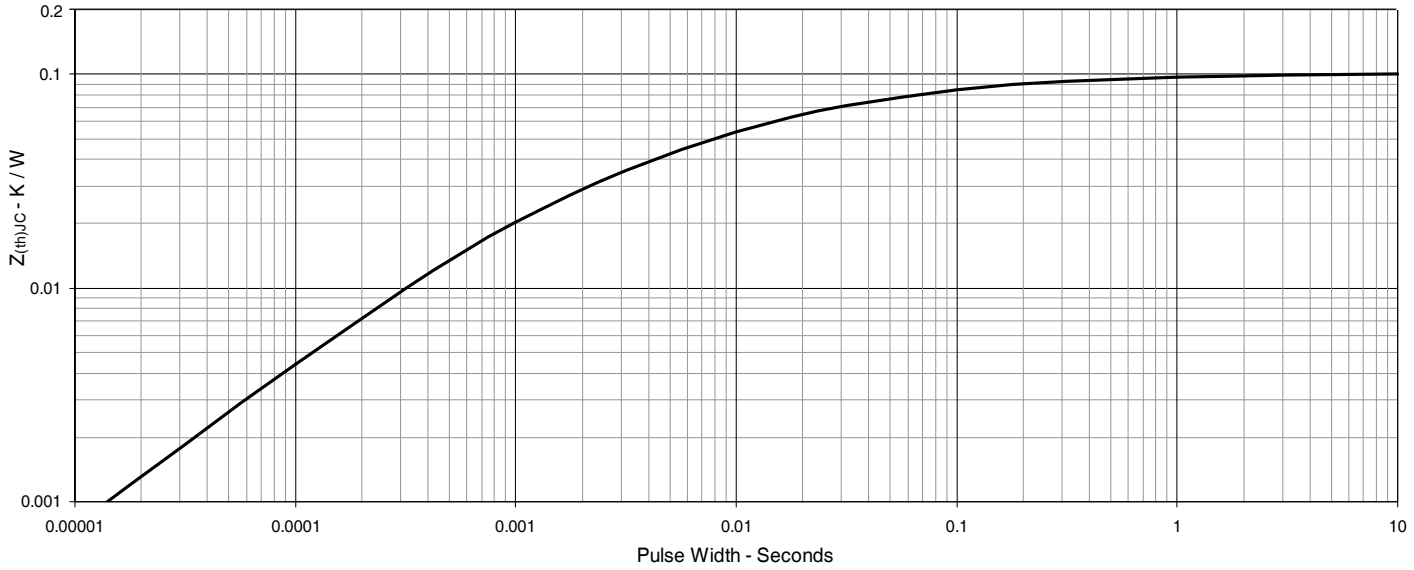
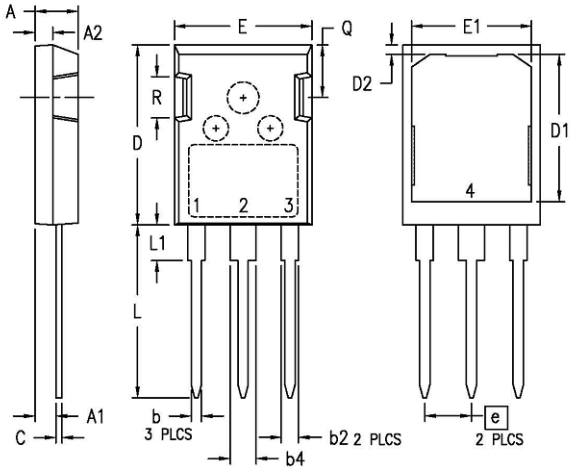



**Fig. 15. Maximum Transient Thermal Impedance**



## PLUS247 Outline

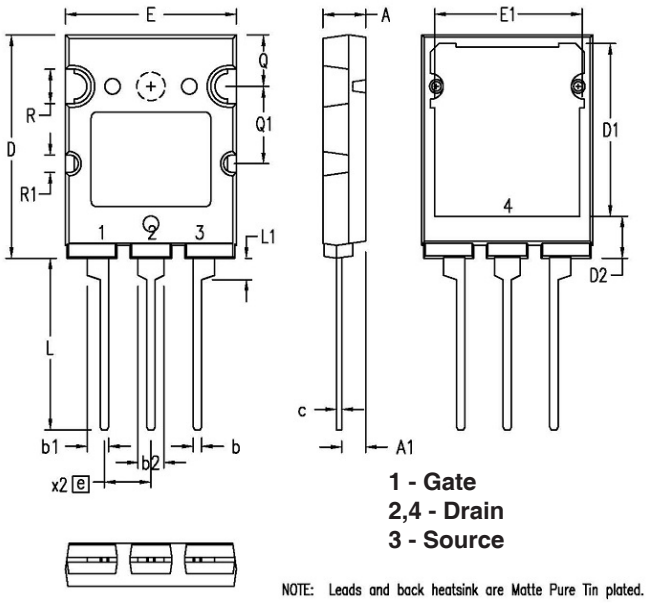



| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .090 | .100 | 2.29 | 2.54 |
| A2 | .075 | .085 | 1.91 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b2 | .075 | .087 | 1.91 | 2.20 |
| b4 | .115 | .126 | 2.92 | 3.20 |
| C | .024 | .031 | 0.61 | 0.80 |
| D | .819 | .840 | 20.80 | 21.34 |
| D1 | .650 | .690 | 16.51 | 17.53 |
| D2 | .035 | .050 | 0.89 | 1.27 |
| E | .620 | .635 | 15.75 | 16.13 |
| E1 | .520 | .560 | 13.08 | 14.22 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .810 | 19.81 | 20.57 |
| L1 | .150 | .170 | 3.81 | 4.32 |
| Q | .220 | .244 | 5.59 | 6.20 |
| R | .170 | .190 | 4.32 | 4.83 |

**1 - Gate**
**2,4 - Drain**
**3 - Source**

NOTE:
1. This drawing will meet all dimensions requirement of JEDEC outline TO-247 AD (R-PSIP-F3) except screw mounting hole.
2. Pin #2 is connected to the bottom heatsink (#4).
3. Lead finish – One of the following depending on the packaging plants.
   3.1 Matte pure tin plating on the leads and back heatsink.
   3.2 Pb free solder dip on the leads and pre Ni plated back heatsink.

## TO-264 Outline




| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .185 | .209 | 4.70 | 5.30 |
| A1 | .102 | .118 | 2.60 | 3.00 |
| b | .035 | .049 | 0.90 | 1.25 |
| b1 | .091 | .106 | 2.30 | 2.70 |
| b2 | .110 | .126 | 2.80 | 3.20 |
| c | .020 | .033 | 0.50 | 0.85 |
| D | 1.012 | 1.035 | 25.70 | 26.30 |
| D1 | .783 | .799 | 19.90 | 20.30 |
| D2 | .185 | .205 | 4.70 | 5.20 |
| E | .776 | .799 | 19.70 | 20.30 |
| E1 | .661 | .677 | 16.80 | 17.20 |
| e | .215 BSC | | 5.46 BSC | |
| L | .768 | .807 | 19.50 | 20.50 |
| L1 | .091 | .106 | 2.30 | 2.70 |
| Q | .228 | .244 | 5.80 | 6.20 |
| Q1 | .346 | .362 | 8.80 | 9.20 |
| øR | .150 | .165 | 3.80 | 4.20 |
| øR1 | .071 | .087 | 1.80 | 2.20 |

**1 - Gate**
**2,4 - Drain**
**3 - Source**

NOTE: Leads and back heatsink are Matte Pure Tin plated.