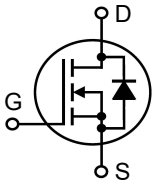
# X3-Class HiPerFET™ Power MOSFET

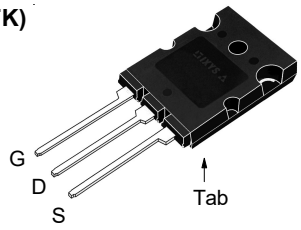
# IXFK300N20X3
# IXFX300N20X3

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

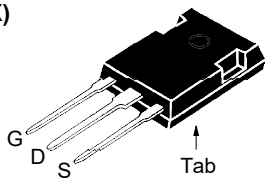
N-Channel Enhancement Mode
Avalanche Rated




**TO-264K (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 1.6 mm (0.062 in.) from Case for 10s | 300 | °C |
| $M_d$ | Mounting Torque (TO-264K) | 1.13/10 | Nm/lb.in |
| $F_C$ | Mounting Force (PLUS247) | 20..120 /4.5..27 | N/lb |
| Weight | TO-264K<br>PLUS247 | 10<br>6 | g<br>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 | | 1640 | | pF |
| $C_{o(tr)}$ | Time related; $V_{DS}$ = 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 @ $T_J$ = 25ºC**

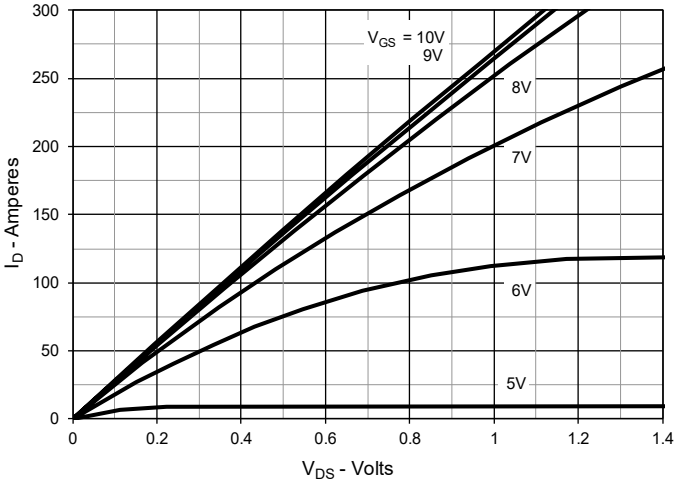



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

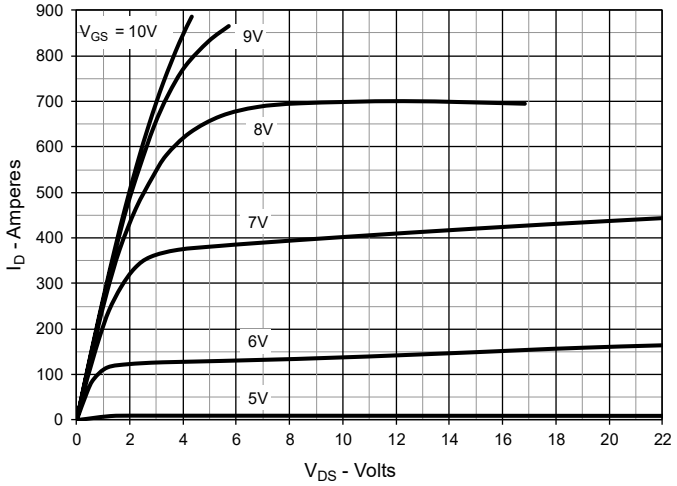



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

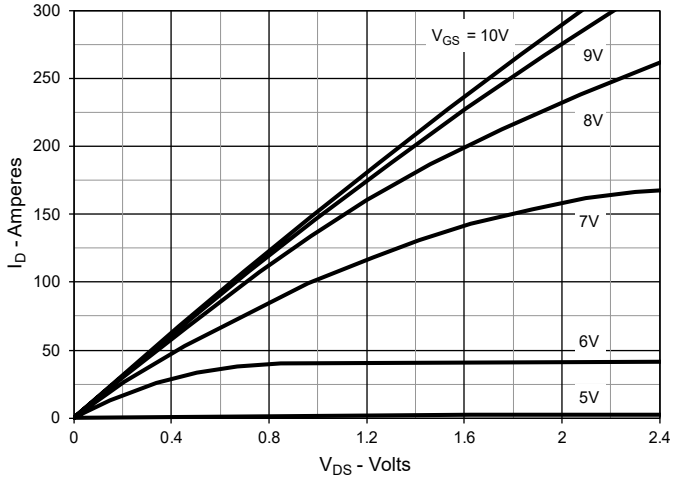



**Fig. 4. $R_{DS(on)}$ Normalized to $I_D$ = 150A Value vs. Junction Temperature**

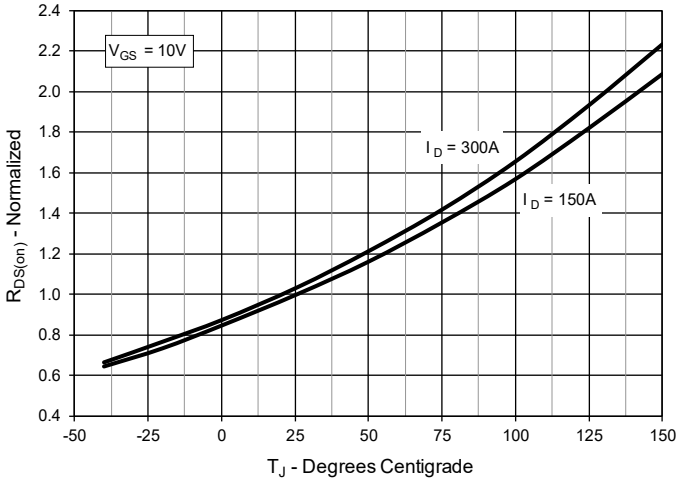



**Fig. 5. $R_{DS(on)}$ Normalized to $I_D$ = 150A Value vs. Drain Current**

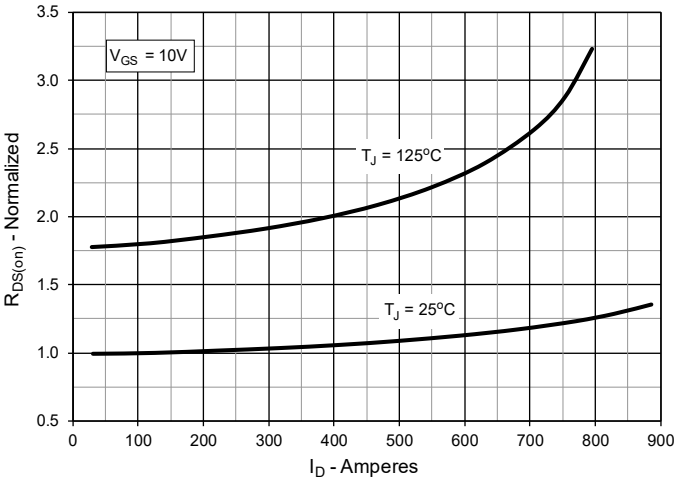



**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

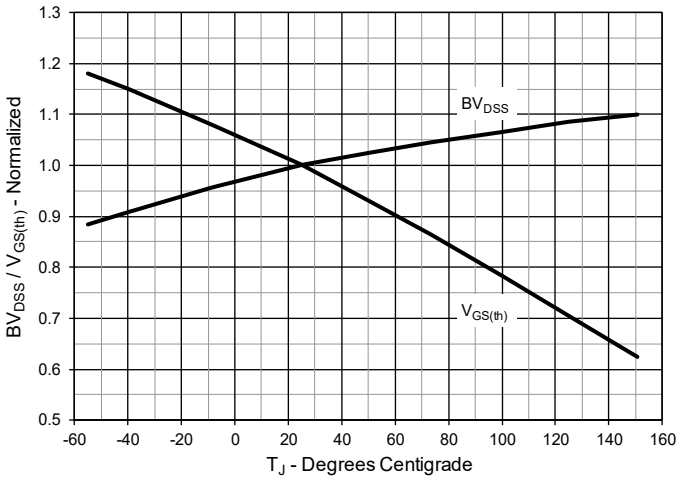


**Fig. 7. Maximum Drain Current vs. Case Temperature**

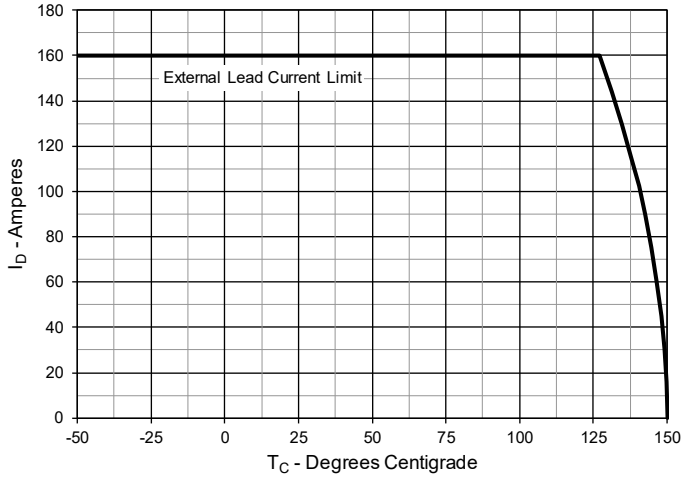



**Fig. 8. Input Admittance**

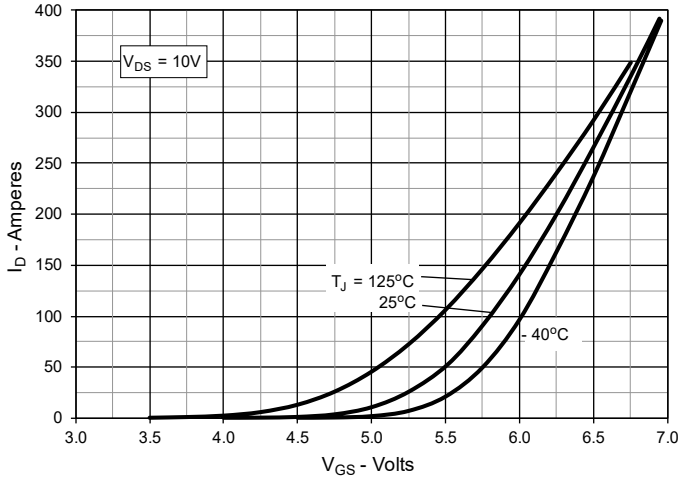



**Fig. 9. Transconductance**

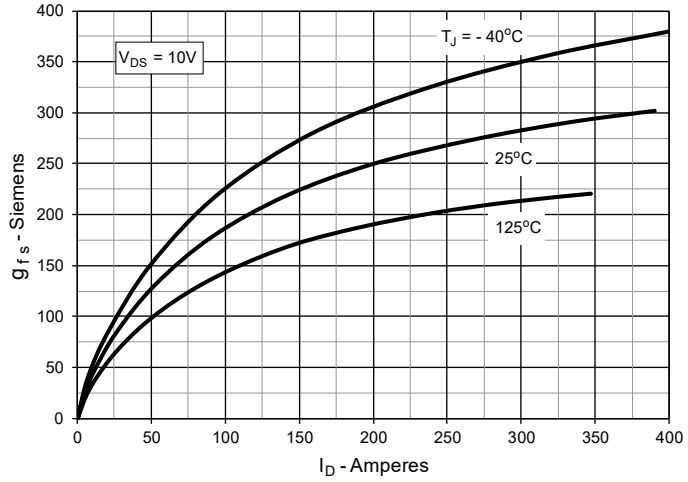



**Fig. 10. Forward Voltage Drop of Intrinsic Diode**

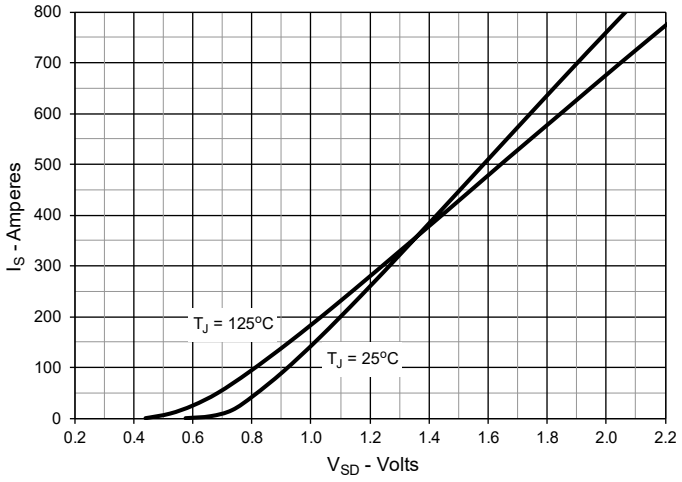



**Fig. 11. Gate Charge**

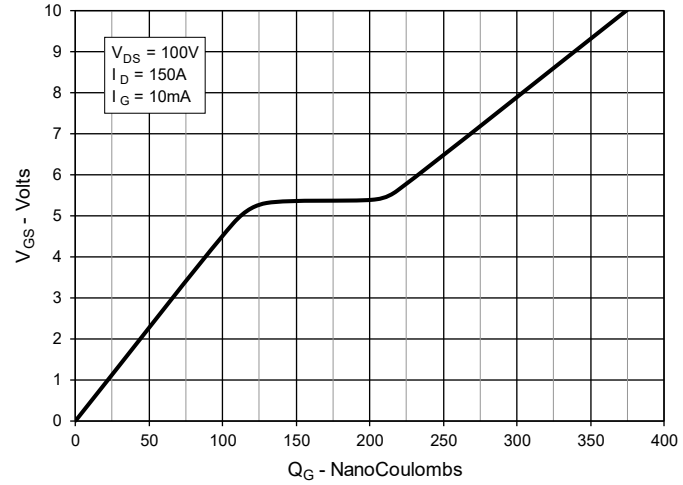



**Fig. 12. Capacitance**

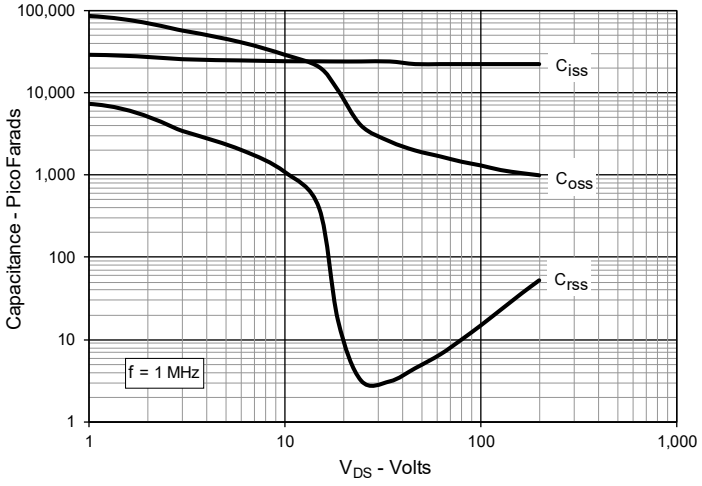


**Fig. 13. Output Capacitance Stored Energy**

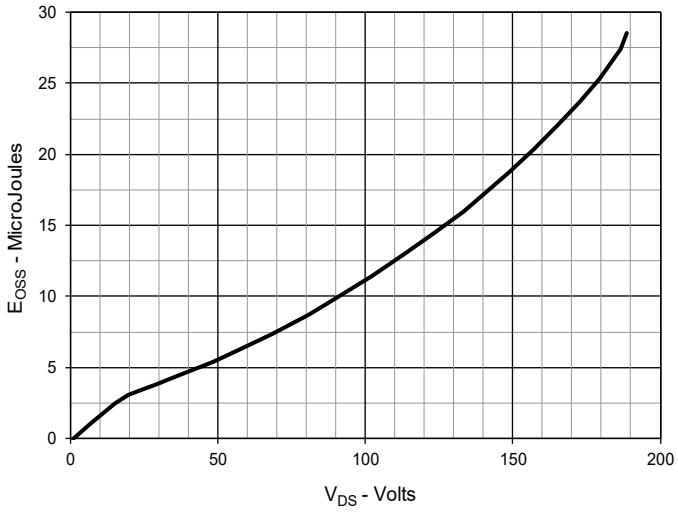



**Fig. 14. Forward-Bias Safe Operating Area**

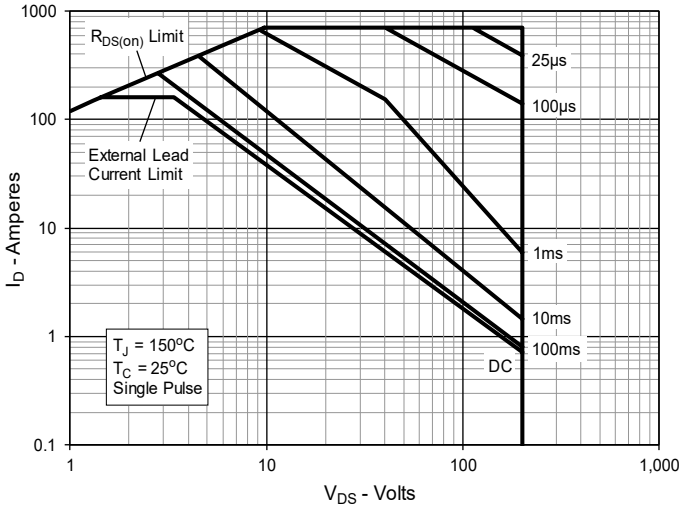
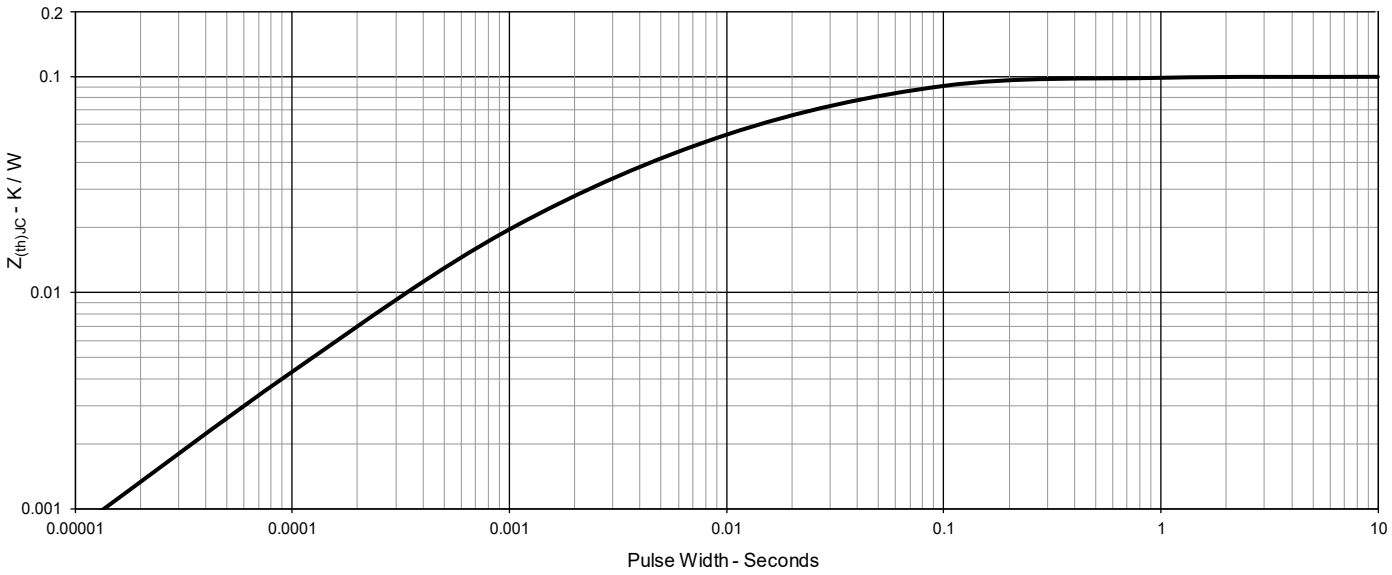
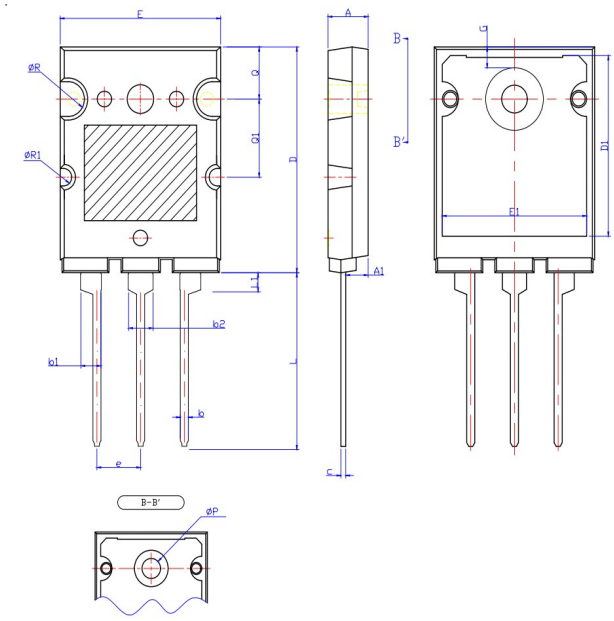



**Fig. 15. Maximum Transient Thermal Impedance**



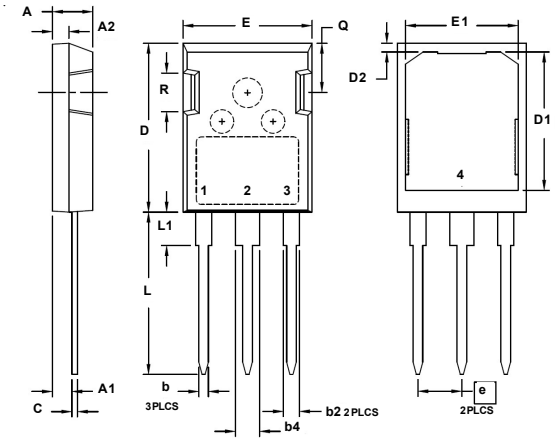
## TO-264K Outline



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

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.189 | 0.205 | 4.80 | 5.20 |
| A1 | 0.098 | 0.122 | 2.50 | 3.10 |
| b | 0.035 | 0.049 | 0.90 | 1.25 |
| b1 | 0.091 | 0.106 | 2.30 | 2.70 |
| b2 | 0.110 | 0.126 | 2.80 | 3.20 |
| c | 0.020 | 0.033 | 0.50 | 0.85 |
| D | 1.016 | 1.031 | 25.80 | 26.20 |
| E | 0.780 | 0.795 | 19.80 | 20.20 |
| e | 0.203 | 0.226 | 5.15 | 5.75 |
| L | 0.768 | 0.807 | 19.50 | 20.50 |
| L1 | 0.094 | 0.102 | 2.40 | 2.60 |
| ØP | 0.118 | 0.134 | 3.00 | 3.40 |
| Q | 0.228 | 0.244 | 5.80 | 6.20 |
| Q1 | 0.346 | 0.362 | 8.80 | 9.20 |
| E1 | 0.701 | 0.717 | 17.80 | 18.20 |
| D1 | 0.811 | 0.827 | 20.60 | 21.00 |
| G | 0.087 | 0.102 | 2.20 | 2.60 |
| ØR | 0.079 | | 2.00 | |
| ØR1 | 0.039 | | 1.00 | |

## PLUS247™ Outline



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

| 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 |