IXYS

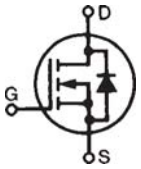
Preliminary Technical Information

# Depletion Mode MOSFET

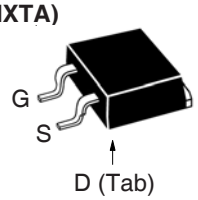
# IXTA1N170DHV
# IXTH1N170DHV

$V_{DSX}$ = 1700V
$I_{D(on)}$ ≥ 1A
$R_{DS(on)}$ ≤ 16Ω

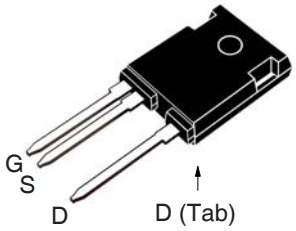
## N-Channel




**TO-263HV (IXTA)**




**TO-247HV (IXTH)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{DSX}$ | $T_J$ = 25°C to 150°C | 1700 | V |
| $V_{DGX}$ | $T_J$ = 25°C to 150°C, $R_{GS}$ = 1MΩ | 1700 | V |
| $V_{GSX}$ | Continuous | ±20 | V |
| $V_{GSM}$ | Transient | ±30 | V |
| $P_D$ | $T_C$ = 25°C | 290 | 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 |
| $F_C$ | Mounting Force (TO-263HV) | 10..65 / 22..14.6 | N/lb |
| $M_d$ | Mounting Torque (TO-247HV) | 1.13/10 | Nm/lb.in |
| **Weight** | TO-263HV | 2.5 | g |
| | TO-247HV | 6.0 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{DSX}$ | $V_{GS}$ = - 5V, $I_D$ = 250μA | 1700 | | | V |
| $V_{GS(off)}$ | $V_{DS}$ = 25V, $I_D$ = 250μA | - 2.5 | | - 4.5 | V |
| $I_{GSX}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | | | ±100 | nA |
| $I_{DSX(off)}$ | $V_{DS}$ = $V_{DSX}$, $V_{GS}$ = - 5V | | | 10 | μA |
| | $T_J$ = 125°C | | | 100 | μA |
| $R_{DS(on)}$ | $V_{GS}$ = 0V, $I_D$ = 0.5A, Note 1 | | | 16 | Ω |
| $I_{D(on)}$ | $V_{GS}$ = 0V, $V_{DS}$ = 50V, Note 1 | 1.0 | | | A |

### Features

- Normally ON Mode
- Molding Epoxies Meet UL 94 V-0 Flammability Classification

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Audio Amplifiers
- Start-Up Circuits
- Protection Circuits
- Ramp Generators
- Current Regulators
- Active Loads

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $V_{DS}$ = 30V, $I_D$ = 0.5A, Note 1 | 570 | 950 | | mS |
| $C_{iss}$ | $V_{GS}$ = -10V, $V_{DS}$ = 25V, f = 1MHz | | 3090 | | pF |
| $C_{oss}$ | | | 95 | | pF |
| $C_{rss}$ | | | 30 | | pF |
| $t_{d(on)}$ | **Resistive Switching Times** | | 46 | | ns |
| $t_r$ | $V_{GS}$ = ±5V, $V_{DS}$ = 850V, $I_D$ = 0.5A | | 38 | | ns |
| $t_{d(off)}$ | $R_G$ = 10Ω (External) | | 130 | | ns |
| $t_f$ | | | 216 | | ns |
| $Q_{g(on)}$ | $V_{GS}$ = ±5V, $V_{DS}$ = 850V, $I_D$ = 0.5A | | 47 | | nC |
| $Q_{gs}$ | | | 3.7 | | nC |
| $Q_{gd}$ | | | 25 | | nC |
| $R_{thJC}$ | | | | 0.43 | °C/W |
| $R_{thCS}$ | TO-247HV | | 0.21 | | °C/W |

**Safe-Operating-Area Specification**

| Symbol | Test Conditions | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| **SOA** | $V_{DS}$ = 1700V, $I_D$ = 100mA, $T_C$ = 75°C, Tp = 5s | 170 | | | W |

**Source-Drain Diode**

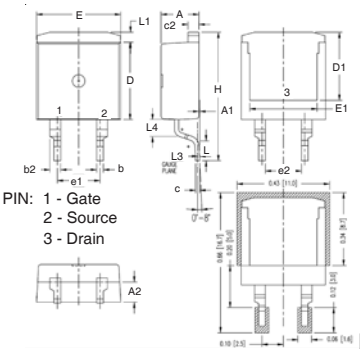
| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $V_{SD}$ | $I_F$ = 1A, $V_{GS}$ = -10V, Note 1 | | 0.75 | 1.30 | V |
| $t_{rr}$ | $I_F$ = 1A, -di/dt = 100A/µs | | 2.8 | | µs |
| $I_{RM}$ | $V_R$ = 100V, $V_{GS}$ = -10V | | 45.0 | | A |
| $Q_{RM}$ | | | 63.0 | | µC |

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

**PRELIMANARY 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.

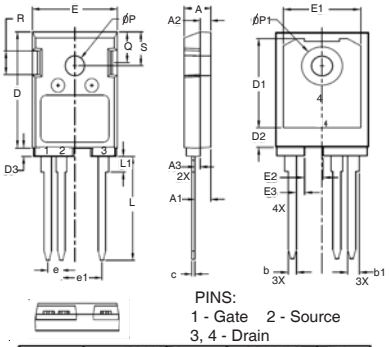
**TO-263HV-2L Outline**



PIN: 1 - Gate
2 - Source
3 - Drain

| SYM | INCHES MIN | INCHES MAX | MILLIMETER MIN | MILLIMETER MAX |
|---|---|---|---|---|
| A | .170 | .185 | 4.30 | 4.70 |
| A1 | .000 | .008 | 0.00 | 0.20 |
| A2 | .091 | .098 | 2.30 | 2.50 |
| b | .028 | .035 | 0.70 | 0.90 |
| b2 | .046 | .054 | 1.18 | 1.38 |
| C | .018 | .024 | 0.45 | 0.60 |
| C2 | .049 | .055 | 1.25 | 1.40 |
| D | .354 | .370 | 9.00 | 9.40 |
| D1 | .311 | .327 | 7.90 | 8.30 |
| E | .386 | .402 | 9.80 | 10.20 |
| E1 | .307 | .323 | 7.80 | 8.20 |
| e1 | .200 BSC | | 5.08 BSC | |
| (e2) | .163 | .174 | 4.13 | 4.43 |
| H | .591 | .614 | 15.00 | 15.60 |
| L | .079 | .102 | 2.00 | 2.60 |
| L1 | .039 | .055 | 1.00 | 1.40 |
| L3 | .010 BSC | | 0.254 BSC | |
| (L4) | .071 | .087 | 1.80 | 2.20 |

**TO-247HV Outline**



PINS:
1 - Gate 2 - Source
3, 4 - Drain

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .193 | .201 | 4.90 | 5.10 |
| A1 | .114 | .122 | 2.90 | 3.10 |
| A2 | .075 | .083 | 1.90 | 2.10 |
| A3 | .035 | .043 | 0.90 | 1.10 |
| b | .053 | .059 | 1.35 | 1.50 |
| b1 | .075 | .083 | 1.90 | 2.10 |
| c | .022 | .030 | 0.55 | 0.75 |
| D | .819 | .843 | 20.80 | 21.40 |
| D1 | .638 | .646 | 16.20 | 16.40 |
| D2 | .134 | .146 | 3.40 | 3.70 |
| D3 | .055 | .063 | 1.40 | 1.60 |
| E | .622 | .638 | 15.80 | 16.20 |
| E1 | .520 | .528 | 13.20 | 13.40 |
| E2 | .118 | .126 | 3.00 | 3.20 |
| E3 | .051 | .059 | 1.30 | 1.50 |
| e | .100 BSC | | 2.54 BSC | |
| e1 | .300 BSC | | 7.62 BSC | |
| L | .732 | .748 | 18.60 | 19.00 |
| L1 | .106 | .118 | 2.70 | 3.00 |
| øP | .138 | .142 | 3.50 | 3.60 |
| øP1 | .272 | .280 | 6.90 | 7.10 |
| Q | .216 | .224 | 5.50 | 5.70 |
| R | .165 | .169 | 4.20 | 4.30 |
| S | .240 | .248 | 6.10 | 6.30 |

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

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

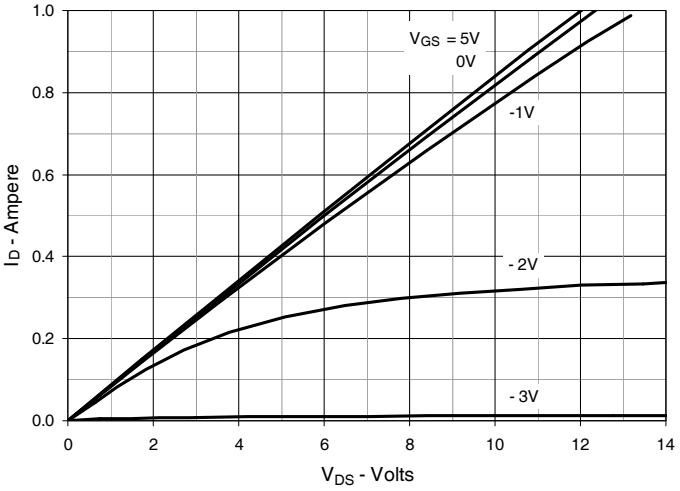



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25°C**

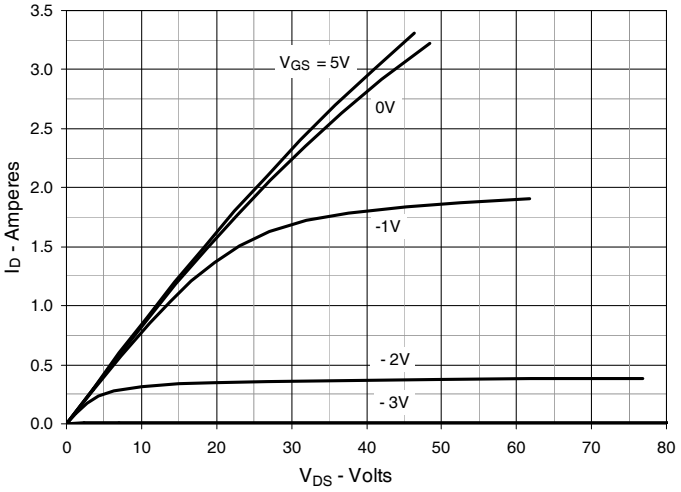



**Fig. 3. Output Characteristics @ $T_J$ = 125°C**

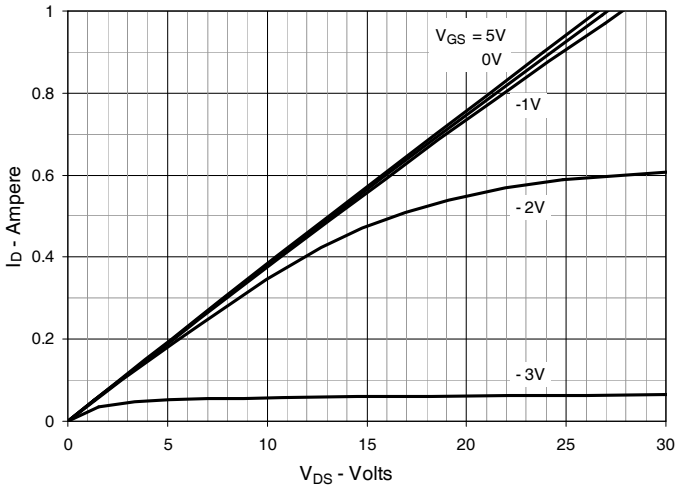



**Fig. 4. Drain Current @ $T_J$ = 25°C**

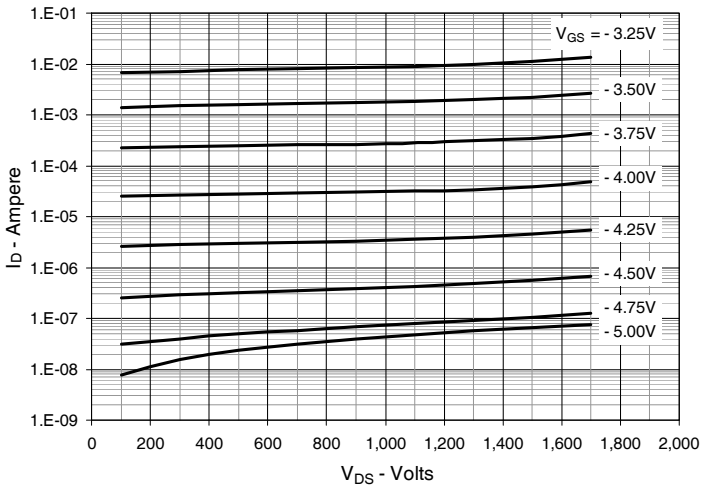



**Fig. 5. Drain Current @ $T_J$ = 100°C**

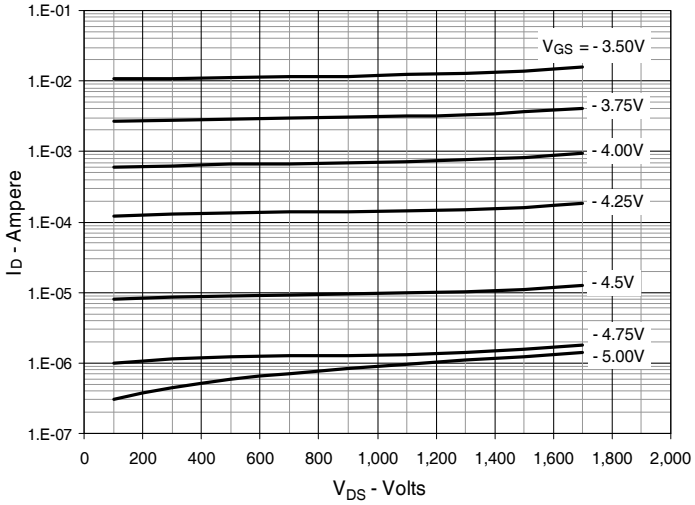



**Fig. 6. Dynamic Resistance vs. Gate Voltage**

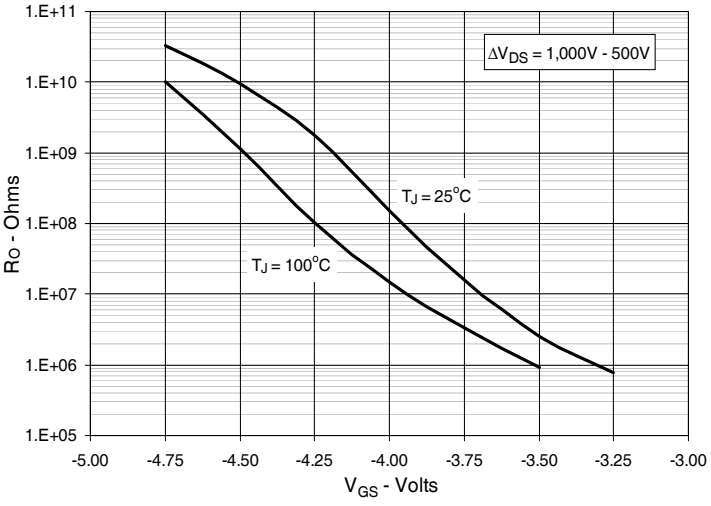


**Fig. 7. Normalized $R_{DS(on)}$ vs. Junction Temperature**

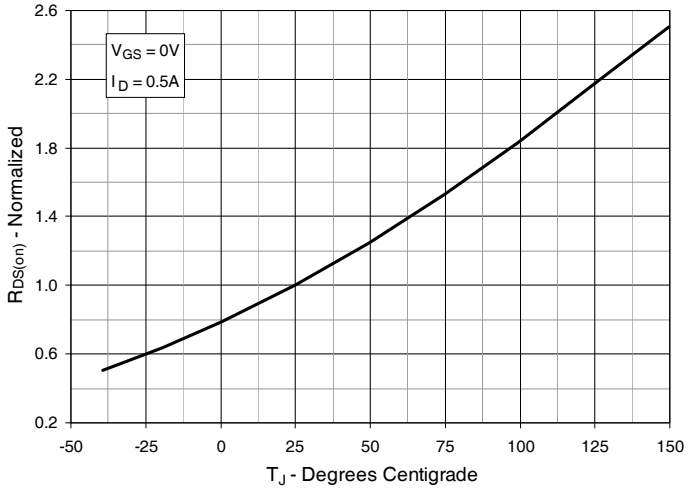



**Fig. 8. $R_{DS(on)}$ Normalized to $I_D$ = 0.5A Value vs. Drain Current**

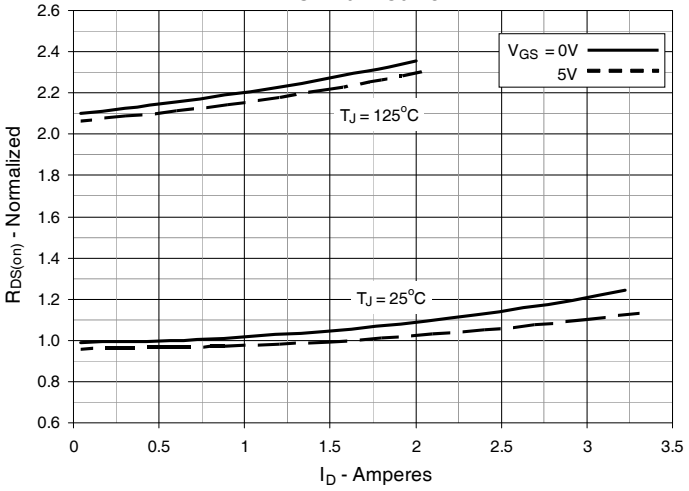



**Fig. 9. Input Admittance**

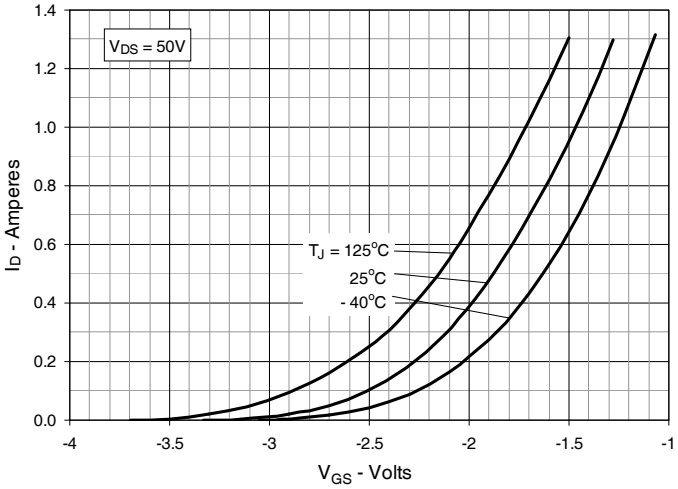



**Fig. 10. Transconductance**

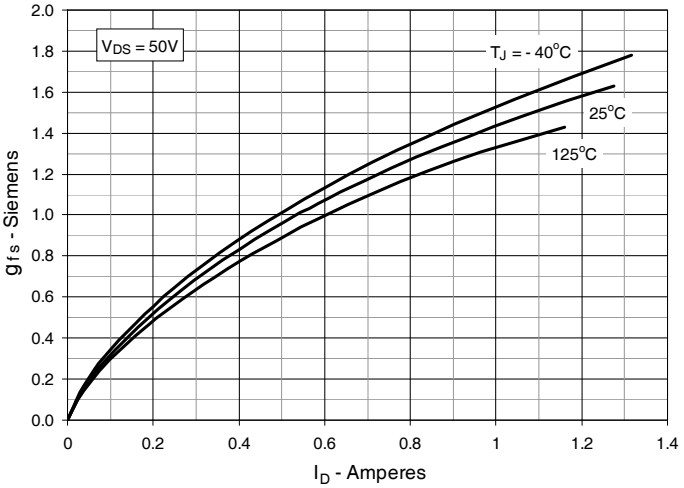



**Fig. 11. Normalized Breakdown and Threshold Voltages vs. Junction Temperature**

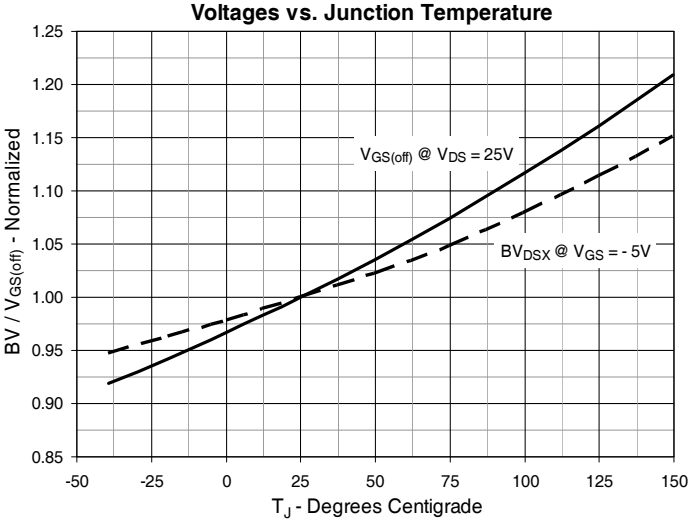



**Fig. 12. Forward Voltage Drop of Intrinsic Diode**

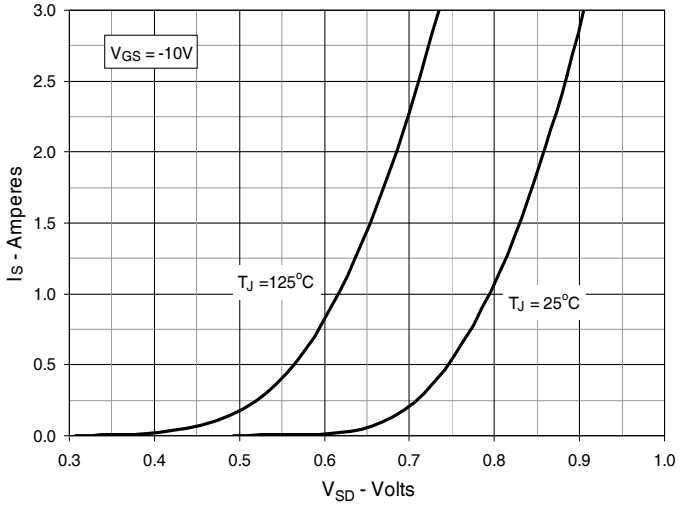


**Fig. 13. Capacitance**

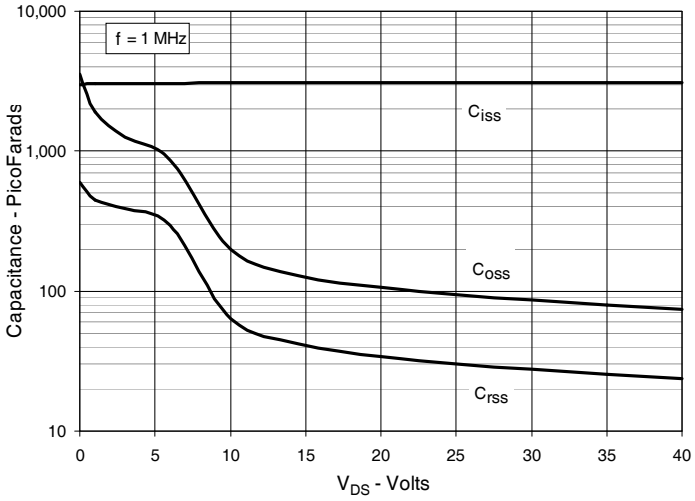



**Fig. 14. Gate Charge**

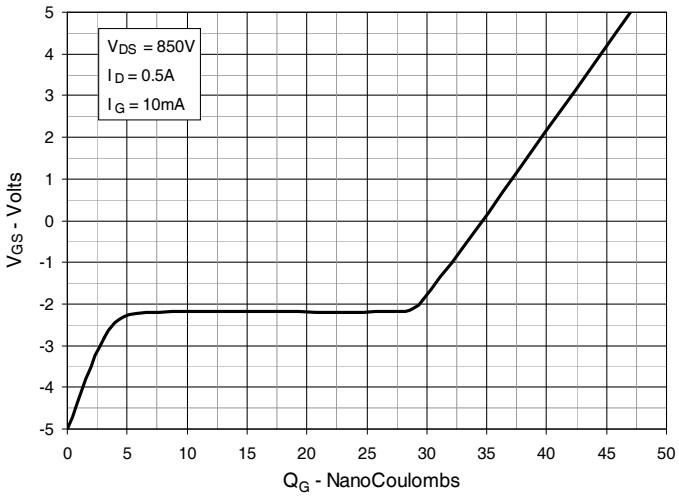



**Fig. 15. Forward-Bias Safe Operating Area @ $T_C$ = 25°C**

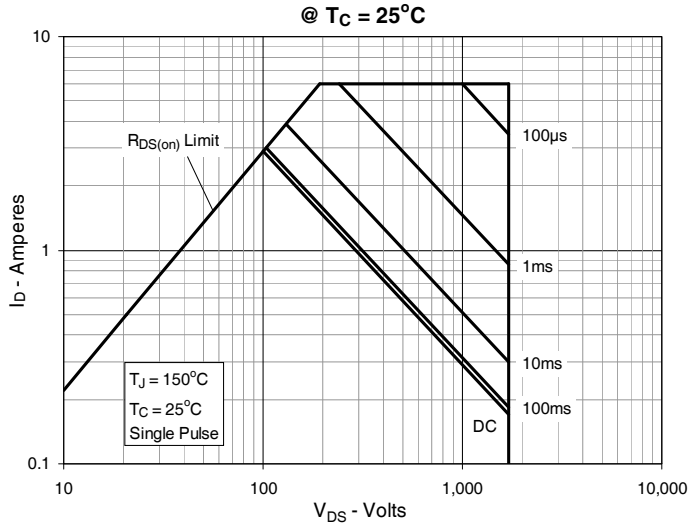



**Fig. 16. Forward-Bias Safe Operating Area @ $T_C$ = 75°C**

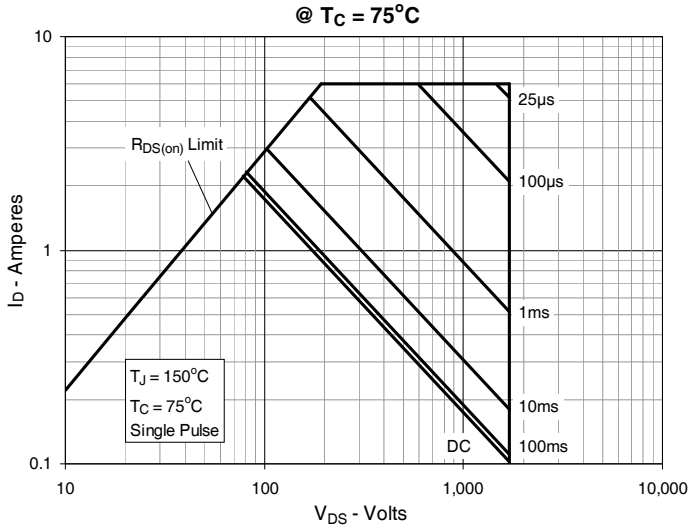



**Fig. 17. Maximum Transient Thermal Impedance**