优尚

YOUSHANG SEMICONDUCTOR

# 设计研发新型功率器件

## 各类小信号开关

## 中低压及高压大电流等场效应管

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## Features

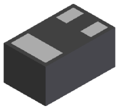
- Low On-Resistance
- Low Gate Threshold Voltage
- Fast Switching Speed
- Ultra-Small Surface Mount Package

## Mechanical Data

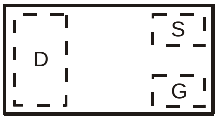
- Case: X1-DFN1006-3
- Case Material: Molded Plastic, “Green” Molding Compound; UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe; Solderable per MIL-STD-202, Method 208 e4
- Weight: 0.001 grams (Approximate)

ESD PROTECTED TO 1kV

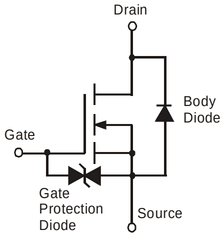
X1-DFN1006-3



Bottom View



Top View
Internal Schematic



Equivalent Circuit

## Maximum Ratings (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-Source Voltage | | | $V_{DSS}$ | 25 | V |
| Gate-Source Voltage | | | $V_{GSS}$ | ±8 | V |
| Continuous Drain Current (Note 4) | Steady State | $T_A$ = +25°C | $I_D$ | 1.3 | A |
| | | $T_A$ = +85°C | | 0.9 | |
| Pulsed Drain Current | | | $I_{DM}$ | 3.0 | A |

## Thermal Characteristics (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Power Dissipation (Note 4) | $P_D$ | 0.54 | W |
| Thermal Resistance, Junction to Ambient @$T_A$ = +25°C | $R_{\theta JA}$ | 234 | °C/W |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Electrical Characteristics (@$T_A$ = +25°C unless otherwise specified.)

| Characteristic | Symbol | Min | Typ | Max | Unit | Test Condition |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS (Note 5)** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | 25 | - | - | V | $V_{GS}$ = 0V, $I_D$ = 250μA |
| Zero Gate Voltage Drain Current $T_J$ = +25°C | $I_{DSS}$ | - | - | 1 | μA | $V_{DS}$ = 25V, $V_{GS}$ = 0V |
| Gate-Source Leakage | $I_{GSS}$ | - | - | 10 | μA | $V_{GS}$ = ±8V, $V_{DS}$ = 0V |
| **ON CHARACTERISTICS (Note 5)** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | 0.45 | - | 1.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Static Drain-Source On-Resistance | $R_{DS\ (ON)}$ | - | - | 350 | mΩ | $V_{GS}$ = 4.5V, $I_D$ = 200mA |
| | | | | 450 | | $V_{GS}$ = 2.5V, $I_D$ = 100mA |
| | | | | 600 | | $V_{GS}$ = 1.8V, $I_D$ = 75mA |
| Forward Transfer Admittance | $\lvert Y_{fs}\rvert$ | 40 | - | - | mS | $V_{DS}$ = 3V, $I_D$ = 200mA |
| Diode Forward Voltage | $V_{SD}$ | - | - | 1.2 | V | $V_{GS}$ = 0V, $I_S$ = 300mA |
| **DYNAMIC CHARACTERISTICS (Note 6)** | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 70.13 | - | pF | $V_{DS}$ = 15V, $V_{GS}$ = 0V,<br>f = 1.0MHz |
| Output Capacitance | $C_{oss}$ | - | 7.56 | - | pF | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 5.59 | - | pF | |
| Gate Resistance | $R_g$ | - | 72.3 | - | Ω | $V_{DS}$ =0V, $V_{GS}$ = 0V, f = 1MHz |
| Total Gate Charge | $Q_g$ | - | 0.85 | - | nC | $V_{GS}$ = 4.5V, $V_{DS}$ = 15V,<br>$I_D$ = 1A |
| Gate-Source Charge | $Q_{gs}$ | - | 0.16 | - | nC | |
| Gate-Drain Charge | $Q_{gd}$ | - | 0.11 | - | nC | |
| Turn-On Delay Time | $t_{D(on)}$ | - | 4.1 | - | ns | $V_{DS}$ = 15V, $R_L$=15Ω<br>$V_{GS}$ = 10V, $R_G$ = 6Ω |
| Turn-On Rise Time | $t_r$ | - | 11.5 | - | ns | |
| Turn-Off Delay Time | $t_{D(off)}$ | - | 34.8 | - | ns | |
| Turn-Off Fall Time | $t_f$ | - | 20.9 | - | ns | |

Notes: 4. Device mounted on FR-4 substrate PCB board, with minimum recommended pad layout.
5. Short duration pulse test used to minimize self-heating effect.
6. Guaranteed by design. Not subject to production testing.

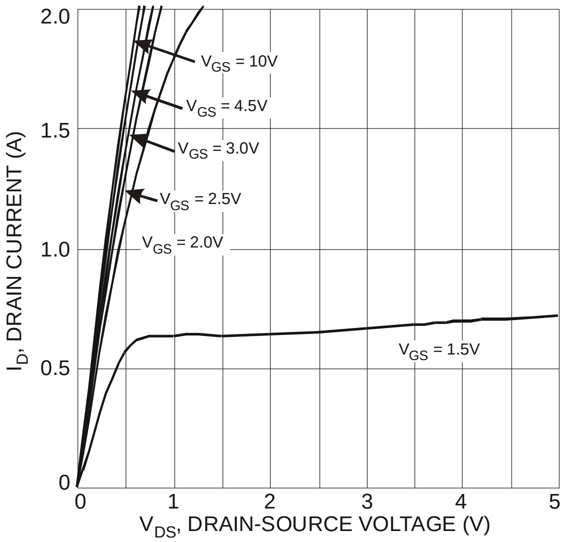


Fig. 1 Typical Output Characteristic

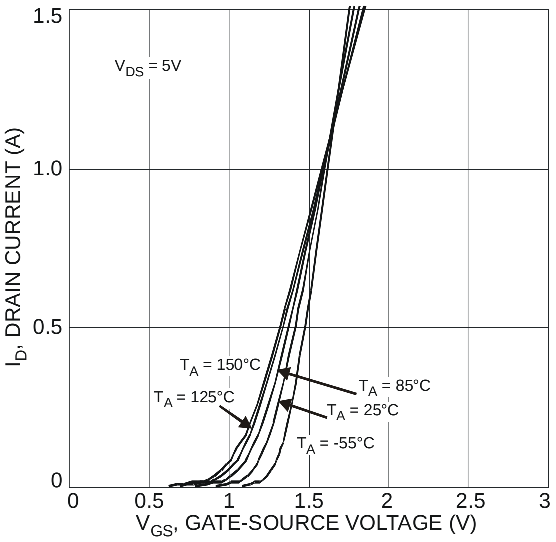


Fig. 2 Typical Transfer Characteristic

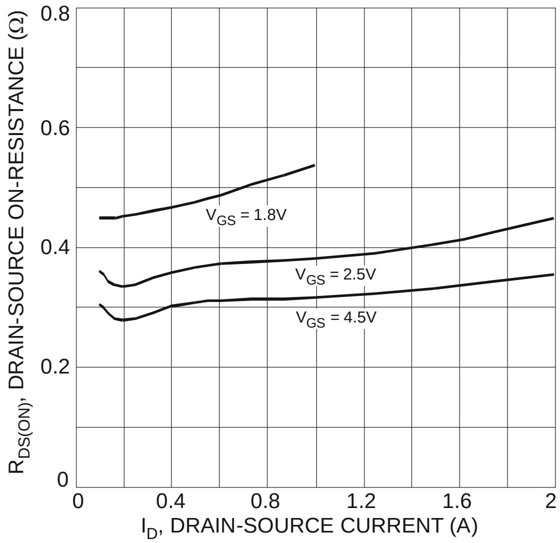


Fig. 3 Typical On-Resistance vs. Drain Current and Gate Voltage

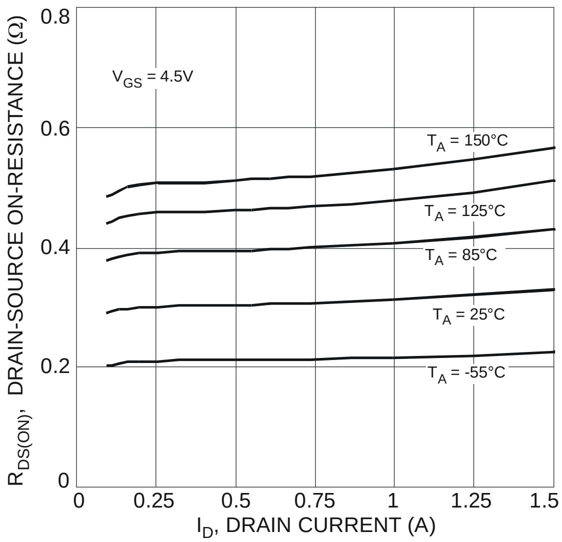


Fig. 4 Typical On-Resistance vs. Drain Current and Temperature

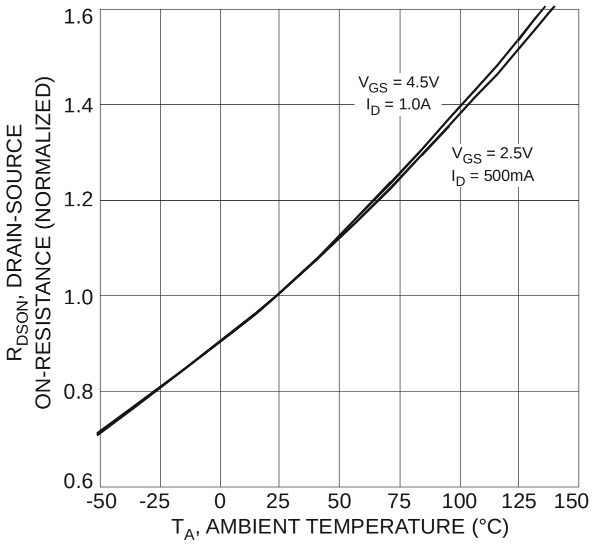


Fig. 5 On-Resistance Variation with Temperature

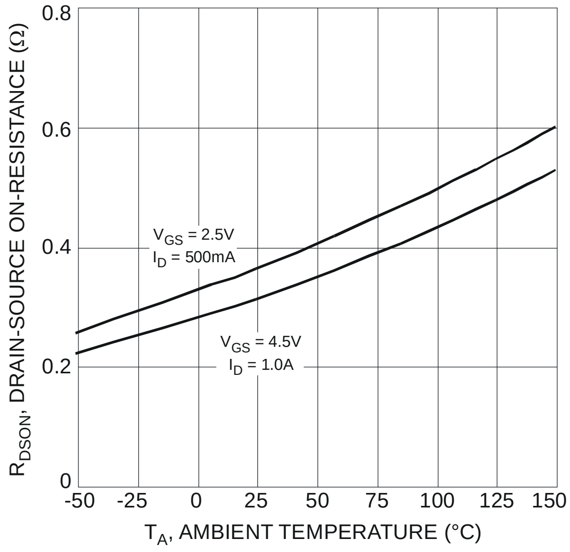


Fig. 6 On-Resistance Variation with Temperature

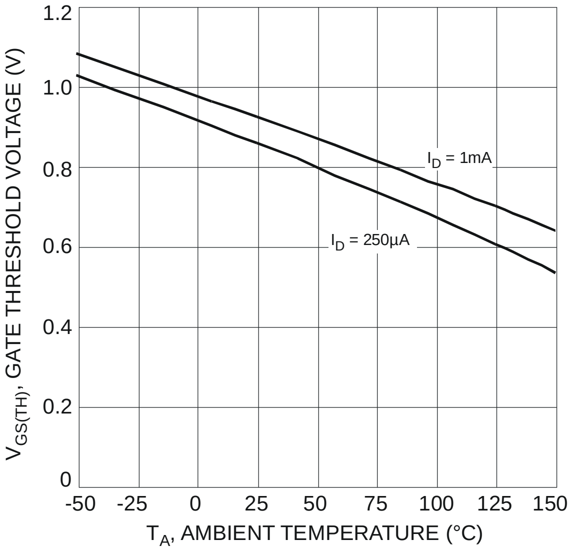


Fig. 7 Gate Threshold Variation vs. Ambient Temperature

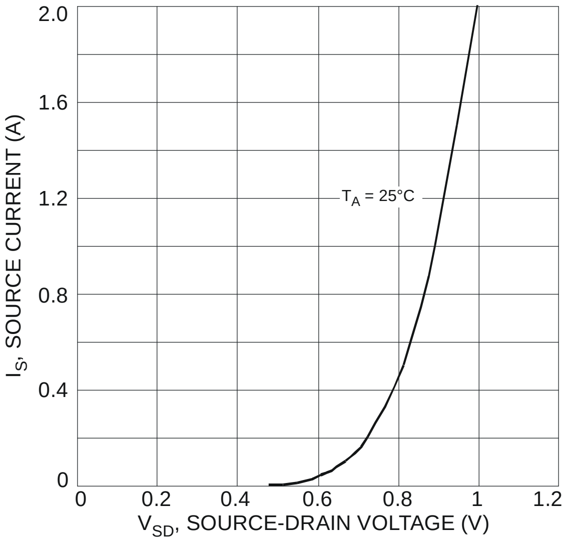


Fig. 8 Diode Forward Voltage vs. Current

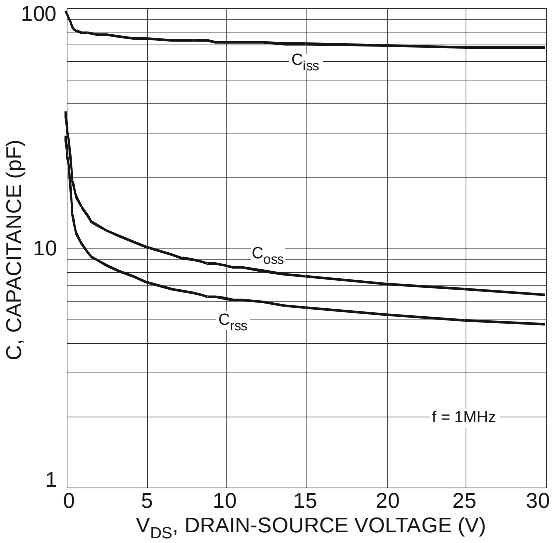


Fig. 9 Typical Total Capacitance

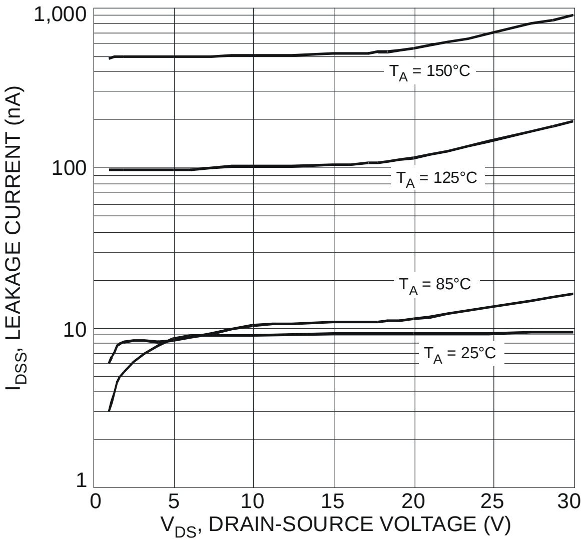


Fig. 10 Typical Leakage Current
vs. Drain-Source Voltage

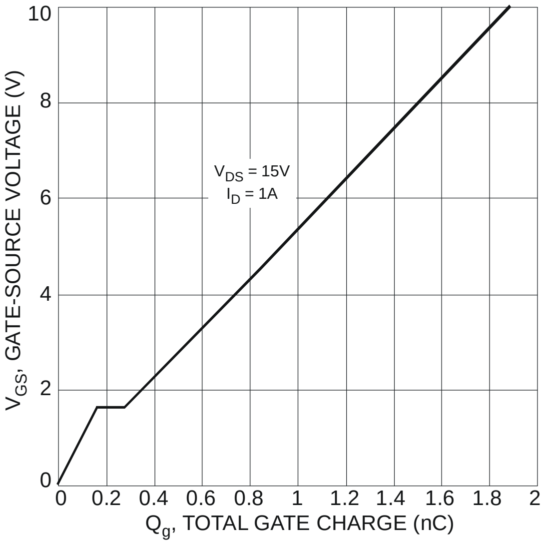


Fig. 11 Gate-Charge Characteristics

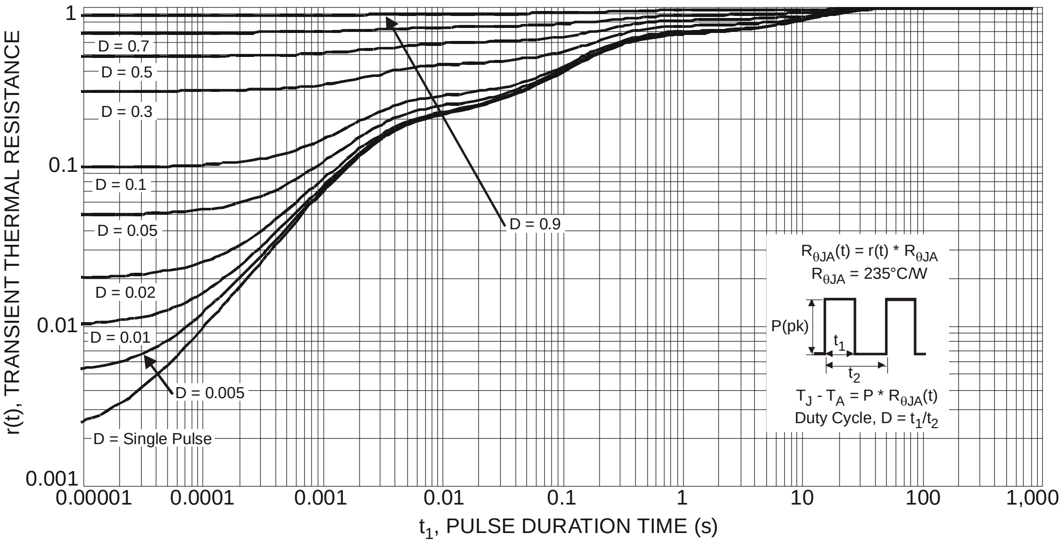
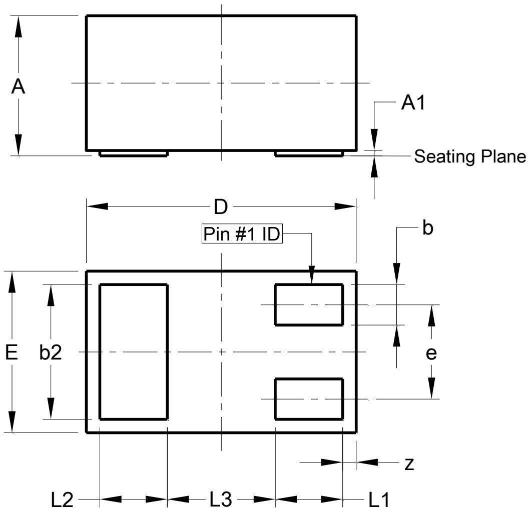


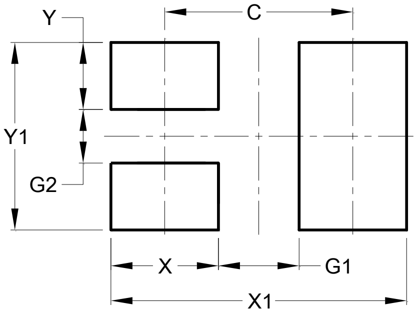
Fig. 12 Transient Thermal Response

## Package Outline Dimensions



| X1-DFN1006-3 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.47 | 0.53 | 0.50 |
| **A1** | 0.00 | 0.05 | 0.03 |
| **b** | 0.10 | 0.20 | 0.15 |
| **b2** | 0.45 | 0.55 | 0.50 |
| **D** | 0.95 | 1.075 | 1.00 |
| **E** | 0.55 | 0.675 | 0.60 |
| **e** | - | - | 0.35 |
| **L1** | 0.20 | 0.30 | 0.25 |
| **L2** | 0.20 | 0.30 | 0.25 |
| **L3** | - | - | 0.40 |
| **z** | 0.02 | 0.08 | 0.05 |
| **All Dimensions in mm** | | | |

## Suggested Pad Layout



| Dimensions | Value (in mm) |
|---|---|
| C | 0.70 |
| G1 | 0.30 |
| G2 | 0.20 |
| X | 0.40 |
| X1 | 1.10 |
| Y | 0.25 |
| Y1 | 0.70 |