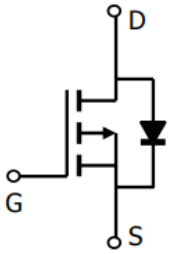
# SI2309

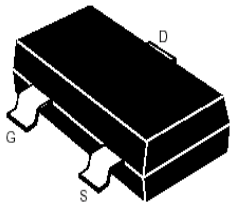
**P-Channel MOSFET**

## »Features

$V_{DS}$ = -60V
$I_D$ = -2A
$R_{DS(ON)}$ @$V_{GS}$ = -10V, Max =200mΩ
$R_{DS(ON)}$ @$V_{GS}$ = -4.5V, Max =300mΩ

## »Pin Configurations




## »General Description

- Advanced trench process technology
- High Density Cell Design For Ultra Low On-Resistance
- SOT-23-3L for Surface Mount Package.

## »Applications

- Load Switch
- Switching Circuits
- High Speed line Driver

## »Absolute Maximum Ratings @$T_A$=25℃ unless otherwise noted

| Parameter | | Symbol | Limit | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | |
| Continuous Drain Current | | $I_D$ | -2 | A |
| Pulsed Drain Current [1] | | $I_{DM}$ | -8 | |
| Maximum Power Dissipation [2] | TA = 25° | $P_D$ | 1 | W |
| | TA = 75°C | | 0.8 | |
| Operating Junction and Storage Temperature Range | | $T_J$, $T_{stg}$ | -50 to 150 | °C |
| Junction-to-Ambient Thermal Resistance (PCB mounted) [2] | | $R_{thJA}$ | 100 | °C/W |
| Junction-to-Ambient Thermal Resistance (PCB mounted) [3] | | | 166 | |

Notes
1) Pulse width limited by maximum junction temperature.
2) Surface Mounted on FR4 Board, t ≤ 5 sec.
3) Surface Mounted on FR4 Board.

## »Electrical Characteristics @$T_A$=25℃ unless otherwise noted

| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics @ $T_J$ = 25°C (unless otherwise stated)** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V $I_D$=-250μA | -60 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current($T_A$=25℃) | $V_{DS}$=-60V, $V_{GS}$=0V | -- | -- | -1 | μA |
| | Zero Gate Voltage Drain Current($T_A$=125℃) | $V_{DS}$=-60V, $V_{GS}$=0V | -- | -- | -100 | uA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0V | -- | -- | ±100 | nA |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=-250μA | -1.0 | -1.5 | -2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance② | $V_{GS}$=-10V, $I_D$=-2A | -- | 150 | 200 | mΩ |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance② | $V_{GS}$=-4.5V, $I_D$=-1A | -- | 200 | 300 | mΩ |
| **Dynamic Electrical Characteristics @ $T_J$ = 25°C (unless otherwise stated)** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-30V, $V_{GS}$=0V, f=1MHz | -- | 310 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 22 | -- | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 15 | -- | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$=-30V $I_D$=-2A, $V_{GS}$=-10V | -- | 5.4 | -- | nC |
| $Q_{gs}$ | Gate Source Charge | | -- | 1.1 | -- | nC |
| $Q_{gd}$ | Gate Drain Charge | | -- | 1.6 | -- | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn on Delay Time | $V_{DD}$=-30V, $I_D$=-2A, $R_G$=3.3Ω, $V_{GS}$=-10V | -- | 41 | -- | ns |
| $t_r$ | Turn on Rise Time | | -- | 22 | -- | ns |
| $t_{d(off)}$ | Turn Off Delay Time | | - | 25 | -- | ns |
| $t_f$ | Turn Off Fall Time | | -- | 32 | -- | ns |
| **Source Drain Diode Characteristics** | | | | | | |
| $I_{SD}$ | Source drain current(Body Diode) | $T_A$=25℃ | -- | -- | -1.4 | A |
| $V_{SD}$ | Forward on voltage② | $T_j$=25℃, $I_{SD}$=-2A, $V_{GS}$=0V | -- | -0.84 | -1.2 | V |

Notes:

① Pulse width limited by maximum allowable junction temperature

②Pulse test ; Pulse width≤300μs, duty cycle≤2%.

## »Typical Performance Characteristics ((TJ = 25 °C, unless otherwise noted))

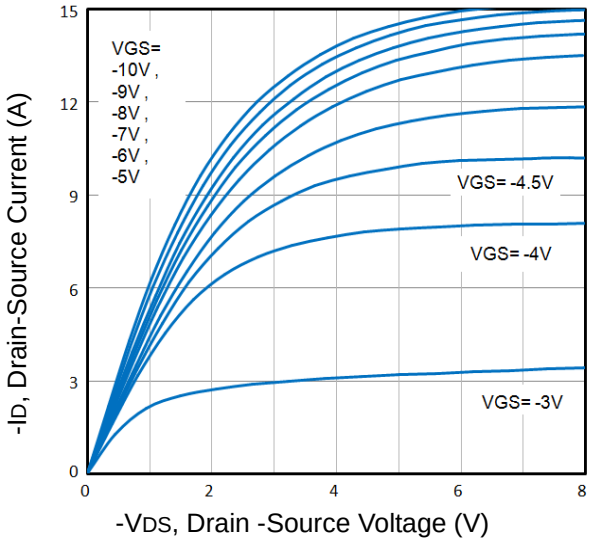



**Fig1.** Typical Output Characteristics

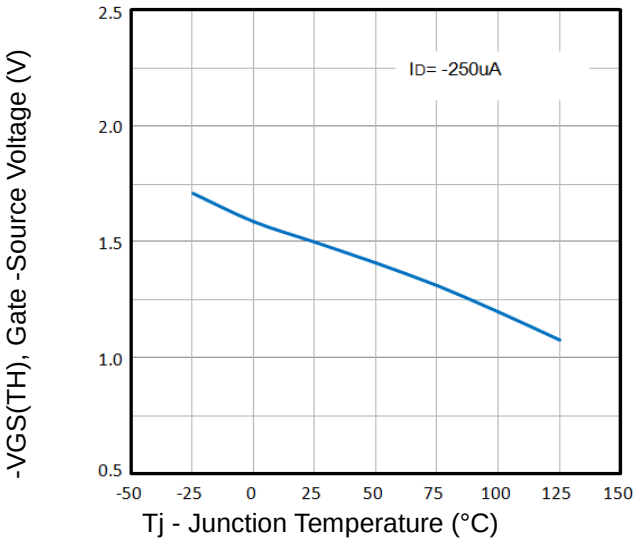



**Fig2.** Normalized Threshold Voltage Vs. Temperature

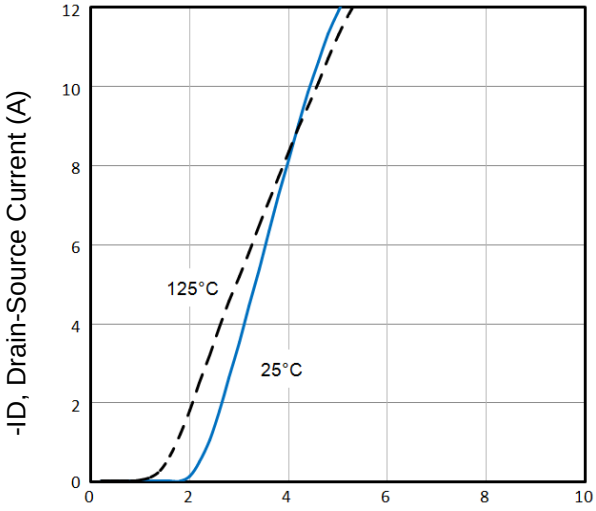



**Fig3.** Typical Transfer Characteristics

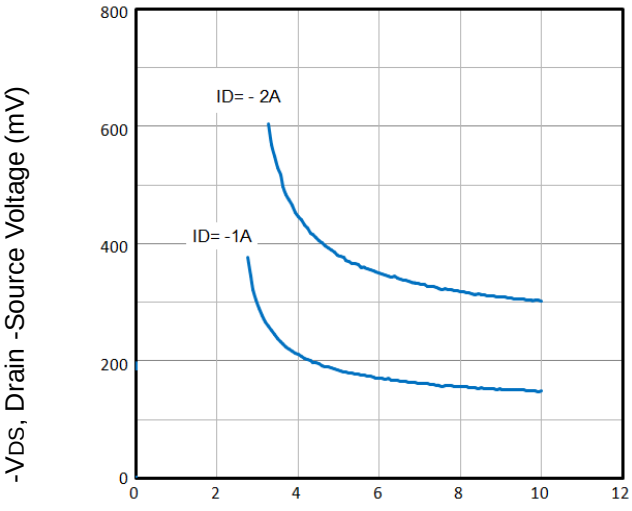



**Fig4.** Drain -Source Voltage vs Gate -Source Voltage

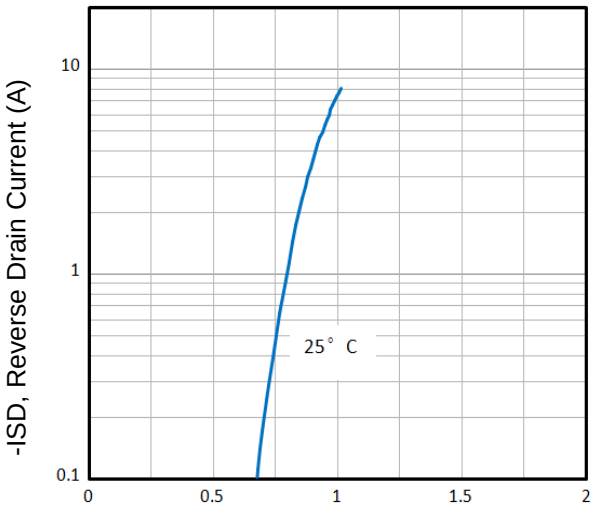



**Fig5.** Typical Source-Drain Diode Forward Voltage

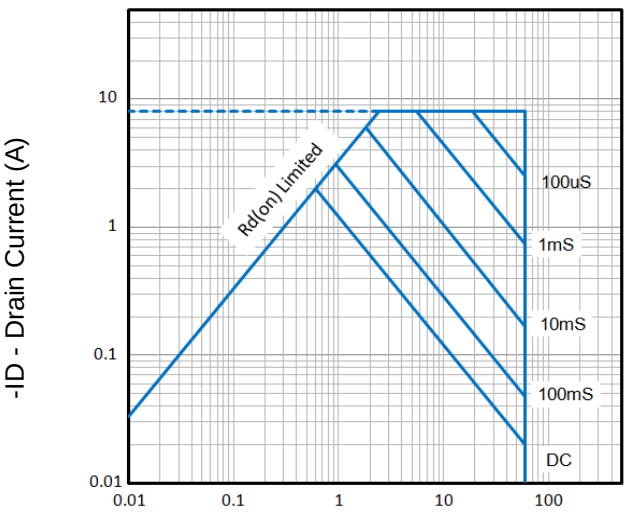



**Fig6.** Maximum Safe Operating Area

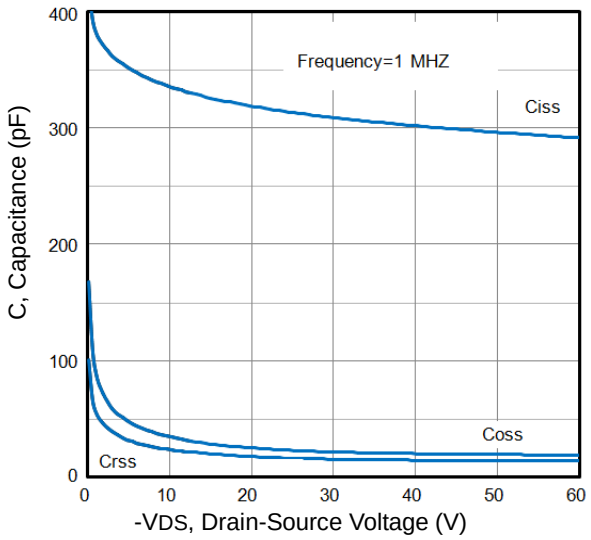



**Fig7.** Typical Capacitance Vs. Drain-Source Voltage

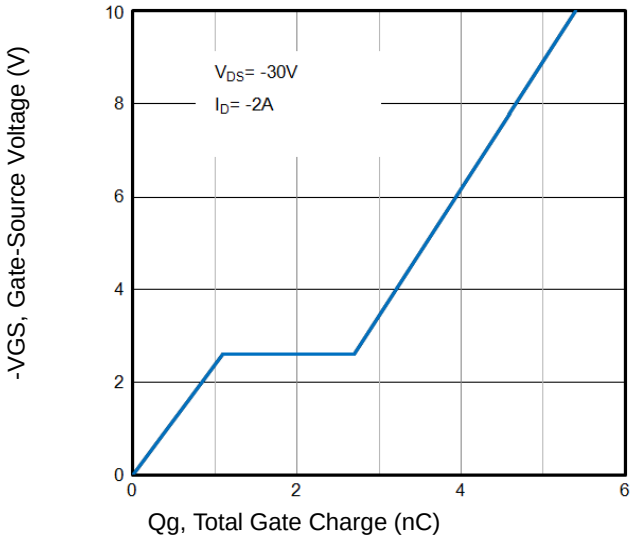



**Fig8.** Typical Gate Charge Vs. Gate-Source Voltage

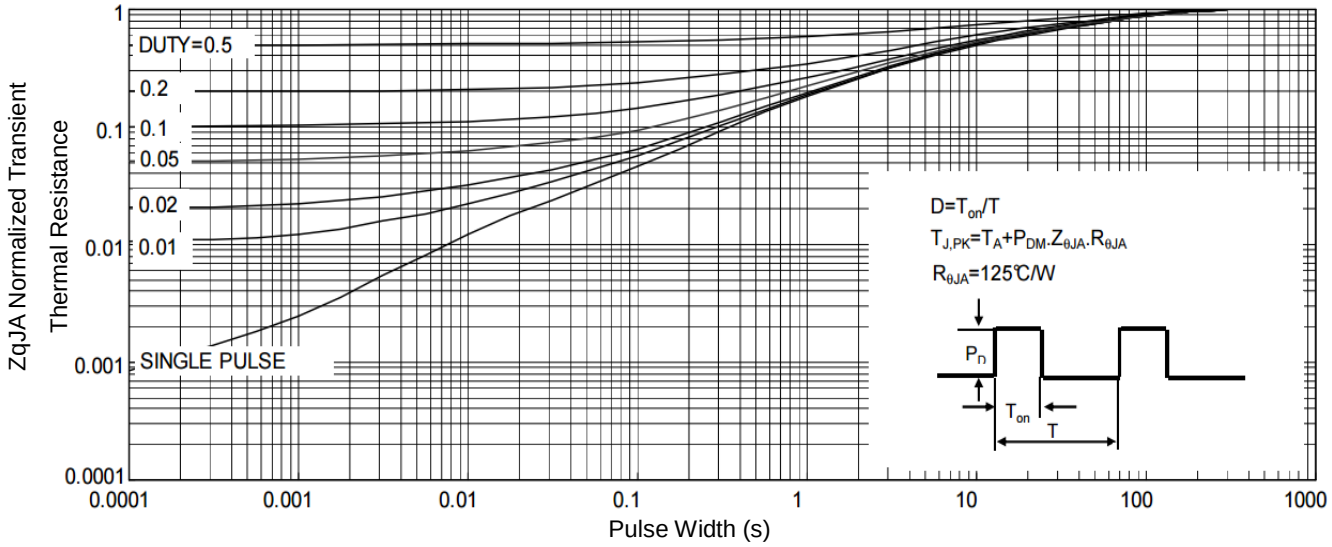
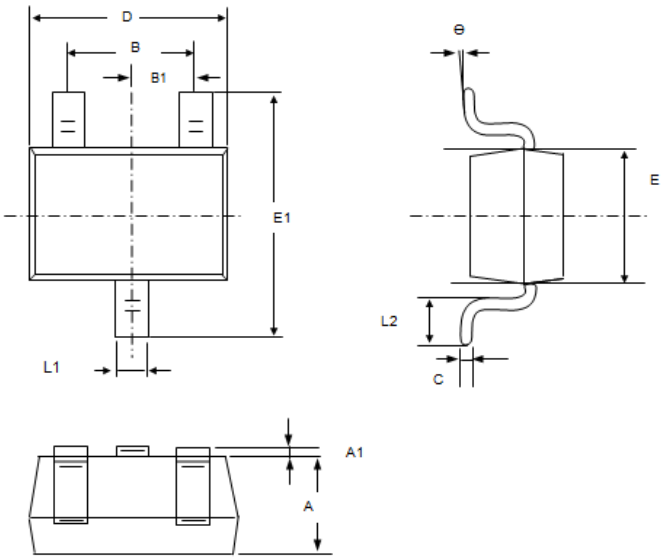



**Fig9.** Normalized Maximum Transient Thermal Impedance

## »Package Information

**SOT-23-3L**




| Symbol | Dim in mm | | |
|---|---|---|---|
| | Min | Nor | Max |
| A | 1.050 | 1.100 | 1.150 |
| A1 | 0.00 | 0.050 | 0.100 |
| L1 | 0.300 | 0.400 | 0.500 |
| C | 0.100 | 0.150 | 0.200 |
| D | 2.820 | 2.920 | 3.020 |
| E | 1.500 | 1.600 | 1.700 |
| E1 | 2.650 | 2.800 | 2.950 |
| B | 1.800 | 1.900 | 2.000 |
| B1 | | 0.950 TPY. | |
| L2 | 0300 | 0.450 | 0.600 |
| θ | 0° | 4° | 8° |

## »Ordering information

| Order code | Package | Marking | Base qty | Delivery mode |
|---|---|---|---|---|
| SI2309 | SOT-23-3L | N9ADE | 3K | Tape and reel |