BORN SEMICONDUCTOR

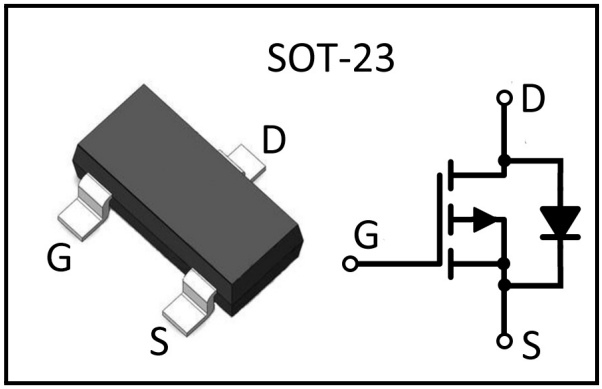
# SI2309L

**P-Channel MOSFET**

## Features

- $V_{DS}$=-60V
- $I_D$=-1.9A
- $R_{DS(ON)}$ @$V_{GS}$=-10V, TYP=170mΩ
- $R_{DS(ON)}$ @$V_{GS}$=-4.5V, TYP=200mΩ

## Package



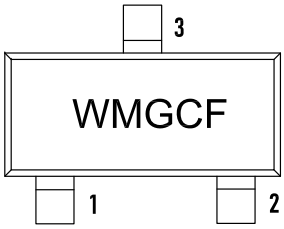

## Description

- Advanced trench process technology
- High Density Cell Design For Ultra LowOn-Resistance
- SOT-23 for Surface Mount Package.

## Applications

- Load Switch
- High Speed line Driver
- Switching Circuits

## Marking




## Ordering information

| Order code | Package | Marking | Base qty | Delivery mode |
|---|---|---|---|---|
| SI2309L | SOT-23 | WMGCF | 3K | Tape and reel |

## Absolute Maximum Ratings (@$T_A$=25°C unless otherwise noted)

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | | -60 | V |
| $V_{GS}$ | Gate-Source Voltage | | ±20 | V |
| $I_D$ | Continuous Drain Current | $T_A$ = 25°C | -1.9 | A |
| | | $T_A$ = 70°C | -1.5 | |
| $I_{DM}$ | Pulsed Drain Current | $T_A$ = 25°C | -7.6 | A |
| $P_D$ | Maximum Power Dissipation | $T_A$ = 25°C | 1.4 | W |
| | | $T_A$ = 70°C | 0.9 | W |
| $T_J$ | Maximum Junction Temperature | | 150 | °C |
| $T_{stg}$ | Storage Temperature Range | | -50 to + 150 | °C |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | | 90 | °C/W |

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**Revision: 2022-Jan-1-A**

# SI2309L

**P-Channel MOSFET**

**Electrical Characteristics @$T_A$=25°C unless otherwise noted**

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics @ $T_J$=25°C (unless otherwise stated)** | | | | | | |
| $BV_{DS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ =-250uA | -60 | – | – | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = -60V, $V_{GS}$ = 0V,$T_A$ =25°C | – | – | -10 | uA |
| | | $V_{DS}$ = -60V, $V_{GS}$ = 0V,$T_A$ =125°C | – | – | -100 | |
| $I_{GSS}$ | Gate Body Leakage | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | – | – | ±100 | nA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = -250uA | -1.0 | -1.8 | -3 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance(2) | $V_{GS}$ = -10V, $I_D$ = -1.8A | – | 170 | 215 | mΩ |
| | | $V_{GS}$ = -4.5V, $I_D$ = -1.4A | – | 200 | 260 | |
| **Dynamic Electrical Characteristics @ $T_J$=25°C (unless otherwise stated)** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$ = -25V, $V_{GS}$ = 0V, f = 1.0MHZ | – | 364 | – | pF |
| $C_{oss}$ | Output Capacitance | | – | 41 | – | |
| $C_{rss}$ | Reverse Transfer Capacitance | | – | 12 | – | |
| $Q_g$ | Total Gate Charge | $V_{DS}$ = -48V $I_D$ = -1A, $V_{GS}$ = -4.5V | – | 6.3 | – | nC |
| $Q_{gs}$ | Gate-Source Charge | | – | 2.3 | – | |
| $Q_{gd}$ | Gate-Drain Charge | | – | 1.8 | – | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DD}$ = -30V, $I_D$ = -1A, $V_{GS}$ = -10V, $R_L$ = 30Ω,$R_G$ = 3.3Ω | – | 20 | – | ns |
| $t_r$ | Turn-On Rise Time | | – | 33.1 | – | |
| $t_{d(off)}$ | Turn-Off Delay Time | | – | 5.2 | – | |
| $t_f$ | Turn-Off Fall Time | | – | 3.8 | – | |
| **Source Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Diode Forward Voltage (2) | $I_S$ = -1.2A,$V_{GS}$ = 0V,$T_J$ =25°C | – | – | -1.2 | V |

Note(1) :Pulse width limited by maximum allowable junction temperature

(2) :Pulse test: pulse width <= 300us, duty cycle≤ 2%

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# SI2309L

P-Channel MOSFET

## Typical Performance Characteristics($T_J$ = 25 °C, unless otherwise noted)

**Figure 1 : On Resistance vs. Junction Temperature**

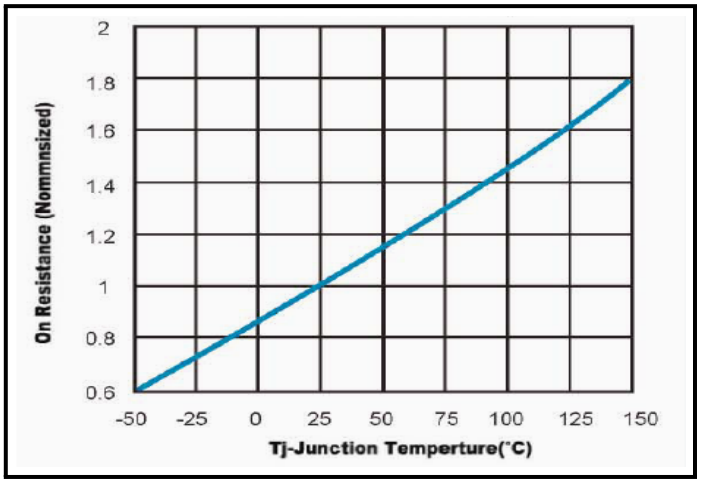



**Figure 2 :On Resistance vs.Drain Current**

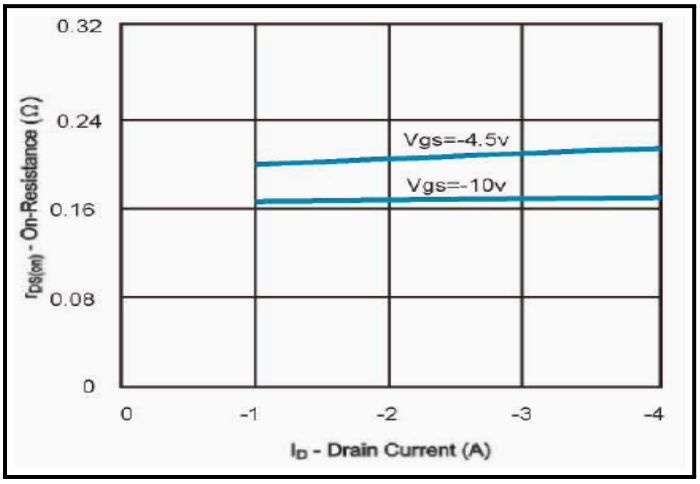



**Figure 3 : Capacitance**

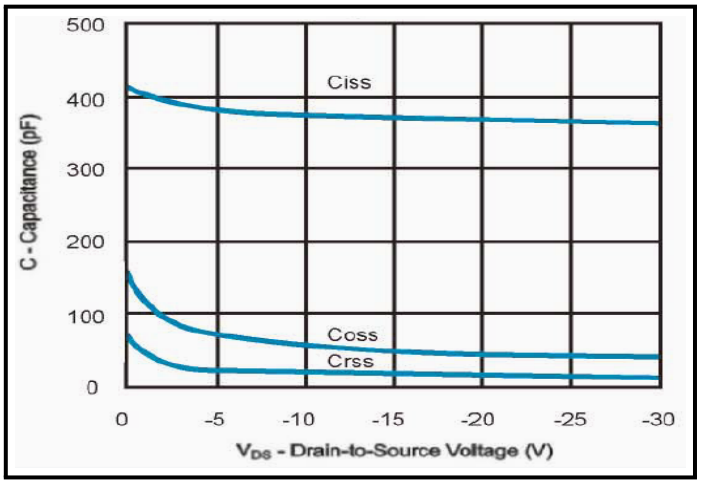



**Figure 4 :On Resistance vs.Gate-to-Source Voltage**

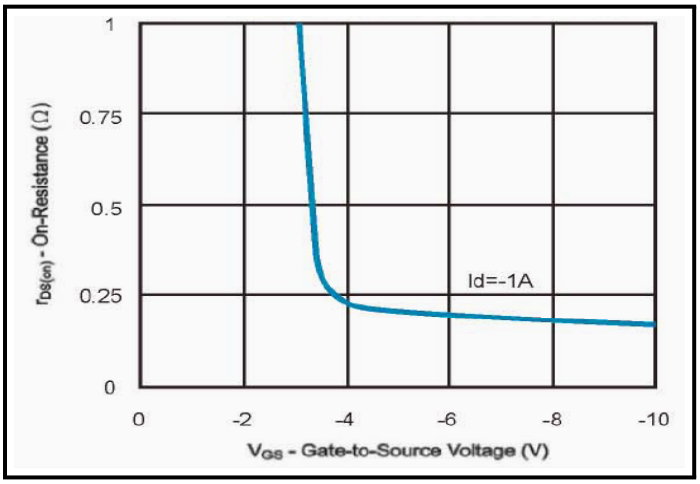



**Figure 5 :Threshold Voltage**

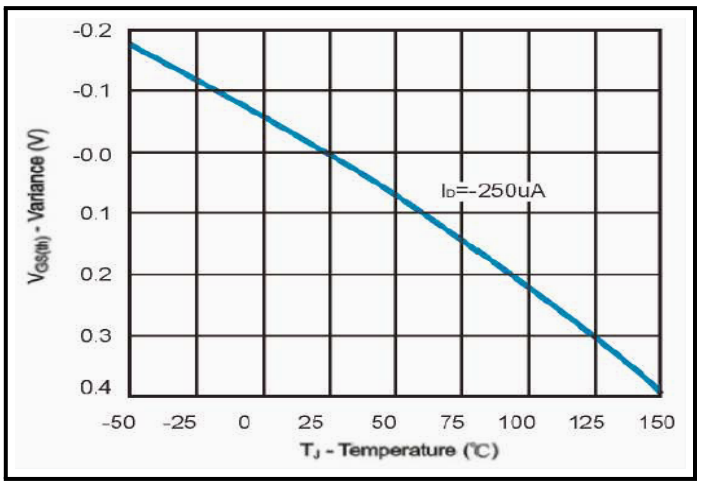
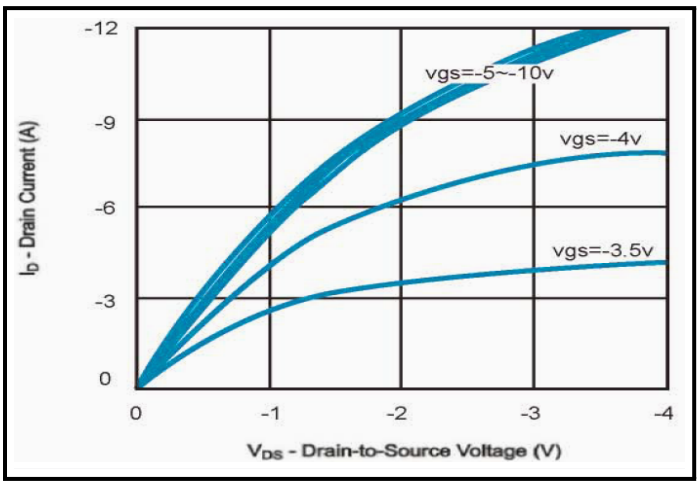



**Figure 6 : On-Region Characteristics**




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**Figure 7 :Gate Charge**

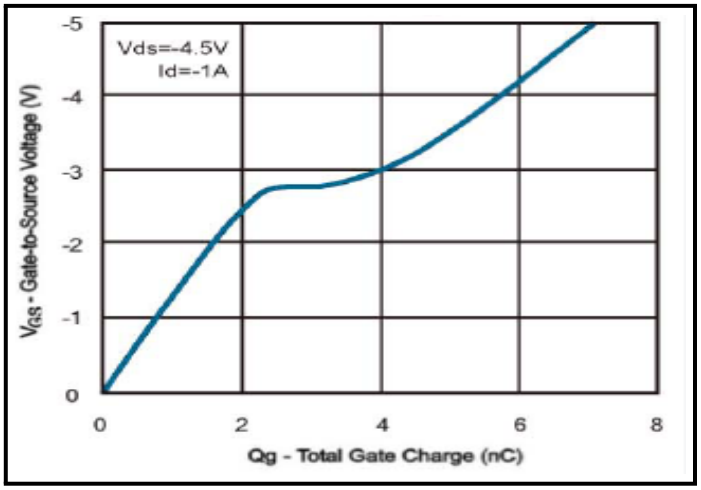



**Figure 8 :On Resistance vs.Drain Current**

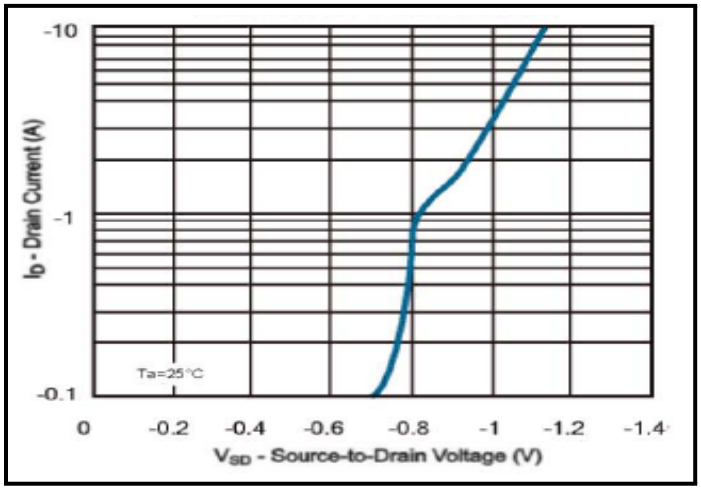



**Figure 9 :Maximum Forward Biassed Safe Operating Area**

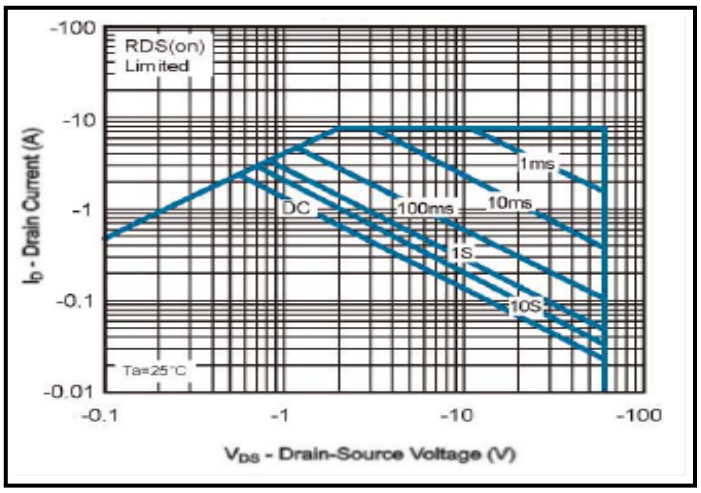
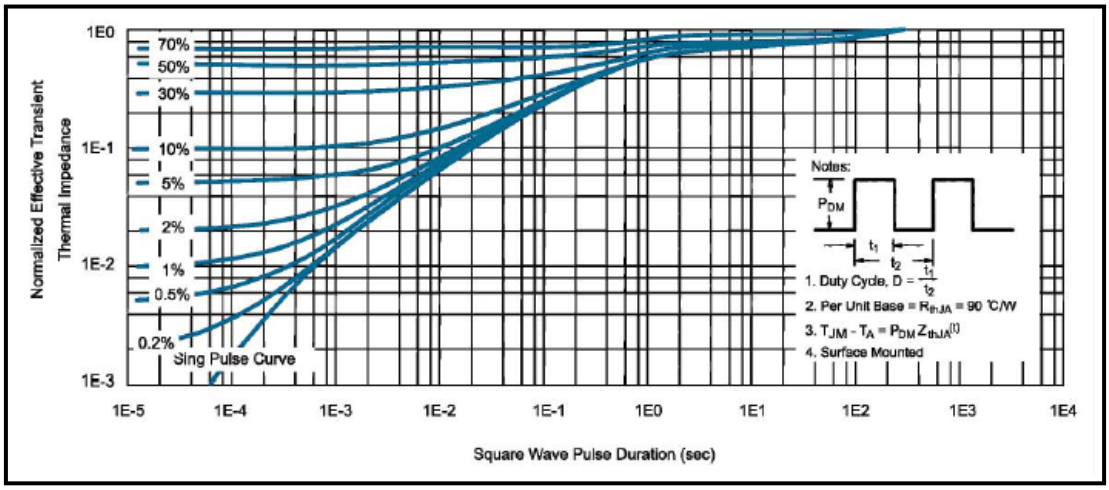



**Figure 10 :Normalized Maximum Transient Thermal Impedance**

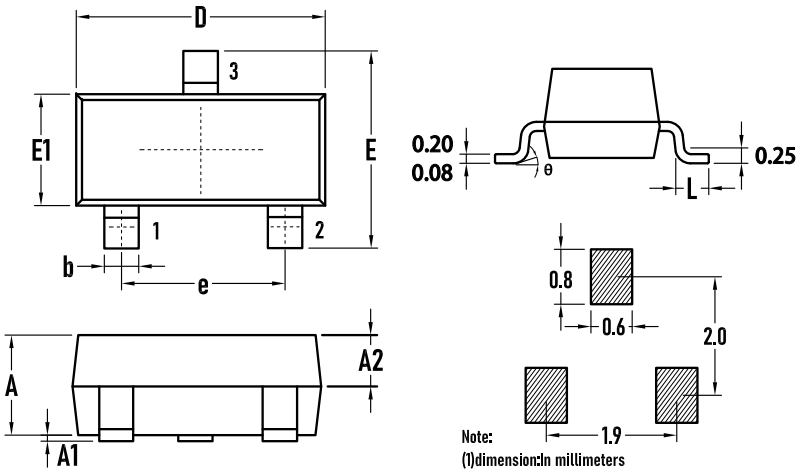



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# SI2309L

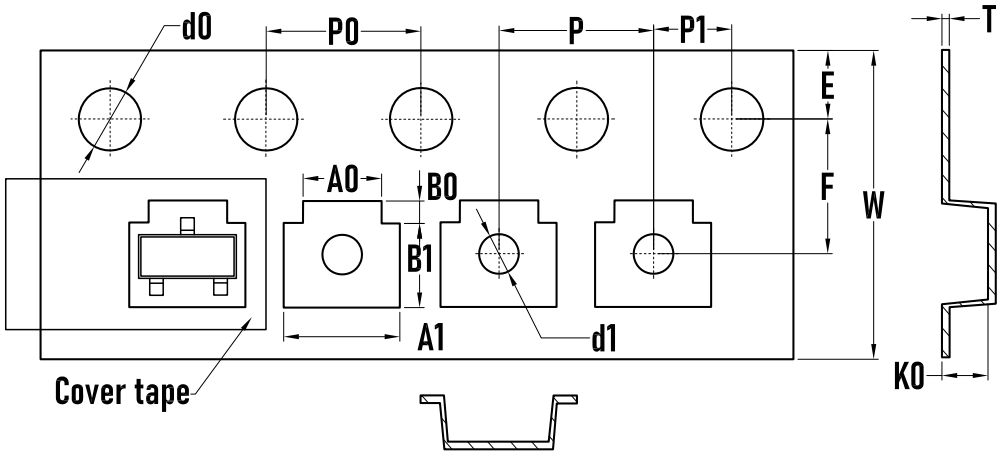
**P-Channel MOSFET**

## Outline Drawing - SOT-23



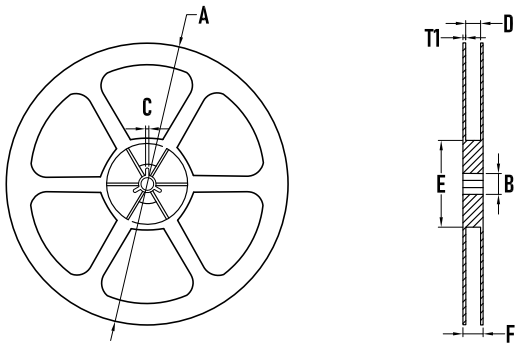

| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN. | Typ. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.01 | – | 0.10 |
| A2 | 0.50 | 0.60 | 0.70 |
| D | 2.80 | 2.90 | 3.00 |
| b | 0.25 | 0.35 | 0.45 |
| E | 2.10 | 2.30 | 2.50 |
| E1 | 1.20 | 1.30 | 1.40 |
| e | 1.80 | 1.90 | 2.00 |
| L | 0.25 | 0.35 | 0.45 |
| θ | 0 | – | 8° |

## Packaging Tape - SOT-23




| SYMBOL | MILLIMETER |
|---|---|
| A0 | 2.10±0.10 |
| A1 | 3.10±0.10 |
| B0 | 0.65±0.10 |
| B1 | 2.75±0.10 |
| d0 | 1.55±0.10 |
| d1 | 1.00±0.05 |
| E | 1.75±0.10 |
| F | 3.50±0.10 |
| K0 | 1.10±0.10 |
| P | 4.00±0.10 |
| P0 | 4.00±0.10 |
| P1 | 2.00±0.10 |
| W | 8.00±0.30 |
| T | 0.20 ±0.05 |

## Packaging Reel




| SYMBOL | MILLIMETER |
|---|---|
| A | 177.8±0.2 |
| B | 3.1 |
| C | 13.50 |
| D | 9.6±0.3 |
| E | 75±0.2 |
| F | 12.3±0.3 |
| T1 | 1.0±0.2 |
| Quantity | 3000PCS |

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**Revision: 2022-Jan-1-A**