

-3.0A,-20V P-Channel Power MOSFET

GENERALDESCRIPTION

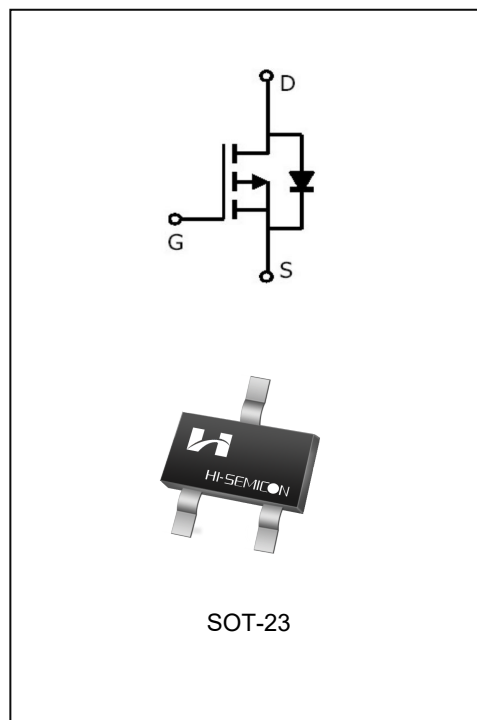
The Power MOSFET has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- ◆ $V_{DS}=-20V, I_D=-3.0A$
- ◆ $R_{DS(ON)}$
 TYP:47mΩ@ $V_{GS}= -4.5V$
 TYP:58mΩ@ $V_{GS}= -2.5V$

Applications

- ◆ PWM Applications
- ◆ Load Switch
- ◆ Power Management



ORDERING INFORMATION

| Part No. | Package | Marking | Material | Packing |
|----------|---------|---------|----------|---------|
| SFS2301 | SOT-23 | 2301 | Pb Free | Reel |

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

| Characteristics | | Symbol | Ratings | Unit |
|---|-----------------------|------------------|----------|------|
| Drain-Source Voltage | | V _{DS} | -20 | V |
| Gate-Source Voltage | | V _{GS} | ±12 | V |
| Drain Current | T _C = 25°C | I _D | -3.0 | A |
| | T _C = 75°C | | -2.1 | |
| Drain Current Pulsed(Note 1) | | I _{DM} | -12 | A |
| Power Dissipation(T _C =25°C) -Derate above 25°C | | P _D | 1.0 | W |
| Single Pulsed Avalanche Energy (Note 2) | | E _{AS} | 16 | mJ |
| Operation Junction Temperature Range | | T _J | -55~+150 | °C |
| Storage Temperature Range | | T _{stg} | -55~+150 | °C |
| Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds | | TL | 300 | °C |

ELECTRICAL CHARACTERISTICS

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|--|---------------------|---|-------|-------|------|------|
| Off Characteristics | | | | | | |
| Drain -Source Breakdown Voltage | B _{VDS} | V _{GS} = 0V, I _D = -250μA | -20 | -- | -- | V |
| Drain-Source Leakage Current | I _{DSS} | V _{DS} = -20V, V _{GS} = 0V | -- | -- | 1 | uA |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} = 12V, V _{DS} = 0V | -- | -- | 100 | nA |
| Gate-Source Leakage Current | I _{GSS} | V _{GS} = -12V, V _{DS} = 0V | -- | -- | -100 | |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{GS} = V _{DS} , I _D = -250μA | -0.45 | -0.65 | -1.0 | V |
| Static Drain- Source On State Resistance | R _{DSON} | V _{GS} = -4.5V, I _D = -2.0A | -- | 47 | 60 | mΩ |
| | | V _{GS} = -2.5V, I _D = -1.0A | -- | 58 | 80 | |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} = -10V V _{GS} = 0V f=1.0MHZ | -- | 478 | -- | pF |
| Output Capacitance | C _{oss} | | -- | 56 | -- | |
| Reverse Transfer Capacitance | C _{rss} | | -- | 41 | -- | |
| Switching Characteristics | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} = -10V, V _{GS} = -4.5V R _G = 1.0Ω , I _D = -3.0A (Note 3.4) | -- | 11.3 | -- | nS |
| Turn-on Rise Time | t _r | | -- | 51.2 | -- | |
| Turn-off Delay Time | t _{d(off)} | | -- | 16.6 | -- | |
| Turn-off Fall Time | t _f | | -- | 10.5 | -- | |
| Total Gate Charge | Q _g | V _{DS} =-10V, I _D =-2A V _{GS} =-4.5V (Note 3.4) | -- | 4.2 | -- | nC |
| Gate-Source Charge | Q _{gs} | | -- | 0.8 | -- | |
| Gate-Drain Charge | Q _{gd} | | -- | 1.1 | -- | |

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

| Characteristics | Symbol | Test conditions | Min. | Typ. | Max. | Unit |
|---------------------------|----------|---|------|------|------|------|
| Continuous Source Current | I_S | Integral Reverse P-N Junction Diode in the MOSFET | -- | -- | -3.0 | A |
| Pulsed Source Current | I_{SM} | | -- | -- | -12 | |
| Diode Forward Voltage | V_{SD} | $I_S = -3A, V_{GS} = 0V$ | -- | -0.8 | -1.2 | V |

NOTE:

1. Pulse width limited by maximum junction temperature
2. $L=0.5mH, V_{DD}=-10V, V_G=-10V, R_G=25\Omega$, starting $T_J=25^\circ$
3. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1: Output Characteristics

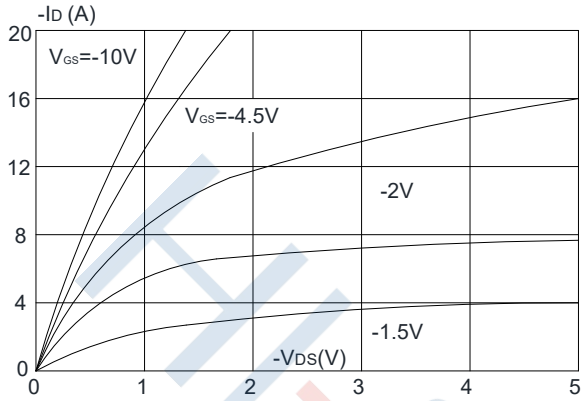


Figure 2: Typical Transfer Characteristics

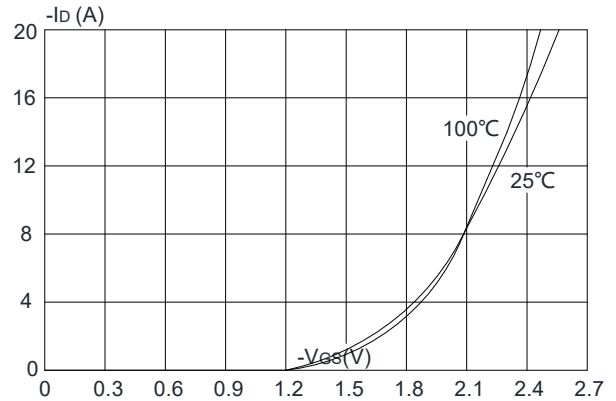


Figure 3: On-resistance vs. Drain Current

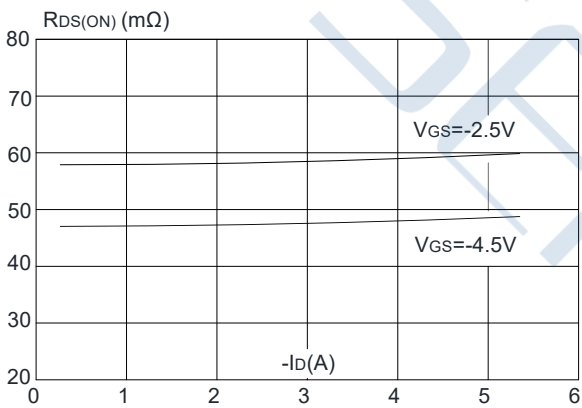


Figure 4: Body Diode Characteristics

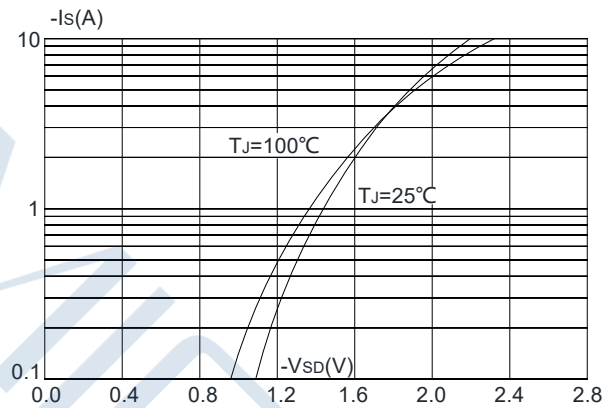


Figure 5: Gate Charge Characteristics

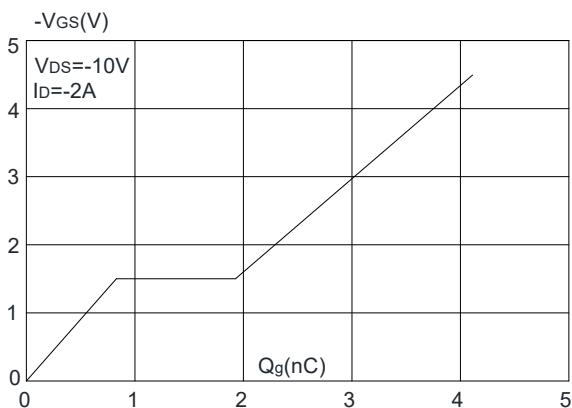
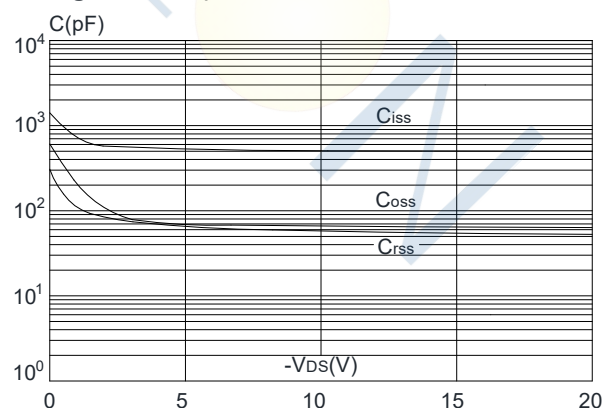


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

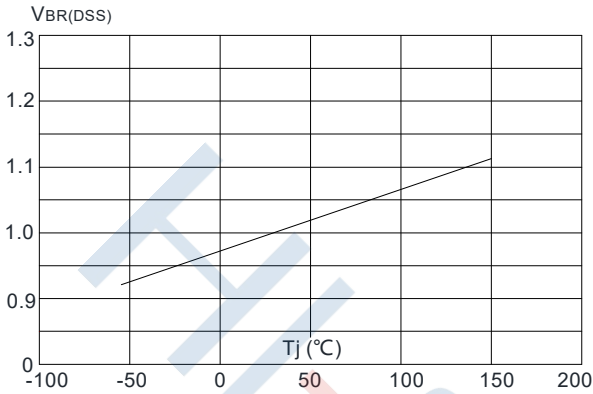


Figure 8: Normalized on Resistance vs. Junction Temperature

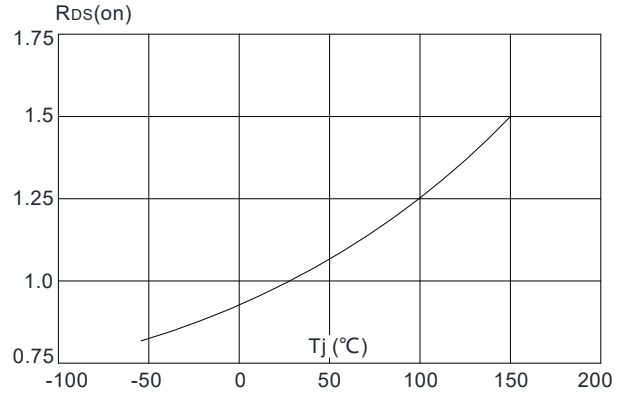


Figure 9: Maximum Safe Operating Area

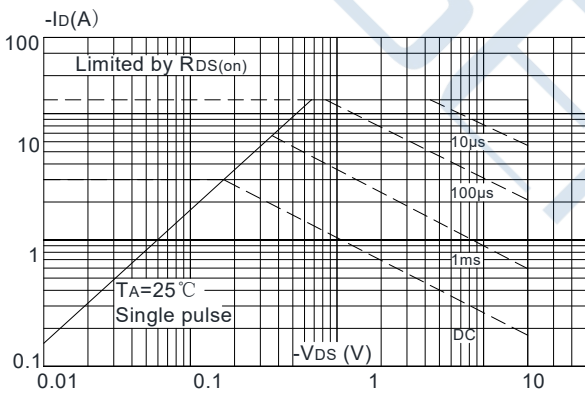
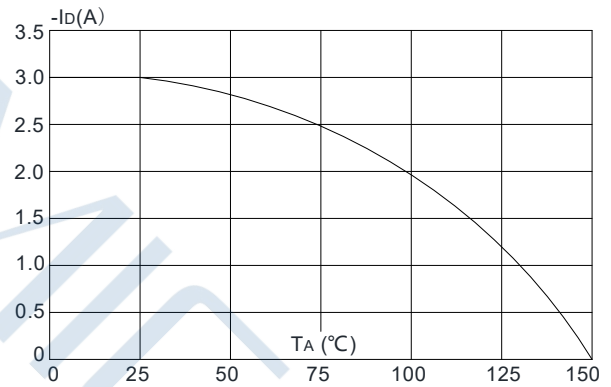
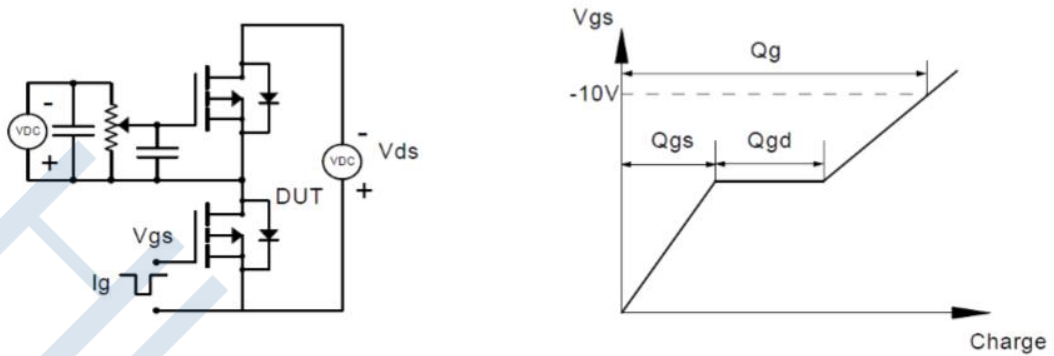


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

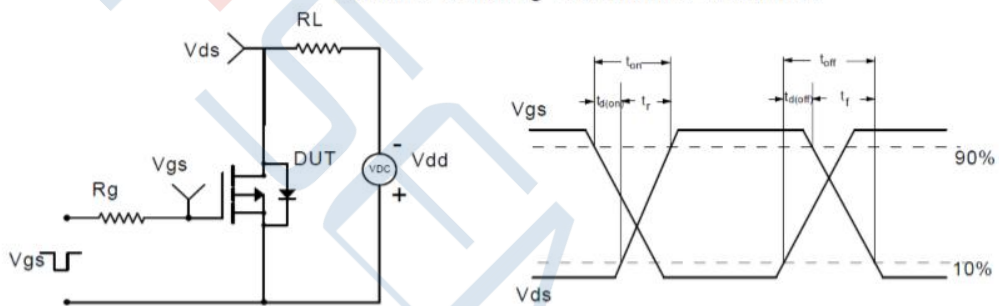


Test Circuit

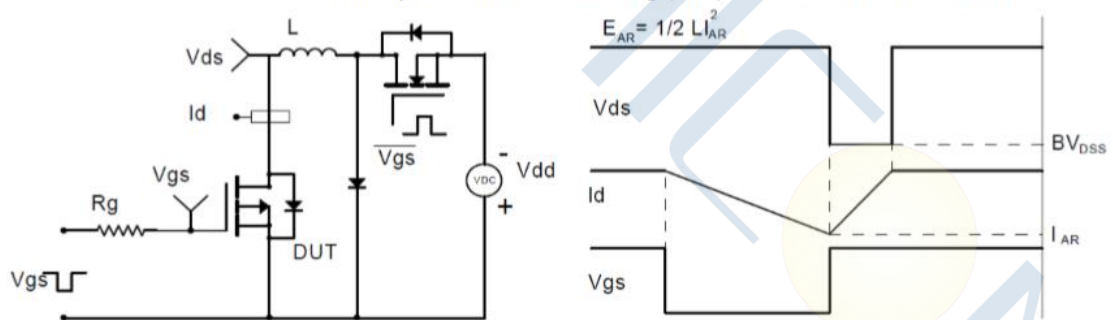
Gate Charge Test Circuit & Waveform



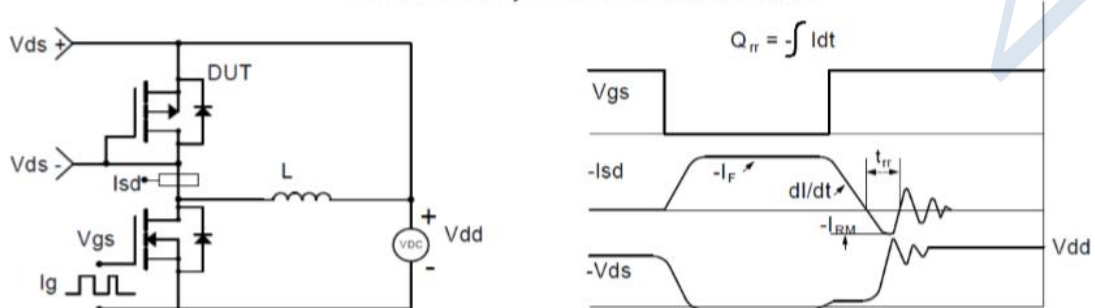
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

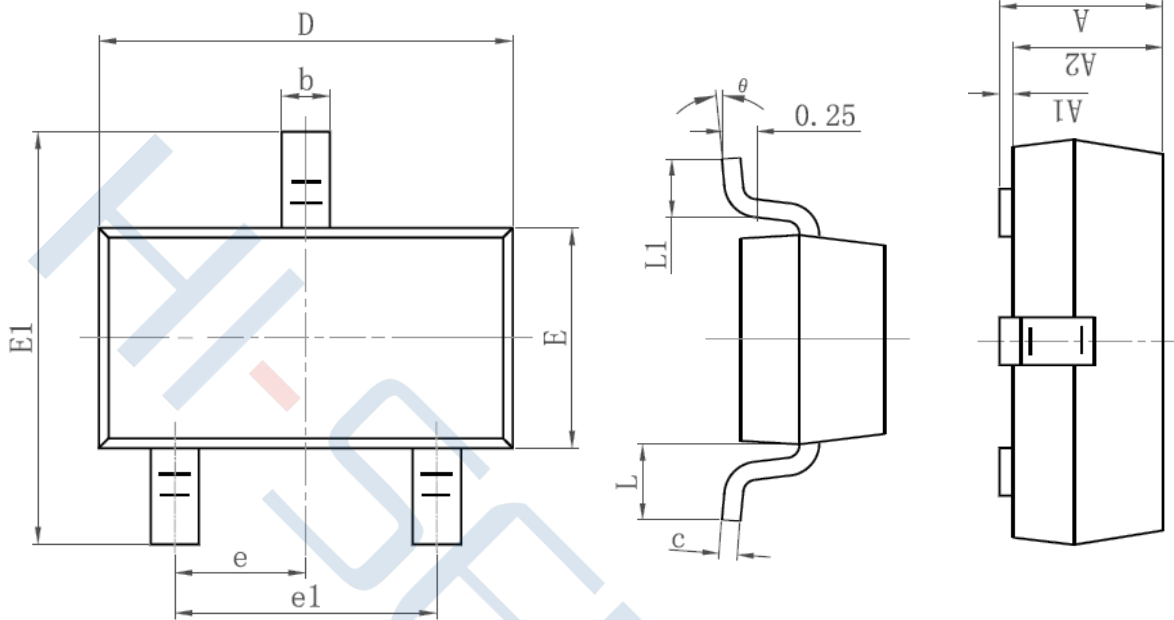


Diode Recovery Test Circuit & Waveforms



Package Dimensions of SOT-23

Unit:mm



| Symbol | Dimensions in Millimeters | |
|--------|---------------------------|-------|
| | MIN. | MAX. |
| A | 0.900 | 1.150 |
| A1 | 0.000 | 0.100 |
| A2 | 0.900 | 1.050 |
| b | 0.300 | 0.500 |
| c | 0.080 | 0.150 |
| D | 2.800 | 3.000 |
| E | 1.200 | 1.400 |
| E1 | 2.250 | 2.550 |
| e | 0.950TYP | |
| e1 | 1.800 | 2.000 |
| L | 0.550REF | |
| L1 | 0.300 | 0.500 |
| theta | 0° | 8° |

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