

## Features

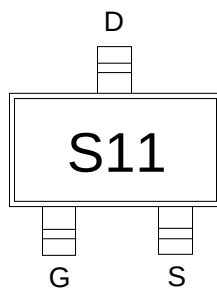
- Trench Power LV MOSFET technology
- High Density Cell Design for Low  $R_{DS(ON)}$
- High Speed switching

## Product Summary

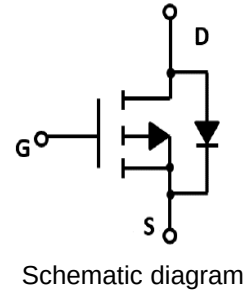
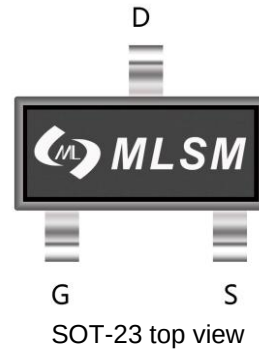
| $V_{DS}$ | $R_{DS(ON)}$ TYP | $I_D$ |
|----------|------------------|-------|
| -8V      | 36mΩ@-4.5V       | -3.5A |
|          | 58mΩ@-2.5V       |       |

## Application

- Battery protection
- Load switch
- Power management



S11: Device code



Halogen-Free

Marking and pin assignment

| Absolute Maximum Ratings (TA=25°C unless otherwise noted) |                                        |         |            |      |
|-----------------------------------------------------------|----------------------------------------|---------|------------|------|
| Symbol                                                    | Parameter                              |         | Rating     | Unit |
| Common Ratings (TC=25°C Unless Otherwise Noted)           |                                        |         |            |      |
| V <sub>DS</sub>                                           | Drain-Source Breakdown Voltage         |         | -8         | V    |
| V <sub>GS</sub>                                           | Gate-Source Voltage                    |         | ±8         | V    |
| T <sub>J</sub>                                            | Maximum Junction Temperature           |         | 150        | °C   |
| T <sub>STG</sub>                                          | Storage Temperature Range              |         | -55 to 150 | °C   |
| I <sub>S</sub>                                            | Diode Continuous Forward Current       | Tc=25°C | -3.5       | A    |
| Mounted on Large Heat Sink                                |                                        |         |            |      |
| I <sub>DM</sub>                                           | Pulse Drain Current Tested             | Tc=25°C | -18        | A    |
| I <sub>D</sub>                                            | Continuous Drain Current               | Tc=25°C | -3.5       | A    |
| P <sub>D</sub>                                            | Maximum Power Dissipation              | Tc=25°C | 1.2        | W    |
| R <sub>θJA</sub>                                          | Thermal Resistance Junction-to-Ambient |         | 105        | °C/W |

| Ordering Information (Example) |         |         |                      |                         |                            |               |
|--------------------------------|---------|---------|----------------------|-------------------------|----------------------------|---------------|
| Type                           | Package | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
| MLS2311                        | SOT-23  | S11     | 3,000                | 45,000                  | 180,000                    | 7"reel        |

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

| Symbol                                                                   | Parameter                        | Condition                                                                               | Min  | Typ  | Max  | Unit |
|--------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------|------|------|------|------|
| Static Electrical Characteristics @ TJ = 25°C (unless otherwise stated)  |                                  |                                                                                         |      |      |      |      |
| BV <sub>(BR)DSS</sub>                                                    | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                             | -8   | --   | --   | V    |
| I <sub>DSS</sub>                                                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-8V, V <sub>GS</sub> =0V                                               | --   | --   | -1   | μA   |
| I <sub>GSS</sub>                                                         | Gate-Body Leakage Current        | V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V                                               | --   | --   | ±100 | nA   |
| V <sub>GS(th)</sub>                                                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                               | -0.4 | -0.7 | -0.9 | V    |
| R <sub>DS(on)</sub>                                                      | Drain-Source On-State Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3.5A                                           | --   | 36   | 45   | mΩ   |
|                                                                          |                                  | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3A                                             | --   | 58   | 72   | mΩ   |
|                                                                          |                                  | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1.0A                                           | --   | 96   | 120  | mΩ   |
| Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated) |                                  |                                                                                         |      |      |      |      |
| C <sub>ISS</sub>                                                         | Input Capacitance                | V <sub>DS</sub> =-9V, V <sub>GS</sub> =0V, f=1MHz                                       | --   | 1015 | --   | pF   |
| C <sub>OSS</sub>                                                         | Output Capacitance               |                                                                                         | --   | 138  | --   | pF   |
| C <sub>RSS</sub>                                                         | Reverse Transfer Capacitance     |                                                                                         | --   | 105  | --   | pF   |
| Switching Characteristics                                                |                                  |                                                                                         |      |      |      |      |
| Q <sub>g</sub>                                                           | Total Gate Charge                | V <sub>DS</sub> =-9V, I <sub>D</sub> =-5.6A, V <sub>GS</sub> =-4.5V                     | --   | 11.3 | --   | nC   |
| Q <sub>gs</sub>                                                          | Gate Source Charge               |                                                                                         | --   | 2.3  | --   | nC   |
| Q <sub>gd</sub>                                                          | Gate Drain Charge                |                                                                                         | --   | 2.4  | --   | nC   |
| t <sub>d(on)</sub>                                                       | Turn-on Delay Time               | V <sub>DD</sub> =-9V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =2.5Ω | --   | 8.5  | --   | nS   |
| t <sub>r</sub>                                                           | Turn-on Rise Time                |                                                                                         | --   | 35.5 | --   | nS   |
| t <sub>d(off)</sub>                                                      | Turn-Off Delay Time              |                                                                                         | --   | 78   | --   | nS   |
| t <sub>f</sub>                                                           | Turn-Off Fall Time               |                                                                                         | --   | 58   | --   | nS   |
| Source- Drain Diode Characteristics                                      |                                  |                                                                                         |      |      |      |      |
| V <sub>SD</sub>                                                          | Forward on voltage               | Tj=25°C, Is=-3.5A                                                                       | --   | --   | -1.2 | V    |

## Typical Operating Characteristics

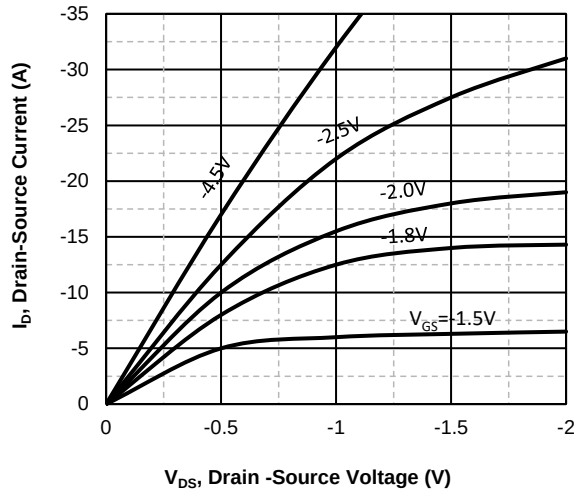


Fig1. Typical Output Characteristics

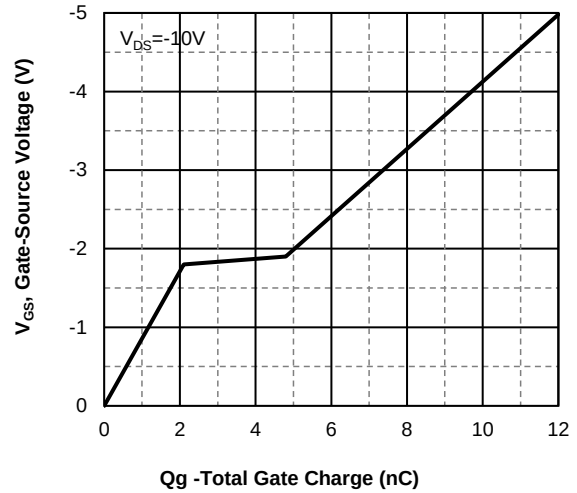


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

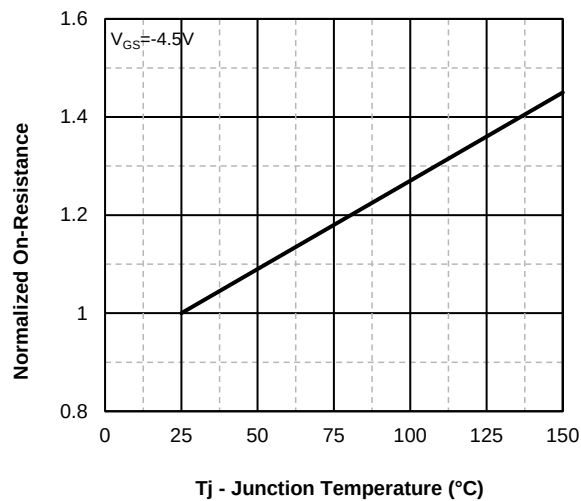


Fig3. Normalized On-Resistance Vs. Temperature

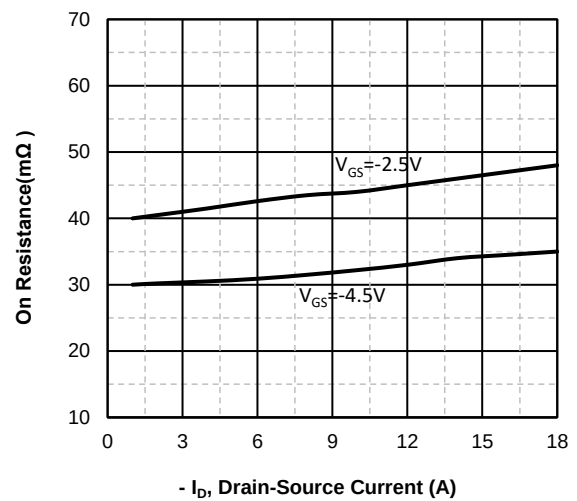


Fig4. On Resistance Vs. Drain-Source Current

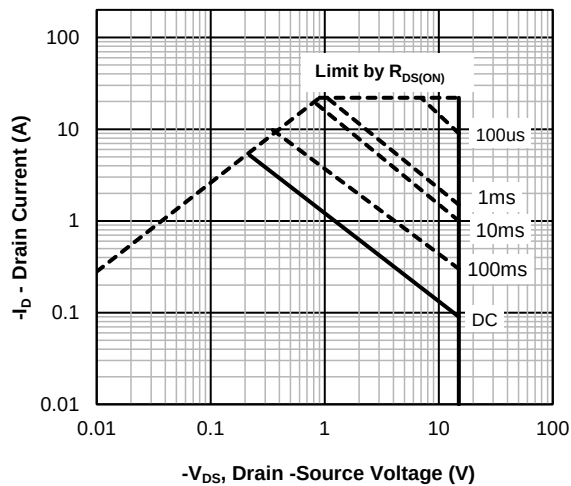


Fig5. Maximum Safe Operating Area

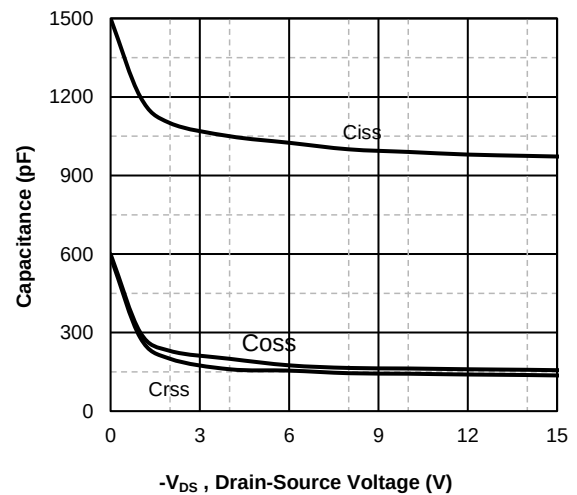
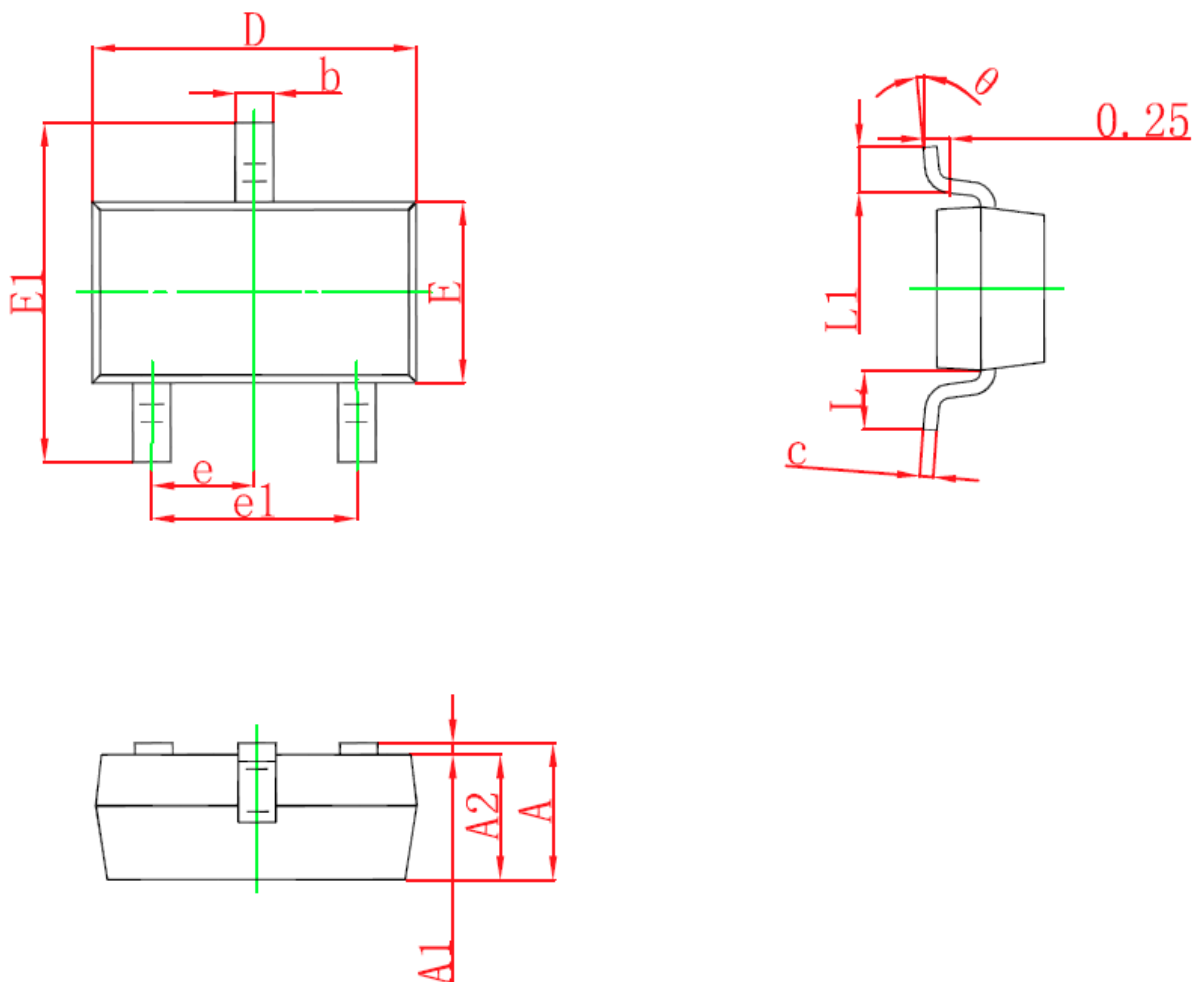


Fig6 Typical Capacitance Vs. Drain-Source Voltage

**SOT-23 Package information**



| Symbol | Dimensions in Millimeters(mm) |       | Dimensions In Inches |       |
|--------|-------------------------------|-------|----------------------|-------|
|        | Min                           | Max   | Min                  | Max   |
| A      | 0.900                         | 1.150 | 0.035                | 0.045 |
| A1     | 0.000                         | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                         | 1.050 | 0.035                | 0.041 |
| b      | 0.300                         | 0.500 | 0.012                | 0.020 |
| c      | 0.080                         | 0.150 | 0.003                | 0.006 |
| D      | 2.800                         | 3.000 | 0.110                | 0.118 |
| E      | 1.200                         | 1.400 | 0.047                | 0.055 |
| E1     | 2.250                         | 2.550 | 0.089                | 0.100 |
| e      | 0.950TYP                      |       | 0.037TYP             |       |
| e1     | 1.800                         | 2.000 | 0.071                | 0.079 |
| L      | 0.550REF                      |       | 0.022REF             |       |
| L1     | 0.300                         | 0.500 | 0.012                | 0.020 |
| θ      | 0°                            | 8°    | 0°                   | 8°    |