

## Features

- Trench Power LV MOSFET technology
- High Power and current handing capability
- ESD protected up to 2000V

## Product Summary

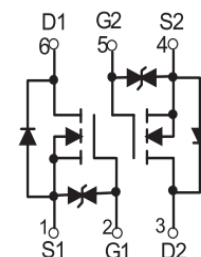
| $V_{DS}$ | $R_{DS(ON)}$ TYP | $I_D$ |
|----------|------------------|-------|
| 20V      | 150mΩ@4.5V       | 0.9A  |
|          | 200mΩ@2.5V       |       |

## Application

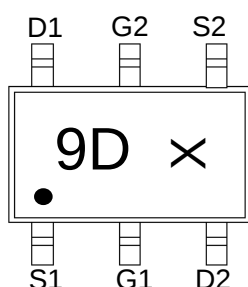
- Load/Power Switching
- Interfacing Switching
- Logic Level Shift



SOT-363 top view



Schematic diagram



9D : Device code  
X : Code

Marking and pin assignment



Halogen-Free

| 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            |         | 20         | V    |
| V <sub>GS</sub>                                           | Gate-Source Voltage                       |         | ±10        | V    |
| T <sub>J</sub>                                            | Maximum Junction Temperature              |         | 150        | °C   |
| T <sub>STG</sub>                                          | Storage Temperature Range                 |         | -50 to 155 | °C   |
| I <sub>S</sub>                                            | Diode Continuous Forward Current          | Tc=25°C | 0.9        | A    |
| Mounted on Large Heat Sink                                |                                           |         |            |      |
| I <sub>DM</sub>                                           | Pulse Drain Current Tested                | Tc=25°C | 3.5        | A    |
| I <sub>D</sub>                                            | Continuous Drain Current                  | Tc=25°C | 0.9        | A    |
| P <sub>D</sub>                                            | Maximum Power Dissipation                 | Tc=25°C | 0.15       | W    |
| R <sub>θJA</sub>                                          | Thermal Resistance Junction-to-Ambient    |         | 833        | °C/W |
| E <sub>SD</sub>                                           | Gate-Source ESD Rating (HBM, Method 3015) |         | 2000       | V    |

| Ordering Information (Example) |         |         |                      |                         |                            |               |
|--------------------------------|---------|---------|----------------------|-------------------------|----------------------------|---------------|
| Type                           | Package | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
| MLS1012DW                      | SOT-363 | 9D      | 3,000                | 45,000                  | 180,000                    | 7"reel        |



| Electrical Characteristics (T <sub>J</sub> =25℃ unless otherwise noted)             |                                  |                                                                                        |      |      |     |      |
|-------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------|------|------|-----|------|
| Symbol                                                                              | Parameter                        | Condition                                                                              | Min  | Typ  | Max | Unit |
| Static Electrical Characteristics @ T <sub>J</sub> = 25℃ (unless otherwise stated)  |                                  |                                                                                        |      |      |     |      |
| B <sub>V(BR)DSS</sub>                                                               | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                             | 20   | --   | --  | V    |
| I <sub>DSS</sub>                                                                    | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V                                              | --   | --   | 1   | μA   |
| I <sub>GSS</sub>                                                                    | Gate-Body Leakage Current        | V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V                                             | --   | --   | ±10 | μA   |
| V <sub>GS(th)</sub>                                                                 | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                               | 0.35 | 0.7  | 1.1 | V    |
| R <sub>DS(on)</sub>                                                                 | Drain-Source On-State Resistance | V <sub>GS</sub> =4.5V, I <sub>D</sub> =0.5A                                            | --   | 150  | 400 | mΩ   |
|                                                                                     |                                  | V <sub>GS</sub> =2.5V, I <sub>D</sub> =0.2A                                            | --   | 200  | 650 | mΩ   |
|                                                                                     |                                  | V <sub>GS</sub> =1.8V, I <sub>D</sub> =0.1A                                            | --   | 300  | 800 | mΩ   |
| Dynamic Electrical Characteristics @ T <sub>J</sub> = 25℃ (unless otherwise stated) |                                  |                                                                                        |      |      |     |      |
| C <sub>ISS</sub>                                                                    | Input Capacitance                | V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1MHz                                      | --   | 33   | --  | pF   |
| C <sub>OSS</sub>                                                                    | Output Capacitance               |                                                                                        | --   | 21   | --  | pF   |
| C <sub>RSS</sub>                                                                    | Reverse Transfer Capacitance     |                                                                                        | --   | 10   | --  | pF   |
| Switching Characteristics                                                           |                                  |                                                                                        |      |      |     |      |
| Q <sub>g</sub>                                                                      | Total Gate Charge                | V <sub>DS</sub> =10V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =4.5V                      | --   | 0.8  | --  | nC   |
| Q <sub>gs</sub>                                                                     | Gate Source Charge               |                                                                                        | --   | 0.3  | --  | nC   |
| Q <sub>gd</sub>                                                                     | Gate Drain Charge                |                                                                                        | --   | 0.17 | --  | nC   |
| t <sub>d(on)</sub>                                                                  | Turn-on Delay Time               | V <sub>DD</sub> =10V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =4.5V, R <sub>G</sub> =10Ω | --   | 4.2  | --  | nS   |
| t <sub>r</sub>                                                                      | Turn-on Rise Time                |                                                                                        | --   | 19.1 | --  | nS   |
| t <sub>d(off)</sub>                                                                 | Turn-Off Delay Time              |                                                                                        | --   | 10.3 | --  | nS   |
| t <sub>f</sub>                                                                      | Turn-Off Fall Time               |                                                                                        | --   | 24   | --  | nS   |
| Source- Drain Diode Characteristics                                                 |                                  |                                                                                        |      |      |     |      |
| V <sub>SD</sub>                                                                     | Forward on voltage               | T <sub>J</sub> =25℃, I <sub>S</sub> =0.5A                                              | --   | --   | 1.2 | V    |

## Typical Operating Characteristics

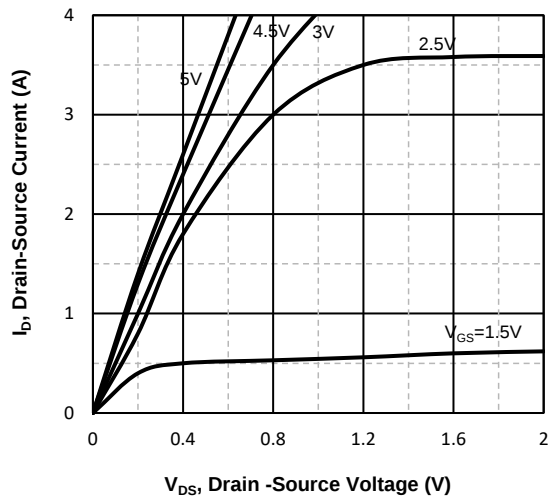


Fig1. Typical Output Characteristics

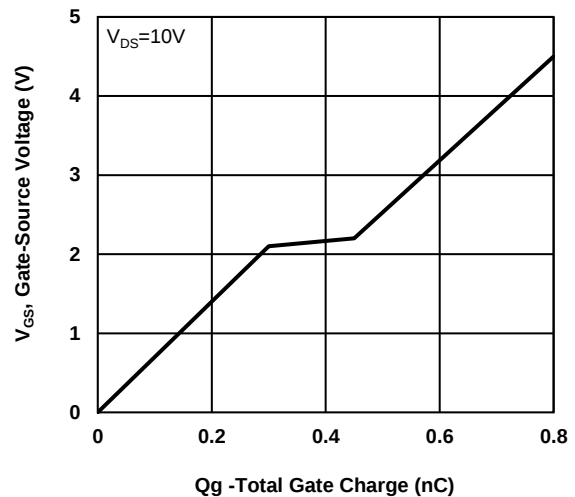


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

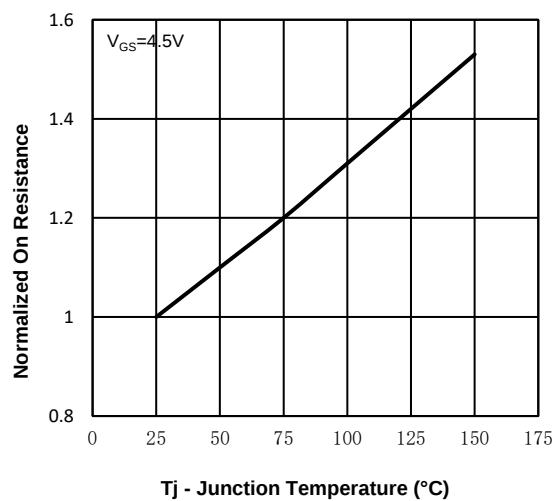


Fig3. Normalized On-Resistance Vs. Temperature

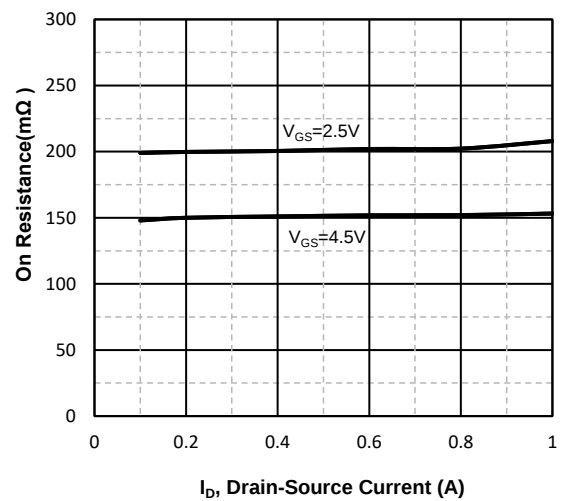


Fig4. On-Resistance Vs. Drain-Source Current

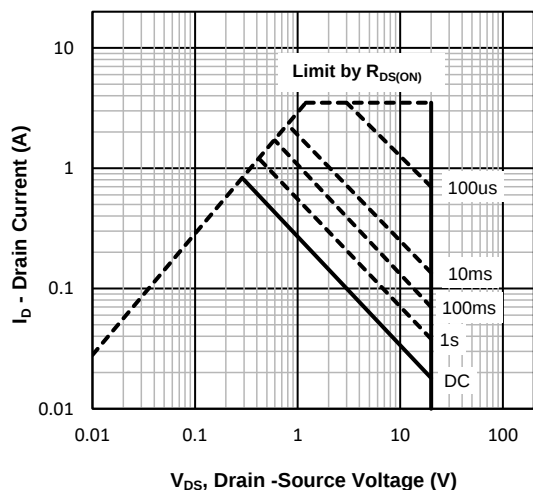


Fig5. Maximum Safe Operating Area

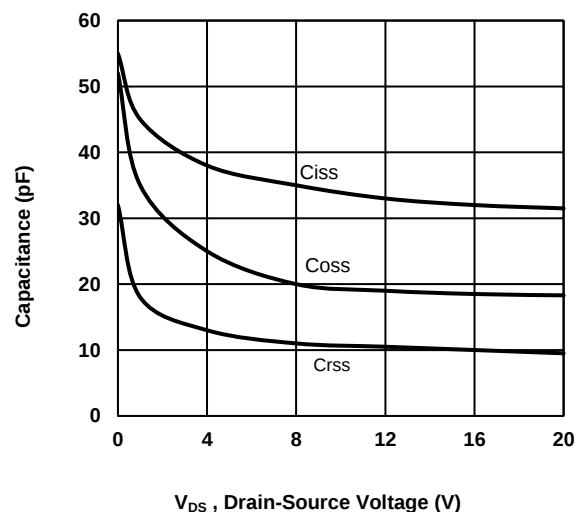
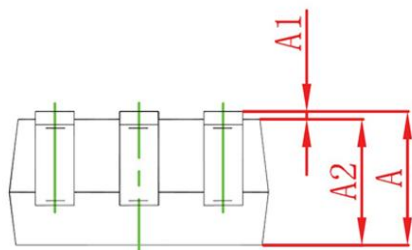
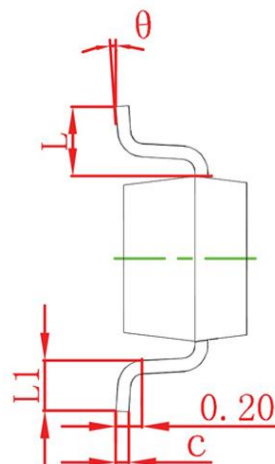
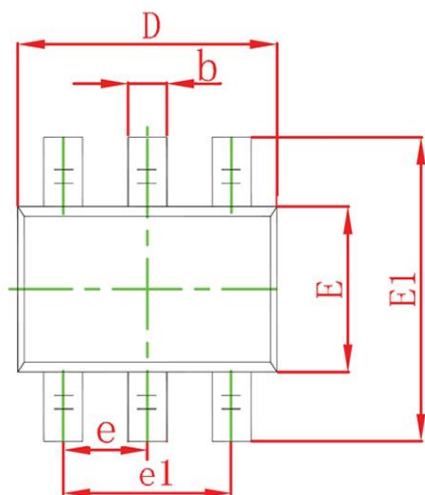


Fig6 Typical Capacitance Vs. Drain-Source Voltage

**SOT-363 Package information**



| Symbol   | Dimensions in Millimeters(mm) |       | Dimensions In Inches |       |
|----------|-------------------------------|-------|----------------------|-------|
|          | Min                           | Max   | Min                  | Max   |
| A        | 0.900                         | 1.100 | 0.035                | 0.043 |
| A1       | 0.000                         | 0.100 | 0.000                | 0.004 |
| A2       | 0.900                         | 1.000 | 0.035                | 0.039 |
| b        | 0.150                         | 0.350 | 0.006                | 0.014 |
| c        | 0.100                         | 0.150 | 0.004                | 0.006 |
| D        | 2.000                         | 2.200 | 0.079                | 0.087 |
| E        | 1.150                         | 1.350 | 0.045                | 0.053 |
| E1       | 2.150                         | 2.400 | 0.085                | 0.094 |
| e        | 0.650TYP                      |       | 0.026TYP             |       |
| e1       | 1.200                         | 1.400 | 0.047                | 0.055 |
| L        | 0.525REF                      |       | 0.021REF             |       |
| L1       | 0.260                         | 0.460 | 0.010                | 0.018 |
| $\theta$ | 0°                            | 8°    | 0°                   | 8°    |