

## Features

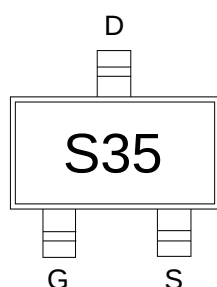
- Trench Power LV MOSFET technology
- High density cell design for Low  $R_{DS(ON)}$
- High Speed switching

## Application

- Battery protection
- Load switch
- Power management

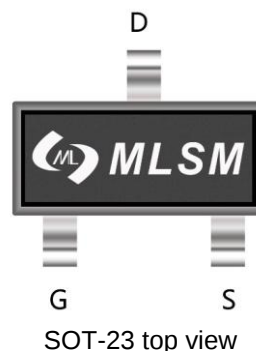
## Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ TYP    | $I_D$ |
|----------|---------------------|-------|
| -12V     | 42m $\Omega$ @-4.5V | -4A   |
|          | 58m $\Omega$ @-2.5V |       |

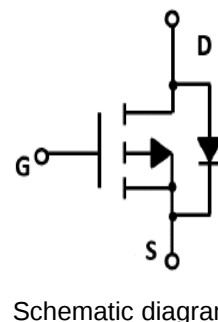


S35: Device code

Marking and pin assignment



SOT-23 top view



Schematic diagram



Pb-Free



RoHS



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   |         | -12        | 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        |         | -50 to 155 | °C |
| I <sub>S</sub>   | Diode Continuous Forward Current | Tc=25°C | -4         | A  |

## Mounted on Large Heat Sink

|                 |                                     |                        |      |      |
|-----------------|-------------------------------------|------------------------|------|------|
| $I_{DM}$        | Pulse Drain Current Tested          | $T_C=25^\circ\text{C}$ | -15  | A    |
| $I_D$           | Continuous Drain Current            | $T_C=25^\circ\text{C}$ | -4   | A    |
| $P_D$           | Maximum Power Dissipation           | $T_C=25^\circ\text{C}$ | 1.25 | W    |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient |                        | 100  | °C/W |

## Ordering Information (Example)

| Type    | Package | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|---------|---------|---------|----------------------|-------------------------|----------------------------|---------------|
| MLS2335 | SOT-23  | S35     | 3,000                | 45,000                  | 180,000                    | 7"reel        |

| Electrical Characteristics (TJ=25℃ unless otherwise noted)              |                                  |                                                                                         |       |      |      |      |
|-------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------------|-------|------|------|------|
| Symbol                                                                  | Parameter                        | Condition                                                                               | Min   | Typ  | Max  | Unit |
| Static Electrical Characteristics @ TJ = 25℃ (unless otherwise stated)  |                                  |                                                                                         |       |      |      |      |
| BV <sub>(BR)DSS</sub>                                                   | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                             | -12   | --   | --   | V    |
| I <sub>DSS</sub>                                                        | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =-12V, 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                               | -0.45 | --   | 1.0  | V    |
| R <sub>DS(on)</sub>                                                     | Drain-Source On-State Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.0A                                           | --    | 42   | 51   | mΩ   |
|                                                                         |                                  | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3.5A                                           | --    | 58   | 70   | mΩ   |
|                                                                         |                                  | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2.0A                                           | --    | 82   | 106  | mΩ   |
| Dynamic Electrical Characteristics @ TJ = 25℃ (unless otherwise stated) |                                  |                                                                                         |       |      |      |      |
| C <sub>ISS</sub>                                                        | Input Capacitance                | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz                                      | --    | 1040 | --   | pF   |
| C <sub>OSS</sub>                                                        | Output Capacitance               |                                                                                         | --    | 80   | --   | pF   |
| C <sub>RSS</sub>                                                        | Reverse Transfer Capacitance     |                                                                                         | --    | 68   | --   | pF   |
| Q <sub>g</sub>                                                          | Total Gate Charge                | V <sub>DS</sub> =-15V, I <sub>D</sub> =-4.4A, V <sub>GS</sub> =-10V                     | --    | 22   | --   | nC   |
| Q <sub>gs</sub>                                                         | Gate Source Charge               |                                                                                         | --    | 3.28 | --   | nC   |
| Q <sub>gd</sub>                                                         | Gate Drain Charge                |                                                                                         | --    | 2.11 | --   | nC   |
| Switching Characteristics                                               |                                  |                                                                                         |       |      |      |      |
| t <sub>d(on)</sub>                                                      | Turn-on Delay Time               | V <sub>DS</sub> =-15V, I <sub>D</sub> =-4.4A, V <sub>GS</sub> =-10V, R <sub>G</sub> =3Ω | --    | 4.4  | --   | nS   |
| t <sub>r</sub>                                                          | Turn-on Rise Time                |                                                                                         | --    | 26   | --   | nS   |
| t <sub>d(off)</sub>                                                     | Turn-Off Delay Time              |                                                                                         | --    | 49.2 | --   | nS   |
| t <sub>f</sub>                                                          | Turn-Off Fall Time               |                                                                                         | --    | 42.8 | --   | nS   |
| Source- Drain Diode Characteristics                                     |                                  |                                                                                         |       |      |      |      |
| V <sub>SD</sub>                                                         | Forward on voltage               | Tj=25℃, Is=-4A                                                                          | --    | --   | -1.2 | V    |

## Typical Operating Characteristics

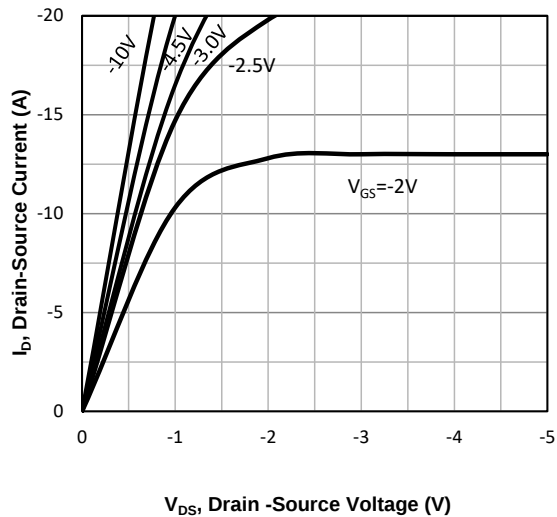


Fig1. Typical Output Characteristics

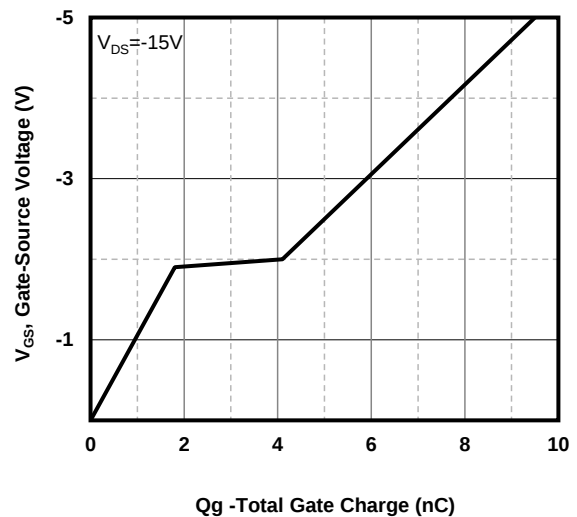


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

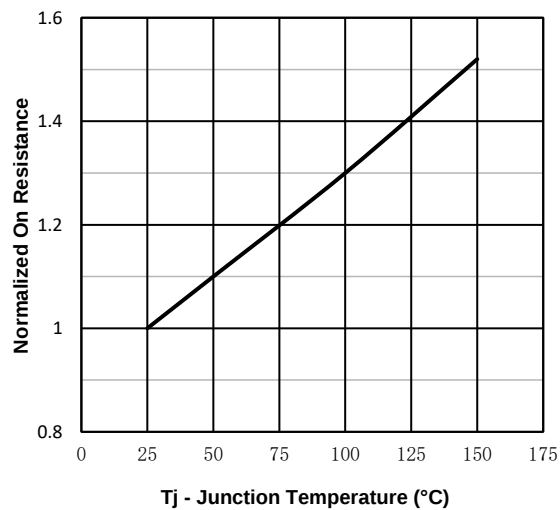


Fig3. Normalized On-Resistance Vs. Temperature

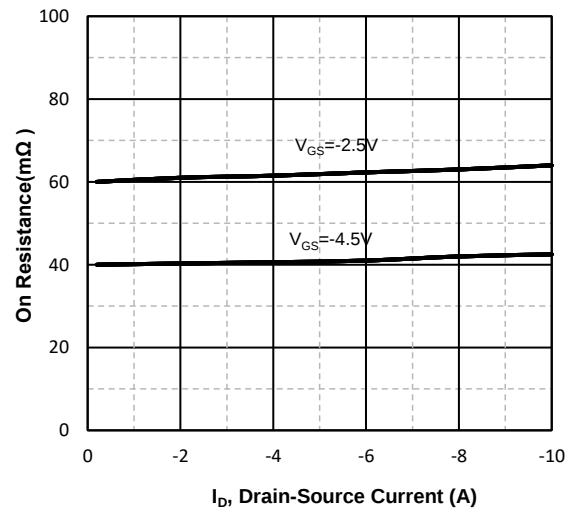


Fig4. On-Resistance Vs. Drain-Source Current

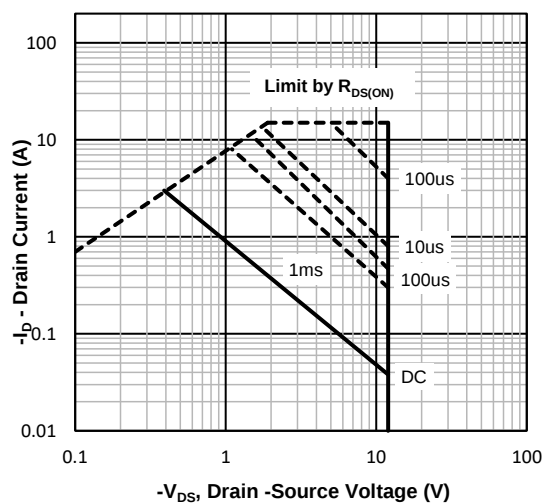


Fig5. Maximum Safe Operating Area

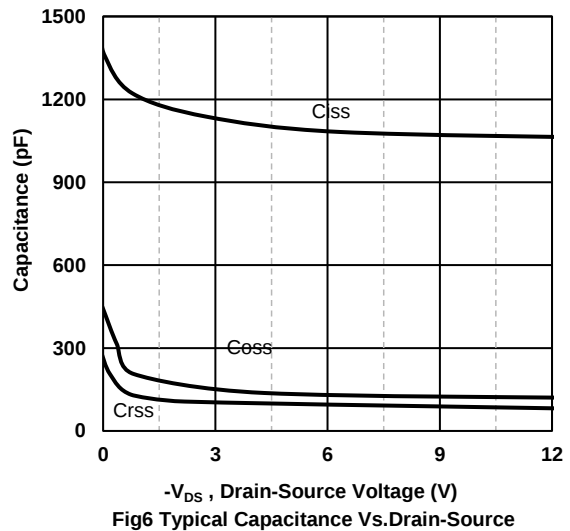
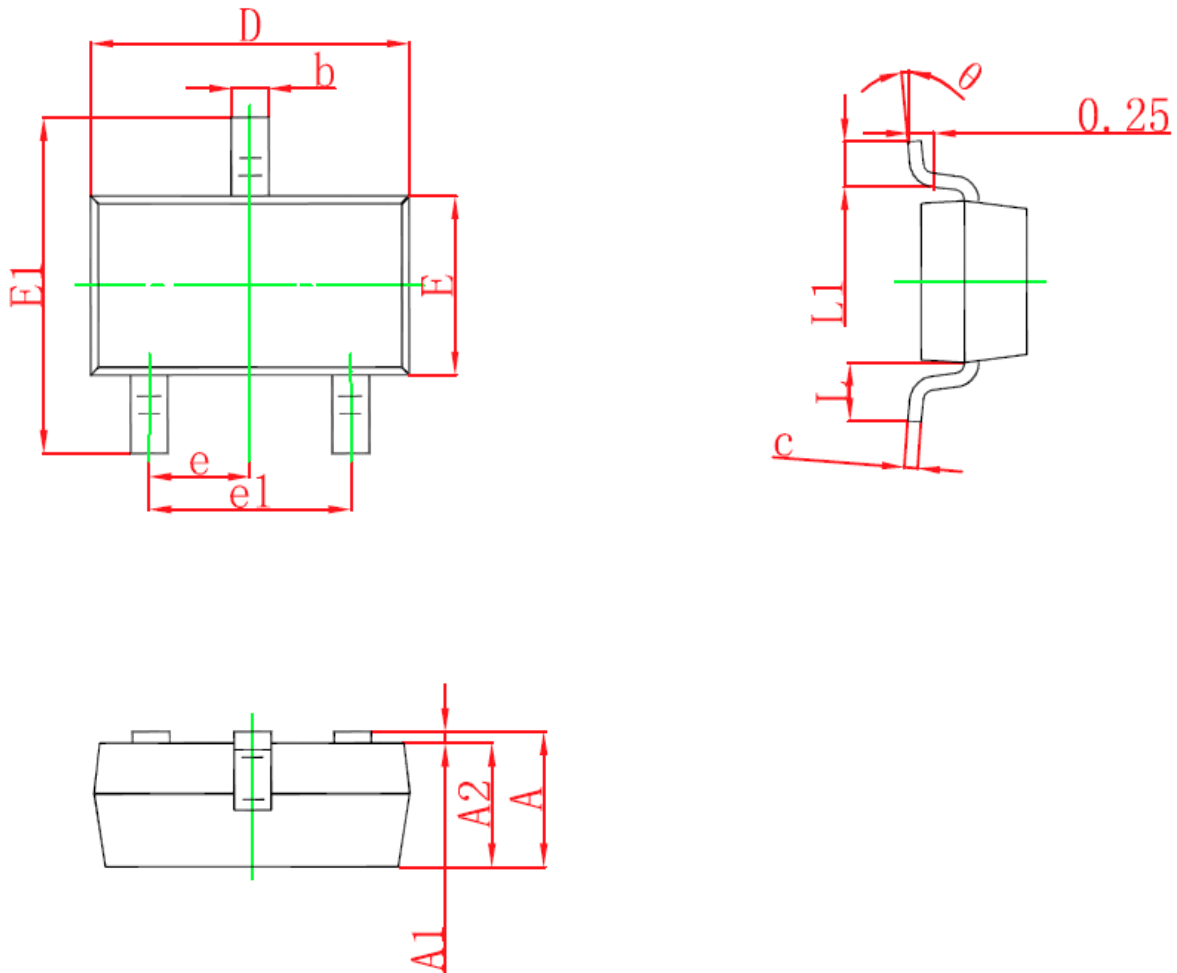


Fig6 Typical Capacitance Vs. Drain-Source

**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°    |