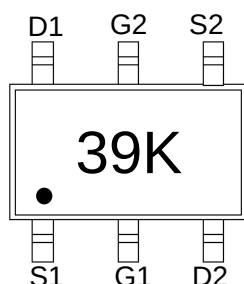


## Features

- Lead Free Product is Acquired
- Surface Mount Package
- P-Channel Switch with Low  $R_{DS(on)}$
- Operated at Low Logic Level Gate Drive

## Application

- Load/Power Switching
- Interfacing, Logic Switching
- Battery Management for Ultra Small Portable Electronics

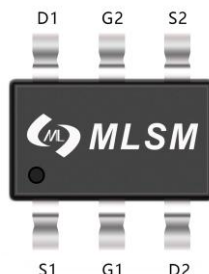


39K: Device code

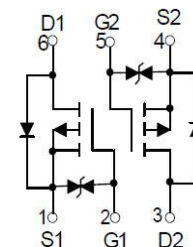
Marking and pin assignment

## Product Summary

| $V_{DS}$ | $R_{DS(on)}$ TYP | $I_D$  |
|----------|------------------|--------|
| -20V     | 380mΩ@-4.5V      | -0.66A |
|          | 520mΩ@-2.5V      |        |



SOT-363 top view



Schematic diagram



Pb-Free



Halogen-Free

## Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Symbol | Parameter | Rating | Unit |
|--------|-----------|--------|------|
|--------|-----------|--------|------|

## Common Ratings (TC=25°C Unless Otherwise Noted)

|           |                                  |                                 |    |
|-----------|----------------------------------|---------------------------------|----|
| $V_{DS}$  | Drain-Source Breakdown Voltage   | -20                             | V  |
| $V_{GS}$  | Gate-Source Voltage              | ±12                             | V  |
| $T_J$     | Maximum Junction Temperature     | 150                             | °C |
| $T_{STG}$ | Storage Temperature Range        | -55 to 150                      | °C |
| $I_S$     | Diode Continuous Forward Current | $T_c=25^\circ\text{C}$<br>-0.66 | A  |

## Mounted on Large Heat Sink

|                 |                                        |                                 |      |
|-----------------|----------------------------------------|---------------------------------|------|
| $I_{DM}$        | Pulse Drain Current Tested             | $T_c=25^\circ\text{C}$<br>-2.64 | A    |
| $I_D$           | Continuous Drain Current               | $T_c=25^\circ\text{C}$<br>-0.66 | A    |
| $P_D$           | Maximum Power Dissipation              | $T_c=25^\circ\text{C}$<br>0.15  | W    |
| $R_{\theta JA}$ | Thermal Resistance Junction-to-Ambient | 833                             | °C/W |

## Ordering Information (Example)

| Type       | Package | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|------------|---------|---------|----------------------|-------------------------|----------------------------|---------------|
| MLS3139KDW | SOT-363 | 39K     | 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                                                | --    | --    | ±20   | μA   |
| V <sub>GS(th)</sub>                                                                 | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA                                 | -0.35 | -0.65 | -1.10 | V    |
| R <sub>DS(on)</sub>                                                                 | Drain-Source On-State Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-1.0A                                             | --    | 380   | 520   | mΩ   |
|                                                                                     |                                  | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-0.8A                                             | --    | 520   | 700   | 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                                        | --    | 115   | --    | pF   |
| C <sub>OSS</sub>                                                                    | Output Capacitance               |                                                                                           | --    | 15    | --    | pF   |
| C <sub>RSS</sub>                                                                    | Reverse Transfer Capacitance     |                                                                                           | --    | 8.8   | --    | pF   |
| Switching Characteristics                                                           |                                  |                                                                                           |       |       |       |      |
| Q <sub>g</sub>                                                                      | Total Gate Charge                | V <sub>DD</sub> =-10V, I <sub>D</sub> =-0.5A, V <sub>GS</sub> =-4.5V                      | --    | 1.25  | --    | nC   |
| Q <sub>gs</sub>                                                                     | Gate Source Charge               |                                                                                           | --    | 0.35  | --    | nC   |
| Q <sub>gd</sub>                                                                     | Gate Drain Charge                |                                                                                           | --    | 0.29  | --    | nC   |
| t <sub>d(on)</sub>                                                                  | Turn-on Delay Time               | V <sub>DS</sub> =-10V, I <sub>D</sub> =-0.2A, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =10Ω | --    | 9     | --    | nS   |
| t <sub>r</sub>                                                                      | Turn-on Rise Time                |                                                                                           | --    | 5.5   | --    | nS   |
| t <sub>d(off)</sub>                                                                 | Turn-Off Delay Time              |                                                                                           | --    | 30.8  | --    | nS   |
| t <sub>f</sub>                                                                      | Turn-Off Fall Time               |                                                                                           | --    | 20    | --    | nS   |
| Source- Drain Diode Characteristics                                                 |                                  |                                                                                           |       |       |       |      |
| V <sub>SD</sub>                                                                     | Forward on voltage               | T <sub>J</sub> =25℃, I <sub>S</sub> =-0.66A                                               | --    | --    | -1.2  | V    |

## Typical Operating Characteristics

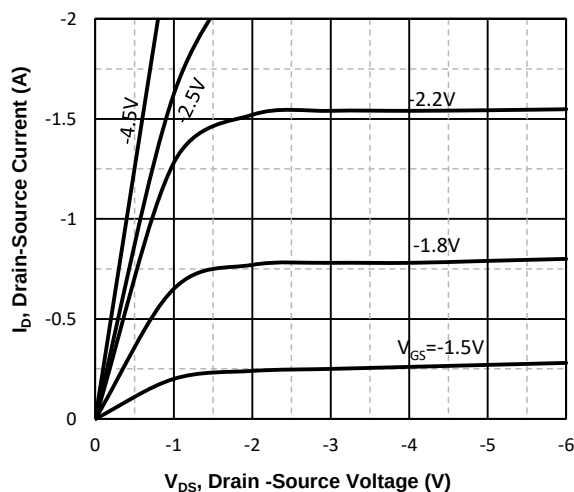


Fig1. Typical Output Characteristics

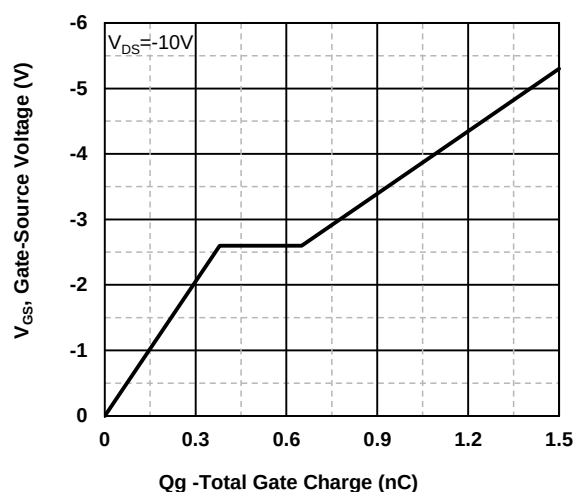


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

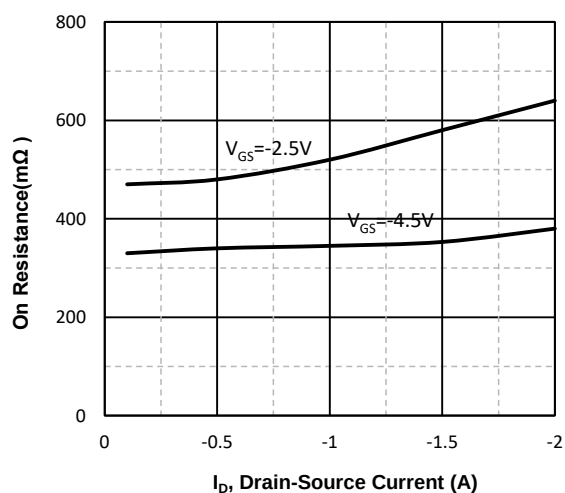


Fig3. On Resistance Vs. Drain-Source Current

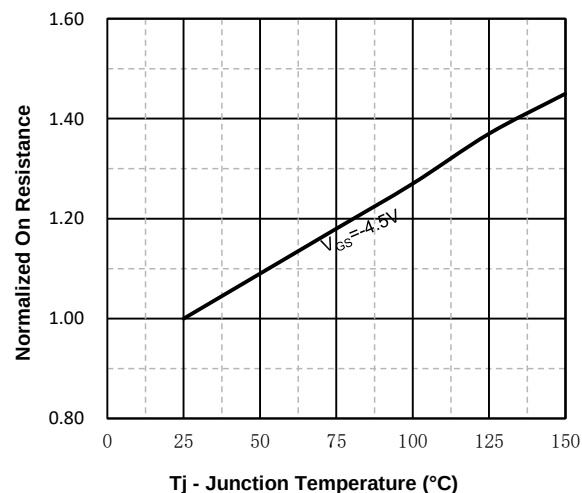


Fig4. Normalized On-Resistance Vs. Temperature

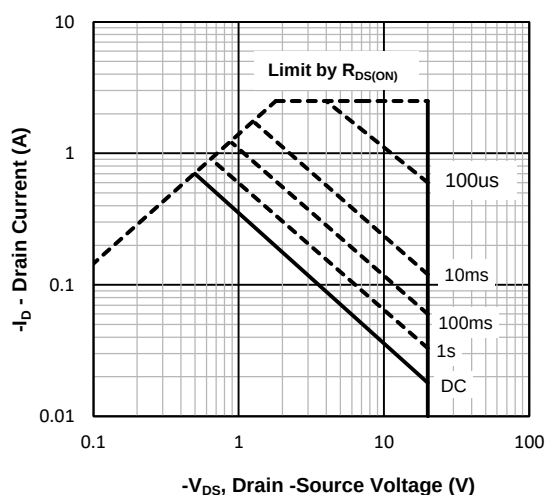


Fig5. Maximum Safe Operating Area

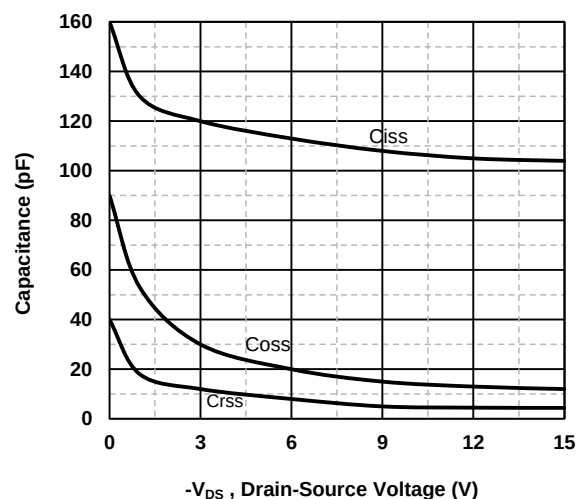
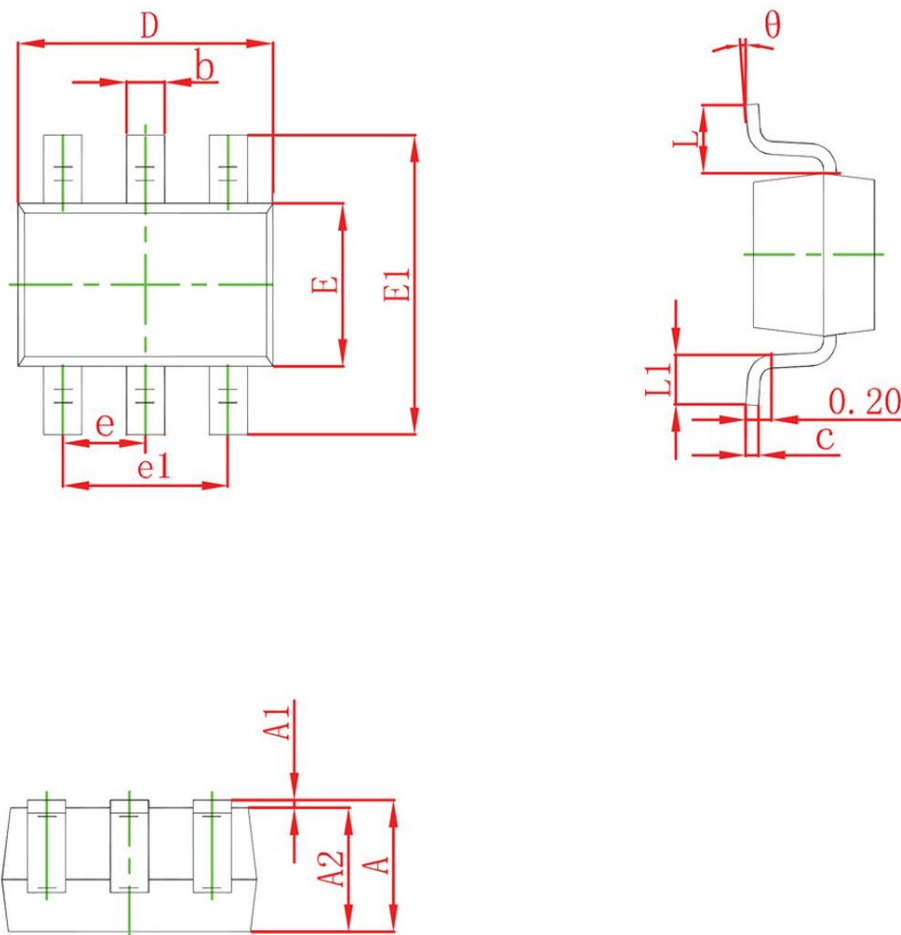


Fig6 Typical Capacitance Vs. Drain-Source Voltage

**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 |
| θ      | 0°                            | 8°    | 0°                   | 8°    |