# MLSK3415E

## -20V/-5A P-Channel MOSFET

### Features

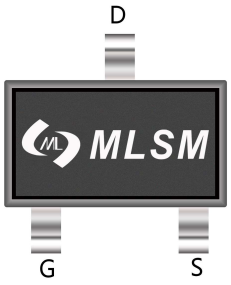
- Leading trench technology for low $R_{DS(on)}$
- Low Gate Charge

### Product Summary

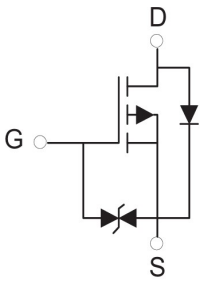
| $V_{DS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| -20V | 45mΩ@-4.5V | -5A |
| | 65mΩ@-2.5V | |

### Application

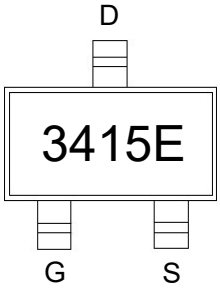
- Video monitor
- Power management




SOT-23-3L top view




Schematic diagram




3415E: Device code

Marking and pin assignment

Pb-Free RoHS Halogen-Free

| Absolute Maximum Ratings (TA=25℃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 | Tc=25°C | -5 | A |
| **Mounted on Large Heat Sink** | | | | |
| $I_{DM}$ | Pulse Drain Current Tested | Tc=25°C | -30 | A |
| $I_D$ | Continuous Drain Current | Tc=25°C | -5 | A |
| $P_D$ | Maximum Power Dissipation | Tc=25°C | 1.5 | W |
| $R_{\theta JA}$ | Thermal Resistance Junction-to-Ambient | | 90 | °C/W |

| Ordering Information (Example) | | | | | | |
|---|---|---|---|---|---|---|
| **Type** | **Package** | **Marking** | **Minimum Package(pcs)** | **Inner Box Quantity(pcs)** | **Outer Carton Quantity(pcs)** | **Delivery Mode** |
| MLSK3415E | SOT-23-3L | 3415E | 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°C (unless otherwise stated)** | | | | | | |
| $BV_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V，$I_D$=-250μA | -20 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=-20V，$V_{GS}$=0V | -- | -- | -1 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±12V，$V_{DS}$=0V | -- | -- | ±10 | μA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$，$I_D$=-250μA | -0.4 | -0.8 | -1.0 | V |
| $R_{DS(on)}$ | Drain-Source On-State Resistance | $V_{GS}$=-4.5V，$I_D$=-4A | -- | 37 | 45 | mΩ |
| | | $V_{GS}$=-2.5V，$I_D$=-3A | -- | 50 | 65 | mΩ |
| | | $V_{GS}$=-1.8V，$I_D$=-1A | -- | 100 | 200 | mΩ |
| **Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated)** | | | | | | |
| $C_{ISS}$ | Input Capacitance | $V_{DS}$=-10V，$V_{GS}$=0V， f=1MHz | -- | 540 | -- | pF |
| $C_{OSS}$ | Output Capacitance | | -- | 120 | -- | pF |
| $C_{RSS}$ | Reverse Transfer Capacitance | | -- | 100 | -- | pF |
| **Switching Characteristics** | | | | | | |
| $Q_g$ | Total Gate Charge | $V_{DS}$=-10V，$I_D$=-5A，$V_{GS}$=-4.5V | -- | 13 | -- | nC |
| $Q_{gs}$ | Gate Source Charge | | -- | 1.9 | -- | nC |
| $Q_{gd}$ | Gate Drain Charge | | -- | 2 | -- | nC |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DS}$=-10V，$R_L$=2.5Ω，$V_{GS}$=-10V，$R_G$=2.2Ω | -- | 5 | -- | nS |
| $t_r$ | Turn-on Rise Time | | -- | 47 | -- | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 52 | -- | nS |
| $t_f$ | Turn-Off Fall Time | | -- | 69 | -- | nS |
| **Source- Drain Diode Characteristics** | | | | | | |
| $V_{SD}$ | Forward on voltage | Tj=25℃，Is=-5A | -- | -- | -1.2 | V |

## Typical Operating Characteristics

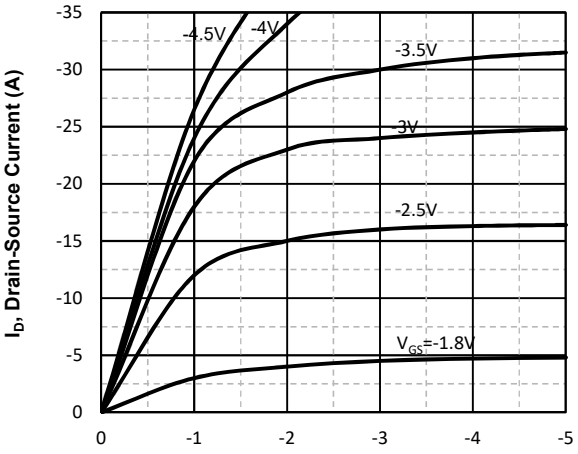



Fig1. Typical Output Characteristics

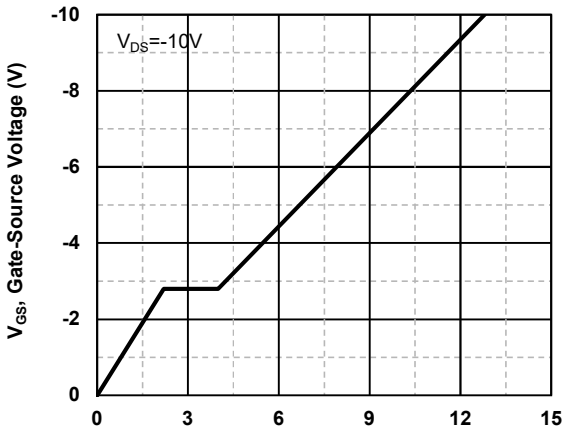



Fig2. Typical Gate Charge Vs.Gate-Source Voltage

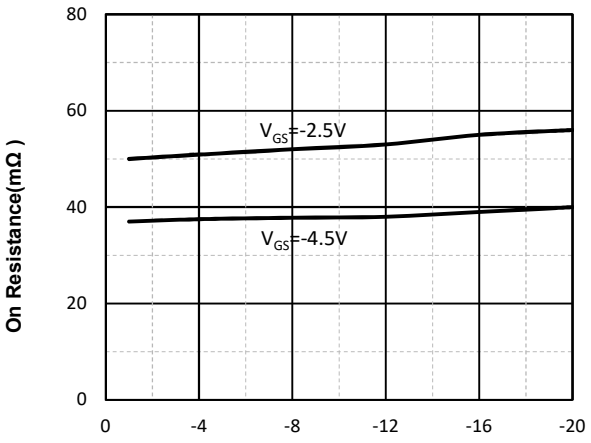



Fig3. Drain-Source on Resistance

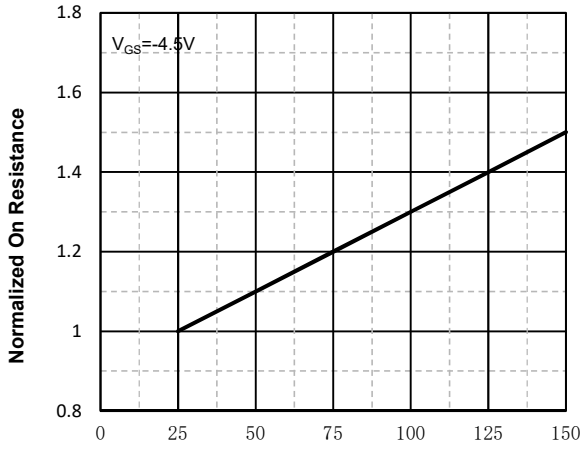



Fig4. Normalized On-Resistance Vs. Temperature

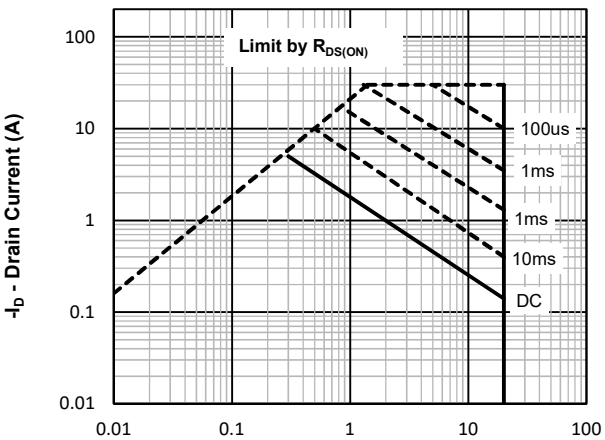



Fig5. Maximum Safe Operating Area

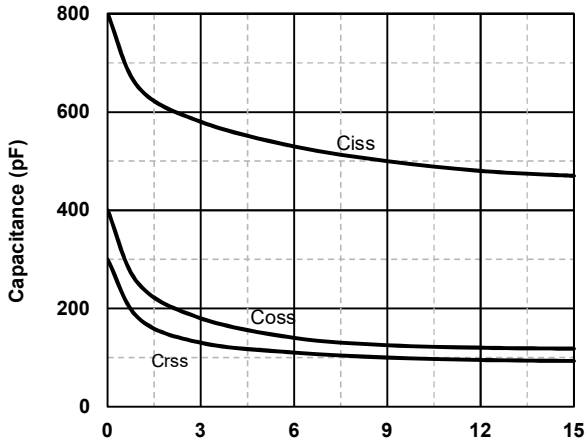
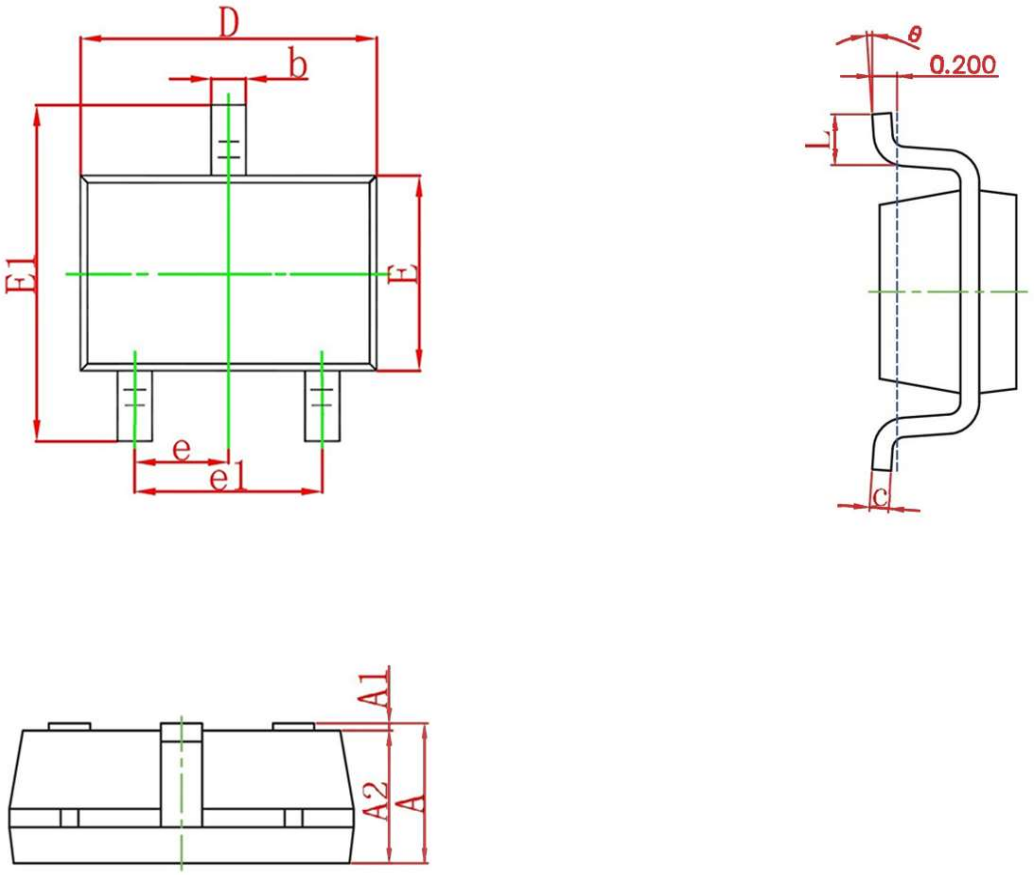



Fig6 Typical Capacitance Vs.Drain-Source Voltage

## SOT-23-3L Package information




| Symbol | Dimensions in Millimeters(mm) | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.050 | 1.250 | 0.042 | 0.050 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.042 | 0.046 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 0.004 | 0.008 |
| D | 2.820 | 3.020 | 0.112 | 0.120 |
| E | 1.500 | 1.700 | 0.060 | 0.068 |
| E1 | 2.650 | 2.950 | 0.106 | 0.118 |
| e | 0.950TYP | | 0.037TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |