

SuperMOS – SOT-23 -20V BV_{DSS}, 580mΩ R_{DS(ON)}, P-channel MOSFET

1. Description

The ES3139K is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent R_{DS(ON)} with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product ES3139K is Pb-free.

2. Features

- -20V, R_{DS(ON)}=580mΩ(Typ), V_{GS}=-4.5V
- R_{DS(ON)}=855mΩ(Typ), V_{GS}=-2.5V
- R_{DS(ON)}=1350mΩ(Typ), V_{GS}=-1.8V
- Use trench MOSFET technology
- High density cell design for low R_{DS(on)}
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

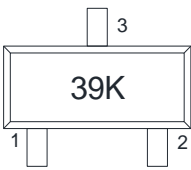
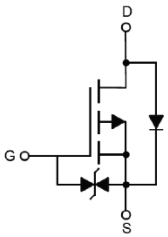
3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

4. Ordering Information

| Part Number | Package | Marking | Material | Packing | Quantity per reel | Flammability Rating | Reel Size |
|-------------|---------|---------|--------------|-------------|-------------------|---------------------|-----------|
| ES3139K | SOT-23 | 39K | Halogen free | Tape & Reel | 3,000 PCS | UL 94V-0 | 7 inches |

5. Pin Configuration and Functions

| Pin | Function | Outline | Circuit Diagram |
|-----|----------|---|---|
| 1 | Gate |  |  |
| 2 | Source | | |
| 3 | Drain | | |

6. Specification

Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter | Symbol | Limit | Unit |
|--------------------------------|------------|------------------------|------------------|
| Drain-Source Voltage | BV_{DSS} | -20 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Continuous Drain Current | I_D | $T_A=25^\circ\text{C}$ | -0.5 |
| | | $T_A=75^\circ\text{C}$ | -0.4 |
| Maximum Power Dissipation | P_D | 0.35 | W |
| Pulsed Drain Current | I_{DM} | -2.6 | A |
| Operating Junction Temperature | T_J | 150 | $^\circ\text{C}$ |
| Lead Temperature | T_L | 260 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Thermal resistance ratings

| Single Operation | | | | | |
|--|---------------------|-----------------|---------|---------|--------------------|
| Parameter | | Symbol | Typical | Maximum | Unit |
| Junction-to-Ambient Thermal Resistance | $t \leq 10\text{s}$ | $R_{\theta JA}$ | | 357 | $^\circ\text{C/W}$ |

Electrical Characteristics

At TA = 25°C unless otherwise specified

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|--|--------------|---|-------|-------|----------|------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=-250\mu A$ | -20 | | | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-20V, V_{GS}=0V$ | | | -1 | μA |
| Gate-to-source Leakage Current | I_{GSS} | $V_{DS}=0V, V_{GS}=\pm 10V$ | | | ± 10 | μA |
| ON CHARACTERISTICS | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=-250\mu A$ | -0.35 | -0.62 | -1.2 | V |
| Drain-to-source On-resistance | $R_{DS(on)}$ | $V_{GS}=-4.5V, I_D=-0.5A$ | | 580 | 850 | m Ω |
| | | $V_{GS}=-2.5V, I_D=-0.3A$ | | 855 | 1200 | |
| | | $V_{GS}=-1.8V, I_D=-0.2A$ | | 1350 | 2000 | |
| CHARGES, CAPACITANCES AND GATE RESISTANCE | | | | | | |
| Input Capacitance | C_{ISS} | $V_{GS}=0V, f=1MHz,$ $V_{DS}=-10V$ | | 71 | | pF |
| Output Capacitance | C_{OSS} | | | 20 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 15 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}=-4.5V, V_{DS}=-10V,$ $I_D=-0.5A$ | | 1.25 | | nC |
| Gate-to-Source Charge | Q_{GS} | | | 0.38 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 0.28 | | |
| SWITCHING CHARACTERISTICS | | | | | | |
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS}=-4.5V, V_{DS}=-10V,$ $R_L=2.5\Omega, R_G=-3\Omega$ | | 4 | | ns |
| Rise Time | t_r | | | 19 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 16 | | |
| Fall Time | t_f | | | 25 | | |
| BODY DIODE CHARACTERISTICS | | | | | | |
| Forward Voltage | V_{SD} | $V_{GS}=0V, I_S=-0.5A$ | | | -1.2 | V |

7. Typical Characteristic

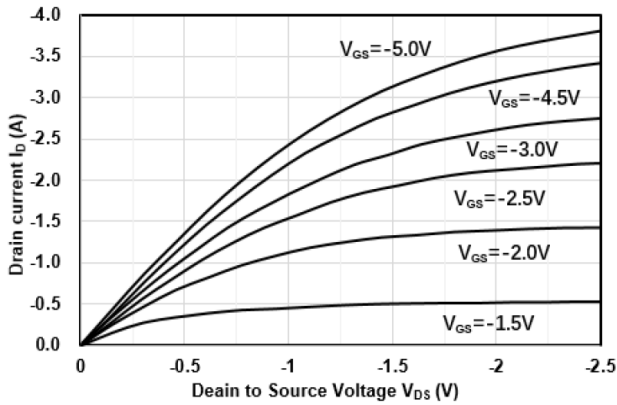


Figure1. Output Characteristics

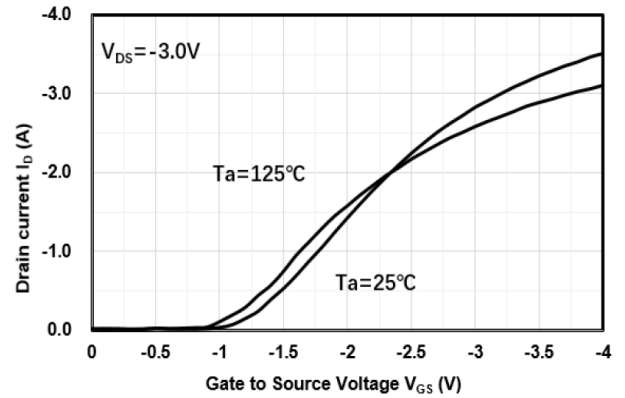


Figure2. Transfer Characteristics

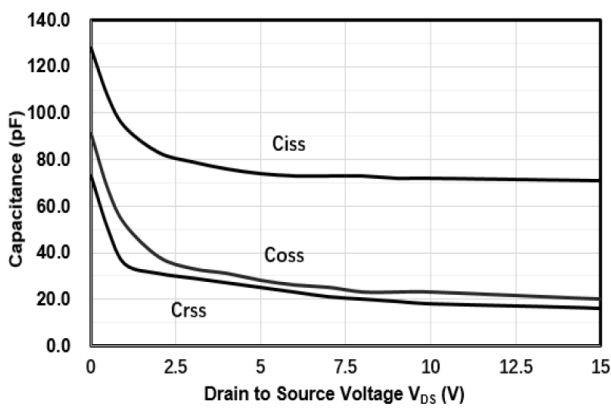


Figure3. Capacitance Characteristics

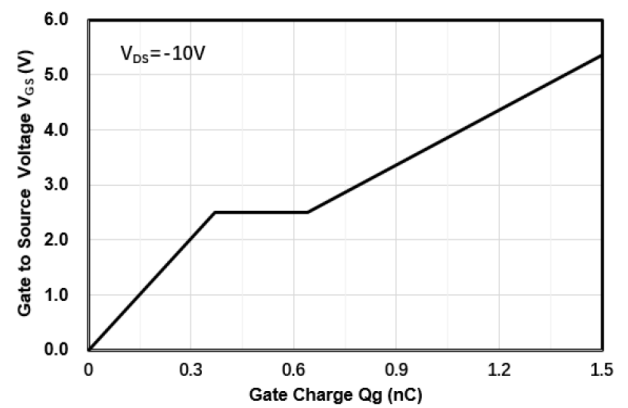


Figure4. Gate Charge

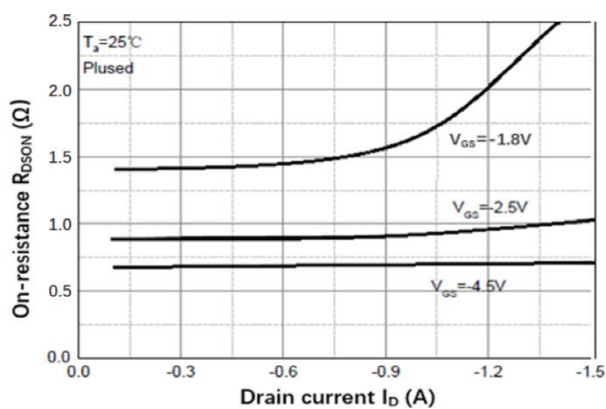


Figure5. Drain-Source on Resistance

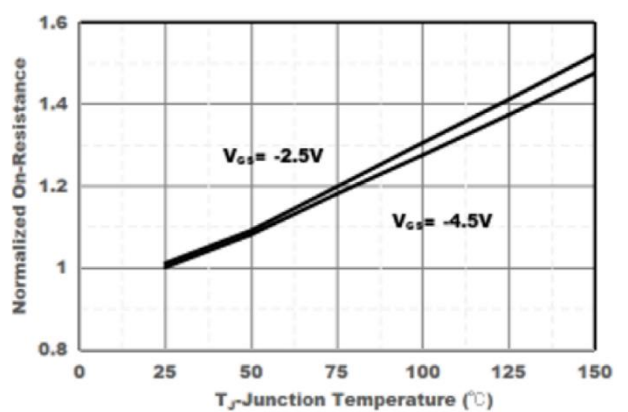


Figure6. Drain-Source on Resistance

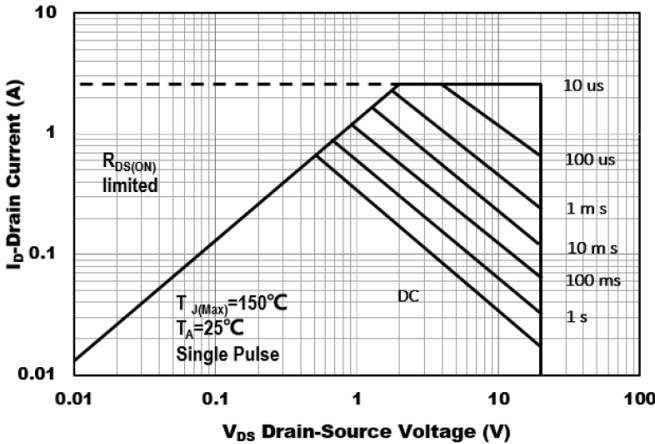
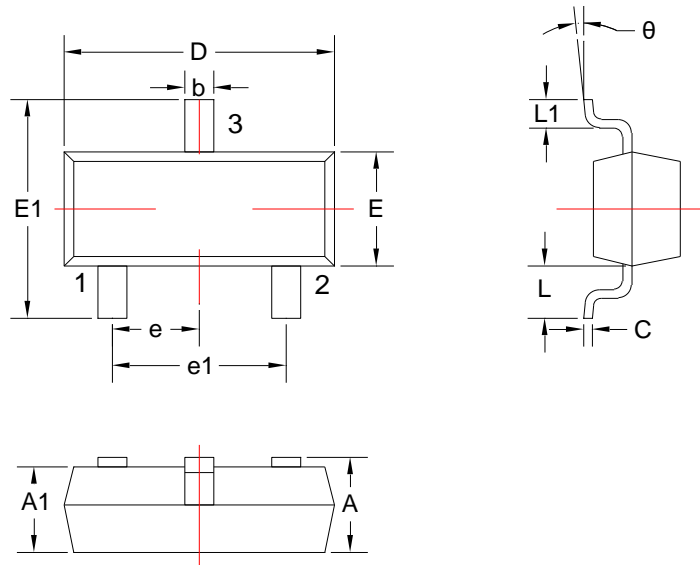


Figure7. Safe Operation Area

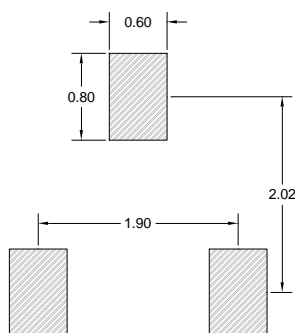
8. Dimension (SOT-23)



Units: mm

| Symbol | Dimensions | | Symbol | Dimensions | |
|--------|------------|-------|----------|------------|-------|
| | Min. | Max. | | Min. | Max. |
| A | 0.900 | 1.150 | E1 | 2.250 | 2.550 |
| A1 | 0.900 | 1.050 | e | 0.950TYP | |
| b | 0.300 | 0.500 | e1 | 1.800 | 2.000 |
| c | 0.080 | 0.150 | L | 0.550REF | |
| D | 2.800 | 3.00 | L1 | 0.300 | 0.500 |
| E | 1.200 | 1.400 | θ | 0° | 8° |

Recommended Land Pattern



Note:

1. Controlling dimension: in millimeters
2. General tolerance: ± 0.05 mm
3. The pad layout is for reference only

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