

**SuperMOS – SOT-23 -20V BV<sub>DSS</sub>, 580mΩ R<sub>DS(ON)</sub>, 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<sub>DS(ON)</sub> 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<sub>DS(ON)</sub>=580mΩ(Typ), V<sub>GS</sub>=-4.5V
- R<sub>DS(ON)</sub>=855mΩ(Typ), V<sub>GS</sub>=-2.5V
- R<sub>DS(ON)</sub>=1350mΩ(Typ), V<sub>GS</sub>=-1.8V
- Use trench MOSFET technology
- High density cell design for low R<sub>DS(on)</sub>
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

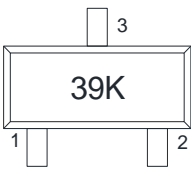
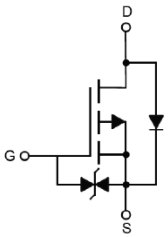
**3. Applications**

- 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	$V_{GS}$	$\pm 12$	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
<b>OFF CHARACTERISTICS</b>						
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	$\mu A$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 10V$			$\pm 10$	$\mu A$
<b>ON CHARACTERISTICS</b>						
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 $\Omega$
		$V_{GS}=-2.5V, I_D=-0.3A$		855	1200	
		$V_{GS}=-1.8V, I_D=-0.2A$		1350	2000	
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
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		
<b>SWITCHING CHARACTERISTICS</b>						
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		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=-0.5A$			-1.2	V

### 7. Typical Characteristic

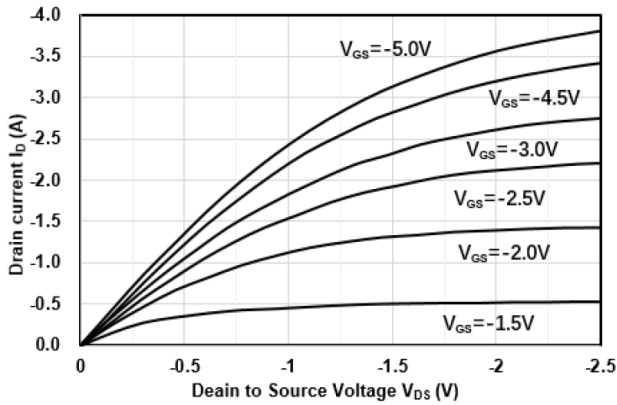


Figure1. Output Characteristics

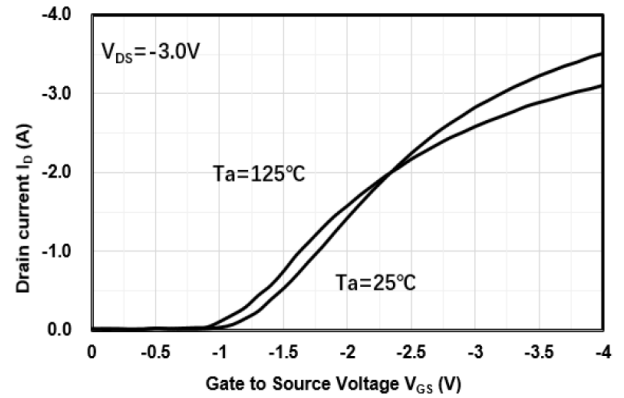


Figure2. Transfer Characteristics

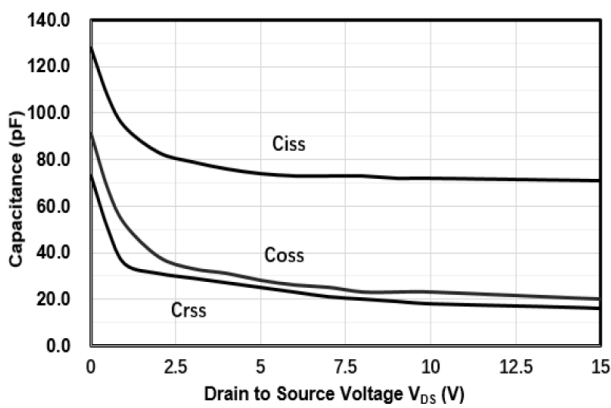


Figure3. Capacitance Characteristics

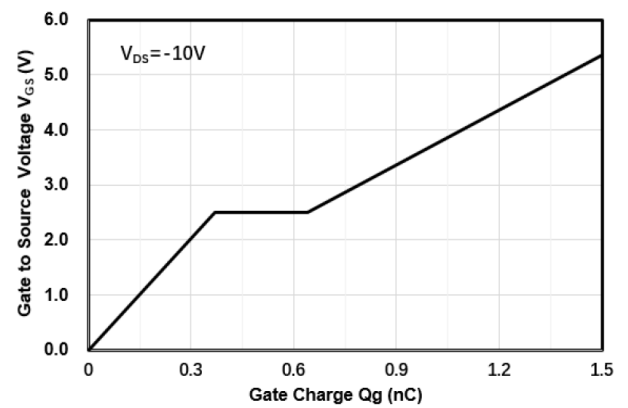


Figure4. Gate Charge

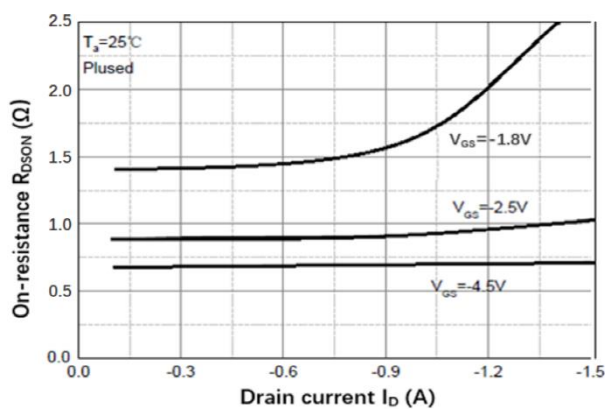


Figure5. Drain-Source on Resistance

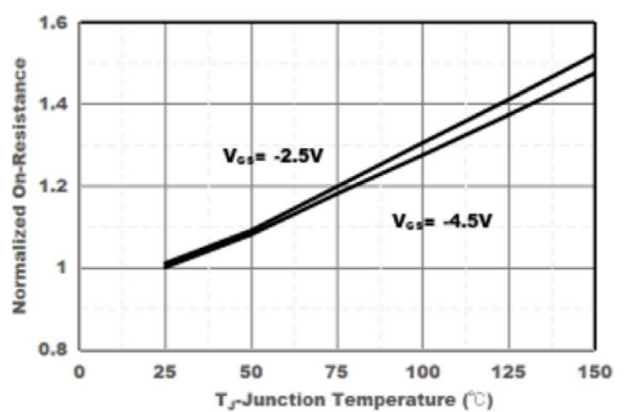


Figure6. Drain-Source on Resistance

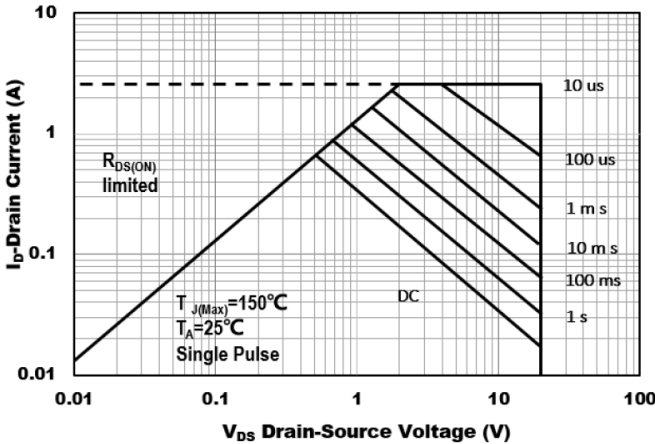
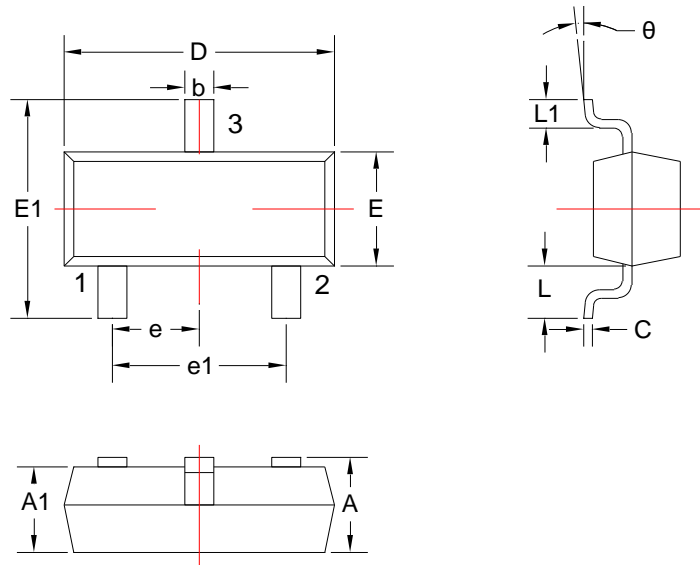


Figure7. Safe Operation Area

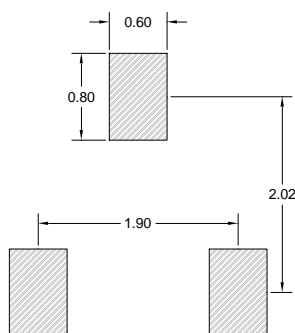
**8. Dimension (SOT-23)**



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	$\theta$	0°	8°

**Recommended Land Pattern**



**Note:**

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

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