

SuperMOS – SOT-323 -20V BV_{DSS} , 580m Ω $R_{DS(ON)}$, P-channel MOSFET

1. Description

The ES3139KQ 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 ES3139KQ is Pb-free.

2. Features

- -20V, $R_{DS(ON)}$ =580m Ω (Typ), V_{GS} =-4.5V
 $R_{DS(ON)}$ =855m Ω (Typ), V_{GS} =-2.5V
 $R_{DS(ON)}$ =1350m Ω (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

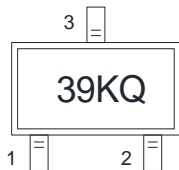
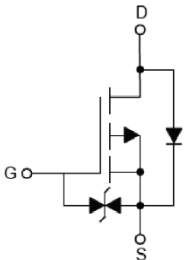
3. Applications

- 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
ES3139KQ	SOT-323	39KQ	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	0.15	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	$R_{\theta JA}$		833	$^\circ\text{C/W}$

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

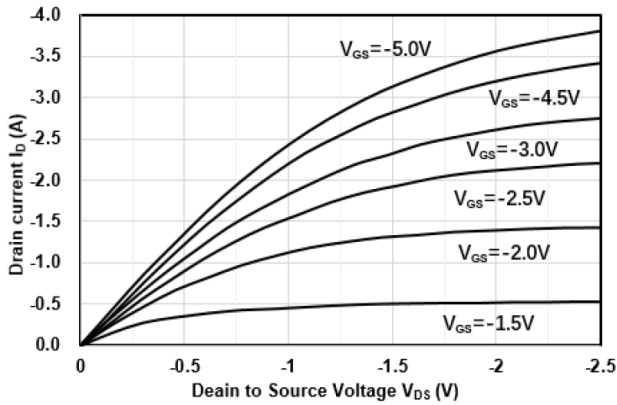


Figure1. Output Characteristics

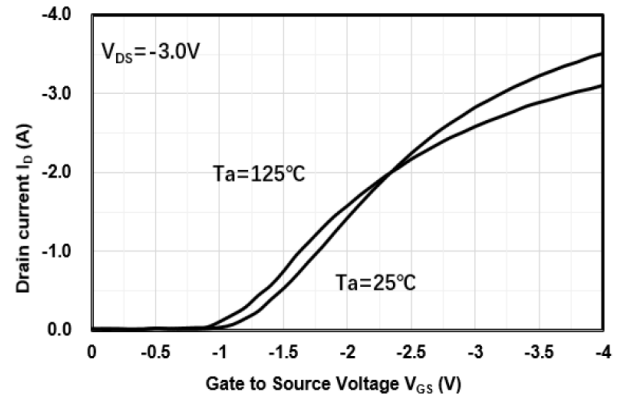


Figure2. Transfer Characteristics

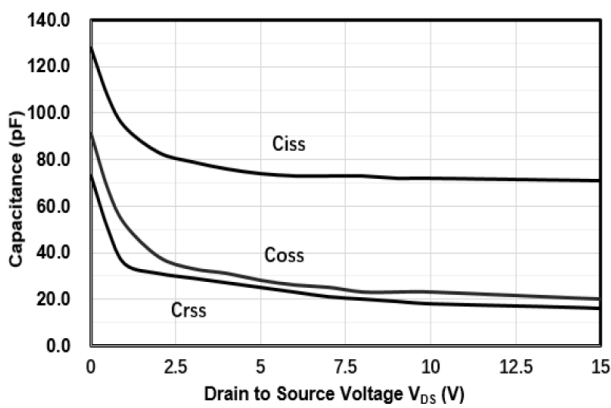


Figure3. Capacitance Characteristics

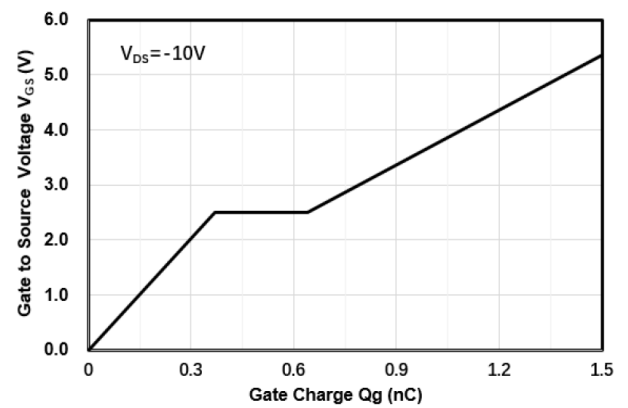


Figure4. Gate Charge

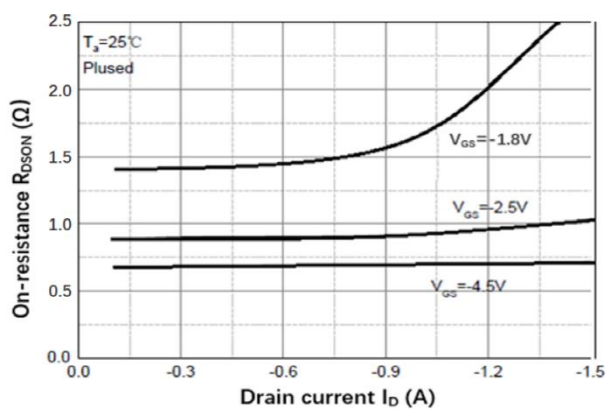


Figure5. Drain-Source on Resistance

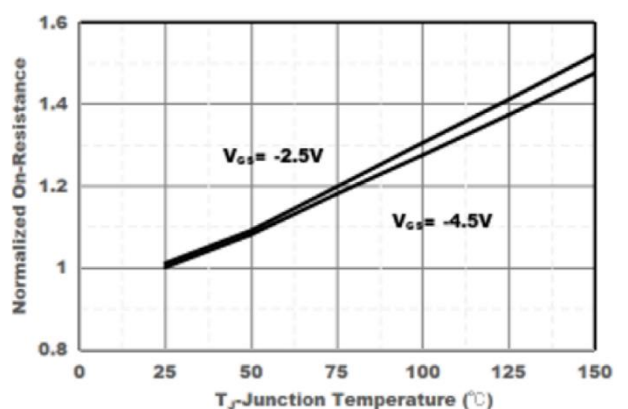


Figure6. Drain-Source on Resistance

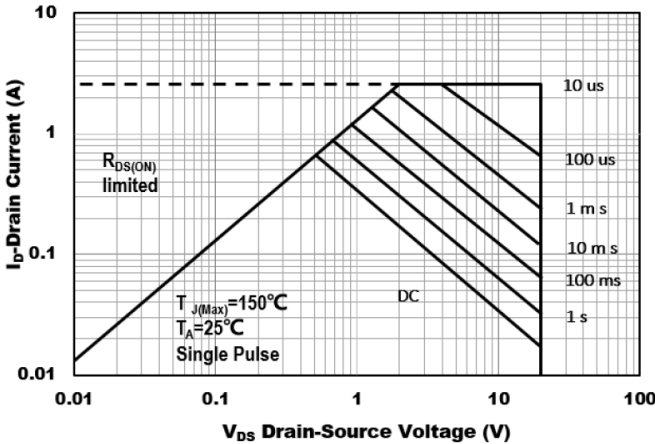
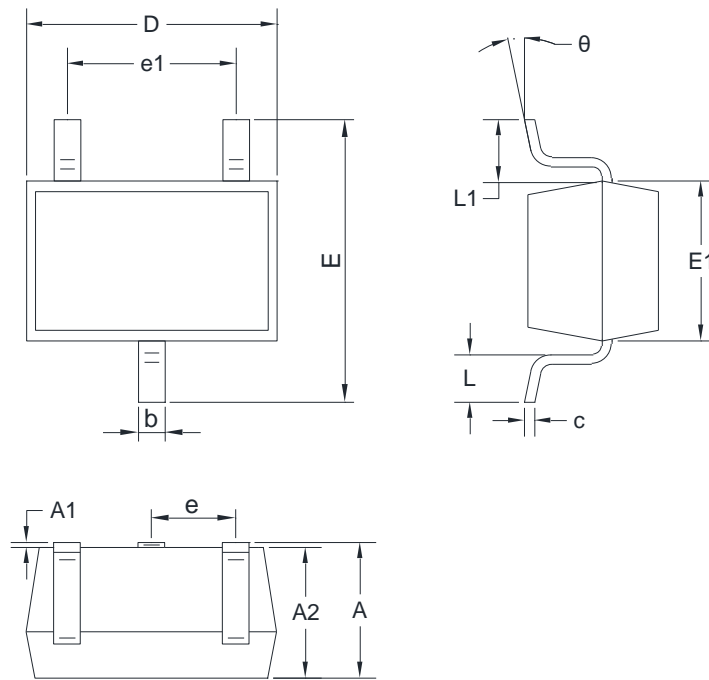


Figure7. Safe Operation Area

8. Dimension (SOT-323)



Symbol	Millimeters		Symbol	Millimeters	
	Min	Max		Min	Max
A	0.90	1.10	E1	1.15	1.35
A1	0.00	0.10	e	0.65 TYP	
A2	0.90	1.00	e1	1.20	1.40
b	0.20	0.40	L	0.26	0.46
c	0.08	0.15	L1	0.525 REF	
D	2.00	2.20	θ	0°	8°
E	2.15	2.45			

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