

SuperMOS – SOT-523 60V BV_{DSS} , 1.5Ω $R_{DS(on)}$, N-channel MOSFET

1. Description

The ES138KW is N-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 ES138KW is Pb-free.

2. Features

- 60V, $R_{DS(on)}=1.5\Omega$ (TYP.) @ $V_{GS}=10V$
 $R_{DS(on)}=1.6\Omega$ (TYP.) @ $V_{GS}=4.5V$
- 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
ES138KW	SOT-523	38KW	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	7 inches

Table-1 Ordering information

5. Pin Configuration and Functions

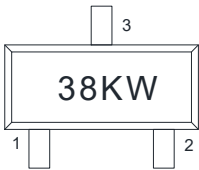
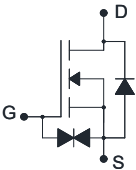
Pin	Function	Outline	Circuit Diagram
1	Gate		
2	Source		
3	Drain		

Table-2 Pin configuration

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}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	0.25	A
Maximum Power Dissipation	P_D	150	mW
Pulsed Drain Current ^a	I_{DM}	1.0	A
Operating Junction Temperature	T_J	150	°C
Lead Temperature	T_L	260	°C
Storage Temperature Range	T_{stg}	-55 to 150	°C

Thermal resistance ratings

Single Operation			
Parameter	Symbol	Typical	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	833	°C/W

Note:

a: Repetitive rating, pulse width limited by junction temperature, $t_p=10\mu s$, Duty Cycle=1%

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 =10mA	60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V, T _J =25℃			1.0	uA
		V _{DS} =40V, V _{GS} =0V, T _J =125℃			100	
Gate-to-source Leakage Current	I _{GSS}	V _{DS} =0V, V _{GS} =±20V			±10	uA
ON CHARACTERISTICS						
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} =V _{DS} , I _D =250uA	0.8	1.0	1.5	V
Drain-to-source On-resistance	R _{DS(on)}	V _{GS} =10V, I _D =0.25A		1.5	1.9	Ω
		V _{GS} =4.5V, I _D =0.2A		1.6	2.5	
		V _{GS} =2.5V, I _D =0.1A		2.7	4.5	
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C _{ISS}	V _{GS} =0V, f=1MHz, V _{DS} =25V		25	50	pF
Output Capacitance	C _{OSS}			9.7	22	
Reverse Transfer Capacitance	C _{RSS}			2.2	5	
Total Gate Charge	Q _{G(TOT)}	V _{GS} =4.5V, V _{DS} =25V, I _D =0.25A		0.65	1	nC
Gate-to-Source Charge	Q _{GS}			0.2		
Gate-to-Drain Charge	Q _{GD}			0.23		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	t _{d(ON)}	V _{GS} =10V, V _{DS} =25V, I _D =0.25A, R _G =6Ω		2.3	5	ns
Rise Time	t _r			19.2	40	
Turn-Off Delay Time	t _{d(OFF)}			6.3	12	
Fall Time	t _f			23	50	
BODY DIODE CHARACTERISTICS						
Forward Voltage	V _{SD}	V _{GS} =0V, I _S =0.25A		0.86	1.5	V

7. Typical Characteristic

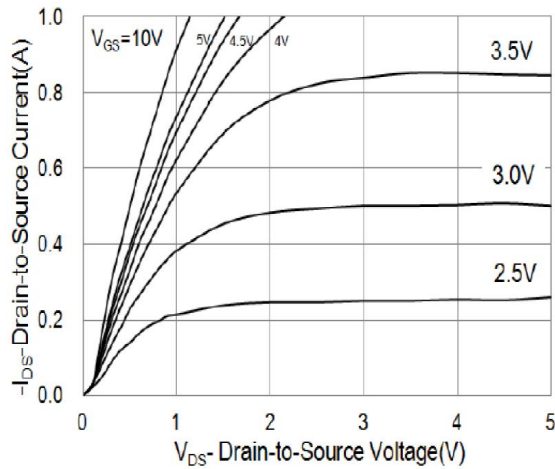


Fig.1 On-Region Characteristics

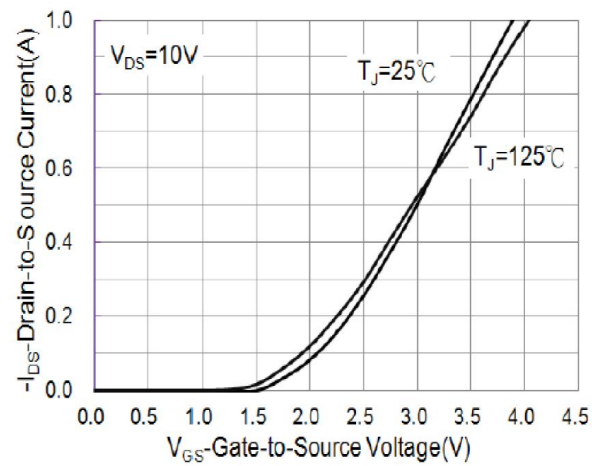


Fig.2 Transfer Characteristics

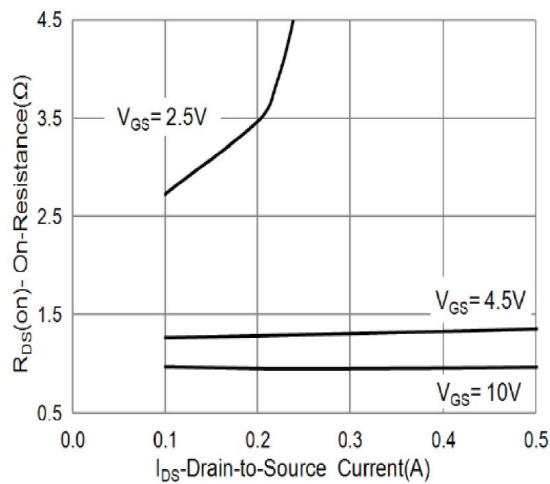


Fig.3 On-Resistance vs. Drain Current

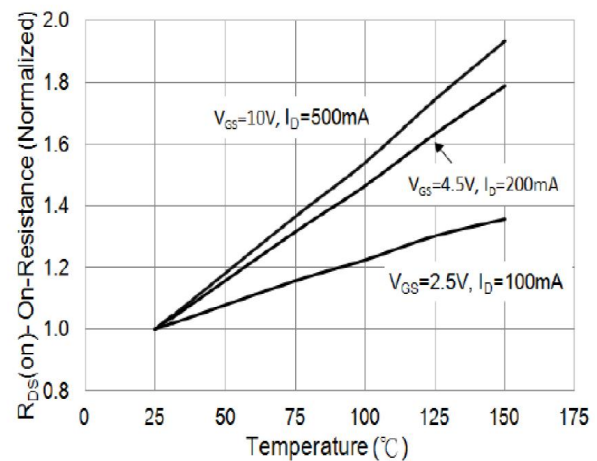


Fig.4 On-Resistance vs. Junction temperature

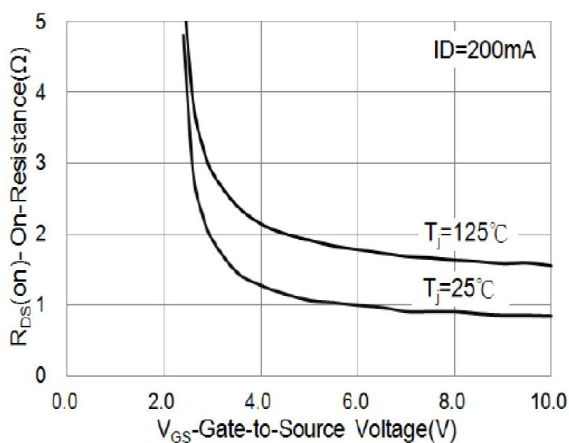


Fig.5 On-Resistance Variation with V_{GS}

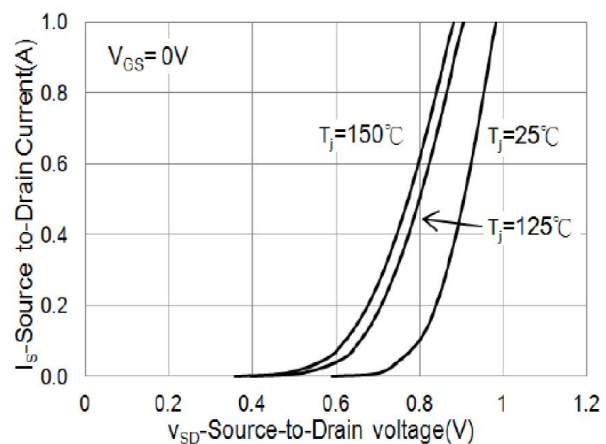


Fig.6 Body Diode Characteristics

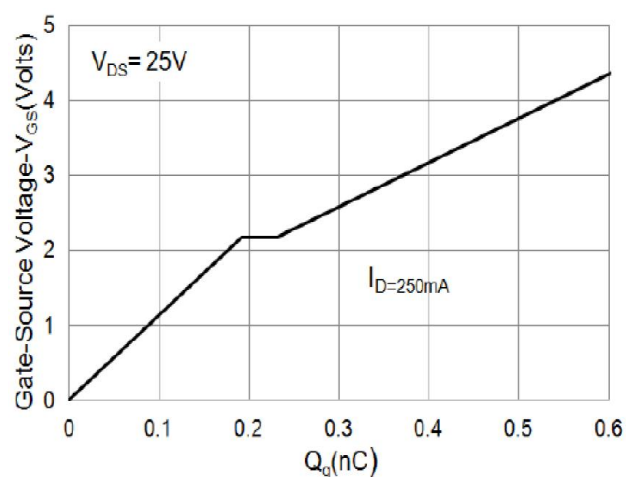


Fig.7 Gate-Charge Characteristics

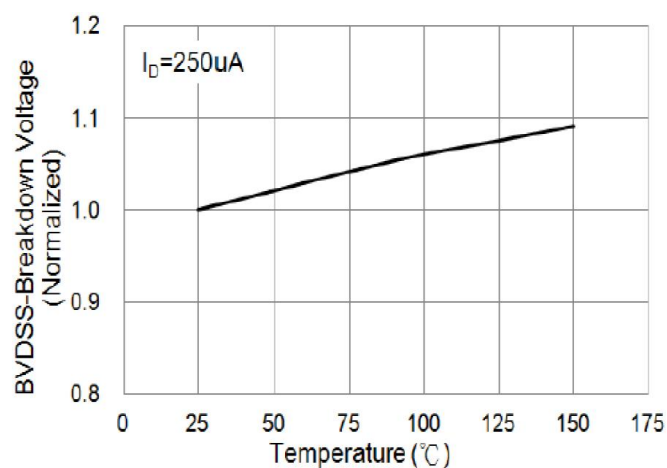


Fig.8 Breakdown Voltage Variation vs. Temperature

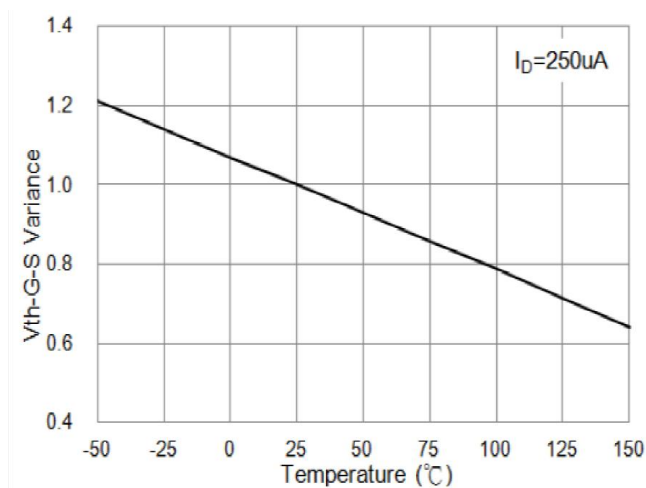


Fig.9 Threshold Voltage Variation with Temperature

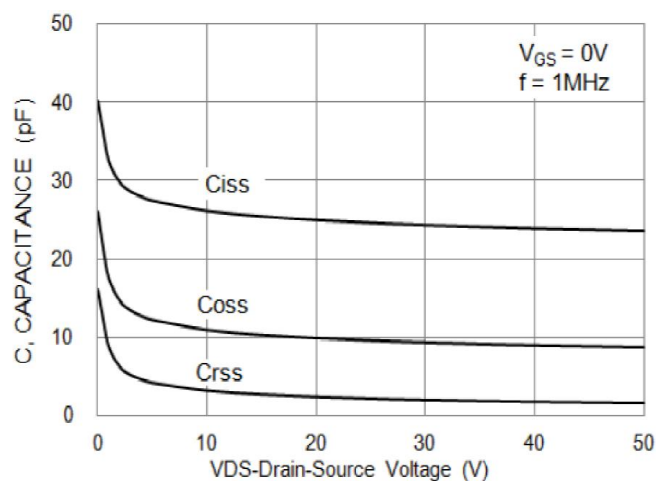
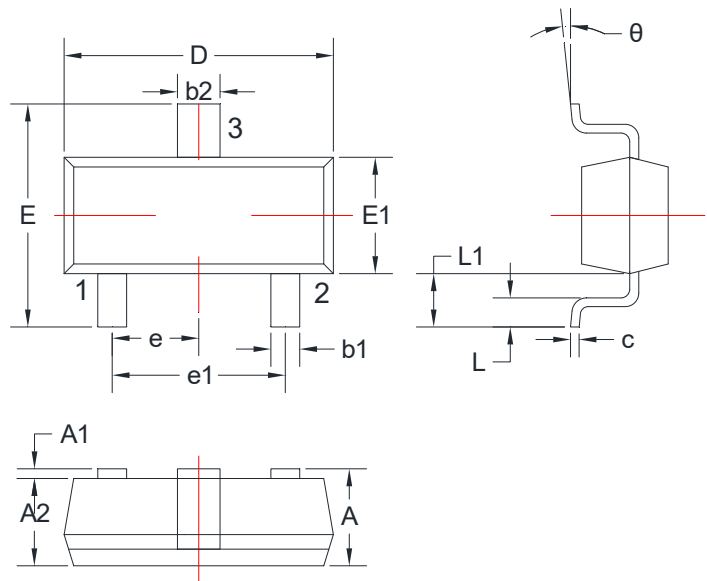


Fig.10 Capacitance vs. Drain-Source Voltage.

8. Dimension (SOT-523)



REF	Millimeters		REF	Millimeters	
	Min	Max		Min	Max
A	0.70	0.90	E	1.45	1.75
A1	0.00	0.10	E1	0.70	0.90
A2	0.70	0.80	e	0.50 TYP	
b1	0.15	0.25	e1	0.90	1.10
b2	0.25	0.35	L	0.26	0.46
c	0.10	0.20	L1	0.40 REF	
D	1.50	1.70	θ	0°	8°

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