

2SK3938-VB Datasheet

N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A)	Q_g (Typ.)
20	0.300 at $V_{GS} = 4.5$ V	0.9	3.5
	0.350 at $V_{GS} = 2.5$ V	0.7	

FEATURES

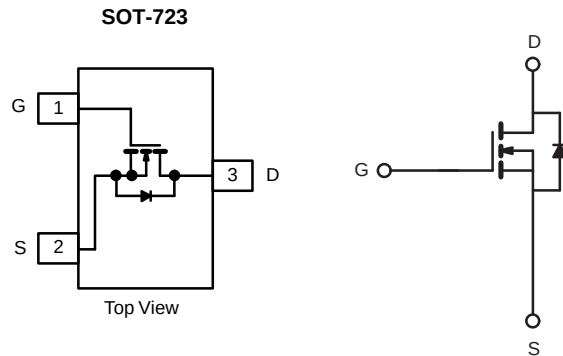
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Load Switching for Portable Devices
- DC/DC Converter



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

Parameter	Symbol	5 s	Steady State	Unit
Drain-Source Voltage	V_{DS}	20		V
Gate-Source Voltage	V_{GS}	± 12		
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	I_D	0.9	0.72	A
		0.68	0.57	
Pulsed Drain Current ($t = 300\ \mu\text{s}$) ^b	I_{DM}	3.5		
Continuous Source Current (Diode Conduction) ^a	I_S	0.72	0.6	W
Power Dissipation ^a	P_D	0.35	0.28	
		0.21	0.16	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150		$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	R_{thJA}	120	145	$^\circ\text{C/W}$
		140	175	
Maximum Junction-to-Foot	R_{thJF}	62	78	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

b. Pulse width limited by maximum junction temperature.

SPECIFICATIONS ($T_A = 25^\circ\text{C}$, unless otherwise noted)

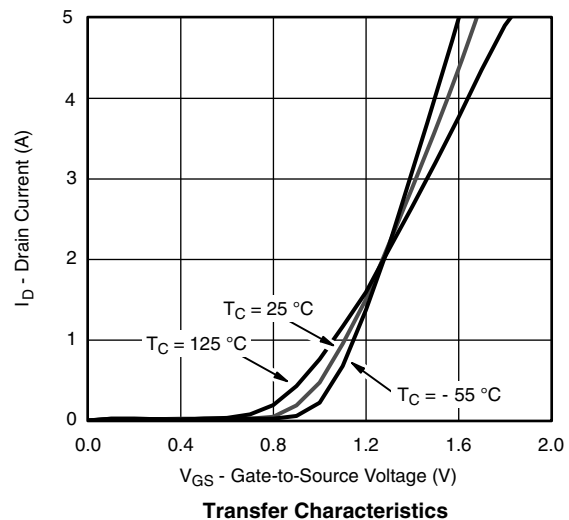
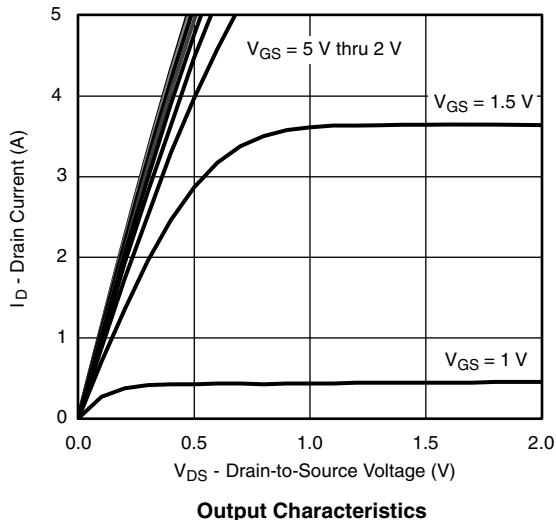
Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
Static						
Drain-Source Breakdown Voltage	V _{DS}	V _{GS} = 0 V, I _D = 250 μA	20			V
Gate-Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	0.50		0.90	
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V			1	μA
		V _{DS} = 20 V, V _{GS} = 0 V, T _J = 70 °C			75	
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 10 V, V _{GS} = 4.5 V	6			A
Drain-Source On-Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 0.9A		0.300		Ω
		V _{GS} = 2.5 V, I _D = 0.7 A		0.350		
Forward Transconductance ^a	g _{fs}	V _{DS} = 5 V, I _D = 0.9 A		13		S
Diode Forward Voltage	V _{SD}	I _S = 0.95 A, V _{GS} = 0 V		0.7	1.2	V
Dynamic ^b						
Total Gate Charge	Q _g	V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 0.9A		1.5	1.9	nC
Gate-Source Charge	Q _{gs}			0.25		
Gate-Drain Charge	Q _{gd}			0.40		
Gate Resistance	R _g	f = 1 MHz	2	4	8	Ω
Switching						
Turn-On Delay Time	t _{d(on)}	V _{DD} = 10 V, R _L = 2.78 Ω I _D ≅ 0.9 A, V _{GEN} = 4.5 V, R _g = 1 Ω		8	15	ns
Rise Time	t _r			7	15	
Turn-Off Delay Time	t _{d(off)}			30	45	
Fall Time	t _f			7	15	
Source-Drain Reverse Recovery Time	t _{rr}	I _F = 0.9 A, dI/dt = 100 A/μs		8.5	15	nC
Body Diode Reverse Recovery Charge	Q _{rr}			2	4	

Notes:

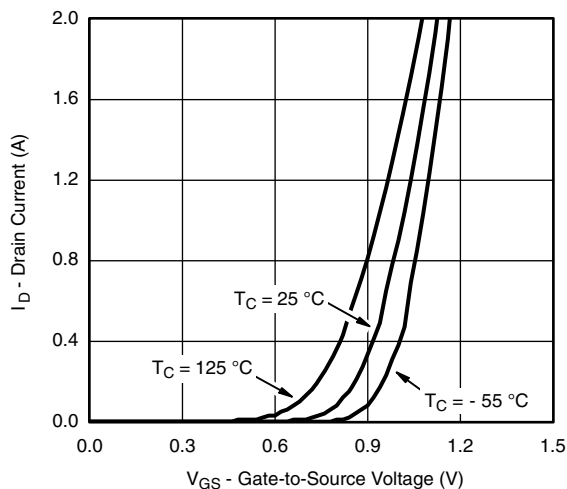
a. Pulse test: Pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

b. Guaranteed by design, not subject to production testing.

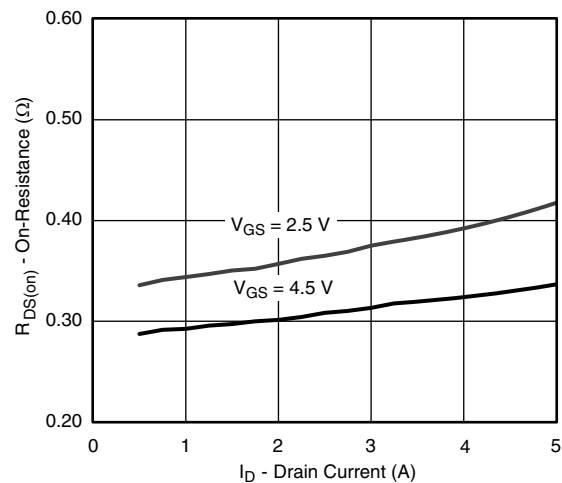
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

TYPICAL CHARACTERISTICS (25°C , unless otherwise noted)

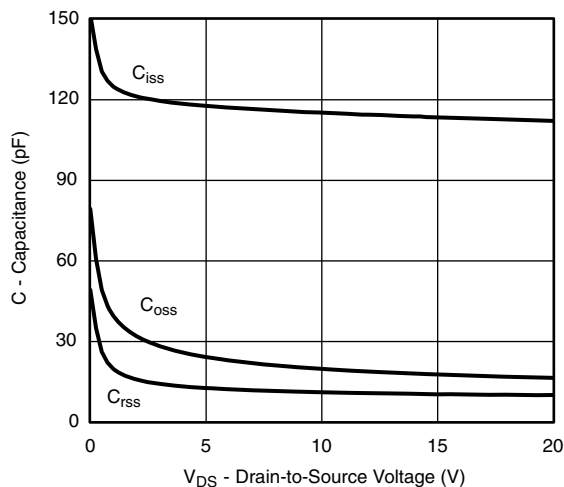
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



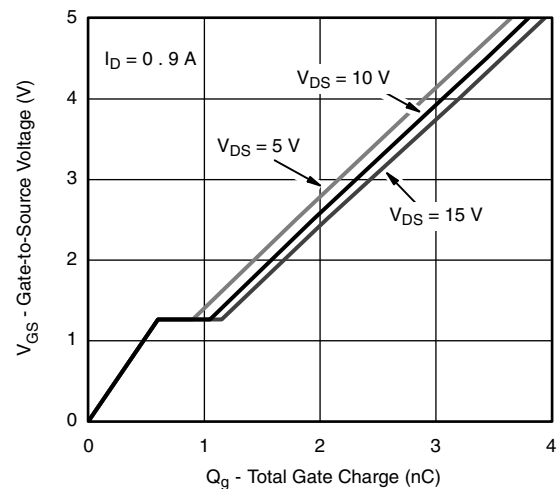
Transfer Characteristics



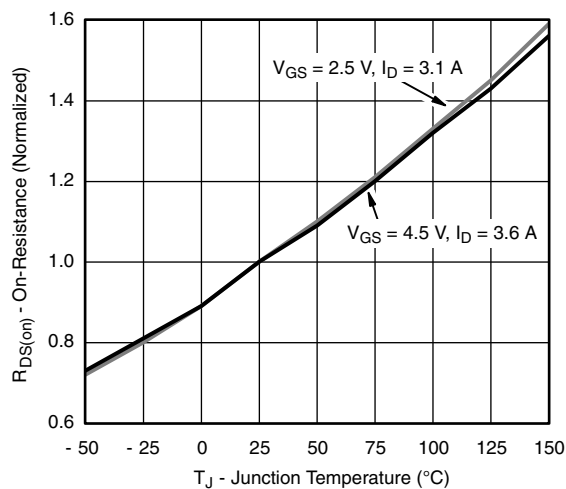
On-Resistance vs. Drain Current



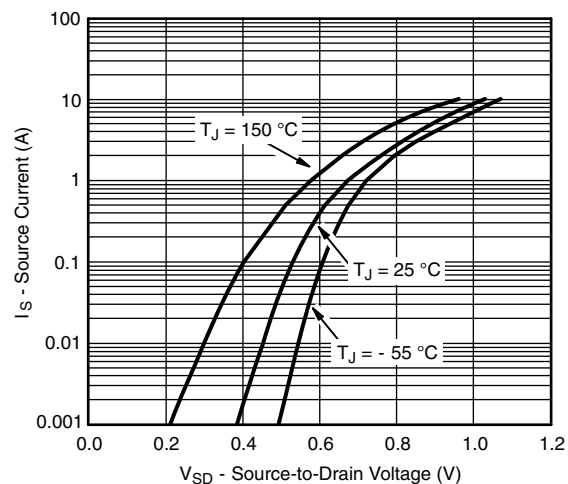
Capacitance



Gate Charge

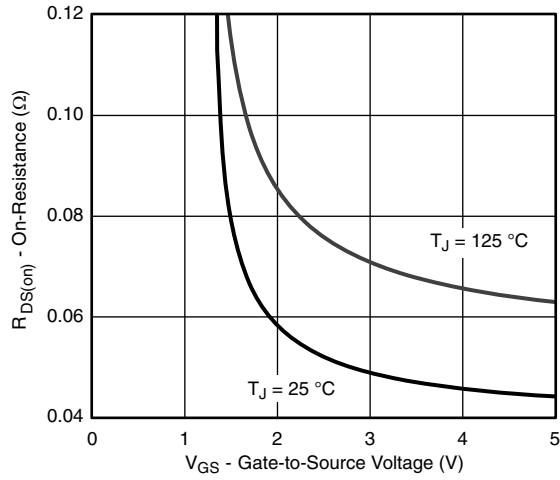


On-Resistance vs. Junction Temperature

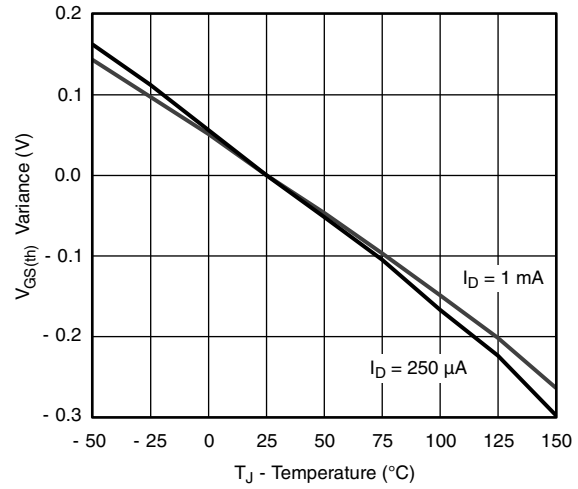


Source-Drain Diode Forward Voltage

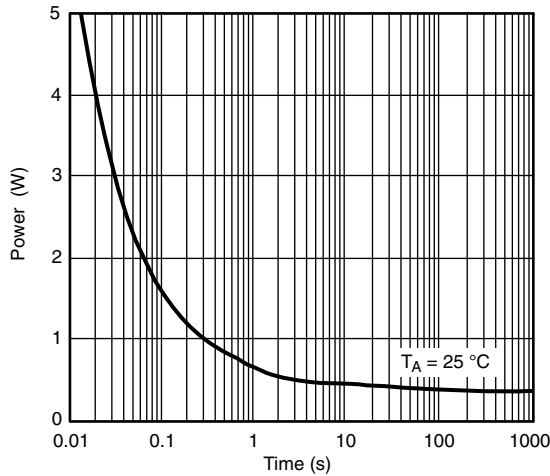
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



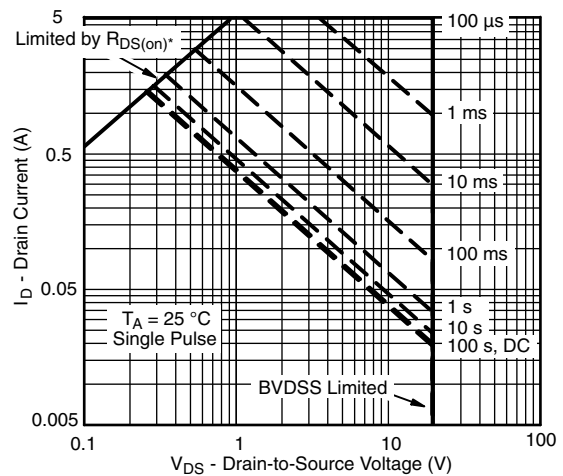
On-Resistance vs. Gate-to-Source Voltage



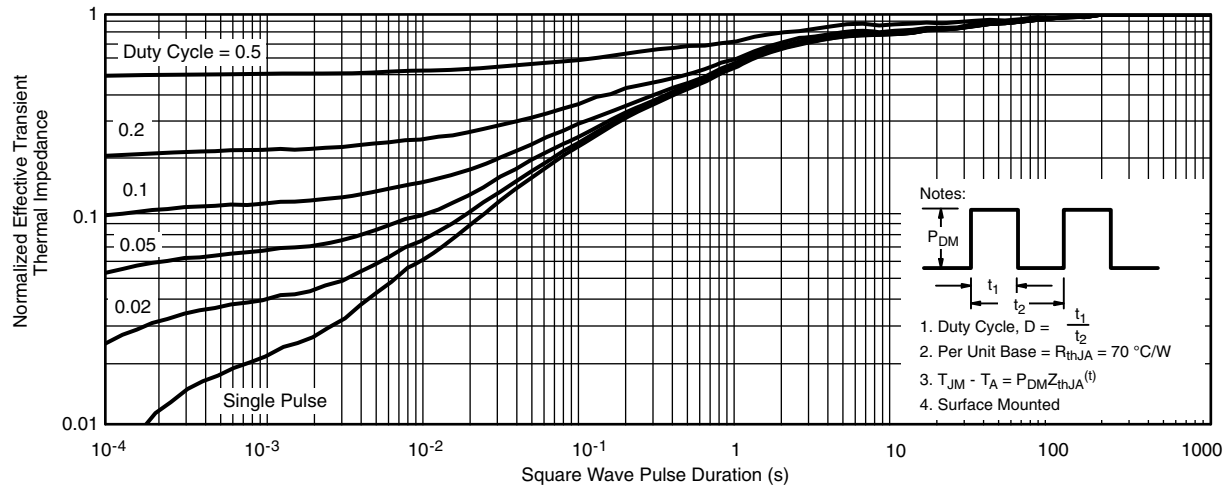
Threshold Voltage



Single Pulse Power



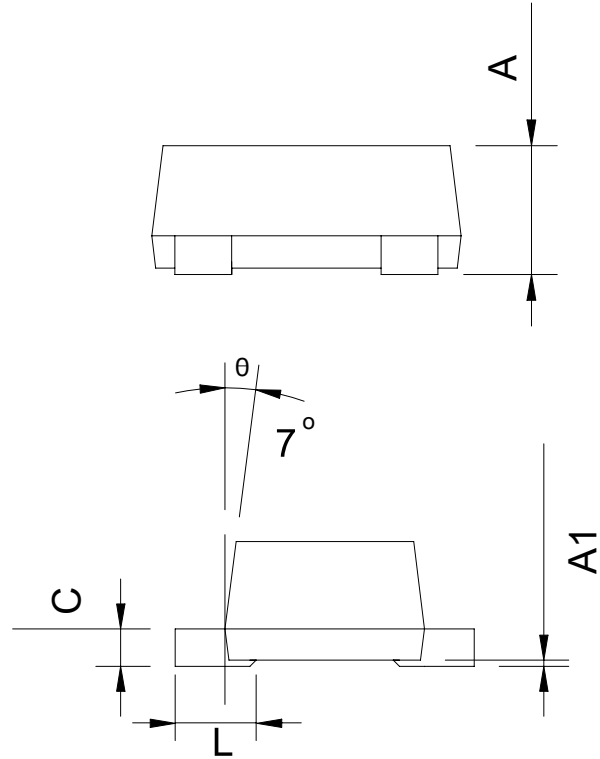
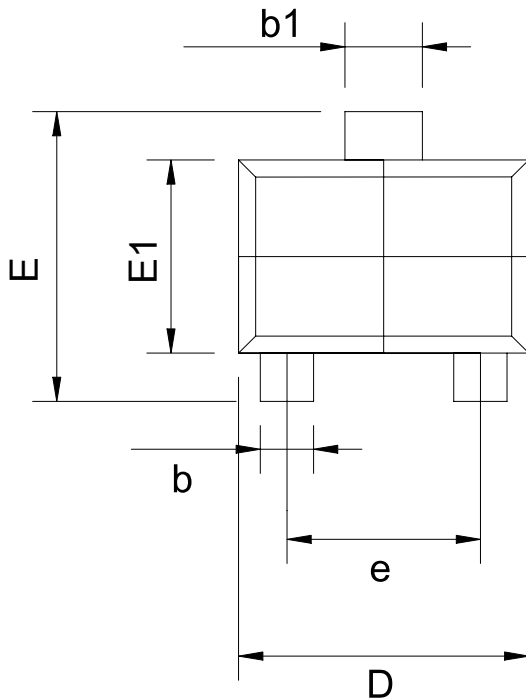
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

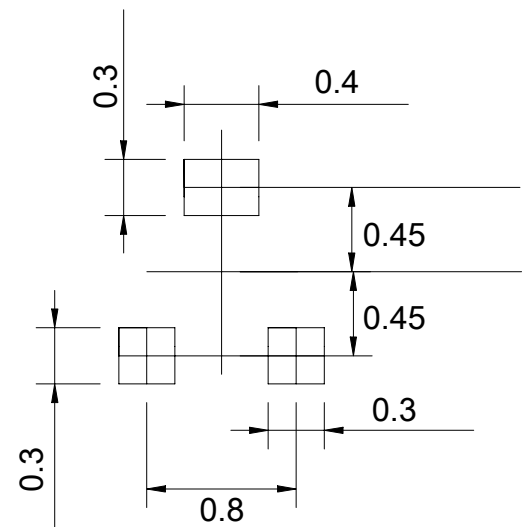
- Notes:
1. Duty Cycle, $D = \frac{t_1}{t_2}$
 2. Per Unit Base = $R_{thJA} = 70^\circ\text{C/W}$
 3. $T_{JM} - T_A = P_{DM}Z_{thJA}^{(t)}$
 4. Surface Mounted

SOT-723: 3 Leads



SYMBOL	SOT-723			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	0.500	-	0.020
A1	0.000	0.050	0.000	0.002
b	0.170	0.270	0.007	0.011
b1	0.270	0.370	0.011	0.015
c	-	0.150	-	0.006
D	1.150	1.250	0.045	0.049
E	1.150	1.250	0.045	0.049
E1	0.750	0.850	0.030	0.033
e	0.800 TYP.		0.031 TYP.	
L	0.32 BSC		0.013 BSC	
-	$^\circ$ REF.		$^\circ$ REF.	

RECOMMENDED LAND PATTERN



UNIT: mm

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