

SuperMOS – SOT-23 60V B_{VDSS} , 58m Ω $R_{DS(ON)}$, 3.2A I_D N-channel MOSFET

1. Description

The ES2310 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 ES2310 is Pb-free.

2. Features

- 60V, $R_{DS(ON)}$ =58m Ω (Typ), V_{GS} =10V
 $R_{DS(ON)}$ =69m Ω (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

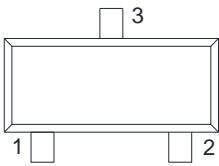
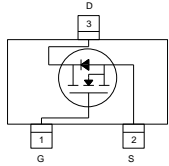
3. Applications

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

4. Ordering Information

Part Number	Package	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
ES2310	SOT-23	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}	60	V
Gate-Source Voltage		V_{GS}	± 20	V
Continuous Drain Current ^a	$T_A=25^\circ\text{C}$	I_D	3.2	A
	$T_A=75^\circ\text{C}$		2.4	
Maximum Power Dissipation ^a	$T_A=25^\circ\text{C}$	P_D	1.4	W
	$T_A=75^\circ\text{C}$		0.84	
Pulsed Drain Current ^c		I_{DM}	12.8	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 ^a	$t \leq 10 \text{ s}$	$R_{\theta JA}$	75	90	$^\circ\text{C/W}$
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$	43	70	

Note:

- a: Surface mounted on FR4 Board using 1 square inch pad size, 1oz copper
- b: Surface mounted on FR4 board using minimum pad size, 1oz copper
- c: Repetitive rating, pulse width limited by junction temperature, $t_p=10\mu\text{s}$, 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}	$V_{GS}=0V, I_D=250\mu A$	60			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS}=60V, V_{GS}=0V$			1	μA
Gate-to-source Leakage Current	I_{GSS}	$V_{DS}=0V, V_{GS}=\pm 20V$			± 100	nA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=250\mu A$	0.9	1.35	2.0	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=3A$		58	90	m Ω
		$V_{GS}=4.5V, I_D=2A$		69	110	
Forward Trans conductance	g_{FS}	$V_{DS}=5.0V, I_D=3A$		6.5	15	S
CHARGES, CAPACITANCES AND GATE RESISTANCE						
Input Capacitance	C_{ISS}	$V_{GS}=0V, f=1MHz, V_{DS}=30V$		400		pF
Output Capacitance	C_{OSS}			29		
Reverse Transfer Capacitance	C_{RSS}			24		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=10V, V_{DS}=30V, I_D=3A$		8.8		nC
Gate-to-Source Charge	Q_{GS}			1		
Gate-to-Drain Charge	Q_{GD}			2.5		
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=10V, V_{DS}=30V, I_D=3A, R_G=2.3\Omega$		4.5		ns
Rise Time	t_r			10		
Turn-Off Delay Time	$t_{d(OFF)}$			12.5		
Fall Time	t_f			1.5		
BODY DIODE CHARACTERISTICS						
Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=1.0A$	0.45	0.75	1.2	V

7. Typical Characteristic

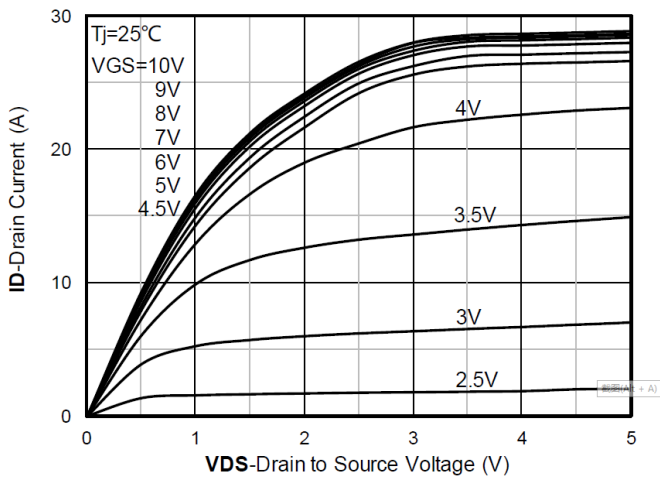


Figure 1. Output Characteristics

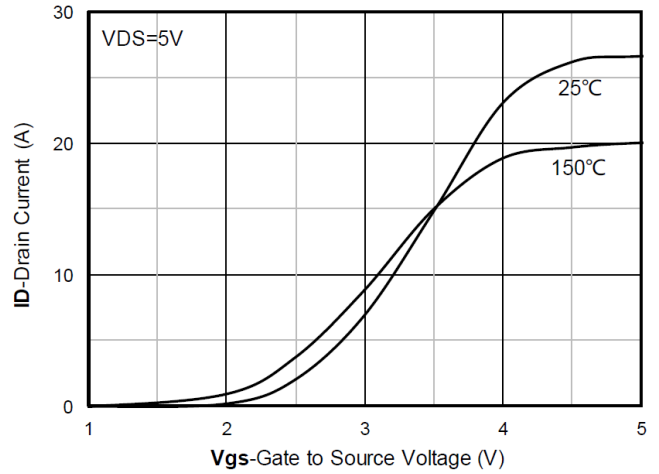


Figure 2. Transfer Characteristics

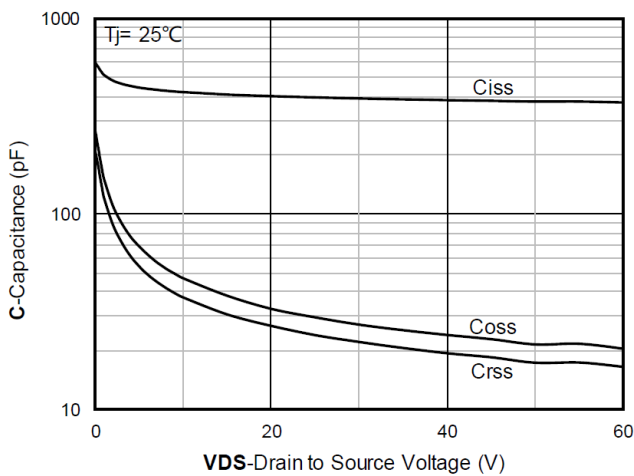


Figure 3. Capacitance Characteristics

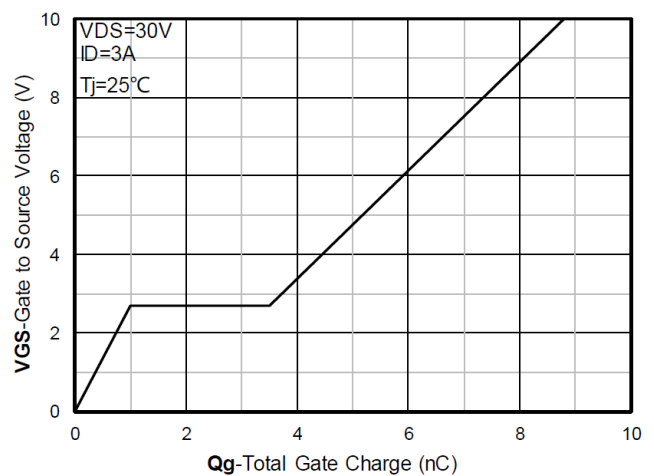
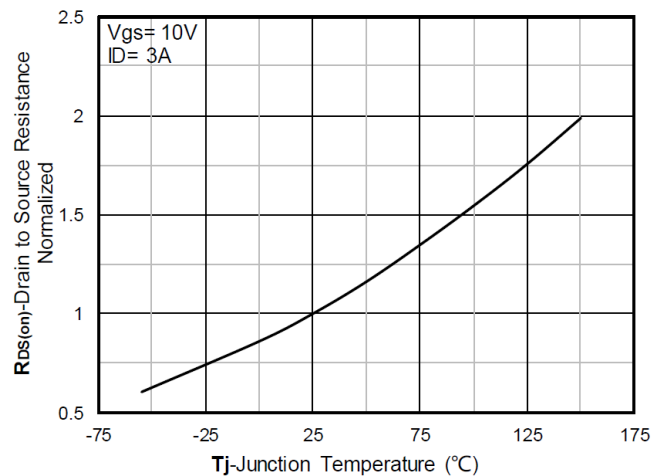
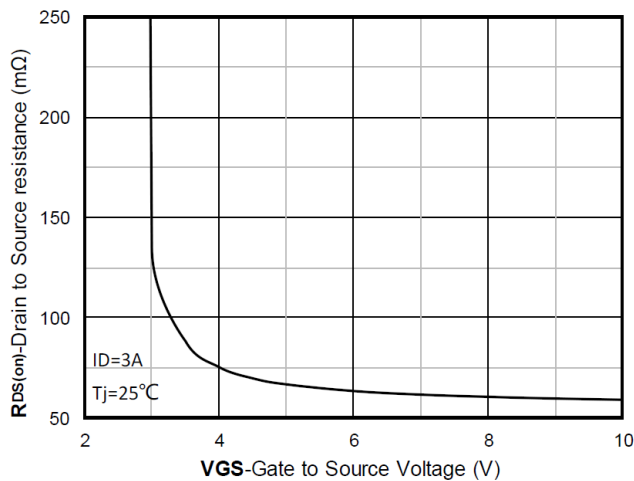


Figure 4. Gate Charge



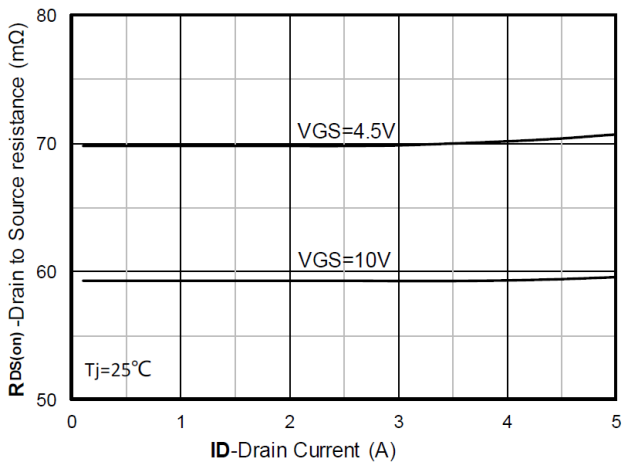


Figure 7. RDS(on) VS Drain Current

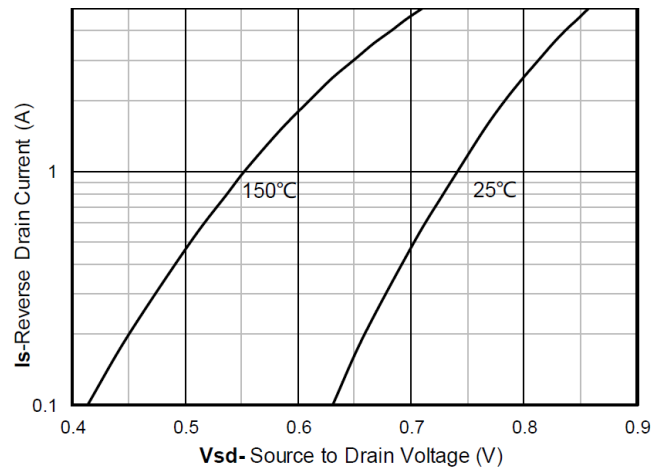


Figure 8. Forward characteristics of reverse diode

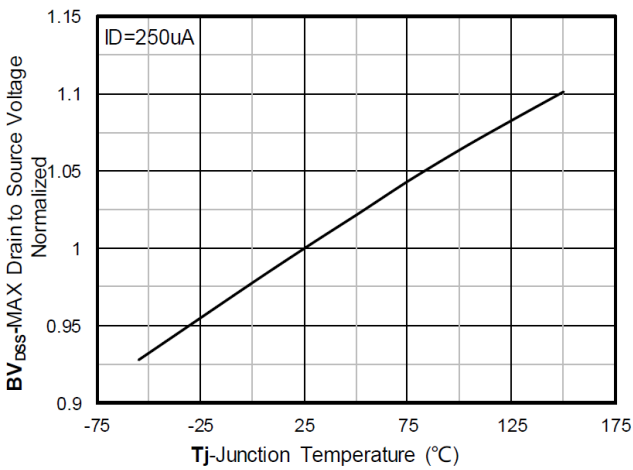


Figure 9. Normalized breakdown voltage

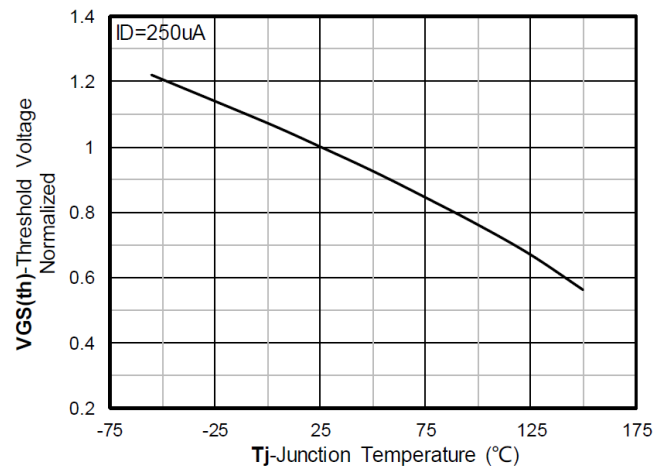


Figure 10. Normalized Threshold voltage

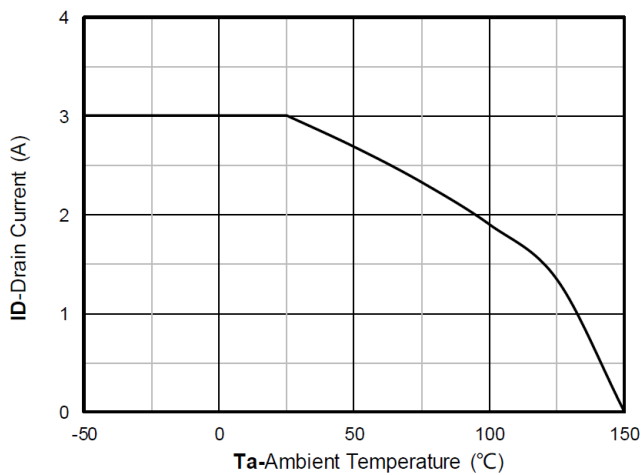


Figure 11. Current dissipation

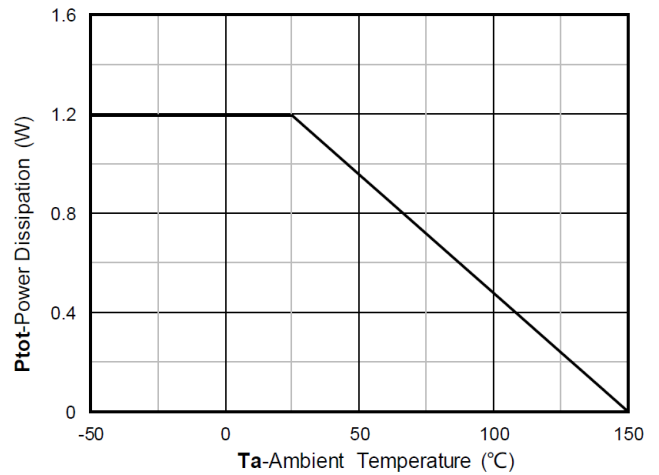


Figure 12. Power dissipation

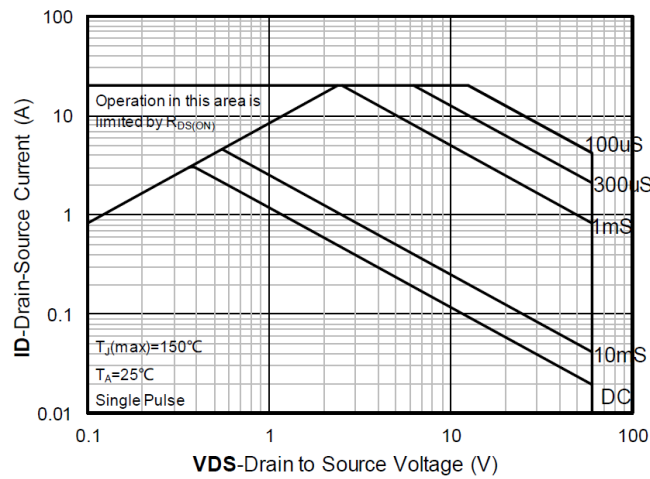


Figure 13. Safe Operation Area

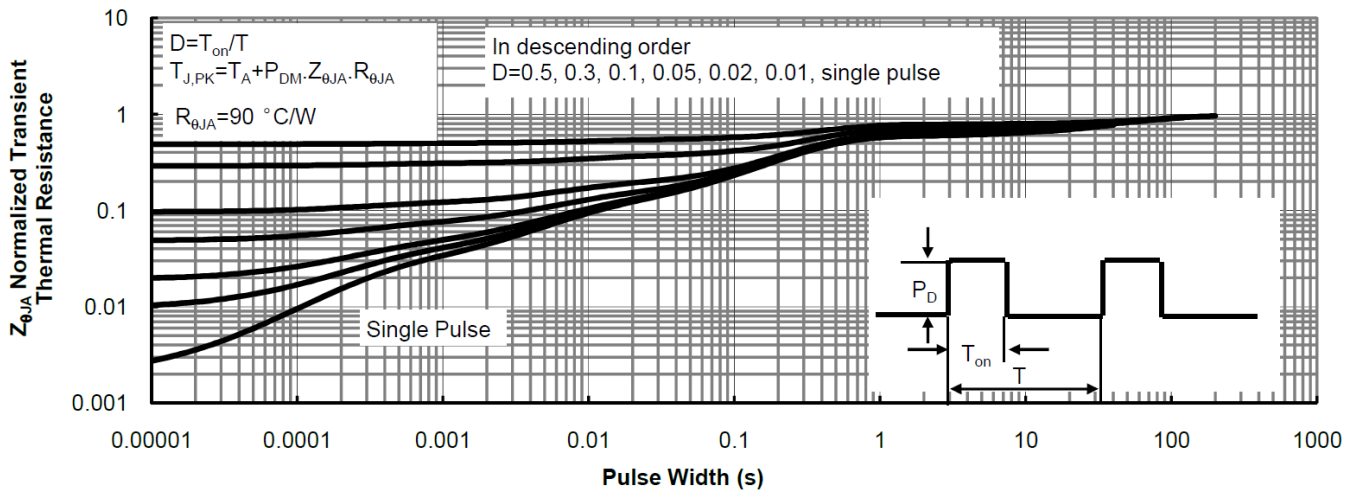
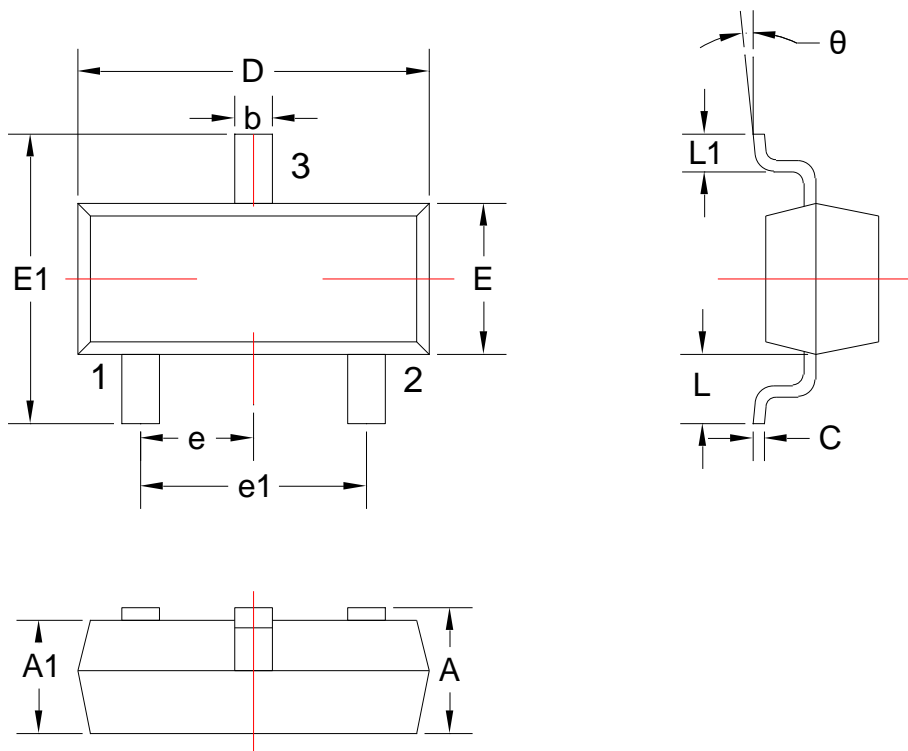


Figure 14: Normalized Maximum Transient Thermal Impedance (Note F)

8. Dimension (SOT-23)



COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

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°

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