

Automotive N-Channel 60 V (D-S) 175 °C MOSFET

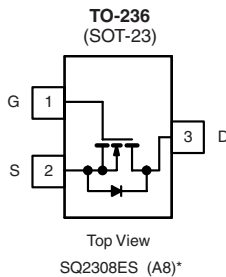
PRODUCT SUMMARY	
V _{DS} (V)	60
R _{DS(on)} (Ω) at V _{GS} = 10 V	0.155
R _{DS(on)} (Ω) at V _{GS} = 4.5 V	0.190
I _D (A)	2.3
Configuration	Single

FEATURES

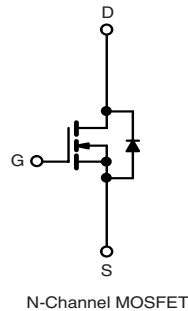
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- Compliant to RoHS Directive 2002/95/EC
- AEC-Q101 Qualified^d
- Find out more about Vishay's Automotive Grade Product Requirements at: www.vishay.com/applications



RoHS
COMPLIANT
HALOGEN
FREE



* Marking Code



ORDERING INFORMATION	
Package	SOT-23
Lead (Pb)-free and Halogen-free	SQ2308ES-T1-GE3

ABSOLUTE MAXIMUM RATINGS T _C = 25 °C, unless otherwise noted			
PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	60	V
Gate-Source Voltage	V _{GS}	± 20	
Continuous Drain Current ^a	I _D	T _C = 25 °C	2.3
		T _C = 125 °C	1.4
Continuous Source Current (Diode Conduction) ^a	I _S	1.4	A
Pulsed Drain Current ^b	I _{DM}	30	
Single Pulse Avalanche Current	I _{AS}	6	
Single Pulse Avalanche Energy	E _{AS}	1.8	mJ
Maximum Power Dissipation ^b	P _D	T _C = 25 °C	1.66
		T _A = 25 °C	1.1
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to + 175	°C

THERMAL RESISTANCE RATINGS			
PARAMETER	SYMBOL	LIMIT	UNIT
Junction-to-Ambient	R _{thJA}	115	°C/W
Junction-to-Foot (Drain)	R _{thJF}	75	

Notes

- Package limited.
- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- When mounted on 1" square PCB (FR-4 material).
- Parametric verification ongoing.

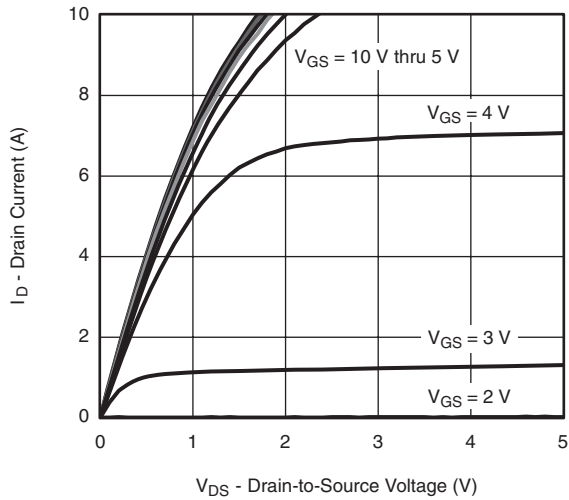
SPECIFICATIONS $T_C = 25\text{ }^\circ\text{C}$, unless otherwise noted							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = -250\text{ }\mu\text{A}$	60	-	-	V	
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\text{ }\mu\text{A}$	1.5	-	2.5		
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$	-	-	± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$	-	-	-1	μA
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	-	-50	
		$V_{GS} = 0\text{ V}$	$V_{DS} = 60\text{ V}$, $T_J = 175\text{ }^\circ\text{C}$	-	-	-150	
On-State Drain Current ^a	$I_{D(on)}$	$V_{GS} = 10\text{ V}$	$V_{DS} \geq 5\text{ V}$	8	-	A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 6\text{ A}$	-	0.130	0.155	Ω
		$V_{GS} = 4.5\text{ V}$	$I_D = 4.9\text{ A}$	-	0.160	0.190	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}$, $I_D = 1.9\text{ A}$		-	5	S	
Dynamic^b							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}$	$V_{DS} = 30\text{ V}$, $f = 1\text{ MHz}$	-	190	-	pF
Output Capacitance	C_{oss}			-	26	-	
Reverse Transfer Capacitance	C_{rss}			-	15	-	
Total Gate Charge ^c	Q_g	$V_{GS} = 10\text{ V}$	$V_{DS} = 30\text{ V}$, $I_D = 6\text{ A}$	-	4.5	6.8	nC
Gate-Source Charge ^c	Q_{gs}			-	2.3	-	
Gate-Drain Charge ^c	Q_{gd}			-	0.8	-	
Turn-On Delay Time ^c	$t_{d(on)}$	$V_{DD} = 30\text{ V}$, $R_L = 20\text{ }\Omega$ $I_D \cong 1.5\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		-	4	6	ns
Rise Time ^c	t_r			-	10	15	
Turn-Off Delay Time ^c	$t_{d(off)}$			-	10	15	
Fall Time ^c	t_f			-	7	10.5	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^\circ\text{C}$ ^b							
Pulsed Current ^a	I_{SM}			-	-	8	A
Forward Voltage	V_{SD}	$I_F = 1.5\text{ A}$, $V_{GS} = 0\text{ V}$		-	0.8	1.2	V

Notes

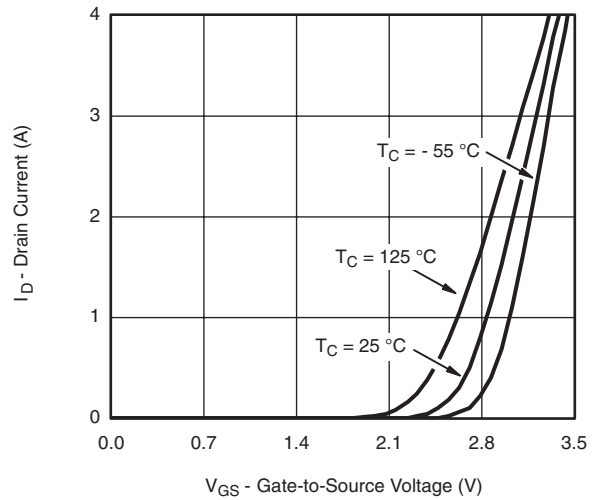
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.
- c. Independent of operating temperature.

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.

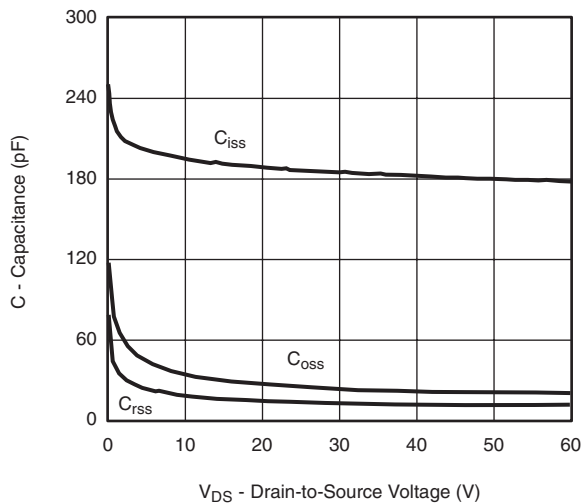
TYPICAL CHARACTERISTICS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



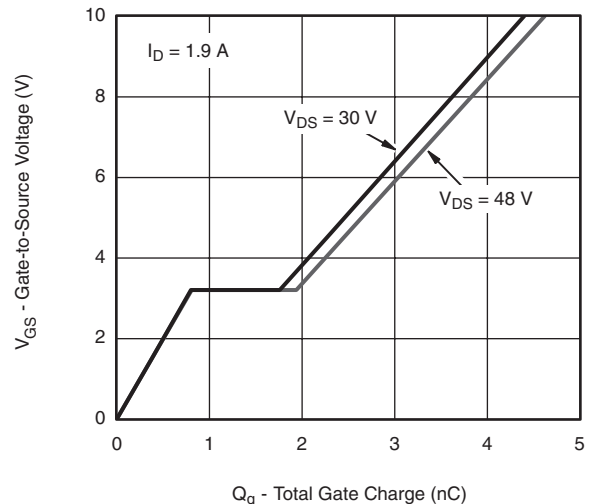
Output Characteristics



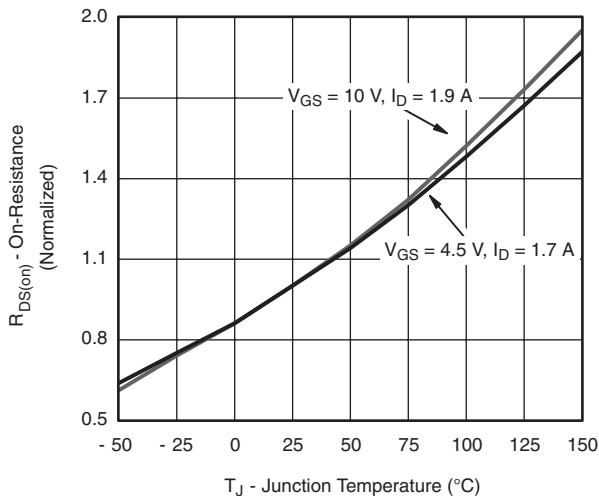
Transfer Characteristics



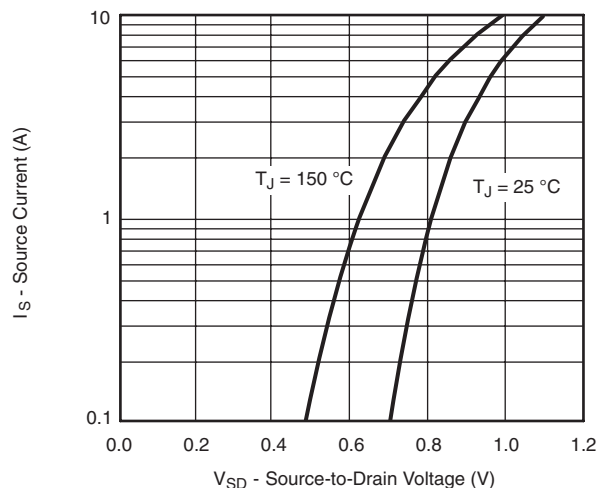
Capacitance



Gate Charge

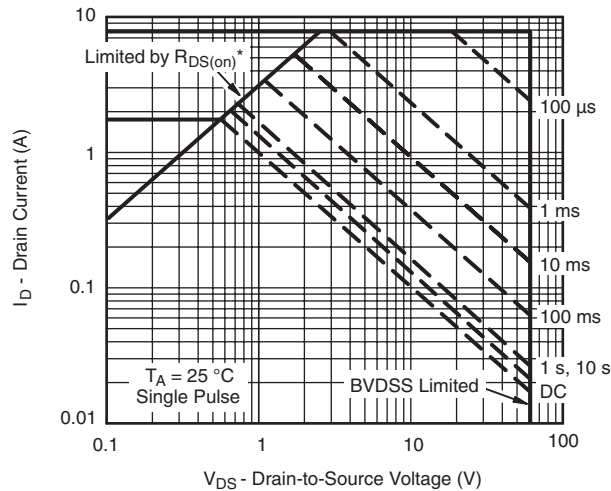


On-Resistance vs. Junction Temperature



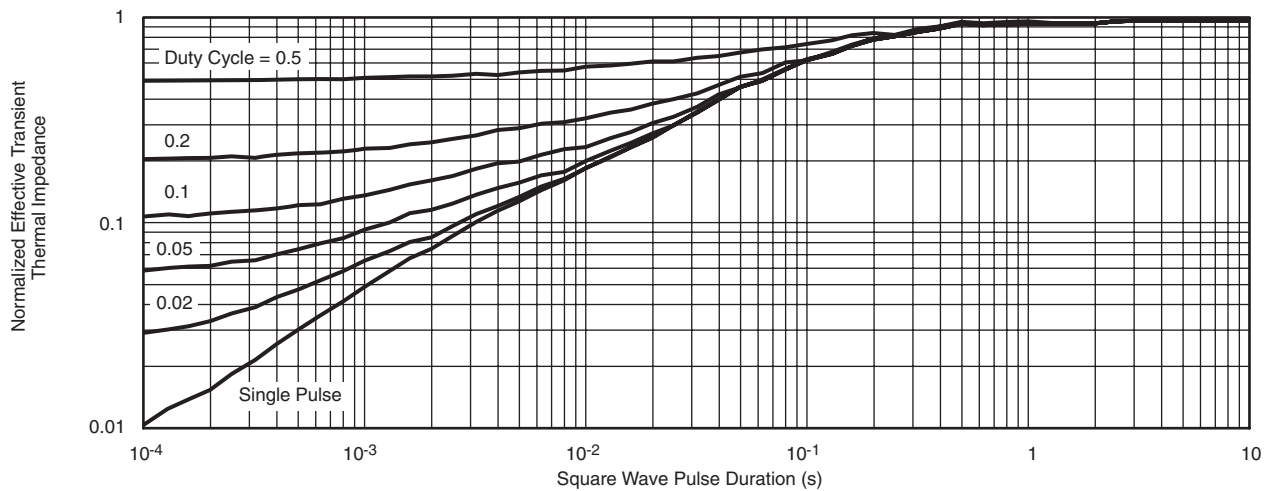
Source Drain Diode Forward Voltage

THERMAL RATINGS $T_A = 25\text{ }^\circ\text{C}$, unless otherwise noted



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



Normalized Thermal Transient Impedance, Junction-to-Foot

Note

The characteristics shown in the graph. Normalized Transient Thermal Impedance Junction to Foot ($25\text{ }^\circ\text{C}$) is given for general guidelines only to enable the user to get a "ball park" indication of part capabilities. The data are extracted from single pulse transient thermal impedance characteristics which are developed from empirical measurements. The latter is valid for the part mounted on printed circuit board - FR4, size $1\text{ }^\prime \times 1\text{ }^\prime \times 0.062\text{ }^\prime$, double sided with 2 oz. copper, 100 % on both sides. The part capabilities can widely vary depending on actual application parameters and operating conditions.

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