

P-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY		
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
- 60	0.340 at V _{GS} = - 10 V	- 1.25
	0.550 at V _{GS} = - 4.5 V	- 1

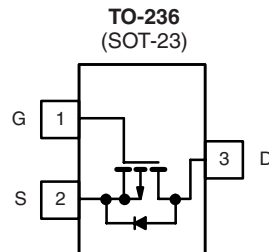
FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET



RoHS*
COMPLIANT

HALOGEN
FREE
Available



Top View
Si2309DS (A9)*
* Marking Code

Ordering Information: Si2309DS-T1
Si2309DS-T1-E3 (Lead (Pb)-free)
Si2309DS-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T _A = 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 (T _J = 150 °C) ^{a, b}	T _A = 25 °C	I _D	- 1.25	A
	T _A = 70 °C		- 0.85	
Pulsed Drain Current	I _{DM}	- 8		
Avalanche Current	L = 0.1 mH	I _{AS}	- 5	
Maximum Power Dissipation ^{a, b}	T _A = 25 °C	P _D	1.25	W
	T _A = 70 °C		0.8	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^a	t ≤ 5 s	R _{thJA}	100	°C/W	
	Steady State		130		
Maximum Junction-to-Lead ^a	Steady State	R _{thJL}	45		

Notes:

a. Surface Mounted on FR4 board.

b. t ≤ 5 s.

* Pb containing terminations are not RoHS compliant, exemptions may apply.



SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{DS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-1			
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -48\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -48\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$			-50	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq -4.5\text{ V}, V_{GS} = -10\text{ V}$	-6			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -1.25\text{ A}$		0.275	0.340	Ω
		$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.406	0.550	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -4.5\text{ V}, I_D = -1\text{ A}$		1.9		S
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -30\text{ V}, V_{GS} = -10\text{ V}, I_D = -1.25\text{ A}$		5.4	12	nC
Gate-Source Charge	Q_{gs}			1.15		
Gate-Drain Charge	Q_{gd}			0.92		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -30\text{ V}, R_L = 30\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_G = 6\text{ }\Omega$		10.5	20	ns
Rise Time	t_r			11.5	20	
Turn-Off Delay Time	$t_{d(off)}$			15.5	30	
Fall Time	t_f			7.5	15	
Source-Drain Rating Characteristics^b						
Continuous Current	I_S				-1.25	A
Pulsed Current	I_{SM}				-8	
Diode Forward Voltage ^a	V_{SD}	$I_S = -1.25\text{ A}, V_{GS} = 0\text{ V}$		-0.82	-1.2	V
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -1.25\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}$		30	55	ns

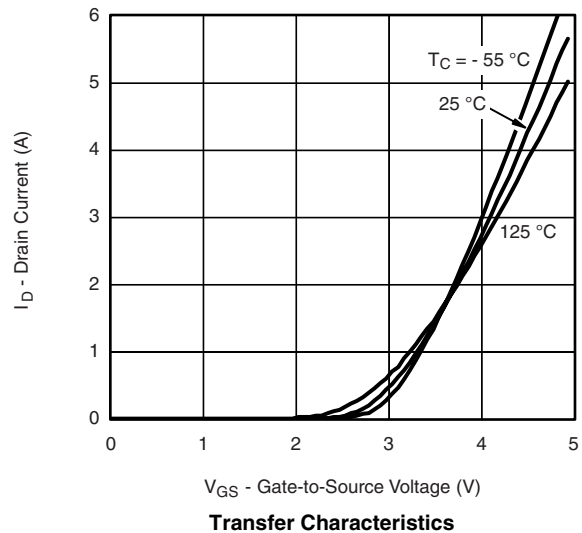
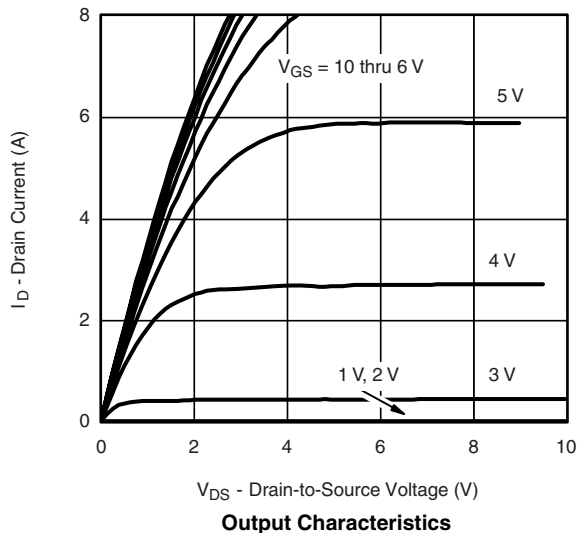
Notes:

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

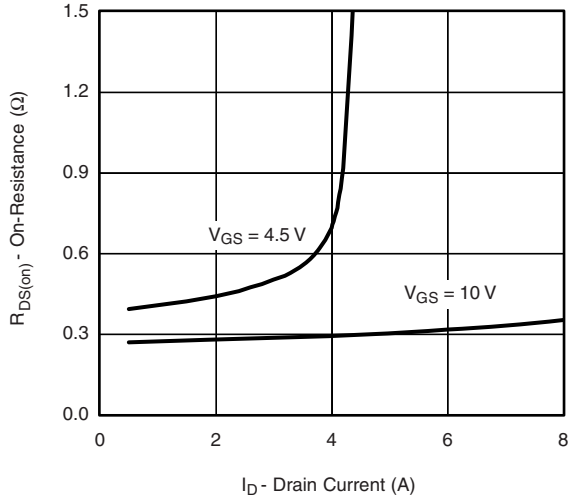
b. Guaranteed by design, not subject to production testing.

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.

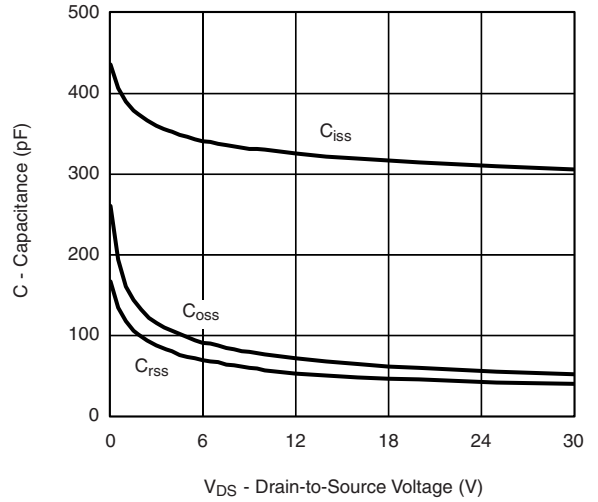
TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted



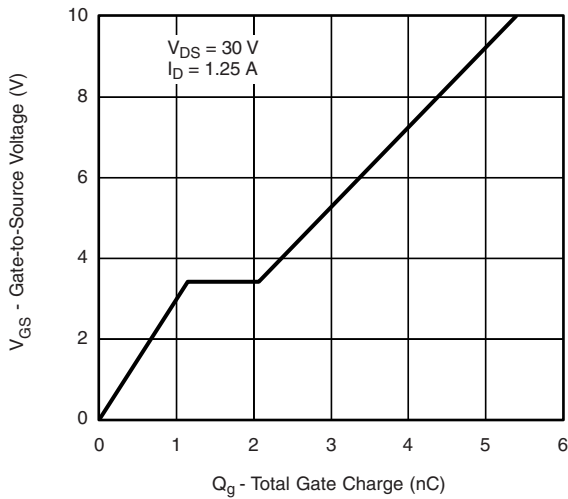
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



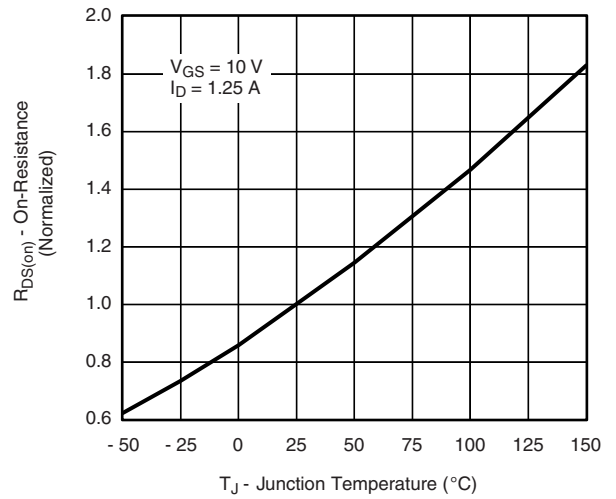
On-Resistance vs. Drain Current



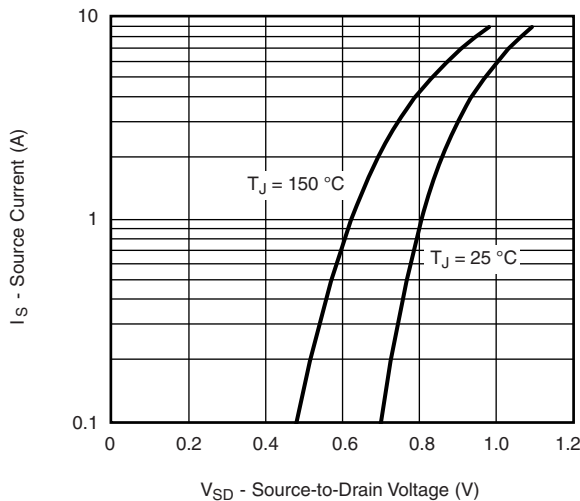
Capacitance



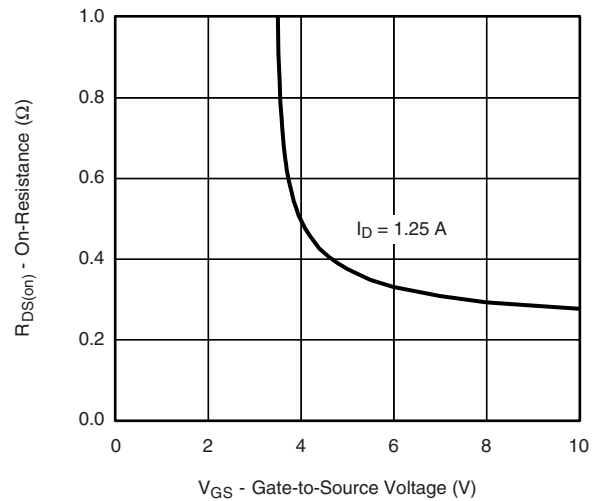
Gate Charge



On-Resistance vs. Junction Temperature

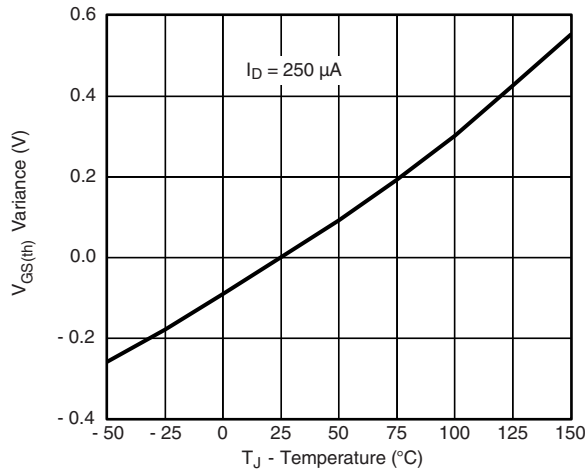


Source-Drain Diode Forward Voltage

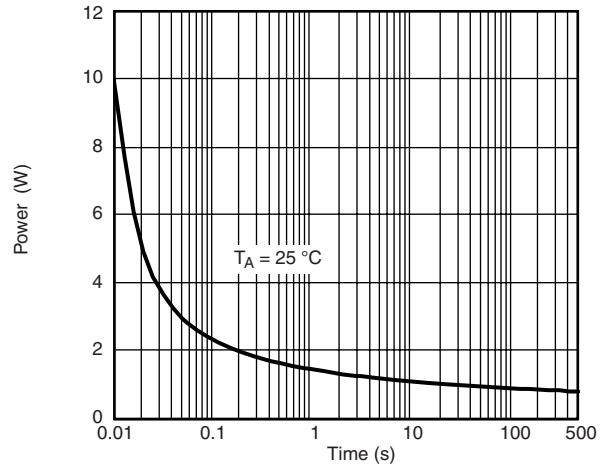


On-Resistance vs. Gate-to-Source Voltage

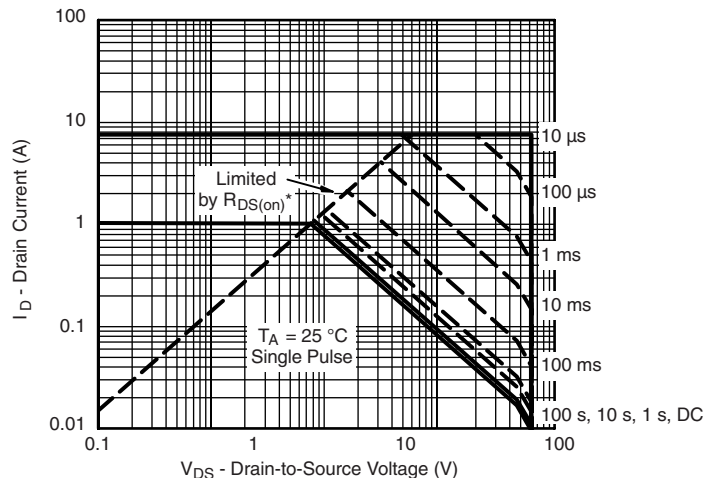
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Threshold Voltage

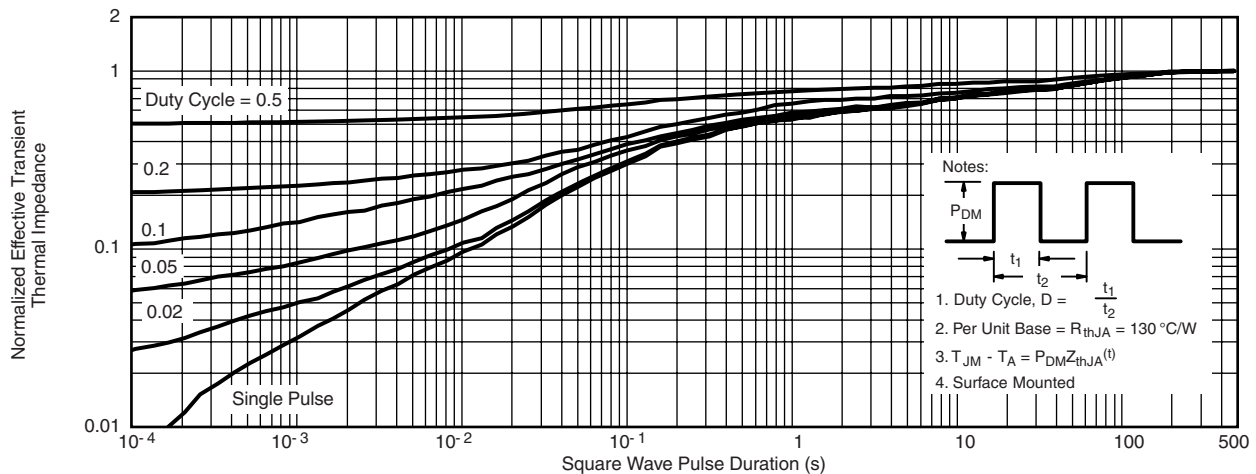


Single Pulse Power



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

Safe Operating Area, Junction-to-Ambient



Notes:

1. Duty Cycle, $D = \frac{t_1}{t_2}$
2. Per Unit Base = $R_{thJA} = 130 \text{ }^\circ\text{C/W}$
3. $T_{JM} - T_A = P_{DM} Z_{thJA}(t)$
4. Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

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