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SI2311DS-T1-GE3 Datasheet

P-Channel 20-V (D-S) MOSFET

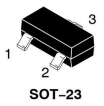
MOSFET PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ.)
- 20	0.060 at V_{GS} = - 10 V	- 4.0	10 nC
	0.065 at V_{GS} = - 4.5 V	- 3.5	
	0.080 at V_{GS} = - 2.5 V	- 2.0	

FEATURES

- **Halogen-free According to Definition**
- Trench Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS

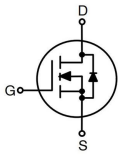
APPLICATIONS

- Load Switch
- PA Switch
- DC/DC Converters



SOT–23

1 – Gate
2 – Source
3 – Drain



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	- 20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	- 4 [e]	A
	T_C = 70 °C		-3.2	
	T_A = 25 °C		- 3 .5[b, c]	
	T_A = 70 °C		- 2 .5[b, c]	
Pulsed Drain Current		I_{DM}	- 10	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 2.1	
	T_A = 25 °C		- 1.0[b, c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	2.5	W
	T_C = 70 °C		1.6	
	T_A = 25 °C		1.25[b, c]	
	T_A = 70 °C		0.8[b, c]	
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[b, d]	≤ 5 s	R_{thJA}	75	100	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	40	50	

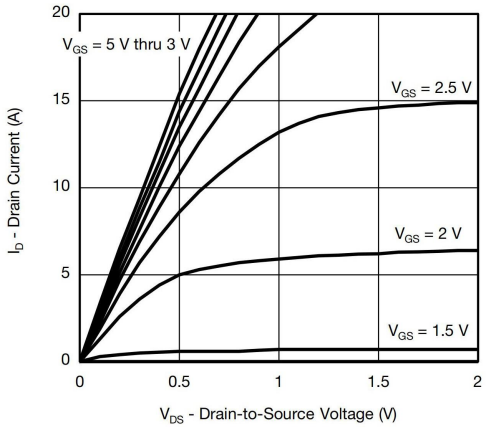
Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 5 s.
d. Maximum under steady state conditions is 166 °C/W.
e. Package limited.

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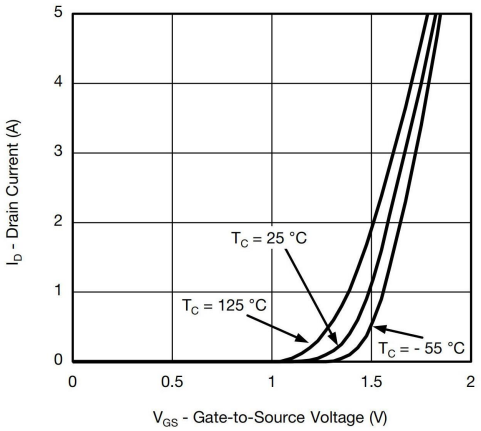
MOSFET SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{DS} = 0 V, I_D = - 250 µA	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 13.4		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.9		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = - 250 µA	- 0.5		- 1.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 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 = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 4.5 V	- 10			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 10 V, I_D = - 3 A		0.060		Ω
		V_{GS} = - 4.5 V, I_D = - 2.5 A		0.065		
		V_{GS} = - 2.5 V, I_D = - 2 A		0.080		
Forward Transconductance[a]	g_{fs}	V_{DS} = - 5 V, I_D = - 3 A		15		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		835		pF
Output Capacitance	C_{oss}			180		
Reverse Transfer Capacitance	C_{rss}			155		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 3.1 A		10		nC
		V_{DS} = - 10 V, V_{GS} = - 2.5 V, I_D = - 3.1 A		6.4		
Gate-Source Charge	Q_{gs}			1.7		
Gate-Drain Charge	Q_{gd}			3.4		
Gate Resistance	R_g	f = 1 MHz	0.9	4.4	8.8	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 2.4 Ω I_D = - 3.1 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		22	33	ns
Rise Time	t_r			20	30	
Turn-Off Delay Time	$t_{d(off)}$			28	42	
Fall Time	t_f			9	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 2.1	A
Pulse Diode Forward Current[a]	I_{SM}				- 1 0	
Body Diode Voltage	V_{SD}	I_S = - 3.1 A		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 3.1 A, dI/dt = 100 A/µs, T_J = 25 °C		23	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			12	20	nC
Reverse Recovery Fall Time	t_a			15		ns
Reverse Recovery Rise Time	t_b			8		

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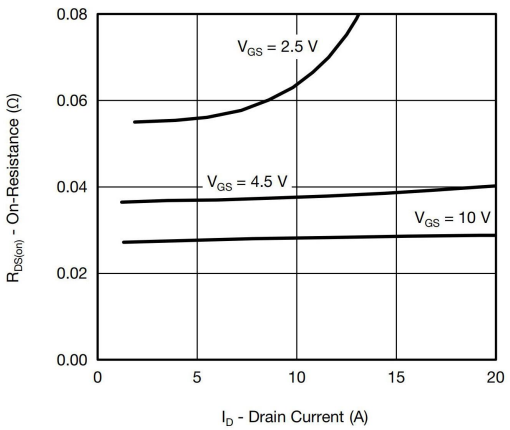
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



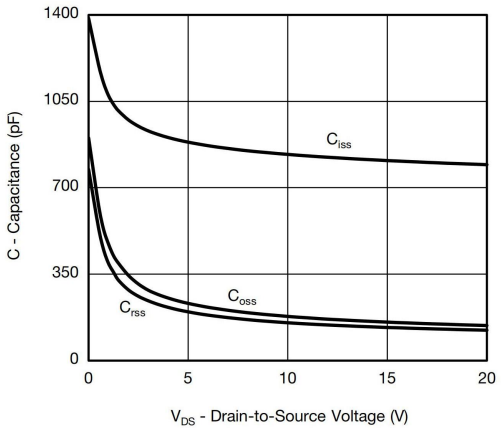
Output Characteristics



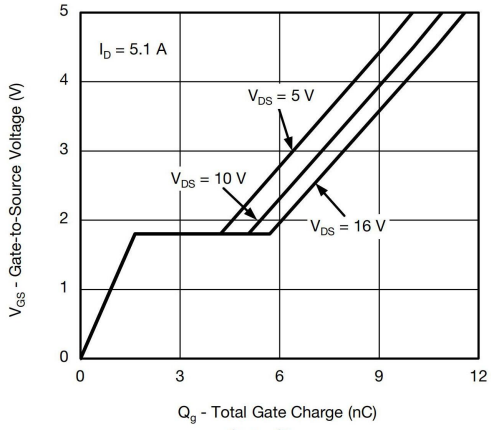
Transfer Characteristics



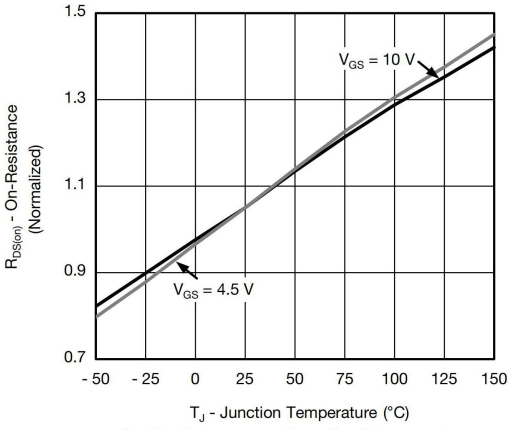
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



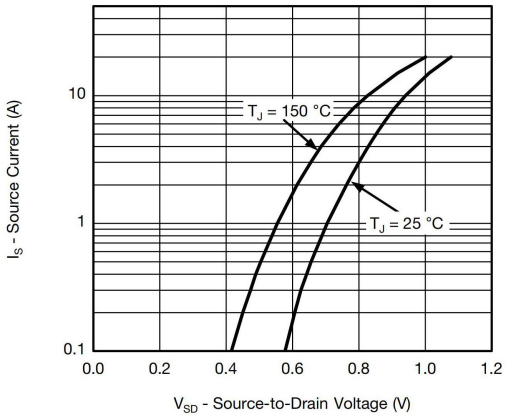
Gate Charge



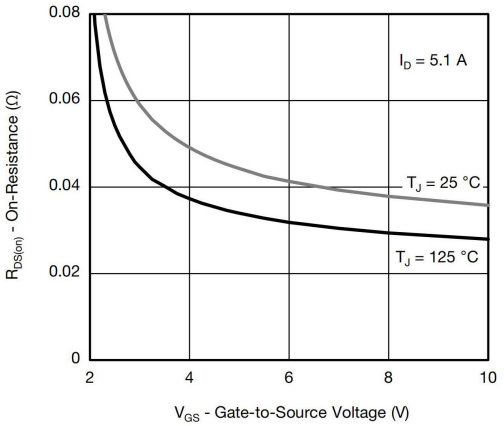
On-Resistance vs. Junction Temperature

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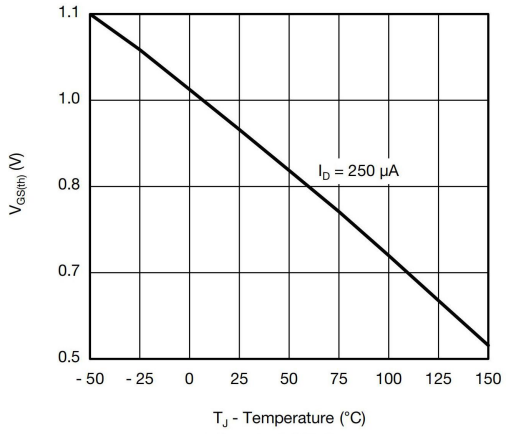
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



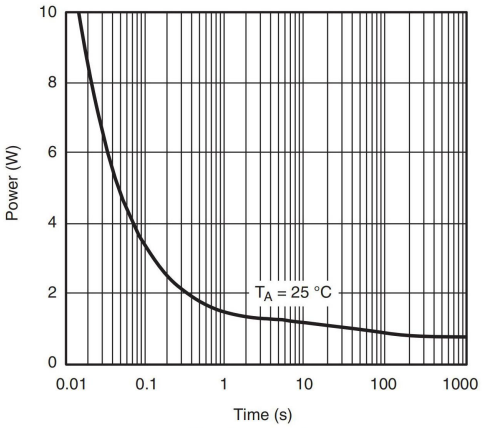
Source-Drain Diode Forward Voltage



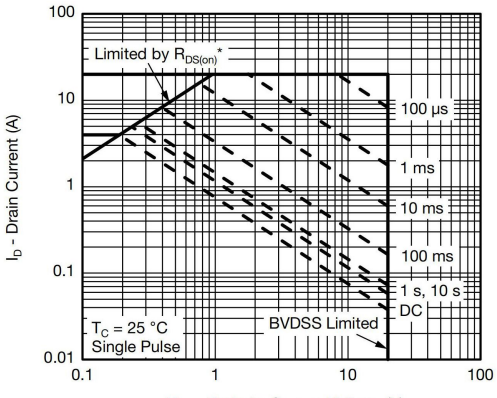
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power

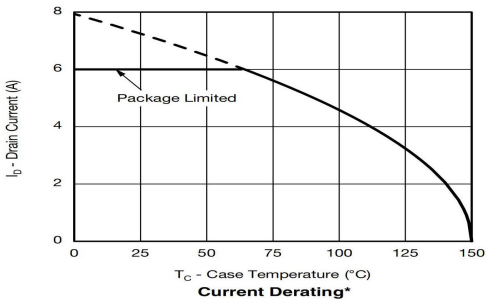


* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

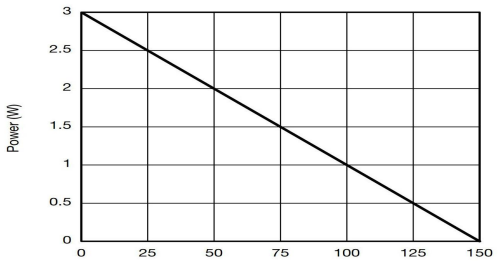
Safe Operating Area

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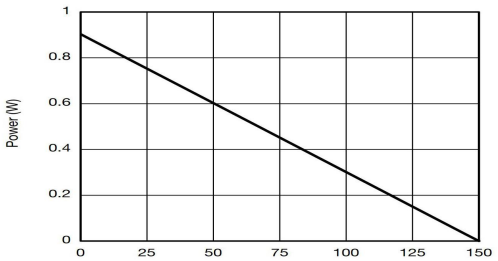
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*

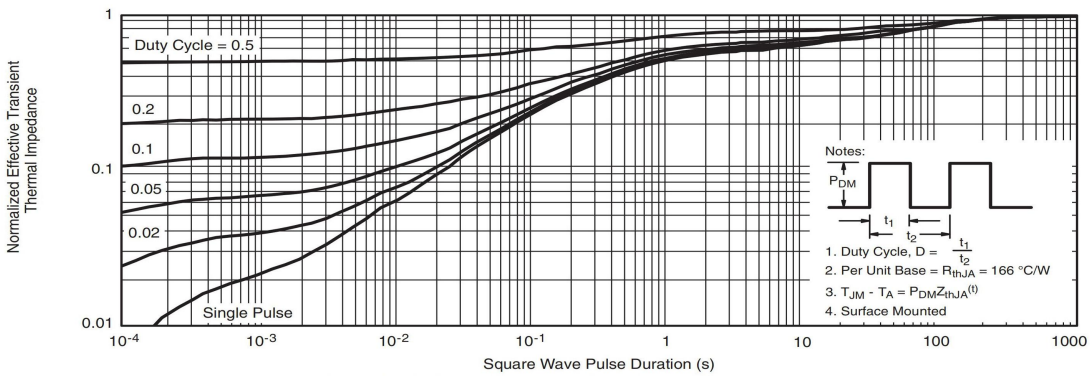


Power, Junction-to-Foot

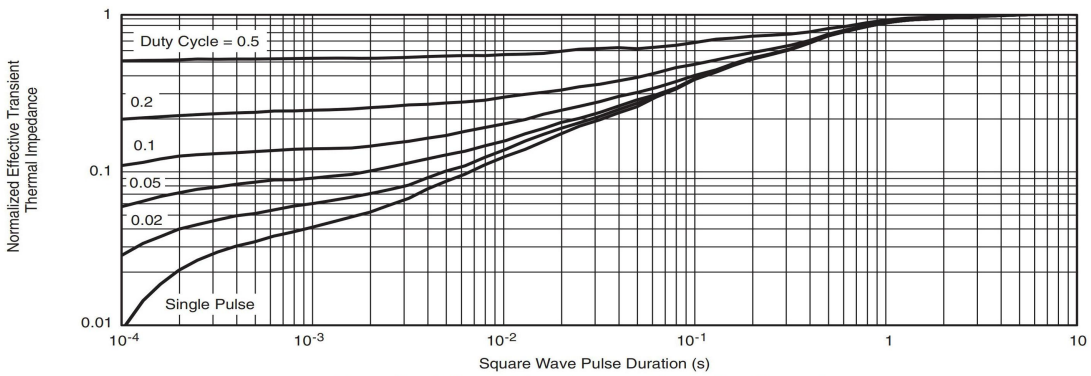


Power, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient



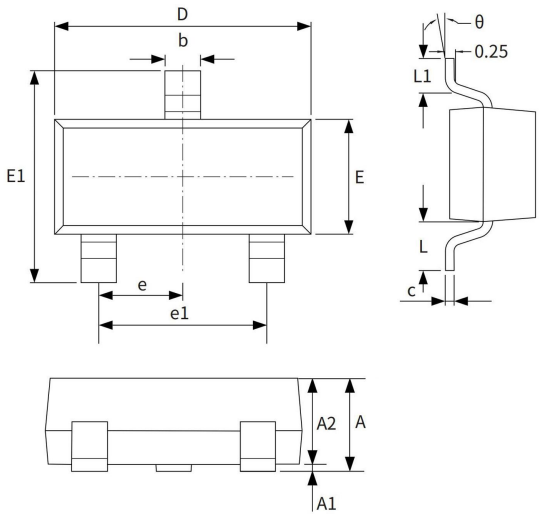
Normalized Thermal Transient Impedance, Junction-to-Foot

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Ordering Information

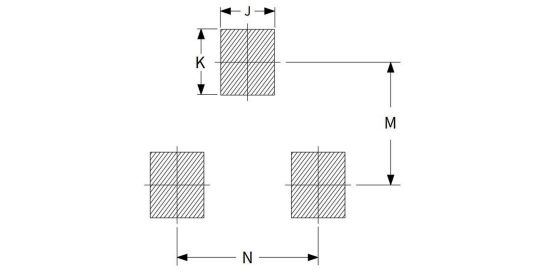
PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SOT-23	R1	0.008	3000	30000	240000	7''

Package Outline Dimensions (SOT-23)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	-	0.10	-	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.80	2.00	0.071	0.079
L	0.550REF		0.022REF	
L1	0.30	0.50	0.012	0.020
θ	-	8°	-	8°

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
J	0.75	0.85	0.030	0.033
K	0.85	0.95	0.033	0.037
M	1.95	2.05	0.077	0.081
N	1.85	1.95	0.073	0.077