

P-Channel 12-V (D-S) MOSFET

MOSFET PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 12	0.035 at $V_{GS} = - 4.5$ V	- 5.1	9 nC
	0.045 at $V_{GS} = - 2.5$ V	- 4.5	
	0.059 at $V_{GS} = - 1.8$ V	- 3.9	

FEATURES

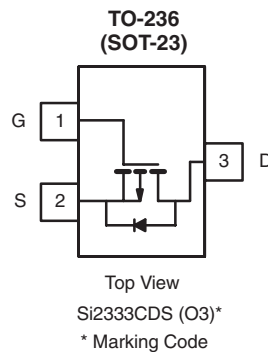
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch
- PA Switch



Ordering Information: Si2333CDS-T1-E3 (Lead (Pb)-free)
Si2333CDS-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}	- 12	V
Gate-Source Voltage	V_{GS}	± 8	
Continuous Drain Current ($T_J = 150$ °C)	I_D	$T_C = 25$ °C	- 7.1
		$T_C = 70$ °C	- 5.7
		$T_A = 25$ °C	- 5.1 ^{b, c}
		$T_A = 70$ °C	- 4.0 ^{b, c}
Pulsed Drain Current	I_{DM}	- 20	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C	
		$T_A = 25$ °C	- 0.63 ^{b, c}
Maximum Power Dissipation	P_D	$T_C = 25$ °C	2.5
		$T_C = 70$ °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:

- Based on $T_C = 25$ °C.
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under Steady State conditions is 166 °C/W.

MOSFET 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_{DS}	$V_{DS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-13		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-1	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -12\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -5.1\text{ A}$		0.0285	0.035	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -4.5\text{ A}$		0.036	0.045	
		$V_{GS} = -1.8\text{ V}, I_D = -2.0\text{ A}$		0.046	0.059	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -5\text{ V}, I_D = -5.3\text{ A}$		18.5		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -6\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1225		pF
Output Capacitance	C_{oss}			315		
Reverse Transfer Capacitance	C_{rss}			260		
Total Gate Charge	Q_g	$V_{DS} = -6\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5.1\text{ A}$		15	25	nC
				9	15	
Gate-Source Charge	Q_{gs}	$V_{DS} = -6\text{ V}, V_{GS} = -2.5\text{ V}, I_D = -5.1\text{ A}$		1.9		
Gate-Drain Charge	Q_{gd}			3.8		
Gate Resistance	R_g	$f = 1\text{ MHz}$		4.0		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\text{ V}, R_L = 6\text{ }\Omega$ $I_D = -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_G = 1\text{ }\Omega$		13	20	ns
Rise Time	t_r			35	60	
Turn-Off Delay Time	$t_{d(off)}$			45	70	
Fall Time	t_f			12	20	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-1.0	A
Pulse Diode Forward Current ^a	I_{SM}				-20	
Body Diode Voltage	V_{SD}	$I_S = -1.0\text{ A}$		-0.7	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -1.0\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		32	50	ns
Body Diode Reverse Recovery Charge	Q_{rr}			20	40	nC
Reverse Recovery Fall Time	t_a			16		ns
Reverse Recovery Rise Time	t_b			16		

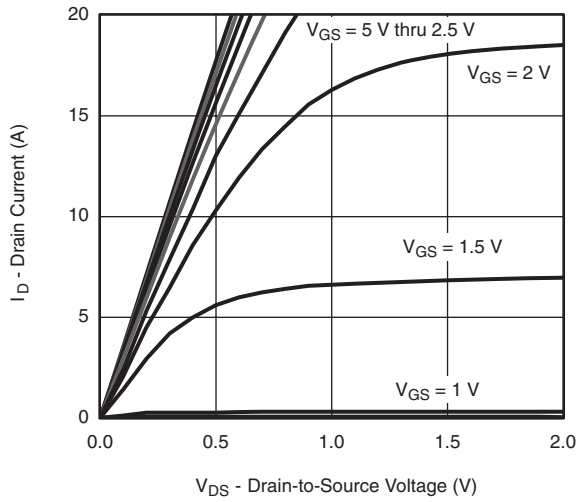
Notes:

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

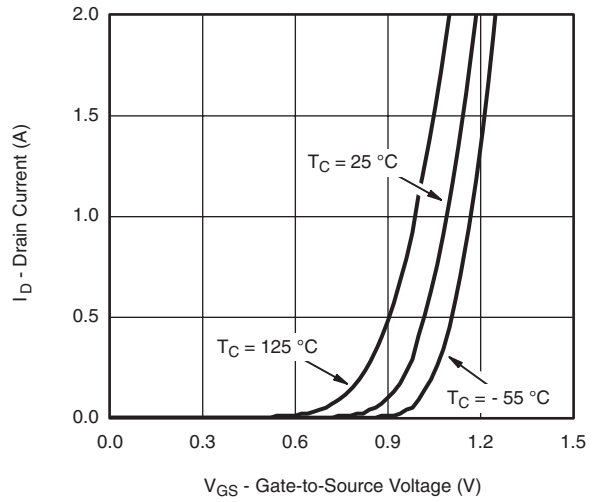
b. Guaranteed by design, not subject to production testing.

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.

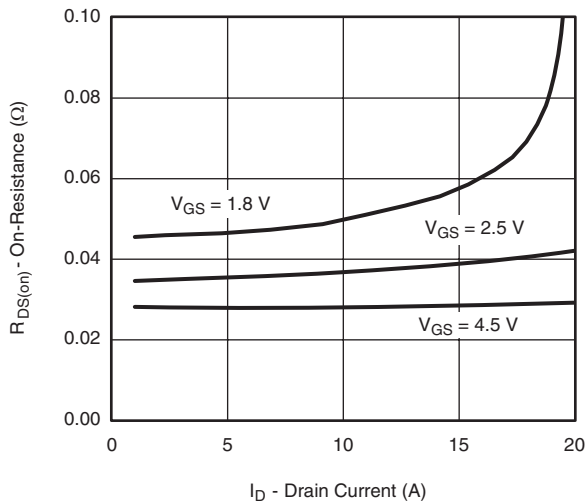
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



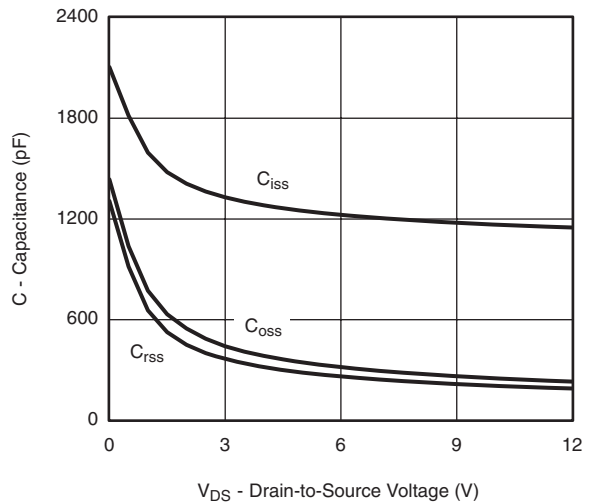
Output Characteristics



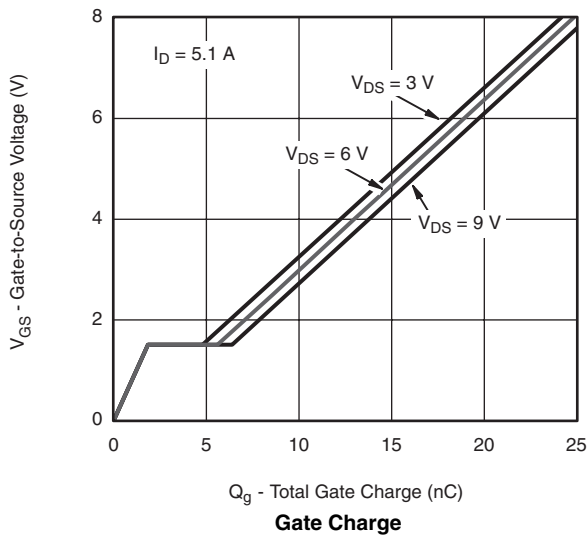
Transfer Characteristics



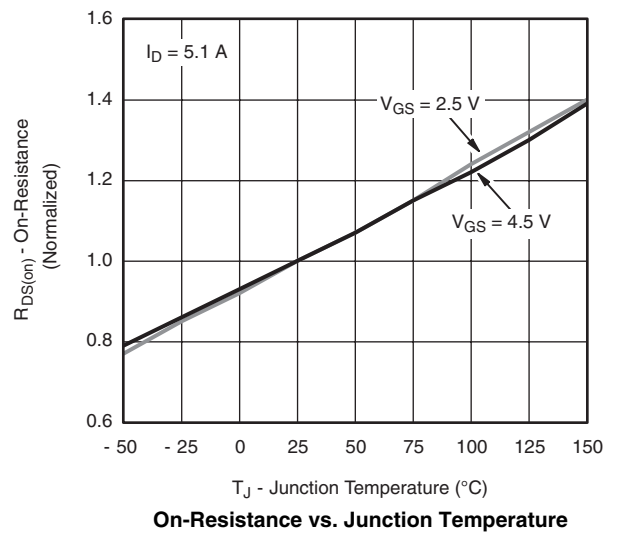
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

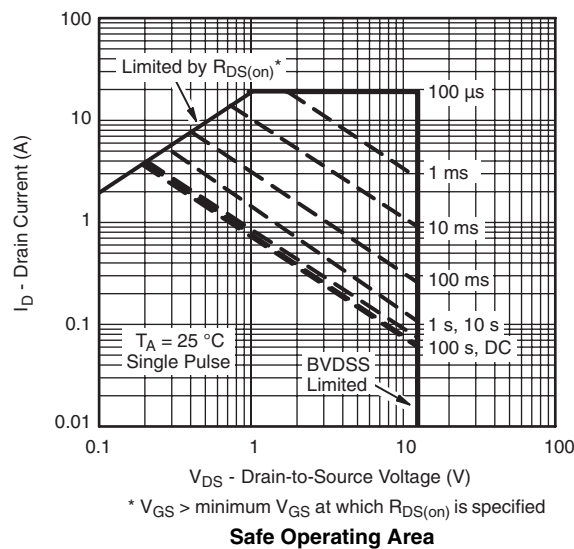
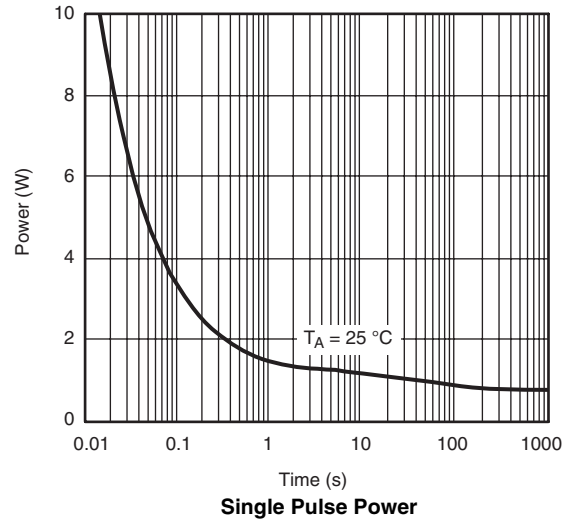
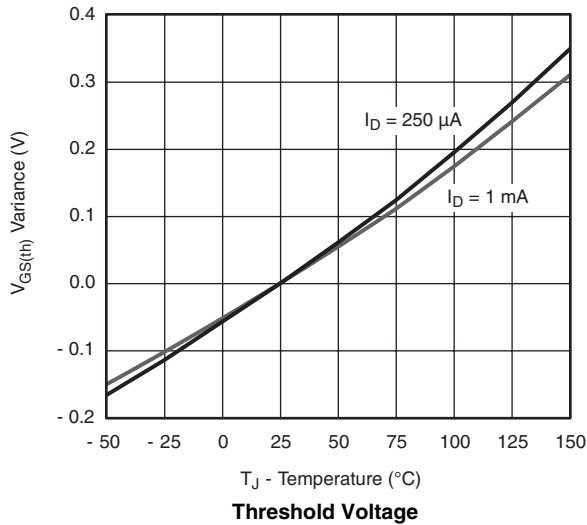
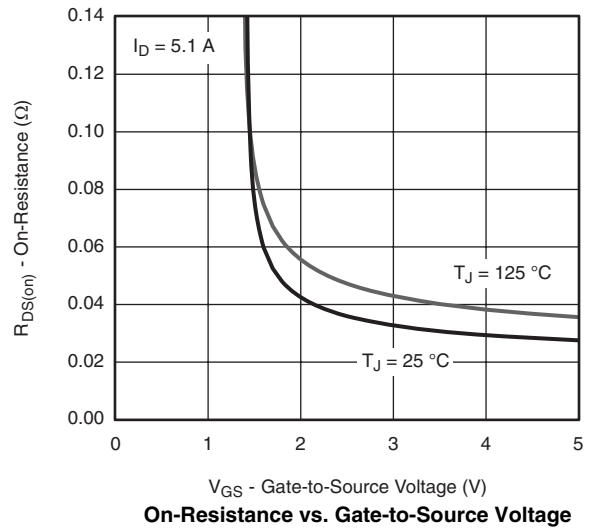
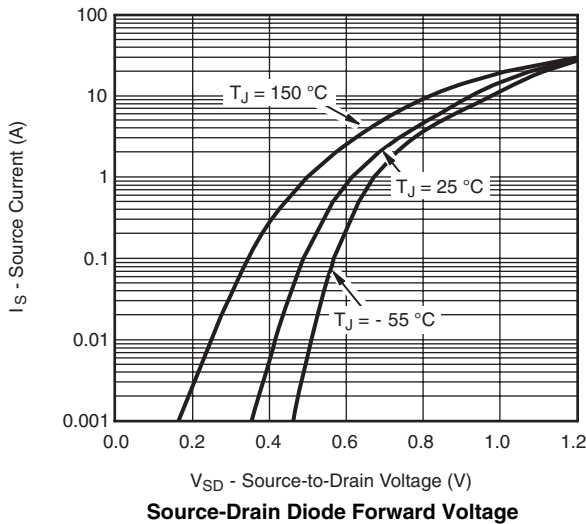


Gate Charge

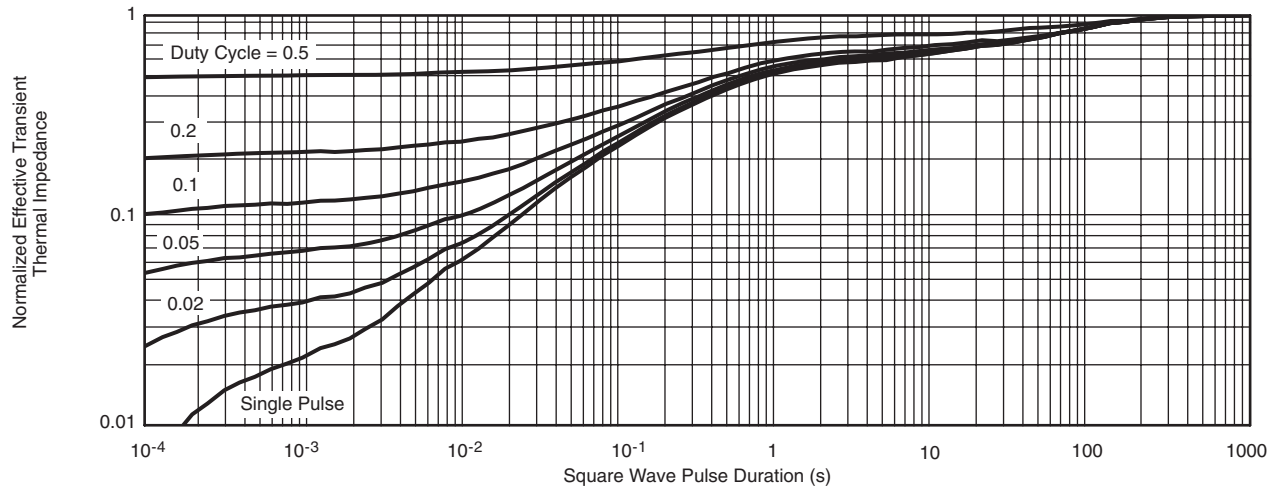


On-Resistance vs. Junction Temperature

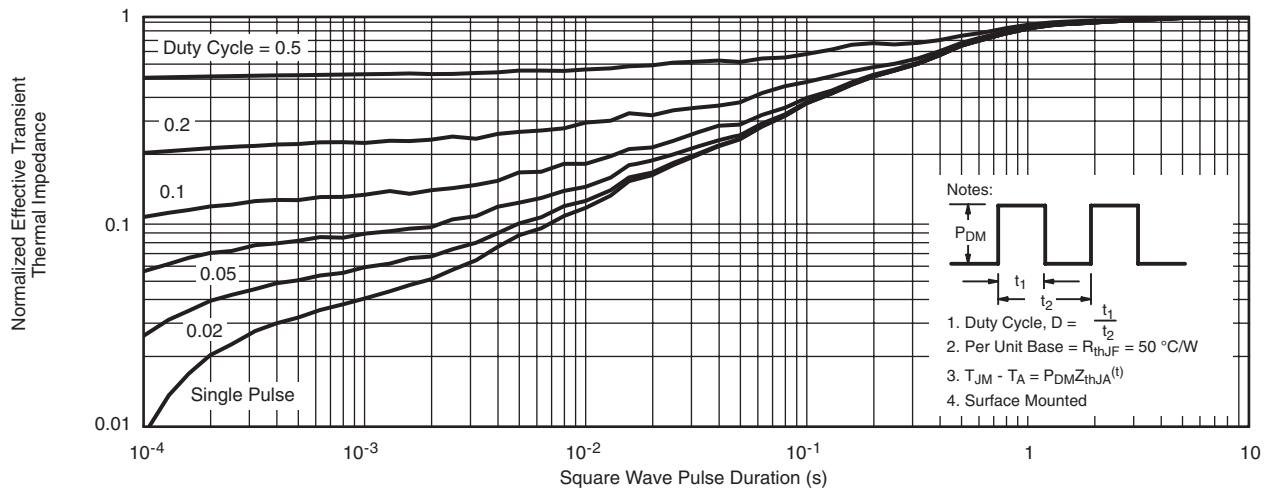
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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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