N-Channel 30 V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[a, e]	Q_g (Typ.)
30	0.028 at V_{GS} = 10 V	6	4.2 nC
	0.033 at V_{GS} = 4.5 V	6	

FEATURES

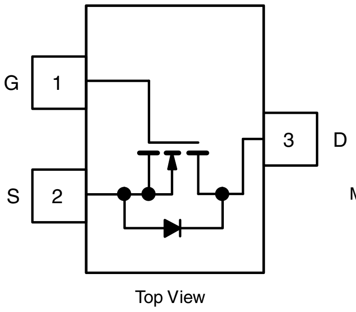
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Low On-Resistance
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

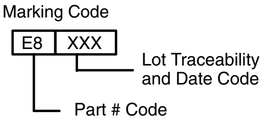
Pb-free
RoHS
COMPLIANT
HALOGEN
FREE

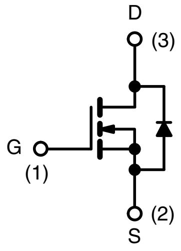
APPLICATIONS

- DC/DC Converters, High Speed Switching

SOT-23







N-Channel MOSFET

Ordering Information:
Si2338DS-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}	30	V
Gate-Source Voltage		V_{GS}	± 20	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	6^e	A
	T_C = 70 °C		6^e	
	T_A = 25 °C		$5.5^{b, c}$	
	T_A = 70 °C		$4.4^{b, c}$	
Pulsed Drain Current (t = 300 µs)		I_{DM}	25	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	2.1	
	T_A = 25 °C		$1.1^{b, c}$	
Maximum Power Dissipation	T_C = 25 °C	P_D	2.5	W
	T_C = 70 °C		1.6	
	T_A = 25 °C		$1.3^{b, c}$	
	T_A = 70 °C		$0.8^{b, c}$	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)			260	

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[b, d]	t ≤ 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.

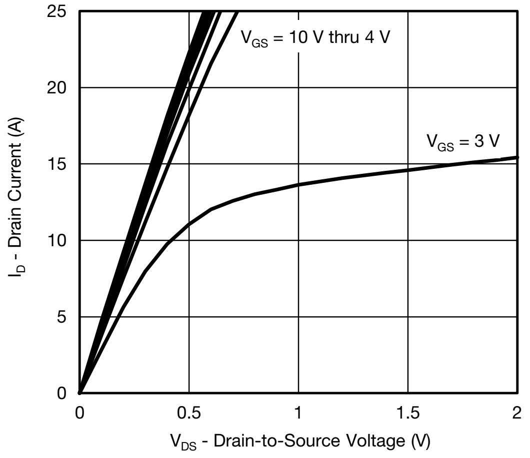
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0$ V, $I_D = 250$ µA	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250$ µA		30		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 4.8		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA	1.2		2.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30$ V, $V_{GS} = 0$ V			1	µA
		$V_{DS} = 30$ V, $V_{GS} = 0$ V, $T_J = 70$ °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \le 5$ V, $V_{GS} = 10$ V	20			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 5.5$ A		0.023	0.028	Ω
		$V_{GS} = 4.5$ V, $I_D = 5$ A		0.027	0.033	
Forward Transconductance[a]	g_{fs}	$V_{DS} = 15$ V, $I_D = 5.5$ A		24		S
Dynamic[b]						
Input Capacitance	C_{iss}	$V_{DS} = 15$ V, $V_{GS} = 0$ V, f = 1 MHz		424		pF
Output Capacitance	C_{oss}			100		
Reverse Transfer Capacitance	C_{rss}			42		
Total Gate Charge	Q_g	$V_{DS} = 15$ V, $V_{GS} = 10$ V, $I_D = 5.5$ A		8.2	13	nC
		$V_{DS} = 15$ V, $V_{GS} = 4.5$ V, $I_D = 5.5$ A		4.2	7	
Gate-Source Charge	Q_{gs}			1.4		
Gate-Drain Charge	Q_{gd}			1.4		
Gate Resistance	R_g	f = 1 MHz	2.5	12.6	25.2	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15$ V, $R_L = 3.4$ Ω $I_D \cong 4.4$ A, $V_{GEN} = 4.5$ V, $R_g = 1$ Ω		6	12	ns
Rise Time	t_r			20	30	
Turn-Off Delay Time	$t_{d(off)}$			14	21	
Fall Time	t_f			10	20	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15$ V, $R_L = 3.4$ Ω $I_D \cong 4.4$ A, $V_{GEN} = 10$ V, $R_g = 1$ Ω		3	6	
Rise Time	t_r			11	20	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	t_f			7	14	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C			2.1	A
Pulse Diode Forward Current	I_{SM}				25	
Body Diode Voltage	V_{SD}	$I_S = 4.4$ A, $V_{GS} = 0$ V		0.82	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 4.4$ A, dI/dt = 100 A/µs, $T_J = 25$ °C		13	20	ns
Body Diode Reverse Recovery Charge	Q_{rr}			6	12	nC
Reverse Recovery Fall Time	t_a			8		ns
Reverse Recovery Rise Time	t_b			5		

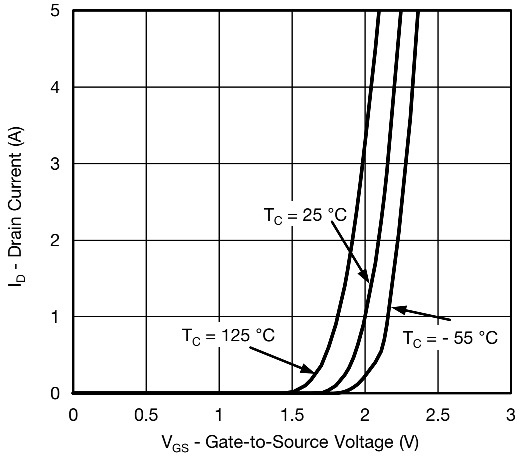
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

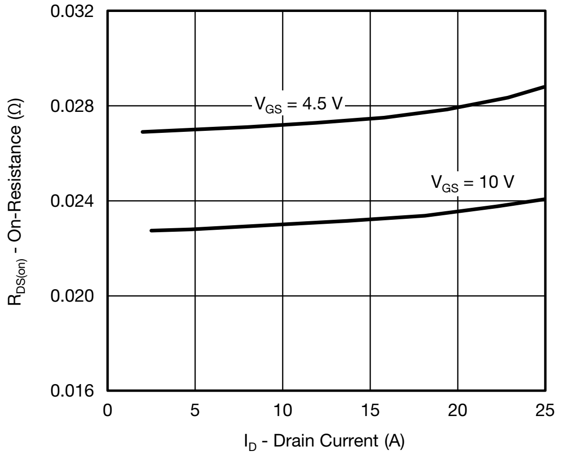
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



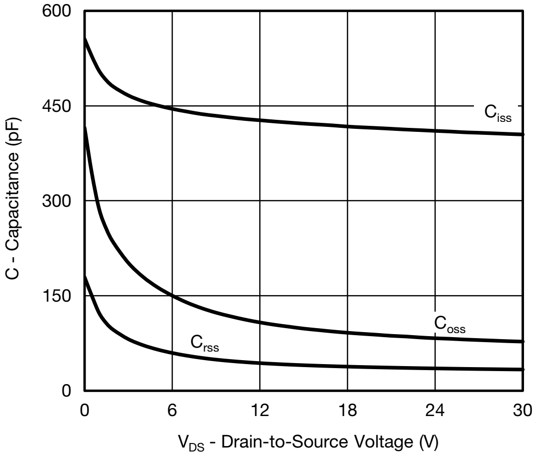
Output Characteristics



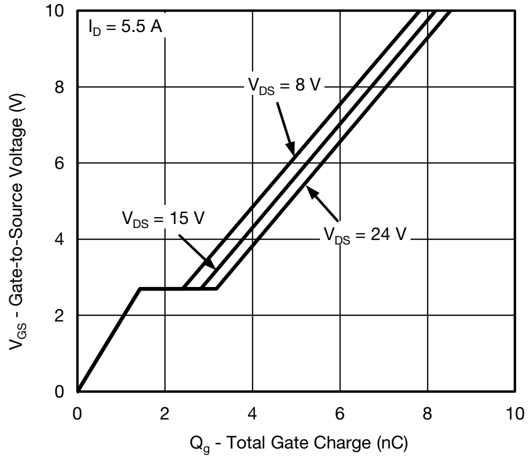
Transfer Characteristics



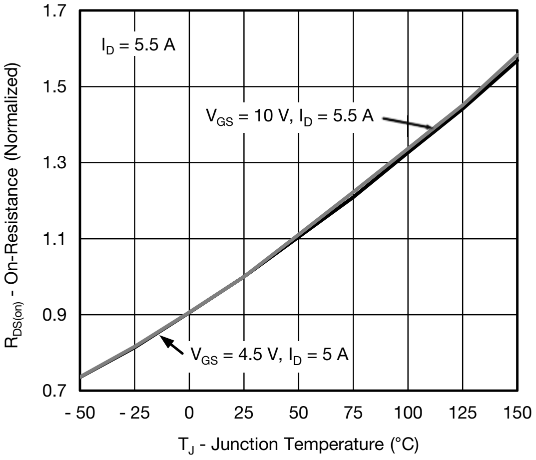
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

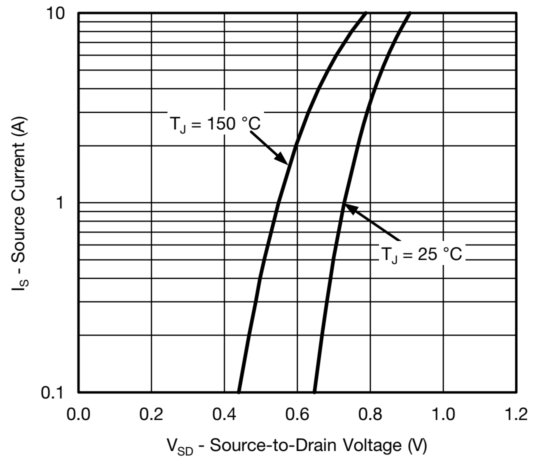


Gate Charge

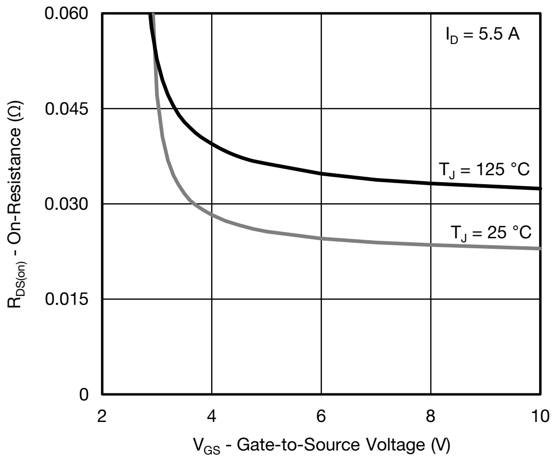


On-Resistance vs. Junction Temperature

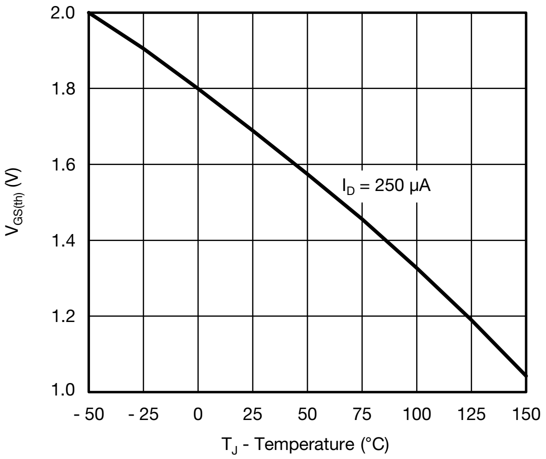
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



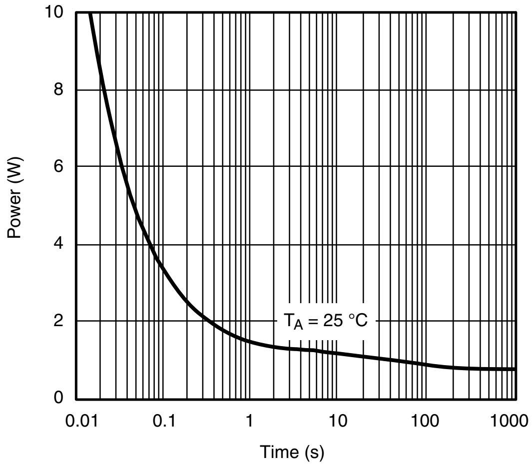
Source-Drain Diode Forward Voltage



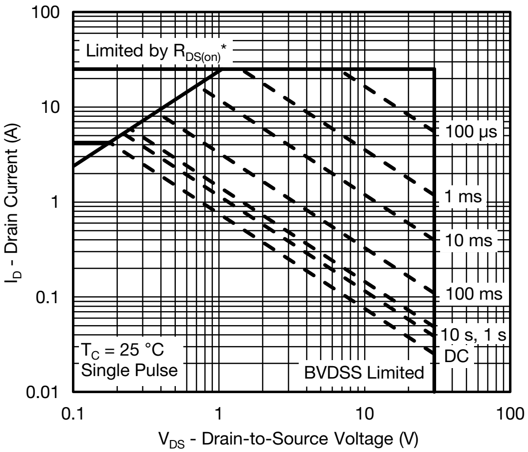
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

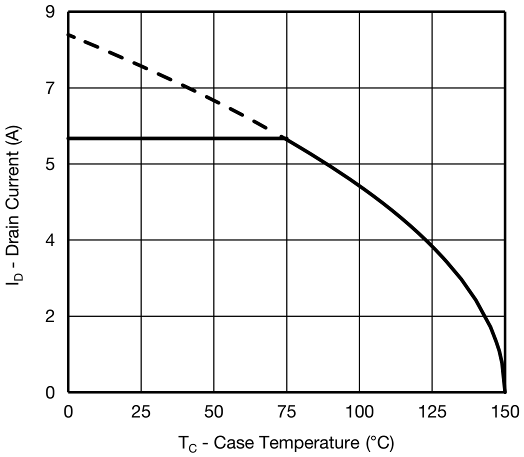


Single Pulse Power (Junction-to-Ambient)

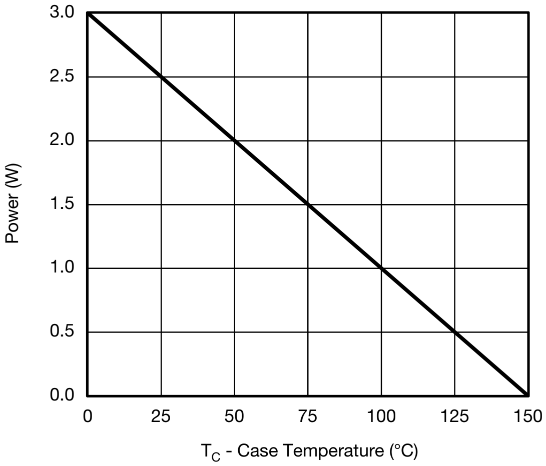


* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

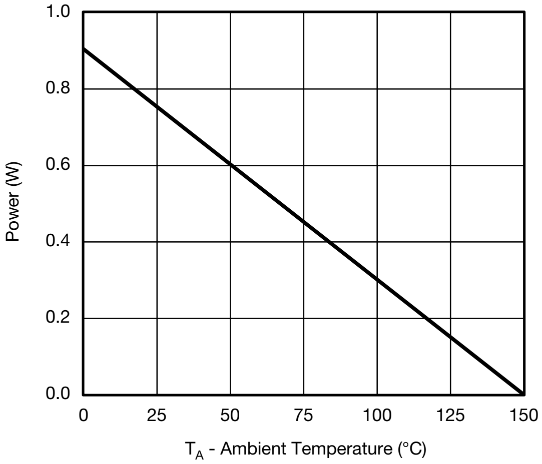
Safe Operating Area, Junction-to-Ambient



Current Derating*



Power Derating, Junction-to-Foot



Power Derating, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max.)}$ = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.