

N-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ)
30	0.050 at V _{GS} = 10 V	4.5	3.16 nC
	0.080 at V _{GS} = 4.5 V	3.4	

FEATURES

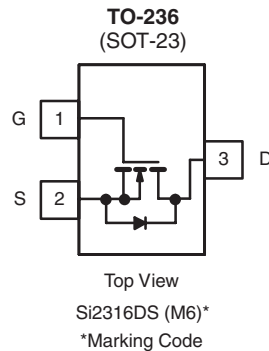
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- PWM Optimized
- 100 % R_g tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Battery Switch
- DC/DC Converter



Ordering Information: Si2316BDS-T1-E3 (Lead (Pb)-free)
Si2316BDS-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	4.5	A
	T _C = 70 °C		3.6	
	T _A = 25 °C		3.9 ^{b, c}	
	T _A = 70 °C		3.13 ^{b, c}	
Pulsed Drain Current		I _{DM}	20	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	1.39	
	T _A = 25 °C		1.04 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	P _D	1.66	W
	T _C = 70 °C		1.06	
	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}	80	100	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	60	75	

Notes:

- Based on T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under Steady State conditions is 130 °C/W.

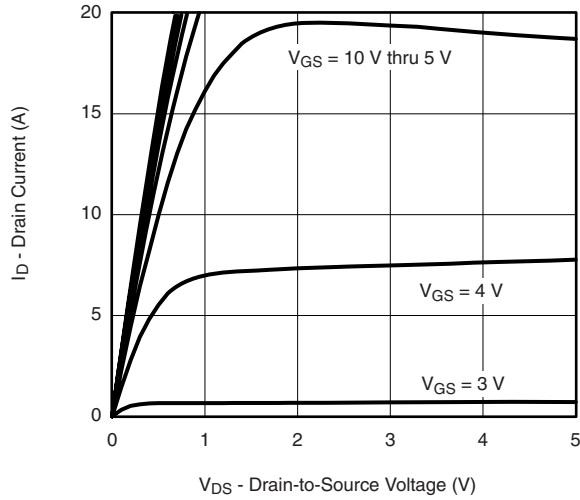
MOSFET SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{DS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		23.92		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			5.2		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1		3	V
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}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 3.9\text{ A}$		0.041	0.050	Ω
		$V_{GS} = 4.5\text{ V}, I_D = 3.3\text{ A}$		0.064	0.080	
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 3.9\text{ A}$		6		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		350		pF
Output Capacitance	C_{oss}			65		
Reverse Transfer Capacitance	C_{rss}			37		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 3.9\text{ A}$		6.35	9.6	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 3.9\text{ A}$		3.16	4.8	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 3.9\text{ A}$		1.56		
Gate-Drain Charge	Q_{gd}			1.1		
Gate Resistance	R_g	$f = 1\text{ MHz}$		2.6	3.9	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 4.8\text{ }\Omega$ $I_D \approx 3.13\text{ A}, V_{GEN} = 10\text{ V}, R_G = 1\text{ }\Omega$		4.5	6.75	ns
Rise Time	t_r			11	16.5	
Turn-Off Delay Time	$t_{d(off)}$			12	18	
Fall Time	t_f			7	10.5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 6.25\text{ }\Omega$ $I_D = 2.4\text{ A}, V_{GEN} = 4.5\text{ V}, R_G = 1\text{ }\Omega$		20	30	ns
Rise Time	t_r			65	98	
Turn-Off Delay Time	$t_{d(off)}$			11	17	
Fall Time	t_f			23	35	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			1.39	A
Pulse Diode Forward Current ^a	I_{SM}				20	
Body Diode Voltage	V_{SD}	$I_S = 2.0\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 2.0\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		10	15	ns
Body Diode Reverse Recovery Charge	Q_{rr}			4	6	nC
Reverse Recovery Fall Time	t_a			6.6		ns
Reverse Recovery Rise Time	t_b			3.5		

Notes:

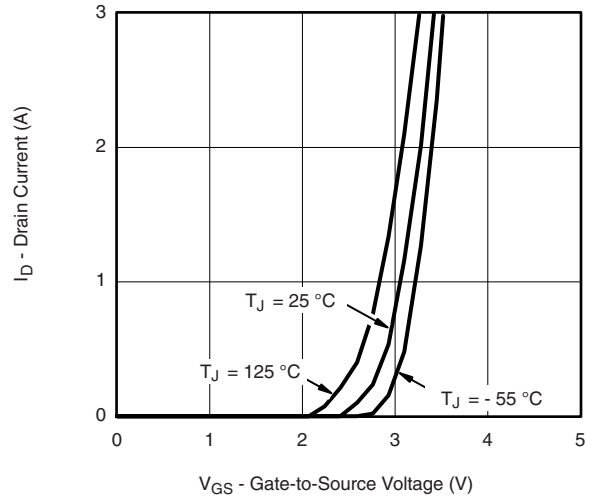
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
b. Guaranteed by design, not subject to production testing.

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.

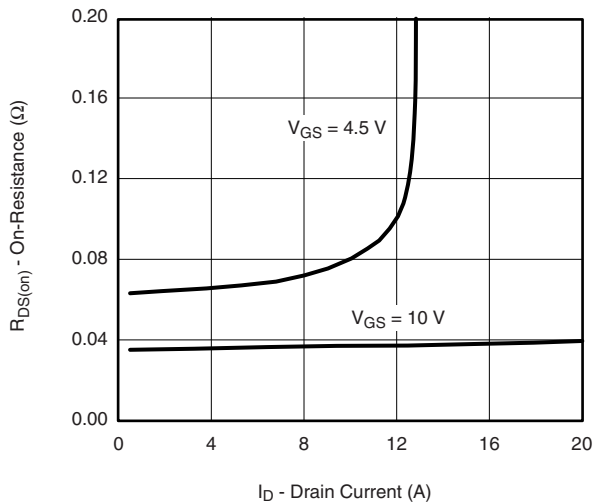
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



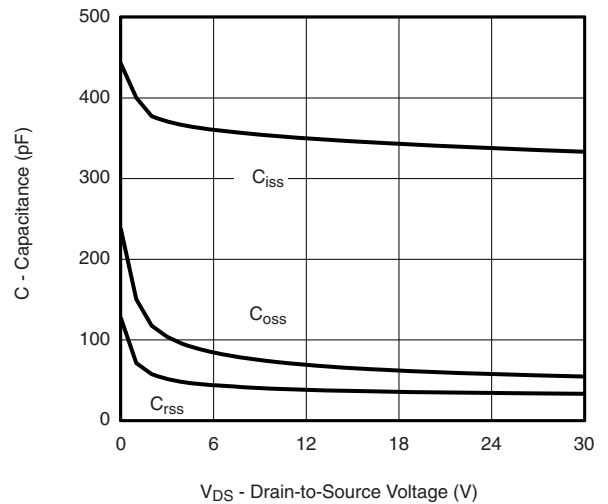
Output Characteristics



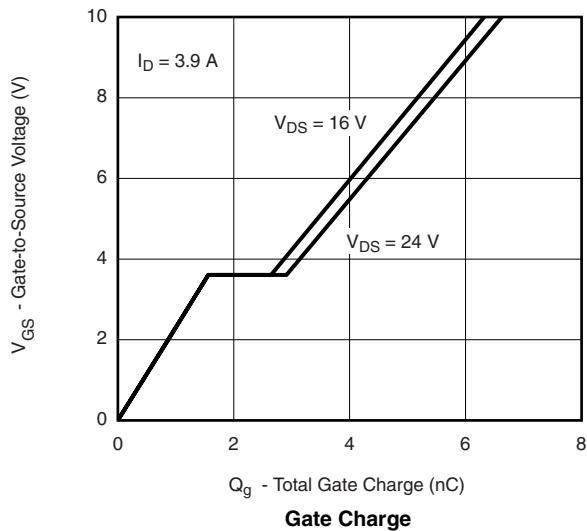
Transfer Characteristics



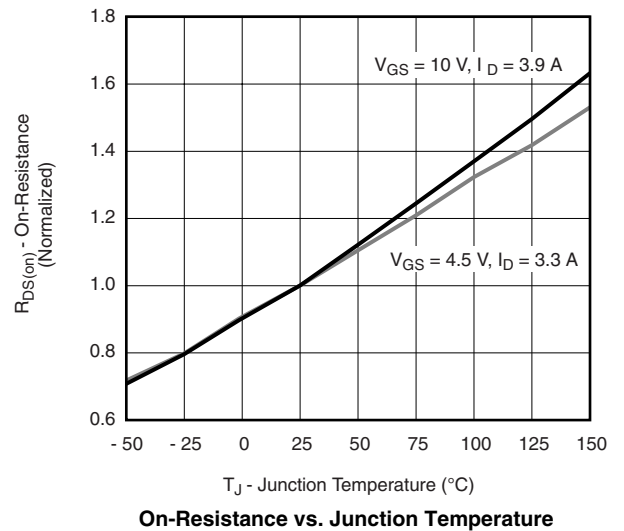
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

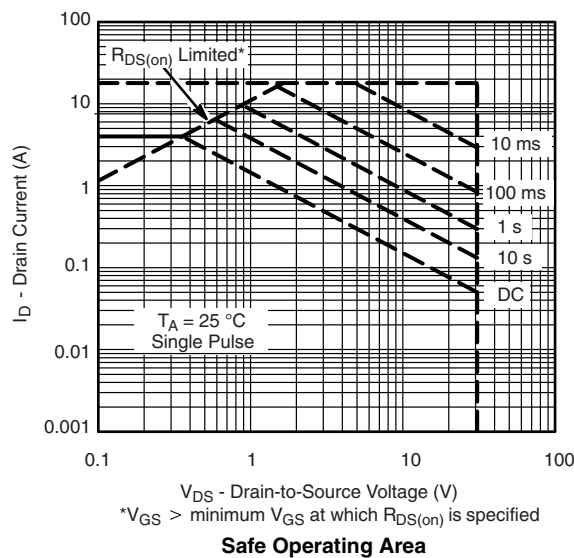
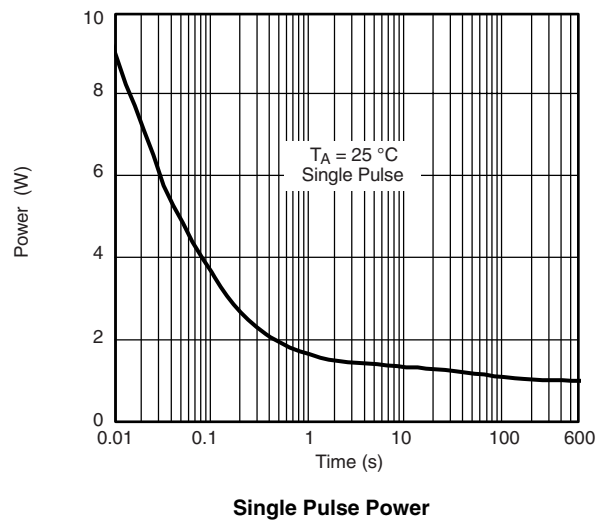
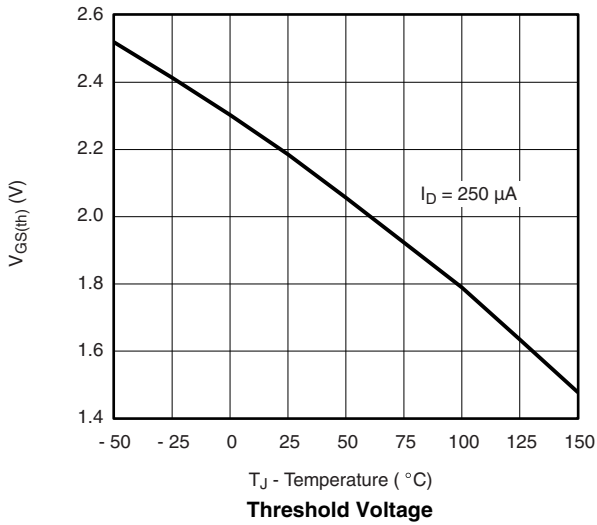
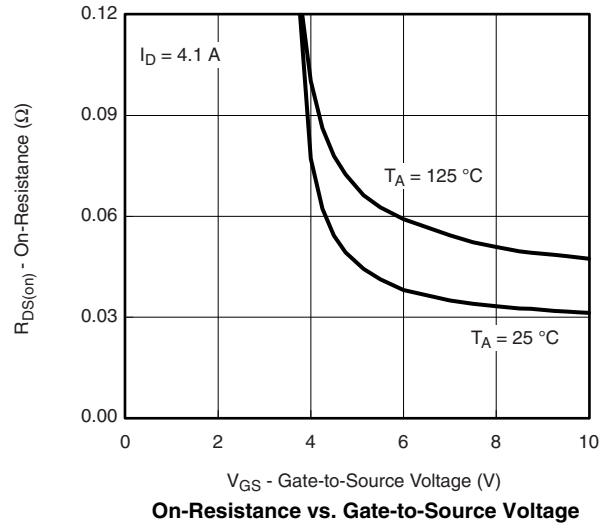
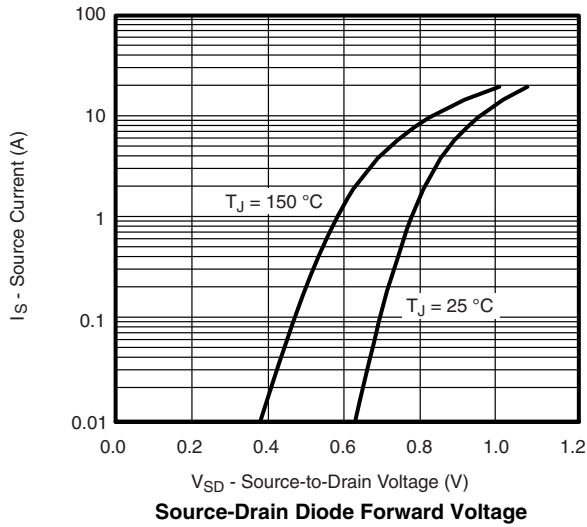


Gate Charge

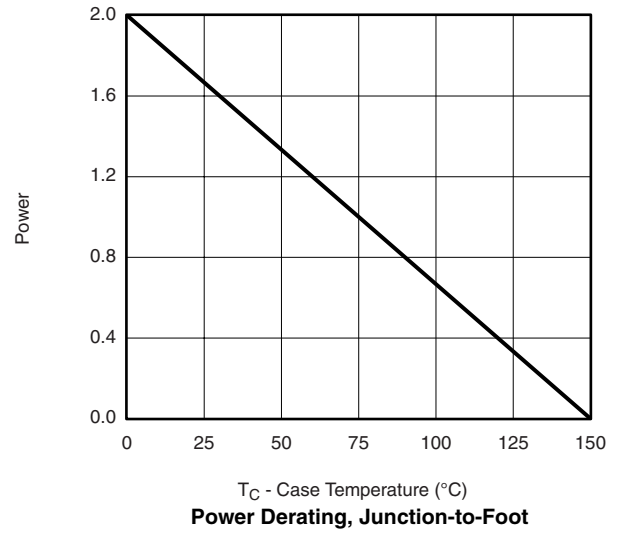
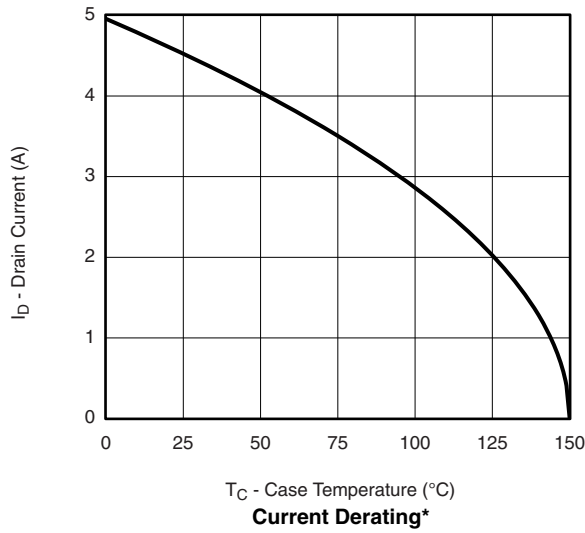


On-Resistance vs. Junction Temperature

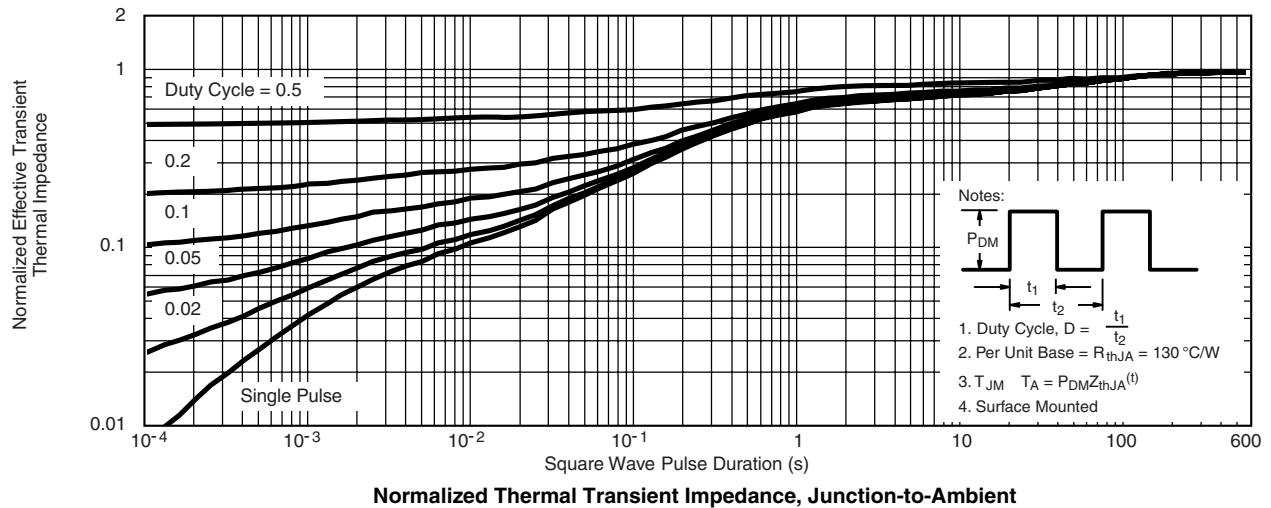
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



*The power dissipation P_D is based on $T_{J(max.)} = 150\text{ °C}$, 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.



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SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A ₁	0.01	0.10	0.0004	0.004
A ₂	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E ₁	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e ₁	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L ₁	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°

ECN: S-03946-Rev. K, 09-Jul-01
 DWG: 5479

RECOMMENDED MINIMUM PADS FOR SOT-23



Recommended Minimum Pads
Dimensions in Inches/(mm)

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