

## N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY		
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)
40	0.045 at V <sub>GS</sub> = 10 V	3.9
	0.058 at V <sub>GS</sub> = 4.5 V	3.5

### FEATURES

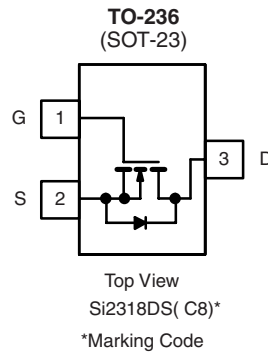
- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET® Power MOSFET



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Stepper Motors
- Load Switch



**Ordering Information:** Si2318DS-T1-E3 (Lead (Pb)-free)  
Si2318DS-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted					
Parameter	Symbol	5 s	Steady State	Unit	
Drain-Source Voltage	V <sub>DS</sub>	40		V	
Gate-Source Voltage	V <sub>GS</sub>	± 20			
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a, b</sup>	T <sub>A</sub> = 25 °C	3.9	3.0	A	
	T <sub>A</sub> = 70 °C	3.1	2.4		
Pulsed Drain Current <sup>b</sup>	I <sub>DM</sub>	16			
Continuous Source Current (Diode Conduction) <sup>a, b</sup>	I <sub>S</sub>	0.8		W	
Power Dissipation <sup>a, b</sup>	T <sub>A</sub> = 25 °C	1.25	0.75		
	T <sub>A</sub> = 70 °C	0.8	0.48		
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150		°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>a</sup>	t ≤ 5 s	75	100	°C/W	
	Steady State	120	166		
Maximum Junction-to-Foot (Drain)	Steady State	R <sub>thJF</sub>	40		

Notes:

- a. Surface mounted on 1" x 1" FR4 board.  
b. Pulse width limited by maximum junction temperature

SPECIFICATIONS $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Limits			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}$			0.5	$\mu\text{A}$
		$V_{DS} = 32\text{ V}, V_{GS} = 0\text{ V}, T_J = 55^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 4.5\text{ V}, V_{GS} = 10\text{ V}$	6			A
Drain-Source On-Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 3.9\text{ A}$		0.036	0.045	$\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$		0.045	0.058	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 3.9\text{ A}$		11		S
Diode Forward Voltage	$V_{SD}$	$I_S = 1.25\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_D = 3.9\text{ A}$		10	15	nC
Gate-Source Charge	$Q_{gs}$			1.6		
Gate-Drain Charge	$Q_{gd}$			2.1		
Gate Resistance	$R_g$			1.8		$\Omega$
Input Capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		540		pF
Output Capacitance	$C_{oss}$			80		
Reverse Transfer Capacitance	$C_{rss}$			45		
<b>Switching</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 20\text{ V}, R_L = 20\ \Omega$ $I_D \cong 1.0\text{ A}, V_{GEN} = 10\text{ V}, R_G = 6\ \Omega$		5	10	ns
Rise Time	$t_r$			12	20	
Turn-Off Delay Time	$t_{d(off)}$			20	30	
Fall Time	$t_f$			15	25	

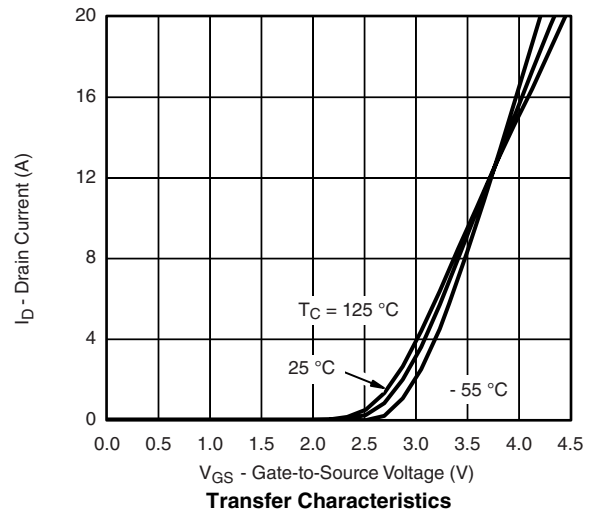
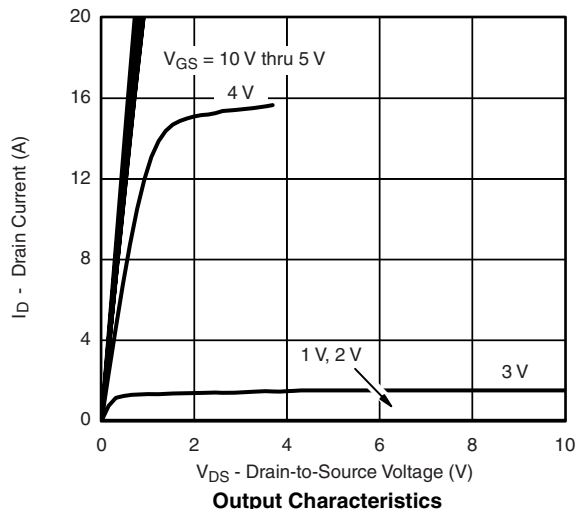
Notes:

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

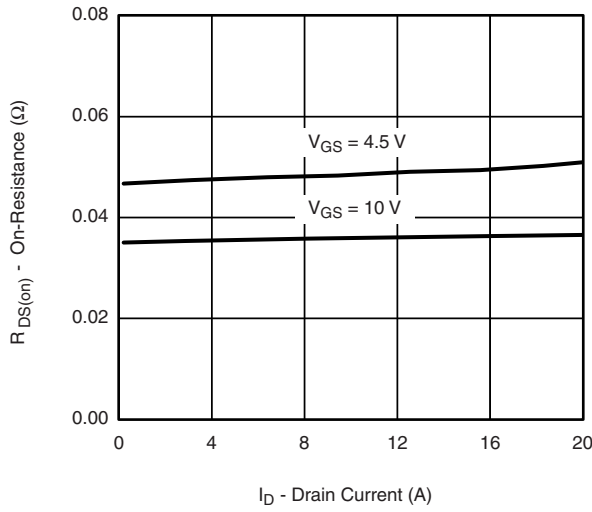
b. Guaranteed by design, not subject to production testing.

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.

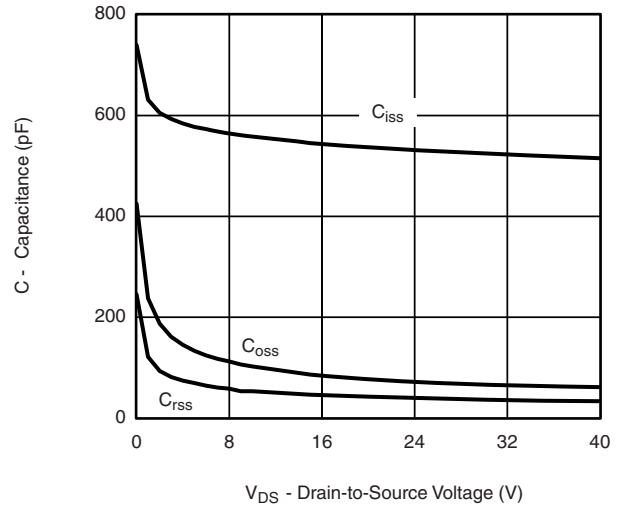
## TYPICAL CHARACTERISTICS $25^\circ\text{C}$ , unless otherwise noted



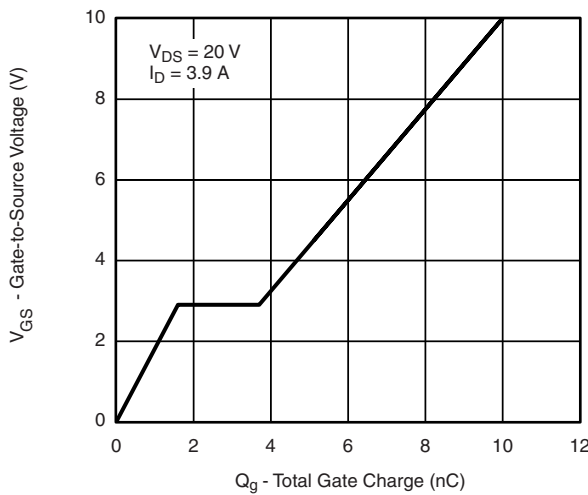
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



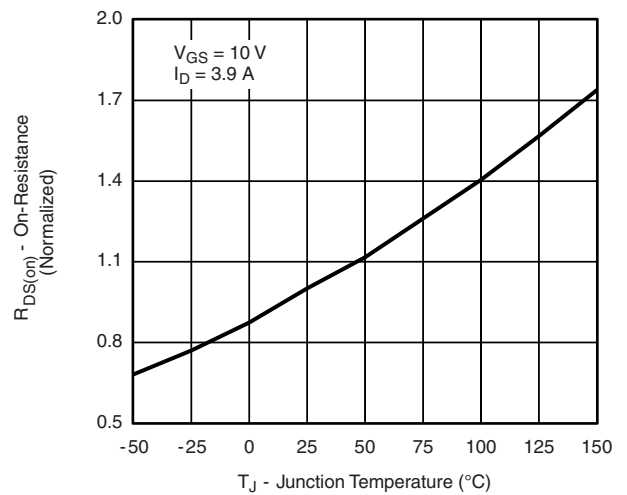
**On-Resistance vs. Drain Current**



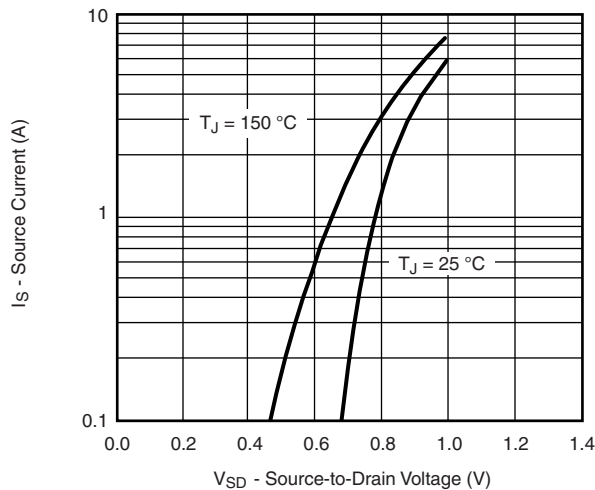
**Capacitance**



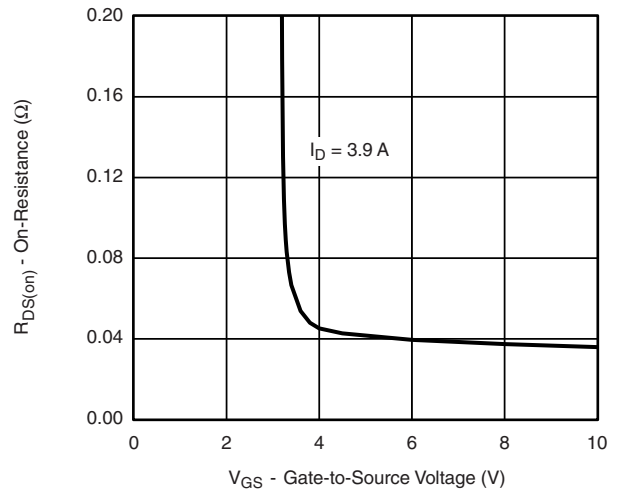
**Gate Charge**



**On-Resistance vs. Junction Temperature**

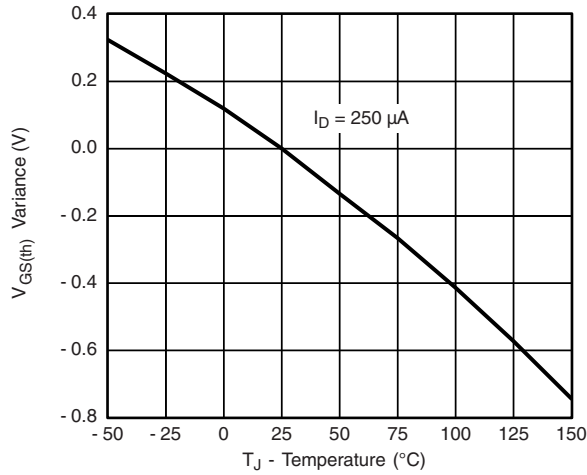


**Source-Drain Diode Forward Voltage**

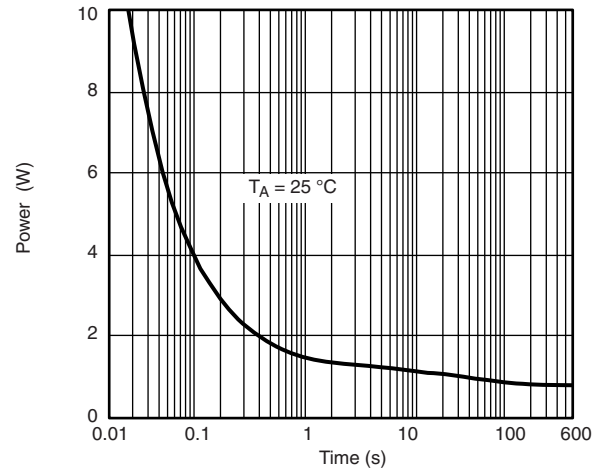


**On-Resistance vs. Gate-to-Source Voltage**

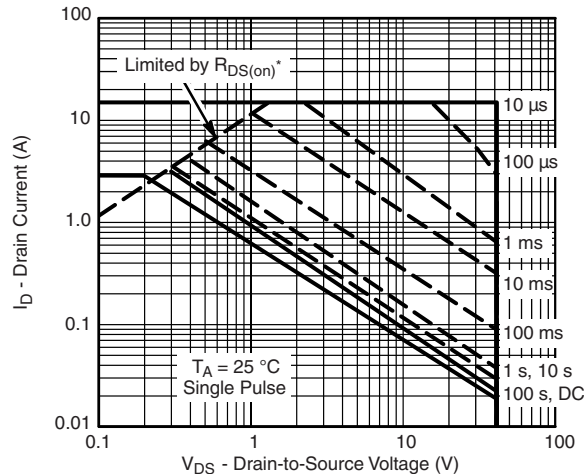
### TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



**Threshold Voltage**

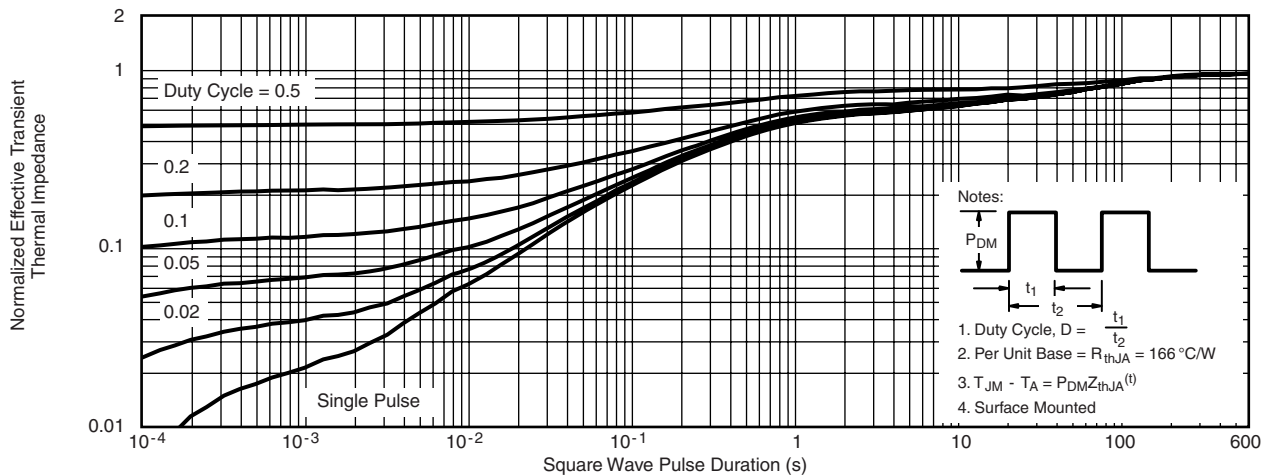


**Single Pulse Power**



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

**Safe Operating Area, Junction-to-Case**



Notes:

1. Duty Cycle,  $D = \frac{t_1}{t_1 + t_2}$
2. Per Unit Base =  $R_{thJA} = 166 \text{ }^\circ\text{C/W}$
3.  $T_{JM} - T_A = P_{DM} Z_{thJA}^{(t)}$
4. Surface Mounted

**Normalized Thermal Transient Impedance, Junction-to-Ambient**

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



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A <sub>1</sub>	0.01	0.10	0.0004	0.004
A <sub>2</sub>	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 <sub>1</sub>	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e <sub>1</sub>	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L <sub>1</sub>	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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