

SI1539DL-T1-GE3-VB Datasheet

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

PRODUCT SUMMARY

	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.090 at $V_{GS} = 4.5$ V	3.28
		0.110 at $V_{GS} = 2.5$ V	2.13
		0.130 at $V_{GS} = 1.8$ V	1.50
P-Channel	- 20	0.155 at $V_{GS} = - 4.5$ V	- 2.80
		0.190 at $V_{GS} = - 2.5$ V	- 1.81
		0.220 at $V_{GS} = - 1.8$ V	- 1.15

FEATURES

- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFETs: 1.8 V Rated
- Thermally Enhanced SC-70 Package
- Fast Switching
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- Load Switch for Portable Devices



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	N-Channel		P-Channel		Unit
		5 s	Steady State	5 s	Steady State	
Drain-Source Voltage	V_{DS}	20		- 20		V
Gate-Source Voltage	V_{GS}	± 20		± 20		
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	I_D	3.28	3.03	- 2.80	- 2.58	A
		2.12	1.81	- 1.72	- 1.53	
Pulsed Drain Current	I_{DM}	9.5		- 8.5		
Continuous Source Current (Diode Conduction) ^a	I_S	2.61	2.48	- 1.61	-1.48	
Maximum Power Dissipation ^a	P_D	1.24	1.17	1.10	0.97	W
		0.88	0.75	0.66	0.5	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150				$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 5$ s	R_{thJA}	130	170	$^\circ\text{C/W}$
	Steady State		170	220	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	80	100	

Notes:

a. Surface mounted on 1" x 1" FR4 board.

SPECIFICATIONS T _J = 25 °C, unless otherwise noted								
Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit	
Static								
Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 100 μA	N-Ch	0.45		1	V	
		V _{DS} = V _{GS} , I _D = - 100 μA	P-Ch	- 0.45		1		
Gate-Body Leakage	I _{GSS}	V _{DS} = 0 V, V _{GS} = ± 8 V	N-Ch P-Ch			± 100 ± 100	nA	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 16 V, V _{GS} = 0 V	N-Ch			1	μA	
		V _{DS} = - 16 V, V _{GS} = 0 V	P-Ch			- 1		
		V _{DS} = 16 V, V _{GS} = 0 V, T _J = 85 °C	N-Ch			5		
		V _{DS} = - 16 V, V _{GS} = 0 V, T _J = 85 °C	P-Ch			- 5		
On-State Drain Current ^a	I _{D(on)}	V _{DS} ≥ 5 V, V _{GS} = 4.5 V	N-Ch	2			A	
		V _{DS} ≤ - 5 V, V _{GS} = - 4.5 V	P-Ch	- 2				
Drain-Source On-State Resistance ^a	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 2.55 A	N-Ch		0.090		Ω	
		V _{GS} = - 4.5 V, I _D = - 1.85 A	P-Ch		0.155			
		V _{GS} = 2.5 V, I _D = 1.55 A	N-Ch		0.110			
		V _{GS} = - 2.5 V, I _D = - 1.35 A	P-Ch		0.190			
		V _{GS} = 1.8 V, I _D = 0.50 A	N-Ch		0.130			
		V _{GS} = - 1.8 V, I _D = - 0.50 A	P-Ch		0.220			
Forward Transconductance ^a	g _{fs}	V _{DS} = 10 V, I _D = 1.13 A	N-Ch		2.6		S	
		V _{DS} = - 10 V, I _D = - 0.88 A	P-Ch		1.5			
Diode Forward Voltage ^a	V _{SD}	I _S = 0.48 A, V _{GS} = 0 V	N-Ch		0.8	1.2	V	
		I _S = - 0.48 A, V _{GS} = 0 V	P-Ch		- 0.8	- 1.2		
Dynamic ^b								
Total Gate Charge	Q _g	N-Channel V _{DS} = 10 V, V _{GS} = 4.5 V, I _D = 2.55 A P-Channel V _{DS} = - 10 V, V _{GS} = - 4.5 V, I _D = - 0.88 A	N-Ch P-Ch		1.25 1.2	2 1.8	nC	
Gate-Source Charge	Q _{gs}		N-Ch P-Ch		0.21 0.3			
Gate-Drain Charge	Q _{gd}		N-Ch P-Ch		0.3 0.21			
Turn-On Delay Time	t _{d(on)}	N-Channel V _{DD} = 10 V, R _L = 20 Ω I _D ≅ 0.5 A, V _{GEN} = 4.5 V, R _g = 6 Ω P-Channel V _{DD} = - 10 V, R _L = 20 Ω I _D ≅ - 0.5 A, V _{GEN} = - 4.5 V, R _g = 6 Ω	N-Ch P-Ch		15 18	25 30	ns	
Rise Time	t _r		N-Ch P-Ch		22 25	35 40		
Turn-Off Delay Time	t _{d(off)}		N-Ch P-Ch		25 15	40 25		
Fall Time	t _f		N-Ch P-Ch		12 12	20 20		
Reverse Recovery Time	t _{rr}		I _F = 0.48 A, dI/dt = 100 A/μs	N-Ch P-Ch		30 30		60 60

Notes:

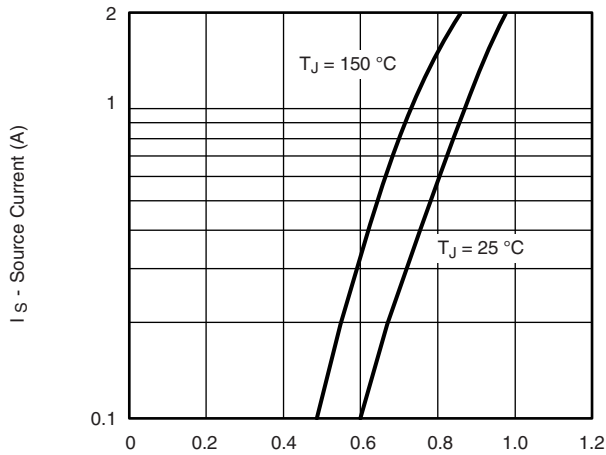
a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

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

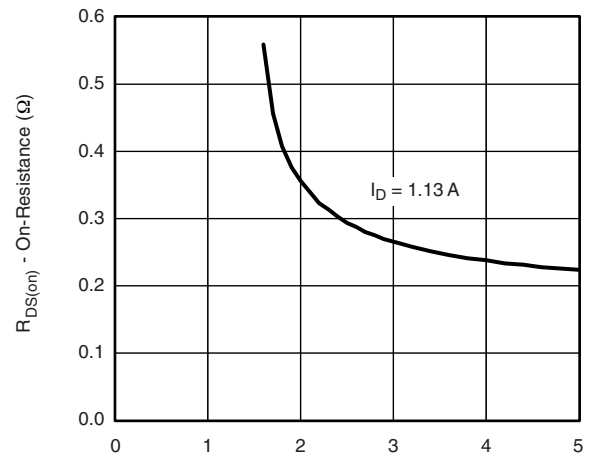
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

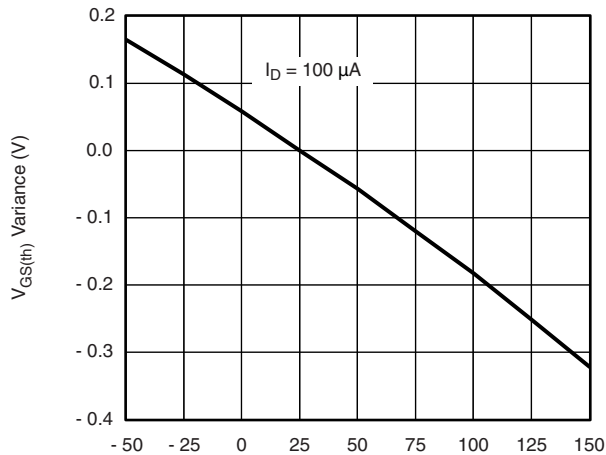

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



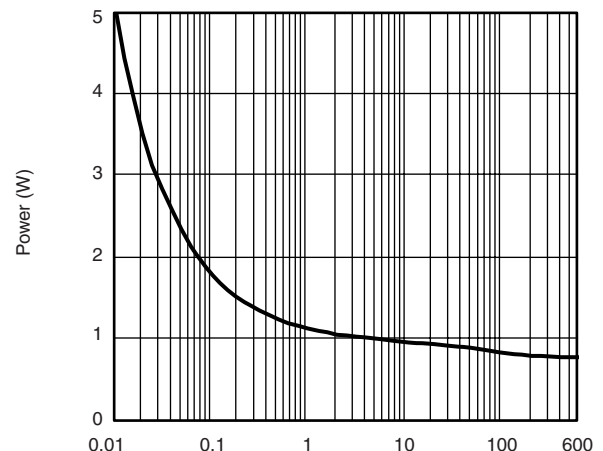
Source-Drain Diode Forward Voltage



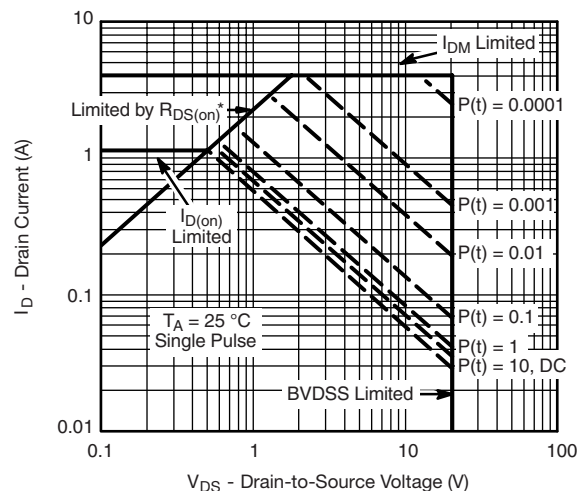
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



Single Pulse Power, Junction-to-Ambient



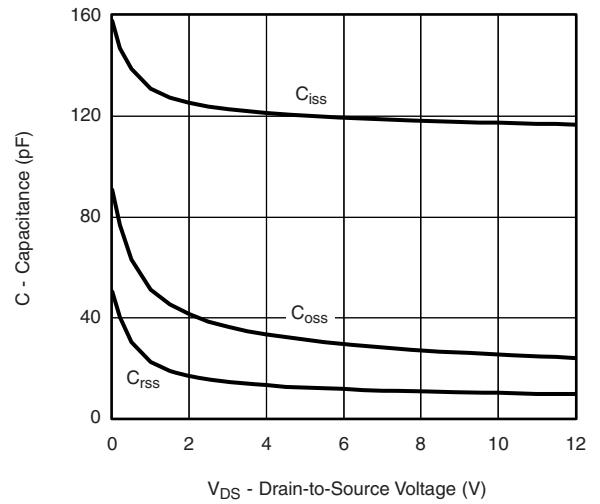
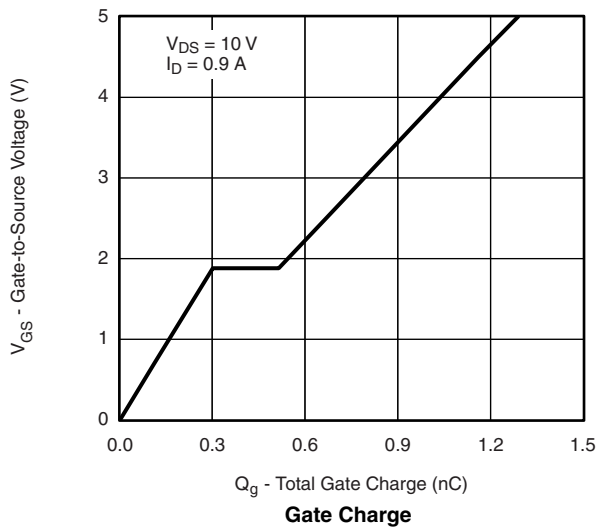
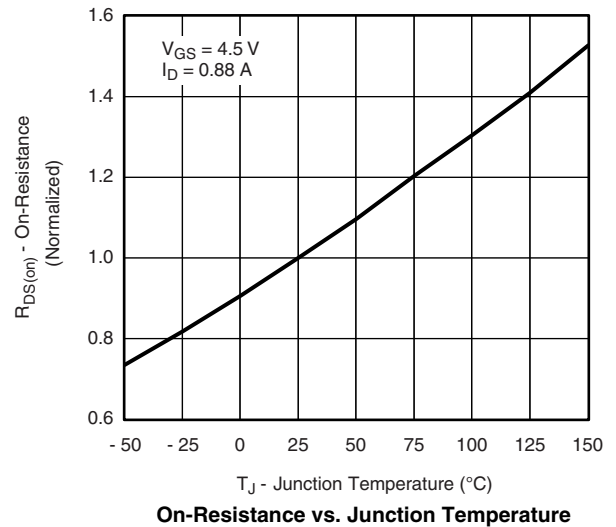
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

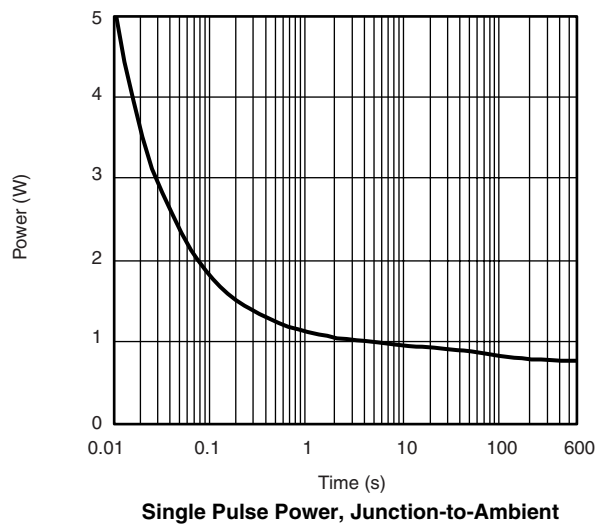
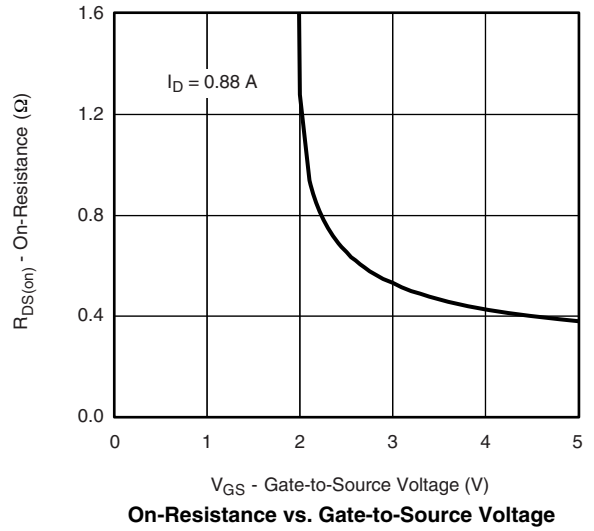
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Output Characteristics

Transfer Characteristics

On-Resistance vs. Drain Current

Capacitance

Gate Charge

On-Resistance vs. Junction Temperature

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


SC-70: 6-LEADS



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.90	—	1.10	0.035	—	0.043
A ₁	—	—	0.10	—	—	0.004
A ₂	0.80	—	1.00	0.031	—	0.039
b	0.15	—	0.30	0.006	—	0.012
c	0.10	—	0.25	0.004	—	0.010
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E ₁	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65BSC			0.026BSC		
e ₁	1.20	1.30	1.40	0.047	0.051	0.055
L	0.10	0.20	0.30	0.004	0.008	0.012
α	7°Nom			7°Nom		

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