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

PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)	Q_g (Typ)
20	0.049 at V_{GS} = 4.5 V	6.1[a]	6.0
	0.056 at V_{GS} = 2.5 V	5.7	
	0.065 at V_{GS} = 1.8 V	5.3	

FEATURES

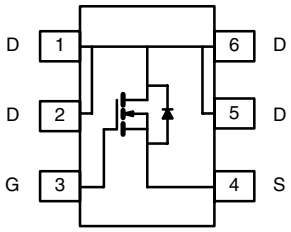
- TrenchFET® Power MOSFET
- 100 % R_g & UIS Tested

APPLICATIONS

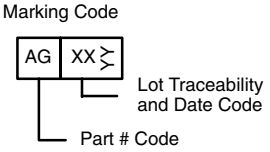
- Load Switch for Portable Devices

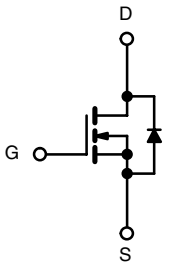
Pb-free
RoHS COMPLIANT

SOT-363
SC-70 (6-LEADS)



Top View





N-Channel MOSFET

Ordering Information: Si1488DH-T1-E3 (Lead (Pb)-free)

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted				
Parameter		**Symbol**	**Limit**	**Unit**
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current (T_J = 150 °C)[a]	T_C = 25 °C	I_D	6.1	A
	T_C = 70 °C		4.9	
	T_A = 25 °C		4.6[b, c]	
	T_A = 70 °C		3.7[b, c]	
Pulsed Drain Current		I_{DM}	20	
Avalanche Current	L = 0.1 mH	I_{AS}	10	
Repetitive Avalanche Energy		E_{AS}	5	mJ
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	2.3	A
	T_A = 25 °C		1.3[b, c]	
Maximum Power Dissipation[a]	T_C = 25 °C	P_D	2.8	W
	T_C = 70 °C		1.8	
	T_A = 25 °C		1.5[b, c]	
	T_A = 70 °C		1.0[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]	t ≤ 5 sec	R_{thJA}	60	80	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	34	45	

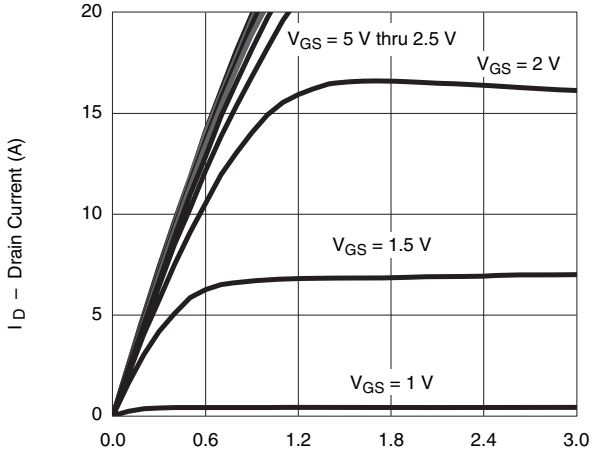
Notes:
a. Based on T_C = 25 °C.
b. Surface Mounted on 1" x 1" FR4 board.
c. t = 5 sec.
d. Maximum under Steady State conditions is 125 °C/W.

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	20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		20.2		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 2.75		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.45		0.95	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 85 °C			10	µA
On-State Drain Current[a]	$I_{D(on)}$	V_{DS} = ≥ 5 V, V_{GS} = 4.5 V	20			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 4.6 A		0.041	0.049	Ω
		V_{GS} = 2.5 V, I_D = 4.3 A		0.047	0.056	
		V_{GS} = 1.8 V, I_D = 3.9 A		0.054	0.065	
Forward Transconductance	g_{fs}	V_{DS} = 10 V, I_D = 4.6 A		15		mS
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		530		pF
Output Capacitance	C_{oss}			100		
Reverse Transfer Capacitance	C_{rss}			48		
Total Gate Charge	Q_g	V_{DS} = 10 V, V_{GS} = 5 V, I_D = 4.6 A		6.6	10	pC
		V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 4.6 A		6	9	
Gate-Source Charge	Q_{gs}			1.5		
Gate-Drain Charge	Q_{gd}			0.9		
Gate Resistance	R_g	f = 1 MHz		7.3	11	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10 V, R_L = 2.7 Ω I_D ≅ 3.7 A, V_{GEN} = 4.5 V, R_g = 1 Ω		8.5	13	ns
Rise Time	t_r			45	68	
Turn-Off DelayTime	$t_{d(off)}$			35	53	
Fall Time	t_f			82	123	
Drain-Source Body Diode Characteristics						
Continous Source-Drain Diode Current	I_S	T_C = 25 °C			2.3	A
Pulse Diode Forward Current[a]	I_{SM}				20	
Body Diode Voltage	V_{SD}	I_S = 2.2 A		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 3.2 A, di/dt = 100 A/µs		10.6	16	nC
Body Diode Reverse Recovery Charge	Q_{rr}			3.7	5.7	ns
Reverse Recovery Fall Time	t_a			6.2		
Reverse Recovery Rise Time	t_b			4.4		

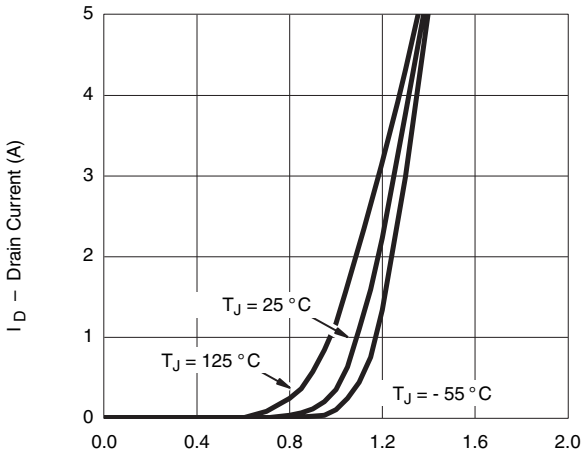
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

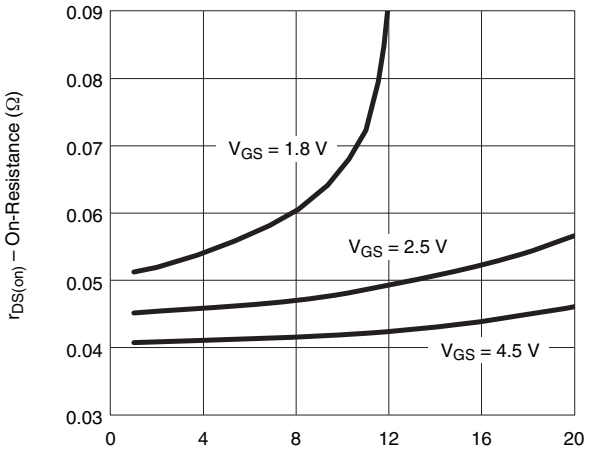
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



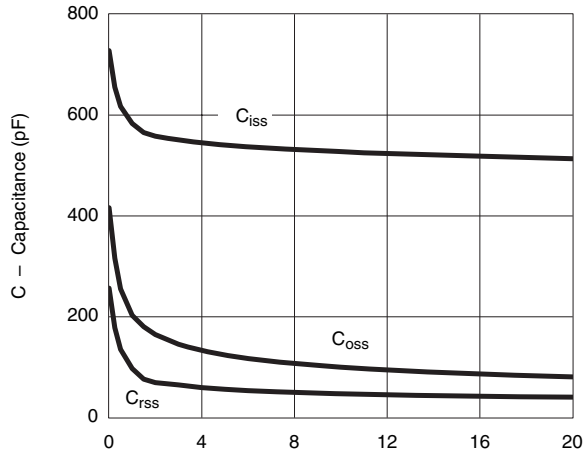
Output Characteristics



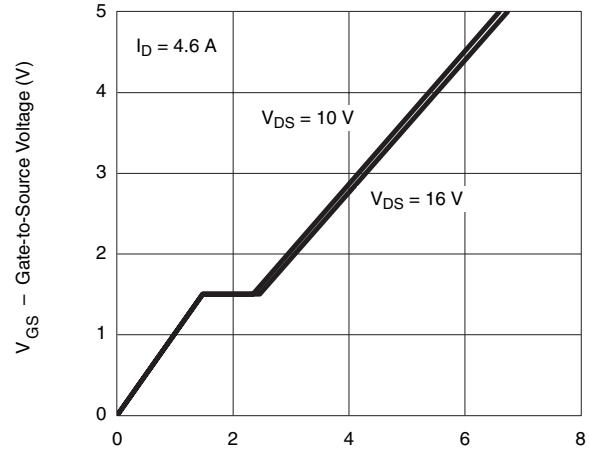
Transfer Characteristics curves vs. Temp



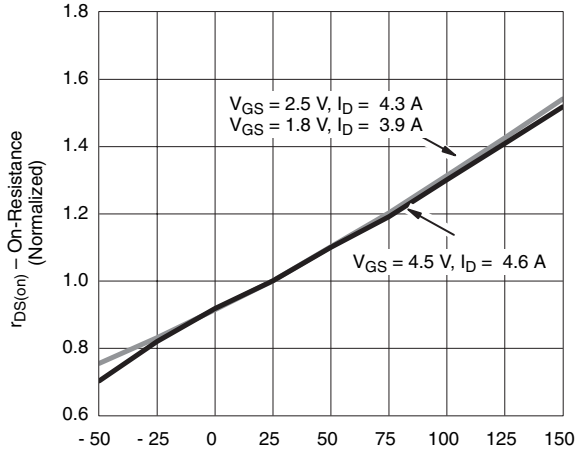
On-Resistance vs. Drain Current



Capacitance

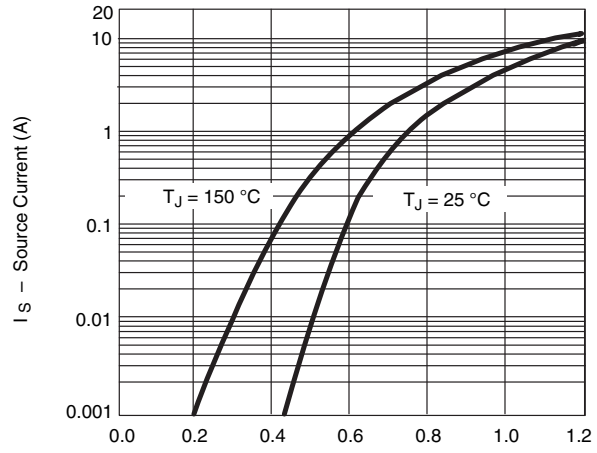


Q_g - Gate Charge

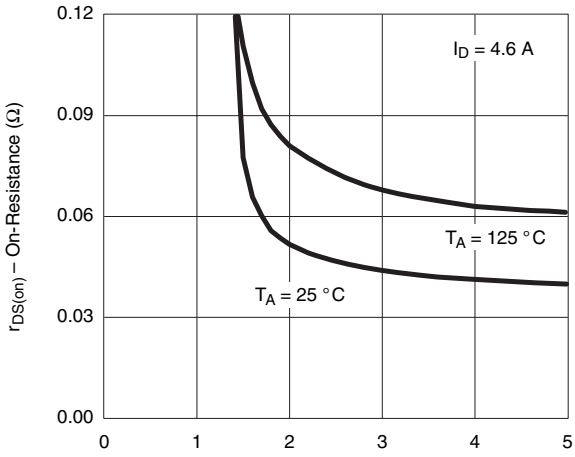


On-Resistance vs. Junction Temperature

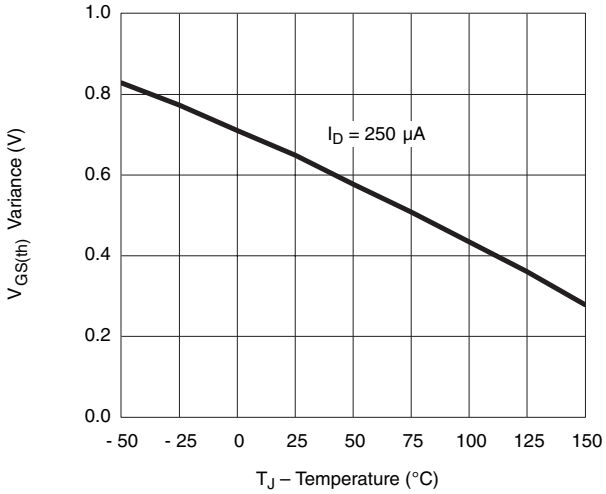
TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



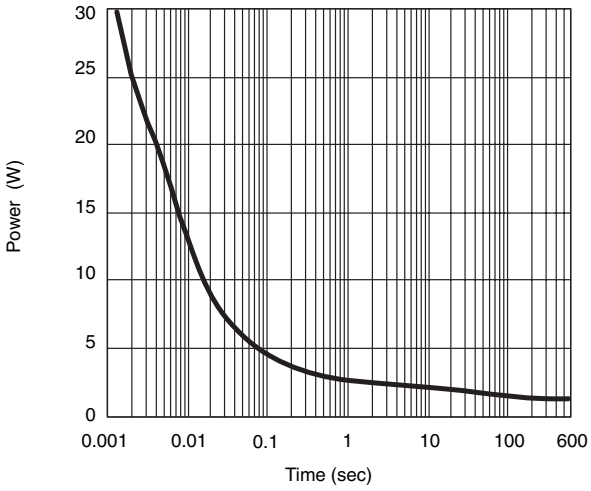
Source-Drain Diode Forward Voltage



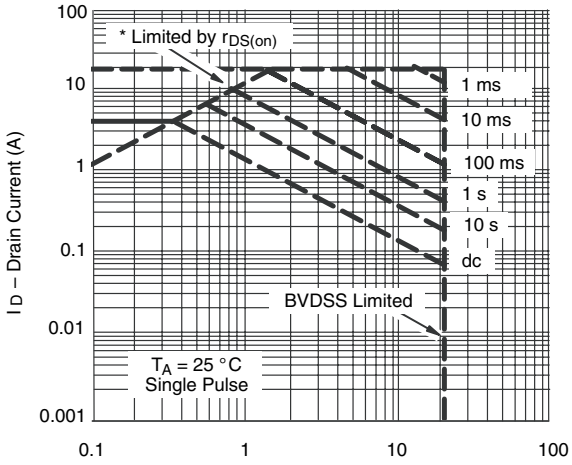
$r_{DS(on)}$ vs V_{GS} vs Temperature



Threshold Voltage



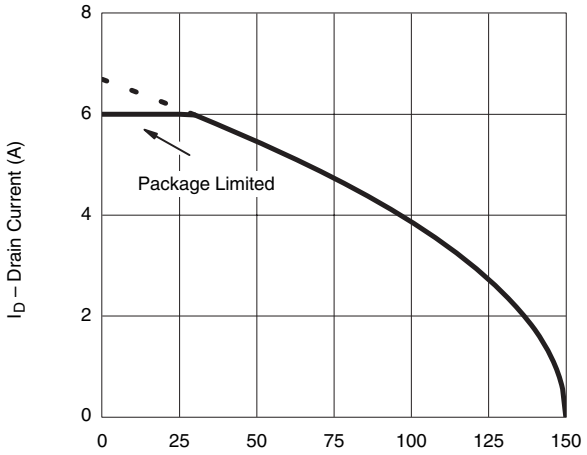
Single Pulse Power



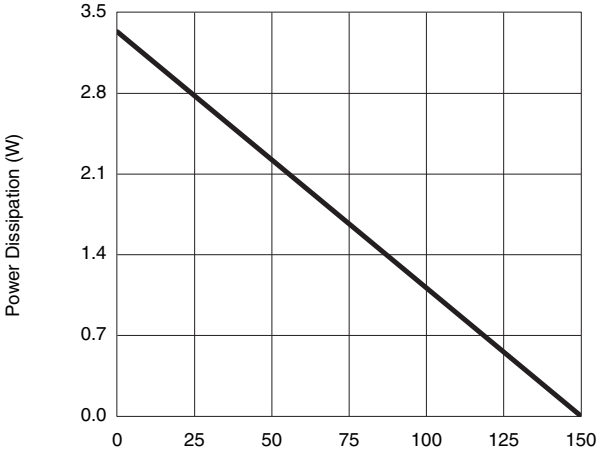
* V_{GS} > minimum V_{GS} at which $r_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



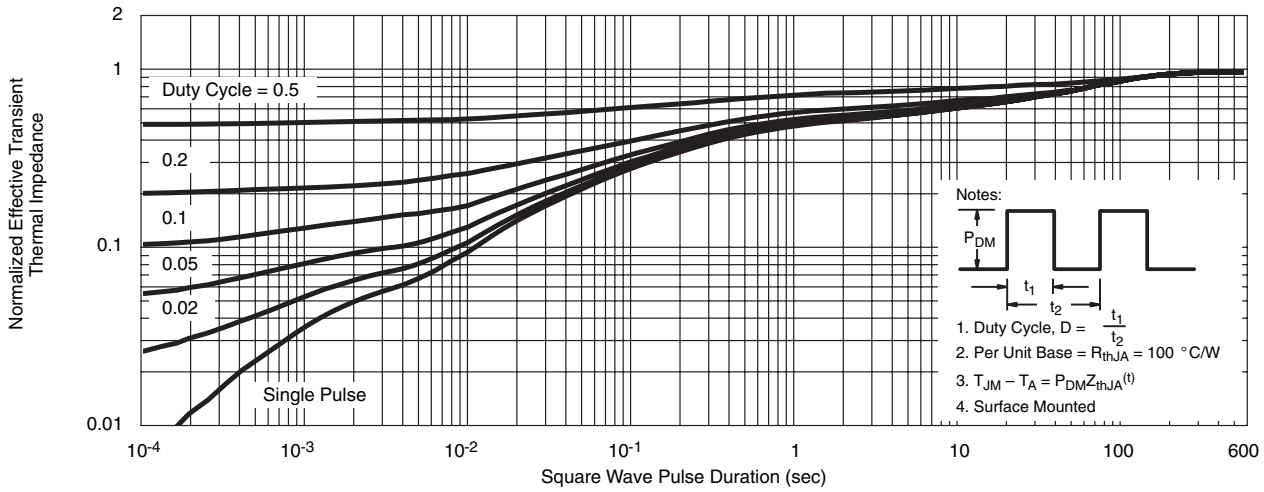
Current Derating*



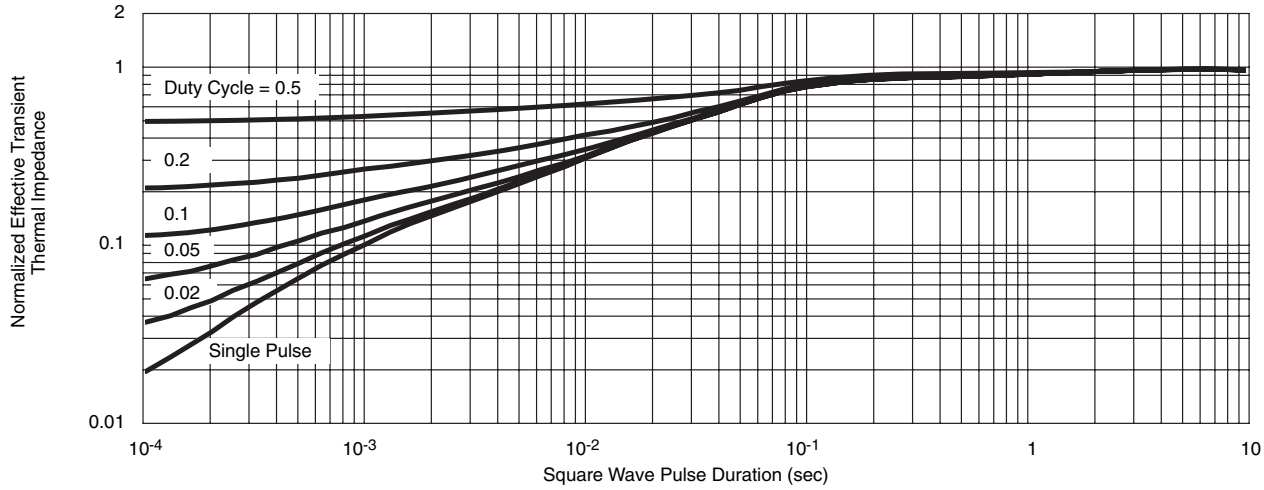
Power Derating

* 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.

TYPICAL CHARACTERISTICS T_A = 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see http://www.vishay.com/ppg?73788.

Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.