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

PRODUCT SUMMARY			
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)[a]	Q_g (Typ)
30	0.225 at V_{GS} = 4.5 V	1.3[a]	1.15 nC
	0.345 at V_{GS} = 2.5 V	1.3[a]	

FEATURES

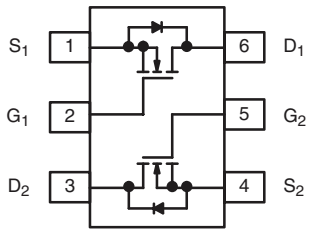
- TrenchFET® Power MOSFET

APPLICATIONS

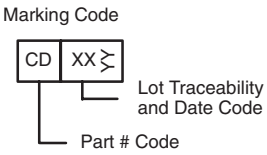
- Load switch for portable applications

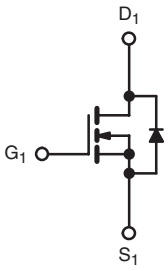
Pb-free
RoHS COMPLIANT

SOT-363
SC-70 (6-LEADS)

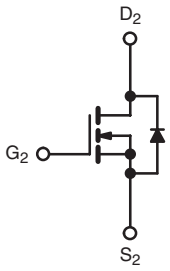


Top View





N-Channel MOSFET



N-Channel MOSFET

Ordering Information: Si1970DH-T1-E3 (Lead (Pb)-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}	± 12	
Continuous Drain Current (T_J = 150 °C)	T_C = 25 °C	I_D	1.3[a]	A
	T_C = 70 °C		1.3[a]	
	T_A = 25 °C		1.3[a]	
	T_A = 70 °C		1.1	
Pulsed Drain Current		I_{DM}	4	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	1.0	
	T_A = 25 °C		0.61[c]	
Maximum Power Dissipation	T_C = 25 °C	P_D	1.25	W
	T_C = 70 °C		0.8	
	T_A = 25 °C		0.74[b, c]	
	T_A = 70 °C		0.47[b, c]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature)[d, e]			260	

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[b, f]	t ≤ 5 sec	R_{thJA}	130	170	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	80	100	

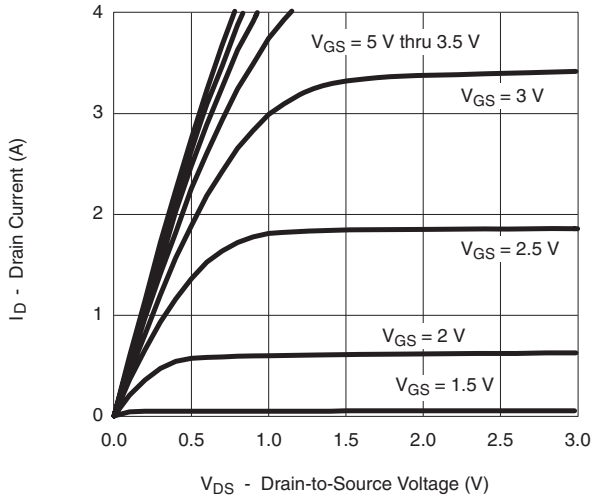
Notes:
a. Package limited.
b. Surface Mounted on 1" x 1" FR4 Board.
c. t = 5 sec.
d. Maximum under Steady State conditions is 220 °C/W.

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	30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA		25		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 3.2		
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	0.6		1.6	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 12 V			± 100	ns
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 = 55 °C			10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ 5 V, V_{GS} = 4.5 V	4			A
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	V_{GS} = 4.5 V, I_D = 1.2 A		0.185	0.225	Ω
		V_{GS} = 2.5 V, I_D = 0.29 A		0.285	0.345	
Forward Transconductance[a]	g_{fs}	V_{DS} = 15 V, I_D = 1.2 A		2.5		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		95		pF
Output Capacitance	C_{oss}			17		
Reverse Transfer Capacitance	C_{rss}			9		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 1.4 A		2.5	3.8	nC
		V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 1.4 A		1.15	1.7	
Gate-Source Charge	Q_{gs}			0.4		
Gate-Drain Charge	Q_{gd}			0.3		
Gate Resistance	R_g	f = 1 MHz		4		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 13.6 Ω $I_D \cong$ 1.1 A, V_{GEN} = 4.5 V, R_g = 1 Ω		9	15	ns
Rise Time	t_r			20	30	
Turn-Off Delay Time	$t_{d(off)}$			15	25	
Fall Time	t_f			15	25	
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 15 V, R_L = 13.6 Ω $I_D \cong$ 1.1 A, V_{GEN} = 10 V, R_g = 1 Ω		5	10	
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			10	15	
Fall Time	t_r			6	12	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			1	A
Pulse Diode Forward Current	I_{SM}				4	
Body Diode Voltage	V_{SD}	I_S = 1.1 A, V_{GS} = 0 V		0.85	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = 1.1 A, di/dt = 100 A/µs, T_J = 25 °C		20	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			10	20	nC
Reverse Recovery Fall Time	t_a			16.5		ns
Reverse Recovery Rise Time	t_b			3.5		

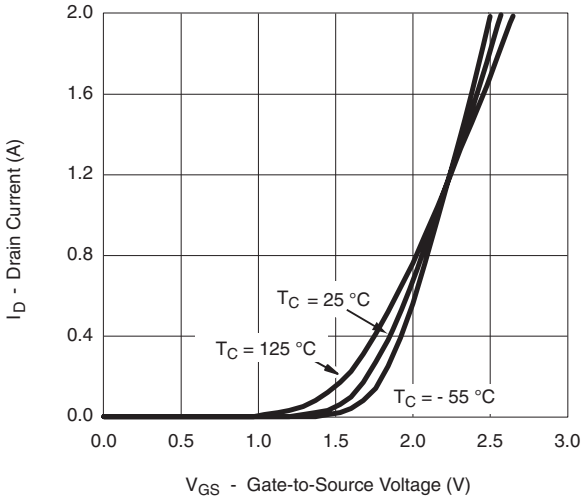
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

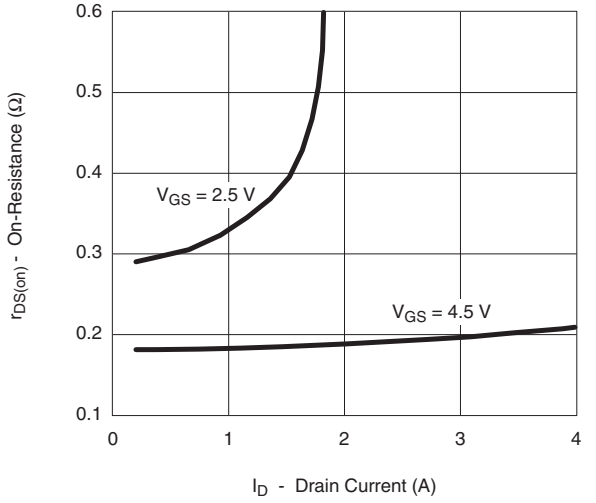
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



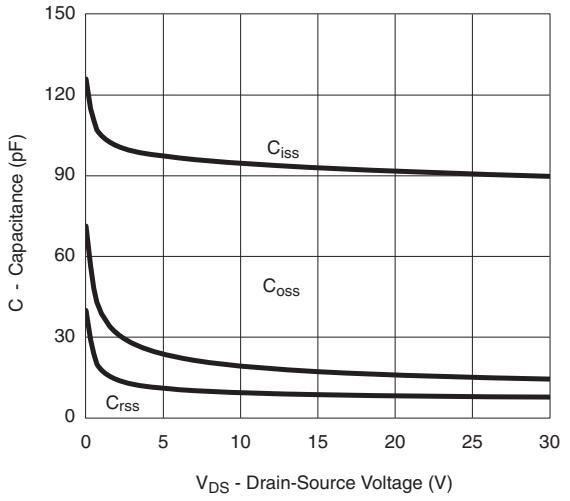
Output Characteristics



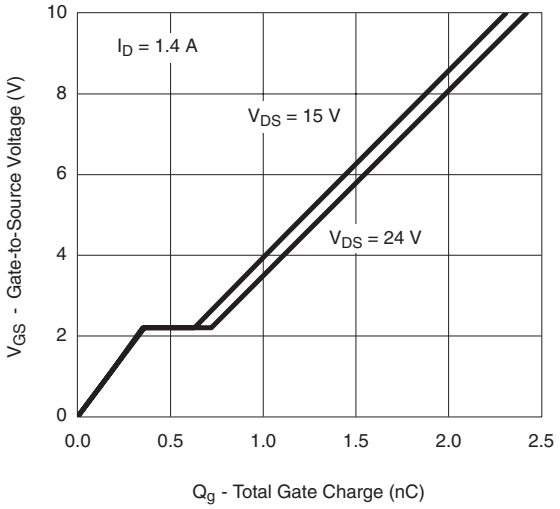
Transfer Characteristics



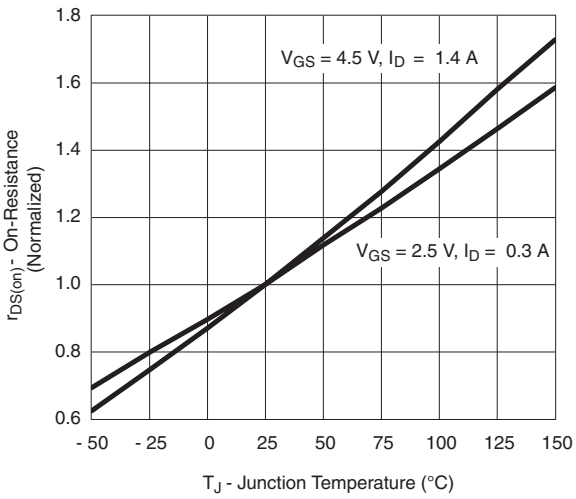
On-Resistance vs. Drain Current



Capacitance

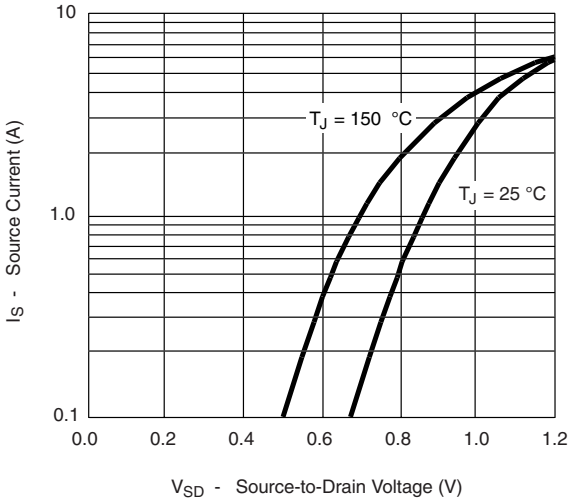


Gate Charge

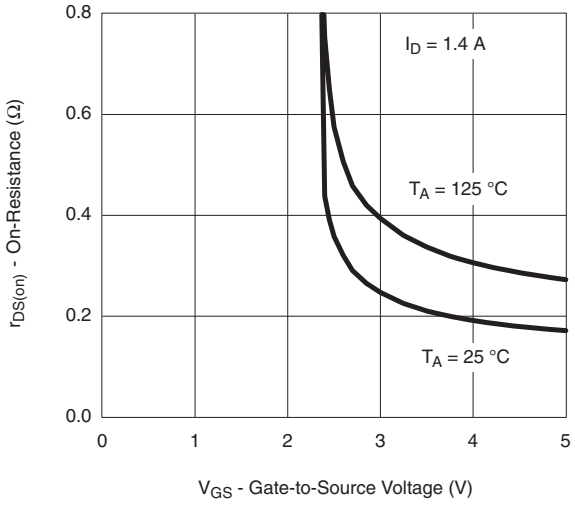


On-Resistance vs. Junction Temperature

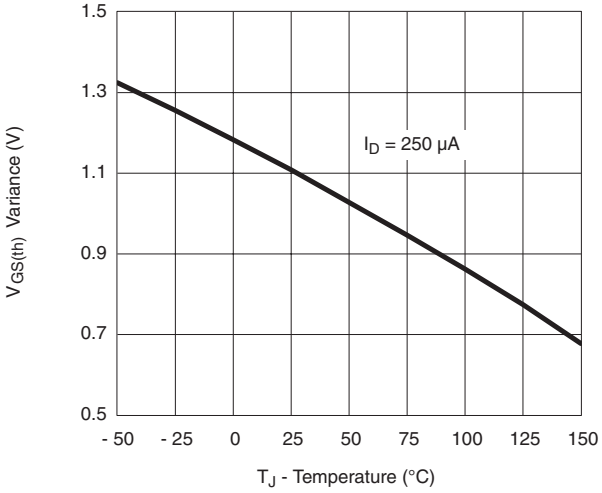
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



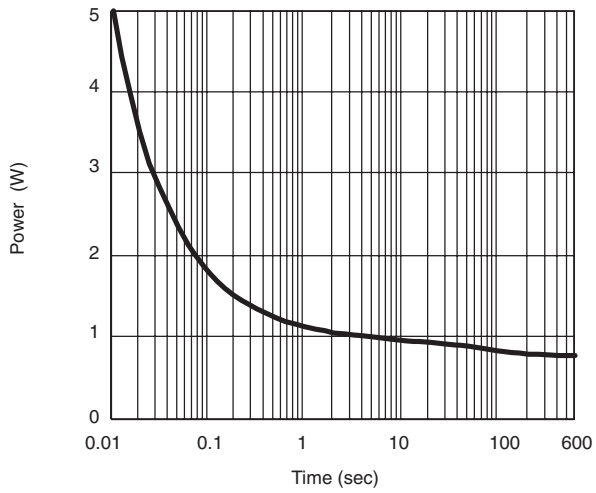
Forward Diode Voltage



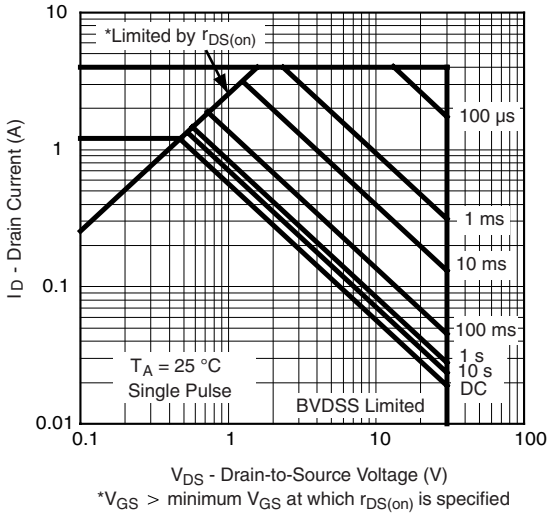
On-Resistance vs. Gate-Source Voltage



Threshold Voltage

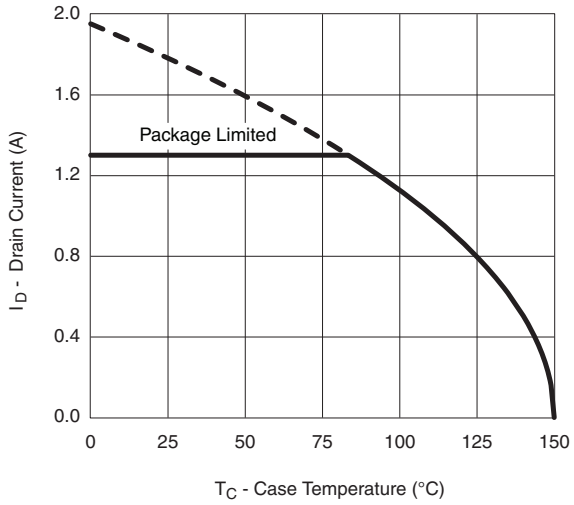


Single Pulse Power

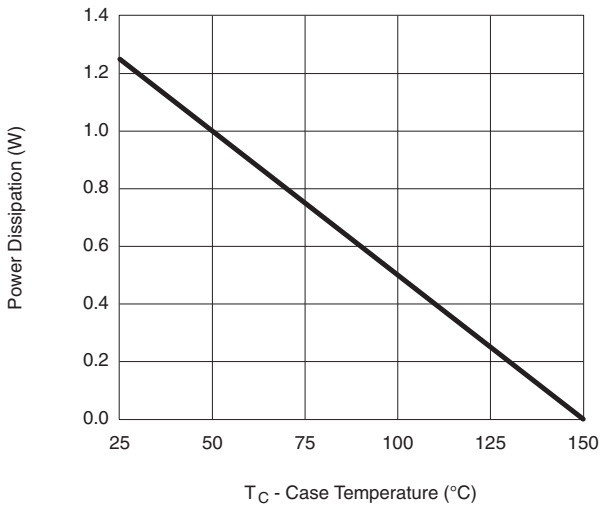


Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

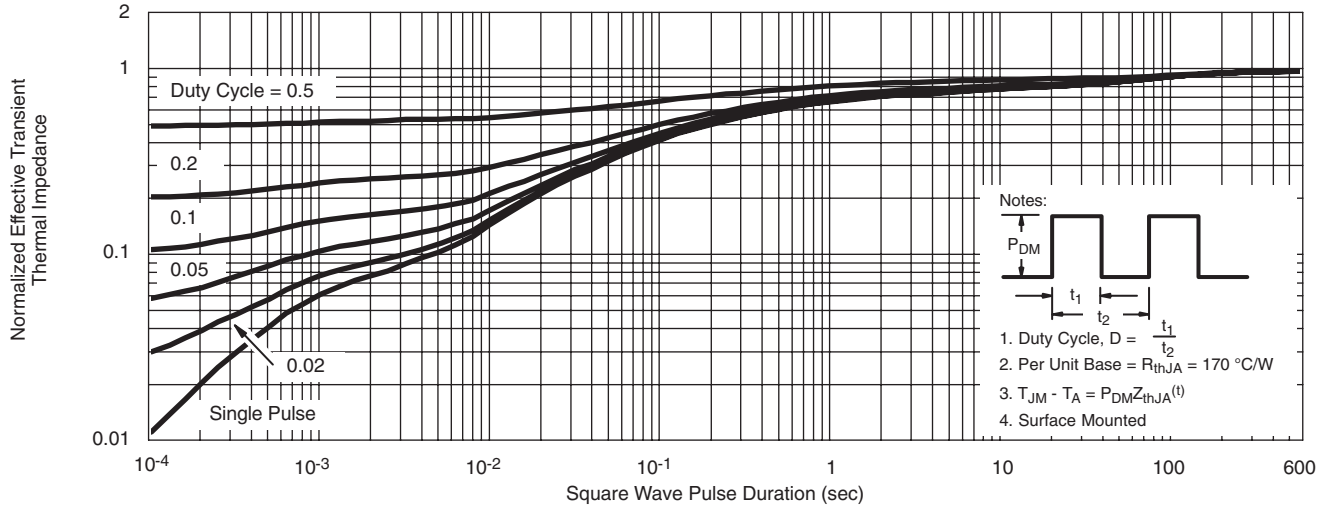


Current Derating*



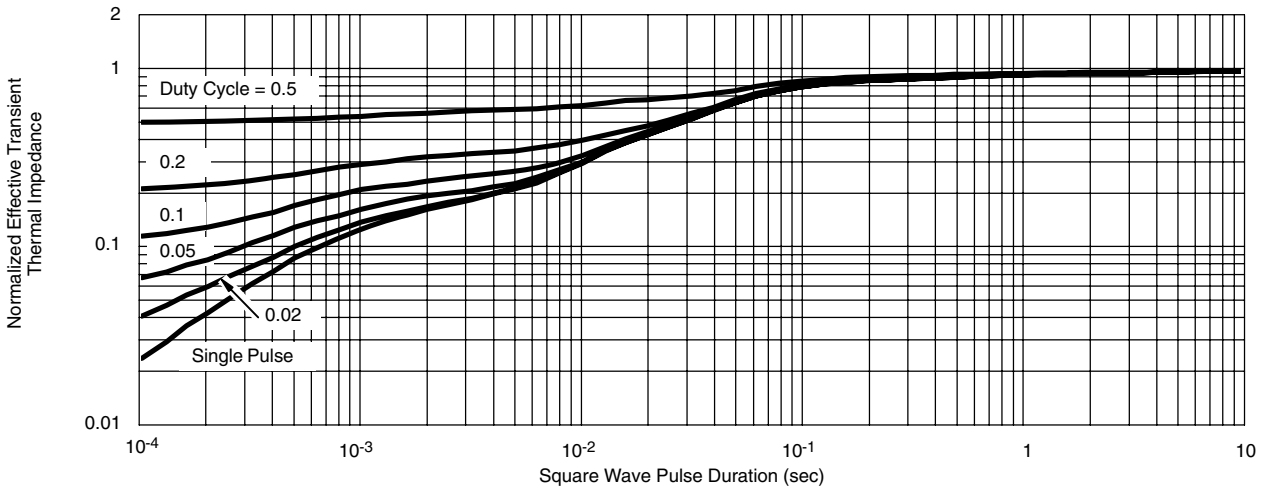
Power Derating

*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.



Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Foot

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