

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

PRODUCT SUMMARY		
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
- 30	0.031 at $V_{GS} = - 10$ V	- 4.7
	0.048 at $V_{GS} = - 4.5$ V	- 3.8

FEATURES

- Halogen-free
- TrenchFET® Power MOSFETs



RoHS
COMPLIANT

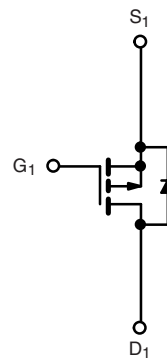
APPLICATIONS

- Load Switch
- Battery Switch

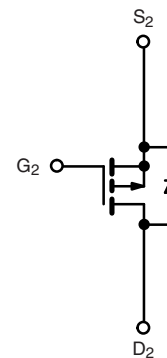


Top View

Ordering Information: Si6993DQ-T1-GE3 (Lead (Pb)-free and Halogen-free)



P-Channel MOSFET



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	V_{DS}	- 30		V	
Gate-Source Voltage	V_{GS}	± 20			
Continuous Drain Current ($T_J = 150$ °C) ^a	I_D	$T_A = 25$ °C	- 4.7	- 3.6	A
		$T_A = 70$ °C	- 3.8	- 3.2	
Pulsed Drain Current (10 μ s Pulse Width)	I_{DM}	- 30			
Continuous Source Current (Diode Conduction) ^a	I_S	- 1.0	- 0.70		
Maximum Power Dissipation ^a	P_D	$T_A = 25$ °C	1.14	0.83	W
		$T_A = 70$ °C	0.73	0.53	
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 ^a	R_{thJA}	$t \leq 10$ s	86	110	°C/W
		Steady State	124	150	
Maximum Junction-to-Foot	R_{thJF}	52	65		

Notes:

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

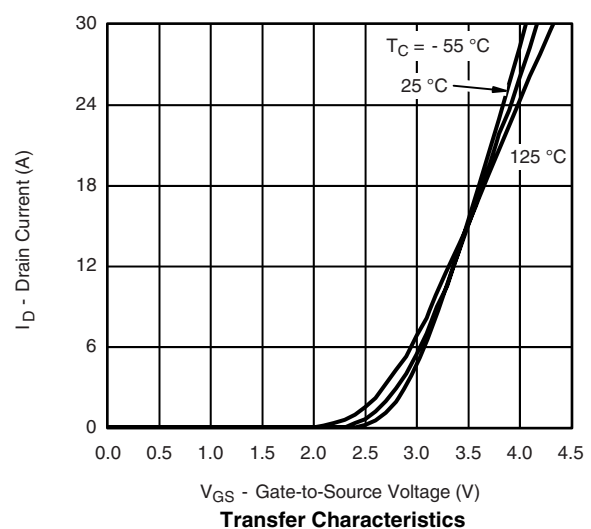
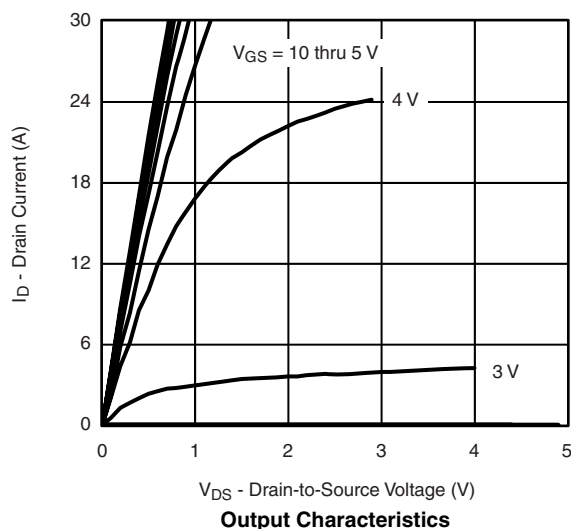
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-1.0		-3.0	V
Gate-Body 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	$I_{D(on)}$	$V_{DS} \geq -5\ \text{V}, V_{GS} = -10\ \text{V}$	-15			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\ \text{V}, I_D = -4.7\ \text{A}$		0.024	0.031	Ω
		$V_{GS} = -4.5\ \text{V}, I_D = -3.8\ \text{A}$		0.038	0.048	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\ \text{V}, I_D = -4.7\ \text{A}$		14		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -1.0\ \text{A}, V_{GS} = 0\ \text{V}$		-0.74	-1.1	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -15\ \text{V}, V_{GS} = -4.5\ \text{V}, I_D = -4.7\ \text{A}$		13	20	nC
Gate-Source Charge	Q_{gs}		3			
Gate-Drain Charge	Q_{gd}		5.8			
Gate Resistance	R_g	$f = 1.0\ \text{MHz}$		4.6		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\ \text{V}, R_L = 15\ \Omega$ $I_D \cong -1\ \text{A}, V_{GEN} = -10\ \text{V}, R_G = 6\ \Omega$		13	20	ns
Rise Time	t_r		14	22		
Turn-Off Delay Time	$t_{d(off)}$		52	80		
Fall Time	t_f		26	40		
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -1.0\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		40	60	

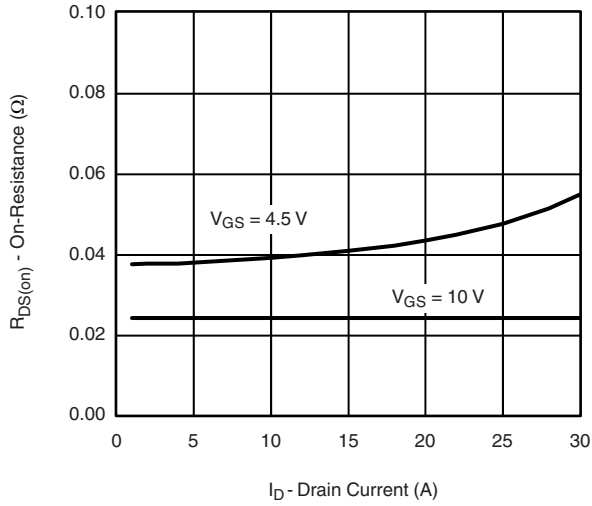
Notes:

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

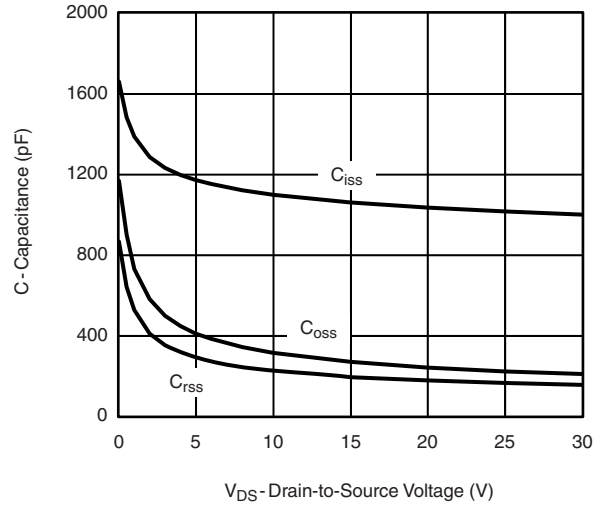
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

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

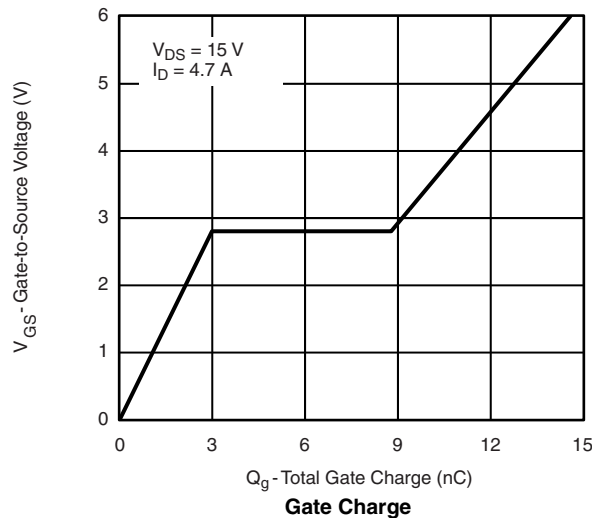
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



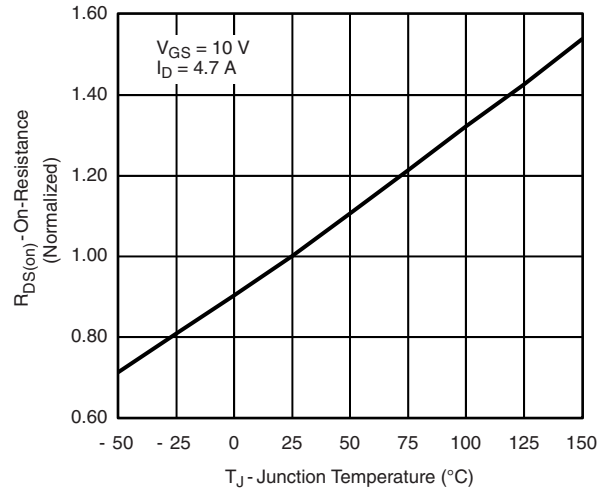
On-Resistance vs. Drain Current



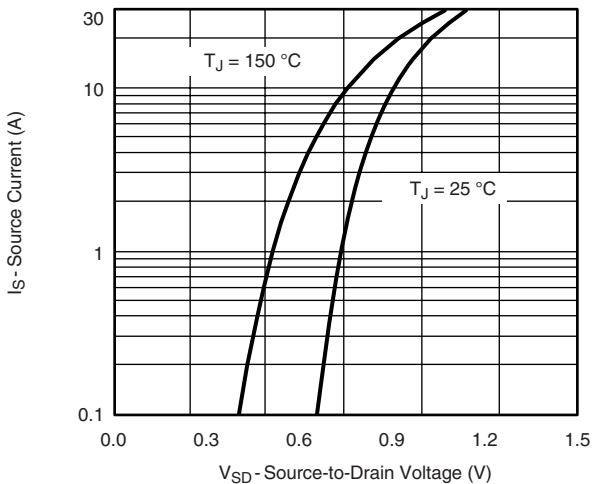
Capacitance



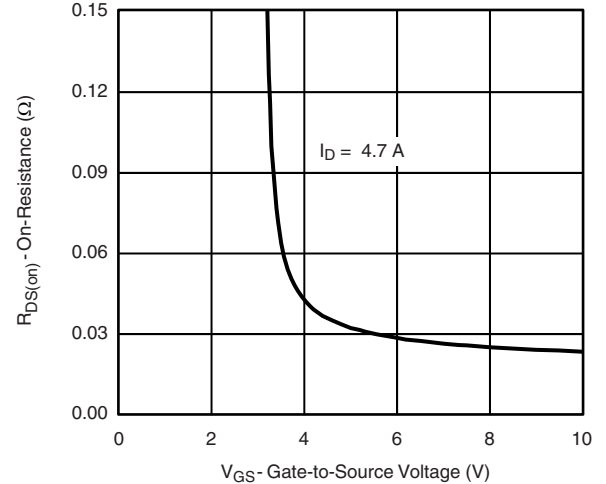
Gate Charge



On-Resistance vs. Junction Temperature

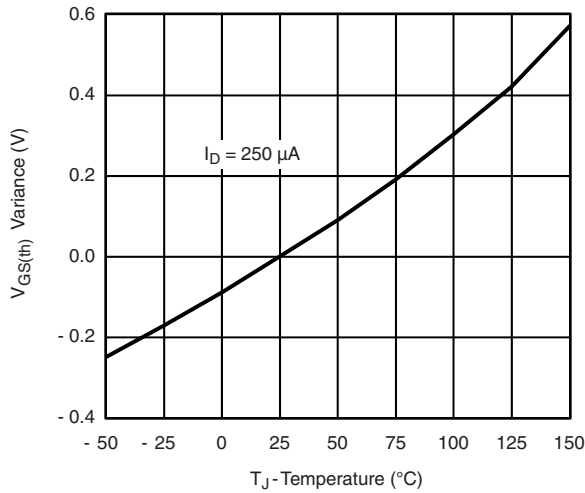


Source-Drain Diode Forward Voltage

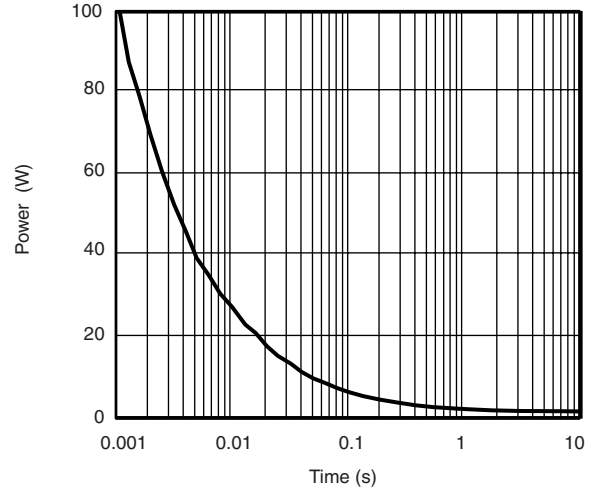


On-Resistance vs. Gate-to-Source Voltage

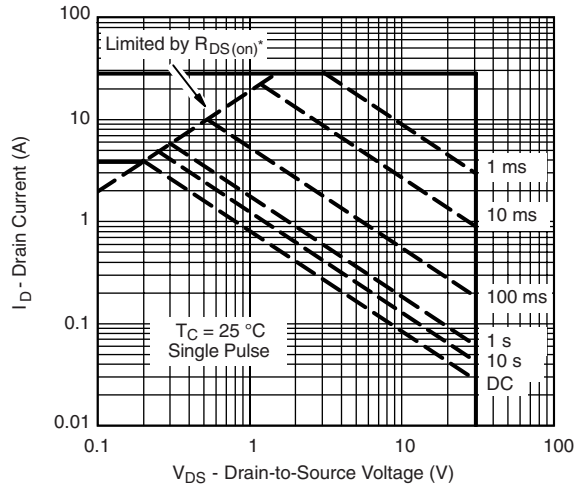
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Threshold Voltage

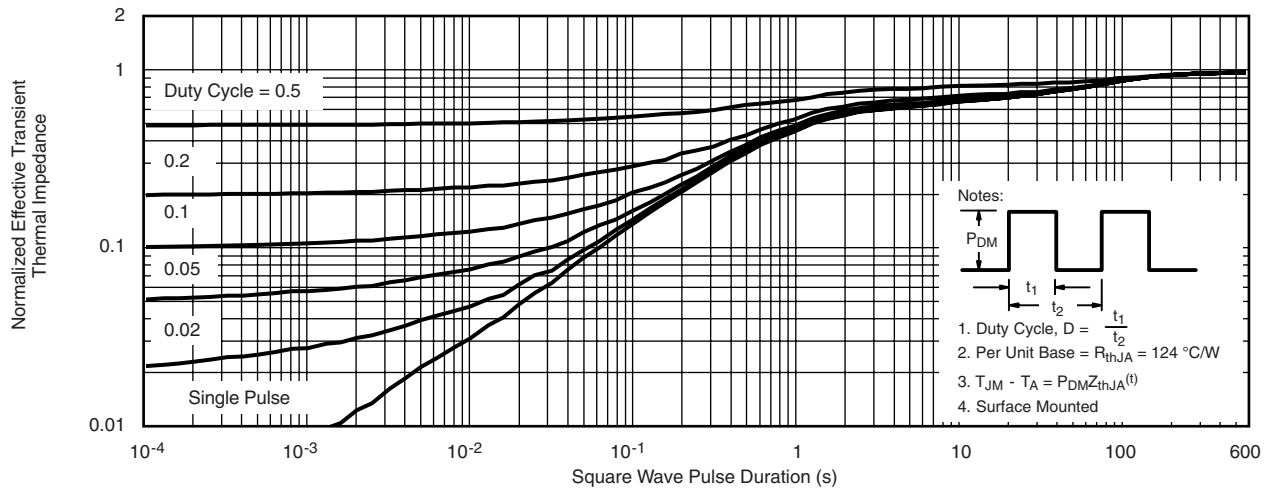


Single Pulse Power, Junction-to-Ambient



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

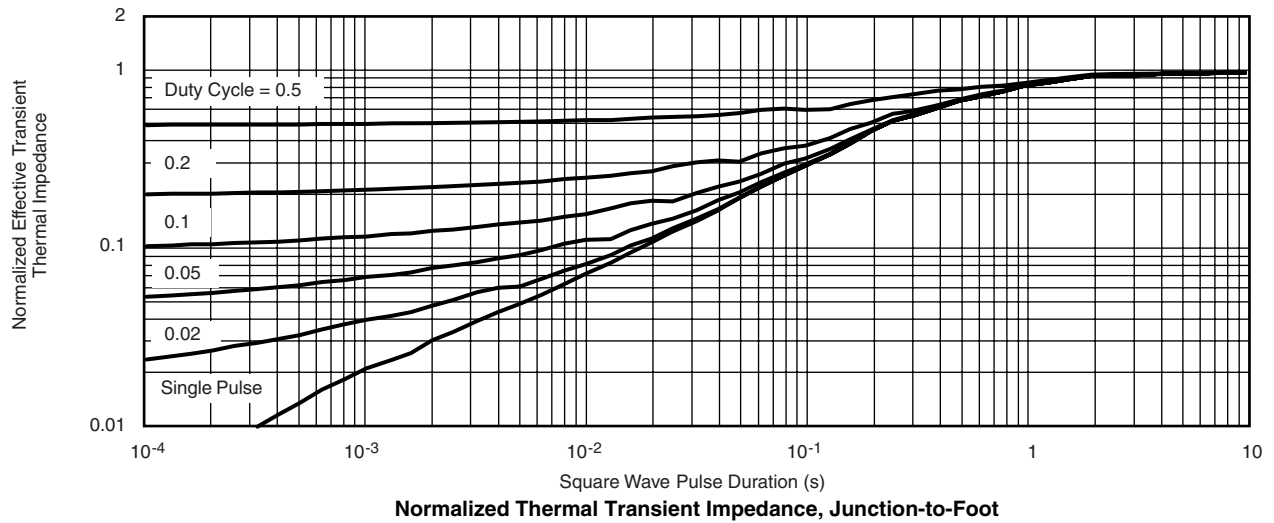
Safe Operating Area, Junction-to-Case



- Notes:
- Duty Cycle, $D = \frac{t_1}{t_2}$
 - Per Unit Base = $R_{thJA} = 124 \text{ }^\circ\text{C/W}$
 - $T_{JM} - T_A = P_{DM} Z_{thJA}(t)$
 - Surface Mounted

Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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