

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

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (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<sup>®</sup> Power MOSFETs



**RoHS**  
COMPLIANT

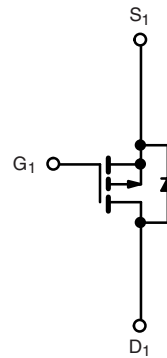
### APPLICATIONS

- Load Switch
- Battery Switch

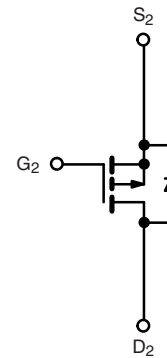


Top View

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	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C) <sup>a</sup>	$I_D$	$T_A = 25$ °C	- 4.7	- 3.6	A
		$T_A = 70$ °C	- 3.8	- 3.2	
Pulsed Drain Current (10 $\mu$ s Pulse Width)	$I_{DM}$	- 30			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	- 1.0	- 0.70		
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °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 <sup>a</sup>	$R_{thJA}$	$t \leq 10$ 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.



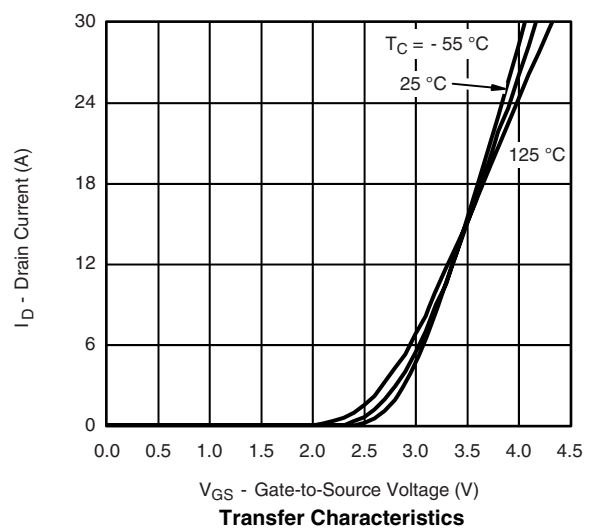
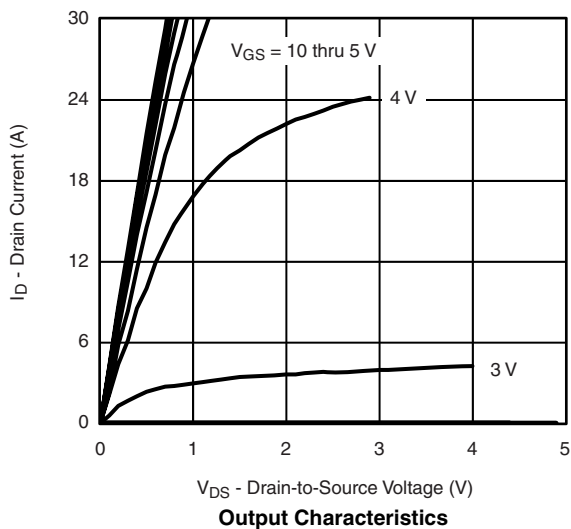
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-1.0		-3.0	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq -5\text{ V}, V_{GS} = -10\text{ V}$	-15			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -4.7\text{ A}$		0.024	0.031	$\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -3.8\text{ A}$		0.038	0.048	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}, I_D = -4.7\text{ A}$		14		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = -1.0\text{ A}, V_{GS} = 0\text{ V}$		-0.74	-1.1	V
<b>Dynamic<sup>b</sup></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		$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 15\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -10\text{ V}, R_G = 6\text{ }\Omega$		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:

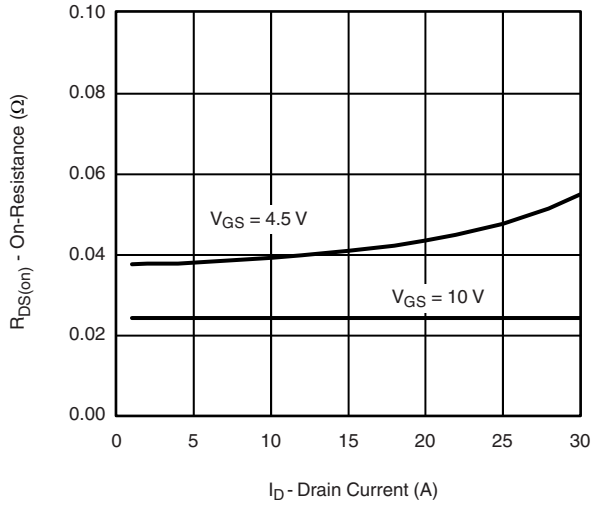
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

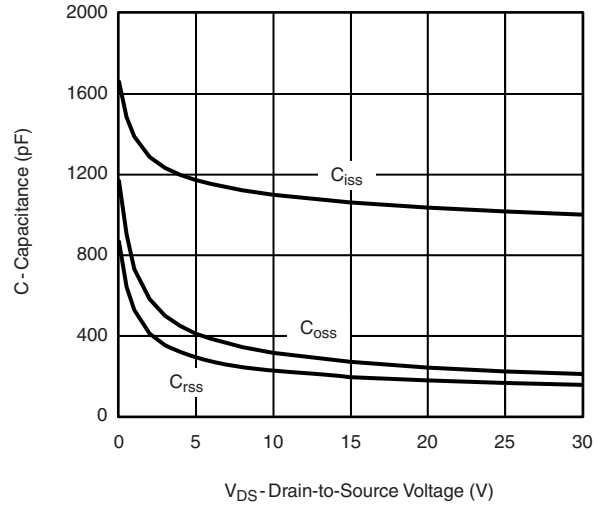
**TYPICAL CHARACTERISTICS**  $25\text{ }^\circ\text{C}$ , unless otherwise noted



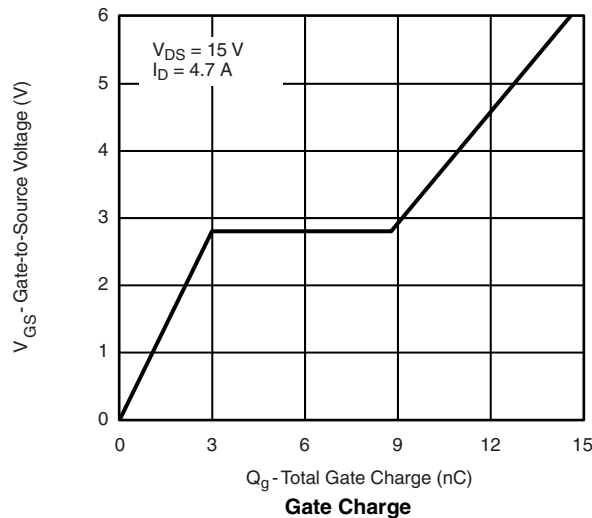
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



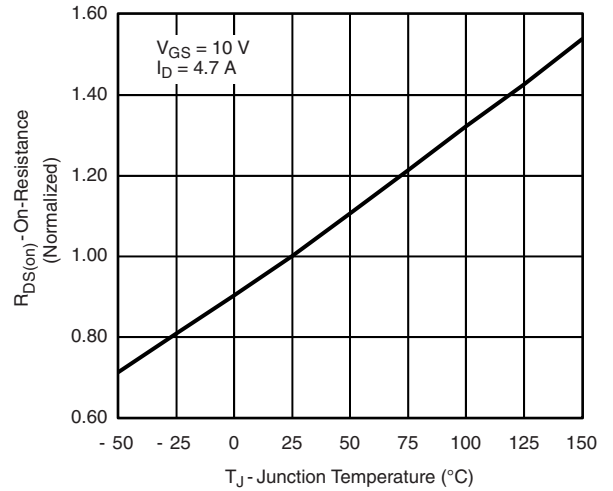
**On-Resistance vs. Drain Current**



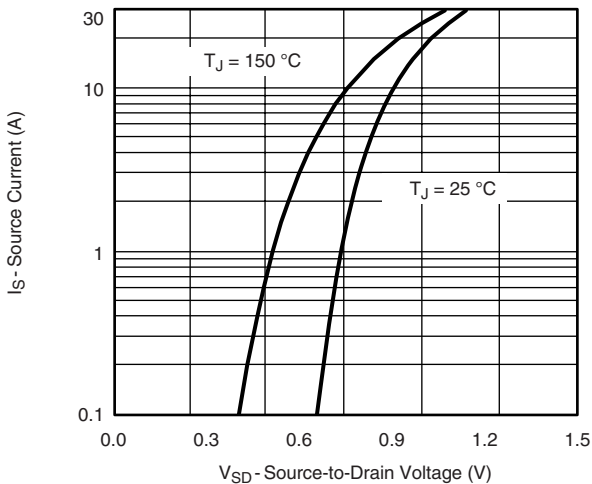
**Capacitance**



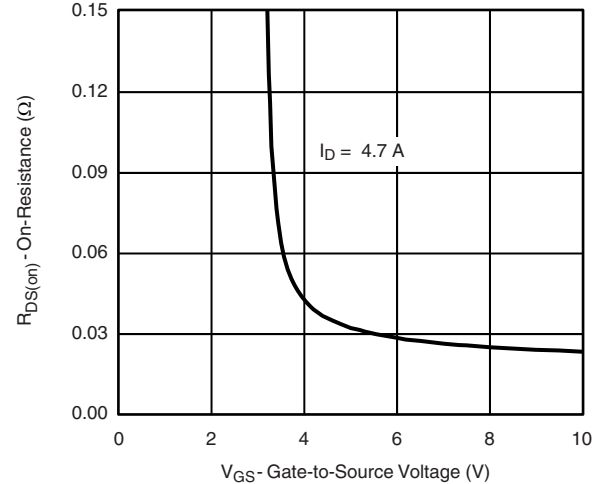
**Gate Charge**



**On-Resistance vs. Junction Temperature**

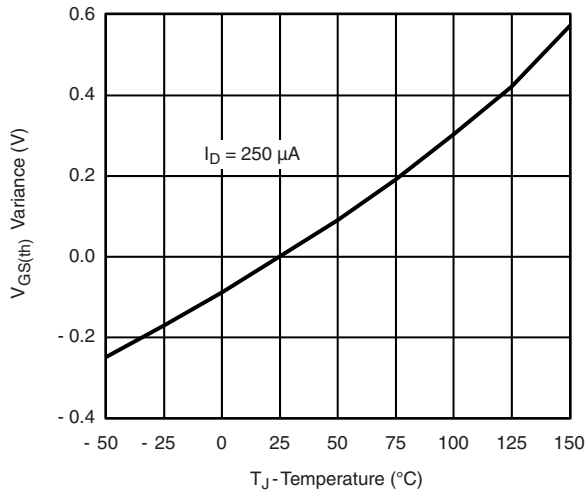


**Source-Drain Diode Forward Voltage**

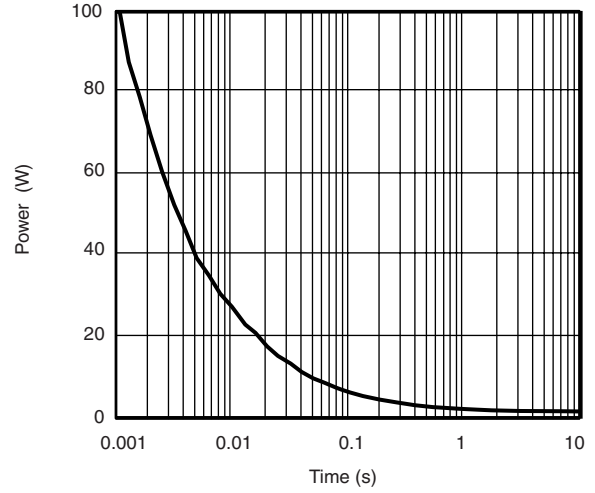


**On-Resistance vs. Gate-to-Source Voltage**

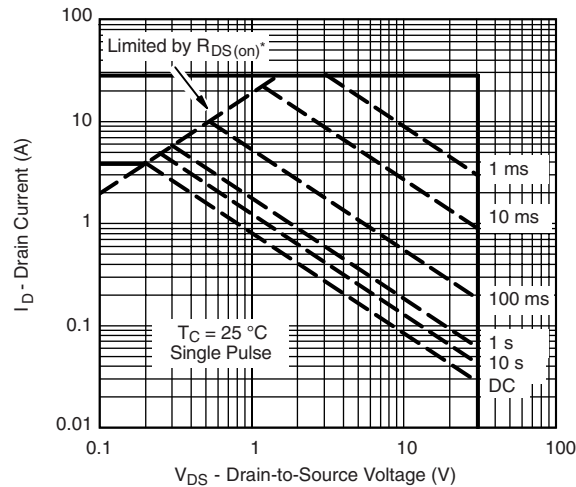
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



**Threshold Voltage**

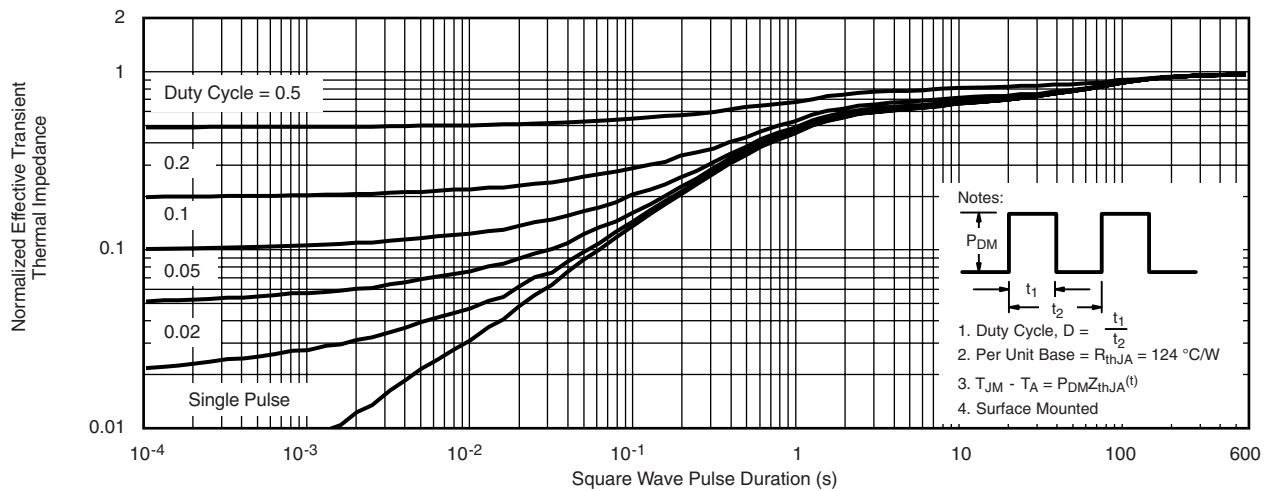


**Single Pulse Power, Junction-to-Ambient**



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

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

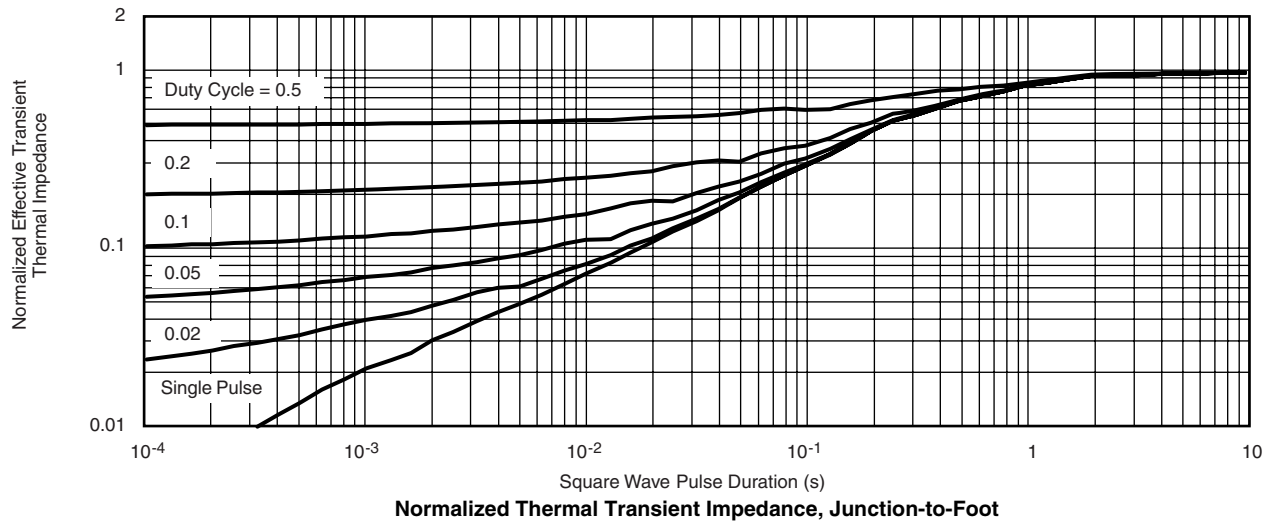


Notes:

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

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

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



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