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

PRODUCT SUMMARY			
	V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)
N-Channel	20	0.060 at V_{GS} = 4.5 V	3.4
		0.070 at V_{GS} = 2.5 V	3.2
		0.100 at V_{GS} = 1.8 V	2.5
P-Channel	- 20	0.110 at V_{GS} = - 4.5 V	- 2.5
		0.145 at V_{GS} = - 2.5 V	- 2.0
		0.220 at V_{GS} = - 1.8V	- 1.0

FEATURES

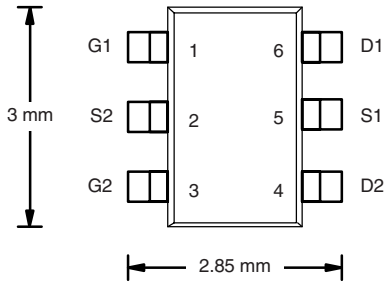
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- Fast Switching In Small Footprint
- Very Low $R_{DS(on)}$ for Increased Efficiency
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE Available

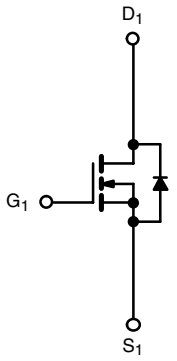
APPLICATIONS

- Load Switch for Portable Devices

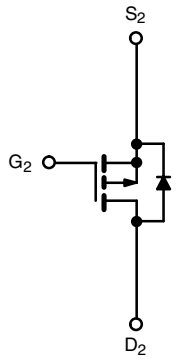
TSOP-6
Top View



Ordering Information: Si3586DV-T1-E3 (Lead (Pb)-free)
Si3586DV-T1-GE3 (Lead (Pb)-free and Halogen-free)



N-Channel MOSFET



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °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}	± 8				
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	3.4	2.9	- 2.5	- 2.1	A
	T_A = 70 °C		2.7	2.3	- 2.0	- 1.7	
Pulsed Drain Current		I_{DM}	± 8				
Continuous Source Current (Diode Conduction)[a]		I_S	1.05	0.75	- 1.05	- 0.75	
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	1.15	0.83	1.15	0.83	W
	T_A = 70 °C		0.73	0.53	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]	t ≤ 5 s	R_{thJA}	93	110	°C/W
	Steady State		130	150	
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	90	90	

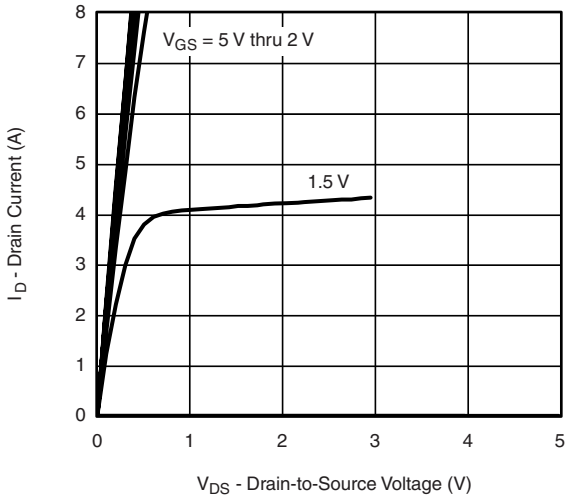
Note:
a. Surface Mounted on 1" x 1" FR4 board.

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 = 250 µA	N-Ch	0.40		1.1	V
		V_{DS} = V_{GS}, I_D = - 250 µA	P-Ch	- 0.40		- 1.1	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V	N-Ch			± 100	nA
		V_{DS} = 0 V, V_{GS} = ± 8 V	P-Ch			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0 V	N-Ch			1	µA
		V_{DS} = - 20 V, V_{GS} = 0 V	P-Ch			- 1	
		V_{DS} = 20 V, V_{GS} = 0 V, T_J = 85 °C	N-Ch			10	
		V_{DS} = - 20 V, V_{GS} = 0 V, T_J = 85 °C	P-Ch			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq$ 5 V, V_{GS} = 4.5 V	N-Ch	5			A
		$V_{DS} \leq$ - 5 V, V_{GS} = - 4.5 V	P-Ch	- 5			
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 3.4 A	N-Ch		0.047	0.060	Ω
		V_{GS} = - 4.5 V, I_D = - 2.5 A	P-Ch		0.086	0.110	
		V_{GS} = 2.5 V, I_D = 3.2 A	N-Ch		0.054	0.070	
		V_{GS} = - 2.5 V, I_D = - 2.0 A	P-Ch		0.116	0.145	
		V_{GS} = - 1.8 V, I_D = - 2.5 A	N-Ch		0.075	0.100	
		V_{GS} = - 1.8 V, I_D = - 1.0 A	P-Ch		0.170	0.220	
Forward Transconductance[a]	g_{fs}	V_{DS} = 5 V, I_D = 3.4 A	N-Ch		13		S
		V_{DS} = - 5 V, I_D = - 2.5 A	P-Ch		6		
Diode Forward Voltage[a]	V_{SD}	I_S = 1.05 A, V_{GS} = 0 V	N-Ch		0.8	1.1	V
		I_S = - 1.05 A, V_{GS} = 0 V	P-Ch		- 0.8	- 1.1	
Dynamic[b]							
Total Gate Charge	Q_g	N-Channel V_{DS} = 10 V, V_{GS} = 4.5 V, I_D = 3.4 A P-Channel V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 2.5 A	N-Ch		4.1	6.0	nC
			P-Ch		5	7.5	
Gate-Source Charge	Q_{gs}		N-Ch		0.65		
			P-Ch		0.68		
Gate-Drain Charge	Q_{gd}		N-Ch		0.8		
			P-Ch		1.3		
Gate Resistance	R_g		N-Ch		2.6		Ω
			P-Ch		9.8		
Turn-On Delay Time	$t_{d(on)}$	N-Channel V_{DD} = 10 V, R_L = 10 Ω $I_D \cong$ 1 A, V_{GEN} = 4.5 V, R_G = 6 Ω P-Channel V_{DD} = - 10 V, R_L = 10 Ω $I_D \cong$ - 1 A, V_{GEN} = - 4.5 V, R_G = 6 Ω	N-Ch		30	45	ns
			P-Ch		28	45	
Rise Time	t_r		N-Ch		52	85	
			P-Ch		55	85	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		25	40	
			P-Ch		55	85	
Fall Time	t_f		N-Ch		20	30	
			P-Ch		32	50	
Source-Drain Reverse Recovery Time	t_{rr}	I_F = 1.05 A, dI/dt = 100 A/µs	N-Ch		25	40	
		I_F = - 1.05 A, dI/dt = 100 A/µs	P-Ch		25	40	

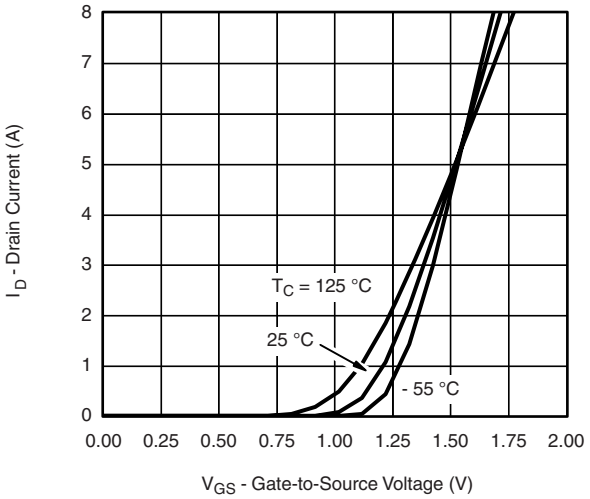
Notes:
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

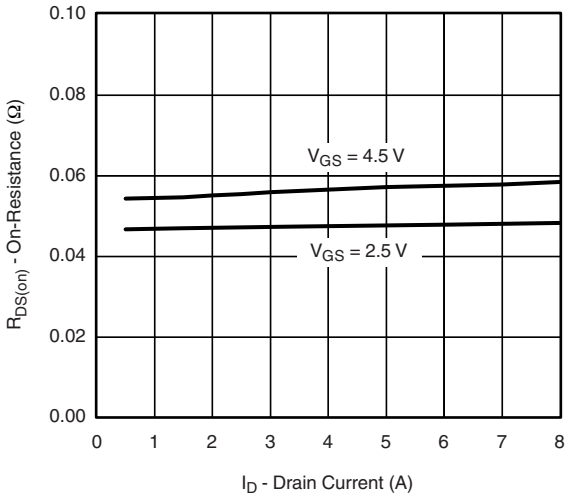
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



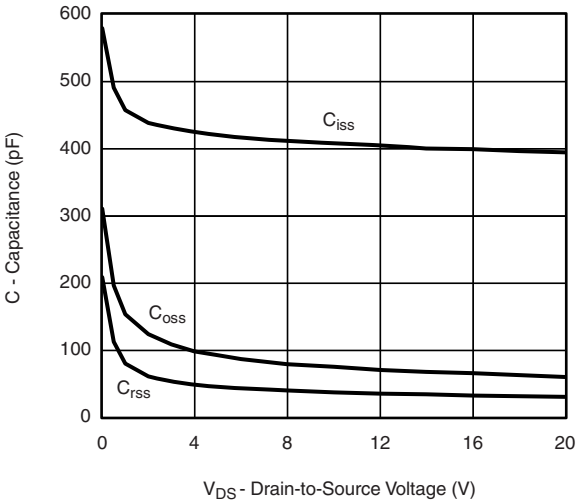
Output Characteristics



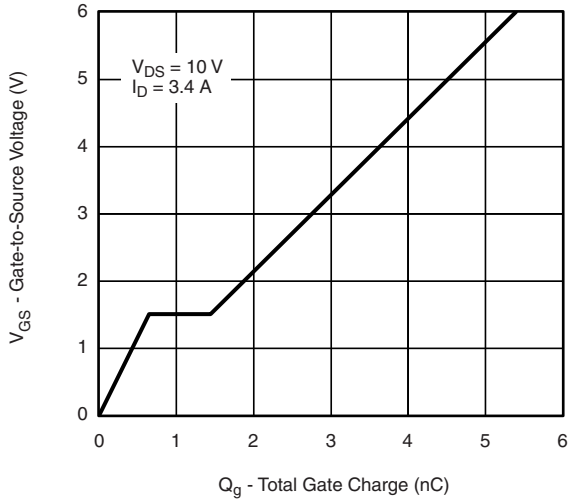
Transfer Characteristics



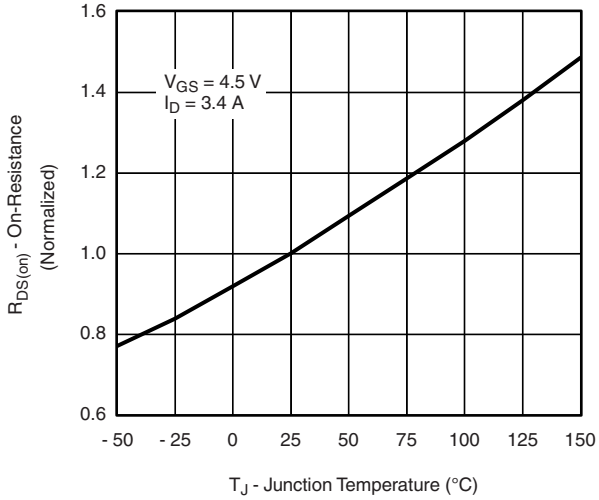
On-Resistance vs. Drain Current



Capacitance

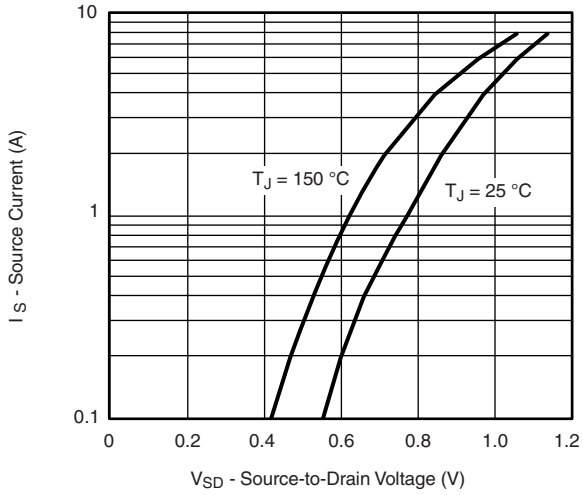


Gate Charge

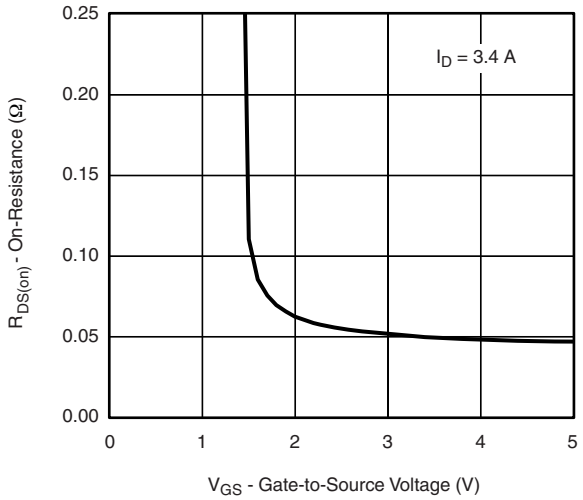


On-Resistance vs. Junction Temperature

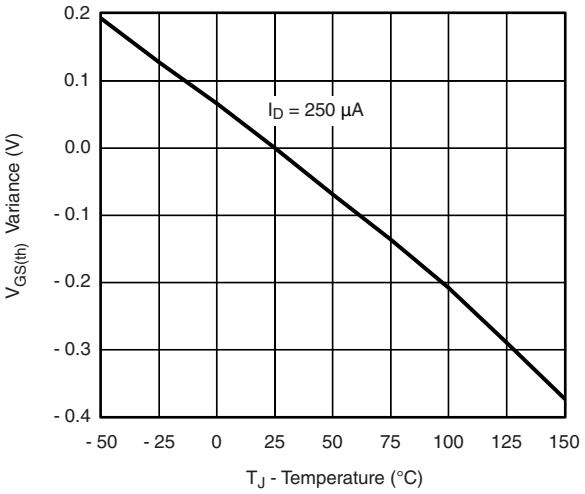
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



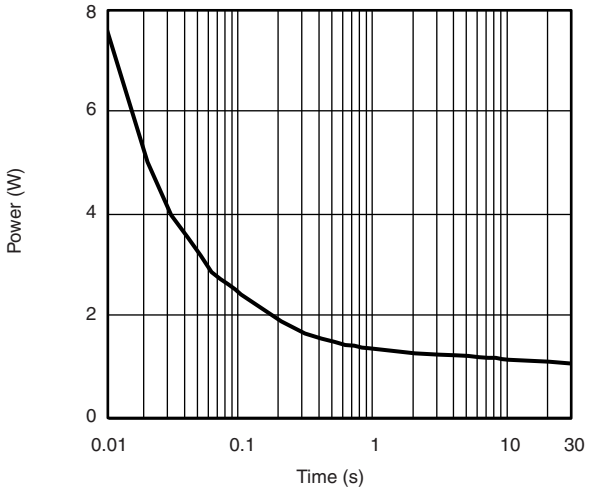
Source-Drain Diode Forward Voltage



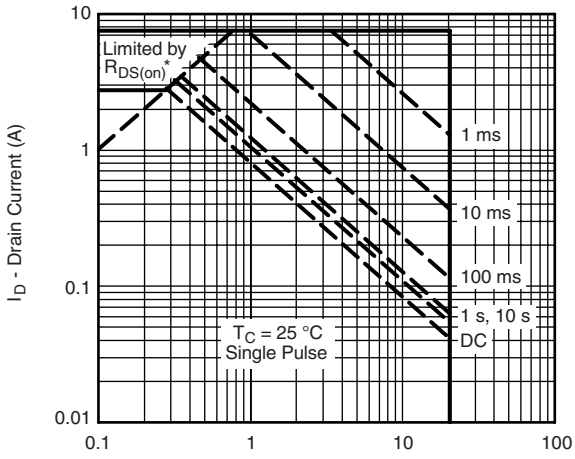
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



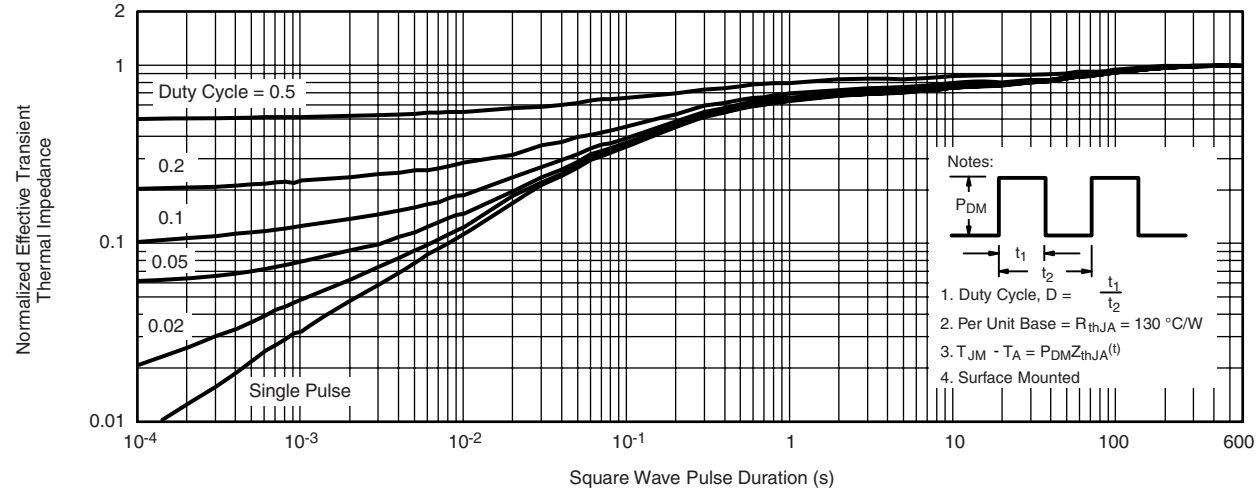
Single Pulse Power (Junction-to-Ambient)



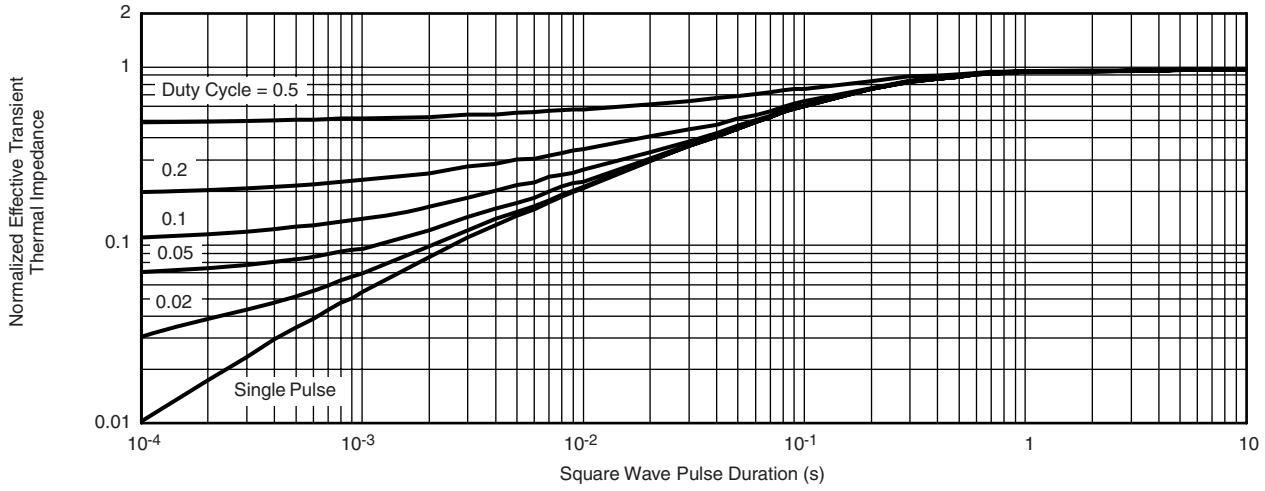
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

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

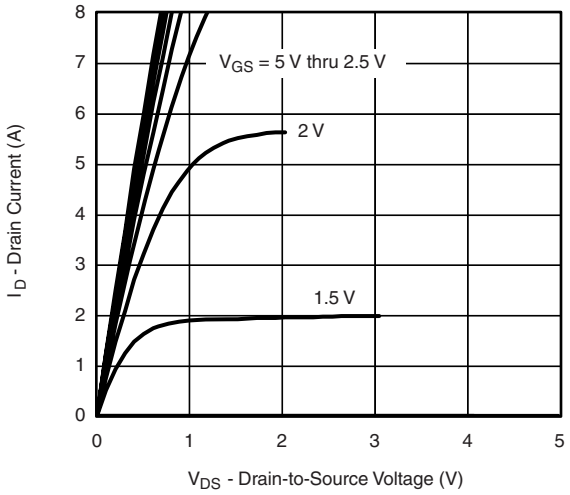


Normalized Thermal Transient Impedance, Junction-to-Ambient

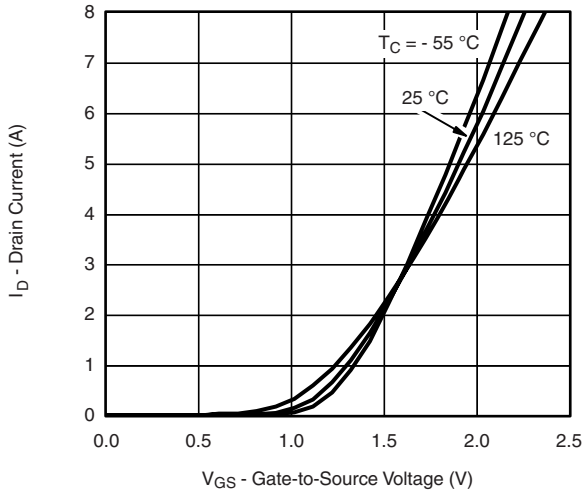


Normalized Thermal Transient Impedance, Junction-to-Foot

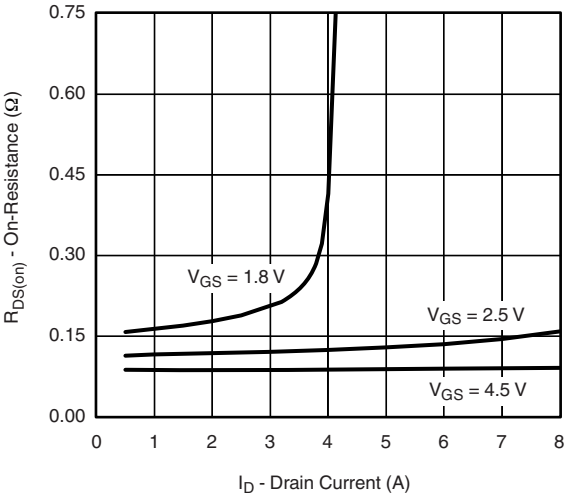
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



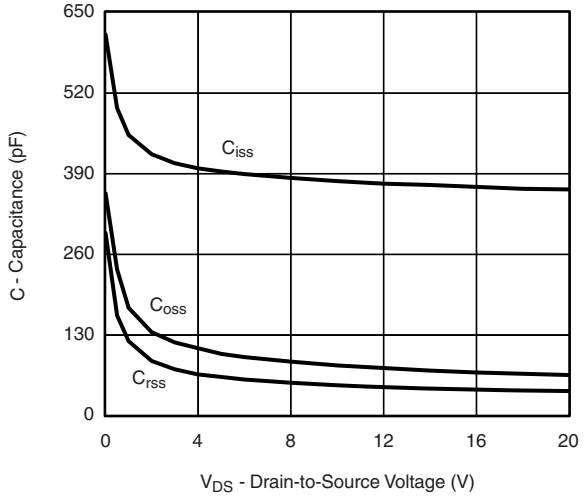
Output Characteristics



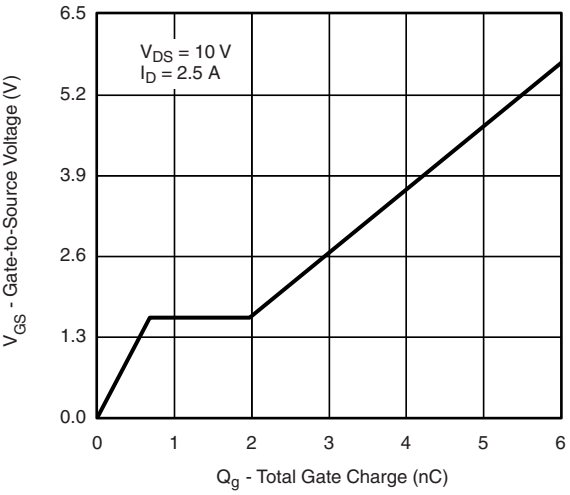
Transfer Characteristics



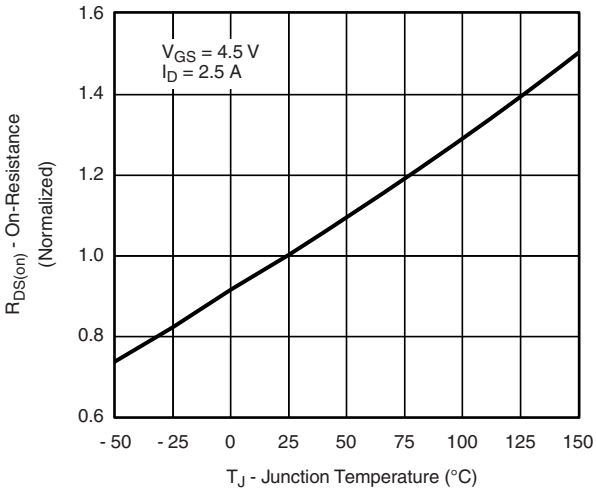
On-Resistance vs. Drain Current



Capacitance

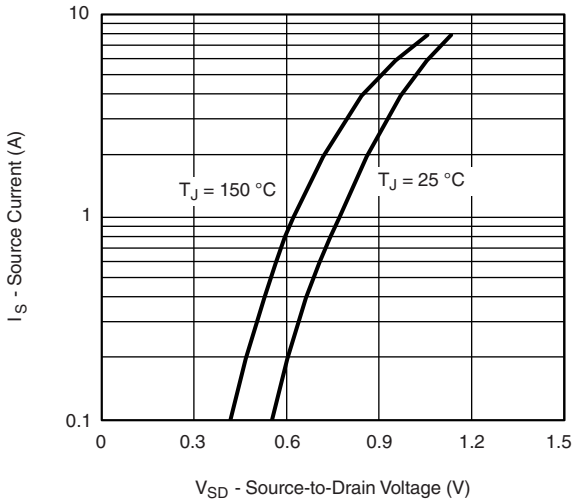


Gate Charge

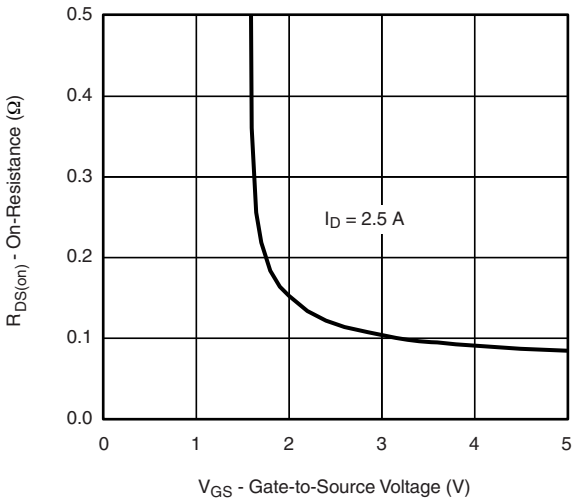


On-Resistance vs. Junction Temperature

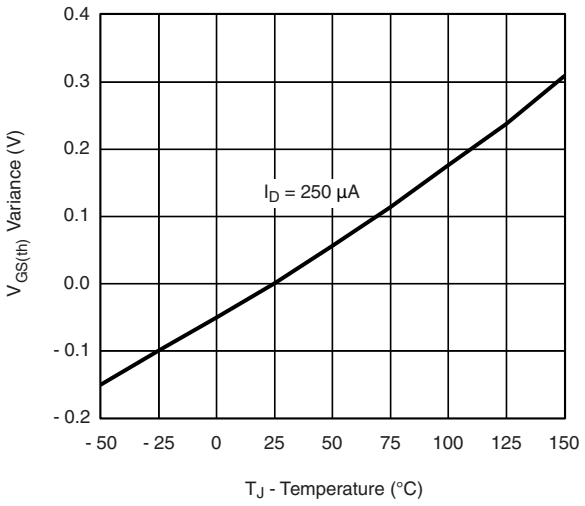
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



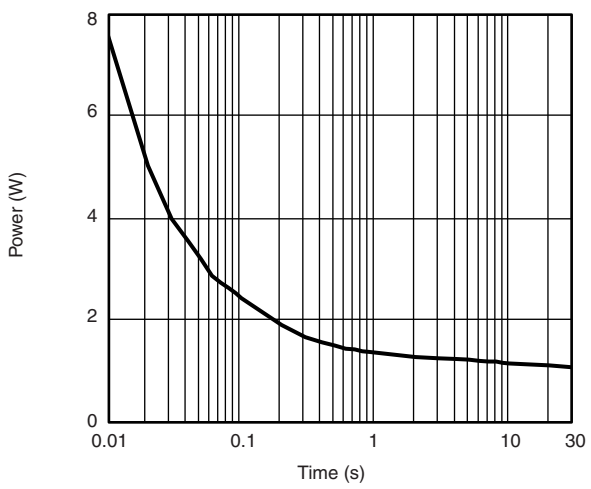
Source-Drain Diode Forward Voltage



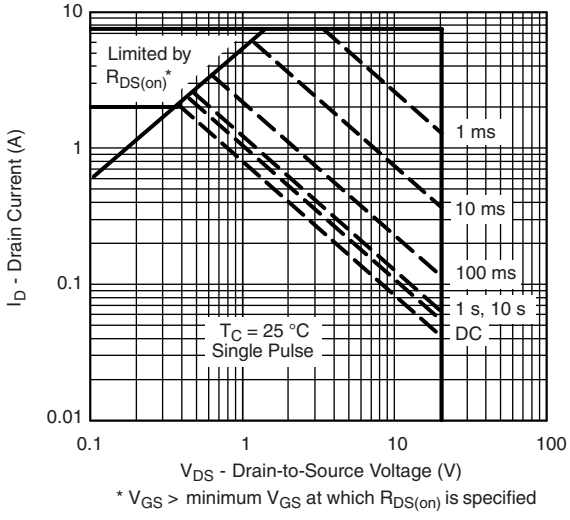
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



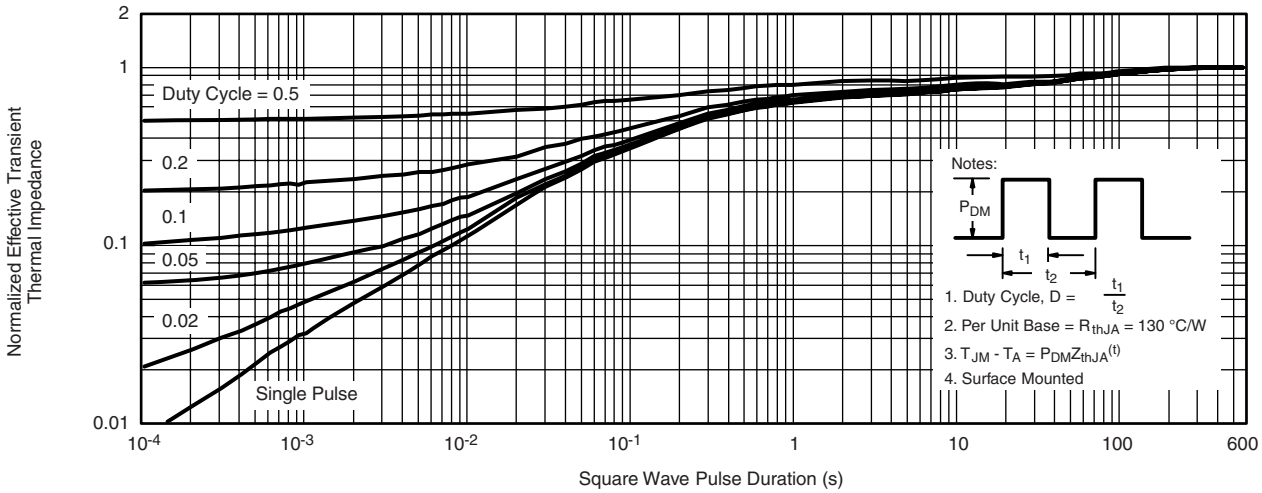
Single Pulse Power (Junction-to-Ambient)



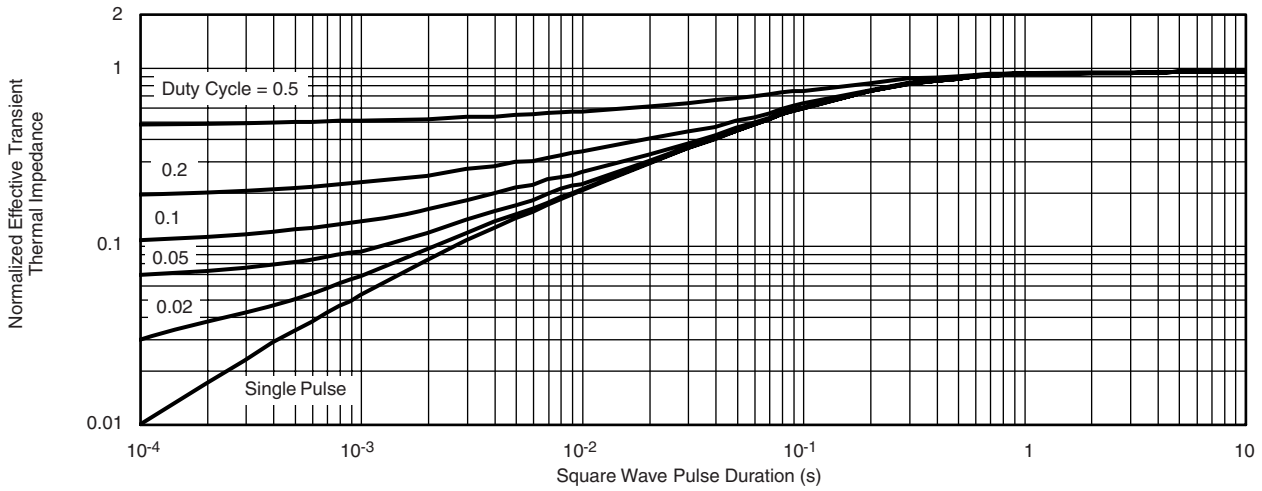
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

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



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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