N- and P-Channel 12-V (D-S) MOSFET

PRODUCT SUMMARY			
	V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
N-Channel	12	0.017 at V_{GS} = 4.5 V	11.8
		0.025 at V_{GS} = 2.5 V	9.8
P-Channel	– 12	0.032 at V_{GS} = – 4.5 V	– 8.9
		0.053 at V_{GS} = – 2.5 V	– 6.9

FEATURES

- TrenchFET® Power MOSFET
- New Low Thermal Resistance PowerPAK® Package with Low 1.07-mm Profile
- PWM Optimized for High Efficiency
- 100 % R_g Tested

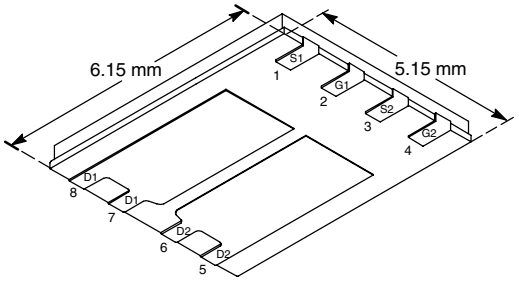
Pb-free Available

RoHS* COMPLIANT

APPLICATIONS

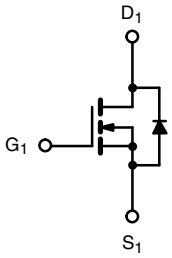
- Point-of-Load Synchronous Rectifier
  - 5 V or 3.3 V BUS Step Down
  - Q_g Optimized for 500-kHz Operation
- Synchronous Buck, Shoot-Thru Resistant

PowerPAK SO-8

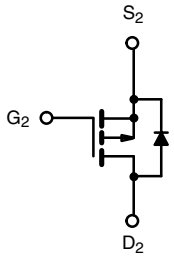


Bottom View

Ordering Information: Si7540DP-T1
Si7540DP-T1—E3 (Lead (Pb)-free)



N-Channel MOSFET



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted							
Parameter		Symbol	N-Channel		P-Channel		Unit
			10 secs	Steady	10 secs	Steady	
Drain-Source Voltage		V_{DS}	12		– 12		V
Gate-Source Voltage		V_{GS}	± 8				
Continuous Drain Current (T_J = 150 °C)[a]	T_A = 25 °C	I_D	11.8	7.6	– 8.9	– 5.7	A
	T_A = 70 °C		9.5	6.1	– 7.1	– 4.6	
Pulsed Drain Current		I_{DM}	20				
Continuous Source Current (Diode Conduction)[a]		I_S	2.9	1.1	– 2.9	– 1.1	
Maximum Power Dissipation[a]	T_A = 25 °C	P_D	3.5	1.4	3.5	1.4	W
	T_A = 70 °C		2.2	0.9	2.2	0.9	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	– 55 to 150				°C
Soldering Recommendations (Peak Temperature)[b,c]			260				

THERMAL RESISTANCE RATINGS							
Parameter		Symbol	N-Channel		P-Channel		Unit
			Typical	Maximum	Typical	Maximum	
Maximum Junction-to-Ambient[a]	t ≤ 10 sec	R_{thJA}	26	35	26	35	°C/W
	Steady State		60	85	60	85	
Maximum Junction-to-Case (Drain)	Steady State	R_{thJC}	3.9	5.5	3.9	5.5	

Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. See Solder Profile (*http://www.vishay.com/ppg?73257*). The PowerPAK SO-8 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.
c. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

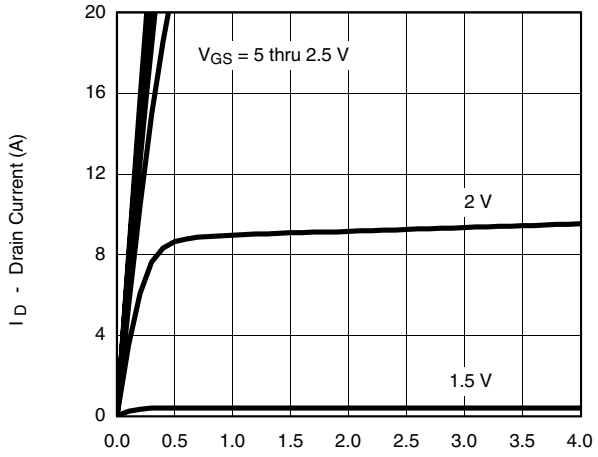
* Pb containing terminations are not RoHS compliant, exemptions may apply.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Condition**		**Min**	**Typ**	**Max**	**Unit**
Static							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA	N-Ch	0.6		1.5	V
		$V_{DS} = V_{GS}$, $I_D = -250$ µA	P-Ch	– 0.6		– 1.5	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0$ V, $V_{GS} = \pm 8$ V	N-Ch			± 100	nA
			P-Ch			± 100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 12$ V, $V_{GS} = 0$ V	N-Ch			1	µA
		$V_{DS} = -12$ V, $V_{GS} = 0$ V	P-Ch			– 1	
		$V_{DS} = 12$ V, $V_{GS} = 0$ V, $T_J = 55$ °C	N-Ch			5	
		$V_{DS} = -12$ V, $V_{GS} = 0$ V, $T_J = 55$ °C	P-Ch			– 5	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \geq 5$ V, $V_{GS} = 4.5$ V	N-Ch	20			A
		$V_{DS} \leq -5$ V, $V_{GS} = -4.5$ V	P-Ch	– 20			
Drain-Source On-State Resistance[a]	$r_{DS(on)}$	$V_{GS} = 4.5$ V, $I_D = 11.8$ A	N-Ch		0.014	0.017	Ω
		$V_{GS} = -4.5$ V, $I_D = -8.9$ A	P-Ch		0.026	0.032	
		$V_{GS} = 2.5$ V, $I_D = 9.8$ A	N-Ch		0.020	0.025	
		$V_{GS} = -2.5$ V, $I_D = -6.9$ A	P-Ch		0.043	0.053	
Forward Transconductance[a]	g_{fs}	$V_{DS} = 5$ V, $I_D = 11.8$ A	N-Ch		32		S
		$V_{DS} = -5$ V, $I_D = -8.9$ A	P-Ch		23		
Diode Forward Voltage[a]	V_{SD}	$I_S = 2.9$ A, $V_{GS} = 0$ V	N-Ch		0.77	1.2	V
		$I_S = -2.9$ A, $V_{GS} = 0$ V	P-Ch		– 0.8	– 1.2	
Dynamic[b]							
Total Gate Charge	Q_g	N-Channel $V_{DS} = 6$ V, $V_{GS} = 4.5$ V, $I_D = 11.8$ A P-Channel $V_{DS} = -6$ V, $V_{GS} = -4.5$ V, $I_D = -8.9$ A	N-Ch		11.5	17	nC
			P-Ch		13	20	
Gate-Source Charge	Q_{gs}		N-Ch		3.2		
			P-Ch		4.1		
Gate-Drain Charge	Q_{gd}		N-Ch		2.5		
			P-Ch		1.9		
Gate Resistance	R_g		N-Ch	0.5	1.7	2.5	Ω
			P-Ch	1.5	3.5	5.6	
Turn-On Delay Time	$t_{d(on)}$	N-Channel $V_{DD} = 6$ V, $R_L = 6$ Ω $I_D \cong 1$ A, $V_{GEN} = 4.5$ V, $R_G = 6$ Ω P-Channel $V_{DD} = -6$ V, $R_L = 6$ Ω $I_D \cong -1$ A, $V_{GEN} = -4.5$ V, $R_G = 6$ Ω	N-Ch		30	45	ns
			P-Ch		35	55	
Rise Time	t_r		N-Ch		50	75	
			P-Ch		42	65	
Turn-Off Delay Time	$t_{d(off)}$		N-Ch		60	90	
			P-Ch		54	85	
Fall Time	t_f		N-Ch		25	40	
			P-Ch		17	30	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 2.9$ A, di/dt = 100 A/µs	N-Ch		40	80	
		$I_F = -2.9$ A, di/dt = 100 A/µs	P-Ch		40	80	

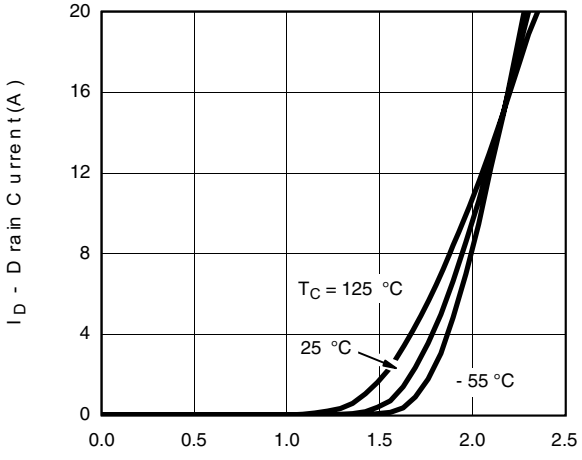
Notes
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

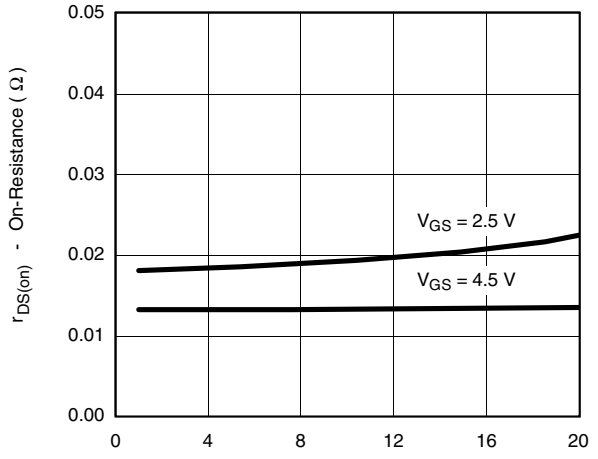
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



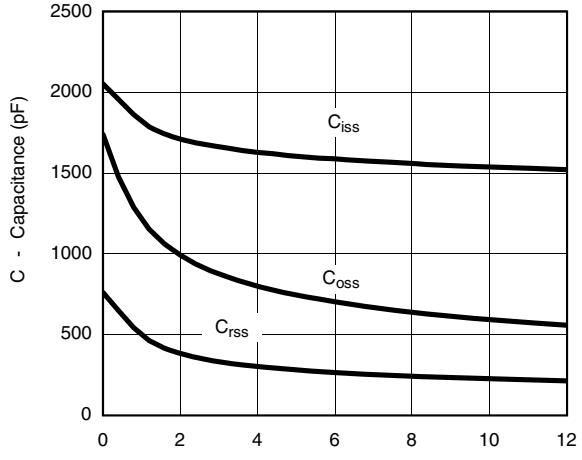
Output Characteristics



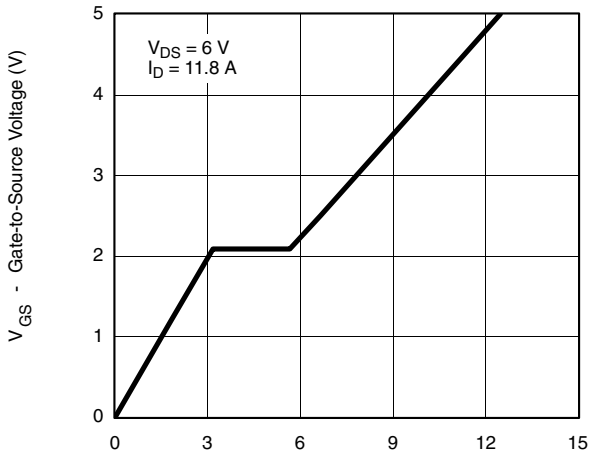
Transfer Characteristics



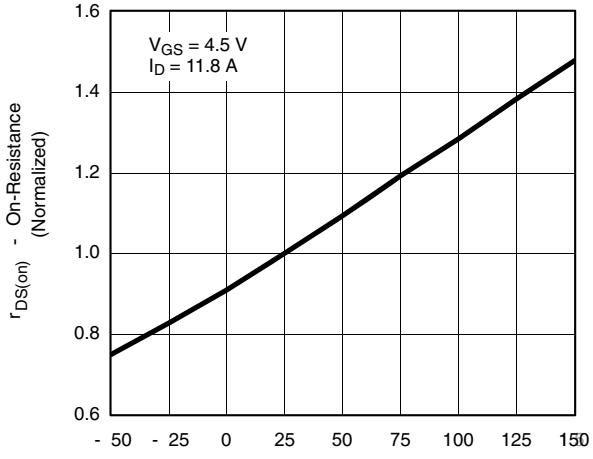
On-Resistance vs. Drain Current



Capacitance

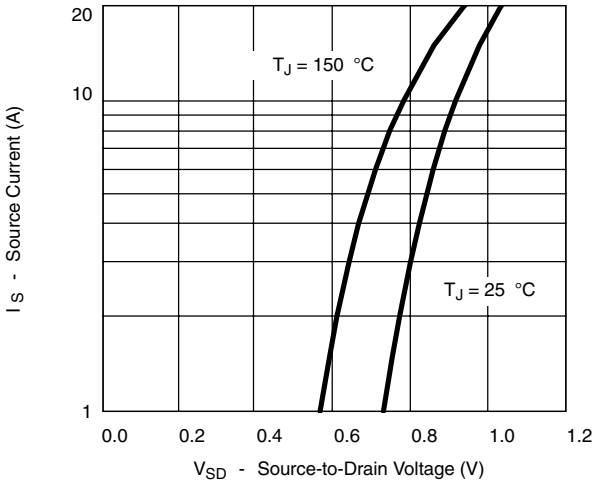


Gate Charge

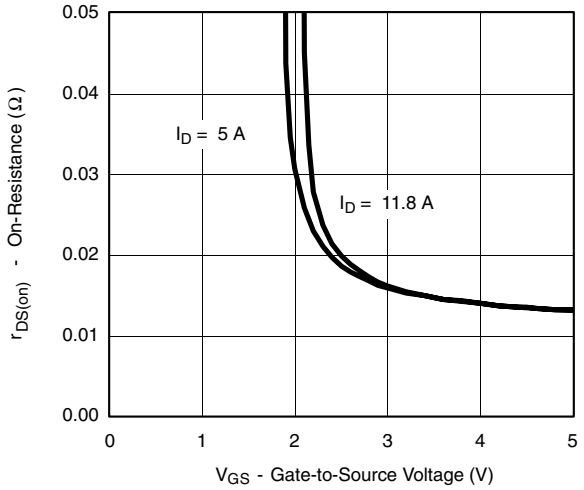


On-Resistance vs. Junction Temperature

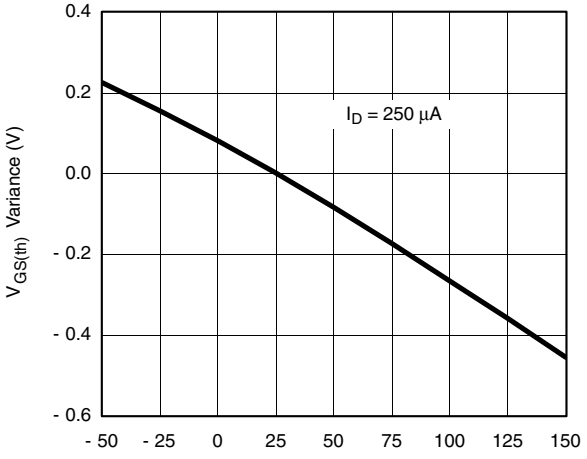
N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



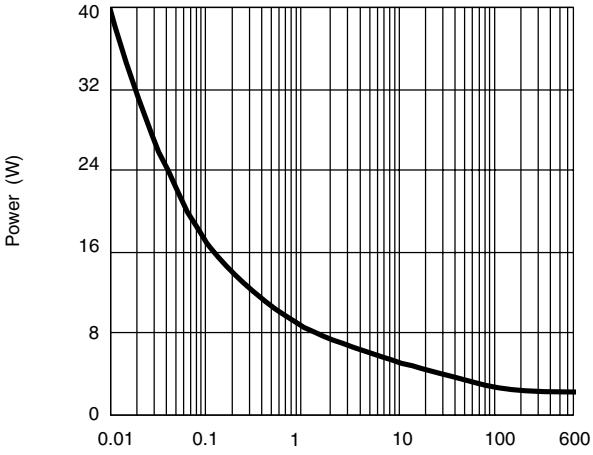
Source-Drain Diode Forward Voltage



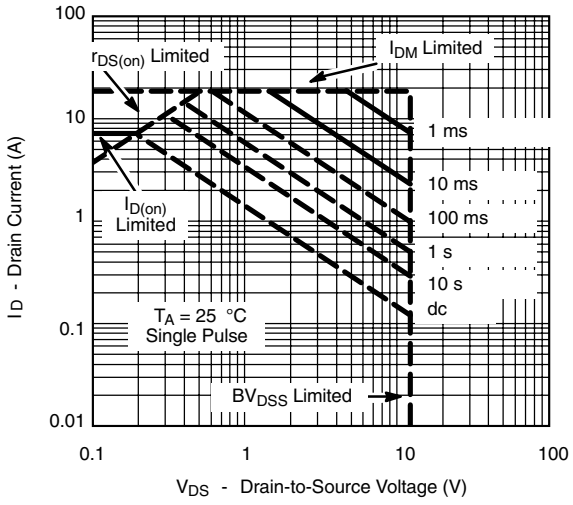
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

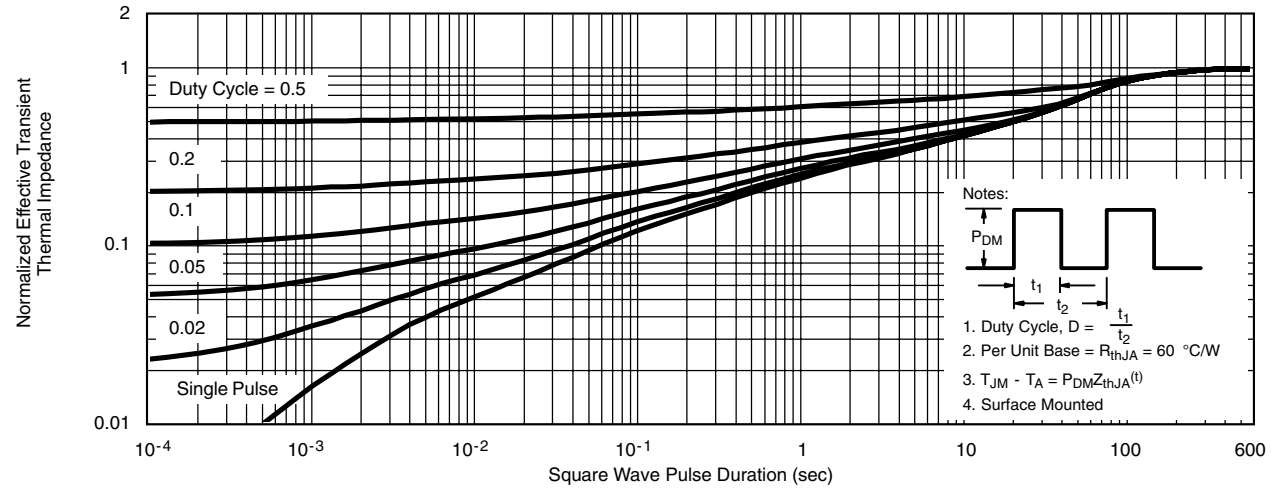


Single Pulse Power

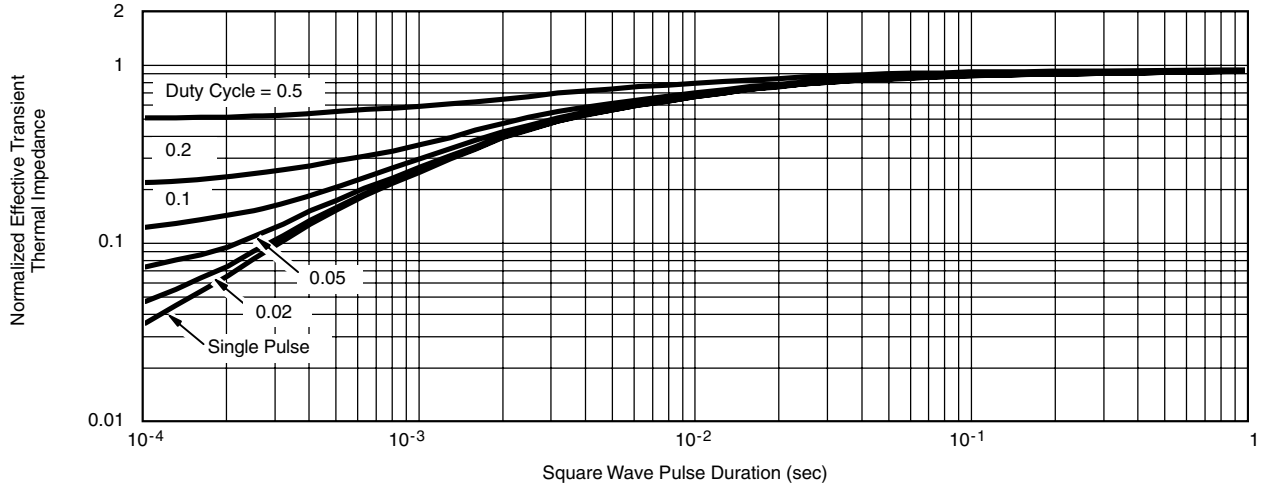


Safe Operating Area, Junction-to-Ambient

N-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted

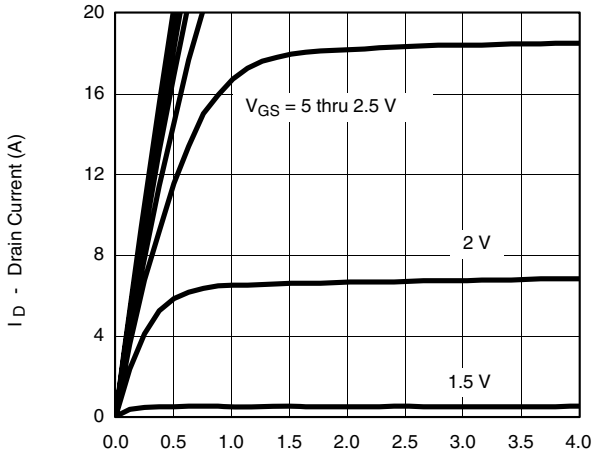


Normalized Thermal Transient Impedance, Junction-to-Ambient

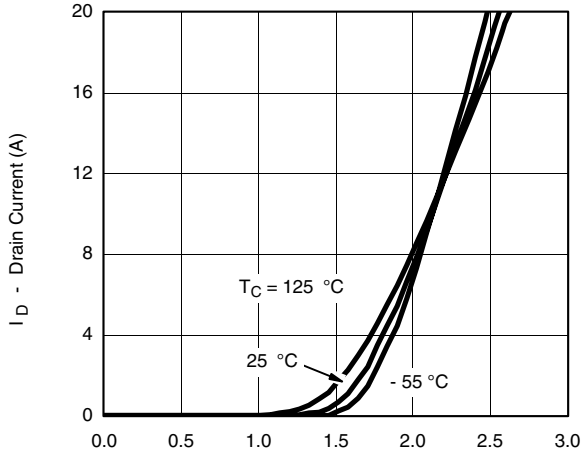


Normalized Thermal Transient Impedance, Junction-to-Case

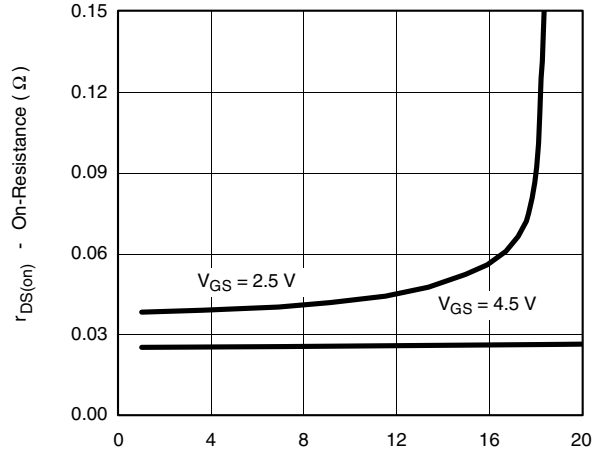
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



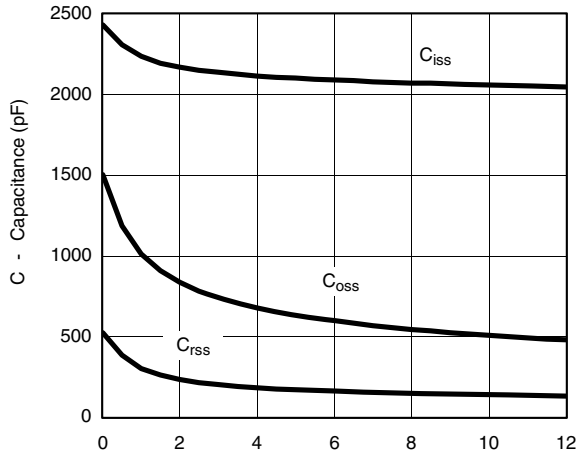
Output Characteristics



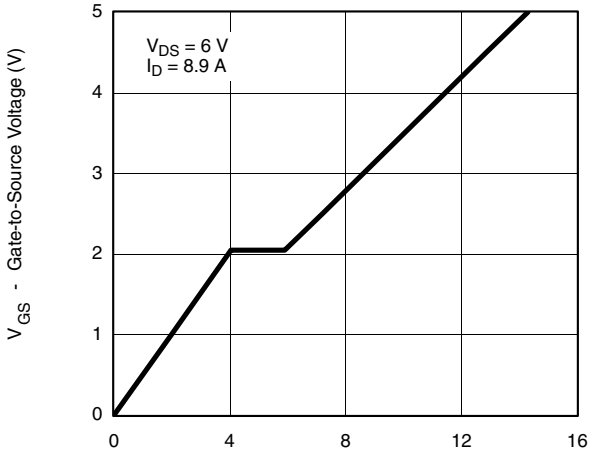
Transfer Characteristics



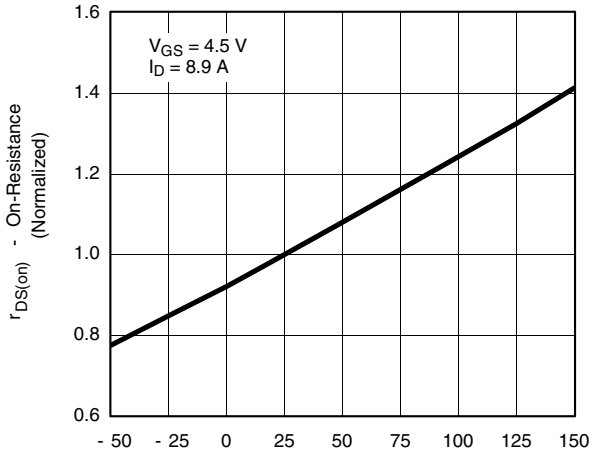
On-Resistance vs. Drain Current



Capacitance

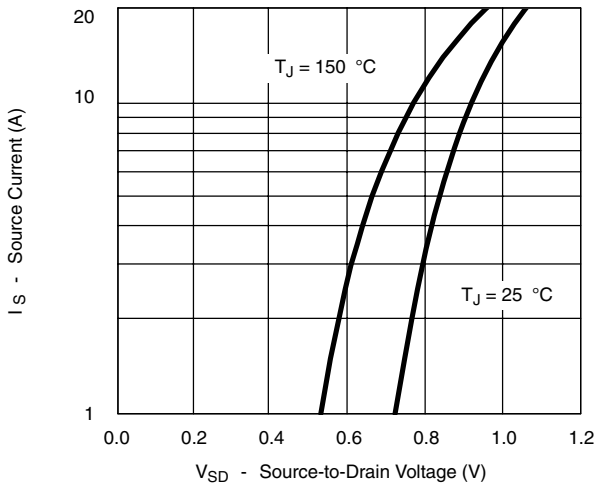


Gate Charge

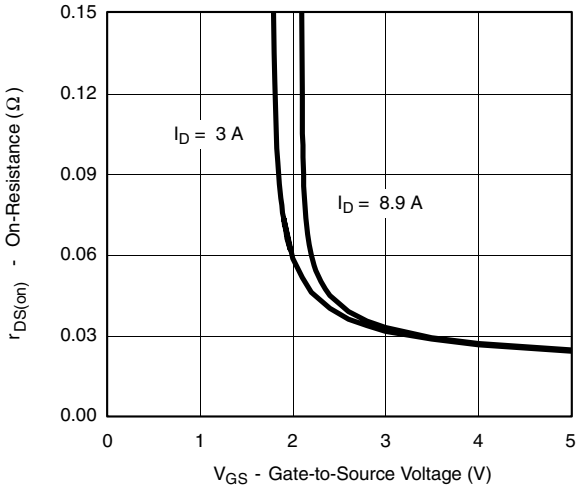


On-Resistance vs. Junction Temperature

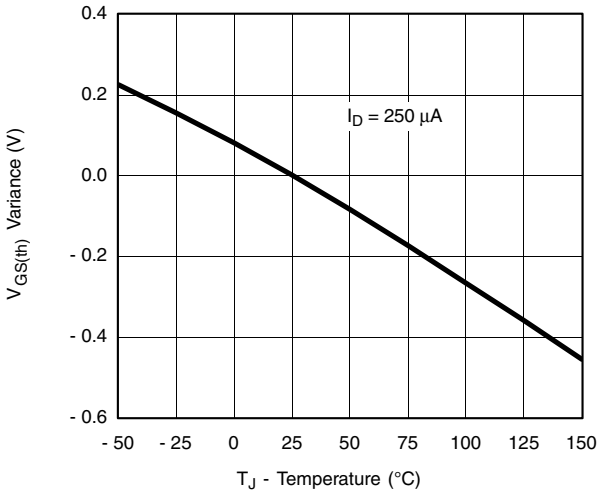
P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



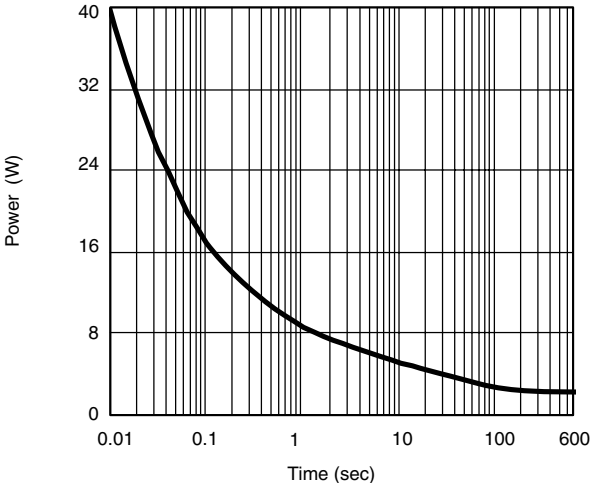
Source-Drain Diode Forward Voltage



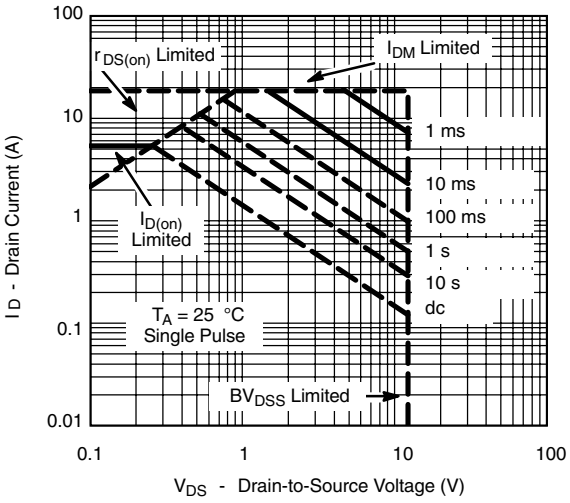
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

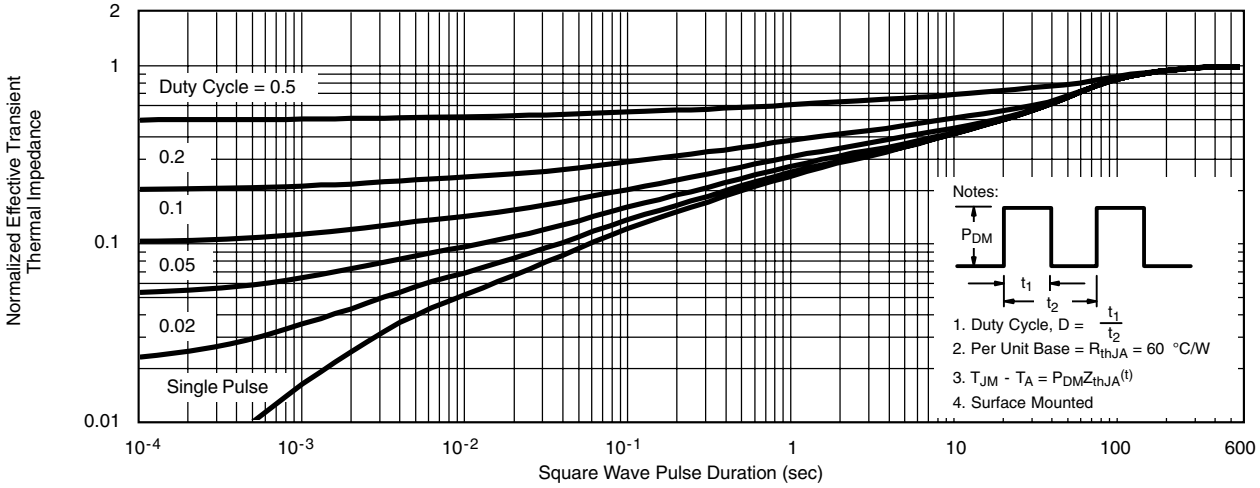


Single Pulse Power

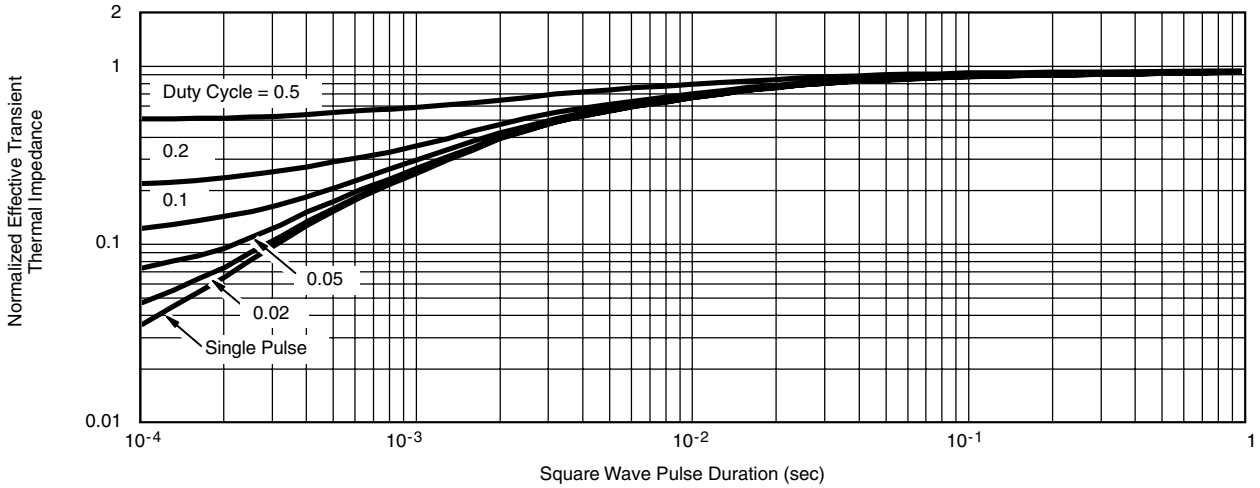


Safe Operating Area, Junction-to-Ambient

P-CHANNEL TYPICAL CHARACTERISTICS 25 °C, unless noted



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

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