

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

PRODUCT SUMMARY				
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
Channel 1	30	0.0145 at V _{GS} = 10 V	10.8	8.3
		0.0195 at V _{GS} = 4.5 V	9.3	
Channel 2	30	0.0265 at V _{GS} = 10 V	7.2	4
		0.036 at V _{GS} = 4.5 V	6.2	

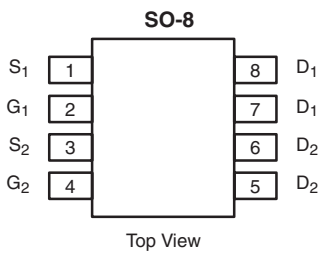
FEATURES

- Halogen-free According to IEC 61249-2-21 Available
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested

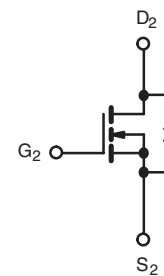
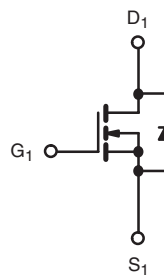


APPLICATIONS

- Logic DC/DC for Notebook PC



Ordering Information: Si4972DY-T1-E3 (Lead (Pb)-free)
Si4972DY-T1-GE3 (Lead (Pb)-free and Halogen-free)



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Channel 1	Channel 2	Unit
Drain-Source Voltage	V _{DS}	30		V
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	10.8	7.2	A
	T _C = 70 °C	8.7	5.7	
	T _A = 25 °C	8.7 ^{b,c}	6.4 ^{b,c}	
	T _A = 70 °C	6.9 ^{b,c}	5.1 ^{b,c}	
Pulsed Drain Current (10 μs Pulse Width)	I _{DM}	20	20	A
Source-Drain Current Diode Current	T _C = 25 °C	2.5	2.1	
	T _A = 25 °C	1.6 ^{b,c}	1.6 ^{b,c}	
Pulsed Source-Drain Current	I _{SM}	20	20	mJ
Single Pulse Avalanche Current	L = 0.1 mH I _{AS}	15	6	
Avalanche Energy	E _{AS}	11	1.8	W
Maximum Power Dissipation	T _C = 25 °C	3.1	2.5	
	T _C = 70 °C	2.1	1.6	
	T _A = 25 °C	2.0 ^{b,c}	2.0 ^{b,c}	
	T _A = 70 °C	1.25 ^{b,c}	1.25 ^{b,c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C

THERMAL RESISTANCE RATINGS						
Parameter	Symbol	Channel 1		Channel 2		Unit
		Typical	Maximum	Typical	Maximum	
Maximum Junction-to-Ambient ^{b, d}	t ≤ 10 s R _{thJA}	52	62.5	55	62.5	°C/W
Maximum Junction-to-Foot (Drain)	Steady R _{thJF}	32	40	40	50	

Notes:
a. Based on T_C = 25 °C.
b. Surface mounted on 1" x 1" FR4 board.
c. t = 10 s.
d. Maximum under steady state conditions is 110 °C/W (Ch 1) and 120 °C/W (Ch 2).

SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted								
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit		
Static								
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	Ch 1	30		V		
		$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	Ch 2	30				
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch 1		35	mV/ $^\circ\text{C}$		
		$I_D = 250\text{ }\mu\text{A}$	Ch 2		35			
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = 250\text{ }\mu\text{A}$	Ch 1		- 6.5			
		$I_D = 250\text{ }\mu\text{A}$	Ch 2		- 6.5			
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	Ch 1	1.5	3.0	V		
		$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	Ch 2	1.5	3.0			
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	Ch 1		100	nA		
			Ch 2		100			
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch 1		1	μA		
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}$	Ch 2		1			
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	Ch 1		10			
		$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	Ch 2		10			
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	Ch 1	10		A		
		$V_{DS} = 5\text{ V}, V_{GS} = 10\text{ V}$	Ch 2	10				
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 6\text{ A}$	Ch 1		0.012	Ω		
		$V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$	Ch 2		0.022			
		$V_{GS} = 4.5\text{ V}, I_D = 5.6\text{ A}$	Ch 1		0.016		0.0195	
		$V_{GS} = 4.5\text{ V}, I_D = 4\text{ A}$	Ch 2		0.030		0.036	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 6\text{ A}$	Ch 1		27	S		
		$V_{DS} = 15\text{ V}, I_D = 4.5\text{ A}$	Ch 2		20			
Dynamic^a								
Input Capacitance	C_{iss}	Channel 1 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch 1		1080	pF		
			Ch 2		515			
Output Capacitance	C_{oss}		Ch 1		170			
			Ch 2		91			
Reverse Transfer Capacitance	C_{rss}		Channel 2 $V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	Ch 1			72	
				Ch 2			38	
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		Ch 1		18.5	nC	
		$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 5\text{ A}$		Ch 2		9.6		15
		Channel 1 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$		Ch 1		8.3		13
				Ch 2		4		6
Gate-Source Charge	Q_{gs}	Channel 2 $V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	Ch 1		3.9			
			Ch 2		1.9			
Gate-Drain Charge	Q_{gd}		Ch 1		2.7			
			Ch 2		1.3			
Gate Resistance	R_g		$f = 1\text{ MHz}$	Ch 1		2.5	Ω	
				Ch 2		2.9		4.4



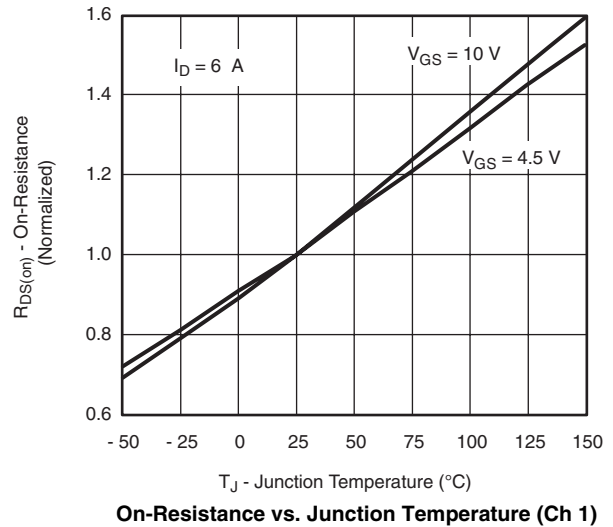
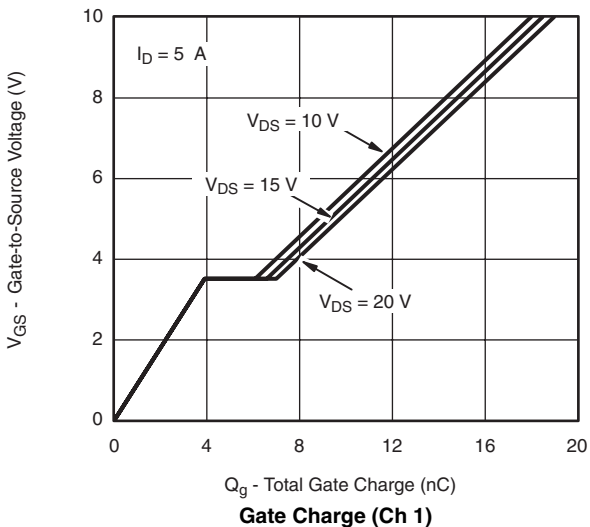
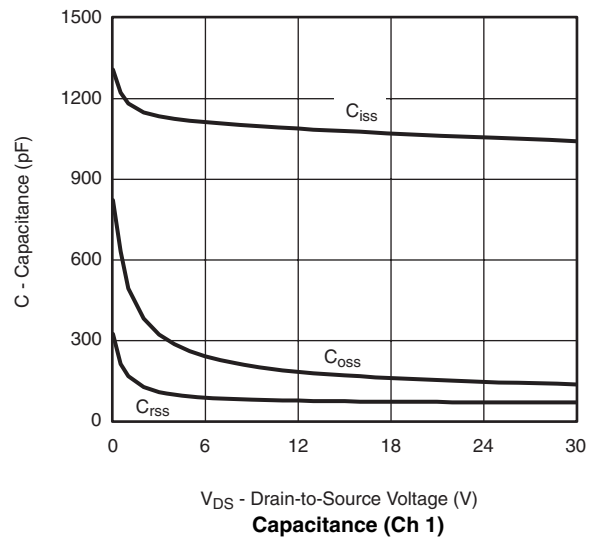
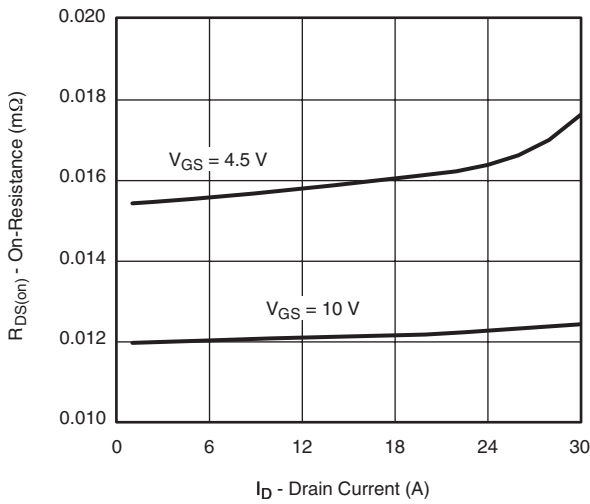
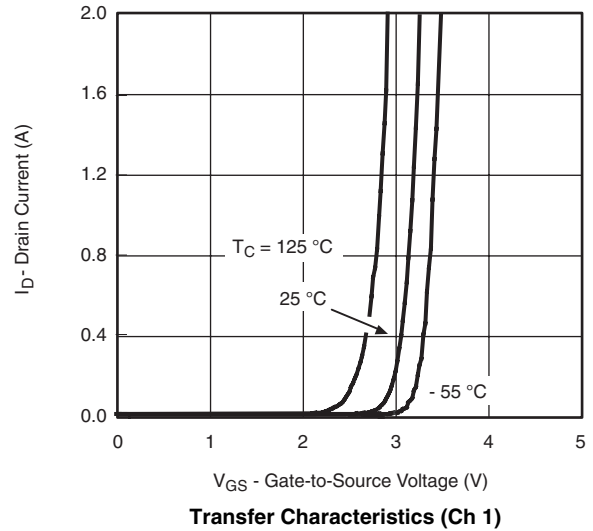
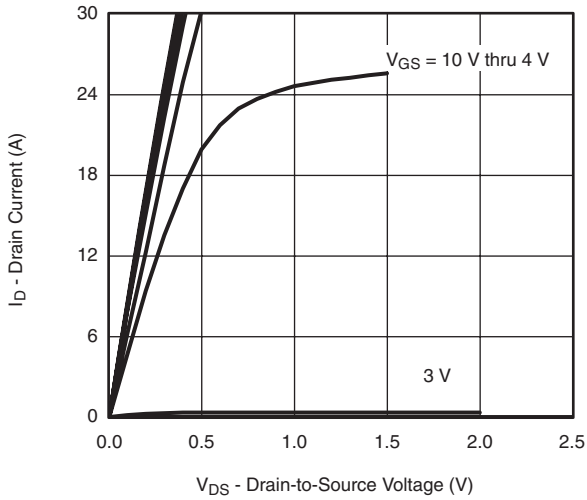
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit	
Dynamic^a							
Turn-On Delay Time	$t_{d(on)}$	Channel 1 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\ \Omega$	Ch 1		12	18	ns
			Ch 2		10	15	
Rise Time	t_r		Ch 1		55	83	
			Ch 2		60	90	
Turn-Off Delay Time	$t_{d(off)}$	Channel 2 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\ \Omega$	Ch 1		30	45	
			Ch 2		22	33	
Fall Time	t_f		Ch 1		7	11	
			Ch 2		6	9	
Turn-On Delay Time	$t_{d(on)}$	Channel 1 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\ \Omega$	Ch 1		120	180	
			Ch 2		108	162	
Rise Time	t_r		Ch 1		150	225	
			Ch 2		130	195	
Turn-Off Delay Time	$t_{d(off)}$	Channel 2 $V_{DD} = 15\text{ V}, R_L = 3\ \Omega$ $I_D \cong 5\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 16\ \Omega$	Ch 1		29	44	
			Ch 2		19	29	
Fall Time	t_f		Ch 1		13	20	
			Ch 2		26	39	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	Ch 1			2.5	A
			Ch 2			2.1	
Pulse Diode Forward Current ^a	I_{SM}		Ch 1			20	
			Ch 2			20	
Body Diode Voltage	V_{SD}	$I_S = 1.6\text{ A}$	Ch 1		0.77	1.2	V
			Ch 2		0.79	1.2	
Body Diode Reverse Recovery Time	t_{rr}	Channel 1 $I_F = 2\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	Ch 1		21	42	ns
			Ch 2		18	36	
Body Diode Reverse Recovery Charge	Q_{rr}		Ch 1		15	30	nC
			Ch 2		11	22	
Reverse Recovery Fall Time	t_a	Channel 2 $I_F = 2\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	Ch 1		13		ns
			Ch 2		11		
Reverse Recovery Rise Time	t_b		Ch 1		8		
			Ch 2		7		

Notes:

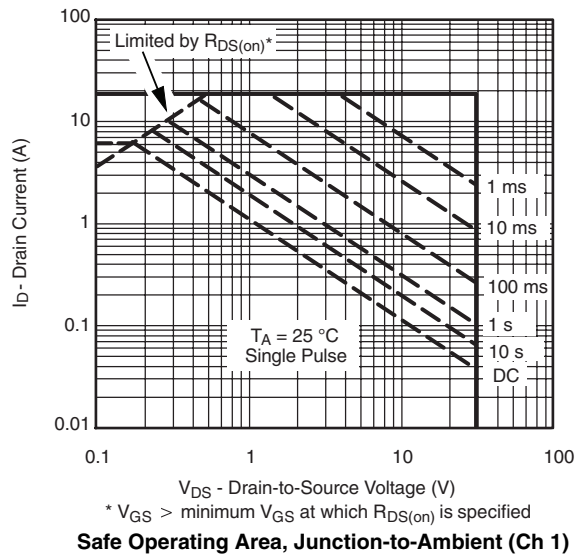
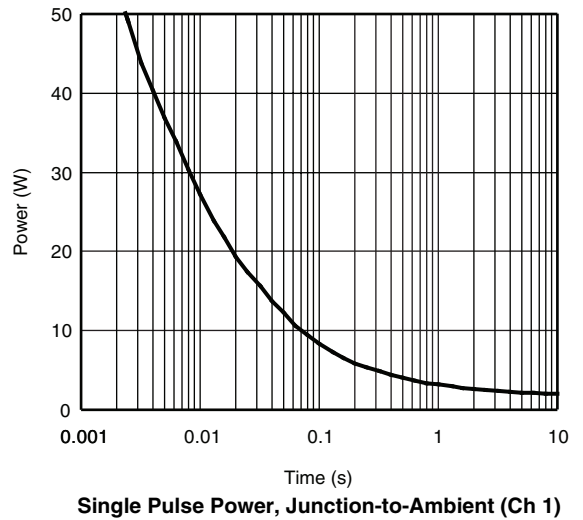
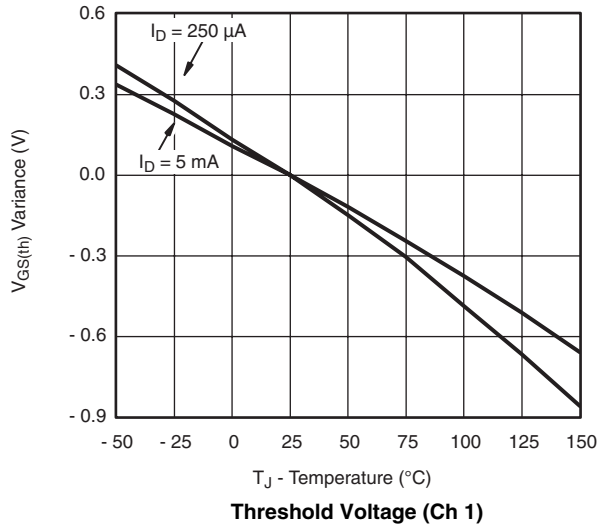
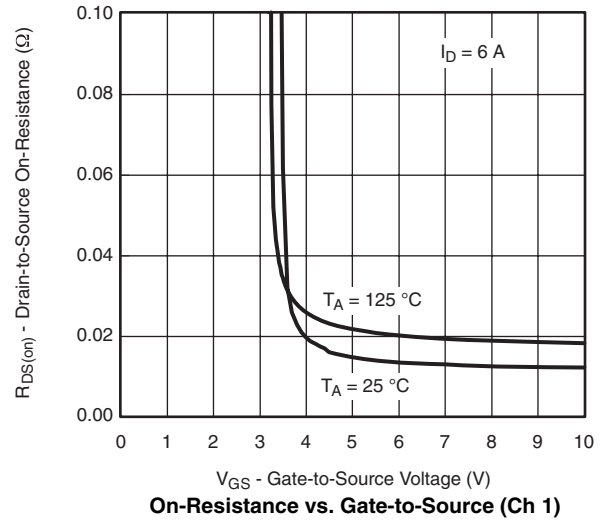
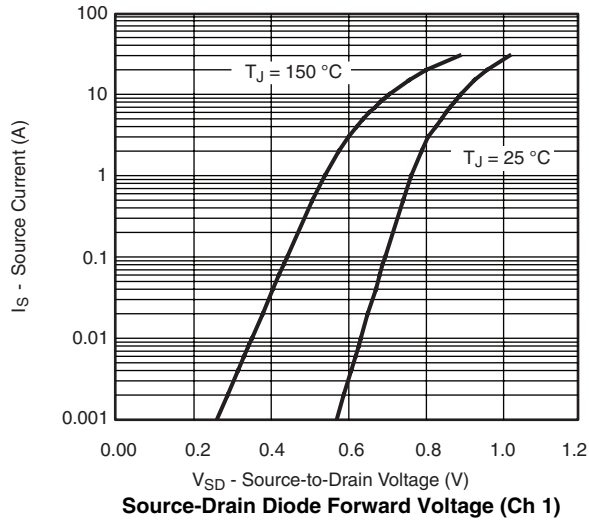
- a. Guaranteed by design, not subject to production testing.
- b. Pulse test; pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

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.

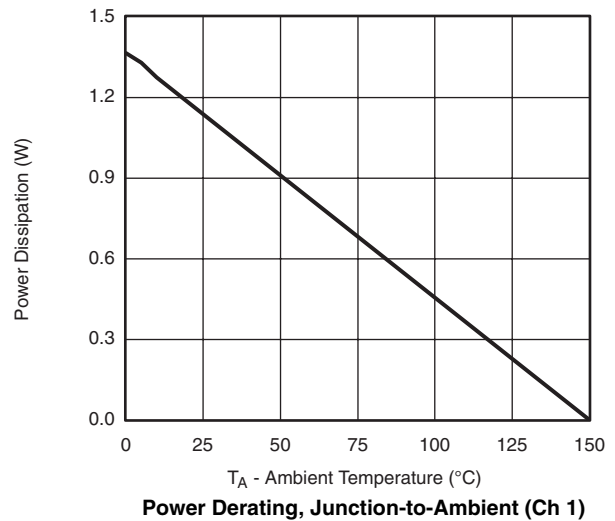
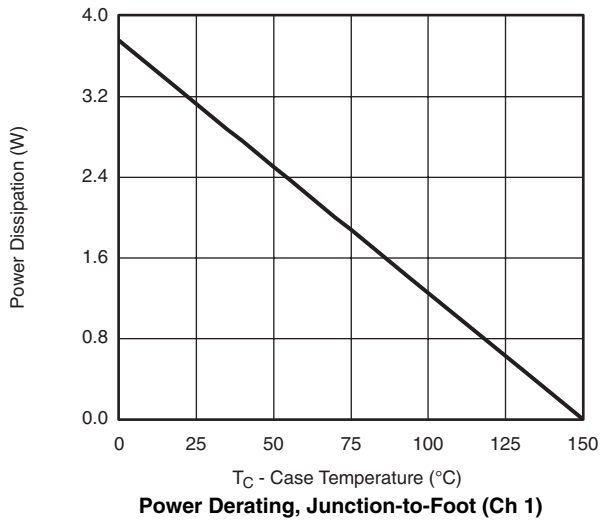
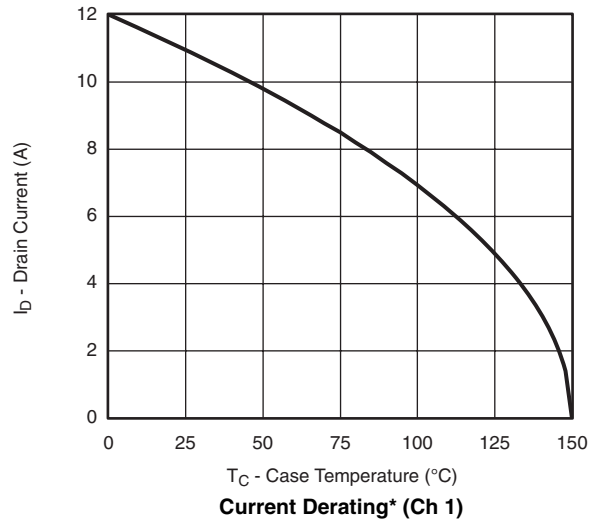
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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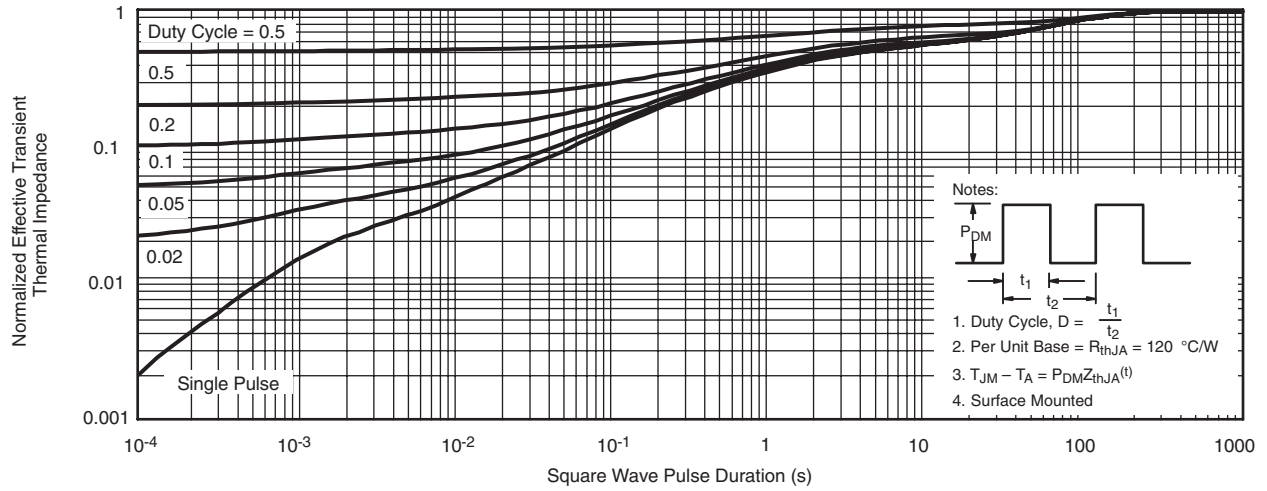


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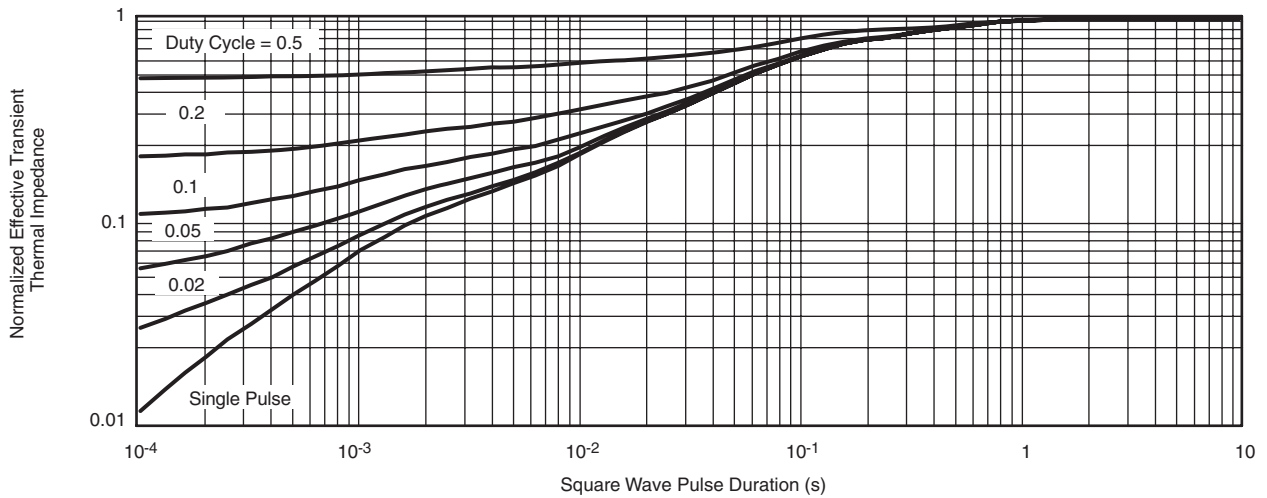


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

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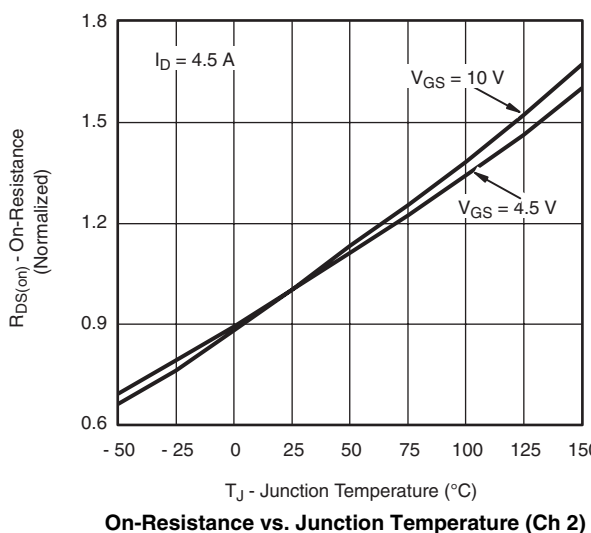
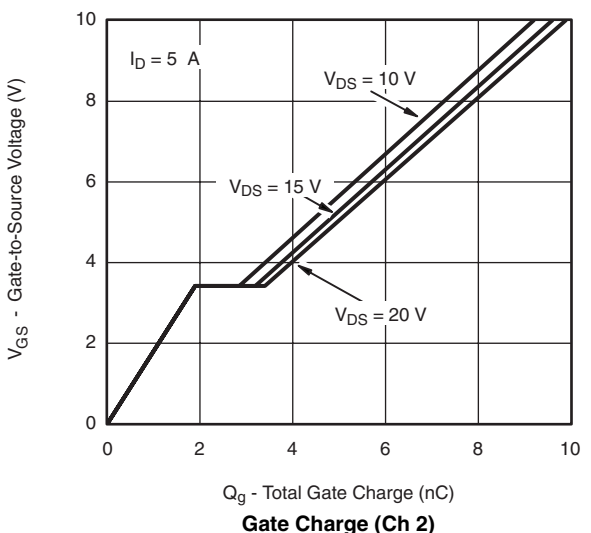
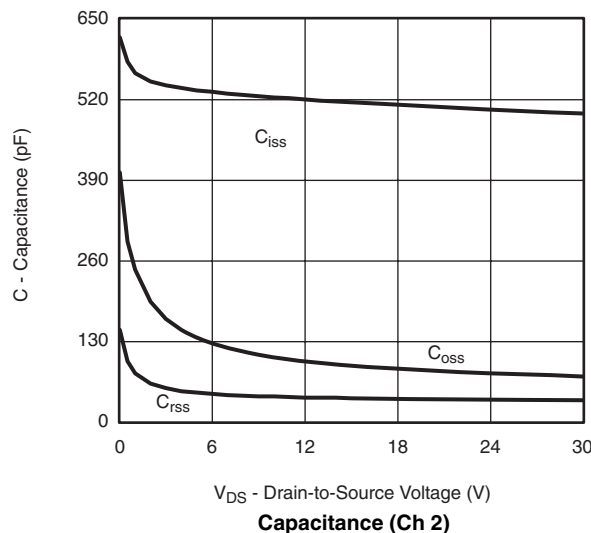
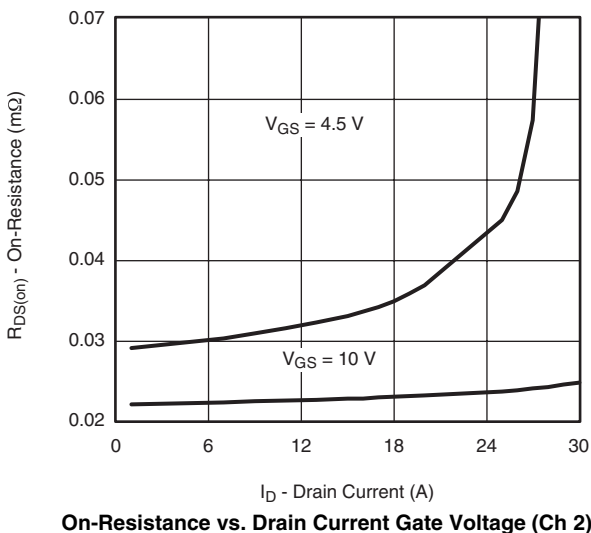
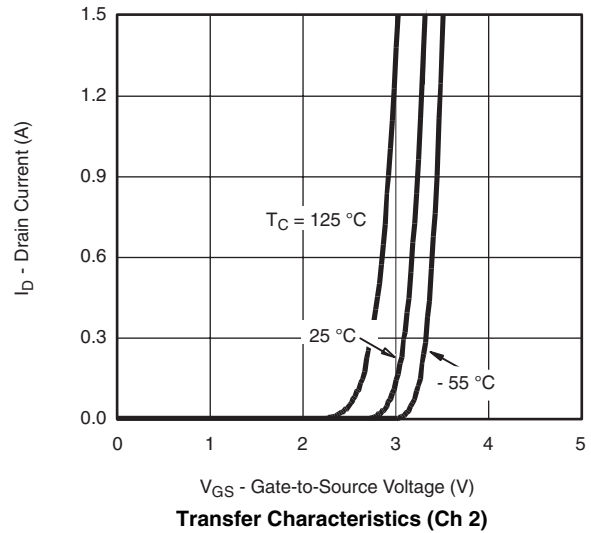
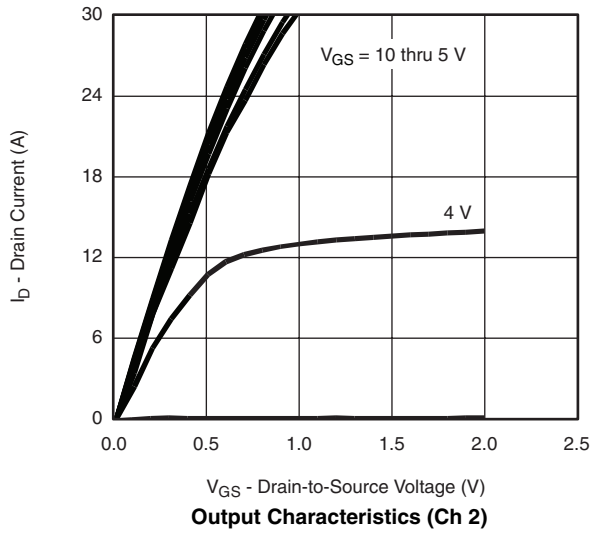


Normalized Thermal Transient Impedance, Junction-to-Ambient (Ch 1)

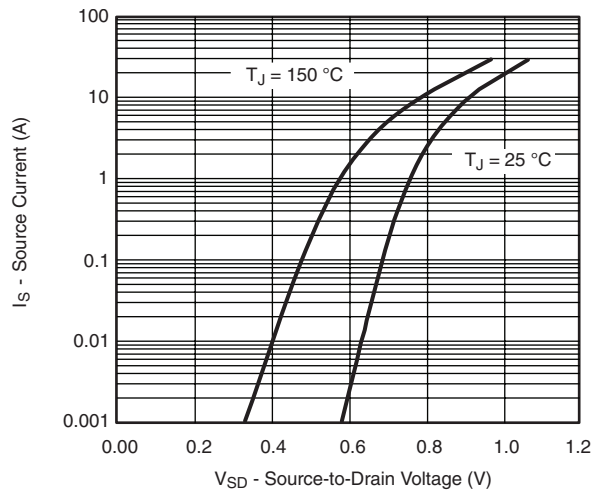


Normalized Thermal Transient Impedance, Junction-to-Case (Ch 1)

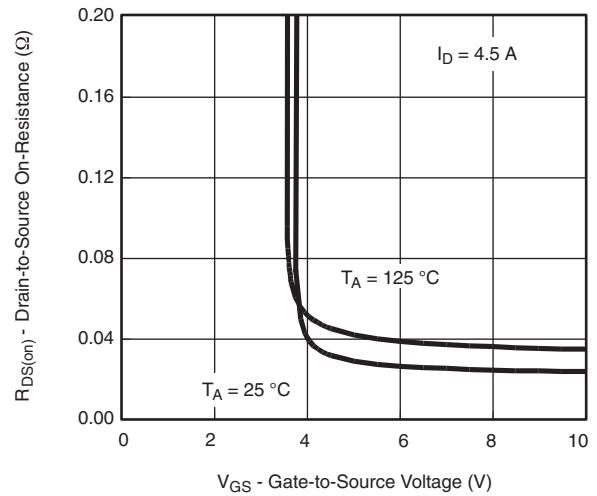
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



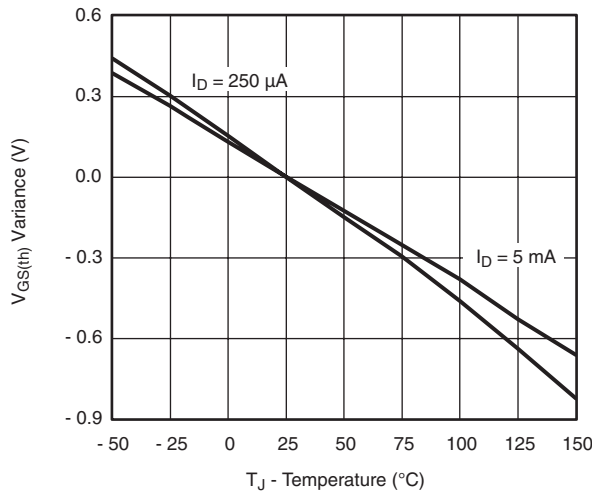
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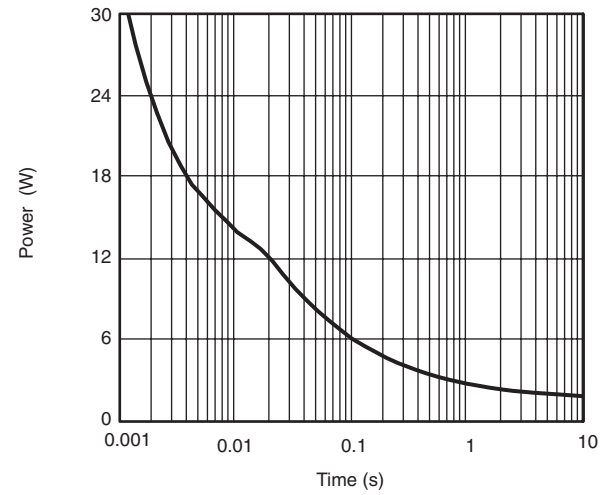
Source-Drain Diode Forward Voltage (Ch 2)



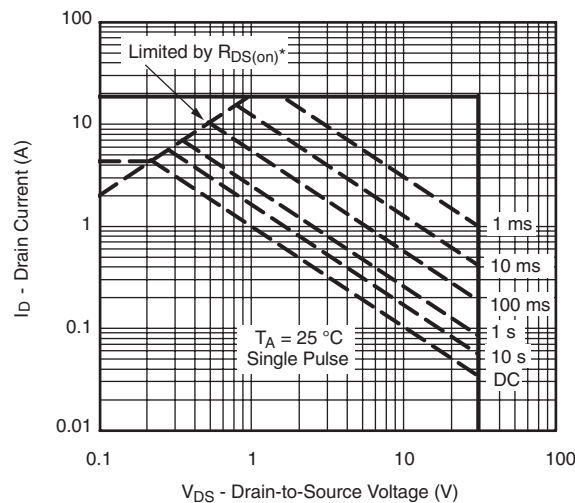
On-Resistance vs. Gate-to-Source Temperature (Ch 2)



Threshold Voltage (Ch 2)



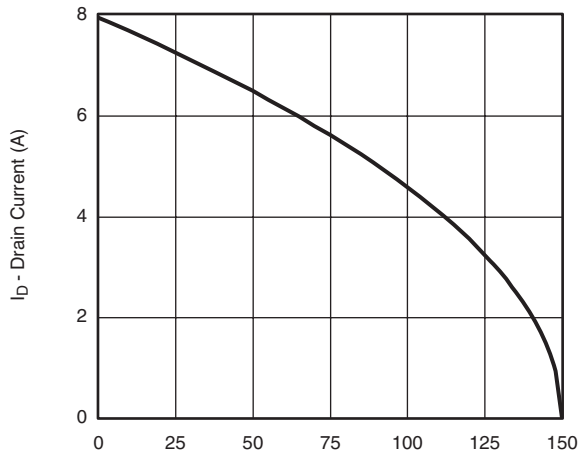
Single Pulse Power, Junction-to-Ambient (Ch 2)



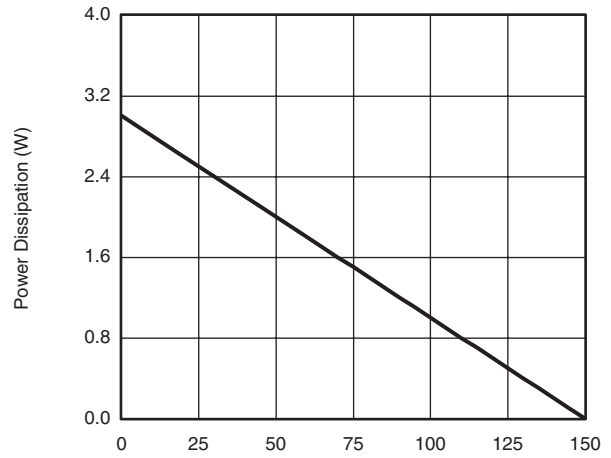
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient (Ch 2)

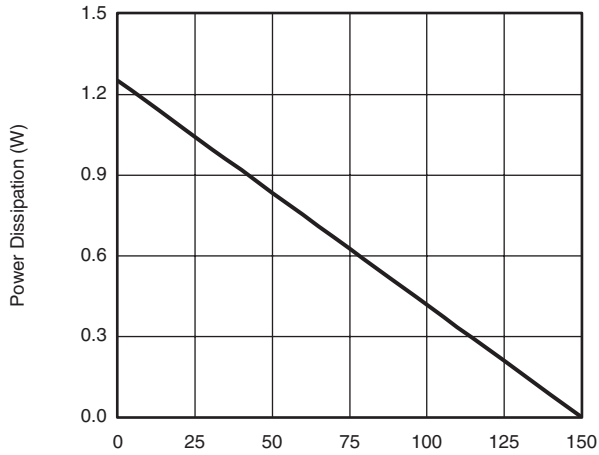
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



T_C - Case Temperature (°C)
Current Derating* (Ch 2)



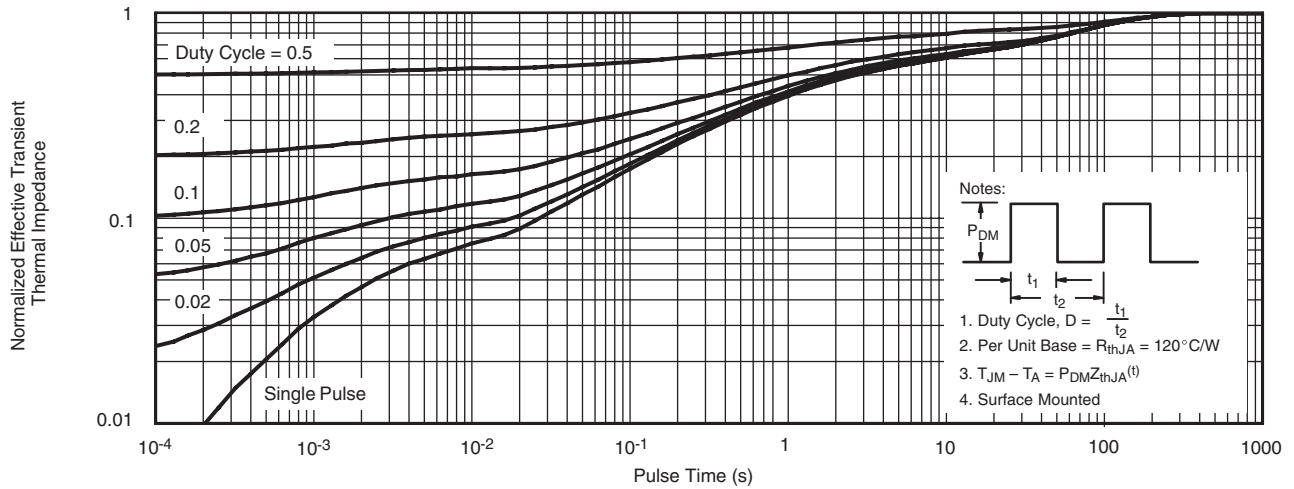
T_C - Case Temperature (°C)
Power Derating, Junction-to-Foot (Ch 2)



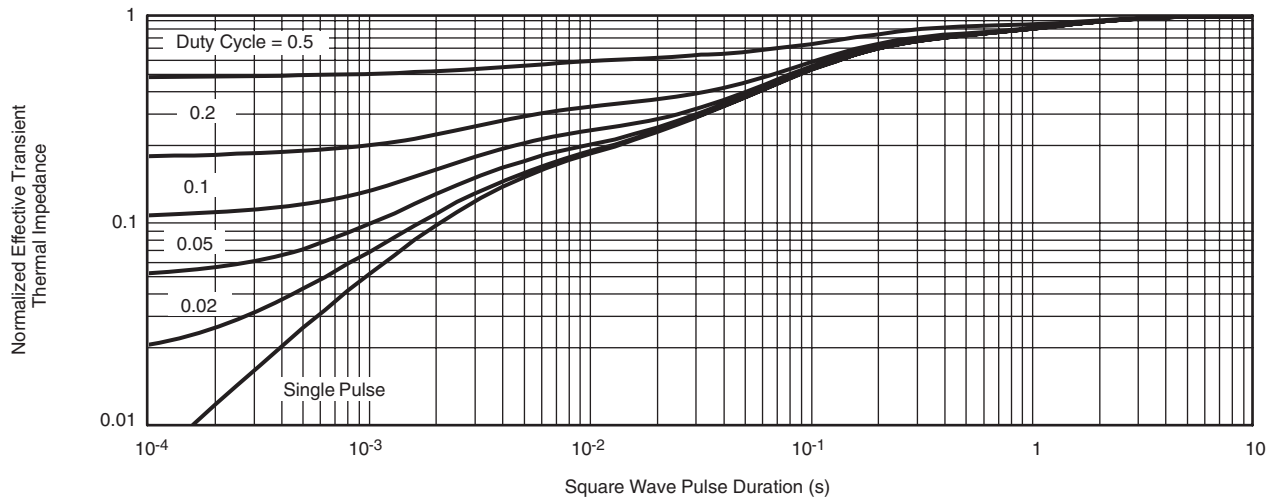
T_A - Ambient Temperature (°C)
Power Derating, Junction-to-Ambient (Ch 2)

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TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient (Ch 2)



Normalized Thermal Transient Impedance, Junction-to-Case (Ch 2)

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