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	

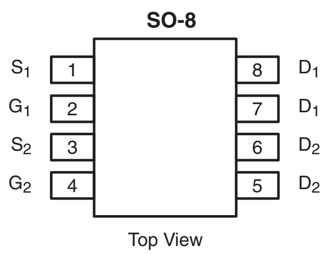
FEATURES

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

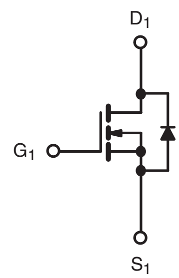
RoHS COMPLIANT
HALOGEN FREE Available

APPLICATIONS

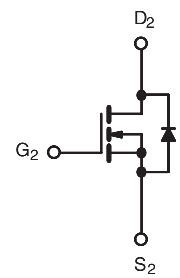
- Logic DC/DC for Notebook PC



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



N-Channel MOSFET



N-Channel MOSFET

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	I_D	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	
Source-Drain Current Diode Current	T_C = 25 °C	I_S	2.5	2.1	
	T_A = 25 °C		1.6[b,c]	1.6[b,c]	
Pulsed Source-Drain Current		I_{SM}	20	20	
Single Pulse Avalanche Current	L = 0.1 mH	I_{AS}	15	6	
Avalanche Energy		E_{AS}	11	1.8	mJ
Maximum Power Dissipation	T_C = 25 °C	P_D	3.1	2.5	W
	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							
			Channel 1		Channel 2		
Parameter		**Symbol**	**Typical**	**Maximum**	**Typical**	**Maximum**	**Unit**
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 °C, unless otherwise noted

Parameter	Symbol	Test Conditions		Min.	Typ.[a]	Max.	Unit
Static							
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	Ch 1	30			V
		V_{GS} = 0 V, I_D = 250 µA	Ch 2	30			
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = 250 µA	Ch 1		35		mV/°C
		I_D = 250 µA	Ch 2		35		
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	I_D = 250 µA	Ch 1		- 6.5		
		I_D = 250 µA	Ch 2		- 6.5		
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	Ch 1	1.5		3.0	V
		V_{DS} = V_{GS}, I_D = 250 µA	Ch 2	1.5		3.0	
Gate-Body Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 20 V	Ch 1			100	nA
			Ch 2			100	
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	Ch 1			1	µA
		V_{DS} = 30 V, V_{GS} = 0 V	Ch 2			1	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 55 °C	Ch 1			10	
		V_{DS} = 30 V, V_{GS} = 0 V, T_J = 55 °C	Ch 2			10	
On-State Drain Current[b]	$I_{D(on)}$	V_{DS} = 5 V, V_{GS} = 10 V	Ch 1	10			A
		V_{DS} = 5 V, V_{GS} = 10 V	Ch 2	10			
Drain-Source On-State Resistance[b]	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 6 A	Ch 1		0.012	0.0145	Ω
		V_{GS} = 10 V, I_D = 4.5 A	Ch 2		0.022	0.0265	
		V_{GS} = 4.5 V, I_D = 5.6 A	Ch 1		0.016	0.0195	
		V_{GS} = 4.5 V, I_D = 4 A	Ch 2		0.030	0.036	
Forward Transconductance[b]	g_{fs}	V_{DS} = 15 V, I_D = 6 A	Ch 1		27		S
		V_{DS} = 15 V, I_D = 4.5 A	Ch 2		20		
Dynamic[a]							
Input Capacitance	C_{iss}	Channel 1 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz Channel 2 V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz	Ch 1		1080		pF
			Ch 2		515		
Output Capacitance	C_{oss}		Ch 1		170		
			Ch 2		91		
Reverse Transfer Capacitance	C_{rss}		Ch 1		72		
			Ch 2		38		
Total Gate Charge	Q_g	V_{DS} = 15 V, V_{GS} = 10 V, I_D = 5 A	Ch 1		18.5	28	nC
		V_{DS} = 15 V, V_{GS} = 10 V, I_D = 5 A	Ch 2		9.6	15	
		Channel 1 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 5 A Channel 2 V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 5 A	Ch 1		8.3	13	
			Ch 2		4	6	
Gate-Source Charge	Q_{gs}		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 MHz	Ch 1		2.5	3.8	Ω
			Ch 2		2.9	4.4	

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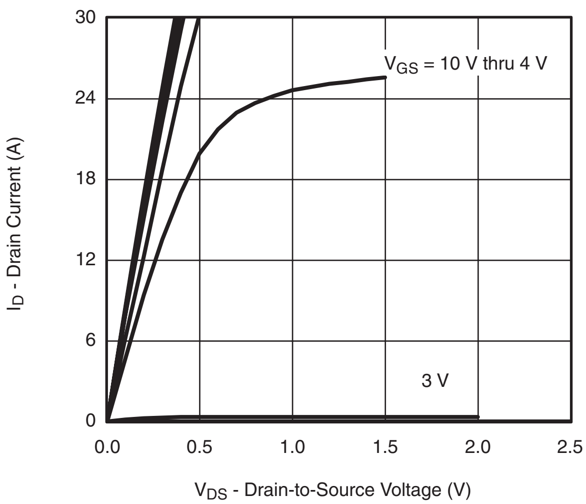
SPECIFICATIONS T_J = 25 °C, unless otherwise noted							
Parameter	**Symbol**	**Test Conditions**		**Min.**	**Typ.[a]**	**Max.**	**Unit**
Dynamic[a]							
Turn-On Delay Time	$t_{d(on)}$	Channel 1 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω Channel 2 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 10 V, R_g = 1 Ω	Ch 1		12	18	ns
			Ch 2		10	15	
Rise Time	t_r		Ch 1		55	83	
			Ch 2		60	90	
Turn-Off DelayTime	$t_{d(off)}$		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 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 1 Ω Channel 2 V_{DD} = 15 V, R_L = 3 Ω $I_D \cong$ 5 A, V_{GEN} = 4.5 V, R_g = 16 Ω	Ch 1		120	180	
			Ch 2		108	162	
Rise Time	t_r		Ch 1		150	225	
			Ch 2		130	195	
Turn-Off Delay Time	$t_{d(off)}$		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							
Continous Source-Drain Diode Current	I_S	T_C = 25 °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 A	Ch 1		0.77	1.2	V
		I_S = 1.6 A	Ch 2		0.79	1.2	
Body Diode Reverse Recovery Time	t_{rr}	Channel 1 I_F = 2 A, dI/dt = 100 A/µs, T_J = 25 °C Channel 2 I_F = 2 A, dI/dt = 100 A/µs, T_J = 25 °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		Ch 1		13		ns
			Ch 2		11		
Reverse Recovery Rise Time	t_b		Ch 1		8		
			Ch 2		7		

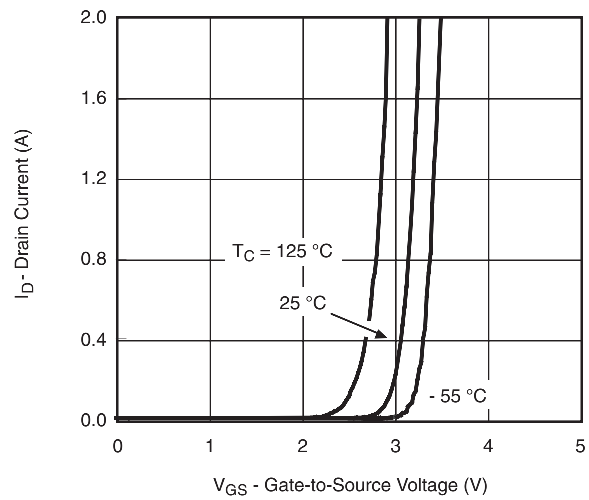
Notes:
a. Guaranteed by design, not subject to production testing.
b. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

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.

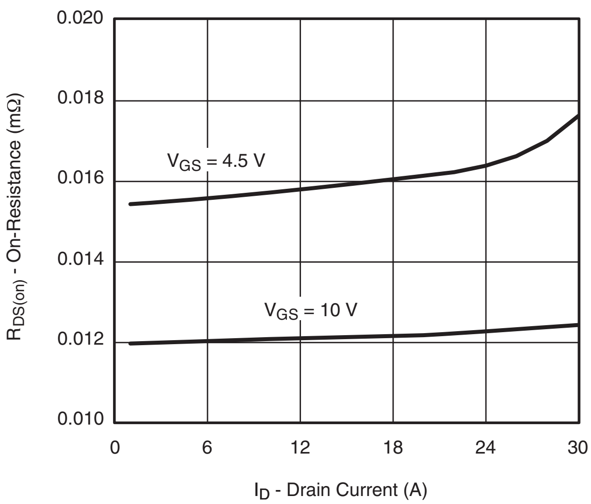
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



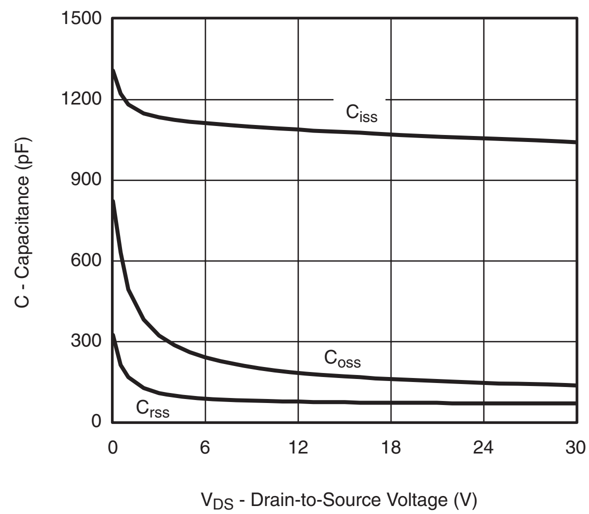
Output Characteristics (Ch 1)



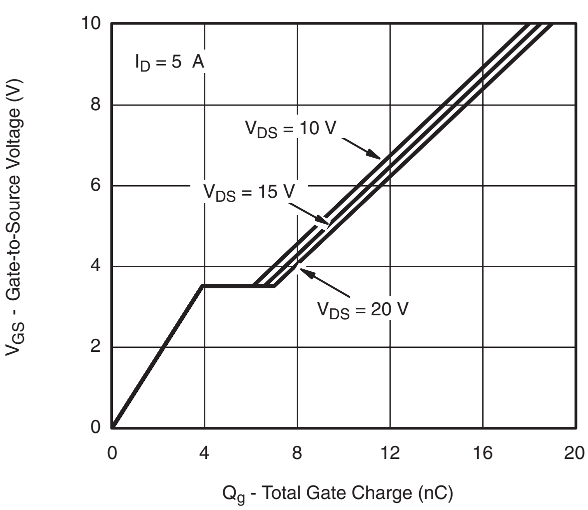
Transfer Characteristics (Ch 1)



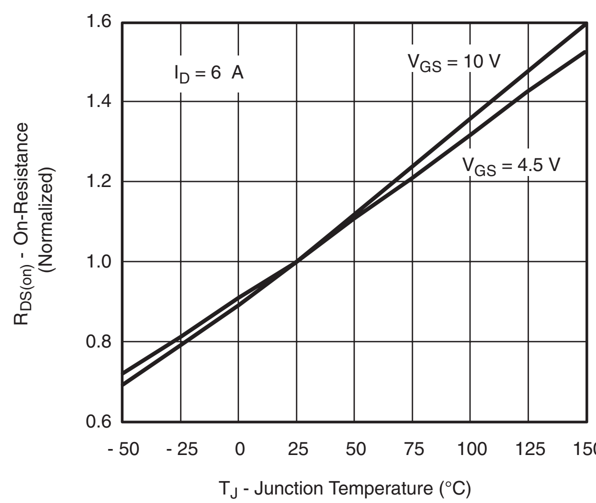
On-Resistance vs. Drain Current and Gate Voltage (Ch 1)



Capacitance (Ch 1)

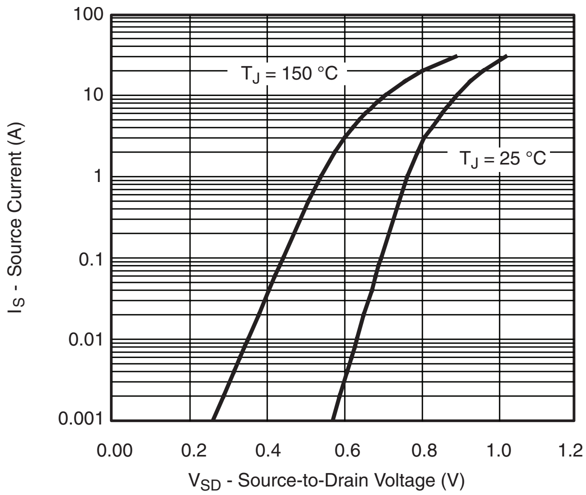


Gate Charge (Ch 1)

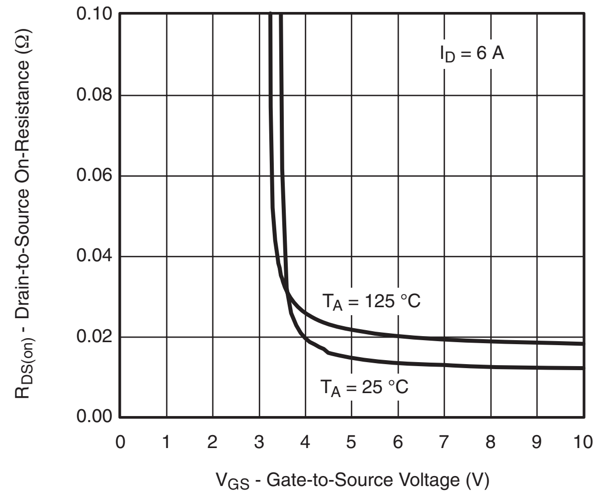


On-Resistance vs. Junction Temperature (Ch 1)

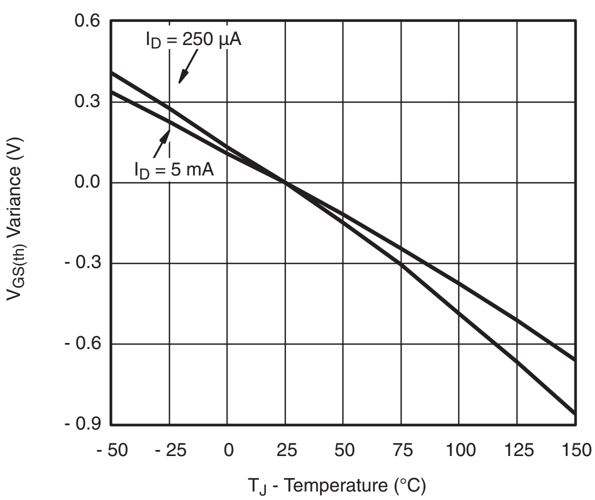
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



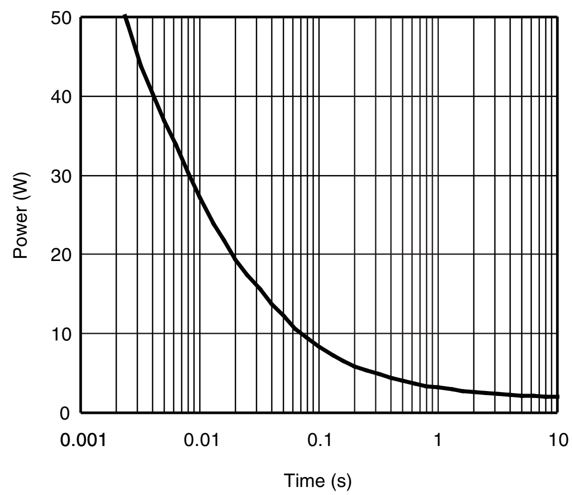
Source-Drain Diode Forward Voltage (Ch 1)



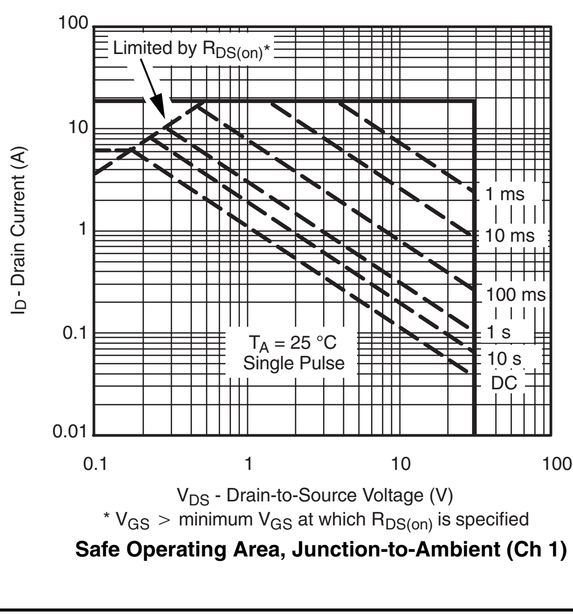
On-Resistance vs. Gate-to-Source (Ch 1)



Threshold Voltage (Ch 1)



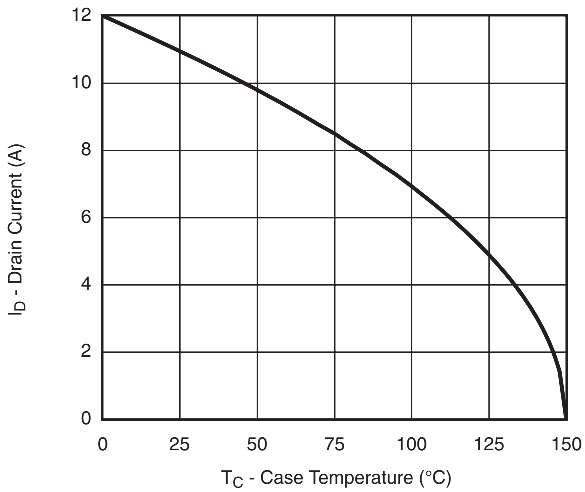
Single Pulse Power, Junction-to-Ambient (Ch 1)



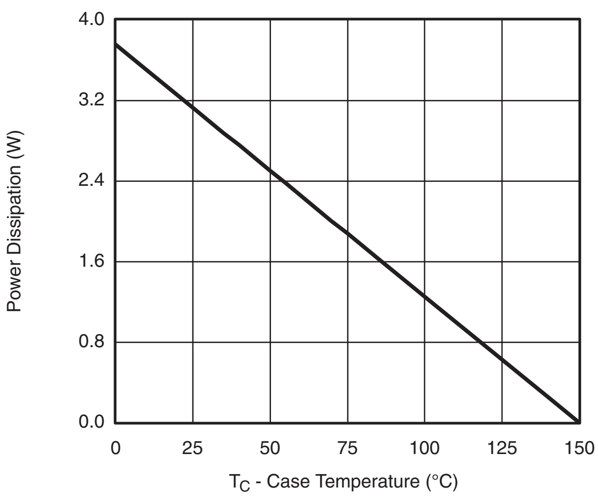
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient (Ch 1)

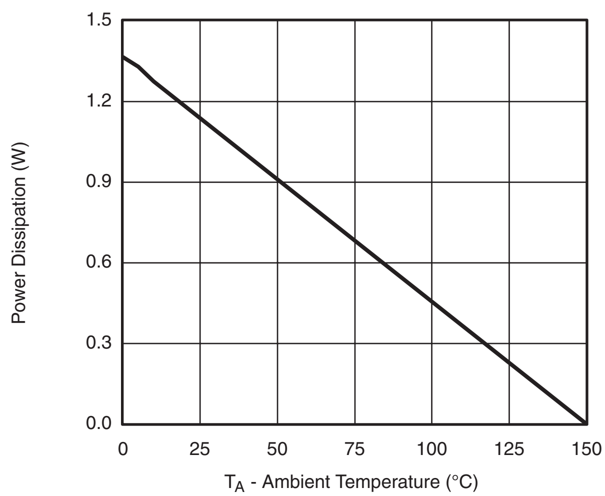
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating* (Ch 1)



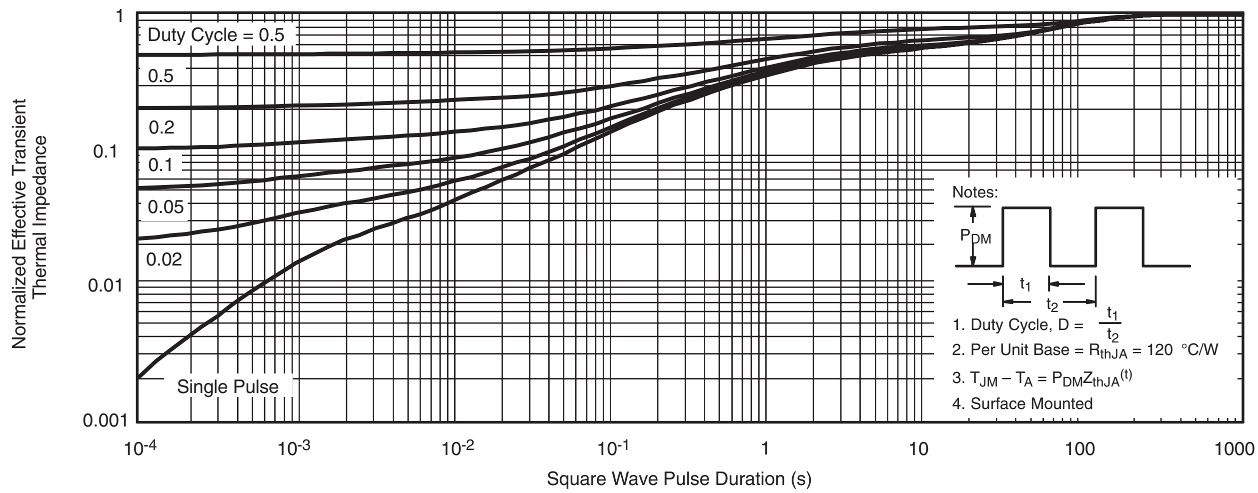
Power Derating, Junction-to-Foot (Ch 1)



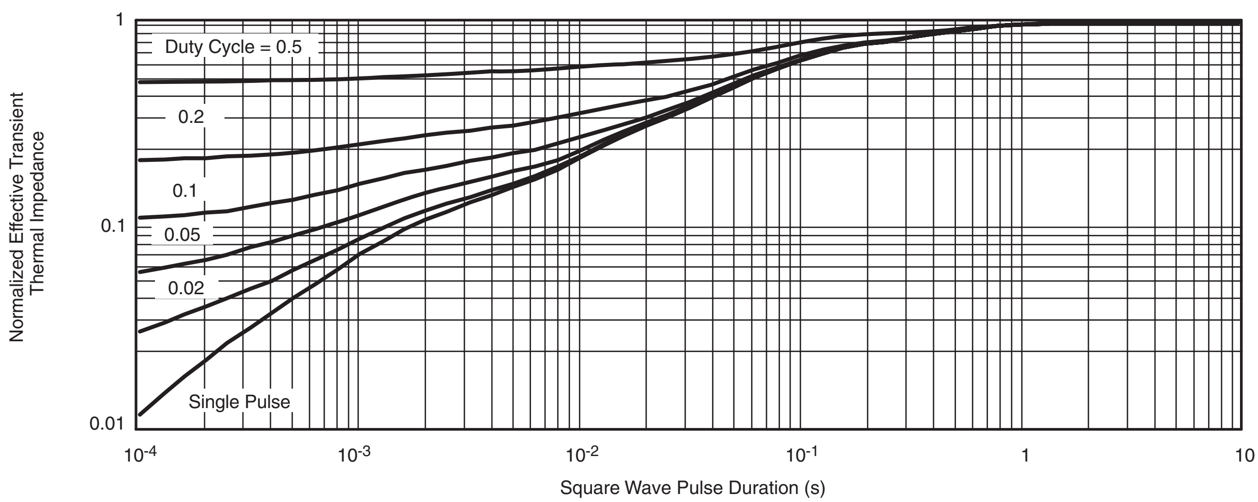
Power Derating, Junction-to-Ambient (Ch 1)

* 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.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

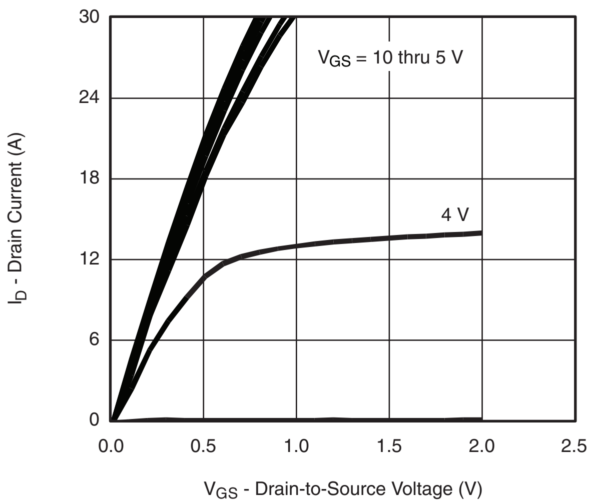


Normalized Thermal Transient Impedance, Junction-to-Ambient (Ch 1)

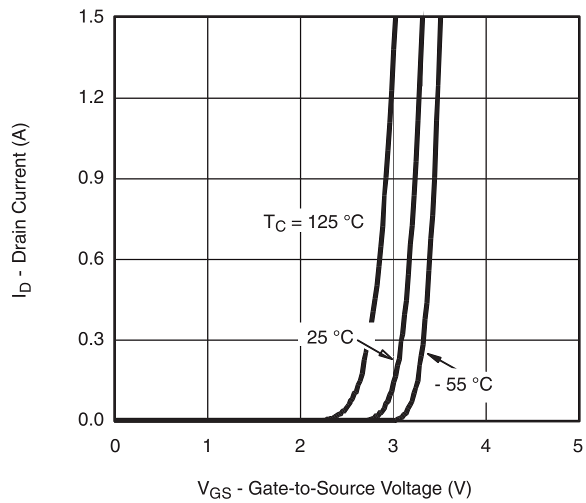


Normalized Thermal Transient Impedance, Junction-to-Case (Ch 1)

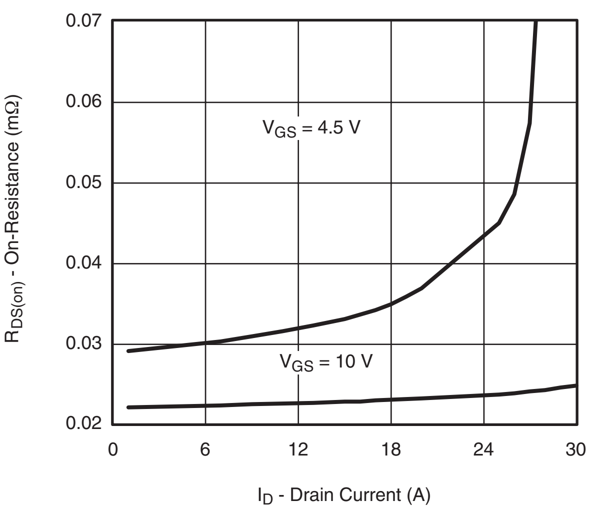
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



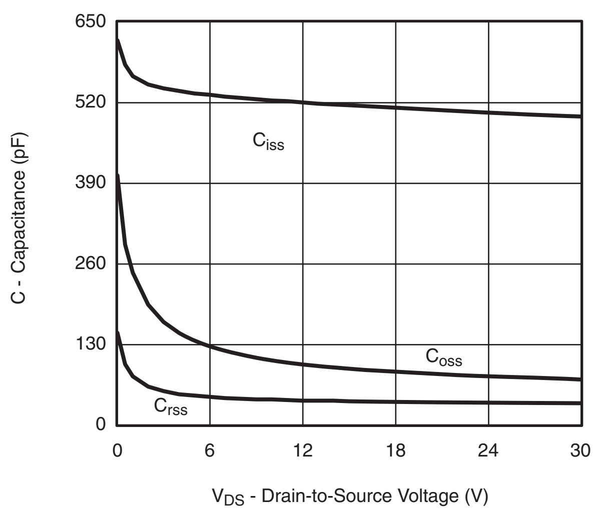
Output Characteristics (Ch 2)



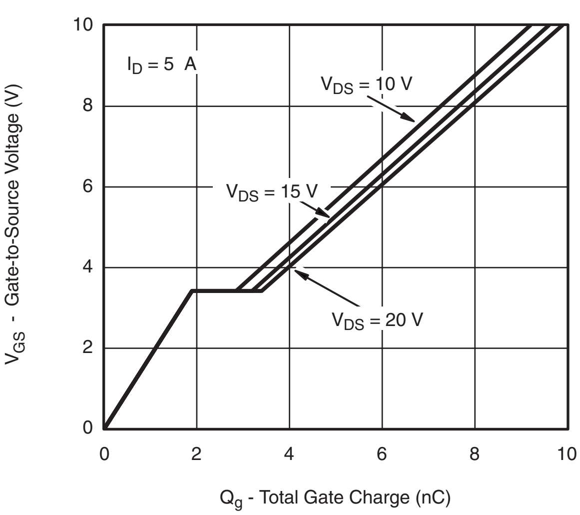
Transfer Characteristics (Ch 2)



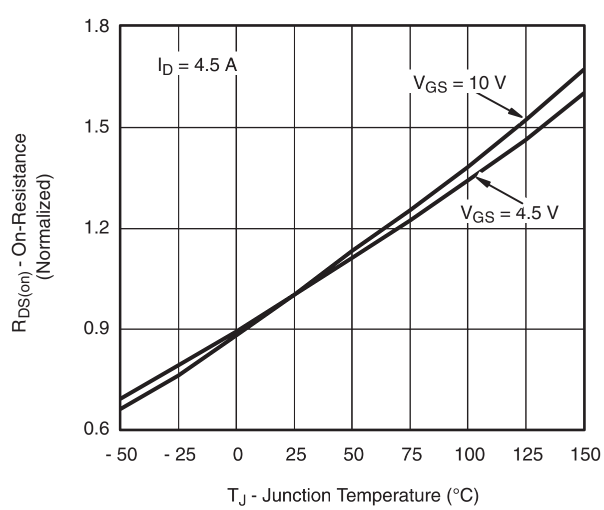
On-Resistance vs. Drain Current Gate Voltage (Ch 2)



Capacitance (Ch 2)

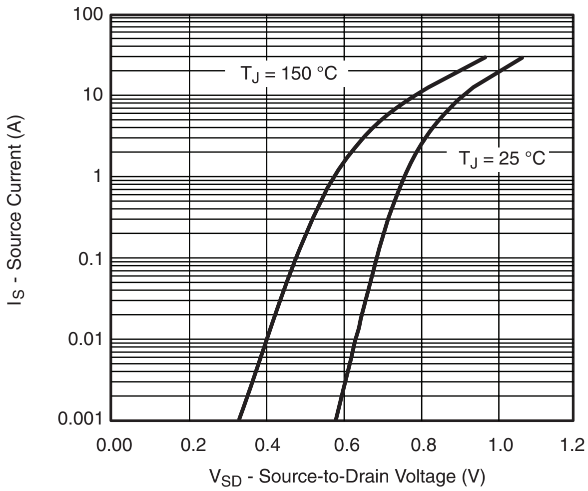


Gate Charge (Ch 2)

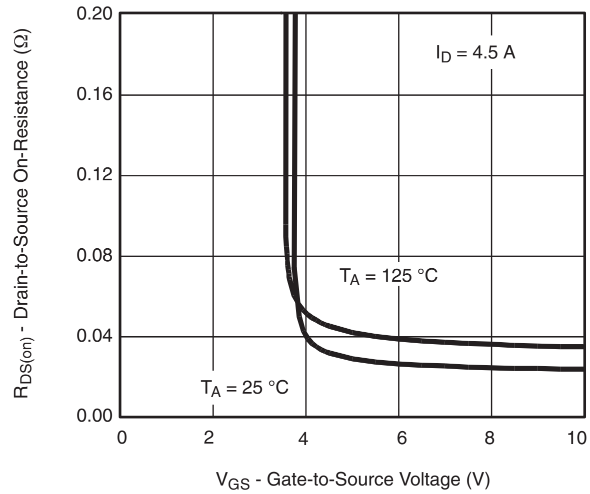


On-Resistance vs. Junction Temperature (Ch 2)

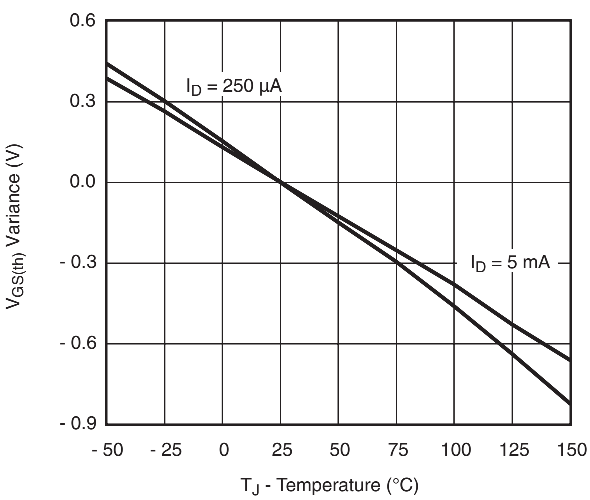
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



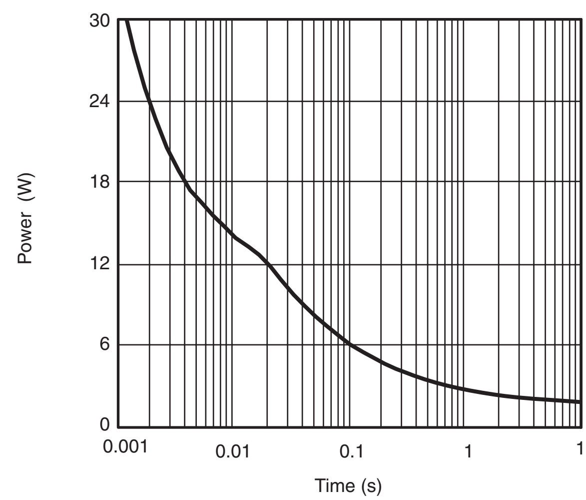
Source-Drain Diode Forward Voltage (Ch 2)



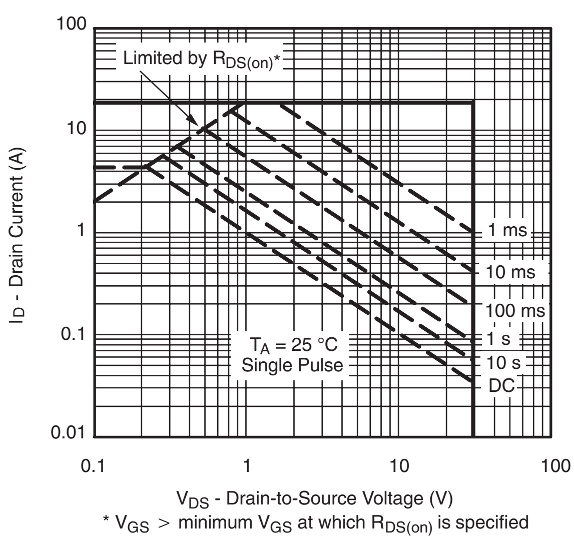
On-Resistance vs. Gate-to-Source Temperature (Ch 2)



Threshold Voltage (Ch 2)

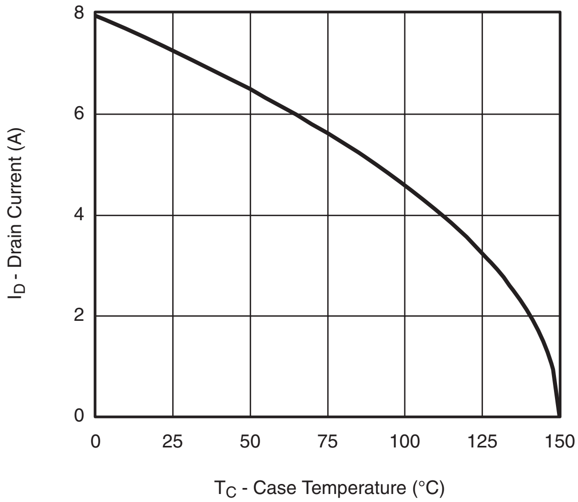


Single Pulse Power, Junction-to-Ambient (Ch 2)

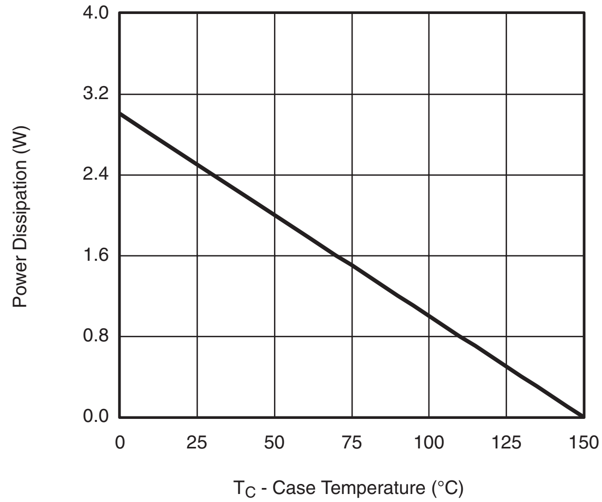


Safe Operating Area, Junction-to-Ambient (Ch 2)

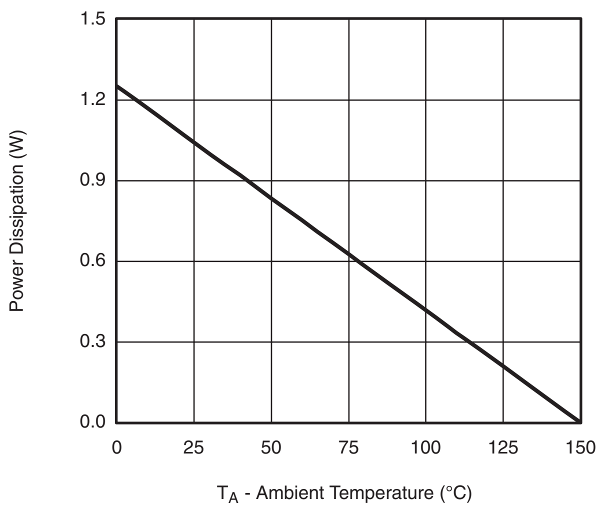
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating* (Ch 2)



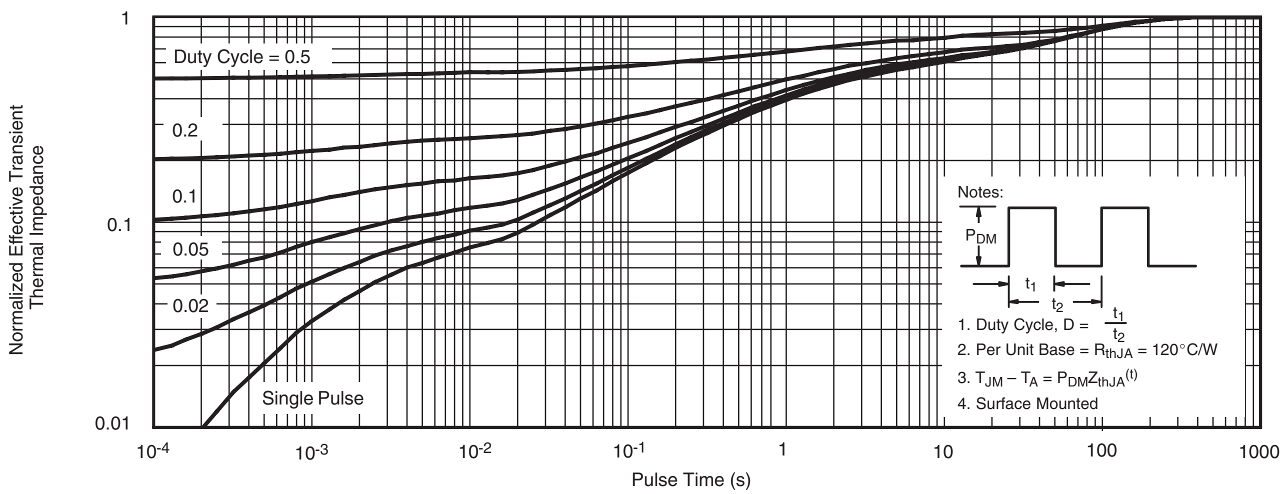
Power Derating, Junction-to-Foot (Ch 2)



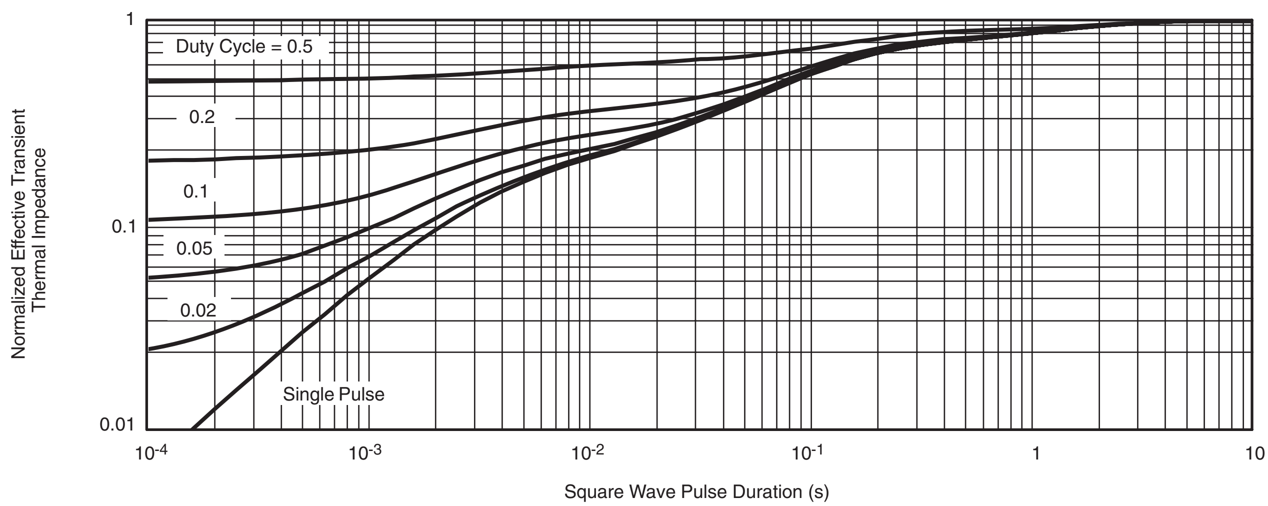
Power Derating, Junction-to-Ambient (Ch 2)

* 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.

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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