

Dual N-Channel 20-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
	V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
Channel-1	20	0.012 at V _{GS} = 10 V	9.6
		0.0175 at V _{GS} = 4.5 V	7.8
Channel-2		0.010 at V _{GS} = 10 V	13.5
		0.0115 at V _{GS} = 4.5 V	12.8

SCHOTTKY PRODUCT SUMMARY		
V _{DS} (V)	V _{SD} (V) Diode Forward Voltage	I _F (A)
20	0.53 V at 3 A	2.0

FEATURES

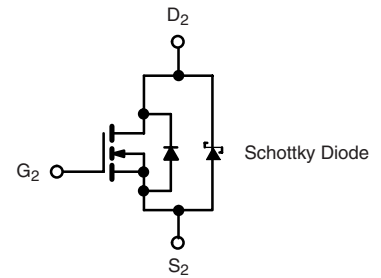
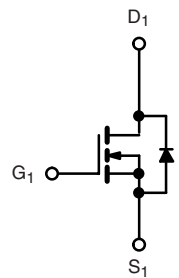
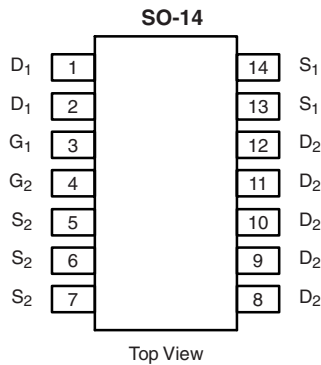
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE
Available

APPLICATIONS

- DC/DC Converters
- Game Stations
- Notebook PC Logic



Ordering Information: Si4340DY-T1-E3 (Lead (Pb)-free)
Si4340DY-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	
		10 s	Steady State	10 s	Steady State		
Drain-Source Voltage	V _{DS}	20				V	
Gate-Source Voltage	V _{GS}	± 20		± 16			
Continuous Drain Current (T _J = 150 °C) ^a	I _D	T _A = 25 °C	9.6	7.3	13.5	9.9	A
		T _A = 70 °C	7.7	5.8	10.8	7.5	
Pulsed Drain Current	I _{DM}	40		50		W	
Continuous Source Current (Diode Conduction) ^a	I _S	1.8	1.04	2.73	1.30		
Maximum Power Dissipation ^a	P _D	T _A = 25 °C	2.0	1.14	3.0	1.43	W
		T _A = 70 °C	1.28	0.73	1.9	0.91	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150				°C	

THERMAL RESISTANCE RATINGS									
Parameter	Symbol	Channel-1		Channel-2		Schottky		Unit	
		Typ.	Max.	Typ.	Max.	Typ.	Max.		
Maximum Junction-to-Ambient ^a	t ≤ 10 s	R _{thJA}	53	62.5	35	42	40	48	°C/W
	Steady State		92	110	72	87	76	93	
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	35	42	18	23	21	25	

Notes:

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

MOSFET SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ. ^a	Max.	Unit	
Static							
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	Ch-1	0.8		2.00	V
			Ch-2	0.8		1.90	
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$	Ch-1			100	nA
		$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 12\text{ V}$	Ch-2			100	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$	Ch-1			1	μA
			Ch-2			100	
		$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 85\text{ }^\circ\text{C}$	Ch-1			15	
			Ch-2			4000	
On-State Drain Current ^b	$I_{D(on)}$	$V_{DS} = 5\text{ V}$, $V_{GS} = 10\text{ V}$	Ch-1	20			A
			Ch-2	30			
Drain-Source On-State Resistance ^b	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 9.6\text{ A}$	Ch-1		0.0095	0.012	Ω
		$V_{GS} = 10\text{ V}$, $I_D = 13.5\text{ A}$	Ch-2		0.007	0.010	
		$V_{GS} = 4.5\text{ V}$, $I_D = 7.8\text{ A}$	Ch-1		0.0135	0.0175	
		$V_{GS} = 4.5\text{ V}$, $I_D = 12.8\text{ A}$	Ch-2		0.0085	0.0115	
Forward Transconductance ^b	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 9.6\text{ A}$	Ch-1		25		S
		$V_{DS} = 15\text{ V}$, $I_D = 13.5\text{ A}$	Ch-2		38		
Diode Forward Voltage ^b	V_{SD}	$I_S = 1.8\text{ A}$, $V_{GS} = 0\text{ V}$	Ch-1		0.74	1.1	V
		$I_S = 2.73\text{ A}$, $V_{GS} = 0\text{ V}$	Ch-2		0.485	0.53	
Dynamic^a							
Total Gate Charge	Q_g	Channel-1 $V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 9.6\text{ A}$	Ch-1		10	15	nC
			Ch-2		17	25	
Gate-Source Charge	Q_{gs}	Channel-2 $V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = -13.5\text{ A}$	Ch-1		3.3		nC
			Ch-2		4.5		
Gate-Drain Charge	Q_{gd}	Channel-2 $V_{DS} = 10\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = -13.5\text{ A}$	Ch-1		3.1		nC
			Ch-2		4.5		
Gate Resistance	R_g	$f = 1\text{ MHz}$	Ch-1	0.45	0.9	1.35	Ω
			Ch-2	0.7	1.4	2.1	
Turn-On Delay Time	$t_{d(on)}$	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 6\text{ }\Omega$	Ch-1		15	25	ns
Rise Time	t_r	Channel-1 $V_{DD} = 10\text{ V}$, $R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 6\text{ }\Omega$	Ch-2		24	35	
			Ch-1		16	25	
Turn-Off Delay Time	$t_{d(off)}$	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 6\text{ }\Omega$	Ch-1		42	65	
			Ch-2		68	100	
Fall Time	t_f	Channel-2 $V_{DD} = 10\text{ V}$, $R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 6\text{ }\Omega$	Ch-1		16	25	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = 1.8\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$	Ch-1		35	60	
		$I_F = 2.73\text{ A}$, $dI/dt = 100\text{ }\mu\text{A}/\mu\text{s}$	Ch-2		38	65	

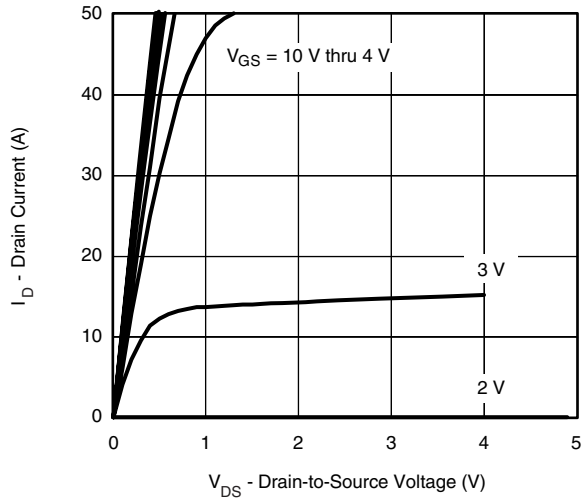
Notes:

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

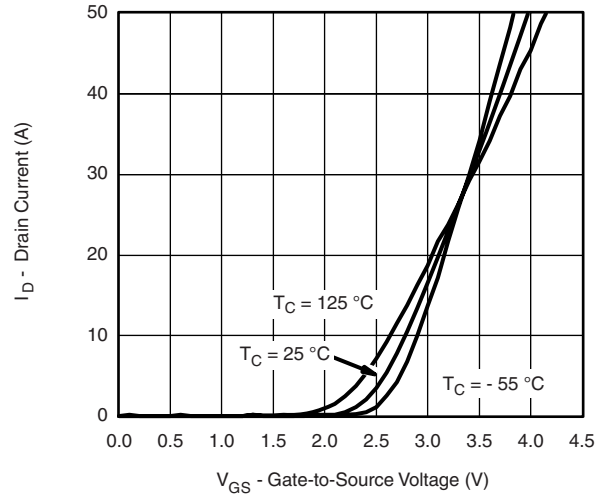
SCHOTTKY SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	V_F	$I_F = 3\text{ A}$		0.485	0.53	V
		$I_F = 3\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		0.42	0.42	
Maximum Reverse Leakage Current	I_{rm}	$V_R = 20\text{ V}$		0.008	0.100	mA
		$V_R = 20\text{ V}$, $T_J = 75\text{ }^\circ\text{C}$		0.4	5	
		$V_R = -20\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$		6.5	20	
Junction Capacitance	C_T	$V_R = 15\text{ V}$		102		pF

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.

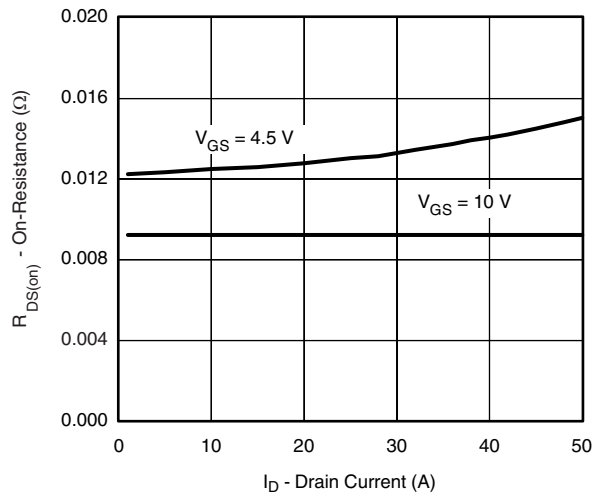
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



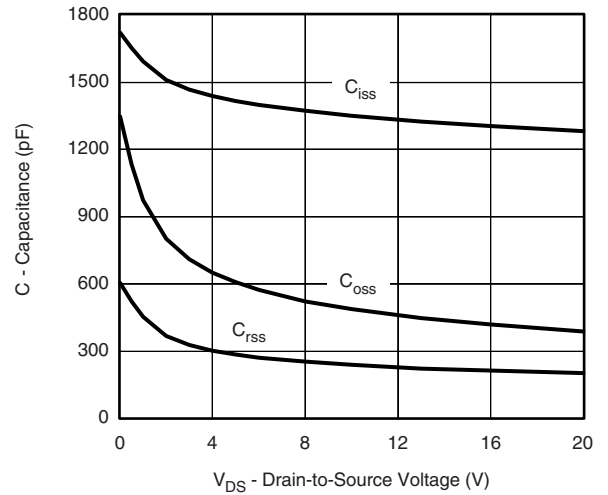
Output Characteristics



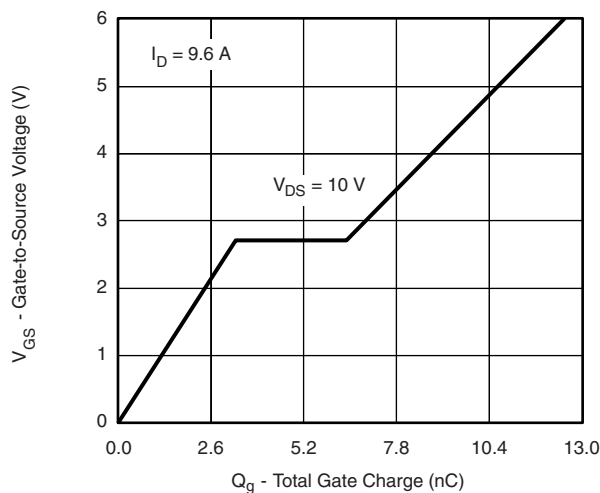
Transfer Characteristics



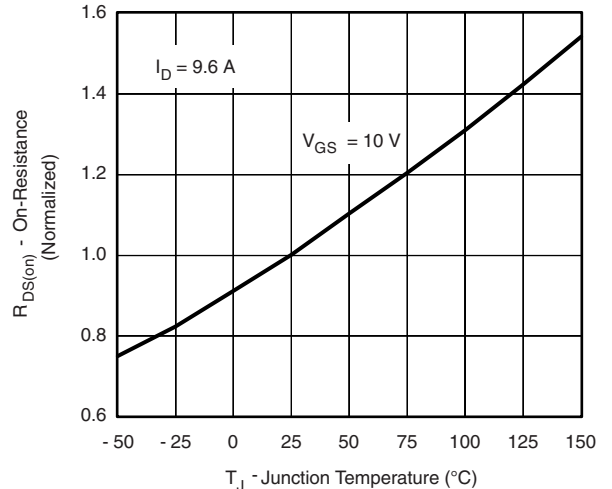
On-Resistance vs. Drain Current



Capacitance

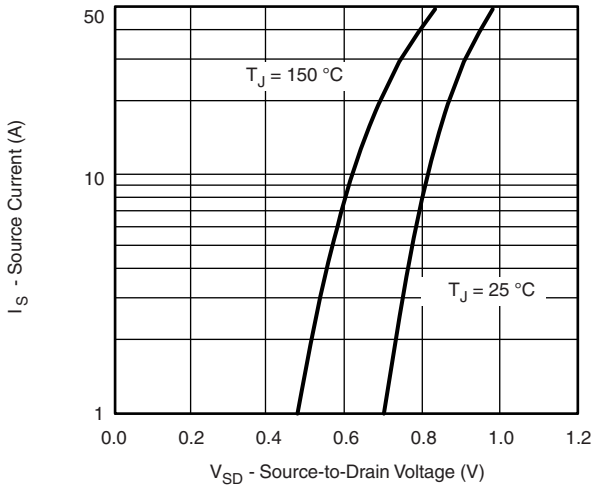


Gate Charge

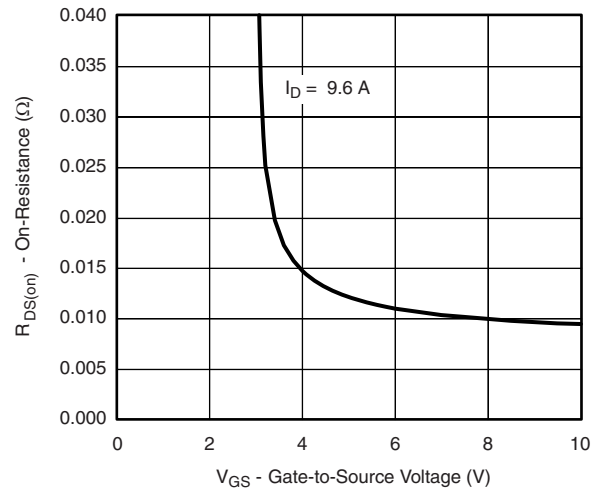


On-Resistance vs. Junction Temperature

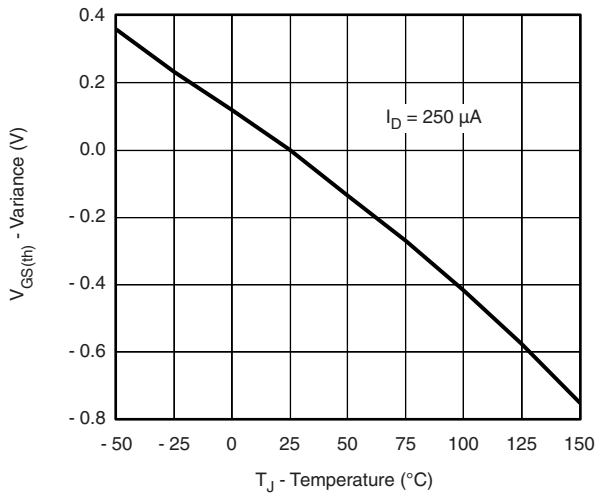
CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



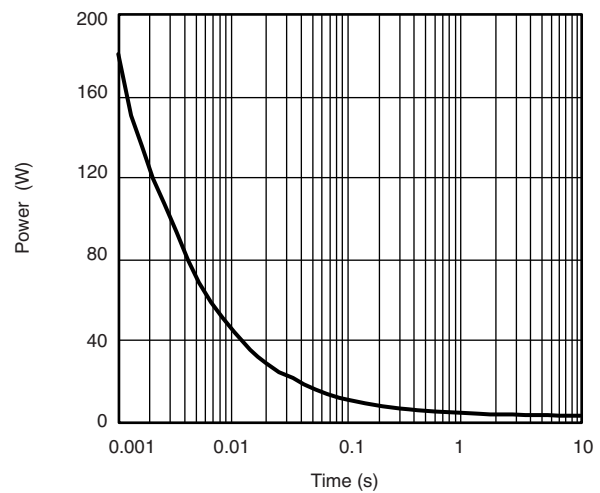
Source-Drain Diode Forward Voltage



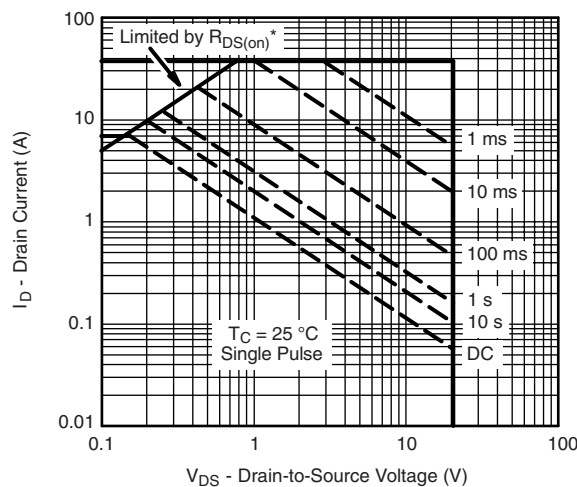
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



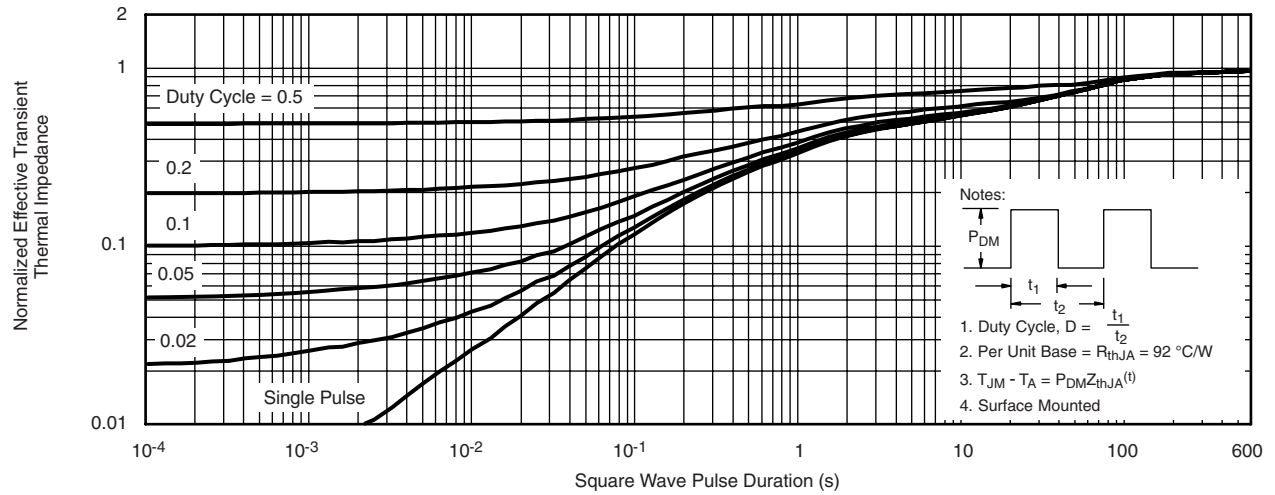
Single Pulse Power



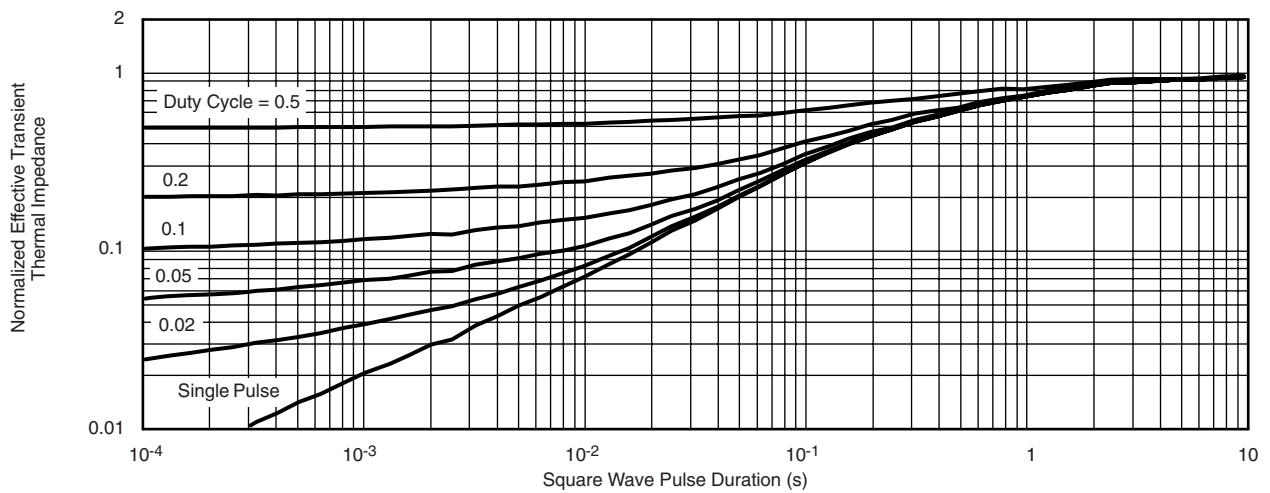
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

CHANNEL-1 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

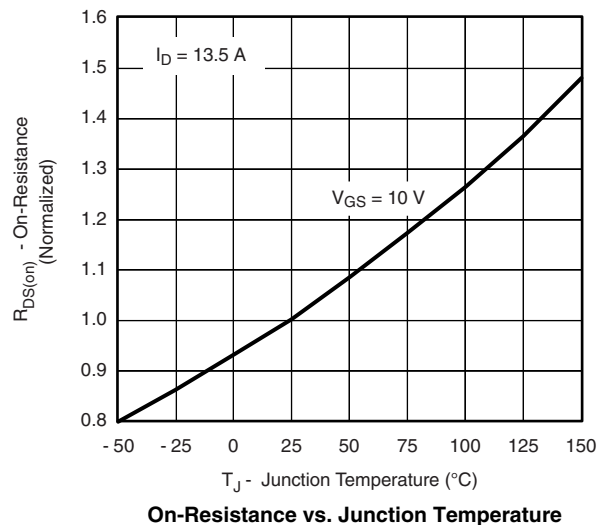
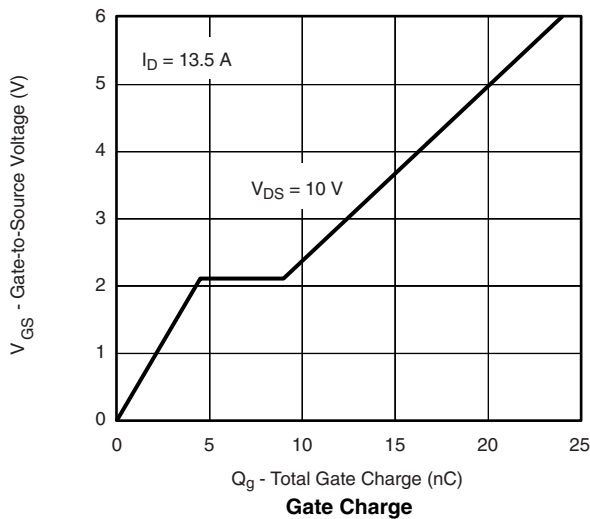
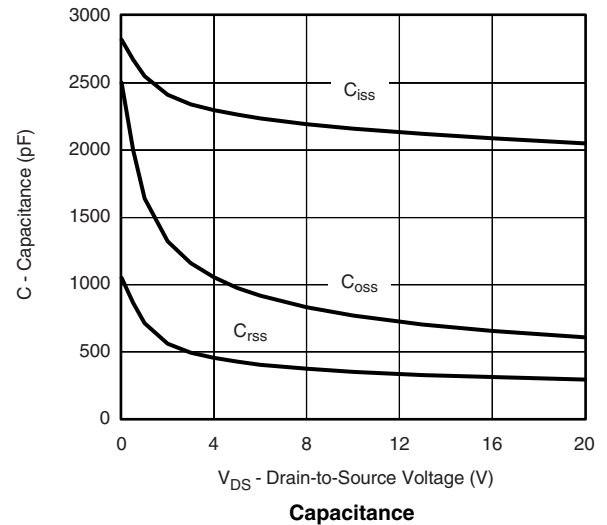
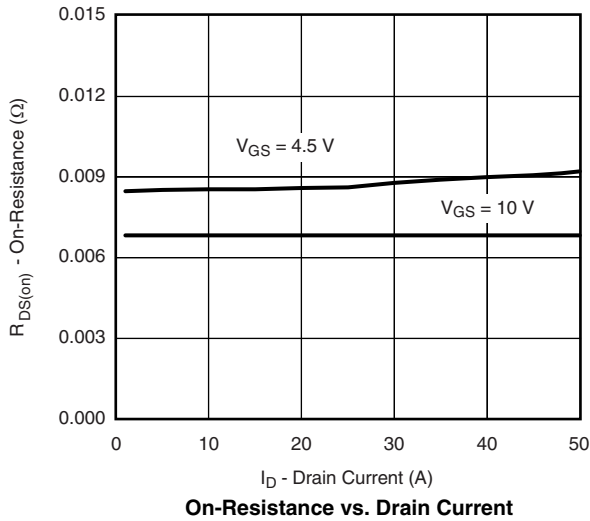
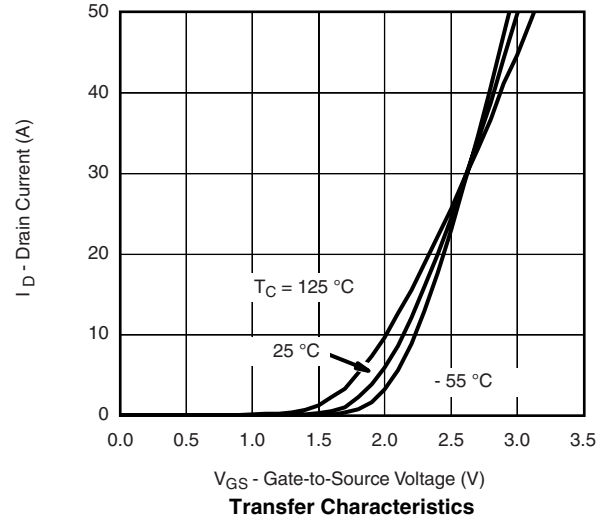
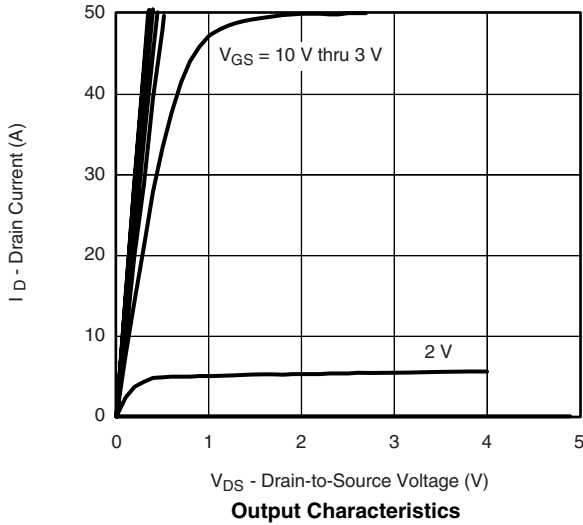


Normalized Thermal Transient Impedance, Junction-to-Ambient

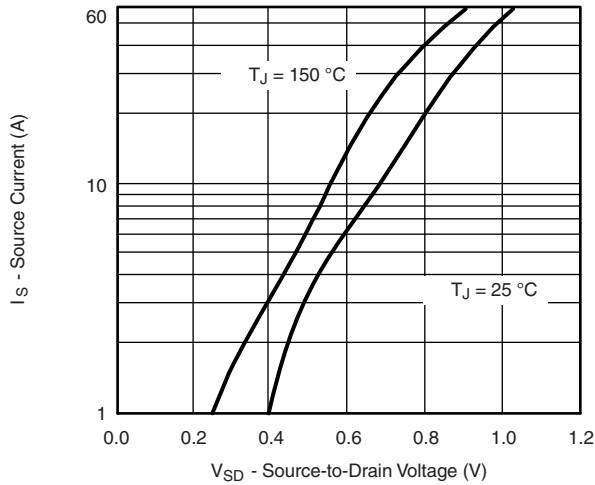


Normalized Thermal Transient Impedance, Junction-to-Foot

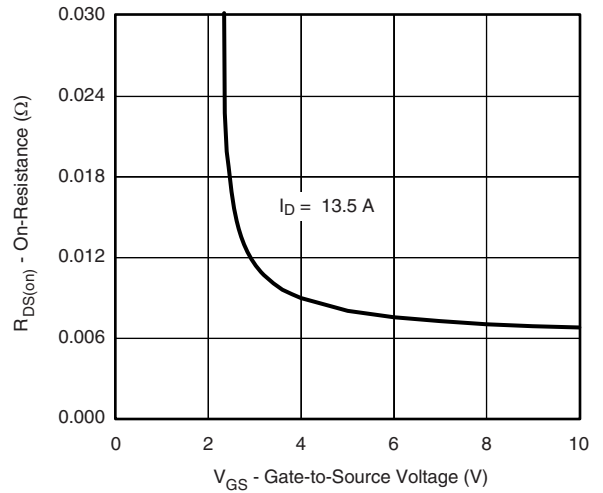
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



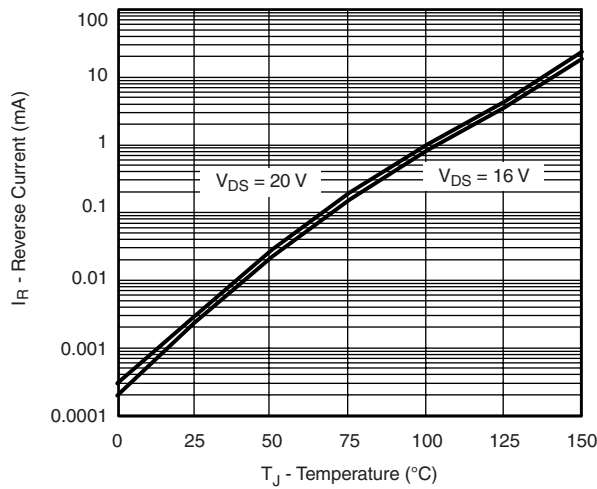
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



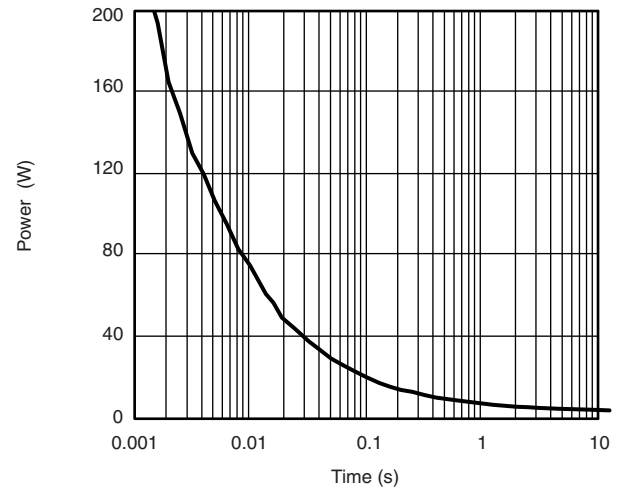
Source-Drain Diode Forward Voltage



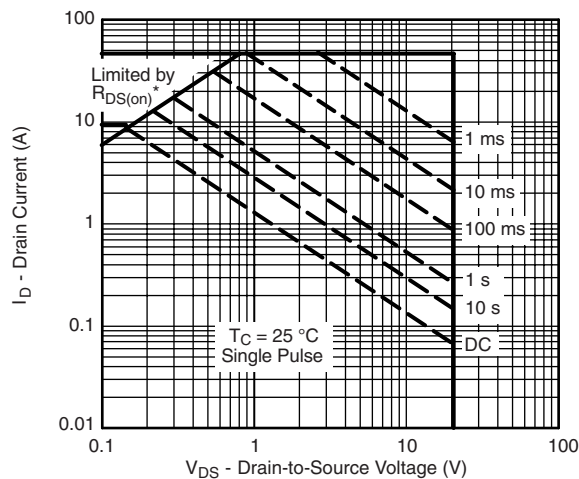
On-Resistance vs. Gate-to-Source Voltage



Reverse Current vs. Junction Temperature



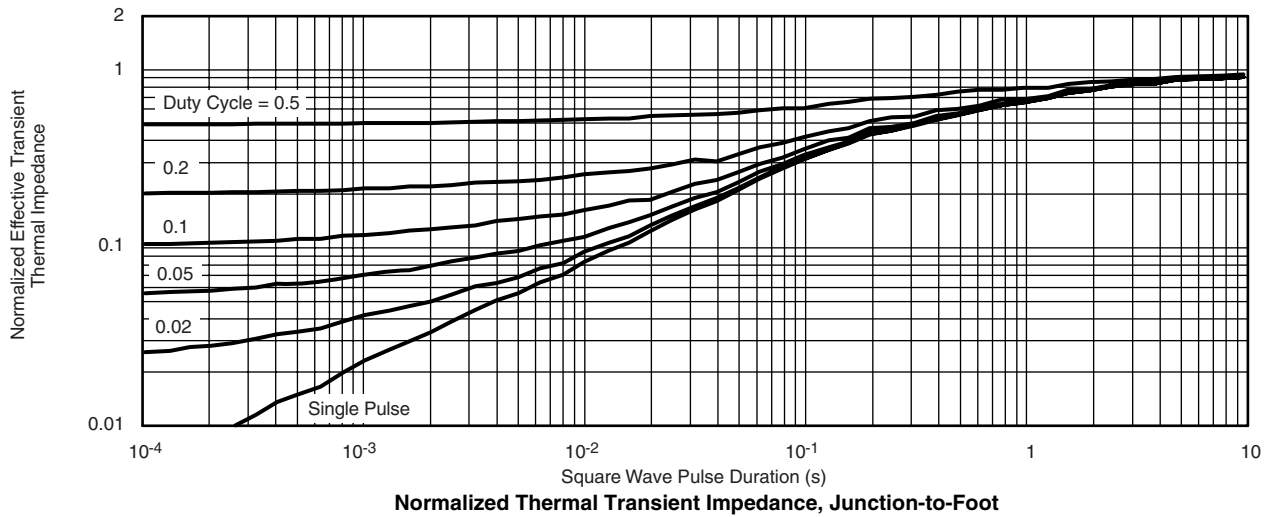
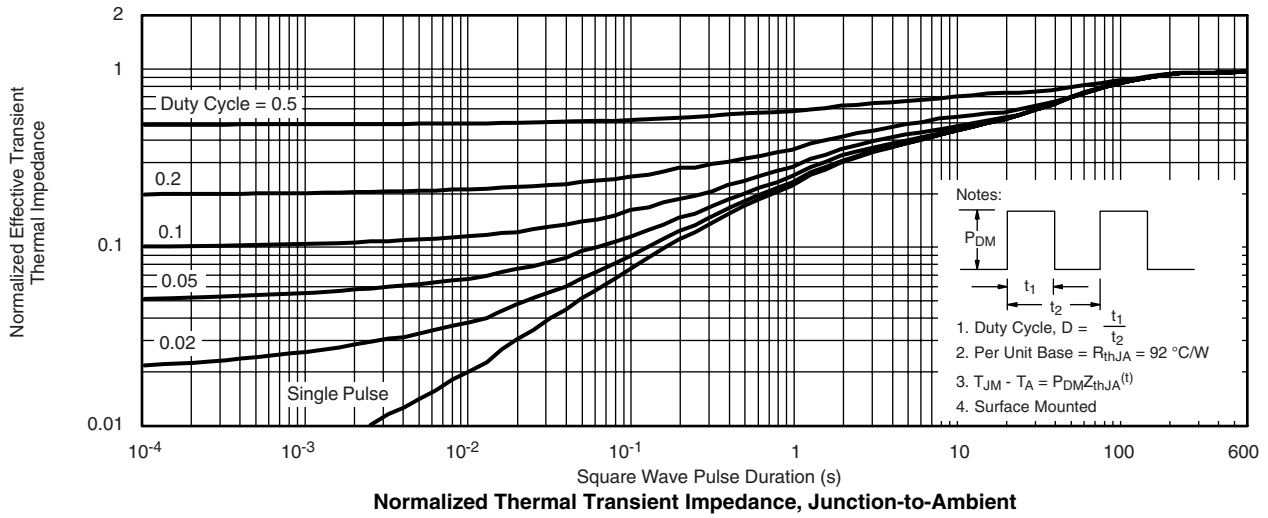
Single Pulse Power



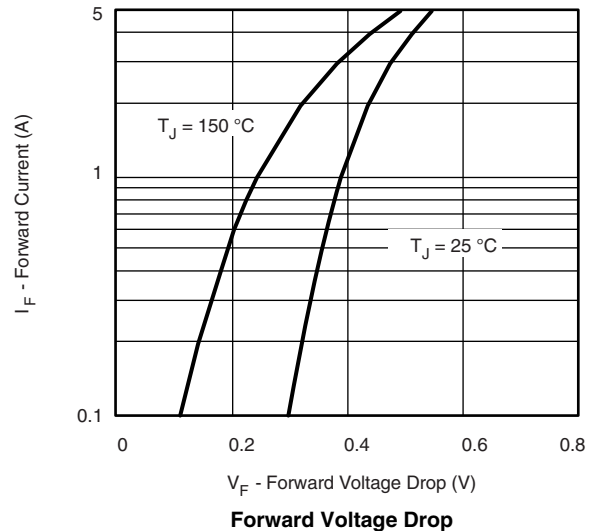
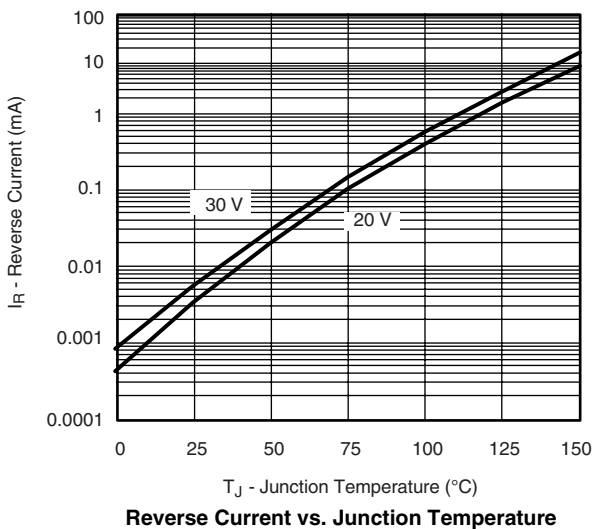
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Case

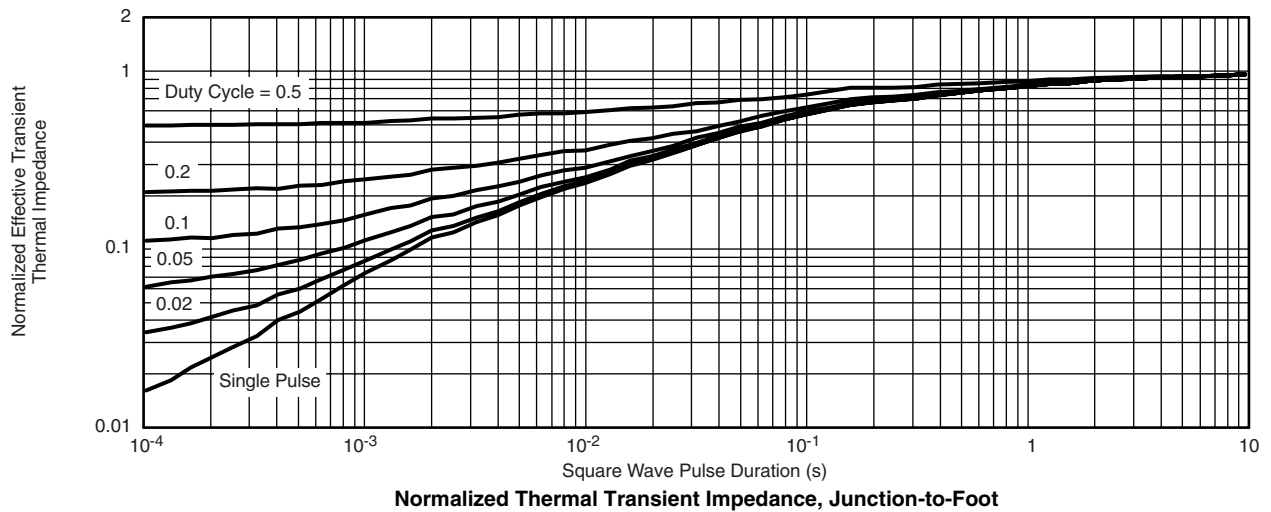
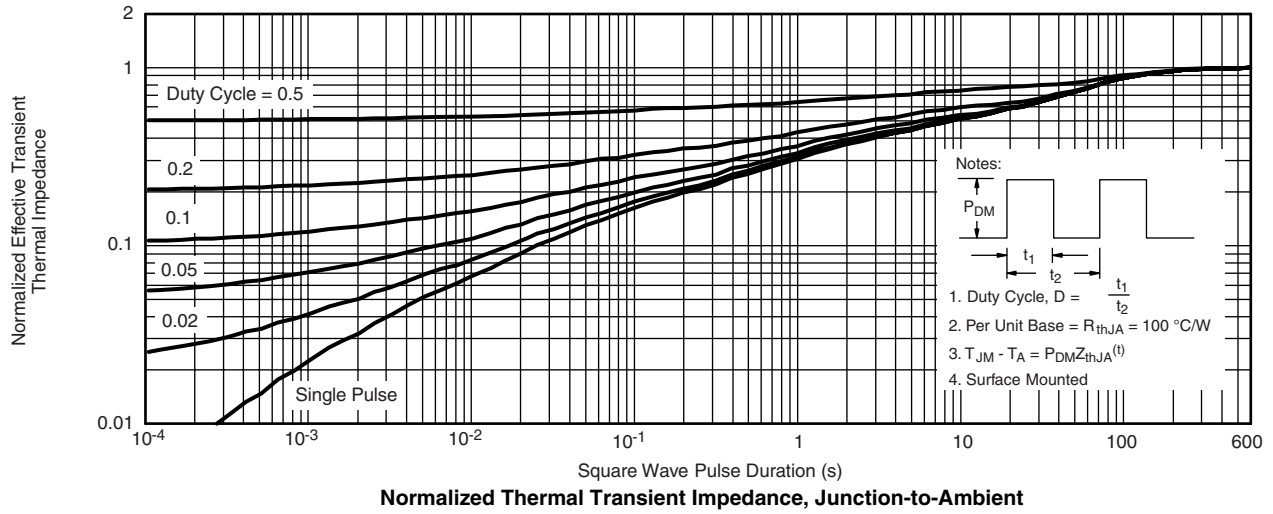
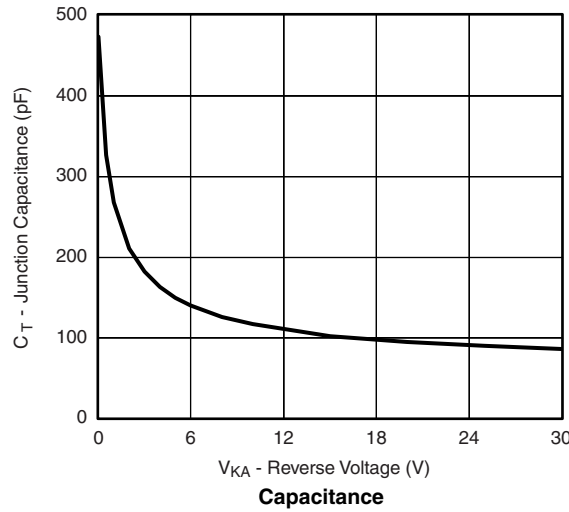
CHANNEL-2 TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



SCHOTTKY TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



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