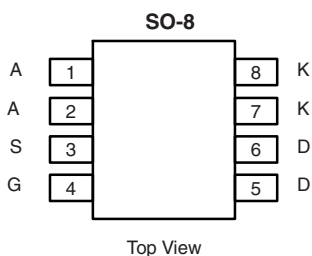


## P-Channel 20-V (D-S) MOSFET with Schottky Diode

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
- 20	0.054 at $V_{GS} = -10$ V	6.2	4.5 nC
	0.094 at $V_{GS} = -4.5$ V	4.7	

SCHOTTKY PRODUCT SUMMARY		
$V_{KA}$ (V)	$V_f$ (V) Diode Forward Voltage	$I_F$ (A) <sup>a</sup>
20	0.45 at 1 A	2



Ordering Information: Si4621DY-T1-E3 (Lead (Pb)-free)  
Si4621DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

### FEATURES

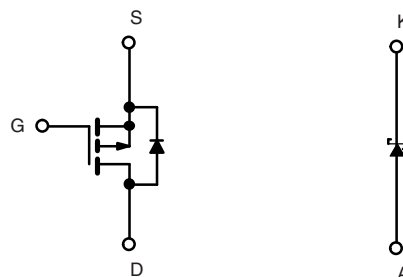
- Halogen-free According to IEC 61249-2-21 Definition
- LITTLE FOOT® Plus Schottky
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
Available

### APPLICATIONS

- Portable Devices
  - Ideal for Boost Circuits
  - Ideal for Buck Circuits



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage (MOSFET)	$V_{DS}$	- 20	V
Reverse Voltage (Schottky)	$V_{KA}$	20	
Gate-Source Voltage (MOSFET)	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ ) (MOSFET)	$T_C = 25^\circ\text{C}$	- 6.2	A
	$T_C = 70^\circ\text{C}$	- 5 <sup>a</sup>	
	$T_A = 25^\circ\text{C}$	- 5 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$	- 4 <sup>b, c</sup>	
Pulsed Drain Current (MOSFET)	$I_{DM}$	- 25	
Continuous Source-Drain Diode Current (MOSFET Diode Conduction)	$T_C = 25^\circ\text{C}$	- 2.6	
	$T_A = 25^\circ\text{C}$	1.7 <sup>b, c</sup>	
Average Forward Current (Schottky)	$I_F$	2 <sup>b</sup>	
Pulsed Forward Current (Schottky)	$I_{FM}$	5	
Maximum Power Dissipation (MOSFET)	$T_C = 25^\circ\text{C}$	3.1	W
	$T_C = 70^\circ\text{C}$	2	
	$T_A = 25^\circ\text{C}$	2 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$	1.3 <sup>b, c</sup>	
Maximum Power Dissipation (Schottky)	$T_C = 25^\circ\text{C}$	2.7	
	$T_C = 70^\circ\text{C}$	1.7	
	$T_A = 25^\circ\text{C}$	1.6 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$	1 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$

**THERMAL RESISTANCE RATINGS**

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient (MOSFET) <sup>b, f</sup>	$R_{thJA}$	55	62.5	°C/W
Maximum Junction-to-Foot (Drain) (MOSFET)	$R_{thJF}$	33	40	
Maximum Junction-to-Ambient (Schottky) <sup>b, g</sup>	$R_{thJA}$	63	78	
Maximum Junction-to-Foot (Drain) (Schottky)	$R_{thJF}$	39	47	

Notes:

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

c.  $t = 10$  s.

f. Maximum under Steady State conditions is 110 °C/W.

g. Maximum under Steady State conditions is 115 °C/W.

**SPECIFICATIONS** ( $T_J = 25$  °C, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0$ V, $I_D = -250$ $\mu$ A	- 20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250$ $\mu$ A		- 16		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3.6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = -250$ $\mu$ A	- 1		- 3	V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0$ V, $V_{GS} = \pm 20$ V			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20$ V, $V_{GS} = 0$ V			- 1	$\mu$ A
		$V_{DS} = -20$ V, $V_{GS} = 0$ V, $T_J = 55$ °C			- 10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq 5$ V, $V_{GS} = -10$ V	- 25			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10$ V, $I_D = -5$ A		0.042	0.054	$\Omega$
		$V_{GS} = -4.5$ V, $I_D = -1.1$ A		0.073	0.094	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10$ V, $I_D = -5$ A		10		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -10$ V, $V_{GS} = 0$ V, $f = 1$ MHz		450		pF
Output Capacitance	$C_{oss}$			160		
Reverse Transfer Capacitance	$C_{rss}$			105		
Total Gate Charge	$Q_g$	$V_{DS} = -10$ V, $V_{GS} = -10$ V, $I_D = -6.2$ A		8.7	13	nC
		$V_{DS} = -10$ V, $V_{GS} = -4.5$ V, $I_D = -6.2$ A		4.5	6.8	
				1.7		
Gate-Source Charge	$Q_{gs}$	$f = 1$ MHz		1.8		$\Omega$
Gate-Drain Charge	$Q_{gd}$			9		
Gate Resistance	$R_g$					
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 2.5$ $\Omega$ $I_D \cong -4$ A, $V_{GEN} = -4.5$ V, $R_g = 1$ $\Omega$		15	25	ns
Rise Time	$t_r$			60	90	
Turn-Off DelayTime	$t_{d(off)}$			22	35	
Fall Time	$t_f$			15	25	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10$ V, $R_L = 2.5$ $\Omega$ $I_D \cong -4$ A, $V_{GEN} = -10$ V, $R_g = 1$ $\Omega$		5	10	
Rise Time	$t_r$			60	90	
Turn-Off DelayTime	$t_{d(off)}$			20	30	
Fall Time	$t_f$			7	15	



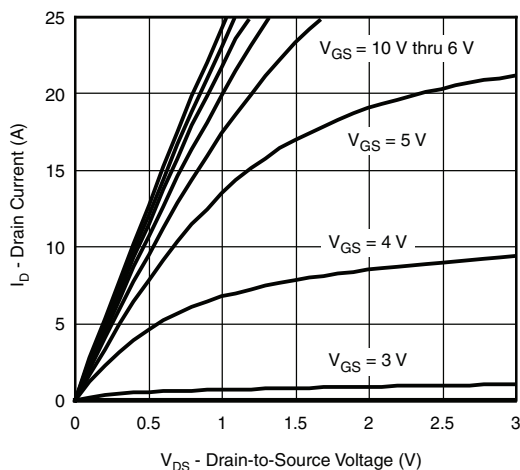
SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$			- 6.2	A
Pulse Diode Forward Current	$I_{SM}$				- 25	
Body Diode Voltage	$V_{SD}$	$I_S = -1.7\text{ A}$ , $V_{GS} = 0\text{ V}$		- 0.8	- 1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = -1.7\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 25\text{ }^{\circ}\text{C}$		21	40	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			10	20	nC
Reverse Recovery Fall Time	$t_a$			7		ns
Reverse Recovery Rise Time	$t_b$			16		

Notes:

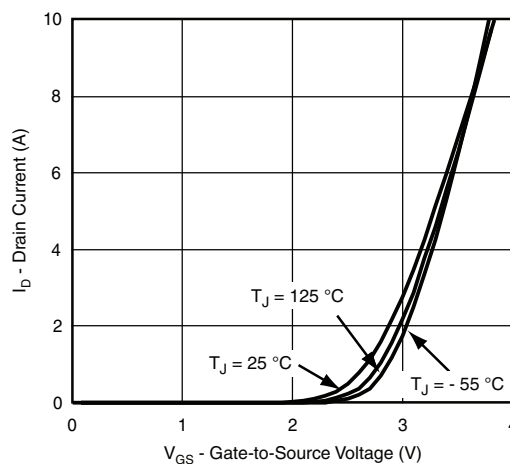
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. Guaranteed by design, not subject to production testing.

SCHOTTKY SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Forward Voltage Drop	$V_F$	$I_F = 1\text{ A}$		0.41	0.45	V
		$I_F = 1\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		0.36	0.41	
Maximum Reverse Leakage Current	$I_{rm}$	$V_r = 20\text{ V}$		0.02	0.20	mA
		$V_r = 20\text{ V}$ , $T_J = 85\text{ }^{\circ}\text{C}$		0.7	7	
		$V_r = 20\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$		5	50	
Junction Capacitance	$C_T$	$V_r = 10\text{ V}$		60		pF

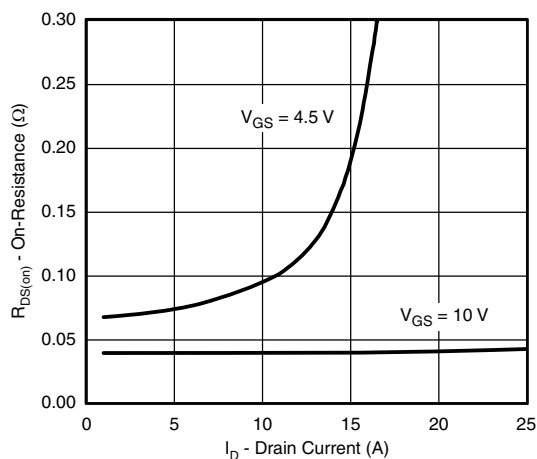
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**MOSFET TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)


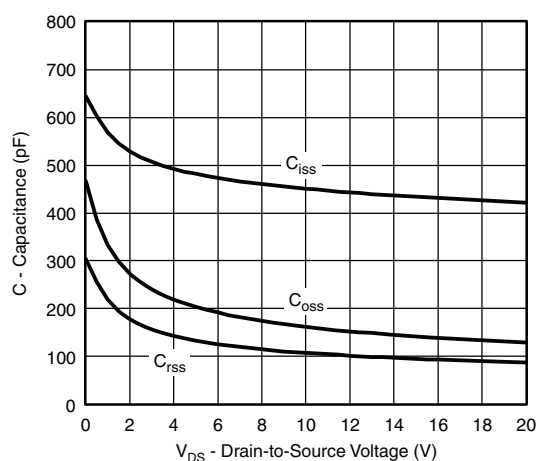
Output Characteristics



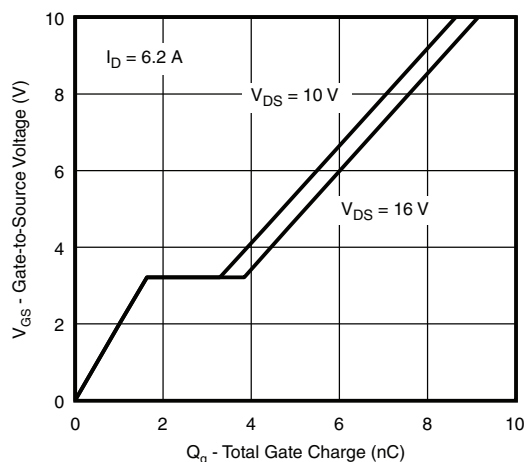
Transfer Characteristics



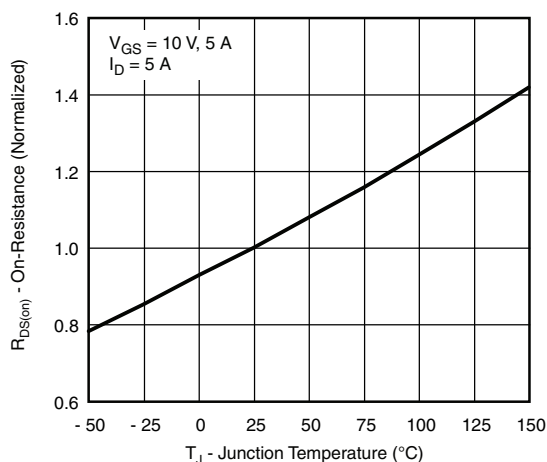
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

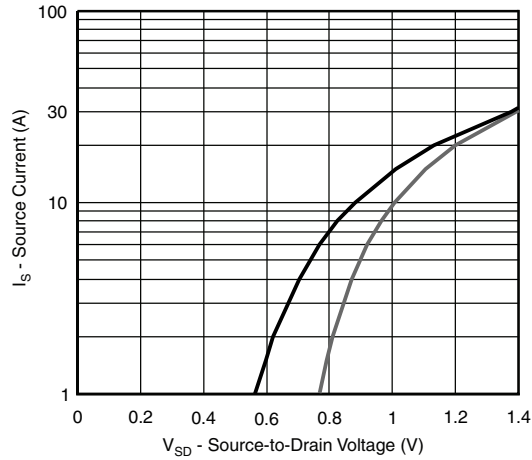


Gate Charge

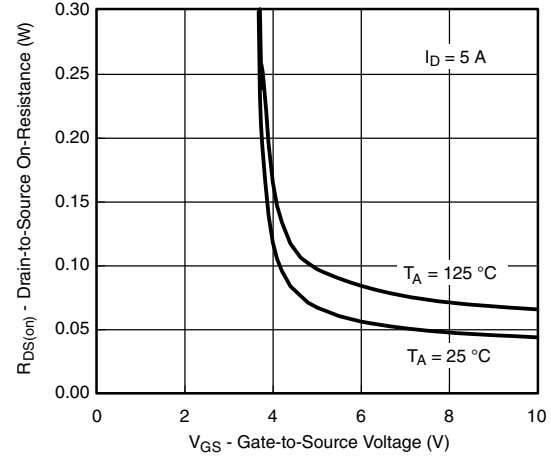


On-Resistance vs. Junction Temperature

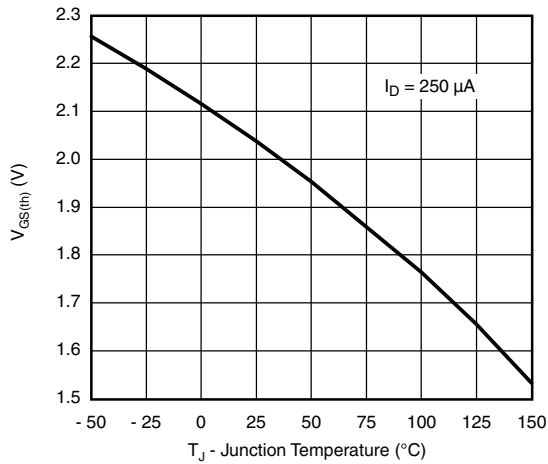
## MOSFET TYPICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



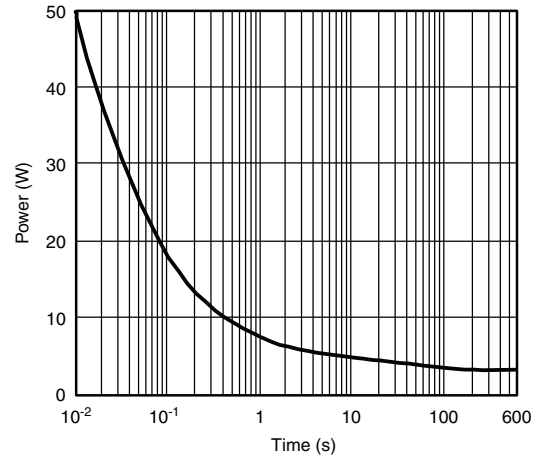
Source-Drain Diode Forward Voltage



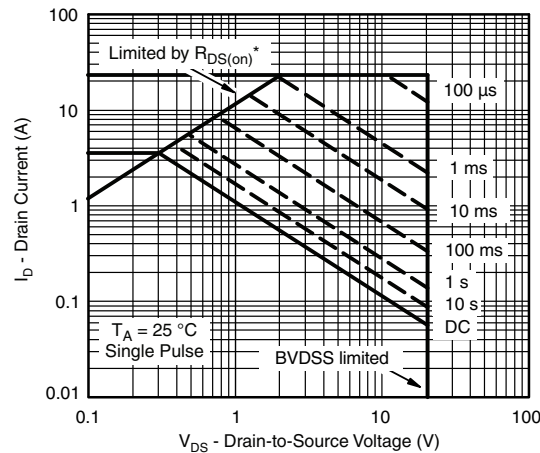
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

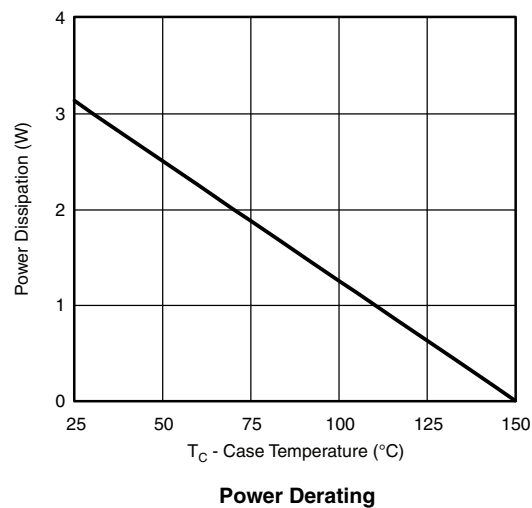
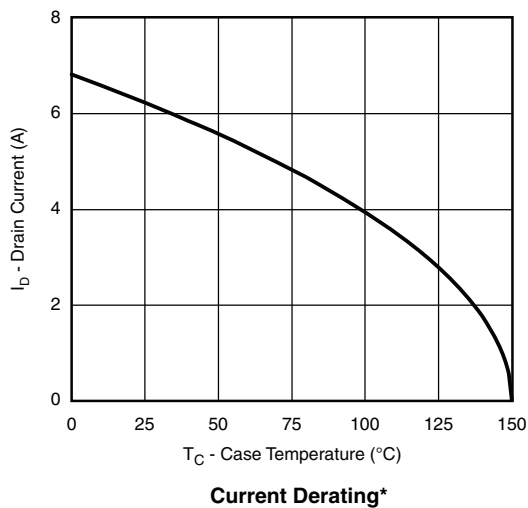


Single Pulse Power, Junction-to-Ambient



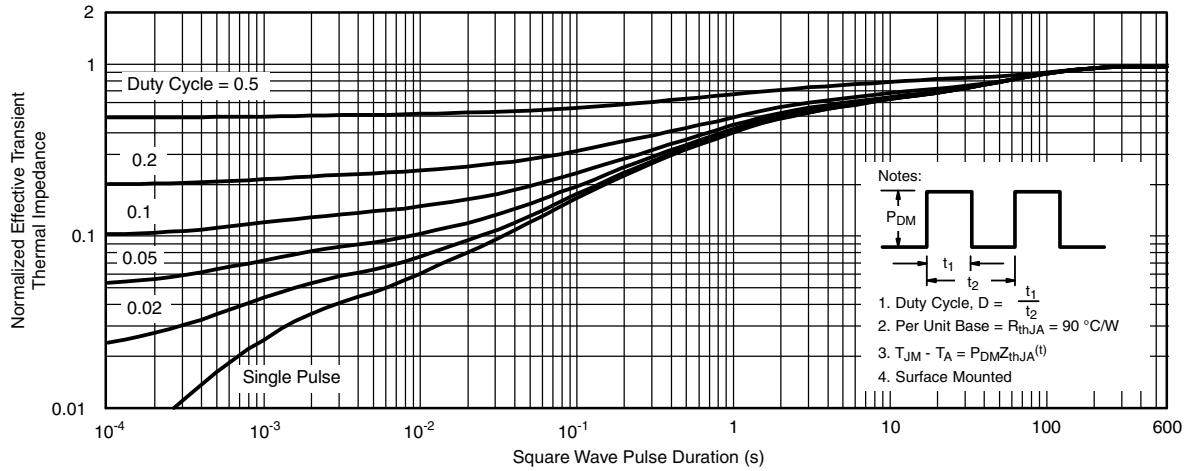
\*  $V_{DS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area, Junction-to-Case

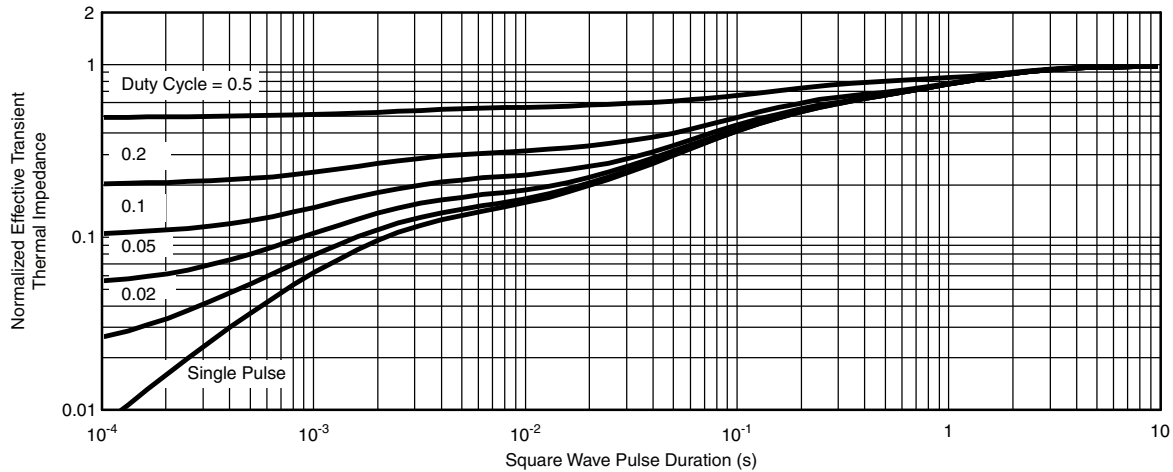
**MOSFET TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)

\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150\text{ }^{\circ}\text{C}$ , 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.

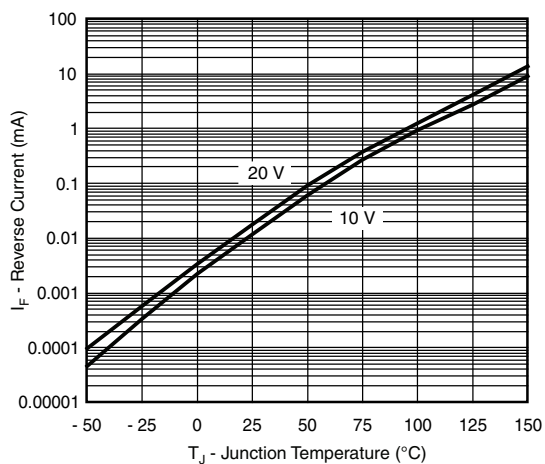
**MOSFET TYPICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)



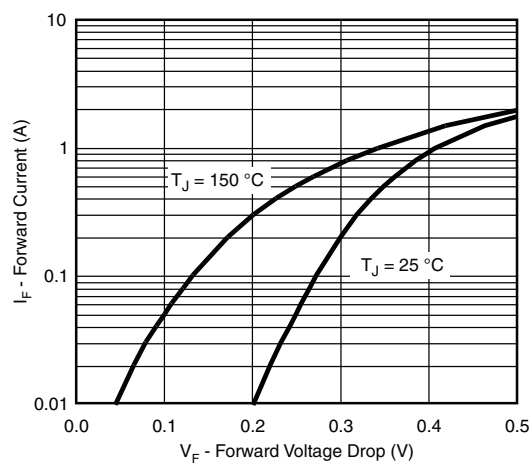
**Normalized Thermal Transient Impedance, Junction-to-Ambient**



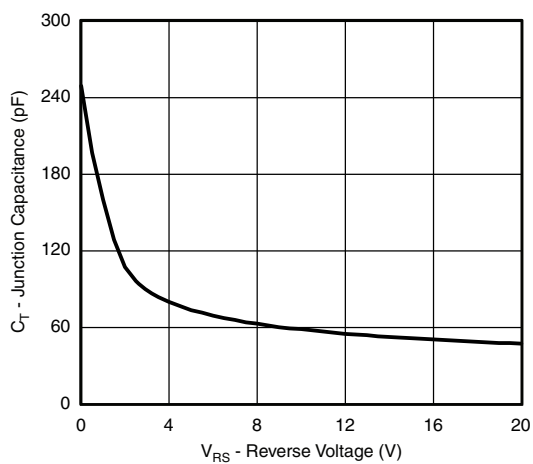
**Normalized Thermal Transient Impedance, Junction-to-Foot**

**SCHOTTKY TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)


Reverse Current vs. Junction Temperature



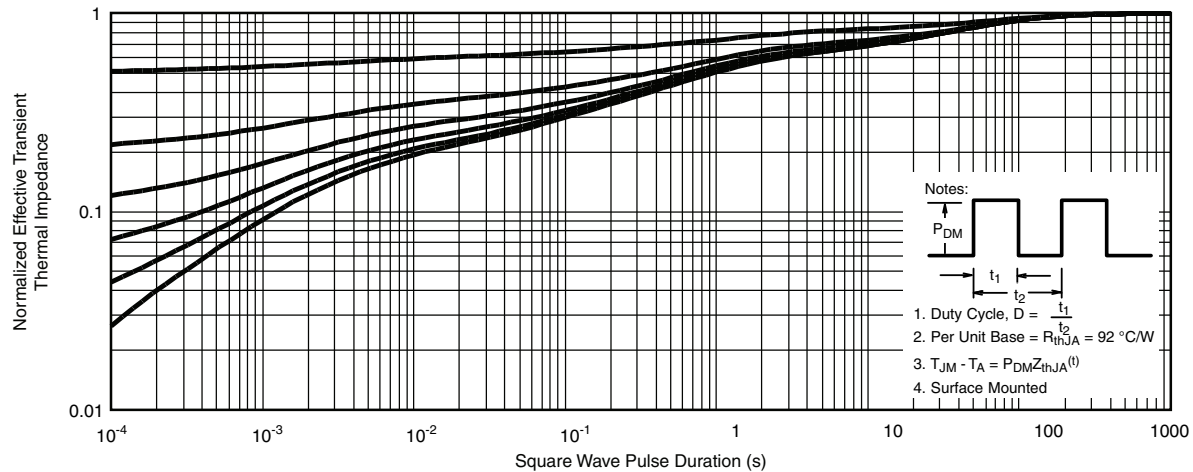
Forward Voltage Drop



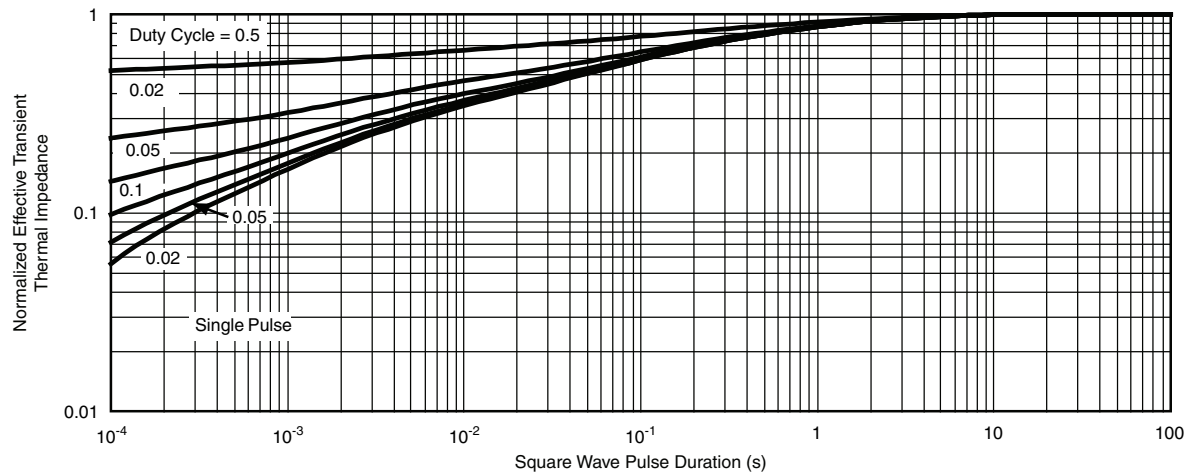
Capacitance



**SCHOTTKY TYPICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted)



**Normalized Thermal Transient Impedance, Junction-to-Ambient**



**Normalized Thermal Transient Impedance, Junction-to-Foot**

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