



# N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A) <sup>d</sup>	Q <sub>g</sub> (Typ.)
40	0.040 at V <sub>GS</sub> = 10 V	5.2	8
	0.045 at V <sub>GS</sub> = 4.5 V	4.9	

## FEATURES

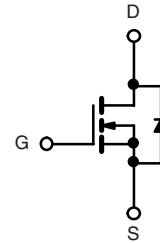
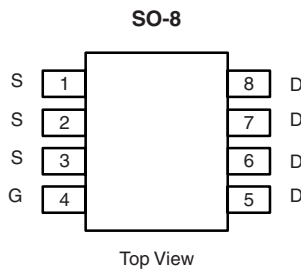
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET<sup>®</sup> Power MOSFET
- 100 % R<sub>g</sub>
- 100 % R<sub>g</sub> UIS Tested



RoHS COMPLIANT  
HALOGEN FREE  
Available

## APPLICATIONS

- CCFL Inverter



Ordering Information: Si4446DY-T1-E3 (Lead (Pb)-free)  
Si4446DY-T1-GE3 (Lead (Pb)-free and Halogen-free)

ABSOLUTE MAXIMUM RATINGS T <sub>A</sub> = 25 °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	V <sub>DS</sub>	40		V	
Gate-Source Voltage	V <sub>GS</sub>	± 12			
Continuous Drain Current (T <sub>J</sub> = 150 °C) <sup>a</sup>	I <sub>D</sub>	T <sub>A</sub> = 25 °C	5.2	3.9	A
		T <sub>A</sub> = 70 °C	4.2	3.1	
Pulsed Drain Current	I <sub>DM</sub>	30			
Continuous Source Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	1.7	0.9		
Avalanche Current	I <sub>AS</sub>	L = 0.1 mH	13		
Single-Pulse Avalanche Energy			E <sub>AS</sub>	8.5	
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	2.0	1.1	W
		T <sub>A</sub> = 70 °C	1.3	0.7	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	- 55 to 150		°C	

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient <sup>a</sup>	R <sub>thJA</sub>	t ≤ 10 s	52	62.5	°C/W
		Steady State	90	110	
Maximum Junction-to-Foot (Drain)	R <sub>thJF</sub>	32	40		

Notes:

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



SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	0.6		1.6	V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		40		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 3.8		
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 12\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 5.2\text{ A}$		0.033	0.040	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 4.9\text{ A}$		0.037	0.045	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 5.2\text{ A}$		18		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 1.7\text{ A}$ , $V_{GS} = 0\text{ V}$		0.75	1.2	V
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		700		pF
Output Capacitance	$C_{oss}$			76		
Reverse Transfer Capacitance	$C_{rss}$			45		
Total Gate Charge	$Q_g$	$V_{DS} = 20\text{ V}$ , $V_{GS} = 4.5\text{ V}$ , $I_D = 5.2\text{ A}$		8	12	nC
Gate-Source Charge	$Q_{gs}$			1.5		
Gate-Drain Charge	$Q_{gd}$			2.4		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$		1.9	2.9	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$ , $R_L = 15\text{ }\Omega$ $I_D \cong 1\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 6\text{ }\Omega$		7	11	ns
Rise Time	$t_r$			11	17	
Turn-Off Delay Time	$t_{d(off)}$			27	40	
Fall Time	$t_f$			8	13	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 1.7\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		25	40	nC
Body Diode Reverse Recovery Charge	$Q_{rr}$			17	26	

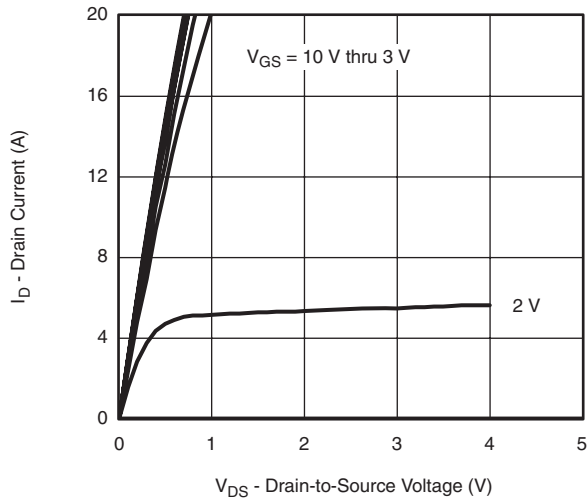
Notes:

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

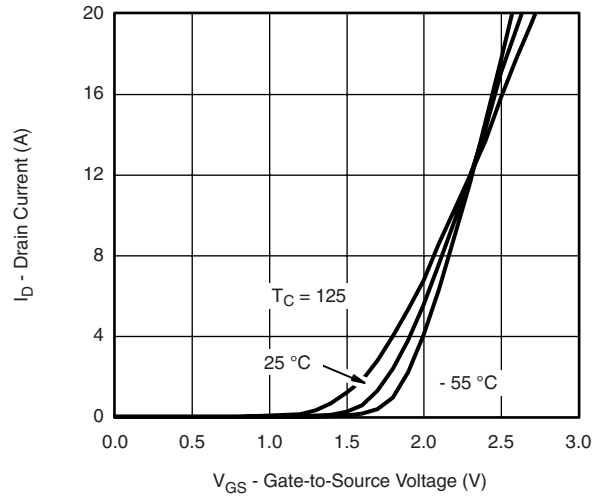
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



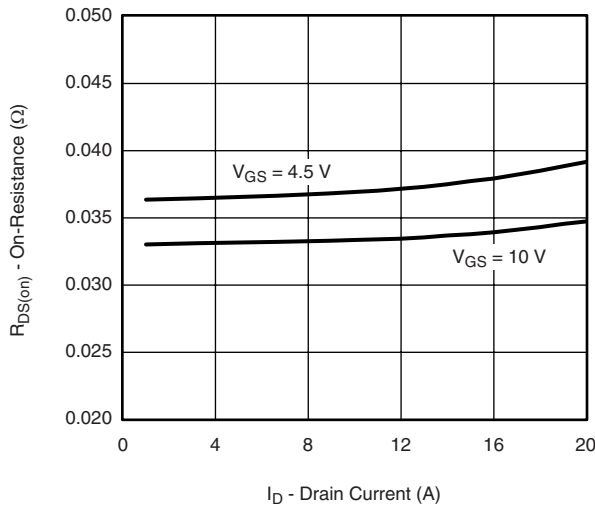
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



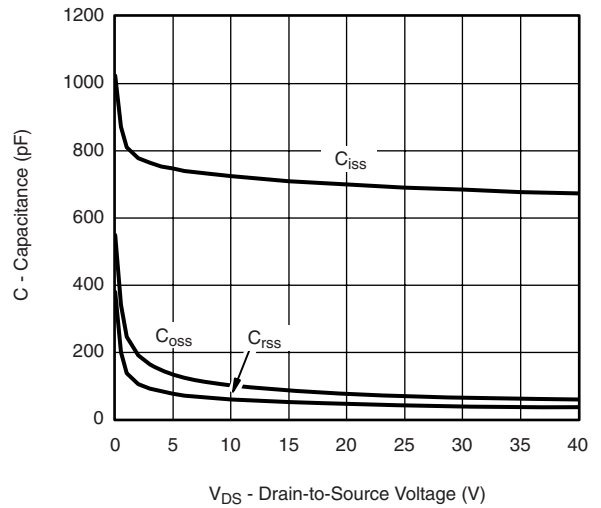
**Output Characteristics**



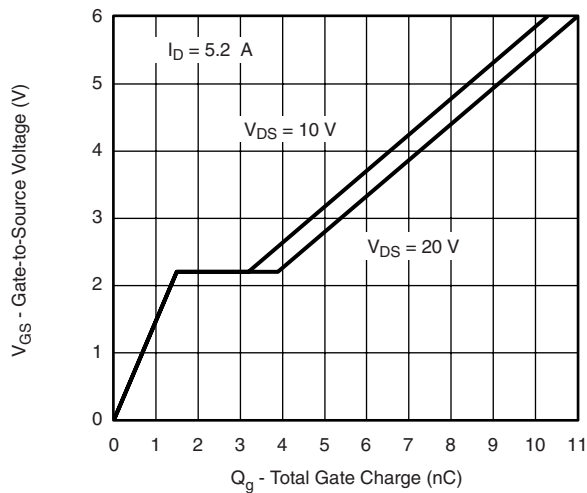
**Transfer Characteristics**



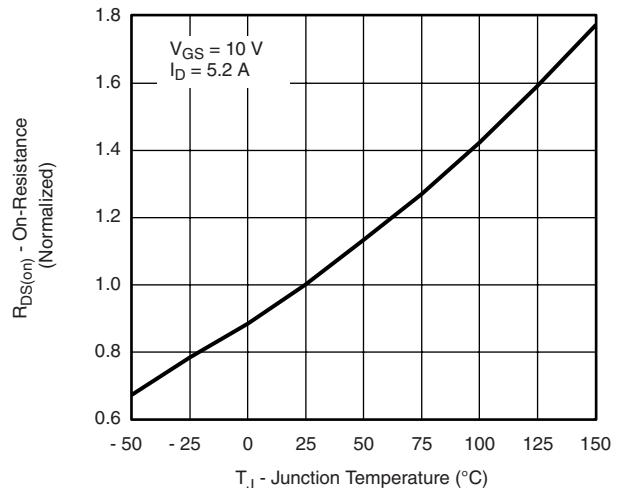
**On-Resistance vs. Drain Current**



**Capacitance**



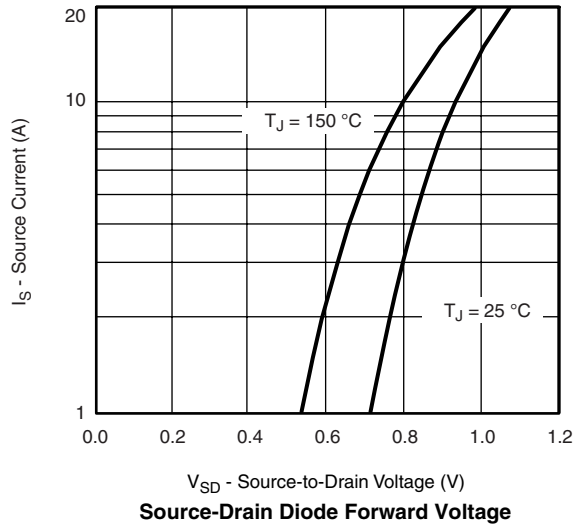
**Gate Charge**



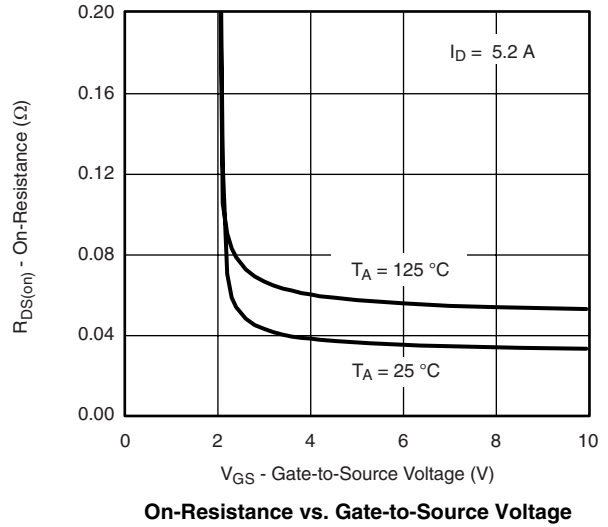
**On-Resistance vs. Junction Temperature**



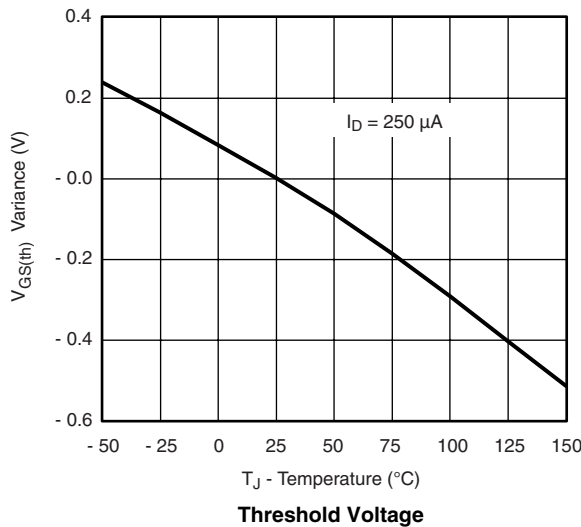
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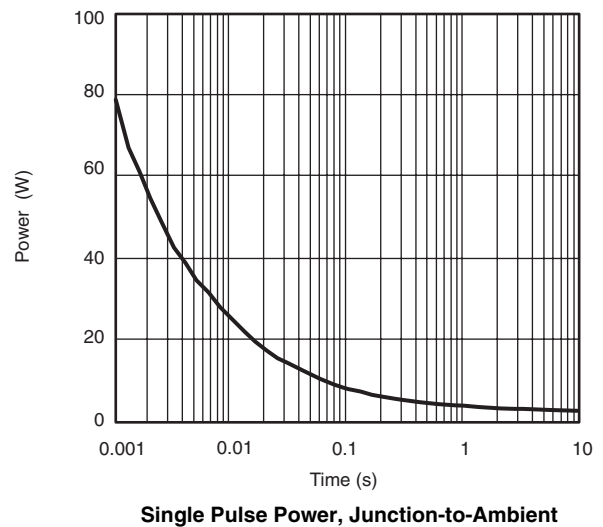
Source-Drain Diode Forward Voltage



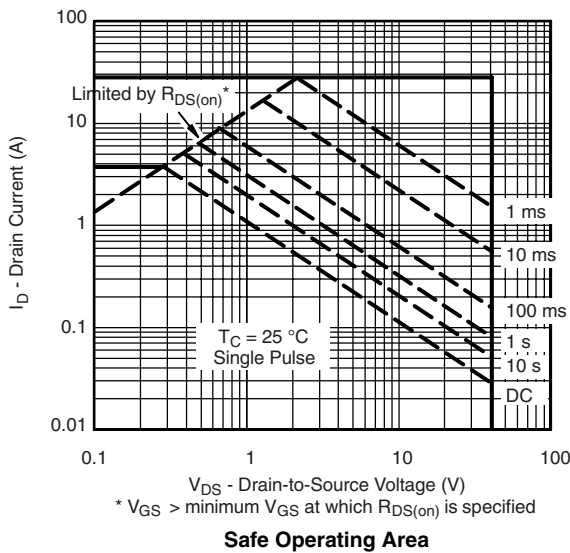
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



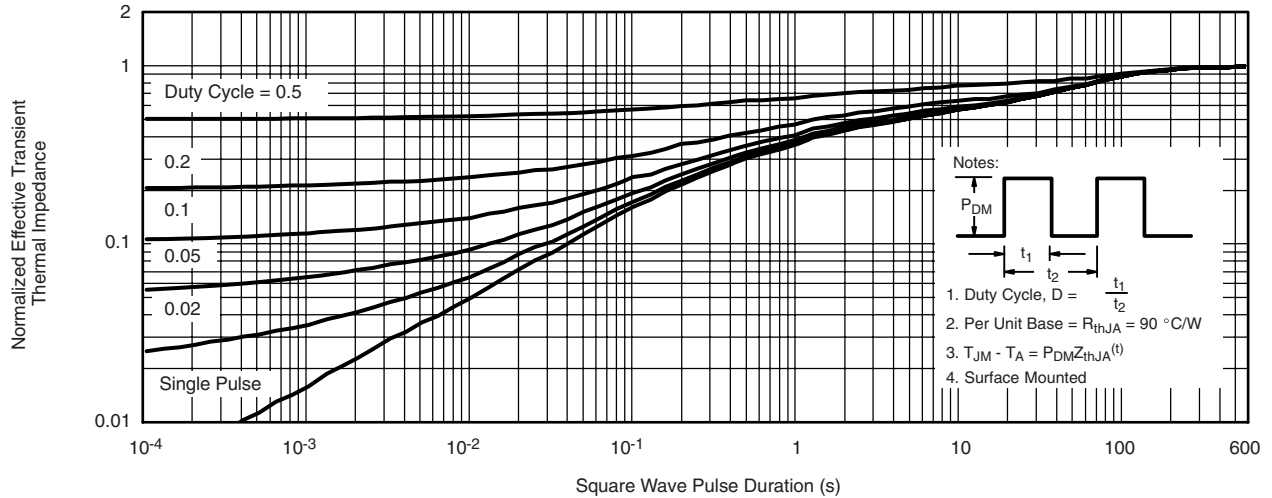
Single Pulse Power, Junction-to-Ambient



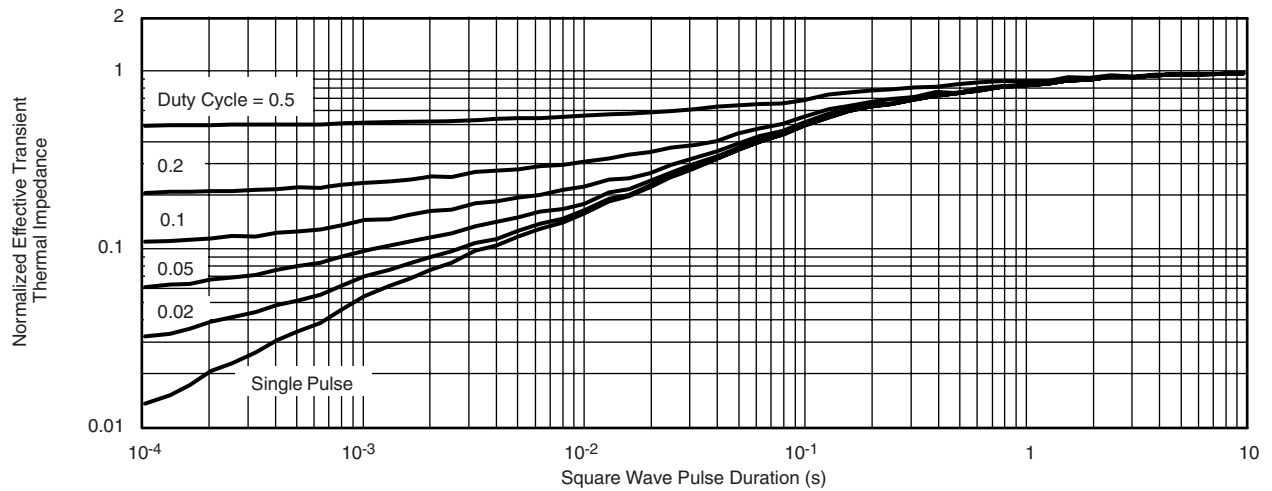
Safe Operating Area



**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



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



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

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