

## Bi-Directional N-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V <sub>DS</sub> (V)	R <sub>DS(on)</sub> (Ω)	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ.)
20	0.022 at V <sub>GS</sub> = 4.5 V	10.3	9.1
	0.023 at V <sub>GS</sub> = 4.0 V	10.0	
	0.026 at V <sub>GS</sub> = 3.1 V	9.4	
	0.028 at V <sub>GS</sub> = 2.5 V	9.0	

### FEATURES

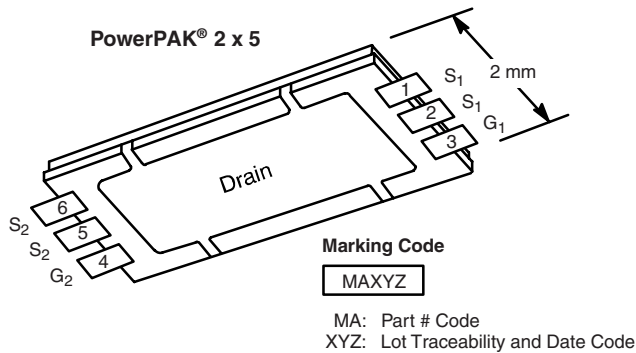
- Halogen-free
- TrenchFET<sup>®</sup> Power MOSFET: 2.5 V Rated
- ESD Protected: 4000 V



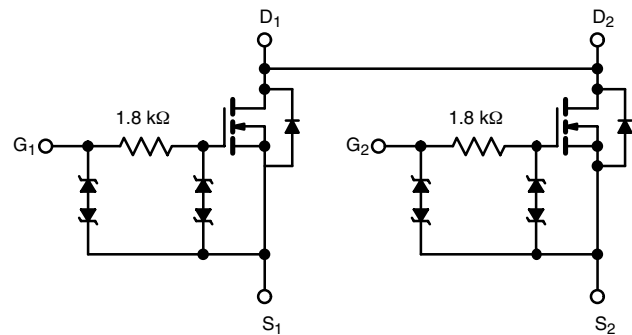
**RoHS**  
COMPLIANT

### APPLICATIONS

- Battery Protection Circuitry
- Cell Li-Ion LiB/LiP Battery Packs



Ordering Information: SiF902EDZ-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>	20		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	10.3	7.0	A
		T <sub>A</sub> = 85 °C	7.4	5.1	
Pulsed Drain Current (V <sub>GS</sub> = 8 V)	I <sub>DM</sub>	40			
Continuous Diode Current (Diode Conduction) <sup>a</sup>	I <sub>S</sub>	3.1	1.5		
Maximum Power Dissipation <sup>a</sup>	P <sub>D</sub>	T <sub>A</sub> = 25 °C	3.5	1.6	W
		T <sub>A</sub> = 85 °C	1.8	0.86	
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	30	36	°C/W
		Steady State	61	76	
Maximum Junction-to-Case (Drain)	R <sub>thJC</sub>	4.8	6.0		

Notes:

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



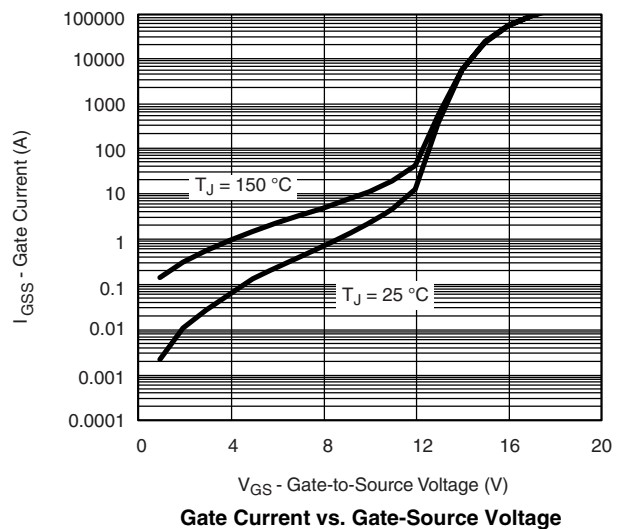
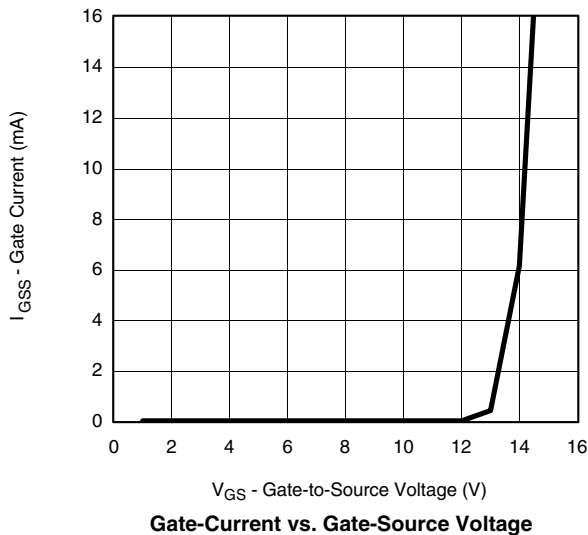
<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.6		1.5	V
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			$\pm 10$	$\mu\text{A}$
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 500$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = 5\text{ V}, V_{GS} = 4.5\text{ V}$	40			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 7.0\text{ A}$		0.018	0.022	$\Omega$
		$V_{GS} = 4.0\text{ V}, I_D = 6.5\text{ A}$		0.019	0.023	
		$V_{GS} = 3.1\text{ V}, I_D = 4.0\text{ A}$		0.021	0.026	
		$V_{GS} = 2.5\text{ V}, I_D = 3.5\text{ A}$		0.023	0.028	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 10\text{ V}, I_D = 7.0\text{ A}$		38		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 3.1\text{ A}, V_{GS} = 0\text{ V}$		0.76	1.1	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 7.0\text{ A}$		9.1	14	$\text{nC}$
Gate-Source Charge	$Q_{gs}$			1.9		
Gate-Drain Charge	$Q_{gd}$			2.7		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 6\text{ }\Omega$		1.7	2.6	$\mu\text{s}$
Rise Time	$t_r$			2.3	3.5	
Turn-Off Delay Time	$t_{d(off)}$			1.1	1.7	
Fall Time	$t_f$			4.4	6.6	

Notes:

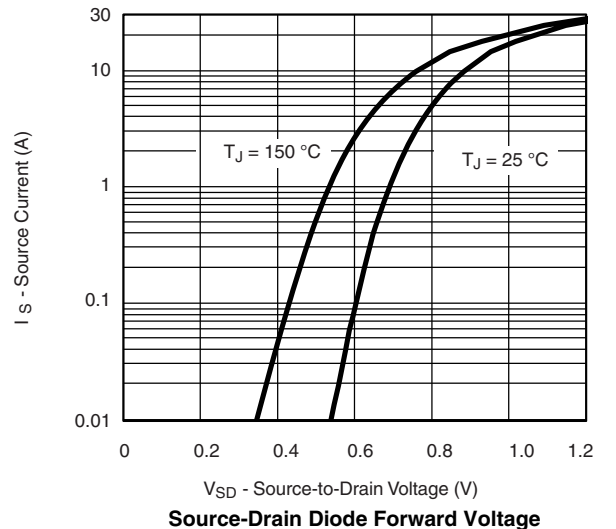
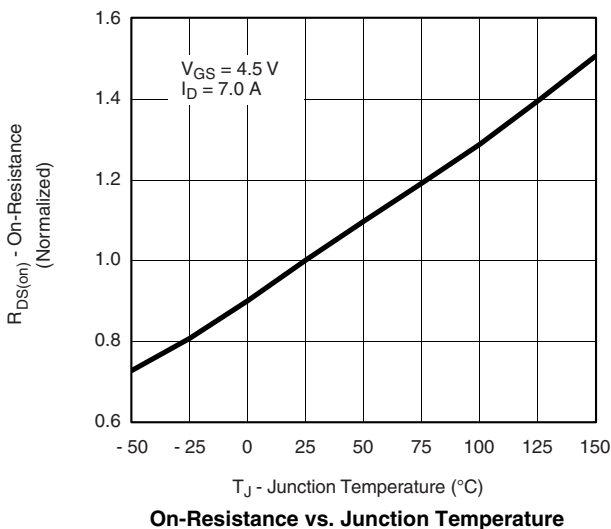
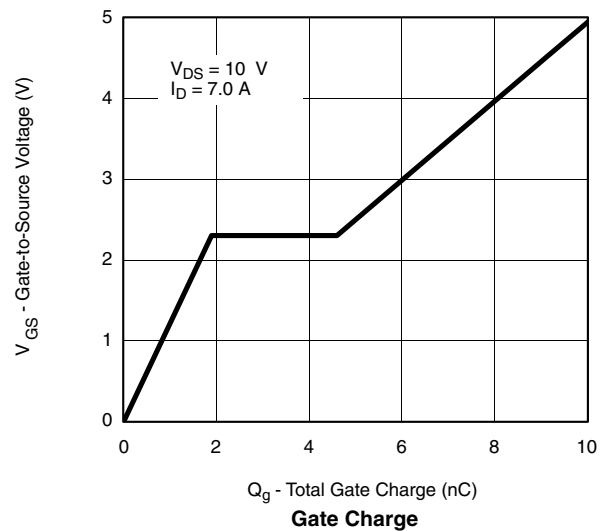
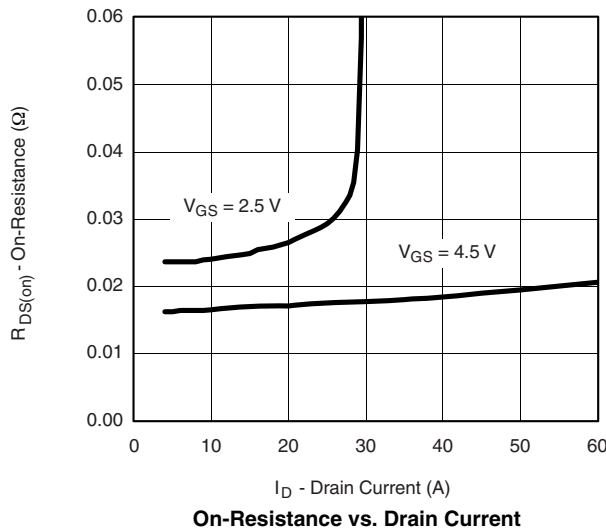
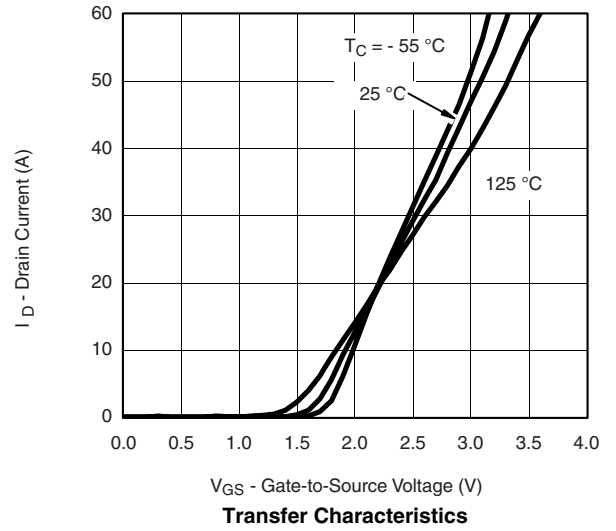
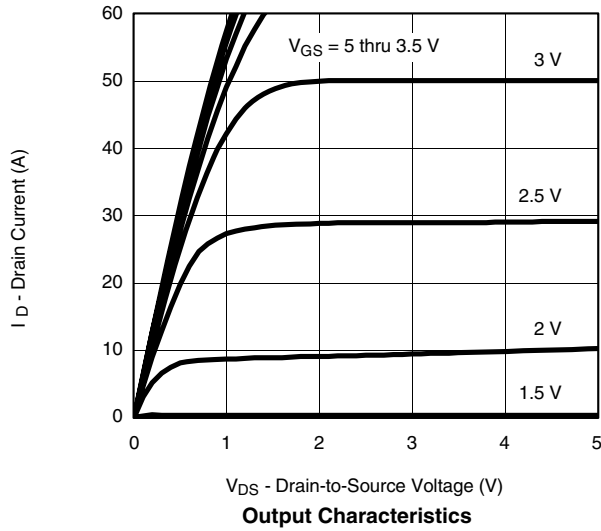
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .
- b. Guaranteed by design, not subject to production testing.

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.

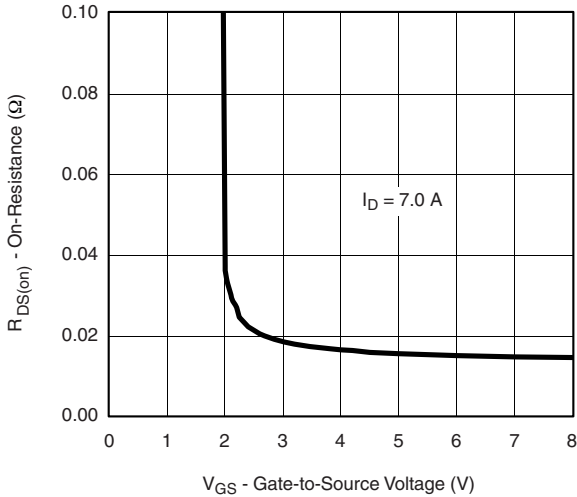
**TYPICAL CHARACTERISTICS**  $25\text{ }^\circ\text{C}$ , unless otherwise noted



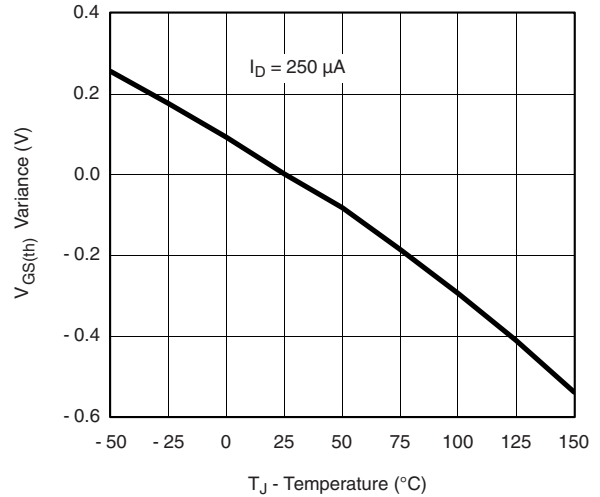
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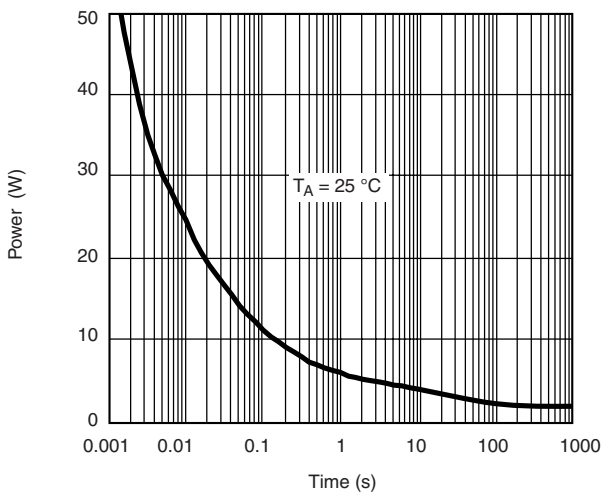
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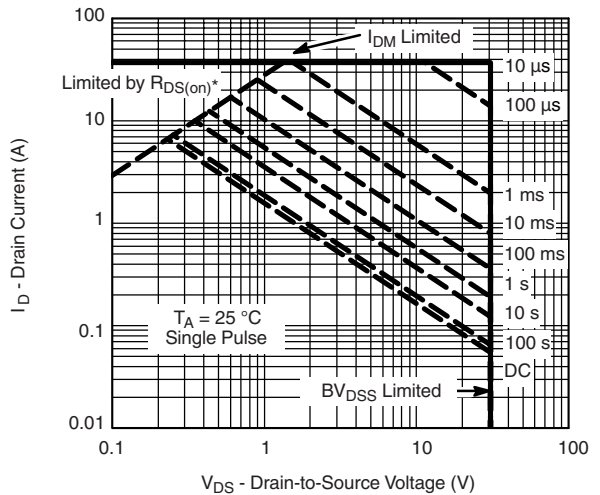
**On-Resistance vs. Gate-to-Source Voltage**



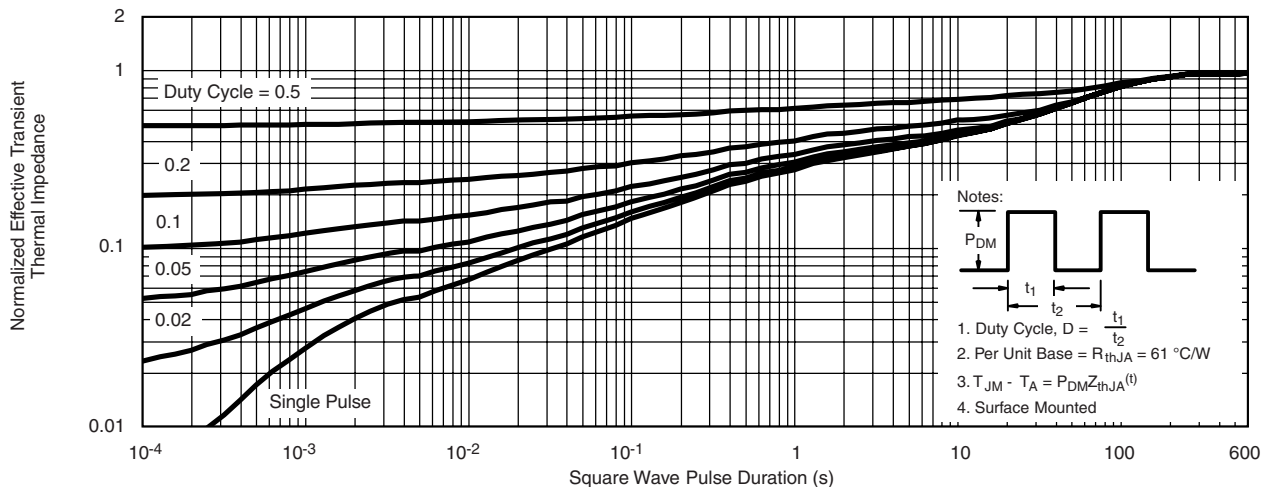
**Threshold Voltage**



**Single Pulse Power, Junction-to-Ambient**



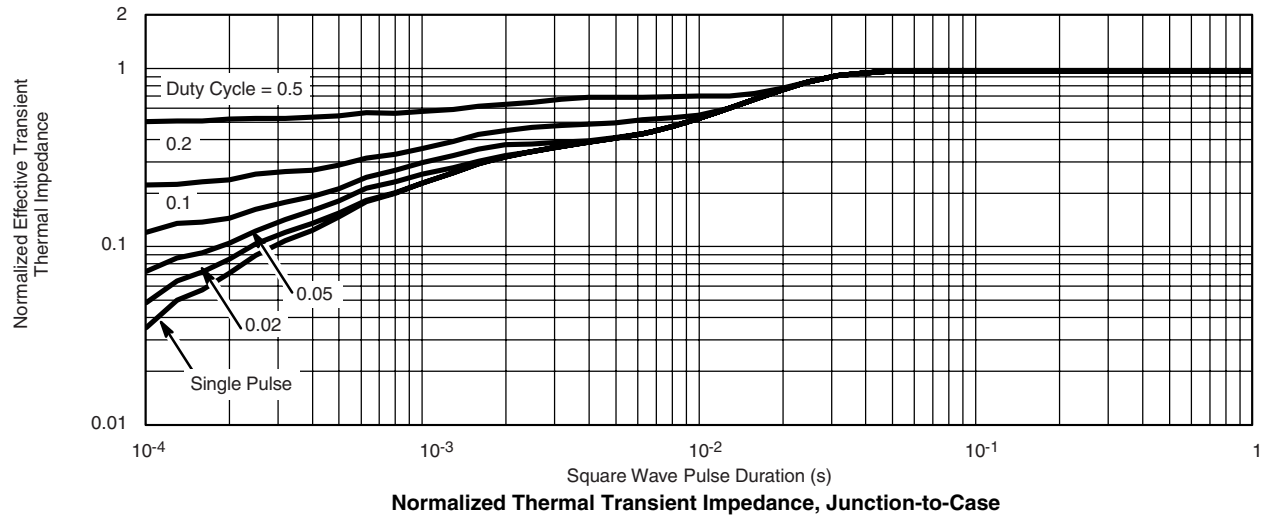
**Safe Operating Area**  
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified



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



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



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