

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

PRODUCT SUMMARY		
V _{S1S2} (V)	R _{S1S2(on)} (Ω)	I _{S1S2} (A)
20	0.045 at V _{GS} = 4.5 V	5.0
	0.048 at V _{GS} = 3.7 V	4.8
	0.057 at V _{GS} = 2.5 V	4.4
	0.072 at V _{GS} = 1.8 V	3.9

FEATURES

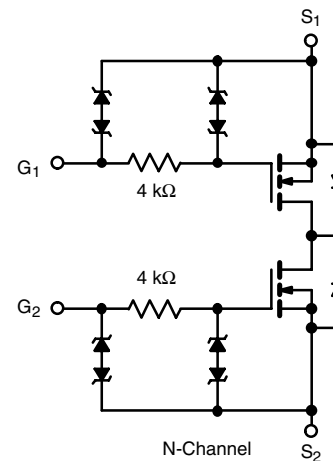
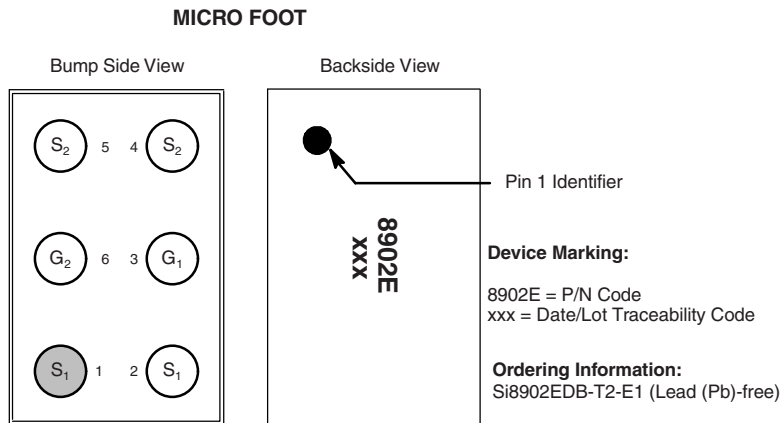
- TrenchFET[®] Power MOSFET
- Ultra-Low R_{SS(on)}
- ESD Protected: 4000 V
- MICRO FOOT[®] Chipscale Packaging
Reduces Footprint Area Profile (0.62 mm) and On-Resistance Per Footprint Area



RoHS
COMPLIANT

APPLICATIONS

- Battery Protection Circuit
- 1-2 Cell Li+/LiP Battery Pack for Portable Devices



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted					
Parameter	Symbol	5 s	Steady State	Unit	
Source1- Source2 Voltage	V _{S1S2}	20		V	
Gate-Source Voltage	V _{GS}	± 12			
Continuous Source1- Source2 Current (T _J = 150 °C) ^a	I _{S1S2}	T _A = 25 °C	5.0	3.9	A
		T _A = 85 °C	3.4	2.8	
Pulsed Source1- Source2 Current	I _{SM}	40			
Maximum Power Dissipation ^a	P _D	T _A = 25 °C	1.7	1	W
		T _A = 85 °C	0.8	0.5	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C	
Package Reflow Conditions ^c	IR/Convection	260			

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^a	R _{thJA}	t ≤ 5 s	60	75	°C/W
		Steady State	95	120	
Maximum Junction-to-Foot ^b	R _{thJF}	18	22		

Notes:

- Surface Mounted on 1" x 1" FR4 board.
- The foot is defined as the top surface of the package.
- Refer to IPC/JEDEC (J-STD-020C), no manual or hand soldering.



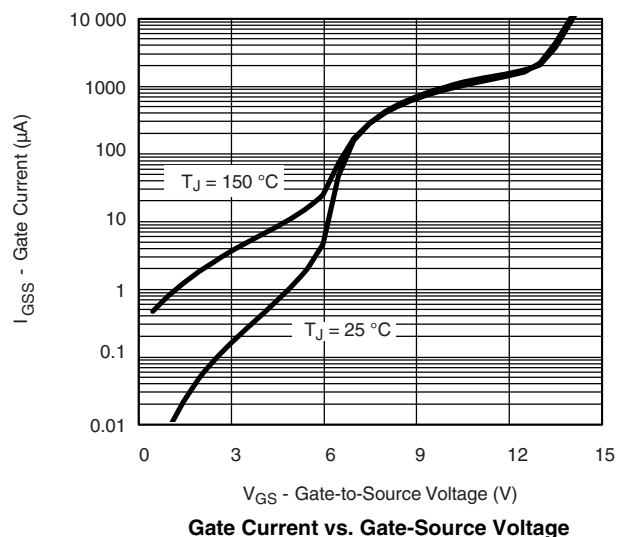
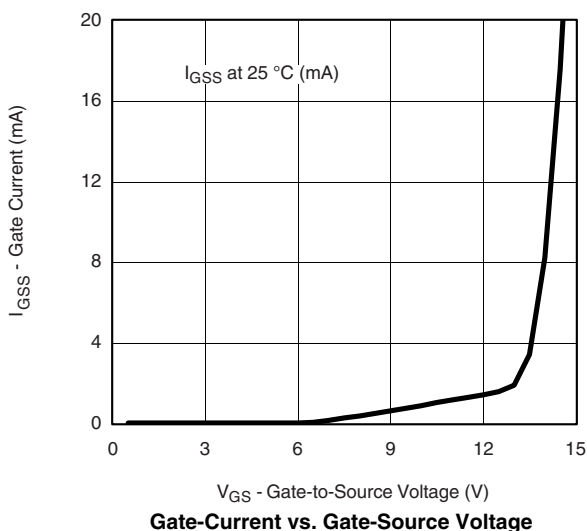
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{SS} = V_{GS}, I_D = 980\text{ }\mu\text{A}$	0.45		1.0	V
Gate-Body Leakage	I_{GSS}	$V_{SS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 4	μA
		$V_{SS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 10	mA
Zero Gate Voltage Source Current	I_{S1S2}	$V_{SS} = 20\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{SS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 85\text{ }^\circ\text{C}$			5	
On-State Source Current ^a	$I_{S(on)}$	$V_{SS} = 5\text{ V}, V_{GS} = 4.5\text{ V}$	5			A
Source1-Source2 On State Resistance ^a	$R_{S1S2(on)}$	$V_{GS} = 4.5\text{ V}, I_{SS} = 1\text{ A}$		0.038	0.045	Ω
		$V_{GS} = 3.7\text{ V}, I_{SS} = 1\text{ A}$		0.041	0.048	
		$V_{GS} = 2.5\text{ V}, I_{SS} = 1\text{ A}$		0.048	0.057	
		$V_{GS} = 1.8\text{ V}, I_{SS} = 1\text{ A}$		0.060	0.072	
Forward Transconductance ^a	g_{fs}	$V_{SS} = 10\text{ V}, I_{SS} = 1\text{ A}$		20		S
Dynamic^b						
Turn-On Delay Time	$t_{d(on)}$	$V_{SS} = 10\text{ V}, R_L = 10\text{ }\Omega$ $I_{SS} \cong 1\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 6\text{ }\Omega$		1	1.5	μs
Rise Time	t_r			3	4.5	
Turn-Off Delay Time	$t_{d(off)}$			17	26	
Fall Time	t_f			10	15	

Notes:

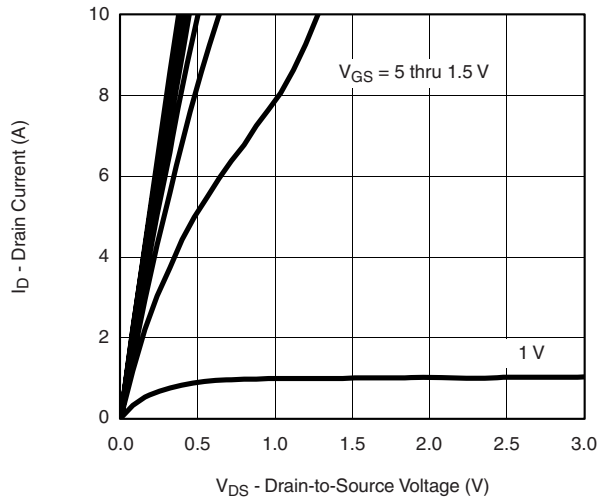
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

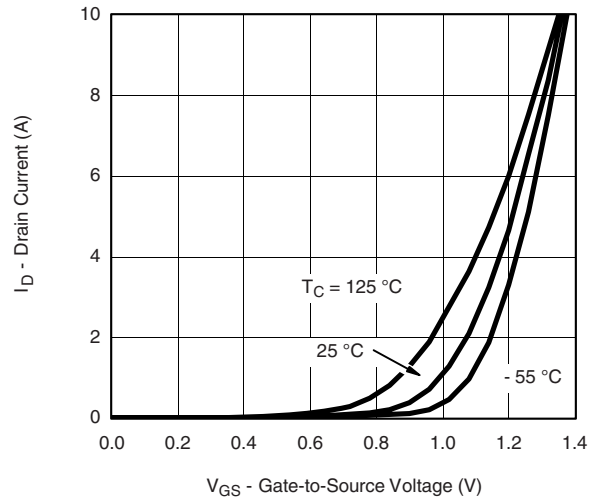
TYPICAL CHARACTERISTICS $25\text{ }^\circ\text{C}$, unless otherwise noted



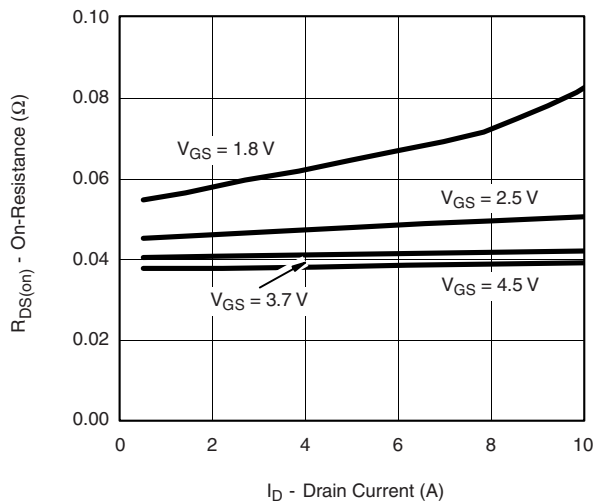
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



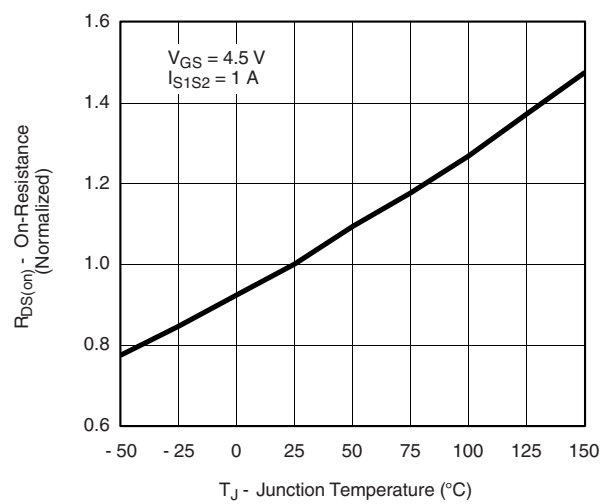
Output Characteristics



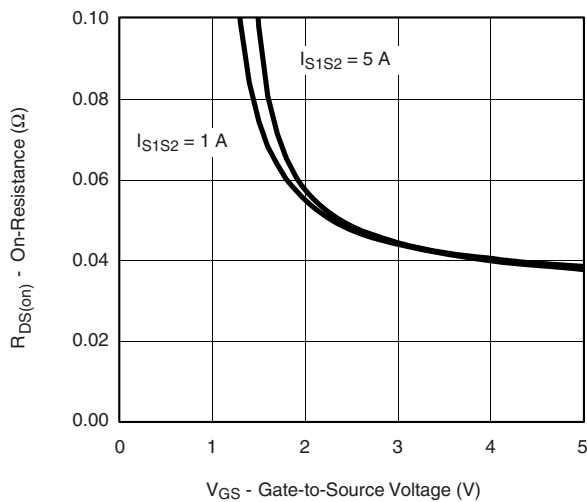
Transfer Characteristics



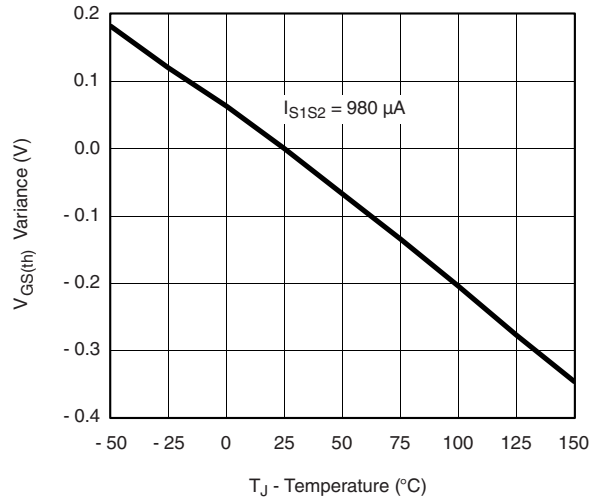
On-Resistance vs. Drain Current



On-Resistance vs. Junction Temperature

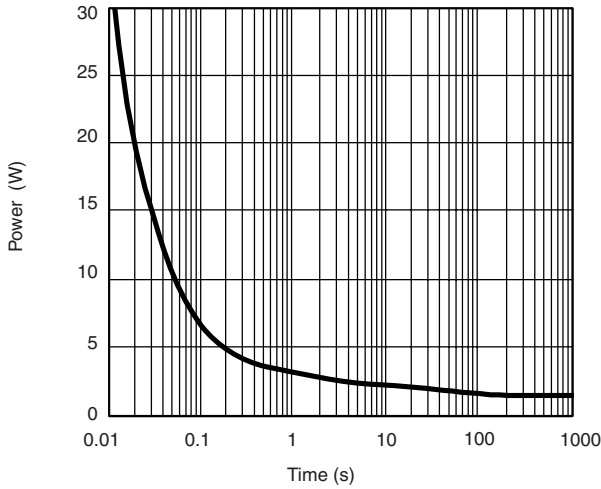


On-Resistance vs. Gate-to-Source Voltage

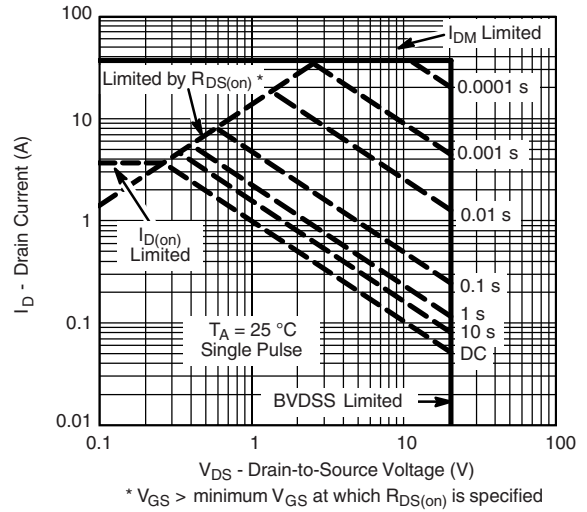


Threshold Voltage

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

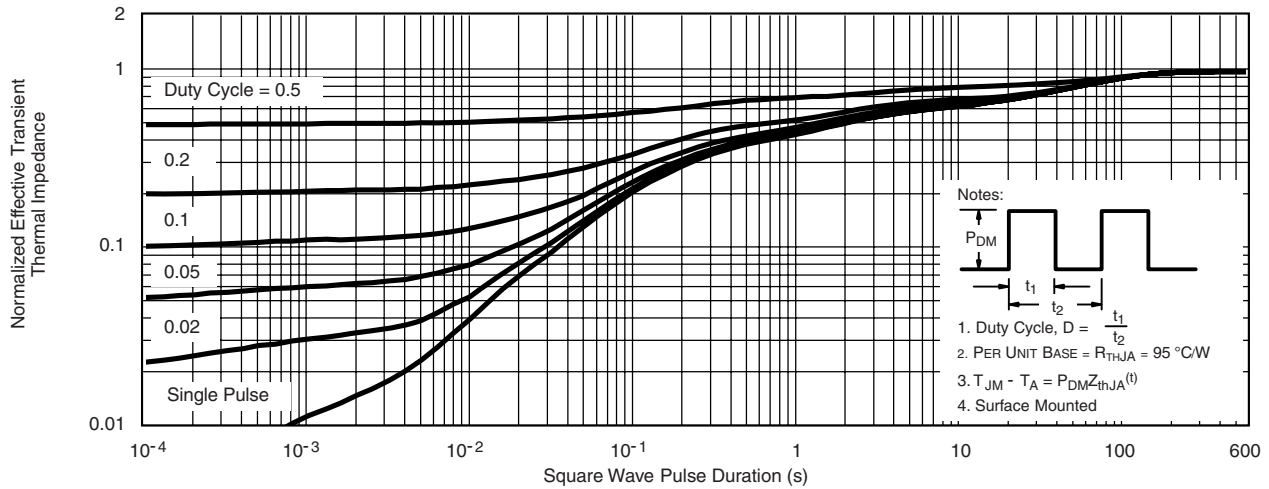


Single Pulse Power, Junction-to-Ambient

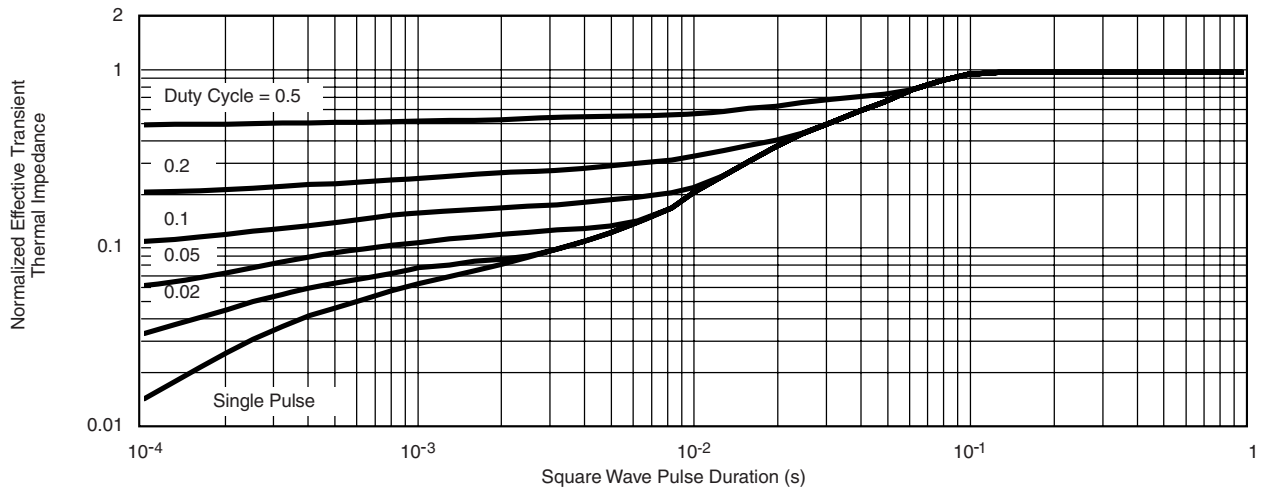


* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area



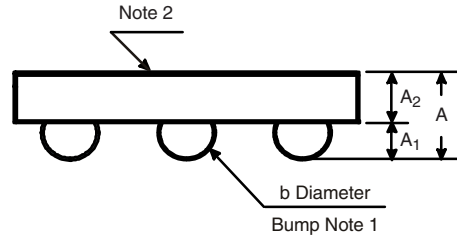
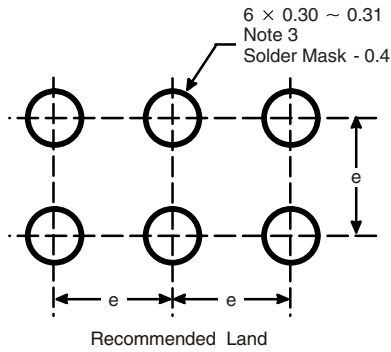
Normalized Thermal Transient Impedance, Junction-to-Ambient



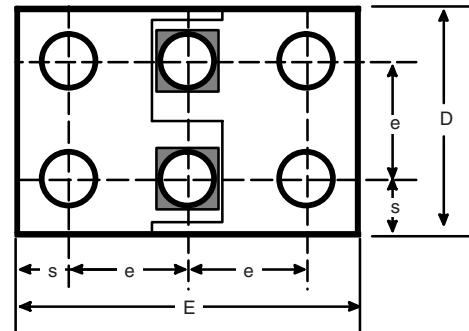
Normalized Thermal Transient Impedance, Junction-to-Foot

PACKAGE OUTLINE

MICRO FOOT: 6 BUMP (2 x 3, 0.8 mm PITCH)



Mark on Backside of Die



Notes (Unless Otherwise Specified):

1. 6 solder bumps are 95.5/3.8/0.7 Sn/Ag/Cu.
2. Backside surface is coated with a Ag/Ni/Ti layer.
3. Non-solder mask defined copper landing pad.
4. Laser marks on the silicon die back.

Dim.	Millimeters ^a		Inches	
	Min.	Max.	Min.	Max.
A	0.600	0.650	0.0236	0.0256
A₁	0.260	0.290	0.102	0.114
A₂	0.33	0.360	0.0134	0.0142
b	0.370	0.410	0.0146	0.0161
D	1.520	1.600	0.0598	0.0630
E	2.320	2.400	0.0913	0.0945
e	0.750	0.850	0.0295	0.0335
s	0.380	0.400	0.0150	0.0157

Notes:

- a. Use millimeters as the primary measurement.

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