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

PRODUCT SUMMARY		
V_{S1S2} (V)	$r_{S1S2(on)}$ (Ω)	I_{S1S2} (A)
20	0.024 @ V_{GS} = 4.5 V	7
	0.026 @ V_{GS} = 3.7 V	6.8
	0.034 @ V_{GS} = 2.5 V	5.0
	0.040 @ V_{GS} = 1.8 V	5.5

FEATURES

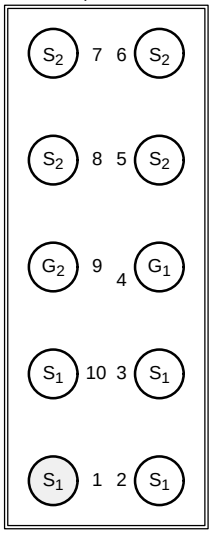
- TrenchFET® Power MOSFET
- Ultra-Low $r_{SS(on)}$
- ESD Protected: 4000 V
- New MICRO FOOT™ Chipscale Packaging Reduces Footprint Area Profile (0.62 mm) and On-Resistance Per Footprint Area

APPLICATIONS

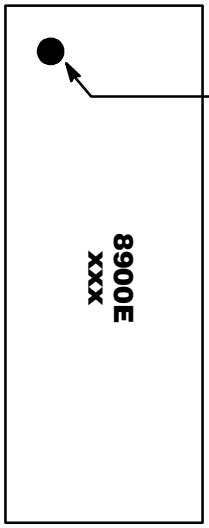
- Battery Protection Circuit
  - 1-2 Cell Li+/LiP Battery Pack for Portable Devices

MICRO FOOT™

Bump Side View



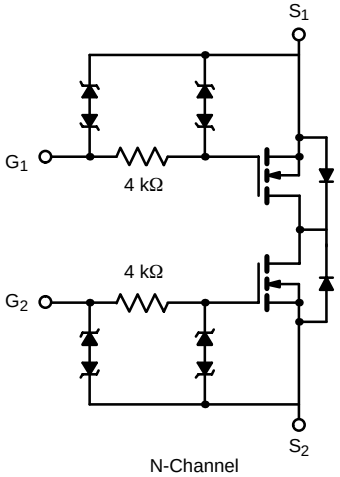
Backside View



Pin 1 Identifier

Device Marking:

8900E = P/N Code
xxx = Date/Lot Traceability Code



N-Channel

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C UNLESS OTHERWISE NOTED)					
Parameter		Symbol	5 secs	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]	T_A = 25°C	I_{S1S2}	7	5.4	A
	T_A = 85°C		5.1	3.9	
Pulsed Source1—Source2 Current		I_{SM}	10		
Maximum Power Dissipation[a]	T_A = 25°C	P_D	1.8	1	W
	T_A = 85°C		0.9	0.5	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C
Package Reflow Conditions[c]	VPR		215		
	IR/Convection		220		

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a]	t ≤ 5 sec	R_{thJA}	55	70	°C/W
	Steady State		95	120	
Maximum Junction-to-Foot[b]	Steady State	R_{thJF}	12	15	

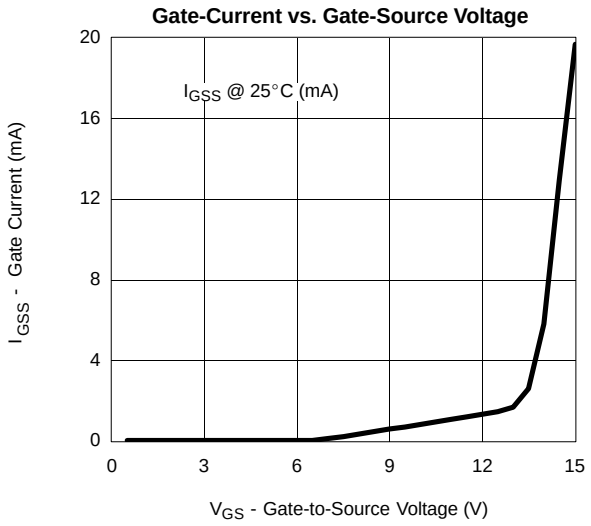
Notes
a. Surface Mounted on 1" x 1" FR4 Board.
b. The Foot is defined as the top surface of the package.
c. Refer to IPC/JEDEC (J-STD-020A), no manual or hand soldering.

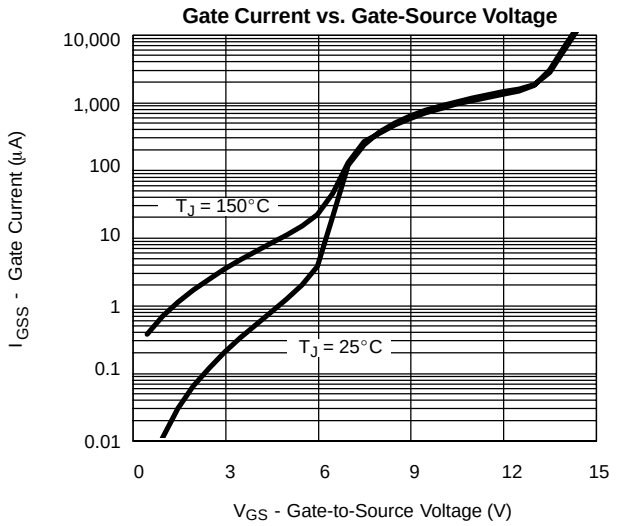
SPECIFICATIONS (T_J = 25°C UNLESS OTHERWISE NOTED)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	V_{SS} = V_{GS}, I_D = 1.1 mA	0.45		1.0	V
Gate-Body Leakage	I_{GSS}	V_{SS} = 0 V, V_{GS} = ±4.5 V			±4	μA
		V_{SS} = 0 V, V_{GS} = ±12 V			±10	mA
Zero Gate Voltage Source Current	I_{S1S2}	V_{SS} = 16 V, V_{GS} = 0 V			1	μA
		V_{SS} = 16 V, V_{GS} = 0 V, T_J = 85°C			5	
On-State Source Current[a]	$I_{S(on)}$	V_{SS} = 5 V, V_{GS} = 4.5 V	5			A
Source1—Source2 On-State Resistance[a]	$r_{S1S2(on)}$	V_{GS} = 4.5 V, I_{SS} = 1 A		0.020	0.024	Ω
		V_{GS} = 3.7 V, I_{SS} = 1 A		0.022	0.026	
		V_{GS} = 2.5 V, I_{SS} = 1 A		0.026	0.034	
		V_{GS} = 1.8 V, I_{SS} = 1 A		0.032	0.040	
Forward Transconductance[a]	g_{fs}	V_{SS} = 10 V, I_{SS} = 1 A		31		S
Dynamic[b]						
Turn-On Delay Time	$t_{d(on)}$	V_{SS} = 10 V, R_L = 10 Ω I_{SS} ≅ 1 A, V_{GEN} = 4.5 V, R_G = 6 Ω		3	5	μs
Rise Time	t_r			4.5	7	
Turn-Off Delay Time	$t_{d(off)}$			55	85	
Fall Time	t_f			15	25	

Notes
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2%.
b. Guaranteed by design, not subject to production testing.

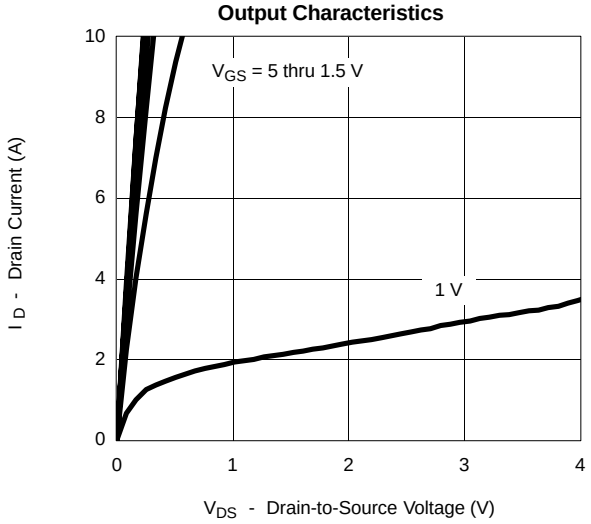
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)



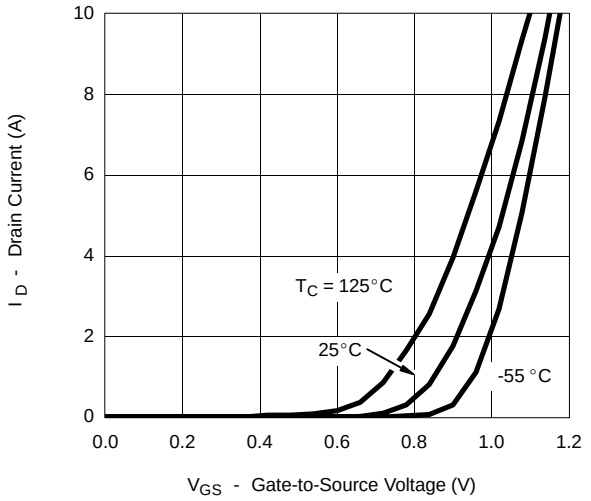


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

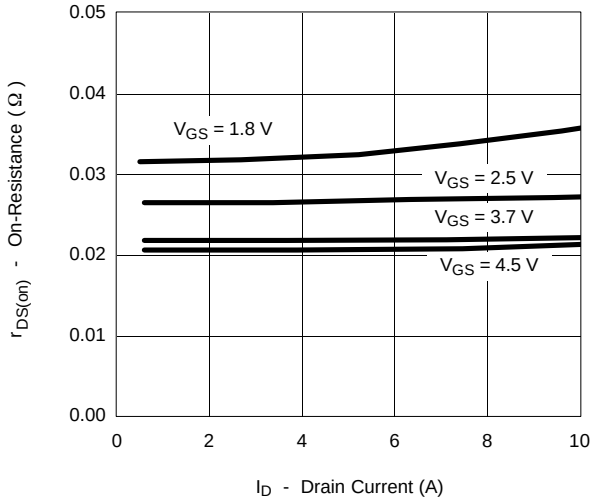
Output Characteristics



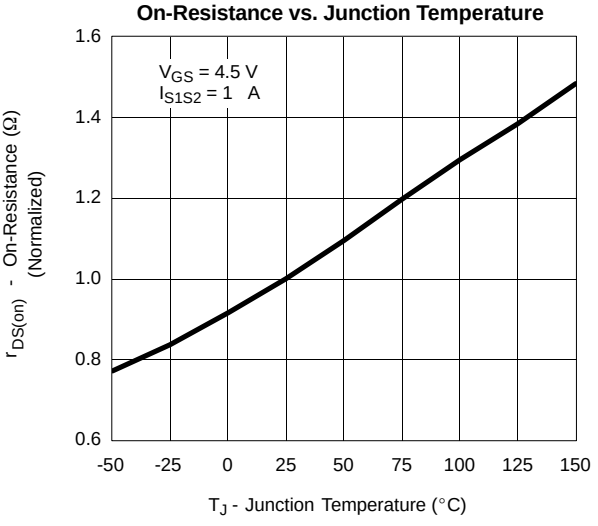
Transfer Characteristics



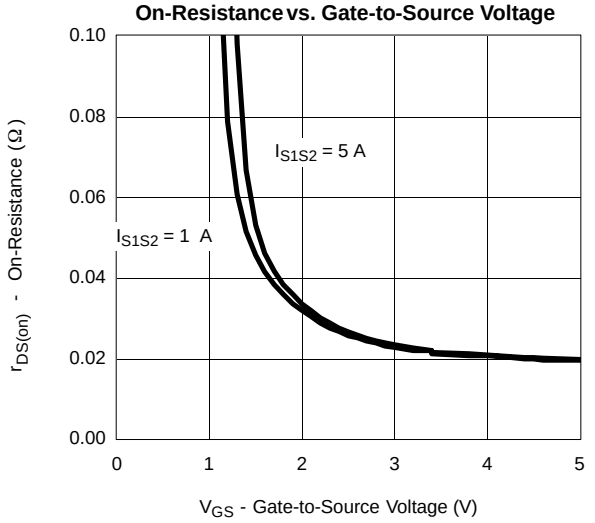
On-Resistance vs. Drain Current



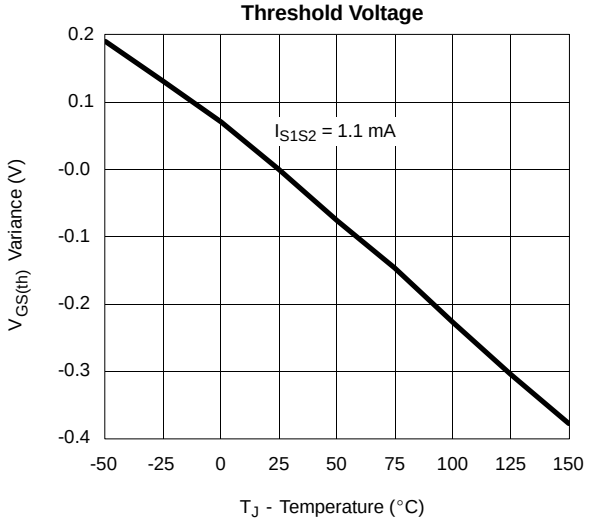
On-Resistance vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage

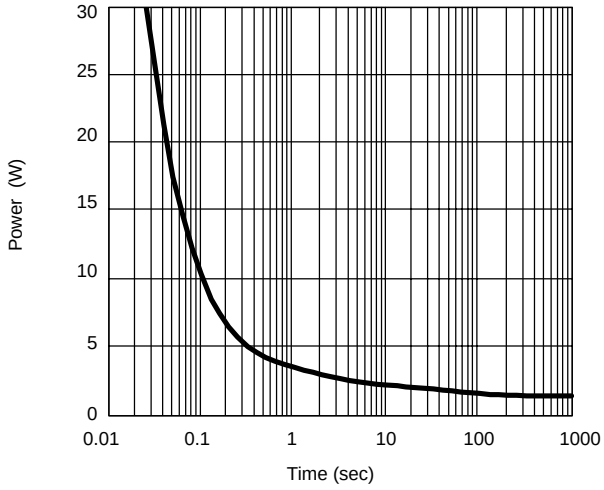


Threshold Voltage

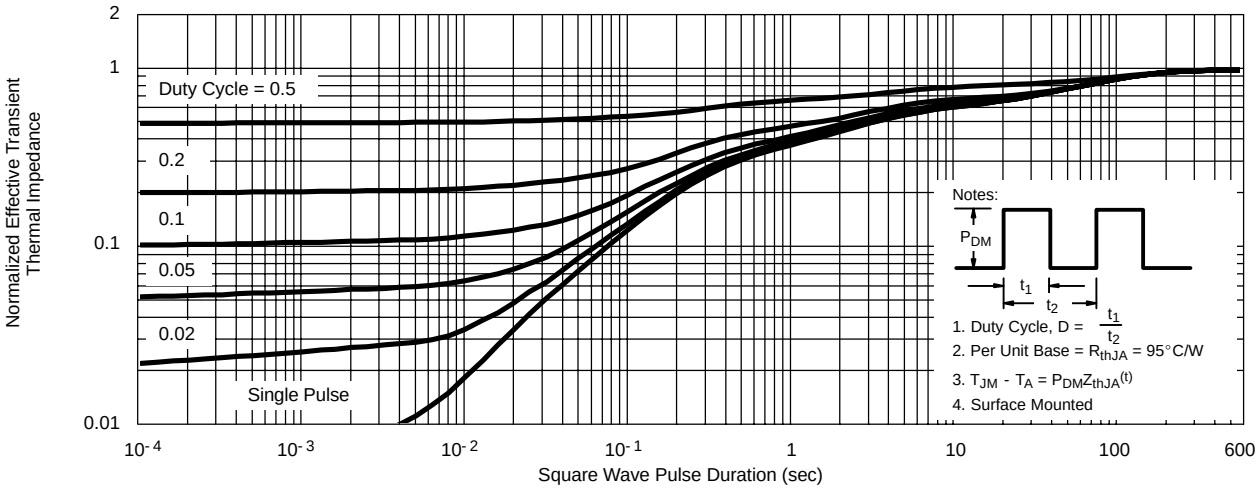


TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

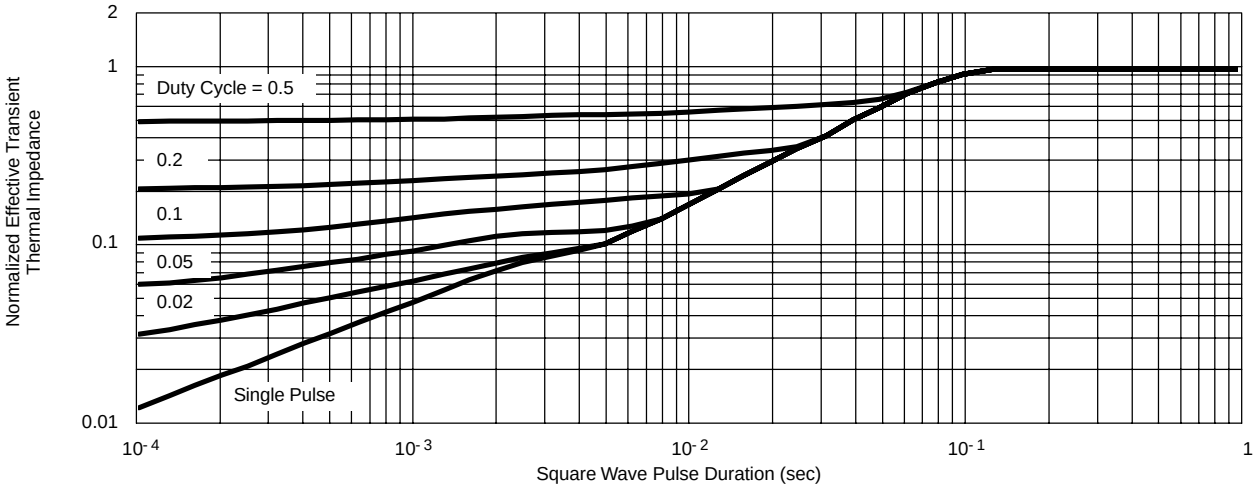
Single Pulse Power, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Ambient

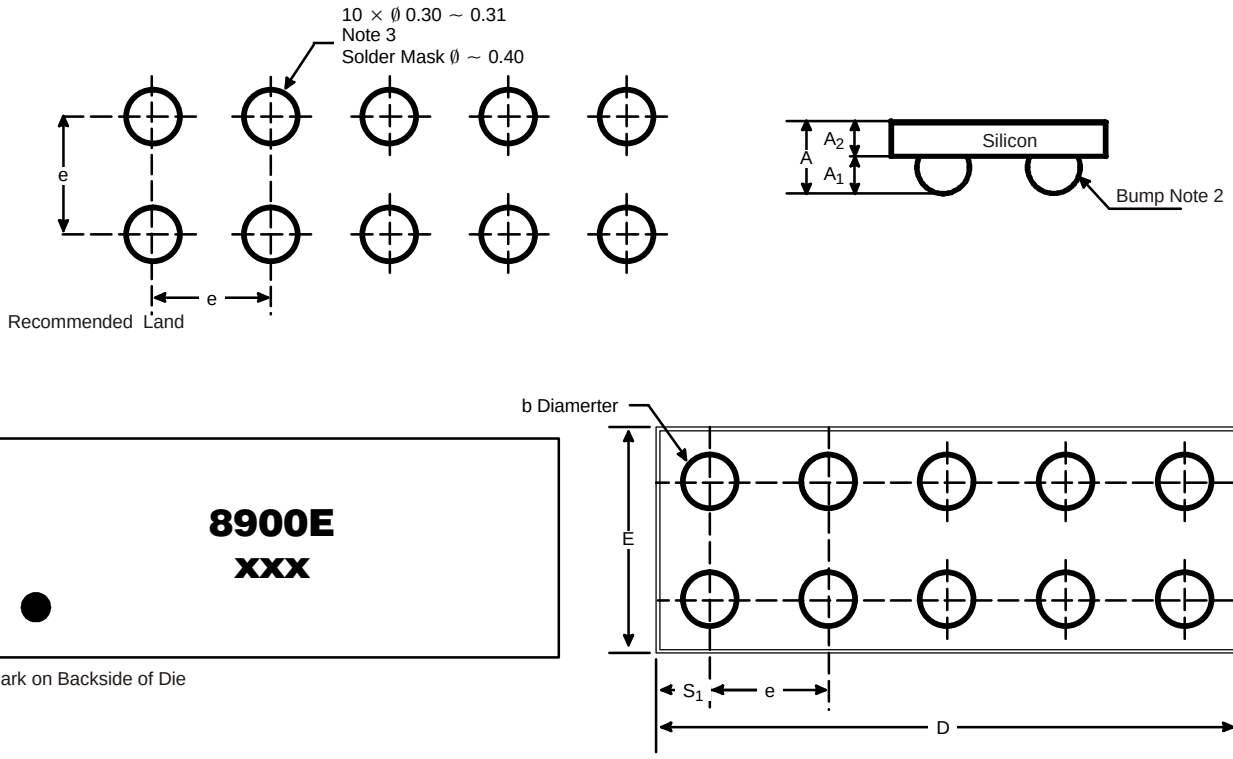


Normalized Thermal Transient Impedance, Junction-to-Foot



PACKAGE OUTLINE

MICRO FOOT: 10-BUMP (2 X 5, 0.8-mm PITCH)



NOTES (Unless Otherwise Specified):

1. Laser mark on the silicon die back, coated with a thin metal.
2. Bumps are Eutectic solder 63/57 Sn/Pb.
3. Non-solder mask defined copper landing pad.

Dim	MILLIMETERS*		INCHES	
	Min	Max	Min	Max
A	0.600	0.650	0.0236	0.0256
A_1	0.260	0.290	0.102	0.0114
A_2	0.340	0.360	0.0134	0.0142
b	0.370	0.410	0.0146	0.0161
D	4.050	4.060	0.1594	0.1598
E	1.980	2.000	0.0780	0.0787
e	0.750	0.850	0.0295	0.0335
S_1	0.430	0.450	0.0169	0.0177
S_2	0.580	0.600	0.0228	0.0236

* Use millimeters as the primary measurement.