

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

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

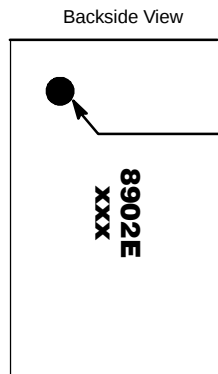
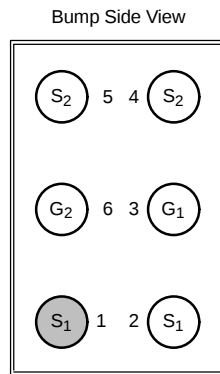
FEATURES

- TrenchFET® Power MOSFET
- Ultra-Low r_{SS(on)}
- ESD Protected: 4000 V
- New MICRO FOOT™ Chipscale Packaging Reduces Footprint Area, Profile (0.65 mm) and On-Resistance Per Footprint Area

APPLICATIONS

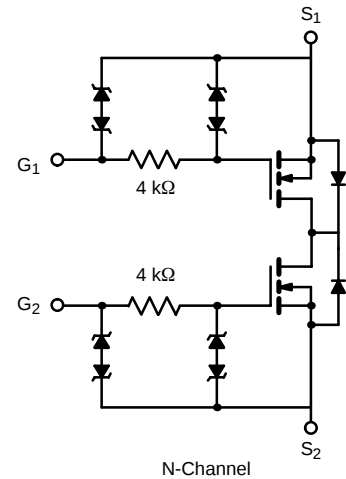
- Battery Protection Circuit
 - 1-2 Cell Li+/LiP Battery Pack for Portable Devices

MICRO FOOT™



Pin 1 Identifier

Device Marking:

8902E = P/N Code
xxx = Date/Lot Traceability Code


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}	5.0	3.9	A
	T _A = 85°C		3.4	2.8	
Pulsed Source1—Source2 Current		I _{SM}	8		
Maximum Power Dissipation ^a	T _A = 25°C	P _D	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	VPR		215		
	IR/Convection		220		

THERMAL RESISTANCE RATINGS

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

Notes

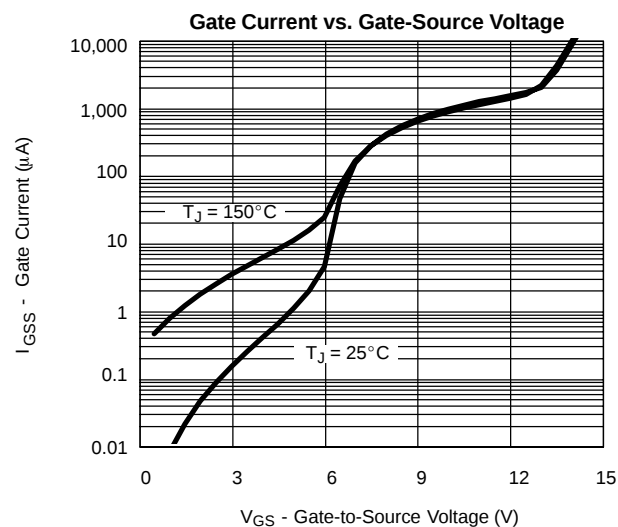
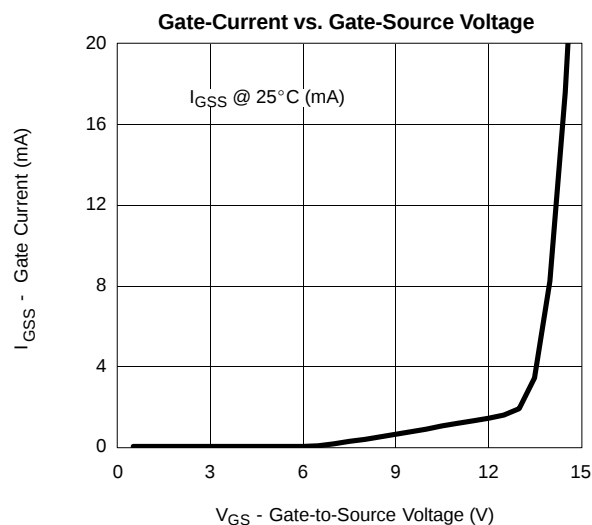
- Surface Mounted on 1" x 1" FR4 Board.
- The Foot is defined as the top surface of the package.
- Refer to IPC/JEDEC (J-STD-020A), no manual or hand soldering.

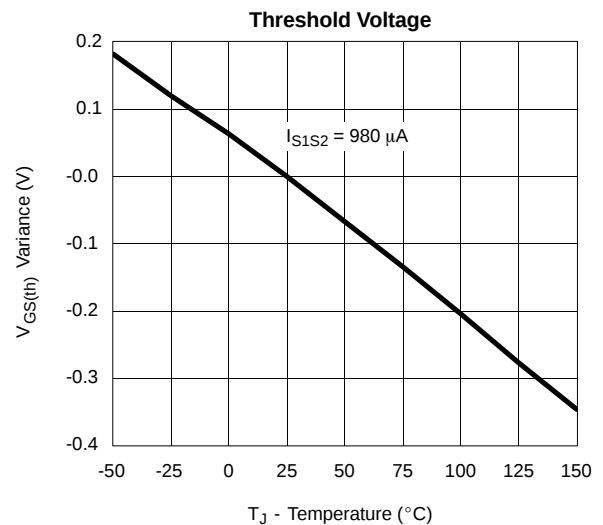
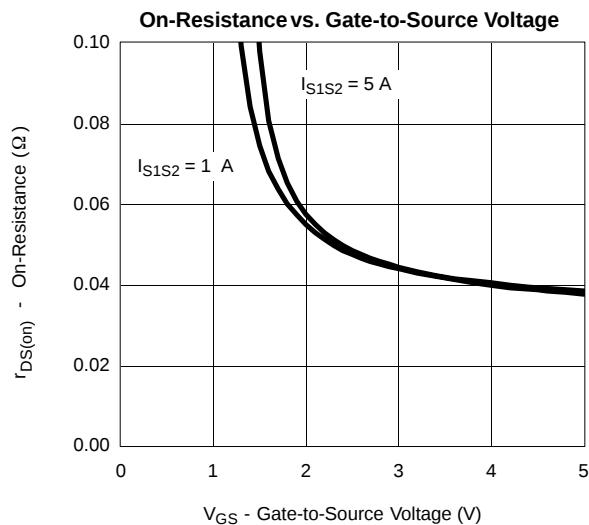
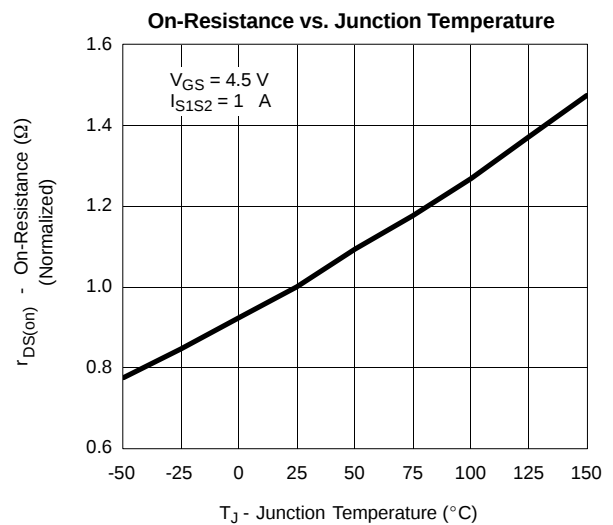
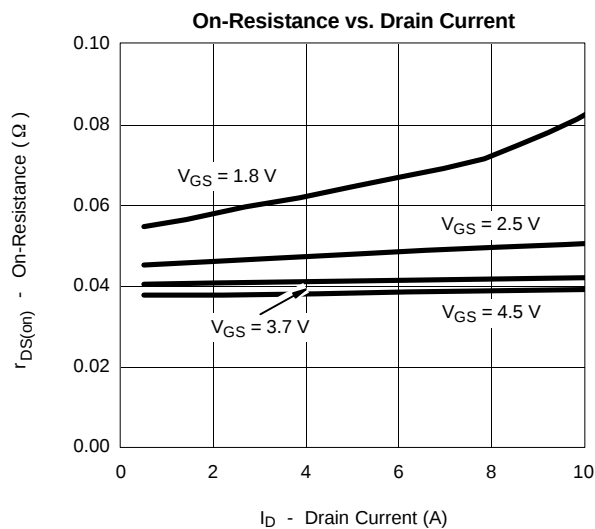
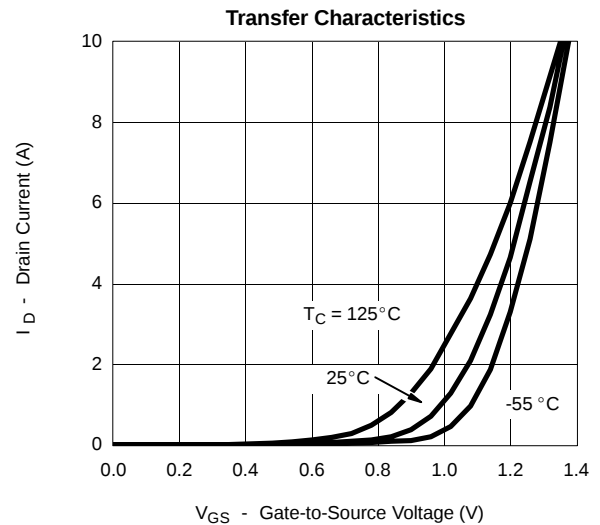
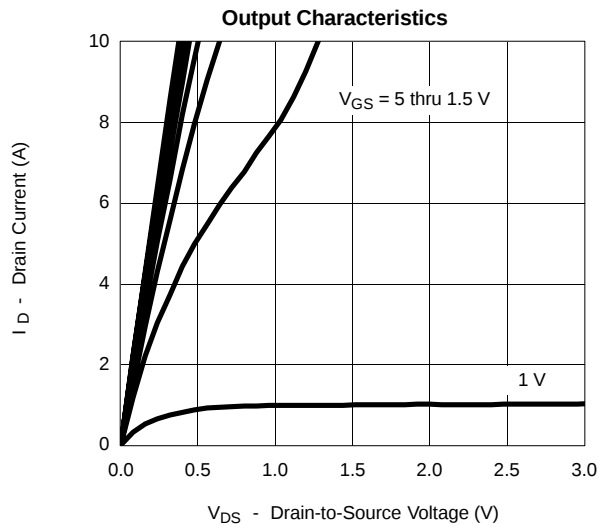
SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

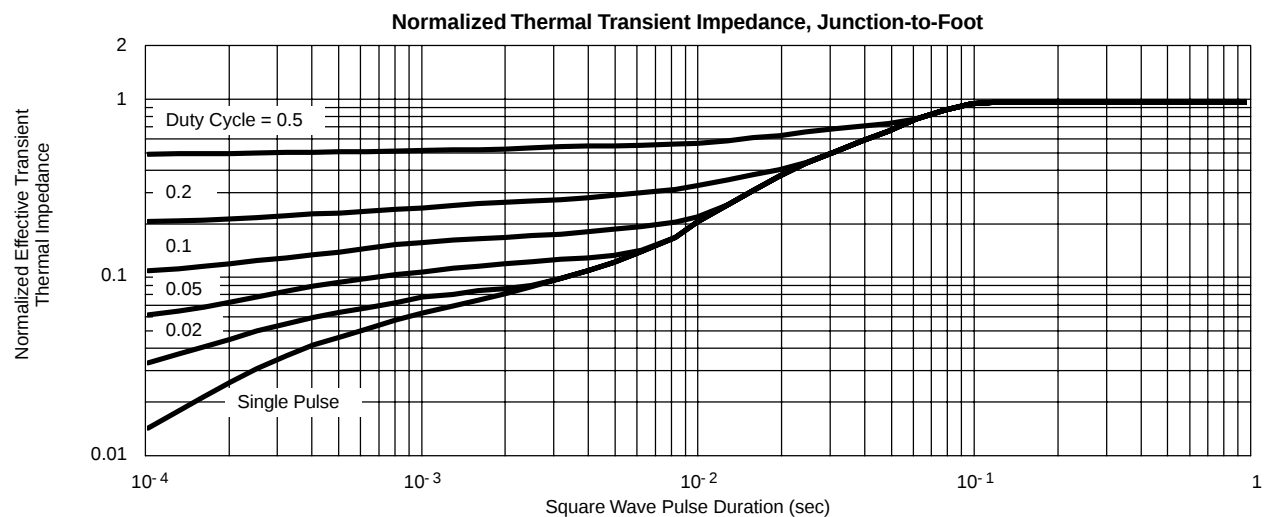
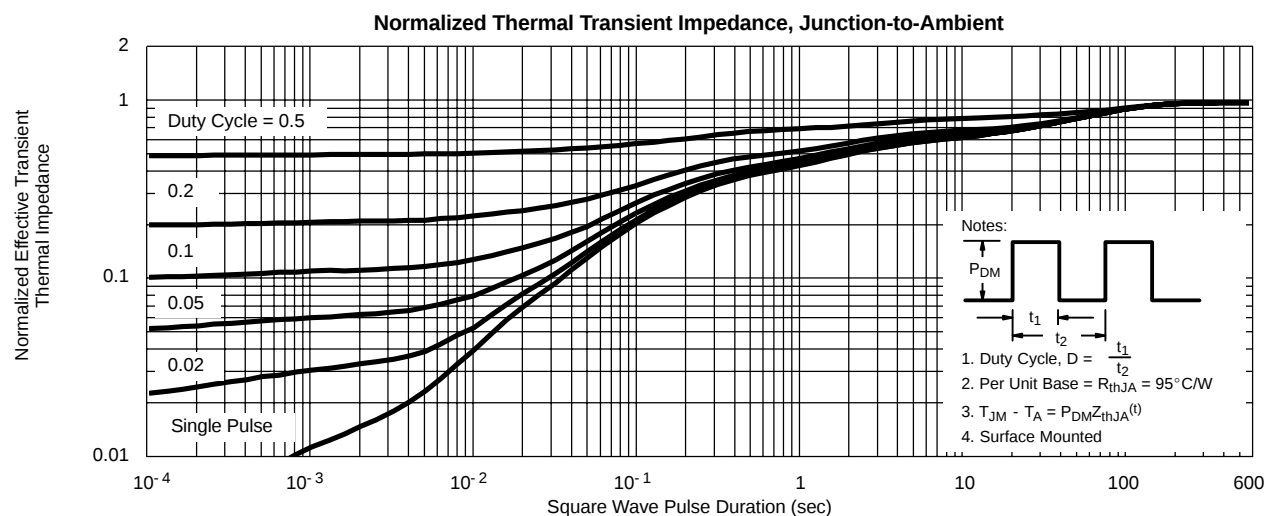
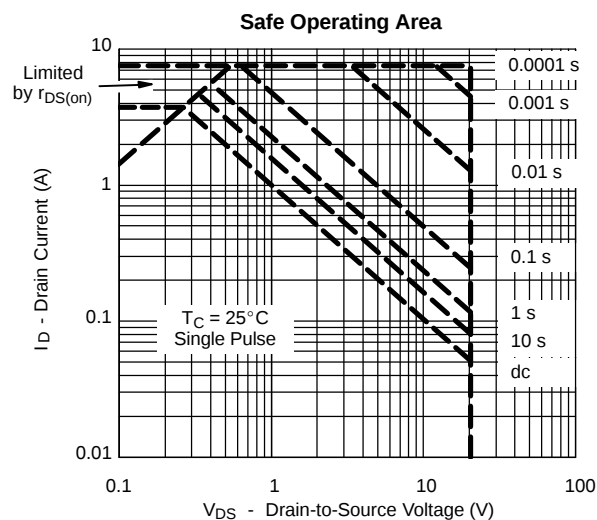
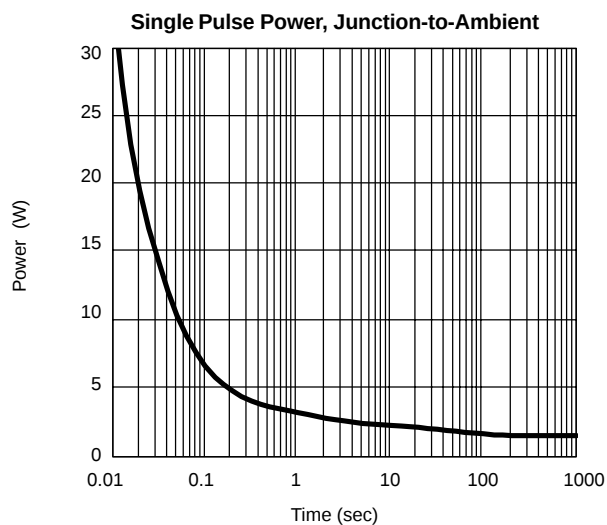
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{SS} = V_{GS}, I_D = 980\ \mu\text{A}$	0.45		1.0	V
Gate-Body Leakage	I_{GSS}	$V_{SS} = 0\ \text{V}, V_{GS} = \pm 4.5\ \text{V}$			± 4	μA
		$V_{SS} = 0\ \text{V}, V_{GS} = \pm 12\ \text{V}$			± 10	mA
Zero Gate Voltage Source Current	I_{S1S2}	$V_{SS} = 16\ \text{V}, V_{GS} = 0\ \text{V}$			1	μA
		$V_{SS} = 16\ \text{V}, V_{GS} = 0\ \text{V}, T_J = 85^\circ\text{C}$			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	$t_{d(on)}$	$V_{SS} = 10\ \text{V}, R_L = 10\ \Omega$ $I_{SS} \approx 1\ \text{A}, V_{GEN} = 4.5\ \text{V}, R_G = 6\ \Omega$		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	

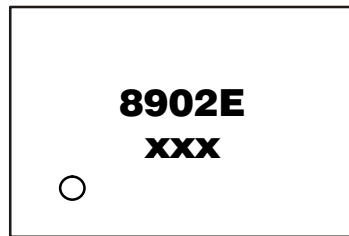
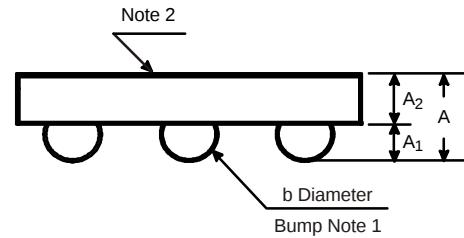
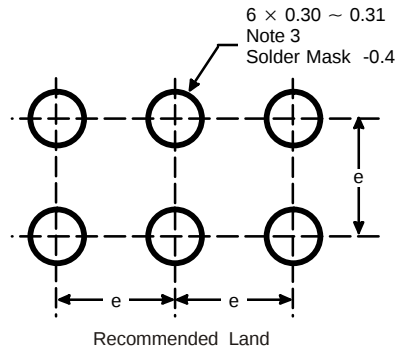
Notes

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

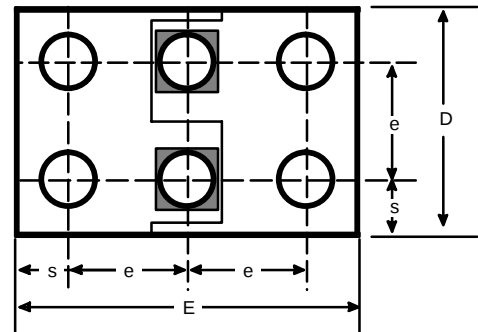
TYPICAL CHARACTERISTICS (25°C UNLESS NOTED)

**TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)**

TYPICAL CHARACTERISTICS (25 °C UNLESS NOTED)


**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 Eutetic 63Sn/37Pb with diameter 0.37 - 0.41 mm
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*		INCHES	
	Min	Max	Min	Max
A	0.600	0.650	0.0236	0.0256
A ₁	0.260	0.290	0.102	0.114
A ₂	0.340	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

* Use millimeters as the primary measurement.