



12-V P-Channel 1.8-V (G-S) MOSFET

PRODUCT SUMMARY		
V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A)
-12	0.055 @ $V_{GS} = -4.5$ V	-4.9
	0.070 @ $V_{GS} = -2.5$ V	-4.4
	0.090 @ $V_{GS} = -1.8$ V	-4.0

FEATURES

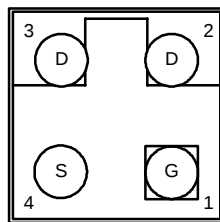
- TrenchFET® Power MOSFET
- New MICRO FOOT™ Chipscale Packaging
Reduces Footprint Area Profile (0.62 mm) and
On-Resistance Per Footprint Area

APPLICATIONS

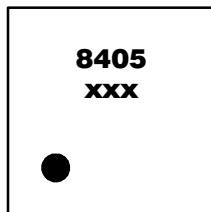
- PA, Battery and Load Switch
- Battery Charger Switch

MICRO FOOT™

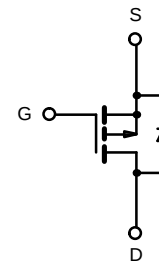
Bump Side View



Backside View



Device Marking: 8405
xxx = Date/Lot Traceability Code



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)				
Parameter		Symbol	5 secs	Steady State
Drain-Source Voltage		V_{DS}	-12	
Gate-Source Voltage		V_{GS}	± 8	
Continuous Drain Current ($T_J = 150^\circ\text{C}$) ^a	$T_A = 25^\circ\text{C}$	I_D	-4.9	-3.6
	$T_A = 70^\circ\text{C}$		-3.9	-2.8
Pulsed Drain Current		I_{DM}	-10	
continuous Source Current (Diode Conduction) ^a		I_S	-2.5	-1.3
Maximum Power Dissipation ^a	$T_A = 25^\circ\text{C}$	P_D	2.77	1.47
	$T_A = 70^\circ\text{C}$		1.77	0.94
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150	
Package Reflow Conditions ^b	VPR		215	
	IR/Convection		220	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^a	$t \leq 5$ sec	R_{thJA}	35	45	$^\circ\text{C/W}$
	Steady State		72	85	
Maximum Junction-to-Foot (drain)	Steady State	R_{thJF}	16	20	

Notes

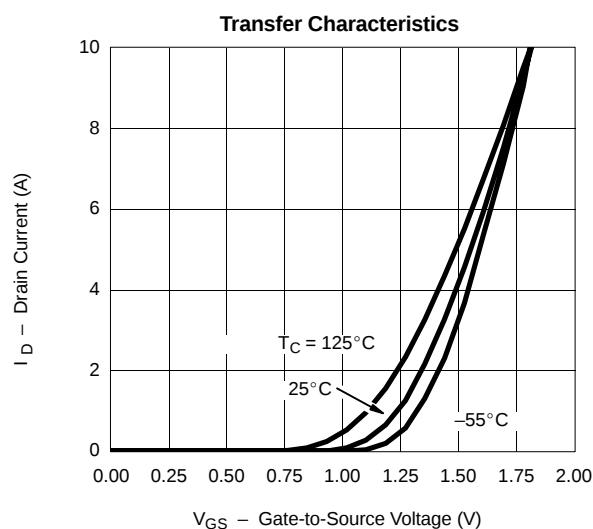
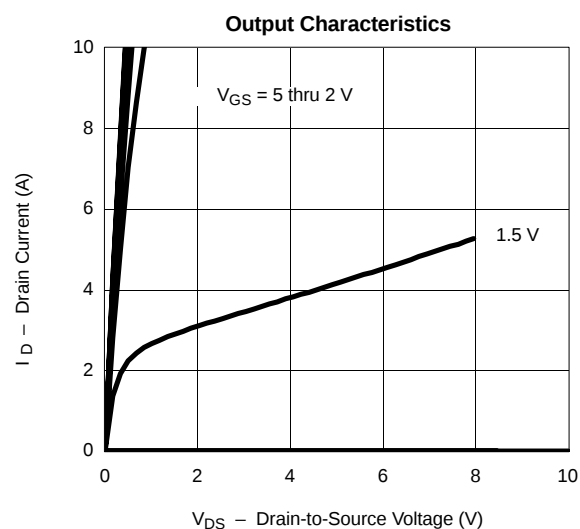
- a. Surface Mounted on 1" x 1" FR4 Board.
b. Refer to IPC/JEDEC (J-STD-020A), no manual or hand soldering.

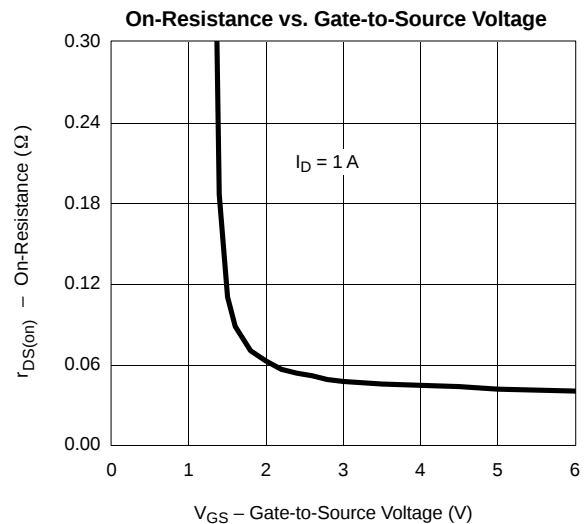
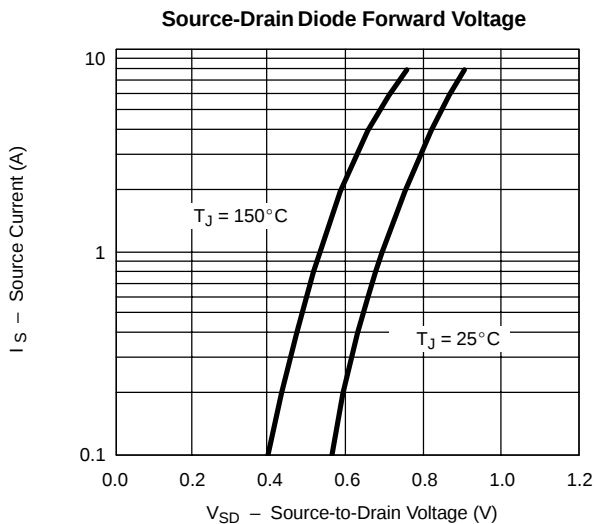
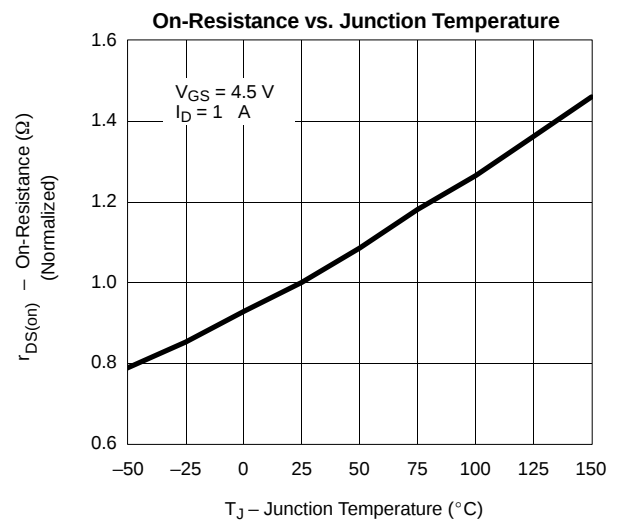
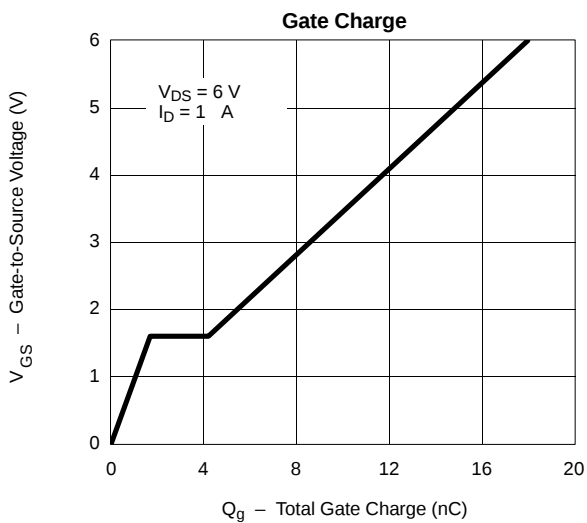
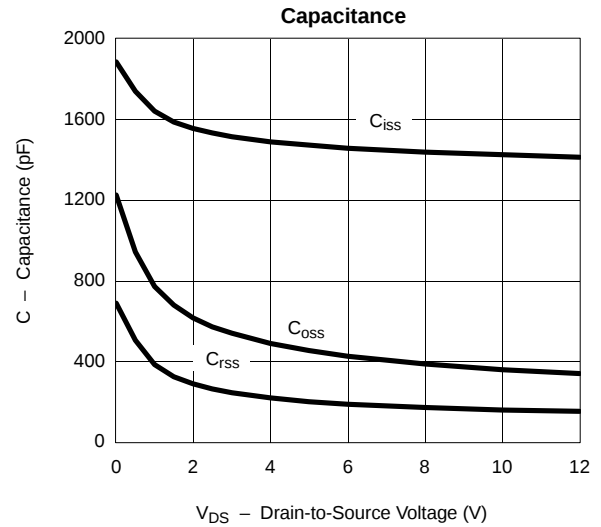
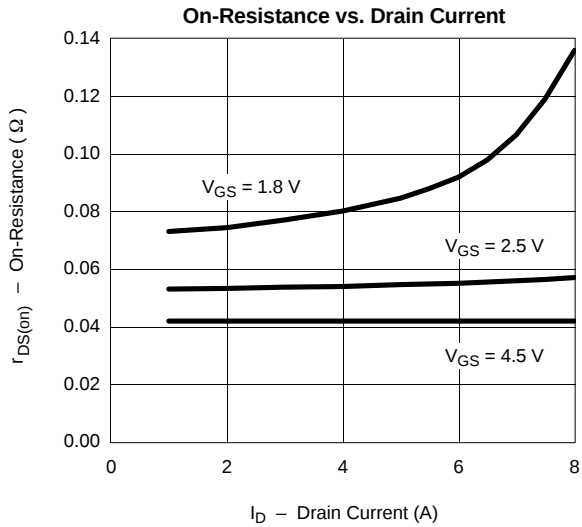
SPECIFICATIONS ($T_J = 25^\circ\text{C}$ UNLESS OTHERWISE NOTED)

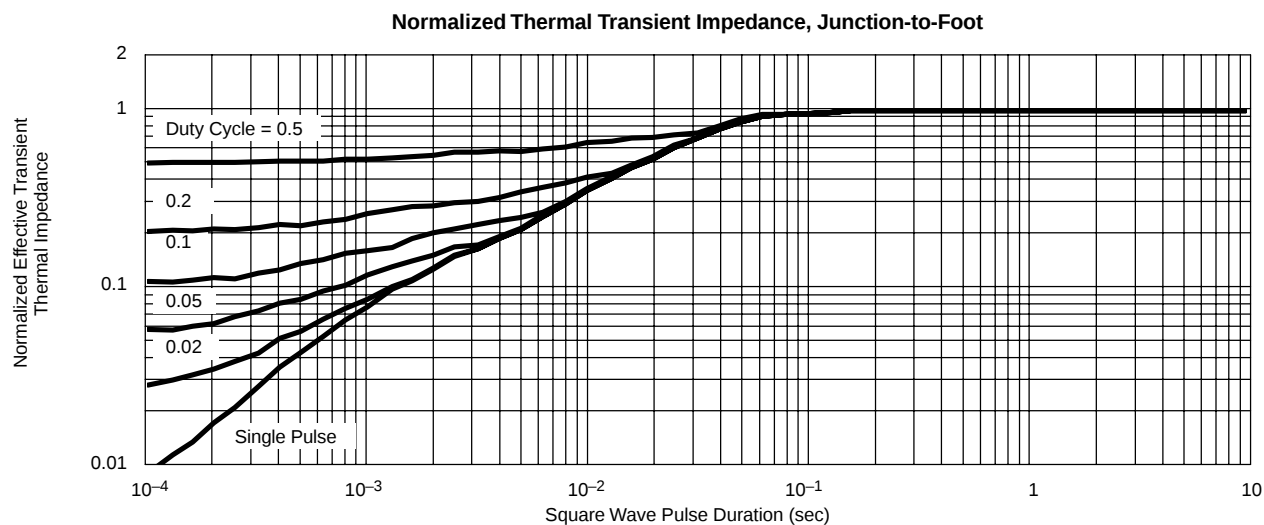
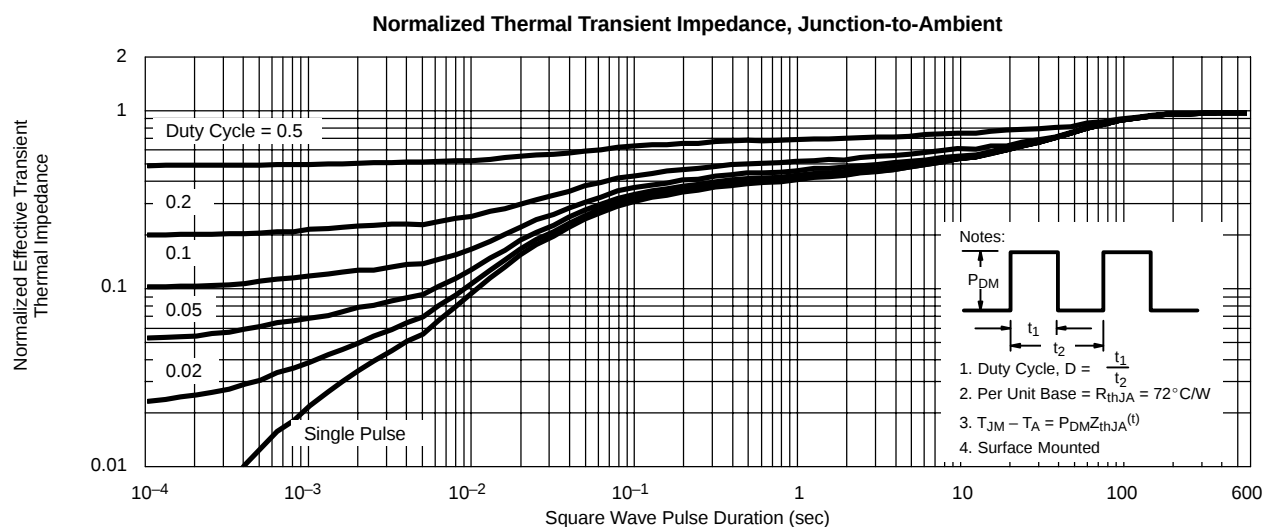
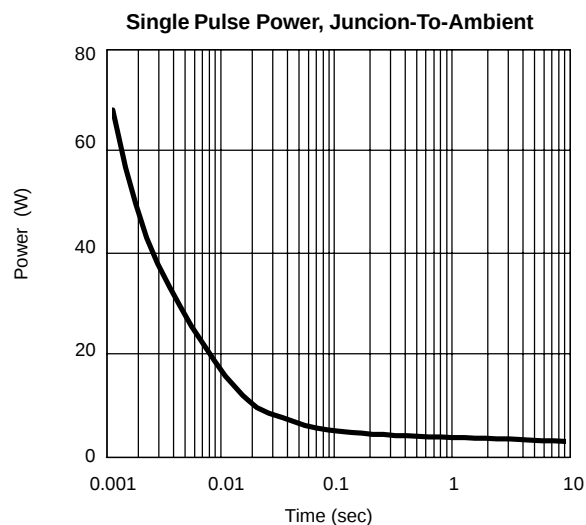
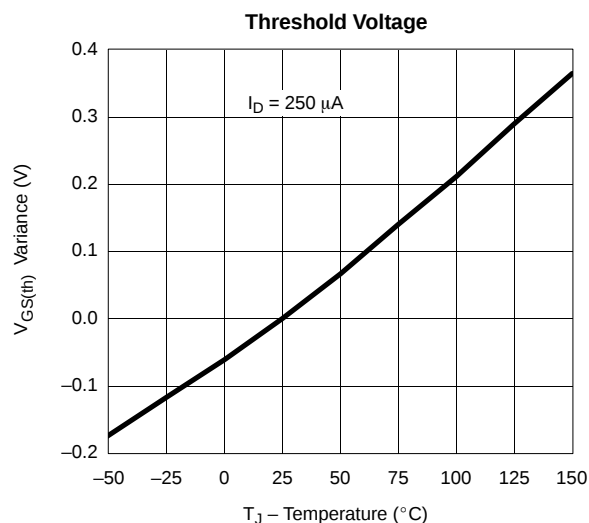
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = -250\ \mu\text{A}$	-0.45	-0.7	-0.95	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\ \text{V}$, $V_{GS} = \pm 8\ \text{V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -12\ \text{V}$, $V_{GS} = 0\ \text{V}$			-1	μA
		$V_{DS} = -12\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_J = 70^\circ\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\ \text{V}$, $V_{GS} = -4.5\ \text{V}$	-5			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -4.5\ \text{V}$, $I_D = -1\ \text{A}$		0.045	0.055	Ω
		$V_{GS} = -2.5\ \text{V}$, $I_D = -1\ \text{A}$		0.055	0.070	
		$V_{GS} = -1.8\ \text{V}$, $I_D = -1\ \text{A}$		0.073	0.090	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\ \text{V}$, $I_D = -1\ \text{A}$		6		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -1\ \text{A}$, $V_{GS} = 0\ \text{V}$		-0.73	-1.1	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -6\ \text{V}$, $V_{GS} = -4.5\ \text{V}$, $I_D = -1\ \text{A}$		14	21	nC
Gate-Source Charge	Q_{gs}			1.7		
Gate-Drain Charge	Q_{gd}			2.5		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -6\ \text{V}$, $R_L = 6\ \Omega$ $I_D \cong -1\ \text{A}$, $V_{GEN} = -4.5\ \text{V}$, $R_G = 6\ \Omega$		16	25	ns
Rise Time	t_r			32	50	
Turn-Off Delay Time	$t_{d(off)}$			120	180	
Fall Time	t_f			80	120	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -\text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		46	70	

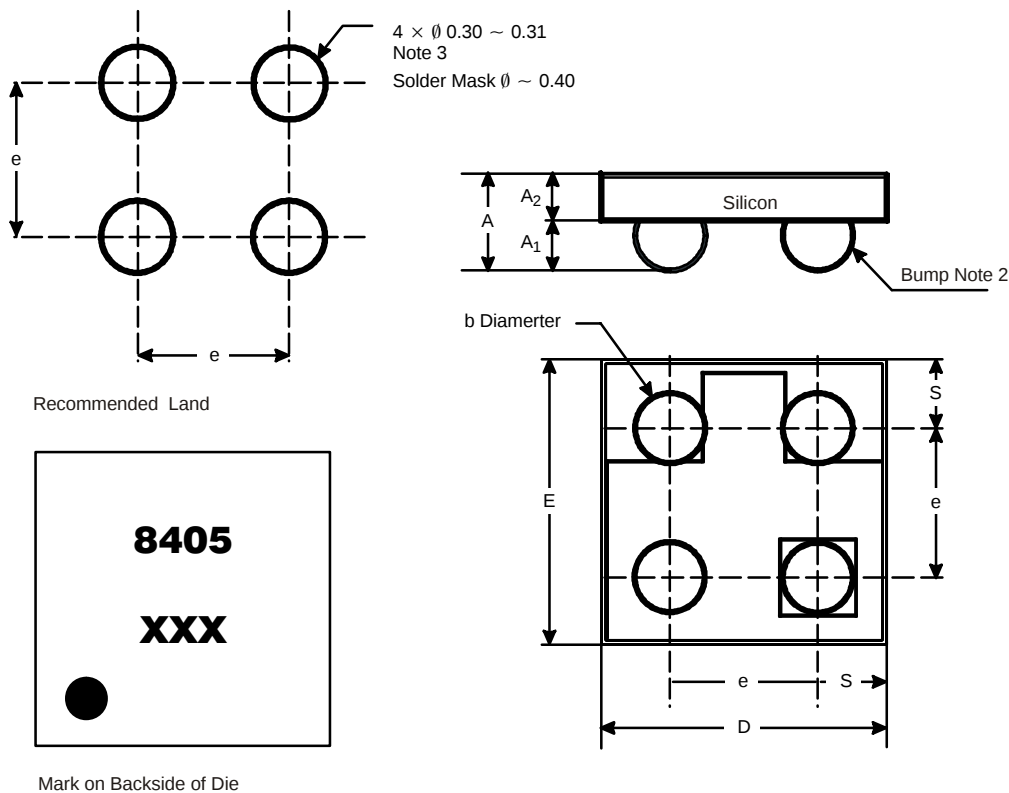
Notes

- 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)

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**PACKAGE OUTLINE****MICRO FOOT: 4-BUMP (2 X 2, 0.8-mm PITCH)**

NOTES (Unless Otherwise Specified):

5. Laser mark on the silicon die back, coated with a thin metal.
6. Bumps are Eutectic solder 63/57 Sn/Pb.
7. Non-solder mask defined copper landing pad.
8. The flat side of wafers is oriented at the bottom.

Dim	MILLIMETERS*		INCHES	
	Min	Max	Min	Max
A	0.600	0.650	0.0236	0.0256
A ₁	0.260	0.290	0.0102	0.0114
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	1.520	1.600	0.0598	0.0630
e	0.750	0.850	0.0295	0.0335
S	0.370	0.380	0.0146	0.0150

* Use millimeters as the primary measurement.