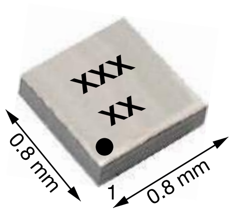
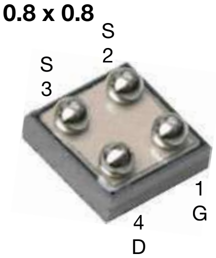
P-Channel 20 V (D-S) MOSFET

MICRO FOOT® 0.8 x 0.8



Backside View



Bump Side View

PRODUCT SUMMARY

V_{DS} (V)	-20
$R_{DS(on)}$ max. (Ω) at V_{GS} = -4.5 V	0.095
$R_{DS(on)}$ max. (Ω) at V_{GS} = -2.5 V	0.120
$R_{DS(on)}$ max. (Ω) at V_{GS} = -1.8 V	0.200
$R_{DS(on)}$ max. (Ω) at V_{GS} = -1.5 V	0.335
Q_g typ. (nC)	6.6
I_D (A)	-2.7 [a]
Configuration	Single

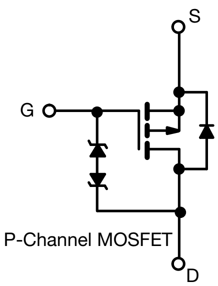
FEATURES

- TrenchFET® Gen III p-channel power MOSFET
- Compact 0.8 mm x 0.8 mm outline area
- Low 0.4 mm max. profile
- $R_{DS(on)}$ rating at V_{GS} = -1.5 V
- Typical ESD protection: 1900 V HBM
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Load switch
- Power management in battery-operated, mobile, and wearable devices



P-Channel MOSFET

ORDERING INFORMATION

Package	MICRO FOOT
Lead (Pb)-free and halogen-free	Si8823EDB-T2-E1

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNIT
Drain-source voltage		V_{DS}	-20	V
Gate-source voltage		V_{GS}	± 8	
Continuous drain current (T_J = 150 °C)	T_A = 25 °C	I_D	-2.7 [a]	A
	T_A = 70 °C		-2.1 [a]	
	T_A = 25 °C		-1.9 [b]	
	T_A = 70 °C		-1.5 [b]	
Pulsed drain current (t = 100 μs)		I_{DM}	-15	
Continuous source-drain diode current	T_A = 25 °C	I_S	-0.7 [a]	
	T_A = 70 °C		-0.4 [b]	
Maximum power dissipation	T_A = 25 °C	P_D	0.9 [a]	W
	T_A = 70 °C		0.6 [a]	
	T_A = 25 °C		0.5 [b]	
	T_A = 70 °C		0.3 [b]	
Operating junction and storage temperature range		T_J, T_{stg}	-55 to +150	°C
Package reflow conditions [c]		VPR	260	
		IR / convection		

THERMAL RESISTANCE RATINGS

PARAMETER		SYMBOL	TYPICAL	MAXIMUM	UNIT
Maximum junction-to-ambient [a, f]	t = 5 s	R_{thJA}	105	135	°C/W
Maximum junction-to-ambient [b, g]			200	260	

Notes

a. Surface mounted on 1" x 1" FR4 board with full copper, t = 5 s.
b. Surface mounted on 1" x 1" FR4 board with minimum copper, t = 5 s.
c. Refer to IPC / JEDEC® (J-STD-020), no manual or hand soldering.
d. In this document, any reference to case represents the body of the MICRO FOOT device and foot is the bump.
e. Based on T_A = 25 °C.
f. Maximum under steady state conditions is 185 °C/W.
g. Maximum under steady state conditions is 330 °C/W.

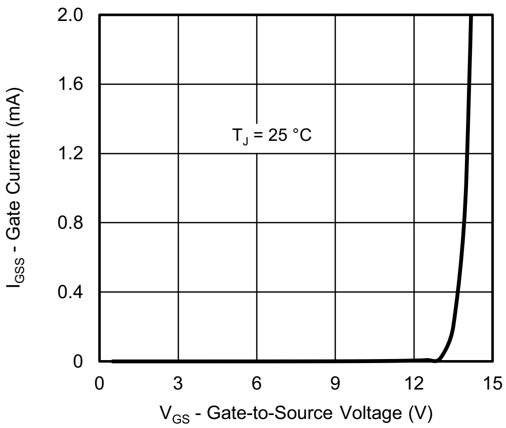
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Static						
Drain-source breakdown voltage	V_{DS}	V_{GS} = 0 V, I_D = -250 μA	-20	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	I_D = -250 μA	-	-12.5	-	mV/°C
$V_{GS(th)}$ temperature coefficient	$\Delta V_{GS(th)}/T_J$		-	2.3	-	
Gate-source threshold voltage	$V_{GS(th)}$	V_{DS} = V_{GS} , I_D = -250 μA	-0.4	-	-0.8	V
Gate-source leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 4.5 V	-	-	± 0.5	μA
		V_{DS} = 0 V, V_{GS} = ± 8 V	-	-	± 5	
Zero gate voltage drain current	I_{DSS}	V_{DS} = -20 V, V_{GS} = 0 V	-	-	-1	
		V_{DS} = -20 V, V_{GS} = 0 V, T_J = 55 °C	-	-	-10	
On-state drain current [a]	$I_{D(on)}$	V_{DS} ≥ -5 V, V_{GS} = -4.5 V	-5	-	-	A
Drain-source on-state resistance [a]	$R_{DS(on)}$	V_{GS} = -4.5 V, I_D = -1 A	-	0.077	0.095	Ω
		V_{GS} = -2.5 V, I_D = -1 A	-	0.100	0.120	
		V_{GS} = -1.8 V, I_D = -0.5 A	-	0.137	0.185	
		V_{GS} = -1.5 V, I_D = -0.5 A	-	0.200	0.335	
Forward transconductance [a]	g_{fs}	V_{DS} = -5 V, I_D = -1 A	-	6	-	S
Dynamic [b]						
Input capacitance	C_{iss}	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	-	580	-	pF
Output capacitance	C_{oss}		-	165	-	
Reverse transfer capacitance	C_{rss}		-	75	-	
Total gate charge	Q_g	V_{DS} = -10 V, V_{GS} = -8 V, I_D = -1 A	-	11	17	nC
		V_{DS} = -10 V, V_{GS} = -4.5 V, I_D = -1 A	-	6.6	10	
Gate-source charge	Q_{gs}	V_{DS} = -10 V, V_{GS} = -4.5 V, I_D = -1 A	-	1	-	
Gate-drain charge	Q_{gd}		-	1.5	-	
Gate resistance	R_g	f = 1 MHz	-	20	-	Ω
Turn-on delay time	$t_{d(on)}$	V_{DD} = -10 V, R_L = 10 Ω, I_D ≅ -1 A, V_{GEN} = -4.5 V, R_g = 1 Ω	-	16	30	ns
Rise time	t_r		-	30	60	
Turn-off delay time	$t_{d(off)}$		-	60	120	
Fall time	t_f		-	40	80	
Turn-on delay time	$t_{d(on)}$	V_{DD} = -10 V, R_L = 10 Ω, I_D ≅ -1 A, V_{GEN} = -8 V, R_g = 1 Ω	-	7	15	
Rise time	t_r		-	20	40	
Turn-off delay time	$t_{d(off)}$		-	75	150	
Fall time	t_f		-	35	70	
Drain-Source Body Diode Characteristics						
Continuous source-drain diode current	I_S	T_A = 25 °C	-	-	-0.7	A
Pulse diode forward current	I_{SM}		-	-	-15	
Body diode voltage	V_{SD}	I_S = -1 A, V_{GS} = 0 V	-	-0.8	-1.2	V
Body diode reverse recovery time	t_{rr}	I_F = -1 A, dI/dt = 100 A/μs, T_J = 25 °C	-	20	40	ns
Body diode reverse recovery charge	Q_{rr}		-	7	15	nC
Reverse recovery fall time	t_a		-	12.5	-	ns
Reverse recovery rise time	t_b		-	7.5	-	

Notes

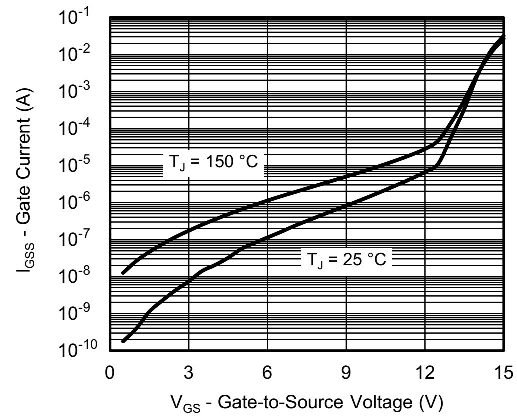
a. Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

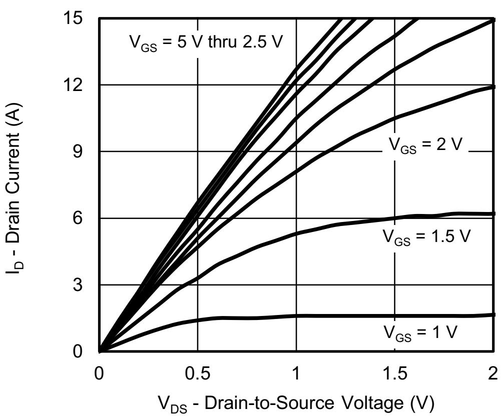
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



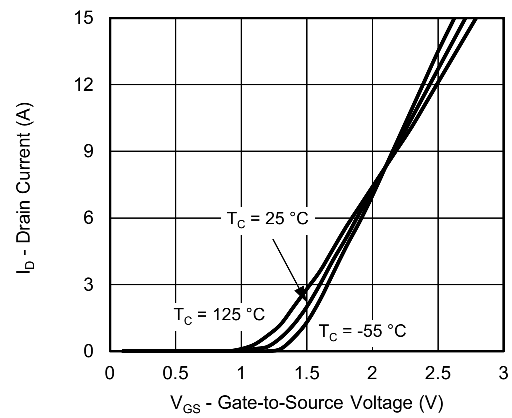
Gate-Current vs. Gate-Source Voltage



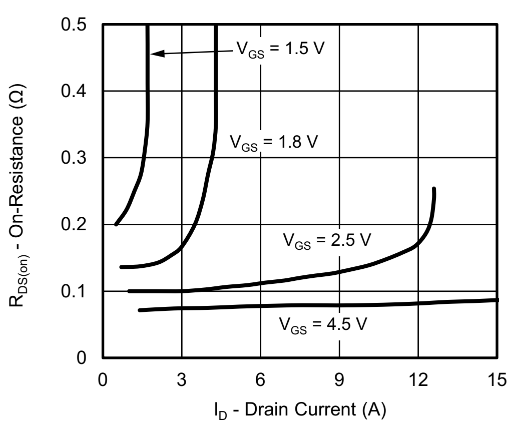
Gate-Current vs. Gate-Source Voltage



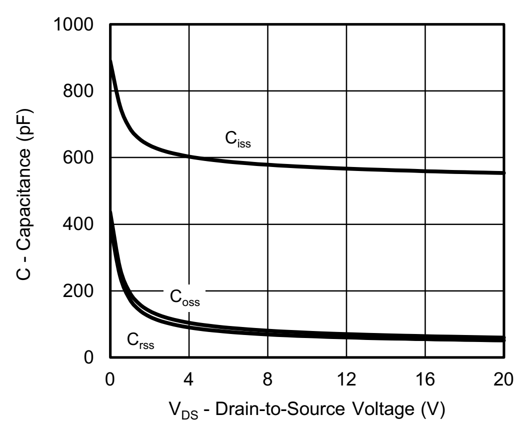
Output Characteristics



Transfer Characteristics

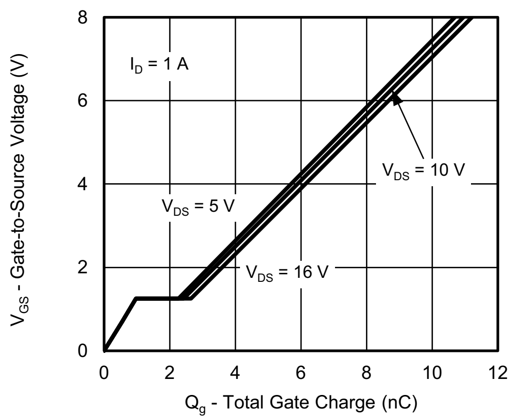


On-Resistance vs. Drain Current and Gate Voltage

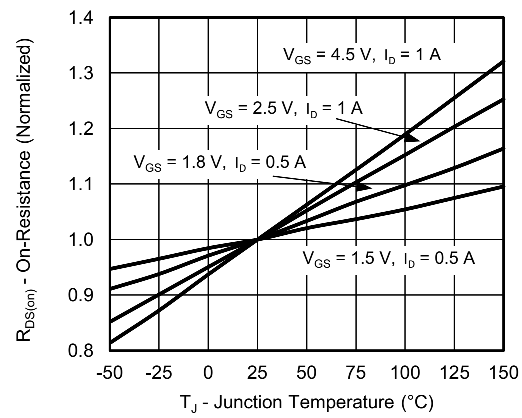


Capacitance

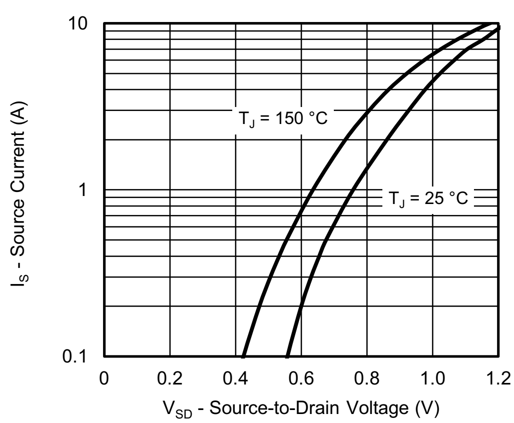
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



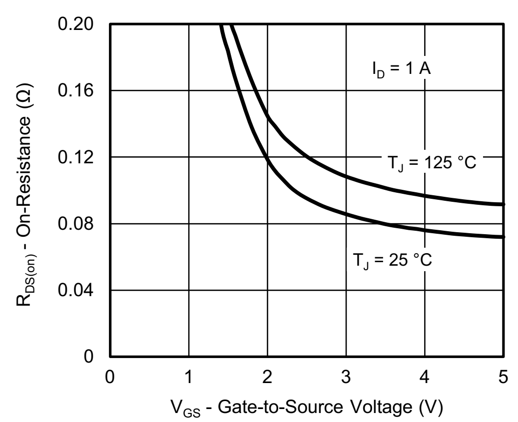
Gate Charge



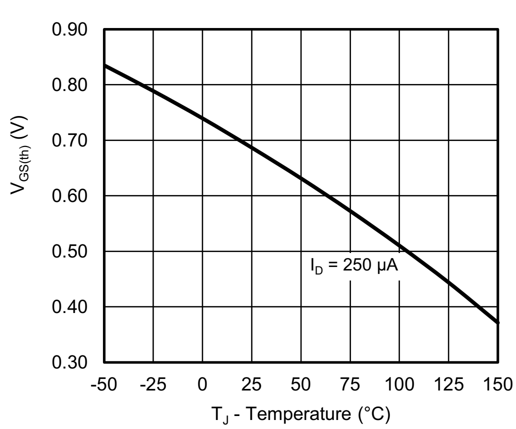
On-Resistance vs. Junction Temperature



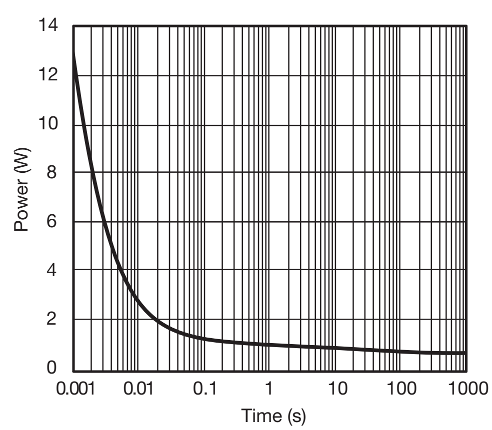
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

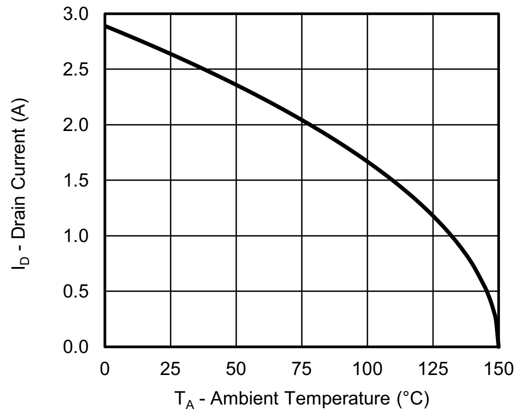


Threshold Voltage

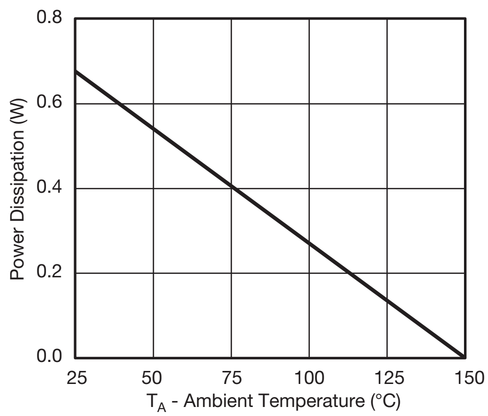


Single Pulse Power, Junction-to-Ambient

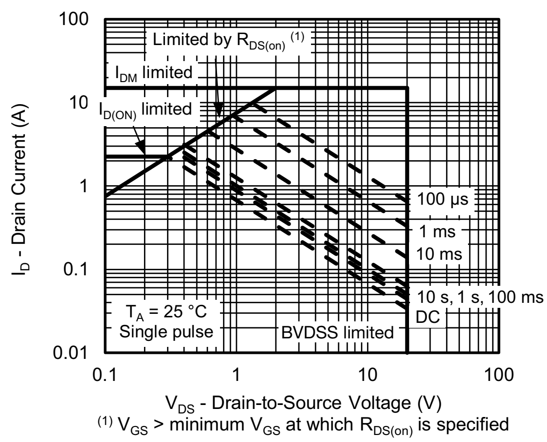
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating [a]



Power, Junction-to-Ambient

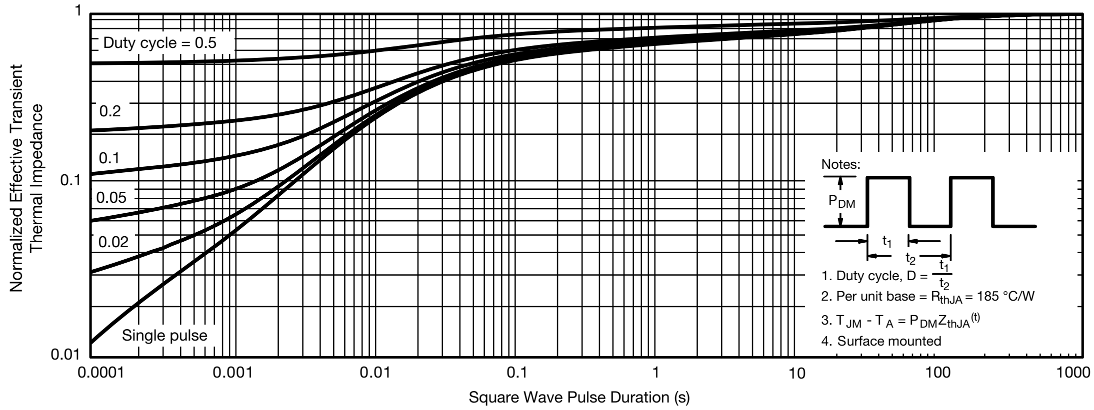


Safe Operating Area, Junction-to-Ambient

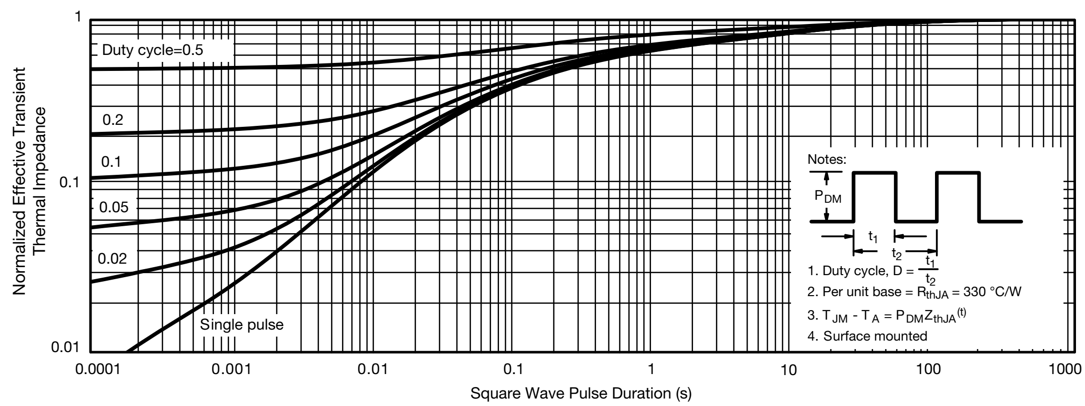
Note

a. The power dissipation P_D is based on T_J max. = 25 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with maximum copper)



Normalized Thermal Transient Impedance, Junction-to-Ambient (on 1" x 1" FR4 board with minimum copper)

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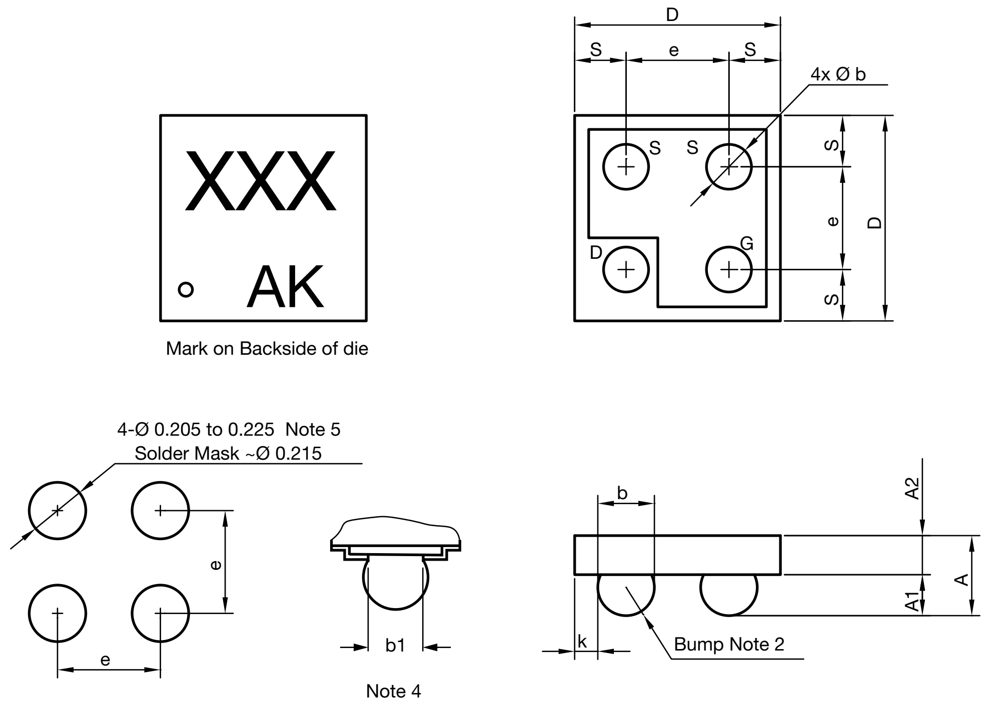
MICRO FOOT®: 4-Bump (0.8 mm x 0.8 mm, 0.4 mm Pitch)



Notes

(1) Laser mark on the backside surface of die

(2) Bumps are 95.5 % Sn,3.8 % Ag,0.7 % Cu

(3) "i" is the location of pin 1

(4) "b1" is the diameter of the solderable substrate surface, defined by an opening in the solder resist layer solder mask defined.

(5) Non-solder mask defined copper landing pad.

DIM.	MILLIMETERS [a]			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.328	0.365	0.402	0.0129	0.0144	0.0158
A1	0.136	0.160	0.184	0.0053	0.0062	0.0072
A2	0.192	0.205	0.218	0.0076	0.0081	0.0086
b	0.200	0.220	0.240	0.0078	0.0086	0.0094
b1		0.175			0.0068	
e		0.400			0.0157	
S	0.160	0.180	0.200	0.0062	0.0070	0.0078
D	0.720	0.760	0.800	0.0283	0.0299	0.0314
K	0.040	0.070	0.100	0.0015	0.0027	0.0039

Note

a. Use millimeters as the primary measurement.

ECN: T15-0053-Rev. A, 16-Feb-15
DWG: 6033

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