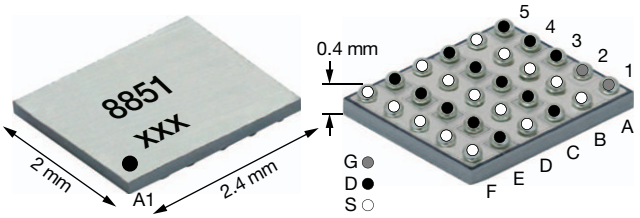
P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω) Max.	I_D (A) [a, d]	Q_g (Typ.)
-20	0.0080 at V_{GS} = -4.5 V	-16.7	70 nC
	0.0086 at V_{GS} = -3.7 V	-16.1	
	0.0110 at V_{GS} = -2.5 V	-14.2	
	0.0185 at V_{GS} = -1.8 V	-11	

Power MICRO FOOT® 2.4 x 2



Backside View Bump Side View

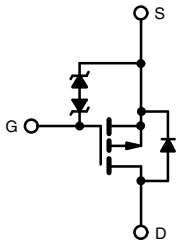
FEATURES

- TrenchFET® power MOSFET
- Small 2.4 mm x 2 mm outline area
- Low 0.4 mm max. profile
- Typical ESD protection 6000 V HBM
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE

APPLICATIONS

- Battery switch / load switch
- Power management
- For smart phones, tablet PCs, and mobile computing



P-Channel MOSFET

Ordering Information:
Si8851EDB-T2-E1 (Lead (Pb)-free and halogen-free)

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	-16.7 [a]	A
	T_A = 70 °C		-13.4 [a]	
	T_A = 25 °C		-7.7 [b]	
	T_A = 70 °C		-6.2 [b]	
Pulsed Drain Current (t = 100 µs)		I_{DM}	-80	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	-2.6 [a]	
	T_A = 25 °C		-0.55 [b]	
Maximum Power Dissipation	T_A = 25 °C	P_D	3.1 [a]	W
	T_A = 70 °C		2 [a]	
	T_A = 25 °C		0.66 [b]	
	T_A = 70 °C		0.43 [b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to +150	°C
Package Reflow Conditions [c]	VPR		260	
	IR/Convection		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. Based on T_A = 25 °C.

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	Typical	Maximum	Unit
Maximum Junction-to-Ambient [a, b]	t = 5 s	R_{thJA}	30	40	°C/W
Maximum Junction-to-Ambient [c, d]	t = 5 s		145	188	

Notes
a. Surface mounted on 1" x 1" FR4 board with full copper.
b. Maximum under steady state conditions is 85 °C/W.
c. Surface mounted on 1" x 1" FR4 board with minimum copper.
d. Maximum under steady state conditions is 330 °C/W.

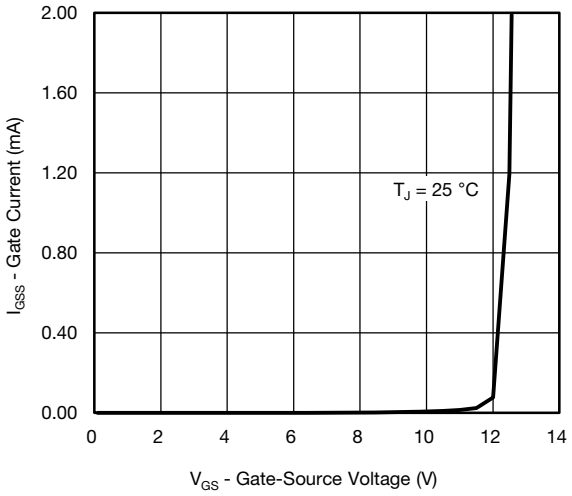
SPECIFICATIONS (T_J = 25 °C, unless otherwise noted)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = -250 µA	-20	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = -250 µA	-	-11	-	mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		-	3	-	
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = -250 µA	-0.45	-	-1	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	-	-	± 10	
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 = 70 °C	-	-	-10	
On-State Drain Current [a]	$I_{D(on)}$	$V_{DS} \leq$ -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 = -7 A	-	0.0060	0.0080	Ω
		V_{GS} = -3.7 V, I_D = -7 A	-	0.0065	0.0086	
		V_{GS} = -2.5 V, I_D = -5 A	-	0.0081	0.0110	
		V_{GS} = -1.8 V, I_D = -3 A	-	0.0130	0.0185	
Forward Transconductance [a]	g_{fs}	V_{DS} = -10 V, I_D = -7 A	-	50	-	S
Dynamic [b]						
Input Capacitance	C_{iss}	V_{DS} = -10 V, V_{GS} = 0 V, f = 1 MHz	-	6900	-	pF
Output Capacitance	C_{oss}		-	640	-	
Reverse Transfer Capacitance	C_{rss}		-	715	-	
Total Gate Charge	Q_g	V_{DS} = -10 V, V_{GS} = -8 V, I_D = -5 A	-	120	180	nC
		V_{DS} = -10 V, V_{GS} = -4.5 V, I_D = -5 A	-	70	105	
Gate-Source Charge	Q_{gs}		-	8	-	
Gate-Drain Charge	Q_{gd}		-	14	-	
Gate Resistance	R_g	V_{GS} = -0.1 V, f = 1 MHz	-	2.3	-	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = -10 V, R_L = 2 Ω $I_D \cong$ -5 A, V_{GEN} = -4.5 V, R_g = 1 Ω	-	35	70	ns
Rise Time	t_r		-	40	80	
Turn-Off Delay Time	$t_{d(off)}$		-	115	230	
Fall Time	t_f		-	35	70	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = -10 V, R_L = 2 Ω $I_D \cong$ -5 A, V_{GEN} = -8 V, R_g = 1 Ω	-	15	30	
Rise Time	t_r		-	10	20	
Turn-Off Delay Time	$t_{d(off)}$		-	110	220	
Fall Time	t_f		-	25	50	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_A = 25 °C	-	-	-2.6	A
Pulse Diode Forward Current (t = 100 µs)	I_{SM}		-	-	-80	
Body Diode Voltage	V_{SD}	I_S = -5 A, V_{GS} = 0 V	-	-0.8	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = -5 A, dI/dt = 100 A/µs, T_J = 25 °C	-	40	80	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	30	60	nC
Reverse Recovery Fall Time	t_a		-	16	-	ns
Reverse Recovery Rise Time	t_b		-	24	-	

Notes

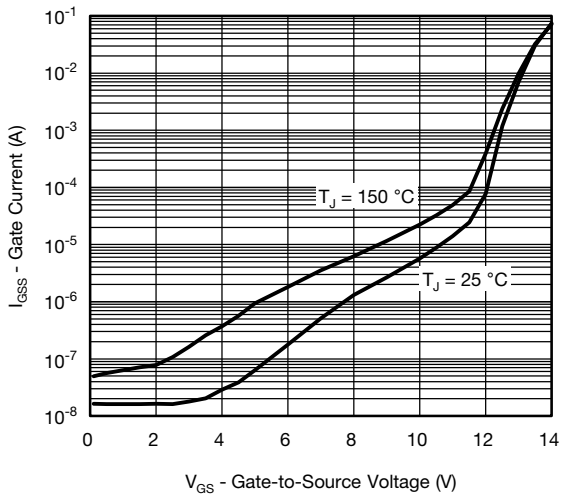
a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.
b. Guaranteed by design, not subject to production testing.

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.

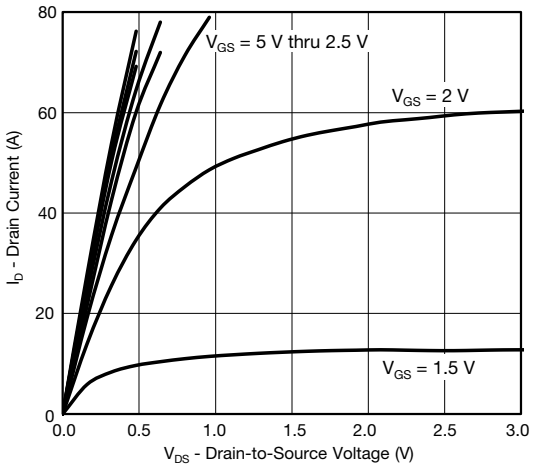
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



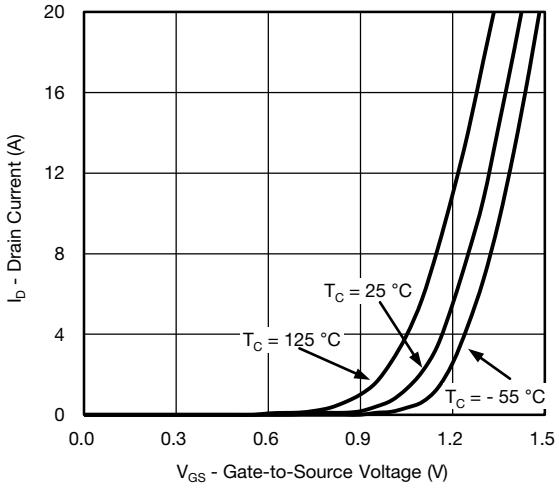
Gate Current vs. Gate-Source Voltage



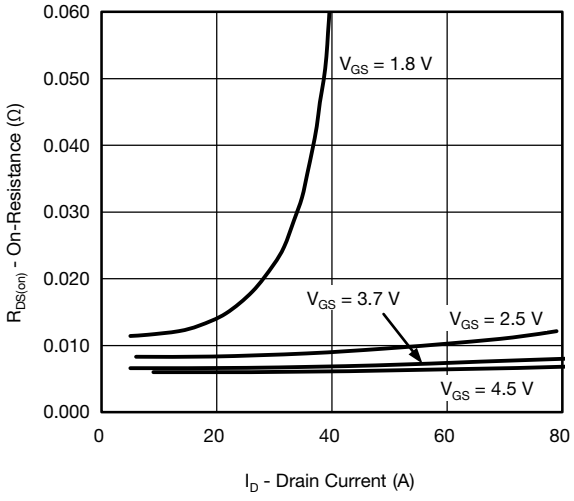
Gate Current vs. Gate-Source Voltage



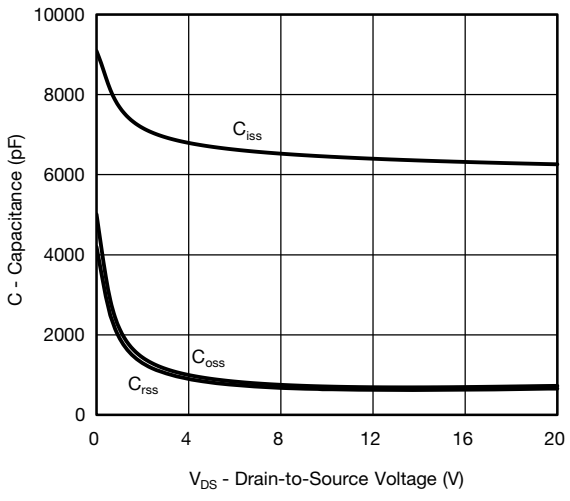
Output Characteristics



Transfer Characteristics

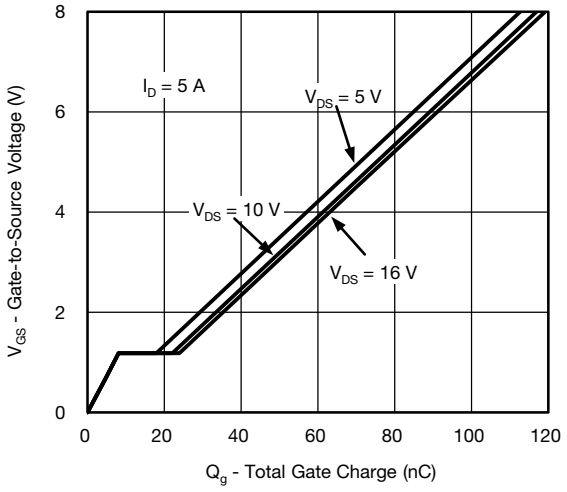


On-Resistance vs. Drain Current and Gate Voltage

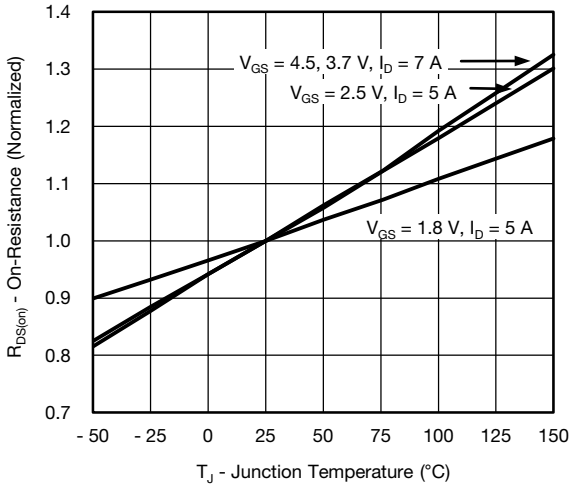


Capacitance

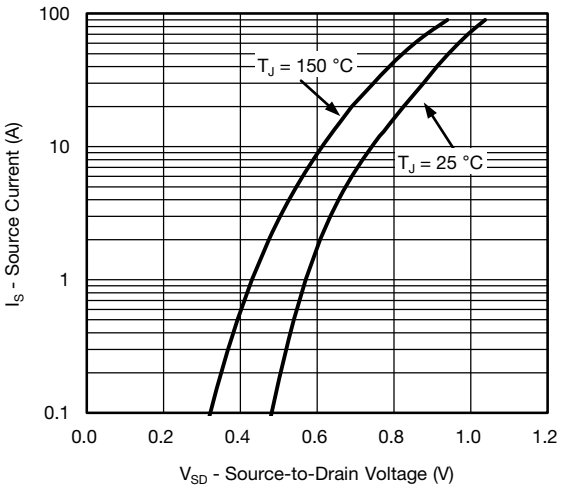
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



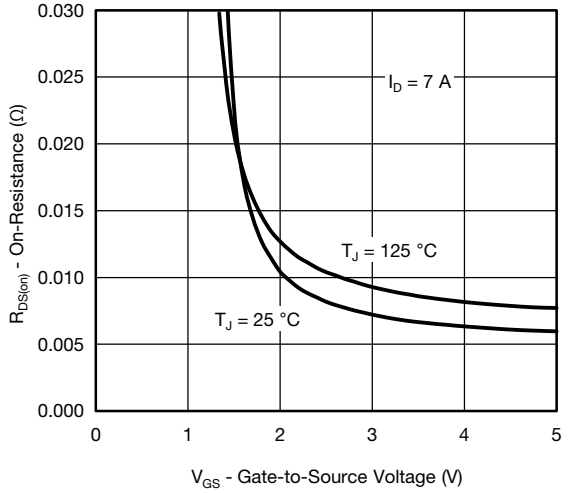
Gate Charge



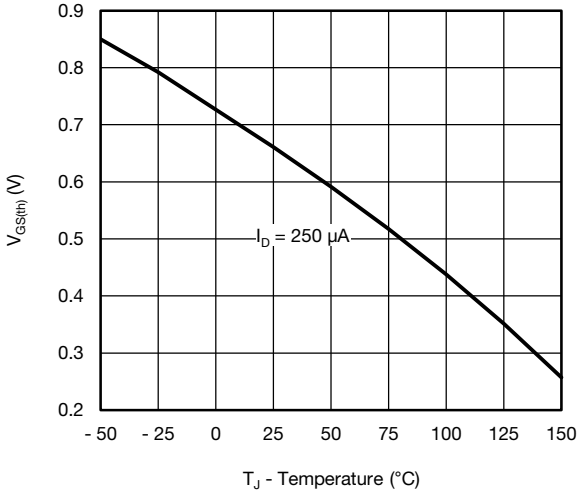
On-Resistance vs. Junction Temperature



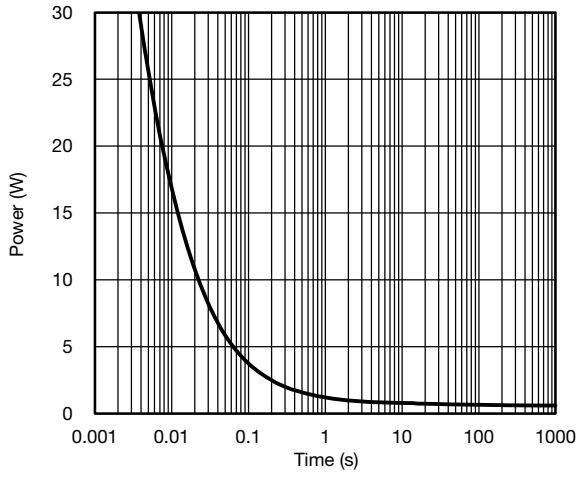
Source-Drain Diode Forward Voltage



On-Resistance vs. Gate-to-Source Voltage

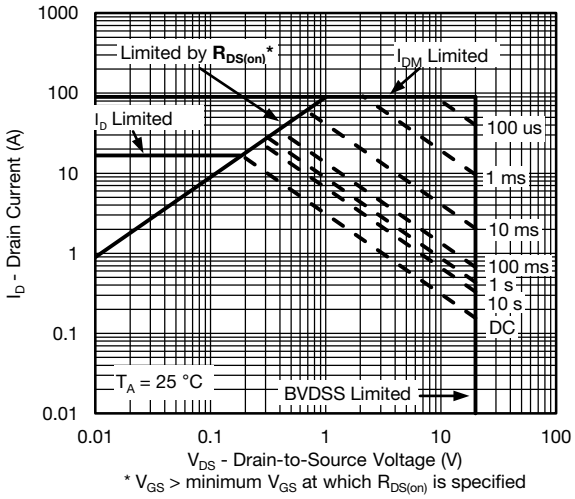


Threshold Voltage

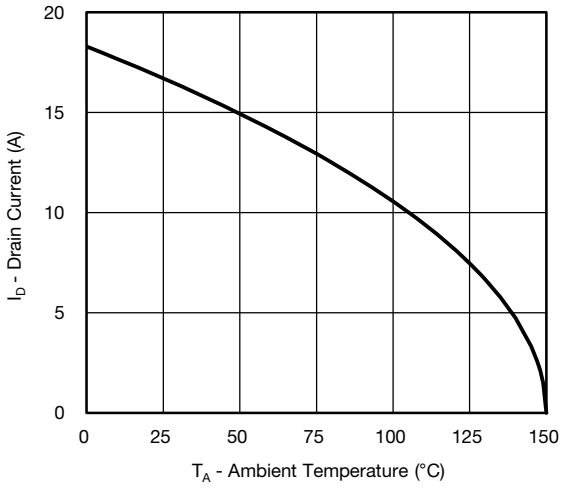


Single Pulse Power, Junction-to-Ambient

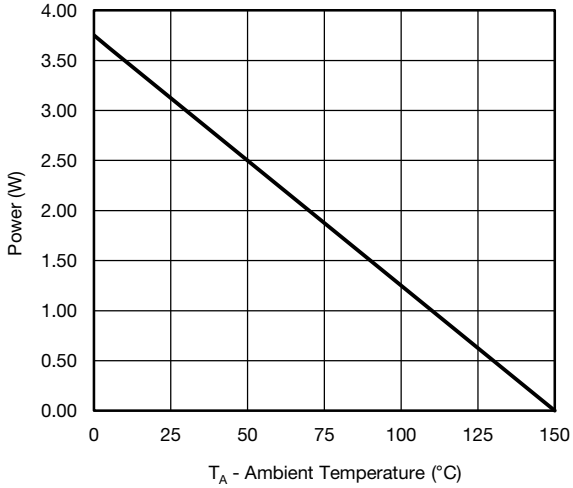
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Safe Operating Area, Junction-to-Ambient[a]



Current Derating [a]

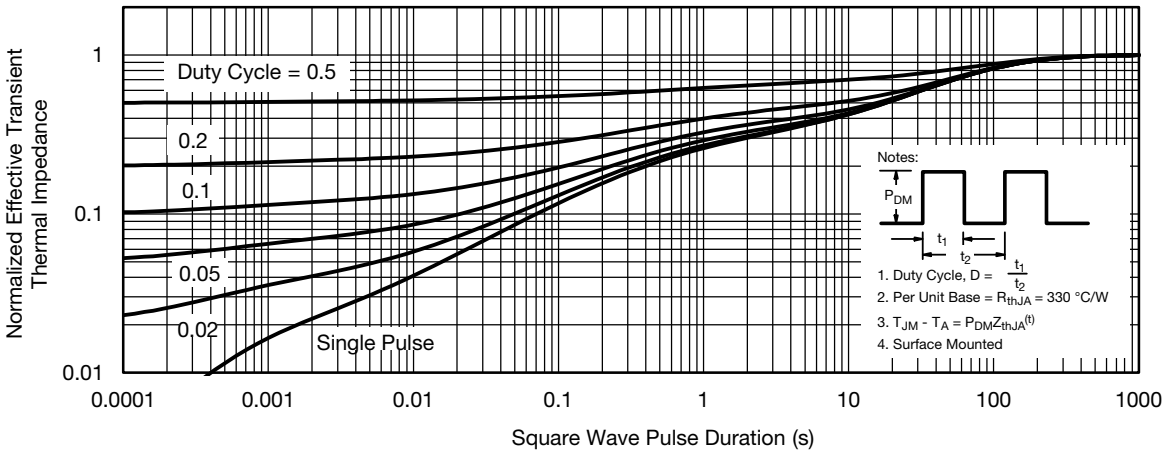


Power Derating[a]

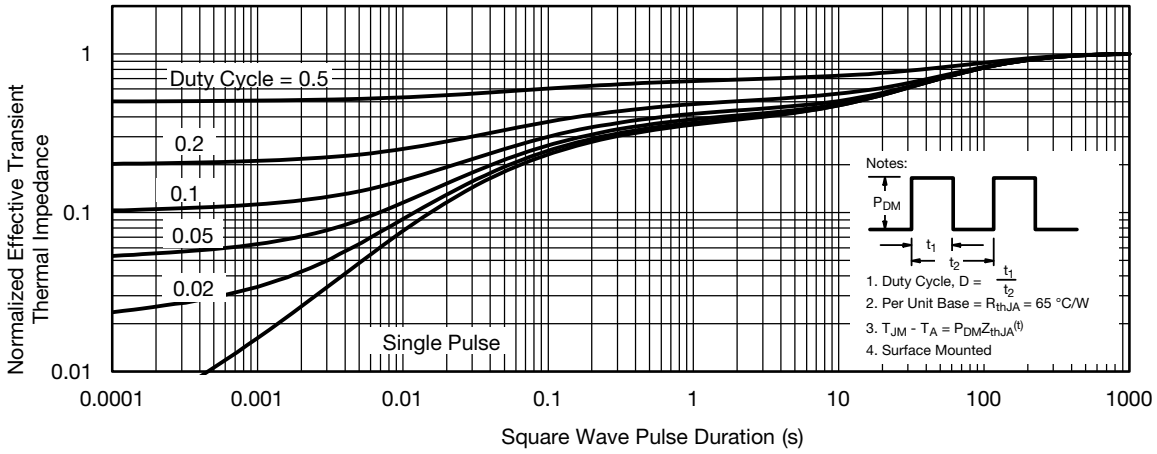
Note

a. When mounted on 1" x 1" FR4 with full copper and t = 5 s

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



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



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

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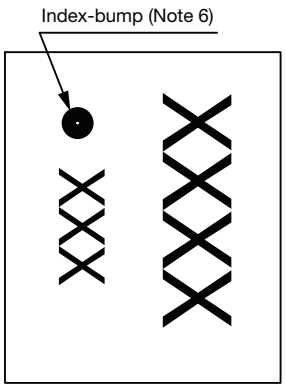
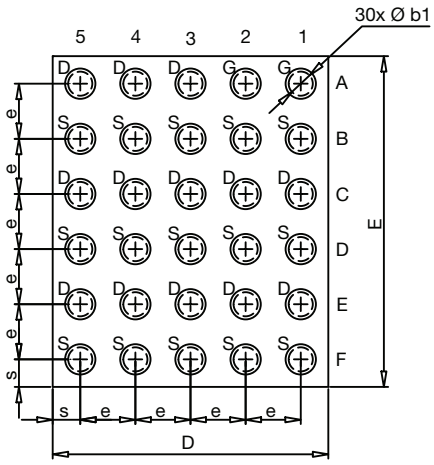
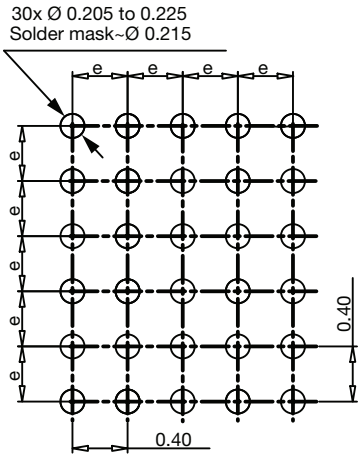
MICRO FOOT®: 30-Bumps
(2.4 mm x 2 mm, 0.4 mm Pitch, 0.184 mm Bump Height)



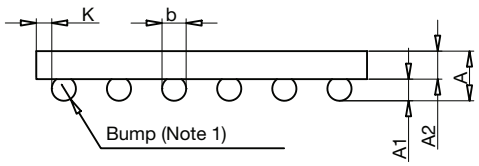
Top side (die back)

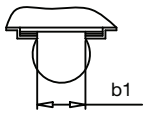


Bump side view



Recommended land pattern





Notes

1. Bumps are 95.5/3.8/0.7 Sn/Ag/Cu.
2. Backside surface is coated with a Ti/Ni/Ag layer.
3. Non-solder mask defined copper landing pad.
4. Laser marks on the silicon die back.
5. “b1” is the diameter of the solderable substrate surface, defined by an opening in the solder resist layer solder mask defined.
6. • is the location of pin 1

DIM.	MILLIMETERS			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	0.0054	0.0063	0.0072
A2	0.192	0.205	0.218	0.0076	0.0081	0.0086
b	0.200	0.220	0.240	0.0079	0.0087	0.0094
b1		0.175			0.0069	
e		0.400			0.0157	
s	0.160	0.180	0.200	0.0063	0.0071	0.0079
D	1.920	1.960	2.000	0.0756	0.0772	0.0787
E	2.320	2.360	2.400	0.0913	0.0929	0.0945
K	0.040	0.070	0.100	0.0016	0.0028	0.0039

Note

- Use millimeters as the primary measurement.

ECN: T15-0177-Rev. A, 27-Apr-15
DWG: 6040

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