P-Channel 1.5-V Rated MOSFET

PRODUCT SUMMARY

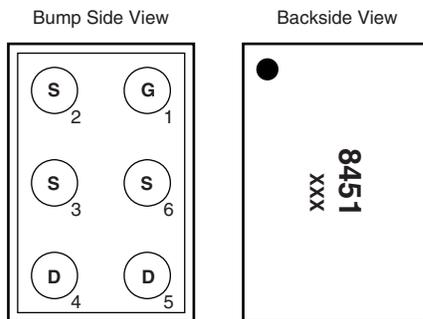| V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[e]	Q_g (Typ.)
- 20	0.080 at V_{GS} = - 4.5 V	- 10.8	7.7 nC
	0.100 at V_{GS} = - 2.5 V	- 9.7	
	0.126 at V_{GS} = - 1.8 V	- 3.0	
	0.200 at V_{GS} = - 1.5 V	- 1.2	

FEATURES

- TrenchFET[®] Power MOSFET

APPLICATIONS

- Portable Devices
  - Battery Management
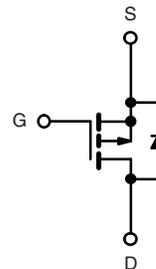 - Low Threshold Load Switch
  - Battery Protection

RoHS
COMPLIANT

MICRO FOOT

Bump Side View   Backside View

Device Marking: 8451
xxx = Date/Lot Traceability Code

Ordering Information: Si8451DB-T2-E1 (Lead (Pb)-free)

P-Channel MOSFET

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_C = 25 °C	I_D	- 10.8	A
	T_C = 70 °C		- 8.7	
	T_A = 25 °C		- 5.0[a, b]	
	T_A = 70 °C		- 4.0[a, b]	
Pulsed Drain Current		I_{DM}	- 15	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 10.8	
	T_A = 25 °C		- 2.3[a, b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	13	W
	T_C = 70 °C		8.4	
	T_A = 25 °C		2.77[a, b]	
	T_A = 70 °C		1.77[a, b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C
Package Reflow Conditions[c]	IR/Convection		260	

Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. t = 10 s.
c. Refer to IPC/JEDEC (J-STD-020C), 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_C = 25 °C.

THERMAL RESISTANCE RATINGS

Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient[a, b]		R_{thJA}	37	45	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	7	9.5	

Notes:
a. Surface Mounted on 1" x 1" FR4 Board.
b. Maximum under Steady State conditions is 85 °C/W.
c. Case is defined as top surface of the package.

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		- 20		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	- 0.4		- 1.0	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	µA
		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 = - 1 A		0.065	0.080	Ω
		V_{GS} = - 2.5 V, I_D = - 1 A		0.080	0.100	
		V_{GS} = - 1.8 V, I_D = - 1 A		0.101	0.126	
		V_{GS} = - 1.5 V, I_D = - 1 A		0.138	0.200	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 10 V, I_D = - 1 A		8		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		750		pF
Output Capacitance	C_{oss}			160		
Reverse Transfer Capacitance	C_{rss}			100		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 8 V, I_D = - 1 A		16	24	nC
				10	15	
Gate-Source Charge	Q_{gs}	V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = 1 A		1.3		
Gate-Drain Charge	Q_{gd}			2.7		
Gate Resistance	R_g	V_{GS} = - 0.1 V, f = 1 MHz		8		Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 10 Ω, $I_D \cong$ - 1 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		20	30	ns
Rise Time	t_r			30	45	
Turn-Off Delay Time	$t_{d(off)}$			45	70	
Fall Time	t_f			30	45	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 10 Ω, $I_D \cong$ - 1 A, V_{GEN} = - 8 V, R_g = 1 Ω		5	10	
Rise Time	t_r			12	20	
Turn-Off Delay Time	$t_{d(off)}$			45	70	
Fall Time	t_f			30	45	

| SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 10.8	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		25	40	ns
Body Diode Reverse Recovery Charge	Q_{rr}			13	20	nC
Reverse Recovery Fall Time	t_a			9		ns
Reverse Recovery Rise Time	t_b			16		

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.
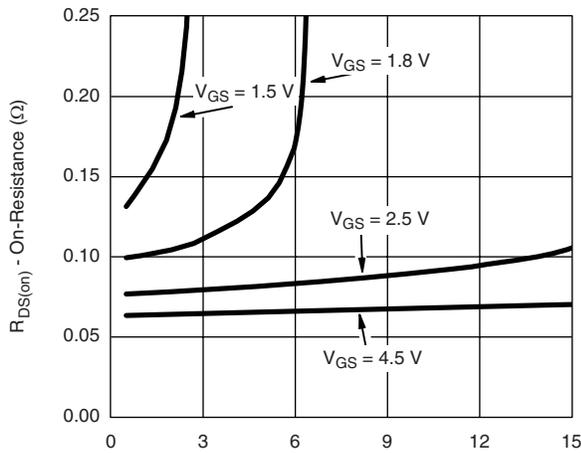
Si8451DB

Vishay Siliconix

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted
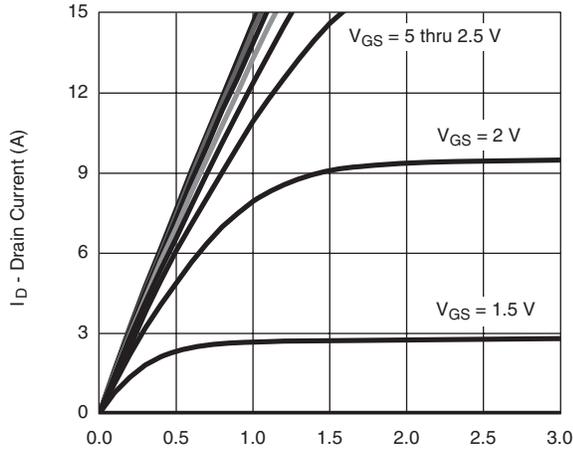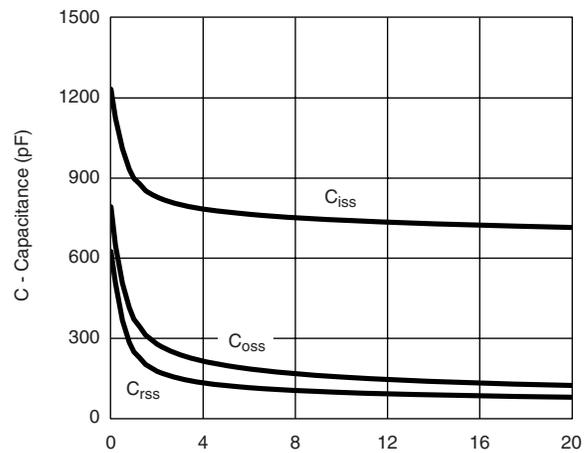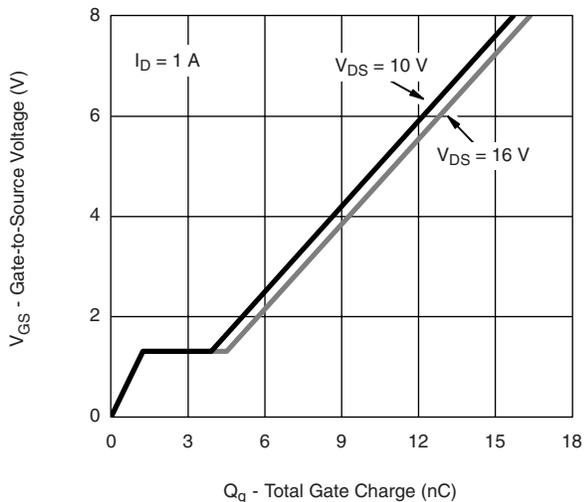

Output Characteristics
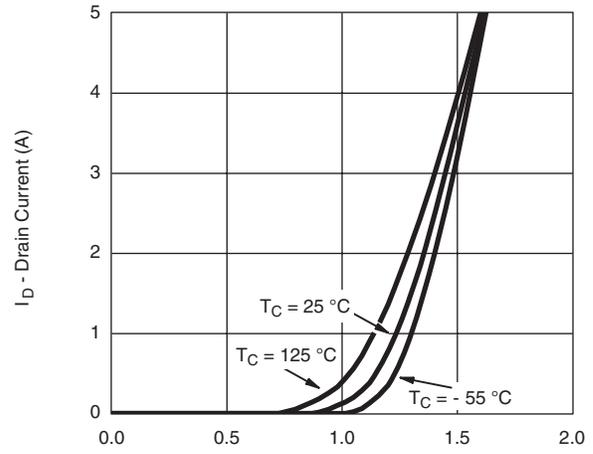
Transfer Characteristics

On-Resistance vs. Drain Current and Gate Voltage

Capacitance

Gate Charge
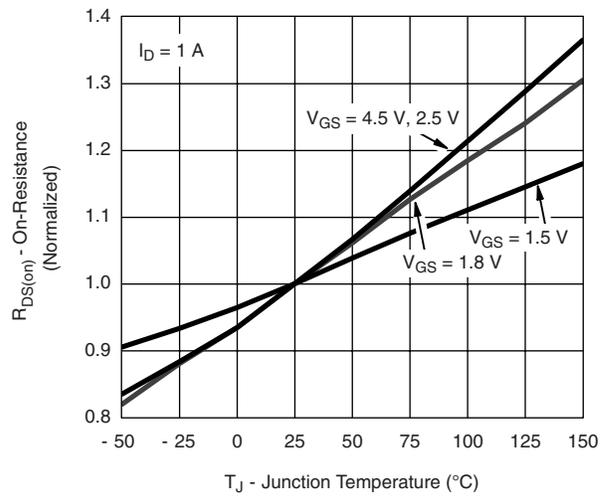
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Source-Drain Diode Forward Voltage

On-Resistance vs. Gate-to-Source Voltage

Threshold Voltage
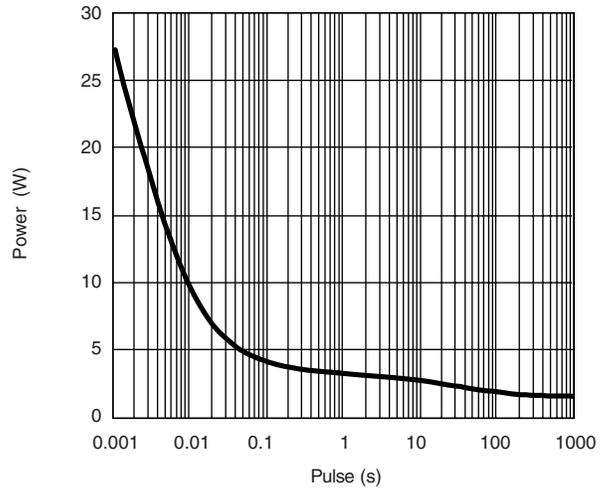
Single Pulse Power, Junction-to-Ambient

* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified
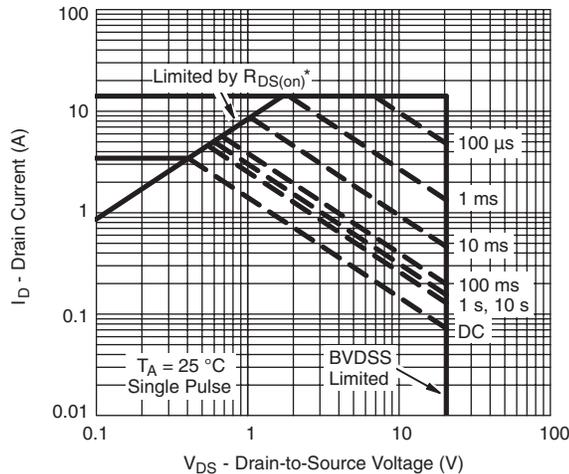
Safe Operating Area, Junction-to-Ambient

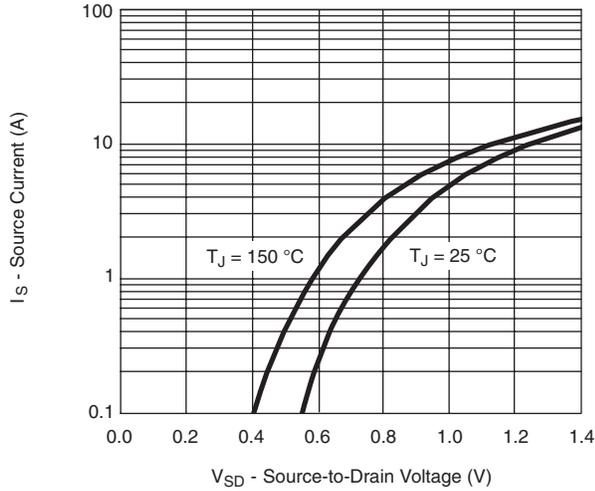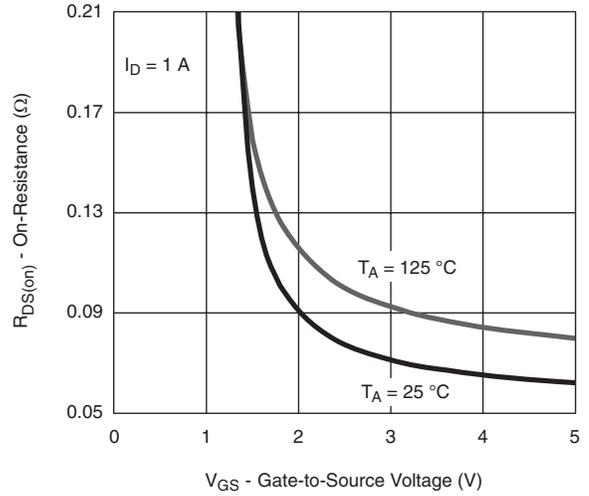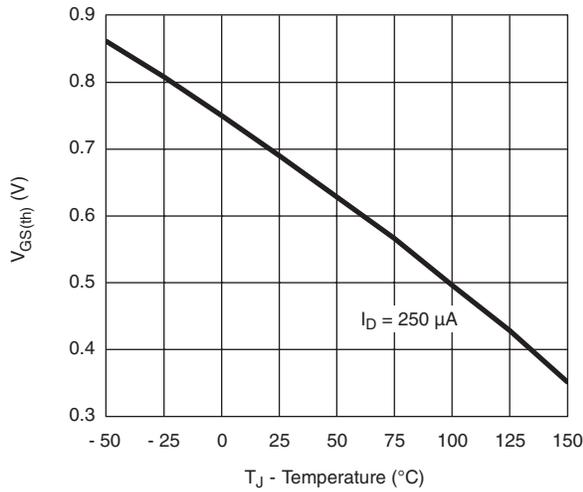## TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

Current Derating*
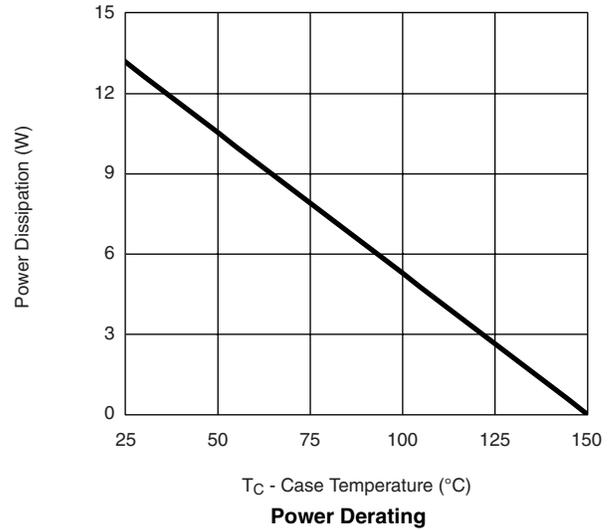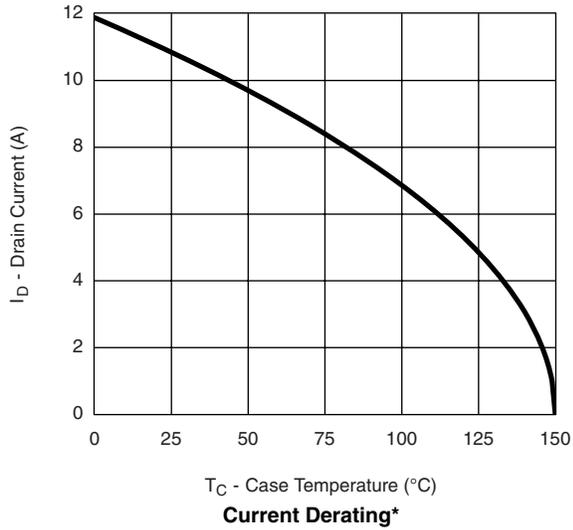
Power Derating

* The power dissipation P_D is based on $T_{J(max)}$ = 150 °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

Notes:

1. Duty Cycle, D = $\dfrac{t_1}{t_2}$
2. Per Unit Base = R_{thJA} = 65 °C/W
3. $T_{JM} - T_A = P_{DM} Z_{thJA}{}^{(t)}$
4. Surface Mounted
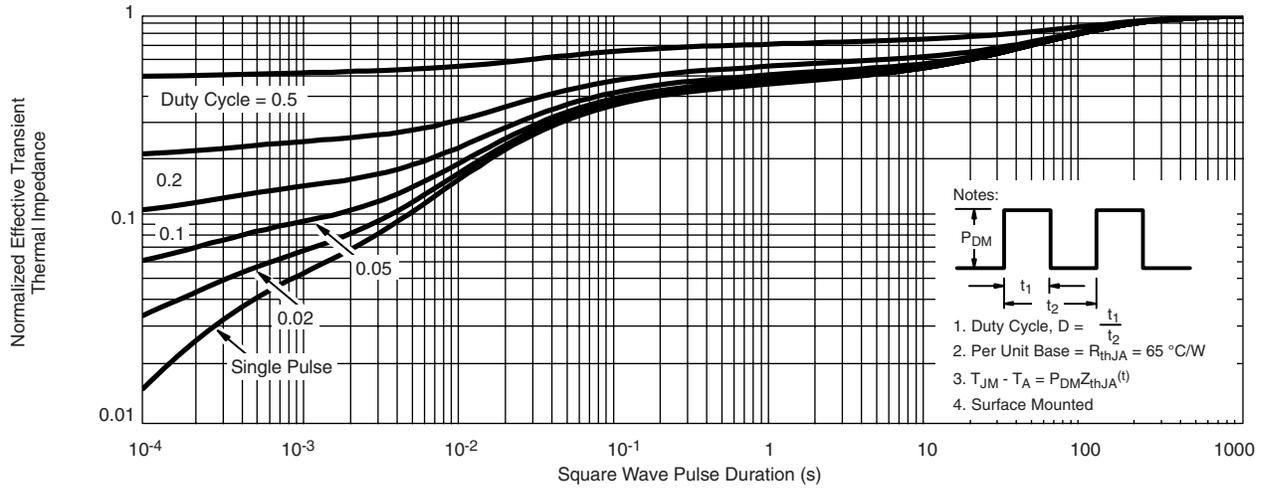
Normalized Thermal Transient Impedance, Junction-to-Ambient
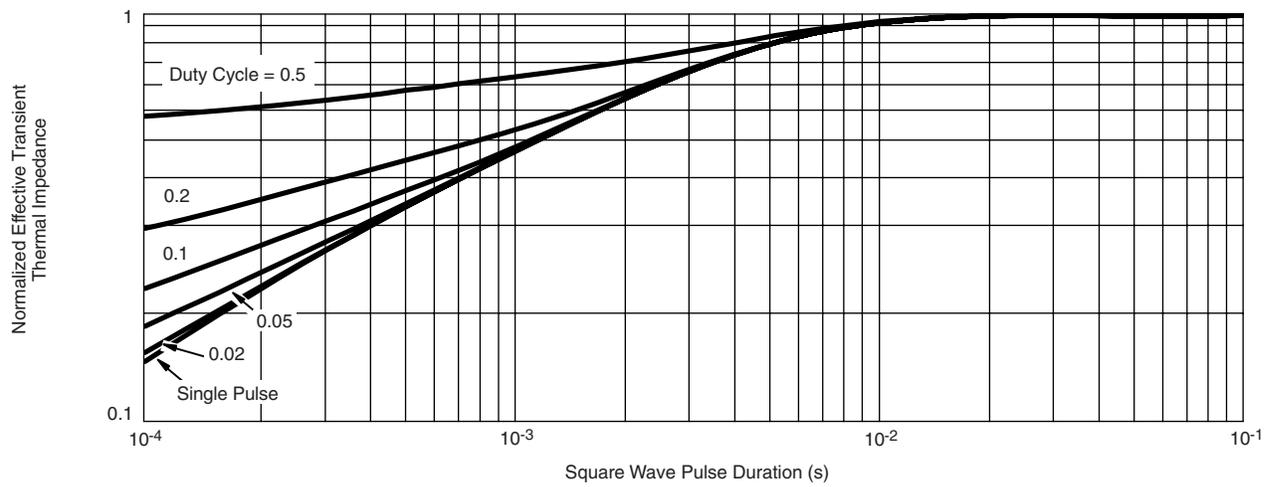
Normalized Thermal Transient Impedance, Junction-to-Foot

PACKAGE OUTLINE

MICRO FOOT: 6-BUMP (2 x 3, 0.5 mm PITCH)

6 x Ø 0.24 to 0.26 Note 3
Solder Mask ~ Ø 0.25

Recommended Land

Bump Note 2

8451

XXX

Mark on Backside of Die

6 x Ø b

Notes (Unless otherwise specified):
1. All dimensions are in millimeters.
2. Six (6) solder bumps are lead (Pb)-free 95.5Sn/3.8Ag/0.7Cu with diameter ⌀ 0.30 to 0.32 mm.
3. Backside surface is coated with a Ti/Ni/Ag layer.
4. Non-solder mask defined copper landing pad.
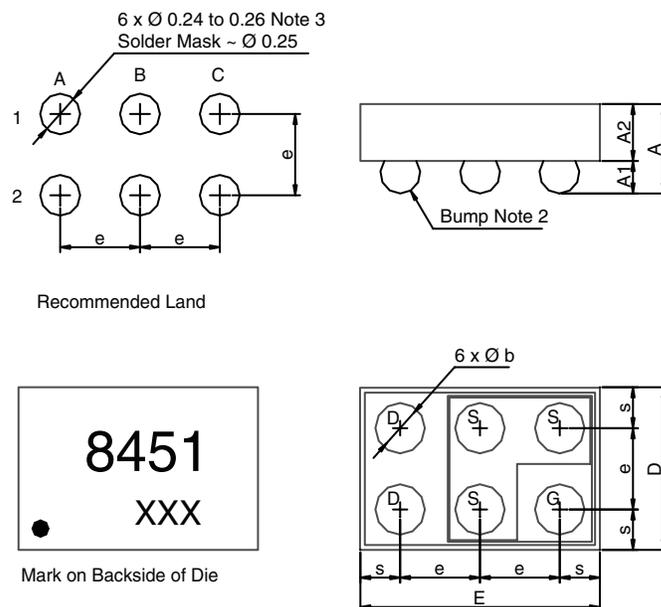5. • is location of Pin 1.

Dim.	Millimeters[a]			Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0.510	0.575	0.590	0.0201	0.0224	0.0232
A_1	0.220	0.250	0.280	0.0087	0.0098	0.0110
A_2	0.290	0.300	0.310	0.0114	0.0118	0.0122
b	0.300	0.310	0.320	0.0118	0.0122	0.0126
e		0.500			0.0197	
s	0.230	0.250	0.270	0.0090	0.0098	0.0106
D	0.920	0.960	1.000	0.0362	0.0378	0.0394
E	1.420	1.460	1.500	0.0559	0.0575	0.0591

Notes:
a. Use millimeters as the primary measurement.

Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Vishay](#):
  [Si8451DB-T2-E1](#)