

P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY		
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)
- 20	0.027 at V _{GS} = - 4.5 V	- 8.2
	0.032 at V _{GS} = - 2.5 V	- 7.5
	0.045 at V _{GS} = - 1.8 V	- 6.6

FEATURES

- Halogen-free according to IEC 61249-2-21 Definition
- TrenchFET[®] Power MOSFET
- MICRO FOOT[®] Chipscale Packaging
Reduces Ultra-Low Footprint Area Profile (0.62 mm) and On-Resistance
- Compliant to RoHS Directive 2002/95/EC

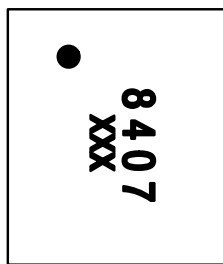
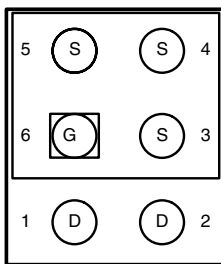


RoHS
COMPLIANT
HALOGEN
FREE

MICRO FOOT

Bump Side View

Backside View

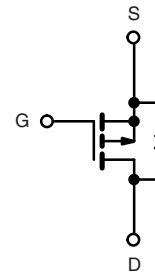


Device Marking: 8407
xxx = Date/Lot Traceability Code

Ordering Information: Si8407DB-T2-E1 (Lead (Pb)-free and Halogen-free)

APPLICATIONS

- Portable Devices
 - PA Switch
 - Battery Switch
 - Load Switch



P-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C, unless otherwise noted)				
Parameter	Symbol	5 s	Steady State	Unit
Drain-Source Voltage	V _{DS}	- 20		V
Gate-Source Voltage	V _{GS}	± 8		
Continuous Drain Current (T _J = 150 °C) ^a	I _D	T _A = 25 °C	- 8.2	- 5.8
		T _A = 70 °C	- 6.5	- 4.6
Pulsed Drain Current	I _{DM}	- 15		A
Continuous Source Current (Diode Conduction) ^a	I _S	- 2.6	- 1.34	
Maximum Power Dissipation ^a	P _D	T _A = 25 °C	2.9	1.47
		T _A = 70 °C	1.86	0.94
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150		°C
Package Reflow Conditions ^b	IR/Convection	260		

THERMAL RESISTANCE RATINGS					
Parameter	Symbol	Typical	Maximum	Unit	
Maximum Junction-to-Ambient ^a	R _{thJA}	t ≤ 5 s	33	43	°C/W
		Steady State	72	85	
Maximum Junction-to-Foot (drain)	R _{thJF}	15	19		

Notes:

- Surface mounted on 1" x 1" FR4 board.
- Refer to IPC/JEDEC (J-STD-020), no manual or hand soldering.

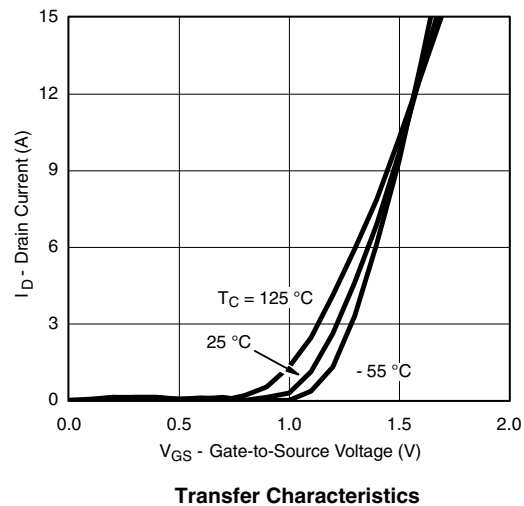
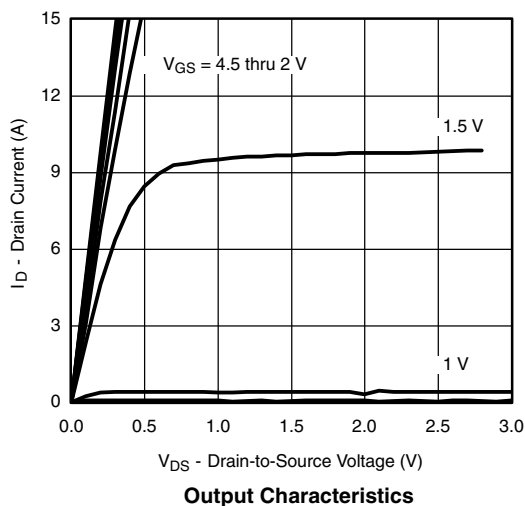
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -350\text{ }\mu\text{A}$	-0.4		-0.9	V
Gate-Body Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 70\text{ }^\circ\text{C}$			-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	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		0.022	0.027	Ω
		$V_{GS} = -2.5\text{ V}, I_D = -1\text{ A}$		0.026	0.032	
		$V_{GS} = -1.8\text{ V}, I_D = -1\text{ A}$		0.033	0.045	
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -1\text{ A}$		10		S
Diode Forward Voltage ^a	V_{SD}	$I_S = -1\text{ A}, V_{GS} = 0$		-0.6	-1.1	V
Dynamic^b						
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -1\text{ A}$		32	50	nC
Gate-Source Charge	Q_{gs}			3.6		
Gate-Drain Charge	Q_{gd}			8.5		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -1\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 6\text{ }\Omega$		30	45	ns
Rise Time	t_r			45	70	
Turn-Off Delay Time	$t_{d(off)}$			550	825	
Fall Time	t_f			220	330	
Source-Drain Reverse Recovery Time	t_{rr}	$I_F = -1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		265	500	

Notes:

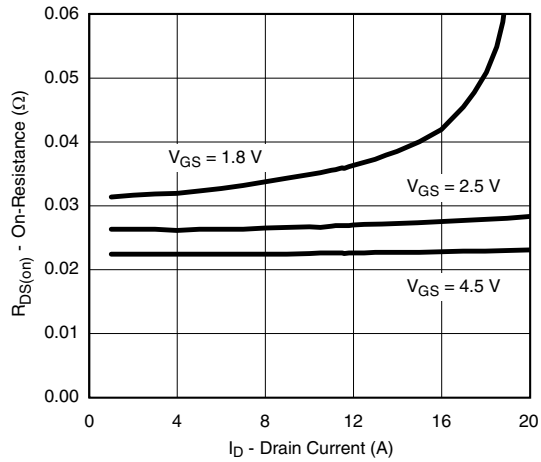
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

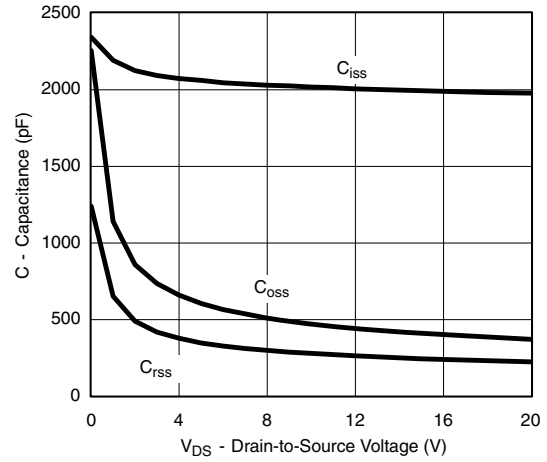
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



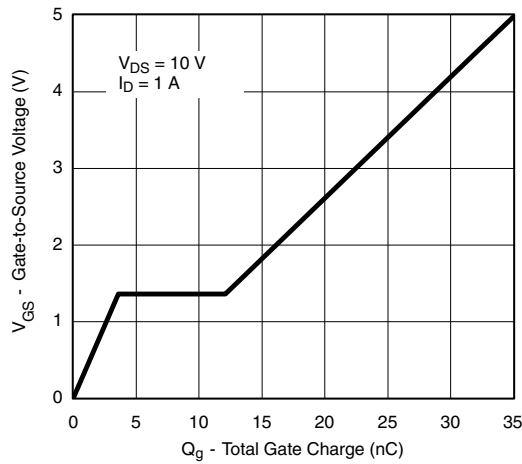
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



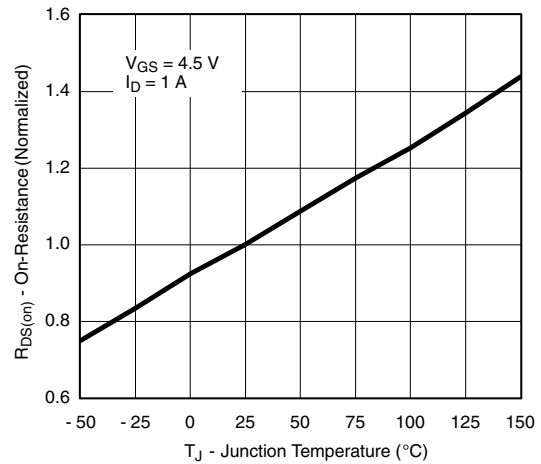
On-Resistance vs. Drain Current



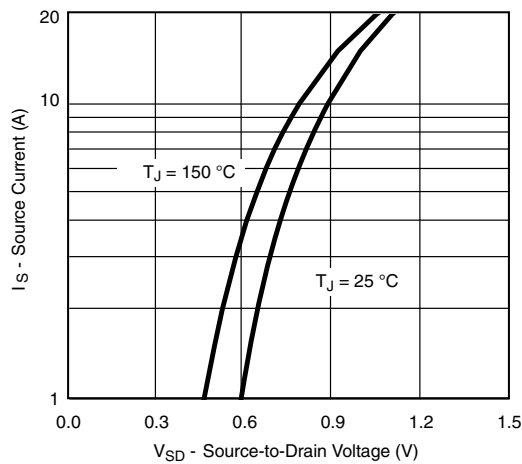
Capacitance



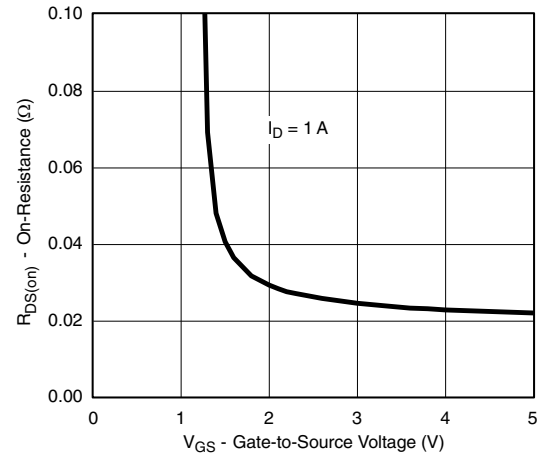
Gate Charge



On-Resistance vs. Junction Temperature

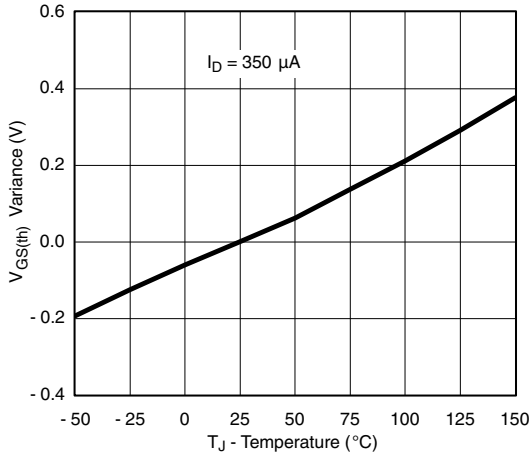


Source-Drain Diode Forward Voltage

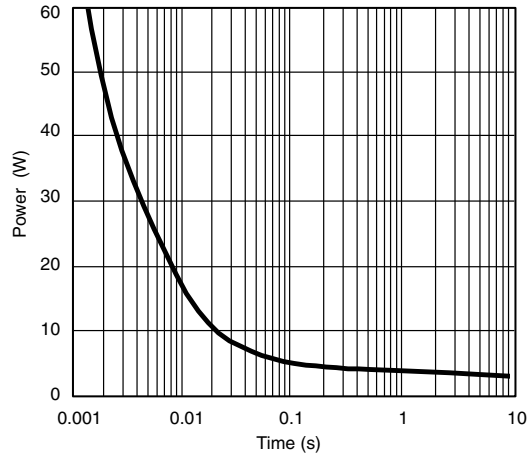


On-Resistance vs. Gate-to-Source Voltage

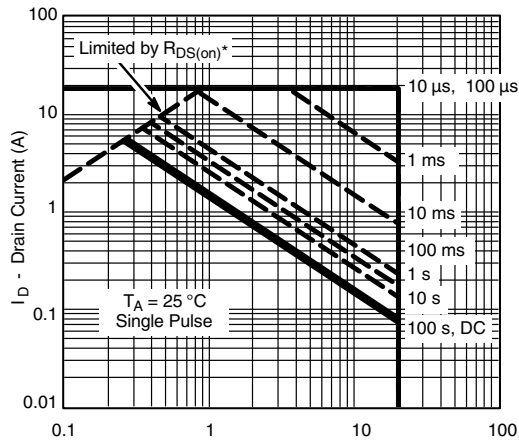
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Threshold Voltage

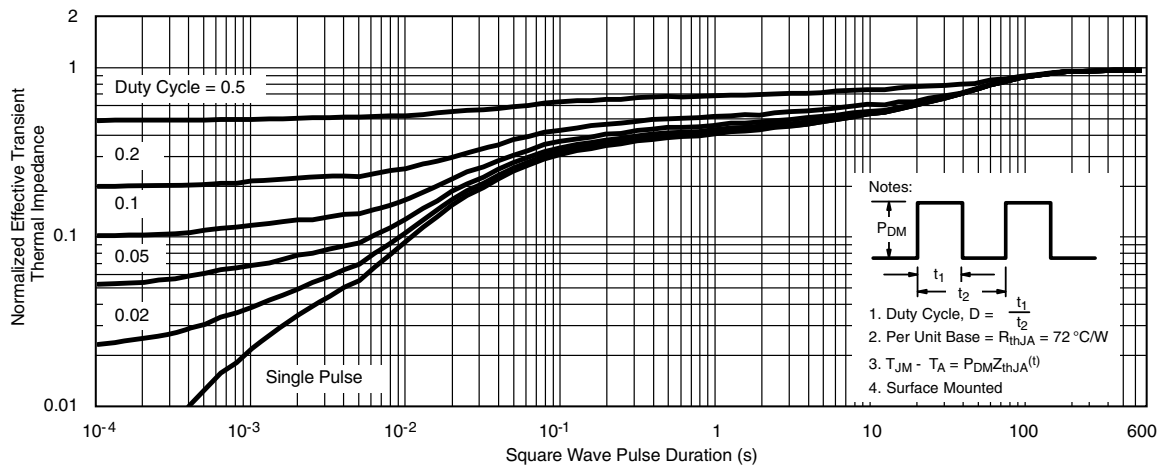


Single Pulse Power, Junction-to-Ambient



* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

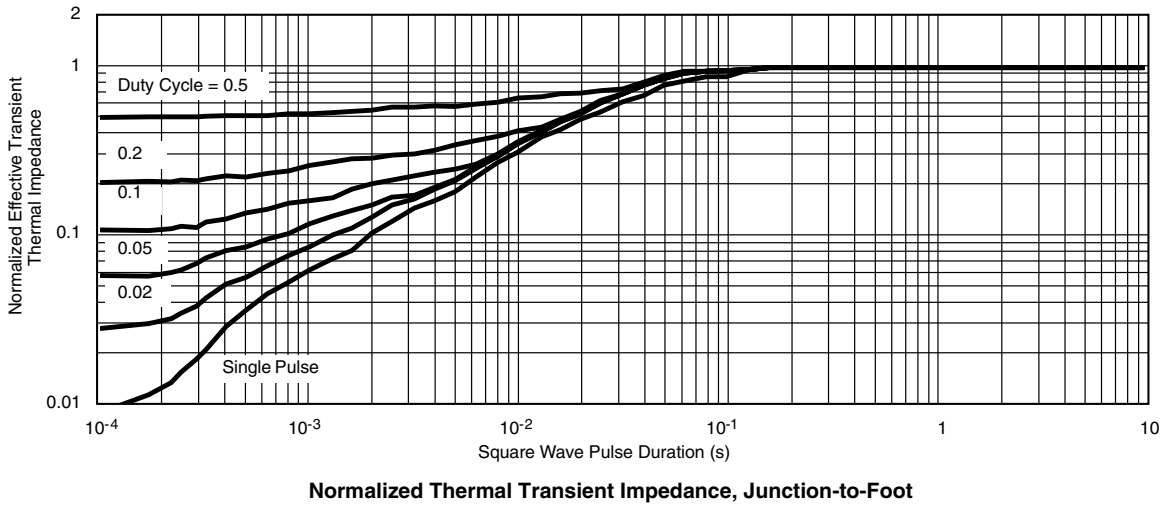
Safe Operating Area



- Notes:
1. Duty Cycle, $D = \frac{t_1}{t_2}$
 2. Per Unit Base = $R_{thJA} = 72\text{ }^\circ\text{C/W}$
 3. $T_{JM} - T_A = P_{DM} Z_{thJA}(t)$
 4. Surface Mounted

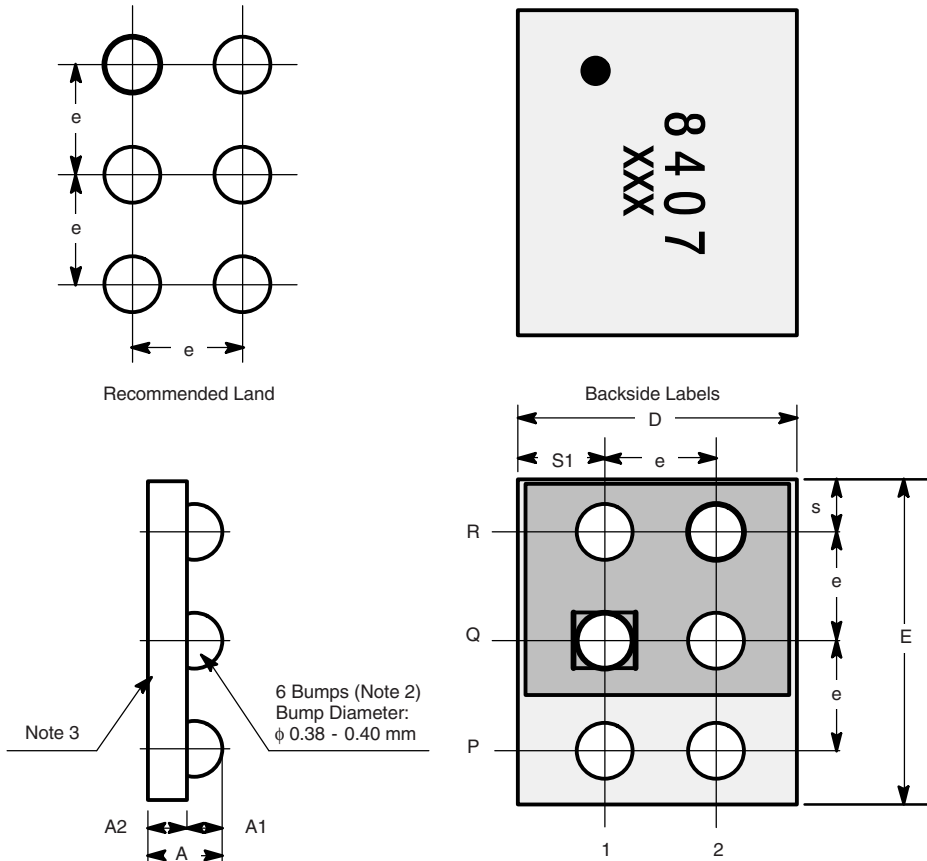
Normalized Thermal Transient Impedance, Junction-to-Ambient

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



PACKAGE OUTLINE

MICRO FOOT: 6-BUMP (2.4 mm x 2 mm, 0.8 mm PITCH)



Notes (Unless Otherwise Specified):

1. All dimensions are in millimeters.
2. Bumps are 95.5/3.8/0.7 Sn/Ag/Cu with diameter ϕ 0.38 mm - 0.40 mm.
3. Backside surface is coated with a Ti/Ni/Ag layer.
4. Non-solder mask defined copper landing pad.
5. The flat side of wafers is oriented at the bottom.
6. • is location of Pin 1P.

Dim.	Millimeters ^a		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	1.920	2.000	0.0756	0.0787
E	2.320	2.400	0.0913	0.0945
e	0.750	0.850	0.0295	0.0335
S	0.370	0.400	0.0150	0.0157
S1	0.580	0.600	0.0228	0.0236

PAD DISTRIBUTION TABLE			
	P	Q	R
1	Drain	Gate	Source
2	Drain	Source	Source

Notes:

- a. Use millimeters as the primary measurement.

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