



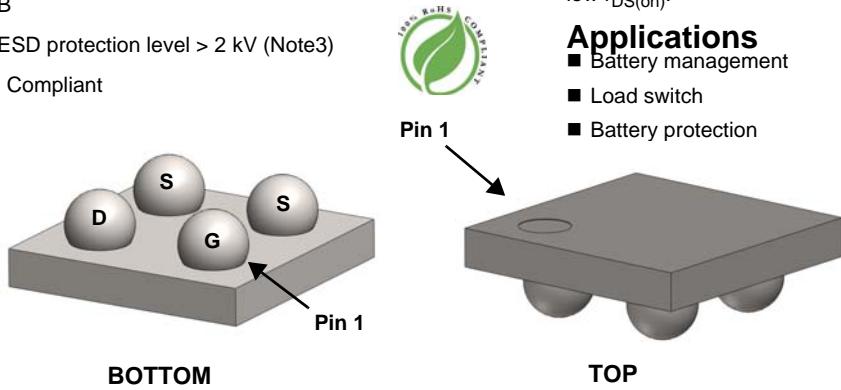
ON Semiconductor®

FDZ451PZ

P-Channel 1.5 V Specified PowerTrench® Thin WL-CSP MOSFET -20 V, -2.6 A, 140 mΩ

Features

- Max $r_{DS(on)}$ = 140 mΩ at $V_{GS} = -4.5$ V, $I_D = -2$ A
- Max $r_{DS(on)}$ = 182 mΩ at $V_{GS} = -2.5$ V, $I_D = -1.5$ A
- Max $r_{DS(on)}$ = 231 mΩ at $V_{GS} = -1.8$ V, $I_D = -1$ A
- Max $r_{DS(on)}$ = 315 mΩ at $V_{GS} = -1.5$ V, $I_D = -1$ A
- Occupies only 0.64 mm² of PCB area. Less than 16% of the area of 2 x 2 BGA
- Ultra-thin package: less than 0.4 mm height when mounted to PCB
- HBM ESD protection level > 2 kV (Note3)
- RoHS Compliant



WL-CSP 0.8X0.8 Thin

MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	± 8	V
I_D	-Continuous $T_A = 25$ °C (Note 1a)	-2.6	A
	-Pulsed	-10	
P_D	Power Dissipation $T_A = 25$ °C (Note 1a)	1.3	W
	Power Dissipation $T_A = 25$ °C (Note 1b)	0.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	93	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	311	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
EH	FDZ451PZ	WL-CSP 0.8X0.8 Thin	7 "	8 mm	5000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250 \mu\text{A}, V_{GS} = 0 \text{ V}$	-20			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C		-13		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16 \text{ V}, V_{GS} = 0 \text{ V}$		-1		μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$		± 10		μA

On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250 \mu\text{A}$	-0.3	-0.7	-1.2	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$, referenced to 25°C		2.5		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = -4.5 \text{ V}, I_D = -2 \text{ A}$		108	140	$\text{m}\Omega$
		$V_{GS} = -2.5 \text{ V}, I_D = -1.5 \text{ A}$		129	182	
		$V_{GS} = -1.8 \text{ V}, I_D = -1 \text{ A}$		159	231	
		$V_{GS} = -1.5 \text{ V}, I_D = -1 \text{ A}$		201	315	
		$V_{GS} = -4.5 \text{ V}, I_D = -2 \text{ A}, T_J = 125^\circ\text{C}$		143	204	
g_{FS}	Forward Transconductance	$V_{DD} = -5 \text{ V}, I_D = -2 \text{ A}$		7.8		s

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		416	555	pF
C_{oss}	Output Capacitance			61	80	pF
C_{rss}	Reverse Transfer Capacitance			53	70	pF

Switching Characteristics

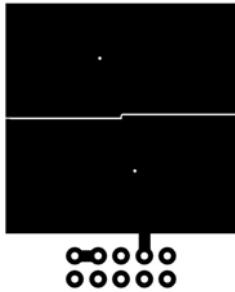
$t_{d(\text{on})}$	Turn-On Delay Time	$V_{DD} = -10 \text{ V}, I_D = -2.5 \text{ A}, V_{GS} = -4.5 \text{ V}, R_{\text{GEN}} = 6 \Omega$		4.9	10	ns
t_r	Rise Time			6.3	13	ns
$t_{d(\text{off})}$	Turn-Off Delay Time			68	108	ns
t_f	Fall Time			33	52	ns
Q_g	Total Gate Charge	$V_{GS} = -4.5 \text{ V}, V_{DD} = -10 \text{ V}, I_D = -2.5 \text{ A}$		6.3	8.8	nC
Q_{gs}	Gate to Source Charge			0.6		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.7		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = -1.4 \text{ A}$ (Note 2)		-0.9	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -2.5 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		29	46	ns
Q_{rr}	Reverse Recovery Charge				10	18

Notes:

1. R_{QJA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{QJC} is guaranteed by design while R_{QCA} is determined by the user's board design.



a. 93 °C/W when mounted on a 1 in² pad of 2 oz copper.



b. 311 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300μs, Duty cycle < 2.0%.

3. The diode connected between the gate and source serves only as protection ESD. No gate overvoltage rating is implied.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

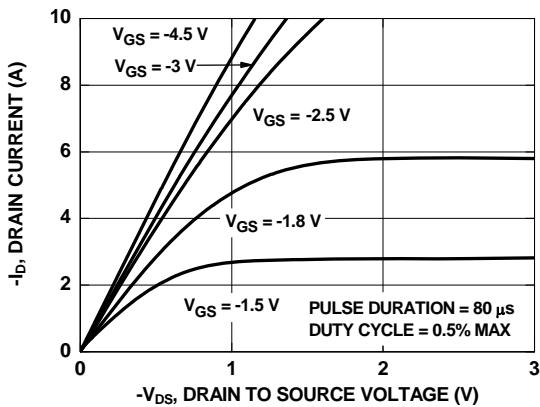


Figure 1. On-Region Characteristics

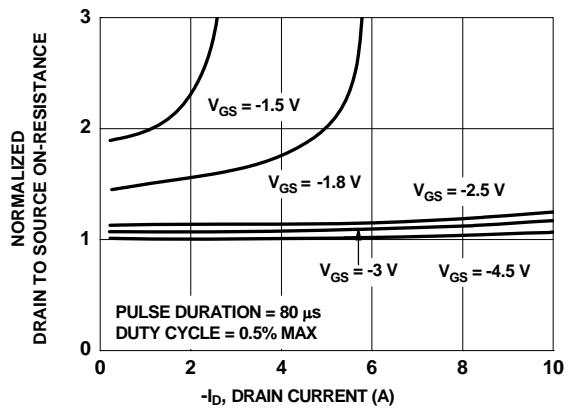


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

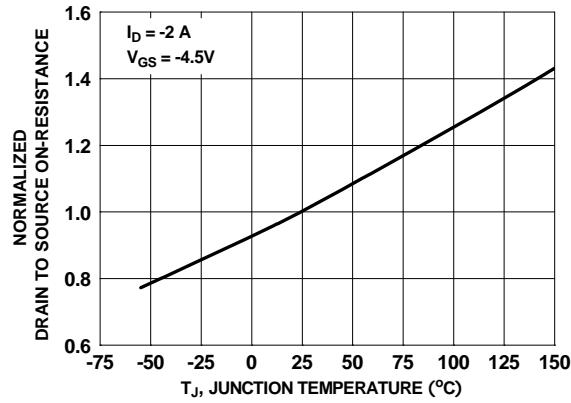


Figure 3. Normalized On-Resistance vs Junction Temperature

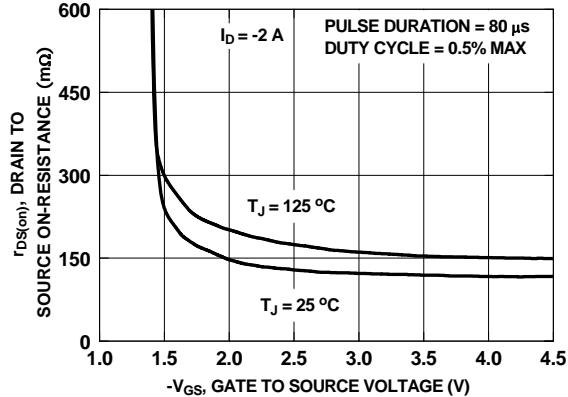


Figure 4. On-Resistance vs Gate to Source Voltage

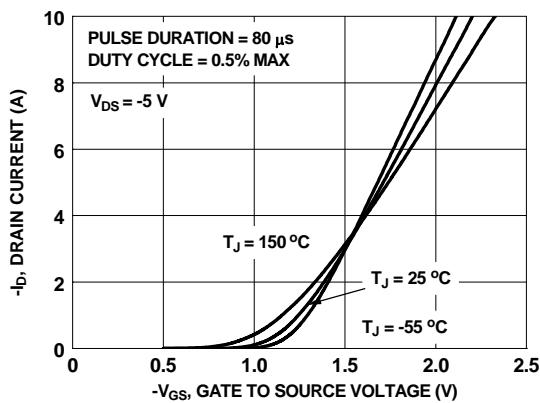


Figure 5. Transfer Characteristics

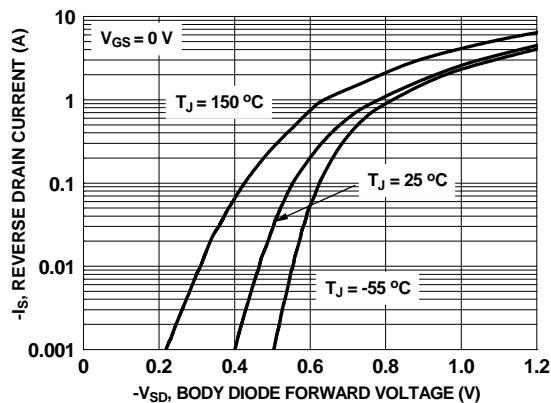
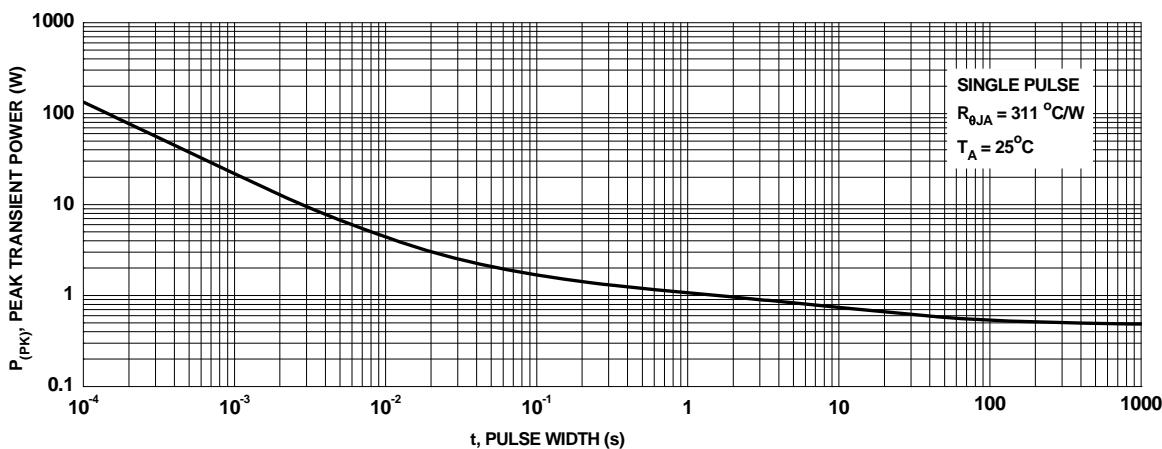
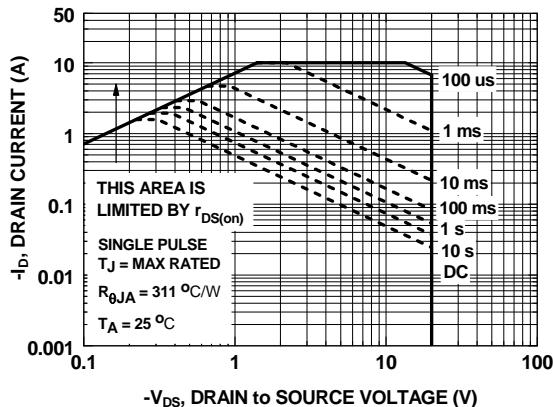
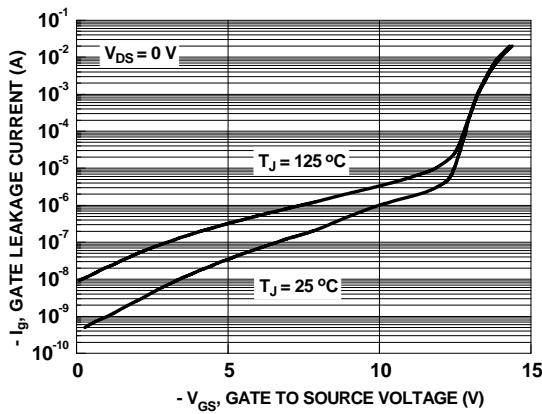
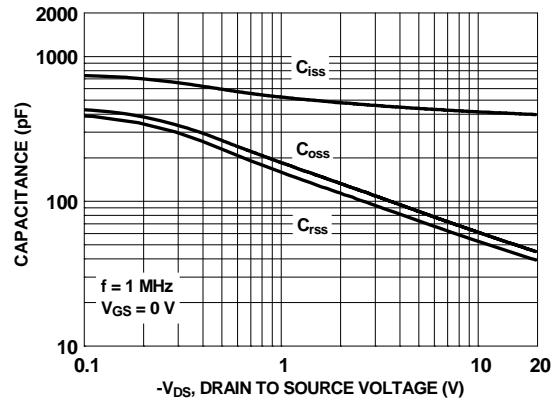
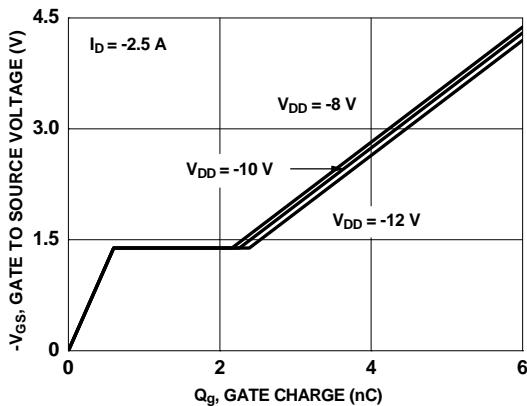
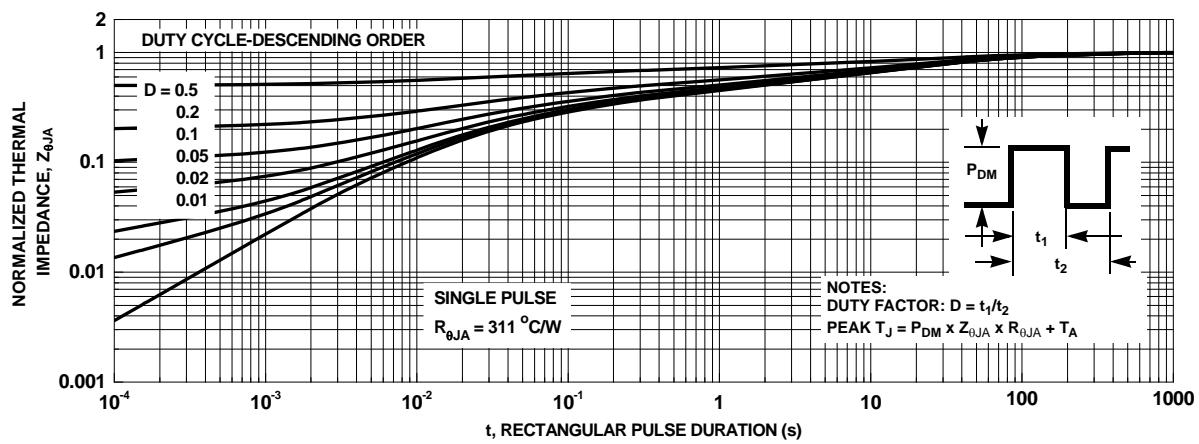


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

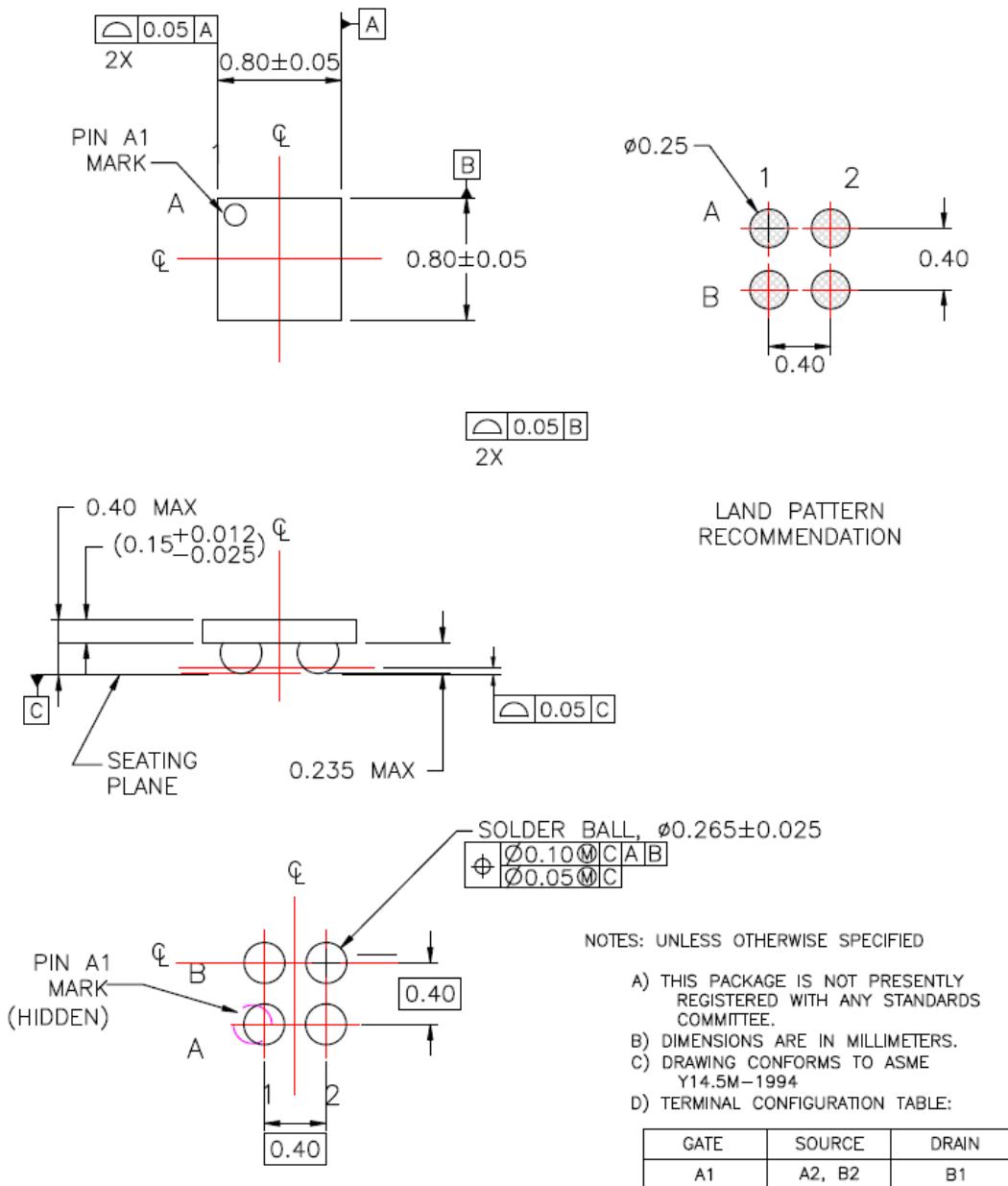
Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted



Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted



Dimensional Outline and Pad Layout



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