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July 2014

FDZ371PZ

P-Channel 1.5 V Specified PowerTrench[®] Thin WL-CSP MOSFET -20 V, -3.7 A, 75 m Ω

Features

- Max $r_{DS(on)} = 75 \text{ m}\Omega$ at $V_{GS} = -4.5 \text{ V}$, $I_D = -2.0 \text{ A}$
- Max $r_{DS(on)}$ = 90 m Ω at V_{GS} = -2.5 V, I_D = -1.5 A
- Max $r_{DS(on)} = 110 \text{ m}\Omega$ at $V_{GS} = -1.8 \text{ V}$, $I_D = -1.0 \text{ A}$
- Max $r_{DS(on)}$ = 150 m Ω at V_{GS} = -1.5 V, I_D = -1.0 A
- Occupies only 1.0 mm² of PCB area.Less than 30% of the area of 2 x 2 BGA
- Ultra-thin package: less than 0.4 mm height when mounted to PCR
- HBM ESD protection level >4.4kV typical (Note 3)
- RoHS Compliant

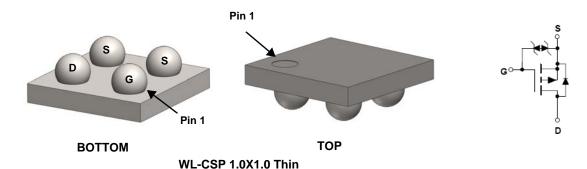


General Description

Designed on Fairchild's advanced 1.5 V PowerTrench® process with state of the art "fine pitch" Thin WLCSP packaging process, the FDZ371PZ minimizes both PCB space and $r_{\text{DS}(\text{on})}.$ This advanced WLCSP MOSFET embodies a breakthrough in packaging technology which enables the device to combine excellent thermal transfer characteristics, ultra-low profile packaging, low gate charge, and low $r_{\text{DS}(\text{on})}.$

Applications

- Battery management
- Load switch
- Battery protection



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parame	Ratings	Units		
V_{DS}	Drain to Source Voltage			-20	V
V_{GS}	Gate to Source Voltage			±8	V
	-Continuous	T _A = 25°C	(Note 1a)	-3.7	Δ.
ID	-Pulsed			-12	A
Б	Power Dissipation	T _A = 25°C	(Note 1a)	1.7	W
P_{D}	Power Dissipation	T _A = 25°C	(Note 1b)	0.5	VV
T _J , T _{STG}	Operating and Storage Junction Temperat	ure Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	75	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	260	C/VV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
K	FDZ371PZ	WL-CSP 1.0X1.0 Thin	7 "	8 mm	5000 units

Electrical Characteristics $T_J = 25$ °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	acteristics					
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = -250 \mu A, V_{GS} = 0 V$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = -250 μA, referenced to 25 °C		22		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = -16 V, V _{GS} = 0 V			-1	μΑ
I _{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8 \text{ V}, V_{DS} = 0 \text{ V}$			±10	μΑ

On Characteristics

V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_{D} = -250 \mu A$	-0.35	-0.6	-1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = -250 μ A, referenced to 25 °C		-4		mV/°C
		$V_{GS} = -4.5 \text{ V}, I_D = -2.0 \text{ A}$		55	75	
	Static Drain to Source On Resistance	$V_{GS} = -2.5 \text{ V}, I_D = -1.5 \text{A}$		65	90	
rno()		$V_{GS} = -1.8 \text{ V}, I_D = -1.0 \text{ A}$		80	110	mΩ
'DS(on)		$V_{GS} = -1.5 \text{ V}, I_D = -1.0 \text{ A}$		100	150	11122
		$V_{GS} = -4.5 \text{ V}, I_D = -2.0 \text{ A},$ $T_J = 125 ^{\circ}\text{C}$		80	124	
9 _{FS}	Forward Transconductance	$V_{DD} = -5 \text{ V}, I_{D} = -3.3 \text{ A}$		14		S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 40.V.V 0.V	750	1000	pF
Coss	Output Capacitance	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V},$ f = 1 MHz	110	145	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1 101112	100	150	pF

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		5.9	12	ns
t _r	Rise Time	$V_{DD} = -10 \text{ V}, I_{D} = -3.3 \text{ A},$	9.1	18	ns
t _{d(off)}	Turn-Off Delay Time	$V_{GS} = -4.5 \text{ V}, R_{GEN} = 6 \Omega$	124	198	ns
t _f	Fall Time		88	140	ns
Q_{g}	Total Gate Charge	V 45VV 40V	12	17	nC
Q_{gs}	Gate to Source Charge	$V_{GS} = -4.5 \text{ V}, V_{DD} = -10 \text{ V},$ $I_{D} = -3.3 \text{ A}$	1.1		nC
Q_{gd}	Gate to Drain "Miller" Charge	1D = 0.0 A	3.4		nC

Drain-Source Diode Characteristics

Is	Maximum Continuous Drain-Source Diode Forward Current				-1.1	Α
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = -1.3 \text{ A}$ (Note 2)		-0.7	-1.2	V
t _{rr}	Reverse Recovery Time	-I _F = -3.3 A, di/dt = 100 A/μs		61	98	ns
Q _{rr}	Reverse Recovery Charge	IF = -3.3 A, α//αι = 100 A/μS		29	47	nC

Notes:

^{1.} R_{0JA} 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_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design.



 a. 75 °C/W when mounted on a 1 in² pad of 2 oz copper.



b. 260 °C/W when mounted on a minimum pad of 2 oz copper.

- 2. Pulse Test: Pulse Width < $300\mu s$, 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 °C unless otherwise noted

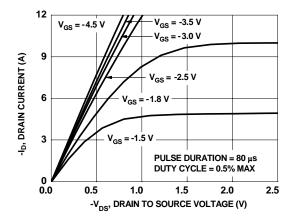


Figure 1. On-Region Characteristics

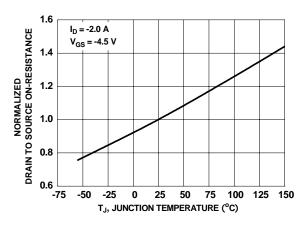


Figure 3. Normalized On-Resistance vs Junction Temperature

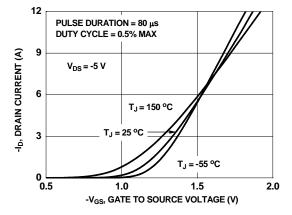


Figure 5. Transfer Characteristics

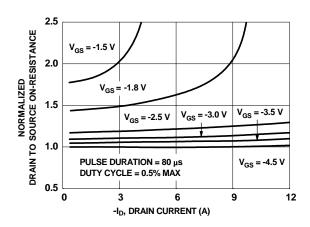


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

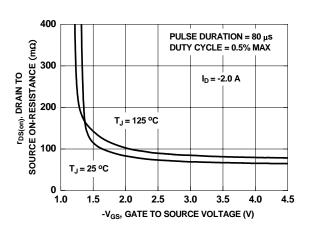


Figure 4. On-Resistance vs Gate to Source Voltage

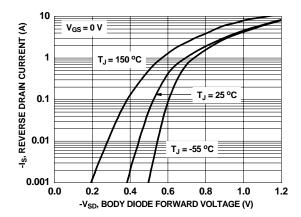


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

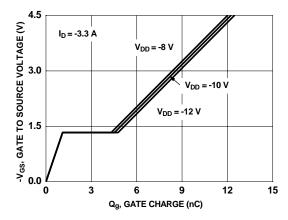


Figure 7. Gate Charge Characteristics

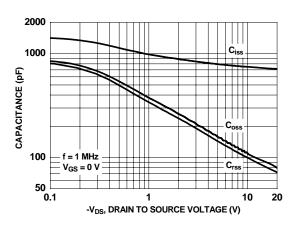


Figure 8. Capacitance vs Drain to Source Voltage

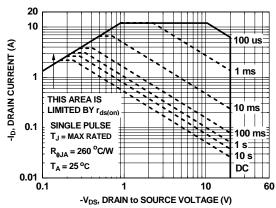


Figure 9. Forward Bias Safe Operating Area

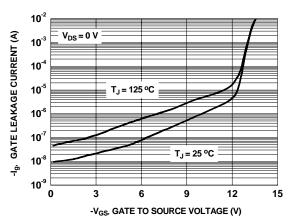


Figure 10. Gate Leakage Current vs Gate to Source Voltage

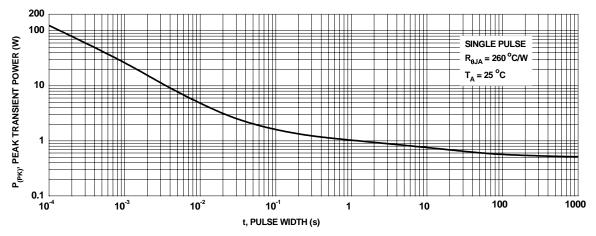


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25$ °C unless otherwise noted

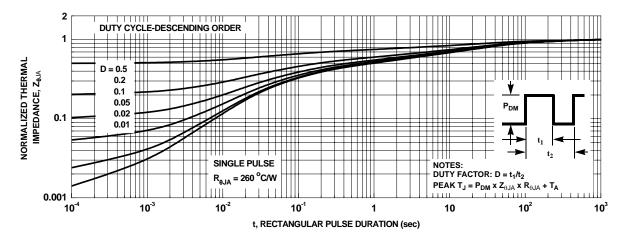
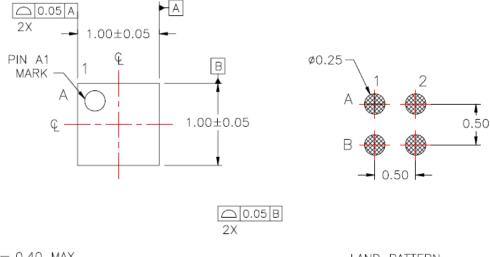
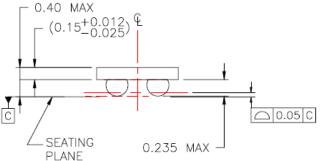


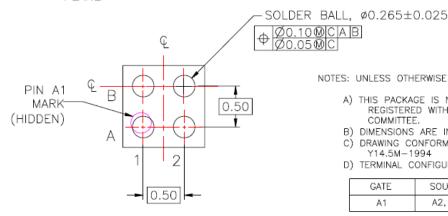
Figure 12. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout





LAND PATTERN RECOMMENDATION



NOTES: UNLESS OTHERWISE SPECIFIED

05 M C

- THIS PACKAGE IS NOT PRESENTLY REGISTERED WITH ANY STANDARDS COMMITTEE.
- B) DIMENSIONS ARE IN MILLIMETERS.
- DRAWING CONFORMS TO ASME Y14.5M-1994
- TERMINAL CONFIGURATION TABLE:

GATE	SOURCE	DRAIN
A1	A2, B2	B1

E) DRAWING FILENAME: MKT-UC004ADREV2

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