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March 2015

FDD5614P

60V P-Channel PowerTrench® MOSFET

General Description

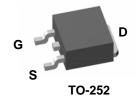
This 60V P-Channel MOSFET uses Fairchild's high voltage PowerTrench process. It has been optimized for power management applications.

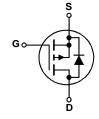
Applications

- DC/DC converter
- Power management
- Load switch

Features

- -15 A, -60 V. $R_{DS(ON)} = 100$ m Ω @ $V_{GS} = -10$ V $R_{DS(ON)} = 130$ m Ω @ $V_{GS} = -4.5$ V
- Fast switching speed
- High performance trench technology for extremely low $R_{\mbox{\scriptsize DS(ON)}}$
- · High power and current handling capability





Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units	
V _{DSS}	Drain-Source Voltage		-60	V	
V _{GSS}	Gate-Source Voltage		±20	V	
I _D	Drain Current - Continuous	(Note 3)	- 15	А	
	– Pulsed	(Note 1a)	- 45		
P _D	Power Dissipation for Single Operation	(Note 1)	42	W	
		(Note 1a)	3.8		
		(Note 1b)	1.6		
T _J , T _{STG}	Operating and Storage Junction Temperat	ture Range	-55 to +175	°C	

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	3.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	40	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	°C/W

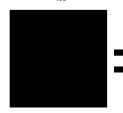
Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDD5614P	FDD5614P	13"	16mm	2500 units

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Drain-Sc	ource Avalanche Ratings (Note	1)			•	
W _{DSS}	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = -30 \text{ V}, I_{D} = -4.5 \text{ A}$			90	mJ
I _{AR}	Maximum Drain-Source Avalanche Current				-4.5	Α
Off Char	acteristics					
BV _{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0 \text{ V}, I_{D} = -250 \mu\text{A}$	-60			V
ΔBV _{DSS} ΔT _J	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu A$, Referenced to 25°C		-49		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -48 \text{ V}, V_{GS} = 0 \text{ V}$			-1	μА
I _{GSSF}	Gate-Body Leakage, Forward	$V_{GS} = 20V$, $V_{DS} = 0 V$			100	nA
I _{GSSR}	Gate-Body Leakage, Reverse	$V_{GS} = -20 \text{ V}, V_{DS} = 0 \text{ V}$			-100	nA
On Char	acteristics (Note 2)					
V _{GS(th)}	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{D} = -250 \mu A$	-1	-1.6	-3	V
$\Delta V_{GS(th)} \over \Delta T_J$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250 \mu A$, Referenced to 25°C		4		mV/°C
R _{DS(on)}	Static Drain–Source On–Resistance	$V_{GS} = -10 \text{ V}, I_D = -4.5 \text{ A}$ $V_{GS} = -4.5 \text{ V}, I_D = -3.9 \text{ A}$ $V_{GS} = -10 \text{ V}, I_D = -4.5 \text{ A}, T_J = 125 ^{\circ}\text{C}$		76 99 137	100 130 185	mΩ
I _{D(on)}	On-State Drain Current	$V_{GS} = -10 \text{ V}, \qquad V_{DS} = -5 \text{ V}$	-20			Α
g _{FS}	Forward Transconductance	$V_{DS} = -5 \text{ V}, \qquad I_{D} = -3 \text{ A}$		8		S
Dynamic	Characteristics			l .	l .	
C _{iss}	Input Capacitance	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V},$		759		pF
Coss	Output Capacitance	f = 1.0 MHz		90		pF
C _{rss}	Reverse Transfer Capacitance			39		pF
Switchin	g Characteristics (Note 2)					•
t _{d(on)}	Turn-On Delay Time	$V_{DD} = -30 \text{ V}, \qquad I_{D} = -1 \text{ A},$		7	14	ns
t _r	Turn-On Rise Time	$V_{DD} = -30 \text{ V}, \qquad I_{D} = -1 \text{ A}, \\ V_{GS} = -10 \text{ V}, \qquad R_{GEN} = 6 \Omega$		10	20	ns
t _{d(off)}	Turn-Off Delay Time	1		19	34	ns
t _f	Turn-Off Fall Time			12	22	ns
Qg	Total Gate Charge	$V_{DS} = -30V$, $I_{D} = -4.5 A$,		15	24	nC
Q _{gs}	Gate-Source Charge	V _{GS} = -10 V		2.5		nC
Q_{gd}	Gate-Drain Charge			3.0		nC
Drain-S	ource Diode Characteristics	and Maximum Ratings				
Is	Maximum Continuous Drain–Source	_			-3.2	Α
V _{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = -3.2 \text{ A} \text{(Note 2)}$		-0.8	-1.2	V

Notes:

1. R_{0JA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design.



a) $R_{\theta,JA} = 40$ °C/W when mounted on a 1in^2 pad of 2 oz copper



b) $R_{\theta JA} = 96^{\circ}\text{C/W}$ when mounted on a minimum pad.

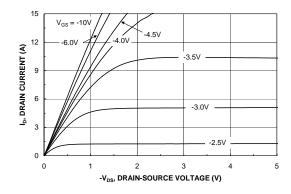
Scale 1:1 on letter size paper

2. Pulse Test: Pulse Width < 300μ s, Duty Cycle < 2.0%



3. Maximum current is calculated as: $\sqrt{R_{OS(ON)}}$ where P_D is maximum power dissipation at $T_C = 25^{\circ}C$ and $R_{DS(on)}$ is at $T_{J(max)}$ and $V_{GS} = 10V$. Package current limitation is 21A

Typical Characteristics



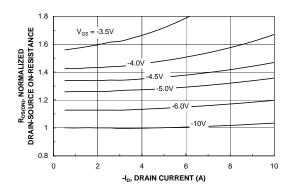
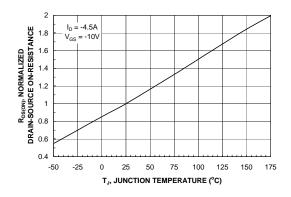


Figure 1. On-Region Characteristics.

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.



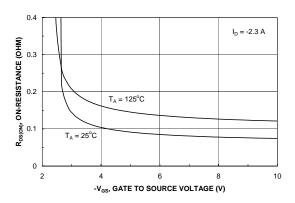
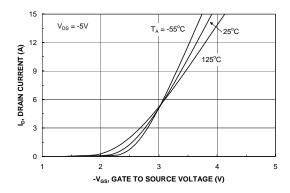


Figure 3. On-Resistance Variation with Temperature.

Figure 4. On-Resistance Variation with Gate-to-Source Voltage.



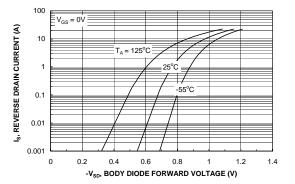
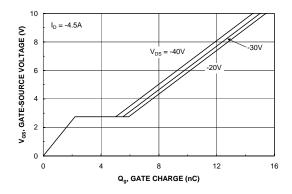


Figure 5. Transfer Characteristics.

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics



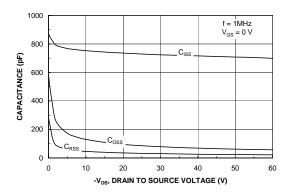
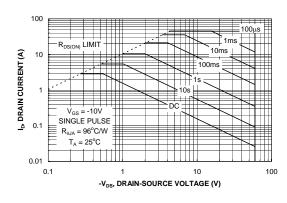


Figure 7. Gate Charge Characteristics.





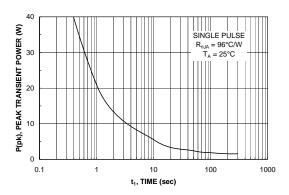


Figure 9. Maximum Safe Operating Area.

Figure 10. Single Pulse Maximum Power Dissipation.

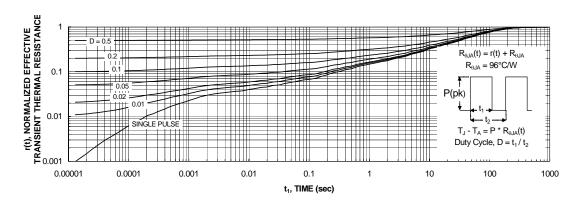
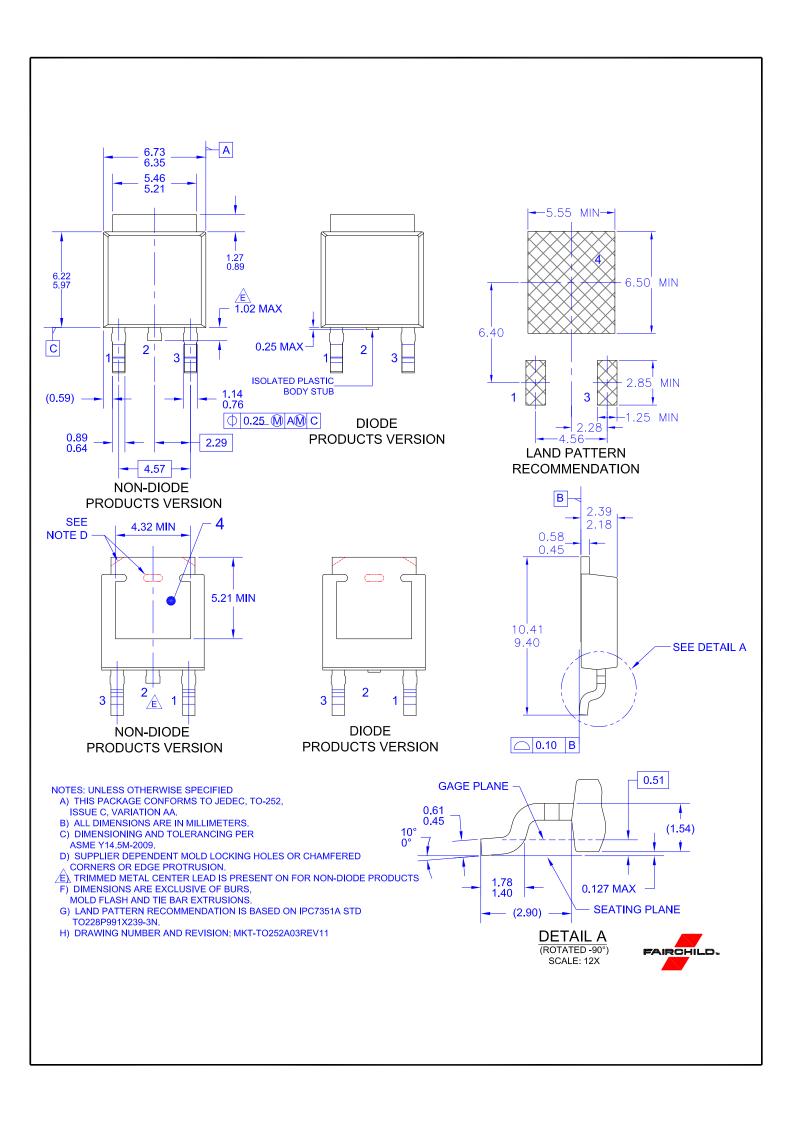


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b. Transient thermal response will change depending on the circuit board design.



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