

FDD4243

40V P-Channel PowerTrench® MOSFET

-40V, -14A, 44mΩ

Features

- Max $r_{DS(on)}$ = 44mΩ at $V_{GS} = -10V$, $I_D = -6.7A$
- Max $r_{DS(on)}$ = 64mΩ at $V_{GS} = -4.5V$, $I_D = -5.5A$
- High performance trench technology for extremely low $r_{DS(on)}$
- RoHS Compliant

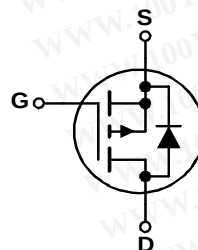
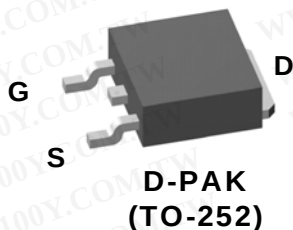


General Description

This P-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench® technology to deliver low $r_{DS(on)}$ and optimized B_{vds} capability to offer superior performance benefit in the applications.

Application

- Inverter
- Power Supplies



MOSFET Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-40	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous (Package limited)	$T_C = 25^\circ\text{C}$	A
	-Continuous (Silicon limited)	$T_C = 25^\circ\text{C}$ (Note 1)	
	-Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	
	-Pulsed		
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	mJ
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	W
	Power Dissipation	(Note 1a)	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	40	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD4243	FDD4243	D-PAK(TO-252)	13"	12mm	2500 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\mu\text{A}$, $V_{GS} = 0\text{V}$	-40			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		-32		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -32\text{V}$, $V_{GS} = 0\text{V}$ $T_J = 125^\circ\text{C}$			-1 -100	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\mu\text{A}$	-1.4	-1.6	-3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\mu\text{A}$, referenced to 25°C		4.7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -10\text{V}$, $I_D = -6.7\text{A}$		36	44	m Ω
		$V_{GS} = -4.5\text{V}$, $I_D = -5.5\text{A}$		48	64	
		$V_{GS} = -10\text{V}$, $I_D = -6.7\text{A}$, $T_J = 125^\circ\text{C}$		53	69	
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{V}$, $I_D = -6.7\text{A}$		16		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -20\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		1165	1550	pF
C_{oss}	Output Capacitance			165	220	pF
C_{rss}	Reverse Transfer Capacitance			90	135	pF
R_g	Gate Resistance	$f = 1\text{MHz}$		4		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -20\text{V}$, $I_D = -6.7\text{A}$ $V_{GS} = -10\text{V}$, $R_{GEN} = 6\Omega$		6	12	ns
t_r	Rise Time			15	26	ns
$t_{d(off)}$	Turn-Off Delay Time			22	35	ns
t_f	Fall Time			7	14	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{DD} = -20\text{V}$, $I_D = -6.7\text{A}$		21	29	nC
Q_{gs}	Gate to Source Gate Charge	$V_{GS} = -10\text{V}$		3.4		nC
Q_{gd}	Gate to Drain "Miller" Charge			4		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = -6.7\text{A}$ (Note 2)		0.86	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -6.7\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$		29	43	ns
Q_{rr}	Reverse Recovery Charge			30	44	nC

Notes:

1: $R_{\theta JA}$ is sum of 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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JC}$ is determined by the user's board design.

a. $40^\circ\text{C}/\text{W}$ when mounted on a 1in^2 pad of 2 oz copper

b. $96^\circ\text{C}/\text{W}$ when mounted on a minimum pad.

2: Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.

3: Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 7.5\text{A}$, $V_{DD} = 40\text{V}$, $V_{GS} = 10\text{V}$.

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

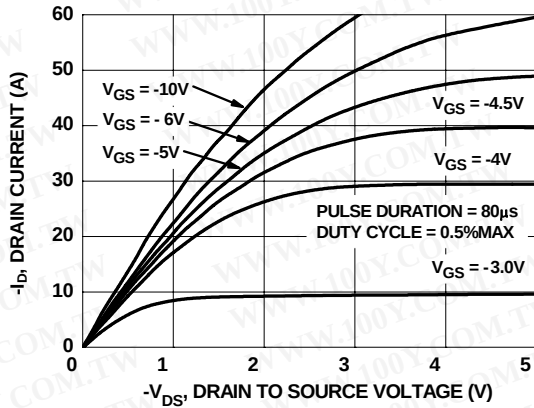


Figure 1. On Region Characteristics

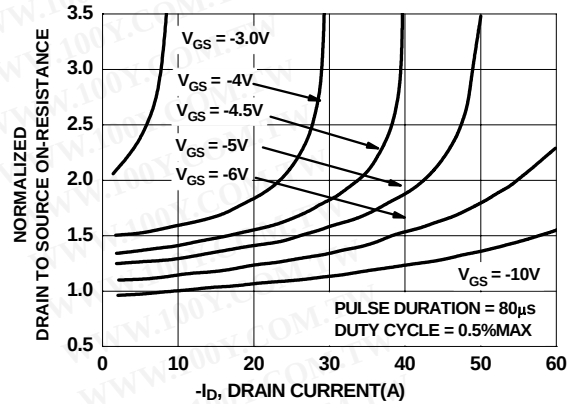


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

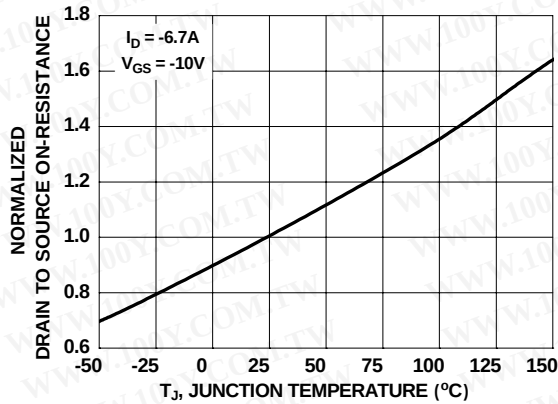


Figure 3. Normalized On Resistance vs Junction Temperature

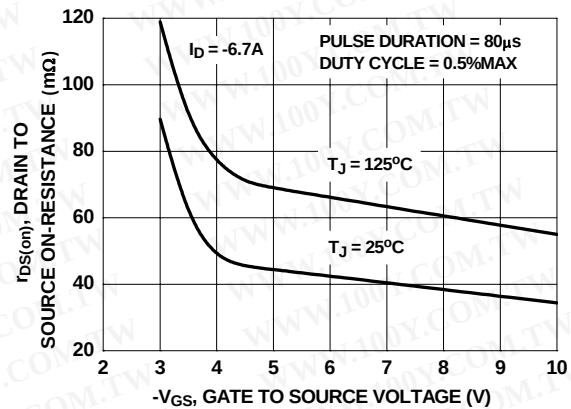


Figure 4. On-Resistance vs Gate to Source Voltage

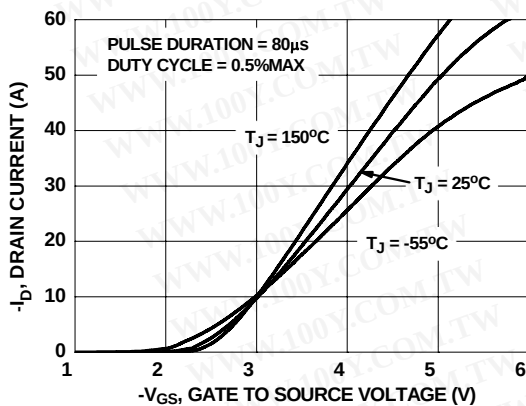


Figure 5. Transfer Characteristics

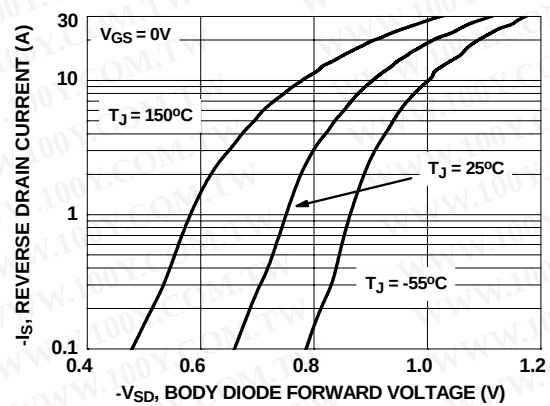


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

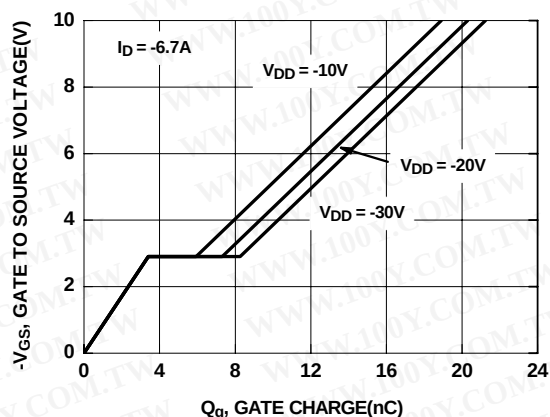


Figure 7. Gate Charge Characteristics

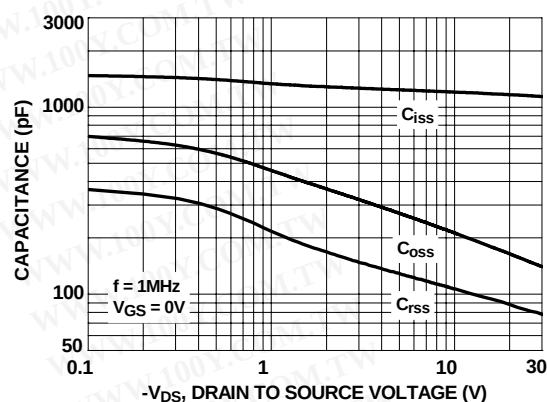


Figure 8. Capacitance vs Drain to Source Voltage

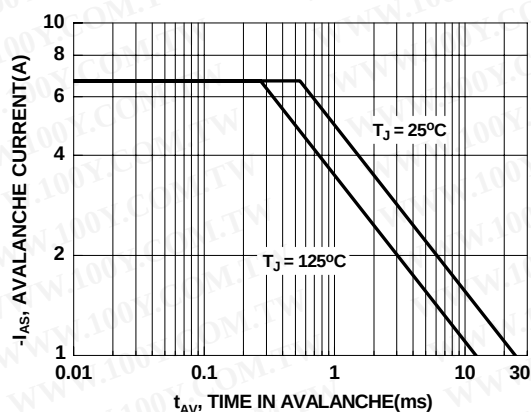


Figure 9. Unclamped Inductive Switching Capability

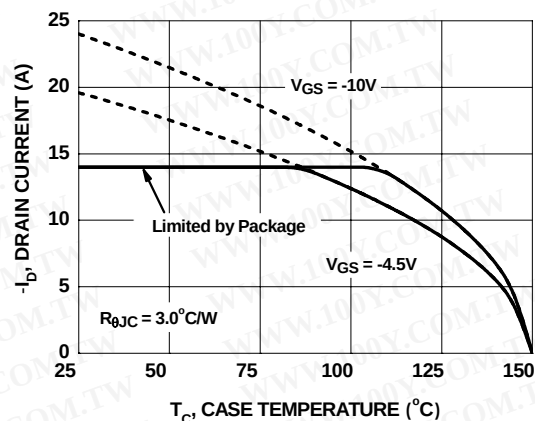


Figure 10. Maximum Continuous Drain Current vs Case Temperature

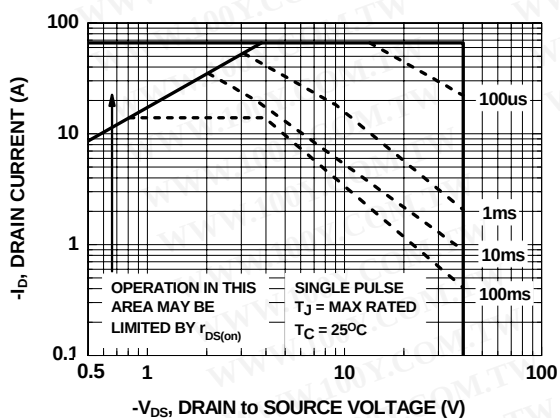


Figure 11. Forward Bias Safe Operating Area

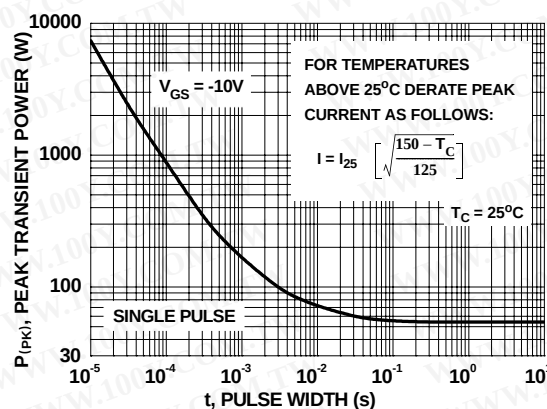
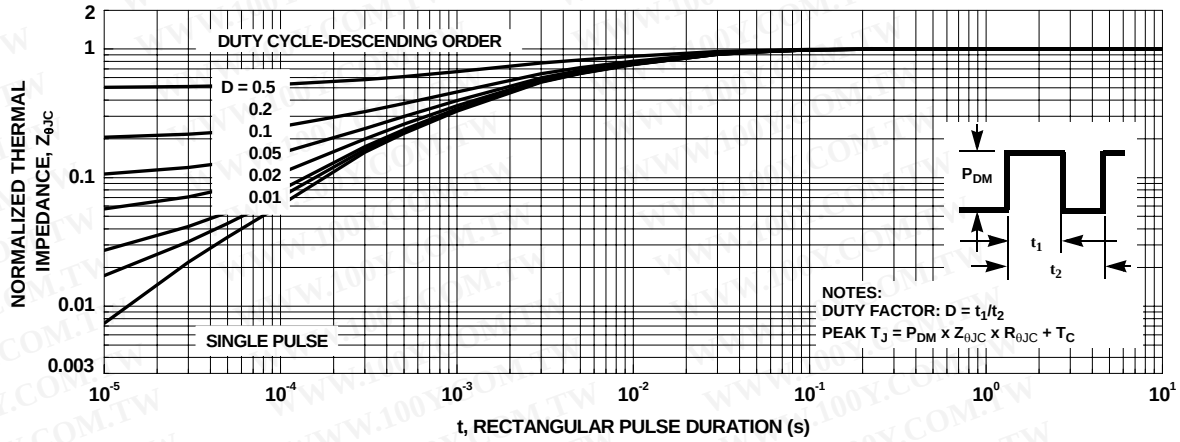


Figure 12. Single Pulse Maximum Power Dissipation

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



TRADEMARKS

The following are registered and unregistered trademarks and service marks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEX [®]	Green FPS [™]	Power247 [®]	SuperSOT [™] -8
Build it Now [™]	Green FPS [™] e-Series [™]	POWEREDGE [®]	SyncFET [™]
CorePLUS [™]	GTO [™]	Power-SPM [™]	The Power Franchise [®]
CROSSVOLT [™]	i-Lo [™]	PowerTrench [®]	the power franchise
CTL [™]	IntelliMAX [™]	Programmable Active Droop [™]	TinyBoost [™]
Current Transfer Logic [™]	ISOPANAR [™]	QFET [®]	TinyBuck [™]
EcoSPARK [®]	MegaBuck [™]	QS [™]	TinyLogic [®]
F [®]	MICROCOUPLER [™]	QT Optoelectronics [™]	TINYOPTO [™]
Fairchild [®]	MicroFET [™]	Quiet Series [™]	TinyPower [™]
Fairchild Semiconductor [®]	MicroPak [™]	RapidConfigure [™]	TinyPWM [™]
FACT Quiet Series [™]	MillerDrive [™]	SMART START [™]	TinyWire [™]
FACT [®]	Motion-SPM [™]	SPM [®]	μSerDes [™]
FAST [®]	OPTOLOGIC [®]	STEALTH [™]	UHC [®]
FastvCore [™]	OPTOPLANAR [®]	SuperFET [™]	UniFET [™]
FPS [™]	[®]	SuperSOT [™] -3	VCX [™]
FRFET [®]	PDP-SPM [™]	SuperSOT [™] -6	
Global Power Resource SM	Power220 [®]		

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild Semiconductor. The datasheet is printed for reference information only.

Rev. 131