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## FDB047N10 N-Channel PowerTrench<sup>®</sup> MOSFET 100 V, 164 A, 4.7 m $\Omega$

## Features

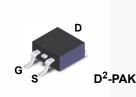
- $R_{DS(on)}$  = 3.9 m $\Omega$  (Typ.) @ V<sub>GS</sub> = 10 V, I<sub>D</sub> = 75 A
- · Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{\text{DS}(\text{on})}$
- High Power and Current Handling Capability
- RoHS Compliant

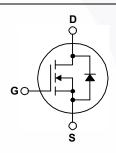
## Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench<sup>®</sup> process that has been tailored to minimize the on-state resistance while maintaining superior switching performance.

## Applications

- Synchronous Rectification for ATX / Server / Telecom PSU
- Battery Protection Circuit
- Motor Drives and Uninterruptible Power Supplies
- Micro Solar Inverter





### MOSFET Maximum Ratings T<sub>C</sub> = 25°C unless otherwise noted.

Symbol		Parameter		FDB047N10	Unit
V <sub>DSS</sub>	Drain to Source Voltage			100	V
V <sub>GSS</sub>	Gate to Source Voltage			±20	V
ID	Drain Current -	mited)	164*	A	
	-	mited)	116*	A	
	-	Limited)	120	Α	
I <sub>DM</sub>	Drain Current	- Pulsed	(Note 1)	656*	Α
E <sub>AS</sub>	Single Pulsed Avalanche E	nergy	(Note 2)	1153	mJ
dv/dt	Peak Diode Recovery dv/dt (No		(Note 3)	6.0	V/ns
P <sub>D</sub>	Dower Dissinction	(T <sub>C</sub> = 25°C)		375	W
	Power Dissipation	- Derate Above 25°C		2.5	W/ºC
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range			-55 to +175	°C
ΤL	Maximum Lead Temperature for Soldering, 1/8" from Case for 5 Seconds		Seconds	300	°C

\*Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 120A.

## **Thermal Characteristics**

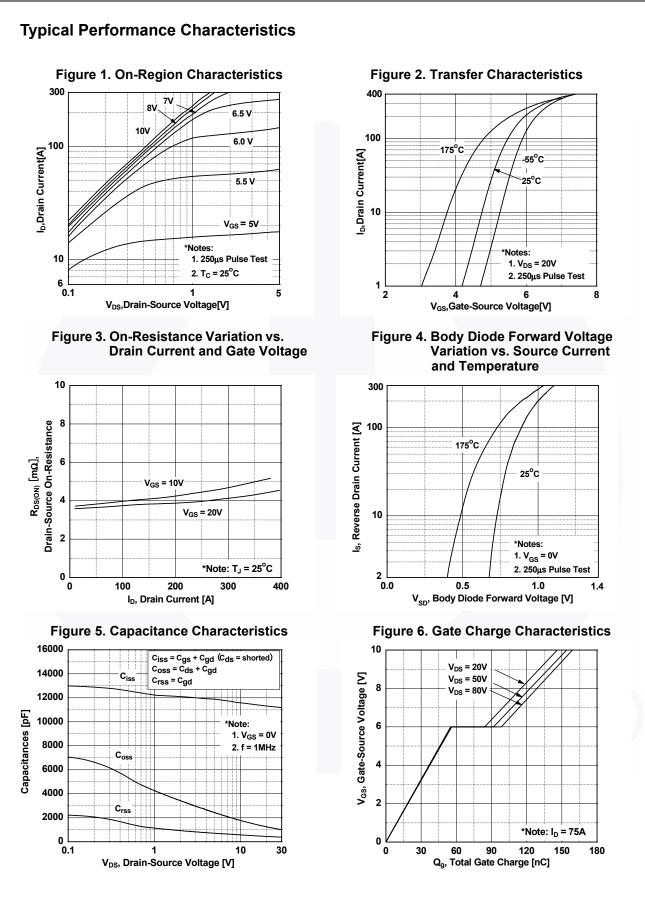
Symbol	Parameter	FDB047N10	Unit
$R_{ extsf{ heta}JC}$	Thermal Resistance, Junction to Case, Max.	0.4	
D	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	62.5	°C/W
$R_{ extsf{ heta}JA}$	Thermal Resistance, Junction to Ambient (1 in <sup>2</sup> Pad of 2-oz Copper), Max.	40	

November 2013

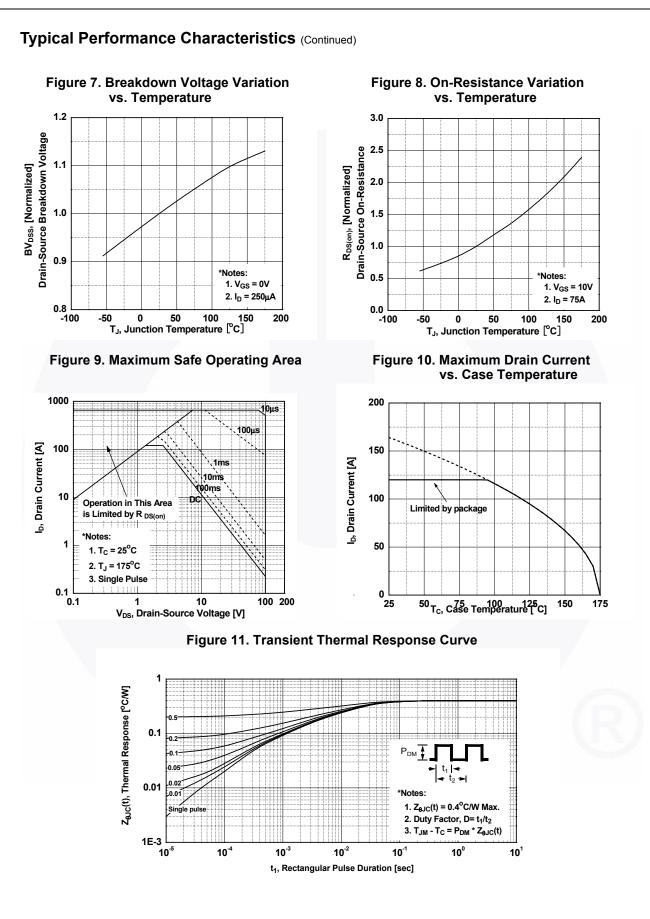
	Part Number Top Mark		Packing Method	Reel Size	Тар	e Width	Qua	ntity
•		D <sup>2</sup> -PAK	Tape and Reel	330 mm			800 units	
l Chara		C unless of	herwise noted.					
	Parameter			ns	Min.	Тур.	Max.	Unit
teristics								
Drain to S	Source Breakdown Voltage	e l	<sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V,	T <sub>.I</sub> = 25 <sup>o</sup> C	100	-	-	V
	<b>U</b> 1	li	<sub>D</sub> = 250 μA, Referenced	-	-	0.1	-	V/ºC
Zero Gat	e Voltage Drain Current				-	-	1	μA
2010 000	5 Voltage Drain Guirein		$V_{DS}$ = 100 V, $V_{GS}$ = 0 V, $T_{C}$ = 150°C		-	-	500	μΛ
Gate to E	ody Leakage Current	٧	$V_{\rm GS}$ = ±20 V, $V_{\rm DS}$ = 0 V		-	-	±100	nA
teristics								
Gate Thr	eshold Voltage	١	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA		2.5	3.5	4.5	V
Static Dra	ain to Source On Resistan				-	3.9	4.7	mΩ
Forward	Transconductance				-	170	-	S
haracte	ristics							
Input Cap	pacitance				-	11500	15265	pF
Output C	apacitance			_	-	1120	1500	pF
Reverse	Transfer Capacitance		= f = 1 MHz		-	455	680	pF
Characte	eristics			·				
					-	174	358	ns
	,	· · ·	√ <sub>DD</sub> = 50 V, I <sub>D</sub> = 75 A,	-	-			ns
					-			ns
	,			(Note 4)	-	244	499	ns
Total Gate	e Charge at 10V		/ _ <u>90 \/ I</u> _ 75 A	, ,	-	160	210	nC
	-				-	56	-	nC
Gate to D	rain "Miller" Charge		63 101	(Note 4)	-	36	-	nC
	Charactoristics	I		1		1		
		rce Diode I	Forward Current		-	_	164*	A
					-	-		A
Drain to S	Source Diode Forward Volt		$V_{GS} = 0 V, I_{SD} = 75 A$		-	-	1.25	V
	Recovery Time		$V_{GS} = 0 V, I_{SD} = 75 A,$ $V_{GS} = 0 V, I_{SD} = 75 A,$		-	88	-	ns
Reveiser	Reverse Recovery Charge		$dI_{\rm F}/dt = 100  A/\mu s$		-	245	-	nC
	teristics Drain to S Breakdov Coefficier Zero Gate Gate to B teristics Gate Thr Static Dra Static Dra Forward Haracter Input Cap Output Ca Output Ca Output Ca Output Ca Output Ca Character Turn-On I Turn-On I Turn-Of I Turn-Of I Turn-Of I Turn-Of I State to S Gate to D Ce Diode	Parameter   teristics   Drain to Source Breakdown Voltage   Breakdown Voltage Temperature   Coefficient   Zero Gate Voltage Drain Current   Gate to Body Leakage Current   teristics   Gate Threshold Voltage   Static Drain to Source On Resistan   Forward Transconductance   haracteristics   Input Capacitance   Output Capacitance   Qutput Capacitance   Characteristics   Turn-On Delay Time   Turn-On Rise Time   Turn-Off Fall Time   Total Gate Charge at 10V   Gate to Source Gate Charge   Gate to Drain "Miller" Charge   ce Diode Characteristics   Maximum Continuous Drain to Source	Parameter   teristics   Drain to Source Breakdown Voltage I   Breakdown Voltage Temperature Coefficient I   Breakdown Voltage Temperature Coefficient I   Zero Gate Voltage Drain Current I   Gate to Body Leakage Current I   teristics I   Gate Threshold Voltage I   Static Drain to Source On Resistance I   Forward Transconductance I   haracteristics I   Input Capacitance I   Output Capacitance I   Characteristics I   Turn-On Delay Time I   Turn-On Rise Time I   Turn-Off Fall Time I   Total Gate Charge at 10V I   Gate to Source Gate Charge I   Gate to Drain "Miller" Charge I   Maximum Continuous Drain to Source Diode I	teristicsDrain to Source Breakdown VoltageID = 250 $\mu$ A, VGS = 0 V,Breakdown Voltage TemperatureID = 250 $\mu$ A, ReferencedCoefficientVDS = 100 V, VGS = 0 V,Zero Gate Voltage Drain CurrentVDS = 100 V, VGS = 0 V,Gate to Body Leakage CurrentVGS = ±20 V, VDS = 0 V,Gate Threshold VoltageVGS = ±20 V, VDS = 0 V,Static Drain to Source On ResistanceVGS = 10 V, ID = 75 A,Forward TransconductanceVDS = 10 V, ID = 75 A,Input CapacitanceVDS = 10 V, ID = 75 A,Output CapacitanceVDS = 25 V, VGS = 0 V,f = 1 MHzTurn-On Delay TimeTurn-On Rise TimeVDD = 50 V, ID = 75 A,Turn-Off Delay TimeVDS = 10 V, ID = 75 A,Turn-Off Fall TimeVDS = 10 V, ID = 75 A,Total Gate Charge at 10VVDS = 80 V, ID = 75 A,VGS = 10 VVDS = 80 V, ID = 75 A,VGS = 10 VVGS = 10 VVDS = 10 VVDS = 80 V, ID = 75 A,VGS = 10 VVGS = 10 VVGS = 10 VVGS = 10 VVDS = 80 V, ID = 75 A,VGS = 10 VVGS	ParameterTest ConditionsteristicsDrain to Source Breakdown Voltage $I_D = 250 \ \mu\text{A}, \ V_{GS} = 0 \ V, \ T_J = 25^{\circ}\text{C}$ Breakdown Voltage Temperature Coefficient $I_D = 250 \ \mu\text{A}, \ Referenced to 25^{\circ}\text{C}$ Zero Gate Voltage Drain Current $V_{DS} = 100 \ V, \ V_{GS} = 0 \ V$ Qate to Body Leakage Current $V_{GS} = 100 \ V, \ V_{GS} = 0 \ V, \ T_C = 150^{\circ}\text{C}$ Gate to Body Leakage Current $V_{GS} = 250 \ \mu\text{A}, \ P_{GS} = 0 \ V, \ T_D = 75 \ A$ Gate Threshold Voltage $V_{GS} = 10 \ V, \ I_D = 75 \ A$ Forward Transconductance $V_{DS} = 10 \ V, \ I_D = 75 \ A$ Porward TransconductanceV_{DS} = 25 \ V, \ V_{GS} = 0 \ V, \ f = 1 \ MHzInput CapacitanceQutput CapacitanceV_{DS} = 25 \ V, \ V_{GS} = 0 \ V, \ f = 1 \ MHzCharacteristicsTurn-On Delay Time(Note 4)V_{DS} = 80 \ V, \ I_D = 75 \ A, \ V_{GS} = 10 \ V, \ R_G = 25 \ \Omega(Note 4)Total Gate Charge at 10VV_{DS} = 80 \ V, \ I_D = 75 \ A, \ V_{GS} = 10 \ VGate to Drain "Miller" Charge(Note 4)	ParameterTest ConditionsMin.teristicsDrain to Source Breakdown Voltage $I_D = 250 \ \mu$ A, $V_{GS} = 0 \ V, \ T_J = 25^{\circ}C$ 100Breakdown Voltage Temperature Coefficient $I_D = 250 \ \mu$ A, Referenced to $25^{\circ}C$ -Zero Gate Voltage Drain Current $V_{DS} = 100 \ V, \ V_{GS} = 0 \ V, \ T_C = 150^{\circ}C$ -Gate to Body Leakage Current $V_{GS} = 420 \ V, \ V_{DS} = 0 \ V$ -Gate to Body Leakage Current $V_{GS} = 420 \ V, \ V_{DS} = 0 \ V$ -Gate Threshold Voltage $V_{GS} = 100 \ V, \ I_D = 75 \ A$ -Gate Threshold Voltage $V_{GS} = 10 \ V, \ I_D = 75 \ A$ -Forward Transconductance $V_{DS} = 10 \ V, \ I_D = 75 \ A$ -Input Capacitance $V_{DS} = 25 \ V, \ V_{GS} = 0 \ V, \ -$ -Output Capacitance $V_{DS} = 25 \ V, \ V_{GS} = 0 \ V, \ -$ -Turn-On Delay Time $V_{DS} = 50 \ V, \ I_D = 75 \ A, \ -$ -Turn-Off Belay Time $V_{DS} = 50 \ V, \ I_D = 75 \ A, \ -$ -Turn-Off Fall Time $V_{DS} = 80 \ V, \ I_D = 75 \ A, \ -$ -Turn-Off Fall Time $V_{DS} = 80 \ V, \ I_D = 75 \ A, \ -$ -Gate to Source Gate Charge $V_{DS} = 80 \ V, \ I_D = 75 \ A, \ -$ -Gate to Drain "Miller" Charge $(Note 4)$ -Characteristics $V_{DS} = 10 \ V \ CS = 10 \ V, \ CS = 10 \ V \ CS = 10 \ V, \ CS = 10 $	$\begin{tabular}{ c c c c c } \hline Parameter & Test Conditions & Min. Typ. \\ \hline teristics \\ \hline \begin{tabular}{ c c c c } \hline Test Conditions & Min. Typ. \\ \hline teristics & & & & & & & & & & & & & & & & & & &$	$\begin{tabular}{ c c c c } \hline Parameter Test Conditions Min. Typ. Max. \\ \hline teristics \\ \hline \begin{tabular}{ c c c c } \hline Test Source Breakdown Voltage II_b = 250 \mbox{ $\mu$, $V_{GS} = 0 \mbox{ $V$, $V_{J} = 25^{\circ}C$} & 100 & - & - \\ \hline \begin{tabular}{ c c c c } \hline Drain to Source Breakdown Voltage Temperature II_b = 250 \mbox{ $\mu$, $Referenced to $25^{\circ}C$} & - & 0.1 & - \\ \hline \begin{tabular}{ c c c c } \hline Test Source Breakdown Voltage Temperature II_b = 250 \mbox{ $\mu$, $Referenced to $25^{\circ}C$} & - & 0.1 & - \\ \hline \begin{tabular}{ c c c } \hline Test Source V \begin{tabular}{ c c c } \hline V_{DS} = 100 \begin{tabular}{ c c c } V_{DS} = 0 \begin{tabular}{ c c c } \hline V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 0 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 0 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 0 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 250 \begin{tabular}{ c c } V_{DS} = 250 \begin{tabular}{ c c } V_{DS} = 250 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 100 \begin{tabular}{ c c c } V_{DS} = 100 \begin{tabular}{ c c } V_{DS} = 100 tabu$

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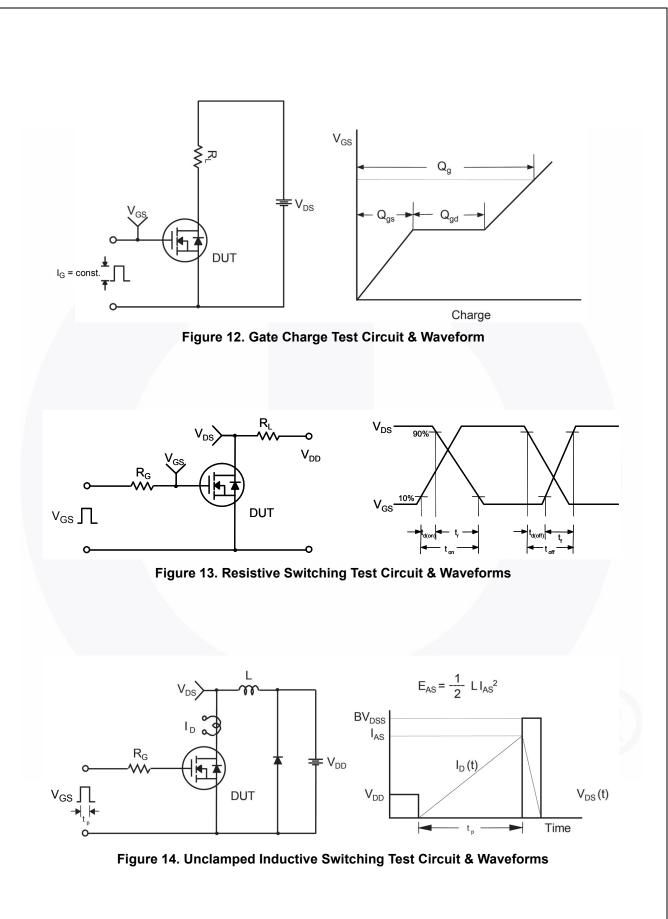
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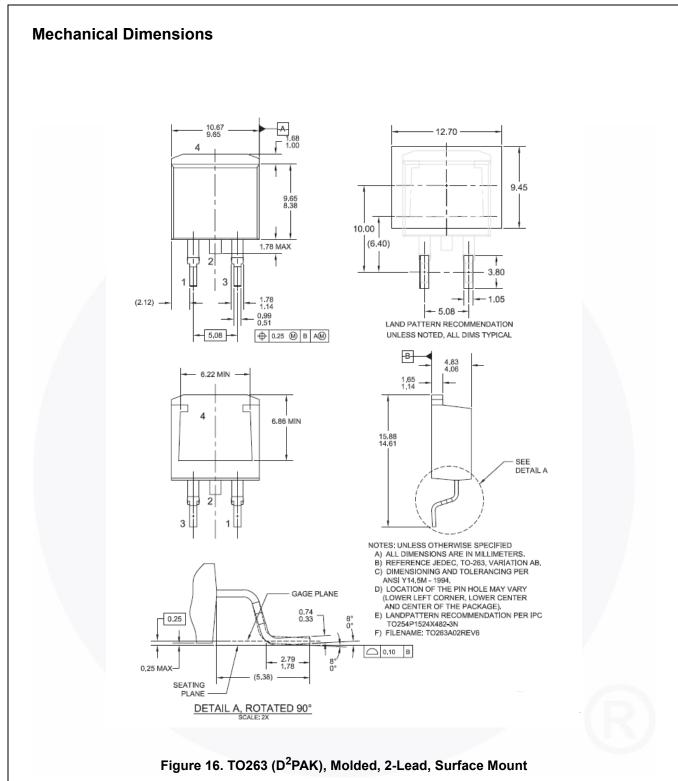


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DUT +  $V_{DS}$ a ۱<sub>SD</sub> م L Driver R<sub>G</sub>, Same Type as DUT L F ∨<sub>DD</sub>  $\prod V_{GS}$ • dv/dt controlled by R<sub>G</sub> • I<sub>SD</sub> controlled by pulse period Î Gate Pulse Width V<sub>GS</sub> D = Gate Pulse Period 10V (Driver) I<sub>FM</sub>, Body Diode Forward Current I <sub>SD</sub> di/dt (DUT)  $I_{RM}$ Body Diode Reverse Current  $V_{DS}$ (DUT) Body Diode Recovery dv/dt  $V_{SD}$ V<sub>DD</sub> Body Diode Forward Voltage Drop Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

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