

FDB047N10 N-Channel PowerTrench[®] MOSFET 100V, 164A, 4.7m Ω

Description

- $R_{DS(on)} = 3.9 m\Omega$ (Typ.) @ $V_{GS} = 10V$, $I_D = 75A$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low R_{DS(on)}
- High power and current handing capability
- RoHS compliant



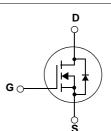
General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Application

• DC to DC converters / Synchronous Rectification





MOSFET Maximum Ratings T_C = 25°C unless otherwise noted*

Symbol	Parameter			Ratings	Units
V _{DSS}	Drain to Source Voltage			100	V
V _{GSS}	Gate to Source Voltage			±20	V
	Drain Current -	icon Limited)	164*	А	
I _D	 Continuous (T_C = 100°C, Silicon Limited) Continuous (T_C = 25°C, Package Limited) 			116*	А
				120	А
I _{DM}	Drain Current	- Pulsed	(Note 1)	656*	А
E _{AS}	Single Pulsed Avalanche Energy (Note 2)		(Note 2)	1153	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)		(Note 3)	4.5	V/ns
P _D	Deven Dissistenties	$(T_{C} = 25^{\circ}C)$		375	W
	Power Dissipation	- Derate above 25°C		2.5	W/ºC
T _J , T _{STG}	Operating and Storage Temperature Range			-55 to +175	°C
TL	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds			300	°C

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

Thermal Characteristics

Symbol	Parameter	Ratings	Units
$R_{ ext{ heta}JC}$	Thermal Resistance, Junction to Case	0.4	°C/W
$R_{ ext{ heta}JA}$	Thermal Resistance, Junction to Ambient	62.5	°C/vv

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5265	pF	MO
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358	ns	
782	ns	
698	ns	
499	ns	
210	nC	
-	nC	
-	nC	
	LI	
164	Α	
656	A	
.25	V	
-	ns	
-	nC	

_		Package	e	Reel Size	Таре	e Width		Quantit	у	
		D2-PAK	(330mm	2	4mm		800		
Electrica	I Char	acteristics T _c =	25°C unless o	otherwise no	oted					
Symbol		Parameter			est Conditions	5	Min.	Тур.	Max.	Units
Off Charac	teristic	s								
BV _{DSS}	Drain to	Source Breakdown V	oltage	I _D = 250μA	, V _{GS} = 0V, T _J	= 25°C	100	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_{J}}$	Breakdo Coeffici	own Voltage Temperat ent	ure		, Referenced to	o 25°C	-	0.1	-	V/°C
I _{DSS}	Zero Ga	ate Voltage Drain Curre	ent		/, V _{GS} = 0V /, V _{GS} = 0V, T _C	= 150°C	-	-	1 500	μA
I _{GSS}	Gate to	Body Leakage Curren	ıt		/, V _{DS} = 0V		-	-	±100	nA
On Charac	teristic	S								
V _{GS(th)}	Gate Th	nreshold Voltage		$V_{CS} = V_{DS}$, I _D = 250μA		2.5	3.5	4.5	V
R _{DS(on)}		rain to Source On Res	sistance	$V_{GS} = 10V$			-	3.9	4.7	mΩ
9FS		d Transconductance		$V_{DS} = 10V_{CS}$		(Note 4)	-	170	-	S
Dynamic C	haracte	vietice		20	5			I		
C _{iss}	1	apacitance					-	11500	15265	pF
C _{oss}	-	Capacitance		$V_{DS} = 25V, V_{GS} = 0V$ f = 1MHz		_	1120	1500	pF	
C _{rss}		e Transfer Capacitance	9			-	455	680	pF	
Switching	Charac	teristics		L		I			I	
t _{d(on)}	1	Delay Time					-	174	358	ns
t _r	Turn-Or	Rise Time		V _{DD} = 50V	I _D = 75A	_	-	386	782	ns
t _{d(off)}	Turn-Of	f Delay Time		V _{GS} = 10V	, $R_{GEN} = 25\Omega$		-	344	698	ns
t _f	Turn-Of	f Fall Time				(Note 4, 5)	-	244	499	ns
Q _{g(tot)}	Total Ga	ate Charge at 10V		$V_{} = 80V_{}$	I_ = 75A		-	160	210	nC
Q _{gs}	Gate to	Source Gate Charge		V _{DS} = 80V, I _D = 75A V _{GS} = 10V		-	56	-	nC	
Q _{gd}	Gate to	Drain "Miller" Charge		60		(Note 4, 5)	-	36	-	nC
Drain-Sou	ce Dioc	de Characteristic	S							
I _S	Maximu	m Continuous Drain to	Source Diode	Forward C	urrent		-	-	164	Α
I _{SM}		m Pulsed Drain to Sou					-	-	656	Α
V _{SD}	Drain to	Source Diode Forward	d Voltage	$V_{GS} = 0V,$	_{SD} = 75A		-	-	1.25	V
t _{rr}		Recovery Time	-	$V_{GS} = 0V,$	-		-	88	-	ns
Q _{rr}	Reverse	Recovery Charge		$dI_F/dt = 100$		(Note 4)	-	245	-	nC
2. L = 0.41mH, I _{AS} 3. I _{SD} ≤ 75A, di/dt 4. Pulse Test: Puls	s = 75A, V _{DD} ≤ 200A/μs, V se width ≤ 300	h limited by maximum junction = 50V, $R_G = 25\Omega$, Starting T_J : $_{DD} \leq BV_{DSS}$, Starting $T_J = 25^{\circ}$ $\Omega\mu$ s, Duty Cycle $\leq 2\%$ perating Temperature Typical	= 25°C C							

Typical Performance Characteristics Figure 1. On-Region Characteristics 300 7٧ 8V 6.5 \ 10V l_o,Drain Current[A] 00 6.0 V 5.5 V $V_{GS} = 5V$ *Notes: 10 1. 250µs Pulse Test 2. $T_{C} = 25^{\circ}C$ 6 0.1 1 5 V_{DS},Drain-Source Voltage[V] Figure 3. On-Resistance Variation vs. **Drain Current and Gate Voltage** 10 8 Drain-Source On-Resistance Is, Reverse Drain Current [A] $R_{DS(ON)}$ [m Ω], 6 $V_{GS} = 10V$ 4 $V_{GS} = 20V$ 2 *Note: T_J = 25°C 0 0 100 200 300 400 ID, Drain Current [A] **Figure 5. Capacitance Characteristics** 16000 $C_{iss} = C_{gs} + C_{gd} (C_{ds} = shorted)$ $C_{OSS} = C_{dS} + C_{gd}$ 14000 Ciss C_{rss} = C_{gd} 12000 Capacitances [pF] 10000 *Note: 1. $V_{GS} = 0V$ 8000 2. f = 1MHz Coss 6000 4000 Crss 2000 0 0.1 1 10 30 V_{DS}, Drain-Source Voltage [V]

Figure 2. Transfer Characteristics

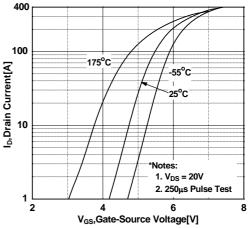


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

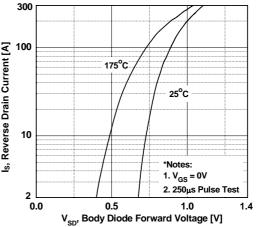
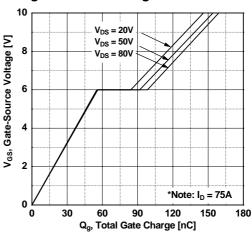
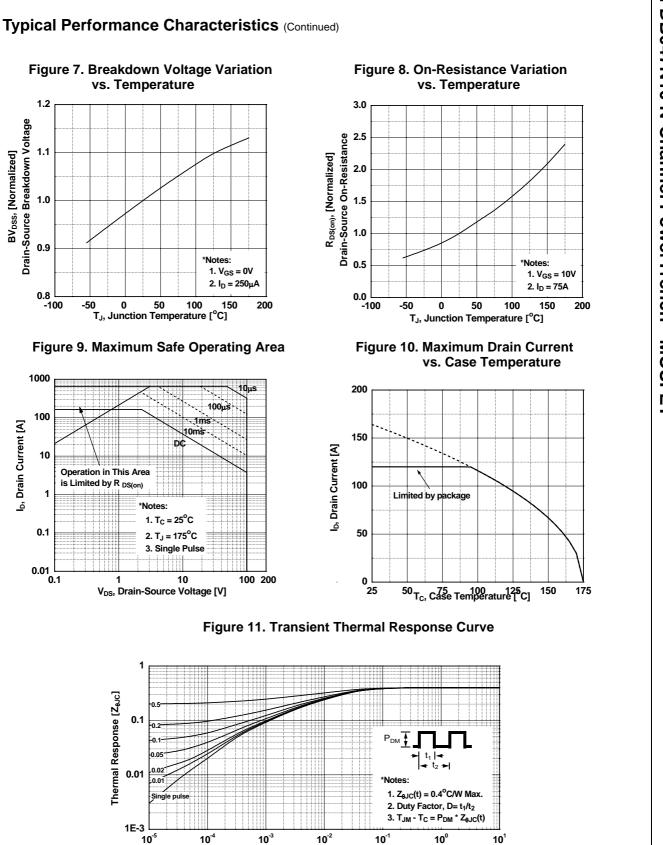


Figure 6. Gate Charge Characteristics





1.2

1.1

1.0

0.9

0.8

1000

100

10

1

0.1

0.01 L 0.1

1

Thermal Response [Z_{0JC}]

b, Drain Current [A]

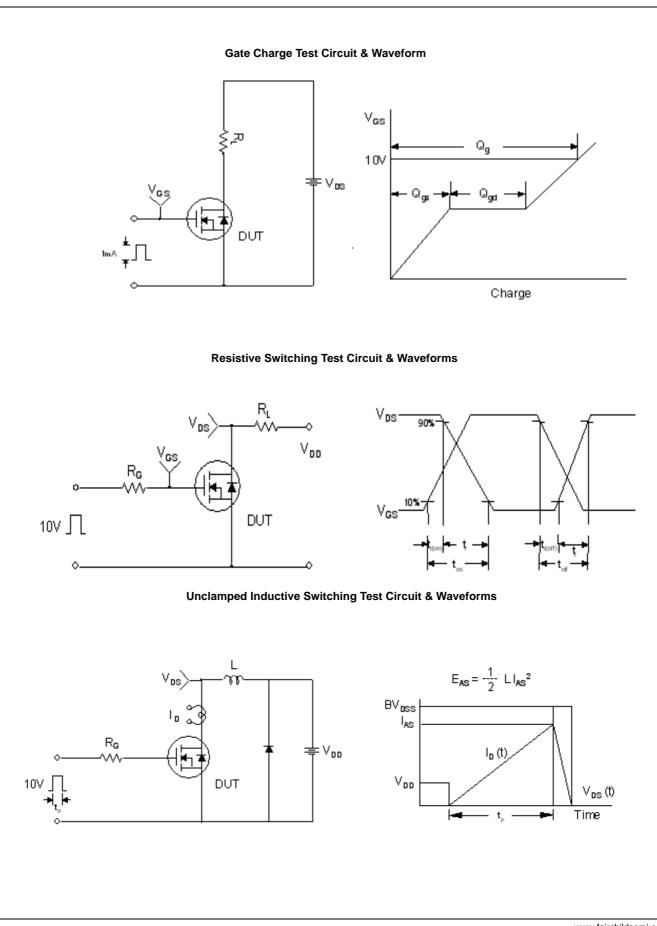
-100

-50

Drain-Source Breakdown Voltage

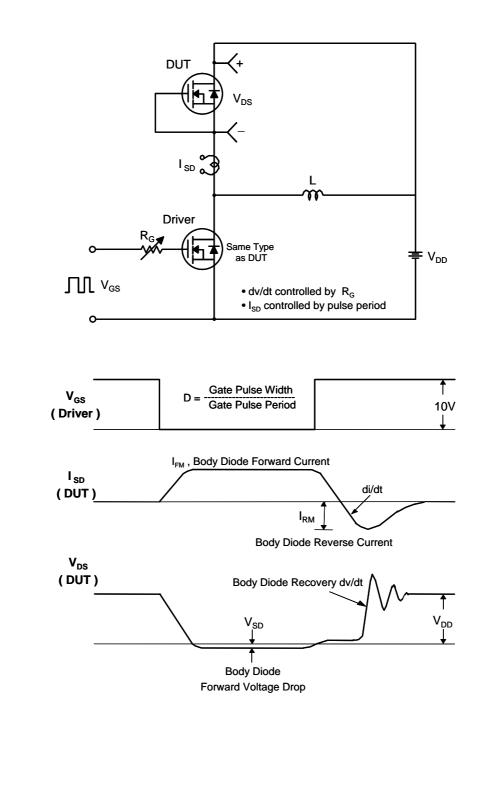
BV_{DSS}, [Normalized]

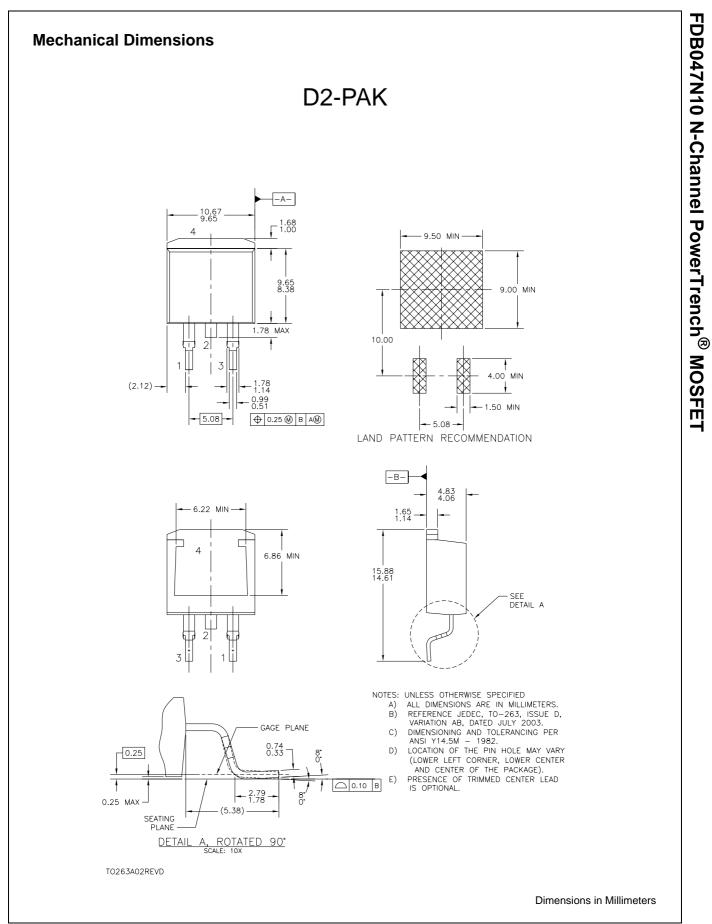
Rectangular Pulse Duration [sec]



FDB047N10 N-Channel PowerTrench[®] MOSFET

Peak Diode Recovery dv/dt Test Circuit & Waveforms







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