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January 2003

FDV305N

20V N-Channel PowerTrench[®] MOSFET

General Description

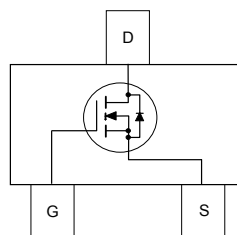
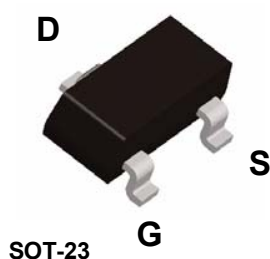
This 20V N-Channel MOSFET uses Fairchild's high voltage PowerTrench process. It has been optimized for power management applications.

Applications

- Load switch
- Battery protection
- Power management

Features

- 0.9 A, 20 V $R_{DS(ON)} = 220 \text{ m}\Omega @ V_{GS} = 4.5 \text{ V}$
 $R_{DS(ON)} = 300 \text{ m}\Omega @ V_{GS} = 2.5 \text{ V}$
- Low gate charge
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_D	Drain Current – Continuous	0.9	A
	– Pulsed	2	
P_D	Maximum Power Dissipation	0.35	W
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	$^\circ\text{C/W}$
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Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
305	FDV305N	7"	8mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		15		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 12\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = -12\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	0.6	1	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		-3		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 4.5\text{ V}, I_D = 0.9\text{ A}$ $V_{GS} = 2.5\text{ V}, I_D = 0.7\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 0.9\text{ A}, T_J = 125^\circ\text{C}$		164 235 220	220 300 303	m Ω
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$	1			A
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 0.9\text{ A}$		3		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		109		pF
C_{oss}	Output Capacitance			30		pF
C_{rss}	Reverse Transfer Capacitance			14		pF

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 10\text{ V}, I_D = 1\text{ A},$ $V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$		4.5	9	ns
t_r	Turn–On Rise Time			7	14	ns
$t_{d(off)}$	Turn–Off Delay Time			8	16	ns
t_f	Turn–Off Fall Time			1.4	2.8	ns
Q_g	Total Gate Charge	$V_{DS} = 10\text{ V}, I_D = 0.9\text{ A},$ $V_{GS} = 4.5\text{ V}$		1.1	1.5	nC
Q_{gs}	Gate–Source Charge			0.26		nC
Q_{gd}	Gate–Drain Charge			0.26		nC

Drain–Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain–Source Diode Forward Current				0.29	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 0.29\text{ A}$		0.75	1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 0.9\text{ A},$ $d_{IF}/d_t = 100\text{ A}/\mu\text{s}$		7.4		nS
Q_{rr}	Diode Reverse Recovery Charge			2.2		nC

Notes:

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$

Typical Characteristics

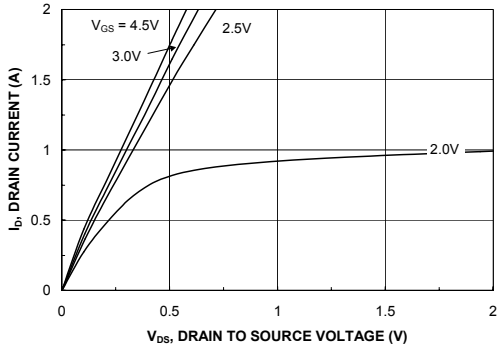


Figure 1. On-Region Characteristics.

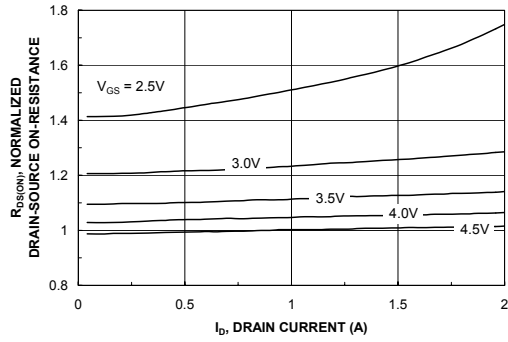


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

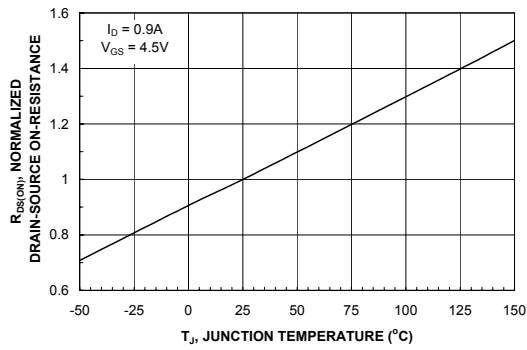


Figure 3. On-Resistance Variation with Temperature.

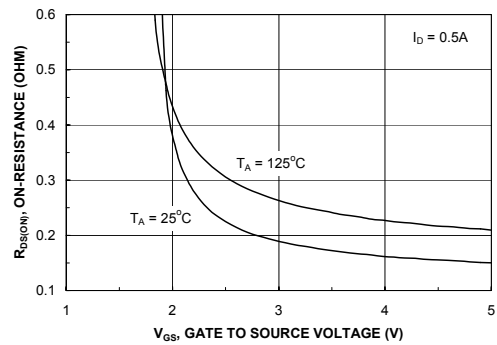


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

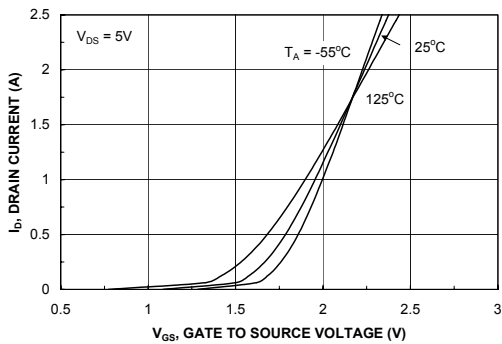


Figure 5. Transfer Characteristics.

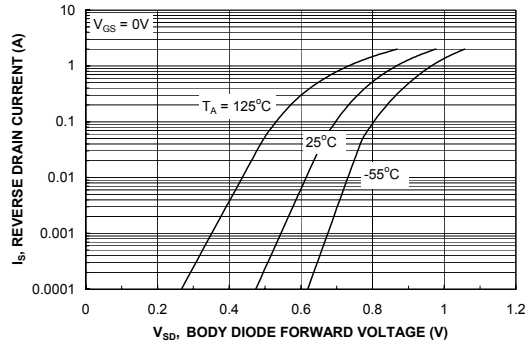


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

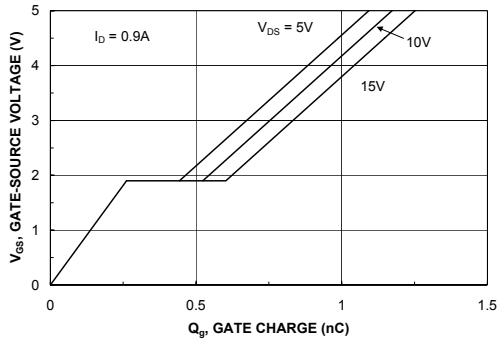


Figure 7. Gate Charge Characteristics.

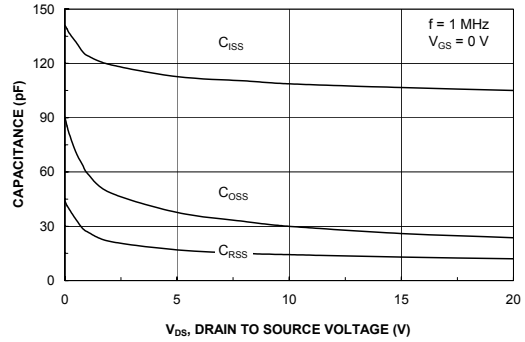


Figure 8. Capacitance Characteristics.

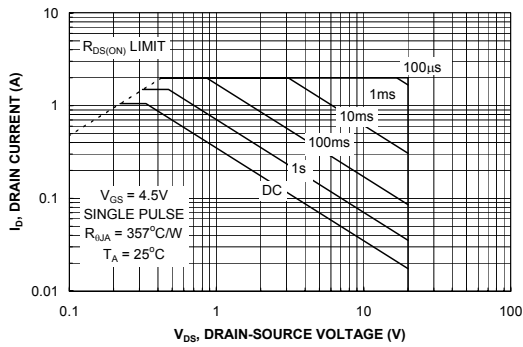


Figure 9. Maximum Safe Operating Area.

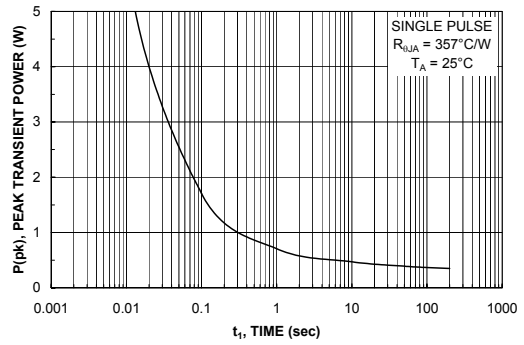


Figure 10. Single Pulse Maximum Power Dissipation.

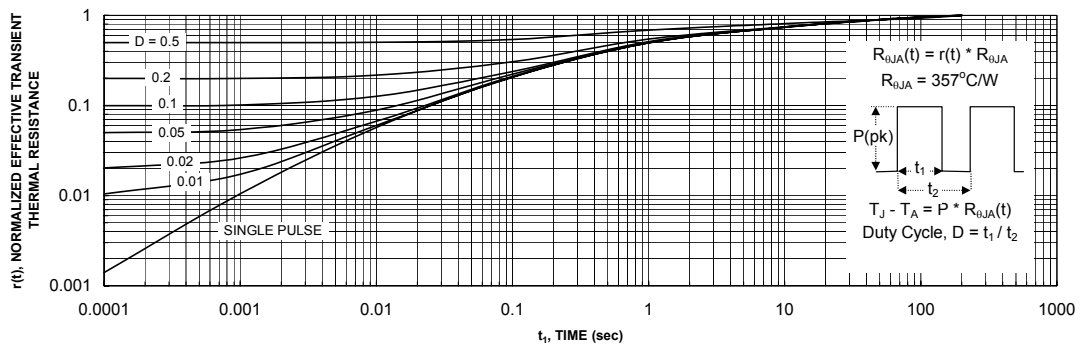


Figure 11. Transient Thermal Response Curve.

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CROSSVOLT™	FRFET™	MicroPak™	QFET™	SuperSOT™-8
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Programmable Active Droop™	OPTOPLANAR™	OPTOPLANAR™	SMART START™	

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