FAIRCHILD SEMICONDUCTOR®

October 2001

FDV305N

20V N-Channel PowerTrench® MOSFET

General Description

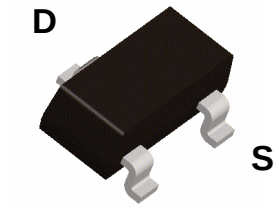
This 20V N-Channel MOSFET uses Fairchild's high voltage PowerTrench process. It has been optimized for power management applications.

Applications

- Load switch
- Battery protection
- Power management

Features

- 0.9 A, 20 V $R_{DS(ON)}$ = 220 mΩ @ V_{GS} = 4.5 V
  $R_{DS(ON)}$ = 300 mΩ @ V_{GS} = 2.5 V
- Low gate charge (11 nC typical)
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$



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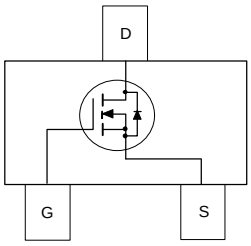

Absolute Maximum Ratings T_A=25°C unless otherwise noted

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	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	°C/W

Package Marking and Ordering Information

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

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		15		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 12 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –12 V, V_{DS} = 0 V			–100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.6	1	1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA,Referenced to 25°C		–3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 4.5 V, I_D = 0.9 A V_{GS} = 2.5 V, I_D = 0.7 A V_{GS} = 4.5V, I_D = 0.9 A, T_J = 125°C		164 235 220	220 300 303	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 4.5V, V_{DS} = 5 V	1			A
g_{FS}	Forward Transconductance	V_{DS} = 5V, I_D = 0.9 A		3		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 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 V, I_D = 1 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		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 V, I_D = 0.9 A, V_{GS} = 4.5 V		11	15	nC
Q_{gs}	Gate–Source Charge			2.6		nC
Q_{gd}	Gate–Drain Charge			2.7		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 V, I_S = 0.29 A		0.75	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 0.9 A, d_{iF}/d_t = 100 A/µs		7.4		nS
Q_{rr}	Diode Reverse Recovery Charge			2.2		nC

Notes:

1. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Typical Characteristics

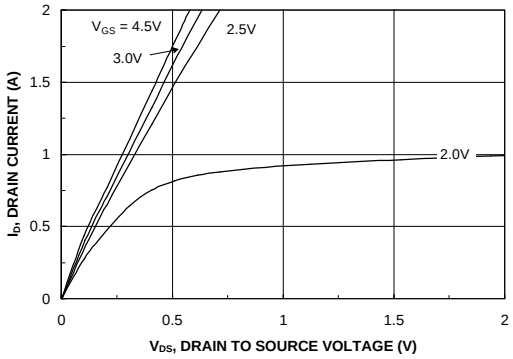

Figure 1. On-Region Characteristics.

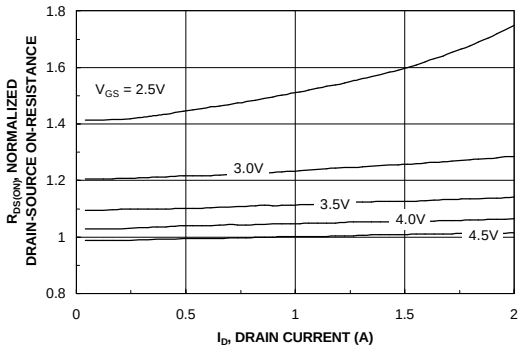

Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

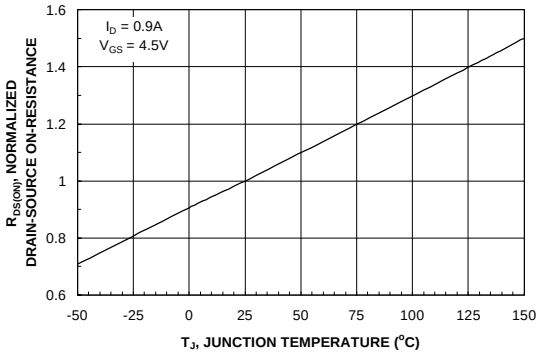

Figure 3. On-Resistance Variation with Temperature.

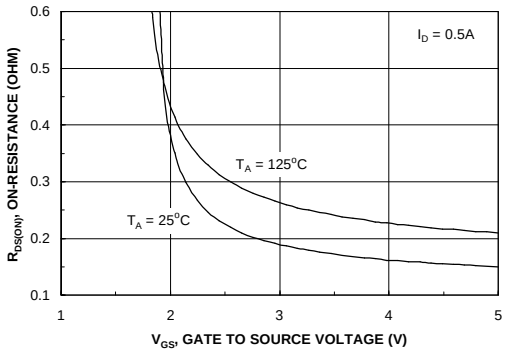

Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

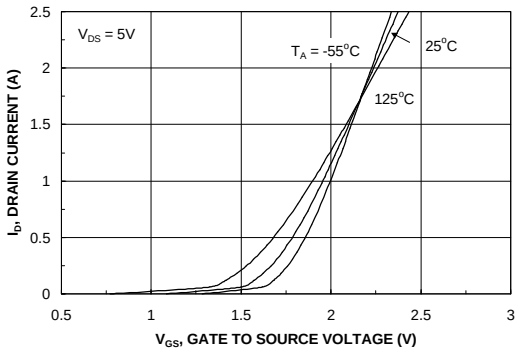

Figure 5. Transfer Characteristics.

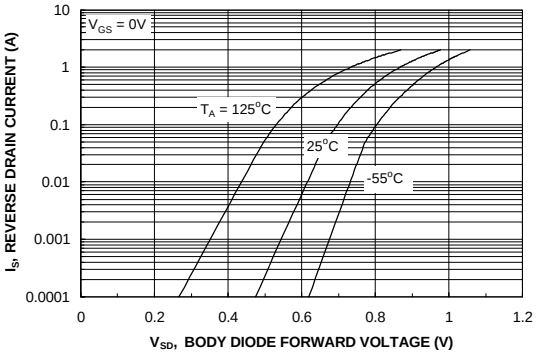

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

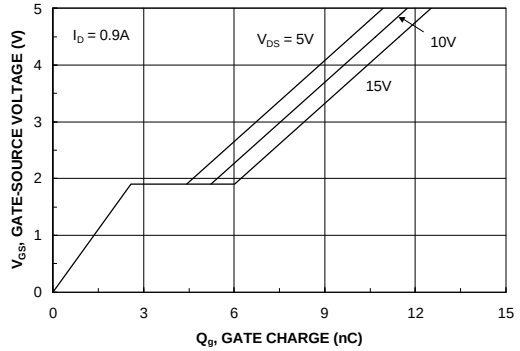

Figure 7. Gate Charge Characteristics.

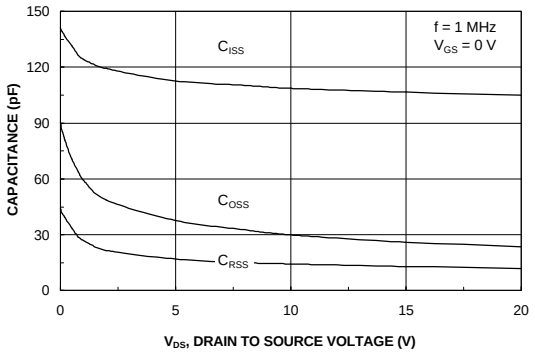

Figure 8. Capacitance Characteristics.

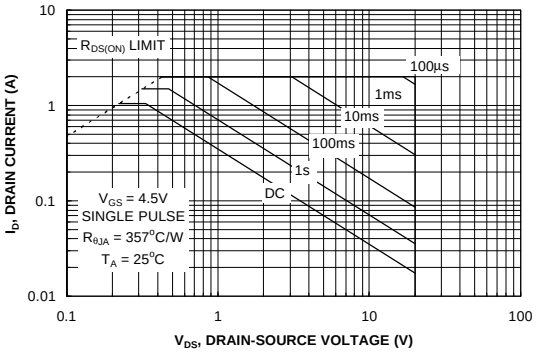

Figure 9. Maximum Safe Operating Area.

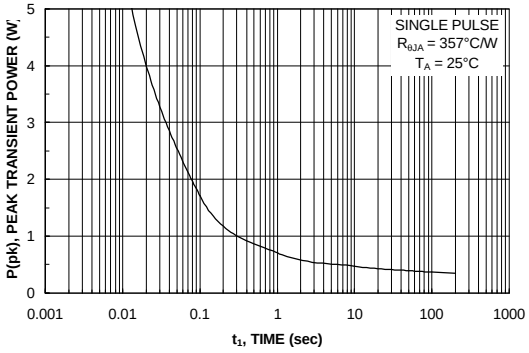

Figure 10. Single Pulse Maximum Power Dissipation.

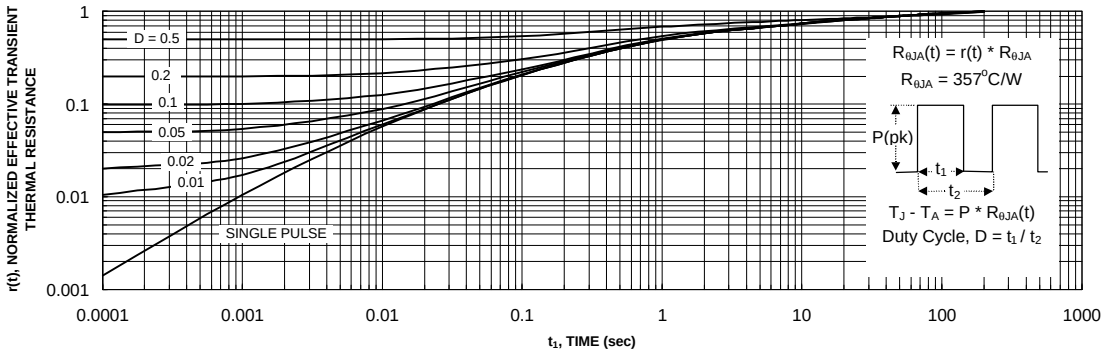

Figure 11. Transient Thermal Response Curve.
Transient thermal response will change depending on the circuit board design.

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