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# FDV305N

## 20V N-Channel PowerTrench® MOSFET

### General Description

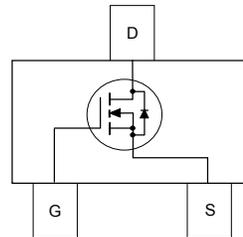
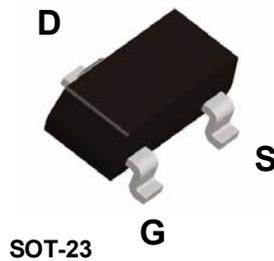
This 20V N-Channel MOSFET uses Fairchild's high voltage PowerTrench process. It has been optimized for power management applications.

### 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<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	20	V
V <sub>GSS</sub>	Gate-Source Voltage	± 12	V
I <sub>D</sub>	Drain Current – Continuous	0.9	A
	– Pulsed	2	
P <sub>D</sub>	Maximum Power Dissipation	0.35	W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	–55 to +150	°C

### Thermal Characteristics

R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	357	°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 $25^\circ\text{C}$		15		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSSF}$	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 $25^\circ\text{C}$		-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 $\Omega$
$I_{D(on)}$	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	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$		109		pF
$C_{oss}$	Output Capacitance	$f = 1.0\text{ MHz}$		30		pF
$C_{rss}$	Reverse Transfer Capacitance			14		pF

**Switching Characteristics** (Note 2)

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 10\text{ V}, I_D = 1\text{ A},$		4.5	9	ns
$t_r$	Turn–On Rise Time	$V_{GS} = 4.5\text{ V}, R_{GEN} = 6\ \Omega$		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	$V_{DS} = 10\text{ V}, I_D = 0.9\text{ A},$		1.1	1.5	nC
$Q_{gs}$	Gate–Source Charge	$V_{GS} = 4.5\text{ V}$		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	$I_F = 0.9\text{ A},$		7.4		nS
$Q_{rr}$	Diode Reverse Recovery Charge	$dI_F/dt = 100\text{ A}/\mu\text{s}$		2.2		nC

**Notes:**

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

### Typical Characteristics

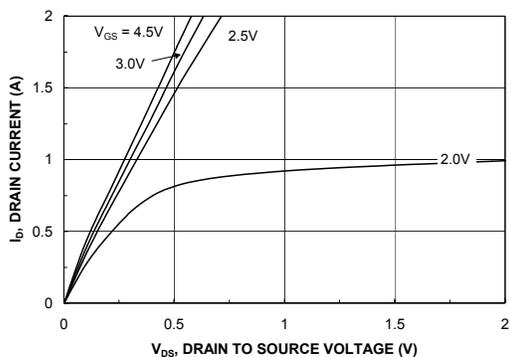


Figure 1. On-Region Characteristics.

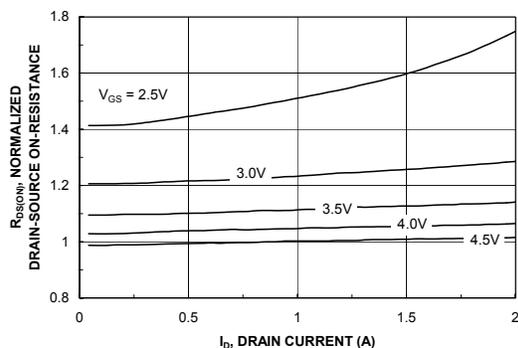


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

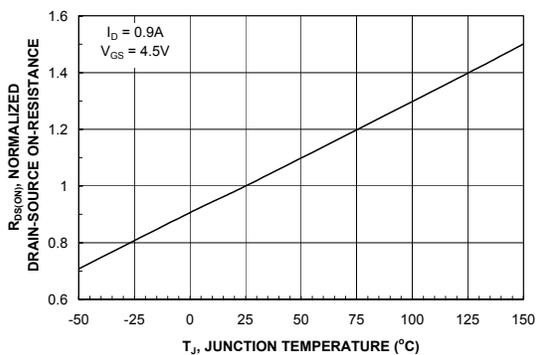


Figure 3. On-Resistance Variation with Temperature.

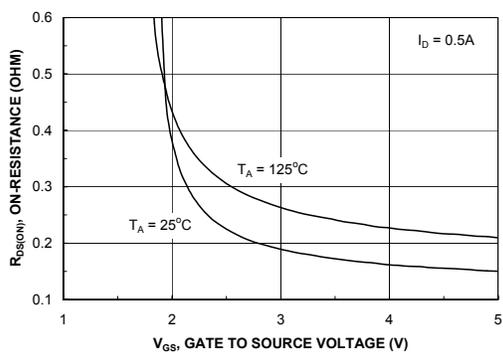


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

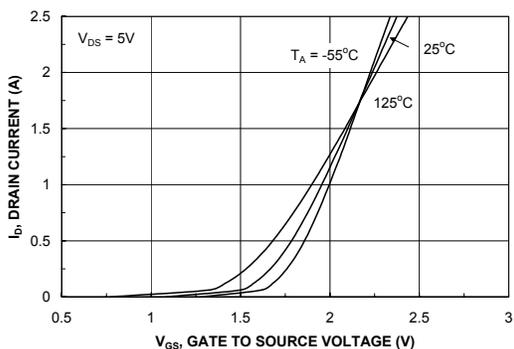


Figure 5. Transfer Characteristics.

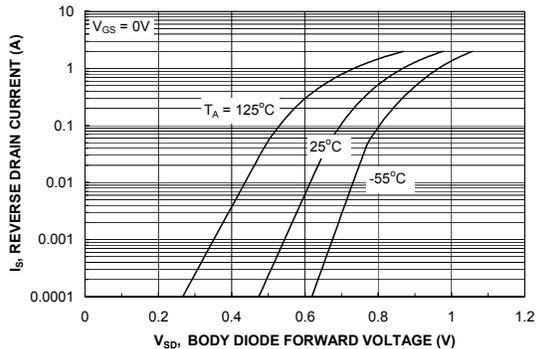


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

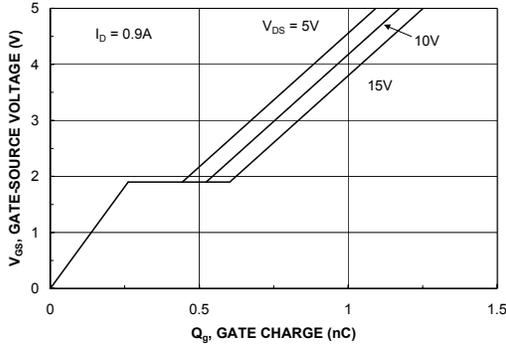


Figure 7. Gate Charge Characteristics.

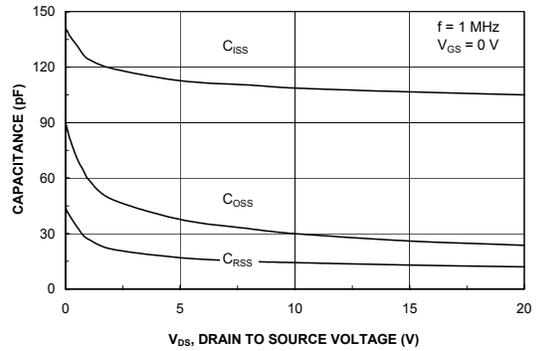


Figure 8. Capacitance Characteristics.

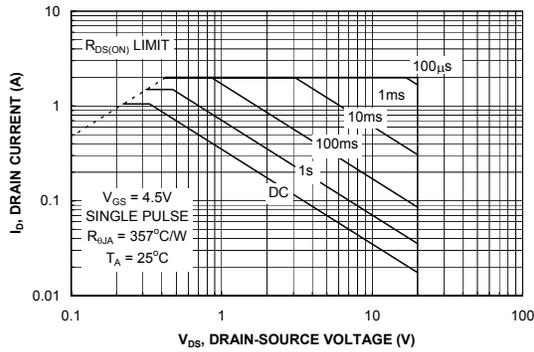


Figure 9. Maximum Safe Operating Area.

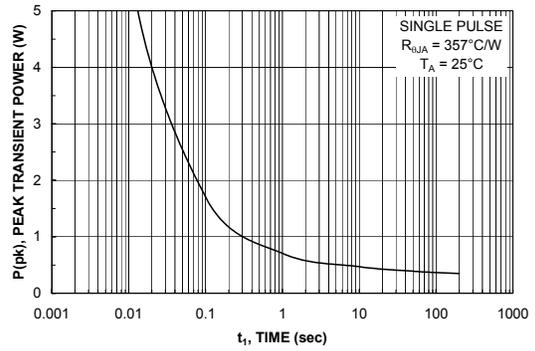


Figure 10. Single Pulse Maximum Power Dissipation.

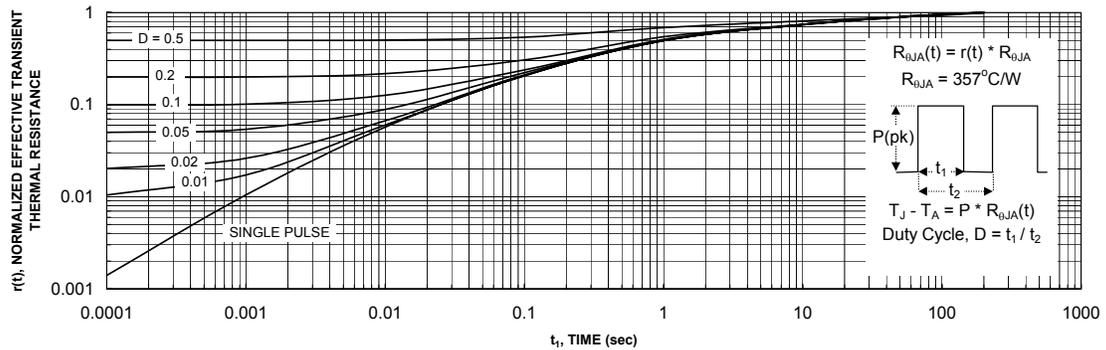


Figure 11. Transient Thermal Response Curve.

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