FAIRCHILD
SEMICONDUCTOR ™

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FDV301N
Digital FET , N-Channel

General Description

This N-Channel logic level enhancement mode field effect transistor is produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for digital transistors. Since bias resistors are not required, this one N-channel FET can replace several different digital transistors, with different bias resistor values.

Features

■ 25 V, 0.22 A continuous, 0.5 A Peak.
$R_{DS(ON)} = 5\ \Omega$ @ $V_{GS} = 2.7$ V
$R_{DS(ON)} = 4\ \Omega$ @ $V_{GS} = 4.5$ V.

■ Very low level gate drive requirements allowing direct operation in 3V circuits. $V_{GS(th)} < 1.06$V.

■ Gate-Source Zener for ESD ruggedness.
>6kV Human Body Model

■ Replace multiple NPN digital transistors with one DMOS FET.

| SOT-23 | SuperSOT™-6 | SuperSOT™-8 | SO-8 | SOT-223 | SOIC-16 |

Mark:301

SOT-23

INVERTER APPLICATION
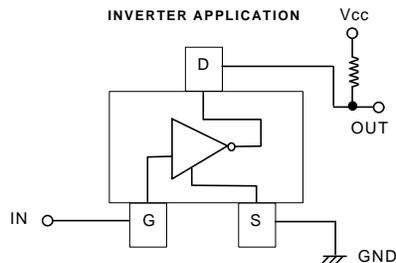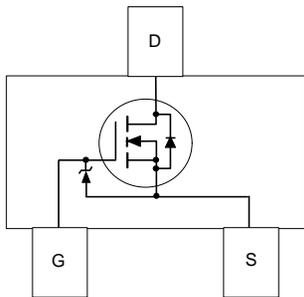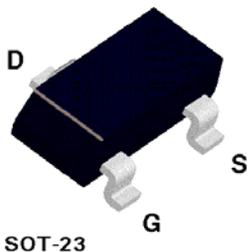
Absolute Maximum Ratings $T_A = 25^{\circ}C$ unless other wise noted

Symbol	Parameter	FDV301N	Units
V_{DSS}, V_{CC}	Drain-Source Voltage, Power Supply Voltage	25	V
V_{GSS}, V_I	Gate-Source Voltage, V_{IN}	8	V
I_D, I_O	Drain/Output Current - Continuous	0.22	A
		0.5	
P_D	Maximum Power Dissipation	0.35	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 150	°C
ESD	Electrostatic Discharge Rating MIL-STD-883D Human Body Model (100pf / 1500 Ohm)	6.0	kV
THERMAL CHARACTERISTICS			
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	357	°C/W

Inverter Electrical Characteristics ($T_A = 25\,°C$ unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$I_{O\,(off)}$	Zero Input Voltage Output Current	$V_{CC} = 20$ V, $V_I = 0$ V			1	µA
$V_{I\,(off)}$	Input Voltage	$V_{CC} = 5$ V, $I_O = 10$ µA			0.5	V
$V_{I\,(on)}$		$V_O = 0.3$ V, $I_O = 0.005$ A	1			V
$R_{O\,(on)}$	Output to Ground Resistance	$V_I = 2.7$ V, $I_O = 0.2$ A		4	5	Ω

Electrical Characteristics ($T_A = 25\,°C$ unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
OFF CHARACTERISTICS							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0$ V, $I_D = 250$ µA		25			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = 250$ µA, Referenced to 25 °C			25		mV / °C
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 20$ V, $V_{GS} = 0$ V				1	µA
			$T_J = 55°C$			10	µA
I_{GSS}	Gate - Body Leakage Current	$V_{GS} = 8$ V, $V_{DS} = 0$ V				100	nA
ON CHARACTERISTICS (Note)							
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = 250$ µA, Referenced to 25 °C			-2.1		mV / °C
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250$ µA		0.70	0.85	1.06	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS} = 2.7$ V, $I_D = 0.2$ A			3.8	5	Ω
			$T_J = 125°C$		6.3	9	
		$V_{GS} = 4.5$ V, $I_D = 0.4$ A			3.1	4	
$I_{D(ON)}$	On-State Drain Current	$V_{GS} = 2.7$ V, $V_{DS} = 5$ V		0.2			A
g_{FS}	Forward Transconductance	$V_{DS} = 5$ V, $I_D = 0.4$ A			0.2		S
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	$V_{DS} = 10$ V, $V_{GS} = 0$ V,			9.5		pF
C_{oss}	Output Capacitance	f = 1.0 MHz			6		pF
C_{rss}	Reverse Transfer Capacitance				1.3		pF
SWITCHING CHARACTERISTICS (Note)							
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = 6$ V, $I_D = 0.5$ A,			3.2	8	ns
t_r	Turn - On Rise Time	$V_{GS} = 4.5$ V, $R_{GEN} = 50\,\Omega$			6	15	ns
$t_{D(off)}$	Turn - Off Delay Time				3.5	8	ns
t_f	Turn - Off Fall Time				3.5	8	ns
Q_g	Total Gate Charge	$V_{DS} = 5$ V, $I_D = 0.2$ A,			0.49	0.7	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 4.5$ V			0.22		nC
Q_{gd}	Gate-Drain Charge				0.07		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 (Note)			0.8	1.2	V

Note:
Pulse Test: Pulse Width $\leq$ 300µs, Duty Cycle $\leq$ 2.0%.

Typical Electrical Characteristics
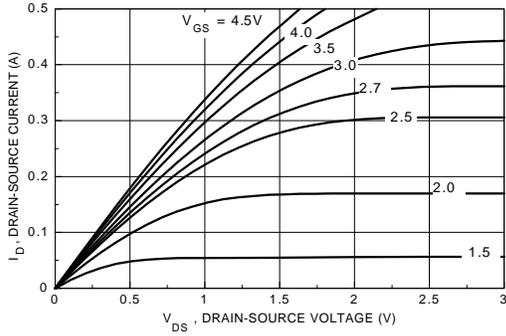
Figure 1. On-Region Characteristics.
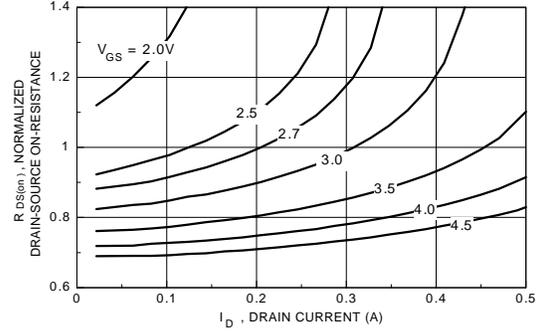
Figure 2. On-Resistance Variation with
Drain Current and Gate Voltage.
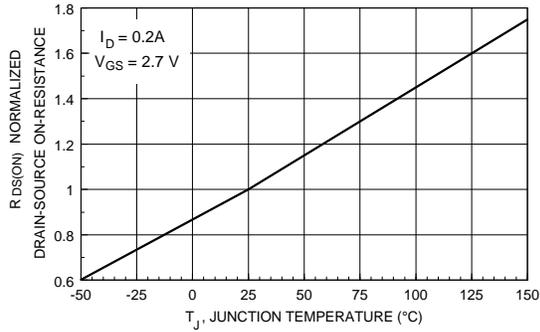
Figure 3. On-Resistance Variation
with Temperature.
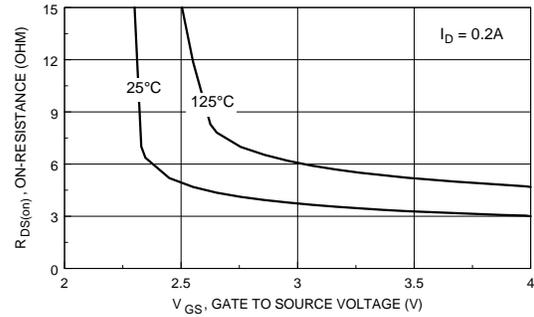
Figure 4. On Resistance Variation with
Gate-To-Source Voltage.
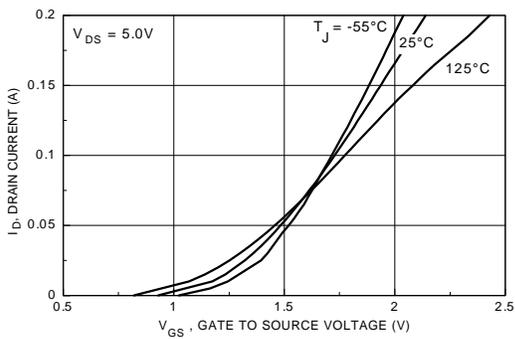
Figure 5. Transfer Characteristics.
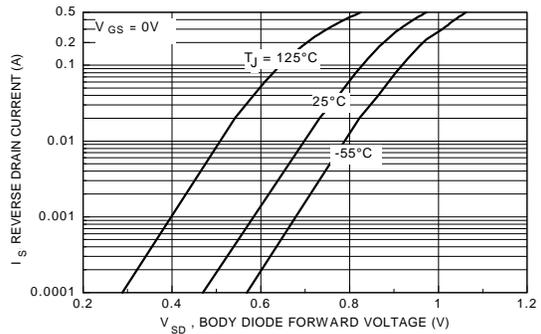
Figure 6. Body Diode Forward Voltage
Variation with Source Current and Temperature.

Typical Electrical And Thermal Characteristics
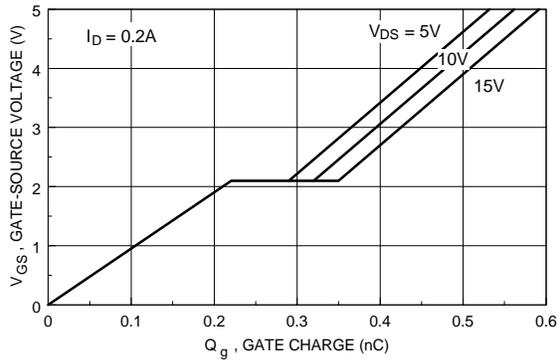
**Figure 7. Gate Charge Characteristics.**
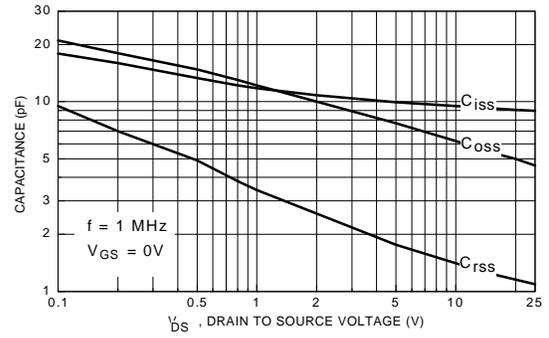
**Figure 8. Capacitance Characteristics.**
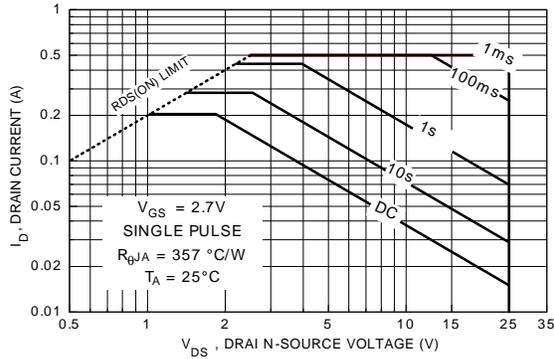
Figure 9. Maximum Safe Operating Area.
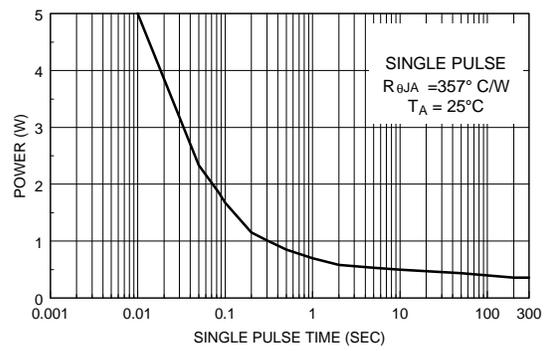
Figure 10. Single Pulse Maximum Power Dissipation.
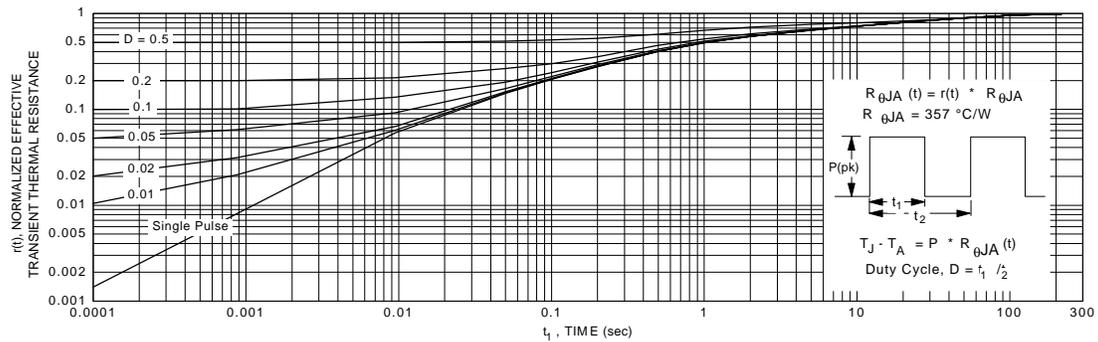
Figure 11. Transient Thermal Response Curve.

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