



March 1998

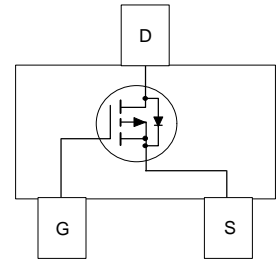
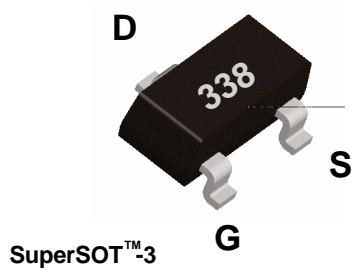
FDN338P P-Channel Logic Level Enhancement Mode Field Effect Transistor

General Description

SuperSOT™-3 P-Channel logic level enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage applications in notebook computers, portable phones, PCMCIA cards, and other battery powered circuits where fast switching, and low in-line power loss are needed in a very small outline surface mount package.

Features

- -1.6 A, -20 V, $R_{DS(ON)} = 0.13 \Omega @ V_{GS} = -4.5 V$
 $R_{DS(ON)} = 0.18 \Omega @ V_{GS} = -2.5 V$.
- Industry standard outline SOT-23 surface mount package using proprietary SuperSOT™-3 design for superior thermal and electrical capabilities.
- High density cell design for extremely low $R_{DS(ON)}$.
- Exceptional on-resistance and maximum DC current capability.



Absolute Maximum Ratings $T_A = 25^\circ C$ unless other wise noted

Symbol	Parameter	FDN338P	Units
V_{DSS}	Drain-Source Voltage	-20	V
V_{GSS}	Gate-Source Voltage - Continuous	± 8	V
I_D	Drain/Output Current - Continuous	-1.6	A
	- Pulsed	-5	
P_D	Maximum Power Dissipation (Note 1a) (Note 1b)	0.5	W
		0.46	
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 150	$^\circ C$

THERMAL CHARACTERISTICS

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	250	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	75	$^\circ C/W$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
OFF CHARACTERISTICS							
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V	
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$		-28		mV/ $^\circ\text{C}$	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	μA	
				$T_J = 55\text{ }^\circ\text{C}$		-10	μA
I_{GSSF}	Gate - Body Leakage, Forward	$V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$			100	nA	
I_{GSSR}	Gate - Body Leakage, Reverse	$V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$			-100	nA	
ON CHARACTERISTICS (Note)							
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4	-0.6	-1	V	
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to $25\text{ }^\circ\text{C}$		2		mV/ $^\circ\text{C}$	
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -4.5\text{ V}, I_D = -1.6\text{ A}$		0.115	0.13	Ω	
				$T_J = 125\text{ }^\circ\text{C}$	0.16		0.22
				$V_{GS} = -2.5\text{ V}, I_D = -1.3\text{ A}$	0.155		0.18
$I_{D(on)}$	On-State Drain Current	$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	-2.5			A	
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}, I_D = -1.6\text{ A}$		3		S	
DYNAMIC CHARACTERISTICS							
C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		405		pF	
C_{oss}	Output Capacitance			170		pF	
C_{rss}	Reverse Transfer Capacitance			45		pF	
SWITCHING CHARACTERISTICS (Note)							
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = -5\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\text{ }\Omega$		6.5	13	ns	
t_r	Turn - On Rise Time			20	35	ns	
$t_{D(off)}$	Turn - Off Delay Time			31	50	ns	
t_f	Turn - Off Fall Time			21	35	ns	
Q_g	Total Gate Charge		$V_{DS} = -5\text{ V}, I_D = -1.6\text{ A},$ $V_{GS} = -4.5\text{ V}$		6	8.5	nC
Q_{gs}	Gate-Source Charge			0.8		nC	
Q_{gd}	Gate-Drain Charge			1.3		nC	
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS							
I_S	Maximum Continuous Drain-Source Diode Forward Current				-0.42	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -0.42\text{ A}$ (Note)		-0.7	-1.2	V	

Note:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.

Typical $R_{\theta JA}$ using the board layouts shown below on FR-4 PCB in a still air environment :



a. $250\text{ }^\circ\text{C/W}$ when mounted on
a 0.02 in^2 pad of 2oz Cu.

a



b. $270\text{ }^\circ\text{C/W}$ when mounted on
a 0.001 in^2 pad of 2oz Cu.

Scale 1 : 1 on letter size paper

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

Typical Electrical Characteristics

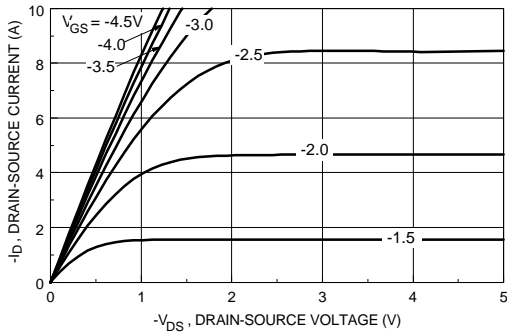


Figure 1. On-Region Characteristics.

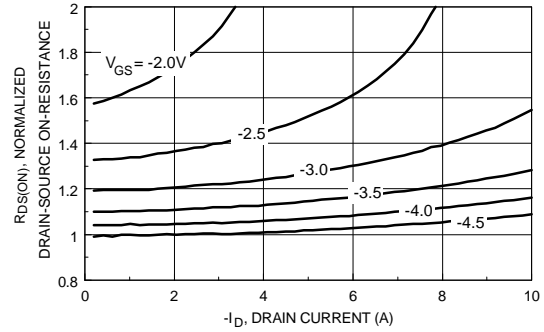


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

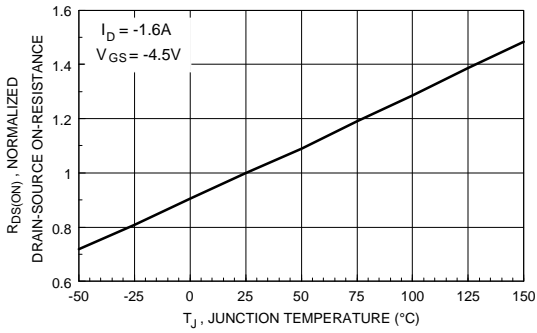


Figure 3. On-Resistance Variation with Temperature.

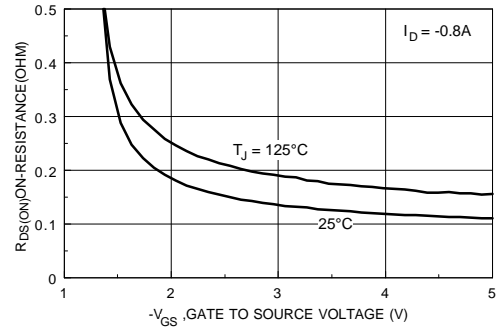


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

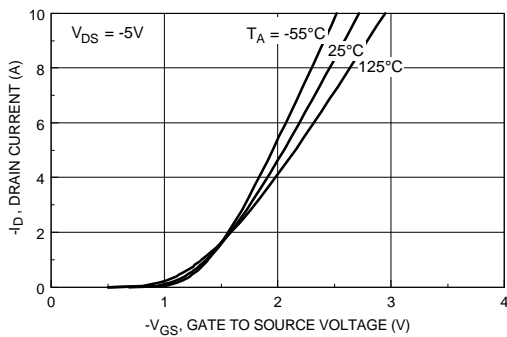


Figure 5. Transfer Characteristics.

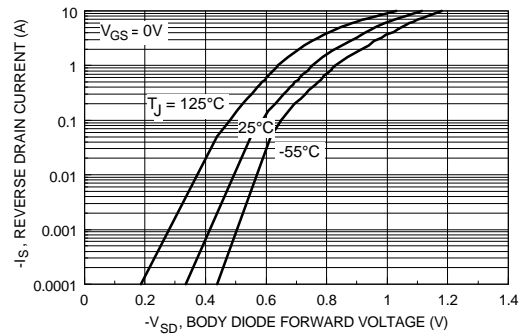


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics

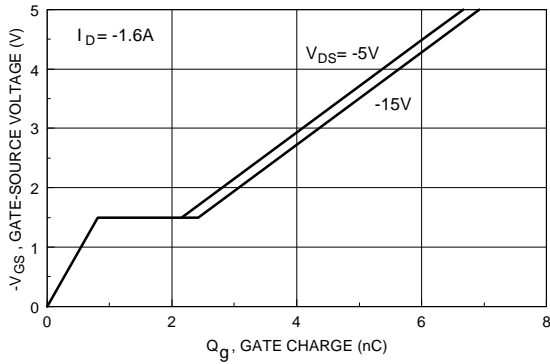


Figure 7. Gate Charge Characteristics.

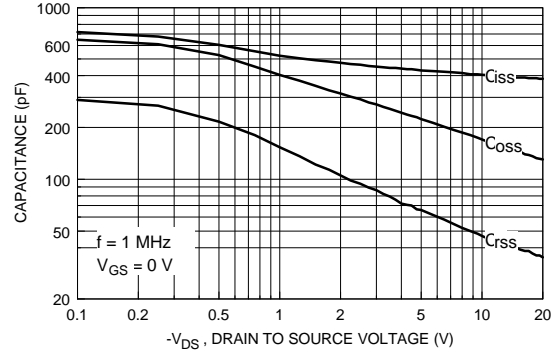


Figure 8. Capacitance Characteristics.

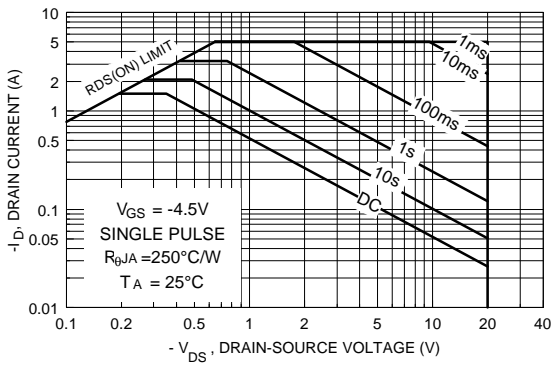


Figure 9. Maximum Safe Operating Area.

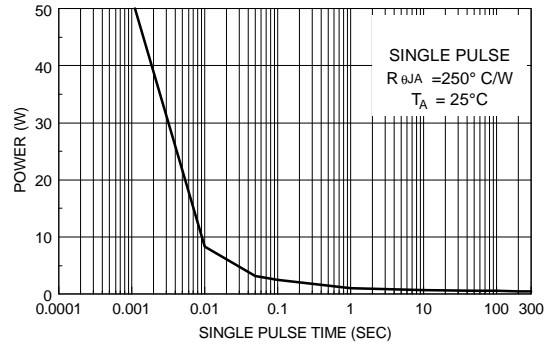


Figure 10. Single Pulse Maximum Power Dissipation.

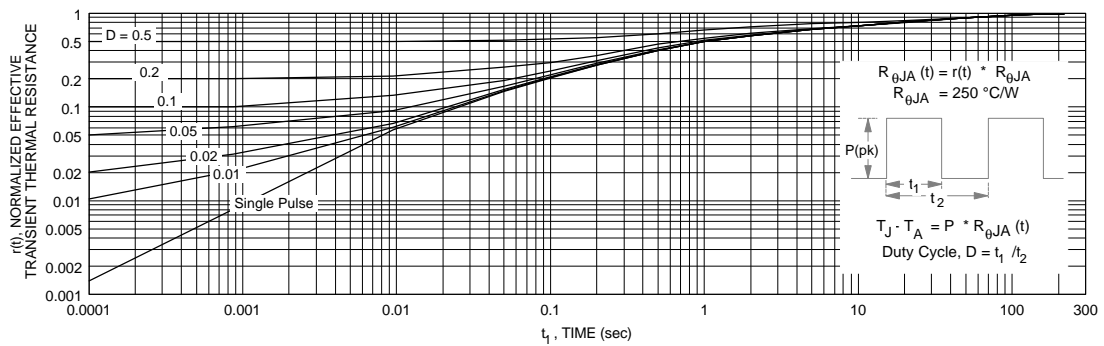


Figure 11. Transient Thermal Response Curve.