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March 1998

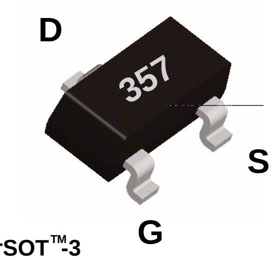
FDN357N
N-Channel Logic Level Enhancement Mode Field Effect Transistor

General Description

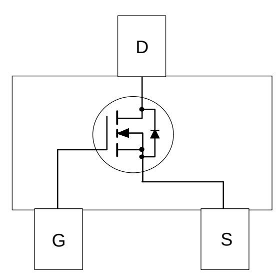
SuperSOT™-3 N-Channel logic level enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage 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

- 1.9 A, 30 V, $R_{DS(ON)}$ = 0.090 Ω @ V_{GS} = 4.5 V
  $R_{DS(ON)}$ = 0.060 Ω @ V_{GS} = 10 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.



SuperSOT™-3



Absolute Maximum Ratings T_A = 25°C unless other wise noted

Symbol	Parameter	FDN357N	Units
V_{DSS}	Drain-Source Voltage	30	V
V_{GSS}	Gate-Source Voltage - Continuous	±20	V
I_D	Drain/Output Current - Continuous	1.9	A
	- Pulsed	10	
P_D	Maximum Power Dissipation (Note 1a)	0.5	W
	(Note 1b)	0.46	
T_J,T_{STG}	Operating and Storage Temperature Range	-55 to 150	°C
THERMAL CHARACTERISTICS			
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	250	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	75	°C/W

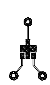
Electrical Characteristics (T_A = 25 °C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	I_D = 250 µA, Referenced to 25 °C		36		mV/ °C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	µA
		T_J = 55°C			10	µA
I_{GSSF}	Gate - Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate - Body Leakage, Reverse	V_{GS} = -20 V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS (Note)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 µA	1	1.6	2	V
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	I_D = 250 µA, Referenced to 25 °C		-3.6		mV/ °C
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = 4.5 V, I_D = 1.9 A		0.081	0.09	Ω
		T_J =125°C		0.11	0.14	
		V_{GS} = 10 V, I_D = 2.2 A		0.053	0.06	
$I_{D(ON)}$	On-State Drain Current	V_{GS} = 4.5 V, V_{DS} = 5 V	5			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 1.9 A		5		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1.0 MHz		235		pF
C_{oss}	Output Capacitance			145		pF
C_{rss}	Reverse Transfer Capacitance			50		pF
SWITCHING CHARACTERISTICS (Note)						
$t_{D(on)}$	Turn - On Delay Time	V_{DD} = 10 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		5	10	ns
t_r	Turn - On Rise Time			12	22	ns
$t_{D(off)}$	Turn - Off Delay Time			12	22	ns
t_f	Turn - Off Fall Time			3	8	ns
Q_g	Total Gate Charge	V_{DS} = 10 V, I_D = 1.9 A, V_{GS} = 5 V		4.2	5.9	nC
Q_{gs}	Gate-Source Charge			1.3		nC
Q_{gd}	Gate-Drain Charge			1.7		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 V, I_S = 0.42 A (Note)		0.71	1.2	V

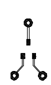
Note:

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 4.5"x5" FR-4 PCB in a still air environment :



a. 250°C/W when mounted on a 0.02 in^2 pad of 2oz Cu.



b. 270°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 ≤ 300µs, Duty Cycle ≤ 2.0%.

Typical Electrical Characteristics

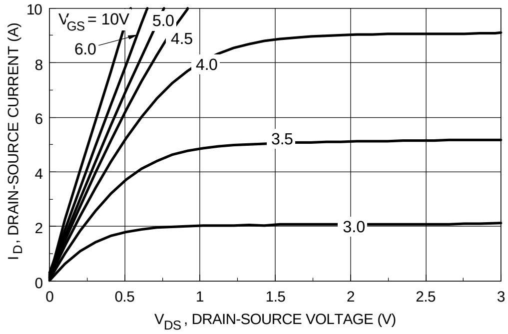


Figure 1. On-Region Characteristics.

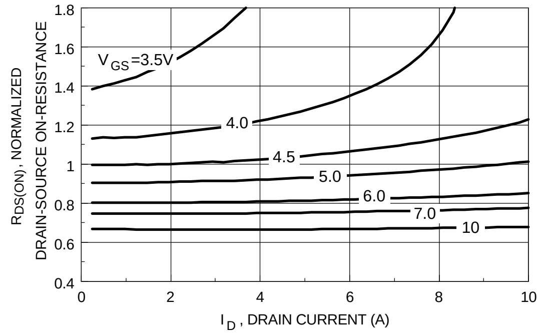


Figure 2. On-Resistance Variation with Drain Current and Gate

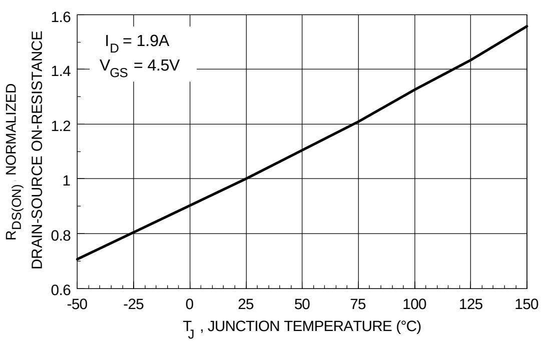


Figure 3. On-Resistance Variation with Temperature.

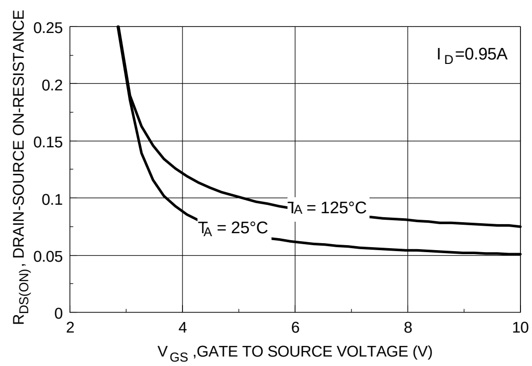


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

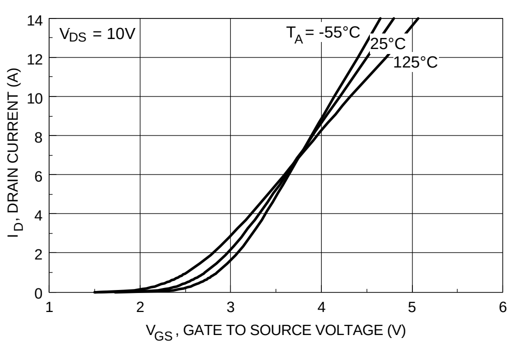


Figure 5. Transfer Characteristics.

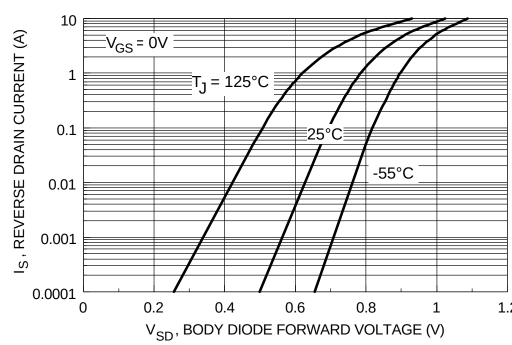


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical And Thermal Characteristics

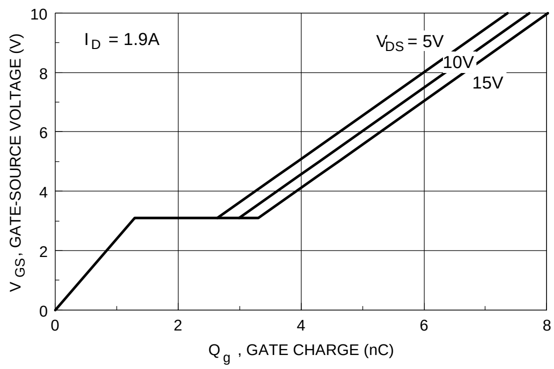


Figure 7. Gate Charge Characteristics.

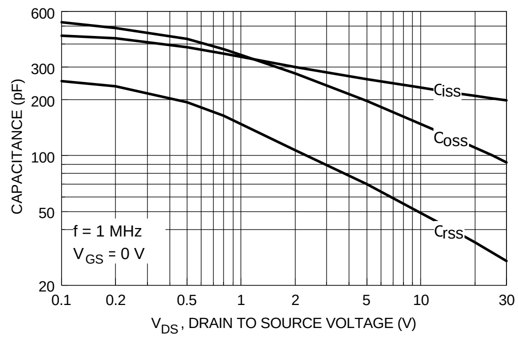


Figure 8. Capacitance Characteristics.

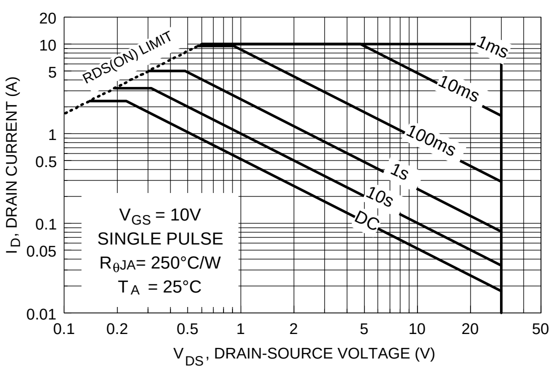


Figure 9. Maximum Safe Operating Area.

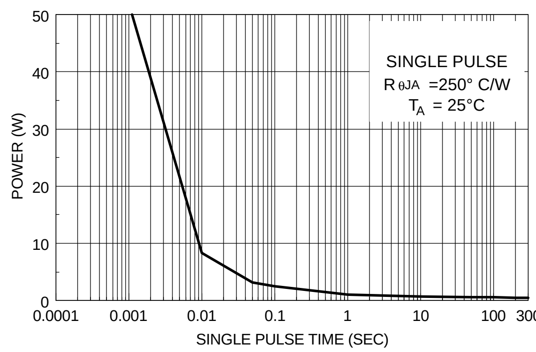


Figure 10. Single Pulse Maximum Power Dissipation.

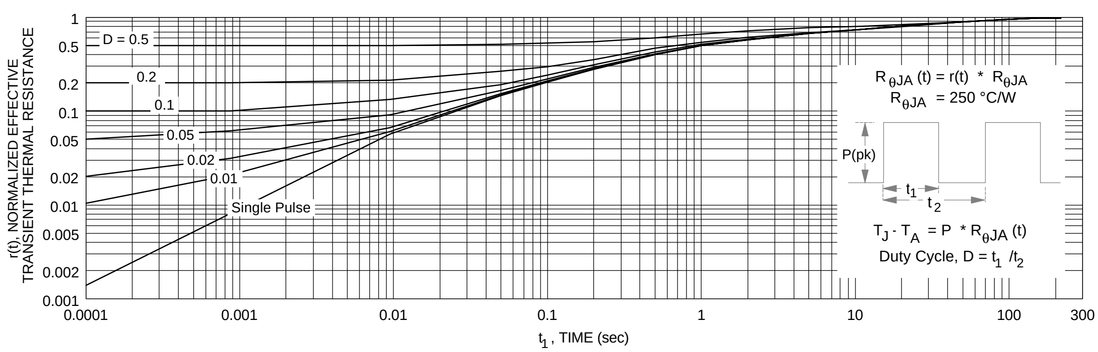


Figure 11. Transient Thermal Response Curve.

Note: Thermal characterization performed using the conditions described in note 1a.
Transient thermal response will change depending on the circuit board design.

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Rev. H4

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