



# FDA59N25

## 250V N-Channel MOSFET

**V<sub>DS</sub> = 250V**  
**V<sub>DS(Avalanche)</sub> = 300V**  
**R<sub>DS(on)</sub> Typ. @10V = 41mΩ**

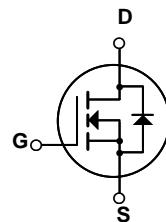
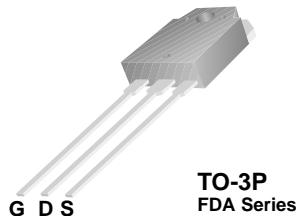
### Features

- 59A, 250V, R<sub>DS(on)</sub> = 0.049Ω @ V<sub>GS</sub> = 10 V
- Low gate charge (typical 63 nC)
- Low C<sub>rss</sub> (typical 70 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

### Description

These N-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology.

This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficient switched mode power supplies and active power factor correction.



### Absolute Maximum Ratings

Symbol	Parameter	FDA59N25	Unit
V <sub>DSS</sub>	Drain-Source Voltage	250	V
V <sub>DS(Avalanche)</sub>	Repetitive Avalanche Voltage (Note 1, 2)	300	V
I <sub>D</sub>	Drain Current - Continuous (T <sub>C</sub> = 25°C) - Continuous (T <sub>C</sub> = 100°C)	59 35	A A
I <sub>DM</sub>	Drain Current - Pulsed (Note 1)	236	A
V <sub>GSS</sub>	Gate-Source voltage	±30	V
E <sub>AS</sub>	Single Pulsed Avalanche Energy (Note 2)	1458	mJ
I <sub>AR</sub>	Avalanche Current (Note 1)	59	A
E <sub>AR</sub>	Repetitive Avalanche Energy (Note 1)	39.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P <sub>D</sub>	Power Dissipation (T <sub>C</sub> = 25°C) - Derate above 25°C	392 3.2	W W/°C
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	°C

### Thermal Characteristics

Symbol	Parameter	Min.	Max.	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case	--	0.32	°C/W
R <sub>θCS</sub>	Thermal Resistance, Case-to-Sink	0.24	--	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient	--	40	°C/W

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDA59N25	FDA59N25	TO-3P	--	--	30

## Electrical Characteristics

$T_C = 25^\circ\text{C}$  unless otherwise noted

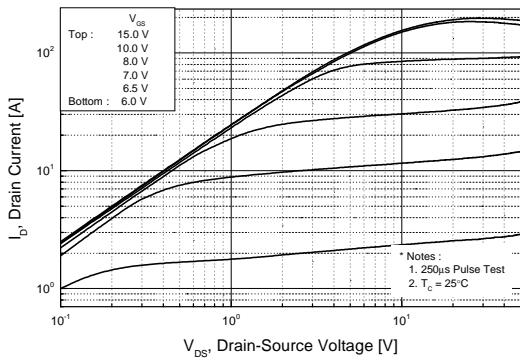
Symbol	Parameter	Conditions	Min.	Typ.	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{V}$ , $I_D = 250\mu\text{A}$	250	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	--	0.25	--	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{V}$ , $V_{GS} = 0\text{V}$ $V_{DS} = 200\text{V}$ , $T_C = 125^\circ\text{C}$	-- --	-- --	1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSSF}$	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{V}$ , $V_{DS} = 0\text{V}$	--	--	100	nA
$I_{GSSR}$	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{V}$ , $V_{DS} = 0\text{V}$	--	--	-100	nA
<b>On Characteristics</b>						
$V_{GS(\text{th})}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	3.0	--	5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{V}$ , $I_D = 29.5\text{A}$	--	0.041	0.049	$\Omega$
$g_{FS}$	Forward Transconductance	$V_{DS} = 40\text{V}$ , $I_D = 29.5\text{A}$	(Note 4)	--	45	--
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1.0\text{MHz}$	--	3090	4020	pF
$C_{oss}$	Output Capacitance		--	630	820	pF
$C_{rss}$	Reverse Transfer Capacitance		--	70	110	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{V}$ , $I_D = 59\text{A}$ $R_G = 25\Omega$	--	70	150	ns
$t_r$	Turn-On Rise Time		--	480	970	ns
$t_{d(off)}$	Turn-Off Delay Time		--	90	190	ns
$t_f$	Turn-Off Fall Time		--	170	350	ns
$Q_g$	Total Gate Charge	$V_{DS} = 200\text{V}$ , $I_D = 59\text{A}$ $V_{GS} = 10\text{V}$	--	63	82	nC
$Q_{gs}$	Gate-Source Charge		--	18.5	--	nC
$Q_{gd}$	Gate-Drain Charge		--	30	--	$\mu\text{C}$
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current	--	--	59	--	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current	--	--	236	--	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{V}$ , $I_S = 59\text{A}$	--	--	1.4	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{V}$ , $I_S = 59\text{A}$ $dI_F/dt = 100\text{A}/\mu\text{s}$	--	190	--	ns
$Q_{rr}$	Reverse Recovery Charge		(Note 4)	--	4.4	--

### NOTES:

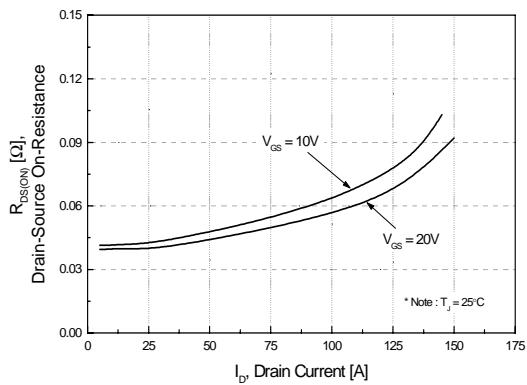
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L = 0.67\text{mH}$ ,  $I_{AS} = 59\text{A}$ ,  $V_{DD} = 50\text{V}$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 59\text{A}$ ,  $di/dt \leq 200\text{A}/\mu\text{s}$ ,  $V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$
5. Essentially Independent of Operating Temperature Typical Characteristics

## Typical Performance Characteristics

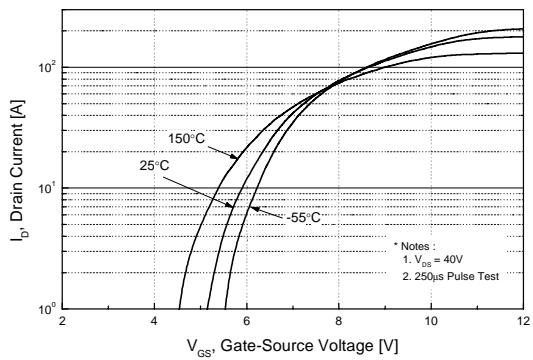
**Figure 1. On-Region Characteristics**



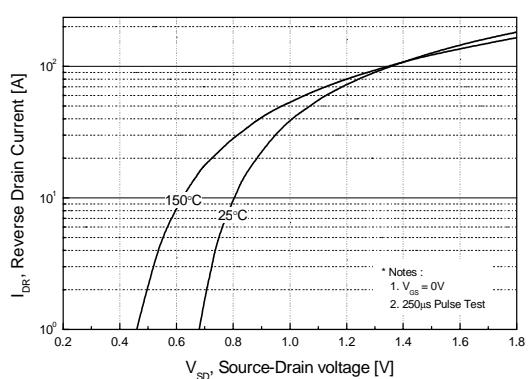
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



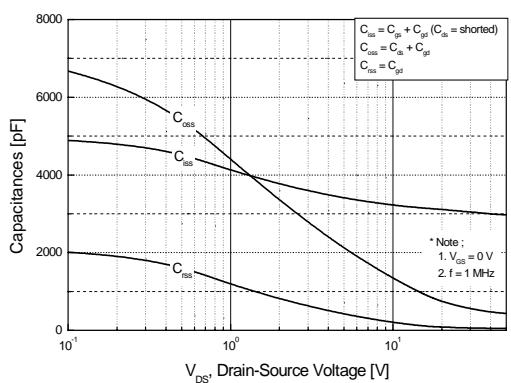
**Figure 2. Transfer Characteristics**



**Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature**



**Figure 5. Capacitance Characteristics**



**Figure 6. Gate Charge Characteristics**

