

FDS9945

60V N-Channel PowerTrench[®] MOSFET

General Description

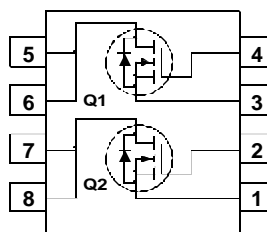
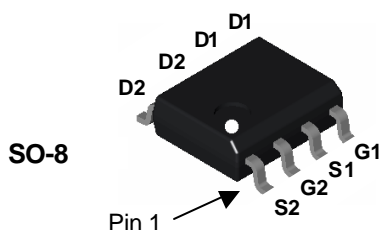
These N Channel Logic Level MOSFET have been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers.

The MOSFET feature faster switching and lower gate charge than other MOSFET with comparable RDS(on) specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

Features

- 3.5 A, 60 V. $R_{DS(ON)} = 0.100\Omega @ V_{GS} = 10 V$
 $R_{DS(ON)} = 0.200\Omega @ V_{GS} = 4.5V$
- Optimized for use in switching DC/DC converters with PWM controllers
- Very fast switching
- Low gate charge.



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V _{DSS}	Drain-Source Voltage	60	V
V _{GSS}	Gate-Source Voltage	±20	V
I _D	Drain Current – Continuous (Note 1a)	3.5	A
	– Pulsed	10	
P _D	Power Dissipation for Single Operation (Note 1a)	2	W
	(Note 1b)	1.6	
	(Note 1c)	1.0	
T _J , T _{STG}	Operating and Storage Junction Temperature Range	-55 to +175	°C

Thermal Characteristics

R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1a)	78 (steady state), 50 (10 sec)	°C/W
R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1c)	135	°C/W
R _{θJC}	Thermal Resistance, Junction-to-Case (Note 1)	40	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS9945	FDS9945	13"	12mm	2500 units

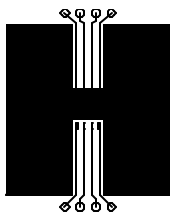
Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		62.5		$\text{mV}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$			-100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1	2.5	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		-6		$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$ $V_{GS} = 4.5\text{ V}, I_D = 2.5\text{ A}$ $V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}, T_J = 125^\circ\text{C}$		74 103 126	100 200 170	$\text{m}\Omega$
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 30\text{ V}$	10			A
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}, I_D = 3.5\text{ A}$		8.6		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 30\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$		420		pF
C_{oss}	Output Capacitance			48		pF
C_{rss}	Reverse Transfer Capacitance			20		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 30\text{ V}, I_D = 1\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\ \Omega$		7	14	ns
t_r	Turn–On Rise Time			4.3	8.6	ns
$t_{d(off)}$	Turn–Off Delay Time			19	34	ns
t_f	Turn–Off Fall Time			3	6	ns
Q_g	Total Gate Charge	$V_{DS} = 30\text{ V}, I_D = 3.5\text{ A}, V_{GS} = 5\text{ V}$		8	13	nC
Q_{gs}	Gate–Source Charge			4		nC
Q_{gd}	Gate–Drain Charge			2.5		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 2.1\text{ A}$ (Note 2)		0.8	1.2	V

Notes:

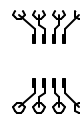
- $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 78°W when mounted on a 0.5 in^2 pad of 2 oz copper



b) 125°W when mounted on a 0.02 in^2 pad of 2 oz copper



c) 135°W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width $< 300\ \mu\text{s}$, Duty Cycle $< 2.0\%$

Typical Characteristics

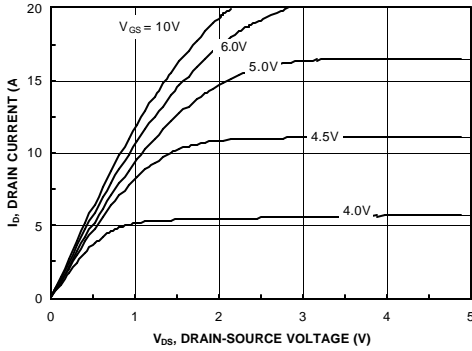


Figure 1. On-Region Characteristics.

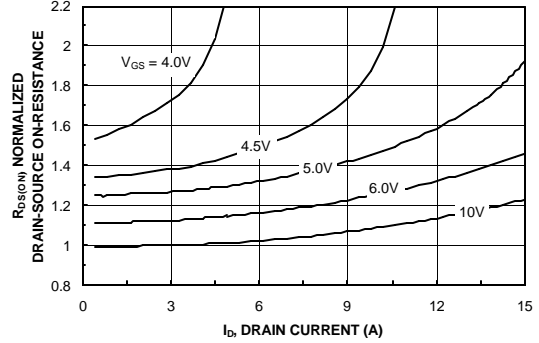


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

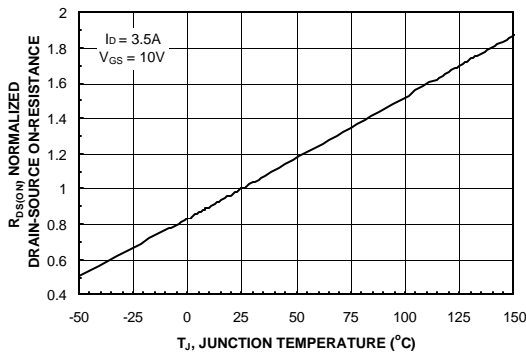


Figure 3. On-Resistance Variation with Temperature.

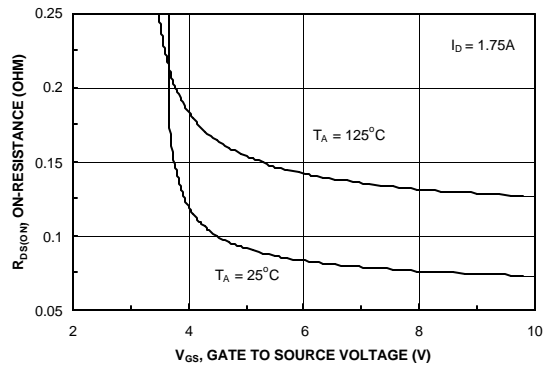


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

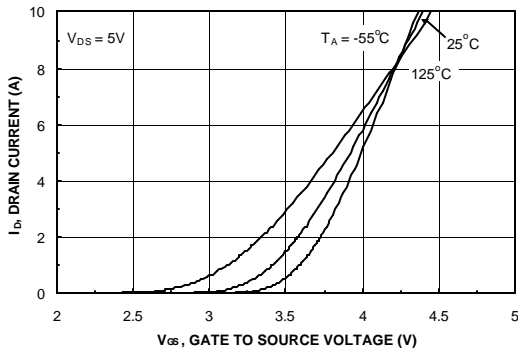


Figure 5. Transfer Characteristics.

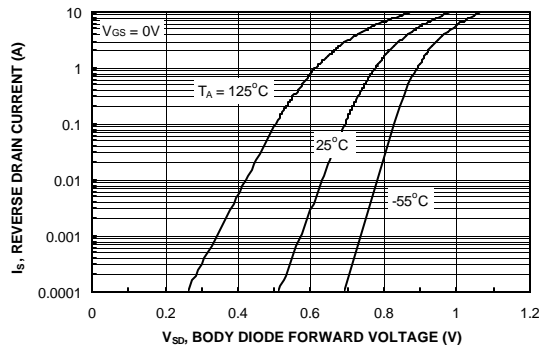


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

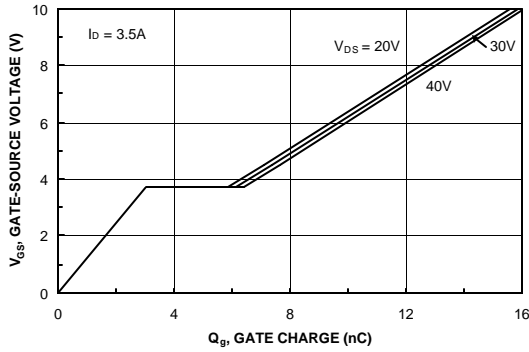


Figure 7. Gate Charge Characteristics.

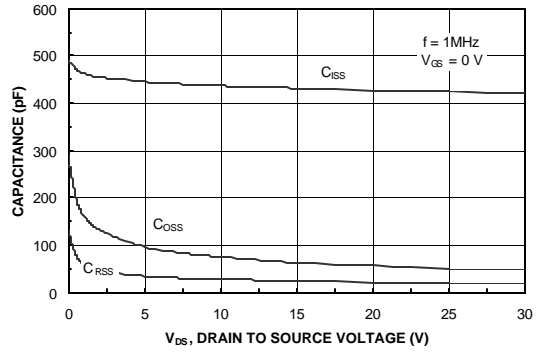


Figure 8. Capacitance Characteristics.

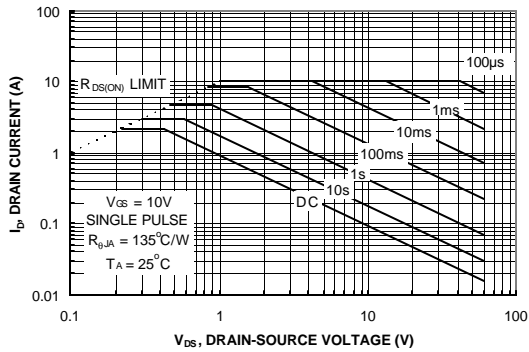


Figure 9. Maximum Safe Operating Area.

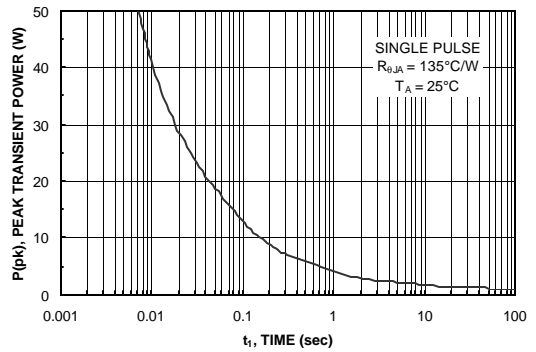


Figure 10. Single Pulse Maximum Power Dissipation.

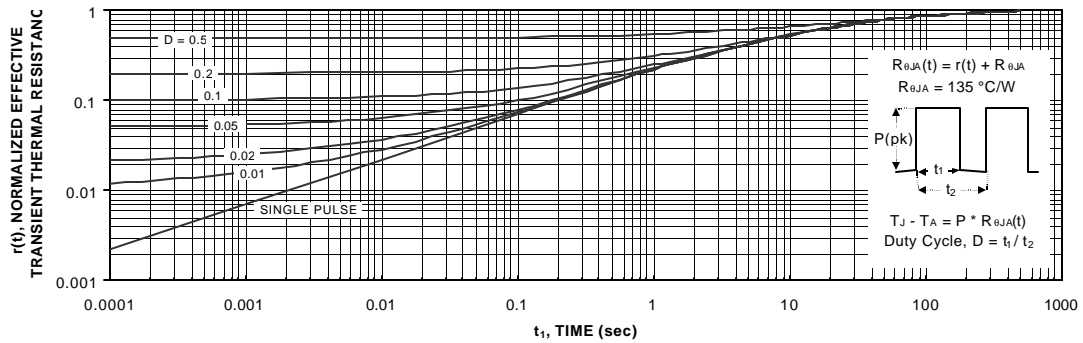


Figure 11. Transient Thermal Response Curve.

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

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
No Identification Needed	Full Production	This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.
Obsolete	Not In Production	This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.

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60V N-Channel PowerTrench MOSFET

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Product status/pricing/packaging

BUY

Product	Product status	Pb-free Status	Pricing*	Package type	Leads	Packing method	Package Marking Convention**
FDS9945	Full Production	 Full Production	\$0.74	SO-8	8	TAPE REEL	Line 1: \$Y (Fairchild logo) &Z (Asm. Plant Code) &2 (2-Digit Date Code) &T (Die Trace Code) Line 2: FDS Line 3: 9945

* Fairchild 1,000 piece Budgetary Pricing

** A sample button will appear if the part is available through Fairchild's on-line samples program. If there is no sample button, please contact a [Fairchild distributor](#) to obtain samples



Indicates product with Pb-free second-level interconnect. For more information [click here](#).

Package marking information for product FDS9945 is available. [Click here for more information](#).

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Models

Package & leads	Condition	Temperature range	Software version	Revision date
PSPICE				
SO-8-8	Electrical	25°C to 125°C	Orcad 9.1	Aug 2, 2004

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Qualification Support

Click on a product for detailed qualification data

Product
FDS9945

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