

FDMS8690

N-Channel Power Trench® MOSFET

30V, 27A, 9.0mΩ

Features

- Max $r_{DS(on)}$ = 9.0mΩ at $V_{GS} = 10V$, $I_D = 14.0A$
- Max $r_{DS(on)}$ = 12.5mΩ at $V_{GS} = 4.5V$, $I_D = 11.5A$
- High performance trench technology for extremely low $r_{DS(on)}$ and gate charge
- Minimal Qgd (2.9nC typical)
- RoHS Compliant

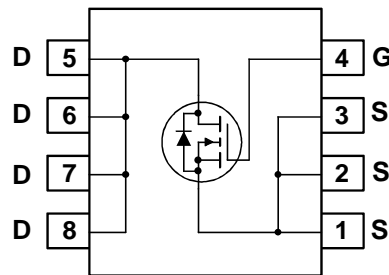
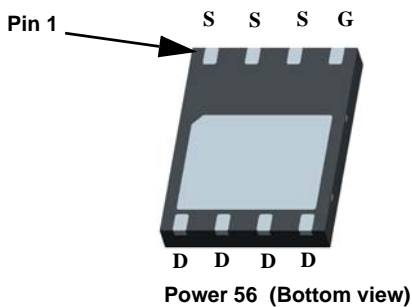


General Description

This device has been designed specifically to improve the efficiency of DC/DC converters. Using new techniques in MOSFET construction, the various components of gate charge and capacitance have been optimized to reduce switching losses. Low gate resistance and very low Miller charge enable excellent performance with both adaptive and fixed dead time gate drive circuits. Very low $r_{DS(on)}$ has been maintained to provide an extremely versatile device.

Application

- High Efficiency DC-DC converters.
- Notebook CPU power supply
- Multi purpose Point of Load



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$	27	A
	-Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	52	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	14	
	-Pulsed	100	
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	37.8	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.3	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS8690	FDMS8690	Power 56	13"	12mm	3000 units

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
--------	-----------	-----------------	-----	-----	-----	-------

Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$, $V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		34		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$, $V_{GS} = 0\text{V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$, $V_{DS} = 0\text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\mu\text{A}$	1	1.6	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$, referenced to 25°C		-4.5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{V}$, $I_D = 14.0\text{A}$		7.4	9.0	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 11.5\text{A}$		9.9	12.5	
		$V_{GS} = 10\text{V}$, $I_D = 14.0\text{A}$, $T_J = 125^\circ\text{C}$		10.6	13.3	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		1260	1680	pF
C_{oss}	Output Capacitance			535	715	pF
C_{rss}	Reverse Transfer Capacitance			80	120	pF
R_g	Gate Resistance		$f = 1\text{MHz}$		1.1	5.0

Switching Characteristics

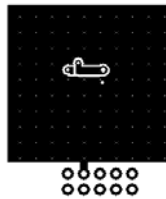
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}$, $I_D = 1.0\text{A}$ $V_{GS} = 10\text{V}$, $R_{GEN} = 6\Omega$		8	16	ns
t_r	Rise Time			1.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			26	42	ns
t_f	Fall Time			19	35	ns
$Q_{g(TOT)}$	Total Gate Charge at 10V		$V_{GS} = 0\text{V}$ to 10V	$V_{DD} = 15\text{V}$ $I_D = 14.0\text{A}$	18.8	27
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0\text{V}$ to 5V	10		14	nC
Q_{gs}	Gate to Source Gate Charge		3.5			nC
Q_{gd}	Gate to Drain "Miller" Charge		2.9			nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}$, $I_S = 2.1\text{A}$ (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	$I_F = 14.0\text{A}$, $di/dt = 100\text{A}/\mu\text{s}$			45	ns
Q_{rr}	Reverse Recovery Charge				33	nC

Notes:

1: $R_{\theta JA}$ is determined with the device mounted on a 1in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. $50^\circ\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper



b. $125^\circ\text{C}/\text{W}$ when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0%.

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

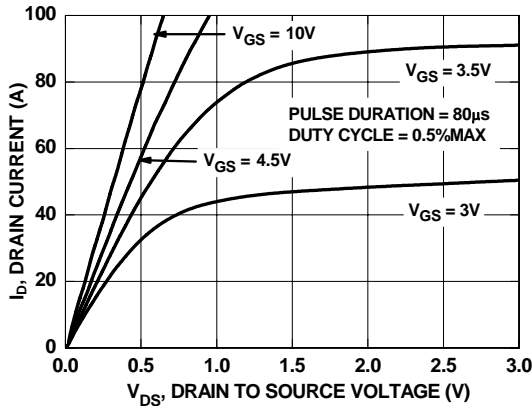


Figure 1. On-Region Characteristics

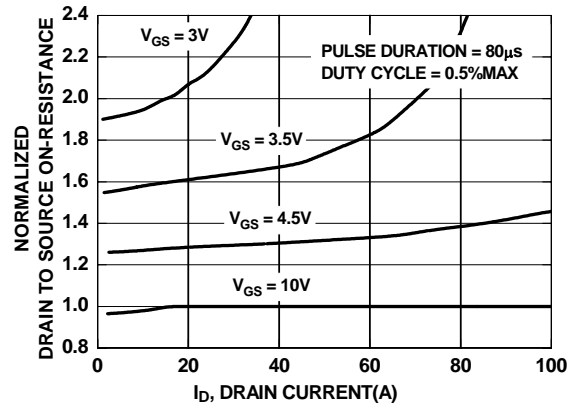


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

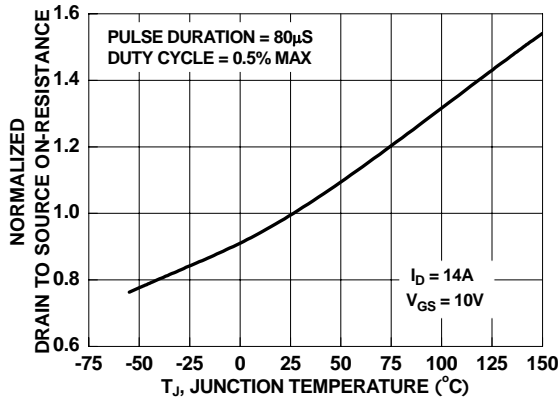


Figure 3. Normalized On-Resistance vs Junction Temperature

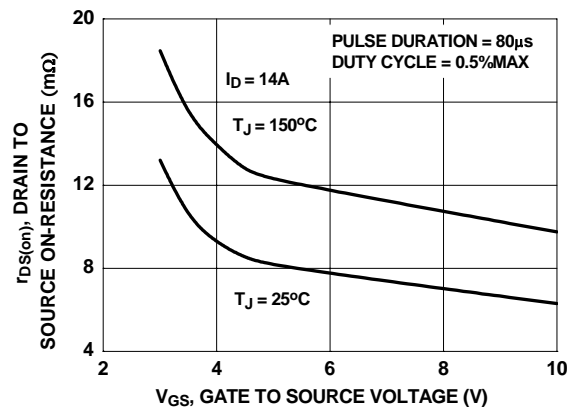


Figure 4. On-Resistance vs Gate to Source Voltage

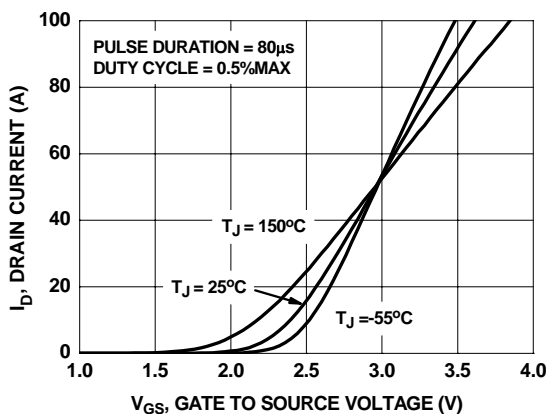


Figure 5. Transfer Characteristics

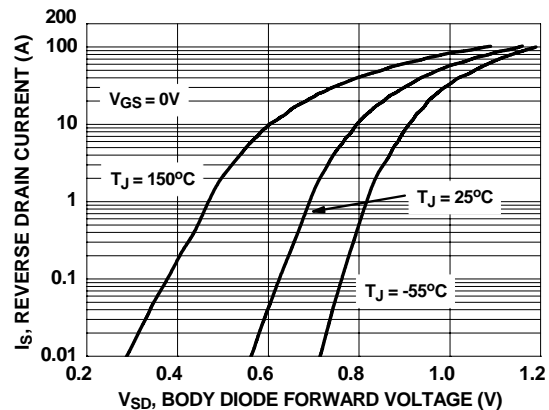


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

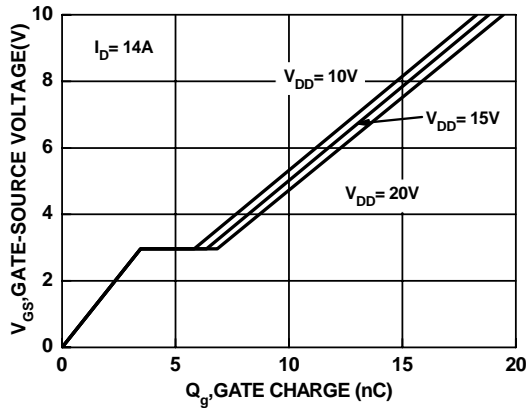


Figure 7. Gate Charge Characteristics

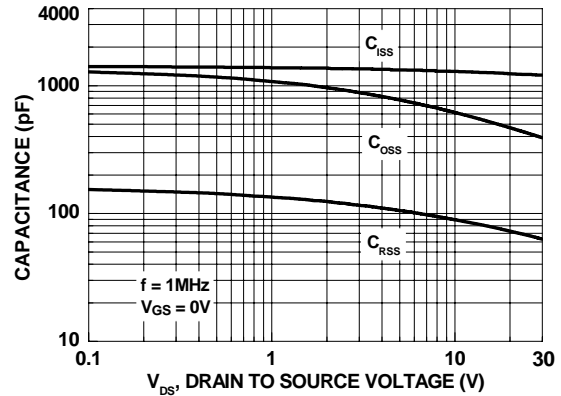


Figure 8. Capacitance vs Drain to Source Voltage

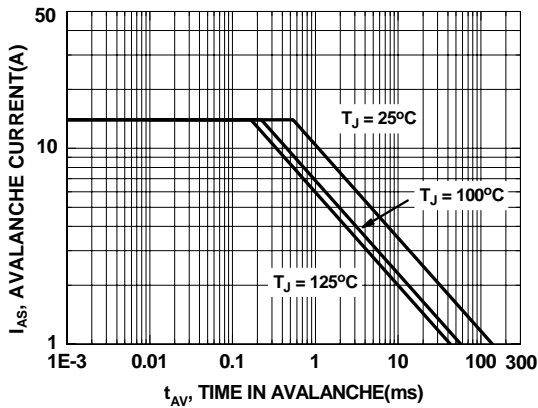


Figure 9. Unclamped Inductive Switching Capability

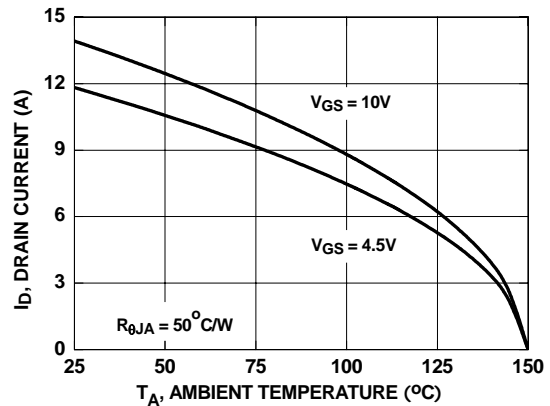


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

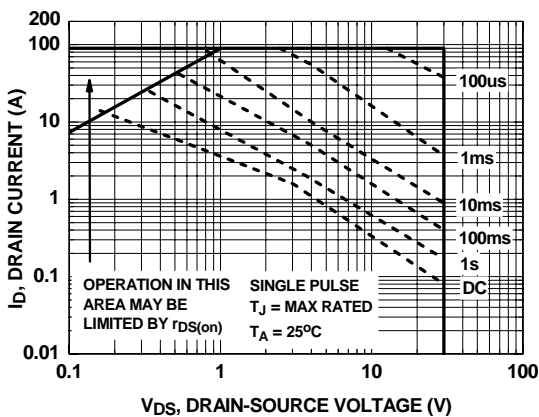


Figure 11. Forward Bias Safe Operating Area

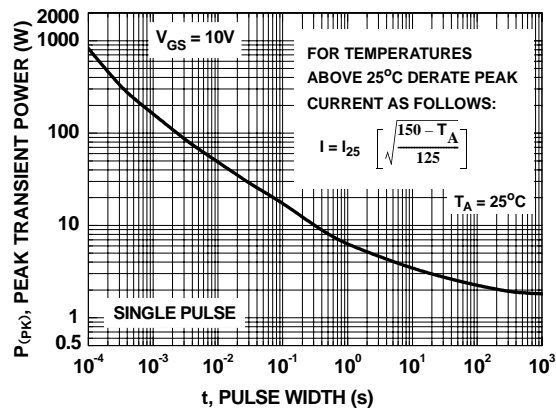


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

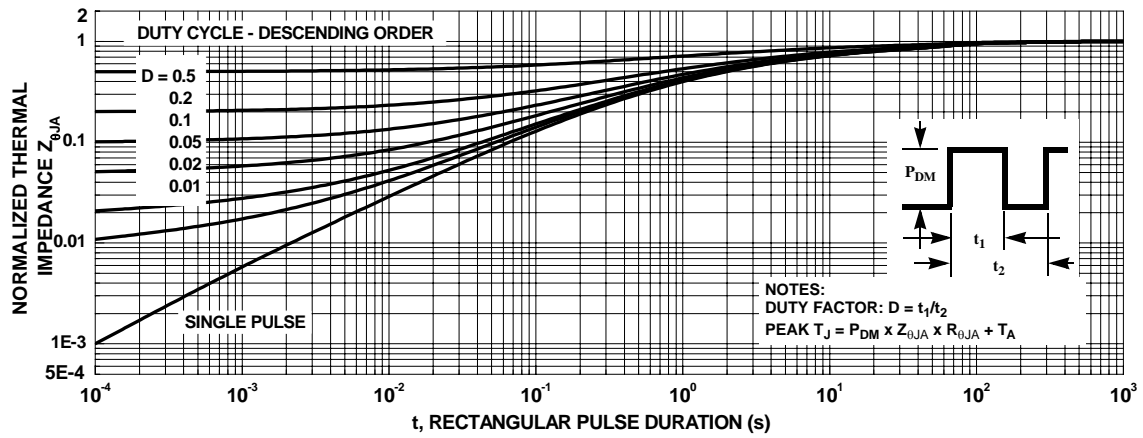
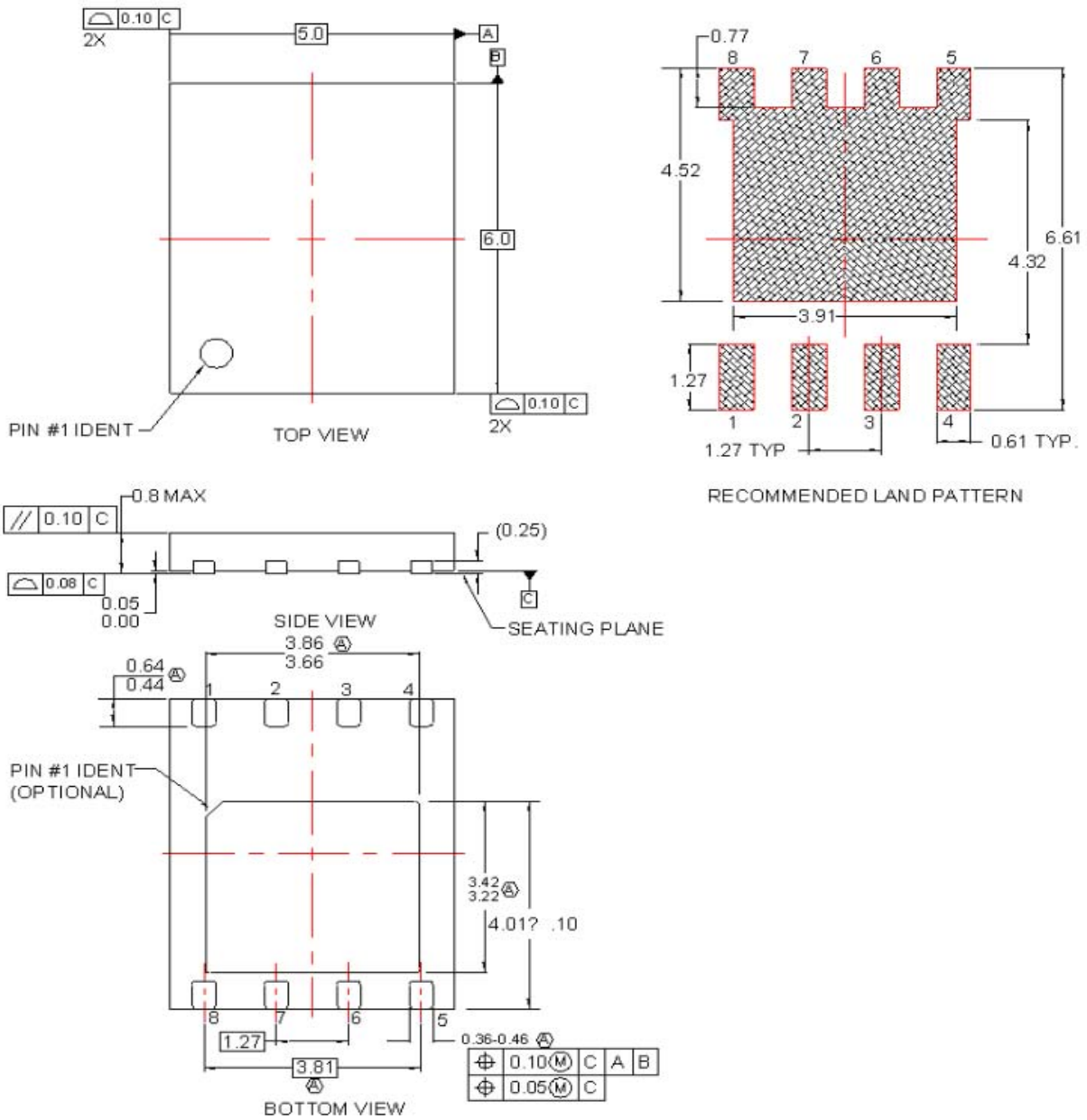


Figure 13. Transient Thermal Response Curve



NOTES:


- (A) DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MO-229, DATED 11/2001.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. TERMINALS 5,6,7 AND 8 ARE TIED TO THE EXPOSED PADDLE

MLP08GrevD



TRADEMARKS

The following are registered and unregistered trademarks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

ACEx [®]	HiSeC [™]	PowerTrench [®]	TinyLogic [®]
Across the board. Around the world. [™]	<i>i-Lo</i> [™]	Programmable Active Droop [™]	TINYOPTO [™]
ActiveArray [™]	ImpliedDisconnect [™]	QFET [®]	TinyPower [™]
Bottomless [™]	IntelliMAX [™]	QS [™]	TinyWire [™]
Build it Now [™]	ISOPLANAR [™]	QT Optoelectronics [™]	TruTranslation [™]
CoolFET [™]	MICROCOUPLER [™]	Quiet Series [™]	μSerDes [™]
CROSSVOLT [™]	MicroPak [™]	RapidConfigure [™]	UHC [®]
CTL [™]	MICROWIRE [™]	RapidConnect [™]	UniFET [™]
Current Transfer Logic [™]	MSX [™]	ScalarPump [™]	VCX [™]
DOME [™]	MSXPro [™]	SMART START [™]	Wire [™]
E ² CMOS [™]	OCX [™]	SPM [®]	
EcoSPARK [®]	OCXPro [™]	SuperFET [™]	
EnSigna [™]	OPTOLOGIC [®]	SuperSOT [™] -3	
FACT Quiet Series [™]	OPTOPLANAR [®]	SuperSOT [™] -6	
FACT [®]	PACMAN [™]	SuperSOT [™] -8	
FAST [®]	POP [™]	TCM [™]	
FASTr [™]	Power220 [®]	The Power Franchise [®]	
FPS [™]	Power247 [®]	 ™	
FRFET [®]	PowerEdge [™]	TinyBoost [™]	
GlobalOptoisolator [™]	PowerSaver [™]	TinyBuck [™]	
GTO [™]			

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice 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 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.

Rev. I23

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative