



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

ON Semiconductor and the ON Semiconductor logo 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.

FDP8876

N-Channel PowerTrench® MOSFET

30V, 71A, 8.5mΩ

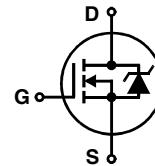
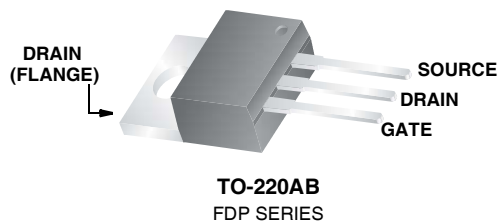
General Descriptions

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(ON)}$ and fast switching speed.



Features

- $r_{DS(ON)} = 8.5m\Omega$, $V_{GS} = 10V$, $I_D = 40A$
- $r_{DS(ON)} = 10.3m\Omega$, $V_{GS} = 4.5V$, $I_D = 40A$
- High performance trench technology for extremely low $r_{DS(ON)}$
- Low gate charge
- High power and current handling capability
- RoHS Compliant



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

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current	70	A
	Continuous ($T_C = 25^\circ C$, $V_{GS} = 10V$)		
	Continuous ($T_C = 25^\circ C$, $V_{GS} = 4.5V$)		
	Pulsed	Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	180	mJ
P_D	Power dissipation	70	W
T_J, T_{STG}	Operating and Storage Temperature	-55 to 175	$^\circ C$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case TO-263	2.14	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263, 1in ² copper pad area	62	$^\circ C/W$

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP8876	FDP8876	TO-220AB	Tube	N/A	50 units

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

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

Off Characteristics

B_{VDSS}	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}$			1	μA
		$V_{GS} = 0\text{V}, T_A = 150^\circ\text{C}$	-	-	250	
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	± 100	nA

On Characteristics

$V_{GS(TH)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1.2	-	2.5	V
$r_{DS(ON)}$	Drain to Source On Resistance	$I_D = 40\text{A}, V_{GS} = 10\text{V}$	-	6.1	8.7	m Ω
		$I_D = 40\text{A}, V_{GS} = 4.5\text{V}$	-	7.7	10.5	
		$I_D = 40\text{A}, V_{GS} = 10\text{V}, T_A = 175^\circ\text{C}$	-	11	14	

Dynamic Characteristics

C_{ISS}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$	-	1700	-	pF
C_{OSS}	Output Capacitance		-	340	-	pF
C_{RSS}	Reverse Transfer Capacitance		-	210	-	pF
R_G	Gate Resistance	$V_{GS} = 0.5\text{V}, f = 1\text{MHz}$	-	2.3	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	$V_{GS} = 0\text{V to } 10\text{V}$	-	32	45	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0\text{V to } 5\text{V}$				
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0\text{V to } 1\text{V}$				
Q_{gs}	Gate to Source Gate Charge	$I_D = 40\text{A}, I_g = 1.0\text{mA}$	-	4.7	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		-	3.1	-	nC
Q_{gd}	Gate to Drain "Miller" Charge		-	7.0	-	nC

Switching Characteristics ($V_{GS} = 10\text{V}$)

t_{ON}	Turn-On Time	$V_{DD} = 15\text{V}, I_D = 40\text{A}, V_{GS} = 10\text{V}, R_{GS} = 10\Omega$	-	-	189	ns
$t_{d(ON)}$	Turn-On Delay Time		-	9	-	ns
t_r	Rise Time		-	97	-	ns
$t_{d(OFF)}$	Turn-Off Delay Time		-	51	-	ns
t_f	Fall Time		-	39	-	ns
t_{OFF}	Turn-Off Time		-	-	135	ns

Drain-Source Diode Characteristic

V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 40\text{A}$	-	-	1.25	V
		$I_{SD} = 3.2\text{A}$	-	-	1.0	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 40\text{A}, di_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	22	ns
Q_{RR}	Reverse Recovered Charge	$I_{SD} = 40\text{A}, di_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	9	nC

Notes:

- Starting $T_J = 25^\circ\text{C}, L = 1\text{mH}, I_{AS} = 19\text{A}, V_{DD} = 27\text{V}, V_{GS} = 10\text{V}$
- Pulse width = 100s

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

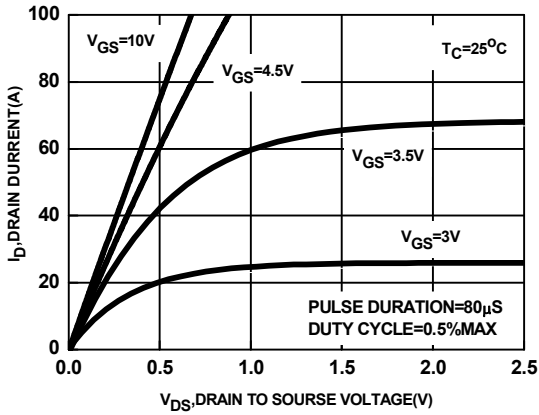


Figure 1. On Region Characteristics

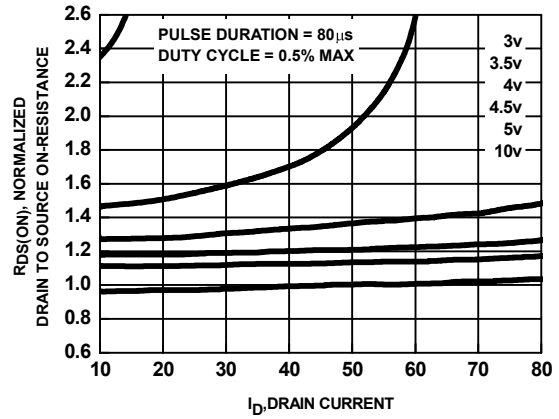


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage

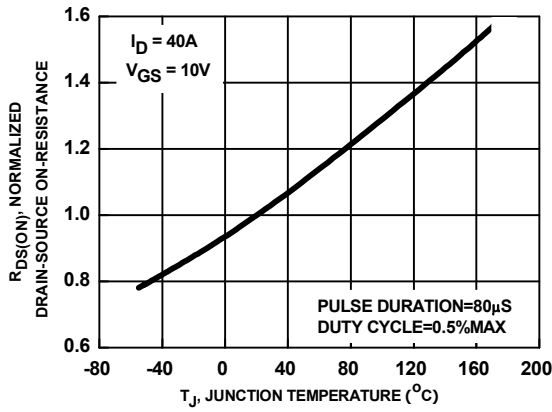


Figure 3. On Resistance Variation with Temperature

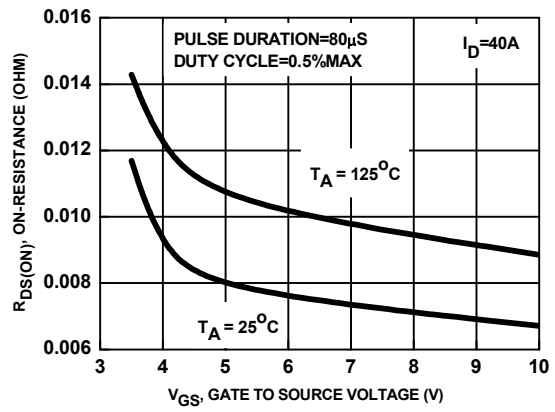


Figure 4. On-Resistance Variation with Gate-to-Source Voltage

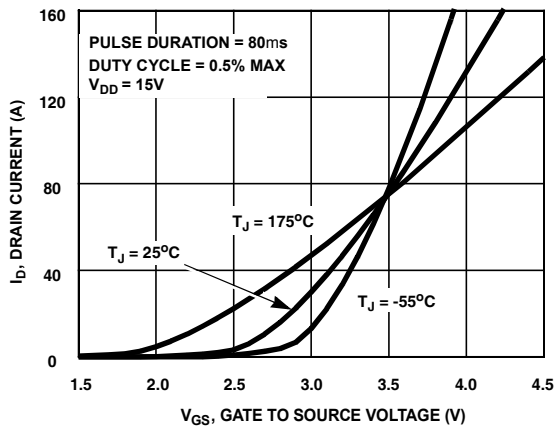


Figure 5. Transfer Characteristics

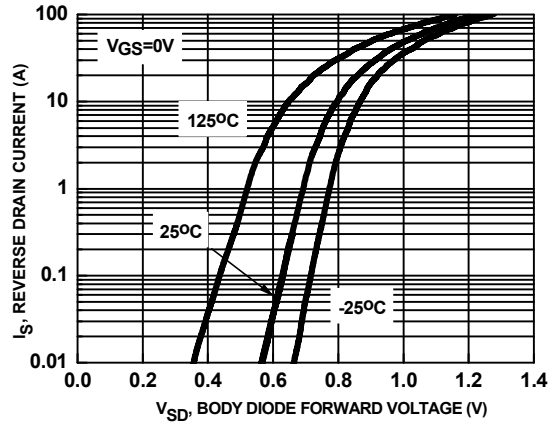


Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature

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

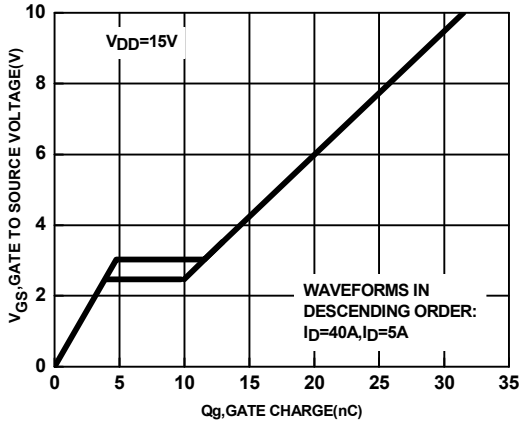


Figure 7. Gate Charge characteristics

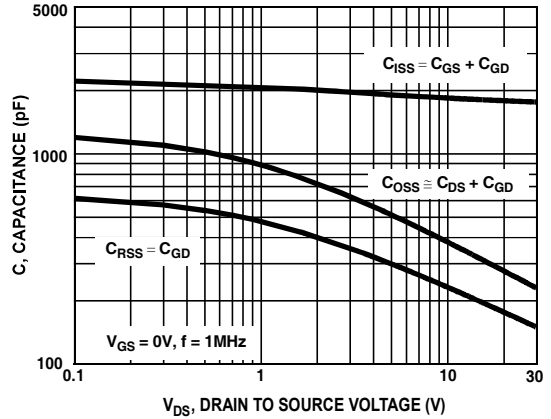


Figure 8. Saturation characteristics

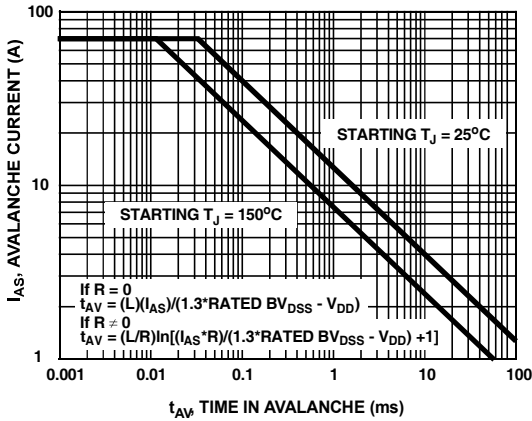


Figure 9. Unclamped Inductive Switching Capability

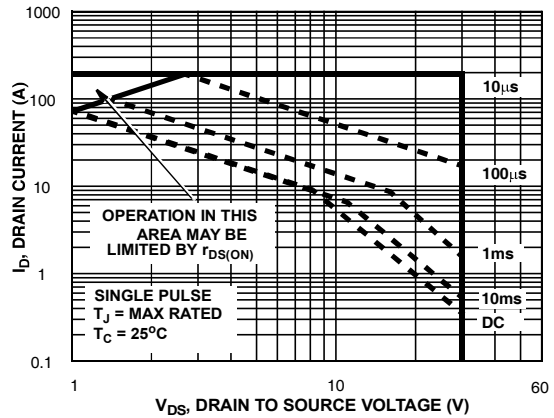


Figure 10. Safe Operating Area

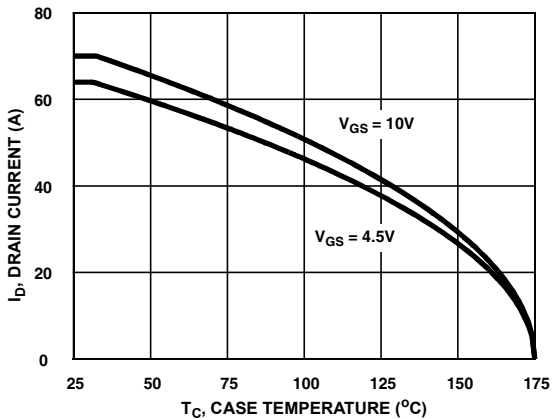


Figure 11. Maximum Continuous Drain Current vs Case Temperature

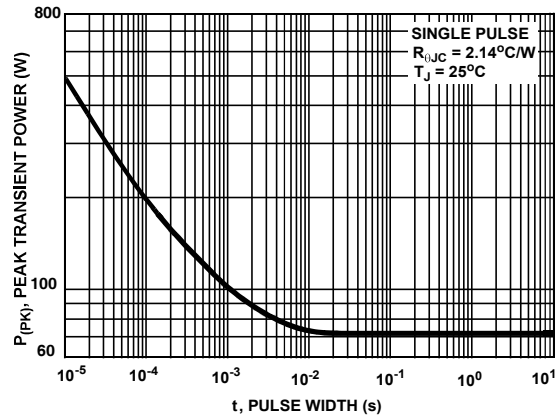


Figure 12. Normalized Drain to Source Break Down Voltage vs Junction Temperature

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

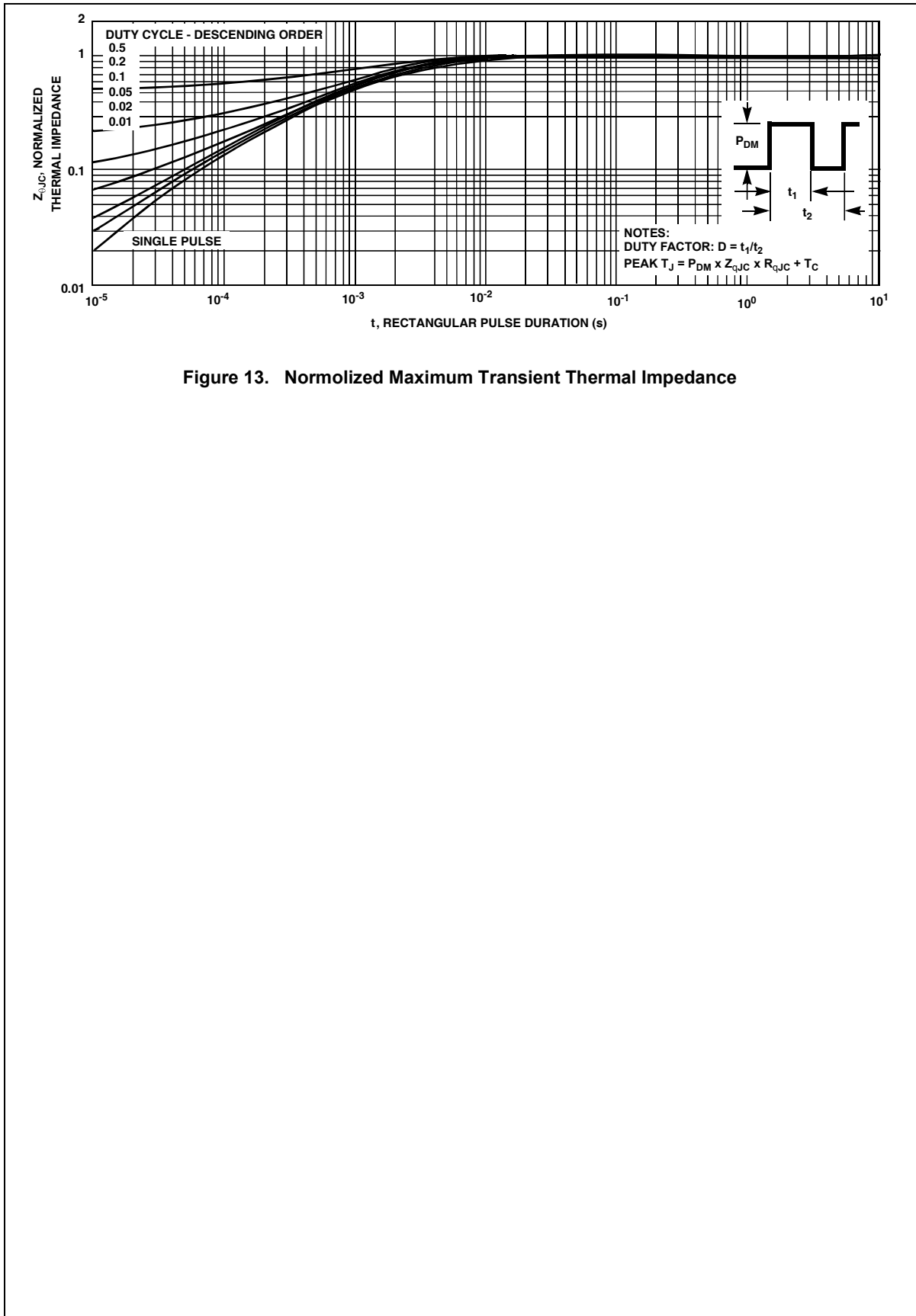


Figure 13. Normalized Maximum Transient Thermal Impedance

FDP8876 N-Channel PowerTrench[®] MOSFET

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™	FAST®	ISOPLANAR™	PowerSaver™	SuperSOT™-6
ActiveArray™	FASTr™	LittleFET™	PowerTrench®	SuperSOT™-8
Bottomless™	FPS™	MICROCOUPLER™	QFET®	SyncFET™
Build it Now™	FRFET™	MicroFET™	QS™	TinyLogic®
CoolFET™	GlobalOptoisolator™	MicroPak™	QT Optoelectronics™	TINYOPTO™
CROSSVOLT™	GTO™	MICROWIRE™	Quiet Series™	TruTranslation™
DOME™	HiSeC™	MSX™	RapidConfigure™	UHC™
EcoSPARK™	I ² C™	MSXPro™	RapidConnect™	UltraFET®
E ² C MOS™	i-Lo™	OCX™	μSerDes™	UniFET™
EnSigna™	ImpliedDisconnect™	OCXPro™	ScalarPump™	VCX™
FACT™	IntelliMAX™	OPTOLOGIC®	SILENT SWITCHER®	Wire™
FACT Quiet Series™		OPTOPLANAR™	SMART START™	
Across the board. Around the world.™		PACMAN™	SPM™	
The Power Franchise®		POP™	Stealth™	
Programmable Active Droop™		Power247™	SuperFET™	
		PowerEdge™	SuperSOT™-3	

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.

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, or (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 significant injury to the user.
2. A critical component is 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, 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.

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