



Is Now Part of



ON Semiconductor®

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

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@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.

KA5L0565R

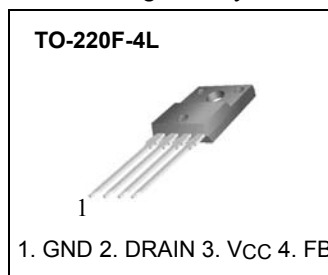
Fairchild Power Switch(FPS™)

Features

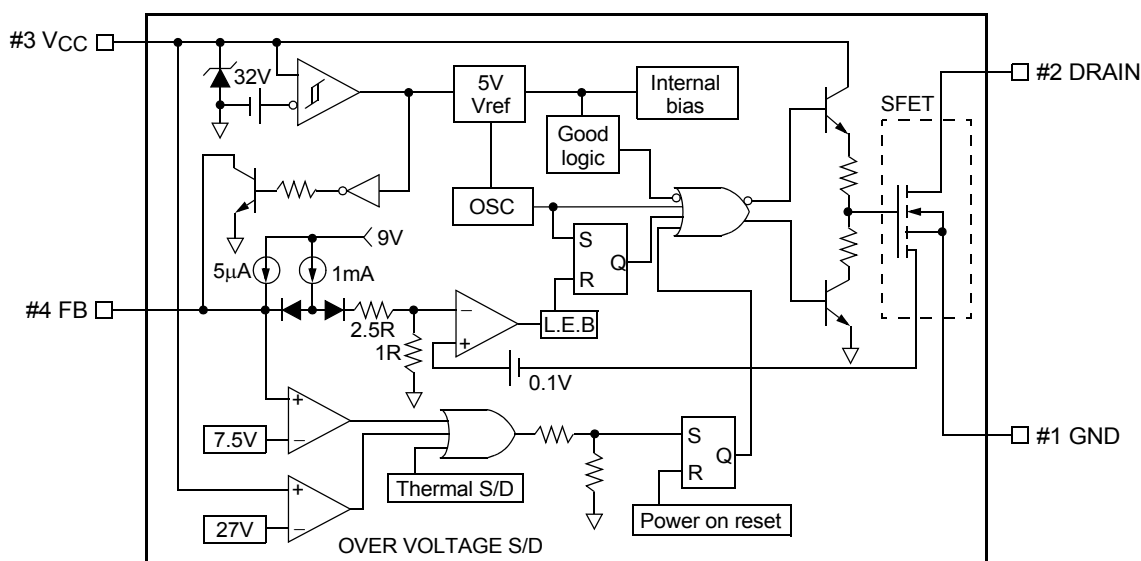
- Precision Fixed Operating Frequency (50kHz)
- Low Start-up Current(Typ. 100uA)
- Pulse by Pulse Current Limiting
- Over Current Protection
- Over Voltage Protection (Min. 25V)
- Internal Thermal Shutdown Function
- Under Voltage Lockout
- Internal High Voltage Sense FET
- Auto-Restart Mode

Description

The Fairchild Power Switch(FPS) product family is specially designed for an off-line SMPS with minimal external components. The Fairchild Power Switch(FPS) consists of a high voltage power SenseFET and a current mode PWM IC. Included PWM controller integrates the fixed frequency oscillator, the under voltage lock-out, the leading edge blanking, the optimized gate turn-on/turn-off driver, the thermal shutdown protection, the over voltage protection, and the temperature compensated precision current sources for the loop compensation and the fault protection circuitry. Compared to a discrete MOSFET and a PWM controller or an RCC solution, a Fairchild Power Switch(FPS) can reduce the total component count, design size and weight and at the same time increase efficiency, productivity, and system reliability. It has a basic platform well suited for the cost effective design in a flyback converter.



Internal Block Diagram



Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Gate Voltage ($R_{GS}=1M\Omega$)	V_{DGR}	650	V
Gate-Source (GND) Voltage	V_{GS}	± 30	V
Drain Current Pulsed ⁽²⁾	I_{DM}	20	ADC
Single Pulsed Avalanche Current ⁽³⁾ (Energy ⁽²⁾)	$I_{AS}(EAS)$	13(400)	A(mJ)
Continuous Drain Current ($T_C=25^\circ C$)	I_D	5.0	ADC
Continuous Drain Current ($T_C=100^\circ C$)	I_D	3.5	ADC
Maximum Supply Voltage	$V_{CC,MAX}$	30	V
Input Voltage Range	V_{FB}	-0.3 to V_{SD}	V
Total Power Dissipation	P_D	38	W
	Darting	0.3	W/ $^\circ C$
Operating Ambient Temperature	T_A	-25 to +85	$^\circ C$
Storage Temperature	T_{STG}	-55 to +150	$^\circ C$

Notes:

- $T_j = 25^\circ C$ to $150^\circ C$
- Repetitive rating: Pulse width limited by maximum junction temperature
- $L = 30mH$, $V_{DD} = 50V$, $R_G = 27\Omega$, starting $T_j = 25^\circ C$

Electrical Characteristics (SenseFET part)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BVDSS	VGS=0V, ID=50μA	650	-	-	V
Zero Gate Voltage Drain Current	IDSS	VDS=Max., Rating, VGS=0V	-	-	50	μA
		VDS=0.8Max., Rating, VGS=0V, TC=125°C	-	-	200	μA
Static Drain-Source on Resistance ^(Note)	RDS(ON)	VGS=10V, ID=2.5A	-	1.76	2.2	Ω
Forward Transconductance ^(Note)	gfs	VDS=50V, ID=2.5A	2.5	-	-	S
Input Capacitance	Ciss	VGS=0V, VDS=25V, f=1MHz	-	1457	-	pF
Output Capacitance	Coss		-	130	-	
Reverse Transfer Capacitance	Crss		-	38.8	-	
Turn on Delay Time	td(on)	VDD=0.5BVDSS, ID=5.0A (MOSFET switching time are essentially independent of operating temperature)	-	-	60	nS
Rise Time	tr		-	-	150	
Turn Off Delay Time	td(off)		-	-	300	
Fall Time	tf		-	-	130	
Total Gate Charge (Gate-Source+Gate-Drain)	Qg	VGS=10V, ID=5.0A, VDS=0.5BVDSS (MOSFET switching time are essentially independent of operating temperature)	-	-	56	nC
Gate-Source Charge	Qgs		-	10.3	-	
Gate-Drain (Miller) Charge	Qgd		-	22.3	-	

Note:

1. Pulse test: Pulse width ≤ 300μS, duty cycle ≤ 2%

2. $S = \frac{1}{R}$

Electrical Characteristics (Control Part) (Continued)

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
UVLO SECTION						
Start Threshold Voltage	VSTART	-	14	15	16	V
Stop Threshold Voltage	VSTOP	After turn on	8.4	9	9.6	V
OSCILLATOR SECTION						
Initial Accuracy	FOSC	KA5L0565R	45	50	55	kHz
Frequency Change With Temperature ⁽²⁾	$\Delta F/\Delta T$	-25°C ≤ Ta ≤ +85°C	-	±5	±10	%
Maximum Duty Cycle	Dmax	KA5L0565R	72	77	82	%
FEEDBACK SECTION						
Feedback Source Current	IFB	Ta=25°C, 0V ≤ Vfb ≤ 3V	0.7	0.9	1.1	mA
Shutdown Feedback Voltage	VSD	-	6.9	7.5	8.1	V
Shutdown Delay Current	I _{delay}	Ta=25°C, 5V ≤ Vfb ≤ VSD	4.0	5.0	6.0	μA
REFERENCE SECTION						
Output Voltage ⁽¹⁾	Vref	Ta=25°C	4.80	5.00	5.20	V
Temperature Stability ⁽¹⁾⁽²⁾	Vref/ΔT	-25°C ≤ Ta ≤ +85°C	-	0.3	0.6	mV/°C
CURRENT LIMIT (SELF-PROTECTION) SECTION						
Peak Current Limit	I _{OVER}	Max. inductor current	1.76	2.00	2.24	A
PROTECTION SECTION						
Thermal Shutdown Temperature (Tj) ⁽¹⁾	TSD	-	140	160	-	°C
Over Voltage Protection Voltage	VOVP	-	25	27	29	V
TOTAL DEVICE SECTION						
Start Up Current	I _{START}	VCC=14V	-	100	170	uA
Operating Supply Current (Control Part Only)	I _{OP}	Ta=25°C	-	7	12	mA

Note:

1. These parameters, although guaranteed, are not 100% tested in production
2. These parameters, although guaranteed, are tested in EDS (wafer test) process

Typical Performance Characteristics

(These characteristic graphs are normalized at $T_a=25^\circ\text{C}$)

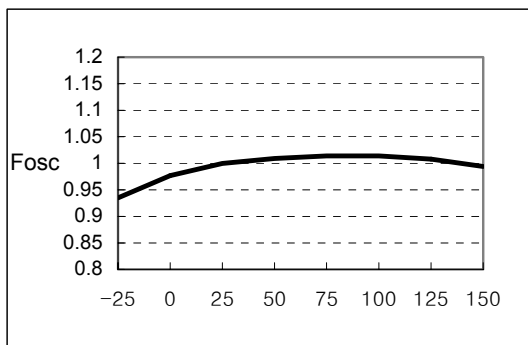


Figure 1. Operating Frequency

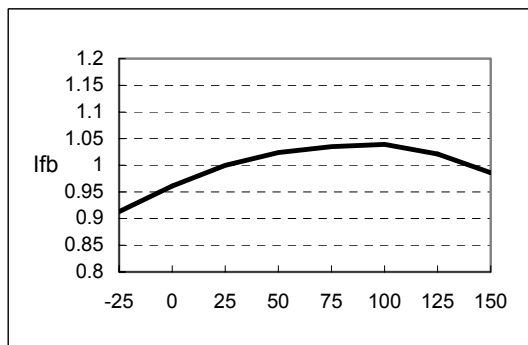


Figure 2. Feedback Source Current

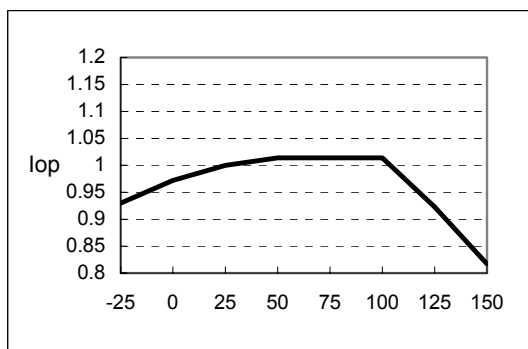


Figure 3. Operating Supply Current

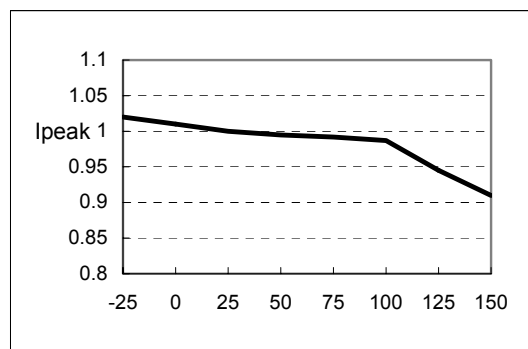


Figure 4. Peak Current Limit

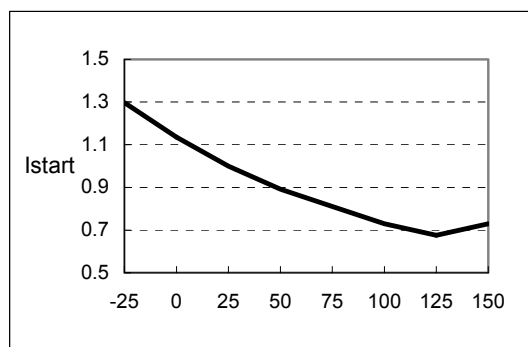


Figure 5. Start up Current

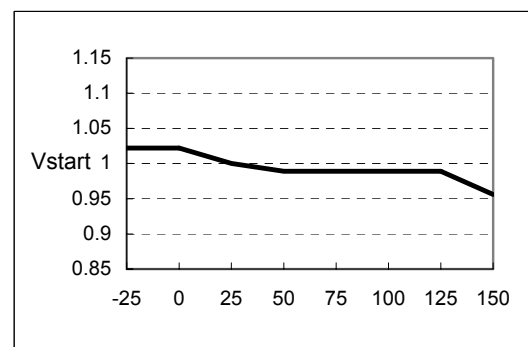


Figure 6. Start Threshold Voltage

Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at $T_a=25^\circ\text{C}$)

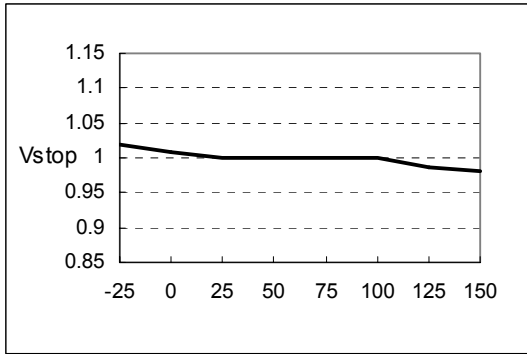


Figure 7. Stop Threshold Voltage

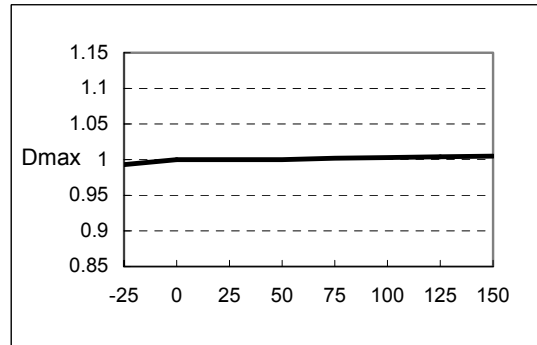


Figure 8. Maximum Duty Cycle

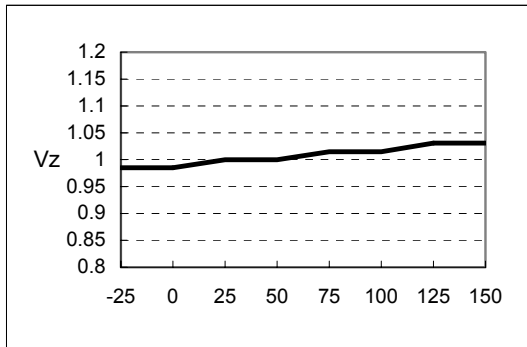


Figure 9. VCC Zener Voltage

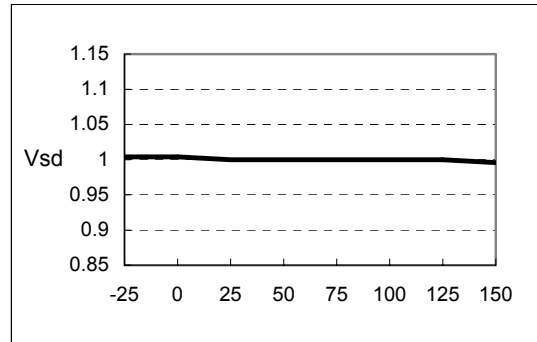


Figure 10. Shutdown Feedback Voltage

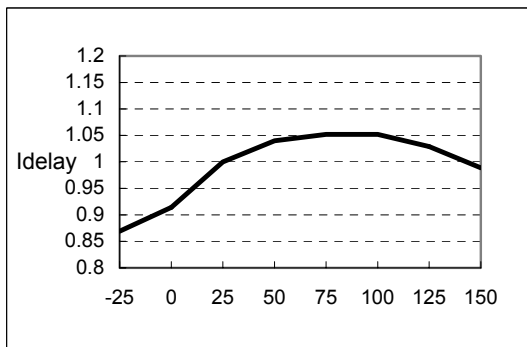


Figure 11. Shutdown Delay Current

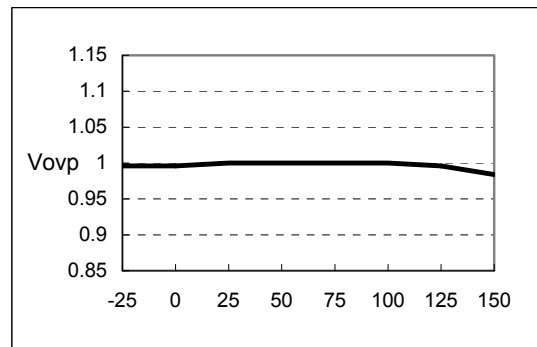


Figure 12. Over Voltage Protection

Typical Performance Characteristics (Continued)

(These characteristic graphs are normalized at $T_a=25^\circ\text{C}$)

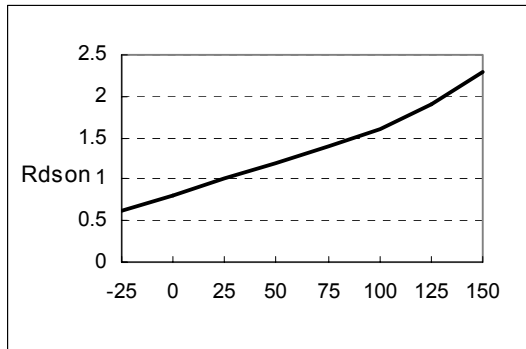
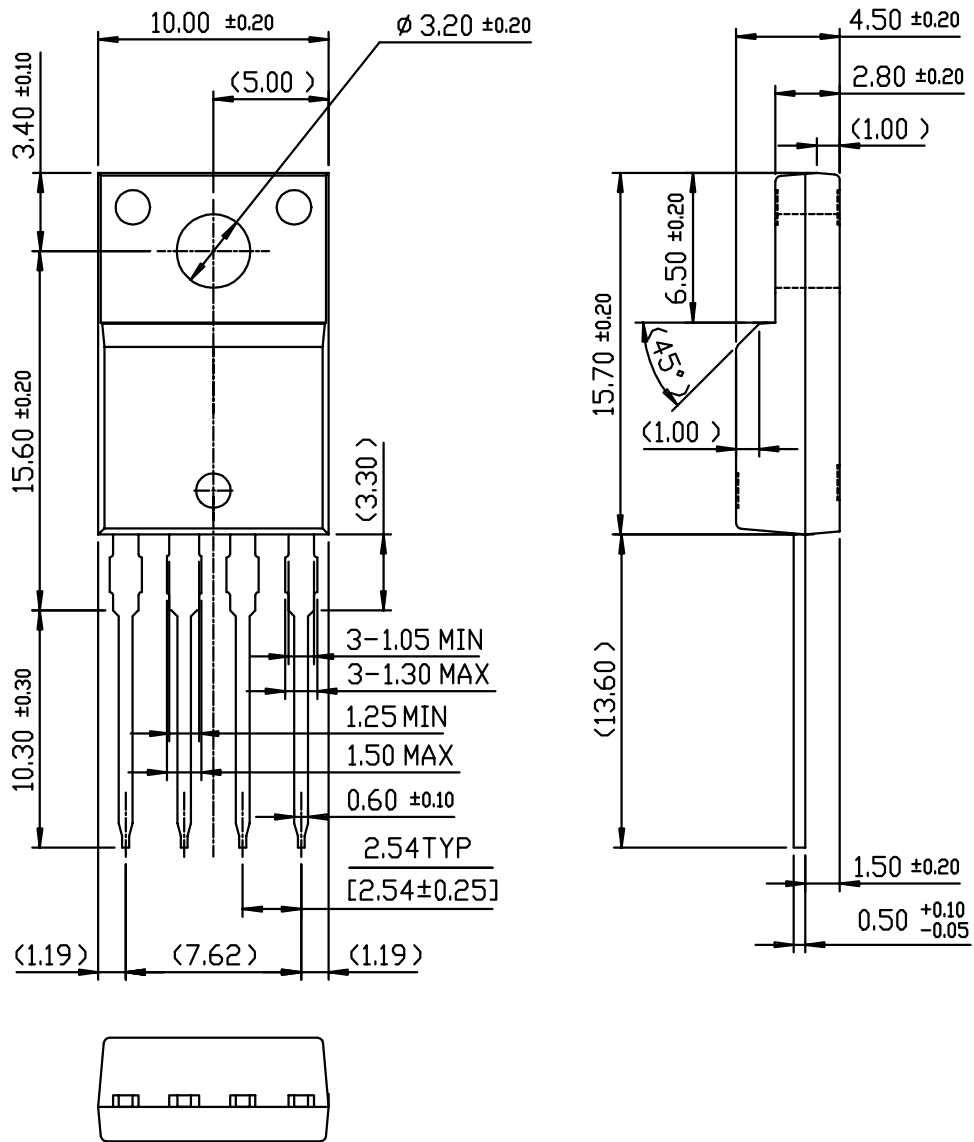


Figure 13. Static Drain-Source on Resistance

Package Dimensions

TO-220F-4L



Ordering Information

Product Number	Package	Rating	Fosc
KA5L0565RTU	TO-220F-4L	650V, 5A	50kHz
KA5L0565RYDTU	TO-220F-4L(Forming)		

TU : Non Forming Type

YDTU : Forming Type

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 THE PRESIDENT 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.

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