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.

September 2014

LM350
3-Terminal 3 A Positive Adjustable Regulator

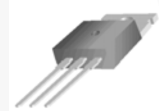
Features

- Output Adjustable Between 1.2 V and 33 V
- Guaranteed 3 A Output Current
- Internal Thermal Overload Protection
- Load Regulation (Typical: 0.1%)
- Line Regulation (Typical: 0.015%/V)
- Internal Short-Circuit Current Limit
- Output Transistor Safe-Area Compensation

Description

The LM350 is an adjustable 3-terminal positive voltage regulator capable of supplying in excess of 3.0 A over an output voltage range of 1.2 V to 33 V.

TO-220 (Single Gauge)



1

1. Adj 2. Output 3. Input

Ordering Information

Product Number	Marking	Package	Packing Method	Operating Temperature
LM350T	LM350	TO-220 3L (Single Gauge)	Rail	0 to +125°C

Block Diagram

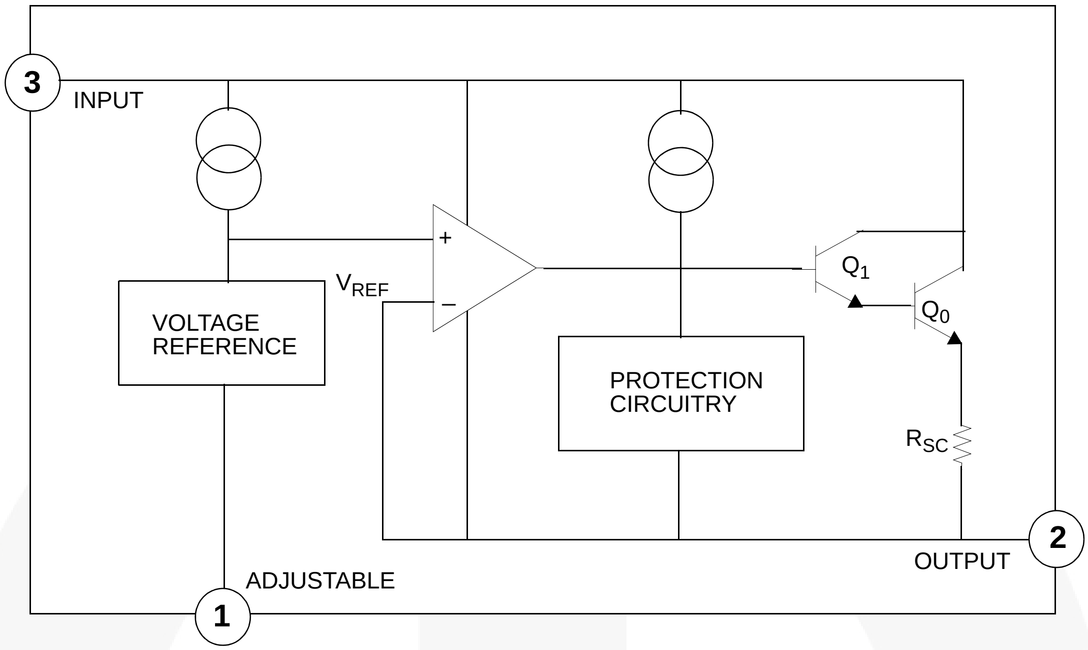


Figure 1. Block Diagram

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
V_I - V_O	Input-Output Voltage Differential	35	V
T_{LEAD}	Lead Temperature (Soldering, 10 sec)	300	°C
T_{OPR}	Operating Temperature Range	0 to +125	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C

Thermal Characteristics

Values are at T_A = 25°C unless otherwise noted.

Symbol	Parameter	Value	Unit
P_D	Power Dissipation	Internally Limited	W

Electrical Characteristics

V_I - V_O = 5 V, I_O = 1.5 A, 0°C ≤ T_J ≤ +125°C, P_D ≤ P_{DMAX}, unless otherwise specified.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Rline	Line Regulation[(1)]	T_A = +25°C, 3 V ≤ V_I - V_O ≤ 35 V		0.015	0.030	%/V
Rload	Load Regulation[(1)]	T_A = +25°C, 3 V ≤ V_I - V_O ≤ 35 V, V_O ≤ 5V		5	25	mV
		T_A = +25°C, 3 V ≤ V_I - V_O ≤ 35 V, V_O ≥ 5V		0.1	0.5	%
I_{ADJ}	Adjustment Pin Current	-		50	100	µA
ΔI_{ADJ}	Adjustment Pin Current Change	3 V ≤ V_I - V_O ≤ 35 V, 10 mA ≤ I_O ≤ 3 A, P_D ≤ P_{MAX}		0.2	5.0	µA
REG_T	Thermal Regulation	Pulse = 20 ms, T_A = +25°C		0.002		%/W
V_{REF}	Reference Voltage	3 V ≤ V_I - V_O ≤ 35 V, 10 mA ≤ I_O ≤ 3 A, P_D ≤ 30 W	1.20	1.25	1.30	V
Rline	Line Regulation	3.0 V ≤ V_I - V_O ≤ 35 V		0.02	0.07	%/W
Rload	Load Regulation	10 mA ≤ I_O ≤ 3.0 A, V_O ≤ 5.0 V		20	70	mV
		10 mA ≤ I_O ≤ 3.0 A, V_O ≥ 5.0 V		0.3	1.5	%
ST_T	Temperature Stability	T_J = 0°C to +125°C		1.0		%
$I_{O(MAX)}$	Maximum Output Current	V_I - V_O ≤ 10 V, P_D ≤ P_{MAX}	3.0	4.5		A
		V_I - V_O = 30 V, P_D ≤ P_{MAX}, T_A = +25°C	0.25	1.0		
$I_{L(MIN)}$	Minimum Load Current	V_I - V_O = 35 V		3.5	10	mA
V_N	RMS Noise, %of V_{OUT}	10 Hz ≤ f ≤ 10 kHz, T_A = +25°C		0.003		%/V_o
RR	Ripple Rejection	V_O = 10 V, f = 120 Hz, C_{ADJ} = 0		65		dB
		V_O = 10 V, f = 120 Hz, C_{ADJ} = 10 µF	66	80		
ST	Long-Term Stability	T_J = +125°C		0.3	1	%/ 1000HR

Note:

1. Regulation is measured at constant junction temperature. Changes in output voltage due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

Typical Performance Characteristics

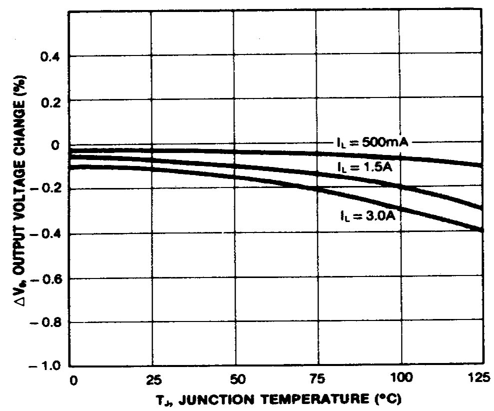


Figure 2. Load Regulation

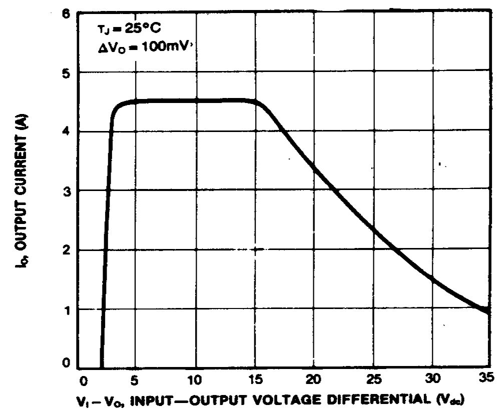


Figure 3. Current Limit

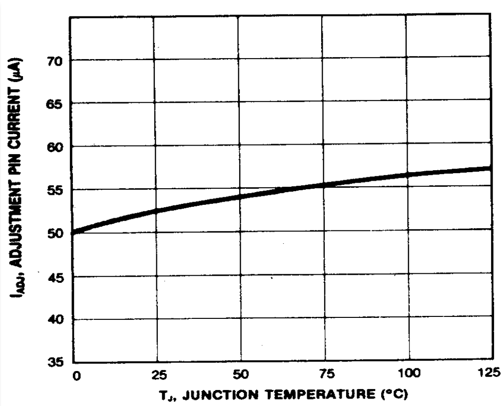


Figure 4. Adjustment Pin Current

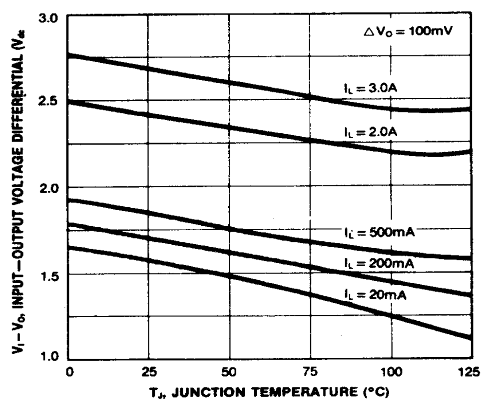


Figure 5. Dropout Voltage

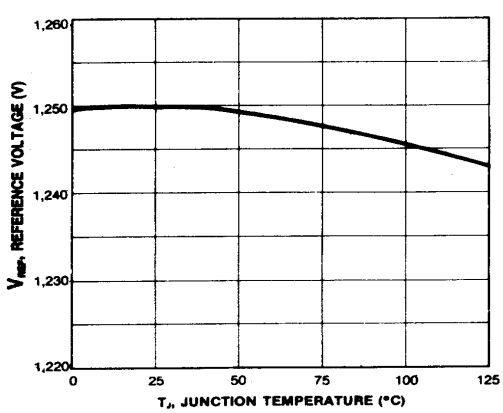


Figure 6. Temperature Stability

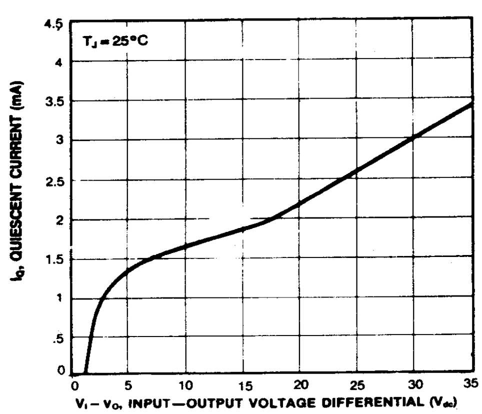


Figure 7. Minimum Load Current

Typical Performance Characteristics (Continued)

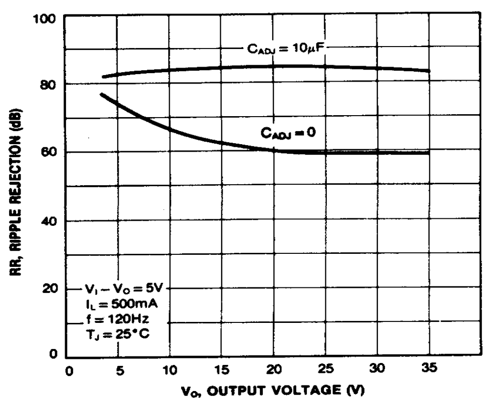


Figure 8. Ripple Rejection vs. V_O

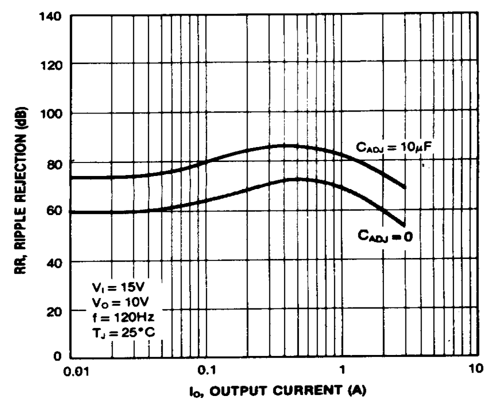


Figure 9. Ripple Rejection vs. I_O

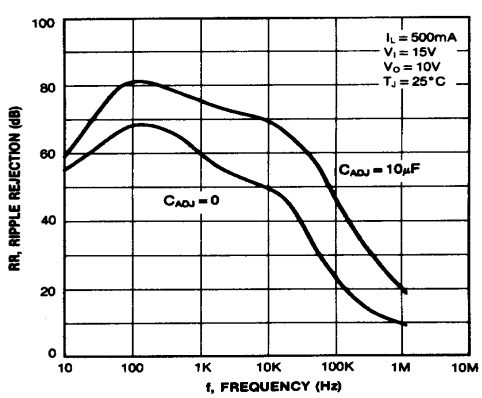


Figure 10. Ripple Rejection vs Frequency

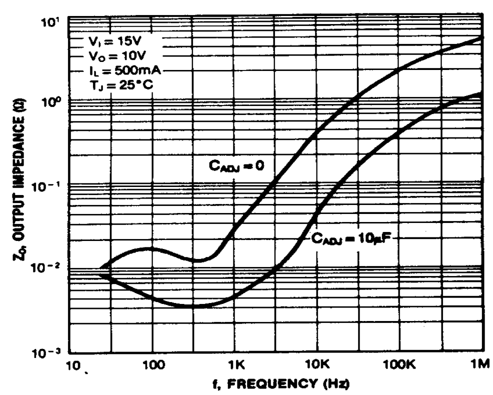


Figure 11. Output Impedan

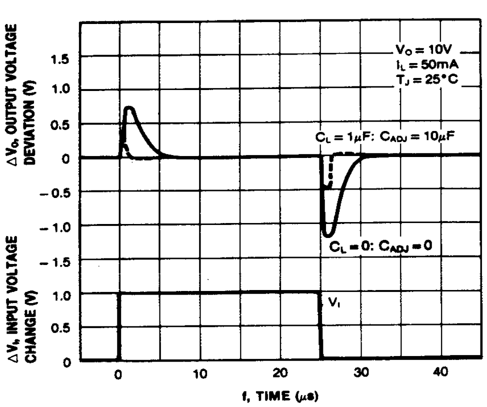


Figure 12. Line Transient Response

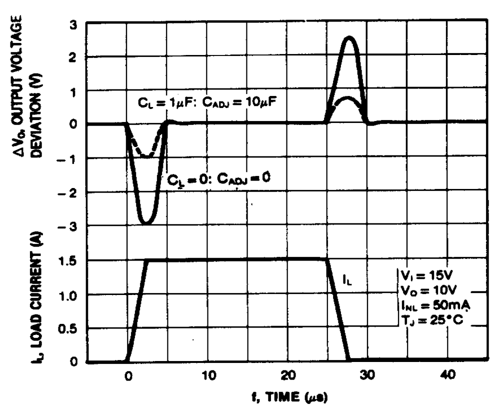


Figure 13. Load Transient Response

Typical Application[2]

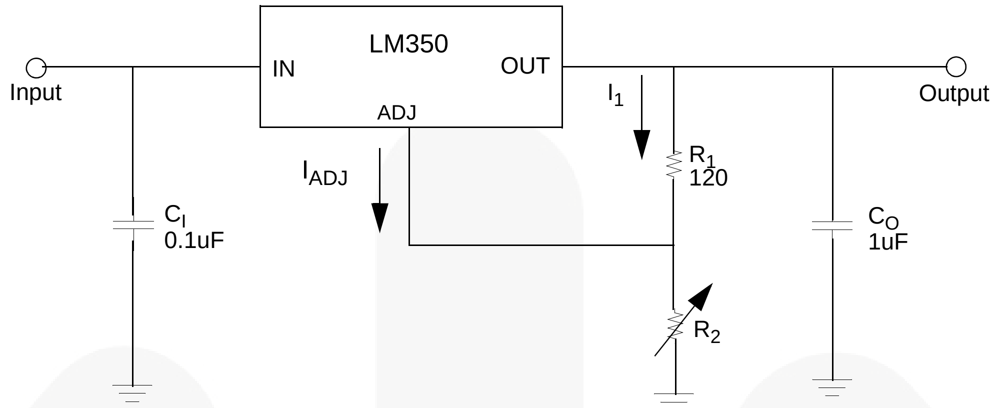


Figure 14.

Note:

2. C_I: C_I is required if the regulator is located an appreciable distance from power supply filter.
   C_O: Output capacitors in the range of 1 µF to 100 µF of aluminum or tantalum electronic are commonly used to provide improved output impedance and rejection of transients.

In operation, the LM350 develops a nominal 1.25 V reference voltage, V_{REF}, between the output and adjustment terminal. The reference voltage is impressed across program resistor R_1 and, since the voltage is constant, a constant current I_1 then flows through the output set resistor R_2, giving an output voltage of

$$V_O = 1.25\ V(1+R_2/R_1) + I_{ADJ}\ R_2$$

Since I_{ADJ} current (less than 100 mA) from the adjustment terminal represents an error term, the LM350 was designed to minimize I_{ADJ} and make it very constant with line and load changes. To do this, all quiescent operating current is returned to the output establishing a minimum load current requirement. If there is insufficient load on the output, the output voltage will rise. Since the LM350 is a floating regulator, it is only the voltage differential across the circuit which is important to performance, and operation at high voltage with respect to ground is possible.
Since I_{ADJ} is controlled to less than 100 mA, the error associated with this term is negligible in most applications.

Physical Dimensions

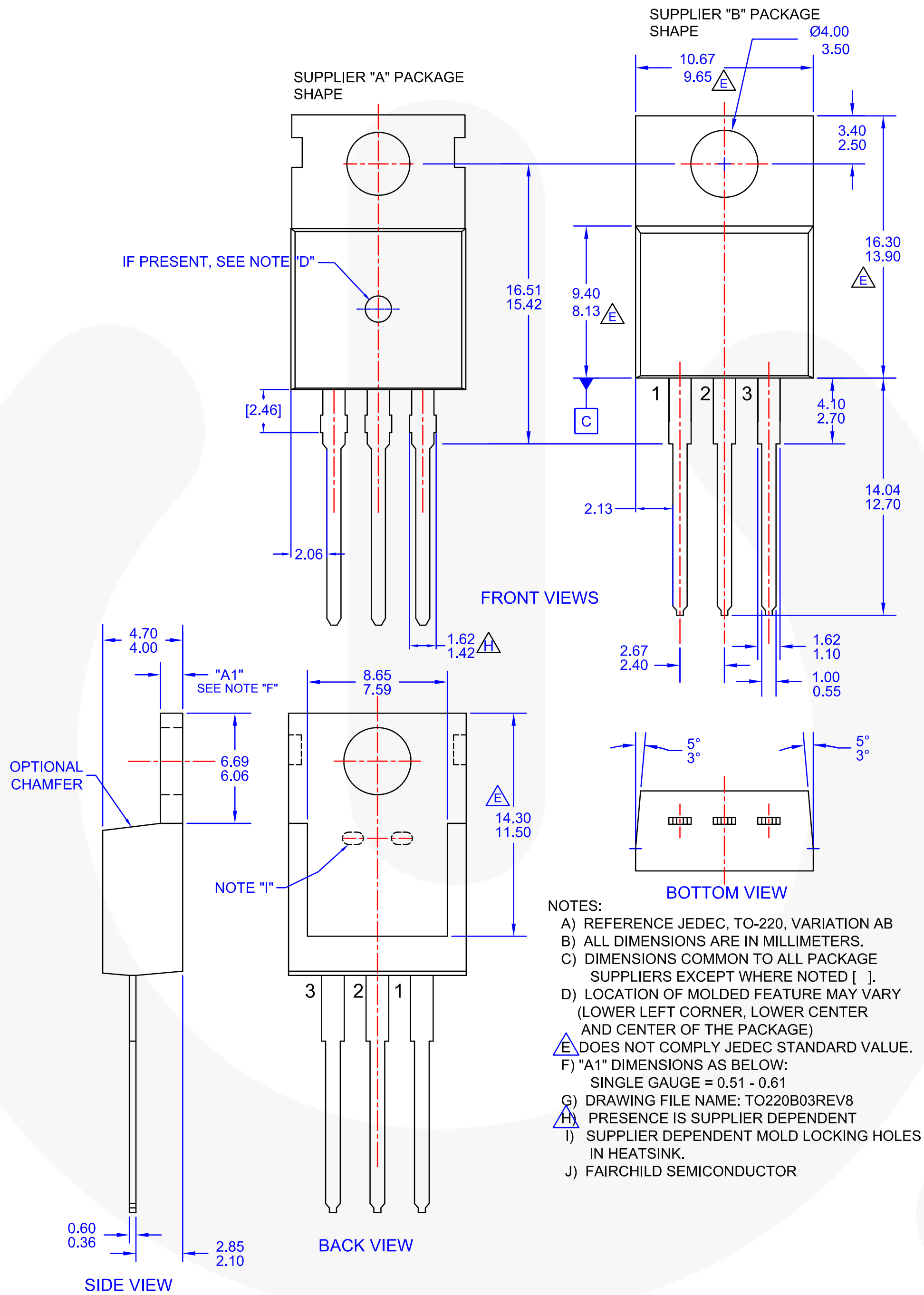


Figure 15. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
Awinda®
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
G*max*™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHiT™
®
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
μSerDes™
μSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™
Xsens™
仙童™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT HTTP://WWW.FAIRCHILDSEMI.COM. 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.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	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	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I71

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