FAIRCHILD SEMICONDUCTOR®

July 2013

FSA8058
Audio Jack Detection and Configuration Switch with Moisture Sensing

Features

Detection	Accessory Plug-In 3-Pole or 4-Pole Audio Jack Send/End Key Pressed Moisture	
Switch Type	MIC	
V_{DD}	2.5 V to 4.5 V	
V_{IO}	1.6 to V_{DD}	
THD (MIC)	0.01% Typical	
ESD (Air Gap)	15 kV	
Operating Temperature	-40°C to 85°C	
Package	10-Lead UMLP, 1.4 mm × 1.8 mm × 0.5 mm, 0.4 mm Pitch	
Top Mark	FSA8058	NC
Ordering Information	FSA8058UMX	

Applications

- 3.5 mm and 2.5 mm Audio Jacks
- Cellular Phones, Smart Phones
- MP3 and PMP

Description

The FSA8058 is an audio jack detection switch for 3-pole and 4-pole accessories. The FSA8058 features moisture sensing, which prevents false positive detection of accessories in the audio jack. The FSA8058 also features an integrated MIC switch that allows a processor to configure attached accessories. The architecture is designed to allow common third-party headphones to be used for listening to music from mobile handsets, personal media players, and portable peripheral devices.

- Prevents False Detection of Accessories in the Audio Jack when Moisture is Present
- Removes Audio Jack Pop and Click Caused by MIC Bias
- Detects Audio Jack Accessories:
  - Standard Headphones
  - Send / End Button Presses
- Integrates a MIC Switch for 4-Pole Configuration

Related Resources

- *FSA8058 Evaluation Board*
- *For samples and questions, please contact:* *Analog.Switch@fairchildsemi.com*

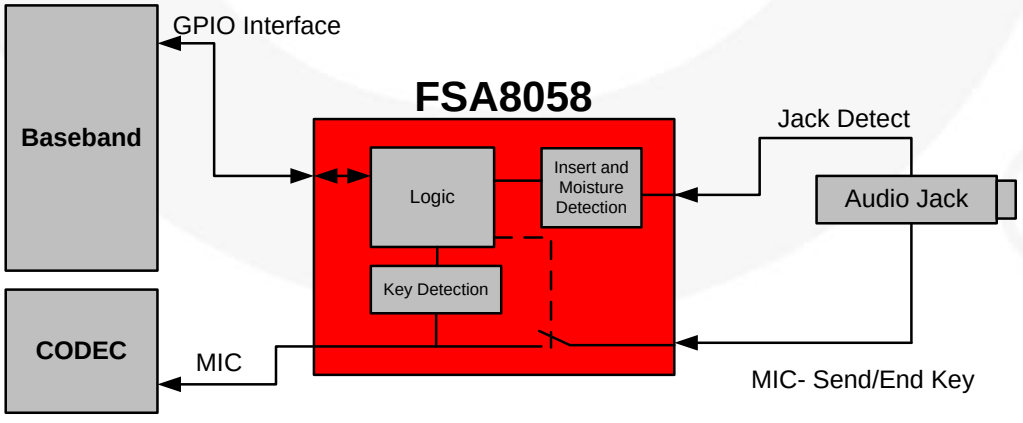


Figure 1. System Diagram

© 2012 Fairchild Semiconductor Corporation

Pin Configuration

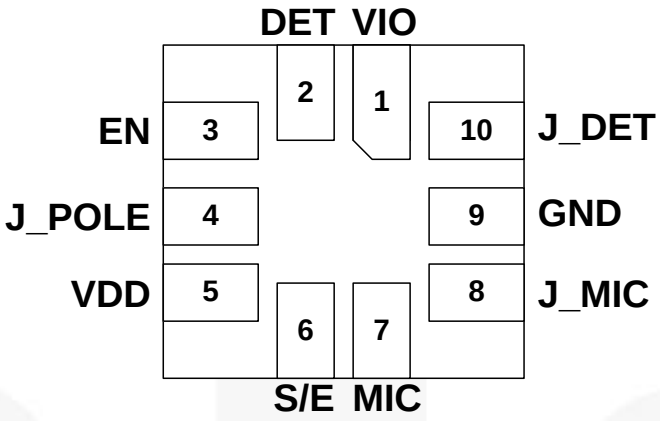


Figure 2. Pin Assignment (Through View)

Pin Definitions

Name	Pin #	Type	Description	
DET	2	Output	Indicates if audio jack is plugged in as detected on J_DET pin	DET = LOW, Plugged
				DET = HIGH, Unplugged
JPOLE	4	Output	Indicates if audio jack is a 3-pole jack or a 4-pole jack	JPOLE = LOW, 4-Pole Jack
				JPOLE = HIGH, 3-Pole Jack
S/E	6	Output	Indicates state of SEND/END for a 4-pole accessory when a key has been pressed	S/E = LOW, No Key Press
				S/E = HIGH, Key Press
EN	3	Input	Controls internal microphone switch between the J_MIC and MIC pins	EN = LOW, Switch Open
				EN = HIGH, Switch Closed
J_DET	10	Input	Input from a pin of the audio jack socket tied to a mechanical switch that typically closes whenever an audio jack is inserted into that socket	J_DET = HIGH, Unplugged
				J_DET = LOW, Plugged
MIC	7	Switch	Microphone switch path that goes to the CODEC microphone amplifier input	EN = LOW, Switch Open
				EN = HIGH, Switch Closed
J_MIC	8	Switch	Microphone switch path that connects to the microphone and SEND/END key audio jack pole	EN = LOW, Switch Open
				EN = HIGH, Switch Closed
VDD	5	Power	Core supply voltage	
VIO	1	Power	Baseband I/O supply voltage	
GND	9	Ground	Ground for both the audio jack and the PCB	

© 2012 Fairchild Semiconductor Corporation

Operation and Application Description

Moisture Issue

Mobile device manufacturers today face a customer experience issue when liquid/moisture enters the audio jack connector housing and causes electrical shorts between metal connectors. The mobile device recognizes it as an accessory insert, resulting in the mobile device rerouting all the audio signals though the audio jack path, where the end user loses all audio function on the device.

Moisture Detection

The FSA8058 automatically detects moisture on the J_DET pin. If there is moisture, the device enters Moisture Mode and monitors for a real accessory insert. It remains in Moisture Mode until the device no longer detects moisture on the J_DET pin.

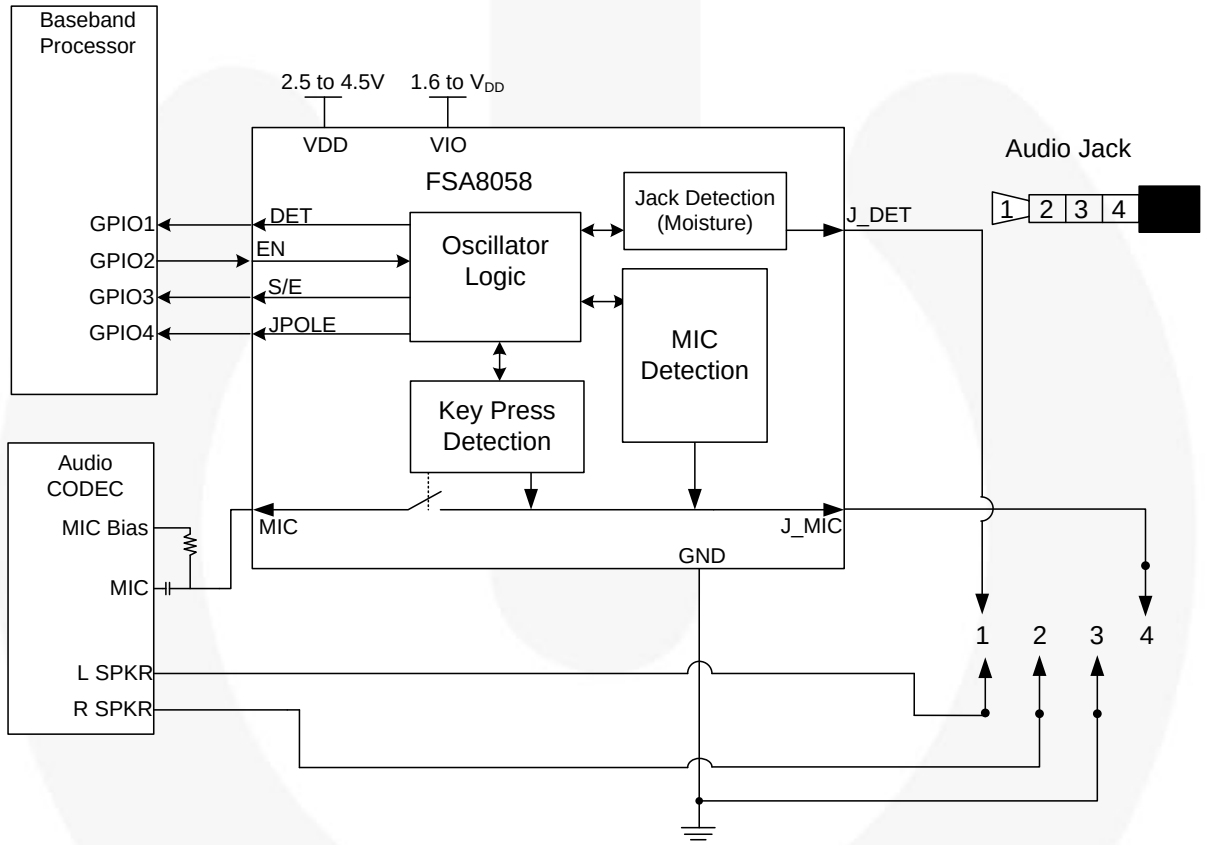


Figure 3. Typical Application Diagram

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.

Symbol	Parameter		Min.	Max.	Unit
V_{DD}, V_{IO}	Supply Voltage from Battery		-0.5	6.0	V
V_{SW}	Switch I/O Voltage for “S” Switch, All Input Voltages Except J_DET		-0.5	V_{DD}+0.5	V
V_{JD}	Input Voltage for J_DET Input		-1.5	V_{DD}+0.5	V
I_{IK}	Input Clamp Diode Current		-50		mA
I_{SW}	Switch I/O Current (Continuous)			50	mA
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Maximum Junction Temperature			+150	°C
T_L	Lead Temperature (Soldering, 10 Seconds)			+260	°C
ESD	IEC 61000-4-2 System ESD	Air Gap	15.0		kV
		Contact	8.0		
	JEDEC JESD22-A114, Human Body Model	All Pins	7.5		
		J_DET, J_MIC, V_{DD}, V_{IO}	12.0		
	JEDEC JESD22-C101, Charged Device Model	All Pins	2.0		

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding them or designing to Absolute Maximum Ratings.

Symbol	Parameter	Min.	Max.	Unit
V_{DD}	Battery Supply Voltage	2.5	4.5	V
V_{IO}	Parallel I/O Supply Voltage	1.6	V_{DD}	V
T_A	Operating Temperature	-40	+85	ºC

© 2012 Fairchild Semiconductor Corporation

DC Electrical Characteristics

All typical values are at T_A=25°C unless otherwise specified.

Symbol	Parameter	V_{DD} (V)	Condition	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
MIC Switch							
R_{ON}	MIC Switch On Resistance	2.8	I_{OUT} = 30 mA, V_{IN} = 2.2 V		0.85	2.00	Ω
		3.0			0.70	2.00	
		3.3			0.50	2.00	
		3.8			0.40	2.00	
$R_{FLAT(ON)}$	On Resistance Flatness	2.8	I_{OUT} = 30 mA, V_{IN} = 1.6 to 2.8 V		0.45	1.50	
		3.0			0.40	1.50	
		3.3			0.35	1.50	
		3.8			0.30	1.50	
V_{IN}	Switch Input Voltage Range	2.5 to 4.5		0		V_{DD}	V
C_{ON}	MIC and J_MIC Switch ON Capacitance	3.8	f = 1 MHz		60		pF
C_{OFF}	MIC and J_MIC Switch OFF Capacitance	3.8	f = 1 MHz		35		pF
J_MIC							
J_MIC_{AudioV}	Audio Voltage Range on J_MIC Pin	2.5 to 4.5	DET = LOW	0		3	V
J_MIC_{Audiof}	Audio Frequency on J_MIC Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
J_MIC_{RGND2}	Detection Resistance to Ground			1250			Ω
J_MIC_{HYS}	Hysteresis of J_MIC				60		mV
J_MIC_{VIH}	Input High Voltage			0.3			V
J_MIC_{VIL}	Input Low Voltage			-0.5		1.0	V
J_DET							
J_DET_{AudioV}	Audio Voltage Range on J_DET Pin	2.5 to 4.5	DET = LOW	-1		1	V
J_DET_{Audiof}	Audio Frequency on J_DET Pin	2.5 to 4.5	DET = LOW	20		20000	Hz
J_DET_{RGND}	Detection Resistance to Ground	2.5 to 4.5	Audio Jack Inserted	0		500	kΩ
J_DET_{HYS}	Hysteresis of J_DET				200		mV
J_DET_{VIH}	Input High Voltage			0.7 × V_{DD}		V_{DD}	V
J_DET_{VIL}	Input Low Voltage			-1.0		0.4 × V_{DD}	V
Parallel I/O							
V_{IH}	Input High Voltage			0.7 × V_{IO}		V_{IO}	V
V_{IL}	Input Low Voltage					0.3 × V_{IO}	
V_{OH}	Output High Voltage		I_{OH} = -100 µA	0.8 × V_{IO}			
V_{OL}	Output Low Voltage		I_{OL} = +100 µA			0.2 × V_{IO}	

Continued on the following page…

© 2012 Fairchild Semiconductor Corporation

DC Electrical Characteristics

All typical values are at T_A=25°C unless otherwise specified.

Symbol	Parameter	V_{DD} (V)	Condition	T_A = -40 to +85°C			Unit
				Min.	Typ.	Max.	
Comparator							
$V_{COMP_S/E}$	Comparator Threshold for SEND / END Sensing	2.8 to 4.5	J_DET, EN = LOW		780		mV
Current							
I_{OFF}	Power-Off Leakage Current Through Switch	0	MIC, J_MIC, Ports V_{IN} = 4.3 V			1	µA
I_{IN}	Input Leakage Current	0	Inputs V_{IN} = 4.3 V			1	µA
$I_{CC-SLNA}$	Battery Supply Sleep Mode Current No Accessory Attached	2.5 to 4.5	Static Current During Sleep Mode (EN = LOW)		1.5	3.0	µA
$I_{CC-SLWA}$	Battery Supply Sleep Mode Current with Accessory Attached	2.5 to 4.4	Active Current (EN = LOW and/or DET = HIGH)		20	25	µA

AC Electrical Characteristics

All typical values are for V_{CC}=3.3 V at T_A=25°C unless otherwise specified.

Symbol	Parameter	V_{DD} (V)	Conditions	Typical	Unit
MIC Switch					
THD	Total Harmonic Distortion	3.8	R_T = 600 Ω, V_{SW} = 0.5 V_{PP}, f = 20 Hz to 20 kHz, V_{IN} = 2.2 V	0.01	%
O_{IRR}	Off Isolation	3.8	f = 20 kHz, R_S = 32 Ω, C_L = 0 pF, R_T = 32 Ω	-85	dB
Parallel I/O					
t_R, t_F	Output Edge Rates (DET, S/E)	3.8	C_L = 5 pF, 20% to 80%, -40°C to 85°C	20	ns
t_{POLL}	On Time of MIC Switch for Sensing SEND / END Button Press Oscillator Stable Time	2.5 to 4.5		1	ms
t_{WAIT}	Period of MIC Switching Time for Sensing SEND / END Button Press	2.5 to 4.5		10	ms
t_{DET_IN}	Debounce Time after J_DET Changes State from HIGH to LOW	2.5 to 4.5		100	ms
t_{DET_REM}	Debounce Time after J_DET Changes State from LOW to HIGH	2.5 to 4.5		1	ms
t_{KBK}	Debounce Time for Sensing SEND / END Key Press / Release	2.5 to 4.5		30	ms
Power					
PSRR	Power Supply Rejection Ratio	3.8	Power Supply Noise 300 mV_{PP}, Measured 10/90%, f = 217 Hz	-80	dB

© 2012 Fairchild Semiconductor Corporation

Physical Dimensions

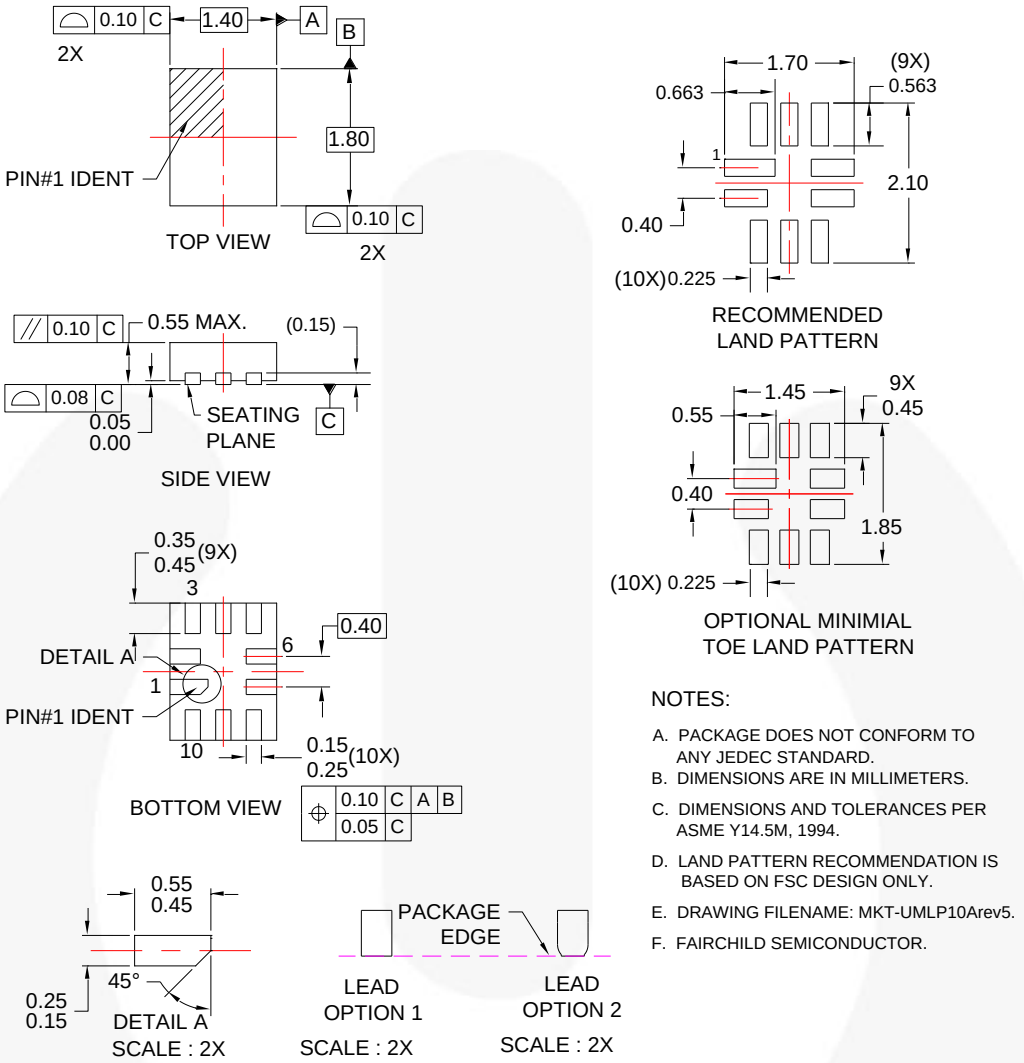


Figure 4. 10-Lead, Quad Ultrathin MLP (UMLP), 1.4 X 1.8 mm Body

Table 1. Nominal Values

JEDEC Symbol	Description	Nominal Values (mm)
A	Overall Height	0.5
A1	Package Standoff	0.072
A3	Lead Thickness	0.152
b	Lead Width	0.4
L	Lead Length	0.2
e	Lead Pitch	0.4
D	Body Length (Y)	1.8
E	Body Width (X)	1.4

Package drawings are provided as a service to customers considering Fairchild components. Drawings may change in any manner without notice. Please note the revision and/or date on the drawing and contact a Fairchild Semiconductor representative to verify or obtain the most recent revision. Package specifications do not expand the terms of Fairchild's worldwide terms and conditions, specifically the warranty therein, which covers Fairchild products.

Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:
http://www.fairchildsemi.com/dwg/UM/UMLP10A.pdf.

© 2012 Fairchild Semiconductor Corporation

FAIRCHILD SEMICONDUCTOR®

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.

2Cool™
AccuPower™
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
mWSaver™
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
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™
SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™

* 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. 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. I64

© 2012 Fairchild Semiconductor Corporation