FAIRCHILD SEMICONDUCTOR®

September 2008

FSSD06 — SD/SDIO and MMC Two-Port Multiplexer

Features

- On Resistance Typically 4Ω, V_{DDH}=2.7V
- F_{toggle}: > 120MHz
- Low On Capacitance: 9pF Typical
- Low Power Consumption: 1µA Maximum
- Conforms to Secure Digital (SD), Secure Digital I/O (SDIO), and Multimedia Card (MMC) Specifications
- Supports 1-Bit / 4-Bit Host Controllers (V_{DDH}=1.65V to 3.6V) Communicating with High-Voltage (2.7-3.6V) and Dual-Voltage Cards (1.65-1.95V, 2.7-3.6V)
  - V_{DDH}=1.65 to 3.6V, $V_{DDC1/C2}$=V_{DDH} to 3.6V
- 24-Lead MLP (3.5 x 4.5mm) and UMLP Packages

Applications

- Cell Phone, PDA, Digital Camera, Portable GPS
- LCD Monitor, Home Theater PC/TV, All-in-One Printer

Description

The FSSD06 is a two-port multiplexer that allows Secure Digital (SD), Secure Digital I/O (SDIO), and Multimedia Card (MMC) host controllers to be expanded out to multiple cards or peripherals. This configuration enables the CMD, CLK, and D[3:0] signals to be multiplexed to dual-card peripherals. It is optimized for 1-bit / 4-bit SD / MMC applications.

The architecture includes the necessary bi-directional data and command transfer capability for single high-voltage cards or dual-voltage supply cards. The clock path for the FSSD06 is a uni-directional buffer with an integrated pull-up for high-impedance mode.

Typical applications involve switching in portables and consumer applications: cell phones, digital cameras, home theater monitors, portable GPS units, and printers.

IMPORTANT NOTE:

For additional performance information, please contact analogswitch@fairchildsemi.com.

Analog Symbol Diagram

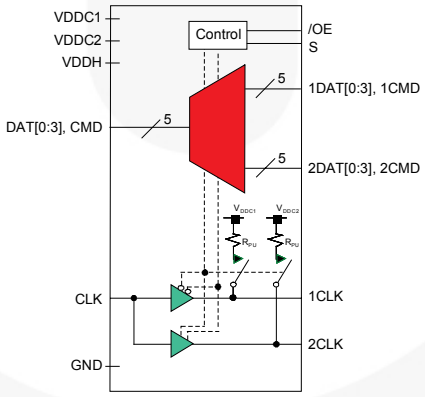


Figure 1. Analog Symbol Diagram

Ordering Information

Part Number	Operating Temperature Range	Eco Status	Package Description	Packing Method
FSSD06BQX	-40°C to +85°C	Green	24-Lead Molded Leadless Package (MLP), JEDEC MO-220, 3.5 x 4.5mm	Tape & Reel
FSSD06UMX	-40°C to +85°C	Green	24-Lead Ultrathin Molded Leadless Package (UMLP)	Tape & Reel

For Fairchild's definition of "green" Eco Status, please visit: http://www.fairchildsemi.com/company/green/rohs_green.html.

Pin Configuration

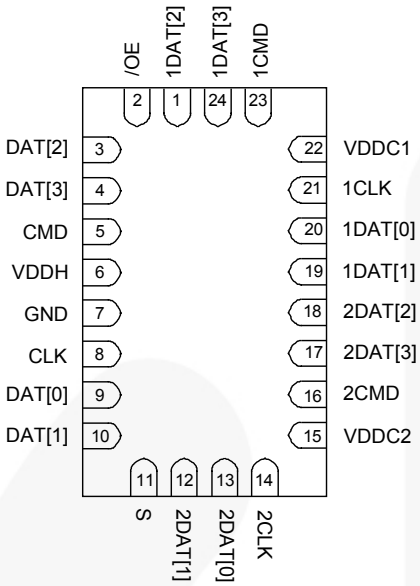


Figure 2. MLP Pin Assignments

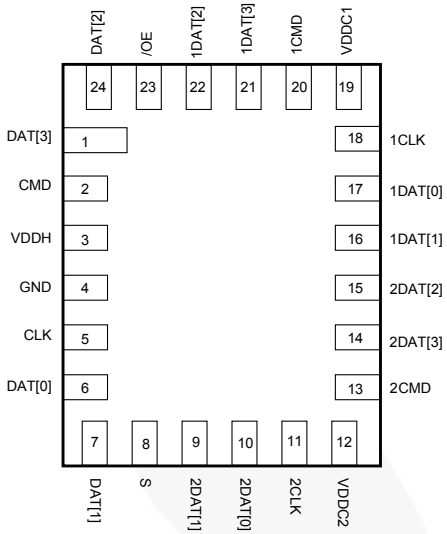


Figure 3. UMLP Pin Assignments

Pin Definitions

Name	Description
VDDH	Power Supply (Host ASIC)
VDDC1, VDDC2	Power Supply (SDIO Peripheral Card Ports)
/OE	Output Enable (Active Low)
S	Select Pin
1DAT[3:0], 2DAT[3:0], 1CMD, 2CMD	SDIO Card Ports
DAT[3:0], CMD	SDIO Common Ports
CLK, 1CLK, 2CLK	Clock Path Ports

Truth Table

/OE	S	Function
LOW	LOW	CMD, CLK, DAT[3:0] connected to 1CMD, 1CLK, 1DAT[3:0]; 2CLK pulled HIGH via R_{PU}
LOW	HIGH	CMD, CLK, DAT[3:0] connected to 2CMD, 2CLK, 2DAT[3:0]; 1CLK pulled HIGH via R_{PU}
HIGH	X	All Ports High Impedance; 1CLK, 2CLK pulled HIGH via R_{PU}

Typical Application Diagram

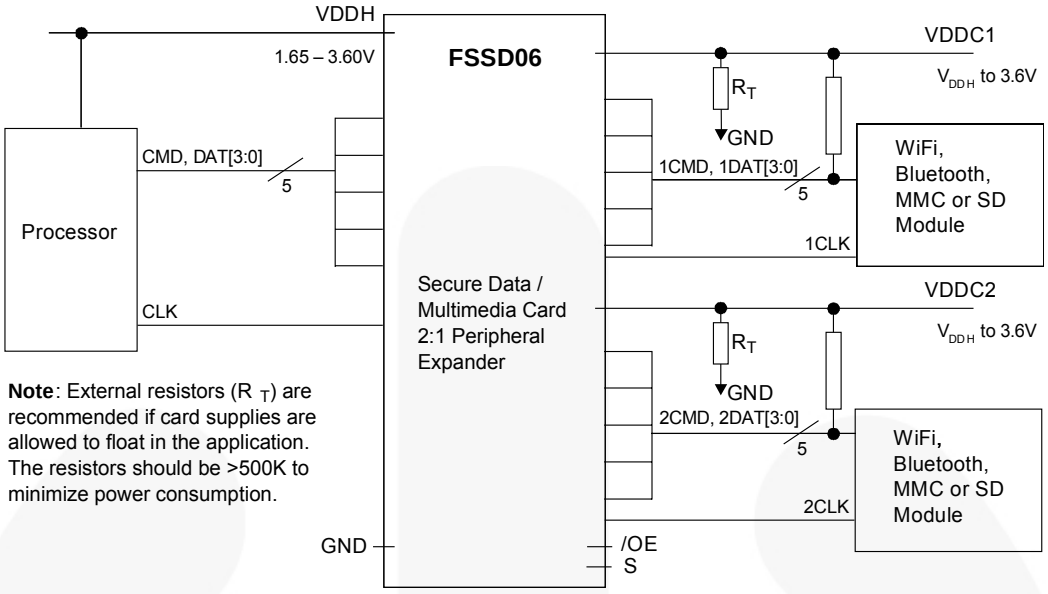


Figure 4. Typical Application Diagram

Functional Description

The FSSD06 enables sharing the ASIC/baseband processor SDIO port(s) to two peripheral cards, providing bi-directional support for dual-voltage SD/SDIO or MMC cards available in the marketplace. Each SDIO port of the FSSD06 has its own supply rail, allowing peripheral cards with different supplies to be interfaced to the host. The peripheral card supplies must be equal or greater than the host to minimize power consumption. The independent V_{DDH}, V_{DDC1}, and V_{DDC2} are defined by the supplies connected from the application Power Management ICs (PMICs) to the FSSD06. The clock path is a uni-directional buffered path rather than a bi-directional switch port.

CMD, DAT Bus Pull-ups

The 1CMD, 2CMD, 1DAT[3:0], and 2DAT[3:0] ports do not have, internally, the system pull-up resistors as defined in the MMC or SD card system bus specifications. The system bus pull-up must be added external to the FSSD06. The value, within the specific specification limits, is a function of the individual application and type of card or peripheral connected. For SD card applications, the R_{CMD} and R_{DAT} pull-ups should be between 10kΩ and 100kΩ. For MMC applications, the R_{CMD} pull-ups should be between 4.7kΩ and 100kΩ and the R_{DAT} pull-ups between 50kΩ and 100kΩ. The card-side 1CMD, 2CMD, 1DAT[3:0], and 2DAT[3:0] outputs have a circuit that facilitates incident wave switching, so the external pull-up resistors ensure retention of the output high level.

The /OE pin can be used to place the 1CMD, 2CMD, 1DAT[3:0] and 2DAT[3:0] into high-impedance mode when the system enters IDLE state (*see IDLE State CMD/DAT Bus "Parking"*).

CLK Bus

The 1CLK and 2CLK outputs are bi-state buffer architectures, rather than a switch I/O, to ensure 52MHz incident wave switching. When there is no communication on the bus (IDLE), the FSSD06 can be disabled with the /OE pin. When this pin is pulled HIGH, the nCLK outputs are also pulled HIGH. Along with nCMD, nDAT[3:0] goes high-impedance to ensure that the CLK path between the FSSD06 and the peripheral does not float.

IDLE State CMD/DAT Bus "Parking"

The SD and MMC card specifications were written for a direct point-to-point communication between host controller and card. The introduction of the FSSD06 in that path, as an expander, requires that the functional operation and system latency not be impacted by the FSSD06 switch characteristics. Since there are various card formats, protocols, and configurable controllers, a /OE pin is available to facilitate a fast IDLE transition for the nCMD/nDAT[3:0] outputs. Some controllers, rather than simply placing CMD/DAT into high-impedance mode, may pull their outputs HIGH for a clock cycle prior to going into high-impedance mode (referred to as "parking" the output). Some legacy controllers pull their outputs HIGH versus high impedance.

If the /OE pin is left LOW and the controller places the CMD/DAT[3:0] outputs into high impedance, the nCMD/nDAT[3:0] output rise time is a function of the RC time constant through the switch path. It is recommended that the host controller pull CMD and DAT[3:0] HIGH for one cycle before pulling /OE HIGH. This facilitates parking all nCMD/nDAT[3:0] outputs HIGH before putting the switch I/Os in high impedance.

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	Conditions	Min.	Max.	Unit
V_{DDH}	Supply Voltage		-0.5	4.6	V
V_{DDC1},V_{DDC2}	Supply Voltage		-0.5	4.6	V
V_{SW}(1)	Switch I/O Voltage	1DAT[3:0], 2DAT[3:0], 1CMD, 2CMD Pins	-0.5	V_{DDx}(2)+ 0.3V (4.6V maximum)	V
		DAT[3:0], CMD Pins	-0.5	V_{DDx}(2)+ 0.3V (4.6V maximum)	V
V_{CNTRL}(1)	Control Input Voltage	S, /OE	-0.5	4.6	V
V_{CLKI}(1)	CLK Input Voltage	CLK	-0.5	4.6	V
V_{CLKO}(1)	CLK Output Voltage	1CLK, 2CLK	-0.5	V_{DDx}(2)+ 0.3V (4.6V maximum)	V
I_{INDC}	Input Clamp Diode Current			-50	mA
I_{SW}	Switch I/O Current	SDIO Continuous		50	mA
I_{SWPEAK}	Peak Switch Current	SDIO Pulsed at 1ms Duration, <10% Duty Cycle		100	mA
T_{STG}	Storage Temperature Range		-65	+150	°C
T_J	Max Junction Temperature			+150	°C
T_L	Lead Temperature	Soldering, 10 Seconds		+260C	°C
ESD	Human Body Model (JEDEC: JESD22-A114)	I/O to GND		8	kV
		Supply to GND		9	
		All Other Pins		5	
	Charged Device Model (JEDEC: JESD22-C101)			2	kV

Notes:

1. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.
2. V_{DDx} references the specific SDIO port V_{DD} rail (i.e. V_{DDC1}, V_{DDC2}, V_{DDH}).

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	Minimum	Maximum	Unit
V_{DDH}	Supply Voltage - Host Side	1.65	3.6V	V
V_{DDC1}, V_{DDC2}	Supply Voltage - SDIO Cards	V_{DDH}	3.6V	V
V_{CNTRL}	Control Input Voltage - V_S,$V_{/OE}$	0	V_{DDH}	V
V_{CLKI}	Clock Input Voltage - V_{CLKI}	0	V_{DDH}	V
V_{SW}	Switch I/O Voltage - CMD, DAT[3:0]	0	V_{DDH}	V
	Switch I/O Voltage - 1CMD, 1DAT[3:0]	0	V_{DDC1}	V
	Switch I/O Voltage - 2CMD, 2DAT[3:0]	0	V_{DDC2}	V
°C	Operating Temperature	-40	+85	°C
θ_{JA}	Thermal Resistance (free air), MLP24		50	°C/W

DC Electrical Characteristics at 1.8V V_{DDH}

All typical values are for V_{DDH}=1.8V at 25°C unless otherwise specified.

Symbol	Parameter	V_{DDC1} / V_{DDC2} (V)	Conditions	T_A=- 40°C to +85°C			Unit
				Min.	Typ.	Max.	
Common Pins							
V_{IK}	Clamp Diode Voltage	2.7	I_{IK}=-18mA			-1.2	V
V_{IH}	Control Input Voltage High	2.7	V_{DDH}=1.65V	1.3			
V_{IL}	Control Input Voltage Low	2.7				0.5	
I_{IN}	S, /OE Input High Current	3.6	V_{DDH}=1.95V, V_{CNTRL}=0V to V_{DDH}	-1		1	µA
I_{OZ}	Off Leakage, Current of all ports	3.6	V_{DDH}=1.95V, V_{SW}=0V to V_{DDX}	-1.0	0.5	1.0	µA
I_{PU}	CLK Pull-up Current	3.6	V_{CLKI}=V_{DDH} V_{CLKO}=0V, /OE=V_{DDH}			35	µA
V_{OHC}	CLK Output Voltage High	2.7	I_{OH}=-2mA	2.4			V
V_{OLC}	CLK Output Voltage Low	3.6	I_{OL}=-2mA			90	mV
R_{PU}	CLK Pull-up Resistance(3)			50	100		kΩ
R_{ON}	Switch On Resistance(4)	2.7	$V_{CMD, DAT[3:0]}$=0V, I_{ON}=-2mA, See Figure 5		4	6	Ω
ΔR_{ON}	Delta On Resistance(4, 5)	2.7	$V_{CMD, DAT[3:0]}$=0V, I_{ON}=- 2mA		0.8		Ω
Power Supply							
$I_{CC(VDDH)}$	Quiescent Supply Current (Host)	0	V_{DDH}=1.95V, V_{SW}=0 or V_{DDH}, I_{OUT}=0			1	µA
$I_{CC(VDDC1, VDDC2)}$	Quiescent Supply Current (SDIO Cards)	3.6	V_{SW}=0 or V_{DDx}, I_{OUT}=0, V_{CLKI}=V_{DDH}, V_{CLKO}=Open, /OE=0V			1	µA
ΔI_{CARD}	Delta $I_{CC(VDDC1, VDDC2)}$ for One Card Powered Off	3.6V / 0V	V_{SW}=0 or V_{DDx}, I_{OUT}=0, V_{CLKI}=V_{DDH}, V_{CLKO}=Open, /OE=0V			1	µA

Notes:

3. Guaranteed by characterization, not production tested.
4. On resistance is determined by the voltage drop between the switch I/O pins at the indicated current through the switch.
5. $\Delta R_{ON}=R_{ON\ max} - R_{ON\ min}$ measured at identical V_{CC}, temperature, and voltage.

DC Electrical Characteristics at 2.7V V_{DDH}

All typical values are for V_{DDH}=2.7V at 25°C unless otherwise specified.

Symbol	Parameter	V_{DDC1} / V_{DDC2} (V)	Conditions	T_A=- 40°C to +85°C			Unit
				Min.	Typ.	Max.	
Common Pins							
V_{IK}	Clamp Diode Voltage	2.7	I_{IK}=-18mA			-1.2	V
V_{IH}	Control Input Voltage High	2.7	V_{DDH}=2.7V	1.8			
V_{IL}	Control Input Voltage Low	2.7				0.8	
I_{IN}	S, /OE Input High Current	3.6	V_{DDH}=3.6V, V_{CNTRL}=0V to V_{DDH}	-1		1	µA
I_{OZ}	Off Leakage Current of all ports	3.6	V_{DDH}=3.6V, V_{SW}=0V to V_{DDX}	-1.0	0.5	1.0	µA
I_{PU}	CLK Pull-up Current	3.6	V_{CLKI}=V_{DDH}, V_{CLKO}=0V, /OE=V_{DDH}			50	µA
V_{OHC}	CLK Output Voltage High	2.7	I_{OH}=-2mA	2.4			V
V_{OLC}	CLK Output Voltage Low	3.6	I_{OL}=-2mA			90	mV
R_{PU}	CLK Pull-up Resistance(6)			50	100		kΩ
R_{ON}	Switch On Resistance(7)	2.7	$V_{CMD, DAT[3:0]}$=0V, I_{ON}=-2mA See Figure 5		2.5	6.0	Ω
ΔR_{ON}	Delta On Resistance(7,8)	2.7	$V_{CMD, DAT[3:0]}$=0V, I_{ON}=- 2mA		0.8		Ω
Power Supply							
$I_{CC(VDDH)}$	Quiescent Supply Current (Host)	0	V_{DDH}=3.6V, V_{SW}=0 or V_{DDH}, I_{OUT}=0			1	µA
$I_{CC(VDDC1, VDDC2)}$	Quiescent Supply Current (SDIO Cards)	3.6	V_{SW}=0 or V_{DDx}, I_{OUT}=0, V_{CLKI}=V_{DDH} , V_{CLKO}=Open, /OE=0V			1	µA
ΔI_{CARD}	Delta $I_{CC(VDDC1, VDDC2)}$ for One Card Powered Off	3.6V/0V 0V/3.6V	V_{SW}=0 or V_{DDx}, I_{OUT}=0, V_{CLKI}=V_{DDH}, V_{CLKO}=Open, /OE=0V			1	µA

Notes:

6. Guaranteed by characterization, not production tested.
7. On resistance is determined by the voltage drop between the switch I/O pins at the indicated current through the switch.
8. $\Delta R_{ON}=R_{ON\ max} - R_{ON\ min}$ measured at identical V_{CC}, temperature, and voltage.

AC Electrical Characteristics at 1.8V V_{DDH}

All typical values are for V_{DDH}=1.8V at 25°C unless otherwise specified.

Symbol	Parameter	V_{DDC1} / V_{DDC2} (V)	Conditions	T_A=- 40°C to +85°C			Unit
				Min.	Typ.	Max.	
t_{ON1}	Turn-On Time, S, /OE to CMD, DAT[3:0]	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		10	24	ns
t_{OFF1}	Turn-Off Time, S, /OE to CMD, DAT[3:0]	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		7	22	ns
t_{PD}	Switch Propagation Delay(9)	2.7 to 3.6	See Figure 9		1		ns
t_{SKEW}	Switch Skew(9, 10) CMD, DAT[3:0]	2.7 to 3.6	R_L=1kΩ, C_L=30pF		2		ns
t_{ON2}	Turn-On Time, S, /OE to 1CLK, 2CLK	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		17	35	ns
t_{OFF2}	Turn-Off Time S, /OE to 1CLK, 2CLK	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		10	28	ns
t_{PDCLK}	Clock Propagation Delay	2.7 to 3.6	R_L=1kΩ, C_L=30pF See Figure 11		3.0	5.5	ns
O_{IRR}	Off Isolation(9)	2.7 to 3.6	f=10MHz, R_T=50Ω, C_L=30pF, See Figure 12		-60		dB
Xtalk	Non-Adjacent Channel Crosstalk(9)	2.7 to 3.6	f=10MHz, R_T=50Ω, C_L=30pF, See Figure 13		-60		dB
f_{toggle}	Clock Frequency(9)	2.7 to 3.6	C_L=30pF		120		MHz

Notes:

9. Guaranteed by characterization, not production tested.
10. Skew is determined by $|T_{PLH} - T_{PHL}|$ for worst-case temperature and V_{DDX}.

AC Electrical Characteristics at 2.7V V_{DDH}

All typical values are for V_{DDH}=2.7V at 25°C unless otherwise specified.

Symbol	Parameter	V_{DDC1} / V_{DDC2} (V)	Conditions	T_A=- 40°C to +85°C			Unit
				Min.	Typ.	Max.	
t_{ON1}	Turn-On Time S, /OE to CMD, DAT[3:0]	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		8	17	ns
t_{OFF1}	Turn-Off Time S, /OE to CMD, DAT[3:0]	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		6	13	ns
t_{PD}	Switch Propagation Delay(11)	2.7 to 3.6	See Figure 9		1		ns
t_{SKEW}	Switch Skew(12) CMD, DAT[3:0]	2.7 to 3.6	R_L=1kΩ, C_L=30pF		1.5		ns
t_{ON2}	Turn-On Time S, /OE to 1CLK, 2CLK	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		15	25	ns
t_{OFF2}	Turn-Off Time S, /OE to 1CLK, 2CLK	2.7 to 3.6	V_{SW}=0V, R_L=1kΩ, C_L=30pF See Figure 7, Figure 8		10	25	ns
t_{PDCLK}	Clock Propagation Delay	2.7 to 3.6	R_L=1kΩ, C_L=30pF See Figure 11		1.5	3.0	ns
O_{IRR}	Off Isolation(11)	2.7 to 3.6	f=10MHz, R_T=50Ω, C_L=30pF See Figure 12		-60		dB
Xtalk	Non-Adjacent Channel Crosstalk(11)	2.7 to 3.6	f=10MHz, R_T=50Ω, C_L=30pF See Figure 13		-60		dB
f_{toggle}	Clock Frequency(11)	2.7 to 3.6	C_L=30pF		120		MHz

Notes:

11. Guaranteed by characterization, not production tested.
12. Skew is determined by $|T_{PLH} - T_{PHL}|$ for worst-case temperature and V_{DDX}.

Capacitance

Symbol	Parameter	Conditions	T_A=- 40°C to +85°C			Unit
			Min.	Typ.	Max.	
$C_{IN\ (S,\ /OE,\ CLK)}$	Control and CLK Pin Input Capacitance	V_{DDH}=0V		2.5		pF
C_{ON}	Common Port On Capacitance ($C_{DAT[3:0],\ CMD}$)	V_{DDH}=1.8V,V_{DDC1}=V_{DDC2}=2.7V, $V_{/OE}$=0V, V_{bias}=0V, f=1MHz See Figure 15		9.0		
C_{OFF}	Input Source Off Capacitance	V_{DDH}=1.8V,V_{DDC1}=V_{DDLH2}=2.7V, $V_{/OE}$=3.3V, V_{bias}=0V, f=1MHz See Figure 14		4.0		

Test Diagrams

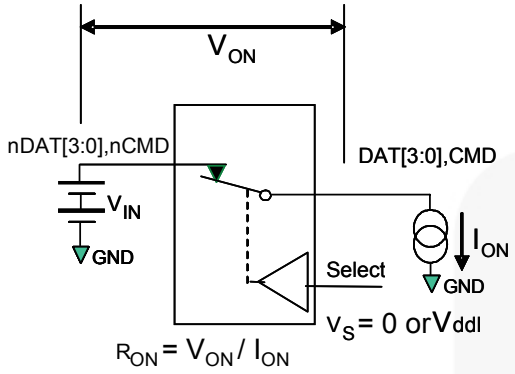


Figure 5. On Resistance

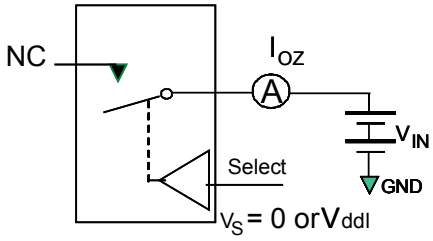
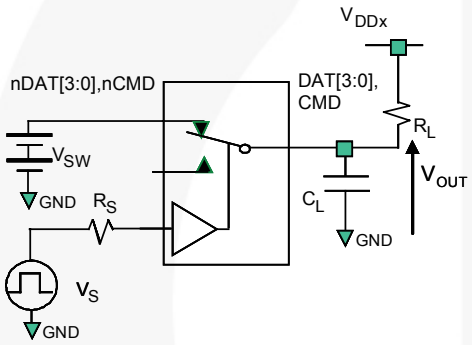


Figure 6. Off Leakage (Each Switch Port is Tested Separately)



R_L, R_S, and C_L are function of application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance

Figure 7. AC Test Circuit Load

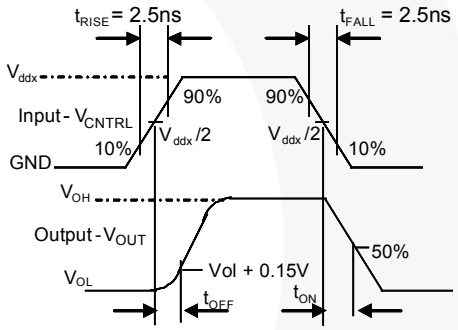


Figure 8. Turn On/Off Time Waveforms

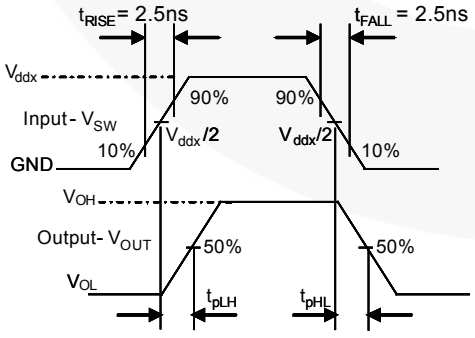
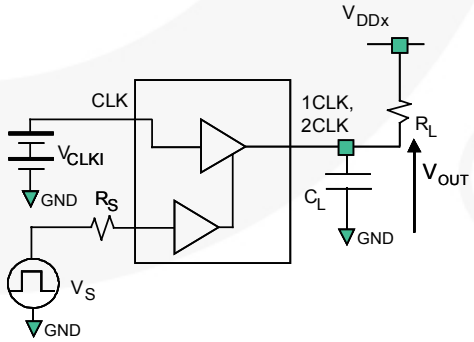


Figure 9. Switch Propagation Delay Waveform



R_L, R_S, and C_L are function of application environment (see AC Tables for specific values)
C_L includes test fixture and stray capacitance

Figure 10. AC Test Circuit Load (CLK)

Test Diagrams (Continued)

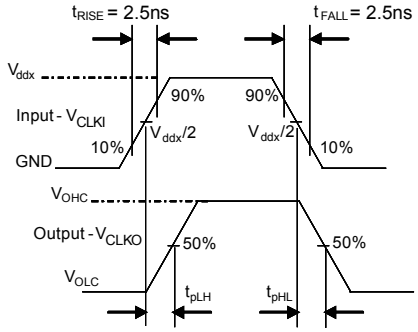


Figure 11. CLK Propagation Delay Waveforms

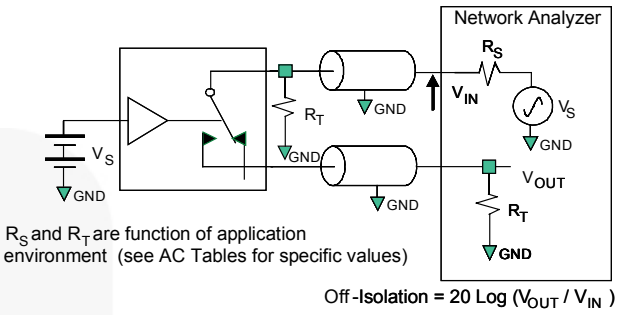


Figure 12. Channel Off Isolation

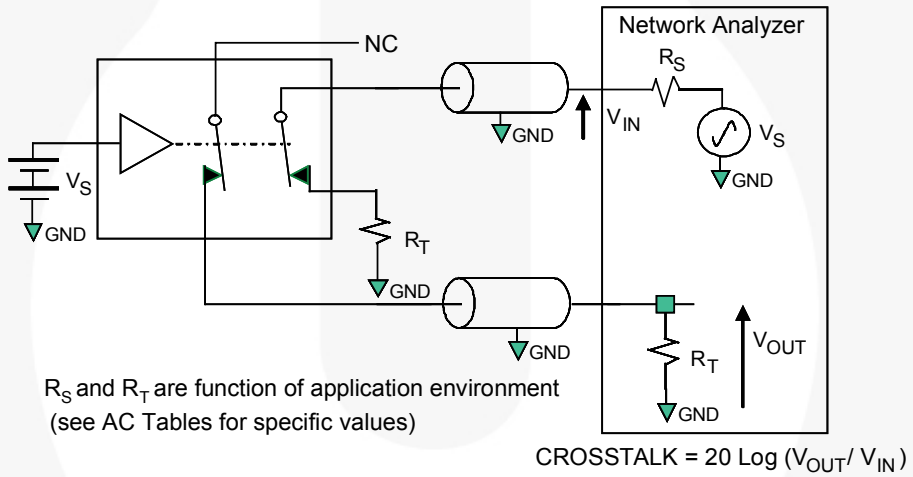


Figure 13. Channel-to-Channel Crosstalk

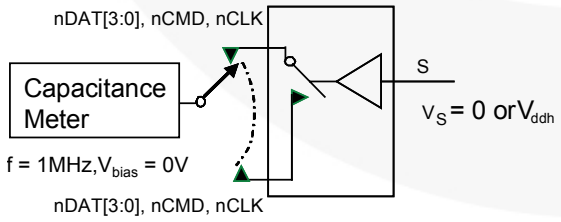


Figure 14. Channel Off Capacitance

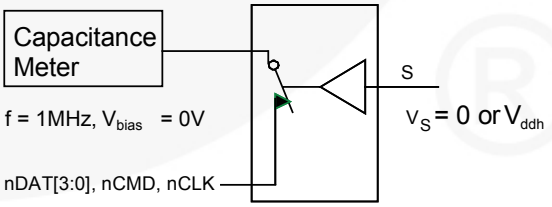


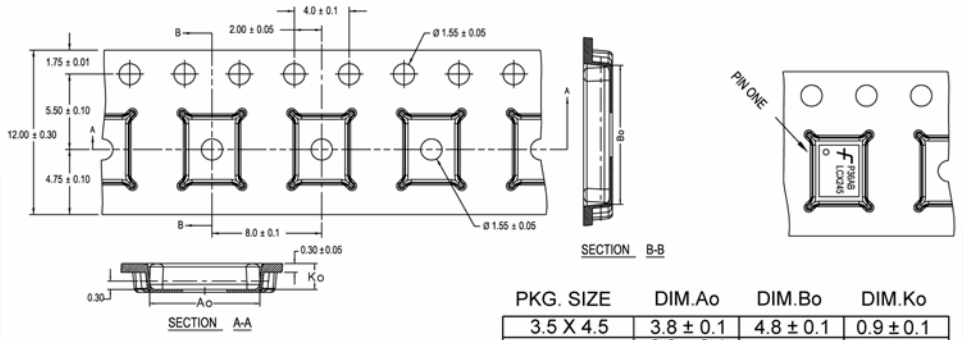
Figure 15. Channel On Capacitance

Tape and Reel Specifications

Package Designator	Tape Selection	Number Cavities	Cavity Status	Cover Tape Status
MPX	Leader (Start End)	125 (Typical)	Empty	Sealed
	Carrier	3000	Filled	Sealed
	Trailer (Hub End)	75 (Typical)	Empty	Sealed

Tape Dimensions

Dimensions are in millimeters unless otherwise noted.



PKG. SIZE	DIM.Ao	DIM.Bo	DIM.Ko
3.5 X 4.5	3.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
3.0 X 3.0	3.3 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 4.5	2.8 ± 0.1	4.8 ± 0.1	0.9 ± 0.1
2.5 X 3.5	2.8 ± 0.1	3.8 ± 0.1	0.9 ± 0.1
2.5 X 3.0	2.8 ± 0.1	3.3 ± 0.1	0.9 ± 0.1
2.5 X 2.5	2.8 ± 0.1	2.8 ± 0.1	0.9 ± 0.1

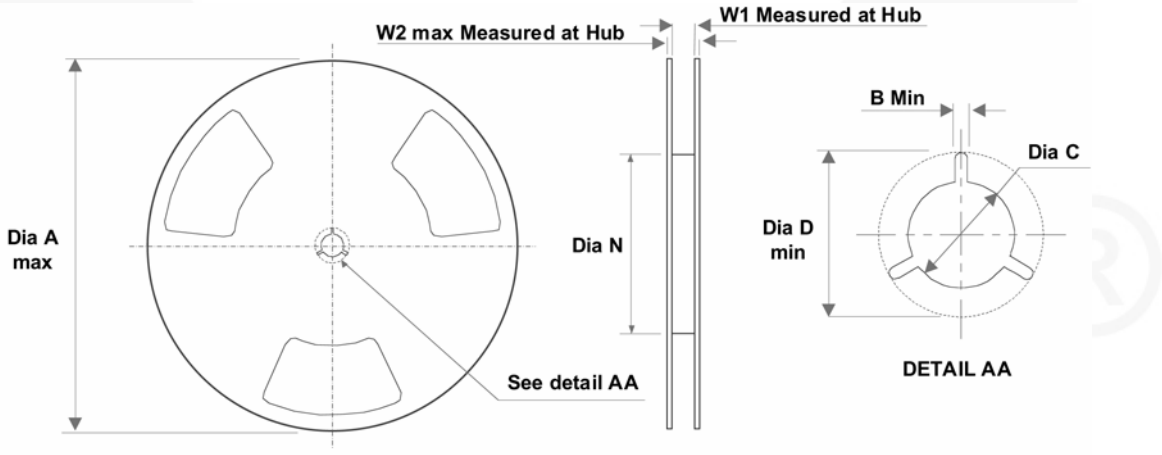
DIMENSIONS ARE IN MILLIMETERS

NOTES: unless otherwise specified

1. Cummulative pitch for feeding holes and cavities (chip pockets) not to exceed 0.008[0.20] over 10 pitch span.
2. Smallest allowable bending radius.
3. Thru hole inside cavity is centered within cavity.
4. Tolerance is ±0.002[0.05] for these dimensions on all 12mm tapes.
5. Ao and Bo measured on a plane 0.120[0.30] above the bottom of the pocket.
6. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
7. Pocket position relative to sprocket hole measured as true position of pocket. Not pocket hole.
8. Controlling dimension is millimeter. Diemension in inches rounded.

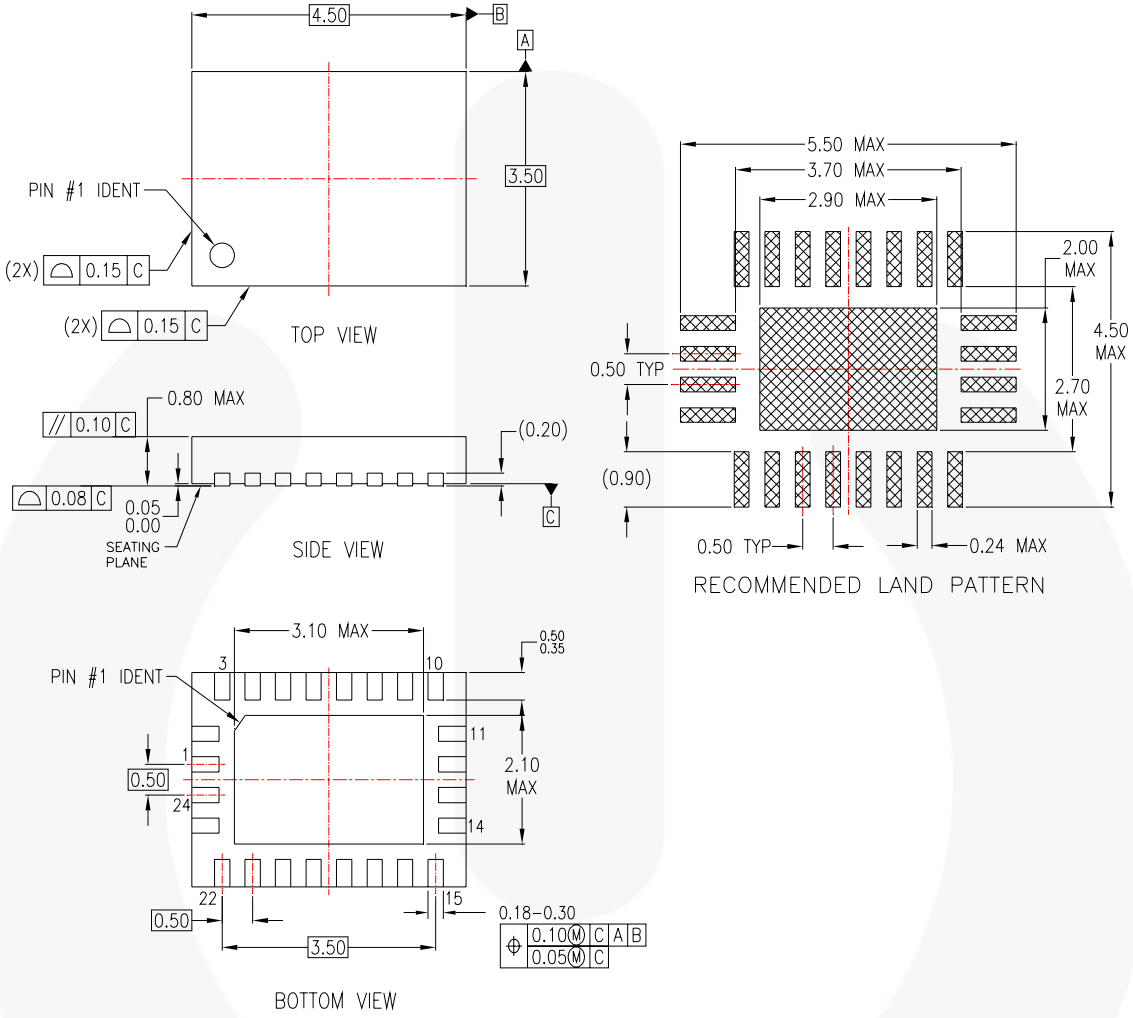
Reel Dimensions

Dimensions are in inches (millimeters) unless otherwise noted.



Tape Size	A	B	C	D	N	W1	W2
	13.000	0.059	0.512	0.795	2.165	0.488	0.724
(12.00mm)	(330.00)	(1.50)	(13.00)	(20.00)	(55.00)	(12.40)	(18.40)

Physical Dimensions



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MO-220, VARIATION WFSD-2 FOR DIMENSIONS ONLY. PIN NUMBERING DOES NOT COMPLY.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

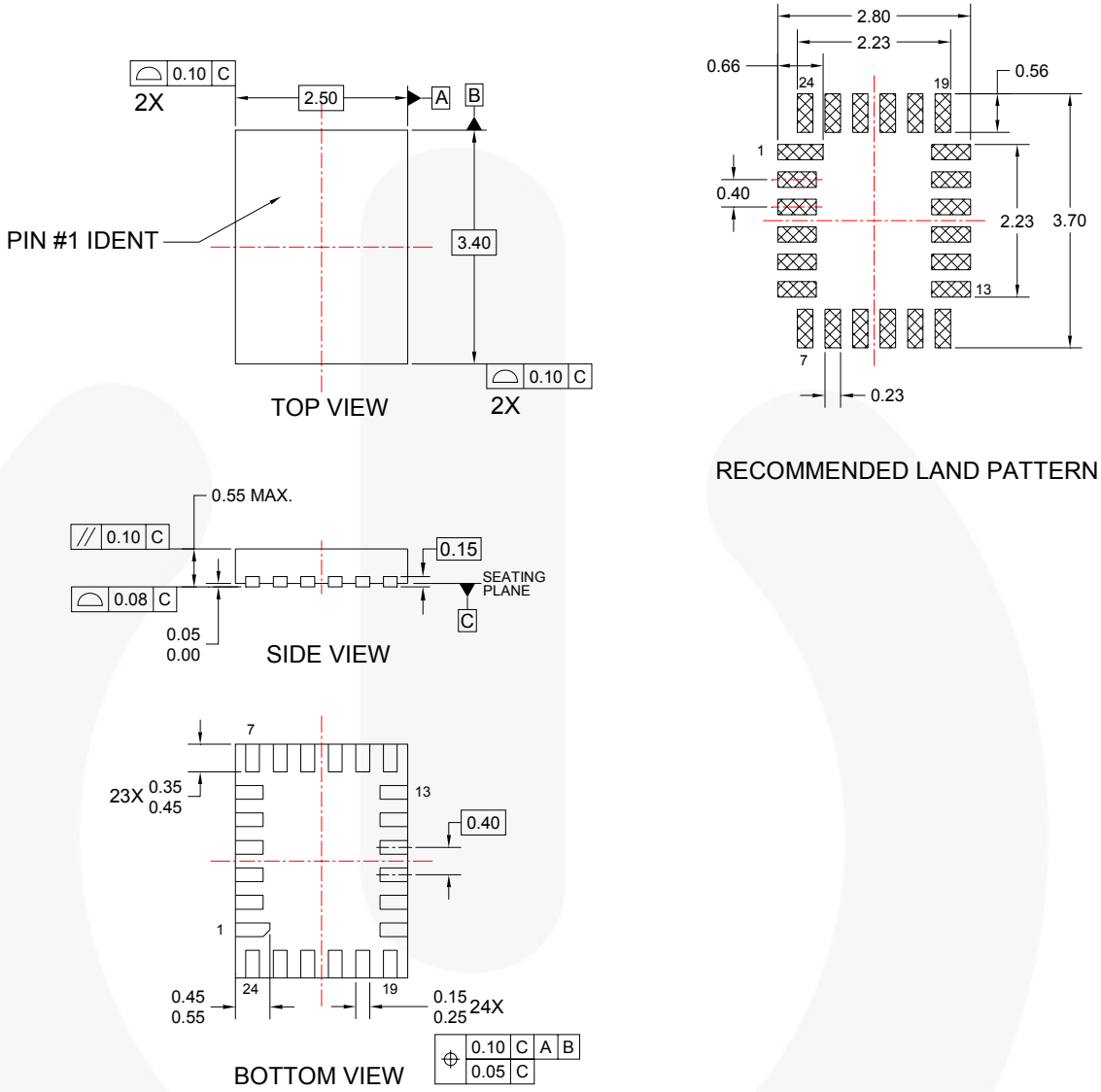
MLP24Brev4

Figure 16. 24-Lead Molded Leadless Package

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/packaging/.

Physical Dimensions



NOTES:

A. NO JEDEC STANDARD APPLIES

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994

D. DRAWING FILENAME: MKT–UMLP24Arev1.

Figure 17. 24-Lead Ultrathin Molded Leadless Package

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/packaging/.

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.

Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
EcoSPARK®
EfficentMax™
EZSWITCH™ *
EZ™
F®
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FlashWriter®*
FPS™
F-PFS™
FRFET®
Global Power Resource℠
Green FPS™
Green FPS™ e-Series™
GTO™
IntelliMAX™
ISOPLANAR™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MillerDrive™
MotionMax™
Motion-SPM™
OPTOLOGIC®
OPTOPLANAR®
®
PDP SPM™
Power-SPM™
PowerTrench®
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
™
Saving our world, 1mW/W/kW at a time™
SmartMax™
SMART START™
SPM®
STEALTH™
SuperFET™
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS™
SyncFET™
SYSTEM ® GENERAL
The Power Franchise®
the power franchise
TinyBoost™
TinyBuck™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
µSerDes™
SerDes
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™

* EZSWITCH™ and FlashWriter® are 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. I36