

74AC14, 74ACT14 Hex Inverter with Schmitt Trigger Input

Features

- I_{CC} reduced by 50%
- Outputs source/sink 24mA
- 74ACT14 has TTL-compatible inputs

General Description

The 74AC14 and 74ACT14 contain six inverter gates each with a Schmitt trigger input. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. In addition, they have a greater noise margin than conventional inverters.

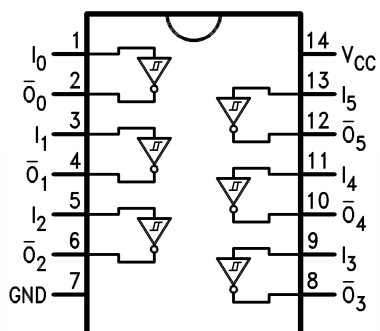
The 74AC14 and 74ACT14 have hysteresis between the positive-going and negative-going input thresholds (typically 1.0V) which is determined internally by transistor ratios and is essentially insensitive to temperature and supply voltage variations.

Ordering Information

Order Number	Package Number	Package Description
74AC14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74AC14SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74ACT14SC	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
74ACT14MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

Device also available in Tape and Reel. Specify by appending suffix letter "X" to the ordering number.

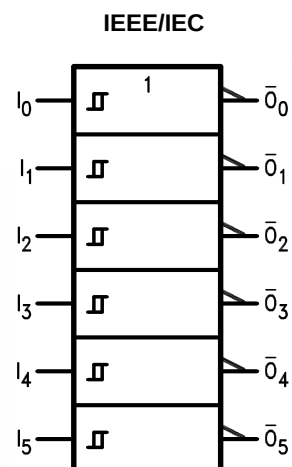
Connection Diagram



Pin Description

Pin Names	Description
I_n	Inputs
$\bar{O}_n$	Outputs

Logic Symbol



Function Table

Input	Output
A	O
L	H
H	L

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	Rating
V_{CC}	Supply Voltage	−0.5V to +7.0V
I_{IK}	DC Input Diode Current $V_I = -0.5V$	−20mA
	$V_I = V_{CC} + 1.5$	+20mA
V_I	DC Input Voltage	−0.5V to $V_{CC} + 1.5V$
I_{OK}	DC Output Diode Current $V_O = -0.5V$	−20mA
	$V_O = V_{CC} + 0.5V$	+20mA
V_O	DC Output Voltage	−0.5V to $V_{CC} + 0.5V$
I_O	DC Output Source or Sink Current	±50mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current per Output Pin	±50mA
T_{STG}	Storage Temperature	−65°C to +150°C
T_J	Junction Temperature	140°C

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	Rating
V_{CC}	Supply Voltage AC	2.0V to 6.0V
	ACT	4.5V to 5.5V
V_I	Input Voltage	0V to V_{CC}
V_O	Output Voltage	0V to V_{CC}
T_A	Operating Temperature	−40°C to +85°C

DC Electrical Characteristics for AC

Symbol	Parameter	V _{CC}	Conditions	T _A = +25°C		T _A = −40°C to +85°C	Units
		(V)		Typ	Guaranteed Limits		
V _{OH}	Minimum HIGH Level Output Voltage	3.0	I _{OUT} = −50μA	2.99	2.9	2.9	V
		4.5		4.49	4.4	4.4	
		5.5		5.49	5.4	5.4	
		3.0	I _{OH} = 12mA		2.56	2.46	
		4.5	I _{OH} = 24mA		3.86	3.76	
		5.5	I _{OH} = 24mA ⁽¹⁾		4.86	4.76	
V _{OL}	Maximum LOW Level Output Voltage	3.0	I _{OUT} = 50μA	0.002	0.1	0.1	V
		4.5		0.001	0.1	0.1	
		5.5		0.001	0.1	0.1	
		3.0	I _{OL} = 12mA		0.36	0.44	
		4.5	I _{OL} = 24mA		0.36	0.44	
		5.5	I _{OL} = 24mA ⁽¹⁾		0.36	0.44	
I _{IN} ⁽³⁾	Maximum Input Leakage Current	5.5	V _I = V _{CC} , GND		±0.1	±1.0	μA
V _{t+}	Maximum Positive Threshold	3.0	T _A = Worst Case		2.2	2.2	V
		4.5			3.2	3.2	
		5.5			3.9	3.9	
V _{t−}	Minimum Negative Threshold	3.0	T _A = Worst Case		0.5	0.5	V
		4.5			0.9	0.9	
		5.5			1.1	1.1	
V _{H(MAX)}	Maximum Hysteresis	3.0	T _A = Worst Case		1.2	1.2	V
		4.5			1.4	1.4	
		5.5			1.6	1.6	
V _{H(MIN)}	Minimum Hysteresis	3.0	T _A = Worst Case		0.3	0.3	V
		4.5			0.4	0.4	
		5.5			0.5	0.5	
I _{OLD}	Minimum Dynamic	5.5	V _{OLD} = 1.65V Max.			75	mA
I _{OHD}	Output Current ⁽²⁾	5.5	V _{OHD} = 3.85V Min.			−75	mA
I _{CC} ⁽³⁾	Maximum Quiescent Supply Current	5.5	V _{IN} = V _{CC} or GND		2.0	20.0	μA

Notes:

1. All outputs loaded; thresholds on input associated with output under test.
2. Maximum test duration 2.0ms, one output loaded at a time.
3. I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC} .

DC Electrical Characteristics for ACT

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C		T _A = −40°C to +85°C		Units
				Typ.	Guaranteed Limits			
V _{IH}	Minimum HIGH Level Input Voltage	4.5	V _{OUT} = 0.1V or V _{CC} − 0.1V	1.5	2.0	2.0		V
		5.5		1.5	2.0	2.0		
V _{IL}	Maximum LOW Level Input Voltage	4.5	V _{OUT} = 0.1V or V _{CC} − 0.1V	1.5	0.8	0.8		V
		5.5		1.5	0.8	0.8		
V _{OH}	Minimum HIGH Level Output Voltage	4.5	I _{OUT} = −50μA	4.49	4.34	4.4		V
		5.5		5.49	5.4	5.4		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA		3.86	3.76		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OH} = −24mA ⁽⁴⁾		4.86	4.76		
V _{OL}	Maximum LOW Level Output Voltage	4.5	I _{OUT} = 50μA	0.001	0.1	0.1		V
		5.5		0.001	0.1	0.1		
		4.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA		0.36	0.44		
		5.5	V _{IN} = V _{IL} or V _{IH} , I _{OL} = 24mA ⁽⁴⁾		0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5	V _I = V _{CC} , GND		±0.1	±1.0		μA
V _{H(MAX)}	Maximum Hysteresis	4.5	T _A = Worst Case		1.4	1.4		V
		5.5			1.6	1.6		
V _{H(MIN)}	Minimum Hysteresis	4.5	T _A = Worst Case		0.4	0.4		V
		5.5			0.5	0.5		
V _{t+}	Maximum Positive Threshold	4.5	T _A = Worst Case		2.0	2.0		V
		5.5			2.0	2.0		
V _{t−}	Minimum Negative Threshold	4.5	T _A = Worst Case		0.8	0.8		V
		5.5			0.8	0.8		
I _{CCT}	Maximum I _{CC} /Input	5.5	V _I = V _{CC} − 2.1V	0.6		1.5		mA
I _{OLD}	Minimum Dynamic Output Current ⁽⁵⁾	5.5	V _{OLD} = 1.65V Max.			75		mA
I _{OHD}		5.5	V _{OHD} = 3.85V Min.			−75		mA
I _{CC}	Maximum Quiescent Supply Current	5.5	V _{IN} = V _{CC} or GND		2.0	20.0		μA

Notes:

4. All outputs loaded; thresholds on input associated with output under test.
5. Maximum test duration 2.0ms, one output loaded at a time.

AC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V) ⁽⁶⁾	$T_A = +25^\circ\text{C}$, $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$, $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay	3.3	1.5	9.5	13.5	1.5	15.0	ns
		5.0	1.5	7.0	10.0	1.5	11.0	
t_{PHL}	Propagation Delay	3.3	1.5	7.5	11.5	1.5	13.0	ns
		5.0	1.5	6.0	8.5	1.5	9.5	

Note:

6. Voltage range 3.3 is $3.3\text{V} \pm 0.3\text{V}$. Voltage range 5.0 is $5.0\text{V} \pm 0.5\text{V}$.

AC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V) ⁽⁷⁾	$T_A = +25^\circ\text{C}$, $C_L = 50\text{pF}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$, $C_L = 50\text{pF}$		Units
			Min.	Typ.	Max.	Min.	Max.	
t_{PLH}	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns
t_{PHL}	Propagation Delay	5.0	3.0	8.0	10.0	3.0	11.0	ns

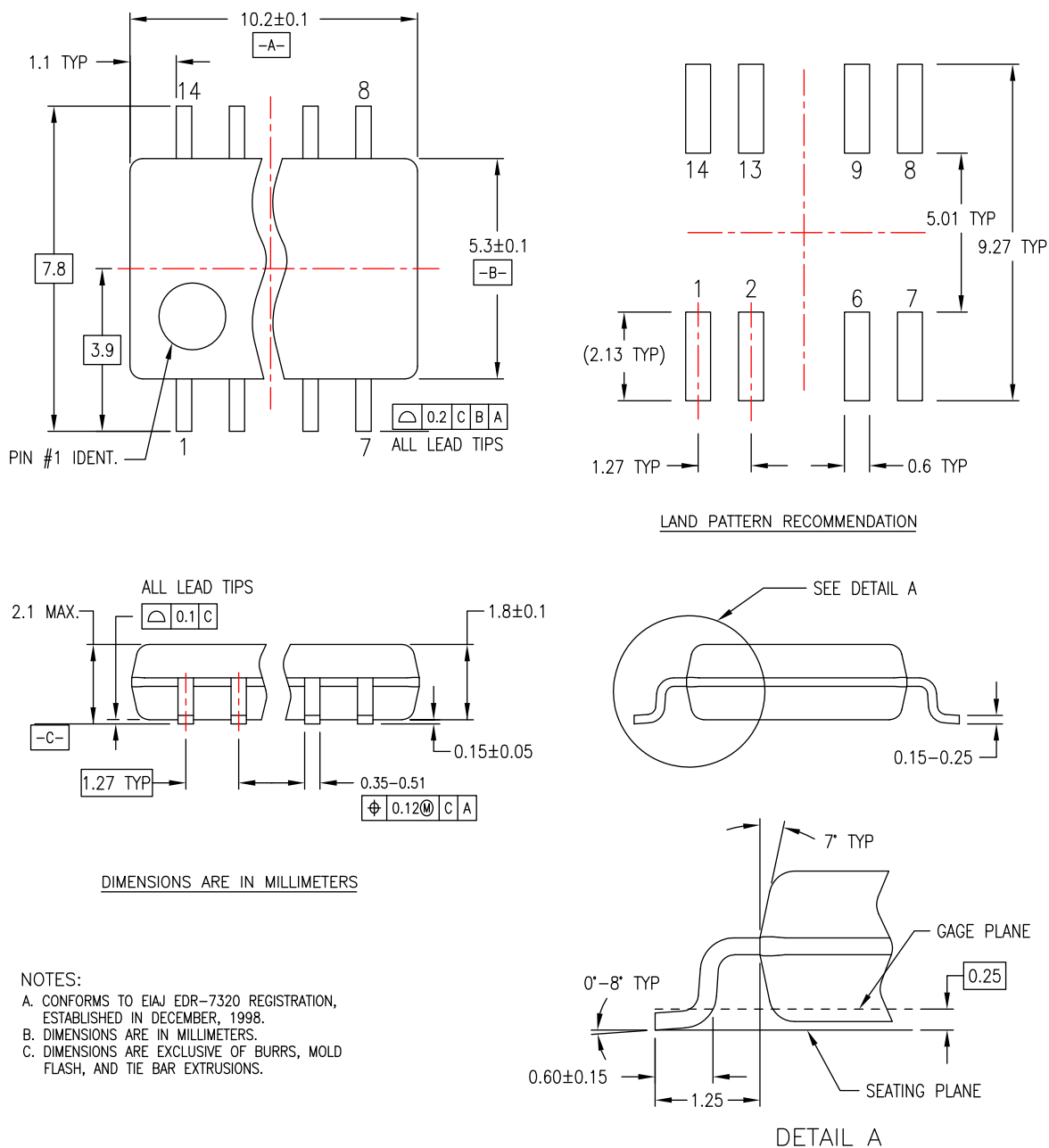
Note:

7. Voltage Range 5.0 is $5.0\text{V} \pm 0.5\text{V}$.

Capacitance

Symbol	Parameter	Conditions	Typ	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{OPEN}$	4.5	pF
C_{PD}	Power Dissipation Capacitance AC	$V_{CC} = 5.0\text{V}$	25.0	pF
	ACT		80	

Physical Dimensions (Continued)



M14DREVC

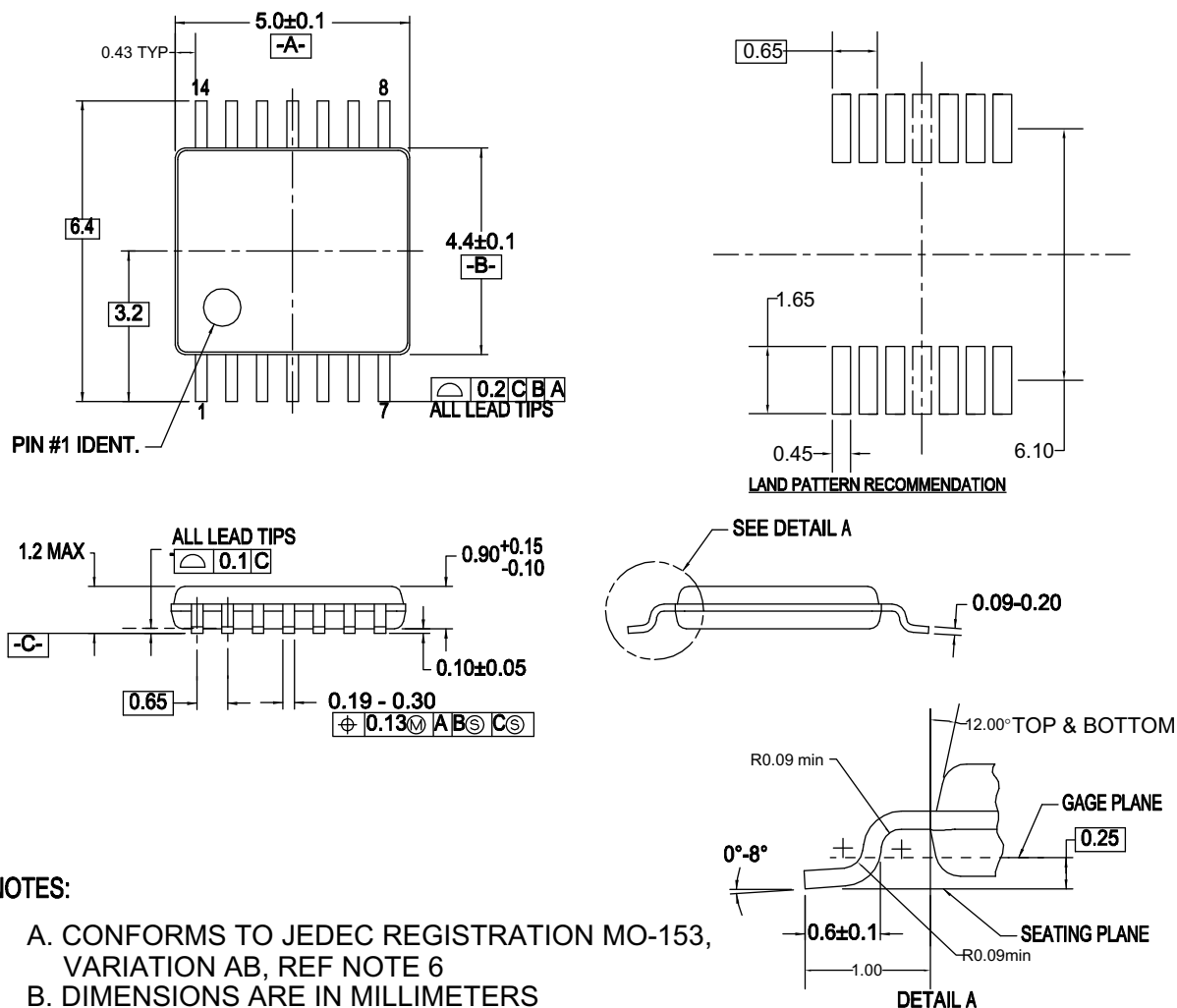
Figure 2. 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide

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 (Continued)



NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AB, REF NOTE 6
- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982
- E. LANDPATTERN STANDARD: SOP65P640X110-14M
- F. DRAWING FILE NAME: MTC14REV6

Figure 3. 14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide

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.

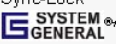
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

<http://www.fairchildsemi.com/packaging/>



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™	F-PFST™	Power-SPM™	The Power Franchise®
Auto-SPM™	FRFET®	PowerTrench®	The Right Technology for Your Success™
AX-CAP™	Global Power Resource™	PowerXS™	
Build it Now™	Green FPST™	Programmable Active Droop™	the power franchise
CorePLUS™	Green FPS™ e-Series™	QFET®	TinyBoost™
CorePOWER™	Gmax™	QST™	TinyBuck™
CROSSVOLT™	GTO™	Quiet Series™	TinyCalc™
CTL™	IntelliMAX™	RapidConfigure™	TinyLogic®
Current Transfer Logic™	ISOPLANAR™		TINYOPTO™
DEUXPEED®	MegaBuck™	Saving our world, 1mW/kW at a time™	TinyPower™
Dual Cool™	MICROCOUPLER™	SignalWise™	TinyPWM™
EcoSPARK®	MicroFET™	SmartMax™	TinyWire™
EfficientMax™	MicroPak™	SMART START™	TriFault Detect™
ESBC™	MicroPak2™	SPM®	TRUECURRENT®*
	MillerDrive™	STEALTH™	µSerDes™
Fairchild®	MotionMax™	SuperFET®	
Fairchild Semiconductor®	Motion-SPM™	SuperSOT™-3	UHC®
FACT Quiet Series™	mWSaver™	SuperSOT™-6	Ultra FRFET™
FACT®	OptoHit™	SuperSOT™-8	UniFET™
FAST®	OPTOLOGIC®	SupreMOS®	VCX™
FastvCore™	OPTOPLANAR®	SyncFET™	VisualMax™
FETBench™		Sync-Lock™	XST™
FlashWriter®	PDP SPM™		
FPST™			

* 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. I53