

MCT9001

Dual Phototransistor Optocouplers

Features

- Two isolated channels per package
- Two packages fit into a 16 lead DIP socket
- Underwriters Laboratory (U.L.) recognized File E90700
- VDE approved for IEC60747-5-2

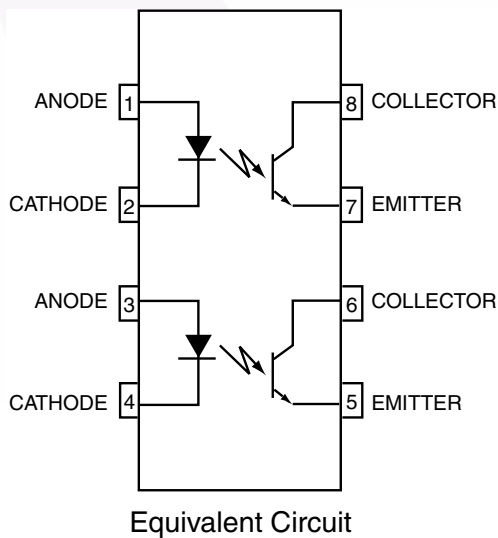
Applications

- AC line/digital logic – isolate high voltage transients
- Digital logic/digital logic – eliminate spurious grounds
- Digital logic/AC triac control – isolate high voltage transients
- Twisted pair line receiver – eliminate ground loop feedthrough
- Telephone/telegraph line receiver – isolate high voltage transients
- High frequency power supply feedback control – maintain floating grounds and transients
- Relay contact monitor – isolate floating grounds and transients
- Power supply monitor – isolate transients

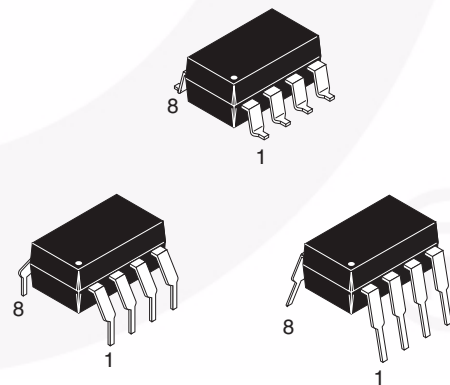
Description

The MCT9001 Optocoupler has two channels for density applications. For four channel applications, two-packages fit into a standard 16-pin DIP socket. Each channel is an NPN silicon planar phototransistor optically coupled to a gallium arsenide infrared emitting diode.

Schematic



Package Outlines



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	Rating	Value	Unit
TOTAL DEVICE			
T_{STG}	Storage Temperature	-55 to +150	°C
T_{OPR}	Operating Temperature	-55 to +100	°C
T_{SOL}	Lead Solder Temperature (Refer to Reflow Temperature Profile)	260 for 10 sec	°C
P_D	Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	400	mW
		4.83	mW/°C
EMITTER (Each channel)			
I_F	Forward Current – Continuous	60	mA
$I_F(pk)$	Forward Current – Peak (PW = 1 μ s, 300pps)	3	A
V_R	Reverse Voltage	5.0	V
P_D	LED Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C (Total Input)	100	mW
		1.1	mW/°C
DETECTOR (Each channel)			
I_C	Collector Current – Continuous	30	mA
P_D	Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	150	mW
		1.67	mW/°C

Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise specified)**Individual Component Characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Unit
EMITTER						
V_F	Input Forward Voltage	$I_F = 10\text{mA}$		1.0	1.3	V
I_R	Reverse Current	$V_R = 5\text{V}$			10	μA
C_J	Junction Capacitance	$V_F = 0\text{V}, f = 1\text{MHz}$		50		pF
DETECTOR						
BV_{CEO}	Collector-Emitter Breakdown Voltage	$I_C = 0.5\text{mA}, I_F = 0$	55			V
BV_{ECO}	Emitter-Collector Breakdown Voltage	$I_E = 100\mu\text{A}, I_F = 0$	7			V
I_{CEO}	Collector-Emitter Dark Current	$V_{CE} = 24\text{V}, I_F = 0$		5	100	nA
		$V_{CE} = 24\text{V}, T_A = 85^\circ\text{C}$			50	μA
C_{CE}	Capacitance	$V_{CE} = 0\text{V}, f = 1\text{MHz}$		8		pF

Transfer Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.*	Max.	Units
SWITCHING TIMES (AC)						
Non-Saturated						
t_{on}	Turn-on Time	$R_L = 100\Omega, I_C = 2\text{mA}, V_{CC} = 10\text{V}$		3		μs
t_{off}	Turn-off Time			3		μs
t_r	Rise Time			2.4		μs
t_f	Fall Time			2.4		μs
Saturated						
t_{on}	Turn-on Time	$I_F = 16\text{mA}, R_L = 1.9\text{k}\Omega, V_{CE} = 5\text{V}$		2.4		μs
t_{off}	Turn-off Time			25.0		μs
DC CHARACTERISTICS						
CTR	Current Transfer Ratio, Collector-Emitter	$I_F = 5\text{mA}, V_{CE} = 5\text{V}$	50		600	%
$CTR_{(sat)}$		$I_F = 8\text{mA}, V_{CE} = 0.4\text{V}$	30			%
$V_{CE(sat)}$	Saturation Voltage	$I_F = 8\text{mA}, I_C = 2.4\text{mA}$			0.40	V

Isolation Characteristics

Symbol	Characteristic	Test Conditions	Min.	Typ.*	Max.	Units
V_{ISO}	Input-Output Isolation Voltage	$I_{I-O} \leq 10\mu\text{A}, t = 1\text{min.}$	5000			Vac(rms)
R_{ISO}	Isolation Resistance	$V_{I-O} = 500\text{VDC}$	10^{11}			Ω
C_{ISO}	Isolation Capacitance	$f = 1\text{MHz}$		0.5		pF

*All typicals at $T_A = 25^\circ\text{C}$

Typical Performance Curves

Fig. 1 Normalized CTR vs. Forward Current

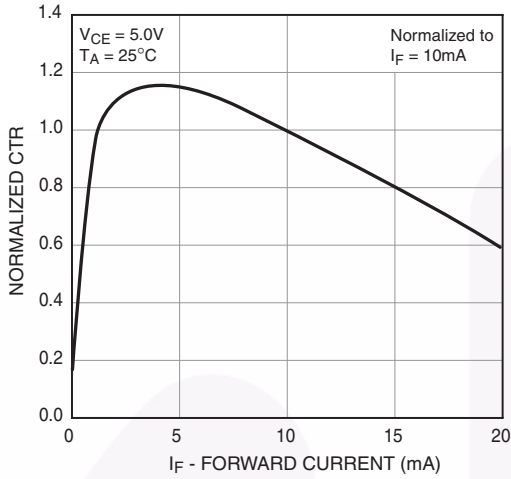


Fig. 2 Normalized CTR vs. Ambient Temperature

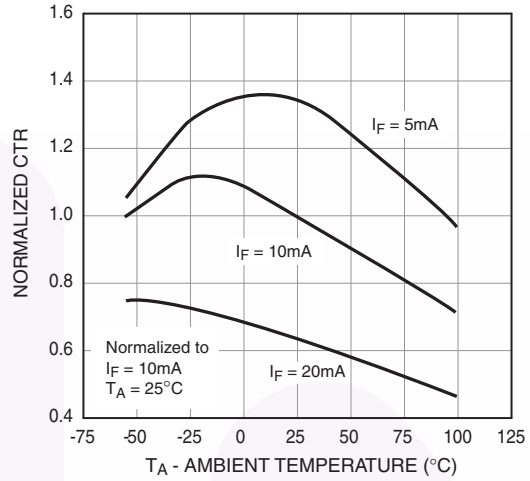


Fig. 3 Dark Current vs. Ambient Temperature

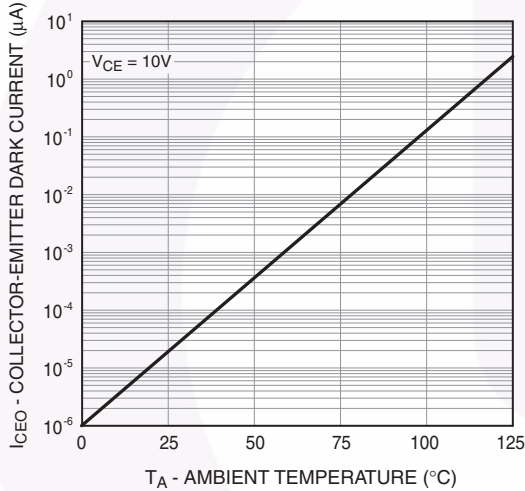


Fig. 4 Switching Speed vs. Load Resistor

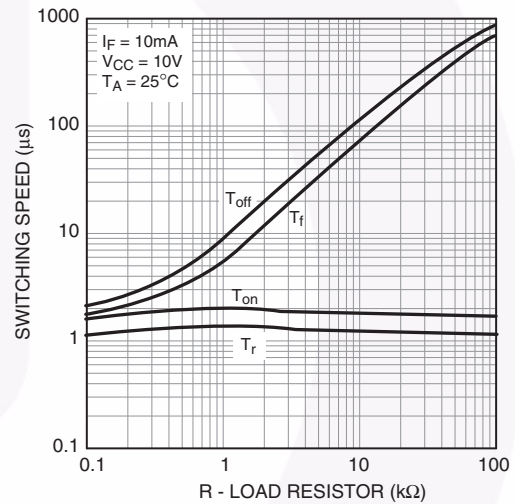


Fig. 5 LED Forward Voltage vs. Forward Current

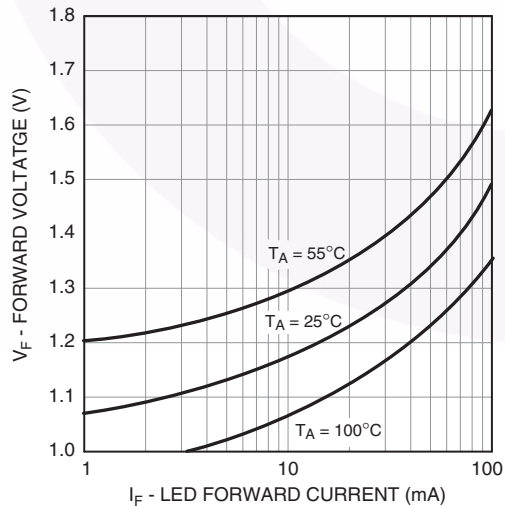
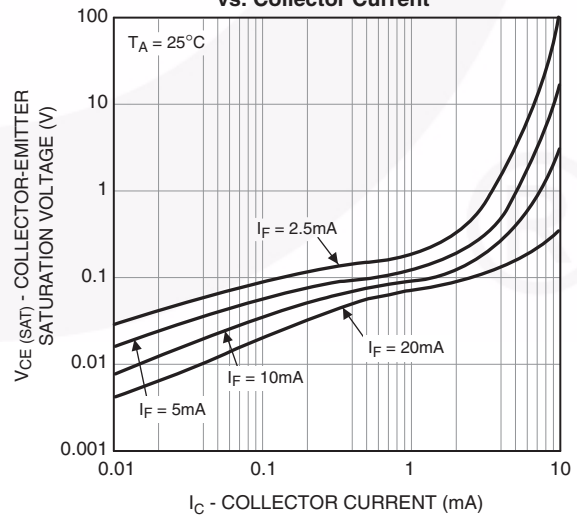
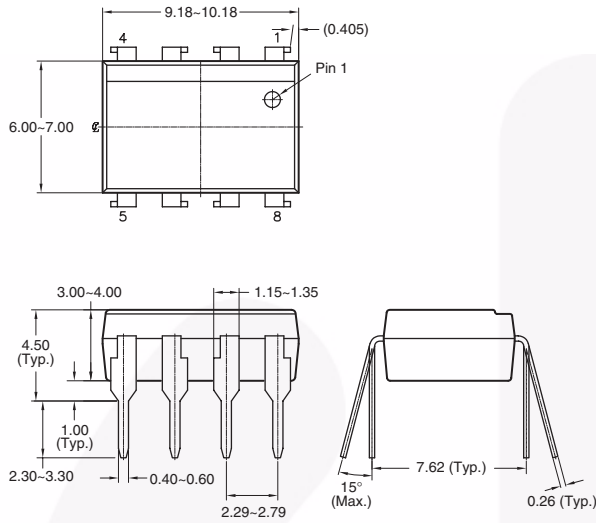


Fig. 6 Collector-Emitter Saturation Voltage vs. Collector Current

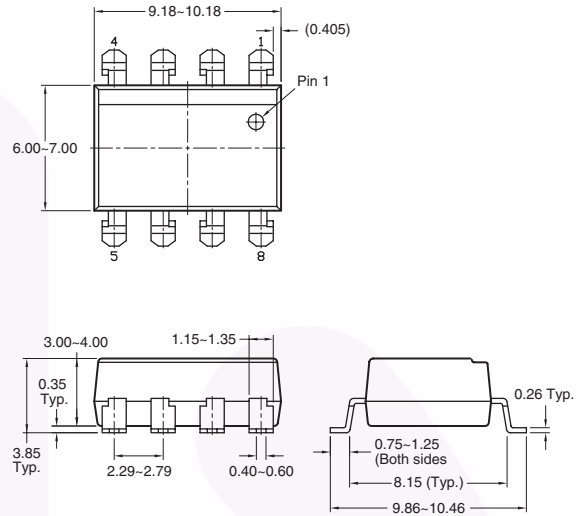


Package Dimensions

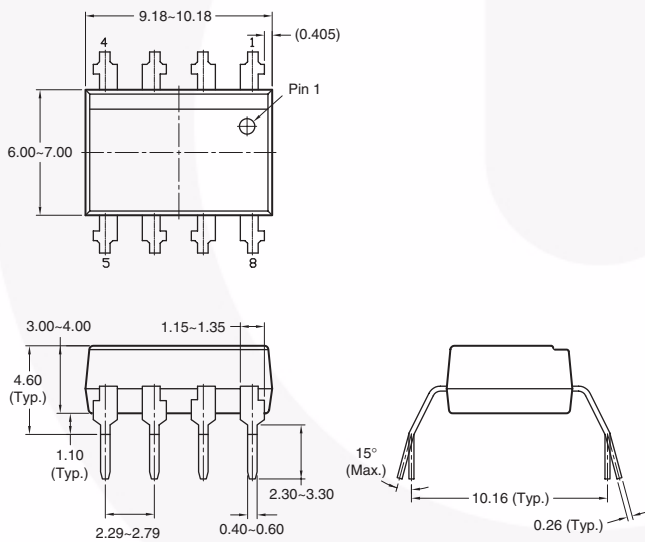
Through Hole



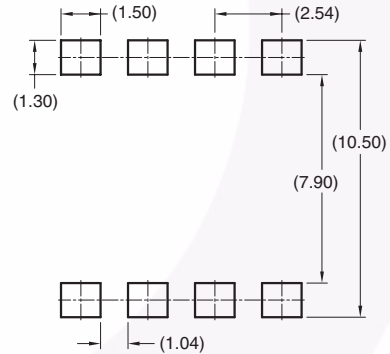
Surface Mount



0.4" Lead Spacing



Recommend Pad Layout for Surface Mount Leadform



Note:

All dimensions are in millimeters.

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.

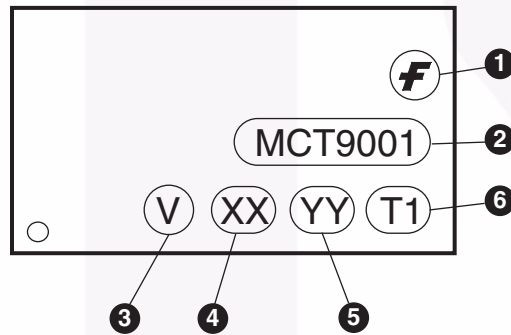
Always visit Fairchild Semiconductor's online packaging area for the most recent package drawings:

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

Ordering Information

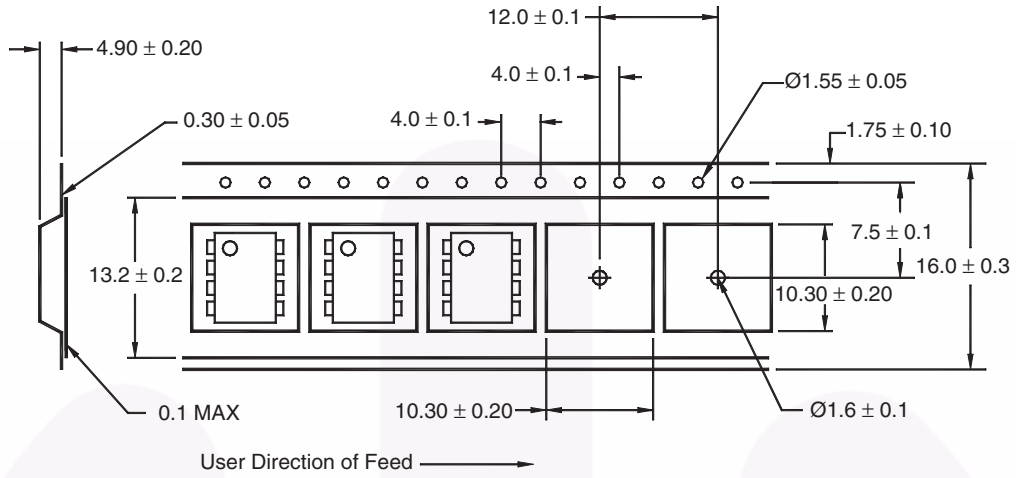
Option	Example Part Number	Description
No Option	MTC9001	Standard Through Hole
S	MTC9001S	Surface Mount Lead Bend
SD	MTC9001SD	Surface Mount; Tape and Reel
300	MTC9001300	VDE Approved
3S	MTC90013S	Surface Mount Lead Bend; VDE Approved
3SD	MTC90013SD	Surface Mount; Tape and Reel; VDE Approved
300W	MTC9001300W	0.4" Lead Spacing; VDE Approved

Marking Information



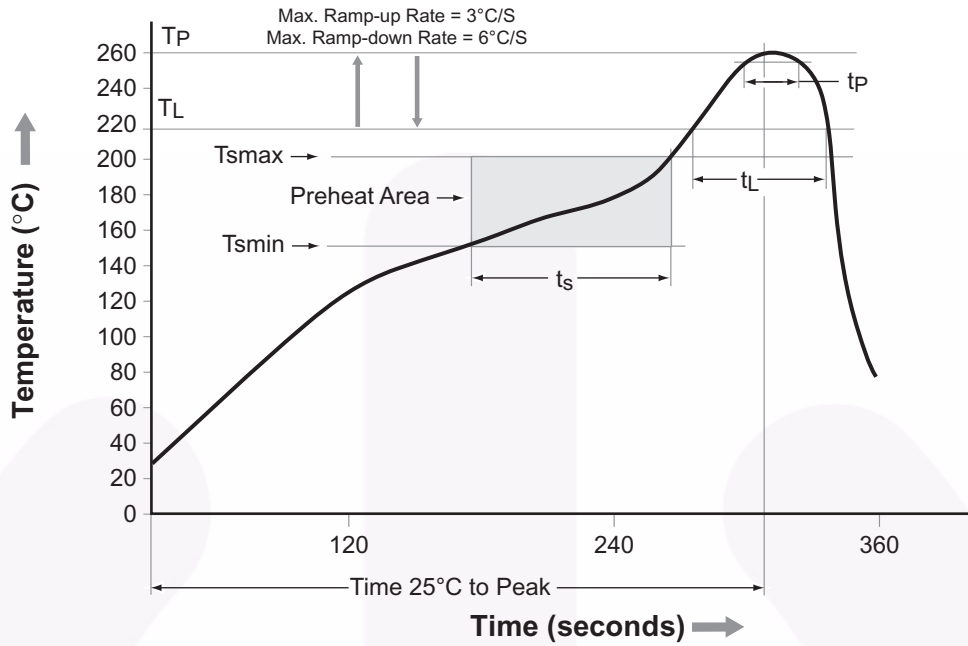
Definitions	
1	Fairchild logo
2	Device number
3	VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4	Two digit year code, e.g., '03'
5	Two digit work week ranging from '01' to '53'
6	Assembly package code

Carrier Tape Specifications



Note:
All dimensions are in inches (millimeters)

Reflow Profile








Profile Feature	Pb-Free Assembly Profile
Temperature Min. (Tsmín)	150°C
Temperature Max. (Tsmáx)	200°C
Time (ts) from (Tsmín to Tsmáx)	60–120 seconds
Ramp-up Rate (tL to tP)	3°C/second max.
Liquidous Temperature (TL)	217°C
Time (tL) Maintained Above (TL)	60–150 seconds
Peak Body Package Temperature	260°C +0°C / -5°C
Time (tp) within 5°C of 260°C	30 seconds
Ramp-down Rate (TP to TL)	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.



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

* 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:

- 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.
- 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. 147