

## DESCRIPTION

The CNX48U, H11BX, MOC8080 and TIL113 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

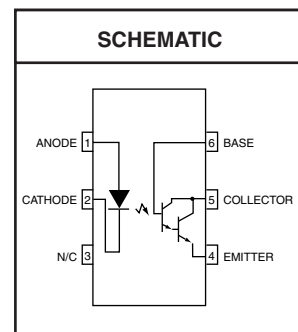
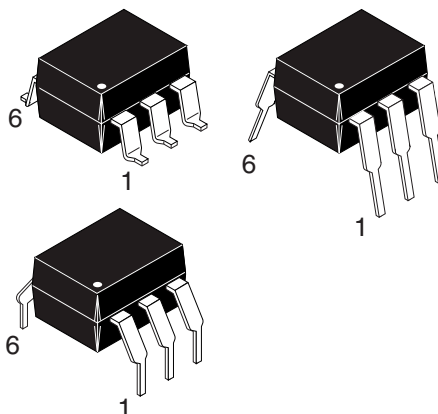
|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## FEATURES

- High sensitivity to low input drive current
- Meets or exceeds all JEDEC Registered Specifications
- VDE 0884 approval available as a test option  
-add option .300. (e.g., H11B1.300)

## APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.



| Parameter                                                                   | Symbol             | Device                                  | Value          | Units |
|-----------------------------------------------------------------------------|--------------------|-----------------------------------------|----------------|-------|
| <b>TOTAL DEVICE</b>                                                         |                    |                                         |                |       |
| Storage Temperature                                                         | T <sub>STG</sub>   | All                                     | -55 to +150    | °C    |
| Operating Temperature                                                       | T <sub>OPR</sub>   | All                                     | -55 to +100    | °C    |
| Lead Solder Temperature                                                     | T <sub>SOL</sub>   | All                                     | 260 for 10 sec | °C    |
| Total Device Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>     | All                                     | 250            | mW    |
|                                                                             |                    |                                         | 3.3            | mW/°C |
| <b>EMITTER</b>                                                              |                    |                                         |                |       |
| Continuous Forward Current                                                  | I <sub>F</sub>     | All                                     | 100            | mA    |
| Reverse Voltage                                                             | V <sub>R</sub>     | All                                     | 6              | V     |
| Forward Current - Peak (300 μs, 2% Duty Cycle)                              | I <sub>F(pk)</sub> | All                                     | 3.0            | A     |
| LED Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C          | P <sub>D</sub>     | All                                     | 100            | mW    |
|                                                                             |                    |                                         | 1.8            | mW/°C |
| <b>DETECTOR</b><br><br>Collector-Emitter Breakdown Voltage                  | BV <sub>CEO</sub>  | CNX48U, TIL113                          | 30             | V     |
|                                                                             |                    | H11B1, H11B2<br>H11B3                   | 25             |       |
|                                                                             |                    | H11B255<br>MOC8080                      | 55             |       |
| Collector-Base Breakdown Voltage                                            | BV <sub>CBO</sub>  | CNX48U, H11B1<br>H11B2, H11B3<br>TIL113 | 30             | V     |
|                                                                             |                    | H11B255<br>MOC8080                      | 55             | V     |
| Emitter-Collector Breakdown Voltage                                         | BV <sub>ECO</sub>  | All                                     | 7              | V     |
| Detector Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C     | P <sub>D</sub>     | All                                     | 150            | mW    |
|                                                                             |                    |                                         | 2.0            | mW/°C |

|                |               |              |                |              |
|----------------|---------------|--------------|----------------|--------------|
| <b>CNX48U</b>  | <b>H11B1</b>  | <b>H11B2</b> | <b>H11B255</b> | <b>H11B3</b> |
| <b>MOC8080</b> | <b>TIL113</b> |              |                |              |

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C Unless otherwise specified.)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter                                                     | Test Conditions                                  | Symbol            | Device                                       | Min | Typ** | Max | Unit |
|---------------------------------------------------------------|--------------------------------------------------|-------------------|----------------------------------------------|-----|-------|-----|------|
| <b>EMITTER</b><br><br>Input Forward Voltage                   | (I <sub>F</sub> = 10 mA)                         | V <sub>F</sub>    | H11B1, H11B2<br>H11B255<br>MOC8080<br>TIL113 | 0.8 | 1.2   | 1.5 | V    |
|                                                               | (I <sub>F</sub> = 10 mA)                         |                   | CNX48U                                       |     | 1.2   | 1.3 |      |
|                                                               | (I <sub>F</sub> = 10 mA, T <sub>A</sub> = -55°C) |                   | MOC8080                                      | 0.9 | 1.3   | 1.7 |      |
|                                                               | (I <sub>F</sub> = 10 mA, T <sub>A</sub> = 100°C) |                   |                                              | 0.7 | 1.05  | 1.4 |      |
|                                                               | (I <sub>F</sub> = 50 mA)                         |                   | H11B3                                        |     | 1.35  | 1.5 |      |
| Reverse Leakage Current                                       | (V <sub>R</sub> = 6 V)                           | I <sub>R</sub>    | All                                          |     | 0.001 | 10  | μA   |
| Capacitance                                                   | (V <sub>F</sub> = 0 V, f = 1.0 MHz)              | C                 | All                                          |     | 50    |     | pF   |
| <b>DETECTOR</b><br><br>Collector-Emitter<br>Breakdown Voltage | (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)      | BV <sub>CEO</sub> | CNX48U                                       | 30  | 60    |     | V    |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | TIL113                                       |     |       |     |      |
|                                                               | (I <sub>C</sub> = 10 mA, I <sub>F</sub> = 0)     |                   | H11B1, H11B2<br>H11B3                        | 25  | 60    |     |      |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | H11B255                                      | 55  | 70    |     |      |
|                                                               | (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)      |                   | MOC8080                                      |     |       |     |      |
| Collector-Base<br>Breakdown Voltage                           | (I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)    | BV <sub>CBO</sub> | CNX48U, H11B1<br>H11B2, H11B3<br>TIL113      | 30  | 100   |     | V    |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | H11B255<br>MOC8080                           | 55  | 100   |     |      |
| Emitter-Collector<br>Breakdown Voltage                        | (I <sub>E</sub> = 100 μA, I <sub>B</sub> = 0)    | BV <sub>ECO</sub> | All                                          | 7   | 10    |     | V    |
| Collector-Emitter<br>Dark Current                             | (V <sub>CE</sub> = 10 V, Base Open)              | I <sub>CEO</sub>  | All                                          |     | 1     | 100 | nA   |

Note

\*\* Typical values at T<sub>A</sub> = 25°C

|                |               |              |                |              |
|----------------|---------------|--------------|----------------|--------------|
| <b>CNX48U</b>  | <b>H11B1</b>  | <b>H11B2</b> | <b>H11B255</b> | <b>H11B3</b> |
| <b>MOC8080</b> | <b>TIL113</b> |              |                |              |

## TRANSFER CHARACTERISTICS (T<sub>A</sub> = 25°C Unless otherwise specified.)

| DC Characteristics                      | Test Conditions                                                                                                   | Symbol               | Device                         | Min        | Typ** | Max  | Units  |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------|------------|-------|------|--------|
| Collector Output Current <sup>(1)</sup> | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V)                                                                   | I <sub>C</sub> (CTR) | MOC8080                        | 50 (500)   |       |      | mA (%) |
|                                         |                                                                                                                   |                      | H11B255                        | 10 (100)   |       |      |        |
|                                         | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1 V)                                                                   |                      | CNX48U                         | 60 (600)   |       |      |        |
|                                         |                                                                                                                   |                      | TIL113                         | 30 (300)   |       |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V)                                                                    |                      | H11B1                          | 5 (500)    |       |      |        |
|                                         |                                                                                                                   |                      | H11B2                          | 2 (200)    |       |      |        |
|                                         |                                                                                                                   |                      | H11B3                          | 1 (100)    |       |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 1 V)                                                                    |                      | CNX48U                         | 5 (500)    |       |      |        |
|                                         | (I <sub>F</sub> = 0.5 mA, V <sub>CE</sub> = 1 V)                                                                  |                      |                                | 1.75 (350) |       |      |        |
| Saturation Voltage                      | (I <sub>F</sub> = 1 mA, I <sub>C</sub> = 1 mA)                                                                    | V <sub>CE(sat)</sub> | H11B1, H11B2<br>H11B3, MOC8080 |            |       | 1.0  | V      |
|                                         | (I <sub>F</sub> = 5 mA, I <sub>C</sub> = 10 mA)                                                                   |                      | CNX48U                         |            |       | 1.0  |        |
|                                         | (I <sub>F</sub> = 50 mA, I <sub>C</sub> = 50 mA)                                                                  |                      | H11B255                        |            |       | 1.0  |        |
|                                         | (I <sub>F</sub> = 8 mA, I <sub>C</sub> = 2 mA)                                                                    |                      | TIL113                         |            |       | 1.25 |        |
| AC Characteristics                      | (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 V)<br>(R <sub>L</sub> = 100 Ω) (Fig.7)                              | t <sub>on</sub>      | H11B1<br>H11B2                 |            | 25    |      | μs     |
|                                         |                                                                                                                   | t <sub>off</sub>     | H11B255<br>H11B3               |            | 18    |      |        |
|                                         | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V)<br>(R <sub>E</sub> = 100 Ω), (R <sub>BE</sub> = 1MΩ)<br>(Fig. 8)  | t <sub>on</sub>      | CNX48U                         |            | 3.5   |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 36    |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CC</sub> = 5 V)<br>(R <sub>E</sub> = 1kΩ), (R <sub>BE</sub> = 10MΩ)<br>(Fig. 8)    | t <sub>on</sub>      |                                |            | 70    |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 190   |      |        |
|                                         | (I <sub>F</sub> = 5 mA, V <sub>CC</sub> = 10 V)<br>(R <sub>L</sub> = 100 Ω) (Fig.7)                               | t <sub>on</sub>      | MOC8080                        |            | 3.5   |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 25    |      |        |
|                                         | (I <sub>F</sub> = 200 mA, I <sub>C</sub> = 50 mA)<br>(V <sub>CC</sub> = 10 V) (R <sub>L</sub> = 100 Ω)<br>(Fig.7) | t <sub>on</sub>      | TIL113                         |            | 0.35  | 5    |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 55    | 100  |        |

## ISOLATION CHARACTERISTICS

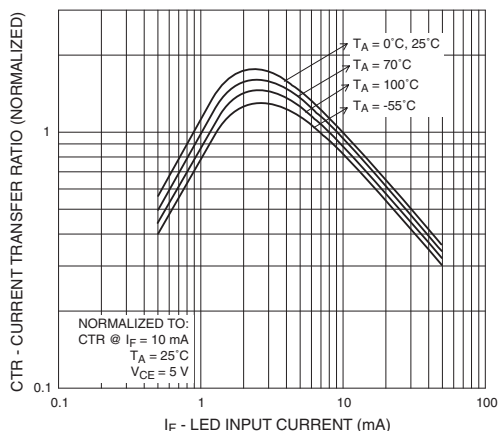
| Characteristic                                | Test Conditions                                          | Symbol           | Min  | Typ**            | Max | Units    |
|-----------------------------------------------|----------------------------------------------------------|------------------|------|------------------|-----|----------|
| Input-Output Isolation Voltage <sup>(2)</sup> | (I <sub>I-O</sub> ≤ 1 μA, V <sub>rms</sub> , t = 1 min.) |                  | 5300 |                  |     | Vac(rms) |
| Isolation Resistance <sup>(2)</sup>           | (V <sub>I-O</sub> = 500 VDC)                             | R <sub>ISO</sub> |      | 10 <sup>11</sup> |     | Ω        |
| Isolation Capacitance <sup>(2)</sup>          | (V <sub>I-O</sub> = ∅, f = 1 MHz)                        | C <sub>ISO</sub> |      | 0.8              |     | pf       |

Note

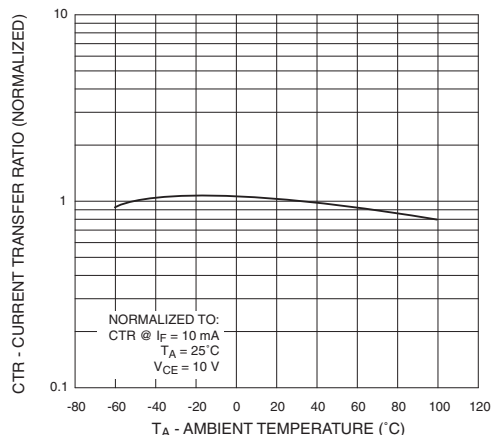
\*\* Typical values at T<sub>A</sub> = 25°C

**CNX48U H11B1 H11B2 H11B255 H11B3**  
**MOC8080 TIL113**

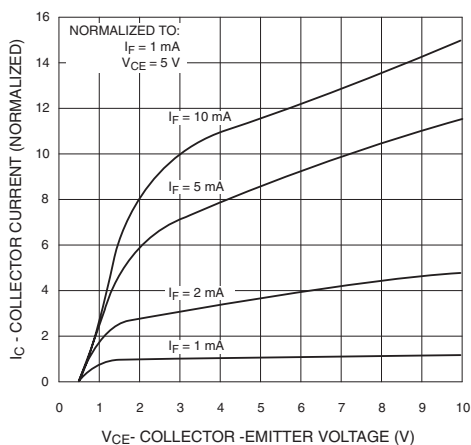
**Fig. 1 Output Current vs. Input Current**



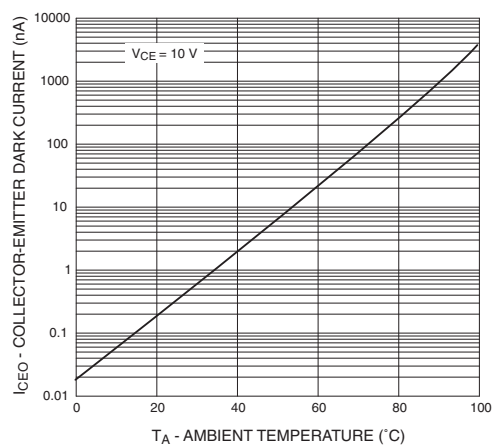
**Fig. 2 Current Transfer Ratio vs. Ambient Temperature**



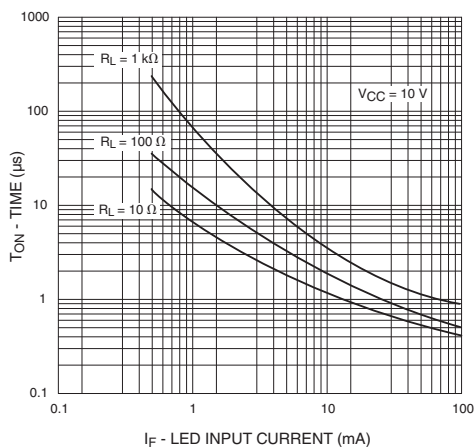
**Fig. 3 Collector Current vs. Collector-Emitter Voltage**



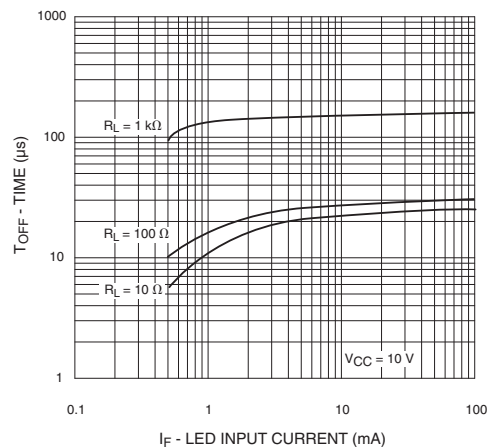
**Fig. 4 Dark Current vs. Ambient Temperature**



**Fig. 5 Turn-On Time vs. Input Current**



**Fig. 6 Turn-Off Time vs. Input Current**



|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free air temperature unless otherwise specified) (Cont.)

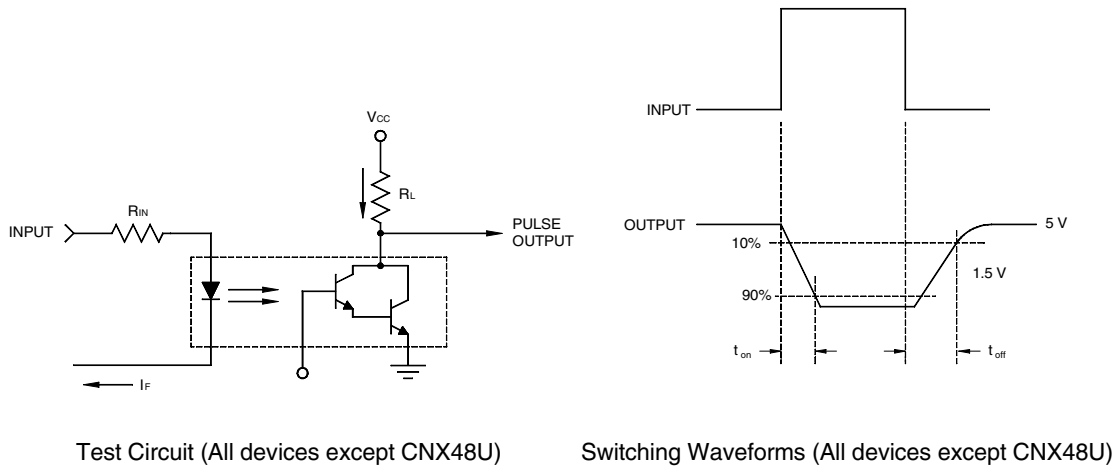


Fig. 7 Switching Time Test Circuit and Waveforms (All devices except CNX48U)

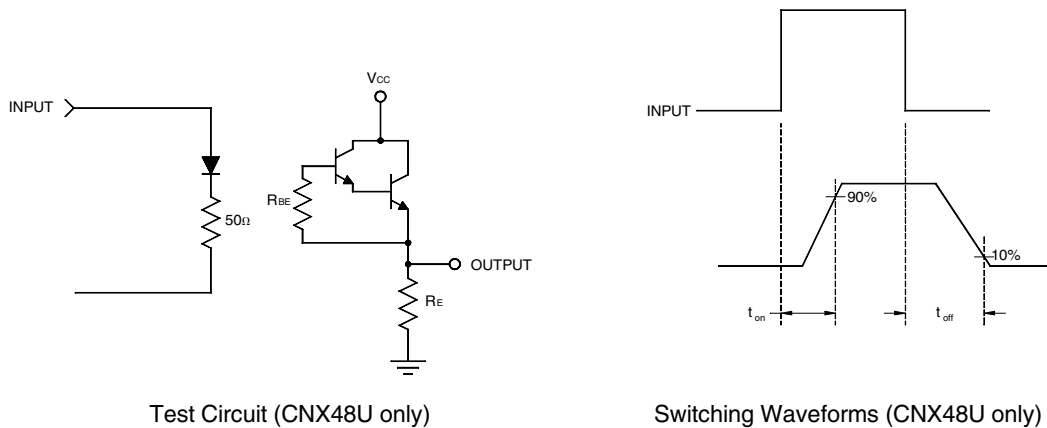


Fig. 8 Switching Time Test Circuit and Waveforms (CNX48U only)

### Notes

1. The current transfer ratio ( $I_C/I_F$ ) is the ratio of the detector collector current to the LED input current with  $V_{CE}$  @ 10 V.
2. For this test, LED pins 1 and 2 are common and phototransistor pins 4,5 and 6 are common.

### Package Dimensions (Through Hole)

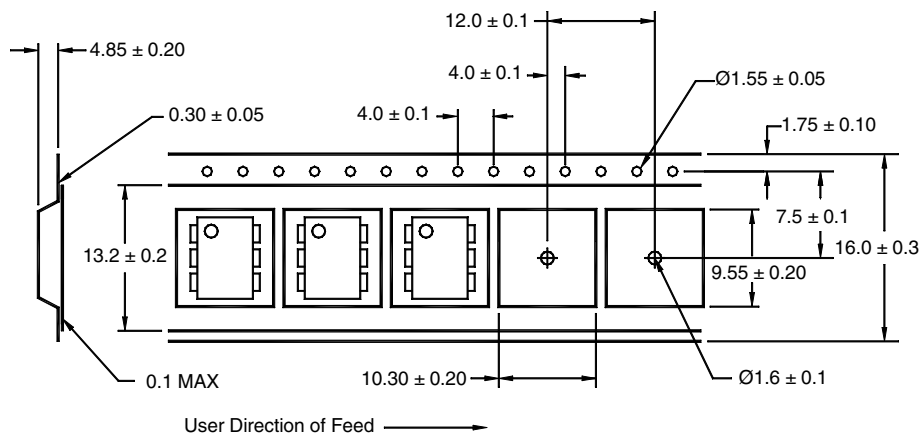


|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## ORDERING INFORMATION

| Option | Order Entry Identifier | Description                          |
|--------|------------------------|--------------------------------------|
| S      | .S                     | Surface Mount Lead Bend              |
| SD     | .SD                    | Surface Mount; Tape and reel         |
| W      | .W                     | 0.4" Lead Spacing                    |
| 300    | .300                   | VDE 0884                             |
| 300W   | .300W                  | VDE 0884, 0.4" Lead Spacing          |
| 3S     | .3S                    | VDE 0884, Surface Mount              |
| 3SD    | .3SD                   | VDE 0884, Surface Mount, Tape & Reel |

## QT Carrier Tape Specifications ("D" Taping Orientation)



## NOTE

All dimensions are millimeters

## 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.

## 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 THE PRESIDENT 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.