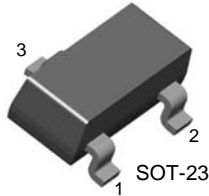**FAIRCHILD**
**SEMICONDUCTOR®**

February 2008

# MMBT5770
# NPN RF Transistor

- This device is designed for use as RF amplifiers, oscillators and multipliers with collector currents in the 1.0 mA to 30 mA range.

- Sourced from process 43.

SOT-23

1. Base   2. Emitter   3. Collector

## Absolute Maximum Ratings $T_a$ = 25°C unless otherwise noted

| Symbol | Parameter | Value | Units |
|--------|-----------|-------|-------|
| $V_{CBO}$ | Collector-Base Voltage | 30 | V |
| $V_{CEO}$ | Collector-Emitter Voltage | 15 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 4.5 | V |
| $I_C$ | Collector Current     - Continuous | 10 | mA |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | °C |

## Thermal Characteristics $T_a$=25°C unless otherwise noted

| Symbol | Parameter | Max. | Units |
|--------|-----------|------|-------|
| $P_D$ | Total Device Dissipation<br>Derate above 25°C | 225<br>1.8 | mW<br>mW/°C |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 556 | °C/W |

\* Device mounted on FR-4PCB 1.6" × 1.6" × 0.06".

## Electrical Characteristics $T_a$=25°C unless otherwise noted

| Symbol | Parameter | Test Condition | Min. | Max. | Units |
|--------|-----------|----------------|------|------|-------|
| **Off Characteristics** | | | | | |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = 1.0 μA, $I_E$ = 0 | 30 | | V |
| $V_{CEO(sus)}$ | Collector-Emitter Sustaining Voltage* | $I_C$ = 3.0 mA, $I_B$ = 0 | 15 | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = 10 μA, $I_C$ = 0 | 3 | | V |
| $I_{CBO}$ | Collector-Cutoff Current | $V_{CB}$ = 15 V, $I_E$ = 0 | | 50 | nA |
| **On Characteristics \*** | | | | | |
| $h_{FE}$ | DC Current Gain | $V_{CE}$ = 1.0V, $I_C$ = 3.0mA | 30 | | |
| $V_{CE (sat)}$ | Collector-Emitter Saturation Voltage | $I_C$ = 10mA, $I_B$ = 1.0mA | | 0.4 | V |
| $V_{BE (sat)}$ | Base-Emitter Saturation Voltage | $I_C$ = 10mA, $I_B$ = 1.0mA | | 1.0 | V |
| **Small Signal Characteristics** | | | | | |
| $f_T$ | Current Gain Bandwidth Product | $I_C$ = 4.0mA, $V_{CE}$ = 10V, f = 100MHz | 600 | | MHz |

\* Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%
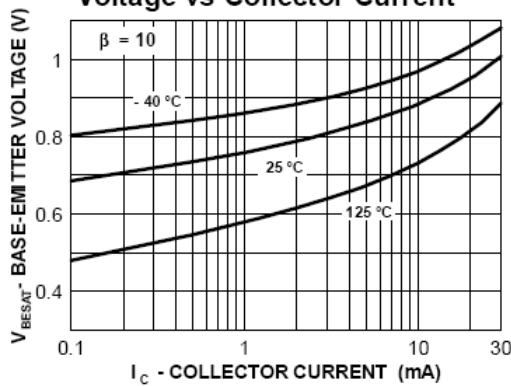
## Typical Characteristics

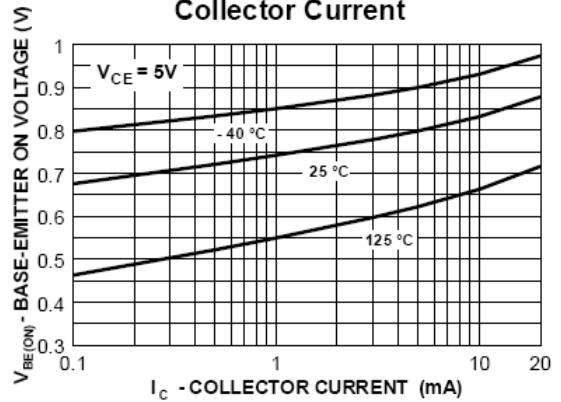### Typical Pulsed Current Gain vs Collector Current
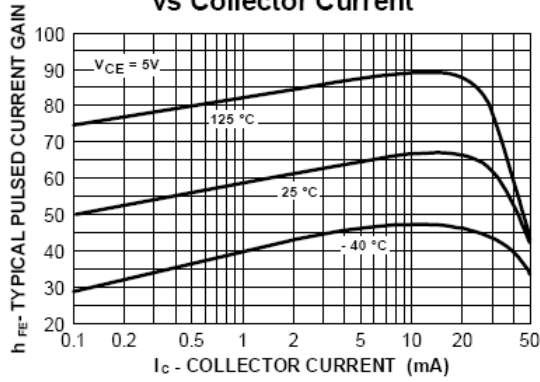


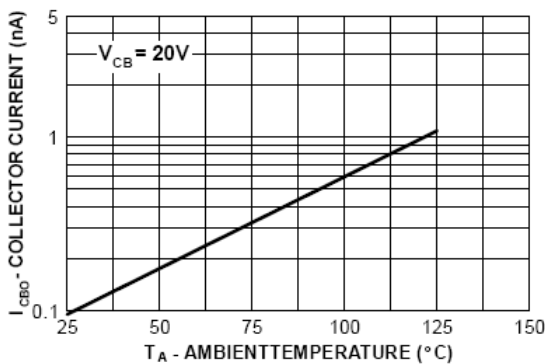### Collector-Emitter Saturation Voltage vs Collector Current
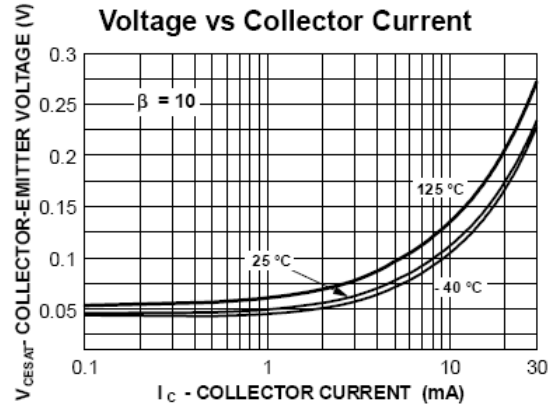


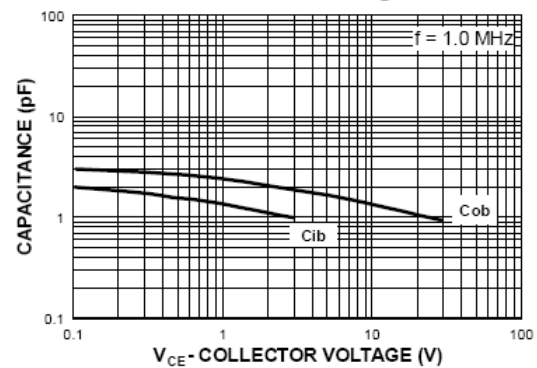### Base-Emitter Saturation Voltage vs Collector Current



### Base-Emitter ON Voltage vs Collector Current



### Collector-Cutoff Current vs Ambient Temperature
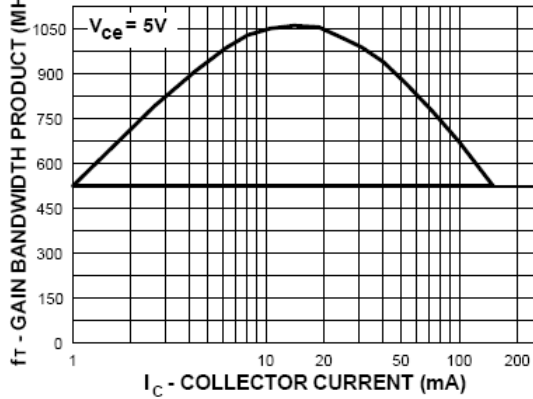


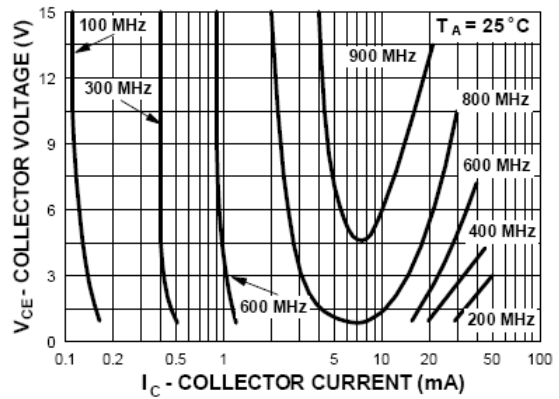### Input and Output Capacitance vs Reverse Voltage

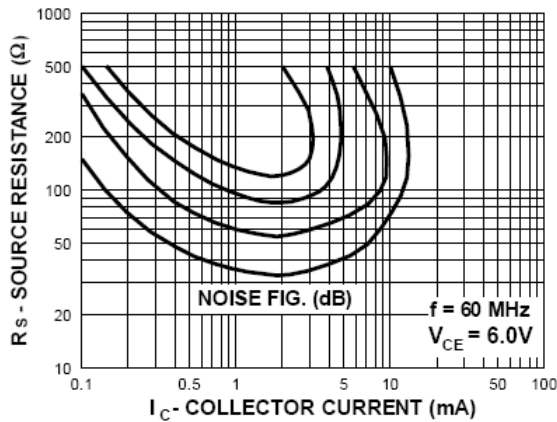## Typical Characteristics (continued)

### Gain Bandwidth Product vs Collector Current
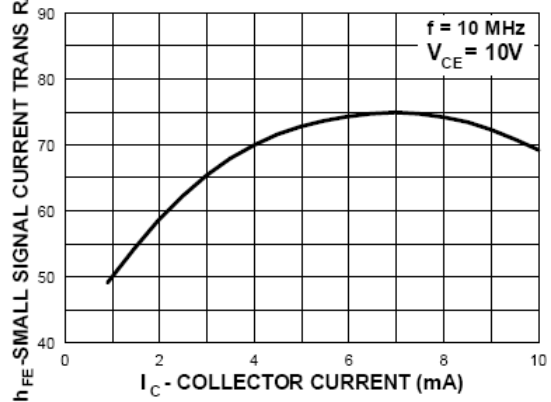


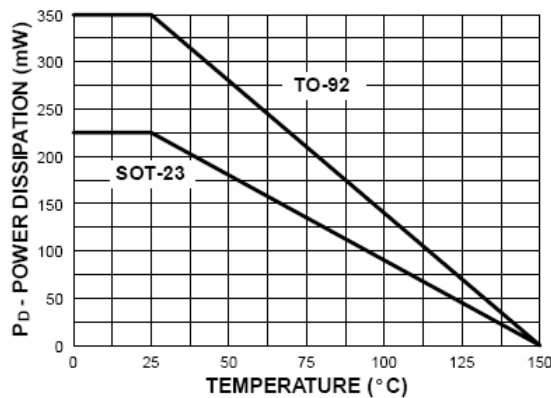### Contours of Constant Gain Bandwidth Product ($f_T$)



### Contours of Constant Noise Figure



### Small Signal Current Gain vs Collector Current



### Power Dissipation vs Ambient Temperature

## Typical Characteristics (continued)

### Input Admittance vs Collector Current-Output Short Circuit
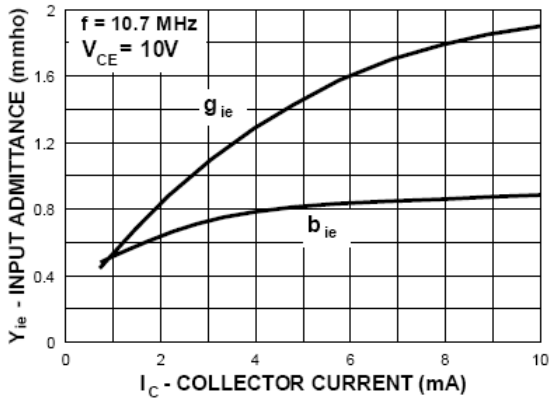


### Input Admittance vs Collector Current-Output Short Circuit
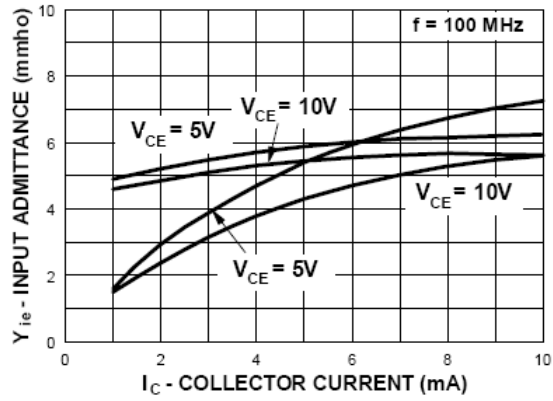


### Input Admittance vs Frequency-Output Short Circuit



### Forward Transfer Admittance vs Frequency-Output Open Circuit



### Forward Trans. Admittance vs Collector Current-Output Short Circuit



### Forward Trans. Admittance vs Collector Current-Output Short Circuit
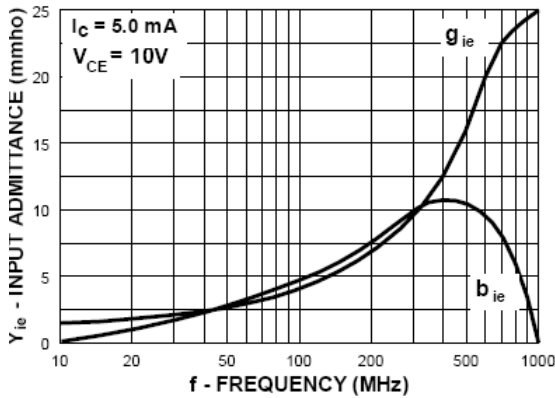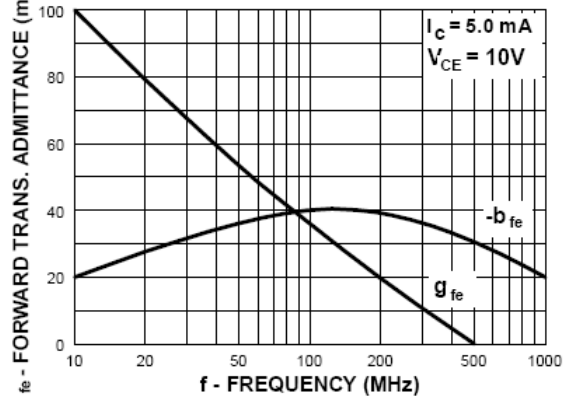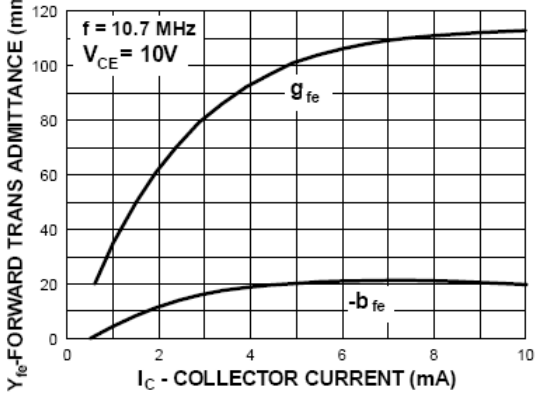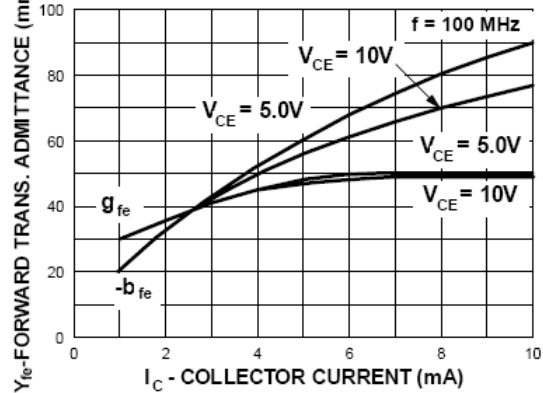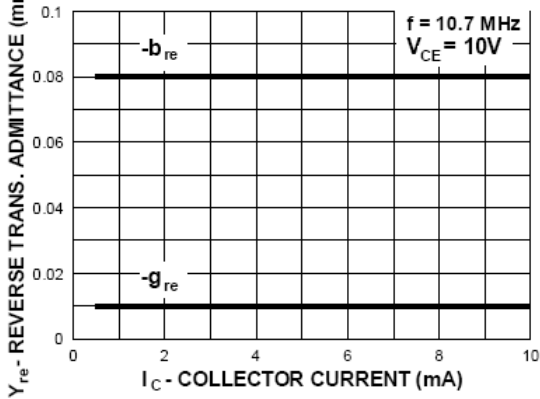
## Typical Characteristics (continued)

**Reverse Transfer Admittance vs Collector Current-Input Short Circuit**

f = 10.7 MHz
V_CE = 10V

-b_re
-g_re

Y_re - REVERSE TRANS. ADMITTANCE (mmho)
I_C - COLLECTOR CURRENT (mA)

**Reverse Transfer Admittance vs Collector Current-Input Short Circuit**

-b_re
V_CE = 5.0V
V_CE = 10V
V_CE = 5.0V
-g_re
V_CE = 10V
f = 100 MHz

Y_re - REVERSE TRANS. ADMITTANCE (mmho)
I_C - COLLECTOR CURRENT (mA)

**Reverse Transfer Admittance vs Frequency-Input Short Circuit**

I_C = 5.0 mA
V_CE = 10V
-b_re
-g_re

Y_re - REVERSE TRANS. ADMITTANCE (mmho)
f - FREQUENCY (MHz)

**Output Admittance vs Collector Current-Input Short Circuit**

f = 10.7 MHz
V_CE = 10V
b_oe
g_oe

Y_oe - REVERSE TRANS. ADMITTANCE (mmho)
I_C - COLLECTOR CURRENT (mA)

**Output Admittance vs Collector Current-Input Short Circuit**

f = 100 MHz
V_CE = 5.0V
b_oe
V_CE = 10V
V_CE = 5.0V
g_oe
V_CE = 10V

Y_oe - REVERSE TRANS. ADMITTANCE (mmho)
I_C - COLLECTOR CURRENT (mA)

**Output Admittance vs Frequency-Input Short Circuit**

I_C = 5.0 mA
V_CE = 10V
b_oe
g_oe
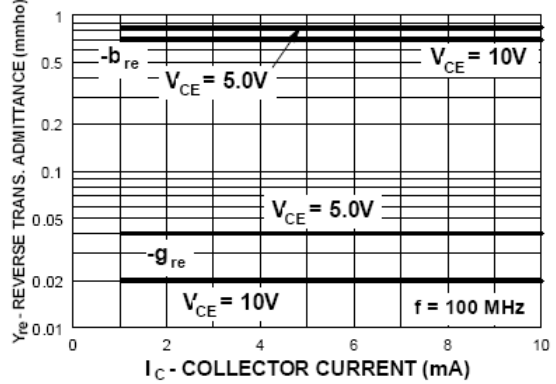
Y_oe - REVERSE TRANS. ADMITTANCE (mmho)
f - FREQUENCY (MHz)
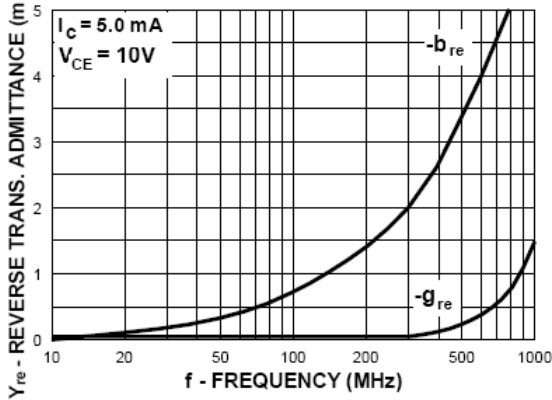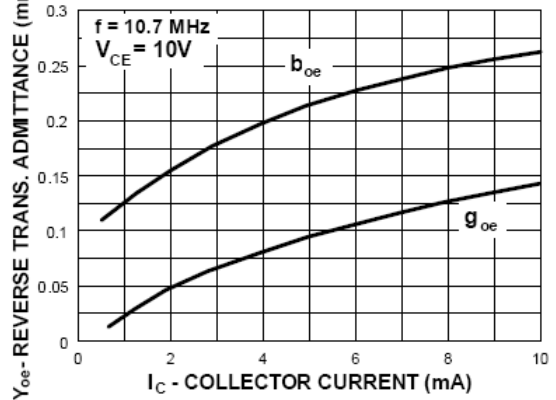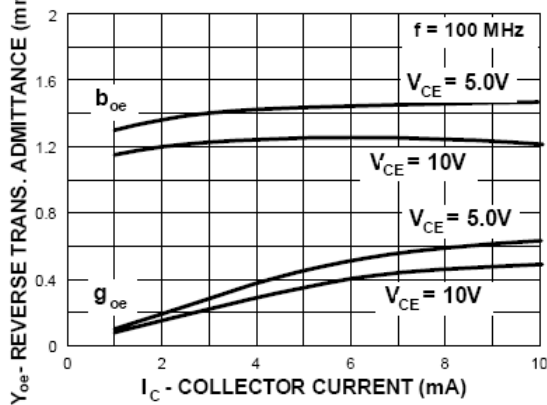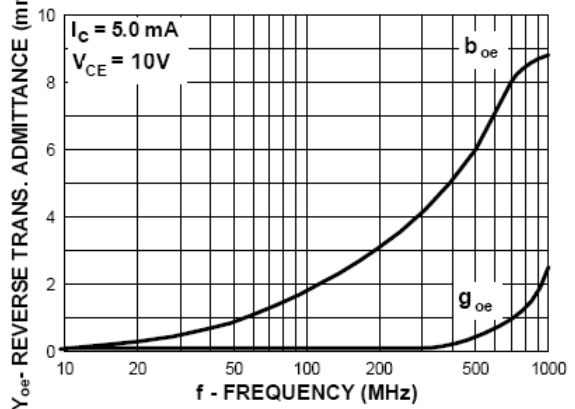
## TRADEMARKS

The following are registered and unregistered trademarks and service marks Fairchild Semiconductor owns or is authorized to use and is not intended to be an exhaustive list of all such trademarks.

| | | | |
|---|---|---|---|
| ACEx® | Green FPS™ | Power247® | SuperSOT™-8 |
| Build it Now™ | Green FPS™ e-Series™ | POWEREDGE® | SyncFET™ |
| CorePLUS™ | GTO™ | Power-SPM™ | The Power Franchise® |
| CROSSVOLT™ | i-Lo™ | PowerTrench® | |
| CTL™ | IntelliMAX™ | Programmable Active Droop™ | the p⏻wer franchise |
| Current Transfer Logic™ | ISOPLANAR™ | QFET® | TinyBoost™ |
| EcoSPARK® | MegaBuck™ | QS™ | TinyBuck™ |
| ℱ® | MICROCOUPLER™ | QT Optoelectronics™ | TinyLogic® |
| Fairchild® | MicroFET™ | Quiet Series™ | TINYOPTO™ |
| Fairchild Semiconductor® | MicroPak™ | RapidConfigure™ | TinyPower™ |
| FACT Quiet Series™ | MillerDrive™ | SMART START™ | TinyPWM™ |
| FACT® | Motion-SPM™ | SPM® | TinyWire™ |
| FAST® | OPTOLOGIC® | STEALTH™ | µSerDes™ |
| FastvCore™ | OPTOPLANAR® | SuperFET™ | UHC® |
| FPS™ | ⏻® | SuperSOT™-3 | UniFET™ |
| FRFET® | PDP-SPM™ | SuperSOT™-6 | VCX™ |
| Global Power Resource℠ | Power220® | | |

## 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 significant injury to the user.

2.  A critical component is 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.

## PRODUCT STATUS DEFINITIONS
### Definition of Terms

| Datasheet Identification | Product Status | Definition |
|---|---|---|
| Advance Information | Formative or In Design | This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. |
| Preliminary | First Production | This 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 | This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design. |
| Obsolete | Not In Production | This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only. |

Rev. I31

www.fairchildsemi.com