**FAIRCHILD**

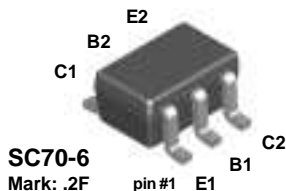SEMICONDUCTOR ™

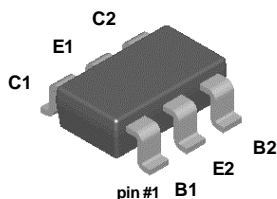# FFB2907A    FMB2907A    MMPQ2907A

**SC70-6**
**Mark: .2F**    pin #1  E1

NOTE: The pinouts are symmetrical; pin 1 and pin 4 are interchangeable.  Units inside the carrier can be of either orientation and will not affect the functionality of the device.

**SuperSOT™-6**
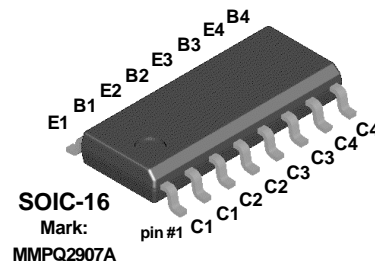**Mark: .2F**
**Dot denotes pin #1**

**SOIC-16**
**Mark:**
**MMPQ2907A**    pin #1

## PNP Multi-Chip General Purpose Amplifier

This device is designed for use as a general purpose amplifier and switch requiring collector currents to 500 mA. Sourced from Process 63.

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

| Symbol | Parameter | Value | Units |
|--------|-----------|-------|-------|
| $V_{CEO}$ | Collector-Emitter Voltage | 60 | V |
| $V_{CBO}$ | Collector-Base Voltage | 60 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 5.0 | V |
| $I_C$ | Collector Current - Continuous | 600 | mA |
| $T_J$, $T_{stg}$ | Operating and Storage Junction Temperature Range | -55 to +150 | °C |

*These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

**NOTES**:
**1)** These ratings are based on a maximum junction temperature of 150 degrees C.
**2)** These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

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

| Symbol | Characteristic | Max | | | Units |
|--------|---------------|-----|-----|-----|-------|
| | | **FFB2907A** | **FMB2907A** | **MMPQ2907A** | |
| $P_D$ | Total Device Dissipation | 300 | 700 | 1,000 | mW |
| | Derate above 25°C | 2.4 | 5.6 | 8.0 | mW/°C |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 415 | 180 | | °C/W |
| | Effective 4 Die | | | 125 | °C/W |
| | Each Die | | | 240 | °C/W |

## PNP Multi-Chip General Purpose Amplifier
(continued)

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

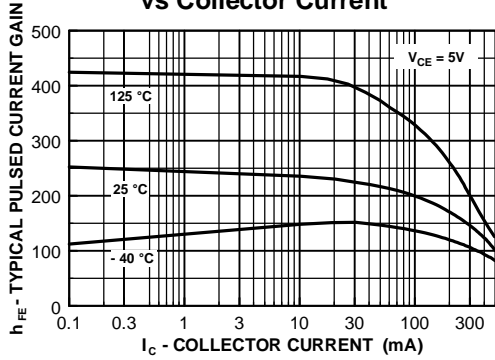| Symbol | Parameter | Test Conditions | Min | Typ | Max | Units |
|--------|-----------|-----------------|-----|-----|-----|-------|
| **OFF CHARACTERISTICS** | | | | | | |
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage* | $I_C = 10$ mA, $I_B = 0$ | 60 | | | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C = 10$ μA, $I_E = 0$ | 60 | | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E = 10$ μA, $I_C = 0$ | 5.0 | | | V |
| $I_B$ | Base Cutoff Current | $V_{CB} = 30$ V, $V_{EB} = 0.5$ V | | | 50 | nA |
| $I_{CEX}$ | Collector Cutoff Current | $V_{CE} = 30$ V, $V_{BE} = 0.5$ V | | | 50 | nA |
| $I_{CBO}$ | Collector Cutoff Current | $V_{CB} = 50$ V, $I_E = 0$ <br> $V_{CB} = 50$ V, $I_E = 0$, $T_A = 125°C$ | | | 0.02 <br> 20 | μA <br> μA |
| **ON CHARACTERISTICS** | | | | | | |
| $h_{FE}$ | DC Current Gain | $I_C = 0.1$ mA, $V_{CE} = 10$ V <br> $I_C = 1.0$ mA, $V_{CE} = 10$ V <br> $I_C = 10$ mA, $V_{CE} = 10$ V <br> $I_C = 150$ mA, $V_{CE} = 10$ V* <br> $I_C = 500$ mA, $V_{CE} = 10$ V* | 75 <br> 100 <br> 100 <br> 100 <br> 50 | | <br> <br> <br> 300 | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage* | $I_C = 150$ mA, $I_B = 15$ mA <br> $I_C = 500$ mA, $I_B = 50$ mA | | | 0.4 <br> 1.6 | V <br> V |
| $V_{BE(sat)}$ | Base-Emitter Saturation Voltage | $I_C = 150$ mA, $I_B = 15$ mA* <br> $I_C = 500$ mA, $I_B = 50$ mA | | | 1.3 <br> 2.6 | V <br> V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| $f_T$ | Current Gain - Bandwidth Product | $I_C = 50$ mA, $V_{CE} = 20$ V, <br> f = 100 MHz | | 250 | | MHz |
| $C_{obo}$ | Output Capacitance | $V_{CB} = 10$ V, $I_E = 0$, <br> f = 100 kHz | | 6.0 | | pF |
| $C_{ibo}$ | Input Capacitance | $V_{EB} = 2.0$ V, $I_C = 0$, <br> f = 100 kHz | | 12 | | pF |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_{on}$ | Turn-on Time | $V_{CC} = 30$ V, $I_C = 150$ mA, | | 30 | | ns |
| $t_d$ | Delay Time | $I_{B1} = 15$ mA | | 8.0 | | ns |
| $t_r$ | Rise Time | | | 20 | | ns |
| $t_{off}$ | Turn-off Time | $V_{CC} = 6.0$ V, $I_C = 150$ mA | | 80 | | ns |
| $t_s$ | Storage Time | $I_{B1} = I_{B2} = 15$ mA | | 60 | | ns |
| $t_f$ | Fall Time | | | 20 | | ns |

*Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%

## Spice Model

PNP (Is=650.6E-18 Xti=3 Eg=1.11 Vaf=115.7 Bf=231.7 Ne=1.829 Ise=54.81f Ikf=1.079 Xtb=1.5 Br=3.563 Nc=2 Isc=0 Ikr=0 Rc=.715 Cjc=14.76p Mjc=.5383 Vjc=.75 Fc=.5 Cje=19.82p Mje=.3357 Vje=.75 Tr=111.3n Tf=603.7p Itf=.65 Vtf=5 Xtf=1.7 Rb=10)

**PNP Multi-Chip General Purpose Amplifier**
(continued)

## Typical Characteristics

### Typical Pulsed Current Gain vs Collector Current
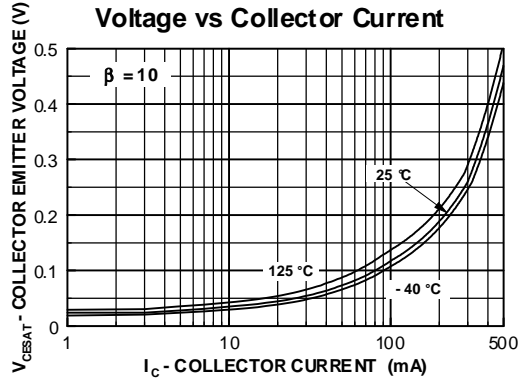
$h_{FE}$ - TYPICAL PULSED CURRENT GAIN

$I_C$ - COLLECTOR CURRENT (mA)

$V_{CE} = 5V$

125 °C

25 °C

- 40 °C

### Collector-Emitter Saturation Voltage vs Collector Current

$V_{CESAT}$ - COLLECTOR EMITTER VOLTAGE (V)

$I_C$ - COLLECTOR CURRENT (mA)

$\beta = 10$

25 °C

125 °C

- 40 °C

### Base-Emitter Saturation Voltage vs Collector Current

$V_{BESAT}$ - BASE EMITTER VOLTAGE (V)

$I_C$ - COLLECTOR CURRENT (mA)

- 40 °C

25 °C

125 °C

$\beta = 10$

### Base Emitter ON Voltage vs Collector Current

$V_{BE(ON)}$ - BASE EMITTER ON VOLTAGE (V)

$I_C$ - COLLECTOR CURRENT (mA)

- 40 °C

25 °C

125 °C

$V_{CE} = 5V$
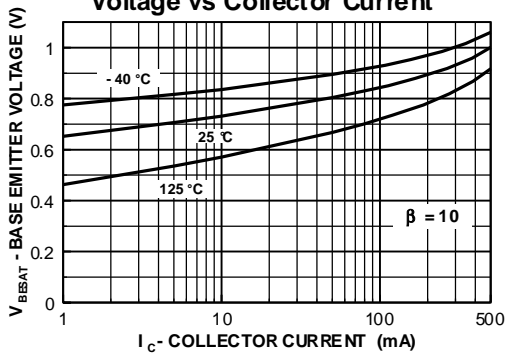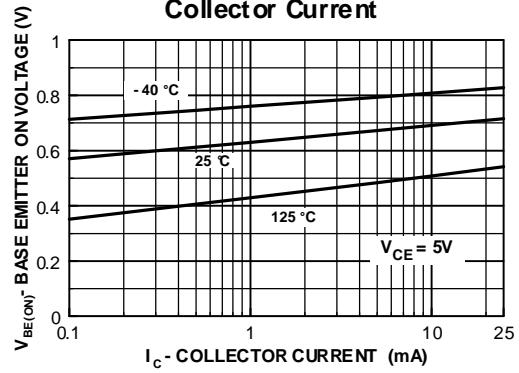
### Collector-Cutoff Current vs Ambient Temperature

$I_{CBO}$ - COLLECTOR CURRENT (nA)

$T_A$ - AMBIENT TEMPERATURE (° C)

$V_{CB} = 35V$
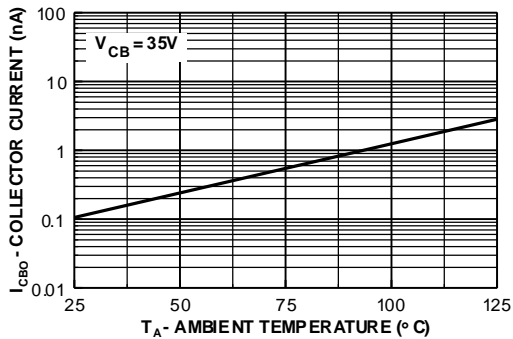
### Input and Output Capacitance vs Reverse Bias Voltage
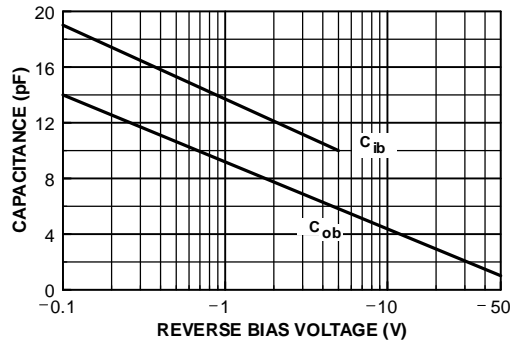
CAPACITANCE (pF)

REVERSE BIAS VOLTAGE (V)

$C_{ib}$

$C_{ob}$

# PNP Multi-Chip General Purpose Amplifier
(continued)

## Typical Characteristics (continued)

### Switching Times vs Collector Current

$I_{B1} = I_{B2} = \dfrac{I_c}{10}$

$V_{CC} = 15\ V$

$t_s$

$t_r$  $t_f$

$t_d$

TIME (nS)

I $_C$ - COLLECTOR CURRENT (mA)
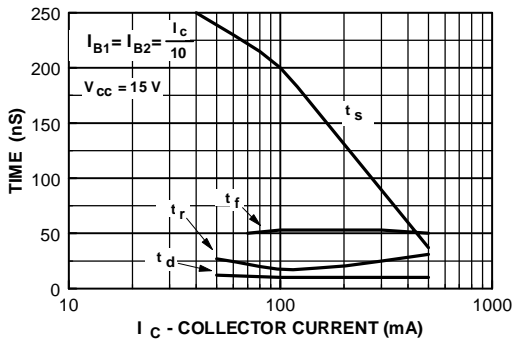
### Turn On and Turn Off Times vs Collector Current

$I_{B1} = I_{B2} = \dfrac{I_c}{10}$

$V_{CC} = 15\ V$

$t_{off}$

$t_{on}$

TIME (nS)

I $_C$ - COLLECTOR CURRENT (mA)
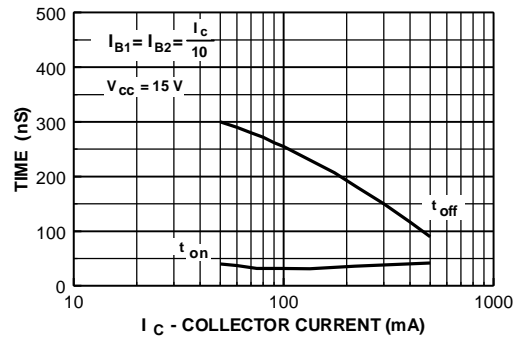
### Rise Time vs Collector and Turn On Base Currents

$t_r = 15\ V$

30 ns

60 ns

I $_{B1}$ - TURN 0N BASE CURRENT (mA)

I $_C$ - COLLECTOR CURRENT (mA)
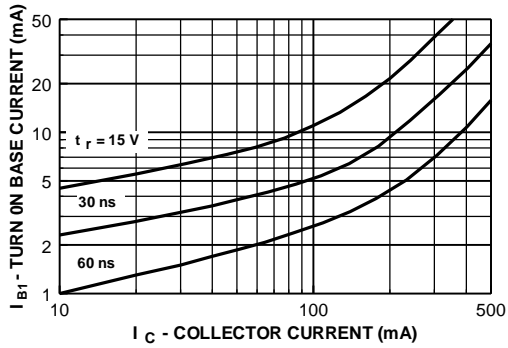
### Power Dissipation vs Ambient Temperature
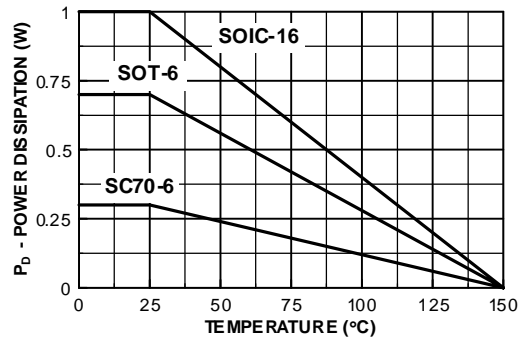
SOIC-16

SOT-6

SC70-6

P $_D$ - POWER DISSIPATION (W)

TEMPERATURE (°C)

**PNP Multi-Chip General Purpose Amplifier**
(continued)

## Typical Common Emitter Characteristics (f = 1.0kHz)

### Common Emitter Characteristics

CHAR. RELATIVE TO VALUES AT $I_C$= -10mA

$I_C$ - COLLECTOR CURRENT (mA)

$h_{oe}$
$h_{re}$
$h_{fe}$
$h_{ie}$

$V_{CE}$ = -10 V
$T_A$ = 25°C

### Common Emitter Characteristics

CHAR. RELATIVE TO VALUES AT $V_{CE}$ = -10V

$V_{CE}$ - COLLECTOR VOLTAGE (V)

$h_{re}$ and $h_{oe}$
$h_{ie}$
$h_{fe}$
$h_{re}$
$h_{ie}$
$h_{fe}$
$h_{oe}$

$I_C$ = -10mA
$T_A$ = 25°C

### Common Emitter Characteristics

CHAR. RELATIVE TO VALUES AT $T_A$ = 25°C

$T_A$ - AMBIENT TEMPERATURE (°C)

$I_C$ = -10mA
$V_{CE}$ = -10 V

$h_{fe}$
$h_{ie}$
$h_{re}$
$h_{oe}$

$h_{oe}$
$h_{re}$
$h_{ie}$
$h_{fe}$

**PNP Multi-Chip General Purpose Amplifier**
(continued)

## Test Circuits

- 30 V

200 Ω

1.0 KΩ

0

-.16 V

50 Ω

≤200ns

**FIGURE 1: Saturated Turn-On Switching Time Test Circuit**

1.5 V

- 6.0 V

1 KΩ

37 Ω

1.0 KΩ

0

- 30 V

50 Ω

≤ 200ns

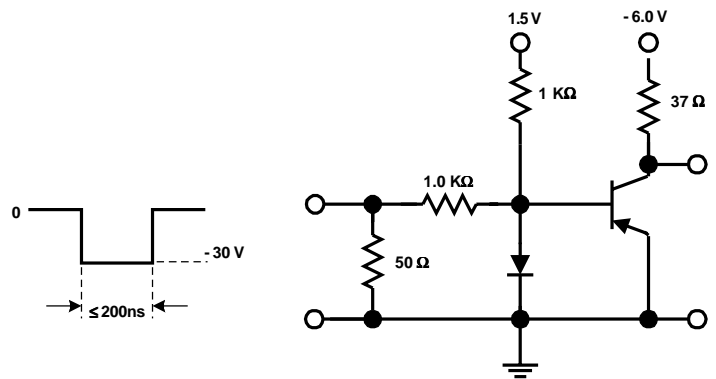**FIGURE 2: Saturated Turn-Off Switching Time Test Circuit**

## TRADEMARKS

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

| | | | |
|---|---|---|---|
| ACEx™ | FASTr™ | PowerTrench ® | SyncFET™ |
| Bottomless™ | GlobalOptoisolator™ | QFET™ | TinyLogic™ |
| CoolFET™ | GTO™ | QS™ | UHC™ |
| CROSSVOLT™ | HiSeC™ | QT Optoelectronics™ | VCX™ |
| DOME™ | ISOPLANAR™ | Quiet Series™ | |
| E²CMOS™ | MICROWIRE™ | SILENT SWITCHER ® | |
| EnSigna™ | OPTOLOGIC™ | SMART START™ | |
| FACT™ | OPTOPLANAR™ | SuperSOT™-3 | |
| FACT Quiet Series™ | PACMAN™ | SuperSOT™-6 | |
| FAST ® | POP™ | SuperSOT™-8 | |

## 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 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, or (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, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order 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 in order 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. G