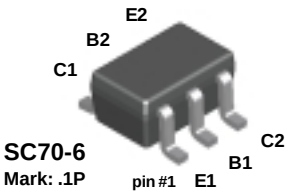
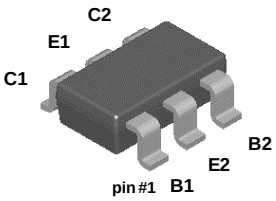
FAIRCHILD
SEMICONDUCTOR TM

# FFB2222A FMB2222A MMPQ2222A

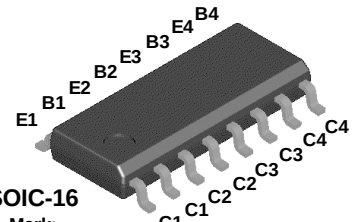



**SC70-6**
**Mark: .1P**

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: .1P**
**Dot denotes pin #1**




**SOIC-16**
**Mark: MMPQ2222A**

## NPN Multi-Chip General Purpose Amplifier

This device is for use as a medium power amplifier and switch requiring collector currents up to 500 mA. Sourced from Process 19.

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

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $V_{CEO}$ | Collector-Emitter Voltage | 40 | V |
| $V_{CBO}$ | Collector-Base Voltage | 75 | V |
| $V_{EBO}$ | Emitter-Base Voltage | 5.0 | V |
| $I_C$ | Collector Current - Continuous | 500 | 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 |
|---|---|---|---|---|---|
| | | FFB2222A | FMB2222A | MMPQ2222A | |
| $P_D$ | 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 |

## NPN 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 | 40 | | | V |
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C$ = 10 µA, $I_E$ = 0 | 75 | | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E$ = 10 µA, $I_C$ = 0 | 5.0 | | | V |
| $I_{CBO}$ | Collector Cutoff Current | $V_{CB}$ = 60 V, $I_E$ = 0 | | | 10 | nA |
| $I_{EBO}$ | Emitter Cutoff Current | $V_{EB}$ = 3.0 V, $I_C$ = 0 | | | 10 | nA |
| **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>$I_C$ = 150 mA, $V_{CE}$ = 1.0 V*<br>$I_C$ = 500 mA, $V_{CE}$ = 10 V* | 35<br>50<br>75<br>100<br>50<br>40 | | <br><br><br>300<br><br> | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage* | $I_C$ = 150 mA, $I_B$ = 15 mA<br>$I_C$ = 500 mA, $I_B$ = 50 mA | | | 0.3<br>1.0 | 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 | | | 1.2<br>2.0 | V<br>V |
| **SMALL SIGNAL CHARACTERISTICS** | | | | | | |
| $f_T$ | Current Gain - Bandwidth Product | $I_C$ = 20 mA, $V_{CE}$ = 20 V, f = 100 MHz | | 300 | | MHz |
| $C_{obo}$ | Output Capacitance | $V_{CB}$ = 10 V, $I_E$ = 0, f = 100 kHz | | 4.0 | | pF |
| $C_{ibo}$ | Input Capacitance | $V_{EB}$ = 0.5 V, $I_C$ = 0, f = 100 kHz | | 20 | | pF |
| NF | Noise Figure | $I_C$ = 100 µA, $V_{CE}$ = 10 V, $R_S$ = 1.0 kΩ, f = 1.0 kHz | | 2.0 | | dB |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| $t_d$ | Delay Time | $V_{CC}$ = 30 V, $V_{BE(OFF)}$ = 0.5 V, $I_C$ = 150 mA, $I_{B1}$ = 15 mA | | 8 | | ns |
| $t_r$ | Rise Time | | | 20 | | ns |
| $t_s$ | Storage Time | $V_{CC}$ = 30 V, $I_C$ = 150 mA, $I_{B1}$ = $I_{B2}$ = 15 mA | | 180 | | ns |
| $t_f$ | Fall Time | | | 40 | | ns |

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

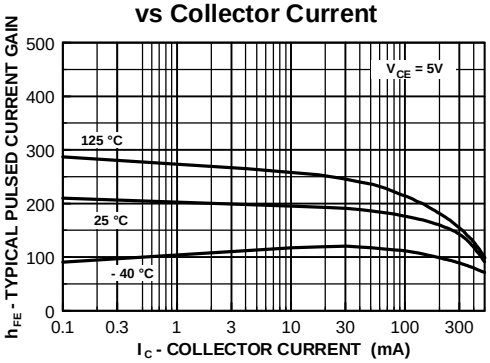
### Spice Model

NPN (Is=14.34f Xti=3 Eg=1.11 Vaf=74.03 Bf=255.9 Ne=1.307 Ise=14.34f Ikf=.2847 Xtb=1.5 Br=6.092 Nc=2 Isc=0 Ikr=0 Rc=1 Cjc=7.306p Mjc=.3416 Vjc=.75 Fc=.5 Cje=22.01p Mje=.377 Vje=.75 Tr=46.91n Tf=411.1p Itf=.6 Vtf=1.7 Xtf=3 Rb=10)

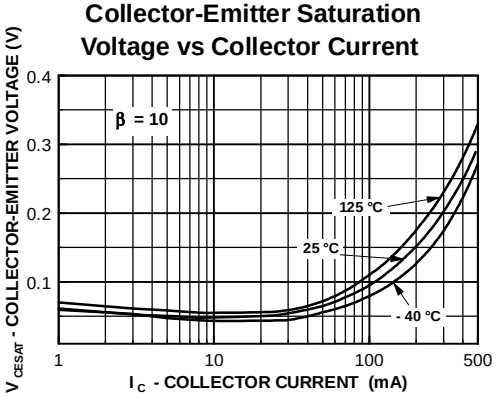
## NPN Multi-Chip General Purpose Amplifier
(continued)

### Typical Characteristics

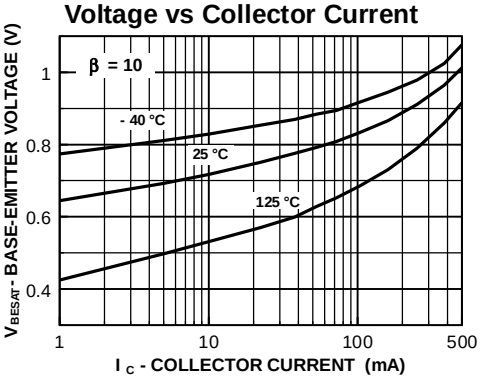
**Typical Pulsed Current Gain vs Collector Current**



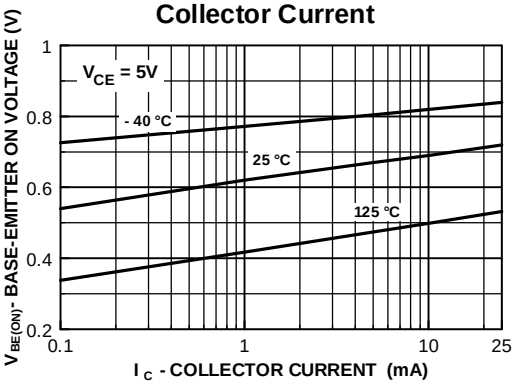

**Collector-Emitter Saturation Voltage vs Collector Current**



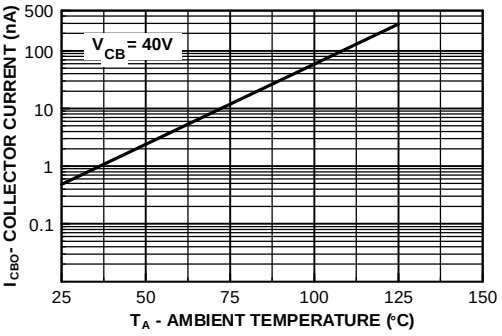

**Base-Emitter Saturation Voltage vs Collector Current**



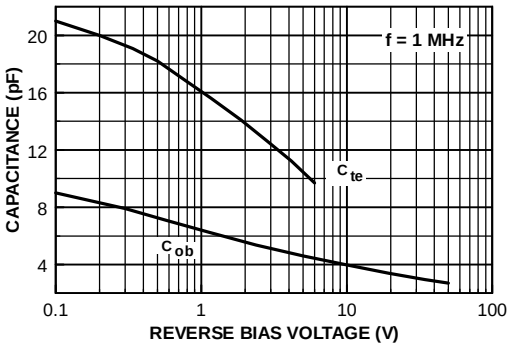

**Base-Emitter ON Voltage vs Collector Current**




**Collector-Cutoff Current vs Ambient Temperature**

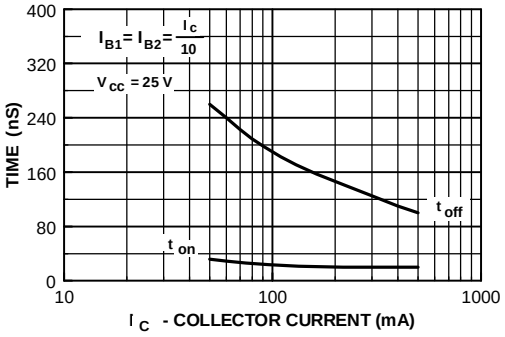



**Emitter Transition and Output Capacitance vs Reverse Bias Voltage**

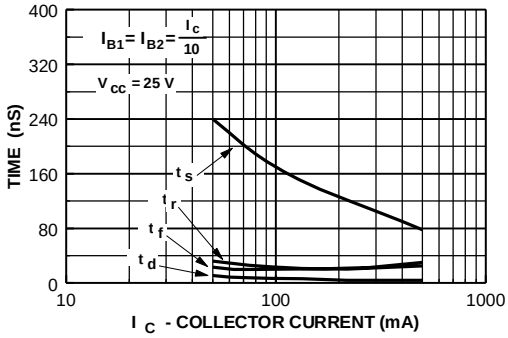


## Typical Characteristics (continued)

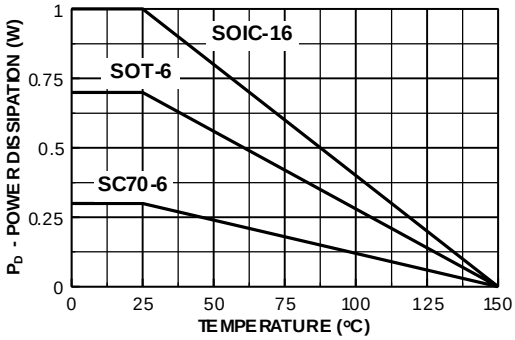
**Turn On and Turn Off Times vs Collector Current**




**Switching Times vs Collector Current**

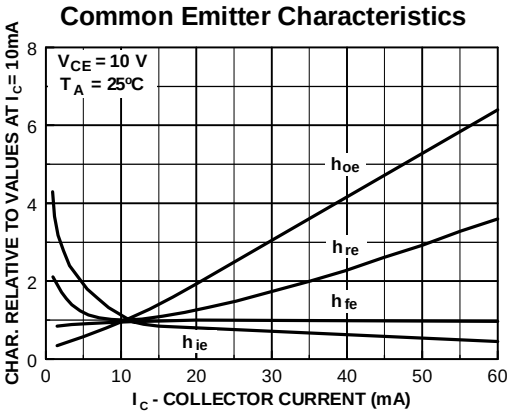


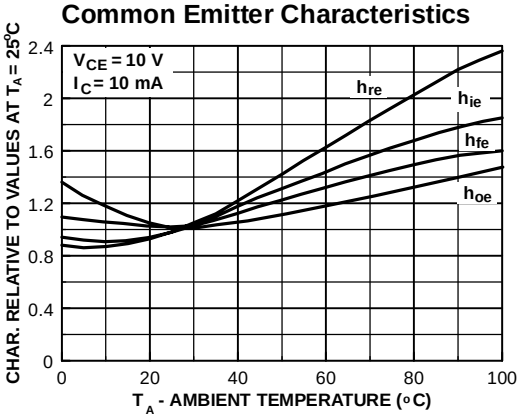

**Power Dissipation vs Ambient Temperature**

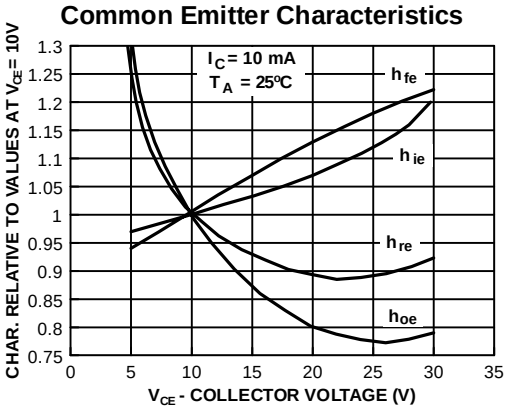


## NPN Multi-Chip General Purpose Amplifier
(continued)

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



## Test Circuits

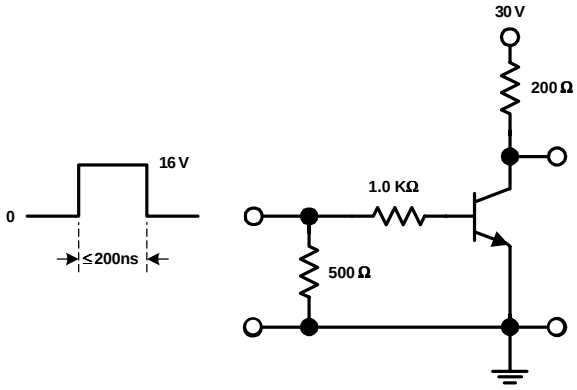



**FIGURE 1: Saturated Turn-On Switching Time**

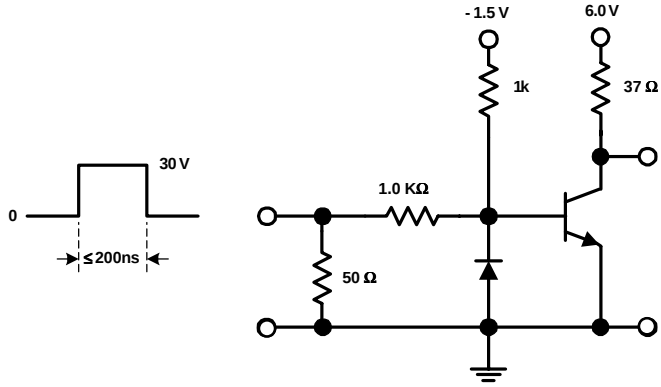



**FIGURE 2: Saturated Turn-Off Switching Time**

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