To learn more about ON Semiconductor, please visit our website at www.onsemi.com

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor’s system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.
FFB2222A / FMB2222A / MMPQ2222A
NPN Multi-Chip General-Purpose Amplifier

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

Block Diagram

Figure 1. FFB2222A Device Package

Figure 2. FFB2222A Internal Connection

Figure 3. FMB2222A Device Package

Figure 4. FMB2222A Internal Connection

Figure 5. MMPQ2222A Device Package

Figure 6. MMPQ2222A Internal Connection
Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Top Mark</th>
<th>Package</th>
<th>Packing Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFB2222A</td>
<td>.1P</td>
<td>SC70 6L</td>
<td>Tape and Reel</td>
</tr>
<tr>
<td>FMB2222A</td>
<td>.1P</td>
<td>SSOT 6L</td>
<td>Tape and Reel</td>
</tr>
<tr>
<td>MMPQ2222A</td>
<td>MMPQ2222A</td>
<td>SOIC 16L</td>
<td>Tape and Reel</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings\(^{(1)}\)

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. Values are at \(T_A = 25^\circ C\) unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{CEO})</td>
<td>Collector-Emitter Voltage</td>
<td>45</td>
<td>V</td>
</tr>
<tr>
<td>(V_{CBO})</td>
<td>Collector-Base Voltage</td>
<td>75</td>
<td>V</td>
</tr>
<tr>
<td>(V_{EBO})</td>
<td>Emitter-Base Voltage</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>(I_C)</td>
<td>Collector Current - Continuous</td>
<td>500</td>
<td>mA</td>
</tr>
<tr>
<td>(T_{J,T_{STG}})</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Note:
1. These ratings are based on a maximum junction temperature of 150°C. These are steady-state limits. Fairchild Semiconductor should be consulted on applications involving pulsed or low-duty cycle operations.

Thermal Characteristics\(^{(2)}\)

Values are at \(T_A = 25^\circ C\) unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max. FFB2222A</th>
<th>Max. FMB2222A</th>
<th>Max. MMPQ2222A</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(P_D)</td>
<td>Total Device Dissipation</td>
<td>300</td>
<td>700</td>
<td>1,000</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td>Derate Above 25°C</td>
<td>2.4</td>
<td>5.6</td>
<td>8.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>(R_{JUA})</td>
<td>Thermal Resistance, Junction-to-Ambient</td>
<td>415</td>
<td>180</td>
<td>125</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td>Thermal Resistance, Junction-to-Ambient, Effective 4 Dies</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermal Resistance, Junction-to-Ambient, Each Die</td>
<td></td>
<td></td>
<td></td>
<td>240</td>
</tr>
</tbody>
</table>

Note:
2. PCB size: FR-4, 76 mm x 114 mm x 1.57 mm (3.0 inch x 4.5 inch x 0.062 inch) with minimum land pattern size.
### Electrical Characteristics

Values are at $T_A = 25^\circ\text{C}$ unless otherwise noted.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{(BR)CEO}$</td>
<td>Collector-Emitter Breakdown Voltage(^{(3)})</td>
<td>$I_C = 10\ \text{mA}, I_B = 0$</td>
<td>40</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{(BR)CBO}$</td>
<td>Collector-Base Breakdown Voltage</td>
<td>$I_C = 10\ \mu\text{A}, I_E = 0$</td>
<td>75</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$V_{(BR)EBO}$</td>
<td>Emitter-Base Breakdown Voltage</td>
<td>$I_E = 10\ \mu\text{A}, I_C = 0$</td>
<td>5.0</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>$I_{CBO}$</td>
<td>Collector Cut-Off Current</td>
<td>$V_{CB} = 60\ \text{V}, I_E = 0$</td>
<td>10</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>Emitter Cut-Off Current</td>
<td>$V_{EB} = 3.0\ \text{V}, I_C = 0$</td>
<td></td>
<td>10</td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

$h_{FE}$ DC Current Gain

- $I_C = 0.1\ \text{mA}, V_{CE} = 10\ \text{V}$ | 35 |
- $I_C = 1.0\ \text{mA}, V_{CE} = 10\ \text{V}$ | 50 |
- $I_C = 10\ \text{mA}, V_{CE} = 10\ \text{V}$ | 75 |
- $I_C = 150\ \text{mA}, V_{CE} = 10\ \text{V}\(^{(3)}\)$ | 100 | 300 |
- $I_C = 150\ \text{mA}, V_{CE} = 1.0\ \text{V}\(^{(3)}\)$ | 50 |
- $I_C = 500\ \text{mA}, V_{CE} = 10\ \text{V}\(^{(3)}\)$ | 40 |

$V_{CE(sat)}$ Collector-Emitter Saturation Voltage\(^{(3)}\)

- $I_C = 150\ \text{mA}, I_B = 15\ \text{mA}$ | 0.3 | | V |
- $I_C = 500\ \text{mA}, I_B = 50\ \text{mA}$ | 1.0 | | V |

$V_{BE(sat)}$ Base-Emitter Saturation Voltage\(^{(3)}\)

- $I_C = 150\ \text{mA}, I_B = 15\ \text{mA}$ | 1.2 | | V |
- $I_C = 500\ \text{mA}, I_B = 50\ \text{mA}$ | 2.0 | | V |

$f_T$ Current Gain - Bandwidth Product

- $I_C = 20\ \text{mA}, V_{CE} = 20\ \text{V}, f = 100\ \text{MHz}$ | 300 | | MHz |

$C_{obo}$ Output Capacitance

- $V_{CB} = 10\ \text{V}, I_E = 0, f = 100\ \text{kHz}$ | 4.0 | | pF |

$C_{ibo}$ Input Capacitance

- $V_{EB} = 0.5\ \text{V}, I_C = 0, f = 100\ \text{kHz}$ | 20 | | pF |

$NF$ Noise Figure

- $I_C = 100\ \mu\text{A}, V_{CE} = 10\ \text{V}, R_S = 1.0\ \text{kOhm}, f = 1.0\ \text{kHz}$ | 2.0 | | dB |

$t_d$ Delay Time

- $V_{CC} = 30\ \text{V}, V_{BE(OFF)} = 0.5\ \text{V}, R_S = 1.0\ \text{kOhm}, f = 1.0\ \text{kHz}$ | 8 | | ns |

$t_r$ Rise Time

- $I_C = 150\ \text{mA}, I_B = 15\ \text{mA}$ | 20 | | ns |

$t_s$ Storage Time

- $V_{CC} = 30\ \text{V}, I_C = 150\ \text{mA}, I_B = 15\ \text{mA}$ | 180 | | ns |

$t_f$ Fall Time

- $I_B = I_{B2} = 15\ \text{mA}$ | 40 | | ns |

**Note:**

3. Pulse test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2.0\%$. 
Typical Performance Characteristics

Figure 7. Typical Pulsed Current Gain vs. Collector Current

Figure 8. Collector-Emitter Saturation Voltage vs. Collector Current

Figure 9. Base-Emitter Saturation Voltage vs. Collector Current

Figure 10. Base-Emitter On Voltage vs. Collector Current

Figure 11. Collector Cut-Off Current vs. Ambient Temperature

Figure 12. Emitter Transition and Output Capacitance vs. Reverse Bias Voltage
Typical Performance Characteristics (Continued)

Figure 13. Turn-On and Turn-Off Times vs. Collector Current

Figure 14. Switching Time vs. Collector Current

Figure 15. Power Dissipation vs. Ambient Temperature

Figure 16. Common Emitter Characteristics

Figure 17. Common Emitter Characteristics

Figure 18. Common Emitter Characteristics
Test Circuits

Figure 19. Saturated Turn-On Switching Time

Figure 20. Saturated Turn-Off Switching Time
**LAND PATTERN RECOMMENDATION**

**NOTES:** UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ SC-88, 1996.

B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009

E) DRAWING FILENAME: MKT-MAA06AREV7

**FAIRCHILD.**
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A) THIS PACKAGE CONFORMS TO JEDEC MO-193.
VAR. AA, ISSUE E.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
PACKAGE LENGTH DOES NOT INCLUDE MOLD
FLASH, PROTRUSIONS OR GATE BURRS. MOLD
FLASH, PROTRUSIONS OR GATE BURRS SHALL
NOT EXCEED 0.25mm PER END. PACKAGE WIDTH
DOES NOT INCLUDE INTERLEAD FLASH OR
PROTRUSION. INTERLEAD FLASH OR
PROTRUSION SHALL NOT EXCEED 0.25mm PER
SIDE. PACKAGE LENGTH AND WIDTH DIMENSIONS
ARE DETERMINED AT DATUM H.
D) DRAWING FILE NAME: MKT-MA06AREVF

LAND PATTERN RECOMMENDATION

NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE CONFORMS TO JEDEC MO-193.
VAR. AA, ISSUE E.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) PACKAGE LENGTH DOES NOT INCLUDE MOLD
FLASH, PROTRUSIONS OR GATE BURRS. MOLD
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PROTRUSION SHALL NOT EXCEED 0.25mm PER
SIDE. PACKAGE LENGTH AND WIDTH DIMENSIONS
ARE DETERMINED AT DATUM H.
D) DRAWING FILE NAME: MKT-MA06AREVF

ON Semiconductor
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D) CONFORMS TO ASME Y14.5M-2009
E) LANDPATTERN STANDARD:
   SOIC127P600X175-16AM
F) DRAWING FILE NAME: M16AREV13.