*Technical Data*

*MRFIC0970/D*
*Rev. 0, 07/2002*

*3.2 V GSM GaAs Integrated Power Amplifier*

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# MRFIC0970

(Scale 2:1)

**Package Information**
Plastic Package
Case 1308
(QFN-20)

**Ordering Information**

| Device | Marking | Package |
|---|---|---|
| MRFIC0970 | 0970 | QFN-20 |

The MRFIC0970 is a single supply, RF power amplifier designed for the 2.0 W GSM900 handheld radios. The device is packaged in the QFN-20 package, with exposed backside pad, which allows excellent electrical and thermal performance through a solderable contact.

- Target 3.2 V Characteristics:
  RF Output Power: 34.5 dBm Typical
  Efficiency: 50% Typical
- Single Positive Supply Solution
- Available in Tape and Reel only. R2 Suffix = 2500 Units per 12 mm, 13 inch Reel

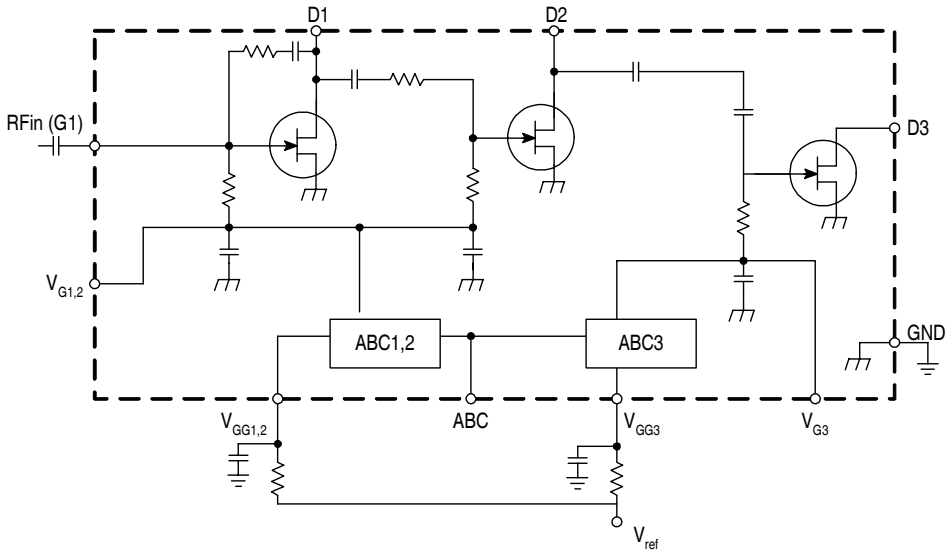



**Figure 1. Functional Block Diagram**

# 1 Electrical Characteristics

**Table 1. Maximum Ratings**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Supply Voltage | $V_{D1,2,3}$, $V_{abc}$<br>$V_{ref}$ | 8.0<br>5.0 | V<br>V |
| RF Input Power | $P_{in}$ | 15 | dBm |
| RF Output Power | $P_{out}$ | 38 | dBm |
| Operating Case Temperature Range | $T_C$ | -40 to 85 | °C |
| Storage Temperature Range | $T_{stg}$ | -40 to 85 | °C |
| Junction Temperature | $T_J$ | 150 | °C |

**NOTES:** 1. Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics or Recommended Operating Conditions tables.
2 ESD (electrostatic discharge) immunity meets Human Body Model (HBM) ≤250 V and Machine Model (MM) ≤60 V. This device is rated Moisture Sensitivity Level (MSL) 1. Additional ESD data available upon request.

**Table 2. Recommended Operating Conditions**

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{D1,2,3}$<br>$V_{abc}$<br>$V_{ref}$ | 2.8<br>0<br>0.04 | -<br>-<br>- | 5.5<br>5.5<br>1.8 | Vdc<br>V<br>V |
| Input Power | $P_{in}$ | 5.0 | - | 10 | dBm |

### Table 3. Electrical Specifications

($V_{D1,2,3}$ = 3.2 V, $V_{abc}$ = 2.6 V, $P_{in}$ = 5.0 dBm, Peak measurement at 12.5% duty cycle, 4.6 ms period, $T_A$ = 25°C, unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Frequency Range | BW | 880 | - | 915 | MHz |
| Output Power | $P_{out}$ | 34.5 | - | - | dBm |
| Power Added Efficiency | PAE | 50 | - | - | % |
| Minimum Output Power ($V_{ref}$ = 0.04, $V_{abc}$ = 2.6 V) | | - | - | -17 | dBm |
| Power Control Slope ($V_{ref}$ = 0.1 to 1.8 V, $\Delta V_{ref}$ = 0.01 V) | | - | - | 50:1 | $\frac{RFVrms}{V_{ref}}$ |
| Bleed thru Power ($P_{in(fo)} \leq$ -12dBm, $V_{ref}$ = 0.04, $V_{abc}$ = 10 k load) | | - | - | -36 | dBm |
| RF Leakage Current ($I_{DD1}$ + $I_{DD2}$ +$I_{DD3,}$ Pin ($f_o$) ≤5.0 dBm) ($V_{abc}$ = 10 k load, $V_{ref}$ = 0.04 V) | | - | - | 35 | mA |
| Output Power Switching Speed (± step input of $V_{ref}$ RF Pout within 1.0 dB of final value) | | - | - | 1.0 | µs |
| Input Return Loss | \|S11\| | - | - | 6.0 | dB |
| Noise Power in Rx band<br>925 to 935 MHz<br>935 to 960 MHz | NP | <br>-<br>- | <br>-<br>- | <br>-73<br>-85 | dBm |
| Stability-Spurious Output (Load VSWR 6:1 all phase angles, Adjust $V_{D1, 2\&3}$ for specified power) | $P_{spur}$ | - | - | -30 | dBc |
| Load Mismatch Stress (Load VSWR = 10:1 all phase angles, 5 seconds, Adjust $V_{D1, 2\&3}$ for specified power) | No Degradation in Output Power Before & After Test | | | | |

# 2 Pin Connections

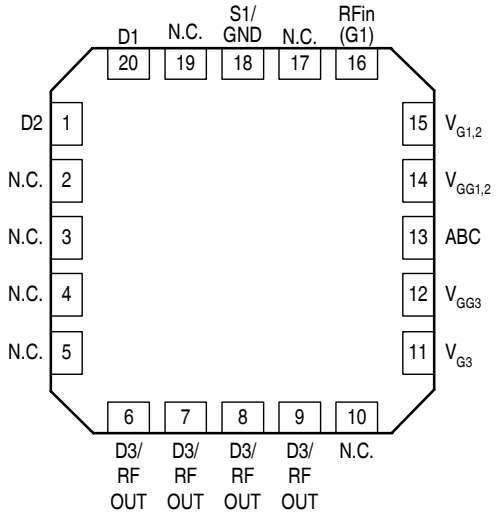



**Figure 2. Pin Connections**

# 3 Typical Performance Characteristics

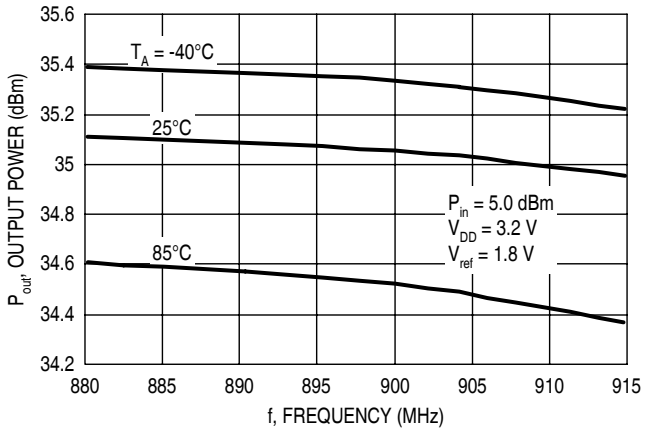



**Figure 3. Output Power versus Frequency**

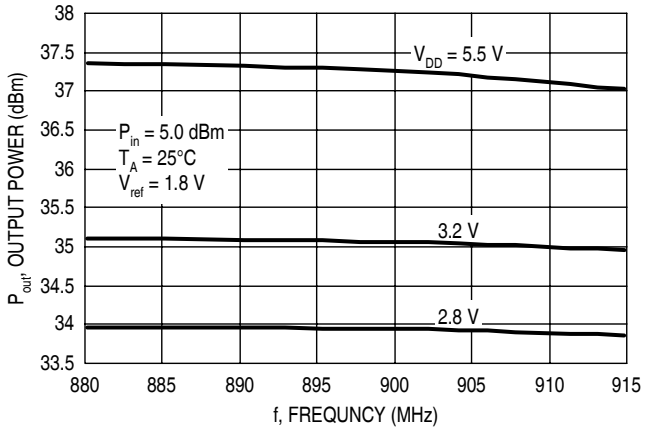



**Figure 4. Output Power versus Frequency**

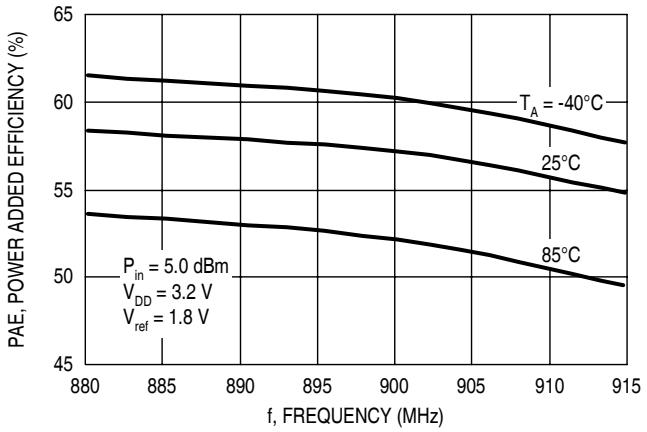



**Figure 5. Power Added Efficiency versus Frequency**

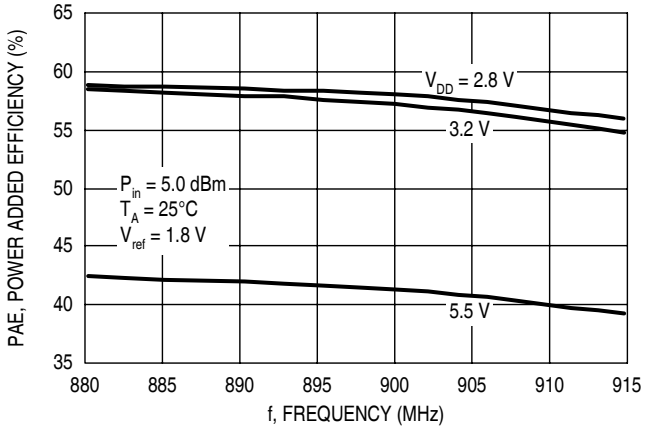



**Figure 6. Power Added Efficiency versus Frequency**

# 4 Application Schematic

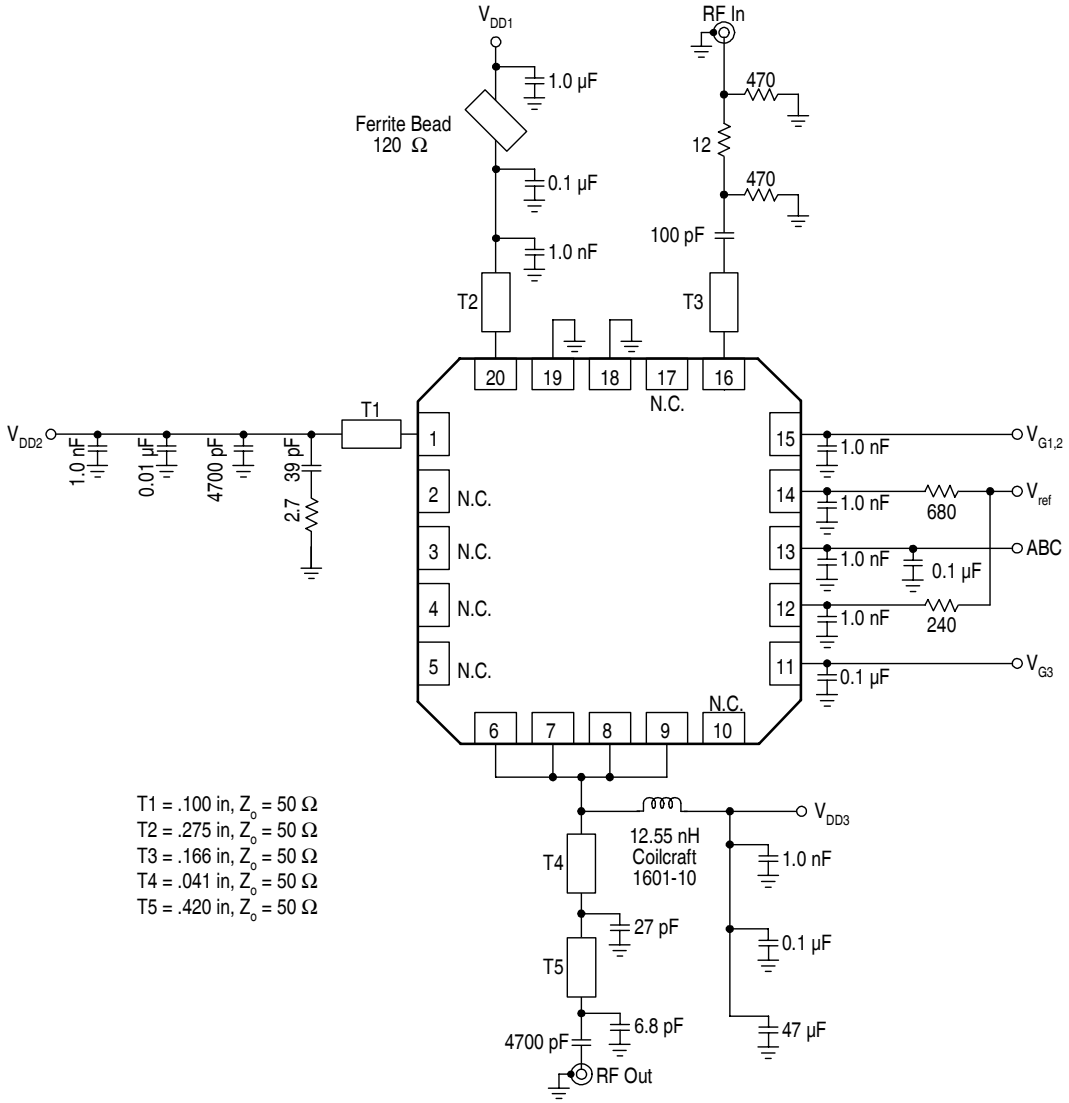
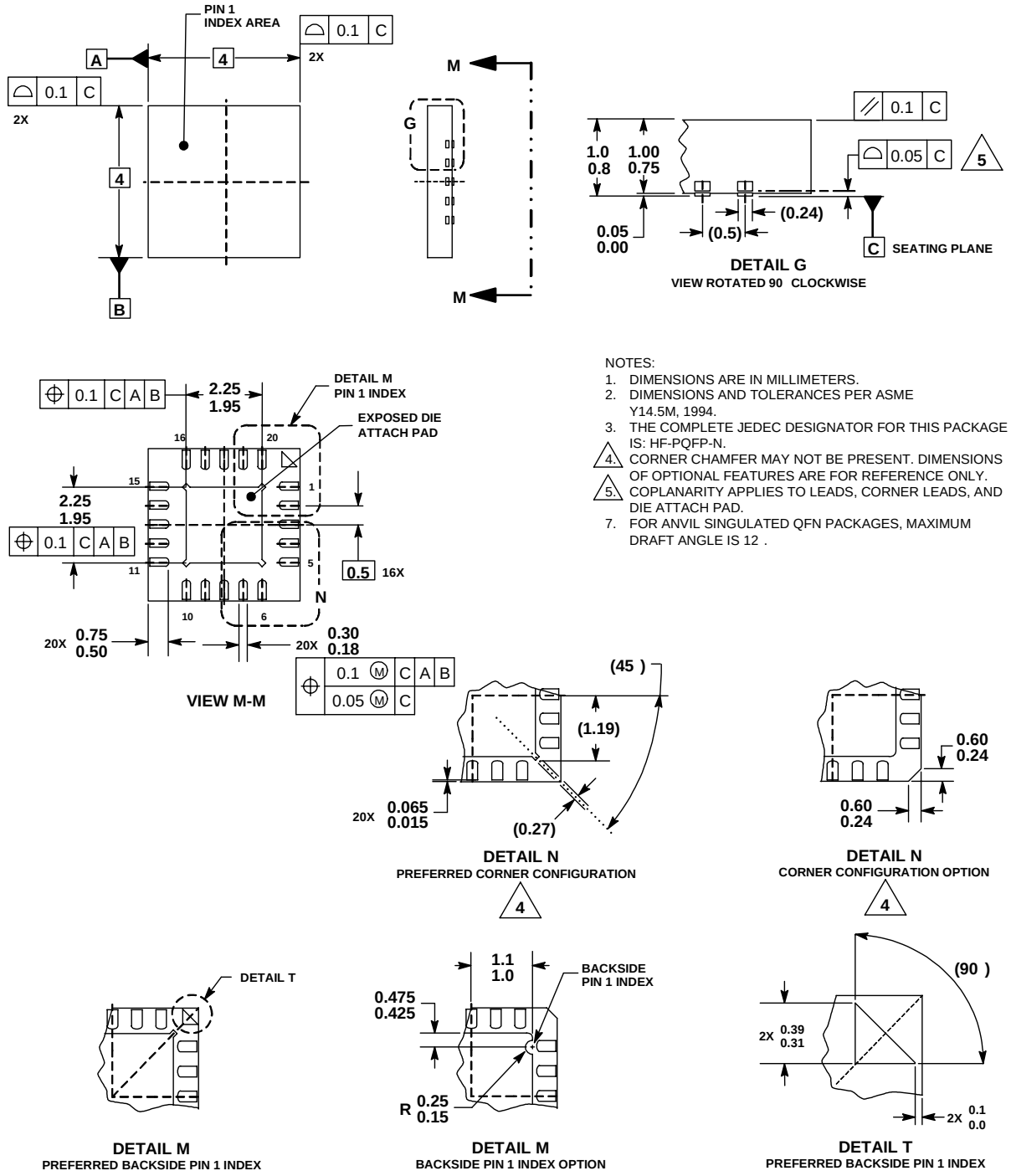



**Figure 7. Application Schematic**

# 5 Packaging




NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. THE COMPLETE JEDEC DESIGNATOR FOR THIS PACKAGE IS: HF-PQFP-N.
4. CORNER CHAMFER MAY NOT BE PRESENT. DIMENSIONS OF OPTIONAL FEATURES ARE FOR REFERENCE ONLY.
5. COPLANARITY APPLIES TO LEADS, CORNER LEADS, AND DIE ATTACH PAD.
7. FOR ANVIL SINGULATED QFN PACKAGES, MAXIMUM DRAFT ANGLE IS 12 .

**Figure 8. Outline Dimensions for QFN-20**
(Case 1308-02, Issue C)

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