

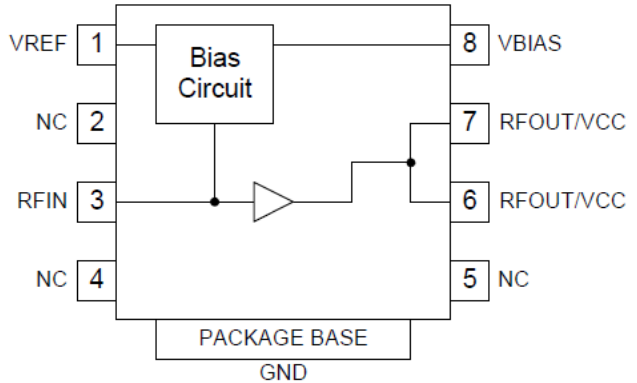


### Features

- 5W Output Power (P1dB)
- High Linearity: OIP3 > 48dBm
- High Efficiency
- Low Noise: NF = 3.2dB at 945MHz
- 5V to 7V Operation
- Thermally Enhanced Slug Package

### Applications

- GaAs Driver for Base Station Amplifiers
- PA Stage for Commercial Wireless Infrastructure
- Final Stage PA in Femtocell and Repeater Applications
- Final Stage PA in High Efficiency, High Power Applications
- Class AB Operation for LTE and GSM Transceiver Applications



Functional Block Diagram

### Product Description

The RFPA3800 is a single-stage GaAs HBT power amplifier specifically designed for high power, high efficiency applications. It is also well-suited for Wireless Infrastructure linear power amplifier applications. The RFPA3800 can be optimized for linear or saturated operation by varying the quiescent bias point and load line. It also offers low noise figure making it an excellent solution for 2nd and 3rd stage LNAs. The RFPA3800 exhibits excellent thermal performance through the use of a thermally-enhanced plastic surface-mount slug package.

### Ordering Information

|                 |   |
|-----------------|---|
| RFPA3800SQ      | Sample bag with 25 pieces                     |
| RFPA3800SR      | 7" Reel with 100 pieces                       |
| RFPA3800TR7     | 7" Reel with 750 pieces                       |
| RFPA3800TR13    | 13" Reel with 2500 pieces                     |
| RFPA3800PCK-410 | 450MHz to 470MHz PCBA with 5-piece Sample Bag |
| RFPA3800PCK-411 | 920MHz to 960MHz PCBA with 5-piece Sample Bag |

### Optimum Technology Matching<sup>®</sup> Applied

- |  |                                      |                                     |                                    |
|--|--------------------------------------|-------------------------------------|------------------------------------|
| <input checked="" type="checkbox"/> GaAs HBT | <input type="checkbox"/> SiGe BiCMOS | <input type="checkbox"/> GaAs pHEMT | <input type="checkbox"/> GaN HEMT  |
| <input type="checkbox"/> GaAs MESFET         | <input type="checkbox"/> Si BiCMOS   | <input type="checkbox"/> Si CMOS    | <input type="checkbox"/> BIFET HBT |
| <input type="checkbox"/> InGaP HBT           | <input type="checkbox"/> SiGe HBT    | <input type="checkbox"/> Si BJT     |                                    |

## Absolute Maximum Ratings

| Parameter  | Rating      | Unit |
|--|-------------|------|
| Supply Voltage ( $V_{CC}$ and $V_{BIAS}$ ) >300MHz | 7.5         | V    |
| Supply Voltage ( $V_{CC}$ and $V_{BIAS}$ ) <300MHz | 5.5         | V    |
| Reference Current ( $I_{REF}$ )                    | 10          | mA   |
| DC Supply Current ( $I_C$ )                        | 2300        | mA   |
| CW Input Power, 2:1 Output VSWR                    | 28          | dBm  |
| CW Input Power, 5:1 Output VSWR                    | 20          | dBm  |
| Output Load VSWR at P3dB                           | 5:1         |      |
| Operating Junction Temperature                     | 160         | °C   |
| Operating Temperature Range ( $T_L$ )              | -40 to +85  | °C   |
| Storage Temperature                                | -55 to +150 | °C   |
| ESD Rating: Human Body Model                       | Class 1B    |      |
| Moisture Sensitivity Level                         | MSL 2       |      |



**Caution!** ESD sensitive device.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

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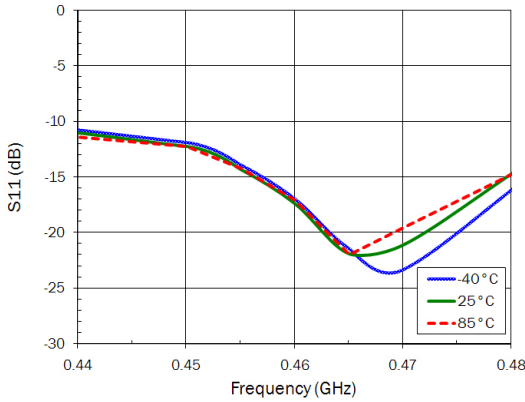
RFMD Green: RoHS compliant per EU Directive 2002/95/EC, halogen free per IEC 61249-2-21, < 1000 ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

| Parameter                       | Specification |      |      | Unit | Condition  |
|---------------------------------|---------------|------|------|------|--|
|                                 | Min.          | Typ. | Max. |      |  |
| <b>460MHz</b>                   |               |      |      |      | $V_{CC}=7.0V$ , $V_{BIAS}=7.0V$ , $I_{CQ}=650mA$ |
| Frequency                       | 450           | 460  | 470  | MHz  | EVB tuned for linear operation                   |
| Input Power ( $P_{IN}$ )        |               |      | 23   | dBm  | $V_{CC}<7.5V$ , load VSWR < 2:1                  |
| Gain (S21)                      |               | 18   |      | dB   |  |
| OIP3                            |               | 48   |      | dBm  | 20dBm/tone, tone spacing = 1MHz                  |
| P1dB                            |               | 36.7 |      | dBm  | EVB tuned for linear operation                   |
| Efficiency at P3dB              |               | 50   |      | %    | At P3dB, EVB tuned for linear operation          |
| Input Return Loss (S11)         |               | 15   |      | dB   |  |
| Output Return Loss (S22)        |               | 9    |      | dB   |  |
| Noise Figure                    |               | 5    |      | dB   |  |
| WCDMA Ch Power at -65dBc ACPR   |               | 19.5 |      | dBm  | 3GPP 3.5, Test Model 1, 64 DPCH                  |
| WCDMA Ch Power at -55dBc ACPR   |               | 24.5 |      | dBm  | 3GPP 3.5, Test Model 1, 64 DPCH                  |
| <b>945MHz</b>                   |               |      |      |      | $V_{CC}=7.0V$ , $V_{BIAS}=7.0V$ , $I_{CQ}=650mA$ |
| Frequency                       | 920           | 940  | 960  | MHz  | EVB tuned for linear operation                   |
| Input Power ( $P_{IN}$ )        |               |      | 26   | dBm  | $V_{CC}<7.5V$ , load VSWR < 2:1                  |
| Gain (S21)                      |               | 15   |      | dB   | 945MHz   |
| OIP3                            |               | 49   |      | dBm  | 20dBm/tone, tone spacing = 1MHz                  |
| P1dB                            |               | 36   |      | dBm  | EVB tuned for linear operation                   |
| Efficiency at P3dB              |               | 45   |      | %    | At P3dB, EVB tuned for linear operation          |
| Input Return Loss (S11)         |               | 12   |      | dB   |  |
| Output Return Loss (S22)        |               | 11   |      | dB   |  |
| Noise Figure                    |               | 3.2  |      | dB   |  |
| WCDMA Ch Power at -65dBc ACPR   |               | 19.3 |      | dBm  | 3GPP 3.5, Test Model 1, 64 DPCH                  |
| WCDMA Ch Power at -55dBc ACPR   |               | 23.7 |      | dBm  | 3GPP 3.5, Test Model 1, 64 DPCH                  |
| <b>Power Supply</b>             |               |      |      |      |  |
| Operating Current (Quiescent)   | 500           | 650  | 700  | mA   | At $V_{CC}=7.0V$                                 |
| Operating Voltage ( $V_{CC}$ )  |               | 7.0  | 7.5  | V    | Max recommended collector voltage                |
| Thermal Resistance ( $R_{TH}$ ) |               | 11.5 |      | C/W  | At quiescent current, no RF                      |
| Power Down Current              |               |      | 20   | μA   | At $V_{REF}=0V$ .                                |

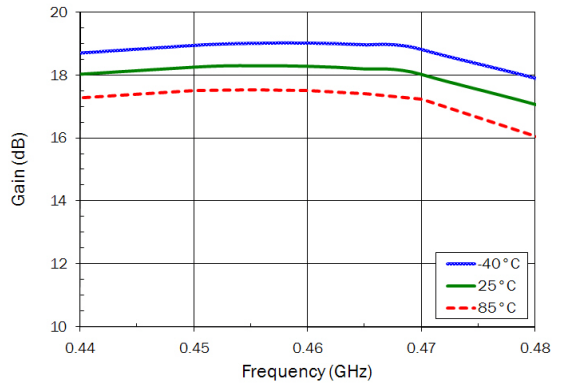
## Typical Performance

(450MHz to 470MHz Application Circuit)

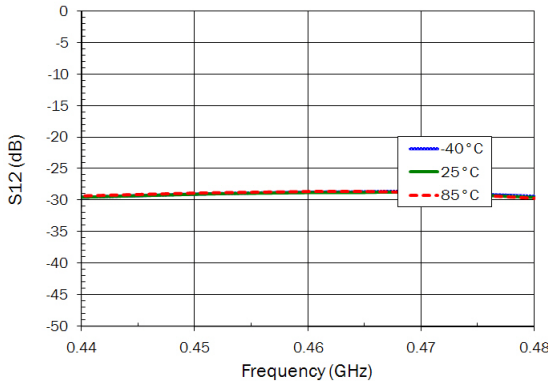
**S11 versus Frequency**



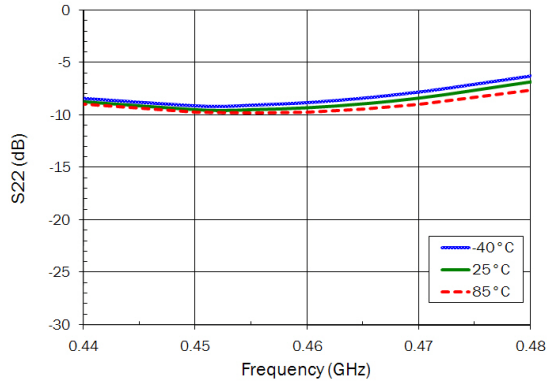
**S21 versus Frequency**



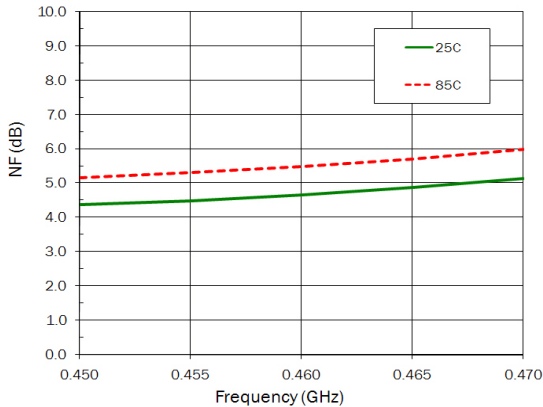
**S12 versus Frequency**



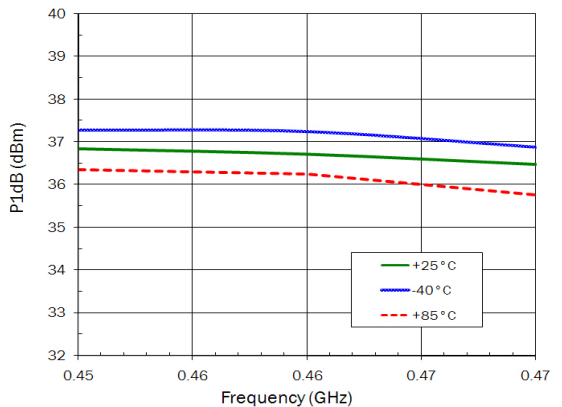
**S22 versus Frequency**



**Noise Figure versus Frequency**

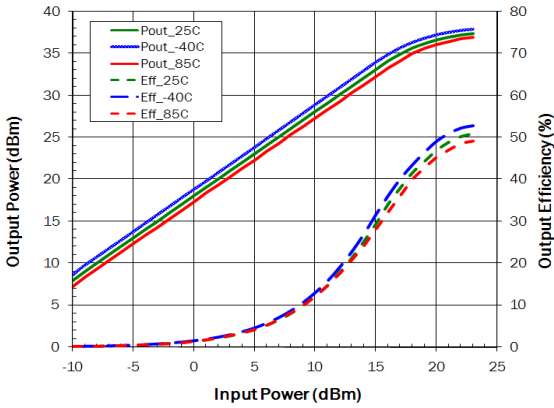


**P1dB versus Frequency**

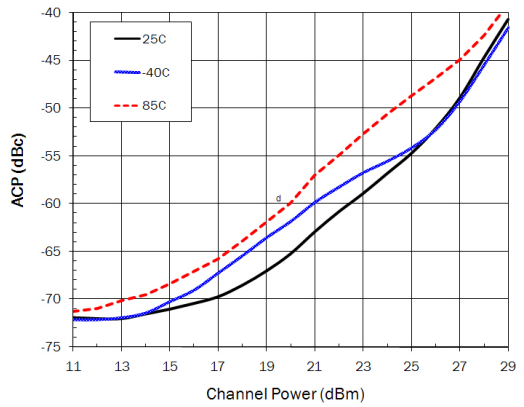


## Typical Performance (450MHz to 470MHz Application Circuit)

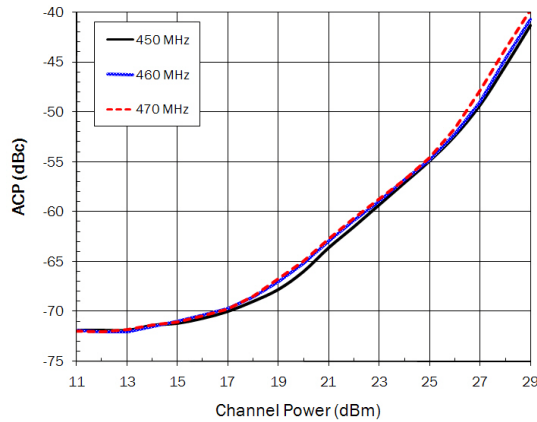
Pout versus Pin @460MHz



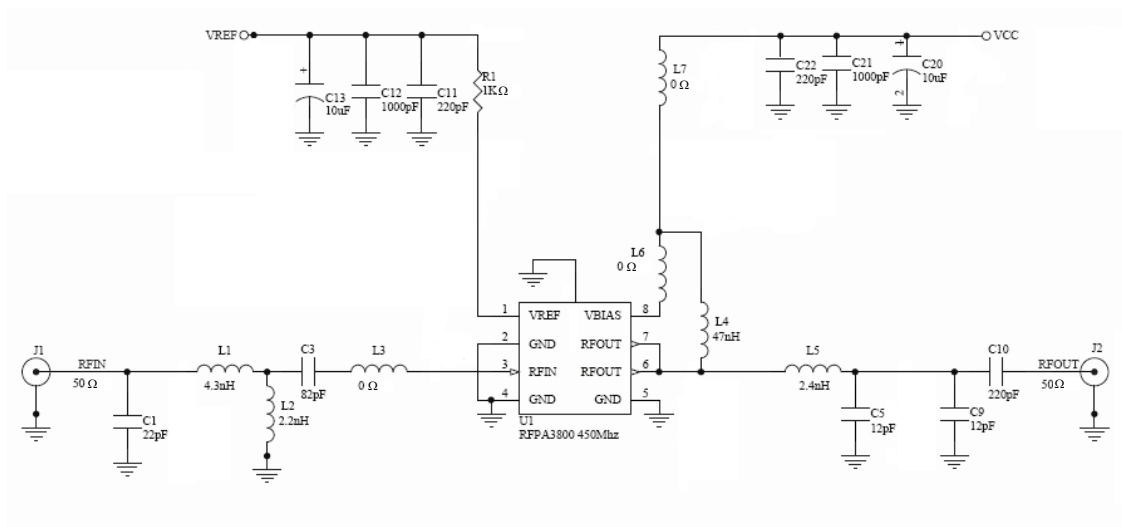
ACP versus W-CDMA Channel Power (460MHz)



ACP versus W-CDMA Channel Power, 25C



## Evaluation Board Schematic (450MHz to 470MHz Application Circuit)

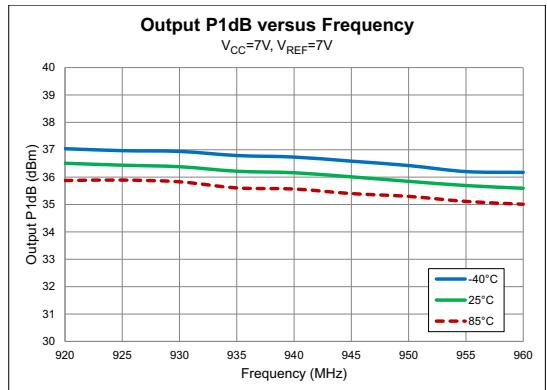
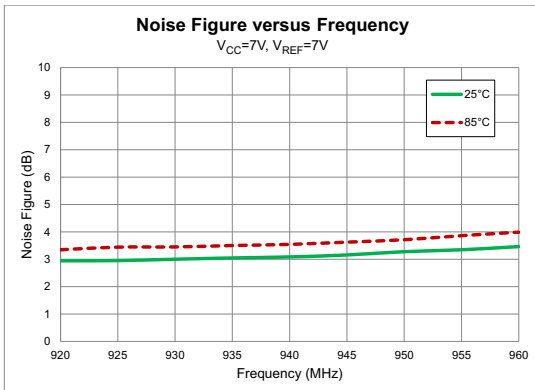
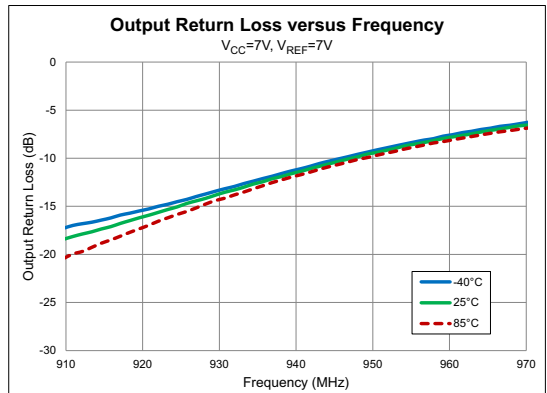
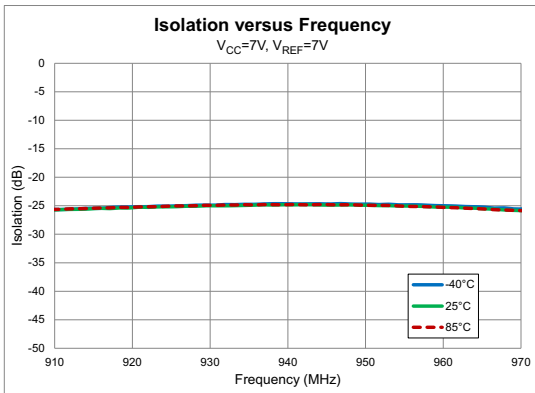
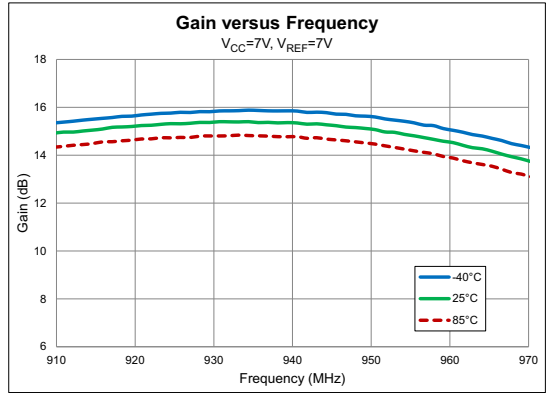
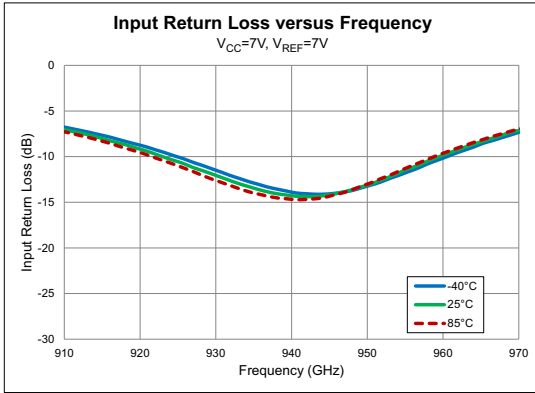


## Evaluation Board Bill of Materials (BOM) 450MHz to 470MHz Application Circuit

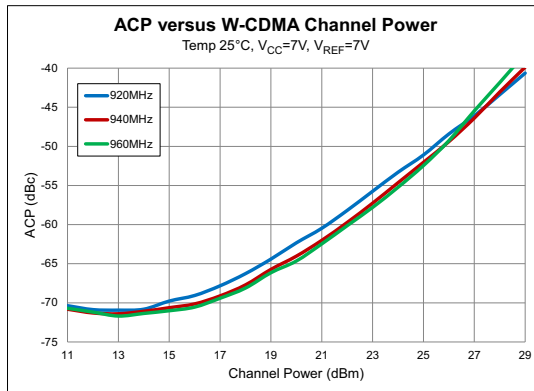
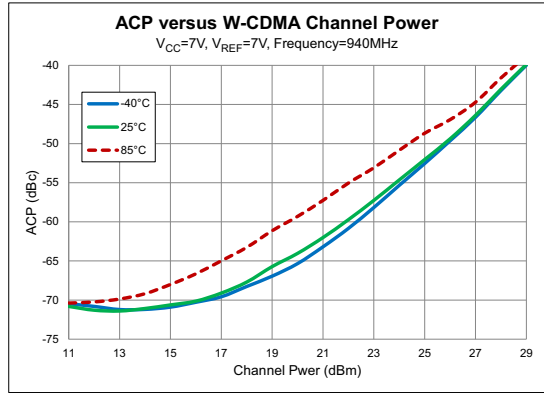
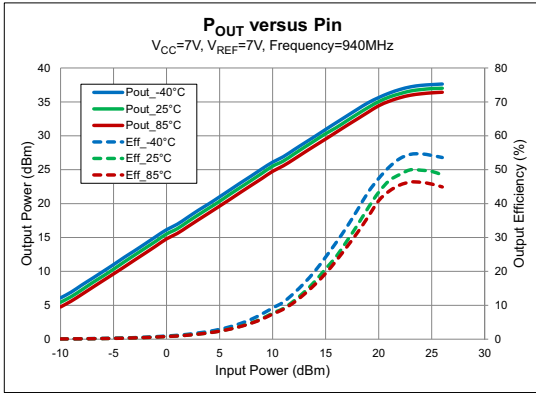
| Description                           | Reference Designator                 | Manufacturer                        | Manufacturer's P/N |
|---------------------------------------|--------------------------------------|-------------------------------------|--------------------|
| PCB                                   |                                      | DDI                                 | RFPA3800410(A)     |
| RFPA3800                              | U1                                   | RFMD                                | RFPA3800           |
| RES, 1K, 1%, 1/16W, 0603              | R1                                   | Panasonic Industrial Co             | ERJ-3EKF1001V      |
| CAP, 10uF, 20%, 10V, TANT-A           | C13, C20                             | Kemet                               | T491A106M010AT     |
| CAP, 22pF, 5%, 50V, COG, 0402         | C1                                   |                                     | GRM1555C1H220J01E  |
| CAP, 12pF, 2%, 50V, HI-Q, 0402        | C5, C9                               | Johanson Technology                 | 500R07S120GV4TD    |
| CAP, 82pF, 5%, 50V, COG, 0402         | C3                                   | Murata Electronics North America    | GRM1555C1H820J01D  |
| CAP, 220pF, 10%, 50V, X7R, 0402       | C10-C11, C22                         | Murata Electronics North America, I | GRM155R71H221KA01E |
| CAP, 1000pF, 10%, 50V, X7R, 0402      | C12, C21                             | Murata Electronics                  | GRM155R71H102KA01E |
| IND, 4.3nH, +/-0.1nH, T/F, 0402       | L1                                   | Murata Electronics                  | LQP15MN4N3B02D     |
| IND, 2.4nH, +/-0.1nH, T/F, 0402       | L5                                   | Murata Electronics                  | LQP15MN2N4B02D     |
| IND, 2.2nH, +/-0.1nH, T/F, 0402       | L2                                   | Murata Electronics                  | LQP15MN2N2B02D     |
| RES, 0Ω, 0402                         | L3, L6-L7                            | Kamaya, Inc                         | RMC1/16SJPTH       |
| IND, 47nH, 5%, W/W, 0603              | L4                                   | Coilcraft                           | 0603HC-47NXJLW     |
| CONN, BANANA JACK, RED                | P1-P2                                | JOHNSON CO                          | 108-0902-001       |
| CONN, BANANA JACK, BLACK              | P3                                   | JOHNSON CO                          | 108-0903-001       |
| CONN, SMA, ST JACK REC, FLNG MT, T/H  | J1-J2                                | JOHNSON CO                          | 142-0701-631       |
| HEATSINK, POWER CELL                  | MP1                                  |                                     | 2020048-2          |
| 2-56 SS socket head screws, 3/16 long | S1-S10                               | McMaster-Carr                       | 92196A076          |
| DNP                                   | C2, C4, C6-C8, C14, C16-C19, C23-C27 |                                     |                    |
| DNP                                   | R2-R5                                |                                     |                    |
| DNP                                   | L8                                   |                                     |                    |

## Typical Performance

(920MHz to 960MHz Application Circuit)

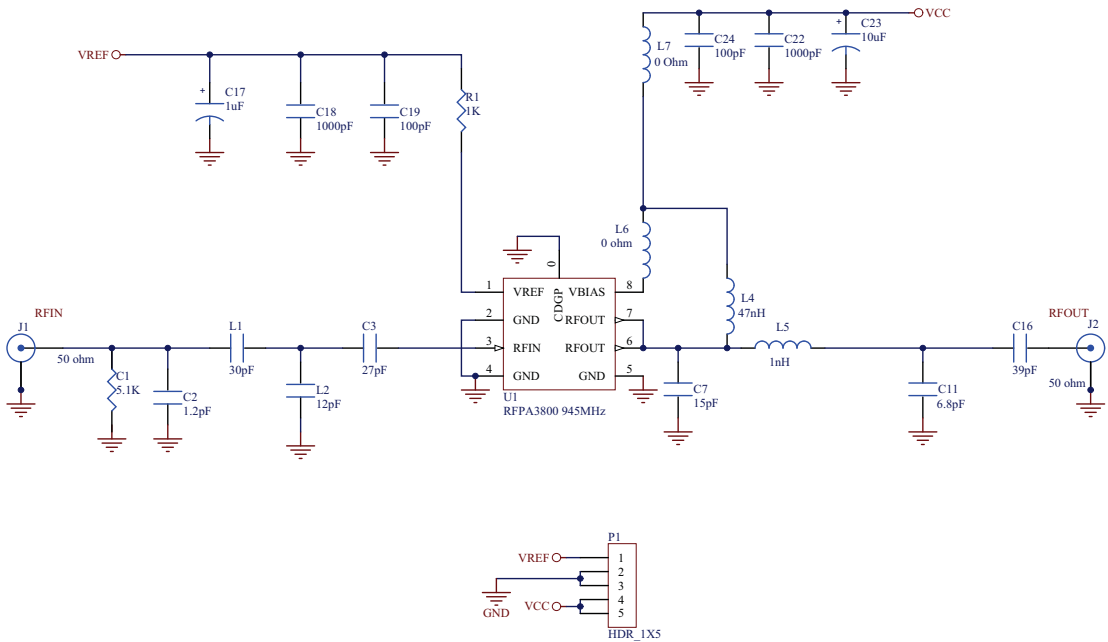


## Typical Performance (920MHz to 960MHz Application Circuit)





## Evaluation Board Schematic (920MHz to 960MHz Application Circuit)



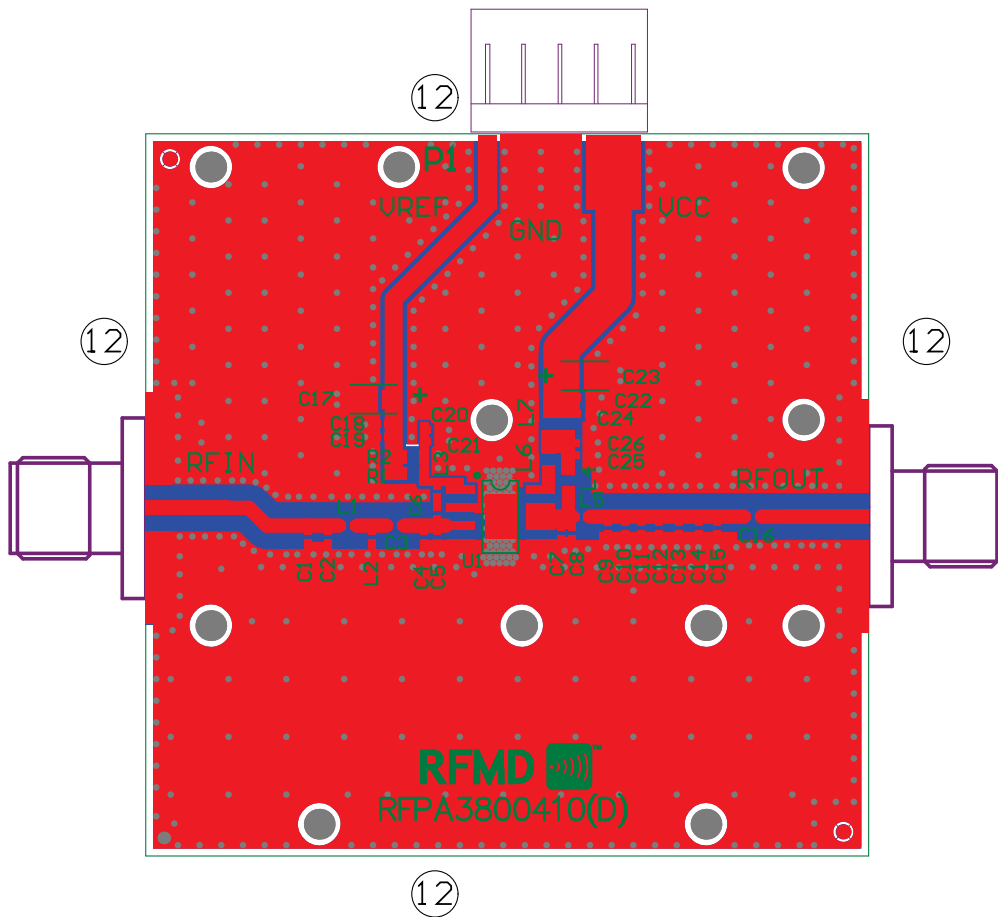
## Evaluation Board Build of Materials (BOM) 920MHz to 960MHz Application Circuit

| Description                           | Reference Designator                          | Manufacturer             | Manufacturer's P/N |
|---------------------------------------|---|--------------------------|--------------------|
| Evaluation Board                      |   | DDI                      | RFPA3800410(D)     |
| RFPA3800                              | U1  | RFMD                     | RFPA3800           |
| RES, 1K, 1%, 1/16W, 0603              | R1  | Panasonic Industrial Co. | ERJ-3EKF1001V      |
| CAP, 10 $\mu$ F, 20%, 10V, TANT-A     | C23   | Kemet                    | T491A106M010AT     |
| CAP, 1 $\mu$ F, 20%, 25V, TANT-A      | C17   | AVX Corporation          | TAJA105M025R       |
| CAP, 1000pF, 10%, 50V, X7R, 0402      | C18, C22                                      | Murata Electronics       | GRM155R71H102KA01E |
| CAP, 100pF, 5%, 50V, COG, 0402        | C19, C24                                      | Taiyo Yuden (USA), Inc.  | RM UMK105CG101JV-F |
| RES, 5.1K, 5%, 1/16W, 0402            | C1  | Kamaya, Inc              | RMC1/16S-512JTH    |
| CAP, 1.2pF, +/-0.1pF, 50V, HI-Q, 0402 | C2  | Johanson Technology      | 500R07S1R2BV4TD    |
| CAP, 27pF, 5%, 50V, HI-Q, 0402        | C3  | Johanson Technology      | 500R07S270JV4TD    |
| CAP, 15pF, 5%, 50V, HI-Q, 0402        | C7  | Johanson Technology      | 500R07S150JV4TD    |
| CAP, 6.8pF, +/-0.1pF, 50V, HI-Q, 0402 | C11   | Johanson Technology      | 500R07S6R8BV4TD    |
| CAP, 39pF, 5%, 50V, CG, 0402          | C16   | Taiyo Yuden (USA), Inc   | RM UMK105CG390JV-F |
| CAP, 30pF, 5%, 25V, MID-Q, 0402       | L1  | Johanson Technology      | 250R07S300JV4T     |
| CAP, 12pF, 5%, 50V, HI-Q, 0402        | L2  | Johanson Technology      | 500R07S120JV4TD    |
| IND, 47nH, 5%, W/W, 0603              | L4  | Coilcraft                | 0603HC-47NXJLW     |
| IND, 1nH, 5%, W/W, 0402               | L5  | Coilcraft                | 0402CS-1N0XJLW     |
| RES, 0 $\Omega$ , 0603                | L6, L7  | Panasonic Industrial Co. | ERJ-3GEY0R00V      |
| CONN, HDR, ST, PLRZD, 5-PIN, 0.100"   | P1  | ITW Pancon               | MPSS100-5-C        |
| CONN, SMA, ST JACK REC, FLNG MT, T/H  | RF-in, RF-out ( <b>See Notes</b> )            | Johnson Co.              | 142-0701-631       |
| HEATSINK, POWER CELL                  | MP1 ( <b>See Notes</b> )                      |                          | 2020048-2          |
| 2-56 SS Socket Head Screws, 3/16 Long | S1 through S11 ( <b>See Notes</b> )           | McMaster-Carr            | 92196A076          |
| DNP                                   | C4-C6*, C8-C10*, C12-C15*, C20-C21*, C25-C26* |                          |                    |
| DNP                                   | R2*   |                          |                    |
| DNP                                   | L3*   |                          |                    |

Notes:

- Parts with \* following the Reference Designator should not be populated on PCBA.
- RFIN SMA and RFOUT SMA will have 2 screws each. See Assembly Drawing

Evaluation Board Assembly Drawing

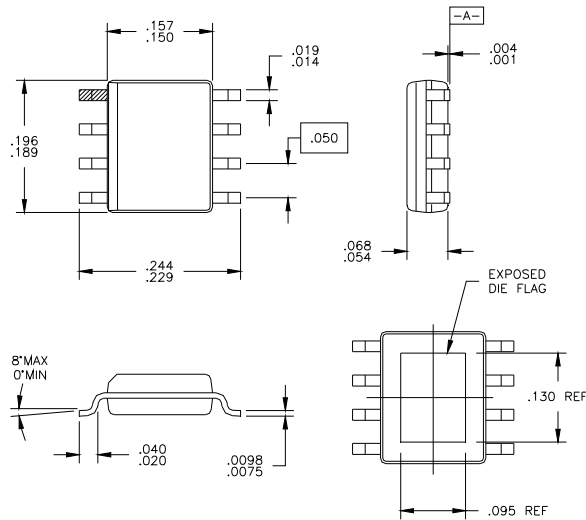


## Pin Names and Description

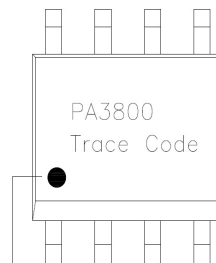
| Pin  | Name       | Description   |
|------|------------|---|
| 1    | VREF       | Control input to the active bias circuit to set $I_{CQ}$ . Can be used as a power-down pin.               |
| 2    | NC         | No connection.  |
| 3    | RF IN      | RF input. External DC block is required.  |
| 4    | NC         | No connection.  |
| 5    | NC         | No connection.  |
| 6    | RF OUT/VCC | RF output, device collector.  |
| 7    | RF OUT/VCC | RF output, device collector.  |
| 8    | VBIAS      | Supply voltage for the active bias circuit.   |
| EPAD | GND        | DC and RF ground. Must be soldered to EVB ground plane over a bed of vias for thermal and RF performance. |

## Package Drawing

Dimensions in inches (millimeters)



## Branding Diagram



Pin 1 Indicator

Trace Code to be assigned by Subcon

## X-ON Electronics

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[HMC8121-SX](#) [HMC-ALH382-SX](#) [HMC-ALH476-SX](#) [SE2433T-R](#) [SMA3101-TL-E](#) [SMA39](#) [A66-1](#) [A66-3](#) [A67-1](#) [LX5535LQ](#) [LX5540LL](#)  
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[LX5511LQ-TR](#) [HMC7441-SX](#) [HMC-ALH310](#) [XD1001-BD-000V](#)