



RF3807

GaAs HBT PRE-DRIVER AMPLIFIER

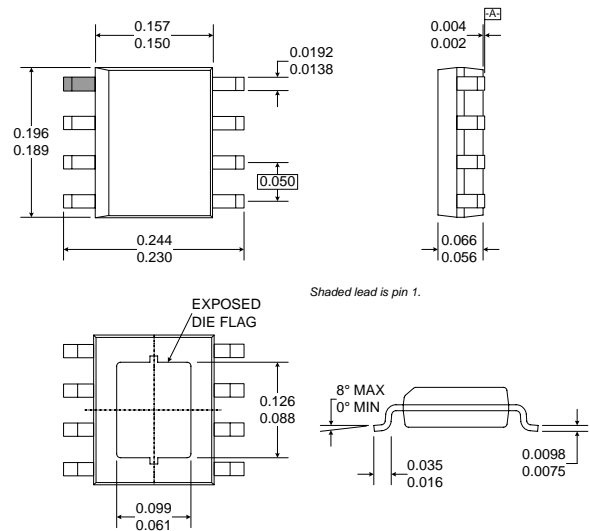
RoHS Compliant & Pb-Free Product

Typical Applications

- GaAs Pre-Driver for Basestation Amplifiers
- PA Stage for Commercial Wireless Infrastructure
- Class AB Operation for NMT, GSM, DCS, PCS, UMTS, and WLAN Transceiver Applications

Product Description

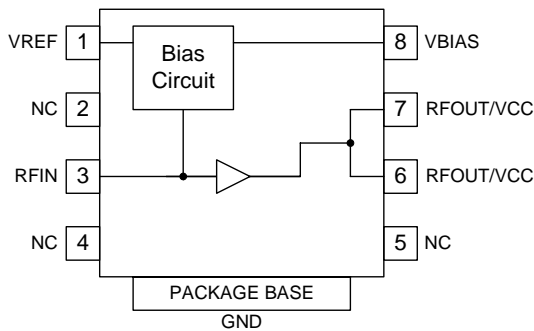
The RF3807 is a GaAs pre-driver power amplifier, specifically designed for wireless infrastructure applications. Using a highly reliable GaAs HBT fabrication process, this high-performance single-stage amplifier achieves high output power over a broad frequency range. The RF3807 also provides excellent efficiency and thermal stability through the use of a thermally-enhanced surface-mount plastic-slug package. Ease of integration is accomplished through the incorporation of an optimized evaluation board design provided to achieve proper 50Ω operation. Various evaluation boards are available to address a broad range of wireless infrastructure applications: NMT 450MHz; GSM850; GSM900; DCS1800; PCS1900; UMTS2100; and, WLAN2400.



Package Style: SOIC-8

Optimum Technology Matching® Applied

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



Functional Block Diagram

Features

- Output Power > 0.5W P1dB
- High Linearity
- High Power-Added Efficiency
- Thermally-Enhanced Packaging
- Broadband Platform Design Approach, 450MHz to 2500MHz

Ordering Information

RF3807	GaAs HBT Pre-Driver Amplifier
RF3807PCK-410	Fully Assembled Evaluation Board, 450MHz
RF3807PCK-411	Fully Assembled Evaluation Board, 869MHz to 894MHz
RF3807PCK-412	Fully Assembled Evaluation Board, 920MHz to 960MHz
RF3807PCK-413	Fully Assembled Evaluation Board, 1800MHz to 1880MHz
RF3807PCK-414	Fully Assembled Evaluation Board, 1930MHz to 1990MHz
RF3807PCK-415	Fully Assembled Evaluation Board, UMTS

RF Micro Devices, Inc.
 7628 Thorndike Road
 Greensboro, NC 27409, USA

Tel (336) 664 1233
 Fax (336) 664 0454
<http://www.rfmd.com>

RF3807

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (V_{CC} and V_{BIAS})	9.0	V
Power Control Voltage (V_{REF})	9.0	V
DC Supply Current	250	mA
Maximum Input Power	see below	
Output Load VSWR @ P1dB	4:1	
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C



Caution! ESD sensitive device.

RF Micro Devices believes the furnished information is correct and accurate at the time of this printing. RoHS marking based on EU Directive 2002/95/EC (at time of this printing). However, RF Micro Devices reserves the right to make changes to its products without notice. RF Micro Devices does not assume responsibility for the use of the described product(s).

Parameter	Specification			Unit	Condition	
	Min.	Typ.	Max.			
Overall - 450MHz						
Frequency	420		480	MHz	$I_{REF}=14\text{mA}$, $V_{CC}=8\text{V}$, $V_{REF}=8\text{V}$, $V_{BIAS}=8\text{V}$, Temp= $+25^{\circ}\text{C}$	
P1dB	+28.5	+29.0	+29.5	dBm		
P_{IN} , Maximum			16	dBm		
Total Efficiency	51.0	53.5	55.0	%		@ P1dB
Total Power Added Efficiency	50.0	52.5	54.0	%		@ P1dB
Gain (S21)	16.0	16.5	17.0	dB		
Second Harmonic (2fo)	-21.0	-19.0	-18.5	dBc		@ P1dB
Third Harmonic (3fo)	-25.0	-21.0	-20.0	dBc		@ P1dB
Input Return Loss (S11)	-15.0	-13.0	-11.0	dB		
Output Return Loss (S22)	-8.0	-6.5	-6.0	dB		
Two-Tone Specification						
OIP3	38.0	40.0		dBm	15 dBm/tone	
	39.5	42.0		dBm	17 dBm/tone	
	41.0	43.5		dBm	19 dBm/tone	
	42.5	44.5		dBm	21 dBm/tone	

Parameter	Specification			Unit	Condition	
	Min.	Typ.	Max.			
Overall - GSM800						
Frequency	869		894	MHz	I _{REF} =14mA, V _{CC} =8V, V _{REF} =8V, V _{BIAS} =8V, Temp=+25°C	
P1dB	+30.0	+30.5	+32.0	dBm		
P _{IN} , Maximum			16	dBm		
Total Efficiency	54	56	60	%		@ P1dB
Total Power Added Efficiency	53	55	59	%		@ P1dB
Gain (S21)	15.5	16.5	17.0	dB		
Second Harmonic (2fo)	-25.0	-20.0	-18.0	dBc		@ P1dB
Third Harmonic (3fo)	-44.0	-39.0	-35.0	dBc		@ P1dB
Input Return Loss (S11)	-33.0	-18.0	-10.0	dB		
Output Return Loss (S22)	-20.0	-12.0	-8.0	dB		
Two-Tone Specification						
OIP3	36.0	38.5		dBm	15 dBm/tone	
	38.0	41.0		dBm	17 dBm/tone	
	40.0	44.0		dBm	19 dBm/tone	
	43.0	45.0		dBm	21 dBm/tone	
Overall - GSM900						
Frequency	920		960	MHz	I _{REF} =14mA, V _{CC} =8V, V _{REF} =8V, V _{BIAS} =8V, Temp=+25°C	
P1dB	+30.0	+30.5	+31.0	dBm		
P _{IN} , Maximum			16	dBm		
Total Efficiency	54	56	58	%		@ P1dB
Total Power Added Efficiency	53	55	57	%		@ P1dB
Gain (S21)	16.0	16.5	17.0	dB		
Second Harmonic (2fo)	-25.0	-22.0	-21.0	dBc		@ P1dB
Third Harmonic (3fo)	-33.0	-30.5	-24.5	dBc		@ P1dB
Input Return Loss (S11)	-29.0	-22.0	-9.0	dB		
Output Return Loss (S22)	-10.0	-8.5	-7.5	dB		
Two-Tone Specification						
OIP3	41.5	42.5		dBm	15 dBm/tone	
	42.0	43.0		dBm	17 dBm/tone	
	41.5	44.0		dBm	19 dBm/tone	
	40.5	42.0		dBm	21 dBm/tone	

RF3807

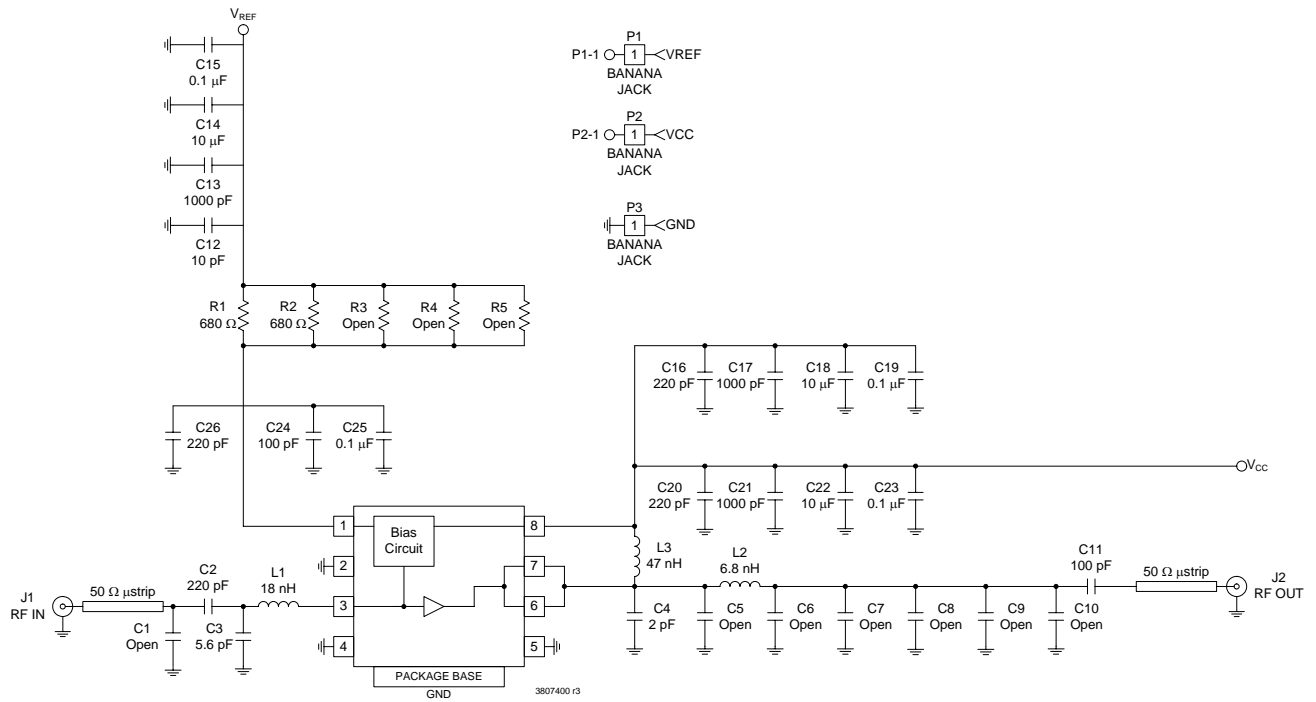
Parameter	Specification			Unit	Condition	
	Min.	Typ.	Max.			
Overall - DCS1800						
Frequency	1805		1880	MHz	$I_{REF}=14\text{mA}$, $V_{CC}=8\text{V}$, $V_{REF}=8\text{V}$, $V_{BIAS}=8\text{V}$, Temp=+25°C	
P1dB	27.5	29.0	30.0	dBm		
P_{IN} , Maximum			18.0	dBm		
Total Efficiency	49.0	53.0	60.0	%		@ P1dB
Total Power Added Efficiency	48.0	52.0	59.0	%		@ P1dB
Gain (S21)	13.0	14.5	15.5	dB		
Second Harmonic (2fo)	-49.0	-36.0	-33.0	dBc		@ P1dB
Third Harmonic (3fo)	-47.0	-36.0	-30.0	dBc		@ P1dB
Input Return Loss (S11)	-50.0	-14.0	-9.0	dB		
Output Return Loss (S22)	-10.0	-6.0	-4.5	dB		
Two-Tone Specification						
OIP3	38.0	40.0		dBm	15 dBm/tone	
	39.5	41.0		dBm	17 dBm/tone	
	40.0	42.0		dBm	19 dBm/tone	
	41.0	42.0		dBm	21 dBm/tone	
Overall - PCS1900						
Frequency	1930		1990	MHz	$I_{REF}=14\text{mA}$, $V_{CC}=8\text{V}$, $V_{REF}=8\text{V}$, $V_{BIAS}=8\text{V}$, Temp=+25°C	
P1dB	27.5	28.0	29.0	dBm		
P_{IN} , Maximum			18.0	dBm		
Total Efficiency	44.0	49.0	55.0	%		@ P1dB
Total Power Added Efficiency	43.0	48.0	54.0	%		@ P1dB
Gain (S21)	13.0	14.0	14.5	dB		
Second Harmonic (2fo)	-63.0	-41.0	-34.0	dBc		@ P1dB
Third Harmonic (3fo)	-63.0	-41.0	-34.0	dBc		@ P1dB
Input Return Loss (S11)	-25.0	-12.0	-8.0	dB		
Output Return Loss (S22)	-12.0	-7.0	-5.5	dB		
Two-Tone Specification						
OIP3	39.5	39.5		dBm	15 dBm/tone	
	39.5	41.5		dBm	17 dBm/tone	
	40.0	42.5		dBm	19 dBm/tone	
	39.0	41.5		dBm	21 dBm/tone	

Parameter	Specification			Unit	Condition	
	Min.	Typ.	Max.			
UMTS 2100						
Frequency	2110		2170	MHz	$I_{REF}=14\text{mA}$, $V_{CC}=8\text{V}$, $V_{REF}=8\text{V}$, $V_{BIAS}=8\text{V}$, Temp= $+25^{\circ}\text{C}$	
P1dB	+28.0	+28.5	+29.0	dBm		
P_{IN} , Maximum			18	dBm		
Total Efficiency	41	46	51	%		@ P1dB
Total Power Added Efficiency	40	45	50	%		@ P1dB
Gain (S21)	13.5	14.0	14.5	dB		
Second Harmonic (2fo)	-39.0	-35.0	-28.5	dBc		@ P1dB
Third Harmonic (3fo)	-65.0	-56.0	-44.5	dBc		@ P1dB
Input Return Loss (S11)	-35.0	-16.0	-8.0	dB		
Output Return Loss (S22)	-20.0	-11.0	-6.0	dB		
Two-Tone Specification						
OIP3	38.5	39.5		dBm	15 dBm/tone	
	39.5	40.5		dBm	17 dBm/tone	
	41.5	42.0		dBm	19 dBm/tone	
	39.5	40.5		dBm	21 dBm/tone	
Power Supply						
Power Supply Voltage	4.5	8.0	9.0	V	I_{CCQ} for best IP3 and efficiency	
Supply Current ($I_{CC}+I_{BIAS}$)	50	120	135	mA		
Control Current (I_{REF})	13	14	15	mA		$V_{REF}=8\text{V}$, $V_{CC}=8\text{V}$
Power Down Current			30	μA		$V_{REF}=0\text{V}$, $V_{CC}=8\text{V}$

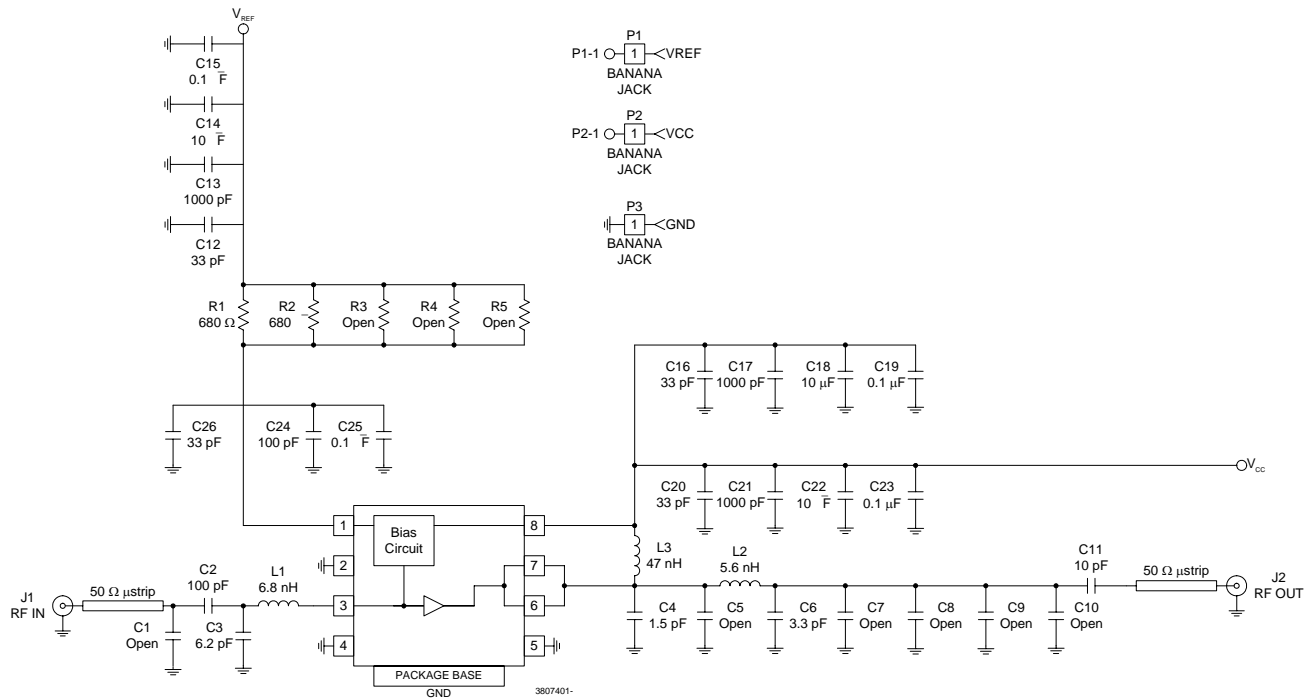
RF3807

Pin	Function	Description
1	VREF	Control input to internal bias circuitry.
2	NC	No connection.
3	RFIN	Input for RF signal.
4	NC	No connection.
5	NC	No connection.
6	RFOUT/VCC	RF output pin and V _{CC} supply pin.
7	RFOUT/VCC	RF output pin and V _{CC} supply pin.
8	VBIAS	RF supply to internal bias circuitry.
Pkg Base	GND	Backside of package should be connected to a short path to ground.

Evaluation Board Schematic 450MHz (RF3807410)

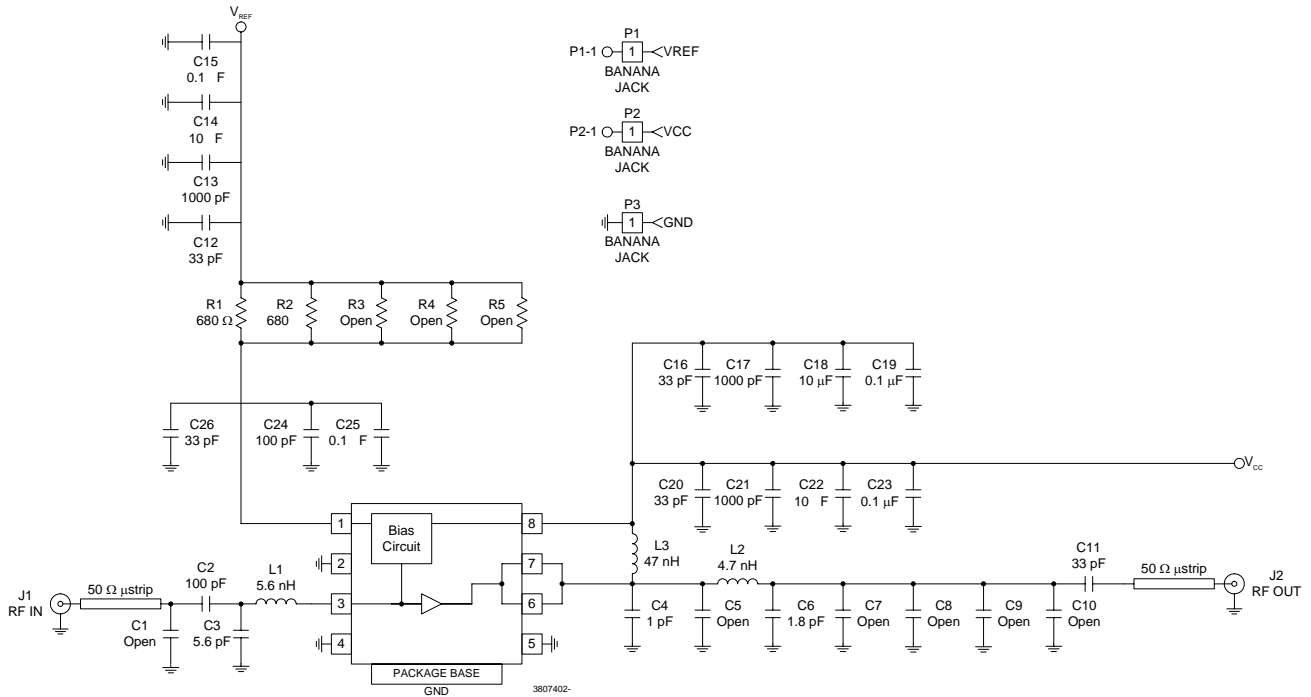


Evaluation Board Schematic 869MHz to 894MHz (GSM800) (RF3807411)

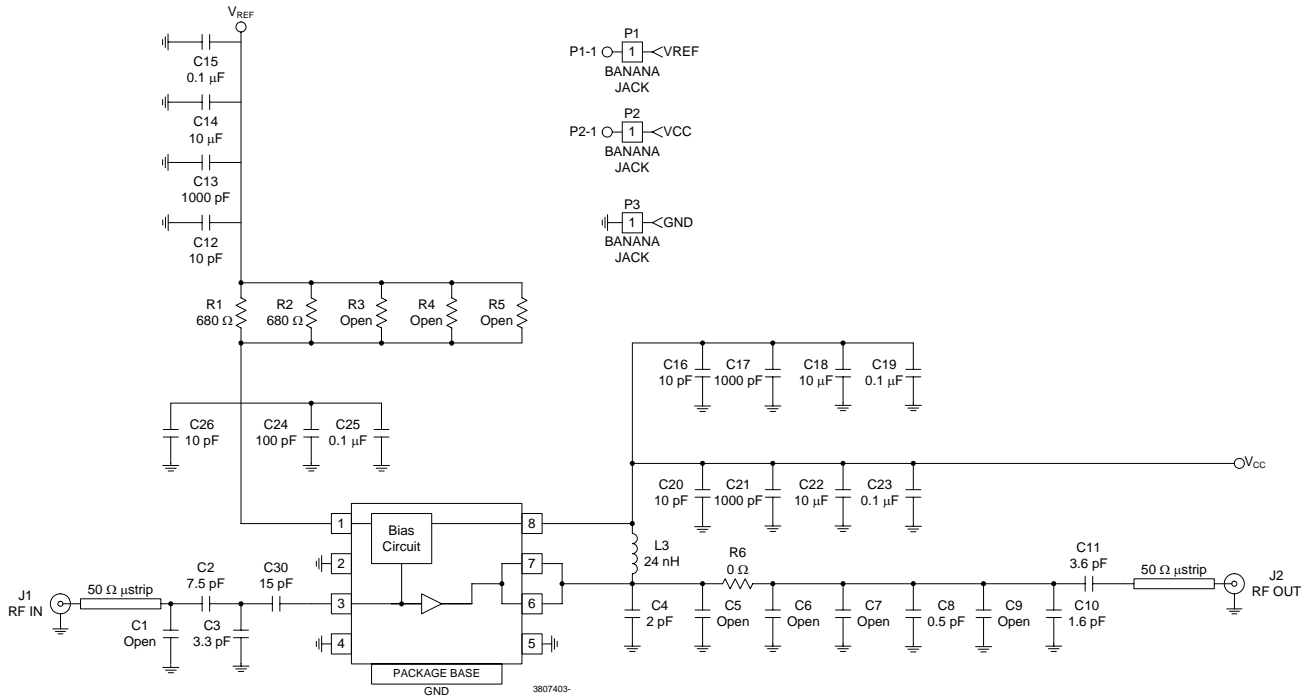


RF3807

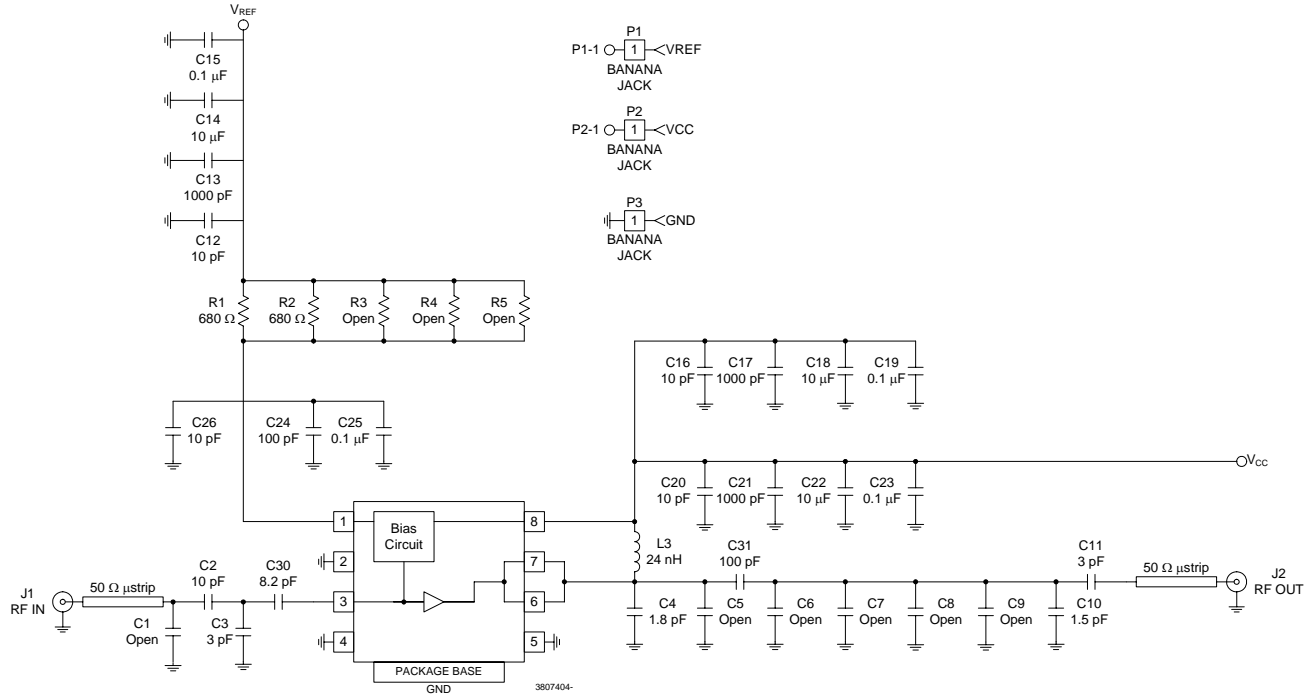
Evaluation Board Schematic 920MHz to 960MHz (GSM900) (RF3807412)



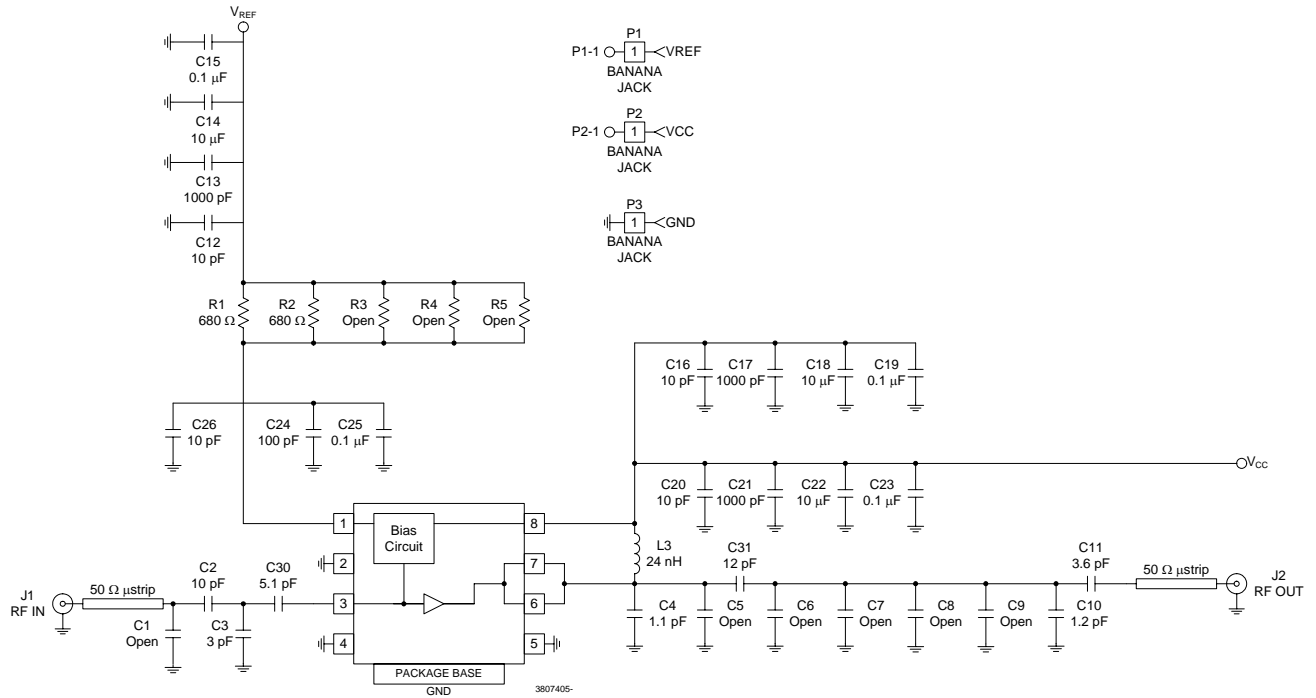
Evaluation Board Schematic 1800MHz to 1880MHz (DCS1800) (RF3807413)



Evaluation Board Schematic 1930MHz to 1990MHz (PCS1900) (RF3807414)

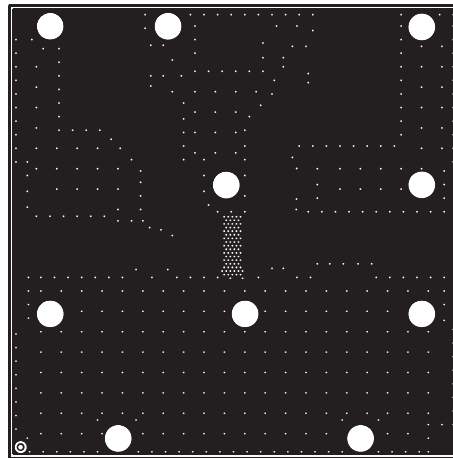
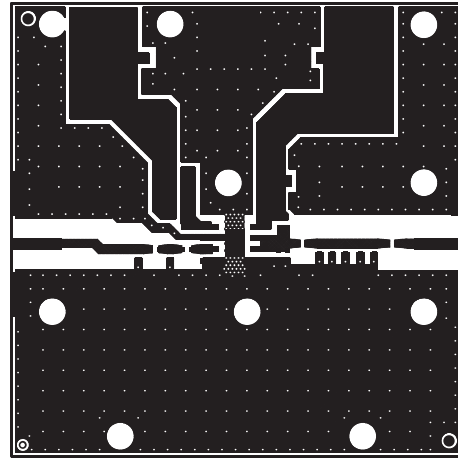
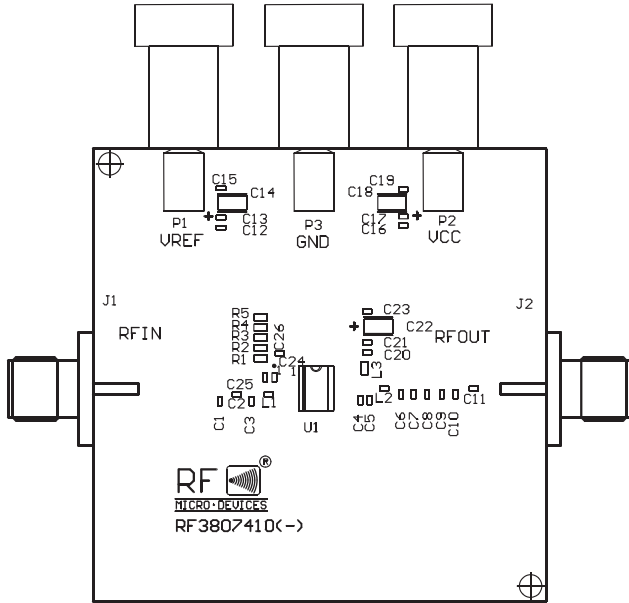


Evaluation Board Schematic UMTS (RF3807415)



RF3807

Evaluation Board Layout - 400MHz
Board Size 2.0" x 2.0"
Board Thickness 0.023", Board Material Rogers 4530



PCB Design Requirements

PCB Surface Finish

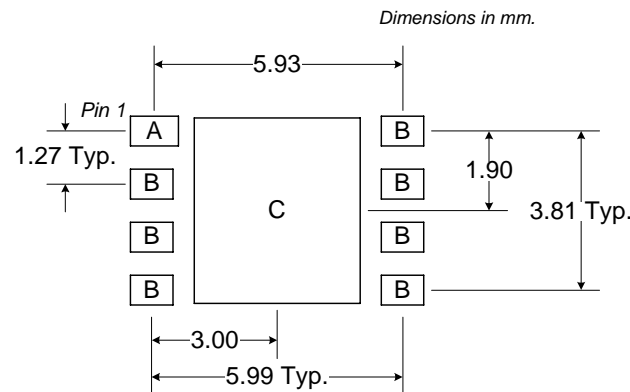
The PCB surface finish used for RFMD's qualification process is electroless nickel, immersion gold. Typical thickness is 3μinch to 8μinch gold over 180μinch nickel.

PCB Land Pattern Recommendation

PCB land patterns for PFMD components are based on IPC-7351 standards and RFMD empirical data. The pad pattern shown has been developed and tested for optimized assembly at RFMD. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

PCB Metal Land Pattern

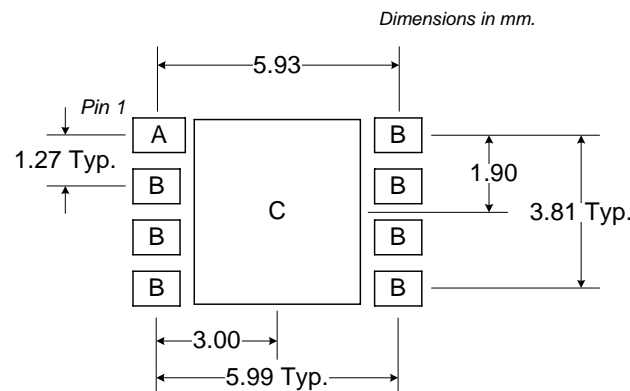
$$\begin{aligned} A &= 1.14 \times 0.71 \\ B &= 1.02 \times 0.71 \text{ Typ.} \\ C &= 3.96 \times 4.44 \end{aligned}$$



PCB Solder Mask Pattern

Liquid Photo-Imageable (LPI) solder mask is recommended. The solder mask footprint will match what is shown for the PCB metal land pattern with a 2mil to 3mil expansion to accommodate solder mask registration clearance around all pads. The center-grounding pad shall also have a solder mask clearance. Expansion of the pads to create solder mask clearance can be provided in the master data or requested from the PCB fabrication supplier.

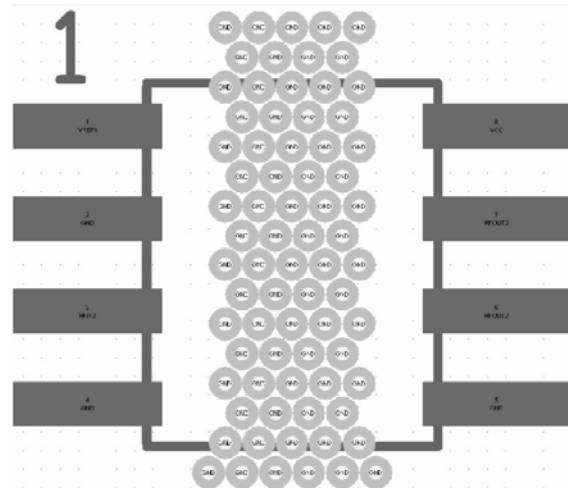
$$\begin{aligned} A &= 1.30 \times 0.86 \\ B &= 1.17 \times 0.86 \text{ Typ.} \\ C &= 4.11 \times 4.60 \end{aligned}$$



RF3807

Thermal Pad and Via Design

The DUT must be connected to the PCB backside ground through a low inductance, low thermal resistance path. The required interface is achieved with the via pattern shown below for both low inductance as well as low thermal resistance. The footprint provided below worked well on the RFMD 20mil thick Rogers 4350 PCB and also standard FR4. The vias are 8mil vias that are partially plated through and are finished to $8\text{mils} \pm 2\text{mils}$ with a minimum plating of 1.5mil. Failure to place these vias within the DUT mounting area on the PCB in this prescribed manner may result in electrical performance and/or reliability degradation.



Tape and Reel Information

Carrier tape basic dimensions are based on EIA481. The pocket is designed to hold the part for shipping and loading onto SMT manufacturing equipment, while protecting the board and the solder terminals from damaging stresses. The individual pocket design can vary from vendor to vendor, but wide and pitch will be consistent.

Carrier tape is wound or placed on a shipping reel with a diameter of either 330mm (13 inches) or 178mm (7 inches). The center hub design is large enough to ensure the radius formed by the carrier tape around it does not put unnecessary stress on the parts.

Prior to shipping, moisture sensitive parts (MSL level 2a to 5a) are baked and placed into the pockets of the carrier tape. A cover tape is sealed over the top of the entire length of the carrier tape. The reel is sealed in a moisture barrier, ESD bag, which is placed in a cardboard shipping box. It is important to note that unused moisture sensitive parts need to be resealed in the moisture barrier bag. If the reels exceed the exposure limit and need to be rebaked, most carrier tape and shipping reels are not rated as bakeable at 125°C. If baking is required, devices may be baked according to section 4, table 4-1, column 8 of Joint Industry Standard IPC/JEDECJ-STD-033A.

The following table provides useful information for carrier tape and reels used for shipping the devices described in this document.

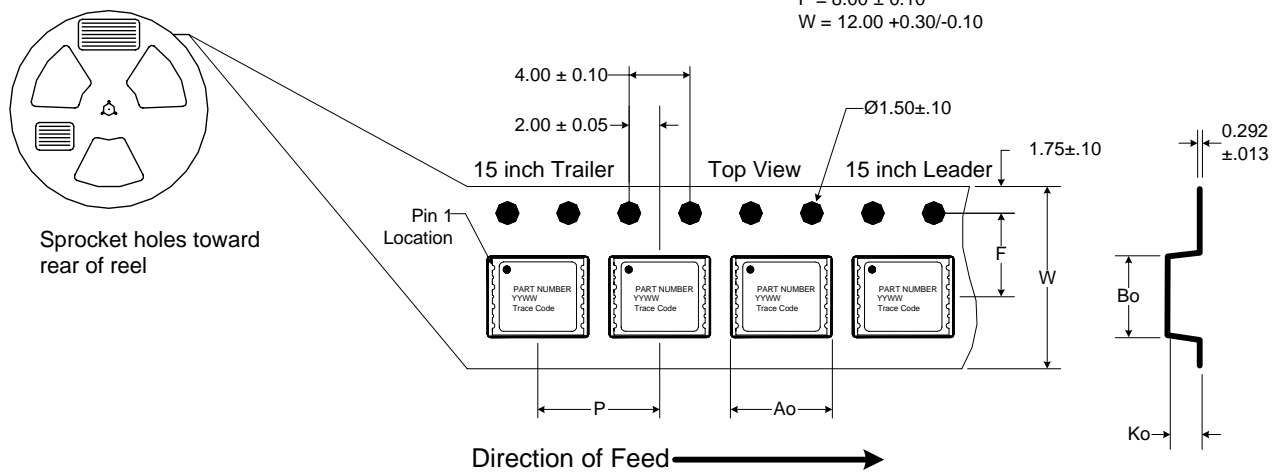
RFMD Part Number	Reel Diameter Inch (mm)	Hub Diameter Inch (mm)	Width (mm)	Pocket Pitch (mm)	Feed	Units per Reel
RF3807TR13	13 (330)	4 (102)	12	8	Single	2500
RF3807TR7	7 (178)	2.4 (61)	12	8	Single	750

Carrier Tape Drawing with Part Orientation

Notes:

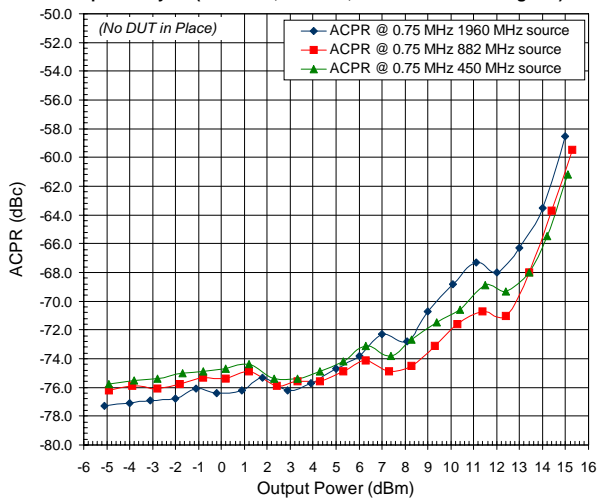
1. All dimensions are in millimeters (mm).
2. Unless otherwise specified, all dimension tolerances per EIA-481.

$A_o = 6.70 \pm 0.10$
 $B_o = 5.40 \pm 0.10$
 $F = 5.50 \pm 0.05$
 $K_o = 2.10 \pm 0.10$
 $P = 8.00 \pm 0.10$
 $W = 12.00 +0.30/-0.10$

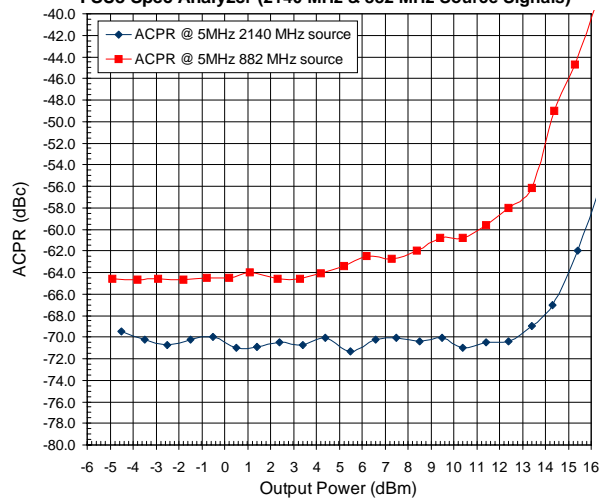


RF3807

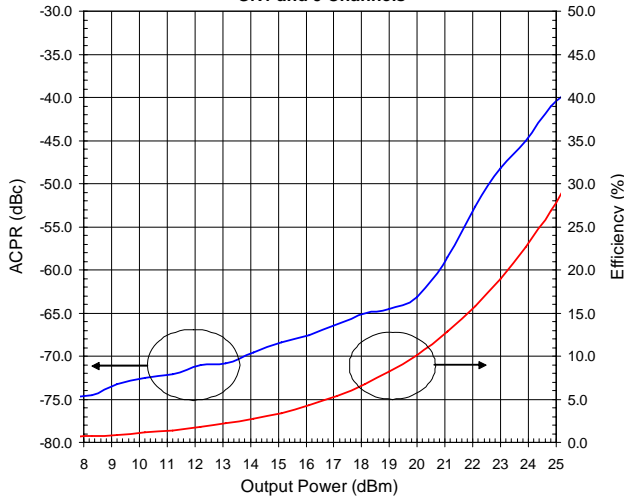
CDMA2K ACPR Performance for RS SMIQ03HD Sig Gen & FSU8 Spec Analyzer (1960 MHz, 882 MHz, & 450 MHz Source Signals)



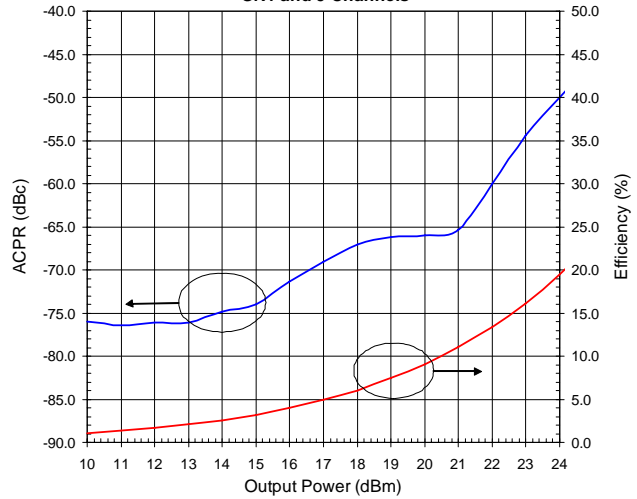
W-CDMA ACPR Performance for RS SMIQ03HD Sig Gen & FSU8 Spec Analyzer (2140 MHz & 882 MHz Source Signals)



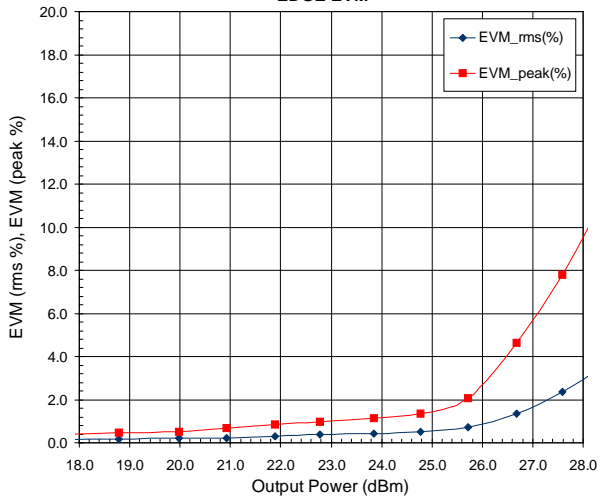
**RF3807410 @ 450 MHz CDMA2K
SR1 and 9 Channels**



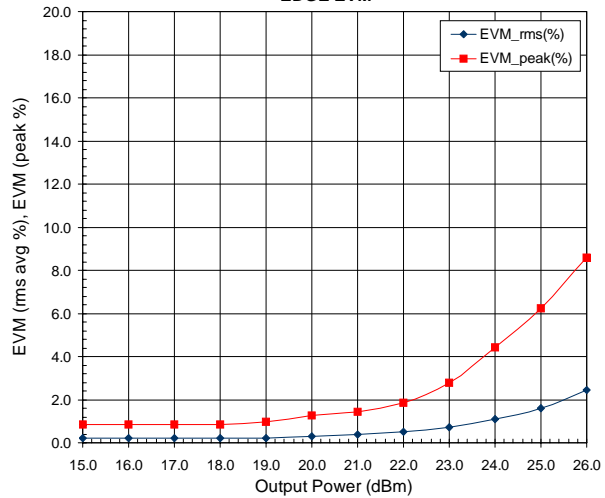
**RF3807411 @ 882 MHz CDMA2K
SR1 and 9 Channels**



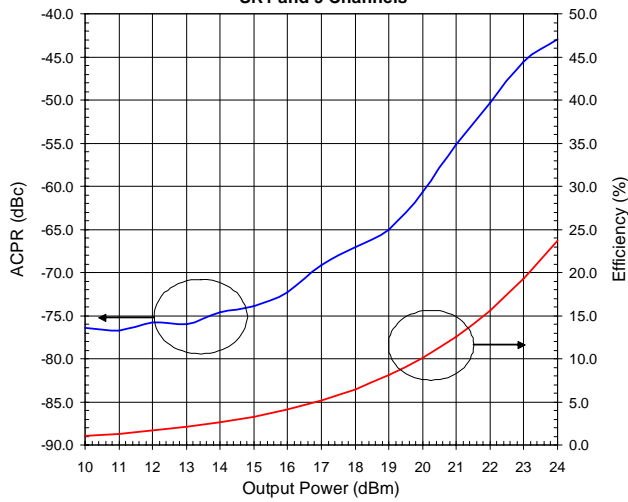
**RF3807412 @ 940 MHz
EDGE EVM**



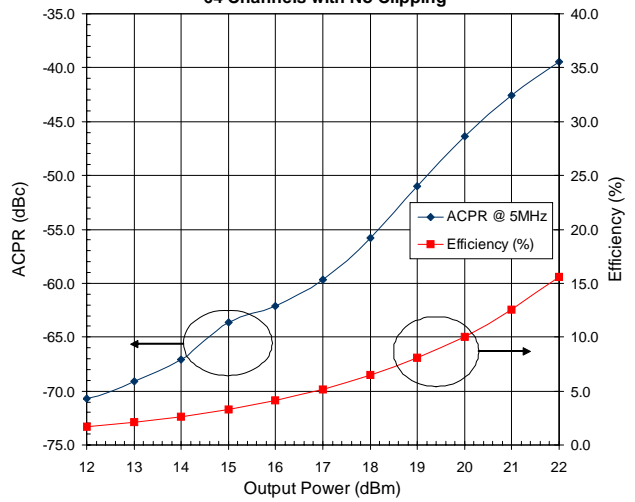
**RF3807413 @ 1840 MHz
EDGE EVM**



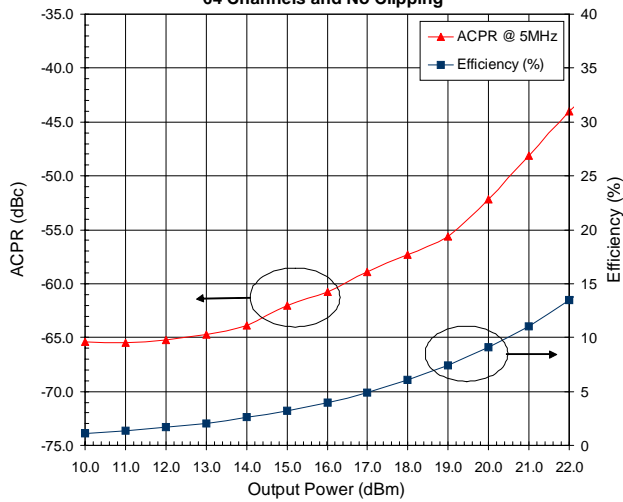
**RF3807414 @ 1960 MHz CDMA2K
SR1 and 9 Channels**



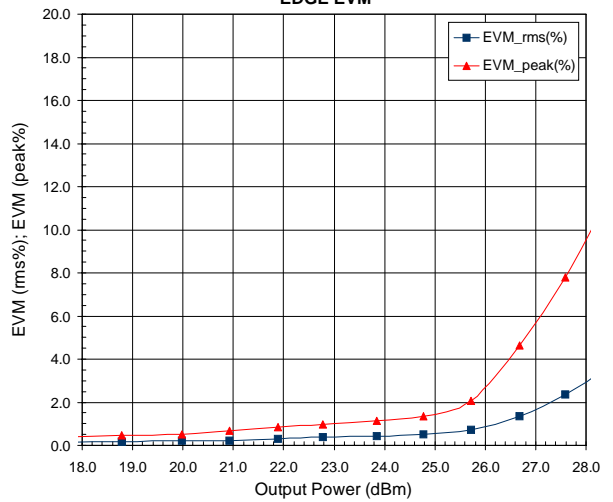
**RF3807415 @ 2140 MHz UMTS W-CDMA
64 Channels with No Clipping**



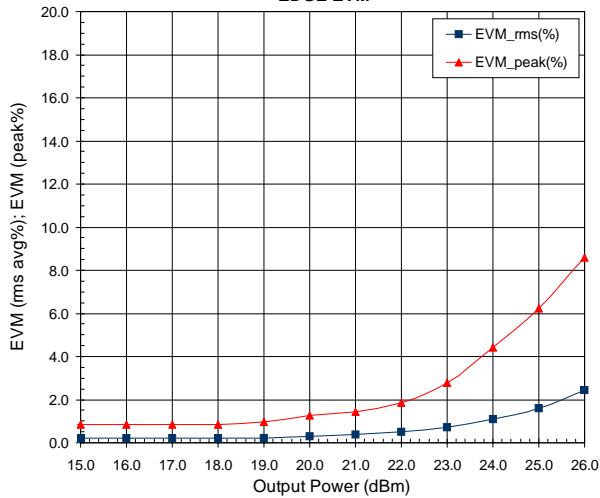
**RF3807411 @ 882 MHz W-CDMA
64 Channels and No Clipping**



**RF3807412 @ 940 MHz
EDGE EVM**

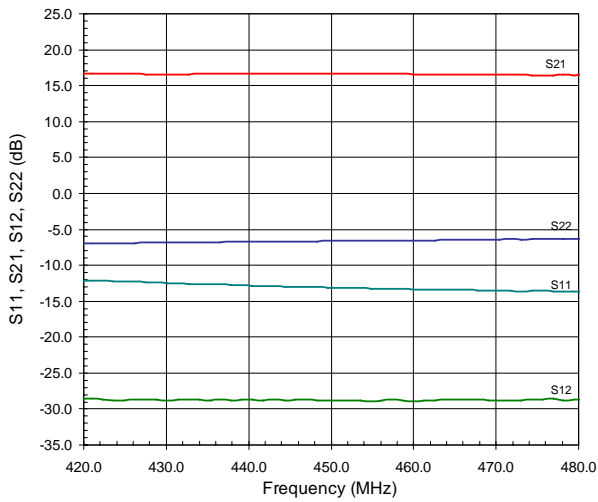


**RF3807413 @ 1840 MHz
EDGE EVM**

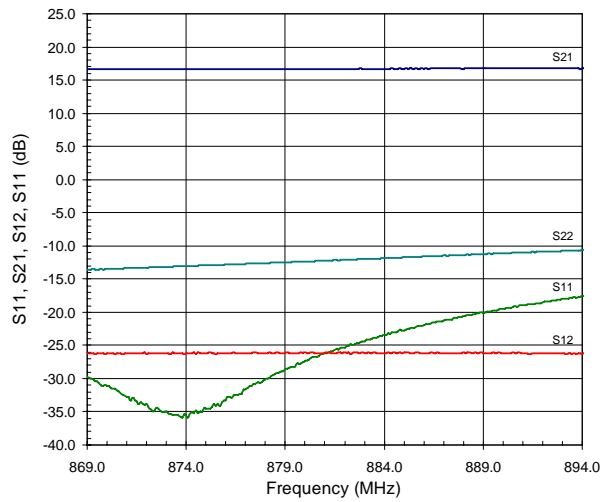


RF3807

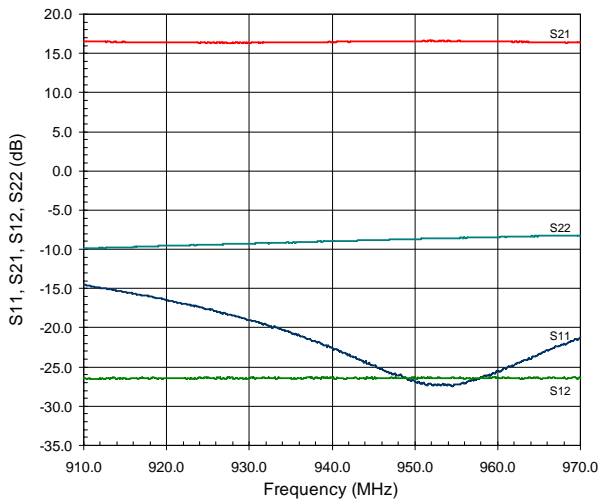
RF3807410 Evaluation Board S-Parameters



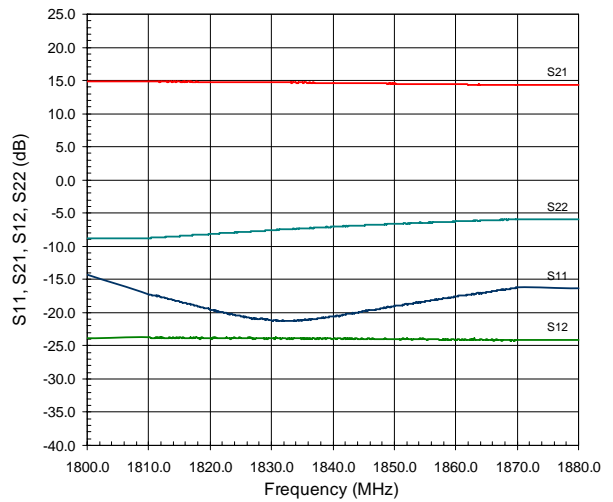
RF3807411 Evaluation Board S-Parameters



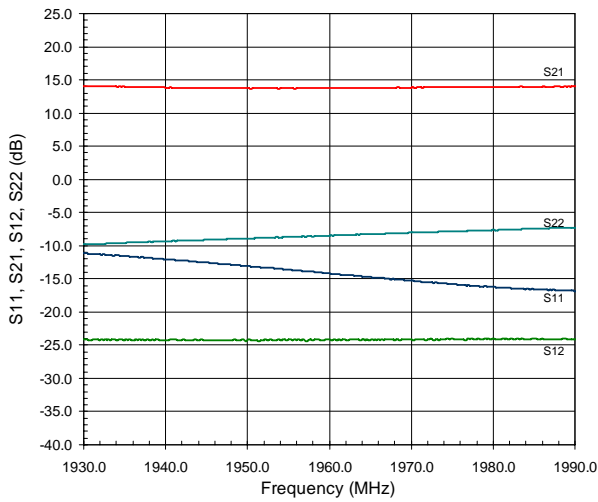
RF3807412 Evaluation Board S-Parameters



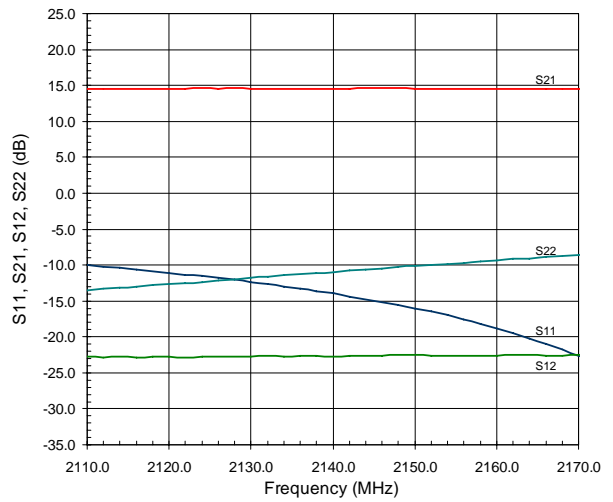
RF3807413 Evaluation Board S-Parameters



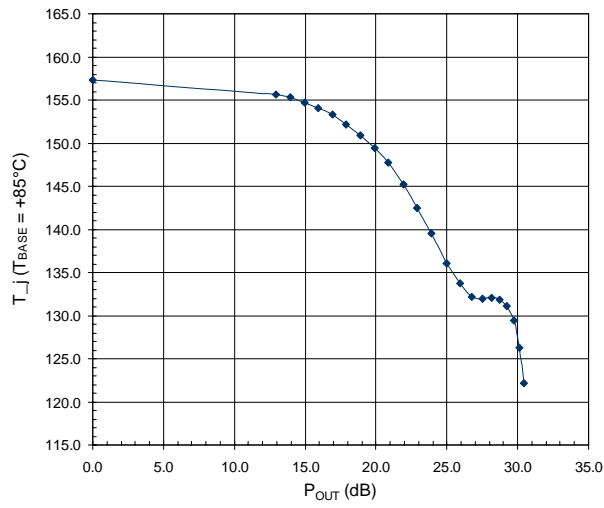
RF3807414 Evaluation Board S-Parameters



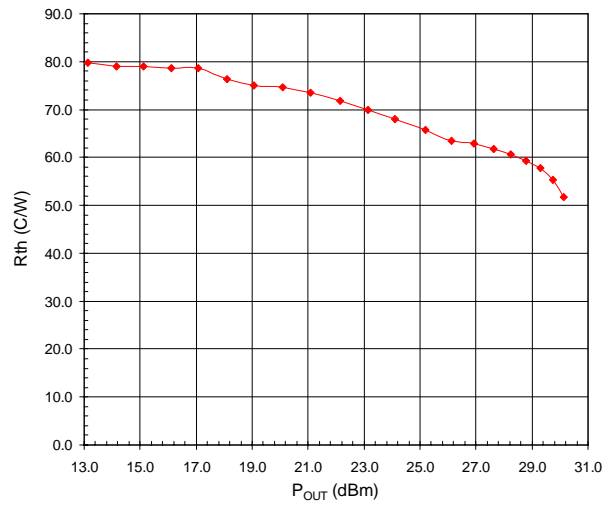
RF3807415 Evaluation Board S-Parameters



RF3807415 Junction Temperature @ 2140MHz



Thermal Resistance of RF3807 @ 2.14 GHz



RF3807