






RF3482
Application note

Rev.01

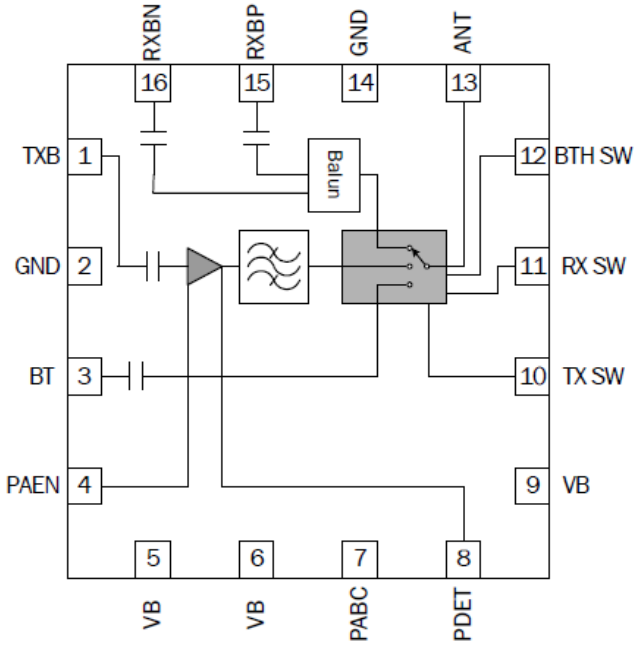
RFMD™

RF3482 Front End Modules

Key Features:

- Single Module Radio Front End
- Single Voltage Supply 3.0V to 4.8V
- Integrated 2.5GHz b/g/n Amplifier, RX Balun and TX/RX Switch
- P_{OUT}=15.5dBm, 11g, OFDM at <3.5% EVM and P_{OUT}=20.5dBm, Meeting 11b Mask

Functional Block Diagram:



Applications:

- IEEE802.11b/g/n WLAN Applications
- Single-Chip RF Front End Module
- 2.5GHz ISM Bands Applications
- Wireless LAN Systems
- Portable Battery-Powered Equipment
- Optional Bluetooth Sharing of Single Antenna Port

Schedule:
Samples:
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RF3482 Theory Of Operation

The RF3482 FEM is a single-chip integrated front end module (FEM) for high performance WLAN applications in the 2.4GHz to 2.5GHz ISM band. The FEM addresses the need for aggressive size reduction for a typical 802.11b/g/n RF front end design, and greatly reduces the number of components outside of the core chipset. Therefore, the footprint and assembly cost of the overall 802.11b/g/n solution is minimized. The FEM has integrated b/g/n power amplifier, power detector, RX balun, and TX filtering. Also, it is capable of switching between WLAN RX, WLAN TX, and BTH RX/TX operations. It has low insertion loss at the 2.4GHz to 2.5GHz WLAN and BTH paths. The device is manufactured in a GaAs pHEMT processes, and provided in a 3mmx3mmx0.45mm, 16-pin package. This module meets or exceeds the RF front end needs of 802.11b/g/n WLAN RF systems.

For best results, the PA circuit layout from the evaluation board should be copied as closely as possible, particularly the ground layout and ground vias. Other configurations may also work, but the design process is much easier and quicker if the layout is copied from the RF3482 evaluation board. There is an indicator pin labeled P1 ID that should be left as a no-connect on the PCB. This pin is directly connected to the ground pad of the IC. For the best performance, it is recommended that voltage and RF lines do not cross under this pin. Gerber files of RFMD PCBA designs can be provided on request. The supply voltage lines should present an RF short to the FEM by using bypass capacitors on the VB traces. The RF3482 is a very easy part to implement, but care in circuit layout and component selection is always advisable when designing circuits to operate at 2.5GHz. Please contact RFMD Sales or Application Engineering for additional data and guidance.

The RF3482 is designed primarily for IEEE802.11 b/g/n WLAN applications where the available supply voltage and current are limited. The RF3482 requires a single positive supply voltage (VB), PA enable (PA_EN) supply, efficiency control (PABC), and a positive supply for switch control to simplify bias requirements. The RF3482 FEM also has built in power detection. All inputs and outputs are internally matched to 50Ω except the WLAN receive path it is deferential with nominal impedance of 100Ω on each pin.

802.11b/g/n Transmit Path

The RF3482 has a typical gain of 33dB from 2.4GHz to 2.5GHz, and delivers 16.5dBm typical output power under 54Mbps OFDM modulation, and 21dBm under 1Mbps 11b modulation. The RF3482 requires a single positive supply of 3.0V to 4.8V to operate at full specifications. PA control for the 802.11b/g/n band is provided through one bias control input pin (PA_EN). The PA_EN pin requires a regulated supply to maintain nominal bias current. In general, the PABC pin controls acts as an efficiency and linearity control pin. The current or voltage applied at this pin may produce higher linear output power, higher operating current, and higher gain.

Out of Band Rejection

The RF3482 contains basic filtering components to produce bandpass responses for the WLAN transmit path. Due to space constraints inside the module, filtering is limited to a few resonant poles on the RF path.

802.11b/g/n Receive Path

The 802.11b/g/n path has a100Ω differential impedance with a nominal insertion loss of 2.1dB. The RX port return loss is -9db maximum. Depending on the application, if filtering is required beyond what the RF3482 can achieve then additional external filters will need to be added outside of the RF3482.





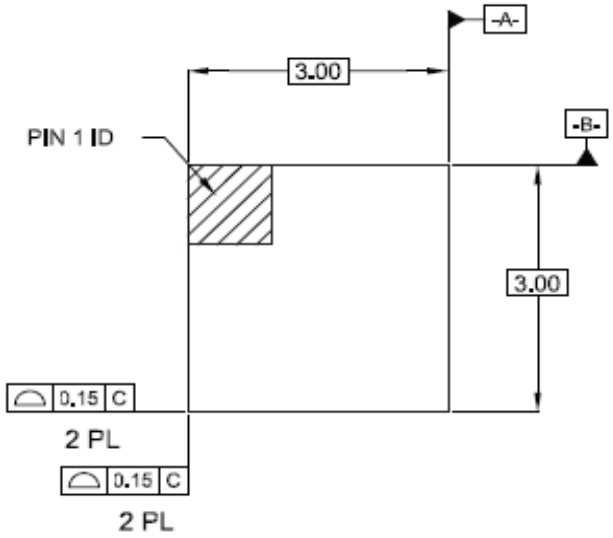


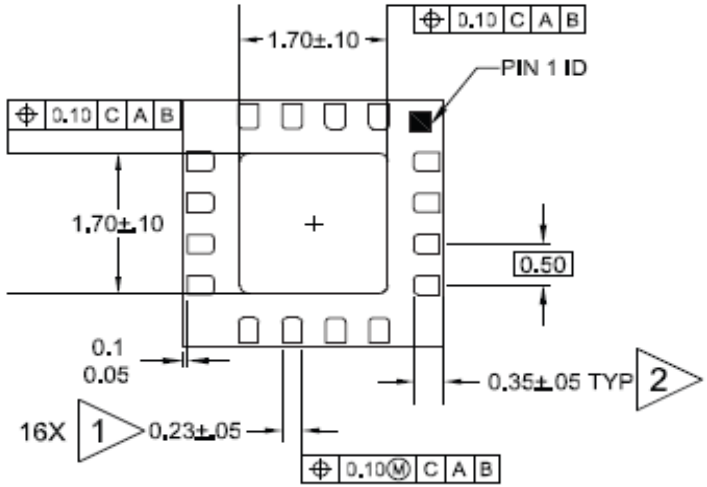

Package Drawing for RF3482

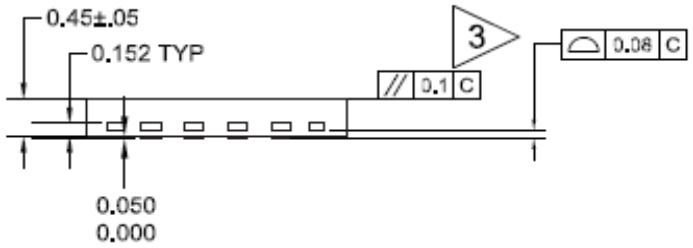
QFN, 16-pin, 3mmx3mmx0.45mm

NOTES:

1. DIMENSION APPLIES TO METALLIZED TERMINAL AND IS MEASURED BETWEEN 0.25mm AND 0.30mm FROM TERMINAL TIP.
2. DIMENSION REPRESENTS TERMINAL PULL BACK FROM PACKAGE EDGE UP TO 0.1mm IS ACCEPTABLE.
3. COPLANARITY APPLIES TO THE EXPOSED HEAT SLUG AS WELL AS THE TERMINAL.
4. RADIUS ON TERMINALS IS OPTIONAL.









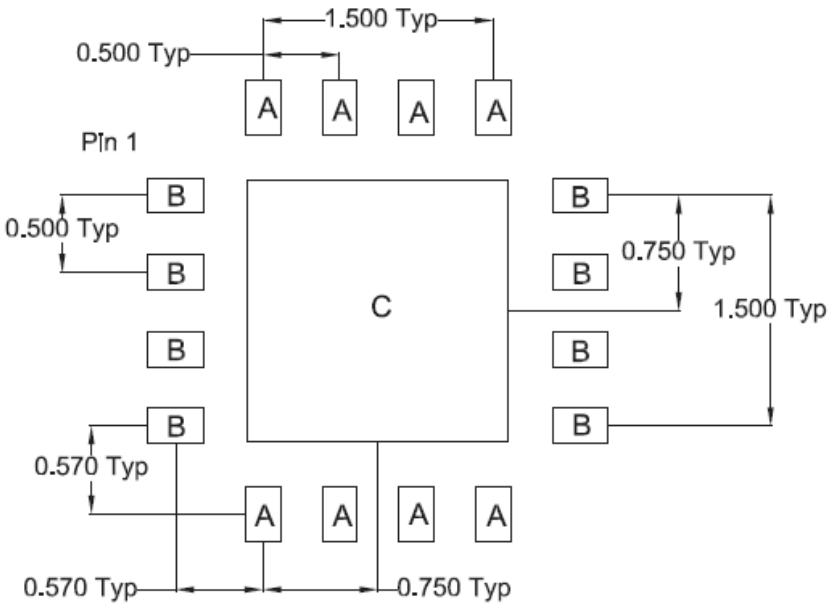





PCB Artwork for RF3482

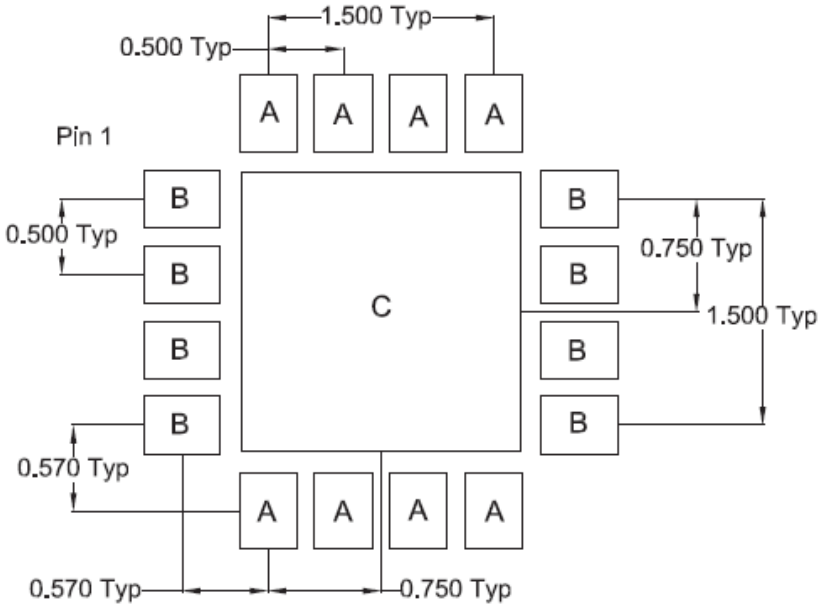
PCB Metal Land Pattern

A = 0.230 x 0.360 (mm) Typ
B = 0.360 x 0.230 (mm) Typ
C = 1.700 (mm) Sq



PCB Solder Mask Pattern

A = 0.38 x 0.51 (mm) Typ
B = 0.51 x 0.38 (mm) Typ
C = 1.85 (mm) Sq



RF3482 Pin-out Description

Pin	Function	Description
1	TXB	RF input for the 802.11b/g/n PA. Input is matched to 50Ω and DC block is provided.
2	GND	Ground.
3	BT	RF bidirectional port for Bluetooth. Input is matched to 50Ω and DC block is provided.
4	PAEN	Digital enable pin for the 802.11b/g/n PA. This is an active high control. An external bypass capacitor may be needed on the PA EN line for decoupling purposes.
5	VB	Supply voltage for the 802.11b/g/n PA.
6	VB	Supply voltage for the 802.11b/g/n PA.
7	PABC	Linearity and Efficiency control pin, please see the Theory of Operation for more information.
8	PDET	Power detector voltage for TX section. PDET voltage varies with output power. May need external decoupling capacitor for module stability. May need external circuitry to bring output voltage to desired level.
9	VB	Supply voltage for the 802.11b/g/n PA.
10	TX SW	Switch control port. See switch truth table for proper level.
11	RX SW	Switch control port. See switch truth table for proper level.
12	BTH SW	Switch control port. See switch truth table for proper level.
13	ANT	FEM connection to filter and antenna. Port is matched to 50Ω and DC block is provided.
14	GND	Ground.
15	RX+	Receive port for 802.11b/g/n band. Internally matched to 100Ω differential. DC block provided.
16	RX-	Receive port for 802.11b/g/n band. Internally matched to 100Ω differential. DC block provided.
Pkg Base	GND	The center metal base of the QFN package provides DC and RF ground as well as heat sink for the front end module.








RF3482 Logic Control Table & Biasing Instructions

Mode	BTW_SW	RX_SW	TX_SW	PA_EN
Bluetooth	1	0	0	0
WLAN TX	0	0	1	1
WLAN RX	0	1	0	0
Calibration	0	1	0	1
	1	0	0	1
	1	1	0	1

- 802.11b/g/n Transmit (VB compliance=5.5V, 400mA, PA EN compliance=2V, ~450µA)
  - Connect the FEM to a signal generator at the input and a spectrum analyzer at the output.
  - Bias VB to 3.6V first with PA_EN=0.0V
  - Refer to switch operational truth table to set the control lines at the proper levels for WLAN TX.
- Turn on PA_EN to 1.8V (typ.). Be extremely careful not to exceed 3.0V on the PA_EN pin, or the part may exceed device current limits.
- Turn on PABC to 1.5mA (or 0.6V). For 11b operation Adjust PABC to 1.8mA. This controls the current drawn by the 802.11b/g/n power amplifier and the idle current should rise to ~115mA±20mA for a typical part, but it varies based on the output power desired.
- 802.11 b/g/n Receive
  - To Receive WLAN set the switch control lines per the truth table below.
- Bluetooth Receive
  - To Receive Bluetooth set the switch control lines per the truth table below.



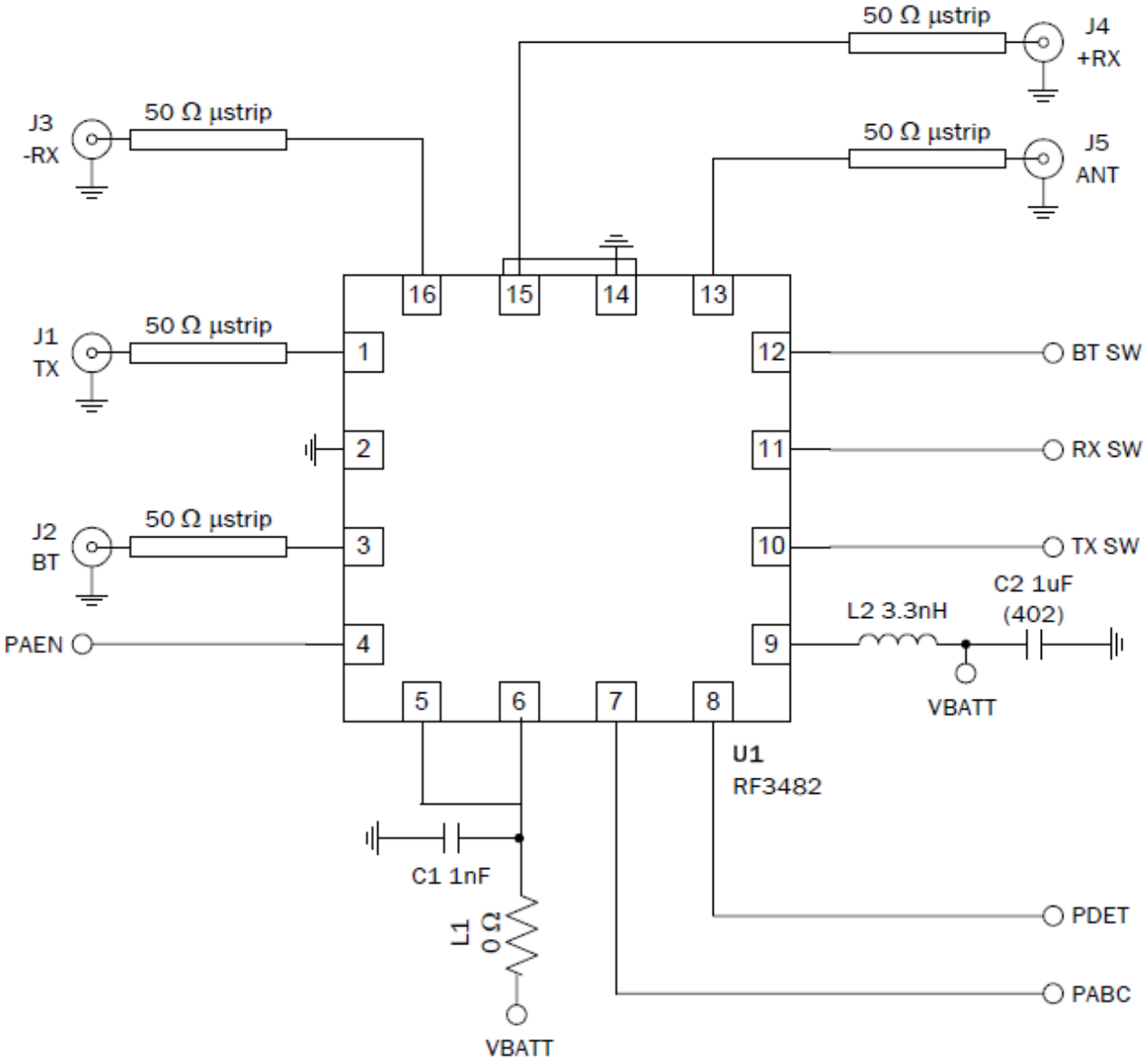




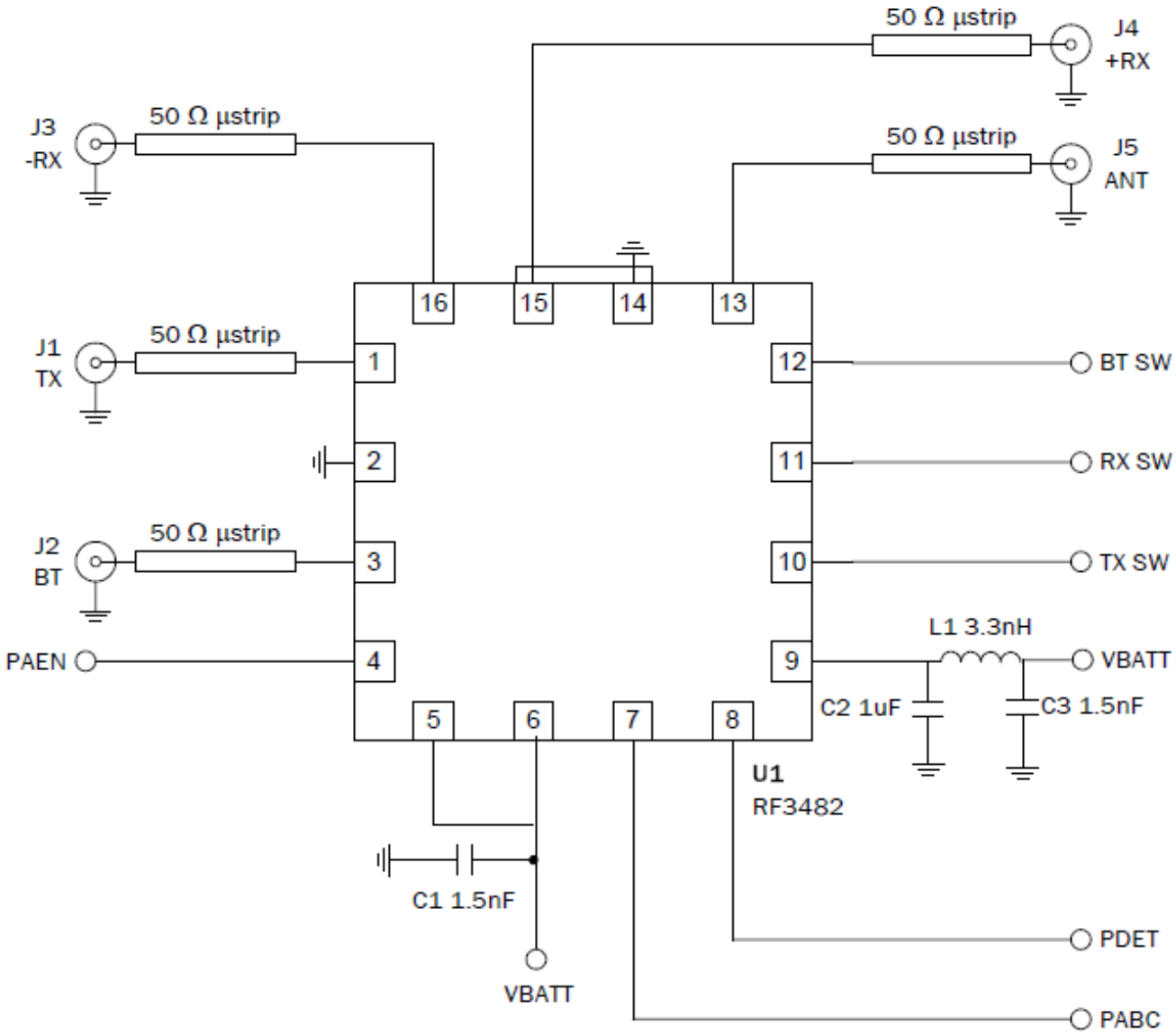

Recommended PABC Settings for various modulations

Modulation	Rate	RFMD recommendation Ibias [uA]
MCS7	MCS7	1600
54 OFDM	OFDM48/54, MCS5/6	1500
16 OFDM	OFDM24/36, MCS3/4	1650
QPSK	OFDM12/18, MCS1/2	1650
BPSK	OFDM6/9, MCS0	1650
11b	1DSSS, 11CCK	1800
BPSK	MCS0	1800

RF3482 Evaluation Board Schematic

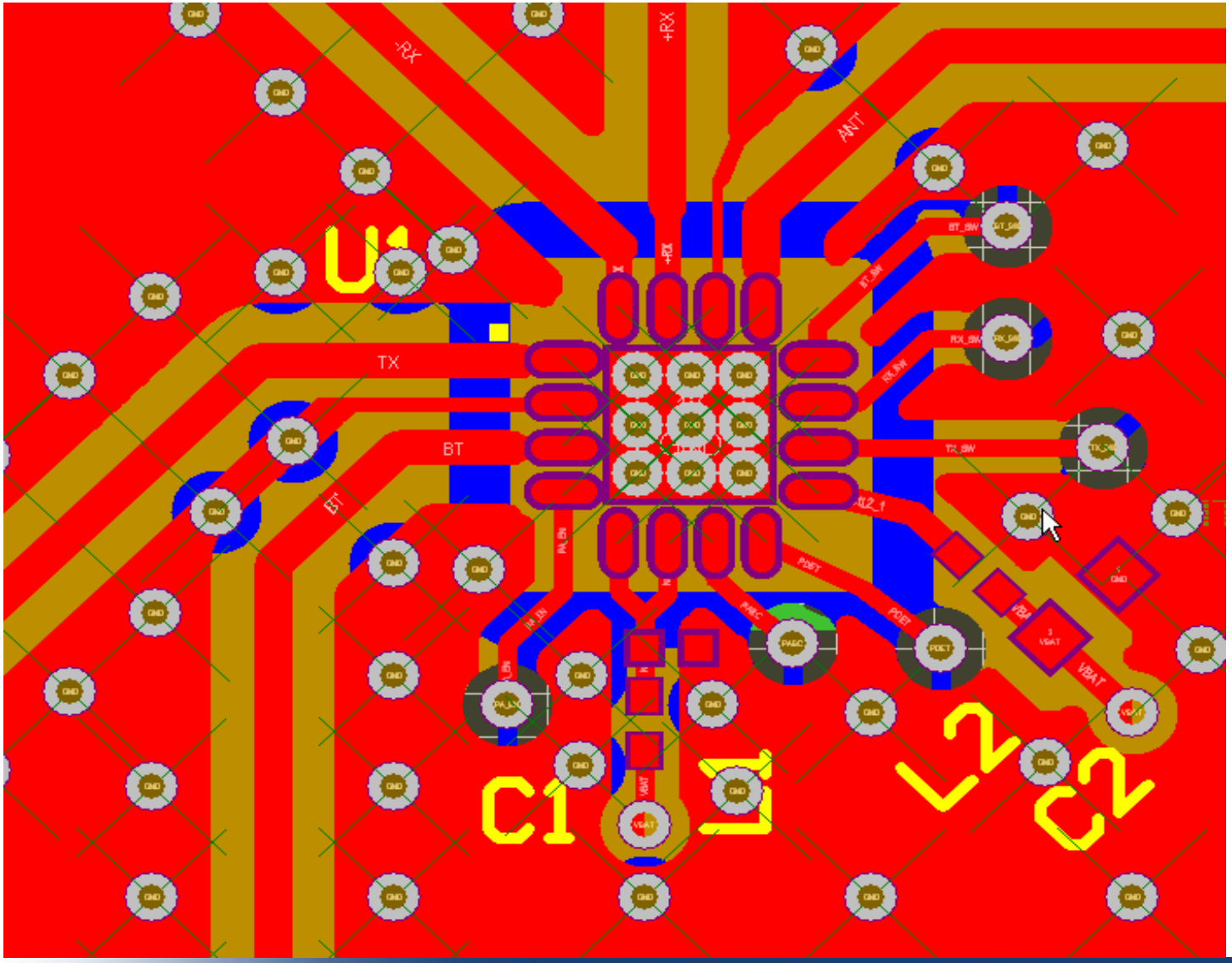


RF3482 Application Schematic



RF3482 Evaluation Board Layout (Top View)

*Note Please follow layout as closely as possible



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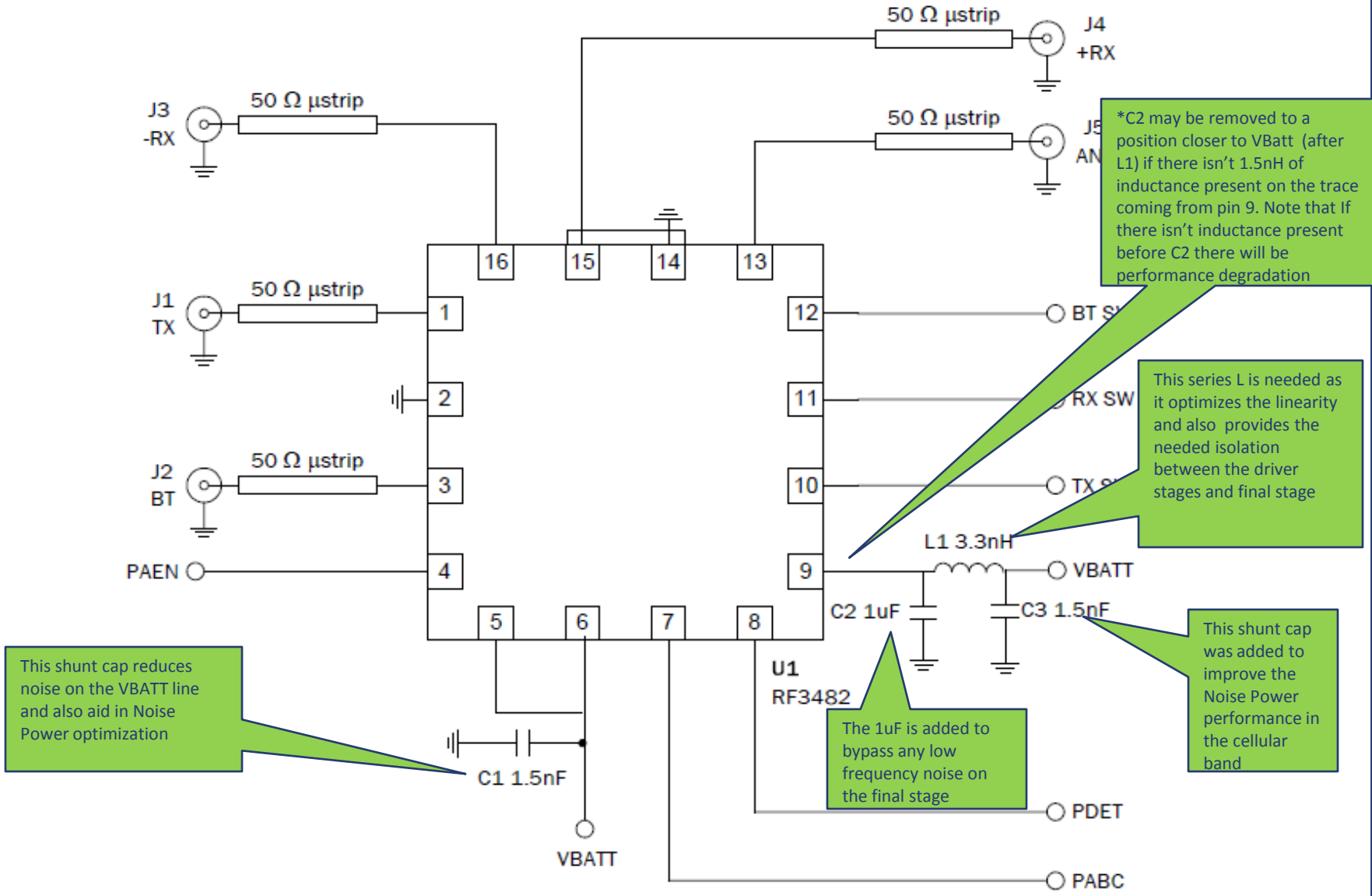
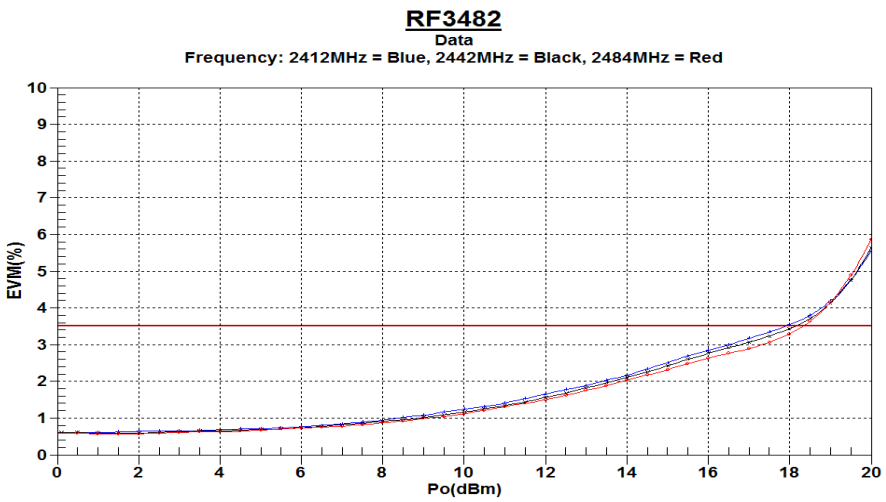
Explanation of Components used in RF3482 Apps Schematic

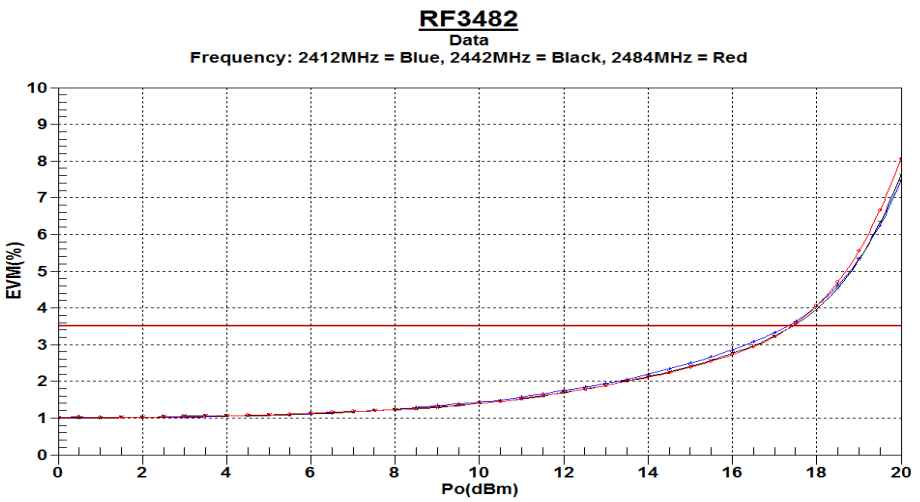


11g TX Performance: EVM vs. Output Power Vbatt = 3.6V @ -10C, 25C, 75C

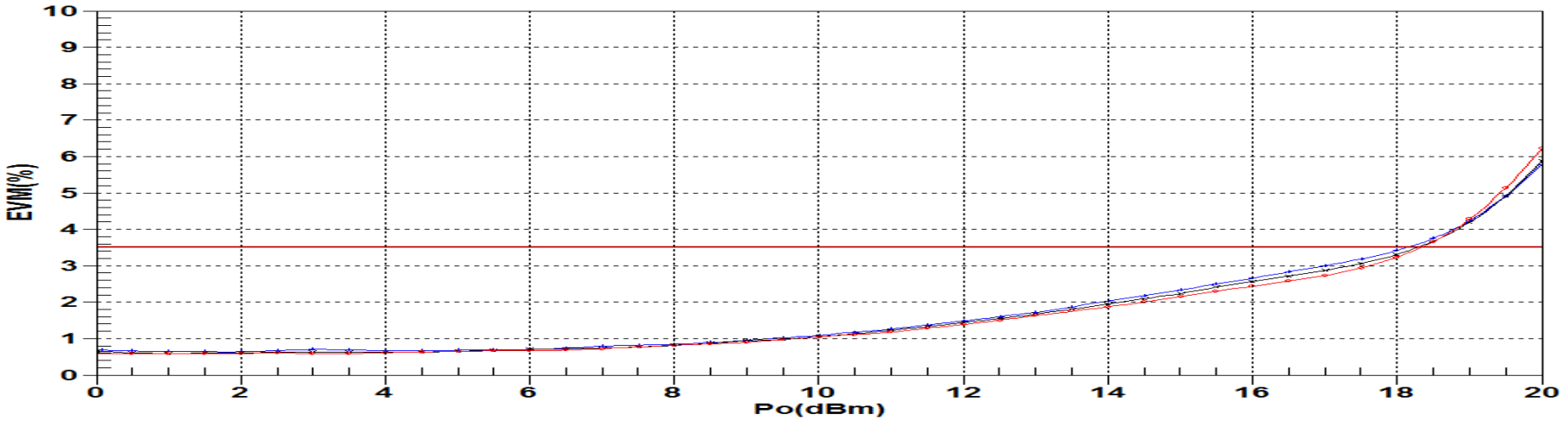
-10C



75C

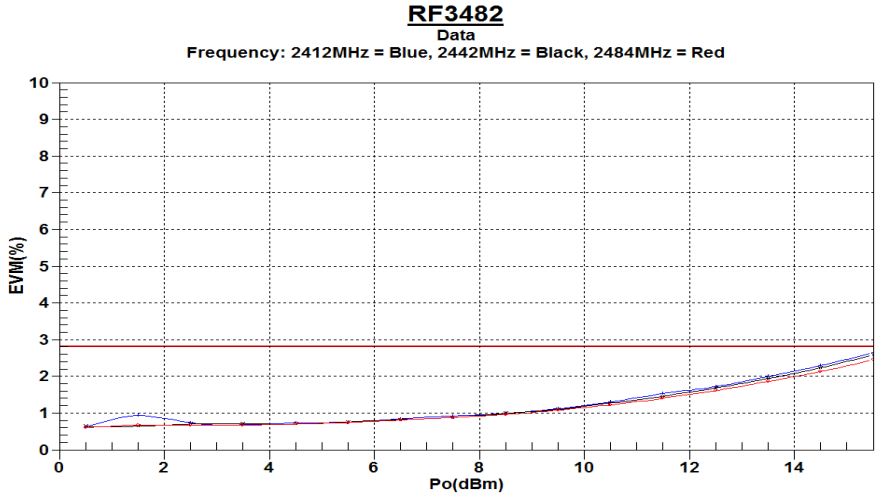


25C



11n TX Performance: EVM vs. Output Power Vbatt = 3.6V @ -10C, 25C, 75C

-10C



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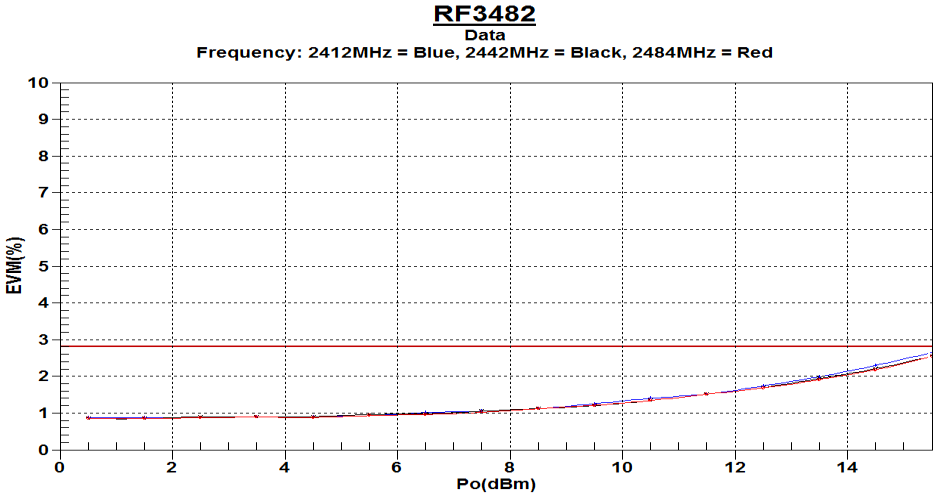

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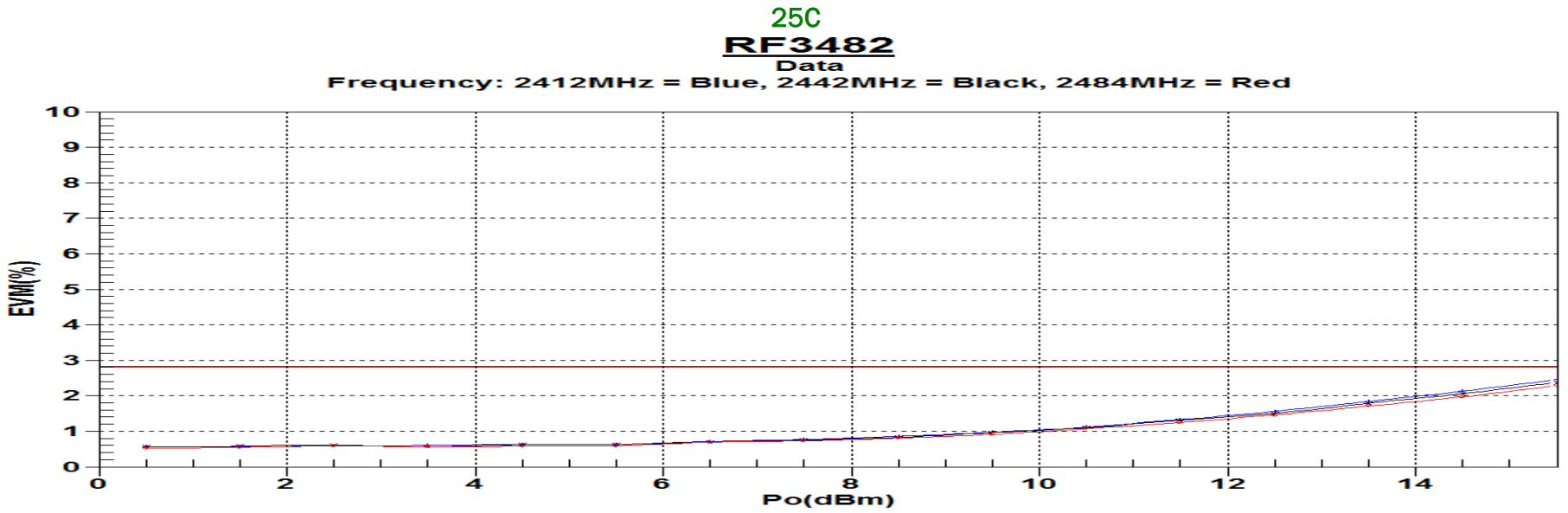
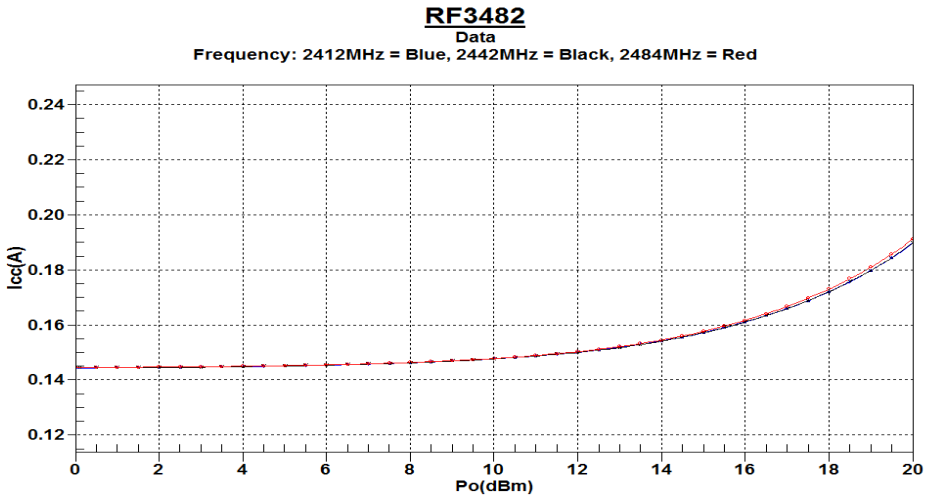


TX Performance: Operating Current vs. Output Power Vbatt = 3.6V @ -10C, 25C, 75C

-10C



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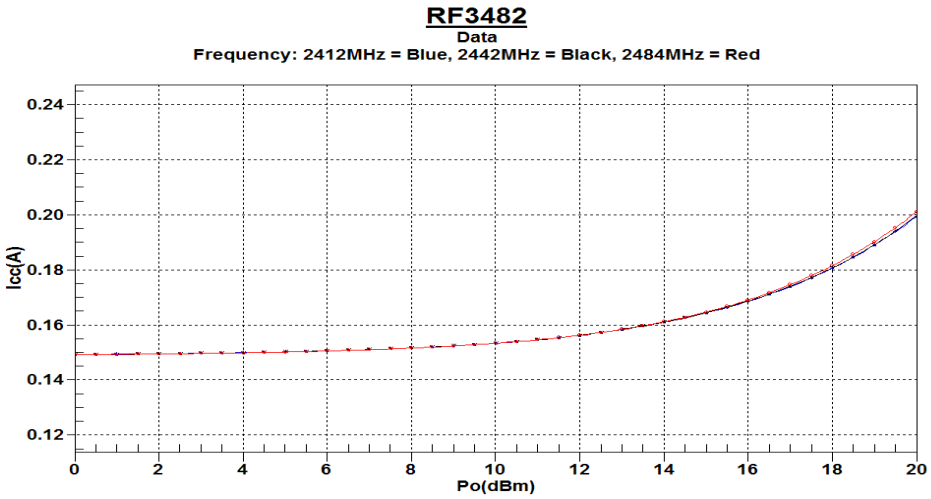

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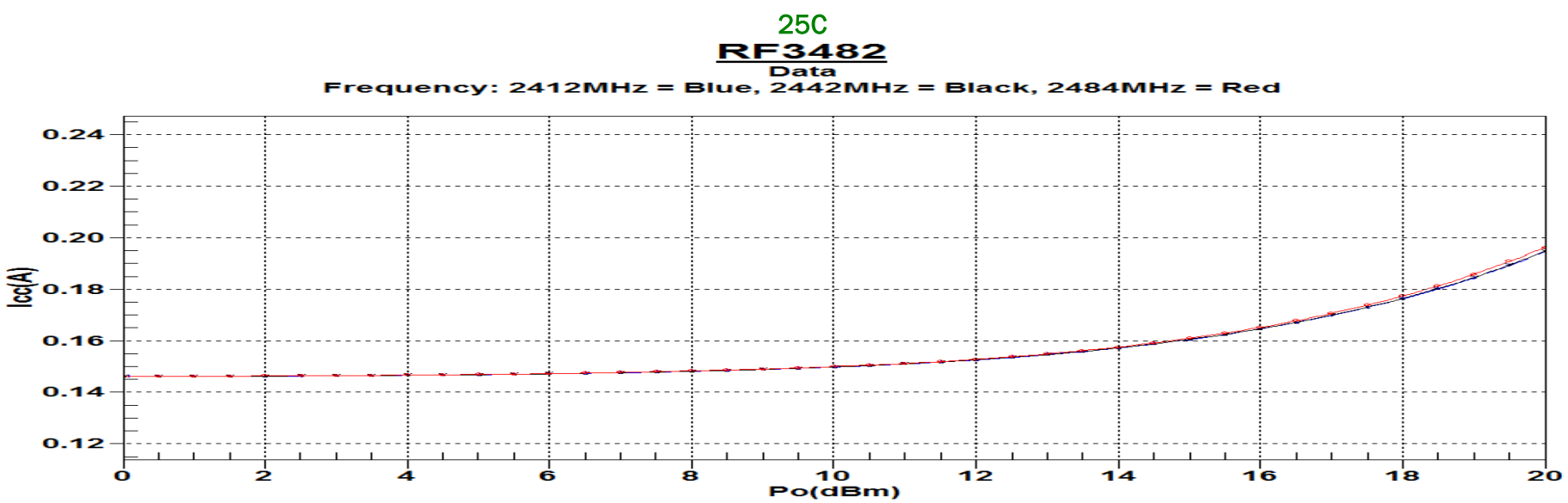
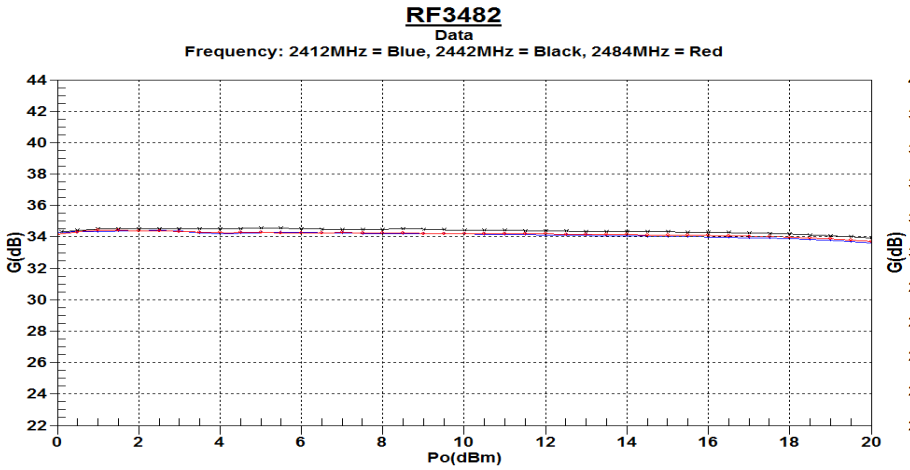


TX Performance: Gain vs. Output Power Vbatt = 3.6V @ -10C, 25C, 75C

-10C



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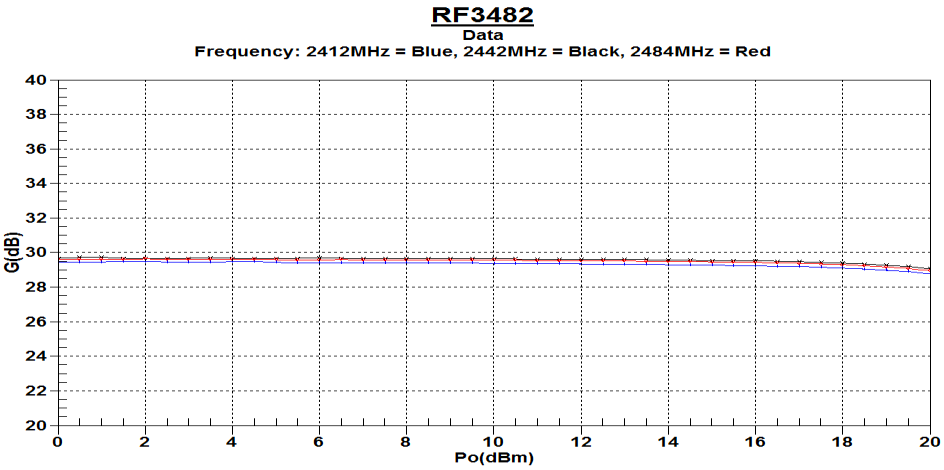

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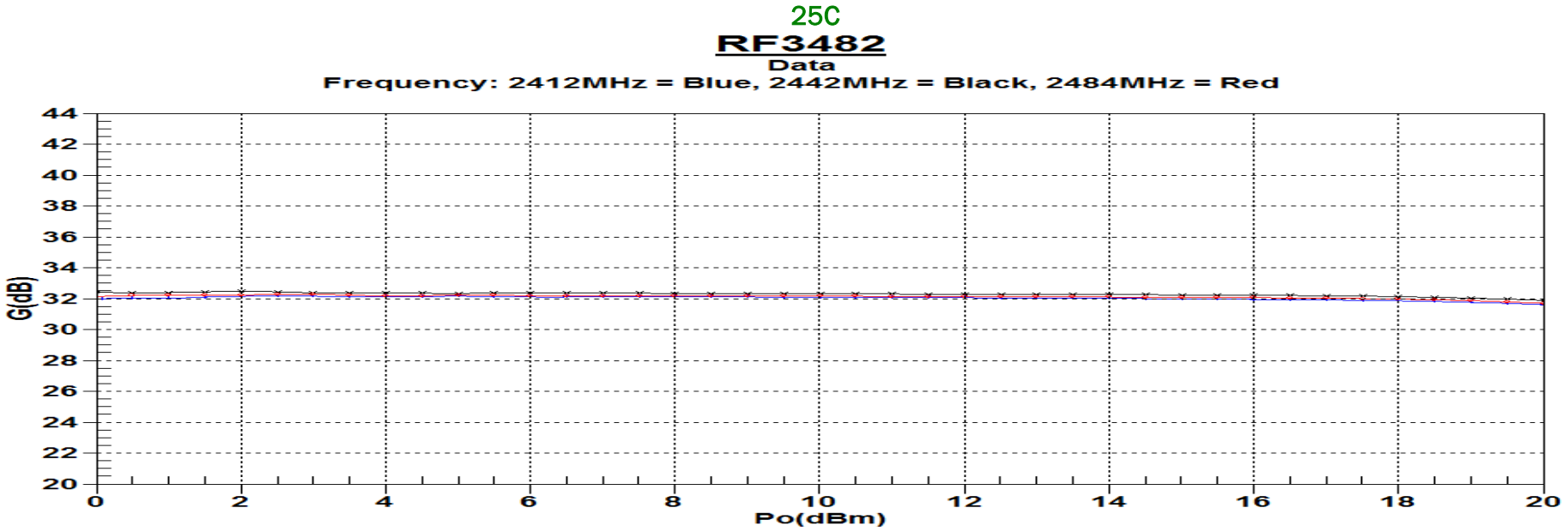
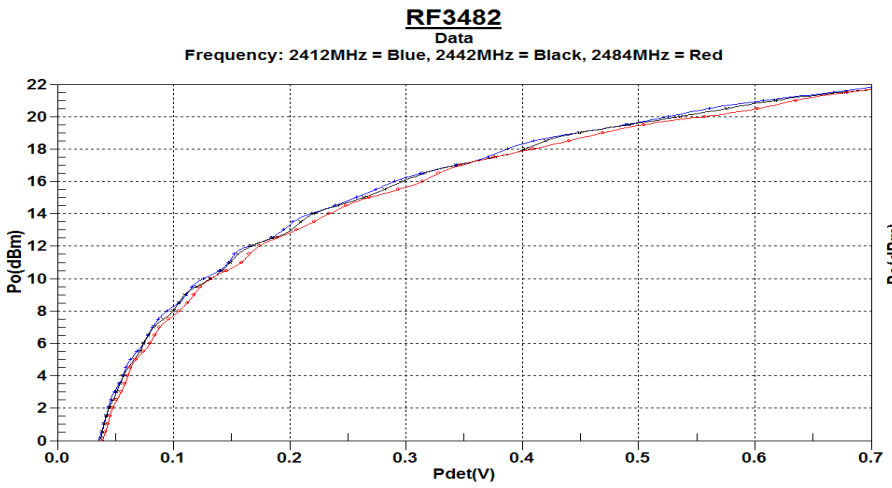
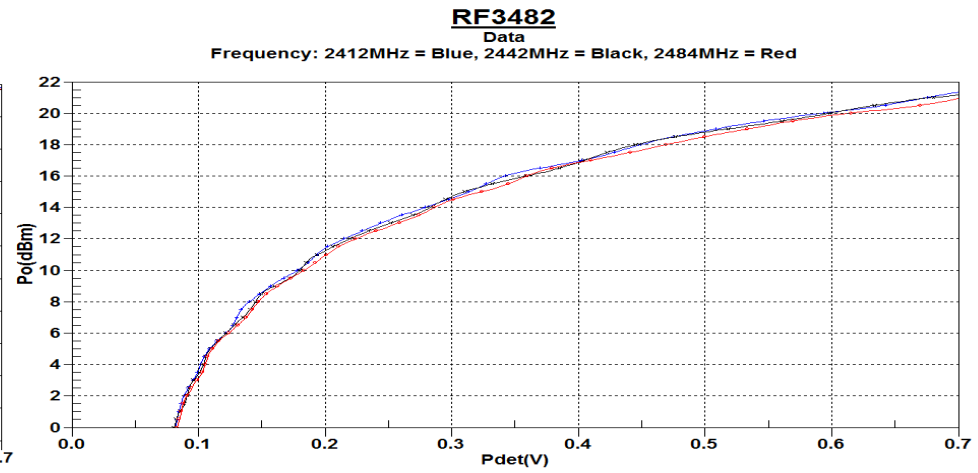


TX Performance: Power Detector Voltage vs. Output Power Vbatt = 3.6V @ -10C, 25C, 75C

-10C



75C



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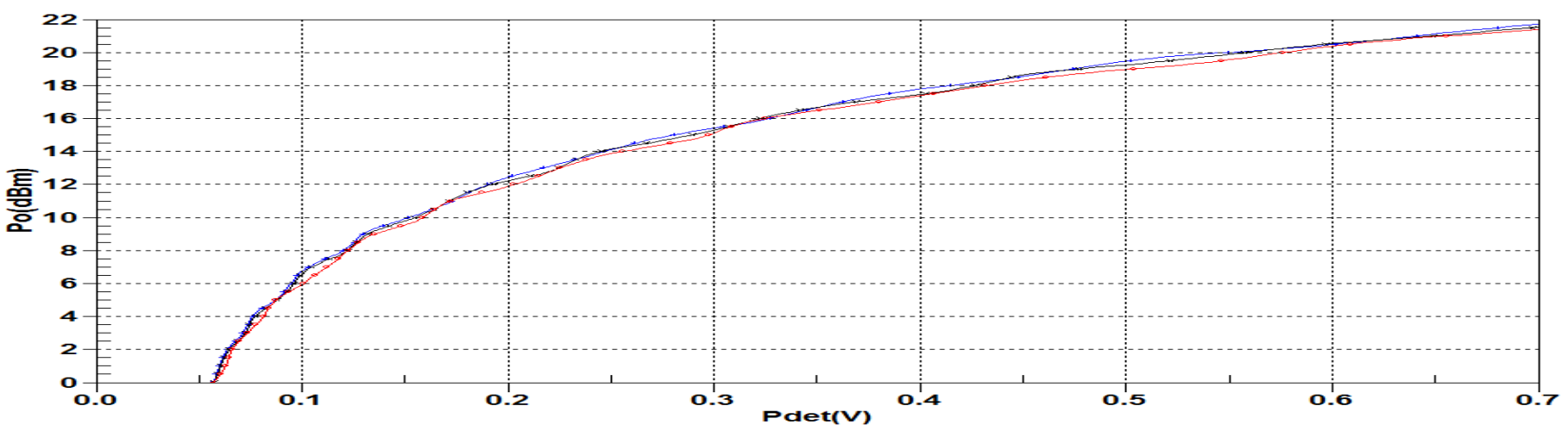


RF3482 Noise Power @ 20dBm

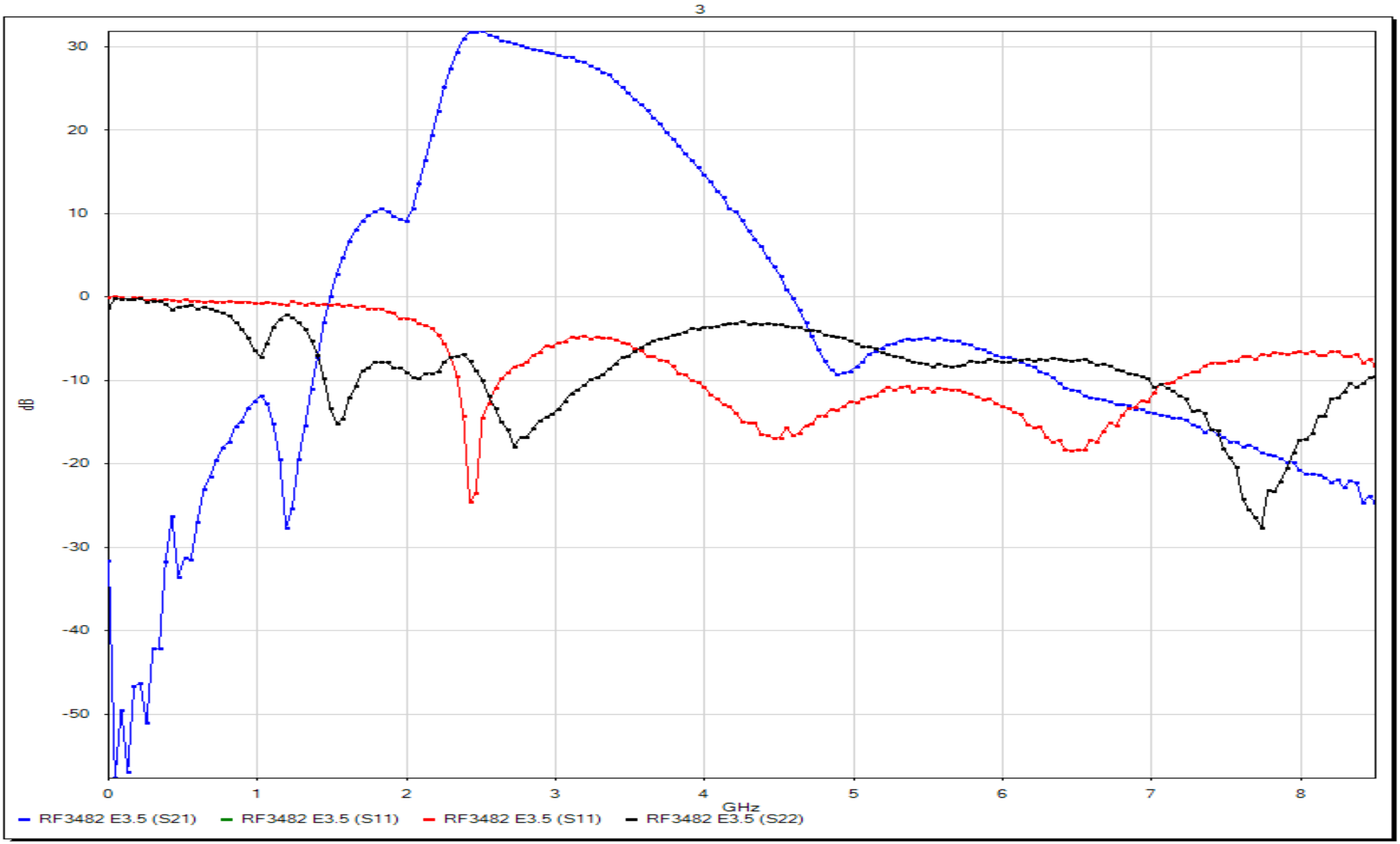
Cellular Band (MHz)	Noise (dBm/Hz) @ Pout 20dBm
2170	-133
2140	-133
2110	-133



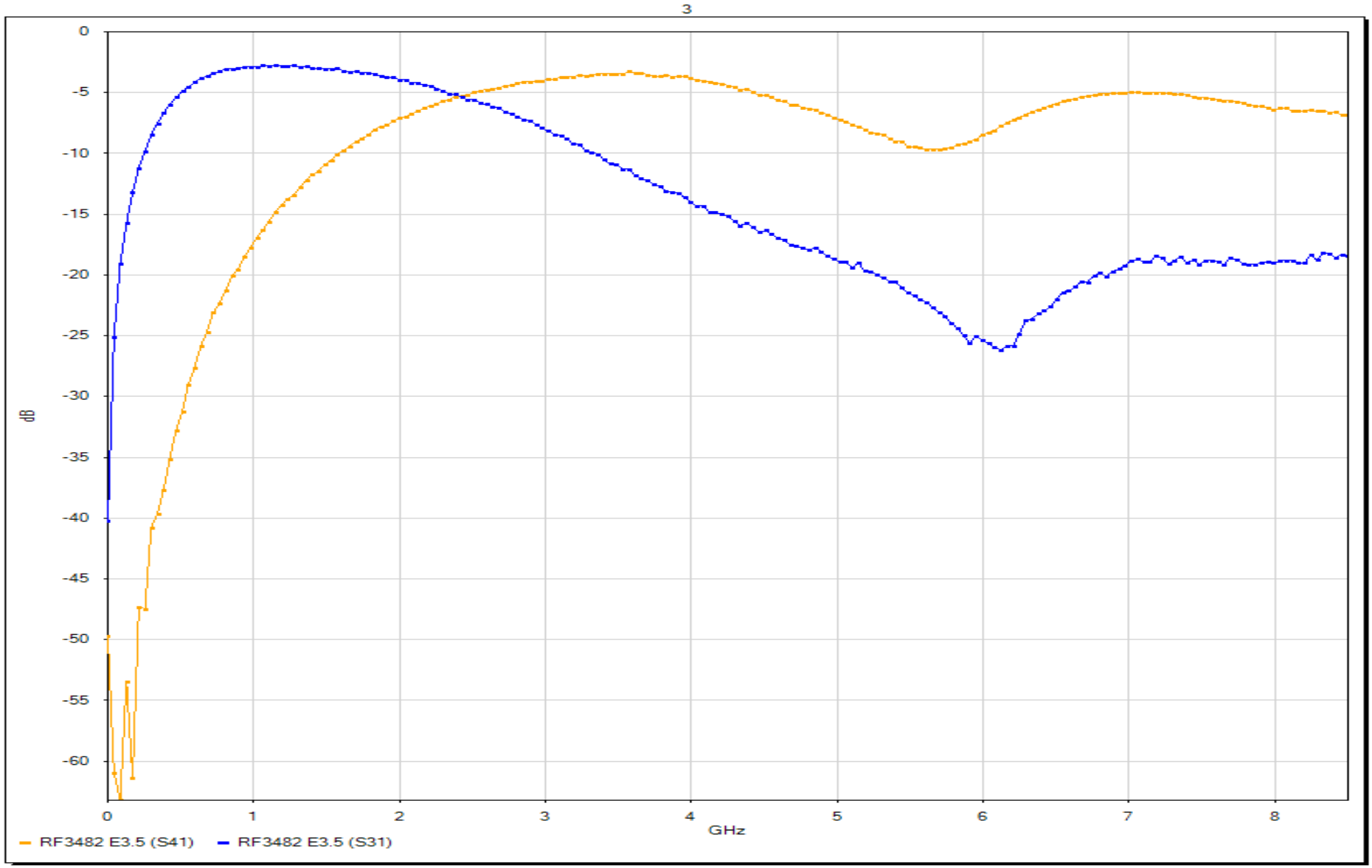




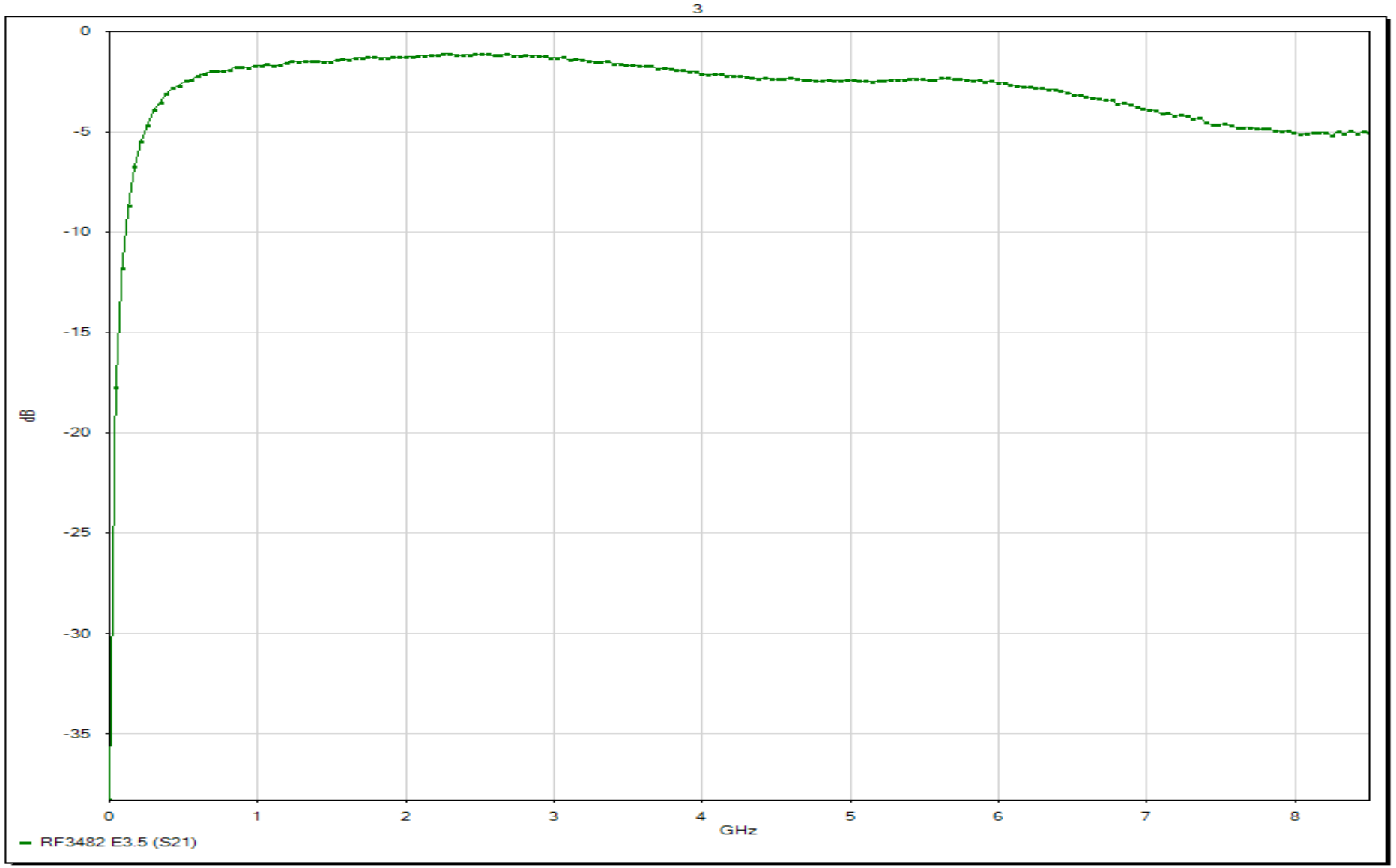

RF3482 Transmit S-Parameters



RF3482 Receiver S-Parameters



RF3482 Bluetooth S-Parameters







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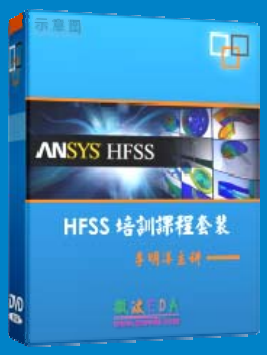
课程网址：http://www.edatop.com/peixun/cst/24.html

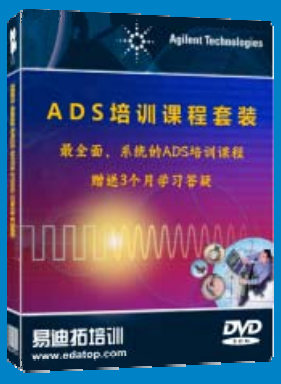


HFSS 学习培训课程套装

该套课程套装包含了本站全部 HFSS 培训课程，是迄今国内最全面、最专业的 HFSS 培训教程套装，可以帮助您从零开始，全面深入学习 HFSS 的各项功能和在多个方面的工程应用。购买套装，更可超值赠送 3 个月免费学习答疑，随时解答您学习过程中遇到的棘手问题，让您的 HFSS 学习更加轻松顺畅…

课程网址：http://www.edatop.com/peixun/hfss/11.html

ADS 学习培训课程套装



该套装是迄今国内最全面、最权威的 ADS 培训教程，共包含 10 门 ADS 学习培训课程。课程是由具有多年 ADS 使用经验的微波射频与通信系统设计领域资深专家讲解，并多结合设计实例，由浅入深、详细而又全面地讲解了 ADS 在微波射频电路设计、通信系统设计和电磁仿真设计方面的内容。能让您在最短的时间内学会使用 ADS，迅速提升个人技术能力，把 ADS 真正应用到实际研发工作中去，成为 ADS 设计专家...

课程网址： http://www.edatop.com/peixun/ads/13.html

我们的课程优势：

※ 成立于 2004 年，10 多年丰富的行业经验，

※ 一直致力并专注于微波射频和天线设计工程师的培养，更了解该行业对人才的要求

※ 经验丰富的一线资深工程师讲授，结合实际工程案例，直观、实用、易学

联系我们：

※ 易迪拓培训官网：http://www.edatop.com

※ 微波 EDA 网：http://www.mweda.com

※ 官方淘宝店：http://shop36920890.taobao.com