

### Features

- 802.11a,n,ac Applications
- 0.9 dB  $T_x$  Insertion Loss
- 19 dB  $R_x$  Isolation
- 12 dB  $R_x$  Gain
- 2.2 dB Noise Figure
- 10 mA Current
- -40 dB EVM @ 23 dBm Input  
(802.11ac 80 MHz / 256 QAM)
- Lead Free 2 mm 12-lead STQFN package
- RoHS\* Compliant and 260°C Reflow Compatible
- Alternate Pin-Out of the MAMF-010614

### Description

The MAMF-011038 is a multi-function MMIC assembled in a lead-free 2 mm 12-lead STQFN plastic package that includes a SPDT switch and LNA with bypass mode for the  $R_x$  path.

This multi-function device delivers high isolation between  $T_x$  and  $R_x$  paths, low  $T_x$  insertion loss and a high gain, low noise  $R_x$  path.

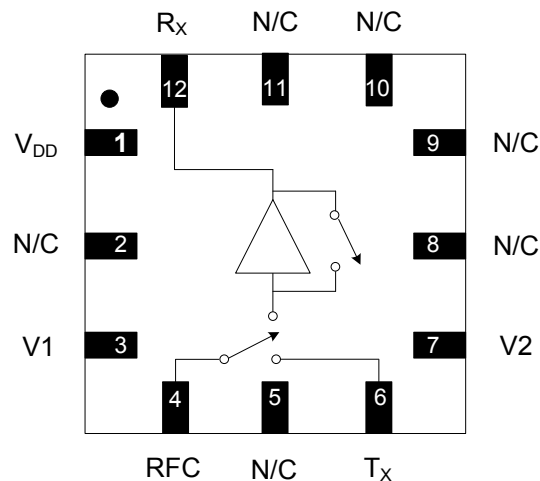
The MAMF-011038 is ideally suited for use on the front end of WLAN 802.11a,n,ac modules where small size is critical.

### Ordering Information<sup>1,2</sup>

Part Number	Package
MAMF-011038-TR3000	3000 piece reel
MAMF-011038-001SMB	Sample Board

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

### Functional Schematic



### Pin Configuration<sup>3</sup>

Pin No.	Function	Description
1	$V_{DD}$	Drain Voltage Supply
2	N/C	No Connection
3	V1	Control 1
4	RFC	RF Common
5	N/C	No Connection
6	$T_x$	$T_x$ Port
7	V2	Control 2
8	N/C	No Connection
9	N/C	No Connection
10	N/C	No Connection
11	N/C	No Connection
12	$R_x$	$R_x$ Port
13	Pad <sup>4</sup>	Ground

3. MACOM recommends connecting unused package pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF and DC ground.

\* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

## Integrated SPDT Switch and LNA with Bypass Mode 5 - 6 GHz

Rev. V1

**Electrical Specifications: Freq. = 5.25 - 5.825 GHz,  $V_{DD} = 3\text{ V}$ ,  $V_C = 0/2.8\text{ V}$ ,  $T_A = 25^\circ\text{C}$**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Isolation	RFC to $T_X$ RFC to $R_X$ (Gain Mode) RFC to $R_X$ (Bypass Mode)	dB	—	19 19 19	—
$T_X$ Insertion Loss	RFC to $T_X$	dB	—	0.9	1.2
$T_X$ Input / Output Return Loss	RFC to $T_X$	dB	—	22	—
$T_X$ Input P0.1dB	$T_X$ Path On	dBm	—	31	—
$T_X$ EVM	$P_{IN} = +23\text{ dBm}$ , 802.11AC 80 MHz / 256 QAM	dB	—	-42	—
$R_X$ Gain	RFC to $R_X$ , Gain Mode	dB	10	12	—
$R_X$ Insertion Loss	RFC to $R_X$ , Bypass Mode	dB	—	6	7.5
$R_X$ Input / Output Return Loss	RFC to $R_X$ , Gain Mode	dB	—	10	—
$R_X$ Noise Figure	Gain Mode	dB	—	2.2	—
$R_X$ Input IP3	Gain Mode	dBm	—	10	—
$R_X$ Input P0.1dB	Bypass Mode	dBm	—	10	—
$R_X$ Input P1dB	Gain Mode	dBm	-5	-3	—
$R_X$ EVM	$P_{IN} = -15\text{ dBm}$ , Gain Mode	dB	—	-46	—
Quiescent Current	No RF, Gain Mode, $V_{DD} = 3\text{ V}$	mA	—	10	12
Control Current	All States except High Gain High Gain State	$\mu\text{A}$	—	10 330	—

### Absolute Maximum Ratings<sup>5,6</sup>

Parameter	Absolute Maximum
Input Power $R_X$ Gain Mode $R_X$ Bypass Mode $T_X$ , 5.0 $V_C$ , RFC - $T_X$ $T_X$ , 3.3 $V_C$ , RFC - $T_X$	0 dBm 20 dBm 35 dBm CW 33 dBm CW
$V_{DD}$	5 V
Operating Temperature	-40°C to +85°C
Storage Temperature	-65°C to +150°C

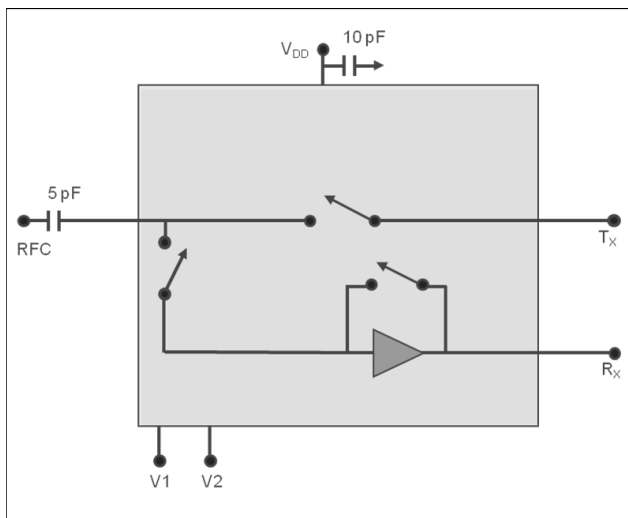
- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.

### Truth Table<sup>7,8</sup>

Control V1	Control V2	RFC- $R_X$	RFC- $T_X$
Low	Low	Bypass Mode	Off
Hi	Low	Gain Mode	Off
Low	Hi	Off	On

- Differential voltage, V (state Low) - V (state Hi), must be +2.7 V minimum and must not exceed +5.0 V.
- Low =  $0 \pm 0.3\text{ V}$ , Hi = +2.7 V to +5.0 V.

### Functional Schematic



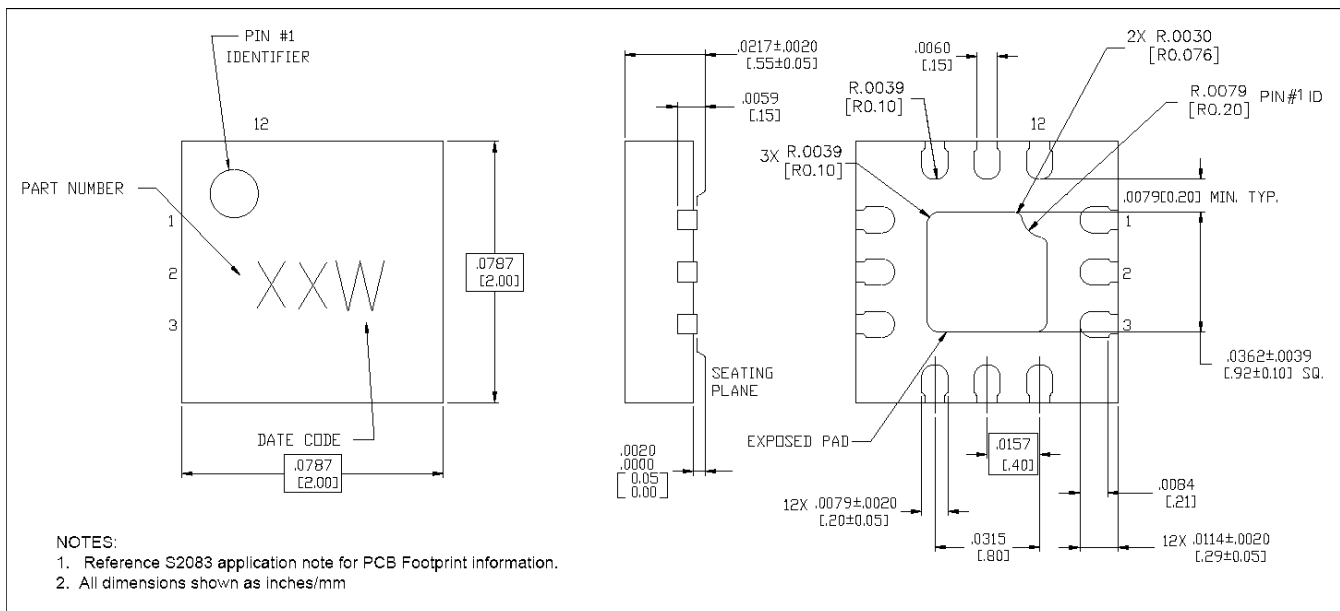
### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

### Lead-Free 2 mm STQFN-12LD -0.4 mm Pitch<sup>†</sup>



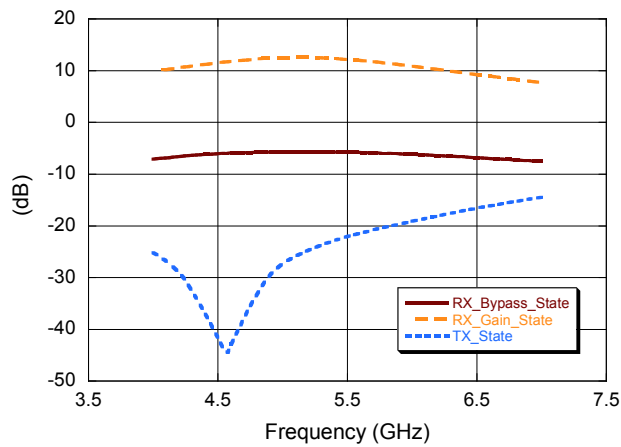
<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is Ni/Pd/Au over Copper.

## Integrated SPDT Switch and LNA with Bypass Mode 5 - 6 GHz

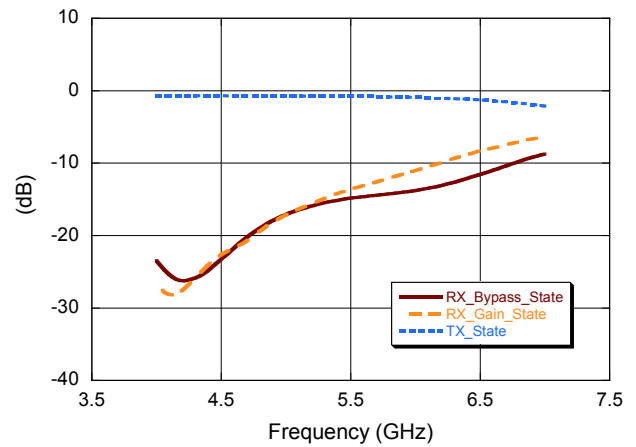
Rev. V1

### Typical Performance Curves:

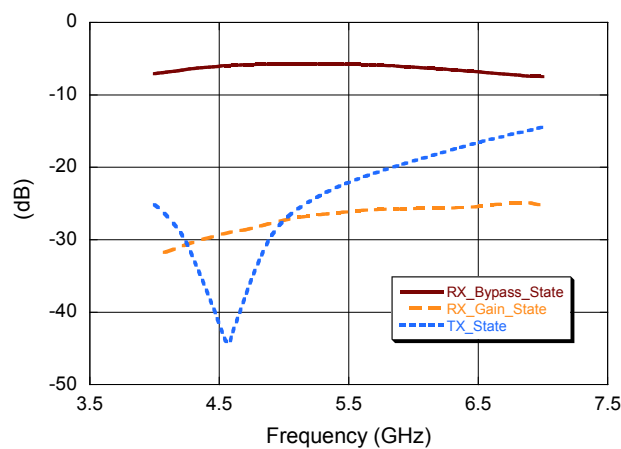
RFC to  $R_X$



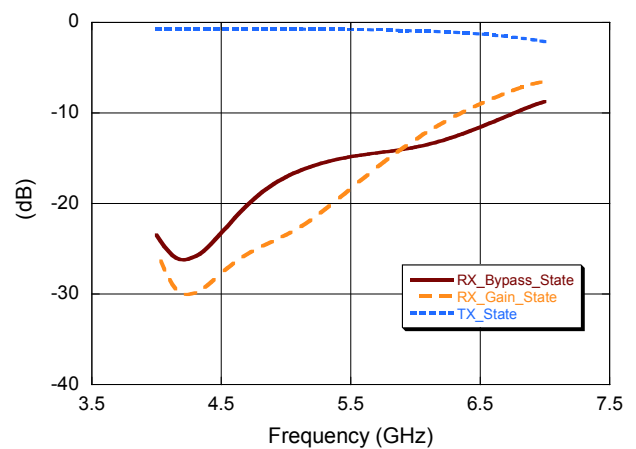
RFC to  $T_X$



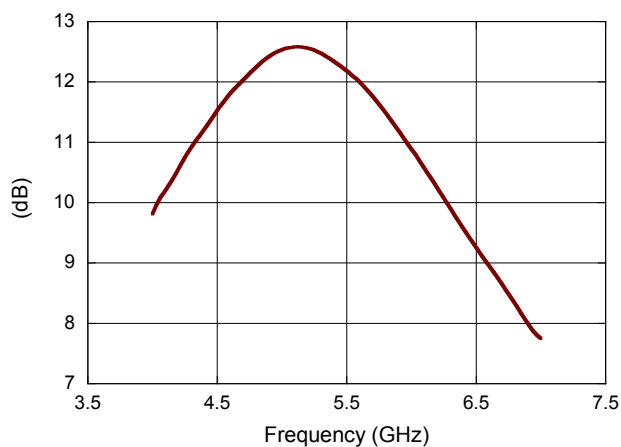
$R_X$  to RFC



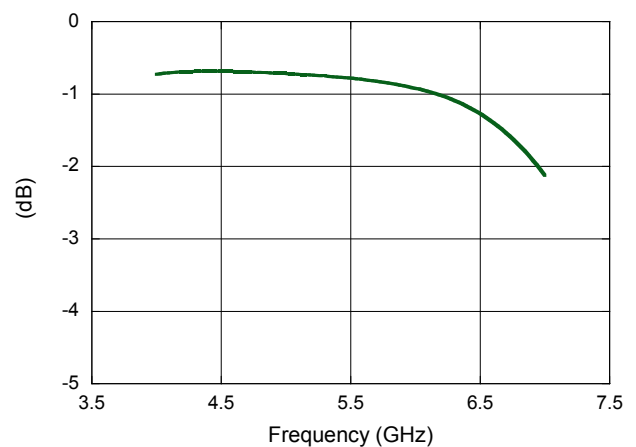
$T_X$  to RFC



RFC to  $R_X$  Gain

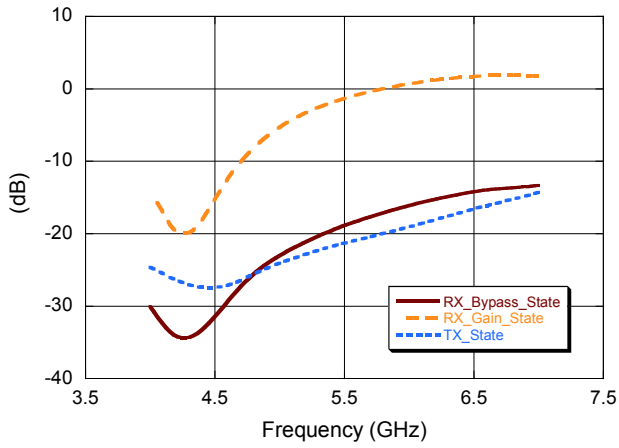


$T_X$  Insertion Path

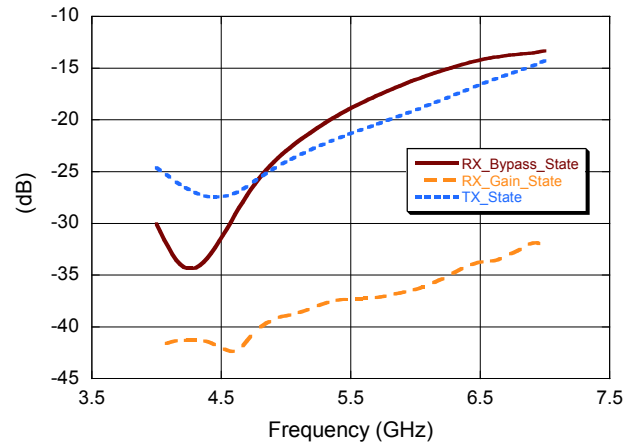


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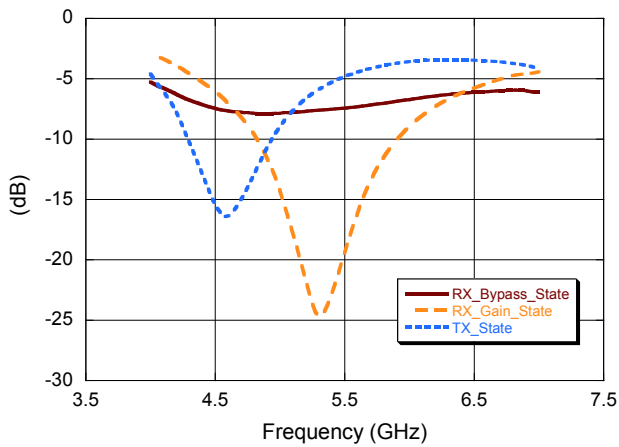
RFC Isolation from  $T_X$



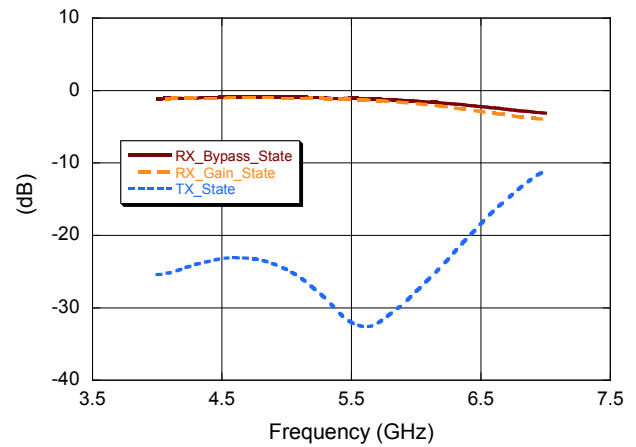
$T_X$  Isolation from  $R_X$



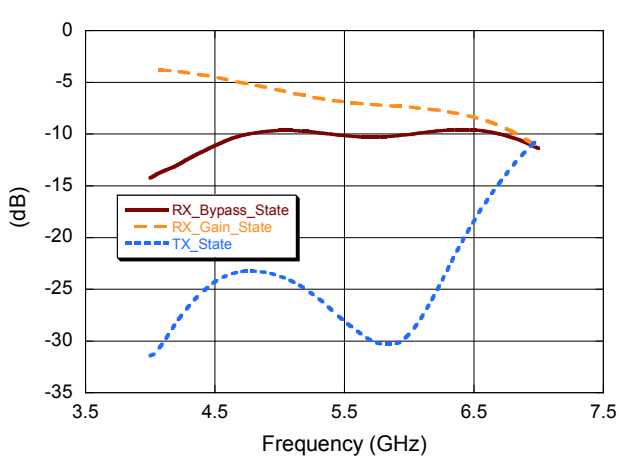
$R_X$  Port Return Loss



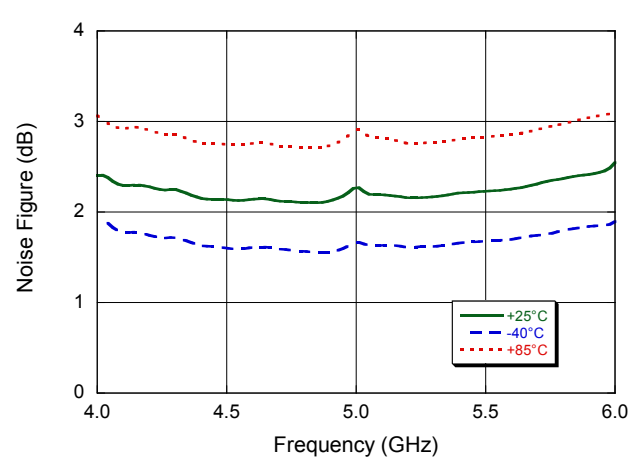
$T_X$  Port Return Loss



RFC Port Return Loss



$R_X$  Noise Figure, Gain Mode

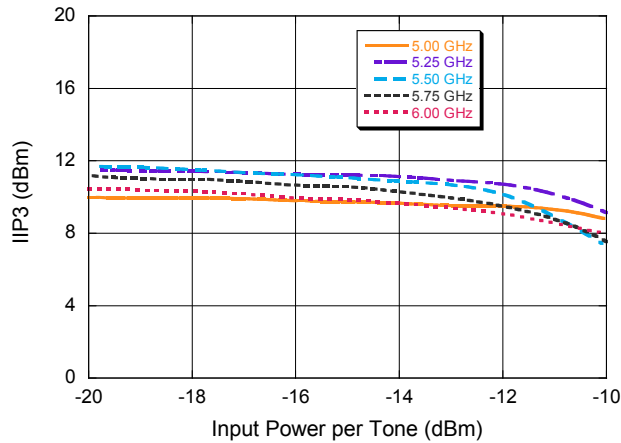


## Integrated SPDT Switch and LNA with Bypass Mode 5 - 6 GHz

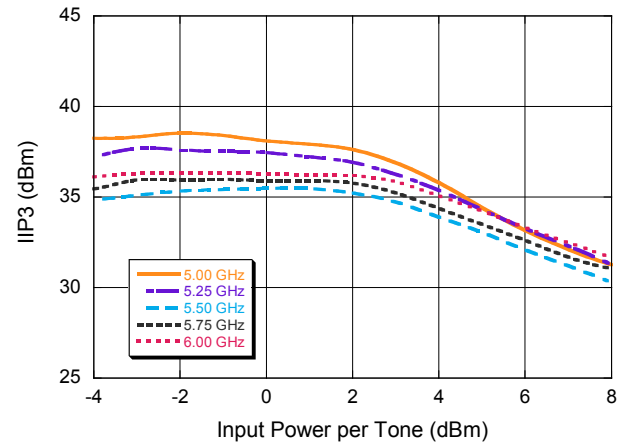
Rev. V1

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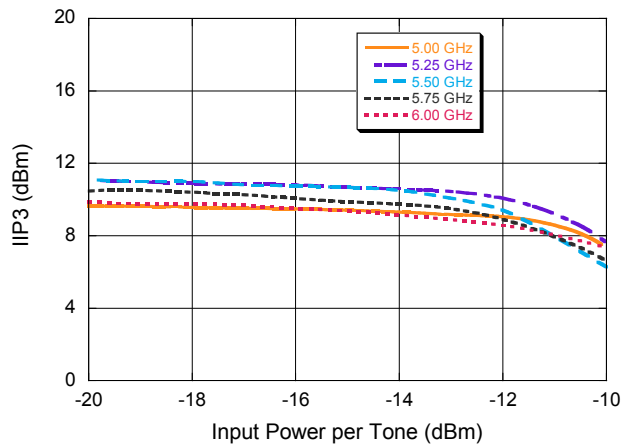
$R_x$  Input IP3, Gain Mode @ +25°C



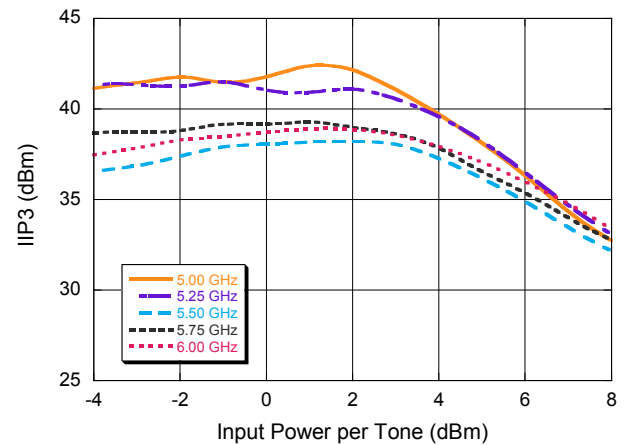
$R_x$  Input IP3, Bypass Mode @ +25°C



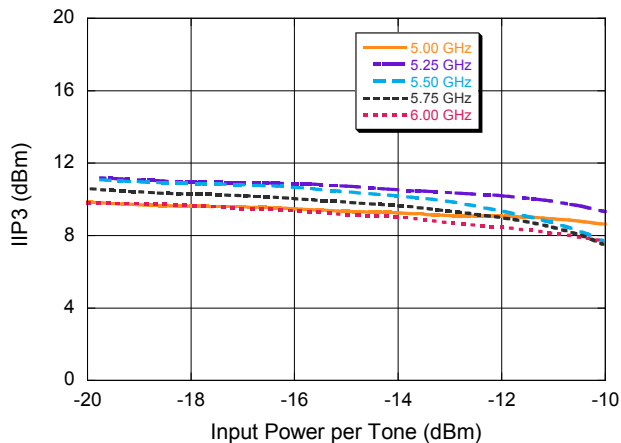
$R_x$  Input IP3, Gain Mode @ -40°C



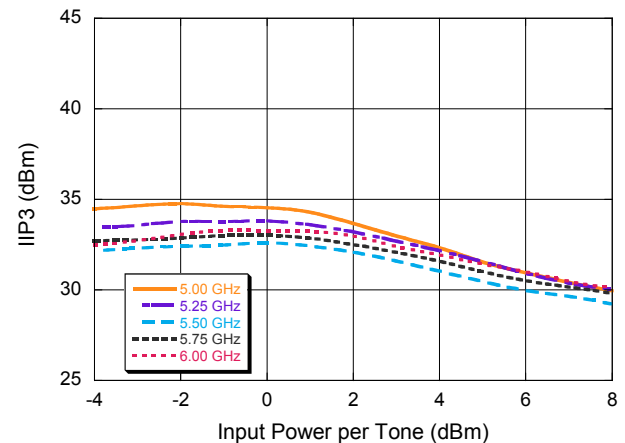
$R_x$  Input IP3, Bypass Mode @ -40°C



$R_x$  Input IP3, Gain Mode @ +85°C



$R_x$  Input IP3, Bypass Mode @ +85°C

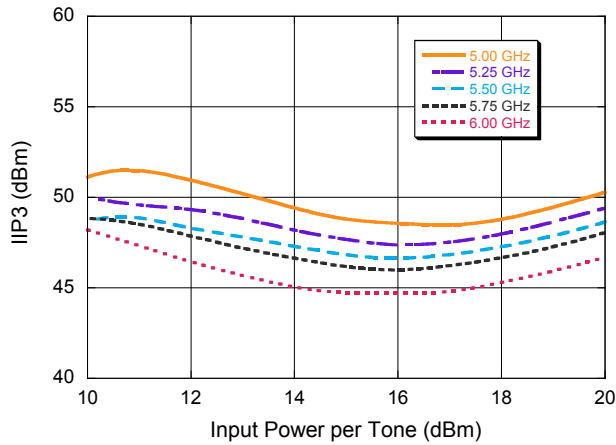


## Integrated SPDT Switch and LNA with Bypass Mode 5 - 6 GHz

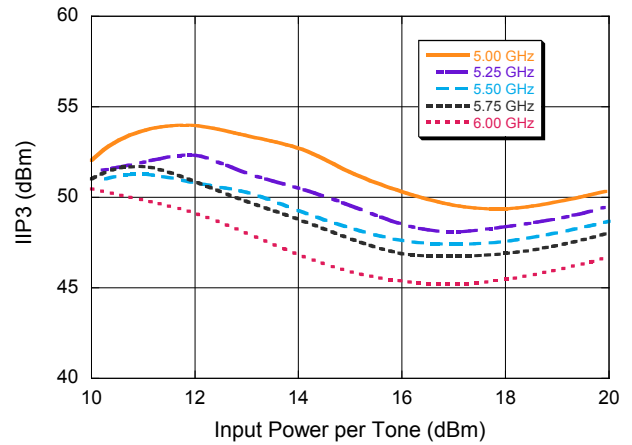
Rev. V1

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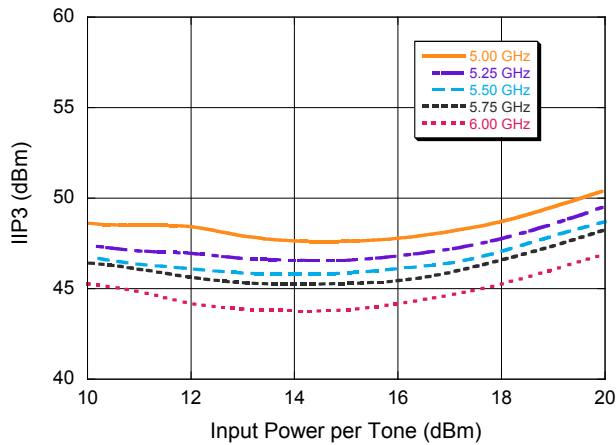
$T_x$  Input IP3 @ +25°C



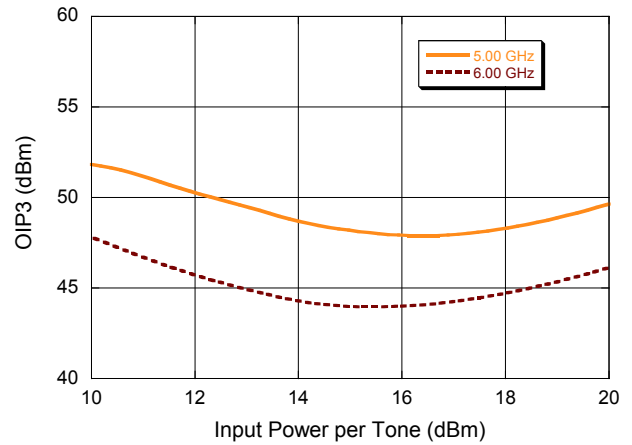
$T_x$  Input IP3 @ -40°C



$T_x$  Input IP3 @ +85°C



$T_x$  Output IP3 @ +25°C



## System Compensated EVM, 802.11AC 80 MHz / 256 QAM

