RECOMMENDED FOR NEW DESIGN

ATEK896BN6

1 to 18 GHz 1024 State Tunable Bandpass Filter

Product Description

ATEK896BN6 is a GaAs MMIC 1024 state digitally tunable band pass filter with low in band loss and high rejection of –45dBc from 1 to 18 GHz. The filter is controlled by a 3-bit GPIO control interface that selects one of 4 filter sections with each filter high or low pass state selected by an 8-bit GPIO which is combined to yield a desired band pass state. There are 2 bypass paths enabling external filtering, through line, or amplification.

The ATEK896BN6 RF input and outputs are bidirectional and internally matched to 50 ohms for low SWaP transmit and receive applications. A single +5V @ 15mA supply eliminates the need for negative voltage rails.

Housed in a 6x6 mm QFN surface mount package, the monolithic filter bank IC inherently minimizes phase noise degradation caused by mechanical vibration (microphonics). The highly repeatable MMIC manufacturing process also yields minimal part to part variation.

MMICs and Evaluation Boards are available from stock. Custom package configurations, MMIC die, and module options are available upon request.

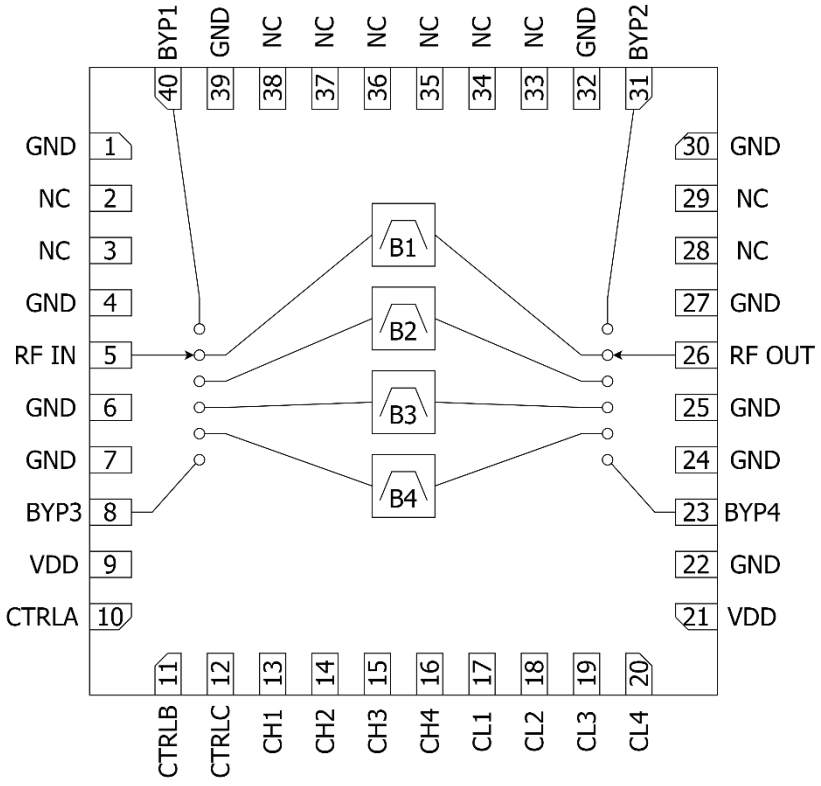
Product Features

- 1024 Filter States, 1 to 18 GHz
- High Rejection: -45 dBc
- Fast Tuning Speed: 250 nS
- +5V @ 15mA Single Supply
- 6x6 mm Compact Size

Applications

- Wideband Receivers & SDRs
- EW / ECM / C-UAS
- Telecom & SatCom
- Test & Measurement
- Ideal for Low SWaP

Functional Block Diagram



Electrical Specifications

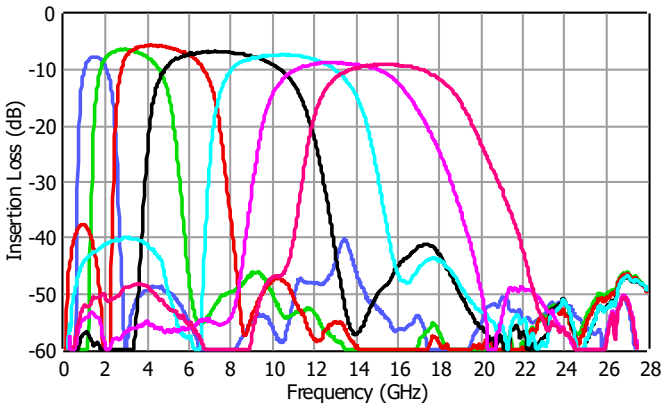
Conditions unless otherwise specified: V_{DD} = 5 V, Typical, T = 25 C, CW.

Parameter		Min	Typ	Max	Units
Operational Frequency Range			1 - 18		GHz
Insertion Loss (BPF)	1 - 2.5 GHz		7		dB
	2 – 6 GHz		6		
	5.5 - 12 GHz		7		
	11 - 18 GHz		9		
Insertion Loss Bypass 1 to 2	DC - 20 GHz		5.5		dB
Insertion Loss Bypass 3 to 4	DC - 20 GHz		6.5		dB
Input Return Loss			-12		dB
Output Return Loss			-12		dB
Input IP3			44		dBm
Input P1dB			26		dBm
Switching Speed	On		250		ns
50% Vctrl to 90% of RF Output	Off		50		
DC Supply Voltage (Vdd)		3	5	5.5	V
DC Supply Current			15		mA
Control Supply Current (Total Ictrl)			6		mA
Control Voltage (CTRL)	Low	-0.1		0.5	V
	High	3		5.5	
Operating Temperature		-40		85	°C

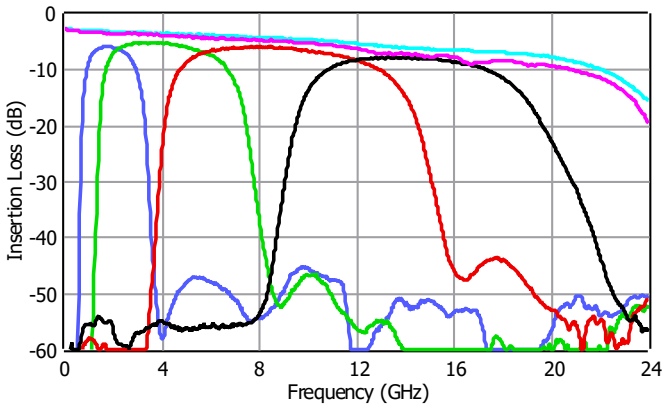
Typical Performance Plots

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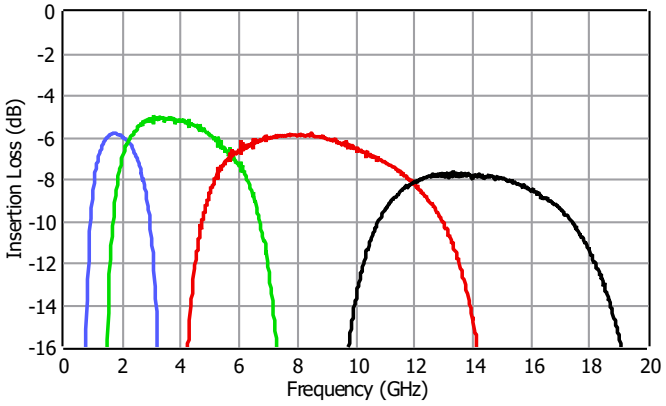
BPF Insertion Loss, 1 to 18 GHz



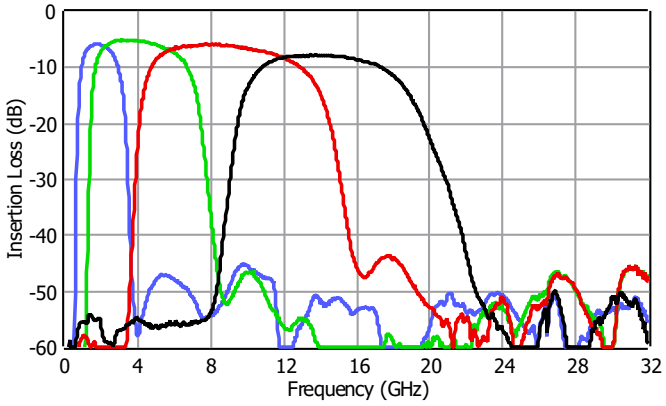
Insertion Loss, Widest Bands with Bypass



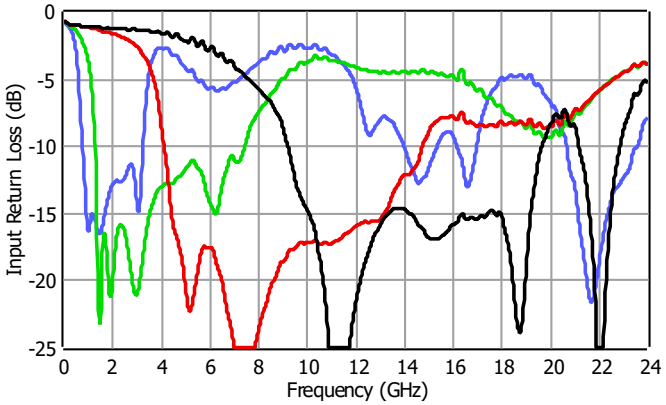
Insertion Loss Widest Bands



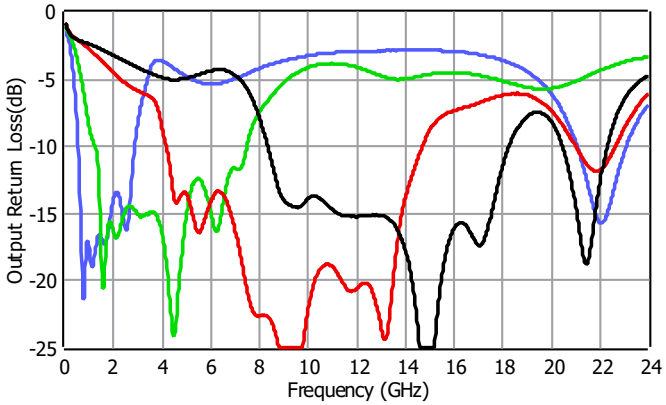
Insertion Loss Widest Bands



Input Return Loss Widest Bands



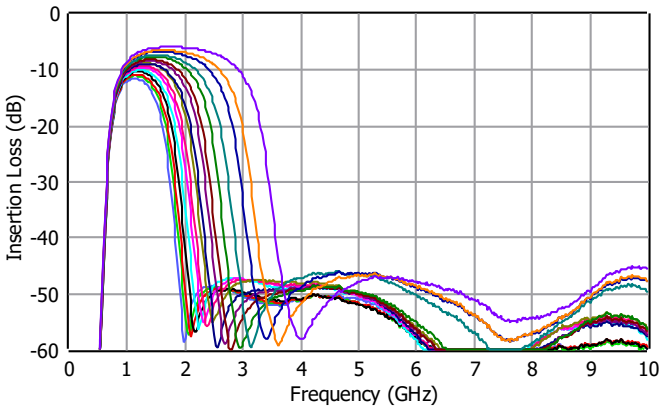
Output Return Loss Widest Bands



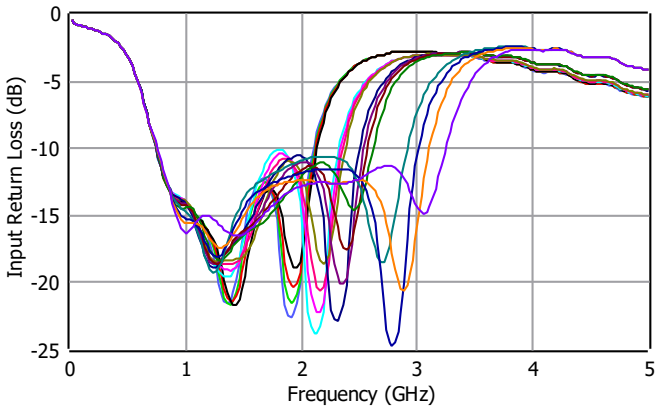
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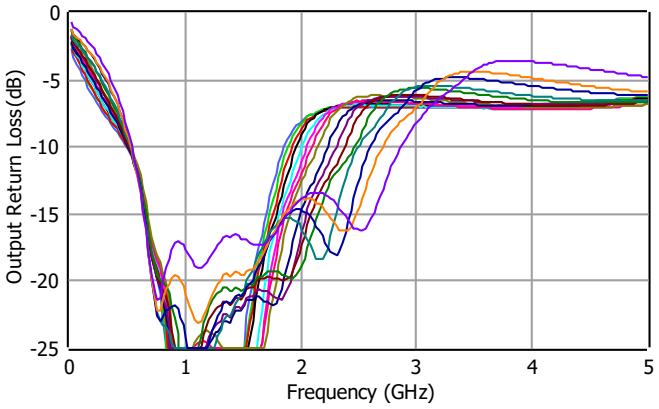
Insertion Loss, 1 to 2.5 GHz, Low Pass Tuning



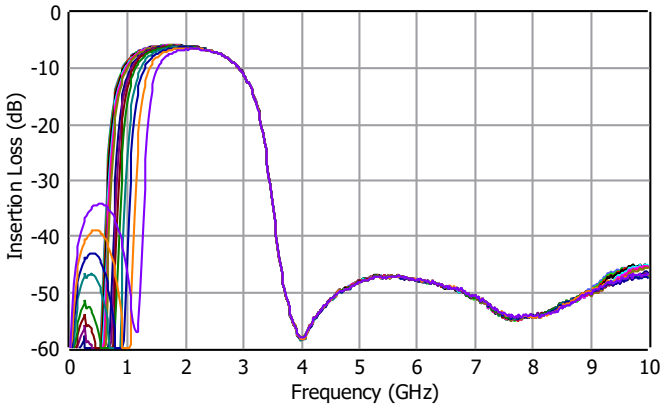
Input Return Loss, 1 to 2.5 GHz, Low Pass Tuning



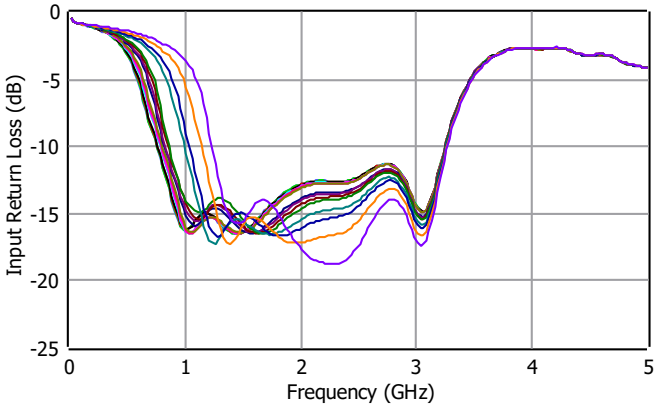
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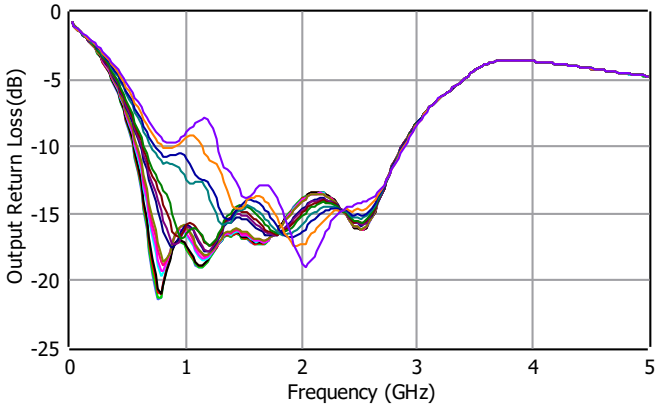
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Input Return Loss, 1 to 2.5 GHz, High Pass Tuning



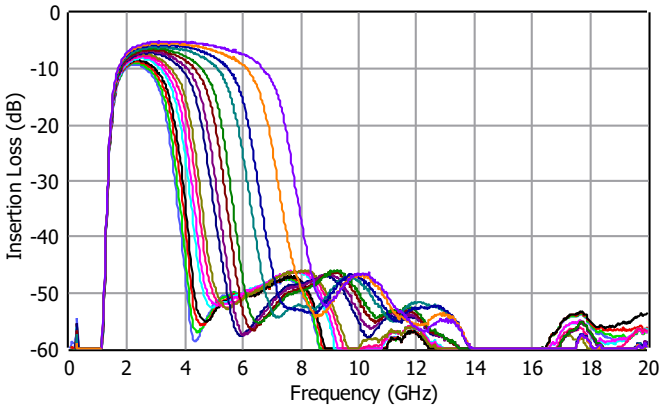
Output Return Loss, 1 to 2.5 GHz, High Pass Tuning



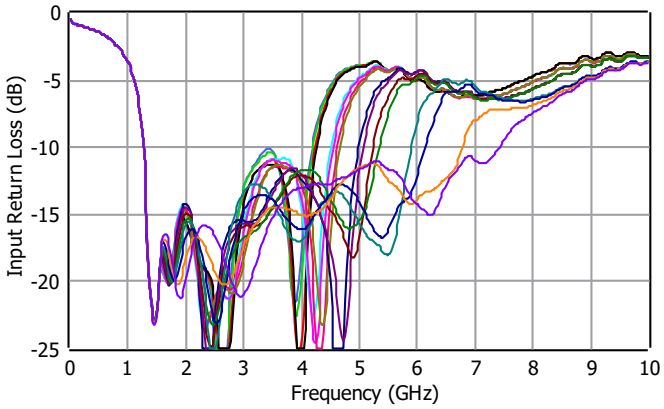
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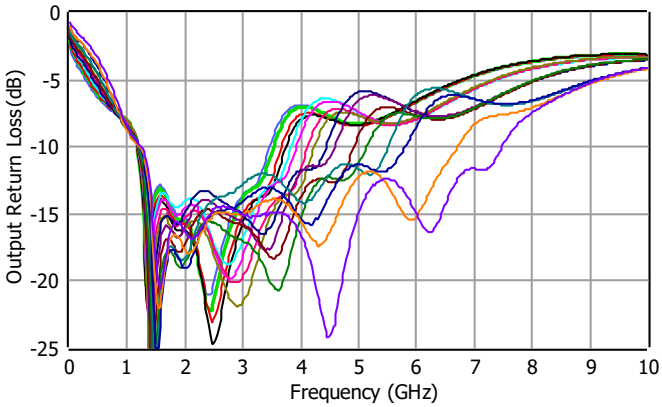
Insertion Loss, 2 to 6 GHz, Low Pass Tuning



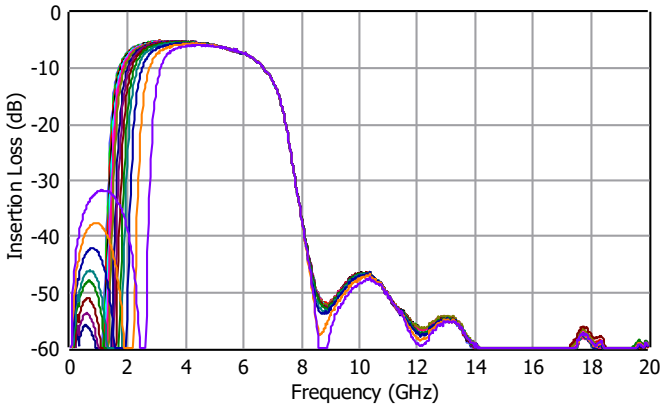
Input Return Loss, 2 to 6 GHz, Low Pass Tuning



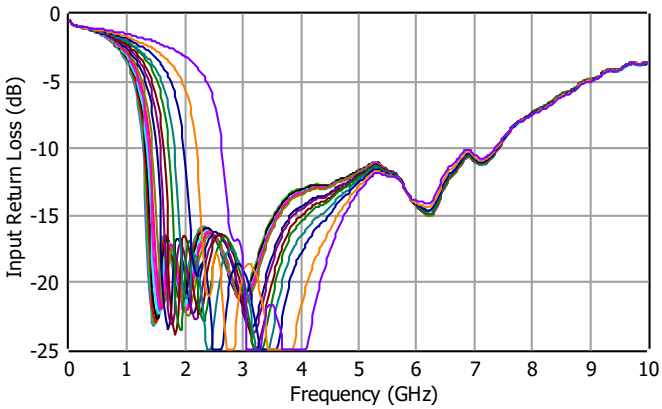
Output Return Loss, 2 to 6 GHz, Low Pass Tuning



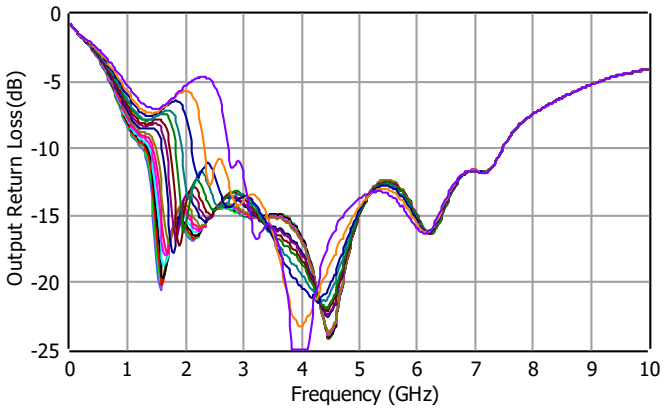
Insertion Loss, 2 to 6 GHz, High Pass Tuning



Input Return Loss, 2 to 6 GHz, High Pass Tuning



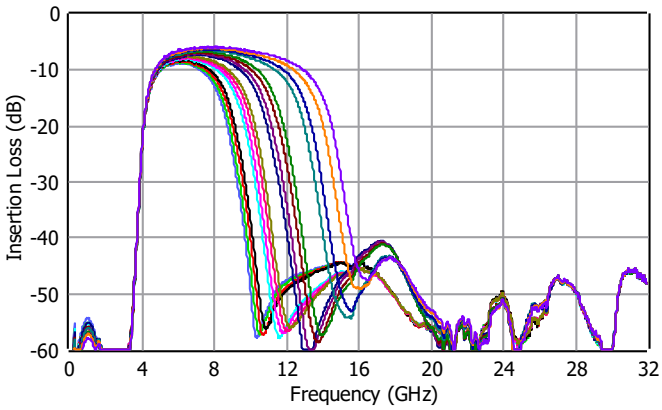
Output Return Loss, 2 to 6 GHz, High Pass Tuning



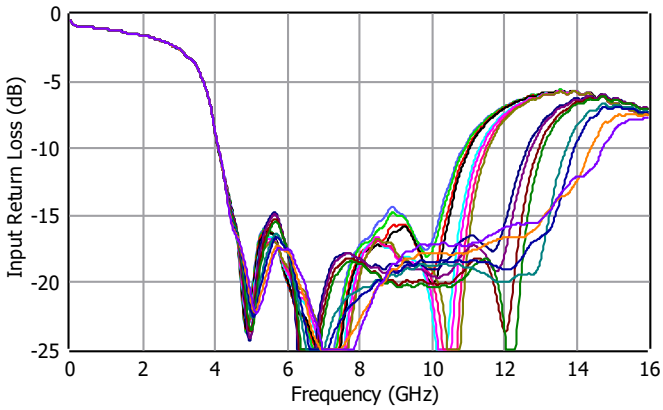
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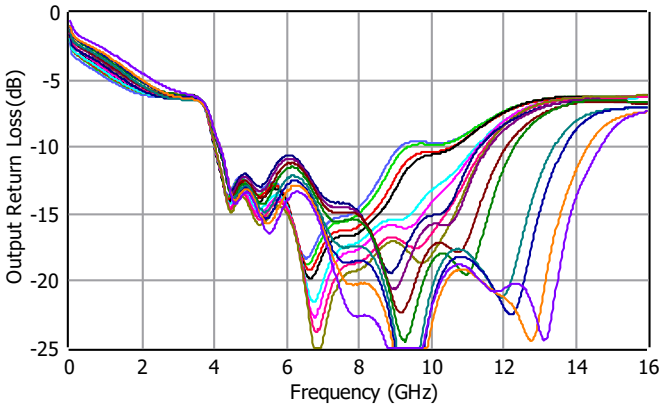
Insertion Loss, 5.5 to 12 GHz, Low Pass Tuning



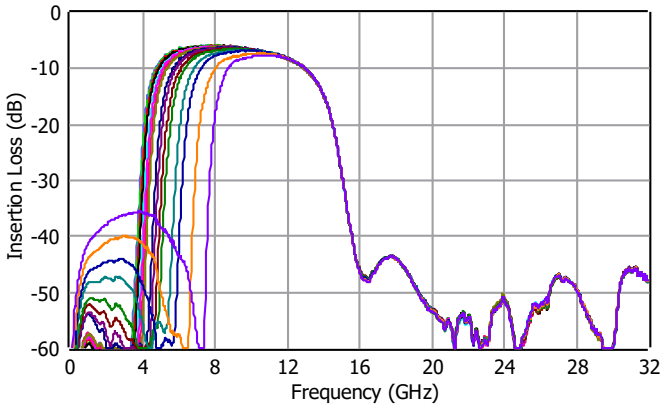
Input Return Loss, 5.5 to 12 GHz, Low Pass Tuning



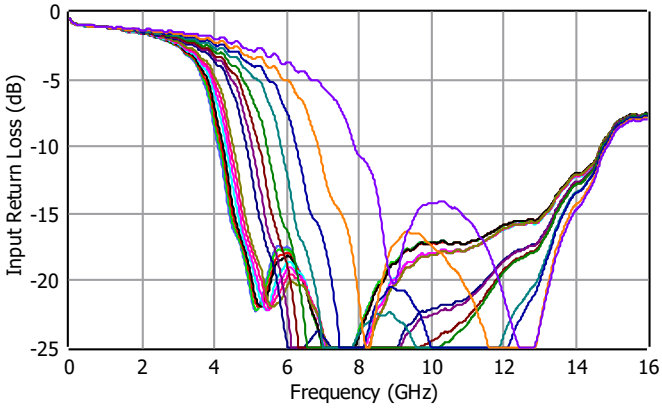
Output Return Loss, 5.5 to 12 GHz, Low Pass Tuning



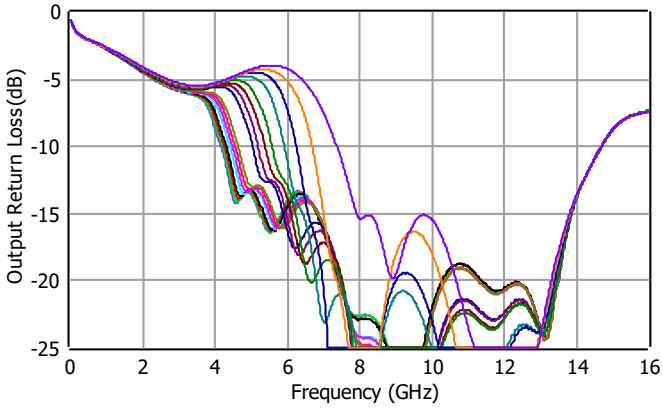
Insertion Loss, 5.5 to 12 GHz, High Pass Tuning



Input Return Loss, 5.5 to 12 GHz, High Pass Tuning



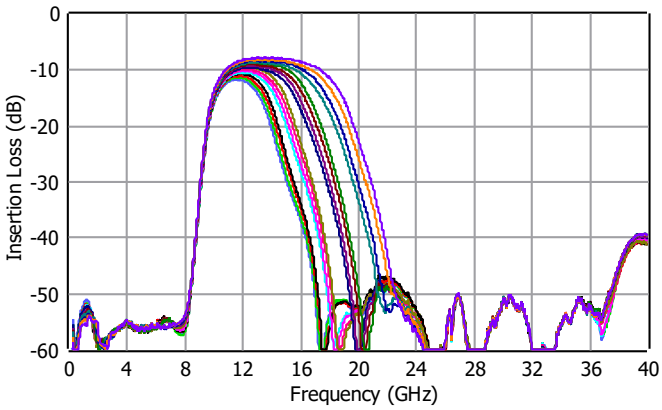
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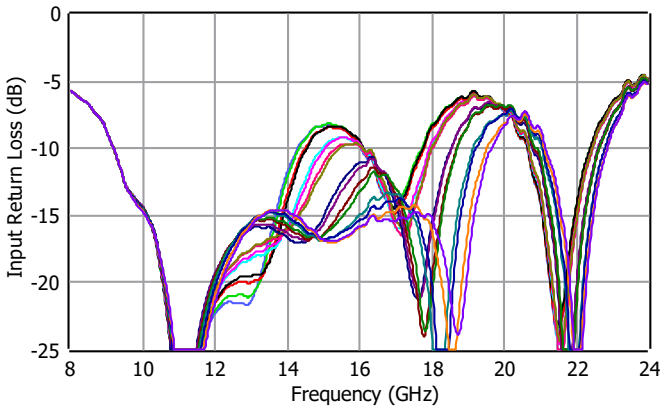
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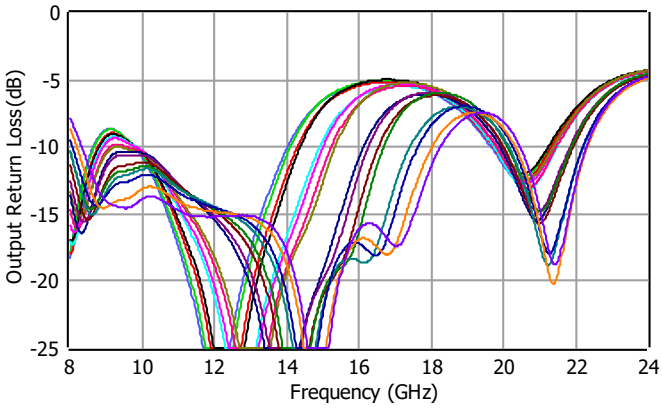
Insertion Loss, 11 to 18 GHz, Low Pass Tuning



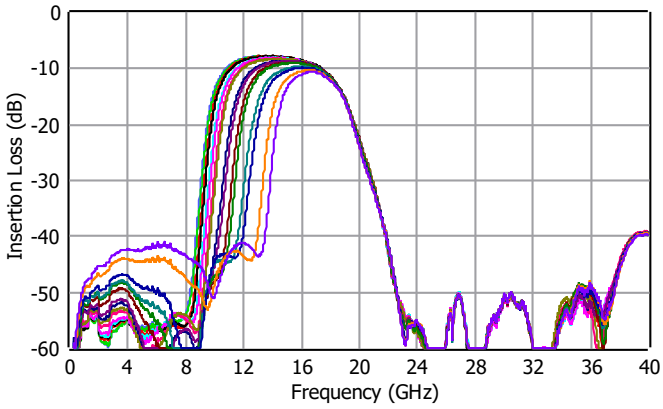
Input Return Loss, 11 to 18 GHz, Low Pass Tuning



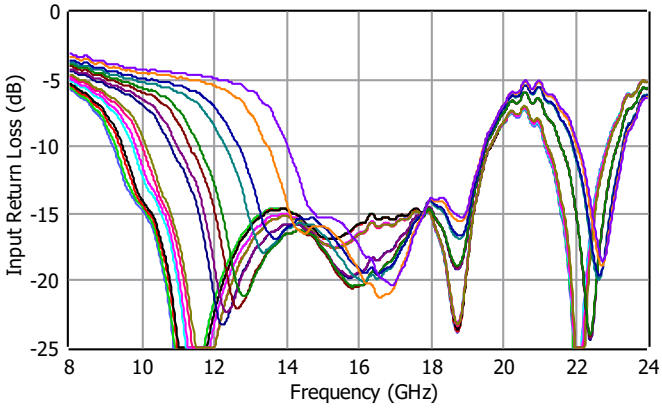
Output Return Loss, 11 to 18 GHz, Low Pass Tuning



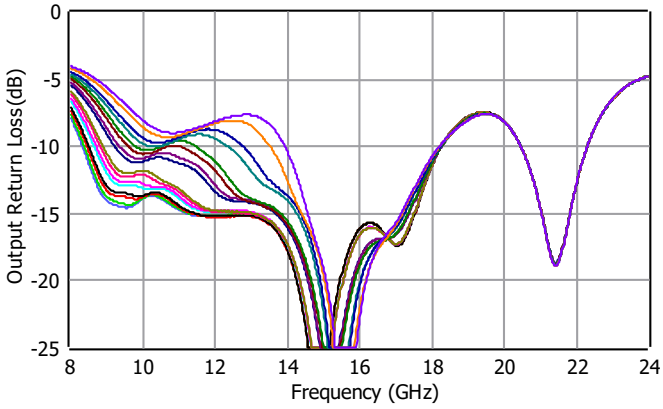
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Input Return Loss, 11 to 18 GHz, High Pass Tuning



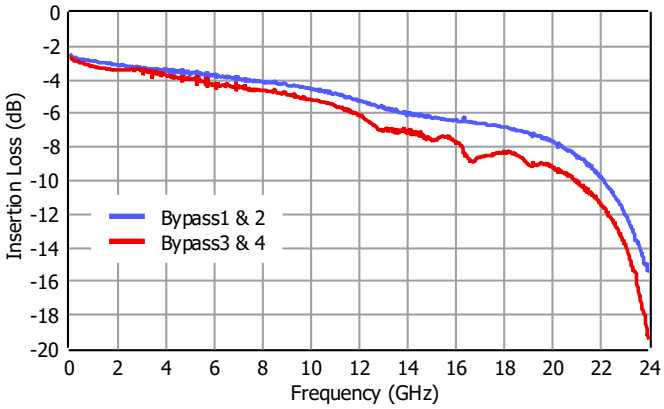
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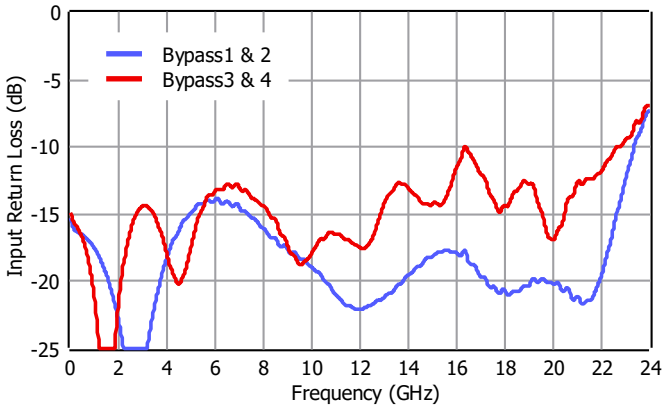
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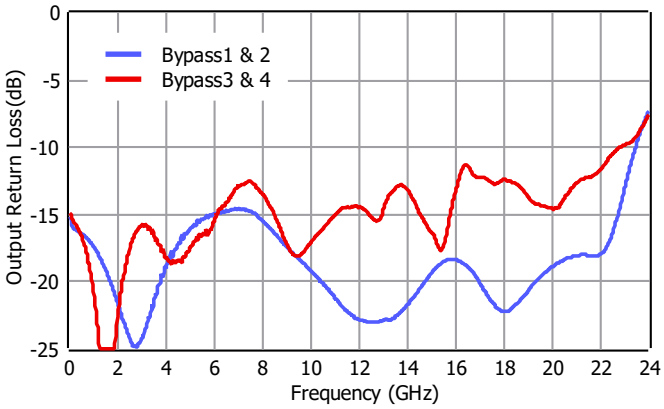
Insertion Loss, Bypass



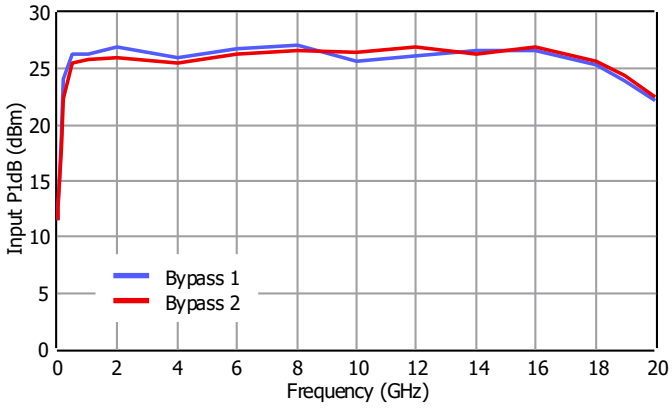
Input Return Loss, Bypass



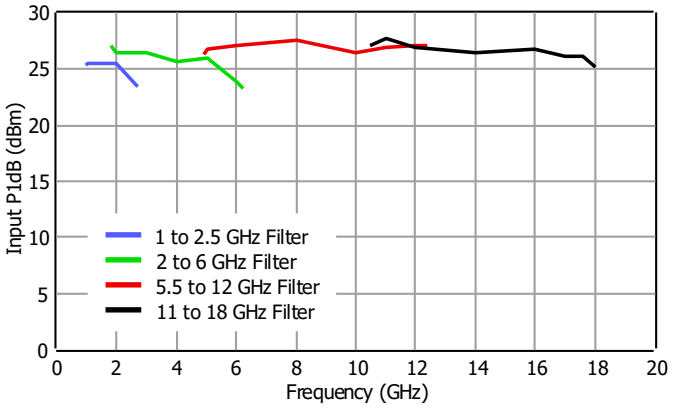
Output Return Loss, Bypass



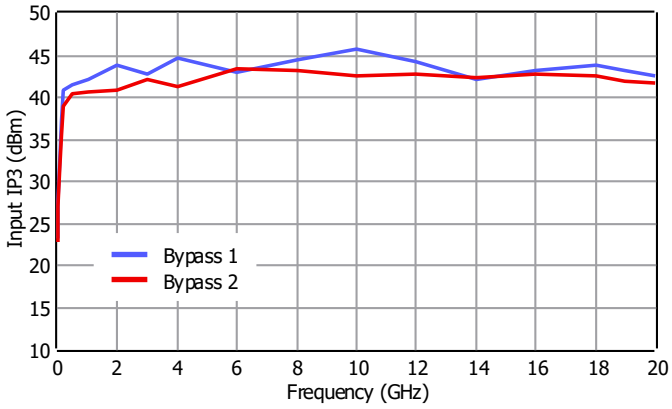
Input P1dB, Bypass Path



Input P1dB, Filter Path



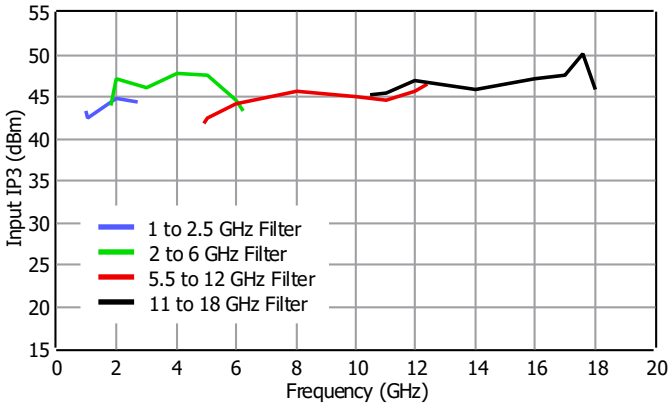
Input IP3 at Pout = 0 dBm/tone, Bypass Path



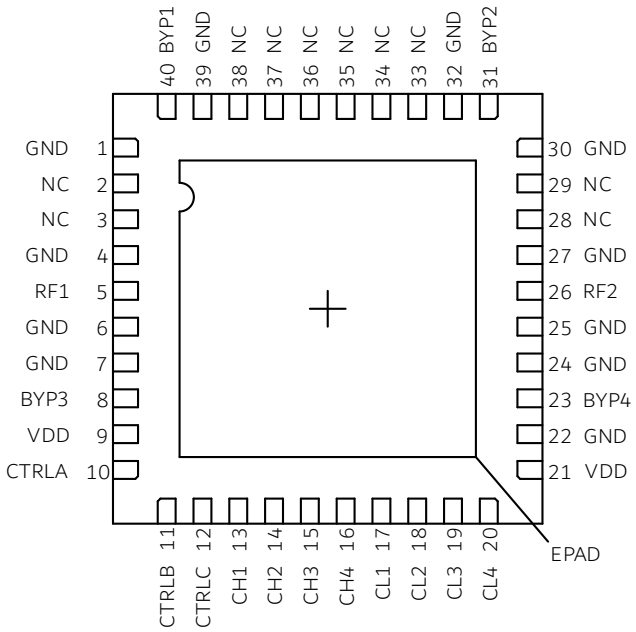
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Input IP3 at Pout = 0 dBm/tone, Filter Path



Pin Description (Top View)



Pin Number	Pin Name	Description
5	RF IN	RF input/output pin. Wideband external DC block capacitor is required.
26	RF OUT	RF input/output pin. Wideband external DC block capacitor is required.
40	BYP1	RF bypass in/out pin. Wideband external DC block capacitor is required.
31	BYP2	RF bypass in/out pin. Wideband external DC block capacitor is required.
8	BYP3	RF bypass in/out pin. Wideband external DC block capacitor is required.
23	BYP4	RF bypass in/out pin. Wideband external DC block capacitor is required.
9, 21	VDD	Vdd supply pin.
10	CTRLA	Control A pin
11	CTRLB	Control B pin
12	CTRLC	Control C pin
13	VH1	High Pass Control Pin1
14	VH2	High Pass Control Pin2
15	VH3	High Pass Control Pin3
16	VH4	High Pass Control Pin4
17	VL1	Low Pass Control Pin1
18	VL2	Low Pass Control Pin2
19	VL3	Low Pass Control Pin3
20	VL4	Low Pass Control Pin4
2, 3, 28, 29, 33-38	NC	These pins are not internally connected. Can be grounded on the PCB.
1, 4, 6, 7, 22, 24, 25, 27, 30, 32, 39	GND	Ground.
41	EPAD	Exposed Pad on the bottom of the package should be connected to ground with multiple number of vias to reduce the inductance to the GND.

Control Interface

CTRLA	CTRLB	CTRLC	Filter Bank State
LOW	LOW	LOW	Bypass 1&2
LOW	LOW	HIGH	11 to 18 GHz Band Pass Filter
LOW	HIGH	LOW	5.5 to 12 GHz Band Pass Filter
LOW	HIGH	HIGH	Bypass 3&4
HIGH	LOW	LOW	2 to 6 GHz Band Pass Filter
HIGH	LOW	HIGH	1 to 2.5 GHz Band Pass Filter

1 – 2.5 GHz Band Pass Filter Control Interface

H4	H3	H2	H1	CTRLA	CTRLB	CTRLC	Typical High Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	HIGH	LOW	HIGH	0.96
LOW	LOW	LOW	HIGH	HIGH	LOW	HIGH	0.97
LOW	LOW	HIGH	LOW	HIGH	LOW	HIGH	0.98
LOW	LOW	HIGH	HIGH	HIGH	LOW	HIGH	0.99
LOW	HIGH	LOW	LOW	HIGH	LOW	HIGH	1
LOW	HIGH	LOW	HIGH	HIGH	LOW	HIGH	1.02
LOW	HIGH	HIGH	LOW	HIGH	LOW	HIGH	1.04
LOW	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	1.06
HIGH	LOW	LOW	LOW	HIGH	LOW	HIGH	1.08
HIGH	LOW	LOW	HIGH	HIGH	LOW	HIGH	1.1
HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	1.15
HIGH	LOW	HIGH	HIGH	HIGH	LOW	HIGH	1.17
HIGH	HIGH	LOW	LOW	HIGH	LOW	HIGH	1.25
HIGH	HIGH	LOW	HIGH	HIGH	LOW	HIGH	1.3
HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	1.4
HIGH	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	1.5

L4	L3	L2	L1	CTRLA	CTRLB	CTRLC	Typical Low Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	HIGH	LOW	HIGH	1.45
LOW	LOW	LOW	HIGH	HIGH	LOW	HIGH	1.5
LOW	LOW	HIGH	LOW	HIGH	LOW	HIGH	1.53
LOW	LOW	HIGH	HIGH	HIGH	LOW	HIGH	1.56
LOW	HIGH	LOW	LOW	HIGH	LOW	HIGH	1.6
LOW	HIGH	LOW	HIGH	HIGH	LOW	HIGH	1.65
LOW	HIGH	HIGH	LOW	HIGH	LOW	HIGH	1.7
LOW	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	1.75
HIGH	LOW	LOW	LOW	HIGH	LOW	HIGH	1.8
HIGH	LOW	LOW	HIGH	HIGH	LOW	HIGH	1.9
HIGH	LOW	HIGH	LOW	HIGH	LOW	HIGH	1.95
HIGH	LOW	HIGH	HIGH	HIGH	LOW	HIGH	2.05
HIGH	HIGH	LOW	LOW	HIGH	LOW	HIGH	2.2
HIGH	HIGH	LOW	HIGH	HIGH	LOW	HIGH	2.4
HIGH	HIGH	HIGH	LOW	HIGH	LOW	HIGH	2.5
HIGH	HIGH	HIGH	HIGH	HIGH	LOW	HIGH	2.8

2 – 6 GHz Band Pass Filter Control Interface

H4	H3	H2	H1	CTRLA	CTRLB	CTRLC	Typical High Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	HIGH	LOW	LOW	1.85
LOW	LOW	LOW	HIGH	HIGH	LOW	LOW	1.86
LOW	LOW	HIGH	LOW	HIGH	LOW	LOW	1.88
LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW	1.9
LOW	HIGH	LOW	LOW	HIGH	LOW	LOW	1.93
LOW	HIGH	LOW	HIGH	HIGH	LOW	LOW	1.96
LOW	HIGH	HIGH	LOW	HIGH	LOW	LOW	2
LOW	HIGH	HIGH	HIGH	HIGH	LOW	LOW	2.05
HIGH	LOW	LOW	LOW	HIGH	LOW	LOW	2.1
HIGH	LOW	LOW	HIGH	HIGH	LOW	LOW	2.16
HIGH	LOW	HIGH	LOW	HIGH	LOW	LOW	2.25
HIGH	LOW	HIGH	HIGH	HIGH	LOW	LOW	2.35
HIGH	HIGH	LOW	LOW	HIGH	LOW	LOW	2.45
HIGH	HIGH	LOW	HIGH	HIGH	LOW	LOW	2.6
HIGH	HIGH	HIGH	LOW	HIGH	LOW	LOW	2.85
HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	3.2

L4	L3	L2	L1	CTRLA	CTRLB	CTRLC	Typical Low Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	HIGH	LOW	LOW	2.98
LOW	LOW	LOW	HIGH	HIGH	LOW	LOW	3
LOW	LOW	HIGH	LOW	HIGH	LOW	LOW	3.1
LOW	LOW	HIGH	HIGH	HIGH	LOW	LOW	3.15
LOW	HIGH	LOW	LOW	HIGH	LOW	LOW	3.3
LOW	HIGH	LOW	HIGH	HIGH	LOW	LOW	3.35
LOW	HIGH	HIGH	LOW	HIGH	LOW	LOW	3.45
LOW	HIGH	HIGH	HIGH	HIGH	LOW	LOW	3.55
HIGH	LOW	LOW	LOW	HIGH	LOW	LOW	3.95
HIGH	LOW	LOW	HIGH	HIGH	LOW	LOW	4
HIGH	LOW	HIGH	LOW	HIGH	LOW	LOW	4.2
HIGH	LOW	HIGH	HIGH	HIGH	LOW	LOW	4.4
HIGH	HIGH	LOW	LOW	HIGH	LOW	LOW	4.9
HIGH	HIGH	LOW	HIGH	HIGH	LOW	LOW	5.25
HIGH	HIGH	HIGH	LOW	HIGH	LOW	LOW	5.7
HIGH	HIGH	HIGH	HIGH	HIGH	LOW	LOW	6.25

5.5 – 12 GHz Band Pass Filter Control Interface

H4	H3	H2	H1	CTRLA	CTRLB	CTRLC	Typical High Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	LOW	HIGH	LOW	4.96
LOW	LOW	LOW	HIGH	LOW	HIGH	LOW	4.98
LOW	LOW	HIGH	LOW	LOW	HIGH	LOW	5
LOW	LOW	HIGH	HIGH	LOW	HIGH	LOW	5.1
LOW	HIGH	LOW	LOW	LOW	HIGH	LOW	5.2
LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	5.3
LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW	5.4
LOW	HIGH	HIGH	HIGH	LOW	HIGH	LOW	5.5
HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	5.8
HIGH	LOW	LOW	HIGH	LOW	HIGH	LOW	5.9
HIGH	LOW	HIGH	LOW	LOW	HIGH	LOW	6.2
HIGH	LOW	HIGH	HIGH	LOW	HIGH	LOW	6.4
HIGH	HIGH	LOW	LOW	LOW	HIGH	LOW	6.9
HIGH	HIGH	LOW	HIGH	LOW	HIGH	LOW	7.2
HIGH	HIGH	HIGH	LOW	LOW	HIGH	LOW	7.9
HIGH	HIGH	HIGH	HIGH	LOW	HIGH	LOW	8.6

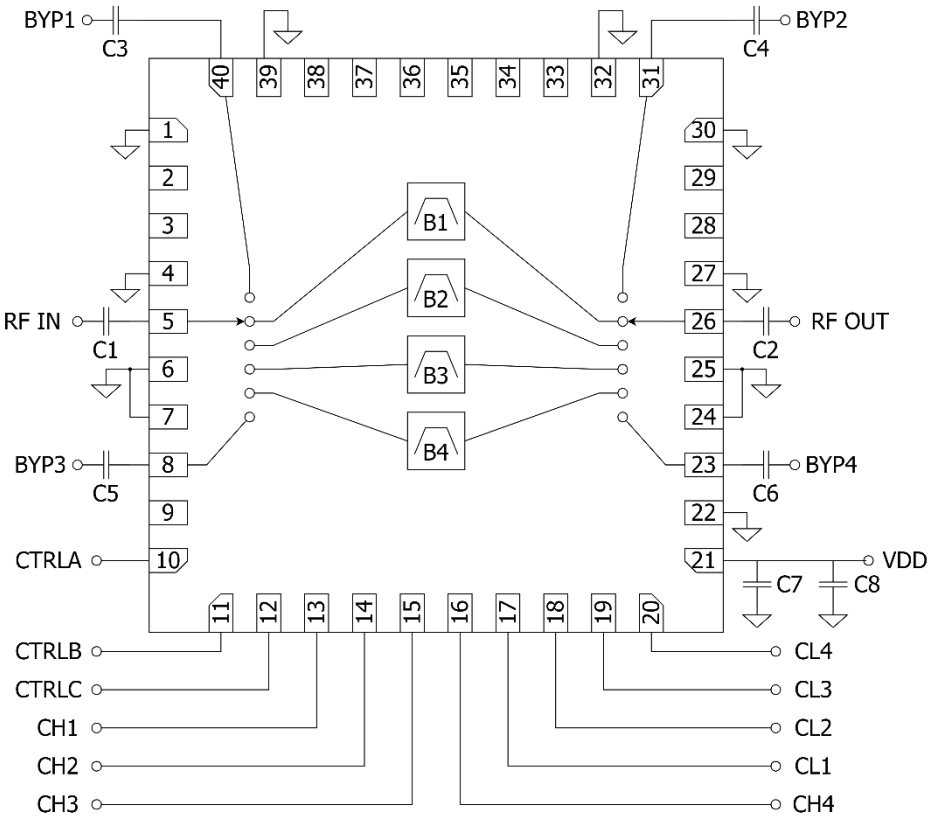
L4	L3	L2	L1	CTRLA	CTRLB	CTRLC	Typical Low Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	LOW	HIGH	LOW	7.75
LOW	LOW	LOW	HIGH	LOW	HIGH	LOW	7.9
LOW	LOW	HIGH	LOW	LOW	HIGH	LOW	8
LOW	LOW	HIGH	HIGH	LOW	HIGH	LOW	8.15
LOW	HIGH	LOW	LOW	LOW	HIGH	LOW	8.5
LOW	HIGH	LOW	HIGH	LOW	HIGH	LOW	8.6
LOW	HIGH	HIGH	LOW	LOW	HIGH	LOW	8.8
LOW	HIGH	HIGH	HIGH	LOW	HIGH	LOW	9
HIGH	LOW	LOW	LOW	LOW	HIGH	LOW	9.5
HIGH	LOW	LOW	HIGH	LOW	HIGH	LOW	9.7
HIGH	LOW	HIGH	LOW	LOW	HIGH	LOW	10
HIGH	LOW	HIGH	HIGH	LOW	HIGH	LOW	10.3
HIGH	HIGH	LOW	LOW	LOW	HIGH	LOW	11
HIGH	HIGH	LOW	HIGH	LOW	HIGH	LOW	11.5
HIGH	HIGH	HIGH	LOW	LOW	HIGH	LOW	12
HIGH	HIGH	HIGH	HIGH	LOW	HIGH	LOW	12.4

11 – 18 GHz Band Pass Filter Control Interface

H4	H3	H2	H1	CTRLA	CTRLB	CTRLC	Typical High Pass 3dB Cutoff Frequency (GHz)	L4	L3	L2	L1	CTRLA	CTRLB	CTRLC	Typical Low Pass 3dB Cutoff Frequency (GHz)
LOW	LOW	LOW	LOW	LOW	LOW	HIGH	10.6	LOW	LOW	LOW	LOW	LOW	LOW	HIGH	13
LOW	LOW	LOW	HIGH	LOW	LOW	HIGH	10.65	LOW	LOW	LOW	HIGH	LOW	LOW	HIGH	13.25
LOW	LOW	HIGH	LOW	LOW	LOW	HIGH	10.75	LOW	LOW	HIGH	LOW	LOW	LOW	HIGH	13.4
LOW	LOW	HIGH	HIGH	LOW	LOW	HIGH	10.8	LOW	LOW	HIGH	HIGH	LOW	LOW	HIGH	13.5
LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	11	LOW	HIGH	LOW	LOW	LOW	LOW	HIGH	13.9
LOW	HIGH	LOW	HIGH	LOW	LOW	HIGH	11.15	LOW	HIGH	LOW	HIGH	LOW	LOW	HIGH	14.1
LOW	HIGH	HIGH	LOW	LOW	LOW	HIGH	11.4	LOW	HIGH	HIGH	LOW	LOW	LOW	HIGH	14.25
LOW	HIGH	HIGH	HIGH	LOW	LOW	HIGH	11.5	LOW	HIGH	HIGH	HIGH	LOW	LOW	HIGH	14.5
HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	12.1	HIGH	LOW	LOW	LOW	LOW	LOW	HIGH	15
HIGH	LOW	LOW	HIGH	LOW	LOW	HIGH	12.25	HIGH	LOW	LOW	HIGH	LOW	LOW	HIGH	15.25
HIGH	LOW	HIGH	LOW	LOW	LOW	HIGH	12.6	HIGH	LOW	HIGH	LOW	LOW	LOW	HIGH	15.5
HIGH	LOW	HIGH	HIGH	LOW	LOW	HIGH	12.8	HIGH	LOW	HIGH	HIGH	LOW	LOW	HIGH	15.85
HIGH	HIGH	LOW	LOW	LOW	LOW	HIGH	13.5	HIGH	HIGH	LOW	LOW	LOW	LOW	HIGH	16.5
HIGH	HIGH	LOW	HIGH	LOW	LOW	HIGH	13.8	HIGH	HIGH	LOW	HIGH	LOW	LOW	HIGH	16.85
HIGH	HIGH	HIGH	LOW	LOW	LOW	HIGH	14.5	HIGH	HIGH	HIGH	LOW	LOW	LOW	HIGH	17.3
HIGH	HIGH	HIGH	HIGH	LOW	LOW	HIGH	14.9	HIGH	HIGH	HIGH	HIGH	LOW	LOW	HIGH	18

Applications Information

Signal entering from RF IN goes to RF OUT with band pass filtering.
A typical application schematic to operate the filter is given below.



C1, C2, C3, C4, C5 and C6 are DC block capacitors. It is recommended to use wideband low loss DC block capacitors to achieve the best performance. Using low profile capacitors is also possible, which will result in additional loss.

C7, C8, C9 and C10 are used to filter out the ripples and unwanted signals coming from the Vdd supply. Using additional capacitors in parallel to C7, C8, C9 and C10 will improve this filtering. If this filtering is of no concern, then filters can be operated without C7, C8, C9 and C10.

Small signal data plots are gathered with probe PCB measurements to generate plots shown in this document.

Large signal data are generated with connectorized evaluation of PCB measurements. The PCB trace and connector transition losses are de-embedded, to generate plots shown in this document.

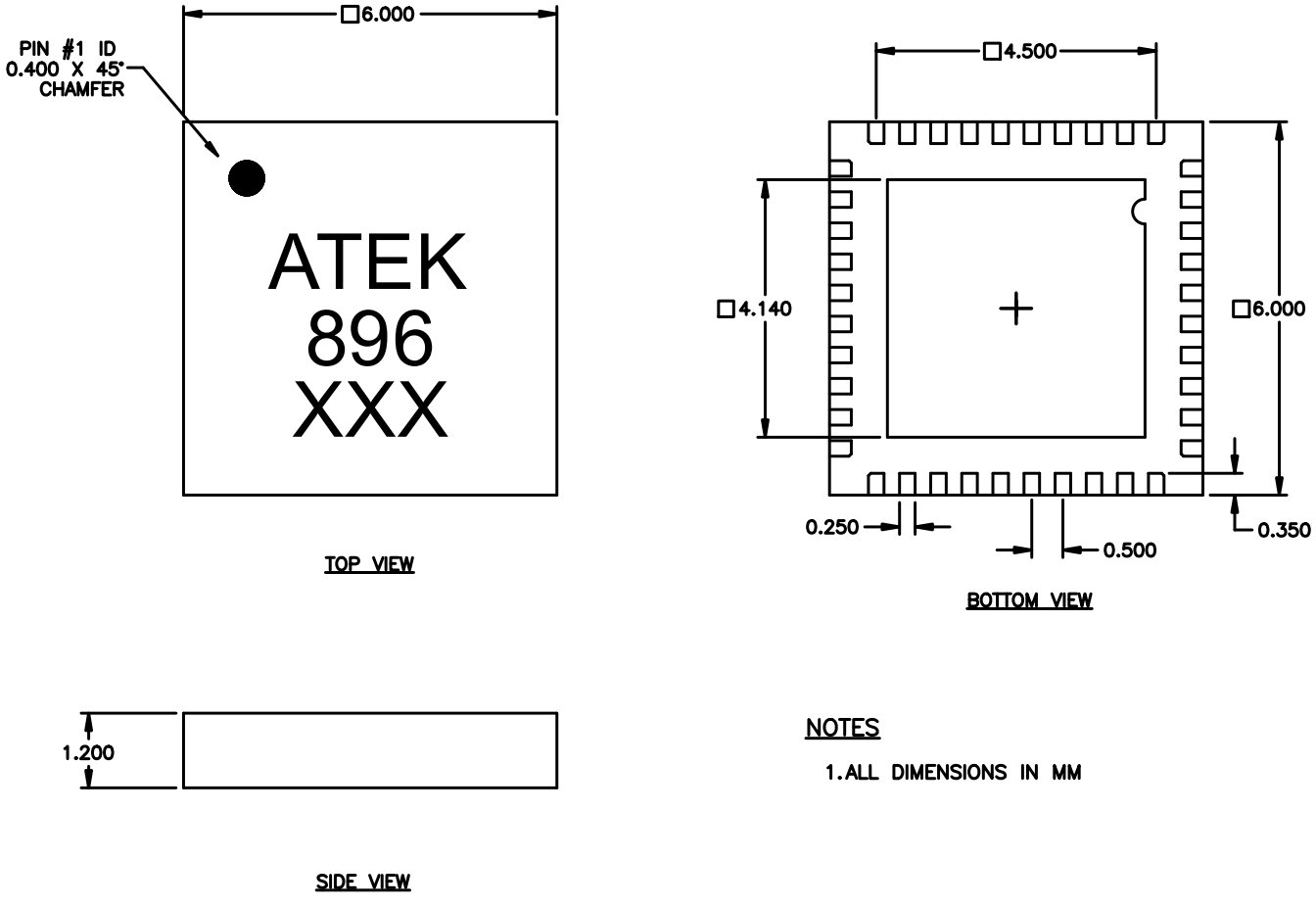
The NC pins of the filter are connected to the GND on the PCBs used to generate the plots shown in this document.

Absolute Maximum Ratings

Parameter	Value/Range
Supply Voltage	+6V
VCTRL (VCTRLA, VCTRLB, VCTRLC) If VCTRL> VDD, then VCTRL – VDD must be lower than 2V.	+6V
Supply Current	19mA
Control Current (ICTRLA + ICTRLB + ICTRLC + ICTRLD)	6.5mA
Channel Temperature	150 °C
Thermal Resistance	90 °C/W
RF Input Power	30dBm
Storage Temperature	−55 to +125 °C
Operating Temperature	−40 to +85 °C

Operation of this device outside the parameter ranges given above may cause damage. These conditions should not be applied simultaneously.

Mechanical and Marking Information



Handling Precautions



Caution!
ESD-Sensitive Device
Handle Accordingly

Contact Information

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Notice

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Revisions

Revision No	Revision Date	Revision Reason	Section / Page No
0.1	06.06.2026	Initial Release	
0.2	07.06.2026	Format Update	
0.3	23.06.2026	Large Signal Data Added	
0.4	02.10.2026	Format and Context Update	