

## Product Description

ATEK822P4 is a tunable low pass filter with low in band loss and high rejection. Filter is controlled by 4-bit GPIO control interface. 15 filter covering from 0.35 to 1.1 GHz frequency band, and an additional state for wideband 1.7 GHz LPF.

Filter is developed in highly repeatable MMIC manufacturing process, which results in minimal part to part variation.

Bias and control voltages of the filters are positive, which eliminates the need for negative voltage rails.

Filter is housed in compact 4x4 mm low cost SMD package. Input and output are matched to 50 ohms internally.

Evaluation Board, bare die, custom package, and module options are available upon request.

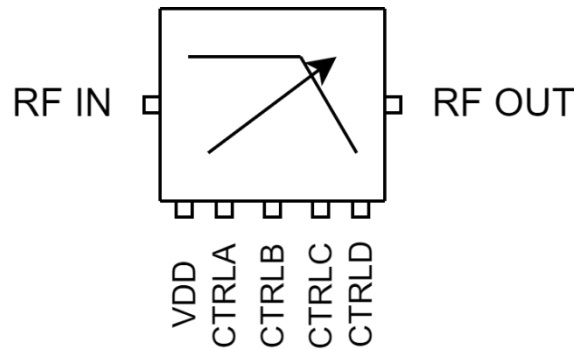
## Product Features

- Insertion Loss: 2.5 dB
- Input IP3: 45 dBm
- 40 dBc Rejection
- Positive Supply
- 4x4 mm compact size

## Applications

- Wideband Receivers
- Telecommunication
- Test and Measurement
- SATCOM
- SDR

## Functional Block Diagram



## Electrical Specifications

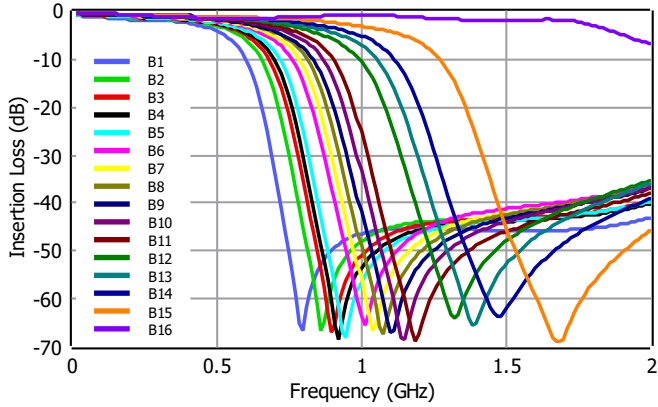
Conditions unless otherwise specified:  $V_{DD} = 5V$ , Typical,  $T = 25\text{ C}$ .

Parameter	Min	Typ	Max	Units
Operational Frequency Range	0.35	1.1		GHz
Insertion Loss		2.5		dB
Input Return Loss		-15		dB
Output Return Loss		-15		dB
Input IP3		45		dBm
Switching Speed		TBD		ns
DC Supply Voltage (Vdd)	3	5	5.5	V
DC Supply Current		0.5		mA
Logic Level (CTRLA-B-C-D)	Low	-0.1	0.5	V
	High	3	5.5	
Operating Temperature	-40		85	°C

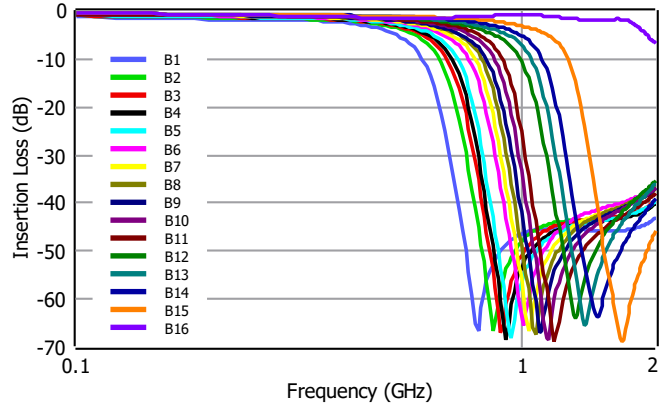
**Typical Performance Plots**

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

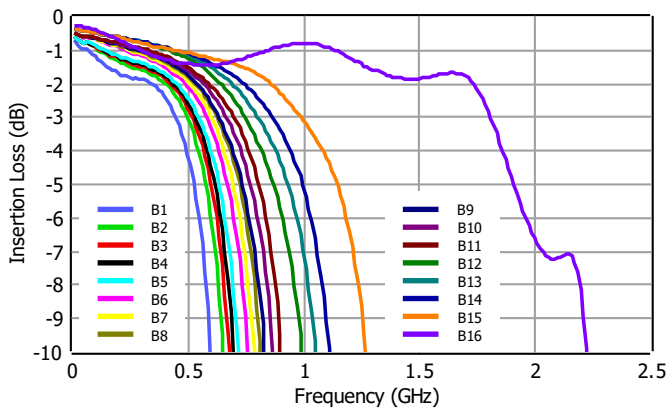
Insertion Loss



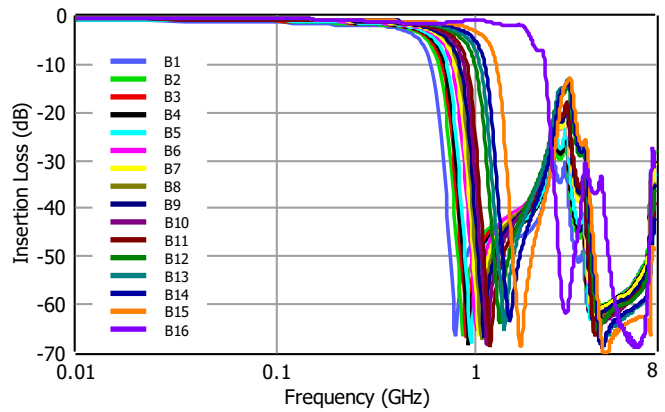
Insertion Loss, Log Scale



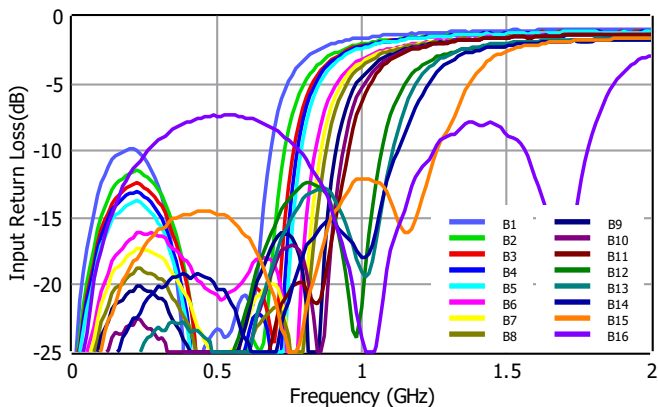
Insertion Loss



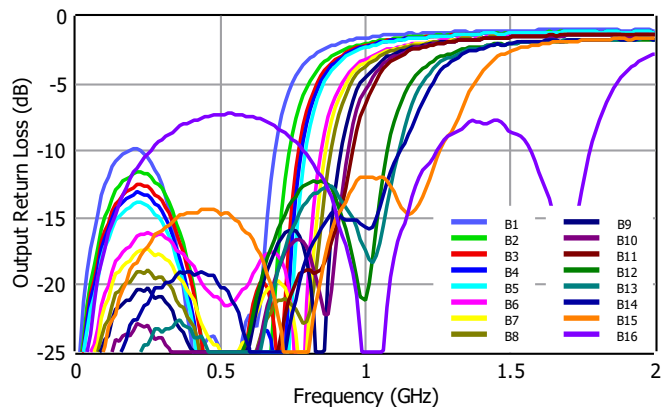
Insertion Loss, Log Scale



Input Return Loss



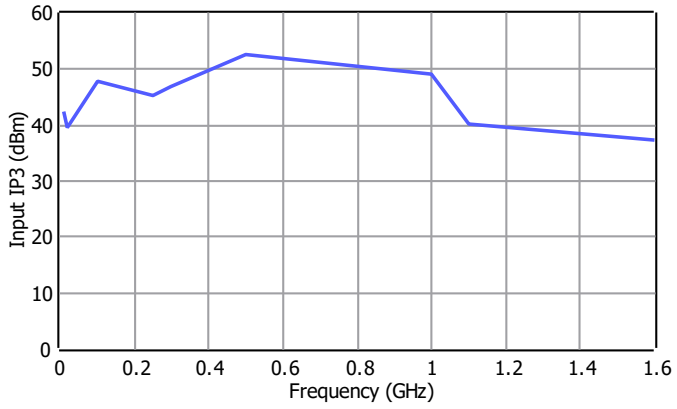
Output Return Loss



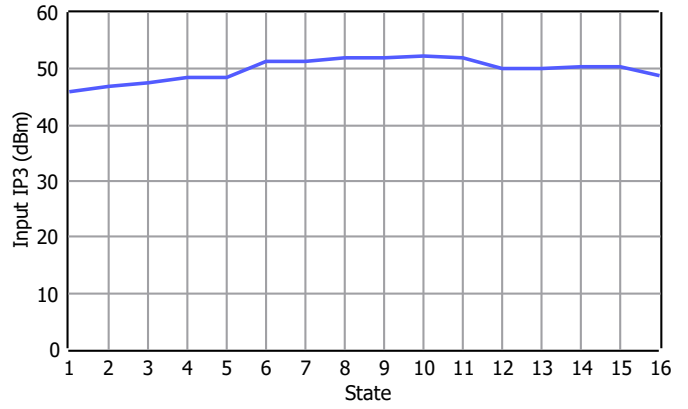
**Typical Performance Plots**

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

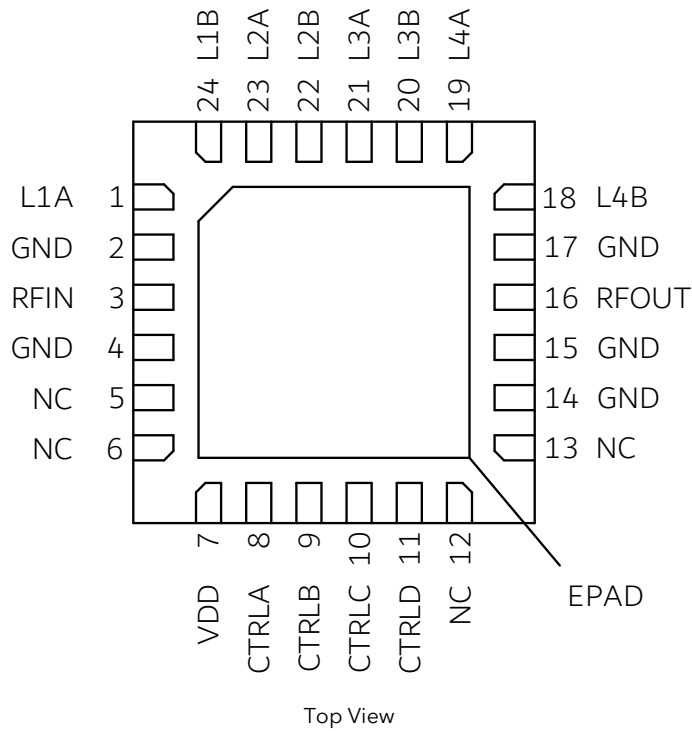
Input IP3, Filter Path



Input IP3 at 250MHz vs. States



## Pin Description



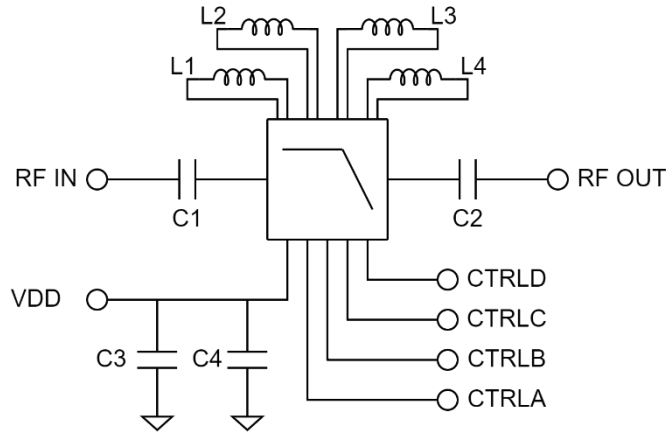
Pin Number	Pin Name	Description
3	RF IN	RF input pin. Wideband external DC block capacitor is required.
16	RF OUT	RF output pin. Wideband external DC block capacitor is required.
7	VDD	Vdd bias pin.
8	CTRLA	Control pin.
9	CTRLB	Control pin.
10	CTRLC	Control pin.
11	CTRLD	Control pin.
1	L1A	External inductor connection.
24	L1B	External inductor connection.
23	L2A	External inductor connection.
22	L2B	External inductor connection.
21	L3A	External inductor connection.
20	L3B	External inductor connection.
19	L4A	External inductor connection.
18	L4B	External inductor connection.
1, 5, 6, 12, 13, 18-24	NC	These pins are not internally connected. Can be grounded on the PCB.
2, 4, 14, 15, 17	GND	Ground.
24	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	CTRLD	Filter State	Typical 3dB Cutoff Frequency (GHz)
HIGH	HIGH	HIGH	HIGH	Band1	0.484
LOW	HIGH	HIGH	HIGH	Band2	0.522
HIGH	LOW	HIGH	HIGH	Band3	0.547
HIGH	HIGH	LOW	HIGH	Band4	0.560
HIGH	HIGH	HIGH	LOW	Band5	0.584
LOW	LOW	HIGH	HIGH	Band6	0.610
LOW	HIGH	LOW	HIGH	Band7	0.620
HIGH	LOW	LOW	HIGH	Band8	0.647
LOW	HIGH	HIGH	LOW	Band9	0.660
HIGH	LOW	HIGH	LOW	Band10	0.684
HIGH	HIGH	LOW	LOW	Band11	0.722
LOW	LOW	LOW	HIGH	Band12	0.772
LOW	LOW	HIGH	LOW	Band13	0.847
LOW	HIGH	LOW	LOW	Band14	0.910
HIGH	LOW	LOW	LOW	Band15	1.100
LOW	LOW	LOW	LOW	Band16	1.910

## Applications Information

Signal entering from RF input goes to RF output with low pass filtering. Typical application schematic to operate the filter is given below.



C1 and C2 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.

C3 and C4 are used to filter out the ripples and unwanted signals coming from the Vdd supply. Using additional capacitors in parallel to C3 and C4 will improve this filtering. If this filtering is of no concern, then filters can be operated without C3 and C4.

L1, L2, L3 and L4 inductors are high Q RF inductors.

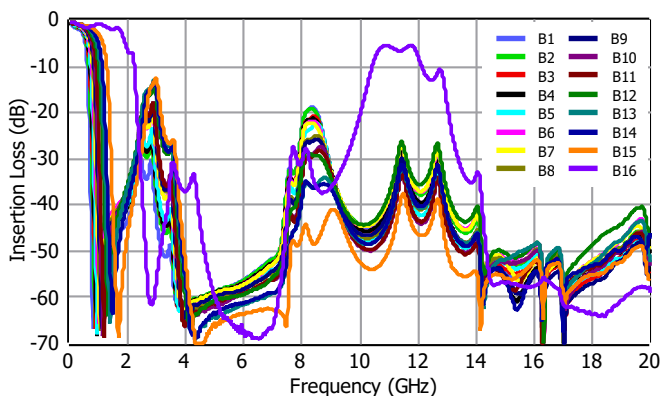
Large signal data is generated with connectorized evaluation PCB measurements. Then the input loss of the PCB is de-embedded from the large signal measurement data across frequency, to generate the large signal data shown in this document.

Defined voltages in specification table are valid when Vdd supply and control voltages are equal such as  $V_{dd} = V_{ctrls} = 5V$  or  $V_{dd} = V_{ctrls} = 3.3V$ .

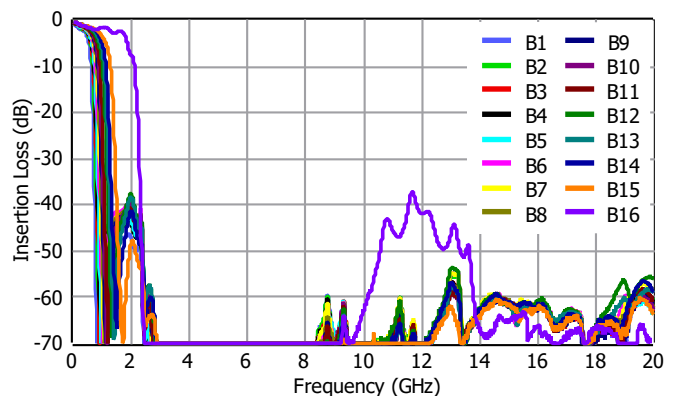
The NC pins of the filter are connected to the GND on the PCBs used to generate the plots shown in this document.

In order to reduce high frequency peaking around 11 GHz, a low-cost COTS SMD filter can be utilized. In the case below, the Mini-Circuits® LFCG-1700+ LPF is chosen.

ATEK822P4 Insertion Loss, Wideband



ATEK822P4 with LPF Insertion Loss, Wideband

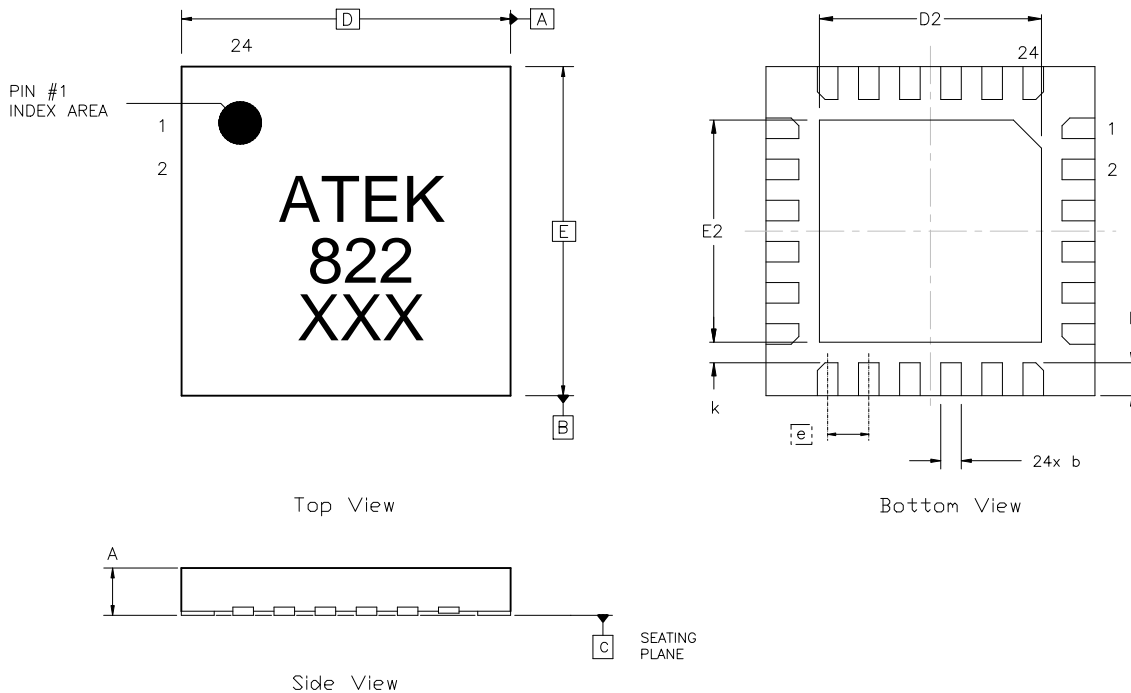


## Absolute Maximum Ratings

Parameter	Value/Range
Supply Voltage (Vdd)	TBD
RF Input Power	TBD
Storage Temperature	-55 to +125°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



NOTES:  
1) ALL DIMENSIONS IN MM

SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A, $\varnothing$	0.80	1.00	E2	2.60	2.80
b	0.18	0.30	e	0.50	BSC
D	4.00	BSC	k	0.20	-
D2	2.60	2.80	L	0.35	0.45
E	4.00	BSC			

## Handling Precautions



Caution!  
ESD-Sensitive Device  
Handle Accordingly

## Contact Information

For the latest specifications, additional product information, support, and sales.

Web: [www.atekmidas.com](http://www.atekmidas.com)

Tel: +90-212-483-71-67

Email: [support@atekmidas.com](mailto:support@atekmidas.com)

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## Revisions

Revision No	Revision Date	Revision Reason	Section / Page No
1.0	19.01.2023	Initial Release	
1.1	13.05.2023	Application Information Added	
1.2	02.10.2024	Control Interfaces Table Expanded	