Product Description

ATEK821P4 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 1 to 2.5 GHz frequency band, and an additional state for wideband 3.8 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.

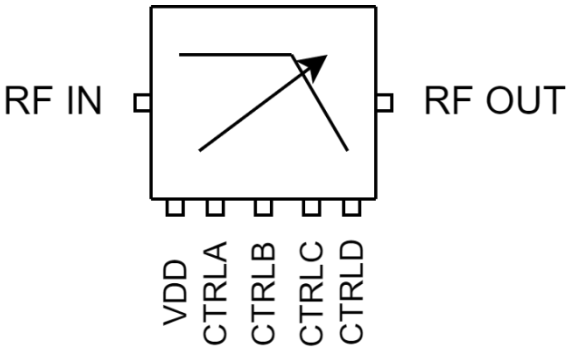
Product Features

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

Applications

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

Functional Block Diagram



Electrical Specifications

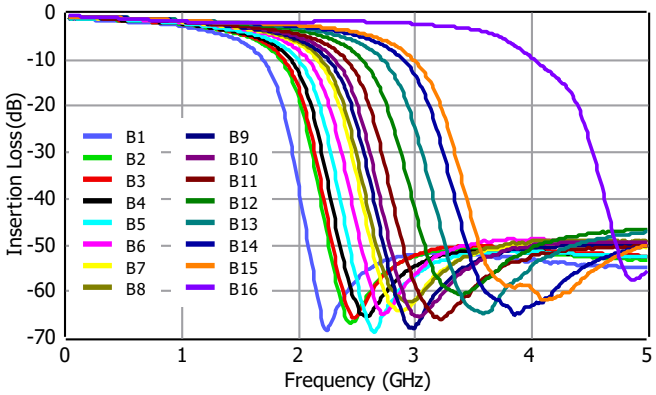
Conditions unless otherwise specified: V_{DD} = 5 V, Typical, T = 25 C.

Parameter		Min	Typ	Max	Units
Operational Frequency Range		1	2.5		GHz
Insertion Loss			2.5		dB
Input Return Loss			-18		dB
Output Return Loss			-18		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

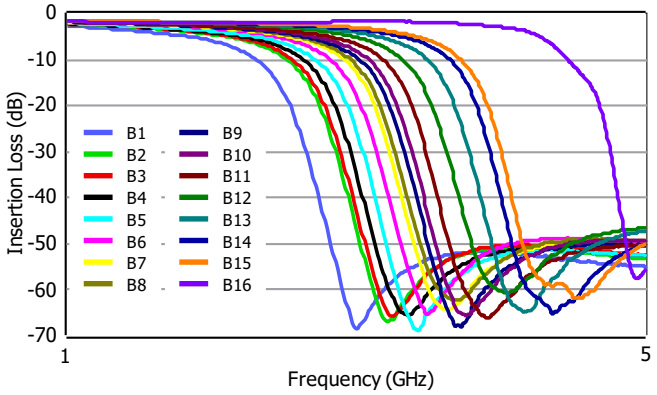
Typical Performance Plots

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

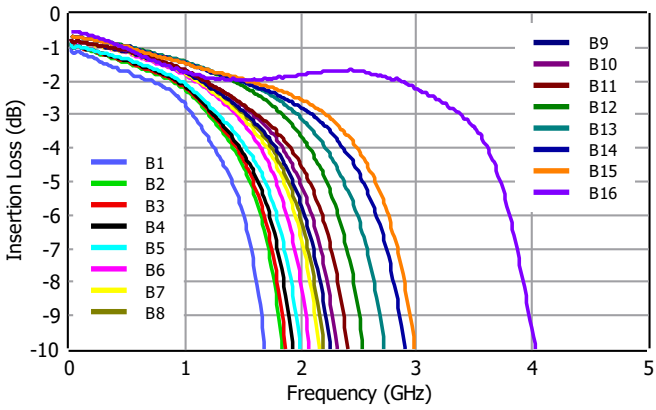
Insertion Loss



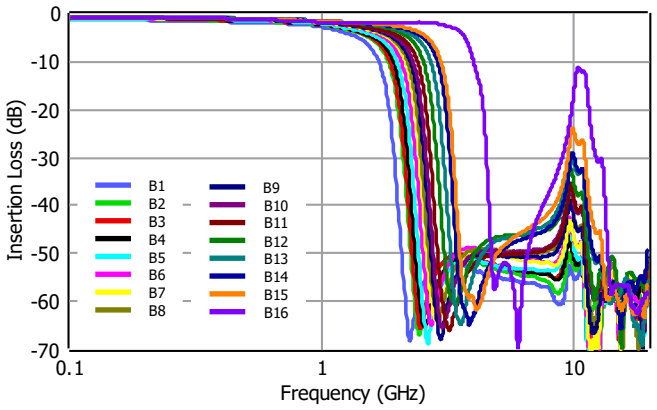
Insertion Loss, Log Scale



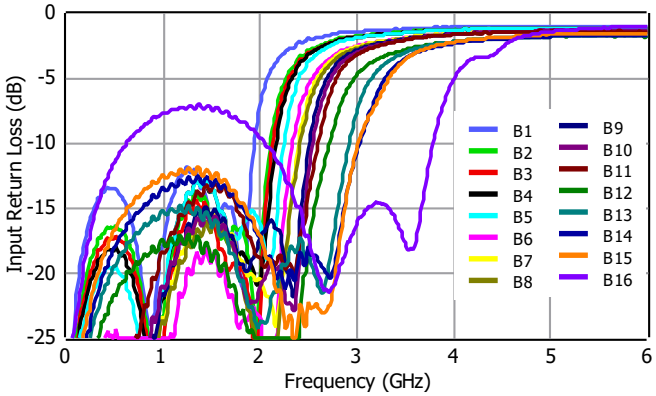
Insertion Loss



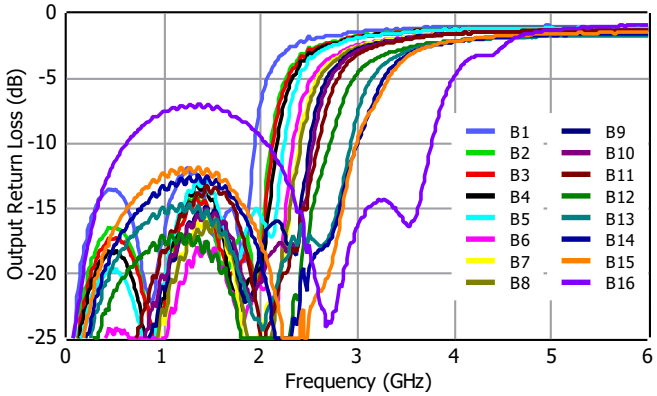
Insertion Loss, Log Scale



Input Return Loss



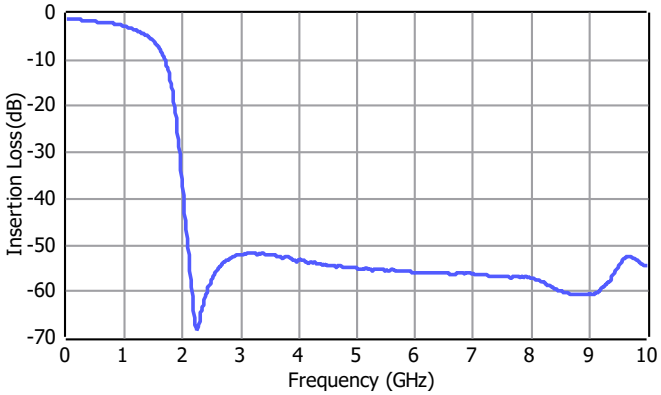
Output Return Loss



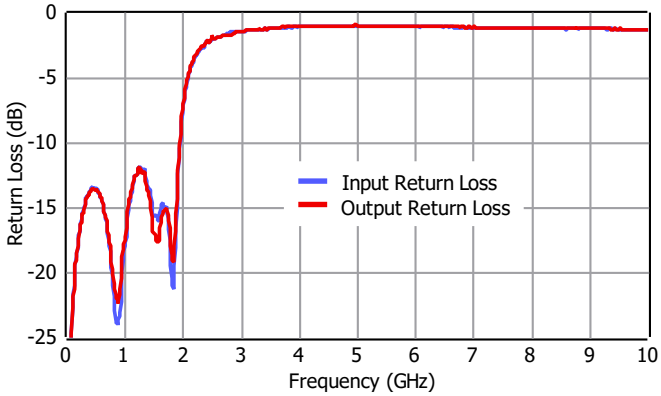
Typical Performance Plots

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

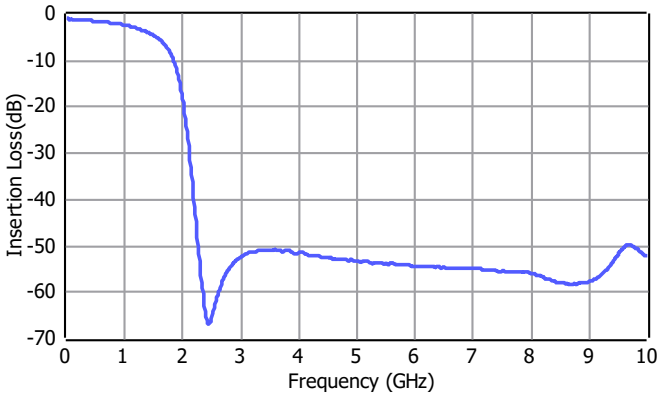
Band 1 Insertion Loss



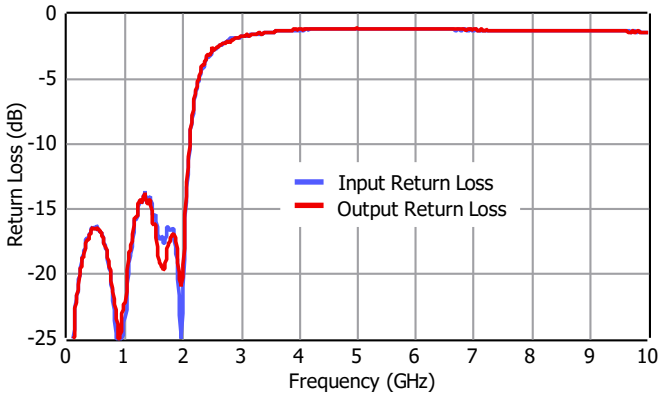
Band 1 Return Loss



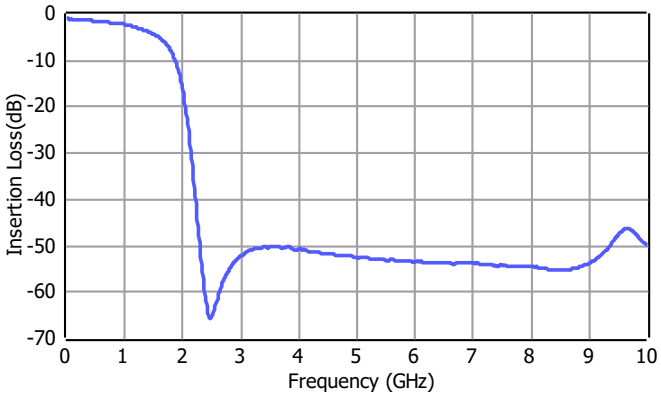
Band 2 Insertion Loss



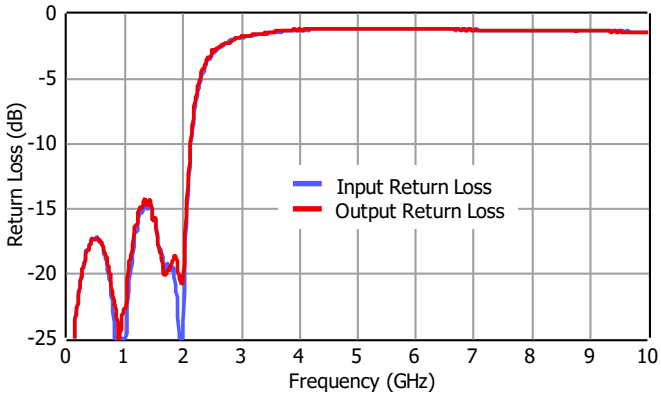
Band 2 Return Loss



Band 3 Insertion Loss



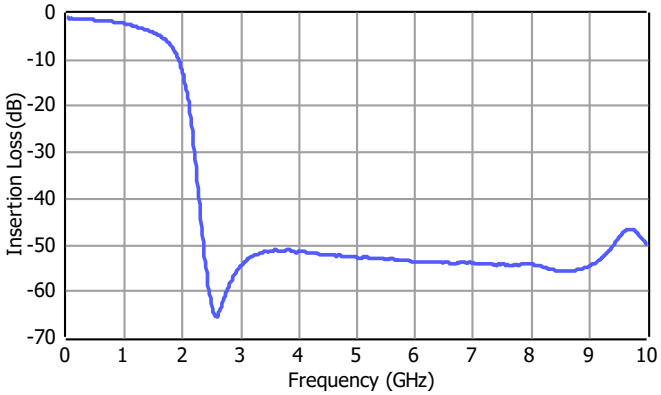
Band 3 Return Loss



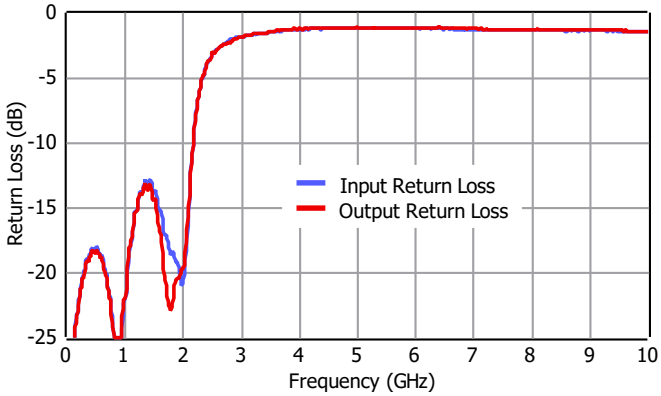
Typical Performance Plots

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

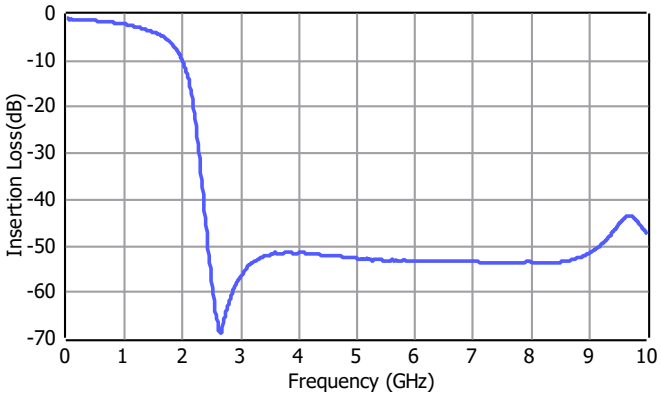
Band 4 Insertion Loss



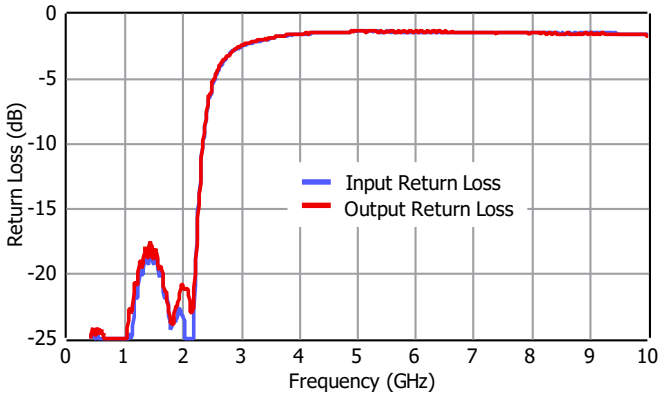
Band 4 Return Loss



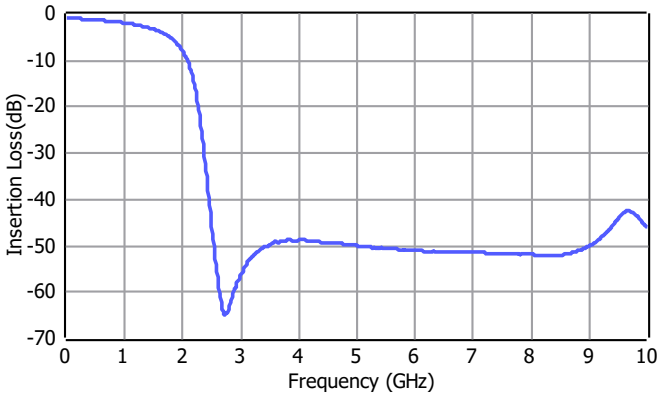
Band 5 Insertion Loss



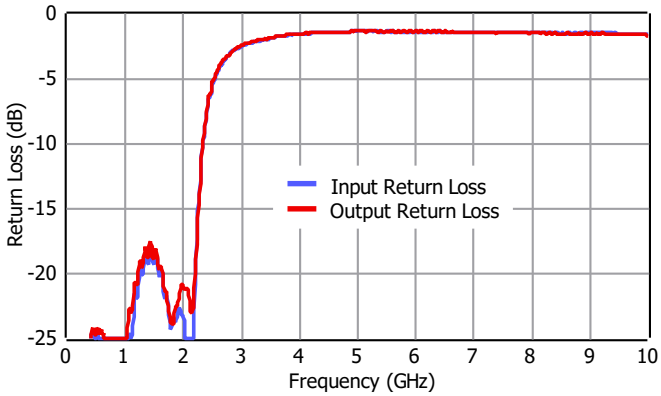
Band 5 Return Loss



Band 6 Insertion Loss



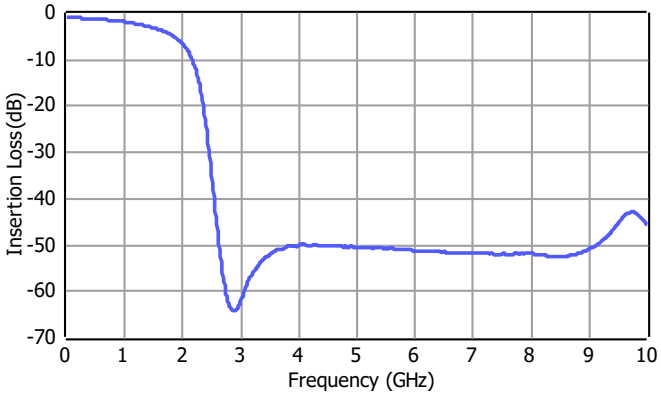
Band 6 Return Loss



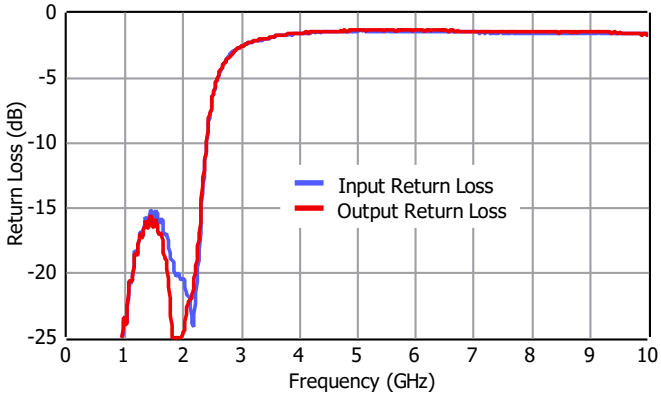
Typical Performance Plots

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

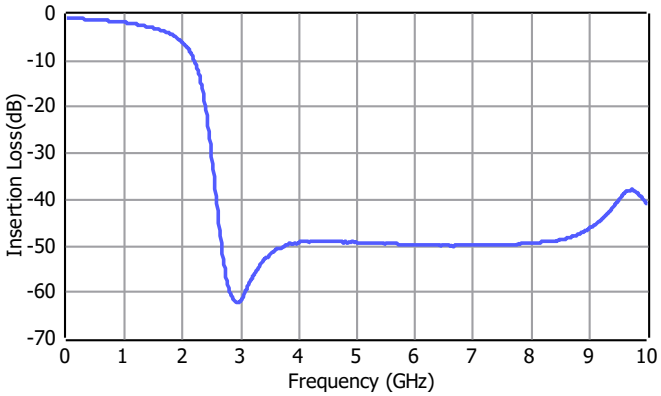
Band 7 Insertion Loss



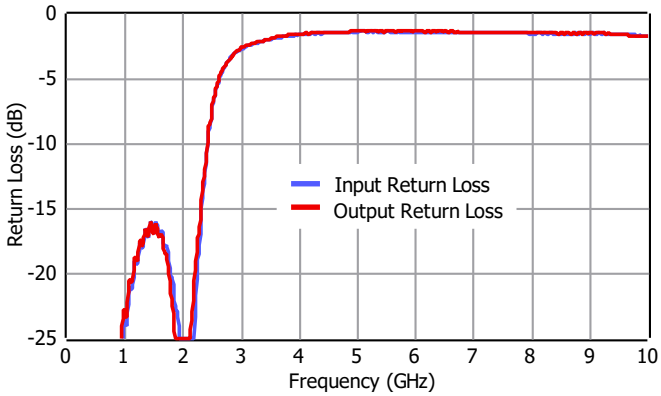
Band 7 Return Loss



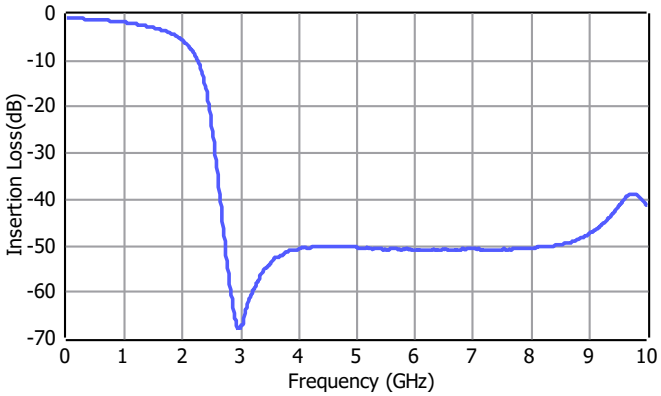
Band 8 Insertion Loss



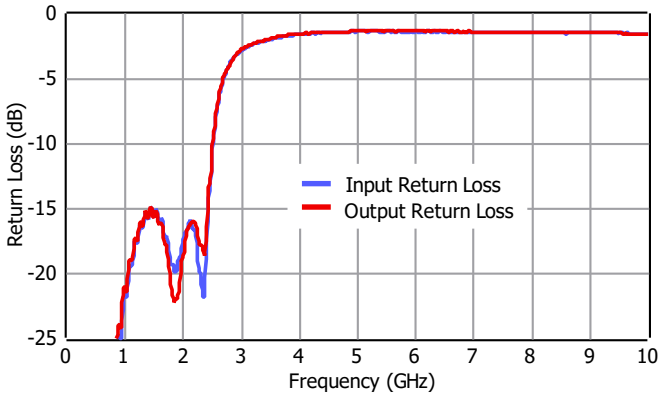
Band 8 Return Loss



Band 9 Insertion Loss



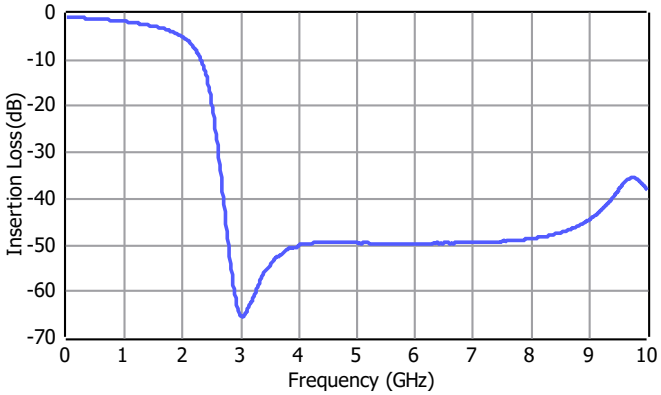
Band 9 Return Loss



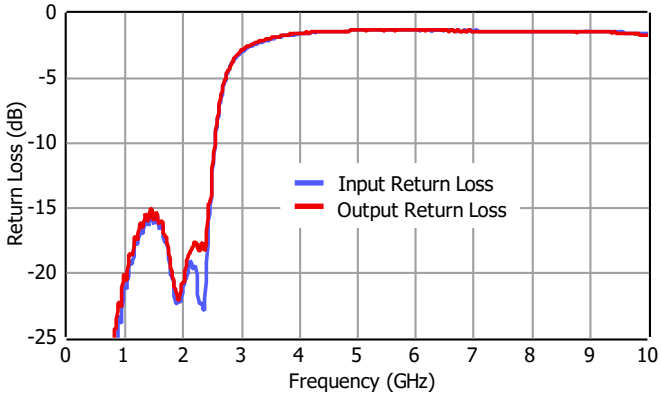
Typical Performance Plots

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

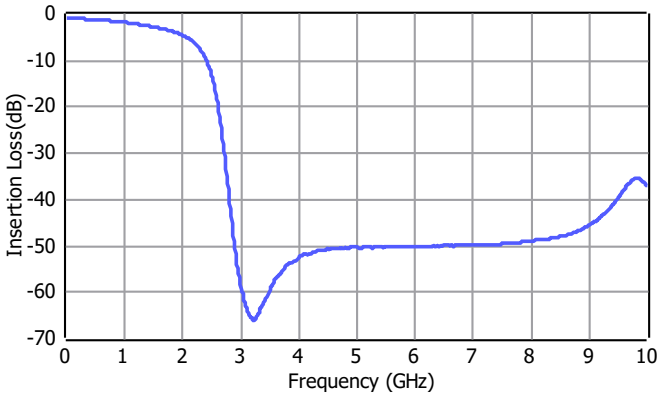
Band 10 Insertion Loss



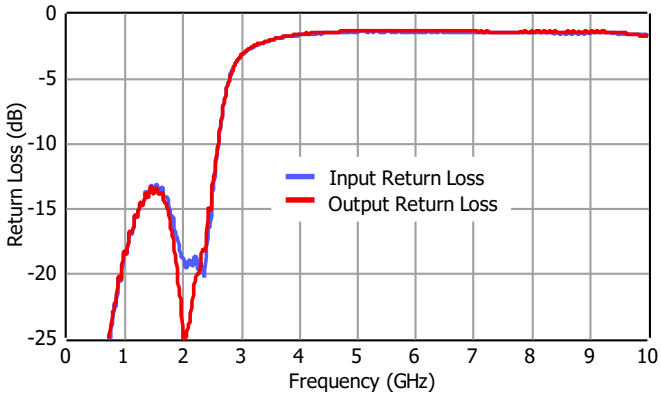
Band 10 Return Loss



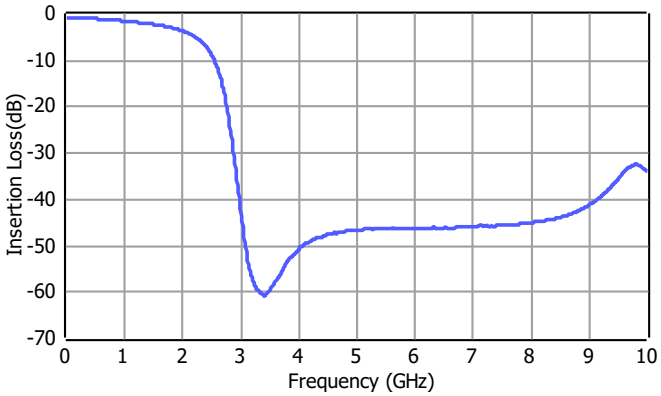
Band 11 Insertion Loss



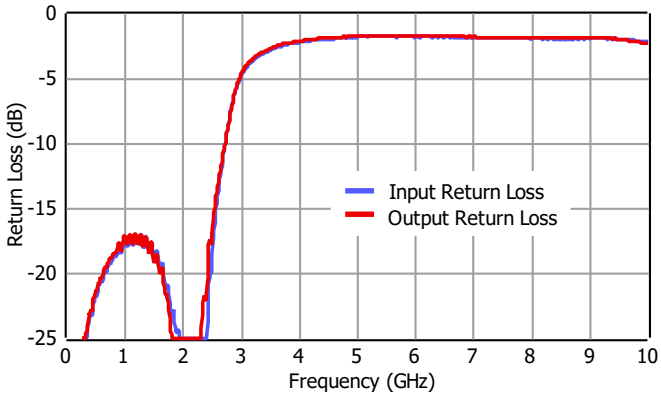
Band 11 Return Loss



Band 12 Insertion Loss



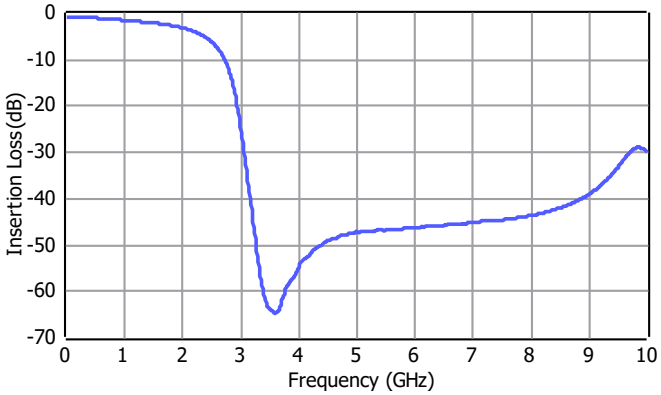
Band 12 Return Loss



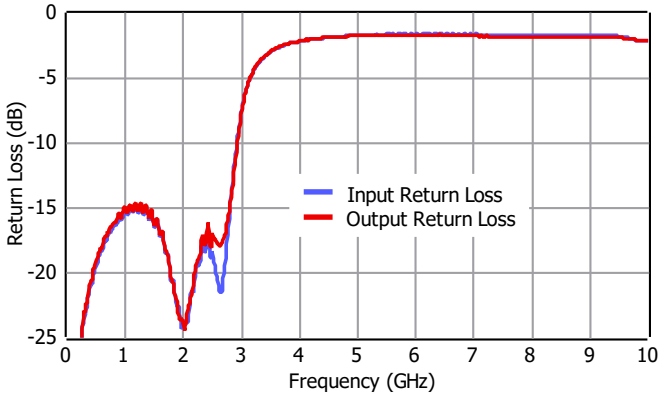
Typical Performance Plots

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

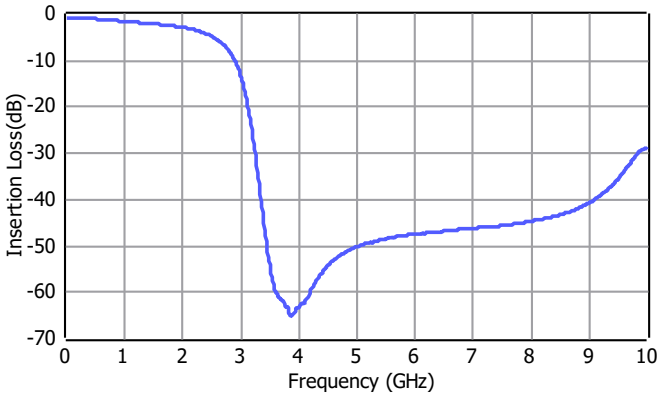
Band 13 Insertion Loss



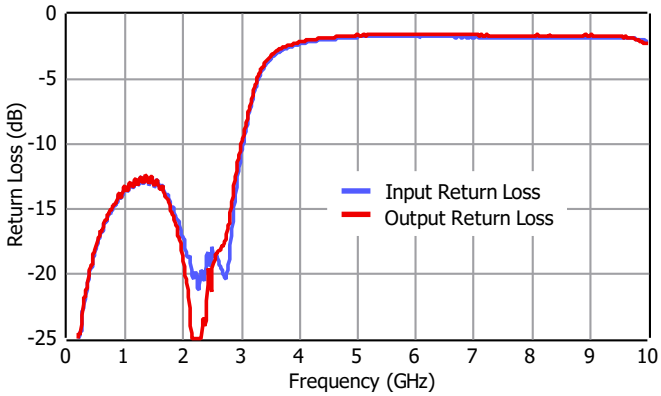
Band 13 Return Loss



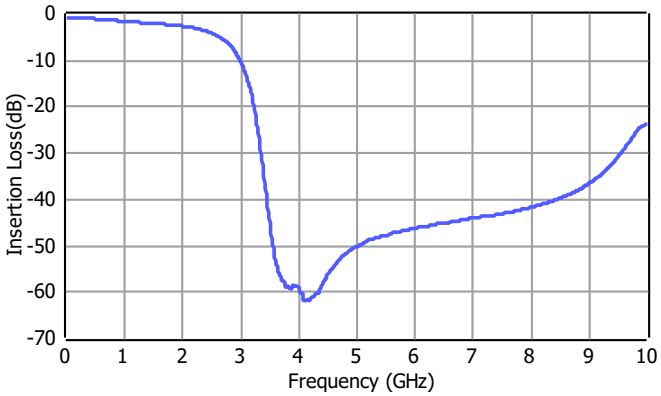
Band 14 Insertion Loss



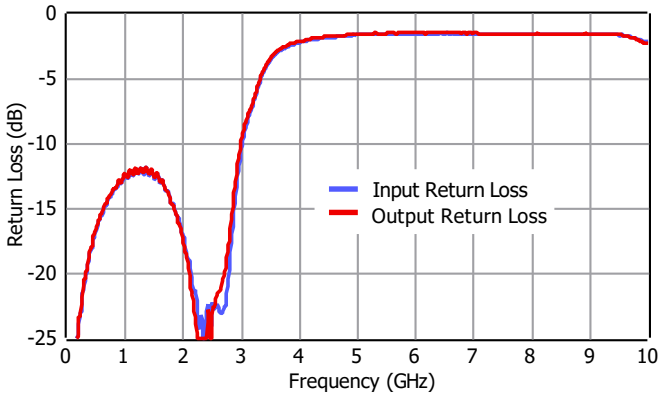
Band 14 Return Loss



Band 15 Insertion Loss



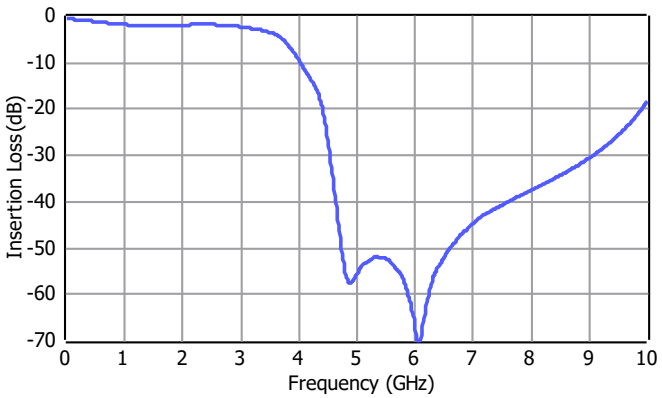
Band 15 Return Loss



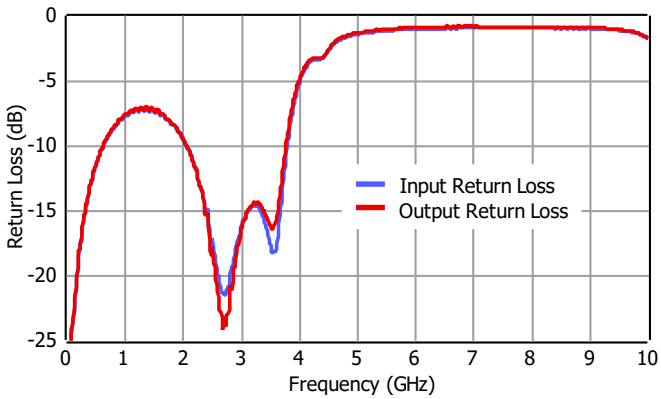
Typical Performance Plots

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

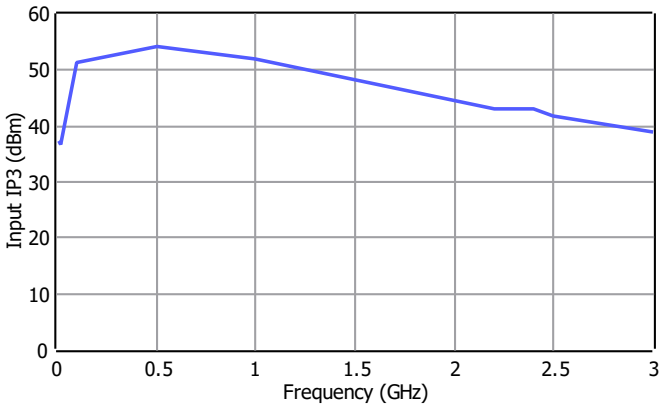
Band 16 Insertion Loss



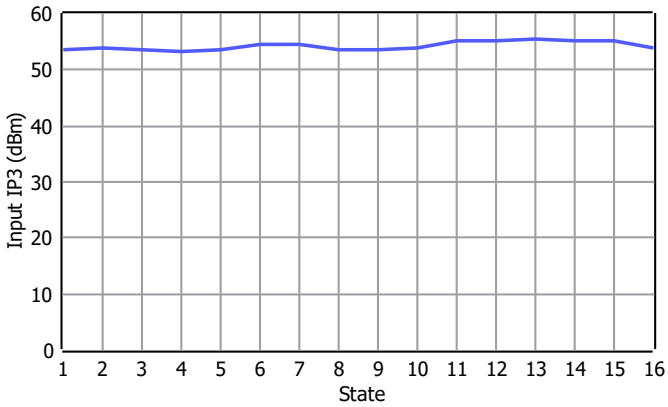
Band 16 Return Loss



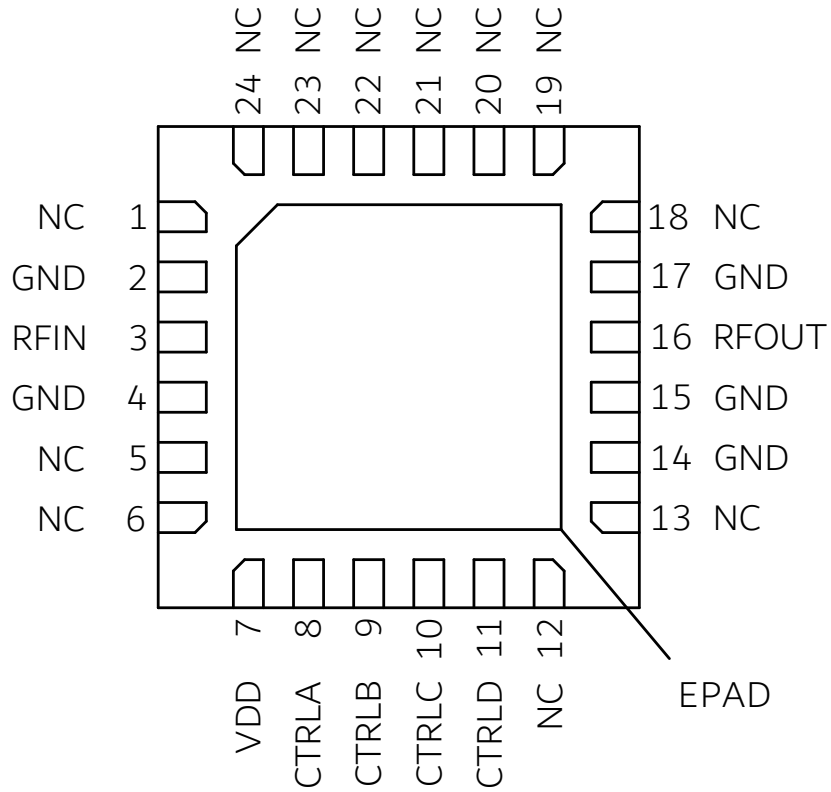
Input IP3, Filter Path



Input IP3 at 500MHz vs. States



Pin Description



Top View

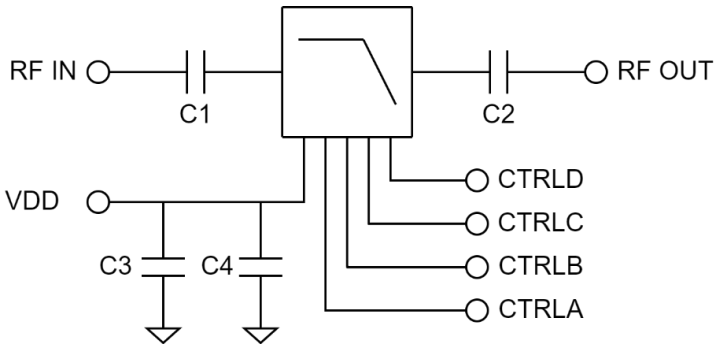
Pin Number	Pin Name	Description
3	RF IN	RF input pin. Wideband external DC block capacitor is required.
16	RF OUT	RF output pin. Wideband external DC block capacitor is required.
7	VDD	Vdd bias pin.
8	CTRLA	Control pin.
9	CTRLB	Control pin.
10	CTRLC	Control pin.
11	CTRLD	Control pin.
1, 5, 6, 12, 13, 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
HIGH	HIGH	HIGH	HIGH	Band1
LOW	HIGH	HIGH	HIGH	Band2
HIGH	LOW	HIGH	HIGH	Band3
HIGH	HIGH	LOW	HIGH	Band4
HIGH	HIGH	HIGH	LOW	Band5
LOW	LOW	HIGH	HIGH	Band6
LOW	HIGH	LOW	HIGH	Band7
HIGH	LOW	LOW	HIGH	Band8
LOW	HIGH	HIGH	LOW	Band9
HIGH	LOW	HIGH	LOW	Band10
HIGH	HIGH	LOW	LOW	Band11
LOW	LOW	LOW	HIGH	Band12
LOW	LOW	HIGH	LOW	Band13
LOW	HIGH	LOW	LOW	Band14
HIGH	LOW	LOW	LOW	Band15
LOW	LOW	LOW	LOW	Band16

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.

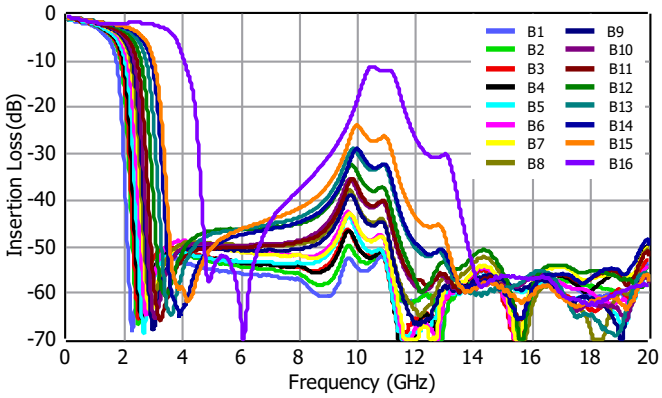
Large signal data is generated with connectorized evaluation PCB measurements. Then the input loss of the PCB is de-embedded from the large signal measurement data across frequency, to generate the large signal data shown in this document.

Defined voltages in specification table are valid when Vdd supply and control voltages are equal such as Vdd = Vctrls = 5V or Vdd = Vctrls =3.3V.

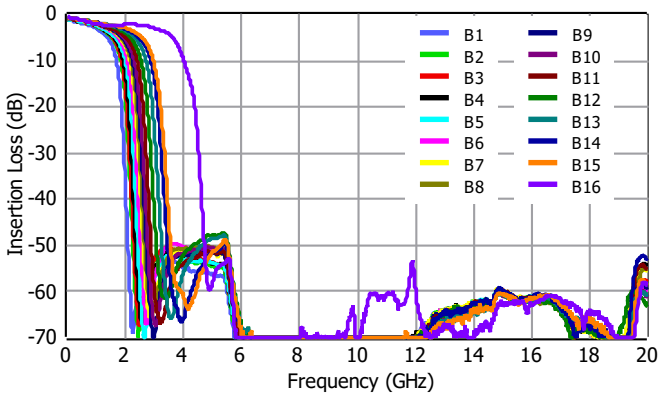
The NC pins of the filter are connected to the GND on the PCBs used to generate the plots shown in this document.

In order to reduce high frequency peaking around 10 GHz, a low-cost COTS SMD filter can be utilized.
In the case below, the Mini-Circuits® LFCG-4800+ LPF is chosen.

ATEK821P4 Insertion Loss, Wideband



ATEK821P4 with LPF Insertion Loss, Wideband

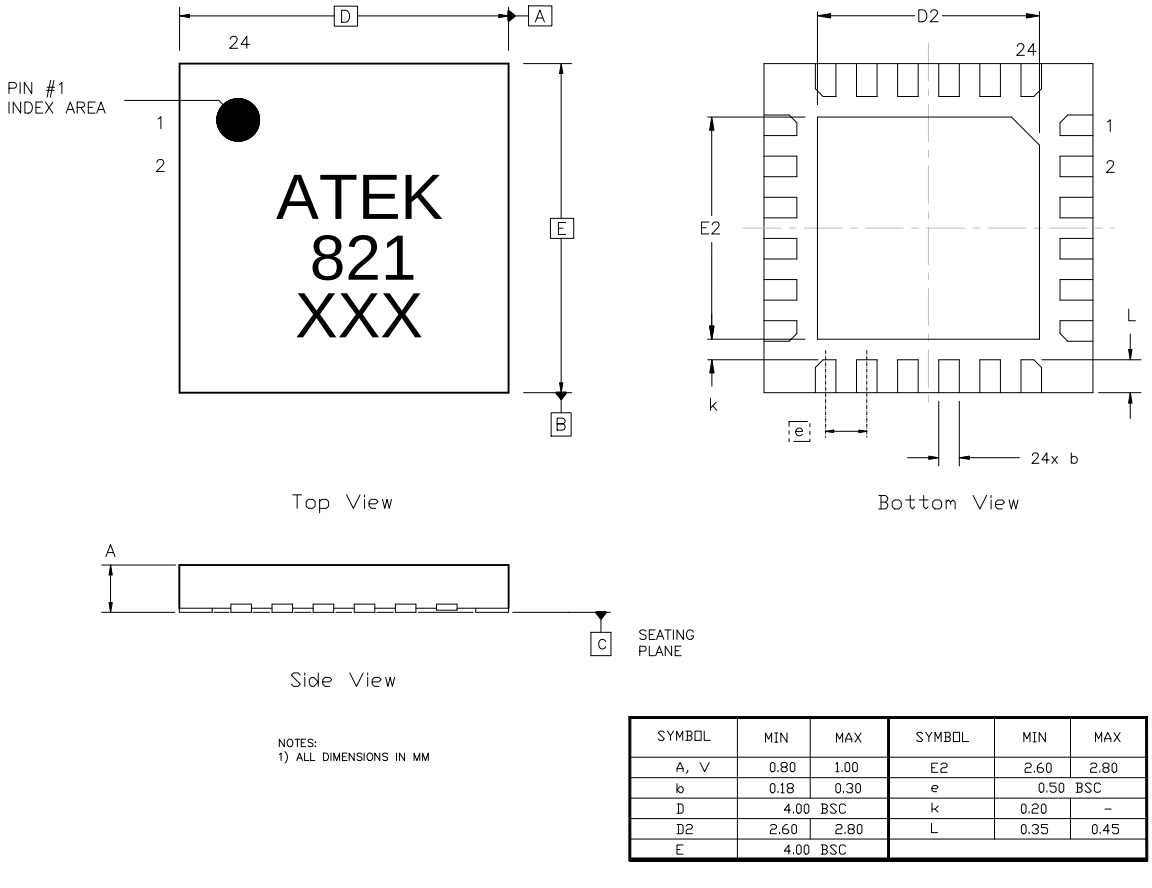


Absolute Maximum Ratings

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, V	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
Tel: +90-212-483-71-67
Email: support@atekmidas.com

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Revisions

Revision No	Revision Date	Revision Reason	Section / Page No
1.0	14.01.2023	Initial Release	
1.1	13.05.2023	Application Information Added	