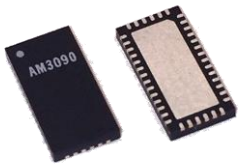
AM3090 – Digitally Tunable Filter

100 to 225 MHz Highpass
150 to 450 MHz Lowpass

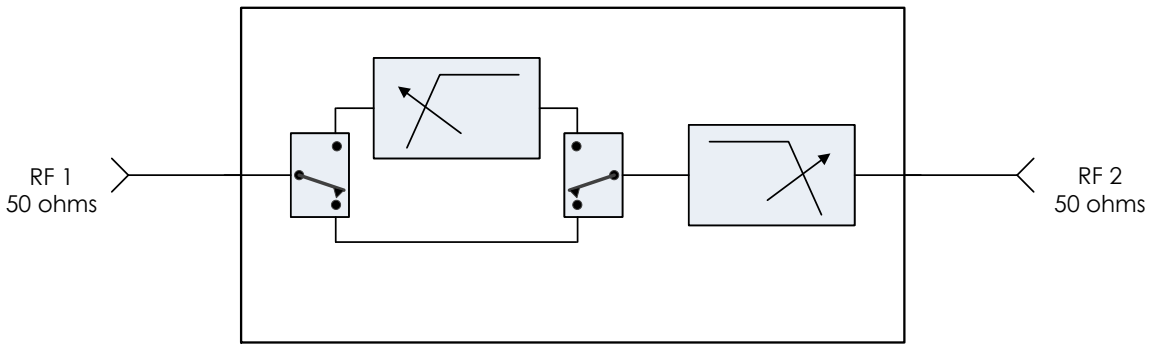


AM3090 is a miniature digitally tunable filter providing selectable highpass filtering over the 100 to 225 MHz and independently selectable lowpass filtering over the 150 to 450 MHz frequency range. The filter also provides a bypass mode where only the lowpass filter is active. With independent 4-bit digital control for each of the filters many center frequency/bandwidth configurations can easily be achieved. AM3090 has a compact 4mm x 8mm QFN footprint.

Features

- Independent highpass/ lowpass filter states
- DC-coupled low-pass mode
- 4-bit control, 3V or 5V Logic
- +5V DC Supply
- Integrated control line filtering
- No calibration required
- 4mm x 8mm QFN Package
- -40C to +85C Operation

Functional Block Diagram



Simplified block diagram of the AM3090 tunable bandpass filter.

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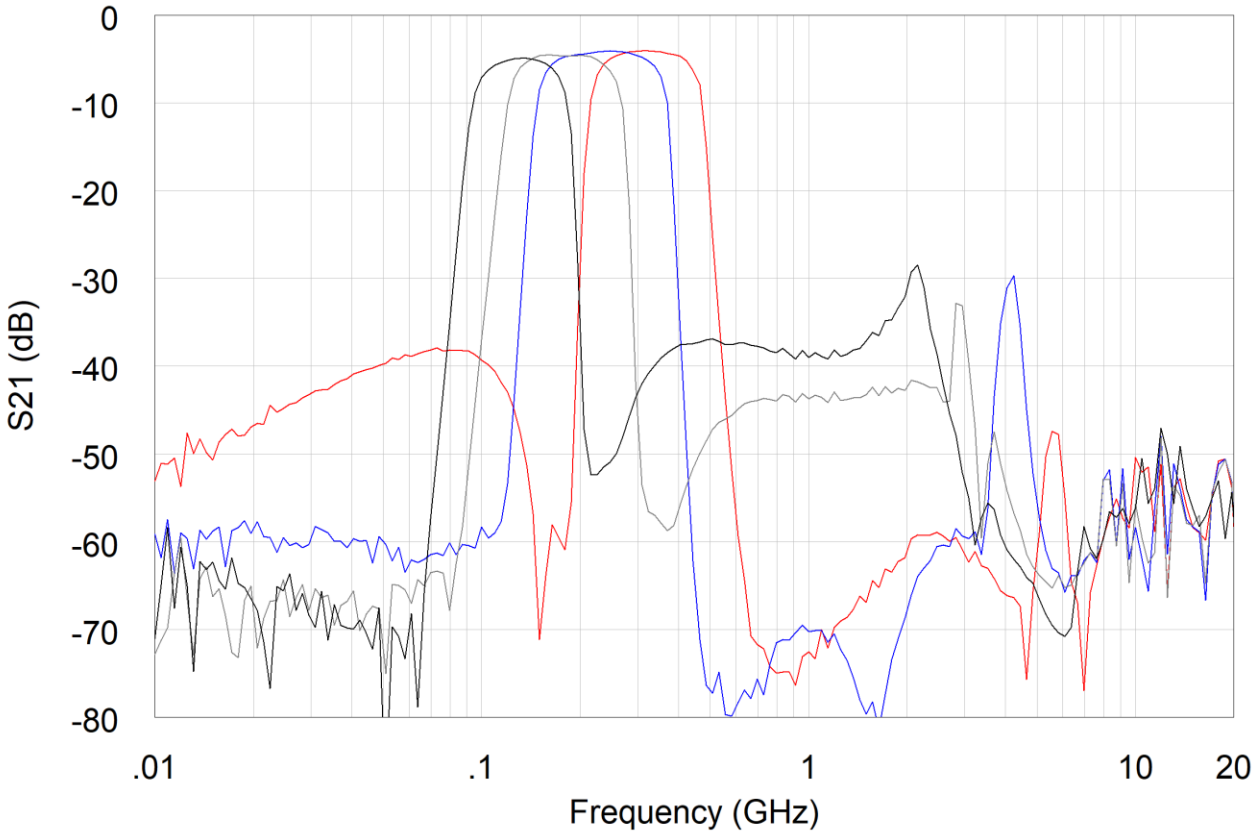
Performance Example – Bandpass Configurations Across Frequency Range



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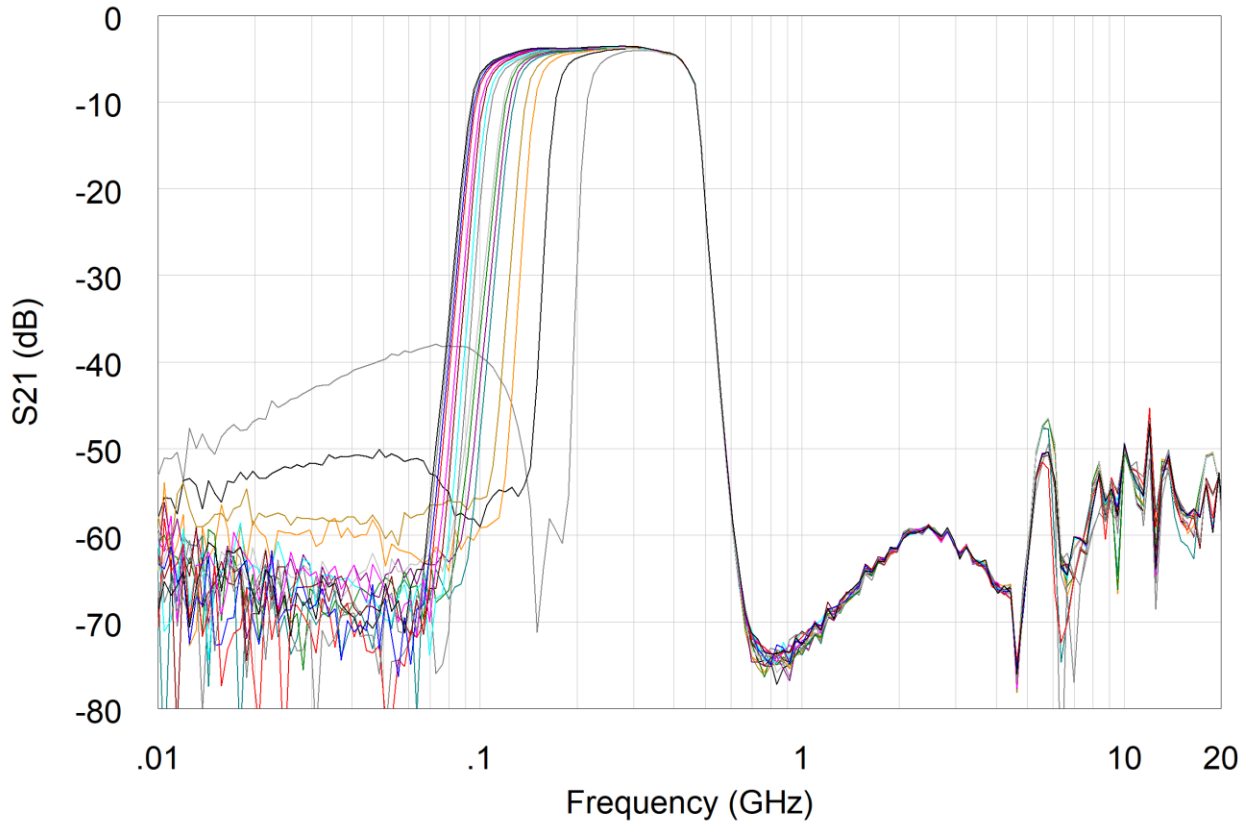
Performance Example – Max-Tuned Lowpass, Tuning Highpass



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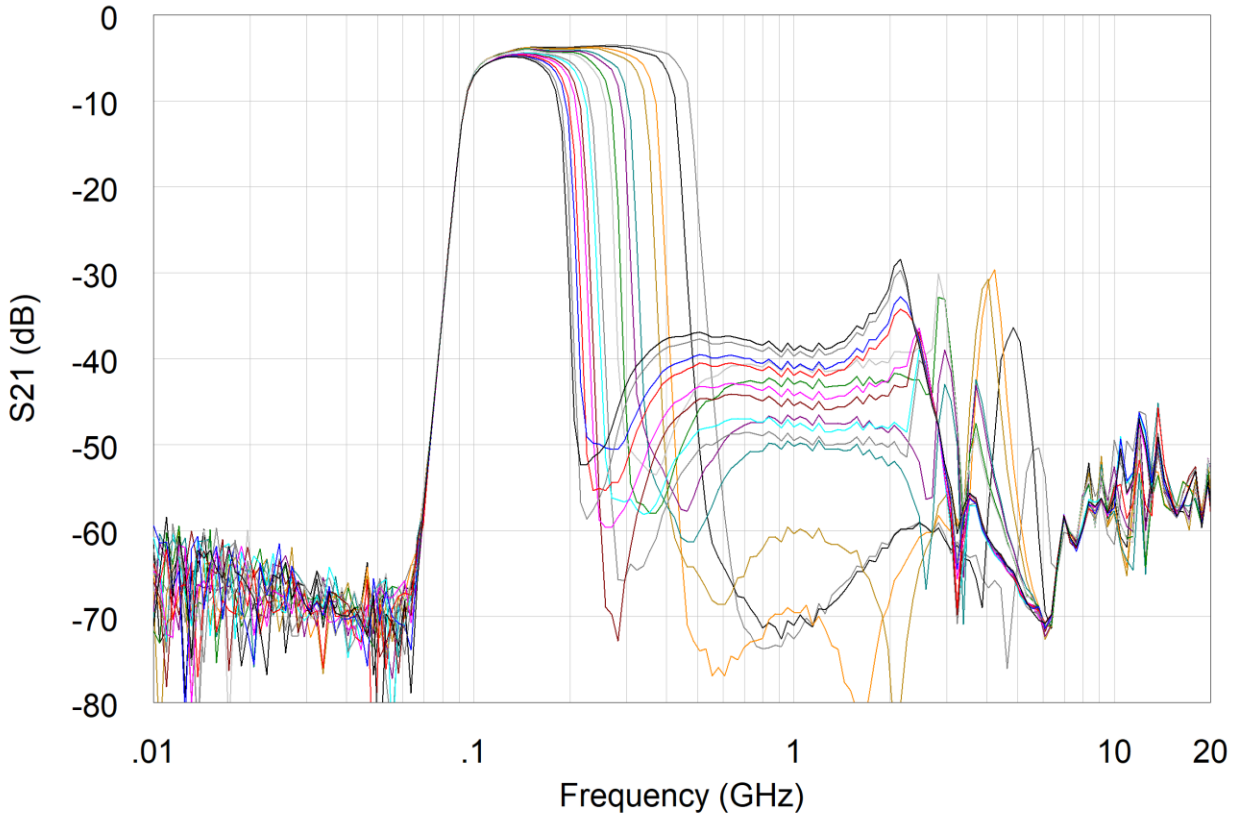
Performance Example – Min-Tuned Highpass, Tuning Lowpass



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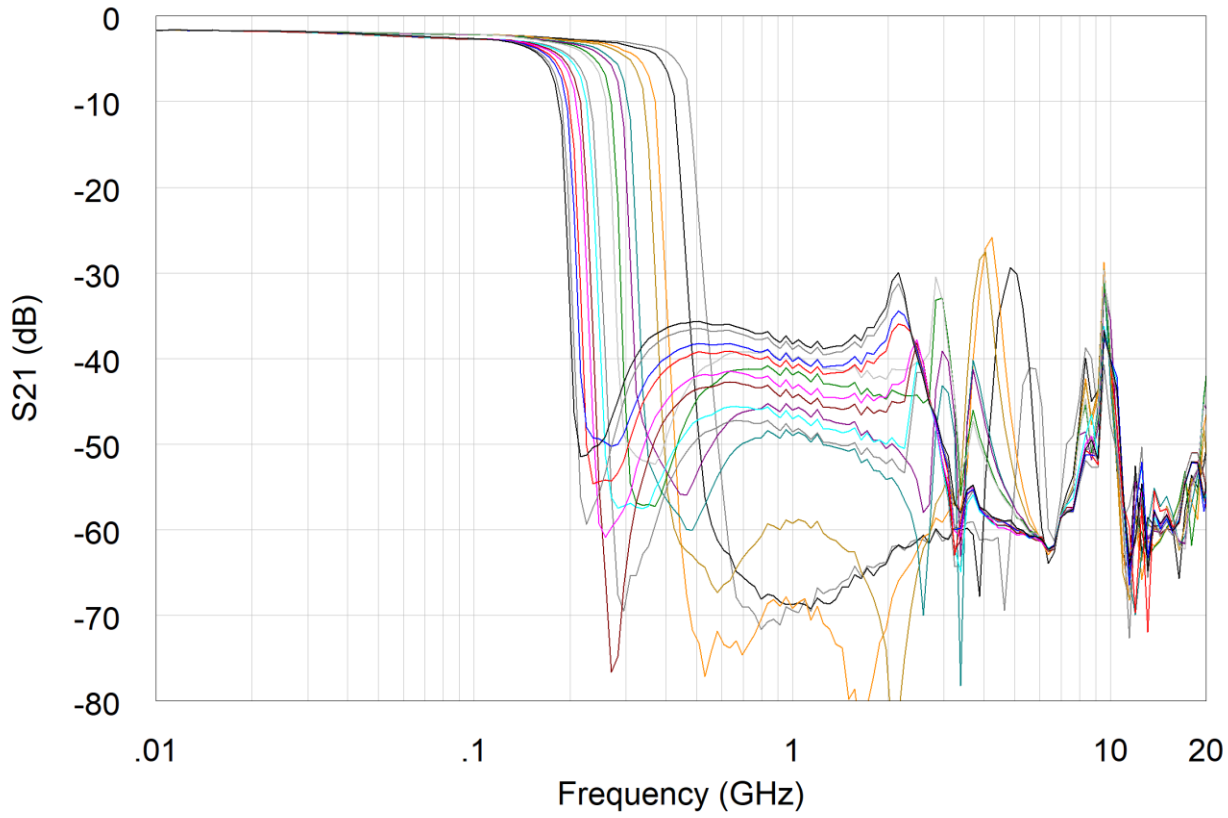
Performance Example – DC-Coupled Lowpass Mode



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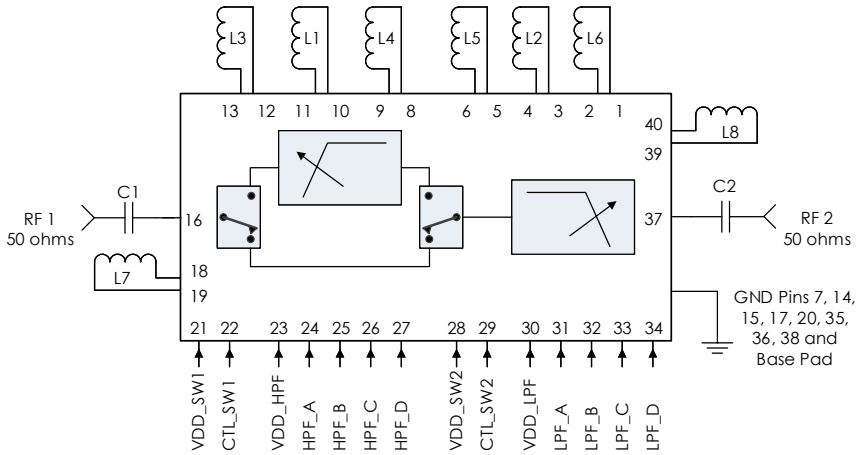
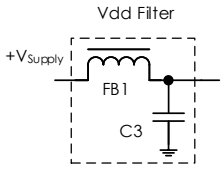
Typical Application Circuit





Typical (at each Vdd pin)

Recommended Component List (or equivalent):

Part	Value	Part Number	Manufacturer
C1, C2	0.1uF	0402BB104KW160	Passives Plus
C3	0.1uF	C1005X7R1H104K050BB	TDK
FB1	-	MMZ1005A222E	TDK
L4, L7	68nH	0402HP-68NXGLW	Coilcraft
L1, L3	56nH	0402HP-56NXGLW	Coilcraft
L2, L6	27 nH	0402HP-24NXGLW	Coilcraft
L5, L8	24 nH	0402HP-27NXGLW	Coilcraft

Notes:

1. DC blocking capacitors should be low-loss, broadband parts for optimum performance.
2. RC filtering on the control lines is recommended to prevent noise on the RF paths.
3. Routes to off-chip inductors, L1 through L8, should be kept short as possible.

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Specifications

Parameter	Minimum	Typical	Maximum
HPF Cutoff Frequency Range	100 MHz		225 MHz
LPF Cutoff Frequency Range	150 MHz		450 MHz
Insertion Loss		3 dB	
Input IP3 (350 MHz)		+40 dBm	
RF Input Level			+27 dBm
Switching Speed			1 us
Logic Level Low	-0.1V		+0.5V
Logic Level High	+2.0V		+5.0V
Package Size		4.0 x 8.0 x 0.9mm	
DC Supply Voltage	+4.7V	+5.0 V	+5.2V
DC Supply Current		3 mA	
Power Consumption		15 mW	
Operating Temperature	-40 C		+85 C
Storage Temperature	-50 C		+125 C

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Pin Definitions – 40 pin, 4mm x 8mm QFN package

Pin Number	Name	Function
1	L6A	External Inductor L6 Connection
2	L6B	External Inductor L6 Connection
3	L2A	External Inductor L2 Connection
4	L2B	External Inductor L2 Connection
5	L5A	External Inductor L5 Connection
6	L5B	External Inductor L5 Connection
7	GND	Ground - Common
8	L4A	External Inductor L4 Connection
9	L4B	External Inductor L4 Connection
10	L1A	External Inductor L1 Connection
11	L1B	External Inductor L1 Connection
12	GND	Ground - Common
13	L3A	External Inductor L3 Connection
14	L3B	External Inductor L3 Connection
15	GND	Ground - Common
16	RF 1	RF Port 1 - 50 ohms, DC coupled. External AC coupling capacitor required.
17	GND	Ground - Common
18	L7A	External Inductor L7 Connection
19	L7B	External Inductor L7 Connection
20	GND	Ground - Common
21	VDD_SW1	+5.0V DC Power Input
22	CTL_SW1	Control Line for Switch 1
23	VDD_HPF	+5.0V DC Power Input
24	HPF_A	Highpass Filter Control Bit A
25	HPF_B	Highpass Filter Control Bit B
26	HPF_C	Highpass Filter Control Bit C
27	HPF_D	Highpass Filter Control Bit D

Pin Definitions – continued

28	VDD_SW2	+5.0V DC Power Input
29	CTL_SW2	Control Line for Switch 2
30	VDD_LPF	+5.0V DC Power Input
31	LPF_A	Lowpass Filter Control Bit A
32	LPF_B	Lowpass Filter Control Bit B
33	LPF_C	Lowpass Filter Control Bit C
34	LPF_D	Lowpass Filter Control Bit D
35	GND	Ground - Common
36	GND	Ground - Common
37	RF 2	RF Port 2 – 50 ohms, DC coupled. External AC coupling capacitor required.
38	GND	Ground - Common
39	L8A	External Inductor L8 Connection
40	L8B	External Inductor L8 Connection

Switch Control Table

SW1	SW2	Action
L	H	Bypasses HPF
H	L	Selects HPF

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HPF Control Table

HPF Band Select Control Line (CTL_SW1=5V, CTL_SW2=0V)				Typical Cutoff Frequency (MHz)
HPF_D	HPF_C	HPF_B	HPF_A	
L	L	L	L	102
L	L	L	H	103
L	L	H	L	105
L	L	H	H	106
L	H	L	L	110
L	H	L	H	112
L	H	H	L	116
L	H	H	H	120
H	L	L	L	127
H	L	L	H	130
H	L	H	L	134
H	L	H	H	138
H	H	L	L	148
H	H	L	H	159
H	H	H	L	183
H	H	H	H	228

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LPF Control Table

LPF Band Select Control Line (CTL_SW1=0V, CTL_SW2=5V)				Typical Cutoff Frequency (MHz)
LPF_D	LPF_C	LPF_B	LPF_A	
L	L	L	L	153
L	L	L	H	156
L	L	H	L	162
L	L	H	H	165
L	H	L	L	172
L	H	L	H	177
L	H	H	L	185
L	H	H	H	190
H	L	L	L	215
H	L	L	H	226
H	L	H	L	246
H	L	H	H	264
H	H	L	L	309
H	H	L	H	333
H	H	H	L	385
H	H	H	H	450

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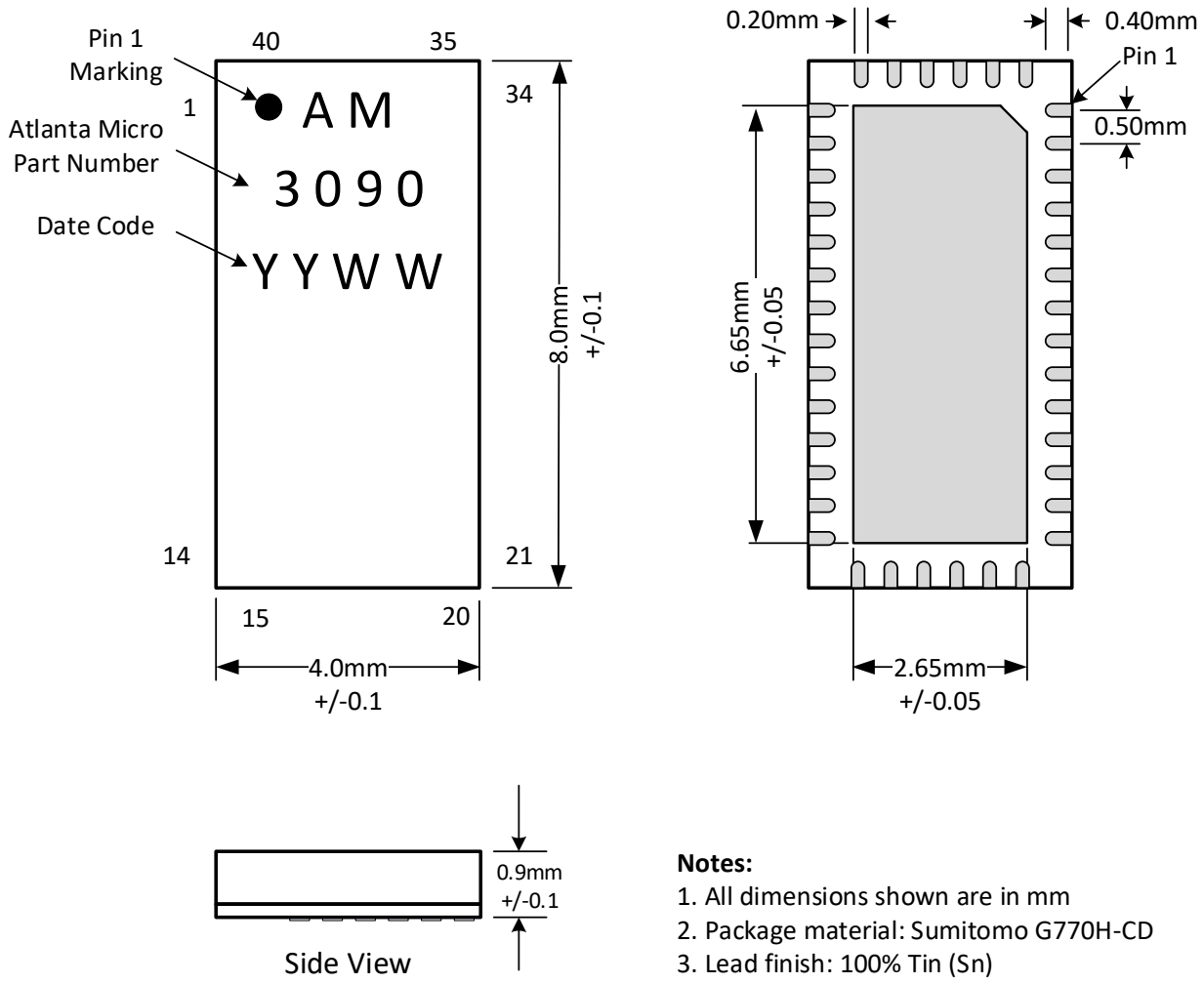
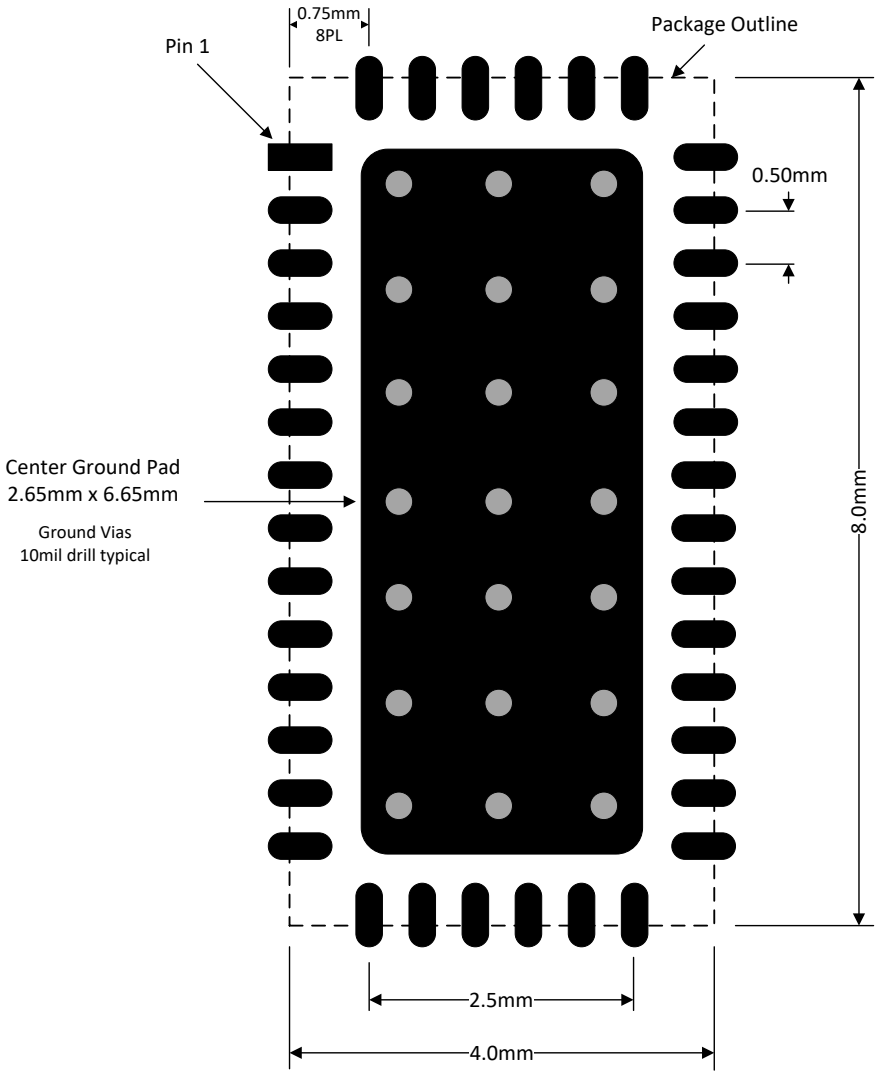
4mm x 8mm x 40 Lead QFN Package Details and Footprint

Package Drawing

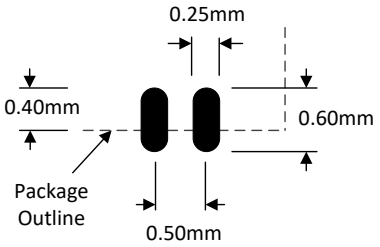


Notes:
1. All dimensions shown are in mm
2. Package material: Sumitomo G770H-CD
3. Lead finish: 100% Tin (Sn)

Recommended Footprint



Pad and Spacing Detail



Recommend 0.08mm soldermask oversize beyond pad outlines

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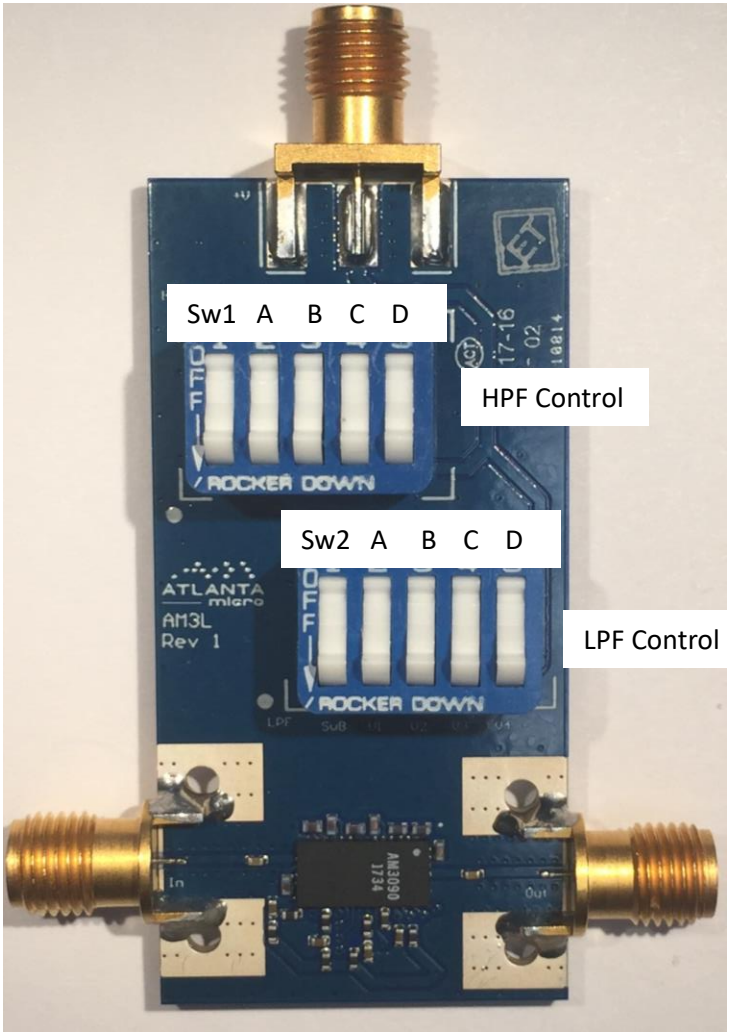
Evaluation PC Board

+5V Vdd



Switch off/ open = low

Switch on/ closed = high

RF 1

RF 2