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ANALOG DEVICES

HMC899

v00.0911

FILTER - TUNABLE, BAND PASS 19 - 38 GHz

RoHS✓ EARTH FRIENDLY

Typical Applications

The HMC899 is ideal for:

- Test & Measurement Equipment
- Military RADAR & EW/ECM
- SATCOM & Space
- Industrial & Medical Equipment

Features

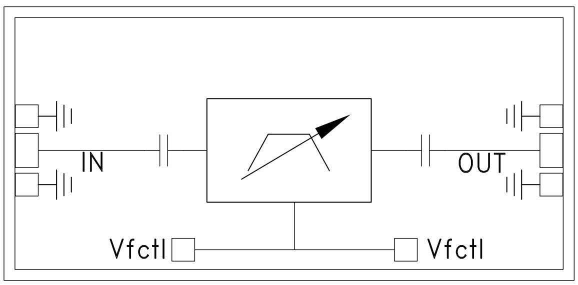
Fast Tuning Response

Excellent Wideband Rejection

Single Chip Replacement
for Mechanically Tuned Designs

Small Size: 2.5 x 1.2 x 0.10 mm

Functional Diagram



General Description

The HMC899 is a MMIC band pass filter which features a user selectable passband frequency. The 3 dB filter bandwidth is approximately 18%. The 20 dB filter bandwidth is approximately 35%. The center frequency can be varied between 19 and 38 GHz by applying an analog tune voltage between 0 and 14V. This tunable filter can be used as a much smaller alternative to physically large switched filter banks and cavity tuned filters. The HMC899 has excellent microphonics due to the monolithic design, and provides a dynamically adjustable solution in advanced communications applications.

Electrical Specifications, T_A = +25 °C

Parameter	Min.	Typ.	Max.	Units
F_{center} Tuning Range	19		38	GHz
3 dB Bandwidth		18		%
Low Side Rejection Frequency (Rejection >20 dB)		0.81 *F_{center}		GHz
High Side Rejection Frequency (Rejection >20 dB)		1.20 *F_{center}		GHz
Low Side Sub-Harmonic Rejection (Rejection >40 dB)		0.54 *F_{center}		GHz
High Side Sub-Harmonic Rejection (Rejection >40 dB)		1.32 *F_{center}		GHz
Re-entry Frequency (Rejection <30 dB)		>50		GHz
Insertion Loss		7		dB
Return Loss		10		dB
Input IP3 (Pin = 0 to +20 dBm)		25		dBm
Input Power @ 5° Shift In Insertion Phase (Vfctl = 0.5V)		14		dBm
Input Power @ 5° Shift In Insertion Phase (Vfctl > = 1V)		16		dBm
Frequency Control Voltage (V_{fctl})	0		14	V
Source/Sink Current (I_{fctl})			±1	mA
Residual Phase Noise [1] (100 kHz Offset)		-157		dBc/Hz
F_{center} Drift Rate		-3.2		MHz/°C
Tuning Speed, Phase Settling to within 10° [2]		< 100		ns

[1] Optimum residual phase noise performance requires the use of a low noise driver circuit.
[2] Tuning speed includes 40 ns tuning voltage ramp from driver.

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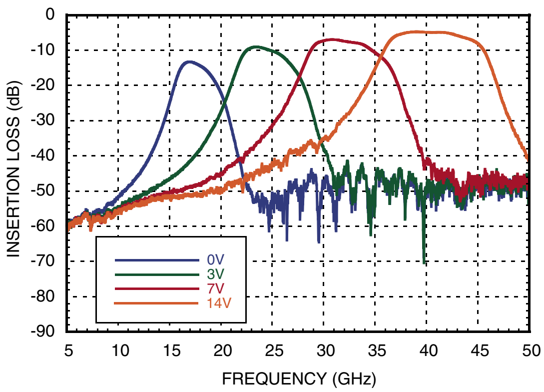
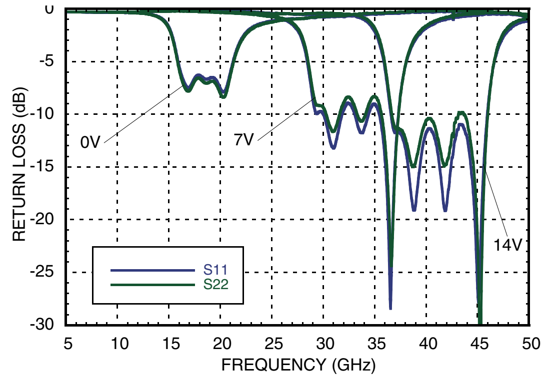
FILTER - TUNABLE, BAND PASS 19 - 38 GHz

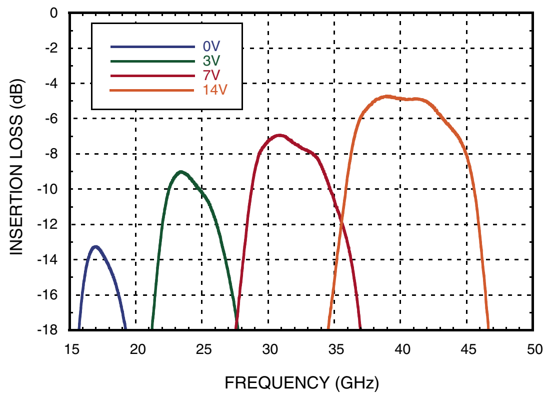
Broadband Insertion Loss vs. Vfctl



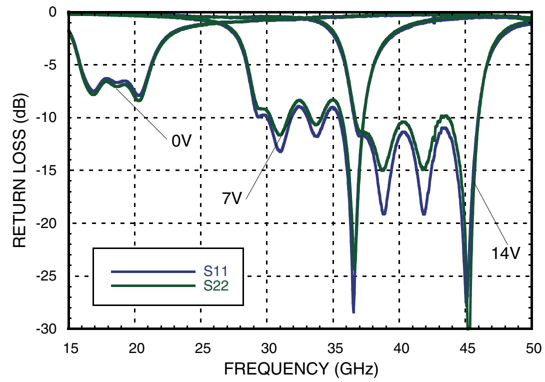
Broadband Return Loss vs. Vfctl



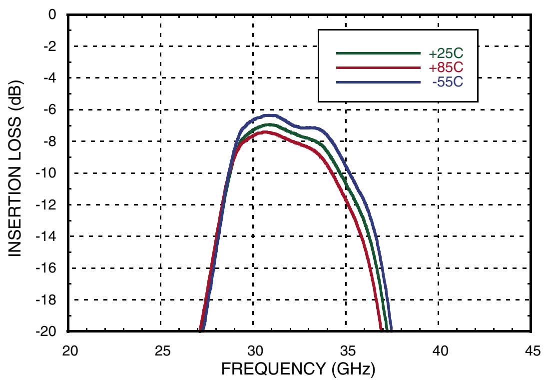
Insertion Loss vs. Vfctl



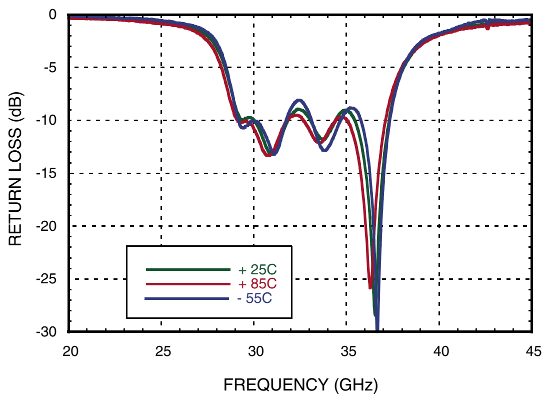
Return Loss vs. Vfctl



Insertion Loss vs. Temperature, Vfctl = 7V



Return Loss vs. Temperature, Vfctl = 7V



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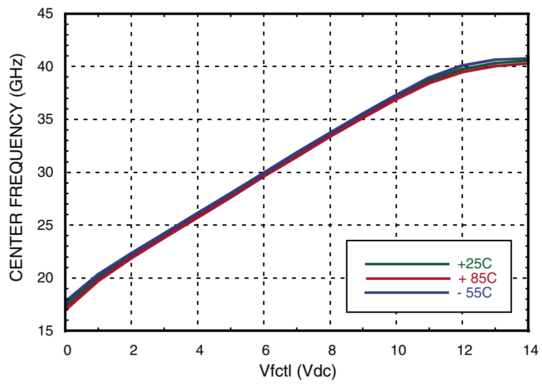
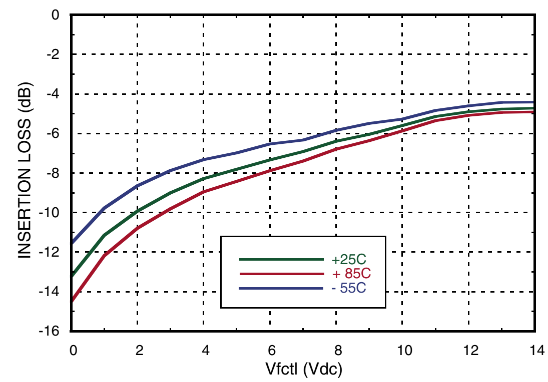
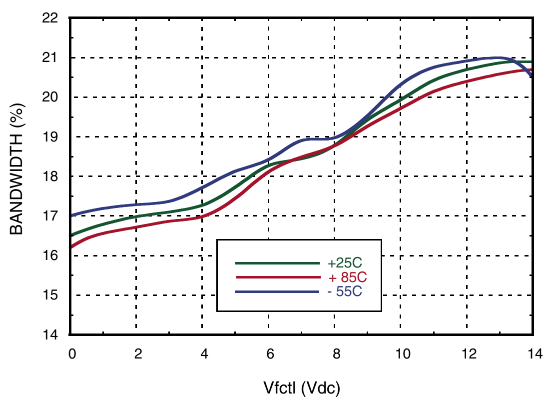
Center Frequency vs. Temperature



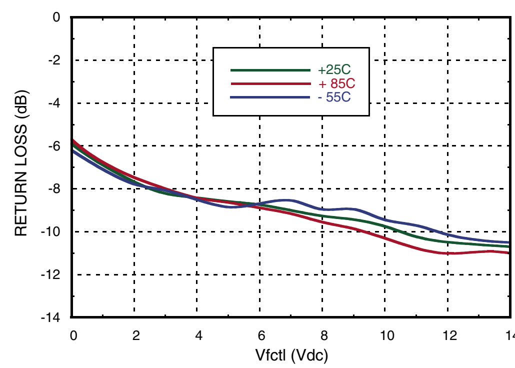
Insertion Loss vs. Temperature



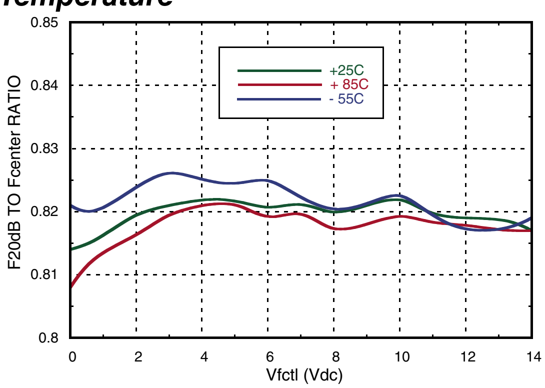
3 dB Bandwidth vs. Temperature



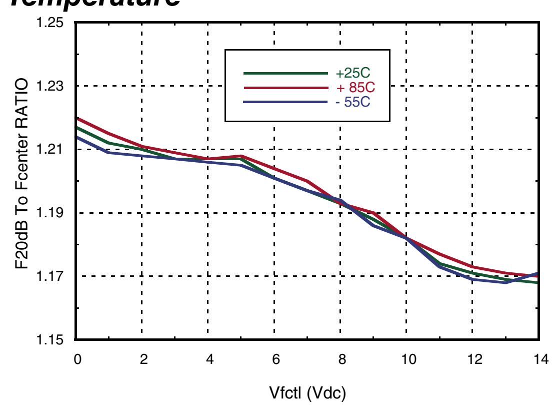
Maximum Return Loss in a 2 dB Bandwidth vs Temperature



Low Side Rejection Ratio vs. Temperature [1]



High Side Rejection Ratio vs. Temperature [1]



[1] Rejection ratio is defined as the ratio of the frequency at which the relative insertion loss is 20 dB to the insertion loss at ƒcenter.

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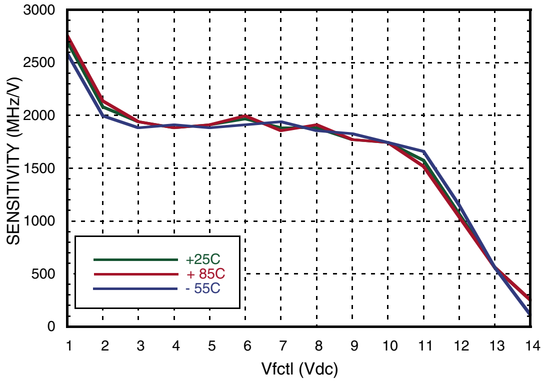
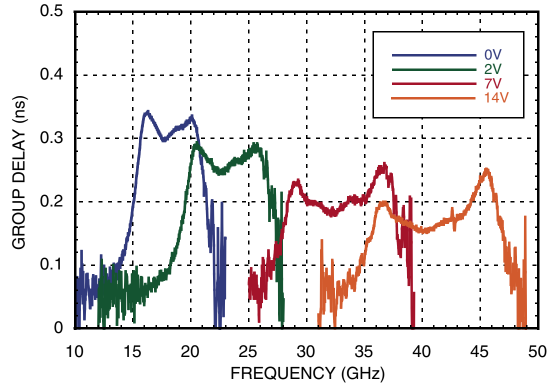
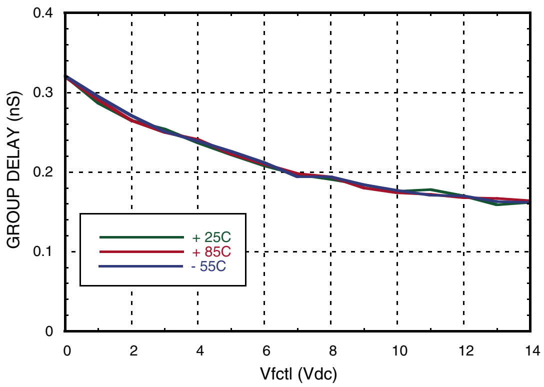
Tuning Sensitivity vs. Vfctl



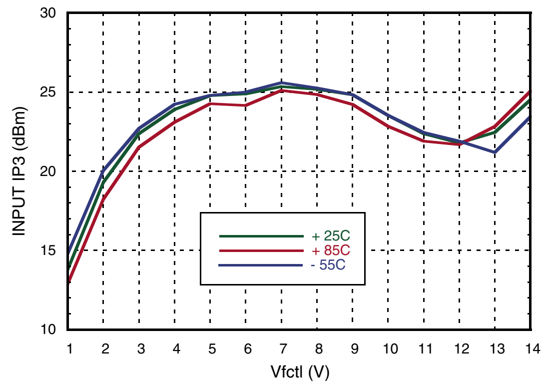
Group Delay vs. Frequency



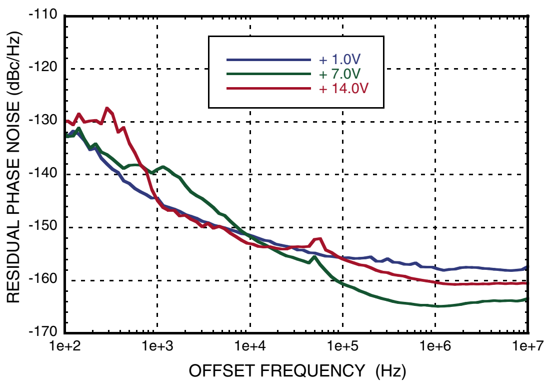
Group Delay vs. Fcenter



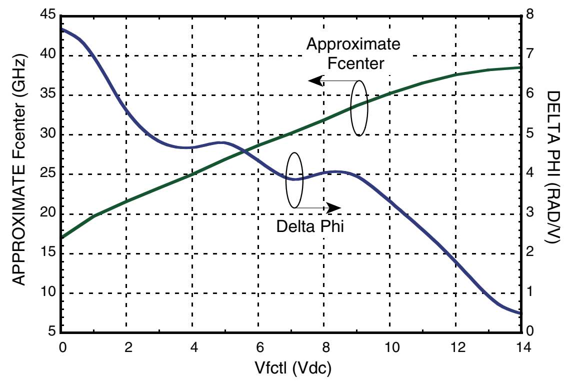
Input IP3 vs. Temperature



Residual Phase Noise



Phase Sensitivity vs. Vfctl



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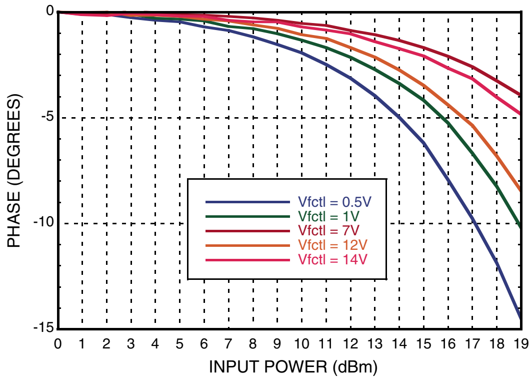
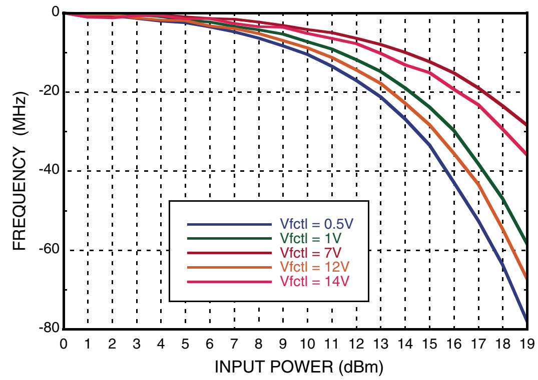
Phase Shift vs. Pin



Frequency Shift vs. Pin



Absolute Maximum Ratings

Frequency Control Voltage (Vfctl)	-0.5 to +15V
RF Power Input	27 dBm
Storage Temperature	-65 to +150 °C
ESD Sensitivity (HBM)	Class 1 A

Reliability Information

Junction Temperature to Maintain 1 Million Hour MTTF	150 °C
Nominal Junction Temperature (T= 85 °C and Pin = 27 dBm)	103 °C
Operating Temperature	-55 to +85 °C

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

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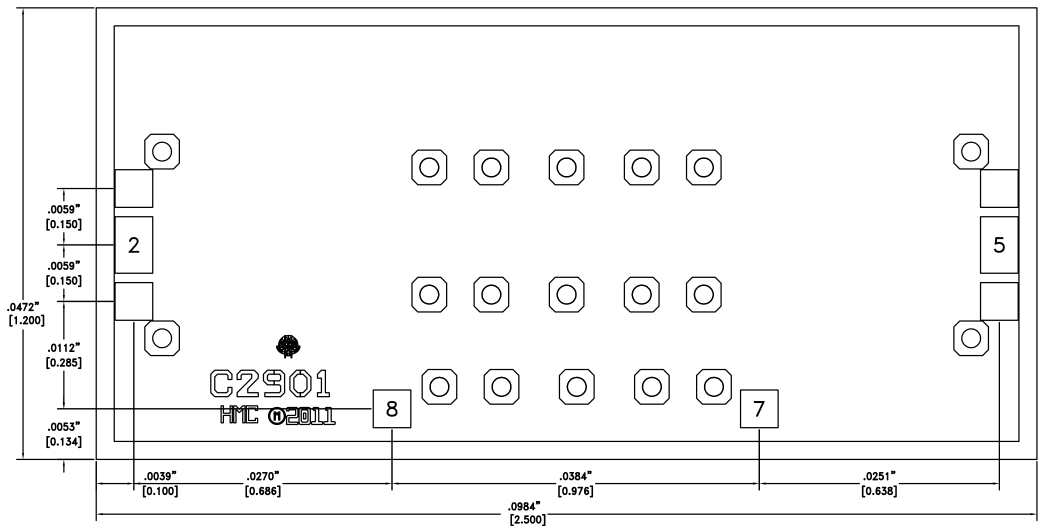
Outline Drawing



Die Packaging Information [1]

Standard	Alternate
WP-9	[2]

[1] Refer to "Waffle-Pak & Gel-Pak" section for die packaging dimensions.
[2] For alternate packaging information contact Hittite Microwave Corporation.

NOTES:
1. ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]
2. DIE THICKNESS IS .004".
3. TYPICAL BOND PAD IS .004" SQUARE..
5. BOND PAD METALIZATION: GOLD
6. BACKSIDE METALIZATION: GOLD
7. BACKSIDE METAL IS GROUND
7. CONNECTION NOT REQUIRED FOR UNLABELED PADS.

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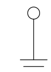
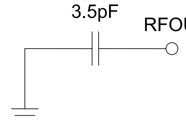
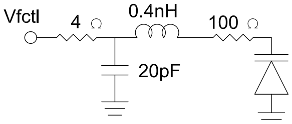
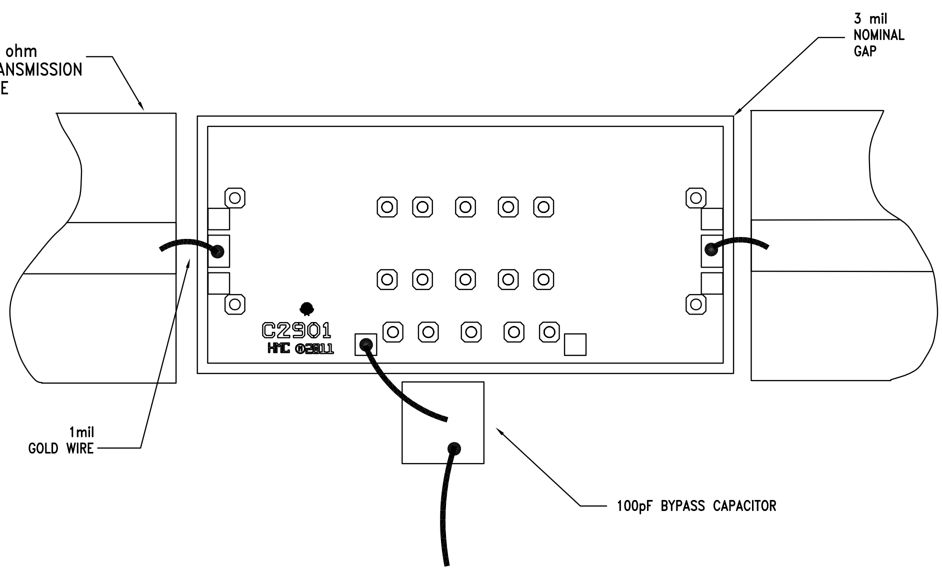
FILTER - TUNABLE, BAND PASS
19 - 38 GHz

Pin Descriptions

Pin Number	Function	Description	Interface Schematic
Die Bottom	GND	Die bottom must be connected to RF/DC ground.	
2	RFIN	This pad is AC coupled and matched to 50 Ohms.	
5	RFOUT	This pad is AC coupled and matched to 50 Ohms.	
7, 8	Vfctl	Center frequency control voltage. Pads are connected together internally.	

Assembly Diagram



NOTES:
1. The HMC899 I/O's are inherently capacitive in order to accommodate bond wire connections.
2. 1 mil diameter bond wires can be used.
3. Ideally, double bond wires 20 mils long, or a single bond wire 12 mils long should be used (approx.140 pH).
4. It is recommended that on the opposite side of the bond wires, an additional 20-50 fF fringe capacitance be present.

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