Sales: 408-778-9952 | General: 408-778-4200 | Fax: 408-778-4300
Sales & Customer Support: sales@markimicrowave.com
Tech Support: support@markimicrowave.com
General Support: info@markimicrowave.com

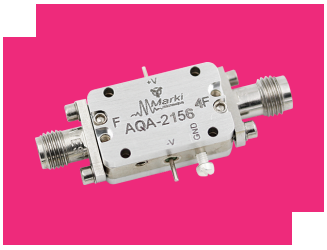
AQA-2156

21-56 GHz Amplified 4F Multiplier

DEVICE OVERVIEW

General Description

The AQA-2156 is an amplified frequency multiplier that quadruples the 5.25 – 14 GHz input frequency, producing an amplified 21 - 56 GHz quadrupled output frequency. This multiplier is designed to provide +20 dBm 4F output power with +0 dBm input power and offers superior harmonic suppressions. It can provide sufficient LO drive for Marki S-, H-, and L- diode mixers.



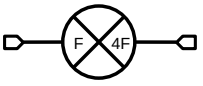
Features

- High fundamental rejection
- Millimeter wave output frequencies
- +20 dBm 4F output Power
- +3.5V/-5V Bias

Applications

- High frequency synthesis
- LO drive for S-diode mixers
- LO signal chain

Functional Block Diagram



Part Ordering Options

Part Number	Description	Connectors	Green Status	Product Lifecycle	Export Classification
AQA-2156	21-56 GHz Amplified 4F Multiplier	Standard	RoHS REACH	Released	EAR99

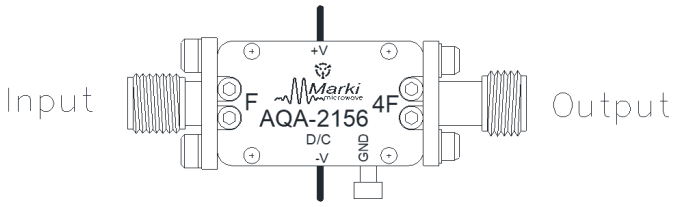
Table Of Contents

Revision History

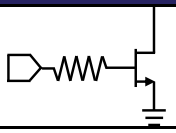
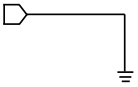
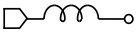
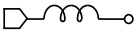
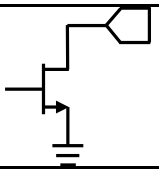
Revision Code	Revision Date	Comment
-	2020-04-01	Initial Release Datasheet
A	2020-07-01	Updated Min Output Power and Suppression Specs
B	2020-08-01	Inclusion of internal chipset
C	2020-10-01	Adjusted Build to Reduce Power Dissipation, Updated Bias Condition, Updated Absolute Maximum Specifications, Updated Performance Plots
D	2021-07-01	Adjusted Build to Reduce Power Dissipation, Updated Bias Condition, Updated Absolute Maximum Specifications, Updated Performance Plots
E	2023-03-01	Adjusted Build, Updated Electrical Specifications and Performance Plots

Port Configuration and Functions

Port Diagram



Port Functions

Port	Function	Connector Type	Description	Equivalent Circuit for Package
Bias	Negative bias	-	Gate control for the amplifier must be connected to a -5.0 to -6.0 Volt power supply.	
GND	Ground	-	Ground path is provided through the metal housing and outer ground lug.	
Port 1	Input	SMAF	This pin is for the RF input. It is internally DC-blocked and is matched to 50 ohms from 5.25-14 GHz.	
Port 2	Output	1.85F	This pin is for the RF output. It is internally DC-blocked matched to 50 ohms from 21-56 GHz.	
Power Supply	Positive bias	-	Positive bias port must be connected to a +3V to +3.5V power supply.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	50	°C
Maximum Storage Temperature	150	°C
Minimum Operating Temperature	-40	°C
Minimum Storage Temperature	-65	°C
Negative Bias Current	3	mA
Negative Bias Voltage	-10	V
Positive Bias Current	800	mA
Positive Bias Voltage	4	V
RF Input Power	5	dBm

Package Information

Parameter	Details	Rating
ESD	250 to < 500 Volts	HBM Class 1A
Dimensions	-	21.84 x 13.21 mm

Sequencing Requirements

Turn-on Procedure:
1) Apply -5V to Bias port
2) Apply +3.5V to Power Supply port

Turn-off Procedure:
1) Turn off Power Supply port
2) Turn off Bias port

***NOTE: RF input power may be applied at any time in the turn-on procedure.**

Electrical Specifications

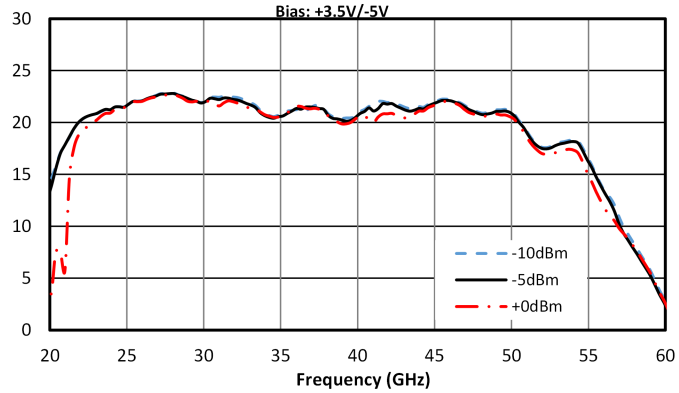
The electrical specifications apply at TA=+25°C in a 50Ω system.

Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
4F Output Power	Input = 12 – 14 GHz Output = 48 - 56 GHz	-	-	-	18	-	dBm
4F Output Power	Input = 5.25 – 6.25 GHz Output = 21 - 25 GHz	-	-	-	20	-	dBm
4F Output Power	Input = 6.25 – 12 GHz Output = 25 - 48 GHz	-	-	17	21	-	dBm
Bias requirements, Bias: -5.0 Volts DC [1]	-	-	-	-	10	-	mA
Bias Requirements, Power Supply [2]	3.5 Volts DC	-	-	-	250	-	mA
Input Frequency Range	-	-	-	5.25	-	14	GHz
Input Power [3]	-	-	-	-10	-5	0	dBm
Output Frequency Range	-	-	-	21	-	56	GHz
Suppression, 1F [4]	Input = 5.25 – 14 GHz Output = 5.25 – 14 GHz	-	-	-	44	-	dBc
Suppression 2F [5]	Input = 5.25 – 14 GHz Output = 10.5 - 28 GHz	-	-	-	35	-	dBc
Suppression, 3F [6]	Input = 5.25 – 14 GHz Output = 15.75 - 42 GHz	-	-	-	24	-	dBc
Suppression, 5F [7]	Input = 5.25 – 13.4 GHz Output = 26.25 - 67 GHz	-	-	-	32	-	dB

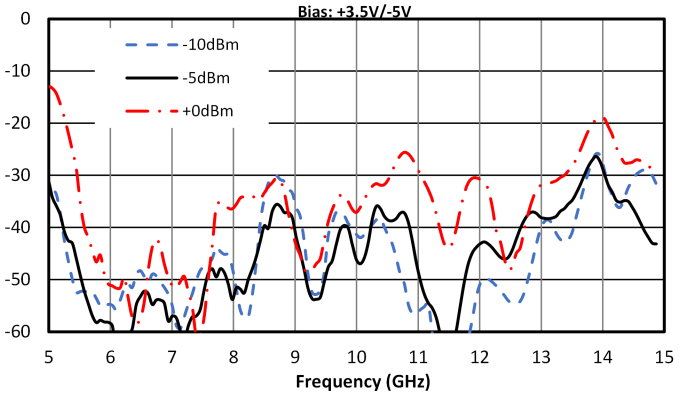
[1][2] Current consumption taken under NO RF input power. Current draw will increase with increased input power. Optimal Performance is at approximately +3.5V / -5.0V.
[3] Optimal suppression levels at -10 - 0 dBm input power.
[4][5][6][7] Suppression is defined as the harmonic power relative to the 4F quadrupled output power.

Typical Performance Plots

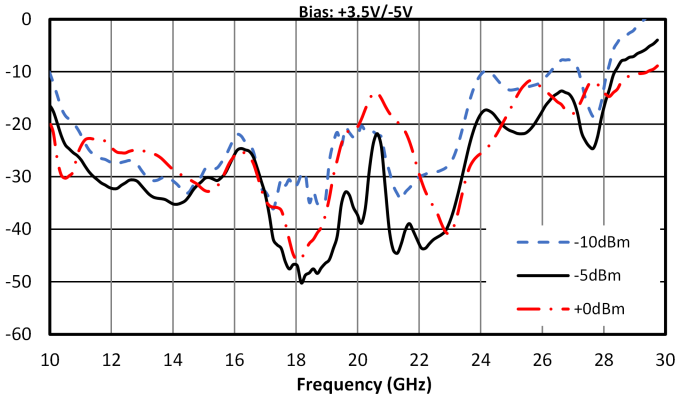
4F Output Power (dBm) vs. Output Frequency, Over Input Power, Bias: +3.5V/-5V



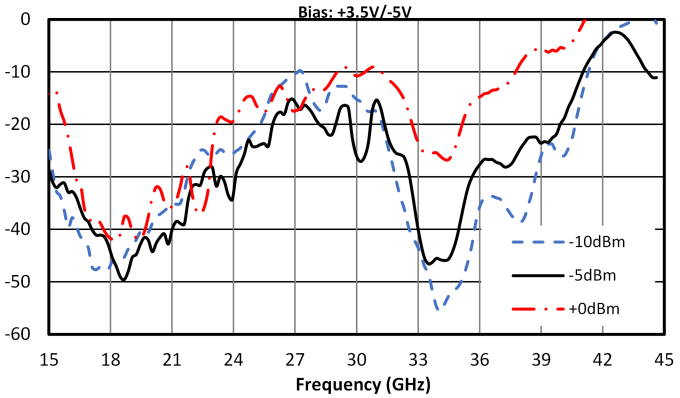
1F Output Suppression (dBc) vs. Output Frequency, Over Input Power, Bias: +3.5V/-5V



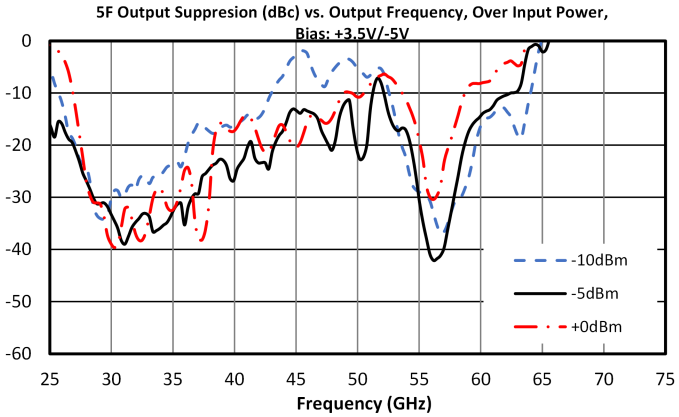
2F Output Suppression (dBc) vs. Output Frequency, Over Input Power, Bias: +3.5V/-5V



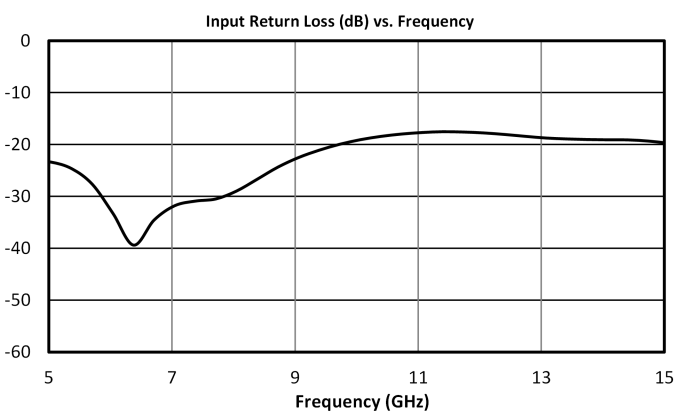
3F Output Suppression (dBc) vs. Output Frequency, Over Input Power, Bias: +3.5V/-5V



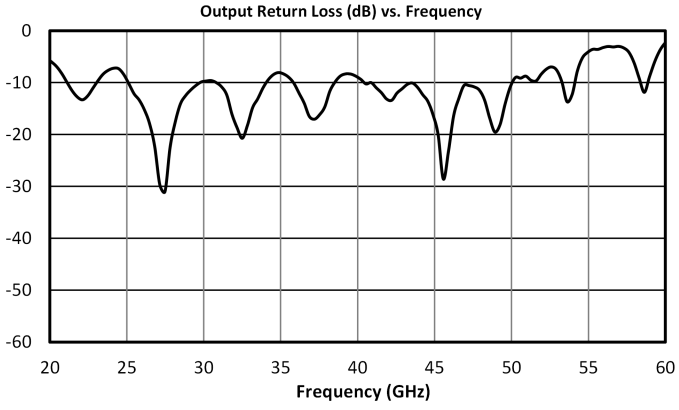
5F Output Suppresion (dBc) vs. Output Frequency, Over Input Power, Bias: +3.5V/-5V



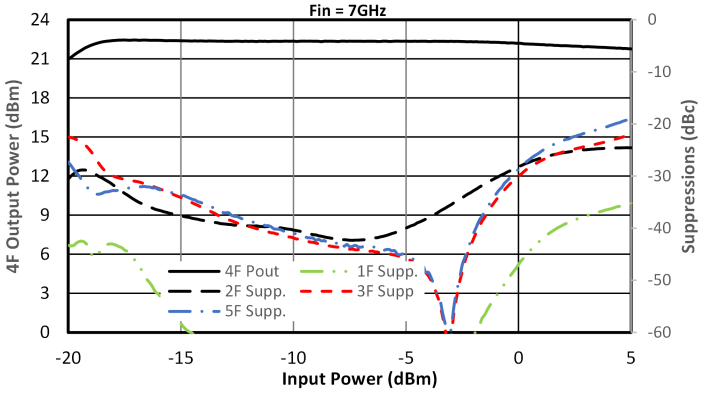
Input Return Loss (dB) vs. Frequency

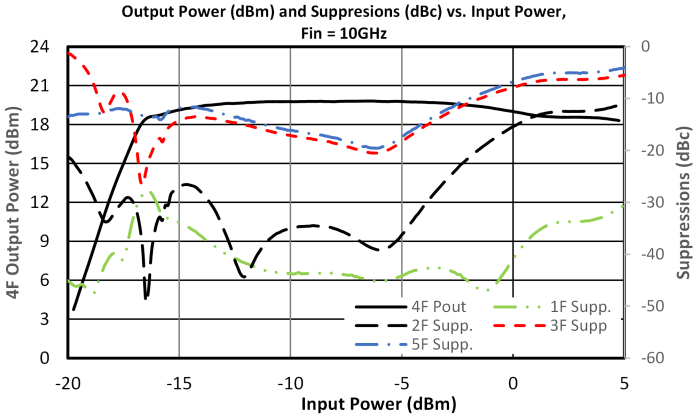


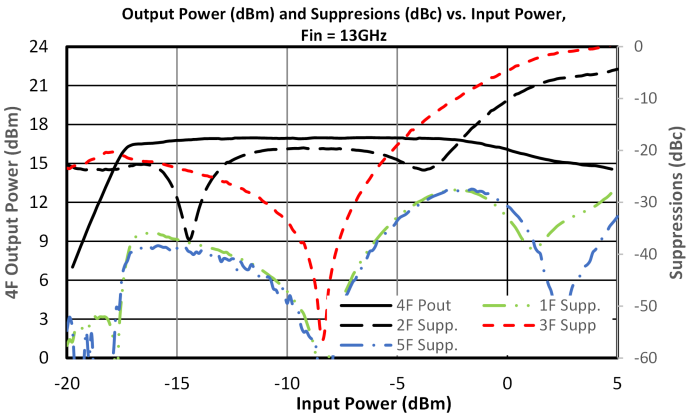
Output Return Loss (dB) vs. Frequency

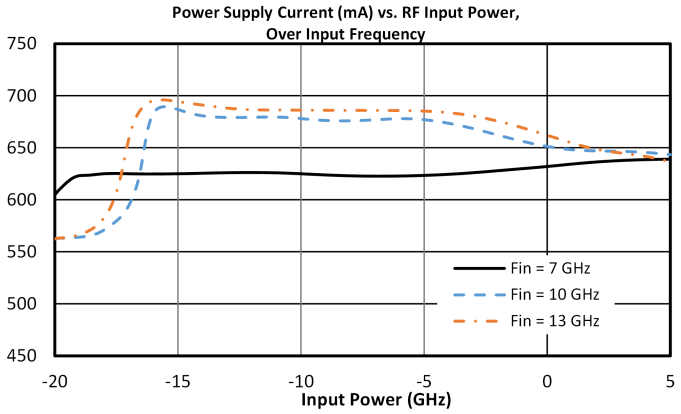


Output Power (dBm) and Suppresions (dBc) vs. Input Power, Fin = 7GHz



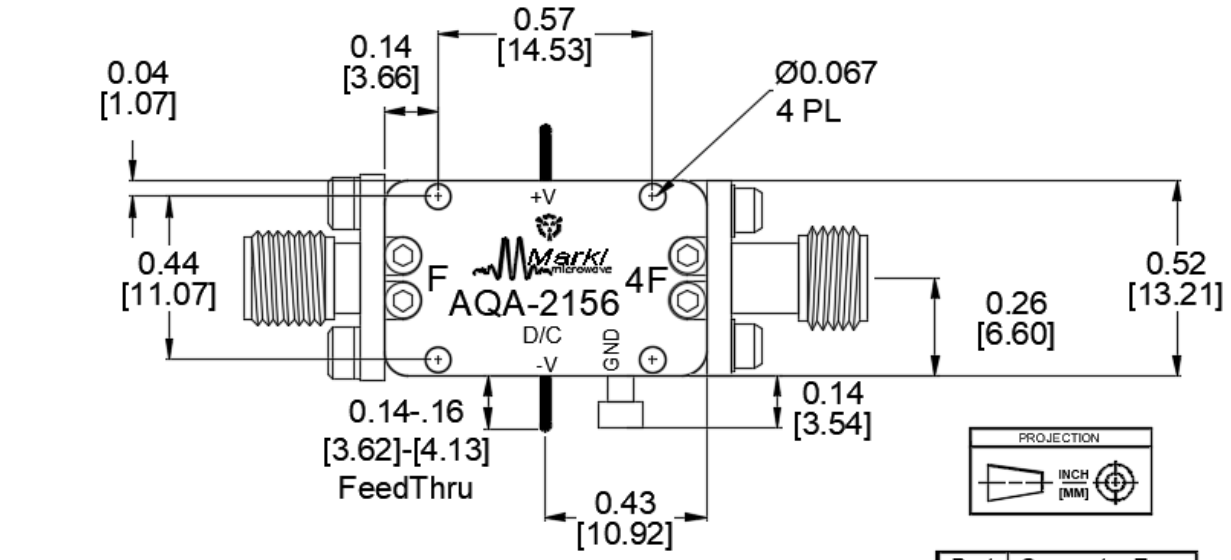






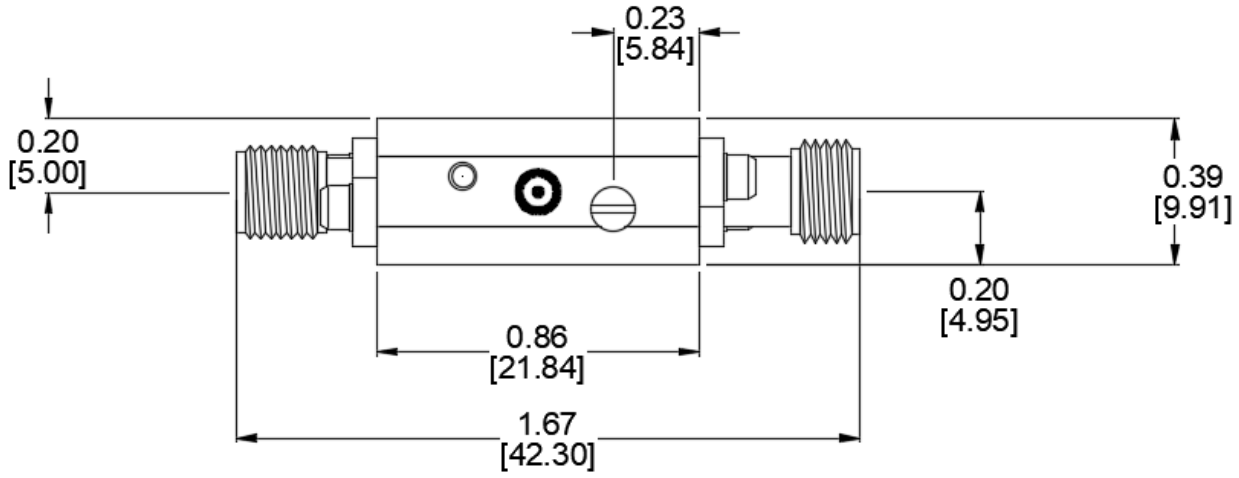
Mechanical Data

Outline Drawing



Port	Connector Type
F	SMA Female
4F	1.85 mm Female

*Note: All measurements are typical



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