



Application Note



Filtering in Flight: Marki Filters for Satcom and Space Applications

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The increasing adoption of communication technology demands an expansive infrastructure. Enter: space. Space had long been a place for scientific research and political capital, but it has turned into a resource for communications systems. As more systems launch, the available bandwidth lessens, increasing the need for spectrum filtering.

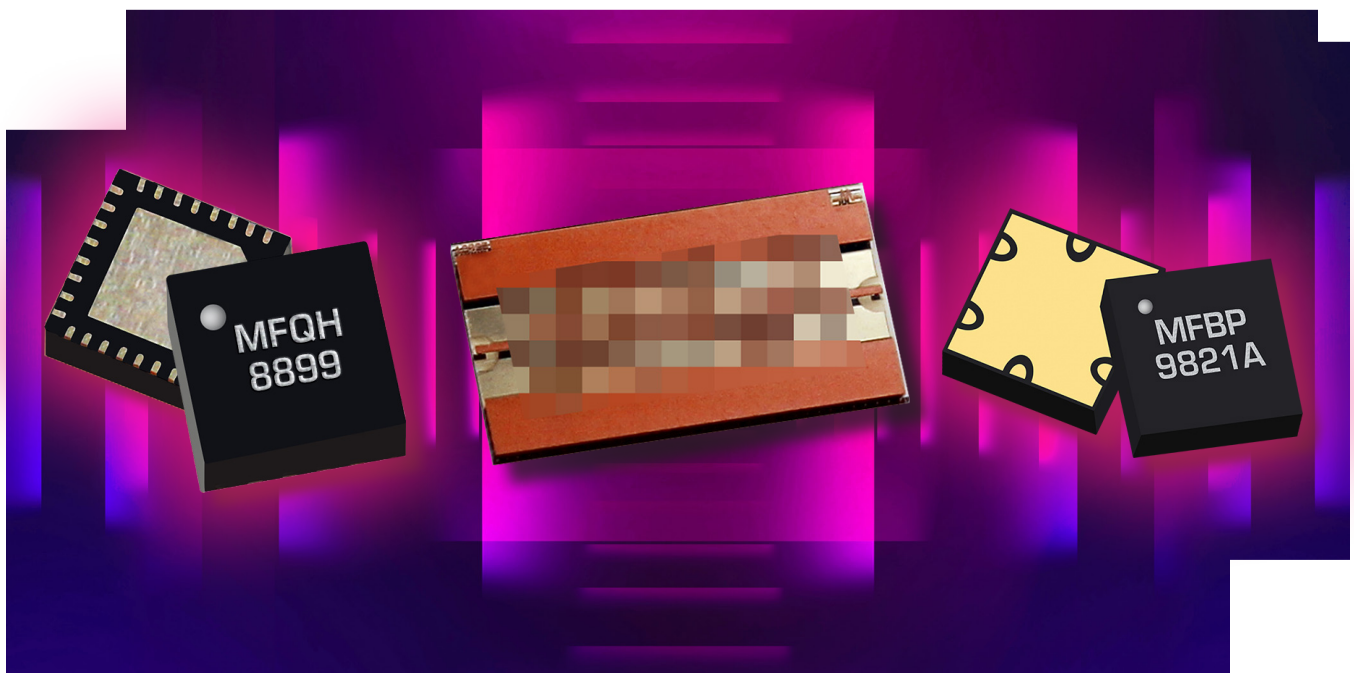
THE COMPLICATIONS:

Filters must be precise, repeatable, and able to withstand the vibrations, mechanical shocks, and thermal changes during launch and in orbit. As quantities of space vessels increase, the size, weight, power, and cost (SWaP-C) of each component must be reduced.

THE FIXES:

Marki Microwave® is familiar with the challenge of reducing SWaP-C and has released a full line of filters from the L- to the Ka-band that are fully space qualified. These filters have GaAs or glass substrates for superior performance and small package sizes for easy integration. All Marki Microwave space qualified components began as COTS products, reducing cost and increasing reliability.

Depending on the construction, they are qualified to MIL-STD-981, MIL-PRF-38534, MIL-PRF-38535, NASA EEE-INST-002, or custom requirements. These include tests such as thermal shock, burn in, random vibration, dielectric withstanding voltage, radiography, 1000 hours life test, destructive physical analysis, and more. For further details on our qualification plans, see our [Space and Hi-Rel page](#).



MERITS OF GLASS:

- Replaces large lumped-element and ceramic filters from VHF to C-band
 - See **Figure 1** for a true-to-scale footprint comparison of a competitor's lumped LC filter and Marki glass filter with similar passbands
- Sharp selectivity via steeper rejection skirts
- High power handling, up to 15 W CW based on design
- Better rejection via its high-Q performance
- Excellent temperature stability
- Highly repeatable manufacturing



Fig. 1: To-scale footprints of competing low frequency filters.

MERITS OF GAAS:

- Low SWaP-C
- Inherently radiation tolerant
- Wideband performance up to mmWave frequencies
- Sharp selectivity
- High power handling
- Excellent simulated-versus-measured accuracy
- Highly repeatable manufacturing

Marki Satcom Filters			
Band	Prime Satcom Link	1 dB Passband (GHz)	Part Number
L	up- and downlink	1.42 - 1.99	MFBP-00162GSM1
S	up- and downlink	1.95 - 2.49	MFBP-00161GSM1
C	downlink	2.81 - 4.62	MFBP-00150PSM
C	uplink	5.85 - 7.45	MFBP-00002PSM
X	downlink	5.99 - 8.41	MFBP-00110CSP3
X	uplink	7.45 - 9.62	MFBP-00090PSM
Ku	downlink	10.38 - 13.84	MFBP-00008PSM
Ku	uplink	13.56 - 14.69	MFBP-00186PSM
Ka	commercial downlink	17.44 - 20.43	MFBP-00061CSP3
Ka	commercial uplink	27.43 - 30.16	MFBP-00128CSP3
Ka	downlink, lower segment	17.28 - 18.98	MFBP-00130PSM
Ka	commercial downlink	17.20 - 20.56	MFBP-00126CSP3
Ka	receive, reflectionless	18.49 - 21.19	MFQH-00001PSM
Ka	military downlink	19.78 - 21.68	MFBP-00133PSM
Ka	military uplink	29.92 - 32.00	MFBP-00058PSM

Marki Microwave offers a full line of RF filters ready for space deployment in addition to these core and premier options. Recognizing that every RF system has different requirements, in addition to our extensive catalog, we offer custom filter designs with quick turnaround times. Marki puts design in your control via [Prodigy Filter Designer](#). Specify your desired topology, center frequency, and bandwidth, and Prodigy will generate a real, manufacturable filter design with known dimensions and variables. Marki designers are available to review designs and help with more complicated designs.

Marki Microwave has served the RF industry for 35 years with hybrid and MMIC products. As we continue to serve the space industry, we look forward to expanding our product lines and supporting our space industry through COTS and custom products. To see our full MMIC catalog, visit our [website](#).

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