



Application Note

Capitalizing on the Design Flexibility of Common Footprint DFN-6 Packages AN003

At Guerrilla RF, we are constantly adding to our portfolio of 1.5 mm DFN-6 devices. Currently, there are more than 20 amplifier devices in this family - offering a wide variety of gain, NF, linearity and bypass options.

Why do we put so many of our amplifiers into the same package? Simple. ***It provides our customers with maximum design flexibility.*** Common packaging means common board layout and common application schematics. The DFN-6 is a leadframe based package known for high reliability, a factory-friendly MSL1 rating and RoHS compliance.

When your specs change - and you know they will - just select a new device from the library which more closely matches the new requirements without needing to re-layout your system board. Now that's flexibility!

Below is a list of our devices currently using this common package and pinout:

Device	Reference V/mA/GHz	Gain (dB)	NF (dB)	OP1dB (dBm)	OIP3 (dBm)	Tuning Range (volts)	VDD Range (Volts)	IDDQ Range (mA)	Comments
GRF2003	5.0/55/5.5	12.0	3.5	15.0	29.0	0.1 to 10.0	2.7 to 5.0	40 to 80	
GRF2004	5.0/100/4.0	16.5	1.9	18.0	31.0	0.1 to 10.0	2.7 to 5.0	60 to 120	
GRF2012	5.0/90/0.9	14.8	2.7	23.0	40.0	0.05 to 3.8	2.7 to 5.0	15 to 100	
GRF2013	5.0/90/1.9	18.5	1.3	22.5	38.5	0.05 to 8.0	2.7 to 5.0	15 to 100	
GRF2014	5.0/150/0.9	15.9	3.4	24.0	43.5	0.05 to 3.8	2.7 to 5.0	50 to 180	
GRF2093	5.0/70/2.5	21.0	0.38	19.0	36.0	1.0 to 6.0	2.7 to 5.0	20 to 100	
GRF2100	3.3/15/2.5	16.5	0.8	10.0	19.0	0.1 to 3.8	1.8 to 5.0	8 to 30	
GRF2105	5.0/70/2.5	20.5	0.75	22.5	37.0	0.4 to 5.0	2.7 to 5.0	20 to 90	
GRF2106	3.3/15/2.5	16.5	0.8	12.0	26.0	0.1 to 4.2	1.8 to 5.0	10 to 40	
GRF2133	5.0/60/1.9	28.5	0.65	20.0	31.0	0.1 to 2.7	2.7 to 5.0	35 to 160	
GRF2140	3.3/15/1.9	18.0	1.1	9.3	20.0	0.1 to 3.8	1.8 to 5.0	8 to 30	Bypass Mode
GRF2373	3.3/15/1.9	18.5	1.3	13.5	25.0	0.1 to 3.8	2.7 to 5.0	10 to 25	
GRF2374	3.3/15/1.9	16.5	1.3	10.0	22.0	0.1 to 3.8	2.7 to 5.0	10 to 25	Bypass Mode
GRF2505	5.0/40/5.5	12.5	1.2	19.0	30.0	4.0 to 6.0	1.8 to 5.0	20 to 60	
GRF4001	3.3/45/2.5	15.5	0.9	16.5	30.5	0.1 to 6.0	1.8 to 3.6	15 to 50	
GRF4002	5.0/70/1.9	17.5	0.8	23.5	36.0	0.1 to 3.8	1.8 to 5.0	20 to 80	
GRF4003	5.0/95/1.9	15	0.8	24.5	41.0	0.1 to 3.8	1.8 to 5.0	20 to 120	
GRF4004	5.0/135/1.9	14.5	0.8	26.0	43.0	0.1 to 3.8	1.8 to 5.0	30 to 150	
GRF4005	5.0/170/1.9	15.0	0.8	26.5	42.0	0.1 to 3.8	1.8 to 5.0	50 to 200	
GRF4014	5.0/60/2.5	16.5	0.8	24.3	39.0	0.1 to 6.0	2.7 to 8.0	30 to 120	
GRF4142	3.3/50/1.9	15.3	0.9	19.3	33.0	0.1 to 3.8	1.8 to 5.0	15 to 80	Bypass Mode

* Coming Soon!

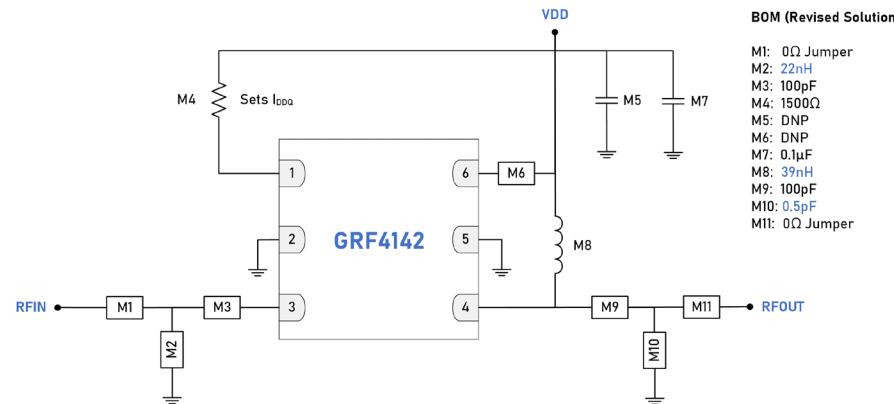
provide; the other RF requirements remain unchanged. Luckily, thanks to the breadth of the Guerrilla RF DFN-6 portfolio, a drop-in solution to the new requirement exists and it is called **GRF4142**.

Revised Solution with Bypass:
GRF4142
Gain: 14.5 dB

NF: 0.95 dB

OP1dB: 22.5 dBm

OIP3: 33.0 dBm

Iddq: 70 mA Bypass: Yes


The example above showed how a completely new performance capability (bypass) could be accommodated by a single layout using the Guerrilla RF DFN-6 layout and general purpose schematic. The need to revise the layout for a new part/package was avoided.

Following is an example of how this same layout can be used for a different frequency band, with significantly different RF performance targets. For this example, the goal is to find a single, ultra-high gain LNA to reduce a cascaded lineup of two amplifiers – down to a single device for cost and layout purposes.

Performance Requirements:
Frequency: 1900 MHz

Gain: >= 26.0 dB Max.

NF: <= 1.0 dB

OP1dB: >= 18.0 dBm

OIP3: >= 30.0 dBm

Iddq: <= 80 mA

Vdd: 5.0 V

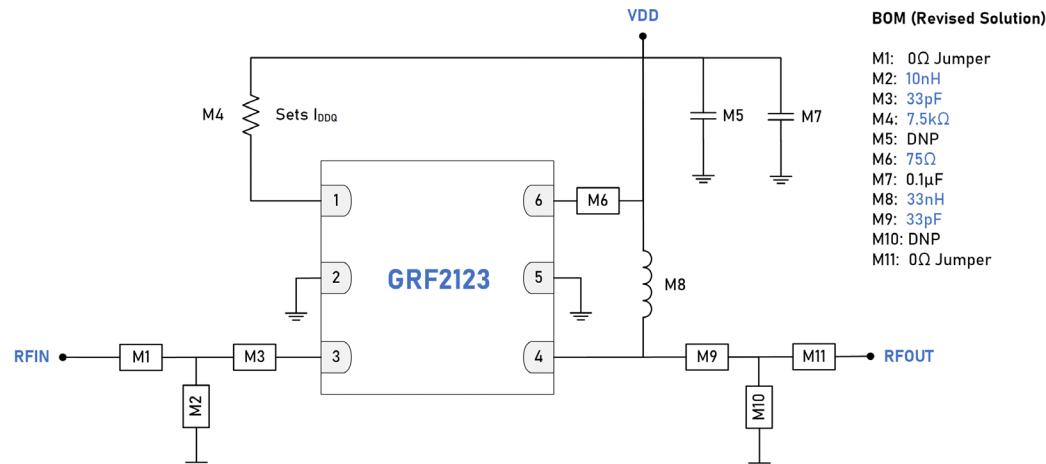
Bypass Capability: No

Solution: GRF2133
Gain: 28.0 dB

NF: 0.6 dB

OP1dB: 20.0 dBm

OIP3: 31.0 dBm

Iddq: 60 mA


Regardless of your application requirements, the Guerrilla RF applications engineering team is happy to help recommend the optimal solution for you. Contact us at applications@guerrilla-rf.com with any questions!

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**AN003**

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APPLICATION NOTE

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Revision History

Revision	Date Reason for Revision
Initial Release	September 1, 2020