RF Overview and Roadmap Introduction

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AUG.2015

freescale™

External Use

Land Mobile Radio

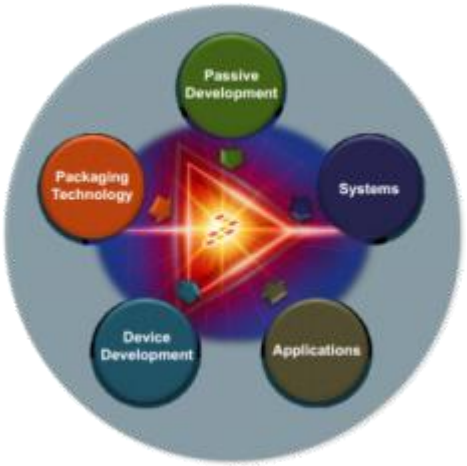
Freescale RF Strategy for Professional Mobile Radios

1. Complete refresh of the portfolio with 10+ new Airfast transistors

2. Series of low power LDMOS transistors (3-4W)

3. Dual-stage RF ICs with 0dBm input

….Bringing Freescale's leading-edge ***Airfast*** *technology to PMR*



Airfast is a result of a Holistic design approach and not any one individual piece of technology

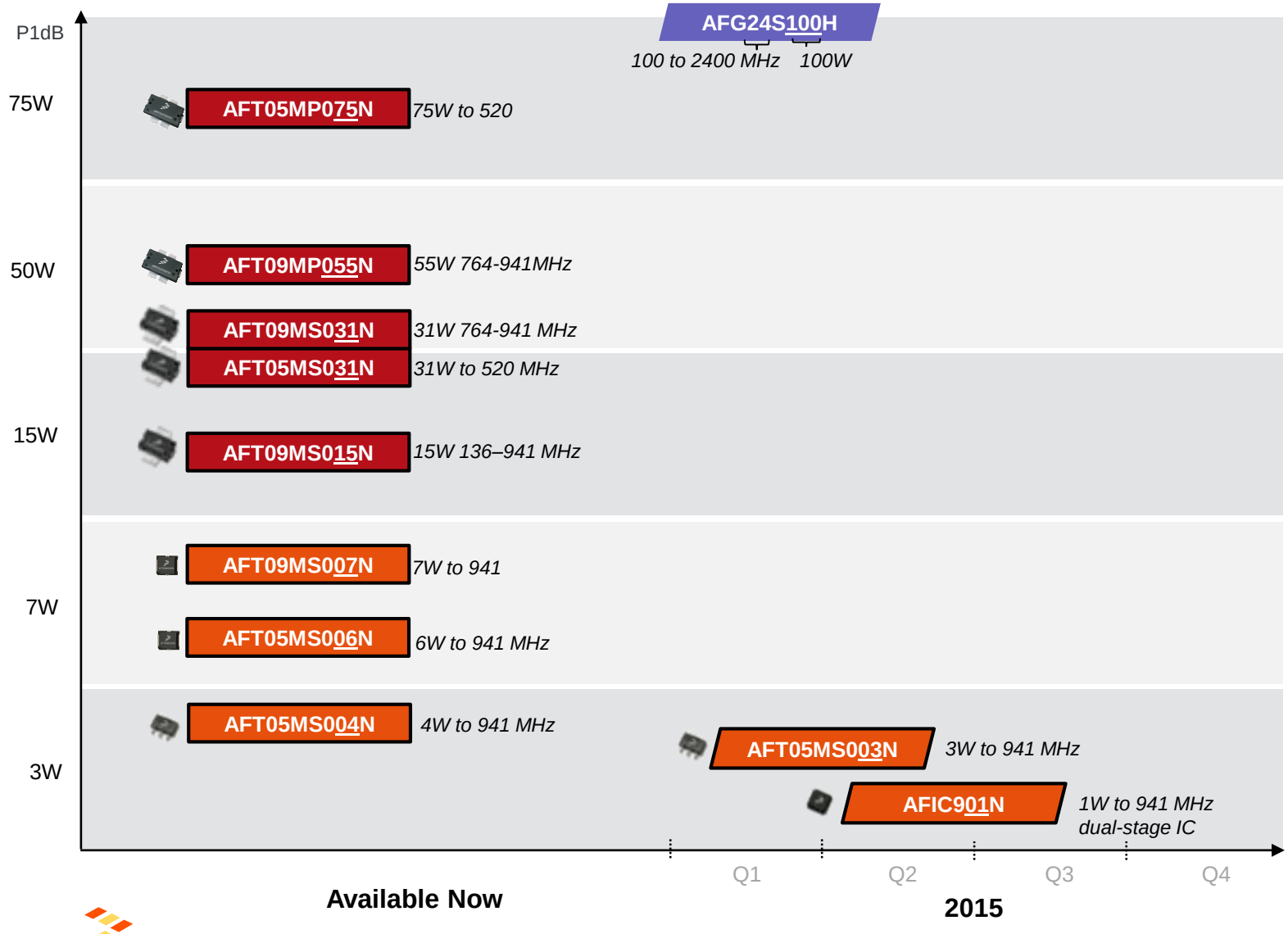
Freescale New Airfast Mobile Radio Devices

Features include

- Best ruggedness in the industry:
  - LDMOS devices handle > 65:1 VSWR with 3 dB overdrive
- High gain
  - Eliminates stages, reducing system cost
- High efficiency
  - Allows use of smaller heatsinks and housings
  - Less heat improves reliability
- Broadband capability
  - Enables full performance across in each PMR band
  - Slightly reduced performance across multiple bands.
- Available in cost effective plastic packages
- Freescale product longevity program

Land Mobile Radio roadmap

All watts are CW.

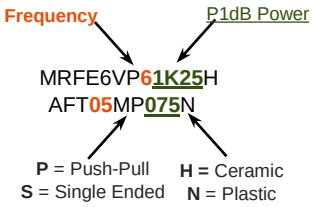


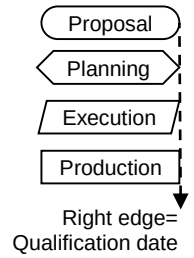
50V GaN

12V LDMOS rugged

3.6-7.2V LDMOS rugged

Plastic

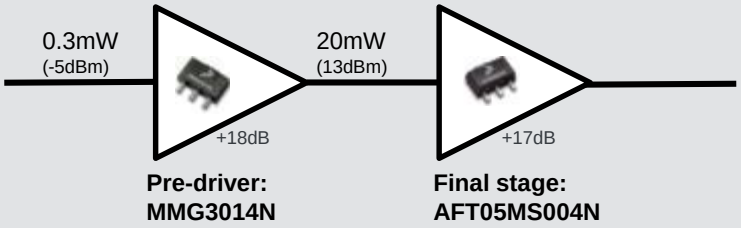




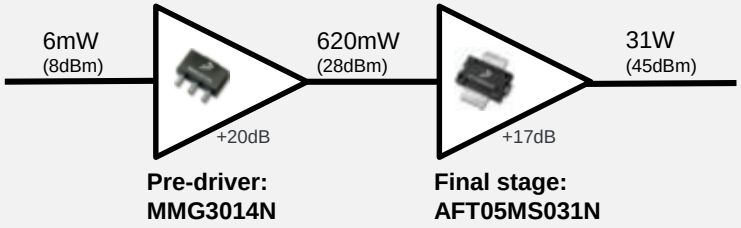
Back to overview

Example of Professional Mobile Radio line-ups:

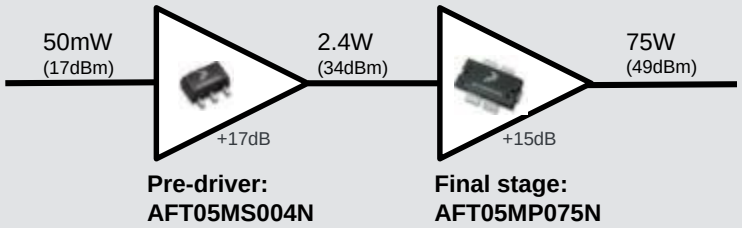
Line-up for **handheld** radio:



Line-up for **mobile** (vehicle) radio:



Line-up for **BTS**:

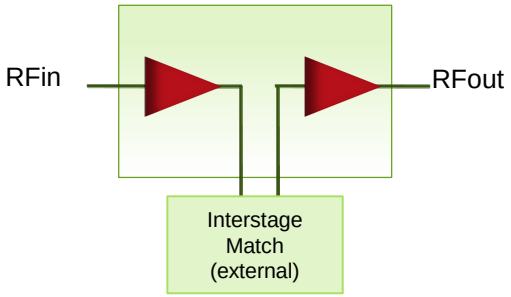


New

AFIC901N: 1W frequency-configurable LDMOS RFIC

Two-stage LDMOS Driver

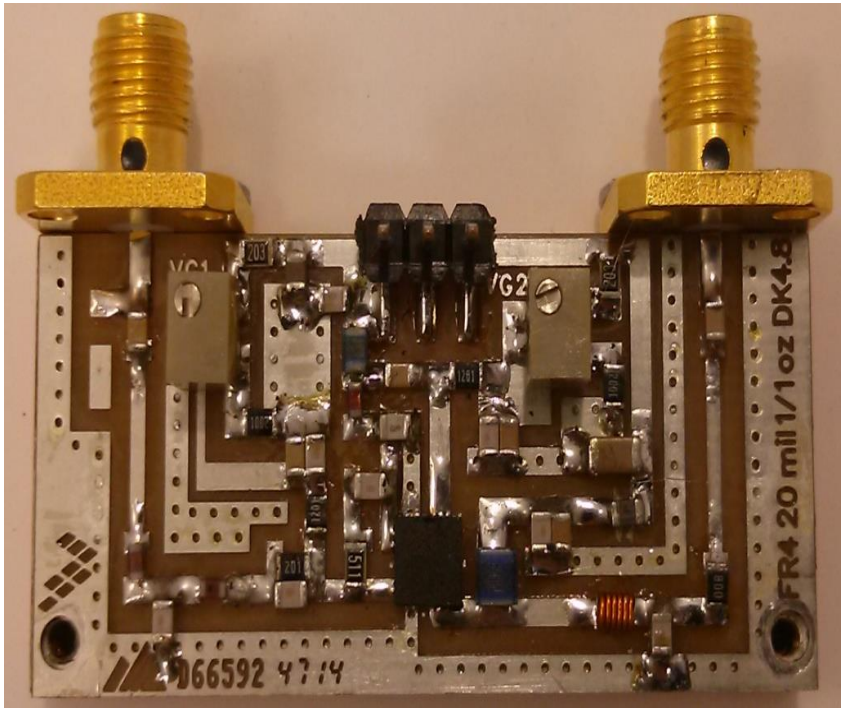
- External matching allows optimization for range of voltages and frequencies
- 1W output power
- Housed in a QFN 4 x 4 package
- Product Longevity program: warranted availability until 2030

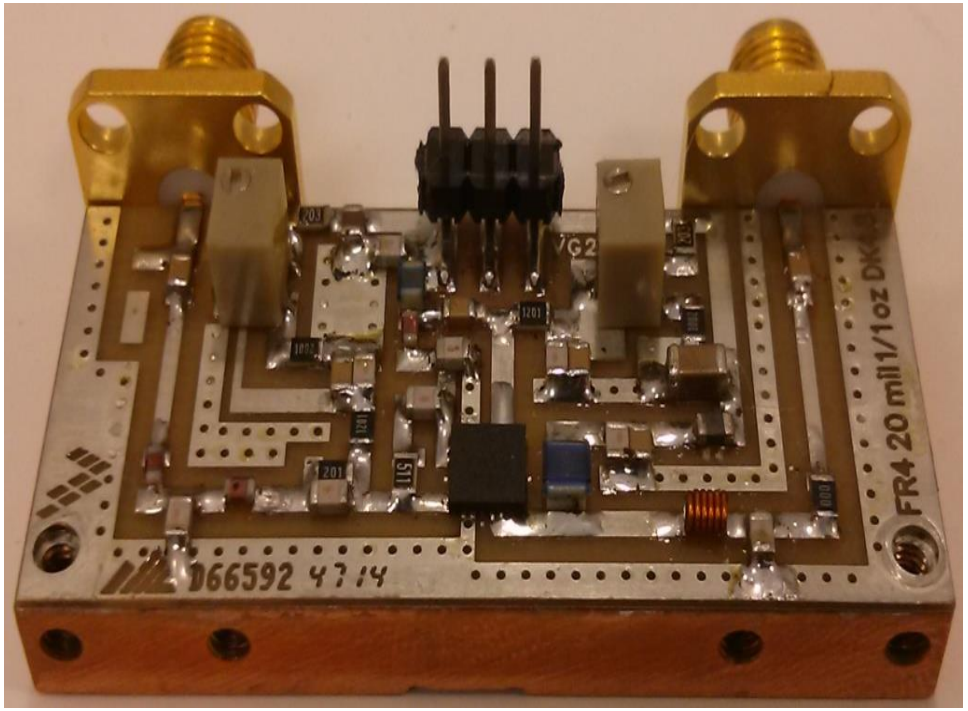


Available Reference Circuits

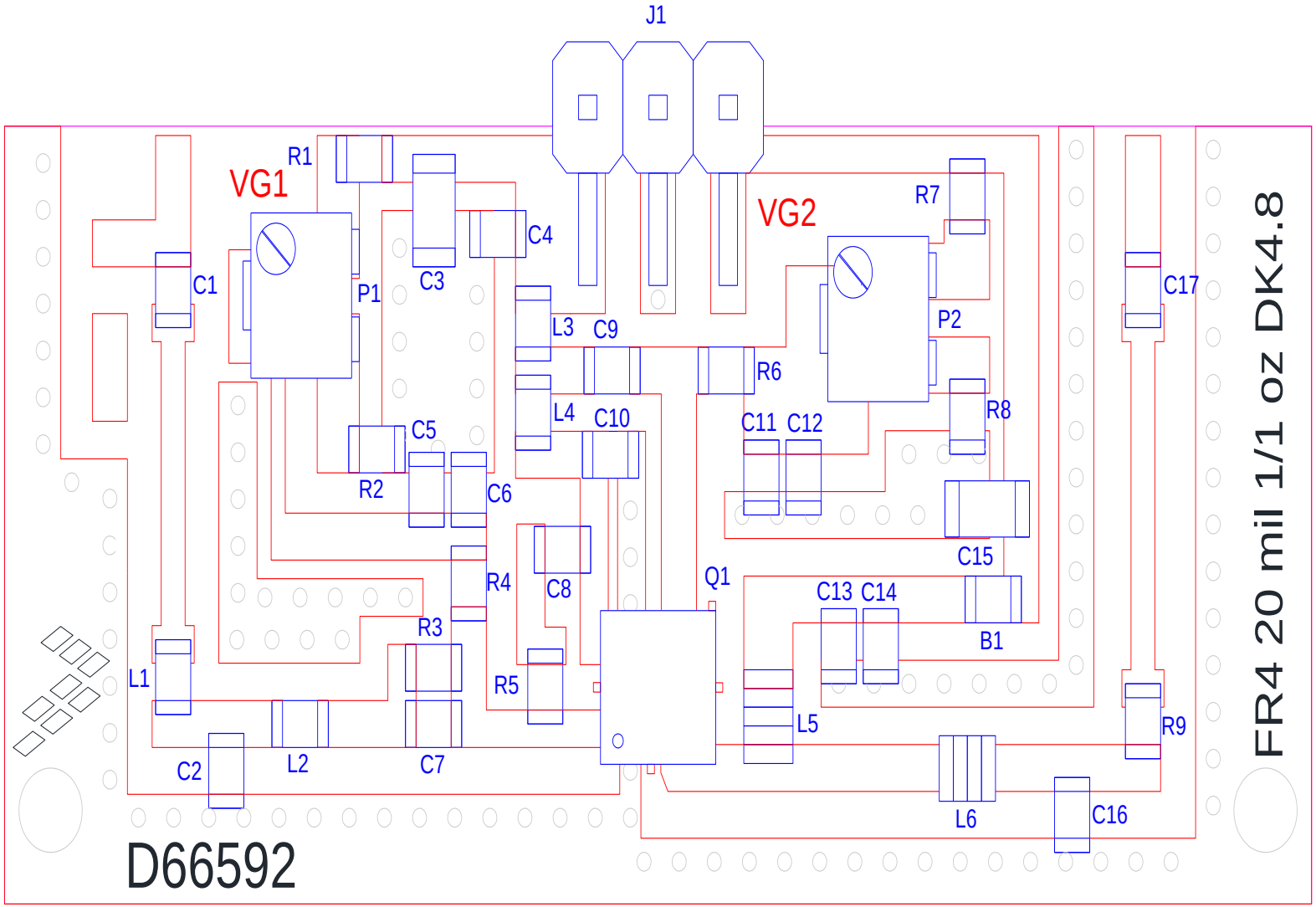
Board Frequency (MHz)	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	PCB Size	Link
136-175	1 CW	32	60	0.83x1.88”	
350-520	1 CW	30	55	0.83x1.88”	

Assembly Photo

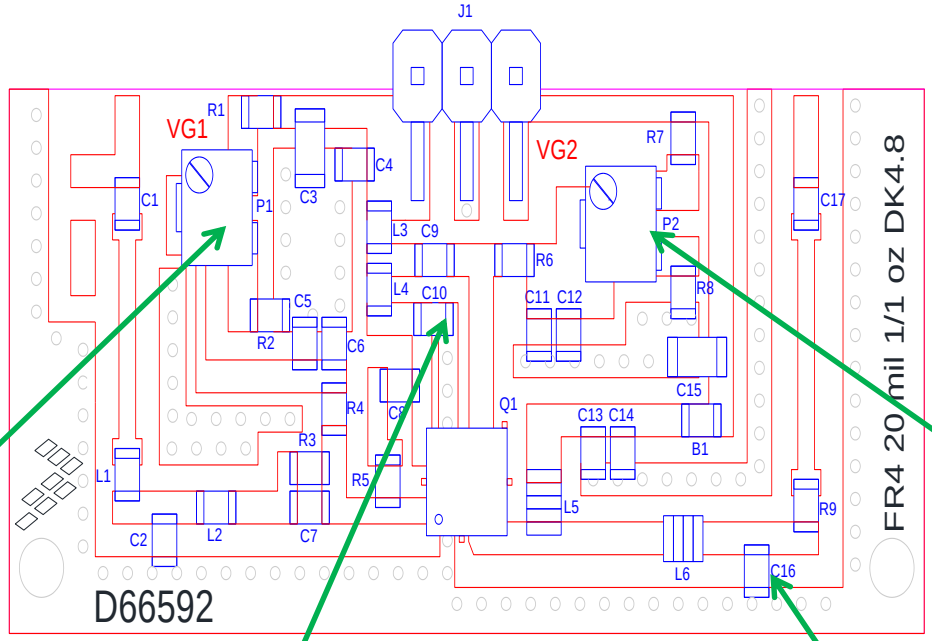




Assembly drawing



Tuning tips



Disconnect second stage VD and adjust P1 to set first stage current to 10 mA

Disconnect first stage VD and adjust P2 to set second stage current to 30 mA

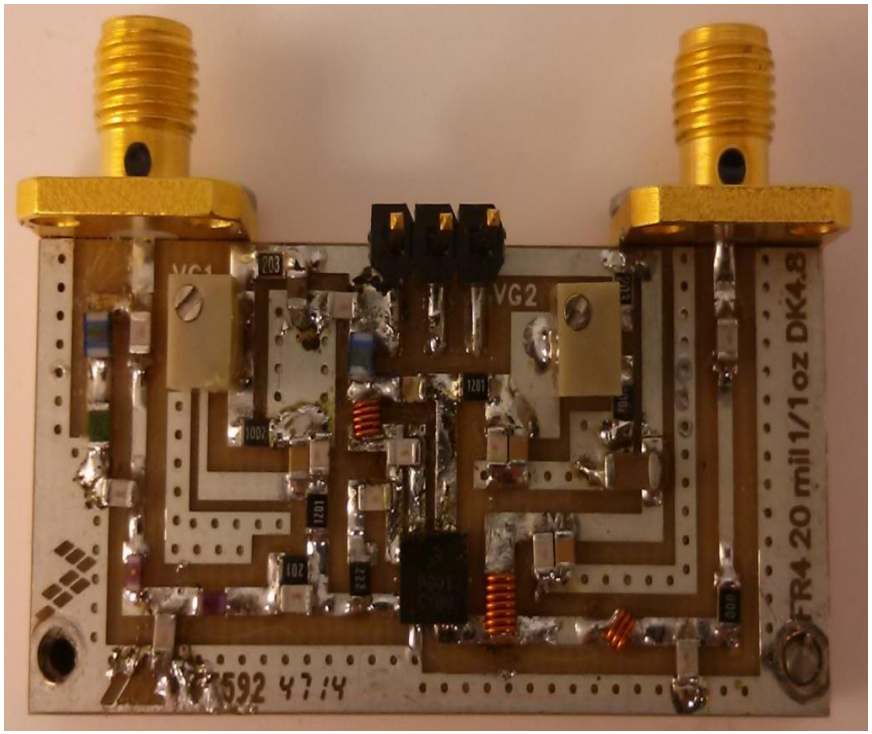
Change C10 to larger value to increase low frequencies gain and efficiency

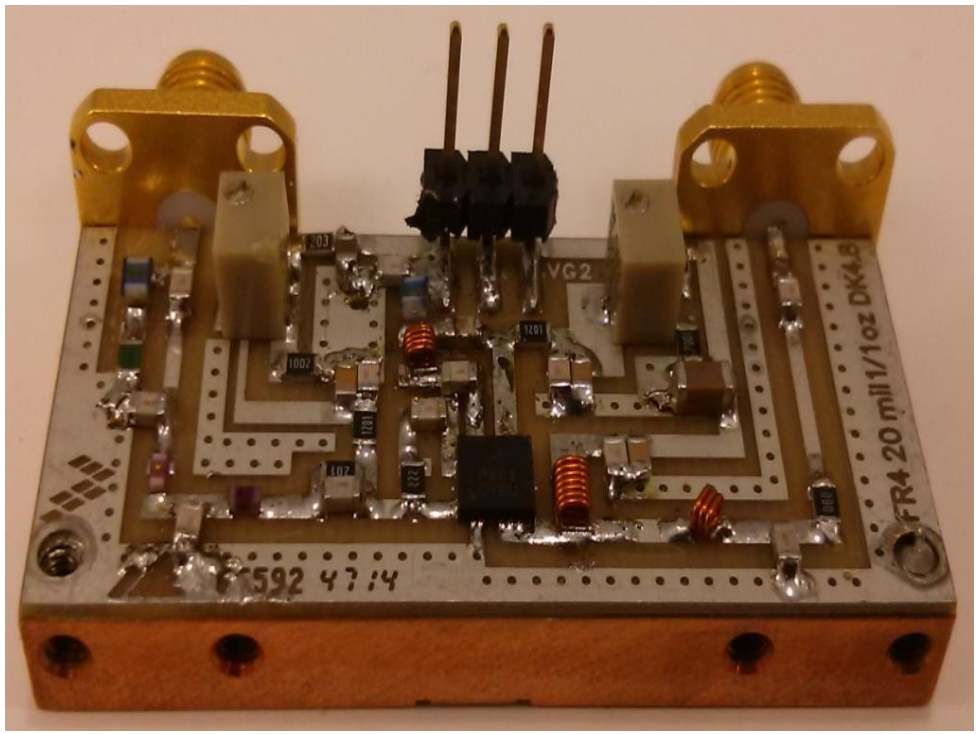
Change C16 to smaller value to increase high frequency power and efficiency

Correlation data

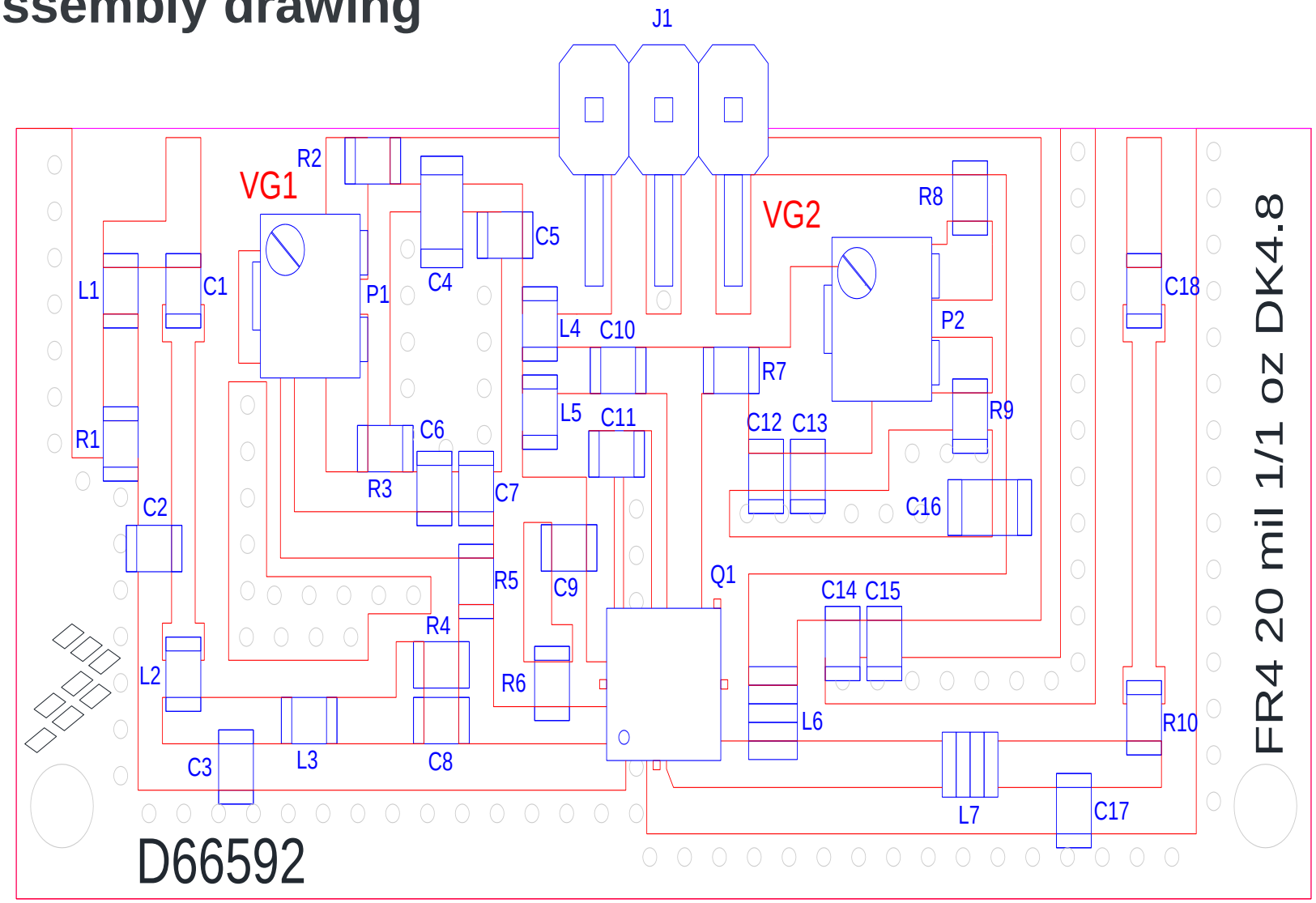
Part ID	Freq (MHz)	Pin (dBm)	Pout (dBm)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Id (A)
TF2	135	0.0	30.2	30.2	-9.8	64.9	7.5	0.216
TF2	155	0.0	30.7	30.7	-18.8	63.0	7.5	0.248
TF2	175	0.0	30.7	30.7	-10.1	61.9	7.5	0.254
TF3	135	0.0	30.2	30.2	-9.5	64.9	7.5	0.217
TF3	155	0.0	30.7	30.7	-18.1	63.0	7.5	0.249
TF3	175	0.0	30.8	30.8	-12.9	62.0	7.5	0.258
TF4	135	0.0	30.3	30.3	-10.1	65.4	7.5	0.218
TF4	155	0.0	30.7	30.7	-18.9	63.2	7.5	0.251
TF4	175	0.0	30.7	30.7	-10.1	61.6	7.5	0.253

Assembly Photo

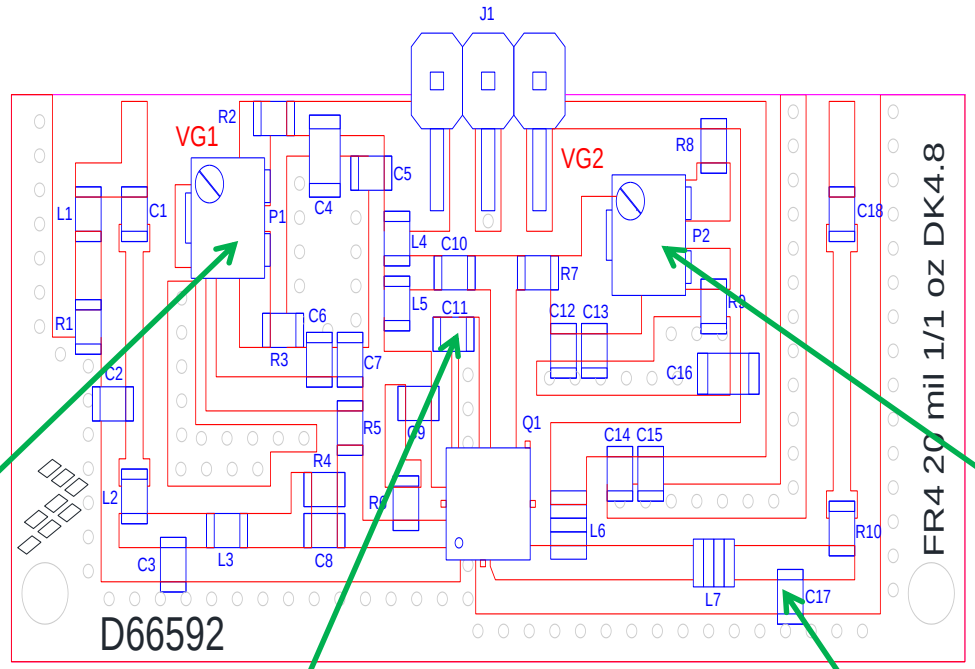




Assembly drawing



Tuning tips



Disconnect second stage VD and adjust P1 to set first stage current to 10 mA

Disconnect first stage VD and adjust P2 to set second stage current to 30 mA

Change C11 to larger value to increase low frequencies gain and efficiency

Change C17 to smaller value to increase high frequency power and efficiency

Correlation data

Part ID	Freq (MHz)	Pin (dBm)	Pout (dBm)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Id (A)
TF2	350	4.0	30.4	26.4	-4.4	55.9	7.5	0.3
TF2	435	4.0	31.6	27.6	-1.8	66.8	7.5	0.3
TF2	520	4.0	30.7	26.8	-2.7	72.2	7.5	0.2
TF3	350	4.0	30.4	26.4	-4.4	55.9	7.5	0.3
TF3	435	4.0	31.7	27.7	-1.7	68.4	7.5	0.3
TF3	520	4.0	30.5	26.5	-2.8	70.1	7.5	0.2
TF4	350	4.0	30.4	26.4	-4.6	56.1	7.5	0.3
TF4	435	4.0	31.5	27.5	-1.8	68.3	7.5	0.3
TF4	520	4.0	30.5	26.5	-2.6	72.1	7.5	0.2

New

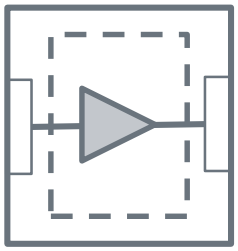
AFT05MS003N

136-941 MHz

3.6 V
7.5 V

>3W (P1dB CW @ 7.5V)

- Unmatched Input and Output LDMOS transistor
- Housed in an SOT89 over-molded plastic package
- Extreme Ruggedness: handles >65:1 VSWR
- Product Longevity program: warranted availability until 2030



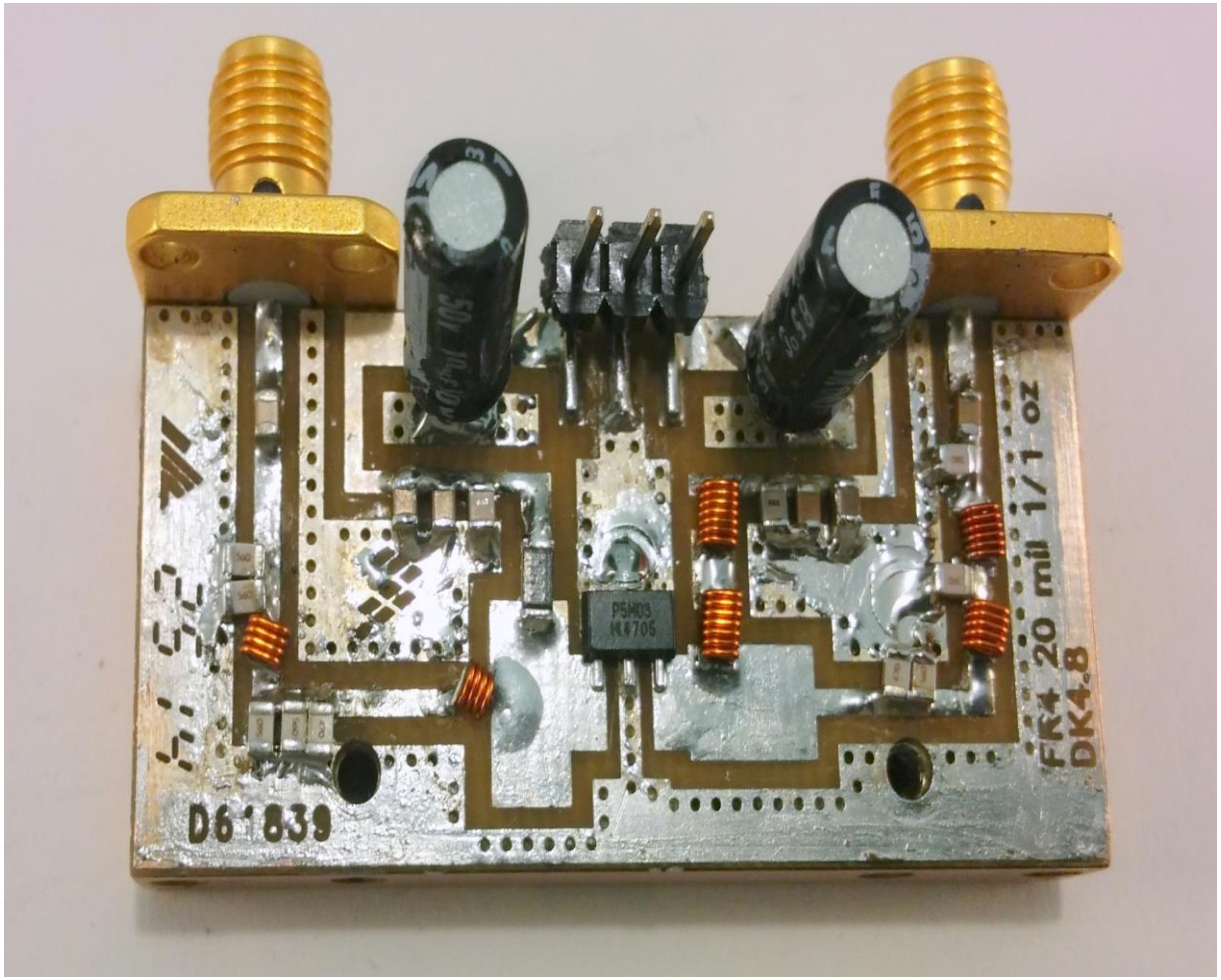
Available Reference Circuits

Board Frequency (MHz)	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	PCB Size	Link
136-175	*planned*				
350-520	3 CW	14.5	60	0.83x1.86”	

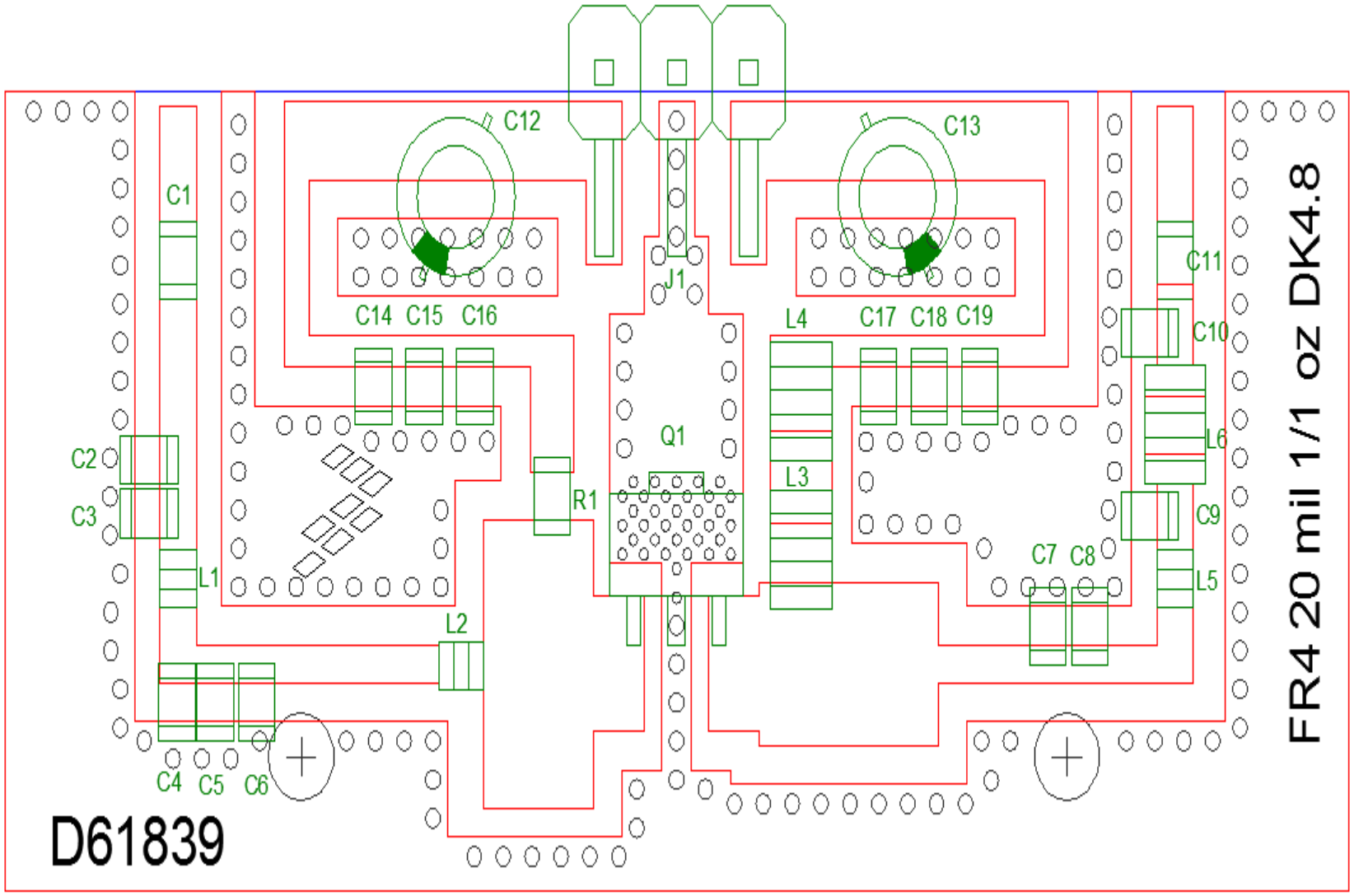

ISM driver Roadmap


Land Mobile Roadmap

Fixture Assembly Photo – Top view

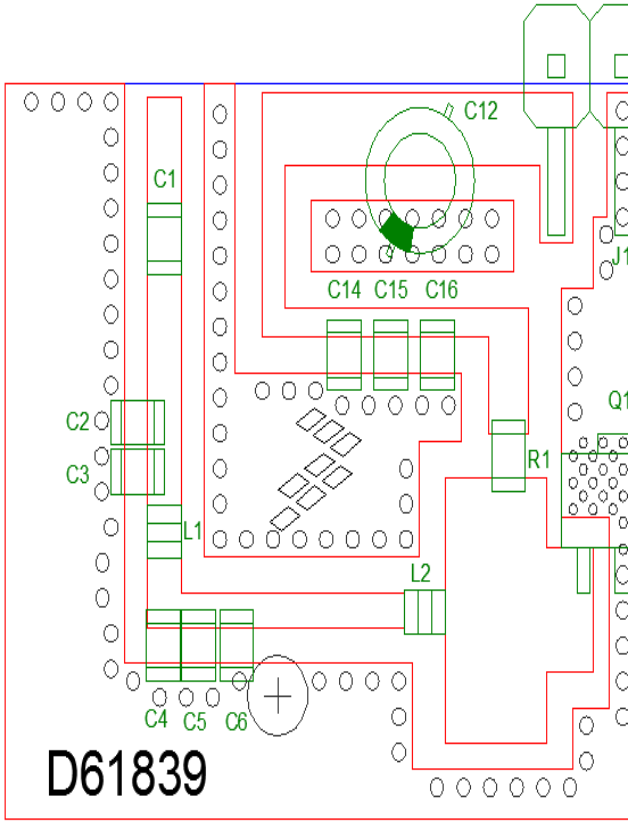


Assembly Layout



Tuning Tips – Input side

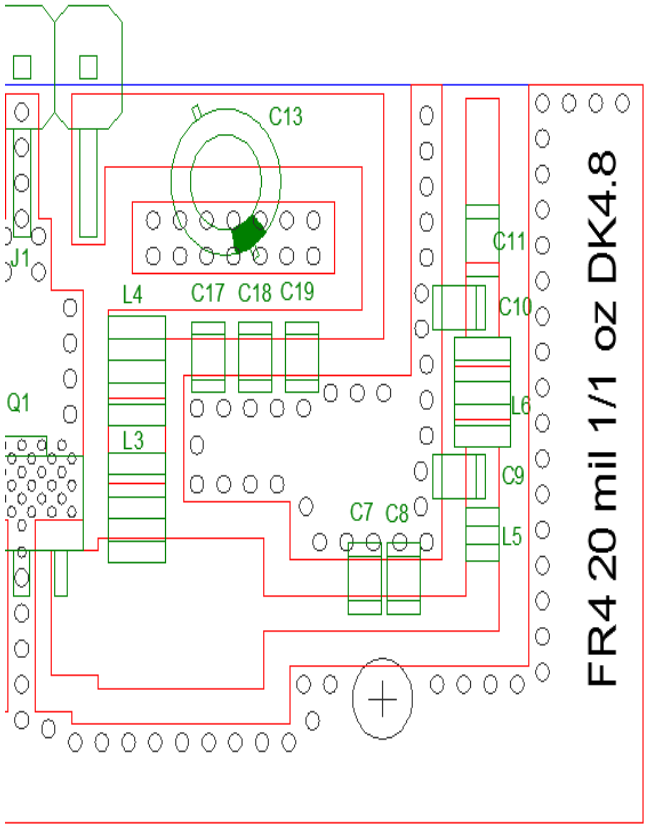
- Ensure that C2 and C3 are close to L1. This will protect the gain at the high end of the band.
- If IRL is bad, first replace C1 to be sure it was not damaged on installation.
- In some cases, separating C4 from C5 and C6 by a small gap will help the IRL at the top end of the band.



D61839

Tuning Tips – Output side

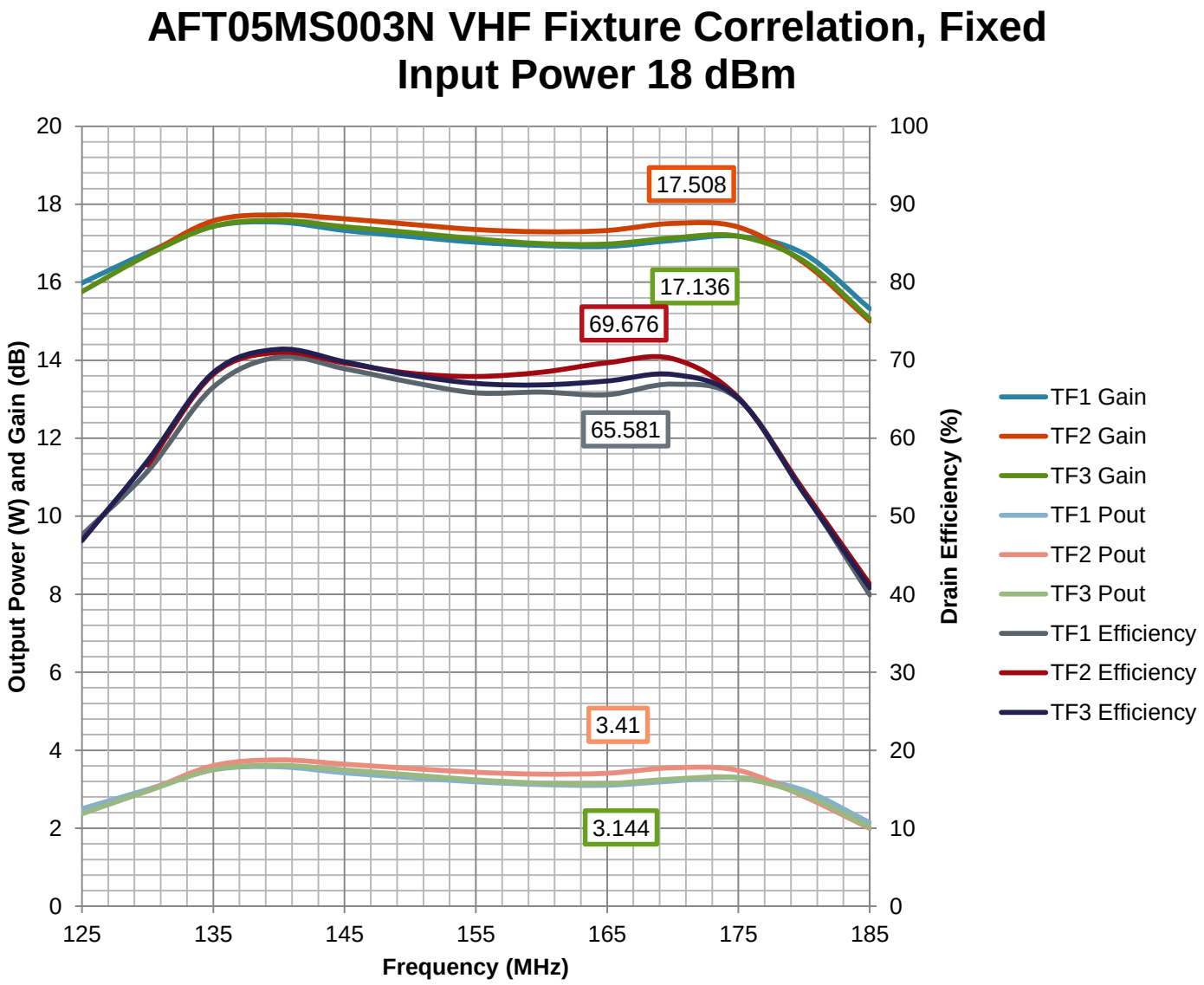
- If gain seems too low, double check that there is 7.5V supplied at the drain lead.
- In all cases, tuning was needed to increase gain at 165 and 175 MHz, and increase efficiency at 175 MHz.
- C10 should be close to C11 for best matching (check this first).
- C7 and C8 move left to increase the gain and efficiency at top end of band, but watch out for a dip in gain at 165 MHz when doing this.
- In some cases, moving C7 left by 0.5mm will get the efficiency to recover at 175 MHz.



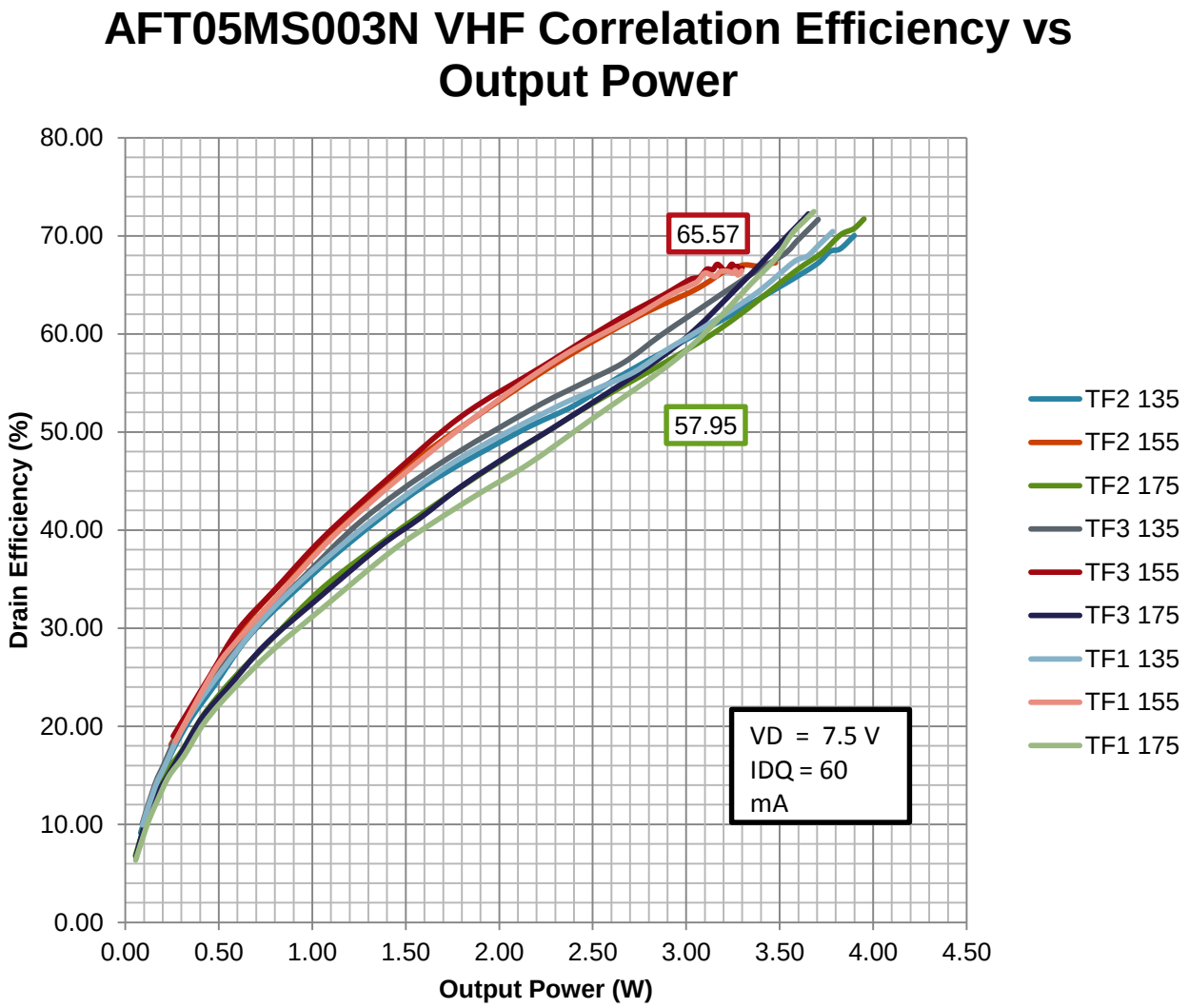
Correlation Data – Standard Test Points

Part ID	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vg (V)	Id (A)	Idq (A)
TF2	135	0.063	3.60	17.57	-4.45	68.19	7.5	2.97	0.71	0.06
TF2	145	0.063	3.64	17.63	-9.14	69.64	7.5	2.97	0.70	0.06
TF2	155	0.063	3.44	17.35	-12.11	67.92	7.5	2.97	0.68	0.06
TF2	165	0.063	3.41	17.33	-4.87	69.68	7.5	2.96	0.65	0.06
TF2	175	0.063	3.48	17.41	-3.50	65.19	7.5	2.96	0.71	0.06
TF3	135	0.063	3.50	17.43	-4.56	68.41	7.5	2.91	0.68	0.06
TF3	145	0.063	3.50	17.42	-9.54	69.80	7.5	2.91	0.67	0.06
TF3	155	0.063	3.24	17.11	-11.61	67.03	7.5	2.91	0.65	0.06
TF3	165	0.063	3.14	16.98	-4.80	67.34	7.5	2.91	0.62	0.06
TF3	175	0.063	3.29	17.18	-3.56	65.09	7.5	2.91	0.68	0.06
TF1	135	0.063	3.50	17.44	-4.37	66.55	7.5	2.93	0.68	0.06
TF1	145	0.063	3.42	17.33	-8.90	68.92	7.5	2.93	0.65	0.06
TF1	155	0.063	3.19	17.03	-12.38	65.82	7.5	2.93	0.63	0.06
TF1	165	0.063	3.10	16.92	-4.92	65.58	7.5	2.93	0.62	0.06
TF1	175	0.063	3.30	17.18	-3.56	65.00	7.5	2.93	0.66	0.06

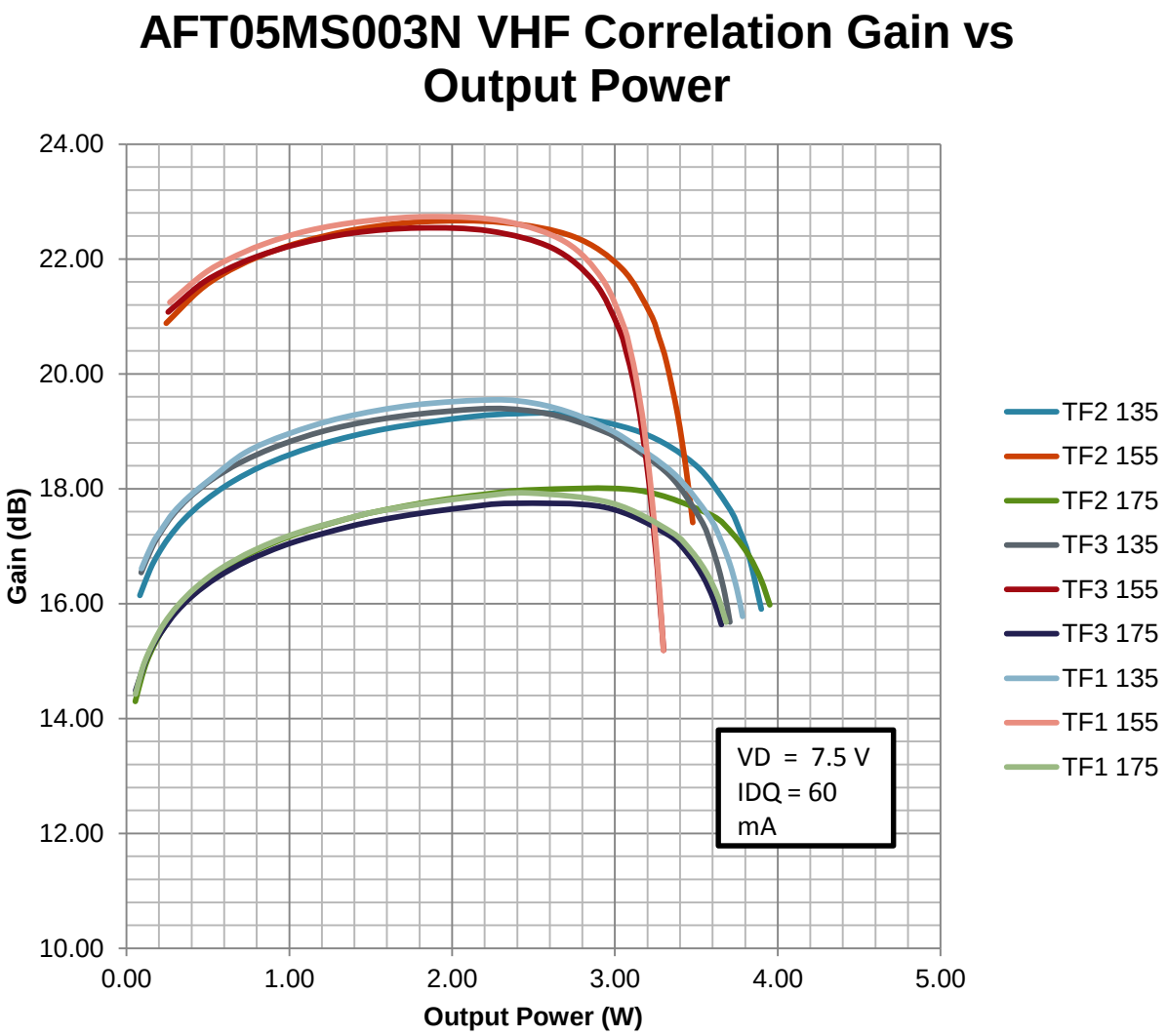
Correlation Data – Wideband Sweep Comparison



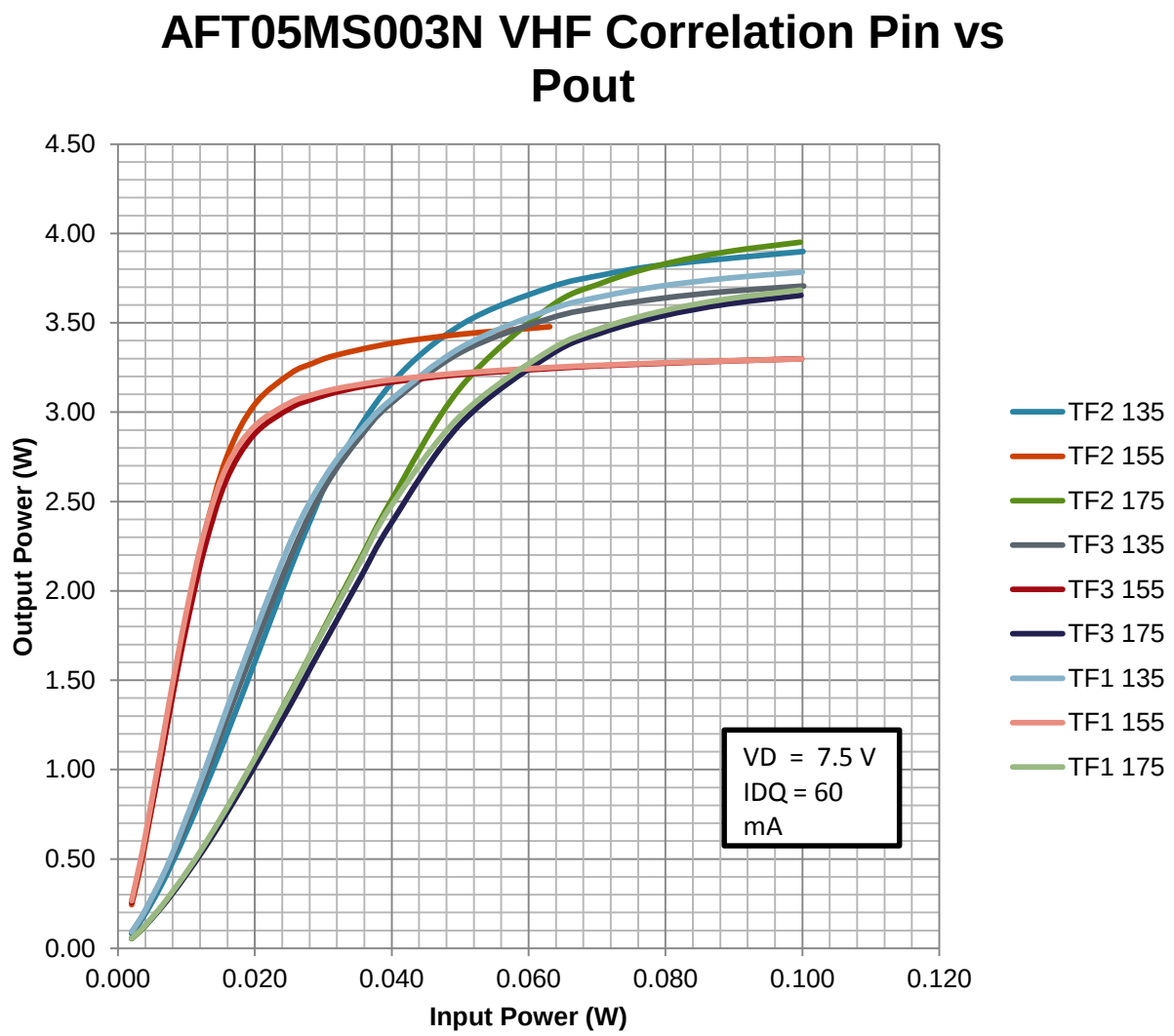
Graph 1 – Gain and Efficiency vs Frequency



Graph 1 – Gain and Efficiency vs Frequency



Graph 2 – Input vs Output Power



Compression Tables

TF1		P-1dB			P-3dB		
Freq	Gpk	G	P	E	G	P	E
135	19.6	18.6	3.2	62.5	16.7	3.7	69.0
155	22.7	21.7	2.9	64.0	19.5	3.2	65.9
175	17.9	16.9	3.5	67.5	14.9	3.9	73.5

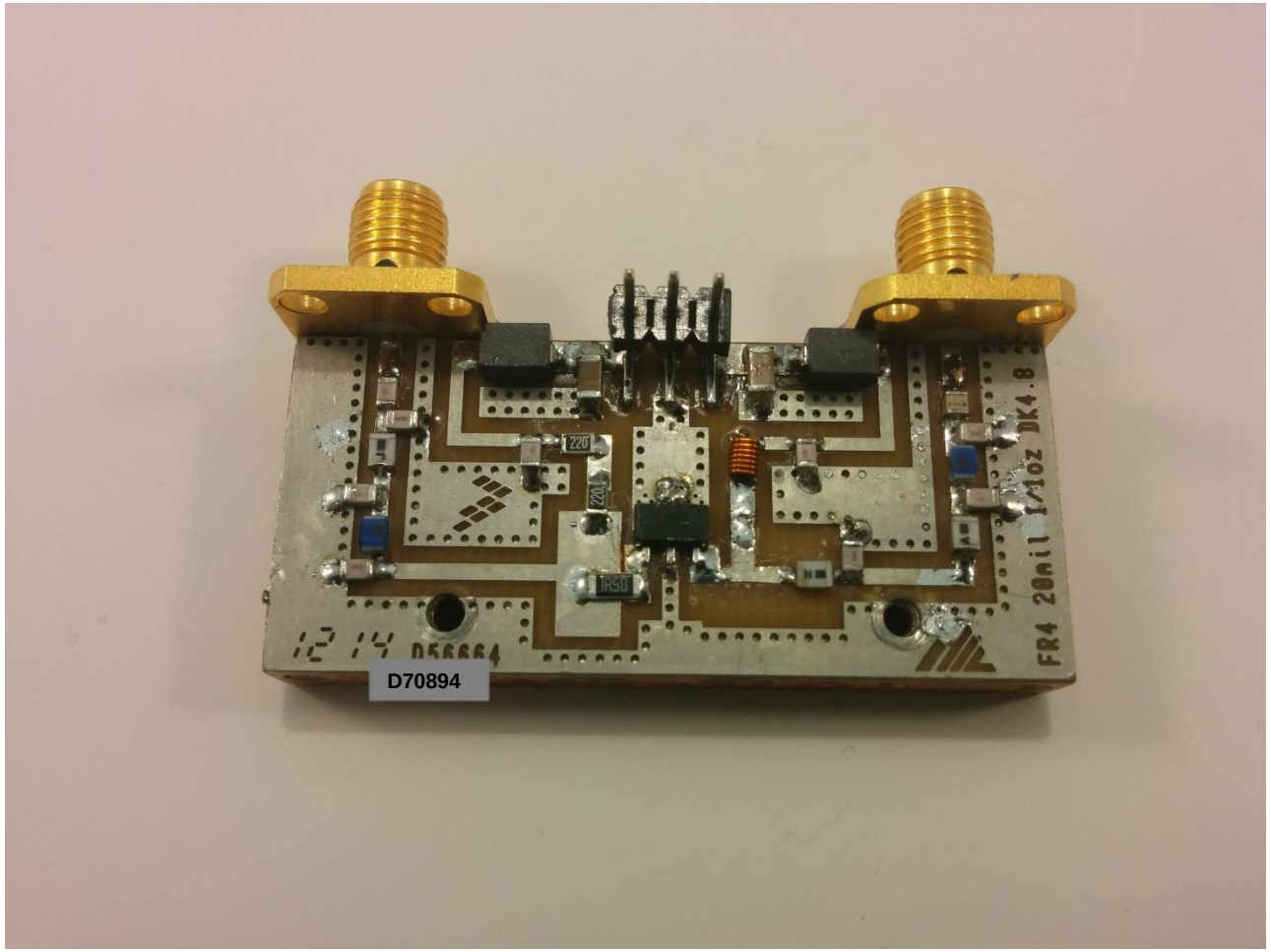
TF2		P-1dB			P-3dB		
Freq	Gpk	G	P	E	G	P	E
135	18.4	18.4	3.5	64.7	16.4	3.9	69.5
155	22.7	21.8	3.0	64.4	19.7	3.4	67.0
175	18.0	17.0	3.8	68.5	15.0	4.0	73.0

TF3		P-1dB			P-3dB		
Freq	Gpk	G	P	E	G	P	E
135	19.4	18.4	3.2	64.5	16.4	3.7	70.7
155	22.5	21.6	2.9	63.9	19.5	3.1	66.5
175	17.9	16.9	3.5	68.1	14.9	3.9	73.3

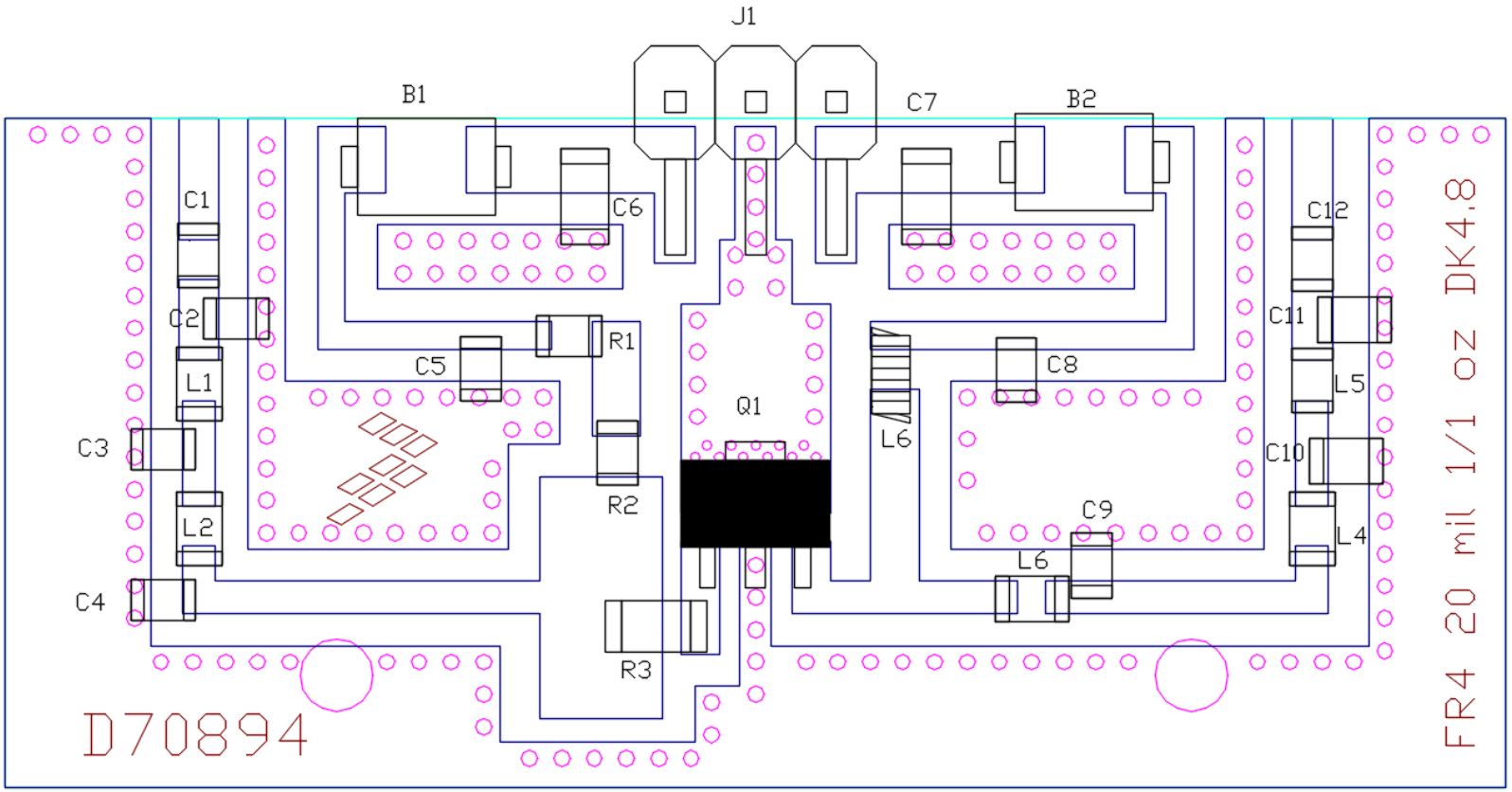
STDEV		P-1dB			P-3dB		
Freq	Gpk	G	P	E	G	P	E
135	0.6	0.1	0.2	1.2	0.2	0.1	0.9
155	0.1	0.1	0.1	0.3	0.1	0.2	0.6
175	0.1	0.1	0.2	0.5	0.1	0.1	0.3

AVG		P-1dB			P-3dB		
Freq	Gpk	G	P	E	G	P	E
135	19.1	18.5	3.3	63.9	16.5	3.8	69.7
155	22.6	21.7	2.9	64.1	19.6	3.2	66.5
175	17.9	16.9	3.6	68.0	14.9	3.9	73.3

Fixture Assembly Photo – top view



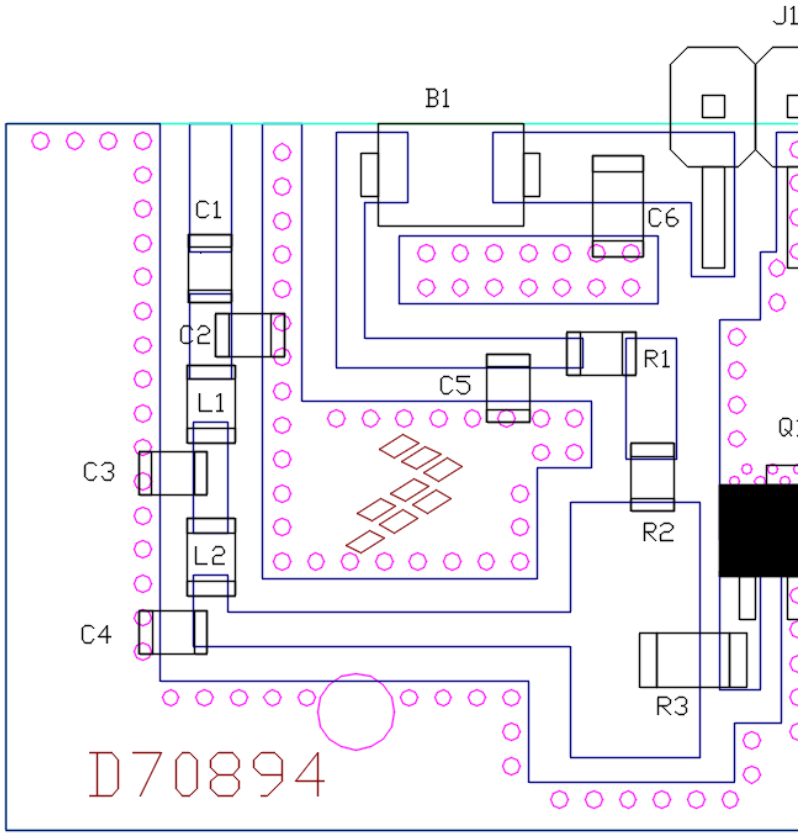
Assembly Layout



Tuning Tips – Input side

Input match tuning

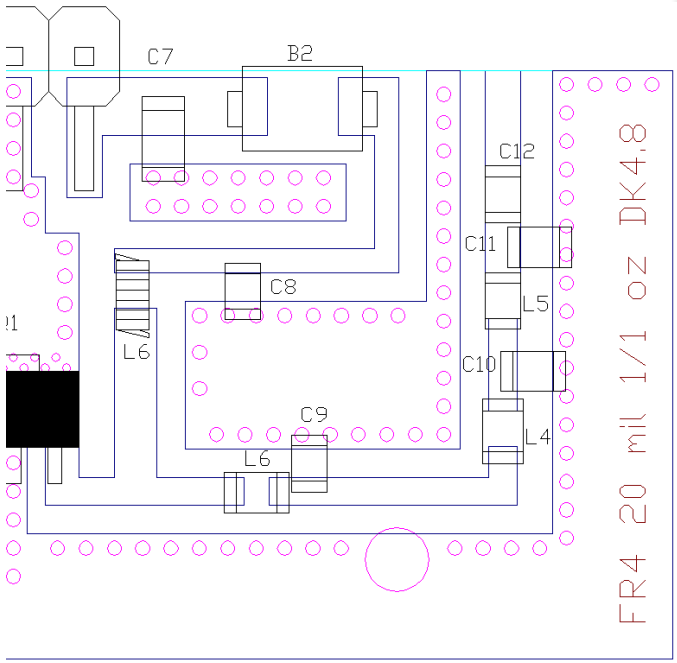
- No tuning should be required. However, C4 may be moved along transmission line to adjust IRL/Gain.
- Ensure all components are mounted as shown



Tuning Tips – Output side

Output match tuning

- No tuning should be required if all components are placed as shown and SMD's are properly soldered. If tuning is required follow the suggestions
- C9 may be moved along the transmission line to adjust output power.



Correlation Data-1 Tone CW FX1

Part ID	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vg (V)	Id (A)	Idq (A)
FX1	350	0.0999	4.208	16.245	-7.565	60.998	7.5	2.865	0.92	0.05
FX1	360	0.1	4.468	16.502	-7.25	65.891	7.5	2.865	0.904	0.05
FX1	370	0.0998	4.533	16.573	-6.421	69.471	7.5	2.865	0.87	0.05
FX1	380	0.0997	4.445	16.494	-5.455	72.207	7.5	2.865	0.821	0.05
FX1	390	0.1002	4.263	16.289	-4.548	73.984	7.5	2.865	0.768	0.05
FX1	400	0.1002	4.028	16.044	-4.157	74.992	7.5	2.865	0.716	0.05
FX1	410	0.1003	3.794	15.778	-3.663	75.337	7.5	2.865	0.671	0.05
FX1	420	0.1	3.599	15.562	-3.46	75.44	7.5	2.865	0.636	0.05
FX1	430	0.0999	3.451	15.383	-3.407	75.041	7.5	2.865	0.613	0.05
FX1	440	0.1	3.359	15.264	-3.508	74.307	7.5	2.865	0.603	0.05
FX1	450	0.1002	3.339	15.227	-3.779	73.614	7.5	2.865	0.605	0.05
FX1	460	0.0997	3.385	15.308	-4.227	73.177	7.5	2.865	0.617	0.05
FX1	470	0.0997	3.503	15.458	-5.197	73.075	7.5	2.865	0.639	0.05
FX1	480	0.0997	3.665	15.655	-6.736	73.041	7.5	2.865	0.669	0.05
FX1	490	0.0999	3.848	15.855	-9.727	73.43	7.5	2.865	0.699	0.05
FX1	500	0.1	3.964	15.979	-16.562	73.409	7.5	2.865	0.72	0.05
FX1	510	0.0998	3.941	15.964	-15.573	73.087	7.5	2.865	0.719	0.05
FX1	520	0.0999	3.664	15.644	-7.746	71.217	7.5	2.865	0.686	0.05

Correlation Data-1 Tone CW FX2

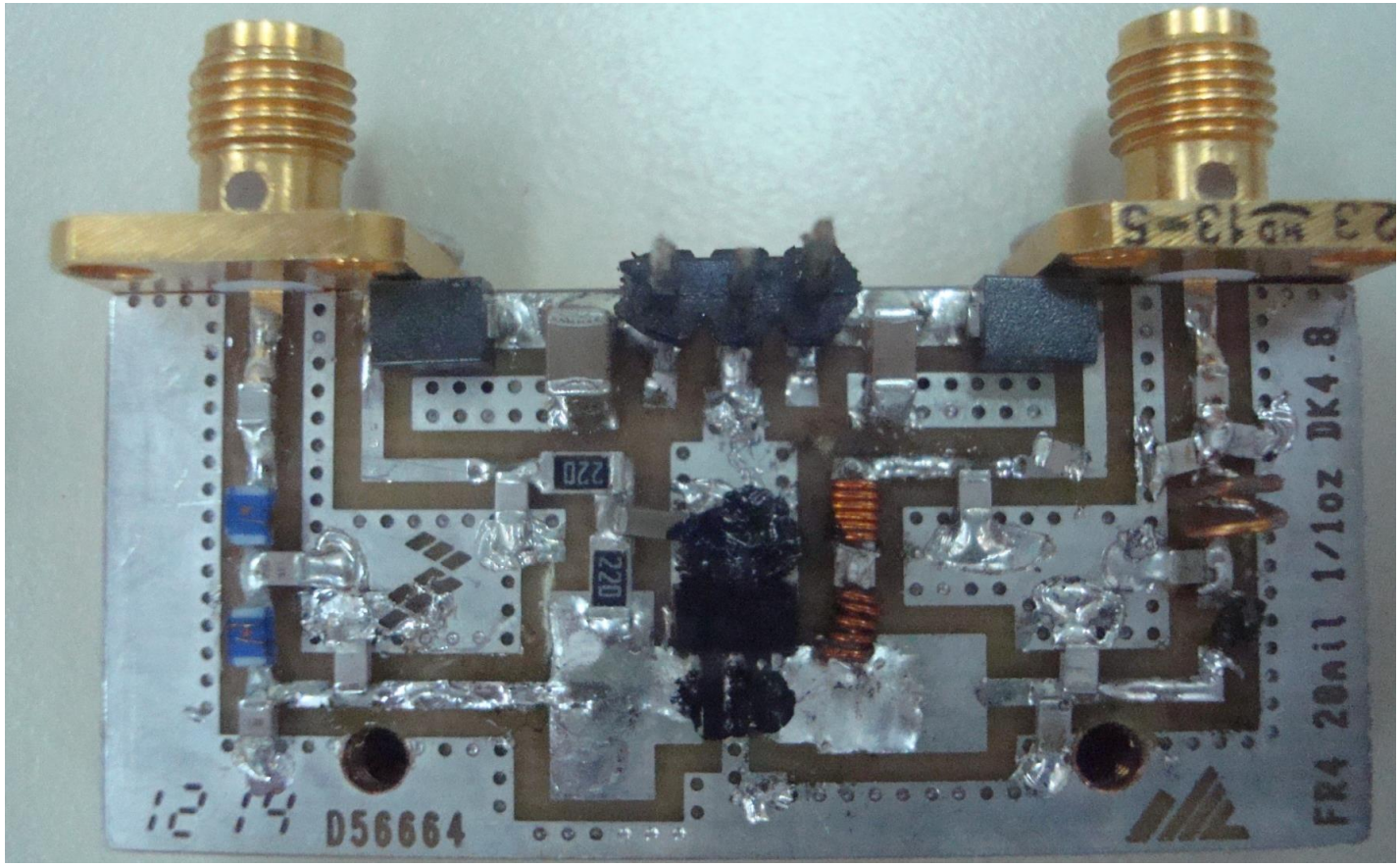
Part ID	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vg (V)	Id (A)	Idq (A)
FX2	350	0.0998	4.294	16.34	-7.399	61.22	7.5	2.87	0.935	0.049
FX2	360	0.1	4.554	16.583	-7.041	65.958	7.5	2.87	0.921	0.049
FX2	370	0.0999	4.612	16.645	-6.175	69.446	7.5	2.87	0.886	0.049
FX2	380	0.1003	4.53	16.549	-5.212	72.275	7.5	2.87	0.836	0.049
FX2	390	0.1003	4.329	16.353	-4.321	73.996	7.5	2.87	0.78	0.049
FX2	400	0.0998	4.073	16.106	-3.943	74.874	7.5	2.87	0.725	0.049
FX2	410	0.1001	3.831	15.828	-3.445	75.354	7.5	2.87	0.678	0.049
FX2	420	0.0998	3.623	15.6	-3.241	75.478	7.5	2.87	0.64	0.049
FX2	430	0.0996	3.465	15.412	-3.175	75.275	7.5	2.87	0.614	0.049
FX2	440	0.1002	3.365	15.259	-3.261	74.725	7.5	2.87	0.6	0.049
FX2	450	0.1	3.324	15.218	-3.499	74.089	7.5	2.87	0.598	0.049
FX2	460	0.1001	3.363	15.263	-3.874	73.848	7.5	2.87	0.607	0.049
FX2	470	0.1003	3.465	15.385	-4.723	73.862	7.5	2.87	0.626	0.049
FX2	480	0.0999	3.602	15.571	-5.995	73.931	7.5	2.87	0.65	0.049
FX2	490	0.1002	3.761	15.745	-8.398	74.39	7.5	2.87	0.674	0.049
FX2	500	0.1	3.848	15.851	-13.221	74.387	7.5	2.87	0.69	0.049
FX2	510	0.1	3.803	15.803	-15.928	74.165	7.5	2.87	0.684	0.049
FX2	520	0.1001	3.529	15.472	-8.574	72.561	7.5	2.87	0.648	0.049

Correlation Data-1 Tone CW FX3

Part ID	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vg (V)	Id (A)	Idq (A)
FX3	350	0.1002	4.386	16.414	-7.457	64.535	7.5	2.895	0.906	0.05
FX3	360	0.0997	4.506	16.549	-6.589	68.722	7.5	2.895	0.874	0.05
FX3	370	0.1001	4.455	16.482	-5.556	71.668	7.5	2.895	0.829	0.05
FX3	380	0.1001	4.269	16.297	-4.636	73.553	7.5	2.895	0.774	0.05
FX3	390	0.1	4.039	16.062	-3.85	74.916	7.5	2.895	0.719	0.05
FX3	400	0.1	3.784	15.779	-3.6	75.331	7.5	2.895	0.67	0.05
FX3	410	0.0999	3.557	15.514	-3.196	75.265	7.5	2.895	0.63	0.05
FX3	420	0.1001	3.389	15.296	-3.085	75.064	7.5	2.895	0.602	0.05
FX3	430	0.1004	3.272	15.132	-3.085	74.344	7.5	2.895	0.587	0.05
FX3	440	0.1002	3.206	15.052	-3.227	73.278	7.5	2.895	0.583	0.05
FX3	450	0.1	3.215	15.071	-3.511	72.479	7.5	2.895	0.591	0.05
FX3	460	0.0998	3.3	15.192	-3.962	71.978	7.5	2.895	0.611	0.05
FX3	470	0.1003	3.466	15.384	-4.904	72.016	7.5	2.895	0.642	0.05
FX3	480	0.1003	3.675	15.639	-6.404	72.307	7.5	2.895	0.678	0.05
FX3	490	0.1003	3.896	15.893	-9.383	72.942	7.5	2.895	0.712	0.05
FX3	500	0.1	4.022	16.044	-16.26	73.137	7.5	2.895	0.733	0.05
FX3	510	0.1003	3.958	15.964	-14.871	72.791	7.5	2.895	0.725	0.05
FX3	520	0.0998	3.588	15.557	-7.141	70.689	7.5	2.895	0.677	0.05

AFT05MS004 VHF Performance

- Freq Band 135-175MHz;
- Pout>5.5W@7.5V, Gain>17dB
- Eff>63%.



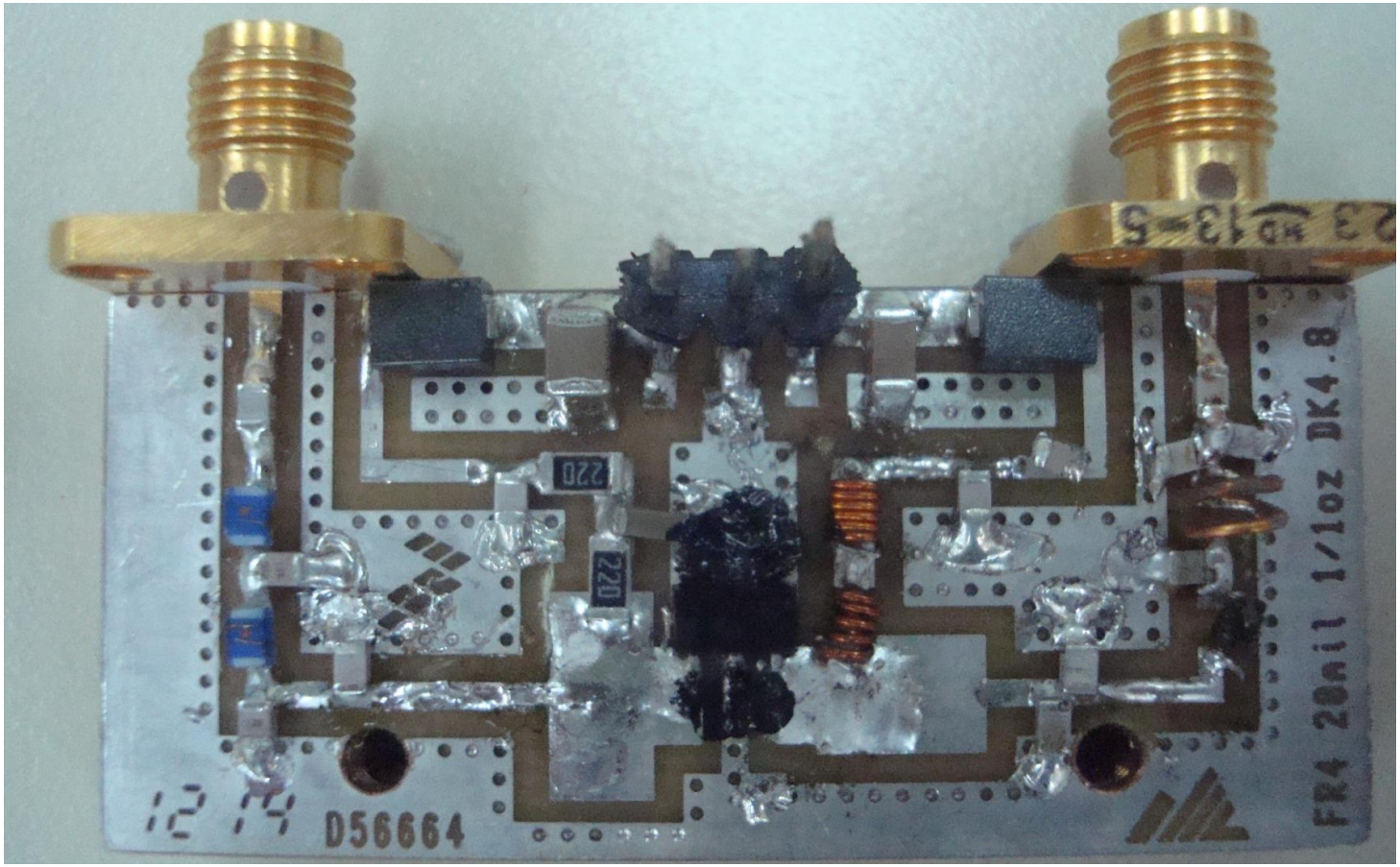
AFT05MS004 VHF Performance

- Freq Band 135-175MHz;
- Pout>5.5W@7.5V, Gain>17dB
- Eff>63%.

Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd1 (V)	Id1 (A)	Vg1 (V)	Id1q (A)
135	0.1	5.9	17.7	-5.4	63.5	7.5	1.2	3.0	0.10
140	0.1	5.9	17.8	-6.5	65.7	7.5	1.2	3.0	0.10
145	0.1	6.0	17.8	-7.7	67.8	7.5	1.2	3.0	0.10
150	0.1	5.5	17.5	-9.0	64.5	7.5	1.1	3.0	0.10
155	0.1	6.0	17.8	-9.8	68.4	7.5	1.2	3.0	0.10
160	0.1	6.3	18.0	-9.6	73.5	7.5	1.1	3.0	0.10
165	0.1	6.7	18.3	-8.5	80.4	7.5	1.1	3.0	0.10
170	0.1	6.3	18.0	-7.3	82.3	7.5	1.0	3.0	0.10
175	0.1	5.6	17.5	-6.5	82.9	7.5	0.9	3.0	0.10

AFT05MS004 UHF Performance

- Freq Band 350-390MHz/380-450MHz/400-470MHz/450-520MHz;
- Pout>6W@7.5V, Gain>15dB
- Eff>63%.

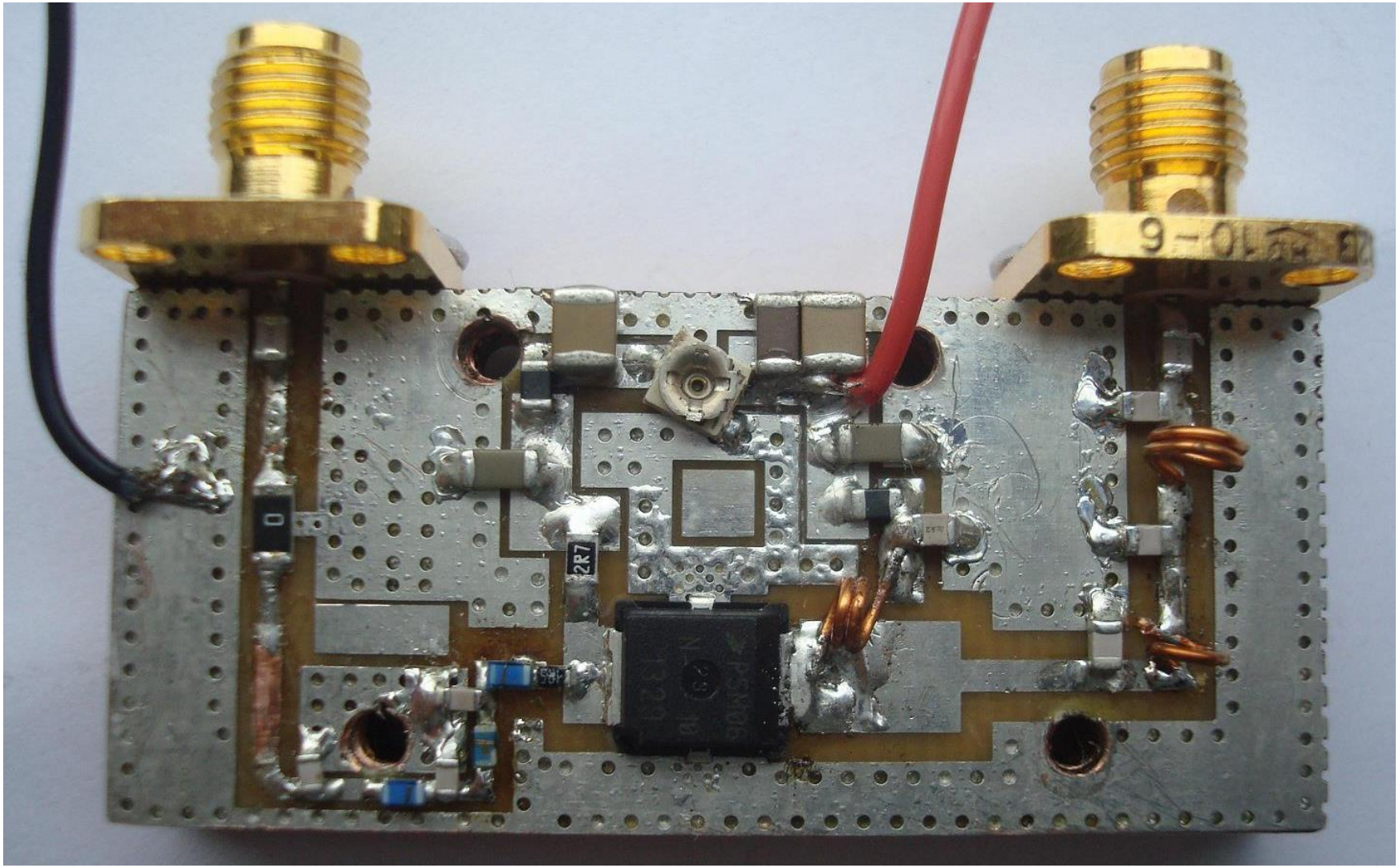


AFT05MS004 UHF Performance

- Freq Band 350-390MHz/380-450MHz/400-470MHz/450-520MHz;
- Pout>6W@7.5V, Gain>15dB
- Eff>63%.

Freq (MHz	Pin (dBm)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vds (V)	Idmm (A)
400	23.0	7.2	15.6	-14.0	63.0	7.5	1.5
410	23.0	7.3	15.7	-15.0	65.0	7.5	1.5
420	23.0	7.4	15.7	-14.7	66.7	7.5	1.5
430	23.0	7.3	15.7	-14.1	67.7	7.5	1.4
440	23.0	7.1	15.5	-13.8	66.8	7.5	1.4
450	23.0	7.0	15.4	-13.8	66.1	7.5	1.4
460	23.0	7.1	15.5	-14.3	66.3	7.5	1.4
470	23.0	7.3	15.6	-15.1	66.4	7.5	1.5

Board Picture



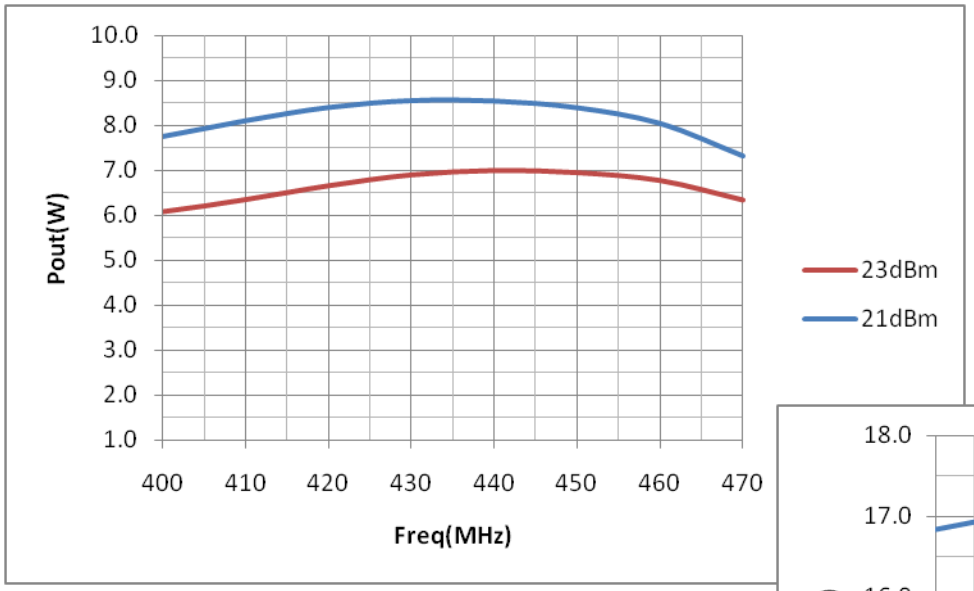
Data correlation

190mA/7.5V bias								
Part ID	Freq (MHz	Pin (dBm)	Pout (dBm	Gain (dB)	IRL (dB)	Eff (%)	Vds (V)	Idmm (A)
board1	400	21.0	37.8	16.8	-8.1	55.8	7.5	1.5
board1	410	21.0	38.0	17.0	-7.9	57.8	7.5	1.5
board1	420	21.0	38.2	17.2	-8.1	60.4	7.5	1.5
board1	430	21.0	38.4	17.4	-8.6	63.2	7.5	1.5
board1	440	21.0	38.5	17.5	-9.1	65.1	7.5	1.4
board1	450	21.0	38.4	17.4	-9.5	66.0	7.5	1.4
board1	460	21.0	38.3	17.3	-8.9	66.2	7.5	1.4
board1	470	21.0	38.0	17.0	-7.1	65.6	7.5	1.3
board2	400	21.0	37.7	16.7	-7.6	55.0	7.5	1.4
board2	410	21.0	37.9	16.9	-7.2	56.6	7.5	1.4
board2	420	21.0	38.0	17.1	-7.1	59.0	7.5	1.4
board2	430	21.0	38.2	17.2	-7.3	62.1	7.5	1.4
board2	440	21.0	38.4	17.4	-7.7	64.6	7.5	1.4
board2	450	21.0	38.4	17.4	-8.2	65.8	7.5	1.4
board2	460	21.0	38.3	17.3	-8.5	66.2	7.5	1.4
board2	470	21.0	38.1	17.1	-7.7	65.9	7.5	1.3

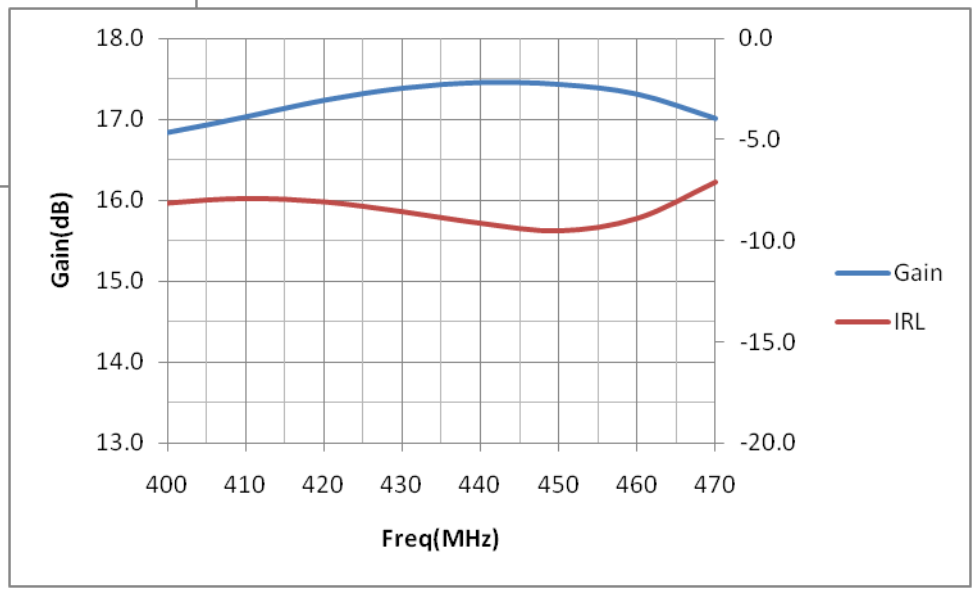
Data from reference circuits

Part ID	Freq (MHz)	Pin (dBm)	Pout (dBm)	Gain (dB)	IRL (dB)	Eff (%)	Vds (V)	Idmm (A)	Vgs (V)	Idmmq (A)
board3	400	22.0	38.1	16.1	-7.6	56.2	7.5	1.5	3.0	0.2
board3	410	22.0	38.2	16.2	-7.3	57.8	7.5	1.5	3.0	0.2
board3	420	22.0	38.4	16.4	-7.4	60.5	7.5	1.5	3.0	0.2
board3	430	22.0	38.6	16.6	-7.7	63.6	7.5	1.5	3.0	0.2
board3	440	22.0	38.7	16.7	-8.1	66.4	7.5	1.5	3.0	0.2
board3	450	22.0	38.7	16.7	-8.7	67.6	7.5	1.4	3.0	0.2
board3	460	22.0	38.5	16.5	-8.7	67.9	7.5	1.4	3.0	0.2
board3	470	22.0	38.3	16.3	-7.7	67.4	7.5	1.3	3.0	0.2
board4	400	22.0	38.3	16.3	-7.5	57.6	7.5	1.6	3.0	0.2
board4	410	22.0	38.4	16.4	-7.1	59.6	7.5	1.6	3.0	0.2
board4	420	22.0	38.6	16.6	-7.0	62.2	7.5	1.6	3.0	0.2
board4	430	22.0	38.8	16.8	-7.1	65.5	7.5	1.5	3.0	0.2
board4	440	22.0	38.8	16.8	-7.4	67.8	7.5	1.5	3.0	0.2
board4	450	22.0	38.7	16.7	-7.8	69.0	7.5	1.4	3.0	0.2
board4	460	22.0	38.5	16.5	-7.9	69.1	7.5	1.4	3.0	0.2
board4	470	22.0	38.2	16.2	-7.1	68.4	7.5	1.3	3.0	0.2

Data_Freq sweep

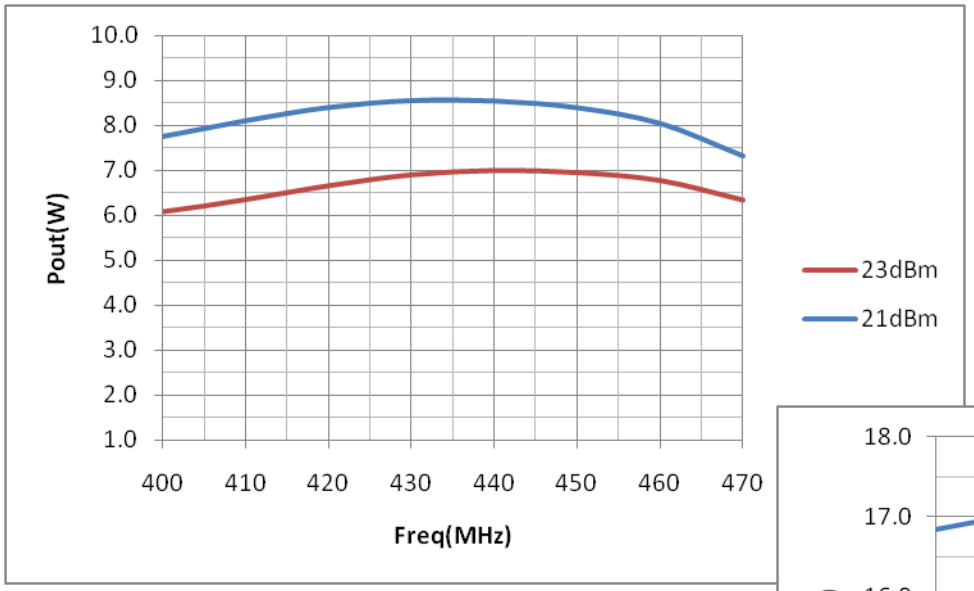


Gain>16.5dB @21dBm input;
IRL<-6dB across the band.



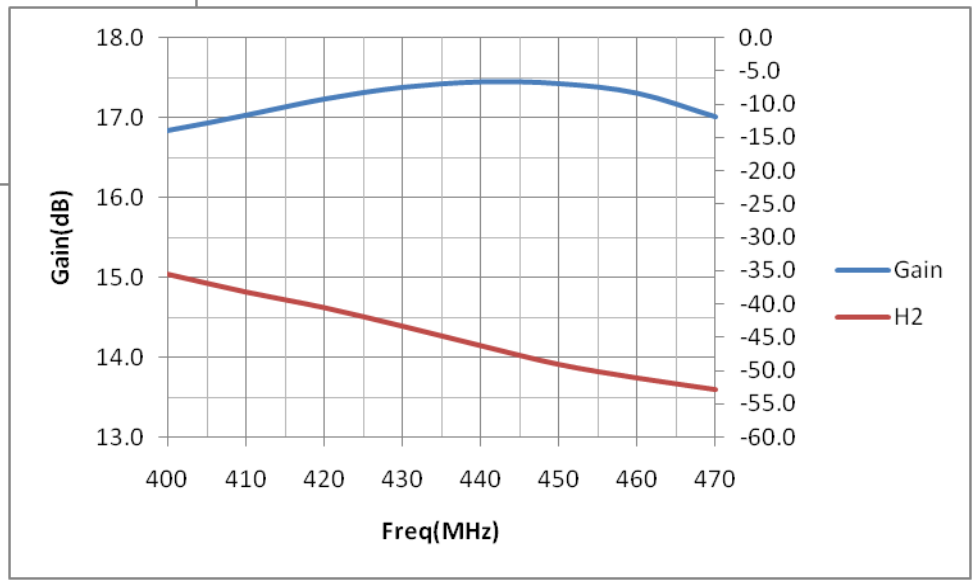
190mA/7.5V bias;
Pout>6W at 21dBm input;
Pout>7W at 23dBm input.

Data_Freq sweep

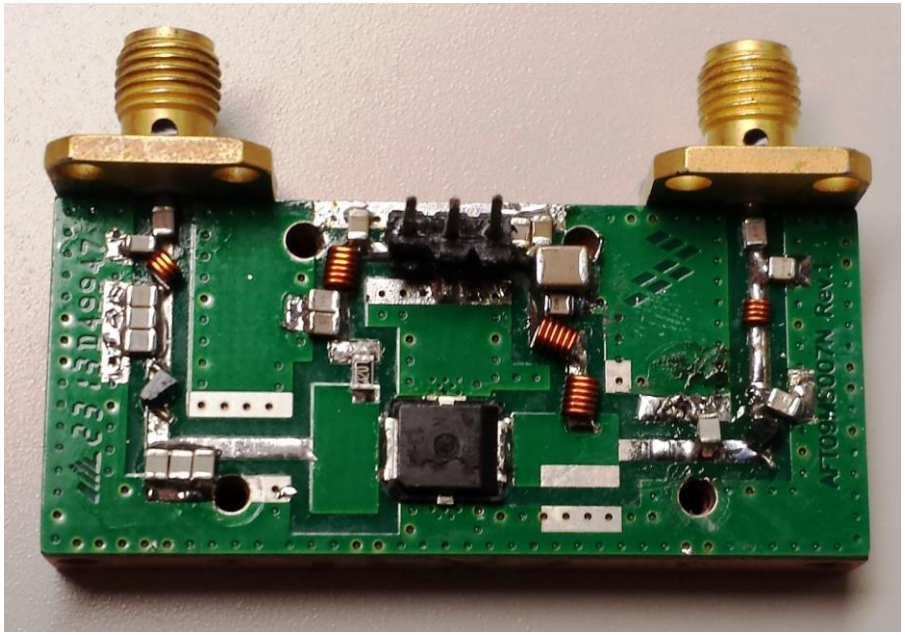


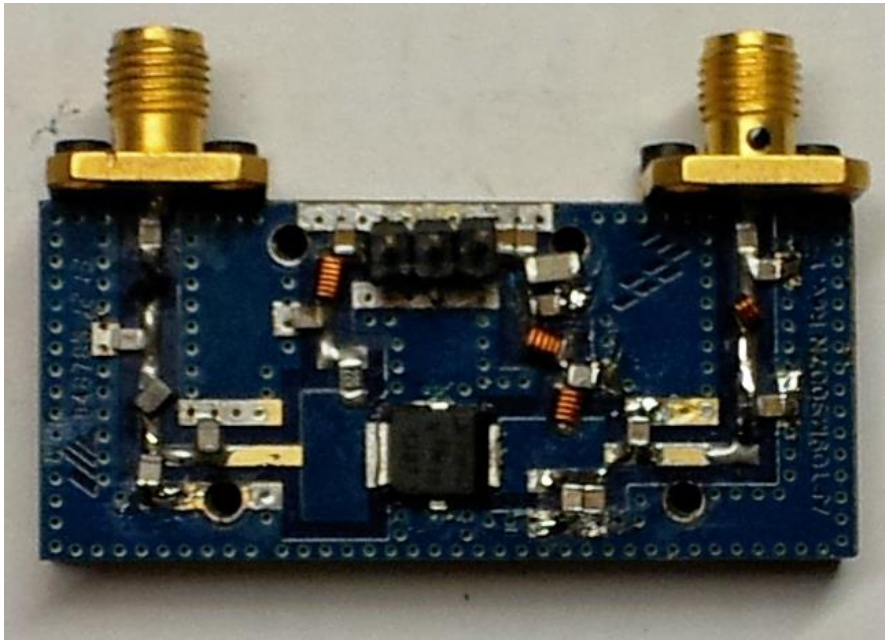
Gain>16.5dB @21dBm input;
2nd harmonic H2<-35dBc.

190mA/7.5V bias;
Pout>6W at 21dBm input;
Pout>7W at 23dBm input.



Board Picture





Data correlation

Part ID	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vgs (V)	Id (A)	Idq (A)
FX10	450	0.25	8.87	15.48	-2.71	59.84	7.20	2.89	2.06	0.15
FX10	500	0.25	7.43	14.71	-4.86	58.03	7.20	2.89	1.78	0.15
FX10	520	0.25	7.27	14.62	-4.08	64.41	7.20	2.89	1.57	0.15
FX11	450	0.25	8.85	15.46	-2.28	59.71	7.20	2.88	2.06	0.15
FX11	500	0.25	7.91	14.99	-5.32	59.28	7.20	2.87	1.85	0.15
FX11	520	0.25	7.84	14.95	-4.56	66.54	7.20	2.87	1.64	0.15
FX12	450	0.25	8.82	15.46	-2.73	60.30	7.20	2.89	2.03	0.15
FX12	500	0.25	7.42	14.70	-4.86	57.99	7.20	2.89	1.78	0.15
FX12	520	0.25	7.24	14.60	-4.07	64.29	7.20	2.89	1.57	0.15

Data from reference circuits

Freq (MHz)	Pin (dBm)	Pin (W)	Pout (dBm)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vg (V)	Id (A)	Idq (A)
380	24.0	0.25	39.19	8.30	15.18	-2.94	54.0	7.5	2.86	2.05	0.164
390	24.0	0.25	39.60	9.12	15.60	-3.68	57.6	7.5	2.86	2.11	0.164
400	24.0	0.25	39.92	9.82	15.92	-4.52	61.0	7.5	2.86	2.15	0.164
410	24.0	0.25	40.13	10.30	16.13	-5.29	63.8	7.5	2.85	2.15	0.164
420	24.0	0.25	40.15	10.36	16.15	-5.55	65.7	7.5	2.85	2.10	0.164
430	24.0	0.25	39.94	9.85	15.94	-5.08	65.6	7.5	2.85	2.00	0.164
440	24.0	0.25	39.49	8.88	15.47	-4.16	63.4	7.5	2.85	1.87	0.164
450	24.0	0.25	38.99	7.92	14.99	-3.30	61.4	7.5	2.85	1.72	0.164
460	24.0	0.25	38.53	7.13	14.53	-2.65	60.2	7.5	2.85	1.58	0.164
470	24.0	0.25	38.07	6.41	14.07	-2.22	59.2	7.5	2.85	1.44	0.164

Data get from the test fixture

24dBm fived drive	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vgs (V)	Id (A)	Idq (A)
Part ID										
Fix2	135	0.25	9.1	15.6	6.0	71.5	7.5	2.853	1.70	0.08
Fix2	140	0.25	9.2	15.6	6.0	77.8	7.5	2.852	1.57	0.08
Fix2	145	0.25	9.2	15.6	6.0	85.0	7.5	2.852	1.44	0.08
Fix2	150	0.25	9.0	15.5	6.0	85.3	7.5	2.851	1.40	0.08
Fix2	155	0.25	9.0	15.5	6.0	84.8	7.5	2.851	1.42	0.08
Fix2	160	0.25	9.2	15.7	6.0	84.5	7.5	2.851	1.46	0.08
Fix2	165	0.25	9.3	15.7	6.0	84.3	7.5	2.851	1.47	0.08
Fix2	170	0.25	8.8	15.4	6.0	83.2	7.5	2.85	1.41	0.08
Fix2	175	0.25	7.9	15.0	6.0	80.7	7.5	2.85	1.30	0.08

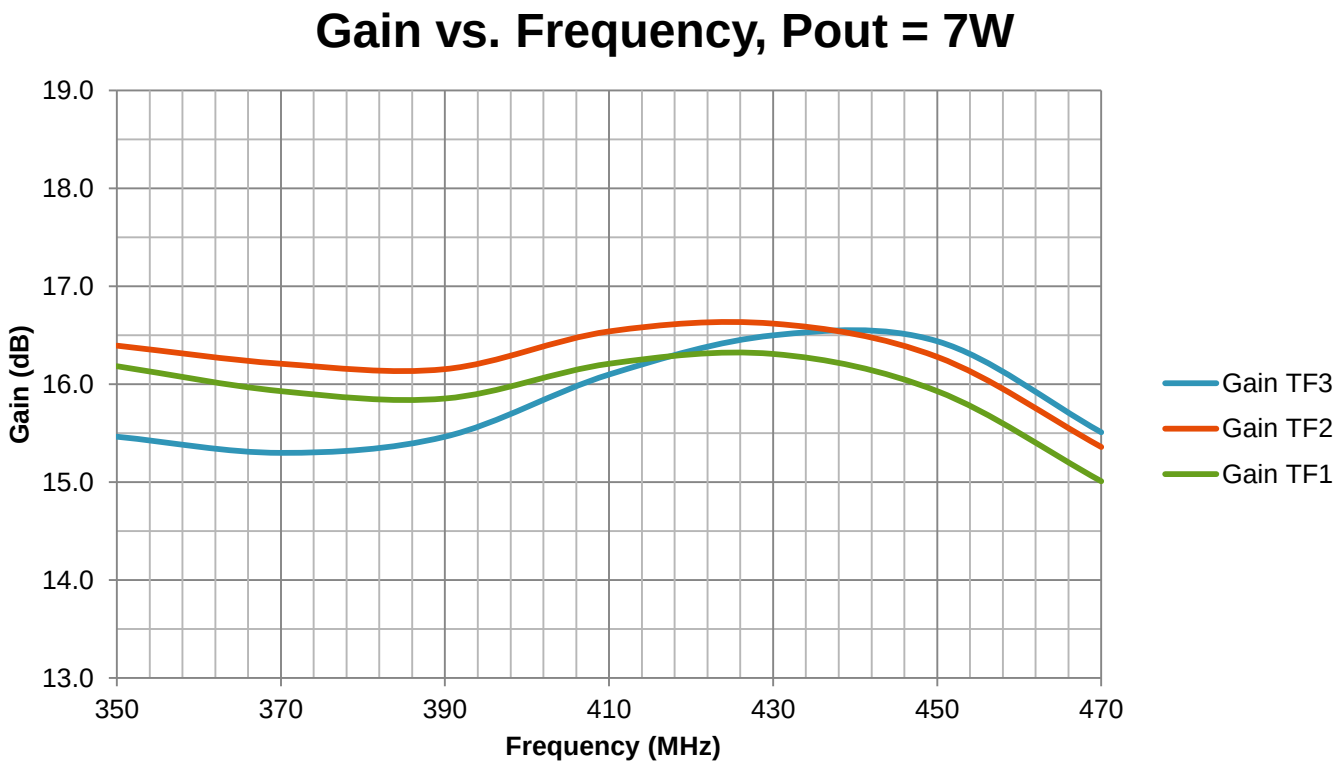
7W out	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vgs (V)	Id (A)	Idq (A)
Part ID										
Fix2	135	0.07	7.0	20.0	11.6	65.5	7.5	2.85	1.42	0.108
Fix2	140	0.04	7.0	22.2	13.7	70.6	7.5	2.85	1.32	0.108
Fix2	145	0.03	7.0	23.7	15.2	74.5	7.5	2.85	1.26	0.108
Fix2	150	0.03	7.0	24.0	15.5	76.2	7.5	2.85	1.22	0.108
Fix2	155	0.03	7.0	23.2	14.7	76.1	7.5	2.85	1.23	0.108
Fix2	160	0.04	7.0	22.4	14.0	74.7	7.5	2.85	1.25	0.108
Fix2	165	0.05	7.0	21.6	13.2	73.5	7.5	2.849	1.27	0.108
Fix2	170	0.06	7.0	20.4	11.9	73.3	7.5	2.849	1.28	0.108
Fix2	175	0.10	7.0	18.5	10.0	74.1	7.5	2.849	1.26	0.108

Data get from the test fixture

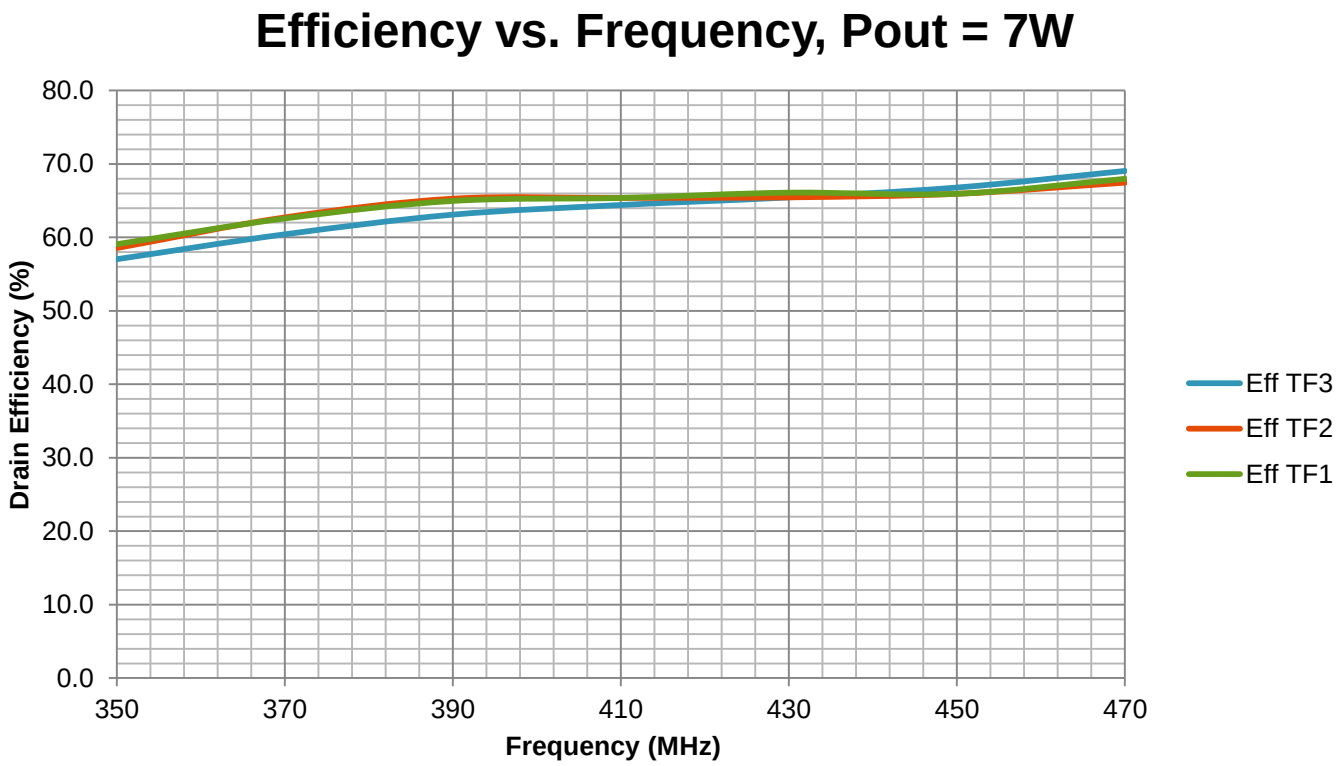
8W out	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vgs (V)	Id (A)	Idq (A)
Part ID										
Fix2	135	0.10	8.0	19.1	10.1	70.6	7.5	2.85	1.51	0.108
Fix2	140	0.07	8.0	20.7	11.6	76.0	7.5	2.85	1.41	0.108
Fix2	145	0.06	8.0	21.3	12.2	79.7	7.5	2.85	1.34	0.108
Fix2	150	0.06	8.0	21.1	12.1	81.0	7.5	2.85	1.32	0.108
Fix2	155	0.07	8.0	20.7	11.7	80.6	7.5	2.85	1.32	0.108
Fix2	160	0.07	8.0	20.6	11.5	79.5	7.5	2.85	1.35	0.108
Fix2	165	0.08	8.0	20.2	11.2	78.4	7.5	2.849	1.36	0.108
Fix2	170	0.11	8.0	18.6	9.6	78.8	7.5	2.849	1.35	0.108
Fix2	175	0.32	8.0	14.0	5.0	81.2	7.5	2.849	1.31	0.108

6W out	Freq (MHz)	Pin (W)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vd (V)	Vgs (V)	Id (A)	Idq (A)
Part ID										
Fix2	135	0.05	6.0	20.6	12.8	59.9	7.5	2.852	1.33	0.107
Fix2	140	0.03	6.0	23.1	15.3	64.7	7.5	2.851	1.24	0.107
Fix2	145	0.02	6.0	25.2	17.5	68.5	7.5	2.851	1.17	0.107
Fix2	150	0.02	6.0	25.6	17.8	70.9	7.5	2.851	1.13	0.107
Fix2	155	0.02	6.0	24.6	16.9	70.7	7.5	2.851	1.13	0.107
Fix2	160	0.03	6.0	23.6	15.8	69.3	7.5	2.85	1.15	0.107
Fix2	165	0.03	6.0	22.5	14.7	68.1	7.5	2.85	1.17	0.107
Fix2	170	0.04	6.0	21.4	13.6	67.3	7.5	2.85	1.19	0.107
Fix2	175	0.06	6.0	19.9	12.1	67.2	7.5	2.85	1.19	0.107

Correlation Data

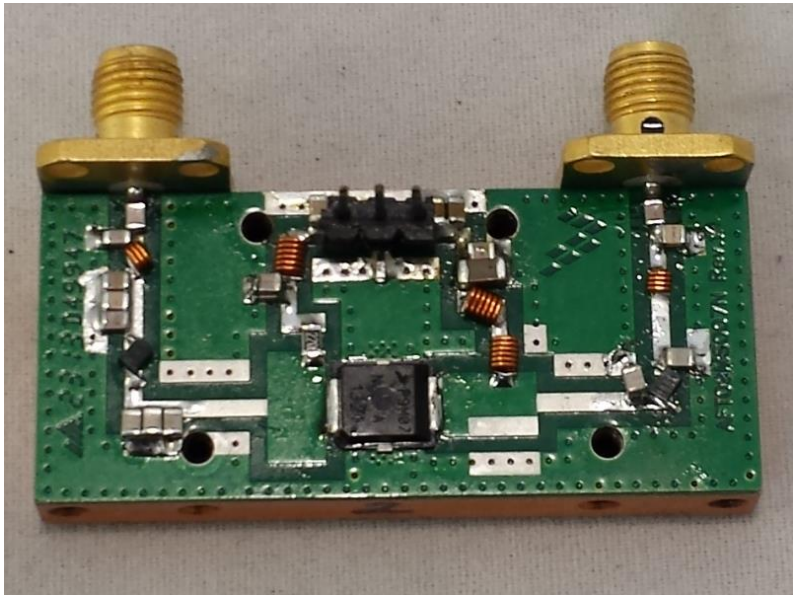


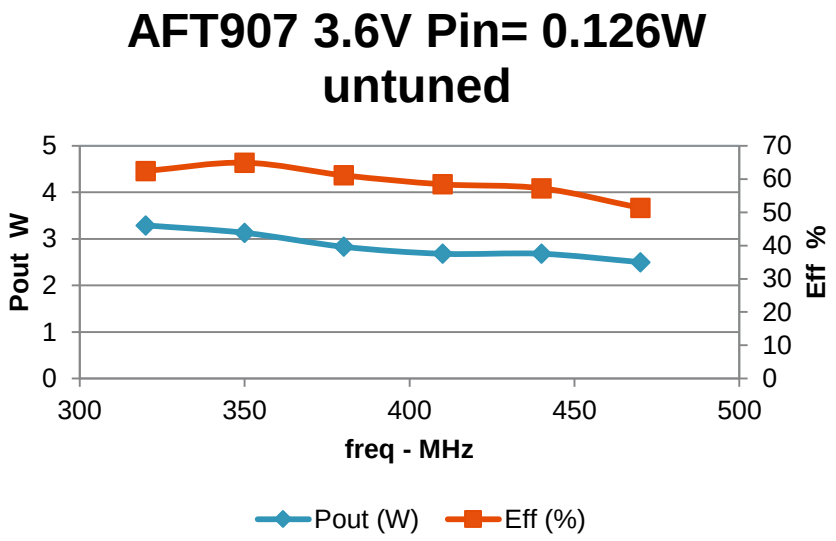
Correlation Data

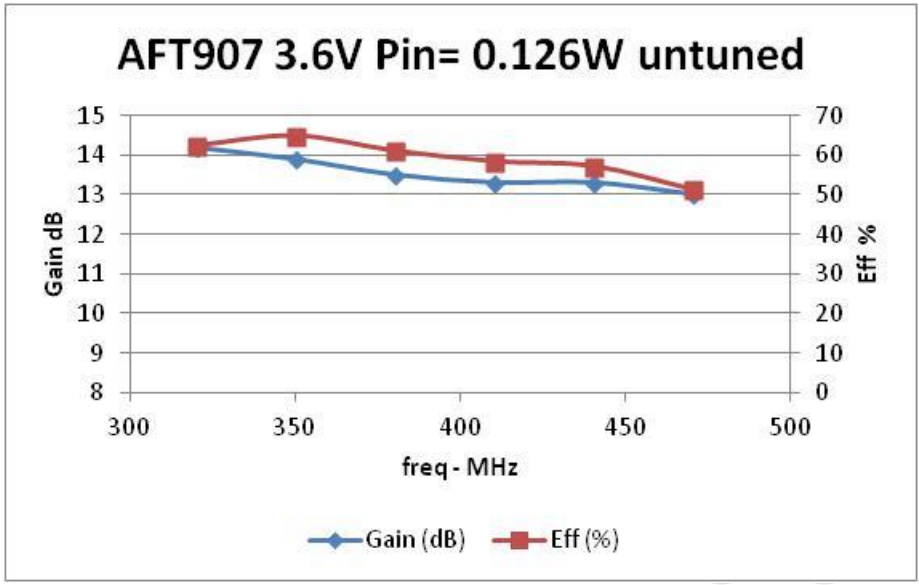


AFT09MS007 UHF Performance at 3.6V

- Uses 7.5V broadband reference circuit covers 350-470MHz
- No circuit retuning performed

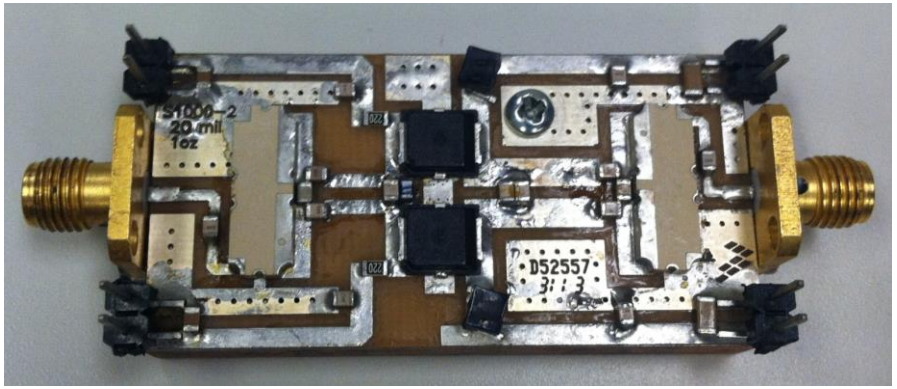


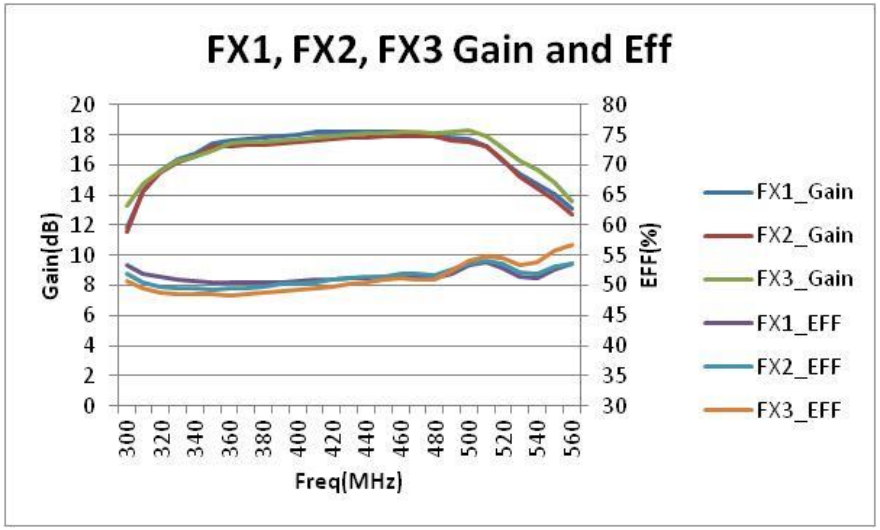




AFT09MS007 Dual Device UHF Performance

- Single broadband reference circuit covers 350-520MHz
- Excellent broadband performance
  - 15W: Gp >17dB, Eff 50% nom
- Designed for linear applications



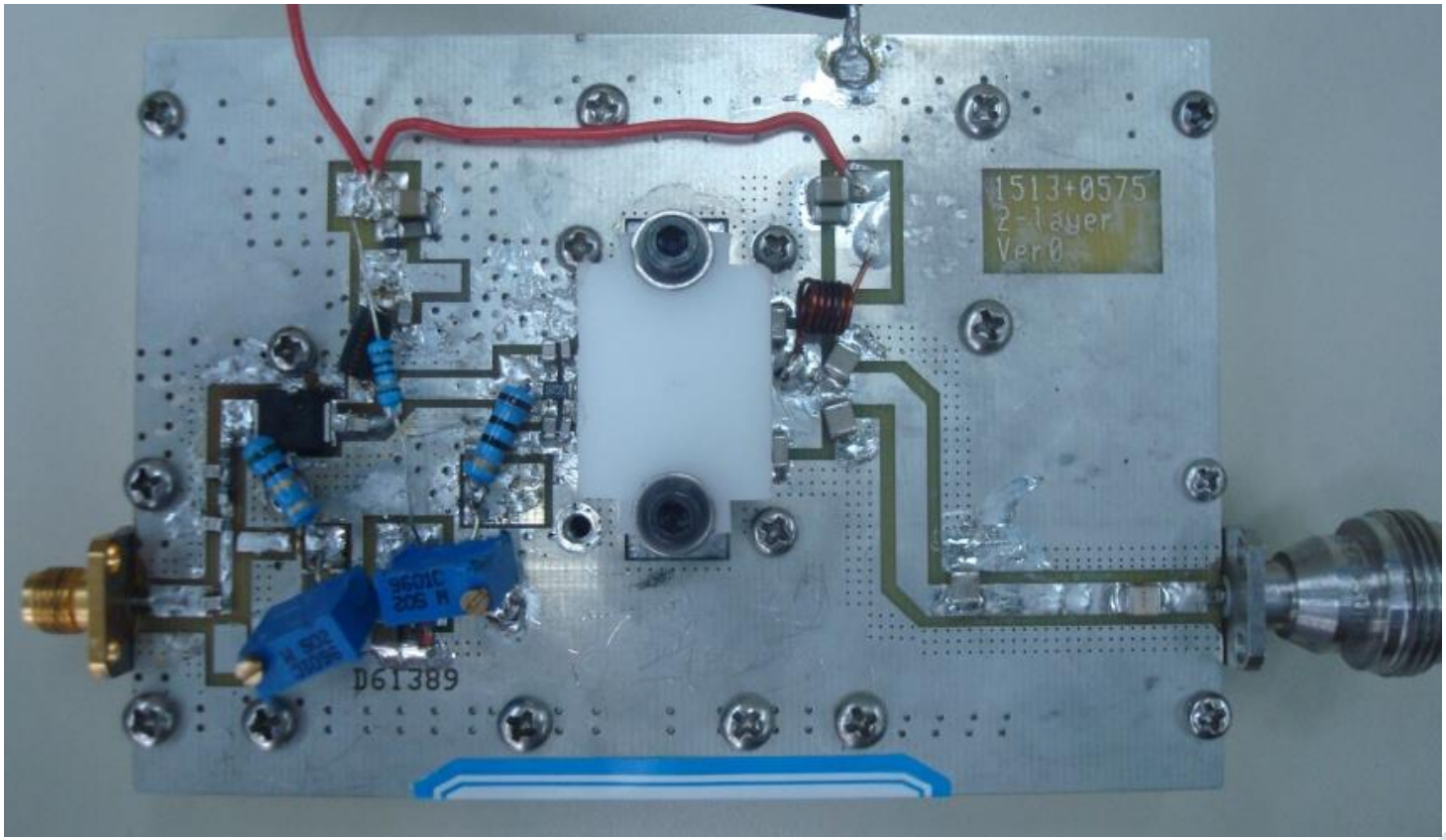


Freescale Mobile(12.5VDS) Solutions

		Pout(W)	Pin(W)	Gain(dB)	Eff(%)
AFT09MS015 (no pre-match)	VHF	20	0.3	20	70
	UHF	20	0.3	19	65
	800MHZ	18	0.4	16	60
AFT05MS031 (no pre-match)	HF	35	0.4	20	65
	VHF	35	0.6	19	70
	UHF	30	1	17	65
AFT05MP075 (no pre-match)	FM	80	0.8	20	70
	VHF	80	1	19	70
	UHF	75	2	16	65
AFT09MS031 (pre-matched)	800MHZ	35	1.5	15	60
AFT09MP055 (pre-matched)	800MHZ	55	2.2	14	55

50W UHF Mobile Lineup

- MRF1513+AFT05MP075;
- Band 350-390MHz/380-450MHz/400-470MHz/450-520MHz;
- Pout>75W;
- Lineup Eff>61%.



50W UHF Mobile Lineup

- MRF1513+AFT05MP075;
- Band 350-390MHz/380-450MHz/400-470MHz/450-520MHz;
- Pout>75W;
- Lineup Eff>61%.

Freq (MHz)	Pin (dBm)	Pout (dBm)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Idmm (A)
400	18.0	48.7	74.9	30.7	-12.1	63.5	8.7
410	18.0	48.8	76.5	30.8	-15.3	66.8	8.5
420	18.0	48.8	76.3	30.8	-17.4	68.7	8.2
430	18.0	48.8	75.1	30.8	-19.4	69.9	8.0
440	18.0	48.6	72.9	30.6	-23.4	69.4	7.8
450	18.0	48.7	74.3	30.7	-33.6	70.3	7.8
460	18.0	48.9	78.4	30.9	-16.3	72.1	8.1
470	18.0	49.1	81.0	31.1	-7.2	73.6	8.1

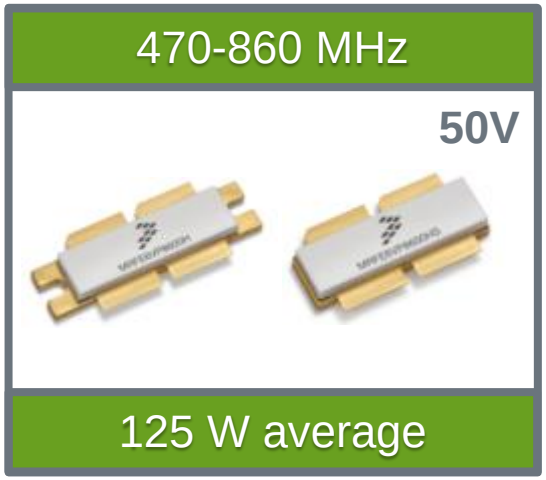
25W UHF solution

- AFT05MS004+AFT05MS031;
- Band 350-390MHz/380-450MHz/400-470MHz/450-520MHz;
- Pout>35W;
- Lineup Eff>60%.

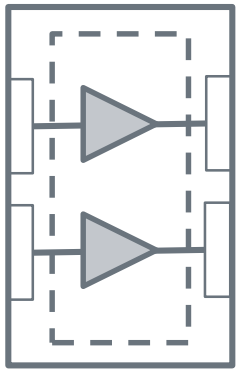
Freq (MHz)	Pin (dBm)	Pout (dBm)	Pout (W)	Gain (dB)	IRL (dB)	Eff (%)	Vds (V)	Vgs (V)	Idmm (A)	Idmmq (A)
380	27.0	45.3	33.7	18.3	-9.8	59.4	13.2	3.1	4.3	0.5
390	27.0	45.5	35.8	18.5	-10.5	62.9	13.2	3.1	4.3	0.5
400	27.0	45.4	34.9	18.4	-10.6	64.1	13.2	3.1	4.1	0.5
410	27.0	45.2	33.3	18.2	-10.6	63.2	13.2	3.1	4.0	0.5
420	27.0	45.7	36.9	18.7	-10.6	70.4	13.2	3.1	4.0	0.5
430	27.0	45.7	37.3	18.7	-10.9	72.4	13.2	3.1	3.9	0.5
440	27.0	45.6	36.6	18.6	-11.3	71.6	13.2	3.1	3.9	0.5
450	27.0	45.6	36.6	18.6	-11.8	70.1	13.2	3.1	3.9	0.5
460	27.0	45.6	36.4	18.6	-12.2	68.1	13.2	3.1	4.0	0.5
470	27.0	45.5	35.7	18.5	-11.6	67.2	13.2	3.1	4.0	0.5
475	27.0	45.4	34.7	18.4	-10.9	66.9	13.2	3.1	3.9	0.5

UHF Broadcast

MRFE6VP8600H: 600W PEP transistor for UHF broadcast applications



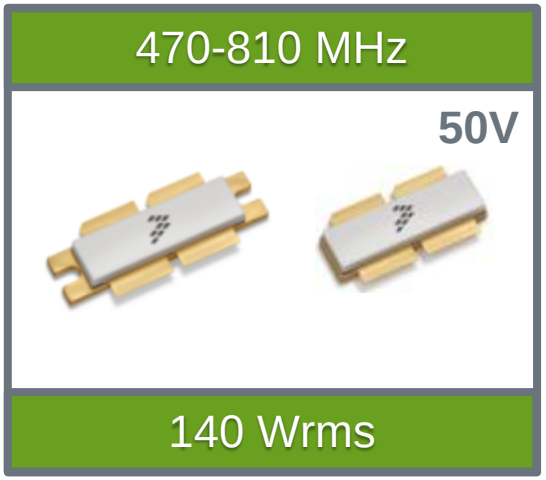
- Input pre-matched
- 25% Class AB wideband efficiency, 35% Doherty narrowband
- Housed in an NI-1230 air-cavity ceramic package
- Extreme Ruggedness: handles >65:1 VSWR with 3dB overdrive



Board Frequency (MHz)	*Example of application*	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	Size (inch)	Link
860	*TV Broadcast*	125 W avg	18-21	28	4x5	
470-860	*TV Broadcast*	125 W avg	18	25	4x5	
470-810	*TV Broadcast*	125 W DVB-T	18.5	25	2x4	
474-562	*TV Broadcast*	240 W DVB-T	17.5	39	5x9	
700-724	*TV Broadcast*	120 W DVB-T	16.9	39	3x5	
730-810	*TV Broadcast*	240 W DVB-T	16.5	35	5x9	

MRFE8VP8600H: transistor for UHF broadcast

New



- Input pre-matched, no output match
- Housed in an NI-1230 air-cavity ceramic package
- Extreme Ruggedness: handles >65:1 VSWR with 3dB overdrive
- Freescale Product Longevity Program: availability guaranteed until 2025

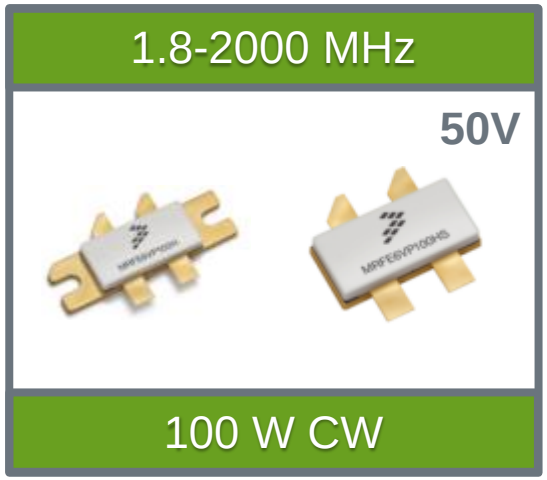
Major differences with previous generation

	MRFE6VP8600H	MRFE8VP8600H
Technology	VHV6	VHV8
Pout (Wrms)	125W @ 50V	140W @ 50V
$R_{\theta JC}$	0.19°C/W	0.16°C/W
C_{oss}	80pF	71pF
Gain (860MHz NB)	19.3dB	21dB

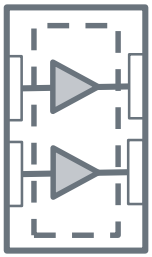
SARFT Bid Winners

	1kW	500W	300W	100W	50W	8600H/888	3090N/881	Revenue $
GME	230	9	219	21		3732	1866	373,200
KTSF	498	7	73	1		6312	3156	631,200
CDXG	485		109	2	548	6808	3404	680,800
Anywave	498		127			6484	3242	648,400
Gospell	407	2	191			5660	2830	566,000
KT	143	8	217			2632	1316	263,200
CDDX	346		252			5160	2580	516,000
ASGB	100		9	3		1242	621	124,200
Panda	99		11			1232	616	123,200
Haihua	308		248			4688	2344	468,800
CDBEF	35					420	210	42,000
						44370	22185	4,437,000.00

MRFE6VP100H: 100W wideband LDMOS transistor



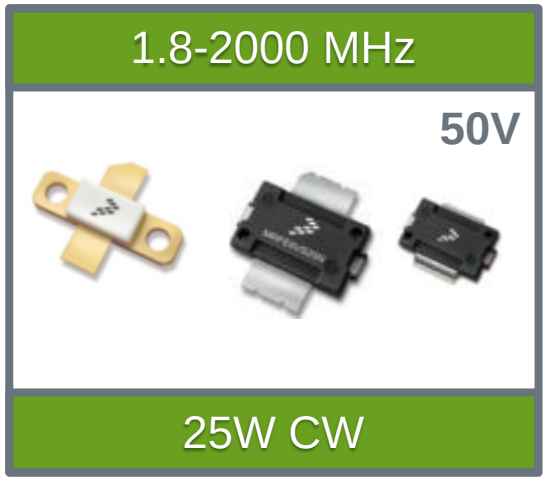
- Unmatched Input and Output, very broadband
- Housed in NI-780 air-cavity ceramic package
- Extreme Ruggedness: 65:1 VSWR
- Product Longevity Program: warranted availability until 2027
- Recommended driver: AT05MS004N (or MRFE6VS25N for wideband)



Available Reference Circuits

Board Frequency (MHz)	*Example of application*	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	Size (inch)	Link
2-200	*Various*	100 PEP	17	49	4x5	
30-512	*Broadband radio*	100 CW	19	30	4x5	
400-1000	*Telemetry*	100 CW	14	30	4x5	

MRFE6VS25L/25N: 25W wideband LDMOS transistor



- Unmatched Input and Output, very broadband
- Housed in TO-270 over-molded plastic (25N) or NI-360 air-cavity ceramic package (25L)
- Extreme Ruggedness: 65:1 VSWR
- Product Longevity Program: warranted availability until 2027
- Recommended driver: AFT05MS004N (4W)

Available Reference Circuits

Board Frequency (MHz)	*Example of application*	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	Size (inch)	Link
2-54	*Various*	25 CW	25	51	2x3	
30-520	*Broadband radio*	25 PEP 2-tone	17	30	2x3	
1030 (plastic only)	*Transponder driver*	25 CW	22.5	60	4x5	
400-1000 (pl only)	*Various*	2.5 DVB-T	15	12	2x3	
960-1215 (pl only)	*DME*	25 CW	16	40	2x3	

Roadmap Datasheet ceramic Datasheet plastic

New

AFG24S100H: 100W CW wideband GaN transistor

100-2450 MHz

50V

100 CW

- Advanced GaN on SiC
- 100Wcw Power Across 100-2450 MHz
- Housed in NI-360 air-cavity ceramic package
- High Ruggedness: 20:1 VSWR
- Product Longevity Program: warranted availability until 2025
- Typical Applications
  - EMC testers
  - Scientific research
  - Professional mobile radios
  - Wideband drivers
  - General purpose wideband amplifiers

Planned Reference Circuit

Board Frequency (MHz)	*Example of application*	Power (W P1dB)	Gain (dB)	Drain Eff. (%)	Link
2450	*Land Mobile BTS*	100W cw	12	50	

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