**Document information**

| Info | Content |
|---|---|
| Status | General Publication |
| Author(s) | Tyler Ware |
| Abstract | Measurement results of the BLP15H9S30 LDMOS Device in Board #AR192182 tuned for 360-450MHz at 50V |

# 1 Revision History

**Table 1. Report revisions**

| Revision No. | Date | Description | Author |
|---|---|---|---|
| 1.0 | 20180608 | Initial document | Tyler Ware |
| 2.0 | 20200310 | Device Part Number Update | Tyler Ware |
| 3.0 | 20220426 | Updated Security Status | Tyler Ware |

# 2 Contents

# 3 List of Figures



# 4 List of Tables



# 5 General Description

This report presents the measurement results Demo Board AR192182 using the BLP15H9S30. The demo achieves ≥ 44.7dBm at 360-450MHz.

# 6 Biasing

## 6.1 Bias Details

VDD =50V
IDQ =120mA

# 7 Test Bench Set Up

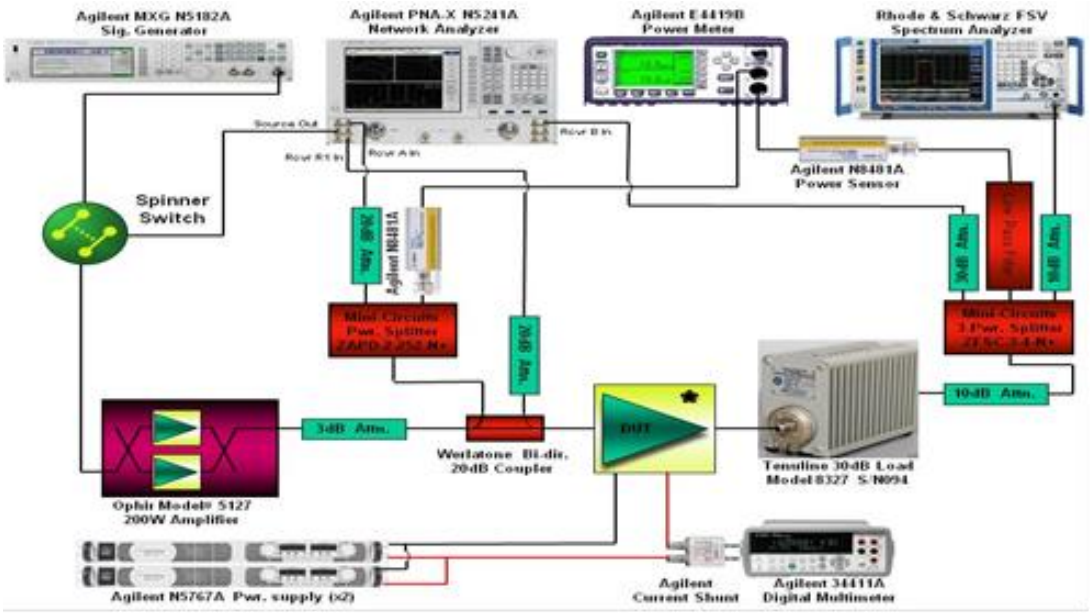


**Figure 1.Test Bench Equipment set up**

Demo placed on a liquid cold plate for testing

# 8 Performance Summary

**Table 2. RF Performance, Frequency = 405MHz, Signal: CW**

| Parameter | Measurement | Unit |
|---|---|---|
| Specified frequency | 405 | MHz |
| Drain voltage | 50 | V |
| Quiescent drain current | 120 | mA |
| P3dB | 42.17 | W |
| Efficiency at P3dB | 60.12 | % |
| Gain at P3dB | 14.80 | dB |

The BLP15H9S30 is a 30 W LDMOS driver transistor for broadcast and industrial applications. The excellent ruggedness of this device makes it ideal for digital and analog transmitter applications in the frequency range from HF to 1500MHz.

| AR192182_BLP15H9S30_50_360-450MHz_CW Drive Up | | | | |
|---|---|---|---|---|
| Freq(MHz) | P1.0dB | Pout(W) | P1dB Gain (dB) | P1dB Eff(%) |
| 360 | 43.98 | 25.00 | 16.24 | 43.26 |
| 380 | 44.60 | 28.84 | 16.52 | 48.51 |
| 385 | 44.72 | 29.65 | 16.58 | 49.71 |
| 395 | 45.05 | 31.99 | 16.69 | 53.19 |
| 405 | 45.28 | 33.73 | 16.82 | 55.57 |
| 415 | 45.59 | 36.22 | 16.97 | 59.61 |
| 430 | 45.79 | 37.93 | 17.26 | 64.73 |
| 450 | 45.60 | 36.31 | 17.72 | 69.07 |
| | P2.0dB | Pout(W) | P2dB Gain(dB) | P2dB Eff(%) |
| 360 | 44.84 | 30.48 | 15.23 | 46.33 |
| 380 | 45.38 | 34.51 | 15.53 | 52.45 |
| 385 | 45.48 | 35.32 | 15.58 | 53.14 |
| 395 | 45.70 | 37.15 | 15.70 | 56.60 |
| 405 | 45.95 | 39.36 | 15.81 | 58.46 |
| 415 | 46.12 | 40.93 | 15.97 | 62.20 |
| 430 | 46.20 | 41.69 | 16.25 | 66.40 |
| 450 | 45.92 | 39.08 | 16.71 | 70.55 |
| | P3.0dB | Pout(W) | P3dB Gain(dB) | P3dB Eff(%) |
| 360 | 45.27 | 33.65 | 14.23 | 49.89 |
| 380 | 45.75 | 37.58 | 14.51 | 55.20 |
| 385 | 45.86 | 38.55 | 14.58 | 54.68 |
| 395 | 46.06 | 40.36 | 14.69 | 57.53 |
| 405 | 46.25 | 42.17 | 14.80 | 60.12 |
| 415 | 46.37 | 43.35 | 14.95 | 62.73 |
| 430 | 46.41 | 43.75 | 15.28 | 66.48 |
| 450 | 46.09 | 40.64 | 15.73 | 69.53 |

# 9 Performance Details

## 9.1 Small Signal Results

Vdd=50V, Idq=120mA, Pin=20dBm

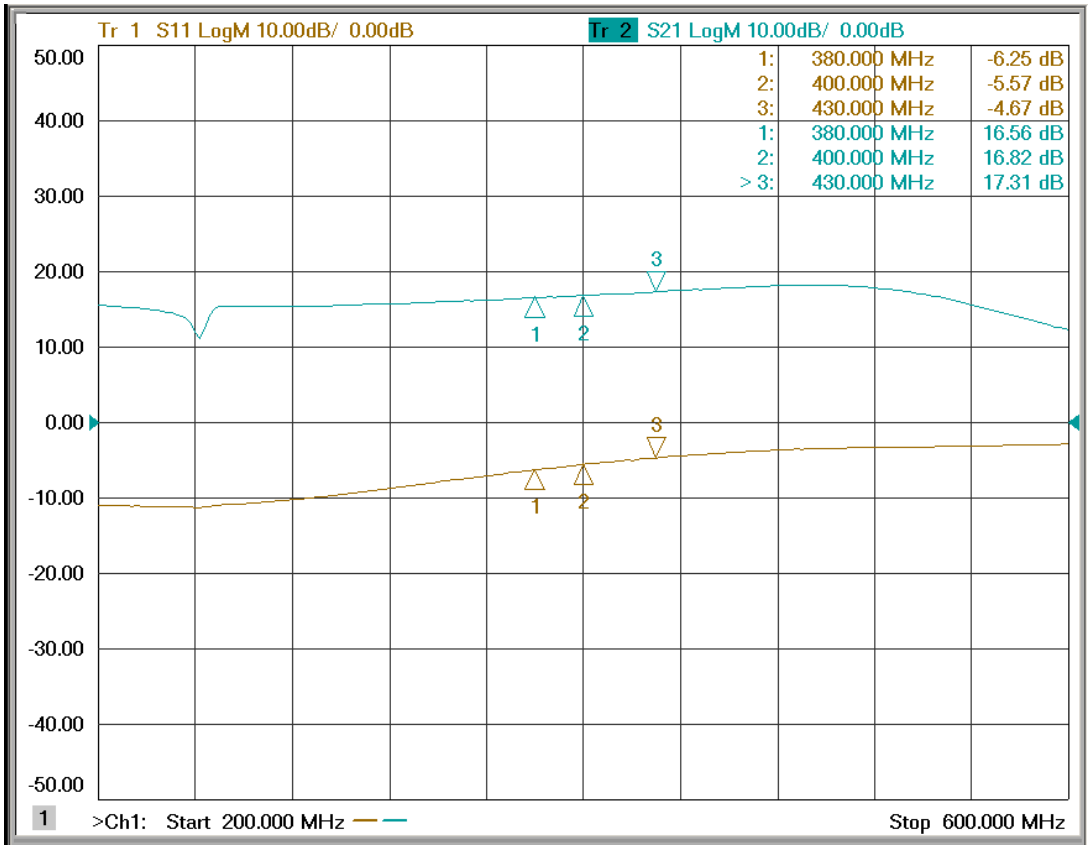


**Figure 2. Small Signal Results**

## 9.2 CW Gain

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz

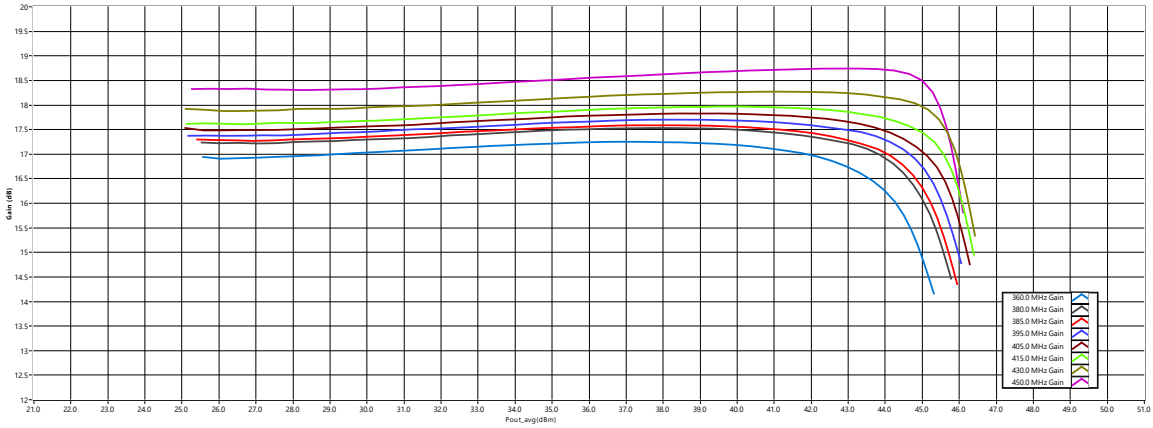


**Figure 3. CW Gain (dB) vs Power Out(dBm)**

## 9.3 CW Efficiency

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz

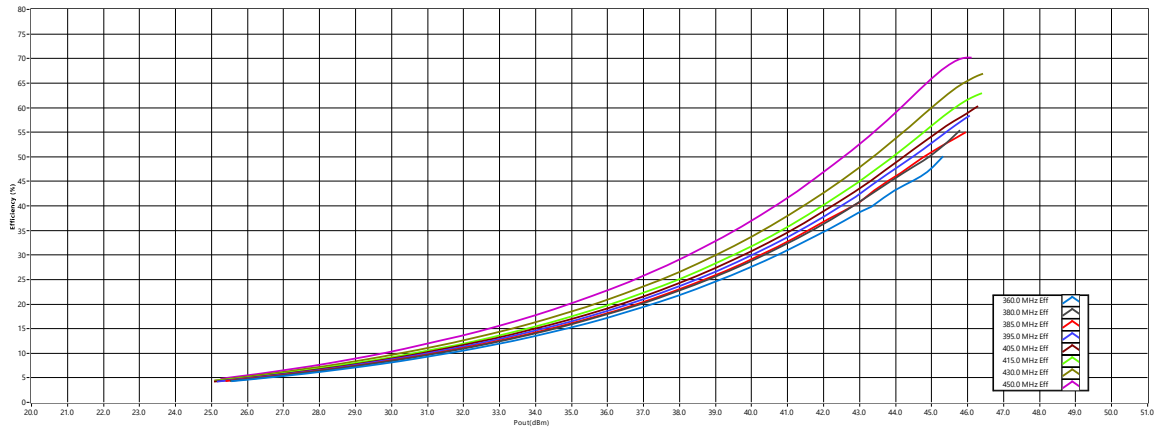


**Figure 4. CW Efficiency(%) vs Power Out(dBm)**

## 9.4 Pulse Gain

Vdd = 50V, Idq=120mA, 100uS Pulse Width 10% Duty, Frequency=360-450MHz

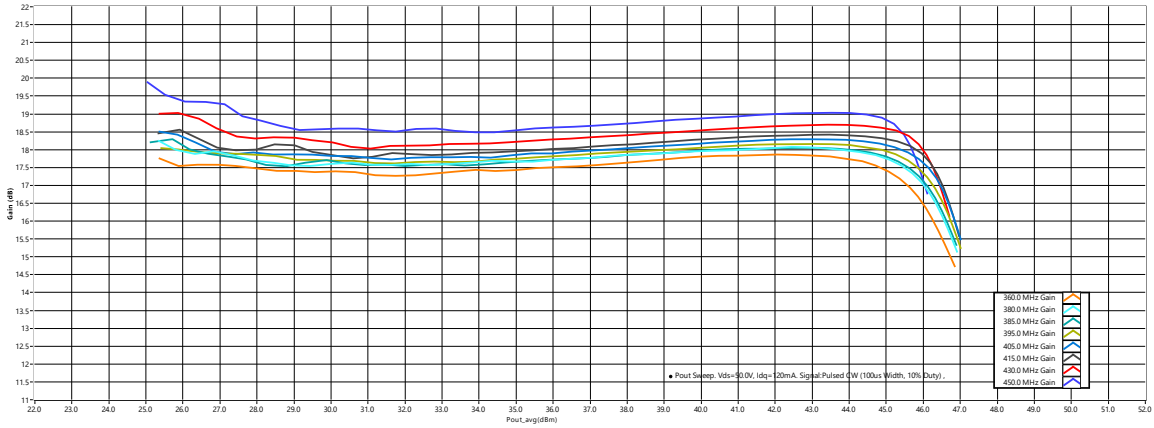


**Figure 5. Pulse Gain (dB) vs Power Out(dBm)**

## 9.5 Pulse Efficiency

Vdd = 50V, Idq=120mA, 100uS Pulse Width 10% Duty, Frequency=360-450MHz

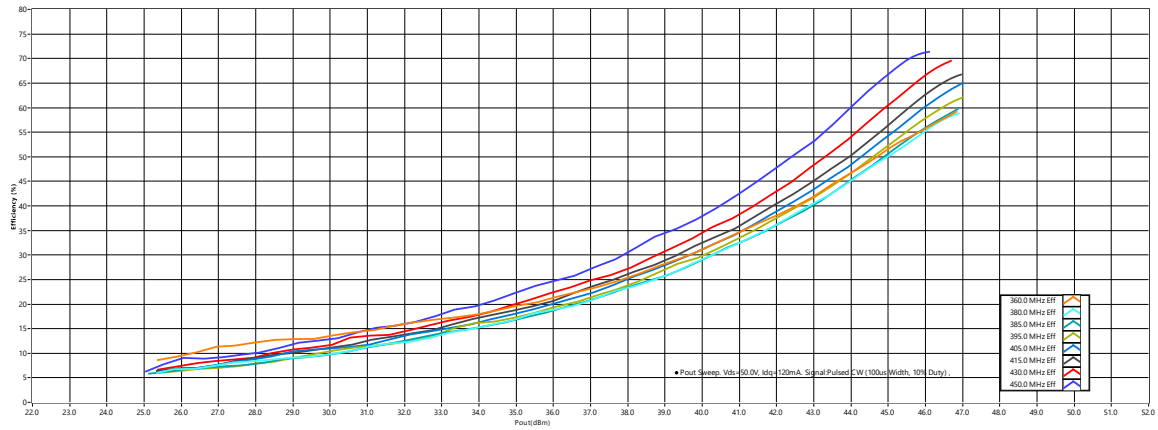


**Figure 6. Pulse Efficiency(%) vs Power Out(dBm)**

# 10 Fixed Power Out Results

## 10.1 Output Power v Frequency at P1dB

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz, **Pout=P1dB**

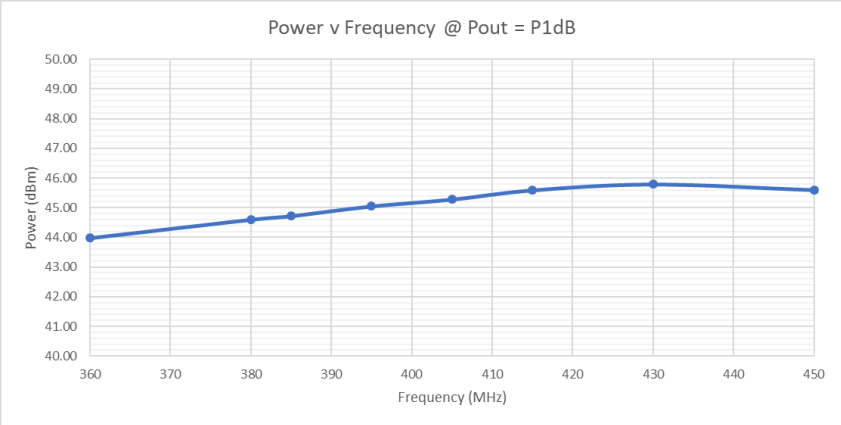


**Figure 7. Output Power v Frequency at Pout=P1dB**

## 10.2 Output Power v Frequency at P3dB

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz, **Pout=P3dB**

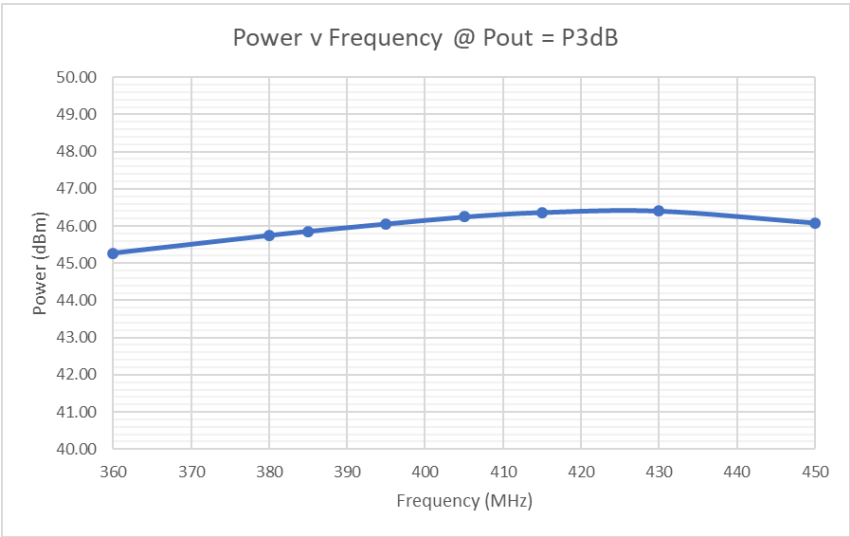


**Figure 8. Output Power v Frequency at Pout=P3dB**

## 10.3 Gain v Frequency at P1dB

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz, **Pout=P1dB**

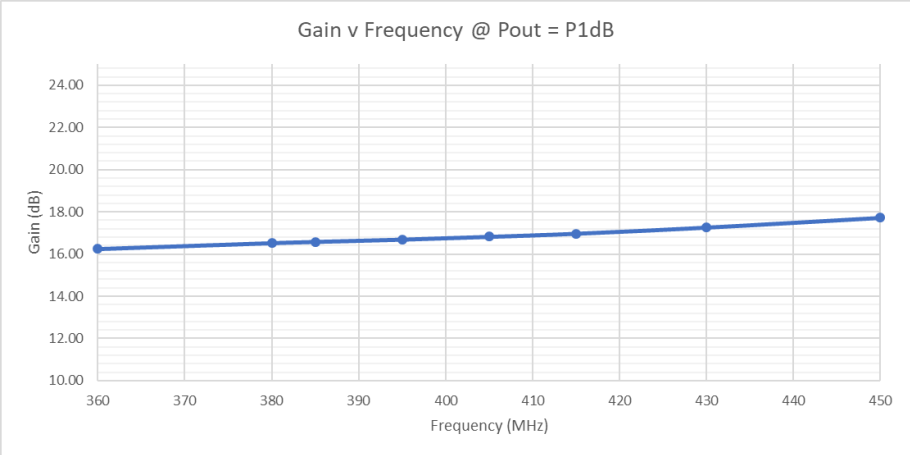


**Figure 9. Gain(dB) vs Power Out(dBm) at P1dB**

## 10.4 Efficiency v Frequency at P1dB

Vdd = 50V, Idq=120mA, CW, Frequency=360-450MHz, **Pout=P1dB**

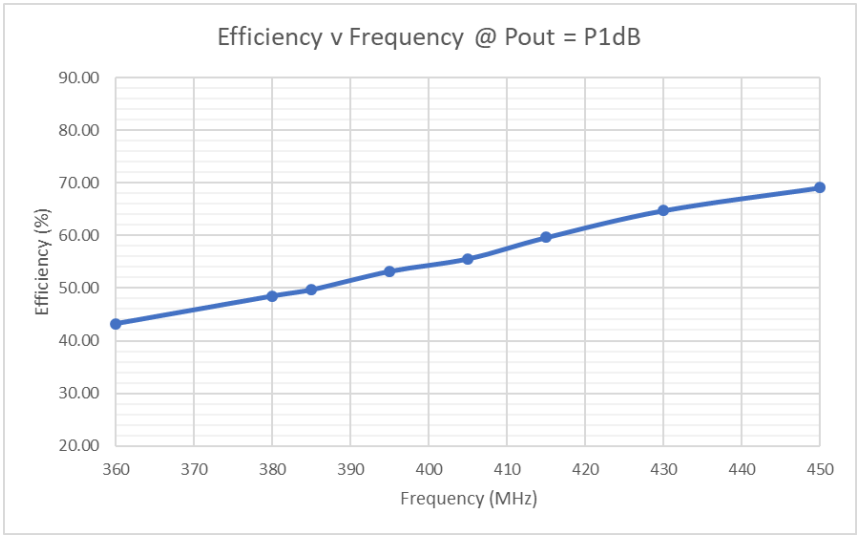


**Figure 10. Efficiency(%) vs Power Out(dBm) at P1dB**

# 11 Swept Voltage Results

## 11.1 Gain(dB) vs Output Power (dBm), Sweep Vdd

Vdd varied **50V**, **45V**, **40V**; Idq=120mA, Frequency=405MHz, CW, Pout=P3dB

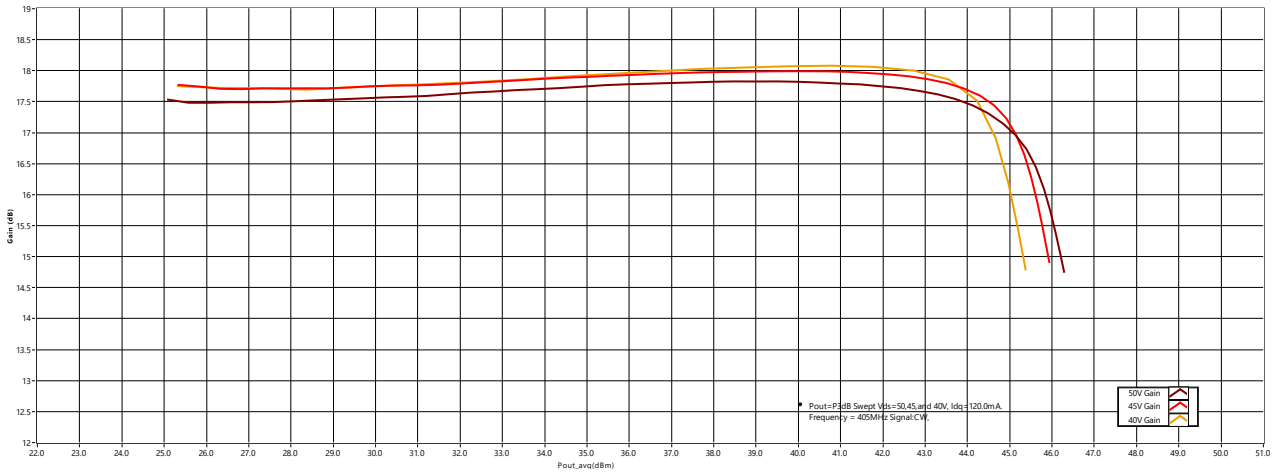


**Figure 11. (Swept Voltage)** Gain(dB) as a function of Output Power (dBm)

## 11.2 Efficiency(%) vs Output Power (dBm), Sweep Vdd

Vdd varied **50V**, **45V**, **40V**; Idq=120mA, Frequency=405MHz, CW, Pout=P3dB

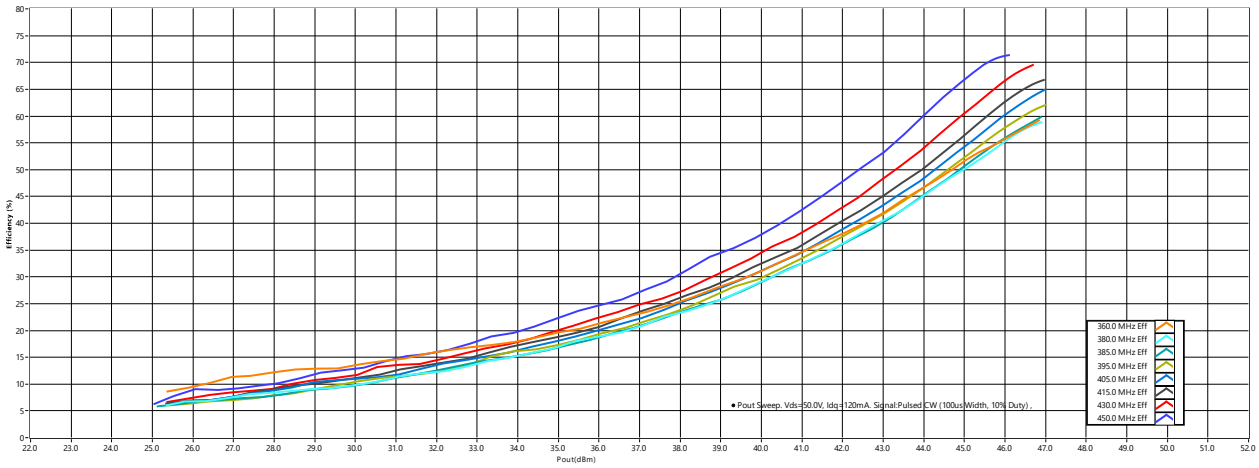


**Figure 12. (Swept Voltage)** Drain Efficiency(%) as a function of Output Power (dBm)

# 12 IMD Results

## 12.1 IMD3 Results

Vdd = 50V, Idq=120mA, 2-Tone Signal 100kHz spacing, Frequency=360,405,450MHz, **Pout=25-43dBm**

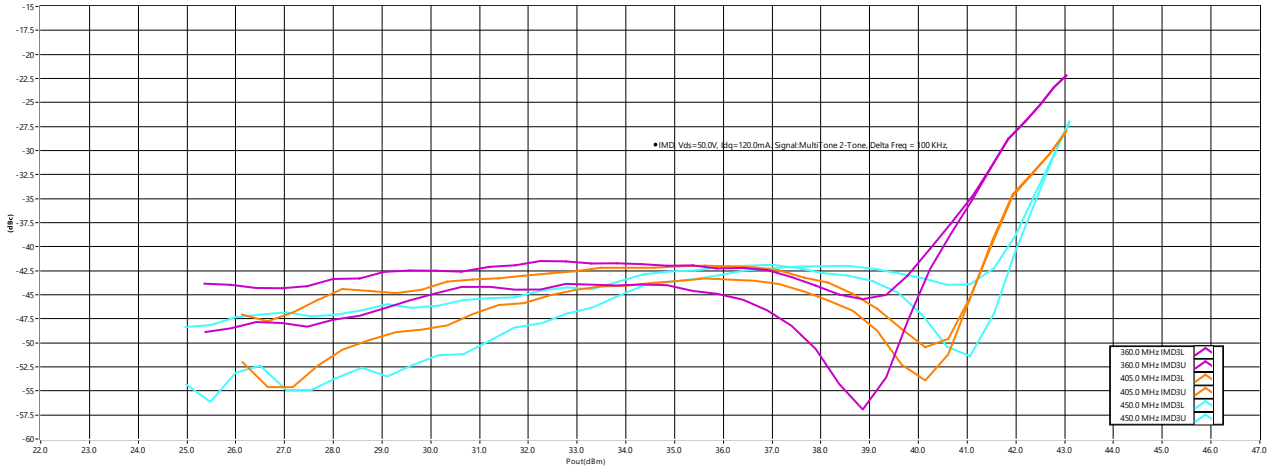


**Figure 13.** IMD3 Results

## 12.2 IMD5 Results

Vdd = 50V, Idq=120mA, 2-Tone Signal 100kHz spacing, Frequency=360,405,450MHz, **Pout=25-43dBm**

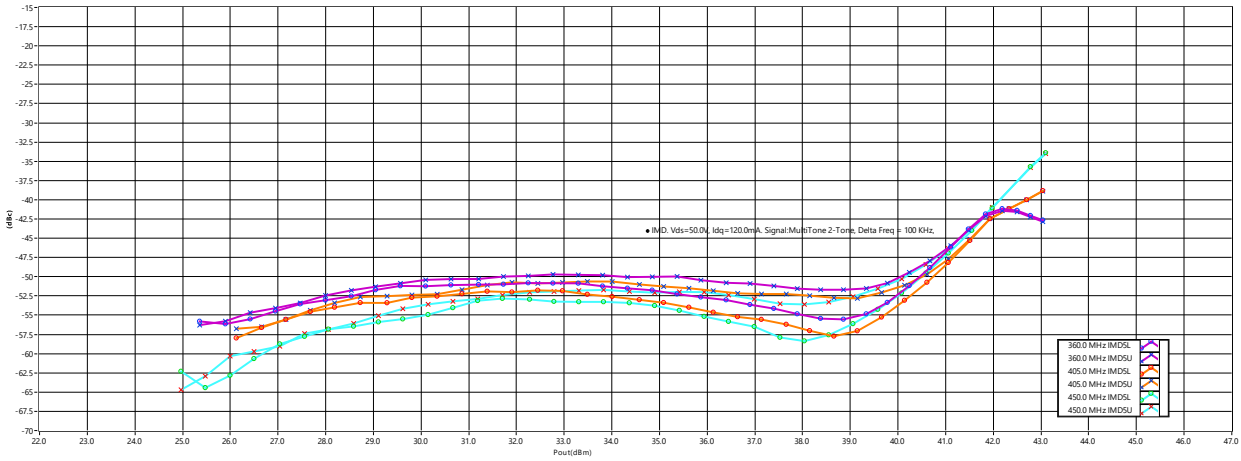


**Figure 14.** IMD5 Results

# 13 ACPR Results

## 13.1 1-carrier W-CDMA ACPR Results

Vdd=50V, Idq=120mA, LTE Signal, Frequency=360,405,450MHz, **Pout=32dBm-42dBm**

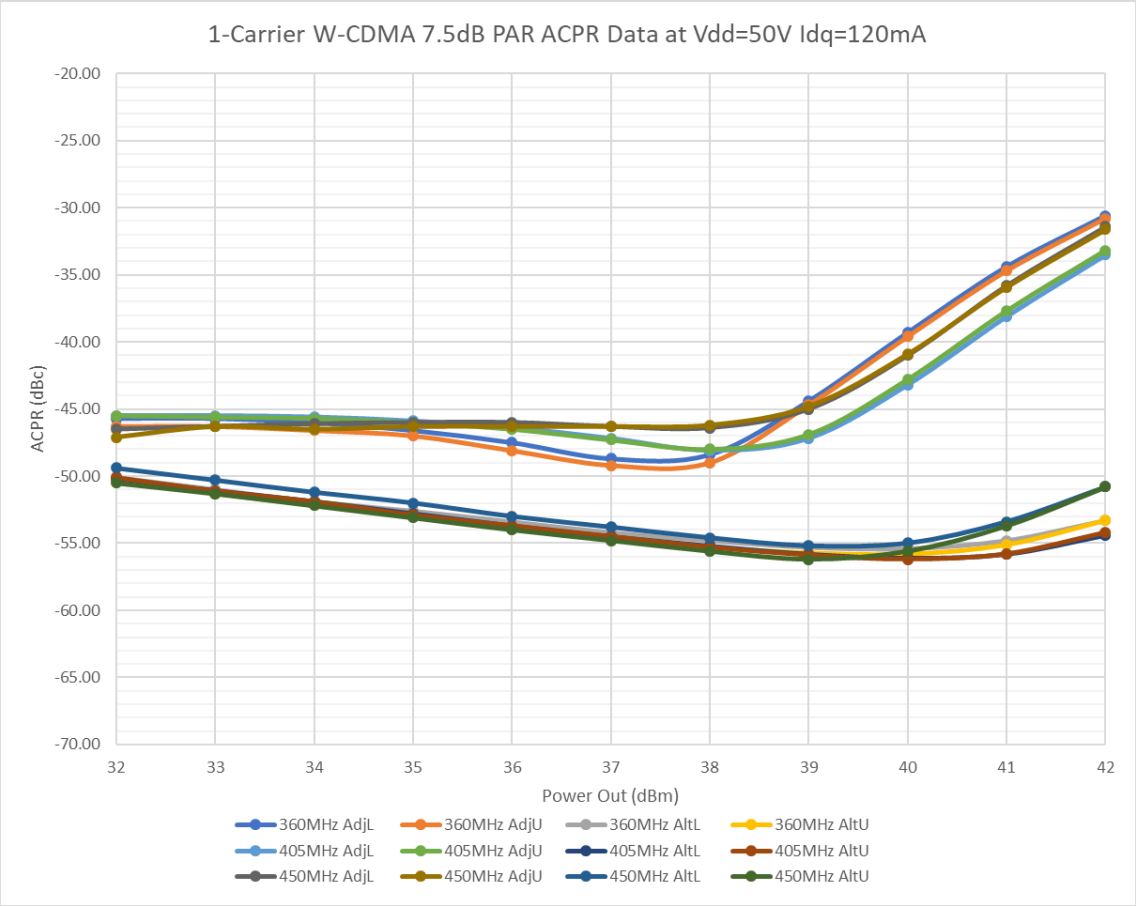


**Figure 15.** 1-carrier W-CDMA ACPR Results

# 14 Hardware

## 14.1 Board photograph

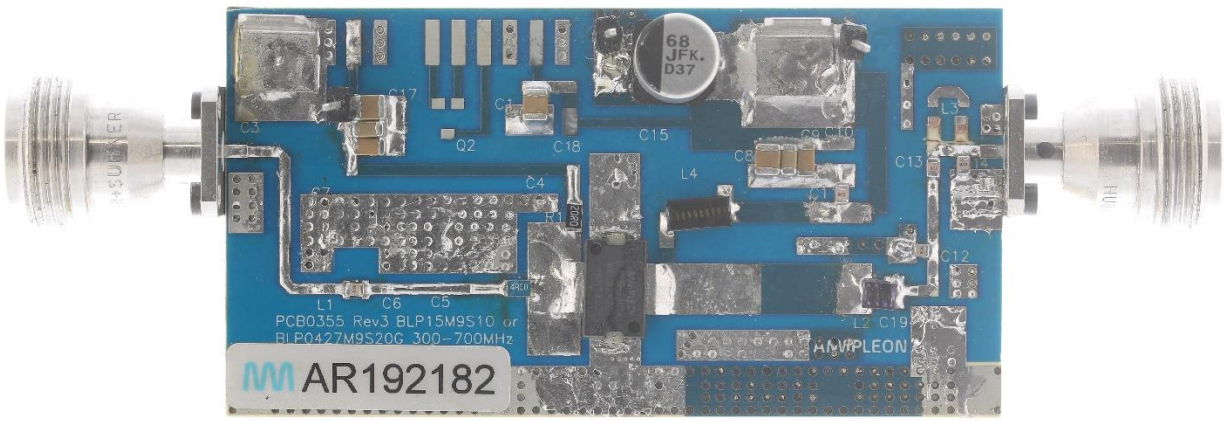


**Figure 16. Board Photograph**

## 14.2 PCB layout

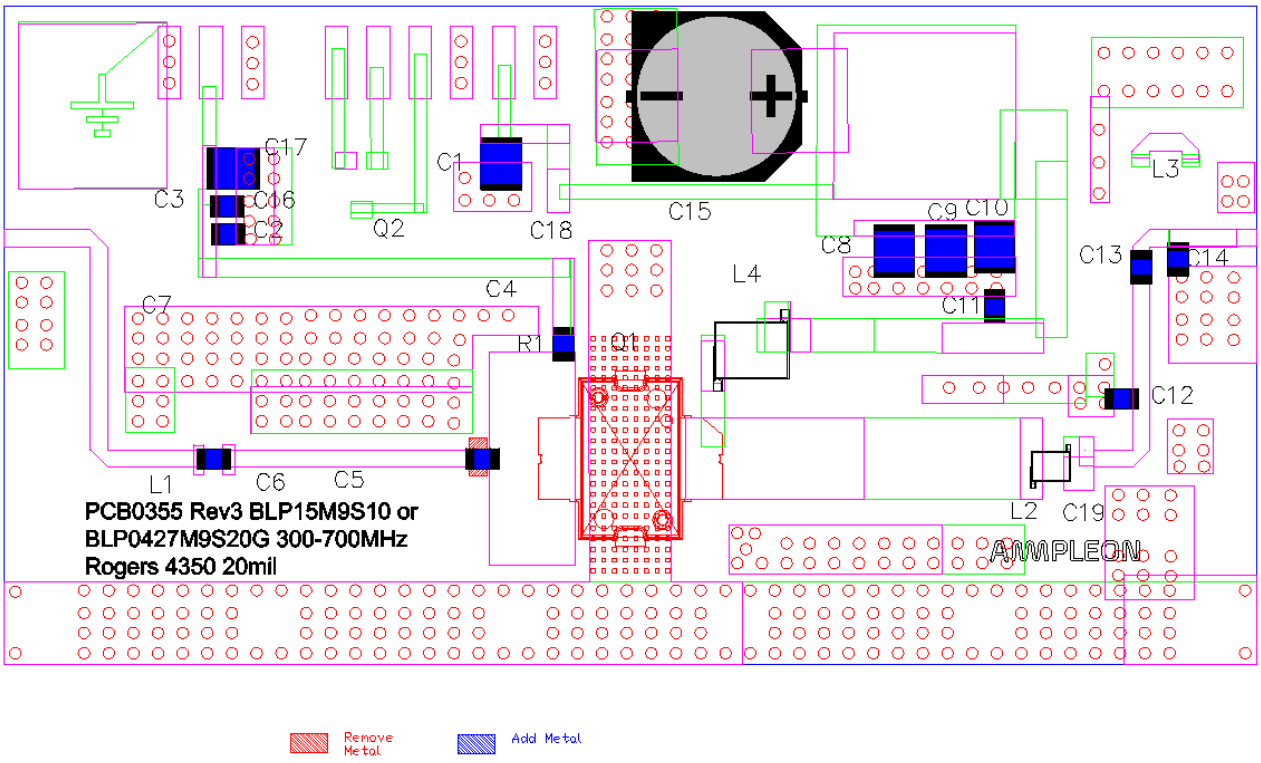


**Figure 17. PCB Layout Board #AR192182**

## 14.3 Bill of materials

**Table 3. BOM**

| Designator | Description | Manufacturer | Part# |
|---|---|---|---|
| PCB | 20 mil thk. Rogers 4350 | Avanti Circuits | PCB0355 Rev 3 |
| | | | |
| Q1 * | RF Transistor 10W 50V LDMOS | Ampleon | BLP15H9S30 |
| Q2 | 2N2222 NPN Transistor | Fairchild | MMBT2222 |
| | | | |
| U1 | LDMOS bias module | Ampleon | CA-330-11 |
| | | | |
| R1 | 20 Ω | Generic | 1206 |
| | | | |
| C1,C8,C17 | 1uF, ceramic, 50V, ±10% | Murata | GRM31CR71H105K |
| C2,C10 | 0.01uF,100V,X7R,1206 | Murata | GRM319R72A103KA01D |
| C9,C16 | 0.1uF 100V,X7R | Murata | GRM319R72A104KA01D |
| C11,C13 | 120pF | ATC | 600F |
| C3 | DNP | | |
| C4 | DNP | | |
| C5 | DNP | | |
| C6 | DNP | | |
| C7 | DNP | | |
| C7A | DNP | | |
| C12 | 6.2pF | ATC | 600F |
| C19 | DNP | | |
| C14 | 6.2pF | ATC | 600F |
| C15 | 68uF, 63 V electrolytic SMT | Panasonic | EEE-FK1J680UP |
| Cadd | DNP | ATC | 600F |
| C18 | DNP | | |
| L1 | Use ATC 600F 120pF | ATC | 600F |
| L2 | 8nH | Coilcraft | A03T_L_ |
| L3 | | | |
| L4 | 43nH | Coilcraft | B10T |
| Rgate | 4 Ω | Generic 1206 | Cut Metal |
| | | | |
| *Bend leads Q1 | | | |
| | | | |

## 14.4 PCB materials

**Table 4. Board Specifications**

| Parameter | Value |
|---|---|
| Manufacturer | Rogers |
| Type | 4350 |
| Thickness | 20 mils, 1oz. copper |
| Layers | 2, top/bottom. Bottom all copper |

## 14.5 Device markings

**Table 5. Device Specifications**

| Parameter | Value |
|---|---|
| Manufacturer | Ampleon |
| Device | BLP15H9S30 |
| Date Code | W6N92M20<br>NH1902 |

# 15 Legal Information

## Definitions

**Draft —** The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Ampleon does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

## Disclaimers

**Limited warranty and liability —** Information in this document is believed to be accurate and reliable. However, Ampleon does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Ampleon takes no responsibility for the content in this document if provided by an information source outside of Ampleon.

In no event shall Ampleon be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Ampleon' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the Terms and conditions of commercial sale of Ampleon.

**Right to make changes —** Ampleon reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use —** Ampleon products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Ampleon product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Ampleon and its suppliers accept no liability for inclusion and/or use of Ampleon products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications —** Applications that are described herein for any of these products are for illustrative purposes only. Ampleon makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Ampleon products, and Ampleon accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Ampleon product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Ampleon does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Ampleon products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Ampleon does not accept any liability in this respect.

**Export control —** This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

## Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

Any reference or use of any 'NXP' trademark in this document or in or on the surface of Ampleon products does not result in any claim, liability or entitlement vis-à-vis the owner of this trademark. Ampleon is no longer part of the NXP group of companies and any reference to or use of the 'NXP' trademarks will be replaced by reference to or use of Ampleon's own trademarks.

## 15.1 Contact information

For more information, please visit: http://www.ampleon.com

For sales office addresses, please visit: http://www.ampleon.com/sales