

AMZ-40 Driver Amplifier Operation Guide

Introduction

The AMZ-40 is a broadband 40 Gb/s modulator driver amplifier. This manual describes the power ON/OFF procedures for the AMZ-40 and includes typical eye diagrams at 40 Gb/s.

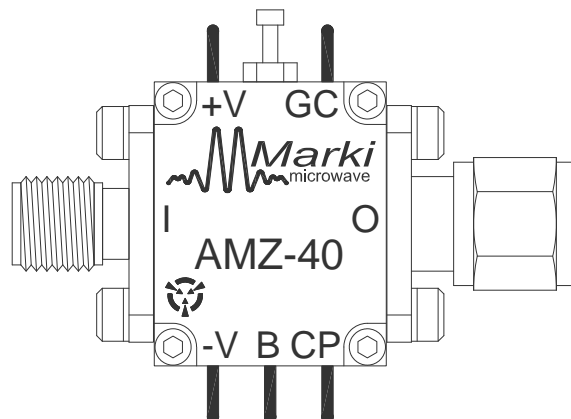
Biasing Procedure

The following steps describe the Power ON and Power OFF procedure for the AMZ-40 amplifier. Since the amplifier has 4 bias ports, **+V**, **-V**, **CP** (eye Crossing Percentage) and **GC** (Gain Control), proper operation of the AMZ-40 requires 1 positive supply and up to 3 negative supplies (**GC** can be grounded, negative or left open). Operating specifications for the 4 bias pins are shown in Table 1.

| Parameter | Unit | Absolute Min | Typical | Absolute Max |
|------------------------------------|-----------------|--------------|-----------------|--------------|
| Input Power | dBm | | -6 | +10 |
| Input Voltage Swing (50 Ω) | V _{pp} | | 0.30 to 0.45 | 2 |
| Positive Drain Voltage (+V) | V mA | 0 | +5 to +7 225 | +9 400 |
| Negative Gate Voltage (-V) | V mA | 0 | -0.65 8 | -2 30 |
| Eye Crossing Percentage (CP) | V mA | 0 | -4 12 | -8 30 |
| Gain Control (GC) | V | 0 | 0 | -2 |
| Output Bias Tee Control (B) | V mA | -8 -300 | | 8 300 |

Table 1. Operating Specifications. **Do not exceed Max/Min setting!** Output bias tee control is optional.

Pin Description





POWER ON SEQUENCE

1. Proper operation of the AMZ-40 requires that both the input and output connections interface with broadband $50\ \Omega$ systems. **Prior to any DC bias connection, connect the input to a broadband $50\ \Omega$ source impedance and connect the output to a broadband $50\ \Omega$ load impedance.** Applying DC bias to a non- $50\ \Omega$ terminated amplifier can result in damage to the device—especially when operating the amplifier in saturation. If viewing the output eye diagram on an oscilloscope, ensure that the output of the AMZ-40 is properly attenuated (typ. $> 20\ \text{dB}$) such that the oscilloscope sampling head is not damaged. Consult the oscilloscope manufacturer for “safe” input levels.
 2. Turn on the power supply and set both the positive and 3 negative voltages to 0 V. Verify that the displayed voltage on the DC supply matches the actual voltage using a multimeter.
 3. (Optional Step). Use the current limiting option on the DC power supply to set the maximum allowable current on the **negative port to 30 mA**. Set the current limit on the **positive port to 500 mA**. This will prevent the supply from damaging the amplifier in case of user malfunction.
 4. Connect the first **negative** DC supply port to the AMZ-40 amplifier pin labeled **-V**.
 5. Connect the second **negative** DC supply to the AMZ-40 pin labeled **CP**.
 6. To connect the gain control pin, **GC**, perform one of the following steps:
 - a. For high output swing applications (i.e. output swing **greater than $7\ \text{V}_{pp}$**), leave the gain control pin, **GC**, floating.
- OR
- b. For applications requiring output voltage swing **less than $7\ \text{V}_{pp}$** , connect the third **negative** DC supply to **GC**.
7. Connect the **positive** DC supply port to the AMZ-40 pin labeled **+V**. (NOTE: All the DC supply voltages should still read 0 V).
 8. Slowly turn up the **-V** voltage from **0 V to $-0.65\ \text{V}$** . Verify that the negative current draw increases from 0 mA to about **8 mA** (actual values can range from 5 to 15 mA).
 9. Slowly turn up the **CP** voltage from **0 V to $-4\ \text{V}$** . Verify that the negative current draw increases from 0 mA to about **12 mA** (actual values can range from 5 to 20 mA).
 10. Slowly turn up the **positive** supply voltage from **0 V to $+6.5\ \text{V}$** . Verify that the positive current draw increases from 0 mA to about **185 mA** (actual values can range from 130 to 180 mA).
 11. Set the external pattern generator to have a signal voltage swing of **$250\ \text{mV}_{pp}$ to $600\ \text{mV}_{pp}$** . Note that any DC bias on the signal pattern will be blocked by the AMZ-40’s internal DC blocking capacitor. Marki Microwave tests all AMZ-40 amplifiers with an input signal swing of **300 to $400\ \text{mV}_{pp}$ @ 40 Gb/s**.
 12. Enable the pattern generator output. Notice that the positive **+V** current draw increases (actual values will depend on exact input signal swing, **-V** voltage and **CP** voltage).
 13. Using a high speed oscilloscope (Marki Microwave uses an Agilent DCA 86100C sampling oscilloscope with a 86118A 70 GHz sampling head with a 86107A Precision Timebase Module), optimize the eye diagram crossing point to 50% by adjusting **CP** between **$-2.5\ \text{V}$ and $-5\ \text{V}$** .
 14. Toggle **-V** between $-0.5\ \text{V}$ and $-0.8\ \text{V}$ to achieve desired eye opening. Optimal **-V** voltages typically range from 0.6 to 0.7 V.
 15. (Optional Step) Optimize the eye swing by toggling **GC** between 0 V and $-1\ \text{V}$. (NOTE: For ease of use, **GC** can be grounded at all times and the eye swing can be adjusted alternatively by toggling **+V**.)



16. If a different output voltage swing is desired, increase **+V** (do not exceed +9 V) and/or make **GC** more negative. Note that steps #13-15 should be repeated to optimize the eye at the new **+V** voltage.

POWER OFF SEQUENCE

1. Turn down the **positive** supply voltage 0 V. The positive supply current should go to 0 mA.
2. Turn down the **negative** supply voltages to 0 V (order does not matter). The negative supply current should go to 0 mA.
3. Turn OFF the input RF signal (if it is still ON).
4. Disconnect the AMZ-40 from the setup.

POWER ON SEQUENCE—Cheat Sheet

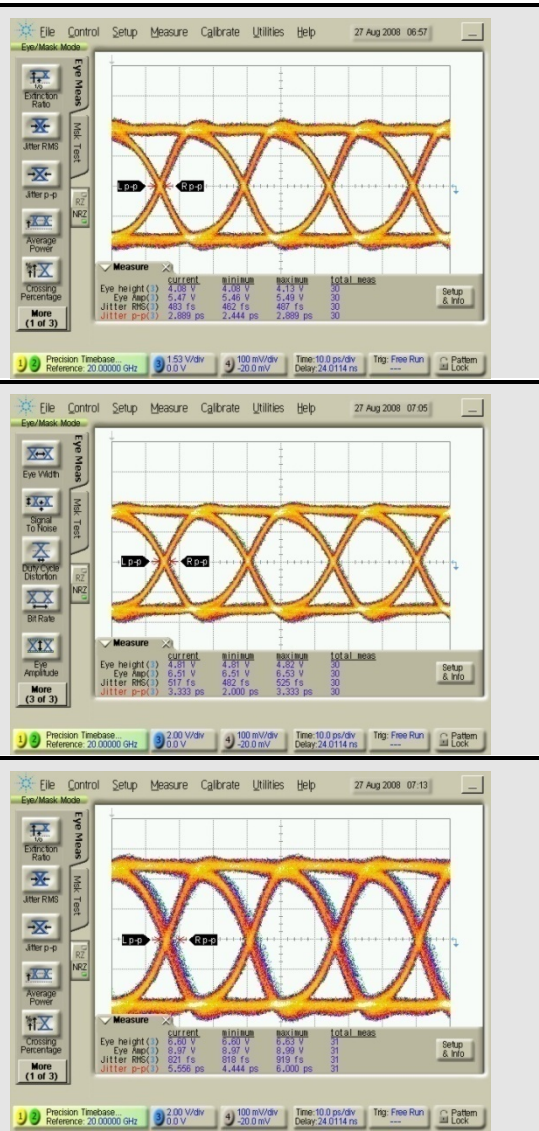
The following tables can be used as “cheat sheets” assuming an input signal swing of 350 mV_{pp}. The values listed are approximate as results will vary slightly depending the test setup and amplifier.

Remember, never turn on the AMZ-40 without first properly connecting the to a 50 Ω load.

| Power ON Sequence (5.5 V _{pp} Output) | |
|--|-------------------|
| Bias Pin | Voltage (Current) |
| +V | +5 V (190 mA) |
| -V | -0.63 V (8 mA) |
| CP | -4.35 V (12 mA) |
| GC | Ground |

| Power ON Sequence (6.5 V _{pp} Output) | |
|--|-------------------|
| Bias Pin | Voltage (Current) |
| +V | 6.5 V (225 mA) |
| -V | -0.63 V (8 mA) |
| CP | -3.75 V (12 mA) |
| GC | Ground |

| Power ON Sequence (9 V _{pp} Output) | |
|--|-------------------|
| Bias Pin | Voltage (Current) |
| +V | 8.7 V (320 mA) |
| -V | -0.55 V (6 mA) |
| CP | -2.5 V (8 mA) |
| GC | Float |



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