



User Guide for GMR10K000 MODULE EVALKIT

This is a preliminary announcement for a product that is in development. We encourage commentary as to features or suggestions that you would want to see in this product.

Introduction:

The primary purpose of the Evalkit is to aid the engineer in evaluating the operation of his system using the root GMR10K000 module. The root GMR10K000 module is a dc-dc converter capable of delivering 100W at 20V output with input voltage of 100VDC to 380VDC.

GMR10K000 is called a root module because there are important extensions that can be added to this module (either modules available from Ganmar Technologies or your unique modules required to meet the needs of your system. Some examples are:

1. Attach an AC- Front End Ganmar Technologies' rectifier module and you get an AC-DC converter with Ganmar Technologies' proprietary EMI filter integrated into it. This approach is very useful if in your system requires AC as an input.
2. You may want to create a 100W AC/DC adaptor. Using the AC- Front End Ganmar Technologies' rectifier module and the GMR10K000 will provide a 100W AC/DC adaptor. Note that this will require some form of protective cover. You can contact Ganmar Product Support for supplying you with one.
3. Attach an USB PD drive module, Ganmar Technologies is developing one, to obtain 100W USB C version of Power delivery (USB C PD). This is attractive when you plan to use it for multiple purposes –e.g. 5v @ 1 amp (USB A), 6V or 9V or 12V, 15v up to 5 amp as outlined in the USB C Specifications.

Additionally, the EvalKit can act as a production Test fixture for keeping quality records of the GMR10K000 modules or of your manufacturing system build-up.

Evalkit Features:

As original "First Article" Test policy, the EvalKit allows some major dc-dc module characterization:

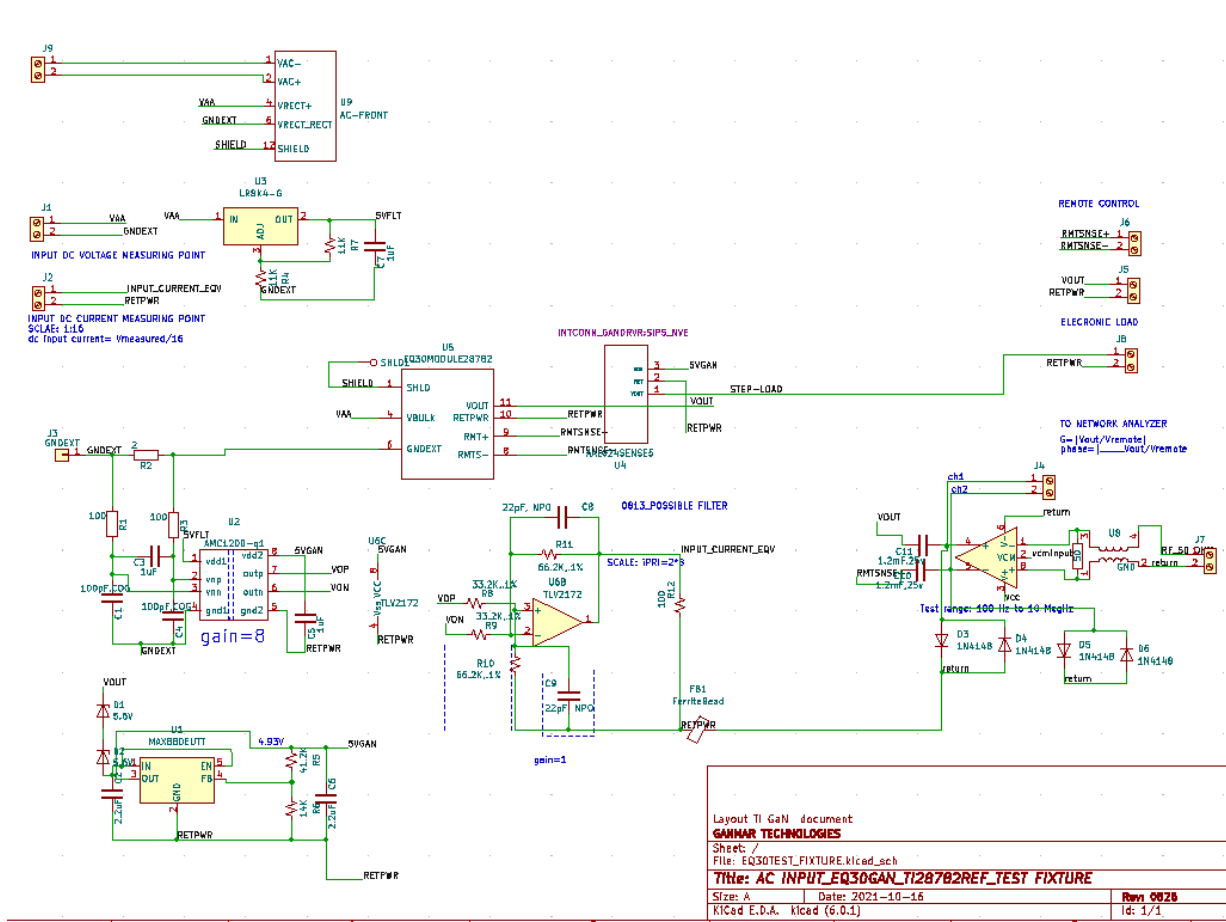
- Testing over 4-corners: $V_{min}/I_{out\ min}$, $I_{out\ max}$, $V_{max}-I_{out\ min}$ & $I_{out\ max}$. using electronic load. Either in CR or CC mode
- Step load testing over 20% to 80% of rated output current (i.e., 1-amp to 4-amp step)
- Visualizing on the oscilloscope the step impedance across the connector provided to monitor this jump.
- Measuring input filter/noise free DC current provides the ability for calculating Efficiency when combined with input voltage measured across connector.
- A Network Analyzer can be connected to the J4 connector and set up to measure loop response. This gives you direct understanding of Stability in terms of gain margin & phase margin.

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2.0 Schematic of the Evalkit



2.1 Review of the blocks in the Schematic (viewed from the 3D model of the Evalkit)

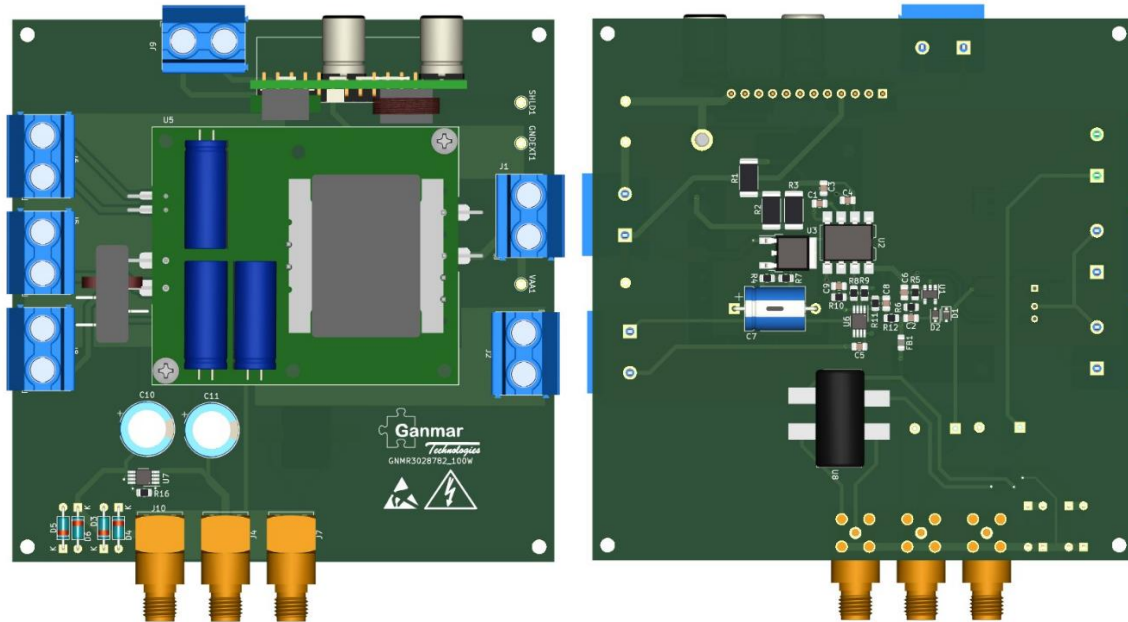
- (U5) Center: Placement of the module. It is connectorized for ease of testing many sequentially.
- No heat sink is necessary as it is integrated with the module base.
- (U1) AC Front End:
- (J1) Input DC current measuring port
- (J2) Input dc voltage measuring port
- (J3) Output step load visualization port
- (J4) Loop Response measuring port
- (J5) Output dc voltage measuring port.
- (J6) Network Analyzer

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U1 and U3 provide 5V bias for all internal circuits.

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3.0 Test Bench Setup with the Evalkit: - step by step setup

Before starting make sure all parts with connectors are inserted fully and secured.

3.0.1 Instrument/ equipment needed:

- DC power supply, if using it: up to your level of testing capability.
- OR AC line with a switch from the bench. In this case, make sure you start with AC switch OFF
- Some digital multi meter to measure input DC voltage, voltage at J1. OR connect to an oscilloscope channel.
- Connect sequence of channels for J2, J3, J4.
- Connect a scope channel at J5: this port connects to an electronic load.
- Keep Loop testing as a separate step on a different bench perhaps containing a Network Analyzer.

3.0.2 Setting up Instruments

- If using DC, put SW1 is OFF position.
- Power ON DC power supply. Set DV voltage level to 100V or to desired level.
- **Turn it off.**
- Set 1 amp Constant current set mode in the Electronic load to start with.
- scope channel for J1: range 0 to 500mV to start off. Change it to proper setting once module is in operation and a waveform is visible.
- Scope channel for J2: set to 0.50V/div to start with.
- Channel for J3: 200mV/div to start with.
- Channel for J5: 5V/div to start with.

Spread the channel 0 positions suitable for clear view of each.

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3.0.3 Powering up the Module

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-With everything set up, for DC, turn DC power supply ON.

-Then turn SW1 switch ON .

All channels in the scope will show each of the measuring waveforms. Adjust knob scaling for each to get all waveforms in view.

4.0 Test Results

Calculating Input current from J1 reading

Input DC level	Voltage at J1	Load(amp)	Scale factor	Input DC current
100v	Vj1	2.5	16	$I1 = vj1/16$
150v		2.5		
200v		2.5		
300v		2.5		
350v		2.5		
380v		2.5		

4.0.1 Line Regulation

Input Voltage	Input current	Input Power	Vo	Io	Po	efficiency
Vin=100v	I1	Pin =Vin*I1				=Po/Pin
150v						
200v						
250v						
300v						
350v						



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Load Regulation

Output load	Input vin	Input Iin	Pin	vo	Po	efficiency
1a	200v					= Po/Pin
2a						
3a						
4a						
5a						

4.02 Step Load

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4.03 Loop Response

The Evalkit has a unique ac signal injection circuit that allows it to go down to very low frequency range. This depends upon the dc decoupling capacitors C10 & C11.

Check your Network Analyzer input DC limits. If this is more than 20, you do not need C10 & C11.

The signal is injected into the loop not by a "coupling transformer" but highly balanced differential amplifier across an injecting resistor of 10 Ohms(as is done for a transformer coupling case).

Gain margin and phase margin are read off from the Network Analyzer screen.



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5.0 Finishing Notes: This is a very unique EvalKit : this not only allows you to explore all the characteristics of the module but also do regular quality control on the manufacturing line for sensitive applications such as Aerospace. This Eval kit also will allow you to test any "competitor's" module with similar I/O capabilities. This will require an "adaptor" card to go between the original GMR30D000 connectors and the other . Contact Tech support for such exploration and comparison. We can help configure the Adaptor card.