APPLICATION NOTE

Application Guidelines for Non Isolated Converters

AN15-001 Guidelines for use of Dual Output Modules

Introduction

Today's high density board designs require multiple power supply voltages to power the various ICs. As an example, board designers need to power FPGAs with not just 2 or 3 but up to 8 voltage rails. A typical board can have 20+ rails and it is a challenge for a designer to accommodate, the required rails, with limited board space. OmniOn's Dual Output DLynx modules maximize power density over the existing single output modules and then additionally save valuable board space by reducing the aggregate footprint of the power supply and external components. This Application Note is structured to explain the following characteristics of Dual Output Modules.

Advantages: Dual output modules are denser and save board space when co pared to single output designs. They also have higher MTBF values

Features: Dual Output Modules offer as much control on each output stage as individual modules would. There is no reduction in capability when using a dual output module. Each output is electrically independent while sharing a common power input.

Layout: Dual Output Modules are new, but the layout of components can be done using the same rules as OmniOn's standard single output modules. There will be more routing required since there is twice the number of power outputs, but a symmetrical approach to layout can simplify the effort

Benefits of Dual Output Modules

Dual Output Modules offer substantial space saving through the implementation of a high density design and the usage of two integrated output stages.

Module Footprint

231 mm² (20.3 x 11.4) **298mm² (2 x 12.2 x 12.2)**

A 2x12A Dual Module is 22% smaller than 2 single 12A PICO Modules.

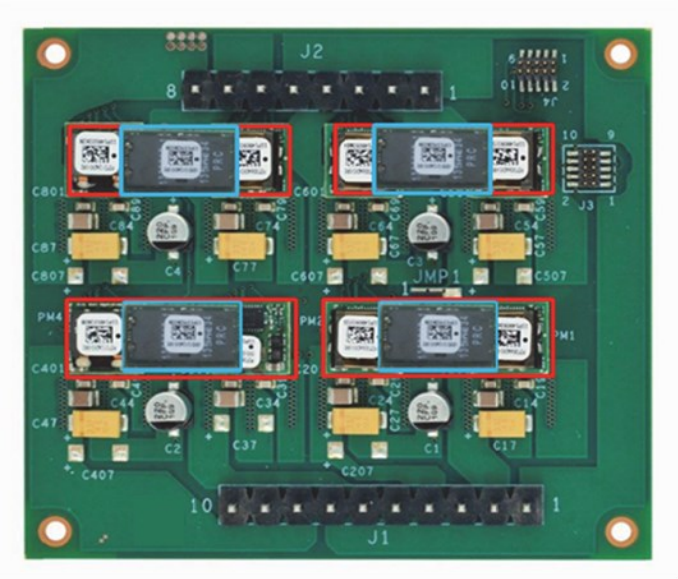
Figure 1. Comparison of Module Footprints.

Board Area

549 mm²(28.3 x 19.4) **735mm² (36.4 x 20.2)**

A 2x12A Dual Module occupies 25% less board area than 2 single 12A PICO modules.

Figure 2. Savings in overall board area.



The Red rectangles shows layout with 2 PICO modules
The Blue rectangle shows the equivalent layout with DUAL output modules

Figure 3. Pictorial Perspective of the Footprint reduction, showing the difference between the single output OmniOn and the dual output MICRO.

Dual Output Modules have a better calculated MTBF (at least 3X) than single output modules resulting in a highly reliable solution as well.

Features

Single Common Input

Both outputs are fed from a single common input. Each output stage is switched 180° out of phase. This results in half the input ripple of two individual modules switching simultaneously. This results in a reduction of the input capacitance to achieve the same input ripple level as a single input module.

The Dual output module also offers external Synchronization capability for applications that need access to control the switching phase angle of the individual module or slightly adjust the switching frequency.

In the case of the digital version of the dual output module, only one set of address resistors are required for both the output stages. Having a single I^2C address not only reduces the used addresses on the I^2C bus, but also the bus loading. The modules support the PMBus™# Page command which allows the external system controller to use the same address for both outputs and communicate with each stage by switching the page command. More information regarding this is available in the datasheet for the Dual Output product.

Individual Control of each output stage

There is no loss of functionality while using dual output modules. Users have access to the following capabilities:

1. Output Voltage Setting through separate Trim resistors.
2. Remote On/Off control for each output.
3. PowerGood signal for each output.
4. External Voltage Sense for each output.
5. Tunable Loop Control for each output.

The PMBus name and logo are registered trademarks of the System Management Interface Forum (SMIF)

PMBus Commands

Apart from the above analog capabilities, the Dual output modules support a substantial number of relevant PMBus commands. The modules offer voltage, current and temperature measurement of each stage. They also offer digital on/off control, voltage trim capability and rise time control. **Sequencing** has been implemented through the PMBus feature set by allowing the user to adjust the Turn On and Turn Off delay as a multiple of the rise time setting. The following view of the ProGUI configuration window summarizes the digital adjustments and readback available.

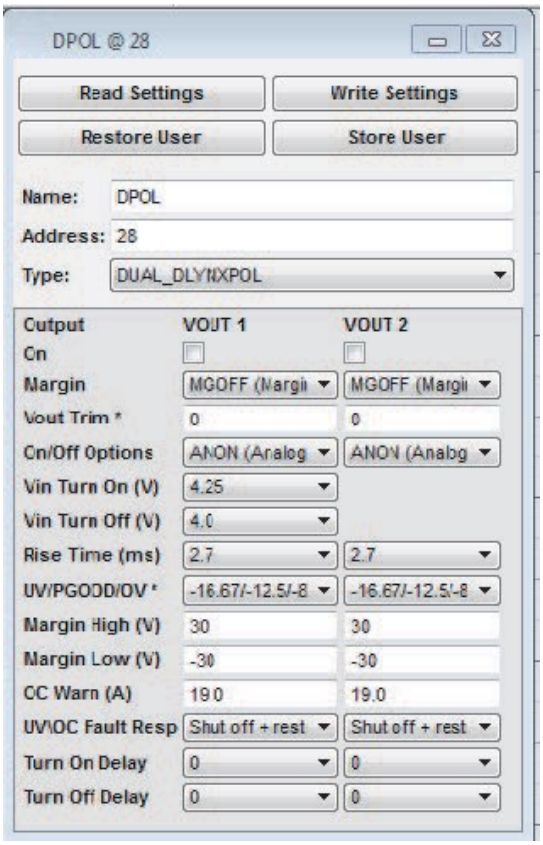


Figure 4. ProGUI Dual Output POL Parameter Window.

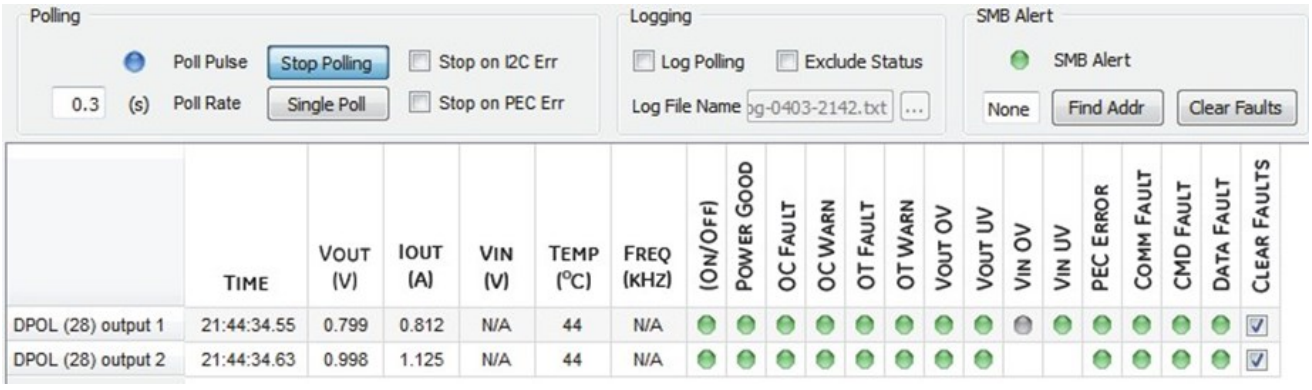


Figure 5. ProGUI Module Status Window.

Layout Considerations:

Similarities with Single Output Modules

Filtering and Layout concepts explained in Applications Note AN13-001 apply to dual output modules as well. The core concepts remain the same whether it is a single output module or dual output module. Attention needs to be paid to the location of the module, location of filtering components, loops, ground plane and routing of noise sensitive traces/signals. A 4.0mm (0.16 inches) of clearance is recommended around the module outline to allow for repair/removal of the module. Just as with the single output modules, it is important to

- Optimize placement of module
- Optimize location of Filtering Components
- Minimize loop area

Placement of module

Dual output modules should also be located as close as possible to the load. If the module is used to support two voltage rails that are not part of the same load, then the module should be located closer to the lower voltage load since that will generally have the tighter tolerance. The two outputs of the dual module cannot be connected in parallel to double the current capacity of a single voltage rail.

Location of Filtering Components

Single Input Stage

Despite the availability of 2 input pins, dual output modules share a common input for each of the 2 output stages. Having two input pins separated by a ground pin allows design rs to make use of the length of the module to spread the required input pins into 2 columns instead of a single long column. A visual comparison is as follows:

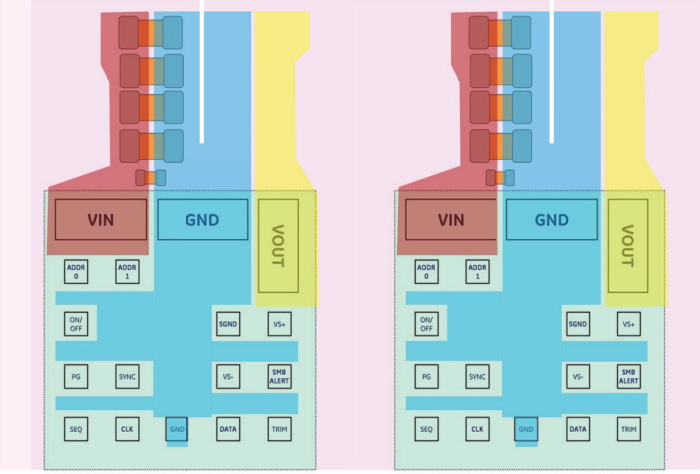


Figure 6. Input Capacitor Layout for Two Single Output Module placed 4mm apart (min required spacing).

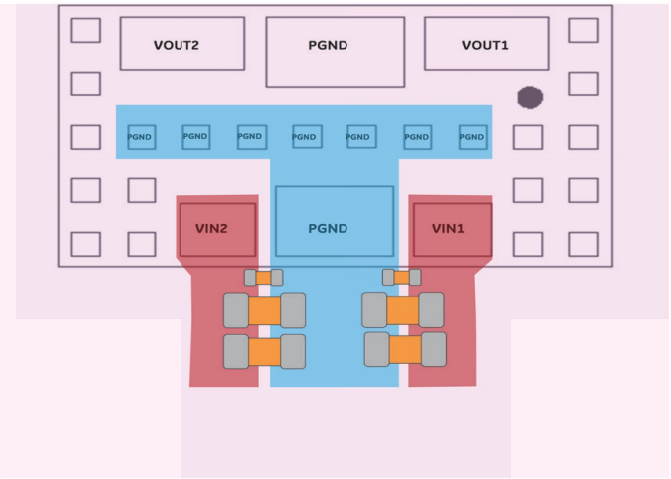


Figure 7. Input Capacitor Layout for Dual Output Module.

Dual Output Stages

The layout of each output can be treated as 2 separate modules linked together by a common ground. Visual comparison of the layouts is shown in Figures 8 and 9.

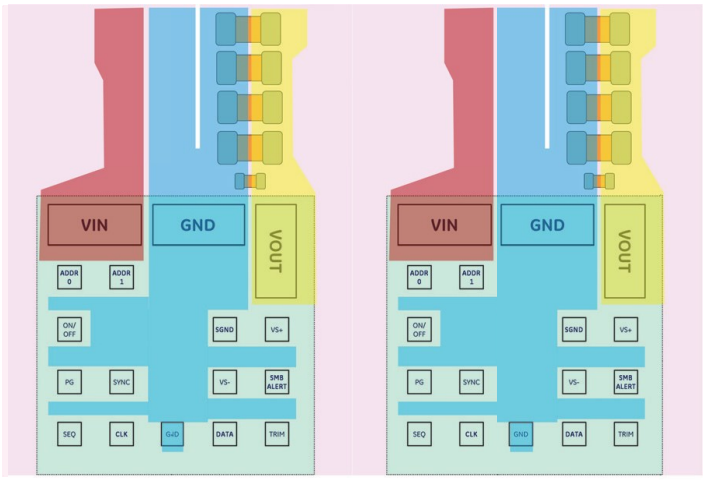


Figure 8. Output Capacitor Layout for Two Single Output Module placed 4mm apart (min required spacing).

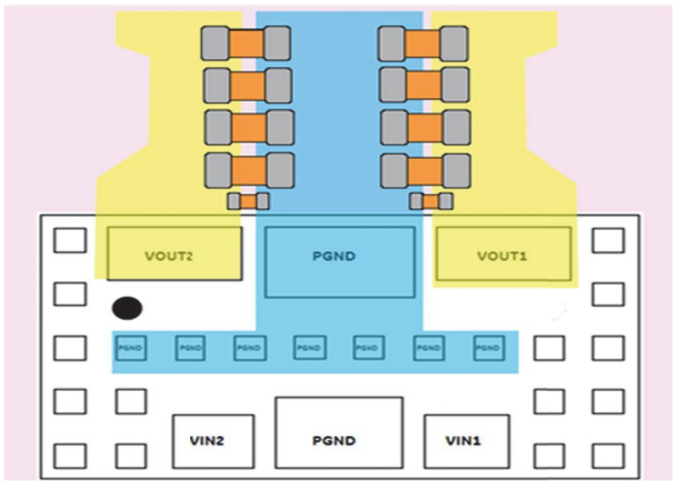


Figure 9. Output Capacitor Layout for Dual Output Module.

Layout of Control and Signal Traces

For best performance and space utilization, it is recommended that the Tunable Loop components be placed symmetrically for each output. For the digital version, the module only needs one set of address resistors since it utilizes the page command to switch the internal communication bus between the 2 output stages. Key suggestions:

- Trim Resistors are located on either side of SGND.
- Tunable Loop Components, if any, are located near the corresponding output.
- Minimize length of traces connected to Trim pin and keep them away from noisy areas.

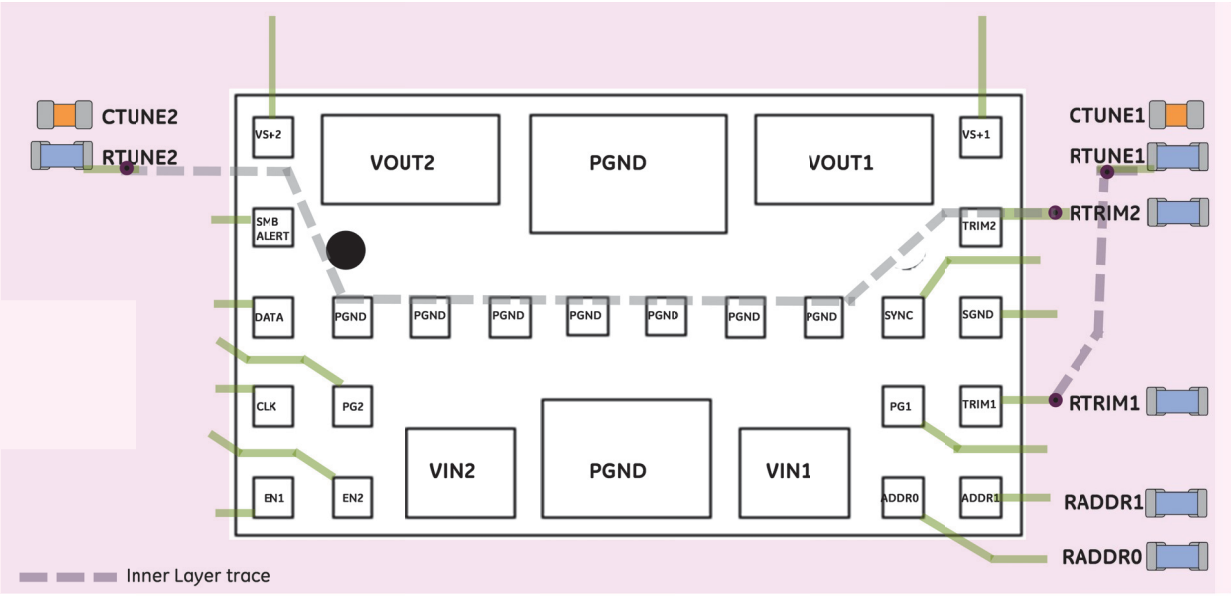


Figure 10. Layout of control and communication components for Dual Output Module.

The layout of the input and output capacitors along the longer rectangular side of the module, and the signal and control components along the shorter side allows for effective utilization of space around the module.

For customers wanting to use an existing layout for modification, OmniOn can share the layout files of the evaluation board.

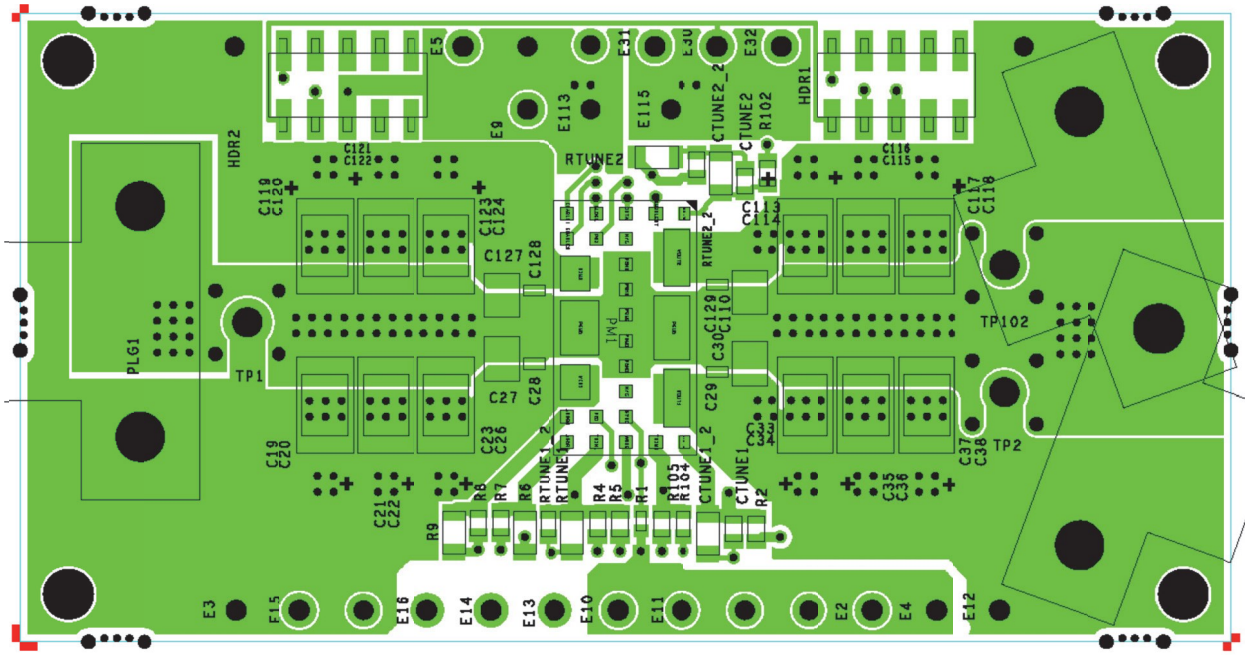


Figure 11. Evaluation Board Layout. Available on request.

Contact Us

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