

# Power Distribution Modules

**COBHAM**

Brochure

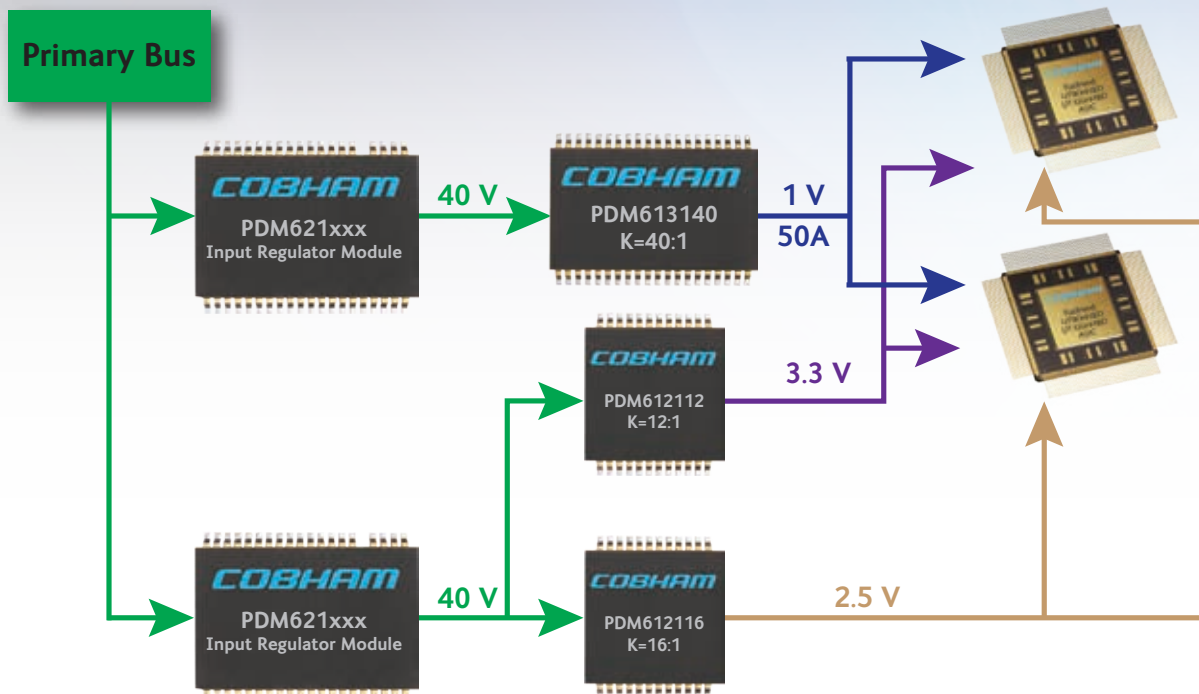
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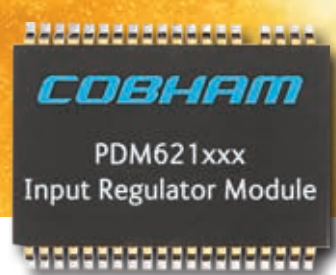
High Efficiency

Flexibility and Scalability

Small Size & Light Weight

MIL-PRF-38534 Screening





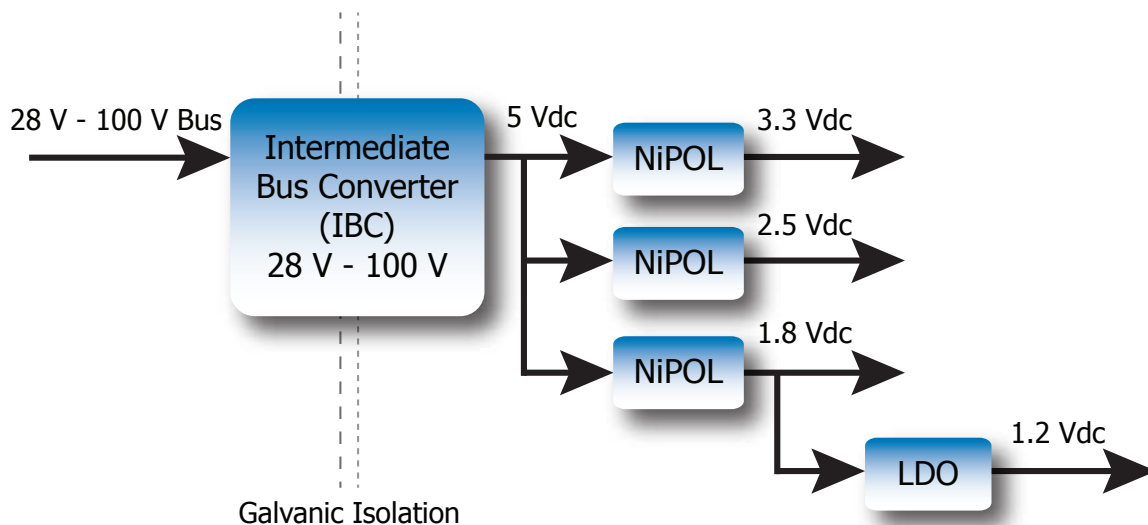
**Cobham Semiconductor Solution's Power Distribution Modules (PDMs)** offer the industry's best end-to-end efficiency from the satellite bus (22 - 100 V) down to the point of load. The PDMs are a two stage solution that leverage resonant mode control, zero-voltage/zero-current switching, chip on board manufacturing, planar magnetics, proprietary FETs, controllers and drivers to provide greater than 50W of power at 85%+ end-to-end efficiency to your FPGA or ASIC. All of this is accomplished in a very small footprint of 4.10 in<sup>2</sup>.

## INDUSTRY TRENDS

- Spacecraft power systems are utilizing highly distributed bus voltages as payload power demands continue to increase
  - 28 Vdc, 70 Vdc, 100 Vdc Bus Voltages
- High speed digital payloads require voltages ranging from 3.3 V to 0.65 V. These voltages continue to decrease while at the same time require ever increasing currents as high as 20A per digital device.

## CONVENTIONAL APPROACH

- Off-the-Shelf Hybrid Power Converters with Point of Load (POL) Converters and Linear Regulators
  - Low Efficiency, Large Size (resulting in fault and compatibility issues)
- Custom Power Supply Design with POL Converters and Linear Regulators
  - Large Size, Large NRE, Long Development Times
- Advantages
  - Many solutions in the market
  - Available for multiple rails
- Disadvantages
  - Not efficient for lower output voltages and high currents
  - Not practical for >20A
  - Poor Power Density



**Conventional Approach**

**COBHAM**

PDM612xxx  
Isolated POL

**COBHAM**

PDM613xxx  
Isolated POL

The PDMs are a family of Input Regulator Modules (IRM) and isolated Point of Load Modules (iPOL) that together make up a power conversion system. The IRM provides a regulated intermediate voltage to the iPOL. The iPOLs are isolated, unregulated, DC/DC converters that divide down the intermediate bus voltage, provided by the IRM, by a constant k-factor. These PDMs can generate an adjustable output voltage as low as 0.65 V to meet the core voltage requirements of the latest state-of-the-art FPGAs and ASICs.

### PDM APPROACH COMPARISON

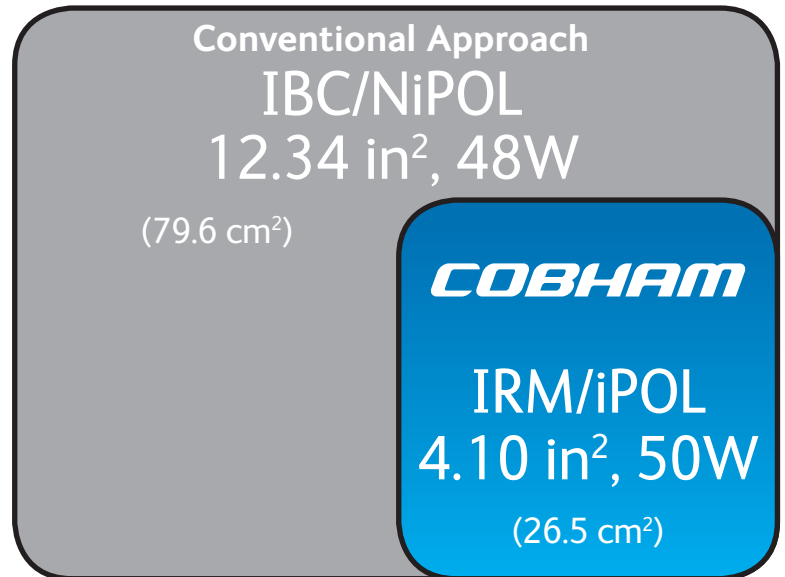
#### ■ System Comparison (28 V input, 1 V output @ 50A)

##### • IBC/NiPOL Approach

- Total Efficiency 57%
- Total Area 12.34 in<sup>2</sup>
- Power Delivered 48W

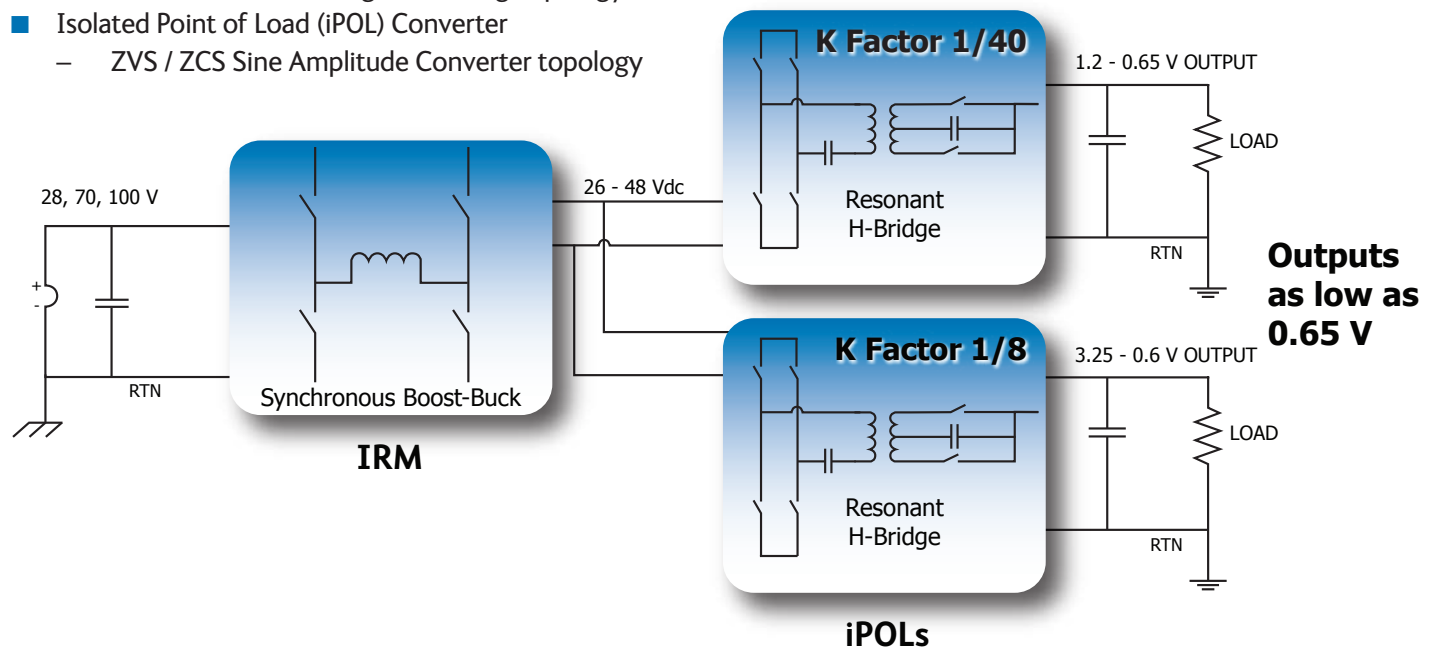
##### • IRM/iPOL Approach

- Total Efficiency 85%
- Total Area 4.10 in<sup>2</sup>
- Power Delivered 50W



### COBHAM MODULAR APPROACH

- Based on highly successful commercial Factorized Power Architecture
- Input Regulator Module (IRM)
  - Boost-Buck Zero Voltage Switching Topology
- Isolated Point of Load (iPOL) Converter
  - ZVS / ZCS Sine Amplitude Converter topology



## Cobham Modular Approach

# Input Regulator Modules (IRM)

## FEATURES

- Self Contained Built-In Protection
  - Input overvoltage and undervoltage shutdown
  - Overcurrent / short circuit
- Built in soft start capability
- Adaptive Loop Feedback
- ZVS boost-buck regulator
- Provides enable/disable control for sequencing
- 0.6 to 0.8 MHz switching frequency
- >90% Efficiency
- -40°C to +125°C Operation  $T_J$
- TRL 9

## RADIATION

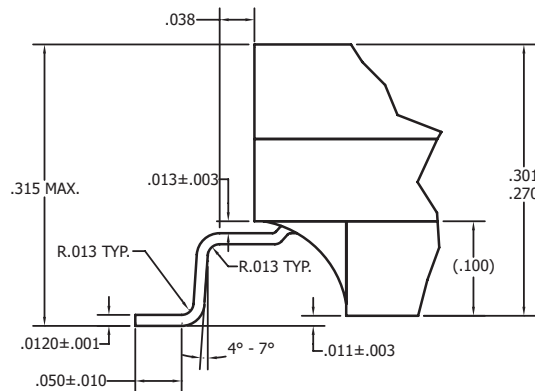
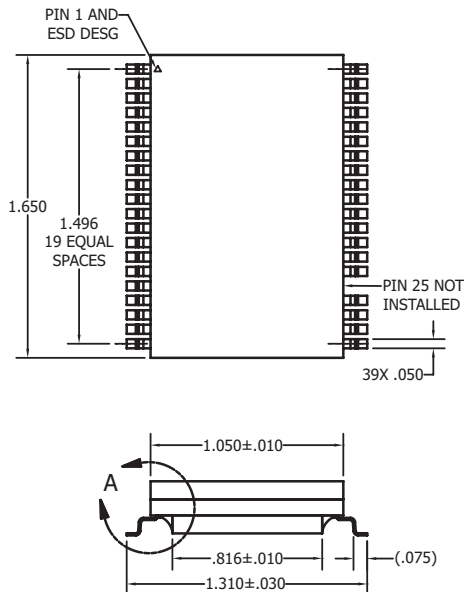
- TID = 50 krad(Si)
- SEL Immune up to 80 MeV-cm<sup>2</sup>/mg

## MECHANICAL ATTRIBUTES

- High Density, >150W per cubic inch
- Small Footprint, 1.65”L x 1.31”W x 0.315”H
- Weight: 27g
- Surface Mount Power Package

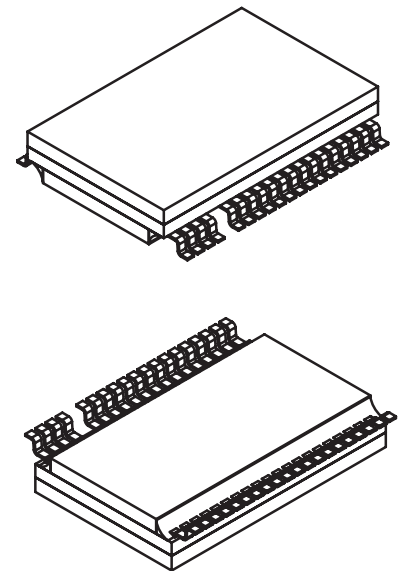
IRM Model	Input Range	User Adjustable Output	Power
621100	95 V <sub>DC</sub> - 100 V <sub>DC</sub>	26 - 48 V	75W
621070	63 V <sub>DC</sub> - 77 V <sub>DC</sub>	26 - 48 V	75W
621028	22 V <sub>DC</sub> - 36 V <sub>DC</sub>	26 - 48 V	100W

## MECHANICAL OUTLINE



DETAIL A

Note: Pin 25 is installed on 621028 Module





# High Current and Half Power isolated POL Modules (iPOL)

## FEATURES

- Companion to Input Regulator Module (IRM)
- >90% Efficiency
- +/- 2.5% Load Regulation
  - Using Adaptive Loop Feedback to IRM
- Self Contained Built-In Protection
  - Input overvoltage and undervoltage shutdown
  - Overcurrent / Short Circuit
- Built in soft start capability
- ZVS/ZCS Resonant Converter topology
- Provides enable/disable control for sequencing
- -40°C to 125°C Operation  $T_J$
- TRL 9

## RADIATION

- TID = 100 krad(Si)
- SEL Immune up to 80 MeV-cm<sup>2</sup>/mg

## MECHANICAL ATTRIBUTES

- High Density, >150W per cubic inch
- Low Weight
- Surface Mount Power Package

iPOL Model	User Defined Output	K FACTOR	Output Current (A)
613140	0.65 - 1.2 V	1/40	50
613132	0.8125 - 1.5 V	1/32	50
613124*	1.083 - 2.0 V	1/24	37.5

\* Product in development

iPOL Model	User Defined Output	K FACTOR	Output Current (A)
612116	1.625 - 3.0 V	1/16	16.7
612112	2.17 - 4.0 V	1/12	12.5
612108	3.25 - 6.0 V	1/8	8.3
612106	4.33 - 8.0 V	1/6	6.3
612105	5.2 - 9.6 V	1/5	5.2
612104*	6.5 - 12.0 V	1/4	4.2
612103*	8.67 - 16.0 V	1/3	3.1
612102*	13.0 - 24.0 V	1/2	2.1
612203*	17.3 - 32.0 V	2/3	1.5
612101*	26.0 - 48.0 V	1/1	1.0

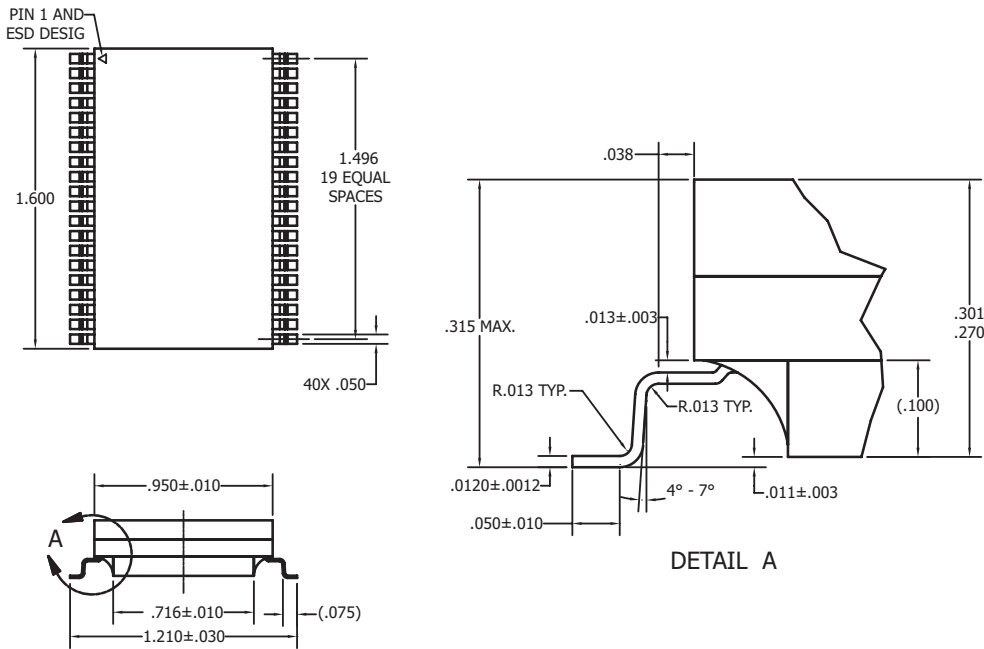
\* Product in development



Actual Size

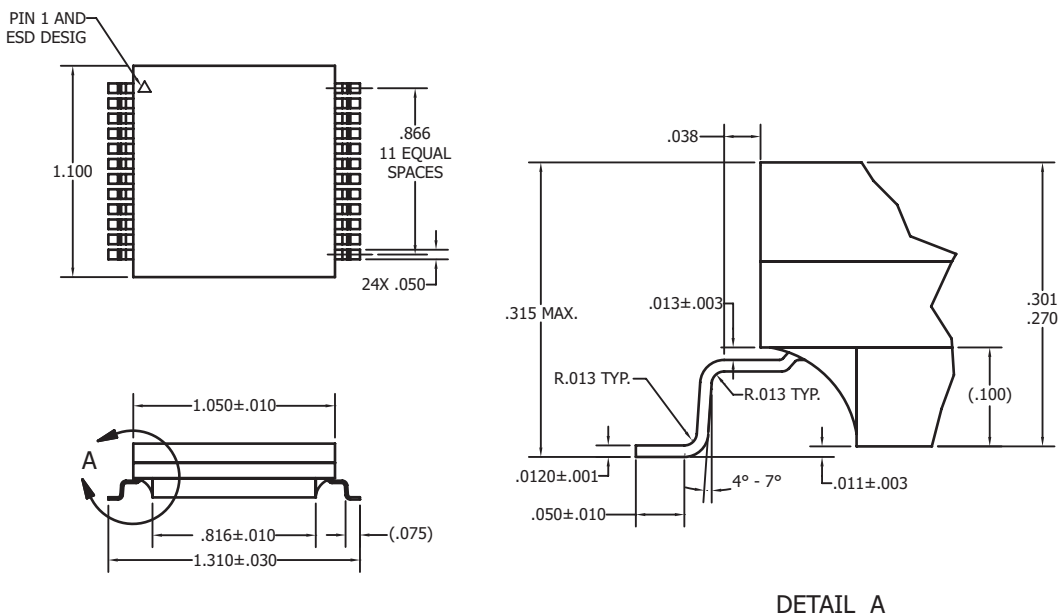
# High Current and Half Power isolated POL Modules (iPOL)

## MECHANICAL DRAWING 613XXX



Footprint = 1.10"L x 1.21"W x 0.315"H

## MECHANICAL DRAWING 612XXX



Footprint = 1.10"L x 1.31"W x 0.315"H

## IRM ADAPTIVE LOOP APPLICATION NOTE

The Adaptive Loop is a feature of the IRM module which may be used to compensate for output voltage changes as the load current varies. These voltage changes are due to current flowing through the output resistance of the iPOL and the PC board trace resistance. With no load on the iPOL, the IRM is set to regulate the input voltage to the iPOL to produce the desired output voltage. Then, as more current is drawn by the load, the output voltage at the load will drop because voltage is lost across output resistance of the iPOL and the PC board trace resistance in accordance with Ohm's Law. But as the iPOL load current increases, the current increase is reflected at its input, increasing the load current drawn from the IRM. The IRM senses this increase in load current and responds by increasing its output voltage slightly. This increase to the iPOL input voltage is transferred to its output, returning the load output voltage to its nominal value.

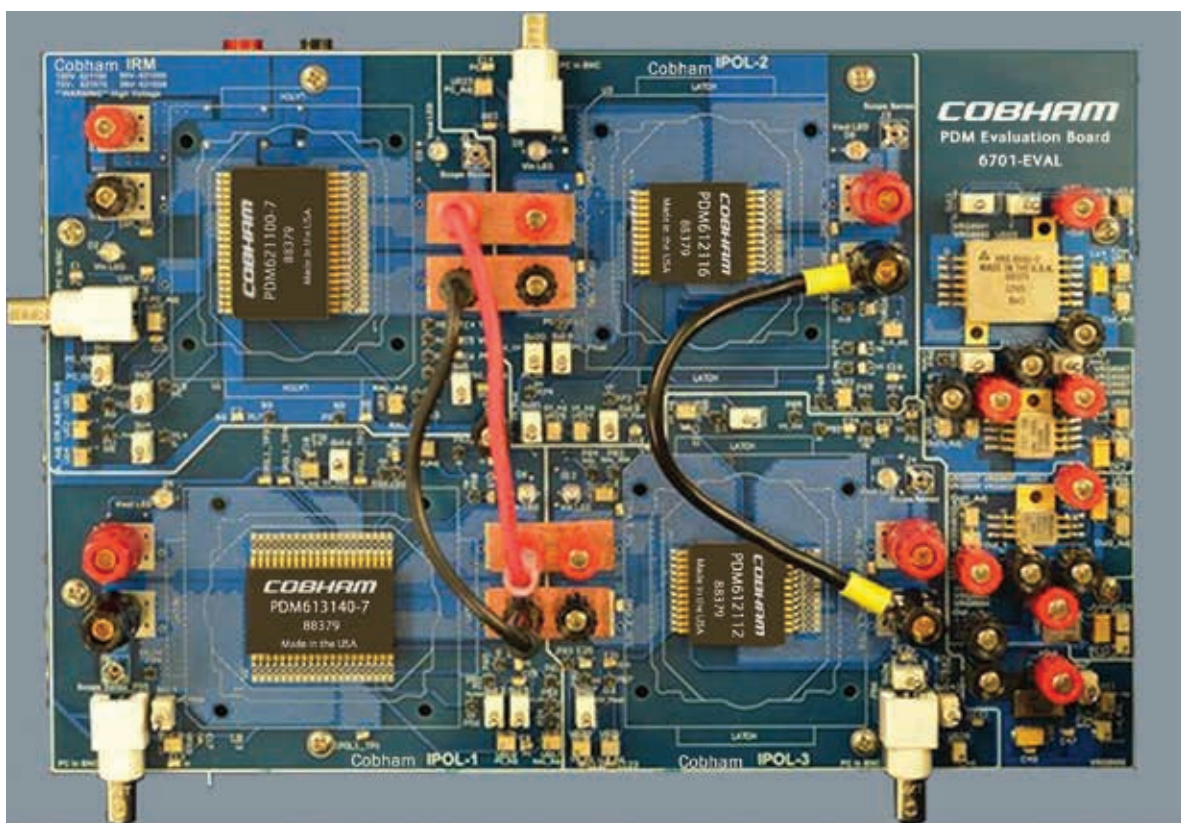
Since the output resistance of the iPOL will change as its temperature varies, each iPOL includes a thermistor temperature sensor. This thermistor is available at the RAL pin of the iPOL and may be connected to the IRM in order to have the IRM account for the temperature variations of resistance when compensating for the resistive drop.

View the complete Application Note at [www.cobham.com/Power](http://www.cobham.com/Power)

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## EVALUATION BOARDS AVAILABLE

- Populated to customer requirements





# Power Distribution Modules



## WHY USE COBHAM PDMs?

- High efficiency
  - End-to-end efficiency, 100 V, 70 V or 28 V to 1 V at significantly higher efficiencies than comparable solutions
- Flexibility and Scalability
  - The modularity of the PDMs enables power systems to be rapidly re-architected with minimal engineering effort
- Extremely small size and light weight
- Needs less output capacitance
  - Significantly increase the reliability of your system, while decreasing the footprint of the power solution on your Printed Wiring Board (PWB) assembly versus competitive solutions. Cost is also reduced by eliminating hi-rel caps.
- Very fast transient response
  - Excellent transient response for step loads up to 80% of module capacity
- Lower System Cost
  - Completely integrated end to end power system with minimal external components required
  - Minimizes engineering time required

*The most important thing we build is trust.*

# COBHAM

[www.cobham.com](http://www.cobham.com)

**WEB SITE** [www.cobham.com/Power](http://www.cobham.com/Power)

**TELEPHONE** 1-800-645-8862