

myPower online Design Center

iPOWIR Spice simulation



<http://mypower.irf.com>

Prepared by:

Dan Barsell

Design Services Applications Engineer

Home page & login:

POWER TO LEAD

Welcome to MyPower
International Rectifier's premier site for power

Power Factor Correction



PDF Guided Tour (413KB)
Simple circuit design
Calculate all part values
Reduce PCB space 50%
[Design a PFC Circuit](#)

Synchronous Rect



PDF Guided
Improve c
Compare
Calculate a
[Design a Sync Rec Circuit](#)

Point of Load



PDF Guided Tour 1.1MB
Simulate iPower circuits
Compare discrete MOSFETs
Calculate efficiency and Tj
[Design a POL Circuit](#)

Bus Converter



PDF Guided Tour 433KB
Multiple
Compare
Calculate
[Design a](#)

Motion Control



PDF Guided Tour 568KB
Analyze performance
Compare IGBT modules
Calculate efficiency and Tj
[Evaluate & Compare IPMs](#)

Lighting



PDF Guid
Create S
Display o
AC or DC
Download

Click on any image to log in
Login protects your saved designs
Enter email address and password here
Or register free by clicking here

You must first login or register to access this resource.

New Visitors Register Here.

You will receive quick and easy access to:

- Convenient On-line Ordering.
- Enhanced pricing and availability information.
- IR's design tools.
- Easy access to literature and CD-ROM's.
- Sign-up to receive the latest product information, new product announcements, special offers and more.
- IR Learning Center.
- Seamless access to all areas of WWW.IRF.COM.

[REGISTER](#)

To access this site, you must have your browser set to accept temporary cookies. If you need help enabling cookies, [click here](#).

Login Here

Email:
(e.g. johndoe@company.com)

Password:

[SUBMIT](#)

Forgot your password? [Click here](#)

APPLICATIONS

AC-DC	DC-DC
Appliances	Die Products
Audio	Hi-Rel
Automotive	Lighting
	Motion Control

COMPANY INFO

Careers
Investor Relations
Press Room
Environmental
Tradeshows
Webcasts
Contact Us
E-Mail News
Site Index

Discrete and modular POL solutions

POWER TO LEAD

Point of Load

MOSFET Selector tool with Losses Calculator

PDF guided tour (864kb)
 Calculates MOSFET Tj
 Review detailed FET losses
 View passive & active losses
 Compare cost and efficiency
 Calculates optimal Vgs

MOSFET Selector Tools

Discrete Sync Buck Converter

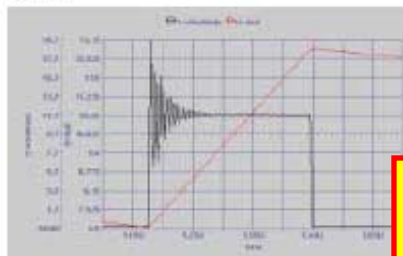
Iload	Vin	Vout	Frequency	#of Phases
1-300A	3.0-21.0V	0.5-0.9V	50-2000kHz	1-10

MOSFET selector tool calculates losses, efficiency and junction temperatures in discrete applications

iPOWIR Sync Buck Simulations



PDF guided tour (864kb)
 Calculates MOSFET Tj
 Review detailed FET losses
 View passive & active losses
 Compare cost and efficiency
 Calculates optimal Vgs



Online Spice Tools

- iP1201 Single Output
- iP1201 Dual Output
- iP1202 Single Output
- iP1202 Dual Output
- iP1203 Single Output
- iP2001 Single Output

Iload	Vin	Vout	Frequency	#of Phases
1-30A	3.14-5.5V	0.8-3.3V	200-400kHz	2
1-15A (x2)	3.14-5.5V	0.8-3.3V	200-400kHz	2
1-30A	5.5-13.2V	0.8-3.3V	200-400kHz	2
1-15A (x2)	5.5-13.2V	0.8-3.3V	200-400kHz	2
1-15A	5.5-13.2V	1.0-3.3V	200-400kHz	1
20-80A	4.0-14.0V	1.0-1.85V	200-1000kHz	2-4

iPOWIR Simulation tools helps engineers evaluate iPOWIR devices in Sync Buck converter applications

MyPower – iPOWIR Web Simulation

International Rectifier myPOWER

PRODUCT LINE SALES SUPPORT TECHNICAL LIBRARY DESIGN SUPPORT

Part Search Site Search

these four simple steps to complete your electrical design:
 1. Set your Operating Conditions 2. Simulate these conditions 3. Change your components 4. Buy

Step 1: Enter Operating Conditions

Ch. 1 Max Iload: 10 A ? Vin: 5 V ? Freq: 300 kHz ?
 Ch. 2 Max Iload: 10 A ? Rin: 3 mOhm ? Ch. 1 Vout: 1.5 V ?
 Ch. 2 Vout: 2.5 V ?

Step 2: Select Simulation Mode

AC Analysis (Bode Plot) GO
 start: 10 Hz To: 1 MHz

Transient-Steady State GO
 window: 10 us step time: 2 ns

Transient-Step Input GO
 Vin start: 4.3 V Vin dv/dt: 1.4 V/us
 Vin Stop: 5 V Vin time: 200 us
 window: 500 us step time: 100 ns

Transient-Step Loading GO
 Iload start: 1 A Iload dI/dt: 5 A/us
 Iload Stop: 10 A Iload time: 200 us
 window: 500 us step time: 100 ns

2 Output iPOWIR IRDCiP1201-A Demo Board

1=iInput 2=vInput 3=iControlFET 4=iSyncFET 5=vSwNode-A
 6=iInd-A 7=vOut-A 8=vSwNode-B 9=iInd-B 10=vOut-B

Step 3: Customize Your Design

Choose Alternate Passive Components

Select the radio button next to the choices of passive components for simulation validation

Standard Component	Value	Qty
<input type="radio"/> C1: ?	100uF 6.3V (C4532X5R0J107M - TDK)	6 ?
<input type="radio"/> L1: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	
<input type="radio"/> C2: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?
<input type="radio"/> L2: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	
<input type="radio"/> C3: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?

Create Custom Components

Select the radio button next to the custom values of components to be simulated (IR however does not supply these components)

Custom Component	Value	Esr	Qty
<input type="radio"/> C1: ?	100 uF	1.8 mOhm	6 ?
<input type="radio"/> L1: ?	1000 nH	1.56 mOhm	
<input type="radio"/> C2: ?	470 uF	35 mOhm	2 ?
<input type="radio"/> L2: ?	1000 nH	1.56 mOhm	
<input type="radio"/> C3: ?	470 uF	35 mOhm	2 ?

Step 4: Buy Your Design

Order the design kit you just customized. Includes: a standard, fully assembled and tested evaluation board with your custom components.

BUY THIS DESIGN

A

B

C

A. Input Operating Conditions: Vin, Vout, Iload, Frequency

B. Run Simulation Analysis: AC Analysis, Transient Steady State, Transient Step Input, and/or Transient-Step Load

C. Modify Quantity and Types of Passive Components or Enter Custom Values AND rerun simulation

MyPower – Now with Type 3 feedback compensation

IR International Rectifier

PRODUCT LINE | SALES SUPPORT | TECHNICAL LIBRARY | DESIGN SUPPORT | **myPOWER**

GO

Part Search Site Search

Follow these four simple steps to complete your electrical design:

- 1 Set your Operating Conditions
- 2 Simulate these conditions
- 3 Change your components
- 4 Buy your design

SAVE DESIGN **LIST**
HELP **FAQ**
RESET

Step 1a: Enter Operating Conditions

Ch. 1 Max Iload: A ? Vin: v ? Ch. 1 Vout: v ?
 Ch. 2 Max Iload: A ? Rin: mOhm ? Ch. 2 Vout: v ? Freq: kHz ?

Step 1b: Enter Compensation Values

C9: nF ? C11: nF ?
 C21: pF ? C23: pF ?
 C22: pF ? C24: pF ?
 R5: kΩ ? R6: kΩ ?
 R7: Ω ? R8: Ω ?
 R9: Ω ? R10: Ω ?
 R25: MΩ ? R27: MΩ ?
 R26: MΩ ? R28: MΩ ?

Step 2: Select Simulation Mode

AC Analysis (Bode Plot) **GO**

start: Hz To: MHz

Transient-Steady State **GO**

C window: us step time: ns

Transient-Step Input **GO**

Vin start: V Vin dv/dt: V/us

Vin Stop: V Vin time: us

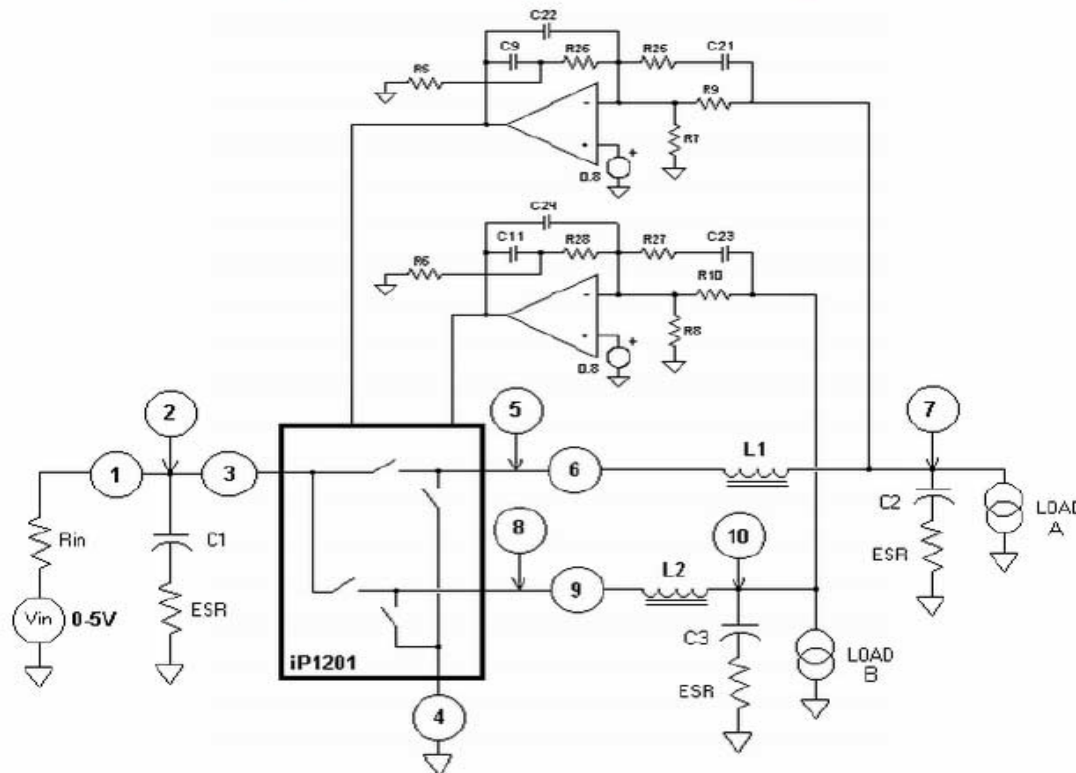
C window: us step time: ns

Transient-Step Loading **GO**

Iload start: A Iload di/dt: A/us

Iload Stop: A Iload time: us

C window: us step time: ns



A Enter operating Conditions

IR International Rectifier

PRODUCT LINE SALES SUPPORT TECHNICAL LIBRARY DESIGN SUPPORT myPOWER

Follow these four simple steps to complete your electrical design:

- 1 Set your Operating Conditions
- 2 Simulate these conditions
- 3 Change your components
- 4 Buy your design

Step 1: Enter Operating Conditions

Ch. 1 Max Iload: 10 A ? Vin: 5 V ? Ch. 1 Vout: 1.5 V ? Freq: 300 kHz ?
 Ch. 2 Max Iload: 10 A ? Rin: 3 mOhm ? Ch. 2 Vout: 2.5 V ?

Step 2: Select Simulation Mode

AC Analysis (Bode Plot) GO
 start: 10 Hz To: 1 MHz
 Transient-Steady State GO

Step 3: Customize Your Design

Choose Alternate Passive Components

Select the radio button next to the choices of passive components for simulation validation

Standard Component	Value	Qty
C1: ?	100uF 6.3V (C4532X5R0J107M - TDK)	6 ?
L1: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	
C2: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?
L2: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	
C3: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?

Create Custom Components

Select the radio button next to the custom values of components to be simulated (IR however does not supply these components)

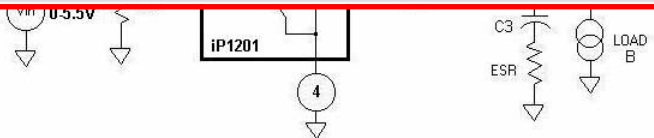
Custom Component	Value	Esr	Qty
C1: ?	100 uF	1.8 mOhm	6 ?
L1: ?	1000 nH	1.56 mOhm	
C2: ?	470 uF	35 mOhm	2 ?
L2: ?	1000 nH	1.56 mOhm	
C3: ?	470 uF	35 mOhm	2 ?

Step 4: Buy Your Design

Order the design kit you just customized. Includes: a standard, fully assembled and tested evaluation board with your custom components. **BUY THIS DESIGN**

Range of Input Parameters:

Iload: 1 - 80A
 Phases: 1 - 4
 Vin: 3 - 14.4 Volts
 Vout: 0.8 - 3.3V
 Freq: 200 - 1000 KHz
 Rin: 1 - 20 mOhms



2 Output iPOWIR IRDCiP1201-A Demo Board
 1=iInpnt 2=vInput 3=iControlFET 4=iSyncFET 5=vSwNode-A
 6=iInd-A 7=vOut-A 8=vSwNode-B 9=iInd-B 10=vOut-B

Transient-Step Loading GO

Iload start: 1 A Iload di/dt: 5 A/us
 Iload Stop: 10 A Iload timer: 200 us
 window: 500 us step times: 100 ns



IRDCiP2001-A

Iload = 20-40A
 2 phase



Iload = 40.1-60A
 3 Phase

IRDCiP2001-B

Iload = 60.1-80A
 4 Phase

IRDCiP2001-C

B

Waveform Simulation Analysis

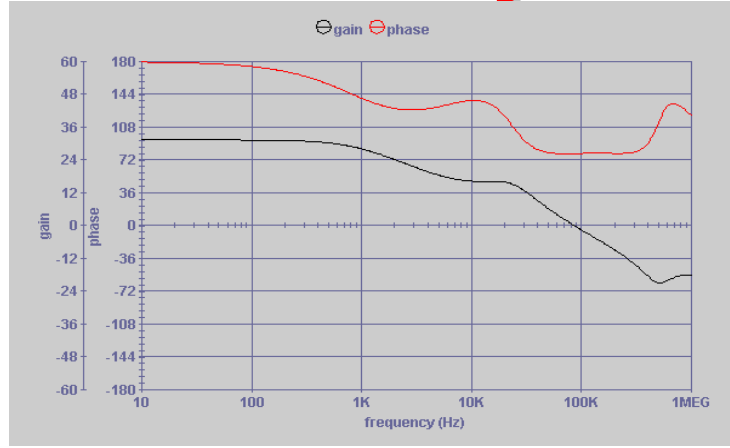
Step 2: Select Simulation Mode

AC Analysis (Bode Plot) **GO**
 start: 10 Hz To: 1 MHz

Transient-Steady State **GO**
 window: 10 us step time: 2 ns

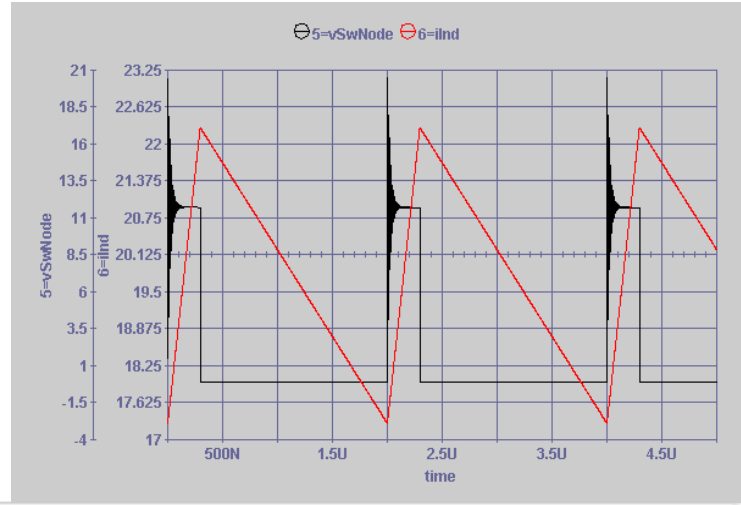
Transient-Step Input **GO**
 Vin start: 4.3 V Vin dv/dt: 1.4 V/us
 Vin Stop: 5 V Vin time: 200 us
 window: 500 us step time: 100 ns

Transient-Step Loading **GO**
 ILoad start: 1 A ILoad di/dt: 5 A/us
 ILoad Stop: 10 A ILoad time: 200 us
 window: 500 us step time: 100 ns



AC Analysis (Bode Plot)
 Function: Exhibits control loop stability - phase and gain

Transient-Steady State
 Function: Transient analysis of the switch node voltage, inductor current, and 5 other current/voltage waveforms



ALL WAVEFORMS ARE SIMULATED IN ~4 SECONDS WITH ACCURACY OF +/-5%!!!



Customization

POWER TO LEAD

IR International Rectifier

PRODUCT LINE SALES SUPPORT TECHNICAL LIBRARY DESIGN SUPPORT myPOWER

Follow these four simple steps to complete your electrical design:
 1 Set your Operating Conditions 2 Simulate these conditions 3 Change your components 4 Buy your design

Step 1: Enter Operating Conditions

Ch. 1 Max. Iloads: 10 A Vin: 5 V Ch. 1 Vout: 1.5 V
 Ch. 2 Max. Iloads: 10 A Rin: 3 mOhm Ch. 2 Vout: 2.5 V Freq: 300 kHz

Step 2: Select Simulation Mode

AC Analysis (Bode Plot) start: 10 Hz To: 1 MHz
 Transient-Steady State window: 10 us step time: 2 ns
 Transient-Step Input Vin start: 4.3 V Vin di/dt: 1.4 V/us
 Vin Stop: 5 V Vin time: 200 us window: 500 us step time: 100 ns
 Transient-Step Loading Iload start: 1 A Iload di/dt: 5 A/us
 Iload Stop: 10 A Iload time: 200 us window: 500 us step time: 100 ns

2 Output iPOWIR IRDCIP1201-A Demo Board
 1=Inpvt 2=VInpt 3=ICntrolFET 4=ISyncFET 5=vSwNode-A
 6=IInd-A 7=vOut-A 8=vSwNode-B 9=IInd-B 10=vOut-B

Dimensions of Design Optimization:

- Cost
- Size
- Output Ripple
- Efficiency
- Faster Transient Response

* Guidance provided in the "Technical Support/Advice" section of the Electrical webpage & "Help Guide"

Step 3: Customize Your Design

Choose Alternate Passive Components

Select the radio button next to the choices of passive components for simulation validation

Standard Component	Value	Qty
C1: ?	100uF 6.3V (C4532X5R0J107M - TDK)	6 ?
L1: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	?
C2: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?
L2: ?	1.0uH (ETQP1H1R0BFA - Panasonic)	?
C3: ?	470uF 6.3V (6TPB470M - Sanyo)	2 ?

Create Custom Components

Select the radio button next to the custom values of components to be simulated (IR however does not supply these components)

Custom Component	Value	Esr	Qty
C1: ?	100 uF	1.8 mOhm	6 ?
L1: ?	1000 nH	1.56 mOhm	?
C2: ?	470 uF	35 mOhm	2 ?
L2: ?	1000 nH	1.56 mOhm	?
C3: ?	470 uF	35 mOhm	2 ?

Modify Type & Qty of Passive Components:

- Input Capacitor Value & ESR (ie.C1)
- Output Capacitor Value & ESR (ie. C2, C3)
- Output Inductor Value (ie. L1, L2)
- All feedback compensation components

Supplied by IR along with demo board

NOT supplied by IR with demo board

MyPower – Assembly Instructions

Assembly Instructions for your 2-phase iPowIR (IRDCIP2001-A) Reference Design Board

CHANGES:

You have made the following changes to the standard reference design board:

- C1 Input capacitance: No change required
 - C2 Output capacitance: Replace 4 (GRM44-1X5R107K6.3) with 4 (EEFUE0G181R) in locations C19,C20,C22,C23.
 - L1 Inductor: Replace 2(ETQP6F0R6BFA) with 2(CDEP134-0R3NC-H) in locations L2,L3.
- Any adjustments that need to be made to frequency need to reference the product data sheets.

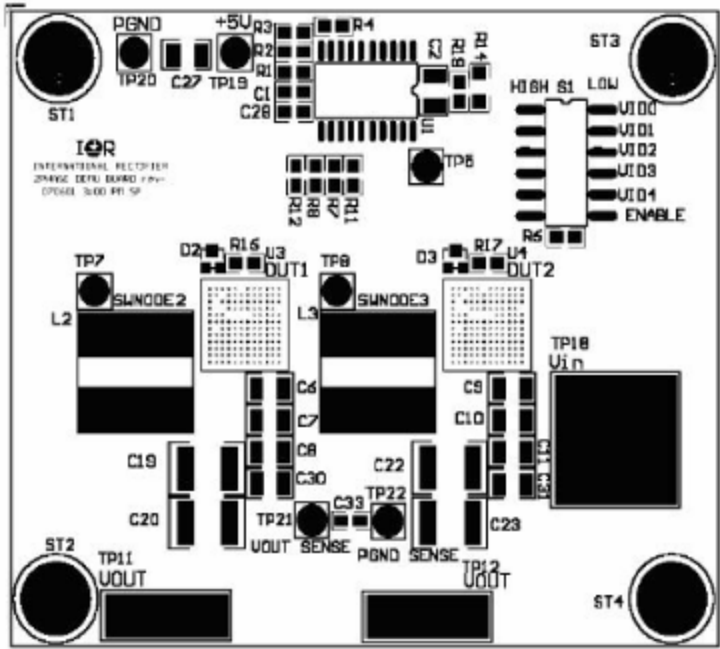
GENERAL DESCRIPTION:

IR's iPOWIR technology is a breakthrough in power density, efficiency and simplicity for power conversion. With iPOWIR technology, all layout-critical power semiconductor and passive components of the circuit are integrated to form complete functional building blocks, reducing converter size as well as simplifying and reducing power system design time. iPOWIR technology offers designers an innovative board space saving solution for applications requiring high power densities. iPOWIR technology solutions are also optimized internally for layout, heat transfer and component selection. All standard reference design boards are fully assembled, tested and documented.

Board Layout

Notates:

1. Component Changes
2. Instructs Assembly Location



Board Diagram with denoted part locations

2-phase iPowIR (IRDCIP2001-A) reference design board
Actual Size: 3.5 x 3.0 Inches



Order Fulfillment

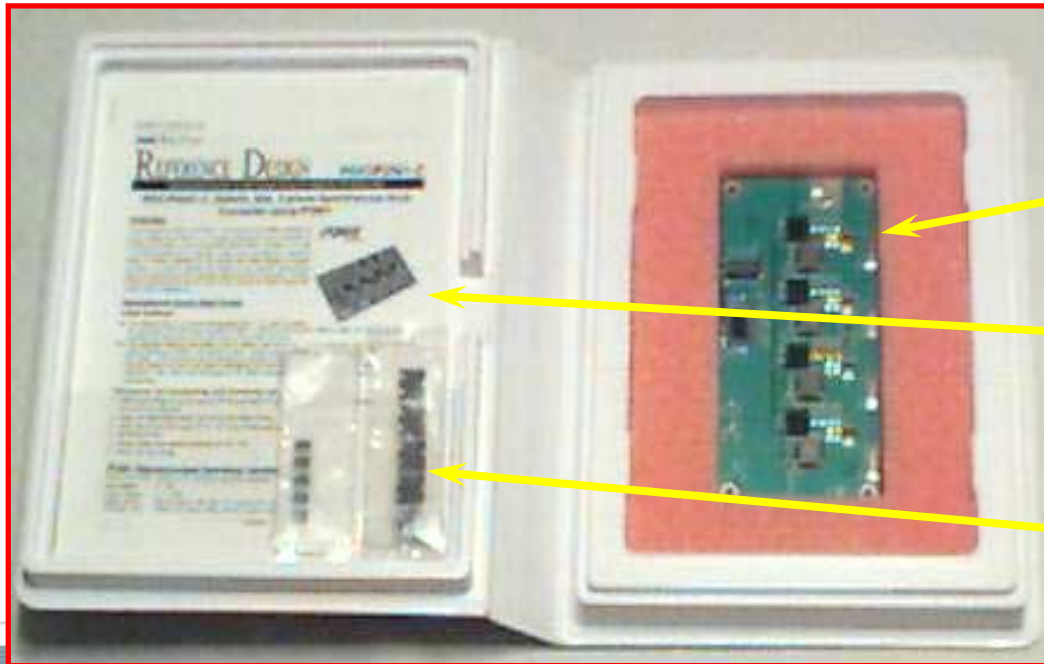
POWER TO LEAD

Channel Distribution:

- Standard or customized order fulfilled via IR Overnight



- 24 hour delivery for domestic orders placed before 5pm (PST).
2-3 day delivery for international orders



Kits Content:

- Fully assembled & tested standard prototype reference design, along with customized passive components
- Reference Design Guide
 - *Circuit Schematic*
 - *Std. Bill of Materials*
- Custom Passive Components added