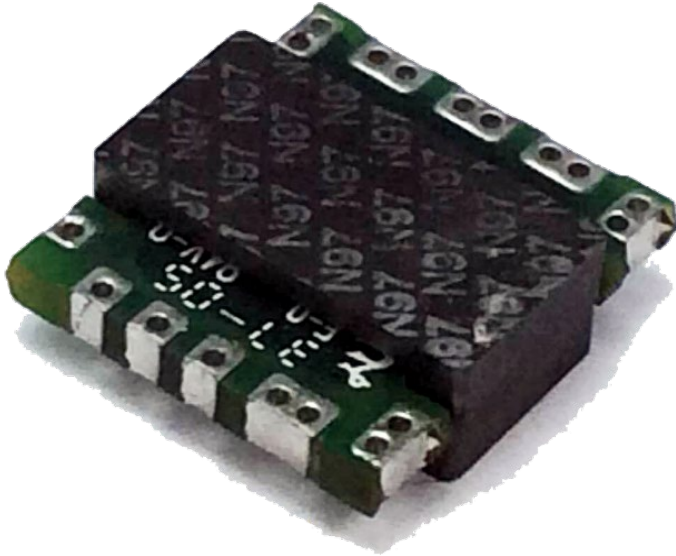


## Champs 168F1 Series BCM Flyback Solutions DC2014A & DC2393A



- Footprint: 16 x 16 mm x Low Profile 7.6mm Height
- Proven in actual DC-DC converter designs using LT8302 & LT8304 ICs.
- Optimized for No-Opto Isolated Flyback Converter BCM Mode Operation.
- Typical Efficiency 88-90%
- Aggressive Interleave planar construction -- lowest achievable Leakage Inductance.
- Multilayer PCB optimization for lowest AC resistance & Proximity Loss Effect.
- Wide variety of PNs, Designs and Turns Ratios in stock. If not listed, Contact Us.
- Integer Turns 1 thru 16 Available [Contact Us if Not Shown in Table].
- Surface Mount, Thru-Hole, Pad-to-Pad, Embedded Planar Windings as Options

## General Notes:

1. This subset of Champs' 168F1 series is earmarked to function in No-Opto Isolated Flyback circuits as described by the LT8302 and LT8304 ICs from Analog Devices.
2. Input Voltage and Output Power Ratings are a function of the IC's on-board FET and not a limitation of the transformer. In other applications the 168F1 part can operate over a wider  $V_{in}$  range or greater output power. Increased height allows increased power output due to higher current capability.
3. Integer Turns available from 1T to 16T. Can be used as Primary or Secondary. Mechanical configuration and outline allow for a "flex" arrangement. Contact factory for information on any flyback topology design.
4. All designs can be supplied with planar windings as embedded in the pcb of the Main Module of the converter. Heat Sink and installed power components SM assembly and installation are also available.
5. All transformers installed with associated power components are available from Champs as Main Modules to be installed as a functioning DC-DC converter application. Accompanying Base-Boards ease the task of evaluation. Aspects of this construction are patent pending concepts of Champs and are made available as "open source".

## 1. Input Voltage Range 36-72. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (Avc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode
168F1-1402-42R	36	72	3.3	3.60	12.0	150-265	2.1	3.4	BCM
168F1-1402-42R	36	72	5.0	3.0	15	190-305	2.1	3.4	BCM
168F1-1206-30R	36	72	12.0	1.25	15.0	172-300	2.6	4.1	BCM
168F1-1210-36R	36	60	24	0.62	15.0	172-320	2.4	3.4	BCM

Note: At Vin < 36V the above PNs will operate with a de-rated Power Rating

LT8304 Product Page & DC2393A Ref Design:

<http://www.analog.com/en/products/power-management/switching-regulators/flyback-forward-isolated-controllers/lt8304.html#product-overview>

<http://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/dc2393a.html> -- LT8304 Based Reference Design

## 2. Input Voltage Range 17-36. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (Avc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode
168F1-0702-15R	17	36	3.3	2.4	8.0	145-250	3.0	4.85	BCM
168F1-0703-15R	17	36	5.0	1.6	8.0	145-250	3.0	4.85	BCM
168F1-1205-15R	17	36	5.0	2.0	10.0	118-220	3.8	8.4	BCM
168F1-1006-17R	17	36	12.0	1.0	12.0	125-220	3.5	5.1	BCM
168F1-1012-20R	17	36	24.0	0.50	12.0	125-220	3.5	5.1	BCM

Note: At Vin < 18V the Power Rating decreases to that shown in Table 3 below

### 3. Input Voltage Range 8-32. BCM Flyback.

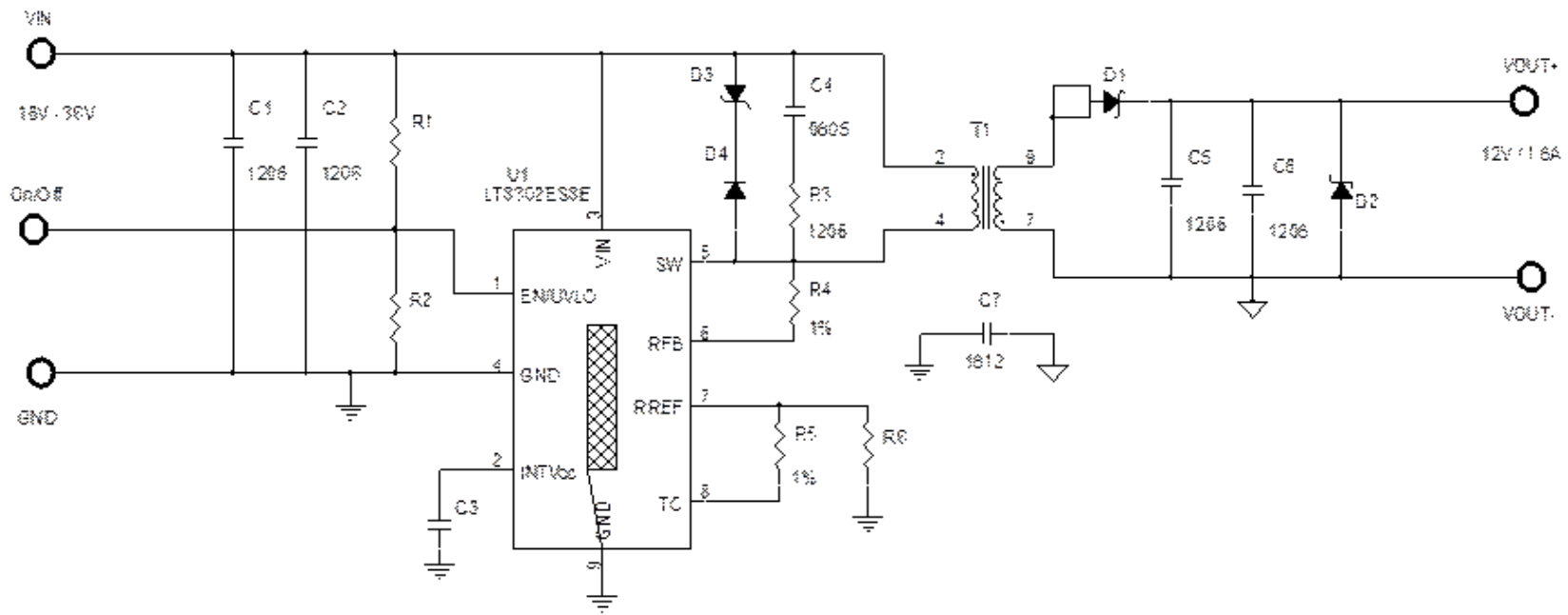
<b>Champs PN</b>	<b>Vin (Min)</b>	<b>Vin (Max)</b>	<b>Vout</b>	<b>Iout (Avc)</b>	<b>Pout (Watts)</b>	<b>Freq (KHz)</b>	<b>Ipk [Rated]</b>	<b>Ipk [Max]</b>	<b>Mode (BCM/CCM)</b>
168F1-0702-9R	8	32	3.3	2.40	8.0	105-350	4.7	8.1	BCM
168F1-0703-9R	8	32	5.0	1.6	8.0	110-350	4.6	8.1	BCM
168F1-1006-16R	8	32	12.0	0.67	8.0	85-350	4.0	6.4	BCM
168F1-0610-9R	8	32	24.0	0.33	8.0	125-350	4.4	6.8	BCM

Note: At Vin > 8V the Power Rating increases to that shown in Table 2 above

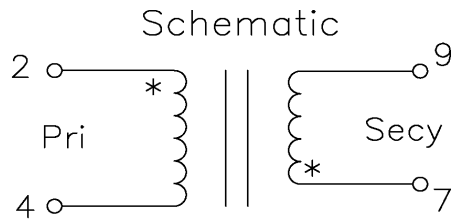
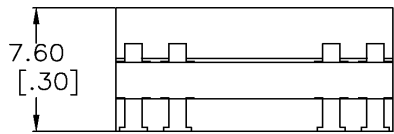
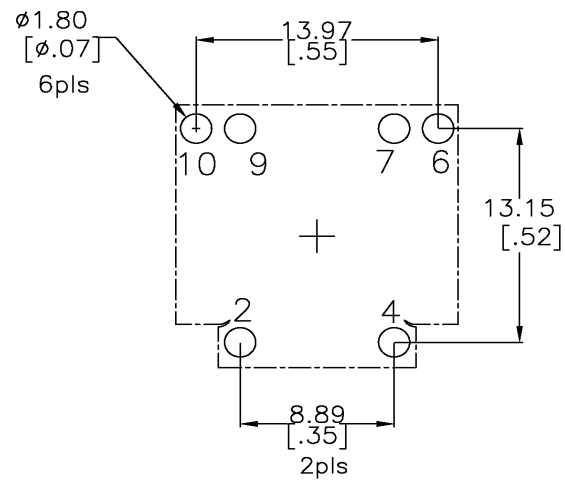
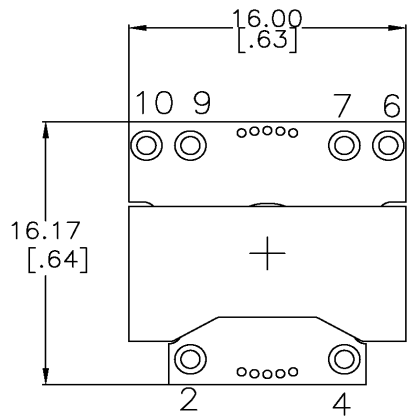
LT8302 Product Page & DC2014A Ref Design:

<http://www.analog.com/en/products/power-management/switching-regulators/flyback-forward-isolated-controllers/lt8302.html#product-overview>

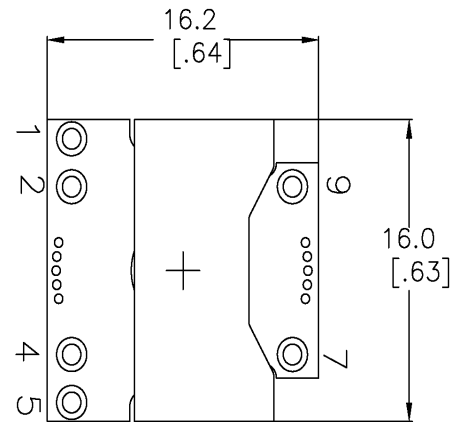
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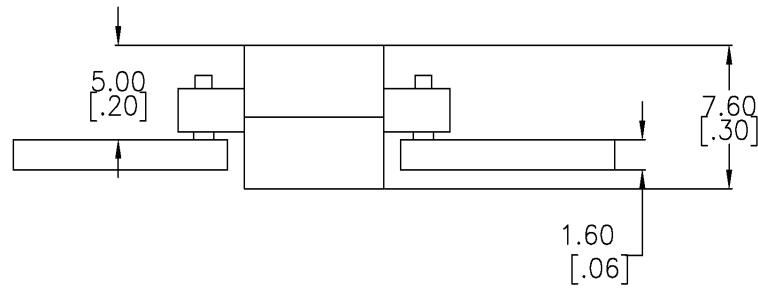
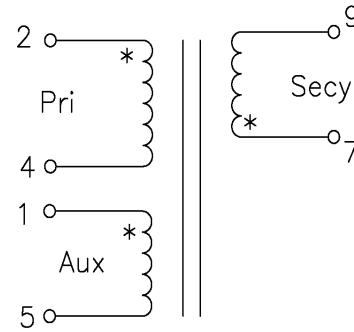
**Reference Design: 168F1 Series LT8302 Schematic**



## Mechanical Design Drawing 168F1 Surface Mount

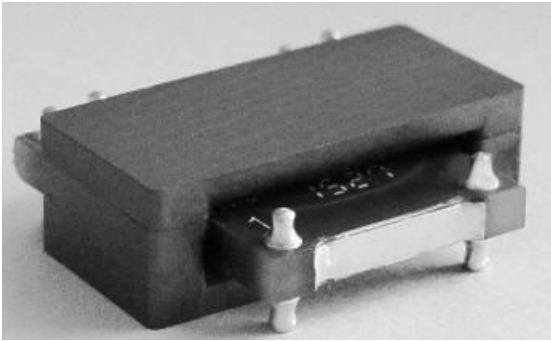


Schematic



## Mechanical Design Drawing 168F1 Pad-to-Pad

## Champs 20F1 Series BCM Flyback Solutions DC2014A & DC2393A



- Footprint: 17.8 x 21.0 mm
- Low Profile: 7.0mm Height
- Proven in actual DC-DC converter using LT8302 & LT8304 ICs.
- Designs Available as Demonstration Boards.
- Optimized for No-Opto Isolated Flyback Converter Design, BCM Mode Operation.
- Typical Efficiency 92%
- Aggressive Interleave planar construction -- lowest achievable Leakage Inductance.
- Multilayer PCB optimization for lowest AC resistance & Proximity Loss Effect.
- Wide variety of PNs, Designs and Turns Ratios in stock. If not listed, Contact Us.
- Integer Turns 1 thru 16 Available [Contact Us if Not Shown in Table].
- Surface Mount, Thru-Hole, Pad-to-Pad, Embedded Planar Windings as Options

### General Notes:

1. This subset of Champs' 20F1 series is earmarked to function in No-Opto Isolated Flyback circuits as described by the LT8302 and LT8304 ICs from Analog Devices.
2. Input Voltage and Output Power Ratings are a function of the IC's on-board FET and not a limitation of the transformer. In other applications the 20F1 part can operate over a wider  $V_{in}$  range or to 60W Output Power. Increased height allows increased power output due to higher current capability.
3. Integer Turns available from 1T to 16T. Can be used as Primary or Secondary. Mechanical configuration and outline allow for a "flex" arrangement. Contact factory for information on any flyback topology design
4. All designs can be supplied with planar windings as embedded in the pcb of the Main Module of the converter. Heat Sink and installed power components SM assembly and installation are also available.
5. All transformers installed with associated power components are available from Champs as Main Modules to be installed as a functioning DC-DC converter application. Accompanying Base-Boards ease the task of evaluation. Aspects of this construction are patent pending concepts of Champs and are made available as "open source".

### 1. Input Voltage Range 36-72. BCM Flyback.

Champs PN	$V_{in}$ (Min)	$V_{in}$ (Max)	$V_{out}$	$I_{out}$ (A <sub>dc</sub> )	$P_{out}$ (Watts)	Freq (KHz)	$I_{pk}$ [Rated]	$I_{pk}$ [Max]	Mode
20F1-1402-68R	36	72	3.3	3.60	12.0	105-200	1.9	2.90	BCM
20F1-1202-72R	36	72	5.0	2.50	12.5	140-245	1.7	2.35	BCM
20F1-1606-84R	36	72	12.0	1.25	15.0	105-185	2.0	2.68	BCM
20F1-1203-78R	36	60	12.0	1.25	15.0	160-320	1.6	1.90	BCM

Note: At  $V_{in} < 36V$  the above PNs will operate with a de-rated Power Rating

LT8304 Product Page & DC2393A Ref Design:

<http://www.analog.com/en/products/power-management/switching-regulators/flyback-forward-isolated-controllers/lt8304.html#product-overview>

<http://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/dc2393a.html>

## 2. Input Voltage Range 18-36. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A dc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode
20F1-0802-16R	18	36	3.3	4.54	15	105-185	4.3	7.0	BCM
20F1-0702-17R	18	36	5.0	2.50	12.5	115-200	4.0	5.5	BCM
20F1-0706-17R	18	36	12.0	1.25	15.0	105-185	4.2	5.8	BCM

Note: At Vin <18V the Power Rating decreases to that shown in Table 3 below

## 3. Input Voltage Range 8-32. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A dc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode (BCM/CCM)
20F1-0802-18R	8	32	3.3	2.25	7.5	85-330	3.6	6.3	BCM
20F1-0502-14R	8	32	5.0	1.5	7.5	105-330	3.75	5.0	BCM
20F1-0706-18R	8	32	12.0	0.625	7.5	80-310	3.5	5.5	BCM
20F1-0504-11R	8	30	12.0	0.60	7.2	100-330	3.6	5.0	BCM

Note: At Vin > 8V the Power Rating increases to that shown in Table 2 above

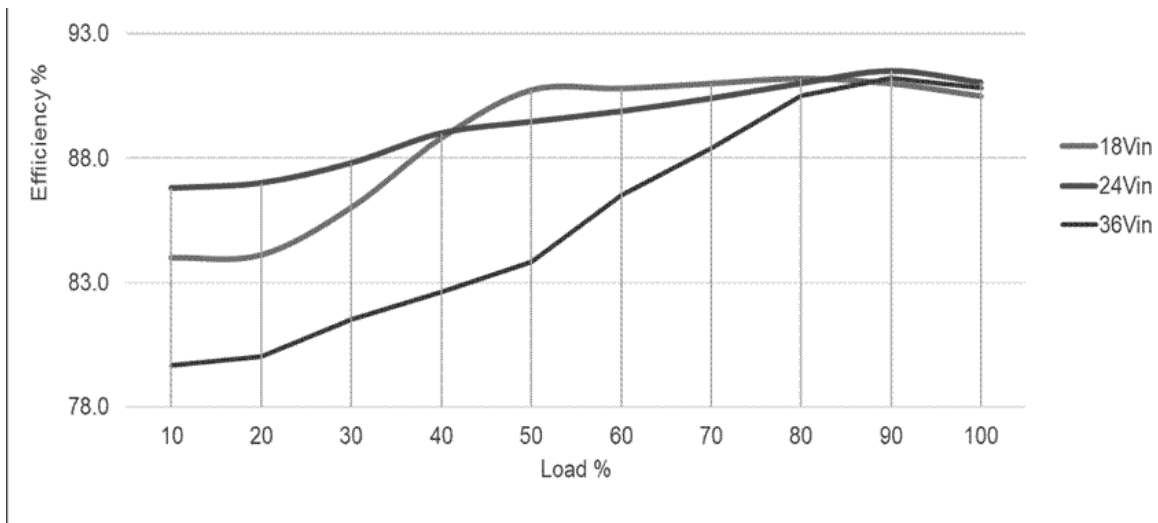
LT8302 Product Page & DC2014A Ref Design:

<http://www.analog.com/en/products/power-management/switching-regulators/flyback-forward-isolated-controllers/lt8302.html#product-overview>

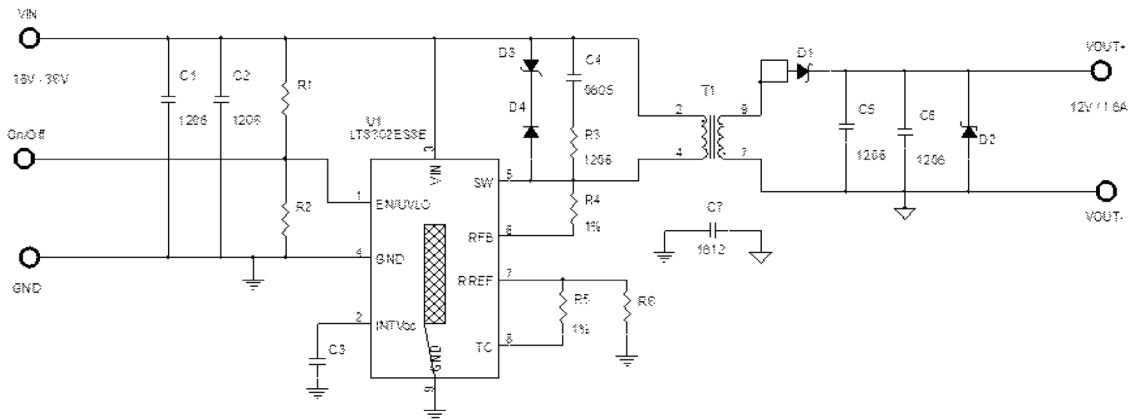
<http://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/dc2014a.html#eb-overview>

## 4. Input Voltage Range 18-36. BCM Flyback -- Demo Boards Specifications

Champs Part No	Input Voltage	Output Voltage	Output Current	Output Power	Efficiency %		Mode	Dimension (mm)
					Min	Typ		
IPPCM 20F1-0802-16R	18-36 Vin	3.3 Vout	4.54 A	15 W	88	90	BCM	20.83 x 21.34 x 9.0
IPPCM-20F1-0702-17R	18-36 Vin	5 Vout	2.5 A	12.5 W	88	90	BCM	20.83 x 21.34 x 9.0
IPPCM-20F1-0706-17R	18-36 Vin	12 Vout	1.25 A	15 W	89	92	BCM	20.83 x 21.34 x 9.0

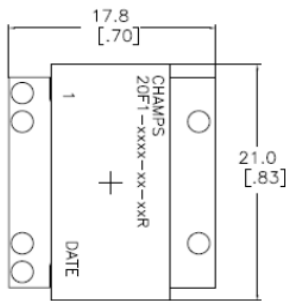


**Typical Efficiency Curve: 18-36Vin to 12Vout 15W**

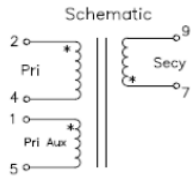
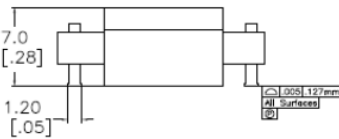
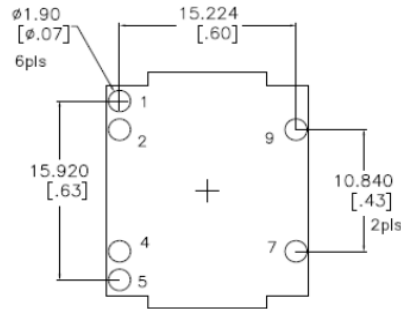


**Reference Design: 20F1 Series LT8302 Schematic**

MECHANICAL TOP VIEW

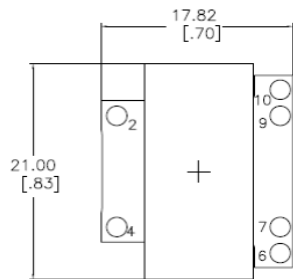


SUGGESTED PAD LAYOUT

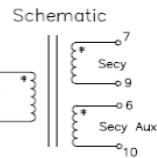
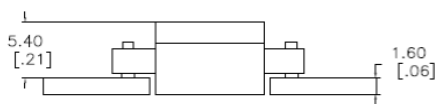
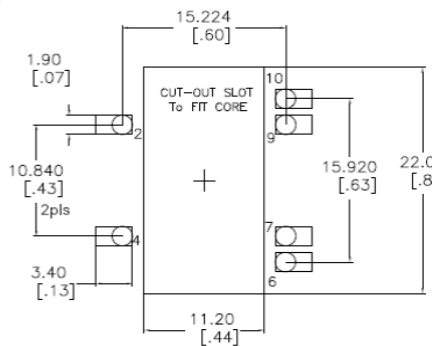


**Mechanical Design Drawing 20F1 Surface Mount**

MECHANICAL DIMENSIONS [TOP VIEW]



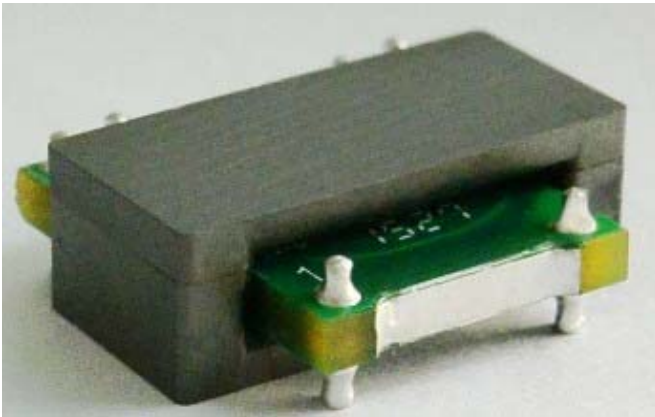
SUGGESTED PAD LAYOUT



PCB MOTHERBOARD SLOT

**Mechanical Design Drawing 20F1 Pad-to-Pad**

## Planar Flyback - Low Height. Vin 36-72 & 9-36. Pout 20-40W



- Flyback Topology -- CCM + BCM Options. *Low Profile [7.0 to 8.5mm]*.
- Highest Efficiency - -Secondary Side Synchronous FET Driven.
- Aggressive Interleave planar construction -- lowest achievable Leakage Inductance.
- Multilayer PCB optimization for lowest AC resistance and Proximity Effect.
- Wide variety of PNs, Designs and Turns Ratios in stock [Contact Us if Not Shown in Table].
- Surface Mount, Thru-Hole, Pad-to-Pad Options

### 1. Input Voltage Range 36-72. CCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A <sub>dc</sub> )	Pout (Watts)	Freq (KHz)	I <sub>pk</sub> [Rated]	I <sub>pk</sub> [Max]	Mode (BCM/CCM)
20F1-1602-08-45R	36	72	3.3	10.0	33.0	200	3.4	5.5	CCM
20F1-1202-05-30R	36	72	5.0	7.0	35.0	200	4.0	6.0	CCM
20F1-1305-06-30R	36	72	12.0	3.0	36.0	200	4.0	6.7	CCM

### 2. Input Voltage Range 9-36. CCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A <sub>dc</sub> )	Pout (Watts)	Freq (KHz)	I <sub>pk</sub> [Rated]	I <sub>pk</sub> [Max]	Mode (BCM/CCM)
20F1-0602-07-6R0	9	36	3.3	7.3	24.0	200	8.0	13.3	CCM
20F1-0603-07-6R0	9	36	5.0	5.0	25.0	200	8.3	13.3	CCM
20F1-0607-07-6R5	9	36	12.0	2.0	24.0	200	7.8	12.0	CCM

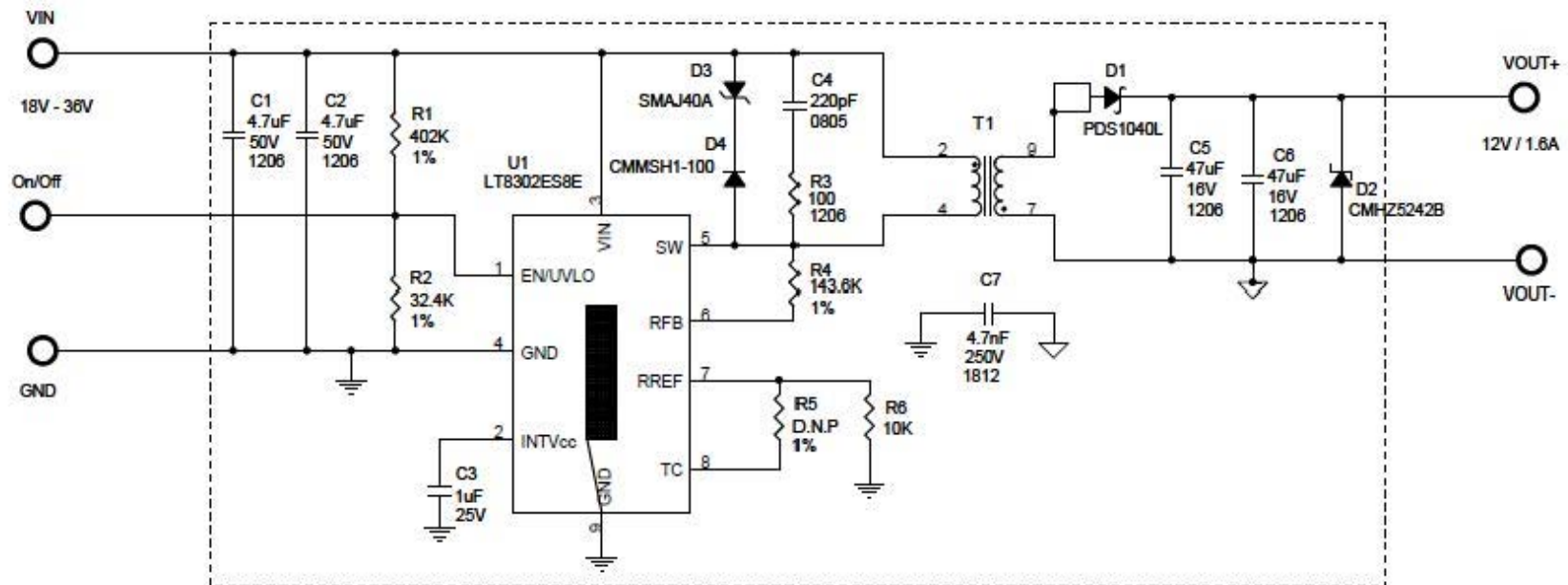
### 3. Input Voltage Range 36-72. BCM Flyback. Ref ICs: <http://www.linear.com/product/LT3748>

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A <sub>dc</sub> )	Pout (Watts)	Freq (KHz)	I <sub>pk</sub> [Rated]	I <sub>pk</sub> [Max]	Mode (BCM/CCM)
20F1-1602-08-25R	36	72	3.3	9.0	30.0	160-270	4.6	9.2	BCM
20F1-1202-05-28R	36	72	5.0	6.0	30.0	150-260	4.3	6.5	BCM
20F1-1305-06-25R	36	72	12.0	3.0	36.0	140-240	5.2	7.8	BCM

#### 4. Input Voltage Range 9-36. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A dc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode (BCM/CCM)
20F1-0602-07-4R0	9	36	3.3	7.3	24.0	90-230	12.5	22.0	BCM
20F1-0603-07-4R0	9	36	5.0	5.0	25.0	90-230	12.8	22.0	BCM
20F1-0607-07-4R5	9	36	12.0	2.0	24.0	90-230	11.8	20.0	BCM

Ref ICs: <http://www.linear.com/product/LT8302>





# Champs Technologies

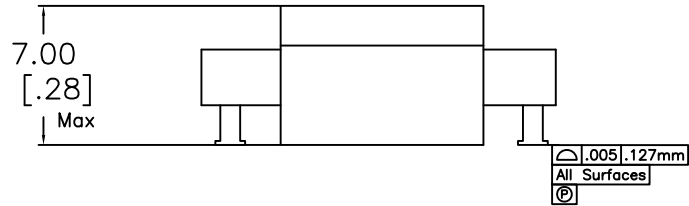
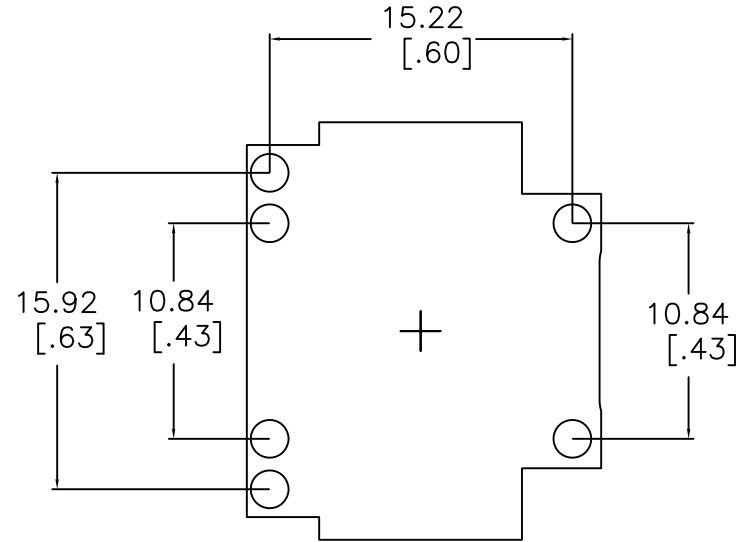
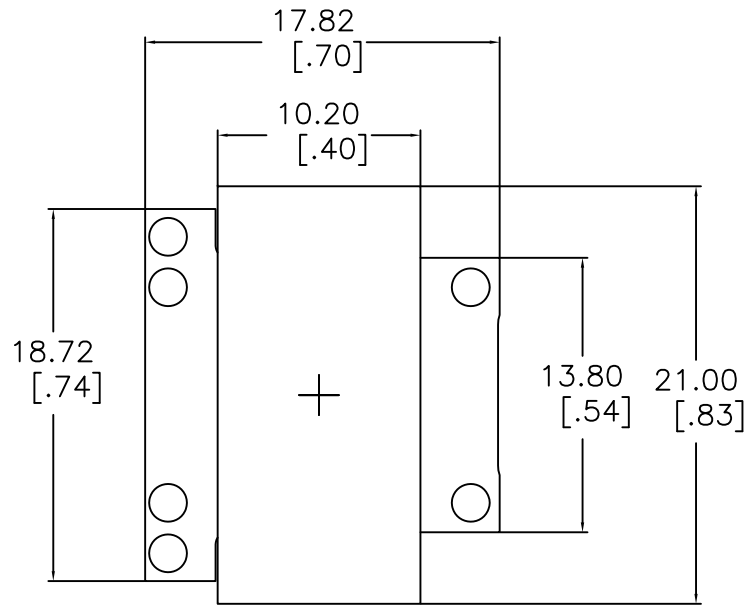
## Champs USA

Champs Technologies, LLC  
7 Peter Cooper Rd #10E  
New York, NY 10010  
Attn: Harold Eicher  
646-330-5064  
646-202-2899  
Harold.eicher@champs-tech.com  
<http://www.champs-tech.com>

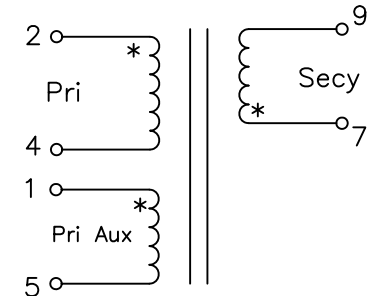
## Champs Taiwan

All Purchase Orders, Returns, Invoices, etc to:  
Champs Technologies Co., Ltd  
No 955 Sec 7.Taiwan Blvd.  
Shalu Dist , Taichung , 43350 Taiwan R.O.C.  
Phone: 886-2-2546-7766  
Attn: Cathy Lee Cathy@champstech.com

SUGGESTED PAD LAYOUT



Schematic



NOTES:

1. TURNS RATIO [7-9] : [2-4] = 0.125 +/- 2% || [1-5] : [2-4] = 0.50
2. DCR [2-4]=130 mohm Nom, [7-9]= 1.35 mohm Nom.[1-5]=30 mohm Max.
3. Inductance [2-4]=45.0 uH Nom, 100KHz, 1.0 VRMS @ 25C
4. Leakage Inductance [2-4] Short [7-9] = 250nH Nom @100 KHz
5. Dielectric Strength [2,4-1,5] to [7-9] 1500 VDC, [2-4] to CORE 1500 VDC, [7-9] to CORE 500 VDC
6. Weight 6.8 grams Max | RoHS & REACH Compliant

No.	DESCRIPTION	REVISIONS	DATE	APPR
CHAMPS TECHNOLOGIES				
DRAWN		SIGN	DATE	Champs No. 20F1-1602-08-45R
CHKD		HE	10.07.13	Customer
APPR				Part #: ISSUE A REV 00
SIZE			SCALE 3:1	



# Planar Transformer P20F2 40-60W No-Opto Isolated BCM Flyback

## 1. Input Voltage Range 32-72. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A dc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode
P20F2-0801-04-25R0	32	72	3.3	10.0	33.0	140-240	5.0	7.3	BCM
P20F2-0802-05-20R5	32	72	5.0	7.0	35.0	110-170	5.9	9.0	BCM
P20F2-0803-03-20R5	32	72	12.0	4.0	48.0	130-230	6.0	9.0	BCM
P20F2-0803-03-22R0	36	60	12.0	5.0	60.0	105-180	7.7	9.0	BCM

Note: At Vin < 36V the above PNs will operate with a de-rated Power Rating

## 2. Input Voltage Range 16-60. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A dc)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode
P20F2-0401-5R2	16	60	3.3	12.0	40.0	102-350	13.0	18.0	BCM
P20F2-0502-6R0	16	60	5.0	8.0	40.0	90-230	13.0	19.0	BCM
P20F2-0504-6R0	16	60	12.0	4.0	48.0	88-300	14.3	19.0	BCM

Note: At Vin < 18V the Power Rating decreases to that shown in Table 3 below



# Planar Transformer P20F2 40-60W No-Opto Isolated BCM Flyback

## 3. Input Voltage Range 9-36. BCM Flyback.

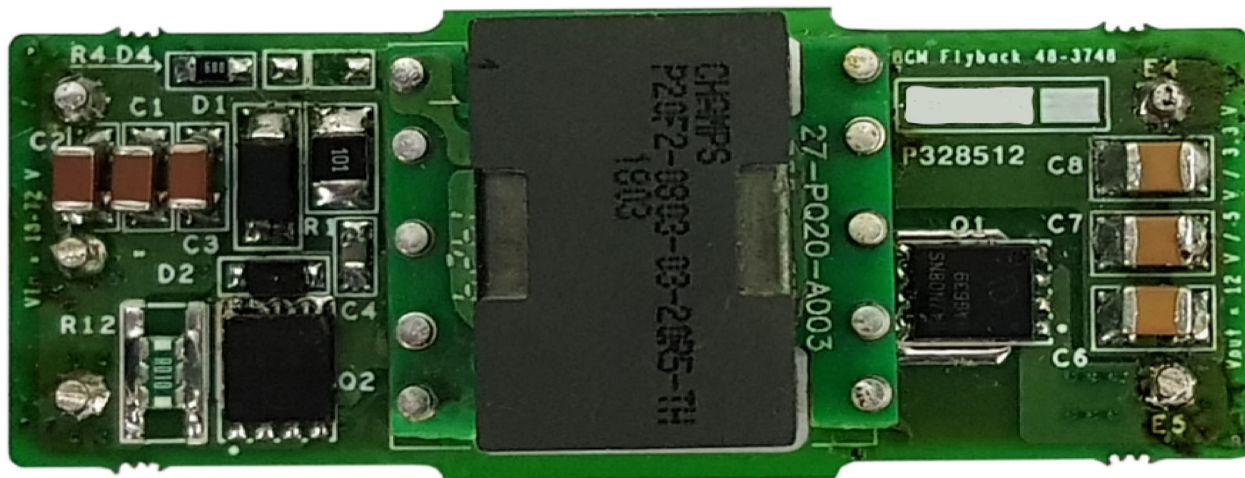
Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A <sub>dc</sub> )	Pout (Watts)	Freq (KHz)	I <sub>pk</sub> [Rated]	I <sub>pk</sub> [Max]	Mode (BCM/CCM)
P20F2-0402-3R3	9	36	3.3	8.0	26.4	84-200	17.0	28.0	BCM
P20F2-0503-4R5	9	36	5.0	6.0	30.0	65-180	17.0	26.0	BCM
P20F2-0406-3R3	9	36	12.0	3.0	36.0	68-180	20.5	28.0	BCM

Note: At Vin > 18V the Power Rating increases to that shown in Table 2 above

## 4. Input Voltage Range 18-60. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A <sub>dc</sub> )	Pout (Watts)	Freq (KHz)	I <sub>pk</sub> [Rated]	I <sub>pk</sub> [Max]	Mode (BCM/CCM)
P20F2-0506-01-7R2	18	60	48.0	1.50	72.0	118-440	14.0	16.0	BCM

## Champs P20F Series BCM Planar Flyback Solutions for DC1961A



- Optimized for No-Opto Isolated Flyback Converter Design, BCM
  - Footprint 20.9 x 22.7 mm || Low Profile [9.8 to 12.7 mm]
  - Typical Efficiency 91-94%
  - Data shown for BCM. Can configure for CCM with different Lp Value
  - Aggressive Interleave planar construction -- lowest achievable Leakage Inductance.
  - Multilayer PCB optimization for lowest AC resistance & Proximity Loss Effect.
  - Wide variety of PNs, Designs and Turns Ratios in stock
  - Integer Turns 1 thru 16 Available [Contact Us if Not Shown in Table].
  - Surface Mount, Thru-Hole, Pad-to-Pad, Embedded Planar Windings Available
  - Proven in actual DC-DC converter applications using LT3748 IC
  - Designs Available as Demonstration Boards. Contact Factory
- 
- This subset of Champs' P20F2 series is earmarked to function in No-Opto Isolated Flyback circuits as described by the LT3748 IC available from Analog Devices.
  - Input Voltage and Output Power Ratings are a function of the Primary and Secondary side FET and not a limitation of the transformer. In other applications the P20F2 part can operate over a wider Vin range or to 100W Output Power with a narrower Vin range.
  - Integer Turns available from 1T to 20T to be used as Primary or Secondary are available in a "flex" arrangement. Contact factory for information on any flyback topology design



Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode (BCM/CCM)
P20F2-0402-3R3	9	36	3.3	8.0	26.4	84-200	17.0	28.0	BCM
P20F2-0503-4R5	9	36	5.0	6.0	30.0	65-180	17.0	26.0	BCM
P20F2-0406-3R3	9	36	12.0	3.0	36.0	68-180	20.5	28.0	BCM

Note: At Vin > 9V the Power Rating increases to that shown in Table 2 above

#### 4. Input Voltage Range 18-60. BCM Flyback.

Champs PN	Vin (Min)	Vin (Max)	Vout	Iout (A)	Pout (Watts)	Freq (KHz)	Ipk [Rated]	Ipk [Max]	Mode (BCM/CCM)
P20F2-0506-01-7R2	9	60	48.0	1.50	72.0	118-380	14.0	16.0	BCM

LT3748 Product Page & DC1961A Ref Design:

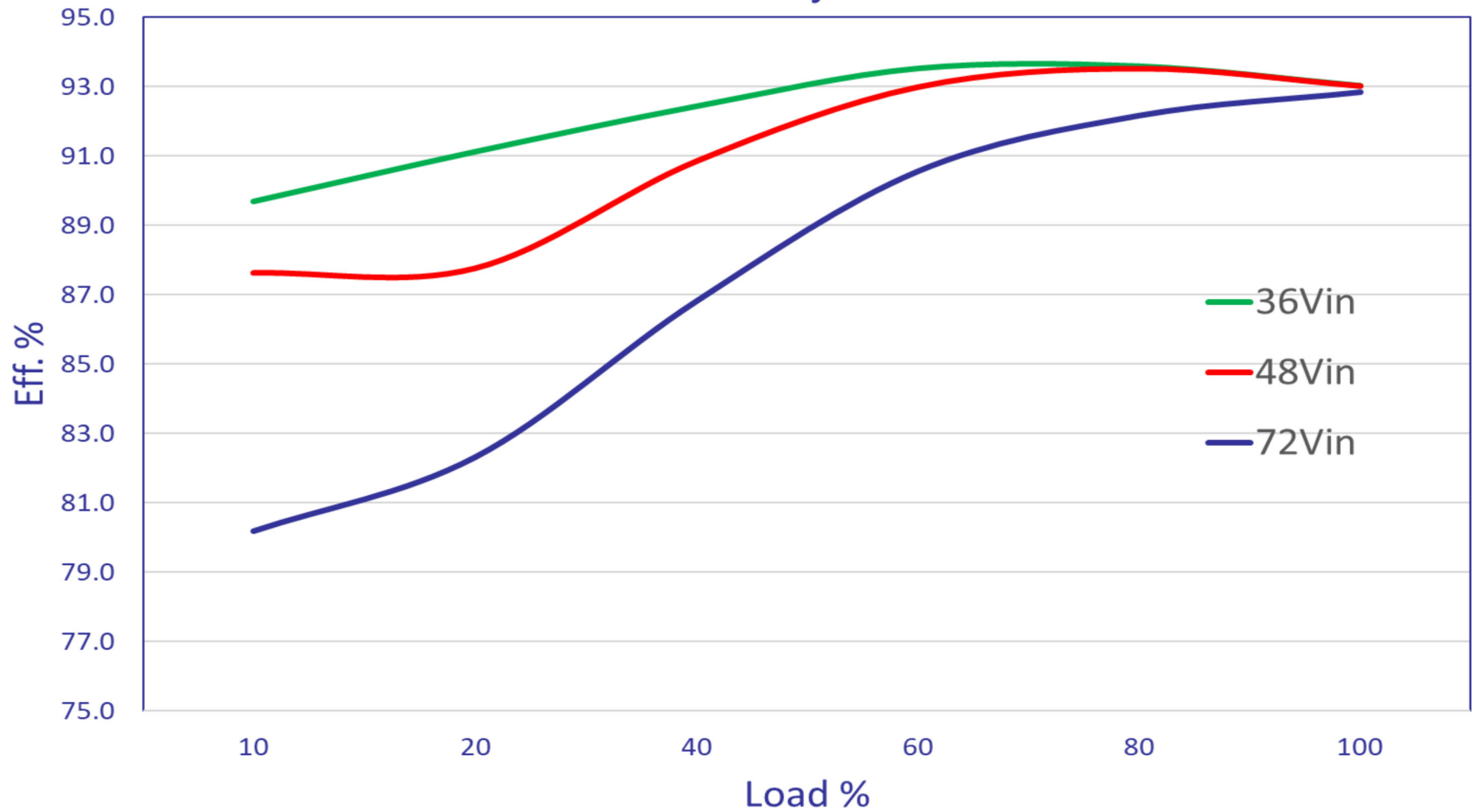
<https://www.analog.com/en/products/lt3748.html>

<https://www.analog.com/en/design-center/evaluation-hardware-and-software/evaluation-boards-kits/dc1961a.html>

#### Demo Boards IPPCM-P20F2 Series available Champs Technologies

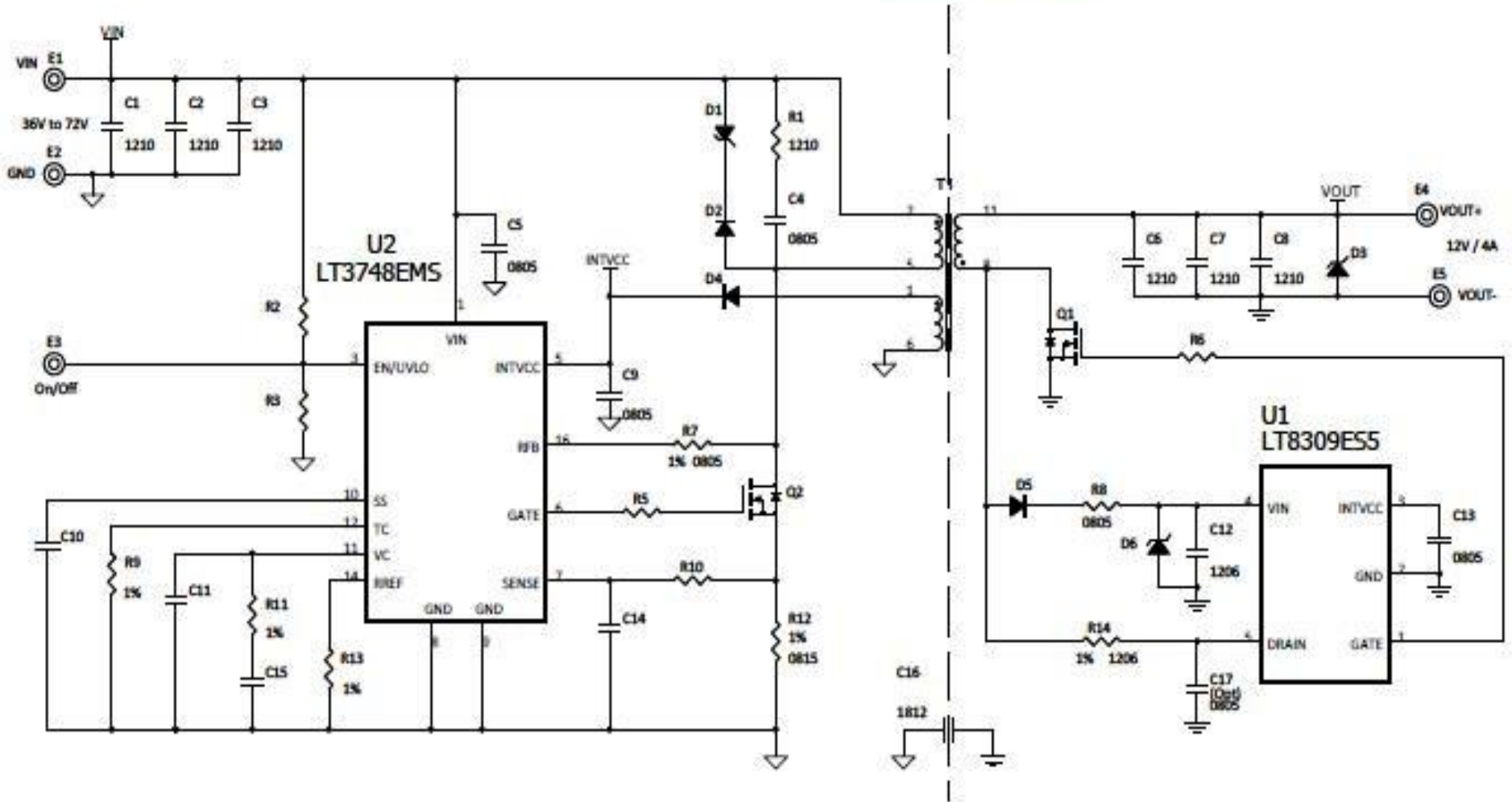
Champs Part No	Input Voltage	Output Voltage	Output Current	Output Power	Efficiency %		Mode	Dimension (mm)
					Min	Typ		
IPPCM P20F2-0801-04-25R	32-72 Vin	3.3 Vout	10.0 A	33 W	88	90	BCM	25 x 58.4 x 12.0
IPPCM-P20F2-0802-05-20R5	32-72 Vin	5.0 Vout	7.0 A	35 W	88	91	BCM	25 x 58.4 x 12.0
IPPCM-P20F2-0803-20R5	32-72 Vin	12 Vout	4.0 A	48 W	91	93	BCM	25 x 58.4 x 12.0

# Efficiency



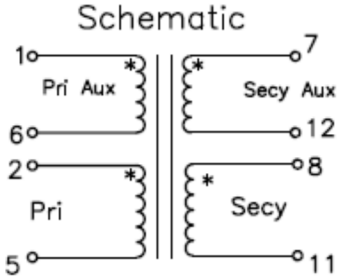
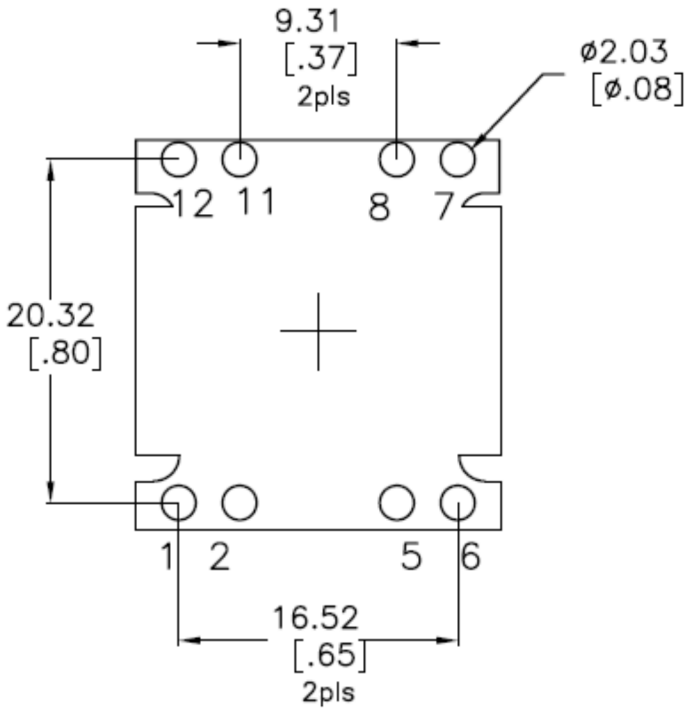
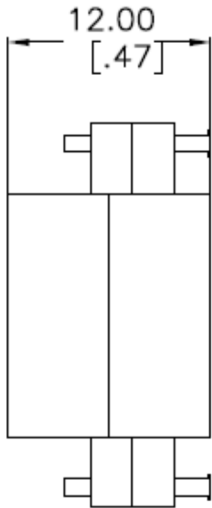
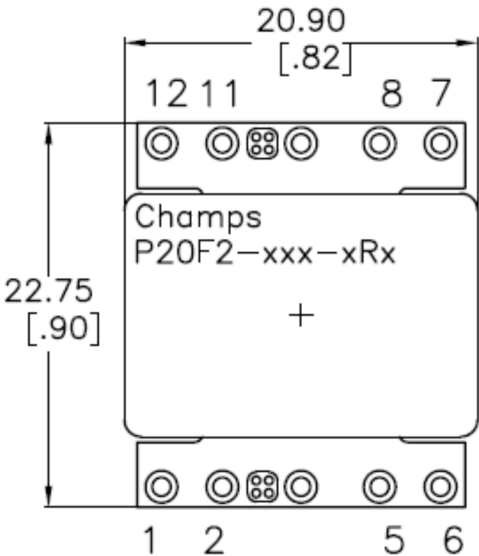
**Typical Efficiency Curve: 36-72Vin to 12Vout 40W**

DIELECTRIC ISOLATION 2250Vdc



Reference Design: P20F2 Series LT3748 Schematic

SUGGESTED PAD LAYOUT



**Mechanical Design Drawing P20F2 Surface Mount**