

Part: IP1206PBF

Multiple Output Synchronous Buck Power Block. Integrated Power Semiconductors PWM

Description: Control and Passives Designed for Medium Current applications requiring up to 15A per phase or a single phase of 30A.

Features

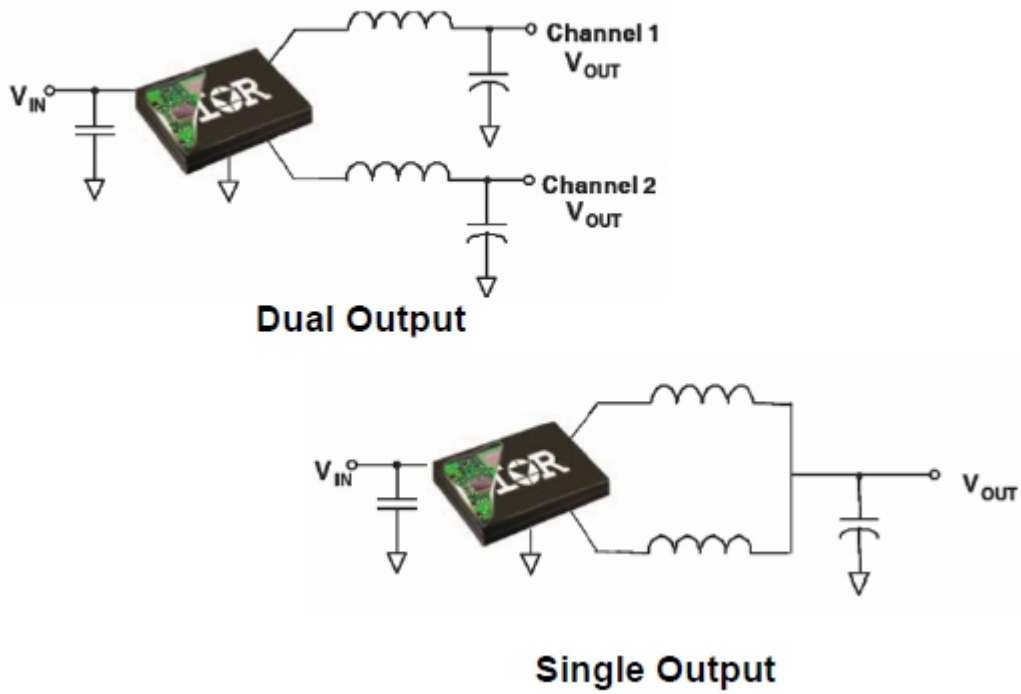
- Internal 600kHz Oscillator
- Input voltage range of 7.5V to 14.5V
- Output voltage range of 0.8V to 5.5V
- Output voltage accuracy of +/-1%
- Output current range of 0A to 30A
- Operation up to 600kHz
- Lossless current limit
- Output overvoltage protection
- Pre-Bias start-up
- External synchronization
- Output voltage tracking
- Output voltage sequencing
- Over temperature protection

Long Description

The iP1206 is a fully optimized solution for medium current synchronous buck applications. The iP1206 can be configured as a dual output voltage power supply delivering up to 15A of current per output. Alternatively, the iP1206 can be configured as a single output voltage power supply delivering up to 30A of current. In both cases, the power stages are operated 180° out of phase. This reduces the amount of input RMS current and lessens the quantity of input capacitors needed.

iPOWIR Technology offers designers an innovative board space saving solution for applications requiring high power densities. iPOWIR technology eases design for applications where component integration offers benefits in performance and functionality. iPOWIR technology solutions are also optimized internally for layout, heat transfer, and component selection.

Typical Application



Specifications	
Parameter	Value
Package	LGA - 15.5mm x 9.25mm x 1.97mm
Circuit	2 Phase Single Output or Dual Ch
I _{out} (A)	30
Switch Frequency	200kHz to 0.6MHz
PbF	PbF Option Available
Input Voltage Range	7.5 - 14.5
Output Voltage Range	0.8 - 5.5
Features	OVP + OCP + OTP + Pre-Bias Ext Sync tracking and Sequencing

Packaging Options						
Product ID	Description	Status	Standard Pack	1K Budgetary Pricing (USD)	Qty	
IP1206PBF	Similar to IP1206 shipped in bag	Active	5	\$8.96	1	
IP1206TRPBF	Similar to IP1206 shipped on Tape and Reel	Active	750	\$8.96	1	



Synchronous Buck
Multiphase Optimized LGA Power Block
Integrated Power Semiconductors, PWM Control, & Passives

Features

- Input voltage range of 7.5V to 14.5V
- Output voltage range of 0.8V to 5.5V
- Output voltage accuracy of +/-1%
- Output current range of 0A to 30A
- Operation up to 600kHz
- Lossless current limit
- Output overvoltage protection
- Pre-Bias start-up
- External synchronization
- Output voltage tracking
- Output voltage sequencing
- Over temperature protection



Description

The iP1206 is a fully optimized solution for medium current synchronous buck applications. The iP1206 can be configured as a dual output voltage power supply delivering up to 15A of current per output. Alternatively, the iP1206 can be configured as a single output voltage power supply delivering up to 30A of current. In both cases, the power stages are operated 180° out of phase. This reduces the amount of input RMS current and lessens the quantity of input capacitors needed.

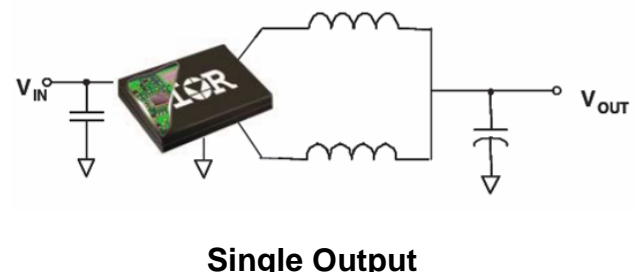
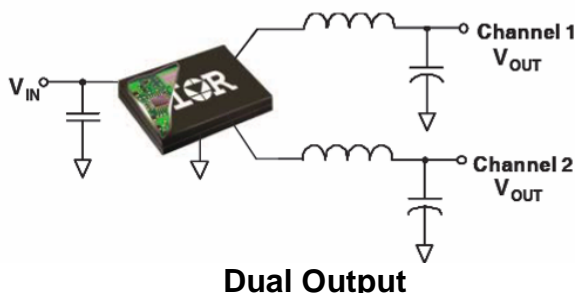
iPOWIR Technology offers designers an innovative board space saving solution for applications requiring high power densities. iPOWIR technology eases design for applications where component integration offers benefits in performance and functionality. iPOWIR technology solutions are also optimized internally for layout, heat transfer, and component selection.

Applications

- Embedded Telecom Systems
- Distributed Point of Load Power Architectures
- Powering Dual Voltage ASICs
- Microprocessor Power Supplies
- General DC/DC Converters

Package Description	Interface Connection	Parts Per Bag	Parts Per Reel	T & R Orientation
iP1206PbF	LGA	10	-	Fig. 29
iP1206TRPbF	LGA	-	750	

Typical Application



Recommended Operating Conditions

Symbol	Definition	Min	Max	Units
V_{IN1}, V_{IN2}	Input Supply Voltage	7.5	14.5	V
V_{CC}	Bias Supply Voltage	7.5	14.5	V
I_o (Note1)	Output current per Phase	0	15	A
F_s	Operating frequency	200	600	kHz
T_j	Junction temperature	-40	125	°C

Electrical Specifications

Unless otherwise specified, these specification apply over $V_{CC}=12V, 0^{\circ}C < T_j < 105^{\circ}C$

PARAMETER	Min	Typ	Max	Units	Conditions
Supply Power					
Power Loss	-	5	6.5	W	$V_{IN} = 12V, V_{O1} = V_{O2} = 1.5V, I_{O1} = I_{O2} = 15A, f_{SW} = 300kHz, T_{BLK} = 25^{\circ}C$
V_{IN} Supply Current (Static)	-	0.5	2	mA	$V_{IN} = 12V, ENABLE = 0V$
V_{CC} Supply Current (Static)	-	25	30	mA	SS=0V ; no switching; V_{CC} tied to V_{CL}
V_{CH} Supply Current (Static)	-	10	12	mA	SS=0V ; no switching
Power-On Reset (POR)					
V_{CC} Rising	6.9	-	7.5	V	
V_{CC} Falling	6.1	-	6.75	V	
Hysteresis	500	-	-	mV	V_{IN} Rising & Falling
DC Output Regulation					
System Set Point Accuracy	0.792	0.8	0.808	V	$T_J = 0^{\circ}C$ to $105^{\circ}C$ (Note 2)
	0.784	0.8	0.810	V	$T_J = -40^{\circ}C$ to $125^{\circ}C$ (Note 2)
Enable					
Turn-on Threshold (V_{IH})	1.14	-	1.34	V	
Hysteresis	150	-	-	mV	Rising & Falling
Soft Start 1,2					
Voltage Level	-	3.0	-	V	$V_{IN} = ENABLE = 12V$
Disable Voltage Level	-	-	0.25	V	
Sink/Source Current	18	23	28	μA	

Electrical Specifications

PARAMETER	Min	Typ	Max	Units	Conditions
Error Amplifier 1,2					
Input Bias Current	-	-0.1	-0.5	μA	Soft Start Pin = 3V
Sink/Source Current	120	200	280	μA	
Transconductance	3000	-	5000	μmho	
Input Offset Voltage	-3.5	-	3.5	mV	FB to Vref
VP pin Voltage Range	0.4	-	$V_{CC} - 2$	V	(Note 3)
TRACK pin Voltage Range	0	-	V_{O3}	V	(Note 3)
Oscillator					
Frequency Range	200	-	600	kHz	
Frequency Accuracy	88	-	112	%	$F_S = 300\text{kHz}$
Ramp Amplitude	-	1.25	-	V	
Minimum Duty Cycle	-	-	0	%	FB = 1V
Maximum Duty Cycle	84	-	-	%	$F_S = 300\text{kHz}$, FB = 0V
Minimum Pulse Width	-	-	150	ns	$F_S = 300\text{kHz}$
SYNC Frequency Range	-	-	1200	kHz	20% above Free Running Freq
SYNC Pulse Duration	200	300	-	ns	
SYNC HIGH Level Threshold (V_{IH})	2	-	-	V	
SYNC LOW Level Threshold (V_{IL})	-	-	0.6	V	
Sequence					
Turn on Threshold	-	-	5	V	
Turn off Threshold	0.3	-	-	V	
POWER GOOD Monitor					
FB1/2S Threshold	80	90	95	%	Percentage of Voltage Reference
PGOOD1/2 Output Low Voltage	-	0.1	0.5	V	$I_{SINK} = 2\text{mA}$
Over Voltage Protection					
Start Threshold	110	115	120	%	Percentage of Voltage Reference
Propagation Delay to Shutdown	-	-	5	μs	Output Voltage set to 1.25Vref (Note3)

Electrical Specifications

PARAMETER	Min	Typ	Max	Units	Conditions
Over Current Protection					
Start Threshold	20	24.5	29	A	$V_{IN} = 12V, R_{OCSET} = 7.5K\Omega$
Hiccup Duty Cycle	-	5	-	%	(Note 3)
Thermal Shutdown					
Start Threshold	130	145	-	°C	(Note 3)
Temperature Hysteresis	-	20	-	°C	
Internal Regulator (V_{O3})					
Output Accuracy	6.7	7.2	7.7	V	$V_{CC} = 12V, I_{LOAD} = 50mA$
Dropout Voltage			2	V	$V_{CC} = 9V, I_{LOAD} = 100mA$
Current Limit	110			mA	

Note1: Continuous output current determined by input and output voltage setting. Refer to SOA curve.

Note2: FB1,2 connected to CC1,2. Measured at the CC1,2 pin. Production tested at 25°C. Other temperatures guaranteed by design.

Note3: Guaranteed by design but not tested in production.

Note4: Block Temperature is defined as any Die temperature within the package.

Application Information

Design Example:

The following example is a typical application for iP1206. The application circuit is shown in page25.

$$V_{in} = 12V, (13.2V, \max)$$

$$V_o = 1.2V$$

$$I_o = 30A$$

$$\Delta V_o \leq 30mV$$

$$F_s = 300kHz$$

Output Voltage Programming

Output voltage is programmed by the reference voltage and an external voltage divider. The Fb pin is the inverting input of the error amplifier, which is internally referenced to 0.8V. The divider ratio is chosen to provide 0.8V at the Fb pin when the output is at its desired value. The output voltage is defined by using the following equation:

$$V_o = V_{REF} * \left(1 + \frac{R_6}{R_5}\right) \quad \text{-----(6)}$$

When an external resistor divider is connected to the output as shown in Fig. 19.

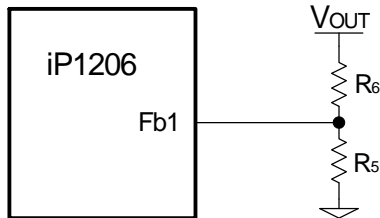


Fig. 19: Typical application of the iP1206 for programming the output voltage

Equation (6) can be rewritten as:

$$R_5 = R_6 * \left(\frac{V_{ref}}{V_o - V_{ref}}\right) \quad \text{-----(7)}$$

For the calculated values of R_5 and R_6 see feedback compensation section.

Soft-Start Programming

The soft-start timing can be programmed by selecting the soft-start capacitance value. The start-up time of the converter can be calculated by using:

$$C_{SS} \cong 20\mu A * T_{start} \quad \text{-----(8)}$$

Where T_{start} is the desired start-up time (ms)

For a start-up time of 5ms, the soft-start capacitor will be 0.1uF. Choose a ceramic capacitor at 0.1uF.

Input Capacitor Selection

The 180° out of phase feature will reduce the RMS value of the ripple current seen by input capacitors. This reduces numbers of input capacitors. The input capacitors selected must handle both the maximum ripple RMS at highest ambient temperature as well as the maximum input voltage. The RMS value of current ripple for duty cycle under 50% is expressed by:

$$I_{RMS} = \sqrt{(I_1^2 D_1 (1-D_1) + I_2^2 D_2 (1-D_2) - 2I_1 I_2 D_1 D_2)} \quad \text{-----(9)}$$

Where:

- I_{RMS} is the RMS value of the input capacitor current
- D_1 and D_2 are the duty cycle for each channel
- I_1 and I_2 are the output current for each channel

For $I_o=30A$ and $D=0.10$, the $I_{RMS}= 12A$.

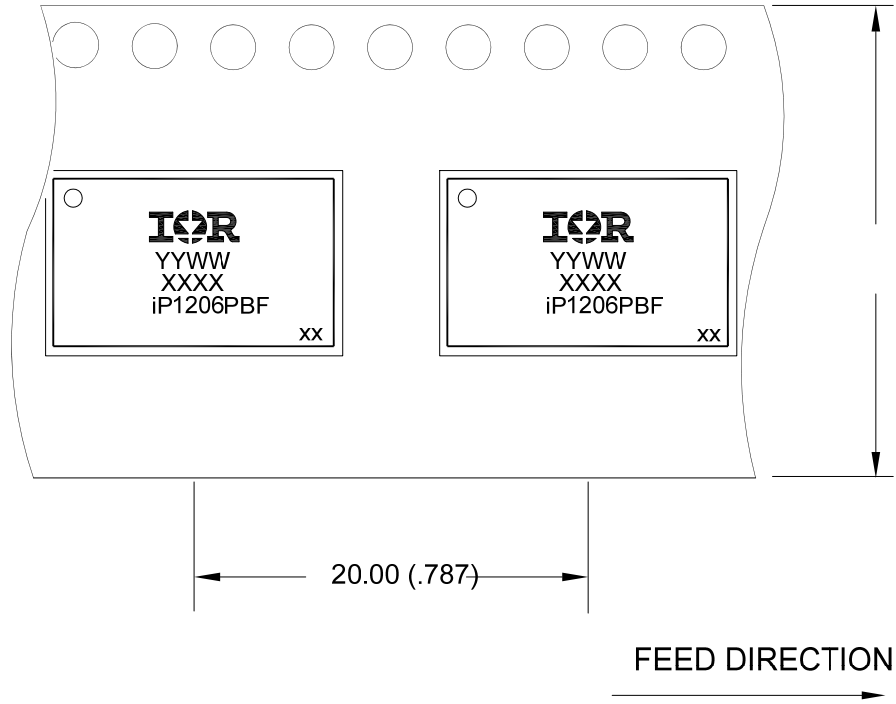
Ceramic capacitors are recommended due to their peak current capabilities, they also feature low ESR and ESL at higher frequency which enhance better efficiency,

Use 8x22uF, 16V ceramic capacitor from TDK (C3225X5R1C226M).

For the single output application when the duty cycle is larger than 50% the following equation can be used to calculate the total RMS value input capacitor current:

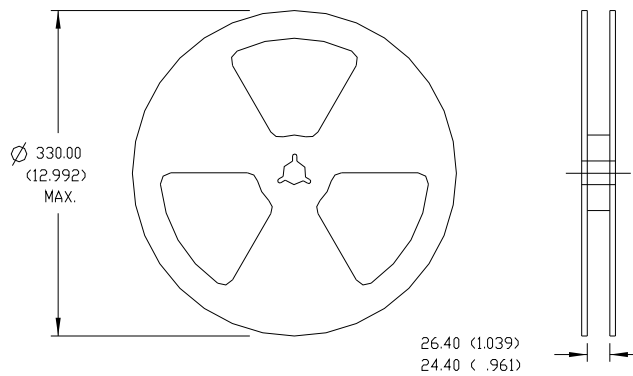
$$I_{RMS} = I_o \sqrt{(2D(1-D) + (2-2D))} \quad D > 0.5$$

Tape and Reel Information



NOTES:

1. OUTLINE CONFORMS TO EIA-481 & EIA-541.
iP1206, LGA



NOTES:

1. CONTROLLING DIMENSION: MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.

Fig. 29

Recommended Solder Paste Stencil Design

The recommended reflow peak temperature is 260°C. The total furnace time is approximately 5 minutes with approximately 10 seconds at peak temperature.

SQUEEZE VIEW
RECOMMENDED STENCIL OPENNING
ALL DIMENSION IN MM

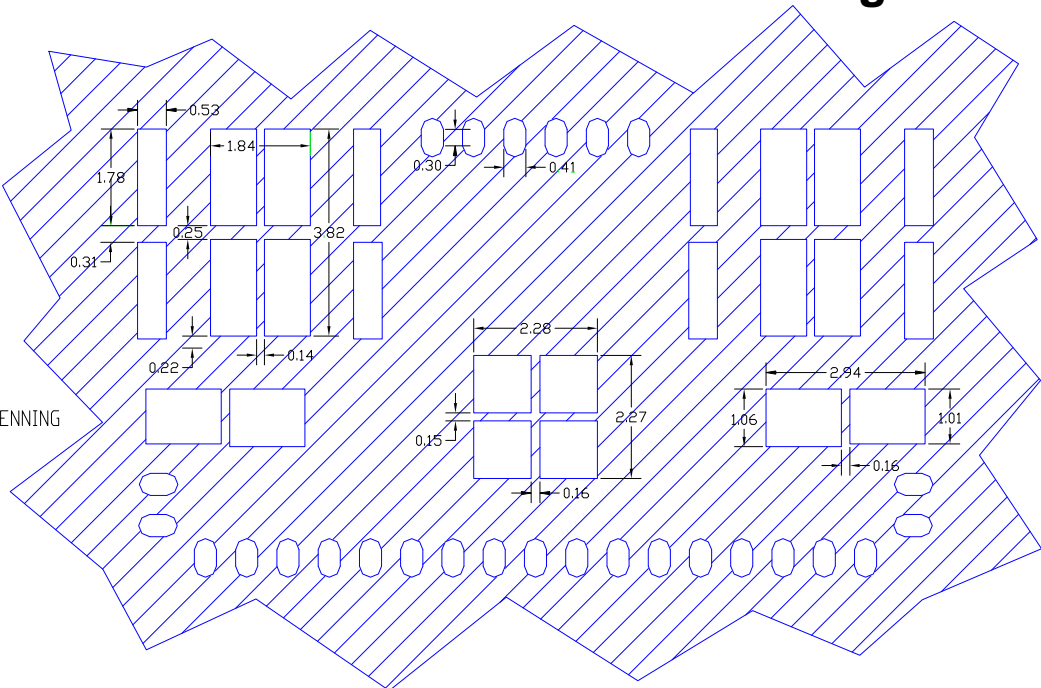


Fig. 30

Part Marking

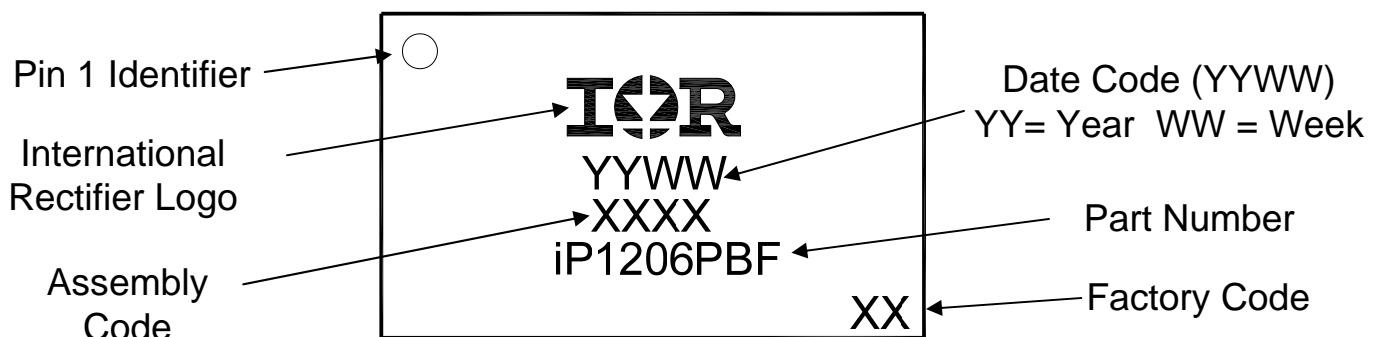


Fig. 31