IPP28XXS-30

Single Output Series
High Reliability DC-DC Converters

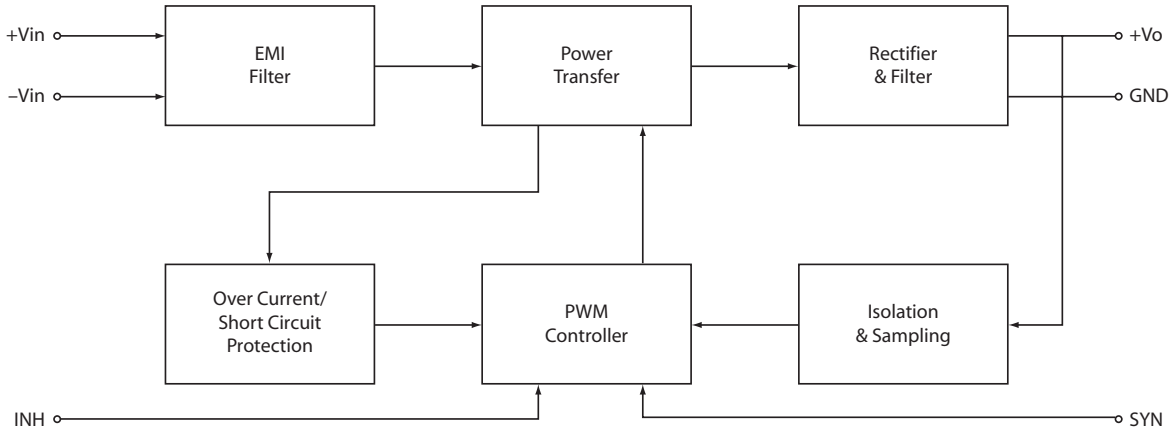
FEATURES

- **High reliability, compact size**
- **High power density: 31W/in^3**
- **Input voltage range: 16V_{DC} to 40V_{DC}**
- **Output power: 20W to 30W**
- **Inhibit and synchronization functions**
- **Fully isolated**
- **Over-current / short-circuit protection**
- **Hermetically sealed metal DIP package**

DESCRIPTION

The IPP28XXS-30 single output series DC-DC converter is an integrated, hermetically sealed thick-film microcircuit, and is a perfect fit for a variety of demanding hi-rel industrial, aerospace and military applications. The output voltage options are 3.3V, 5V, 12V or 15V with output power rated from 20W to 30W. The switching frequency is fixed at 265KHz to minimize noise, and includes an internal input filter circuit designed to reduce electro-magnetic interference. The typical input voltage is 28V_{DC}, and covers input ranges from 16 V_{DC} to 40V_{DC}. The IPP28XXS -30 series also provides control functions such as synchronization, shut down, and over-current / short-circuit protection.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

INPUT VOLTAGE:	$16V_{DC}$ to $40V_{DC}$
OUTPUT POWER:	20W to 30W
OPERATING TEMP (Tc):	–40°C to +85°C
STORAGE TEMP:	–55°C to +125°C (M)
PIN SOLDER TEMP (10S):	300°C

ELECTRICAL CHARACTERISTICS

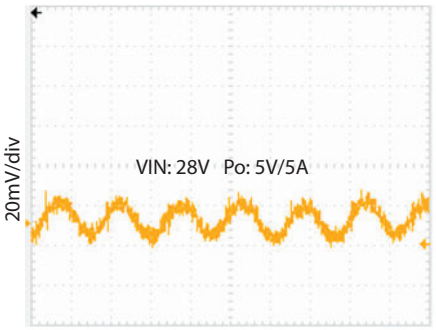
PARAMETER	CONDITIONS[3]	IPP283R3S–20			IPP2805S–25			IPP2812S–30			IPP2815S–30			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	V_{IN}=16V_{DC}–40V_{DC}	3.27	3.30	3.33	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	V_{DC}
OUTPUT CURRENT	V_{IN}=28V_{DC}	0	–	6.06	0	–	5.0	0	–	2.5	0	–	2.0	A
OUTPUT POWER	V_{IN} =28V_{DC}	0	–	20	0	–	25	0	–	30	0	–	30	W
OUTPUT RIPPLE VOLTAGE [1]	20MHz	–	15	40	–	35	50	–	25	50	–	25	50	mV_{p-p}
	–55°C to +105°C	–	–	50	–	50	90	–	40	90	–	40	90	
LINE REGULATION	V_{IN} =16V_{DC} 40V_{DC}	–	10	20	–	10	30	–	25	50	–	30	60	mV
	–55°C to +105°C	–	–	33	–	15	50	–	50	90	–	50	90	
LOAD REGULATION	V_{IN} =28V_{DC}	–	10	20	–	5	30	–	25	50	–	30	60	mV
	–55°C to +105°C	–	–	33	–	15	50	–	50	90	–	50	90	
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	16	28	40	V
	50V/50ms	–	–	50	–	–	50	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	30	85	–	35	75	–	35	75	–	35	75	mA
	FULL LOAD	–	0.94	–	–	1.17	–	–	1.30	–	–	1.25	–	A
	INHIBIT	–	7	8	–	3	8	–	3	8	–	3	8	mA
INPUT RIPPLE CURRENT	20MHz	–	25	50	–	20	50	–	20	50	–	20	50	mA_{p-p}
EFFICIENCY		74	76	–	72	76	–	80	83	–	80	84	–	%
SHORT CIRCUIT	DISSIPATION	–	–	15	–	15	–	–	15	–	–	15	–	W
	RECOVERY	–	1.4	6	–	1.4	5	–	1.4	5	–	1.4	5	ms
TRANSIENT LOAD RESPONSE[2]	50%–100%–50%	–	±125	±250	–	±200	±400	–	±250	±400	–	±350	±500	mV
		–	–	200	–	60	200	–	60	200	–	60	200	µs
TRANSIENT LINE RESPONSE RECOVERY	16–40–16V_{IN}	–	–	±300	–	±200	±300	–	±400	±500	–	±500	±600	mv
		–	–	300	–	–	300	–	–	300	–	–	300	µs
START–UP	DELAY	–	1.4	5	–	1.4	5	–	1.4	5	–	1.4	5	ms
	FULL LOAD OVERSHOOT	–	0	50	–	0	50	–	0	120	–	0	150	mV_{pk}
	NO LOAD OVERSHOOT	–	33	150	–	50	250	–	120	600	–	150	750	
	≥100M@ 500V_{DC} (input-output; input case; output case)													

NOTES

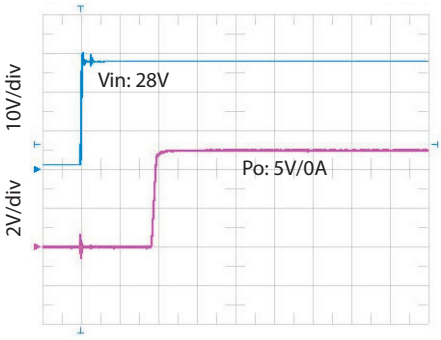
1. Using tip and barrel measurement.
2. Recovery time is measured from application of the transient to the point at which Vout is within 1% of final value.
3. Unless otherwise specified, T_A = 25°C Tc, Vin = 28V_{DC},100% load.

TYPICAL PERFORMANCE CURVES

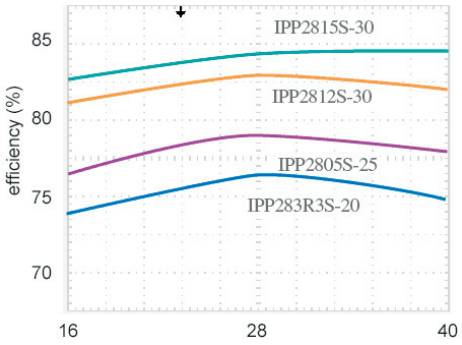
IPP2805S-25 Output Ripple Voltage



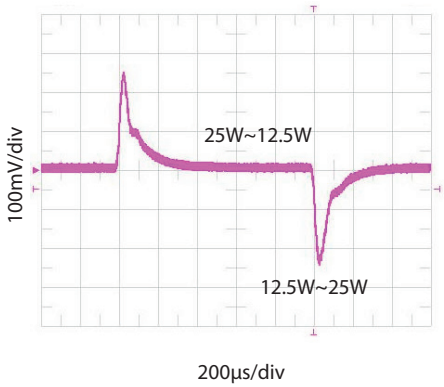
IPP2805S-25 Start-Up



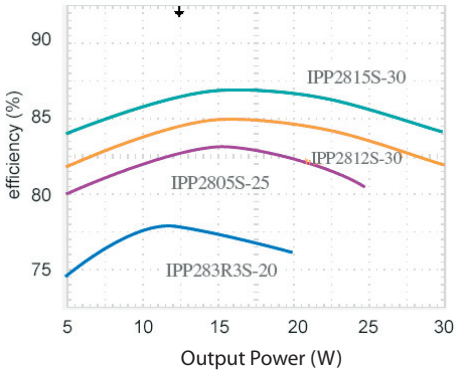
Efficiency vs. Input Voltage



IPP2805S-25 Load Step 50% - 100% - 50%



Efficiency vs. Output Power



APPLICATION NOTES

Inhibit Function

The INH pin is used to control the on/off inhibit function. A connection to Pin 2 is not necessary for normal operation of the converter. Shut down may be implemented by simply pulling Pin 2 below 0.3V referenced to common input.

Over-Current / Short-Circuit Protection

The IPP28XXS-30 series of DC-DC converters feature internal over-current / short-circuit protection. When operating under a load fault condition, the converter will automatically activate the over-current / short-circuit protection feature and restore the converter to normal operating condition when the load fault is removed. It is suggested that the duration of the over-current / short-circuit be less than 10s, and the case temperature lower than 105°C, or the module will shut down.

Ripple Voltage Suppress

If the output voltage ripple needs to be reduced for a particular application, adding a high quality 50V / 10µF film or ceramic filter capacitor between Vo+ and Vo- outputs is recommended.

Synchronization

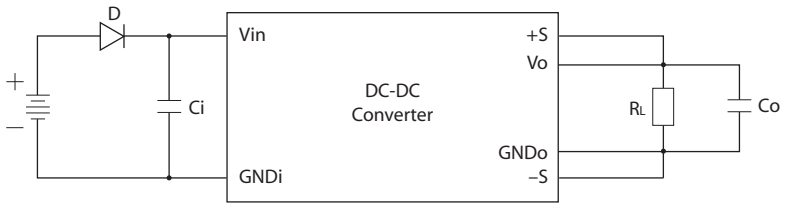
The IPP28XXS-30 series of DC-DC converters allows the designer to match the switching frequency of the converter to the frequency of an external system clock or synchronize several modules by use of the synchronization pin. The frequency ranges are from 200KHz to 350KHz, the voltage level ranges is from -0.3V to 10V, and the duty cycle range is from 40% to 60%. Under a master and slave configuration, the master module will deliver ±3mA, and the slave will deliver ±0.5mA maximum.

Remote Sensing

Remote sense allows the user to compensate for voltage drop between the output of the converter and the point ofregulation. The total voltage which may be compensated for is 0.5V in both leads (+) and (-). Mark the connection to the regulation point within 1.2 meters of the converter output terminals.

REVERSE POLARITY PROTECTION

To avoid damage to the converter caused by reverse input connections, it is advised to connect a diode, in series, with the input pin of the converter, as shown below.



ORDERING INFORMATION

IP P 28 15 S – 30 H I

- Grade: I = Industrial E = High Reliability
- Package Style: H = H Style Blank = K Style
- Output Power: 30 = 30W
- Number of Outputs: S = Single
- Output Voltage: 15 = 15V
- Input Voltage: 28 = 28V
- Hermiticity: P = Stannic Seam Welding Process
- Model Number

PRODUCT GRADE

Military (M) and high reliability (E) products are hermetically sealed with a Parallel Seam Welding process. There are two Package styles (H and K) for customers to choose from. Please refer to the package outline drawing below and note your preferred package style when ordering.

MARKING SPECIFICATION

Serial Number: DC 0821 001, example indicates this product has been manufactured in the 21st week of 2008, and the sequence number is 001.

ENVIRONMENTAL SCREENING

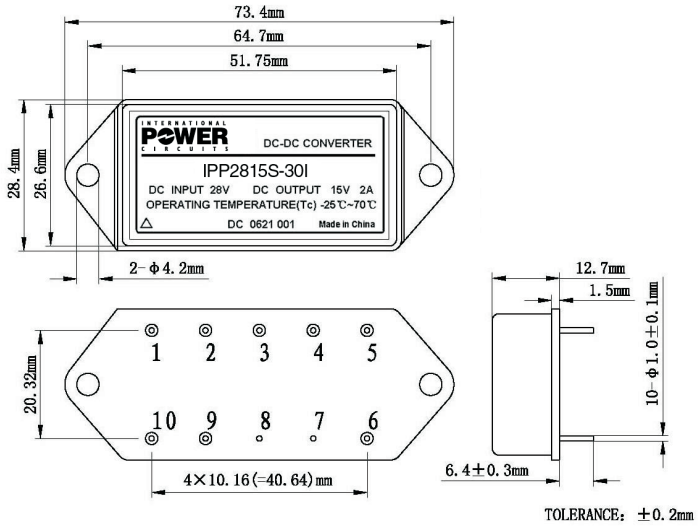
TEST ITEM	METHOD	CONDITION	E	I
PRE-CAP INSPECTION	MIL-STD-883 METHOD 2017	–	Yes	Yes
TEMP-CYCLE	MIL-STD-883 METHOD 1010	–55°C to +125°C (E), 10 Times	Yes	–
CONSTANT ACCELERATION	MIL-STD-883 METHOD 2001	500 g, Y1, 1 Minute	Yes	–
BURN-IN	MIL-STD-883 METHOD 1015	+85°C, 96 Hours	Yes	–
		+85°C, 48 Hours	–	Yes
FINAL ELECTRICAL TEST	MIL-PRF-38534	+25°C	Yes	Yes
		+85°C	Yes	–
		–40°C	Yes	–
FINAL VISUAL INSPECTION	MIL-STD-883 METHOD 2009	–	Yes	Yes

MECHANICAL SPECIFICATIONS

WEIGHT:	≤ 53 g
VOLUME:	18.6 cm^3
ENCAPSULATION:	SOLDER SEAL
SHELL MATERIAL:	COLD ROLLED STEEL
PACKAGE STYLES:	H OR K, PLEASE INDICATE PACKAGE STYLE WHEN ORDERING

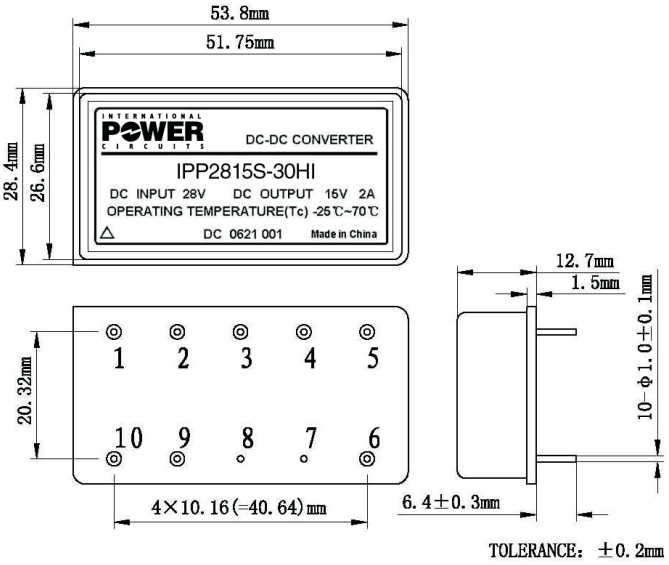
PACKAGES

Package Style K



PIN FUNCTIONS (I/E)		PIN
POSITIVE INPUT	$+V_{IN}$	1
INHIBIT	INH	2
SENSE RETURN	−S	3
OUTPUT COMMON	GND_0	4
POSITIVE OUTPUT	$+V_0$	5
POSITIVE SENSE	+S	6
CASE GROUND	CASE	7
CASE GROUND	CASE	8
SYNC	SYN	9
INPUT COMMON	$-V_{IN}$	10

Package Style H



Notes

1. Please properly connect pins of power module to PCB following instructions of part's specification.
2. To prevent pins of power module from being stressed to cause glass insulators cracked and power module leaked, please install power module with fixed flanges or screws prior to welding pins of power module.
3. The bottom of power module should be stressed to heat sink tightly. If necessary, thermal washers and shockproof gaskets are employed.
4. In any case, bending of pins should be avoided to keep glass insulators from cracking and prevent power module from leaking.

