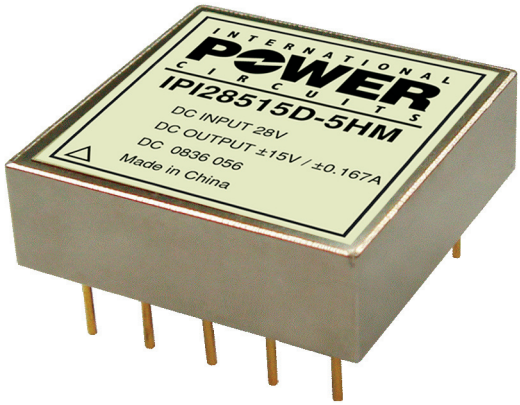
IPI28XXS/D-5HM

Single/Dual Output Series
High Reliability DC-DC Converters



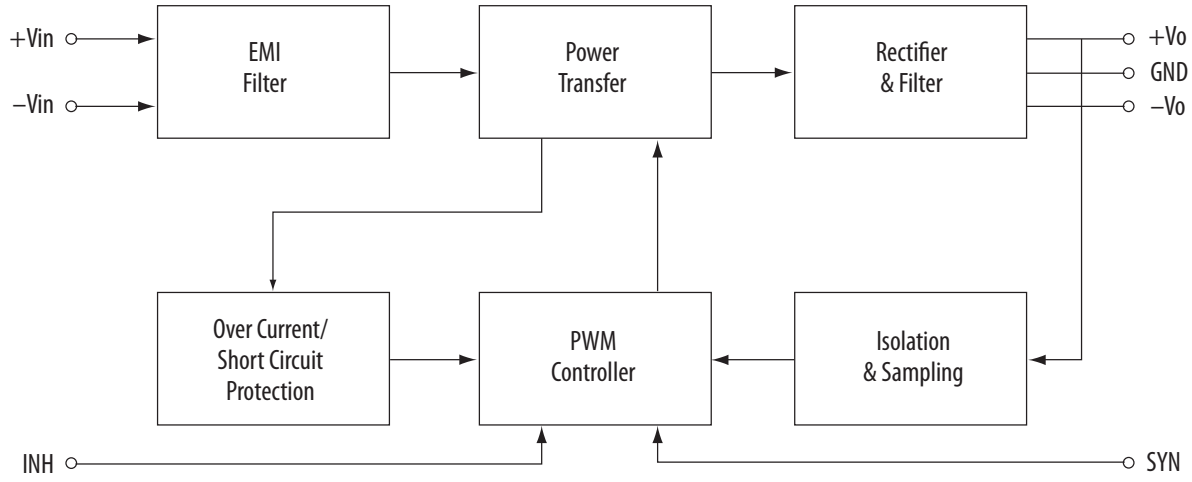
FEATURES

- **High reliability, compact size**
- **Fully Isolated**
- **Input Voltage range: $16V_{DC}$ to $40V_{DC}$**
- **Output Power: 5W**
- **Inhibit function**
- **Short-circuit protection**
- **Hermetically sealed metal DIP package**

DESCRIPTION

The IPI28XXS/D-5HM 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 5V, 12V or 15V with output power rating of 5W. The switching frequency is fixed at 430KHz 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 $16V_{DC}$ to $40V_{DC}$. The IPI28XXS/D-5HM series also provide control functions such as shut down and over-current / short-circuit protection.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

INPUT VOLTAGE:	$16V_{DC}$ – $40V_{DC}$	
OUTPUT POWER:	5W	
OPERATING TEMP (Tc):	–55°C to +105°C (M)	–40°C to +85°C (E)
STORAGE TEMP:	–55°C to +125°C	
PIN SOLDER TEMP (10S):	300°C	

ELECTRICAL CHARACTERISTICS – SINGLE OUTPUT

PARAMETER	CONDITIONS	IPI2805S-5HM			IPI2812S-5HM			IPI2815S-5HM			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	V_{IN}=28V_{DC}	4.95	5.00	5.05	11.88	12.00	12.12	14.85	15.00	15.15	V_{DC}
OUTPUT CURRENT	V_{IN} =16V_{DC} 40V_{DC}	0	–	1000	0	–	417	0	–	333	mA
OUTPUT POWER	V_{IN} =16V_{DC} 40V_{DC}	0	–	5	0	–	5	0	–	3	W
OUTPUT RIPPLE VOLTAGE [1]	V_{IN}=28V_{DC} FULL LOAD 20MHz	–	30	50	–	30	50	–	30	50	mV_{pp}
	MIN-MAX T_C	–	50	100	–	50	100	–	50	100	
LINE REGULATION	V_{IN} =16V_{DC} 40V_{DC}	–	10	20	–	10	20	–	10	20	mV
	MIN-MAX T_C	–	10	20	–	10	20	–	10	20	
LOAD REGULATION	V_{IN}=28V_{DC}	–	10	20	–	10	20	–	10	20	mV
	MIN-MAX T_C	–	10	20	–	10	20	–	10	20	
INPUT VOLTAGE	CONTINUOUS	16	28	40	16	28	40	16	28	40	V
	50V/50ms	–	–	50	–	–	50	–	–	50	
INPUT CURRENT	NO LOAD	–	10	20	–	10	20	–	10	20	mA
	FULL LOAD	–	238	–	–	230	–	–	235	–	mA
	INHIBITED	–	3	6	–	3	6	–	3	6	mA
INPUT RIPPLE CURRENT	V_{IN}=28V_{DC} FULL LOAD 20MHz	–	25	50	–	25	50	–	25	50	mApp
EFFICIENCY	V_{IN}=28V_{DC} FULL LOAD	71	75	–	75	77	–	75	77	–	%
SHORT CIRCUIT POWER DISSIPATION	V_{IN}=28V_{DC} FULL LOAD	–	0.2	1	–	0.2	1	–	0.2	1	W
STEP LOAD RESPONSE, TRANSIENT	50%-100%-50%	–	±100	±200	–	±100	±200	–	±100	±200	mV
STEP LOAD RESPONSE, TRANSIENT RECOVERY		–	200	300	–	200	300	–	200	300	µs
STEP LINE RESPONSE, TRANSIENT	16-40-16V_{DC}	–	50	100	–	100	200	–	100	200	mV
STEP LINE RESPONSE, TRANSIENT RECOVERY		–	200	300	–	200	300	–	200	300	µs
START-UP	DELAY	–	2	5	–	2	5	–	2	5	ms
	FULL LOAD OVERSHOOT	–	0	50	–	0	50	–	0	50	mVpk
INSULATION RESISTANCE	≥100M @ 500 V_{DC} (input-output any pins to case)										

NOTES

1. Using tip and barrel measurement.
2. 25°C Tc, Vin= 28V_{DC}, 100% load, unless otherwise specified.

ELECTRICAL CHARACTERISTICS – DUAL OUTPUT

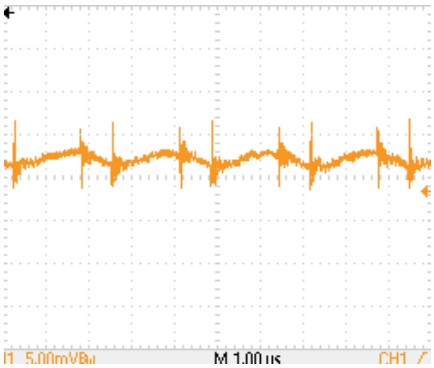
PARAMETER	CONDITIONS		IPI2812D-5HM			IPI2815D-5HM			UNITS
			MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	V_{IN}=28V_{DC}	+Vo	11.88	12.00	12.12	14.85	15.00	15.15	V
OUTPUT CURRENT	V_{IN} =16V_{DC} 40V_{DC}	+Vo	0	–	208	0	–	167	mA
OUTPUT POWER	V_{IN} =16V_{DC} 40V_{DC}		0	–	5	0	–	5	W
OUTPUT RIPPLE VOLTAGE [1]	VIN=28V_{DC} FULL LOAD 20MHz		–	30	50	–	30	50	mV_{p-p}
	MIN-MAX T_C		–	50	100	–	50	100	
LINE REGULATION	V_{IN} =16V_{DC} 40V_{DC}	+Vo	–	10	30	–	10	30	mV
		–Vo	–	10	30	–	10	30	
LOAD REGULATION	V_{IN} =28V_{DC}	+Vo	–	10	30	–	10	30	mV
		–Vo	–	10	30	–	10	30	
CROSS REGULATION	20%-80%		–	2	5	–	2	5	%
	10%-50%		–	1	2	–	1	2	
INPUT VOLTAGE	CONTINUOUS		16	28	40	16	28	40	V_{DC}
	50V/50ms		–	–	50	–	–	50	
INPUT CURRENT	NO LOAD		–	20	30	–	20	30	mA
	FULL LOAD		–	230	–	–	230	–	mA
	INHIBITED		–	3	5	–	3	5	mA
INPUT RIPPLE CURRENT	V_{IN}=28V_{DC} FULL LOAD 20MHz		–	20	50	–	20	50	mA_{p-p}
EFFICIENCY	V_{IN}=28V_{DC} FULL LOAD		71	76	–	75	78	–	%
SHORT CIRCUIT POWER DISSIPATION	V_{IN}=28V_{DC} FULL LOAD		–	0.2	1	–	0.2	1	W
STEP LOAD RESPONSE, TRANSIENT ±Vo	50%-100%-50%		–	±100	±200	–	±100	±200	mV
STEP LOAD RESPONSE, TRANSIENT RECOVERY			–	100	200	–	100	200	µs
STEP LINE RESPONSE, TRANSIENT ±Vo	16-40-16V_{DC}		–	–	±100	–	–	±100	mV
STEP LINE RESPONSE, TRANSIENT RECOVERY			–	–	200	–	–	200	µs
START-UP	DELAY		–	5	10	–	5	10	ms
	FULL LOAD OVERSHOOT		–	–	50	–	–	50	mVpk
INSULATION RESISTANCE	≥100MΩ @ 500V_{DC} (input-output; any pins to case)								

NOTES

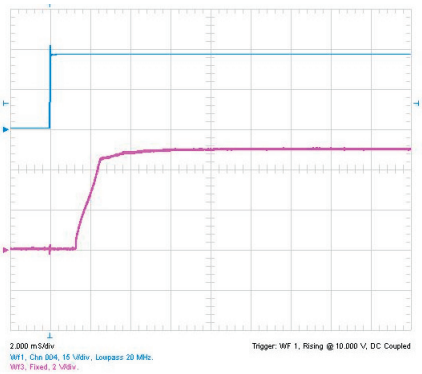
1. Using tip and barrel measurement.
2. 25°C Tc, 28VDC Vin, 100% load, unless otherwise specified.

TYPICAL PERFORMANCE CURVES – SINGLE OUTPUT

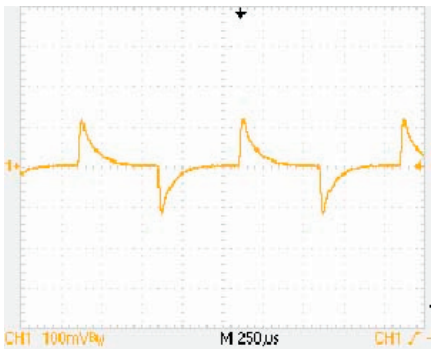
Output Ripple Voltage



Start-Up

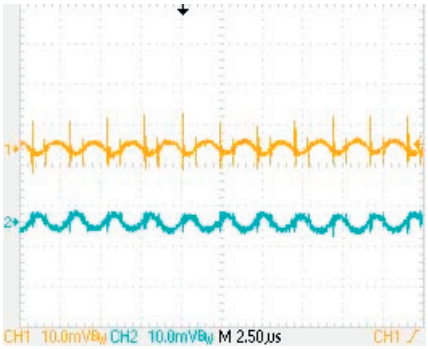


Efficiency vs. Input Voltage

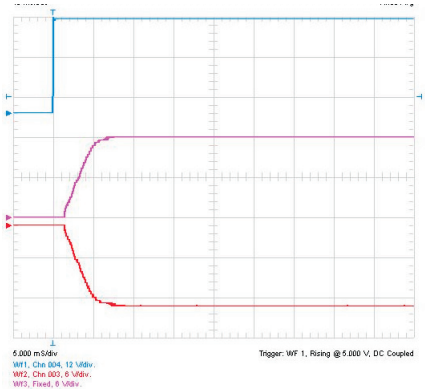


TYPICAL PERFORMANCE CURVES – DUAL OUTPUT

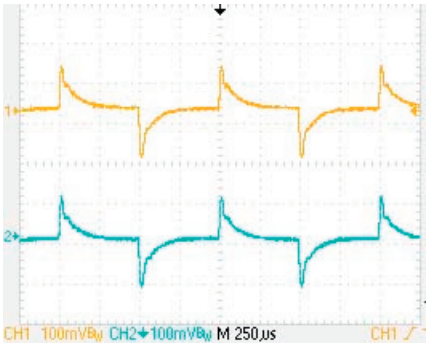
Output Ripple Voltage



Start-Up



Efficiency vs. Input Voltage



APPLICATION NOTES

Inhibit Function

The INH pin is used to control the on/off inhibit function. A connection to Pin 5 is not necessary for normal operation of the converter. Shut down may be implemented by simply pulling Pin 5 below 0.3V referenced to common input.

Over-Current / Short-Circuit Protection

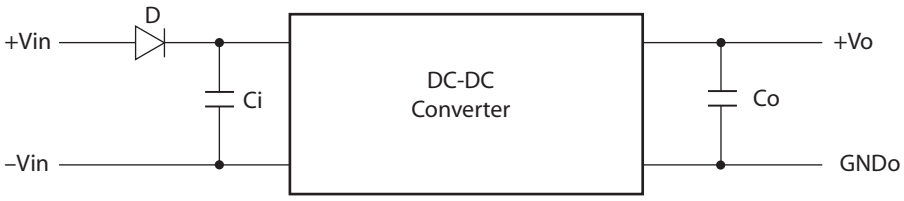
Thel IPI28XXS/D-5HM series of DC-DC converters feature internal over-current / short-circuit protection. When operating under a load fault condition, the converter will automatically activate the over-current / short-circuit protection feature and restore the converter to normal operating condition when 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.

REVERSE POLARITY PROTECTION

To avoid the input reverse connection, it's advised to connect a diode in series with the input pin of the converter. (See below)



ORDERING INFORMATION

IP I 28 05 S – 5 H M

- M: Grade: M = Military E = High Reliability
- H: Package Style: H = H Style
- 5: Output Power: 5 = 5W
- S: Number of Outputs: S= Single D=Dual
- 05: Output Voltage: 05 = 5V
- 28: Input Voltage: 28 = 28V
- I: Hermeticity: I = Hermetically Sealed
- IP: Model Number

MARKING SPECIFICATION

Serial Number: DC 0621 001, which indicates this product has been manufactured in the 21st week of 2006, and the sequence number is 001.

ENVIRONMENTAL SCREENING M/E:

NUMBER	TEST ITEM	METHOD	REQUEST	CONDITION
1	INTERNAL VISUAL	MIL-STD-883 METHOD 2017	100%	–
2	TEMP-CYCLE	MIL-STD-883 METHOD 1010	100%	–55°C to +125°C , 10 Times
3	CONSTANT ACCELERATION	MIL-STD-883 METHOD 2001	100%	3000 g, (Seam Seal)/500g, (Stannic Seal), Y1, 1 Minute
4	BURN-IN	MIL-STD-883 METHOD 1015	100%	T_C +105°C (M) 160h, +85°C (E), 85h
5	FINAL ELECTRICAL TEST	MIL-PRF-38534	100%	–55°C, +25°C, +105°C (M) –40°C, +25°C, +85°C (E)
6	SEAL (FINE AND GROSS)	MIL-STD-883 METHOD 1014	100%	Fine Leak, Cond. A1 (Seam Seal) Gross Leak, Cond. C1
7	EXTERNAL VISUAL	MIL-STD-883 METHOD 2009	100%	–

ENVIRONMENTAL SCREENING I:

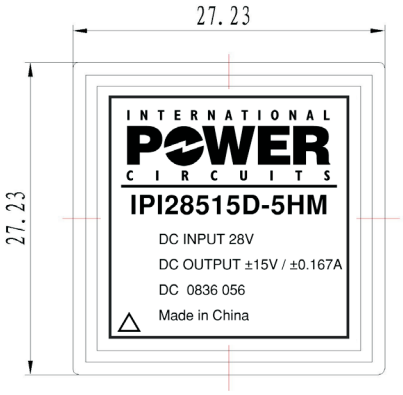
NUMBER	TEST ITEM	METHOD	REQUEST	CONDITION
1	INTERNAL VISUAL	MIL-STD-883 METHOD 2017	100%	–
2	BURN-IN	MIL-STD-883 METHOD 1015	100%	T_C +85°C 48h
3	FINAL ELECTRICAL TEST	MIL-PRF-38534	100%	+25°C
4	EXTERNAL VISUAL	MIL-STD-883 METHOD 2009	100%	–

MECHANICAL SPECIFICATIONS

ENCAPSULATION: SEAM SEAL/STANNIC SEAL
SHELL MATERIAL: COLD ROLLED STEEL

PACKAGE OUTLINE

Package Style H



PIN FUNCTIONS SINGLE (M/E)		PIN	PIN FUNCTIONS DUAL (M/E)		PIN
POSITIVE INPUT	$+V_0$	1	POSITIVE INPUT	$+V_0$	1
POSITIVE COMMON	GND_0	2	POSITIVE COMMON	GND_0	2
NO CONNECTION	NC	3	NEGATIVE OUTPUT	$-V_0$	3
NO CONNECTION	NC	4	NO CONNECTION	NC	4
INHIBIT	INH	5	INHIBIT	INH	5
POSITIVE INPUT	$+V_{IN}$	6	POSITIVE INPUT	$+V_{IN}$	6
INPUT COMMON	$-V_{IN}$	7	INPUT COMMON	$-V_{IN}$	7
CASE GROUND	CASE	8	CASE GROUND	CASE	8