



HR300™ dc-dc converters combine the small size and high reliability of hybrid-based components, the high efficiency of switching regulators, and the isolation, regulation, and low noise characteristics of linear regulators.

SMALL SIZE AND HIGH RELIABILITY

HR300 dc-dc converters use thick-film hybrid manufacturing techniques for smaller size, lighter weight and higher reliability than converters produced with other circuit techniques. With a footprint of less than 3.2 square inches and a 0.5 inch maximum height, the HR300 converters reach power densities up to 22 watts per cubic inch.

The HR300 parts use the same manufacturing procedures and quality controls that Interpoint applies to converters built for aerospace and military applications. The converters are hermetically sealed in metal packages that are guaranteed a maximum leak rate of 10^{-3} atm-cc/sec. 24-hour burn-in at maximum operating temperature and 100% electrical testing are standard.

HIGH PERFORMANCE

HR300 converters utilize a constant frequency pulse-width modulated switching regulator design operating in the forward mode with a clock switching frequency of 240 to 300 kHz. Isolation is achieved through the use of a transformer in the forward power circuit and an optocoupler in the feedback control loop. The full load output power of 30 watts is available over the entire 18 to 36 Vdc input range. On dual output models, up to 90% of full power is available from either output up to a combined total of 30 watts.

The HR300's high efficiency is maintained over the entire input voltage range and from approximately 25% of full load to full load (see typical efficiency curves).

Short circuit protection is provided through foldback current limiting. When the output current reaches approximately 125% of the full rated load, the output voltage begins

- Up to 30 watts output power
- Less than 3.2 square inches of board area
- Hermetically sealed metal case
- Short circuit protected
- Up to 86% typical efficiency
- 18 to 36 Vdc input range
- Single or dual outputs
- Low profile (1/2 inch max.)

to reduce to protect the converter. The converter can sustain a true short circuit condition indefinitely. The HR300's flanged case facilitates removal of heat and provides for mechanically secure mounting. If full power operation or indefinite short circuit protection is a system requirement, the HR300 converter should be mounted with an efficient heat sink in contact with the mounting flange.

Internal filters in all HR300 converters provide low noise on both the input and outputs. On HR301 models, two-section L-C filters limit output ripple voltage and reflected input ripple current. On HR302 models, single-section L-C filters perform the same function.

For maximum output regulation, the HR301-2805 is provided with external output voltage remote sense pins. Connecting the remote sense pins to the load provides a four-terminal voltage mode which eliminates the adverse effects of line resistance voltage drops. Remote sense pins may be left unconnected, but see cautions in this data sheet. For normal operation, remote sense pins should be connected to the respective output pins.

OUTPUT INHIBIT

An inhibit is provided to allow a logic input to shut down the converter. An open circuit on the inhibit pin (pin 2) allows normal operation. A connection between the inhibit pin and the input common (pin 10) disables the internal oscillator, shutting down the output. The inhibit pin has an open circuit voltage of 11 to 16 Vdc. In the inhibit mode, approximately 1 mA must be sunk. An active low open collector is required to activate the inhibit function.

CHARACTERISTICS: Tcase = 25°C, VIN = 28 Vdc unless otherwise specified.

CLOCK FREQUENCY = 240 to 300 kHz

I/O ISOLATION = 100 megohm minimum at 500 Vdc

OPERATING TEMPERATURE = -40°C to 85°C

TRANSIENT PROTECTION: Up to 50 Vdc for 50 m-sec.

BURN-IN: 24 hrs. at 85°C

HERMETICITY: Leak rate less than 1×10^{-3} atm-cc/sec

CASE & PIN MATERIAL: Cold rolled steel with fused tin finish

HR301-2850, HR301-2812, HR301-2815 DC-DC CONVERTERS

PARAMETER	CONDITIONS	HR301-2805			HR301-2812			HR301-2815			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
INPUT VOLTAGE	Tcase = -40°C to +85°C	19	—	36	18	—	36	18	—	36	Vdc
INPUT CURRENT	NO LOAD	—	15	—	—	20	—	—	20	—	mA
OUTPUT VOLTAGE		4.95	5.0	5.05	11.88	12.0	12.12	14.85	15.0	15.15	Vdc
OUTPUT CURRENT	VIN = min. to 36 Vdc	—	—	6.0	—	—	2.5	—	—	2.0	A
OUTPUT POWER	Tc = -40°C to +85°C	—	—	30.0	—	—	30.0	—	—	30.0	watts
EFFICIENCY	Po = 30W Rated Load	79	82	—	80	84	—	82	86	—	%
LINE 1/ REGULATION	Po = 30W VIN = min. to 36 Vdc	—	7	25	—	10	40	—	10	40	mV
LOAD 1/ REGULATION	Po = 0 to 30W	—	5	25	—	10	40	—	10	40	mV
OUTPUT RIPPLE VOLTAGE	FULL LOAD BW ≤ 2 MHz	—	30	60	—	30	70	—	30	75	mVp-p
INPUT RIPPLE CURRENT	FULL LOAD BW ≤ 2 MHz	—	5	15	—	10	25	—	10	25	mA p-p
STARTUP 2/ TIME	FULL LOAD	—	15	—	—	30	—	—	40	—	msec
STARTUP OVERSHOOT	FULL LOAD	—	500	—	—	1200	—	—	1500	—	mV
INPUT/OUTPUT CAPACITANCE		—	80	—	—	80	—	—	80	—	pF
INHIBIT PIN OPEN CKT V	Tcase = 25°C	11	—	16	11	—	16	11	—	16	V
INHIBIT PIN CURRENT	UNIT INHIBITED PIN 2 ≤ 1 V	—	1.0	—	—	1.0	—	—	1.0	—	mA
TEMP COEFF OF OUTPUT VOLTAGE	-40°C to +85°C	—	±.01	—	—	±.01	—	—	±.01	—	%/°C
WEIGHT		—	—	60	—	—	60	—	—	60	grams

CAUTION: Permanent damage to the HR301-2805 will result if pin 6 is shorted to ground. Damage may also result if pin 4 or pin 5 is disconnected from the load during operation with the remote sense leads connected to load.

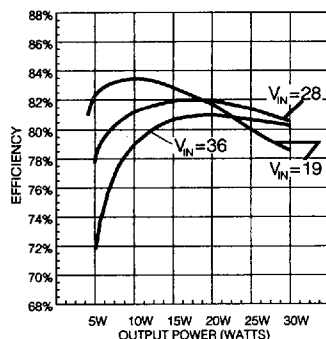
If remote sense pins are not connected to load, output voltage of the HR301-2805 will rise to approximately 6.2 Vdc measured across pins 4 and 5.

NOTES:

1/ With remote sense pins connected to load and no resistance between output pins and load.

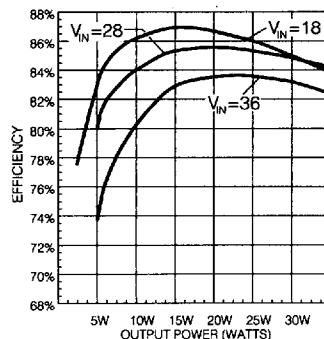
2/ A low output impedance power source is required on the input to realize this startup time. If less than full surge current is available, startup time will be longer.

TYPICAL PERFORMANCE CURVES:



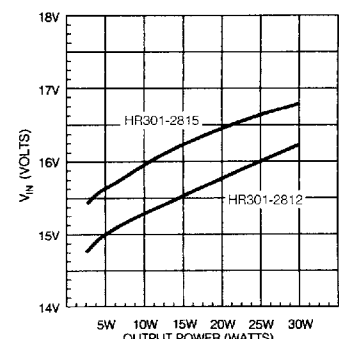
HR301-2805 EFFICIENCY VS LINE AND LOAD

Figure 1



HR301-2812 EFFICIENCY VS LINE AND LOAD

Figure 2



LOWLINE DROPOUT VS. LOAD

Figure 3

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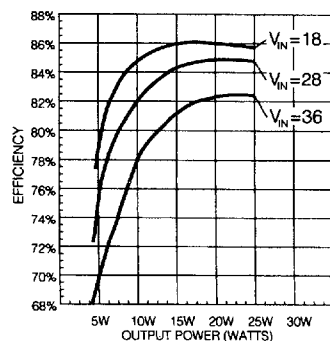
HR302-2812 and HR302-2815 DC-DC CONVERTERS

PARAMETER	CONDITIONS	HR302-2805			HR302-2812			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
INPUT VOLTAGE	Tcase = -40°C to +85°C	18	—	36	18	—	36	Vdc
INPUT CURRENT	NO LOAD	—	35	50	—	45	60	mA
OUTPUT VOLTAGE	Po = 18 to 36 Vdc	+11.88 -11.88	+12.0 -12.0	+12.12 -12.12	+14.85 -14.85	+15.0 -15.0	+15.15 -15.15	Vdc
OUTPUT 1/ CURRENT	VIN = min. to 36 Vdc	—	—	2.5	—	—	2.0	A
OUTPUT POWER	Tcase = -40°C to +85°C	—	—	30.0	—	—	30.0	watts
EFFICIENCY	Po = Max Rated Load	80	84	—	81	85	—	%
LINE REGULATION	Po = 30W VIN = 18 to 36 Vdc	—	10	30	—	10	40	mV
LOAD REGULATION	Po = 0 to 30W	—	20	60	—	20	60	mV
OUTPUT RIPPLE VOLTAGE	FULL LOAD BW ≤ 2 MHz	—	50	90	—	50	90	mVp-p
INPUT RIPPLE CURRENT	FULL LOAD BW ≤ 2 MHz	—	15	60	—	15	60	mA p-p
STARTUP 2/ TIME	FULL LOAD	—	60	—	—	60	—	msec
STARTUP OVERSHOOT	FULL LOAD	—	1500	—	—	1500	—	mV
INPUT/OUTPUT CAPACITANCE		—	—	70	—	—	60	pF
INHIBIT PIN OPEN CKT V	Tcase = 25°C	8	—	12	10	—	14	V
CROSS REGULATION	+Po = 3W (+) -Po = 3W to 27W	—	2.5	3.5	—	2.2	3.2	%
	+Po = 3W (-) -Po = 3W to 27W	—	2.5	3.5	—	2.2	3.2	%
TEMP COEFF OF OUTPUT VOLTAGE	-40°C to +85°C	—	±.01	—	—	±.01	—	%/°C
WEIGHT		—	—	60	—	—	60	grams

NOTES:

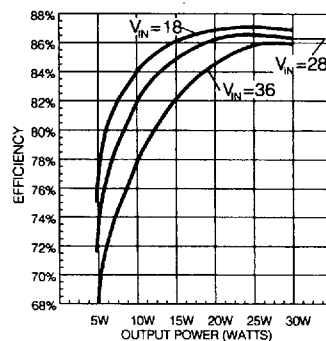
- 1/ Up to 90% full power is available from either output providing the total output power does not exceed 30 watts.
- 2/ A low output impedance power source is required on the input to realize this startup time. If less than full surge current is available, startup time will be longer.

TYPICAL PERFORMANCE CURVES:



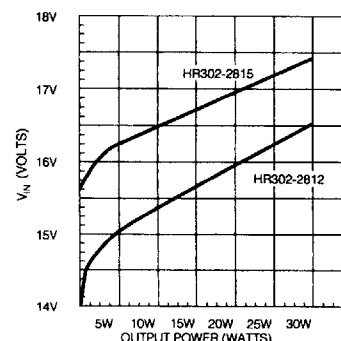
HR302-2812 EFFICIENCY VS LINE AND LOAD

Figure 4



HR302-2815 EFFICIENCY VS LINE AND LOAD

Figure 5

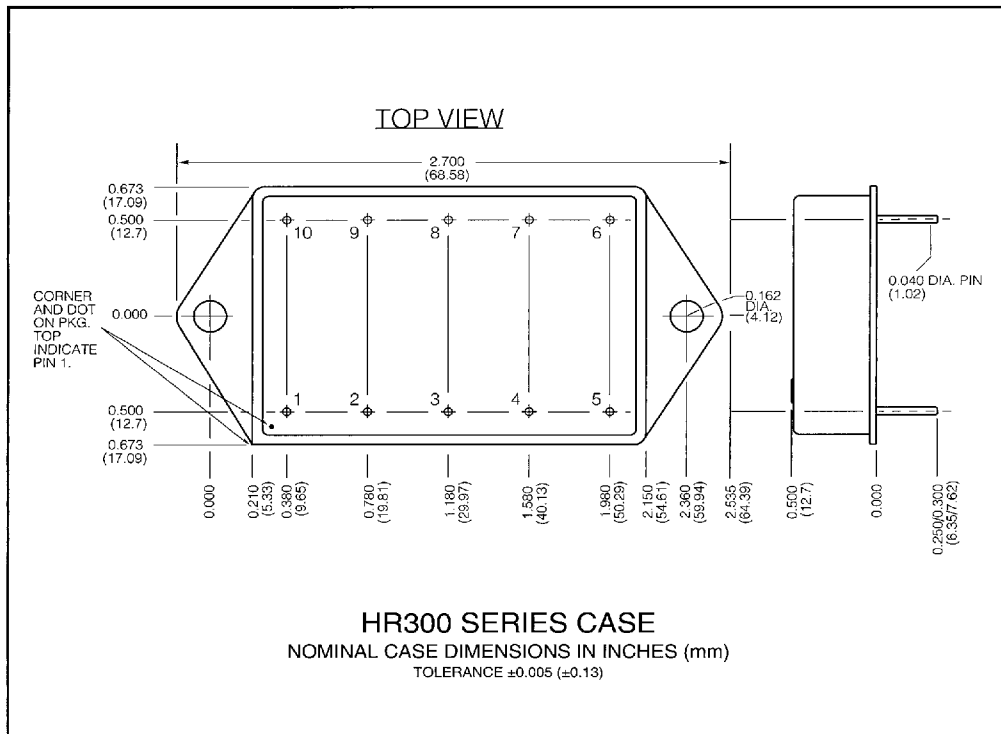


LOWLINE DROPOUT VS. LOAD

Figure 6

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METAL HERMETIC 10-PIN DIP PACKAGE



	HR301-2805, 2812 2815	HR302-2812 2815
DESIGNATION	PIN NO.	PIN NO.
Positive input	1	1
Inhibit	2	8
Neg. remote sense (301-2805 only)	3	N/A
Output common	4	4
Positive output	5	3
Pos. remote sense (301-2805 only)	6	N/A
Case ground	7	7
Negative output	N/A	5
Input common	10	9, 10
All Other Pins — No Connection		

CAUTION: Heat from reflow or wave soldering may damage this converter. Solder pins individually with heat application NOT exceeding 300°C for 10 seconds per pin.