

DC/DC CONVERTERS 28 VOLT INPUT

HR150
SERIES
20 WATT

NOT RECOMMENDED FOR NEW DESIGNS

FEATURES

- -40°C to +85°C operation
- 18 to 36 VDC input
- Transient protection 50 V for 50 ms for 28 Vin models
- Fully isolated
- Fixed frequency switching
- Output trim on single output models
- Inhibit function
- Indefinite short circuit protection
- Up to 86% efficiency



MODELS VDC OUTPUT		
SINGLE	DUAL	TRIPLE
5	±12	+5 & ±12
12	±15	+5 & ±15
15		

Size (max.): HR151 and HR152 models, case H6
2.110 x 1.1120 x 0.495 inches (53.59 x 28.45 x 12.57 mm)
HR153 models, case F4
1.950 x 1.350 x 0.505 inches (49.53 x 34.29 x 12.83 mm)
See cases F4 and H6 for dimensions.
Weight: HR151 and HR152: 50 grams typical. HR153: 53 grams typical.
Screening: Standard only. See screening table for more information.

DESCRIPTION

The HR150 Series™ DC/DC converters have been designed to give industrial applications the same high reliability, small size, and high performance that Interpoint has provided to military and aerospace programs since 1969.

HIGH RELIABILITY

Each HR150 converter is built to perform reliably in the harshest environments. Assembled using thick-film hybrid technology, HR150 converters have more uniform thermal coefficients and 50% fewer connections than converters built by surface mount techniques. The HR150 converter parts use the same manufacturing procedures and quality controls that we apply to converters designed for commercial airliners, the space shuttle, advanced fighter aircraft, and other high reliability applications. The steel cases are hermetically sealed in a dry nitrogen environment and are guaranteed a maximum leak rate of less than 10^{-3} atm-cc/sec. All devices are 100% electrically tested.

SMALL SIZE – LOW PROFILE

The HR150 Series manufacturing techniques provide extremely small size and low profile components. Each converter uses less than 2.7 square inches of board area. The overall power density is from 11 to 17 watts per cubic inch.

HIGH PERFORMANCE

The HR150 Series converters are high efficiency, low noise, pulse width modulated, forward mode switching regulators with a constant switching frequency of 125 kHz typical for single and dual output

models and 250 kHz typical for triple output models. They achieve high isolation (500 V, 100 megohm) through use of a transformer in the forward power circuit and an opto-coupler in the feedback control loop.

HR 150 Series input voltage range is 18 to 36 VDC. Outputs are available as 5, 12, 15, ±12, ±15, +5/±12, and +5/±15 VDC. The converters typically provide greater than 80% efficiency over the entire input range and from 25% to full load. Line regulation is typically within 0.1 % and load regulation within 0.2%.

HR150 converters are designed to operate between -40°C and +85°C case and are short circuit protected up to a case temperature of 85°C. The combination of high conversion efficiency and heat dissipating metal enclosures minimizes heat sinking requirements. If additional dissipation is desired, heat conducting material (PCB, copper sheet, heat sink, etc.) may be brought into contact with the unit's baseplate.

An inhibit function is provided for HR150 converters when the inhibit input pin is connected to the input common. The open circuit voltage of the inhibit input pin is 11 to 13 VDC. The inhibit input pin must sink approximately 1 mA during the inhibit state. During inhibit, the converter's output voltage drops to less than 1 volt and the input current is typically 8 mA.

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ABSOLUTE MAXIMUM RATINGS

Input Voltage

- 18 to 36 VDC

Output Power

- 15 watts (HR151-2812 & HR151-2815, 20 watts)

Lead Soldering Temperature (10 sec)

- 300°C

Storage Temperature Range (Case)

- -55°C to +125°C

TYPICAL CHARACTERISTICS

Output Voltage Temperature Coefficient

- 150 ppm/°C, typical

Input to Output Capacitance

- 60 pF, typical

Isolation

- 100 megohm minimum at 500 V

Conversion Frequency

- 250 kHz

Inhibit Pin Voltage (unit enabled)

- 11 to 13 V HR15X-28XX models

Line Regulation

- 0.1% typical, 0.2% maximum

Load Regulation

- 0.2% typical, 0.4% maximum

INHIBIT

Inhibit TTL Open Collector

- Logic low (output disabled)
 - Inhibit pin current 1 mA typical
 - Inhibited input current 8 mA typical
- Referenced to input common
- Logic high (output enabled)
 - Open collector

RECOMMENDED OPERATING CONDITIONS

Input Voltage Range

- 18 to 36 VDC continuous
- 50 V/50 ms transient

Case Operating Temperature (Tc)

- -40°C to +85°C full power
- -40°C to +105°C absolute

Derating Output Power/Current

- Linearly from 100% at 85°C to 0% at 105°C for HR151 and HR152 models
- Linearly from 100% at 85°C to 0% at 115°C for HR153 models

Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

SINGLE OUTPUT MODELS, 28 V IN		HR151-2805			HR151-2812			HR151-2815			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		4.90	5.0	5.05	11.88	12	12.12	14.85	15	15.15	VDC
OUTPUT CURRENT		—	—	3.0	—	—	1.667	—	—	1.333	A
OUTPUT POWER		—	—	15	—	—	20	—	—	20	W
OUTPUT RIPPLE	0 TO 1 MHz	—	30	60	—	40	80	—	40	80	mV p-p
INPUT VOLTAGE	CONTINUOUS	18	28	36	18	28	36	18	28	36	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	—	20	—	—	30	—	—	30	mA
INPUT RIPPLE CURRENT	0 TO 2 MHz	—	25	50	—	25	50	—	25	50	mA p-p
EFFICIENCY		75	81	—	76	82	—	77	83	—	%

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Electrical Characteristics: 25°C Tc, 28 VDC Vin, 100% load, unless otherwise specified.

DUAL OUTPUT MODELS		HR152-2812			HR152-2815			UNITS
PARAMETER	CONDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE		±11.88	±12	±12.12	±14.85	±15	±15.15	VDC
OUTPUT CURRENT		—	—	±625	—	—	±500	mA
OUTPUT POWER		—	—	15	—	—	15	W
OUTPUT RIPPLE	0 TO 1 MHz	—	30	50	—	30	50	mV p-p
INPUT VOLTAGE	CONTINUOUS	18	28	36	18	28	36	VDC
	TRANSIENT 50 ms	—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD	—	—	35	—	—	35	mA
INPUT RIPPLE CURRENT	0 TO 2 MHz	—	25	50	—	25	50	mA p-p
EFFICIENCY		75	79	—	75	79	—	%

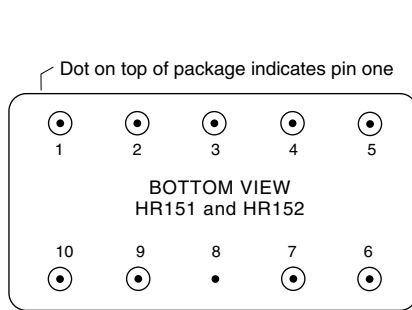
TRIPLE OUTPUT MODELS			HR153-2812			HR153-2815			UNITS
PARAMETER	CONDITIONS		MIN	TYP	MAX	MIN	TYP	MAX	
OUTPUT VOLTAGE	FULL LOAD	MAIN	4.95	5.00	5.05	4.95	5.00	5.05	VDC
		DUAL	±11.88	±12	±12.12	±14.85	±15	±15.15	
OUTPUT CURRENT	MAIN ¹		100	—	2000	100	—	2000	mA
	DUAL		—	—	±208	—	—	±167	
OUTPUT POWER	MAIN		—	—	10	—	—	10	W
	±DUAL		—	—	2.5	—	—	2.5	
	TOTAL		—	—	15	—	—	15	
OUTPUT RIPPLE	0 TO 1 MHz	MAIN	—	40	80	—	40	80	mV p-p
		DUAL	—	20	40	—	20	40	
INPUT VOLTAGE	CONTINUOUS		18	28	36	18	28	36	VDC
	TRANSIENT 50 ms		—	—	50	—	—	50	V
INPUT CURRENT	NO LOAD		—	—	50	—	—	50	mA
INPUT RIPPLE CURRENT	0 TO 2 MHz		—	40	80	—	40	80	mA p-p
EFFICIENCY			75	79	—	75	79	—	%

Notes

1. Minimum load required for full output capability on auxiliary outputs. Minimum current can be reduced when dual outputs are used at reduced loads.

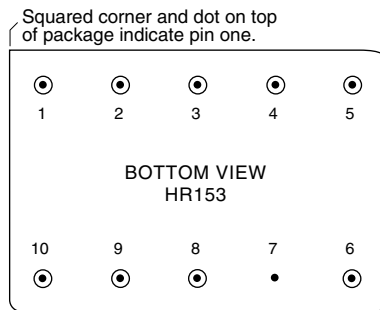
PIN OUT

Pin	Single Output	Dual Output	Triple Output
1	Positive Input	Positive Input	Positive Input
2	Inhibit	Inhibit	Main (+5) Output
3	Trim	Positive Output	Output Common
4	Output Common	Output Common	Neg. Aux. Output
5	Positive Output	Negative Output	Pos. Aux. Output
6	No connection	No connection	No connection
7	No connection	No connection	Case Ground
8	Case Ground	Case Ground	Inhibit
9	No connection	No connection	No connection
10	Input Common	Input Common	Input Common



See case H6 for dimensions.

FIGURE 1: HR151 AND HR152 PIN OUT



See case F4 for dimensions.

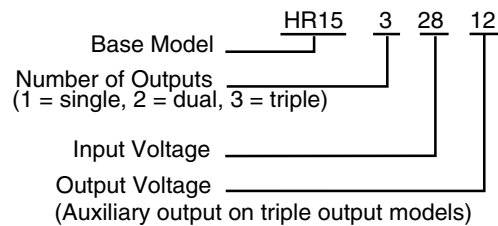
FIGURE 2: HR153 PIN OUT

OUTPUT ADJUSTMENT RESISTOR VALUES FOR HR151-2805

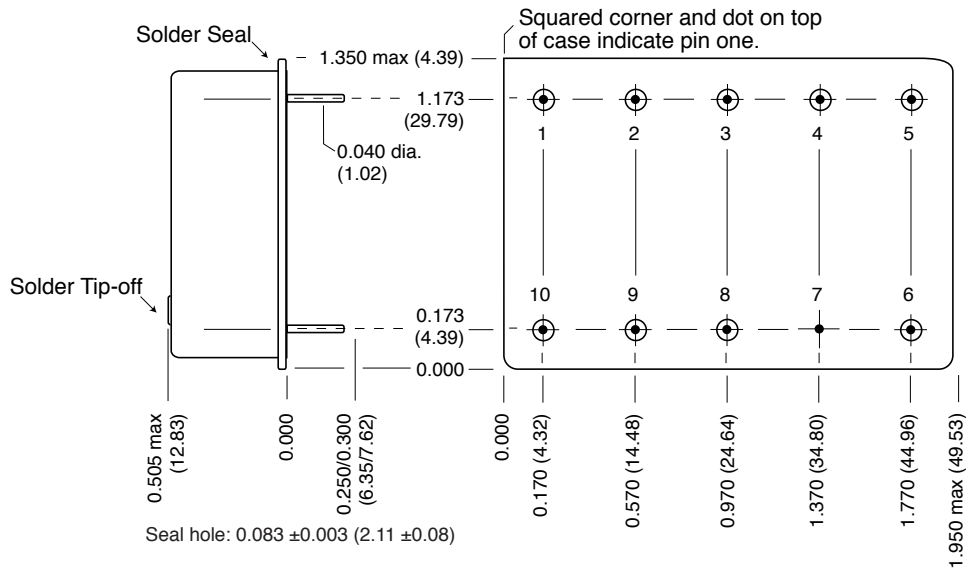
Resistance Pin 3 to 4	Output Voltage Increase (%)
∞	0
390K	+1%
145K	+2%
63K	+3%
22K	+4%
0	+5%

Output Adjustment all HR151 models (single output):
The output can be adjusted upward by using the output adjust (pin3). The resistance between output adjust (pin 3) and output common (pin 4) will determine the magnitude of the increase in the output. The table above is only applicable to HR151-2805.

MODEL NUMBERING KEY



BOTTOM VIEW CASE F4



Case dimensions in inches (mm)

Tolerance ± 0.005 (0.13) for three decimal places
 ± 0.01 (0.3) for two decimal places
 unless otherwise specified

CAUTION

Heat from reflow or wave soldering may damage the device.
 Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials

Header Cold Rolled Steel/Nickel/Tin
 Cover Cold Rolled Steel/Nickel/Tin
 Pins #52 alloy, compression glass seal or ceramic seal

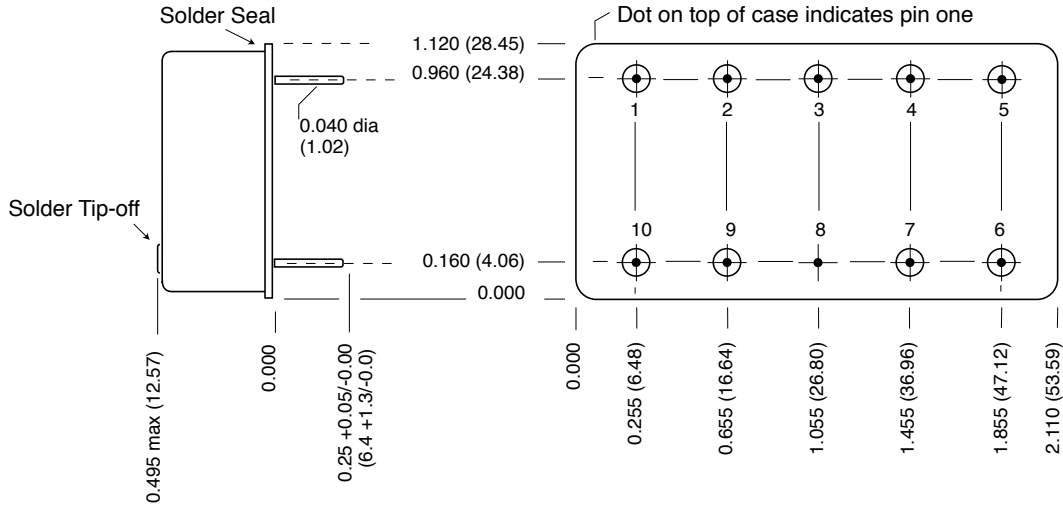
Case F4, Rev C, 20060802

Please refer to the numerical dimensions for accuracy. All information is believed to be accurate, but no responsibility is assumed for errors or omissions. Interpoint reserves the right to make changes in products or specifications without notice.

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FIGURE 3: CASE F4 – HR153

BOTTOM VIEW CASE H6



Case dimensions in inches (mm)

Tolerance ± 0.005 (0.13) for three decimal places
 ± 0.01 (0.3) for two decimal places
 unless otherwise specified

CAUTION

Heat from reflow or wave soldering may damage the device.
 Solder pins individually with heat application not exceeding 300°C for 10 seconds per pin.

Materials

Header Cold Rolled Steel/Nickel/Tin
 Cover Cold Rolled Steel/Nickel/Tin
 Pins #52 alloy, compression glass seal or ceramic seal

Case H6, Rev D, 20100211

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FIGURE 4: CASE H6 – HR151 AND HR152

HR INDUSTRIAL (STANDARD, NON-QML) PRODUCTS ENVIRONMENTAL SCREENING

TEST PERFORMED	HR INDUSTRIAL STANDARD NON-QML ¹
Pre-cap Inspection Method 2017, 2032	yes
Final Electrical Test MIL-PRF-38534, Group A Subgroups 1 and 4: +25°C case	yes
Hermeticity Test Gross Leak, Dip (1×10^{-3})	yes
Final visual inspection Method 2009	yes

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Notes:

1. Standard, non-QML products, do not meet all of the requirements of MIL-PRF-38534.