

Efficiency

Figures 4 and 5 below present the typical efficiency performance and the efficiency performance over the specified temperature range of -35°C to +185°C of a standard 5V output model.

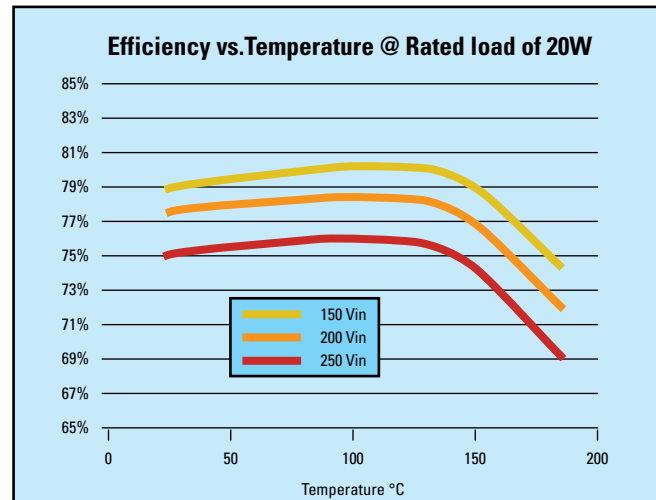
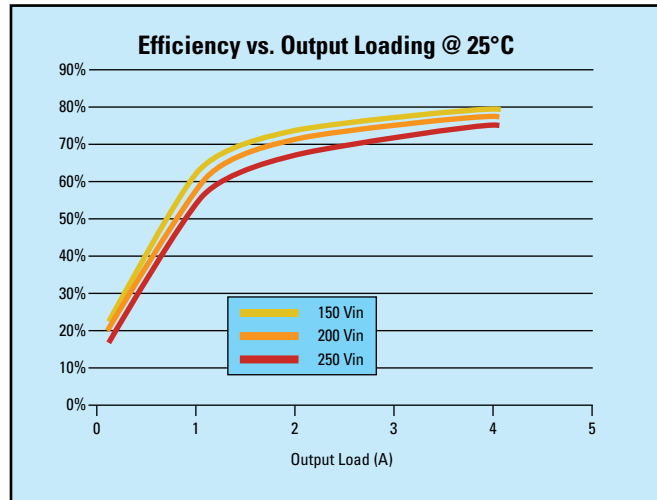
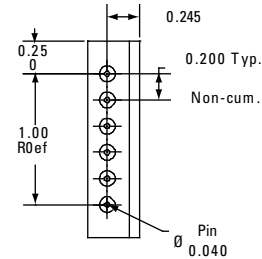
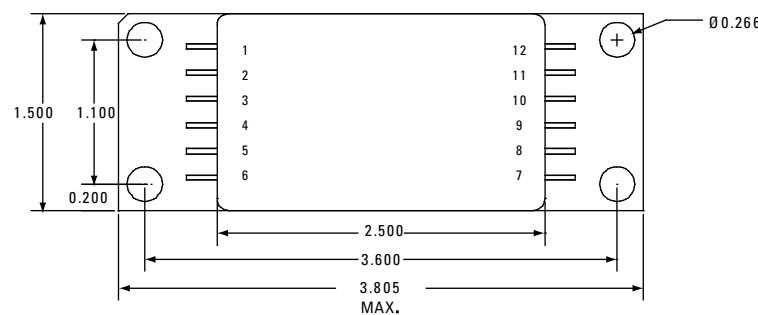


Figure 4 – Typical Efficiency Performance with Respect to Output Load and Input Voltage, HTA20005S (5V Output)

Figure 5 – Typical Efficiency Performance with Respect to Operating Temperature, HTA20005S (5V Output)

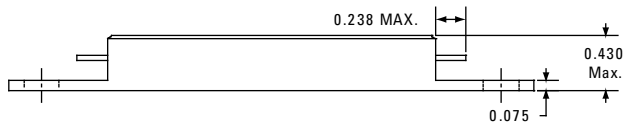
Mechanical Outline



Pin Designation (Single/Dual)

Pin #	Single	Dual
1	DC Input	DC Input
2	Input Return	Input Return
3	Case	Case
4	Enable	Enable
5	Sync. Output	Sync. Output
6	Sync. Input	Sync. Input
7	+ Output	+ Output
8	Output Return	Output Return
9	-Sense	- Output
10	+ Sense	N/C
11	Trim *	Trim
12	N/C	N/C

\*Trim pin for Single Output modules is reserved for future use. This pin must not be used or connected for any purpose



NOTES: UNLESS OTHERWISE SPECIFIED, DIMENSIONAL TOLERANCE IS: 0.005"

Data sheets, qualification report, stress and thermal analysis reports are available. To order, please contact your local sales representative.

HTA Series Features

- 150 to 250V DC input voltage range
- Up to 20W output power
- Single and Dual output models include 3.3V, 5V, 12V, 15V, +5V, ±12V, and ±15V
- Internal EMI filter
- Configurable in series for higher voltage and higher power output
- Magnetic coupled feedback for robust performance under extreme temperatures
- High efficiency - to 76%
- -35°C to +185°C operating case temperature range
- Isolated input, output and case
- Short circuit and overload protection
- Adjustable output voltage
- Remote error sensing
- Remote ON/OFF command control
- Light weight, < 70 grams
- Small form factor: 4.0"L x 1.5"W x 0.46"H

Also Available:

- HTH27022S: 270V input, 22V output, 2.5A, 55 W DC-DC converter, rated at 175°C, 4.0" x 2.15" x 0.4"
- HTM27092S: 270V input, 92V output, 1A, 92 W, DC-DC converter, rated at 175°C, 4.5" x 2.15" x 0.4"

HTA Series: DC-DC Converters for High Temperature and High Shock Environments, Qualified for Oil Exploration Tools



The HTA series is a family of DC-DC converters capable of providing up to 20W of output power over the extreme case temperatures of -35°C to +185°C. They are available in single and dual output configurations. The HTA series is the first family of commercial off the shelf (COTS) converters in the industry designed specifically for high temperature and operations requiring input voltage in the range of 150 to 250V DC. Input and output are galvanically isolated to protect the output loads from catastrophic system failures at the input side and to provide the flexibility of stacking several converters to obtain a higher output voltage. The converters are hermetically sealed thick film based microelectronic hybrids, with which IR has successfully manufactured and enjoyed world class reliability for almost 30 years.



Figure 1 – A photograph of an HTA DC-DC Converter

This product family offers distinct benefits in short lead time and zero non-recurring costs over the traditional in-house designs as the products are readily available as COTS. The HTA DC-DC converters come standard with functionality and noise control designs that simplify system design and integration. They are ideal as building blocks and intermediate bus converters to source low dropout (LDO) and point of loads (POLs) voltage regulators. Target applications include down-hole oil drilling, seismic survey, aircraft engine controls, other natural resources explorations, and any design applications requiring up to 185°C of operations. Figure 1 is a photograph of an HTA converter uncovered.

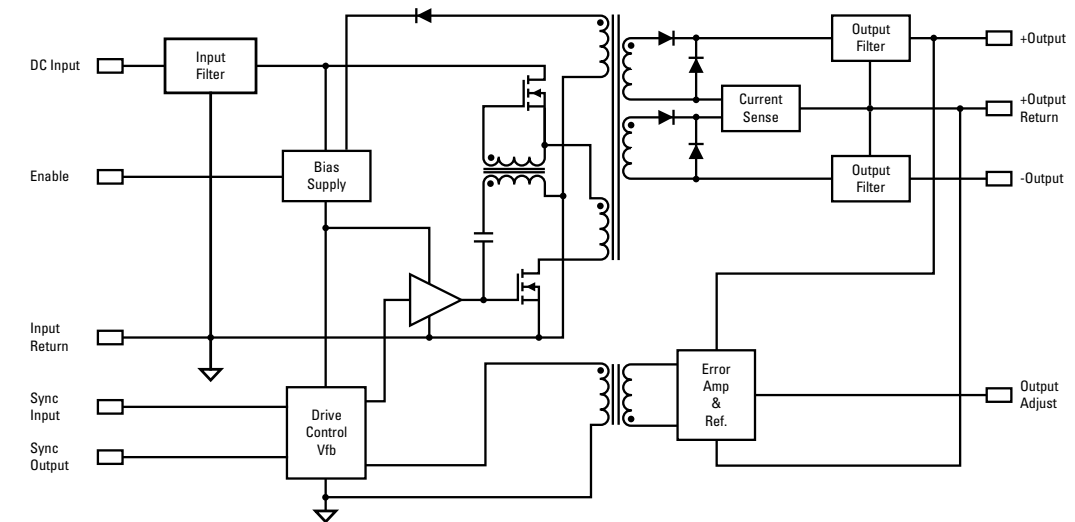


Figure 2 – HTA Dual Output Block Diagram

## Design Topology

Block diagram of a typical HTA dual output model is shown in Figure 2. The HTA series utilizes a single-ended forward topology with resonant reset. Two high voltage power MOSFETs are used in series to accommodate the high operating input voltage and to minimize the voltage stress. The nominal switching frequency is 500KHz. PWM controller incorporates an IR's proprietary custom ASIC to minimize size and components count. Input/output isolation and excellent output voltage regulation are achieved through the use of magnetically coupled feedback. Voltage feed-forward with duty factor limiting provides high line rejection and protection against excessive output over voltage in the event of an internal control loop failure. The design includes an LC input filter to control the conducted emission propagating back on to the input lines. A typical input ripple current is limited to less than 15mA peak-to-peak.

The output section uses two isolated windings with the traditional rectification arrangement followed by the individual low pass output filters to attenuate the higher frequency ripple and noise. The output overload and short circuit protection makes use of the resistance of the inductor wire to minimize power losses. Output voltage is sensed and the control loop is closed across the positive output. The negative output is expected to provide regulation when

the loads of both the positive and negative outputs are balanced. For single output models, only one single secondary winding, associated rectification and filter circuit is used.

## Key Design Benefits

The electrical design with conservative de-rating of electrical components to minimize stress and the hybrid assembly with uni-body package and careful selection of bonding materials have proven to be the key ingredients in the feasibility and long term reliability of the HTA. Following are the key benefits the HTA offers.

- Well characterized performances under the temperature extremes without power de-rating
- Designed for high voltage applications up to 250V continuous operation with 300V for short duration
- Thermal management using proprietary package design
- Low noise design to facilitate system integration
- Qualified high temperature processes for long term mechanical integrity and reliability
- Designed to operate through extended severe shock and vibration environments

## Qualification

The HTA series of DC-DC converters has been internally qualified and is available as COTS. Following is a qualification flow chart depicting the qualification requirements the HTA converters were subjected to and have successfully passed.

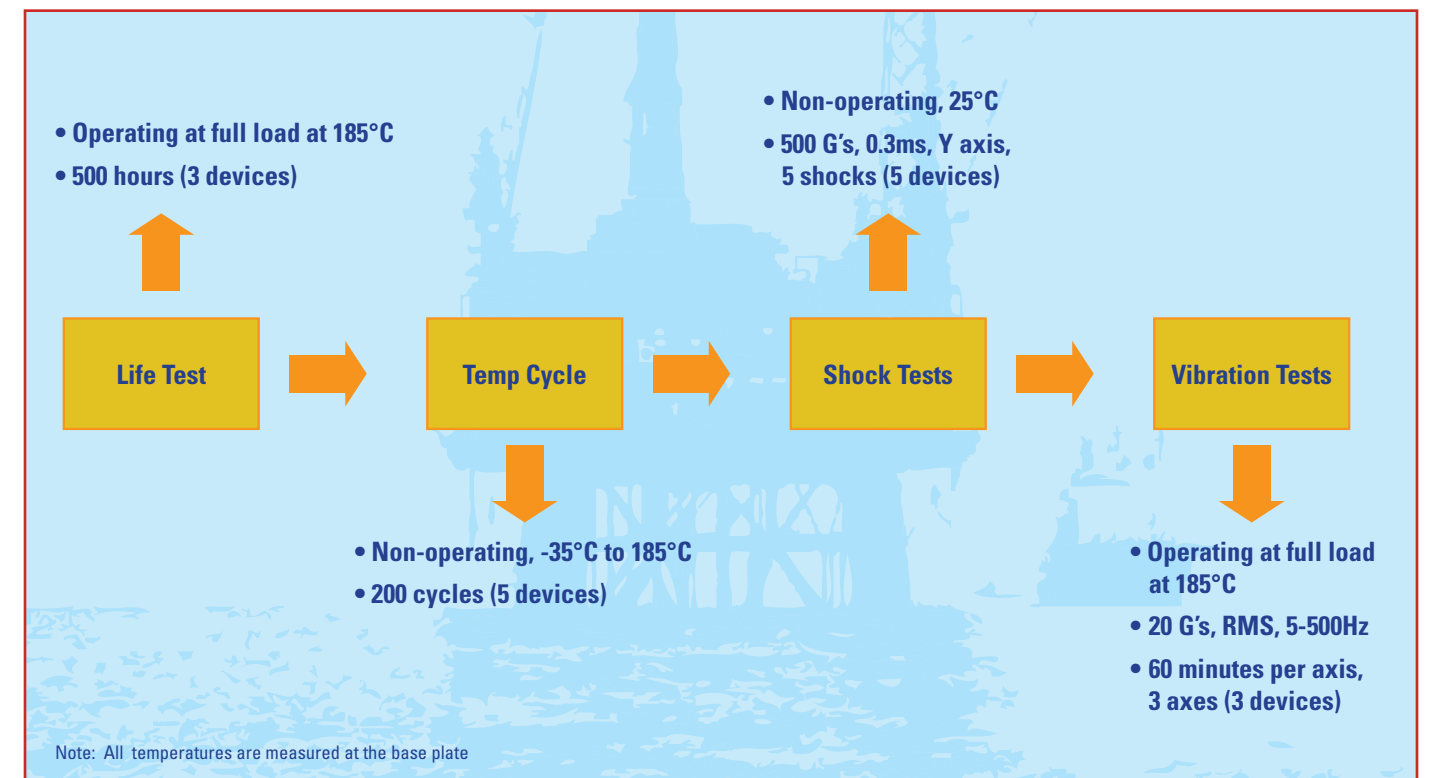


Figure 3 – Qualification Tests