

## Features

- 1.5 to 12 Volt outputs @ up to 60 Amps
- Input range: 36V-75V
- Open frame: 2.3" x 2.4" x 0.42"
- Industry-standard package/pinout
- Light weight: 2.24 ounces (63.5g)
- Remote sense, Trim, On/Off Control
- High efficiency: 92%
- Fully isolated, 2250Vdc (BASIC)
- Input undervoltage shutdown
- Output overvoltage protection
- Short circuit protection; thermal shutdown
- UL60950 and EN60950 safety approvals
- CE mark

DATEL's fully isolated UHP series of DC/DC converters affords users a practical solution for their low-voltage/high-current applications. With an input voltage range of 36 to 75 Volts, the UHP Series delivers up to 60 Amps of output current from a fully regulated 1.8V output, or 50 Amps of 2.5V. Additional outputs are available up to 12V. Using both surface-mount technology and planar magnetics, these converters are manufactured on a 2.3" x 2.4" open-frame package with an industry-standard pinout configuration.

UHP converters utilize a full-bridge, fixed-frequency topology along with synchronous output rectification to achieve a high efficiency of 92%. This efficiency, coupled with the open-frame package that allows unrestricted air flow, reduces internal component temperatures thereby allowing operation at elevated ambient temperatures.

These DC/DC's provide output trim, sense pins and primary side on/off control (available with positive or negative logic). Standard features also include input undervoltage shutdown circuitry, output overvoltage protection, output short-circuit and current limiting protection and thermal shutdown. All devices meet IEC/UL/EN60950 safety standards and carry the CE mark (meet LVD requirements). CB reports are available on request.

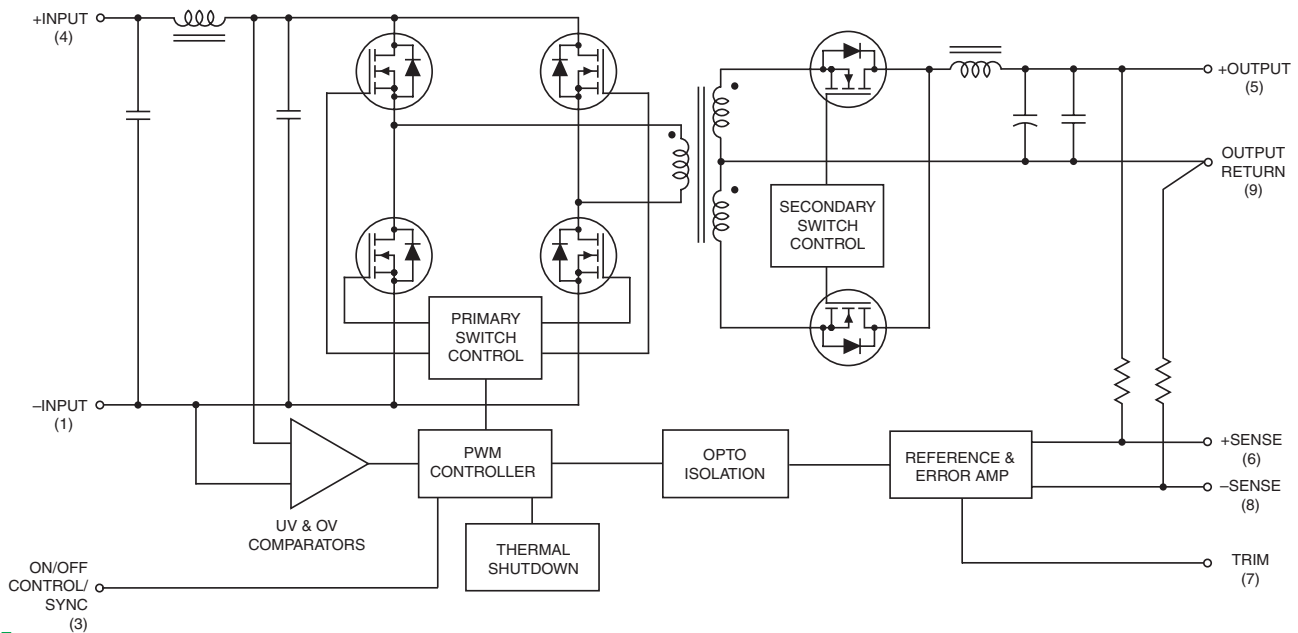


Figure 1. Simplified Schematic



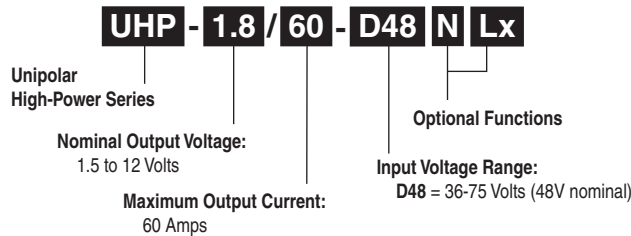
For full details go to  
[www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)

## Performance Specifications and Ordering Guide <sup>①</sup>

Model	Output						Input			Efficiency		Package (Case/ Pinout)
	V <sub>OUT</sub> (Volts)	I <sub>OUT</sub> (Amps)	R/N (mVp-p) <sup>②</sup>		Regulation		V <sub>IN</sub> Nom. (Volts)	Range (Volts)	I <sub>IN</sub> <sup>④</sup> (mA/A)	Full Load	½ Load	
			Typ.	Max.	Line	Load <sup>③</sup>						
UHP-1.5/60-D48	1.5	60	100	150	±0.5%	±0.5%	48	36-75	150/2.4	82.5%	86.5%	C27,P53
UHP-1.8/60-D48	1.8	60	120	150	±0.5%	±0.5%	48	36-75	140/2.7	83%	87%	C27,P53
UHP-2.5/50-D48	2.5	50	80	120	±0.5%	±0.5%	48	36-75	120/3.2	84%	87.5%	C27,P53
UHP-3.3/45-D48	3.3	45	150	190	±0.5%	±1%	48	36-75	120/3.6	87%	89%	C27,P53
UHP-12/21-D48	Please refer to the separate UHP-12/21-D48 data sheet for this model. Contact DATEL.											
UHP-28.2/12-D48	Please refer to the separate UHP-28.2/12-D48 data sheet for this model. Contact DATEL.											

- ① Typical at T<sub>A</sub> = +25°C under nominal line voltage and full-load conditions.
- ② Ripple/Noise (R/N) measured over a 20MHz bandwidth with 10µF tantalum and 1µF ceramic output capacitors.
- ③ Tested from no load to 100% load.
- ④ Nominal line voltage, no load/full load condition.
- ⑤ Contact DATEL for availability and additional technical information.

### PART NUMBER STRUCTURE

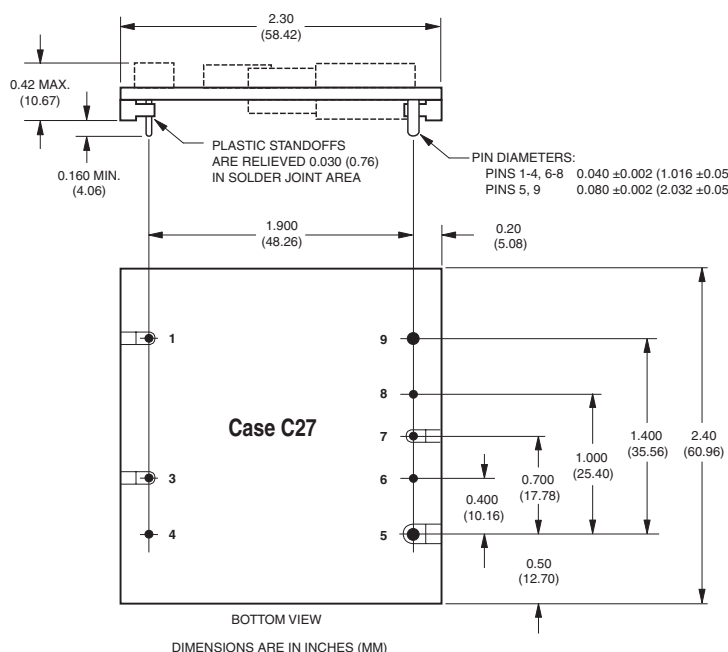


### Optional Functions

UHP Series DC/DC's are designed so a negative logic on/off control ("N" suffix) or a Sync function ("S" suffix) can be added in the pin 3 position.

- Blank**: On/Off Control function (positive polarity)
- N**: Negative polarity on/off control (pin 3)
- S**: Sync function (excludes On/Off Control)
- L1**: Pin length: 0.110 in. (2.79mm) ±0.010
- L2**: Pin length: 0.145 in. (3.68mm) ±0.010

### MECHANICAL SPECIFICATIONS



I/O Connections	
Pin	Function P53
1	-Input
2	No Pin
3	On/Off Control
4	+Input
5	+Output
6	+Sense
7	Trim
8	-Sense
9	-Output

### Performance/Functional Specifications

Typical @ T<sub>A</sub> = +25°C under nominal line voltage, full-load conditions, unless noted. ①

Input	
<b>Input Voltage Range</b>	36-75 Volts (48V nominal)
<b>Overvoltage Shutdown</b>	None (see Absolute Max. Ratings)
<b>Start-Up Threshold</b>	31-35 Volts (33V typical)
<b>Undervoltage Shutdown</b>	30-33 Volts (31.5V typical)
<b>Input Current:</b>	
Normal Operating Conditions	See Ordering Guide
Standby Mode:	
Off, UV, Thermal Shutdown	10mA typical
<b>Input Reflected Ripple Current</b> ④	5mA <sub>p-p</sub>
<b>Internal Input Filter Type</b>	Pi (0.47μF - 1.5μH - 3.3μF)
<b>Reverse-Polarity Protection</b>	None (see Absolute Max. Ratings)
<b>On/Off Control (Pin 3):</b> ③ ⑥	On = open or 3.5V to +V <sub>IN</sub> , I <sub>IN</sub> = less than 50μA Off = 0 to 0.8V, I <sub>IN</sub> = 200μA @ 0V
"N" Suffix Models	On = 0 to 0.8V, I <sub>IN</sub> = TBD @ 0V Off = open or 3.5V to +V <sub>IN</sub>
<b>Sync (Option, Pin 3):</b> ③	
External Clock Frequency	500kHz
Input Voltage Low	2 Volts
Input Voltage High	5 Volts
Input Impedance	4.35kΩ    33pF
Input/Output Pulse Width	85 nsec
Output	
<b>V<sub>OUT</sub> Accuracy:</b>	±1.0% maximum
<b>Minimum Loading Per Specification</b>	No load
<b>Ripple/Noise (20MHz BW)</b> ⑤	See Ordering Guide
<b>Line/Load Regulation</b>	See Ordering Guide
<b>Efficiency</b>	See Ordering Guide
<b>Output Voltage Sense Range</b>	5% (10% for 3.3V models)
<b>Trim Range:</b> ②	
3.3V Output	±10%
1.5, 1.8, 2.5V Output	±5%
<b>Isolation Voltage:</b>	
Input-to-Output	2250Vdc minimum
<b>Isolation Resistance</b>	100MΩ
<b>Isolation Capacitance</b>	940pF
<b>Current Limit Inception:</b> 97% V <sub>OUT</sub>	110% I <sub>OUT</sub>
<b>Short Circuit Current:</b>	TBD Amps average current
<b>Overvoltage Protection:</b>	Comparator, hiccup
1.5V Output	1.7 Volts
1.8V Output	2 Volts
2.5V Output	2.8 Volts
3.3V Output	4.2 Volts
<b>Capacitive Loading Tested To</b>	50,000μF
<b>Temperature Coefficient</b>	±0.02% per °C
Dynamic Characteristics	
<b>Dynamic Load Response:</b>	
1.5V (50-75% load step to 1% V <sub>OUT</sub> )	250μsec maximum
1.8V (50-75% load step to 1% V <sub>OUT</sub> )	250μsec maximum
2.5V (50-75% load step to 1% V <sub>OUT</sub> )	250μsec maximum
3.3V (50-75% load step to 1% V <sub>OUT</sub> )	250μsec maximum

Dynamic Characteristics (continued)	
<b>Start-Up Time:</b>	
V <sub>IN</sub> to V <sub>OUT</sub>	10msec
On/Off to V <sub>OUT</sub>	10msec
<b>Switching Frequency</b>	250kHz (±30kHz)
Environmental	
<b>MTBF</b> ⑦	TBD million hours
<b>Operating Temperature (Ambient):</b> ②	
Without Derating (400lfm)	
1.5V Output	TBD
1.8V Output	+36°C
2.5V Output	TBD
3.3V Output	+35°C
With Derating	See Derating Curves
<b>Thermal Shutdown</b>	125°C
<b>Storage Temperature</b>	-55 to +125°C
Physical	
<b>Dimensions</b>	2.3" x 2.4" x 0.42" (58.4 x 61 x 10.6mm)
<b>Pin Material</b>	Copper, solder coated
<b>Weight:</b>	2.24 ounces (63.5 grams)
<b>Primary to Secondary Insulation Level</b>	Basic

- ① All models are specified with external 10μF tantalum and 1μF ceramic output capacitors.  
 ② See Technical Notes/Graphs for details.  
 ③ The On/Off Control function can be replaced with a Sync function. See Part Number Suffixes and Technical Notes for details.  
 ④ Input Ripple Current is tested/specified over a 5-20MHz bandwidth with an external 33μF input capacitor and a simulated source impedance of 220μF and 12μH. See I/O Filtering, Input Ripple Current and Output Noise for details.  
 ⑤ Output noise may be further reduced with the installation of additional external output capacitors. See Technical Notes.  
 ⑥ On/Off control is designed to be driven with open collector or by appropriate voltage levels. Voltages must be referenced to the -Input (pin 1).  
 ⑦ MTBF's are calculated using Telcordia (Bellcore), ground fixed conditions, +25°C ambient air, and full-load conditions. Contact DATEL for demonstrated life-test data.

Absolute Maximum Ratings	
<b>Input Voltage:</b>	
Continuous:	81 Volts
Transient (100msec):	100 Volts
<b>Input Reverse-Polarity Protection</b>	None. (Input Current must be <1.5A all the time.)
<b>Output Current</b>	Current limited. Devices can withstand an indefinite output short circuit.
<b>On/Off Control (Pin 3) Max. Voltages</b>	
Referenced to -Input (pin 1)	+V <sub>IN</sub>
<b>Storage Temperature</b>	-55 to +125°C
<b>Lead Temperature (Soldering, 10 sec.)</b>	+300°C

These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. Proper operation under conditions other than those listed in the Performance/Functional Specifications Table is not implied, nor recommended.

**TECHNICAL NOTES**

**Input Fusing**

Certain applications and/or safety agencies may require the installation of fuses at the inputs of power conversion components. Fuses should also be used if the possibility of sustained, non-current-limited, input-voltage polarity reversals exists. For DATEL UHP Series DC/DC Converters, we recommend the use of slow-blow type fuses, installed in the ungrounded input supply line, with values no greater than the following.

Output	Fuse Value
1.5 $V_{OUT}$	TBD Amp
1.8 $V_{OUT}$	TBD Amp
2.5 $V_{OUT}$	TBD Amp
3.3 $V_{OUT}$	TBD Amp

All relevant national and international safety standards and regulations must be observed by the installer. For system safety agency approvals, the converters must be installed in compliance with the requirements of the end-use safety standard, i.e. IEC/EN/UL60950.

**Input Reverse-Polarity Protection**

The UHP Series does not have reverse polarity protection. If the input voltage polarity is accidentally reversed, an internal diode will become forward biased. The current however is limited to 1.6A. If this current is exceeded, it could cause permanent damage to the converter.

**Input Undervoltage Shutdown and Start-Up Threshold**

Under normal start-up conditions, devices will not begin to regulate properly until the ramping-up input voltage exceeds the Start-Up Threshold Voltage (33V typ.). Once operating, devices will not turn off until the input voltage drops below the Undervoltage Shutdown limit (31.5V typ.). Subsequent re-start will not occur until the input is brought back up to the Start-Up Threshold. This built in hysteresis prevents any unstable on/off situations from occurring at a single input voltage.

**Start-Up Time**

The  $V_{IN}$  to  $V_{OUT}$  Start-Up Time is the interval of time between the point at which the ramping input voltage crosses the Start-Up Threshold and the fully loaded output voltage enters and remains within 90% of  $V_{OUT}$ . Actual measured times will vary with input source impedance, external input capacitance, and the slew rate and final value of the input voltage as it appears at the converter. The UHP Series implements a soft start circuit that limits the duty cycle of its PWM controller at power up, thereby limiting the input inrush current.

The On/Off Control to  $V_{OUT}$  start-up time assumes the converter has its nominal input voltage applied but is turned off via the On/Off Control pin. The specification defines the interval between the point at which the converter is turned on (released) and the fully loaded output voltage enters and remains within its specified accuracy band.

Similar to the  $V_{IN}$  to  $V_{OUT}$  start-up, the On/Off Control to  $V_{OUT}$  start-up time is also governed by the internal soft start circuitry and external load capacitance. The difference in start up time from  $V_{IN}$  to  $V_{OUT}$  and from On/Off Control to  $V_{OUT}$  is therefore insignificant.

**Input Overvoltage Shutdown**

The UHP Series does not feature input overvoltage shutdown. The converters do withstand and fully operate during input transients to 100V for 100msec without interruption; consequently, this function has been disabled. Please contact DATEL to have input overvoltage shutdown enabled.

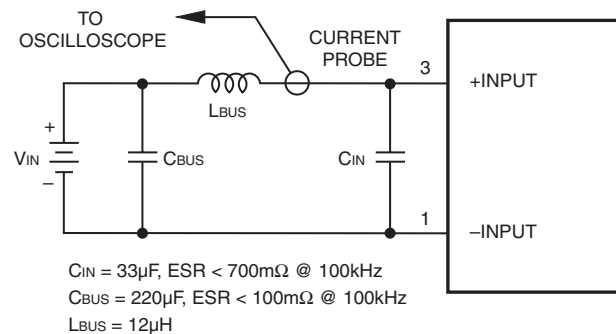
**Input Source Impedance**

The input of UHP converters must be driven from a low ac-impedance source. The DC/DC's performance and stability can be compromised by the use of highly inductive source impedances. The input circuit shown in Figure 2 is a practical solution that can be used to minimize the effects of inductance in the input traces. For optimum performance, components should be mounted as close as possible to the DC/DC converter.

**I/O Filtering, Input Ripple Current, and Output Noise**

All models in the UHP Series are tested/specified for input reflected ripple current and output noise using the specified external input/output components/circuits and layout as shown in the following two figures.

External input capacitors ( $C_{IN}$  in Figure 2) serve primarily as energy-storage elements, minimizing line voltage variations caused by transient IR drops in conductors from backplane to the DC/DC. Input caps should be selected for bulk capacitance (at appropriate frequencies), low ESR, and high rms-ripple-current ratings. The switching nature of DC/DC converters requires that dc voltage sources have low ac impedance as highly inductive source impedance can affect system stability. In Figure 2,  $C_{BUS}$  and L simulate a typical dc voltage bus. Your specific system configuration may necessitate additional considerations.



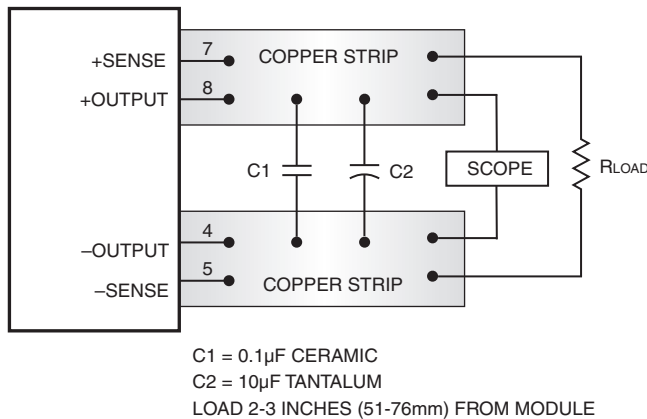
**Figure 2. Measuring Input Ripple Current**

In critical applications, output ripple/noise (also referred to as periodic and random deviations or PARD) may be reduced below specified limits using filtering techniques, the simplest of which is the installation of additional external output capacitors. They function as true filter elements and should be selected for bulk capacitance, low ESR and appropriate frequency response. All external capacitors should have appropriate voltage ratings and be located as close to the converter as possible. Temperature variations for all relevant parameters should also be taken carefully into consideration.

**Single Output, Isolated, Low V<sub>OUT</sub> to 60A  
Half-Brick, DC/DC Converters**

The most effective combination of external I/O capacitors will be a function of line voltage and source impedance, as well as particular load and layout conditions. Our Applications Engineers can recommend potential solutions and discuss the possibility of our modifying a given device's internal filtering to meet your specific requirements. Contact our Applications Engineering Group for additional details.

In Figure 3, the two copper strips simulate real-world PCB impedances between the power supply and its load. In order to minimize measurement errors, scope measurements should be made using BNC connectors, or the probe ground should be as short as possible (i.e. less than ½ inch) and soldered directly to the fixture.



**Figure 3. Measuring Output Ripple/Noise (PARD)**

**Floating Outputs**

Since these are isolated DC/DC converters, their outputs are "floating" with respect to their input. Designers will normally use the -Output (pin 9) as the ground/return of the load circuit. You can however, use the +Output (pin 5) as ground/return to effectively reverse the output polarity.

**Minimum Output Loading Requirements**

UHP converters employ a synchronous-rectifier design topology and all models regulate within spec and are stable under no-load to full load conditions. Operation under no-load conditions however might slightly increase the output ripple and noise.

**Thermal Shutdown**

The UHP converters are equipped with thermal-shutdown circuitry. If environmental conditions cause the temperature of the DC/DC converter to rise above the designed operating temperature, a precision temperature sensor will power down the unit. When the internal temperature decreases below the threshold of the temperature sensor, the unit will self start. See Performance/Functional Specifications.

**Output Overvoltage Protection**

The UHP output voltage is monitored for an overvoltage condition using a comparator. The signal is optically coupled to the primary side and if the output voltage rises to a level which could be damaging to the load, the sens-

ing circuitry will power down the PWM controller causing the output voltage to decrease. Following a time-out period the PWM will restart, causing the output voltage to ramp to its appropriate value. If the fault condition persists, and the output voltage again climbs to excessive levels, the overvoltage circuitry will initiate another shutdown cycle. This on/off cycling is referred to as "hiccup" mode.

**Current Limiting**

As soon as the output current increases to approximately 110% of its rated value, the DC/DC converter will go into a current-limiting mode. In this condition, the output voltage will decrease proportionately with increases in output current, thereby maintaining somewhat constant power dissipation. This is commonly referred to as power limiting. Current limit inception is defined as the point at which the full-power output voltage falls below the specified tolerance. See Performance/Functional Specifications. If the load current, being drawn from the converter, is significant enough, the unit will go into a short circuit condition as described below.

**Short Circuit Condition**

When a converter is in current-limit mode, the output voltage will drop as the output current demand increases. If the output voltage drops too low, the magnetically coupled voltage used to develop primary side voltages will also drop, thereby shutting down the PWM controller. Following a time-out period, the PWM will restart causing the output voltage to begin ramping to their appropriate value. If the short-circuit condition persists, another shutdown cycle will be initiated. This on/off cycling is referred to as "hiccup" mode. The hiccup cycling reduces the average output current, thereby preventing internal temperatures from rising to excessive levels. The UHP Series is capable of enduring an indefinite short circuit output condition.

**Features and Options**

**Remote Sense**

Note: The Sense and V<sub>OUT</sub> lines are internally connected through resistors ( 10Ω). Nevertheless, if the sense function is not used for remote regulation the user should connect the +Sense to +V<sub>OUT</sub> and -Sense to -V<sub>OUT</sub> at the DC/DC converter pins.

UHP Series converters employ a sense feature to provide point of use regulation, thereby overcoming moderate IR drops in pcb conductors or cabling. The remote sense lines carry very little current and therefore require minimal cross-sectional-area conductors. The sense lines, which are capacitively coupled to their respective output lines, are used by the feedback control-loop to regulate the output. As such, they are not low impedance points and must be treated with care in layouts and cabling. Sense lines on a pcb should be run adjacent to dc signals, preferably ground. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.

UHP Series converters will compensate for drops between the output voltage at the DC/DC and the sense voltage at the DC/DC provided that:

$$[V_{out (+)} - V_{out (-)}] - [Sense (+) - Sense (-)] \quad 5\% V_{out}$$

$$(\quad 10\% V_{out} \text{ for } 3.3V \text{ models})$$

Output overvoltage protection is monitored at the output voltage pin, not the Sense pin. Therefore, excessive voltage differences between V<sub>OUT</sub> and Sense in conjunction with trim adjustment of the output voltage can cause the overvoltage protection circuitry to activate (see Performance Specifications for overvoltage limits). Power derating is based on maximum output current and voltage at the converter's output pins. Use of trim and sense functions can cause output voltages to increase, thereby increasing output power beyond the converter's specified rating, or cause output voltages to climb into the output overvoltage region. Therefore, the designer must ensure:

$$(V_{out} \text{ at pins}) \times (I_{out}) \quad \text{rated output power}$$

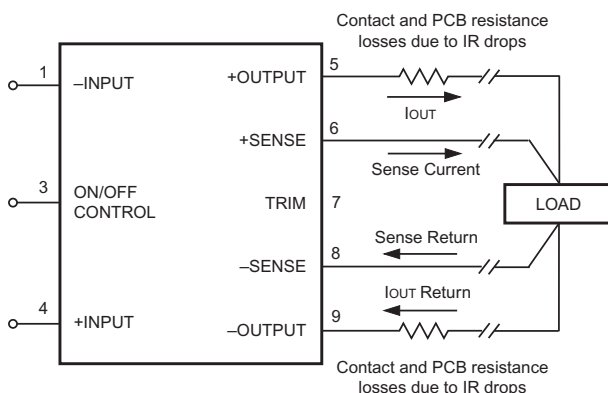


Figure 4. Remote Sense Circuit Configuration

**On/Off Control Function**

The input-side, remote On/Off Control function (pin 3) is specified to operate with either positive (standard) or negative (optional) polarity.

Standard models are equipped with Positive-polarity (no suffix). Positive-polarity devices are enabled when pin 3 is left open (or is pulled high, applying +3.5V to +V<sub>IN</sub> with respect to -Input, pin 1) and are disabled when pin 3 is pulled low (0 to 0.8V with respect to -Input).

"N" suffix models are specified with an optional Negative-polarity; these devices are off when pin 3 is left open (or pulled high, applying +3.5V to +V<sub>IN</sub>), and on when pin 3 is pulled low (0 to 0.8V) with respect to -Input. See Figure 5.

Note: The On/Off Control Function excludes the Sync Function and vice versa.

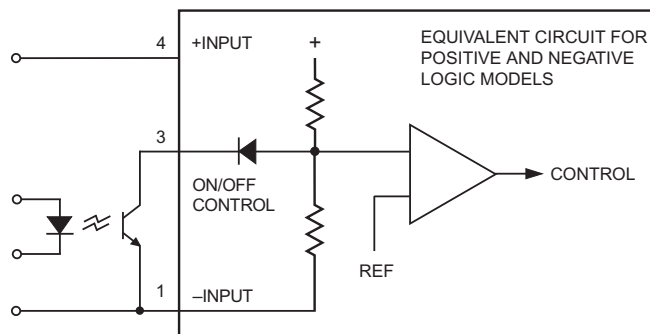


Figure 5. Driving the On/Off Control Pin

Dynamic control of the remote on/off function is best accomplished with a mechanical relay or an open-collector/open-drain drive circuit (optically isolated if appropriate). The drive circuit should be able to sink appropriate current (see Performance Specifications) when activated and withstand appropriate voltage when deactivated. Applying an external voltage to pin 3 when no input power is applied to the converter can cause permanent damage to the converter.

Single Output, Isolated, Low V<sub>OUT</sub> to 60A Half-Brick, DC/DC Converters

**Trimming Output Voltage**

UHP converters have a trim capability (pin 7) that allows users to adjust the output voltage within the specified range. Adjustments to the output voltages can be accomplished via a trim pot (Figure 7) or a single fixed resistor as shown in Figures 8 and 9. A single fixed resistor can increase or decrease the output voltage depending on its connection. The resistor should be located close to the converter and have a TCR less than 100ppm/°C to minimize sensitivity to changes in temperature. If the trim function is not used, leave the trim pin floating.

A single resistor connected from the Trim (pin 7) to the +Sense (pin 6), will increase the output voltage (Figure 8). A resistor connected from the Trim (pin 9) to the -Sense (pin 8), will decrease the output voltage (Figure 9).

Trim adjustments greater than the specified range can have an adverse affect on the converter's performance and are not recommended. Excessive voltage differences between V<sub>OUT</sub> and Sense, in conjunction with trim adjustment of the output voltage, can cause the overvoltage protection circuitry to activate (see Performance Specifications for overvoltage limits). Power derating is based on maximum output current and voltage at the converter's output pins. Use of trim and sense functions can cause output voltages to increase, thereby increasing output power beyond the converter's specified rating or cause output voltages to climb into the output overvoltage region. Therefore:

$$(V_{OUT} \text{ at pins}) \times (I_{OUT}) \leq \text{rated output power}$$

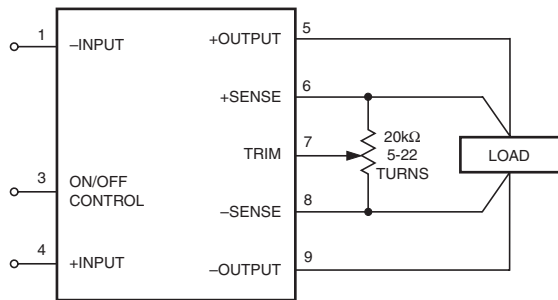


Figure 6. Trim Connections Using A Trim Pot

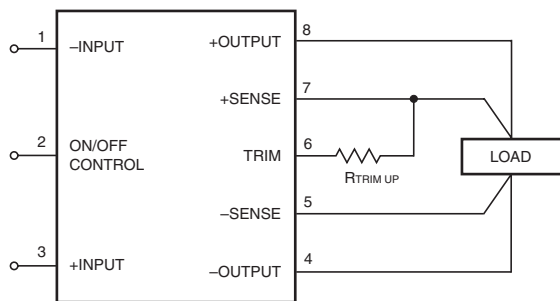


Figure 7. Trim Connections To Increase Output Voltages Using Fixed Resistors

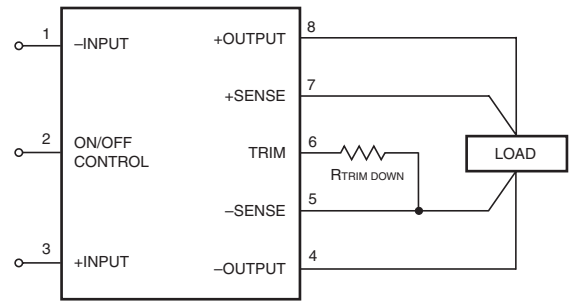


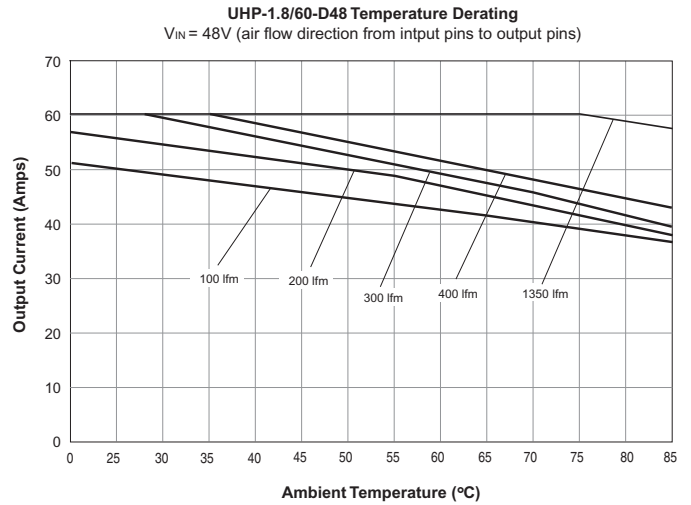
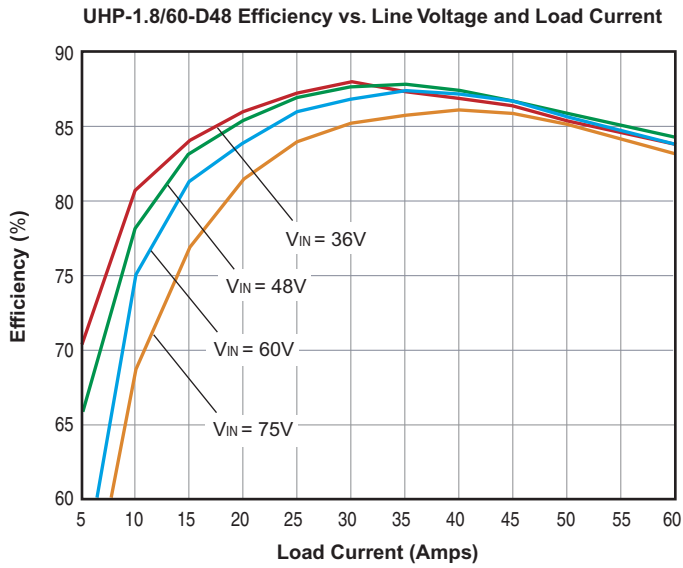
Figure 8. Trim Connections To Decrease Output Voltages Using Fixed Resistors

**Trim Equations**

UHP-1.5/60-D48	
$R_{TUP} (k\Omega) = \frac{6.23(V_O - 1.226)}{V_O - 1.5} - 10.2$	$R_{TDOWN} (k\Omega) = \frac{7.64}{1.5 - V_O} - 10.2$
UHP-1.8/60-D48	
$R_{TUP} (k\Omega) = \frac{7.44(V_O - 1.226)}{V_O - 1.8} - 10.2$	$R_{TDOWN} (k\Omega) = \frac{9.12}{1.8 - V_O} - 10.2$
UHP-2.5/50-D48	
$R_{TUP} (k\Omega) = \frac{10(V_O - 1.226)}{V_O - 2.5} - 10.2$	$R_{TDOWN} (k\Omega) = \frac{12.26}{2.5 - V_O} - 10.2$
UHP-3.3/45-D48	
$R_{TUP} (k\Omega) = \frac{13.3(V_O - 1.226)}{V_O - 3.3} - 10.2$	$R_{TDOWN} (k\Omega) = \frac{16.31}{3.3 - V_O} - 10.2$

Note: Resistor values are in kΩ. Accuracy of adjustment is subject to tolerances or resistor values and factory-adjusted output accuracy.  
V<sub>O</sub> = desired output voltage.

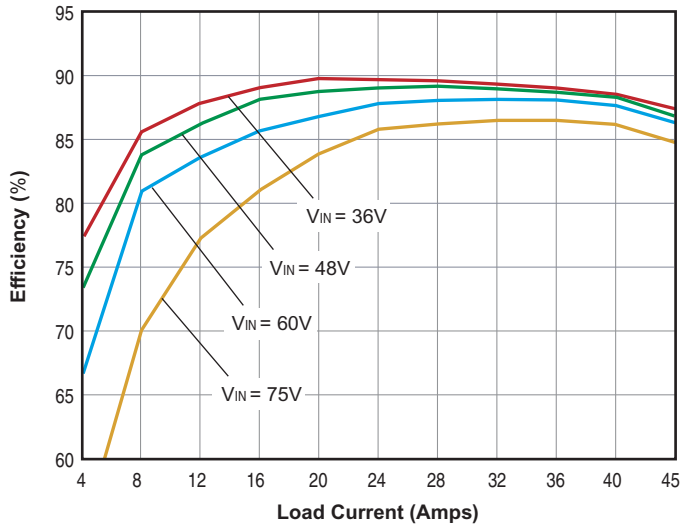
**Typical Performance Curves for UHP 1.8V<sub>OUT</sub> Models**



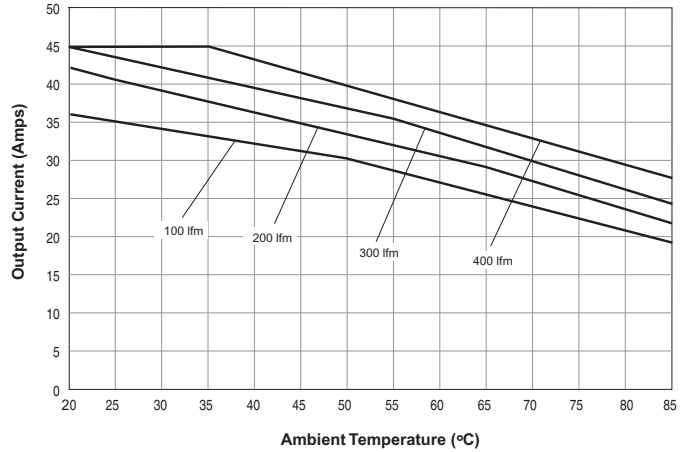


## Typical Performance Curves for UHP 3.3V<sub>OUT</sub> Models

UHP-3.3/45-D48 Efficiency vs. Line Voltage and Load Current



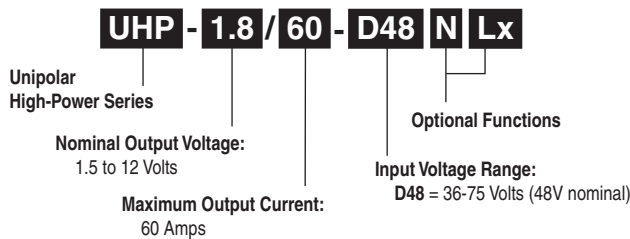
UHP-3.3/45-D48 Temperature Derating  
V<sub>IN</sub> = 48V (air flow direction from input pins to output pins)



**Options and Adaptations**

**Optional Functions and Part Number Suffixes**

The UHP series of Half-Brick DC/DC converters offer numerous electrical and mechanical options. Per the Ordering Guide on page 2, the trailing D48 (standing for 48V<sub>IN</sub>) in each part number pertains to the base part number. Part-number suffixes are added after this input identification, indicating the selection of standard options. The resulting part number is a "standard product" and is available to any customer desiring that particular combination of options.



The On/Off Control function on pin 3 employs a positive polarity (on = open or "high," no suffix). To request a negative polarity on this pin/function, add an "N" suffix to the part number and to request a Sync function to synchronize the switching frequency of two modules with an external clock, add an "S" suffix (excludes On/Off Control). All standard models feature remote sense. See below.

Suffix	Description
Blank	Positive polarity On/Off Control function (pin 3), Vout trim (pin 7), Remote Sense, pin length 0.160 inches (4.06 mm).
N	Add Negative polarity on the On/Off Control function, no Sync, Vout trim (pin 7).
S	Sync function (pin 3), no On/Off Control, Vout trim (pin 7)
L1	Trim the pin length to 0.110 ±0.010 inches (2.79 ±0.25mm). This option requires a 100-piece minimum order quantity.
L2	Trim the pin length to 0.145 ±0.010 inches (3.68 ±0.25mm). This option requires a 100-piece minimum order quantity.

**Adaptations**

There are various additional configurations available on UHP series of DC/DC's. Because designating each of them with a standard part-number suffix is not always feasible, such are designated by DATEL in assigning a 5-digit "adaptation code" after the part-number suffixes. Once a configuration has been requested by a customer and created by DATEL, the resulting product is available to any customer as a "standard" off-the-shelf product. Contact DATEL directly if you are interested in your own set of options/adaptations. Our policy for minimum order quantities may apply.

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