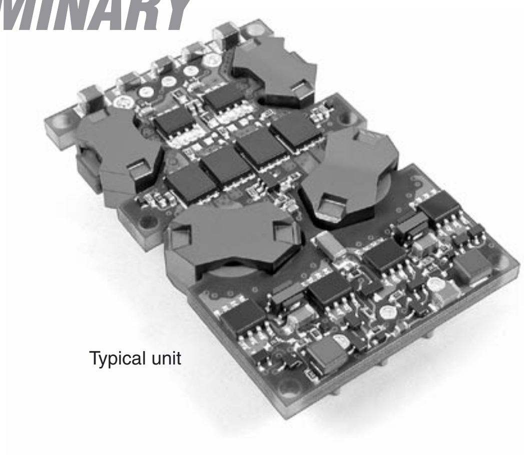
PRELIMINARY

DATEL®
A SUBSIDIARY OF C&D TECHNOLOGIES


Typical unit

Single Output
UVQ Models

Low-Profile, Isolated Quarter-Brick 2.5-40 Amp DC/DC Converters

Features

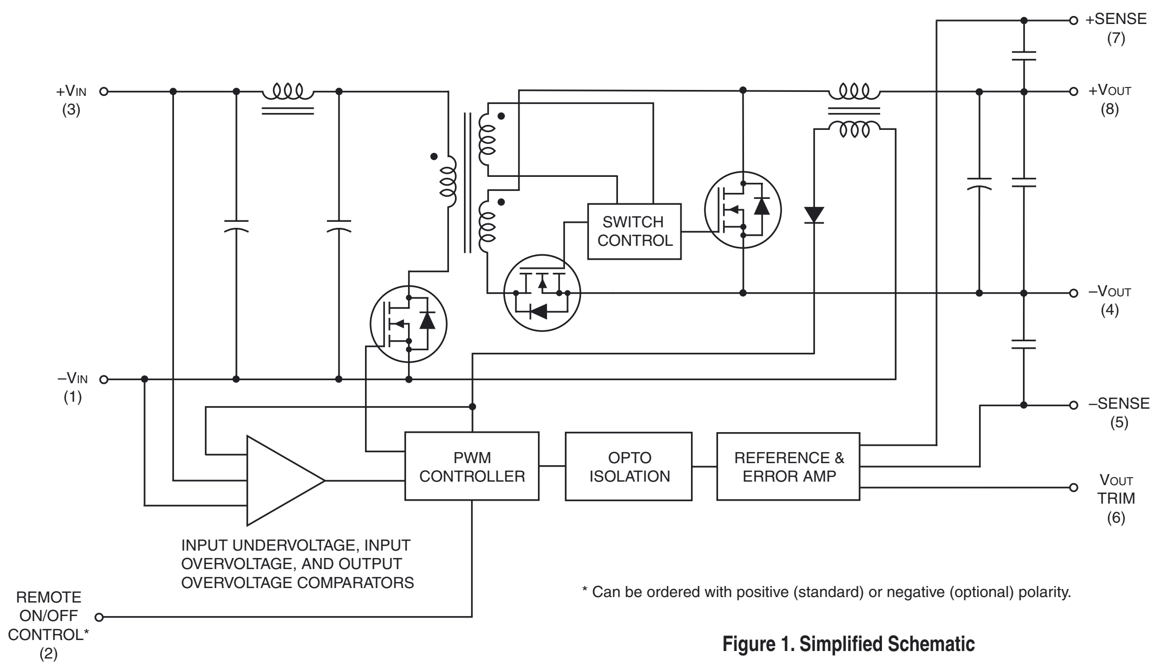
- **Standard quarter-brick package/pinout**
- **Outputs from 1.2 to 48V up to 125W**
- **Low profile 0.42" height**
- **24 and 48Vdc nominal inputs**
- **Fully isolated, 2250Vdc (BASIC) insulation**
- **Designed for RoHS compliance**
- **Output overvoltage and short-circuit protected**
- **On/Off control, trim and sense functions**
- **Interleaved synchronous rectification yields high efficiency to 94%**
- **Fully protected against temperature and voltage limits**
- **UL/IEC/EN60950 safety approvals**
- **Qual/HALT/EMI tested**

For efficient, fully isolated DC power in the smallest space, DATEL's UVQ series quarter bricks offer output voltages from 1.2 to 48 Volts with currents up to 40 Amps. UVQ's operate over a wide temperature range (up to +70°C at 200 lfm airflow) at full-rated power. The optional mounting baseplate extends this to all practical temperature ranges at full power.

UVQ's achieve these impressive specifications while delivering excellent electrical performance. Overall noise is 35mVp-p (3.3V models) with fast step response (200µsec). These converters offer high stability even with no load and tight output regulation of ±0.125%. The unit is fully protected against input over and undervoltage, output overcurrent and short circuit. An on-board temperature sensor shuts down the converter if thermal limits are reached. Protection may use either the "hiccup" (auto restart) method or latching (manual restart) termination.

A convenient remote On/Off control input operates by external digital logic, relay or transistor input. To compensate for longer wiring and to retain output voltage accuracy at the load, UVQ's include a Sense input to dynamically correct for ohmic losses. A trim input may be connected to a user's adjustment potentiometer or trim resistors for output voltage calibration closer than the standard ±1% accuracy.

UVQ's include industry-standard safety certifications and BASIC I/O insulation provides 2250 Volt input/output isolation. Radiation emission testing is performed to widely-accepted EMC standards. Contact DATEL for details on HALT qualification testing. The UVQ's may be considered as higher performance replacements for some DATEL USQ models.



* Can be ordered with positive (standard) or negative (optional) polarity.

Figure 1. Simplified Schematic

Performance Specifications and Ordering Guide ①

Model Number	Output						Input				Efficiency		Case/ Pinout
	V_{OUT} (Volts)	I_{OUT} (Amps)	R/N (mVp-p)		Regulation (Max.)		V_{IN} Nom. (Volts)	Range (Volts)	I_{IN}, No load (mA)	I_{IN}, Full load (Amps)			
			Typ.	Max.	Line	Load					Min.	Typ.	
UVQ-1.2/40-D48	1.2	40	TBD	TBD	±0.125%	±0.25%	48	36-75	TBD	TBD	TBD	TBD	C59,P32
UVQ-1.5/40-D48	1.5	40	TBD	TBD	±0.125%	±0.25%	48	36-75	TBD	TBD	TBD	TBD	C59,P32
UVQ-1.8/40-D48	1.8	40	TBD	TBD	±0.125%	±0.25%	48	36-75	TBD	TBD	TBD	TBD	C59,P32
UVQ-2.5/35-D24	2.5	35	TBD	TBD	±0.125%	±0.25%	24	18-36	TBD	TBD	TBD	TBD	C59,P32
UVQ-2.5/40-D48	2.5	40	35	55	±0.125%	±0.25%	48	36-75	30	1.72	89.5%	91%	C59,P32
UVQ-3.3/35-D24	3.3	35	TBD	TBD	±0.125%	±0.25%	24	18-36	TBD	TBD	TBD	TBD	C59,P32
UVQ-3.3/35-D48	3.3	35	35	55	±0.125%	±0.25%	48	36-75	30	2.24	90.5%	92%	C59,P32
UVQ-5/25-D24	5	25	TBD	TBD	±0.125%	±0.25%	24	18-36	TBD	TBD	TBD	TBD	C59,P32
UVQ-5/25-D48	5	25	35	55	±0.125%	±0.25%	48	36-75	30	3.36	91.5%	93%	C59,P32
UVQ-12/8-D24	12	8	TBD	100	±0.25%	±0.25%	24	18-36	120	4.44	89%	90%	C59,P32
UVQ-12/10-D48	12	10	120	TBD	±0.125%	±0.25%	48	36-75	45	2.69	91%	93%	C59,P32
UVQ-15/7-D24	15	7	125	TBD	±0.125%	±0.25%	24	18-36	45	4.7	91%	93%	C59,P32
UVQ-15/7-D48	15	7	120	TBD	±0.125%	±0.25%	48	36-75	45	2.33	92%	94%	C59,P32
UVQ-18/5.6-D24	18	5.6	33	TBD	±0.125%	±0.25%	24	18-36	45	4.84	92%	93%	C59,P32
UVQ-18/6-D48	18	6	125	185	±0.125%	±0.25%	48	36-75	45	2.42	92%	93%	C59,P32
UVQ-24/4.5-D24	24	4.5	125	TBD	±0.125%	±0.25%	24	18-36	45	4.79	93%	94%	C59,P32
UVQ-24/4.5-D48	24	4.5	120	TBD	±0.125%	±0.25%	48	36-75	45	2.39	93%	94%	C59,P32
UVQ-48/2.5-D48	48	2.5	100	125	±0.125%	±0.2%	48	36-75	30	2.66	91.5%	94%	C59,P32

(1) All models less than 12V output are tested and specified with 200 lfm airflow, external 1 and 10µF parallel ceramic/tantalum output capacitors and no external input capacitors. These capacitors are necessary to accommodate our test equipment and may not be required to achieve specified performance in your applications. All models are stable and regulate within spec under no-load conditions.

Specifications are +25°C, V_{IN} = nominal, V_{OUT} = nominal, full load. For units with 12V or greater output, an external 33µF low ESR input capacitor is added.

(2) Input Ripple Current is tested and specified over a 5-20 MHz bandwidth. Input filtering is C_{IN} = 33µF tantalum, C_{BUS} = 220µF electrolytic, L_{BUS} = 12µH.

(3) Note that Maximum Power Derating curves indicate an average current at nominal input voltage. At higher temperatures and/or lower airflow, the DC/DC converter will tolerate shorter full current outputs if the total RMS current over time does not exceed the Derating curve.

(4) Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ground fixed conditions, $T_{PCBOARD}$ = +25°C, full output load, natural air convection.

(5) The On/Off Control may be driven with external logic or by applying appropriate external voltages which are referenced to Input Common. The On/Off Control Input should use either an open collector/open drain transistor or logic gate which does not exceed $+V_{IN}$.

The On/Off Control may also be supplied with negative logic (LO = on, HI = off) under special quantity order.

(6) Short circuit shutdown begins when the output voltage degrades approximately 2% from the selected setting.

(7) The outputs are not intended to sink appreciable reverse current. If the outputs are forced to sink excessive current, damage may result.

(8) Output noise may be further reduced by adding an external filter. See I/O Filtering and Noise Reduction.

(9) All models are fully operational and meet published specifications, including "cold start" at –40°C.

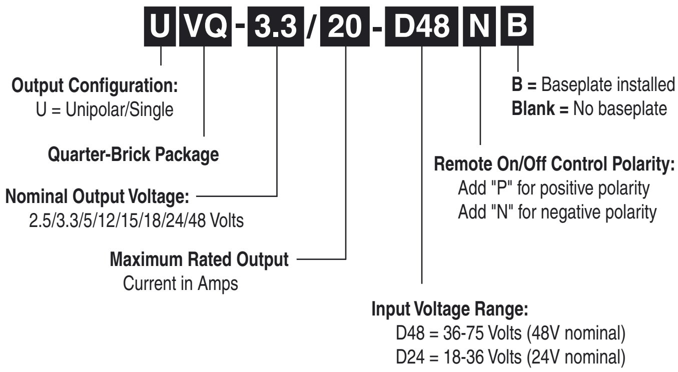
(10) Contact DATEL for availability of all models.

(11) Alternate pin length and/or other output voltages are available under special quantity order.

Restriction of Hazardous Substance (RoHS) Compliance

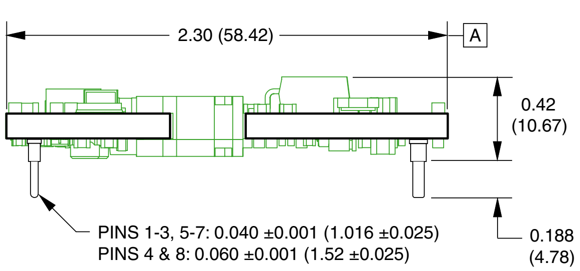
The UVQ series are designed to comply with RoHS requirements in a phased program while retaining high performance, reasonable costs and product availability. For more background, please refer to our website at www.datel.com/rohs_dir.html. Or contact DATEL for full details.

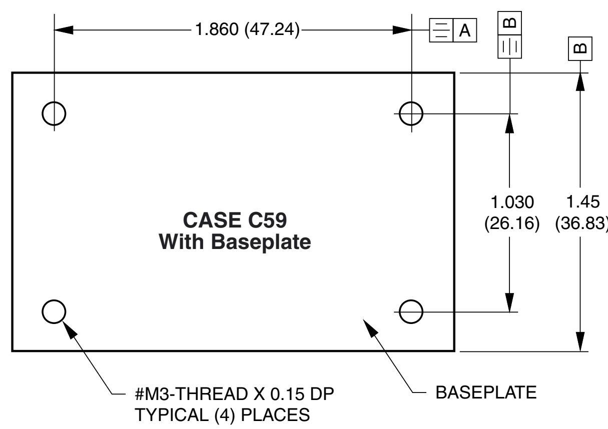
PART NUMBER STRUCTURE

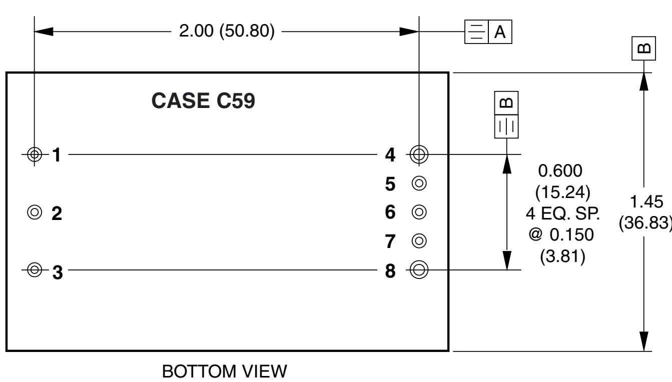


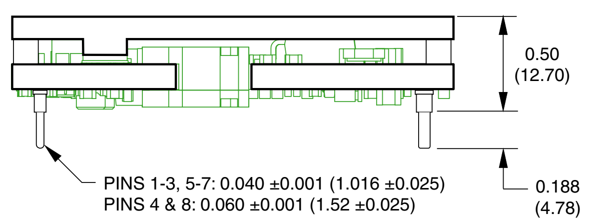
Note:
Not all model number combinations are available. Contact DATEL.

MECHANICAL SPECIFICATIONS



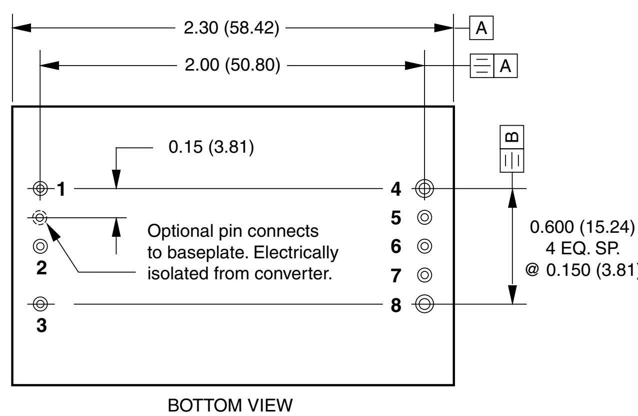






DIMENSIONS ARE IN INCHES (MM)

Alternate pin lengths are available. Contact DATEL.



Optional baseplate pin is special order. Contact DATEL.

I/O Connections	
Pin	**Function P32**
1	–Input
2	On/Off Control
3	+Input
4	–Output
5	–Sense
6	Output Trim
7	+Sense
8	+Output

* The Remote On/Off can be provided with either positive (P suffix) or negative (N suffix) polarity.

Performance/Functional Specifications

Typical @ T_A = +25°C under nominal line voltage, nominal output voltage, natural air convection, external caps and full-load conditions, unless noted. (1)

Input	
Input Voltage Range	See Ordering Guide
Start-Up Threshold	
24V models	16.5-17.5 Volts (17V typical)
48V models	34-35.9 Volts (35V typical)
Undervoltage Shutdown	
24V models	16-17.5 Volts (16.75V typical)
48V models	32-35 Volts (33.5V typical)
Overvoltage Shutdown	
24V models	37-41 Volts (39V typical)
48V models	Not applicable (11)
Reflected (Back) Ripple Current (2)	8-15mAp-p
Input Current:	
Full Load Conditions	See Ordering Guide
Inrush Transient	0.05-0.1A²sec.
Output Short Circuit	10-50mA, model dependent
No Load	
24V models	120mA
48V models	30mA
Low Line (V_{IN} = V_{MIN})	
UVQ-2.5/35-D48	2.66 Amps
UVQ-3.3/35-D48	3.47 Amps
UVQ-5/25-D48	4.46 Amps
UVQ-12/8-D24	5.93 Amps
UVQ-12/10-D48	3.58 Amps
UVQ-15/7-D24	6.27 Amps
UVQ-15/7-D48	3.10 Amps
UVQ-18/6-D24	6.45 Amps
UVQ-18/6-D48	3.33 Amps
UVQ-24/4.5-D24	6.38 Amps
UVQ-24/4.5-D48	3.19 Amps
Standby Mode (Off, UV, OT shutdown)	1mA
Internal Input Filter Type	LC
Reverse Polarity Protection	See fuse information
Remote On/Off Control (5)	
Positive Logic ("P" model suffix)	OFF = ground pin to +0.8 V max. ON = open pin or +3.5V min. to +13.5V max.
Negative Logic ("N" model suffix)	ON = ground pin to +0.8 V max. OFF = open pin or +3.5V min. to +13.5V max.
Current	2 mA maximum

Output	
Voltage Output Range	See Ordering Guide
Voltage Output Accuracy	±1 % of V_{NOM}
Voltage Adjustment Range (12)	–20% to +10% of nominal
Temperature Coefficient	±0.02% of V_{OUT} range per °C
Minimum Loading	No minimum load
Remote Sense Compensation	+10%
Maximum Capacitive Loading (Low ESR <0.02Ω max.)	
UVQ-2.5/35-D48	10,000µF typ., 20,000µF max.
UVQ-3.3/35-D48	10,000µF typ., 20,000µF max.
UVQ-5/25-D48	10,000µF typ., 20,000µF max.
UVQ-12/8-D24	4700µF max.
UVQ-12/10-D48	4700µF typ., 10,000µF max.
UVQ-15/7-D24	4700µF typ., 10,000µF max.
UVQ-15/7-D48	4700µF typ., 10,000µF max.
UVQ-18/6-D24	4700µF max.
UVQ-18/6-D48	2200µF typ., 4700µF max.
UVQ-24/4.5-D24	4700µF typ., 10,000µF max.
UVQ-24/4.5-D48	4700µF typ., 10,000µF max.
UVQ-48/2.5-D48	10,000µF max.
Ripple/Noise (20MHz bandwidth)	See Ordering Guide (8)

Line/Load Regulation	See Ordering Guide (10) (See Tech. Notes)
Efficiency	See Ordering Guide
Isolation Voltage	
Input to Output	2250Vdc min.
Input to Baseplate	1500Vdc min.
Baseplate to Output	1000Vdc min.
Isolation Resistance	100MΩ
Isolation Capacitance	1500pF
Isolation Safety Rating	Basic insulation
Current Limit Inception (98% of V_{OUT})	
UVQ-2.5/40-D48	45 Amps
UVQ-3.3	42 Amps
UVQ-5/25-D48	40 Amps
UVQ-12/8-D24	10 Amps
UVQ-12/10-D48	12.5 Amps
UVQ-15/7	10 Amps
UVQ-18	7 Amps
UVQ-24	6 Amps
UVQ-48/2.5-D48	4 Amps
Short Circuit Protection Method (6) Remove overload for recovery.	Current limiting with hiccup autorestart.
Short Circuit Current	
UVQ-2.5/40-D48	4 Amps
UVQ-3.3/35	3.5 Amps
UVQ-5/25-D48	2.5 Amps
UVQ-12/8-D24	0.8 Amps
UVQ-12/10-D48	1 Amps
UVQ-15/7	0.7 Amps
UVQ-18/5.6-D24	0.5 Amps
UVQ-18/6-D48	0.6 Amps
UVQ-24/4.5	0.5 Amps
UVQ-48/2.5-D48	0.25 Amps
Short Circuit Duration	Continuous, output shorted to ground (no damage)
Overvoltage Protection	
2.5 or 3.3V output	TBD
5V output	6Vdc
12V outputs	14.4Vdc
15V outputs	18Vdc
18V outputs	22Vdc
48V outputs	55Vdc
Method	Magnetic feedback

Dynamic Characteristics	
Dynamic Load Response (50% to 100% load step)	
2.5 or 5V outputs	200µsec to ±1% of final value
3.3 or 5V outputs	150µsec to ±1% of final value
12V D24 outputs	50µsec to ±1% of final value
12V D48 outputs	75µsec to ±1% of final value
15V outputs	75µSec to ±2% of final value
18V D24 outputs	50µsec to ±1% of final value
18V D48 outputs	75µsec to ±1% of final value
24V outputs	75µsec to ±2% of final value
48V outputs	150µsec to ±2% of final value
Start-Up Time (V_{IN} on to V_{OUT} regulated or On/Off to V_{OUT})	50msec for V_{OUT} = nominal
Switching Frequency	
2.5, 3.3, 5V, 48 models	600 ±50kHz
12V models	290 ±30kHz
15, 24V models	200kHz
18V models	240 ±25kHz

Environmental	
Calculated MTBF (4)	TBD Hours
Operating Temperature Range (Ambient) No derating, 200 LFM airflow (all models except 18V-D24) No derating, 200 LFM airflow With derating	No baseplate –40 to +70°C (9) –40 to +45°C (18V-D24 models) See Derating Curves
Operating Temperature with Baseplate	–40 to +110°C maximum (No derating required) (3) (13)
Storage Temperature Range	–55 to +125°C
Thermal Protection/Shutdown	+110°C
Density Altitude	0 to 10,000 feet
Relative Humidity	10% to 90%, non-condensing
Physical	
Outline Dimensions	See Mechanical Specifications
Baseplate Material	Aluminum
Pin Material	Solder-coated brass
Weight	TBD ounces (TBD grams)
Electromagnetic Interference	FCC part 15, class B, EN55022 (conducted and radiated) (may need external filter)
Safety	UL/cUL 60950 CSA-C22.2 No.234 IEC/EN 60950

(1) All models are tested and specified with 200 LFM airflow, external 1||10μF ceramic/tantalum output capacitors and a 33μF external input capacitor. All capacitors are low ESR types. These capacitors are necessary to accommodate our test equipment and may not be required to achieve specified performance in your applications. All models are stable and regulate within spec under no-load conditions.

General conditions for Specifications are +25°C, V_{IN} =nominal, V_{OUT} = nominal, full load.

(2) Input Ripple Current is tested and specified over a 5-20MHz bandwidth. Input filtering is C_{IN} = 33μF tantalum, C_{BUS} = 220μF electrolytic, L_{BUS} = 12μH.

(3) Note that Maximum Power Derating curves indicate an average current at nominal input voltage. At higher temperatures and/or lower airflow, the DC/DC converter will tolerate brief full current outputs if the total RMS current over time does not exceed the Derating curve.

(4) Mean Time Before Failure is calculated using the Telcordia (Belcore) SR-332 Method 1, Case 3, ground fixed conditions, Tpcboard = +25°C, full output load, natural air convection.

(5) The On/Off Control may be driven with external logic or by applying appropriate external voltages which are referenced to Input Common. The On/Off Control Input should use either an open collector/open drain transistor or logic gate which does not exceed +13.5V.

(6) Short circuit shutdown begins when the output voltage degrades approximately 2% from the selected setting.

(7) The outputs are not intended to sink appreciable reverse current. Sinking excessive reverse current may damage the outputs.

(8) Output noise may be further reduced by adding an external filter. See I/O Filtering and Noise Reduction.

(9) All models are fully operational and meet published specifications, including “cold start” at –40°C.

(10) Regulation specifications describe the deviation as the line input voltage or output load current is varied from a nominal midpoint value to either extreme.

(11) Overvoltage shutdown on 48V input models is not supplied in order to comply with telecom reliability requirements. These requirements attempt continued operation despite significant input overvoltage.

(12) Do not exceed maximum power specifications when adjusting the output trim.

(13) Note that the converter may operate up to +110°C with the baseplate installed. However, thermal self-protection occurs near +110°C. Therefore, +100°C is recommended to avoid thermal shutdown.

Absolute Maximum Ratings		
Input Voltage	**24V models**	**48V models**
Continuous	0 to +36V	0 to +75V
Transient (100 mS)	+50V	+100V
On/Off Control	–0.3 V min to +13.5V max.	
Input Reverse Polarity Protection	See Fuse section	
Output Overvoltage	V_{OUT} +20% max.	
Output Current (Note 7)	Current-limited. Devices can withstand sustained short circuit without damage.	
Storage Temperature	–55 to +125°C	
Lead Temperature (soldering 10 sec.)	+300°C	

Absolute maximums 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

Removal of Soldered UVQ's from Printed Circuit Boards

Should removal of the UVQ from its soldered connection be needed, thoroughly de-solder the pins using solder wicks or de-soldering tools. At no time should any prying or leverage be used to remove boards that have not been properly de-soldered first.

Input Source Impedance

UVQ converters must be driven from a low ac-impedance input 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 close to the DC/DC converter.

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

All models in the UVQ Series are tested/specified for input ripple current (also called input reflected ripple current) and output noise using the circuits and layout shown in Figures 2 and 3.

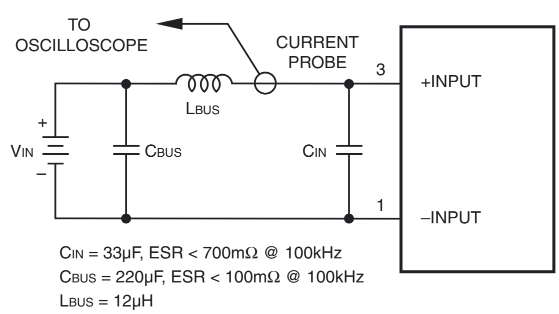


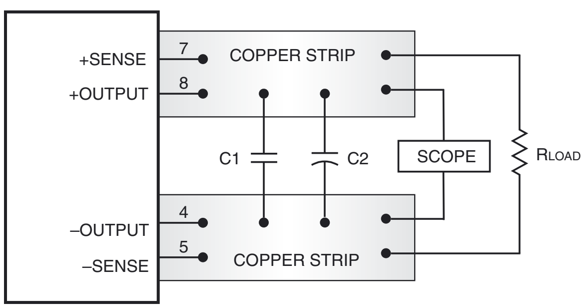
Figure 2. Measuring Input Ripple Current

External input capacitors (C_{IN} in Figure 2) serve primarily as energy-storage elements. They 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_{BUS} simulate a typical dc voltage bus. Your specific system configuration may necessitate additional considerations.

In critical applications, output ripple/noise (also referred to as periodic and random deviations or PARD) can be reduced below specified limits using filtering techniques, the simplest of which is the installation of additional external output capacitors. Output capacitors function as true filter elements and should be selected for bulk capacitance, low ESR, and appropriate frequency response. In Figure 3, the two copper strips simulate real-world pcb impedances between the power supply and its load. Scope measurements should be made using BNC connectors or the probe ground should be less than ½ inch and soldered directly to the fixture.

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 be taken into consideration. OS-CON™ organic semiconductor capacitors (www.sanyo.com) can be especially effective for further reduction of ripple/noise.

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.



C1 = 1µF CERAMIC
C2 = 10µF TANTALUM
LOAD 2-3 INCHES (51-76mm) FROM MODULE

Figure 3. Measuring Output Ripple/Noise (PARD)

Start-Up Threshold and Undervoltage Shutdown

Under normal start-up conditions, the UVQ Series will not begin to regulate properly until the ramping input voltage exceeds the Start-Up Threshold. Once operating, devices will turn off when the applied voltage drops below the Undervoltage Shutdown point. Devices will remain off as long as the undervoltage condition continues. Units will automatically re-start when the applied voltage is brought back above the Start-Up Threshold. The hysteresis built into this function avoids an indeterminate on/off condition at a single input voltage. See Performance/Functional Specifications table for actual limits.

Start-Up Time

The V_{IN} to V_{OUT} Start-Up Time is the interval between the point at which a ramping input voltage crosses the Start-Up Threshold voltage and the point at which the fully loaded output voltage enters and remains within its specified ±1% accuracy band. 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 to the converter. The On/Off to V_{OUT} start-up time assumes that the converter is turned off via the Remote On/Off Control with the nominal input voltage already applied.

On/Off Control

The primary-side, Remote On/Off Control function (pin 2) can be specified to operate with either positive or negative polarity. Positive-polarity devices ("P" suffix) are enabled when pin 2 is left open or is pulled high. Positive-polarity devices are disabled when pin 2 is pulled low (0-0.8V with respect to –Input). Negative-polarity devices are off when pin 2 is high/open and on when pin 2 is pulled low. See Figure 4.

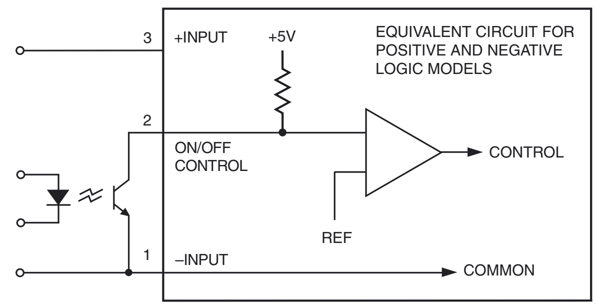


Figure 4. Driving the Remote On/Off Control Pin

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.

Current Limiting

When power demands from the output falls within the current limit inception range for the rated output current, 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 a somewhat constant power dissipation. This is commonly referred to as power limiting. Current limit inception is defined as the point where the full-power output voltage falls below the specified tolerance. If the load current being drawn from the converter is significant enough, the unit will go into a short circuit condition. See "Short Circuit Condition."

Short Circuit Condition

When a converter is in current limit mode the output voltages 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 of about 50 milliseconds, the PWM will restart, causing the output voltages to begin ramping to their appropriate values. 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 UVQ is capable of enduring an indefinite short circuit output condition.

Thermal Shutdown

UVQ converters are equipped with thermal-shutdown circuitry. If the internal temperature of the DC/DC converter rises above the designed operating temperature (See Performance Specifications), 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.

Output Overvoltage Protection

The output voltage is monitored for an overvoltage condition via magnetic coupling to the primary side. If the output voltage rises to a fault condition, which could be damaging to the load circuitry (see Performance Specifications), the sensing 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 voltages again climb to excessive levels, the overvoltage circuitry will initiate another shutdown cycle. This on/off cycling is referred to as "hiccup" mode.

Input Reverse-Polarity Protection

If the input-voltage polarity is accidentally reversed, an internal diode will become forward biased and likely draw excessive current from the power source. If the source is not current limited or the circuit appropriately fused, it could cause permanent damage to the converter.

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 a sustained, non-current-limited, input-voltage polarity reversal exists. For DATEL UVQ Series DC/DC Converters, slow-blow fuses are recommended with values no greater than twice the maximum input current.

Trimming Output Voltage

UVQ converters have a trim capability (pin 6) that enables users to adjust the output voltage from +10% to –20% (refer to the trim equations). Adjustments to the output voltage can be accomplished with a single fixed resistor as shown in Figures 5 and 6. A single fixed resistor can increase or decrease the output voltage depending on its connection. Resistors should be located close to the converter and have TCR's less than 100ppm/°C to minimize sensitivity to changes in temperature. If the trim function is not used, leave the trim pin open.

Standard UVQ's have a "positive trim" where a single resistor connected from the Trim pin (pin 6) to the +Sense (pin 7) will increase the output voltage. A resistor connected from the Trim Pin (pin 6) to the –Sense (pin 5) will decrease the output voltage.

Trim adjustments greater than the specified +10%/–20% can have an adverse affect on the converter's performance and are not recommended. Excessive voltage differences between V_{OUT} 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).

Temperature/power derating is based on maximum output current and voltage at the converter's output pins. Use of the trim and sense functions can cause output voltages to increase, thereby increasing output power beyond the UVQ's specified rating, or cause output voltages to climb into the output overvoltage region. Therefore:

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

The Trim pin (pin 6) is a relatively high impedance node that can be susceptible to noise pickup when connected to long conductors in noisy environments. In such cases, a 0.22µF capacitor to –Output can be added to reduce this long lead effect.

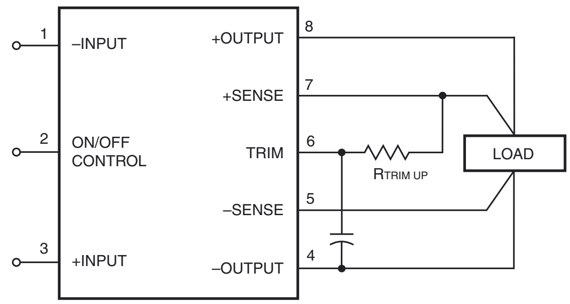


Figure 5. Trim Connections To Increase Output Voltages Using Fixed Resistors

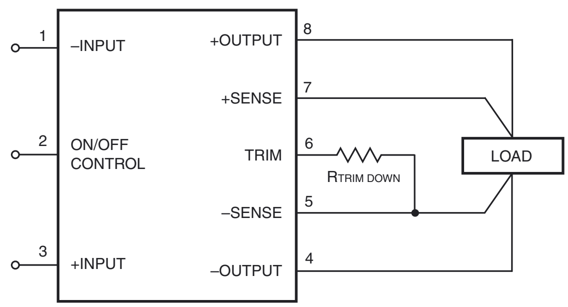


Figure 6. Trim Connections To Decrease Output Voltages Using Fixed Resistors

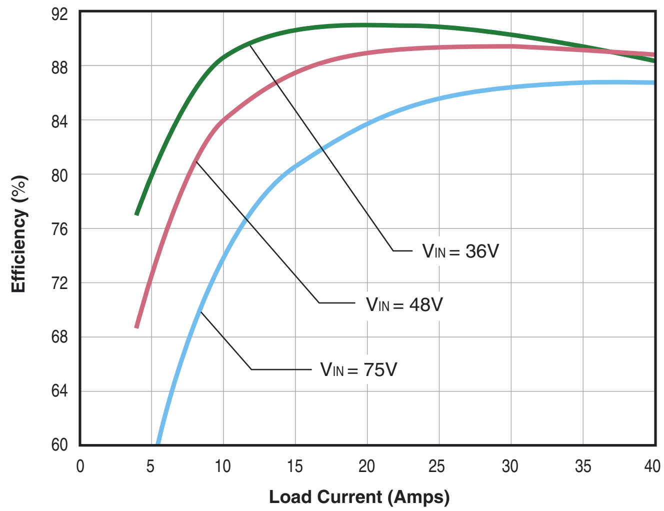
UVQ Trim Equations

Trim Up	Trim Down
UVQ-1.2/40-D48	
$RT_{UP}\ (k\Omega) = \frac{1.308(V_O - 0.793)}{V_O - 1.2} - 1.413$	$RT_{DOWN}\ (k\Omega) = \frac{1.037}{1.2 - V_O} - 1.413$
UVQ-1.5/40-D48	
$RT_{UP}\ (k\Omega) = \frac{6.23(V_O - 1.226)}{V_O - 1.5} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{7.64}{1.5 - V_O} - 10.2$
UVQ-1.8/40-D48	
$RT_{UP}\ (k\Omega) = \frac{7.44(V_O - 1.226)}{V_O - 1.8} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{9.12}{1.8 - V_O} - 10.2$
UVQ-2.5/40-D48	
$RT_{UP}\ (k\Omega) = \frac{10(V_O - 1.226)}{V_O - 2.5} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{12.26}{2.5 - V_O} - 10.2$
UVQ-3.3/35-D48	
$RT_{UP}\ (k\Omega) = \frac{13.3(V_O - 1.226)}{V_O - 3.3} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{16.31}{3.3 - V_O} - 10.2$
UVQ-5/25-D48	
$RT_{UP}\ (k\Omega) = \frac{20.4(V_O - 1.226)}{V_O - 5} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{25.01}{5 - V_O} - 10.2$
UVQ-12/8-D24, -12/10-D48	
$RT_{UP}\ (k\Omega) = \frac{49.6(V_O - 1.226)}{V_O - 12} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{60.45}{12 - V_O} - 10.2$
UVQ-15/7-D24, -D48	
$RT_{UP}\ (k\Omega) = \frac{62.9(V_O - 1.226)}{V_O - 15} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{75.56}{15 - V_O} - 10.2$
UVQ-18/5.6-D24, -18/6-D48	
$RT_{UP}\ (k\Omega) = \frac{75.5(V_O - 1.226)}{V_O - 18} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{92.9}{18 - V_O} - 10.2$
UVQ-24/4.5-D24, -D48	
$RT_{UP}\ (k\Omega) = \frac{101(V_O - 1.226)}{V_O - 24} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{124.2}{24 - V_O} - 10.2$
UVQ-48/2.5-D48	
$RT_{UP}\ (k\Omega) = \frac{210.75(V_O - 1.226)}{V_O - 48} - 10.2$	$RT_{DOWN}\ (k\Omega) = \frac{250}{48 - V_O} - 10.2$

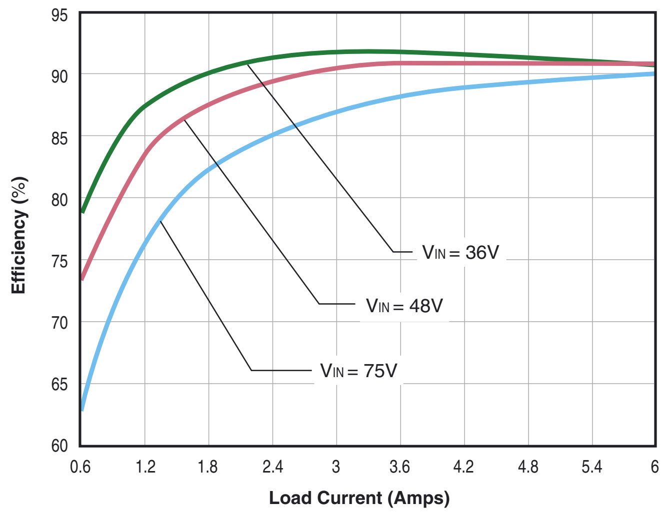
Note: Higher output 24V and 48V converters require larger, low-tempco, precision trim resistors. An alternative is a low-TC multi-turn potentiometer (20kΩ typical) connected between $+V_{OUT}$ and $–V_{OUT}$ with the wiper to the Trim pin.

Typical Performance Curves

UVQ-2.5/40-D48N
Efficiency vs. Line Voltage and Load Current @ 25°C

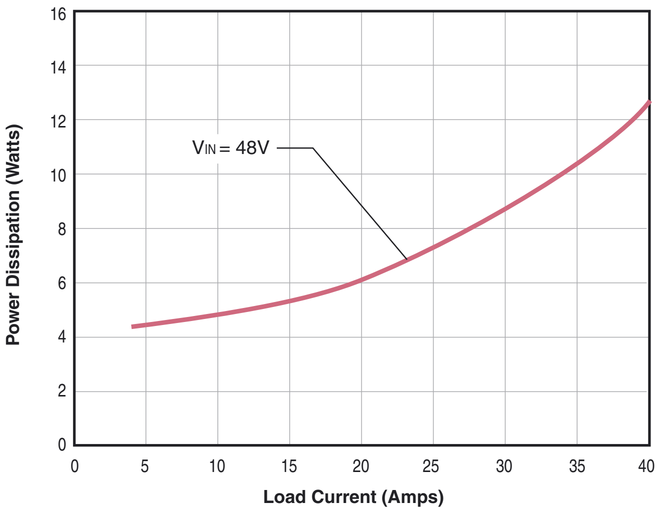


UVQ-18/6-D48N
Efficiency vs. Line Voltage and Load Current @ 25°C

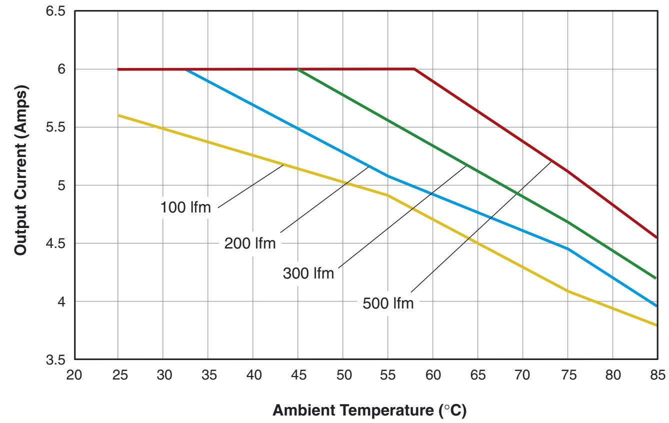


Typical Performance Curves

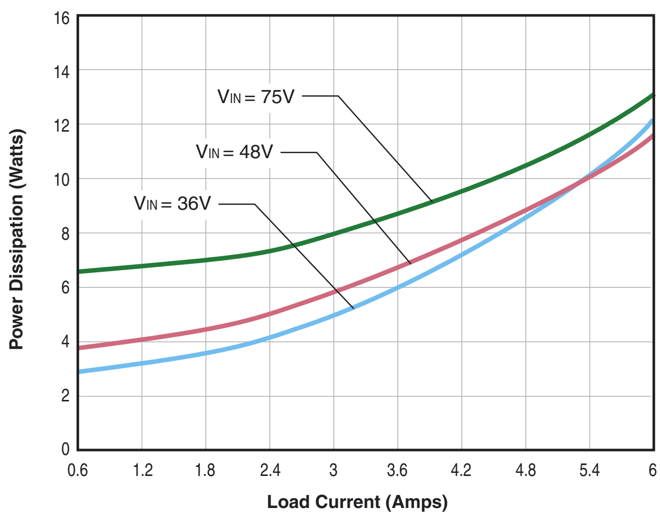
UVQ-2.5/40-D48
Power Dissipation vs. Load Current @ 25°C



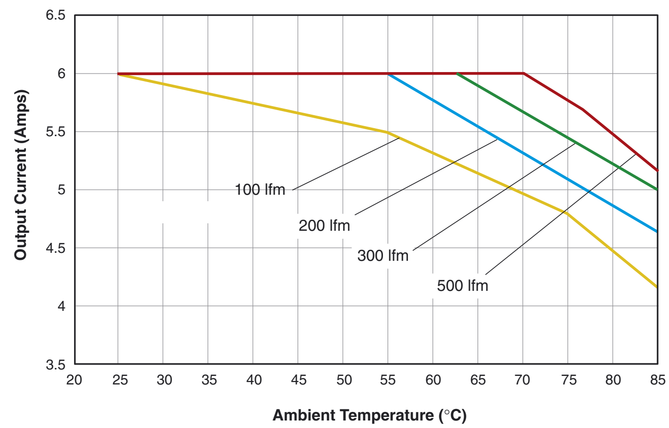
UVQ-18/6-D48: Maximum Current Temperature Derating
(No baseplate, V_{IN} = 48V, transverse air flow)



UVQ-18/6-D48
Power Dissipation vs. Load Current @ 25°C



UVQ-18/6-D48: Maximum Current Temperature Derating
(With baseplate, V_{IN} = 48V, transverse air flow)



DATEL®
A SUBSIDIARY OF C&D TECHNOLOGIES

DATEL, Inc. 11 Cabot Boulevard, Mansfield, MA 02048-1151
Tel: (508) 339-3000 (800) 233-2765 Fax: (508) 339-6356
www.datel.com **Email: sales@datel.com**
www.cdpowerelectronics.com

ISO 9001 REGISTERED DS-0549 02/05

DATEL (UK) LTD. Tadley, England Tel: (01256)-880444
Internet: www.datel-europe.com E-mail: datel.ltd@datel.com

DATEL S.A.R.L. Montigny Le Bretonneux, France Tel: 01-34-60-01-01
Internet: www.datel-europe.com E-mail: datel.sarl@datel.com

DATEL GmbH München, Germany Tel: 89-544334-0
Internet: www.datel-europe.com E-mail: datel.gmbh@datel.com

DATEL KK Tokyo, Japan Tel: 3-3779-1031, Osaka Tel: 6-6354-2025
Internet: www.datel.co.jp Email: salestko@datel.co.jp, salesosa@datel.co.jp

DATEL China Shanghai, China Tel: 011-86-51317131
E-mail: davidx@datel.com