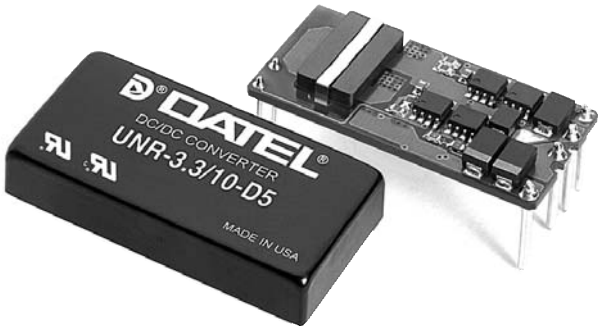


DATEL®
INNOVATION and EXCELLENCE

Single Output
UNR Series

Non-Isolated, 1.8/2.5/3.3V_{OUT} 8 and 10 Amp DC/DC Converters

Features

- **Input ranges of 4.75-5.5V or 10.8-13.6V**
- **Output voltages of 1.8/2.5/3.3V**
- **8 and 10 Amp output current models**
- **Non-isolated, full synchronous topology**
- **1" x 2" through-hole package**
- **High efficiency to 91%; Low noise**
- **200kHz switching frequency**
- **–40 to +40/50/60°C ambient operation with no derating**
- **Remote on/off control; Output overcurrent detection**
- **IEC950/EN60950/UL1950 approval**

As supply voltages trend lower and load currents increase, centralized power becomes more impractical. The tight accuracy, low noise and quick transient response demanded by today's low voltage CPU's, ASIC's and DSP's make power processing at the point of use the only viable solution. The UNR 18-33W series provides a complete line of non-isolated DC/DC converters to satisfy this requirement. With input voltages of 5V (-D5 models) and 12V (-D12 models) these converters offer standard output voltages of 1.8, 2.5 and 3.3 Volts and up to 10 Amps of output current in through-hole 1" x 2" metal cases.

With on/off control as a standard feature, these non-isolated converters exploit full synchronous rectification, and 100% automated assembly to deliver high efficiencies (to 91%) and low noise at low cost.

These versatile DC/DC's are fully line and load regulated. They feature quick transient response (50µsec), user-optional on/off control (for power sequencing), and output overcurrent detection and shutdown ("hiccup" technique with auto-recovery). Their impressive guaranteed efficiencies enable them to deliver fully rated output power from +40/50/60°C (ambient) without supplemental cooling.

If your high current requirements have made the use of inefficient linear regulators impractical, take a look at one of DATEL's switching buck regulators. Their high efficiency, ease-of-use, long-term reliability, and overall cost effectiveness will impress you. Safety agency approvals and EMC characterizations are currently in progress.

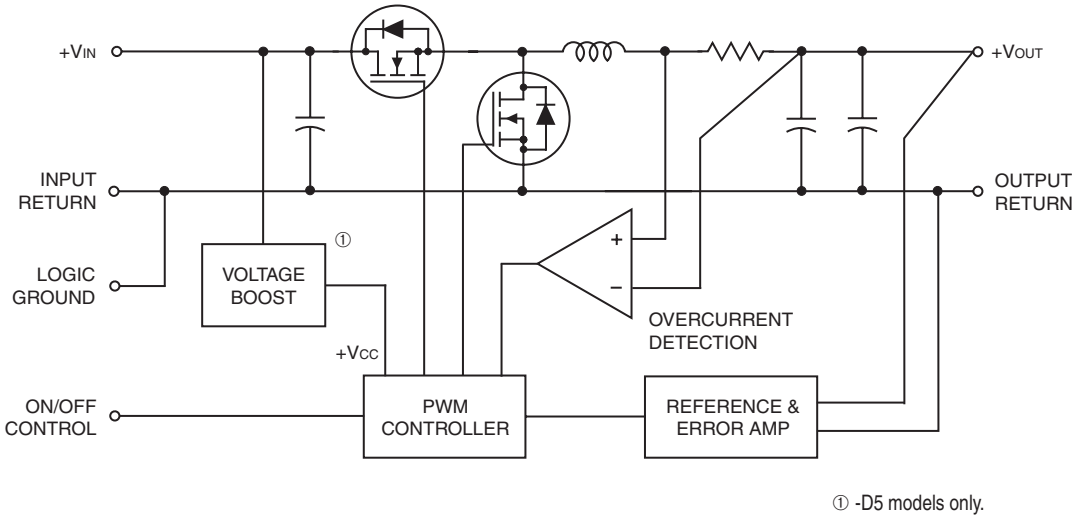


Figure 1. Simplified Schematic

Performance Specifications and Ordering Guide ①

Model	Output						Input			Efficiency		Package (Case, Pinout)
	VOUT (Volts)	IOUT (Amps)	R/N (mVp-p) ②		Regulation (Max.)		VIN Nom. (Volts)	Range (Volts)	IIN ④ (mA/A)	Min.	Typ.	
			Typ.	Max.	Line	Load ③						
UNR-1.8/10-D5	1.8	10	70	100	±0.1%	±0.5%	5	4.75-5.5	150/4190	82%	86%	C5A2, P9
UNR-2.5/8-D5	2.5	8	40	80	±0.1%	±0.5%	5	4.75-5.5	100/4440	86%	90%	C5A1, P9
UNR-2.5/10-D5	2.5	10	40	80	±0.1%	±0.5%	5	4.75-5.5	150/5620	85%	89%	C5A2, P9
UNR-3.3/8-D5	3.3	8	40	80	±0.1%	±0.5%	5	4.75-5.5	100/5740	88%	92%	C5A1, P9
UNR-3.3/10-D5	3.3	10	40	80	±0.1%	±0.5%	5	4.75-5.5	100/7250	86%	91%	C5A2, P9
UNR-2.5/8-D12	2.5	8	40	80	±0.1%	±0.625%	12	10.8-13.6	100/1890	85%	88%	C5A1, P9
UNR-2.5/10-D12	2.5	10	40	80	±0.1%	±0.625%	12	10.8-13.6	100/2410	83%	86%	C5C2, P9
UNR-3.3/8-D12	3.3	8	60	120	±0.1%	±0.625%	12	10.8-13.6	50/2440	86%	91%	C5A1, P9
UNR-3.3/10-D12	3.3	10	60	120	±0.1%	±0.625%	12	10.8-13.6	50/3090	86%	89%	C5C2, P9

① Typical at TA = +25°C under nominal line voltage and full-load conditions, unless otherwise noted. All models are tested and specified with an external 22µF output capacitor with a 200mΩ ESR and a 470µF input capacitor with 6Arms ripple-current rating and 20mΩ ESR. See I/O Filtering and Noise Reduction for more details.

② Ripple/Noise (R/N) is tested/specified over a 20MHz bandwidth. Output noise may be further reduced by installing additional external output caps. See I/O Filtering and Noise Reduction.

③ These devices have no minimum-load requirements and will regulate under no-load conditions.

④ Nominal line voltage, no-load/full-load conditions.

PART NUMBER STRUCTURE

U NR - 1.8 / 10 - D5

Output Configuration:
U = Unipolar

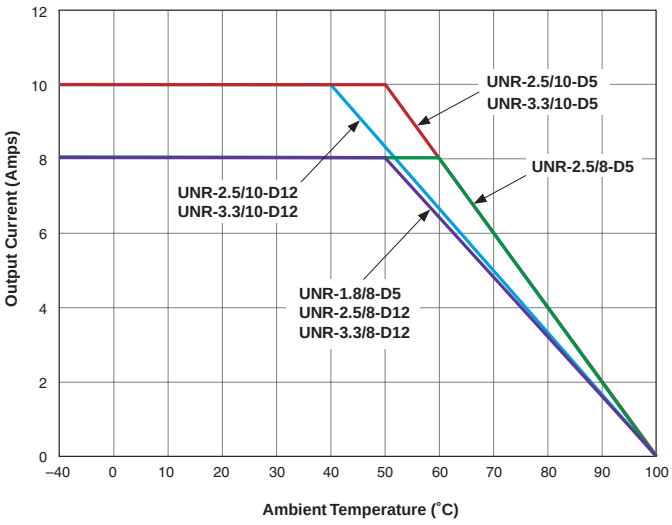
Non-Isolated

Nominal Output Voltage:
1.8, 2.5 or 3.3 Volts

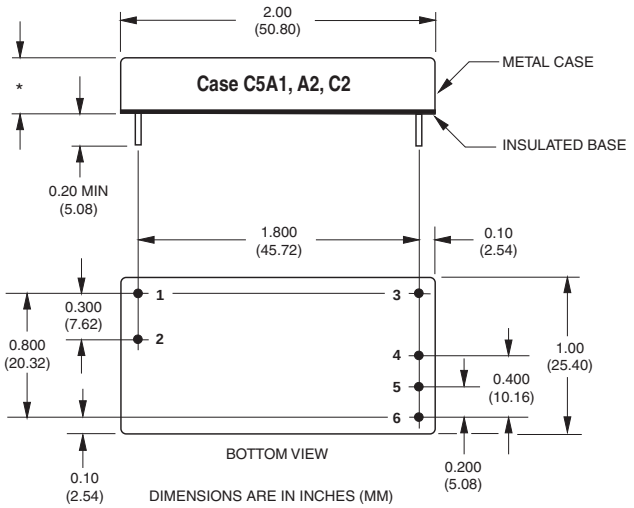
Maximum Rated Output
Current in Amps

Input Voltage Range:
D5 = 4.75 to 5.5 Volts (5V nominal)
D12 = 10.8 to 13.6 Volts (12V nominal)

TEMPERATURE DERATING



MECHANICAL SPECIFICATIONS



CASE C5A1
*CASE HEIGHT: 0.39 (9.91)
PIN DIAMETERS:
PINS 1-7: 0.040 ±0.002 (1.016 ±0.051)

CASE C5A2
*CASE HEIGHT: 0.39 (9.91)
PIN DIAMETERS:
PINS 1-2: 0.040 ±0.002 (1.016 ±0.051)
PINS 3-6: 0.062 ±0.002 (1.575 ±0.051)

CASE C5C2
*CASE HEIGHT: 0.48 (12.19)
PIN DIAMETERS:
PINS 1-2: 0.040 ±0.002 (1.016 ±0.051)
PINS 3-6: 0.062 ±0.002 (1.575 ±0.051)

I/O Connections	
Pin	Function P23
1	Logic Ground
2	On/Off Control
3	+Output
4	Output Return
5	Input Return
6	+Input

Performance/Functional Specifications

Typical @ T_A = +25°C under nominal line voltage and full-load conditions unless noted. ①

Input	
Input Voltage Range	
D5 Models	4.75-5.5 Volts (5V nominal)
D12 Models	10.8-13.6 Volts (12V nominal)
Input Current ②	See Ordering Guide
Input Filter Type	Capacitive
Overvoltage Protection	None
Reverse-Polarity Protection	None
On/Off Control: ③ ④	TTL high (or open) = on, low = off
Output	
V_{OUT} Accuracy (50% load):	
1.8V_{OUT} Models	±2% of V_{OUT} maximum
2.5/3.3V_{OUT} Models	±1% of V_{OUT} maximum
Ripple/Noise (20MHz BW) ⑤	See Ordering Guide
Line/Load Regulation	See Ordering Guide
Efficiency	See Ordering Guide
Overcurrent Protection: ②	
8 Amp -D5 Models	9-15 Amps (12 Amps typical)
10 Amp -D5 Models	11-18 Amps (15 Amps typical)
8 Amp -D12 Models	9-15 Amps (12 Amps typical)
10 Amp -D12 Models	11-19 Amps (14 Amps typical)
Dynamic Characteristics	
Transient Response (50-100% load):	
1.8V_{OUT} -D5 Models	60µsec to 2.5% V_{OUT}
2.5-3.3V_{OUT} -D5 Models	50µsec to 2.5% V_{OUT}
2.5-3.3V_{OUT} -D12 Models	50µsec to 1% V_{OUT}
Switching Frequency	200kHz (±20kHz)
Environmental	
Operating Temperature (Ambient):	
Without Derating	See Derating Curves
With Derating	to +100°C (See Derating Curves)
Storage Temperature	–40 to +105°C
Physical	
Dimensions:	
D5 Models	2" x 1" x 0.39" (51 x 25 x 9.9mm)
2.5V -D12 Models	2" x 1" x 0.48" (51 x 25 x 12.2mm)
3.3/8 -D12 Models	2" x 1" x 0.39" (51 x 25 x 9.9mm)
3.3/10 -D12 Models	2" x 1" x 0.48" (51 x 25 x 12.2mm)
Shielding	5 sided
Case Connection	Pin 5 (Input Return)
Case Material	Corrosion-resistant steel with non-conductive, epoxy-based, black enamel finish and plastic baseplate
Pin Material	Brass, solder coated
Weight	
C5A1, C5A2 Cases	1.4 ounces (39.7 grams)
C5C2 Case	1.76 ounces (49.4 grams)

① All models are tested and specified with an external 470µF input capacitor rated for 6Arms ripple current and an external 22µF output capacitor with an ESR lower than 200mΩ. These devices have no minimum-load requirements and will regulate under no-load conditions.
② No-load/full-load conditions. When the unit is off, the input "standby" current is typically 10mA.
③ Applying an external voltage to the On/Off Control pin when no input voltage is applied can cause permanent damage to the converter.
④ See On/Off Control Functionality.
⑤ Output noise may be further reduced with additional external capacitors across the output terminals. Caps should have low ESR (typically 60mΩ) and be located as close to the unit as possible.
⑥ Current limiting initiates at approximately 30% above rated load. Under short-circuit conditions, output current folds back to approximately 1A and remains there until the short is removed.

Absolute Maximum Ratings	
Input Voltage:	
Continuous:	
D5 Models	7 Volts
D12 Models	15 Volts
Input Reverse-Polarity Protection	None
Input/Output Overvoltage Protection	None
Output Current	Current limited. Devices can withstand a sustained output short circuit without damage.
Storage Temperature	–40 to +105°C
Lead Temperature (Soldering, 10 sec.)	+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.

TECHNICAL NOTES

Return Current Paths

These are non-isolated DC/DC converters. The Input Return, Output Return and Logic Ground pins are all connected together internally. To the extent possible, all input and load currents should be returned through the Input Return and Output Return, respectively (via low-impedance runs). Any control signals applied to the On/Off Control pin should be referenced to Logic Ground. The internal trace leading to Logic Ground is not designed to carry high current. Consequently, devices should never be installed in a manner that results in high current flow through Logic Ground (i.e., the Input/Output Return pins should never be left open or connected via high-impedance paths).

I/O Filtering and Noise Reduction

All models in the UNR 18-33W Series converters are tested and specified with external 470µF input capacitors (20mΩ ESR, 6Arms ripple-current rating) and external 22µF output capacitors (200mΩ ESR). In critical applications, input/output ripple/noise may be further reduced by installing additional I/O caps.

External input capacitors serve primarily as energy-storage elements. They should be selected for bulk capacitance (at appropriate frequencies), low ESR, and high rms-ripple-current ratings. Input capacitors compensate for I·R drops on input lines and power sources. Providing a solid input voltage will greatly reduce the need for capacitors. The switching nature of modern DC/DC converters requires that dc input voltage sources have low ac impedance, as highly inductive source impedances can affect system stability. Your specific system configuration may necessitate additional considerations.

Output ripple/noise (also referred to as periodic and random deviations or PARD) can be reduced below published specifications by 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. Any scope measurements of PARD should be made directly at the DC/DC output pins with scope probe ground less than 0.5" in length.

All external capacitors should have appropriate voltage ratings and be located as close to the converters as possible. Temperature variations for all relevant parameters should be taken into consideration.

The most effective combination of external I/O capacitors will be a function of your line voltage and source impedance, as well as your 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.

Input Overvoltage and Reverse-Polarity Protection

UNR 18-33W Series DC/DC converters do not incorporate either input overvoltage or input reverse-polarity protection. Input voltages in excess of the listed absolute maximum ratings and input polarity reversals of longer than "instantaneous" duration can cause permanent damage to these devices.

On/Off Control Functionality

The On/Off Control pin has an internal 5kΩ pull-up resistor to $+V_{IN}$. It can be driven with any logic circuit capable of meeting the following requirements: Logic "0" = 0 to +0.8V; Logic "1" = +2.0V to $+V_{IN}$; I_H ($@V_{IN}$ = +2.0V) = –0.7mA; I_{IL} ($@V_{IN}$ = 0V) = –1.1mA. Open collector logic or a single NPN drive transistor can be used. The drive circuit should be rated for more than 5.5V. Applying a voltage to pin 2 when no input power is applied to the converter can cause permanent damage to the converter.

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