



Single Output UNR Series

Non-Isolated, 12V-to-5V
5 Amp, DC/DC Converters

Features

- No external I/O filtering required
- +10.4V to +13.6V Input
- +5V ($\pm 50\text{mV}$), 5 Amp output
- Synchronous-rectifier topology
- 300kHz switching frequency
- Low output noise, 60mVp-p
- Quick transient response, 30 μsec
- High efficiency, 91%
- -40 to +70°C operation with no derating
- On/off control; Undervoltage shutdown
- Output trim capability (3.3V to 6V)
- 1" x 2" metal package; EMC compliant
- IEC950/EN60950/UL1950 pending
- Modifications and customs for OEM's

When you're faced with upgrading your system's +5V power supply because your new, high-speed, 5V electronics simply demand too much current, consider tapping into your +12V line with one of DATEL's new, low-cost, 12V-to-5V DC/DC converters. These non-isolated buck regulators deliver up to 5 Amps of clean (60mVp-p noise), rapidly responding (30 μsec step response) 5V current. They are housed in standard 1" x 2" metal packages and require absolutely no external filtering to achieve specified performance.

The UNR-5/5-D12 achieves its high power density (25W/in³) through circuit topology and packaging. Its 91% efficient, fixed-frequency (300kHz), synchronous-rectifier design is packaged, with thermally conductive potting compound, in a heat-radiating, black metal case. It achieves low cost and high reliability through its use of proven, fully automated, SMT-on-pcb assembly techniques. Consequently, every 1 Amp of 12V current gives you 2.2 Amps of additional 5V current at an incremental cost.

The impressively efficient UNR-5/5-D12 delivers its full rated 25W output power over the -40 to +70°C ambient temperature range without heat sinking or forced-air cooling. Units derate to +100°C ambient. Devices are fully line ($\pm 0.25\%$ max.) and load ($\pm 0.5\%$ max.) regulated and feature user-optional remote on/off control and output-voltage trim capabilities (from 3.3 to 6 Volts).

If you need more 5V current and you've already rejected the use of inefficient, step-down, linear regulators, take a look at one of DATEL's "switchers." Their high efficiency and ease of use may surprise you. Safety agency approvals and full EMI/EMC characterization tests are currently in progress.

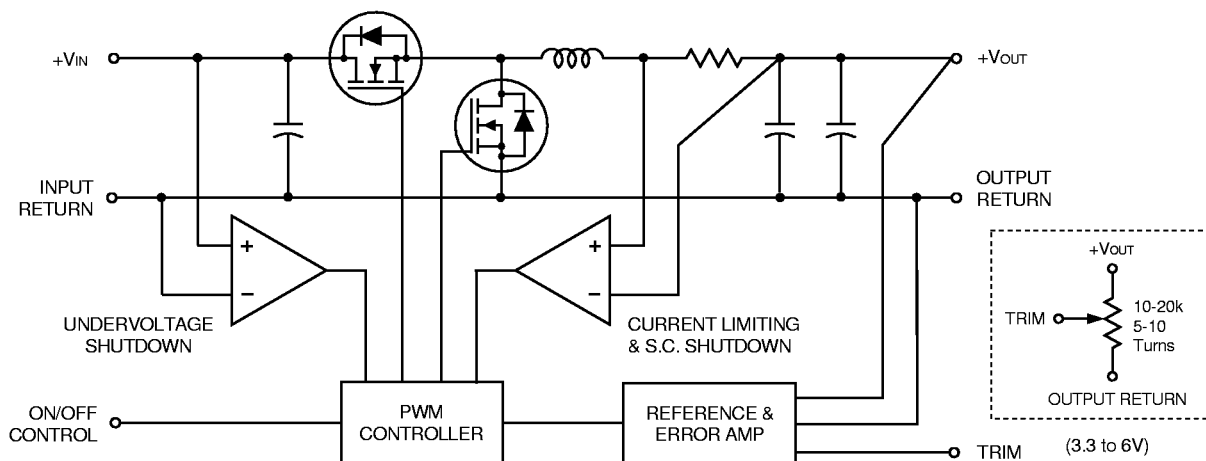


Figure 1. Simplified Schematic

Performance/Functional Specifications

Typical @ $T_A = +25^\circ\text{C}$ under nominal line voltage and full-load conditions, with no external I/O filtering, unless noted. ①

Input	
Input Voltage Range	10.4-13.6 Volts (12V nominal)
Input Current ②	40/2290mA
Input Filter Type	Capacitive
Overvoltage Protection	None
Reverse-Polarity Protection	None
Start-Up Threshold ③	10.2V typical, 10.4V maximum
Undervoltage Shutdown ③	9.6V typical, 8.2V minimum
On/Off Control (Pin 3) ④	TTL high (or open) = on, low = off
Output	
V _{OUT} Accuracy (50% load)	$\pm 1\%$ ($\pm 50\text{mV}$) maximum
Temperature Coefficient	$\pm 0.02\%$ per $^\circ\text{C}$
Ripple/Noise (20MHz BW) ⑤	60mVp-p typical, 85mVp-p maximum
Line/Load Regulation	$\pm 0.25\%$ maximum/ $\pm 0.5\%$ maximum
Efficiency	91% typical, 87% minimum
Current Limiting ⑥	Auto-recovery
Dynamic Characteristics	
Transient Response (50% load step)	30 μsec to $\pm 1\%$ of final value
Switching Frequency	300kHz ($\pm 30\text{kHz}$)
Environmental	
Operating Temperature (Ambient):	
Without Derating	-40 to $+70^\circ\text{C}$
With Derating	to $+100^\circ\text{C}$ (Straight line to 0 Watts)
Storage Temperature	-40 to $+105^\circ\text{C}$
Physical	
Dimensions	2" x 1" x 0.48" (51 x 25 x 12.2mm)
Shielding	5-sided
Case Connection	Pin 2 (Input Return)
Case Material	Corrosion resistant steel with non-conductive, epoxy-based, black enamel finish and plastic baseplate
Pin Material	Brass, solder coated
Weight	1.6 ounces (45.4 grams)

- ① 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 Upon start-up, devices will not regulate properly until the input voltage reaches approximately +10.2V. If the input subsequently drops below +9.6V, devices will turn off. Restart requires bringing the input back up to +10.2V.
 ④ See On/Off Control Functionality.
 ⑤ Output noise may be reduced by installing external capacitors across the output terminals. Caps should be selected for low ESR (typ. 60m Ω) and 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 200mA and remains there until the short is removed.

Absolute Maximum Ratings

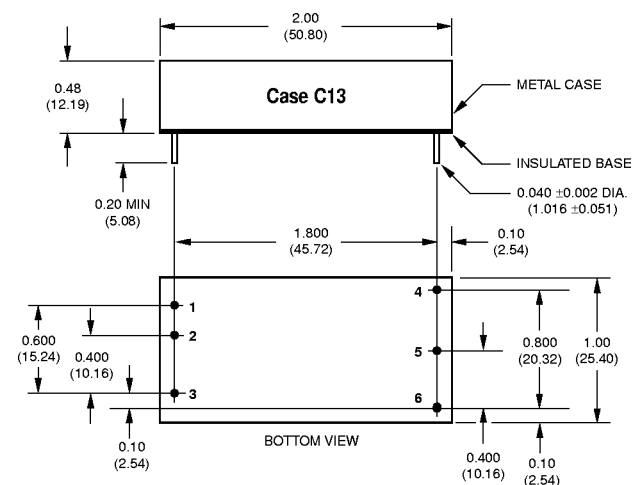
Input Voltage	15 Volts
Output Current	Current limited. Devices can withstand a sustained output short circuit without damage.
Storage Temperature	-40 to $+105^\circ\text{C}$
Lead Temperature (soldering, 10 sec.)	$+300^\circ\text{C}$

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.

On/Off Control Functionality

The On/Off Control pin has an internal 10k Ω pull-up resistor to +V_{IN}. It can be driven with any logic circuit capable of meeting the following drive requirements. Logic "0" = 0 to +0.8V. Logic "1" = +2.0V to +V_{IN}. I_{IH} (@V_{IN} = +2.0V) = -1.2mA. I_{IL} (@V_{IN} = 0V) = -1.4mA. Open collector logic or a single NPN drive transistor can be used. The drive circuit should be rated for more than 13.6V. Applying a voltage to pin 3 when no input power is applied to the converter can cause permanent damage to the converter.

MECHANICAL SPECIFICATIONS



I/O Connections

Pin	Function P21
1	+Input
2	Input Return
3	On/Off Control
4	+Output
5	Output Return
6	Trim

Note:

The case is connected to pin 2 (Input Return).

ORDERING INFORMATION

UNR-5/5-D12 Non-Isolated, 12V-to-5V, 25 Watt, DC/DC Converter

Non-Isolated DC/DC Converter Selection Guide

2.5V SINGLE OUTPUT, NON-ISOLATED

Output Current (Amps, Max.)	Input Voltage, Nominal (Range) (Volts)	Package ①		Regulation		Ripple/ Noise ② (mVp-p)	Efficiency (Min.)	DATEL Model Number	Data Sheet @ www.datel.com
		Dimensions (Inches)	Case, Pinout	Line (Max.)	Load (Max.)				
2	5 (4.75-5.5)	1 x 1 x 0.45	C7A, P9	±0.25%	±0.5%	30	83%	UNR-2.5/2-D5	UNR, 5W
8	5 (4.75-5.5)	2 x 1 x 0.39	C5A, P9	±0.1%	±0.5%	40	86%	UNR-2.5/8-D5	UNR, 20/25W
	12 (10.4-13.6)	2 x 1 x 0.48	C5C, P9	±0.1%	±0.6%	40	85%	UNR-2.5/8-D12	UNR, 20/25W
10	5 (4.75-5.5)	2 x 1 x 0.39	C5A, P9	±0.1%	±0.5%	40	85%	UNR-2.5/10-D5	UNR, 20/25W
	12 (10.4-13.6)	2 x 1 x 0.48	C5C, P9	±0.1%	±0.6%	40	83%	UNR-2.5/10-D12	UNR, 20/25W
12	5 (4.75-5.5)	2 x 1 x 0.44	C5B, P9	±0.1%	±0.5%	40	84%	UNR-2.5/12-D5	UNR, 30W
20	5 (4.5-5.5)	2 x 2 x 0.49	C21, P26	±0.1%	±1.0%	60	85%	UNR-2.5/20-D5 ③	Contact DATEL

3.3V SINGLE OUTPUT, NON-ISOLATED

3	5 (4.75-5.5)	1 x 1 x 0.45	C7A, P9	±0.4%	±0.5%	30	86%	UNR-3.3/3-D5	UNR, 10W
	7.5 (4.75-13.6)	2 x 0.4 x 0.8 ④	B1, P18	±1.0%	±3.0%	50	90% ⑥	UNS-3.3/3-D5	UNS, 10/15W
	7.5 (4.75-13.6)	2 x 0.8 x 0.4 ⑤	B2, P18	±1.0%	±3.0%	50	90% ⑥	UNS-3.3/3-D5D	UNS, 10/15W
	12 (10.4-13.6)	1 x 1 x 0.45	C7A, P9	±0.25%	±0.5%	100	87%	UNR-3.3/3-D12	UNR, 10W
8	5 (4.75-5.5)	2 x 1 x 0.39	C5A, P9	±0.1%	±0.5%	40	88%	UNR-3.3/8-D5	UNR, 26/33W
	5 (4.75-5.5)	2 x 1 x 0.39	C16A, P23	±0.1%	±0.5%	40	88%	UNR-3.3/8-D5T ③ ⑥	Contact DATEL
	5 (4.75-5.5)	2 x 0.4 x 0.53 ⑦	B3, P27	±0.1%	±0.5%	40	88%	USN-3.3/8-D5 ③	Contact DATEL
	12 (10.4-13.6)	2 x 1 x 0.48	C5C, P9	±0.1%	±0.6%	60	86%	UNR-3.3/8-D12	UNR, 26/33W
10	12 (10.4-13.6)	2 x 1 x 0.48	C16C, P23	±0.1%	±0.6%	60	86%	UNR-3.3/8-D12T ③ ⑥	Contact DATEL
	5 (4.75-5.5)	2 x 1 x 0.39	C5A, P9	±0.1%	±0.5%	40	86%	UNR-3.3/10-D5	UNR, 26/33W
	5 (4.75-5.5)	2 x 1 x 0.39	C16A, P23	±0.1%	±0.5%	40	86%	UNR-3.3/10-D5T ③ ⑥	Contact DATEL
	5 (4.75-5.5)	2 x 0.4 x 0.53 ⑦	B3, P27	±0.1%	±0.5%	40	86%	USN-3.3/10-D5 ③	Contact DATEL
	12 (10.4-13.6)	2 x 1 x 0.48	C5C, P9	±0.1%	±0.6%	60	85%	UNR-3.3/10-D12	UNR, 26/33W
	12 (10.4-13.6)	2 x 1 x 0.48	C16C, P23	±0.1%	±0.6%	60	85%	UNR-3.3/10-D12T ③ ⑥	Contact DATEL
12	5 (4.75-5.5)	2 x 1 x 0.44	C5B, P9	±0.1%	±0.5%	40	87%	UNR-3.3/12-D5	UNR, 40W
20	5 (4.5-5.5)	2 x 2 x 0.49	C21, P26	±0.1%	±1.0%	50	87%	UNR-3.3/20-D5 ③	Contact DATEL

5V SINGLE OUTPUT, NON-ISOLATED

3	12 (6-16.5)	2 x 0.4 x 0.8 ④	B1, P18	±1.0%	±3.0%	50	92% ⑥	UNS-5/3-D12	UNS, 10/15W
	12 (6-16.5)	2 x 0.8 x 0.4 ⑤	B2, P18	±1.0%	±3.0%	50	92% ⑥	UNS-5/3-D12D	UNS, 10/15W
5 ⑦	12 (10.4-13.6)	2 x 1 x 0.48	C13, P21	±0.25%	±0.5%	60	87%	UNR-5/5-D12	UNR, 25W

Listed specifications are typical at T_A = +25°C under nominal line voltage and full-load conditions, unless noted.

① See individual product data sheets for mechanical specifications and pinouts.

② Ripple/Noise is specified over a 20MHz bandwidth.

③ Listed specifications for these products are preliminary.

④ 10-pin SIP package.

⑤ 10-pin DIP package.

⑥ Listed specification is a typical.

⑦ Output voltage is user adjustable from 3.3 to 6V.

⑧ Output voltage is user adjustable from 1.4 to 3.6V.

⑨ Industry-standard, 11-pin SIP package.

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