



LNB10000

Low-Noise 10W DC/DC Converter

Low Noise, High Efficiency, 2:1 Wide Input Range

5 V_{IN} +/-5 V_{OUT} @ 1A

US Patent 5,777,519

Key Features

- Wide input voltage range (2:1)
- Less than 5mV output noise
- Efficiency up to TBD
- Six-sided shielding
- Soft start
- Adjustable output
- 1mA off state current
- 250mV dropout linear regulators
- Dual output tracking linear regulator
- Industry pinouts

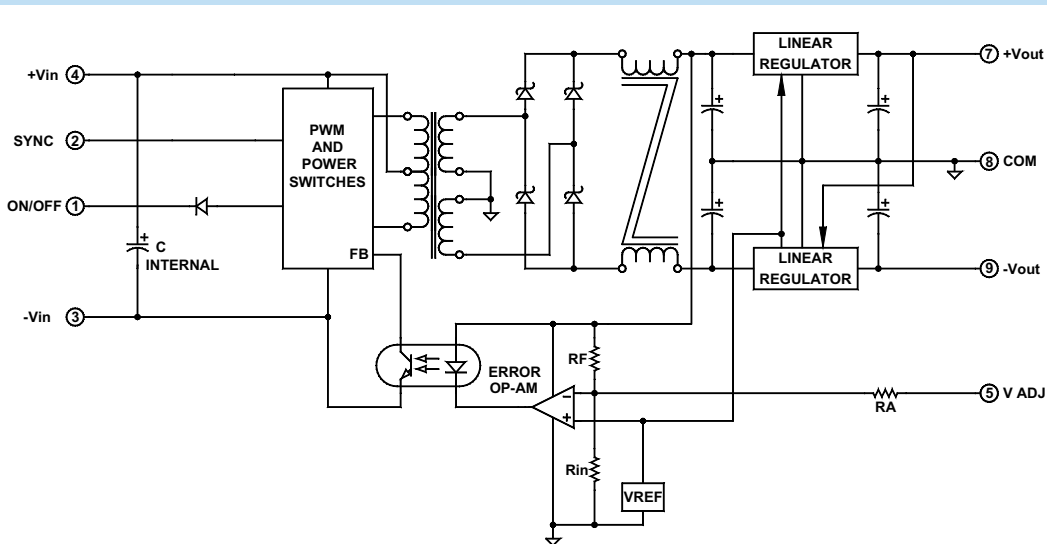


Beta Dyne is protected under various patents, including but not limited to U.S. Patent numbers: 5,777,519; 6,188,276; 6,262,901; 6,452,818; 6,473,3171.

Applications

Functional Description

The LNB10000 is a low-noise, dual output DC/DC converter. The converter accepts 4.6 to 9 V_{IN} and provides +/-5V @ 1A at its output. Push-pull topology followed by dual tracking linear regulators reduce the output ripple to 5mV_{pp}. Other features include input *pi* filter, external synchronization, input current limit, and adjustable outputs.



Typical Block Diagram of LNB10000 Dual Output Converter

Electrical Specifications

INPUT SPECIFICATIONS

Unless otherwise specified, all parameters are given under typical +25°C with nominal input voltage and under full output load conditions.

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Input Voltage Range		4.6	5	9	Vdc
Input Filter					
Reverse Polarity Input Current	External series-blocking diode			12	A
Input Surge Current (20µS Spike)				10	A
No Load Input Current					mA
Full Load Input Current					mA
Short Circuit Current Limit			150		% I _{IN}
Undervoltage Shutdown		4.5			Vdc
Off State Current, 5V			3		mA
Remote ON/OFF Control					
Converter ON	Open (Open circuit voltage at Pin 1: 10V Max.)				
Converter OFF		-0.6	0	0.2	Vdc
Logic Input Reference	-Input				
Logic Compatibility	TTL Open Collector or CMOS Open Drain				

OUTPUT SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Voltage and Current Ratings			+/-5		Vdc
Output Voltage Accuracy			±1	±1.5	%
Output Voltage Adjustment			3	±5	%
Voltage Balance, Dual ¹			±0.2	±0.5	%
Minimum Load ¹		10			% of FL
Ripple & Noise			5	10	mV _{PP}
Line Regulation	Minimum V _{IN} to maximum V _{IN}		0.05	0.1	%
Load Regulation, Dual ²			±1		%
Temperature Coefficient @ FL			0.02		%/°C of V _{OUT}
Transient Response Time (to within 0.5% of V _{OUT})	50% FL to FL to 50% FL, See Figure 1		TBD		µS
Short Circuit Protection	All outputs, by input current limiting				

GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency			TBD		
Isolation Voltage (1 min.)			1500		Vdc
Isolation Resistance			10 ⁹		Ω
Isolation Capacitance			80		pF
Switching Frequency		300	320	333	kHz

ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature, Industrial (Ambient)*	See Figure 2	-40		+75	°C
Operating Temperature, Extended (X)	See Ordering Guide (Please contact factory)	-55		+85	°C
Storage Temperature Range		-55		+125	°C
Thermal Resistance			3.5	4	°C/W _{DISS}
Maximum Operating Case Temperature				105	°C
Derating	See Figure 2				
Humidity	Up to 95% non-condensing				
Cooling	Free-air convection				
EMI/RFI	Six-sided continuous shielded metal case				
MTBF	per MIL-HNBK-217F (Ground benign, +25°C)		1×10 ⁶		hours

* See footnotes 3, 4, 5 and 6

PHYSICAL CHARACTERISTICS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Dimensions (L×W×H)	2.00×1.00×0.395 in. (50.80×25.40×10.03mm)				
Weight	1.04 oz. (30g)				
Case Material	Coated metal				
Shielding Connection	-Input (Pin 3)				

¹ In applications where the $-V_{OUT}$ is loaded more than $+V_{OUT}$, a minimum load is required between $+V_{OUT}$ and GND. If the load is connected between $+V_{OUT}$ and $-V_{OUT}$, no minimum load is required.

² For dual converters if only the $-V_{OUT}$ is loaded. A 10% FL must be connected from $+V_{OUT}$ to Ground.

³ Contact factory for -55° to $+85^{\circ}$ C operating temperature range.

⁴ The maximum input current measured at minimum input voltage is given as $1.6 \cdot I_{NOMINAL}$. Nominal input current is the typical value measured at the input of the converter under full-load room temperature and nominal input voltage.

⁵ Adequate insulation is to be provided to the converters at the end usage as per applicable requirements.

⁶ Temperature rise on the case of the converters is to be considered during the end usage as per applicable requirements.

⁷ Measured without external filter. When the recommended filter is used, a reduction by a factor of 5 or more is achieved.

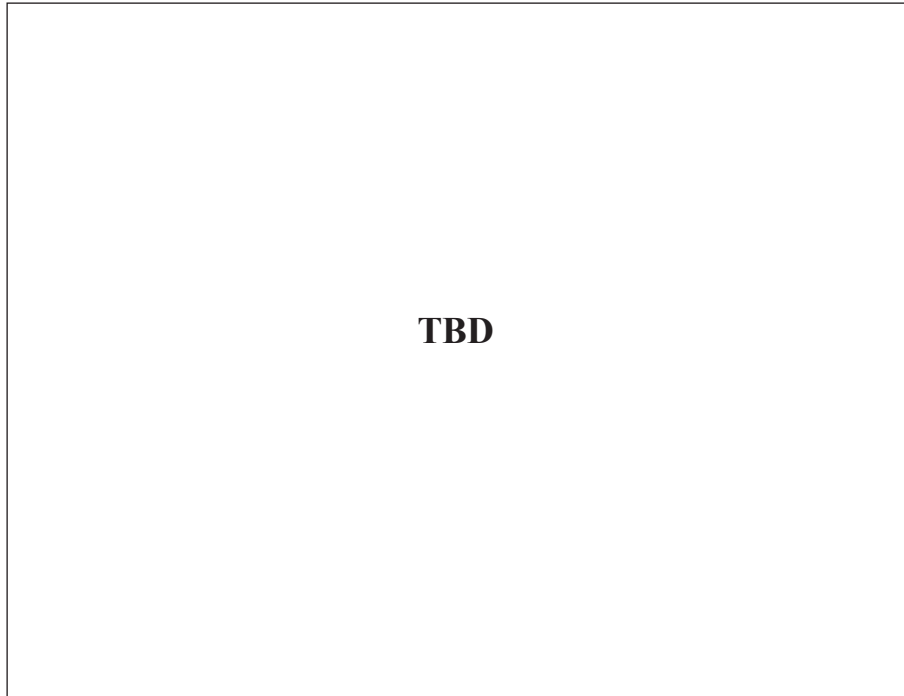


FIGURE 1. Transient response and turn on delay with soft start

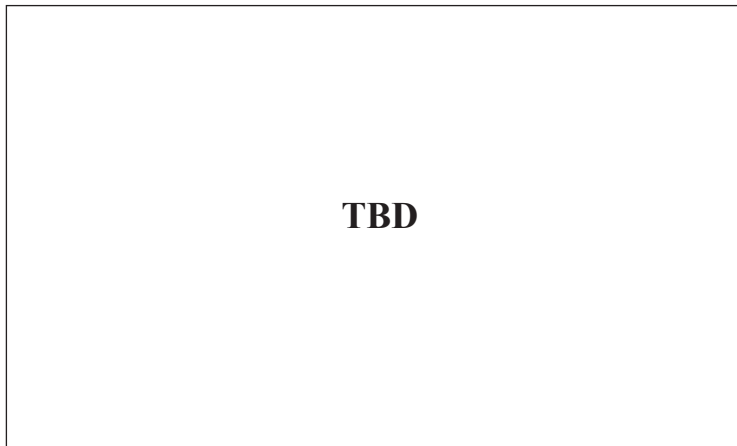


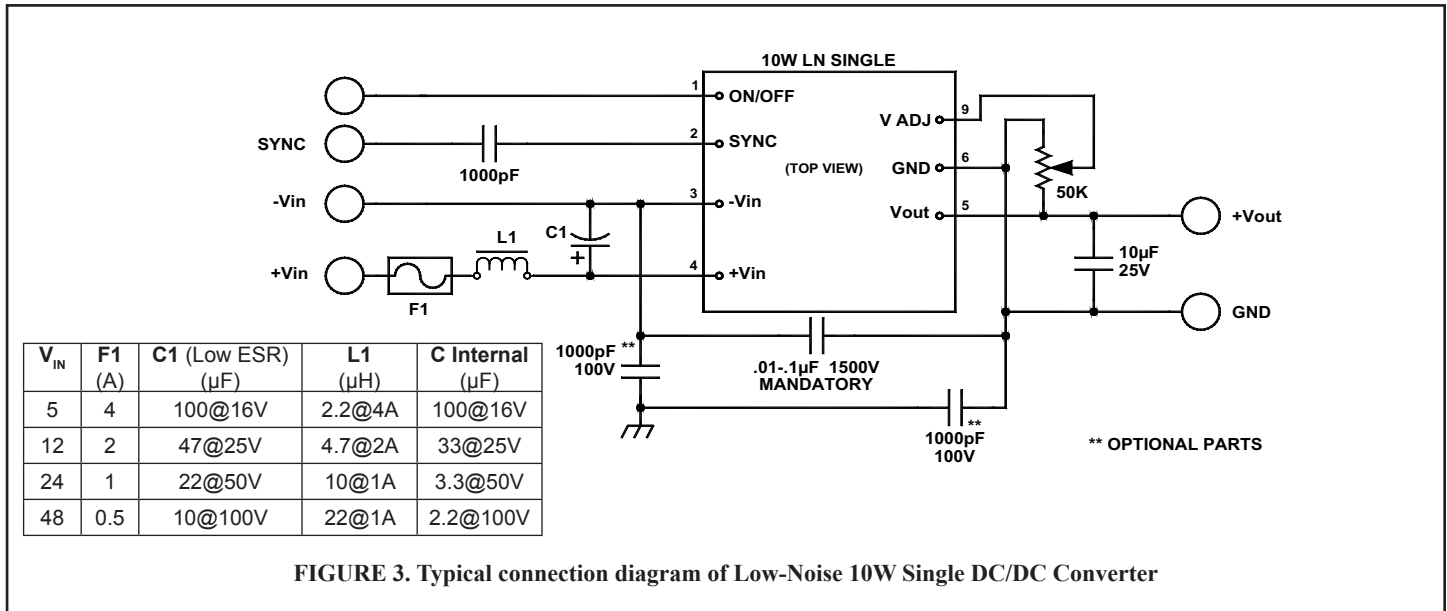
FIGURE 2. Typical derating curve of Low-Noise 10W series

OUTPUT VOLTAGE ADJUSTMENT

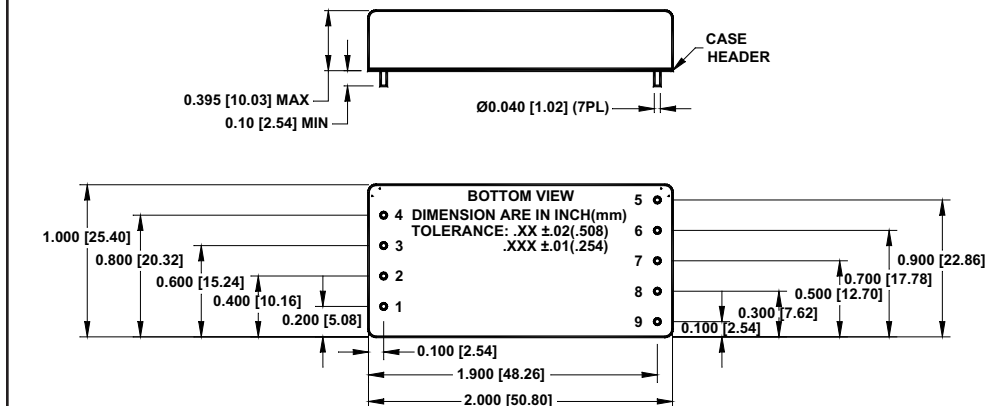
For both single and dual models, the output reference voltage is referenced to the output ground: Pin 6 for singles and Pin 8 for duals. To trim the output voltage high, connect a 1% resistor (0kΩ–200kΩ range) between $-V_{OUT}$ (Pin 6) and V_{OUT} Adjust (Pin 9) for the singles, and COM (Pin 8) and V_{OUT} Adjust (Pin 5) for the duals. To trim the output voltage low, connect a 1% resistor (50kΩ–500kΩ range) between $+V_{OUT}$ (Pin 5) and V_{OUT} Adjust (Pin 9) for the singles,

and $+V_{OUT}$ (Pin 7) and V_{OUT} Adjust (Pin 5) for the duals.

With the wiper connected to the V_{OUT} Adjust pin, a variable resistor (potentiometer) can also be used for V_{OUT} adjustment by connecting each end to $+V_{OUT}$ and $-V_{OUT}$ for the singles, and $+V_{OUT}$ and COM for the duals. A potentiometer between 50kΩ–100kΩ can be used. Avoid using a low resistance potentiometer or a high temperature coefficient such as wound wire.



MECHANICAL SPECIFICATIONS



Pin	Function
DUAL	
1	ON/OFF
2	SYNC
3	$-V_{IN}$
4	$+V_{IN}$
5	V_{OUT} ADJ
6	No Pin
7	$+V_{OUT}$
8	COM
9	$-V_{OUT}$

EXTERNAL SYNCHRONIZATION

This series of converters can be synchronized to an external system clock of 320kHz -2% to 10%. The external clock is AC-coupled to the input SYNC terminal (Pin 2) through a coupling capacitor

from 220pF to 1000pF. The required amplitude is 3.3V to 5V and its duty cycle is 50% \pm 20%. Please refer to *Application Note DC-005: Synchronization* for more information.