



# LN10017

## Low-Noise 10W DUAL DC/DC CONVERTER

9 - 18 V<sub>IN</sub> ±5 V<sub>OUT</sub> @ ±1A

### Key Features

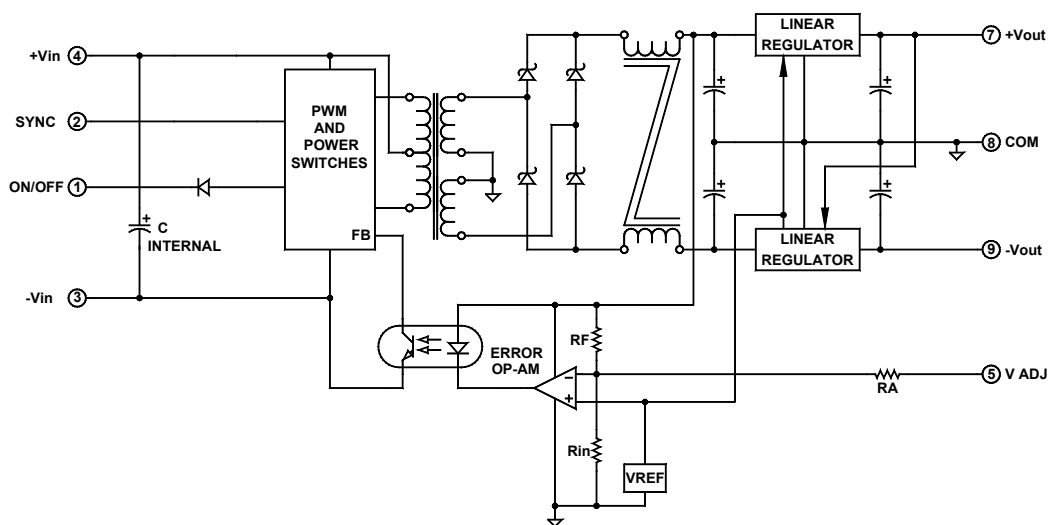
- Wide input voltage range (2:1)
- Less than 5mV output noise
- Six-sided shielding
- Soft start
- Dual output
- Short circuit protection
- Adjustable output
- 1.75mA off state current
- 250mV dropout linear regulators
- Dual output tracking linear regulator
- Industry pinouts



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.

### Functional Description

The LN10017 is a dual output, isolated DC/DC converter that accepts 9V<sub>IN</sub> to 18V<sub>IN</sub> and provides ±5V<sub>OUT</sub> @ ±1A. The converter's design is based on Beta Dyne's patents and offers low noise and an extended operating temperature range from -40°C to +71°C. The converter is designed to synchronize to an external frequency: f<sub>SYNC</sub> ≥ 370 kHz.



Typical Block Diagram of 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		9	12	18	Vdc
Input Filter	C				
No load nput Filter			30		mA
Full load nput Filter			1126		mA
Reverse Polarity Input Current	External series-blocking diode			12	A
Input Surge Current (20µS Spike)				10	A
Short Circuit Current Limit			150		% I <sub>IN</sub>
Undervoltage Shutdown		4.5			Vdc
Off State Current			1.75		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
Output Voltage			±5		Vdc
Output Current			±1000		mA
Output Voltage Accuracy, Single and Dual			±1	±1.5	%
Output Voltage Adjustment			3	±5	%
Voltage Balance, Dual <sup>1</sup>			±0.2	±0.5	%
Minimum Load <sup>1</sup>		10			% of FL
Ripple & Noise	See Figure 4, see note 8		5	10	mV <sub>pp</sub>
Line Regulation	Minimum V <sub>IN</sub> to maximum V <sub>IN</sub>		0.05	0.1	%
Load Regulation, Dual <sup>2</sup>			±1		%
Temperature Coefficient @ FL			0.02		%/°C of V <sub>OUT</sub>
Transient Response Time (to within 0.5% of V <sub>OUT</sub> )	50% FL to FL to 50% FL, See Figure 1		5		µS
Short Circuit Protection	All outputs, by input current limiting				

<sup>1</sup> In applications where the -V<sub>OUT</sub> is loaded more than +V<sub>OUT</sub>, a minimum load is required between +V<sub>OUT</sub> and GND. If the load is connected between +V<sub>OUT</sub> and -V<sub>OUT</sub>, no minimum load is required.

<sup>2</sup> For dual converters if only the -V<sub>OUT</sub> is loaded. A 10% FL must be connected from +V<sub>OUT</sub> to Ground.

### GENERAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Efficiency			74		%
Isolation Voltage (1 min.)			1500		Vdc
Isolation Resistance			10 <sup>9</sup>		Ω
Isolation Capacitance			80		pF
Switching Frequency		350	360	365	kHz

### ENVIRONMENTAL SPECIFICATIONS

PARAMETER	CONDITION / NOTE	MIN	TYP	MAX	UNIT
Operating Temperature, Industrial (Ambient) <sup>1</sup>	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 <sub>DISS</sub>
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 <sup>6</sup>		hours

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, 5, 12, 24V <sub>IN</sub>	-Input (Pin 3)				

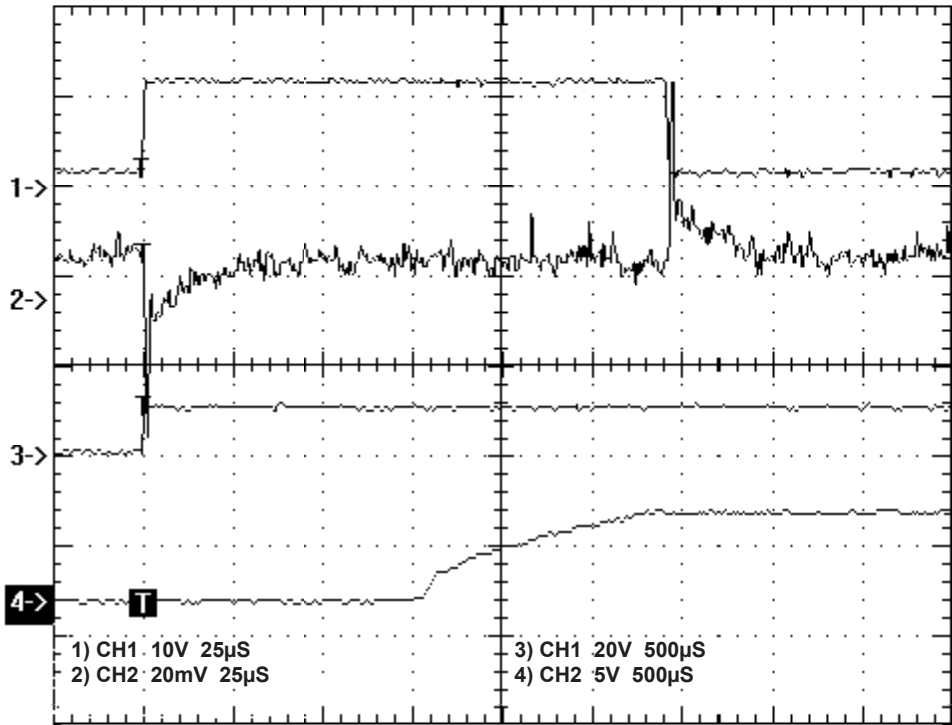


FIGURE 1. Transient response and turn on delay with soft start

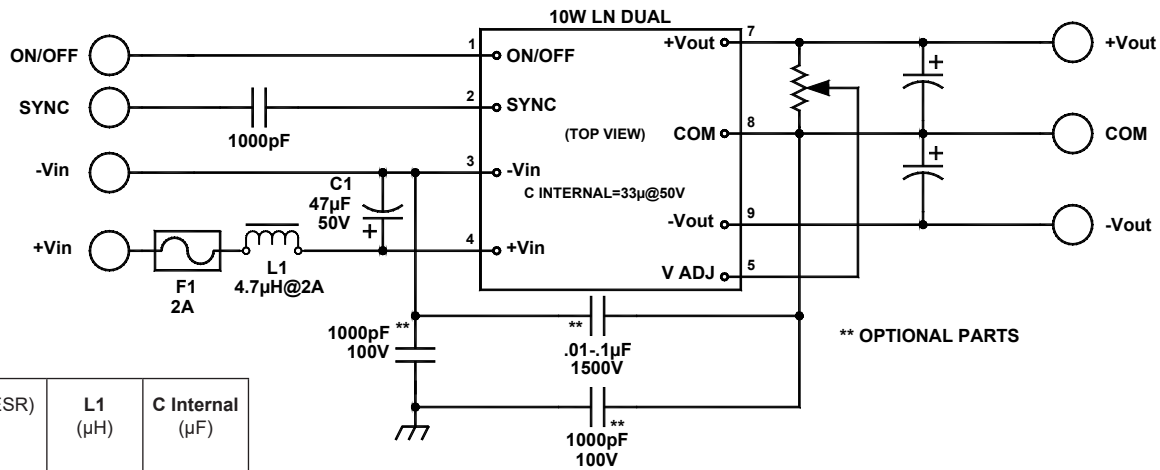
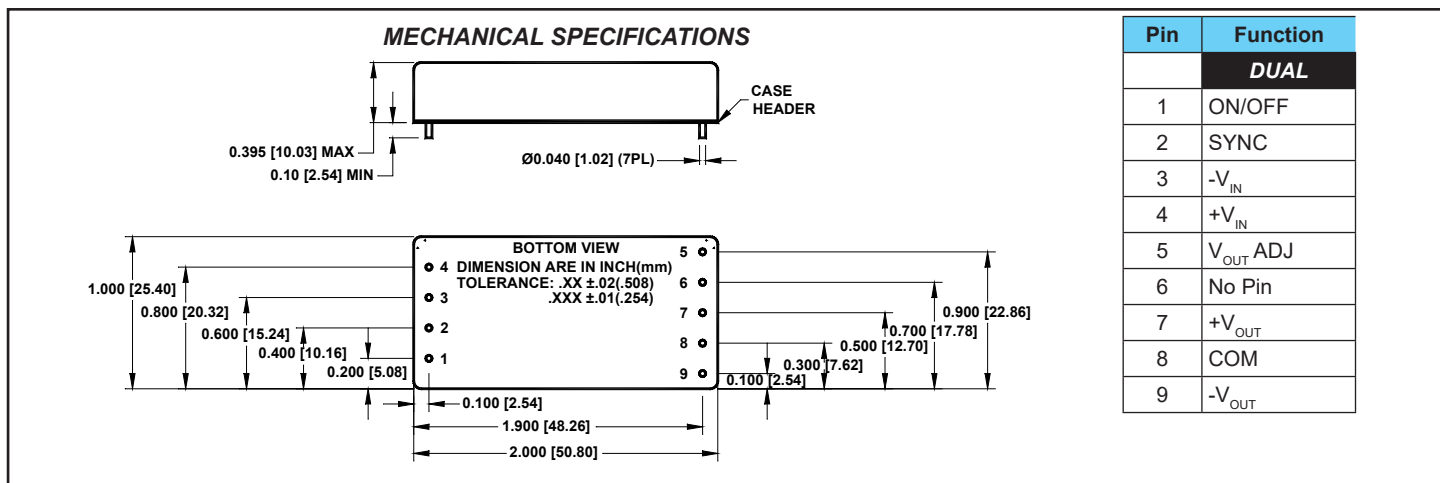


FIGURE 2. Typical connection diagram of Low-Noise 10W Dual DC/DC Converter



### 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 (0k $\Omega$ –200k $\Omega$  range) between -V<sub>OUT</sub> (Pin 6) and V<sub>OUT</sub> Adjust (Pin 9) for the singles, and COM (Pin 8) and V<sub>OUT</sub> Adjust (Pin 5) for the duals. To trim the output voltage low, connect a 1% resistor (50k $\Omega$ –500k $\Omega$  range) between +V<sub>OUT</sub> (Pin 5) and V<sub>OUT</sub> Adjust (Pin 9) for the singles,

and +V<sub>OUT</sub> (Pin 7) and V<sub>OUT</sub> Adjust (Pin 5) for the duals.

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

### EXTERNAL SYNCHRONIZATION

This series of converters can be synchronized to an external system clock of 370kHz or greater. 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.