

## Wall Industries, Inc.

# LANC2433UW12

**DC/DC Converter**  
**9-36 VDC Input**  
**3.3 VDC Output at 3.5A**



### Features:

- **RoHS Compliant**
- **Single Output**
- **Standard 24 Pin DIP and SMT Package**
- **Five-Sided Continuous Shield**
- **No Minimum Load Required**
- **High Power Density**
- **High Efficiency up to 88%**
- **Small Size: 1.25 x 0.8 x 0.450 Inches**
- **Input to Output Isolation (1600VDC)**
- **4:1 Ultra Wide Input Voltage Range**
- **Fixed Switching Frequency**
- **Input Under-Voltage Protection**
- **Output Over-Voltage Protection**
- **Over-Current Protection**
- **Output Short Circuit Protection**
- **Remote ON/OFF**

### Applications:

- **Distributed Power Architectures**
- **Communications Equipment**
- **Computer Equipment**
- **Work Stations**

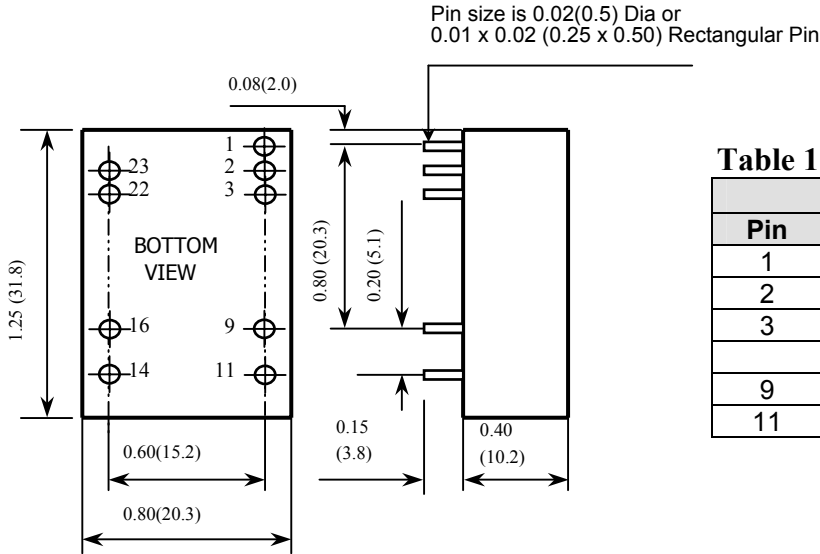
### Description:

The LANC2433UW12 single output series offers 12 watts of output power from a package in an IC compatible 24pin DIP and SMT configuration. LANC2433UW12 single output series has 4:1 wide input voltage of 9-36VDC and 18-75VDC. The LANC2433UW12 single output series features 1600VDC of isolation, short circuit protection and five sided shielding. All models are particularly suited for telecommunications, industrial, mobile telecom, and test equipment applications.

Technical Specifications		Model No. LANC2433UW12			
All specifications are based on 25 °C, Nominal Input Voltage and Maximum Output Current unless otherwise noted. We reserve the right to change specifications based on technological advances.					
SPECIFICATION	Related condition	Min	Nom	Max	Unit
Switching Frequency	Test at nominal Vin and full load		400		kHz
<b>INPUT (V<sub>in</sub>)</b>					
Operating Voltage Range		9	24	36	Vdc
Input Voltage (Continuous)				40	Vdc
Input Voltage (Transient 100ms)				50	Vdc
UVLO Turn-on Threshold			9		Vdc
UVLO Turn-off Threshold			8		Vdc
Input Standby Current	Nominal Vin and No Load		55		mA
Input Voltage Variation	Complies with EST300 132 part 4.4			5	V/ms
Input Current	Nominal Vin and Full Load			602	mA
Reflected Ripple Current	5 to 20MHz, 12μH source impedance (See the Test Setup section - pg 8)		20		mA <sub>pk-pk</sub>
<b>EFFICIENCY</b>					
	Test at nominal Vin and full load (See the Test Setup section – pg 8)		84		%
<b>OUTPUT (V<sub>o</sub>)</b>					
Operating Output Range	Nominal Vin and Full Load	3.26	3.3	3.34	Vdc
Load Regulation (DIP Type)	0% to 100% Full Load	-0.5		+0.5	%
Load Regulation (SMT Type)	0% to 100% Full Load	-1.0		+1.0	%
Line Regulation	LL to HL at Full Load	-0.2		+0.2	%
Output Ripple & Noise	5Hz to 20MHz bandwidth (See the Test Setup section - pg 8)			85	mV <sub>pk-pk</sub>
Output Current		0		3.5	A
Output Voltage Overshoot	LL to HL at Full Load		0	3	% Vout
Over Voltage Protection	Zener diode clamp		3.9		Vdc
Over Current Protection			150		% FL
Short Circuit Protection			Continuous, automatic recovery		
<b>DYNAMIC LOAD RESPONSE</b>					
	Test at nominal Vin				
Peak Deviation	Load step change from 75 to 100% or 100 to 75 % of FL		200		mV
Setting Time (Vout < 10% peak deviation)			250		μs
<b>REMOTE ON/OFF</b>					
	The ON/OFF pin voltage is referenced to -Vin (See the Remote ON/OFF Control section - pg 5)				
ON/OFF pin High Voltage (Remote ON)		3.0		12	Vdc
ON/OFF pin Low Voltage (Remote OFF)		0		1.2	Vdc
ON/OFF pin Low Voltage, input current				2.5	mA
<b>START UP TIME</b>					
	Test at nominal Vin and constant resistive load				
Power Up			450		ms
Remote ON/OFF			5		ms
<b>ISOLATION</b>					
Isolation Voltage (Input-Output)		1600			Vdc
Isolation Voltage (Output to Case–DIP Type)		1600			Vdc
Isolation Voltage (Output to Case–SMT Type)		1000			Vdc
Isolation Voltage (Input to Case - DIP Type)		1600			Vdc
Isolation Voltage (Input to Case - SMT Type)		1000			Vdc
Isolation Resistance		1			GΩ
Isolation Capacitance				1500	pF
<b>ENVIRONMENTAL</b>					
Operating Ambient Temperature (w/ derating)		-40		85	°C
Operating Case Temperature				105	°C
Storage Temperature		-55		125	°C
Temperature Coefficient		-0.02		+0.02	% / °C
<b>MTBF</b>					
	See the MTBF and Reliability section (pg 13)				
Bellcore TR-NWT-000332, T <sub>c</sub> =40°C			2,350,000		hours
MIL-STD-217F			875,000		hours
<b>MECHANICAL</b>					
			<b>See Figure 1</b>		
Weight			18.0		grams
Dimensions			1.25 x 0.8 x 0.450		inches

**Figure 1: Mechanical Dimensions**

### DIP Type



**Table 1**

Pin Connection			
Pin	Define	Pin	Define
1	CTRL		
2	-Input	23	+Input
3	-Input	22	+Input
9	NC	16	-Output
11	NC	14	+Output

1. All dimensions are in Inches (mm)  
Tolerance: x.xx±0.02 (x.x±0.5)
2. Pin pitch tolerance ±0.014(0.35)

### SMT Type

Suffix-S



**Table 2**

Pin Connection			
Pin	Define	Pin	Define
1	CTRL		
2	-Input	23	+Input
3	-Input	22	+Input
9	NC	16	-Output
11	NC	14	+Output
Others	NC	Others	NC

1. All dimensions in Inches (mm)  
Tolerance: x.xx±0.02 (x.x±0.5)
2. Pin pitch tolerance ±0.014(0.35)

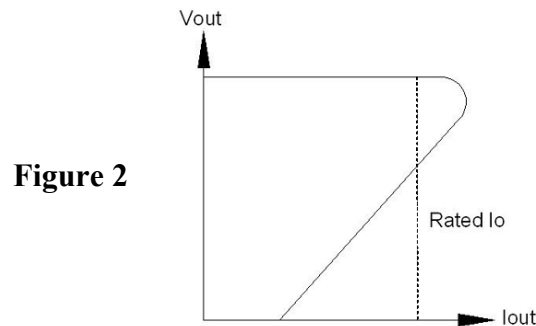
**DESIGN CONSIDERATIONS:****Output Over Current Protection**

When excessive output currents occur in the system, circuit protection is required on all power supplies. Normally, overload current is maintained at approximately 150% of rated current for the LANC2433UW12 single output series.

Fold back-mode is a method of operation in a power supply whose purpose is to protect the power supply from being damaged during an over-current fault condition. It also enables the power supply to operate normally when the fault is removed.

One of the problems resulting from over current is that excessive heat may be generated in power devices; especially MOSFET and Schottky diodes and the temperature of those devices may exceed their specified limits. A protection mechanism has to be used to prevent those power devices from being damaged.

The operation of fold back is as follows. When the current sense circuit sees an over-current event, the output voltage of the module will be decreased for low power dissipation and decrease the heat of the module.

**Output Over Voltage Protection**

The output over-voltage protection consists of an output Zener diode that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over-voltage protection threshold, then the Zener diode clamps the output voltage.

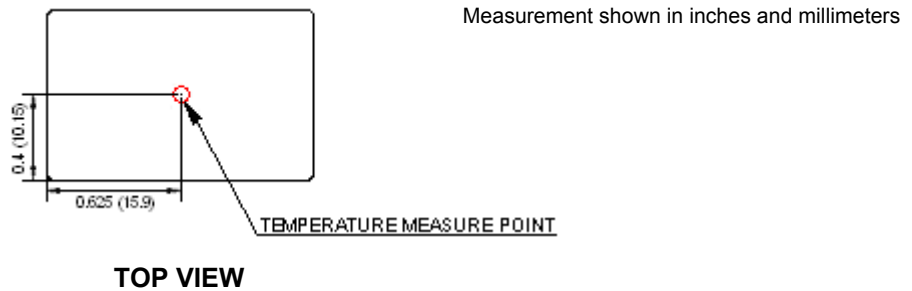
**Input Source Impedance**

The power module should be connected to a low impedance input source. Highly inductive source impedance can affect the stability of the power module. Input external L-C filter is recommended to minimize input reflected ripple current. The inductor is simulated source impedance of  $12\mu\text{H}$  and capacitor is Nippon chemi-con KZE series  $47\mu\text{F}/100\text{V}$ . The capacitor must as close as possible to the input terminals of the power module for lower impedance.

### Thermal Consideration

The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convention, and radiation to the surrounding environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed 105°C. When operating, adequate cooling must be provided to maintain the test point temperature at or below 105°C. Although the maximum point temperature of the power modules is 105°C, you can limit this temperature to a lower value for extremely high reliability.

**Figure 3**



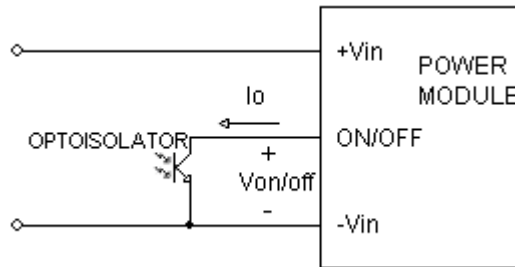
### Remote ON/OFF Control

The positive logic remote ON/OFF control circuit is included.

Turns the module ON during a logic High on the On/Off pin and turns OFF during a logic Low. The On/Off pin is an open collector/drain logic input signal ( $V_{on/off}$ ) that's referenced to GND. If not using the Remote On/Off feature, please open circuit between on/off pin and -input pin to turn the module on.

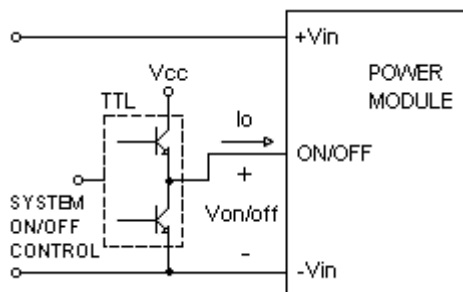
### Remote ON/OFF Implementation

**Figure 4**



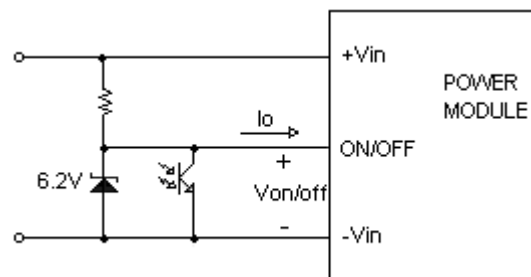
Isolated-Closure Remote ON/OFF

**Figure 5**



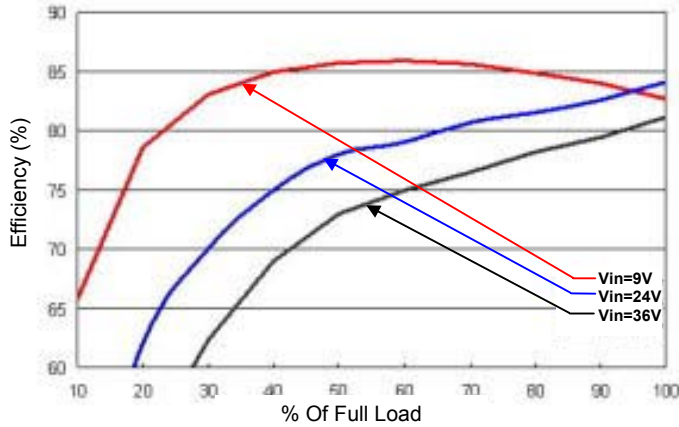
Level Control using TTL Output

**Figure 6**

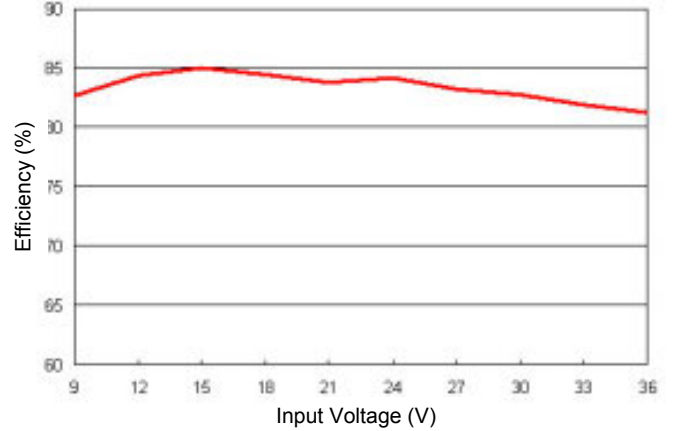


Level Control using Line Voltage

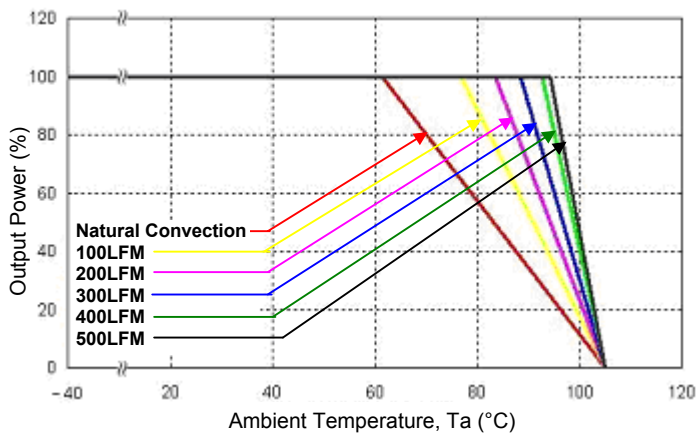
**Graph 1: Efficiency vs. Output Current**



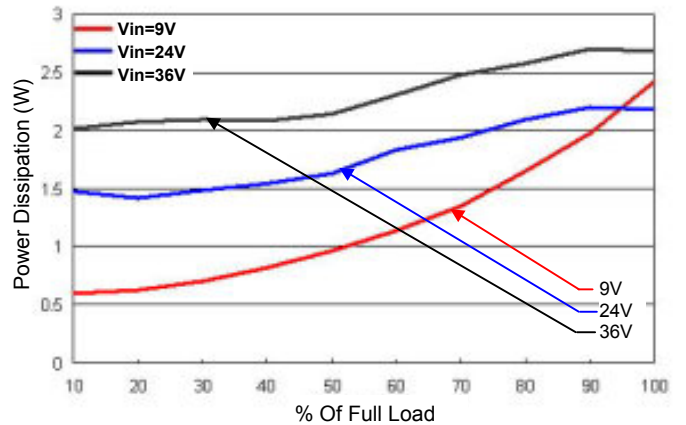
**Graph 2: Efficiency vs. Input Voltage (Full Load)**



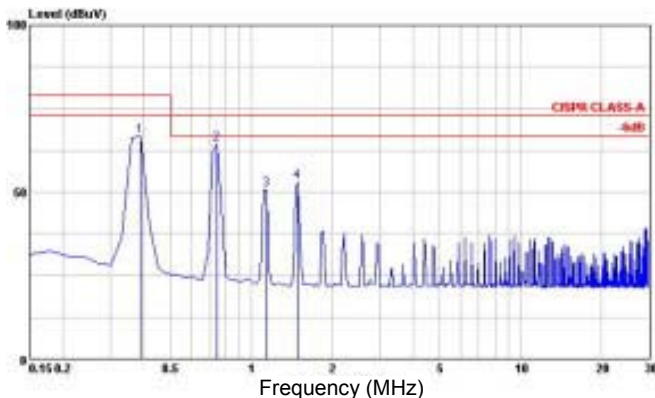
**Graph 3: Output Power vs. Ambient Temperature & Airflow (Nominal Vin)**



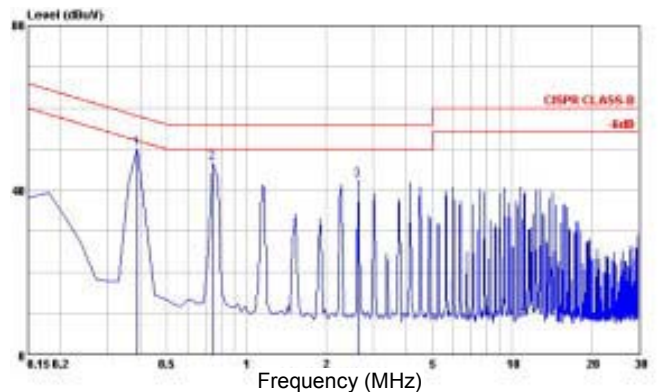
**Graph 4: Power Dissipation Vs. Output Current**



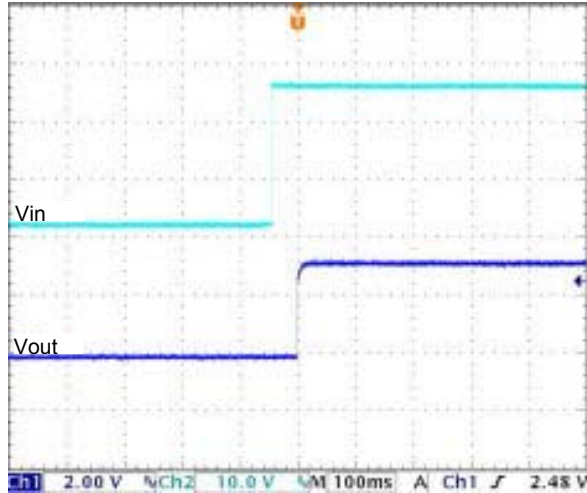
**Graph 5: Conducted Emission of EN55022 Class A (Nominal Vin and Full Load)**



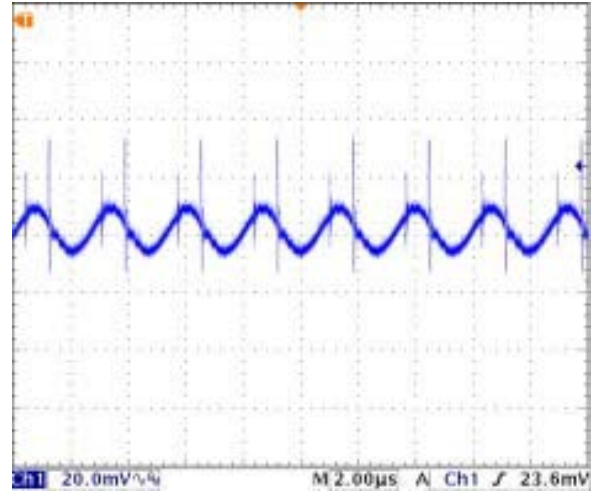
**Graph 6: Conducted Emission of EN55022 Class B (Nominal Vin and Full Load)**



**Graph 7:** Typical Input Start-Up and Output Rise Characteristic (Nominal  $V_{in}$  and Full Load)



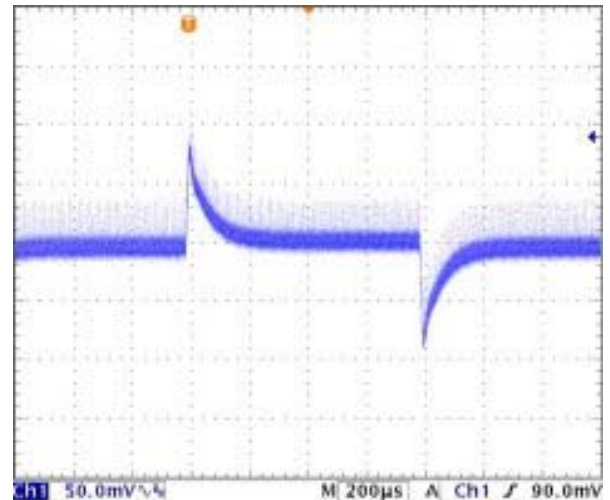
**Graph 8:** Typical Output Ripple and Noise (Nominal  $V_{in}$  and Full Load)



**Graph 9:** Using ON/OFF Voltage Start-Up and  $V_o$  Rise Characteristic (Nominal  $V_{in}$  and Full Load)



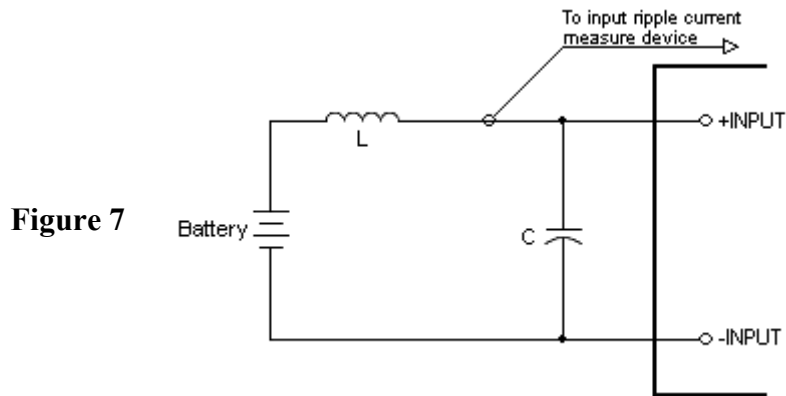
**Graph 10:** Transient Response to Dynamic Load Change from 100% to 75% to 100% of Full Load at Nominal  $V_{in}$



### TEST SETUP:

The LANC2433UW12 specifications are tested with the following configurations:

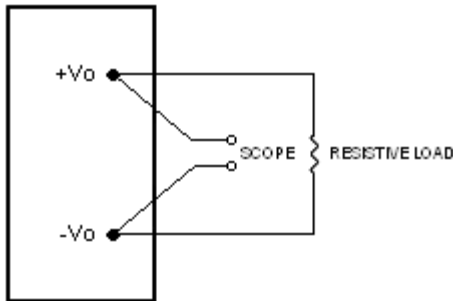
#### Input Reflected-Ripple Current Measurement Test Setup



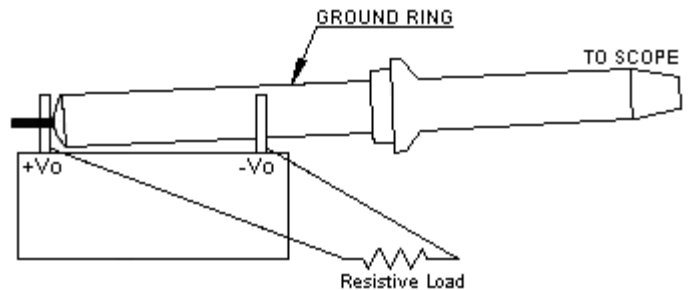
Component	Value	Voltage	Reference
L	12 $\mu$ H	----	----
C	47 $\mu$ F	100V	Aluminum Electrolytic Capacitor

#### Peak-to-Peak Output Ripple & Noise Measurement Setup

**Figure 8**

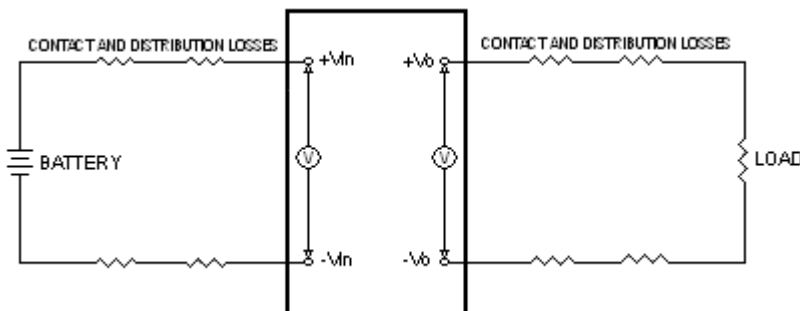


**Figure 9**



#### Output Voltage and Efficiency Measurement Setup

**Figure 10**



$$Efficiency = \left( \frac{V_{out} \times I_{out}}{V_{in} \times I_{in}} \right) \times 100\%$$

NOTE: All measurements are taken at the module terminals



### EMC Considerations

#### Suggested Schematic for EN55022 Conducted Emission Class A Limits

Figure 11

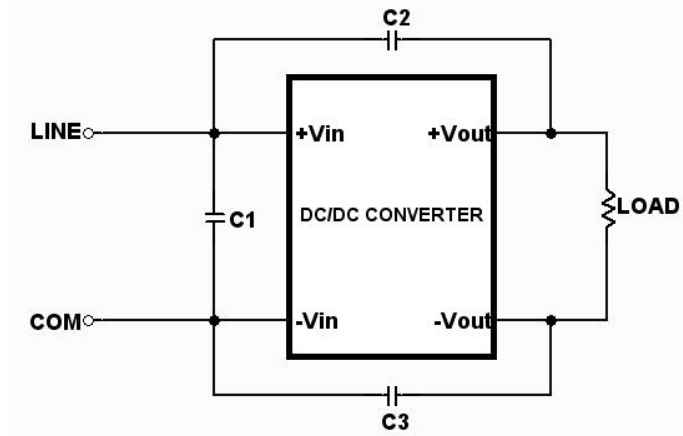
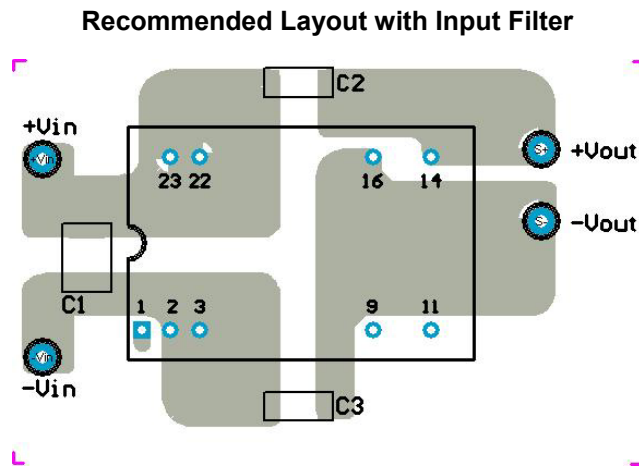


Figure 12



To meet Conducted Emissions EN55022 CLASS A needed the following components:

#### LANC24xxUW12

Component	Value	Voltage	Reference
C1	1uF	50V	1210 MLCC
C2, C3	1000pF	2KV	1206 MLCC

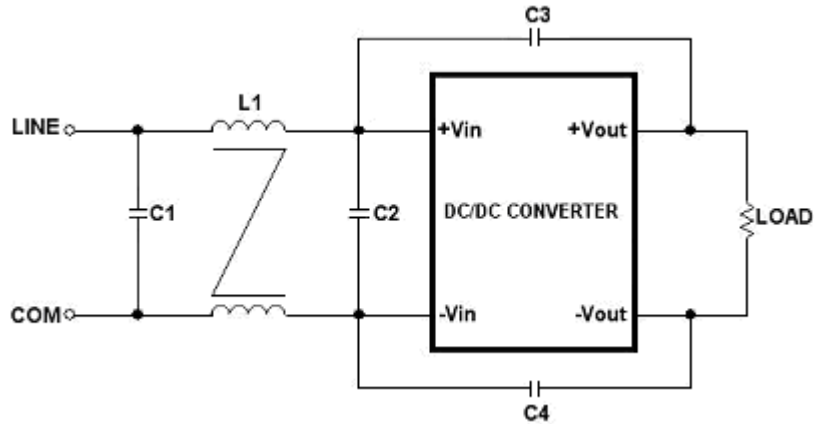
#### LANC48xxUW12

Component	Value	Voltage	Reference
C1	0.47uF	100V	1812 MLCC
C2, C3	1000pF	2KV	1206 MLCC

### EMC Considerations (Continued)

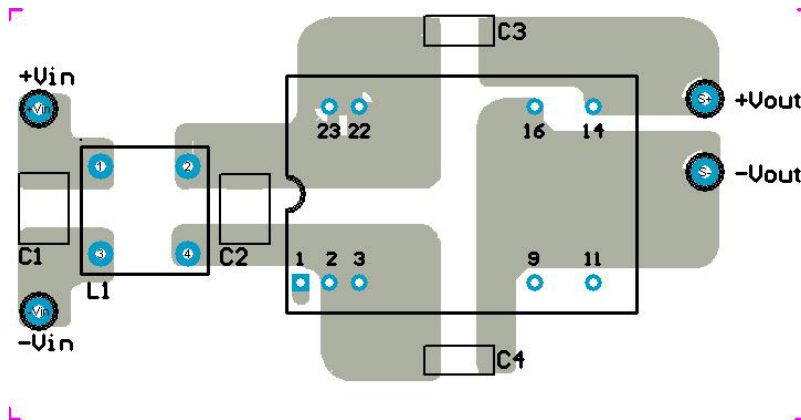
#### Suggested Schematic for EN55022 Conducted Emission Class B limits

Figure 13



#### Recommended Layout with Input Filter

Figure 14



To meet Conducted Emissions EN55022 CLASS B needed the following components:

#### LANC24xxUW12

Component	Value	Voltage	Reference
C1	4.7 $\mu$ F	50V	1812 MLCC
C3, C4	1000pF	2KV	1206 MLCC
L1	325 $\mu$ H	----	Common Choke, P/N: PMT-050

#### LANC48xxUW12

Component	Value	Voltage	Reference
C1	1.5 $\mu$ F	100V	1812 MLCC
C3, C4	1000pF	2KV	1206 MLCC
L1	325 $\mu$ H	----	Common Choke, P/N: PMT-050

### Recommended Pad Layout for DIP Type

Figure 15



### Recommended Pad Layout for SMT Type

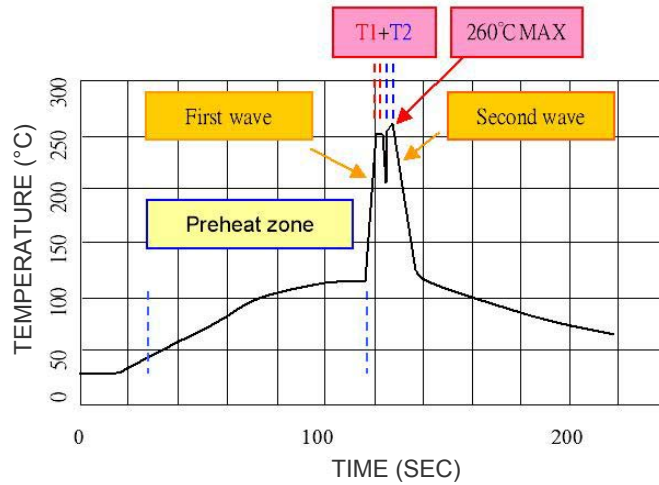
Figure 16



1. All dimensions in Inches (mm)
2. Pin pitch tolerance  $\pm 0.35\text{mm}$
3. Tolerance:  $x.xx \pm 0.02$  ( $x.x \pm 0.5$ )  
 $x.xxx \pm 0.01$  ( $x.xx \pm 0.25$ )

### Soldering and Reflow Considerations:

#### Lead Free Wave Solder Profile for DIP Type



Reference Solder: Sn-Ag-Cu; Sn-Cu

Hand Welding:  
Soldering Iron: Power 90W  
Welding Time: 2~4 sec  
Temp: 380~400°C

Figure 17

Zone	Reference Parameter
Preheat Zone	Rise temp. speed: 3°C/sec max. Preheat temp: 100~130°C
Actual Heating	Peak temp: 250~260°C Peak time (T1+T2 time): 4~6 sec

#### Lead free reflow profile for SMT type

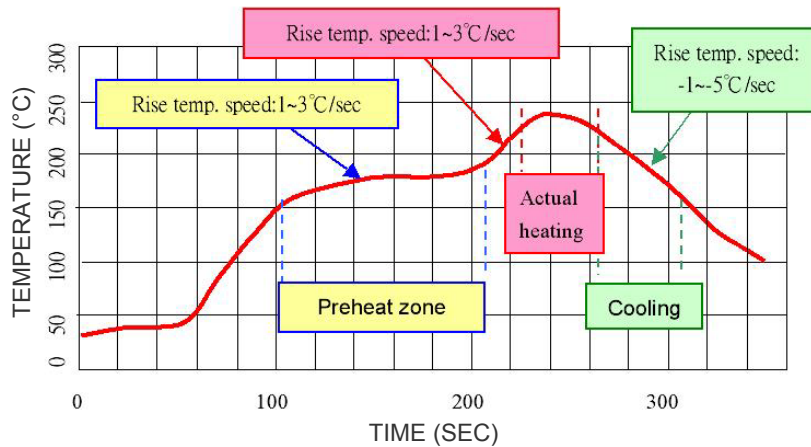
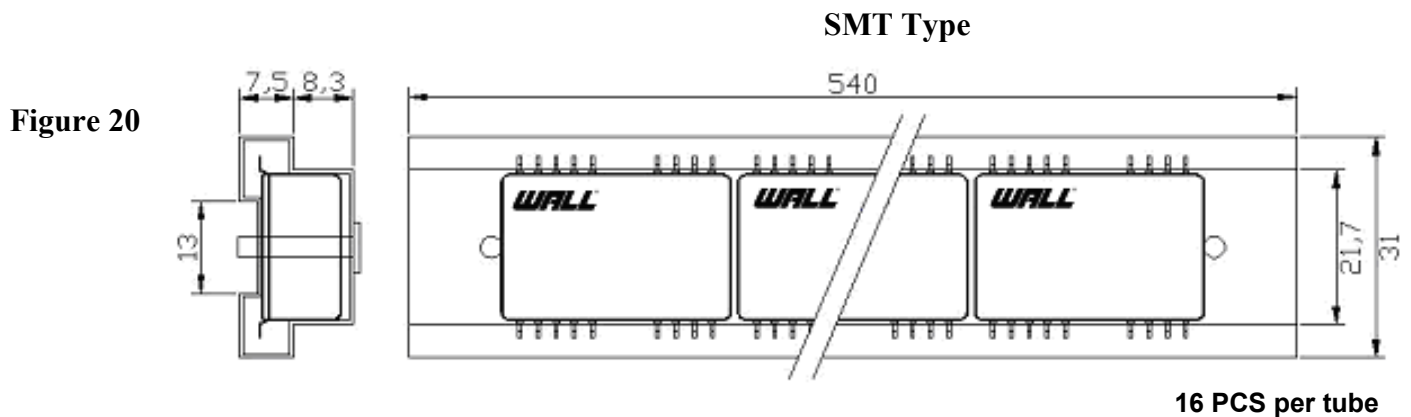
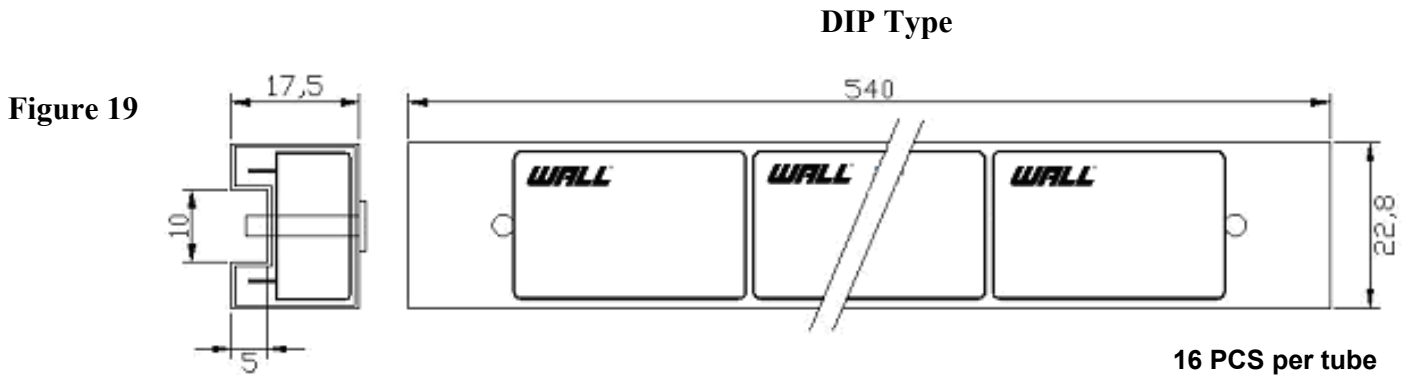


Figure 18

Zone	Reference Parameter
Preheat Zone	Rise temp. speed: 1~3°C/sec Preheat time: 60~120sec Preheat temp. 155~185°C
Actual Heating	Rise temp. speed: 1~3°C/sec Melting time: 30~60 sec Melting temp: 217°C Peak temp: 230~240°C Peak time: 10~20 sec
Cooling	Rise temp. speed: -1~ -5°C/sec

Reference Solder: Sn-Ag-Cu; Sn-Cu

### Packaging Information:



### Safety and Installation Instruction:

#### Fusing Consideration

Caution: This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture. To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a normal-blow fuse with maximum rating of 3A. Based on the information provided in this data sheet on Inrush energy and maximum DC input current; the same type of fuse with lower rating can be used. Refer to the fuse manufacturer's data for further information.

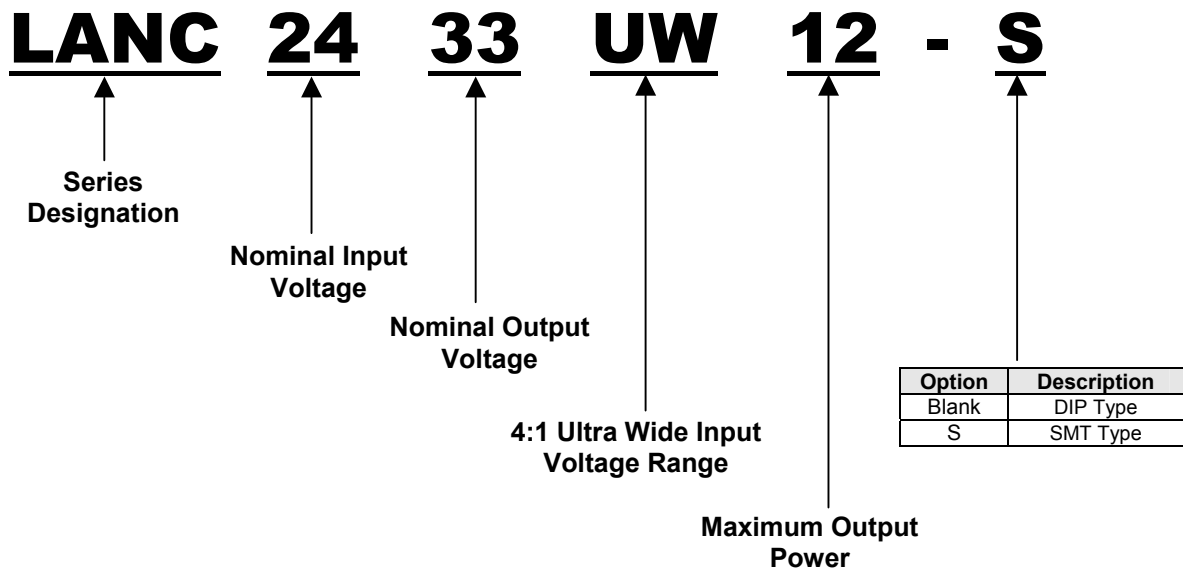
#### MTBF and Reliability

The MTBF of the LANC UW12 single output series of DC/DC converters has been calculated using Bellcore TR-NWT-000332 Case I: 50% stress, Operating Temperature at 40°C (Ground fixed and controlled environment). The resulting figure for MTBF is  $2.35 \times 10^6$  hours.

MIL-HDBK 217F NOTICE2 FULL LOAD, Operating Temperature at 25°C. The resulting figure for MTBF is  $8.745 \times 10^6$  hours.

### Ordering Information:

Part Number Example:



### Company Information:

Wall Industries, Inc. has created custom and modified units for over 40 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001-2000 certification is just one example of our commitment to producing a high quality, well documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

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