

# User Manual

## TNN400APF - V2

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

Zalman Tech Co., Ltd.

## 1. INTRODUCTION

The "TNN400APF-V2" is a Power Supply designed to be used "ATX/ATX12V" form factor personal computers.

### 1.1 SCOPE

The scope of this document is limited to the requirements of "ATX/ATX12V" PC form factor switching Power Supply. Especially, It is applied to the line input capability, remote ON/OFF, cooling, standby voltage("VSB") and electrical characteristics.

Form - factor		ATX/ATX12V		
POWER		440. Watt max peak 400. Watt max Continuous		
Efficiency		75% at Full load		
Output voltage	Regulation	Min load(Amps)	Max load(Amps)	Peak current(Amps)
<b>+12V1DC</b>	±5%	<b>1</b>	<b>16</b>	<b>18</b>
+12V2DC	±5%	<b>1</b>	<b>18</b>	
+5VDC	±5%	0.5A	26.0A	
+3.3VDC	±5%	0.5A	27.0A	
-12VDC	±5%	0A	0.8A	
-5VDC	±10%	<b>0A</b>	<b>0.3A</b>	
+5VSB	±5%	0A	2A	2.5A

## 2. ELECTRICAL SPECIFICATION

### 2.1 AC INPUT LINE REQUIREMENTS

Parameter	MIN	NOM	MAX	UNIT
Vin(115VAC)	90	115	135	VACrms
Vin(230VAC)	180	230	265	VACrms
Vin FREQUENCY	47	-	63	Hz
Vin(115VAC)			10	A
Vin(230VAC)			5	A

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### 2.1.1 INRUSH CURRENT

Max. inrush current shall not exceed 90A(Peak to Peak).

### 2.2 DC OUTPUT REQUIREMENTS

#### 2.2.1 OUTPUT REQUIREMENTS

TEST POINT : OUTPUT CONNECTOR LOAD TERMINALS.

Parameter	Range	MIN	NOM	MAX	UNIT
+12V1DC	±5%	+11.4	+12.00	+12.6	Volts
+12V2DC	±5%	+11.4	+12.00	+12.6	Volts
+5VDC	±5%	+4.75	+5.00	+5.25	Volts
+3.3VDC	±5%	+3.14	+3.30	+3.47	Volts
-12VDC	±10%	-10.80	-12.00	-13.20	Volts
-5V	±10%	-4.75	-5.00	-5.25	Volts
+5VSB	±5%	+4.75	+5.00	+5.25	Volts

#### 2.2.2 DC output CURRENT

- 1) Maximum continuous total DC output power shall not exceed 400Watts.
- 2) Maximum +5V and +3.3V output power shall not exceed 180Watts.
- 3) Maximum Peak Total DC output power shall not exceed 440Watts.
- 4) It shall not exceed 17 seconds in duration at peak +12VDC output power, 234Watts.
- 5) Output voltage of +5VSB shall be maintained within the power shut down.

Range	Parameter	MIN	NOM	MAX	PEAK	UNIT
Range 1 (high Load)	<b>+12V1DC</b>	1.0	-	<b>16</b>	18	Amps
	<b>+12V2DC</b>	1.0	-	<b>18</b>		"
	+5VDC	0.5	-	7.0	-	"
	+3.3VDC	0.5	-	11.5	-	"
	-12VDC	0.0	-	0.5	-	"
	-5VDC	0.0	-	0.3	-	"
	+5VSB	0.0	-	1.0	-	"
Range 2 (normal Load)	+12V1DC	1.0	-	10		Amps
	+12V2DC	1.0	-	10		"
	+5VDC	0.5	-	3.0		"
	+3.3VDC	0.5	-	5.0		"
	-12VDC	0.0	-	0.3	-	"
	-5VDC	0.0	-	0.3	-	"
	+5VSB	0.0	-	1.0	-	"

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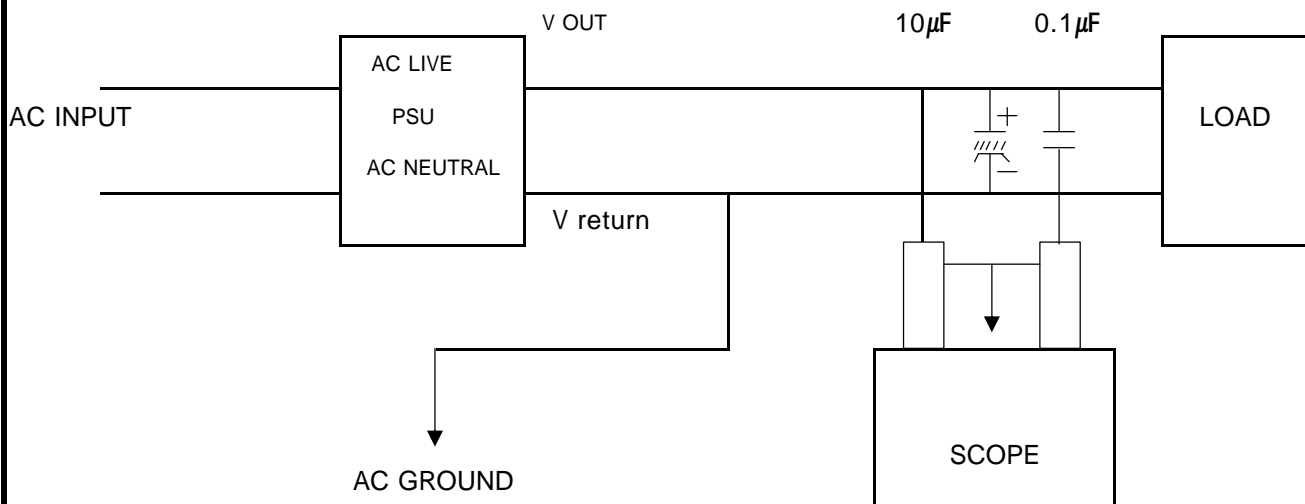
### 2.2.3 EFFICIENCY

1) The power supply at full load provide AC/DC conversion efficiency 75% minimum.

### 2.2.4 OUTPUT RIPPLE/NOISE

. The measurements should be made by crossing a 10 $\mu$ F electrolytic capacitor and a 0.1 $\mu$ F Ceramic capacitors at each output with measuring band width from DC to 20MHz.

Parameter	Range	MIN	NOR	MAX	UNIT
+12V1DC	$\pm 1.0\%$	-		120	mVp - p
+12V2DC	$\pm 1.0\%$	-		200	"
+5VDC	$\pm 1.0\%$	-		50	"
+3.3VDC	$\pm 1.0\%$	-		50	"
-12VDC	$\pm 1.0\%$	-		120	"
-5VDC	$\pm 1.0\%$	-		50	"
+5VSB	$\pm 1.0\%$	-		50	"

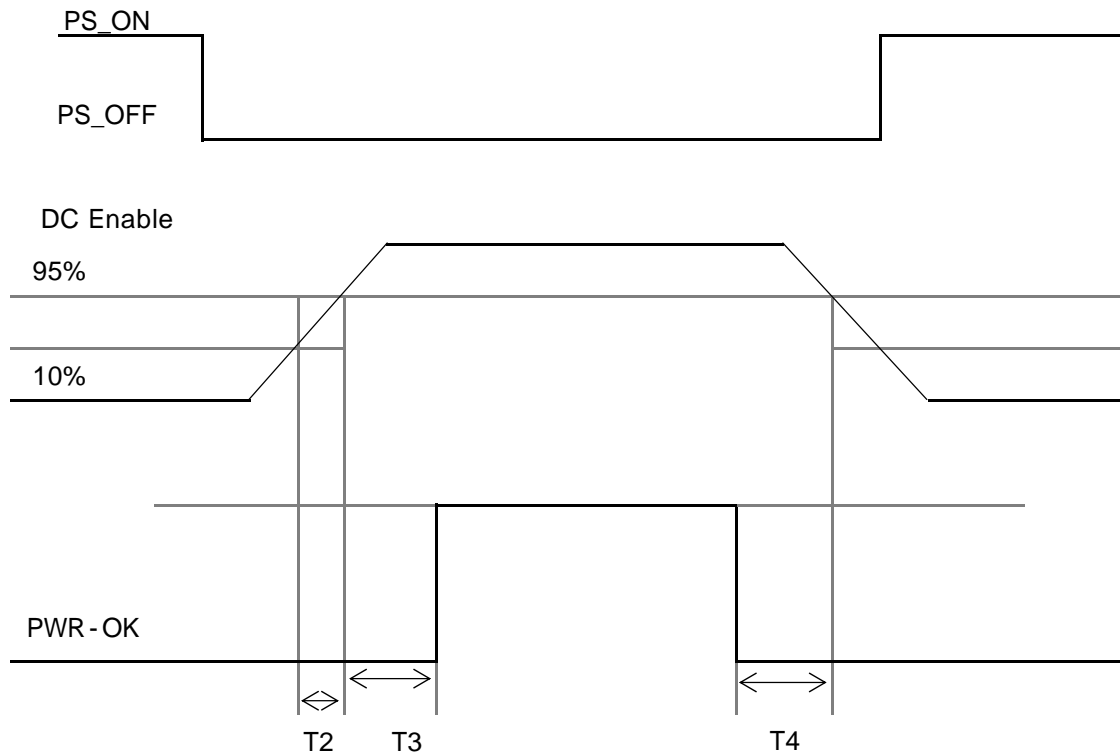


### 2.2.5 OUTPUT TRANSIENT RESPONSE & OVERSHOOT AT TURN ON/OFF

. Load Slew Rate : 0.2A/ $\mu$ s

Parameter	+12V	+5VDC	+3.3VDC	-12VDC	-5V	+5VSB
MAX step	9A	7.8A	8.1A	0.1A	0.1A	0.1A
Voltage range	$\pm 3\%$	$\pm 3\%$	$\pm 3\%$	$\pm 3\%$	$\pm 3\%$	-
Shoot range	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	$\pm 10\%$	-

## 2.3 TIMING / HOUSE KEEPING



\* PW-OK sense level : 95% of nominal

### 2.3.1 REMOTE ON/OFF CONTROL

The power supply DC outputs (with the exception of +5VSB) shall be enabled with an active-low, TTL-compatible signal("PS-ON"). The +5VSB is on whenever the AC power is present.

- . When PS-ON is pulled to TTL low, the DC outputs are to be enabled.
- . When PS-ON is pulled to TTL high or open circuited, the DC outputs are to be disabled. Turn ON/OFF delay 1000mS

### 2.3.2 POWER UP DELAY

The output voltages shall rise from <10% of nominal to within the regulation ranges specified in sec 2.2.1 within 2 to 30ms.

### 2.3.3 POWER GOOD SIGNAL, POK

- . Signal Type : Open Collector +5VDC, TTL compatible.
- . Logic level Low : <0.4V 4mA
- . Logic level High :Between 2.4VDC and 5VDC output while sourcing current, 200 $\mu$ A
- . POK Delay : 100ms<T3<500ms
- . Power Down Warning : T4>1ms

### 2.3.4 VOLTAGE HOLD-UP TIME

The power supply shall maintain output regulation per section 2.2.1 despite a loss of input power at the low-end nominal range at maximum continuous output load as specified in section 1.1 for a minimum 16ms.

## 2.4 OUTPUT PROTECTION

### 2.4.1. OVER VOLTAGE PROTECTION

Parameter	Min	Nom	Max	Unit
+5VDC	5.74	6.3	7.0	V
+12VDC	13.4	15	15.6V	V
+3.3VDC	3.76	4.2	4.3	V

\*Change latch mode at above voltage in power supply unit.

### 2.4.2. SHORT CIRCUIT PROTECTION

- . Shutdown or latch at short +3.3, +5V and +12V.
- . No damage in components, PCB trace connector at continuous short.
- . The maximum short circuit current shall not exceed 240VA.

### 2.4.3. OVER POWER PROTECTION

- . +5V : 29A~ Test Condition : Output Full Load
- . +3.3V : 30A~
- . +12V1 : 19A~ at 12V1 at no load
- . **+12V2 : 19A~ at 12V2 at no load**

2.4.4 DC INPUT PROTECTION

. Use proper fuse for DC input over current protection.

2.4.5. BURN-IN

Primary lot is output full load at 55 24HR

2.4.6. MEAN TIME BETWEEN FAILURES

. Operating Time 50,000HR at 25 .

2.4.7. This power supply shall comply with the followings.

- . UL1950
- . CSA C22.2 NO220 & CSA Bulletin 1402C, Level3
- . VDE 0806, EN60950 A3
- . IEC950

2.4.8. EMI

- . FCC Part 15 Sub Part B, Class B
- . VDE 0871/6.78 Class B

2.4.9. POWER SWITCH On/Off TEST

Control Signal	Output Status
Logic " Low"	On
Logic " High"	Off

2.4.10. INSULATION VOLTAGE WITHSTAND

- . Primary to Secondary : 500VDC 100MΩ
- . Primary to FG : 500VDC 100MΩ

2.4.11. LEAKAGE CURRENT(IEC950)

. The Maximum Leakage Current Following The Frame / AC Sine Conductor  
Shall be 1.0mA Maximum at 220VAC Input

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#### 2.4.12. DIELECTRIC STRENGTH

- . Between Input and Output : 1500VAC 10mA 1min or 1800VAC 10mA 3sec
- . Between Input and FG : 1500VAC 10mA 1min or 1800VAC 10mA 3sec

#### 2.4.13. TEMPRATURE RANGE

- . Operating : 5 ~ 25
- . Storage : -20 ~ 85

#### 2.4.14. HUMIDITY RANGE

- . Operating : 20% ~ 80%
- . Storage : 10% ~ 95%

#### 2.4.15. VIBRATION TEST

- . Non Operation : Sweep Test
- . Frequency : 5 20 500 5Hz
- . Acceleration :0.02G
- . Airection : X, Y, Z
- . Period : 6 Minutes
- . Cycie : 10

#### 2.4.16. ACOUSTIC NOISE

- . The power Supply Must not generate Acoustic Noise in excess of 30dB at a Distance of 1 Meter from any Point on The requirments Surface.

#### 2.4.18. AC LINE NOISE

- . The Power Supply Shall Operate Normally When AC Line Noise is Applied
- . Noise Crest Value : 1000VAC
- . Polarity : +, -
- . Pulse Width : 1 $\mu$ s
- . Phase : 0 - 360 °
- . Mode : Common, Normal
- . Time : 3Minutes

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