# ACQ100 Series
## 100W & 150W / Quarter Brick AC/DC

## Applications

Medical | Railway | Industry

Automation | emiconductor | Network / Telecom

Military | Boat | Aviation

Automobile | Charger


3 Years Warranty

CE RoHS COMPLIANT ISO REACH

## Features

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1/4 Brick | 90~264VAC Input range | 150W Active PFC | Long Hold-up Time | -40~100℃ Case Temperature | ±5% Output Trimming | 3000 VAC Insulation | 91 % High efficiency |
| Base plate cooled | ON / OFF REMOTE (optional) | OCP | OVP | OTP | SCP | | |

## Model Number Structure

AC Q 100 - 050 S - 150

| Series Name | Package | Watt | Output Voltage (VDC) | Output Quantity | Actual Watt |
|---|---|---|---|---|---|
| **AC** series | **Q**uarter Brick | **100** | **050** : 5<br>**120** : 12<br>**190** : 19<br>**240** : 24<br>**280** : 28<br>**360** : 36<br>**480** : 48 | **S** : Single | Actual Watt |

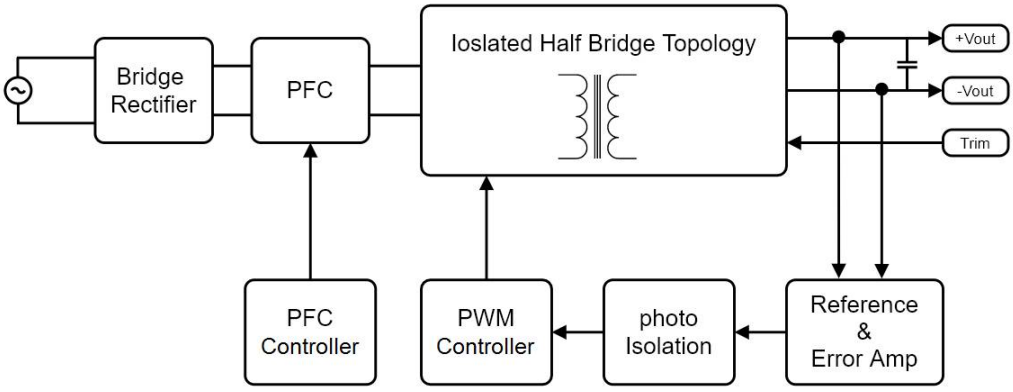
## Model Selection Guide

Typical @ Ta=+25 ℃ under nominal line voltage conditions unless noted

| Model | Input | | | Output | | | Efficiency |
|---|---|---|---|---|---|---|---|
| | Voltage (V) | | Current (A) | Voltage | Current | Power | |
| | Range | Nominal | Full load | (V) | (A) | (W) | Typ.(%) |
| ACQ100-050S-100 | 90-264 | 230 | 0.49 | 5 | 20 | 100 | 87 |
| ACQ100-120S-100 | 90-264 | 230 | 0.48 | 12 | 8.33 | 100 | 90 |
| ACQ100-190S-100 | 90-264 | 230 | 0.48 | 19 | 5.26 | 100 | 90 |
| ACQ100-240S-100 | 90-264 | 230 | 0.48 | 24 | 4.16 | 100 | 91 |
| ACQ100-280S-100 | 90-264 | 230 | 0.48 | 28 | 3.57 | 100 | 91 |
| ACQ100-360S-100 | 90-264 | 230 | 0.48 | 36 | 2.77 | 100 | 90 |
| ACQ100-480S-100 | 90-264 | 230 | 0.48 | 48 | 2.08 | 100 | 90 |
| ACQ100-120S-150 | 90-264 | 230 | 0.75 | 12 | 12.5 | 150 | 90 |
| ACQ100-240S-150 | 90-264 | 230 | 0.75 | 24 | 6.25 | 150 | 91 |
| ACQ100-280S-150 | 90-264 | 230 | 0.75 | 28 | 5.35 | 150 | 91 |
| ACQ100-360S-150 | 90-264 | 230 | 0.75 | 36 | 4.16 | 150 | 91 |
| ACQ100-480S-150 | 90-264 | 230 | 0.75 | 48 | 3.13 | 150 | 91 |

## Description

**AC series - Quarter Brick 100 converter** is a 100W / 150W isolated, regulated ac/dc converter with active PFC in quarter brick package and long hold-up time setting by external capacitors. It features a high efficiency up to 91%, wide working case temperature range -40~+100°C, no minimum load required, 3kVac reinforced insulation, OVP, OCP, SCP, OTP, etc. These power modules use advanced power processing, control and packaging technologies and are suitable for many applications with harsh environments where wide temperature variation and space limitations, etc.




ACQ100 Series Block Diagram

## Electrical Specifications

(Typical @ Ta=+25°C under nominal line voltage conditions unless noted.)

### Input Specifications

| Parameter | Notes and Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Operating Input Voltage Ranges | | 90 | 230 | 264 | VAC |
| Operating Input Frequency Ranges | | 47 | 50/60 | 63 | Hz |
| Input Current | at 115VAC 100% load<br>at 230VAC 100% load | | 1<br>0.5 | | A |
| Inrush Current | cold start at 230Vac, 25℃ | Limited by external components (Thermistor) | | | |
| Power Factor | at 115VAC 100% load<br>at 230VAC 100% load | | 1<br>0.99 | | |
| Leakage Current | at 240VAC 60Hz 100% load | | | 0.75 | mA |

### Output Specifications

| Parameter | Notes and Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | 100% Load | | | ±1.5 | % |
| Line Regulation | High Line to Low Line | | | ±0.5 | % |
| Load Regulation | 0% to 100% Load | | | ±1 | % |
| Output Ripple & Noise Voltage | Bandwidth 20MHz and with 10uF MLCC Output Capacitor | | | 2 | $\%V_{pk-pk}$ |
| Output Voltage Adjustment Range | adjustable by external resistor | | | ±5 | % |
| Minimum Load | | 0 | | | A |
| Hold Up Time | at full load & 115 VAC | Setting by external capacitors between +BC & -BC | | | |
| Over Voltage Protection | | 110 | | 140 | % |
| Over current Protection | Hiccup mode | | 140 | | % |
| Short-circuit Protection | Hiccup mode | Auto-Recovery | | | |

## General Specifications & Environmental Specifications

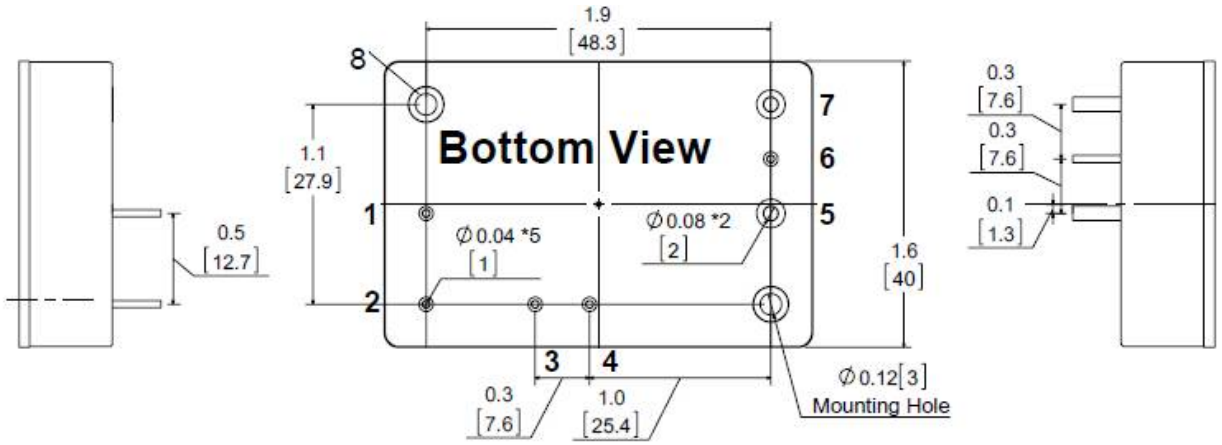
| Parameter | Notes and Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Switching Frequency | PFC/AC-DC | | 100/130 | | kHz |
| Storage Temperature Range | All models | -55 | | 125 | ˚C |
| Over temperature Protection | Auto Recovery | | 110 | | ˚C |
| Operating Case Temperature | on aluminum base plate | -40 | | 100 | ˚C |
| Humidity (non condensing) | All models | | | 95 | % |
| Isolation Voltage | Input to Output | | 3000 | | VAC |
| | Input to Base | | 1500 | | VAC |
| | Output to Base | | 500 | | VAC |
| Calculated MTBF | BellCore-TR-332@ 50˚C G.B | 1.2 | | | M HR |
| Weight | | 72 (2.54) | | | g (oz.) |
| Dimensions | | 2.36” x 1.57” x 0.50” (60.0 x 40.0 x 12.7mm) | | | |
| Case Material | Aluminum base with plastic case | | | | |

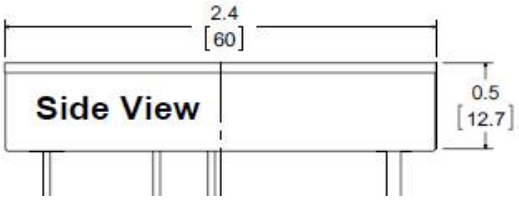
It is recommended to protect the input by fuses or other protection devices.

Modules could meet EN55022 Class A and Class B standard with external components.

## Mechanical Dimensions & Pin Assignments

### Shape



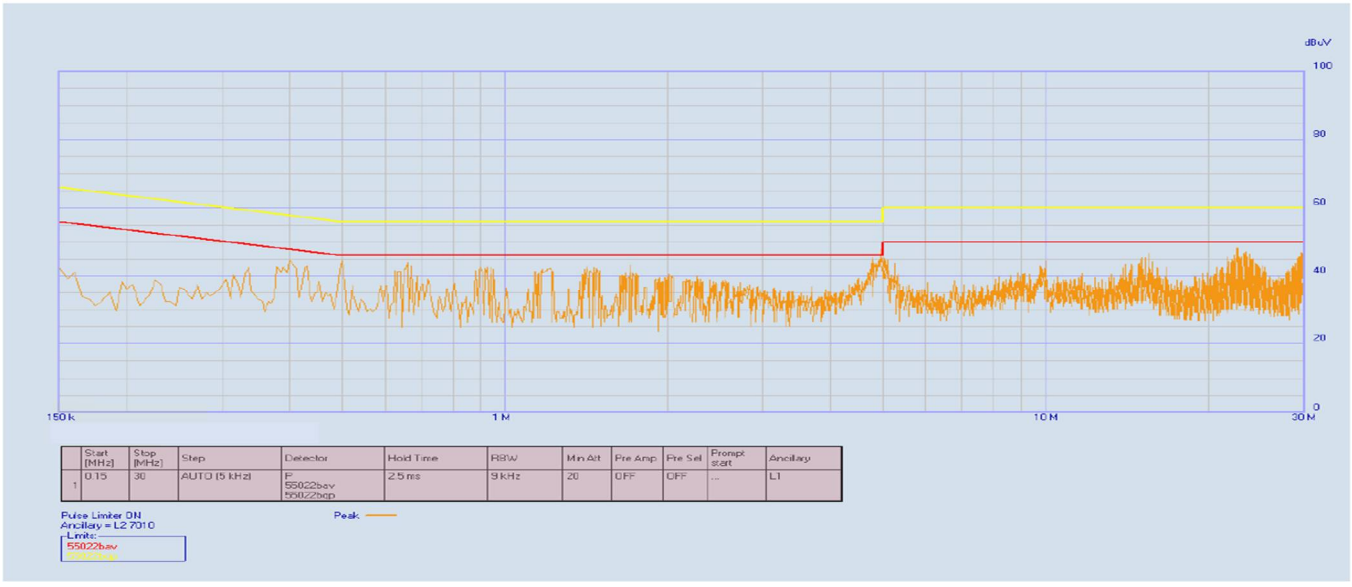

Pin Assignments:

| Pin# | Function |
|---|---|
| 1 | AC1 |
| 2 | AC2 |
| 3 | BC+ |
| 4 | BC- |
| 5 | +VO |
| 6 | Trim |
| 7 | -VO |

**Note:**
**Pin Material:** Copper Alloy
**Pin Plating:** Gold
**Dimensions in** inches [mm]
**Tolerances:** .XX±0.25 [ .X±0.5mm]

## Conducted EMI

Input terminal value (typ.) ACQ100-120S-100 @Vin = 230VDC, Iout = 8.3A




The fundamental switching frequency of the module is 100 kHz.

## Characteristic Curves

Testing conditions are at typical input, Ta=+25˚C, full load (horizontal mount) Unless otherwise indicated

The figures of ACQ100-120S-100

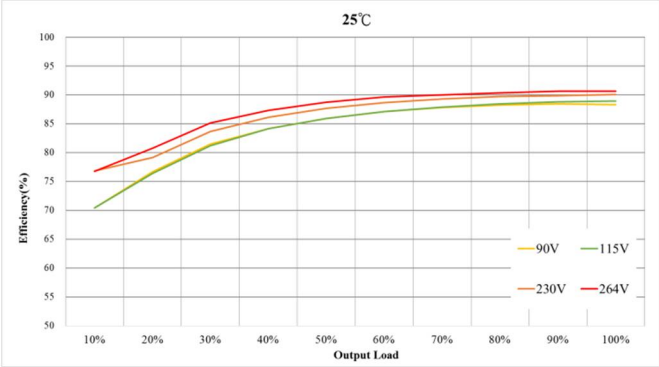



Figure 1 : Efficiency at Minimum, Nominal and Maximum Input Voltages VS. Output Load.

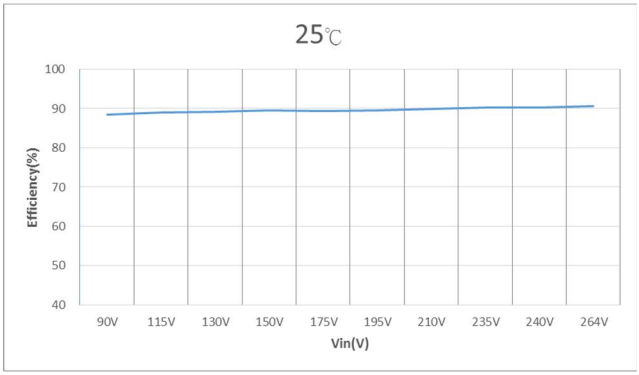



Figure 2 : Efficiency VS. Input Voltages at 100% rated power

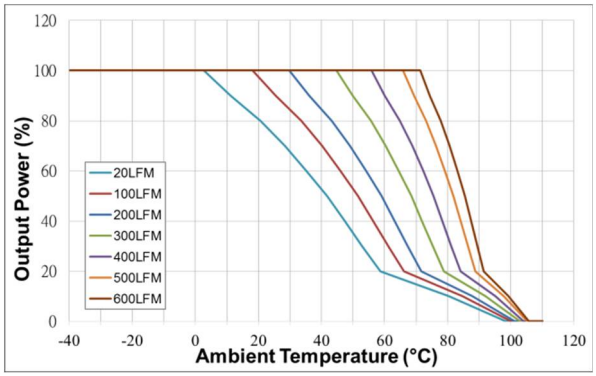



Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note:20LFM=Free Air)

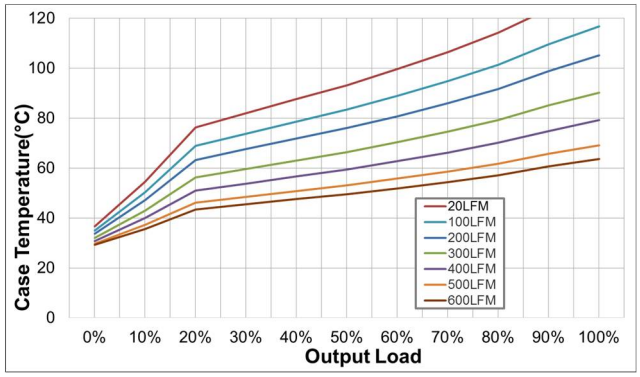



Figure 4 : Case Temperature VS. Output rated Power (Note:20LFM=Free Air)

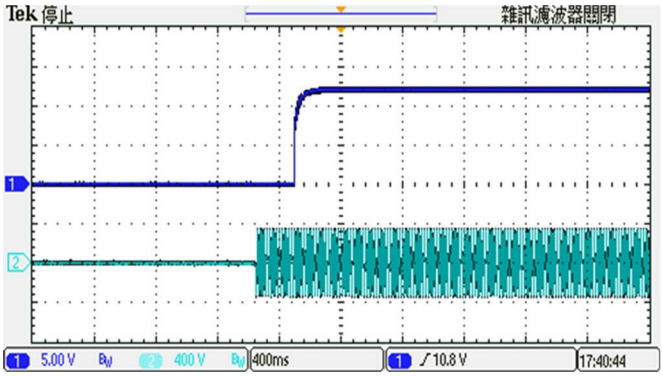



Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

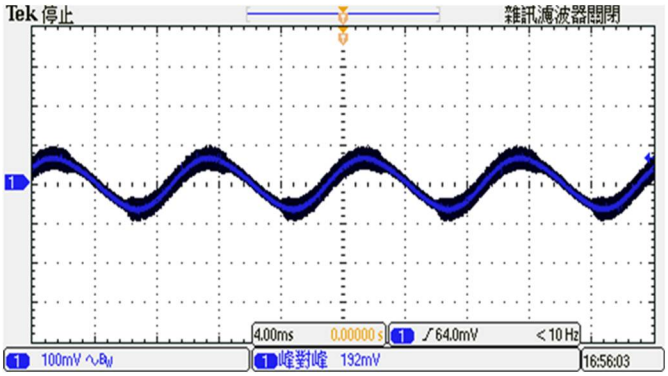



Figure 6 : Output Voltage Ripple & Noise at full load. ( Vin: Typical, With Output Capacitor to add 1uF MLCC )

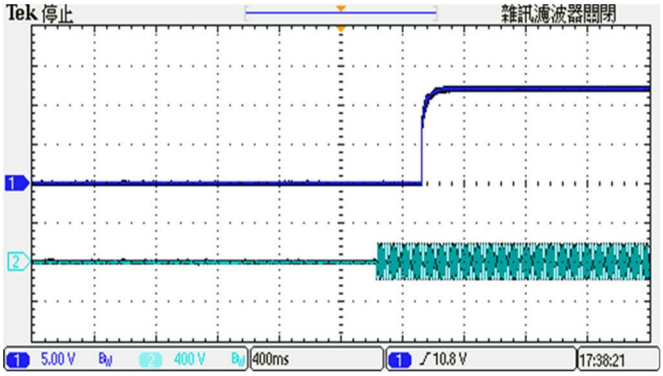



Figure 7 : CH1 = Vout, CH3 = 115V Input Typical Start-up waveform at Full load.

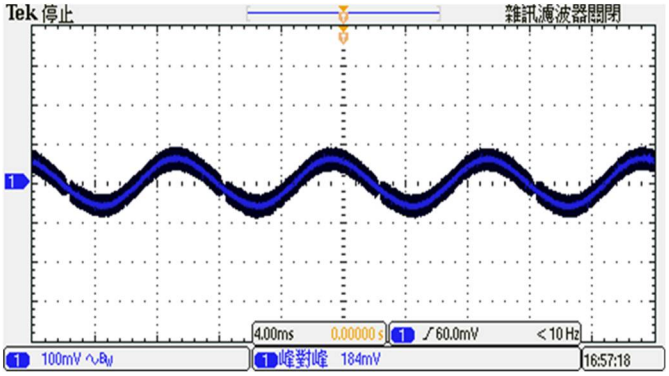



Figure 8 : Output Voltage Ripple & Noise at full load. ( Vin: 115V, With Output Capacitor to add 1uF MLCC )

## Trimming Output Voltage – for Single output models

Only the single output converters have a trim function. That allows users to adjust the output voltage from +5% to –5%, please refer to the trim table that follow for details. Adjustments to the output voltage can be used with a simple fixed resistor as shown in Figures 1 and 2. A single fixed resistor can increase or decrease the output voltage depending on its connection.

### Note:

※ Trim adjustments higher than the specified range can have an adverse effect on the converter's performance and are not recommended.

※ If the trim function is not used, leave the trim pin open.

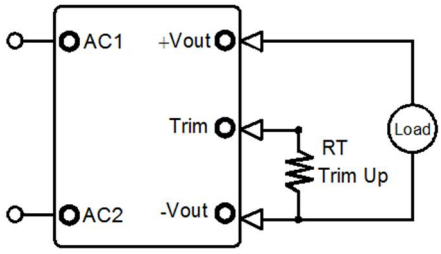



**Figure 1.** Trim Connections To increase Output Voltages Using Fixed Resistors

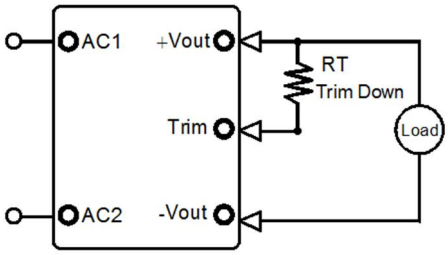



**Figure 2.** Trim Connections To Decrease Output Voltages Using Fixed Resistors

| | Trim up resistor value(KΩ) | | | | |
|---|---|---|---|---|---|
| Vout | 1% | 2% | 3% | 4% | 5% |
| 5 | 195.82 | 72.36 | 31.21 | 10.63 | 0.00 |
| 12 | 198.23 | 73.56 | 32.01 | 11.23 | 0.00 |
| 19 | 1921.13 | 745.57 | 353.71 | 157.78 | 0.00 |
| 24 | 228.91 | 83.45 | 34.97 | 10.73 | 0.00 |
| 28 | 693.51 | 246.76 | 97.84 | 23.38 | 0.00 |
| 36 | 545.73 | 197.87 | 81.91 | 23.93 | 0.00 |
| 48 | 1407.66 | 537.83 | 247.89 | 102.91 | 0.00 |

| | Trim down resistor value(KΩ) | | | | |
|---|---|---|---|---|---|
| Vout | -1% | -2% | -3% | -4% | -5% |
| 5 | 691.98 | 315.44 | 189.93 | 127.17 | 89.52 |
| 12 | 887.57 | 412.24 | 253.79 | 174.57 | 127.03 |
| 19 | 14840.87 | 7116.43 | 4541.62 | 3254.22 | 2481.77 |
| 24 | 2419.09 | 1164.55 | 746.36 | 537.27 | 411.82 |
| 28 | 8806.49 | 4253.24 | 2735.50 | 1976.62 | 1521.30 |
| 36 | 9054.27 | 4402.13 | 2851.42 | 2076.07 | 1610.85 |
| 48 | 30796.34 | 15066.17 | 9822.78 | 7201.09 | 5628.07 |

### Output Ripple Noise

The two copper strips simulate real-world PCB impedances between the converter and its load. Scope measurements should be made using BNC connectors or the probe ground should be less than 1/2 inch and soldered directly to the fixture.

All external capacitors should have appropriate voltage ratings and be located as close to the converter as possible.

Temperature variations for all relevant parameters should be taken into consideration. The most effective combination of external I/O capacitors will be a function of line voltage and source impedance, as well as particular load and layout conditions. See Figure 3.

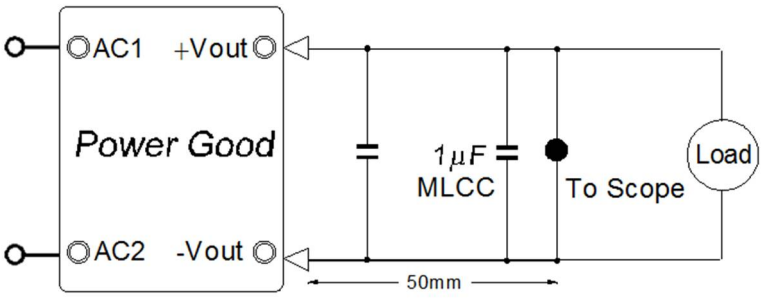
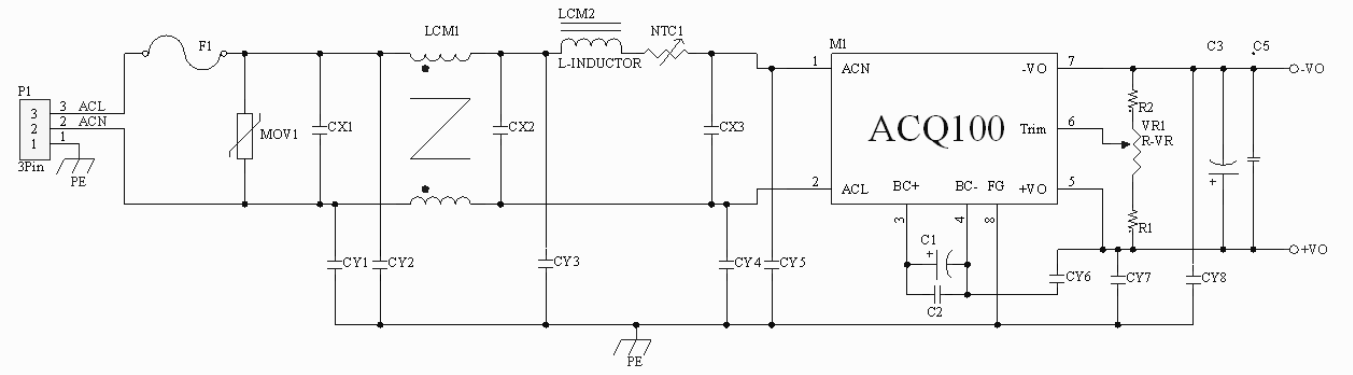



**Figure 3.** Measuring Output Ripple/Noise (20MHz bandwidth)

## Recommended Circuit Diagram




## Bill of Materials

| No. | Sch Symbol | Description | Rating | | Manufacturer / Part Number |
|---|---|---|---|---|---|
| 1 | F1 | Fuse | 3.15A/250Vac | | Littelfuse 39213150000 |
| 2 | MOV1 | Varistor | 620V | | Thinking TVR10621K |
| 3 | CX1、CX2 | X Capacitor | 0.47uF/310Vac | | EPCOS B32922C3474K |
| 4 | LCM1 | Common Mode Choke | 25mH | | Amogreentech A121T14*8*7C<br>with $\phi$0.4mm*54 turns |
| 5 | LDM1 | Differential Mode Choke | 56uH | | SELMAG CH112147<br>with $\phi$0.4mm*30 turns |
| 6 | CY1、CY2 | Y Capacitor | 4700pF/250Vac | | Murata DE2E3SA472MA3BX02F |
| 7 | CY6、CY7 | Y Capacitor | 3300pF/250Vac | | Murata DE2E3SA332MA3BX02F |
| 8 | NTC1 | Thermistor | 5R | | Thinking SCK10053 |
| 9 | C1 | PFC boost capacitor | 120uF/420Vdc | | NIPPON CHEMI-CON<br>EKXL421ELL121MM30S |
| 10 | C3 | Output Capacitor | 5V | 1000uF/35Vdc | UNICON UPL1V102M1021 |
| | | | 12V | 470uF/50Vdc | UNICON UPL1H471M1021 |
| | | | 19V | 470uF/50Vdc | UNICON UPL1H471M1021 |
| | | | 24V | 220uF/50Vdc | UNICON UPL1V221M0812 |
| | | | 28V | 220uF/50Vdc | UNICON UPL1V221M0812 |
| | | | 36V | 180uF/50Vdc | UNICON UPL1J181M1012 |
| | | | 48V | 100uF/63Vdc | UNICON UPL1J101M0812 |
| 11 | C2 | Bypass Capacitor | 0.1uF/630Vdc | | Murata RDER72J104K4K1H03B |
| | C5 | | 1uF/100Vdc | | Murata GRJ31CR72A105 |

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