

L6562A 400W FOT-controlled PFC pre-regulator evaluation board

Data Brief

Features

- Line voltage range: 90 to 265 V_{ac}
- Minimum line frequency (fL): 47 Hz
- Regulated output voltage: 400 V
- Rated output power: 400 W
- Maximum 2fL output voltage ripple: 10 V pk-pk
- Hold-up time: 22 ms
(V_{DROP} after hold-up time: 300 V)
- Maximum switching frequency: 85 kHz
(@V_{in}= 90 V_{ac}, P_{out}= 400 W)
- Minimum estimated efficiency: 90%
(@V_{in}= 90 V_{ac}, P_{out}= 400 W)
- Maximum ambient temperature: 50 °C
- EMI: in accordance with EN55022 Class-B
- PCB type and size: single side, 70 μm, CEM-1, 148.5x132 mm
- Low profile design: 35 mm component maximum height



Table 1. Device summary

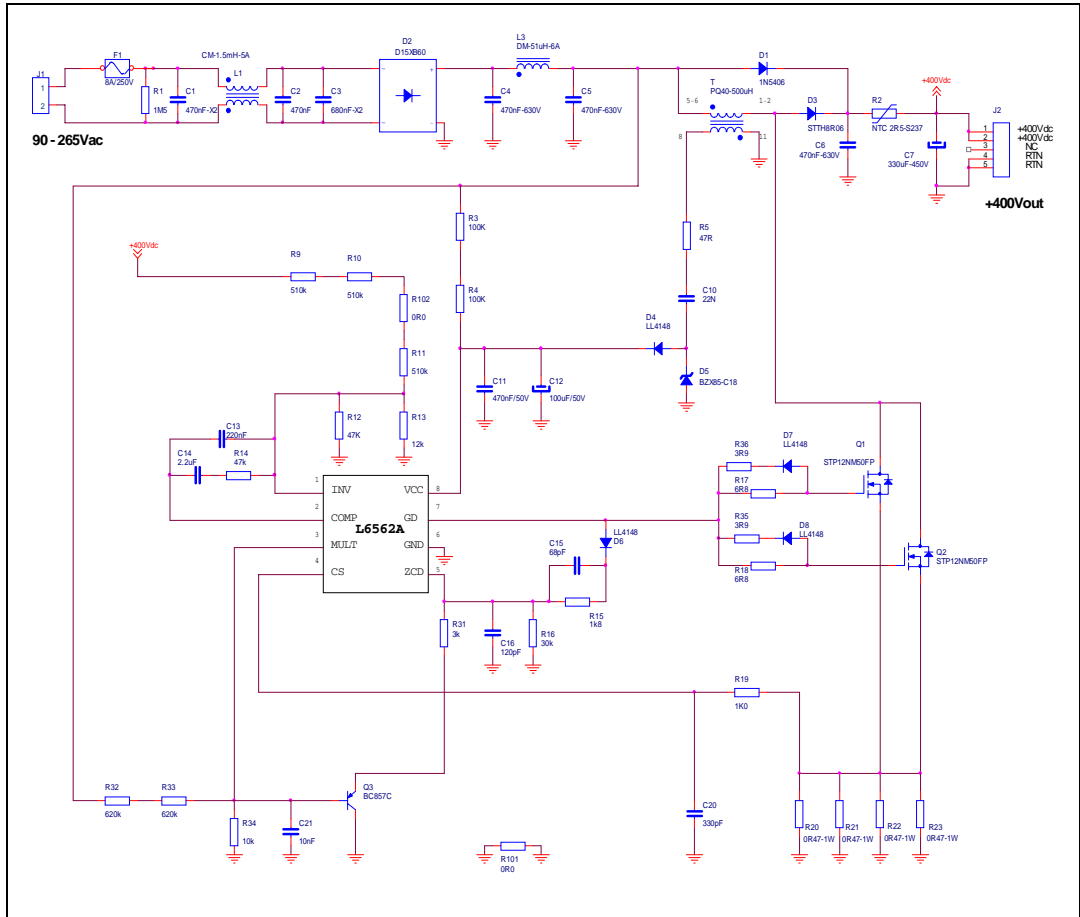
| Order code |
|---------------|
| EVL6562A-400W |

Description

The board implements a 400 W, wide-range mains input, PFC pre-conditioner suitable for ATX PSU, Flat screen displays, etc. To make possible the use of a low-cost device like the L6562A at this power level, usually prohibitive for TM PFC, the chip operates with Fixed-Off-Time control. This allows continuous conduction mode operation, normally achievable with more expensive control chips and more complex control architectures. For technical details and demoboard performance, please refer to the available application note.

1 Circuit schematic

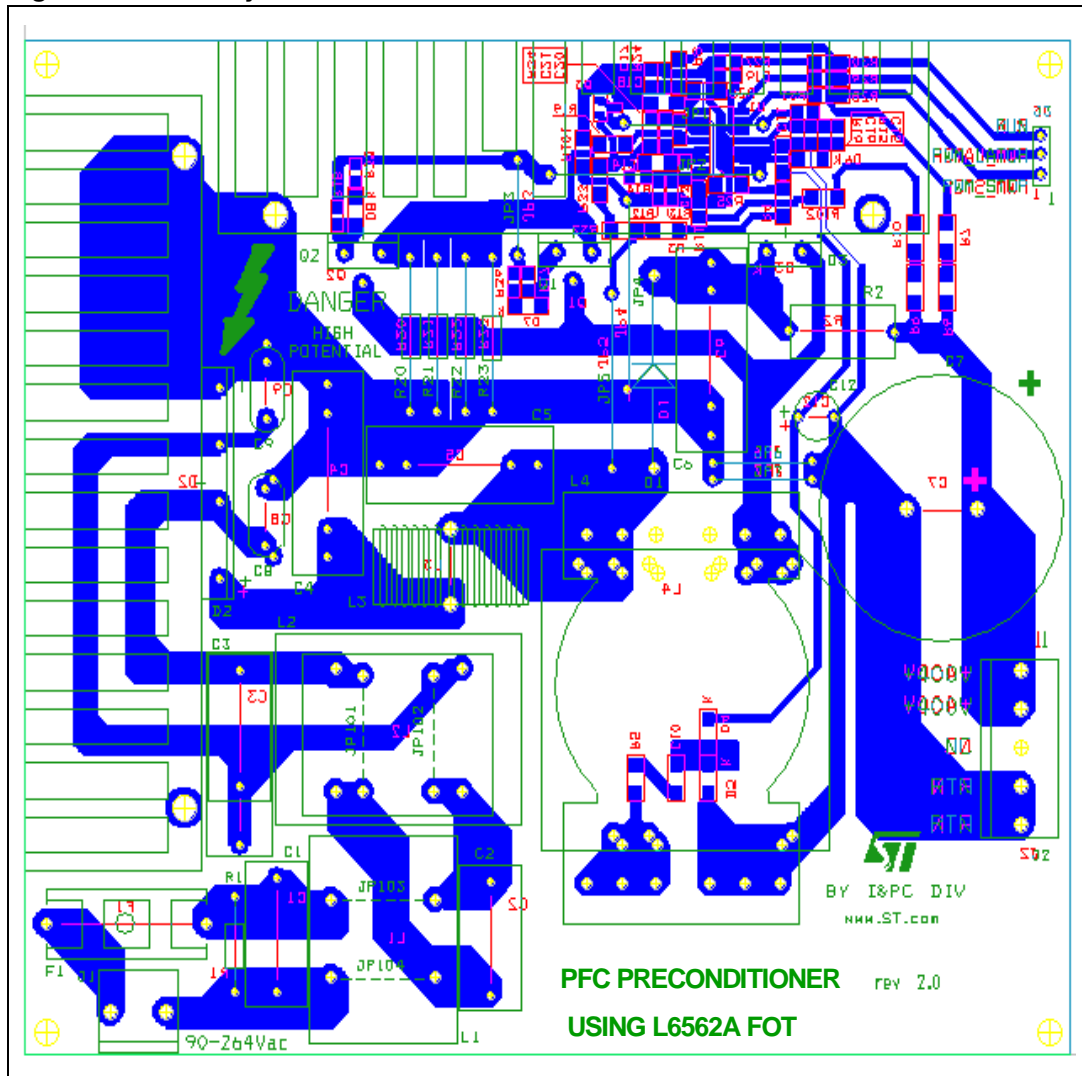
Figure 1. EVL6562A-400W schematic



- *Boost inductor spec. (Delta Electronics 86H-5410B):*
 - vertical 6+6, PQ40+30 ferrite
 - 1 mm gap for 500 μH primary inductance
 - Primary: 65 turns 30x0.2 mm
 - Secondary: 5 turns 0.28 mm

2 Circuit layout

Figure 2. PCB layout^(a)



a. Not in scale

3 Typical performance

Figure 3. EVL6562A-400W compliance to EN61000-3-2 standard @full load

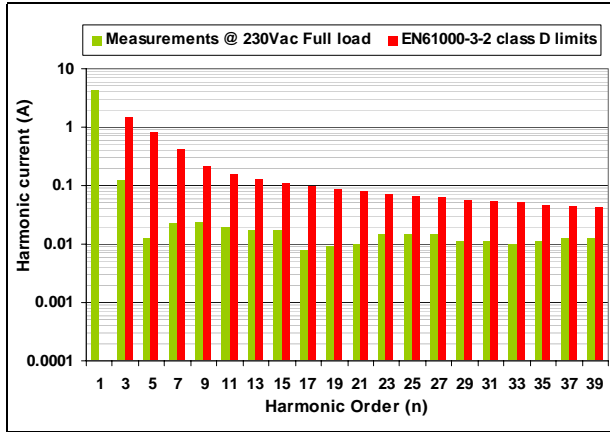


Figure 4. EVL6562A-400W compliance to JEIDA-MITI standard @full load

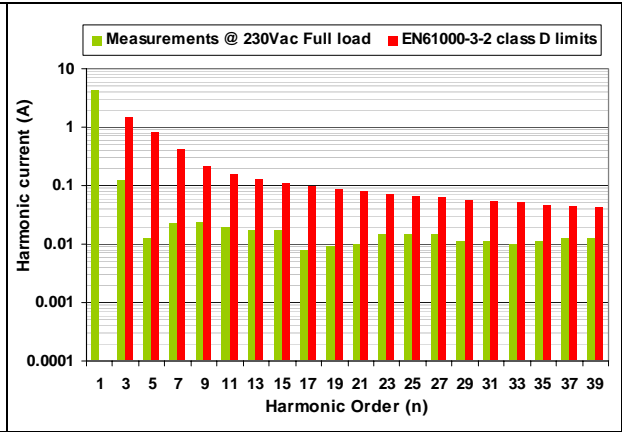


Figure 5. EVL6562A-400W compliance to EN61000-3-2 standard @70W load

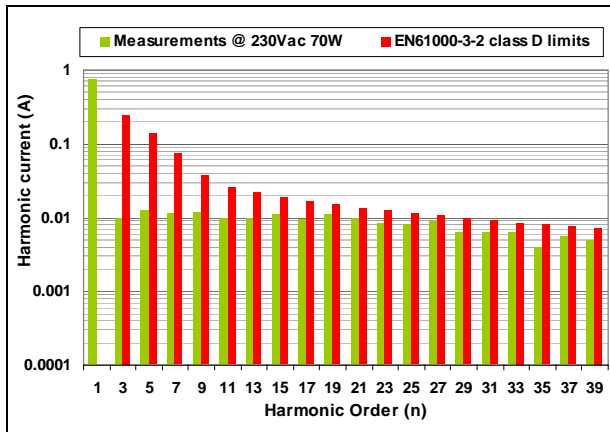


Figure 6. EVL6562A-400W compliance to JEIDA-MITI standard @70W load

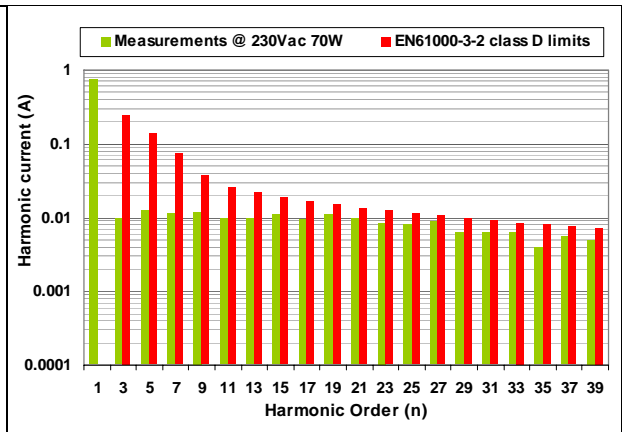


Figure 7. Power factor vs. V_{in} and load

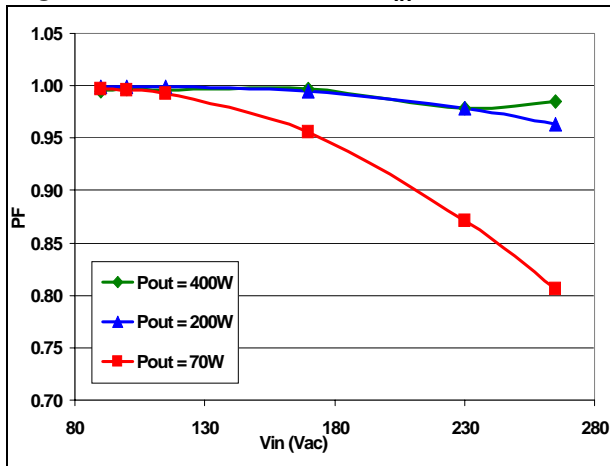
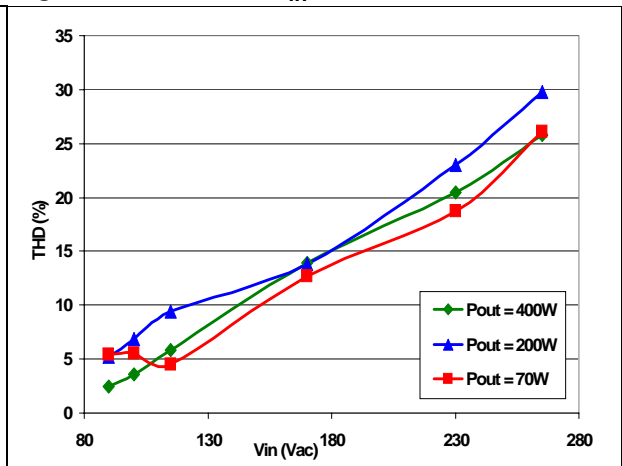


Figure 8. THD vs. V_{in} and load



Appendix A Bill of material

Table 2. Bill of material

| Ref. des. | Part type part value | Case/ package | Description | Supplier |
|-----------|----------------------|----------------|--|--------------------|
| C1 | 470 nF- x2 | DWG | X2 film capacitor R46-I 3470--M1- | ARCOTRONICS |
| C10 | 22 nF | 1206 | 100 V SMD cericap - general purpose | AVX |
| C11 | 470 nF/50 V | 1206 | 50 V SMD cericap - general purpose | AVX |
| C12 | 100 µF/50 V | Dia 8x11 (mm) | Aluminium elcap - yxf series - 105°C | RUBYCON |
| C13 | 220 nF | 0805 | 50 V SMD cericap - general purpose | AVX |
| C14 | 2.2 µF | 1206 | 50V SMD cericap - general purpose | AVX |
| C15 | 100 pF | 0805 | 50 V SMD cericap - general purpose | AVX |
| C16 | 120 pF | 0805 | 50 V SMD cericap - general purpose | AVX |
| C2 | 470 nF-x2 | DWG | X2 film capacitor R46-I 3470--M1- | ARCOTRONICS |
| C20 | 330 pF | 0805 | 50 V SMD cericap - general purpose | AVX |
| C21 | 10 nF | 1206 | 50 V SMD cericap - general purpose | AVX |
| C3 | 680 nF-x2 | DWG | X2 film capacitor R46-I 3680--M1- | ARCOTRONICS |
| C4 | 470 nF-630 V | DWG | film capacitor MKP - B32653A6474J | EPCOS |
| C5 | 470 nF-630 V | DWG | film capacitor MKP - B32653A6474J | EPCOS |
| C6 | 470 nF-630 V | DWG | film capacitor MKP- B32653A6474J | EPCOS |
| C7 | 330 µF-450 V | Dia 35x35 (mm) | Aluminium ELCAP - LLS series - 85°C | NICHICON |
| C8 | Res | DWG | Not used | - |
| C9 | Res | DWG | Not used | - |
| D1 | 1N5406 | DO-201 | Standard recovery rectifier | VISHAY |
| D2 | D15XB60 | DWG | Rectifier bridge | SHINDENGEN |
| D3 | STTH8R06 | TO-220FP | Ultrafast high voltage rectifier | STMICROELECTRONICS |
| D4 | LL4148 | MINIMELF | Fast switching diode | VISHAY |
| D5 | BZX85-C18 | MINIMELF | Zener diode | VISHAY |
| D6 | LL4148 | MINIMELF | Fast switching diode | VISHAY |
| D7 | LL4148 | MINIMELF | Fast switching diode | VISHAY |
| D8 | LL4148 | MINIMELF | Fast switching diode | VISHAY |
| F1 | 8 A/250 V | 5 x 20 mm | 8 A mains input fuse | WICKMANN |
| J1 | | | 3-pins conn. (central rem.) P 3.96 KK series | MOLEX |
| J2 | | | 5-pins conn. (central rem.) P 3.96 KK series | MOLEX |
| JP101 | Jumper | | Wire jumper | |

Table 2. Bill of material (continued)

| Ref. des. | Part type part value | Case/ package | Description | Supplier |
|-----------|----------------------|---------------|--|--------------------|
| JP102 | Jumper | | Wire jumper | |
| L1 | CM-1.5 mH-5 A | DWG | CM CHOKE - LFR2205B | DELTA ELECTRONICS |
| L2 | Res | DWG | Not used | - |
| L3 | DM-51 μ H-6A | DWG | FILTER INDUCTOR - LSR2306-1 | DELTA ELECTRONICS |
| L4 | PQ40-500 μ H | DWG | PFC inductor - 86 H-5410B | DELTA ELECTRONICS |
| Q1 | STP12NM50FP | TO-220FP | N-channel Power MOSFET | STMICROELECTRONICS |
| Q2 | STP12NM50FP | TO-220FP | N-channel Power MOSFET | STMICROELECTRONICS |
| Q3 | BC857C | SOT-23 | Small signal BJT - PNP | VISHAY |
| R1 | 1M5 | AXIAL | HV resistor | BC COMPONENTS |
| R10 | 510 k Ω | 1206 | SMD std film res - 1% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R11 | 510 k Ω | 1206 | SMD std film res - 1% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R12 | 47 k Ω | 0805 | SMD std film res - 1% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R13 | 12 k Ω | 0805 | SMD std film res - 1% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R14 | 47 k Ω | 0805 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R15 | 1 k8 Ω | 0805 | SMD std film res - 1% - 100ppm/ $^{\circ}$ C | BC COMPONENTS |
| R16 | 30 k Ω | 0805 | SMD std film res - 1% - 100ppm/ $^{\circ}$ C | BC COMPONENTS |
| R17 | 6R8 | 0805 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R18 | 6R8 | 0805 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R19 | 1 K Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R2 | NTC 2R5 | DWG | NTC resistor 2R5 S237 | EPCOS |
| R20 | 0R47-1 W | AXIAL | AXIAL res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R21 | 0R47-1 W | AXIAL | AXIAL res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R22 | 0R47-1 W | AXIAL | AXIAL res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R23 | 0R47-1 W | AXIAL | AXIAL res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R25 | Res | 1206 | Not used | - |
| R3 | 100 K Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R31 | 3 k Ω | 0805 | SMD std film res - 1% - 100ppm/ $^{\circ}$ C | BC COMPONENTS |
| R32 | 620 k Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R33 | 620 k Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R34 | 10 k Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R35 | 3R9 | 0805 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R36 | 3R9 | 0805 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R4 | 100 K Ω | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R5 | 47R | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |

Table 2. Bill of material (continued)

| Ref. des. | Part type part value | Case/ package | Description | Supplier |
|-----------|----------------------|---------------|--|--------------------|
| R9 | 510 k Ω | 1206 | SMD std film res - 1% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R101 | 0R0 | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| R102 | 0R0 | 1206 | SMD std film res - 5% - 250ppm/ $^{\circ}$ C | BC COMPONENTS |
| U1 | L6562A | SO-8 | Transition-mode PFC controller | STMICROELECTRONICS |

4 Revision history

Table 3. Document revision history

| Date | Revision | Changes |
|-------------|----------|------------------|
| 07-Feb-2008 | 1 | Initial release. |

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