

PSV-EBAD-65USB 65W USB-C AC to DC Full Power Supply Evaluation Board

FEATURES:

- Hold Up Circuit: ✓
- Half Active Bridge: ✓
- X-Cap Discharge: ✓
- Inrush Current Eliminated: ✓
- Input Voltage Derating Eliminated: ✓
- GaN Optimized: ✓
- PPS Fast Charging: ✓



SPECIFICATION:

- Input Voltage Range: 90 – 265VAC
- Output Voltage: 5 – 20VDC supporting PD3.0, QC4.0, BC1.2, & PPS
- Output Power (Max): 65W
- Transformer Temperature (Max): 39.5°C above ambient
- Operating Frequency: 125kHz
- Peak Efficiency: 96%
- Average Efficiency: 95%
- Line Currents: 0.5A max
- DC-DC Converter: Quasi-Resonant (QR) Flyback

PULSIV OSMIUM TECHNOLOGY:

Pulsiv OSMIUM technology is an AC to DC front-end conversion method that applies intelligence to an active valley fill approach and delivers a combination of game changing benefits in power electronics designs. It significantly improves performance at low loads to increase overall average efficiency, reduce energy consumption and deliver a totally flat efficiency profile across all load conditions.

Pulsiv OSMIUM technology can be used with a variety of industry standard DC-DC converters including Flybacks, Forward Converters, & Asymmetric Half Bridge solutions. Wherever needed, it also delivers Power Factor Correction as standard. The AC to DC conversion method intelligently regulates the charging current and voltage on the storage capacitor using a high-side architecture to switch Qch. This allows the use of 200V or 160V capacitors (selectable) to support a universal mains input. The valley-fill period is broadly similar to a 2C3D architecture; but the charging period of the capacitor is significantly longer and more variable.

For more information, technical articles, and a white paper on Pulsiv OSMIUM technology, please visit our website www.pulsiv.com

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1. DESCRIPTION

The PSV-EBAD-65USB evaluation board has been developed to demonstrate how Pulsiv OSMIUM technology reduces component temperatures and maximises efficiency, enabling products to consume less power and reduce overall size. It represents the first in a series of designs aimed at pushing the boundaries of power conversion to create a sustainable platform for the USB-C standard. In this design, the Pulsiv OSMIUM microcontroller PSV-AD-65EG-Q24IV has been combined with OnSemi's NCP1342 Flyback controller and GaN devices from Innoscience. This board enables engineers to quickly evaluate our world-leading 65W USB-C GaN optimised reference design. It combines a Pulsiv OSMIUM AC to DC front-end design with a performance optimised quasi-resonant (QR) Flyback converter.

Pulsiv OSMIUM technology senses AC line voltage and frequency to adjust capacitor charging time, therefore the circuit draws no line current at the AC zero voltage crossing. This enables a simple half-active bridge implementation to increase efficiency, especially at low line conditions. MOSFETs in the lower half of the AC to DC bridge are carefully controlled, in combination with high-side diodes. The half-active bridge in this design strikes the delicate balance between efficiency, cost, and complexity and supports universal input with efficiency gains of 0.7% at full load from a 115V AC supply.



WARNING

When this evaluation board is connected to the AC mains, high voltages will be present. Incorrect or improper use of this board might lead to electrical shocks, fire hazards, personal injury or death. All necessary safety precautions must be taken when handling or powering this board. An isolation transformer should be used when testing this board.

This evaluation board has been developed for evaluation testing purposes only and is not suitable for commercial use. Although it has been designed to satisfy safety isolation requirements, it has not been approved by any external 3rd party agency.

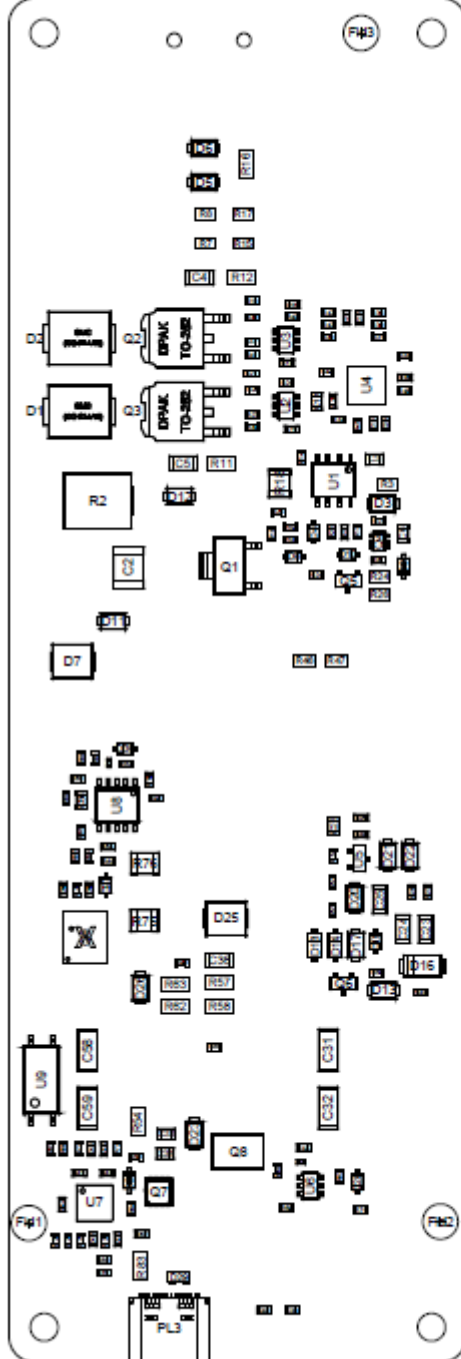
The design of this evaluation board, including any circuits provided in this document might be covered by one or more existing/pending patents.

2. EVALUATION BOARD IMAGES:

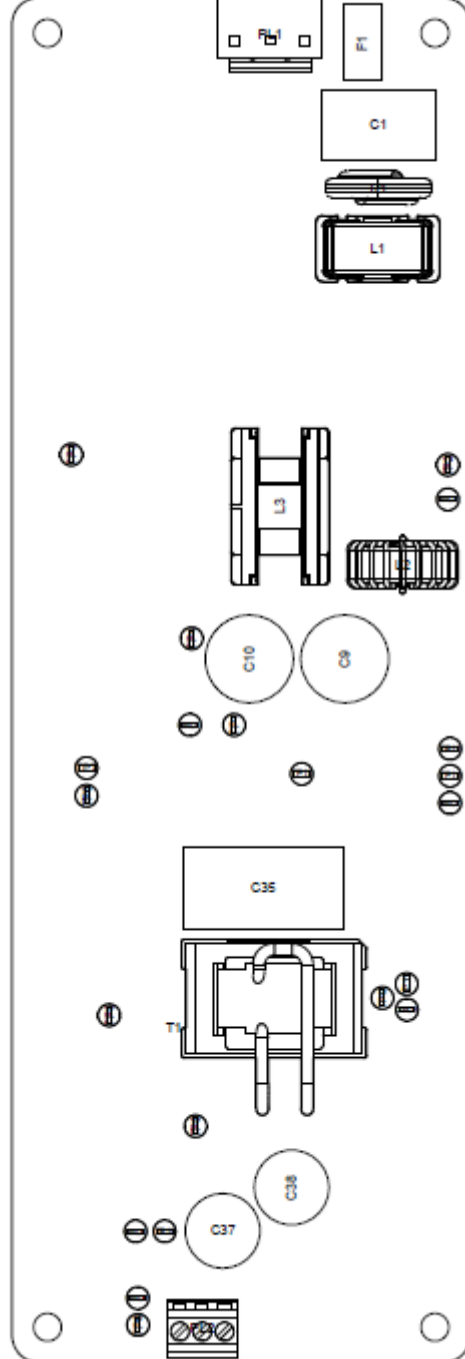


3. PCB LAYOUT

View from Top side (Scale 2:1)

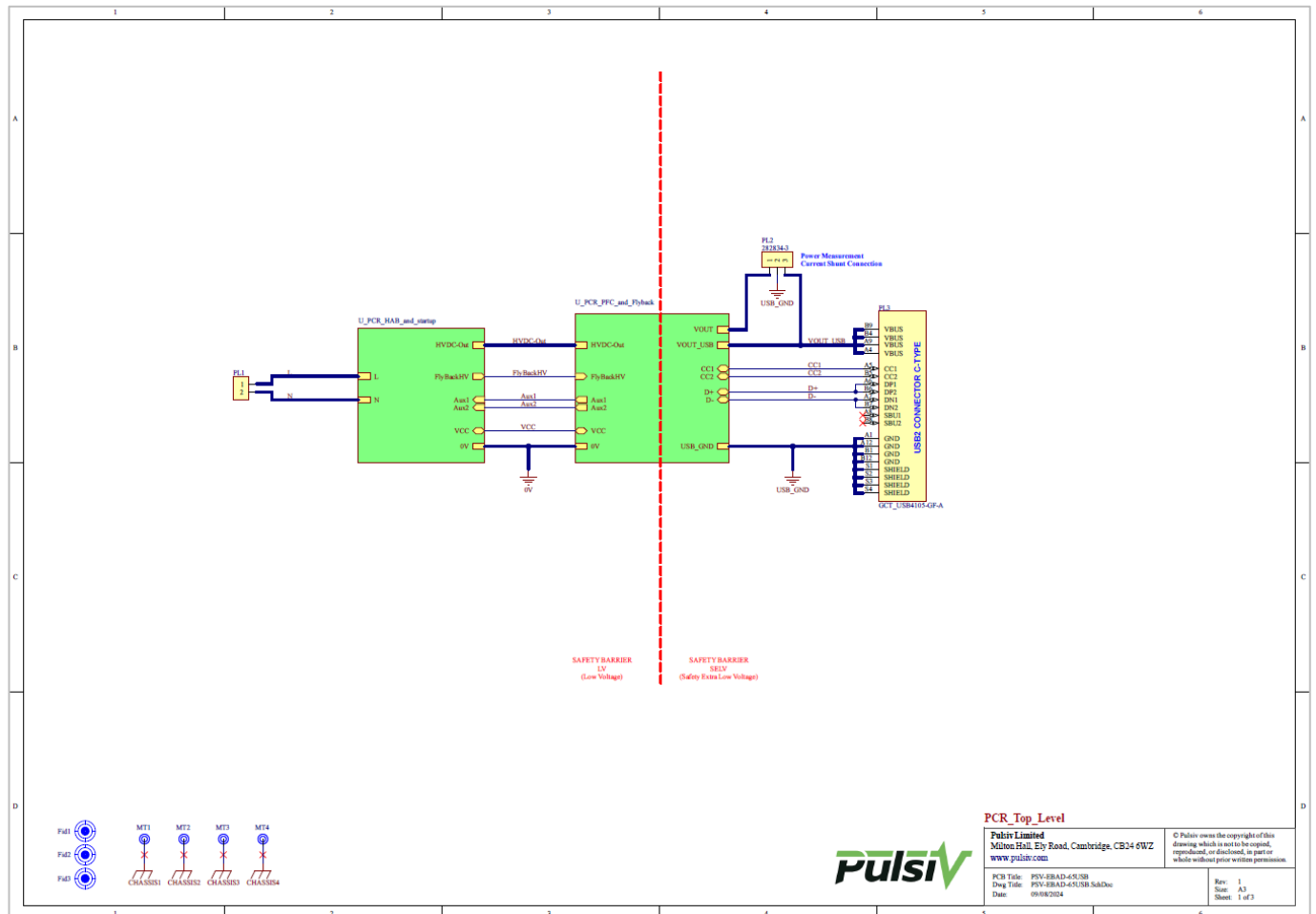


View from Bottom side (Scale 2:1)



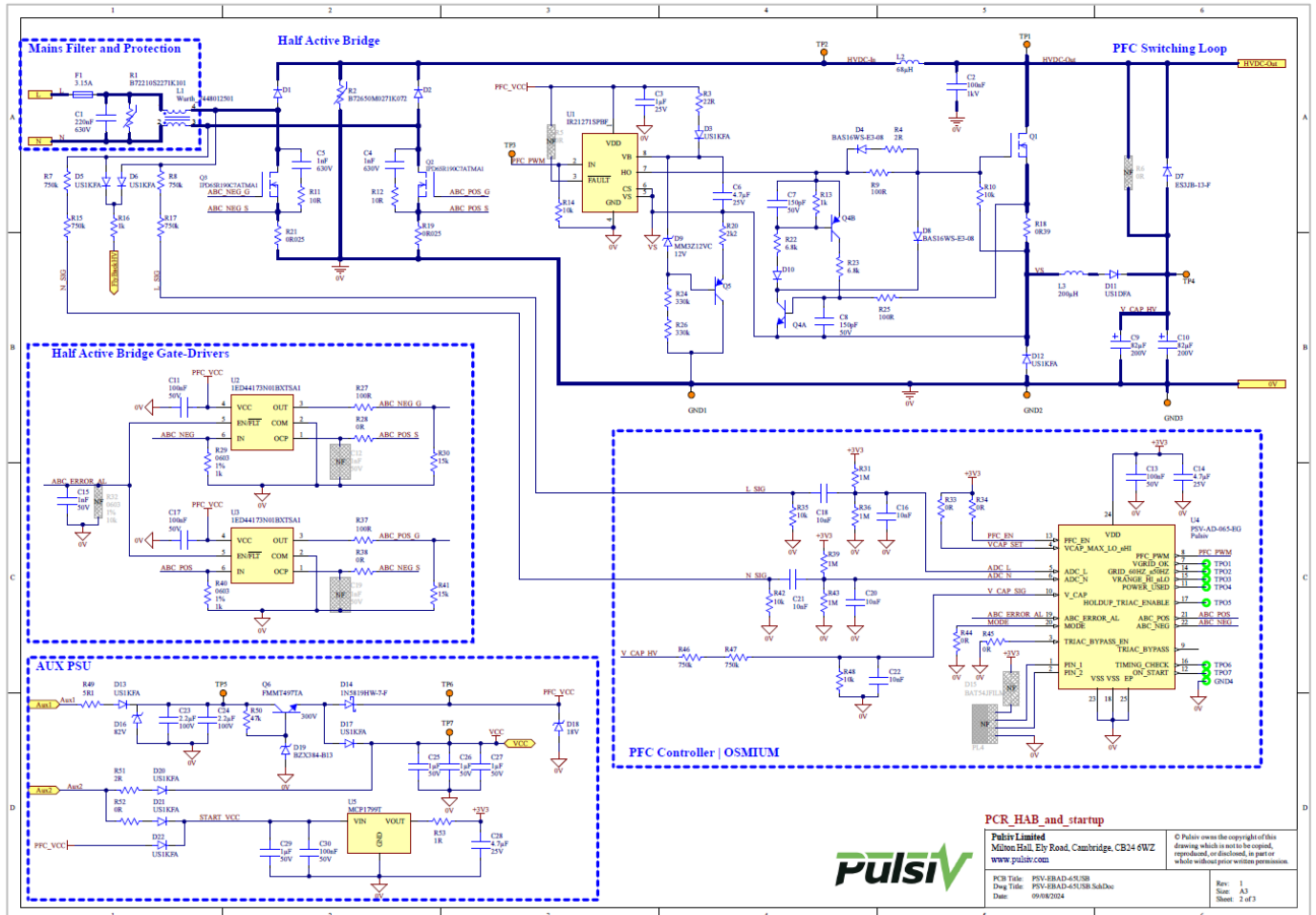
4. SCHEMATICS

BLOCK DIAGRAM



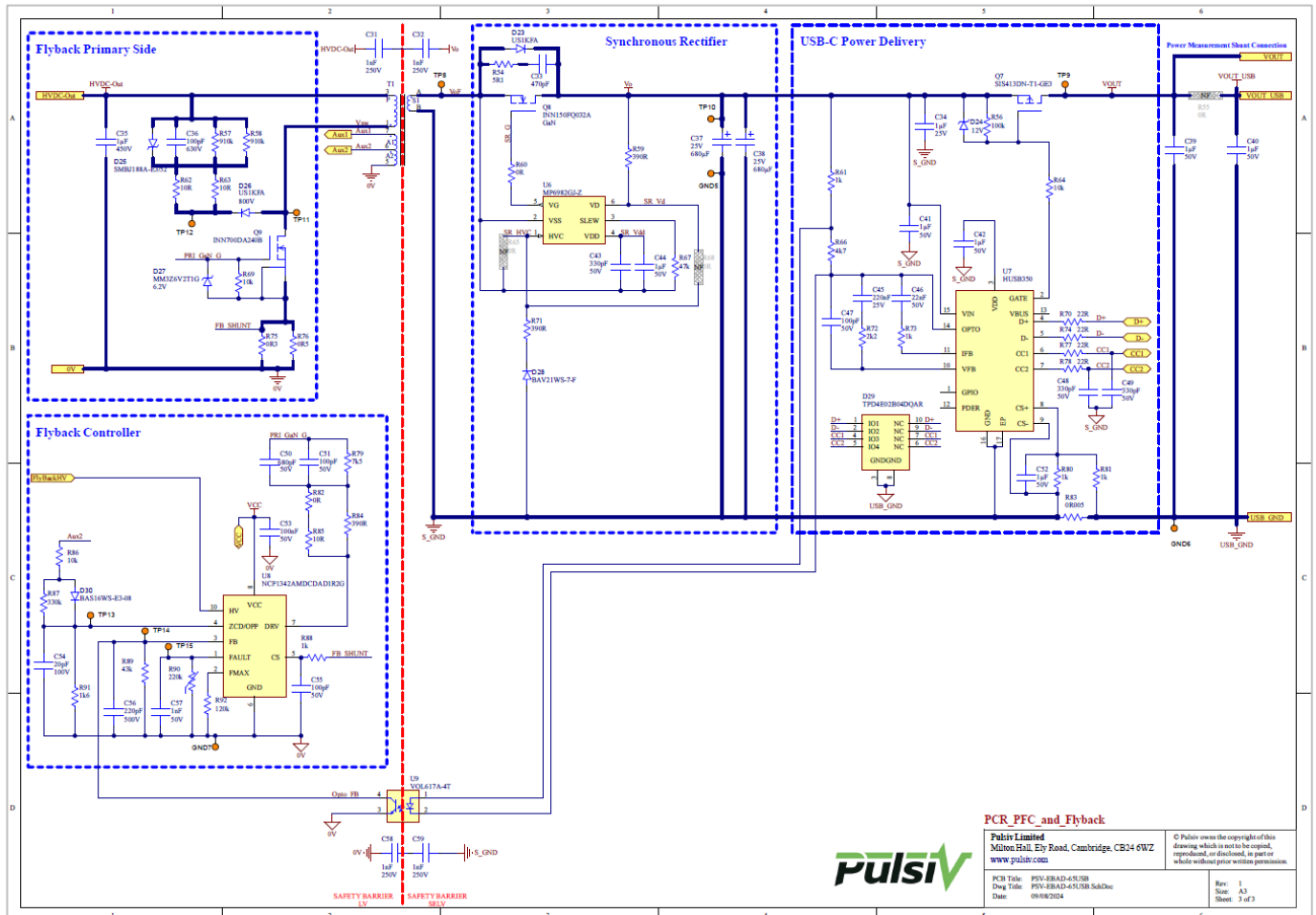
To view this schematic & Altium files, please visit: www.pulsiv.com

AC TO DC FRONT-END



To view this schematic & Altium files, please visit: www.pulsiv.com

DC – DC CONVERTER



To view this schematic & Altium files, please visit: www.pulsiv.com

5. BILL OF MATERIALS

| DESCRIPTION | DESIGNATOR | MANUFACTURER | PART NUMBER |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------|
| Test Point Orange Height 4.6 mm Tail Length 3 mm 1Pin THD | GND1, GND2, GND3, GND5, GND6, GND7, TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15 | Keystone Electronics | 5003 |
| MLCC 1206 X7R | C25 | TDK | C3216X7R1H105K160AB |
| MLCC 0603 X7R | C26, C27, C29, C39, C40, C41, C42, C44, C52 | Kyocera AVX | 06035C105KAT2A |
| MLCC 0603 X7R | C11, C13, C17, C30, C53 | Murata | GCM188R71H104KA57J |
| MLCC 0805 X7R | C6, C14, C28 | TDK | C2012X7R1E475K125AB |
| MLCC 1206 X7R | C23, C24 | Murata | GRM31CR72A225KA73L |
| MLCC 0603 X7R | C15, C57 | TDK | CGA3E2X7R1H102K080AA |
| WCAP-FTXX series, Polypropylene Cap, 13x8x14mm, Pitch 10mm | C1 | Würth Electronics | 890334023028CS |
| Fixed resistor, 0603, 0R | R28, R33, R34, R38, R44, R45, R52, R60, R82 | Yageo | RC0603JR-070RL |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R59, R71, R84 | Vishay | CRCW0603390RFKEA |
| Fixed resistor, 1206, 0.5W, 200V, 1%, 100ppm/°C, thick Film | R16 | TE Connectivity Holsworthy | CRGH1206F1K0 |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R50, R67 | Vishay | CRCW060347K0FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R4, R51 | Vishay Dale | CRCW06032R00FKEA |
| Fixed resistor, 0805, 0.200W, 450V, 1%, 100ppm/°C, thick film | R7, R8, R15, R17, R46, R47 | Vishay | TNPV0805750KBEEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R53 | Vishay Dale | CRCW06031R00FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R9, R25, R27, R37 | Vishay Dale | CRCW0603100RFKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R30, R41 | Vishay | CRCW060315K0FKEA |
| Fixed resistor, 0603, 0.33W, 75V, 1%, 100ppm/°C, thick Film | R19, R21 | Panasonic | ERJ-3BWFR025V |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R13, R29, R40, R61, R73, R80, R81, R88 | Vishay | CRCW06031K00FKEAC |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R10, R14, R35, R42, R48, R64, R69, R86 | Vishay | CRCW060310K0FKEA |
| MLCC 0805 C0G | C33 | Murata | GRM21A5C2E471FWA1J |
| MLCC 0603 X7R | C46 | Yageo | CC0603KRX7R9BB223 |
| MLCC 0603 X7R | C45 | KEMET | C0603C224K3RACAUTO |
| MLCC 0603 C0G | C47, C51, C55 | Yageo | CC0603JRNPO9BN101 |
| MLCC 0603 X7R | C48, C49 | Yageo | CC0603KRX7R9BB331 |
| Fixed resistor, 1206, 0.25W, 200V, 1%, 100ppm/°C, thick Film | R54 | Vishay Dale | CRCW12065R10FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R56 | Vishay | CRCW0603100KFKEAHP |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R66 | Vishay | CRCW06034K70FKEA |
| Fixed resistor, 1206, 0.75W, 200V, 1%, 100ppm/°C, thick Film | R83 | Susumu | KRL1632E-C-R005-G-T5 |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R20, R72 | Vishay | CRCW06032K20FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R70, R74, R77, R78 | Vishay | CRCW060322R0FKEA |
| MLCC 1206 C0G | C36 | Murata | GCM31A5C2J101JX01D |
| MLCC 0603 C0G | C50 | Kyocera AVX | 06035A681FAT2A |
| MLCC 0402 C0G | C54 | Vishay Vitramon | VJ0402D200JXBAJ |
| MLCC 0805 C0G | C56 | Yageo | CC0805JRNPOBBN221 |
| MLCC 1812 X7R | C2 | KEMET | C1812X104KDRACTU |
| MLCC 0603 C0G | C7, C8 | KEMET | C0603C151J5GACTU |
| MLCC 0603 X7R | C16, C18, C20, C21, C22 | KEMET | C0603C103K1RACTU |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R79 | Vishay | CRCW06037K50FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R87 | Vishay | CRCW0603330KFKEA |
| Fixed resistor, 1210, 0.5W, 200V, 1%, 100ppm/°C, thick Film | R75 | Yageo | RL1210FR-070R3L |
| Fixed resistor, 1210, 0.5W, 200V, 1%, 100ppm/°C, thick Film | R76 | Yageo | RL1210FR-070R5L |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R91 | Vishay | CRCW06031K60FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R89 | Vishay | CRCW060343K0FKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R92 | Vishay | CRCW0603120KFKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R49 | Vishay Dale | CRCW06035R11FKEA |
| Fixed resistor, 0805, 0.500W, 150V, 1%, 100ppm/°C, thick film | R3 | Vishay | CRCW080522R0FKEAHP |
| Fixed resistor, 1210, 0.5W, 200V, 1%, 100ppm/°C, thick Film | R18 | Yageo | RL1210FR-070R39L |
| Fixed resistor, 1206, 0.25W, 200V, 1%, 100ppm/°C, thick Film | R57, R58 | Yageo | RC1206FR-07910KL |
| Fixed resistor, 0805, 0.125W, 150V, 1%, 100ppm/°C, thick film | R24, R26 | Vishay | CRCW0805330KFKEA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R31, R36, R39, R43 | Vishay | CRCW06031M00FKEA |

| DESCRIPTION | DESIGNATOR | MANUFACTURER | PART NUMBER |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------|---------------------|
| Fixed resistor, 1206, 0.75W, 250V, 1%, 100ppm/°C, thick Film | R11, R12, R62, R63 | Bourns | CMP1206AFX-10R0ELF |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R85 | Vishay | CRCW060310R0FKEA |
| Quasi-Resonant Flyback Controller with Valley Lock-Out Switching | U8 | ON Semiconductor | NCP1342AMDCDAD1R2G |
| Pulsiv Osium 65W QFN24 | U4 | Pulsiv | PSV-AD-65EG-Q24IV |
| Conn USB2 C-Type 16Pin Horizontal 48V 5A THC | PL3 | Global Connector Technology | USB4105-GF-A |
| Rectifier Diode Small Signal Switching 250V 0.25A 50ns 2-Pin SOD-323 T/R | D28 | Diodes | BAV21WS-7-F |
| Rectifier Diode, 1 Phase, 1 Element, 0.25A, 100V V(RRM), Silicon | D4, D8, D10, D30 | Vishay | BAS16WS-E3-08 |
| A750 series, electrolytic | C37, C38 | KEMET | A750KW687M1EAAE016 |
| TRN NPN/PNP GEN PURP X2 45V 100mA SOT363 | Q4 | Nexperia | BC847BPN,115 |
| MOSFET Transistor, N Channel, 13 A, 650 V, 0.168 ohm, 10 V, 3.5 V | Q2, Q3 | Infineon | IPD65R190C7ATMA1 |
| Varistor, 350V, 8.6J, Surface Mount | R2 | TDK EPCOS | B72650M0271K072 |
| ECW series, Metallized PP Film capacitor, 18.1x9.3x12.6mm, pitch 15mm | C35 | Panasonic | ECW-F2W105KA |
| CAP 1808 Y 1nF 250VAC 10% -55/+125 | C31, C32, C58, C59 | Holystone | SCC1808X102K502TX |
| DIO ZENER 6.2V 300mW SOD323 | D27 | ON Semiconductor | MM3Z6V2T1G |
| Diode Zener Single 13V 2% 300mW Automotive 2-Pin SOD-323 T/R | D19 | Nexperia | BZ384-B13,115 |
| Rectifier Diode, Schottky, 1 Phase, 1 Element, 1A, 40V V(RRM), Silicon | D14 | Diodes | 1N5819HW-7-F |
| Zener Diodes 82V Zener SMA | D16 | Vishay | SML4762AHE3_A/H |
| CAP ELEC RAD 82uF 200V 20% -40/+105 | C9, C10 | Rubycon | 200BXW82MEFR10X30 |
| Electric Fuse, Time Lag Blow, 3.15A, 100A (IR), MICRO | F1 | Bel | 0697A3150-01 |
| Common Mode Choke WE-CMBNC 1mH 2.5A R055 | L1 | Würth Electronics | 7448012501 |
| Transistor BJT NPN 300V 0.5A SOT23-3 | Q6 | Diodes Zetex | FMMT497TA |
| PBHV9050T Series 500 V 150 mA PNP Low VCEsat (BISS) Transistor - SOT-23 | Q5 | Nexperia | PBHV9050T,215 |
| GaN Power Transistor Enhancement-mode 150V 100A 3.9mR | Q8 | Innoscence | INN150EQ032A |
| TRN MOSFET P-CH 30V 18A -55/+150 | Q7 | Vishay Siliconix | SIS413DN-T1-GE3 |
| VAR TVS 10MM DISC 3.5KA 275VAC | R1 | TDK EPCOS | B72210S2271K101 |
| Thermistor NTC 220K Ohm 1% 2-Pin 0603 Surface Mount Solder Pad 4450K T/R Automotive | R90 | Panasonic | ERT-J1VT224FM |
| Fast Turn-Off Intelligent Rectifier No Aux Winding SOT23-6 | U6 | Monolithic Power Systems | MP6982GJ-Z |
| LDO 3.3V 80mA | U5 | Microchip | MCP1799T-3302H/TT |
| Gate Driver Single Channel 25V 6-Pin SOT-23 T/R | U2, U3 | Infineon | 1ED44173N01BXTSA1 |
| TVS DIODE 3.6V 8.8V 10USON / 4-Channel ESD Protection Diode for USB Type-C and HDMI 2.0 | D29 | Texas Instruments | TPD4E02B04DQAR |
| MLCC 0402 C0G | C43 | Murata | GRM1555C1H331JA01D |
| Gate Driver Hi/Low Side SOIC8 | U1 | International Rectifier | IR21271SPBF |
| MLCC 0805 X7R | C3, C34 | KEMET | C0805C105K3RACTU |
| Rectifier 3.0 Amp 600 Volt | D1, D2 | Vishay Semiconductors | S3J-E3/57T |
| Rectifier 800V 1A | D3, D5, D6, D12, D13, D17, D20, D21, D22, D23, D26 | ON Semiconductor / Fairchild | US1KFA |
| Diode Rectifier 600V 3A SMB | D7 | Diodes | ES3JB-13-F |
| Zener Diode 12V 5% | D9, D24 | ON Semiconductor / Fairchild | MM3Z12VC |
| Diode Superfast Rectifier 200V 1A 2-Pin SOD-123FA T/R | D11 | ON Semiconductor / Fairchild | US1DFA |
| Zener Diode 18V SOD123-2 | D18 | Nexperia | PDZ18BGWX |
| Uni-Directional TVS Diode, 600W, 2-Pin DO-214AA | D25 | Vishay Semiconductors | SMBJ188A-E3/52 |
| General Purpose Inductor, 68uH, 20%, 1 Element, Iron-Core | L2 | Würth Electronics | 7447033 |
| Inductor, 200uH | L3 | Frenetic | |
| CON 2W ST PWR POL 7.92MM PTH | PL1 | TE Connectivity | 1-1123724-2 |
| CON 3W TE 2.54MM W-T-B TERM BLOCK ST | PL2 | TE Connectivity | 282834-3 |
| Small Signal Field-Effect Transistor, 600V, 1-Element, N-Channel, Silicon, Metal-oxide Semiconductor FET | Q1 | Infineon | IPN60R360P7SATMA1 |
| TRN GAN 700V 165mR 18A -55/+150 DFN5X6 | Q9 | Innoscence | INN700DA240B |
| Pulsiv TRF EQ20 FLYBACK | T1 | Frenetic | |
| IC HUSB350 USB TYPE-C/PD CTRL 3.3-25V | U7 | Hynetek | HUSB350 |
| Transistor Output Optocoupler, 1-Element | U9 | Vishay Semiconductors | VOL617A-4T |
| MLCC 1206 COG | C4, C5 | TDK | C3216C0G2J102J085AA |
| Fixed resistor, 0603, 0.1W, 75V, 1%, 100ppm/°C, thick Film | R22, R23 | Vishay | CRCW06036K80FKEA |

6. EFFICIENCY

Test Conditions: Board soak tested for 10mins and measured at test point TP9. Please refer to the schematic. Results shown are maximum peak measurements at an ambient temperature of 23°C under laboratory conditions. This PSV-EBAD-65USB evaluation board is for test purposes only. Results may vary due to test methods, conditions, equipment, & component tolerances.

230VAC

| 5V / 3A | | | | 15W |
|-------------|------------|----------------------------|----------------------|-----|
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 92.06% | 89.71% | 92.06% | |
| 75 | 91.84% | | | |
| 50 | 87.99% | | | |
| 25 | 86.97% | | | |
| 9V / 3A | | | | 27W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 93.23% | 91.36% | 93.23% | |
| 75 | 92.89% | | | |
| 50 | 90.76% | | | |
| 25 | 88.56% | | | |
| 15V / 3A | | | | 45W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 94.67% | 93.71% | 94.67% | |
| 75 | 94.15% | | | |
| 50 | 93.93% | | | |
| 25 | 92.09% | | | |
| 20V / 3.25A | | | | 65W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 94.87% | 95.20% | 96.03% | |
| 75 | 96.03% | | | |
| 50 | 94.98% | | | |
| 25 | 94.91% | | | |

115V

| 5V / 3A Output | | | | 15W |
|--------------------|------------|----------------------------|----------------------|-----|
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 92.76% | 92.98% | 93.95% | |
| 75 | 93.85% | | | |
| 50 | 91.38% | | | |
| 25 | 93.95% | | | |
| 9V / 3A Output | | | | 27W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 92.26% | 94.08% | 95.85% | |
| 75 | 95.85% | | | |
| 50 | 95.07% | | | |
| 25 | 93.13% | | | |
| 15V / 3A Output | | | | 45W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 92.54% | 94.87% | 96.58% | |
| 75 | 95.58% | | | |
| 50 | 96.58% | | | |
| 25 | 94.78% | | | |
| 20V / 3.25A Output | | | | 65W |
| % LOAD | Efficiency | 4 Point Average Efficiency | Max. Peak Efficiency | |
| 100 | 91.42% | 92.30% | 93.23% | |
| 75 | 92.95% | | | |
| 50 | 93.23% | | | |
| 25 | 91.59% | | | |

6.1 FULL LOAD EFFICIENCIES

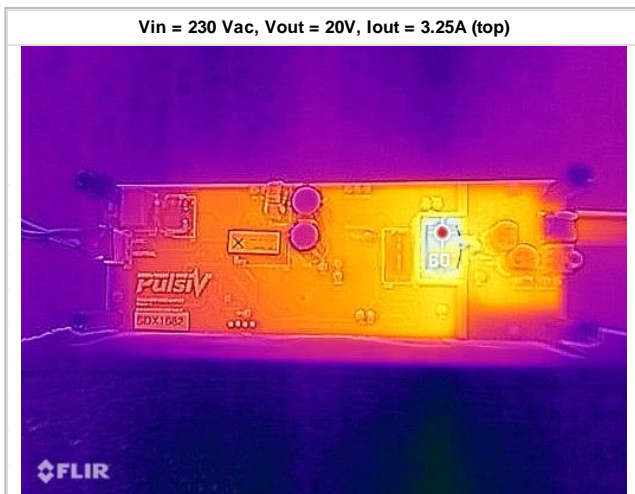
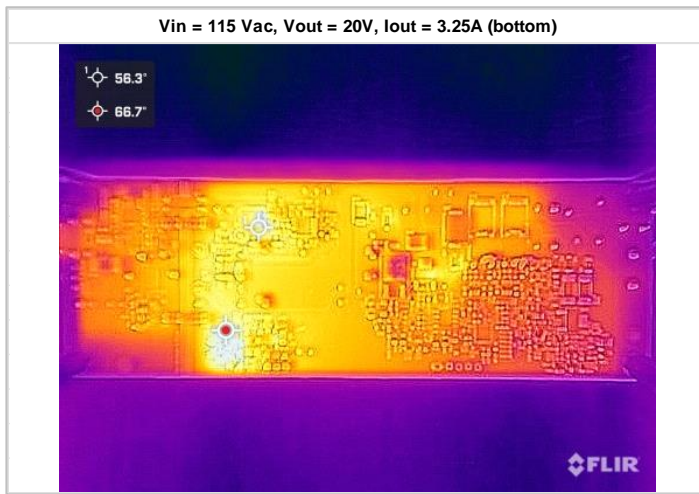
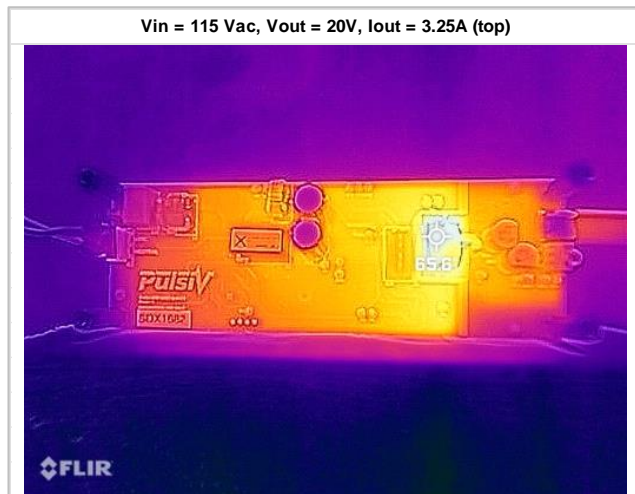
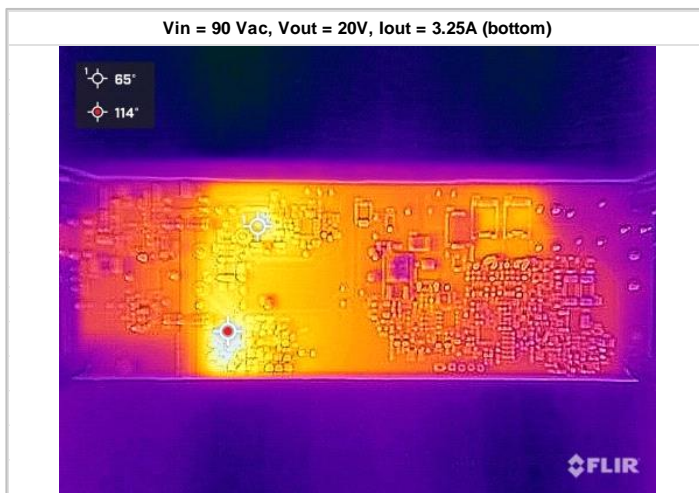
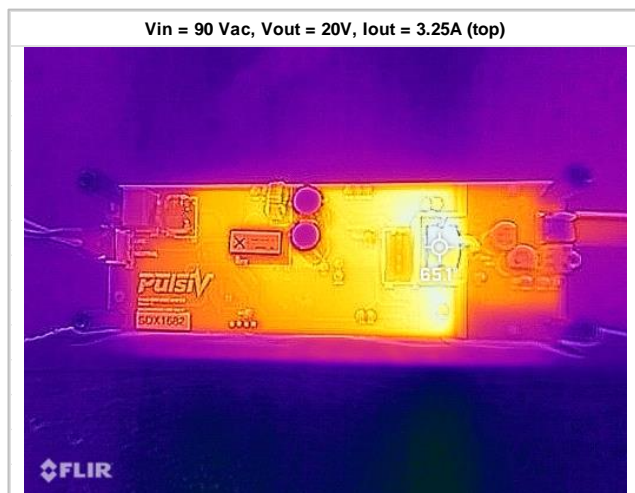
| Vout = 5V@3A | | | 15W |
|--------------------|-------|------------|-----|
| Vin | Iout | Efficiency | |
| 90Vac @ 60Hz | 3A | 90.94% | |
| 115Vac @ 60Hz | 3A | 92.76% | |
| 230Vac @ 50Hz | 3A | 92.06% | |
| 265Vac @ 50Hz | 3A | 91.49% | |
| Vout = 9V@3A | | | 27W |
| Vin | Iout | Efficiency | |
| 90Vac @ 60Hz | 3A | 92.89% | |
| 115Vac @ 60Hz | 3A | 92.26% | |
| 230Vac @ 50Hz | 3A | 93.23% | |
| 265Vac @ 50Hz | 3A | 93.35% | |
| Vout = 15V@3A | | | 45W |
| Vin | Iout | Efficiency | |
| 90Vac @ 60Hz | 3A | 91.27% | |
| 115Vac @ 60Hz | 3A | 92.54% | |
| 230Vac @ 50Hz | 3A | 94.67% | |
| 265Vac @ 50Hz | 3A | 94.89% | |
| Vout = 20V @ 3.25A | | | 65W |
| Vin | Iout | Efficiency | |
| 90Vac @ 60Hz | 3.25A | 89.16% | |
| 115Vac @ 60Hz | 3.25A | 91.42% | |
| 230Vac @ 50Hz | 3.25A | 94.87% | |
| 265Vac @ 50Hz | 3.25A | 95.09% | |

7. NO LOAD INPUT POWER

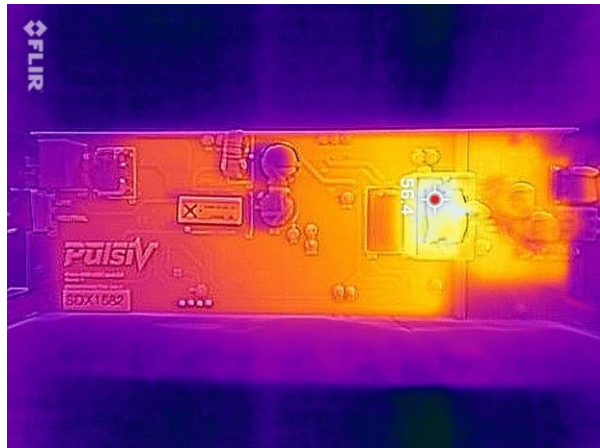
| Input Voltage | No Load Power Measurements |
|---------------|----------------------------|
| 90Vac 60Hz | 92.49mW |
| 115Vac 60 Hz | 104.54mW |
| 230Vac 50 Hz | 170.23mW |
| 265Vac 50 Hz | 201.64mW |

8. THERMAL PERFORMANCE

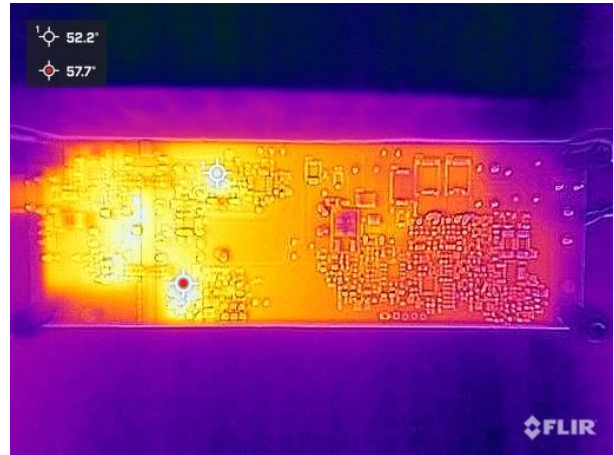
| Designator | Components | 90Vac | 115Vac | 230Vac | 265Vac |
|----------------|---------------------|--------|--------|--------|--------|
| T1 (Top Image) | Flyback Transformer | 65.1°C | 65.6°C | 60°C | 56.4°C |
| Q4 | AUX Transistor | 114°C | 66.7°C | 62.7°C | 57.7°C |
| Q1 | Primary GaN FET | 65°C | 56.3°C | 53.6°C | 52.2°C |



Vin = 265 Vac, Vout = 20V, Iout = 3.25A (top)



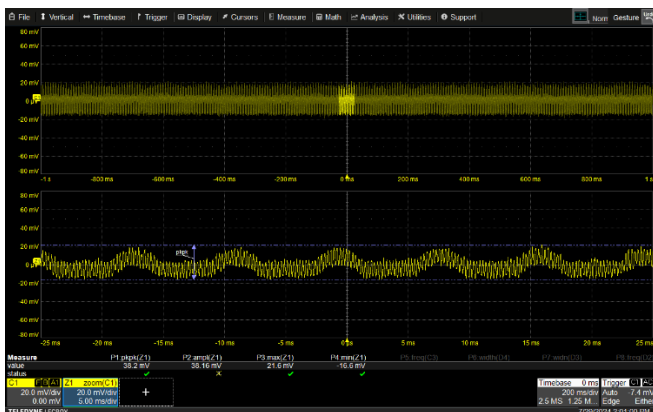
Vin = 265 Vac, Vout = 20V, Iout = 3.25A (bottom)



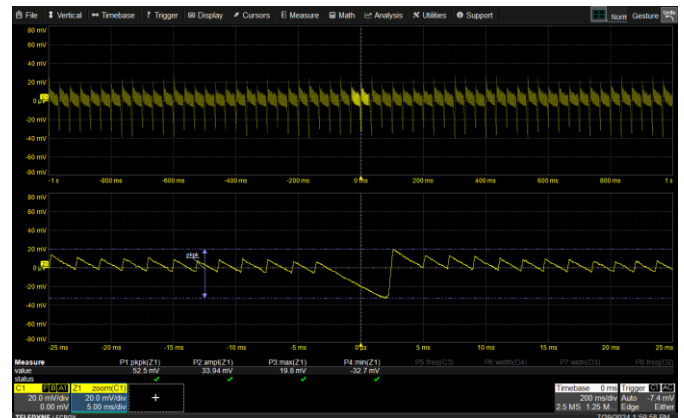
9. OUTPUT VOLTAGE RIPPLE

| Vout/Iout | Measured Ripple at 3A load | Measured Ripple at 0A load |
|-------------|----------------------------|----------------------------|
| 5V / 3A | 38.2mV | 52.5mV |
| 9V / 3A | 43.8mV | 13.3mV |
| 15V / 3A | 65.9mV | 10.7mV |
| 20V / 3.25A | 106.2mV | 12.1mV |

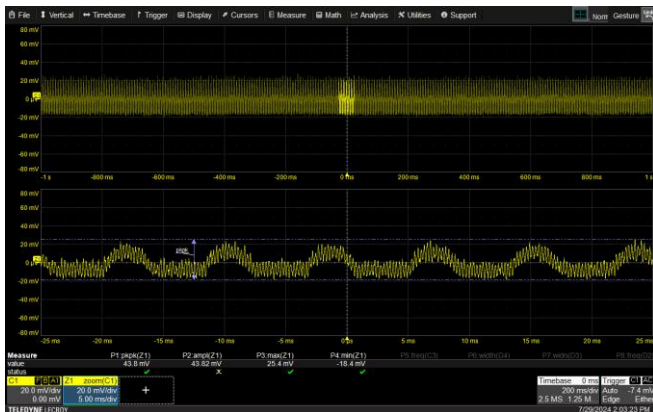
Vin = 115VAC, Vout = 5V @ 3A



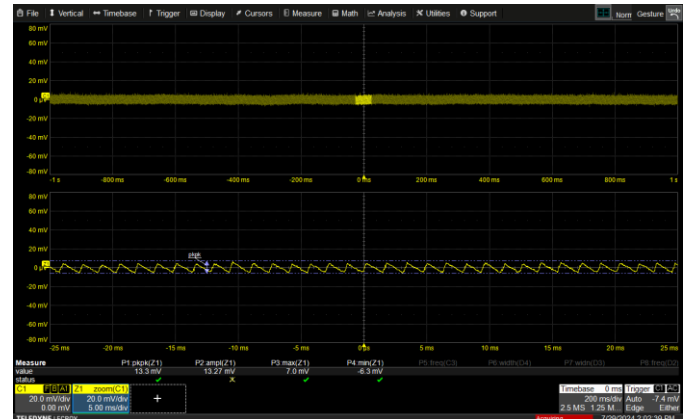
Vin = 115VAC, Vout = 5V @ 0A



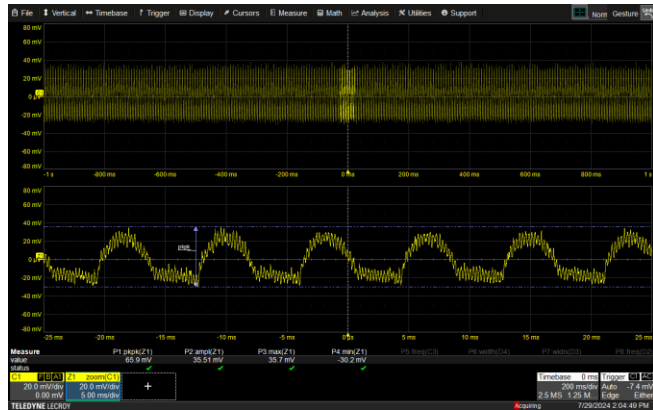
Vin = 115VAC, Vout = 9V @ 3A



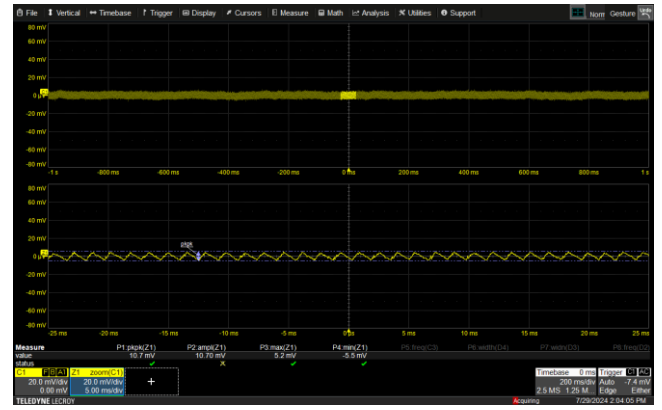
Vin = 115VAC, Vout = 9V @ 0A



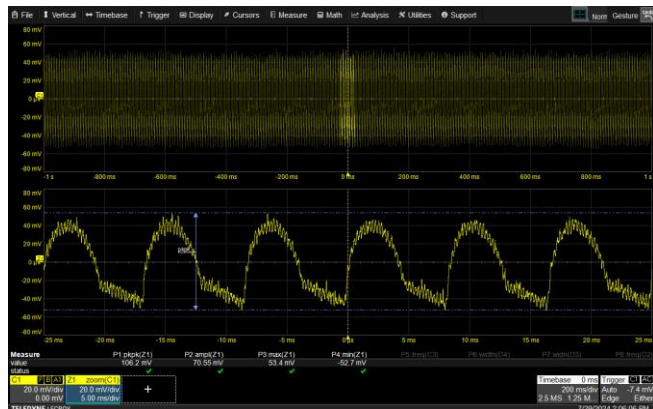
Vin = 115VAC, Vout = 15V @ 3A



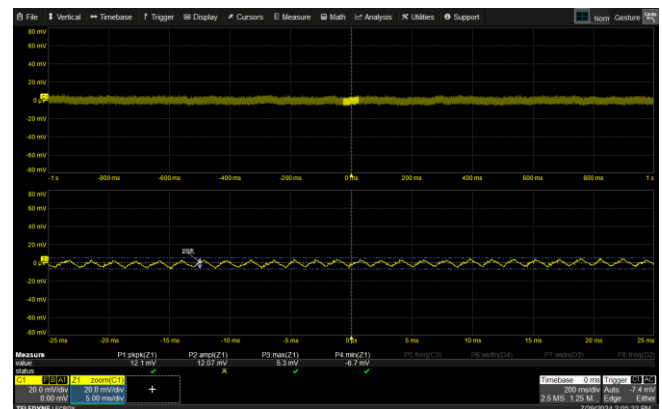
Vin = 115VAC, Vout = 15V @ 0A



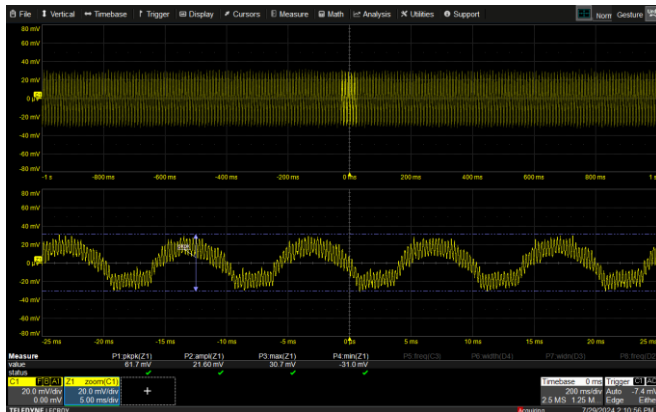
Vin = 115VAC, Vout = 20V @ 3A



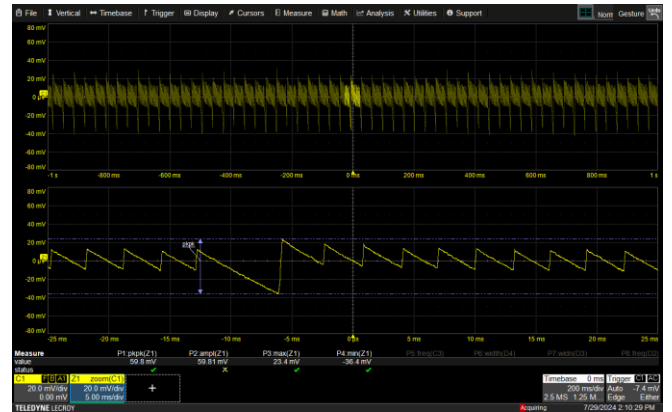
Vin = 115VAC, Vout = 20V @ 0A



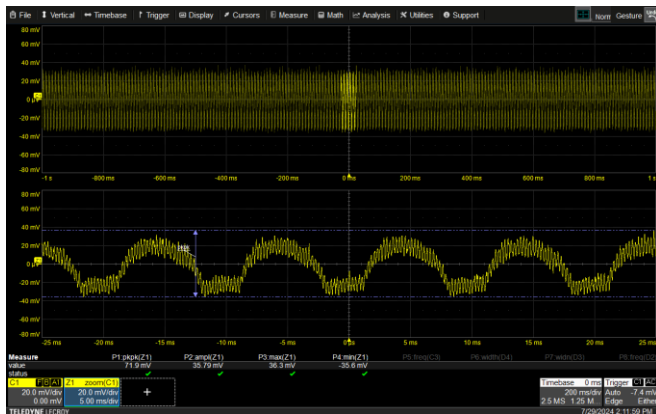
Vin = 230VAC, Vout = 5V @ 3A



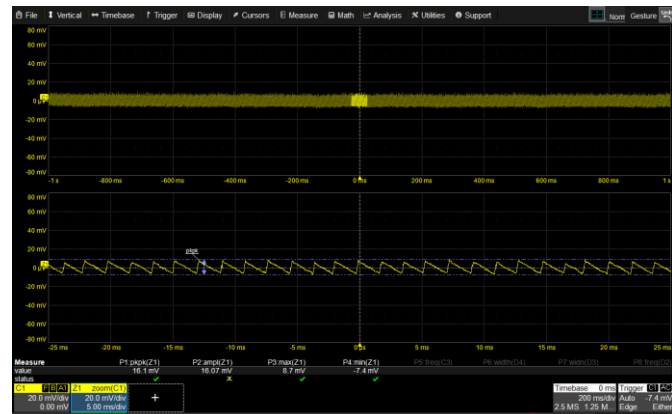
Vin = 230VAC, Vout = 5V @ 0A



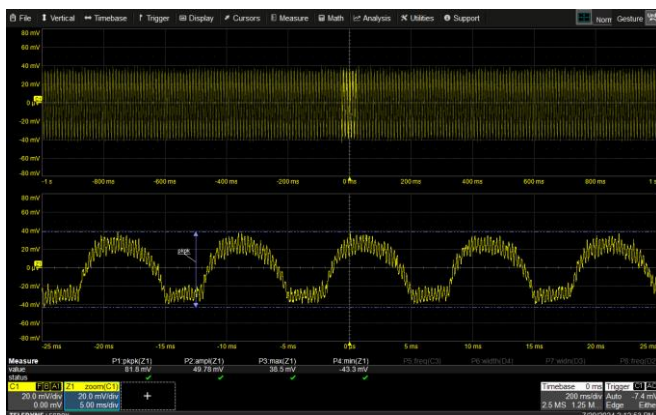
Vin = 230VAC, Vout = 9V @ 3A



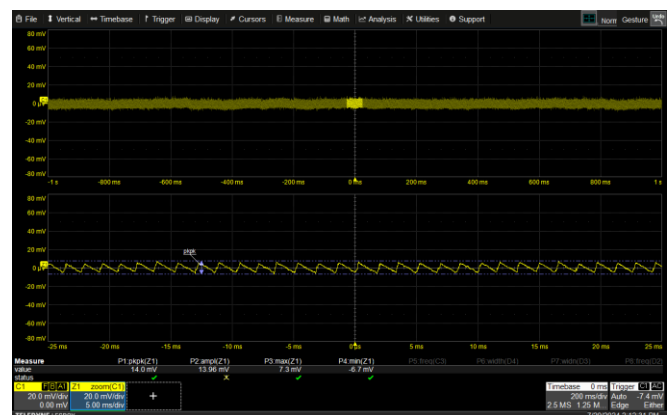
Vin = 230VAC, Vout = 9V @ 0A



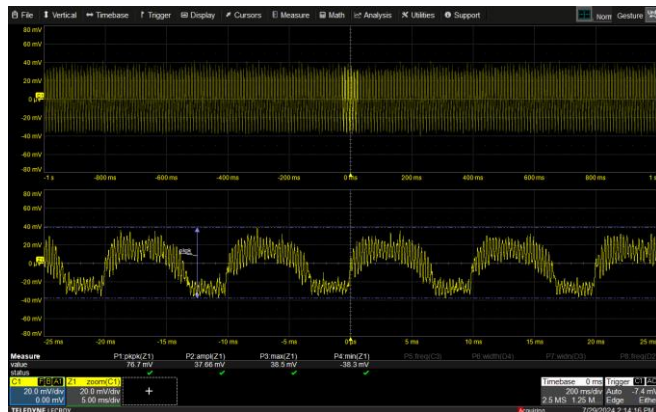
Vin = 230VAC, Vout = 15V @ 3A



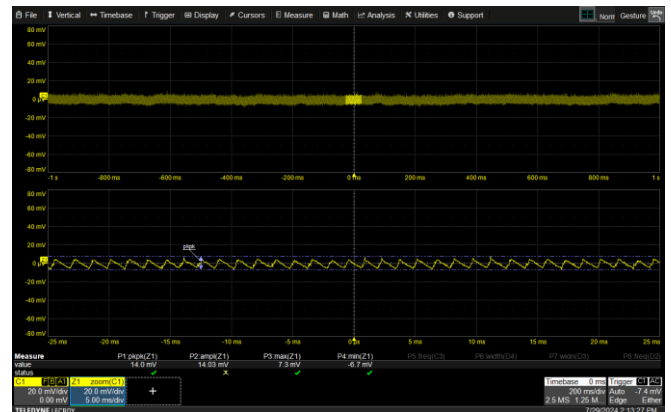
Vin = 230VAC, Vout = 15V @ 0A



Vin = 230VAC, Vout = 20V @ 3A



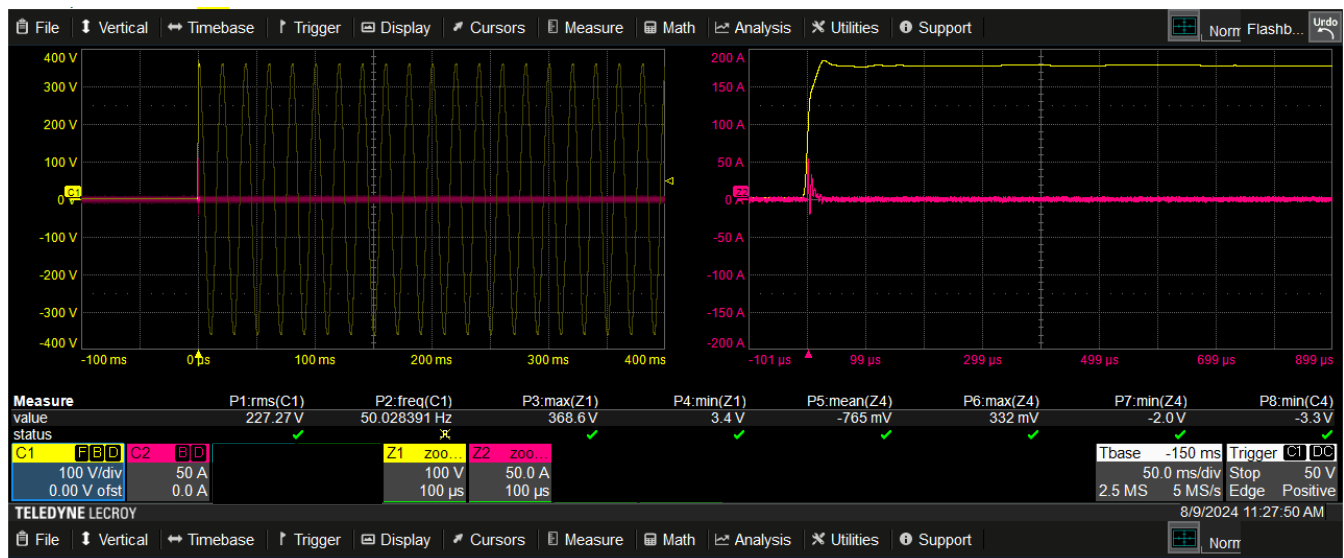
Vin = 230VAC, Vout = 20V @ 0A



9. INRUSH CURRENT

Measured at 230VAC, initial start-up. CH1 = Vac, CH2 = Line Current.

The current spike shown is caused by the X capacitor and the voltage slew rate of the test equipment. It is less than 100uS and does not count as inrush current when measured using industry standard techniques and guidelines.



13. PART NUMBER CONFIGURATION

| Part Number | PSV | - | EBAD | - | xx | USB |
|-------------|-----|---|------|---|----|-----|
| Descriptor | 1 | | 2 | | 3 | 4 |

| Descriptor | | Meaning |
|------------|-----------|-----------------------------------------|
| 1 | Brand | PSV = Pulsiv |
| 2 | Type | EBAD = AC to DC evaluation board |
| 3 | Power (W) | Maximum Output Power (W) |
| 4 | Options | USB = USB-C interface |

EXAMPLE PART NUMBER:

PSV-EBAD-65USB

EXAMPLE PART NUMBER DESCRIPTION:

Pulsiv AC to DC full power supply evaluation board with an output power of 65W (max) and a USB-C interface.

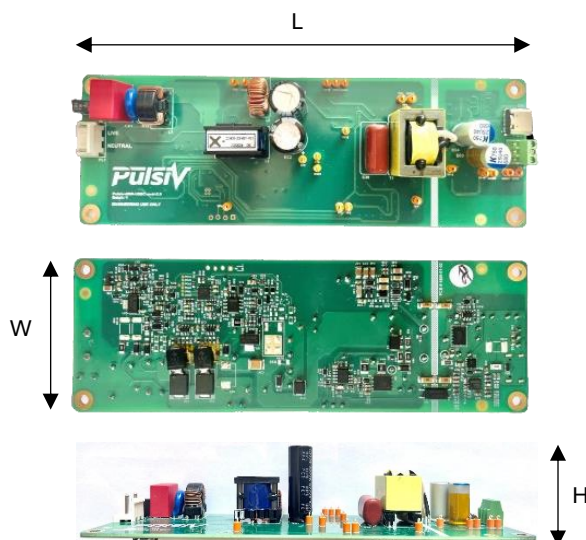
14. MECHANICAL DIMENSIONS

LENGTH (L) = 155mm (6.10in)

WIDTH (W) = 52mm (2.05in)

HEIGHT (H) = 35mm (1.38in)

WEIGHT = 80 g



15. IMPORTANT NOTICE & DISCLAIMER

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16. USEFUL LINKS

- Technical Support: [CLICK HERE](#)
- Evaluation Boards: AC to DC Front-End Only [CLICK HERE](#)
- Evaluation Boards: Full AC to DC Power Supplies [CLICK HERE](#)
- Reference Designs: AC to DC Front-End Only [CLICK HERE](#)
- Reference Designs: Full AC to DC Power Supplies [CLICK HERE](#)
- White Papers [CLICK HERE](#)
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