UM10831

TEA1716DB1258 demo board for 150 W all-in-one PC adapter

Rev. 1 — 5 February 2015 User manual

Document information

Info	Content
Keywords	TEA1716DB1258, TEA1716T, TEA1795T, all-in-one PC adapter, GreenChip SR, synchronous rectification, LLC, resonant, half-bridge, Power Factor Correction (PFC), controller, converter, burst mode, power supply, demo board
Abstract	This user manual describes the application of the TEA1716DB1258 demo board. The TEA1716T includes a Power Factor Correction (PFC) controller and a controller for a Half-Bridge resonant Converter (HBC). This user manual describes a 150 W resonant Switching Mode Power Supply (SMPS) for a typical all-in-one PC adapter design based on the TEA1716T and TEA1795T. The board provides an output of 19.5 V/7.7 A. It operates in normal mode for medium and high-power levels and in burst mode for low-power levels. Burst mode operation provides a reduction of power losses to increase performance. To increase the efficiency at high output power, the supply includes synchronous rectification by the TEA1795. The efficiency at high power is well above 90 %. The no-load power consumption is well below 500 mW. At 250 mW output power, the input power is below 500 mW (EUP lot6 compliant).

Revision history

Rev	Date	Description
v.1	20150205	first issue

Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

1. Introduction

WARNING

Lethal voltage and fire ignition hazard

The non-insulated high voltages that are present when operating this product, constitute a risk of electric shock, personal injury, death and/or ignition of fire.

This product is intended for evaluation purposes only. It shall be operated in a designated test area by personnel qualified according to local requirements and labor laws to work with non-insulated mains voltages and high-voltage circuits. This product shall never be operated unattended.

1.1 Scope of this document

This document describes the 150 W all-in-one PC adapter demo board using the TEA1716T and TEA1795T. A functional description is provided, supported by a set of measurements to show the all-in-one PC adapter characteristics.

1.2 TEA1716T

The TEA1716T integrates a controller for PFC and a controller for an HBC. It provides the drive function for the discrete MOSFET of the upconverter and for the two discrete power MOSFETs in a resonant half-bridge configuration.

The resonant controller part is a high-voltage controller for a Zero Voltage Switching (ZVS) LLC resonant converter. It includes a high-voltage level shift circuit and several protection features such as OverCurrent Protection (OCP), Open-Loop Protection (OLP), Capacitive Mode Protection (CMP), and a general purpose latched protection input.

In addition to the resonant controller, the TEA1716T contains a PFC controller. The efficient operation of the PFC is obtained by functions such as quasi-resonant operation at high-power levels and quasi-resonant operation with valley skipping at lower power levels. OCP, OverVoltage Protection (OVP), and demagnetization sensing ensure safe operation under all conditions.

The proprietary high-voltage Bipolar CMOS DMOS (BCD) power logic process makes direct start-up from the rectified universal mains voltage in an efficient way possible. A second low-voltage Silicon-On-Insulator (SOI) IC is used for accurate, high-speed protection functions and control.

The combination of PFC and a resonant controller in one IC makes the TEA1716T suitable for all-in-one PC adapters.

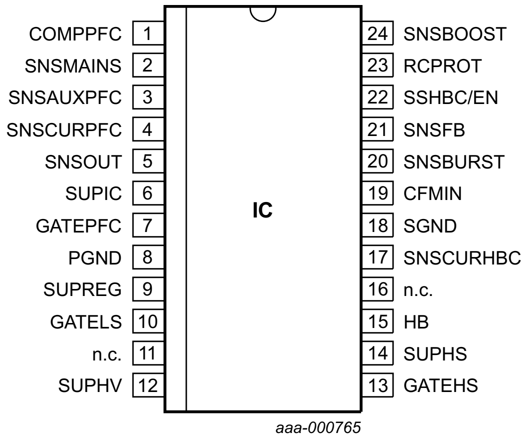


Fig 1. TEA1716T pin configuration

1.3 TEA1795T

The TEA1795T GreenChip SR is a synchronous rectification control IC that does not require any external components to tune the timing. Used in all-in-one PC adapter designs, the GreenChip SR offers a wide V_{CC} operating range between 8.5 V and 38 V, minimizing the number of external components required and enabling simpler designs. In addition, the high driver output voltage (10 V) makes the GreenChip SR compatible with all MOSFET brands.

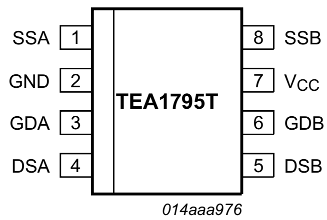


Fig 2. TEA1795T pinning configuration

1.4 Setup of the 150 W all-in-one PC adapter

The board can operate at a mains input voltage of between 90 V and 264 V (universal mains).

The demo board contains two subcircuits:

- A PFC of BCM-type
- An HBC of resonant LLC-type

The TEA1716T controls both converters. At low-power levels, the converters operate in burst mode to reduce power losses.

The TEA1795T controls the synchronous rectification stage in the LLC converter.

The purpose of the TEA1716DB1258 demo board is to demonstrate the operation of the TEA1716T and TEA1795T in a single output supply including burst mode operation. The performance is according to current general standards including the EuPlot6 requirements. It can be used as a starting point for further development.

1.5 Input and output properties

Table 1. TEA1716DB1258 input data

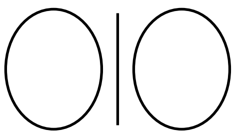
Symbol	Parameter	Conditions	Specification
V_i	input voltage	AC	90 V to 264 V (RMS)
f_i	input frequency		47 Hz to 60 Hz
$P_{i(noload)}$	no-load input power	at 230 V/50 Hz	< 200 mW
$P_{i(load=250mW)}$	standby power consumption	at 230 V/50 Hz	< 500 mW

Table 2. TEA1716DB1258 output data

Symbol	Parameter	Conditions	Specification
V_o	output voltage		19.5 V
$V_{o(ripple)(p-p)}$	peak-to-peak output ripple voltage	20 MHz bandwidth	< 300 mV
I_o	output current	continuous	0 A to 7.65 A

2. Safety warning

The board must be connected to the mains voltage. Avoid touching the board during operation at all times. An isolated housing is obligatory when used in uncontrolled, non-laboratory environments. Galvanic isolation of the mains phase using a variable transformer is always recommended. Figure 3 shows the symbols on how to recognize these devices.



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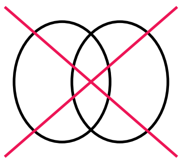
a. Isolated



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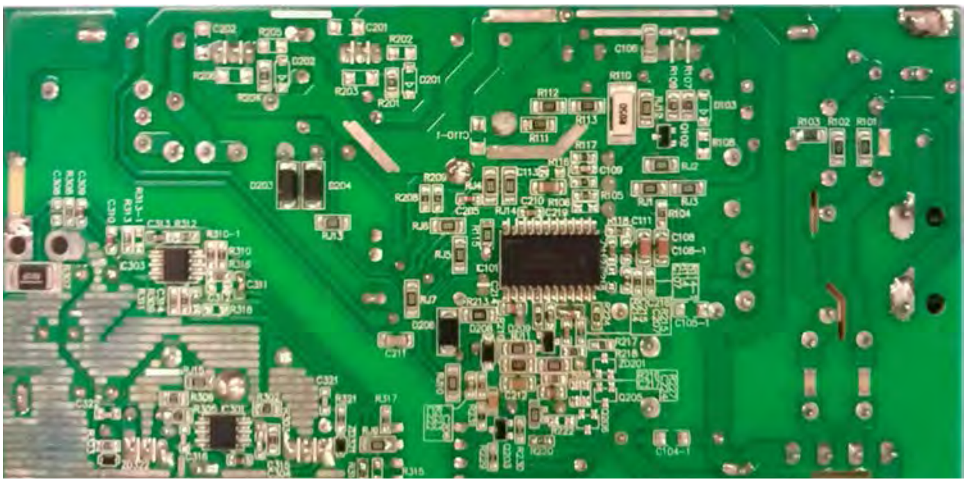
b. Not isolated

Fig 3. Isolation symbols

3. Board photographs

a. Top view



b. Bottom view

Fig 4. TEA1716DB1258 demo board 150 W all-in-one PC adapter

4. Measurements

4.1 Test facilities

Efficiency measurements were made measuring the output voltage on the board (not taking into account the losses in an output connection cable).

- Oscilloscope: Tektronix DPO3034
- AC power source: Chroma 61603
- DC Electronic load: Chroma 63010
- Digital power meter: Yokogawa WT210

4.2 Efficiency characteristics

Efficiency measurements were made measuring the output voltage on the board (not taking into account the losses in an output connection cable).

Table 3. Efficiency results

Condition	Energy Star 2.0 efficiency requirement (%)	Efficiency (%)				
		Average	25 % load	50 % load	75 % load	100 % load
100 V/60 Hz	> 87	91.8	89.9	92.2	92.9	92.1
115 V/60 Hz	> 87	92.1	89.9	92.5	93.3	92.7
230 V/50 Hz	> 87	93.2	90.3	93.9	94.4	94.1

4.3 Power factor correction

Table 4. Power factor correction

Condition	Power factor			
	25 % load	50 % load	75 % load	100 % load
100 V/60 Hz	0.95	0.98	0.99	0.99
115 V/60 Hz	0.95	0.97	0.99	0.99
230 V/50 Hz	0.79	0.88	0.92	0.95

4.4 No-load power consumption

Table 5. Output voltage and power consumption at no-load

Condition	Energy Star 2.0 requirement (mW)	Output voltage (V)	No-load power consumption (mW)
100 V/60 Hz	≤ 500	19.6	140
115 V/60 Hz	≤ 500	19.6	140
230 V/50 Hz	≤ 500	19.6	180

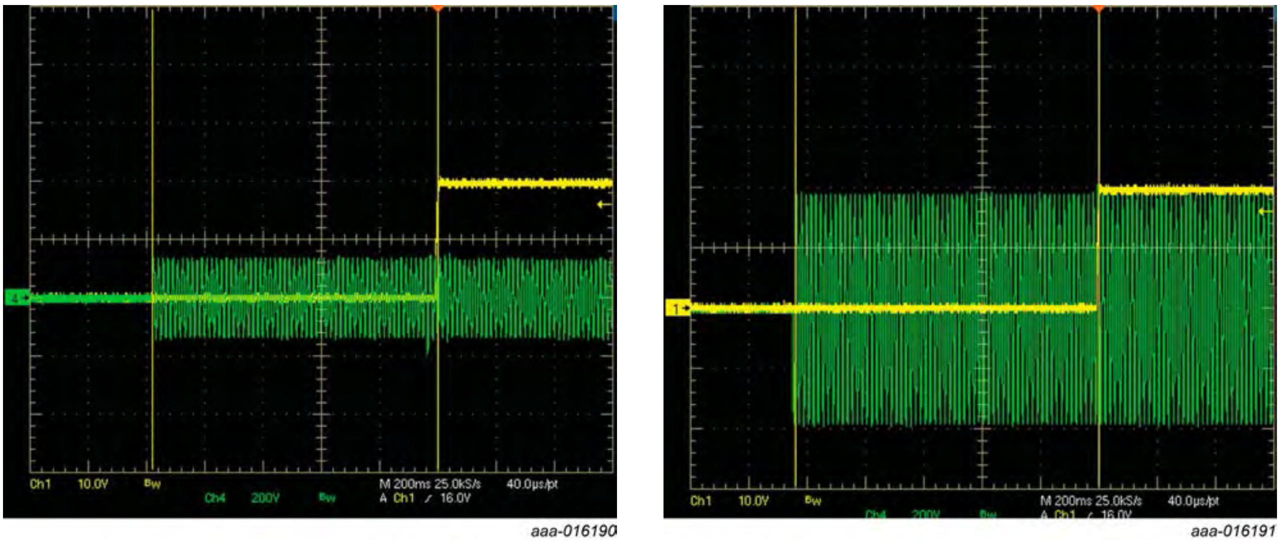
4.5 Standby load power consumption

Table 6. Standby output voltage and power consumption

Condition	Output power (mW)	Output voltage (V)	Power consumption (mW)
100 V/60 Hz	250	19.6	430
115 V/60 Hz	250	19.6	430
230 V/50 Hz	250	19.6	450

4.6 Start-up behavior

The start-up time during full load is depending on input mains AC levels. The duration is less than 1 second.



Ch. 1: V_{out}; Ch. 4: AC input

a. Input: 90 V (AC) full load condition

b. Input: 264 V (AC) full load condition

Fig 5. Start-up time

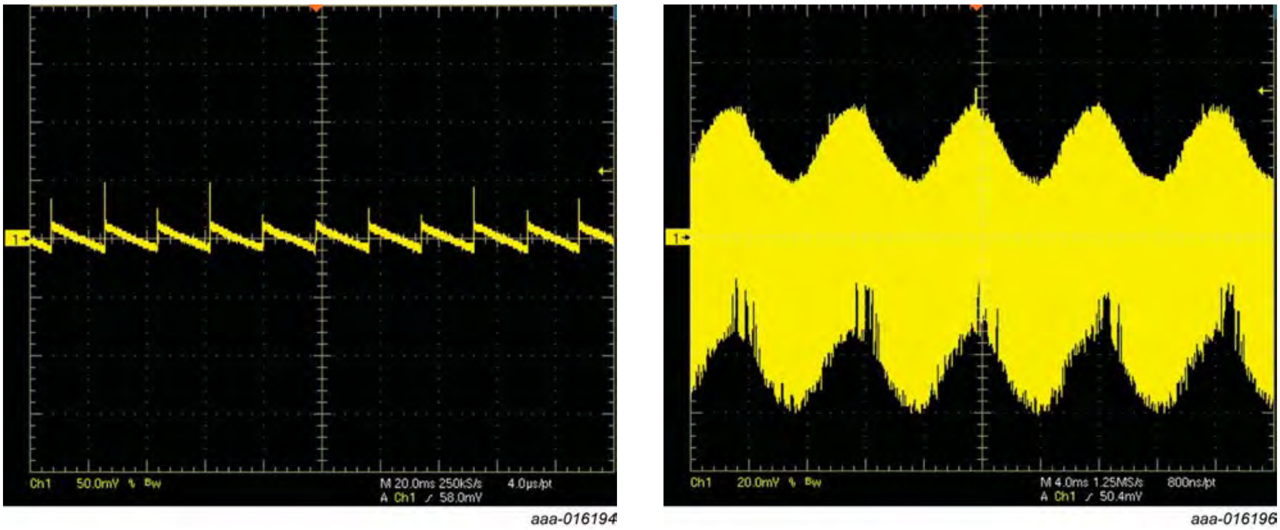
4.7 Output voltage ripple

Ripple and noise are measured at full output load, buffered with a 10 μF capacitor in parallel with a high-frequency 0.1 μF capacitor.

The varying input voltage of the resonant converter causes a frequency component in the output ripple voltage that is related to the mains voltage frequency, either 50 Hz or 60 Hz. The high-frequency component of the output ripple voltage is the result of the high-frequency switching frequency current ripple transferred from the primary side to the secondary side output capacitors and the output load.

Table 7. Output voltage ripple test results

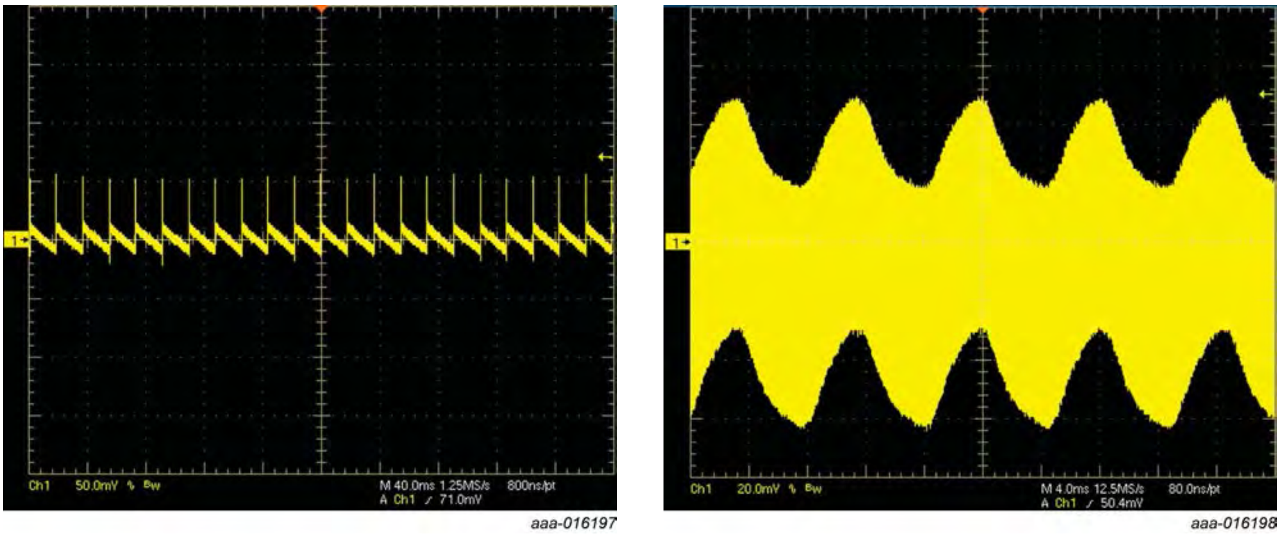
Mains voltage	Output power (W)	Switching condition	Voltage ripple (mV/p-p)
90 V/60 Hz	150	continue mode	53
90 V/60 Hz	no-load	burst mode	112
264 V/50 Hz	150	continue mode	63
264 V/50 Hz	no-load	burst mode	112



a. No-load condition

b. Full load condition

Fig 6. V_{out} voltage ripple (V_{mains} = 90 V (AC))

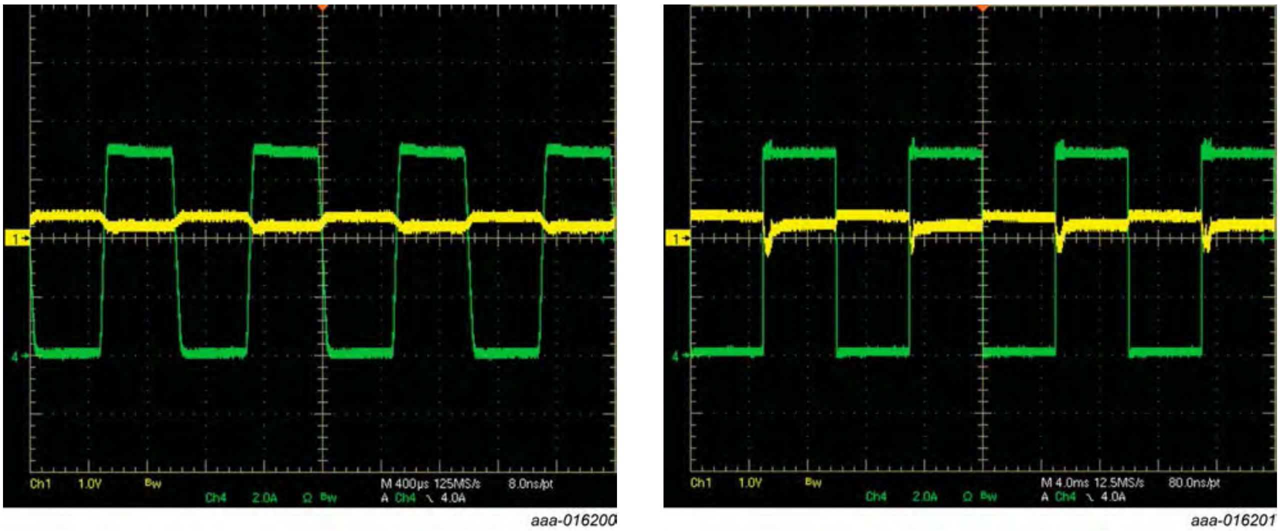


a. No-load condition

b. Full load condition

Fig 7. V_{out} voltage ripple (V_{mains} = 264 V (AC))

4.8 Dynamic response behavior



Output voltage function dynamic load test: 0.05 A; 90 % load; 0.12 μs; f = 100 Hz

Ch. 1 = V_{out}; Ch. 4 = I_{out}

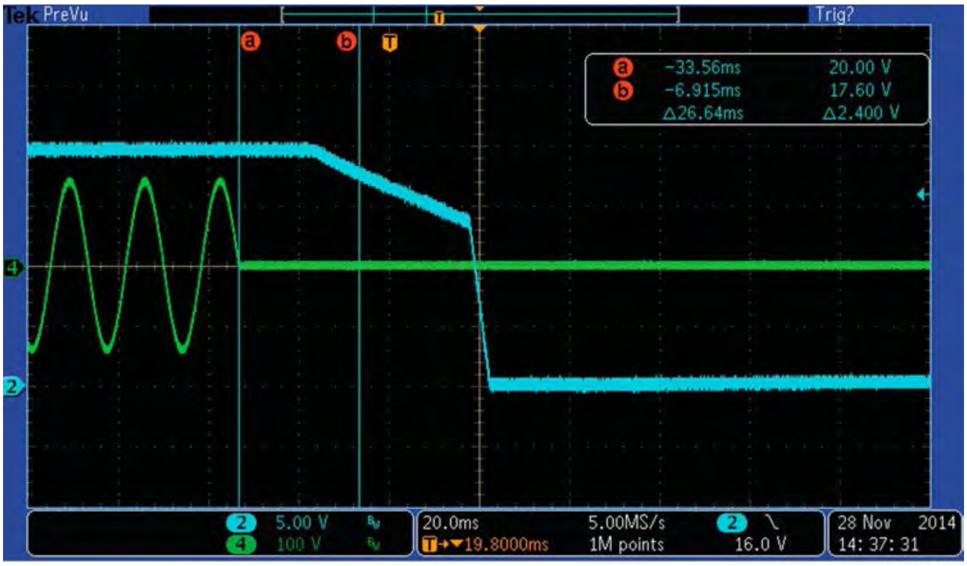
a. 90 V (AC); 1 kHz

b. 90 V (AC); 100 Hz

Fig 8. Load step behavior

4.9 Hold-up time

The output is set to full load and the mains supply voltage of 100 V is disconnected. The time that passes before the output voltage drops to below 90 % of its initial value is then measured. The hold-up time is 26 ms.

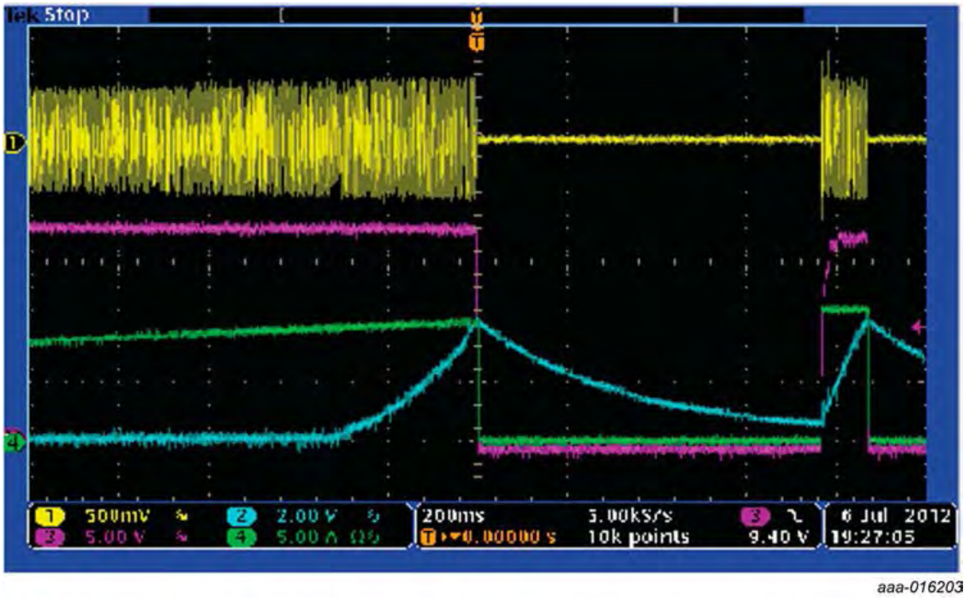


Ch. 2 = V_{out}; Ch. 4 = Input AC voltage

Fig 9. Hold-up time

4.10 OverPower Protection (OPP)

The OPP is activated when the current exceeds 9.5 A (195 W). It corresponds with a load condition that is 23 % higher than the rated power for continuous use. The SNSCURHBC function of the TEA1716 detects OPP. This function monitors the primary resonant current. When the voltage on the SNSCURHBC pin exceeds ±0.5 V, the RCPROT protection timer is started. The RCPROT function performs its restart timer function. It restarts when the voltage has dropped to 0.5 V. When the OPP is removed, the converter starts up and operates normally.

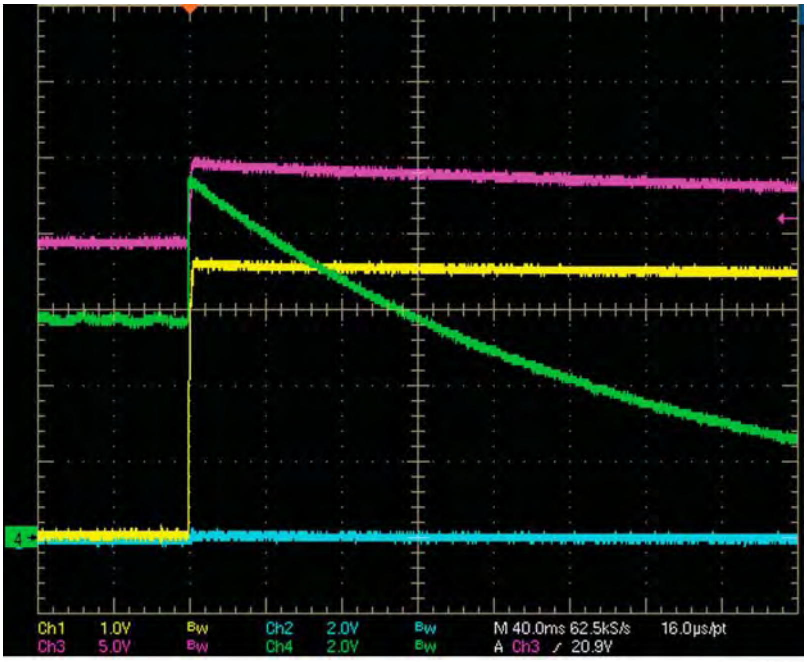


Ch. 1 = SNSCURHBC; Ch. 2 = RCPROT; Ch. 3 = V_{out}; Ch. 4 = I_{out}

Fig 10. Overpower protection

4.11 OverVoltage Protection (OVP)

The worst-case overvoltage happens during no-load. When the output voltage becomes too high (overvoltage event), the SNSOUT pin is triggered to exceed 3.5 V and latch IC operation. Even when the overvoltage event is removed, no restart occurs because the protection is a latched protection. However, if a latch reset is implemented, a restart does occur.



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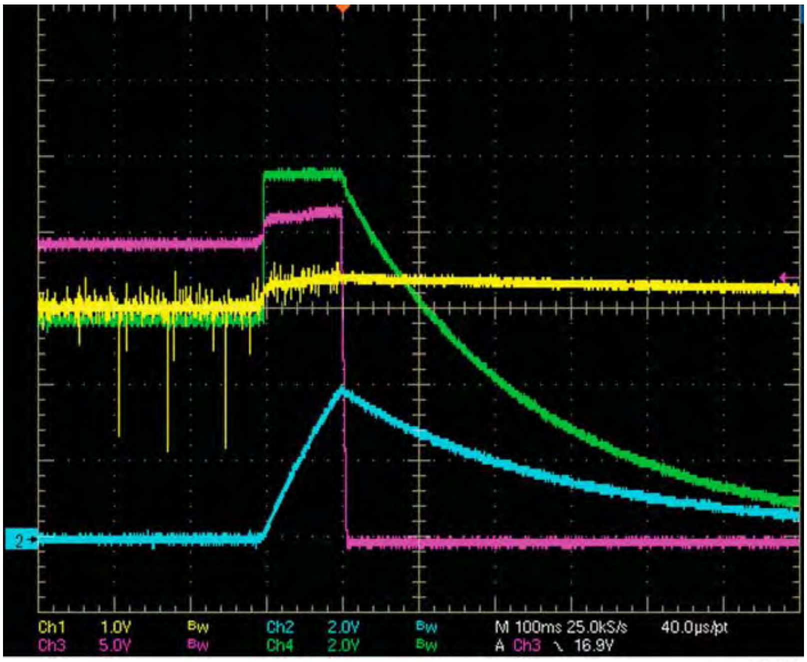
Ch. 1 = SNSOUT; Ch. 2 = RCPROT; Ch. 3 = V_{out}; Ch. 4 = SNSFB

Fig 11. Overvoltage protection

4.12 Open-Loop Protection (OLP)

The SNSFB function detects an open output voltage feedback loop. It is triggered over 8.2 V until the protection timer RCPROT reaches its protection level (4 V). The RCPROT function performs a restart timer function. It restarts when the voltage has dropped to 0.5 V. When the feedback open-loop is removed, the converter starts up and operates normally.



Ch. 1 = SNSOUT; Ch. 2 = RCPROT; Ch. 3 = V_{out}; Ch. 4 = SNSFB

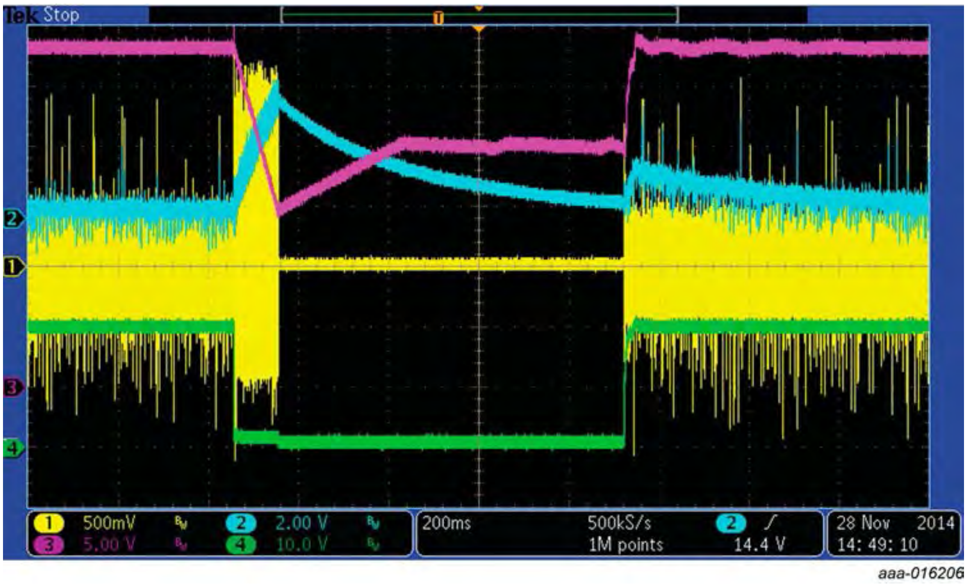
Fig 12. Open-loop protection

4.13 Short Circuit Protection (SCP)

A short circuit on the output of the resonant converter causes the primary current to increase. The SNSCURHBC function detects this increase. It leads to running on maximum frequency until the protection timer RCPROT reaches its protection level (4 V).

The RCPROT function performs its restart timer function. It restarts when the voltage has dropped to 0.5 V. When the short circuit is removed, the converter starts up and operates normally.

SCP is the main protection mechanism. Under certain conditions, other protections can be activated during the output short circuit test.



Ch. 1 = SNSBURST; Ch. 2 = GATELS; Ch. 3 = GATEPFC; Ch. 4 = V_{out}

Fig 13. Short circuit protection

4.14 Burst mode behavior

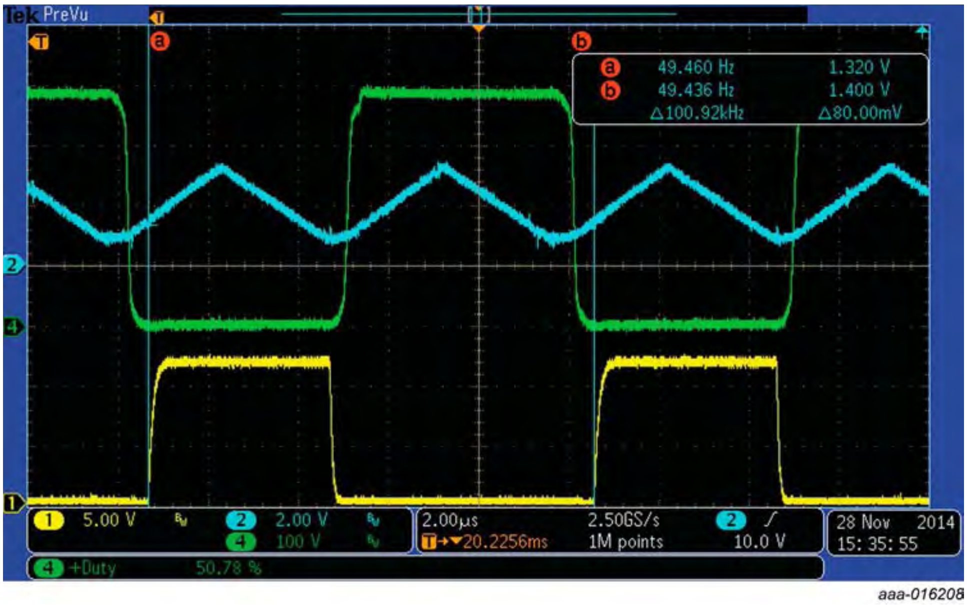
The SNSBURST level, which is the voltage divider from SNSFB controls the PFC and HBC burst mode hysteresis.

Ch. 1 = SNSBURST; Ch. 2 = GATELS; Ch. 3 = GATEPFC; Ch. 4 = V_{out}

Fig 14. Burst mode behavior during no-load

4.15 Half-bridge measurement waveforms

The half-bridge node duty-cycle is 50 %. The CFMIN oscillator frequency is twice the half-bridge switching frequency.

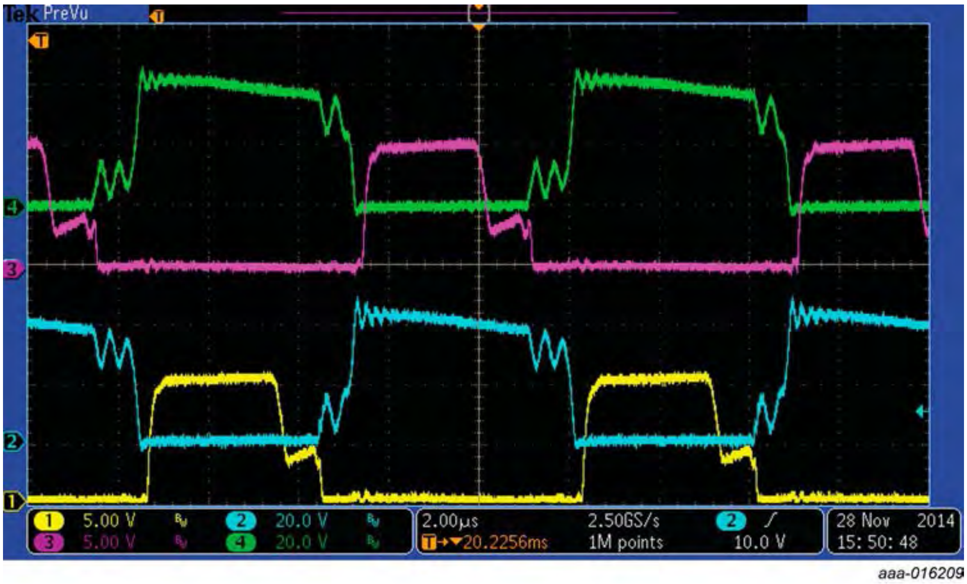


Ch. 1 = GATELS; Ch. 2 = CFMIN; Ch. 4 = HB

Fig 15. Half-bridge measurements during nominal output

4.16 Synchronous rectification

The TEA1795T IC is used for synchronous rectification. It replaces the rectifier diodes at the secondary side of the resonant converter.



Ch. 1 = Vgs-1; Ch. 2 = Vds-1; Ch. 3 = Vgs-2; Ch. 4: Vds-2

Fig 16. TEA1795T synchronous rectification waveforms during nominal output

5. Schematic

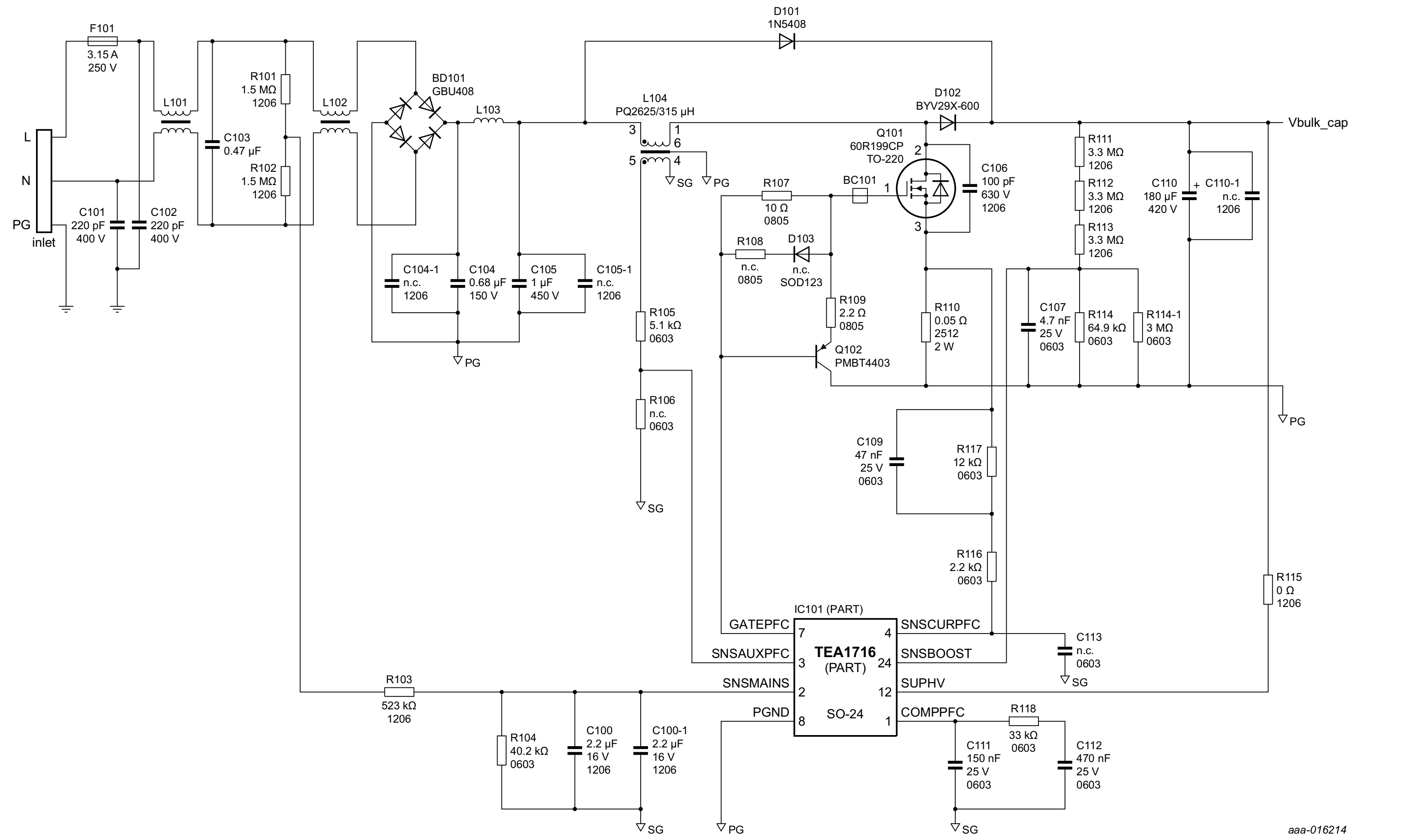


Fig 17. TEA1716DB1258 schematic - part 1

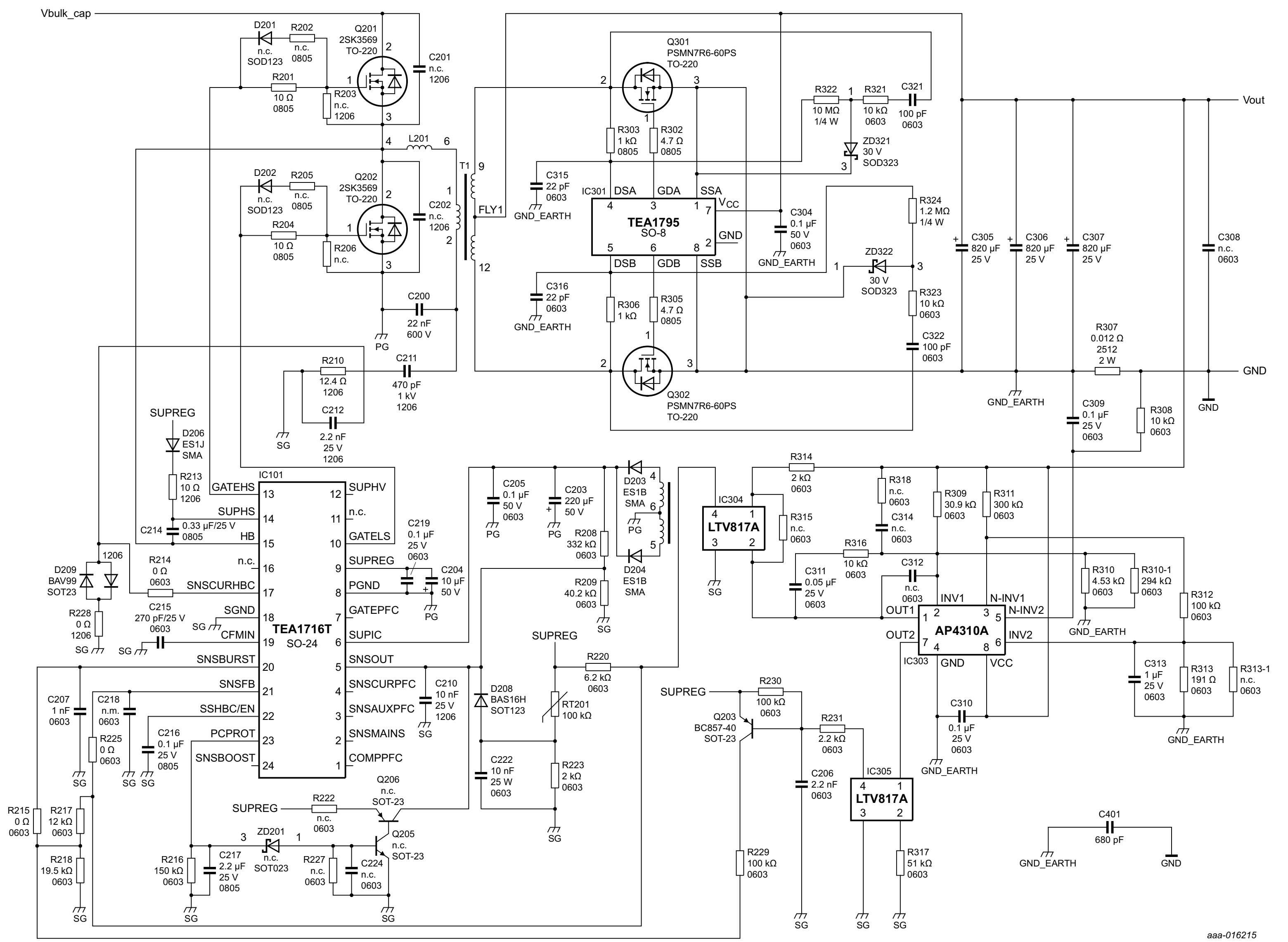


Fig 18. TEA1716DB1258 schematic - part 2 (HBC stage)

6. Bill Of Materials (BOM)

Table 8. TEA1716DB1258 bill of materials

Reference	Description and values	Part number	Manufacturer
BC101	bead core; axial lead; Wide Band RH-type (WBRH); 3.5 mm × 4.7 mm × 0.8 mm; 3L	-	-
BD101	diode; bridge diode; 4 A; 800 V	GBU408	Lite-On
C101; C102	capacitor; ceramic; Y1-capacitor; 220 pF; 250 V (AC)	-	Murata
C103	capacitor; X-capacitor; 0.47 μF; 275 V (AC); MKP/HJC	-	-
C104	capacitor; 680 nF; 450 V (DC); radial lead; MPPN/HJC	-	-
C105	capacitor; 1 μF; 450 V (DC); radial lead; MPPN/HJC	-	-
C106	capacitor; 100 pF; 630 V (DC); 1206; SMD; NPO; MLCC	-	-
C107	capacitor; 4.7 nF; 25 V (DC); 0603; SMD; X7R; MLCC	-	-
C108; C108-1	capacitor; 2.2 μF; 16 V (DC); 1206; SMD; X7R; MLCC	-	-
C109	capacitor; 47 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C110	capacitor; electrolytic; 180 μF; 420 V (DC); 30 mm × 25 mm (width × height); KMQ; NCC	-	-
C111	capacitor; 150 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C112	capacitor; 470 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C200	capacitor; 22 nF; 600 V; radial lead; MP3/HJC	-	-
C203	capacitor; 220 μF; 50 V; 105 °C; 10 mm × 16 mm; E/C; radial lead; KY/NCC	-	-
C204	capacitor; 10 μF; 50 V; 105 °C; 5 mm × 11 mm; E/C; radial lead; KY/NCC	-	-
C205; C304	capacitor; 100 nF; 50 V; 0603; SMD; X7R; MLCC	-	-
C206; C212	capacitor; 2.2 nF; 25 V; 1206; SMD; X7R; MLCC	-	-
C207; C313	capacitor; 1 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C210	capacitor; 10 nF; 25 V; 1206; SMD; X7R; MLCC	-	-
C211	capacitor; 470 pF; 1 kV; 1206; SMD; NPO; MLCC	-	-

Table 8. TEA1716DB1258 bill of materials *...continued*

Reference	Description and values	Part number	Manufacturer
C214	capacitor; 330 nF; 25 V; 0805; SMD; X7R; MLCC	-	-
C215	capacitor; 270 pF; 25 V; 0603; SMD; X7R; MLCC	-	-
C216	capacitor; 100 nF; 25 V; 0805; SMD; X7R; MLCC	-	-
C217	capacitor; 2.2 µF; 25 V; 0805; SMD; X7R; MLCC	-	-
C219; C309; C310	capacitor; 100 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C222	capacitor; 10 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C305; C306; C307	capacitor; electrolytic; 820 µF; 25 V; KZH: 10 mm × 20 mm (width × height); NCC	-	-
C311	capacitor; 47 nF; 25 V; 0603; SMD; X7R; MLCC	-	-
C315; C316	capacitor; 22 pF; 50 V; 0603; SMD; X7R; MLCC	-	-
C321; C322	capacitor; 100 pF; 50 V; 0603; SMD; X7R; MLCC	-	-
C401	capacitor; ceramic; Y1-capacitor; 680 pF; 250 V (AC)	-	Murata
D101	diode; general purpose; 3 A; 1 kV; 1N5408	-	-
D102	diode; ultrafast power diode	BYV29X-600	NXP Semiconductors
D203; D204	diode; ultrafast rectifier; 100 V; 1 A; SMA	ES1B	-
D206	diode; ultrafast rectifier; 600 V; 1 A; SMA	ES1J	-
D208	diode; high-speed switching diode; 100 V; SOD123F	BAS16H	-
D209	diode; high-speed double diode; 75 V; SOT23	BAV99	-
ZD321; ZD322	Zener diode; 30 V; SOD323	ZBX84J-B30V	-
F101	fuse; 3.15 A; 250 V; MST(conquer)	-	-
IC101	IC; TEA1716T resonant power supply control IC with PFC	SO24	NXP Semiconductors
IC301	IC; TEA1795T GreenChip synchronous rectifier controller	SO8	NXP Semiconductors
IC303	IC; AP4310A dual OP amplifier and voltage reference; BCD	SO8	-
IC304; IC305	high-density mounting type photocoupler; DIP 4	LTV817A	Lite-On
inlet	AC Inlet 3P	-	-
L101	choke; EMI; 7.35 mH;	SA382/HJC	-
L102	choke; EMI; 11.07 mH	SA383/HJC	-
L103	choke; filter; 170 µH	SA384/HJC	-
L104	choke; PFC; 315 µH; PQ2625	SA136/HJC	-

Table 8. TEA1716DB1258 bill of materials *...continued*

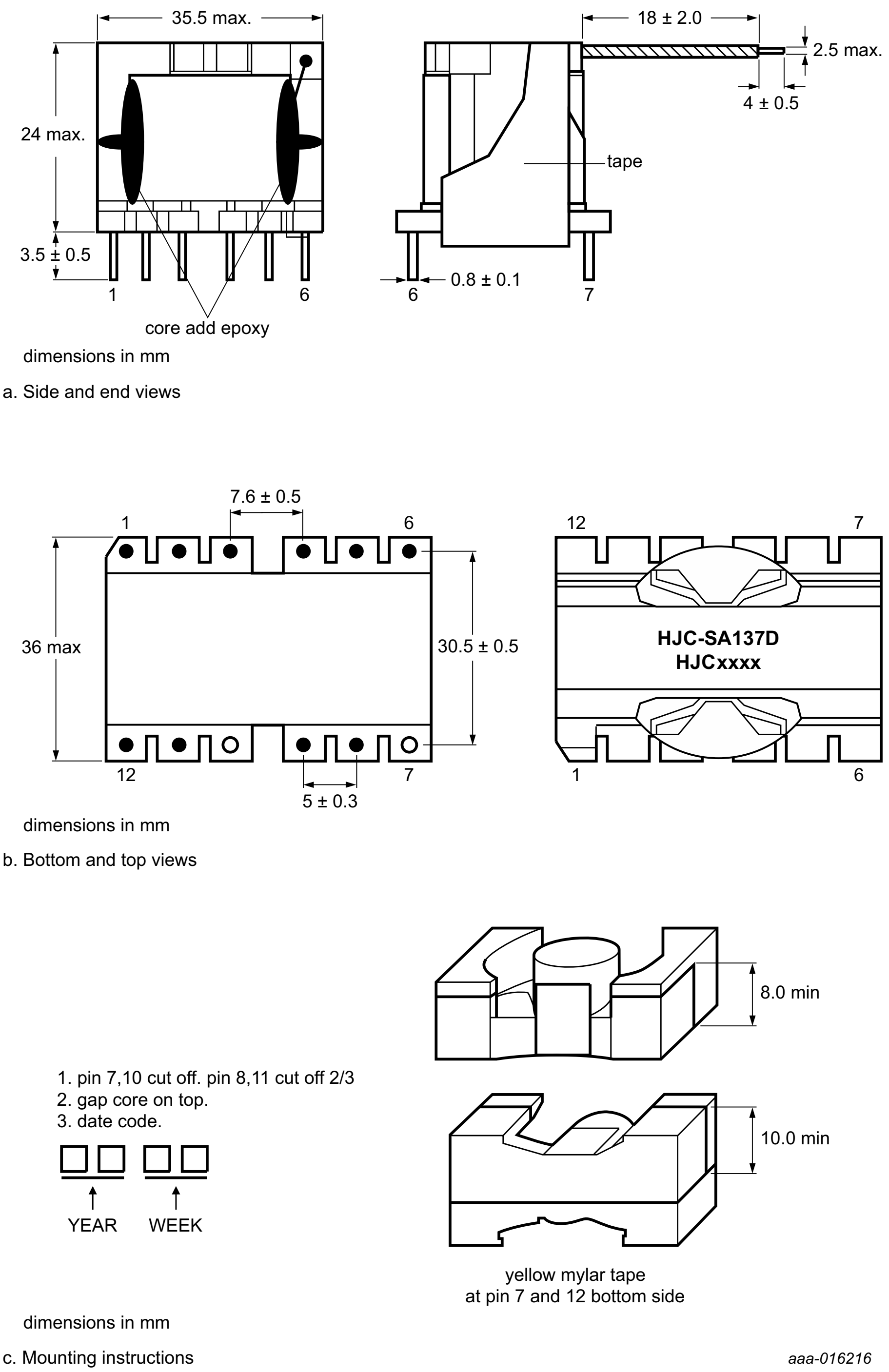
Reference	Description and values	Part number	Manufacturer
L201	choke; 44 μH; ATQ2116.8	SA135/HJC	-
T1	transformer; 800 μH; PQ3221	SA137/HJC	-
Q101	MOSFET; 600 V; 16 A; TO220	IPA60R199CP	Infineon
Q102; Q203	transistor; switching; PNP; SOT23	PMBT4403	NXP Semiconductors
Q201; Q202	MOSFET; 600 V; 10 A; TO220	2SK3569	Toshiba
Q301; Q302	MOSFET; 60 V; 92 A; TO220AB	PSMN7R6-60PS	NXP Semiconductors
R101; R102	resistor; thin film chip; 1.5 MΩ; 5 %; 1206; SMD	-	-
R103	resistor; thin film chip; 523 kΩ; 1 %; 1206; SMD	-	-
R104	resistor; thin film chip; 40.2 kΩ; 1 %; 0603; SMD	-	-
R105	resistor; thin film chip; 5.1 kΩ; 1 %; 0603; SMD	-	-
R107; R201; R204	resistor; thin film chip; 10 Ω; 5 %; 0805; SMD	-	-
R109	resistor; thin film chip; 2.2 Ω; 5 %; 0805; SMD	-	-
R110	resistor; thin film chip; 0.05 W; 1 %; 2 W; 2512; SMD	-	Taiwan Semiconductor
R111; R112; R113	resistor; thin film chip; 3.3 MΩ; 1 %; 1206; SMD	-	-
R114	resistor; thin film chip; 64.9 kΩ; 1 %; 0603; SMD	-	-
R114-1	resistor; thin film chip; 3 MΩ; 1 %; 0603; SMD	-	-
R115; RJ1; RJ2; RJ3; RJ4; RJ5; RJ6; RJ7; RJ8; RJ9; RJ10; RJ11; RJ12; RJ13; RJ14; RJ15; R228	resistor; thin film chip; 0 Ω; 5 %; 1206; SMD	-	-
R116; R231	resistor; thin film chip; 18.2 kΩ; 1 %; 0603; SMD	-	-
R117; R217	resistor; thin film chip; 12 kΩ; 1 %; 0603; SMD	-	-
R118	resistor; thin film chip; 33 kΩ; 5 %; 0603; SMD	-	-
R208	resistor; thin film chip; 332 kΩ; 1 %; 0603; SMD	-	-
R209	resistor; thin film chip; 40.2 kΩ; 1 %; 0603; SMD	-	-
R210	resistor; thin film chip; 12.4 Ω; 1 %; 1206; SMD	-	-
R213	resistor; thin film chip; 10 Ω; 1 %; 1206; SMD	-	-

Table 8. TEA1716DB1258 bill of materials *…continued*

Reference	Description and values	Part number	Manufacturer
R214; R215; R225	resistor; thin film chip; 0 Ω; 5 %; 0603; SMD	-	-
R216	resistor; thin film chip; 150 kΩ; 1 %; 0603; SMD	-	-
R218	resistor; thin film chip; 18.2 kΩ; 1 %; 0603; SMD	-	-
R220	resistor; thin film chip; 6.2 kΩ; 1 %; 0603; SMD	-	-
R223	resistor; thin film chip; 2 kΩ; 1 %; 0603; SMD	-	-
R302; R305	resistor; thin film chip; 4.7 Ω; 5 %; 0805; SMD	-	-
R303; R306	resistor; thin film chip; 1 kΩ; 1 %; 0805; SMD	-	-
R307	resistor; thin film chip; 12 mΩ; 1 %; 2 W; 2512; SMD	-	Taiwan Semiconductor
R308; R316; R321; R323	resistor; thin film chip; 10 kΩ; 1 %; 0603; SMD	-	-
R309	resistor; thin film chip; 30.9 kΩ; 1 %; 0603; SMD	-	-
R310	resistor; thin film chip; 4.53 kΩ; 1 %; 0603; SMD	-	-
R310-1	resistor; thin film chip; 294 kΩ; 1 %; 0603; SMD	-	-
R311	resistor; thin film chip; 300 kΩ; 1 %; 0603; SMD	-	-
R313	resistor; thin film chip; 191 Ω; 1 %; 0603; SMD	-	-
R314	resistor; thin film chip; 2 kΩ; 1 %; 0603; SMD	-	-
R317	resistor; thin film chip; 51 kΩ; 1 %; 0603; SMD	-	-
R322; R324	resistor; 1.2 MΩ; 5 %; 1/4 W; DIP	-	-
RT201	thermistor; NTC; 100 kΩ; 1 %	TTC3A104F4192EY	Thinking
HS1	heat sink; for Q101, D102, Q201, Q202	-	-
HS2	heat sink; for BD101	-	-
HS3	heat sink; for Q301, Q302	-	-

7. Resonant transformer data

7.1 Transformer diagram



a. Side and end views

b. Bottom and top views

c. Mounting instructions

Fig 19. Resonant transformer data: HJC-SA137D

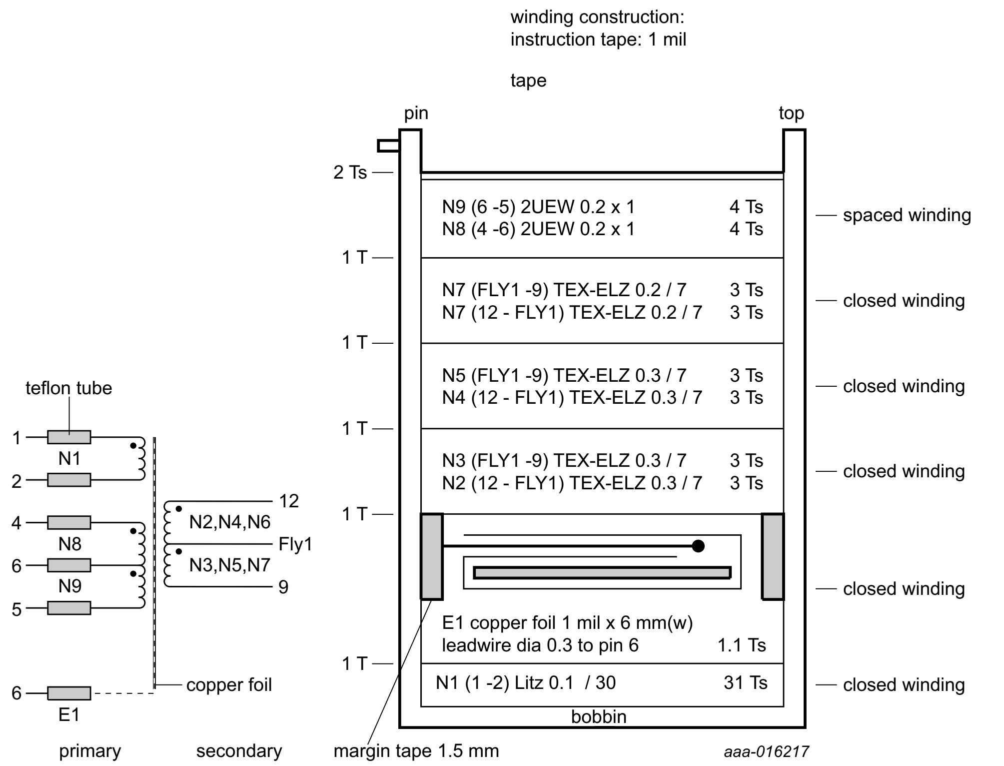


Fig 20. Transformer schematic diagram and winding overview

7.2 Transformer electrical specification

Table 9. Transformer electrical specifications

Parameter	Start	Finish	Specification
inductance[1]	1	2	800 μH; ±3 %
leakage inductance[1]	1	1	secondary winding short; maximum 15 μH
DC resistance[2]	1	2	maximum 165 mΩ
	4	5	maximum 490 mΩ
	12	fly1	maximum 6.10 mΩ
voltage ratio[3]; input 1, 2	4	5	2.58 V (RMS); ±0.08 V (RMS)
	12	fly1	0.975 V (RMS); ±0.08 V (RMS)
	fly1	9	0.975 V (RMS); ±0.08 V (RMS)

[1] Measured with HP: 4284A LCR meter (or equivalent); f = 100 kHz; V = 1 V (RMS) at 25 °C.

[2] Measured with CHEN HWA 502 AC meter (or equivalent) at 25 °C.

[3] Measured with CHEN HWA310 meter (or equivalent); f = 20 kHz; V = 10 V (RMS).

8. PFC coil data

8.1 Transformer schematic diagram and winding specification

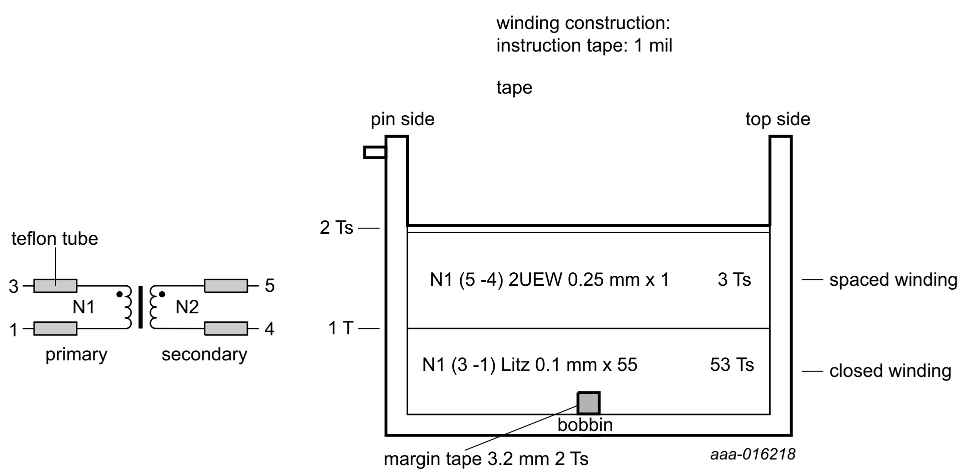


Fig 21. Transformer schematic diagram and winding overview

8.2 Transformer electrical specification

Table 10. Transformer electrical specifications

Parameter	Start	Finish	Specification
inductance[1]	3	1	315 μH; ±3 %
leakage inductance[1]	3	1	not applicable

[1] Measured with HP: 4284A LCR meter (or equivalent); f = 100 kHz; V = 1 V (RMS) at 25 °C.

8.3 Core, bobbin and marking

Core and bobbin:

- Core: PQ2625 (JPP-44A)
- Bobbin: PM9820
- Ae: 120 mm^2

Marking:

- HJC-SA136A

9. Choke coil data

9.1 Choke coil schematic diagram and winding specification

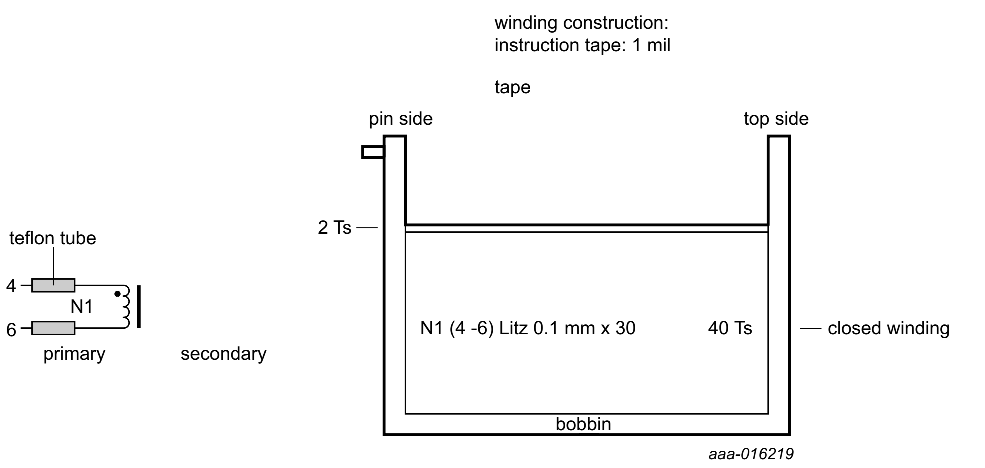


Fig 22. Transformer schematic diagram and winding overview

9.2 Transformer electrical specification

Table 11. Transformer electrical specifications

Parameter	Start	Finish	Specification
inductance[1]	4	6	44 μH; ±3 %
leakage inductance[1]	3	1	not applicable
DC resistance[2]	4	6	maximum 145 mΩ

[1] Measured with HP: 4284A LCR meter (or equivalent); f = 100 kHz; V = 1 V (RMS) at 25 °C.

[2] Measured with CHEN HWA 502 AC meter (or equivalent) at 25 °C.

9.3 Core, bobbin and marking

Core and bobbin:

- Core: ATQ21/16.8 (JPP-44A)
- Bobbin: PM9820

Marking:

- HJC-SA135

10. Abbreviations

Table 12. Abbreviations

Acronym	Description
BCD	Bipolar CMOS DMOS
OLP	Open-Loop Protection
OPP	OverPower Protection
OVP	OverVoltage Protection
PFC	Power Factor Correction
SCP	Short Circuit Protection
SOI	Silicon-On-Insulator

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