

9 Circuit diagrams with comments

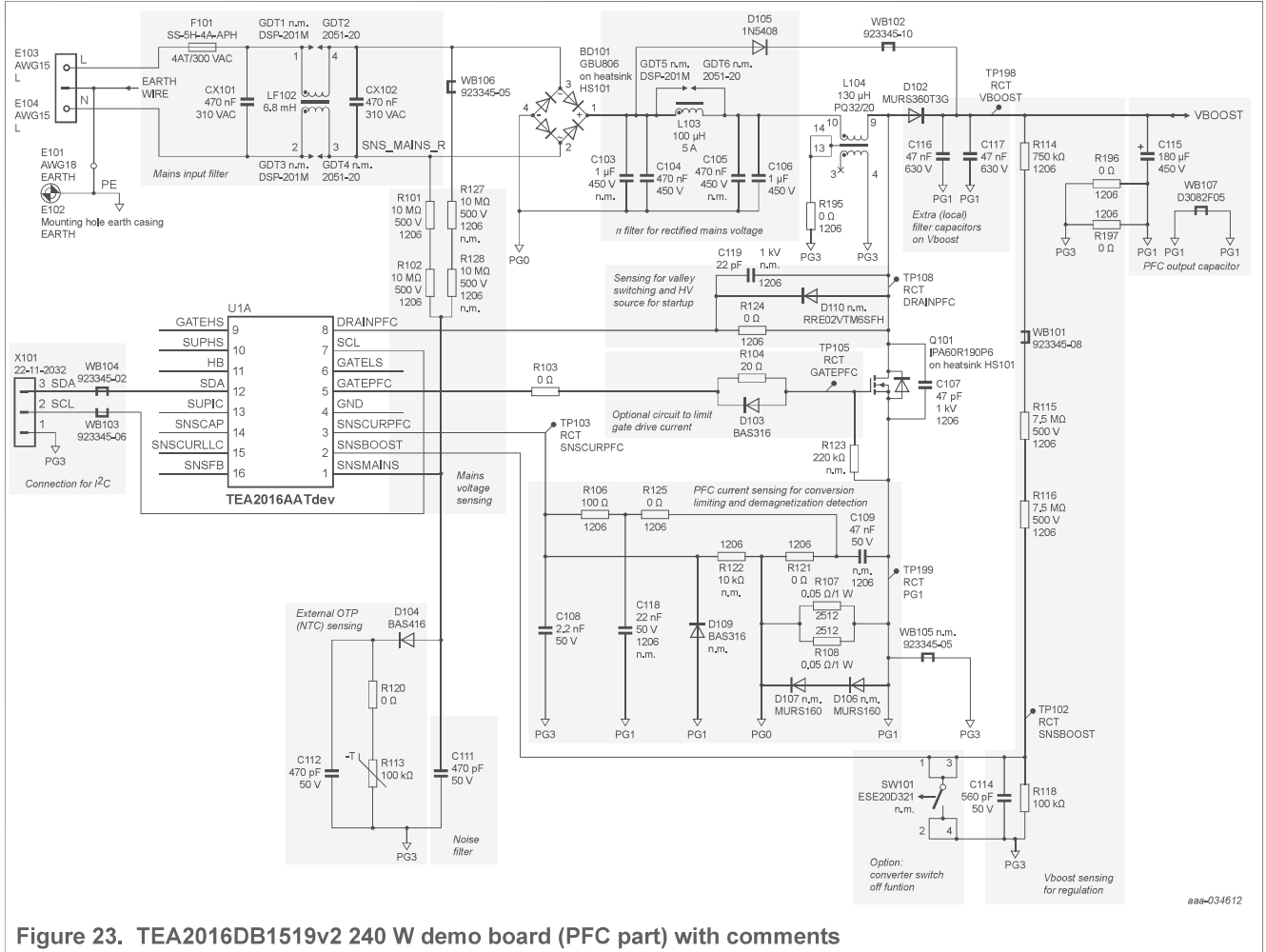


Figure 23. TEA2016DB1519v2 240 W demo board (PFC part) with comments

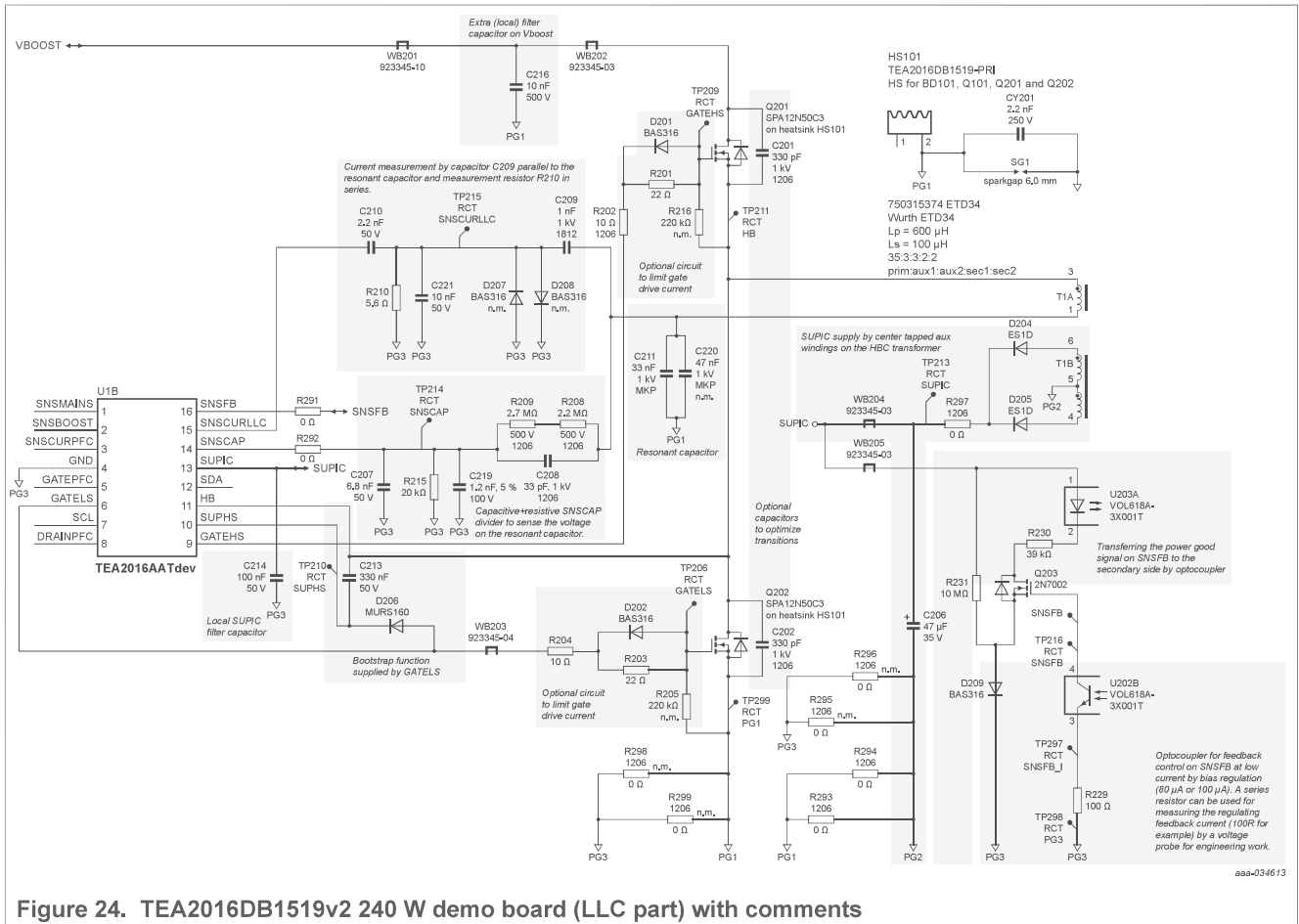
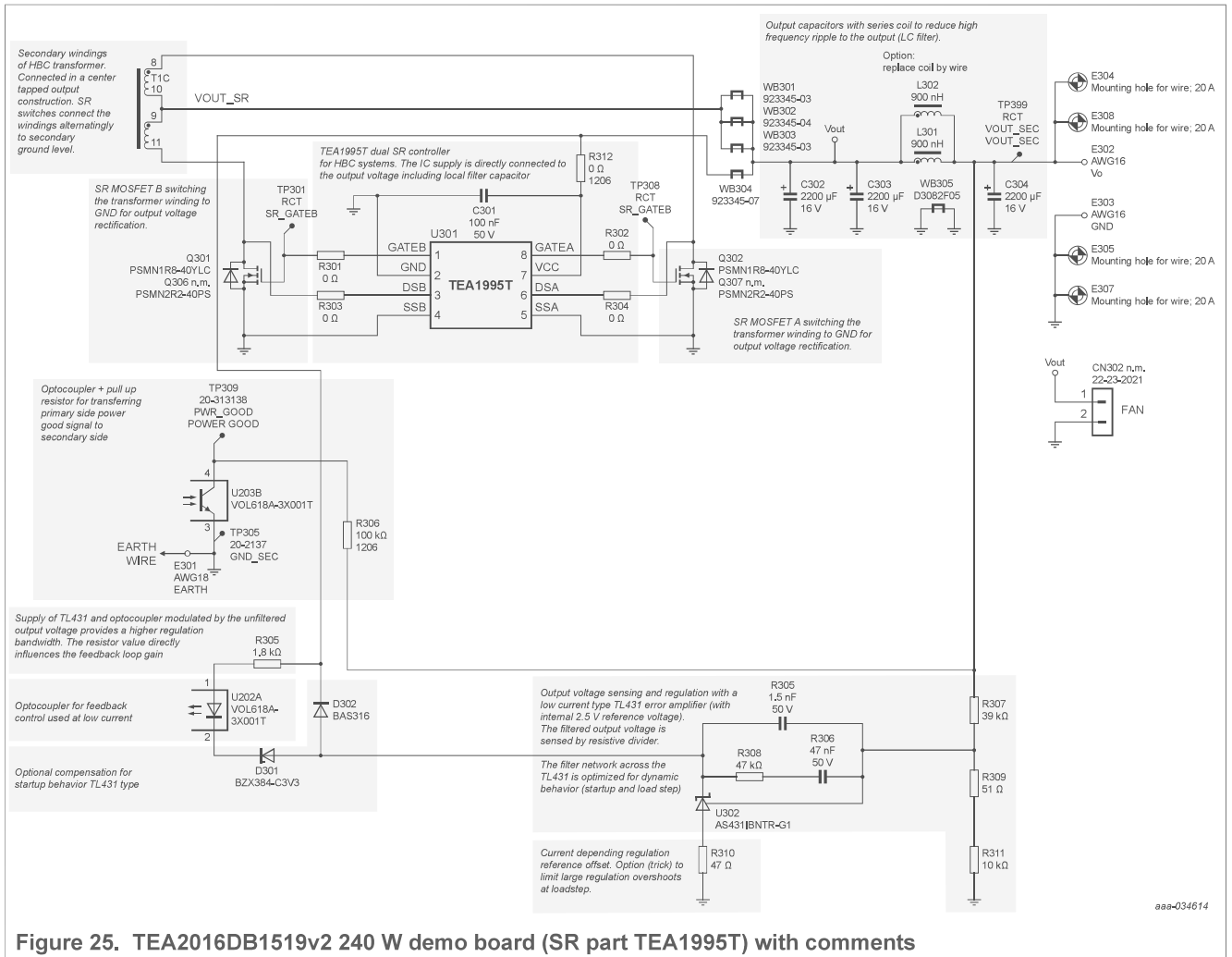


Figure 24. TEA2016DB1519v2 240 W demo board (LLC part) with comments



899-034614

Figure 25. TEA2016DB1519v2 240 W demo board (SR part TEA1995T) with comments

10 Bill of materials (BOM)

Table 6. TEA2016DB1519v2 bill of materials

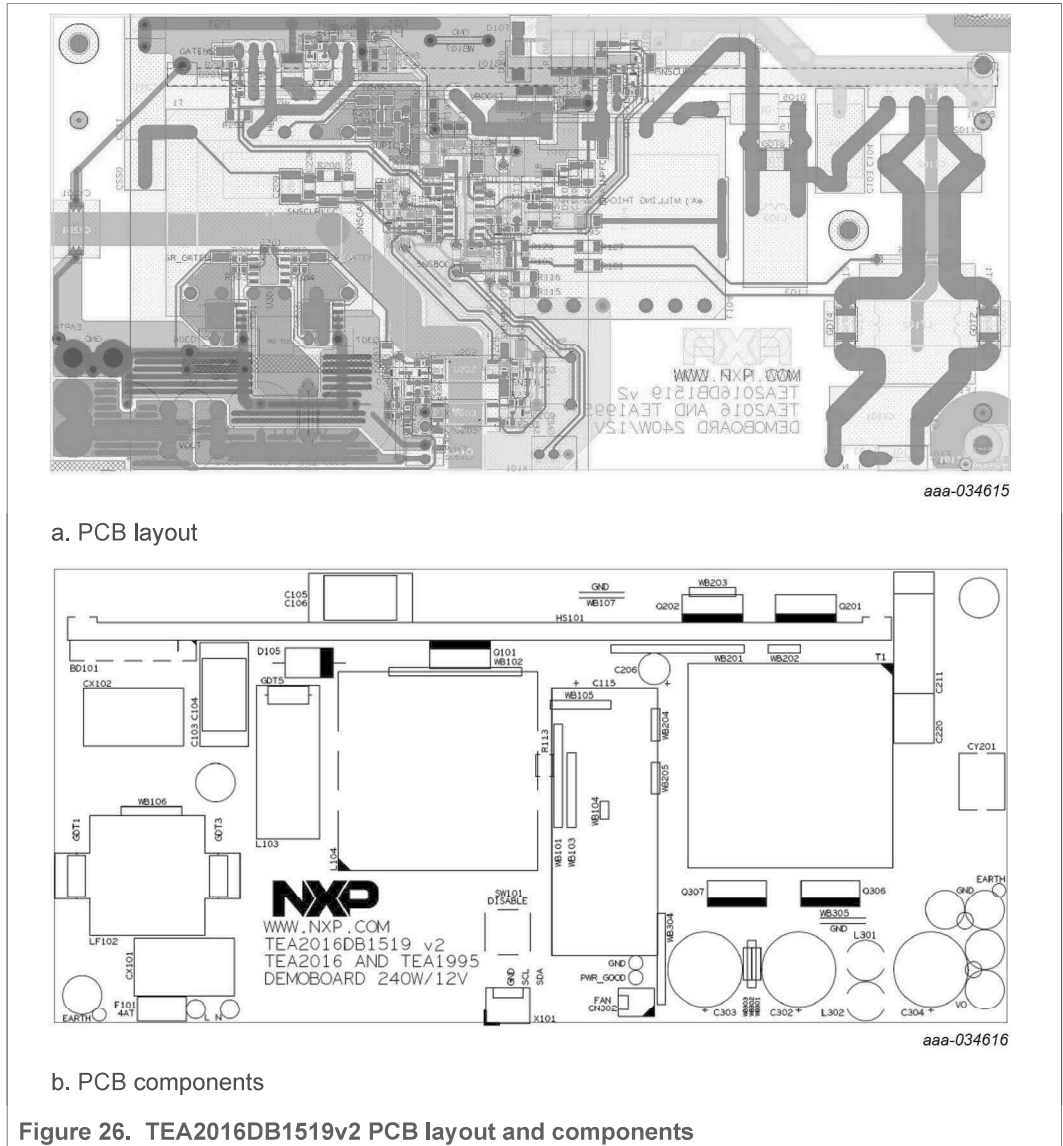
Reference	Description and values	Part number	Manufacturer
BD101	bridge rectifier; 600 V; 8 A	GBU806	Diode Inc.
C103	capacitor; not mounted; 1 μ F; 10 %; 450 V; PET; THT	ECQE2W105KH	Panasonic
C104	capacitor; 470 nF; 10 %; 450 V; PET; THT	ECQE2W474KH	Panasonic
C105	capacitor; not mounted; 470 nF; 10 %; 450 V; PET; THT	ECQE2W474KH	Panasonic
C106	capacitor; 1 μ F; 10 %; 450 V; PET; THT	ECQE2W105KH	Panasonic
C107	capacitor; 47 pF; 5 %; 1 kV; C0G; 1206	GRM31A5C3A470JW01D	Murata
C108	capacitor; 2.2 nF; 5-%; 50 V; C0G; 0603	-	-
C109	capacitor; no mounted; 47 nF; 10 %; 50 V; X7R; 1206	-	-
C111	capacitor; 470 pF; 5 %; 50 V; C0G; 0603	-	-
C112	capacitor; 470 pF; 5 %; 50 V; C0G; 0603	C1608C0G1H471J080AA	TDK
C114	capacitor; 560 pF; 5 %; 50 V; C0G; 0603	C1608C0G1H561J080AA	TDK
C115	capacitor; 180 μ F; 20 %; 450 V; ALU; THT	450QXW180MEFC18X45	Rubycon
C116; C117	capacitor; 47 nF; 10 %; 630 V; X7R; 1210	MC1210B473K631CT	Multicomp
C118	capacitor; not mounted; 10 pF; 10 %; 50 V; X7R; 1206	-	-
C119	capacitor; not mounted; 22 pF; 5 %; 1 kV; C0G; 1206	C0603C122J1GACTU	KEMET
C201; C202	capacitor; 330 pF; 5 %; 1 kV; C0G; 1206	102R18N331JV4E	Johanson Dielectrics
C206	capacitor; 47 μ F; 20 %; 35 V; ALU; THT	35ZLJ47MTA5X11	Rubycon
C207	capacitor; 6.8 nF; 10 %; 50 V; X7R; 0603	-	-
C208	capacitor; 33 pF; 5 %; 1 kV; C0G; 1206	GRM31A5C3A330JW01D	Murata
C209	capacitor; 1 nF; 5 %; 1 kV; C0G; 1812	CC1812JKNPOCBN102	Yageo
C210	capacitor; 2.2 nF; 10 %; 50 V; X7R; 0603	-	-
C211	capacitor; 33 nF; 20 %; 1 kV; MKP	BFC233810333	Vishay
C213	capacitor; 330 nF; 10 %; 50 V; X7R; 0805	-	-
C214; C301	capacitor; 100 nF; 10 %; 50 V; X7R; 0603	-	-
C216	capacitor; 10 nF; 10 %; 500 V; X7R; 1812	C1812C103KCRACTU	KEMET
C219	capacitor; 1.2 nF; 5 %; 100 V; C0G; 0603	C0603C122J1GACTU	KEMET
C220	capacitor; not mounted; 47 nF; 5 %; 1 kV; MKP	BFC237520473	Vishay
C221	capacitor; 10 nF; 10 %; 50 V; X7R; 0805	-	-
C302; C303; C304	capacitor; 2200 μ F; 20 %; 16 V; ALU; THT	16ZLH2200MEFC12.5X20	Rubycon
C305	capacitor; 1.5 nF; 10 %; 50 V; X7R; 0603	-	-
C306	capacitor; 47 nF; 10 %; 50 V; X7R; 0603	-	-

Reference	Description and values	Part number	Manufacturer
CN302	header; straight; not mounted; 1x2-way; 2.54 mm	22-23-2021	Molex
CX101; CX102	capacitor; 470 nF; 20 %; 310 V (AC); MKP; THT	BFC233922474	Vishay
CY201	capacitor; 2.2 nF; 20 %; 250 V; CER; THT	DE1E3KX222MA5B	Murata
D102	diode; 600 V; 3 A	MURS360T3G	On Semi
D103; D201; D202; D209; D302	diode; 100 V; 250 mA	BAS316	NXP Semiconductors
D104	diode; 85 V; 200 mA	BAS416	NXP Semiconductors
D105	diode; 1 kV; 3 A	1N5408	Vishay
D106; D107	diode; not mounted; 600 V; 1 A	MURS160	Vishay
D109	diode; not mounted; 100 V; 250 mA	BAS316	NXP Semiconductors
D204; D205	diode; 140 V; 1 A	ES1D-E3	Vishay
D206	diode; 600 V; 1 A	MURS160	Vishay
D207; D208	diode; not mounted; 100 V; 250 mA	BAS316	NXP Semiconductors
D301	diode; Zener diode; 3.3 V; 250 mA	BZX384-C3V3	NXP Semiconductors
F101	fuse; slow blow; 300 V (AC); 4 A	SS-5H-4A-APH	Cooper Bussmann
GDT1; GDT3; GDT5	gas discharge tube; not mounted; 200 V; THT	DSP-201M	Mitsubishi
GDT2	gas discharge tube; 200 V; SMT	2051-20-SM-RPLF	Bourns
GDT4; GDT6	gas discharge tube; not mounted; 200 V; SMT	2051-20-SM-RPLF	Bourns
HS101	heat sink; primary	TEA2016DB1519-PRI	NXP Semiconductors
L103	inductor; 100 μ H; 5 A	7447070	Würth Elektronik
L104	coil former; PQ32/20	CPV-PQ32/20-1s-12p	Ferroxcube
L301; L302	inductor; 900 nH	-	-
LF102	inductor; common mode; 6.8 mH; 3.2 A	B82734R2322B30	EPCOS
MCL1; MCL2; MCL3; MCL4; MCL5	fixing kit; nut and bolt	MK3311	Multicomp
MCL6; MCL7; MCL8; MCL9	screw; CSK; POZI; M3X12	CP3M12	Duratool
Q101	MOSFET-N; 650 V; 20.2 A	IPA60R190P6	Infineon
Q201; Q202	MOSFET-N; 560 V; 11.6 A or MOSFET-N; 650 V; 20.2 A	SPA12N50C3 or IPA60R190P6	Infineon
Q203	MOSFET-N; 60 V; 300 mA	2N7002	NXP Semiconductors
Q301; Q302	MOSFET-N; 40 V; 100 A	PSMN1R8-40YLC	NXP Semiconductors
Q306; Q307	MOSFET-N; not mounted; 40 V; 100 A	PSMN2R2-40PS	NXP Semiconductors
R101; R102	resistor; 10 M Ω ; 1 %; 250 mW; 500 V; 1206	KTR18EZPF1005	ROHM

Reference	Description and values	Part number	Manufacturer
R103; R291; R292; R301; R302; R303; R304	resistor; jumper; 0 Ω ; 63 mW; 0603	-	-
R104	resistor; 20 Ω ; 1 %; 63 mW; 0603	-	-
R106	resistor; 100 Ω ; 1 %; 250 mW; 1206	-	-
R107; R108	resistor; 0.05 Ω ; 1 %; 1 W; 2512	RL2512FK-070R05L	Yageo
R113	resistor; NTC; 100 k Ω ; 5 %; 100 mW; 4190 K	NTCLE100E3104JB0	Vishay
R114	resistor; 750 k Ω ; 1 %; 250 mW; 1206	-	-
R115; R116	resistor; 7.5 M Ω ; 1 %; 250 mW; 500 V; 1206	KTR18EZPF7504	ROHM
R118	resistor; 100 k Ω ; 1 %; 63 mW; 0603	-	-
R120	resistor; jumper; 0 Ω ; 100 mW; 0603	-	-
R121; R124; R125; R195; R196; R197; R293; R294; R297; R312	resistor; jumper; 0 Ω ; 250 mW; 1206	-	-
R122	resistor; not mounted; 10 k Ω ; 1 %; 250 mW; 1206	-	-
R123	resistor; not mounted; 220 k Ω ; 1 %; 63 mW; 0603	-	-
R127; R128	resistor; 10 M Ω ; 1 %; 250 mW; 500 V; 1206	KTR18EZPF1005	ROHM
R201; R203	resistor; 22 Ω ; 1 %; 63 mW; 0603	-	-
R202	resistor; 10 Ω ; 1 %; 250 mW; 1206	RC1206FR-0710RL	Yageo
R204	resistor; 10 Ω ; 1 %; 63 mW; 0603	-	-
R205; R216	resistor; not mounted; 220 k Ω ; 1 %; 63 mW; 0603	-	-
R208	resistor; 2.2 M Ω ; 1 %; 250 mW; 500 V; 1206	KTR18EZPF2204	ROHM
R209	resistor; 2.7 M Ω ; 1 %; 250 mW; 500 V; 1206	KTR18EZPF2704	ROHM
R210	resistor; 5.6 Ω ; 1 %; 63 mW; 0603	-	-
R215	resistor; 20 k Ω ; 1 %; 63 mW; 0603	-	-
R229	resistor; 100 Ω ; 1 %; 63 mW; 0603	-	-
R230; R307	resistor; 39 k Ω ; 1 %; 63 mW; 0603	-	-
R231	resistor; 10 M Ω ; 1 %; 63 mW; 0603	-	-
R295; R296; R298; R299	resistor; jumper; not mounted; 0 Ω ; 250 mW; 1206	-	-
R305	resistor; 1.8 k Ω ; 1 %; 63 mW; 0603	-	-
R306	resistor; 100 k Ω ; 1 %; 250 mW; 1206	-	-
R308	resistor; 47 k Ω ; 1 %; 63 mW; 0603	-	-
R309	resistor; 51 Ω ; 1 %; 63 mW; 0603	-	-
R310	resistor; 47 Ω ; 1 %; 63 mW; 0603	-	-
R311	resistor; 10 k Ω ; 1 %; 63 mW; 0603	-	-
SW01	switch; push; not mounted; SPST; off-on; 1-way	ESE20D321	Panasonic

Reference	Description and values	Part number	Manufacturer
T1	transformer; ETD34	750315374	Würth Elektronik
TP102; TP103; TP105; TP108; TP198; TP199; TP206; TP209; TP210; TP211; TP213; TP214; TP215; TP216; TP297; TP298; TP299; TP301; TP308; TP399	test point; 0805	RCT-0C	TE Connectivity
TP305	test point; isolated; 1.02 mm; black	20-2137	Vero Technologies
TP309	test point; isolated; 1.02 mm; Green	20-313138	Vero Technologies
U1	PFC + LLC controller	TEA2016AATdev	NXP Semiconductors
U202; U203	optocoupler; NPN; 80 V; 60 mA	VOL618A-3X001T	Vishay
U301	synchronous rectifier Controller; dual	TEA1995T	NXP Semiconductors
U302	regulator; AS431	AS431IBNTR-G1	BCD Semi
WB101	wire bridge; 0.8 mm; P = 20.32 mm	923345-08	3M
WB102; WB201	wire bridge; 0.8 mm; P = 25.40 mm	923345-10	3M
WB103	wire bridge; 0.8 mm; P = 15.24 mm	923345-06	3M
WB104	wire bridge; 0.8 mm; P = 5.08 mm	923345-02	3M
WB105	wire bridge; not mounted; 0.8 mm; P = 12.10 mm	923345-05	3M
WB106	wire bridge; 0.8 mm; P = 12.10 mm	923345-05	3M
WB107; WB305	wire bridge; bare; 1 mm; P = 10.16 mm	D3082F05	Harwin
WB202; WB204; WB205; WB301; WB303	wire bridge; 0.8 mm; P = 7.62 mm	923345-03	3M
WB203; WB302	wire bridge; 0.8 mm; P = 10.16 mm	923345-04	3M
WB304	wire bridge; 0.8 mm; P = 17.18 mm	923345-07	3M
X101	header; straight; 1 x 3-way; 2.54 mm	22-11-2032	Molex

11 PCB layout



12 Transformer specifications

12.1 LLC transformer

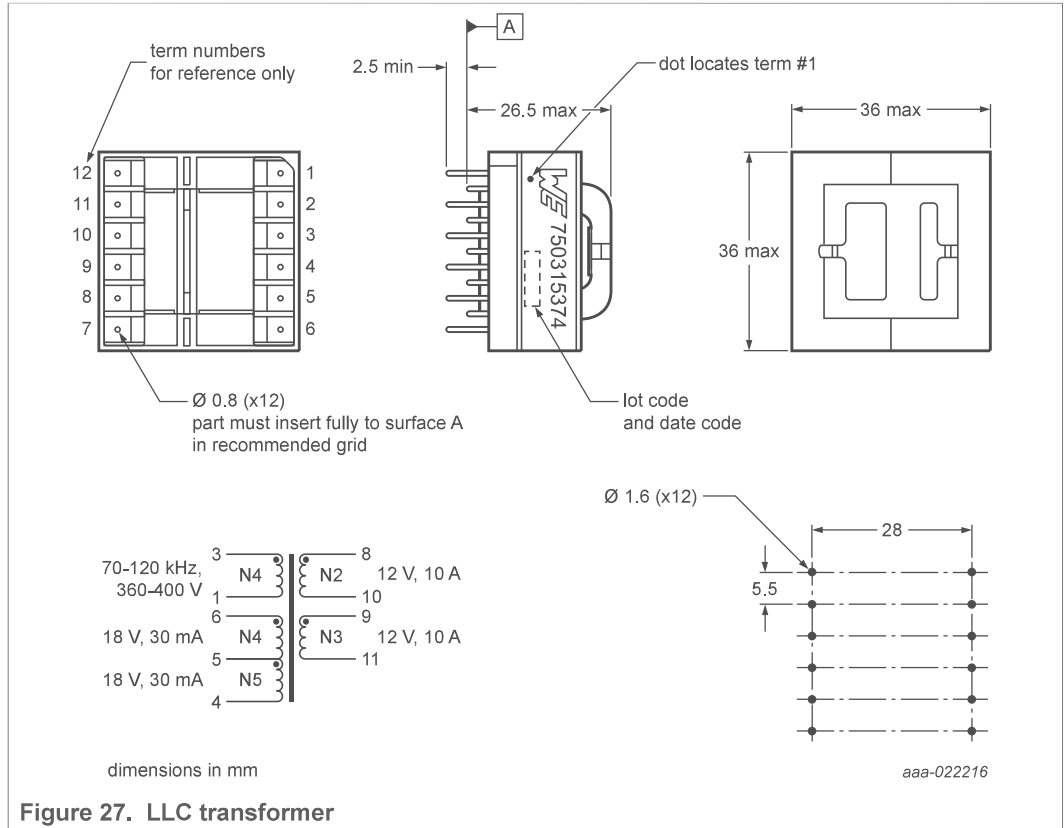


Figure 27. LLC transformer

Table 7. LLC transformer specifications

Parameter	Values	Test conditions
DC resistance; 3-1	0.152 Ω; ±10	at 20 °C
DC resistance; 8-10	maximum 0.005 Ω	at 20 °C
DC resistance; 9-11	maximum 0.005 Ω	at 20 °C
DC resistance; 6-5	0.122 Ω; ±10 %	at 20 °C
DC resistance; 5-4	0.122 Ω; ±10 %	at 20 °C
inductance; 3-1	600 μH; ±10 %	10 kHz; 100 mV; L _s
saturation current; 3-1	1.7 A	20 % roll-off from initial
leakage inductance; 3-1	100 μH; ±10 %	tie(4+5+6, 8+9+10+11); 100 kHz; 100 mA; L _s
dielectric; 1-11	3200 V (AC); 1 minute	tie(3=4, 10+11); 4000 V (AC); 1 s

12.2 PFC coil

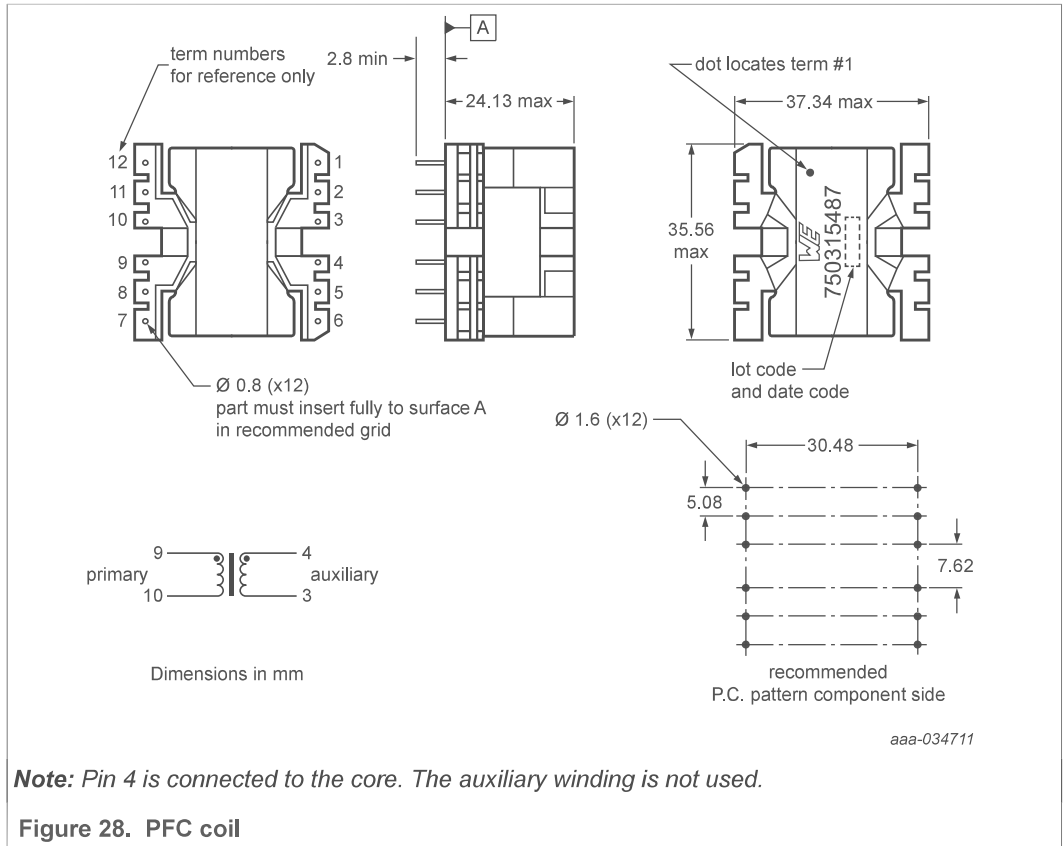


Table 8. PFC coil specifications

Parameter	Value	Conditions
Electric specifications		
DC resistance; 3-4	0.048 Ω; ±20 %	at 20 °C
DC resistance; 9-10	0.060 Ω; ±20 %	at 20 °C
inductance; 9-10	130 μH; ±5 %	10 kHz; 100 mV; L _s
saturation current; 9-10	13 A	20 % roll-off from initial
leakage current; 9-10	52 μH (typical); maximum 75 μH	tie(3+4); 100 kHz; 100 mV; L _s
dielectric; 3-10	-	1500 V (AC); 1 s
turns ratio	30:1; ±1 %	(9-10):(4-3)
General specifications		
operating temperature	-40 °C to +125 °C	including temperature rise