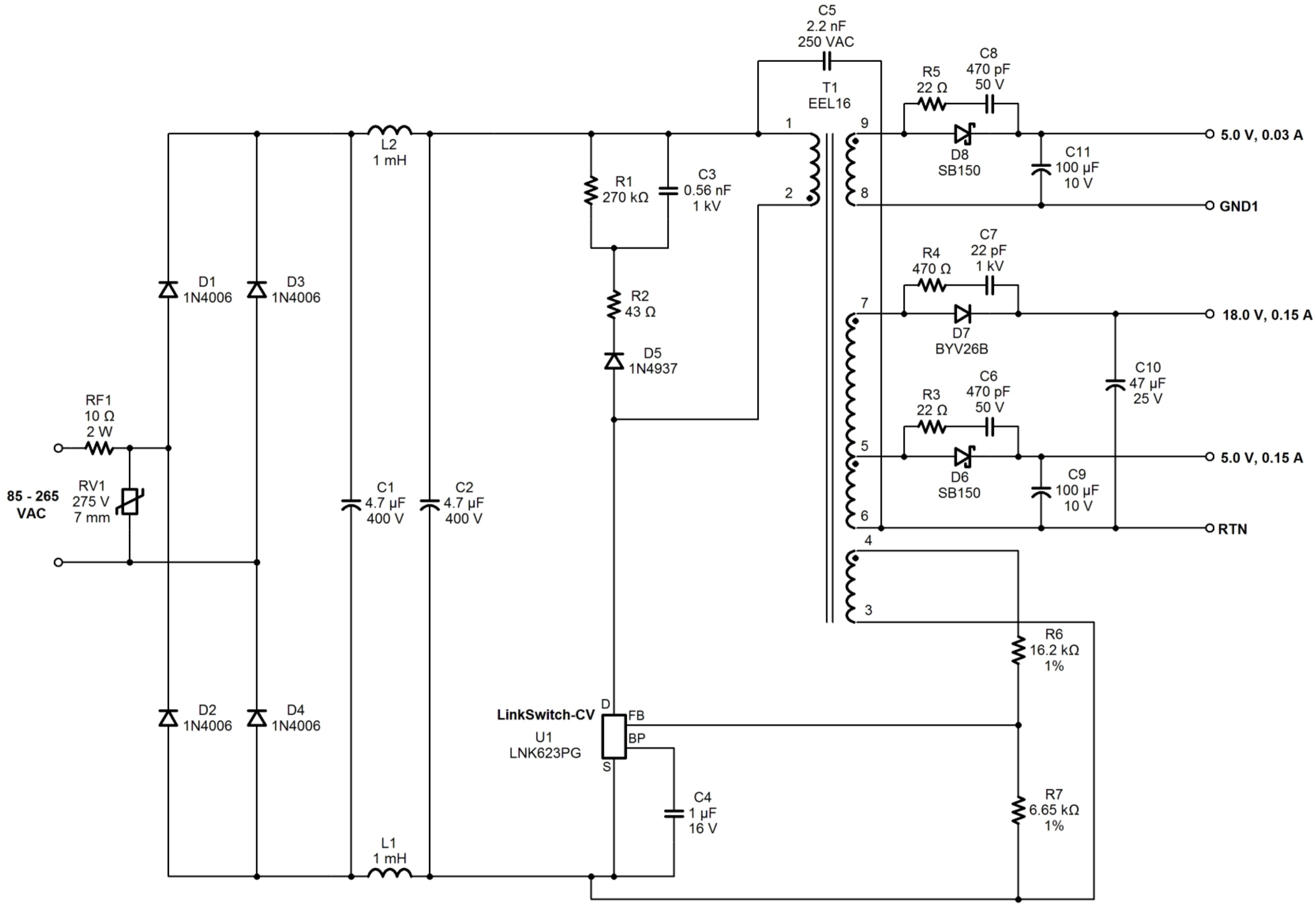


C5
2.2 nF
250 VAC
T1
EEL16
R5
22 Ω
C8
470 pF
50 V
D8
SB150
C11
100 µF
10 V
5.0 V, 0.03 A
GND1
L2
1 mH
R1
270 kΩ
C3
0.56 nF
1 kV
R2
43 Ω
D5
1N4937
R4
470 Ω
C7
22 pF
1 kV
D7
BYV26B
18.0 V, 0.15 A
C10
47 µF
25 V
R3
22 Ω
C6
470 pF
50 V
D6
SB150
C9
100 µF
10 V
5.0 V, 0.15 A
RTN
D1
1N4006
D3
1N4006
RF1
10 Ω
2 W
85 - 265
VAC
RV1
275 V
7 mm
C1
4.7 µF
400 V
C2
4.7 µF
400 V
D2
1N4006
D4
1N4006
LinkSwitch-CV
U1
LNK623PG
D
FB
BP
S
C4
1 µF
16 V
L1
1 mH
R6
16.2 kΩ
1%
R7
6.65 kΩ
1%
1
2
9
8
7
5
6
4
3

Power Supply Input

Var	*Value*	*Units*	*Description*
VACMIN	**85**	V	Minimum Input AC Voltage
VACMAX	**265**	V	Maximum Input AC Voltage
FL	**50**	Hz	Line Frequency
TC	**2.69**	ms	Diode Conduction Time
Z	**0.46**		Loss Allocation Factor
η	**74.0**	%	Efficiency Estimate
VMIN	**83.0**	V	Minimum DC Input Voltage
VMAX	**374.8**	V	Maximum DC Input Voltage

Input Section

Var	*Value*	*Units*	*Description*
RFUSE	**10.00**	Ω	**Fusible Resistor.**
IAVG	**0.06**	A	Average Diode Bridge Current (DC Input Current)
MOV_VRATED	**275**	V	MOV Rated Voltage

Device Variables

Var	*Value*	*Units*	*Description*
Device	**LNK623PG**		PI Device Name
BVDSS	**700**		Drn-Src Bkdn Voltage
Device Mode	**Default**		Current Limit mode for device
PO	**3.60**	W	Total Output Power
VDRAIN Estimated	**535.69**	V	Actual Estimated Drain Voltage
VDS	**11.89**	V	On state Drain to Source Voltage
I2F_MIN	**3.97**	A^2kHz	Minimum I2F
I2F_MAX	**5.16**	A^2kHz	Maximum I2F
FS_AT_ILIMMIN	**103316**	Hz	Switching Frequency at Current Limit Minimum
KP	**0.71**		Continuous/Discontinuous Operating Ratio
KP_TRANSIENT	**0.54**		Transient Ripple to Peak Current Ratio
ILIMITMIN	**0.20**	A	Minimum Current Limit
ILIMITMAX	**0.23**	A	Maximum Current Limit
IRMS	**0.09**	A	Primary RMS Current (at VMIN)
DMAX	**0.48**		Maximum Duty Cycle
RTH_DEVICE	**109.76**	°C/W	PI Device Maximum Thermal Resistance
DEV_HSINK_TYPE	**2 Oz (70 µ) Copper PCB**		PI Device Heatsink Type
DEV_HSINK_AREA	**52**	mm^2	PI Device Heatsink Area

Clamp Circuit

Var	*Value*	*Units*	*Description*
Clamp Type	**RCD Clamp**		Clamp Circuit Type
VCLAMP	**96**	V	Estimated average clamping voltage
Estimated Clamp Loss	**0.11**	W	Clamp Dissipation

Feedback Winding

Var	*Value*	*Units*	*Description*
NFB	**11**		Feedback Winding Number of Turns
Layers	**0.95**		Feedback Winding Layers

Transformer Construction Parameters

Var	*Value*	*Units*	*Description*
Core Type	**EEL16**		Core Type
Core Material	**NC-2H (Nicera) or Equivalent**		Core Material
Bobbin Reference	**Generic, 4 pri. + 6 sec.**		Bobbin Reference
Bobbin Orientation	**Vertical**		Bobbin type
Primary Pins	**4**		Number of Primary pins used
Secondary Pins	**5**		Number of Secondary pins used
USE_SHIELDS	**YES**		Use shield Windings
LP_nom	**2557**	µH	Nominal Primary Inductance
LP_Tol	**10.0**	%	Primary Inductance Tolerance
NP	**113.0**		Calculated Primary Winding Total Number of Turns
NSM	**10**		Secondary Main Number of Turns
CMA	**430**	Cmils/A	Primary Winding Current Capacity
VOR	**64.4**	V	Reflected Output Voltage
BW	**17.60**	mm	Bobbin Winding Width
ML	**3.20**	mm	Safety Margin on Left Width
MR	**3.20**	mm	Safety Margin on Right Width
FF	**62**	%	Actual Transformer Fit Factor. 100% signifies fully utilized winding window
AE	**19.40**	mm²	Core Cross Sectional Area
ALG	**180**	nH/T²	Gapped Core Effective Inductance
BM	**2429**	Gauss	Maximum Flux Density
BAC	**749**	Gauss	AC Flux Density for Core Loss
LG	**0.107**	mm	Estimated Gap Length
L_LKG	**102.28**	µH	Estimated primary leakage inductance
LSEC	**15**	nH	Secondary Trace Inductance

Primary Winding Section 1

Var	*Value*	*Units*	*Description*
NP1	**114**		Rounded (Integer) Number of Primary winding turns in the first section of primary
Wire Size	**34**	AWG	Wire size of primary winding
Winding Type	**Single (x1)**		Primary winding number of parallel wire strands
L	**1.94**		Primary Number of Layers
DC Copper Loss	**0.03**	W	Primary 1 DC Losses

Output 1

Var	*Value*	*Units*	*Description*
VO	**18.00**	V	Output Voltage
IO	**0.15**	A	Output Current
VOUT_ACTUAL	**18.08**	V	Actual Output Voltage
NS	**24**		Secondary Number of Turns
Wire Size	**33**	AWG	Wire size of secondary winding
Winding Type	**Single (x1)**		Output winding number of parallel strands
L_S_OUT	**0.46**		Secondary Output Winding Layers
DC Copper Loss	**0.03**	W	Secondary DC Losses
VD	**1.30**	V	Output Winding Diode Forward Voltage Drop

PIVS	**130**	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	**0.46**	A	Peak Secondary Current
ISRMS	**0.23**	A	Secondary RMS Current
RTH_DIODE	**196.44**	°C/W	Output Diode Maximum Thermal Resistance
OD_HSINK_TYPE	**2 Oz (70 µ) Copper PCB**		Output Diode Heatsink Type
OD_HSINK_AREA	**52**	mm²	Output Diode Heatsink Area
CO	**47 x 1**	µF	Output Capacitor
IRIPPLE	**0.17**	A	Output Capacitor RMS Ripple Current
Expected Lifetime	**23281**	hr	Expected Lifetime of Output Capacitor

Output 2

Var	***Value***	***Units***	***Description***
VO	**5.00**	V	Output Voltage
IO	**0.15**	A	Output Current
VOUT_ACTUAL	**5.00**	V	**Actual Output Voltage.**
NS	**10**		Secondary Number of Turns
Wire Size	**30**	AWG	Wire size of secondary winding
Winding Type	**Single (x1)**		Output winding number of parallel strands
L_S_OUT	**0.26**		Secondary Output Winding Layers
DC Copper Loss	**0.03**	W	Secondary DC Losses
VD	**0.70**	V	Output Winding Diode Forward Voltage Drop
PIVS	**38**	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	**0.46**	A	Peak Secondary Current
ISRMS	**0.23**	A	Secondary RMS Current
RTH_DIODE	**395.90**	°C/W	Output Diode Maximum Thermal Resistance
OD_HSINK_TYPE	**2 Oz (70 µ) Copper PCB**		Output Diode Heatsink Type
OD_HSINK_AREA	**52**	mm²	Output Diode Heatsink Area
CO	**100 x 1**	µF	Output Capacitor
IRIPPLE	**0.17**	A	Output Capacitor RMS Ripple Current
Expected Lifetime	**23281**	hr	Expected Lifetime of Output Capacitor

Output 3

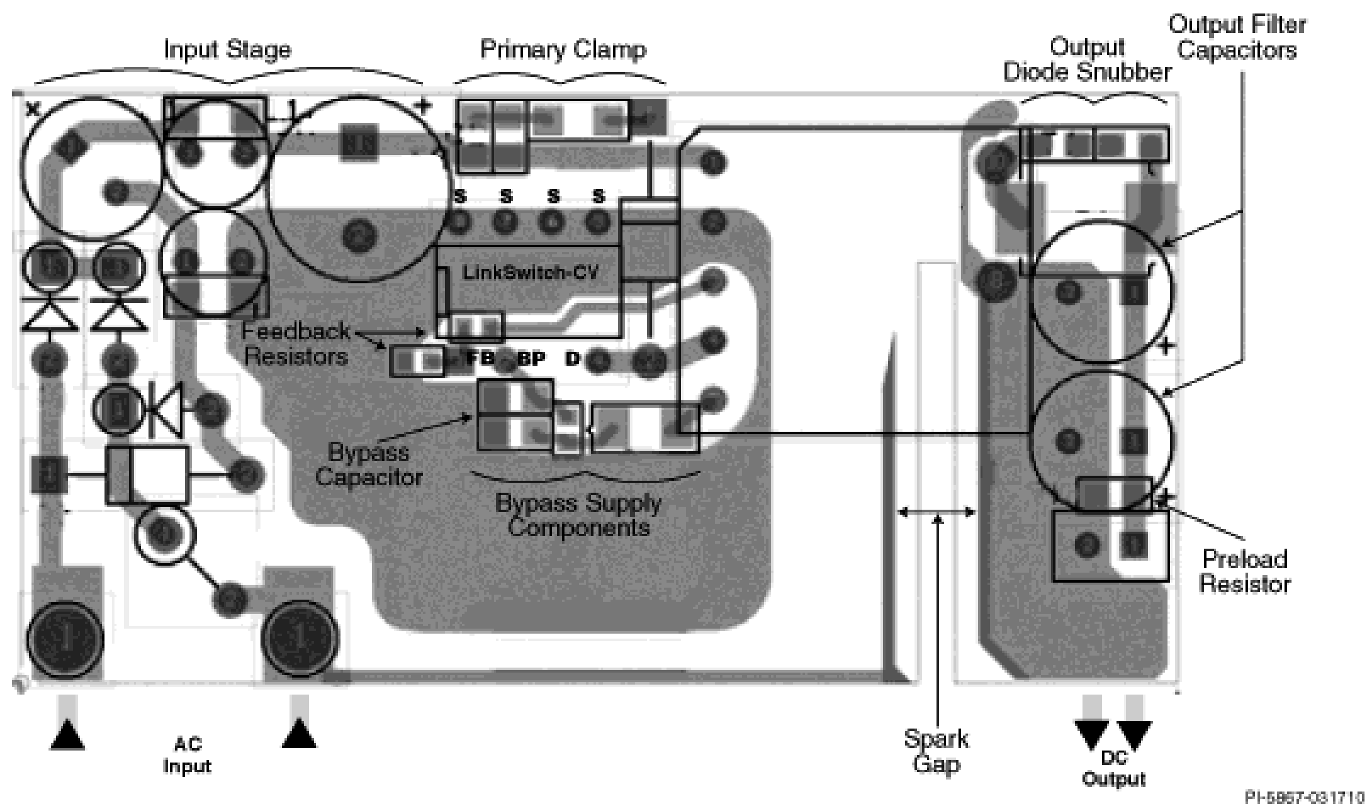
Var	***Value***	***Units***	***Description***
VO	**5.00**	V	Output Voltage
IO	**0.03**	A	Output Current
VOUT_ACTUAL	**5.00**	V	Actual Output Voltage
NS	**10**		Secondary Number of Turns
Wire Size	**38**	AWG	Wire size of secondary winding
Winding Type	**Single (x1)**		Output winding number of parallel strands
L_S_OUT	**0.11**		Secondary Output Winding Layers
DC Copper Loss	**0.00**	W	Secondary DC Losses
VD	**0.70**	V	Output Winding Diode Forward Voltage Drop
PIVS	**38**	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	**0.09**	A	Peak Secondary Current
ISRMS	**0.05**	A	Secondary RMS Current
RTH_DIODE	**2134.55**	°C/W	Output Diode Maximum Thermal Resistance
OD_HSINK_TYPE	**2 Oz (70 µ) Copper PCB**		Output Diode Heatsink Type

OD_HSINK_AREA	**52**	mm²	Output Diode Heatsink Area
CO	**100 x 1**	µF	Output Capacitor
IRIPPLE	**0.03**	A	Output Capacitor RMS Ripple Current
Expected Lifetime	**31595**	hr	Expected Lifetime of Output Capacitor

The regulation and tolerances do not account for thermal drifting and component tolerance of the output diode forward voltage drop and voltage drops across the LC post filter. The actual voltage values are estimated at full load only.

Please verify cross regulation performance on the bench.

Board Layout Recommendations

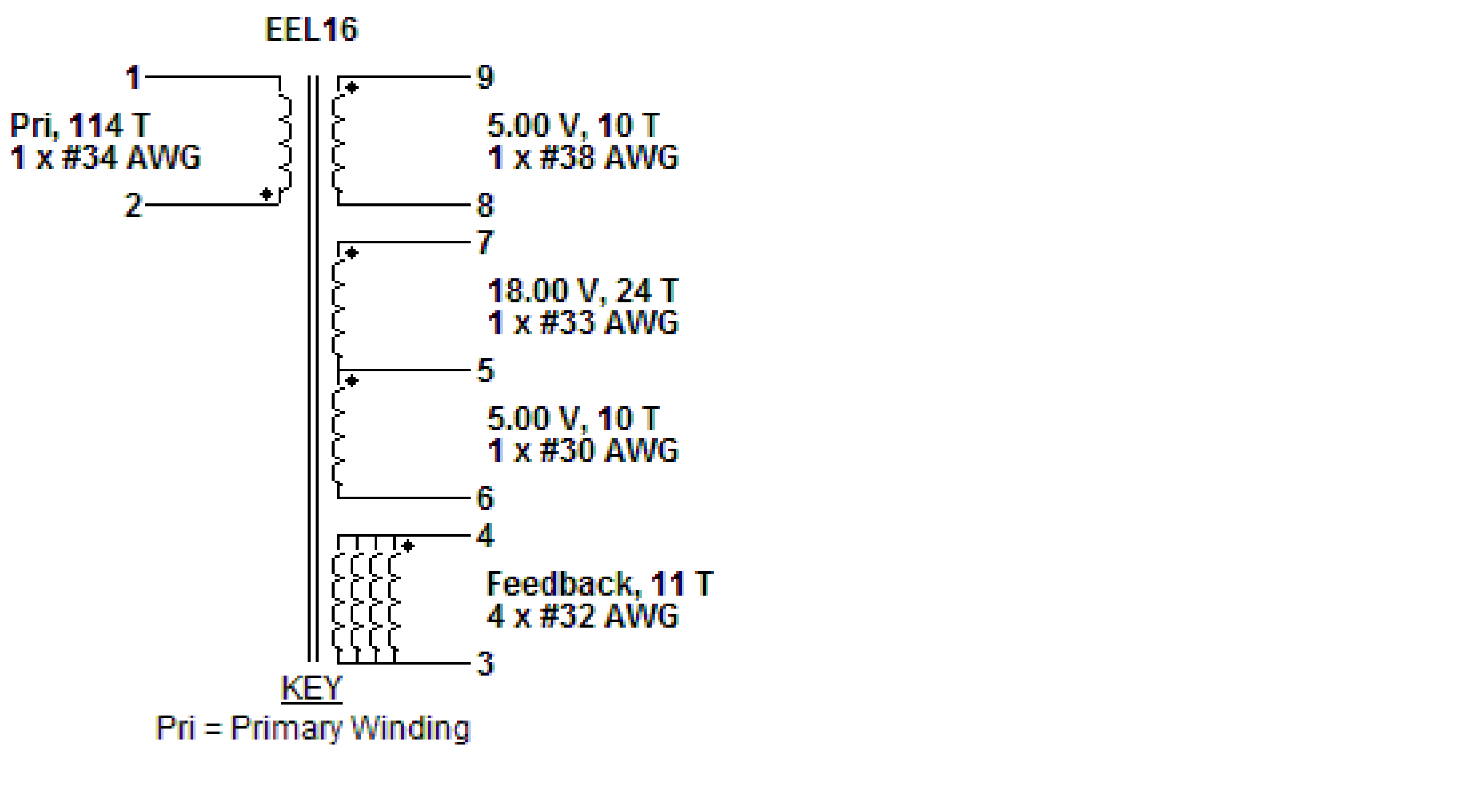


Click on the "Show me" icon to highlight relevant areas on the sample layout.		
	Description	Show Me
1	Maximize source area for good heat-sinking	
2	Keep drain trace short	
3	The BYPASS pin capacitor should be located as close as possible to the BYPASS and SOURCE pins	
4	Keep noisy traces away from FB pin	
5	Route bias winding currents directly back to the bulk cap via a dedicated trace	
6	Keep clamp loop short	
7	The Y capacitor should be placed directly from the primary input filter capacitor positive terminal to the common/return terminal of the transformer secondary	
8	The area of the loop connecting the secondary winding, the output diode and the output filter capacitor should be minimized	

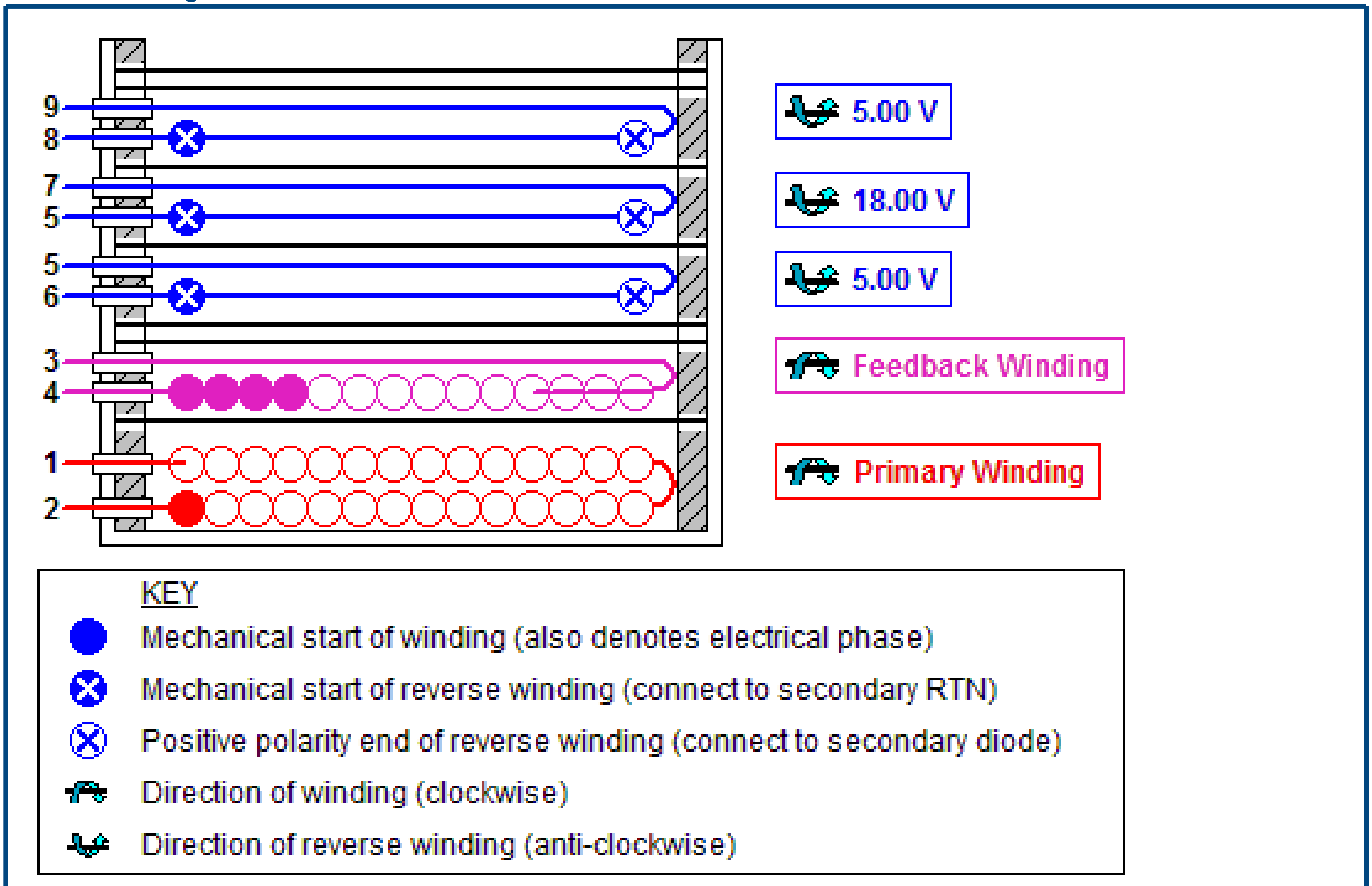
Bill Of Materials

Item #	Quantity	Part Ref	Value	Description	Mfg	Mfg Part Number
1	2	C1, C2	4.7 µF	4.7 µF, 400 V, High Voltage Al Electrolytic, (16 mm x 10 mm)	Nippon Chemi-Con	ESMG401ELL4R7MJ16S
2	1	C3	0.56 nF	0.56 nF, 1 kV, High Voltage Ceramic	Panasonic	ECK-D3A561KBN
3	1	C4	1 µF	1 µF, 16 V, Ceramic, X7R	TDK	C1608X7R1C105K
4	1	C5	2.2 nF	2.2 nF, 250 VAC, Ceramic, Y Class	TDK	CD12-E2GA222MYNS
5	2	C6, C8	470 pF	470 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H471J
6	1	C7	22 pF	22 pF, 1 kV, High Voltage Ceramic	Panasonic	ECC-D3A220JGE
7	2	C9, C11	100 µF	100 µF, 10 V, Electrolytic, Super Low ESR, 300 mΩ, (11 mm x 5 mm)	United Chemi-Con	EKZE100ELL101ME11D
8	1	C10	47 µF	47 µF, 25 V, Electrolytic, Super Low ESR, 300 mΩ, (11 mm x 5 mm)	United Chemi-Con	EKZE250ELL470ME11D
9	4	D1, D2, D3, D4	1N4006	800 V, 1 A, Standard Recovery, DO-41	Vishay	1N4006
10	1	D5	1N4937	600 V, 1 A, Fast Recovery, 200 ns, DO-41	Vishay	1N4937
11	2	D6, D8	SB150	50 V, 1 A, Schottky, DO-41	Vishay	SB150
12	1	D7	BYV26B	400 V, 1 A, Ultrafast Recovery, 30 ns, SOD57	Philips	BYV26B
13	2	L1, L2	1 mH	1 mH, 0.19 A	TDK	TSL0709RA-102KR19-PF
14	1	R1	270 kΩ	270 kΩ, 5 %, 0.25 W, Carbon Film	Generic	
15	1	R2	43 Ω	43 Ω, 5 %, 0.25 W, Carbon Film	Generic	
16	2	R3, R5	22 Ω	22 Ω, 5 %, 0.25 W, Carbon Film	Generic	
17	1	R4	470 Ω	470 Ω, 5 %, 0.25 W, Carbon Film	Generic	
18	1	R6	16.2 kΩ	16.2 kΩ, 1 %, 0.125 W, Metal Film	Generic	
19	1	R7	6.65 kΩ	6.65 kΩ, 1 %, 0.125 W, Metal Film	Generic	
20	1	RF1	10 Ω	10 Ω, 2 W, Flameproof Wire-Wound Resistor	Vitrohm	CRF253-4 10R
21	1	RV1	V275LA4P	275 V, 23 J, 7 mm, RADIAL, MOV	Littelfuse	V275LA4P
22	1	T1	EEL16	NC-2H (Nicera) or Equivalent Core Material See Transformer Construction’s Materials List for complete information	TDK	PC40EE16/24/5-Z
23	1	U1	LNK623PG	LinkSwitch-CV, LNK623PG, DIP-8	Power Integrations	LNK623PG
24	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Diode D6.	Custom	
25	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Diode D7.	Custom	
26	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Device U1.	Custom	
27	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Diode D8.	Custom	

Electrical Diagram



Mechanical Diagram



Winding Instruction

Use 3.20 mm margin (item [3]) on the bottom. Use 3.20 mm margin (item [3]) on the top.

Primary Winding

Start on pin(s) 2 using item [5] at the start leads and wind 114 turns (x 1 filar) of item [7]. in 2 layer(s) from left to right. At the end of 1st layer, continue to wind the next layer from right to left. On the final layer, spread the winding evenly across entire bobbin. Finish this winding on pin(s) 1 using item [5] at the finish leads.

Add 1 layer of tape, item [4], for insulation.

Feedback Winding

Start on pin(s) 4 using item [5] at the start leads and wind 11 turns (x 4 filar) of item [8]. Wind in same rotational direction as primary winding. Spread the winding evenly across entire bobbin. Finish this winding on pin(s) 3 using item [5] at the finish leads.

Add 2 layers of tape, item [4], for insulation.

Secondary Winding

Start on pin(s) 6 using item [5] at the start leads and reverse wind 10 turns (x 1 filar) of item [9]. Spread the winding evenly across entire bobbin. Wind in opposite rotational direction as primary winding. Finish this winding on pin(s) 5 using item [5] at the finish leads.

Add 1 layer of tape, item [4], for insulation.

Start on pin(s) 5 using item [5] at the start leads and reverse wind 24 turns (x 1 filar) of item [10]. Spread the winding evenly across entire bobbin. Wind in opposite rotational direction as primary winding. Finish this winding on pin(s) 7 using item [5] at the finish leads.

Add 1 layer of tape, item [4], for insulation.

Start on pin(s) 8 using item [5] at the start leads and reverse wind 10 turns (x 1 filar) of item [11]. Spread the winding evenly across entire bobbin. Wind in opposite rotational direction as primary winding. Finish this winding on pin(s) 9 using item [5] at the finish leads.

Add 2 layers of tape, item [4], for insulation.

Core Assembly

Assemble and secure core halves. Item [1].

Varnish

Dip varnish uniformly in item [6]. Do not vacuum impregnate.

Materials

Item	*Description*
[1]	**Core: EEL16, NC-2H (Nicera) or Equivalent, gapped for ALG of 180 nH/T²**
[2]	**Bobbin: Generic, 4 pri. + 6 sec.**
[3]	**Tape: Polyester web 3.20 mm wide**
[4]	**Barrier Tape: Polyester film [1 mil (25 µm) base thickness], 17.60 mm wide**
[5]	**Teflon Tubing # 22**
[6]	**Varnish**
[7]	**Magnet Wire: 34 AWG, Solderable Double Coated**
[8]	**Magnet Wire: 32 AWG, Solderable Double Coated**
[9]	**Magnet Wire: 30 AWG, Solderable Double Coated**
[10]	**Magnet Wire: 33 AWG, Solderable Double Coated**
[11]	**Magnet Wire: 38 AWG, Solderable Double Coated**

Electrical Test Specifications

Parameter	*Condition*	*Spec*
Electrical Strength, VAC	**60 Hz 1 second, from pins 1,2,3,4 to pins 5,6,7,8,9.**	**4000**
Nominal Primary Inductance, µH	**Measured at 1 V pk-pk, typical switching frequency, between pin 1 to pin 2, with all other Windings open.**	**2557**
Tolerance, ±%	**Tolerance of Primary Inductance**	**10.0**
Maximum Primary Leakage, µH	**Measured between Pin 1 to Pin 2, with all other Windings shorted.**	**102.28**

Although the design of the software considered safety guidelines, it is the user's responsibility to ensure that the user's power supply design meets all applicable safety requirements of user's product.

1 Design Passed (Optimization Done)

	Description	*Fix*	*Ref. #*
	Some of the specified tolerances could not be met (Tolerance better than 10%). See design results for details.	Reassign another output as main output and try to reoptimize the design. Enable DC stacking from preferences and try reoptimizing design or Increase tolerance.	149
	Fusible Resistor is used.	Make sure to use a wire-wound, flameproof, fusible resistor for RF1.	165