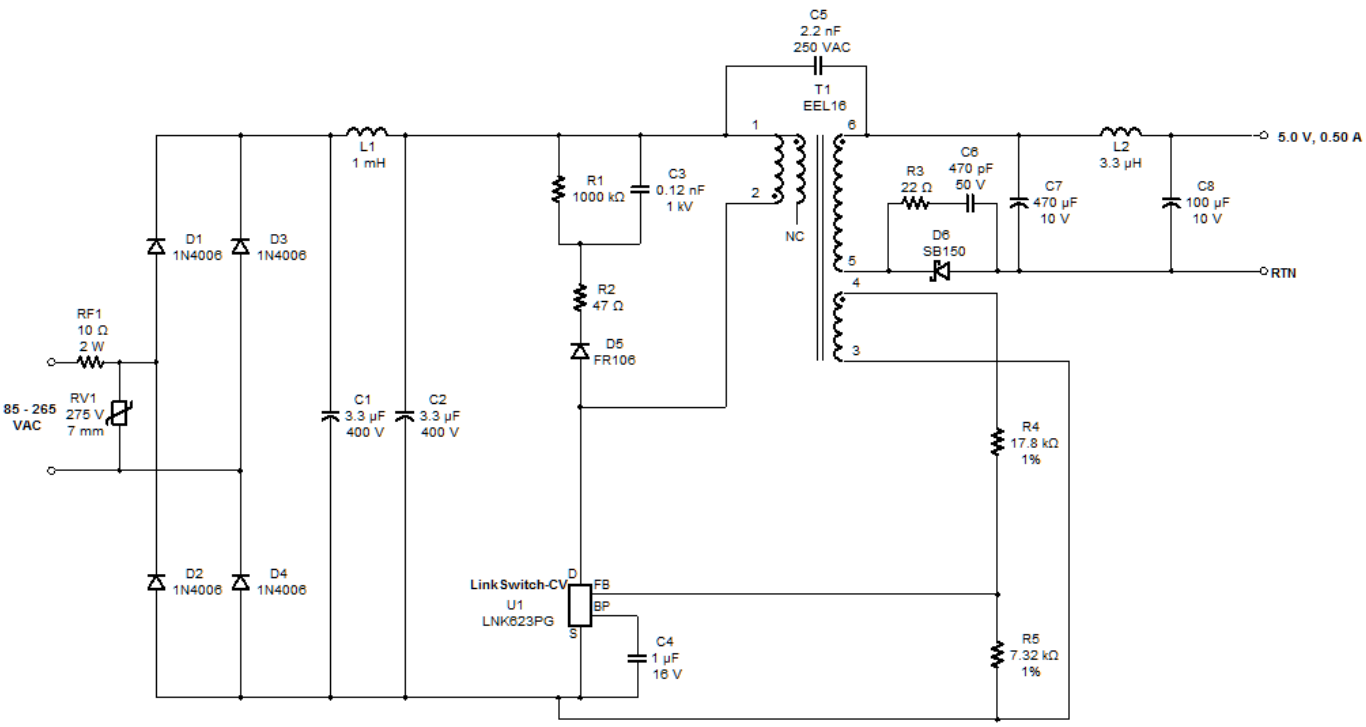

C5
2.2 nF
250 VAC
T1
EEL16
1
6
2
NC
5
4
3
5.0 V, 0.50 A
RTN
L1
1 mH
L2
3.3 µH
R1
1000 kΩ
C3
0.12 nF
1 kV
R3
22 Ω
C6
470 pF
50 V
C7
470 µF
10 V
C8
100 µF
10 V
D6
SB150
D1
1N4006
D3
1N4006
D2
1N4006
D4
1N4006
RF1
10 Ω
2 W
RV1
275 V
7 mm
85 - 265
VAC
C1
3.3 µF
400 V
C2
3.3 µF
400 V
R2
47 Ω
D5
FR106
R4
17.8 kΩ
1%
R5
7.32 kΩ
1%
LinkSwitch-CV
U1
LNK623PG
D
FB
BP
S
C4
1 µF
16 V

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	0.45		Loss Allocation Factor
η	75.0	%	Efficiency Estimate
IAVG	0.04	A	Average Diode Bridge Current (DC Input Current)
VMIN	84.1	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. See Information section for detail**
MOV_VRATED	275	V	MOV Rated Voltage

Device Variables

Var	Value	Units	Description
Device	LNK623PG		PI Device Name
PO	2.50	W	Total Output Power
VDRAIN Estimated	587.85	V	Actual Estimated Drain Voltage
VDS	10.83	V	On state Drain to Source Voltage
I2F_MIN	3.97	A²kHz	Minimum I2F
I2F_MAX	5.16	A²kHz	Maximum I2F
FS_AT_ILIMMIN	103316	Hz	Switching Frequency at Current Limit Minimum
KP	1.14		Continuous/Discontinuous Operating Ratio
KP_TRANSIENT	1.14		Transient Ripple to Peak Current Ratio
ILIMITMIN	0.20	A	Minimum Current Limit
ILIMITMAX	0.23	A	Maximum Current Limit
IRMS	0.08	A	Primary RMS Current (at VMIN)
P_NO_LOAD	300	mW	Estimated No Load Input Power
DMAX	0.42		Maximum Duty Cycle
RTH_DEVICE	158.09	°C/W	PI Device Maximum Thermal Resistance
	2 Oz (70 µ) Copper PCB		PI Device Heatsink Type
	52	mm²	PI Device Heatsink Area

Clamp Circuit

Var	Value	Units	Description
Clamp Type	RCD Clamp		Clamp Circuit Type
VCLAMP	176	V	Estimated average clamping voltage
Estimated Clamp Loss	0.03	W	Clamp Dissipation

Feedback Winding

Var	Value	Units	Description
NFB	10		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	2		Number of Secondary pins used
USE_SHIELDS	YES		Use shield Windings
LP_nom	1611	µH	Nominal Primary Inductance
LP_Tol	10.0	%	Primary Inductance Tolerance
NP	95.3		Calculated Primary Winding Total Number of Turns
NSM	9		Secondary Main Number of Turns
CMA	668	Cmils/A	Primary Winding Current Capacity
VOR	60.3	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	75	%	Actual Transformer Fit Factor. 100% signifies fully utilized winding window
AE	19.40	mm²	Core Cross Sectional Area
ALG	160	nH/T²	Gapped Core Effective Inductance
BM	1840	Gauss	Maximum Flux Density
BAC	859	Gauss	AC Flux Density for Core Loss
LG	0.124	mm	Estimated Gap Length
L_LKG	64.45	µH	Estimated primary leakage inductance
LSEC	15	nH	Secondary Trace Inductance

Primary Winding Section 1

Var	Value	Units	Description
NP1	96		Rounded (Integer) Number of Primary winding turns in the first section of primary
Wire Size	33	AWG	Wire size of primary winding
Winding Type	Single (x1)		Primary winding number of parallel wire strands
L	1.85		Primary Number of Layers
DC Copper Loss	0.01	W	Primary 1 DC Losses

Output 1

Var	Value	Units	Description
VO	5.00	V	Output Voltage
IO	0.50	A	Output Current
VOUT_ACTUAL	5.00	V	Actual Output Voltage
NS	9		Secondary Number of Turns
Wire Size	25	AWG	Wire size of secondary winding
Winding Type	Single (x1)		Output winding number of parallel strands
L_S_OUT	0.41		Secondary Output Winding Layers
DC Copper Loss	0.03	W	Secondary DC Losses
VD	0.70	V	Output Winding Diode Forward Voltage Drop
PIVS	40	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	2.07	A	Peak Secondary Current
ISRMS	0.85	A	Secondary RMS Current
RTH_DIODE	110.63	°C/W	Output Diode Maximum Thermal Resistance
	2 Oz (70 µ) Copper PCB		Output Diode Heatsink Type
	52	mm²	Output Diode Heatsink Area
CO	470 x 1	µF	Output Capacitor
IRIPPLE	0.69	A	Output Capacitor RMS Ripple Current
Expected Lifetime	26960	hr	Expected Lifetime of Output Capacitor

Feedback Circuit

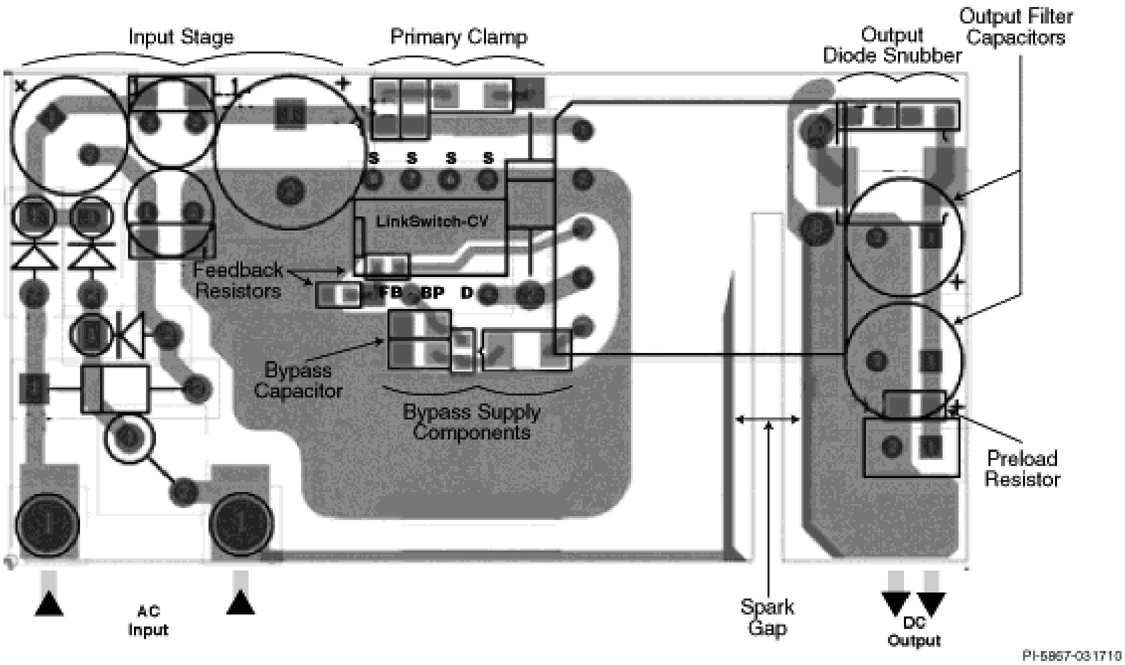
Var	Value	Units	Description
Rupper	17.80	kΩ	Upper Feedback Resistor in Resistor Divider

Rlower	*7.32*	*kΩ*	*Lower Feedback Resistor in Resistor Divider*
DCON	*4.7*	*μs*	*Output Diode conduction time (Full load)*

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



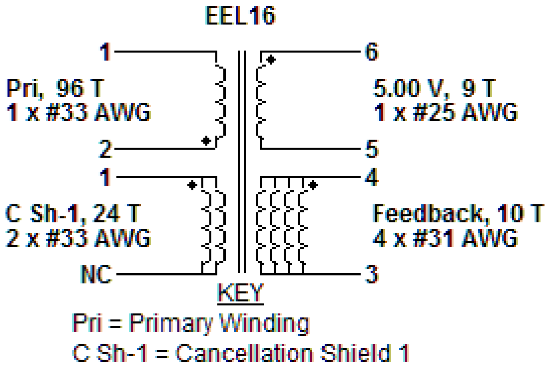
Click on the "Show me" icon to highlight relevant areas on the sample layout.

	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*	

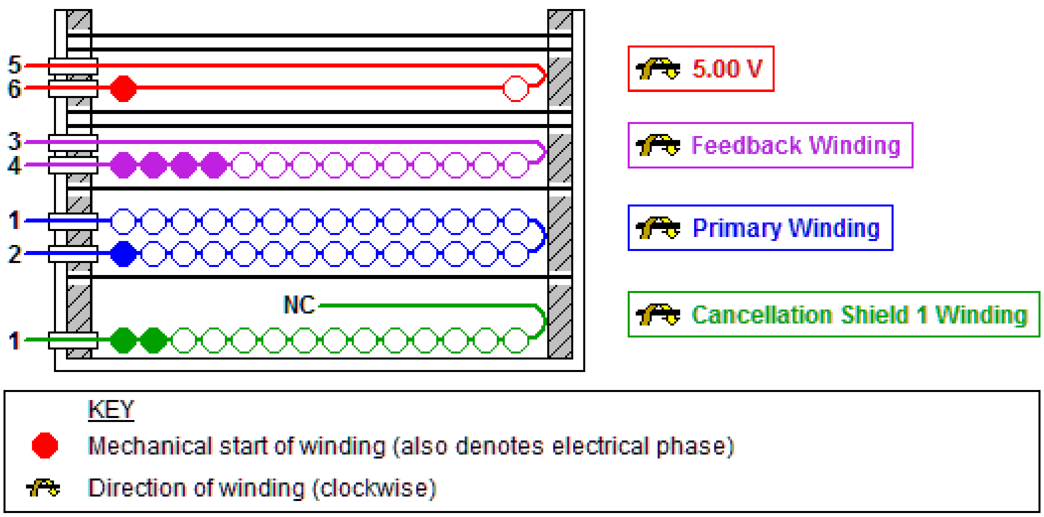
Bill Of Materials

Item #	Quantity	Part Ref	Value	Description	Mfg	Mfg Part Number
1	2	C1, C2	3.3 µF	3.3 µF, 400 V, High Voltage Al Electrolytic, 96458 mΩ, (12.5 mm x 10 mm)	Nippon Chemi-Con	ESMG401ELL3R3MJC5S
2	1	C3	0.12 nF	0.12 nF, 1 kV, High Voltage Ceramic Disc	Panasonic	ECK-D3A121KBN
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	1	C6	470 pF	470 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H471J
6	1	C7	470 µF	470 µF, 10 V, Electrolytic, Super Low ESR, 72 mΩ, (11.5 mm x 8 mm)	United Chemi-Con	EKZE100ELL471MHB5D
7	1	C8	100 µF	100 µF, 10 V, Electrolytic, Low ESR, 500 mΩ, (11.5 mm x 5 mm)	United Chemi-Con	ELXZ100ELL101MEB5D
8	4	D1, D2, D3, D4	1N4006	800 V, 1 A, Standard Recovery, DO-41	Vishay	1N4006
9	1	D5	FR106	800 V, 1 A, Fast Recovery, 250 ns, DO-41	Diodes Inc.	FR106
10	1	D6	SB150	50 V, 1 A, Schottky, DO-41	Vishay	SB150
11	1	L1	1 mH	1 mH, 0.19 A	TDK	TSL0709RA-102KR19-PF
12	1	L2	3.3 µH	3.3 µH, 2.66 A	Bourns Inc.	RL822-3R3K-RC
13	1	R1	1000 kΩ	1000 kΩ, 5 %, 0.25 W, Carbon Film	Generic	
14	1	R2	47 Ω	47 Ω, 5 %, 0.25 W, Carbon Film	Generic	
15	1	R3	22 Ω	22 Ω, 5 %, 0.25 W, Carbon Film	Generic	
16	1	R4	17.8 kΩ	17.8 kΩ, 1 %, 0.125 W, Metal Film	Generic	
17	1	R5	7.32 kΩ	7.32 kΩ, 1 %, 0.125 W, Metal Film	Generic	
18	1	RF1	10 Ω	10 Ω, 2 W, Flameproof Wire-Wound Resistor	Vitrohm	CRF253-4 10R
19	1	RV1	V275LA4P	275 V, 23 J, 7 mm, RADIAL, MOV	Littelfuse	V275LA4P
20	1	T1	EEL16	NC-2H (Nicera) or Equivalent Core Material See Transformer Construction's Materials List for complete information	TDK	PC40EE16/24/5-Z
21	1	U1	LNK623PG	LinkSwitch-CV, LNK623PG, DIP-8	Power Integrations	LNK623PG
22	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Device U1.	Custom	
23	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Diode D6.	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.

Cancellation Shield 1 Winding

Start on pin(s) 1 using item [5] at the start leads and wind 24 turns (x 2 filar) of item [7] from left to right in exactly 1 layer. Wind in same rotational direction as primary winding. Leave this end of cancellation shield winding not connected. Bend the end 90 deg and cut the wire in the middle of the bobbin.

Add 1 layer of tape, item [4], to secure the winding in place.

Primary Winding

Start on pin(s) 2 using item [5] at the start leads and wind 96 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 10 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 wind 9 turns (x 1 filar) of item [9]. Spread the winding evenly across entire bobbin. Wind in same rotational direction as primary winding. Finish this winding on pin(s) 5 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.

Comments

1. For lowest EMI place diode in return leg of the secondary (diode cathode connected to finish / termination pin side of secondary winding).

Materials

Item	*Description*
[1]	Core: EEL16, NC-2H (Nicera) or Equivalent, gapped for ALG of 160 nH/T^2
[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: 33 AWG, Solderable Double Coated
[8]	Magnet Wire: 31 AWG, Solderable Double Coated
[9]	Magnet Wire: 25 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.	3000
Nominal Primary Inductance, µH	Measured at 1 V pk-pk, typical switching frequency, between pin 1 to pin 2, with all other Windings open.	1611
Tolerance, ±%	Tolerance of Primary Inductance	10.0
Maximum Primary Leakage, µH	Measured between Pin 1 to Pin 2, with all other Windings shorted.	64.45

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.

Design Passed (Optimization Done)

	Description	*Fix*	*Ref. #*
	Fusible Resistor is used.	*Make sure to use a wire-wound, flameproof, fusible resistor for RF1.*	*165*