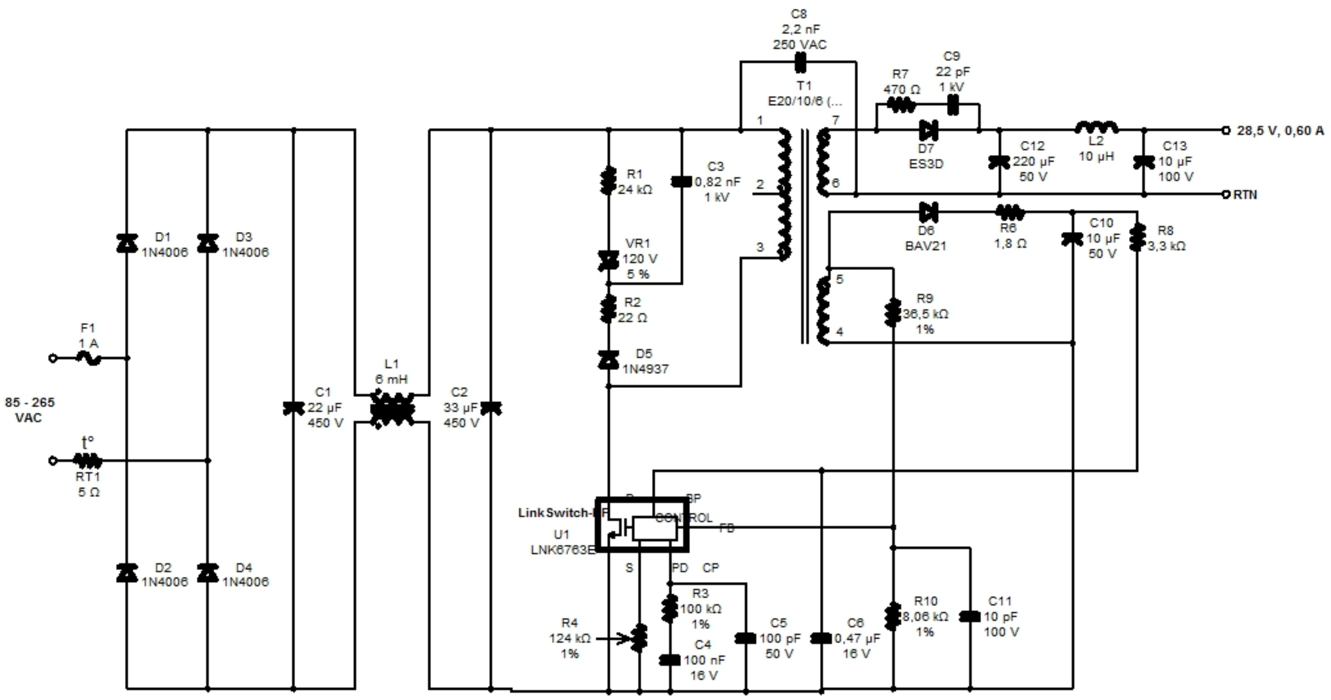

85 - 265 VAC
F1 1 A
RT1 5 Ω
D1 1N4006
D2 1N4006
D3 1N4006
D4 1N4006
C1 22 µF 450 V
L1 6 mH
C2 33 µF 450 V
R1 24 kΩ
C3 0,82 nF 1 kV
VR1 120 V 5 %
R2 22 Ω
D5 1N4937
C8 2,2 nF 250 VAC
T1 E20/10/6 (...
1
2
3
4
5
6
7
R7 470 Ω
C9 22 pF 1 kV
D7 ES3D
C12 220 µF 50 V
L2 10 µH
C13 10 µF 100 V
28,5 V, 0,60 A
RTN
D6 BAV21
R6 1,8 Ω
C10 10 µF 50 V
R8 3,3 kΩ
R9 36,5 kΩ 1%
LinkSwitch-HP
U1 LNK6763E
D
BP
CONTROL
FB
S
PD
CP
R4 124 kΩ 1%
R3 100 kΩ 1%
C4 100 nF 16 V
C5 100 pF 50 V
C6 0,47 µF 16 V
R10 8,06 kΩ 1%
C11 10 pF 100 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	2,36	ms	Diode Conduction Time
Z	0,47		Loss Allocation Factor
η	78,0	%	Efficiency Estimate
VMIN	91,4	V	Minimum DC Input Voltage
VMAX	374,8	V	Maximum DC Input Voltage

Input Section

Var	Value	Units	Description
Fuse	1,00	A	Input Fuse Rated Current
IAVG	0,24	A	Average Diode Bridge Current (DC Input Current)
Thermistor	5,00	Ω	Input Thermistor

Device Variables

Var	Value	Units	Description
Device	LNK6763E		PI Device Name
BVDSS	650		Drn-Src Bkdn Voltage
Device Mode	Default		Current Limit mode for device
PO	17,11	W	Total Output Power
VDRAIN Estimated	545,31	V	Actual Estimated Drain Voltage
VDS	9,08	V	On state Drain to Source Voltage
FS	132000	Hz	Switching Frequency
FMIN_OTE	118049	Hz	Minimum Switching Frequency During On-Time Extension
FMAX_OTE	133281	Hz	Maximum Switching Frequency During On-Time Extension
TSAMPLE_FULL_LOAD	3,06	µs	Auxiliary Winding Sample Time at Full Load
TSAMPLE_NO_LOAD	1,75	µs	Auxiliary Winding Sample Time at No Load
KP	0,60		Continuous/Discontinuous Operating Ratio
KI	1,00		Current Limit Reduction Factor
ILIMITEXT	0,72	A	Programmed Current Limit
ILIMITMIN	0,72	A	Minimum Current Limit
ILIMITMAX	0,82	A	Maximum Current Limit
AROTE_FLAG	NO		Auto Restart On-Time Extension Enable
AROTE_ACT	1	ms	Actual Auto Restart On-Time Extension
IP	0,60	A	Peak Primary Current (at VMIN)
IRMS	0,33	A	Primary RMS Current (at VMIN)
DMAX	0,57		Maximum Duty Cycle
RTH_DEVICE	44,83	°C/W	PI Device Maximum Thermal Resistance
DEV_HSINK_TYPE	Custom Aluminum		PI Device Heatsink Type
DEV_HSINK_AREA	563	mm²	PI Device Heatsink Area

Clamp Circuit

Var	Value	Units	Description
Clamp Type	RCDZ Clamp		Clamp Circuit Type
VCLAMP	61	V	Estimated average clamping voltage
Estimated Clamp Loss	0,39	W	Clamp Dissipation
VC_MARGIN	65,23	V	Clamp Voltage Safety Margin
TPRIMARY	0,98	µs	Primary Drain Voltage Ring Decay Time

Bias Variables

Var	Value	Units	Description
VB	10,0	V	Bias Voltage
IB	0,001	A	Bias Current
PIVB	48	V	Bias Rectifier Max Peak Inverse Voltage

Feedback Winding

Var	Value	Units	Description
NFB	9		Feedback Winding Number of Turns
VFB	9,13		Feedback pin voltage
Layers	0,95		Feedback Winding Layers

Transformer Construction Parameters

Var	Value	Units	Description
Core Type	E20/10/6 (EF20)		Core Type
Core Material	NC-2H (Nicera) or Equivalent		Core Material
Bobbin Reference	Generic, 5 pri. + 5 sec.		Bobbin Reference

Bobbin Orientation	Horizontal		Bobbin type
Primary Pins	5		Number of Primary pins used
Secondary Pins	2		Number of Secondary pins used
USE_SHIELDS	NO		Use shield Windings
LP_nom	1197	μH	Nominal Primary Inductance
LP_Tol	10,0	%	Primary Inductance Tolerance
NP	89,5		Calculated Primary Winding Total Number of Turns
NSM	24		Secondary Main Number of Turns
Primary Current Density	8	A/mm²	Primary Winding Current Density
VOR	110,0	V	Reflected Output Voltage
BW	12,50	mm	Bobbin Winding Width
ML	0,00	mm	Safety Margin on Left Width
MR	0,00	mm	Safety Margin on Right Width
FF	95	%	Actual Transformer Fit Factor. 100% signifies fully utilized winding window
TSAMPLE_FULL_LOAD	3,06	μs	Auxiliary Winding Sample Time at Full Load
TSAMPLE_NO_LOAD	1,75	μs	Auxiliary Winding Sample Time at No Load
AE	32,10	mm²	Core Cross Sectional Area
ALG	149	nH/T²	Gapped Core Effective Inductance
BM	251	mT	Maximum Flux Density
BP	378	mT	Peak Flux Density
BAC	76	mT	AC Flux Density for Core Loss
LG	0,239	mm	Estimated Gap Length
L_LKG	11,97	μH	Estimated primary leakage inductance
LSEC	20	nH	Secondary Trace Inductance

Primary Winding Section 1

Var	*Value*	*Units*	*Description*
NP1	45		Rounded (Integer) Number of Primary winding turns in the first section of primary
Wire Size	0,22	mm	Primary Wire Inner Diameter Actual
Winding Type	Single (x1)		Primary winding number of parallel wire strands
L	0,96		Primary Number of Layers
DC Copper Loss	0,08	W	Primary 1 DC Losses

Primary Winding Section 2

Var	*Value*	*Units*	*Description*
NP2	45		Rounded (Integer) Number of Primary winding turns in the second section of primary
Wire Size	0,22	mm	Primary Wire Inner Diameter Actual
Winding Type	Single (x1)		Primary winding number of parallel wire strands
L2	0,96		Primary Number of Layers in 2nd split winding
DC Copper Loss	0,12	W	Primary 2 DC Losses

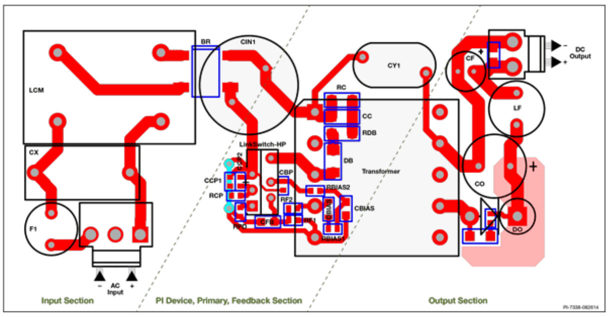
Output 1

Var	*Value*	*Units*	*Description*
VO	28,50	V	Output Voltage
IO	0,60	A	Output Current
VOUT_ACTUAL	28,50	V	Actual Output Voltage
NS	24		Secondary Number of Turns
Wire Size	0,40	mm	Secondary Wire Inner Diameter Actual
Winding Type	Single (x1)		Output winding number of parallel strands
L_S_OUT	1,15		Secondary Output Winding Layers
DC Copper Loss	0,15	W	Secondary DC Losses
VD	1,00	V	Output Winding Diode Forward Voltage Drop (Manual Overwrite)
PIVS	128	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	2,24	A	Peak Secondary Current
ISRMS	1,05	A	Secondary RMS Current
RTH_DIODE	86,53	°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	220 x 1	μF	Output Capacitor (Manual Overwrite)
IRIPPLE	0,87	A	Output Capacitor RMS Ripple Current
Expected Lifetime	48478	hr	Expected Lifetime of Output Capacitor (Manual Overwrite)

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.

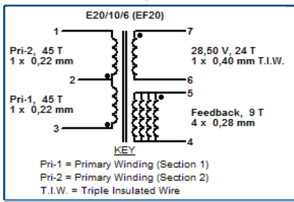
	Description	***Show Me***
1	Minimize loop area formed by drain, input capacitor and transformer	
2	Minimize loop area formed by secondary winding, the output diode and the output filter capacitor	
3	Minimize the loop area formed by the clamp blocking diode, the damping resistor and the snubber capacitor	
4	Place the FB/BP/CP pin components as close to the pin as possible. These signal traces should be routed separately from the power traces. Use of kelvin connection for this purpose is highly recommended.	
5	A large copper area on the cathode of the secondary rectifier is acceptable since this is a quiet node and the larger copper area actually provides heatsinking to the diode.	
6	The Y capacitor should be placed directly from the primary input filter capacitor positive terminal to the common/return terminal of the transformer secondary	

Bill Of Materials

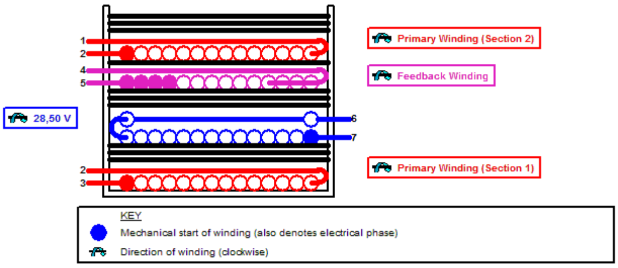
Item #	Quantity	Part Ref	Value	Description	Mfg	Mfg Part Number
1	1	C1	22 µF	22 µF, 450 V, High Voltage Al Electrolytic, (35 mm x 10 mm)	United Chemi-Con	EPAG450VB22RM10X35LL
2	1	C2	33 µF	33 µF, 450 V, High Voltage Al Electrolytic, (30 mm x 12,5 mm)	United Chemi-Con	EPAG450VB33RM12X30LL
3	1	C3	0,82 nF	0,82 nF, 1 kV, High Voltage Ceramic	Panasonic	ECK-D3A821KBN
4	1	C4	100 nF	100 nF, 16 V, Ceramic, X7R	TDK	C1005X7R1C104K
5	1	C5	100 pF	100 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H101J
6	1	C6	0,47 µF	0,47 µF, 16 V, Ceramic, X7R	TDK	C1608X7R1C474K
7	1	C7	47 µF	47 µF, 10 V, Electrolytic, Gen Purpose, 1040 mΩ, (11 mm x 5 mm)	United Chemi-Con	KME10VB47RM5X11LL
8	1	C8	2,2 nF	2,2 nF, 250 VAC, Ceramic, Y Class	TDK	CD12-E2GA222MYNS
9	1	C9	22 pF	22 pF, 1 kV, High Voltage Ceramic	Panasonic	ECC-D3A220JGE
10	1	C10	10 µF	10 µF, 50 V, Electrolytic, Gen Purpose, 1050 mΩ, (11,5 mm x 5 mm)	Panasonic	ECA-1HHG100
11	1	C11	10 pF	10 pF, 100 V, Ceramic, C0G	Epcos	B37979N1100J000
12	1	C12	220 µF	220 µF, 50 V, Electrolytic, Super Low ESR, 42 mΩ, (16 mm x 10 mm)	United Chemi-Con	EKZE500ELL221MJ16S
13	1	C13	10 µF	10 µF, 100 V, Electrolytic, Low ESR, 1200 mΩ, (11 mm x 6,3 mm)	United Chemi-Con	KMF100VB10RM6X11LL
14	4	D1, D2, D3, D4	1N4006	800 V, 1 A, Standard Recovery, DO-41	Vishay	1N4006
15	1	D5	1N4937	600 V, 1 A, Fast Recovery, 200 ns, DO-41	Vishay	1N4937
16	1	D6	BAV21	250 V, 0,25 A, Fast Recovery, 50 ns, DO-35	Vishay	BAV21
17	1	D7	ES3D	200 V, 3 A, Ultrafast Recovery, 20 ns, DO-214BA	Fairchild Semiconductor	ES3D
18	1	F1	1 A	250 VAC, 1 A, Radial TR5, Time Lag Fuse	Littelfuse / Wickmann(R)	37411000410
19	1	HS1		14,1 mm x 20 mm. Aluminum Alloy (3003 OR 5052), 1.6 mm thickness. Heatsink for use with Device U1.	Custom	
20	1	L1	6 mH	6 mH, 1,6 A	Panasonic	ELF18N016
21	1	L2	10 µH	10 µH, 3 A	Bourns Inc.	RL622-100K-RC
22	1	R1	24 kΩ	24 kΩ, 5 %, 0,25 W, Thick Film	Generic	
23	1	R2	22 Ω	22 Ω, 5 %, 0,25 W, Thick Film	Generic	
24	1	R3	100 kΩ	100 kΩ, 1 %, 0,25 W, Thick Film	Generic	
25	1	R4	124 kΩ	124 kΩ, 1 %, 0,125 W, Thick Film	Generic	
26	1	R5	6,8 Ω	6,8 Ω, 5 %, 0,125 W, Thick Film	Generic	
27	1	R6	1,8 Ω	1,8 Ω, 5 %, 0,125 W, Thick Film	Generic	
28	1	R7	470 Ω	470 Ω, 5 %, 0,25 W, Thick Film	Generic	
29	1	R8	3,3 kΩ	3,3 kΩ, 5 %, 0,125 W, Thick Film	Generic	
30	1	R9	36,5 kΩ	36,5 kΩ, 1 %, 0,25 W, Thick Film	Generic	
31	1	R10	8,06 kΩ	8,06 kΩ, 1 %, 0,125 W, Thick Film	Generic	
32	1	RT1	5 Ω	NTC Thermistor 5 Ω, 2,8 A	Thermometrics	CL160
33	1	T1	E20/10/6 (EF20)	NC-2H (Nicera) or Equivalent Core Material See Transformer Construction's Materials List for complete information	Epcos	B66311-G-X127
34	1	U1	LNK6763E	LinkSwitch-HP, LNK6763E, eSIP-7C	Power Integrations	LNK6763E
35	1	VR1	P6KE120A	120 V, 5 W, 5 %, DO-204AC, TVS	Vishay	P6KE120A
36	1			52 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Diode D7.	Custom	

This design will use SMD components wherever available. Use Design Setting/Defaults dialog to change this selection

Electrical Diagram



Mechanical Diagram



Winding Instruction

Primary Winding (Section 1)

Start on pin(s) 3 and wind 45 turns (x 1 filar) of item [5]. in 1 layer(s) from left to right. On the final layer, spread the winding evenly across entire bobbin. Finish this winding on pin(s) 2.

Add 3 layers of tape, item [3], for insulation.

Secondary Winding

Start on pin(s) 7 and wind 24 turns (x 1 filar) of item [6]. Spread the winding evenly across entire bobbin. Wind in same rotational direction as primary winding. Finish this winding on pin(s) 6.

Add 3 layers of tape, item [3], for insulation.

Feedback Winding

Start on any (temp) pin on the secondary side and wind 9 turns (x 4 filar) of item [7]. Wind in same rotational direction as primary winding. Spread the winding evenly across entire bobbin. Finish this winding on pin(s) 4. Move end of wire from temp pin and terminate it on pin 5.

Add 1 layer of tape, item [3], for insulation.

Primary Winding (Section 2)

Start on pin(s) 2 and wind 45 turns (x 1 filar) of item [5]. in 1 layer(s) from left to right. On the final layer, spread the winding evenly across entire bobbin. Finish this winding on pin(s) 1.

Add 3 layers of tape, item [3], for insulation.

Core Assembly

Assemble and secure core halves. Item [1].

Varnish

Dip varnish uniformly in item [4]. Do not vacuum impregnate.

Comments

1. Use of a grounded flux-band around the core may improve the EMI performance.

2. For non margin wound transformers use triple insulated wire for all secondary windings.

Materials

Item	*Description*
[1]	**Core: E20/10/6 (EF20), NC-2H (Nicera) or Equivalent, gapped for ALG of 149 nH/T²**
[2]	**Bobbin: Generic, 5 pri. + 5 sec.**
[3]	**Barrier Tape: Polyester film [1 mil (25 µm) base thickness], 12,50 mm wide**
[4]	**Varnish**
[5]	**Magnet Wire: 0,22 mm, Solderable Double Coated**
[6]	**Triple Insulated Wire: 0,4 mm**
[7]	**Magnet Wire: 0,28 mm, Solderable Double Coated**

Electrical Test Specifications

Parameter	*Condition*	*Spec*
Electrical Strength, VAC	**60 Hz 1 second, from pins 1,2,3,4,5 to pins 6,7.**	**3000**
Nominal Primary Inductance, µH	**Measured at 1 V pk-pk, typical switching frequency, between pin 1 to pin 3, with all other Windings open.**	**1197**
Tolerance, ±%	**Tolerance of Primary Inductance**	**10,0**
Maximum Primary Leakage, µH	**Measured between Pin 1 to Pin 3, with all other Windings shorted.**	**11,97**

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 (No Optimization)