

## Power Supply Input

Var	Value	Units	Description
VACMIN	195	V	Minimum Input AC Voltage (Manual Overwrite)
VACMAX	265	V	Maximum Input AC Voltage (Manual Overwrite)
FL	50	Hz	Line Frequency (Manual Overwrite)
TC	1,69	ms	Input Rectifier Conduction Time
Z	0,65		Loss Allocation Factor
$\eta$	88,0	%	Efficiency Estimate (Target)
VMIN	239,1	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
I <sub>AVG</sub>	0,39	A	Average Diode Bridge Current (DC Input Current)
Thermistor	7,00	$\Omega$	Input Thermistor

## Device Variables

Var	Value	Units	Description
Device	LNK6769E		PI Device Name
BVDSS	650	V	D <sub>rn</sub> -Src Bkdn Voltage
Current Limit Mode	Default		Device Current Limit Mode
PO	82,01	W	Total Output Power
V <sub>DRAIN Estimated</sub>	541,15	V	Estimated Drain Voltage
V <sub>DS</sub>	5,98	V	On state Drain to Source Voltage
FS	132000	Hz	Switching Frequency (at V <sub>MIN</sub> and Full Load)
F <sub>MIN_OTE</sub>	124000	Hz	Minimum Switching Frequency During On-Time Extension
F <sub>MAX_OTE</sub>	140000	Hz	Maximum Switching Frequency During On-Time Extension
T <sub>SAMPLE_FULL_LOAD</sub>	5,00	$\mu$ s	Auxiliary Winding Sample Time at Full Load
T <sub>SAMPLE_NO_LOAD</sub>	1,79	$\mu$ s	Auxiliary Winding Sample Time at No Load
K <sub>P</sub>	0,97		Continuous/Discontinuous Operating Ratio (at V <sub>MIN</sub> and full load)
D <sub>MAX</sub>	0,30		Maximum Duty Cycle (at V <sub>MIN</sub> and full load)
K <sub>I</sub>	1,00		Current Limit Reduction Factor
I <sub>LIMITTEXT</sub>	3,16	A	Programmed Current Limit
I <sub>LIMITMIN</sub>	3,162	A	Minimum Current Limit
I <sub>LIMITMAX</sub>	3,638	A	Maximum Current Limit
A <sub>ROTE_FLAG</sub>	NO		Auto Restart On-Time Extension Enable
A <sub>ROTE_ACT</sub>	1	ms	Actual Auto Restart On-Time Extension
I <sub>P</sub>	2,52	A	Peak Primary Current (at V <sub>MIN</sub> and full load)
I <sub>RMS</sub>	0,81	A	Primary RMS Current (at V <sub>MIN</sub> and full load)
R <sub>TH_DEVICE</sub>	27,07	$^{\circ}$ C/W	PI Device Heatsink Maximum Thermal Resistance
DEV <sub>HSINK_TYPE</sub>	Custom Aluminum		PI Device Heatsink Type
DEV <sub>HSINK_AREA</sub>	1664	mm <sup>2</sup>	PI Device Heatsink Area

## Clamp Circuit

Var	Value	Units	Description
Clamp Type	RCDZ Clamp		Clamp Circuit Type

VCLAMP	66	V	Average Clamping Voltage
Estimated Clamp Loss	4,85	W	Clamp Dissipation
VC_MARGIN	75,23	V	Clamp Voltage Safety Margin
TPRIMARY	1,00	$\mu$ s	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	61	V	Bias Rectifier Maximum Peak Inverse Voltage

### Feedback Winding

Var	Value	Units	Description
NFB	4		Feedback Winding Number of Turns
VFB	35,00		Feedback pin voltage
Layers	0,52		Feedback Winding Layers

### Transformer Construction Parameters

Var	Value	Units	Description
Core Type	EE35		Core Type
Core Material	PC95		Core Material
Bobbin Reference	Generic, 7 pri. + 7 sec.		Bobbin Reference
Bobbin Orientation	Vertical		Bobbin type
Primary Pins	5		Number of Primary pins used
Secondary Pins	8		Number of Secondary pins used.
USE_SHIELDS	NO		Use shield Windings
LP_nom	252	$\mu$ H	Nominal Primary Inductance
LP_Tol	10,0	%	Primary Inductance Tolerance
NP	29,5		Calculated Primary Winding Total Number of Turns
NSM	2		Secondary Main Number of Turns
Primary Current Density	4	A/mm <sup>2</sup>	Primary Winding Current Density
VOR	100,0	V	Reflected Output Voltage
BW	15,70	mm	Bobbin Winding Width
ML	0,00	mm	Safety Margin on Left Width
MR	0,00	mm	Safety Margin on Right Width
FF	91	%	Actual Transformer Fit Factor. 100% signifies fully utilized winding window
TSAMPLE_FULL_LOAD	5,00	$\mu$ s	Auxiliary Winding Sample Time at Full Load
TSAMPLE_NO_LOAD	1,79	$\mu$ s	Auxiliary Winding Sample Time at No Load
AE	101,40	mm <sup>2</sup>	Core Cross Sectional Area
ALG	289	nH/T <sup>2</sup>	Gapped Core Specific Inductance
BM	212	mT	Maximum Flux Density
BP	336	mT	Peak Flux Density
BAC	103	mT	AC Flux Density for Core Loss
LG	0,408	mm	Estimated Gap Length
L_LKG	5,04	$\mu$ H	Estimated primary leakage inductance
LSEC	10	nH	Secondary Trace Inductance

## Primary Winding Section 1

Var	Value	Units	Description
NP1	15		Number of Primary Winding Turns in the First Section of Primary
Wire Size	0,55	mm	Primary Wire Inner Diameter Actual
Winding Type	Single (x1)		Primary Winding - Number of Parallel Wire Strands
L	0,54		Primary Winding - Number of Layers
DC Copper Loss	0,05	W	Primary Section 1 DC Losses

## Primary Winding Section 2

Var	Value	Units	Description
NP2	15		Rounded (Integer) Number of Primary winding turns in the second section of primary
Wire Size	0,55	mm	Primary Wire Inner Diameter Actual
Winding Type	Single (x1)		Primary Winding - Number of Parallel Wire Strands
L2	0,54		Primary Number of Layers in 2nd split winding
DC Copper Loss	0,08	W	Primary Section 2 DC Losses

## Output 1

Var	Value	Units	Description
VO	100,00	V	Typical Output Voltage
IO	0,17	A	Output Current
VOUT_ACTUAL	99,85	V	Actual Output Voltage
NS	30		Secondary Number of Turns
Wire Size	0,20	mm	Secondary Wire Inner Diameter Actual
Winding Type	Single (x1)		Output winding number of parallel strands
L_S_OUT	0,76		Secondary Output Winding Layers
DC Copper Loss	0,08	W	Secondary DC Losses
OD_VD	1,70	V	Output Winding Diode Forward Voltage Drop
PIVS	475	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	0,48	A	Peak Secondary Current
ISRMS	0,23	A	Secondary RMS Current
RTH_RECTIFIER	129,83	°C/W	Output Rectifier Heatsink Maximum Thermal Resistance
OR_HSINK_TYPE	2 Oz (70 µ) 2-Sided Copper		Output Rectifier Heatsink Type
OR_HSINK_AREA	52	mm <sup>2</sup>	Output Rectifier Heatsink Area
CO	33 x 1	µF	Output Capacitor - Capacitance
IRIPPLE	0,16	A	Output Capacitor - RMS Ripple Current
Expected Lifetime	120925	hr	Output Capacitor - Expected Lifetime

## Output 2

Var	Value	Units	Description
VO	100,00	V	Typical Output Voltage
IO	0,17	A	Output Current
VOUT_ACTUAL	99,85	V	Actual Output Voltage
NS	30		Secondary Number of Turns
Wire Size	0,20	mm	Secondary Wire Inner Diameter Actual
Winding Type	Single (x1)		Output winding number of parallel strands
L_S_OUT	0,76		Secondary Output Winding Layers

DC Copper Loss	0,07	W	Secondary DC Losses
OD_VD	1,70	V	Output Winding Diode Forward Voltage Drop
PIVS	475	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	0,48	A	Peak Secondary Current
ISRMS	0,23	A	Secondary RMS Current
RTH_RECTIFIER	129,83	°C/W	Output Rectifier Heatsink Maximum Thermal Resistance
OR_HSINK_TYPE	2 Oz (70 µ) 2-Sided Copper		Output Rectifier Heatsink Type
OR_HSINK_AREA	52	mm <sup>2</sup>	Output Rectifier Heatsink Area
CO	33 x 1	µF	Output Capacitor - Capacitance
IRIPPLE	0,16	A	Output Capacitor - RMS Ripple Current
Expected Lifetime	120925	hr	Output Capacitor - Expected Lifetime

### Output 3

Var	Value	Units	Description
VO	100,00	V	Typical Output Voltage
IO	0,17	A	Output Current
VOUT_ACTUAL	99,85	V	Actual Output Voltage
NS	30		Secondary Number of Turns
Wire Size	0,20	mm	Secondary Wire Inner Diameter Actual
Winding Type	Single (x1)		Output winding number of parallel strands
L_S_OUT	0,76		Secondary Output Winding Layers
DC Copper Loss	0,08	W	Secondary DC Losses
OD_VD	1,70	V	Output Winding Diode Forward Voltage Drop
PIVS	475	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	0,48	A	Peak Secondary Current
ISRMS	0,23	A	Secondary RMS Current
RTH_RECTIFIER	129,83	°C/W	Output Rectifier Heatsink Maximum Thermal Resistance
OR_HSINK_TYPE	2 Oz (70 µ) 2-Sided Copper		Output Rectifier Heatsink Type
OR_HSINK_AREA	52	mm <sup>2</sup>	Output Rectifier Heatsink Area
CO	33 x 1	µF	Output Capacitor - Capacitance
IRIPPLE	0,16	A	Output Capacitor - RMS Ripple Current
Expected Lifetime	120925	hr	Output Capacitor - Expected Lifetime

### Output 4

Var	Value	Units	Description
VO	6,20	V	Typical Output Voltage
IO	5,00	A	Output Current
VOUT_ACTUAL	6,20	V	Actual Output Voltage
NS	2		Secondary Number of Turns
Foil Thickness	125	µm	Secondary Wire Inner Diameter Actual
Winding Type	Foil		Output winding number of parallel strands
L_S_OUT	2,00		Secondary Output Winding Layers
DC Copper Loss	0,04	W	Secondary DC Losses
OD_VD	0,57	V	Output Winding Diode Forward Voltage Drop
PIVS	31	V	Output Rectifier Maximum Peak Inverse Voltage
ISP	14,08	A	Peak Secondary Current

<i>ISRMS</i>	<b>6,90</b>	A	<i>Secondary RMS Current</i>
<i>RTH_RECTIFIER</i>	<b>19,54</b>	°C/W	<i>Output Rectifier Heatsink Maximum Thermal Resistance</i>
<i>OR_HSINK_TYPE</i>	<b>Custom Aluminum</b>		<i>Output Rectifier Heatsink Type</i>
<i>OR_HSINK_AREA</i>	<b>3353</b>	mm <sup>2</sup>	<i>Output Rectifier Heatsink Area</i>
<i>CO</i>	<b>3300 x 2</b>	µF	<i>Output Capacitor - Capacitance</i>
<i>IRIPPLE</i>	<b>4,76</b>	A	<i>Output Capacitor - RMS Ripple Current</i>
<i>Expected Lifetime</i>	<b>47962</b>	hr	<i>Output Capacitor - Expected Lifetime</i>

*High output current Flyback design.*

*Use parallel low ESR output capacitors, reduce secondary ripple currents by reducing VOR and KP.*

*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.*



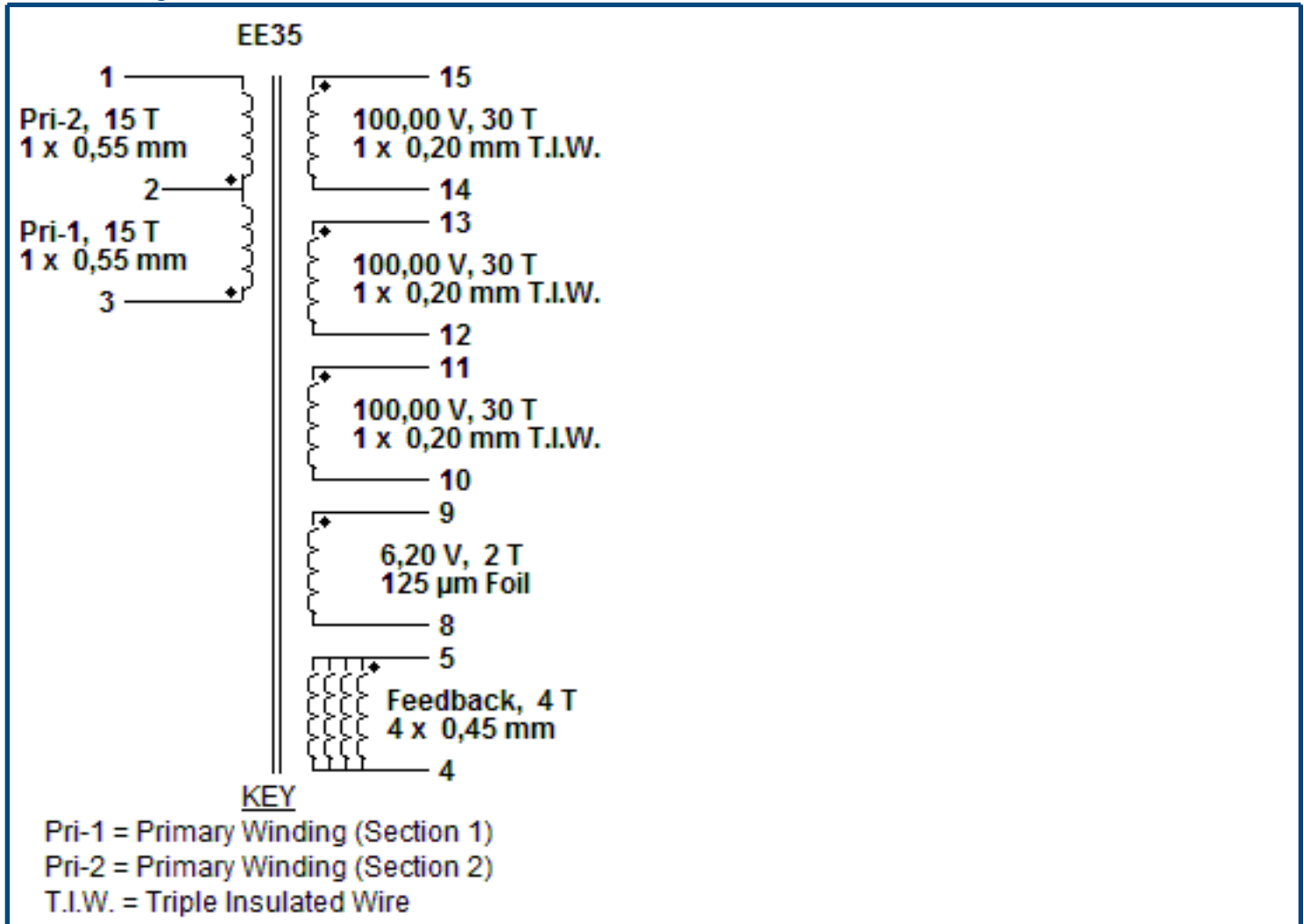
## Bill Of Materials

Ite m #	Quantity	Part Ref	Value	Description	Mfg	Mfg Part Number
1	1	BR1	DF06M	600 V, 1 A, Standard Recovery Bridge, DFM	International Rectifier	DF06M
2	1	C1	330 nF	330 nF, 275 VAC, Film, X Class	Panasonic	ECQ-UAAF334K
3	1	C2	82 µF	82 µF, 400 V, High Voltage Al Electrolytic, (35 mm x 14,5 mm)	United Chemi-Con	EPAG400VB82RM14X35LL
4	1	C3	5,6 nF	5,6 nF, 1 kV, High Voltage Ceramic	Panasonic	ECK-D3A562KBN
5	1	C4	100 nF	100 nF, 16 V, Ceramic, X7R	TDK	C1005X7R1C104K
6	1	C5	100 pF	100 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H101J
7	1	C6	4,7 µF	4,7 µF, 50 V, Electrolytic, Gen Purpose, 1060 mΩ, (11 mm x 5 mm)	United Chemi-Con	EKMG500ELL4R7ME11D
8	1	C7	0,68 nF	0,68 nF, 250 VAC, Ceramic, Y Class	Vishay Cera-Mite	440LT68-R
9	1	C8	470 pF	470 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H471J
10	3	C9, C10, C11	15 pF	15 pF, 1 kV, High Voltage Ceramic	Panasonic	ECC-D3A150JGE
11	1	C12	10 µF	10 µF, 50 V, Electrolytic, Gen Purpose, 1050 mΩ, (11,5 mm x 5 mm)	Panasonic	ECA-1HHG100
12	1	C13	10 pF	10 pF, 100 V, Ceramic, C0G	Epcos	B37979N1100J000
13	2	C14, C15	3300 µF	3300 µF, 10.0 V, Electrolytic, Super Low ESR, 18 mΩ, (25 mm x 12,5 mm)	United Chemi-Con	EKZE100ELL332MK25S
14	1	C16	100 µF	100 µF, 10.0 V, Electrolytic, Low ESR, 500 mΩ, (11,5 mm x 5 mm)	United Chemi-Con	ELXZ100ELL101MEB5D
15	3	C17, C19, C21	33 µF	33 µF, 160 V, Electrolytic, Low ESR, 1300 mΩ, (20 mm x 10 mm)	United Chemi-Con	KMX160VB33RM10X20LL
16	3	C18, C20, C22	100 µF	100 µF, 160 V, Electrolytic, Low ESR, 310 mΩ, (20 mm x 18 mm)	United Chemi-Con	KMX160VB101M18X20LL
17	1	D1	FR257	1000 V, 2,5 A, Fast Recovery, 500 ns, R-3	Rectron	FR257
18	1	D2	1N4148	100 V, 0,3 A, Fast Recovery, 8 ns, DO-35	Vishay	1N4148
19	1	D3	MBR1045	45 V, 10 A, Schottky, TO-220AC	Vishay	MBR1045
20	3	D4, D5, D6	UF4005	600 V, 1 A, Ultrafast Recovery, 75 ns, DO-41	Vishay	UF4005
21	1	F1	1 A	250 VAC, 1 A, Radial TR5, Time Lag Fuse	Littelfuse / Wickmann(R)	37411000410
22	1	HS1		41,6 mm x 20 mm. Aluminum Alloy (3003 OR 5052), 1.6 mm thickness. Heatsink for use with Device U1.	Custom	
23	1	HS2		83,8 mm x 20 mm. Aluminum Alloy (3003 OR 5052), 1.6 mm thickness. Heatsink for use with Rectifier D3.	Custom	
24	1	L1	6 mH	6 mH, 1,6 A	Panasonic	ELF18N016
25	1	L2	3,3 µH	3,3 µH, 5,5 A	Bourns Inc.	RL622-3R3K-RC
26	3	L3, L4, L5	3,3 µH	3,3 µH, 2,66 A	Bourns Inc.	RL822-3R3K-RC
27	2	R1, R2	1,1 MΩ	1,1 MΩ, 5 %, 0,25 W, Thick Film	Generic	
28	2	R3, R4	3,3 kΩ	3,3 kΩ, 5 %, 2 W, Metal Oxide Film	Generic	
29	1	R5	5,1 Ω	5,1 Ω, 5 %, 0,25 W, Thick Film	Generic	
30	1	R6	100 kΩ	100 kΩ, 1 %, 0,25 W, Thick Film	Generic	
31	1	R7	124 kΩ	124 kΩ, 1 %, 0,125 W, Thick Film	Generic	

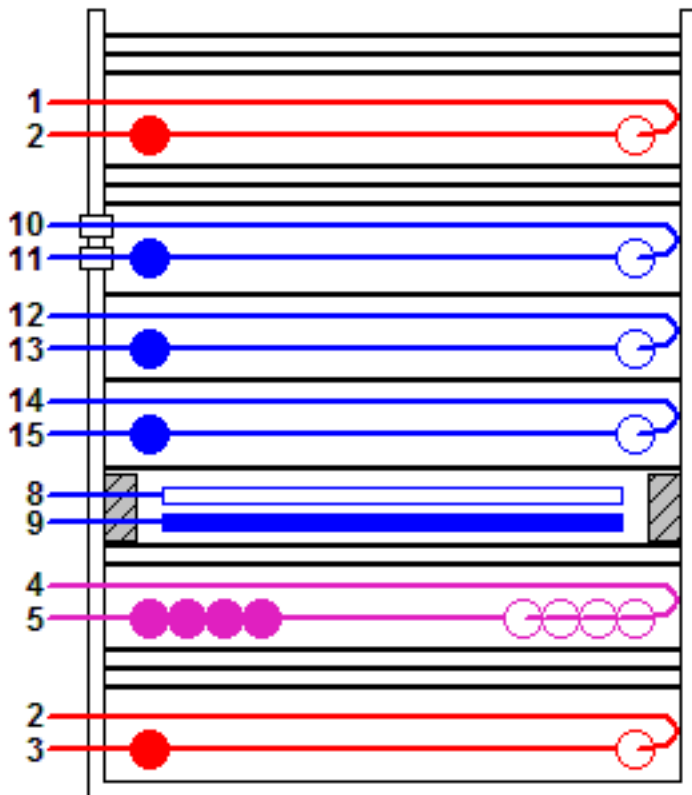
32	1	R8	2 $\Omega$	2 $\Omega$ , 5 %, 0,125 W, Thick Film	Generic	
33	1	R9	22 $\Omega$	22 $\Omega$ , 5 %, 0,25 W, Thick Film	Generic	
34	3	R10, R11, R12	680 $\Omega$	680 $\Omega$ , 5 %, 0,5 W, Thick Film	Generic	
35	1	R13	2,2 k $\Omega$	2,2 k $\Omega$ , 5 %, 0,125 W, Thick Film	Generic	
36	1	R14	140 k $\Omega$	140 k $\Omega$ , 1 %, 0,25 W, Thick Film	Generic	
37	1	R15	30,9 k $\Omega$	30,9 k $\Omega$ , 1 %, 0,125 W, Thick Film	Generic	
38	1	RT1	7 $\Omega$	NTC Thermistor 7 $\Omega$ , 5 A	Thermometrics	CL-50
39	1	T1	EE35	PC95 Core Material See Transformer Construction's Materials List for complete information	TDK	PC40EI35-Z
40	1	U1	LNK6769E	LinkSwitch-HP, LNK6769E, eSIP-7C	Power Integrations	LNK6769E
41	1	VR1	P6KE120A	120 V, 5 W, 5 %, DO-204AC, TVS	Vishay	P6KE120A
42	1			52 mm <sup>2</sup> area on Copper PCB. 2 oz (70 $\mu$ m) thickness. Heatsink for use with Rectifier D4.	Custom	
43	1			52 mm <sup>2</sup> area on Copper PCB. 2 oz (70 $\mu$ m) thickness. Heatsink for use with Rectifier D5.	Custom	
44	1			52 mm <sup>2</sup> area on Copper PCB. 2 oz (70 $\mu$ m) thickness. Heatsink for use with Rectifier D6.	Custom	

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

Electrical Diagram



Mechanical Diagram




 Primary Winding (Section 2)

 100,00 V

 100,00 V


 100,00 V


 6,20 V


 Feedback Winding

 Primary Winding (Section 1)

#### KEY

 Mechanical start of winding (also denotes electrical phase)

 Mechanical start of foil winding (also denotes electrical phase)

 Direction of winding (clockwise)

## Winding Instruction

### Primary Winding (Section 1)

Start on pin(s) 3 and wind 15 turns (x 1 filar) of item [6]. in 1 layer(s) from left to right. Winding direction is clockwise. 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.

### Feedback Winding

Start on pin(s) 5 and wind 4 turns (x 4 filar) of item [7]. Winding direction is clockwise. Spread the winding evenly across entire bobbin. Finish this winding on pin(s) 4.

Add 2 layers of tape, item [3], for insulation.

### Secondary Winding

Use 3 mm margin (item [9]) on the top and 3 mm margin on the bottom (to meet safety). Start on pin(s) 9 and wind 2 turns of item [8]. Winding direction is clockwise. Finish this winding on pin(s) 8.

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

Start on pin(s) 15 and wind 30 turns (x 1 filar) of item [10]. Spread the winding evenly across entire bobbin. Winding direction is clockwise. Finish this winding on pin(s) 14.

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

Start on pin(s) 13 and wind 30 turns (x 1 filar) of item [10]. Spread the winding evenly across entire bobbin. Winding direction is clockwise. Finish this winding on pin(s) 12.

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

Start on pin(s) 11 and wind 30 turns (x 1 filar) of item [10]. Spread the winding evenly across entire bobbin. Winding direction is clockwise. Finish this winding on pin(s) 10.

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

### Primary Winding (Section 2)

Start on pin(s) 2 and wind 15 turns (x 1 filar) of item [6]. in 1 layer(s) from left to right. Winding direction is clockwise. 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].

#### Flux-Band

Construct a flux band by wrapping a single shorted turn of item [4] around the outside of windings and core halves with tight tension. Make an electrical connection to pin(s) 1 using wire.

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

#### Varnish

Dip varnish uniformly in item [5]. Do not vacuum impregnate.

## Comments

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

## Materials

Item	Description
[1]	Core: EE35, PC95, gapped for ALG of 289 nH/T <sup>2</sup>
[2]	Bobbin: Generic, 7 pri. + 7 sec.
[3]	Barrier Tape: Polyester film [1 mil (25 µm) base thickness], 15,70 mm wide
[4]	Copper Tape: 50 µm thick
[5]	Varnish
[6]	Magnet Wire: 0.55 mm, Solderable Double Coated
[7]	Magnet Wire: 0.45 mm, Solderable Double Coated
[8]	Copper Foil: 125 µm thick, 9,70 mm wide, covered with 1 layer of lapped tape. Terminations to foil: 2 x 0.6 mm magnet wire with sleeving
[9]	Tape: Polyester web 3 mm wide
[10]	Triple Insulated Wire: 0.2 mm

## Electrical Test Specifications

Parameter	Condition	Spec
Electrical Strength, VAC	60 Hz 1 second, from pins 1,2,3,4,5 to pins 8,9,10,11,12,13,14,15.	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.	252
Tolerance, ±%	Tolerance of Primary Inductance	10,0
Maximum Primary Leakage, µH	Measured between Pin 1 to Pin 3, with all other Windings shorted.	5,04

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.

	<b>Description</b>	<b>Fix</b>	<b>Ref. #</b>
	<i>Actual number of pins available on bobbin is not enough to build the transformer.</i>	<i>Select or Add a bobbin to the component database with sufficient pins, or reassign pins on the existing bobbin.</i>	570
	<i>Drain voltage close to BVDSS at maximum OV threshold.</i>	<i>Verify BVDSS during line surge, decrease VUVON_MAX or reduce VOR.</i>	237