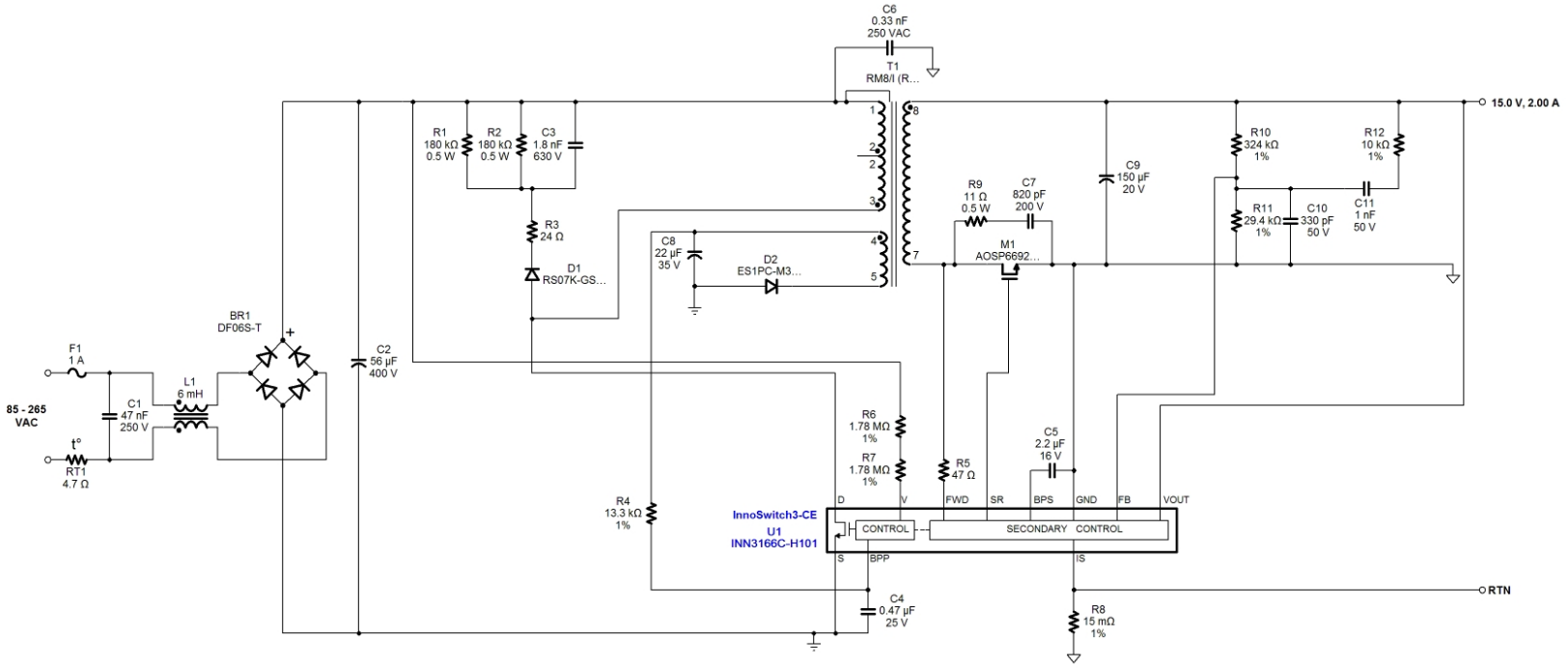


Schematic components that have been frozen by the user will appear with blue reference designators.

For any information regarding user added Shield or Screen and additional EMI features implemented in the Transformer, review Magnetics Designer.

Power Supply Input

Var	Value	Units	Description
VACMIN	85	V	Minimum Input AC Voltage
VACNOM	115	V	Nominal AC Voltage (For universal designs low line nominal voltage is displayed)
VACMAX	265	V	Maximum Input AC Voltage
FL	50	Hz	Line Frequency
η	88.0	%	Efficiency Estimate (Target)
TC	2.71	ms	Input Rectifier Conduction Time
Z	0.52		Loss Allocation Factor
VMIN	77.8	V	Minimum DC Input Voltage
VMAX	374.8	V	Maximum DC Input Voltage
ENCLOSURE	Adapter		Enclosure
TAMB	60	°C	Maximum Operating Ambient air Temperature

Input Section

Var	Value	Units	Description
Fuse	1.00	A	Input Fuse Rated Current
IAVG	0.42	A	Average Diode Bridge Current (DC Input Current)
Thermistor	4.70	Ω	Input Thermistor

Device Variables

Var	Value	Units	Description
Device	INN3166C-H101		PI Device Name (Manual Overwrite)
Current Limit Mode	Standard		Device Current Limit Mode (Manual Overwrite)
BVDSS	650	V	Drn-Src Bkdn Voltage
ILIMITMIN	1.162	A	Minimum Current Limit
ILIMITTYP	1.250	A	Typical Current Limit
ILIMITMAX	1.337	A	Maximum Current Limit
RDSON	2.02	Ω	PI Device RDSON (100°C)
RDSON_25C	1.30	Ω	PI Device RDSON (25°C)
PO	30.00	W	Total Output Power
VOR	89.00	V	Reflected Output Voltage
VDS	0.84	V	On state Drain to Source Voltage
FS	60181	Hz	Switching Frequency (at VMIN and Full Load)
KP	0.555		Continuous/Discontinuous Operating Ratio (at VMIN and Full Load)
DMAX	0.536		Maximum Duty Cycle (at VMIN and Full Load)
TIME_OFF	7.71	µs	Expected Device Off-time (at VMIN and Full Load)
TIME_ON	14.97	µs	Primary controller on-time
IP	1.187	A	Peak Primary Current (at VMIN and Full Load)
IR	0.817	A	Primary Ripple Current (at VMIN and Full Load)

IRMS	**0.595**	A	Primary RMS Current (at VMIN and Full Load)
UVOV_PRIORITY	**Overvoltage**		Input Undervoltage/Overvoltage Priority type
RTH_DEVICE	**76.31**	°C/W	PI Device Heatsink Maximum Thermal Resistance
DEV_HSINK_TYPE	**2 Oz (70 µ) 2-Sided Copper PCB**		PI Device Heatsink Type
DEV_HSINK_AREA	**104**	mm²	PI Device Heatsink Area

Clamp Circuit

Var	Value	Units	Description
Clamp Type	**RCD Clamp**		Clamp Circuit Type
VCLAMP_ESTIMATED	**208.56**	V	Estimated Clamping Voltage above VMAX
VDRAIN Estimated	**583.33**	V	Estimated Drain Voltage

Primary Bias Variables

Var	Value	Units	Description
VBMIN	**11.4**	V	Minimum Bias Voltage
VBMAX	**30.5**	V	Maximum Bias Voltage
Circuit Type	**Simple Resistor**		Bias Circuit Type
PIVB	**85**	V	Bias Rectifier Maximum Peak Inverse Voltage
NB	**13**		Primary Bias Winding Number of Turns

Transformer Construction Parameters

Var	Value	Units	Description
Core Type	**RM8/I (RM8/I-3F3)**		Core Type
Core Material	**3F3**		Core Material (Manual Overwrite)
LP_nom	**1161**	µH	Nominal Primary Inductance
LP_Tol	**5.0**	%	Primary Inductance Tolerance
NP	**89.0**		Calculated Primary Winding Total Number of Turns
NSM	**15**		Secondary Main Number of Turns (Manual Overwrite)
CMA	**266.55**	Cmils/A	Primary Winding Current Capacity
BW	**8.60**	mm	Bobbin Winding Width
FF	**91.93**	%	Actual Transformer Fit Factor. 100% signifies fully utilized winding window
AE	**63.00**	mm²	Core Cross Sectional Area
ALG	**147**	nH/T²	Gapped Core Specific Inductance
BM	**2544**	Gauss	Maximum Flux Density
BP	**2976**	Gauss	Peak Flux Density
BAC	**1272**	Gauss	AC Flux Density for Core Loss
LG	**0.514**	mm	Estimated Gap Length
L_LKG	**27.89**	µH	Estimated primary leakage inductance
LSEC	**20**	nH	Secondary Trace Inductance

Primary Winding Section 1

Var	Value	Units	Description
NP1	**45**		Number of Primary Winding Turns in the First Section of Primary

L	**2.00**		*Primary Winding - Number of Layers*

Primary Winding Section 2

Var	*Value*	*Units*	*Description*
NP2	**44**		*Rounded (Integer) Number of Primary winding turns in the second section of primary*
L2	**1.96**		*Primary Number of Layers in 2nd split winding*

Output 1

Var	*Value*	*Units*	*Description*
VO	**15.00**	*V*	*Typical Output Voltage*
IO	**2.00**	*A*	*Output Current*
VOUT_ACTUAL	**15.00**	*V*	*Actual Output Voltage*
Cable Drop Compensation	**0**	*mV*	*Cable Drop Compensation*
NS	**15**		*Secondary Number of Turns*
L_S_OUT	**2.00**		*Secondary Output Winding Layers*
PIVS	**78.16**	*V*	*Output Rectifier Maximum Peak Inverse Voltage*
ISP	**7.041**	*A*	*Peak Secondary Current*
ISRMS	**3.286**	*A*	*Secondary RMS Current*
ISRMS_WINDING	**3.286**	*A*	*Secondary Winding RMS Current*
CMAS	**312**	*Cmils/A*	*Secondary Winding Current Capacity*
RTH_RECTIFIER	**223.77**	*°C/W*	*Output Rectifier Heatsink Maximum Thermal Resistance*
OR_HSINK_TYPE	**2 Oz (70 µ) 2-Sided Copper PCB**		*Output Rectifier Heatsink Type*
OR_HSINK_AREA	**104**	*mm²*	*Output Rectifier Heatsink Area*
OSR_RDSON	**11.00**	*mΩ*	*Synchronous Rectifier RDSON*
CO	**150 x 1**	*µF*	*Output Capacitor - Capacitance*
IRIPPLE	**2.608**	*A*	*Output Capacitor - RMS Ripple Current*
Expected Lifetime	**24858**	*hr*	*Output Capacitor - Expected Lifetime*

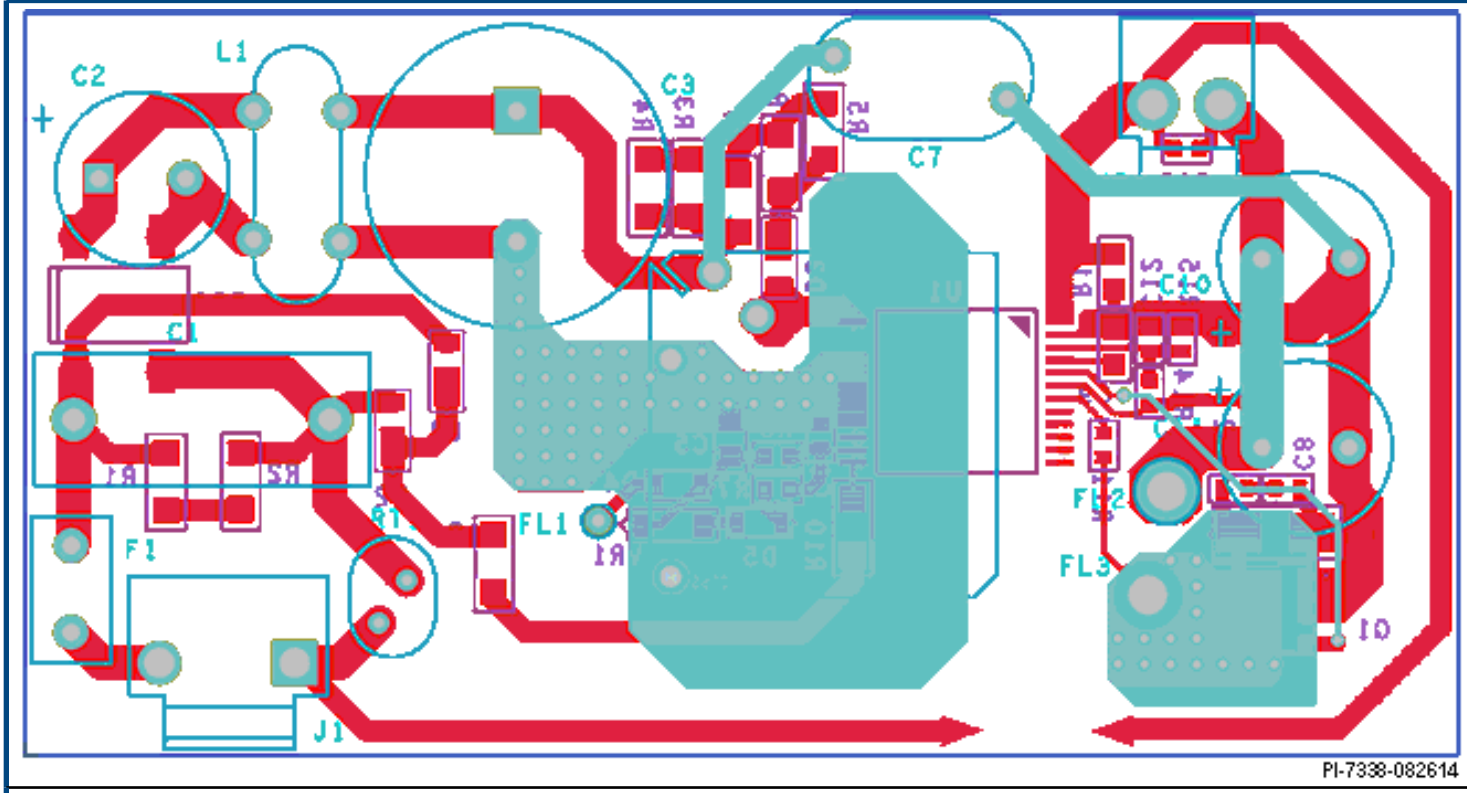
Feedback Circuit

Var	*Value*	*Units*	*Description*
DUAL_OUTPUT_FB_FLAG	**NO**		*Get feedback from 2 outputs*

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 secondary winding, the output rectifier and the output filter capacitor*	
2	*Y-capacitor connected directly to the DC pin of the primary and secondary GND*	
3	*Minimize loop area formed by drain, clamp and transformer*	
4	*Maximize hatched area for heat-sinking*	
5	*Minimize loop area formed by drain, input capacitor and transformer*	
6	*Spark gaps with adequate creepage help in steering away the destructive energy created during an ESD event through the protection components such as the Y-cap.*	
7	*The BYPASS pin capacitor should be located as close as possible to the BYPASS and SOURCE pins*	

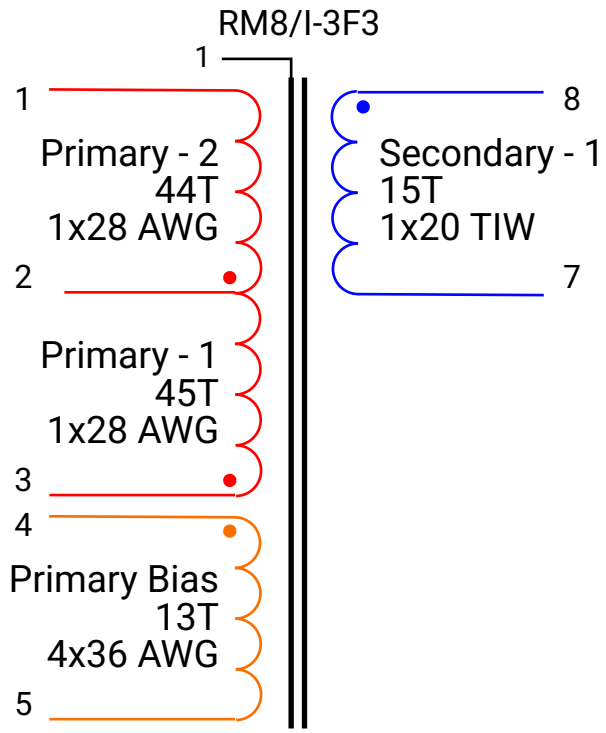
Bill Of Materials

Item #	Quantity	Part Ref	Value	Description	Mfg	Mfg Part Number
1	1	BR1	DF06S-T	600 V, 1 A, Standard Recovery Bridge, DFS	Diodes Inc.	DF06S-T
2	1	C1	47 nF	47 nF, 250 V, Film, X Class	Murata	GA355ER7GB473KW01L
3	1	C2	56 µF	56 µF, 400 V, High Voltage Al Electrolytic, (25 mm x 20 mm)	Nichicon	LGU2G560MELY
4	1	C3	1.8 nF	1.8 nF, 630 V, High Voltage Ceramic	TDK	C3216C0G2J182J115AA
5	1	C4	0.47 µF	0.47 µF, 25 V, Ceramic, X7R	Kemet	C0805C474K3RAC7800
6	1	C5	2.2 µF	2.2 µF, 16 V, Ceramic, X7R	TDK	CGA4J3X7R1C225K125AB
7	1	C6	0.33 nF	0.33 nF, 250 VAC, Ceramic, Y Class	Murata	GA342DR7GF331KW02L
8	1	C7	820 pF	820 pF, 200 V, High Voltage Ceramic	AVX Corp	08052C821KAT2A
9	1	C8	22 µF	22 µF, 35 V, Electrolytic, Gen Purpose, 100 mΩ, (5 mm x 5.8 mm)	Panasonic	EEH-ZA1V220R
10	1	C9	150 µF	150 µF, 20 V, Al Organic Polymer, 20 mΩ, (12.2 mm x 10 mm)	United Chemi-Con	APXA200ARA151MJC0G
11	1	C10	330 pF	330 pF, 50 V, Ceramic, C0G	TDK	FK18C0G1H331J
12	1	C11	1 nF	1 nF, 50 V, Ceramic, C0G	Kemet	C410C102J5G5TA7200
13	1	D1	RS07K-GS08	800 V, 1.4 A, Fast Recovery, 300 ns, DO-219AB	Vishay	RS07K-GS08
14	1	D2	ES1PC-M3/84A	150 V, 1 A, Standard Recovery, DO-214AC	ON Semiconductor	ES1PC-M3/84A
15	1	F1	1 A	250 VAC, 1 A, Radial TR5, Time Lag Fuse	Littelfuse / Wickmann(R)	37411000410
16	1	L1	6 mH	6 mH, 1.6 A	Panasonic	ELF18N016
17	1	M1	AOSP66923	MOSFET, N-Channel, 100 V, 9.5 A, SOIC-8	Alpha & Omega Semiconductor Inc.	AOSP66923
18	2	R1, R2	180 kΩ	180 kΩ, 5 %, 0.5 W, Thick Film	Generic	
19	1	R3	24 Ω	24 Ω, 5 %, 0.125 W, Thick Film	Generic	
20	1	R4	13.3 kΩ	13.3 kΩ, 1 %, 0.125 W, Thick Film	Generic	
21	1	R5	47 Ω	47 Ω, 5 %, 0.125 W, Thick Film	Generic	
22	2	R6, R7	1.78 MΩ	1.78 MΩ, 1 %, 0.25 W, Thick Film	Generic	
23	1	R8	15 mΩ	15 mΩ, 1 %, 0.125 W, Metal Film	Generic	
24	1	R9	11 Ω	11 Ω, 5 %, 0.5 W, Thick Film	Generic	
25	1	R10	324 kΩ	324 kΩ, 1 %, 0.125 W, Thick Film	Generic	
26	1	R11	29.4 kΩ	29.4 kΩ, 1 %, 0.125 W, Thick Film	Generic	
27	1	R12	10 kΩ	10 kΩ, 1 %, 0.125 W, Thick Film	Generic	
28	1	RT1	4.7 Ω	NTC Thermistor 4.7 Ω, 3 A	TDK	B57153S0479M000
29	1	T1	RM8/I (RM8/I-3F3)	3F3 Core Material Refer to Manufacturer datasheet for a number of parts to purchase	Ferroxcube	RM8/I-3F3
30	1	T1 Bobbin	RM8/I - 1 (P6-S6)	Bobbin Material : Polybutyleneterephthalate (PBT)	Ferroxcube	CPV-RM8/I-1S-12PD
31	1	T1 Core Acc.1	CLI/P-RM8/I	Mounting clip with earth pin . Stainless steel (CrNi)	Ferroxcube	CLI/P-RM8/I

32	1	T1 Core Acc.2	CLI-RM8/I	Mounting clip without earth pin . Stainless steel (CrNi)	Ferroxcube	CLI-RM8/I
33	1	U1	INN3166C-H101	InnoSwitch3-CE, INN3166C-H101, inSOP-24D	Power Integrations	INN3166C-H101
34	1			104 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Device U1.	Custom	
35	1			104 mm² area on Copper PCB. 2 oz (70 µm) thickness. Heatsink for use with Rectifier M1.	Custom	

TRANSFORMER CONSTRUCTION REPORT

Electrical Diagram



Winding info

Stack Fill Factor: 91.93%;
Total Copper Weight: 6.02g
Copper Loss: 1.487W; Total Transformer Loss: 1.606W

18.47%H; Primary - 1; IRMS = 0.6A;
2L; 45T; 1x28 AWG; CMA = 266.55 Cmils/A; LENw = 151.1 cm;
RDC = 413.86 mΩ; RAC = 463.1 mΩ; WeightCU = 1.09 g;
Pw = 153.25 mW;

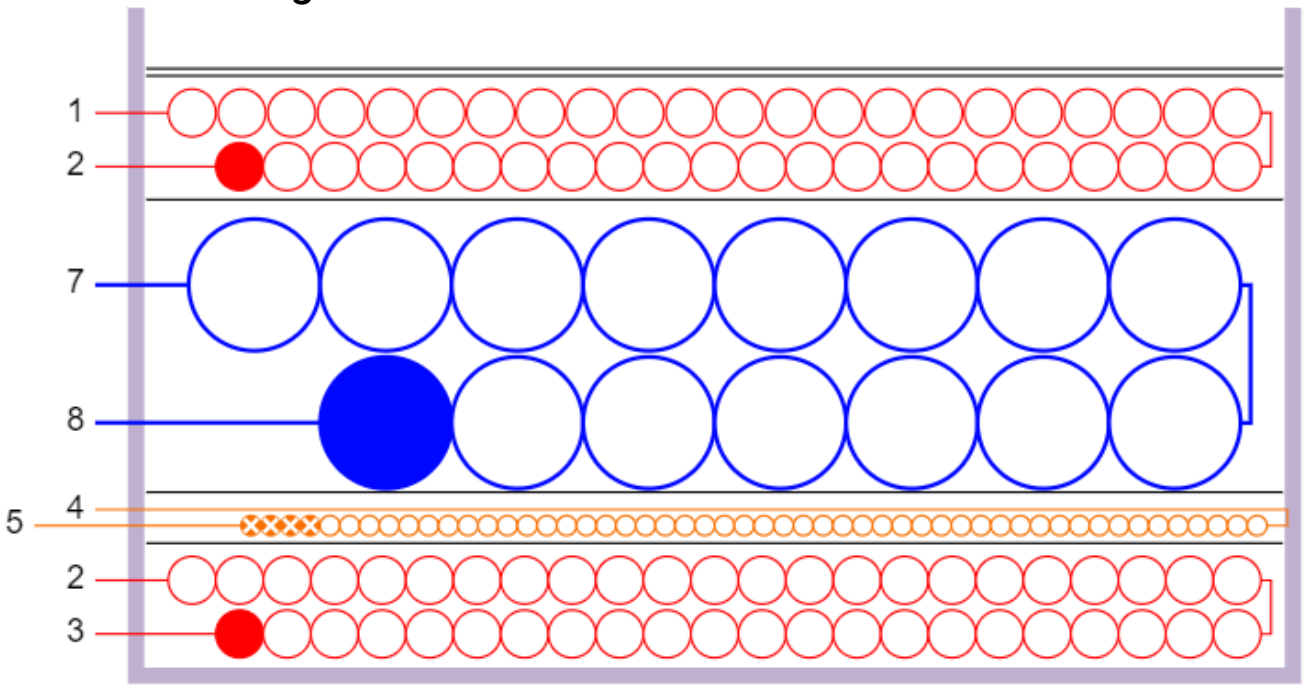
4.33%H; Primary Bias; IRMS = 0.01A;
1L; 13T; 4x36 AWG; LENw = 48.3 cm;

50.03%H; Secondary - 1; IRMS = 3.29A;
2L; 15T; 1x20 TIW; CMA = 311.75 Cmils/A; LENw = 65.6 cm;
RDC = 27.82 mΩ; RAC = 118.3 mΩ; WeightCU = 3.05 g;
Pw = 1102.77 mW;

19.09%H; Primary - 2; IRMS = 0.6A;
1.96L; 44T; 1x28 AWG; CMA = 266.55 Cmils/A; LENw = 230.3 cm;
RDC = 630.52 mΩ; RAC = 703.57 mΩ; WeightCU = 1.66 g; Pw = 231.46 mW;

All losses shown correspond to the nominal current limit and primary winding inductance at the minimum AC voltage.

Mechanical Diagram



Building Instructions

LIST OF MATERIALS

Item	Description
[1]	Core: RM8/I-3F3, 3F3, gapped for ALG of 147 nH / T^2
[2]	Bobbin: Polybutyleneterephthalate (PBT) CPV-RM8/I-1S-12PD
[3]	Tinned copper wire 0.5mm
[4]	Varnish
[5]	Single core wire: 28 AWG (0.37 mm), insulation Heavy Build
[6]	Separation Tape: Polyester film [1 mil (25.4 micrometers) base thickness], 8.6 mm wide
[7]	Single core wire: 36 AWG (0.15 mm), insulation Heavy Build
[8]	Triple Insulated Wire: 20 AWG

WINDING INSTRUCTIONS

1. Primary - 1

Start with 1 lead(s) of Item [5] from Pin 3, and wind 45 turns in Clockwise direction in total of 2 layer(s). Wind one layer from left to right. At the end of 1st layer, continue to wind the next layer towards the beginning of the previous layer. Finish this winding on Pin 2. Add 1 layer(s) of tape, Item [6], on the top.

2. Primary Bias

Start with 4 lead(s) of Item [7] from Pin 5, and wind 13 turns in Counter-Clockwise direction in total of 1 layer(s). Wind one layer from left to right. Finish this winding on Pin 4. Add 1 layer(s) of tape, Item [6], on the top.

3. Secondary - 1

Start with 1 lead(s) of Item [8] from Pin 8, and wind 15 turns in Clockwise direction in total of 2 layer(s). Wind one layer from left to right. At the end of 1st layer, continue to wind the next layer towards the beginning of the previous layer. Finish this winding on Pin 7. Add 1 layer(s) of tape, Item [6], on the top.

4. Primary - 2

Start with 1 lead(s) of Item [5] from Pin 2, and wind 44 turns in Clockwise direction in total of 2 layer(s). Wind one layer from left to right. At the end of 1st layer, continue to wind the next layer towards the beginning of the previous layer and spread the winding evenly across the entire bobbin. Finish this winding on Pin 1. Add 2 layer(s) of tape, Item [6], on the top.

BUILDING PREPARATIONS

1. Gap the core halves to get 1161 uH +- 5.0%.

FINISHING INSTRUCTIONS

1. Using a piece of wire, Item [3], connect the core to Pin 1.
2. Varnish with Item [4]

ELECTRICAL PARAMETERS

Parameter	Condition	Spec
Electrical Strength	60 Hz 1 second, from pins 1,2,3,4,5 to pins 7,8.	3000 VAC
Nominal Primary Inductance	Measured at 1 V pk-pk, typical switching frequency, between pin 3 to pin 1, with all other Windings open.	1161 uH +- 5.0%
Maximum Primary Leakage	Measured between Pin 3 to Pin 1, with all other Windings shorted.	27.89 uH

Comments:

Achieving compliance to applicable safety standard may require additional considerations for transformer construction, manufacturing and methods used for termination of wires.
It is the responsibility of the user to verify that all applicable safety requirements are met and make additional changes as applicable.

Winding Parameters

Type	Power	Bias	Power	Power
Name	Primary - 1	Primary Bias	Secondary - 1	Primary - 2
Turns	45	13	15	44
Layers	2	1	2	1.96
Color	Red	Orange	Blue	Red
Wire Type	Single Core	Single Core	Single Core	Single Core
Wire Size, AWG	28	36	20	28
Wire Grade	Heavy Build	Heavy Build	TIW	Heavy Build
Filar	1	4	1	1
Wire Tolerance, %	0	0	0	0
Split	Series	False	False	Series
Continuous Pin	None	-	-	None
Spread	NO	NO	NO	YES
Arrangement	Independent	Independent	Independent	Independent
Direction	Clockwise	Counter-Clockwise	Clockwise	Clockwise
Z winding	NO	NO	NO	NO
Opposite start	NO	NO	NO	NO
Winding Start	Pin	Pin	Pin	Pin
Winding End	Pin	Pin	Pin	Pin
Start Pin	3	5	8	2
End Pin	2	4	7	1
Sleeving	None	None	None	None
Connection	Split	Floating	Floating	Split
Margin Left	0	0	0	0
Margin Right	0	0	0	0
Tape Between Layers	NO	NO	NO	NO
Tape Between Lead & Winding	NO	NO	NO	NO
Tape on top	1	1	1	2
Tape Thickness, mm	0.0254	0.0254	0.0254	0.0254
CMA, Cmils/A	266.55	10000	311.75	266.55

Core/Coil Former Parameters

Core Type	RM8/I (RM8/I-3F3)
Part Number	RM8/I-3F3
Core Material	3F3
Coil Former Part Number	CPV-RM8/I-1S-12PD
Bobbin type	Vertical
Available Pins	12
Total BW, mm	8.6
BFW, mm	4.1
Bobbin Window Length, mm	8.6
X-Tolerance, %	0
Maximum Stack Height, mm	4.1
Y-Tolerance, %	0
External shielding	Core AC Grounded
Core connect to	1

Design Specifications

Magnetizing Inductance Tolerance (LP_Tol), %	5.0
Frequency (FS), Hz	60181
Reflected Output Voltage (VOR), V	89.00
Main Turns (NSM)	15

Set-Point	1
ILIMIT Tolerance	Min
LP Tolerance	Min
VACMIN [V]	85
VMIN [V]	77.8
INDUCTANCE [uH]	1102.92
ILIMIT [A]	1.16
PO [W]	30.00
VO [V]	15.00
IO [A]	2.00
FS [Hz]	60181
VOR [V]	89.00
DMAX	0.536
KP	0.571
TIME_ON [µs]	8.91
TIME_OFF [µs]	7.71
IAVG [A]	0.42
IP [A]	1.089
IRMS [A]	0.585
ISP [A]	6.463
IRIPPLE [A]	2.533
BM [Gauss]	2143
BP [Gauss]	2340
BAC [Gauss]	1071
ISRMS [A]	3.228
NP	89.0
N_ACTUAL [%]	85.74

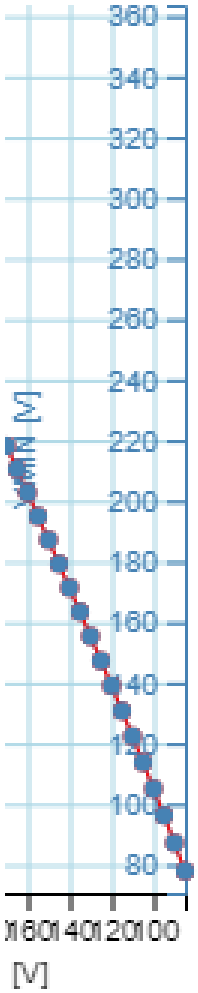
Design Evaluation

LOAD [%]	100
VAC [V]	85
Set-Point	1
ILIMIT Tolerance	MIN
LP Tolerance	MIN

Components	Loss (W)	Rth (C/W)	Temp. Rise (C)
Total Losses	4.990		
INPUT STAGE	1.742		
Common Mode Choke	0.176		
Thermistor	0.342		
Input Bridge Rectifier	0.695		
Input Bulk Capacitor 1	0.530		
PI DEVICE	0.655		
Switching Losses	0.127		
Conduction Losses	0.481		
Self Consumption	0.048		
PRIMARY CLAMP CIRCUIT	0.503		
Clamp Parallel Resistor	0.279		
Clamp Series Resistor	0.039		
Clamp Blocking Diode	0.186		
PRIMARY BIAS	0.031		
Diode	0.001		
Resistor	0.029		
CONTROLLER CIRCUIT	0.064		
Line Sense Resistor 1	0.001		
Line Sense Resistor 2	0.001		
Current Sense Resistor	0.060		
Upper Feedback Resistor	0.001		
Lower Feedback Resistor	0.000		
TRANSFORMER	1.664		
Copper Loss	1.570		
Core Loss	0.094		
SECONDARY RECTIFIER	0.220		
Output Rectifier 1	0.173		
Snubber Resistor	0.047		
OUTPUT CAP	0.111		
Output Capacitor(s)	0.111		

Pie Chart

Line Chart



Note: Design parameters shown in the tool are based on calculations and approximations. Actual results will vary. Power supply designed using the tool should be tested to verify actual parameter values.