### UCC28740 DESIGN CALCULA

TI Literature Number: SLUC487B

#### Disclaimer

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### **UCC28740 CONSTANT-VOLTAGE, CONSTANT-CURRENT F**

## CLEAR ALL USER INPUT CELLS BEFORE START ALL GREEN CELLS ARE USER INI

WHERE APPLICABLE, A RECOMMENDED VALUE IS GIVEN THAT WILL BE THE BEST CHC
THE BEST INTEREST OF THE USER TO USE A VALUE AS CLOSE AS POSSIBLE TO TI
ACCURATE RESULTS, THE USER MUST ENTER THE ACTUAL VALUE U

### **DESIGN REQUIREMENTS**

INPUT SPECIFICATIONS		
Input Voltage Type, AC or DC:	AC	
Minimum Input Voltage, V <sub>INPUTmin</sub> =	85	VAC
Maximum Input Voltage, V <sub>INPUTmax</sub> =	265	VAC
Nominal Input Voltage, V <sub>INPUTnom</sub> =	230	VAC
Minimum Line Frequency, f <sub>LINEmin</sub> =	47	Hz
Minimum Input Voltage for Start-Up, V <sub>INPUTrun</sub> =	80	VAC

OUTPUT SPECIFICATIONS		
Regulated Output Voltage, Constant Voltage Mode, V <sub>OUT_CV</sub> =	85	VDC
Full Load Rated Output Current, I <sub>OUT</sub> =	0.6	A
Target Constant Current Mode Output Load Threshold, I <sub>occ</sub> =	0.6	A
Target Minimum Output Voltage During Constant Current Regulation, V <sub>OUT_CC</sub> =	30	VDC
Allowable Output Voltage Drop During Load-Step Transient in Constant Voltage Mode, V <sub>OUTA</sub> =	0.5	V
Maximum Peak to Peak Output Voltage Ripple, V <sub>RIPPLE</sub> =	30	mV

Maximum Desired Switching Frequency, User must input value not greater than 100 kHz, $f_{max}$ =	100	kHz
Output Over Voltage Protection, V <sub>OUT_OVP</sub> =	90	V
Required Positive Load Step Transient Current, I <sub>TRAN</sub> =	0.65	A
Maximum Allowable Response Time to Load Step Transient, t <sub>RESP</sub> =	20	ms
Target Maximum Stand By Power Dissipation, P <sub>SBtarget</sub> =	50	mW

COMPONENT SELECTION USER INPL			
COMPONENT	PARAMETER		
Input Capacitor, C <sub>BULK</sub>			
<b>Desired</b> Minimum Valley Voltage, V <sub>BULKvalley_desired</sub> =	100	V	
Recommended Input Bulk Capacitance, C <sub>BULK</sub> =	233.16	μF	
Actual Input Bulk Capacitance, C <sub>BULK</sub> , Used =	250.00	μF	
Output Rectifier, D <sub>out</sub>			
Forward Voltage Drop of Output Rectifier, V <sub>F</sub> =	1.25	V	
Output Inductor, L <sub>out</sub>			
DCR of Output Inductor, DCR <sub>Lout</sub> , if used =	0	mΩ	
Flyback Transformer, Primary to Secondary Turns Ratio			
Ideal Primary to Secondary Turns Ratio, N <sub>PSideal</sub> =	1.313		
<b>Actual</b> Primary to Secondary Turns Ratio Used, N <sub>PS</sub> =	1.321	Enter Actual N <sub>PS</sub> of Transformer Used	
Current Sense Resistor, R <sub>cs</sub>			
Recommended Current Sense Resistor, R <sub>cs</sub> =	0.339	Ω	
Actual Current Sense Resistor Used, R <sub>cs</sub> =	0.374	Ω	
Flyback Transformer, T			
Recommended Primary Inductance Value, L <sub>P</sub> =	260.316	μH	

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<b>Actual</b> Primary Inductance Used, L <sub>P</sub> =	250.000	μН
Recommended Primary to Auxillary Turns Ratio, N <sub>PA</sub> =	4.392	Suggested N <sub>P</sub>
<b>Actual</b> Primary to Auxiliary Turns Ratio, N <sub>PA</sub> =	4.625	Enter Actual N <sub>PA</sub> of Transformer Used
MOSFET Switch, Q		
Required Drain to Soure Voltage Rating , V <sub>DSrated</sub> =	635.314	V
MOSFET Rated Drain to Source Voltage, V <sub>DS</sub> =	800	V
Output Capacitance of Selected MOSFET, C <sub>oss</sub> =	16	pF
Drain to Source On-Resistance of Selected MOSFET, $R_{DSon}$ =	0.36	Ω
MOSFET Fall Time, t <sub>f</sub> =	6	ns
MOSFET Turn Off Delay Time, t <sub>Doff</sub> =	40	ns
MOSFET Total Gate Charge, Q <sub>g</sub> =	30	nC
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Output Capacitor, C <sub>out</sub>		
Recommended Minimum Output Capacitance, C <sub>OUT</sub> =	470.000	μF
Actual Minimum Output Capacitance, C <sub>OUT</sub> =	540.000	μF
Recommended Maximum ESR, ESR <sub>Cout</sub> =	10.988	mΩ
Actual ESR of C <sub>OUT</sub> Used, ESR <sub>Cout</sub> =	50.000	mΩ
Bridge Rectifier, D <sub>BRIDGE</sub>		
Forward Voltage Drop, V <sub>F BRIDGE</sub> =	1.1	V
Auxiliary Winding Rectifier, D <sub>AUX</sub>		
Auxiliary Rectifier Forward Voltage Drop, V <sub>FA</sub> =	1.25	V
Input Line Voltage Turn On Resistor, R <sub>vs1</sub>	1	_
Recommended Value for R <sub>VS1</sub> , R <sub>VS1</sub> =	90.900	kΩ
<b>Actual</b> Value for R <sub>VS1</sub> , R <sub>VS1</sub> =	90.900	kΩ
Output Over Voltage Resistor, R <sub>vs2</sub>		1
Recommended Value for R <sub>VS2</sub> , R <sub>VS2</sub> =	20.500	kΩ
Actual Value for R <sub>VS2</sub> , R <sub>VS2</sub> =	20.500	kΩ
Line Compensation Resistor, R <sub>LC</sub>	4 455	l. 0
Recommended Value for R <sub>LC</sub> , R <sub>LC</sub> =	1.400	kΩ
Actual Value for R <sub>LC</sub> , R <sub>LC</sub> =	1.400	kΩ
Loop Compensation Components, R <sub>FB1</sub> , R <sub>FB2</sub> , R <sub>TL</sub> , R <sub>OPT</sub> , C <sub>FB</sub> , C <sub>EXT</sub>		
Reference Voltage of Shunt Regulator, i.e. TL431, V <sub>REF431</sub> =	2.5	V
Maximum Reference Input Current of Shunt Regulator, I <sub>REF431</sub> =	4	μA
<b>Recommended</b> Value for $R_{FB2}$ , $R_{FB2}$ =	44.2	kΩ

Actual Value for R <sub>FB2</sub> , R <sub>FB2</sub> =	44.2	kΩ
<b>Recommended</b> Value for $R_{FB1}$ , $R_{FB1}$ =	1470	kΩ
<b>Actual</b> Value for $R_{FB1}$ , $R_{FB1}$ =	1470	kΩ
Minimum Current Transfer Ratio of Selected Opto-Coupler, CTR <sub>min</sub> =	50	%
Response Fall Time of Opto-Coupler, $t_{f_{-opto}}$ =	18	μS
$R_L$ of Specified Opto-Coupler Fall Time, $R_{L\_opto}$ =	100	Ω
Cut-Off Frequency of Opto-Coupler, f <sub>c opto</sub> =	2	kHz
Input Forward Voltage of Opto-Coupler, V <sub>F_opto</sub> =	1.2	V
<b>Recommended</b> External Capacitor Across Opto-Coupler Output, $C_{EXT}$ =	0	μF
Actual Value for C <sub>EXT</sub> Used , C <sub>EXT</sub> =	0.0015	μF
Recommended Capacitor on Opto_Coupler Emitter, C <sub>FB</sub> =	0.047	μF
Actual Value for C <sub>FB</sub> Used, C <sub>FB</sub> =	0.047	μF
<b>Recommended</b> Value For $R_{FB4}$ , $R_{FB4}$ =	22	kΩ
Actual Value for R <sub>FB4</sub> Used	22	kΩ
<b>Recommended</b> Value for Shunt Regulator Bias Resistor, $R_{TL}$ =	1.5	kΩ
<b>Actual</b> Value of Shunt Regulator Bias Resistor Used, $R_{TL}$ =	1.5	kΩ
<b>Recommended</b> Value for Compensation Capacitor, $C_z$ =	220	pF
<b>Actual</b> Value of Compensation Capacitor Used, $C_z$ =	1500	pF

## ATOR TOOL

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### **FLYBACK DESIGN CALCULATOR**

# ING A NEW DESIGN PUTS

DICE TO MEET THE GIVEN SPECIFICATION. IT IS IN HE SUGGESTED RECOMMENDED VALUE. FOR SED IN THE APPROPRIATE CELL.

Choose either AC or DC
For universal line enter 47 Hz
Recommend target to be a minimum of 5% higher than rated lout
Recommend target to be a minimum of 5% higher than rated lout
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Recommend target to be a minimum of 5% higher than rated lout

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JTS COMMENT	
Used to determine the required input bulk capacitor at minimum line, full load. For DC input, use $V_{INPUTrun}$	
Using a value less than recommended will result in a minimum valley voltage less than desired, requiring a larger power stage to accommodate the higher currents due to the lower input rail. Using a value larger than recommended will result in a higher input rail and lower currents on the power stage but higher peak current in the input capacitor itself.	
Enter actual input bulk capacitor used	
Enter V <sub>F</sub> at full load	
Enter 0 if no secondary LC filter used	
Recommended N <sub>PS</sub>	
Recommended R <sub>cs</sub>	
Enter Actual R <sub>cs</sub> Used	locc will be less than target locc becar
	l

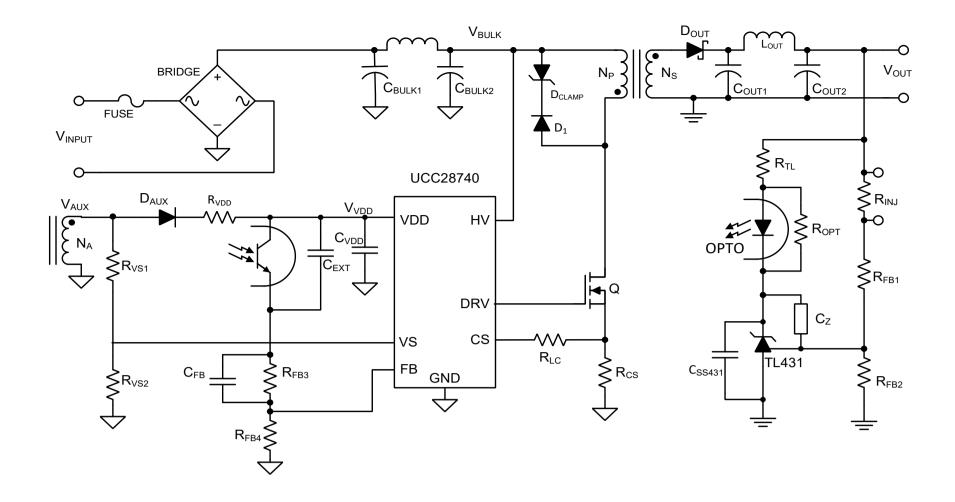
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<u>A</u>
Recommended C <sub>out</sub>
Recommended C <sub>OUT</sub>
Recommended C <sub>OUT</sub> Enter Actual C <sub>OUT</sub> Used
Recommended C <sub>OUT</sub> Enter Actual C <sub>OUT</sub> Used Recommended ESR
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Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used
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Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used
Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used
Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used  At I <sub>INPEAK</sub> Not Applicable for DC input
Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used  At I <sub>INPEAK</sub> Not Applicable for DC input
Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used  At I <sub>INPEAK</sub> Not Applicable for DC input
Recommended ESR Enter Actual ESR of C <sub>OUT</sub> Used
Recommended ESR  Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used
Recommended ESR  Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used
Recommended ESR Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used
Recommended ESR Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used
Recommended ESR  Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used
Recommended ESR Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used  Recommended $R_{\text{VS2}}$ Enter Actual $R_{\text{VS2}}$ Used
Recommended ESR Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used  Recommended $R_{\text{VS2}}$ Enter Actual $R_{\text{VS2}}$ Used
Recommended ESR  Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used  Recommended $R_{\text{VS2}}$ Enter Actual $R_{\text{VS2}}$ Used  Recommeded $R_{\text{VS2}}$
Recommended ESR Enter Actual ESR of $C_{\text{OUT}}$ Used  At $I_{\text{INPEAK}}$ Not Applicable for DC input  Recommended $R_{\text{VS1}}$ Enter Actual $R_{\text{VS1}}$ Used  Recommended $R_{\text{VS2}}$ Enter Actual $R_{\text{VS2}}$ Used

Enter Nominal V<sub>REF</sub> Used
Enter Reference Pin Input Current
Recommended R<sub>FB2</sub>

Enter Actual R <sub>FB2</sub> Used
Recommended R <sub>FB1</sub>
Enter Actual R <sub>FB1</sub> Used
Enter CTR <sub>min</sub>
Enter Opto-Coupler t <sub>f</sub>
Enter R <sub>L</sub> from Opto-Coupler t <sub>f</sub> spec
Enter Opto-Coupler Cut-Off Frequency
Enter Maximum V <sub>F</sub> of Opto-Coupler
Recommended C <sub>EXT</sub>
Enter Actual C <sub>EXT</sub> Used
Recommended C <sub>FB</sub>
Enter Actual C <sub>FB</sub> Used
Recommended R <sub>FB4</sub>
Enter Actual R <sub>FB4</sub> Used
Recommended $R_{TL}$
Enter Actual R <sub>TL</sub> Used
Recommended C <sub>z</sub>
Enter Actual C <sub>7</sub> Used





RECOMMENDED BILL OF MATERIALS			
Reference Designator	Description/Comments		
	Minimum DC Blocking Voltage:	400 V	
BRIDGE RECTIFIER	Minimum Current Rating:	1.184 A	
	Power Dissipation:	3116.985 mW	
	Type:	Aluminum Electrolytic	
C -C +C	Value:	250 µF	Total Capacitance
$\mathbf{C}_{BULKtotal} = \mathbf{C}_{BULK1} + \mathbf{C}_{BULK2}$	Minimum Voltage Rating:	400 V	
	Minimum Ripple Current Rating:	1416.812 mA	
	Туре:	Ceramic	
C <sub>EXT</sub>	Value:	0.0015 µF	±10%
	Minimum Voltage Rating:	50 V	
	Type:	Ceramic	
C <sub>FB</sub>	Value:	0.047 µF	±10%
FB	Minimum Voltage Rating:	0.047 μΓ 10 V	±10 /0
	willillituiti voitage Natilig.	10 V	
	Type:	Aluminum Electro	lvtic
	Minimum Value:	540 μF	Total Capacitance
$\mathbf{C}_{OUTtotal} = \mathbf{C}_{OUT1} + \mathbf{C}_{OUT2}$	Minimum Voltage Rating:	85.000 V	
00110141 0011 0012	Minimum Ripple Current Rating:	0.876 A	
	Maximum ESR Rating:	10.988 mΩ	
	Туре:	Ceramic	
C <sub>SS431</sub>	Value:	1 µF	±10%
	Minimum Voltage Rating:	10 V	
	Type:	Coromio	
c	Type: Minimum Value:	Ceramic 10 μF	±10%
C <sub>VDD</sub>	Voltage Rating:	50 V	±1070
	Voltage Natilig.		
	Type:	Ceramic	
C <sub>z</sub>	Value:	1500 pF	±10%
	Voltage Rating:	10 V	
	Type:	Switching	
$D_{AUX}$	Minimum Required Blocking Voltage:	128.693 V	
	Minimum Rated Current:	250 mA	

	Type:	Transient Voltage	\$uppressor
D <sub>CLAMP</sub>	Voltage:	271.297 V	T # P P 1 0 0 0 0 1
- CLAMP	Power Rating:	600.000 W	
	<sub>j</sub> . ono. rading.	333.000 VV	
	Type:	Schottky	
_	Minimum Blocking Voltage Rating:	579.072 V	
D <sub>out</sub>	Minimum Average Current Rating:	1.028 A	
	Power Dissipation:	0.725 W	
	i ower dissipation.	0.723 VV	
	Type:	Ultra Fast	
$D_{1}$	Voltage Rating:	1000 V	
	Current Rating:	1000 V	
	Current Nating.	17	
	Type	Cla	w Blow
FUSE	Type:		
FUSE	Minimum Voltage Rating:	265 VAC	
	Minimum Peak Current Rating:	3.939 A	
0070 00404 50	ICTD .	50.0/	
OPTO-COUPLER	CTR <sub>min</sub> :	50 %	
	Minimum V V V V		
	Minimum V <sub>DS</sub> Voltage Rating:	800 V	
Q	Minimum Continuous Current Rating:	8.731 A	
	Minimum Repetitive Peak Current Rating:	21.877 A	
	Power Dissipation:	0.580 W	
_	Value:	0.374 Ω	±1%
R <sub>cs</sub>	Power Dissipation:	254.505 mW	
	Туре:	Low I	nductance
	Malara	4.770:0	. 40/
R <sub>FB1</sub>	Value:	1470 kΩ	±1%
101	Power Rating:	1/10 W	
	Malua	44.01.0	140/
$R_{_{FB2}}$	Value:	44.2 kΩ	±1%
152	Power Rating:	1/10 W	
	Value	4001-0	±10/
R <sub>FB3</sub>	Value:	100 kΩ	±1%
	Power Rating:	1/10 W	
	Value:	22 kΩ	±1%
$R_{_{FB4}}$	Power Rating:	1/10 W	± 1 /U
	i ower rading.	1/ 10 00	
_	Value:	20 Ω	±1%
$R_{_{\mathrm{INJ}}}$	Power Rating:	1/10 W	±170
	<sub>1</sub> . 5115. (Milly.	1/ 10 00	
_	Value:	1.4 kΩ	±1%
R <sub>LC</sub>	Power Rating:	1/10 W	
		.,	
	Value:	1 kΩ	±1%
R <sub>OPT</sub>	Power Rating:	1/10 W	
D	Value:	1.5 kΩ	±1%
$R_{_{TL}}$	Power Rating:	1/10 W	
	<u> </u>		
В	Value:	2 to 50 Ω	As Needed for Voltage
$R_{VDD}$	Power Rating:	1/10 to 1/2 W	Spike Smoothing
D	Value:	90.9 kΩ	±1%
R <sub>vs1</sub>	Power Rating:	1/10 W	
$R_{ m vs2}$	Value:	20.5 kΩ	±1%
**VS2	Power Rating:	1/10 W	
SHUNT REGULATOR	Voltage Reference:	2.5 V	
	Primary Inductance:	250 µH	
	Primary to Secondary Turns Ratio:	1.321	N <sub>PS</sub>
	Primary to Auxiliary Turns Ratio:	4.625	N <sub>PA</sub>
TDANCEODMED	Peak Primary Current:	2.067 A	
TRANSFORMER	Primary RMS Current:	0.825 A	
	Peak Secondary Current:	2.730 A	
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Secondary RMS Current:	1.028 A	
Maximum Switching Frequency:	93.714 kHz	

### **UCC28740 DESIGN CALCULATIONS**

The Values Entered by the User on the DESIGN INPUT Page are Used in the Design Calculations

	INPUT			
Input Voltage Type	AC or DC:	AC		
Minimum Input Voltage	V <sub>INPUTmin</sub> =	85	VAC	
Maximum Input Voltage	V <sub>INPUTmax</sub> =	265	VAC	User Input Values From Design Input
Nominal Input Voltage	V <sub>INPUTnom</sub> =	230	VAC	Page
Minimum Line Frequency	f <sub>LINEmin</sub> =	47	Hz	
Minimum Input Voltage for Start-Up	V <sub>INPUTrun</sub> =	80	VAC	
Minimum Peak Bulk Input Voltage	V <sub>BULKmin</sub> =	120.208	V	
Maximum Peak Bulk Input Voltage	V <sub>BULKmax</sub> =	374.767	<b>V</b>	
Nominal Peak Bulk Input Voltage	V <sub>BULKnom</sub> =	325.269	>	
Turn-On Peak Bulk Input Voltage	V <sub>BULKstartup</sub> =	113.137	<b>V</b>	
Line Cycle Period	t <sub>LINE</sub> =	21.277	ms	
	OUTPUT			
Regulated Output Voltage, Constant Voltage Mode	V <sub>OUT_CV</sub> =	85	>	
Full Load Rated Output Current	I <sub>OUT</sub> =	0.6	Α	
Target Constant Current Mode Output Load Threshold	I <sub>OCC_target</sub> =	0.6	A	
Target Minimum Output Voltage During Constant Current Regulation	V <sub>OUT_CC</sub> =	30	V	
Allowable Output Voltage Drop During Load-Step Transient in Constant Voltage Mode	V <sub>OUTA</sub> =	0.5	٧	User Input Values From Design Input Page
Maximum Peak to Peak Output Voltage Ripple	V <sub>RIPPLE</sub> =	30	mV	
Required Positive Load Step Transient Current	I <sub>TRAN</sub> =	0.65	A	
Maximum Allowable Response Time to Load Step Transient	t <sub>resp</sub> =	20	ms	
Output Over Voltage Protection	V <sub>OUT_OVP</sub> =	90	V	
Maximum Stand By Power Dissipation	P <sub>SBtarget</sub> =	50	mW	
Estimated Efficiency	η =	0.850		
Output Power	P <sub>out</sub> =	51.000	W	
Estimated Input Power	P <sub>IN</sub> =	60.000	W	

### COMPONENT PARAMETER CALCULATIONS

INPUT CAPACITOR, C <sub>BULK</sub>				
Recommended Input Bulk Capacitance	C <sub>BULKrecommended</sub> =	233.16	μF	
Actual Input Bulk Capacitance	C <sub>BULKactual</sub> =	250.000	μF	User Input
Input Capacitor Value Used in Calculations	C <sub>BULK</sub> =	250.000	μF	
Minimum Valley Voltage on Input Bulk Capacitors	V <sub>BULKvalley</sub> =	101.326	V	
Minimum Input Capacitor Ripple Current Rating	I <sub>CINripple</sub> =	1416.812	mA	
Minimum Input Capacitor Voltage Rating	V <sub>Cin</sub> =	400	V	

INPUT FUSE			
Voltage Rating	V <sub>FUSE</sub> =	265	VAC
Peak Input Current	I <sub>INpeak</sub> =	3.939	A

BRIDGE RECTIFIER			
Voltage Rating	V <sub>BRIDGE_minrating</sub> =	400.000	V
Current Rating	BRIDGE_minrating =	1.184	A
Forward Voltage Drop	V <sub>F_BRIDGE</sub> =	1.100	V User Input
Full Load Power Dissipation of Bridge Rectifier	P <sub>BRIDGE</sub> =	3116.985	mW

TRANSFORMER TURNS-RATIO, N <sub>PS</sub>				
Demagnetizing Duty Cycle	D <sub>DEMAG_CC</sub> =	0.425		Device Parameter
Amplitude Modulation Control Ratio	K <sub>AMnom</sub> =	4		Device Parameter
Maximum Desired Switching Frequency	f <sub>max_target</sub> =	100.000	kHz	User Input
Desired Switching Period	t <sub>SW_target</sub> =	10.000	μs	
Resonant Frequency During DCM Dead Time	f <sub>RES</sub> =	0.500	MHz	
Time to First Resonant Valley	t <sub>res</sub> =	1.000	μs	
Estimated Maximum Duty Cycle	D <sub>max_target</sub> =	0.475		

Ideal Primary to Secondary Turns Ratio	N <sub>PSideal</sub> =	1.3130	Ideal N <sub>PS</sub>
Actual Primary to Secondary Turns Ratio	N <sub>PSactual</sub> =	1.321	User Input
Primary to Secondary Turns Ratio Used in Calculations	N <sub>PS</sub> =	1.321	
Actual Flyback Voltage	V <sub>FLYBACK</sub> =	113.936	V
Allowable Leakage Inductance Voltage Spike	V <sub>LEAKAGE</sub> =	311.297	V
Estimated Maximum On-Time	t <sub>ONestimated</sub> =	4.764	μs
Estimated Transformer Efficiency	η <sub>XFMR</sub> =	0.9	

CURRENT SENSE RESISTOR, $R_{\rm cs}$ , PEAK PRIMARY CURREN	T, I <sub>PP</sub>			
Constant Current Regulation Factor, Minimum	V <sub>CCR_min</sub> =	318	mV	Device Parameter
Constant Current Regulation Factor, Nominal	V <sub>CCR_nom</sub> =	330	mV	Device Parameter
Constant Current Regulation Factor, Minimum	V <sub>CCR_min</sub> =	343	mV	Device Parameter
Initial estimate for L <sub>P</sub>	L <sub>P_estimate</sub> =	251.721	μΗ	
Recommended Current Sense Resistor Value	R <sub>CSrecommended</sub> =	0.339	Ω	
Actual Current Sense Resistor Used	R <sub>CSactual</sub> =	0.374	Ω	User Input
Current Sense Resistor Value Used in Calculation	R <sub>cs</sub> =	0.374	Ω	
Power Dissipation of R <sub>cs</sub>	P <sub>Rcs</sub> =	254.505	mW	
Maximum Current Sense Threshold Voltage, Minimum	V <sub>CSTmax_min</sub> =	738	mV	Device Parameter
Maximum Current Sense Threshold Voltage, Nominal	V <sub>CSTmax_nom</sub> =	773	mV	Device Parameter
Maximum Current Sense Threshold Voltage, Maximum	V <sub>CSTmax_max</sub> =	810	mV	Device Parameter
Peak Primary Current, Minimum, Full Load	I <sub>PPmin</sub> =	1.973	Α	
Peak Primary Current, Nominal, Full Load	I <sub>PPnom</sub> =	2.067	A	
Peak Primary Current, Maximum, Full Load	I <sub>PPmax</sub> =	2.166	A	
Actual Output Current During Constant Current Mode	I <sub>OCC_actual</sub> =	0.580	Α	
Peak Primary Current During Light Load, FM Mode	I <sub>PP_FM</sub> =	0.517	A	
Worst Case Peak Primary Current	I <sub>PP_WC</sub> =	2.188	Α	Assumes -1%R $_{\rm CS}$ and V $_{\rm CSTmax\_max}$
Maximum Output Current During Constant Current Mode	I <sub>OCCmax</sub> =	0.614	A	Worst Case Estimate

TRANSFORMER PRIMARY INDUCTANCE, L <sub>P</sub>			
Calculated L <sub>P</sub> to meet f <sub>max target</sub> with chosen R <sub>CS</sub>	L <sub>Pcalc</sub> =	260.316	μH
Recommended Primary Inductance to meet t <sub>CSLEB</sub> with chosen R <sub>CS</sub>	L <sub>Precommended</sub> =	260.316	μΗ Ideal L <sub>P</sub>
Actual Primary Inductance	L <sub>Pactual</sub> =	250.000	μH <b>User Input</b>
Primary Inductance Used in Calculations	L <sub>p</sub> =	250.000	μΗ
Actual Maximum Nominal Switching Frequency	f <sub>max</sub> =	93.714	kHz
Actual Switching Period	t <sub>SWactual</sub> =	10.671	µs
Actual Maximum On-Time	t <sub>ONmax</sub> =	5.099	µs
Maximum Duty Cycle	D <sub>MAX</sub> =	0.478	
Demagnetization Time	t <sub>DEMAG</sub> =	4.535	μs
Primary RMS Current	I <sub>PRI_RMS</sub> =	0.825	A
Secondary Peak Current	I <sub>SPmax</sub> =	2.730	A
Secondary RMS Current	I <sub>SEC_RMS</sub> =	1.028	A
VDD Under Voltage Lock Out (UVLO) Voltage, Maximum	VDD <sub>OFF_max</sub> =	8.150	V Device Parameter
VDD Under Voltage Lock Out (UVLO) Voltage, Minimum	VDD <sub>OFF_min</sub> =	7.350	V Device Parameter
Recommended Auxiliary to Secondary Turns Ratio	N <sub>ASrecommended</sub> =	0.301	
Recommended Primary to Auxilliary Turns Ratio	N <sub>PArecommended</sub> =	4.392	
Actual Primary to Auxiliary Turns Ratio	N <sub>PAactual</sub> =	4.625	User Input
Primary to Auxiliary Turns Ratio Used in Calculations	N <sub>PA</sub> =	4.625	
Nominal VDD Voltage	VDD =	23.385	V
Actual Auxiliary to Secondary Turns Ratio	N <sub>AS</sub> =	0.286	
Minimum On-Time, t <sub>CSLEB</sub>	t <sub>ONmin(limit)</sub> =	280.000	ns
Actual Minimum On-Time	t <sub>ONmin(actual)</sub> =	344.689	ns
Minimum Demagnetizing Time	t <sub>DEMAGmin</sub> =	1.134	µs
Minimum Output Voltage During Constant Current Mode	V <sub>OUT_CCmin</sub> =	28.860	v

MOSFET, Q			
Required Drain to Soure Voltage Rating , V <sub>DSrated</sub> =	V <sub>DSmin_rating</sub> =	635.314 V	
MOSFET Rated Drain to Source Voltage	V <sub>DS</sub> =	800.000 V	
Output Capacitance of Selected MOSFET	C <sub>oss</sub> =	16 pF	
Drain to Source On-Resistance of Selected MOSFET	R <sub>DSon</sub> =	0.360 Ω	User Innut Values From Design Innut

MOSFET Truit Off Deby Time	MOSFET Fall Time	t, =	6.000 ns	Page
MOSPET Place Carlo Resonant Place   Q				_
Actual Resonant Frequency During DCM Dead Time         In. 1789 MHz           Actual Estimated Time to First Resonant Valley         U.S. 2016           Valley Switching Achieved?         YES or NO           VES or NO         YES           MOSPET Dry, Dending         V. 2000           MOSPET Dry, Dending         V. 2000           MOSPET Dry Bending         V. 2000           MOSPET Pulsed Current Rating         P. 2000           France Time Control Time Conduction Losese         P. 2000           Processes         2. 21.877A           MOSPET Power Loses         P. 2000           Pettimeted MOSPET Switching Loseses         P. 2000           Processes         P. 2000           Recommended Clamying Valley on Drain         V. 2000           Valley State Control Control         P. 2000           Recommended Clamying Valley on Drain         V. 2000           Control Control Control         P. 2000           AUXILLARY WORNDO GOLDS         P. 2000           AUXIL	·			
Acute Estimated Time to First Resonant Valley	-	-		
Valley Switching Activities   Vestinate	Actual Resonant Frequency During DCM Dead Time	t <sub>RES_actual</sub> =	1.779 MHz	
MOSFET Pulsed Current Rating	Actual Estimated Time to First Resonant Valley	t <sub>RES_actual</sub> =	0.281 μs	
MOSFET Continuous Current Rating	Valley Switching Achieved?	YES or NO	YES	
	MOSFET V <sub>DS</sub> Derating	V <sub>DSderated</sub> =	0.794	
	MOSFET Continuous Current Rating	I <sub>DRAIN</sub> =	8.731 A	
Elimated MOSFET Sudding Losses			21.877 A	
Estimated MOSFET Switching Losses   Particular   Partic	-			
Total Estimated MOSFET Power Loss				
Recommended Clamping Voltage on Drain   V_scottages   271.297 V	-			
OUTPUT DIODE,   Degree   Power   Degree   D		V =		
Forward Voltage Drop of Output Rectifier, V, = V, = 1.256) V User Input Minimum Required Blocking Voltage Rating Voltage Rating From Voltage Page 1.0.28 A Power Dissipation of D <sub>car</sub> P <sub>but</sub> = 1.0.28 A Power Dissipation of D <sub>car</sub> P <sub>but</sub> = 1.256 V User Input Power Dissipation of D <sub>car</sub> P <sub>but</sub> = 1.256 V User Input Voltage Page Rectified Output Current Voltage Power Dissipation of D <sub>car</sub> P <sub>but</sub> = 1.256 V User Input Voltage Page Rating Voltage Rating Voltag	. toooniii oraaa olainpii g votage on Draii	DRAINclamp	2.1.201	
Minimum Required Blocking Voltage Rating   Vocations   England Minimum Average Rectified Output Current   Industry   England Minimum Average Rectified Output Current   Industry   England   Industry   Industr	OUTPUT DIODE, D <sub>OUT</sub>			
Required Minimum Repaired Copy Without Opto-Coupled FeedBack    County   Feedback   County   Feedback   County   Feedback   County   Feedback	Forward Voltage Drop of Output Rectifier, V <sub>F</sub> =		1.250 V	User Input
AUXILIARY WINDING DIODE, D <sub>min</sub> Auxiliary Rectifier Forward Voltage Drop W <sub>fin</sub> = 1.250 V User Input    Value toward   1.28 093 V   Value towa	Minimum Required Blocking Voltage Rating	V <sub>DOUT_blocking</sub> =	579.072 V	
AUXILIARY WINDING DIODE, D <sub>mix</sub> Auxiliary Rectifier Forward Voltage Drop W <sub>1,A</sub> = 1.250 V User Input  V <sub>10000 Busting</sub> = 128.953 V  OUTPUT INDUCTOR, L <sub>corr</sub> DOR of Output Inductor  DCR <sub>1001</sub> = 0, mΩ User Input  OUTPUT CAPACITOR, C <sub>corr</sub> Minimum Required C <sub>corr</sub> , Without Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Required Minimum Repole Current Rating  C <sub>corr</sub> = 540,000 μF  Resultant Output Voltage Peak to Peak Ripple  Voltages = 50,000 mΩ  User Input  Voltages = 50,000 mΩ  User Input  Voltages Repole Voltage Peak to Peak Ripple  Voltages = 136,628 mV  Voltages Repole Current, Minimum  Voltages Repole Current, Venninal  Voltages Repole Current, Venni		I <sub>Dout</sub> =		
Auxiliary Rectifier Forward Voltage Drop  V <sub>IA</sub> = 1.250 \ User Input  Minimum Required Blocking Voltage Rating  V <sub>oltage bustons</sub> = 128.693 \ V  DCR of Output Inductor  DCR <sub>10</sub> = 0 mΩ User Input  The importance of using opto feedback of the importance of using opto feedback should be noted here!  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled Court User Input  Court User in Court User Input  Cou	Power Dissipation of D <sub>OUT</sub>	P <sub>Dout</sub> =	0.725W	
Auxiliary Rectifier Forward Voltage Drop  V <sub>IA</sub> = 1.250 \ User Input  Minimum Required Blocking Voltage Rating  V <sub>oltage bustons</sub> = 128.693 \ V  DCR of Output Inductor  DCR <sub>10</sub> = 0 mΩ User Input  The importance of using opto feedback of the importance of using opto feedback should be noted here!  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Recommended Minimum Required Output Capacitor With Opto-Coupled Court User Input  Court User in Court User Input  Cou	ALIVILIA BY WINDING DIODE D			
Minimum Required Blocking Voltage Rating   V_cook books   128.693   V   V_cook books   128.693   V   V_cook books   128.693   V   V_cook books   V_cook b				
OUTPUT INDUCTOR, Lour         DCR of Output Inductor         DCR <sub>teat</sub> =         0 mΩ         User input           OUTPUT CAPACITOR, Cover         Without Opto-Coupled FeedBack         Courrections         26000,000 μF         The importance of using opto feedback should be noted here!           Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack         Courrections         470,000 μF         Lever input           Actual Output Capacitance Used         Courrections         Courrections         540,000 μF         Lever input           Required Minimum Ripple Current Rating         Lours         0.876 lA         10,988 mΩ         Actual ESR of Courted Maximum ESR         580,000 mΩ         Lever input           Recommended Maximum ESR         ESR Concessedated Sections         10,988 mΩ         19,988 mΩ         Actual ESR of Courted Maximum ESR         50,000 mΩ         Lever input           Actual ESR of Court Used         ESR Concessedated Sections         50,000 mΩ         Lever input         Lever input           Resultant Output Voltage Peak to Peak Ripple         Voltages         130,600 mΩ         Lever input           VS Line Sense Run Current, Minimum         Lever input         Levice Parameter         VS Line Sense Run Current, Minimum         Levice Parameter           VS Line Sense Run Current, Maximum         Levice Input         1,000 μA         Device Paramet		V <sub>FA</sub> =		User Input
DCR of Output Inductor         DCR <sub>cos</sub> =         0 mΩ         User input           OUTPUT CAPACITOR, C <sub>out</sub> Minimum Required C <sub>out</sub> Without Opto-Coupled FeedBack         C <sub>Out to to the county of the co</sub>	Mınımum Required Blocking Voltage Rating	V <sub>DBIAS_blocking</sub> =	128.693 V	
DCR of Output Inductor         DCR <sub>cos</sub> =         0 mΩ         User input           OUTPUT CAPACITOR, Cour           Minimum Required Co <sub>cut</sub> Without Opto-Coupled FeedBack         Co <sub>CUT-No.5000</sub> =         26000.000 μF         The importance of using opto feedback should be noted here!           Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack         Co <sub>CUT-No.5000</sub> =         470.000 μF         Image: Second	OUTPUT INDUCTOR 1			
Minimum Required C <sub>OUT</sub> Without Opto-Coupled FeedBack   C <sub>OUT,100,200</sub> =   26000.000 µF   The importance of using opto feedback should be noted here!		DCR =	0,00	User Innut
Minimum Required C <sub>OLT</sub> Without Opto-Coupled FeedBack   C <sub>OLT Recommended</sub>   26000.000 μF   The importance of using opto feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feed	DCR of Output Inductor	DOI C <sub>Lout</sub> -	UIIILI	Oser input
Minimum Required C <sub>OLT</sub> Without Opto-Coupled FeedBack   C <sub>OLT Recommended</sub>   26000.000 μF   The importance of using opto feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using the feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feedback should be noted here!   The importance of using opto feed	OUTPUT CAPACITOR, Cour			
Recommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Actual Output Capacitance Used  Courrecommended Minimum Required Output Capacitor With Opto-Coupled FeedBack  Actual Coupled Capacitance Used  Courrecommended Minimum Rippel Current Rating  Required Minimum Rippel Current Rating  Required Minimum Rippel Current Rating  Recommended Maximum ESR  ESR_Conscommended = 10,998 mm  Actual ESR of Co <sub>urr</sub> Used  ESR_Conscommended = 10,998 mm  Actual ESR of Co <sub>urr</sub> Used  ESR_Conscommended = 10,998 mm  Actual ESR of Co <sub>urr</sub> Used  ESR_Conscommended = 10,000 mm  ESR Used in Calculations  ESR_Conscommended = 10,000 mm  Actual ESR of Co <sub>urr</sub> Used  ESR_Conscommended = 10,000 mm  Actual ESR of Co <sub>urr</sub> Used  ESR_Conscommended = 10,000 mm  ESR_Used in Calculations  Indicate Indic				The importance of using onto feedback
Actual Output Capacitance Used   Coutractual   540,000   μF   User Input	Minimum Required C <sub>out</sub> Without Opto-Coupled FeedBack	C <sub>OUT_no_opto</sub> =	26000.000 µF	
Actual Output Capacitance Used   Coutractual   540,000   μF   User Input	Becommended Minimum Required Output Congeiter With Onto Coupled			
Court         Local materials         Court         540,000 μF           Required Minimum Ripple Current Rating         Incourtme         0.876 μA           Recommended Maximum ESR         ESR_contented         10.988 mΩ           Actual ESR of Court Used         ESR_contented         50.000 mΩ           ESR Contented         ESR_contented         50.000 mΩ           ESR Contented         50.000 mΩ           Resultant Output Voltage Peak to Peak Ripple         Voltage Test State		C <sub>OUTrecommended</sub> =	470.000 µF	
Court         Local materials         Court         540,000 μF           Required Minimum Ripple Current Rating         Incourtme         0.876 μA           Recommended Maximum ESR         ESR_contented         10.988 mΩ           Actual ESR of Court Used         ESR_contented         50.000 mΩ           ESR Contented         ESR_contented         50.000 mΩ           ESR Contented         50.000 mΩ           Resultant Output Voltage Peak to Peak Ripple         Voltage Test State	A street Ordered Composition and I have	C -	540.000F	Hearland
Required Minimum Ripple Current Rating   I   COUTITINS   ESR   CONSTRUMENT   ESR   ESR   CONSTRUMENT   ESR   ESR   CONSTRUMENT   ESR				Oser input
SR_commended Maximum ESR				
Second	, , , , ,	I <sub>COUTrms</sub> =		
ESR   Sed in Calculations   ESR   Soud   =   50.000   mΩ				Hear Innut
Page		FSR =		Oser input
VOLTAGE SENSE DIVIDER, R <sub>VSI</sub> , R <sub>VS2</sub> VS Line Sense Run Current, Minimum       I <sub>VSLun min</sub> = 190 μA Device Parameter         VS Line Sense Run Current, Maximum       I <sub>VSLun min</sub> = 225 μA Device Parameter         VS Line Sense Run Current, Maximum       I <sub>VSLun min</sub> = 275 μA Device Parameter         VS Line Sense Stop Current, Minimum       I <sub>VSLun min</sub> = 70 μA Device Parameter         VS Line Sense Stop Current, Nominal       I <sub>VSLun min</sub> = 80 μA Device Parameter         VS Line Sense Stop Current, Maximum       I <sub>VSLun min</sub> = 100 μA Device Parameter         VS Line Sense Stop Current, Maximum       I <sub>VSLun min</sub> = 100 μA Device Parameter         VS Line Sense Stop Current, Maximum       I <sub>VSLun min</sub> = 100 μA Device Parameter         VS Line Sense Stop Current, Maximum       I <sub>VSLun min</sub> = 100 μA Device Parameter         VS Line Sense Stop Current, Maximum Start Up Line Voltage       R <sub>VSTactual</sub> = 90.900 μΩ         Recommended Resistor Value Gr Minimum Start Up Line Voltage       R <sub>VSTactual</sub> = 90.900 μΩ         Actual Resistor Value Used for Minimum Start Up Line Voltage       R <sub>VSTactual</sub> = 90.900 μΩ         Resultant Turn On Voltage, Minimum       V <sub>TURRONomin</sub> = 56.483 VAC         Resultant Turn On Voltage, Nominal       V <sub>TURRONomin</sub> = 56.483 VAC         Resultant Turn On Voltage, Maximum       V <sub>TURRONomin</sub> = 81.751 VAC         Resultant Input Brown Out Voltage, Minimum       V <sub>RECOMNOLTmin</sub> = 34.161 VAC     <				
VS Line Sense Run Current, Minimum  VS Line Sense Run Current, Nominal  VS Line Sense Run Current, Nominal  VS Line Sense Run Current, Maximum  VS Line Sense Run Current, Maximum  VS Line Sense Stop Current, Minimum  VS Line Sense Stop Current, Maximum  Recommended Resistor Value for Minimum Start Up Line Voltage  Recommended Resistor Value Used for Minimum Start Up Line Voltage  Resultant Resistor Value Used for Minimum Start Up Line Voltage  Resultant Turn On Voltage, Minimum  VTURNONIMIN START UP LINE VOLTAGE  Resultant Turn On Voltage, Mominal  VTURNONIMIN START UP LINE VOLTAGE  Resultant Turn On Voltage, Maximum  VTURNONIMIN START UP LINE VOLTAGE  Resultant Turn On Voltage, Maximum  VBROWNOUTIMIN START UP LINE VOLTAGE  VBROWNOUTIMIN STA		OUTripple		
VS Line Sense Run Current, Nominal  VS Line Sense Run Current, Maximum  VS Line Sense Run Current, Maximum  VS Line Sense Stop Current, Minimum  VS Line Sense Stop Current, Minimum  VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Maximum  VS Line Sense Stop Current, Maximum  VS Line Sense Stop Current, Maximum  I VS Line Sense Stop Current, Maximum  Recommended Resistor Value for Minimum Start Up Line Voltage  Recommended Resistor Value Used for Minimum Start Up Line Voltage  R VS Line Sense Stop Current, Maximum  Recommended Resistor Value Used for Minimum Start Up Line Voltage  R VS Line Sense Stop Current, Maximum  Resultant Turn On Voltage, Minimum  V TURNONIMIN START Up Line Voltage  Resultant Turn On Voltage, Minimum  V TURNONIMIN START Up Line Voltage, Minimum  V TURNONIMIN START Up Line Voltage, Minimum  V RESULTANT UP LINE VOLTAGE  Resultant Input Brown Out Voltage, Minimum  V RECOMNOUTIMIN START Up Line Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V RECOMNOUTIMIN START Up Line Voltage Alacid VAC  Resultant Input Brown Out Voltage, Maximum  V R	VOLTAGE SENSE DIVIDER, R <sub>VS1</sub> , R <sub>VS2</sub>			
VS Line Sense Run Current, Maximum    Vostation Sense Run Current, Maximum   Vostation Final Parameter   Vostation Sense Stop Current, Minimum   Vostation Final Parameter   Vostation Sense Stop Current, Nominal   Vostation Final Parameter   Vostation Final Parameter   Vostation Sense Stop Current, Nominal   Vostation Final Parameter	VS Line Sense Run Current, Minimum	I <sub>VSLrun_min</sub> =	190 <sub>µ</sub> A	Device Parameter
VS Line Sense Stop Current, Minimum  VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Maximum  I <sub>VSLstop, mon</sub> = 80 μA Device Parameter  VS Line Sense Stop Current, Maximum  I <sub>VSLstop, max</sub> = 100 μA Device Parameter  Recommended Resistor Value for Minimum Start Up Line Voltage  Recommended Resistor Value Used for Minimum Start Up Line Voltage  R <sub>VS1recommended</sub> = 90.900 kΩ  Line Voltage Grammeter  VS Line Sense Stop Current, Maximum Start Up Line Voltage  Resultant Turn On Voltage Minimum Start Up Line Voltage  R <sub>VS1</sub> = 90.9 kΩ  User Input  V <sub>URNONmin</sub> = 56.483 VAC  Resultant Turn On Voltage, Nominal  V <sub>TURNONmin</sub> = 66.887 VAC  Resultant Turn On Voltage, Minimum  V <sub>TURNONmin</sub> = 81.751 VAC  Resultant Input Brown Out Voltage, Minimum  V <sub>SURNONMIN</sub> = 34.161 VAC  Resultant Input Brown Out Voltage, Nominal  V <sub>BROWNOUTmax</sub> = 43.079 VAC  Internal VS Over Voltage Threshold, Minimum  V <sub>OVPmin</sub> = 4.52 V Device Parameter  Internal VS Over Voltage Threshold, Maximum  V <sub>OVPmin</sub> = 4.600 V Device Parameter  Internal VS Over Voltage Threshold, Maximum  V <sub>OVPmin</sub> = 4.710 V Device Parameter	VS Line Sense Run Current, Nominal	I <sub>VSLrun_nom</sub> =	225 <sub>µ</sub> A	Device Parameter
VS Line Sense Stop Current, Nominal  VS Line Sense Stop Current, Maximum  VS Line Sense Stop Current, Maximum  VS Line Sense Stop Current, Maximum  Recommended Resistor Value for Minimum Start Up Line Voltage  Recommended Resistor Value Used for Minimum Start Up Line Voltage  R <sub>VS1 tecommended</sub> = 90.900 kΩ  Was Input  VS Value Used in Calculations  R <sub>VS1</sub> = 90.9 kΩ  Resultant Turn On Voltage, Minimum  V <sub>TURNONmin</sub> = 56.483 VAC  Resultant Turn On Voltage, Nominal  V <sub>TURNONmin</sub> = 66.887 VAC  Resultant Turn On Voltage, Maximum  V <sub>TURNONmin</sub> = 81.751 VAC  Resultant Input Brown Out Voltage, Minimum  V <sub>ROWNOUTmin</sub> = 34.161 VAC  Resultant Input Brown Out Voltage, Nominal  V <sub>ROWNOUTmin</sub> = 37.134 VAC  Resultant Input Brown Out Voltage, Maximum  V <sub>ROWNOUTmin</sub> = 43.079 VAC  Internal VS Over Voltage Threshold, Minimum  V <sub>OVPmin</sub> = 4.52 V  Device Parameter  V <sub>OVPmin</sub> = 4.50 V  Device Parameter  V <sub>OVPmin</sub> = 4.600 V  Device Parameter	VS Line Sense Run Current, Maximum	VSLrun_max =		Device Parameter
VS Line Sense Stop Current, Maximum    VS Line Sense Stop Current, Maximum   VS Line Voltage   R <sub>VS1 tecommended</sub>   Po.900 kΩ	,			
Recommended Resistor Value for Minimum Start Up Line Voltage $R_{VS1recommended} =$ 90.900 kΩ         Actual Resistor Value Used for Minimum Start Up Line Voltage $R_{VS1} =$ 90.9 kΩ       User Input $R_{VS1}$ Value Used in Calculations $R_{VS1} =$ 90.9 kΩ       User Input         Resultant Turn On Voltage, Minimum $V_{TURNONmin} =$ 56.483 VAC         Resultant Turn On Voltage, Nominal $V_{TURNONmin} =$ 66.887 VAC         Resultant Turn On Voltage, Maximum $V_{TURNONmin} =$ 81.751 VAC         Resultant Input Brown Out Voltage, Minimum $V_{BROWNOUTmin} =$ 34.161 VAC         Resultant Input Brown Out Voltage, Nominal $V_{BROWNOUTmin} =$ 37.134 VAC         Resultant Input Brown Out Voltage, Maximum $V_{BROWNOUTmax} =$ 43.079 VAC         Internal VS Over Voltage Threshold, Minimum $V_{OVPmin} =$ 4.52 V       Device Parameter         Internal VS Over Voltage Threshold, Maximum $V_{OVPmin} =$ 4.600 V       Device Parameter         Internal VS Over Voltage Threshold, Maximum $V_{OVPmin} =$ 4.710 V       Device Parameter		VSLstop_nom =		
Actual Resistor Value Used for Minimum Start Up Line Voltage       R <sub>VS1</sub> =       90.9 kΩ       User Input         R <sub>VS1</sub> Value Used in Calculations       R <sub>VS1</sub> =       90.9 kΩ         Resultant Turn On Voltage, Minimum       V <sub>TURNONmin</sub> =       56.483 VAC         Resultant Turn On Voltage, Nominal       V <sub>TURNONmax</sub> =       66.887 VAC         Resultant Turn On Voltage, Maximum       V <sub>TURNONmax</sub> =       81.751 VAC         Resultant Input Brown Out Voltage, Minimum       V <sub>BROWNOUTmin</sub> =       34.161 VAC         Resultant Input Brown Out Voltage, Nominal       V <sub>BROWNOUTmax</sub> =       37.134 VAC         Resultant Input Brown Out Voltage, Maximum       V <sub>BROWNOUTmax</sub> =       43.079 VAC         Internal VS Over Voltage Threshold, Minimum       V <sub>OVPmin</sub> =       4.52 V       Device Parameter         Internal VS Over Voltage Threshold, Nominal       V <sub>OVPmin</sub> =       4.600 V       Device Parameter         Internal VS Over Voltage Threshold, Maximum       V <sub>OVPmin</sub> =       4.710 V       Device Parameter	VS Line Sense Stop Current, Maximum	VSLstop_max =	100 μA	Device Parameter
Actual Resistor Value Used for Minimum Start Up Line Voltage $R_{VS1}$ =       90.9 kΩ       User Input $R_{VS1}$ Value Used in Calculations $R_{VS1}$ =       90.9 kΩ         Resultant Turn On Voltage, Minimum $V_{TURNONini}$ =       56.483 VAC         Resultant Turn On Voltage, Nominal $V_{TURNONinom}$ =       66.887 VAC         Resultant Turn On Voltage, Maximum $V_{TURNONinin}$ =       81.751 VAC         Resultant Input Brown Out Voltage, Minimum $V_{BROWNOUTmin}$ =       34.161 VAC         Resultant Input Brown Out Voltage, Nominal $V_{BROWNOUTmin}$ =       37.134 VAC         Resultant Input Brown Out Voltage, Maximum $V_{BROWNOUTmax}$ =       43.079 VAC         Internal VS Over Voltage Threshold, Minimum $V_{OVPmin}$ =       4.52 V       Device Parameter         Internal VS Over Voltage Threshold, Nominal $V_{OVPmin}$ =       4.600 V       Device Parameter         Internal VS Over Voltage Threshold, Maximum $V_{OVPmin}$ =       4.710 V       Device Parameter	Recommended Resistor Value for Minimum Start Up Line Voltage	R <sub>VS1recommended</sub> =	90.900 kΩ	
R <sub>VS1</sub> Value Used in Calculations         R <sub>VS1</sub> =         90.9 kΩ           Resultant Turn On Voltage, Minimum         V <sub>TURNONmin</sub> =         56.483 VAC           Resultant Turn On Voltage, Nominal         V <sub>TURNONmin</sub> =         66.887 VAC           Resultant Turn On Voltage, Maximum         V <sub>TURNONmax</sub> =         81.751 VAC           Resultant Input Brown Out Voltage, Minimum         V <sub>BROWNOUTmin</sub> =         34.161 VAC           Resultant Input Brown Out Voltage, Nominal         V <sub>BROWNOUTmin</sub> =         37.134 VAC           Resultant Input Brown Out Voltage, Maximum         V <sub>BROWNOUTmax</sub> =         43.079 VAC           Internal VS Over Voltage Threshold, Minimum         V <sub>OVPmin</sub> =         4.52 V         Device Parameter           Internal VS Over Voltage Threshold, Nominal         V <sub>OVPmin</sub> =         4.600 V         Device Parameter           Internal VS Over Voltage Threshold, Maximum         V <sub>OVPmax</sub> =         4.710 V         Device Parameter	-			
Resultant Turn On Voltage, Minimum  V TURNONmin = 56.483 VAC  Resultant Turn On Voltage, Nominal  Resultant Turn On Voltage, Maximum  V TURNONmin = 66.887 VAC  Resultant Turn On Voltage, Maximum  V TURNONmin = 81.751 VAC  Resultant Input Brown Out Voltage, Minimum  V RESUltant Input Brown Out Voltage, Minimum  V RESUltant Input Brown Out Voltage, Nominal  Resultant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Minimum  V RESULTANT ON VOLTAGE Threshold, Minimum  V OVPINION	Actual Resistor Value Used for Minimum Start Up Line Voltage	R <sub>VS1actual</sub> =	90.9 kΩ	User Input
Resultant Turn On Voltage, Minimum  V TURNONmin = 56.483 VAC  Resultant Turn On Voltage, Nominal  Resultant Turn On Voltage, Maximum  V TURNONmin = 66.887 VAC  Resultant Turn On Voltage, Maximum  V TURNONmin = 81.751 VAC  Resultant Input Brown Out Voltage, Minimum  V RESUltant Input Brown Out Voltage, Minimum  V RESUltant Input Brown Out Voltage, Nominal  Resultant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Maximum  V RESUltant Input Brown Out Voltage, Minimum  V RESULTANT ON VOLTAGE Threshold, Minimum  V OVPINION	R <sub>vs1</sub> Value Used in Calculations	R <sub>vs1</sub> =	90.9kΩ	
Resultant Turn On Voltage, Nominal     V <sub>TURNONnom</sub> =     66.887 VAC       Resultant Turn On Voltage, Maximum     V <sub>TURNONmax</sub> =     81.751 VAC       Resultant Input Brown Out Voltage, Minimum     V <sub>BROWNOUTmin</sub> =     34.161 VAC       Resultant Input Brown Out Voltage, Nominal     V <sub>BROWNOUTmax</sub> =     37.134 VAC       Resultant Input Brown Out Voltage, Maximum     V <sub>BROWNOUTmax</sub> =     43.079 VAC       Internal VS Over Voltage Threshold, Minimum     V <sub>OVPmin</sub> =     4.52 V     Device Parameter       Internal VS Over Voltage Threshold, Nominal     V <sub>OVPmon</sub> =     4.600 V     Device Parameter       Internal VS Over Voltage Threshold, Maximum     V <sub>OVPmax</sub> =     4.710 V     Device Parameter	701			
Resultant Turn On Voltage, Maximum  V <sub>TURNONmax</sub> = 81.751 VAC  Resultant Input Brown Out Voltage, Minimum  V <sub>BROWNOUTmin</sub> = 34.161 VAC  Resultant Input Brown Out Voltage, Nominal  Resultant Input Brown Out Voltage, Maximum  V <sub>BROWNOUTmax</sub> = 43.079 VAC  Internal VS Over Voltage Threshold, Minimum  V <sub>OVPmin</sub> = 4.52 V  Device Parameter  Internal VS Over Voltage Threshold, Nominal  V <sub>OVPmax</sub> = 4.710 V  Device Parameter				
Resultant Input Brown Out Voltage, Minimum  VBROWNOUTmin = 34.161 VAC  Resultant Input Brown Out Voltage, Nominal  Resultant Input Brown Out Voltage, Nominal  Resultant Input Brown Out Voltage, Maximum  VBROWNOUTmax = 43.079 VAC  Internal VS Over Voltage Threshold, Minimum  VOVPmin = 4.52 V Device Parameter  Internal VS Over Voltage Threshold, Nominal  VOVPmon = 4.600 V Device Parameter  Internal VS Over Voltage Threshold, Maximum  VOVPmax = 4.710 V Device Parameter		V <sub>TURNONmax</sub> =		
Resultant Input Brown Out Voltage, Nominal     V <sub>BROWNOUTnom</sub> =     37.134 VAC       Resultant Input Brown Out Voltage, Maximum     V <sub>BROWNOUTmax</sub> =     43.079 VAC       Internal VS Over Voltage Threshold, Minimum     V <sub>OVPmin</sub> =     4.52 V     Device Parameter       Internal VS Over Voltage Threshold, Nominal     V <sub>OVPmon</sub> =     4.600 V     Device Parameter       Internal VS Over Voltage Threshold, Maximum     V <sub>OVPmax</sub> =     4.710 V     Device Parameter		V <sub>BROWNOUTmin</sub> =	34.161 VAC	
Resultant Input Brown Out Voltage, Maximum  V_BROWNOUTmax = 43.079 VAC  Internal VS Over Voltage Threshold, Minimum  V_OVPmin = 4.52 V Device Parameter  Internal VS Over Voltage Threshold, Nominal  V_OVPnom = 4.600 V Device Parameter  Internal VS Over Voltage Threshold, Maximum  V_OVPmax = 4.710 V Device Parameter	Resultant Input Brown Out Voltage, Nominal	V <sub>BROWNOUTnom</sub> =		
Internal VS Over Voltage Threshold, Minimum     V <sub>OVPmin</sub> =     4.52 V     Device Parameter       Internal VS Over Voltage Threshold, Nominal     V <sub>OVPmom</sub> =     4.600 V     Device Parameter       Internal VS Over Voltage Threshold, Maximum     V <sub>OVPmax</sub> =     4.710 V     Device Parameter	Resultant Input Brown Out Voltage, Maximum	V <sub>BROWNOUTmax</sub> =		
Internal VS Over Voltage Threshold, Maximum  V <sub>OVPmax</sub> = 4.710 V Device Parameter		V <sub>OVPmin</sub> =		
Recommended Resistor Value for Desired Output Over Voltage Limit $R_{VS2recommended} = 20.500 k\Omega$	Internal VS Over Voltage Threshold, Maximum	V <sub>OVPmax</sub> =	4.710 V	Device Parameter
V5.//ECOMMERCED	Recommended Resistor Value for Desired Output Over Voltage Limit	R <sub>vs2</sub> =	20.500kΩ	
		VS2recommended	20.000 112	
Actual Resistor Value Used for Desired Output Over Voltage Limit $R_{_{VS2actual}} = 20.500$ kΩ User Input	Actual Resistor Value Used for Desired Output Over Voltage Limit	R <sub>vspartual</sub> =	20.500 kΩ	User Input
$R_{VS2}$ Used in Calculations $R_{VS2} = 20.500 k\Omega$	1	K <sub>VS2</sub> =		
Resultant Output Over Voltage Threshold, Minimum  Vour Overwaltent Output Over Voltage Threshold, Marriage  V = 89.769V Actual Output Over Voltage		V OUT_OVPmin =		Actual Output Over Veltaria
INCOMINATE OF VOILAGE THEODOM, NOTHING TO THE OVER ACTUAL OF VOITAGE	Resultant Output Over Voltage Threshold, Nominal Resultant Output Over Voltage Threshold, Maximum	<b>V</b> <sub>OUT_OVPnom</sub> =	88.768 V	Actual Output Over Voltage
	Pasultant Output Over Voltage Threshold Maximum	V <sub>OUT_OVPmax</sub> =	90.861 V	

LINE COMPENSATION, R <sub>LC</sub>					
Line Compensation Current Ratio, Nominal	K <sub>LCnom</sub> =	25	A/A	Device Parameter	
Total Estimated Current Sense Delay	t <sub>DELAY</sub> =	90	ns		
Recommended Resistor Value for Line Compensation	R <sub>LCrecommended</sub> =	1.400	kΩ		
Actual Resistor Value Used for Line Compensation	R <sub>LCactual</sub> =	1.400	kΩ	User Input	
R <sub>LC</sub> Used in Calculations	R <sub>LC</sub> =	1.400	kΩ		
Result of R <sub>Lc</sub> selection	Output Constant Current will have minimal deviation over input line voltage range.				

VDD CAPACITOR, C <sub>VDD</sub>			
Device Supply Current During Run Mode, Maximum	I <sub>RUNmax</sub> =	2.65 mA	Device Parameter
VDD <sub>on</sub> Voltage, Maximum	VDD <sub>ONmax</sub> =	23 V	Device Parameter
VDD <sub>OFF</sub> Voltage, Maximum	VDD <sub>OFFmax</sub> =	8.15 V	Device Parameter
Estimated Minimum Switching Frequency at No-Load	f <sub>SWmin</sub> =	1.199 kHz	
Estimated Over Voltage Charge Duration	t <sub>ov</sub> =	20.000 ms	
Minimum VDD Capacitor for Start UP	C <sub>VDD1</sub> =	10.000 μF	
Minimum VDD Capacitor for Load Transient	C <sub>VDD2</sub> =	4.700 μF	
Minimum VDD Capacitor for Target Ripple on VDD	C <sub>VDD3</sub> =	2.200 μF	
Recommended Capacitor on VDD	C <sub>VDDrecommended</sub> =	10.000 μF	

OPTO-COUPLED FEEDBACK				
Reference Voltage of TL431 Shunt Regulator	VREF <sub>431</sub> =	2.5	/ User Input	
Shunt Regulator Reference Input Current, Maximum	I <sub>REF431</sub> =	4	ıA User Input	
Recommended Bottom Resistor Value for Output Voltage Set Point	R <sub>FB2recommended</sub> =	44.2	Ω	
Actual Bottom Resistor Value Used for Output Voltage Set Point	R <sub>FB2actual</sub> =	44.2	Ω User Input	
R <sub>FB2</sub> Used in Calculations	R <sub>FB2</sub> =	44.2	<b>Ω</b>	
Recommended Top Resistor Value for Output Voltage Set Point	R <sub>FB1recommended</sub> =	1470	Ω	
Actual Top Resistor Value Used for Output Voltage Set Point	R <sub>FB1actual</sub> =	1470	Ω User Input	
R <sub>FB1</sub> Used in Calculations	R <sub>FB1</sub> = R <sub>INJ</sub> =	1470.02		
Noise Injection Resistor For Loop Analysis	R <sub>INJ</sub> =	20	May be changed by Use	er here
Resultant Nominal Constant Voltage Output Voltage	V <sub>OUT_CV</sub> =	85.646	1	
Minimum Current Transfer Ratio of Selected Opto-Coupler	CTR <sub>min</sub> =	50	% User Input	
Response Fall Time of Opto-Coupler	t <sub>f opto</sub> =	3	us User Input	
R <sub>L</sub> of Specified Opto-Coupler Fall Time	R <sub>L_opto</sub> =	100	User Input	
Cut-Off Frequency of Opto-Coupler	f <sub>c_opto</sub> =	80	Hz User Input	
Input Forward Voltage of Opto-Coupler	V <sub>F_opto</sub> =	1.4	/ User Input	
Equivalent Opto-Coupler Output Capacitance	C <sub>OPTO</sub> =	4.775	nF	
Equivalent Internal UCC28740 Dynamic Reistance	R <sub>EQU</sub> =	40	Ω	
Recommended Value for External Capacitor on Opto-Coupler	C <sub>EXTrecommended</sub> =	0	ıF	
Actual Value of External Capacitor on Opto-Coupler Used	C <sub>EXTactual</sub> =	0.0015	F User Input	
C <sub>EXT</sub> Used in Calculations	C <sub>EXT</sub> =	0.0015	ıF	
Recommended C <sub>FB</sub>	C <sub>FBrecommended</sub> =	0.047	ıF	
Actual C <sub>FB</sub> Used	$C_{FBactual} = C_{FB} =$	0.047	ıF User Input	
C <sub>FB</sub> Used in Calculations	C <sub>FB</sub> =	0.047		
Recommended Value For R <sub>FB4</sub>	R <sub>FB4recommended</sub> =	22	Ω	
Actual Value for R <sub>FB4</sub> Used	R <sub>FB4actual</sub> = R <sub>FB4</sub> =	22	Ω User Input	
R <sub>FB4</sub> Used in Calculations	R <sub>FB4</sub> =	22	Ω	
Opto-Coupler Emitter Current to FB Pin Current Gain	G <sub>FB1</sub> =	0.355		
FB Pin Current to Control Law Voltage Gain, Full Load	G <sub>FB2</sub> =	-192	Ω	
Control Law Voltage to Power Stage Modulation Gain, FM Mode	K <sub>FM4</sub> =	50.4	Hz/V	
Power Stage Modulation (FM) to Average Current Gain	G <sub>P4</sub> =	6.402	ıC	
Recommeded Value for Shunt Regulator Bias Resistor	R <sub>TLrecommended</sub> =	1.5	Ω	
Actual Value of Shunt Regulator Bias Resistor Used	R <sub>TLactual</sub> =	1.5	Ω User Input	
R <sub>TL</sub> Used in Calculations	R <sub>TLactual</sub> = R <sub>TL</sub> =	1.5	Ω	
Recommended Value for Compensation Capacitor	C <sub>Zrecommended</sub> =	220	)F	
Actual Value Used C <sub>z</sub>	C <sub>Zactual</sub> =	1500	F User Input	
C <sub>z</sub> Used in Calculations	C <sub>z</sub> =	1500	oF	

