1	ACDC_TOPSwitchJX_032514; Rev.1.6; Copyright Power Integrations 2014	INPUT	INFO	OUTPUT	UNIT	TOP_JX_032514: TOPSwitch-JX Continuous/Discontinuous Flyback Transformer Design Spreadsheet
2	**ENTER APPLICATION VARIABLES**					**Design title**
3	VACMIN	18			Volts	Minimum AC Input Voltage
4	VACMAX	265			Volts	Maximum AC Input Voltage
5	fL	50			Hertz	AC Mains Frequency
6	VO	5.00			Volts	Output Voltage (main)
7	PO_AVG	15.00			Watts	Average Output Power
8	PO_PEAK			15.00	Watts	Peak Output Power
9	Heatsink Type	**External**		External		Heatsink Type
10	Enclosure	**Adapter**				Open Frame enclosure assumes sufficient airflow, while Adapter means a sealed enclosure.
11	n	0.80			%/100	Efficiency Estimate
12	Z	0.50				Loss allocation factor
13	VB	12			Volts	Bias Voltage - Verify that VB is > 8 V at no load and VMAX
14	tC	3.00			ms	Bridge Rectifier Conduction Time Estimate
15	CIN	680.0		680.0	uFarads	Input Filter Capacitor
16						
17						
18	**ENTER TOPSWITCH-JX VARIABLES**					
19	**TOPSwitch-JX**	**TOP267E**			Universal / Peak	115 Doubled/230V
20	Chosen Device		TOP267E	Power Out	40 W / 86 W	85W
21	KI	0.90				External Ilimit reduction factor (KI=1.0 for default ILIMIT, KI <1.0 for lower ILIMIT)
22	ILIMITMIN_EXT			2.520	Amps	Use 1% resistor in setting external ILIMIT
23	ILIMITMAX_EXT			3.311	Amps	Use 1% resistor in setting external ILIMIT. Includes tolerance over temperature. See Fig 37 of datasheet
24	Frequency (F)=132kHz, (H)=66kHz	**H**		H		Select 'H' for Half frequency - 66kHz, or 'F' for Full frequency - 132kHz
25	fS			66000	Hertz	TOPSwitch-JX Switching Frequency: Choose between 132 kHz and 66 kHz
26	fSmin			59400	Hertz	TOPSwitch-JX Minimum Switching Frequency
27	fSmax			72600	Hertz	TOPSwitch-JX Maximum Switching Frequency
28	High Line Operating Mode			FF		Full Frequency, Jitter enabled
29	VOR	15.00			Volts	Reflected Output Voltage
30	VDS			10.00	Volts	TOPSwitch on-state Drain to Source Voltage
31	VD	0.50			Volts	Output Winding Diode Forward Voltage Drop
32	VDB	0.70			Volts	Bias Winding Diode Forward Voltage Drop
33	KP	0.50				Ripple to Peak Current Ratio (0.3 < KRP < 1.0 : 1.0< KDP<6.0)
34						
35						
36	**PROTECTION FEATURES**					
37	**LINE SENSING**					V pin functionality
38	VUV_STARTUP			20.11	Volts	Minimum DC Bus Voltage at which the power supply will start-up
39	VOV_SHUTDOWN			85	Volts	Typical DC Bus Voltage at which power supply will shut-down (Max)
40	RLS			0.8	M-ohms	Use two standard, 0.39 M-Ohm, 5% resistors in series for line sense functionality.
41	**OUTPUT OVERVOLTAGE**					
42	VZ			22	Volts	Zener Diode rated voltage for Output Overvoltage shutdown protection
43	RZ			5.1	k-ohms	Output OVP resistor. For latching shutdown use 20 ohm resistor instead
44	**OVERLOAD POWER LIMITING**					X pin functionality
45	Overload Current Ratio at VMAX			1.20		Enter the desired margin to current limit at VMAX. A value of 1.2 indicates that the current limit should be 20% higher than peak primary current at VMAX
46	Overload Current Ratio at VMIN			1.11		Margin to current limit at low line.
47	ILIMIT_EXT_VMIN			2.18	A	Peak primary Current at VMIN
48	ILIMIT_EXT_VMAX			2.06	A	Peak Primary Current at VMAX
49	RIL			6.90	k-ohms	Current limit/Power Limiting resistor.
50	RPL			N/A	M-ohms	Resistor not required. Use RIL resistor only
51						
52						
53	**ENTER TRANSFORMER CORE/CONSTRUCTION VARIABLES**					
54	**Core Type**	**EF25**		EF25		Core Type
55	Custom Core (Optional)					If Custom core is used - Enter Part number here
56	Bobbin			EF25_BOBBIN	P/N:	*
57	AE			0.5180	cm^2	Core Effective Cross Sectional Area
58	LE			5.7800	cm	Core Effective Path Length
59	AL			2000.0	nH/T^2	Ungapped Core Effective Inductance
60	BW			15.6	mm	Bobbin Physical Winding Width
61	M	4.50			mm	Safety Margin Width (Half the Primary to Secondary Creepage Distance)
62	L	3.00				Number of Primary Layers
63	NS			10		Number of Secondary Turns
64						
65						
66	**DC INPUT VOLTAGE PARAMETERS**					
67	VMIN			16	Volts	Minimum DC Input Voltage
68	VMAX			375	Volts	Maximum DC Input Voltage

69						
70						
71	**CURRENT WAVEFORM SHAPE PARAMETERS**					
72	DMAX			0.71		Maximum Duty Cycle (calculated at PO_PEAK)
73	IAVG			1.16	Amps	Average Primary Current (calculated at average output power)
74	IP			2.18	Amps	Peak Primary Current (calculated at Peak output power)
75	IR			1.09	Amps	Primary Ripple Current (calculated at average output power)
76	IRMS			1.40	Amps	Primary RMS Current (calculated at average output power)
77						
78						
79	**TRANSFORMER PRIMARY DESIGN PARAMETERS**					
80	LP			153	uHenries	Primary Inductance
81	LP Tolerance			10		Tolerance of Primary Inductance
82	NP			27		Primary Winding Number of Turns
83	NB			23		Bias Winding Number of Turns
84	ALG			206	nH/T^2	Gapped Core Effective Inductance
85	BM			2363	Gauss	Maximum Flux Density at PO, VMIN (BM<3000)
86	BP			3946	Gauss	Peak Flux Density (BP<4200) at ILIMITMAX and LP_MAX. Note: Recommended values for adapters and external power supplies <=3600 Gauss
87	BAC			591	Gauss	AC Flux Density for Core Loss Curves (0.5 X Peak to Peak)
88	ur			1776		Relative Permeability of Ungapped Core
89	LG			0.28	mm	Gap Length (Lg > 0.1 mm)
90	BWE			19.8	mm	Effective Bobbin Width
91	OD			0.73	mm	Maximum Primary Wire Diameter including insulation
92	INS			0.08	mm	Estimated Total Insulation Thickness (= 2 * film thickness)
93	DIA			0.65	mm	Bare conductor diameter
94	AWG			22	AWG	Primary Wire Gauge (Rounded to next smaller standard AWG value)
95	CM			645	Cmils	Bare conductor effective area in circular mils
96	CMA			460	Cmils/Amp	Primary Winding Current Capacity (200 < CMA < 500)
97	Primary Current Density (J)			4.32	Amps/mm^2	Primary Winding Current density (3.8 < J < 9.75)
98						
99						
100	**TRANSFORMER SECONDARY DESIGN PARAMETERS (SINGLE OUTPUT EQUIVALENT)**					
101	**Lumped parameters**					
102	ISP			5.95	Amps	Peak Secondary Current
103	ISRMS			2.46	Amps	Secondary RMS Current
104	IO_PEAK			3.00	Amps	Secondary Peak Output Current
105	IO			3.00	Amps	Average Power Supply Output Current
106	IRIPPLE			#NUM!	Amps	Output Capacitor RMS Ripple Current
107	CMS			491	Cmils	Secondary Bare Conductor minimum circular mils
108	AWGS			23	AWG	Secondary Wire Gauge (Rounded up to next larger standard AWG value)
109	DIAS			0.58	mm	Secondary Minimum Bare Conductor Diameter
110	ODS			0.66	mm	Secondary Maximum Outside Diameter for Triple Insulated Wire
111	INSS			0.04	mm	Maximum Secondary Insulation Wall Thickness
112						
113						
114	**VOLTAGE STRESS PARAMETERS**					
115	VDRAIN			422	Volts	Maximum Drain Voltage Estimate (Includes Effect of Leakage Inductance)
116	PIVS			142	Volts	Output Rectifier Maximum Peak Inverse Voltage
117	PIVB			329	Volts	Bias Rectifier Maximum Peak Inverse Voltage
118						
119						
120	**TRANSFORMER SECONDARY DESIGN PARAMETERS (MULTIPLE OUTPUTS)**					
121	**1st output**					
122	VO1	5.00		5.00	Volts	Output Voltage
123	IO1_AVG	2.00		2.00	Amps	Average DC Output Current
124	PO1_AVG			10.00	Watts	Average Output Power
125	VD1			0.50	Volts	Output Diode Forward Voltage Drop
126	NS1			10.00		Output Winding Number of Turns
127	ISRMS1			1.637	Amps	Output Winding RMS Current
128	IRIPPLE1			#NUM!	Amps	Output Capacitor RMS Ripple Current
129	PIVS1			142	Volts	Output Rectifier Maximum Peak Inverse Voltage
130	CMS1			327	Cmils	Output Winding Bare Conductor minimum circular mils
131	AWGS1			24	AWG	Wire Gauge (Rounded up to next larger standard AWG value)
132	DIAS1			0.51	mm	Minimum Bare Conductor Diameter
133	ODS1			0.66	mm	Maximum Outside Diameter for Triple Insulated Wire
134						
135						
136	**2nd output**					
137	VO2	5.00			Volts	Output Voltage
138	IO2_AVG	1.00			Amps	Average DC Output Current
139	PO2_AVG			5.00	Watts	Average Output Power
140	VD2			0.70	Volts	Output Diode Forward Voltage Drop
141	NS2			10.36		Output Winding Number of Turns
142	ISRMS2			0.818	Amps	Output Winding RMS Current
143	IRIPPLE2			#NUM!	Amps	Output Capacitor RMS Ripple Current

144	PIVS2			147	Volts	Output Rectifier Maximum Peak Inverse Voltage
145	CMS2			164	Cmils	Output Winding Bare Conductor minimum circular mils
146	AWGS2			27	AWG	Wire Gauge (Rounded up to next larger standard AWG value)
147	DIAS2			0.36	mm	Minimum Bare Conductor Diameter
148	ODS2			0.64	mm	Maximum Outside Diameter for Triple Insulated Wire
149						
150						
151	**3rd output**					
152	VO3				Volts	Output Voltage
153	IO3_AVG				Amps	Average DC Output Current
154	PO3_AVG			0.00	Watts	Average Output Power
155	VD3			0.70	Volts	Output Diode Forward Voltage Drop
156	NS3			1.27		Output Winding Number of Turns
157	ISRMS3			0.000	Amps	Output Winding RMS Current
158	IRIPPLE3			0.00	Amps	Output Capacitor RMS Ripple Current
159	PIVS3			17	Volts	Output Rectifier Maximum Peak Inverse Voltage
160	CMS3			0	Cmils	Output Winding Bare Conductor minimum circular mils
161	AWGS3			N/A	AWG	Wire Gauge (Rounded up to next larger standard AWG value)
162	DIAS3			N/A	mm	Minimum Bare Conductor Diameter
163	ODS3			N/A	mm	Maximum Outside Diameter for Triple Insulated Wire
164						
165						
166	**Total Continuous Output Power**			15	Watts	Total Continuous Output Power
167						
168	Negative Output	N/A		N/A		If negative output exists enter Output number; e.g.: If VO2 is negative output, enter 2