1	ACDC_InnoSwitch5-Pro_Flyback_122023; Rev.1.0; Copyright Power Integrations 2023	INPUT	INFO	OUTPUT	UNITS	InnoSwitch5-Pro Flyback Design Spreadsheet
2	APPLICATION VARIABLES					Design Title
3	INPUT_TYPE	AC		AC		Input Type
4	VIN_MIN	255		255	V	Minimum AC input voltage
5	VIN_MAX			265	V	Maximum AC input voltage
6	VIN_RANGE			HIGH LINE		Input voltage range
7	FLINE			60	Hz	AC Input voltage frequency
8	CAP_INPUT			140.0	uF	Input capacitance
9						
10	SET-POINT 1					
11	VOUT1	28.000		28.000	V	Output voltage; should be the highest output voltage required
12	CDC1	0.000		0.000	V	Cable-drop compensation required
13	IOUT1	5.000		5.000	A	Output current
14	POUT1			140.00	W	Output power
15	EFFICIENCY1	0.96		0.96		Estimated converter efficiency
16	Z_FACTOR1	0.60		0.60		Estimated Z-factor
17	TYPE	APDO		APDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
18						
19	SET-POINT 2					
20	VOUT2	20.000		20.000	V	Output voltage
21	CDC2	0.000		0.000	V	Cable-drop compensation required
22	IOUT2	5.000		5.000	A	Output current
23	POUT2			100.00	W	Output power
24	EFFICIENCY2	0.96		0.96		Estimated converter efficiency
25	Z_FACTOR2	0.60		0.60		Estimated Z-factor
26	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
27						
28	SET-POINT 3					
29	VOUT3	15.000		15.000	V	Output voltage
30	CDC3	0.000		0.000	V	Cable-drop compensation required
31	IOUT3	5.000		5.000	A	Output current
32	POUT3			75.00	W	Output power
33	EFFICIENCY3	0.91		0.91		Estimated converter efficiency
34	Z_FACTOR3	0.60		0.60		Estimated Z-factor
35	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
36						
37	SET-POINT 4					
38	VOUT4	9.000		9.000	V	Output voltage
39	CDC4	0.000		0.000	V	Cable-drop compensation required
40	IOUT4	3.000		3.000	A	Output current
41	POUT4			27.00	W	Output power
42	EFFICIENCY4	0.90		0.90		Estimated converter efficiency
43	Z_FACTOR4	0.60		0.60		Estimated Z-factor
44	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
45						
46	SET-POINT 5					
47	VOUT5	5.000		5.000	V	Output voltage
48	CDC5	0.000		0.000	V	Cable-drop compensation required
49	IOUT5	3.000		3.000	A	Output current
50	POUT5			15.00	W	Output power
51	EFFICIENCY5	0.89		0.89		Estimated converter efficiency
52	Z_FACTOR5	0.60		0.60		Estimated Z-factor
53	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
54						
55	SET-POINT 6					
56	VOUT6			0.000	V	Output voltage
57	CDC6			0.000	V	Cable-drop compensation required
58	IOUT6			0.000	A	Output current
59	POUT6			0.00	W	Output power
60	EFFICIENCY6			0.00		Estimated converter efficiency
61	Z_FACTOR6			0.00		Estimated Z-factor
62	TYPE	APDO		APDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
63						
64	SET-POINT 7					

65	VOUT7			0.000	V	Output voltage
66	CDC7			0.000	V	Cable-drop compensation required
67	IOUT7			0.000	A	Output current
68	POUT7			0.00	W	Output power
69	EFFICIENCY7			0.00		Estimated converter efficiency
70	Z_FACTOR7			0.00		Estimated Z-factor
71	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
72						
73	SET-POINT 8					
74	VOUT8			0.000	V	Output voltage
75	CDC8			0.000	V	Cable-drop compensation required
76	IOUT8			0.000	A	Output current
77	POUT8			0.00	W	Output power
78	EFFICIENCY8			0.00		Estimated converter efficiency
79	Z_FACTOR8			0.00		Estimated Z-factor
80	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
81						
82	SET-POINT 9					
83	VOUT9			0.000	V	Output voltage
84	CDC9			0.000	V	Cable-drop compensation required
85	IOUT9			0.000	A	Output current
86	POUT9			0.00	W	Output power
87	EFFICIENCY9			0.00		Estimated converter efficiency
88	Z_FACTOR9			0.00		Estimated Z-factor
89	TYPE	PDO		PDO		Select whether this set-point is a PDO(Power Delivery Object) or APDO(Augmented Power Data Object)
90						
91						
92	PRIMARY CONTROLLER SELECTION					
93	ENCLOSURE	OPEN FRAME		OPEN FRAME		Power supply enclosure
94	ILIMIT_MODE	INCREASED		INCREASED		Device current limit mode
95	VDRAIN_BREAKDOWN	750		750	V	Device breakdown voltage
96	DEVICE_GENERIC	INN5377		INN5377		Device selection
97	DEVICE_CODE			INN5377F		Device code
98	PDEVICE_MAX			145	W	Device maximum power capability
99	RDSON_100DEG			0.29	Ω	Primary switch on-time resistance at 100°C
100	ILIMIT_MIN			3.505	A	Primary switch minimum current limit
101	ILIMIT_TYP			3.810	A	Primary switch typical current limit
102	ILIMIT_MAX			4.115	A	Primary switch maximum current limit
103	VDRAIN_ON_PRSW			0.16	V	Primary switch on-time voltage drop
104	VDRAIN_OFF_PRSW		Warning	654.9	V	The peak drain voltage on the primary switch is higher than 650V: Decrease the device VOR
105						
106						
107						
108	WORST CASE ELECTRICAL PARAMETERS					
109	FSWITCHING_MAX	117262	Info	117262	Hz	The worst case minimum operating frequency is less than 25kHz: may result in audible noise
110	VOR	168.0		168.0	V	Voltage reflected to the primary winding (corresponding to set-point 1) when the primary switch turns off
111	VMIN	255.00	Info	255.00	V	A manual overwrite of VMIN voids the value of input capacitor calculated by the tool or manually entered by the user and will be used for all calculations
112	KP			1.413		Measure of continuous/discontinuous mode of operation
113	MODE_OPERATION			DCM		Mode of operation
114	DUTYCYCLE			0.318		Primary switch duty cycle
115	TIME_ON			3.27	us	Primary switch on-time
116	TIME_OFF			5.83	us	Primary switch off-time
117	LPRIMARY_MIN			193.6	uH	Minimum primary magnetizing inductance
118	LPRIMARY_TYP			199.6	uH	Typical primary magnetizing inductance
119	LPRIMARY_TOL	3.0		3.0	%	Primary magnetizing inductance tolerance
120	LPRIMARY_MAX			205.6	uH	Maximum primary magnetizing inductance
121						
122	PRIMARY CURRENT					
123	IAVG_PRIMARY			0.563	A	Primary switch average current
124	IPEAK_PRIMARY			4.070	A	Primary switch peak current
125	IPEDESTAL_PRIMARY			0.000	A	Primary switch current pedestal
126	IRIPPLE_PRIMARY			4.070	A	Primary switch ripple current
127	IRMS_PRIMARY			1.236	A	Primary switch RMS current

128						
129	SECONDARY CURRENT					
130	IPEAK_SECONDARY			24.421	A	Secondary winding peak current
131	IPEDESTAL_SECONDARY			0.000	A	Secondary winding pedestal current
132	IRMS_SECONDARY			9.134	A	Secondary winding RMS current
133	IRIPPLE_CAP_OUT			7.644	A	Output capacitor ripple current
134						
135						
136						
137	TRANSFORMER CONSTRUCTION PARAMETERS					
138	CORE SELECTION					
139	CORE	ATQ27		ATQ27		Core selection. Refer to the "Transformer Construction" tab for the detailed report.
140	CORE NAME			ATQ27/18.4		Core code
141	AE			129.0	mm^2	Core cross sectional area
142	LE			51.0	mm	Core magnetic path length
143	AL			6200	nH	Ungapped core effective inductance per turns squared
144	VE			6579	mm^3	Core volume
145	BOBBIN NAME			ATQ27/18.4 - 1 (P2-S2)		Bobbin name
146	AW			56.2	mm^2	Bobbin window area
147	BW			10.40	mm	Bobbin width
148	MARGIN			0.0	mm	Bobbin safety margin
149						
150	PRIMARY WINDING					
151	NPRIMARY			30		Primary winding number of turns
152	BPEAK			2280	Gauss	Peak flux density
153	BMAX			2150	Gauss	Maximum flux density
154	BAC			1075	Gauss	AC flux density (0.5 x Peak to Peak)
155	ALG			222	nH	squared
156	LG			0.705	mm	Core gap length
157						
158	PRIMARY BIAS WINDING					
159	NBIAS_PRIMARY			8		Primary bias winding number of turns
160						
161	SECONDARY WINDING					
162	NSECONDARY	5		5		Secondary winding number of turns
163						
164	SECONDARY BIAS WINDING					
165	NBIAS_SECONDARY			2		Secondary bias winding number of turns
166						
167						
168	PRIMARY COMPONENTS SELECTION					
169	RCD CLAMP					
170	LLEAK	5.40		5.40	uH	Primary winding leakage inductance
171	CSWNODE			15.00	pF	Primary switching node capacitance (InnoSwitch Coss + Transformer lumped winding capacitance)
172	CCLAMP			4.67	nF	Primary clamp capacitor
173	RCLAMP			18.26	kΩ	Primary Clamp Resistor
174						
175	UNDERVOLTAGE/OVERVOLTAGE					
176	BROWN-IN REQURED	113.00		113.00	V	Required AC RMS/DC line brown-in threshold
177	RLS			5.74	MΩ	Connect two 2.87 MOhm resistors to the V-pin for the required UV/OV threshold
178	BROWN-IN ACTUAL			94.3V - 114.2V	V	Actual AC RMS/DC brown-in threshold using standard resistors
179	BROWN-OUT ACTUAL			83.8V - 103.9V	V	Actual AC RMS/DC brown-out threshold using standard resistors
180	OVERVOLTAGE_LINE		Warning	427.4V - 485.2V	V	The device voltage stress (966.2V) will be higher than 750V when overvoltage is trigerred
181						
182	PRIMARY BIAS WINDING					
183	VBIAS_PRIMARY	7.00	Info	7.00	V	The rectified primary bias voltage maybe too low to supply the BPP pin: Increase the rectified primary bias voltage to a value higher than 9V
184	VF_BIAS_PRIMARY	0.70		0.70	V	Primary bias winding diode forward drop
185	VREVERSE_BIASDIODE_PRIMARY			144.36	V	Primary bias diode reverse voltage (not accounting parasitic voltage ring)
186	CBIAS_PRIMARY			22	uF	Primary bias winding rectification capacitor
187	CBPP			4.70	uF	BPP pin capacitor
188						
189						
190						

191	SECONDARY COMPONENTS SELECTION					
192	RECTIFIER					
193	VDRAIN_OFF_SRFET			90.23	V	Secondary rectifier reverse voltage (not accounting parasitic voltage ring)
194	SRFET	AONS62922		2		Secondary rectifier (Logic MOSFET)
195	VBREAKDOWN_SRFET			120	V	Secondary rectifier breakdown voltage
196	RDSON_SRFET			7.0	mΩ	SRFET on time drain resistance at 25degC for VGS=4.4V
197						
198	SECONDARY BIAS WINDING					
199	USE_SECONDARYBIAS	AUTO		YES		Select to use secondary bias winding or not
200	VBIAS_SECONDARY			6.00	V	Rectified secondary bias voltage at full load
201	VF_BIAS_SECONDARY			0.70	V	Secondary bias winding diode forward drop
202	VREVERSE_BIASDIODE_SECONDARY			30.89	V	Secondary bias diode reverse voltage (not accounting parasitic voltage ring)
203	CBIAS_SECONDARY			2.20	uF	Secondary bias winding rectification capacitor
204	CBPS			2.20	uF	BPS pin capacitor
205						
206	SYNCHRONOUS RECTIFIER ZERO-VOLTAGE SWITCHING TIMING					
207	SRZVS_ENABLE	YES		YES		Enable/Disable SRZVS operation
208	TIME_SRZVS_ON	425		425	ns	Output rectifier on time during SR-ZVS operation
209	IP_SRZVS_ON			2.15	A	Secondary switch peak current after SR-ZVS on-time
210	TIME_SRZVS_DELAY	510		510	ns	Output rectifier delay time during SR-ZVS operation
211	VDS_SRZVS_DELAY			0.0	V	Primary switch drain voltage at the end of SRZVS delay
212						
213						