

1	ACDC_InnoSwitch3-EP_Flyback_032521; Rev.1.7; Copyright Power Integrations 2021	INPUT	INFO	OUTPUT	UNITS	InnoSwitch3 EP Flyback Design Spreadsheet
2	<b>APPLICATION VARIABLES</b>					<b>Design Title</b>
3	VIN_MIN	195		195	V	Minimum AC input voltage
4	VIN_MAX			265	V	Maximum AC input voltage
5	VIN_RANGE			HIGH LINE		Range of AC input voltage
6	LINEFREQ	50		50	Hz	AC Input voltage frequency
7	CAP_INPUT	47.0		47.0	uF	Input capacitor
8	VOUT	24.00		24.00	V	Output voltage at the board
9	CDC			0	mV	Cable drop compensation desired at full load
10	IOUT	2.500		2.500	A	Output current
11	POUT			60.00	W	Output power
12	EFFICIENCY	0.93		0.93		AC-DC efficiency estimate at full load given that the converter is switching at the valley of the rectified minimum input AC voltage
13	FACTOR_Z			0.50		Z-factor estimate
14	ENCLOSURE	OPEN FRAME		OPEN FRAME		Power supply enclosure
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18	<b>PRIMARY CONTROLLER SELECTION</b>					
19	ILIMIT_MODE	INCREASED		INCREASED		Device current limit mode
20	DEVICE_GENERIC	AUTO		INN36X8		Generic device code
21	DEVICE_CODE			INN3678C		Actual device code
22	POUT_MAX			75	W	Power capability of the device based on thermal performance
23	RDSON_100DEG			1.02	Ω	Primary switch on time drain resistance at 100 degC
24	ILIMIT_MIN			1.767	A	Minimum current limit of the primary switch
25	ILIMIT_TYP			1.900	A	Typical current limit of the primary switch
26	ILIMIT_MAX			2.033	A	Maximum current limit of the primary switch
27	VDRAIN_BREAKDOWN			750	V	Device breakdown voltage
28	VDRAIN_ON_PRSW			0.27	V	Primary switch on time drain voltage
29	VDRAIN_OFF_PRSW			543.4	V	Peak drain voltage on the primary switch during turn-off
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33	<b>WORST CASE ELECTRICAL PARAMETERS</b>					
34	FSWITCHING_MAX			70000	Hz	Maximum switching frequency at full load and valley of the rectified minimum AC input voltage
35	VOR			100.0	V	Secondary voltage reflected to the primary when the primary switch turns off
36	VMIN			233.53	V	Valley of the minimum input AC voltage at full load
37	KP			0.94		Measure of continuous/discontinuous mode of operation
38	MODE_OPERATION			CCM		Mode of operation
39	DUTYCYCLE			0.300		Primary switch duty cycle
40	TIME_ON			5.46	us	Primary switch on-time
41	TIME_OFF			10.00	us	Primary switch off-time
42	LPRIMARY_MIN			620.6	uH	Minimum primary inductance
43	LPRIMARY_TYP			653.2	uH	Typical primary inductance
44	LPRIMARY_TOL			5.0	%	Primary inductance tolerance
45	LPRIMARY_MAX			685.9	uH	Maximum primary inductance
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47	<b>PRIMARY CURRENT</b>					
48	IPEAK_PRIMARY			1.884	A	Primary switch peak current
49	IPEDESTAL_PRIMARY			0.103	A	Primary switch current pedestal
50	IAVG_PRIMARY			0.267	A	Primary switch average current
51	IRIPPLE_PRIMARY			1.884	A	Primary switch ripple current
52	IRMS_PRIMARY			0.579	A	Primary switch RMS current
53						
54	<b>SECONDARY CURRENT</b>					
55	IPEAK_SECONDARY			7.879	A	Secondary winding peak current
56	IPEDESTAL_SECONDARY			0.430	A	Secondary winding current pedestal
57	IRMS_SECONDARY			3.698	A	Secondary winding RMS current
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61	<b>TRANSFORMER CONSTRUCTION PARAMETERS</b>					
62	<b>CORE SELECTION</b>					
63	CORE	CUSTOM		CUSTOM		Core selection
64	CORE CODE	ATQ25/9.3		ATQ25/9.3		Core code
65	AE	90.20		90.20	mm^2	Core cross sectional area
66	LE	32.40		32.40	mm	Core magnetic path length
67	AL	5877		5877	nH/turns^2	Ungapped core effective inductance
68	VE	2922.0		2922.0	mm^3	Core volume
69	BOBBIN	ATQ25/9.3		ATQ25/9.3		Bobbin
70	AW	27.30		27.30	mm^2	Window area of the bobbin
71	BW	4.30		4.30	mm	Bobbin width

72	MARGIN			0.0	mm	Safety margin width (Half the primary to secondary creepage distance)
73						
74	<b>PRIMARY WINDING</b>					
75	NPRIMARY			46		Primary turns
76	BPEAK			3440	Gauss	Peak flux density
77	BMAX			3072	Gauss	Maximum flux density
78	BAC			1536	Gauss	AC flux density (0.5 x Peak to Peak)
79	ALG			309	nH/turns*2	Typical gapped core effective inductance
80	LG			0.348	mm	Core gap length
81	LAYERS_PRIMARY			4		Number of primary layers
82	AWG_PRIMARY			29	AWG	Primary winding wire AWG
83	OD_PRIMARY_INSULATED			0.337	mm	Primary winding wire outer diameter with insulation
84	OD_PRIMARY_BARE			0.286	mm	Primary winding wire outer diameter without insulation
85	CMA_PRIMARY			219	Cmil/A	Primary winding wire CMA
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87	<b>SECONDARY WINDING</b>					
88	NSECONDARY			11		Secondary turns
89	AWG_SECONDARY			21	AWG	Secondary winding wire AWG
90	OD_SECONDARY_INSULATED			1.029	mm	Secondary winding wire outer diameter with insulation
91	OD_SECONDARY_BARE			0.723	mm	Secondary winding wire outer diameter without insulation
92	CMA_SECONDARY			219	Cmil/A	Secondary winding wire CMA
93						
94	<b>BIAS WINDING</b>					
95	NBIAS			6		Bias turns
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99	<b>PRIMARY COMPONENTS SELECTION</b>					
100	<b>LINE UNDERVOLTAGE</b>					
101	BROWN-IN REQUIRED			156.0	V	Required AC RMS line voltage brown-in threshold
102	RLS			7.84	MΩ	Connect two 3.92 MOhm resistors to the V-pin for the required UV/OV threshold
103	BROWN-IN ACTUAL			156.7	V	Actual AC RMS brown-in threshold
104	BROWN-OUT ACTUAL			141.7	V	Actual AC RMS brown-out threshold
105						
106	<b>LINE OVERVOLTAGE</b>					
107	OVERVOLTAGE_LINE		Warning	654.6	V	The device voltage stress will be higher than 650V when overvoltage is triggered
108						
109	<b>BIAS DIODE</b>					
110	VBIAS			12.0	V	Rectified bias voltage
111	VF_BIAS			0.70	V	Bias winding diode forward drop
112	VREVERSE_BIASDIODE			60.70	V	Bias diode reverse voltage (not accounting parasitic voltage ring)
113	CBIAS			22	uF	Bias winding rectification capacitor
114	CBPP			4.70	uF	BPP pin capacitor
115						
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118	<b>SECONDARY COMPONENTS</b>					
119	RFB_UPPER			100.00	kΩ	Upper feedback resistor (connected to the first output voltage)
120	RFB_LOWER			5.62	kΩ	Lower feedback resistor
121	CFB_LOWER			330	pF	Lower feedback resistor decoupling capacitor
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125	<b>MULTIPLE OUTPUT PARAMETERS</b>					
126	<b>OUTPUT 1</b>					
127	VOUT1			24.00	V	Output 1 voltage
128	IOUT1			2.50	A	Output 1 current
129	POUT1			60.00	W	Output 1 power
130	IRMS_SECONDARY1			3.698	A	Root mean squared value of the secondary current for output 1
131	IRIPPLE_CAP_OUTPUT1			2.725	A	Current ripple on the secondary waveform for output 1
132	AWG_SECONDARY1			21	AWG	Wire size for output 1
133	OD_SECONDARY1_INSULATED			1.029	mm	Secondary winding wire outer diameter with insulation for output 1
134	OD_SECONDARY1_BARE			0.723	mm	Secondary winding wire outer diameter without insulation for output 1
135	CM_SECONDARY1			740	Cmils	Bare conductor effective area in circular mils for output 1
136	NSECONDARY1			11		Number of turns for output 1
137	VREVERSE_RECTIFIER1			113.28	V	SRFET reverse voltage (not accounting parasitic voltage ring) for output 1
138	SRFET1	AUTO		AON7254		Secondary rectifier (Logic MOSFET) for output 1
139	VF_SRFET1			0.165	V	SRFET on-time drain voltage for output 1
140	VBREAKDOWN_SRFET1			150	V	SRFET breakdown voltage for output 1
141	RDSON_SRFET1			66.0	mΩ	SRFET on-time drain resistance at 25degC and VGS=4.4V for output 1

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143	<b>OUTPUT 2</b>					
144	VOUT2			0.00	V	Output 2 voltage
145	IOUT2			0.000	A	Output 2 current
146	POUT2			0.00	W	Output 2 power
147	IRMS_SECONDARY2			0.000	A	Root mean squared value of the secondary current for output 2
148	IRIPPLE_CAP_OUTPUT2			0.000	A	Current ripple on the secondary waveform for output 2
149	AWG_SECONDARY2			0	AWG	Wire size for output 2
150	OD_SECONDARY2_INSULATED			0.000	mm	Secondary winding wire outer diameter with insulation for output 2
151	OD_SECONDARY2_BARE			0.000	mm	Secondary winding wire outer diameter without insulation for output 2
152	CM_SECONDARY2			0	Cmils	Bare conductor effective area in circular mils for output 2
153	NSECONDARY2			0		Number of turns for output 2
154	VREVERSE_RECTIFIER2			0.00	V	SRFET reverse voltage (not accounting parasitic voltage ring) for output 2
155	SRFET2	<b>AUTO</b>		NA		Secondary rectifier (Logic MOSFET) for output 2
156	VF_SRFET2			NA	V	SRFET on-time drain voltage for output 2
157	VBREAKDOWN_SRFET2			NA	V	SRFET breakdown voltage for output 2
158	RDSON_SRFET2			NA	mΩ	SRFET on-time drain resistance at 25degC and VGS=4.4V for output 2
159						
160	<b>OUTPUT 3</b>					
161	VOUT3			0.00	V	Output 3 voltage
162	IOUT3			0.000	A	Output 3 current
163	POUT3			0.00	W	Output 3 power
164	IRMS_SECONDARY3			0.000	A	Root mean squared value of the secondary current for output 3
165	IRIPPLE_CAP_OUTPUT3			0.000	A	Current ripple on the secondary waveform for output 3
166	AWG_SECONDARY3			0	AWG	Wire size for output 3
167	OD_SECONDARY3_INSULATED			0.000	mm	Secondary winding wire outer diameter with insulation for output 3
168	OD_SECONDARY3_BARE			0.000	mm	Secondary winding wire outer diameter without insulation for output 3
169	CM_SECONDARY3			0	Cmils	Bare conductor effective area in circular mils for output 3
170	NSECONDARY3			0		Number of turns for output 3
171	VREVERSE_RECTIFIER3			0.00	V	SRFET reverse voltage (not accounting parasitic voltage ring) for output 3
172	SRFET3	<b>AUTO</b>		NA		Secondary rectifier (Logic MOSFET) for output 3
173	VF_SRFET3			NA	V	SRFET on-time drain voltage for output 3
174	VBREAKDOWN_SRFET3			NA	V	SRFET breakdown voltage for output 3
175	RDSON_SRFET3			NA	mΩ	SRFET on-time drain resistance at 25degC and VGS=4.4V for output 3
176						
177	PO_TOTAL			60.00	W	Total power of all outputs
178	NEGATIVE OUTPUT	<b>N/A</b>		N/A		If negative output exists, enter the output number; e.g. If VO2 is negative output, select 2
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