

1	HiperTFS2_Two-switch_Forward_012919; Rev.2.2; Copyright Power Integrations 2019	INPUT	INFO	OUTPUT	UNIT
2	Hiper-TFS MAIN OUTPUT (TWO-SWITCH FORWARD STAGE)				
3	OUTPUT VOLTAGE AND CURRENT				
4	VMAIN	27,00		27,00	V
5	IMAIN	13,00		13,00	A
6	VOUT2			0,00	V
7	IOUT2			0,00	A
8	Post Regulated Output				
9	Post Regulator	NONE		NONE	
10	V_SOURCE	NONE		NONE	V
11	VOUT3			0,00	V
12	IOUT3			0,00	A
13	n_PR	1,00		1,00	
14	Coupled Inductor (Low Power) derived output				
15	VOUT4			0,00	V
16	IOUT4			0,00	A
17	System Power				
18	POUT(Main)			351,0	W
19	POUT_PEAK(Main)	280,0		280,0	W
20	POUT(Standby)			15,3	W
21	POUT_PEAK(Standby)			15,3	W
22	POUT(System Total)			366,3	W
23	POUT_PEAK(System Total)			295,3	W
24					
25					
26	INPUT VOLTAGE AND UV/OV				
27	CIN_MIN			46	µF
28	T_HOLDUP	1,0		1,0	ms
29	CIN_ACTUAL	220		220	µF
30	CIN_ESR	0,30		0,30	Ω
31	IRMS_CIN			#N/A	A
32	PLOSS_CIN			#N/A	W
33	VMIN	360		360	V
34	VNOM	385		385	V
35	VMAX	390		390	V
36	RR			4,00	MΩ
37	RL	4,00		4,00	MΩ
38	UV and OV thresholds				
39	VUV OFF (min)			186	V
40	VUV OFF (max)			230	V
41	VUV ON (min)			302	V
42	VUV ON (max)			334	V
43	VOV OFF (min)			474	V
44	VOV ON (max)			654	V
45	Clamp Section				
46	Clamp Selection	CLAMP TO RAIL			
47	VCLAMP	150		150	V
48	VDSOP			540	V
49					
50					
51	DUTY CYCLE VALUES (REGULATION)				
52	DVMIN			0,51	
53	DVNOM_GOAL	0,48		0,48	
54	DVNOM			0,48	
55	DVMAX			0,47	
56	DOV OFF MIN			0,39	
57	Maximum Duty Cycle values				
58	DMAX_UVOFF_MIN			0,65	
59	DMAX_VMIN			0,59	
60	DMAX_VNOM			0,57	
61	DMAX_VMAX			0,56	
62	DMAX_OVOFFMIN			0,46	
63					
64					
65	DEVICE VARIABLES				
66	Device	TFS7708		TFS7708	
67	Select Frequency mode	66		66	kHz
68	ILIMIT_MIN			4,61	A
69	ILIMIT_TYP			4,96	A
70	ILIMIT_MAX			5,31	A
71	fSMIN			62 000	Hz
72	fS			66 000	Hz
73	fSMAX			70 000	Hz
74	KI	1,0		1,0	
75	R(FB)			232	kΩ
76	ILIMIT SELECT			4,61	A
77	RDS(ON)			2,37	Ω

78	VDS		3,40		3,40	V
79	Main MOSFET losses					
80	V_Coss upper FET				150	V
81	MOSFET SWITCHING LOSS				1,0	W
82	MOSFET CONDUCTION LOSS				#N/A	W
83	TOTAL_MOSFET_LOSS				#N/A	W
84	Detailed MOSFET Loss Information					
85	PCOND_LOWER				#N/A	W
86	PCOND_UPPER				#N/A	W
87	LOWERFET_SW_LOSS				0,8	W
88	UPPERFET_SW_LOSS				0,2	W
89						
90						
91	MAIN TRANSFORMER					
92	Transformer core selection					
93	Core Type		ETD34		ETD34	
94	AE		0,97		0,97	cm^2
95	LE		7,68		7,68	cm
96	AL		2780		2780	nH/T^2
97	BW		20,90		20,90	mm
98	B_HT		5,38		5,38	mm
99	B_WA				1,12	cm^2
100	M		4,50		4,50	mm
101						
102	Primary Inductance					
103	LMAG_MAX				51,38	mH
104	LMAG		10,00		10,00	mH
105	GAP			Info	0,04	mm
106	FRES_SYS		136		136	kHz
107	C_SYS				137	pF
108	Diode Vf Selection					
109	VDMIN				0,50	V
110	VDOUT2				0,50	V
111	VDOUT3				0,50	V
112	VDB				0,70	V
113						
114	Turns					
115	NMAIN		13		13	turns
116	NS2				N/A	turns
117	VOUT2 ACTUAL				0,0	V
118	NP				81	turns
119	HI SIDE BIAS WINDING (optional)		No		No	
120	VBIAS					V
121	NBIAS					turns
122	VBIAS_ACTUAL					V
123	Flux calculations					
124	BM_MAX				2181	Gauss
125	BM PK-PK			3304		Gauss
126	BP_MAX				2781	Gauss
127	BP PK-PK				4214	Gauss
128						
129						
130	TRANSFORMER LOSSES AND FIT ESTIMATE					
131	Core loss					
132	Core material		PC44		PC44	
133	core_loss_multiplier	23,97			23,97	
134	f_coeff	1,56			1,56	
135	BAC_coeff	2,89			2,89	
136	specific core loss		91		91	mW/cc
137	core volume	7,63			7,63	cm^3
138	core loss	0,69			0,69	W
139	Primary Winding Fit and losses					
140	L		3		3	layers
141	OD_PRI		0,70		0,70	mm
142	FILAR_PRI		1		1	strands
143	MLT_PRI		6,00		6,00	cm
144	DCR_PRI				279	mΩ
145	PCOND_PRI				#N/A	W
146	FILL_PRI				28	%
147	Secondary Winding 1 (lower winding when AC stacked)					
148	VOUT				27,0	V
149	NS1				13,0	turns
150	IRMS_SEC1				#N/A	A
151	Foil/Wire		WIRE		WIRE	foil/wire
152	OD/Thickness		0,80		0,80	mm
153	FILAR_SEC1		2		2	strands
154	SEC1_WIDTH			Warning	N/A	mm
155	SEC1_MLT		6,00		6,00	cm

156	DCR_SEC1			17,15	mΩ
157	PCOND_SEC1			#N/A	W
158	FILL_SEC1			12	%
159	Secondary Winding 2 (upper winding when AC stacked)				
160	VOUT			0,0	V
161	NS2			0,0	turns
162	IRMS_SEC2			0,0	A
163	Foil/Wire		FOIL	FOIL	foil/wire
164	OD/Thickness			0,13	mm
165	FILAR_SEC2			N/A	strands
166	SEC2_WIDTH			18,00	mm
167	SEC2_MLT			6,00	cm
168	DCR_SEC2			0,00	mΩ
169	PCOND_SEC2			0,00	W
170	FILL_SEC2			0	%
171	Fill Factor and losses of main transformer				
172	FILL_TOTAL			39	%
173	TOTAL_CU_LOSS			#N/A	W
174	TOTAL_CORE_LOSS			0,69	W
175	TOTAL_TRF_LOSS			#N/A	W
176					
177					
178	CURRENT WAVESHAPe PARAMETERS				
179	IP		#N/A	#N/A	A
180	IP_PEAK		#N/A	#N/A	A
181	IPRMS(NOM)			#N/A	A
182	IMAG			0,28	A
183					
184					
185	OUTPUT INDUCTOR				
186	KDI_ACTUAL		#N/A	#N/A	
187	Turns				
188	POWDER TURNS MULTIPLIER	3,00		3,00	
189	NMAIN_INDUCTOR			39,0	turns
190	NOUT2_INDUCTOR				turns
191	NOUT4_INDUCTOR			N/A	turns
192	Inductance and flux				
193	LMAIN_ACTUAL			#N/A	uH
194	LOUT_2			#N/A	uH
195	BM_IND			#N/A	gauss
196	BAC_IND			#N/A	gauss
197					
198	Core Selection				
199	Core Type	Auto		Kool Mu 125u	
200	Core	Auto		77324(O,D)=36.7	
201	AE			#N/A	mm^2
202	LE			#N/A	mm
203	AL			#N/A	nH/T^2
204	BW			#N/A	mm
205	VE			#N/A	mm^3
206	Powder cores (Sendust and Powdered Iron) Cores				
207	MUR			#N/A	
208	H			#N/A	AT/cm
209	MUR_RATIO			#N/A	
210	LMAIN_Obias			#N/A	uH
211					
212	Ferrite Cores				
213	LG			N/A	mm
214	Target BM			N/A	Gauss
215					
216	Choke wires				
217	Total number of layers		#N/A	#N/A	layers
218	IRMS_MAIN			13,03	A
219	IRMS_AUX			0,00	A
220	AWG_MAIN			17	AWG
221	OD_MAIN			1,22	mm
222	FILAR_MAIN			2	strands
223	RDC_MAIN			#N/A	mΩ
224	AC Resistance Ratio (Main)			#N/A	
225	CMA_MAIN			315	CMA
226	J_MAIN			11,07	A/mm^2
227	AWG_AUX			0	AWG
228	OD_AUX			N/A	mm
229	FILAR_AUX			2	strands
230	RDC_AUX			0,00	mΩ
231	AC Resistance Ratio (Aux)			0,00	
232	CMA_AUX		Info	0	CMA
233	J_AUX			0,00	A/mm^2
234					

235	Choke Losses				
236	PCOPPER_MAIN			#N/A	W
237	PCOPPER_AUX			0,00	W
238	PCORE			#N/A	W
239	PTOTAL_IND			#N/A	W
240					
241					
242	SECONDARY OUTPUT DIODE PARAMETERS				
243	Main Output				
244	ISFWRMS			#N/A	A
245	ISCATCHRMS			#N/A	A
246	IDAVMAINF			6,65	A
247	IDAVMAINC			6,87	A
248	IRMSMAIN			#N/A	A
249	PD_LOSS_MAIN			6,50	W
250					
251	Second Output				
252	ISFWD2RMS			#N/A	A
253	ISCATCH2RMS			#N/A	A
254	IDAVOUT2F			0,00	A
255	IDAVOUT2C			0,00	A
256	IRMSOUT2			#N/A	A
257	PD_LOSS_OUT2			0,00	W
258					
259	Diode Derating				
260	VPIVMAINF	1,00		86,67	V
261	VPIVMAINC	1,00		62,59	V
262	VPIVOUT2F	1,00		0,00	V
263	VPIVOUT2C	1,00		0,00	V
264	VPIVB	1,00		N/A	V
265					
266					
267	Hiper-TFS STANDBY SECTION (FLYBACK STAGE)				
268	ENTER APPLICATION VARIABLES				
269	VACMIN			85	V
270	VACMAX			265	V
271	fL			50	Hz
272	VO_SB			5,0	V
273	IO_SB			3,00	A
274	IO_SB_PK			3,00	A
275	POUT_SB			15,00	W
276	POUT_SB_TOTAL			15,32	W
277	POUT_SB_PK			15,32	W
278	n			0,70	
279	Z			0,50	
280	tC			3,00	ms
281					
282					
283	ENTER Hiper-TFS STANDBY VARIABLES				
284	Select Current Limit	INC		Increased Current Limit	
285	ILIM_MIN			0,70	A
286	ILIM_TYP			0,75	A
287	ILIM_MAX			0,80	A
288	R(EN)			107	kΩ
289	fSmin			124 000	Hz
290	I ² fmin			66,8	A ² kHz
291	VOR			100	V
292	VDS			10,0	V
293	VD_SB			0,50	V
294	KP			0,73	
295	KP_TRANSIENT			0,44	
296					
297					
298	ENTER BIAS WINDING VARIABLES				
299	VB			16,0	V
300	IB			20,0	mA
301	PB			0,32	W
302	VDB			0,70	V
303	NB			9,1	turns
304	VZOV			22	V
305					
306					
307	UVLO VARIABLES				
308	RLS			4,00	MΩ
309	V_UV_ACTUAL			102	V
310					
311					
312	ENTER TRANSFORMER CORE/CONSTRUCTION VARIABLES				
313	Core Type	EEL22		EEL22	

314	AE			0,36	cm^2
315	LE			6,32	cm
316	AL			1400	nH/T^2
317	BW			18,00	mm
318	M			0,00	mm
319	L			3	
320	NS_SB			3	
321					
322					
323	DC INPUT VOLTAGE PARAMETERS				
324	VMIN_SB			88	V
325	VMAX_SB			375	V
326					
327					
328	CURRENT WAVEFORM SHAPE PARAMETERS				
329	DMAX_SB			0,56	
330	IAVG			0,28	A
331	IP_SB			0,70	A
332	IR_SB			0,51	A
333	IRMS_SB			0,40	A
334					
335					
336	TRANSFORMER PRIMARY DESIGN PARAMETERS				
337	LP_SB			660	uH
338	LP_TOLERANCE			10,0	%
339	NP_SB			55	turns
340	ALG			222	nH/T^2
341	BM			2713	Gauss
342	BAC			992	Gauss
343	ur			1967	
344	LG			0,17	mm
345	BWE			54	mm
346	OD			0,99	mm
347	INS			0,08	mm
348	DIA			0,91	mm
349	AWG			20	AWG
350	CM			1024	Cmils
351	CMA		Info	2546	Cmils/Amp
352					
353					
354	TRANSFORMER SECONDARY DESIGN PARAMETERS				
355	Lumped parameters				
356	ISP			12,7	A
357	ISRMS			6,46	A
358	IRIPPLE			5,72	A
359	CMS			1292	Cmils
360	AWGS			19	AWG
361					
362					
363	VOLTAGE STRESS PARAMETERS				
364	VDRAIN			605	V
365	PIVS			26	V
366					
367					
368	Forward DC-DC System efficiency				
369	P_MOSFET_MAIN_TOTAL			#N/A	W
370	P_XFMR_LOSS			#N/A	W
371	P_MAIN_OUT_DIODE			6,5	W
372	P_CIN_ESR			#N/A	W
373	P_IND_MAIN			#N/A	W
374	OTHER_LOSSES			0,46	W
375					
376	EFFICIENCY_STDBY			70,0%	
377	EFFICIENCY_MAIN			#N/A	
378	EFFICIENCY_SYSTEM			#N/A	
379	Other Losses				
380	PCB trace losses			0,46	W
381					
382	Detailed Mosfet Loss Information				
383	P_MAIN_COND_LOWER			#N/A	W
384	P_MAIN_COND_UPPER			#N/A	W
385	COSS_LOWER			78	pF
386	COSS_UPPER			205	pF
387	P_MAIN_LOWER_SW			0,84	W
388	P_MAIN_UPPER_SW			0,15	W
389	P_STANDBY_COND			0,89	W
390					