HiperTFS2_Two-switch_Forward_012919; Rev.2.2; Copyright Power Integrations 2019	INPUT	INFO	OUTPUT	UNIT	Two-switch Forward Transformer Design Spreadsheet
Hiper-TFS MAIN OUTPUT (TWO-SWITCH FORWARD STAGE)					
OUTPUT VOLTAGE AND CURRENT					Design Title
VMAIN	14.00		14.00	V	Main output voltage
IMAIN	8.00		8.00	A	Main output current
VOUT2	0.00		0.00	V	Output2 voltage - enter zero or leave blank if none
IOUT2	0.00		0.00	A	Output2 current - enter zero or leave blank if none
Post Regulated Output					
Post Regulator	NONE		NONE		Select post regulator from Mag-Amp, Buck, or NONE
V_SOURCE	NONE		NONE	V	Select source of input voltage for post regulator. Enter None if Post regulator not used.
VOUT3			0.00	V	Enter post regulator output voltage. Enter zero or leave blank if none
IOUT3			0.00	A	Enter post regulator output current. Enter zero or leave blank if none
n_PR			1.00		Enter post regulator efficiency (Buck only)
Coupled Inductor (Low Power) derived output					
VOUT4	0.00		0.00	V	Output choke derived (low power) output voltage (typically -12 V)
IOUT4	0.00		0.00	A	Output choke derived (low power) output current
System Power					
POUT(Main)			112.0	W	Total output power (Main converter)
POUT_PEAK(Main)	112.0		112.0	W	Peak Output power (Main converter). If there is no peak power requirement enter value equal to continuous power
POUT(Standby)			1.2	W	Continuous output power from Standby power supply
POUT_PEAK(Standby)			1.2	W	Peak output power from Standby section below
POUT(System Total)			113.2	W	Total system continuous output power
POUT_PEAK(System Total)			113.2	W	Total system peak output power
INPUT VOLTAGE AND UV/OV					
CIN_MIN			122	uF	Minimum Input Capacitance to meet holdup time. To increase CMIN, increase T_HOLDUP
T_HOLDUP			20.0	ms	Holdup time
CIN_ACTUAL	330		330	uF	Select Actual Bulk Capacitor
CIN_ESR	0.20		0.20	Ω	Bulk capacitor ESR
IRMS_CIN			0.66	A	RMS current through bulk capacitor
PLOSS_CIN			0.09	W	Bulk capacitor ESR losses
VMIN	230		230	V	Minimum input voltage to guarantee output regulation at full load
VNOM	310		310	V	Nominal input voltage
VMAX	350		350	V	Maximum DC input voltage
RR			3.10	MΩ	R pin resistor

RL	3.10		3.10	MΩ	Line Sense resistor value (L-pin) - goal seek (VUV OFF) for std 1% resistor series
UV and OV thresholds					
VUV OFF (min)			143	V	Minimum undervoltage On→Off threshold
VUV OFF (max)			177	V	Maximum undervoltage On→Off threshold
VUV ON (min)			233	V	Minimum undervoltage Off→On threshold
VUV ON (max)			258	V	Maximum undervoltage Off→On threshold
VOV OFF (min)			367	V	Minimum overvoltage On→Off threshold
VOV ON (max)			506	V	Maximum overvoltage Off→On threshold
Clamp Section					
Clamp Selection	CLAMP TO GND				Select either "CLAMP TO RAIL" (default) or "CLAMP TO GND"
VCLAMP	530		530	V	Asymmetric Clamp Zener Voltage
VDSOP			530	V	Estimated Maximum Hiper-TFS Drain voltage (at VOVOFF_MAX)
DUTY CYCLE VALUES (REGULATION)					
DVMIN			0.59		Duty cycle at minimum DC input voltage
DVNOM_GOAL	0.44		0.44		Target duty cycle at nominal input voltage (VNOM)
DVNOM			0.44		Duty cycle at nominal DC input voltage
DVMAX			0.39		Duty cycle at maximum DC input voltage
DOVOFF MIN			0.37		Duty cycle at over-voltage DC input voltage (DOVOFF_MIN)
Maximum Duty Cycle values					
DMAX_UVOFF_MIN			0.78		Max duty cycle clamp at VUVOFF_MIN
DMAX_VMIN			0.70		Max duty clamp cycle at VMIN
DMAX_VNOM			0.55		Max duty clamp cycle at VNOM
DMAX_VMAX			0.48		Max duty clamp cycle at VMAX
DMAX_OVOFFMIN			0.46		Max duty clamp cycle at VOVOFF_MAX
DEVICE VARIABLES					
Device	TFS7704		TFS7704		Selected HiperTFS device
Select Frequency mode	132		132	kHz	Select Frequency mode.
ILIMIT_MIN			3.35	A	Device current limit (Minimum)
ILIMIT_TYP			3.6	A	Device current limit (Typical)
ILIMIT_MAX			3.85	A	Device current limit (Maximum)
fSMIN			124,000	Hz	Device switching frequency (Minimum)
fS			132,000	Hz	Device switching frequency (Typical)
fSMAX			140,000	Hz	Device switching frequency (Maximum)
KI	1.0		1.0		Select Current limit factor (KI=1.0 for default ILIMIT, or select KI=0.9 or KI=0.7)
R(FB)			232	kΩ	Feedback (FB) pin resistor
ILIMIT SELECT			3.35	A	Selected current limit
RDS(ON)			4.20	Ω	Sum of Rds(on) of high and low-side MOSFETs at 100°C
VDS	3.00		3.00	V	HiperTFS full-load average on-state Drain to Source Voltage (sum for both MOSFETs)
Main MOSFET losses					

V_Coss upper FET	200		200	V	Voltage across upper MOSFET at turn on, enter actual value to calculate switching losses
MOSFET SWITCHING LOSS			0.8	W	Sum of switching losses in both MOSFETs
MOSFET CONDUCTION LOSS			2.5	W	Sum of conduction losses in both MOSFETs
TOTAL_MOSFET_LOSS			3.3	W	Total loss in MOSFET (upper + lower)
Detailed MOSFET Loss Information					
PCOND_LOWER			1.7	W	Conduction losses in lower MOSFET
PCOND_UPPER			0.8	W	Conduction losses in upper MOSFET
LOWERFET_SW_LOSS			0.5	W	Switching loss in upper MOSFET
UPPERFET_SW_LOSS			0.3	W	Switching loss in lower MOSFET
MAIN TRANSFORMER					
Transformer core selection					
Core Type	ETD34		ETD34		Selected core type
AE	0.97		0.97	cm^2	Core effective cross sectional area
LE	7.86		7.86	cm	Core Effective Path Length
AL	3300		3300	nH/T^2	Ungapped Core Effective Inductance
BW	20.90		20.90	mm	Bobbin Physical Winding Width
B_HT	5.38		5.38	mm	Height of bobbin (to calculate fit)
B_WA			1.12	cm^2	Bobbin Winding area
M	4.50		4.50	mm	Bobbin safety margin tape width (2 * M = Total Margin)
Primary Inductance					
LMAG_MAX			10.82	mH	Max LMAG to hit min zero-load resonant frequency, calculated from C_PRI. Do not exceed.
LMAG	3.50		3.50	mH	Actual magnetizing inductance (measured) of transformer
GAP			0.1	mm	gap calculated from LMAG
FRES_SYS	211		211	kHz	Total XFMR + system resonant frequency; enter value along with actual LMAG
C_SYS			163	pF	Estimated total XFMR + Sys parasitic cap reflected to primary, calc'd from LMAG and FRES
Diode Vf Selection					
VDMAIN	0.24		0.24	V	Main output diodes forward voltage drop - affects VOUT2_ACTUAL (if present)
VDOUT2	0.00		0.00	V	Output 2 diodes forward voltage drop - affects VOUT2_ACTUAL
VDOUT3	0.00		0.00	V	Output 3 diodes forward voltage drop
VDB	0.70		0.70	V	Bias diode forward voltage drop
Turns					
NMAIN	7		7	turns	Main rounded turns
NS2			N/A	turns	2nd output number of turns
VOUT2 ACTUAL			0.0	V	Approximate Output2 voltage with NS2 = 0 turns (AC stacked secondary). VDMAIN and VDOUT2 affect this.
NP			62	turns	Primary rounded turns. NMAIN and DVNOM_GOAL affect this.
HI SIDE BIAS WINDING (optional)	No		No		Can be used to eliminate pulse skipping at light load 132 kHz when zero transformer gap; better efficiency than adding gap

VBIAS	0.0			V	DC bias voltage from main transformer optional aux winding
NBIAS	0			turns	VBias rounded turns
VBIAS_ACTUAL				V	Vbias not used
Flux calculations					
BM_MAX			1049	Gauss	Peak positive flux density at nominal switching frequency
BM PK-PK			1589	Gauss	Peak-peak flux density at nominal conditions. Used to calculate core losses
BP_MAX			1408	Gauss	Max transient positive flux density at Vmax (limited by DVMAX clamp)
BP PK-PK			2133	Gauss	Max transient peak-peak flux density at Vmax (limited by DVMAX clamp)
TRANSFORMER LOSSES AND FIT ESTIMATE					
Core loss					
Core material	PC44		PC44		Core material
core_loss_multiplier	23.97		23.97		Core Loss multiplier
f_coeff	1.56		1.56		Core Loss Frequency co-efficient
BAC_coeff	2.90		2.90		Core Loss AC flux density co-efficient
specific core loss	161		31	mW/cc	Core loss per unit volume
core volume	7.63		7.63	cm^3	Volume of core
core loss			0.24	W	Core loss
Primary Winding Fit and losses					
L	3		3	layers	Transformer primary layers (split primary recommended)
OD_PRI	0.70		0.70	mm	Primary winding diameter
FILAR_PRI	1		1	strands	Number of parallel strands of wire (primary)
MLT_PRI	6.00		6.00	cm	Mean length per turn
DCR_PRI			214	mΩ	DC resistance of primary winding
PCOND_PRI			0.13	W	Conduction loss in primary winding
FILL_PRI			21	%	Fill factor (primary only)
Secondary Winding 1 (lower winding when AC stacked)					
VOUT			14.0	V	Specified voltage for this winding
NS1			7.0	turns	Number of turns
IRMS_SEC1			5.7	A	RMS current through winding
Foil/Wire	WIRE		WIRE	foil/wire	Select FOIL or WIRE for winding
OD/Thickness	0.85		0.85	mm	Wire diameter or Foil thickness
FILAR_SEC1			2	strands	Number of parallel strands (wire selection only)
SEC1_WIDTH		Warning	N/A	mm	Foil Width (Applicable if FOIL winding used)
SEC1_MLT	5.40		5.40	cm	Mean length per turn
DCR_SEC1			7.36	mΩ	DC resistance of secondary winding
PCOND_SEC1			0.24	W	Conduction loss in secondary winding
FILL_SEC1			7	%	Fill factor (secondary 1 only)
Secondary Winding 2 (upper winding when AC stacked)					
VOUT			0.0	V	Specified voltage for this winding
NS2			0.0	turns	Number of turns

IRMS_SEC2			0.0	A	RMS current through winding
Foil/Wire	FOIL		FOIL	foil/wire	Select FOIL or WIRE for winding
OD/Thickness			0.13	mm	Wire diameter or Foil thickness
FILAR_SEC2			N/A	strands	Number of parallel strands (wire selection only)
SEC2_WIDTH			18.00	mm	Foil Width (Applicable if FOIL winding used)
SEC2_MLT			6.00	cm	Mean length per turn
DCR_SEC2			0.00	mΩ	DC resistance of secondary winding
PCOND_SEC2			0.00	W	Conduction loss in secondary winding
FILL_SEC2			0	%	Fill factor (secondary 1 only)
Fill Factor and losses of main transformer					
FILL_TOTAL			28	%	Total transformer fill factor
TOTAL_CU_LOSS			0.37	W	Total copper losses in transformer
TOTAL_CORE_LOSS			0.24	W	Total core losses in transformer
TOTAL_TRF_LOSS			0.61	W	Total losses in transformer
CURRENT WAVESHAPE PARAMETERS					
IP			1.26	A	Peak primary current at Full Load, VNOM
IP_PEAK			1.26	A	Peak primary current at Peak Load and VNOM
IPRMS(NOM)			0.77	A	Primary RMS current at Full Load, VNOM
IMAG			0.29	A	Peak magnetizing current at VMIN
OUTPUT INDUCTOR					
KDI_ACTUAL			0.15		Current ripple factor of combined Main and Output2 outputs
Turns					
POWDER TURNS MULTIPLIER	5.00		5.00		Powder only. Multiplier factor between main number of turns in transformer and inductor (default value = 3 for 66kHz or 4 for 132kHz).
NMAIN_INDUCTOR			35.0	turns	Main output inductor number of turns - affected by powder turns multiplier or ferrite Target BM
NOUT2_INDUCTOR				turns	Output 2 inductor number of turns
NOUT4_INDUCTOR			N/A	turns	Output 4 number of turns (low power)
Inductance and flux					
LMAIN_ACTUAL			55.7	uH	Estimated inductance of main output at full load
LOUT_2			0.0	uH	Estimated inductance of auxiliary output at full load
BM_IND			4356	gauss	DC component of flux density
BAC_IND			313	gauss	AC component of flux density
Core Selection					
Core Type	Kool Mu 75u		Kool Mu 75u		Select core type
Core	77314(O.D)=23.6		77314(O.D)=23.6		Output choke core size - verify on bench
AE	31.70		31.70	mm^2	Core Effective Cross Sectional Area
LE	56.70		56.70	mm	Core Effective Path Length
AL	65		65	nH/T^2	Ungapped Core Effective Inductance
BW	41.90		41.90	mm	Bobbin Physical Winding Width

VE	1800		1800	mm^3	Volume of core
Powder cores (Sendust and Powdered Iron) Cores					
MUR	90		90		Relative permeability of material at 0 bias
H	9.00		9.00	AT/cm	Magnetic field strength
MUR_RATIO	0.70		0.70		Ratio of permeability at full load divided by initial permeability
LMAIN_0bias			79.6	uH	Estimated inductance of main output with 0 DC bias
Ferrite Cores					
LG			N/A	mm	Gap length of inductor cores
Target BM			N/A	Gauss	Target maximum flux density
Choke wires					
Total number of layers			1.03	layers	Total number of layers for chosen toroid
IRMS_MAIN			8.01	A	RMS current through main inductor windings
IRMS_AUX			0.00	A	RMS current through aux winding
AWG_MAIN	17		17	AWG	Main inductor winding wire gauge
OD_MAIN			1.22	mm	Main winding wire gauge outer diameter
FILAR_MAIN	1		1	strands	Number of parallel strands for main output
RDC_MAIN			17.33	mΩ	Resistance of wire for main inductor winding
AC Resistance Ratio (Main)			4.25		Ratio of total resistance (AC + DC) to the DC resistance (using Dowell curves)
CMA_MAIN			256	CMA	Cir mils per amp for main inductor winding
J_MAIN			6.80	A/mm^2	Current density in main inductor winding
AWG_AUX			0	AWG	Aux winding wire gauge
OD_AUX			N/A	mm	Auxiliary winding wire gauge outer diameter
FILAR_AUX			2	strands	Number of parallel strands for aux output
RDC_AUX			0.00	mΩ	Resistance of wire for aux inductor winding
AC Resistance Ratio (Aux)			0.00		Ratio of total resistance (AC + DC) to the DC resistance (using Dowell curves)
CMA_AUX		Info	0	CMA	!!! Info. Low CMA may cause overheating. Verify acceptable temperature rise
J_AUX			0.00	A/mm^2	Current density in auxiliary winding
Choke Losses					
PCOPPER_MAIN			1.11	W	Copper loss in main inductor winding
PCOPPER_AUX			0.00	W	Copper loss in aux inductor windings
PCORE			0.22	W	Total core loss
PTOTAL_IND			1.33	W	Total losses in output choke
SECONDARY OUTPUT DIODE PARAMETERS					
Main Output					
ISFWDRMS			5.68	A	Full load forward diode RMS current at nominal input voltage
ISCATCHRMS			6.45	A	Freewheeling diode RMS current at nominal input voltage
IDAVMAINF			4.73	A	Worst case average current of forward rectifier at VMIN (single device rating)
IDAVMAINC			4.91	A	Worst case average current of freewheeling diode at VMAX(single device rating)

IRMSMAIN			0.34	A	Maximum RMS current, Main output capacitor
PD_LOSS_MAIN			1.92	W	Conduction loss of forward diode
Second Output					
ISFWD2RMS			0.00	A	Full load forward diode RMS current at nominal input voltage
ISCATCH2RMS			0.00	A	Freewheeling diode RMS current at nominal input voltage
IDAVOUT2F			0.00	A	Worst case average current of forward rectifier at VMIN (single device rating)
IDAVOUT2C			0.00	A	Worst case average current of freewheeling diode at VMAX(single device rating)
IRMSOUT2			0.00	A	Maximum RMS current, Main output capacitor
PD_LOSS_OUT2			0.00	W	Conduction loss of forward diode
Diode Derating					
VPIVMAINF	1.00		59.84	V	Main Forward Diode peak-inverse voltage (at VDSOP), including derating
VPIVMAINC	1.00		39.52	V	Main Catch Diode peak-inverse voltage (at VOVOFF_MAX), including derating
VPIVOUT2F	1.00		0.00	V	Output2 Forward Diode peak-inverse voltage (at VDSOP), including derating
VPIVOUT2C	1.00		0.00	V	Output2 Catch Diode peak-inverse voltage (at VOVOFF_MAX), including derating
VPIVB	1.00		N/A	V	Bias output rectifier peak-inverse voltage (at VDSOP), including derating
Hiper-TFS STANDBY SECTION (FLYBACK STAGE)					
ENTER APPLICATION VARIABLES					
VACMIN	100		100	V	Minimum AC Input Voltage
VACMAX	260		260	V	Maximum AC Input Voltage
fL	50		50	Hz	AC Mains Frequency
VO_SB	18.0		18.0	V	Output Voltage (at continuous power)
IO_SB	0.05		0.05	A	Power Supply Output Current (corresponding to peak power)
IO_SB_PK	0.05		0.05	A	Peak output current
POUT_SB			0.90	W	Continuous Output Power
POUT_SB_TOTAL			1.155	W	Total Standby power (Includes Bias winding power)
POUT_SB_PK			1.155	W	Peak Standby Output Power
n	0.80		0.80		Efficiency Estimate at output terminals. Under 0.7 if no better data available
Z	0.50		0.50		Z Factor. Ratio of secondary side losses to the total losses in the power supply. Use 0.5 if no better data available
tC	3.00		3.00	ms	Bridge Rectifier Conduction Time Estimate
ENTER Hiper-TFS STANDBY VARIABLES					
Select Current Limit	LOW		Low current Limit		Enter "LOW" for low current limit, "RED" for reduced current limit (sealed adapters), "STD" for standard current limit or "INC" for increased current limit (peak or higher power applications)
ILIM_MIN			0.47	A	Minimum Current Limit

ILIM_TYP			0.5	A	Typical Current Limit
ILIM_MAX			0.54	A	Maximum Current Limit
R(EN)			NONE	kΩ	Enable pin resistor
fSmin			124,000	Hz	Minimum Device Switching Frequency
I^2fmin			29.7	A^2kHz	I^2f (product of current limit squared and frequency is trimmed for tighter tolerance)
VOR	135		135	V	Reflected Output Voltage (VOR < 135 V Recommended)
VDS	10.0		10.0	V	Hiper-TFS Standby On State Drain to Source Voltage
VD_SB	1.00		1.00	V	Output Winding Diode Forward Voltage Drop
KP			20.56		Ripple to Peak Current Ratio (KP < 6)
KP_TRANSIENT			18.04		Transient Ripple to Peak Current Ratio. Ensure KP_TRANSIENT > 0.25
ENTER BIAS WINDING VARIABLES					
VB	17.0		17.0	V	Bias Winding Voltage
IB	15.0		15.0	mA	Bias winding Load current
PB			0.26	W	Bias winding power
VDB	1.00		1.00	V	Bias Winding Diode Forward Voltage Drop
NB			3.8	turns	Bias Winding Number of Turns
VZOV			23	V	Over Voltage Protection zener diode voltage.
UVLO VARIABLES					
RLS			3.10	MΩ	Line sense resistor (from Main converter section)
V_UV_ACTUAL			80	V	Typical DC start-up voltage
ENTER TRANSFORMER CORE/CONSTRUCTION VARIABLES					
Core Type	EE16		EE16		Enter Transformer Core
AE	0.20		0.20	cm^2	Core Effective Cross Sectional Area
LE	3.76		3.76	cm	Core Effective Path Length
AL	1000		1000	nH/T^2	Ungapped Core Effective Inductance
BW	8.00		8.00	mm	Bobbin Physical Winding Width
M			0.00	mm	Safety Margin Width (Half the Primary to Secondary Creepage Distance)
L	1		1		Number of Primary Layers
NS_SB	4		4		Number of Secondary Turns
DC INPUT VOLTAGE PARAMETERS					
VMIN_SB	114		114	V	Minimum DC Input Voltage
VMAX_SB	374		374	V	Maximum DC Input Voltage
CURRENT WAVEFORM SHAPE PARAMETERS					
DMAX_SB			0.05		Duty Ratio at full load, minimum primary inductance and minimum input voltage
IAVG			0.01	A	Average Primary Current
IP_SB			0.47	A	Minimum Peak Primary Current
IR_SB			0.47	A	Primary Ripple Current

IRMS_SB			0.07	A	Primary RMS Current
TRANSFORMER PRIMARY DESIGN PARAMETERS					
LP_SB			96	uH	Typical Primary Inductance. +/- 10% to ensure a minimum primary inductance of 87 uH
LP_TOLERANCE	10.0		10.0	%	Primary inductance tolerance
NP_SB			28	turns	Primary Winding Number of Turns
ALG			119	nH/T^2	Gapped Core Effective Inductance
BM			906	Gauss	Maximum Operating Flux Density, BM<3000 is recommended
BAC			453	Gauss	AC Flux Density for Core Loss Curves (0.5 X Peak to Peak)
ur			1496		Relative Permeability of Ungapped Core
LG			0.19	mm	Gap Length (Lg > 0.1 mm)
BWE			8	mm	Effective Bobbin Width
OD	0.35		0.35	mm	Maximum Primary Wire Diameter including insulation
INS			0.06	mm	Estimated Total Insulation Thickness (= 2 * film thickness)
DIA			0.29	mm	Bare conductor diameter
AWG			29	AWG	Primary Wire Gauge (Rounded to next smaller standard AWG value)
CM			128	Cmils	Bare conductor effective area in circular mils
CMA		Info	1776	Cmils/Amp	CAN DECREASE CMA < 500 (decrease L (primary layers), increase NS,use smaller Core)
TRANSFORMER SECONDARY DESIGN PARAMETERS					
Lumped parameters					
ISP			3.3	A	Peak Secondary Current
ISRMS			0.47	A	Secondary RMS Current
IRIPPLE			0.47	A	Output Capacitor RMS Ripple Current
CMS			94	Cmils	Secondary Bare Conductor minimum circular mils
AWGS			30	AWG	Secondary Wire Gauge (Rounded up to next larger standard AWG value)
VOLTAGE STRESS PARAMETERS					
VDRAIN			678	V	Maximum Drain Voltage Estimate (Assumes 20% zener clamp tolerance and an additional 10% temperature tolerance)
PIVS			71	V	Output Rectifier Maximum Peak Inverse Voltage
Forward DC-DC System efficiency					
P_MOSFET_MAIN_TOTAL			3.28	W	HiperTFS losses
P_XFMR_LOSS			0.6	W	Main transformer losses
P_MAIN_OUT_DIODE			1.9	W	Output diode losses
P_CIN_ESR			0.09	W	Bulk capacitor ESR losses
P_IND_MAIN			1.3	W	Output choke losses
OTHER_LOSSES			0.09	W	Other losses (includes PCB traces, clamp loss, magamp loss etc.)

EFFICIENCY_STDBY			*80.0%*		*Estimated efficiency of flyback power supply*
EFFICIENCY_MAIN			*93.7%*		*Estimated Forward efficiency*
EFFICIENCY_SYSTEM			*93.5%*		*Estimated System efficiency (forward + standby)*
Other Losses					
PCB trace losses			*0.09*	*W*	*Estimated PCB trace losses*
Detailed Mosfet Loss Information					
P_MAIN_COND_LOWER			*1.67*	*W*	*Conduction losses in lower MOSFET*
P_MAIN_COND_UPPER			*0.84*	*W*	*Conduction losses in upper MOSFET*
COSS_LOWER			*43*	*pF*	*COSS for low side MOSFET*
COSS_UPPER			*110*	*pF*	*COSS for high side MOSFET*
P_MAIN_LOWER_SW			*0.48*	*W*	*Switching loss in upper MOSFET*
P_MAIN_UPPER_SW			*0.29*	*W*	*Switching loss in lower MOSFET*
P_STANDBY_COND			*0.03*	*W*	*Conduction losses in standby MOSFET at minimum input voltage*