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AN-7732

FL7732 Design Tool Flow (Flyback)

Overview

This document is intended to provide in-depth guidance to using the Fairchild Design Tool for FL7732. Use the Design Tool with the product datasheet.

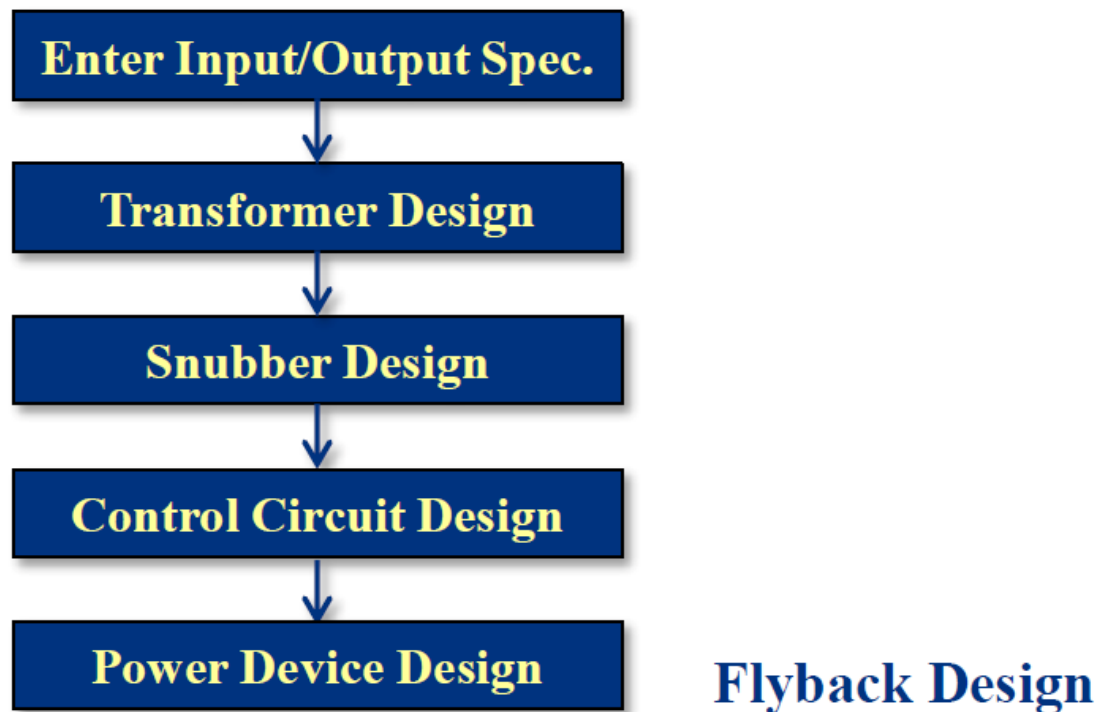
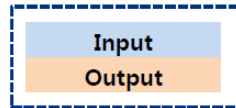


Figure 1. Design Flow

Step 1 — Enter Input Output Specification



Blue box is input from user.
Red box is calculated output.

Input Spec		
Min. Vin	90	Vac
Max. Vin	140	Vac
Output Spec		
Vout	22	V
Max. Vout	28	V
Iout	380	mA
Pout	8.36	W

Max. Vout is OVP level.

Step 2 — Transformer Design

Transformer Design		
Max. Duty	39	%
Max. Ton	6.500	us
Switching freq.	60	kHz
Max. Vcs	0.5	V
Efficiency	80	%
Ae	36.6	mm ²
Bmax	0.3	
Lm	0.982	mH
Nps	3.223	
Nas	0.821	
Nap	0.255	
Np.min	75.347	T
Np	76	T
Ns	23.578	T
Na	19.368	T
Llk	10	uH

Max. duty is generally between 20~50%.
High max. duty = · Low conduction loss. Suitable for low-line
Low max. duty = · More Bmax margin. Suitable for high-line

Max. Ton should be less than 10us.

This switching frequency is the operating frequency at the rated Vout condition.
The switching frequency should be less than 65kHz.

Max. Vcs is max. peak CS voltage.
Enter Max. Vcs less than 0.67V because pulse by pulse CS voltage limit is 0.67V.
Higher Nps makes higher max. Vcs in the primary side CC regulation.
So, when max. Vcs is highly set, Nps becomes higher.

Enter Np over Np.min.
If Np is too big to fit in transformer window, reduce Max. Duty.

Make transformer according to the above spec.
Then, enter Llk (Leakage inductance) after measuring.

Step 3 — Snubber Design

Snubber Design		
Vsn	200	V
ΔV_{sn}	5	V
Rsn	242.7247	kohm
Csn	2.746596	nF

Vsn is snubber voltage.
Vsn is generally set as 2~2.5 times $N_{ps} \cdot V_o$.

ΔV_{sn} is generally set as 5% ripple of Vsn.

Step 4 — Control Circuit Design

Control Circuit Design		
Rsense	0.593767	ohm
Rcc	100	ohm
Vin.bnk	50	V
Vf	0.5	V
Rvs1	165.2367	kohm
Rvs2	19.75502	kohm
Cvs	10	pF
Ccomi	1	uF
Cvdd	33	uF
Dvdd Vmax	73.95584	V
Rstr	155.8442	kohm

Rcc is line CC compensation resistor.
When Iout becomes higher at higher input voltage, increase Rcc.
Rcc should be limited less than 500ohm.
Large Rcc can make CS noise, inducing Vcs peak detection error.

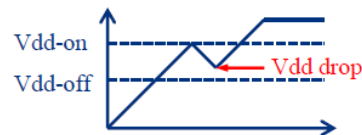
Vin.bnk is VS blanking level.
VS blanking : VS voltage detection is disabled.
Vin.bnk is generally set as 30~70V.

Vf is secondary diode forward voltage.

Cvs is VS filter capacitor, generally set as 10~30pF.

Ccomi capacitor is generally 0.68~3.3uF.
Check output voltage overshoot at startup in max. Vin condition.
If output voltage overshoot is too big, increase Ccomi.

Vdd capacitor is generally in 10~47uF.
If Vdd drops too close to Vdd-off at startup, increase Cvdd.



Step 5 — Power Device Design

Power Device Design		
MOSFET Vmax	397.9899	V
MOSFET Ipk	0.842082	A
Diode Vmax	89.4245	V
Diode Ipk	2.714286	A

Vmax is MOSFET drain-source maximum voltage.
Ipk is MOSFET peak current.

Vmax is maximum reverse voltage of secondary diode.
Ipk is peak current of secondary diode.

Related Resources

Locate the Design Tool at:

http://www.fairchildsemi.com/design_tools/led-driver-design-tool/

Consult the product datasheet at:

[*FL7732 —Single-Stage PFC Primary-Side-Regulation Offline LED Driver*](#)

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