AN-7730
FL7730 Design Tool Flow

Overview

This document is intended to provide in-depth guidance to using the Fairchild Design Tool for FL7730. Use the Design Tool with the product datasheet.

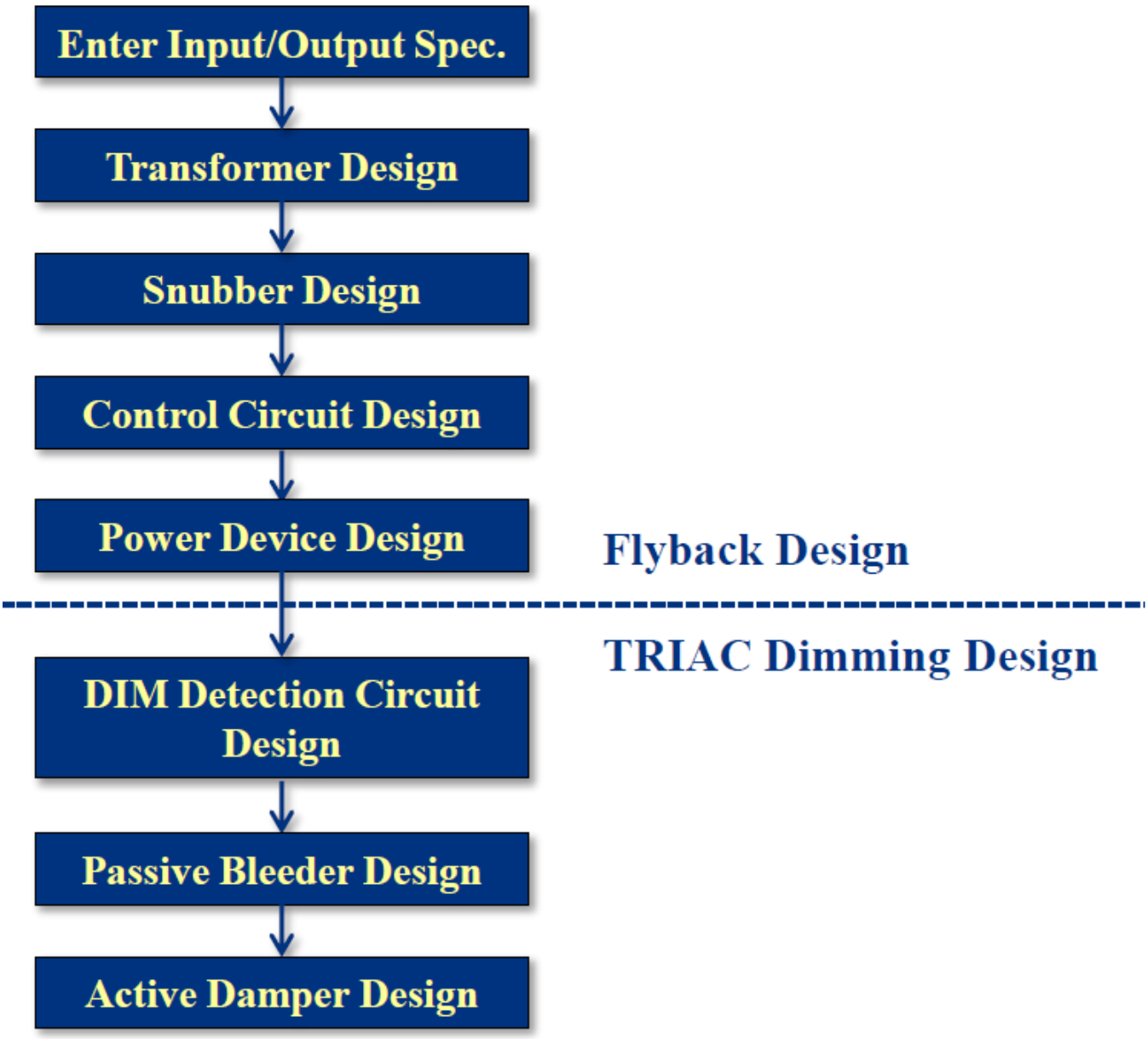
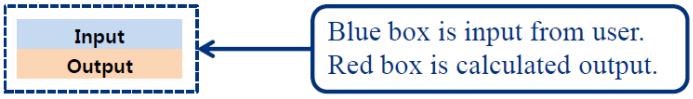


Figure 1. Design Flow

Step 1 — Enter Input Output Specification



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	
ΔVsn	5	V	
Rsn	242.7247	kohm	
Csn	2.746596	nF	

Vsn is snubber voltage.
Vsn is generally set as 2~2.5 times Nps·Vo.

ΔVsn 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 les than 500ohm.
Large Rcc can make CS noise,inducing Vcs peak detection error.

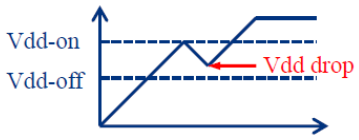
Vin.bnk is COMI/VS blanking level.
COMI blanking : Error amp. input is fixed, working as open loop.
VS blanking : VS voltage detection is disabled.
Vin.bnk is generally set as 30~70V.

Vf is secondary diode forward voltage.

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

COMI 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.



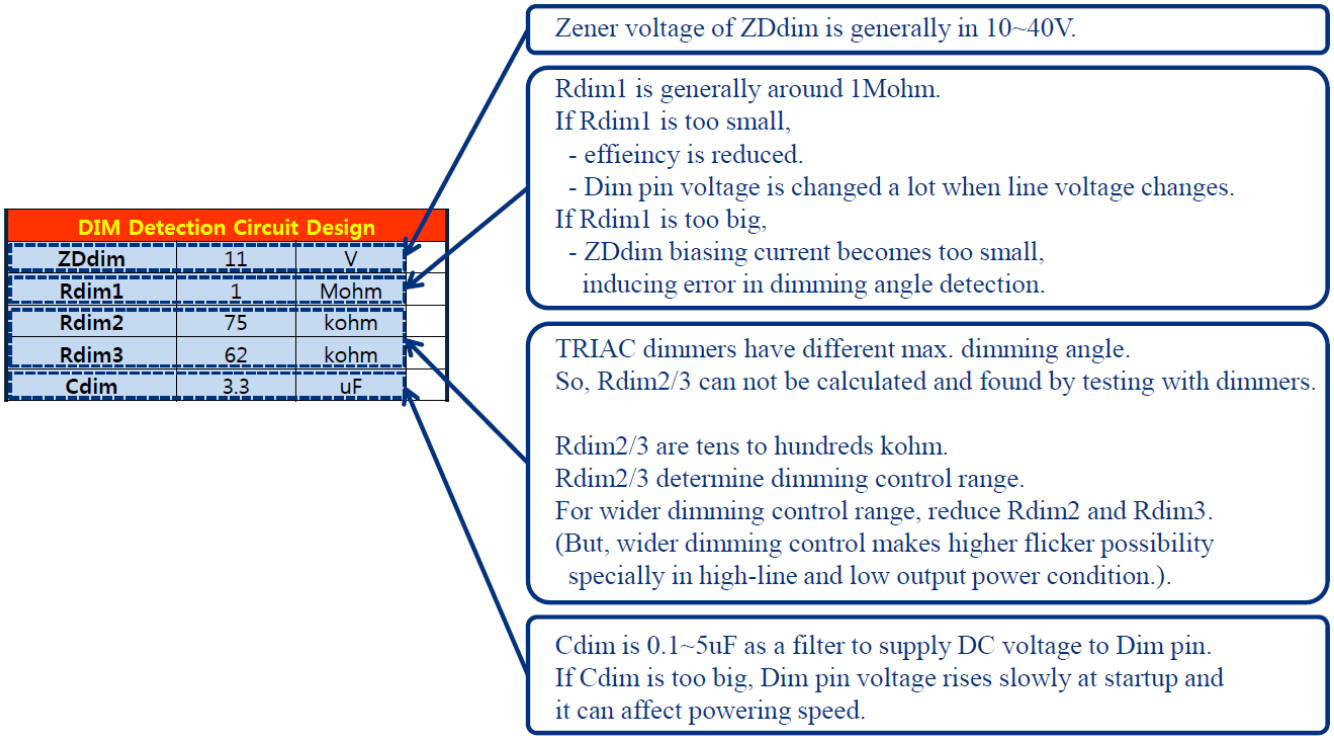
Step 5 — Power Device Design

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

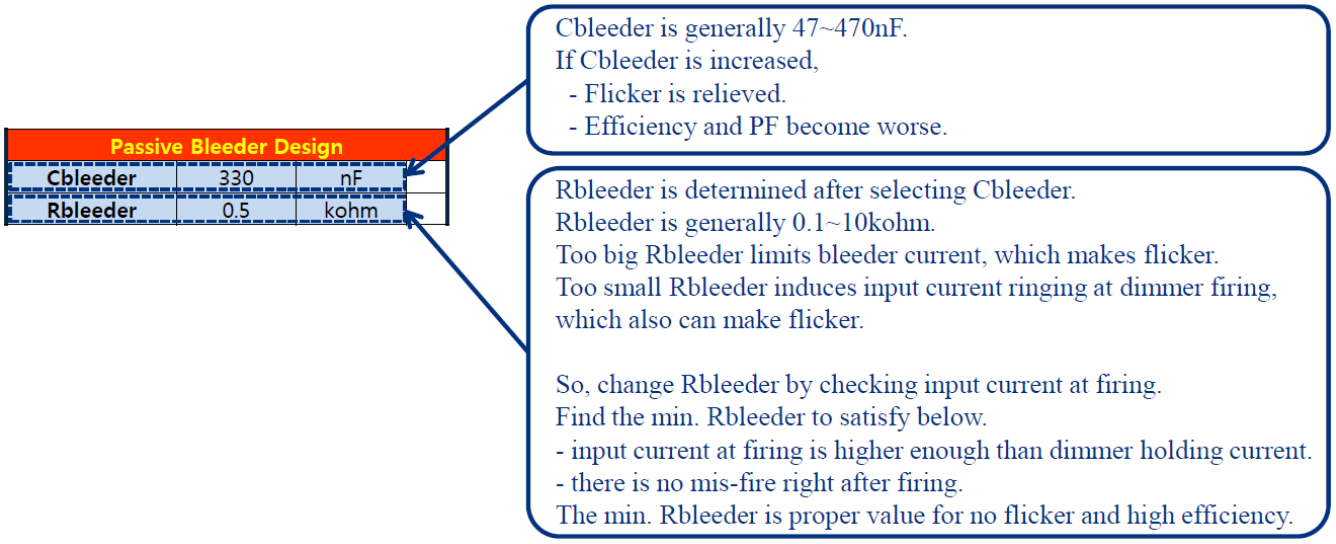
Vmax is MOSFET drain-source maximum voltage.
Ipk is MOSFET peak current.

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

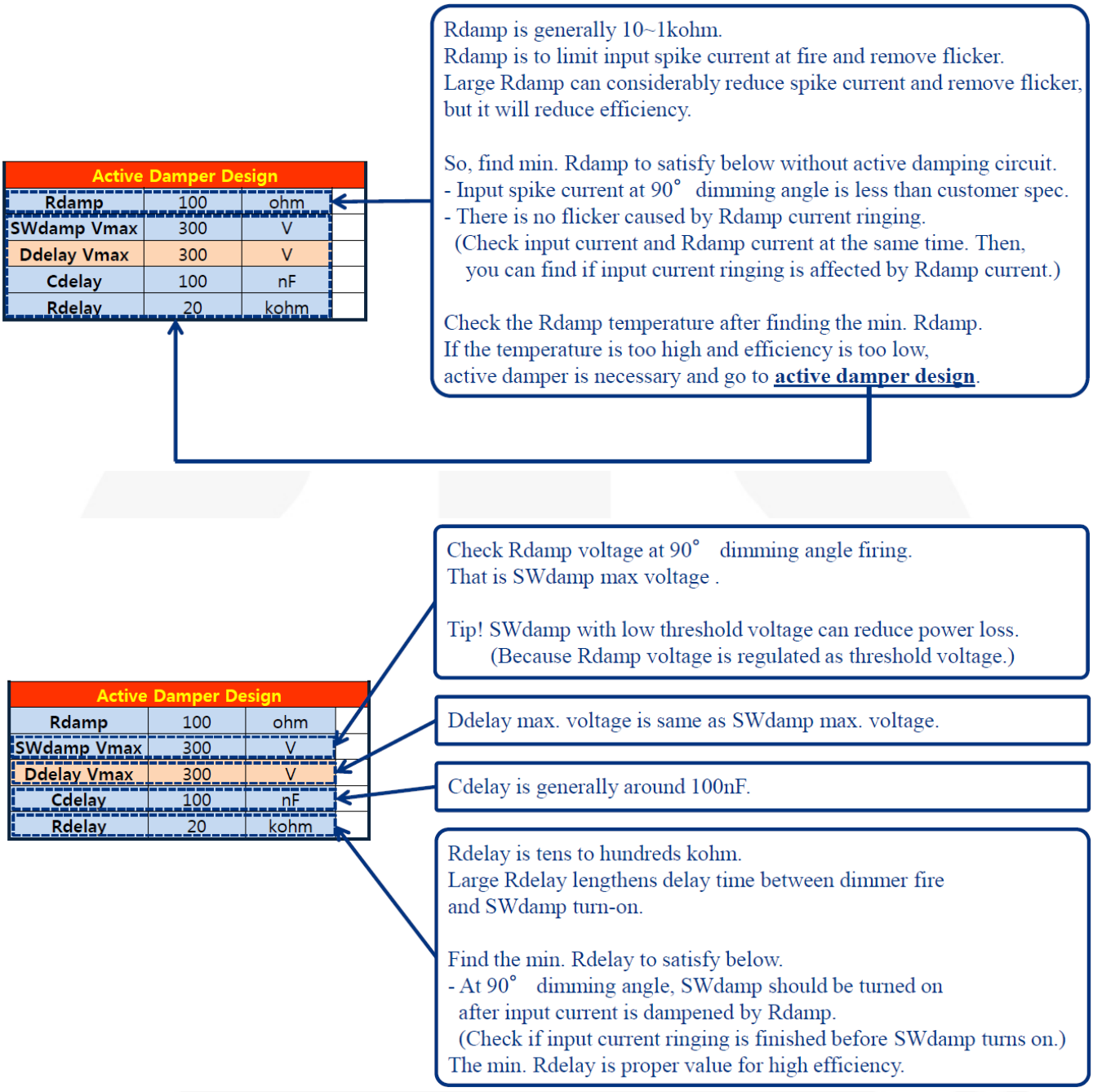
Step 6 — DIM Detection Circuit Design



Step 7 — Passive Bleeder Design



Step 8 — Active Damper Design



Related Resources

Locate the Design Tool at:

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

Consult the product datasheet at:

FL7730 — Dimmable Single-Stage PFC PSR Offline LED Driver

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