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# AN-7730 FL7730设计工具流程

#### 概述

本文档旨在提供飞兆半导体 FL7732 设计工具的详细指南。使用该设计工具时请参考相关产品手册。



图 1. 设计流程

## 步骤1 — 键入输入输出参数



輸	入参数			
Vin最小值	90	Vac		
Vin最大值	140	Vac		
輸	出参数		400	
Vout	22	V		
Max. Vout	28	V	*	Vout 最大值即 OVP 电平
Iout	380	mA		
Pout	8.36	W		

## 步骤2 — 变压器设计

最大占空比通常为20~50%。

较高最大占空比 => 低导通损耗,适用于低压电源应用 较低最大占空比 => Bmax余量更大,适用于高压电源应用

Ton 最大值应小于 10us。

该开关频率为额定 Vout 条件下的工作频率。 该开关频率应低于 65kHz。

Max. Vcs 为峰值 CS 电压的最大值。

输入 Max. Vcs 的值小于 0.67V,因为逐脉冲 CS 电压的限值 为 0.67V。

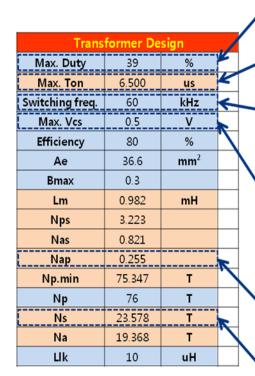
在原边 CC 调节中, Nps 越高, Max. Vcs 越大。 因此, 若设置了较高的 Max. Vcs, Nps 也会变高。

键入的 Np 取值应大于 Np.min。

如果 Np 的取值超过变压器窗口的容量,应减少最大占空比。

根据上述参数设计变压器。

然后测量 Llk (漏感),并键入表格。

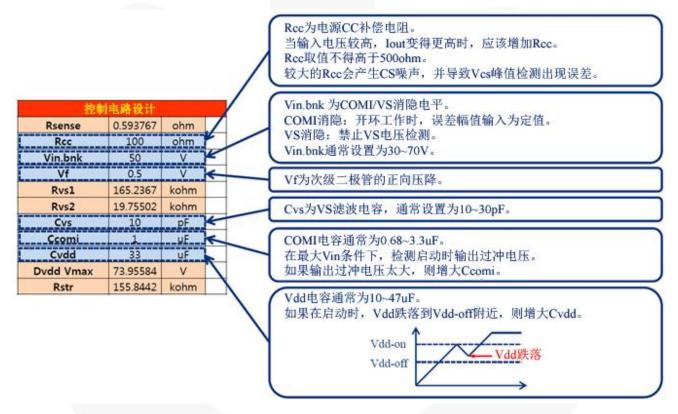


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## 步骤3 — 缓冲器设计



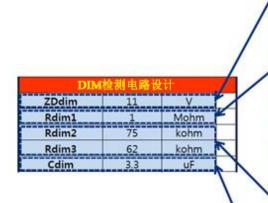
#### 步骤四 - 控制电路设计



## 步骤5 — 功率器件设计



#### 步骤6 — DIM检测电路设计



ZDdm的齐纳电压通常为10~40V。

通常, Rdim1的取值约为1Mohm。

如果Rdim1过小,

- 效率降低。
- 当电源电压变化时, Dim管脚电压会有较大变化。

如果Rdim1过大,

- ZDdim偏置电流会变得很小。
- 引起调光角检测误差。

TRIAC调光器具有不同的最大调光角。

因此, Rdim2/3不能通过调光器测试进行计算与获取。

Rdim为几十~几百kohm。

Rdim决定了调光的控制范围。

为了获得更宽的调光控制范围,可以减少Rdim2与Rdim3。 (但是,随着调光控制范围的扩大,闪烁的可能性也会更高), 尤其是在电源电压较高和输出功率较低时)

滤波电容Cdim为Dim管脚提供直流电压,其取值为0.1~0.5uF。 如果Cdim太大,在启动时,Dim管脚电压上升缓慢,并会影响 上电速度。

### 步骤7 — 无源泄放器设计

无源清放器设计 Cbleeder 330 nF Rbleeder 0.5 kohm Cbleeder通常为47~470nF。

如果增加Cbleeder,

- 闪烁现象会减轻。
- 效率与功率因数会变得更糟。

选择Cbleeder后, Rbleeder可随后确定。

Rbleeder通常为0.1~10kohm。

过大的Rbleeder限制了泄放电流,会引起闪烁。

过小的Rbleeder会引起调光启动时输入电流振荡,也会引起闪烁。

因此,应该根据触发时检测到的输入电流来调整Rbleeder。

- 确定最小Rbleeder时,应该满足以下条件: - 触发时的输入电流相对于调光器维持电流要足够高。
- 在触发后,不出现误触发。

为消除闪烁并获得高效率,应该选取合适的最小Rbleeder值。

#### 步骤8 — 有源阻尼器设计

Rdamp通常为10~1kohm。

Rdamp是用来限制启动过程输入尖峰电流,并由此消除闪烁。 虽然较大的Rdamp可以显著地降低尖峰电流,并消除闪烁,但是也 会降低效率。

因此,在不采用有源阻尼电路时,应该寻找满足以下条件的最小 Rdamp:

- 在调光角90 时,输入尖峰电流小于标准规定。
- Rdamp电流振荡不引起闪烁。

(同时检测输入电流与Rdamp电流。判断输入电流振荡是否受Rdamp 电流影响。)

在找到最小Rdamp后,检查此时Rdamp的温度。 如果温度过高,且效率过低,就需要采用有源阻尼器,着手 **有源阻尼器设计**。

有質阻尼器设计

Rdamp 100 ohm ←
SWdamp Vmax 300 V

Ddelay Vmax 300 V

Cdelay 100 nF
Rdelay 20 kohm

检测调光角90°启动时Rdamp电压。 这是SWdamp最大电压。

提示! 低阀值电压时SWdamp可以减小功率损耗。(因为Rdamp电压 是按照阀值电压进行调节的。)

有演題是課设计
Rdamp 100 ohm
SWdamp Vmax 300 V
Ddelay Vmax 300 V
Cdelay 100 nF
Rdelay 20 kohm

延迟最大电压与SWdamp最大电压相同。

通常, Cdelay的取值约为100nF。

Rdelay取值范围为几十~几百kohm。

较大的Rdelay会延长调光器触发至SWdamp开通之间的延时时间。

寻找最小Rdealy,并满足以下条件:

在调光角90°时,当输入电流得到Rdamp抑制后,SWdamp应该导通。(在SWdamp开通前,应校验输入电流振荡是否已经结束。) 选择比较合适最小Rdelay可以获得高的效率。 AN-7730 APPLICATION NOTE

## 相关资料

查阅设计工具:

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

查阅产品数据手册

FL7730一可调光单级 PFC PSR 离线 LED 驱动器

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