



概述:

UC3842是专为脱线和 DC-DC 开关电源应用设计的恒频电流型 PWM 控制器。内部包含温度补偿精密基准、供精密占空比调节用的可调振荡器、高增益误差放大器、电流传感比较器和适合作功率 MOSFET 驱动用的大电流推挽输出级以及单周期徊滞式限流欠压锁定、死区可调、单脉冲计数控锁等保护电路。

UC3842采用 DIP8 /SOP的封装形式封装。

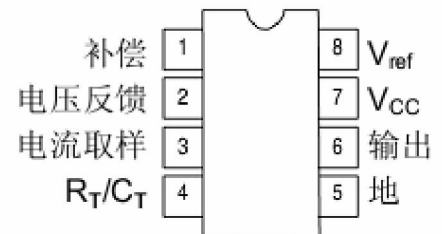


SOP-8

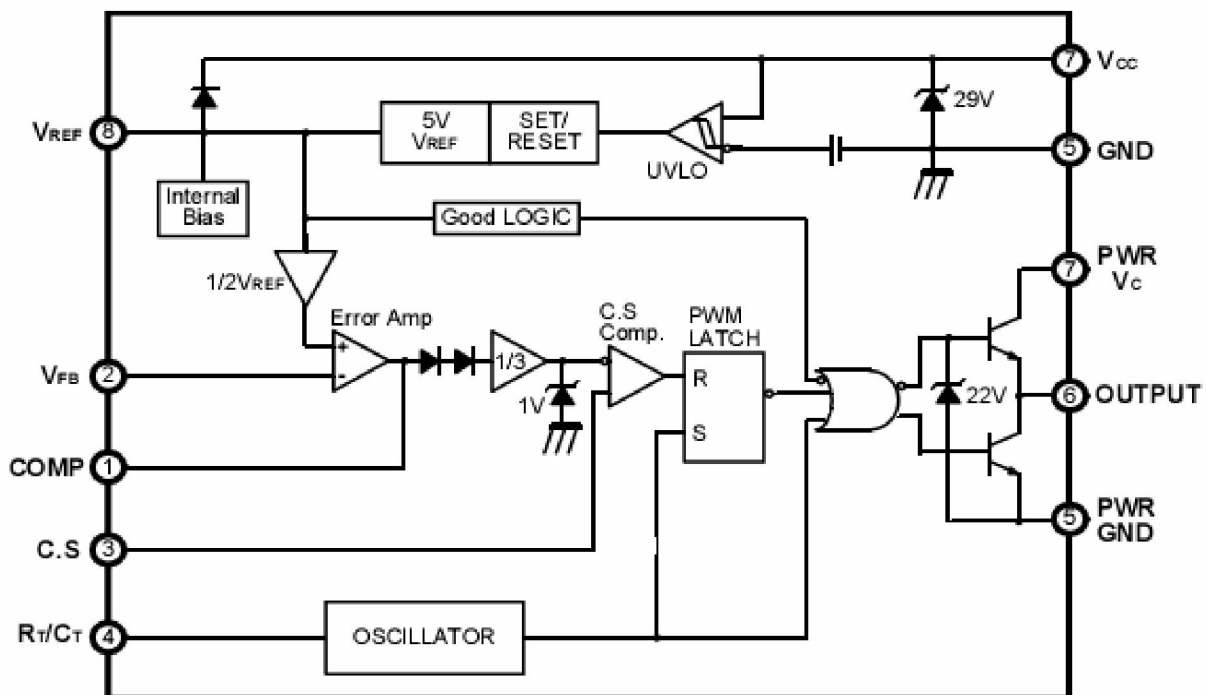
主要特点:

- 起动电流小 (< 0.5mA)
- 自动前馈补偿
- 具有徊滞特性的欠压锁定
- 最大占空比箝制
- 工作频率可达 500kHz

管脚连接图



功能框图





引出端功能说明

引出端序号	功 能	符 号	说 明
1	比较端	COMP	是误差放大器的输出，可以用作回路补偿
2	电压反馈输入	V _{FB}	误差放大器的反相输入，它通常经过一个电阻分压器和开关电源连接
3	电流传感器	Sen	一个和电感线圈的电流成比例的电压连接到这个输入端。PWM 在该端检测到的电压决定输出是否关断
4	振荡端	OSC	将 R _T 和 V _{REF} 相连，将 C _T 和地相连以控制振荡器频率和最大输出占空比。最高频率可达 500kHz
5	地	GND	地
6	输出	OUTPUT	输出直接驱动功率 MOSFET 的栅极。高达 1A 的峰值电流可由此脚输出或吸入。
7	电源	V _{CC}	控制集成电路的正电流
8	基准电压	V _{REF}	基准电压的输出。它经过电阻器 R _T 为电容器 C _T 提供充电电流

极限值（绝对最大额定值，若无其它规定，T_{amb}=25℃）

参 数 名 称	符 号	数 值		单 位
		最 小	最 大	
电源电压	V _{CC}		30	V
输出电流	I _o	-1	1	A
输出能量	W		5.0	μJ
误差放大器输出吸电流	I _o		10	mA
电流传感和电压反馈输入	V _{in}	-0.3	5.5	V
工作结温	T _j		150	℃
功耗	P _D		1	W
工作环境温度	T _{amb}	0	70	℃
贮存温度	T _{stg}	-55	150	℃

电特性（若无其它规定，V_{CC}=15V，T_{amb}=0~70℃，R_T=10kΩ，C_T=3.3nF）

特 性	测 试 条 件	符 号	规 范 值			单 位
			最 小	典 型	最 大	
基准部分						
基准输出电压	T _j =25℃ I _o =1mA	V _{ref}	4.90	5.00	5.10	V
线性调整率	12V ≤ V _i ≤ 25V	ΔV _{ref}		6	20	mV
负载调整率	1mA ≤ V _i ≤ 20mA	ΔV _{ref}		6	25	mV
输出噪声电压	10Hz ≤ f ≤ 10kHz	e _n		50		μV
短路输出电流	T _a =25℃	I _{sc}	-30	-100	-180	mA



电特性 (若无其它规定, $V_{CC}=15V$, $T_{amb}=0\sim 70^{\circ}C$, $R_T=10k\Omega$, $C_T=3.3nF$)

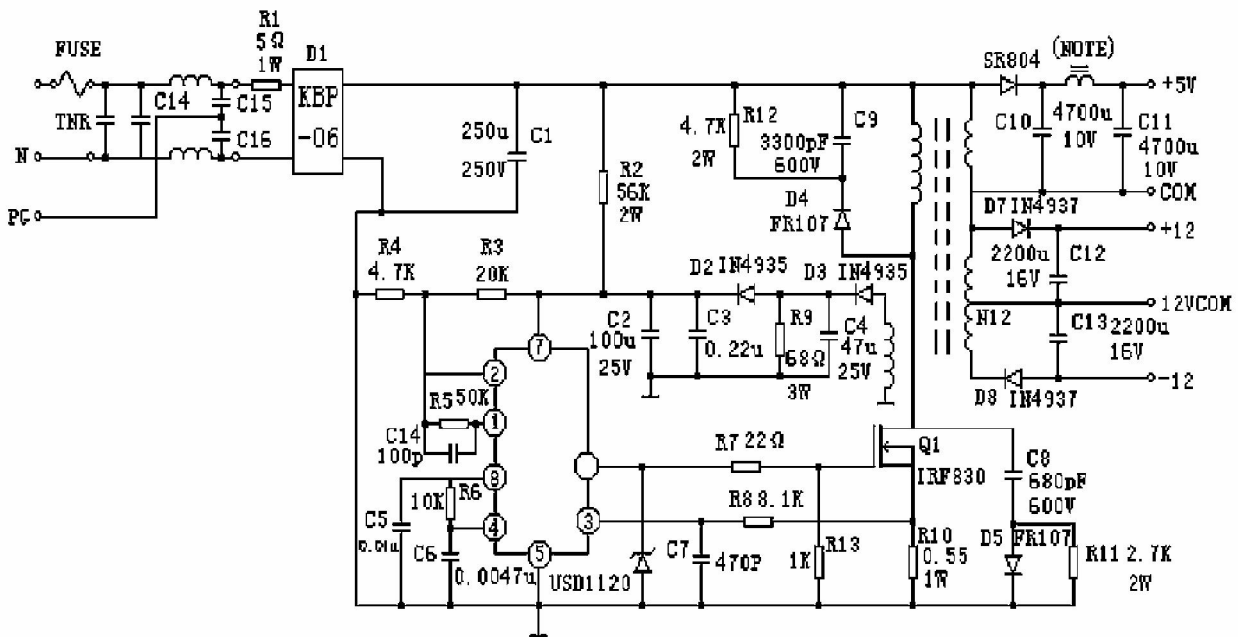
特性	测试条件	符号	规范值			单位
			最小	典型	最大	
振荡器部分						
振荡频率	$T_j=25^{\circ}C$	fosc	47	52	57	kHz
振荡电压特性	$V_{CC}=12V$ to $25V$	$\Delta f_{osc}/\Delta V$	-	0.2	1	%
振荡温度特性	$T_a=T_{low}$ to T_{high}	$\Delta f_{osc}/\Delta T$	-	5	-	%
振荡幅度	peak to peak	Vosc	-	1.6	-	V
放电电流	$T_j=25^{\circ}C$	Idischg	7.8	8.3	8.8	mA
误差放大器部分						
输入电压	$V_{pin1}=2.5V$	Vfb	2.42	2.50	2.58	V
输入偏置电流	$V_{fb}=5V$	Ibias		-0.1	-2	μA
开环电压增益	$2V \leq V_o \leq 4V$	Gvo1	65	90		dB
单位增益带宽	$T_j=25^{\circ}C$	BW	0.7	1		MHz
电源纹波抑制比	$12V \leq V_i \leq 25V$	PSRR	60	70		dB
输出灌电流	$V_{pin2}=2.7V, V_{pin1}=1.1V$	Isink	2	12		mA
输出吸电流	$V_{pin2}=2.3V, V_{pin1}=5V$	Isource	-0.5	-1		mA
输出高电平	$V_{pin2}=2.3V; R_l=15k\Omega$ to Ground	VOH	5	6.2		V
输出低电平	$V_{pin2}=2.7V; R_l=15k\Omega$ to Pin8	VOL		0.8	1.1	V
电流传感部分						
增益	(注 1 & 2)	Gv	2.85	3	3.15	V/V
最大输入信号	$V_{pin1}=5V$ (注 1)	V3	0.9	1.0	1.1	V
电源抑制比	$12V \leq V_i \leq 25V$ (注 1)	SVR		70		dB
输入偏置电流		Ib		-2	-10	μA
传输延迟	电流传感输入到输出	TPLH(in/off)		150	300	ns
输出部分						
输出低电平	$I_{sink}=20mA$	VOL		0.1	0.4	V
	$I_{sink}=200mA$			1.6	2.2	V
输出高电平	$I_{source}=20 mA$	VOH	13	13.5		V
	$I_{source}=200 mA$		12	13.5		V
欠压锁定的输出电压	$V_{CC}=6V; I_{sink}=1mA$	Vols		0.7	1.2	V
输出电压上升时间	$T_j=25^{\circ}C$ $C_l=1nF$ (注 3)	tr		50	150	ns
输出电压下降时间	$T_j=25^{\circ}C$ $C_l=1nF$ (注 3)	tf		50	150	ns
欠压锁定部分						
起动电压		Vth	14.5	16	17.5	V
维持电压		Vcc(min)	8.5	10	11.5	V



电特性 (若无其它规定, $V_{cc}=15V$, $T_{amb}=0\sim70^{\circ}C$, $R_T=10k\Omega$, $C_T=3.3nF$)

特性	测试条件	符号	规范值			单位
			最小	典型	最大	
PWM 部分						
最大占空比		D (max)	94	96	100	%
最小占空比		D (min)		0		%
整个器件						
启动电流	$V_i=14V$	Ist		0.12	0.3	mA
工作电源电流	$V_{pin2}=V_{pin3}=0V$	Ii		12	17	mA
Zener 电压	$I_i=25mA$	Viz	30	36		V

应用电路图



注: 1. 输入电压: $95V_{ac} \sim 130V_{ac}$ (50Hz/60Hz)

2. 线形隔离: 3850V

3. 开关频率: 40kHz

4. 效率 : 满负荷 70%

5. 输出电压: A +5V 5%/-5%: 1A~4A 负载, 脉动电压 : 50mVp-pmax

B +12V 3%/-3% : 0.1A~0.3A 负载, 脉动电压 : 100mVp-pmax

C -12V 3%/-3% : 0.1A~0.3A 负载, 脉动电压 : 100mVp-pmax



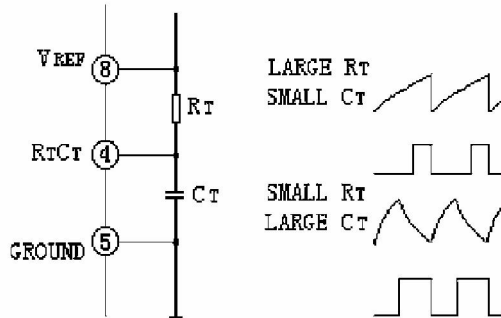
使用说明

1 振荡部分

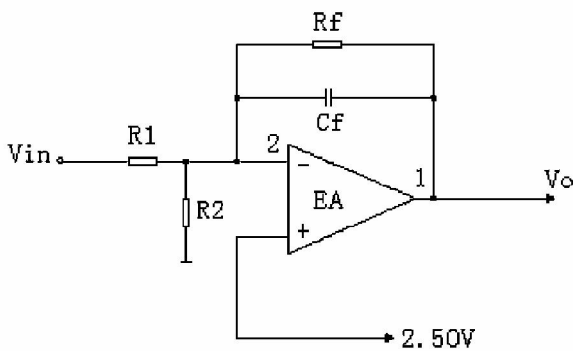
外围元件 R_T 和 C_T 决定振荡频率和最大占空比，如下图所示，充放电时间由下式表示。

充电时间： $t_c=0.55R_T*C_T$

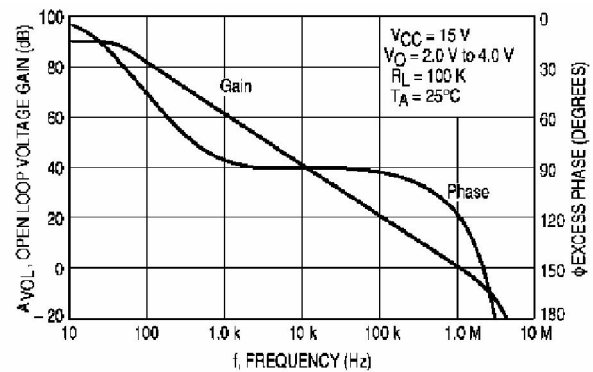
放电时间： $t_a \approx R_T * C_T * \ln\{(0.0063R_T - 2.7)/(0.0063R_T - 4)\}$



2. 误差放大器



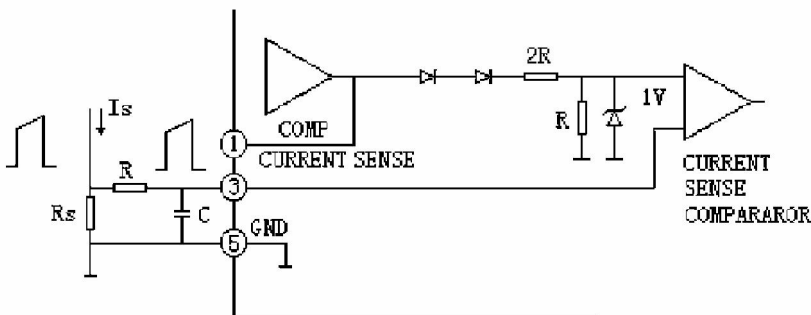
误差放大器开环增益和相位与频率的关系



该放大器的开环增益可达 80dB，开环条件下，频率特性如图所示

内部有 2.5V 基准电压，加在放大器的正端，取样电压经 R_1 、 R_2 分压加在放大器的负端输入，负反馈电阻 R_f 可以调节闭环增益的大小。

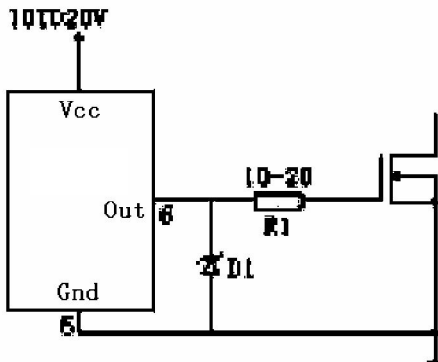
3. 电流传感比较器



取样电压经误差放大器放大后，送至电流传感比较器转换成电流方式控制脉宽。另外，电流传感比较器起着过电流保护作用，最大输出电流 $I_{max} = (N * 1V) / R_s$ ， N 为变压器初级匝数之比。

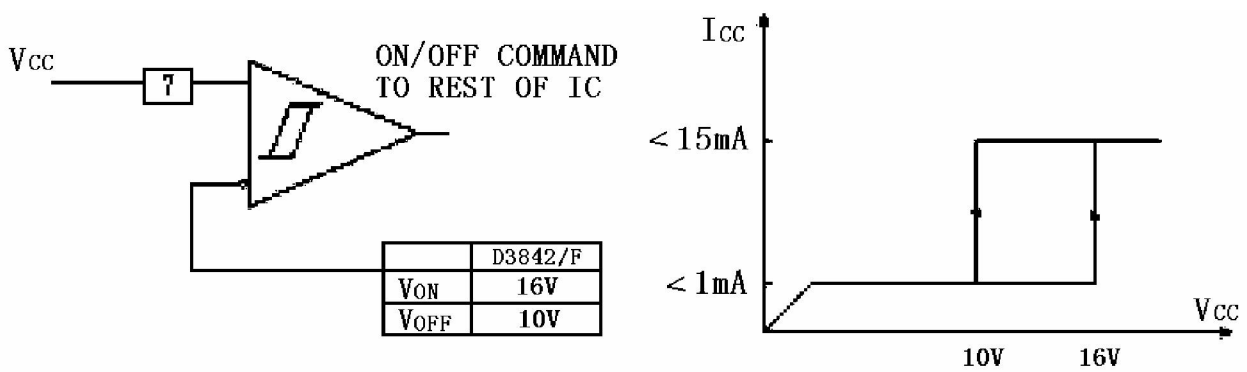


4. 推挽输出



UC3842脉冲方波能直接驱动场效应管，它具有峰值±1A 的驱动电流。

5. 欠电压锁定电路



UC3842内有欠电压锁定电路（UVL），启动电压大于 16V，关断电压小于 10V，这样能使开关电源工作稳定，不受电网波动的影响，另外内部采用 5V 能隙基准电源，非常精确和稳定。



图 1 定时电阻与振荡器频率关系曲线

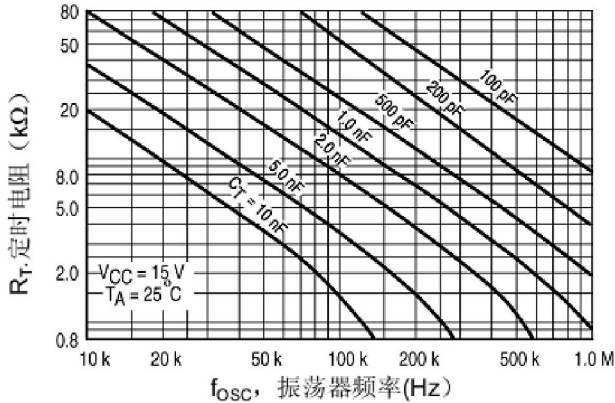


图 2. 输出静区时间与振荡器频率关系曲线

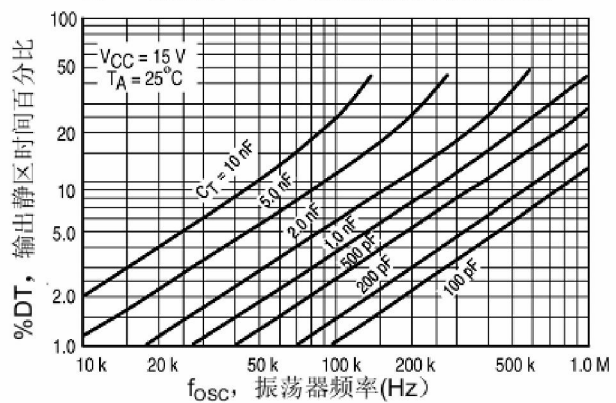


图 3 振荡器放电电流与温度关系曲线

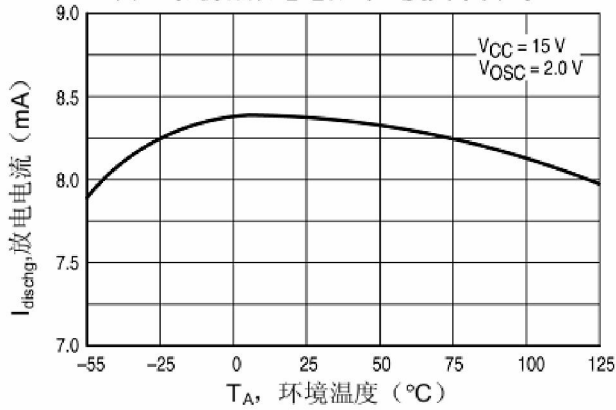


图 4. 最大输出占空比与定时电阻关系曲线

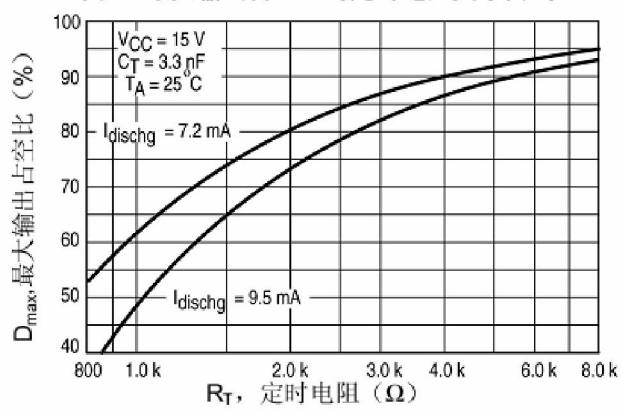


图 5 误差放大器小信号瞬态响应

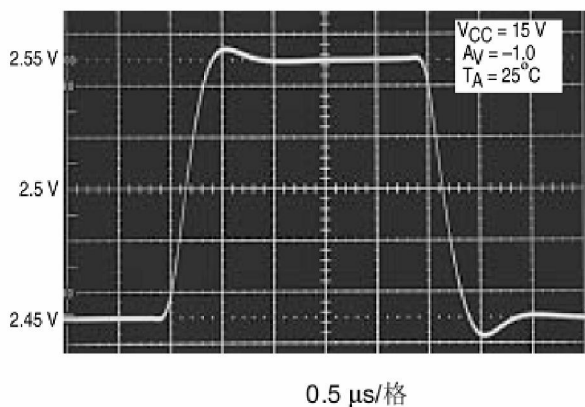


图 6. 误差放大器大信号瞬态响应

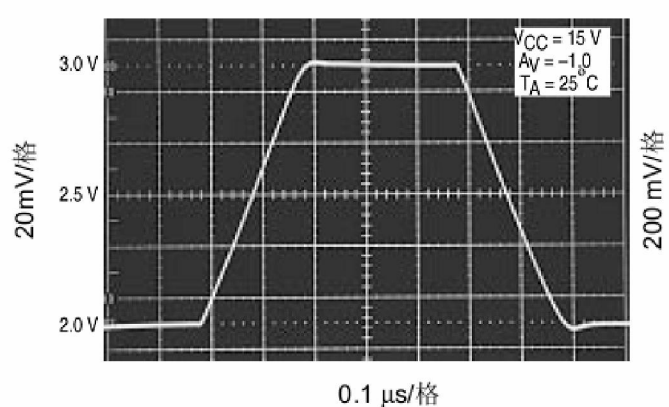




图 7. 误差放大器开环增益及相位与频率关系曲线

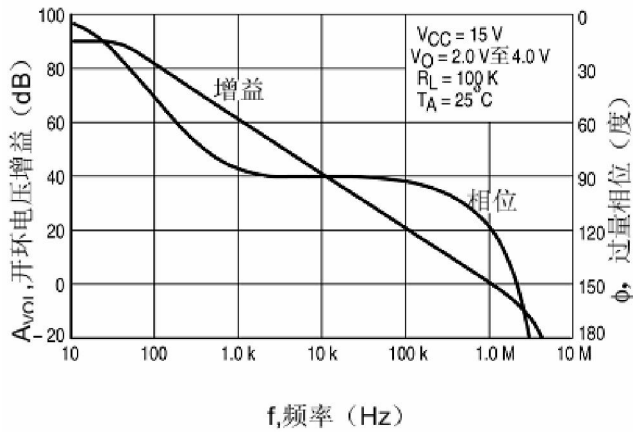


图 8. 电流取样端输入门限与误差放大器输出电压关系曲线

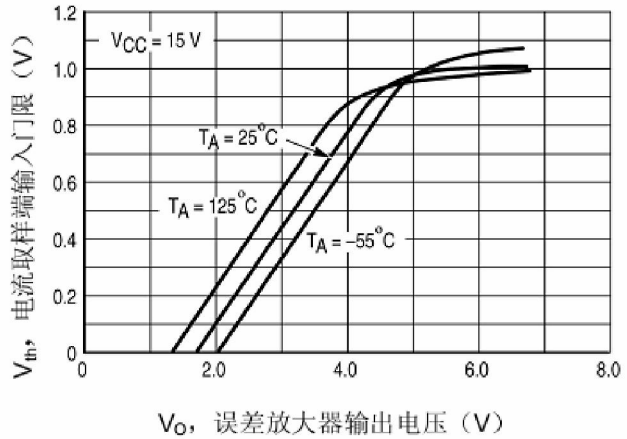


图 9. 参考电压变化与拉电流关系曲线

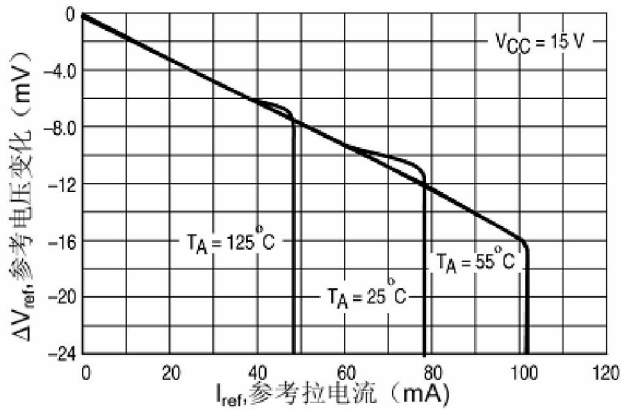


图 10. 参考短路电流与温度关系曲线

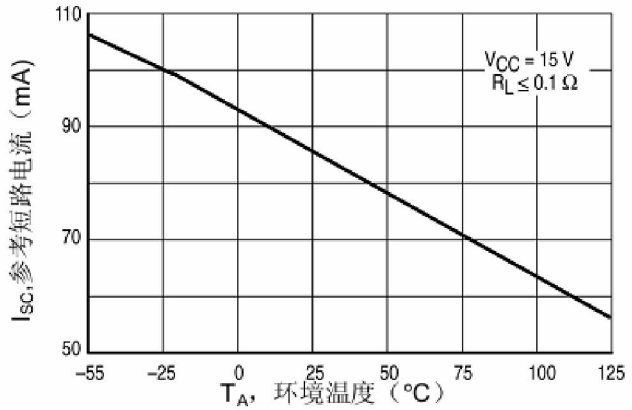


图 11. 参考负载调整率

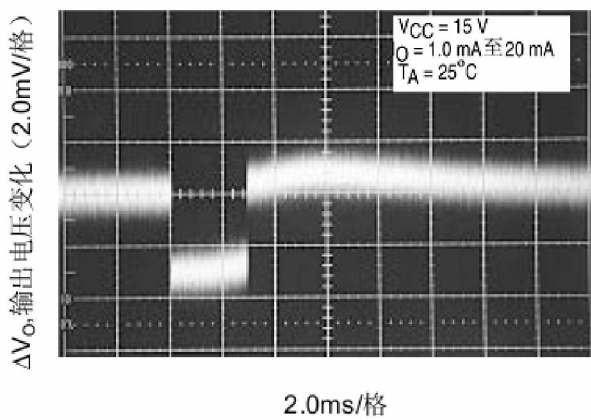


图 12. 参考电源调整率

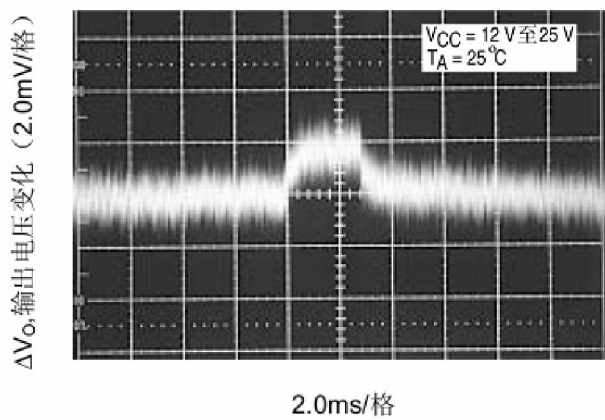




图 13. 输出饱和电压与负载电流关系曲线

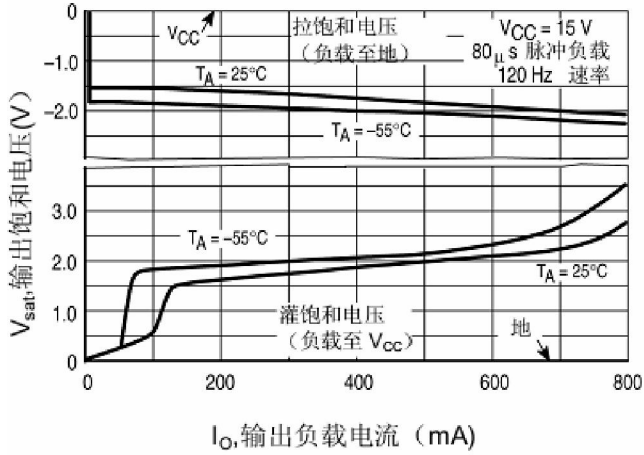


图 14. 输出波形

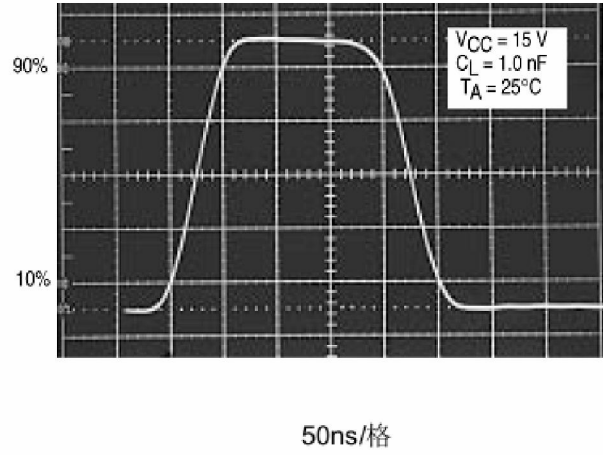


图 15. 输出交叉导通

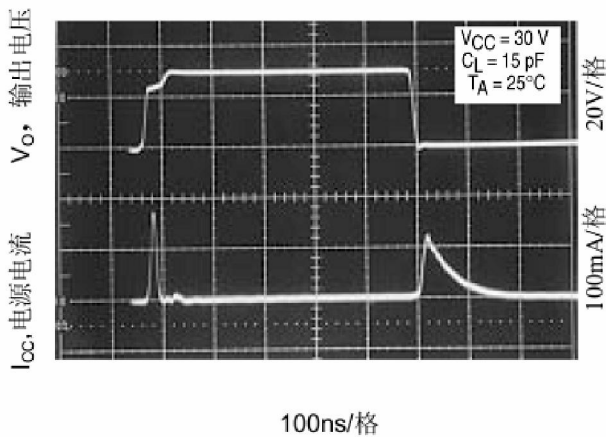
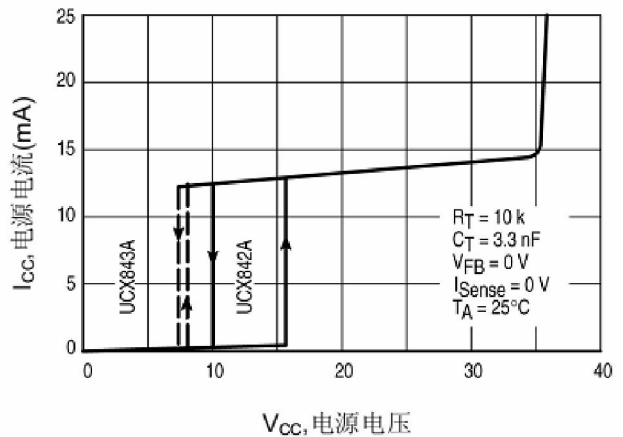


图 16. 电源电流与电源电压关系曲线





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