# BL8305A BALLAST CONTROL IC

The ballast control IC BL8305A is an improved version of the BL8301. The BL8305A provides more functionality and is easier to use than previous IC BL8301. The BL8305A optimizes the compatibility of driving MOSFET half-bridge (**MHF**) or Bipolar half-bridge (**BHF**). Especially for Bipolar half-bridge, the BL8305A can automatically adjust the base current intensity (**BCI Auto-Adj**), and guarantee that the half-bridge is in the optimum condition and reduces the power loss of half-bridge. It also improves the load adaptive of bipolar half-bridge. The BL8305A changes the timing component connection structure according to BL8301, so it is easier to design simply dimming products. The BL8305A has fully protections and all pins have Latch immunity and ESD protection, available in both PDIP14 and SOP14 packages.

Package

PDIP14

SOP14
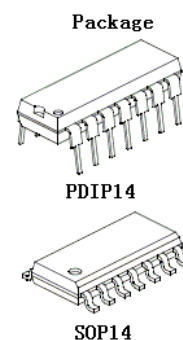
FEATURES

- Driving both MHF and BHF
- Automatically adjusting the BCI of BHF
- Programmable preheat frequency, preheat time and run frequency
- Comprehensive protection
- Micro power startup less than 150uA
- Latch immunity and ESD protection

BRIEF INTRODUCTION

1. The BL8305A automatically provides a dead time 3us for BHF and 1.2us for MHF.

2. The BL8305A features include on power preheat and ignition. Preheat frequency, preheat time and run mode frequency are all programmable by external components.

3. Comprehensive protections such as protection from over current of Half-bridge, filament failures, ignition failure, end of life, detecting base current of half-bridge and so on.

4. The BL8305A have an internal power regulator at 6.35V and micro power startup less than 150uA.

5. The BL8305A is a low cost design for ballast with few external components.

6. The BL8305A is available in both PDIP14 and SOP14 packages. All pins have Latch immunity and ESD protection.
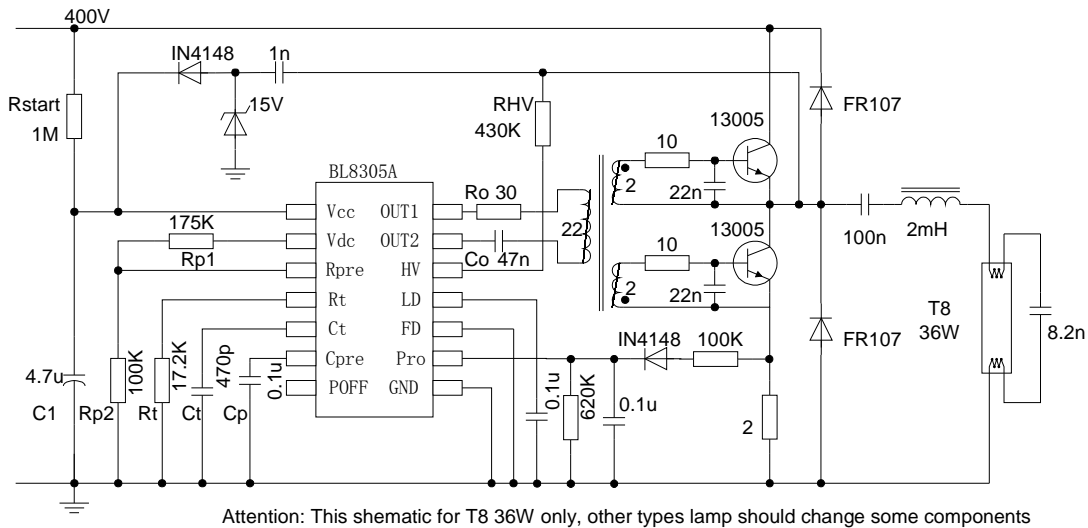
APPLICATION INFORMATION

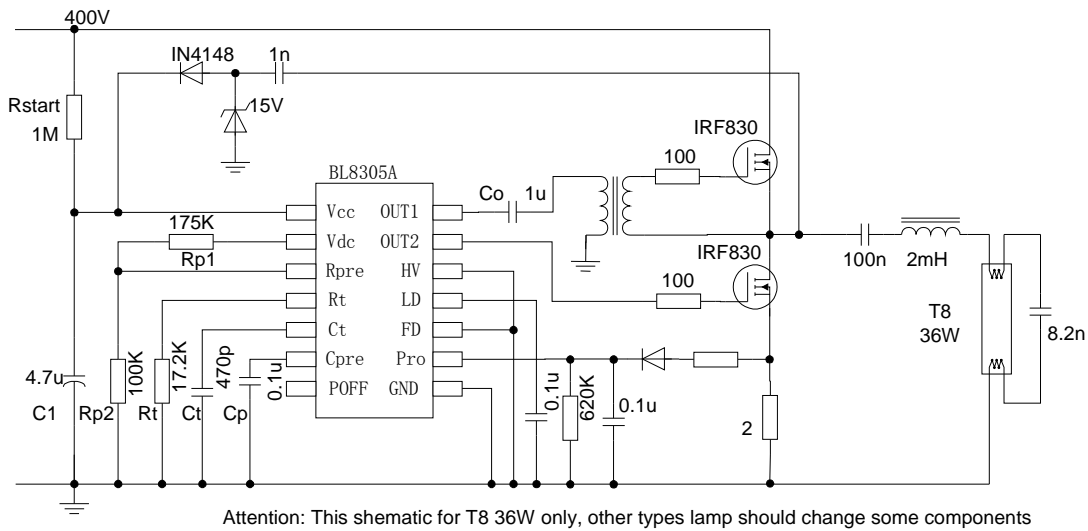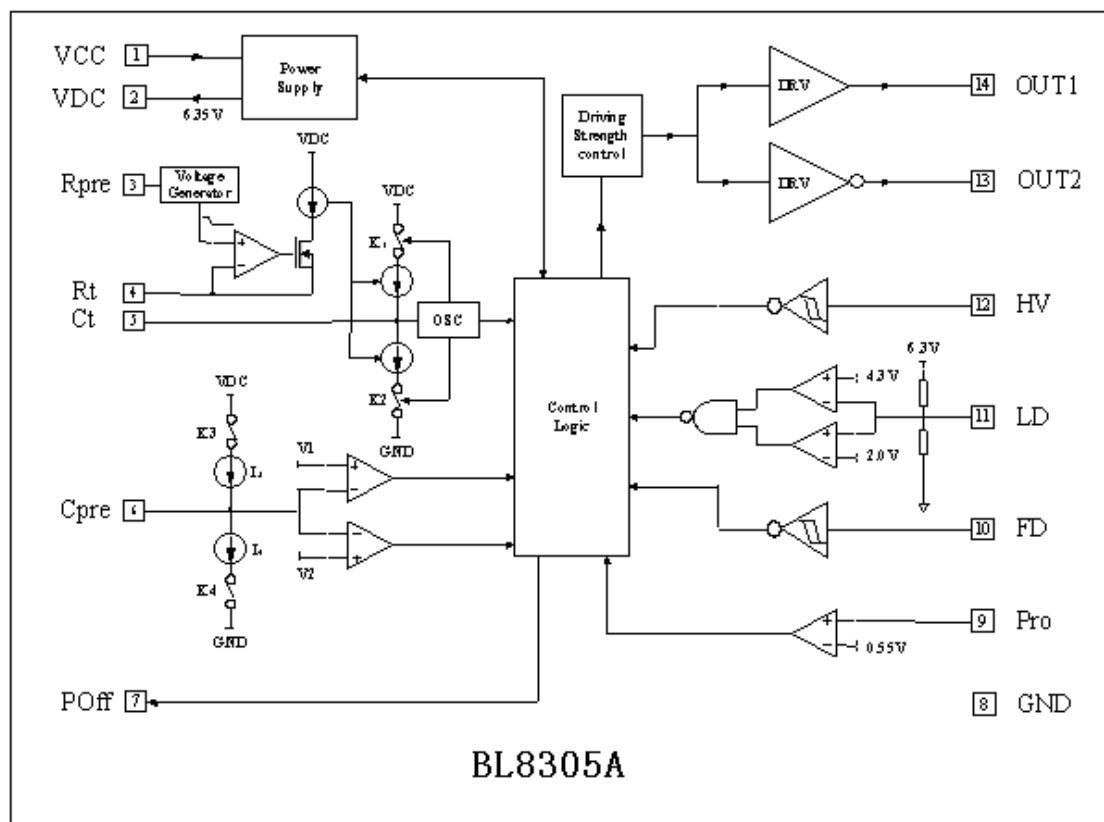
Attention: This shematic for T8 36W only, other types lamp should change some components

Fig. 1

Attention: This shematic for T8 36W only, other types lamp should change some components

Fig. 2

BLOCK DIAGRAM

BL8305A

LEAD ASSIGNMENTS & DEFINITION

Pin#	Symbol	Description
1	VCC	Power Supply
2	VDC	6.3V regulator output
3	Rpre	Preheat frequency timing voltage
4	Rt	Oscillator timing resistor
5	Ct	Oscillator timing capacitor
6	Cpre	Preheat timing capacitor
7	POff	End of preheat output
8	GND	IC power &signal ground
9	Pro	Current sensing input
10	FD	Filament detection input
11	LD	Window discriminator input
12	HV	Half-bridge output sense
13	OUT2	OUTPUT2
14	OUT1	OUTPUT1

BL8305A

1	VCC	Out1	14
2	VDC	Out2	13
3	Rpre	HV	12
4	Rt	LD	11
5	Ct	FD	10
6	Cpre	Pro	9
7	POFF	GND	8
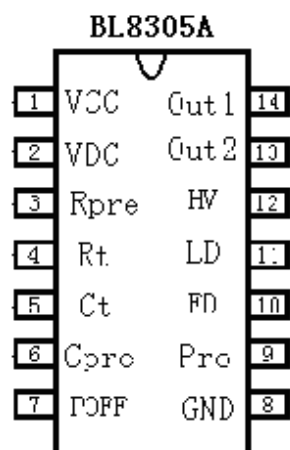
FUNCTION DESCRIPTION

Start-up and Power Supply

When the VCC is below the turn-on threshold of the IC, the BL8305A is in the low power consumption mode, oscillator and half-bridge are shut off. The start-up capacitor (C1) is charged by 400V DC-BUS through resistor (Rstart). The charge current (Icharge) is the current through Rstart minus the start-up current (IQstart) drawn by the IC. So the choice basis of starting resistance Rstart is: In most abominable cases, the current guaranteeing to pass Rstart is IQStart of twice at least.
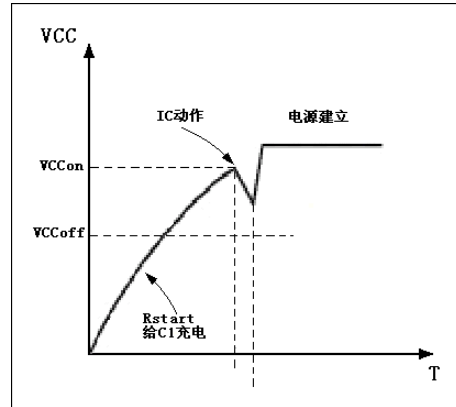
Once the capacitor voltage on VCC reaches the start-up threshold, the IC turns on and the output turns on. The rectified current charges the capacitor at about 15V. The recommended capacitor value is 22uF.

Preheat Mode, Ignition Mode and Run Mode

The Preheat frequency, preheat time and run mode frequency of BL8305A are all programmable by external components. The typical frequency vs. time curve is as the picture shows.

The preheat time is set by the external capacitor Cp. An internal current source ICpreCharge charges Cp when the IC started. The frequency remains at eh preheat frequency until the voltage on Cp over the threshold voltage. After preheat the BL8305A begins to igniting the lamp. The total preheat time is:
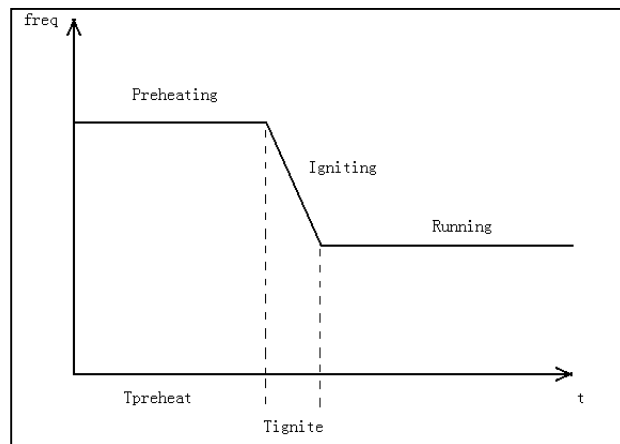
$$T_{preheat} = 0.203 \times C_p \times 10^7 - 0.249 * \frac{R_{p2}}{R_{p1} + R_{p2}}$$ sec。 Preheat frequency is set by the

voltage(VRpre) at pin3, the preheat frequency is: $f_{pre} = \frac{V_{Rpre}}{1.6} \times f_{run}$,

$$V_{RPre} = \frac{R_{pre2}}{R_{pre1} + R_{pre2}} \times 6.35$$. The run mode oscillating frequency is determined by the

timing resistor RT and timing capacitor Ct, $f_{run} = \frac{0.374}{R_t \times C_t}$ 。

Drive BHF or MHF

When driving BHF, a transformer with two secondary magnifies the output current of BL8305A and the half-bridge is drive by the magnified current. The output voltage of half-bridge is divided by the resistor RHV and an internal resistor about 40Kohm in the PIN HV and the BL8305A senses this waveform, and automatically adjusts the BCI. The BCI Auto-Adj is enabled at about 1 sec after the ignition. As showing in the figure, if BCI is appropriate, the output of BL8305A will be remain as the black line; if BCI is low, the output of BL8305A will be increase as the dashed line; if BCI is over driving, the output of BL8305A will be decrease as the dashdotted line.
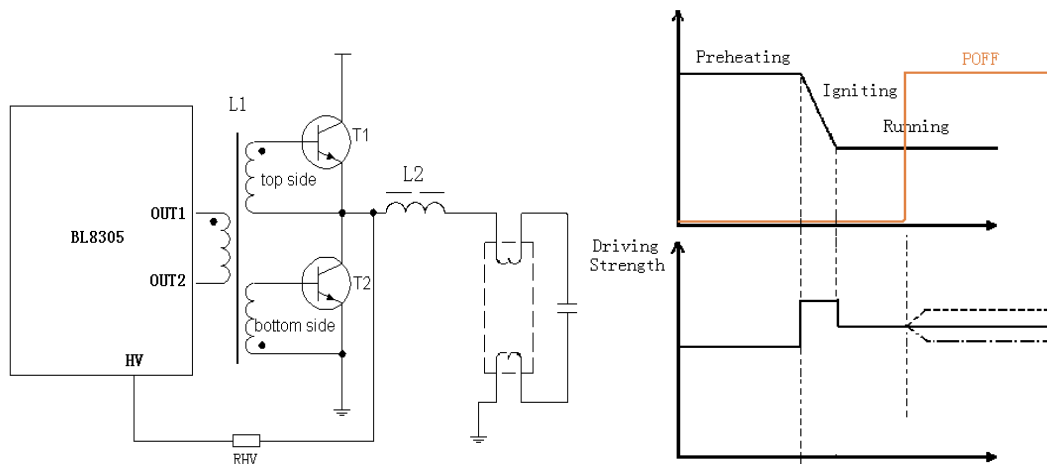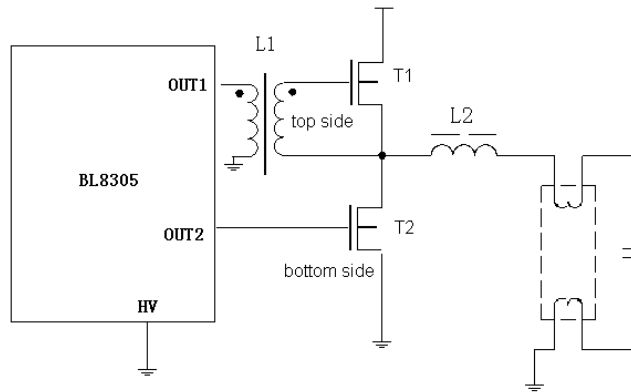
Driving MHF the output connection is shows as the figure above. The driving voltage is coupled from out1 by a 1:2 transformer in order to separate the IC form high voltage. In MHF driving configuration, HV is connect to GND directly, hence whether the BL8305A in preheat, ignition or run mode the output of BL8305A is fixed.

Fault Protection

The BL8305A provides 3 leads to sensing fault: Pro (PIN9), FD (PIN10) and LD (PIN11).

The Pro PIN is enabled at the IC turns on. Once the voltage at this pin exceeds Vpro (0.55V), the IC enters fault mode and both outputs are latched in the 'low' state.

The FD PIN is used for filament detection; the IC will be restart when FD received a pulse.

LD is a window discriminator. The high threshold is 4.3V, and the low threshold is 2.0V. LD has a pull up resistor 200K to Vdc, and a pull down resistor 200K to GND, in order to get a bias voltage 3.2V for the LD PIN. At the end of ignition mode, LD will become effective after 1s delay(1s delay is used for avoid ignition's burr).

Once the BL8305A enters the fault mode, the IC will lock the state until VCC recycles back below the shut down threshold or the filament detection PIN, SD, receives a pulse.
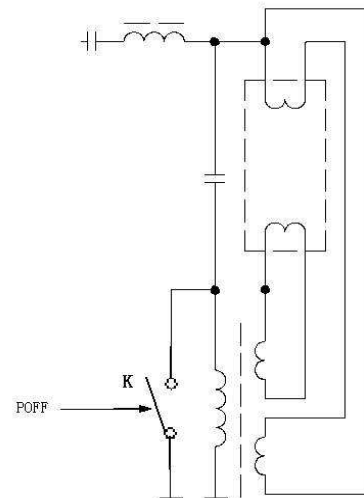
Filament Preheat Voltage Remove

The BL8305A provides a control signal (PIN Poff) to switch off the filament preheat voltage. When it done with the ignition and turns into run mode, Poff will output a high level after about 1s delay (drive ability 20mA). This high level can close the switch K and turn off the filament voltage.

ABSOLUTE MAXIMUM RATIONS

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltages parameter are absolute voltages referenced to GND, all current are defined positive into any lead.

Parameter		Min.	Max	Units
Symbol	Definition			
Vcc(1)	Supply voltage	---	30	V
V_{Rpre}	Preheat frequency timing voltage	1	7	V
I_{Rt}	Oscillator output current	---	1	mA
V_{Pro}	Current sensing voltage	−0.3	Vdc	V
Iout1	Output current of Out1		200	mA
Iout2	Output current of Out2		200	mA
T_S	Storage temperature	−55	150	℃

Note 1: Only for BHF mode. In MHF mode VCC should less than 15V.

RECOMMENDED OPERATING CONDITIONS

Parameter		Min.	Typ.	Max.	Units
Symbol	Definition				
Vcc	Supply voltage	--	15	--	V
V_{Rpre}	Preheat frequency timing voltage	1	--	4	V
I_{Rt}	Oscillator output current	20	82	200	uA
V_{Pro}	Current sensing voltage	0	--	Vdc	V

ELECTRICAL CHARACTERISTICS

TA=25℃，VCC=15V，Rpre1=150K，Rpre2=100K，Rt=17.7K，Ct=470pF，Cp=0.1uF，Vpro=0V，V_{LD1}= 3.2V，V_{HV}=0

Parameters		Min.	Typ.	Max.	Units	Test Condition
Symbol	Definition					
Power Supply Characteristics						
VCCon	Power on Voltage	–	13.7	–	V	VCC rising from 0V
VCCoff	Shut down voltage	–	10	–	V	VCC falling from 15V
VDC	Internal power regulator output	–	6.35	–	V	VCC=15V

	voltage					
I_VDC	Internal power regulator output current			10	mA	VCC=15V
I_QStart	Low power startup current	---	---	150	uA	VCC<VCCon
I_QFault	Fault protection quiescent current	---	---	250	uA	Pro > 0.55V or LD < 2.0V or LD > 4.3V
I_QVCC	Quiescent current	---	3	---	mA	Out1、Out2 Without load
Oscillator Characteristics						
fosc	Oscillator frequency	1	---	300	KHz	
		---	45	---	KHz	
V_CT	Oscillator capacitor voltage	2		4	V	fosc = 45 KHz
Preheat Characteristics						
I_CpreCharge	Cpre charge current	---	0.45	---	uA	
I_CpreDis	Cpre discharge current	---	0.97	---	uA	
Fpre	Preheat frequency		71		KHz	
Tpre	Preheat time		1.4		S	
Tign	Ignition time		140		mS	
V_CpreFault	Cpre voltage under fault protection	---	0	---	V	
Driver Output Characteristics (HV=GND)						
Vout1p-p	p-p output voltage of out1	13	---	15	V	Iout > 100mA
Iout1	p-p output current of out1	–	---	200	mA	Vout1p-p > 13V
Vout2p-p	p-p output voltage of out1	13	---	15	V	Iout > 100mA
Iout2	p-p output current of out1	–	---	200	mA	Vout1p-p > 13V
TdeadMOS	Dead time for MHF mode		1.2		us	
TdeadBip	Dead time for MHF mode		3.0		us	HV＝6.3V
Protection Characteristics						
V_Pro	Over current sensing threshold	–	0.55	–	V	
V_LDup	High threshold of LD	–	4.3	–	V	
V_LDdn	Low threshold of LD	–	2.0	–	V	