# UBA2025

## CFL power IC

Rev. 01 — 16 October 2009 | Product data sheet

## 1. General description

The UBA2025 is a high voltage power IC intended to drive and control a Compact Fluorescent Lamp (CFL). It contains a half bridge power circuit, an oscillator, and a control circuit for starting up, preheating, ignition, lamp burning, and protection.

## 2. Features

- Two internal 600 V, 3 Ω max NMOST half bridge powers
- For steady state half bridge currents up to 280 mA
- For ignition half bridge currents up to 1.5 A
- Adjustable preheat and ignition time
- Adjustable preheat current
- Adjustable lamp power
- Lamp temperature stress protection at higher mains voltages
- Capacitive mode protection
- Protection against too low a drive voltage for the power MOSFETs.

## 3. Applications

- 5 W to 25 W CFLs provided that the maximum junction temperature is not exceeded.

## 4. Ordering information

**Table 1. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| UBA2025T | SO16L | plastic small outline package; 16 leads; body width 7.5 mm | SOT162-1 |

founded by Philips

# 5. Block diagram

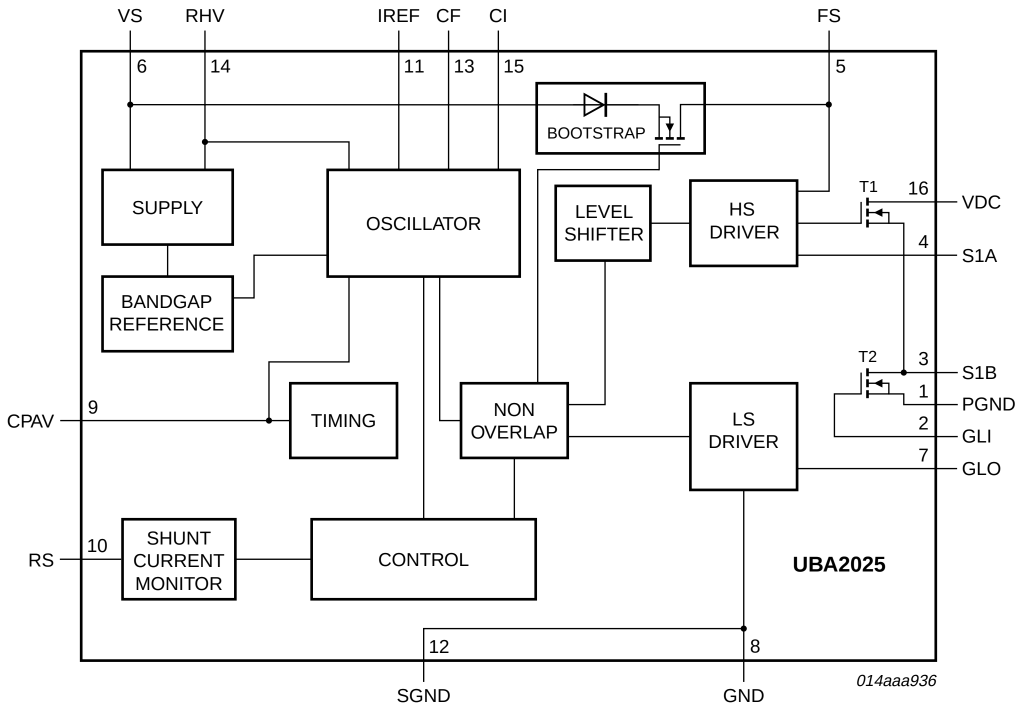



**Fig 1. Block diagram**

# 6. Pinning information

## 6.1 Pinning

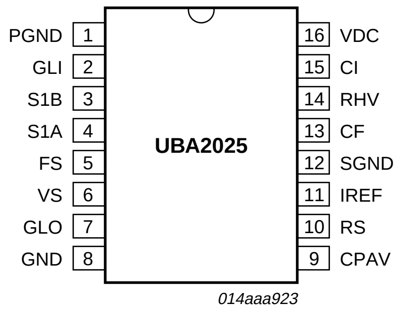



**Fig 2. Pin assignment**

## 6.2 Pin description

**Table 2. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| PGND | 1 | power ground |
| GLI | 2 | LS gate power MOSFET, must be connected to GLO |
| S1B | 3 | half bridge point, must be connected to S1A |
| S1A | 4 | half bridge point, must be connected to S1B |
| FS | 5 | floating supply |
| VS | 6 | IC supply |
| GLO | 7 | LS driver output, must be connected to GLI |
| GND | 8 | diepad ground |
| CPAV | 9 | preheat and averaging capacitor |
| RS | 10 | current monitoring input |
| IREF | 11 | reference resistor |
| SGND | 12 | signal ground |
| CF | 13 | oscillator capacitor |
| RHV | 14 | start-up/feed forward input |
| CI | 15 | integrating capacitor |
| VDC | 16 | high voltage power input |

# 7. Functional description

## 7.1 Introduction

The IC is an integrated circuit for electronically ballasted compact fluorescent lamps and its derivatives, up to a nominal mains voltage of 230 V (RMS). It provides all the necessary functions for proper preheat, ignition and on-state operation of the lamp. Besides the control function, the IC provides the level shift and drive for the two internal power MOSFETs.

## 7.2 Initial start-up

Initial start-up is achieved by charging CS9 (see Figure 6) with the current applied to pin RHV. The start-up of the circuit is such that (see Figure 1) T2 shall be conductive and T1 shall be non-conductive, in order to make sure that $C_{BOOT}$ gets charged. This start-up state is reached for a supply voltage $V_{rst}$, this is the voltage level at pin VS at which the circuit will be reset to the initial state and maintained until the low voltage supply ($V_{VS}$) reaches a value of $V_{startup}$.

## 7.3 Oscillation

If the low voltage supply ($V_{VS}$) has reached the value of $V_{startup}$ the circuit starts oscillating in the preheat state. The internal oscillator is a current-controlled circuit which generates a sawtooth waveform. The frequency of the sawtooth is determined by the capacitor CF and the current out of pin CF (mainly set by $R_{IREF}$). The sawtooth frequency is twice the frequency of the signal across the load. The IC brings alternately the power MOSFETs T1 and T2 into conduction with a duty cycle of approximately 50%. Figure 3 represents the timing of the IC. The circuit block 'non-overlap' generates a non-overlap time $t_{no}$ when T1 and T2 are not conducting. This is dependent on the reference current.

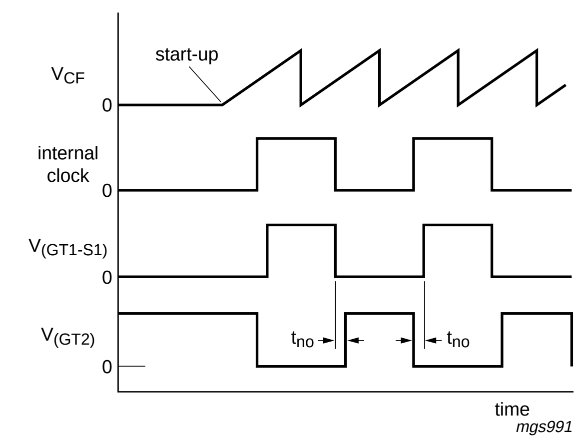



**Fig 3. Oscillator timing**

## 7.4 Operation in preheat mode

The circuit starts oscillating at a frequency of approximately $2.5f_{btm}$ (108 kHz). The frequency will gradually decrease until a defined value of the current through $R_{SHUNT}$ is reached (see Figure 4). The slope of the decrease in frequency is determined by the capacitor connected to pin CI. The frequency during preheating will be approximately 90 kHz. This frequency is well above the resonant frequency of the load, which means that the lamp is off. The load consists of L2, C5 and the electrode resistance only (see Figure 6). The preheat time is determined by the capacitor connected to pin CPAV. The circuit can be locked in the preheat state by connecting pin CPAV to ground. During preheating the circuit monitors the load current by measuring the voltage drop over external resistor $R_{SHUNT}$ at the end of conduction of T2 with decision level $V_{shunt}$. The frequency is decreased as long as $V_{RS} > V_{shunt}$. The frequency is increased for $V_{RS} < V_{shunt}$.

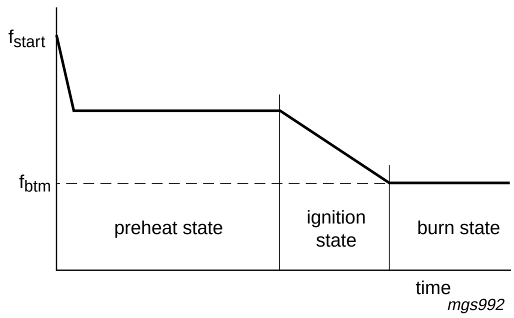



**Fig 4. Operation in preheat mode**

## 7.5 Ignition state

The RS current monitoring function changes from $V_{shunt}$ regulation to capacitive mode protection at the end of the preheat time. Normally this results in a further frequency decrease down to the bottom frequency $f_{btm}$ (approximately 43 kHz). The frequency change per ms is lowered with respect to the frequency change in the preheat mode. During the downward frequency sweep the circuit sweeps through the resonant frequency of the load. A high voltage will then appear across the lamp. This voltage will normally ignite the lamp.

## 7.6 Failure to ignite

Excessive current levels may occur when the lamp fails to ignite. The IC does not limit these currents in any manner.

## 7.7 Transition to the burn state

Assuming that the lamp has ignited during the downward frequency sweep, the frequency normally decreases to the bottom frequency. The IC can transit to the burn state in two ways:

- In the event that the bottom frequency is not reached, the transition is made after reaching the ignition time $t_{ign}$.
- As soon as the bottom frequency is reached.

The bottom frequency is determined by resistor $R_{IREF}$ and capacitor CF.

## 7.8 Feed forward frequency

Above a defined voltage level at pin VDC the oscillation frequency also depends on the supply voltage of the half bridge (see Figure 5). The current for the current controlled oscillator is in this feed forward range and is derived from the current through $R_{HV}$ (this is similar to pin RHV current). The feed forward frequency is proportional to the average value of the current (within its operating range) through $R_{HV}$. The feed forward frequency is clamped for currents beyond the operating range (i.e. between 1.0 mA and 1.6 mA). In order to prevent feed forward of the ripple on the input voltage on pin VDC, the ripple is filtered out. The capacitor connected to pin CPAV is used for this purpose. This pin is also used in the preheat state and the ignition state for timing ($t_{ph}$ and $t_{ign}$).

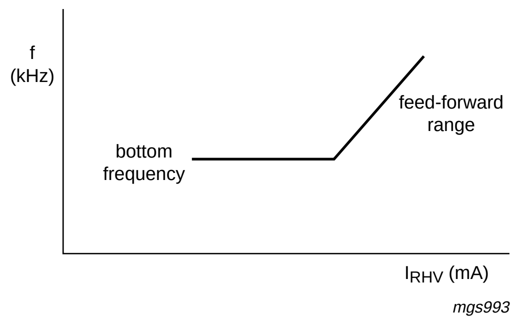



**Fig 5. Feed forward frequency**

## 7.9 Capacitive mode

When the preheat mode is completed, the IC will protect the power circuit against losing the zero voltage switching condition and getting too close to the capacitive mode of operation. This is detected by monitoring the voltage across $R_{SHUNT}$. If the voltage at pin RS is below $V_{th(capm)}$ the capacitive mode threshold voltage at the time of turn-on of T2, then capacitive mode operation is assumed. Consequently, the frequency will be increased as long as the capacitive mode is detected. The frequency decreases down to the feed forward frequency if no capacitive mode is detected. Frequency modulation is achieved via pin CI.

## 7.10 IC supply

Initially, the IC is supplied from the bus voltage VDC by the current through $R_{HV}$. This current charges the supply capacitor CS9 via an internal diode. As soon as VS exceeds $V_{startup}$, the circuit starts oscillating. After the preheat phase is finished, pin RHV is connected to an internal resistor ($R_{RHV}$); prior to this the pin is internally connected to pin VS. The voltage level at pin RHV thus drops from (VS + $V_d$) to a voltage equal to the RHV pin current $\times$ $R_{RHV}$. The capacitor CS9 at pin VS will now be charged via the snubber capacitor CS7. Excess charge is drained by an internal clamp that turns on at the clamp voltage ($V_{clamp}$) on pin VS.

## 7.11 Minimum gate source voltage of T1 and T2

The high side driver is supplied via capacitor $C_{BOOT}$. $C_{BOOT}$ is charged via the bootstrap switch during the on-periods of T2. The IC stops oscillating at a voltage level $V_{stop}$. Given a maximum charge consumption on the gate of T1 (G1) of 1 nC/V, this safeguards the minimum drive voltages $V_{(G1-S1)}$ for the high side driver; see Table 3.

**Table 3. Minimum gate voltages**

| Frequency | Voltage |
|---|---|
| < 75 kHz | 8 V (min.) |
| 75 kHz to 80 kHz | 7 V (min.) |
| > 85 kHz | 6 V (min.) |

The drive voltage at gate of T2 (G2) will exceed the drive voltage of the high side driver.

## 7.12 Frequency and change in frequency

At any point in time during oscillation, the circuit will operate between $f_{btm}$ and $f_{start}$. Any change in frequency will be gradual, no steps in frequency will occur. Changes in frequency caused by a change in voltage at pin CI, show a rather constant df/dt over the entire frequency range. The following rates are realised (at a frequency of 85 kHz and a 100 nF connected to pin CI):

- For any increase in frequency the df/dt will be between 15 kHz/ms and 37.5 kHz/ms
- During preheat and normal operation: the df/dt for a decrease in frequency is between –6 kHz/ms and –15 kHz/ms
- During the ignition phase: the df/dt for a decrease in frequency is between –150 Hz/msand –375 Hz/ms.

## 7.13 Ground pins

Pin PGND and pin GND are the ground references of the IC with respect to the application. Pin SGND provides a local ground reference for the components connected to pins CPAV, CI, IREF and CF. Other external connections to pin SGND are not preferred. The sum of currents flowing out of the pins CPAV, CI, IREF, CF and SGND must remain zero at any time. Pin GND is internally connected to SGND.

## 7.14 Charge coupling

Due to parasitic capacitive coupling to the high voltage circuitry, all pins are exposed to a repetitive charge injection. Given the typical application in figure 6, the pins IREF and CF are sensitive to this charge injection. For the rating $Q_{coup}$ a safe functional operation of the IC is guaranteed, independent of the current level. Charge coupling at current levels below 50 μA will not interfere with the accuracy of the $V_{th(capm)}$ and $V_{shunt}$ levels. Charge coupling at current levels below 20 μA will not interfere with the accuracy of any parameter.

# 8. Limiting values

**Table 4. Limiting values**

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{i(VDC)}$ | input voltage on pin VDC | operating | | - | 556 | V |
| | | during 0.5 s | | - | 600 | V |
| $V_{FS}$ | voltage on pin FS | operating, with respect to S1A and S1B | | - | 14 | V |
| | | during 0.5 s, with respect to S1A and S1B | | - | 17 | V |
| $I_{clamp}$ | clamp current | during 0.5 s | | - | 35 | mA |
| $I_D$ | drain current | on T1; pulsed; $t_p$ limited by $T_{j(max)}$; $T < T_{j(max)}$ | | - | 1.5 | A |
| | | on T2; pulsed; $t_p$ limited by $T_{j(max)}$; $T < T_{j(max)}$ | | - | 1.5 | A |
| $V_I$ | input voltage | on pin RS; transient of 50 ns | | –2.5 | +2.5 | V |
| | | on pin RS; operating normaly | | –1.5 | +2.5 | V |
| SR | slew rate | pins S1A and S1B with respect to GND | | –4 | +4 | V/ns |
| $T_{amb}$ | ambient temperature | | | –40 | +150 | °C |
| $T_j$ | junction temperature | | | –40 | +150 | °C |
| $T_{stg}$ | storage temperature | | | –55 | +150 | °C |
| $Q_{coup}$ | coupling charge | at pins IREF and CF; normal operation | | –8 | +8 | pC |
| $V_{ESD}$ | electrostatic discharge voltage | human body model | [1] | | | |
| | | pins 1, 8, 9, 10, 11, 12, 13, 14, 15 | | - | 3000 | V |
| | | pin 4, 5, 6 | | - | 1500 | V |
| | | pin 7 | | - | 1000 | V |
| | | pin 2, 3, 16 | | - | < 500 | V |
| | | machine model | [2] | | | |
| | | pins 1, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16 | | - | 250 | V |
| | | pin 2 | | - | 200 | V |
| | | pin 7 | | - | <125 | V |

[1] Equivalent to discharging a 100 pF capacitor through a 1.5 kΩ series resistor.

[2] Equivalent to discharging a 200 pF capacitor through a 0.75 μH coil and a 10 Ω resistor.

# 9. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air; SO16L package | 80 | K/W |

## 10. Characteristics

**Table 6. Characteristics**

*$T_{amb}$ = 25 °C; voltage on pin VS = 11 V; $V_{FS}$ – S1A and S1B voltage= 11 V, GLI and GLO voltage measured with respect to PGND; currents are positive when flowing into the IC; unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **High voltage supply** | | | | | | | |
| $I_{leak}$ | leakage current | high voltage pins | | - | - | 10 | µA |
| **Start-up state** | | | | | | | |
| $V_{rst}$ | reset voltage | | | 4.0 | 5.5 | 6.5 | V |
| $V_{startup}$ | start-up voltage | | | 11.35 | 11.95 | 12.55 | V |
| $V_{stop}$ | stop voltage | | | 9.55 | 10.15 | 10.75 | V |
| $V_{hys}$ | hysteresis voltage | | | 1.5 | 1.8 | 2.0 | V |
| $I_{stb}$ | standby current | on pin VS | [1] | 150 | 200 | 250 | µA |
| $V_{(RHV-VS)}$ | voltage difference pin RHV and pin VS | RHV pin current = 1.0 mA | | 0.7 | 0.8 | 1.0 | V |
| $\Delta V_{clamp(startup)}$ | start-up clamp voltage difference | | [2] | 0.2 | 0.3 | 0.4 | V |
| $I_{clamp}$ | clamp current | VS pin voltage < 17 V | | - | 14 | 35 | mA |
| **Preheat mode** | | | | | | | |
| $f_{start}$ | start frequency | CI pin voltage = 0 V | | 98 | 108 | 118 | kHz |
| $t_g$ | conduction time | T1; T2; $f_{start}$ = 108 kHz | | - | 3.2 | - | µs |
| $I_{ch}$ | charge current | on pin CI; pin CI voltage = 0 V; pin RS voltage = –0.3 V | | 38 | 44 | 50 | µA |
| | | on pin CPAV; pin CPAV voltage = 1 V | | - | 6.0 | - | µA |
| $I_{dch}$ | discharge current | on pin CI; pin CI voltage = 0 V; pin RS voltage = –0.9 V | | 79 | 93 | 107 | µA |
| | | on pin CPAV; pin CPAV voltage= 1 V | | - | 5.95 | - | µA |
| $t_{ph}$ | preheat time | | | 599 | 666 | 733 | µs |
| $\Delta V_{M(CPAV)}$ | peak voltage difference on pin CPAV | measured during preheat timing | | - | 2.5 | - | V |
| $V_{ctrl}$ | control voltage | at pin RS | [3] | –636 | –600 | –564 | mV |
| **Frequency sweep to ignition** | | | | | | | |
| $I_{ch}$ | charge current | on pin CI; CI pin voltage = 1.5 V; f = 85 kHz | | 0.8 | 1 | 1.2 | µA |
| $f_{btm}$ | bottom frequency | pin CI voltage at clamp level | | - | 42.9 | - | kHz |
| $t_{ign}$ | ignition time | | | - | 625 | - | ms |
| **Normal operation** | | | | | | | |
| $f_{btm}$ | bottom frequency | $V_{ctrl}$ < 1 V | | 42.21 | 42.90 | 44.59 | kHz |
| $t_g$ | conduction time | for T1 and T2; $f_{btm}$ = 43 kHz | | - | 10.2 | - | µs |
| $t_{no}$ | non-overlap time | | | 1.05 | 1.4 | 1.75 | µs |
| $I_{tot}$ | total current | for supply; f = 43 kHz | | - | - | 1.6 | mA |
| $V_{ctrl}$ | control voltage | for capacitive mode control | [4] | 0 | 20 | 40 | mV |
| $V_{ref}$ | reference voltage | | [5] | 2.425 | 2.5 | 2.575 | V |
| $R_{on}$ | on-state resistance | half bridge power | | - | - | 3 | Ω |

**Table 6. Characteristics** *...continued*

*$T_{amb}$ = 25 °C; voltage on pin VS = 11 V; $V_{FS}$ – S1A and S1B voltage= 11 V, GLI and GLO voltage measured with respect to PGND; currents are positive when flowing into the IC; unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{on(150)}/R_{on(25)}$ | on-state resistance ratio (150 °C to 25 °C) | | | - | 2.7 | - | |
| $V_{Fd(bs)}$ | bootstrap diode forward voltage | $I_{FS}$ = 5 mA | | 0.6 | 1.0 | 1.4 | V |
| **feed forward** | | | | | | | |
| $R_{i(RHV)}$ | input resistance on pin RHV | | | 1.54 | 2.2 | 2.86 | kΩ |
| $I_{i(RHV)}$ | input current on pin RHV | during normal operation | [6] | 0 | | 1 | mA |
| $f_{ff}$ | feed forward frequency | pin RHV current = 0.75 mA | | 60.4 | 63.6 | 66.15 | kHz |
| | | pin RHV current = 1 mA | | 80.3 | 84.5 | 88.2 | kHz |
| $f_{ff(ratio)}$ | feed forward frequency ratio | pin RHV current = 1 mA | [7] | 0.9 | 1.0 | 1.1 | |
| $R_s$ | series resistance | CPAV switch; pin CPAV current = 100 µA | | 0.75 | 1.5 | 2.25 | kΩ |
| $R_{CPAV}$ | resistance on pin CPAV | used with $C_{CPAV}$ for averaging; CPAV pin current = 10 µA | | 22.4 | 32 | 41.6 | kΩ |

[1] The start-up supply current is specified in a temperature ($T_{vj}$) range of 0 °C to 125 °C. For $T_{vj}$ < 0 °C and $T_{vj}$ > 125 °C the start-up supply current is < 350 µA.

[2] The clamp margin is defined as the voltage difference between turn-on of the clamp and start of oscillation. The clamp is in the off-state at start of oscillation.

[3] Data sampling of $V_{th(capm)}$ is performed at the end of conduction of T2.

[4] Data sampling of $V_{th(capm)}$ is performed at the start of conduction of T2.

[5] Within the allowed range of $R_{IREF}$, defined as 30 kΩ +10%.

[6] The input current at pin RHV may increase to 1.6 mA during voltage transient on pin VDC. Only for pin RHV currents beyond approximately 550 mA the oscillator frequency is proportional to the pin RHV current.

[7] The symmetry is best calculated using $f_{ff(ratio)}$ where $f_{ff(ratio)}$ = T1 total time divided by the T2 total time with the T1 total time the time between turn-off of G2 and turn-off of G1, and the T2 total time the time between turn-off of G1 and turn-off of G2.

# 11. Application information

## 11.1 Design equations

- Bottom frequency:

$$f_{btm} = \frac{1}{2 \times [(C_f + C_{par}) \times (X1 \times R_{IREF} - R_{int})] + t} (Hz)$$

- Feed forward frequency:

$$f_{ff} = \frac{1}{2 \times \left[(C_f + C_{par}) \times \left(\frac{X2 \times V_{ref} \times R_{HV}}{V_{i(VDC)}} - R_{int}\right)\right] + t} (Hz)$$

Where:

- X1 = 3.68
- X2 = 22.28
- t = 0.4 μs
- $R_{int}$ = 3 kΩ
- $C_{par}$ = 4.7 pF
- $V_{ref}$ = 2.5 V
- $V_{i(VDC)}$ = 300 V (nominal)
- $R_{HV}$ = 560 KΩ (see Figure 6)

- Operating frequency = $f_{btm(max)}$, $f_{ff(max)}$, and $f_{cm(max)}$

Where:

- $f_{btm}$ = bottom frequency
- $f_{ff(max)}$ = maximum feed forward frequency
- $f_{cm(max)}$ = maximum frequency due to capacitive mode detection

- Preheat time:

$$t_{ph} = \frac{C_{CP}}{150\ nF} \times \frac{R_{ref}}{30\ k\Omega} (s)$$

- Ignition time:

$$t_{ign} = \frac{15}{16} \times t_{ph} (s)$$

- Non-overlap time:

$$t_{no} = 1.4\ \mu s \times \frac{R_{ref}}{30\ k\Omega}$$

## 11.2 Application diagram

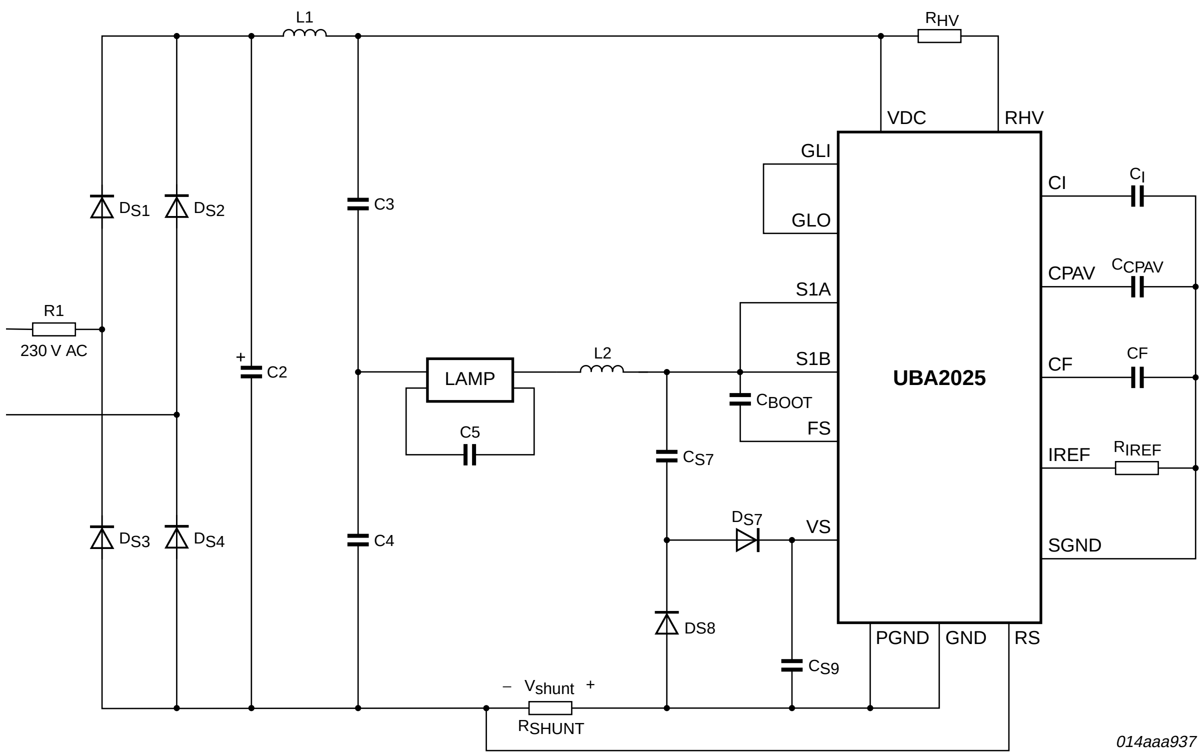



**Fig 6. 23 W CFL application diagram**

**Table 7. 23 W CFL application component values**

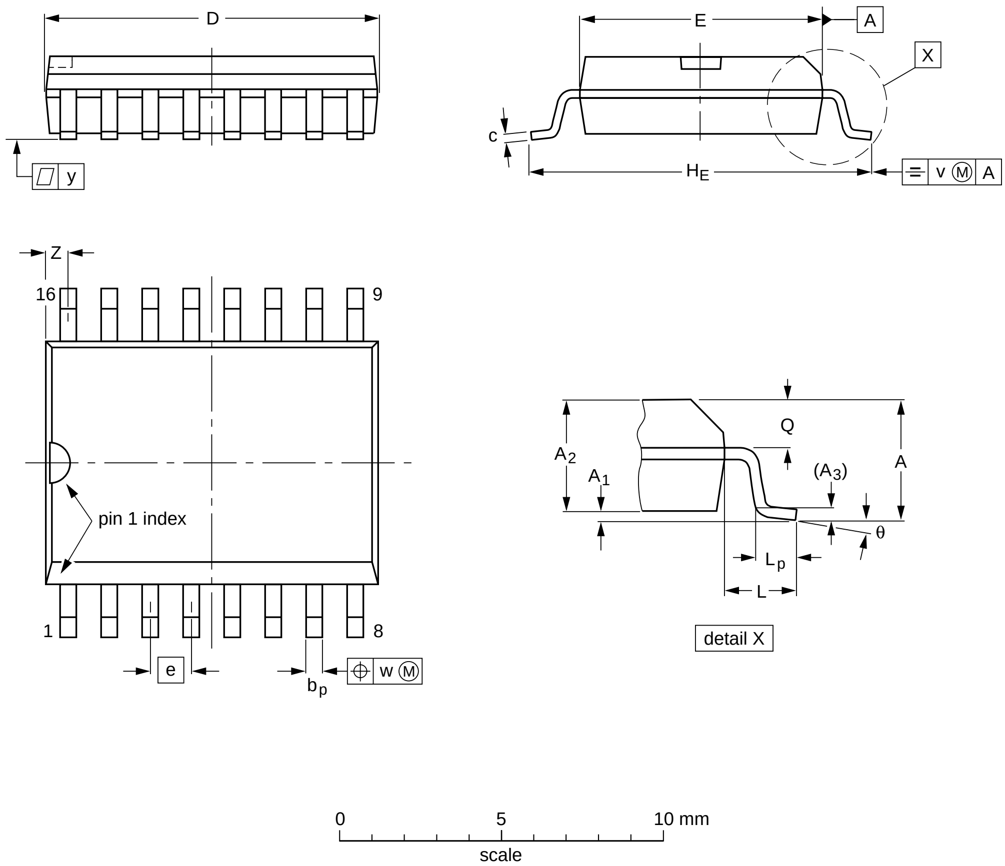
| Component type | Component name | Value | Description |
|---|---|---|---|
| diodes | DS1-DS4 | IN4007 | bridge rectifier |
| | DS7, DS8 | IN4148 | limiting and charge pump |
| resistors | R1 | 10 Ω | inrush or fusistor |
| | $R_{IREF}$ | 30 kΩ | reference |
| | $R_{HV}$ | 560 kΩ | start-up and feed forward frequency |
| | $R_{SHUNT}$ | 1.1 Ω | sensing (2 W) |
| inductors | L1 | 1.8 mH | input mains filter |
| | L2 | 3 mH | resonant |
| capacitors | C2 | 5.6 μH; 400 V | mains buffer |
| | C3, C4 | 100 nF; 200 V | DC blocking |
| | C5 | 3.9 nF; 630 V | resonant |
| | $C_I$ | 47 nF | integrating |
| | $C_{CPAV}$ | 100 nF | preheat and averaging |
| | CF | 100 pF | internal reference oscillator |
| | $C_{BOOT}$ | 100 nF; 400 V | bootstrap |
| | CS7 | 150 pF; 400 V | charge pump and dv/dt limiting |

**Table 7. 23 W CFL application component values**

| Component type | Component name | Value | Description |
|---|---|---|---|
| capacitor | CS9 | 100 nF | decoupling |
| CFL | E27 CFL | 23 W | CFL E27 type, 23 W |
| IC | UBA2025T | SO16L, SOT162-1 | control IC with integrated power MOSFETs |

## 12. Package outline

**SO16: plastic small outline package; 16 leads; body width 7.5 mm** **SOT162-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2.65 | 0.3<br>0.1 | 2.45<br>2.25 | 0.25 | 0.49<br>0.36 | 0.32<br>0.23 | 10.5<br>10.1 | 7.6<br>7.4 | 1.27 | 10.65<br>10.00 | 1.4 | 1.1<br>0.4 | 1.1<br>1.0 | 0.25 | 0.25 | 0.1 | 0.9<br>0.4 | 8°<br>0° |
| inches | 0.1 | 0.012<br>0.004 | 0.096<br>0.089 | 0.01 | 0.019<br>0.014 | 0.013<br>0.009 | 0.41<br>0.40 | 0.30<br>0.29 | 0.05 | 0.419<br>0.394 | 0.055 | 0.043<br>0.016 | 0.043<br>0.039 | 0.01 | 0.01 | 0.004 | 0.035<br>0.016 | |

**Note**

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT162-1 | 075E03 | MS-013 | | | | ~~99-12-27~~<br>03-02-19 |

**Fig 7. Package outline SOT162-1 (SO16)**

## 13. Abbreviations

**Table 8. Abbreviations**

| Acronym | Description |
|---|---|
| CFL | Compact Fluorescent Lamp |
| NMOST | Negative Channel Metal-Oxide Semiconductor |
| MOSFET | Metal-Oxide-Semiconductor Field-Effect Transistors |
| LS | Low Side |

## 14. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| UBA2025_1 | 20091016 | Product data sheet | - | - |

# 15. Legal information

## 15.1 Data sheet status

| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

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[2] The term 'short data sheet' is explained in section "Definitions".

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## 17. Contents





**Date of release: 16 October 2009**
**Document identifier: UBA2025_1**