

UBA2213

Half-bridge power IC family for CFL lamps

Rev. 2 — 21 November 2011

Product data sheet

1. General description

The UBA2213 family of integrated circuits are a range of high voltage monolithic ICs for driving Compact Fluorescent Lamps (CFL) in half-bridge configurations. The family is designed to provide easy integration of lamp loads across a range of burner power and mains voltages.

2. Features and benefits

2.1 System integration

- Integrated half-bridge power transistors
 - ◆ UBA2213A: 220 V; 13.5 Ω ; 0.9 A maximum ignition current
 - ◆ UBA2213B: 220 V; 9 Ω ; 1.35 A maximum ignition current
 - ◆ UBA2213C: 220 V; 6.6 Ω ; 1.85 A maximum ignition current
- Integrated bootstrap diode
- Integrated high-voltage supply

2.2 General

- Adjustable current controlled preheat mode enables the preheat time (t_{ph}) to be set
- Glow-time control minimizes electrode damage in non-preheat applications
- RMS current control

2.3 Fast and smooth light out

- Boost with externally controlled timing
- Temperature controlled timing during boost state
- Smooth transition from boost to burn state

2.4 Burner lifetime

- Current controlled preheat with adjustable preheat time
- Minimum glow time control to support cold start
- Lamp power independent from mains voltage variations
- Lamp inductor saturation protection during ignition



2.5 Safety

- OverTemperature Protection (OTP)
- Capacitive Mode Protection (CMP)
- Saturation Current Protection (SCP)
- Overpower control
- System shutdown at burner end of life

2.6 Ease of use

- Adjustable operating frequency for easy fit with various burners
- Each device in the family incorporates the same controller functionality ensuring easy power scaling and roll-out across a complete range of CFLs

3. Applications

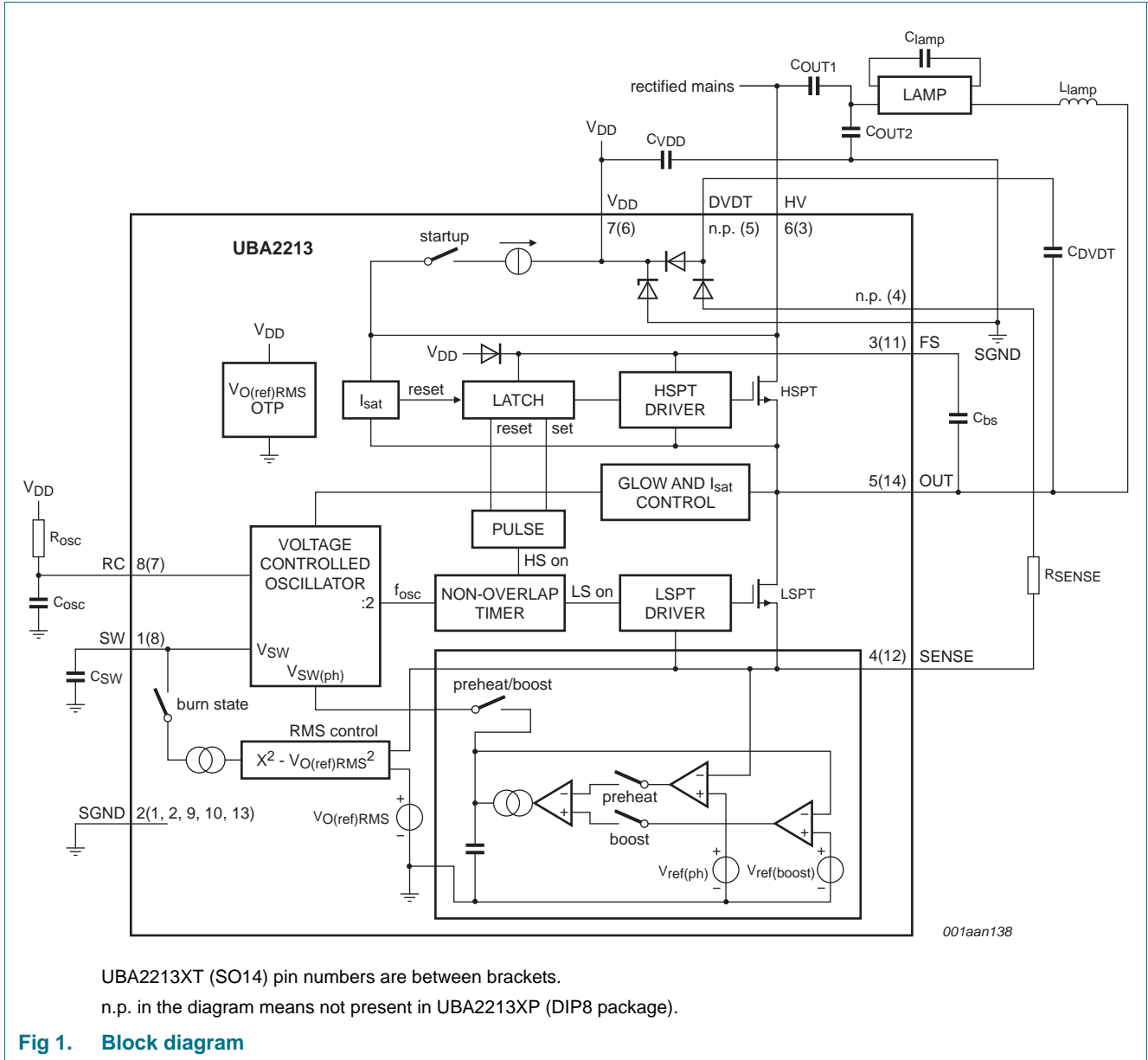
- Compact Fluorescent Lamps up to 23 W for indoor and outdoor applications

4. Ordering information

Table 1. Ordering information

Type number	Package		
	Name	Description	Version
UBA2213AP/N1	DIP8	plastic dual in-line package; 8 leads (300 mil)	SOT97-1
UBA2213BP/N1			
UBA2213CP/N1			
UBA2213AT/N1	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
UBA2213BT/N1			
UBA2213CT/N1			

5. Block diagram



In the SO14 package, the two diodes which are required for the DVDT supply are integrated and connected between pins DVDT and PGND. Mount these diodes externally when using the DIP8 packaged devices because the are not bonded.

6. Pinning information

6.1 Pinning

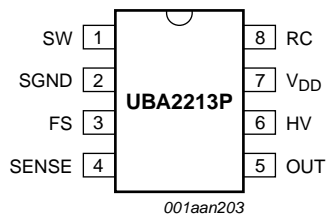


Fig 2. Pin configuration for UBA2213XP (SOT97-1)

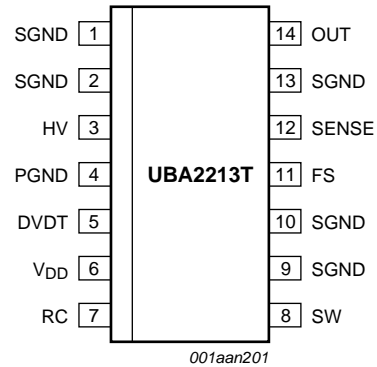


Fig 3. Pin configuration for UBA2213XT (SOT108-1)

6.2 Pin description

Table 2. Pin description

Symbol	Pin		Description
	UBA2213xP	UBA2213xT	
SW	1	8	sweep timing and VCO input
SGND	2	1, 2, 9, 10, 13	signal ground
FS	3	11	high-side floating supply output
SENSE	4	12	voltage sense for preheat and RMS control
OUT	5	14	half-bridge output
HV	6	3	high-voltage supply
V _{DD}	7	6	internal low-voltage supply output
RC	8	7	internal oscillator input
DVDT	n.p.	5	DVDT supply input
PGND	n.p.	4	DVDT supply ground

7. Functional description

7.1 Supply voltage

The UBA2213 family is powered using a start-up current source and a DVDT supply. When the voltage on pin HV increases, the V_{DD} capacitor (C_{VDD}) is charged using the internal JFET current source. The voltage on pin V_{DD} rises until V_{DD} equals $V_{DD(start)}$. The start-up current source is then disabled. The half-bridge starts switching causing the charge pump to generate the required V_{DD} supply.

The amount of current flowing towards V_{DD} equals $V_{I(HV)} \times C_{DVDT} \times f$ where f represents the momentary frequency. The charge pump consists of an external half-bridge capacitor (C_{DVDT}). The SO14 package contains two internal diodes with an internal Zener diode. Mount these diodes externally with DIP8 packaged devices. The Zener diode ensures the V_{DD} voltage cannot rise above the maximum V_{DD} rating.

The DVDT supply has its own ground pin (PGND) to prevent large peak currents from flowing through the external small signal ground pin (SGND).

The start-up current source is enabled when the voltage on pin V_{DD} is below the $V_{DD(stop)}$ level.

7.2 Start-up state

When the supply voltage on pin V_{DD} increases, the IC enters the start-up state. In the start-up state, the High-Side Power Transistor (HSPT) is switched off and the Low-Side Power Transistor (LSPT) is switched on. The circuit is reset and the capacitors on the bootstrap pin FS (C_{bs}) and the low-voltage supply pin V_{DD} (C_{VDD}) are charged. Pins RC and SW are switched to ground.

When pin V_{DD} is above $V_{DD(start)}$, the start-up state is exited and the preheat state is entered. If the voltage on pin V_{DD} falls below $V_{DD(stop)}$, the system returns to the start-up state.

Remark: If OTP is active, the IC remains in the start-up state indefinitely. The V_{DD} voltage slowly oscillates between $V_{DD} = V_{DD(stop)}$ and $V_{DD} = V_{DD(start)}$.

7.3 Reset

A DC reset circuit is incorporated in the high-side driver. The high-side transistor is switched off when the voltage on pin FS is below the high-side lockout voltage.

7.4 Oscillation control

The oscillation frequency is based on the 555-timer function. A self oscillating circuit is created comprising the external components: resistors R_{osc} , R_{sense} and capacitor C_{osc} . R_{osc} and C_{osc} define the nominal oscillating frequency.

An internal divider $0.5 \times f_{osc(int)}$ is used to generate the accurate 50 % duty cycle. The divider sets the bridge frequency at half the oscillator frequency.

The input on pin SW generates the signal V_{SW} and it is used to determine the frequency in all states except preheat and boost. Signal $V_{SW(ph)}$ is an internally generated signal used to determine the frequency during the preheat state.

The output voltage of the bridge changes with the falling edge of the signal on pin RC. The nominal half-bridge frequency is shown in [Equation 1](#):

$$f_{osc(nom)} = \frac{I}{k_{osc} \times R_{osc} \times C_{osc}} \tag{1}$$

The maximum frequency is $2.5 \times f_{osc(nom)}$ and is set at V_{SW} . An overview of the oscillator, internal LSPT and HSPT drive signals and the output is shown in [Figure 4](#).

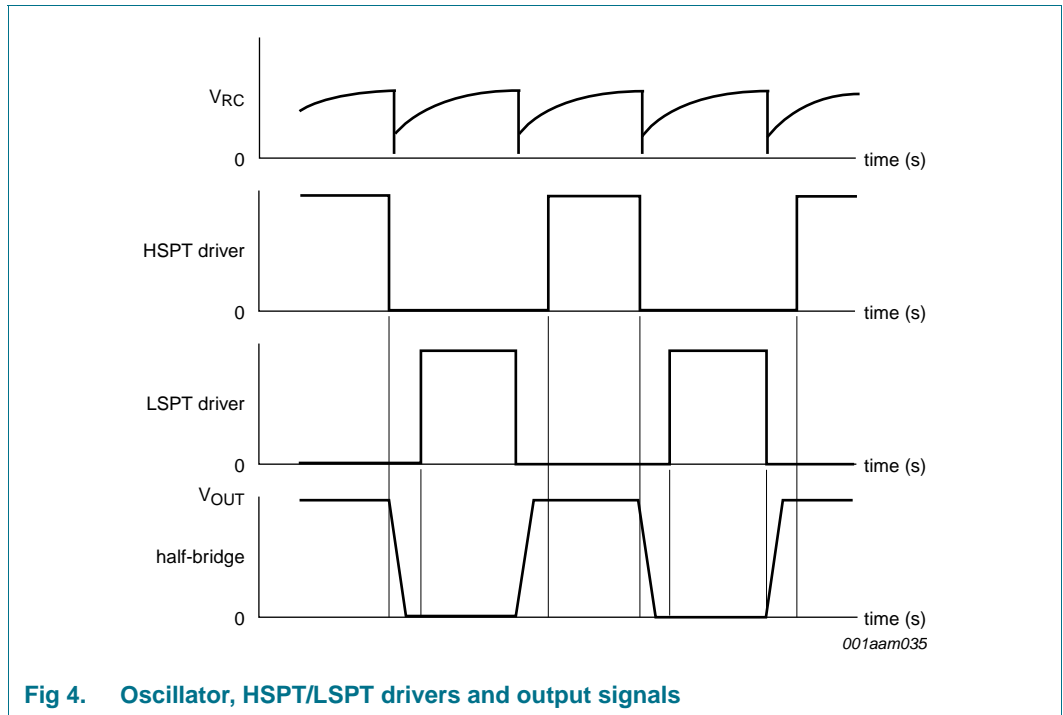


Fig 4. Oscillator, HSPT/LSPT drivers and output signals

7.5 Preheat state

As described in [Section 7.2](#), the IC enters the preheat state when the voltage on pin V_{DD} is above $V_{DD(start)}$ and OTP is not active. The sweep current (I_{SW}) charges the capacitor on pin SW (C_{SW}). The preheat Operational Transconductance Amplifier (OTA) is enabled and the half-bridge circuit starts oscillating.

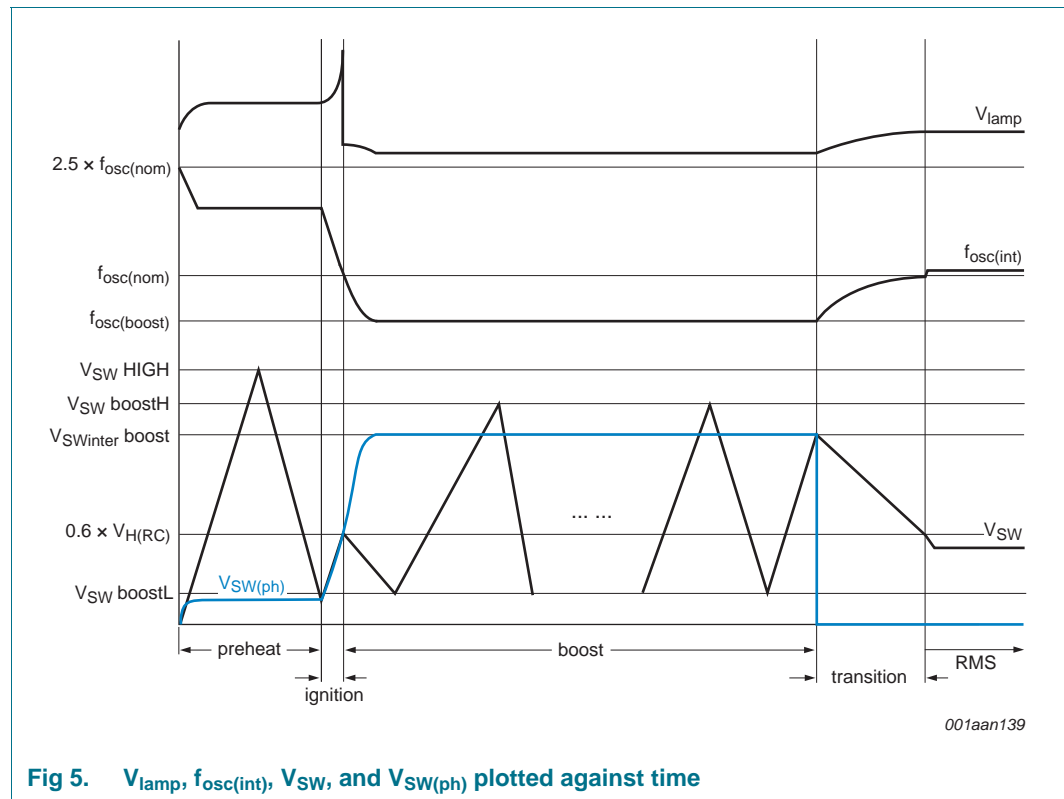
The preheat current is monitored using the external R_{SENSE} resistor. The OTA controls the frequency using output voltage $V_{SW(ph)}$ so that the peak voltage across R_{SENSE} equals the internal reference voltage ($V_{ref(ph)}$). The peak voltage is the voltage at the end of the LSPT conduction time. The preheat peak current through the lamp filament is calculated as shown in [Equation 2](#):

$$I_{ph(peak)} = \frac{V_{ref(ph)}}{R_{SENSE}} \tag{2}$$

The external capacitor (C_{SW}) defines the preheat time. Typically, the external capacitor is calculated as shown in [Equation 3](#). The preheat state ends when the down-going C_{SW} voltage equals $V_{SW(ph)}$; see [Figure 4](#).

$$C_{sw} = \frac{t_{ph}}{1.5 s \times 100 nF} \tag{3}$$

If during the preheat time, capacitive mode is sensed, the internal $V_{SW(ph)}$ node is discharged. The frequency sweep increases until the system is set to the operating point where capacitive mode switching is minimized.



7.6 Ignition state

The ignition state is entered after the preheat state has finished. The capacitor on pin SW (C_{SW}) is charged by I_{SW} up to $0.6 \times V_{H(RC)}$ which corresponds to the frequency $f_{osc(nom)}$.

During this frequency sweep, the resonance frequency is reached resulting in the ignition of the lamp (see [Figure 4](#)). The lamp inductor (L_{lamp}) and lamp capacitor (C_{lamp}) set resonance frequency. The ignition state ends when the voltage on pin SW (V_{SW}) reaches $0.6 \times V_{H(RC)}$.

7.7 Boost state and transition to steady state

The boost state is entered after ignition. During boost period, VCO's input is connected to an internal voltage to get the fix frequency f_{min} . The UBA2213 can provide a higher current than steady state, the current ratio can be set by external component. Capacitor C_{SW} is charged and discharged using an internal current generated saw-tooth waveform which sets boost time.

When boost state is ended, transition control is turned on. V_{ph} is disconnected to V_{SW} and reset. Capacitor C_{SW} is discharged by internal current, the frequency was increased from f_{min} to f_{nom} . The transition state ends when the voltage on pin SW (V_{SW}) reaches $0.6 \times V_{H(RC)}$.

7.8 Steady state

In the steady state, the RMS current control is active. This control sets the frequency so that the RMS voltage across the sense resistor (R_{SENSE}) is equal to $V_{O(ref)RMS}$. This feature ensures the current through the power switches and through the lamp is constant. This results in constant IC dissipation and temperature at a fixed ambient temperature.

During one oscillator clock cycle, the voltage on pin SENSE (V_{SENSE}) is squared and converted into a positive current. This discharge current is added to the capacitor C_{SW} .

During the other oscillator clock cycle, the input of the squarer is connected to the internal reference voltage $V_{O(ref)RMS}$. This voltage is squared and converted into a negative current. This charge current is also added to capacitor C_{SW} . When both currents are equal, then [Equation 4](#) is true:

$$\frac{I}{T_{osc}} \times \int_0^{T_{osc}} V_{SENSE}^2(t)DT = \frac{I}{T_{osc}} \times \int_0^{T_{osc}} V_{O(ref)RMS}^2 DT \tag{4}$$

Where T_{osc} equals the operating frequency $f_{osc} / 1$.

Taking the square root of both sides results in [Equation 5](#):

$$\sqrt{\frac{I}{T_{osc}} \times \int_0^{T_{osc}} V_{SENSE}^2(t)DT} = \sqrt{\frac{I}{T_{osc}} \times \int_0^{T_{osc}} V_{O(ref)RMS}^2 DT} \tag{5}$$

or

$$RMS V_{SENSE} = V_{O(ref)RMS} = R_{SENSE} \times I_{LSPT} \tag{6}$$

The internal reference voltage ($V_{O(ref)RMS}$) and the external R_{SENSE} resistor define the constant current which flows through the power switches and the lamp.

7.9 Non-overlap time

The non-overlap time is defined as the time when both MOSFETs are not conducting. The non-overlap time is fixed internally and is fixed at the t_{no} value (see [Table 5](#)).

7.10 OverTemperature Protection (OTP)

OTP is active in all states except boost. When the die temperature reaches the OTP activation threshold ($T_{th(act)otp}$), the oscillator is stopped and the power switches (LSPT/HSPT) are set to the start-up state. When the oscillator is stopped, the DVDT supply no longer generates the supply current I_{DVDT} . Voltage V_{DD} gradually decreases and the start-up state is entered as described in [Section 7.2 on page 5](#). OTP is reset when the temperature $< T_{th(rel)otp}$.

During boost state, the threshold of temperature is $T_{j(end)bst}$ which is lower than $T_{th(otp)}$. When the die temperature has reached $T_{j(end)bst}$, the boost state ends, the IC enters steady state and OTP is enabled.

7.11 Minimum glow time control

If the preheat time is set too short or omitted, the lamp electrodes do not have the correct temperature in the ignition state. This results in instant light but also in a reduced switching lifetime because when the electrode temperature is too low electrode sputtering and damage occur. The minimum glow time control limits electrode damage by ensuring maximum power use during the glow phase to heat the electrodes quickly (see Figure 6).

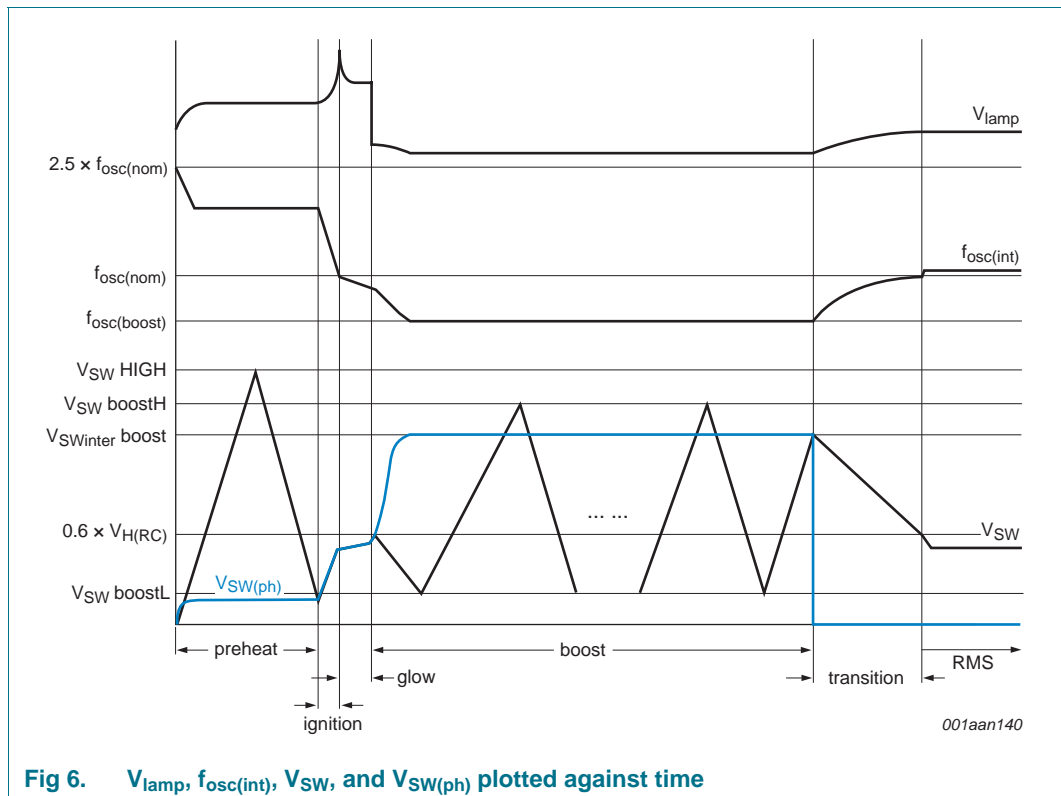


Fig 6. V_{lamp} , $f_{osc(int)}$, V_{SW} , and $V_{SW(ph)}$ plotted against time

Remark: The glow time control is active as t_{ph} is too short to preheat the electrodes.

7.12 Saturation Current Protection (SCP)

A critical parameter in the design of the lamp inductor is its saturation current. When the momentary inductor exceeds its saturation current, the inductance drops significantly. If the inductance drops significantly, the inductor current and the current flowing through the LSPT and HSPT power switches increases rapidly. This action can cause the current to exceed the half-bridge power transistors maximum ratings.

Saturation of the lamp inductor is likely to occur in cost-effective and miniaturized CFLs. The UBA2213 family internally monitors the power transistor current. When this current exceeds the momentary rating of the internal power transistors, the conduction time is reduced and the frequency is slowly increased (by discharging C_{SW}). This function causes the system to balance at the edge of the current rating of the power switches.

7.13 Capacitive Mode Protection (CMP)

When capacitive mode is detected, capacitor C_{SW} is discharged causing the frequency to increase. The system sets itself to the operating point where capacitive mode switching is minimized. CMP is active during the ignition state and in the steady state.

If capacitive mode is sensed during preheat and boost state, the oscillator frequency increases step-by-step by discharging the internal capacitor. This action continues until the system is set to the operating point where capacitive mode switching is minimized. CMP can be triggered for example, by an end of a lamp life condition when a lamp electrode is broken.

8. Limiting values

Table 3. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{HV}	voltage on pin HV	operating	-	373	V
		mains transients: 10 minutes maximum over lifetime	-	550	V
V_{FS}	voltage on pin FS	with respect to pin OUT	0	14	V
V_{DD}	supply voltage	DC supply	0	15	V
V_{SENSE}	voltage on pin SENSE		-5	+5	V
V_{RC}	voltage on pin RC	$I_{RC} < 1 \text{ mA}$	0	V_{DD}	V
V_{SW}	voltage on pin SW	$I_{SW} < 1 \text{ mA}$	0	V_{DD}	V
I_{OUT}	current on pin OUT	$T_j < 125 \text{ }^\circ\text{C}$	[1]		
		UBA2213AX	-0.9	+0.9	A
		UBA2213BX	-1.35	+1.35	A
		UBA2213CX	-1.65	+1.65	A
I_{DVDT}	current on pin DVDT	$T_j < 125 \text{ }^\circ\text{C}$	-0.9	+0.9	A
SR	slew rate	repetitive output on pin OUT	-4	+4	V/ns
T_j	junction temperature		-40	+150	$^\circ\text{C}$
T_{stg}	storage temperature		-55	+150	$^\circ\text{C}$
V_{ESD}	electrostatic discharge voltage	HBM:	[2]		
		pins HV, FS, OUT	-	1	kV
		pins SW, RC, VDD, DVDT	-	2.5	kV
		MM:	[3]		
		all pins	-	200	V
		CDM:	[3]		
		all pins	-	500	V

[1] X where the last letter is P or T.

[2] In accordance with the Human Body Model (HBM): equivalent to discharging a 100 pF capacitor through a 1.5 k Ω series resistor.

[3] In accordance with the Machine Model (MM): equivalent to discharging a 200 pF capacitor through a 1.5 k Ω series resistor and a 0.75 μH inductor.

9. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] 95	K/W
$R_{th(j-c)}$	thermal resistance from junction to case	in free air	[1] 16	K/W

[1] In accordance with IEC 60747-1

10. Characteristics

Table 5. Characteristics

$T_j = 25\text{ °C}$; all voltages are measured with respect to SGND; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Low-voltage supply						
Start-up state						
$I_{I(HV)}$	input current on pin HV	$V_{I(HV)} = 100\text{ V}$	-	0.85	-	mA
$V_{DD(start)}$	start supply voltage	oscillation start	10.7	11.7	12.7	V
$V_{DD(stop)}$	stop supply voltage	oscillation stop	8	8.5	9	V
$V_{DD(hys)}$	hysteresis of supply voltage	start – stop	3	3.5	4	V
$V_{DD(reg)}$	regulation supply voltage		-	13.8	-	V
I_{sink}	sink current	capability of VDD regulator	6	-	-	mA
Output stage						
R_{on}	on-state resistance	high-side transistor:	[1]			
		UBA2213AX; $V_{I(HV)} = 310\text{ V}$; $I_D = 100\text{ mA}$	-	13.5	-	Ω
		UBA2213BX; $V_{I(HV)} = 310\text{ V}$; $I_D = 100\text{ mA}$	-	9.3	-	Ω
		UBA2213CX; $V_{I(HV)} = 310\text{ V}$; $I_D = 100\text{ mA}$	-	6.6	-	Ω
		low-side transistor:	[1]			
		UBA2213AX; $I_D = 100\text{ mA}$	-	13.5	-	Ω
		UBA2213BX; $I_D = 100\text{ mA}$	-	8.2	-	Ω
UBA2213CX; $I_D = 100\text{ mA}$	-	6.6	-	Ω		
$R_{on(150)}/R_{on(25)}$	on-state resistance ratio (150 °C to 25 °C)		-	1.4	-	
V_F	forward voltage	HS; $I_F = 200\text{ mA}$	-	-	2.0	V
		LS; $I_F = 200\text{ mA}$	-	-	2.0	V
		bootstrap diode; $I_F = 1\text{ mA}$	0.7	1.0	1.3	V
t_{no}	non-overlap time		1.05	1.35	1.65	μs
$V_{I(FS)}$	input voltage on pin FS	UnderVoltage LockOut with respect to pin OUT	3.6	4.2	4.8	V
$I_{I(FS)}$	input current on pin FS	$V_{I(HV)} = 310\text{ V}$; $V_{I(FS)} = 12\text{ V}$	10	14	18	μA

Table 5. Characteristics ...continued $T_j = 25\text{ °C}$; all voltages are measured with respect to SGND; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{sat}	saturation current	high-side transistor: [1]				
		UBA2213AX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$; $V_{\text{I(HV)}} = 310\text{ V}$	0.90	-	-	A
		UBA2213BX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$; $V_{\text{I(HV)}} = 310\text{ V}$	1.35	-	-	A
		UBA2213CX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$; $V_{\text{I(HV)}} = 310\text{ V}$	1.85	-	-	A
		low-side transistor: [1]				
		UBA2213AX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$	0.90	-	-	A
		UBA2213BX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$	1.35	-	-	A
		UBA2213CX; $V_{\text{DS}} = 30\text{ V}$; $T_j \leq 125\text{ °C}$	1.85	-	-	A
Internal oscillator						
$f_{\text{osc(int)}}$	internal oscillator frequency	$V_{\text{SW}} = V_{\text{DD}}$; steady state	-	-	60	kHz
$f_{\text{osc(nom)}}$	nominal oscillator frequency	$R_{\text{osc}} = 100\text{ k}\Omega$; $C_{\text{osc}} = 220\text{ pF}$; $V_{\text{SW}} = V_{\text{DD}}$	40.05	41.32	42.68	kHz
$\Delta f_{\text{osc(nom)}/\Delta T}$	nominal oscillator frequency variation with temperature	$R_{\text{osc}} = 100\text{ k}\Omega$; $C_{\text{osc}} = 220\text{ pF}$; $\Delta T = -20\text{ to }+150\text{ °C}$	-	2	-	%
k_{H}	high-level trip point factor		0.371	0.384	0.397	
k_{L}	low-level trip point factor		0.028	0.032	0.036	
$V_{\text{H(RC)}}$	HIGH-level voltage on pin RC	trip point; $V_{\text{H(RC)}} = k_{\text{H}} \times V_{\text{DD}}$	4.08	4.22	4.37	V
$V_{\text{L(RC)}}$	LOW-level voltage on pin RC	trip point; $V_{\text{L(RC)}} = k_{\text{L}} \times V_{\text{DD}}$	0.308	0.352	0.396	V
K_{osc}	oscillator constant	$R_{\text{osc}} = 100\text{ k}\Omega$; $C_{\text{osc}} = 220\text{ pF}$	1.065	1.1	1.135	
Preheat function						
$V_{\text{ref(ph)}}$	preheat reference voltage		-	620	-	mV
t_{ph}	preheat time	$C_{\text{SW}} = 100\text{ nF}$	-	1.2	-	s
		$C_{\text{SW}} = 68\text{ nF}$	-	0.8	-	s
Boost function						
f_{bst}	boost frequency	$R_{\text{osc}} = 100\text{ k}\Omega$; $C_{\text{osc}} = 220\text{ pF}$; $V_{\text{SW}} = V_{\text{DD}}$	-	26	-	kHz
$T_{\text{j(end)bst}}$	boost end junction temperature		-	85	-	°C
t_{bst}	boost time	$C_{\text{SW}} = 68\text{ nF}$	-	51	-	s
t_{t}	transition time	$C_{\text{SW}} = 68\text{ nF}$	-	0.7	-	s
RMS current control function						
$V_{\text{O(ref)RMS}}$	RMS reference output voltage		262	285	308	mV

Table 5. Characteristics ...continued

$T_j = 25\text{ °C}$; all voltages are measured with respect to SGND; positive currents flow into the IC.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OTP function						
$T_{th(Act)otp}$	overtemperature protection activation threshold temperature		155	175	-	°C
$T_{th(Rel)otp}$	overtemperature protection release threshold temperature		-	100	-	°C

[1] X where the last letter is P or T.

11. Application information

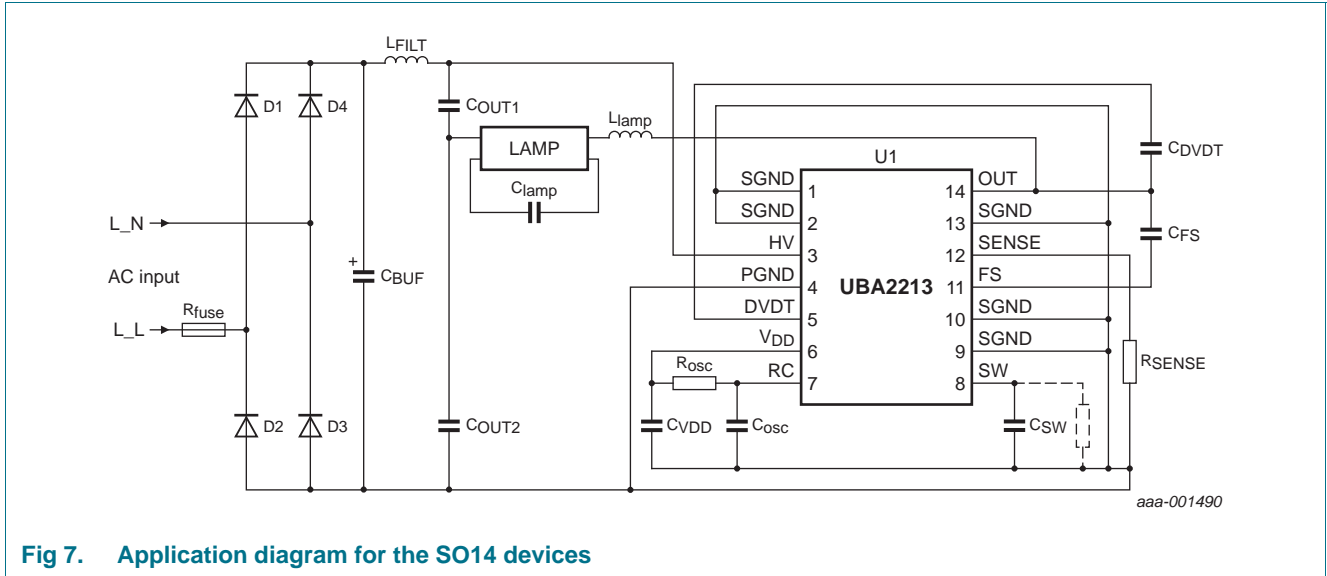


Fig 7. Application diagram for the SO14 devices

The components used in Figure 7 are illustrated in Table 6.

Table 6. SO14 device bill of materials

Number	Reference	Alias	Typical value	Quantity
1	R _{fuse}		10 Ω; 1 W	1
2	D1, D2, D4, D5		M7	4
3	C _{BUF}	C1	2.7 μF; 400 V; 105 °C; 10*16	1
4	C _{FS}	C5	10 nF; 50 V; 0805	1
5	C _{SW} , C _{VDD}	C6	100 nF; 50 V; 0805	2
6	C _{DVDT}	C9	220 pF; 500 V	1
7	C _{osc}	C7	220 pF; 50 V; 0805	1
9	C0, C _{OUT1} , C _{OUT2}	C0, C2, C3	100 nF; 400 V; CL21	3
10	C _{lamp}	C4	2.2 nF; 1 kV; CBB28	1
11	L _{FILT}	L1	3 mH; LGB	1
12	L _{lamp}	L2	3 mH; EE13; PC40	1
13	R _{osc}	R1	100 kΩ; 1 %; 0805	1
14	R _{SENSE}	R2	1.8 Ω; 1 W; 1 %	1
15	PCB		UBA2213-1; UBA2213-8	2
16	IC		UBA2213B	1
17	Burner		3U-12 W; 2700k	1

Remark: The customized component values depend on the burner characteristics. An on-line tool is available to calculate the required components values. This on-line tool can be found on the product information page of the UBA2213.

12. Package outline

DIP8: plastic dual in-line package; 8 leads (300 mil)

SOT97-1

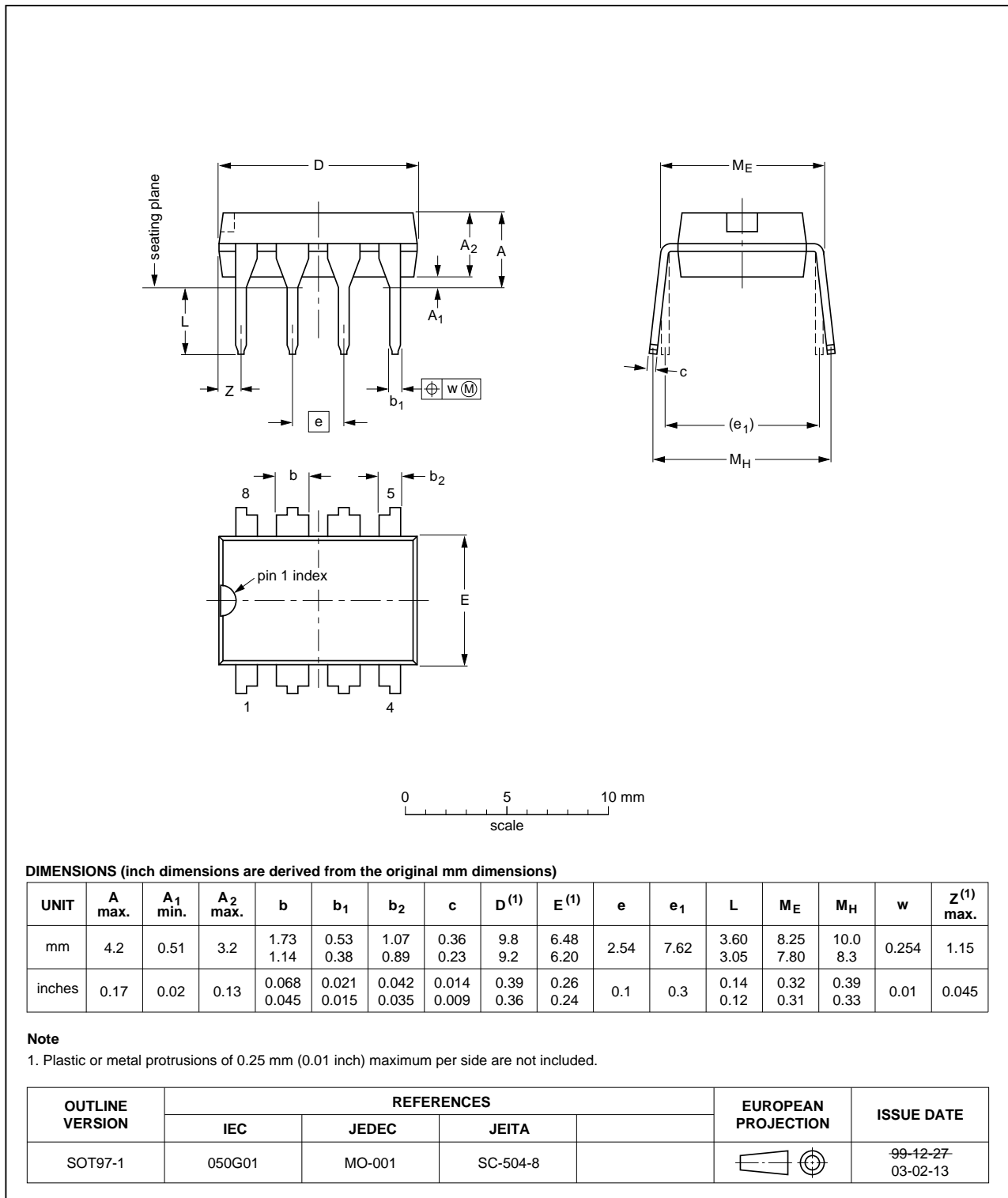


Fig 9. Package outline SOT97-1 (DIP8)

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

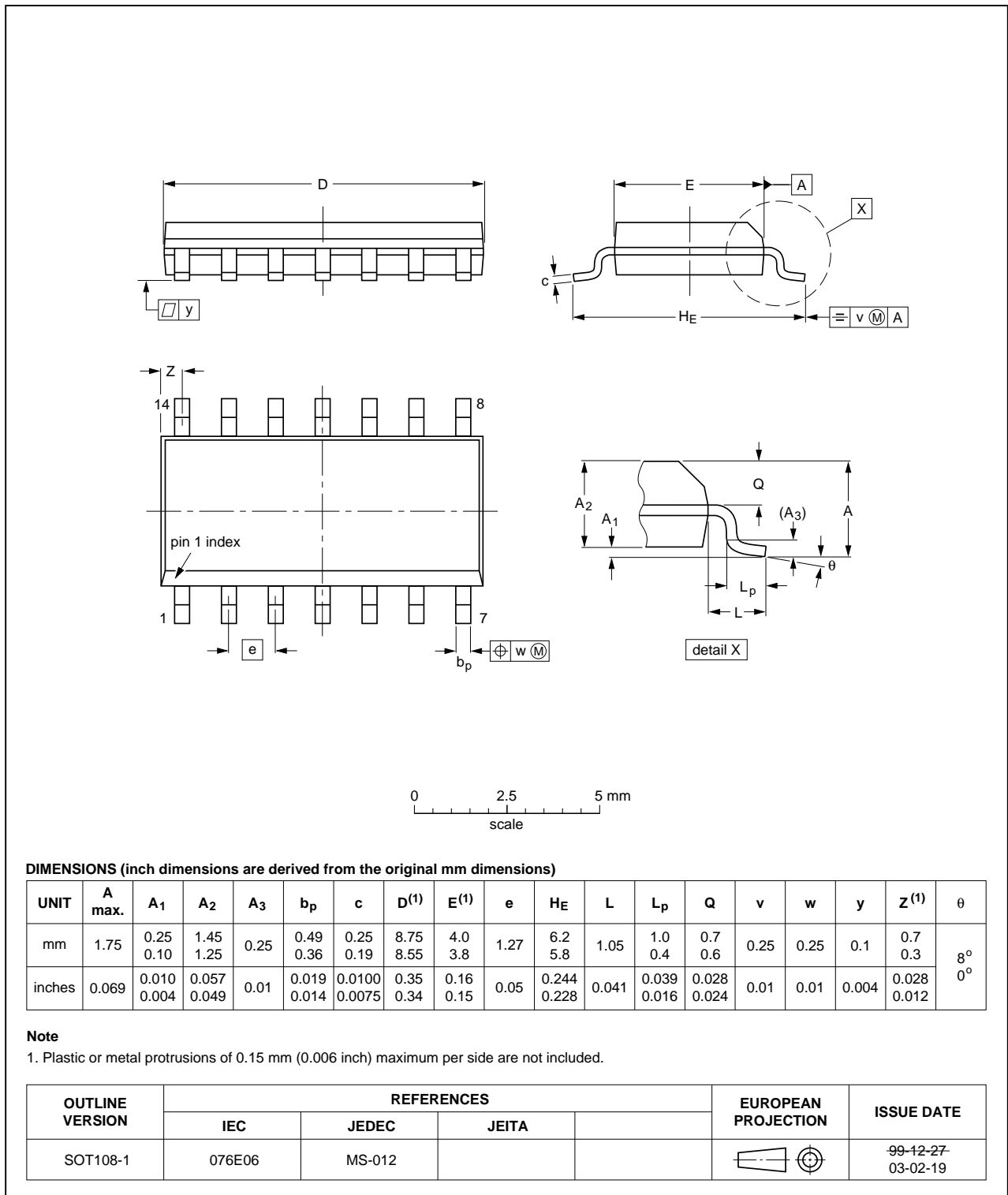


Fig 10. Package outline SOT108-1 (SO14)

13. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
UBA2213 v.2	20111121	Product data sheet	-	UBA2213 v.1
UBA2213 v.1	20101202	Objective data sheet	-	-

14. Legal information

14.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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