



## SP4422A

### Electroluminescent Lamp Driver

#### DESCRIPTION

The **SP4422A** is a high voltage output DC-AC converter that can operate from a 2.2V-5.0V power supply. The **SP4422A** is capable of supplying up to more than 110 V<sub>pp</sub> signals, making it ideal for driving electroluminescent lamps. The device could be used in low power portable products. One external inductor is required to generate the high voltage, and one external capacitor is used to select the oscillator frequency. The **SP4422A** is offered in die form and 8-pin SOP packages.

#### FEATURES

- 2.2V-5.0V Battery Operation
- High Voltage Output
- Internal Oscillator
- Pin-Pin replacement of Sipex SP4422A, SP4423, Functional replacement of : SP4403, IMP803, D340B, D355B

#### APPLICATIONS

- PDA
- Cellular Phones
- Remote Controls
- Handheld Computers
- LCD Module

#### Ordering Information

PART NO.	TEMP. RANGE (°C)	PACKAGE
SP4422ACM	-40 – 85 °C	8-Pin SOP
SP4422ACU	-40 – 85 °C	8-Pin MSOP
SP4422ACX	-40 – 85 °C	Dice

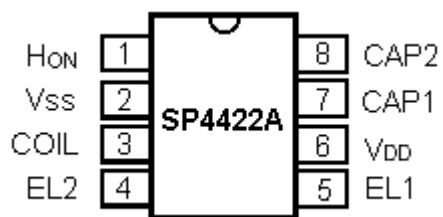
#### SPECIFICATIONS

(T = 25°C; V<sub>DD</sub> = 3.0V, Lamp Capacitance = 3000pF, Coil = 9mH (R = 40Ω), C<sub>OSC</sub> = 180pF unless otherwise noted)

PARAMETER	MIN	TYP	MAX	UNIT	CONDITIONS
Supply Voltage, V <sub>DD</sub>	2.2	3.0	5.0	V	
Supply Current		20	30	mA	V <sub>DD</sub> = 3.0V, H <sub>ON</sub> = 3.0V
Coil Voltage, V <sub>COIL</sub>	V <sub>DD</sub>		5.0	V	
H <sub>ON</sub> Input Voltage, V <sub>HON</sub> LOW: EL off HIGH: EL on	V <sub>DD</sub> – 0.5	0 V <sub>DD</sub>	V <sub>DD</sub> – 2 V <sub>DD</sub> + 0.25	V	V <sub>DD</sub> = 3.0V
H <sub>ON</sub> Current, EL On		25	60	μA	
Shutdown Current, I <sub>SD</sub> = I <sub>COIL</sub> + I <sub>DD</sub>		10	300	nA	V <sub>DD</sub> = 3.0V, H <sub>ON</sub> = 0V
<b>INDUCTOR DRIVE</b>					
Coil Frequency, f <sub>COIL</sub> = f <sub>LAMP</sub> × 32		9.6		kHz	
Peak Coil Current, I <sub>PK-COIL</sub>			60	mA	Guaranteed by design
<b>EL LAMP OUTPUT</b>					
EL Lamp Frequency, f <sub>LAMP</sub>	200	320	450	Hz	V <sub>DD</sub> = 3.0V
Peak to Peak Output Voltage	110	140		V <sub>pp</sub>	V <sub>DD</sub> = 3.0V

\*This data sheet specifies environmental parameters, final test conditions and limits as well suggested operating conditions.

**PIN DESCRIPTION**



Pin 1 – HON- Enable for driver operation, high = active; low = inactive.

Pin 2 – Vss- Power supply common, connect to ground.

Pin 3 – Coil- Coil input, connect coil from VDD to pin 3.

Pin 4 – Lamp- Lamp driver output 2, connect to EL lamp.

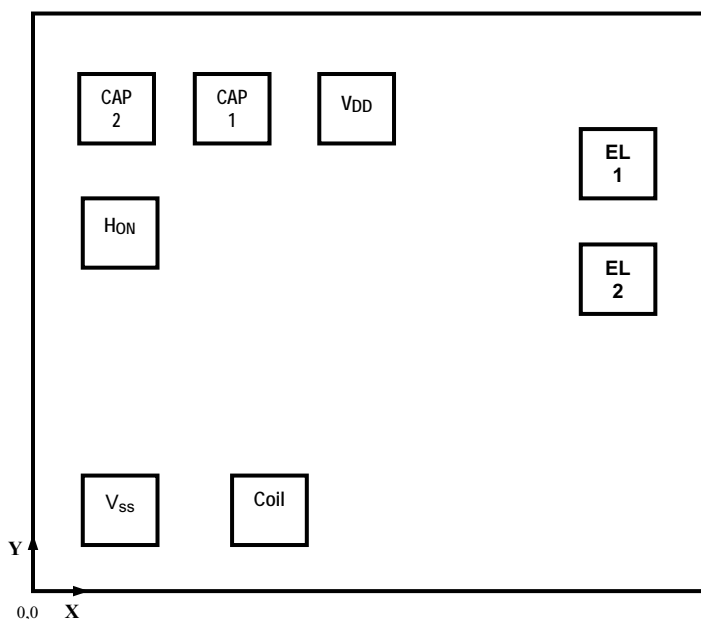
Pin 5 – Lamp- Lamp driver output 1, connect to EL lamp.

Pin 6 – VDD- Power supply for driver, connect to system VDD.

Pin 7 – Cap1- Capacitor input 1, connect to Cosc.

Pin 8 – Cap2- Capacitor input 2, connect to Cosc.

**BOUNDING DIAGRAM**

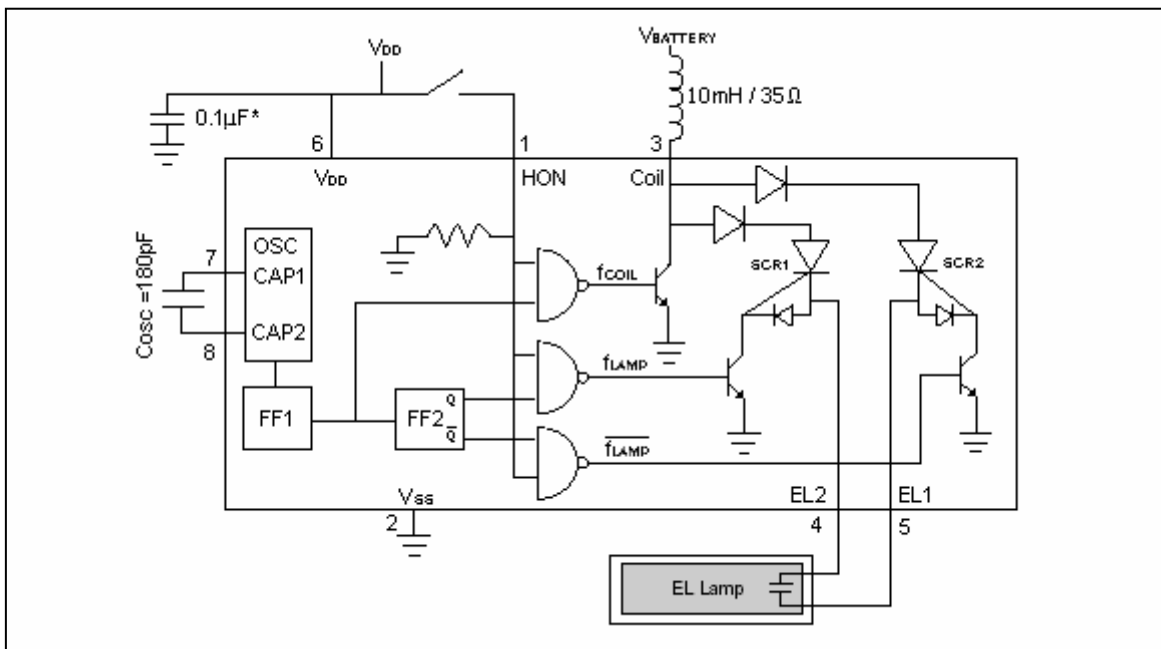


Pad Name	X(μm)	Y(μm)
VDD	765.5	1521.5
CAP1	341.5	1520.5
CAP2	44.5	1512.5
HON	62.5	978.5
Vss	67.5	181.5
COIL	548.5	181.5
EL2	1643.5	948.5
EL1	1643.5	1161.5

**NOTES:**

1. Dimensions are in Microns unless otherwise noted.
2. Bonding pads are 125x125 typical
3. Outside dimensions are maximum, including scribe area.
4. Die size 1.96 x 1.72mm.
5. Die thickness is 400±30 microns.
6. Substrate must be connect to Vss.

## BLOCK DIAGRAM AND TYPICAL APPLICATION



SP4422A Schematic

## THEORY OF OPERATION

The **SP4422A** is made up of three basic circuit elements, an oscillator, coil, and switched H-bridge network. The oscillator provides the device with an on-chip clock source used to control the charge and discharge phases for the coil and lamp. An external capacitor connected between pins 7 and 8 allows the user to vary the oscillator frequency from 32kHz to 400kHz. In general, increasing the  $C_{osc}$  capacitor will increase the lamp output.

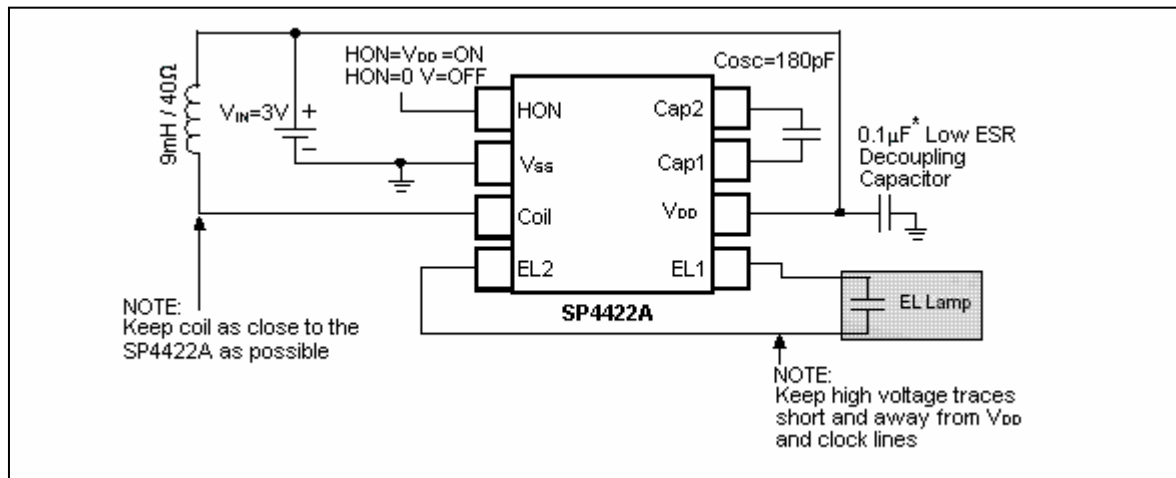
The suggested oscillator frequency is 64kHz. The oscillator output is internally divided to create two internal control signals,  $f_{COIL}$  and  $f_{LAMP}$ . The oscillator output is internally divided down by 8 flip flops, a 64kHz signal will be divided into 8 frequencies; 32kHz, 16kHz, 8kHz, 4kHz, 2kHz, 1kHz, 500Hz, and 250Hz. The 3rd flip flop output (8kHz) is used to drive the coil and the 8th flip flop output (250Hz) is used to drive the lamp. Although the oscillator frequency can be varied to optimize the lamp output, the ratio of  $f_{COIL}/f_{LAMP}$  will always equal 32.

The on-chip oscillator of the **SP4422A** can be overdriven with an external clock source by removing the  $C_{osc}$  capacitor and connecting a clock source to pin 8. The clock should have a 50% duty cycle and range from  $V_{DD}-1V$  to ground. An external clock signal may be desirable in order to synchronize any parasitic switching noise with the system clock. The maximum external clock frequency that can be supplied is 400kHz.

## Layout Considerations

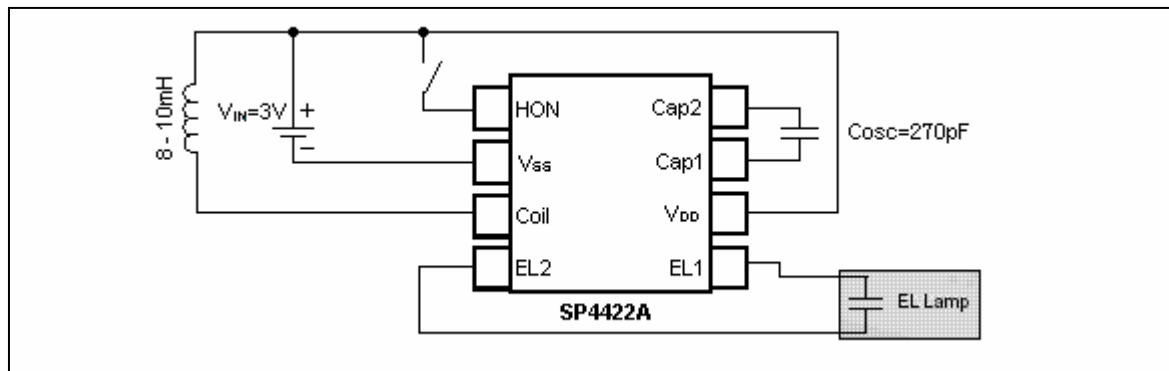
The **SP4422A** circuit board layout must observe careful analog precautions. For applications with noisy voltage power supplies a 0.1 $\mu$ F low ESR decoupling capacitor must be connected from  $V_{DD}$  to ground. Any high voltage traces should be isolated from any digital clock traces or enable lines. A solid ground plane connection is strongly recommended. All traces to the coil or to the high voltage outputs should be kept as short as possible to minimize capacitive coupling to digital clock lines and to reduce EMI emissions.

**TYPICAL APPLICATION CIRCUIT**

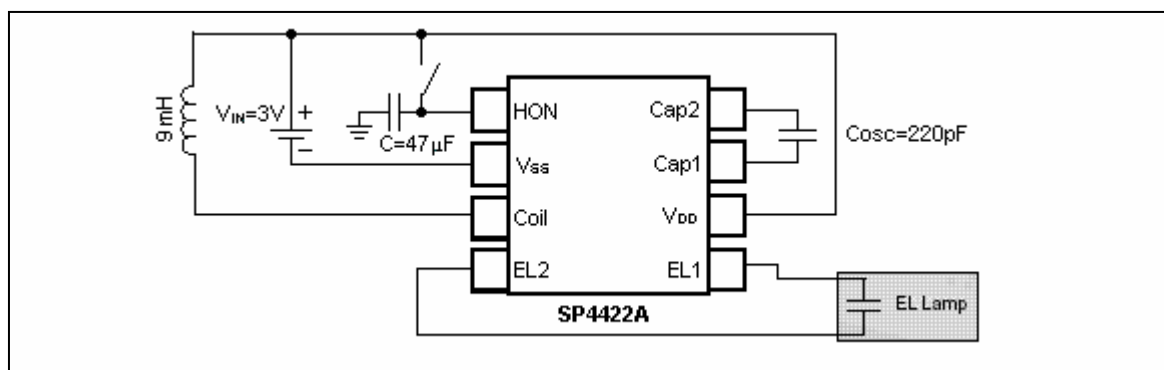


Typical SP4422A Application Circuit

**APPLICATION CIRCUIT – HOLD RELEASE**

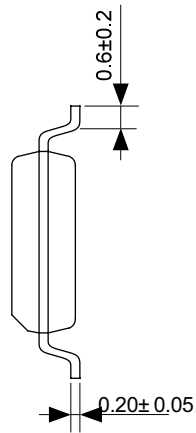
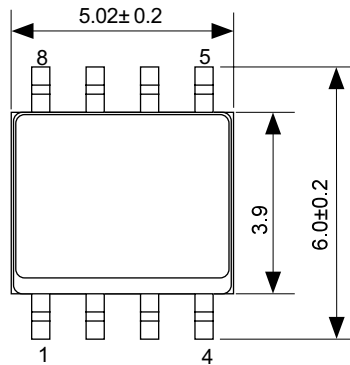


**APPLICATION CIRCUIT – HOLD DELAY**

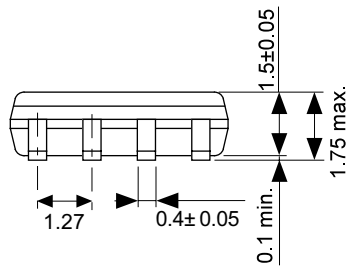


PACKAGE

8-Pin SOP



Unit: mm



8-Pin MSOP

