

## High Voltage EL Lamp Driver

### Ordering Information

Device	Input Voltage	Package Options		
		8-Lead SO	MSOP-8	Die
HV825	1.0 to 1.6V	HV825LG	HV825MG*	HV825X

\* Product supplied on 2500 piece carrier tape reels.

### Features

- Processed with HVC MOS<sup>®</sup> technology
- 1.0V to 1.6V operating supply voltage
- DC to AC conversion
- Output load of typically up to 6nF
- Adjustable output lamp frequency
- Adjustable converter frequency
- Enable function

### Applications

- Pagers
- Portable Transceiver
- Cellular phones
- Remote control units
- Calculators

### Absolute Maximum Ratings\*

Supply voltage, $V_{DD}$	-0.5V to +2.5V
Operating Temperature Range	-25°C to +85°C
Storage Temperature Range	-65°C to +150°C
MSOP-8 Power Dissipation	300mW
SO-8 Power Dissipation	400mW

**Note:**

\*All voltages are referenced to GND.

For detailed circuit and application information, please refer to application notes AN-H33 and AN-H34.

### General Description

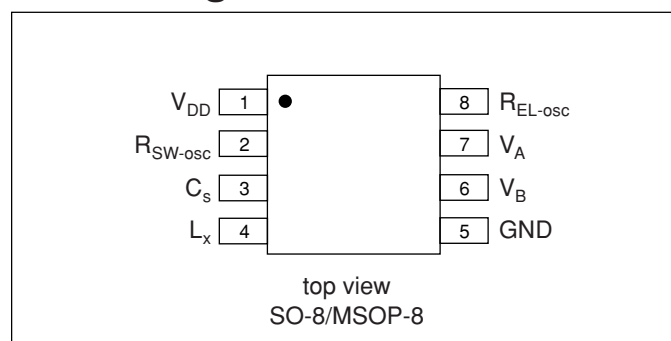
The Supertex HV825 is a high voltage driver designed for driving EL lamps typically up to 6nF. The input supply voltage range is from 1.0V to 1.6V. The device uses a single inductor and a minimum number of passive components. Typical output voltage that can be applied to the EL lamp is  $\pm 56V$ .

The HV825 can be enabled/disabled by connecting the  $R_{SW-osc}$  resistor to  $V_{DD}/ground$ .

The HV825 has two internal oscillators, a switching bipolar junction transistor (BJT), and a high voltage EL lamp driver. The frequency for the switching BJT is set by an external resistor connected between the  $R_{SW-osc}$  pin and the supply pin  $V_{DD}$ . The EL lamp driver frequency is set by an external resistor connected between  $R_{EL-osc}$  pin and the  $V_{DD}$  pin. An external inductor is connected between the  $L_x$  and  $V_{DD}$  pins. A 0.01 to 0.1 $\mu F$ , 100V capacitor is connected between  $C_s$  and ground. The EL lamp is connected between  $V_A$  and  $V_B$ .

The switching BJT charges the external inductor and discharges it into the 0.01 to 0.1 $\mu F$ , 100V capacitor at  $C_s$ . The voltage at  $C_s$  will start to increase. The outputs  $V_A$  and  $V_B$  are configured as an H-bridge and are switching in opposite states to achieve a peak-to-peak voltage of two times the  $V_{CS}$  voltage across the EL lamp.

### Pin Configuration



## Electrical Characteristics

### DC Characteristics (Over recommended operating conditions unless otherwise specified, $T_A=25^{\circ}\text{C}$ )

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$R_{DS(ON)}$	On-resistance of switching transistor			15	$\Omega$	$I=50\text{mA}$
$I_{IN}$	$V_{DD}$ supply current (including inductor current)		30	38	mA	$V_{DD}=1.5\text{V}$ . See test circuit.
$I_{DDQ}$	Quiescent $V_{DD}$ supply current			1.0	$\mu\text{A}$	$R_{SW-osc}=\text{GND}$
$V_{CS}$	Output voltage on $V_{CS}$	52	56	62	V	$V_{DD}=1.5\text{V}$ . See test circuit.
$V_{A-B}$	Differential output voltage across lamp	104	112	124	V	$V_{DD}=1.5\text{V}$ . See test circuit.
$f_{EL}$	$V_{A-B}$ output drive frequency	400			Hz	$V_{DD}=1.5\text{V}$ . See test circuit.
$f_{SW}$	Switching transistor frequency		30		KHz	$V_{DD}=1.5\text{V}$ . See test circuit.
D	Switching transistor duty cycle		88		%	

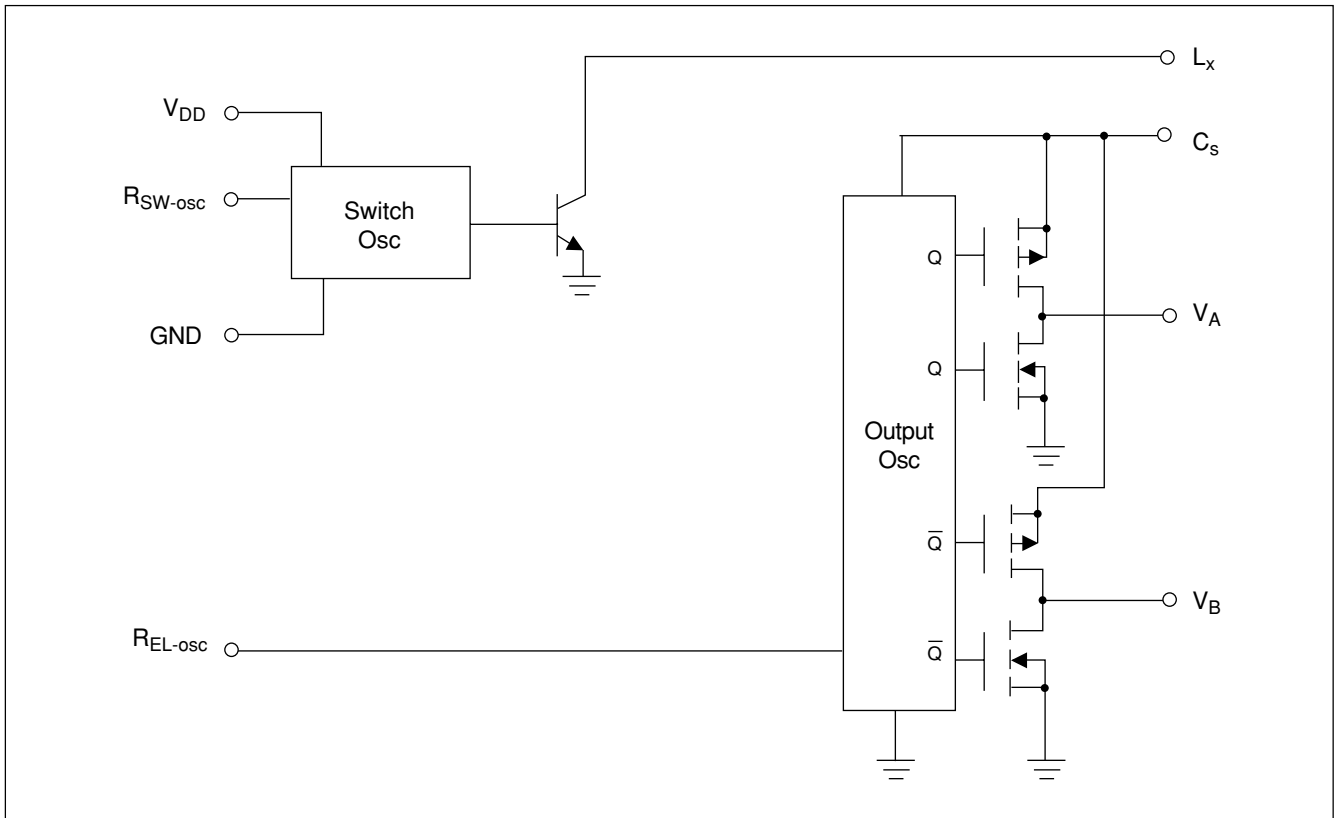
## Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$V_{DD}$	Supply voltage	1.0		1.6	V	
$C_L$	Load Capacitance	0	6.0		nF	
$T_A$	Operating temperature	-25		+85	$^{\circ}\text{C}$	

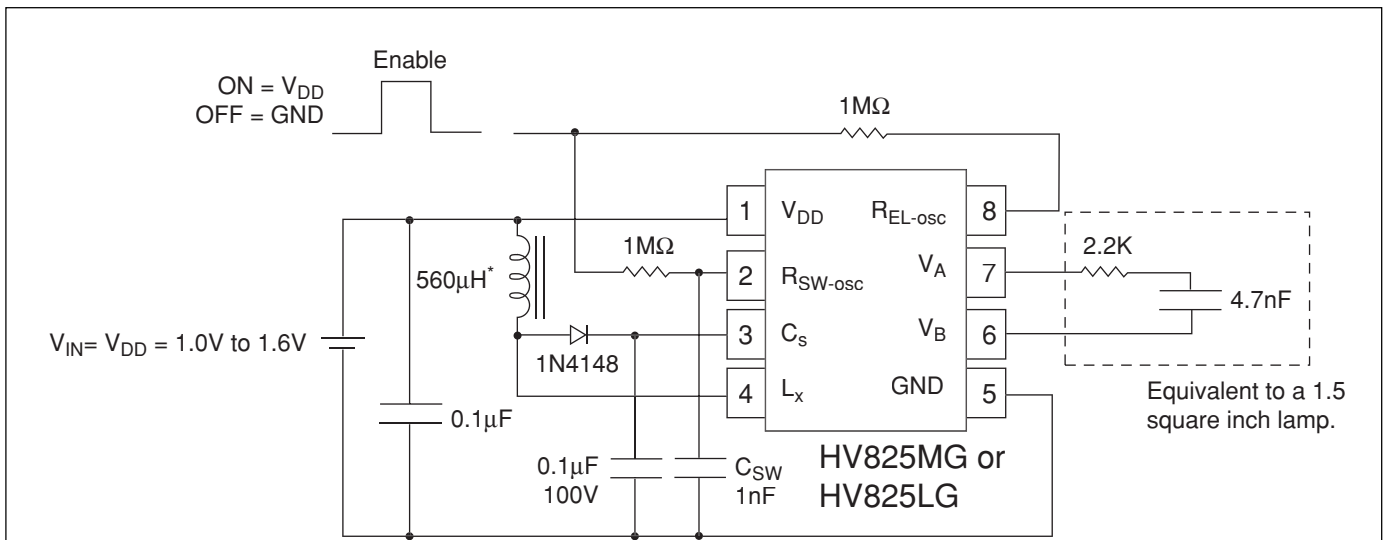
## Enable/Disable Table

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$V_{IL}$	Low level input voltage to $R_{SW-osc}$ resistor	0		0.2	V	$V_{DD}=1.0\text{V}-1.6\text{V}$ .
$V_{IH}$	High level input voltage to $R_{SW-osc}$ resistor	$V_{DD}-0.5$		$V_{DD}$	V	$V_{DD}=1.0\text{V}-1.6\text{V}$ .

# Block Diagram



# Test Circuit



\*560µH Murata inductor (LQH4N561K04), max DC resistance of 14.5Ω.

### Typical Performance

Lamp Size	V <sub>DD</sub>	I <sub>DD</sub>	V <sub>CS</sub>	f <sub>EL</sub>	Brightness
1.5 in <sup>2</sup>	1.5v	30mA	56v	450Hz	3.65ft-lm

## External Component Description

External Component	Selection Guide Line
Diode	Fast reverse recovery, 1N4148 or equivalent.
$C_S$ Capacitor	0.01 to 0.1 $\mu$ F, 100V capacitor to GND is used to store the energy transferred from the inductor.
$R_{EL-osc}$ Resistor	<p>The lamp frequency is controlled via the <math>R_{EL-osc}</math>. The lamp frequency increases as the <math>R_{EL-osc}</math> decreases. As the lamp frequency increases, the amount of current drawn from the battery will increase and the output voltage <math>V_{CS}</math> will decrease. This is because the lamp will draw more current from <math>V_{CS}</math> when driven at higher frequencies.</p> <p>In general, as the lamp size increases, larger <math>R_{EL-osc}</math> is recommended to provide higher <math>V_{CS}</math>. However, the color of the lamp is dependent upon its frequency and the shade of the color will change slightly with different frequencies.</p>
$R_{SW-osc}$ Resistor	The switching frequency of the inductor is controlled via the $R_{SW-osc}$ . The switching frequency increases as the $R_{SW-osc}$ decreases. As the switching frequency increases, the amount of current drawn from the battery will decrease and the output voltage $V_{CS}$ will also decrease.
$L_x$ Inductor	<p>The inductor <math>L_x</math> is used to boost up the low input voltage. When the internal switch is on, the inductor is being charged. When the internal switch is off, the charge in the inductor will be transferred to the high voltage capacitor <math>C_S</math>. The energy stored in the capacitor is connected to the internal H-bridge and therefore to the lamp. In general smaller value inductors, which can handle more current, are more suitable to drive larger size lamps. As the inductor value decreases, the switching frequency of the inductor (controlled by <math>R_{SW-osc}</math>) should be increased to avoid saturation.</p> <p>The test circuit uses a Murata (LQH4N561) 560<math>\mu</math>H inductor. Using different inductor values or inductors from different manufacturers will affect the performance.</p> <p>As the inductor value decreases, smaller <math>R_{SW-osc}</math> value shall be used. This will prevent inductor saturation. Inductor with the same inductance value (560<math>\mu</math>H) but lower series resistance will charge faster. The <math>R_{SW-osc}</math> resistor value needs to be decreased to prevent inductor saturation and high current consumption.</p>
$C_{SW}$ Capacitor	A 1nF capacitor is recommended from $R_{SW-OSC}$ to GND. This capacitor is used to shunt any switching noise that may couple into the $R_{SW-OSC}$ pin.