

## Low Noise Dual EL Lamp Driver

### Features

- ▶ Low audible noise
- ▶ Independent input control for lamp selection
- ▶ 160V<sub>PP</sub> output voltage
- ▶ Split supply capability
- ▶ Patented output timing
- ▶ One miniature inductor to power both lamps
- ▶ Low shutdown current
- ▶ Wide input voltage range 2.0V to 5.8V
- ▶ Output voltage regulation
- ▶ No SCR output
- ▶ Available in MLP/DFN-10 package

### Applications

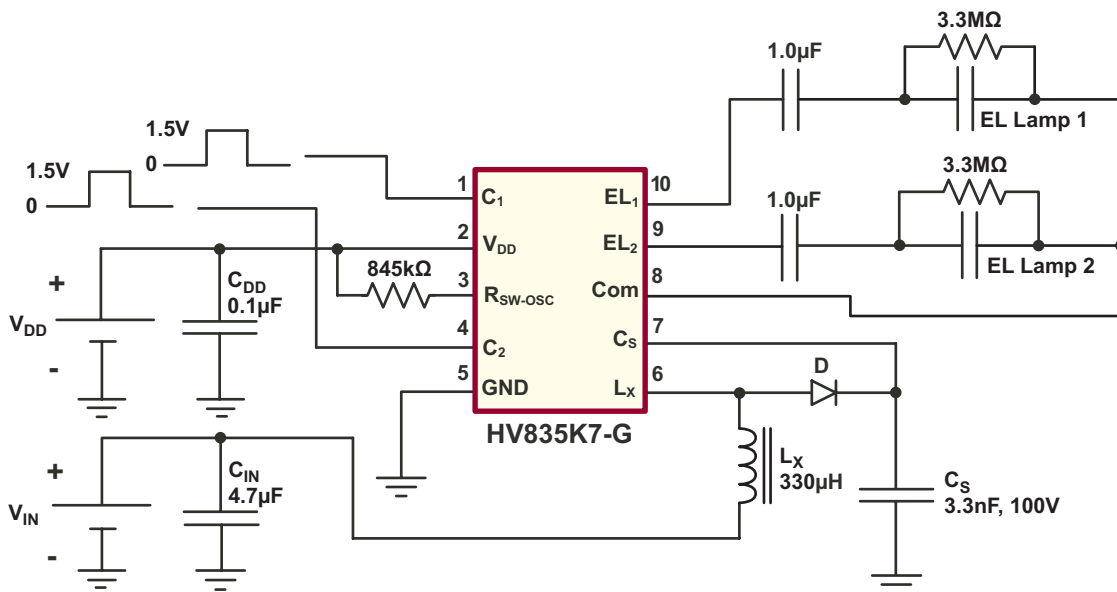
- ▶ Dual display cellular phones
- ▶ Keypad and LCD backlighting
- ▶ Portable instrumentation
- ▶ Dual segment lamps
- ▶ Handheld wireless communication devices

### General Description

The Supertex HV835 is a high voltage driver designed for driving two EL lamps with a combined area of 3.5 square inches. The input supply voltage range is from 2.0V to 5.8V. The device is designed to reduce the amount of audible noise emitted by the lamp. This device uses a single inductor and a minimum number of passive components to drive two EL lamps. The nominal regulated output voltage of  $\pm 80V$  is applied to the EL lamps. The two EL lamps can be turned ON and OFF by the two logic input control pins, C<sub>1</sub> and C<sub>2</sub>. The device is disabled when both C<sub>1</sub> and C<sub>2</sub> (pins 1 and 4) are at logic low.

The HV835 has an internal oscillator, a switching MOSFET, and two high voltage EL lamp drivers. Each driver has its own half bridge common output (COM1 and COM2) connected to a single pin called COM which minimizes the DC offset seen by the EL lamp. An external resistor connected between the R<sub>SW-OSC</sub> pin and the voltage supply pin, V<sub>DD</sub>, sets the frequency for the switching MOSFET. The EL lamp driver frequency is set by dividing the MOSFET switching frequency by 512. An external inductor is connected between the L<sub>x</sub> and the V<sub>DD</sub> pins. Depending on the EL lamp size, a 1.0 to 10.0nF, 100V capacitor is connected between C<sub>s</sub> and Ground. The switching MOSFET charges the external inductor and discharges it into the capacitor at C<sub>s</sub>. The voltage at C<sub>s</sub> increases. Once the voltage at C<sub>s</sub> reaches a nominal value of 80V, the switching MOSFET is turned OFF to conserve power.

### Typical Application Circuit



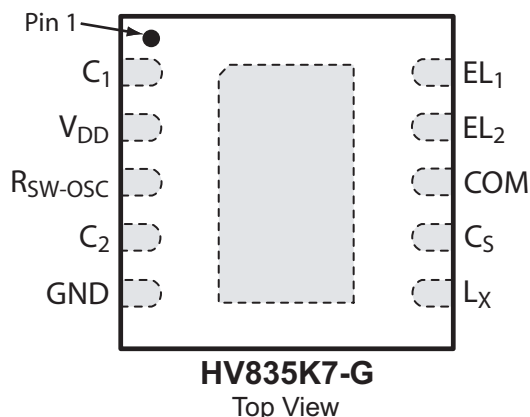
## Ordering Information

Device	Package Options
	MLP/DFN-10 (K7)
HV835	HV835K7-G

-G indicates package is RoHS compliant ('Green')



## Pin Configuration



Note: Pads are on the bottom of the package.  
Back-side heat slug is at ground potential.

## Absolute Maximum Ratings

Parameter	Value
Supply Voltage, $V_{DD}$	-0.5V to 7.5V
Output Voltage, $V_{CS}$	-0.5V to 120V
Operating Temperature Range	-40°C to 85°C
Storage temperature	-65°C to 150°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. Continuous operation of the device at the absolute rating level may affect device reliability. All voltages are referenced to device ground.

## Thermal Resistance

Package	$\theta_{ja}$
MLP/DFN-10	60°C/W

Note: Mounted on FR4 board, 25mm x 25mm x 1.57mm

## Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$V_{DD}$	Supply voltage	2.0	-	5.8	V	---
$T_A$	Operating temperature	-40	-	+85	°C	---

## Electrical Characteristics

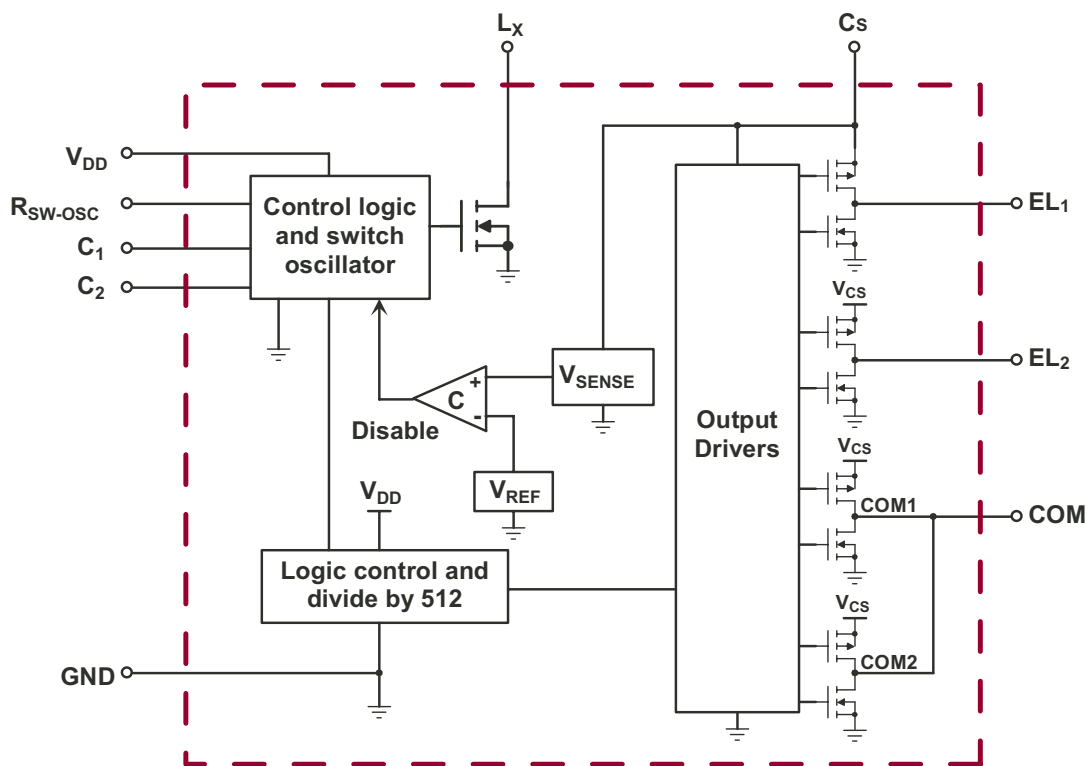
(Over recommended operating conditions unless otherwise specified:  $V_{IN} = V_{DD} = 3.3V$ ,  $T_A = 25^\circ C$ )

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$R_{DS(ON)}$	On-resistance of switching transistor	-	-	10	$\Omega$	$I = 100mA$
$V_{DD}$	Input voltage range	2.0	-	5.8	V	---
$V_{CS}$	Output regulation voltage	72	80	88	V	$V_{DD} = 2.0V$ to 5.8V
$V_{DIFF}$	Differential output peak to peak voltage (EL <sub>1</sub> to COM, EL <sub>2</sub> to COM)	144	160	176	V	$V_{DD} = 2.0V$ to 5.8V
$I_{DDQ}$	Quiescent $V_{DD}$ supply current	-	-	150	nA	$C_1 = C_2 = 0.1V$
		-	-	250	nA	$C_1 = C_2 = 0.3V$
$I_{DD}$	Input current into the $V_{DD}$ pin	-	-	200	$\mu A$	$V_{DD} = 5.8V$
$I_{IN}$	Average input current including inductor current when driving both lamps	-	16	25	mA	$V_{IN} = 5.5V$ (See Figure 1)
$V_{CS}$	Output voltage on $V_{CS}$ when driving both lamps	-	80	-	V	$V_{IN} = 5.5V$ (See Figure 1)

### Electrical Characteristics (cont.)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$V_{DIF}$	Differential output peak to peak voltage across each lamp (EL <sub>1</sub> to COM, EL <sub>2</sub> to COM)	-	160	-	V	$V_{IN} = 5.5V$ (See Figure 1)
$f_{EL}$	$V_{DIFF}$ output drive frequency	170	200	230	Hz	$R_{SW} = 845k\Omega$
$f_{SW}$	Switching transistor frequency	87	102	118	kHz	$R_{SW} = 845k\Omega$
$f_{SW\ temp}$	Switching transistor frequency tempco	-	15	-	%	$T_A = -40^\circ C$ to $+85^\circ C$
D	Switching transistor duty cycle	-	85	-	%	$T_A = -40^\circ C$ to $+85^\circ C$
$I_{IL}$	Input logic low current	-	-	1.0	$\mu A$	$V_{DD} = 2.0V$ to $5.8V$
$I_{IH}$	Input logic high current	-	-	1.0	$\mu A$	$V_{DD} = 2.0V$ to $5.8V$
$V_{IL}$	Logic input low voltage	0	-	0.3	V	---
$V_{IH}$	Logic input high voltage	1.5	-	$V_{DD}$	V	---

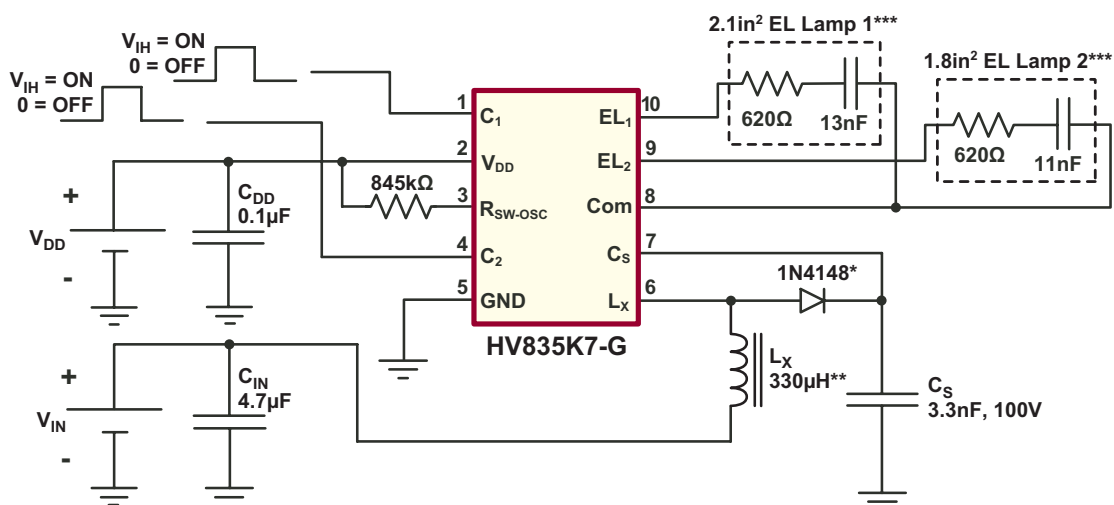
### Functional Block Diagram



### Function Table

Logic Inputs		Outputs			Device
C <sub>1</sub>	C <sub>2</sub>	EL <sub>1</sub>	EL <sub>2</sub>	COM	
0	0	Hi Z	Hi Z	Hi Z	OFF
0	1	Hi Z	ON	ON	ON
1	0	ON	Hi Z	ON	ON
1	1	ON	ON	ON	ON

## Figure 1 - Test Circuit



\* or any (equivalent or better) > 90V, fast recovery diode

\*\* Cooper LPO6610-334MLB

\*\*\* The bigger sized lamp should be tied to EL1 and the smaller sized lamp to EL2 (pins 10 and 9 respectively)

## Typical Performance

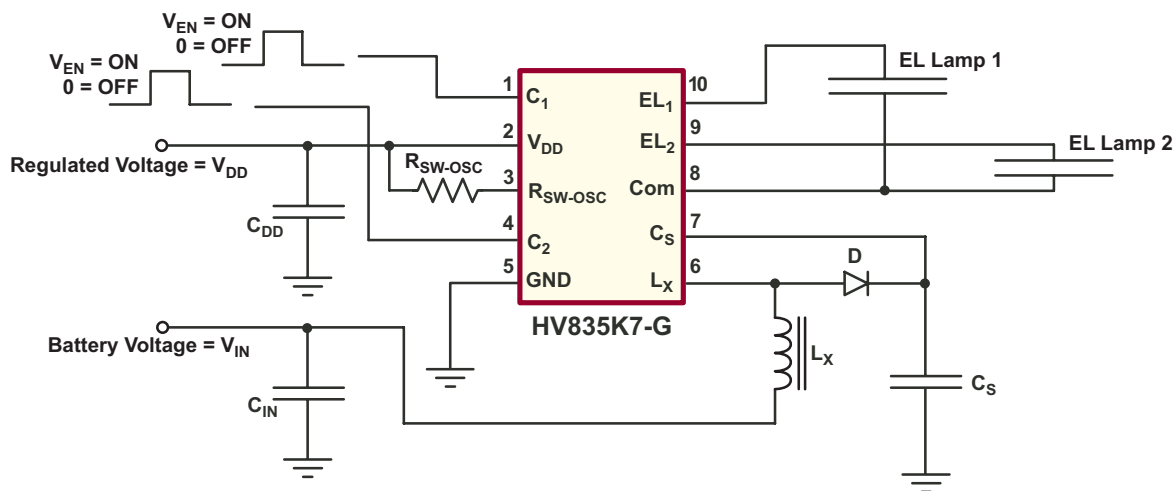
Lamp	V <sub>DD</sub>	V <sub>IN</sub>	I <sub>IN</sub>	V <sub>CS</sub>	f <sub>EL</sub>	Lamp Brightness	
						EL <sub>1</sub>	EL <sub>2</sub>
EL <sub>1</sub> ON	3.0V	5.2V	6.15mA	80V <sub>peak</sub>	200Hz	13.26 cd/m <sup>2</sup>	---
EL <sub>2</sub> ON			5.08mA			---	13.12 cd/m <sup>2</sup>
Both EL <sub>1</sub> and EL <sub>2</sub> ON			9.10mA			12.72 cd/m <sup>2</sup>	12.23 cd/m <sup>2</sup>
EL <sub>1</sub> ON		5.5V	5.7mA			13.34 cd/m <sup>2</sup>	---
EL <sub>2</sub> ON			4.76mA			---	13.24 cd/m <sup>2</sup>
Both EL <sub>1</sub> and EL <sub>2</sub> ON			8.52mA			12.84 cd/m <sup>2</sup>	12.43 cd/m <sup>2</sup>
EL <sub>1</sub> ON		5.8V	5.45mA			13.42 cd/m <sup>2</sup>	---
EL <sub>2</sub> ON			4.41mA			---	13.30 cd/m <sup>2</sup>
Both EL <sub>1</sub> and EL <sub>2</sub> ON			7.94mA			13.00 cd/m <sup>2</sup>	12.55 cd/m <sup>2</sup>

## Split Supply Configuration

The HV835 can be used in applications operating from a battery where a regulated voltage is available. This is shown in Figure 2. The regulated voltage can be used to drive the internal logic of HV835. The amount of current used to drive

the internal logic is less than 200 $\mu$ A. Therefore, the regulated voltage could easily provide the current without being loaded down.

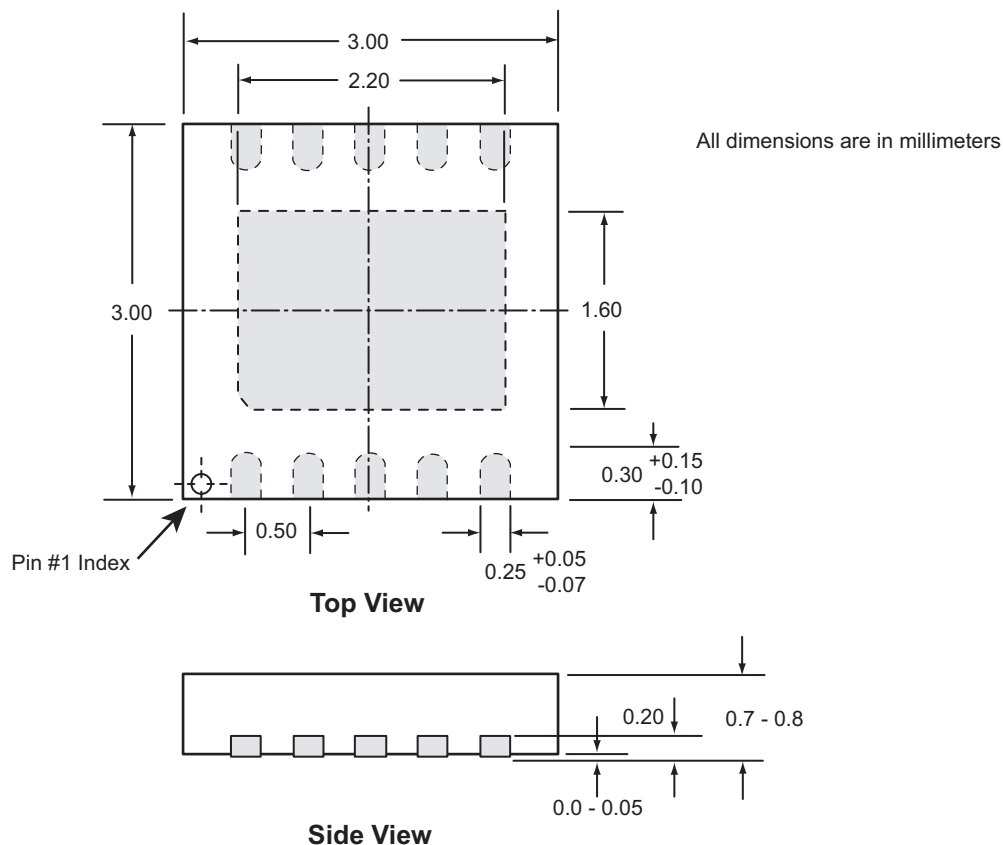
**Figure 2 - Split Supply Configuration**



## Pin Configuration and Description

Pin #	Function	Description
1	C <sub>1</sub>	Enable input signal for EL Lamp 1. Logic high will turn ON the EL lamp 1 and logic low will turn it OFF. Refer to the function table.
2	V <sub>DD</sub>	Input voltage supply pin.
3	R <sub>SW-OSC</sub>	External resistor connection to set both the switching MOSFET frequency and EL Lamp frequency. The external resistor should be connected between V <sub>DD</sub> and this pin. The EL lamp frequency is the switching frequency divided by 512. The switching frequency is inversely proportional to the resistor value. A 845k $\Omega$ resistor will provide a nominal switching frequency of 102kHz and an EL lamp frequency of 200Hz. To change the frequency to f <sub>EL1</sub> , the value of the resistor R <sub>SW-OSC1</sub> can be determined as R <sub>SW-OSC1</sub> = (845 x 200) / f <sub>EL1</sub> k $\Omega$ .
4	C <sub>2</sub>	Enable input signal for EL Lamp 2. Logic high will turn ON the EL lamp 2 and logic low will turn it OFF. Refer to the function table.
5	GND	Device ground.
6	L <sub>x</sub>	Drain of internal switching MOSFET. Connection for an external inductor. When the switching MOSFET is turned ON, the inductor is being charged. When the MOSFET is turned OFF, the energy stored in the inductor is transferred to the high voltage capacitor connected at the C <sub>s</sub> pin.
7	C <sub>s</sub>	Connect a 100V capacitor between this pin and GND. This capacitor stores the energy transferred from the inductor.
8	COM	Common lamp connection for both EL <sub>1</sub> and EL <sub>2</sub> . Connect one end of both the lamps to this pin.
9	EL <sub>2</sub>	EL lamp 2 connection. For optimum performance, the smaller of the two lamps should be connected to this pin.
10	EL <sub>1</sub>	EL lamp 1 connection. For optimum performance, the larger of the two lamps should be connected to this pin.

10-Lead DFN/MLP (3x3) Package (K7)



(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to <http://www.supertex.com/packaging.html>.)

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