

Low Noise Dual EL Lamp Driver

Features

- ▶ Low audible noise
- ▶ Independent input control for lamp selection
- ▶ 180V_{PP} 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 12-Lead QFN/MLP package

Applications

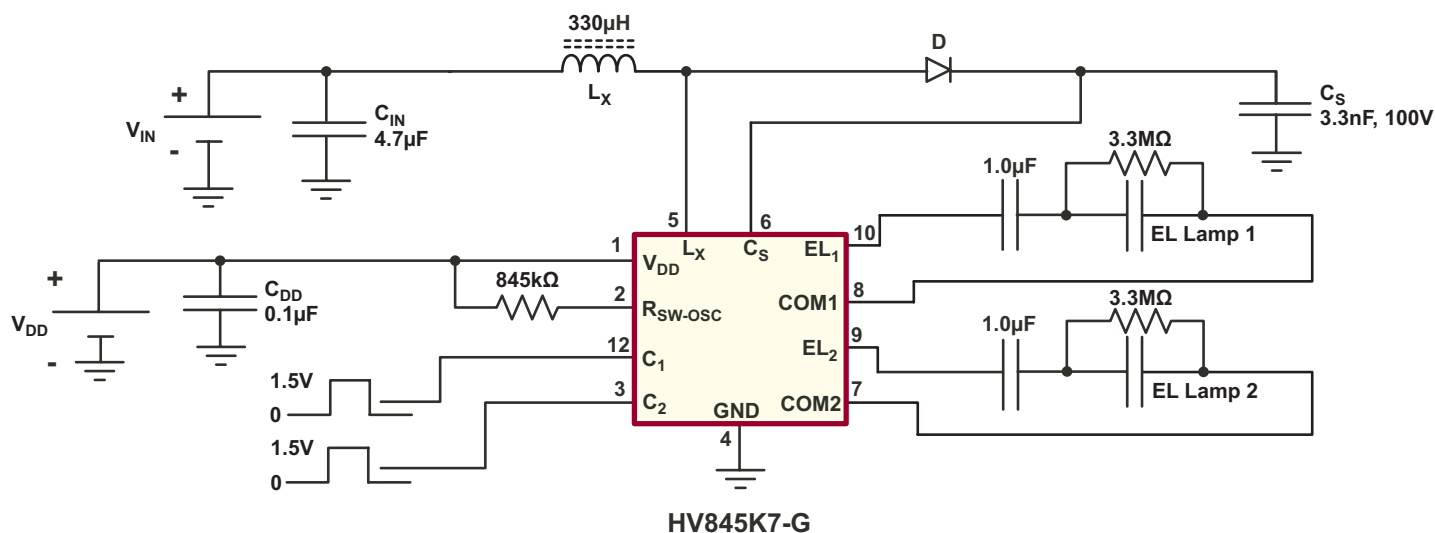
- ▶ Dual display cellular phones
- ▶ Keypad and LCD backlighting
- ▶ Portable instrumentation
- ▶ Dual segment lamps
- ▶ Hand held wireless communication devices

General Description

The Supertex HV845 is a low noise, 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 minimum number of passive components to drive two EL lamps. The nominal regulated output voltage of $\pm 90V$ is applied to the EL lamps. The two EL lamps can be turned ON and OFF by the two logic input control pins, C_1 and C_2 . The device is disabled when both C_1 and C_2 (pins 12 and 3) are at logic low.

The HV845 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, which significantly minimizes the DC offset seen by the EL lamp. An external resistor connected between the R_{SW-OSC} pin and the voltage supply pin, V_{DD} , 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_x and the V_{DD} pins. Depending on the EL lamp size, a 1.0 to 10.0nF, 100V capacitor is connected between C_s and Ground. The switching MOSFET charges the external inductor and discharges it into the capacitor at C_s . The voltage at C_s increases. Once the voltage at C_s reaches a nominal value of 90V, the switching MOSFET is turned OFF to conserve power.

Typical Application Circuit



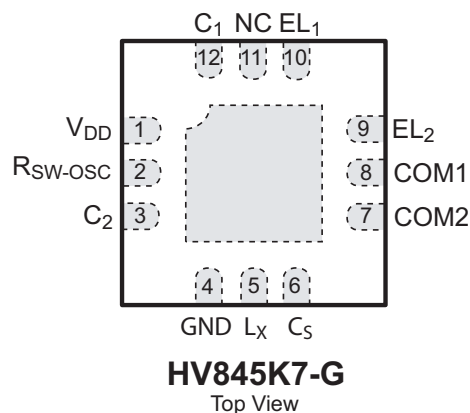
Ordering Information

Device	Package Options
	QFN/MLP - 12
HV845	HV845K7-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	θ_{ja}
QFN/MLP - 12	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

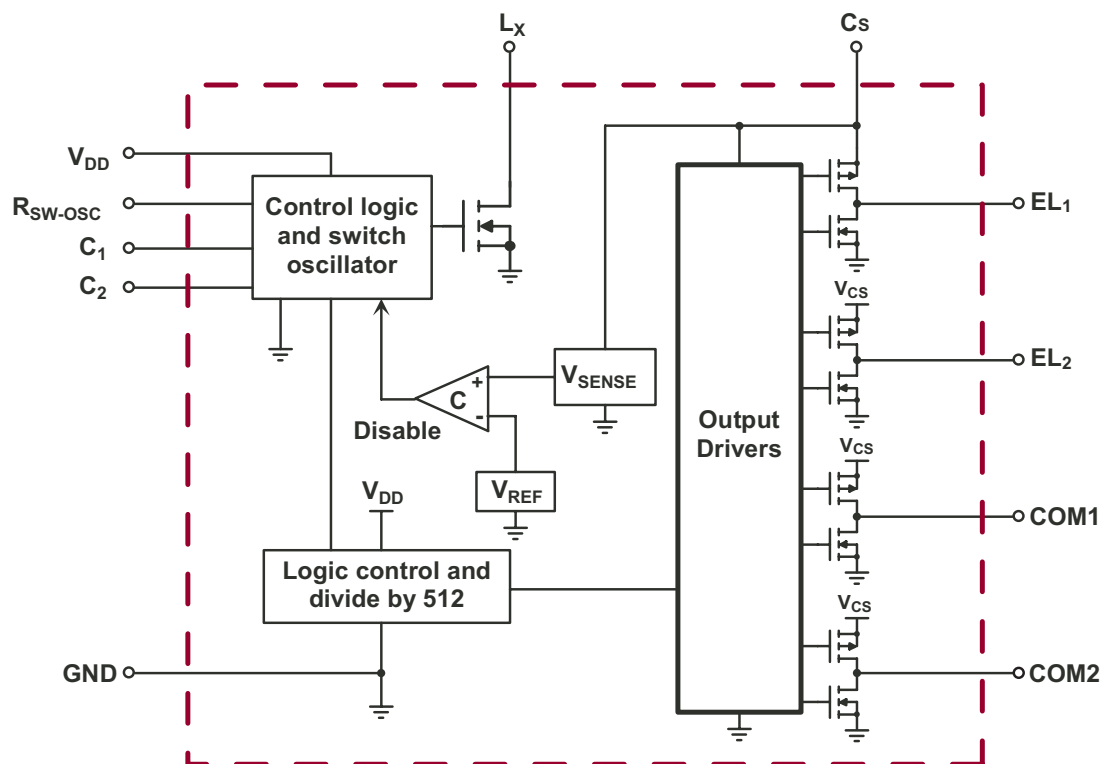
(Over recommended operating conditions unless otherwise specified - $V_{IN} = V_{DD} = 3.3V$, $T_A = 25^\circ C$)

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$R_{DS(ON)}$	On-resistance of switching transistor	-	-	10	Ω	$I = 100mA$
V_{DD}	Input voltage range	2.0	-	5.8	V	---
V_{CS}	Output regulation voltage	80	90	100	V	$V_{DD} = 2.0V$ to 5.8V
V_{DIFF}	Differential output peak to peak voltage (EL ₁ to COM1, EL ₂ to COM2)	160	180	200	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	-	-	250	μA	$V_{DD} = 5.8V$
I_{IN}	Average input current including inductor current when driving both lamps	-	20	30	mA	$V_{IN} = 5.5V$ (See Figure 1)
V_{CS}	Output voltage on V_{CS} when driving both lamps	-	87	-	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 ₁ to COM1, EL ₂ to COM2)	160	180	200	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	μA	$V_{DD} = 2.0V$ to $5.8V$
I_{IH}	Input logic high current	-	-	1.0	μA	$V_{DD} = 2.0V$ to $5.8V$
V_{IL}	Logic input low voltage	0	-	0.3	V	---
V_{IH}	Logic input high voltage	1.5	-	V_{DD}	V	---

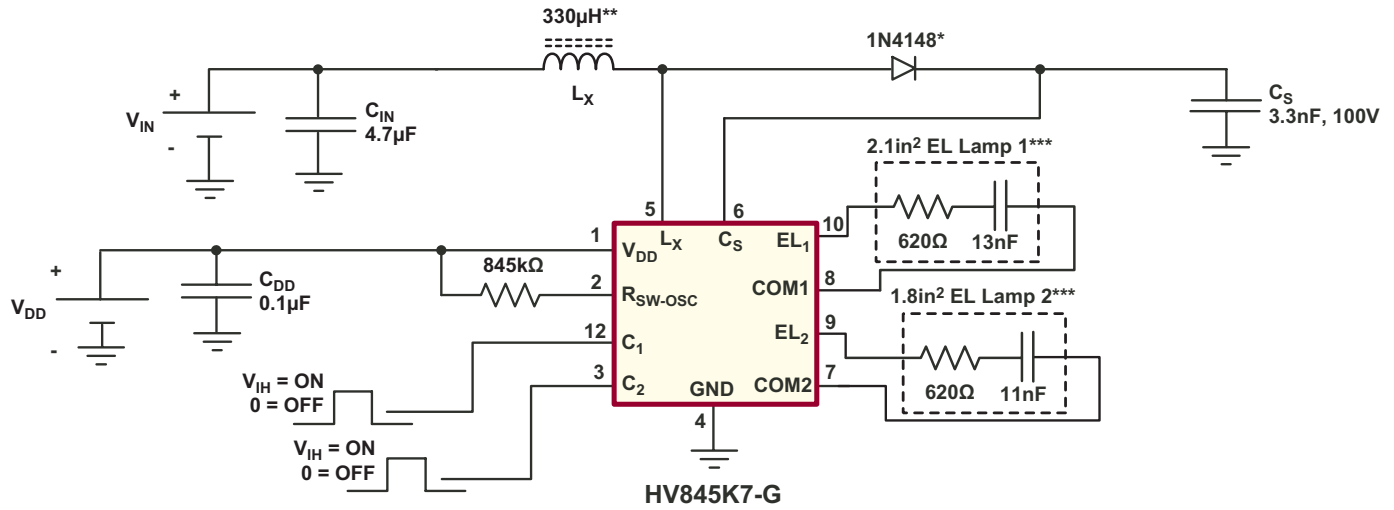
Functional Block Diagram



Function Table

Logic Inputs		Outputs				Device
C_1	C_2	EL ₁	EL ₂	COM1	COM2	
0	0	Hi Z	Hi Z	Hi Z	Hi Z	OFF
0	1	Hi Z	ON	Hi Z	ON	ON
1	0	ON	Hi Z	ON	Hi Z	ON
1	1	ON	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

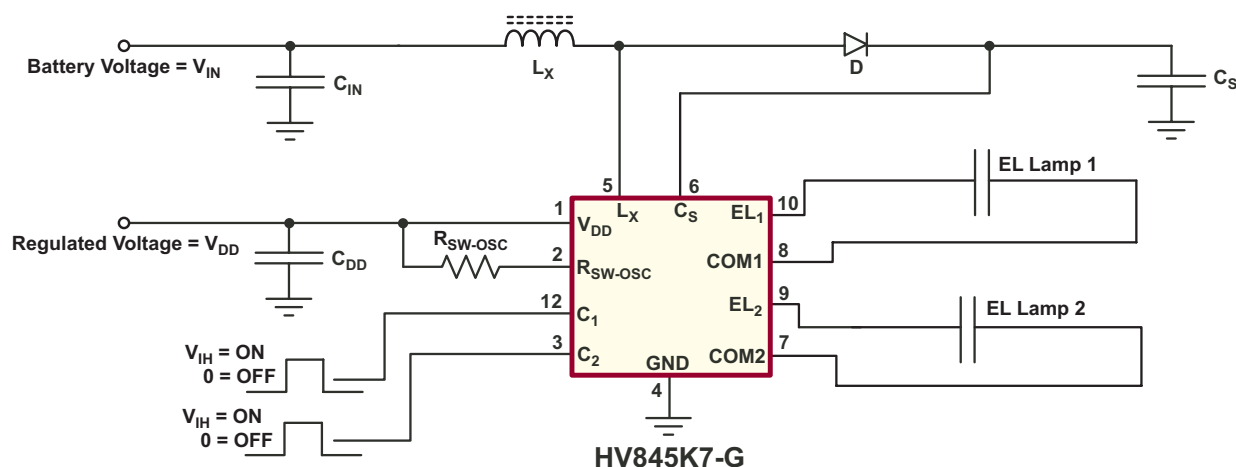
Lamp	V _{DD} (V)	V _{IN} (V)	I _{IN} (mA)	V _{CS} (V _{PEAK})	f _{EL} (Hz)	Lamp Brightness (cd/in ²)	
						EL ₁	EL ₂
EL ₁ ON	3.0V	5.2V	7.96	88	195	13.89	-
EL ₂ ON			6.91			-	12.89
Both EL ₁ and EL ₂ ON			13.93			13.02	11.24
EL ₁ ON		5.5V	7.47			13.93	-
EL ₂ ON			6.42			-	13.22
Both EL ₁ and EL ₂ ON			13.42			13.30	12.05
EL ₁ ON		5.8V	7.04			14.03	-
EL ₂ ON			6.01			-	13.30
Both EL ₁ and EL ₂ ON			12.94			13.55	12.51

Split Supply Configuration

The HV845 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 HV845. The amount of current used to drive

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

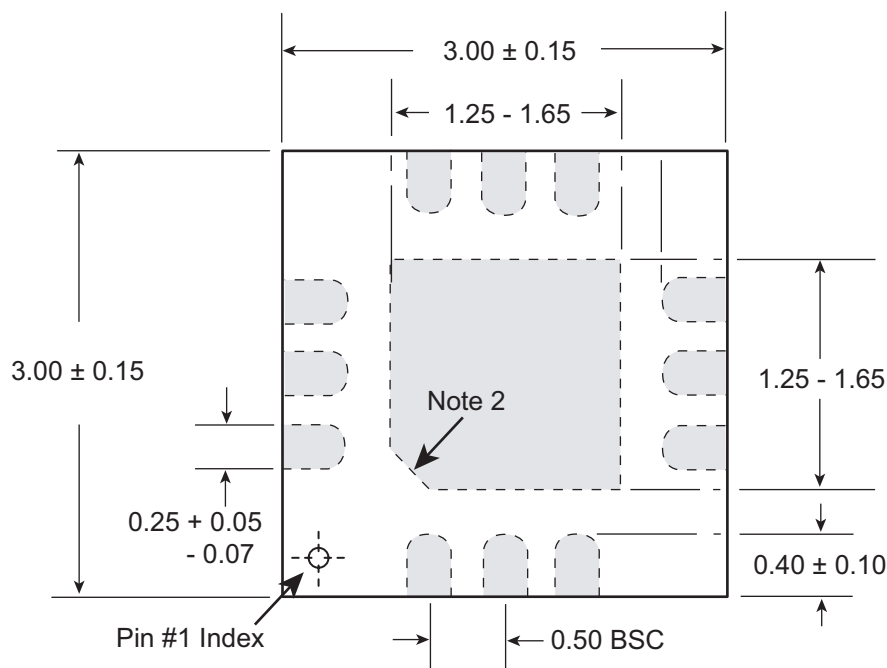
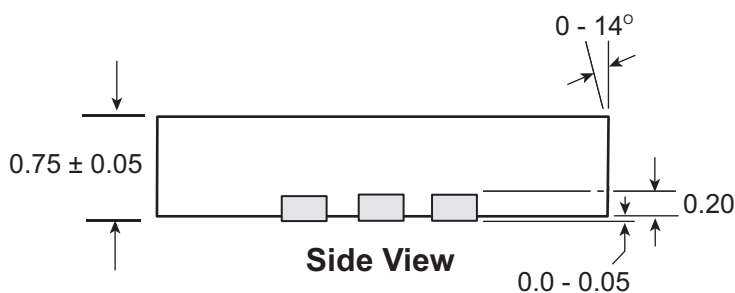
Figure 2 - Split Supply Configuration



Pin Configuration and Description

Pin #	Function	Description
1	V_{DD}	Input voltage supply pin.
2	R_{SW-OSC}	External resistor connection to set both the switching MOSFET frequency and EL Lamp frequency. The external resistor should be connected between V_{DD} 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 Ω resistor will provide a nominal switching frequency of 102kHz and an EL lamp frequency of 200Hz. To change the frequency to f_{EL1} , the value of the resistor $R_{SW-OSC1}$ can be determined as $R_{SW-OSC1} = (845 \times 200) / f_{EL1}$ k Ω .
3	C_2	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.
4	GND	Device ground.
5	L_X	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_S pin.
6	C_S	Connect a 100V capacitor between this pin and GND. This capacitor stores the energy transferred from the inductor.
7	COM2	Common lamp connection for EL_2 .
8	COM1	Common lamp connection for EL_1 .
9	EL_2	EL lamp 2 connection. For optimum performance, the smaller of the two lamps should be connected to this pin.
10	EL_1	EL lamp 1 connection. For optimum performance, the larger of the two lamps should be connected to this pin.
11	NC	No connect.
12	C_1	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.

12-Lead QFN/MLP (3x3) Package (K7)



Note:

1. All dimensions are in millimeters; all angles in degrees
2. Corner shape may differ from drawing

(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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