# Off-Line, High Voltage EL Lamp Driver

#### **Features**

- Processed with HVCMOS® technology
- Input voltage up to 200V DC
- 400V peak-to-peak output voltage
- Output load up to 350nF (100in² for 3.5nF/in² lamp)
- Adjustable output lamp frequency
- Adjustable on/off pulsing frequency

## **Applications**

- ▶ Electronic organizers
- Handheld portable computers
- Display signs
- Portable instrumentation equipment

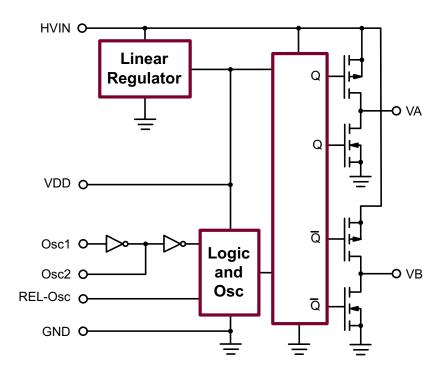
### **General Description**

The Supertex HV809 is an off-line, high voltage, EL lamp driver integrated circuit designed for driving EL lamps of up to 350nF at 400Hz. The input supply voltage can be a rectified nominal 120V AC source or any other DC source up to 200V. The HV809 will supply the EL lamp with an AC square wave with a peak-to-peak voltage of two times the input DC voltage.

The HV809 has two internal oscillators, a low voltage output linear regulator, and a high voltage output H-bridge. The high voltage output H-bridge frequency is set by an external resistor connected between the REL-Osc and GND pins. The EL lamp is connected between pins VA and VB. For the HV809 in the 8-pin package, an external RC network can be connected between the oscillator's Osc1 and Osc2 pins to pulse the EL lamp on and off.

For detailed circuit and application information please refer to Application Note AN-H36.

# **Block Diagram**



# **Ordering Information**

	Package Options										
Device	7-Lead TO-220	8-Lead SOIC 4.90x3.90mm body 1.75mm height (max) 1.27mm pitch	8-Lead SOIC w/ Heat Slug 4.90x3.90mm body 1.70mm height (max) 1.27mm pitch								
HV809	HV809K2-G	HV809LG-G	HV809SG-G								





## **Absolute Maximum Ratings**

Parameter	Value
HV <sub>IN</sub> , High voltage input	+210V
V <sub>DD</sub> , Internal supply voltage	+15V
Operating temperature range	-25°C to +85°C
Storage temperature range	-55°C to +150°C
Power dissipation:	
8-Lead SOIC	500mW
8-Lead SOIC w/ Heat Slug	1.5 Watts
7-Lead TO-220*	15Watts

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.

# **Product Marking**



L = Lot Number
YY = Year Sealed
WW = Week Sealed
\_\_\_\_\_ = "Green" Packaging

Package may or may not include the following marks: Si or

7-Lead TO-220 (K2)

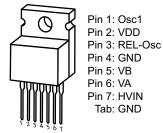


Y = Last Digit of Year Sealed WW = Week Sealed L = Lot Number \_\_\_\_\_ = "Green" Packaging

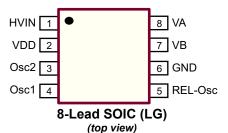
Package may or may not include the following marks: Si or 🌎

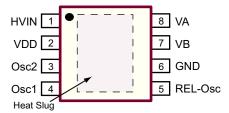
8-Lead SOIC (LG & SG)

# **Pin Configuration**



7-Lead TO-220 (K2) (front view)





8-Lead SOIC w/ Heat Slug (SG) (top view) (Heat slug is at ground potential)

# **Recommended Operating Conditions**

			_			O and lititions			
Sym	Parameter	Min	Тур	Max	Units	Conditions			
$HV_{IN}$	High voltage input	50	-	200	V				
C	Load capacitance	-	-	350	nF	$R_{EL} = 1.0M\Omega$ , $HV_{IN} = 170V$			
$C_{\scriptscriptstyleL}$	Load capacitance	-	-	150	nF	$R_{EL} = 390k\Omega, HV_{IN} = 170V$			
$T_{A}$	Operating temperature	-25	-	85	°C				

<sup>-</sup>G indicates package is RoHS compliant ('Green')

<sup>\*</sup> With external heat sink mounted, refer to App Note AN-H36.

### **Electrical Characteristics**

**DC Characteristics** (Over recommended operating conditions unless otherwise specified -  $T_A$  = 25°C)

Sym	Parameter	Min	Тур	Max	Units	Conditions
	High voltage outply ourrent	-	-	70	mA	$HV_{IN} = 170V, R_{EL} = 1.0M\Omega, C_{L} = 350nF$
I <sub>IN</sub>	High voltage supply current	-	-	9.0	mA	$HV_{\parallel} = 170V, R_{EL} = 1.0M\Omega, C_{L} = 50nF$
	Ouisseent summly surrent	-	-	400	μA	$HV_{IN} = 170V$ , $R_{EL} = 1.0M\Omega$ , Osc1 = GND, No Load
I <sub>INQ</sub>	Quiescent supply current	-	-	100	μA	$HV_{IN} = 170V, R_{EL} = 1.0M\Omega,$ Osc1 = $V_{DD}$ , No Load
ISINK	Osc2 sink current*	-	300	-	μA	V <sub>Osc2</sub> = 1.0V
SOURCE	Osc2 source current*	-	100	-	μA	$V_{Osc2} = V_{DD} -1.0V$
l <sub>Osc1</sub>	Osc1 logic input leakage current	-	±10	-	μA	$V_{Osc1}$ = GND and $V_{DD}$
V <sub>Osc1(hyst)</sub>	Osc1 hysteresis voltage	-	2.5	-	V	
V <sub>A-B</sub>	Min differential output voltage across lamp	-	-	400	V	HV <sub>IN</sub> = 200V
V <sub>DD</sub>	Internal supply voltage	8.0	10	12	V	No load on V <sub>DD</sub>
I <sub>DD (OUT)</sub>	Output V <sub>DD</sub> current	4.0	-	-	mA	For HV809K2, $\Delta V_{DD} = 1.0V$

<sup>\*</sup>  $I_{\rm SINK}$  and  $I_{\rm SOURCE}$  are not valid for the TO-220 package.

# **AC Characteristics** (Over recommended operating conditions unless otherwise specified - $T_A$ = 25°C)

Sym	Parameter	Min	Тур	Max	Units	Conditions
£	V sutput drive frequency	320	400	480	Hz	$R_{EL} = 1.0M\Omega$ , Osc1 = GND, $C_L = 350$ nF
f <sub>EL</sub>	V <sub>A-B</sub> output drive frequency	0.8	1.0	1.2	kHz	$R_{EL} = 390k\Omega$ , Osc1 = GND, $C_L = 150nF$
t <sub>r</sub>	Output rise time	-	180	250	μs	C <sub>L</sub> = 150nF, HV <sub>IN</sub> = 170V
t <sub>f</sub>	Output fall time	-	50	100	μs	C <sub>L</sub> = 150nF, HV <sub>IN</sub> = 170V

# **Function Table**

Input	Outputs						
Osc1	VA	VB					
GND	Enabled	Enabled					
VDD	Disabled	Disabled					

Figure 1. AC Off-Line EL Lamp

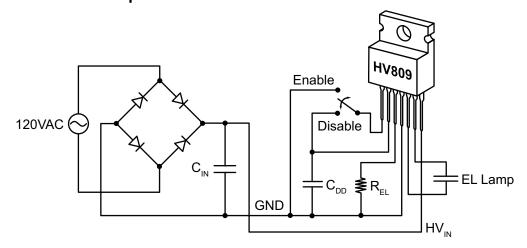


Figure 2. Pulsing EL Lamp

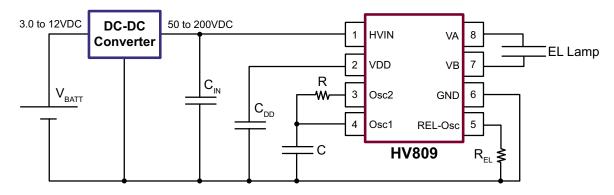
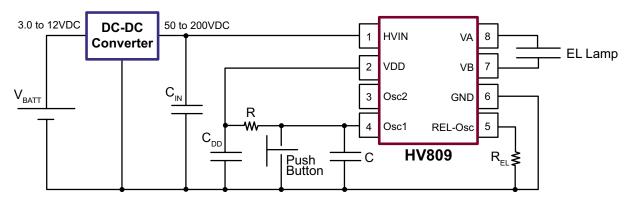
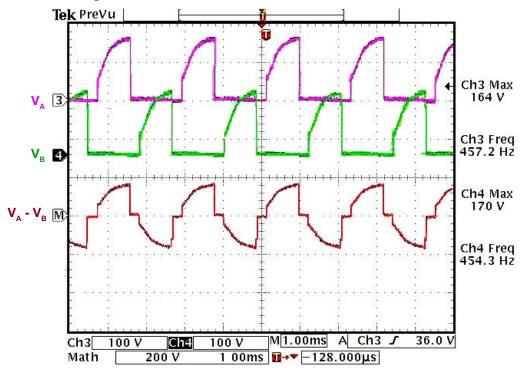


Figure 3. Push-Button, Delayed Turn Off



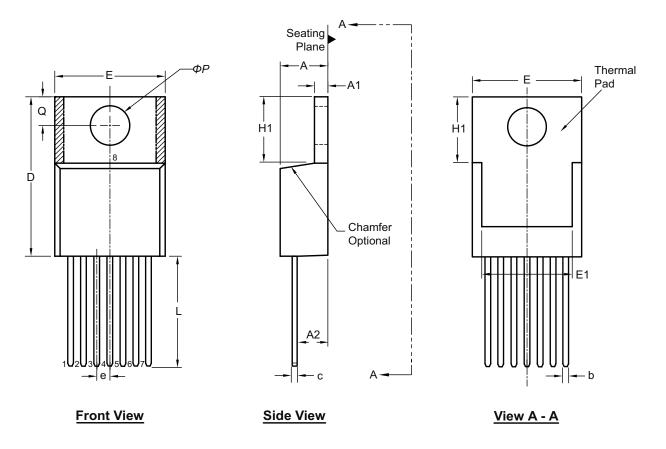
# Typical Waveform on $V_A$ , $V_B$ , and Differential Waveform $V_A$ - $V_B$ (HV<sub>IN</sub> = 170V, $R_{EL}$ = 1.0M $\Omega$ , and $C_L$ = 350nF)



## **Function Table**

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Pin Name	Description
Osc1	The Output H-bridge can be enabled and disabled by connecting the Osc1 pin to the GND and VDD pins. The output can be left enabled by connecting the Osc1 pin to GND.
Osc2	The RC network can be connected between the oscillator's Osc1 and Osc2 pins to pulse the EL lamp on and off.
VDD	Internal supply voltage.
REL-Osc	EL lamp frequency is controlled via an external $R_{\text{EL}}$ resistor connected between the REL-Osc and GND pins of the device.
VB	VB side of the EL lamp driver H-bridge. Connection for one of the EL lamp terminals.
VA	VA side of the EL lamp driver H-bridge. Connection for one of the EL lamp terminals.
HVIN	High voltage input supply pin.
GND	Ground pin.
REL-Osc  VB  VA  HVIN	EL lamp frequency is controlled via an external R <sub>EL</sub> resistor connected between the REL-Osc and G pins of the device.  VB side of the EL lamp driver H-bridge. Connection for one of the EL lamp terminals.  VA side of the EL lamp driver H-bridge. Connection for one of the EL lamp terminals.  High voltage input supply pin.

# 7-Lead TO-220 Package Outline (K2)



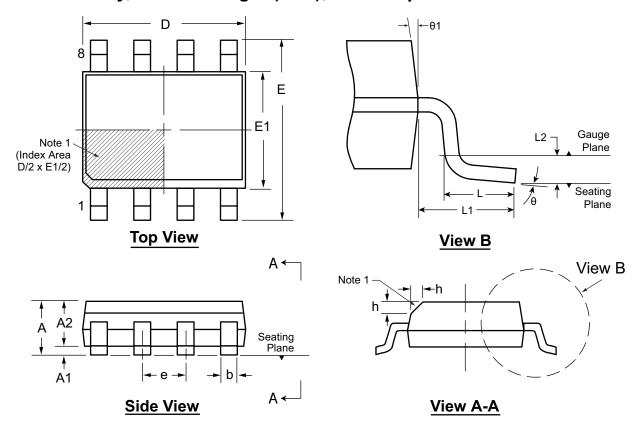
Symbol		Α	A1	A2	b	С	D	E	E1	е	H1	L	Q	ФР
Dimension (inches)	MIN	.160	.045	.090	.023	.015	.560	.385		.045	.234	.540	.103	.146
	NOM	-	-	-	-	-	-	-	.300 REF	-	-	-	-	-
	MAX	.190	.055	.115	.037	.022	.590	.415		.055	.258	.560	.113	.156

Drawings not to scale.

Supertex Doc. #: DSPD-7TO220K2, Version NR090308.

# 8-Lead SOIC (Narrow Body) Package Outline (LG)

4.90x3.90mm body, 1.75mm height (max), 1.27mm pitch



#### Note:

This chamfer feature is optional. A Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.

Symbo		Α	A1	A2	b	D	E	E1	е	h	L	L1	L2	θ	θ1
Dimension (mm)	MIN	1.35*	0.10	1.25	0.31	4.80*	5.80*	3.80*		0.25	0.40			<b>0</b> °	5°
	NOM	-	-	-	ı	4.90	6.00	3.90	1.27 BSC -	-	-	1.04 REF	0.25 BSC	-	-
()	MAX	1.75	0.25	1.65*	0.51	5.00*	6.20*	4.00*		0.50	1.27	<del>-</del> -		<b>8</b> °	15°

JEDEC Registration MS-012, Variation AA, Issue E, Sept. 2005.

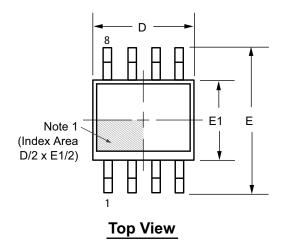
\* This dimension is not specified in the JEDEC drawing.

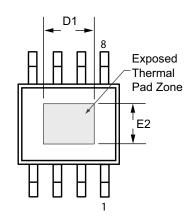
Drawings are not to scale.

Supertex Doc. #: DSPD-8SOLGTG, Version 1041309.

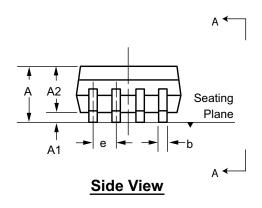
# 8-Lead SOIC (Narrow Body w/Heat Slug) Package Outline (SG)

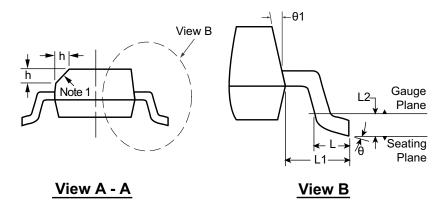
4.90x3.90mm body, 1.70mm height (max), 1.27mm pitch





**Bottom View** 





#### Note:

1. If optional chamfer feature is not present, a Pin 1 identifier must be located in the index area indicated. The Pin 1 identifier can be: a molded mark/identifier; an embedded metal marker; or a printed indicator.

Symbo	ol	Α	A1	A2	b	D	D1	Ε	E1	E2	е	h	L	L1	L2	θ	θ1
	MIN	1.25*	0.00	1.25	0.31	4.80*	3.30 <sup>†</sup>	5.80*	3.80*	2.29 <sup>†</sup>		0.25	0.40			<b>0</b> °	5°
Dimension (mm)	NOM	-	-	-	-	4.90	-	6.00	3.90	-	1.27 BSC	-	-	1.04 REF	0.25 BSC	-	-
(11111)	MAX	1.70	0.15	1.55*	0.51	5.00*	3.81 <sup>†</sup>	6.20*	4.00*	2.79 <sup>†</sup>	200	0.50	1.27		3	<b>8</b> º	15°

JEDEC Registration MS-012, Variation BA, Issue E, Sept. 2005.

Drawings not to scale.

Supertex Doc. #: DSPD-8SOSG, Version D041009.

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

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<sup>\*</sup> This dimension is not specified in the JEDEC drawing.

<sup>†</sup> This dimension differs from the JEDEC drawing.