Initial Release

High Voltage Dual EL Lamp Driver

Features

- Independent input control for lamp selection
- 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 small packages (10-lead MSOP and 10-lead DFN/MLP)

Applications

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

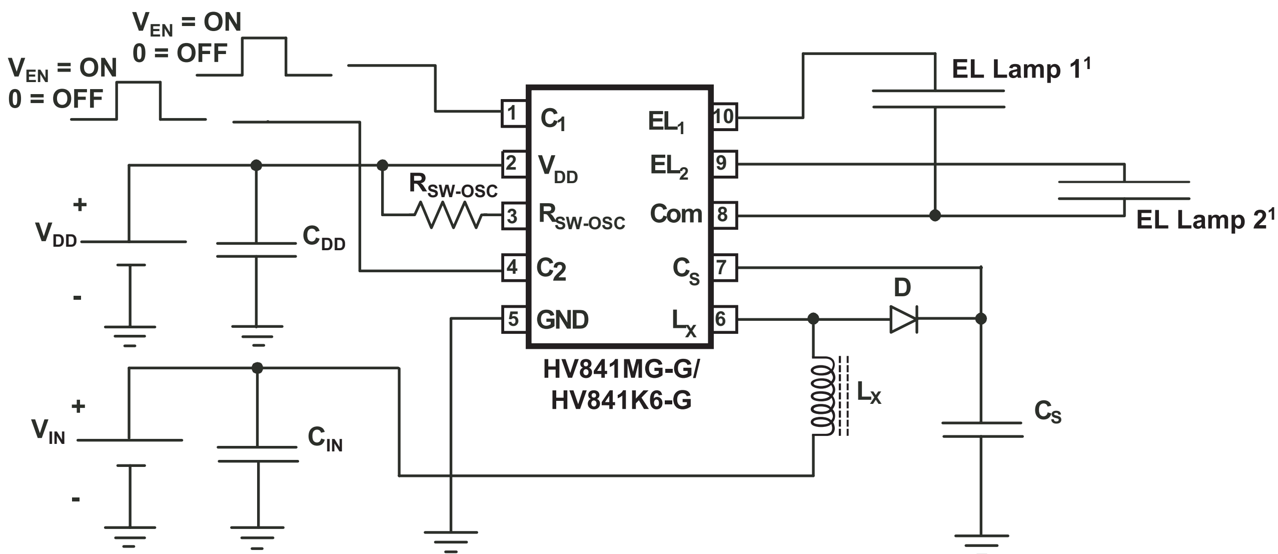
General Description

The Supertex HV841 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 minimum number of passive components to drive two EL lamps. The nominal regulated output voltage of ±100V is applied to the EL lamps. The chip can be enabled/ disabled by connecting C_1 and C_2 (pins 1 and 4) to V_{EN}/ Ground.

The HV841 has an internal oscillator, a switching MOSFET, and two high voltage EL lamp drivers. An external resistor connected between the R_{SW-OSC} 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 128. 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, 200V capacitor is connected between C_S and Ground. The two EL lamps are connected between EL_1 to Com and EL_2 to Com.

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 100V, the switching MOSFET is turned off to conserve power. The outputs EL_1 to Com and EL_2 to Com are configured as H bridges and switch in opposite states to achieve 200V across the EL lamp.

Typical Application Circuit



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

NR033106

Ordering Information

DEVICE	Package Options	
	DFN/MLP-10[1]	MSOP-10[2]
HV841	HV841K6-G	HV841MG-G

1 Product supplied on 3000 piece carrier tape reels only
2 Product supplied on 2500 piece carrier tape reels only

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

Absolute Maximum Ratings*

Supply Voltage, V_{DD}	-0.5 to +7.5V
Supply Voltage, V_{CS}	-0.5 to +120V
Operating Ambient Temperature Range	-40°C to +85°C
Storage Temperature Range	-65° 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, Gnd*

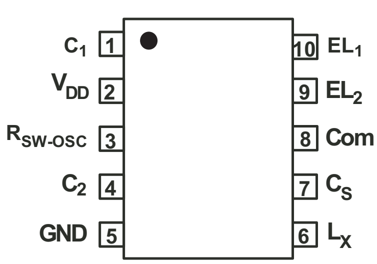
Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units	Conditions
V_{DD}	Supply Voltage	2.0		5.8	V	
T_A	Operating Temperature	-40		85	°C	

Function Table

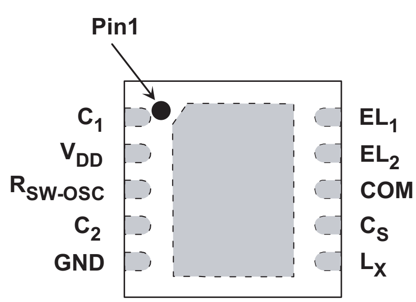
C_1	C_2	EL_1	EL_2	Com	IC
0	0	Hi Z	Hi Z	Hi Z	OFF
0	1	Hi Z	ON	ON	ON
1	0	ON	Hi Z	ON	ON
1	1	ON	ON	ON	ON

Pin Configuration



HV841MG-G

Top View: MSOP-10



HV841K6-G
(Pads are on the bottom of the package.)

Top View: DFN/MLP-10

Note: Packages are not drawn to scale.

Electrical Characteristics

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

Symbol	Parameter	Min	Typ	Max	Units	Conditions
$R_{DS(ON)}$	On-resistance of switching transistor	-	-	6.0	Ω	I = 100mA
V_{DD}	Input Voltage Range	2.0	-	5.8	V	---
V_{CS}	Output regulation voltage	90	100	110	V	V_{DD} = 2.0V to 5.8V
V_{DIFF}	Differential output peak to peak voltage (EL_1 to Com, EL_2 to Com)	180	200	220	V	V_{DD} = 2.0V to 5.8V
I_{DDQ}	Quiescent V_{DD} supply current	-	-	150	nA	C_1 = C_2 = 0 to 0.1V
		-	-	500	nA	C_1 = C_2 = 0.1 to 0.3V
I_{DD}	Input current into the V_{DD} pin	-		190	µA	V_{DD} = 2.0V to 5.8V
f_{EL}	V_{DIFF} output drive frequency	215	244	273	Hz	V_{IN} = 3.0V. See Figure 1.
f_{SW}	Switching transistor frequency	27.5	31.2	34.9	kHz	V_{IN} = 3.0V. See Figure 1.
D	Switching Transistor Duty cycle	85	-	89	%	---
I_{IL}	Input logic low current going into the control pin	-	-	-0.6	µA	V_{DD} = 2.0V to 5.8V
I_{IH}	Input logic low current going into the control pin	-	-	0.6	µA	V_{DD} = 2.0V to 5.8V
V_{EN-L}	Logic input low voltage	0	-	0.3	V	---
V_{EN-H}	Logic input high voltage	1.5	-	V_{DD}	V	---

Thermal Resistance

(Mounted on FR4 board, 25mm x 25mm x 1.57mm)

Package	θ_{JA}
MSOP-10	400 °C/W
DFN/MLP-10	60 °C/W

Functional Block Diagram

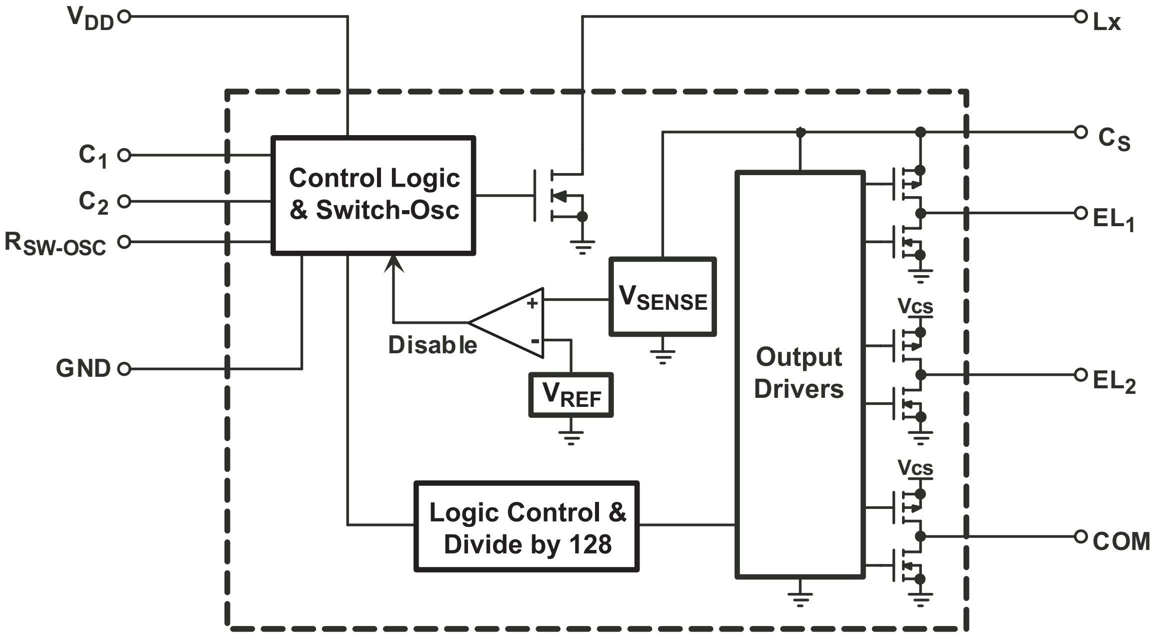
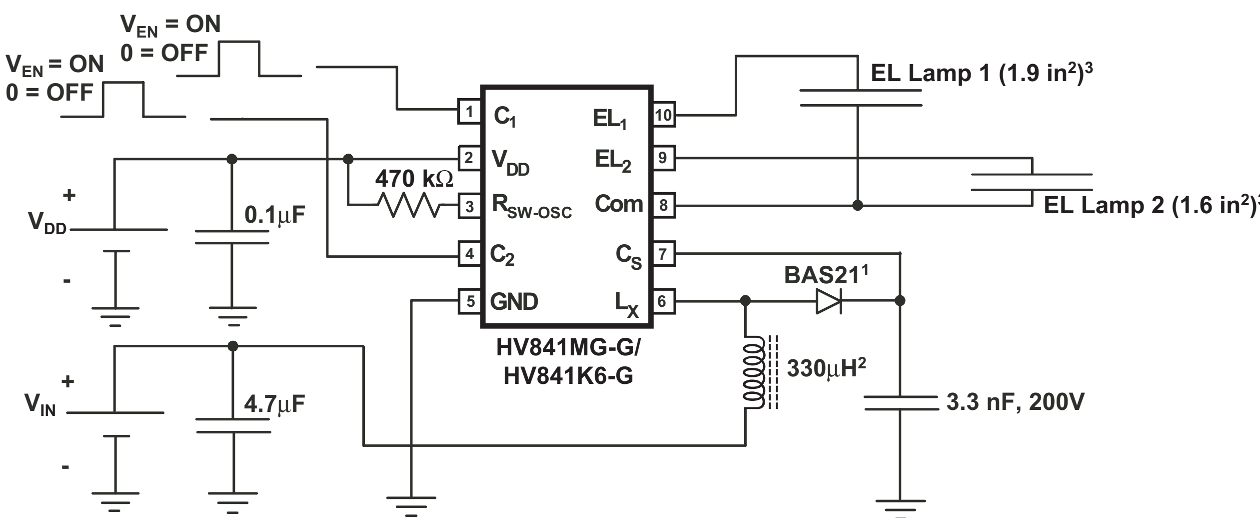


Figure 1: Test Circuit



1 or any (equivalent or better) > 120V, fast recovery diode
2 Murata LQH4CN331K04
3 The bigger sized lamp should be tied to EL1 and the smaller sized lamp to EL2 terminals (pins 10 and 9 respectively)

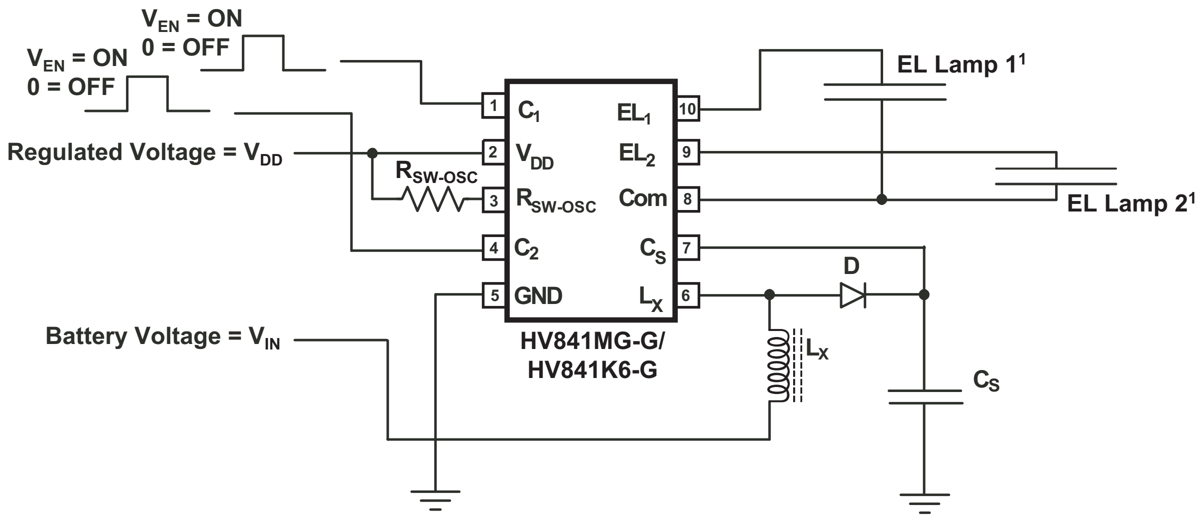
Pin Configuration and Description

Pin #	Name	Function
1	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.
2	V_{DD}	Input supply voltage pin.
3	$R_{SW\text{-}OSC}$	External resistor connection to set both the switching MOSFET frequency and EL Lamp frequency. The external resistor should be connected between this pin and the V_{DD} pin. The EL lamp frequency is switching frequency divided by 128. The switching frequency increases as the value of $R_{SW\text{-}OSC}$ decreases. A 470kΩ resistor will provide a switching frequency of 31.2 kHz, and an EL lamp frequency of 244 Hz. To change the frequency to f_{SW1}, the value of the resistor $R_{SW\text{-}OSC1}$ can be determined as $R_{SW\text{-}OSC1} = (470k \times 31.2k) / f_{SW1}$.
4	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.
5	GND	IC Ground Pin.
6	L_X	External inductor connection to boost the low input voltage using inductive flyback. Connect an inductor between V_{IN} and this pin. Also connect a high voltage fast recovery diode between this pin and the C_S pin. The anode of the diode needs to be connected to the L_X pin and the cathode to the C_S pin. In general, small valued inductors, which can handle more current, are more suitable for driving large sized lamps. As the inductor value decreases, the switching frequency should be increased to avoid saturation. 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.
7	C_S	Connect a 200V capacitor between this pin and GND. This capacitor stores the energy transferred from the inductor.
8	Com	Common connection for both EL lamps. Connect one end of both the lamps to this pin.
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.

Split Supply Configuration

The HV841 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 HV841. The amount of current used to drive the internal logic is less than 190µA. Therefore, the regulated voltage could easily provide the current without being loaded down.

Figure 2: Split Supply Configuration



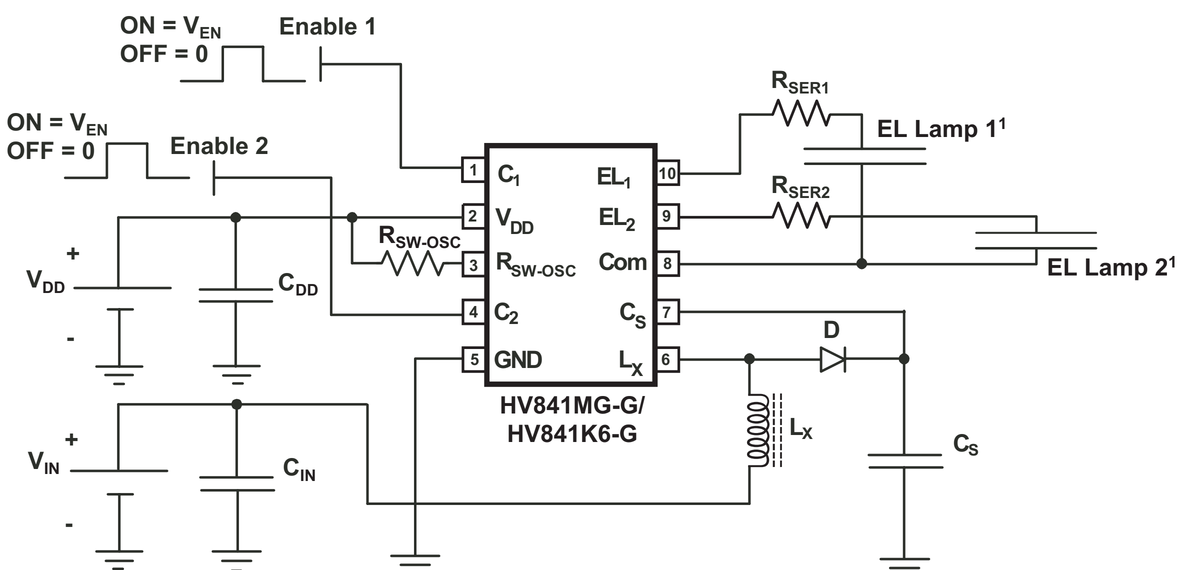
1 The bigger sized lamp should be tied to EL1 and the smaller sized lamp to EL2 terminals (pins 10 and 9 respectively)

Audible Noise Reduction

This section describes a method (patented) developed at Supertex to reduce the audible noise emitted by the EL lamps used in application sensitive to audible noise. The waveform takes the shape of approximately 2RC time constants for rising and 2RC time constants for falling, where C is the capacitance of the EL lamp, and R is the external resistor, R_{SER} connected in series with the EL lamp.

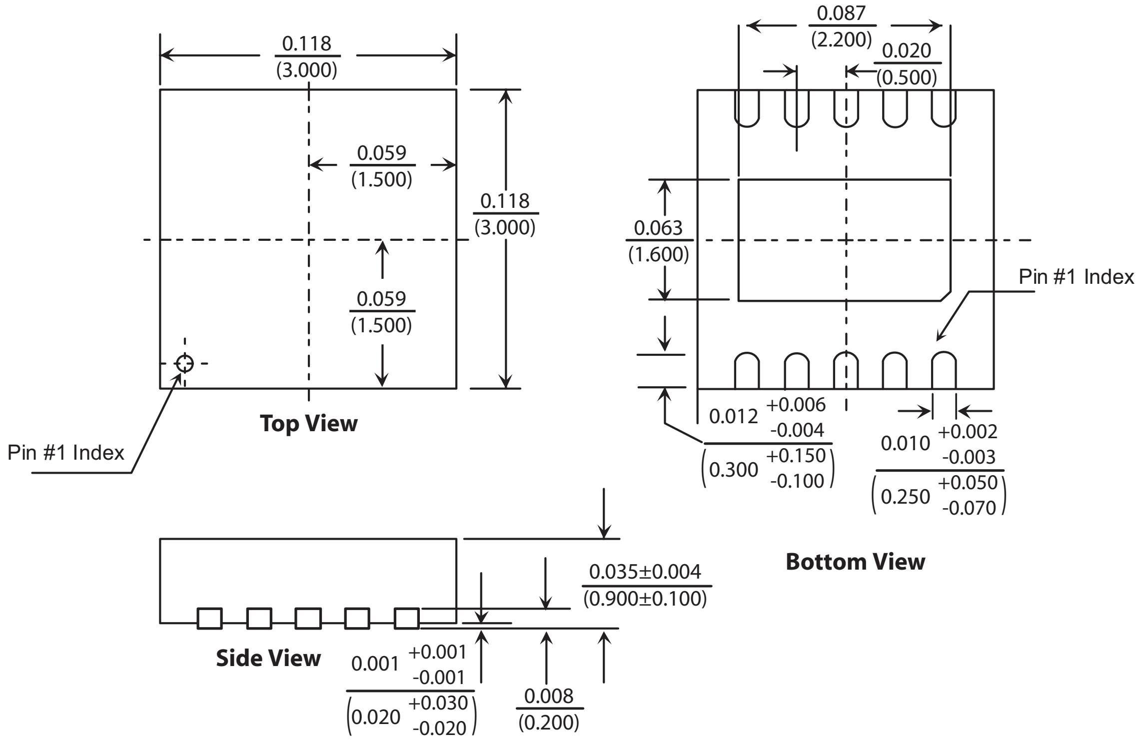
Figure 3 shows a general circuit schematic that uses the series resistors, R_{SER1} and R_{SER2}, for each of the EL lamps. R_{SER1} and R_{SER2} are connected in series with the EL lamp. The audible noise can be set a desirable level by selecting the resistances for R_{SER1} and R_{SER2}. It is important to note that addition of these external resistors will reduce the voltage across the EL lamp, and hence the brightness of the EL lamp.

Figure 3: Typical Application Circuit For Audible Noise Reduction

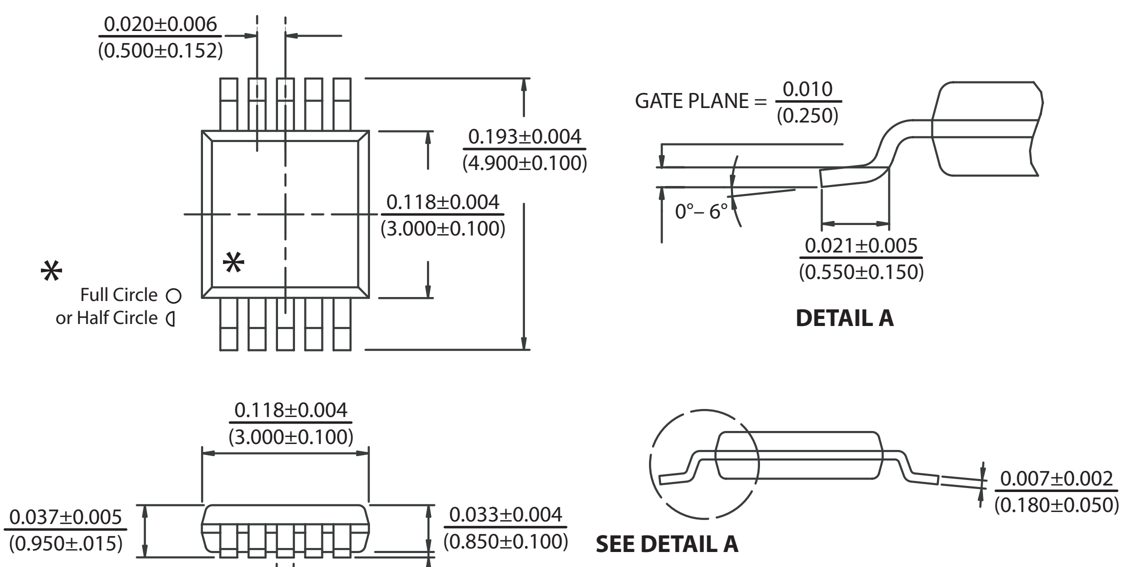


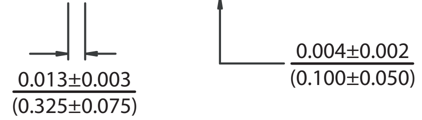
1 The bigger sized lamp should be tied to EL1 and the smaller sized lamp to EL2 terminals (pins 10 and 9 respectively)

10-Lead DFN/MLP Package Outline (K6)



10-Lead MSOP Package Outline (MG)





Notes:
1. Measurement Legend = Dimensions in Inches (Dimensions in Millimeters)
2. MLP Package dimensions conform to JEDEC MO-229

Supertex inc.
1235 Bordeaux Drive, Sunnyvale, CA 94089
TEL: (408) 222-8888 / FAX: (408) 222-4895
www.supertex.com