

<b>SB6540</b>	<b>P.1</b>
<b>LOW FREQUENCY EL DRIVER IC</b>	

## **GENERAL DESCRIPTION**

The SB6540 is specially designed as a low frequency low power Electroluminescent Lamp Driver IC. Built-in RC OSC, transistors and only requires 2~3 external components. It is specially designed for products of EMI concern.

## **FEATURE**

- \* BIPOLAR TECHNOLOGY
- \* OPERATING VOLTAGE :  
2.2V ~ 5.0V DC
- \* TOTAL SUPPLY CURRENT :  
20mA (at V<sub>dd</sub> = 3 V)
- \* LOW FREQUENCY 200 Hz
- \* Built-in RC OSC & TRANSISTORS

## **APPLICATIONS**

- \* CELLULAR PHONE LCD BACKLIGHT
- \* CORDLESS PHONE (DECT, 900MHz, 46/49MHz ..) LCD BACKLIGHT
- \* WATCH BACKLIGHT
- \* PAGER BACKLIGHT
- \* SMALL SIZE DISPLAY DATABACK BACKLIGHT
- \* OTHER PORTABLE PRODUCTS WITH SMALL SIZE LCD BACKLIGHT

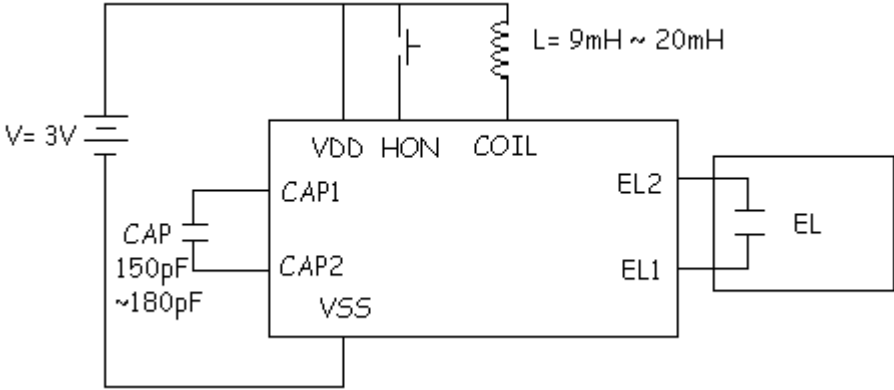
## **SPECIFICATION**

(T=25°C, V<sub>dd</sub>=3.0V, Lamp Capacitance=3000pF, Coil=12mH(R=24Ω), C<sub>OSC</sub>=282pF)

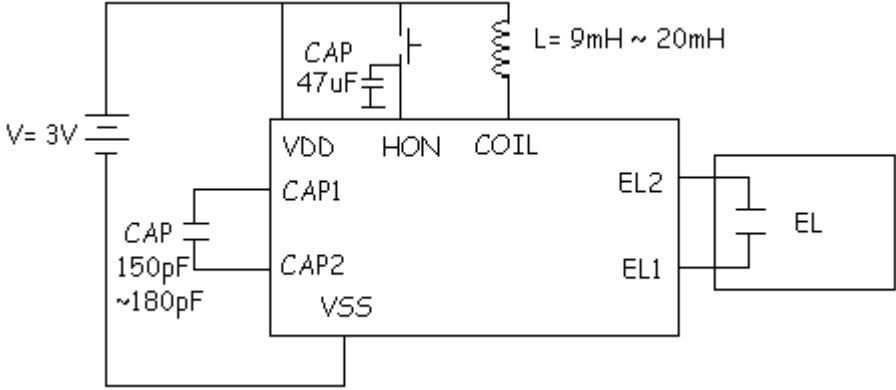
PARAMETER	MIN	MAX	UNIT	CONDITIONS
Supply Voltage	2.2	5.0	V	
Total Supply Current		20	mA	V <sub>dd</sub> =3.0V; H <sub>ON</sub> =3.0V
Quiescent Supply Current		200	nA	V <sub>dd</sub> =3.0V; H <sub>ON</sub> =0V
H <sub>ON</sub> Voltage On	V <sub>dd</sub> -0.5	V <sub>dd</sub>	V	
H <sub>ON</sub> Current On		60	μA	V <sub>dd</sub> =3.0V
H <sub>ON</sub> Voltage Off		V <sub>dd</sub> -2	V	V <sub>dd</sub> =3.0V
Inductor Drive Peak Current		60	mA	
Lamp Output				
Differential Voltage	110		V <sub>PP</sub>	V <sub>dd</sub> =3.0V
Frequency	200	400	Hz	V <sub>dd</sub> =3.0V

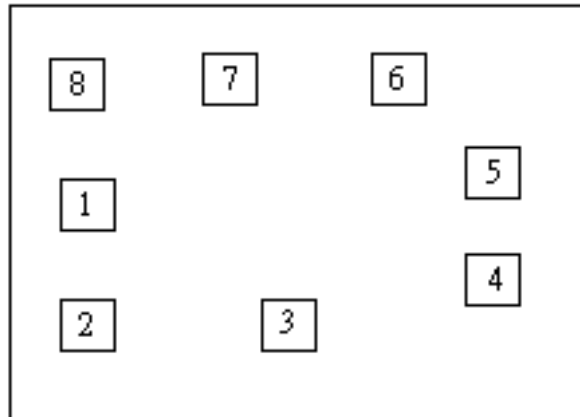
<b>SB6540</b>	<b>P.2</b>
<b>LOW FREQUENCY EL DRIVER IC</b>	

**APPLICATION CIRCUIT – HOLD RELEASE**



**APPLICATION CIRCUIT – HOLD DELAY**



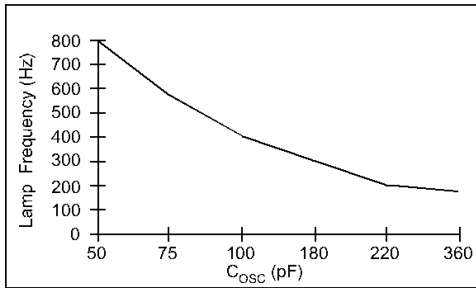
**BONDING DIAGRAM****PAD ALLOCATION**

Pad No.	Pad Name	X (um)	Y (um)
1	HON	-787.5	128.5
2	VSS	-782.5	-668.5
3	COIL	-301.5	-668.5
4	EL2	793.5	98.5
5	EL1	793.5	311.5
6	VDD	-84.5	671.5
7	CAP1	-508.5	670.5
8	CAP2	-805.5	662.5

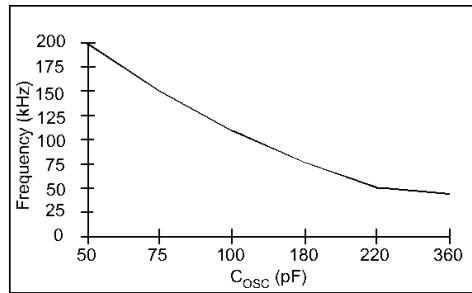
**Note:**

1. Dimensions are in Microns
2. Bonding pads are 125 x 125 typical
3. Outside dimensions are maximum, including acbribe area
4. Pad center coordinates are relative to die center
5. Die size 1970 x 1700
6. Substrate must be connected to Vss
7. Die thickness 450 microns

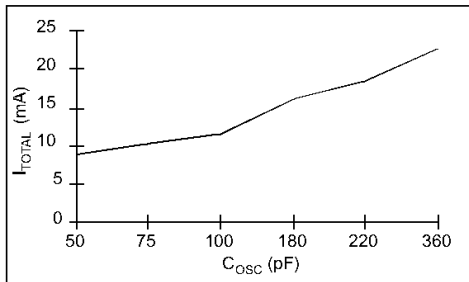
The following performance curves are intended to give the designer a relative scale from which to optimize specific applications. Absolute measurements may vary depending upon the brand of components chosen.



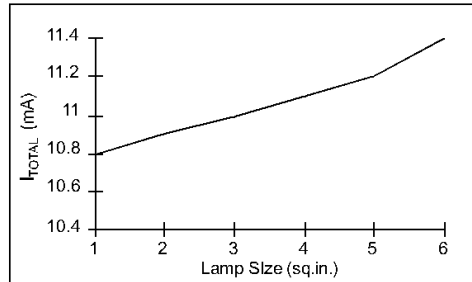
Lamp Frequency vs C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; Lamp=1 sq. in.



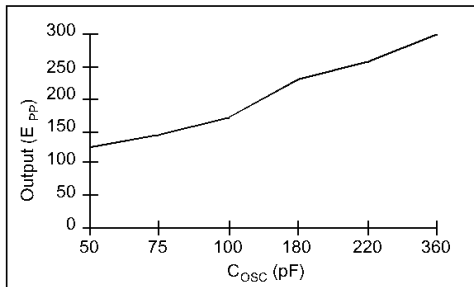
Oscillator Frequency vs C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; Lamp=1 sq. in.



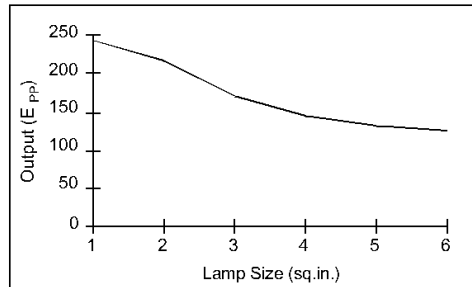
I<sub>TOTAL</sub> vs C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; Lamp=1 sq. in.



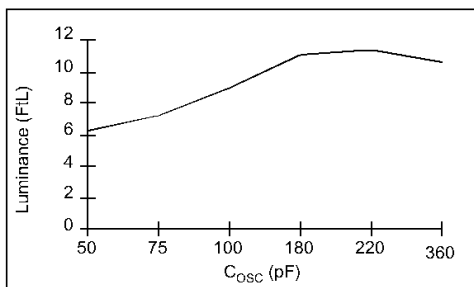
I<sub>TOTAL</sub> vs Lamp Size  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; C<sub>OSC</sub> = 180pF



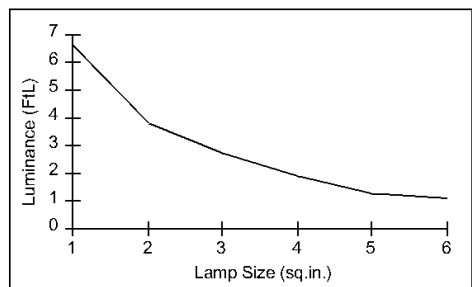
Output Voltage vs C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; Lamp=1 sq. in.



Output Voltage vs Lamp Size.  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; C<sub>OSC</sub> = 180pF

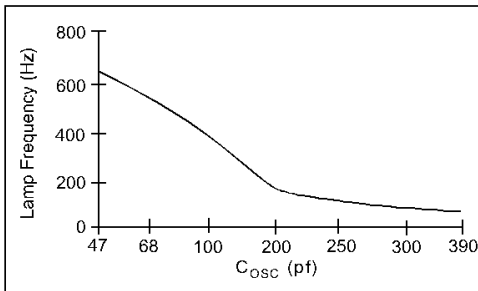


Luminance vs C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; Lamp=1 sq. in.

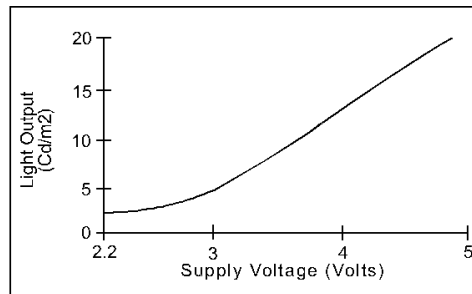


Luminance vs Lamp Size.  
V<sub>DD</sub> = 3.0V; Coil= 9mH, 35Ω; C<sub>OSC</sub> = 180pF

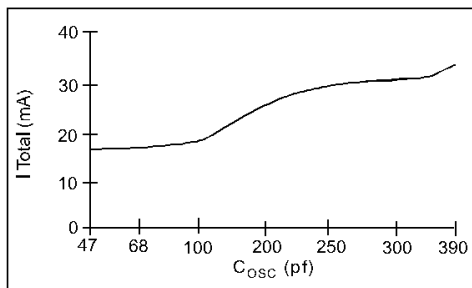
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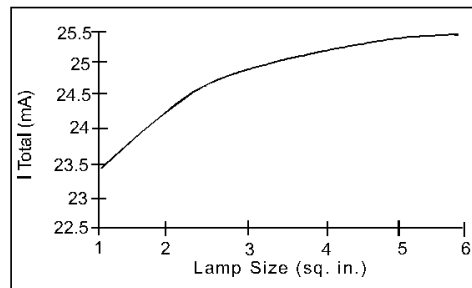
Lamp Frequency vs. C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; Load=10nF



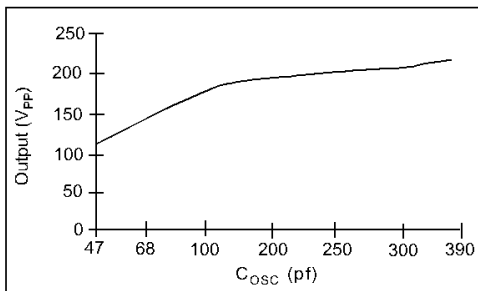
Luminance vs. V<sub>DD</sub>=Vcoil  
V<sub>DD</sub>=3.0V; Coil=5mH, 18Ω; Load=10nF



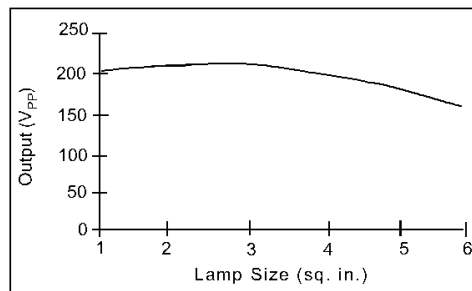
I<sub>TOTAL</sub> vs. C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; Load=10nF



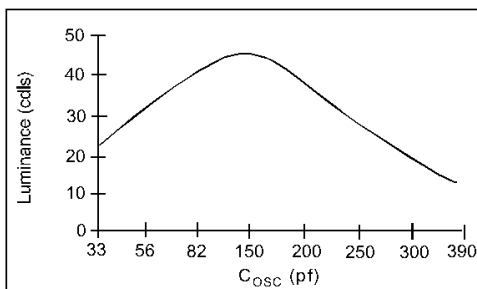
I<sub>TOTAL</sub> vs. Lamp Size  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; C<sub>OSC</sub>=100pF



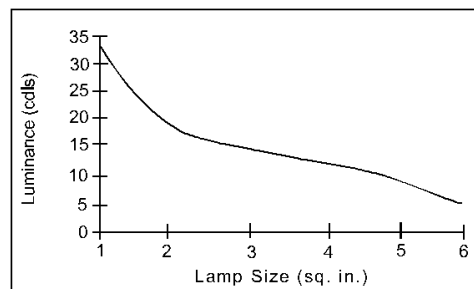
Output Voltage vs. C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; Load=10nF



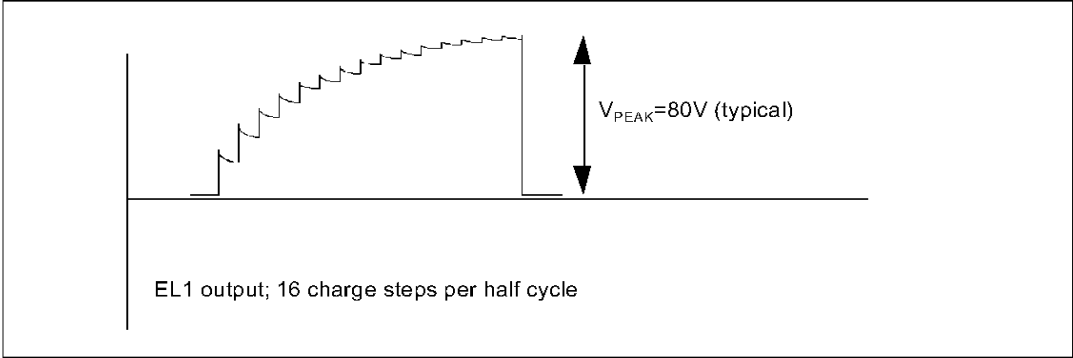
Output Voltage vs. Lamp Size.  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; C<sub>OSC</sub>=100pF



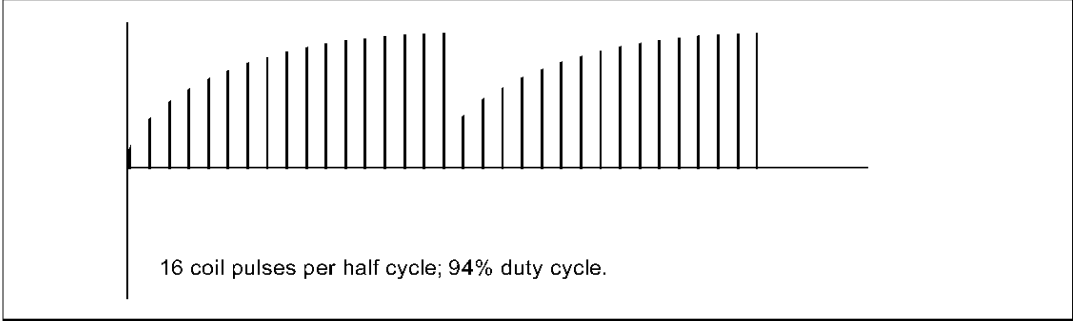
Luminance vs. C<sub>OSC</sub>  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; Load=10nF



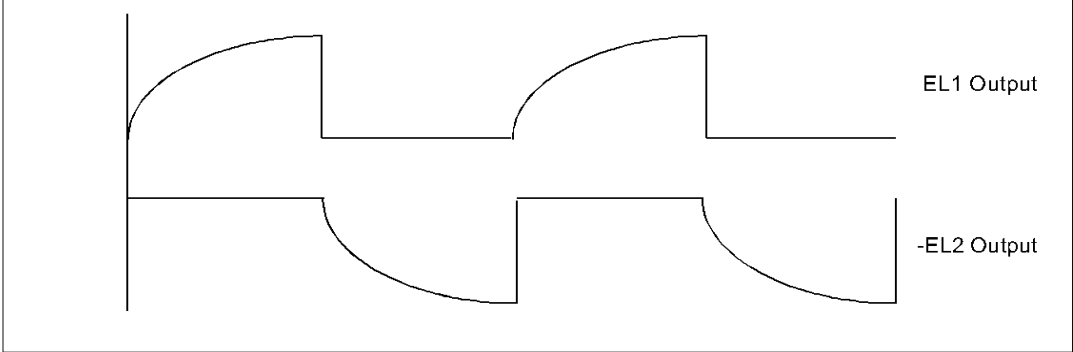
Luminance vs. Lamp Size.  
V<sub>DD</sub> = 3.0V; Coil= 5mH, 18Ω; C<sub>OSC</sub>=100pF



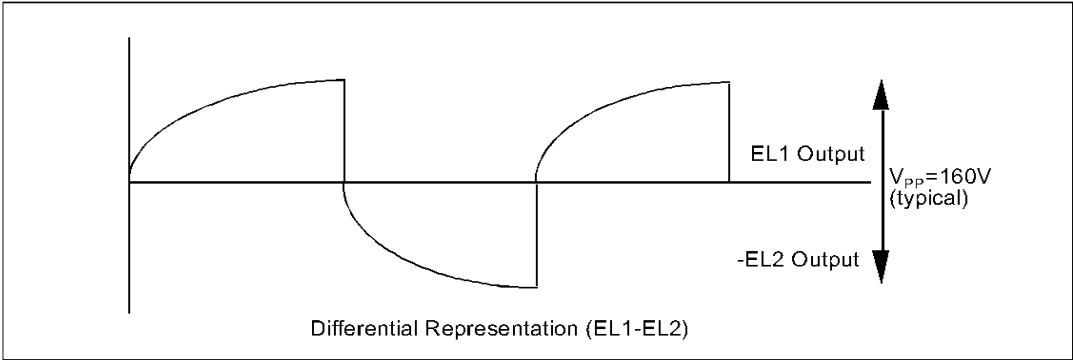
**Figure 1. EL output voltage in discrete steps at EL1 output**



**Figure 2. Voltage pulses released from the coil to the EL driver circuitry**



**Figure 3. EL voltage waveforms from the EL1 and EL2 outputs**



**Figure 4. EL differential output waveform of the EL1 and EL2 outputs**

<b>SB6540</b>	<b>P.7</b>
<b>LOW FREQUENCY EL DRIVER IC</b>	

Experimental results of SB6540C against various sizes of EL elements

1. Testing conditions :

EL element size : 1" X 1.125" (1.125" square)

Supply voltage : 3V

**Capacitance : 282pF**

1.1 Inductance : 9mH, 37Ω  
Output Voltage : 210Vp-p  
Output Frequency: 185Hz

**1.2 Inductance : 12mH, 30Ω**

Output Voltage : 220Vp-p

Output Frequency : 185Hz

2. Testing conditions :

EL element size : 2.125" X 1.125" (2.4" square)

Supply voltage : 3V

**Capacitance : 282pF**

2.1 Inductance : 9mH, 37Ω  
Output Voltage : 170Vp-p  
Output Frequency: 185Hz

**2.2 Inductance : 12mH, 30Ω**

Output Voltage : 176Vp-p

Output Frequency: 185Hz

3. Testing conditions :

EL element size : 2.75" X 1.125" (3" square)

Supply voltage : 3V

**Capacitance : 282pF**

3.1 Inductance : 9mH, 37Ω  
Output Voltage : 140Vp-p  
Output Frequency: 185Hz

**3.2 Inductance : 12mH, 30Ω**

Output Voltage : 156Vp-p

Output Frequency: 185Hz

4. Testing conditions :

EL element size : 3.625" X 1.125" (4.078" square)

Supply voltage : 3V

**Capacitance : 282pF**

4.1 Inductance : 9mH, 37Ω  
Output Voltage : 140Vp-p  
Output Frequency: 185Hz

**4.2 Inductance : 12mH, 30Ω**

Output Voltage : 140Vp-p

Output Frequency : 185Hz

5. Testing conditions :

EL element size : 6.125" X 1.125" (6.89" square)

Supply voltage : 3V

**Capacitance : 282pF**

5.1 Inductance : 9mH, 37Ω  
Output Voltage : 112Vp-p  
Output Frequency: 185Hz

**5.2 Inductance : 12mH, 30Ω**

Output Voltage : 112Vp-p

Output Frequency: 185Hz

**SB6540****P.8****LOW FREQUENCY  
EL DRIVER IC****OPERATING VOLTAGE: 4.2V****EL DRIVER: SB6540 TESTING****TEST CONDITIONS: EL PAPER - 94mm x 43mm (BLUE)  
INDUCTOR: 20mH (R=47.5 ohms)**

<b>Cosc</b>	<b>Light Output (lux)</b>	<b>Current Total (mA)</b>	<b>Voltage p-p (V)</b>	<b>Lamp Frequency (Hz)</b>
68pF	3.0	28.8	67.2	840
82pF	4.2	28.0	74.4	758
100pF	7.2	24.0	88.0	600
150pF	11.5	21.6	104.8	425
180pF	12.9	19.2	110.4	367
220pF	14.1	13.6	114.4	308
300pF	15.6	16.0	125.6	248
330pF	17.1	16.8	136.0	213
470pF	21.3	18.4	167.2	147
<b>560pF</b>	<b>21.5</b>	<b>20.0</b>	<b>177.6</b>	<b>133</b>
680pF	17.8	29.0	159.2	105
820pF	14.7	29.0	153.6	86.5

**EL DRIVER: SB6540 TESTING****TEST CONDITIONS: EL PAPER - 94mm x 43mm (BLUE)  
INDUCTOR: 11mH (R=29 ohms)**

<b>Cosc</b>	<b>Light Output (lux)</b>	<b>Current Total (mA)</b>	<b>Voltage p-p (V)</b>	<b>Lamp Frequency (Hz)</b>
150pF	11.2	17.6	101.6	400
180pF	12.5	17.6	110.7	357
220pF	13.4	18.4	118.4	303
300pF	16.0	20.8	131.2	244
<b>330pF</b>	<b>17.3</b>	<b>23.2</b>	<b>141.6</b>	<b>208</b>
470pF	14.3	31.0	131.2	143
560pF	13.0	33.0	132.8	125
680pF	11.8	33.0	130.4	103
820pF	10.7	35.0	125.6	91

**EL DRIVER: SB6540 TESTING****TEST CONDITIONS: EL PAPER - 94mm x 43mm (BLUE)  
INDUCTOR: 9mH (R=34 ohms)**

<b>Cosc</b>	<b>Light Output (lux)</b>	<b>Current Total (mA)</b>	<b>Voltage p-p (V)</b>	<b>Lamp Frequency (Hz)</b>
150pF	9.7	17.6	100.0	385
180pF	11.0	19.2	104.8	357
220pF	12.3	20.0	115.2	303
<b>300pF</b>	<b>14.6</b>	<b>22.4</b>	<b>128.0</b>	<b>244</b>
330pF	14.4	24.8	132.0	204
470pF	12.3	23.2	129.6	139
560pF	11.4	24.0	124.8	125
680pF	10.3	32.0	127.2	103
820pF	9.4	33.6	122.4	91

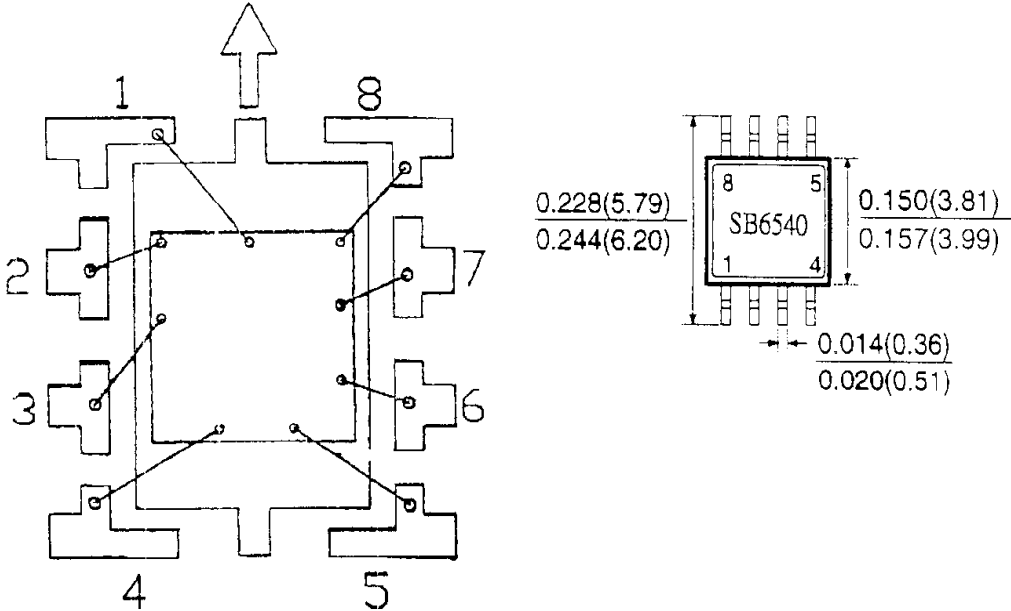
**EL DRIVER: SB6540 TESTING****TEST CONDITIONS: EL PAPER - 94mm x 43mm (BLUE)  
INDUCTOR: 5mH (R=10 ohms)**

<b>Cosc</b>	<b>Light Output (lux)</b>	<b>Current Total (mA)</b>	<b>Voltage p-p (V)</b>	<b>Lamp Frequency (Hz)</b>
68pF	5.7	22.0	80.0	800
82pF	7.0	24.0	85.6	702
100pF	9.8	24.0	95.2	580
<b>150pF</b>	<b>10.7</b>	<b>27.0</b>	<b>96.0</b>	<b>370</b>
180pF	7.9	30.0	84.0	322
220pF	6.4	34.7	78.4	274



<b>SB6540</b>	<b>P.9</b>
<b>LOW FREQUENCY EL DRIVER IC</b>	

8-pin small outline package (8 SOP)



Pinout configuration

Pin No.	1	2	3	4	5	6	7	8
Pin Name	HON	VSS	COIL	EL2	EL1	VDD	CAP1	CAP2