



# SP1937

## DC-DC Step-Up Converter for White LED

### DESCRIPTION

The SP1937 is a step-up DC/DC converter for white LED driver with constant current. The device can driver one to four LEDs in series from a single cell Lithium Ion battery. Internal functions include current limiting; thermal shutdown and soft-start to prevent damage operate status. The SP1937 DC/DC converter operates at 1.2MHz and low output capacitor as small as 0.22uF; apply to Lithium-Ion powered systems. A low 95mV (Typ) reference voltage minimizes power loss in the current setting resistor for better efficiency.

### APPLICATIONS

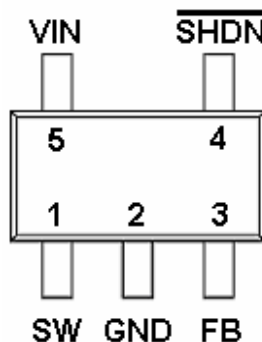
- Battery Power Equipment
- Notebook Computers
- PDA
- Cellular Phone
- Digital Cameras
- MP3 Players
- GPS Receivers

### FEATURES

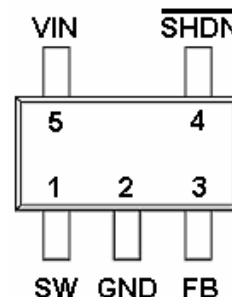
- ◆ Fast 1.2MHz Switching Frequency
- ◆ High Efficiency up to 85%
- ◆ Drives up to Four LEDs From 3.2V Supply
- ◆ Low Quiescent Current
- ◆ Disconnects LEDs in Shutdown Mode
- ◆ Internal Over Temperature and Current Limiting Shutdown Function
- ◆ 36V Rugged Bipolar Switch
- ◆ Small Package SOT-23-5L & SOT-353

### PIN CONFIGURATION

#### SOT-23-5L

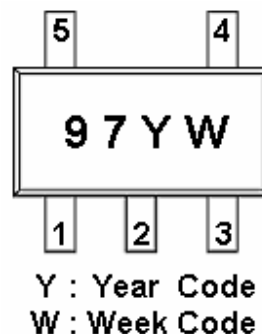


#### SOT-353 ( SC-70-5L )

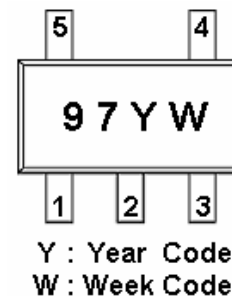


### PART MARKING

#### SOT-23-5L



#### SOT-353 ( SC-70-5L )

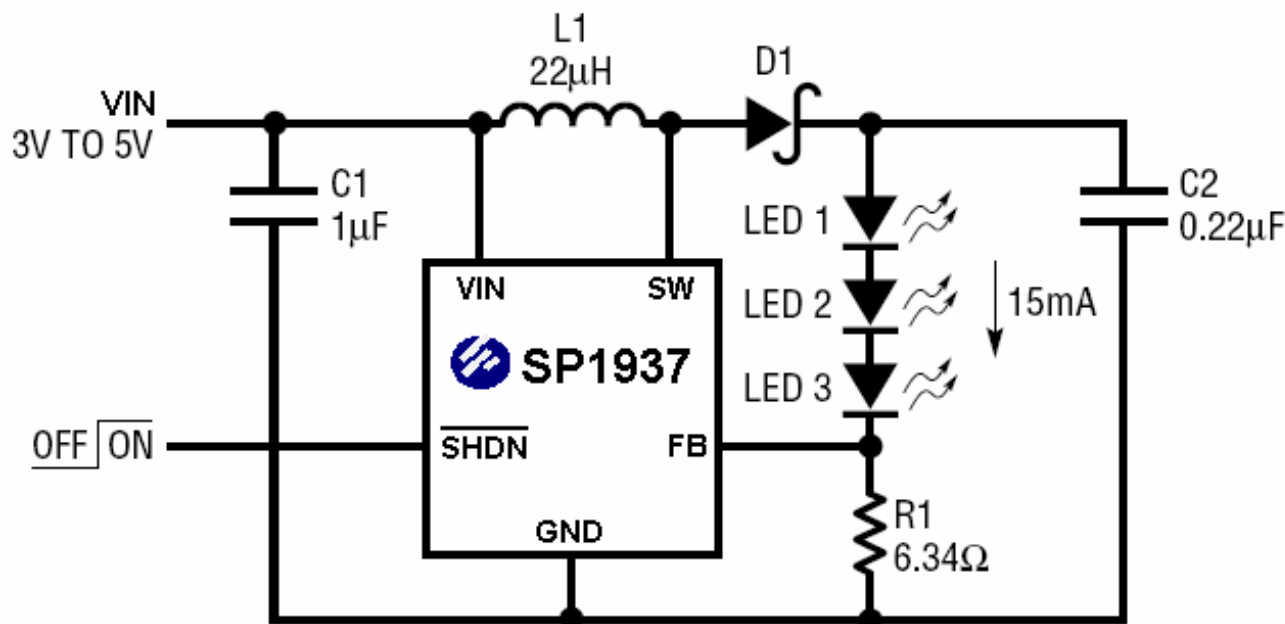




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## DC-DC Step-Up Converter for White LED

### TYPICAL APPLICATION CIRCUIT



### PIN DESCRIPTION

#### SP1937S25RG

| Pin | Symbol | Description                     |
|-----|--------|---------------------------------|
| 1   | SW     | Switch Pin.                     |
| 2   | GND    | Ground Pin                      |
| 3   | FB     | Feedback Pin.                   |
| 4   | SHDN   | Shutdown Pin. Active-low enable |
| 5   | VIN    | Supply Voltage Input            |

#### SP1937S36RG

| Pin | Symbol | Description                     |
|-----|--------|---------------------------------|
| 1   | SW     | Switch Pin.                     |
| 2   | GND    | Ground Pin                      |
| 3   | FB     | Feedback Pin.                   |
| 4   | SHDN   | Shutdown Pin. Active-low enable |
| 5   | GND    | Ground Pin                      |
| 6   | VIN    | Supply Voltage Input            |

### ORDERING INFORMATION

| Part Number | Package              | Part Marking |
|-------------|----------------------|--------------|
| SP1937S25RG | SOT-23-5L            | 97YW         |
| SP1937S35RG | SOT-353 ( SC-70-5L ) | 97YW         |

※ Week Code : A ~ Z ( 1 ~ 26 ) ; a ~ z ( 27 ~ 52 )

※ SP1937S25RG : Tape Reel ; Pb – Free

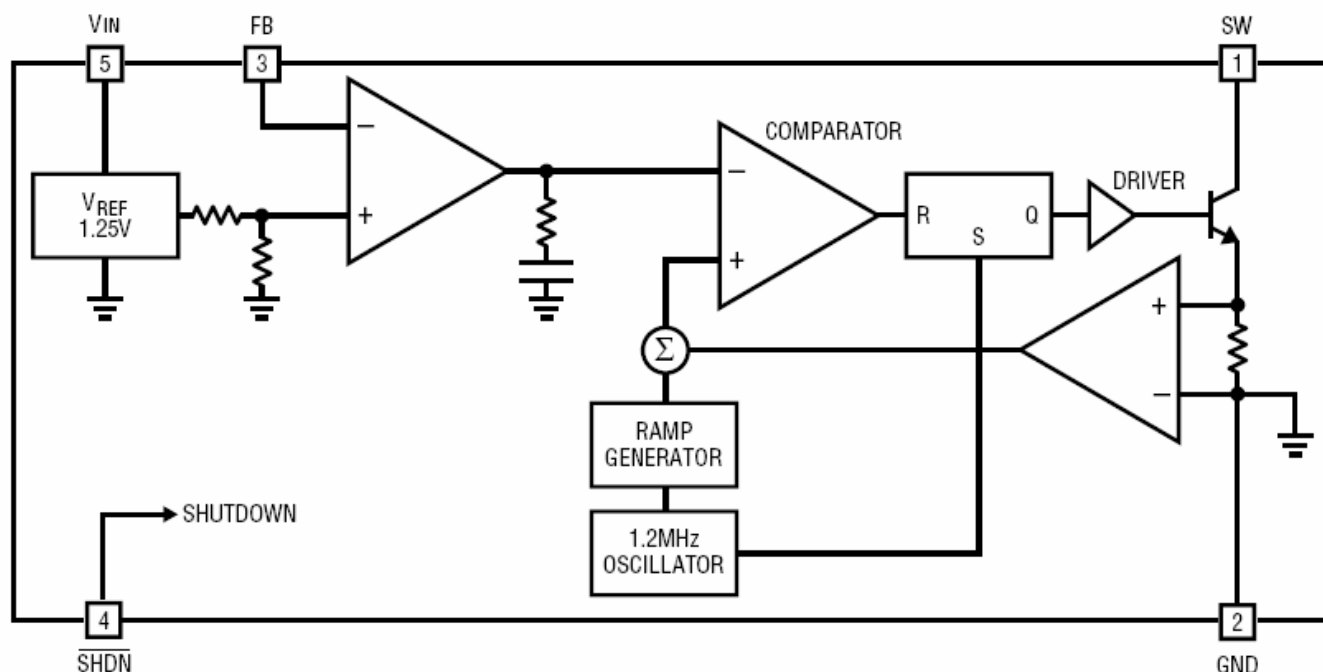
※ SP1937S35RG : Tape Reel ; Pb – Free



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## DC-DC Step-Up Converter for White LED

### BLOCK DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

( $T_A=25^{\circ}\text{C}$  Unless otherwise specified)

| Parameter                    | Symbol              | Value   | Unit               |
|------------------------------|---------------------|---------|--------------------|
| DC Supply Voltage            | $V_{IN}$            | 20      | V                  |
| SW Voltage                   | $V_{SW}$            | 36      | V                  |
| FB Voltage                   | $V_{FB}$            | 10      | V                  |
| SHDN Voltage                 | $V_{SHDN}$          | 10      | V                  |
| Operating Temperature        | $T_{OPR}$           | -40~85  | $^{\circ}\text{C}$ |
| Maximum Junction Temperature | $T_{J(\text{Max})}$ | 125     | $^{\circ}\text{C}$ |
| Storage Temperature          | $T_S$               | -65~150 | $^{\circ}\text{C}$ |

The IC has a protection circuit against static electricity. Do not apply high static electricity or high voltage that exceeds the performance of the protection circuit to the IC.



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## DC-DC Step-Up Converter for White LED

### ELECTRICAL CHARACTERISTICS

( $T_A=25^{\circ}\text{C}$ ,  $V_{IN}=3\text{V}$ ,  $V_{SHDN}=3\text{V}$ , Unless otherwise specified)

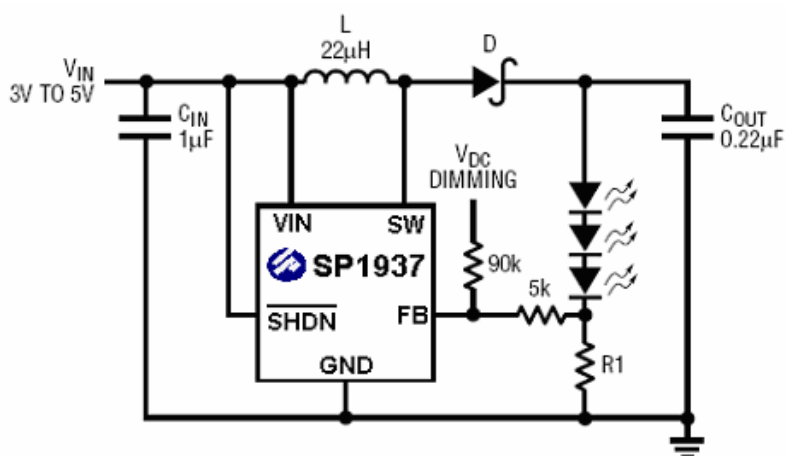
| Parameter              | Conditions                               | Min. | Typ. | Max. | Unit          |
|------------------------|------------------------------------------|------|------|------|---------------|
| Operating Voltage      |                                          | 2.5  |      | 20.0 | V             |
| Feedback Voltage       | $I_{sw}=100\text{mA}$ , Duty Cycle = 66% | 86   |      | 110  | mV            |
| FB Pin Bias Current    |                                          |      |      | 150  | nA            |
| Supply Current         |                                          |      | 2.8  | 3.5  | mA            |
|                        | $V_{SHDN} = 0\text{V}$                   |      | 0.1  | 1.0  | $\mu\text{A}$ |
| Switching Frequency    |                                          | 0.8  | 1.2  | 1.6  | MHz           |
| Maximum Duty Cycle     |                                          |      | 85   |      | %             |
| Switch Current Limit   |                                          |      | 320  |      | mA            |
| Switch Leakage Current | $V_{sw} = 5\text{V}$                     |      | 0.01 | 5    | $\mu\text{A}$ |
| Switch $V_{cesat}$     | $I_{sw} = 200\text{mA}$                  |      | 150  |      | mV            |
| SHDN Voltage High      |                                          | 1.5  |      |      | V             |
| SHDN Voltage Low       |                                          |      |      | 0.4  | V             |
| SHDN Pin Bias Current  |                                          |      | 90   |      | $\mu\text{A}$ |



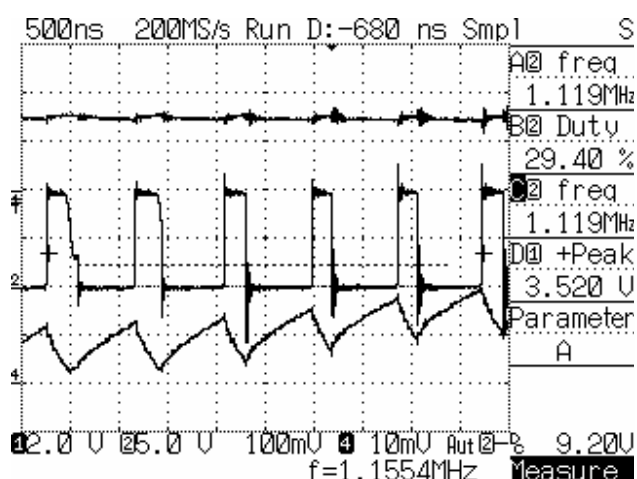
# SP1937

## DC-DC Step-Up Converter for White LED

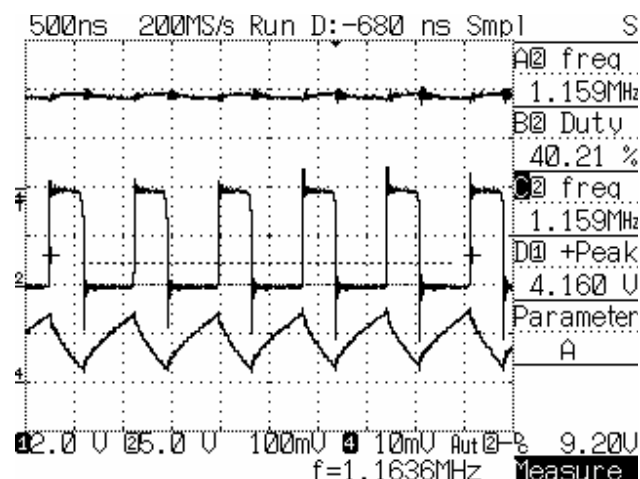
### APPLICATION INFORMATION



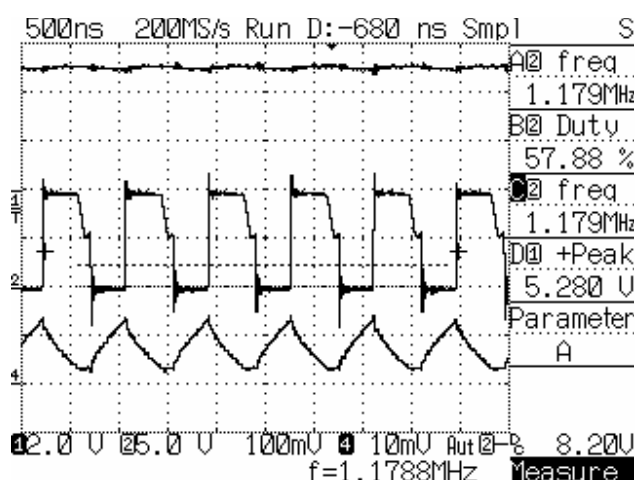
CH1: VCC / CH2: Vsw / CH3: Inductor current / R1= 6.8Ω



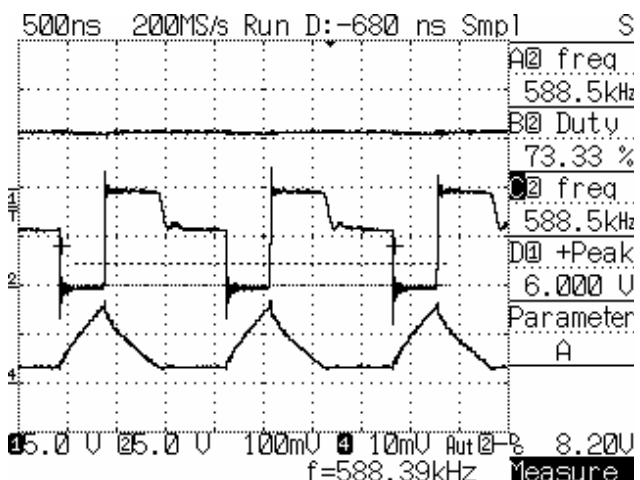
Vin=3V ; Vout=8.972V ; Iout=14.624mA



Vin=3.75V ; Vout=8.957V ; Iout=14.698mA



Vin=5V ; Vout=8.963V ; Iout=14.869mA



Vin=5.5V ; Vout=8.959V ; Iout=14.836mA

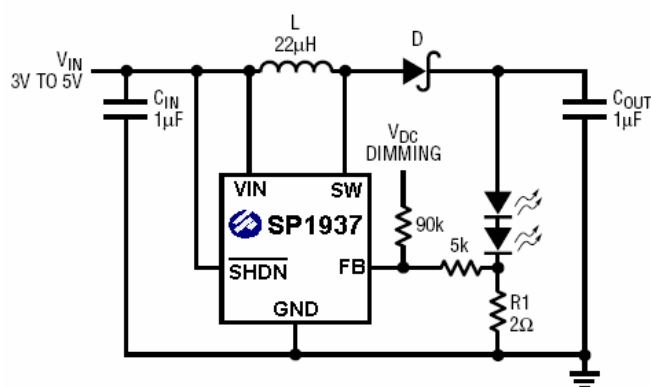


# SP1937

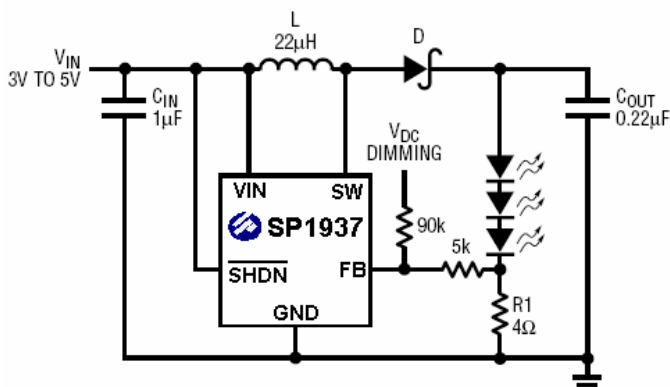
## DC-DC Step-Up Converter for White LED

APPLICATION CIRCUIT ( For Portable System --- Series )

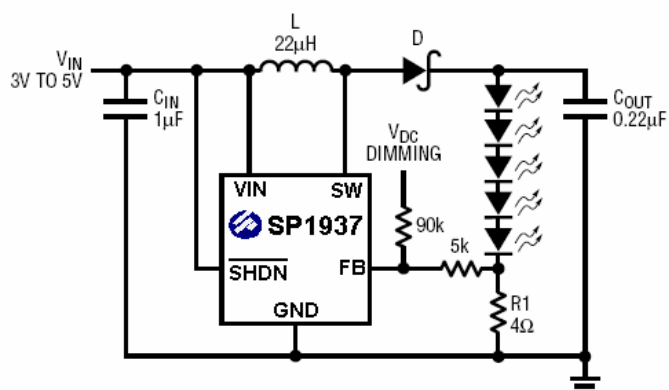
Li-Ion to Two White LEDs



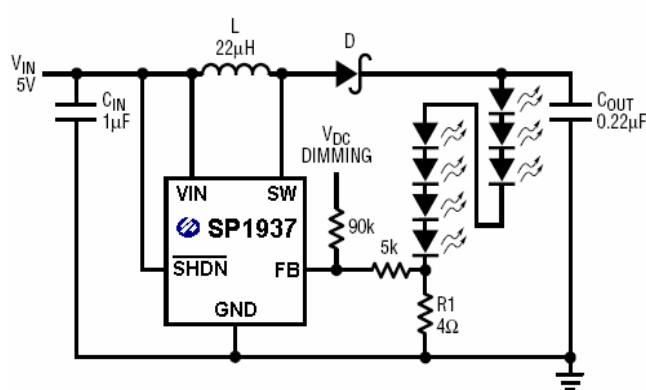
Li-Ion to Three White LEDs



Li-Ion to Five White LEDs



5V to Seven White LEDs



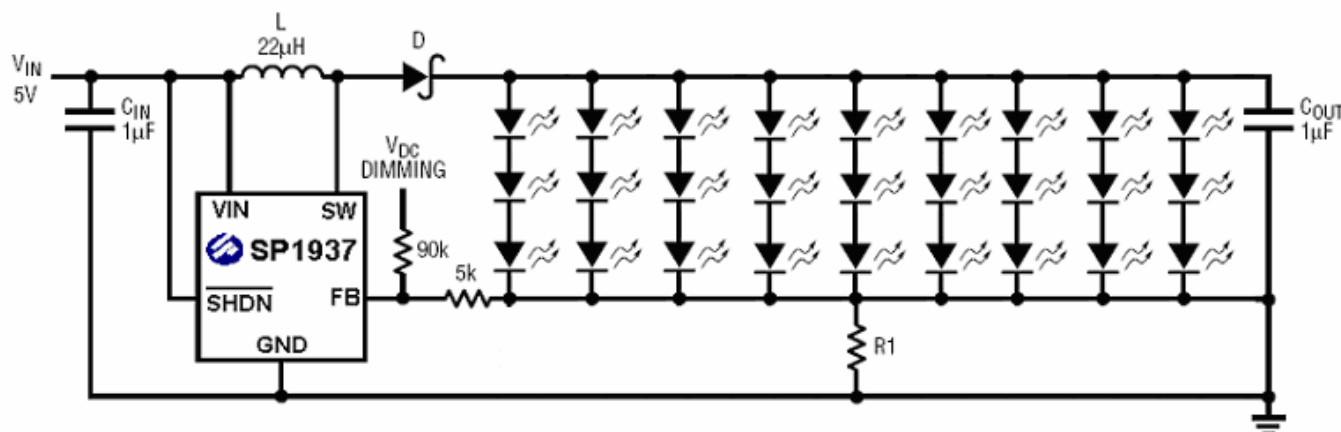


# SP1937

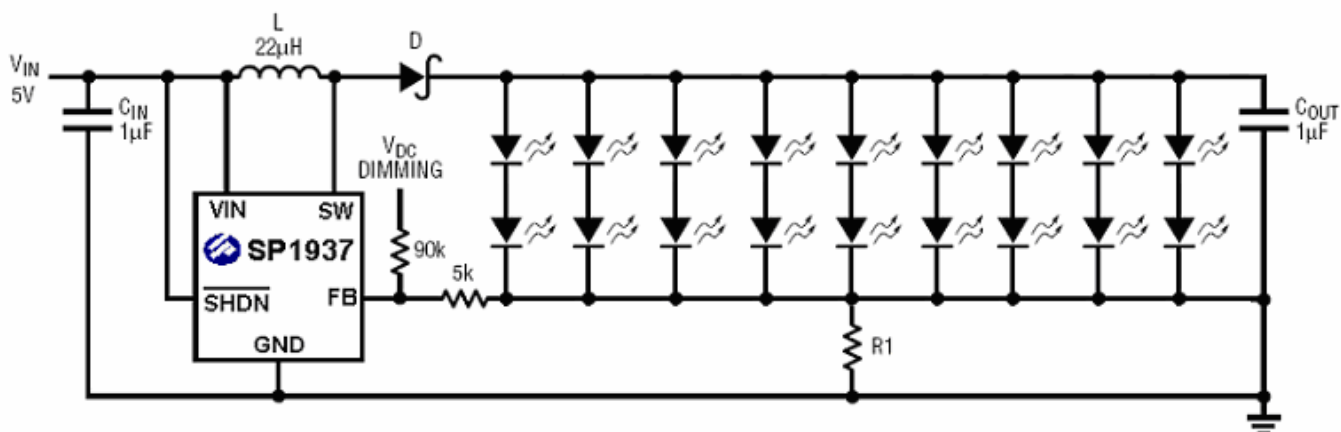
## DC-DC Step-Up Converter for White LED

APPLICATION CIRCUIT ( For LCD Panel --- Series & Parallel )

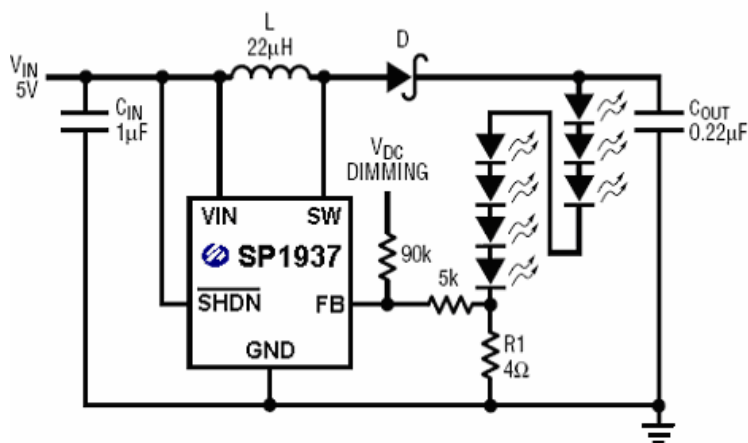
Three Series / Nine Parallel For 8" LCD Panel



Two Series / Nine Parallel For 7" LCD Panel



Seven Series For 3.5" LCD Panel

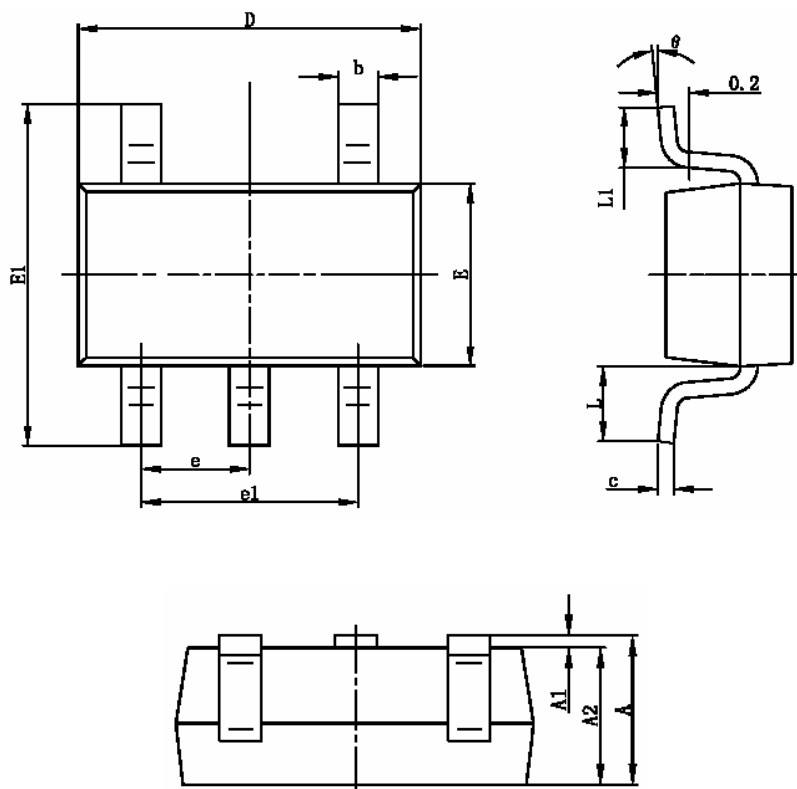




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## DC-DC Step-Up Converter for White LED

### SOT-23-5L PACKAGE OUTLINE



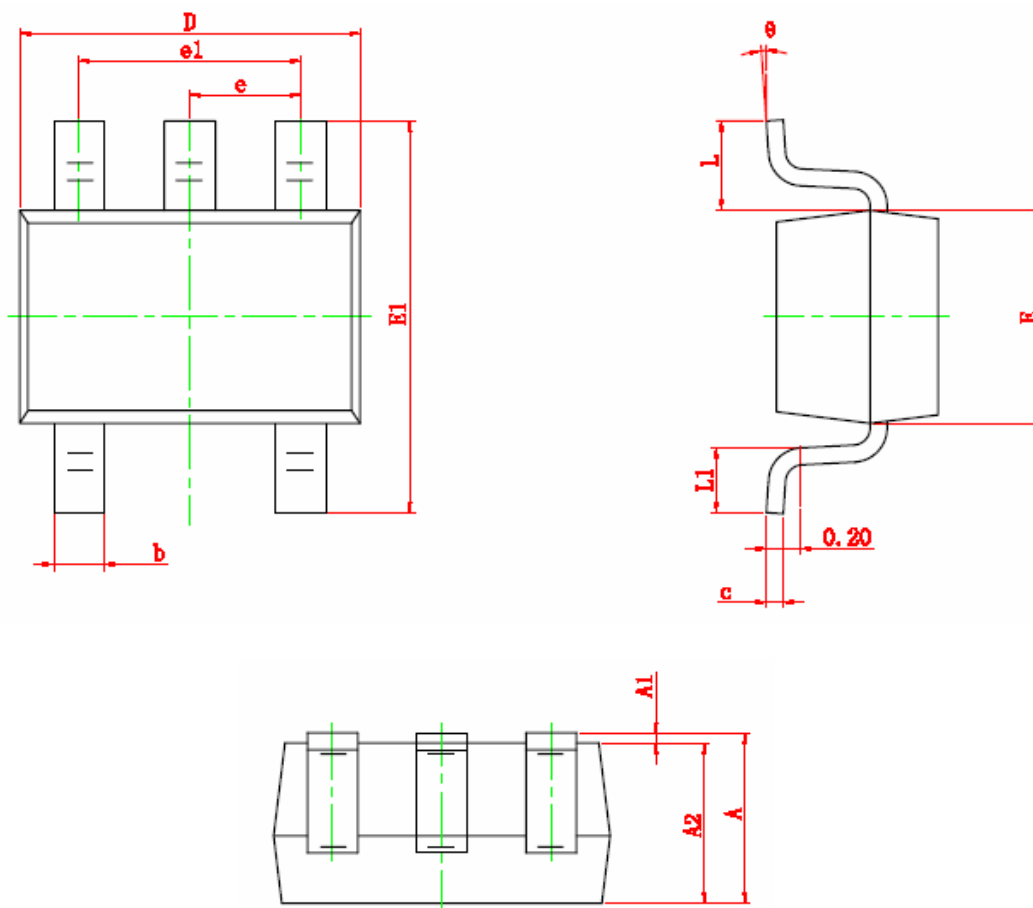
| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.050                     | 1.150 | 0.041                | 0.045 |
| b      | 0.300                     | 0.400 | 0.012                | 0.016 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.020 | 0.111                | 0.119 |
| E      | 1.500                     | 1.700 | 0.059                | 0.067 |
| E1     | 2.650                     | 2.950 | 0.104                | 0.116 |
| e      | 0.950TYP                  |       | 0.037TYP             |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.700REF                  |       | 0.028REF             |       |
| L1     | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



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## DC-DC Step-Up Converter for White LED

### SOT-353 PACKAGE OUTLINE



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 0.900                     | 1.100 | 0.035                | 0.043 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 0.900                     | 1.000 | 0.035                | 0.039 |
| b      | 0.150                     | 0.350 | 0.006                | 0.014 |
| c      | 0.080                     | 0.150 | 0.003                | 0.006 |
| D      | 2.000                     | 2.200 | 0.079                | 0.087 |
| E      | 1.150                     | 1.350 | 0.045                | 0.053 |
| E1     | 2.150                     | 2.450 | 0.085                | 0.096 |
| e      | 0.650 TYP                 |       | 0.026 TYP            |       |
| e1     | 1.200                     | 1.400 | 0.047                | 0.055 |
| L      | 0.525 REF                 |       | 0.021 REF            |       |
| L1     | 0.260                     | 0.460 | 0.010                | 0.018 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



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