# 5 Channel Low Dropout Current Source

## ■ General Description

The LN9305 low-dropout bias supply for white LEDs is a high-performance alternative to the simple ballast resistors used in conventional white LED designs. The LN9305 uses a internal resistor to set the bias current for five LEDs, which are matched to 3%. The LN9305's advantages over ballast resistors include much lower bias variation with supply voltage variation, significantly lower dropout voltage, and in some applications, significantly improved efficiency. The LN9305 requires a 60mV dropout at a 20mA load on each output to match the LED brightness.

The LN9305 is suitable for single cell Li-ion battery power device that using low forward voltage white LEDs. The white LEDs can be powered directly from battery without extra external components. This takes an advantage of highest efficiency and creates no EMI problem.

## ■ Applications

- Next-Generation wireless handsets
- PDAs, palmtops and handy terminals
- Digital cameras and camcorders
- Battery-powered equipment

## ■ Features

- Ultra low 60mV dropout at 20mA
- 3% high accuracy current matching
- 20mA full scale current
- PWM brightness control
- 2.5V to 5.5V supply voltage range
- Thermal shutdown protection
- Under-voltage protection

## ■ Package

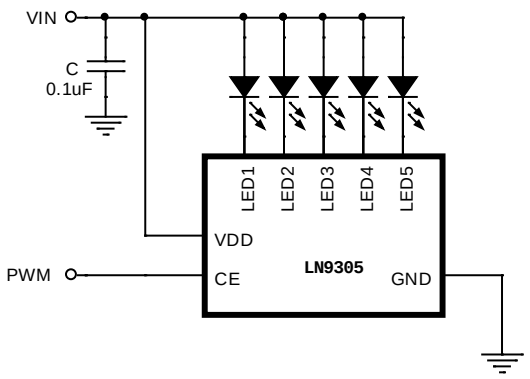
- SOT-23-8
- DFN2×2-8

## ■ Ordering Information

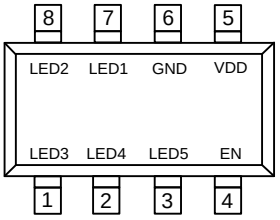
**LN9305 ①②③ (Eg:** LN9305SRG**)**

| Item | Symbol | Function |
|---|---|---|
| ① | S | Denotes Package Type: SOT-23-8 |
| | D | Denotes Package Type: DFN2×2-8 |
| ② | R | Embossed Tape :Standard Feed |
| | L | Embossed Tape :Reverse Feed |
| ③ | N | Normal package |
| | P | Pb Free package |
| | G | Green package |

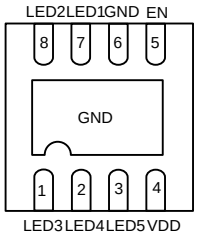
## ■ Typical Application Circuit



## ■ Pin Assignment




LN9305SR(SOT-23-8)

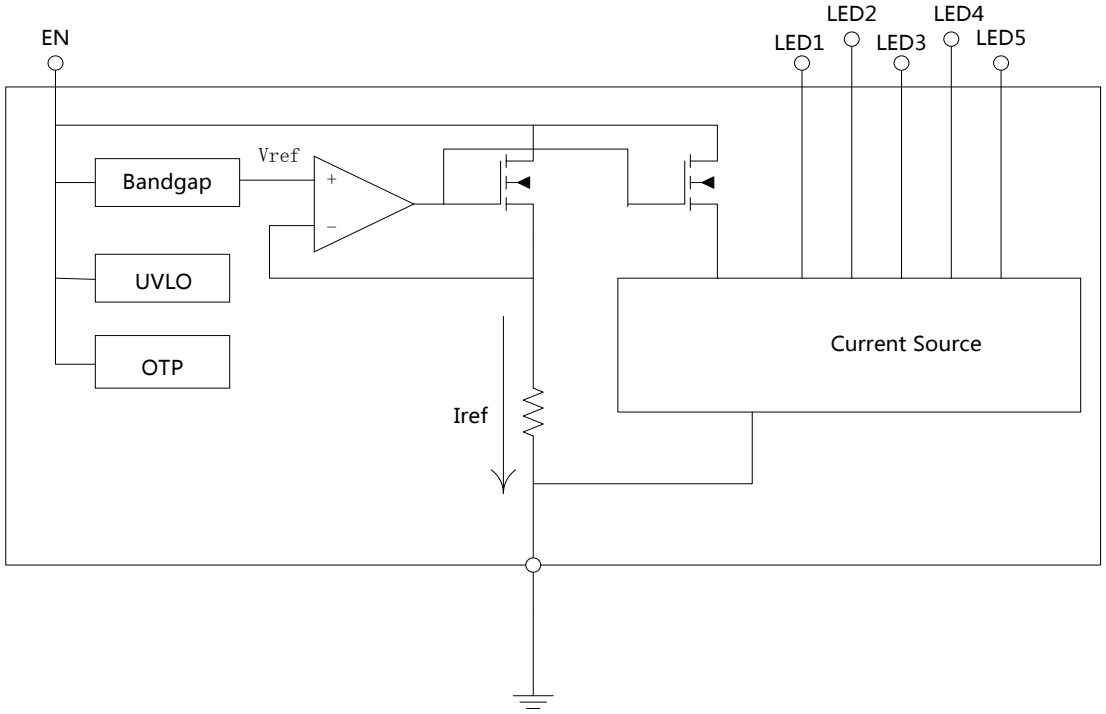



LN9305DR(DFN2*2-8)

## ■ Pin Function Description

| Pin Number | | Pin Name | Function |
|---|---|---|---|
| SOT-23-8 | DFN2×2-8 | | |
| 1 | 1 | LED3 | LED3 bias current input. |
| 2 | 2 | LED4 | LED4 bias current input. |
| 3 | 3 | LED5 | LED5 bias current input. |
| 4 | 5 | EN | Control pin, can input PWM or pulse signal |
| 5 | 4 | VDD | Power supply |
| 6 | 6 | GND | Ground |
| 7 | 7 | LED1 | LED1 bias current input. |
| 8 | 8 | LED2 | LED2 bias current input. |

## ■ Function Block Diagram



## ■ Absolute Maximum Ratings

(Ta=25°C)

| Item | Symbol | | Absolute maximum ratings | Unit |
|---|---|---|---|---|
| VIN to GND | $V_{IN}$ | | GND-0.3～7 | V |
| EN to GND | $V_{EN}$ | | GND-0.3～VDD+0.3 | V |
| Power Dissipation | $P_D$ | SOT-23-8 | 250 | mW |
| | | DFN2×2-8 | 1000 | mW |
| Operating Temperature range | Topr | | -40～＋85 | ℃ |
| Storage Temperature range | Tstg | | -65～＋150 | |
| Lead Temperature (Soldering, 10 sec.) | Tlead | | 260 | |

**Caution:** The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

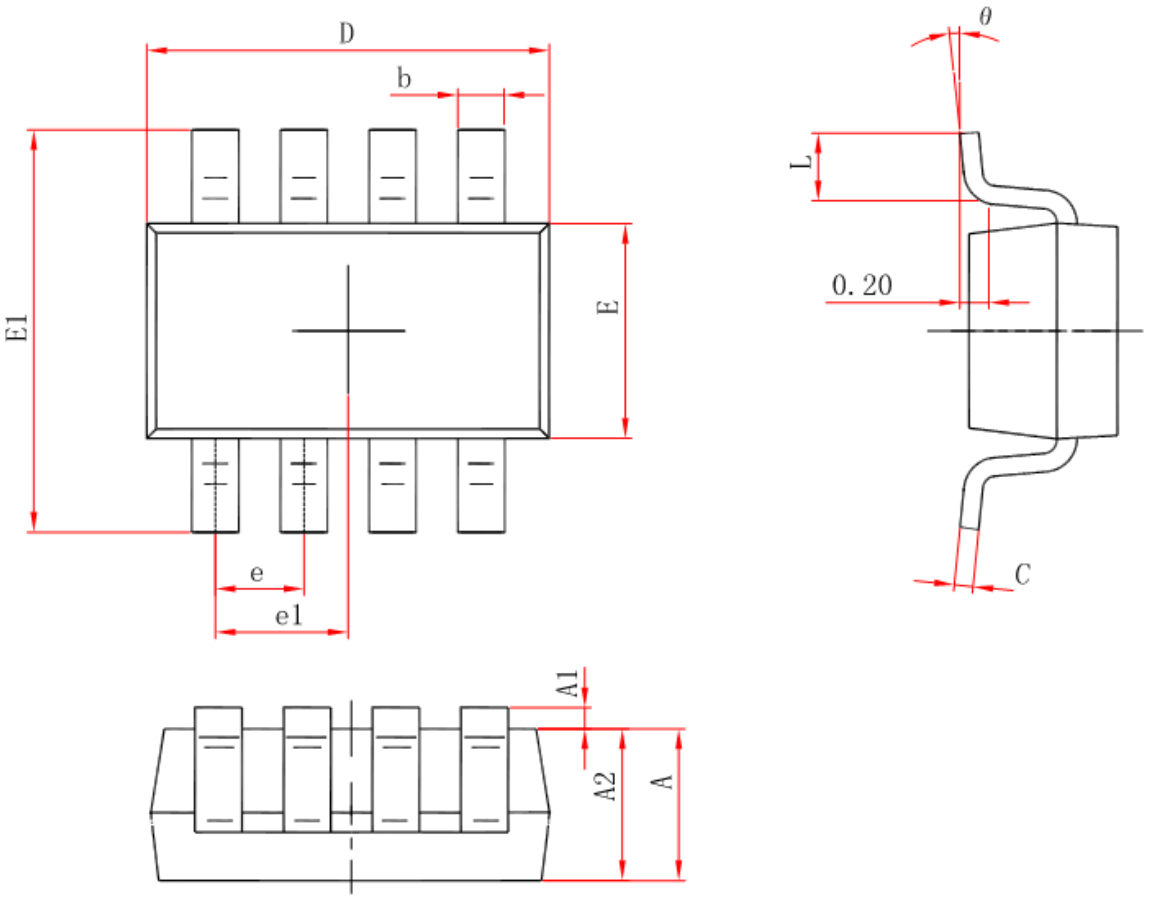
## ■ Electrical Characteristics

**VIN= 3.7V** (Ta=25℃, unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Input Supply Voltage | $V_{DD}$ | | 2.5 | | 5.5 | V |
| Undervoltage Lockout Threshold | $V_{UVLO}$ | | - | 2.1 | - | V |
| UVLO Hysteresis | | | - | 100 | - | V |
| Shutdown Current | $I_{SHDN}$ | EN<0.4V | - | - | 1 | μA |
| Quiescent Current | $I_Q$ | Iout=0mA | - | 450 | - | μA |
| initial current | $I_{LED}$ | | 18 | 20 | 22 | mA |
| LED Pin Voltage Dropout | $V_{LED-DROP}$ | VLED(DROP), 90% Max ILED | - | 60 | - | mV |
| Current Matching | | | | 3 | 5 | % |
| Thermal Shutdown Threshold | | | | 160 | | ℃ |
| Thermal Shutdown Hysteresis | | | | 10 | | ℃ |
| EN Pin Input Voltage High | $V_{IH}$ | $V_{EN}$>$V_{IH}$,ON | 2.5 | - | - | V |
| EN Pin Input Voltage Low | $V_{IL}$ | $V_{EN}$<$V_{IL}$, OFF | -- | -- | 0.7 | V |

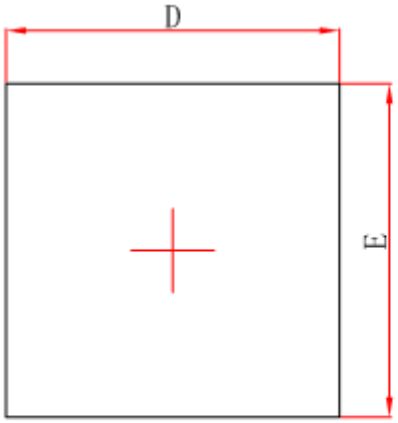
## ■ Package Information

- **SOT-23-8**

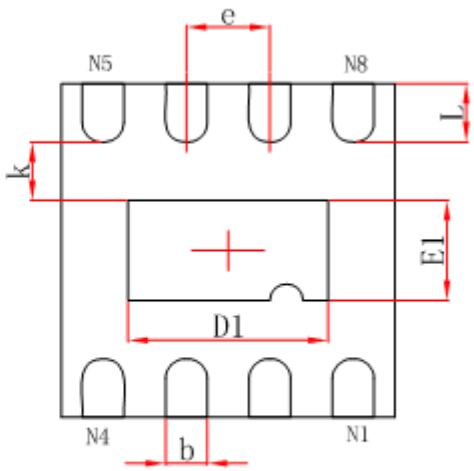



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | **Min** | **Max** | **Min** | **Max** |
| A | 1.050 | 1.250 | 0.041 | 0.049 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 1.050 | 1.150 | 0.041 | 0.045 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.100 | 0.200 | 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 | 0.65（BSC） | | 0.026(BSC) | |
| e1 | 0.975（BSC） | | 0.038(BSC) | |
| L | 0.300 | 0.600 | 0.012 | 0.024 |
| θ | 0° | 8° | 0° | 8° |

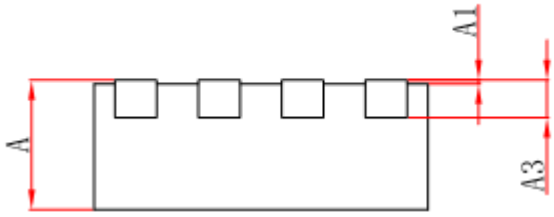
- **DFN2×2-8**




**Top View**




**Bottom View**




**SIde VIew**

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.700/0.800 | 0.800/0.900 | 0.028/0.031 | 0.031/0.035 |
| A1 | 0.000 | 0.050 | 0.000 | 0.002 |
| A3 | 0.203REF. | | 0.008REF. | |
| D | 1.900 | 2.100 | 0.075 | 0.083 |
| E | 1.900 | 2.100 | 0.075 | 0.083 |
| D1 | 1.100 | 1.300 | 0.043 | 0.051 |
| E1 | 0.500 | 0.700 | 0.020 | 0.028 |
| k | 0.200MIN. | | 0.008MIN. | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| e | 0.500TYP. | | 0.020TYP. | |
| L | 0.250 | 0.450 | 0.010 | 0.018 |