Tiny Package Low Dropout Current Source

■ General Description

The LN9300 low-dropout bias supply for white LEDs is a high-performance alternative to the simple ballast resistors used in conventional white LED designs. The LN9300 uses a internal resistor to set the bias current for four LEDs, which are matched to 3%. The LN9300'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 LN9300 requires a 60mV dropout at a 20mA load on each output to match the LED brightness.

■ 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

■ Package

- SOT-23-6
- SOT-363

■ Applications

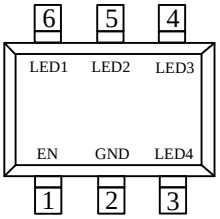
- Next-Generation Wireless Handsets
- PDAs, Palmtops, and Handy Terminals
- Digital Cameras, Camcorders
- Battery-Powered Equipment

■ Ordering Information

LN9300 ①②③④ **(Eg:** LN9300ASPR**)**

Item	Symbol	Function
①	A	LED current:20 mA
	B	LED current:15 mA
②	S	Denotes Package Type: SOT-23-6
	T	Denotes Package Type: SOT-363
③	N	Normal package
	P	Pb Free package
	G	Green package
④	R	Embossed Tape :Standard Feed
	L	Embossed Tape :Reverse Feed

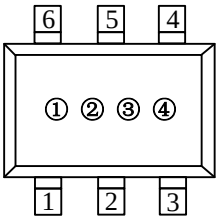
■ Pin Configuration



SOT-23-6L/SOT-363
(Top View)

Pin Number	Pin Name	Function
1	EN.	Chip Enable (Active High)
2	GND	Ground
3	LED4	LED4 Cathode Connection. Current flowing into LED4 is Constant. (20mA) LED4 is High Impedance when EN is Low.
4	LED3	LED3 Cathode Connection. Current flowing into LED3 is Constant. (20mA) LED3 is High Impedance when EN is Low.
5	LED2	LED2 Cathode Connection. Current flowing into LED2 is Constant. (20mA) LED2 is High Impedance when EN is Low.
6	LED1	LED1 Cathode Connection. Current flowing into LED1 is Constant. (20mA) LED1 is High Impedance when EN is Low.

■ Marking Rule

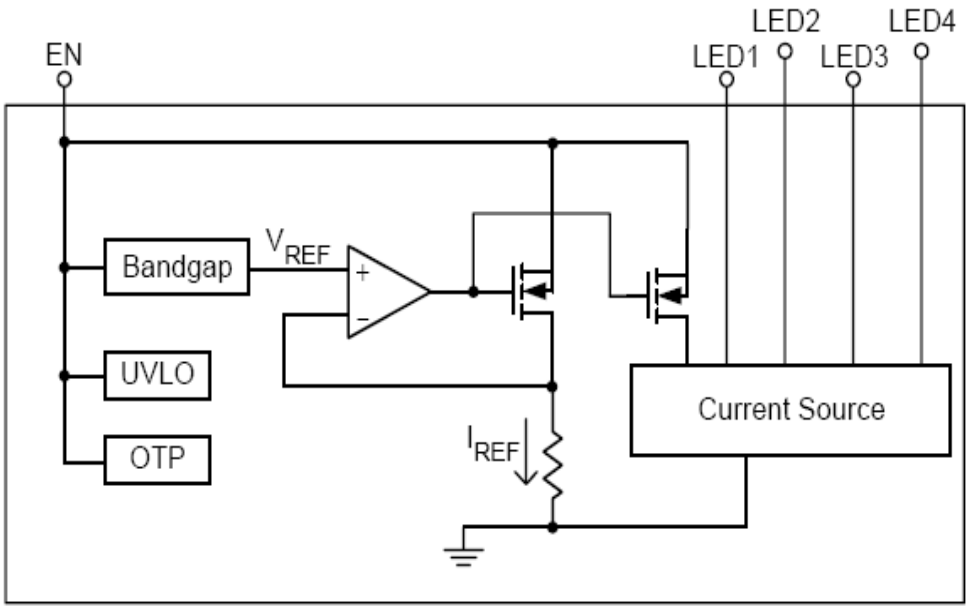


SOT-23-6L/SOT-363
(Top View)

eg：93A6

Mark	Representative Meanings	Common Character	
① ②	Product series	93	LN9300 series
③	current	A	20mA
		B	15mA
④	Product batch	0～9,A～Z （except G，I，J，O，Q，W）	Production batch, according to need to write or repetition

■ Function Block Diagram



■ Absolute Maximum Ratings

(Ta=25°C)

Item	Symbol		Absolute maximum ratings	Unit
VIN to GND	V_{IN}		GND-0.3～6	V
EN to GND	V_{EN}		GND-0.3～V_{IN}+0.3	V
LED1,LED2,LED3 to GND	V_{LED}		GND-0.3～GND+0.3	V
Power Dissipation	P_D	SOT-23-6	400	mW
Package Thermal Resistance	θ_{JA}	SOT-23-6	250	°C/W
Operating Temperature range	Topr		-40～＋85	℃
Junction Temperature	Tjun		0～＋125	
Storage Temperature range	Tstg		-65～＋150	
Reflow Temperature (soldering, 10sec)	Tref		260	
HBM (Human Body Mode)	ESD		4000	V
MM (Machine Mode)			200	

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.

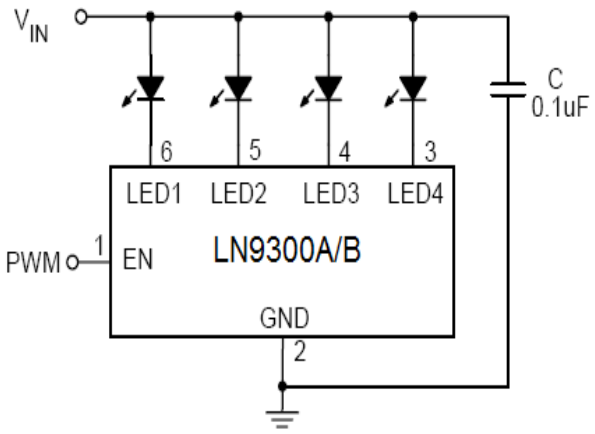
■ Electrical Characteristics

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

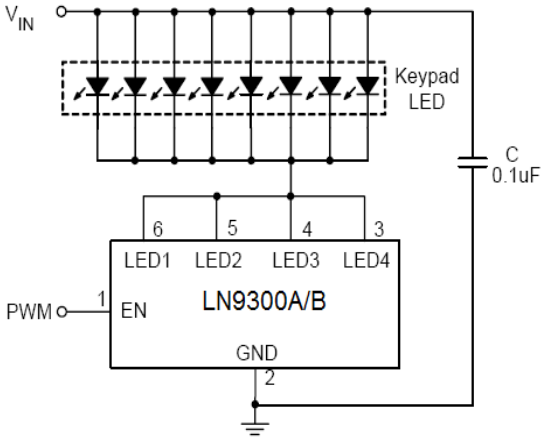
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Input Supply Voltage	V_{IN}		2.5		5.5	V
Undervoltage Lockout Threshold	V_{UVLO}		-	2.1	-	V
UVLO Hysteresis			-	100	-	V
LED Maximum Sink Current		MAX ILED	-	20	-	mA
Shutdown Current	I_{SHDN}	EN<0.4V	-	-	1	μA
Quiescent Current	I_Q		-	-	300	μA
initial current	I_{LED}		18	20	22	mA
LED Pin Voltage Dropout	$V_{LED-DROP}$	VLED(DROP), 90% Max ILED	-	60	-	mV
Current Matching				-	5	%
Thermal Shutdown Threshold				170		℃
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

■ Typical Application Circuit

- **Application circuit for backlight**

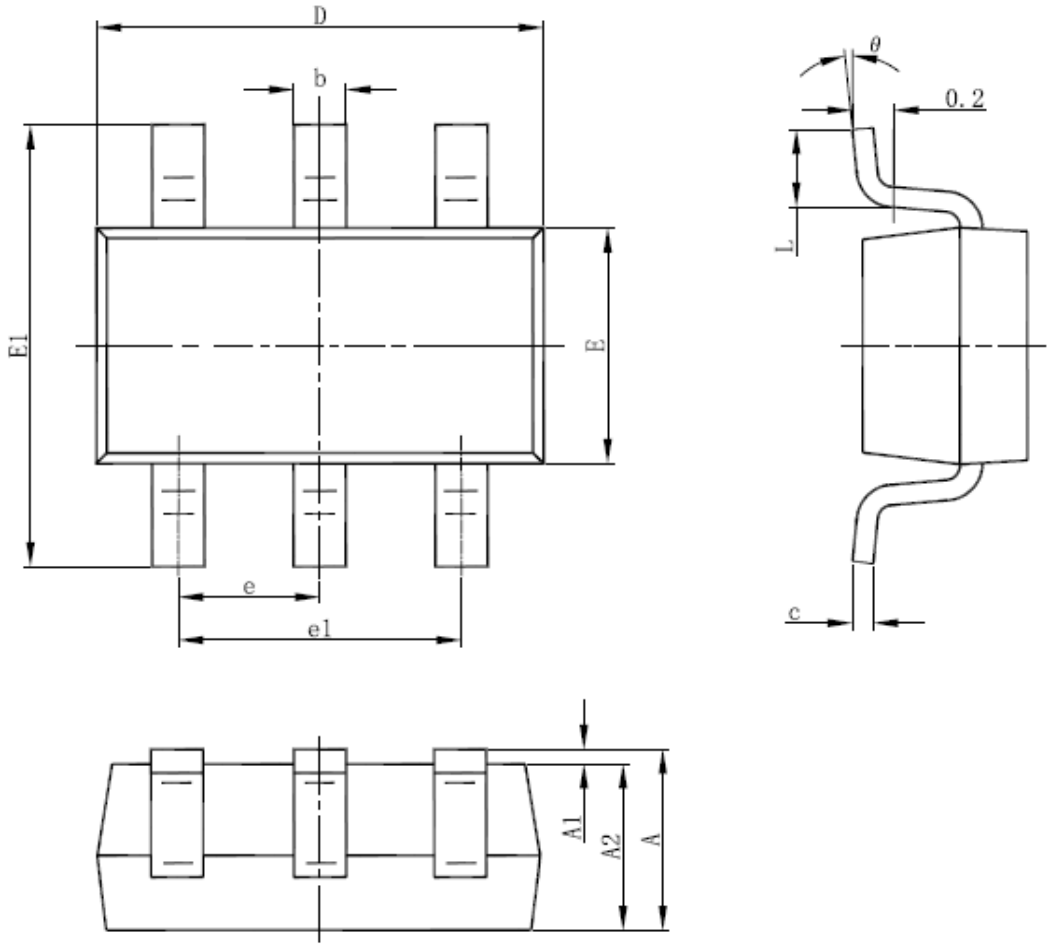


- **Application circuit for keypad**



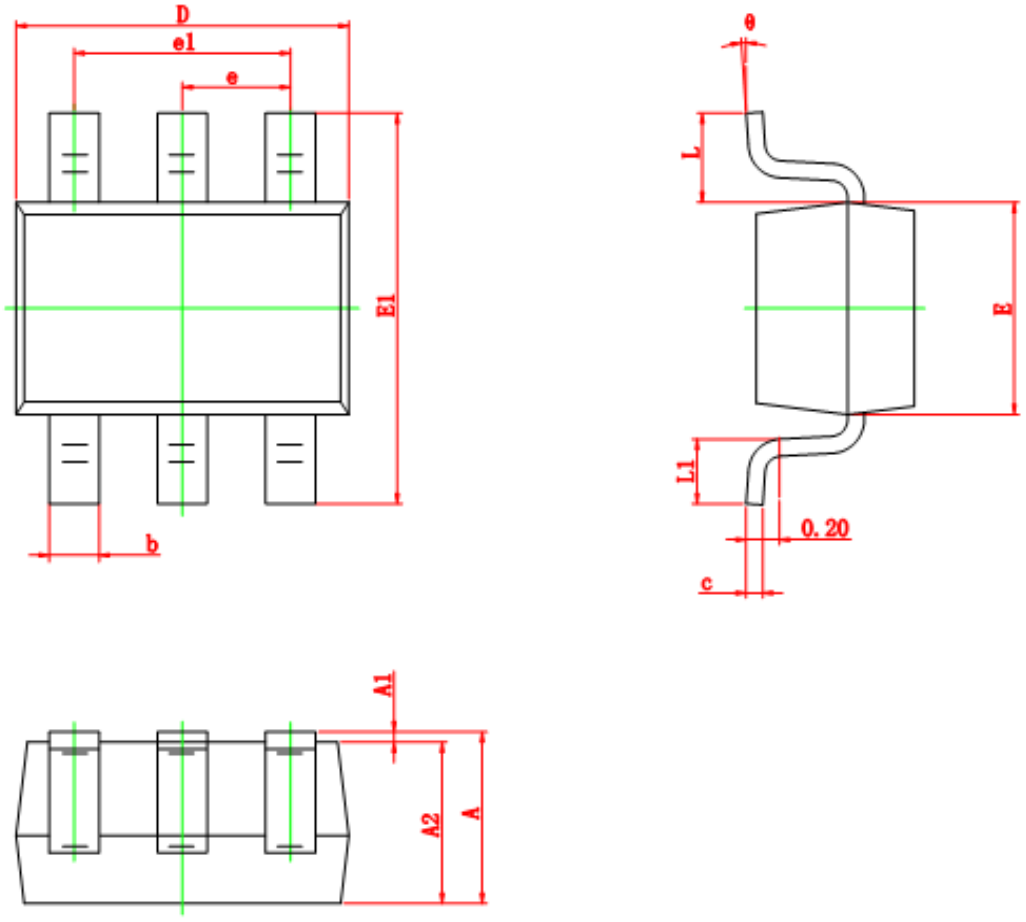
■ Package Information

- **SOT-23-6**



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	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

- **SOT-363**



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°