#### Low-Dropout, Constant-Current White LED Bias Supply

## FEATURES

- Up to 400mA LED Bias Current
- 3% LED Current Matching
- Simple LED Brightness Control
- Low 0.05uA Shutdown Current
- 2.7V to 5V Supply Voltage Range
- SOP-8 Package and Lead-free
- VSET Resistor Option :
  - T6316A : External Resistor
  - T6316B : 20, 85, 100, 125, 150, 175, 200, 250, 300 and 350mA Output Current Option by Internal Resistor
- Build in Thermat Protect 160 °C

### **GENERAL DESCRIPTION**

The T6316A/B low-dropout bias supply for white LEDs is a high-performance alternative to the simple ballast resistors used in conventional white LED designs. The T6316A uses a single resistor to set the bias current for four LEDs, which are matched to 3%. The T6316B build in internal resistor to set the bias current for four LED. The T6316A/B advantages over ballast resistors include significantly better LED to LED bias matching, much lower bias variation with supply voltage variation, significantly lower dropout voltage, in some applications, significantly and improved efficiency. T6316A/B The available in SOP-8 package and lead-free.

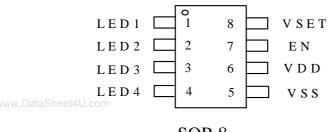
### Applications

- Portable Communication Devices
- Handheld Electronics
- LED/Display Back Light Driver
- Lightings

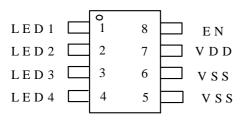
### PART NUMBER EXAMPLES

PART NO.	PACKAGE	Output Current	Vset resistor	
T6316A-D	SOP-8	-	External	
T6316A-DG	SOP-8 lead-free	-	External	
T6316B-20D	SOP-8	20mA	Internal	
T6316B-20DG	SOP-8 lead-free	20mA	Internal	
T6316B-75D	SOP-8	75mA	Internal	
T6316B-75DG	SOP-8 lead-free	75mA	Internal	
T6316B-350D	SOP-8	350mA	Internal	
T6316B-350DG	SOP-8 lead-free	350mA	Internal	

# PIN ARRANGEMENT(Top view)



SOP-8 T6316A-D



SOP-8 T6316B-D

### **PIN DESCRIPTION**

SYMBOL	T6316A	T6316B	DESCRIPTION
LED1	1	1	LED 1 Cathode Connection. Current flowing into LED1 is 270/250 times the current flowing into SET. LED1 is high impedance when EN is low.
LED2	2	2	LED 2 Cathode Connection. Current flowing into LED1 is 270/250 times the current flowing into SET. LED2 is high impedance when EN is low.
LED3	3	3	LED 3 Cathode Connection. Current flowing into LED1 is 270/250 times the current flowing into SET. LED3 is high impedance when EN is low.
LED4			LED 4 Cathode Connection. Current flowing into LED1 is 270/250 times the current flowing into SET. LED4 is high impedance when EN is low.
VSS	5	5,6 Ground	
VDD	6	7	Power supply
EN	7	8	Enables PN6316A/B signal, H: Ative, L: Power Down.
VSET	8	-	VSET terminal is used to connect an external resistor to set output current. The current flowing into VSET sets the bias current into each LED by ILED_= 250 x ISET. VSET is internally biased to 0.306V. VSET is high impedance when EN is low.

# ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Voltage on any pin relative to GND	VIN	-0.3 to 6	V
Operating Temperature Rang	T <sub>A</sub>	-40 to +85	°C
Maximum Soldering Temperature (at leads, 10 sec)	T <sub>LEAD</sub>	300	°C
Storage Temperature Rang	T <sub>S</sub>	-65 to +150	°C
Continuous Power Dissipation ( $T_A = +70^{\circ}C$ )		1	W

### **Electrical Characteristics**

 $(TA = -40 \text{ to } 85^{\circ}\text{C} \text{ unless otherwise noted. Typical values are at TA = <math>25^{\circ}\text{C}$ ,

VEN =3.3V, VLED1 = VLED2= VLED3= VLED4= 1V)

Symbol	Description	Conditions			Typ.	Max	Unit
VEN	Operating voltage range	EN is power supply input	2.7		5	V	
ISET	SET input current range				1400	1600	uA
Isetr	SET to LED current ratio	Iled / Iset, Iset=400uA	T6316A		270		A/A
			T6316B		250		
VSET	SET bias voltage	Iser=400uA, no loading			0.306		V
Ісм	LED to LED current matching	ISET=400uA, 100mA loading			3		%
Iled	Maximum LED sink current	Each LED			350	400	mA
Ilsd	LED leakage current in shutdown	VLED1=VLED2=VLED3=VLED4= 3.3V, EN=GND, TA=+25°C, each LED			0.01	1	uA
Vih	Input high voltage	VEN >VIH for enable, VDD=5V					V
VIL	Input low voltage	VEN <vil disable,="" for="" vdd="5V&lt;/td"><td></td><td>0.8</td><td>V</td></vil>				0.8	V
T <sub>TP</sub>	Thermat Protect				160		°C

### **Functional Description**

The T6316A/B provides constant current bias supply for white LED designs. The T6316A uses a single resistor to set the bias current for up to four LEDs. LED bias currents are matched to 3%. The T6316B build in internal resistor to set the bias current for four LED. The T6316A/B offers several advantages over using ballast resistors, such as improved LED to LED brightness matching, lower bias variation with supply voltage changes, significantly lower dropout voltage. and in some applications, significantly improved efficiency.

#### **Enable Input**

EN powers the input of the T6316A/B. Drive EN high (> 2.0V) to enable the device; drive EN low (< 0.8V) to disable the device. Driving EN low forces LED1, LED2, LED3, LED4 and SET into a high-impedance state.

### Setting the Output Current

SET controls the LED bias current. Current flowing into LED1, LED2, LED3 and LED4 is 270/250 times greater than the current flowing

into SET. Set the output current as follows:

#### T6316A

ILED = 270 (0.306V / RSET)

#### T6316B

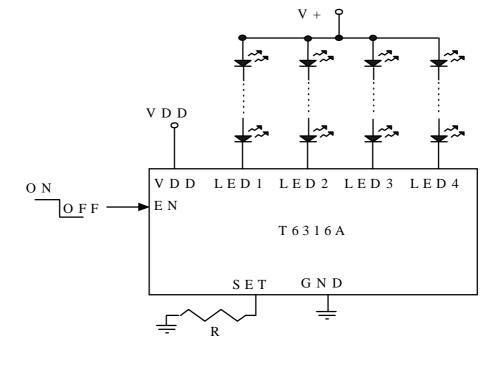
ILED = 250 (0.306V / RSET)

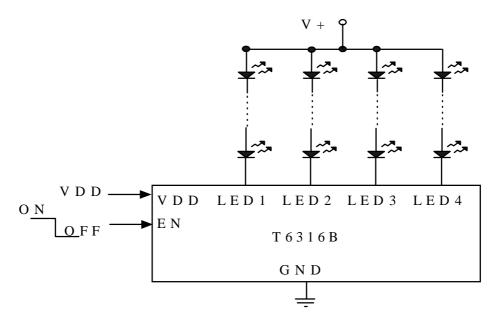
### **Applications Information**

Very Low-Cost, High-Efficiency Solution . A battery (single Li+ or three NiMH cells) powers the LEDs directly. This is the least expensive and most efficient architecture. Due to the high forward voltage of white LEDs, the LED brightness may dim slightly at the end of battery life. The T6316A/B current regulating architecture and low dropout greatly minimize this effect compared to using simple ballast resistors. The enable function of the T6316A/B turns on and off the LEDs.

# TYPICAL APPLICATION CIRCUITS

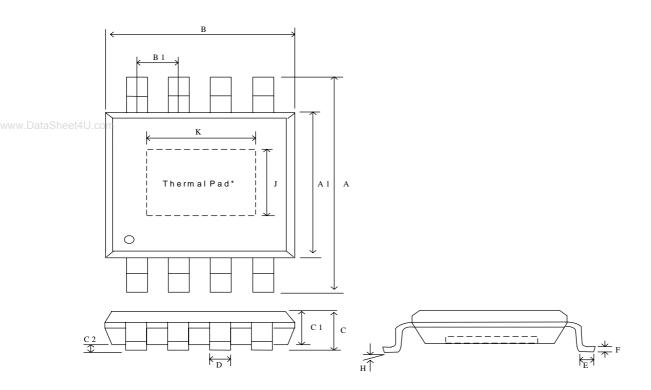






Very low-cost, high-efficiency solution

# PACKAGE DIMENSIONS 8-LEAD SOP



Symbol	Dimension in mm			Dimension in inch			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
А	5.70	6.00	6.30	0.224	0.236	0.248	
A1	3.75	3.95	4.10	0.148	0.156	0.164	
В	-	-	5.13	-	-	0.202	
B1	-	1.27	-	-	0.050	-	
С	-	-	1.80	-	-	0.071	
C1	1.35	1.55	1.75	0.052	0.061	0.069	
C2	0.10	-	0.25	0.001	-	0.004	
D	0.31	0.41	0.51	0.012	0.016	0.020	
Е	0.30	0.50	0.70	0.012	0.020	0.028	
F	0.10	0.15	0.25	0.004	0.006	0.010	
J		2.23 REF			0.088 REF		
K		2.97 REF			0.117 REF		
Н		0~8°			0~8°		

#### \*Note :

The thermal pad on the IC's bottom has to be mounted on the copper foil.

To eliminate the noise influence, the thermal pad is suggested to be connected to GND on PCB. In addition, desired thermal conductivity will be improved, if a heat-conducting copper foil on PCB is soldered with thermal pad. The thermal pad enhances the power dissipation. As a result, a large amount of current can be sunk safely in one package.