

**Bipolar white LED flash driver IC**  
**バイポーラ白色LEDフラッシュドライバIC**

**TK11893AM8**  
**(HSON3030B-10)**
**DESCRIPTION**

The TK11893AM8 type is a step-up DC-DC converter designed for camera lights of mobile phones and portable equipment, using constant frequency PWM architecture, with the following built in: current regulator up to 0.8A, a very high current switching transistor (2.0A peak), a very high speed oscillator (2.0MHz), a switch over current detector, a low voltage reference depended on LED current, a PWM comparator, open-circuit protection and ON/OFF control.

The TK11893AM8 can drive one or two high current white LEDs in series in a high power Flash mode or a low power Torch mode using the CONT pin. The ON/OFF control is built-in and the circuit current can be decreased when the EN pin is low (shutdown mode). During shutdown, the LEDs are disconnected from the input to avoid leakage current path to GND.

The device operates with 2.0MHz fixed switching frequency to allow for the use of small external components.

The operating supply voltage range is 2.5V~6.0V. The white LEDs are connected in series and driven at a constant current, resulting in uniform brightness and high efficiency. The built-in zener diode can be used for open-circuit protection in case the output load is disconnected, such as the string of LEDs opened. The internal Open-circuit protection reduces the external component count.

The TK11893AM8 is available in the HSON3030B-10 surface mount package.

TK11893AM8は携帯電話やポータブル機器のカメラライト用に開発された昇圧型DC-DCコンバータICです。

**FEATURES**

- Can drive 2 high current LEDs in series
- Independently set flash/torch currents and shutdown
- High frequency 2.0MHz PWM operation.
- Built-in current regulator
- LED disconnect during shutdown
- Over voltage protection (OVP)
- Wide operating voltage range (2.5 to 6.0V)
- Uses small inductor
- Internal switching transistor (Max. 2.0A)
- Small outline non-leaded package HSON3030B-10
- 直列2灯を大電流駆動可能
- 独立したフラッシュ/トーチ電流とシャットダウン
- 高周波2MHz動作
- 電流レギュレータ内蔵
- シャットダウン中はLED非接続
- OVP機能
- 広い動作電圧範囲 2.5~6.0V
- 小型インダクタ使用可能
- スイッチングトランジスタ内蔵 (最大2.0A)
- 小型ノンリードパッケージHSON3030B-10

**ABSOLUTE MAXIMUM RATINGS**

Parameter	項目	Symbol	Rating	定格	Unit	Remarks	備考
Operating voltage range	動作電圧範囲	V <sub>OP</sub>	2.5 to 6.0		V		
Operating temperature range	動作温度範囲	T <sub>OP</sub>	-30 to +85		°C		
Power dissipation	許容消費電力	P <sub>D</sub>	1000		mW		
Operating frequency range	動作周波数範囲	f <sub>OP</sub>	2		MHz		

**ELECTRICAL CHARACTERISTICS**

V<sub>IN</sub>=3V, T<sub>A</sub>=25°C (unless otherwise noted)

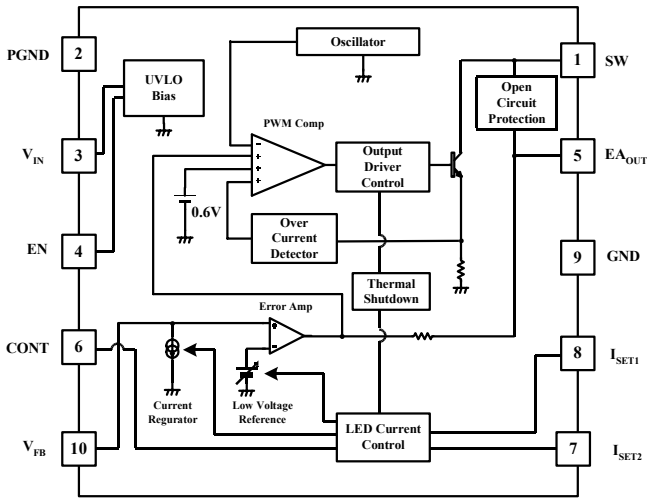
Parameter	項目	Symbol	Min.	Typ.	Max.	Unit	Remarks	備考
<b>Oscillator section</b>								
Operating frequency		f	1.6	2.0	2.4	MHz		
<b>LED current setting section 1 (I<sub>SET1</sub> Pin)</b>								
ISET1 pin voltage 1_50		V <sub>SET1-50</sub>	-	495	-	mV	I <sub>SET1</sub> =-50μA, V <sub>FB</sub> =1.0V	
LED current ratio 1_50(I <sub>LED-50</sub> /I <sub>SET1-50</sub> )		$\alpha_{1-50} = I_{LED-50} / I_{SET1-50}$	-	3970	-	-		
LED current set value 1_50 *NOTE1		$\alpha_{1-50} V_{SET1-50}$	1838	1965	2092	(V)		
ISET1 pin voltage 1_160		V <sub>SET1-160</sub>	-	452	-	mV	I <sub>SET1</sub> =-160μA, V <sub>FB</sub> =1.0V	
LED current ratio 1_160(I <sub>LED-160</sub> /I <sub>SET1-160</sub> )		$\alpha_{1-160} = I_{LED-160} / I_{SET1-160}$	-	3142	-	-		
LED current set value 1_160 *NOTE1		$\alpha_{1-160} V_{SET1-160}$	1328	1420	1512	(V)		
<b>LED current setting section 2 (ISET2 Pin)</b>								
ISET2 pin voltage 2_50		V <sub>SET2-50</sub>	-	495	-	mV	I <sub>SET2</sub> =-50μA, V <sub>FB</sub> =1.0V	
LED current ratio 2_50 (I <sub>LED-50</sub> /I <sub>SET2-50</sub> )		$\alpha_{2-50} = I_{LED-50} / I_{SET2-50}$	-	3970	-	-		
LED current set value 2_50 *NOTE1		$\alpha_{2-50} V_{SET2-50}$	1838	1965	2092	(V)		
ISET2 Pin Voltage 2_160		V <sub>SET2-160</sub>	-	452	-	mV	I <sub>SET2</sub> =-160μA, V <sub>FB</sub> =1.0V	
LED current ratio 2_160 (I <sub>LED-160</sub> /I <sub>SET2-160</sub> )		$\alpha_{2-160} = I_{LED-160} / I_{SET2-160}$	-	3142	-	-		
LED Current Set Value 2_160 *NOTE1		$\alpha_{2-160} V_{SET2-160}$	1328	1420	1512	(V)		
<b>Dead time control section</b>								
Maximum duty cycle		D <sub>MAX</sub>	76	83	95	%	V <sub>FB</sub> =0V	
<b>CONT section (CONT pin)</b>								
Input voltage +		V <sub>CONT,HIGH</sub>	1.2	-	19	V		
Input voltage -		V <sub>CONT,LOW</sub>	0	-	0.3	V		
Input bias current		I <sub>CONTIN</sub>	-	25	50	μA	V <sub>CONT</sub> =3V	
<b>Shutdown section (EN pin)</b>								
Input voltage +		V <sub>EN,HIGH</sub>	1.2	-	19	V	On mode	
Input voltage -		V <sub>EN,LOW</sub>	0	-	0.3	V	Shutdown mode	
Input bias current		I <sub>ENIN</sub>	-	25	50	μA	V <sub>EN</sub> =3V	
<b>Output switch section (SW pin)</b>								
Switch current limit		I <sub>SW,LIMIT</sub>	2.0	2.9	-	A		
Switch saturation voltage 1		V <sub>SW,SAT1</sub>	-	0.05	0.20	V	I <sub>SW</sub> =200mA	
Switch saturation voltage 2		V <sub>SW,SAT2</sub>	-	0.13	0.50	V	I <sub>SW</sub> =500mA	
Switch leakage current		I <sub>SW,OFF</sub>	-	0.10	2.0	μA	V <sub>FB</sub> =1V, V <sub>SW</sub> =10V	
<b>Open circuit protection section</b>								
OVP voltage		V <sub>OVP</sub>	11.6	13.6	15.6	V	V <sub>FB</sub> =open *NOTE2	
<b>Error amplifier section (VFB1 pin,EA<sub>OUT</sub> pin)</b>								
Threshold voltage 1		V <sub>EA1</sub>	191	225	259	mV	I <sub>SET</sub> =-50μA	
Threshold voltage 2		V <sub>EA2</sub>	365	430	495	mV	I <sub>SET</sub> =-160μA	
<b>V<sub>IN</sub> section (VIN Pin)</b>								
Low voltage stop		V <sub>IN,LOW</sub>	2.00	2.20	2.50			
Quiescent supply current		I <sub>IN,ON</sub>	8.0	11.4	15.0	mA	V <sub>FB</sub> =1V, no load	
Shutdown supply current		I <sub>IN,OFF</sub>	-	0.01	1.0	μA	V <sub>EN</sub> =0V	

\*NOTE 1: Output LED current is calculated by "LED Current Set Value" and program resistor R<sub>SET</sub> that is connected from ISET pin to GND.

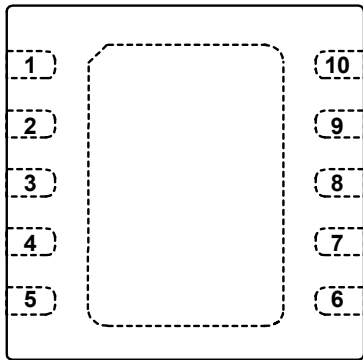
$$I_{LED} = \alpha V_{SET} / R_{SET}$$

\*NOTE 2: Open-Circuit Voltage (OVP) is a measurement value by "9-2. Test Circuit".  
(The other characteristics are measurement value by "9-1. Test Circuit".)

**BLOCK DIAGRAM**

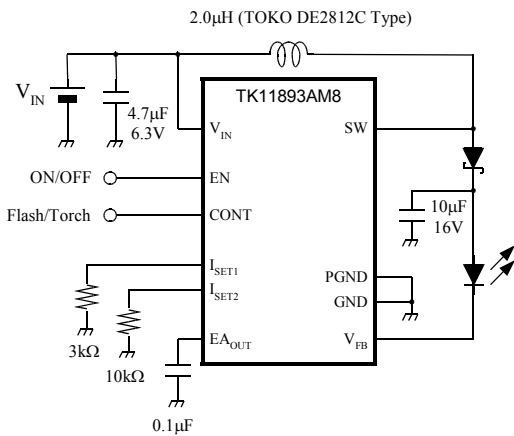


**PIN DESCRIPTION**



Pin no.		
#1	SW	Switch pin (Connect SW to inductor and diode)
#2	PGND	Power ground
#3	VIN	Power supply voltage input
#4	EN	Enable (on/off) input
#5	EAOUT	Error amplifier output
#6	CONT	Flash/torch control Input
#7	ISET2	LED current program pin
#8	ISET1	LED current program p
#9	GND	Ground
#10	VFB	Current regulator output and boost converter feedback pin (Connect VFB to the cathode of LED)

**APPLICATION**



\* Efficiency (%) =  $\frac{V_{OUT} \cdot I_{LED}}{V_{IN} \cdot I_{IN}} \times 100$

\* LED Efficiency (%) =  $\frac{V_{LED} \cdot I_{LED}}{V_{IN} \cdot I_{IN}} \times 100$

