



Step-up DC-DC converter 昇圧型DC-DCコンバータIC

**TK11880FTL-G
(SON3024-8)**

DESCRIPTION

The TK11880FTL-G is a step-up DC-DC converter designed for White LED driver applications, using constant frequency PWM architecture, with the following built in: a very high current switching transistor (0.6A peak), a high speed oscillator (1.0MHz), a switch over current detector, a low voltage reference ($V_{Ref}=0.495V$), an error amplifier, a PWM comparator, a zener diode for open-circuit protection and ON/OFF control.

TK11880FTL-G can drive up to six White LEDs in series. This IC works with a very wide operation supply range (2.65V~10V) and the adjustable output voltage can be set as high as 24.5V. The white LEDs are connected in series and driven at a constant current, resulting in uniform brightness and high efficiency. The reference voltage is a very low 0.495V, achieving high efficiency operation with the constant current output. The ON/OFF control is built-in and the circuit current can be decreased when the EN pin is low (shutdown mode). 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 zener diode reduces the external component count.

The TK11880FTL-G can also be used in other applications as a step-up DC-DC converter.

The TK11880FTL-G is available in the SON3024-8 surface mount package.

TK11880FTL-Gは白色LEDをドライブするために開発した、PWM方式昇圧型DC-DCコンバータICです。直列に接続された最大6個の白色LEDをドライブ出来ます。白色LED直列接続、定電流駆動構成で、輝度ムラが少なく、高効率で動作します。基準電圧は0.5Vと低く、定電流出力で高効率です。その他、一般的な昇圧型DC-DCコンバータとしても使用可能です。

FEATURES

- Very wide operating voltage range (2.65 to 10V)
- 1.0MHz operation
- Internal switching transistor
- Maximum duty cycle 93%
- 24.5V_{MAX} output
- Very small inductor available
- Very small package SON3024-8
- 動作電圧範囲 2.65 to 10V
- 動作周波数 1MHz
- スイッチングトランジスタ内蔵
- 最大デューティーサイクル 93%
- 最大出力電圧24.5V
- 小型コイル使用可能
- 0.75mm薄型パッケージSON3024-8

ABSOLUTE MAXIMUM RATINGS

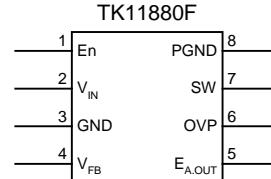
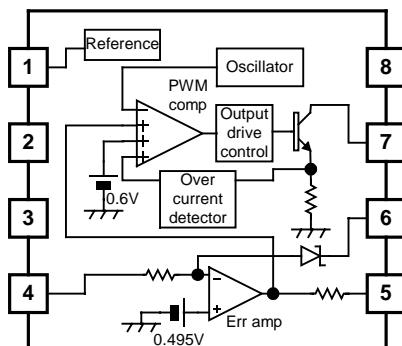
| Parameter | 項目 | Symbol 記号 | Rating | 定格 | Unit | 単位 | Remarks | 備考 |
|-----------------------------|---------|-----------|--------------|----|------|----|----------------------|----|
| Operating voltage range | 動作電圧範囲 | V_{OP} | 2.65 to 10.0 | | V | | | |
| Operating temperature range | 動作温度範囲 | T_{OP} | -30 to +85 | | °C | | | |
| Power dissipation | 許容消費電力 | P_D | 600 | | mW | | *Board mounted 基板実装時 | |
| Operating frequency range | 動作周波数範囲 | f_{OP} | 1.0 | | MHz | | | |

ELECTRICAL CHARACTERISTICS

| $V_{IN}=3V, T_A=25^\circ C$ | | | | | | | | | |
|--|--|-----------|-------|------|------|------|----|------------|----|
| Parameter | 項目 | Symbol 記号 | Value | | | Unit | 単位 | Conditions | 条件 |
| | | | MIN. | TYP. | MAX. | | | | |
| Oscillator section 発振器部 | | | | | | | | | |
| Operating frequency | 動作周波数 | f | 0.7 | 1.0 | 1.3 | MHz | | | |
| Error amplifier section (V_{fb} pin, $E_{a_{out}}$ pin) | エラーアンプ部 (V_{FB} 端子, $E_{A_{OUT}}$ 端子) | | | | | | | | |

$V_{IN}=3V, T_A=25^\circ C$

| Parameter | 項目Symbol 記号 | Value | | | Unit | 単位 | Conditions | 条件 |
|---|----------------------|---------------------|------|------|------|---------|---------------------------|----|
| | | MIN. | TYP. | MAX. | | | | |
| Threshold voltage | スレッショルド電圧 | V_{EA} | 475 | 495 | 515 | mV | | |
| Input bias current | V_{FB} 端子入力電流 | $I_{EA,IN}$ | -1.0 | -0.2 | 1.0 | μA | $V_{FB}=0V$ | |
| Voltage gain | 電圧利得 | A_V | - | 40 | - | dB | | |
| Gain band width | 周波数帯域幅 | GBW | - | 2 | - | MHz | $A_V=0dB$ | |
| Output high voltage | 出力ハイ電圧 | $V_{EA,OUT,HIGH}$ | 0.78 | 0.87 | - | V | $V_{FB}=0V$ | |
| Output low voltage | 出力ロー電圧 | $V_{EA,OUT,LOW}$ | - | 0.05 | 0.2 | V | $V_{FB}=1.0V$ | |
| Output source current | 出力ソース電流 | $I_{EA,OUT,SOURCE}$ | - | -36 | -21 | μA | $V_{EA,OUT}=0.45V$ | |
| Output sink current | 出力シンク電流 | $I_{EA,OUT,SINK}$ | 21 | 36 | - | μA | $V_{EA,OUT}=0.45V$ | |
| Dead time control section | 休止期間調整部 | | | | | | | |
| Maximum duty cycle | 最大デューティサイクル | D_{MAX} | 88 | 93 | - | % | $V_{FB}=0V$ | |
| Shutdown section (En pin) | シャットダウン部 (EN 端子) | | | | | | | |
| En input voltage + | EN端子入力ハイ電圧 | $V_{EN,HIGH}$ | 1.2 | - | 20 | V | On mode | |
| En input voltage - | EN端子入力ロー電圧 | $V_{EN,LOW}$ | 0 | - | 0.3 | V | Shutdown mode | |
| En pin input bias current | EN端子入力電流 | $I_{EN,IN}$ | - | 25 | 55 | μA | $V_{EN}=3V$ | |
| Output switch section (Sw pin) | 出力部 (SW 端子) | | | | | | | |
| Switch current limit | スイッチ制限電流 | $I_{SW,LIMIT}$ | 0.6 | 1.3 | 1.8 | A | | |
| Switch saturation voltage | スイッチ飽和電圧 | $V_{SW,SAT}$ | - | 0.12 | 0.2 | V | $I_{SW}=200mA$ | |
| Switch leakage current | スイッチオフ時リーク電流 | $I_{SW,OFF}$ | - | 0.01 | 2.0 | μA | $V_{FB}=1V, V_{SW}=24.5V$ | |
| Open-circuit protection section (OVP pin) | LEDオープン保護回路 (OVP 端子) | | | | | | | |
| Open-circuit voltage | OVP端子電圧 | V_{OVP} | 25.0 | 26.6 | 28.6 | V | $I_z=0.6mA$ | |
| V_{in} section (v_{in} pin) | 電源電圧部 (V_{IN} 端子) | | | | | | | |
| Low voltage stop | 低入力停止電圧 | $V_{IN,LOW}$ | 2.20 | 2.45 | 2.65 | V | | |
| Quiescent supply current | 静止動作消費電流 | $I_{IN,ON}$ | 2.4 | 3.9 | 5.4 | mA | $V_{FB}=1V$ | |
| Shutdown supply current | シャットダウン消費電流 | $I_{IN,OFF}$ | - | 0.01 | 1.0 | μA | $V_{EN}=0V$ | |

BLOCK DIAGRAM**6 W-LEDs DRIVER APPLICATION**

■ Designed Performance

| Parameter | Value |
|-----------------------|---|
| Input Voltage | $V_{IN}=3.0$ to $9.0V$ |
| LED Current | $I_{LED}=20mA$ |
| Oscillation Frequency | 1.0MHz |
| Inductor Peak Current | 300mA |
| Coil (TOKO) | Type DB318C 15 μH A997AS-150M Type D52LC 10 μH A914BYW-100M |

