Data Sheet

BIT3251

Low Cost PWM Controller

Version: 0.02

Please read the notice stated in this preamble carefully before accessing any contents of the document attached.

Admission of BiTEK's statement therein is presumed once the document is released to the receiver.

BIT3251

Features:

- Voltage Mode PWM Controller
- Low 0.2V reference Voltage
- 330KHz Operation
- Over Voltage Protection
- Internal Soft-Start
- Internal UVLO (Under Voltage Lock Out)
- Limited Output Duty Cycle
- Low Shutdown current (0.1uA)
- CMOS Totem Pole Output
- SOP-8 Package

General Description:

The BIT3251 is a high frequency PWM controller integrates required functions for boost conversion in a small SOP-8 package. A low 0.2V feedback voltage and over voltage protection make the BIT3251 be an ideal controller for LED backlight supplies. CMOS process greatly reduces the operating current when comparing to similar products.

Pin Layout:

VDD	1	8	OUT
EA			GND
CMP			NC
INN-	4	5	OVP

Absolute Ratings: (if Ta=25℃)

VDD……………………… ... ………….-0.3 ~ +8 V
GND……………… .. …………………±0.3 V
Input Voltage………….… …… . ……..-0.3 ~ VDD+0.3 V   ***
Operating Ambit Temperature………… .0 ~ 70 ℃
Extreme Operating Ambient Temp……-40 ~ 85 ℃
Operating Junction Temperature… . … .+150 ℃
Storage Temperature…….……… .. ……. -55~ 150 ℃

Recommended Operating Condition:

Supply Voltage……………….……….… .4~ 8 V

Functional Block Diagram:
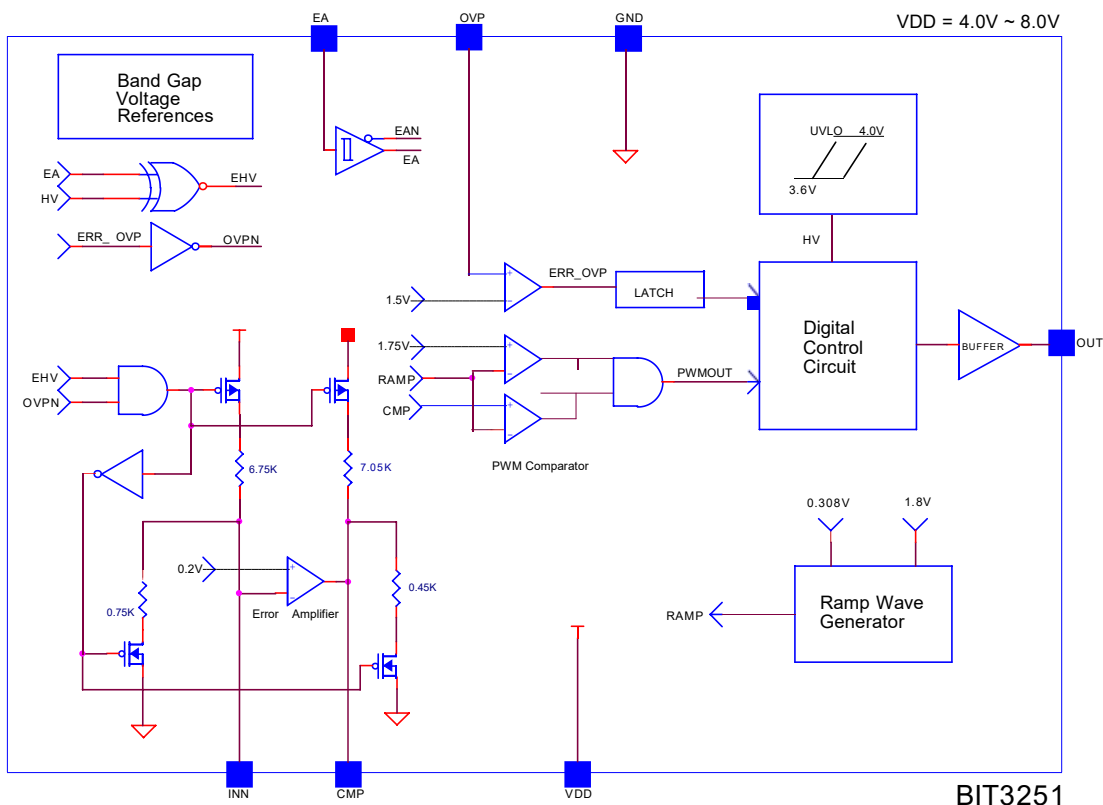
*** For Extreme Operating Ambient Temperature, the supply voltage should be limited.   The recommended voltage range is from 4.5V to 7.5V.

Pin Description:

Pin No.	Names	Description
1	VDD	Supply voltage input.
2	EA	Enable Control Pin
3	CMP	The output of the error amplifier. CMP is force to low when VDD < 3.6V.
4	INN	PWM controller input, the inverting input of error amplifier. INN is pulled high to reduce the CMP when VDD < 3.6V
5	OVP	Over Voltage detection pin
6	NC	No Connection
7	GND	Ground
8	OUT	Output pin

Function Description:

The PWM Controller: The pulse width modulation control circuit includes a ramp wave generator, an error amplifier and a comparator. These devices provide the required active components for the PWM feedback control application. The inverting input of the error amplifier is pulled high to reduce its output CMP when VDD<3.6V. The maximum duty cycle of the PWM controller is limited to 93%

The Over Voltage Protection: The converter output voltage will boost too high when the LEDs are disconnected from the circuit or fail open. The BIT3251 will latch off the output if the OVP pin senses a voltage that is larger than 1.5V. The latched off status can be reset by reducing the supply voltage to lower than 3.6V.

UVLO: The Under-Voltage-Lock-Out circuit turns the output driver off when supplying voltage drops to less than 3.6V

Enable Control: When V(EA) is $\geqq$ 1.2V, the BIT3251 is enabled. When V(EA) is $\leqq$ 0.8V, the BIT3251 enter into shutdown mode operation. The BIT3251 has an internal 80K$\pm$15% ohm pull low resistor on the EA pin, thus the device is normally in the OFF state or shutdown mode operation.

Initial Setting: System will have a fast transition response by setting a suitably initial voltage. The BIT3251 will set an initial voltage of Vinn and Vcmp under below conditions.

Table 1. Initial setting Voltage

Voltage Setting(@5V)	V_{EA}	VDD	V_{OVP}
V_{INN}=0.68V, V_{CMP}=0.53V	V_{EA} > 1.2V	VDD < 3.6V	V_{OVP} < 1.5V
V_{INN}=0.68V, V_{CMP}=0.53V	V_{EA} < 0.8V	VDD > 4.0V	V_{OVP} < 1.5V
V_{INN}=0.68V, V_{CMP}=0.53V	V_{EA} > 1.2V	VDD > 4.0V	V_{OVP} > 1.5V

Setting Equation：

$$V_{INN} = 0.68V + 0.12V*(VDD-5) \qquad (1)$$
$$V_{CMP} = 0.53V + 0.08V*(VDD-5) \qquad (2)$$

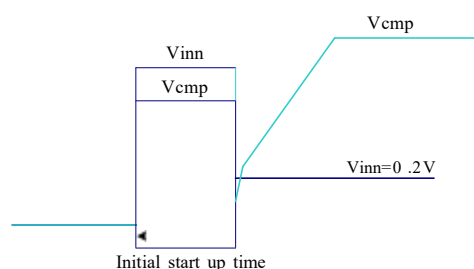Figure 1. Initial transition response
(VDD=5V, V_{INN} =0.68V, V_{CMP} =0.53V)

DC/AC Characteristics:

Parameter	Test Conditions	Min.	Typ.(Limits)	Max.	Unit
Reference Voltage					
Output voltage	Measured with shorted INN CMP pins VDD=5V, Ta=25°C	0.194	0.2	0.206	V
Line regulation	VDD=4 ~ 8V, Ta=25°C		2	20	mV
Under Voltage Look Out					
Upper threshold voltage	Ta=25°C	3.6	3.8	4.0	V
Hysteresis	Note2	0.1	0.2	0.3	V
Ramp Wave Generator					
Frequency		300	330	360	KHz
Output peak (Internal)	Note 1	1.7	1.8	1.9	V
Output valley (Internal)		0.25	0.308	0.35	V
Error Amplifier					
Open loop gain	Note 1	60	80		dB
Unit gain band width		1	1.5		MHz
Over Voltage Protection					
OVP threshold voltage	VDD=5V, Ta=25°C	1.45	1.55	1.65	V
Enable Control					
Turn on Threshold	VDD=5V, Note 1	1.2			V
Turn off Threshold				0.8	V
Output					
CMOS output impedance	Note 1, Note 2		50		Ω
Maximum Duty Cycle	VDD=5V, Ta=25°C, 330KHz.	90	93	95	%
Rising Time	VDD=5V, 1000pF load, Note 1, Note 2		65.5		ns
Falling Time			88.5		ns

Ta: ambient temperature.

Note 1. Only guaranteed by simulation or sampled evaluation during –40~+85°C. Not 100% tested.

Note 2. The voltages of the output drivers are pulled to GND in each off states.

Order Information:

BIT3251 SO

SO: SOP

Part number

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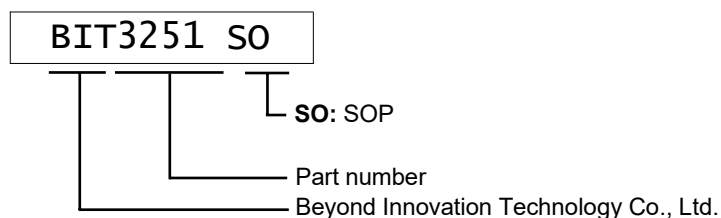
Soldering Information

Reflow Soldering:

The choice of heating method may be influenced by plastic QFP package). If infrared or vapor phase heating is used and the package is not absolutely dry (less than 0.1% moisture content by weight), vaporization of the small amount of moisture in them can cause cracking of the plastic body. Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stenciling or pressure-syringe dispensing before package placement. Several methods exist for reflowing; for example, convection or convection/infrared heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method.

Typical reflow peak temperatures range from 215 to 270 °C depending on solder paste material. The top-surface temperature of the packages should preferable be kept below 245 °C for thick/large packages (packages with a thickness $\geqq$ 2.5 mm or with a volume $\geqq$ 350 mm^3 so called thick/large packages). The top-surface temperature of the packages should preferable be kept below 260 °C for thin/small packages (packages with a thickness < 2.5 mm and a volume < 350 mm^3 so called thin/small packages).

Stage	Condition	Duration
1'st Ram Up Rate	max3.0+/-2℃/sec	-
Preheat	150℃~200℃	60~180 sec
2'nd Ram Up	max3.0+/-2℃/sec	-
Solder Joint	217℃ above	60~150 sec
Peak Temp	260 +0/-5℃	20~40 sec
Ram Down rate	6℃/sec max	-
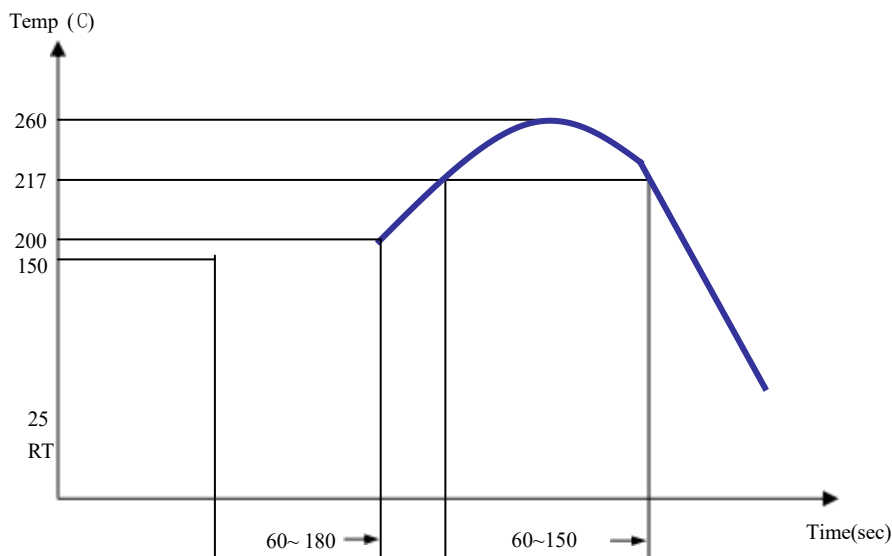
Wave Soldering:

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems.

Manual Soldering:

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

Package   Information   :

Unit: mm

SOP type :

D1 4.87 +0.08 −0.05

8

PIN#1
IDENT

E1 3.86 +0.10 −0.08

E 5.99±0.15

1

e   1.27 BASIC

b1
0.35/0.40/0.45 ── BASE METAL

c 0.18/0.25

c1 0.18/0.20/0.23

WITH PLATING ──
b 0.35/0.50

SECTION "C"−"C"

SEATING
PLANE

0.089 −C−

DETAIL A

"C"
"C"

A   1.60±0.13

1.05 REF.   0.375x45°

0° MIN.

A1 0.16±0.06

A2 1.61±0.11

0~5°

0.700±0.15   L

GAGE PLANE
0.25