Structure Silicon Monolithic Integrated Circuit

Product Name Compound LED Driver for cellular phone

Type **BD6091GU**

Features Boost DC/DC for LED back lighting
Constant current driver for LED back lighting
Auto Luminous Control (ALC)

●Absolute Maximum Ratings（Ta=25℃）

Parameter	Symbol	Limits	Unit	Pins
Maximum voltage 1	VMAX1	7	V	except for VLED, VOUT, SW
Maximum voltage 2	VMAX2	15	V	VLED
Maximum voltage 3	VMAX3	32.6	V	VOUT, SW
Power Dissipation	Pd	1250	mW	
Operating Temperature Range	Topr	-40 ~ +85	°C	
Storage Temperature Range	Tstg	-55 ~ +150	°C	

note）Power dissipation deleting is 10mW/°C, when it's used in over 25°C.
(It's deleting is on the board that is ROHM's standard)
Dissipation by LSI should not exceed tolerance level.of Pd.

●Operating conditions（VBAT≧VIO, Ta=-40～85℃）

Parameter	Symbol	Limits	Unit
VBAT input voltage	VBAT	2.7～5.5	V
VIO pin voltage	VIO	1.65～3.3	V

* Radiation-proof is not designed.

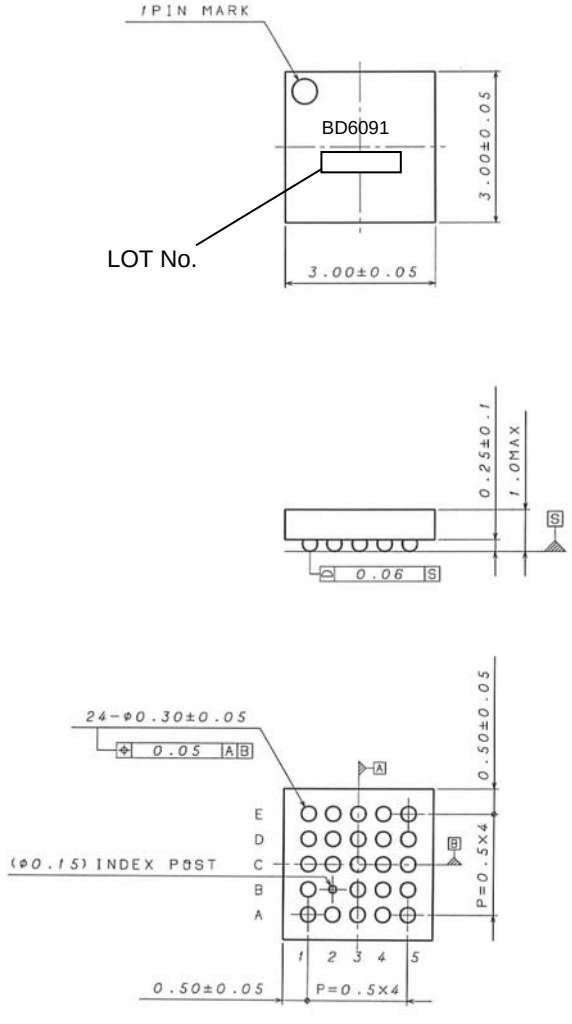
● Electrical Characteristics (Unless otherwise specified, Ta=25°C, VBAT=3.6V, VIO=1.8V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
【Circuit Current】						
VBAT Circuit current 1	IBAT1		0.1	1.0	μA	RESETB=0V, VIO=0V
VBAT Circuit current 2	IBAT2		0.5	3.0	μA	RESETB=0V, VIO=1.8V
VBAT Circuit current 3	IBAT3	-	2.5	5.0	mA	LED=ON, ILED=15mA setting Vo=24V
VBAT Circuit current 4	IBAT4	-	0.4	1.0	mA	Only ALC block ON ADCYC=0.52s setting Except sensor current
【LED Driver】						
LED current Step (Setup)	ILEDSTP1		128		Step	
LED current Step (At slope)	ILEDSTP2		256		Step	
LED Maximum current	IMAXWLED	-	25.6	-	mA	
LED current accuracy	IWLED	-7%	15	+7%	mA	I_{LED}=15mA setting
【DC/DC】						
VLED pin feedback voltage	Vfb	-	0.3	-	V	
Over current protection	OCP	-	650	-	mA	
Oscillator frequency	fosc	0.8	1.0	1.2	MHz	
Over Voltage Protection detect voltage	OVP1	30	31	32	V	
	OVP2	-	27	-	V	
	OVP3	-	24	-	V	
	OVP4	-	21	-	V	
	OVP5	-	18	-	V	
Maximum Duty	Mduty	92.5	-	-	%	
VOUT open protection	OVO	-	0.7	1.4	V	
【I^2C input (SDA, SCL)】						
LOW level input voltage	VIL	-0.3	-	0.25 × VIO	V	
HIGH level input voltage	VIH	0.75 × VIO	-	VBAT +0.3	V	
Hysteresis of Schmitt trigger input	Vhys	0.05 × VIO	-	-	V	
LOW level output voltage (SDA) at 3mA sink current	VOL	0	-	0.3	V	
Input current	Iin	-3	-	3	μA	Input voltage = 0.1×VIO~0.9×VIO
【RESETB】						
LOW level input voltage	VIL	-0.3	-	0.25 × VIO	V	
HIGH level input voltage	VIH	0.75 × VIO	-	VBAT +0.3	V	
Input current	Iin	-3	-	3	μA	Input voltage = 0.1×VIO~0.9×VIO
【ALC】						
SBIAS Output voltage	VoS	2.850	3.0	3.150	V	Io=200μA < Initial value >
		2.470	2.6	2.730	V	Io=200μA
SBIAS Output current	IoS	-	-	30	mA	Vo=3.0V
SSENS Input range	VISS	0	-	VoS x 255/256	V	
SBIAS Discharge resister at OFF	ROFFS	-	1.0	1.5	kΩ	
ADC resolution	ADRES		8		bit	
ADC non-linearity error	ADINL	-3	-	+3	LSB	
ADC differential non-linearity error	ADDNL	-1	-	+1	LSB	
SSENS Input impedance	RSSENS	1	-	-	MΩ	

● Electrical Characteristics (Unless otherwise specified, Ta=25°C, VBAT=3.6V, VIO=1.8V)

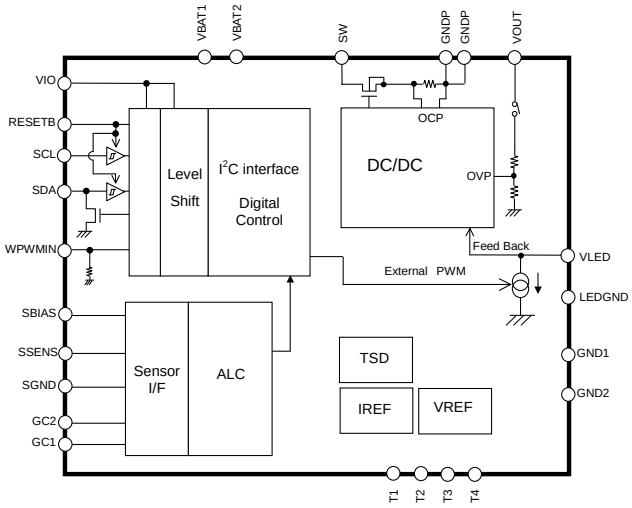
【WPWMIN】						
L level input voltage	VILA	-0.3	-	0.3	V	
H level input voltage	VIHA	1.4	-	VBAT +0.3	V	
Input current	IinA	-	3.6	10	μA	Vin=1.8V
PWM input minimum High pulse width	PWpwm	50	-	-	μs	
【GC1, GC2】						
L level output voltage	VOLS	-	-	0.2	V	IOL=1mA
H level output voltage	VOHS	VoS -0.2	-	-	V	IOH=1mA

●Outside size figure



VCSP85H3（24pin） （unit:mm）

● Block Diagram



●Pin List

PIN	PIN NAME	PIN	PIN NAME
A2	VBAT1	B1	WPWMIN
D5	VBAT2	E4	SW
D1	VIO	C3	VOUT
C1	GND1	A4	VLED
E2	GND2	B4	SBIAS
A3	LEDGND	B5	SSENS
E3	GNDP	B3	GC1
D4	GNDPS	C4	GC2
C5	SGND	A1	T1
D3	RESETB	A5	T2
C2	SDA	E5	T3
D2	SCL	E1	T4

● Cautions on use

(1) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

(2) Power supply and ground line

Design PCB pattern to provide low impedance for the wiring between the power supply and the ground lines. Pay attention to the interference by common impedance of layout pattern when there are plural power supplies and ground lines. Especially, when there are ground pattern for small signal and ground pattern for large current included the external circuits, please separate each ground pattern. Furthermore, for all power supply pins to ICs, mount a capacitor between the power supply and the ground pin. At the same time, in order to use a capacitor, thoroughly check to be sure the characteristics of the capacitor to be used present no problem including the occurrence of capacity dropout at a low temperature, thus determining the constant.

(3) Ground voltage

Make setting of the potential of the ground pin so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no pins are at a potential lower than the ground voltage including an actual electric transient.

(4) Short circuit between pins and erroneous mounting

In order to mount ICs on a set PCB, pay thorough attention to the direction and offset of the ICs. Erroneous mounting can break down the ICs. Furthermore, if a short circuit occurs due to foreign matters entering between pins or between the pin and the power supply or the ground pin, the ICs can break down.

(5) Operation in strong electromagnetic field

Be noted that using ICs in the strong electromagnetic field can malfunction them.

(6) Input pins

In terms of the construction of IC, parasitic elements are inevitably formed in relation to potential. The operation of the parasitic element can cause interference with circuit operation, thus resulting in a malfunction and then breakdown of the input pin. Therefore, pay thorough attention not to handle the input pins, such as to apply to the input pins a voltage lower than the ground respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input pins when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input pins a voltage lower than the power supply voltage or within the guaranteed value of electrical characteristics.

(7) External capacitor

In order to use a ceramic capacitor as the external capacitor, determine the constant with consideration given to a degradation in the nominal capacitance due to DC bias and changes in the capacitance due to temperature, etc.

(8) Thermal shutdown circuit (TSD)

This LSI builds in a thermal shutdown (TSD) circuit. When junction temperatures become detection temperature or higher, the thermal shutdown circuit operates and turns a switch OFF. The thermal shutdown circuit, which is aimed at isolating the LSI from thermal runaway as much as possible, is not aimed at the protection or guarantee of the LSI. Therefore, do not continuously use the LSI with this circuit operating or use the LSI assuming its operation.

(9) Thermal design

Perform thermal design in which there are adequate margins by taking into account the permissible dissipation (Pd) in actual states of use.

(10) About the pin for the test, the un-use pin

Prevent a problem from being in the pin for the test and the un-use pin under the state of actual use. Please refer to a function manual and an application notebook. And, as for the pin that doesn't specially have an explanation, ask our company person in charge.

(11) Rush Current

Rush current may flow in instant in the internal logic unfixed state by the power supply injection order and delay. Therefore, be careful of power supply coupling capacity, a power supply and the width of grand pattern wiring, and leading about.

(12) DC/DC converter

Please select the low DCR inductors to decrease power loss for DC/DC converter.

Notes

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