Structure Silicon Monolithic Integrated Circuit

Product Name Compound LED Driver for cellular phone

Type **BD6086GU**

Features Charge pump system DC/DC
LED Driver for LCD Backlight／RGB LED driver
Ambient light sensor interface／Built-in general-purpose port

● Absolute Maximum Ratings (Ta=25 °C)

Parameter	Symbol	Limits	Unit	Condition
Maximum Applied voltage	VMAX	7	V	
Power Dissipation	Pd	1900 Note1)	mW	
Operating Temperature Range	Topr	-25 ~ +85	°C	
Storage Temperature Range	Tstg	-55 ~ +150	°C	

Note1) Power dissipation deleting is 15.2mW/°C, when it's used in over 25 °C.
(It's deleting is on the board that is ROHM's standard)

● Operating conditions (VBAT≥VIO, VBAT≥VGPIO, Ta=-25~85 °C)

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

* Radiation-proof is not designed.

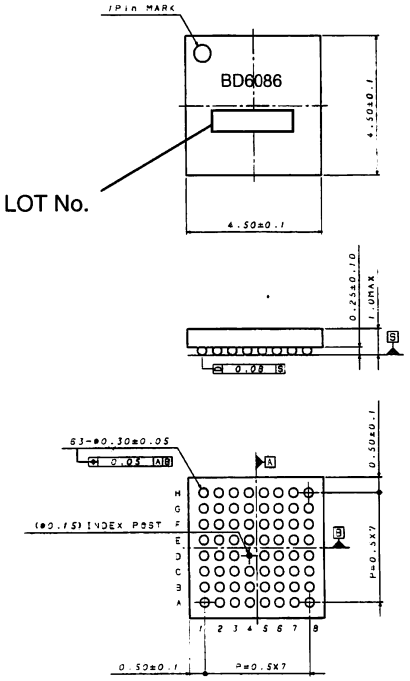
● Electrical Characteristics (Unless otherwise specified, Ta=25 °C, VBAT=3.6V, VIO=VGPIO=1.8V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
【Circuit Current】						
VBAT Circuit current 1	IBAT1	-	0.1	3.0	μA	RESETB=0V, VIO=VGPIO=0V
VBAT Circuit current 2	IBAT2	-	0.5	3.0	μA	RESETB=0V, VIO=1.8V, VGPIO=0V
VBAT Circuit current 3	IBAT3	-	7.5	11.3	μA	REG1,REG2 Low consumption mode Io=0mA, VIO=1.8V, VGPIO=0V (control is register setup)
VBAT Circuit current 4	IBAT4	-	110	165	μA	REG1,REG2 Nomal mode Io=0mA (control is register setup)
VBAT Circuit current 5	IBAT5	-	61	65	mA	DC/DC x1mode, Io=60mA VBAT=4.0V
VBAT Circuit current 6	IBAT6	-	92	102	mA	DC/DC x1.5mode, Io=60mA VBAT=3.6V
VBAT Circuit current 7	IBAT7	-	123	140	mA	DC/DC x2mode, Io=60mA VBAT=2.7V
VBAT Circuit current 8	IBAT8	-	0.35	1.0	mA	ALC operating Setup of ALCEN=1, AD cycle =0.5s Sensor current removes
【LED Driver】						
LED Maximum setup current 1	IMAX1	-	-	25.6	mA	WLED1~7, LED terminal voltage =1V
LED Maximum setup current 2	IMAX2	-	-	30.48	mA	RGB1 group, RGB2 group LED terminal voltage =1V RGBISET=100kΩ
LED current accurate 1	ILED1	18	20	22	mA	WLED1~7, ILED=20mA setup LED terminal voltage =1V
LED current accurate 2	ILED2	18	20	22	mA	RGB1 group, RGB2 group ILED=20mA, RGBISET =120kΩ LED terminal voltage =1V
LED current Matching	ILEDMT	-	5	10	%	WLED1~7 RGB1 group, RGB2 group
LED OFF Leak current	ILKL	-	-	1.0	μA	
【DC/DC (Charge Pump)】						
Output voltage 1	VoCP1	-	Vf+0.2	Vf+0.25	V	Vf is forward direction of LED
Output voltage 2	VoCP2	3.705	3.9	4.095	V	At fixed voltage output mode, Io=60mA VBAT≥3.2V
		3.99	4.2	4.41	V	
		4.275	4.5	4.725	V	
		4.56	4.8	5.04	V	
Load stability	Iout	-	-	255	mA	VBAT≥3.2V, VOUT=4V
Oscillator frequency	fosc	0.8	1.0	1.2	MHz	
Over voltage protection detect voltage	OVP	-	6.0	6.5	V	
Over current protection detect current	OCP	-	250	375	mA	VOUT=0V
【Sensor interface】						
SBIAS Output voltage	VoS	2.85	3.0	3.15	V	Io=200μA
		2.47	2.6	2.73	V	Io=200μA
SBIAS Maximum OutputCurrent	IomaxS	30	-	-	mA	Vo=2.6Vsetup
SBIAS Discharge resister at OFF	ROFFS	-	1.0	1.5	kΩ	
SSENS input voltage range	VISS	0	-	VoS× 255/256	V	
ADC integral calculus non-linearity	ADINL	-3	-	+3	LSB	
ADC differential calculus non-linearity	ADDNL	-1	-	+1	LSB	
SSENS Input impedance	RSSENS	1	-	-	MΩ	

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

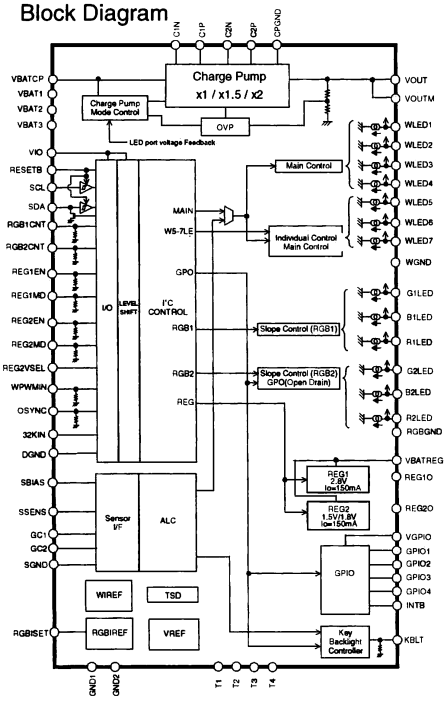
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
【REG1】						
Output voltage 1	Vo11	2.716	2.80	2.884	V	Io=150mA, VBAT≥3.1V (Normal mode)
Output voltage 2	Vo12	2.668	2.80	2.912	V	Io=100μA, VBAT≥3.1V (Low consumption mode)
I/O voltage difference	Vsat1	-	0.2	0.3	V	VBAT=2.5V, Io=150mA (Normal mode)
Load stability	ΔVo1	-	10	60	mV	Io=1～150mA (Normal mode)
Input stability	ΔVi1	-	10	60	mV	VBAT=3.2~5.5V, Io=150mA (Normal mode)
Ripple Rejection Ratio	RR1	40	50	-	dB	f=100Hz, Vin=200mVp-p (Normal mode)
Short circuit current limit	Ilim01	-	225	450	mA	Vo=0V (Normal mode)
Discharge resister at OFF	ROFF1	-	1.0	1.5	kΩ	
【REG2】						
Output voltage 1	Vo21	1.74	1.80	1.86	V	Io=150mA (Normal mode)
		1.44	1.50	1.56	V	
Output voltage 2	Vo22	1.71	1.80	1.89	V	Io=100μA (At low consumption mode)
		1.425	1.50	1.575	V	
Load stability	ΔVo2	-	10	60	mV	Vo21=1.8V setup Io=1~150mA (Normal mode)
Input stability	ΔVi2	-	10	60	mV	Vo21=1.8V setup, VBAT=3.2~5.5V Io=150mA (Normal mode)
Ripple Rejection Ratio	RR2	45	55	-	dB	Vo21=1.8V setup f=100Hz Vin=200mVp-p (Normal mode)
Short circuit current limit	Ilim02	-	225	450	mA	Vo=0V (Normal mode)
Discharge resister at OFF	ROFF2	-	1.0	1.5	kΩ	

● Outside size figure



VCSP85H4(63pin) (unit : mm)

Block Diagram



Pin List

PIN	PIN NAME	PIN	PIN NAME	PIN	PIN NAME
B8	VBATCP	C7	C1P	D5	RGB1CNT
A2	VBAT1	A7	C2N	D6	RGB2CNT
H5	VBAT2	C8	C2P	F4	REG1EN
H6	VBAT3	D8	VOUT	G3	REG2EN
H3	VBATREG	D7	VOUTM	H7	SBIAS
A1	T1	C4	RGBISET	G8	SSENS
A8	T2	H4	REG1O	F5	GC1
H8	T3	H2	REG2O	F6	GC2
H1	T4	B2	WLED1	G5	OSYNC
F8	VIO	B1	WLED2	G7	SGND
G1	VGPIO	C2	WLED3	F3	GPIO1
F7	RESETB	D2	WLED4	E3	GPIO2
E6	SDA	D1	WLED5	D3	GPIO3
E7	SCL	E2	WLED6	C3	GPIO4
A6	CPGND	E1	WLED7	F2	KBLT
F1	GND1	B3	R1LED	G2	INTB
G6	GND2	A3	G1LED	E5	32KIN
C1	WGND	B4	B1LED	C5	REG1MD
A4	RGBGND	B5	R2LED	C6	REG2MD
E8	DGND	A5	G2LED	G4	WPWMIN
B7	C1N	B6	B2LED	E4	REG2VSEL

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) LDO

Use each output of LDO by the independence. Don't use under the condition that each output is short-circuited because it has the possibility that an operation becomes unstable.

(11) 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.

(12) 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.

(13) About the function description or application note or more.

The function manual and the application notebook are the design materials to design a set. So, the contents of the materials aren't always guaranteed. Please design application by having fully examination and evaluation include the external elements.

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