Structure Silicon Monolithic Integrated Circuit

Product Name RGB Illumination LED Driver for mobile phone

Type **BD2812GU**

Features RGB LED driver
A slope control function is incorporated
Slope control can be implemented using the DC current.
Two modes “continuous illumination mode” and “illumination single cycle mode” are supported.
Independent external ON/OFF synchronizing terminals (of dual drivers) are provided.
Low consumption operation is possible by the sleep operation mode function.
Charge pump system DC/DC built-in.

●Absolute Maximum Ratings (Ta=25 ℃)

Parameter	Symbol	Limits	Unit
Maximum Applied voltage	VMAX	7	V
Power Dissipation	Pd	1460 Note1）	mW
Operating Temperature Range	Topr	-40 ~ +85	℃
Storage Temperature Range	Tstg	-55 ~ +150	℃

note1） Power dissipation deleting is-11.68mW/ ℃, when it’s used in over 25 ℃.
(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.

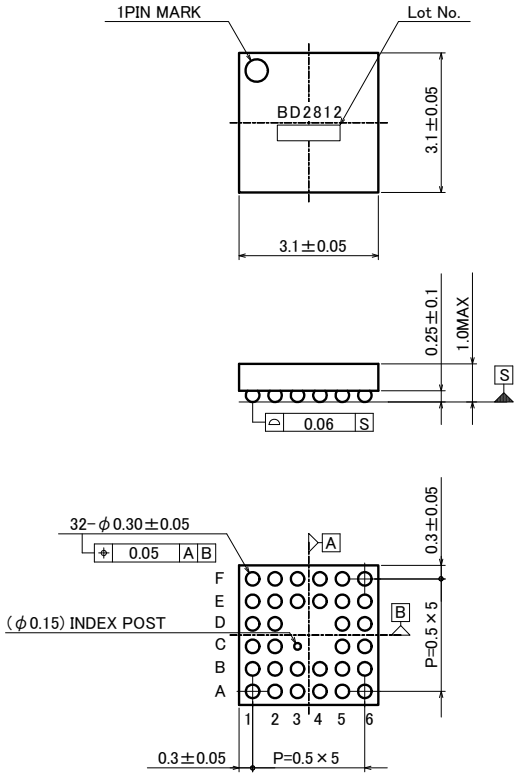
●Electrical Characteristics (Unless otherwise specified, Ta=25°C, VBAT=3.6V, VIO=1.8V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
【Circuit Current】						
VBAT Circuit current 1	IBAT1	-	0.1	3.0	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	-	0.8	1.2	mA	LED 6Ch ON, ILED=10mA setting Exclusive of LED current, RGBISET =120kΩ
VBAT Circuit current 4	IBAT4	-	61	65	mA	DC/DC x1mode, Io=60mA, VBAT=4.0V
VBAT Circuit current 5	IBAT5	-	92	102	mA	DC/DC x1.5mode, Io=60mA, VBAT=3.6V
VBAT Circuit current 6	IBAT6	-	123	140	mA	DC/DC x2mode, Io=60mA, VBAT=2.7V
VBAT Circuit current 7	IBAT7	-	5	7.5	μA	External clock Sleep operation mode External clock = 31.25kHz, ILED=0mA
【LED Driver】						
LED current Step	ILEDSTP		128		step	RGB1 group, RGB2 group
LED Maximum setup current	IMAX	-	-	30.48	mA	RGB1 group, RGB2 group RGBISET=100kΩ
LED current accurate	ILED	18	20	22	mA	RGB1 group, RGB2 group, Terminal voltage =1V ILED=20mA setting, RGBISET =120kΩ
LED current Matching	ILEDMT	-	5	10	%	RGB1 group, between RGB2 group, Terminal voltage =1V ILED=20mA setting
LED OFF Leak current	ILKL	-	-	1.0	μA	
【DC/DC (Charge Pump)】						
Output voltage 1	VoCP1	-	Vf+0.2	Vf+0.25	V	At output voltage auto mode, Vf is forward direction voltage 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
【SDA, SCL】 (I^2C interface)						
L level input voltage	VILI	-0.3	-	0.25 ×VIO	V	
H level input voltage	VIHI	0.75 × VIO	-	VBAT+0.3	V	
Hysteresis of Schmitt trigger input	VhysI	0.05 × VIO	-	-	V	
L level output voltage	VOLI	0	-	0.3	V	SDA pin, IOL=3 mA
Input current	IinI	-10	-	10	μA	Input voltage = 0.1×VIO~ 0.9×VIO

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

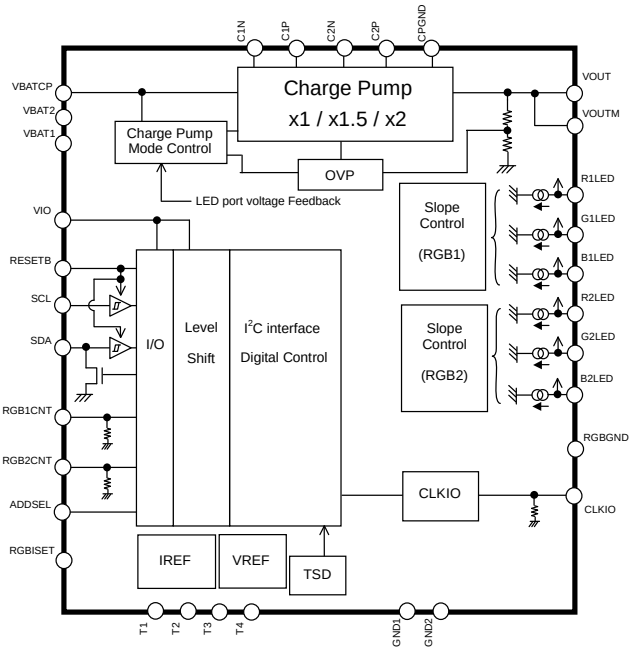
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
【RESETB】 (CMOS input pin)						
L level input voltage	VILR	-0.3	-	0.25 ×VIO	V	
H level input voltage	VIHR	0.75 × VIO	-	VBAT+0.3	V	
Input current	IinR	-10	-	10	μA	Input voltage = 0.1×VIO~ 0.9×VIO
【RGB1CNT, RGB2CNT】 (CMOS input pin with Pull-down resistance)						
L level input voltage	VILCNT	-0.3	-	0.25 ×VIO	V	
H level input voltage	VIHCNT	0.75 × VIO	-	VBAT+0.3	V	
Input current	IinCNT	-	3.6	10	μA	Input voltage = 1.8V
【CLKIO（Output）】 (CMOS output pin)						
L level output voltage	VOLCLK	-	-	0.2	V	IOL=1mA
H level output voltage	VOHCLK	VIO -0.2	-	-	V	IOH=1mA
Output frequency1	fclk1	200	250	300	kHz	FSEL=0 setting
Output frequency2	fclk2	25	31.25	37.5	kHz	FSEL=1 setting
【CLKIO (Input)】 (CMOS input pin with Pull-down resistance)						
L level input voltage	VILCLK	-0.3	-	0.25 ×VIO	V	
H level input voltage	VIHCLK	0.75 × VIO	-	VIO+0.3	V	
Input current	IinCLK	-	3.6	10	μA	Input voltage = 1.8V

● Package



VCSP85H3
（unit:mm）

● Block Diagram



●Pin Functions

PIN	PIN NAME	PIN	PIN NAME
B6	VBATCP	C5	C1P
F2	VBAT1	A5	C2N
C1	VBAT2	C6	C2P
A1	T1	D6	VOUT
A6	T2	D5	VOUTM
F6	T3	E2	RGBISET
F1	T4	E6	R1LED
A2	VIO	E5	G1LED
A3	RESETB	F5	B1LED
B3	SDA	E4	R2LED
B2	SCL	E3	G2LED
A4	CPGND	F3	B2LED
E1	GND1	D2	RGB1CNT
B1	GND2	D1	RGB2CNT
F4	RGBGND	B4	ADDSEL
B5	C1N	C2	CLKIO

● 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) About the rush current

For ICs with more than one power supply, it is possible that rush current may flow instantaneously due to the internal powering sequence and delays. Therefore, give special consideration to power coupling capacitance, power wiring, width of ground wiring, and routing of wiring.

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

The function description 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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