Structure: Silicon Monolithic Integrated Circuit

Product Name: Power supply for CCD camera / White LED driver / RGB LED driver for mobile phone

Type: **BD6025GU**

Features: A system power supply for the CCD camera module
Built-in white LED driver and RGB LED driver

○Absolute Maximum Ratings (Ta=25 °C)

| Parameter | Symbol | Rating | Unit | Condition |
|---|---|---|---|---|
| Maximum Applied Voltage 1 | VMAX1 | 20(*1) | V | |
| Maximum Applied Voltage 2 | VMAX2 | 16(*2) | V | |
| Maximum Applied Voltage 3 | VMAX3 | 15(*3) | V | |
| Maximum Applied Voltage 4 | VMAX4 | -13.5(*4) | V | |
| Maximum Applied Voltage 5 | VMAX5 | 6(*5) | V | |
| Power Dissipation | Pd | 2413(*6) | mW | |
| Operating Temperature Range | Topr | -30 to 85 | °C | |
| Storage Temperature Range | Tstg | -55 to 150 | °C | |

(*1) VPLUS11, VPLUS12, SBD, SBDSENS, VPLUS2 pin (*2) CAMP, CAMPS pin
(*3) LEDR, LEDG, LEDB, BKLED, FLED1 pin (*4) VNEG, CAMN, CAMNS pin (*5) Except Note1~Note4 pin
(*6) Power dissipation deleting is 19.3mW/ °C, when it's used in over 25 °C.
(It's deleting is on the board that is ROHM's standard))

○Recommended operating conditions (VBAT≥VIO, Ta=-30 to 85 °C)

| Parameter | Symbol | Rating | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| VBAT input voltage | VBAT | 2.7 | 3.6 | 4.5 | V | |
| VIO input voltage | VIO | 1.62 | - | 3.3 | V | |

This product isn't designed to protect itself against radioactive rays.

Status of this document
The Japanese version of this document is the formal specification.
A customer may use this translation version only for a reference to help reading the formal version.
If there are any differences in translation version of this document, formal version takes priority.

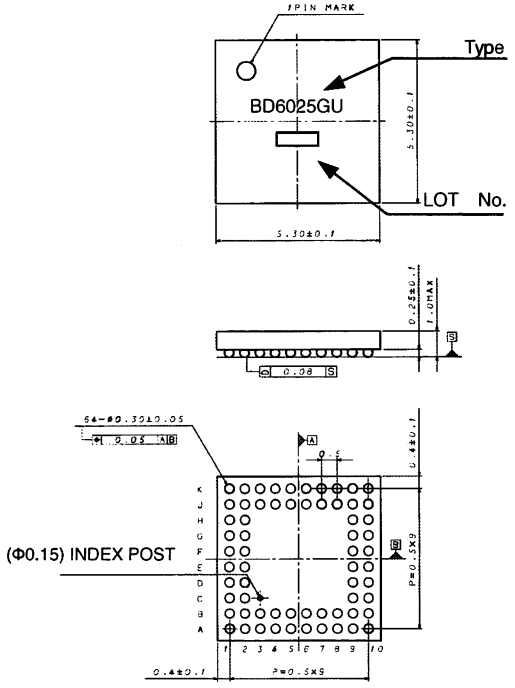
Application example
The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).
Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

○Electrical Characteristics

Unless otherwise specified, Ta=25 °C, VBAT=3.6V, VIO=1.8V/3.0V, VCC=2.45V

| Parameter | Symbol | Spec | | | Unit | Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| **Circuit Current** | | | | | | |
| VBAT Circuit current 1 | IQ1 | - | 0.5 | 3.0 | μA | RSTB=0V |
| VBAT Circuit current 2 | IQ2 | - | 0.1 | 3.0 | μA | RSTB=0V, VIO=0V |
| VBAT Circuit current 3 | IQ3 | - | 6.2 | 9.3 | μA | REGVCC ON (Energy save mode) |
| VBAT Circuit current 5 | IQ5 | - | 11 | 16 | μA | REGVCC ON (Energy save mode)<br>REG1 ON (Energy save mode)<br>REG2 ON (Energy save mode) |
| VBAT Circuit current 8 | IQ8 | - | 17 | 26 | mA | REGVCC ON (Nomal Mode)<br>SWREG1 ON (Vo=14V, Io=1mA)<br>(Add 30h=01h, Add 80h=01h)<br>REGCP ON, REGCN ON |
| **SWREG1 ( DC/DC for White LED and Power supply for Camera )** | | | | | | |
| FLED1 drive current 3 | $I_{FLED13}$ | 27.0 | 30.0 | 33.0 | mA | Add=80h Data=1Eh |
| BKLED drive current 3 | $I_{BKLED3}$ | 27.0 | 30.0 | 33.0 | mA | Add=90h Data=1Eh |
| **SWREG2 ( DC/DC for RGB LED )** | | | | | | |
| LEDR Drive current (Large current) | $I_{LEDR22}$ | 135 | 150 | 165 | mA | Add=A0h Data=0Ch<br>Add=50h Data=1Eh |
| LEDG Drive current (Large current) | $I_{LEDG22}$ | 135 | 150 | 165 | mA | Add=A0h Data=0Ah<br>Add=60h Data=1Eh |
| LEDB Drive current (Large current) | $I_{LEDB22}$ | 135 | 150 | 165 | mA | Add=A0h Data=09h<br>Add=70h Data=1Eh |
| **REGCP (15V/13V/12V LDO)** | | | | | | |
| Output voltage 1 | VO151 | 14.5 | 15.0 | 15.5 | V | Io=60mA, VPLUS12=16V<br>REGCPVSEL1=0, REGCPVSEL2=0 |
| Output voltage 2 | VO152 | 12.5 | 13.0 | 13.5 | V | Io=60mA, VPLUS12=15V<br>REGCPVSEL1=1, REGCPVSEL2=0 |
| Output voltage 3 | VO153 | 11.5 | 12.0 | 12.5 | V | Io=60mA, VPLUS12=15V<br>REGCPVSEL1=1, REGCPVSEL2=1 |
| **REGCN (-8V/-7.5/-7V LDO)** | | | | | | |
| Output voltage 1 | VO81 | -8.5 | -8.0 | -7.5 | V | Io=50mA, VNEG=-10V<br>REGCNVSEL1=0, REGCNVSEL2=0 |
| Output voltage 2 | VO82 | -8.0 | -7.5 | -7.0 | V | Io=50mA, VNEG=-10V<br>REGCNVSEL1=1/0, REGCNVSEL2=1 |
| Output voltage 3 | VO83 | -7.5 | -7.0 | -6.5 | V | Io=50mA, VNEG=-9V<br>REGCNVSEL1=1, REGCNVSEL2=0 |
| **REG1 (3.0V/3.1V LDO)** | | | | | | |
| Output voltage 2 | VO12 | 3.04 | 3.1 | 3.16 | V | Io=150mA, REG1VSEL=1,REG1MD=1 |
| **REG2 (1.2V/1.8V LDO)** | | | | | | |
| Output voltage 3 | VO22 | 1.74 | 1.8 | 1.86 | V | Io=100mA, REG2VSEL=H,REG2MD=1 |

## ○External dimensions

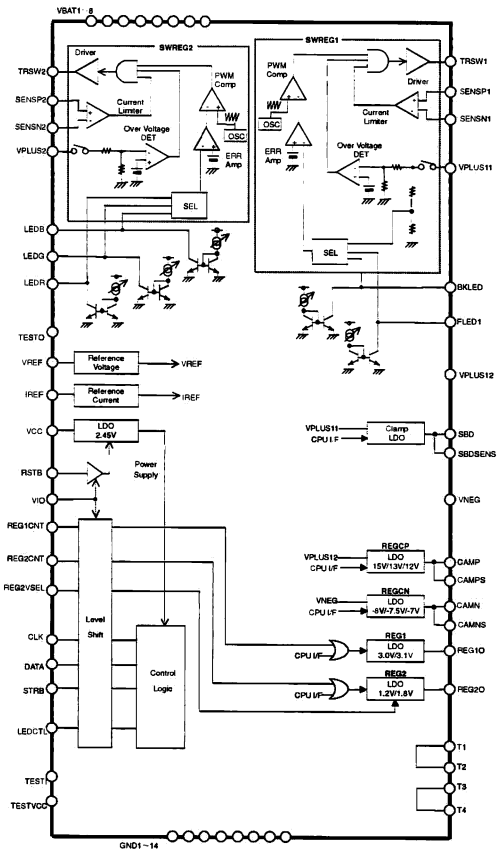



VCSP85H5 (64PIN) (Unit : mm)

## ○Terminals

| PIN | PIN Name | PIN | PIN Name | PIN | PIN Name |
|---|---|---|---|---|---|
| A1 | T1 | C9 | CAMPS | J1 | VIO |
| A2 | GND2 | C10 | CAMP | J2 | TESTI |
| A3 | VBAT1 | D1 | REG2CNT | J3 | REG2VSEL |
| A4 | LEDR | D2 | SENSN2 | J4 | VCC |
| A5 | GND3 | D9 | TESTO | J5 | GND12 |
| A6 | LEDB | D10 | REG2O | J6 | FLED1 |
| A7 | CAMN | E1 | VBAT8 | J7 | TRSW1 |
| A8 | VNEG | E2 | TESTVCC | J8 | SENSP1 |
| A9 | GND6 | E9 | VBAT4 | J9 | GND9 |
| A10 | T2 | E10 | VBAT3 | J10 | SBD |
| B1 | VPLUS2 | F1 | LEDCTL | K1 | T4 |
| B2 | GND1 | F2 | REG1CNT | K2 | GND13 |
| B3 | VBAT2 | F9 | VREF | K3 | VBAT7 |
| B4 | TRSW2 | F10 | REG1O | K4 | BKLED |
| B5 | LEDG | G1 | RSTB | K5 | GND11 |
| B6 | GND4 | G2 | CLK | K6 | VBAT6 |
| B7 | CAMNS | G9 | SBDSENS | K7 | GND10 |
| B8 | GND5 | G10 | IREF | K8 | VPLUS11 |
| B9 | GND7 | H1 | DATA | K9 | SENSN1 |
| B10 | VPLUS12 | H2 | STRB | K10 | T3 |
| C1 | SENSP2 | H9 | GND8 | - | - |
| C2 | GND14 | H10 | VBAT5 | - | - |

## ○Block diagram



○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 GND line

Design PCB pattern to provide low impedance for the wiring between the power supply and the GND lines. Pay attention to the interference by common impedance of layout pattern when there are plural power supplies and GND lines. Especially, when there are GND pattern for small signal and GND pattern for large current included the external circuits, please separate each GND pattern. Furthermore, for all power supply terminals to ICs, mount a capacitor between the power supply and the GND terminal. 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) GND voltage

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

(4) Short circuit between terminals 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 terminals or between the terminal and the power supply or the GND terminal, 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 terminals

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 terminal. Therefore, pay thorough attention not to handle the input terminals, such as to apply to the input terminals a voltage lower than the GND respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input terminals when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input terminals 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. A thermal shutdown circuit works when the junction temperature is beyond detection temperature. Then, a part of the LSI or all is made a state of 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 a operation becomes unstable.

(11) DC/DC converter

Please select the low DCR inductors to decrease power loss for DC/DC converter. Please choose the external parts not to exceed "Maximum Ratings" of the coil, the switching transistor, the diode and the resistance for the electric current detection".

(12) Other cautions on use

Please consult supplementary documents such as technical notebook, function manual and application notebook of this LSI.

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As of 18th. April 2005