

Structure Silicon Monolithic Integrated Circuit
 Product Name Power management LSI for mobile phone

Type **BH6054GU**

Features Charge pump DC/DC converter
 5ch regulators
 Main 6ch, Sub 2ch LED driver
 10ch GPOs

○Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Rating | Unit | Condition |
|-----------------------------|--------------------|------------------------|------|-----------------|
| Maximum applied voltage | Vmax | 5.5 | V | |
| Power dissipation | Pd | 1350 (*1) | mW | |
| Logic input voltage | V _{LIN} | DGND -0.3 to DVDD +0.3 | V | RSTIN, SCL, SDA |
| Logic output voltage1 | V _{LOUT1} | DGND -0.3 to DVDD +0.3 | V | SDA |
| Logic output voltage2 | V _{LOUT2} | DGND -0.3 to DVDD +0.3 | V | GPO0~GPO9 |
| Operating temperature range | Topr | -30 to 85 | °C | |
| Storage temperature range | Tstg | -55 to 125 | °C | |

(*1) This value is the measurement value that was mounted on the PCB by ROHM.
 (50mm×58mm×1.75mm glass epoxy Board)
 Temperature degrading: 16.6mW/°C from Ta>25°C

○Recommended operating conditions (Ta=-30 to 85°C)

| Parameter | Symbol | Rating | | | Unit | Condition |
|-----------------|--------|--------|------|------|------|-----------|
| | | Min. | Typ. | Max. | | |
| Battery voltage | VBAT | 3.1 | 3.6 | 4.8 | V | |
| Supply voltage1 | DVDD | 2.522 | 2.9 | 3.0 | V | |
| Supply voltage2 | GPVDD | 2.522 | 2.9 | 3.0 | 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

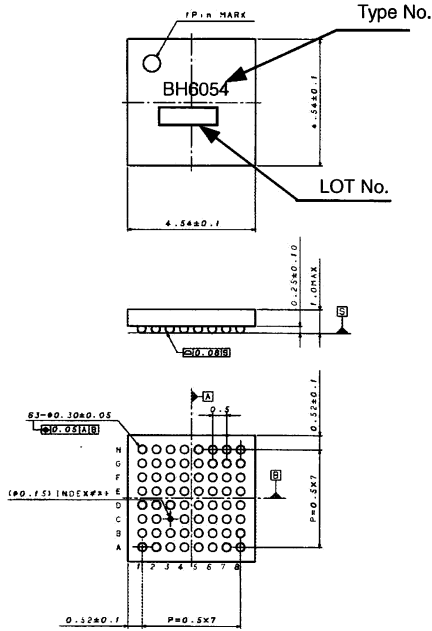
The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).
 Should you intend to use this product with equipment or 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 noted, Ta=25°C, VBAT=3.6V, DVDD=GPVDD=2.9V

| Parameter | Symbol | Spec | | | Unit | Condition |
|----------------------------|---------|-------|-------|-------|------|--|
| | | Min. | Typ. | Max. | | |
| Current consumption | | | | | | |
| VBAT Current consumption 1 | IBAT1 | - | - | 1 | μA | LDO all off DC/DC converter off |
| VBAT Current consumption 2 | IBAT2 | - | 50 | 100 | μA | LDO LCC mode all on (LDO No Load) DC/DC converter off |
| VBAT Current consumption 3 | IBAT3 | - | 120 | 240 | μA | LDO normal mode all on (LDO No Load) DC/DC converter off |
| VBAT Current consumption 4 | IBAT4 | - | 140 | 280 | μA | LDO all on (LDO No Load) DC/DC converter on (DC/DC converter No Load) ×1 mode |
| VBAT Current consumption 5 | IBAT5 | - | 10 | 18 | mA | LDO all on(LDO No Load) DC/DC converter on (DC/DC converter No Load) ×1.5 mode |
| VBAT Current consumption 6 | IBAT6 | - | 1.7 | 3.4 | mA | LDO normal mode all on (LDO No Load) DC/DC converter on (DC/DC converter No Load) ×1 LED MAIN/SUB is all on with 9mA (Each terminal of LED is OPEN) |
| LDO1, 2, 4 | | | | | | |
| Output voltage 1 (Normal) | VO1A | 2.813 | 2.900 | 2.987 | V | Io=75mA,LCC=off |
| Output voltage 2 (LCC) | Vo1B | 2.813 | 2.900 | 2.987 | V | Io=5mA,LCC=on |
| Output current 1 (Normal) | Io1maxA | 150 | - | - | mA | LCC=off |
| Output current 2 (LCC) | Io1maxB | 3 | - | - | mA | LCC=on |
| LDO3 | | | | | | |
| Output voltage 1 (Normal) | VO3A | 2.522 | 2.600 | 2.678 | V | Io=75mA,LCC=off |
| Output voltage 2 (LCC) | VO3B | 2.522 | 2.600 | 2.678 | V | Io=5mA,LCC=on |
| Output current 1 (Normal) | Io3maxA | 150 | - | - | mA | LCC=off |
| Output current 2 (LCC) | Io3maxB | 3 | - | - | mA | LCC=on |
| LDO5 | | | | | | |
| Output voltage | VO5 | 2.813 | 2.900 | 2.987 | V | Io=5mA, |
| Output current | Io5max | 10 | - | - | mA | |
| DC/DC converter | | | | | | |
| Output voltage 1 (×1.5) | VOA | 4.4 | 4.75 | 4.95 | V | Io=160mA,VBAT≥3.5V |
| Output current | Iomax | 160 | - | - | mA | |
| LED Driver | | | | | | |
| Output current 1mA | Iled1 | 0.8 | 1 | 1.2 | mA | Terminal voltage =1(V)~VOA-4.2(V) |
| Output current 2mA | Iled2 | 1.6 | 2 | 2.4 | mA | |
| Output current 6.5mA | Iled6.5 | 5.525 | 6.5 | 7.475 | mA | |
| Output current 7.5mA | Iled4.5 | 6.375 | 7.5 | 8.625 | mA | |
| Output current 9mA | Iled9 | 7.65 | 9 | 10.35 | mA | |
| Output current 10mA | Iled10 | 8.5 | 10 | 11.5 | mA | |
| Output current 13mA | Iled13 | 11.7 | 13 | 14.3 | mA | |
| Output current 15mA | Iled15 | 13.5 | 15 | 16.5 | mA | |
| Output current 18mA | Iled18 | 16.2 | 18 | 19.8 | mA | |
| Output current 20mA | Iled20 | 18 | 20 | 22 | mA | |

External dimensions

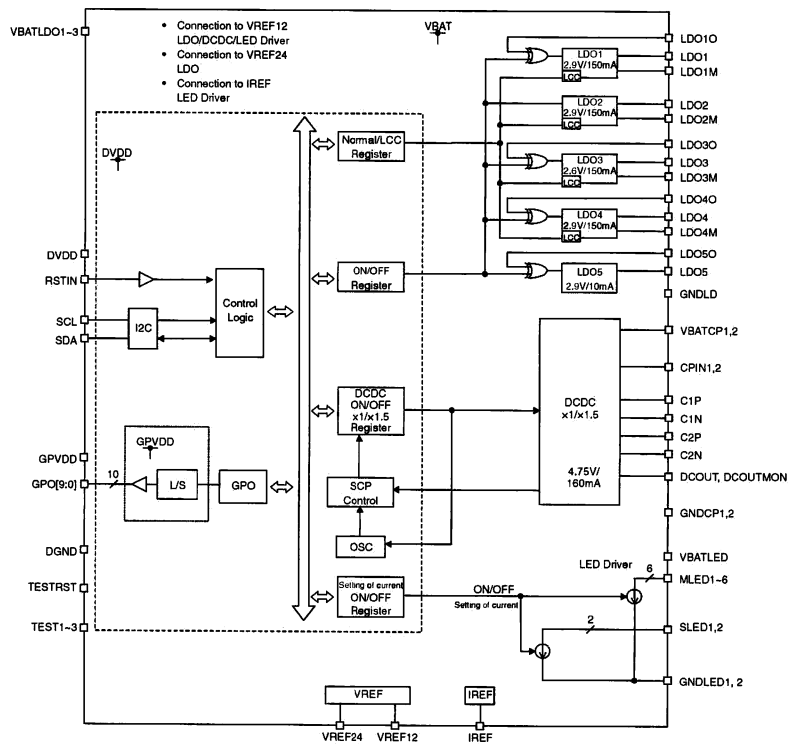


VCSP85H4 (63PIN) (Unit : mm)

Terminals

| PIN | PIN Name | PIN | PIN Name | PIN | PIN Name |
|-----|----------|-----|----------|-----|----------|
| A5 | LDO1 | H3 | CPIN2 | G7 | DGND |
| B5 | LDO1MON | H5 | C1P | B3 | RSTIN |
| C5 | LDO1ON | H4 | C1N | C4 | SCL |
| A7 | LDO2 | H2 | C2P | D4 | SDA |
| B6 | LDO2MON | H6 | C2N | G6 | GPVDD |
| B8 | LDO3 | G2 | DCOUT | E3 | GPO0 |
| C7 | LDO3MON | H1 | DCOUTMON | E4 | GPO1 |
| C6 | LDO3ON | G5 | GNDCP1 | F2 | GPO2 |
| D8 | LDO4 | G3 | GNDCP2 | D3 | GPO3 |
| D7 | LDO4MON | F1 | VBATLED | F5 | GPO4 |
| D6 | LDO4ON | E1 | MLED1 | F4 | GPO5 |
| E8 | LDO5 | E2 | MLED2 | G4 | GPO6 |
| E6 | LDO5ON | D1 | MLED3 | D5 | GPO7 |
| F7 | VREF12 | C1 | MLED4 | E5 | GPO8 |
| E7 | VREF24 | C2 | MLED5 | F3 | GPO9 |
| A6 | VBATLDO1 | B1 | MLED6 | A1 | TESTRST |
| C8 | VBATLDO2 | A2 | SLED1 | A8 | TEST1 |
| F8 | VBATLDO3 | A3 | SLED2 | H8 | TEST2 |
| B7 | GNDLDO | A4 | IREF | F6 | TEST3 |
| G8 | VBATCP1 | D2 | GNDLED1 | | |
| G1 | VBATCP2 | B2 | GNDLED2 | | |
| H7 | CPIN1 | B4 | DVDD | | |

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. 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 a operation becomes unstable.

(11) DC/DC converter

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

(12) Other cautions on use

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

Notes

- No technical content pages of this document may be reproduced in any form or transmitted by any means without prior permission of ROHM CO.,LTD.
- The contents described herein are subject to change without notice. The specifications for the product described in this document are for reference only. Upon actual use, therefore, please request that specifications to be separately delivered.
- Application circuit diagrams and circuit constants contained herein are shown as examples of standard use and operation. Please pay careful attention to the peripheral conditions when designing circuits and deciding upon circuit constants in the set.
- Any data, including, but not limited to application circuit diagrams information, described herein are intended only as illustrations of such devices and not as the specifications for such devices. ROHM CO.,LTD. disclaims any warranty that any use of such devices shall be free from infringement of any third party's intellectual property rights or other proprietary rights, and further, assumes no liability of whatsoever nature in the event of any such infringement, or arising from or connected with or related to the use of such devices.
- Upon the sale of any such devices, other than for buyer's right to use such devices itself, resell or otherwise dispose of the same, no express or implied right or license to practice or commercially exploit any intellectual property rights or other proprietary rights owned or controlled by
- ROHM CO., LTD. is granted to any such buyer.
- Products listed in this document are no antiradiation design.

The products listed in this document are 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 these products 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.

About Export Control Order in Japan

Products described herein are the objects of controlled goods in Annex 1 (Item 16) of Export Trade Control Order in Japan.

In case of export from Japan, please confirm if it applies to "objective" criteria or an "informed" (by MITI clause) on the basis of "catch all controls for Non-Proliferation of Weapons of Mass Destruction.

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available,
please contact your nearest sales office.

Please contact our sales offices for details ;

| | | |
|-------------------------|---------------------------|----------------------------|
| U.S.A / San Diego | TEL : +1(858)625-3630 | FAX : +1(858)625-3670 |
| Atlanta | TEL : +1(770)754-5972 | FAX : +1(770)754-0691 |
| Dallas | TEL : +1(972)312-8818 | FAX : +1(972)312-0330 |
| Germany / Dusseldorf | TEL : +49(2154)9210 | FAX : +49(2154)921400 |
| United Kingdom / London | TEL : +44(1)908-282-666 | FAX : +44(1)908-282-528 |
| France / Paris | TEL : +33(0)1 56 97 30 60 | FAX : +33(0) 1 56 97 30 80 |
| China / Hong Kong | TEL : +852(2)740-6262 | FAX : +852(2)375-8971 |
| Shanghai | TEL : +86(21)6279-2727 | FAX : +86(21)6247-2066 |
| Dilian | TEL : +86(411)8230-8549 | FAX : +86(411)8230-8537 |
| Beijing | TEL : +86(10)8525-2483 | FAX : +86(10)8525-2489 |
| Taiwan / Taipei | TEL : +866(2)2500-6956 | FAX : +866(2)2503-2869 |
| Korea / Seoul | TEL : +82(2)8182-700 | FAX : +82(2)8182-715 |
| Singapore | TEL : +65-6332-2322 | FAX : +65-6332-5662 |
| Malaysia / Kuala Lumpur | TEL : +60(3)7958-8355 | FAX : +60(3)7958-8377 |
| Philippines / Manila | TEL : +63(2)807-6872 | FAX : +63(2)809-1422 |
| Thailand / Bangkok | TEL : +66(2)254-4890 | FAX : +66(2)256-6334 |

Japan /
(Internal Sales)

| | | | |
|----------|--|-----------------------|-----------------------|
| Tokyo | 2-1-1, Yaesu, Chuo-ku, Tokyo 104-0082 | TEL : +81(3)5203-0321 | FAX : +81(3)5203-0300 |
| Yokohama | 2-4-8, Shin Yokohama, Kohoku-ku, Yokohama, Kanagawa 222-8575 | TEL : +81(45)476-2131 | FAX : +81(45)476-2128 |
| Nagoya | Dainagayo Building 9F 3-28-12, Meieki, Nakamura-ku, Nagoya, Aichi 450-0002 | TEL : +81(52)581-8521 | FAX : +81(52)561-2173 |
| Kyoto | 579-32 Higashi Shiokouji-cho, Karasuma Nishi-iru, Shiokoujidori, Shimogyo-ku, Kyoto 600-8216 | TEL : +81(75)311-2121 | FAX : +81(75)314-6559 |

(Contact address for overseas customers in Japan)

| | | |
|----------|-----------------------|------------------------|
| Yokohama | TEL : +81(45)476-9270 | FAX : +81(045)476-9271 |
|----------|-----------------------|------------------------|