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 deleting: 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	

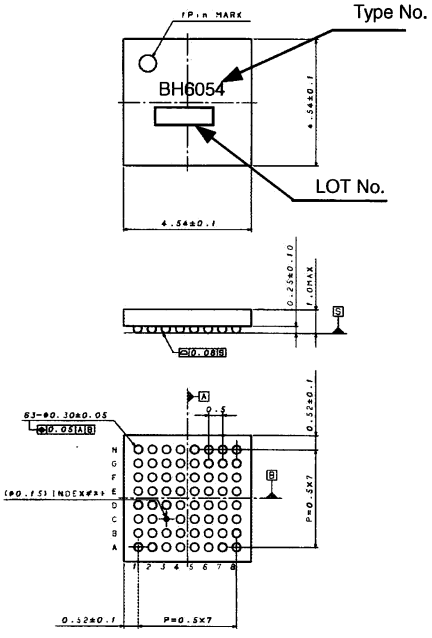
This product isn't designed to protect itself against radioactive rays.

○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

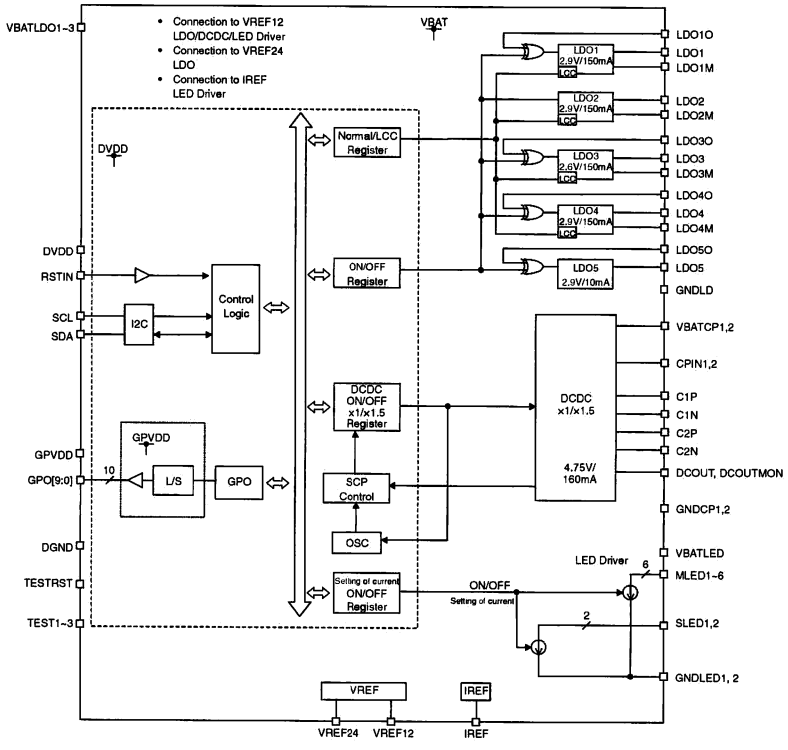


VCSP85H4 (63PIN) (Unit : mm)

○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.

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