ROHM

Structure Silicon Monolithic Integrated Circuit

Product Name 6-Parallel white-LED Driver for mobile phone

Type **BD1606MVV**

Under Development

Features Automatically transition to each mode (x1,x1.5,x2) charge pomp type DC/DC converter
6 channels LED Driver (0.5mA-32mA, 64 steps)

○ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit	Condition
Power supply voltage	VCC	7.0	V	
Power Dissipation	Pd	(750(*1))	mW	
Input voltage	VIN	0.3 ~ 6.0	V	
Operating Temperature Range	Topr	-30 ~ +85	°C	
Storage Temperature Range	Tstr	-55 ~ +150	°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: 13.5mW/deg from Ta>25deg

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

Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	VCC	2.7	3.6	5.5	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
- ROHM cannot provide adequate confirmation of patents.
- 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
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○ Electrical Characteristics

(Unless otherwise noted, Ta = +25°C, VIN=3.6V)

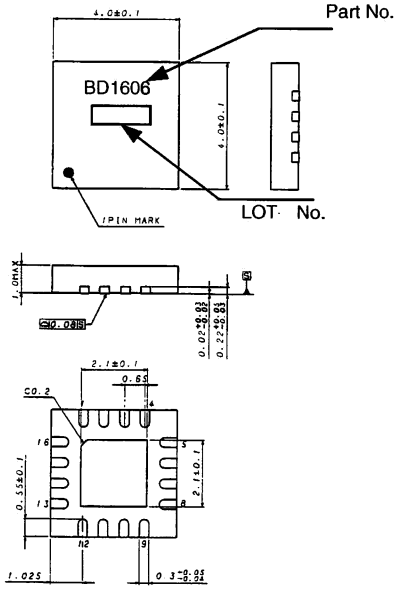
Parameter	Symbol	Rating			Units	Condition
		Min.	Typ.	Max.		
Overall						
Input voltage range	V_{IN}	2.7	3.6	5.5	V	
Quiescent Current	I_{DDQ}	-	0	7	μA	EN=0V, V_{IN}=3.6V
Current Consumption 1	I_{DD1}	-	1.5	2	mA	1x mode, I_{OUT}=0mA, VIN=3.6V
Current Consumption 2	I_{DD2}	-	3	4	mA	1.5x mode and 2x mode, I_{OUT}=0mA, VIN=3.6V
Charge Pump						
Output Current	I_{OUT}	-	-	120	mA	Vout=4.0V
Input current limiter	I_{OV}	-	600	-	mA	Vout is shorted to GND
Over voltage limit	V_{OV}	-	5.0	-	V	
Oscillator frequency1	f_{OSC}	-	1.0	-	MHz	Add=0x03, D6='0'
Oscillator frequency2	f_{OSC}	-	250	-	KHz	Add=0x03, D6='1'
Under Voltage Lock Out	V_{UVLO}	-	2.2	-	V	
Current Source						
LED current accuracy (*1)	$I_{LED-ERR}$	-	-	(±260)	μA	I_{LED} = 4.0mA (LEDxCNT=0x07) (*1)
		-	-	(±6.5)	%	I_{LED} = 16.0mA (LEDxCNT=0x1F) (*2)
LED current matching (*2)	$I_{LED-to-LED}$	-	-	(±140)	μA	I_{LED} = 4.0mA (LEDxCNT=0x07) (*1)
		-	-	(±3.75)	%	I_{LED} = 16.0mA (LEDxCNT=0x1F) (*2)
LED control voltage	V_{LED}	-	0.1	-	V	ILEDA1,A2/ILEDB1,B2/ILEDC1,C2 terminals
Logic Block (DC Characteristics)						
Low threshold voltage	VIL	-	-	0.4	V	EN, SCL, SDA
High threshold voltage	VIH	1.6	-	-	V	EN, SCL, SDA
High Input current	IIH	-	-	10	μA	EN, SCL, SDA = VIN
Low Input current	IIL	-10	-	-	μA	EN, SCL, SDA = GND
SDA Output Low Level	VOL	-	-	0.4	V	SDA, 3mA source
		-	-	0.6	V	SDA, 6mA source
I/O Pin Capacitance	CIN	-	-	400	pF	SCL, SDA

(*1) $I_{LED-ERR} = \pm (I_{LED(actual)} - I_{LED}) / I_{LED} \times 100$

(*2) $I_{LED-to-LED} = \pm (I_{LED(max)} - I_{LED(min)}) / (I_{LED(max)} + I_{LED(min)}) \times 100$

The value inside () in the table is the development target.

○ External dimensions

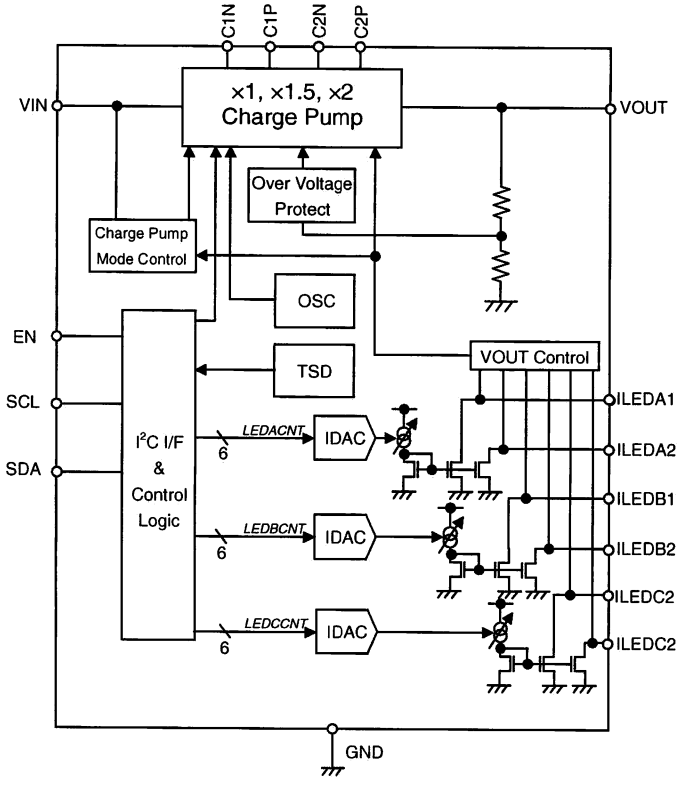


VQFN016V3030 (16PIN) (Unit: mm)

○ Terminals

PIN	Pin Name	PIN	Pin Name
1	LEDA1	9	C2N
2	SDA	10	C2P
3	SCL	11	GND
4	EN	12	LEDC2
5	VOUT	13	LEDC1
6	VIN	14	LEDB2
7	C1N	15	LEDB1
8	C1P	16	LEDA2

○ 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) 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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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

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