Structure	Silicon monolithic integrated circuit
Product name	Strobe capacitor charging control IC
Model No.	BD4220AMUV

Features

1. Built-in power transistor(50V DMOS)
2. Adjustable transformer primary-side peak current to linear current with the ADJ pin
3. Charging control switching with the START pin
4. Includes high precision full charge voltage detection circuit and output pin
5. Various built-in protective circuits (TSD, UVLO)
6. Built-in protective circuits (SDP)
7. Built-in IGBT driver(VDD supply for IGBT driver)
8. Employs small package: VQFN016V3030 (3.0 mm×3.0 mm×1.0 mm)

○ Absolute Maximum Ratings(Ta=25℃)

Parameter	Symbol	Rating	Unit
VCC supply voltage	VCC	-0.3～7	V
VDD supply voltage	VDD	-0.3～7	V
SW pin	VSW	50	V
VC pin (DC characteristic)	VCDC	-15～50	V
Input pin voltage (START, ADJ, IGBT_IN, IGBT_EN)	VI	-0.3～7	V
Operating temperature range	Topr	-35～+85	℃
Storage temperature range	Tstg	-55～+150	℃
Junction temperature	Tjmax	150	℃
Power dissipation	Pd	1770 *1	mW

○ Operating Conditions(Ta=25℃)

Parameter	Symbol	Rating	Unit
VCC supply voltage range	VCC	2.5～5.5	V
VDD supply voltage range	VDD	2.5～5.5	V
Input pin voltage (START, ADJ, IGBT_IN, IGBT_EN)	VI	0～VCC	V
FULL pin input current range	VFULL	0～5.5	V

*1: Reduced by 14.16 mW/°C at Ta=25°C or more (When mounted on a 74.2 mm×74.2 mm×1.6 mm glass epoxy, 4-layer board: Surface radiating copper foil of 6.28mm^2, copper foil laminated in each layer)

○ Outside marking and dimension (UNIT:mm)

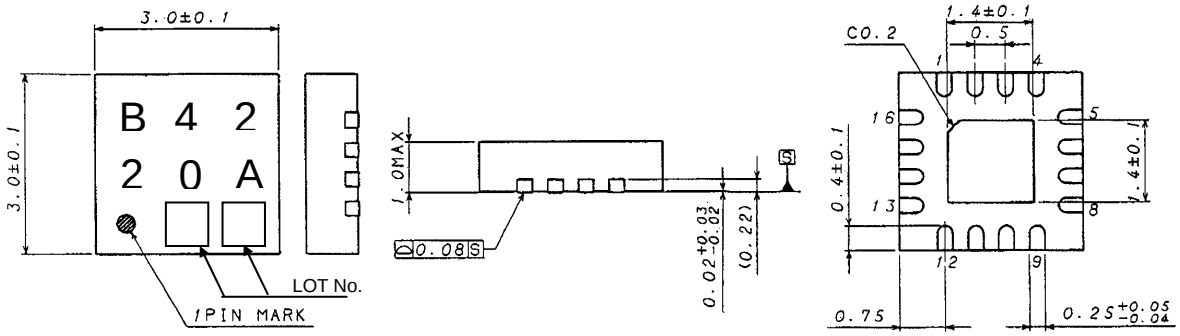


Fig.1 Outside marking and dimension

Notes on this document

The Japanese version of this document is the formal specifications. The translated version of the document should be used for reference.
If there is any difference between the formal specifications and the translated version, the formal specifications shall take priority.

○ Electrical Characteristics

(Ta=25℃,VCC=START=VDD=3.3V, VBAT=3.6V,ADJ=1.0V,unless otherwise specified.)

Parameter	Symbol	Target value			Unit	Condition
		Min.	Standard	Max.		
【Overall device】						
VCC current consumption	IVCC	—	1	2.5	mA	At Output OFF
VCC Circuit current during standby operation	ISTB	—	—	1	μA	START=0V
VDD current consumption	IVDD	20	40	80	μA	IGBT_EN=3.3V,IGBT_IN=0V
VDD Circuit current during standby operation	IVDDSTB	—	—	1	μA	IGBT_EN=0.0V,IGBT_IN=0V
【Standby control START pin】						
START pin high voltage	VSTH	2.0	—	—	V	
START pin low voltage	VSTL	—	—	0.6	V	
START pin sink current	ISTART	12	24	36	μA	START=3.3V
Unresponsive time when START shorted	TSTART	6	12.5	25	μs	
【Transformer primary-side driver block】						
SW pin leak current	ISWL	—	—	1	μA	SW=50V
SW pin peak current 1	IPEAK1	0.7	0.8	0.9	A	ADJ=0V
SW pin peak current 2	IPEAK2	1.0	1.1	1.2	A	ADJ=1V
SW pin peak current 3	IPEAK3	1.95	2.05	2.15	A	ADJ=3V
SW saturation voltage	VSAT	—	0.20	0.40	V	ISW=0.5A
【Charging characteristics adjustment block】						
ADJ sink current	IADJ	—	2.5	5	μA	
Maximum ON time	TONMAX	25	50	100	μs	
Maximum OFF time	TOFFMAX	12	25	50	μs	
【Transformer secondary-side detection block】						
VC pin sink current	IVC	1	2	4	mA	VC=30V
Full charge detection voltage	VFULLTH	29.7	30	30.3	V	
OFF detection voltage	VOFFL	-1.3	-0.5	-0.2	V	
FULL pin ON resistance	RFULLL	50	110	300	Ω	FULL=0.5V
FULL pin leak current	IFULLH	—	—	1	μA	FULL=3.3V
【Protective circuit block】						
UVLO detection voltage	VUVLOTH	1.9	2.05	2.2	V	VCC detection
UVLO hysteresis width	VUVLOHYS	180	230	280	mV	
UVLO VDD detection voltage	VUVLODTH	1.9	2.05	2.2	V	VDD detection IGBT_IN=3.3V, IGBT_EN=3.3V
UVLO VDD hysteresis width	VUVLODHYS	180	230	280	mV	IGBT_IN=3.3V, IGBT_EN=3.3V
【IGBT driver block】						
High-level output short circuit current	Ioso	90	140	200	mA	IGBT_IN=3.3V, IGBT_EN=3.3V START=0V,IGBT_OUT_P=0V
Low-level output short circuit current	Iosi	30	60	90	mA	IGBT_IN=0V, IGBT_EN=3.3V START=0V,IGBT_OUT_N=3.3V
IGBT_IN high-level input voltage range1	VIGBTH1	2.0	—	—	V	IGBT_EN=3.3V, START=0V
IGBT_IN high-level input voltage range2	VIGBTH2	1.4	—	—	V	VDD=3.0～3.6V, Ta=-25～85 , IGBT_EN=3.3V
IGBT_IN low-level input voltage range	VIGBTL	—	—	0.6	V	IGBT_EN=3.3V, START=0V
IGBT_IN sink current	IIGBT_IN	12	24	36	μA	IGBT_IN=3.3V, START=0V
IGBT_EN high-level input voltage range	VIGBTENH	2.0	—	—	V	IGBT_IN=3.3V, START=0V
IGBT_EN low-level input voltage range	VIGBTENL	—	—	0.6	V	
IGBT_EN sink current	IIGBT_EN	4.5	6.5	10	μA	IGBT_EN=3.3V, IGBT_IN=3.3V

○ PIN No.

Pin No.	Pin Name	Function
1	VDD	VDD supply pin
2	VCC	VCC supply pin
3	GND	Ground pin
4	ADJ	primary-side current control pin
5	FULL	FULL charge detection flag pin
6	START	Standby pin
7	VC	Secondary-side voltage detection pin
8～10	SW	Switching pin
11,12	PGND	Power GND pin
13	IGBT_IN	Input terminal of trigger signal for starting output of IGBT driver
14	IGBT_EN	Input terminal of control enable signal of IGBT driver
15	IGBT_OUT_N	IGBT driver output N pin
16	IGBT_OUT_P	IGBT driver output P pin

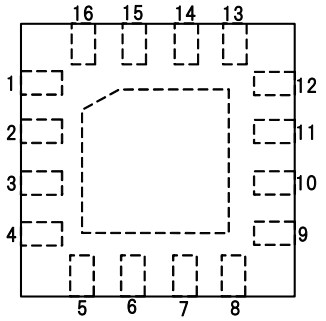


Fig.3 TOP VIEW

◎This is not designed for radiation resistance.

○ Blosk Diagrum

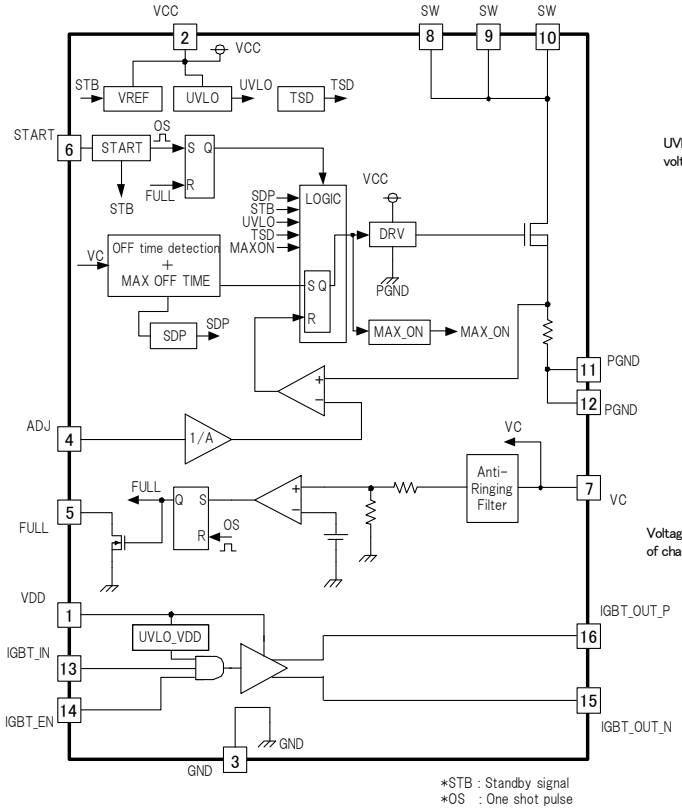


Fig.3 Block diagram

○ UVLO、TSD、SDP

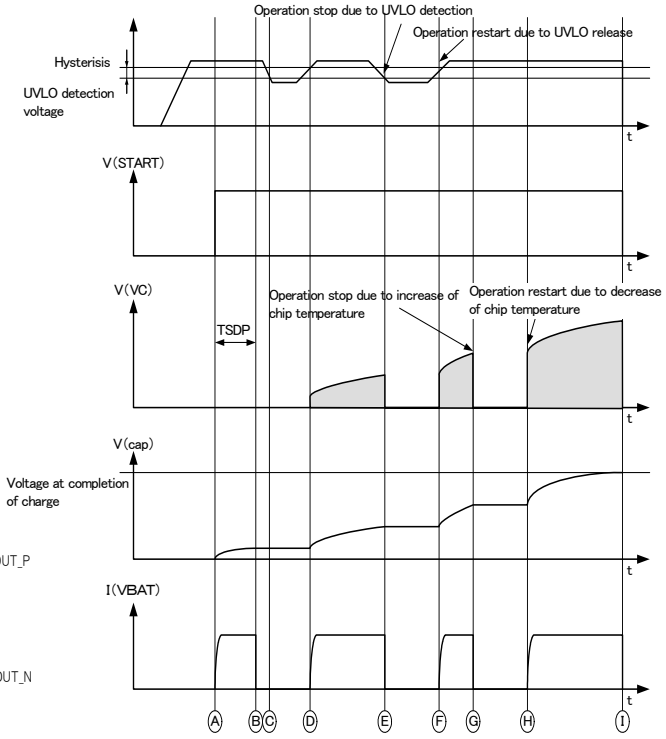


Fig.4 Timing Chart: Under Protective Circuit Operation

◆UVLO

If the VCC voltage is reduced to the UVLO detection voltage specified in the electrical characteristics or less, the UVLO protective circuit is activated and the charging operation temporarily stops. (See Time Ⓒ and Ⓔ in Fig.4.) After that, when the VDD voltage becomes the UVLO release voltage or more, the charging operation automatically restarts. (See Time Ⓓ and Ⓕ in Fig.4.)

◆VDD UVLO

If the VDD voltage becomes the VDD UVLO detection voltage or less, the IGBT_OUT voltage is forced to be set to "L".

◆Termal Shut Down (TSD)

It protects the IC against thermal runaway due to excessive temperature rise (Tj>175°C [TYP]). After detection, the charging operation temporarily stops (See time Ⓖ in Fig.4.), and when the chip temperature decreases, (Tj<150°C [TYP]), it automatically restarts. (See Time Ⓗ in Fig.4.)

◆VC pin short detection (SDP)

If the VC pin becomes the GND level due to any failure and the PowerMOS repeats switching 2^{16}(=65536) times which is the SDP count number (TSDP) at the maximum OFF time, it is judged as an error and the charging operation is forced to be stopped. (See Time Ⓑ in Fig.4.) If the START pin is changed from "L" to "H" and the UVLO detection is released, it restarts.

○ Precautions for Use

1. Absolute Maximum Rating

Although we pay due attention to the quality control of these products, the possibility of deterioration or destruction may exist when impressed voltage, operating temperature range, etc., exceed the absolute maximum rating. In addition, it is impossible to assume a destructive situation, such as short circuit mode, open circuit mode, etc. If a special mode exceeding the absolute maximum rating is assumed, please review to provide physical safety means such as fuse, etc.

2. GND Potential

Maintain the PGND pin potential at the minimum level under the operating conditions. Furthermore, maintain the pin except the VC pin at a voltage higher than the PGND pin voltage including an actual transient phenomenon.
The SW pin sometimes is charged by a negative voltage depending on the characteristics of the external transformer.
If any change in or damage of electrical characteristics is suspected due to the SW pin being charged by a negative voltage, it is recommended that a schottky diode should be connected between the SW pin and the PGND pin.

3. Thermal Design

Work out the thermal design with sufficient margin taking power dissipation (Pd) at the actual operation condition into account.

4. Protective circuits

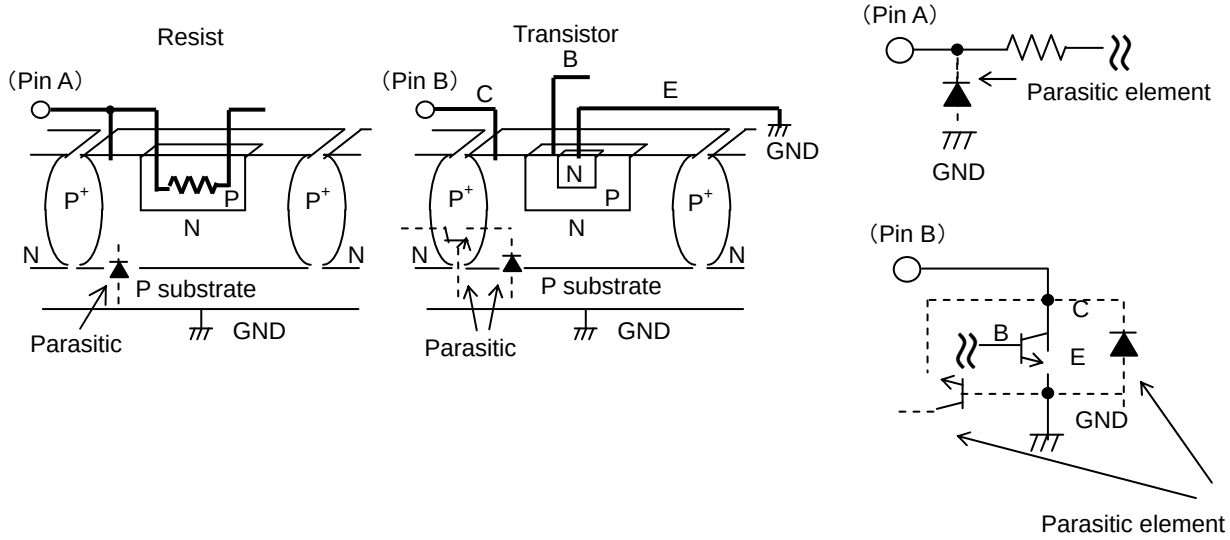
This IC don't have over current protect circuit. The threat of destruction may exist , if Pd is over caused by over current or short circuit pin . Be careful to design around circuit.

5. Short Circuit between Pins and Incorrect Mounting

Sufficient caution is required for IC direction or displacement when installing IC on PCB. If IC is installed incorrectly, it may be broken. Also, the threat of destruction may exist in short circuits caused by foreign object invasion between outputs or output and GND of the power supply.

6. Common Impedance

When providing a power supply and GND wirings, give sufficient consideration to lowering common impedance, reducing ripple (i.e. making thick and short wiring, reduction ripple by LC, etc.) as much as possible.



Notes

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