

System Lens Drivers

Microstep system Lens Driver for Digital Still Cameras



BU24026GU

●General Description

BU24026GU is the system Lens Driver corresponding to the Microstep driving, making it possible to configure the sophisticated, high precision and low noise lens driver system. Microstep controller is incorporated into IC, making it possible to cut down CPU power. In addition, drivers for DC motor and voice coil motor are built in. Multifunctional lens can be applied.

●Key Specifications

- Digital power supply voltage: 2.7V to 3.6V
- Driver power supply voltage: 2.7V to 5.5V
- Output current (1-7ch): ±500mA(Max.)
- Input clock frequency: 1MHz to 27.5MHz
- FET ON resistance (1-6ch): 1.5Ω(Typ.)
- FET ON resistance (7ch): 0.9Ω(Typ.)
- Operating temperature range: -20°C to +85°C

●Features

- Built-in 7 channels Driver block.
1-6ch: Voltage control type H-bridge
7ch: Current control type H-bridge
- Built-in 2 channels PI driving circuit
- Built-in 3 channels Waveforming circuit

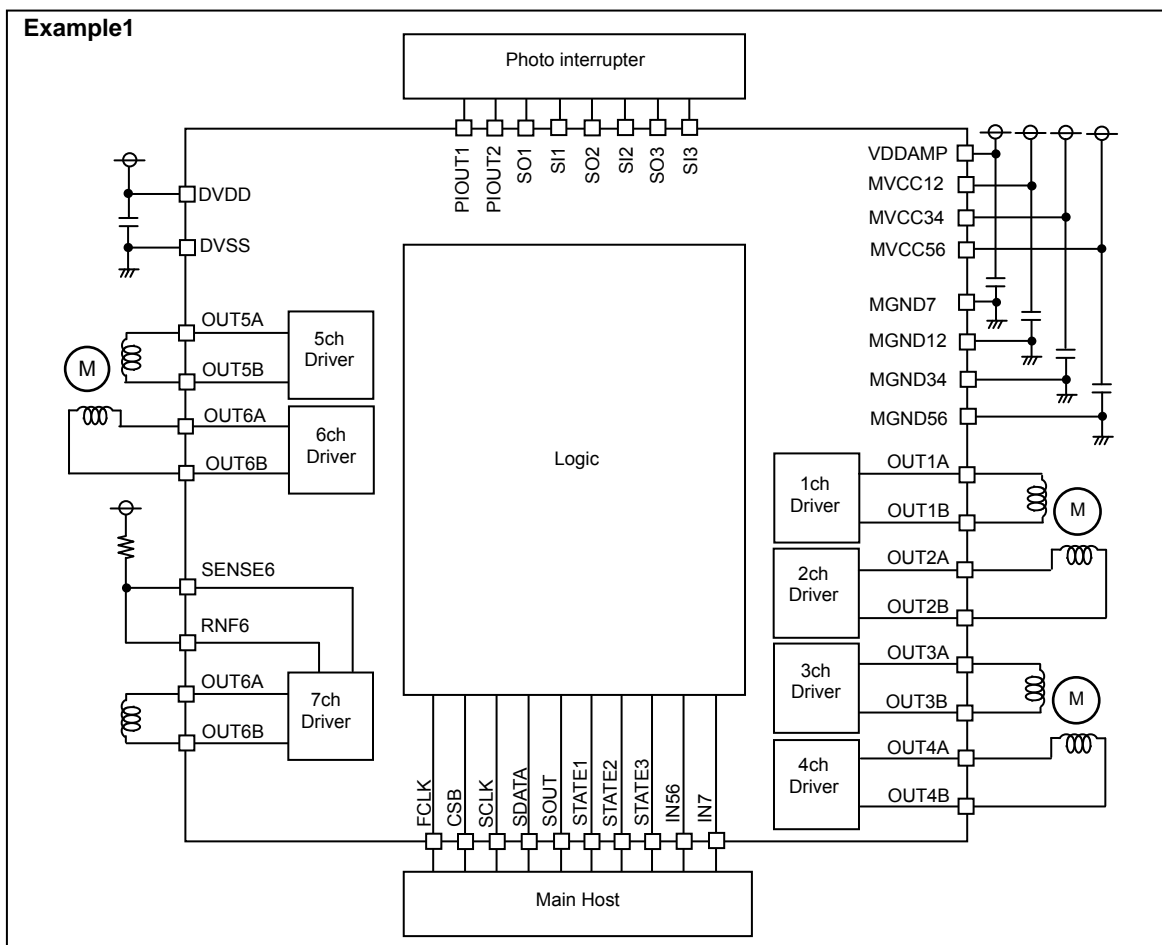
●Package

VCSP85H3 3.80mm x 3.80mm x 1.00mm

●Applications

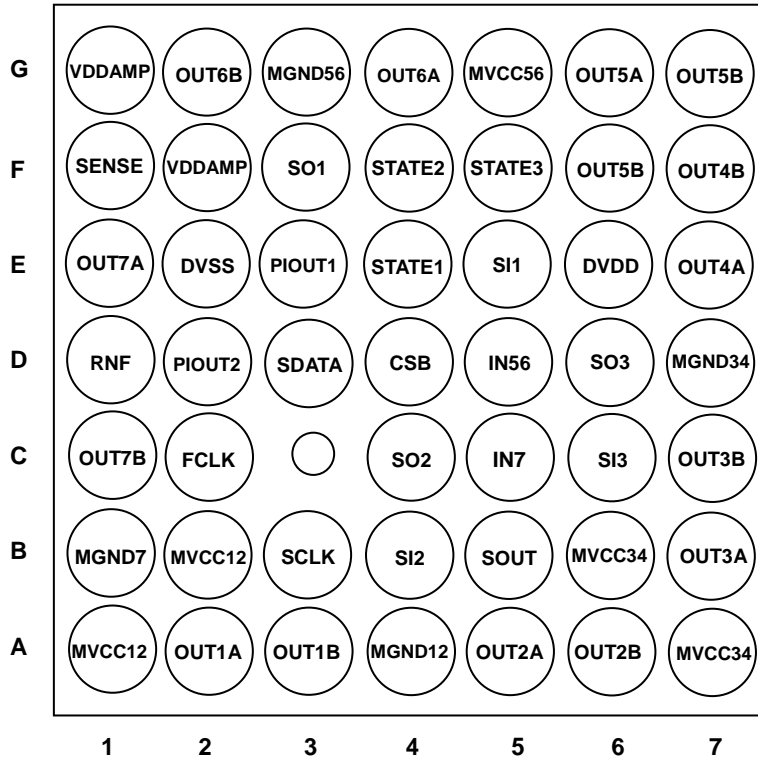
- Digital still cameras

●Typical Application Circuit



● Pin Configuration

(Bottom view)

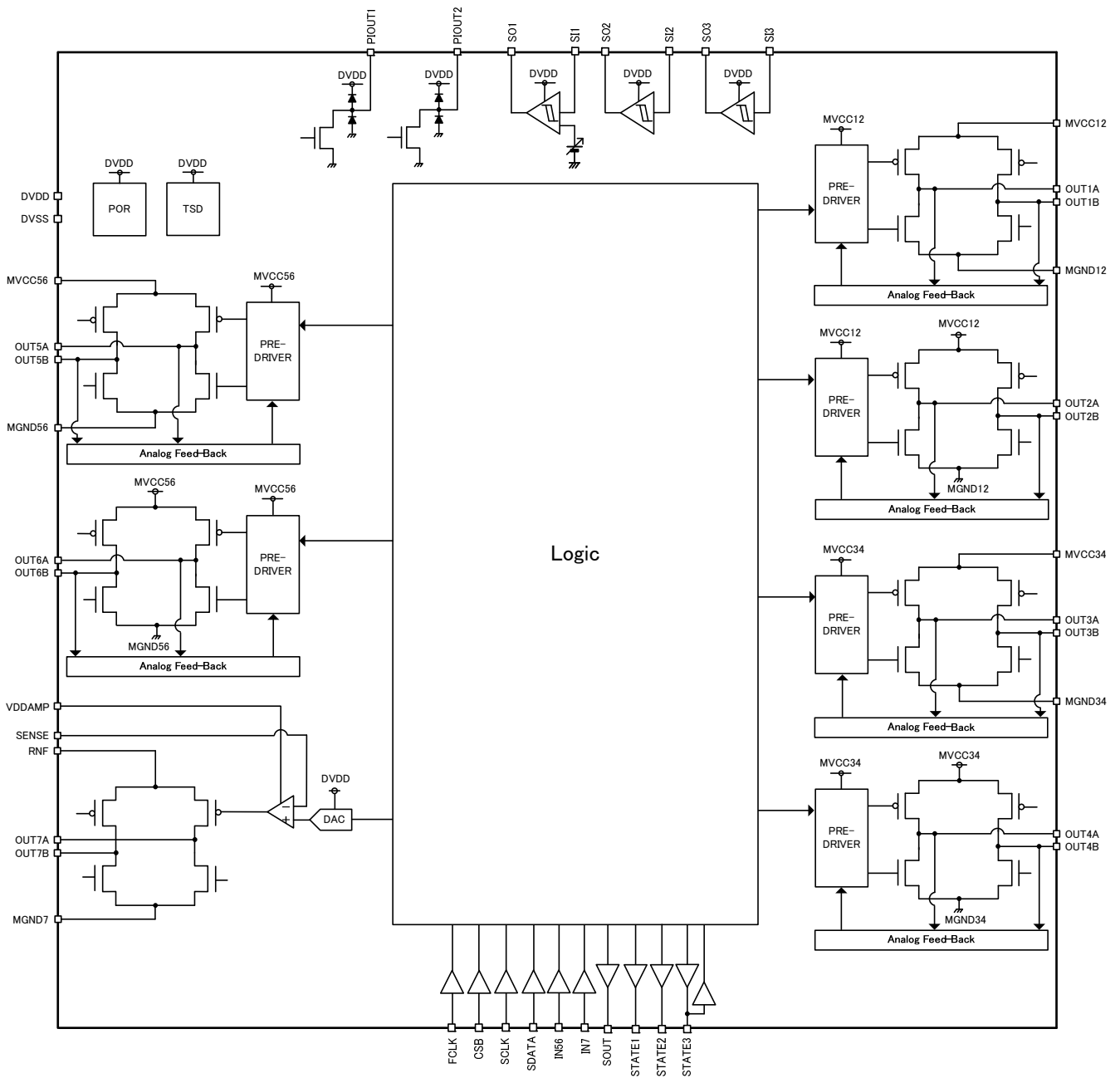


●Pin Description

Land Matrix No.	Pin name	Power supply	Function	Land Matrix No.	Pin name	Power supply	Function
E6	DVDD	-	Digital power supply	A3	OUT1B	MVCC12	1-channel driver B output
E2	DVSS	-	Ground	A5	OUT2A	MVCC12	2-channel driver A output
C2	FCLK	DVDD	main clock logic input	A6	OUT2B	MVCC12	2-channel driver B output
D4	CSB	DVDD	Serial control chip select input	A7, B6(*)	MVCC34	-	3-4channel driver power supply
B3	SCLK	DVDD	Serial control clock input	D7	MGND34	-	3-4channel driver ground
D3	SDATA	DVDD	Serial control data input	B7	OUT3A	MVCC34	3-channel driver A output
B5	SOUT	DVDD	Serial control data output	C7	OUT3B	MVCC34	3-channel driver B output
E4	STATE1	DVDD	STATE1 1,2ch condition logic output	E7	OUT4A	MVCC34	4-channel driver A output
F4	STATE2	DVDD	STATE2 3,4ch condition logic output	F7	OUT4B	MVCC34	4-channel driver B output
F5	STATE3	DVDD	STATE 3 5,6ch condition logic output 5,6ch control logic input	G5	MVCC56	-	5-6channel driver power supply
D5	IN56	DVDD	5,6ch control logic input	G3	MGND56	-	5-6channel driver ground
C5	IN7	DVDD	7ch control logic input	G6	OUT5A	MVCC56	5-channel driver A output
E3	PIOUT1	DVDD	PI driving output1	F6,G7(*)	OUT5B	MVCC56	5-channel driver B output
D2	PIOUT2	DVDD	PI driving output2	G4	OUT6A	MVCC56	6-channel driver A output
E5	SI1	DVDD	1ch waveforming input(With adjustment function of threshold voltage)	G2	OUT6B	MVCC56	6-channel driver B output
B4	SI2	DVDD	2ch waveforming input	D1	RNF	-	7-channel driver power supply
C6	SI3	DVDD	3ch waveforming input	B1	MGND7	-	7-channel driver ground
F3	SO1	DVDD	1ch waveforming output	F2,G1(*)	VDDAMP	-	Power supply of constant current driver control
C4	SO2	DVDD	2ch waveforming output	F1	SENSE	VDDAMP	Negative input for constant current driver control
D6	SO3	DVDD	3ch waveforming output	E1	OUT7A	RNF	7-channel driver A output
A1, B2(*)	MVCC12	-	1-2channel driver power supply	C1	OUT7B	RNF	7-channel driver B output
A4	MGND12	-	1-2channel driver ground	C3	INDEX	-	Index pin
A2	OUT1A	MVCC12	1-channel driver A output				

(*)It is not possible to use corner pin only. (Corner pins are A1, A7, G1, and G7.)
Please use A1-B2, A7-B6, F2-G1, F6-G7 pair respectively or using B2, B6, F2, F6 only.

●Block Diagram



●Description of Blocks

Stepping motor driver (1-6ch Driver)

Built-in the stepping motor driver of PWM driving type.

3 stepping motor can be driven.

Built-in the voltage feedback circuit of D-class type

(1) Control

(i)Autonomous control

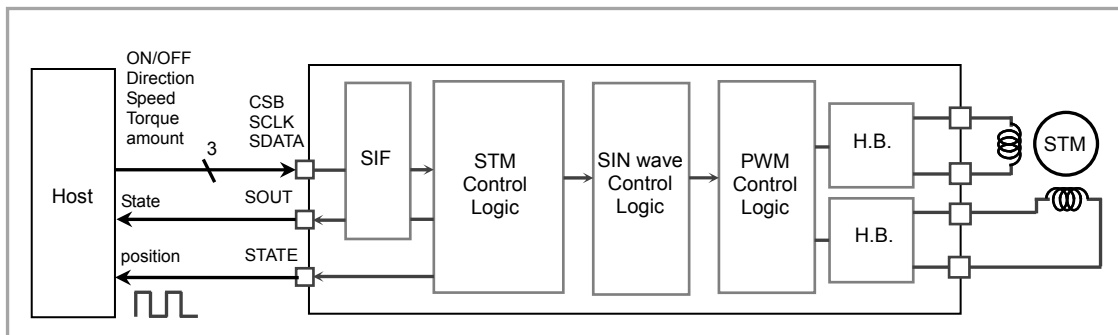
The stepping motor is rotated by the setting of registers for the stepping motor control.

The state of rotation command(executing:1, finished:0), Cache register, and motor position are outputted from the serial output(SOUT pin).

Also, the signal(MO output) synchronized with the motor rotation is outputted from STATE pin. It is possible to select the mode of stepping motor control from Micro-step(1024 portion), 1-2 phase excitation, 2 phase excitation

Built-in Cache registers.

As Cache registers enable to set the subsequent process while the motor is in operation, it is possible to set the continuous operation.



●Description of Blocks

Voltage driver (7ch driver)

Built-in the constant current driver.

The voltage of RNF pin and the external resistor(RRNF)are determined to the output current, and the internal high-precision amplifier(CMOS gate input)is exerted on the constant current control.

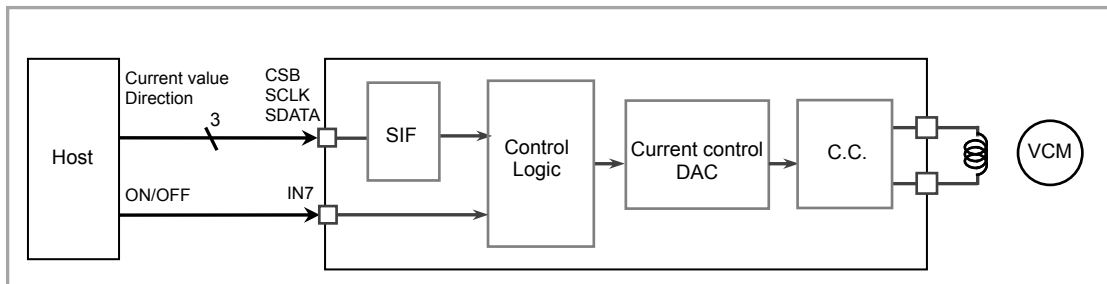
If any resistance component exists in the wirings of RNF pin and the external resistor(RRNF), the precision can be degraded.

To avoid that, pay utmost attention to the wirings.

(1) Control

(i)External pin control

The constant current driving is executed by the setting of register for the output current value and the direction and the control of IN7 pin for ON/OFF.



●Absolute Maximum Ratings(Ta=25°C)

Parameter	Symbol	Limits	Unit	Remark
Power supply voltage	DVDD	-0.3 to 4.5	V	
	MVCC	-0.3 to 7.0	V	
	VDDAMP	-0.3 to 7.0	V	
Input voltage	VIN	-0.3 to supply voltage+0.3	V	
Input/output current	IIN	±500	mA	Driver block (by MVCC pin)
		+100	mA	by PIOOUT pin
Storage temperature range	TSTG	-55 to 125	°C	
Operating temperature range	TOPE	-20 to 85	°C	
Permissible dissipation *1	PD	1370	mW	

*1 To use at a temperature higher than Ta=25 °C, derate 13.7mW per 1 °C
(At mounting 50mm x 58mm x 1.75mm glass epoxy board.)

●Recommended Operating Rating (Ta=25°C)

Parameter	Symbol	Limits	Unit	Remark
Digital power supply voltage	DVDD	2.7 to 3.6	V	DVDD ≤ MVCC
Driver power supply voltage	MVCC	2.7 to 5.5	V	
Constant current control Amplifier power supply voltage	VDDAMP	2.7 to 5.5	V	
Clock operating frequency	FCLK	1 to 27.5	MHz	Reference clock

●Electrical Characteristics

(Unless otherwise specified, Ta=25°C, DVDD=3.0V, MVCC=5.0V, VDDAMP=5.0V, DVSS=MGND=0.0V)

Parameter	Symbol	Limits			Unit	Condition
		MIN.	TYP.	MAX.		
<Current consumption>						
Quiescence (DVDD)	ISSD	-	30	100	uA	CMD_RS=0
(MVCC)	ISSVM	-	0	10	uA	
Operation (DVDD)	IDDD	-	8.5	15.0	mA	CMD_RS=1
<Logic block>						
Low-level input voltage	VIL	DVSS	-	0.3DVDD	V	
High-level input voltage	VIH	0.7DVDD	-	DVDD	V	
Low-level input current	IIL	0	-	10	uA	VIL=DVSS
High-level input current	IIH	0	-	10	uA	VIH=DVDD
Low-level output voltage	VOL	DVSS	-	0.2DVDD	V	IOL=1.0mA
High-level output voltage	VOH	0.8DVDD	-	DVDD	V	IOH=1.0mA
<PI driving circuit>						
Output voltage	PIVO	-	0.28	0.50	V	IIH=50mA
<Waveforming circuit 1ch>						
Detective voltage range	Vth	0.5	-	2.5	V	SI1
Detective voltage error	V	1/2DVDD-0.1	1/2DVDD	1/2DVDD+0.1	V	Waveforming Vth = 20h setting
<Waveforming circuit 2,3ch>						
High-level threshold voltage	VthH1	-	-	1.9	V	SI2,SI3(DVDD=3.25V) Hys ON
Low-level threshold voltage	VthL1	0.6	-	-	V	SI2,SI3(DVDD=3.25V) Hys ON
Hysteresis width	HYS	0.2	-	0.6	V	SI2,SI3(DVDD=3.25V) Hys ON
threshold voltage	VthH2	1.0	-	1.85	V	SI2,SI3(DVDD=3.25V) Hys OFF
< Voltage driver block >						
ON-resistance	Ron	-	1.5	2.0	Ω	IO=±100mA (the sum of high and low sides)
OFF-leak current	IOZ	-10	0	10	uA	Output Hiz setting
Turn-ON time	tON	-	0.15	1.0	uS	
Turn-OFF time	tOFF	-	0.1	0.5	uS	
Average voltage accuracy between different output pins	Vdiff	-5	-	+5	%	Vdiff = 2.0V setting.
<Current driver block >						
ON-resistance	Ron	-	0.9	1.5	Ω	IO=±100mA (the sum of high and low sides)
OFF-leak current	IOZ	-10	0	10	uA	Output Hiz setting
Output voltage	VO	188	200	212	mV	DAC setting : 1010_0111 RRNF=1Ω
Turn-ON time	tON	-	0.15	1.0	uS	
Turn-OFF time	tOFF	-	0.1	0.5	uS	

● Typical Performance Curves

(Unless otherwise specified, $T_a=25^{\circ}\text{C}$, $\text{DVDD}=3.0\text{V}$, $\text{MVCC}=5.0\text{V}$, $\text{DVSS}=\text{MGND}=0.0\text{V}$)

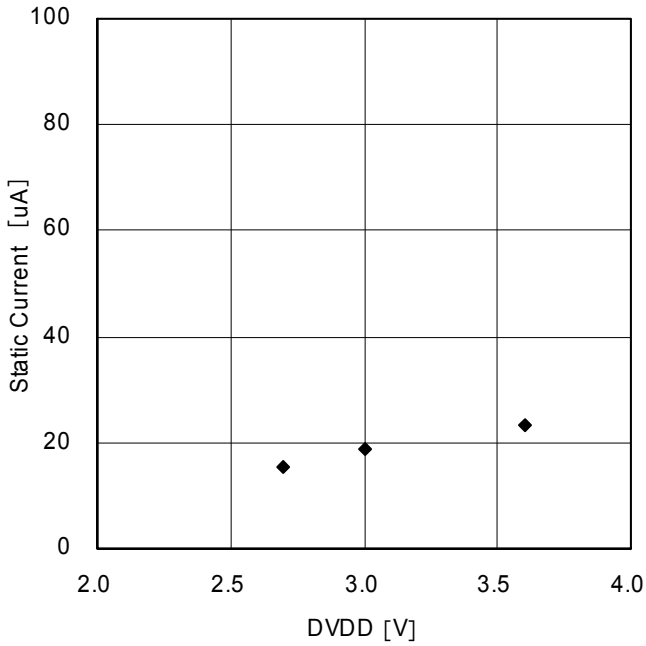


Figure 1. DVDD Static Current Voltage Dependency

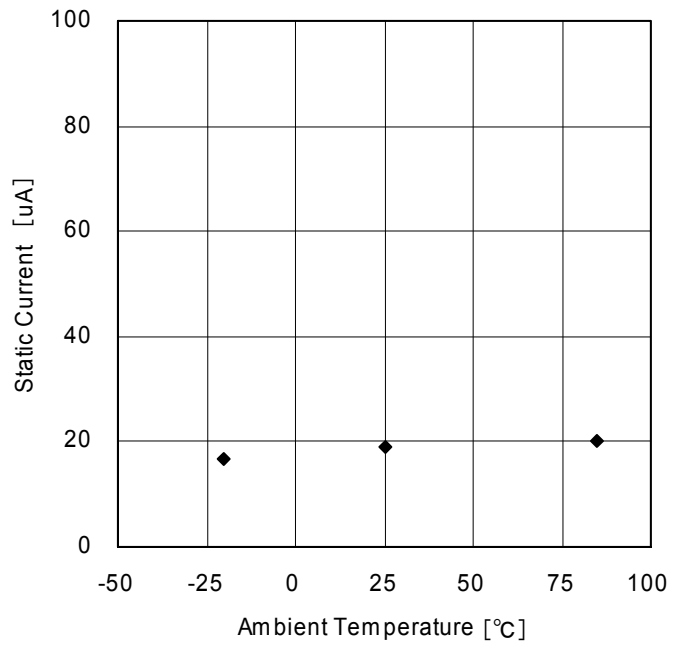


Figure 2. DVDD Static Current Temperature Dependency

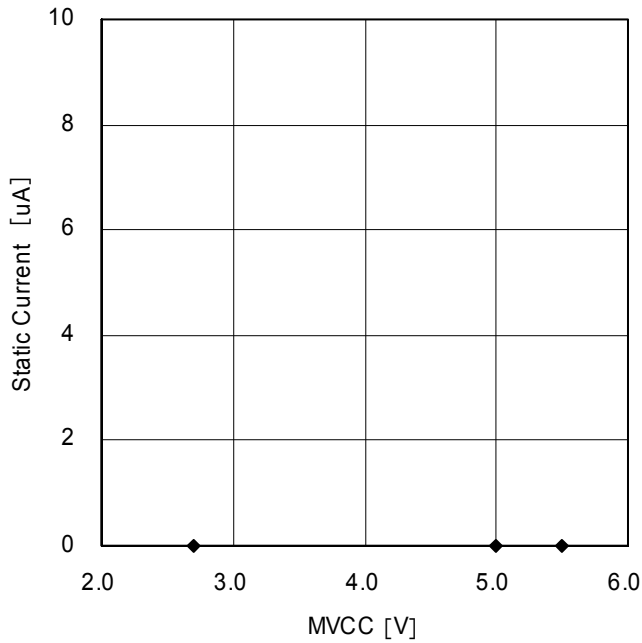


Figure 3. MVCC Static Current Voltage Dependency

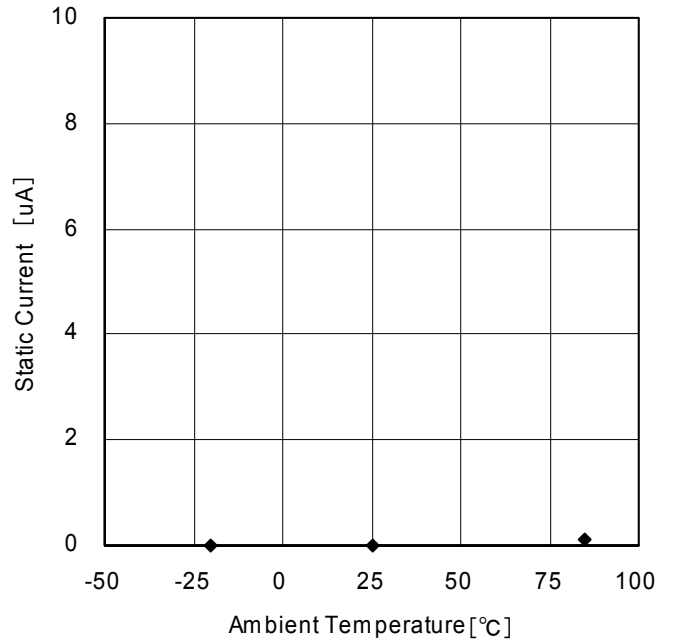


Figure 4. MVCC Static Current Temperature Dependency

● Typical Performance Curves

(Unless otherwise specified, $T_a=25^\circ\text{C}$, $DVDD=3.0\text{V}$, $MVCC=5.0\text{V}$, $DVSS=MGND=0.0\text{V}$)

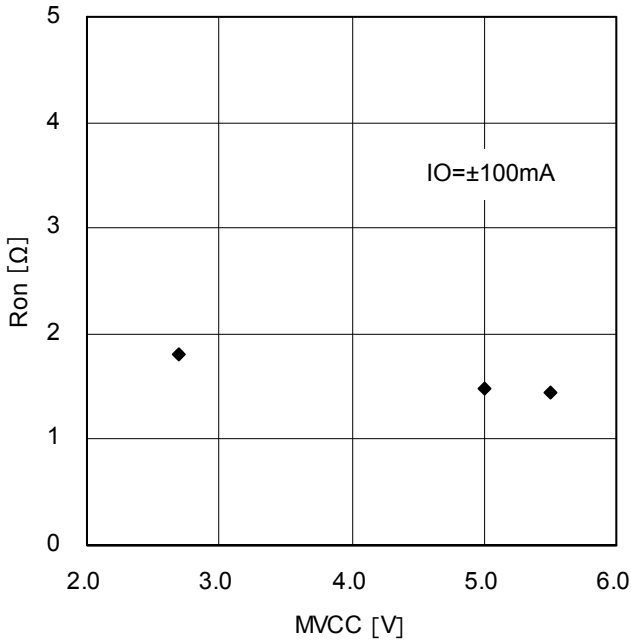


Figure 5. Output ON-Resistance
MVCC Dependency
(Voltage driver block)

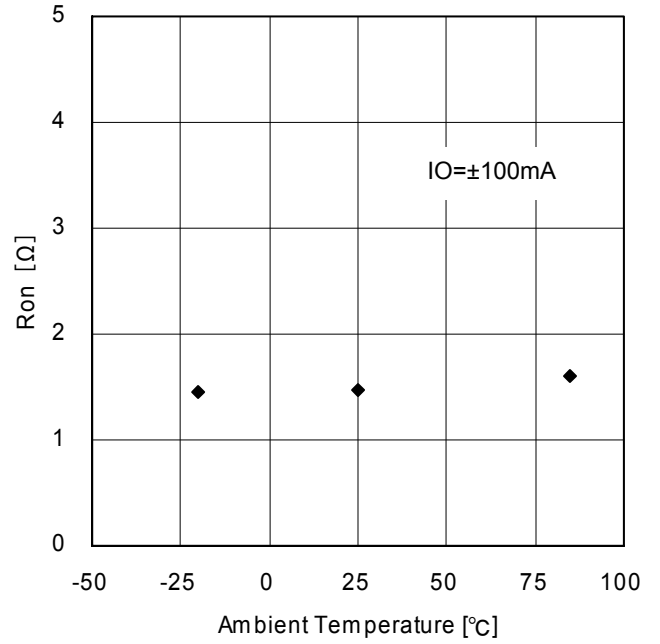


Figure 6. Output ON-Resistance
Temperature Dependency
(Voltage driver block)

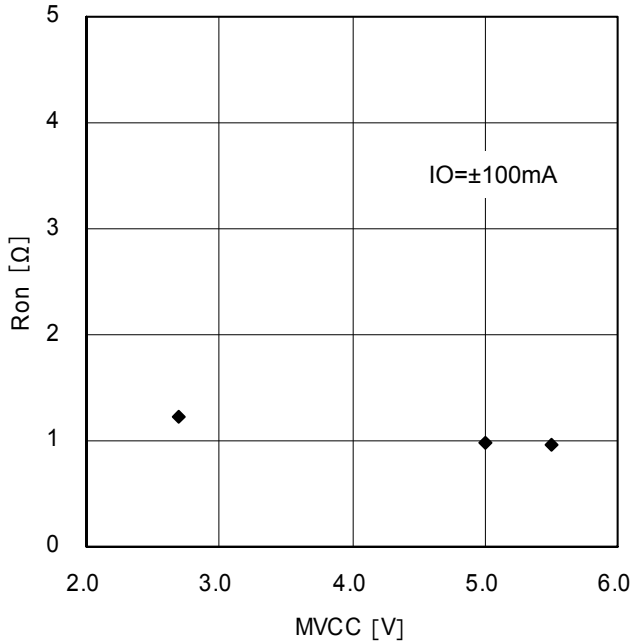


Figure 7. Output ON-Resistance
MVCC Dependency
(Current driver block)

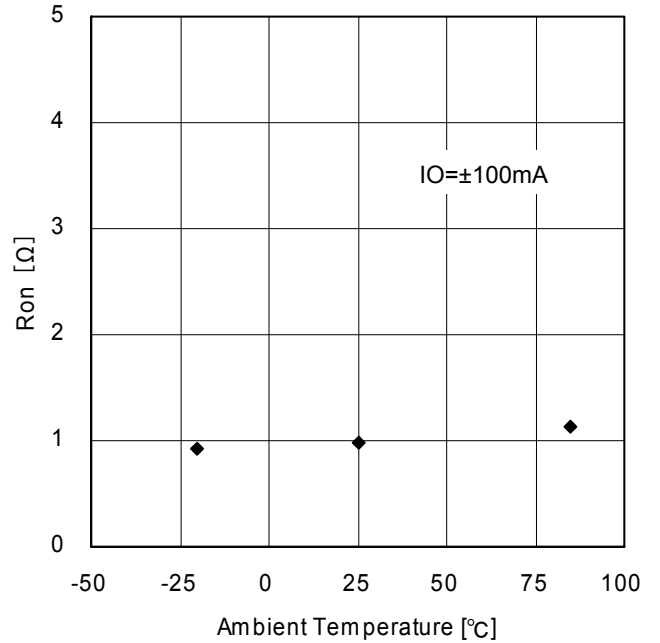


Figure 8. Output ON-Resistance
Temperature Dependency
(Current driver block)

● Typical Performance Curves

(Unless otherwise specified, $T_a=25^{\circ}\text{C}$, $\text{DVDD}=3.0\text{V}$, $\text{MVCC}=5.0\text{V}$, $\text{DVSS}=\text{MGND}=0.0\text{V}$)

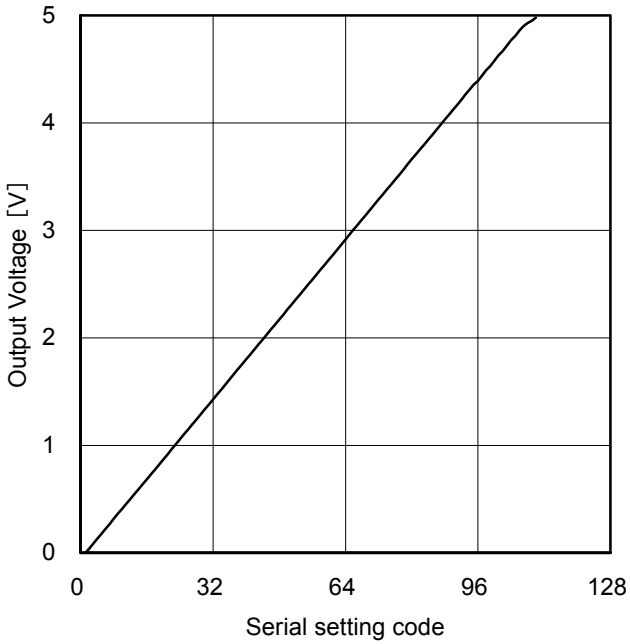


Figure 9. Average Voltage Accuracy between different output pins (Voltage driver block)

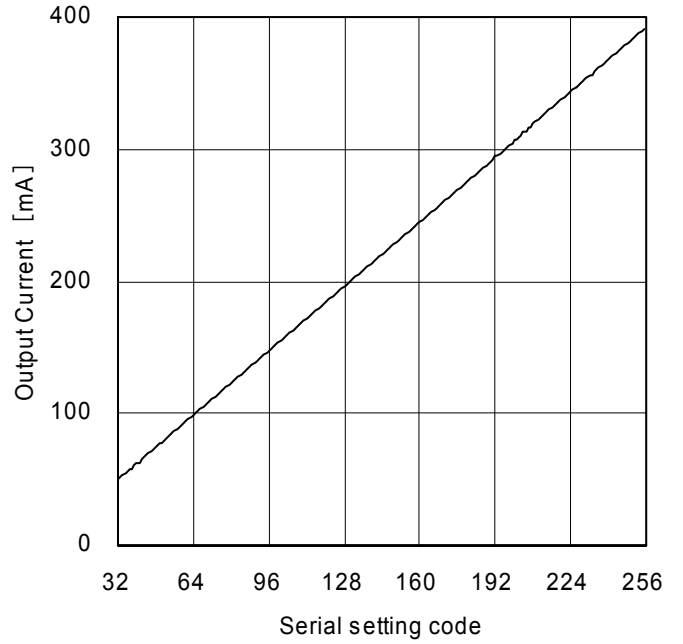


Figure 10. Output Current (Current driver block, $\text{RRNF} = 1.0\Omega$, $\text{RL} = 5.0\Omega$)

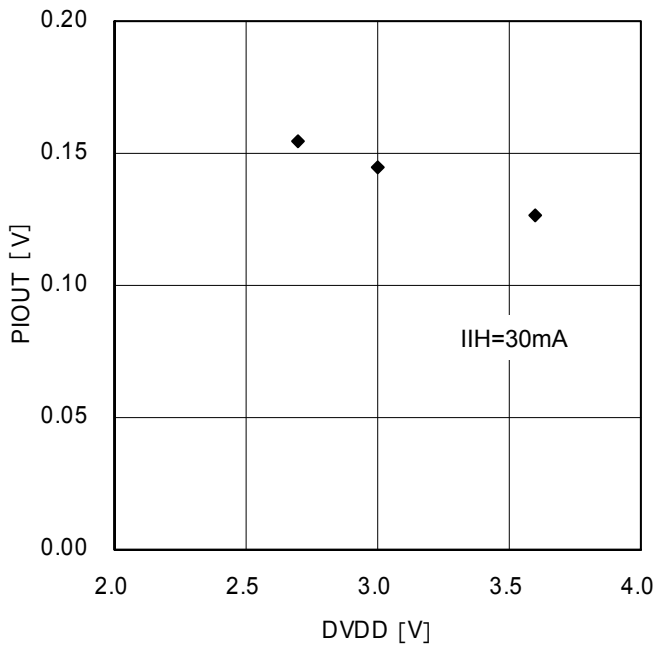


Figure 11. Output Voltage DVDD Dependency (PI driving circuit)

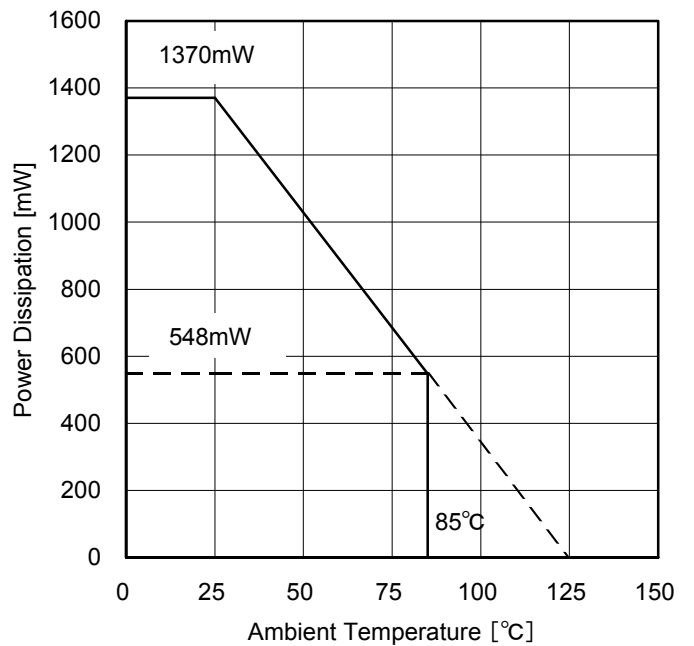
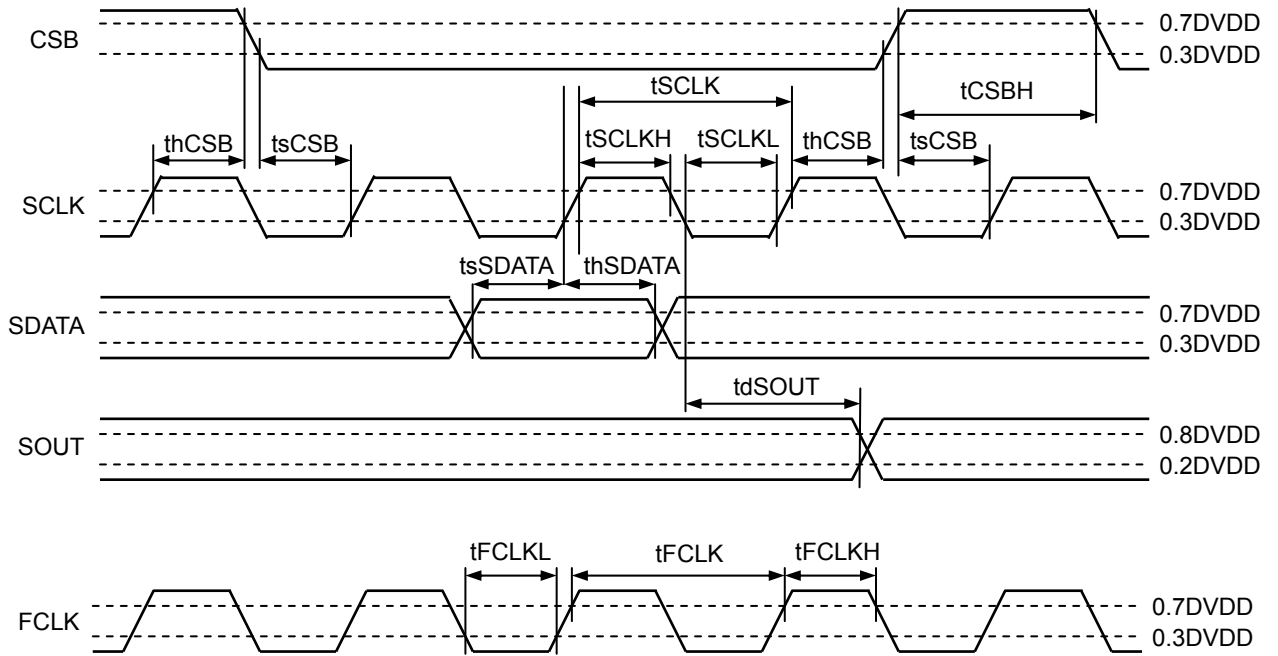


Figure 12. Power Dissipation Curve

●Timing Chart

(Unless otherwise specified, Ta=25°C, DVDD=3.0V)

Parameter	Symbol	Specification
SCLK input cycle	tSCLK	more than 125 nsec
SCLK L-level input time	tSCLKL	more than 50 nsec
SCLK H-level input time	tSCLKH	more than 50 nsec
SDATA setup time	tsSDATA	more than 50 nsec
SDATA hold time	thSDATA	more than 50 nsec
CSB H-level input time	tCSBH	more than 800 nsec
CSB setup time	tsCSB	more than 50 nsec
CSB hold time	thCSB	more than 50 nsec
SOUT output delay time	tdSOUT	more than 50 nsec
FCLK input cycle	tFCLK	more than 36 nsec
FCLK L-level input time	tFCLKL	more than 18 nsec
FCLK H-level input time	tFCLKH	more than 18 nsec



(note1) FCLK is asynchronous with SCLK.
 (note2) Duty of FCLK, SCLK are free.

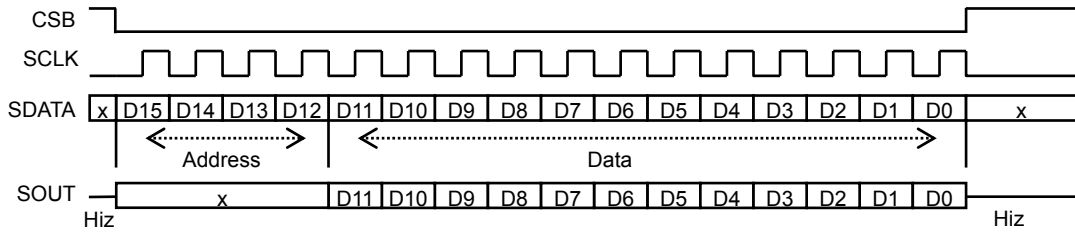
●Serial interface

Control commands are framed by 16-bit serial input (MSB first) and input through the CSB, SCLK, and SDATA pins. 4 higher-order bits specify addresses, while the remaining 12 bits specify data.

Data of every bit is input through the SDATA pin, retrieved on the rising edges of SCLK.

Data becomes valid in the CSB Low area. The loading timing is different in the resistor. (as shown in "Note 5,6")

Furthermore, the interface will be synchronized with the falling edges of SCLK to output the SOUT data of the 12 bits.

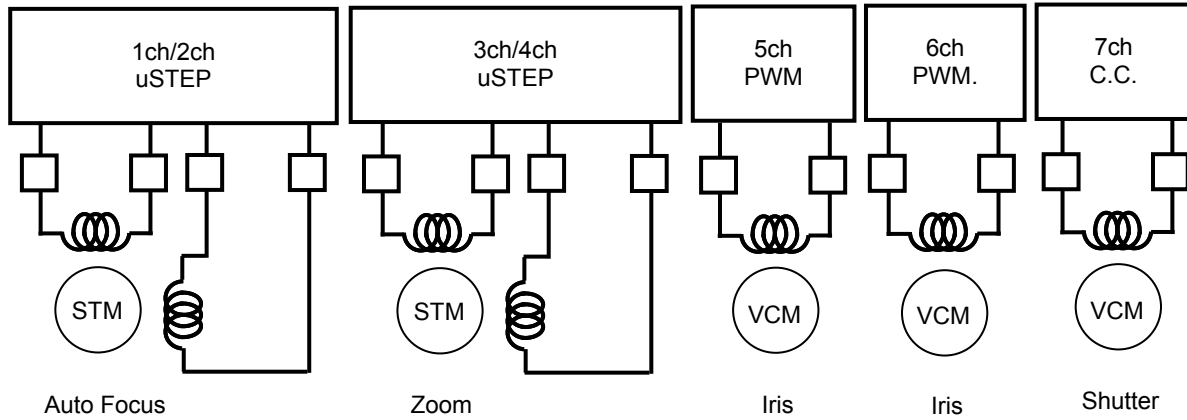
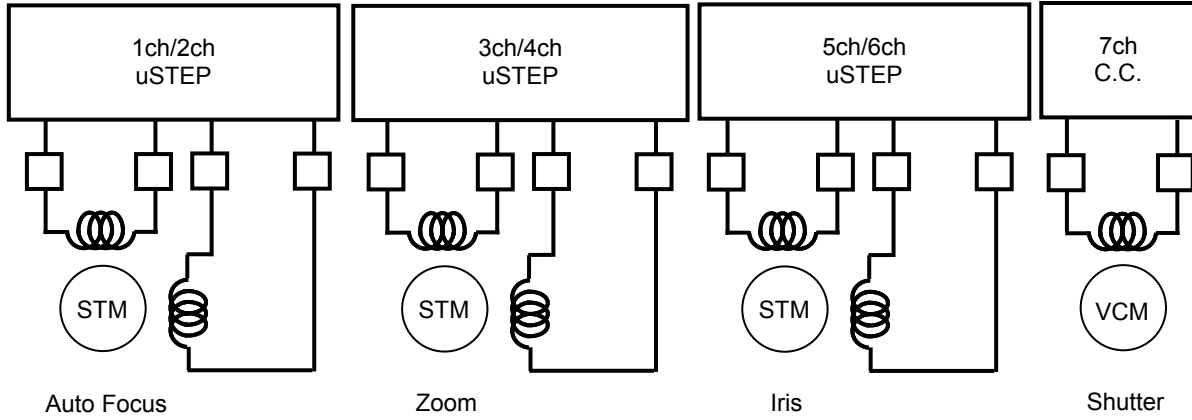


<Register map>

Address[3:0]				Data[11:0]														
14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
0	0	0	0	ModeA[1:0]		SelA[1:0]		0	Ach_different_output_voltage[6:0]									
0	0	0	1	0	0	0	0	Ach_Cycle[7:0]										
				0	0	1	0	Ach_Cycle[15:8]										
				1	1	1	0	0	0	APOS[1:0]	0	0	0	ASTOP				
0	0	1	0	EnA	RtA	Ach_Pulse[9:0]												
0	0	1	1	Ach status[1:0]		Ach operation pulse number[9:0]												
0	1	0	0	ModeB[1:0]		SelB[1:0]		0	Bch_different_output_voltage[6:0]									
0	1	0	1	0	0	0	0	Bch_Cycle[7:0]										
				0	0	1	0	Bch_Cycle[15:8]										
				1	1	1	0	0	0	BPOS[1:0]	0	0	0	BSTOP				
0	1	1	0	EnB	RtB	Bch_Pulse[9:0]												
0	1	1	1	Bch status[1:0]		Bch operation pulse number[9:0]												
1	0	0	0	ModeC[1:0]		SelC[1:0]		0	Cch_different_output_voltage[6:0]									
1	0	0	1	0	0	0	0	Cch_Cycle[7:0]										
				0	0	1	0	Cch_Cycle[15:8]										
				1	0	1	5_PWM_Ct[1:0]		5ch_different_output_voltage[6:0]									
				1	1	0	6_PWM_Ct[1:0]		6ch_different_output_voltage[6:0]									
1	1	1	1	1	0	0	0	C_POS[1:0]	0	0	0	CSTOP						
1	0	1	0	EnC	RtC	Cch_Pulse[9:0]												
1	0	1	1	Cch status[1:0]		Cch operation pulse number[9:0]												
1	1	0	0	0	0	Chopping[1:0]	CacheM	SEL56[2:0]		P_CTRL	CLK_DIV[2:0]							
1	1	0	1	0	0	0	0	0	0	0	0	0	PI_CTRL1	PI_CTRL2				
				0	0	1	0	0	5_PULSE_CNT	5_PULSE_BASE[1:0]	0	6_PULSE_CNT	6_PULSE_BASE[1:0]					
				0	1	0	0	5_PULSE_COUNT[7:0]										
				0	1	0	1	6_PULSE_COUNT[7:0]										
				0	1	1	0	0	EXT_EN	0	EXT_RT	EXT_NUM[3:0]						
				1	0	0	0	EXT_PAT1				EXT_PAT0						
				1	0	0	1	EXT_PAT3				EXT_PAT2						
				1	0	1	0	EXT_PAT5				EXT_PAT4						
				1	0	1	1	EXT_PAT7				EXT_PAT6						
				1	1	0	0	EXT_PAT9				EXT_PAT8						
				1	1	0	1	EXT_PAT11				EXT_PAT10						
				1	1	1	0	EXT_PAT13				EXT_PAT12						
				1	1	1	1	EXT_PAT15				EXT_PAT14						
				1	1	1	0	0	0	0	0	Constant current driver reference voltage adjustment 8bit DAC[7:0]						
								0	1	0	0	0	0	0	0	0	7_CTRL[1:0]	
1	0	0	0					0	wavefoming circuit 1 Vth[5:0]									
1	0	0	1					0	wavefoming circuit 1 Vth[5:0]									
1	0	1	0					0	0	0	0	0	0	HYS3	HYS2			
1	1	0	0	0	0	0	0	0	0	0	0	CMD_RS						
Addresses other than those above				Setting prohibited														

- (Note 1) The notations A, B, C in the register map correspond to Ach, Bch and Cch respectively.
- (Note 2) The Ach is defined as 1ch and 2ch driver output, the Bch as 3ch and 4ch driver output, and Cch as 5ch and 6ch driver output.
- (Note 3) After resetting (Power ON reset, and CMD_RS), "initial setting" is saved in all registers.
- (Note 4) The addresses 4'b0011, 4'b0111, and 4'b1011 have data (status[1:0], operation pulse number[9:0]), which are internal register values and output from the SOUT pin.
- (Note 5) For Mode, different output voltage, Cycle, En, and Rt registers, data that are written before the access to the Pulse register becomes valid, and determined at the rising edge of CSB after the access to the Pulse register. (The Mode, different output voltage, Cycle, En, Rt, and Pulse registers contain Cache registers, but any registers other than those do not contain with such registers.)
- (Note 6) For POS, STOP, PWM_Ct, and different output voltage registers, data are determined at the rising edge of CSB, and for any registers other than those, data are determined at the rising edge of 16th SCLK.

●Application Example



● I/O equivalence circuit

Pin	Equivalent circuit	Pin	Equivalent circuit
FCLK CSB SCLK SDATA IN56 IN7 SI2 SI3 * SI2,SI3 are the Schmitt inputs.		SENSE	
SOUT STATE1 STATE2 SO1 SO2 SO3		PIOUT1 PIOUT2	
OUT1A OUT1B OUT2A OUT2B		OUT3A OUT3B OUT4A OUT4B	
OUT5A OUT5B OUT6A OUT6B		OUT7A OUT7B RNF	
STATE3		SI1	

●Operational Notes

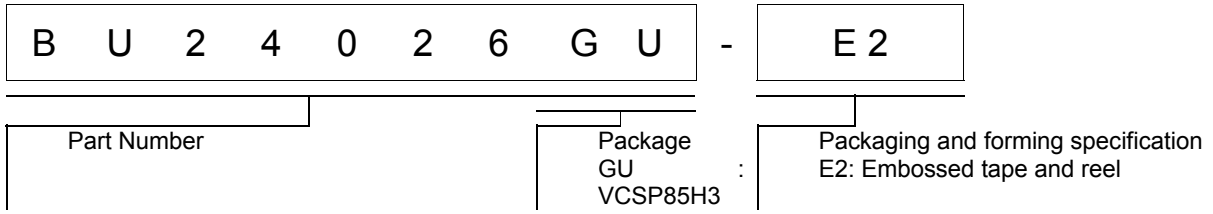
- 1) Absolute maximum ratings
If applied voltage, operating temperature range, or other absolute maximum ratings are exceeded, the LSI may be damaged. Do not apply voltages or temperatures that exceed the absolute maximum ratings. If you expect that any voltage or temperature could be exceeding the absolute maximum ratings, take physical safety measures such as fuses to prevent any conditions exceeding the absolute maximum ratings from being applied to the LSI.
- 2) GND potential
Maintain the GND pin at the minimum voltage even under any operating conditions.
Actually check to be sure that none of the pins have voltage lower than that of GND pin, including transient phenomena.
- 3) Thermal design
With consideration given to the permissible dissipation under actual use conditions, perform thermal design so that adequate margins will be provided.
- 4) Short circuit between pins and malfunctions
To mount the LSI on a board, pay utmost attention to the orientation and displacement of the LSI. Faulty mounting to apply a voltage to the LSI may cause damage to the LSI. Furthermore, the LSI may also be damaged if any foreign matters enter between pins, between pin and power supply, or between pin and GND of the LSI.
- 5) Operation in strong magnetic field
Make a thorough evaluation on use of the LSI in a strong magnetic field. Not doing so may malfunction the LSI.
- 6) Power ON sequence
To turn ON the DVDD, be sure to reset at CMD_RS register.
- 7) Thermal shutdown
The temperature protection circuit (TSD circuit) is a circuit absolutely intended to shut down this IC from thermal runaway, not intended to protect or warrant the IC. Consequently, do not use the IC on the assumption that it will continuously use or operate after operating this circuit.
- 8) PI drive circuit
The output voltage of output PIOOUT will not exceed the voltage of the power supply voltage DVDD.

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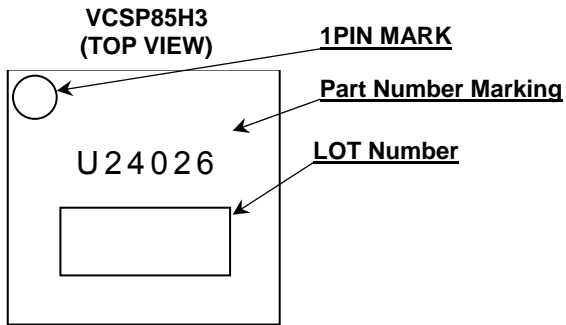
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If there are any differences in translation version of this document formal version takes priority

● Ordering Information

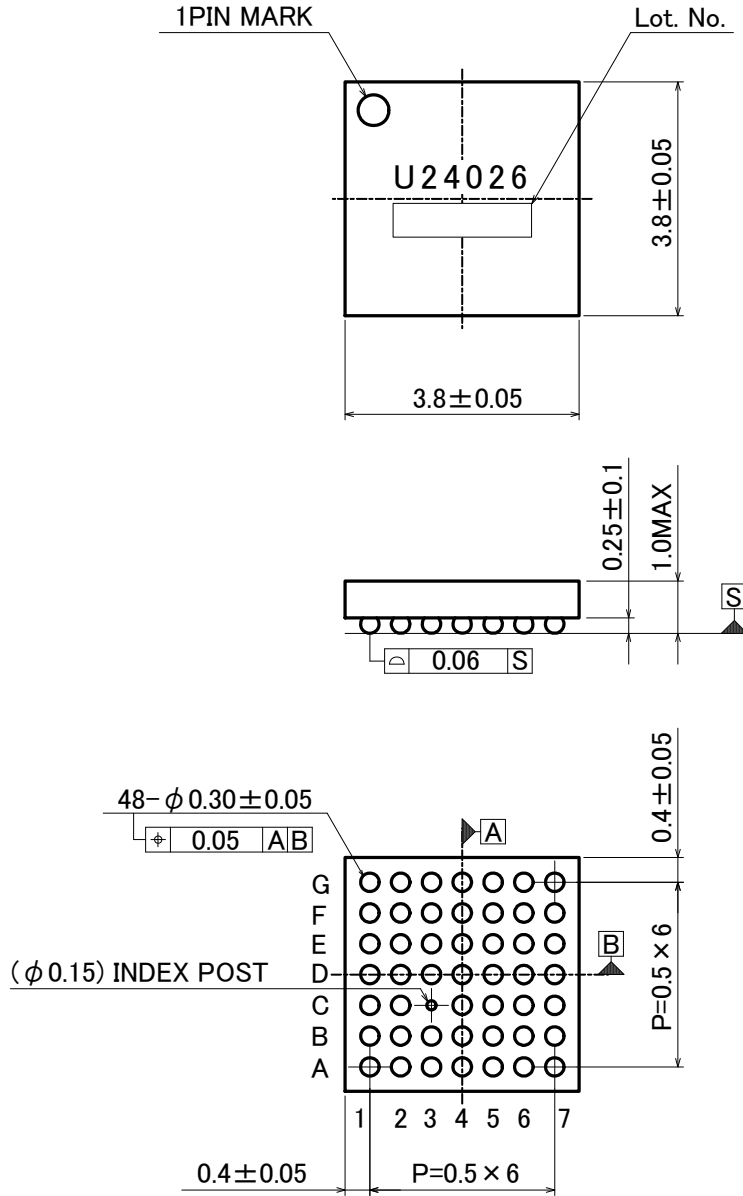


● Marking Diagram

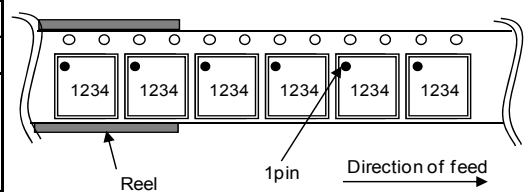


●Physical Dimension Tape and Reel Information

Package Name	VCSP85H3
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Tape	Embossed carriertape
Quantity	2,500pcs/Reel
Direction of feed	E2 (The direction is 1pin product is at the upper left when you hold reel on the hand and you pull out the tape on the right hand)



●Revision History

Date	Revision	Changes
26.Sep.2012	001	New Release

Notice

●General Precaution

- 1) Before you use our Products, you are requested to carefully read this document and fully understand its contents. ROHM shall not be in any way responsible or liable for failure, malfunction or accident arising from the use of any ROHM's Products against warning, caution or note contained in this document.
- 2) All information contained in this document is current as of the issuing date and subject to change without any prior notice. Before purchasing or using ROHM's Products, please confirm the latest information with a ROHM sales representative.

●Precaution on using ROHM Products

- 1) Our Products are designed and manufactured for application in ordinary electronic equipments (such as AV equipment, OA equipment, telecommunication equipment, home electronic appliances, amusement equipment, etc.). If you intend to use our Products in devices requiring extremely high reliability (such as medical equipment, transport equipment, traffic equipment, aircraft/spacecraft, nuclear power controllers, fuel controllers, car equipment including car accessories, safety devices, etc.) and whose malfunction or failure may cause loss of human life, bodily injury or serious damage to property ("Specific Applications"), please consult with the ROHM sales representative in advance. Unless otherwise agreed in writing by ROHM in advance, ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of any ROHM's Products for Specific Applications.
- 2) ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
 - [a] Installation of protection circuits or other protective devices to improve system safety
 - [b] Installation of redundant circuits to reduce the impact of single or multiple circuit failure
- 3) Our Products are designed and manufactured for use under standard conditions and not under any special or extraordinary environments or conditions, as exemplified below. Accordingly, ROHM shall not be in any way responsible or liable for any damages, expenses or losses arising from the use of any ROHM's Products under any special or extraordinary environments or conditions. If you intend to use our Products under any special or extraordinary environments or conditions (as exemplified below), your independent verification and confirmation of product performance, reliability, etc. prior to use, must be necessary:
 - [a] Use of our Products in any types of liquid, including water, oils, chemicals, and organic solvents
 - [b] Use of our Products outdoors or in places where the Products are exposed to direct sunlight or dust
 - [c] Use of our Products in places where the Products are exposed to sea wind or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [d] Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
 - [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
 - [f] Sealing or coating our Products with resin or other coating materials
 - [g] Use of our Products without cleaning residue of flux (even if you use no-clean type fluxes, cleaning residue of flux is recommended); or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
 - [h] Use of the Products in places subject to dew condensation
- 4) The Products are not subject to radiation-proof design.
- 5) Please verify and confirm characteristics of the final or mounted products in using the Products.
- 6) In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse) is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.
- 7) De-rate Power Dissipation (Pd) depending on Ambient temperature (Ta). When used in sealed area, confirm the actual ambient temperature.
- 8) Confirm that operation temperature is within the specified range described in the product specification.
- 9) ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

●Precaution for Mounting / Circuit board design

- 1) When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.
- 2) In principle, the reflow soldering method must be used; if flow soldering method is preferred, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

●Precautions Regarding Application Examples and External Circuits

- 1) If change is made to the constant of an external circuit, please allow a sufficient margin considering variations of the characteristics of the Products and external components, including transient characteristics, as well as static characteristics.
- 2) You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

●Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

●Precaution for Storage / Transportation

- 1) Product performance and soldered connections may deteriorate if the Products are stored in the places where:
 - [a] the Products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, and NO₂
 - [b] the temperature or humidity exceeds those recommended by ROHM
 - [c] the Products are exposed to direct sunshine or condensation
 - [d] the Products are exposed to high Electrostatic
- 2) Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.
- 3) Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.
- 4) Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

●Precaution for Product Label

QR code printed on ROHM Products label is for ROHM's internal use only.

●Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

●Precaution for Foreign Exchange and Foreign Trade act

Since our Products might fall under controlled goods prescribed by the applicable foreign exchange and foreign trade act, please consult with ROHM representative in case of export.

●Precaution Regarding Intellectual Property Rights

- 1) All information and data including but not limited to application example contained in this document is for reference only. ROHM does not warrant that foregoing information or data will not infringe any intellectual property rights or any other rights of any third party regarding such information or data. ROHM shall not be in any way responsible or liable for infringement of any intellectual property rights or other damages arising from use of such information or data.:
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●Other Precaution

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