STRUCTURE Silicon monolithic integrated circuits

PRODUCT SERIES Bipolar stepping motor driver

TYPE **BD6381EFV**

FUNCTION
- PWM constant current controllable two H bridge driver
- Power save mode
- Reference voltage output
- Low on resistance DMOS

○Absolute maximum ratings (Ta=25℃)

Item	Symbol	Limit	Unit
Supply voltage VCC	V_{CC}	-0.2～+7.0	V
Supply voltage VM	V_M	-0.2～+15.0	V
Power dissipation	Pd	1.1※1	W
		4.0※2	W
Input voltage for control pin	V_{IN}	-0.2～(V_{CC} +0.3)	V
RNF maximum voltage	V_{RNF}	0.5	V
Maximum output current	I_{OUT}	1.2※3	A/ch
Operating temperature range	T_{opr}	-25～+75	℃
Storage temperature range	T_{stg}	-55～+150	℃
Junction temperature	T_{jmax}	150	℃

※1 70mm×70mm×1.6mm glass epoxy board. Derating in done at 8.8mW/℃ for operating above Ta=25℃
※2 4-layer recommended board. Derating in done at 32.0mW/℃ for operating above Ta=25℃.
※3 Do not exceed Pd, ASO.

○Operating conditions (Ta=-25～+75℃)

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage VCC	V_{CC}	2.5	3.3	5.5	V
Supply voltage VM	V_M	6.0	7.2	13.5	V
Input voltage for control	V_{IN}	0	-	V_{CC}	V
Output current (DC)	I_{OUT}	-	0.6	0.8※4	A/ch

※4 Do not exceed Pd, ASO.

This product isn't designed for protection 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.

○ Electrical characteristics (Unless otherwise specified Ta=25℃、VCC=3.3V、VM=7.2V)

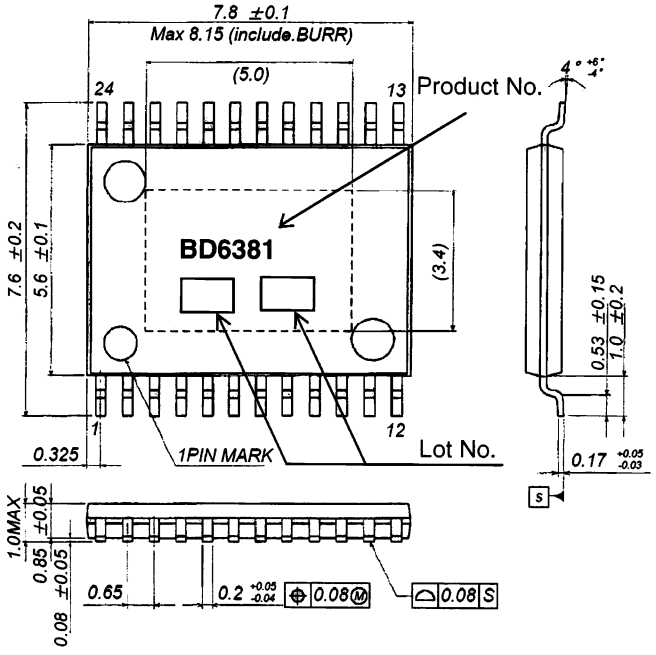
Item	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Whole						
VCC current at standby	I_{CCST}	-	0	10	μA	PS=L
VCC current	I_{CC}	-	1.6	3.0	mA	PS=H, VLIMX=0.5V
VM current at standby	I_{VMST}	-	0	10	μA	PS=L
VM current	I_{VM}	-	0.09	0.50	mA	PS=H, VLIMX=0.5V
Control input (PS, IN1A, IN1B, IN2A, IN2B)						
H level input voltage	V_{INH}	2.0	-	3.3	V	
L level input voltage	V_{INL}	0	-	0.8	V	
H level input current	I_{INH}	15	30	60	μA	V_{IN} =3V
L level input current	I_{INL}	-10	0	-	μA	V_{IN} =0V
Output (OUT1A, OUT1B, OUT2A, OUT2B)						
Output ON resistance	R_{ON}	-	1.0	1.25	Ω	I_{OUT} =±0.6A, VM=7.2V Sum of upper and lower
Output leak current	I_{LEAK}	-	-	10	μA	
Current control						
RNFX input current	I_{RNF}	-40	-20	-	μA	RNFX=0V
SENSEX input current	I_{SENSE}	-2.0	-0.1	-	μA	SENSEX=0V
VLIMX input current	I_{VLIM}	-2.0	-0.1	-	μA	VLIMX=0V
VLIMX input voltage range	V_{VLIM}	0	-	0.5	V	
Comparator offset voltage	V_{OFS}	-10	-	10	mV	
Noise cancel time	t_n	0.3	0.7	1.2	μs	R=39kΩ, C=1000pF
VREF voltage	V_{VREF}	0.97	1.00	1.03	V	I_{VREF}=0~1mA

○ Input-output logic table

	INPUT		OUTPUT		
PS	IN1A IN2A	IN1B IN2B	OUT1A OUT2A	OUT1B OUT2B	
L	X	X	OPEN	OPEN	All circuit Standby
H	L	L	OPEN	OPEN	Standby
H	H	L	H	L	Forward
H	L	H	L	H	Backward
H	H	H	L	L	Brake

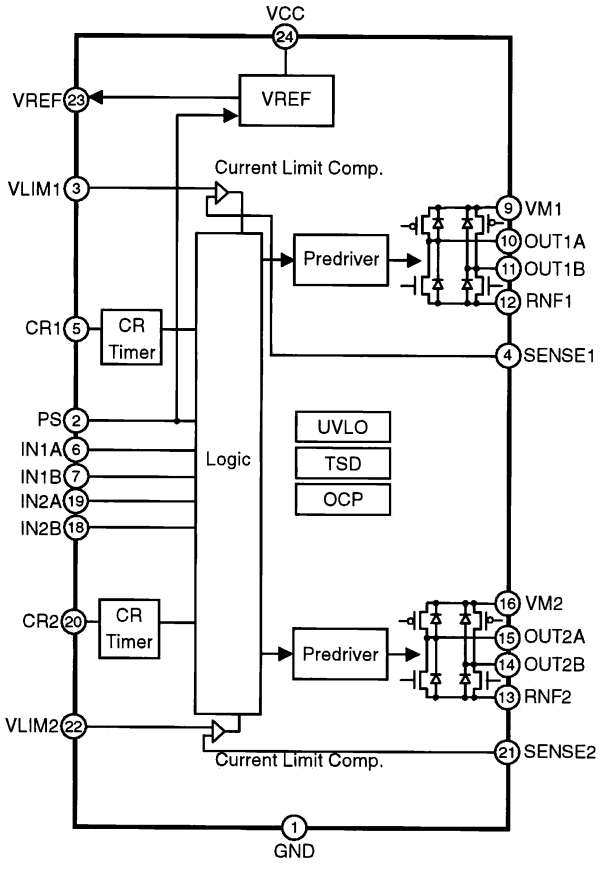
X: H or L

○ Package outline



HTSSOP-B24 (Unit:mm)

○Block diagram



○Pin No. / Pin name

Pin No.	Pin name	Pin No.	Pin name
1	GND	13	RNF2
2	PS	14	OUT2B
3	VLIM1	15	OUT2A
4	SENSE1	16	VM2
5	CR1	17	NC
6	IN1A	18	IN2B
7	IN1B	19	IN2A
8	NC	20	CR2
9	VM1	21	SENSE2
10	OUT1A	22	VLIM2
11	OUT1B	23	VREF
12	RNF1	24	VCC

NC : Non Connection

○Operation Notes

(1) Absolute maximum ratings
An excess in the absolute maximum ratings, such as supply voltage, temperature range of operating conditions, etc., can break down the devices, thus making impossible to identify breaking mode, such as a short circuit or an open circuit. If any over rated values will expect to exceed the absolute maximum ratings, consider adding circuit protection devices, such as fuses.

(2) Power supply lines
As return of current regenerated by back EMF of motor happens, take steps such as putting capacitor between power supply and GND as an electric pathway for the regenerated current. Be sure that there is no problem with each property such as emptied capacity at lower temperature regarding electrolytic capacitor to decide capacity value. If the connected power supply does not have sufficient current absorption capacity, regenerative current will cause the voltage on the power supply line to rise, which combined with the product and its peripheral circuitry may exceed the absolute maximum ratings. It is recommended to implement a physical safety measure such as the insertion of a voltage clamp diode between the power supply and GND pins.

(3) GND potential
The potential of GND pin must be minimum potential in all operating conditions.

(4) Thermal design
Use a thermal design that allows for a sufficient margin in light of the power dissipation (Pd) in actual operating conditions. This IC exposes its frame of the backside of package. Note that this part is assumed to use after providing heat dissipation treatment to improve heat dissipation efficiency . Try to occupy as wide as possible with heat dissipation pattern not only on the board surface but also the backside.

(5) Actions in strong electromagnetic field
Use caution when using the IC in the presence of a strong electromagnetic field as doing so may cause the IC to malfunction.

(6) ASO
When using the IC, set the output transistor so that it does not exceed absolute maximum ratings or ASO.

(7) Thermal shutdown circuit
The IC has a built-in thermal shutdown circuit (TSD circuit). If the chip temperature becomes Tjmax=150℃, and higher, coil output to the motor will be open. The TSD circuit is designed only to shut the IC off to prevent runaway thermal operation. It is not designed to protect or indemnify peripheral equipment. Do not use the TSD function to protect peripheral equipment.

(8) Ground Wiring Pattern
When using both small signal and large current GND patterns, it is recommended to isolate the two ground patterns, placing a single ground point at the ground potential of application so that the pattern wiring resistance and voltage variations caused by large currents do not cause variations in the small signal ground voltage. Be careful not to change the GND wiring pattern of any external components, either.

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