STRUCTURE Silicon monolithic integrated circuits

PRODUCT SERIES Bipolar stepping motor driver

TYPE **BD63860EFV**

FUNCTION
- PWM constant current controllable two H bridge driver
- Built-in translator circuit for CLK-IN control
- Full, Half, Quarter, and Eighth step modes
- Mixed decay control

○Absolute maximum ratings(Ta=25℃)

Item	Symbol	Limit	Unit
Supply voltage	$V_{CC1,2}$	-0.2～+36.0	V
Power dissipation	Pd	1.45※1	W
		4.70※2	W
Input voltage for control pin	V_{IN}	-0.2～+7.0	V
RNF maximum voltage	V_{RNF}	1.0	V
Maximum output current	I_{OUT}	2.5※3	A/phase
Operating temperature range	T_{opr}	-25～+85	℃
Storage temperature range	T_{stg}	-55～+150	℃
Junction temperature	T_{jmax}	+150	℃

※1 70mm×70mm×1.6mm glass epoxy board. Derating in done at 11.6mW/℃ for operating above Ta=25℃.
※2 4-layer recommended board. Derating in done at 37.6mW/℃ for operating above Ta=25℃.
※3 Do not, however exceed Pd, ASO and Tjmax=150℃.

○Recommended operating conditions (Ta=-25～+85℃)

Item	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	$V_{CC1,2}$	16	24	28	V
Output current	I_{OUT}	-	1.5	1.7※4	A/phase

※4 Do not, however exceed Pd, ASO.

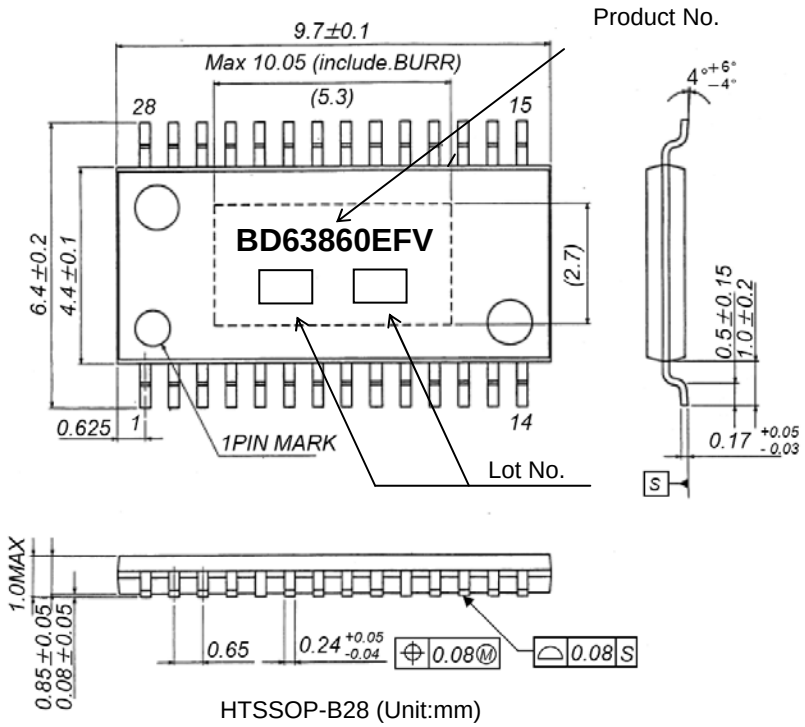
This product isn't designed for protection against radioactive rays.

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℃, VCC1,2=24V)

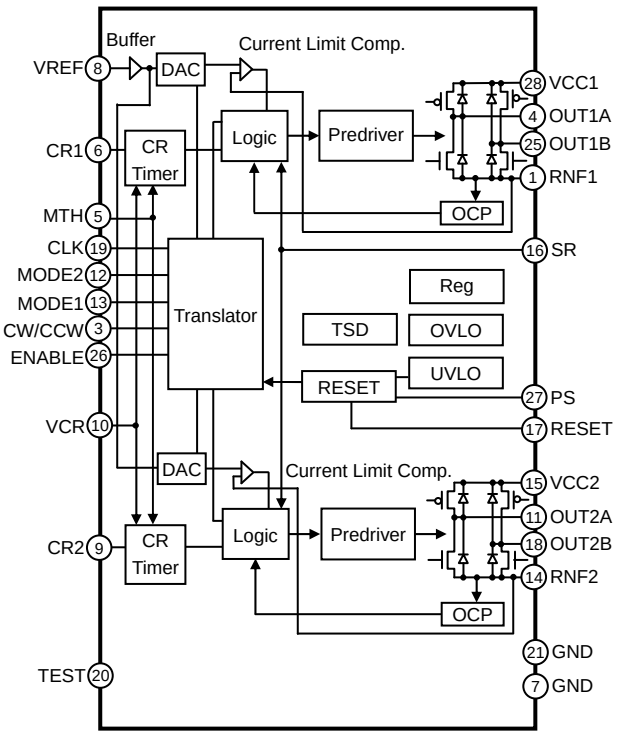
Item	Symbol	Limit			Unit	Conditions
		Min.	Typ.	Max.		
Whole						
Circuit current at standby	I_{CCST}	-	0.4	2.0	mA	PS=L
Circuit current	I_{CC}	-	4.0	7.0	mA	PS=H, VREF=2V
Control input (PS, RESET, ENABLE, CLK, CW/CCW, MODE1, MODE2, SR)						
H level input voltage	V_{INH}	2.0	-	5.5	V	
L level input voltage	V_{INL}	0	-	0.8	V	
H level input current	I_{INH}	38	55	94	μA	V_{IN}=5.5V
L level input current	I_{INL}	-10	0	-	μA	V_{IN}=0V
Output (OUT1A, OUT1B, OUT2A, OUT2B)						
Output ON resistance	R_{ON}	-	0.8	1.0	Ω	I_{OUT}=1.5A, Sum of upper and lower
Output leak current	I_{LEAK}	-	-	10	μA	
Current control						
RNFX input current	I_{RNF}	-40	-20	-	μA	RNFX=0V
VREF input current	I_{VREF}	-2.0	-0.1	-	μA	VREF=0V
VREF input voltage range	V_{REF}	0	-	3.2	V	
VCR input current	I_{VCR}	60	100	140	μA	VCR=3.3V
VCR input voltage range	V_{VCR}	3.0	-	5.5	V	
MTH input current	I_{MTH}	-2.0	-0.1	-	μA	MTH=0V
MTH input voltage range	V_{MTH}	0	-	3.5	V	
Comparator threshold 1	V_{CTH1}	0.212	0.250	0.288	V	VREF=2V, 100%
Comparator threshold 2	V_{CTH2}	0.142	0.177	0.212	V	VREF=2V, 70.71%
Comparator threshold 3	V_{CTH3}	0.076	0.096	0.116	V	VREF=2V, 38.27%
Minimum on time	t_{ONMIN}	0.21	0.54	0.92	μs	R=39kΩ,C=1000pF

○Package outline



HTSSOP-B28 (Unit:mm)

○Block diagram



○Pin No. / Pin name

Pin No.	Pin name	Pin No.	Pin name
1	RNF1	15	VCC2
2	NC	16	SR
3	CW/CCW	17	RESET
4	OUT1A	18	OUT2B
5	MTH	19	CLK
6	CR1	20	TEST
7	GND	21	GND
8	VREF	22	NC
9	CR2	23	NC
10	VCR	24	NC
11	OUT2A	25	OUT1B
12	MODE2	26	ENABLE
13	MODE1	27	PS
14	RNF2	28	VCC1

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) Metal on the backside (Define the side where product markings are printed as front)

The metal on the backside is shorted with the backside of IC chip therefore it should be connected to GND. Be aware that there is a possibility of malfunction or destruction if it is shorted with any potential other than GND.

(5) 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.

(6) 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.

(7) ASO

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

(8) 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.

(9) Ground Wiring Pattern

When using both large current and small signal 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.

(10) Mounting errors and Inter-pin short

When attaching to a printed circuit board, pay attention to the direction of the IC and displacement. Improper attachment may lead to destruction of the IC. There is also possibility of destruction from short circuits which can be caused by foreign matter entering between outputs or an output and the power supply or GND.

(11) TEST pin

Be sure to connect TEST pin to GND.

Notes

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