

---

# M56750FP

## 3-PHASE BRUSHLESS MOTOR DRIVER

REJ03F0049-0100Z

Rev.1.0

Sep.19.2003

---

### Outline

M56750FP is a 3 phase brushless motor driver that include charge pump circuit, which is inputted a acceleration and deceleration pulse signal from a external discriminator circuit. The pulse width is converted to the voltage by the above charge pump circuit and a external filter. And, the current in proportion to this voltage is outputted.

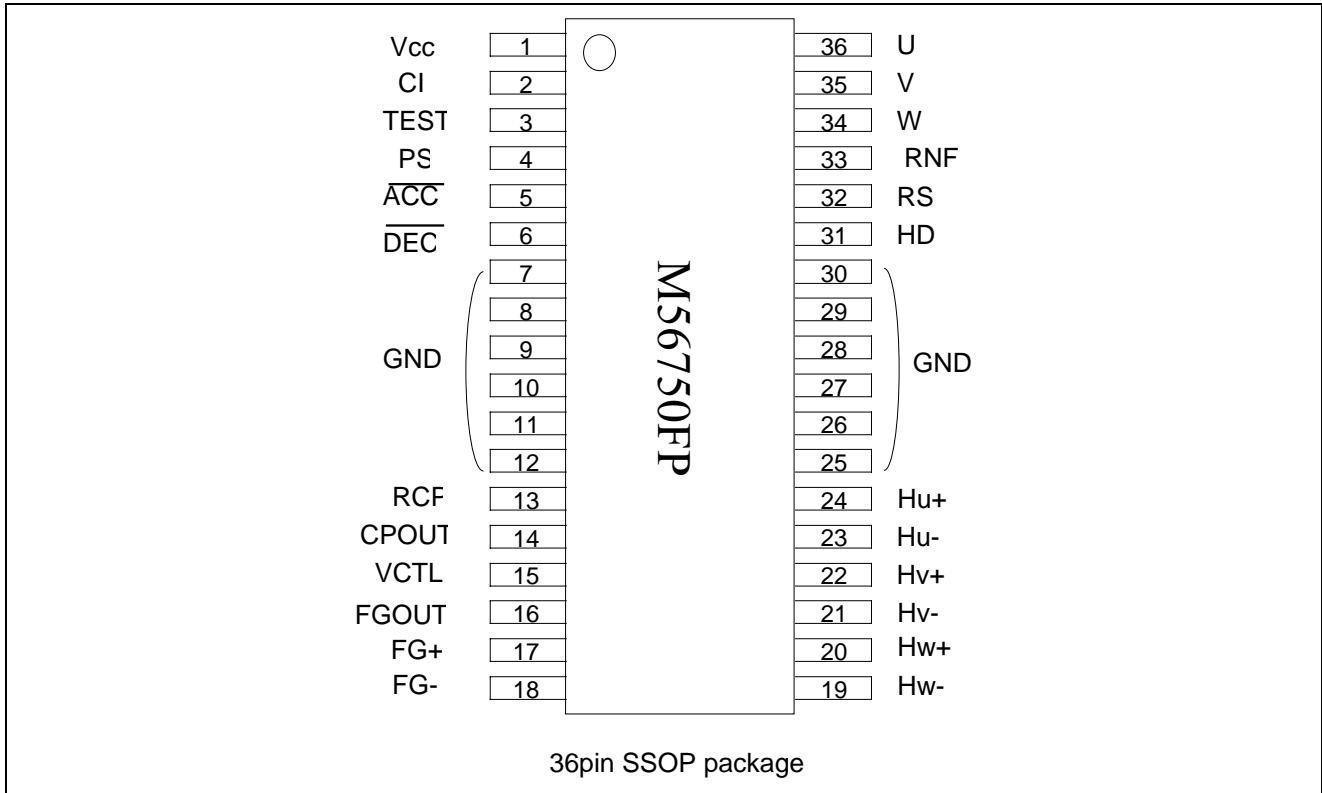
### Features

- Wide voltage range: From 12V to 24V.
- High current capability : 1.0A
- Inclusion of current limit circuit.
- Inclusion of charge pump circuit.
- Inclusion of Hall-sensors drive circuit.  
(This function is linked with a power save function.)
- Inclusion of power save function.
- Inclusion FG amplifier.
- Inclusion of Thermal Shut Down (TSD) circuit.

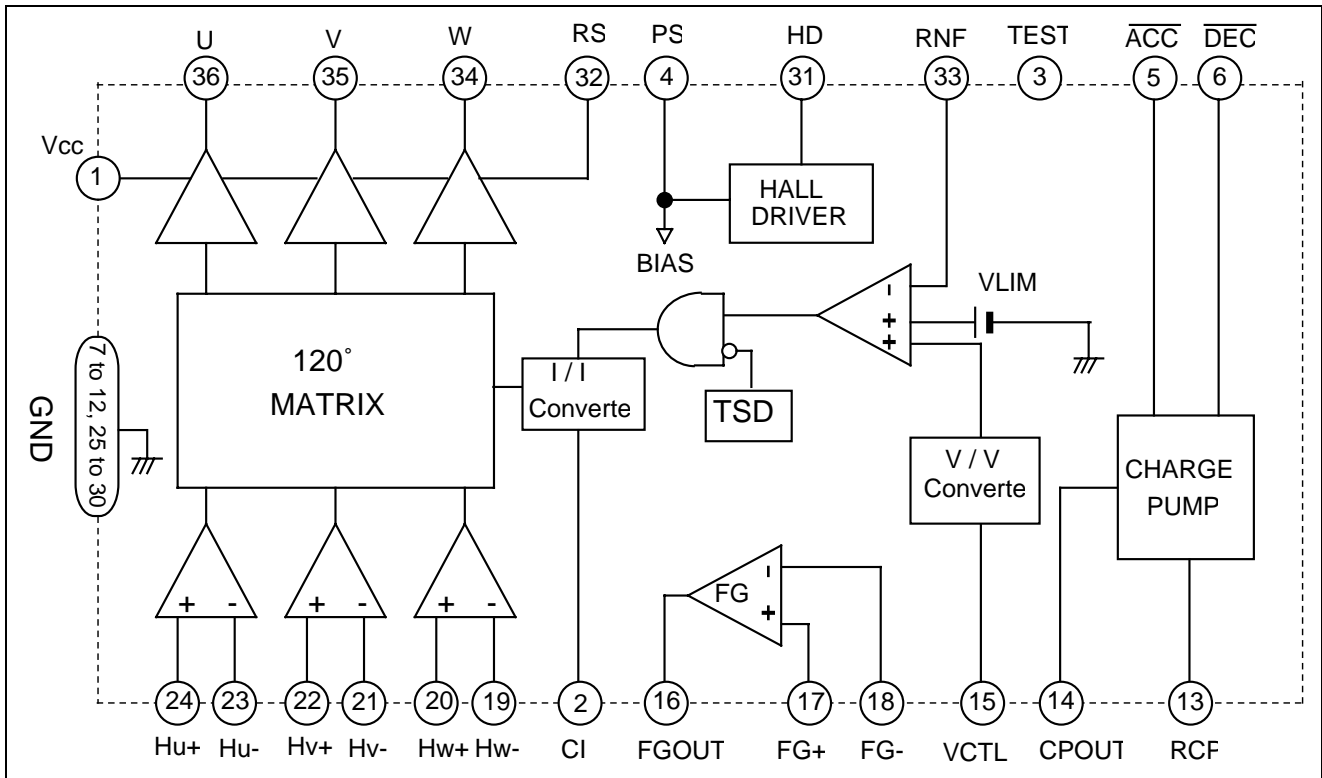
### Application

Scanner motor of Laser Beam Printer.

Pin Configuration



Block Diagram



## Pin Description

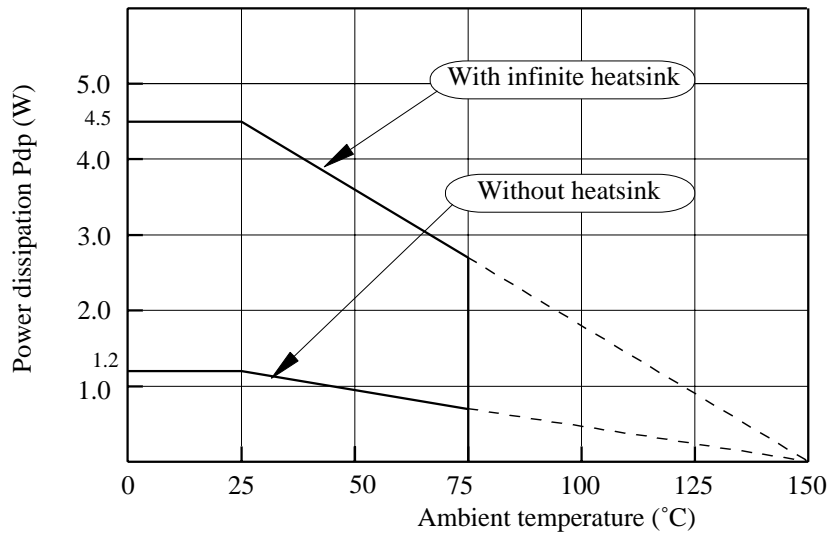
Terminal	Symbol	Function	Terminal	Symbol	Function
1	VCC	Power Supply	36	U	U phase output
2	CI	Phase compensation	35	V	V phase output
3	TEST	Test terminal	34	W	W phase output
4	PS	Power save	33	RS	Current sensing output
5	$\overline{ACC}$	Acceleration signal input	32	RNF	Current sensing
6	$\overline{DEC}$	Deceleration signal input	31	HD	Hall-elements drive
7 to 12	GND	GND	25 to 30	GND	GND
13	RCP	Setting of charge pump output current.	24	Hu+	Hu+ sensor input
14	CPOUT	Charge pump circuit output.	23	Hu-	Hu- sensor input
15	VCTL	Speed control signal input.	22	Hv+	Hv+ sensor input
16	FGOUT	FG amp. output.	21	Hv-	Hv- sensor input
17	FG+	FG amp. non-inverted input (+)	20	Hw+	Hw+ sensor input
18	FG-	FG amp. inverted input (-)	19	Hw-	Hw- sensor input

## Absolute Maximum Ratings

(unless otherwise noted Ta=25°C)

Parameter	Symbol	Limit	Unit	Condition
Power Supply	Vcc	28	V	
Output current	Io	1.0	A	
Hall sensor Amp. differential input range	VHA1	4.5	V	
Input voltage of input terminal	Vi	7.0	V	$\overline{ACC}$ , $\overline{DEC}$ , PS, VCTL terminals.
Output current of HD terminal	IHD	20	mA	
Maximum input voltage of HD	VHD	28	V	Under output Tr. OFF condition. (Open collector output).
Output current of FGout terminal	IFGout	5.0	mA	
Maximum input voltage of FG output.	VFGout	7.0	V	Under output Tr. OFF condition. (Open collector output).
Power dissipation	Pt	4.5	W	With infinite heatsink
Thermal derating	K $\theta$	27.8	°C/W	With infinite heatsink
Junction temperature	Tj	150	°C	
Operating temperature	Topr	-20 to 75	°C	
Storage temperature	Tstg	-40 to 150	°C	

## Thermal Derating



## Recommended Conditions

Parameter	Symbol	Limits			Unit
		Min.	Typ.	Max.	
Power supply	Vcc	—	24	—	V
Motor drive current	Io	—	0.7	—	A

## Electrical characteristics

(Unless otherwise noted Ta=25°C, Vcc=24V)

Parameter	Symbol	Limits			Unit	Measurement conditions
		Min.	Typ.	Max.		
Supply current (1)	ICCL	—	300	600	μA	Under power save function mode (PS=5.0V) condition.
Supply current (2)	ICC	—	7.3	14	mA	VCTL=CPOUT DEC=Lo, ACC=Hi Under motor stop condition.
Saturation voltage	VSAT	—	2.3	3.2	V	Top and bottom at load current 500mA.
Control Gain	GIO	0.30	0.39	0.50	V/V	of VCTL at VCTL(L) = 1.6V, VCTL(H) = 2.0 V Differential voltage of RNF / Differential voltage
Reference voltage of current limit	VLIM	0.329	0.366	0.403	V	The voltage that appears on the RNF terminal at VCTL=5.0V condition.
Common mode input voltage range of Hall amp.	VHA2	1.5	—	VCC-2	V	
Differential input voltage of Hall amp.	VHA3	50	—	—	mVpp	Differential voltage of Hu+/Hu-, Hv+/Hv-, Hw+/Hw-
Input current of Hall sensor amp.	IHA	—	0.5	4.0	μA	Hu+ = Hu-, Hv+ = Hv-, Hw+ = Hw-

## Electrical characteristics

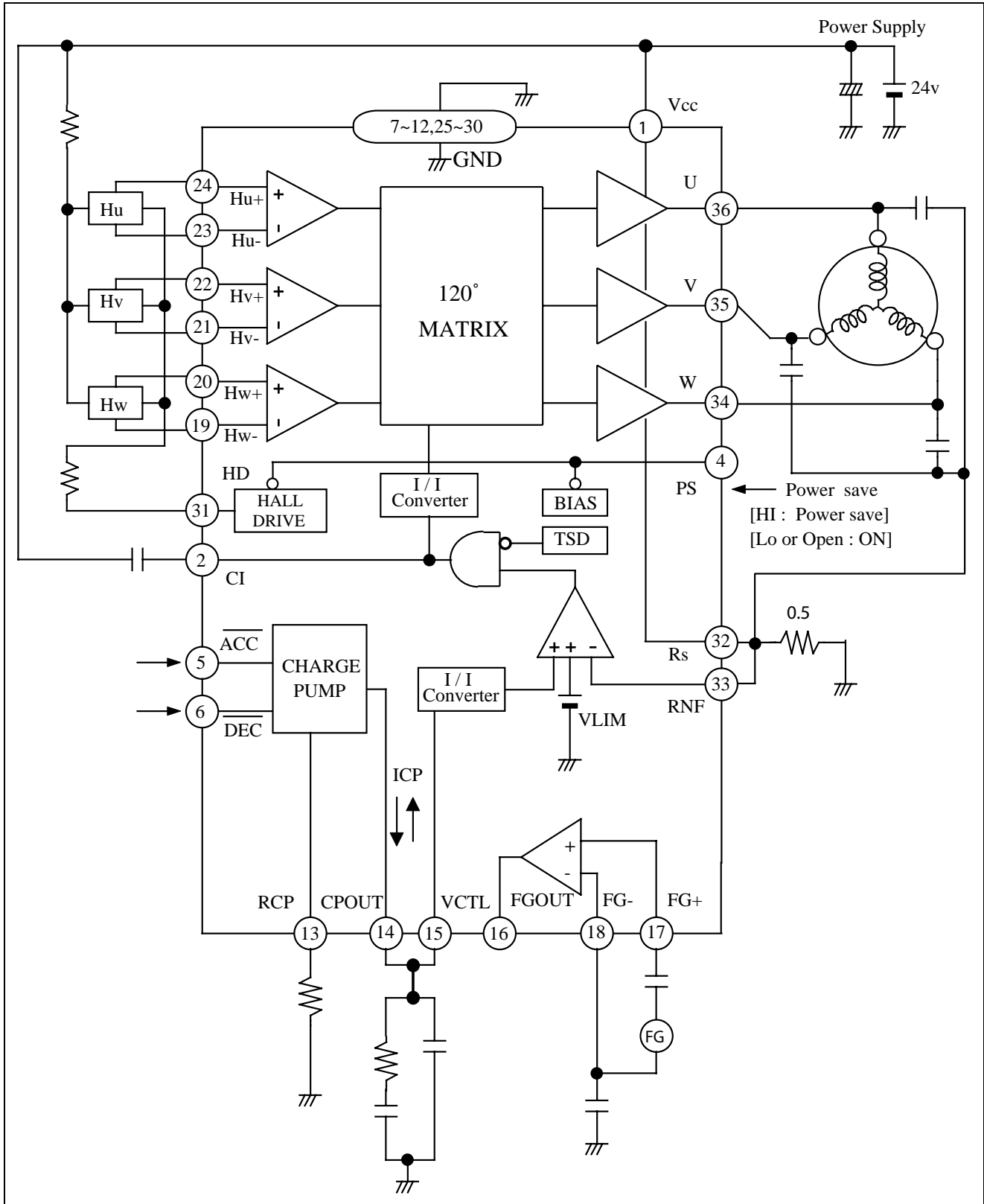
(Unless otherwise noted Ta=25°C, Vcc=24V)

Parameter	Symbol	Limits			Unit	Measurement conditions
		Min.	Typ.	Max.		
Acceleration current	ISS	-240	-200	-160	μA	$\overline{ACC}=LO, \overline{DEC}=HI$ RCP=13 Kohm at CPOUT=1.6V
Deceleration current	ISD	+160	+200	+240	μA	$\overline{ACC}=HI, \overline{DEC}=LO$ RCP=13 Kohm at CPOUT=1.6V
Charge pump output current	IZ	-50	0	+50	nA	$\overline{ACC}=\overline{DEC}=HI$ or LO at CPOUT=1.6V
Charge pump output voltage range	VCPOUT	1.2	—	2.8	V	RCP=13 KΩ
Input current of $\overline{ACC}$ (1)	IACCH	-1	0	1	μA	$\overline{ACC}=5.0V$
Input current of $\overline{ACC}$ (1)	IACCL	-50	-10	—	μA	$\overline{ACC}=0V$
$\overline{ACC}$ Threshold voltage	VTACC	0.8	1.4	2.0	V	
Input current of $\overline{DEC}$ (1)	IDECH	—	250	500	μA	$\overline{ACC}=5.0V$
Input current of $\overline{DEC}$ (1)	IDECL	-50	-10	—	μA	$\overline{ACC}=0V$
$\overline{ACC}$ Threshold voltage	VTDEC	0.8	1.4	2.0	V	
Input current of VCTL	ICTL	-60	-10	+40	nA	VCTL = 1.6 V
Saturation voltage of HD terminal	VSHD	0.6	0.9	1.2	V	Under PS terminal Open or Low and load current 20mA condition.
Shut off current of HD terminal	IBVHD	—	0	+10	μA	Under PS terminal High and 2.4V input condition.
Saturation voltage of FGOUT terminal	VFGL	—	—	0.5	V	(FG-) - (FG+) =100mV and load current 5.0mA.
Shut off current of FGOUT terminal	IBVFG	—	0	+10	μA	(FG-) - (FG+) =100mV and load current 5.0mA and 5.0V input condition.
Input current of PS terminal (H)	IPSH	—	170	300	μA	5.0V input to PS terminal
Input current of PS terminal (L)	IPSL	-10	0	+10	μA	0V input to PS terminal
PS Threshold voltage	VTPS	0.8	1.4	2.0	V	

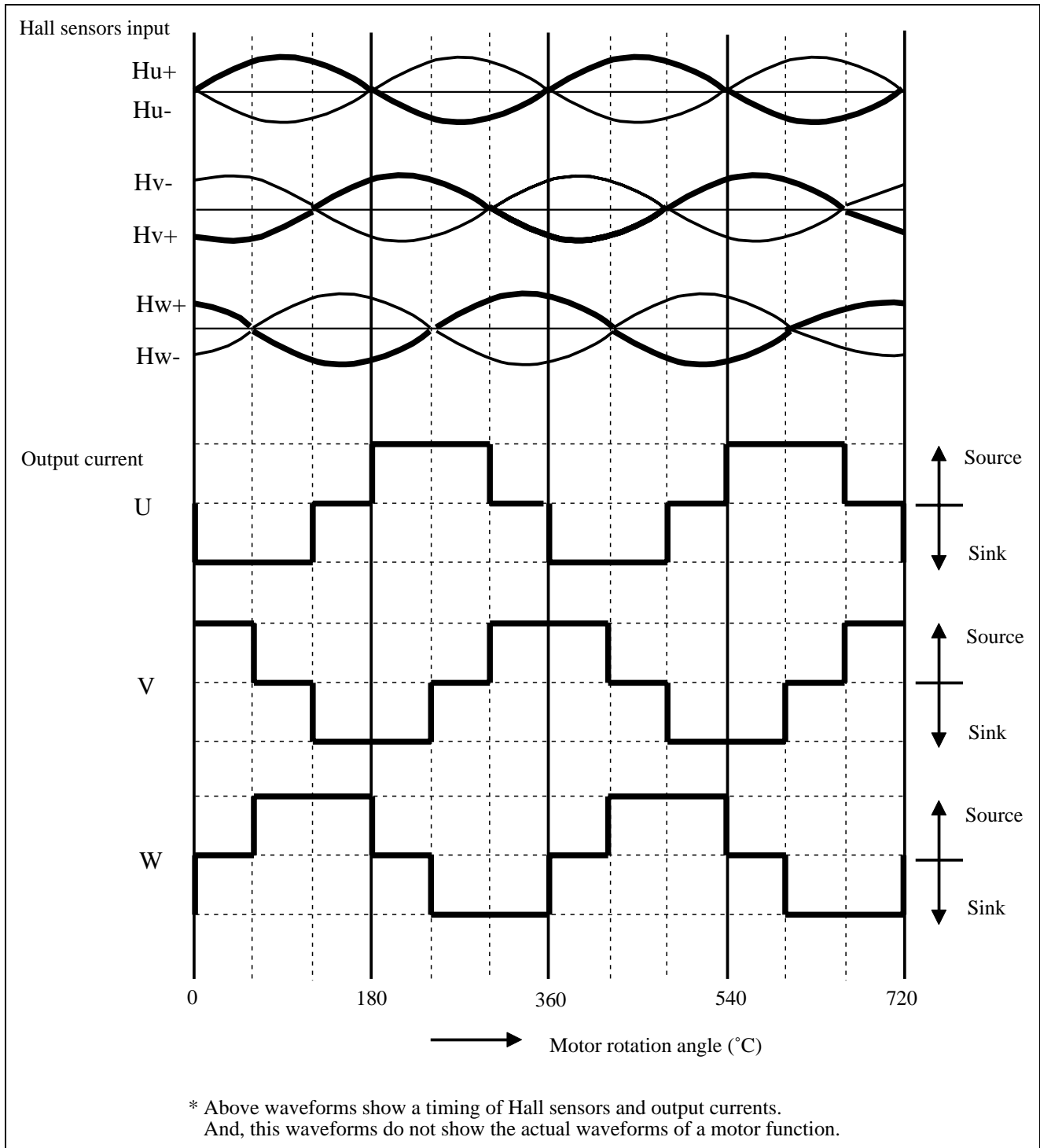
## Electrical characteristics

Parameter	Symbol	Design value			Unit	Remark
		Min.	Typ.	Max.		
Operational temperature of thermal shut down.	TON	150	165	180	°C	
Hysteresis of thermal TSD (shut down function).	THYS	20	35	50	°C	Differential temperature of TSD function-comeback.

Application Circuit



The timing chart of motor output current / Hall-sensor signal input



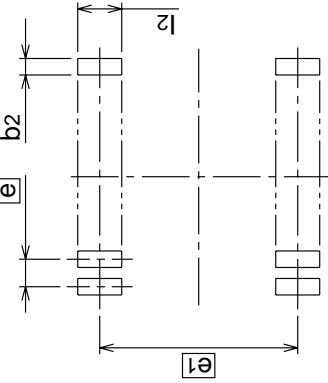
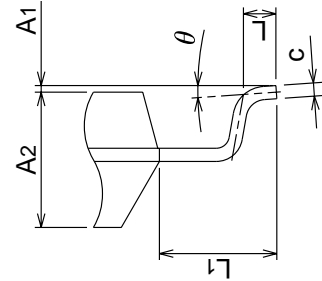
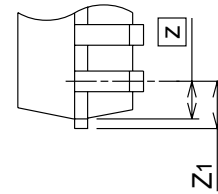
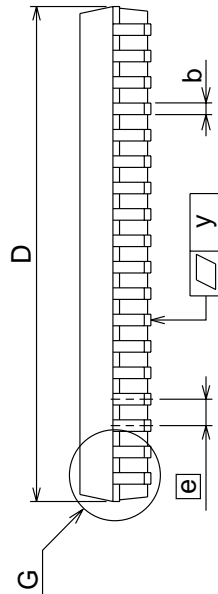
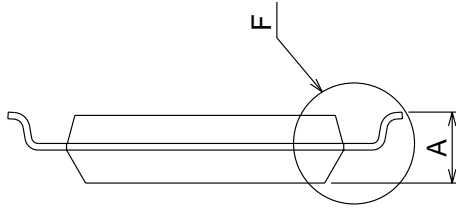
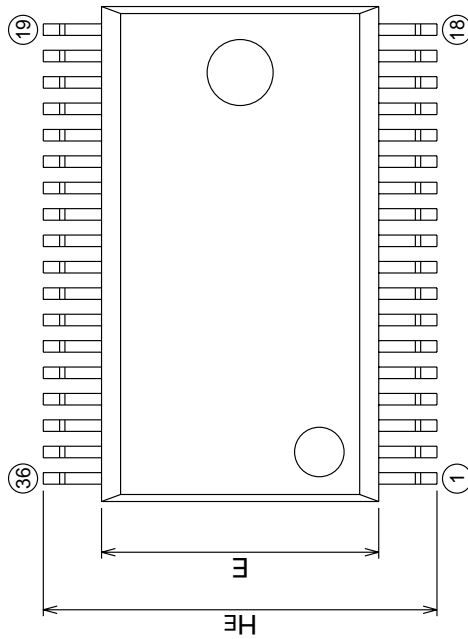
Package Dimensions

**36P2R-D**

(MMP)

**Plastic 36pin 450mil SSOP**

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SSOP36-P-450-0.80	—	0.53	Cu Alloy



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	2.35
A1	0	0.1	0.2
A2	—	2.05	—
b	0.3	0.35	0.45
c	0.18	0.2	0.25
D	14.8	15.0	15.2
E	8.2	8.4	8.6
e	—	0.8	—
HE	11.63	11.93	12.23
L	0.3	0.5	0.7
L1	—	1.765	—
Z	—	0.7	—
Z1	—	—	0.85
y	—	—	0.15
theta	0°	—	8°
b2	—	0.5	—
e1	—	11.43	—
l2	1.27	—	—



## RENESAS Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

---

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.  
Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
  2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.
  3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein.  
The information described here may contain technical inaccuracies or typographical errors.  
Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.  
Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).
  4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
  5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
  6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
  7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.  
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
  8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.
- 



### RENESAS SALES OFFICES

<http://www.renesas.com>

**Renesas Technology America, Inc.**  
450 Holger Way, San Jose, CA 95134-1368, U.S.A  
Tel: <1> (408) 382-7500 Fax: <1> (408) 382-7501

**Renesas Technology Europe Limited.**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, United Kingdom  
Tel: <44> (1628) 585 100, Fax: <44> (1628) 585 900

**Renesas Technology Europe GmbH**  
Dornacher Str. 3, D-85622 Feldkirchen, Germany  
Tel: <49> (89) 380 70 0, Fax: <49> (89) 929 30 11

**Renesas Technology Hong Kong Ltd.**  
7/F., North Tower, World Finance Centre, Harbour City, Canton Road, Hong Kong  
Tel: <852> 2265-6688, Fax: <852> 2375-6836

**Renesas Technology Taiwan Co., Ltd.**  
FL 10, #99, Fu-Hsing N. Rd., Taipei, Taiwan  
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

**Renesas Technology (Shanghai) Co., Ltd.**  
26/F., Ruijin Building, No.205 Maoming Road (S), Shanghai 200020, China  
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

**Renesas Technology Singapore Pte. Ltd.**  
1, Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632  
Tel: <65> 6213-0200, Fax: <65> 6278-8001