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# M56750FP

## 3-PHASE BRUSHLESS MOTOR DRIVER

REJ03F0049-0100Z

Rev.1.0

Sep.19.2003

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### 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.

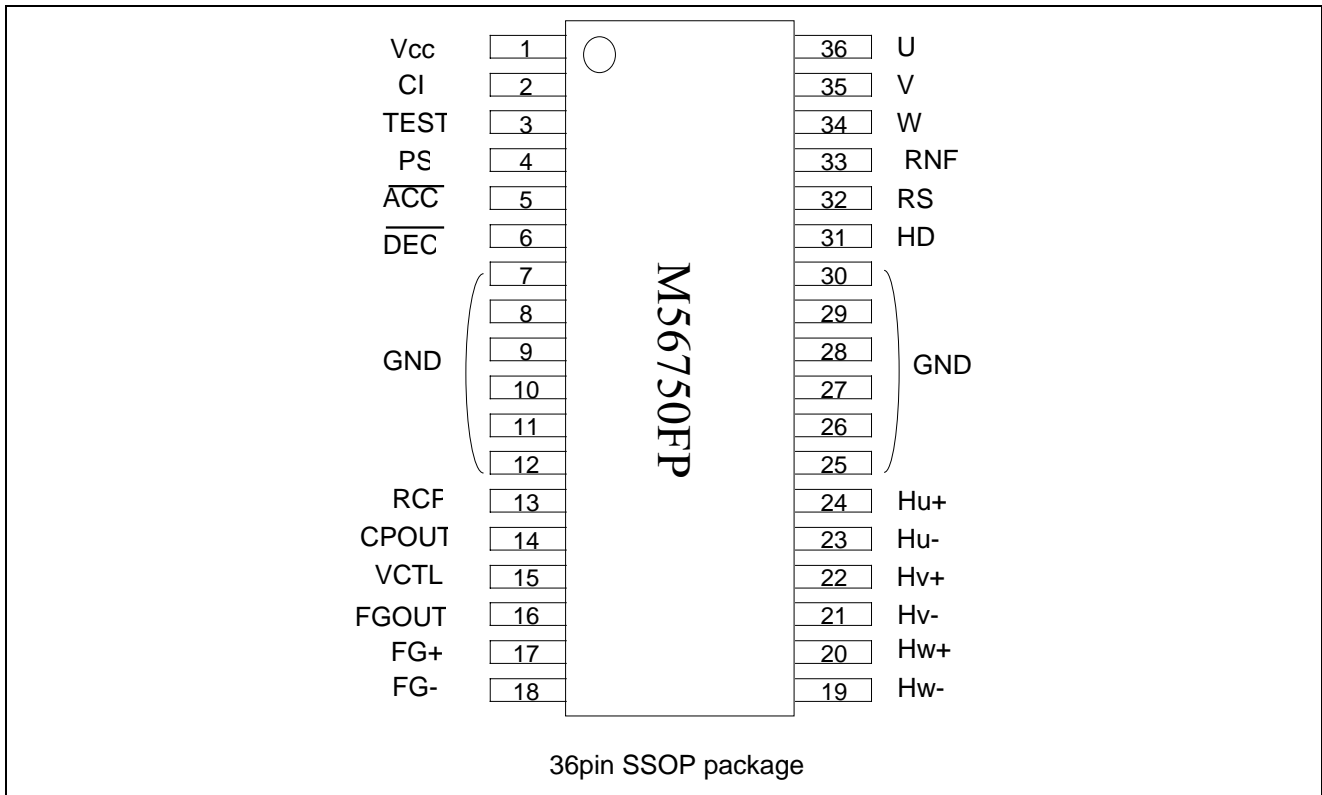
### Features

- 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.

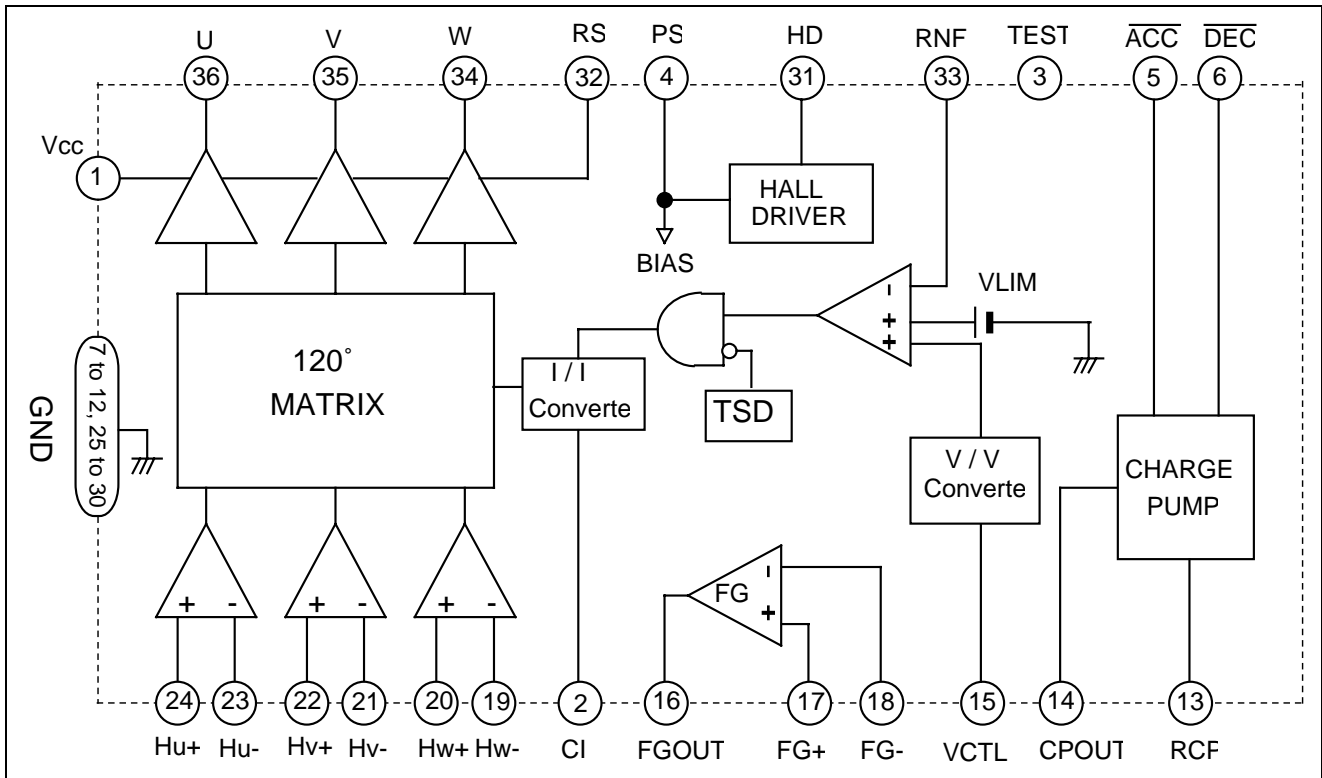
### Application

Scanner motor of Laser Beam Printer.

Pin Configuration



Block Diagram



## Pin Description

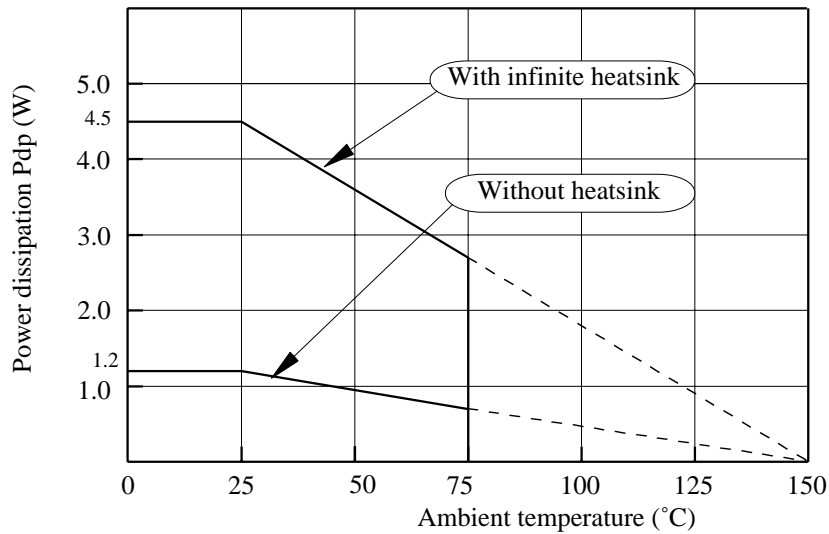
Terminal	Symbol	Function	Terminal	Symbol	Function
1	VCC	Power Supply	36	U	U phase output
2	CI	Phase compensation	35	V	V phase output
3	TEST	Test terminal	34	W	W phase output
4	PS	Power save	33	RS	Current sensing output
5	$\overline{ACC}$	Acceleration signal input	32	RNF	Current sensing
6	$\overline{DEC}$	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

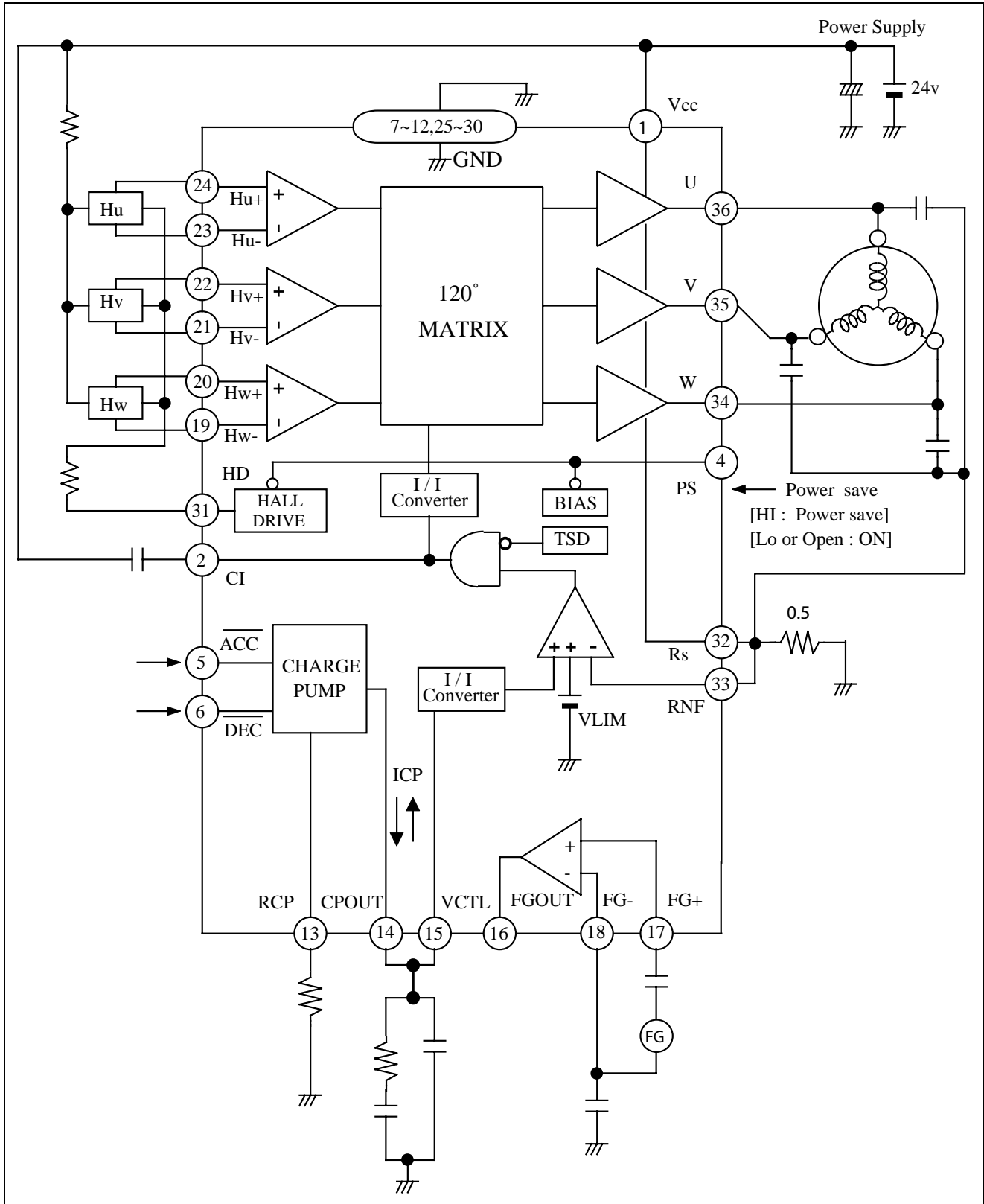
(Unless otherwise noted Ta=25°C, Vcc=24V)

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	

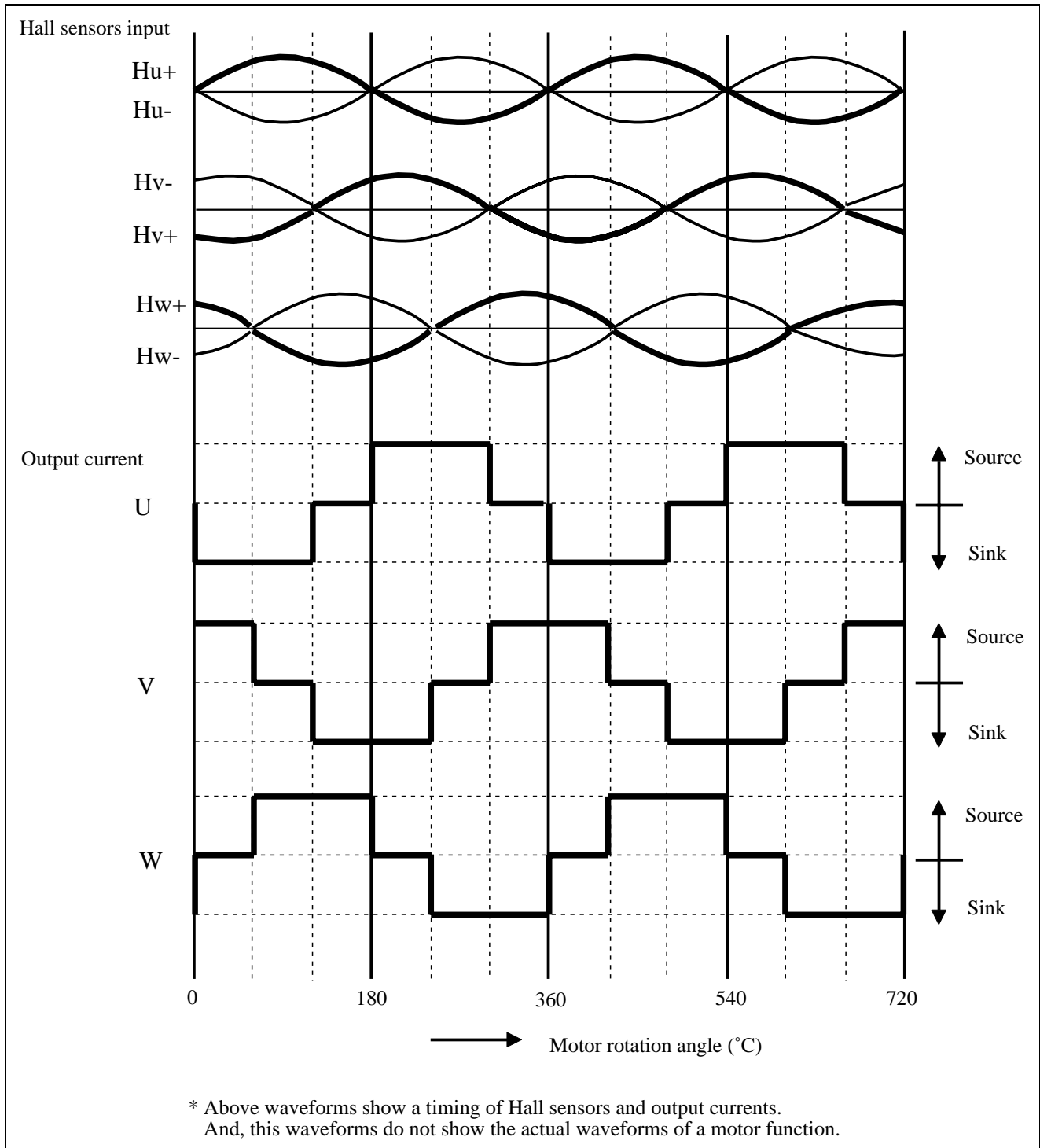
## Electrical characteristics

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



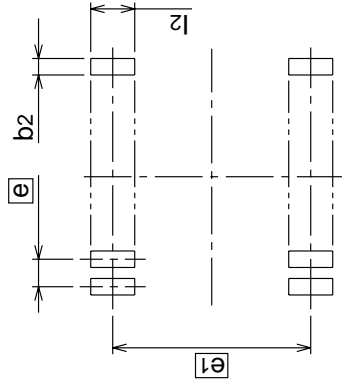
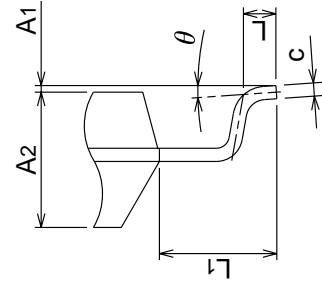
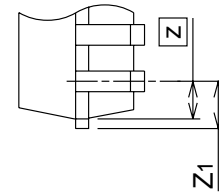
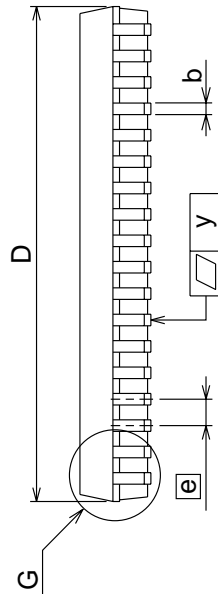
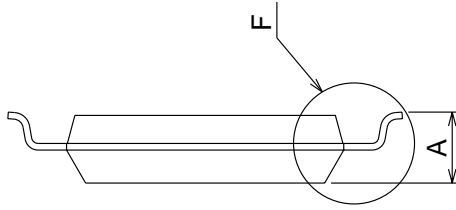
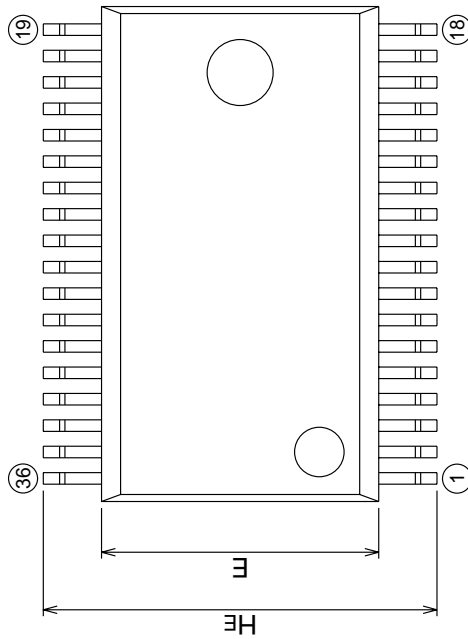
Package Dimensions

**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
θ	0°	—	8°
b2	—	0.5	—
e1	—	11.43	—
l2	1.27	—	—



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