

M50224FP

1.5 Channel Motor Driver with DC/DC Control

REJ03F0070-0100Z

Rev.1.0

Sep.19.2003

Description

M50224FP is the semiconductor integrated circuit which builds in the Motor drive circuit and DC/DC circuit suitable for the camera etc.

1.5 H bridges, the DC/DC circuit of 5VDC/DC, and AE operation circuit were built in one tip by adoption of a detailed CMOS process.

The reduction in power consumption and the miniaturization are considered as the high composition of the flexibility realized with one chip.

Features

- Minute CMOS process acceptance.Low consumption
- 1.5 full swing voltage drive H Bridge circuit built-in (PWM drive correspondence)
- DC/DC circuit built-in of 5V
- One AE operation circuit built-in AE (A sensor corresponds to amorphous and SPD)
- Low voltage incorrect operation prevention circuit thermole shutdown circuit built-in
- A thermometer, with a power save function

Application

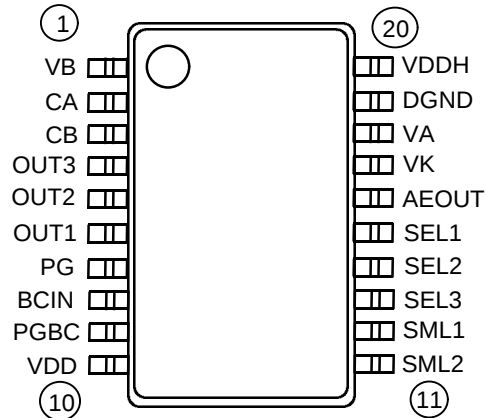
motor driver for cameras etc

Recommend Operating Condition

Supply voltage range..... VB:1.6V to 3.5V

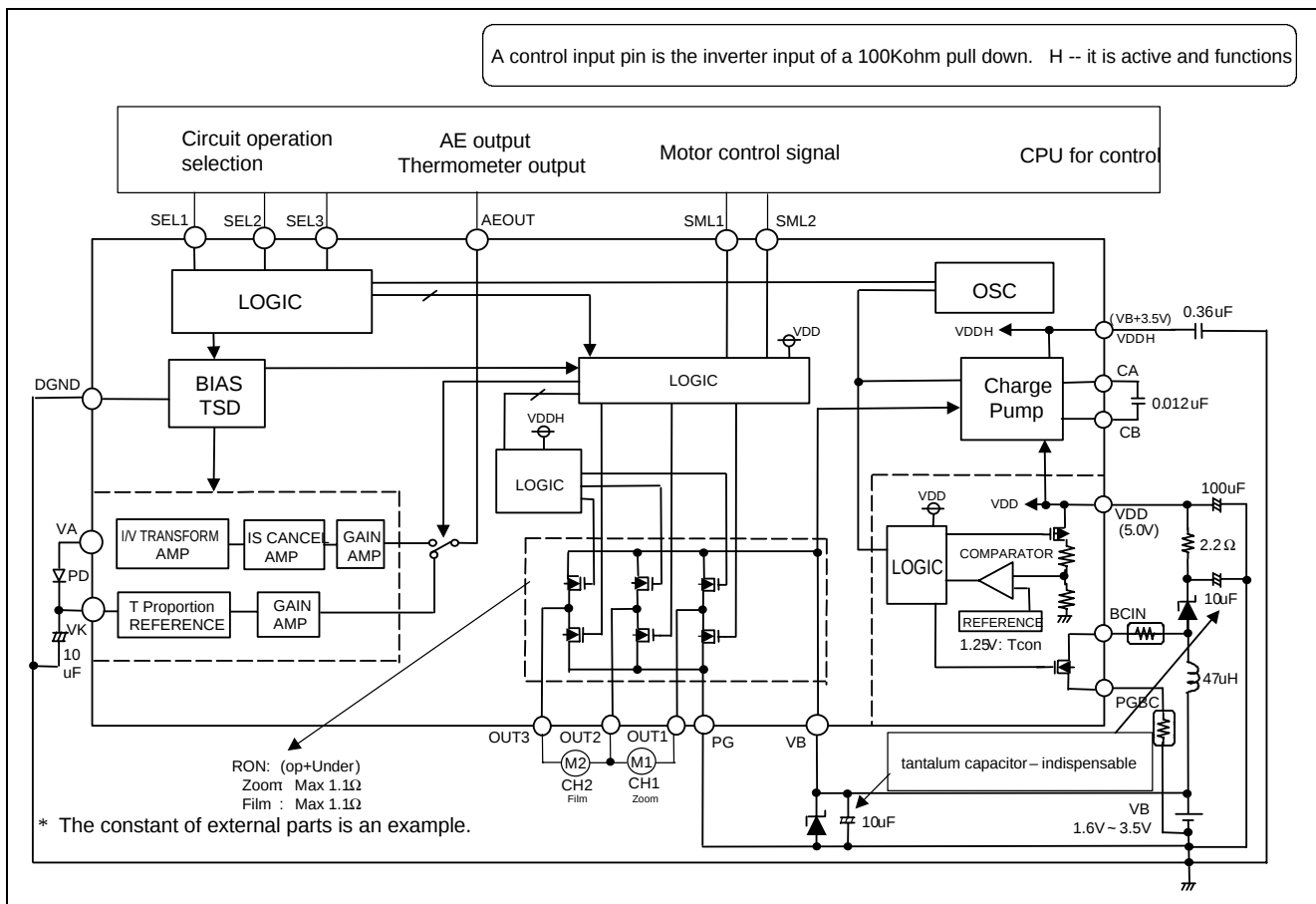
Rated supply voltage VB:3.0V

Pin Configuration



Outline : 20P2F

Block Diagram



Absolute Maximum Ratings

(Ta=25°C, unless otherwise noted)

Parameter	Symbol	Ratings	Unit	Remark
Supply voltage1	VB	3.5	V	Note1
Supply voltage2	VDD	6.5	V	Note1
Supply voltage3	VDDH	VB+4.5	V	Note1
Voltage between BCIN and PGBC	VDSS	15	V	Note1 (VGS=0V)
Power dissipation	Pd	1000	mW	Note2 (Ta=25°C)
Thermal derating	Kθ	-8.0	mW/°C	Note2 (Ta≥25°C)
Pin input Voltage	Vin	0 to VDD+0.3	V	Note3
Operating temperature	Topr	-10 to 50	°C	
Storage temperature	Tstg	-40 to 150	°C	

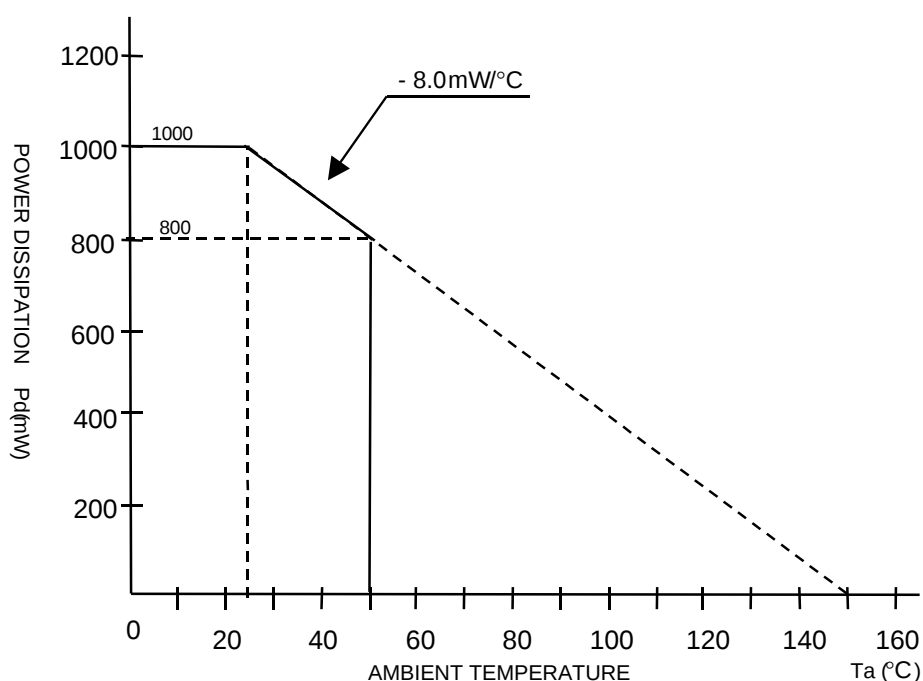
note1: As a principle, do not provide reversely

note2: Glass epoxy circuit board: 70mm × 70mm × 1.6mm 1layer circuit board Cu Share 10%

note3: As a principle, do not provide over supply voltage or under ground voltage

Thermal Derating (Maximum Rating)

THERMAL DERATING (MAXIMUM RATING)



Remark

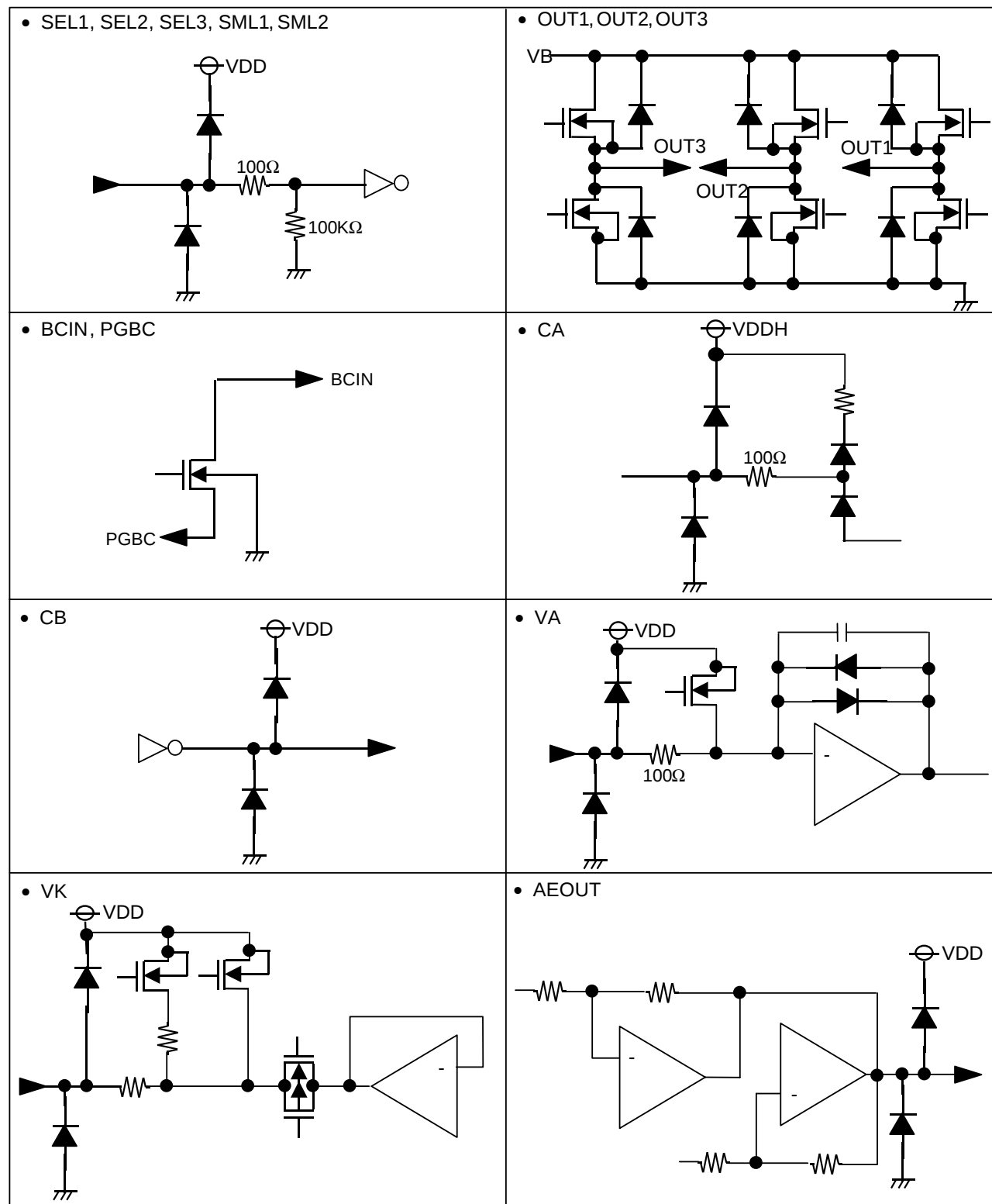
Calculation of power dissipation

Case : $I_{out} \times I_{out} \times \text{On resistance [transistor]}$

*Please refer to the above figure in the case that surroundings temperature exceeded 25°C

*Please add the radiation board, if it is necessary.

I/O Circuit Diagram



Electrical Characteristics

(Ta =25°C, VB=3.0V, VDD=5.0V, unless otherwise noted)

	Parameter	Symbol	Test condition	Limits			Unit	Note
				MIN	TYP	MAX		
	Voltage range of operation	VB		2.0	3.0	3.5	V	
Consumption current	Current at the time of standby	IB1	SEL1:L SEL2:L SEL3:L	-	0.1	5	μA	
	Usual consuming current 1	IDD1	Only a DC/DC circuit is turned ON. SEL1:H SEL2:L SEL3:L	-			mA	
	Usual consuming current 2	IDD2	DC/DC+AE+MD circuit ON SEL1:H SEL2:L SEL3:H	-			mA	
Input terminal	Hi level input current	IIH	VIN=VDD=5.0V	25	50	100	μA	Note1
	Lo level input current	IIL		-1.0	-	-	μA	
	Input pull down resistance	RIND		50	100	200	KΩ	
	Hi level input voltage	VIH	VDD=4.5 to 5.5V	VDD×0.7	-	VDD	V	
	Lo level input voltage	VIL	VDD=4.5 to 5.5V	0	-	VDD ×0.3	V	
DC/DC Circuit	Oscillation frequency	fosc	VDD=5.0V	44	63	82	kHz	Note2
	DUTY	DUTY	VDD=5.0V		75		%	
	Operating start Voltage	Vstart1	VB voltage	-	-	2.0	V	
	Operating stop Voltage	Vstop1	VB voltage	-	-	1.0	V	
	Output voltage	Vout	VDD voltage	4.7	5.0	5.3	V	
	Input stability	ΔVout1	VB=2.0V to 3.3V IDD=50mA	-	-	100	mV	
	Load stability	ΔVout2	VB=2.85V IDD=100mA	-	-	100	mV	
	Maximum output current	Iout	VB=2.85V VDD≥4.5V	100	-	-	mA	
Charge pump circuit	Oscillation frequency	fosc2	VDD=5.0V	150	227	320	kHz	Note3
	DUTY	DUTY2	VDD=5.0V		50		%	
	Operating start Voltage	Vstart2	VDD voltage	4.5	5.0	5.3	V	
	Output voltage	Vout2	VDDH voltage	VB+2.6	VB+3.3	VB+4.5	V	
Motor driver(1, 2)	Operating voltage	VBDCM	VB voltage	1.6	-	3.5	V	
	ON Resistance RVON 1	RVON 1	Io=0.5A, VB=3V, VDD=5V, VDDH=5.5V	-	0.75	1.1	Ω	Note4
	Maximum output current	Iomax	T < ***S	1.8	-	-	A	
	Continual maximum output current	Iocont		500	-	-	mA	
	Turn on time	TvON	RM=5.0Ω Fig. 1	-	0.5	2	μs	
	Turn off time	TvOFF		-	0.1	0.5	μs	
	Output rise time Tr	Tr		-	0.3	1.0	μs	
	Output fall time Tf	Tvf		-	0.01	0.2	μs	

(Ta =25°C, VB=3.0V, VDD=5.0V, unless otherwise noted)

	Parameter	Symbol	Test condition	Limit			Unit	Note
				MIN	TYP	MAX		
AE circuit (Thermometer)	Temperature output absolute value	VTE		.	2713	3392	mV	
	Temperature output power supply voltage change 1	dVTE1	VDD=5.5V	-45	-	45	mV	
	Temperature output power supply voltage change 2	dVTE2	VDD=4.5V	-45	-	45	mV	
	Temperature output voltage load change	dVTE3	Io=-0.2mA	-20	-	20	mV	
	The amount of temperature output change	dVTE4	The Amount of Change (-10 to 50°C)	-22.7	-22.0	-19.1	mV	
AE circuit (Light measurement circuit)	Input range	IA		50p	-	120u	A	
	Light measurement output absolute value	VAE	IA=10nA		1914		mV	
	The amount of change per two step	dEVA1	IA=10nA -> 40nA		-242		mV	
	Output linearity 1	DEVS1	IA=50pA to 1.6nA	-30	-	30	%	
	Output linearity 2	DEVS2	IA=1.6nA to 410nA	-23	-	23	%	
	Output linearity 3	DEVS3	IA=410nA to 13.1μA	-23	-	23	%	
	Output linearity 4	DEVS4	IA=13.1μA to 120μA	-30	-	30	%	
	Power supply response	Trs	IA=50pA	-	-	50	ms	
T S D	thermole shutdown temperature	TTSD	Tip temperature in case H bridge output turns off		150		°C	Note5

Note1: Input terminal : 11 to15 PIN

Note2: L=47μH, C=100uF

Note3: Since it is a power supply only for the insides of IC, please do not connect a charge pump circuit to others.

Note4: The sum of upper and lower sides side ON resistance.

ON resistance is changed with VB, VDD, and VDDH voltage.

Note5: A shipment test is not performed although the TSD circuit characteristic presents reference data.

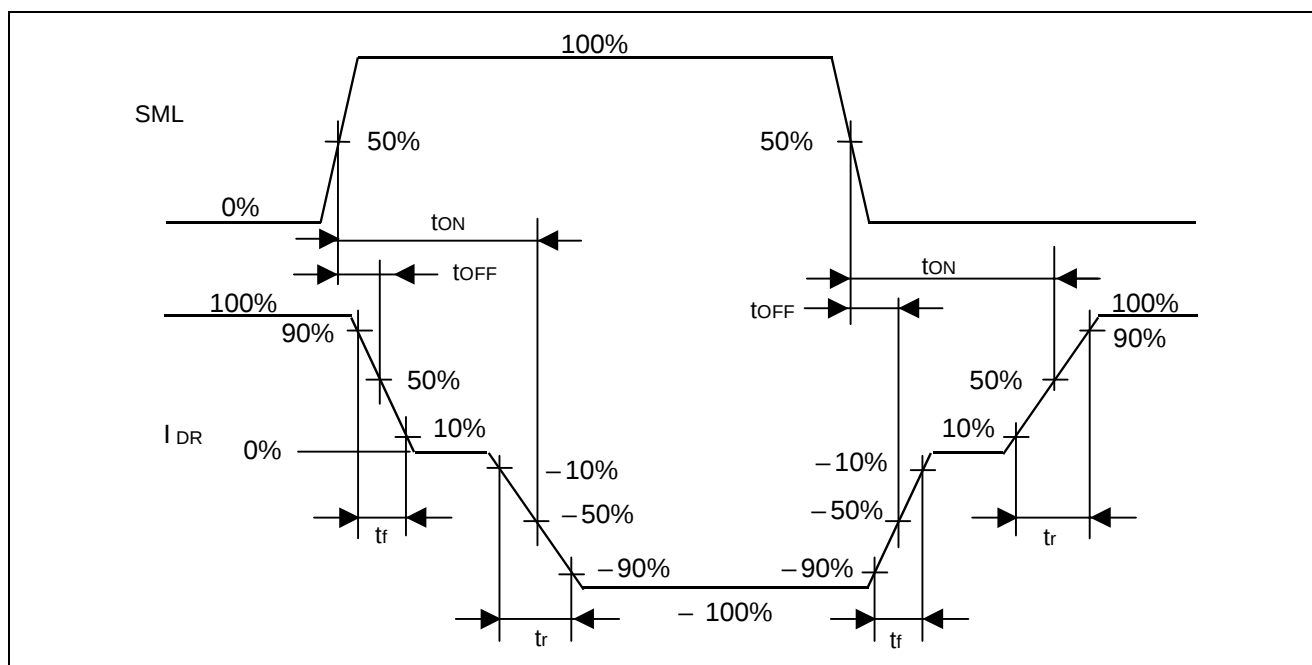
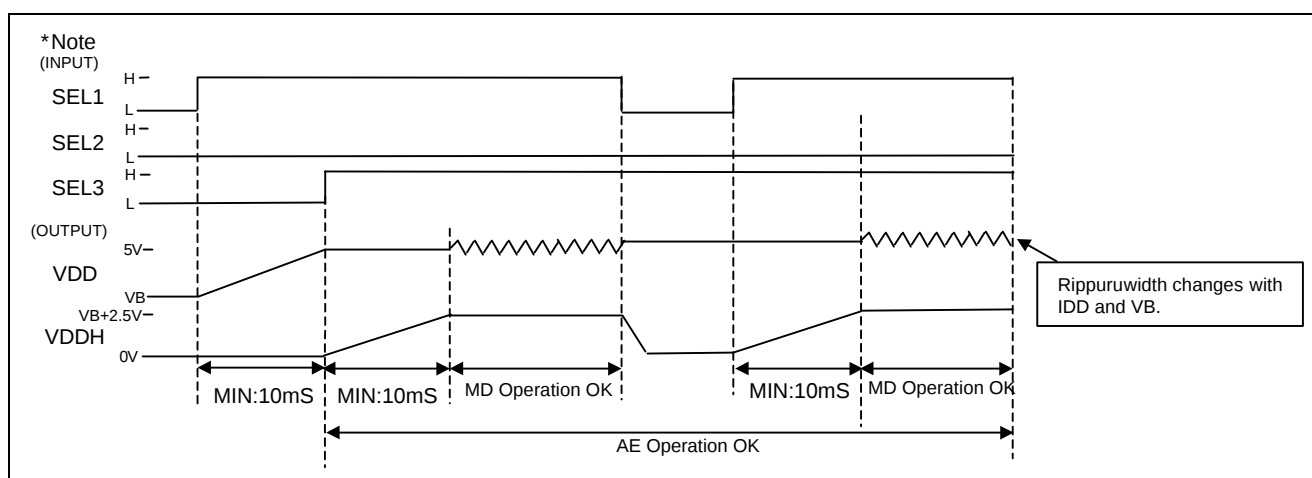


Fig 1 H bridge part switching characteristic waveform

SEL Truth value table

SEL1	SEL2	SEL3	The contents of control
L	L	L	Standby
H	L	L	Only a DC/DC circuit is turned ON (*note)
H	L	H	DC/DC + AE circuit ON + motor1 control (AEOUT: right out)
H	H	H	DC/DC + AE circuit ON + motor2 control (AEOUT: right out)
H	H	L	DC/DC + AE circuit ON + shutter control (AEOUT : temperature out)
L	L	H	Only AE circuit ON (AEOUT: right out)
L	H	H	Only AE circuit ON (AEOUT: right out)
L	H	L	Only AE circuit ON (AEOUT : temperature out)

*1. SEL1:DC/DC and Charge pump control (L=OFF, H=ON)



Motor control Truth value table

	INPUT					MOTOR1	MOTOR2	Shutter	MOTOR Each output		
	SEL1	SEL2	SEL3	SML1	SML2				OUT1	OUT2	OUT3
MOTOR1 Control	H	L	H	L	L	Standby	Standby	Standby	OFF	OFF	OFF
	H	L	H	H	L	Forward Rotation	Standby	Standby	L	H	OFF
	H	L	H	L	H	Reverse	Standby	Standby	H	L	OFF
	H	L	H	H	H	Brake	Standby	Standby	H	H	OFF
MOTOR2 Control	H	H	H	L	L	Standby	Standby	Standby	OFF	OFF	OFF
	H	H	H	H	L	Standby	Forward Rotation	Standby	OFF	H	L
	H	H	H	L	H	Standby	Reverse	Standby	OFF	L	H
	H	H	H	H	H	Standby	Brake	Standby	OFF	H	H
Shutter Control	H	H	L	L	L	Standby	Standby	Standby	OFF	OFF	OFF
	H	H	L	H	L	Standby	Standby	Forward Rotation	OFF	OFF	L
	H	H	L	L	H	Standby	Standby	Reverse	OFF	OFF	H
	H	H	L	H	H	Standby	Standby	Brake	OFF	OFF	H

*: Please pass through the Brake or Stand-by mode by all means in case of moving from forward rotation to Reverse rotation or from Reverse rotation to forward rotation by the motor control.
 (ex.) Forward rotation -> Brake -> Reverse rotation, Reverse rotation -> Stand-by -> Forward rotation

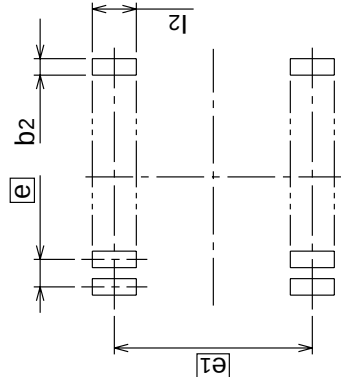
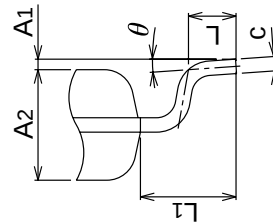
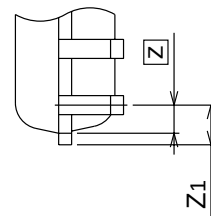
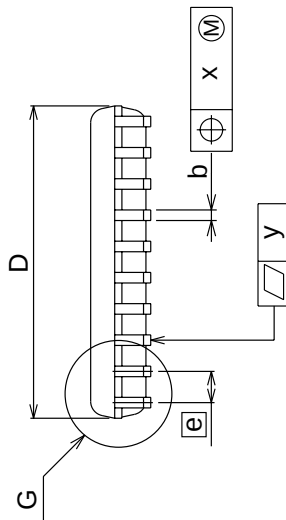
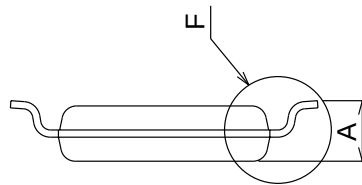
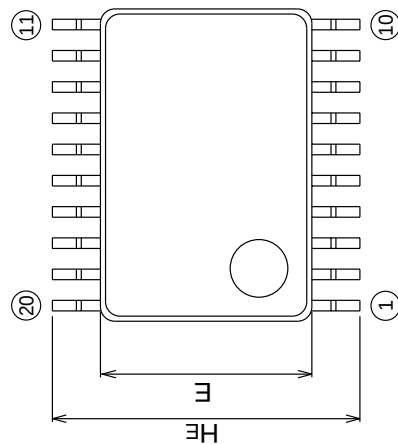
Package Dimensions

20P2F-A

(MMP)

Plastic 20pin 255mil SSOP

EIAJ Package Code	JEDEC Code	Weight(g)	Lead Material
SSOP20-P-255-0.65	—	—	Cu Alloy



Recommended Mount Pad

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	1.45
A1	0	0.1	0.2
A2	—	1.15	—
b	0.17	0.22	0.32
c	0.13	0.15	0.2
D	6.4	6.5	6.6
E	4.3	4.4	4.5
e	—	0.65	—
HE	6.2	6.4	6.6
L	0.3	0.5	0.7
L1	—	1.0	—
Z	—	0.325	—
Z1	—	—	0.475
x	—	—	0.13
y	—	—	0.1
θ	0°	—	10°
b2	—	0.35	—
e1	—	5.8	—
l2	1.0	—	—

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