
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

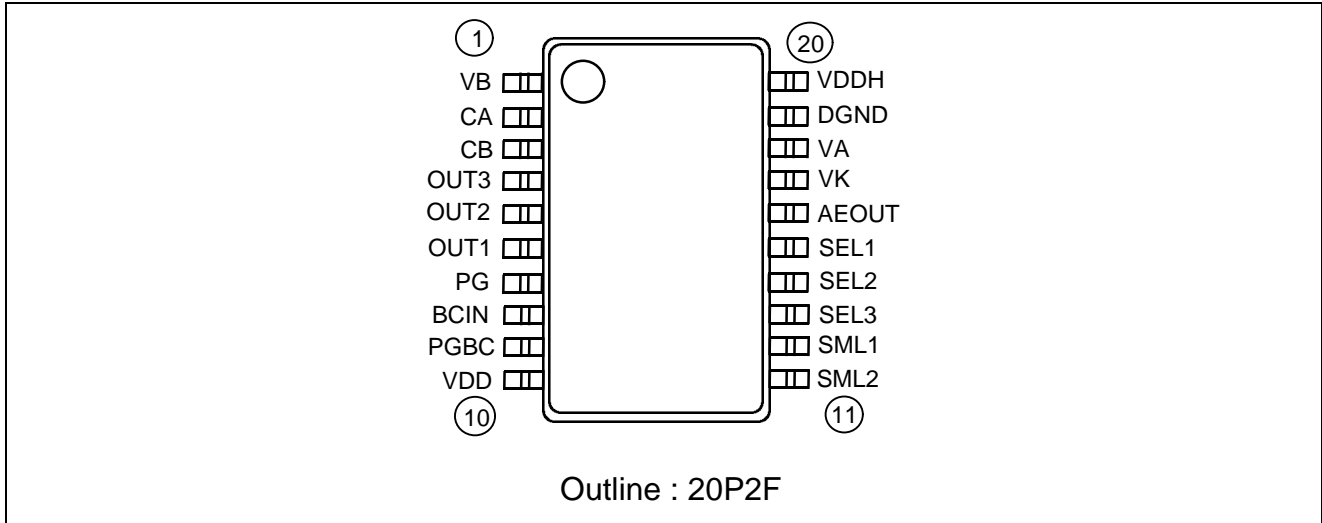
motor driver for cameras etc

Recommend Operating Condition

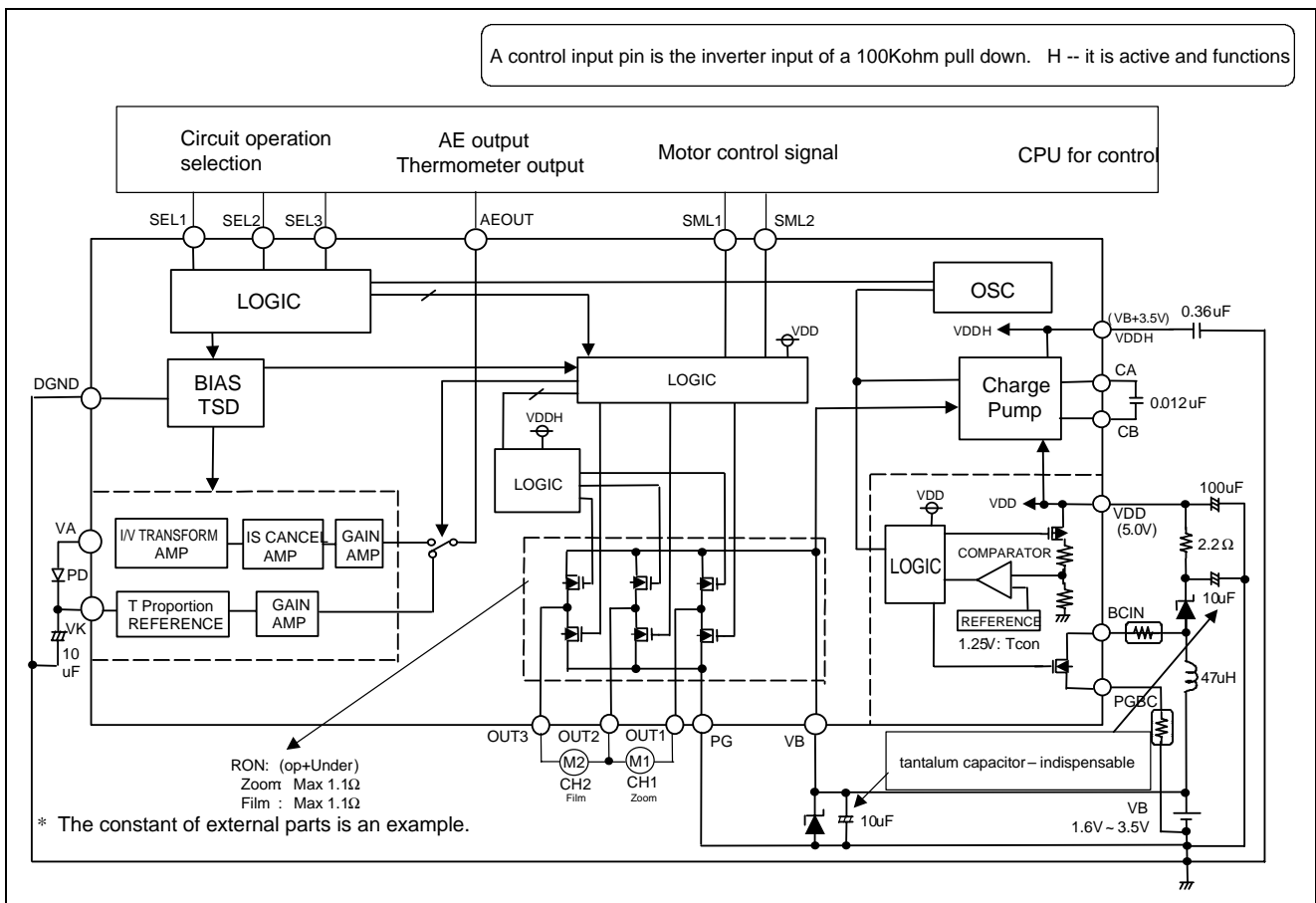
Supply voltage range..... VB:1.6V to 3.5V

Rated supply voltage VB:3.0V

Pin Configuration



Block Diagram



Absolute Maximum Ratings

(Ta=25°C, unless otherwise noted)

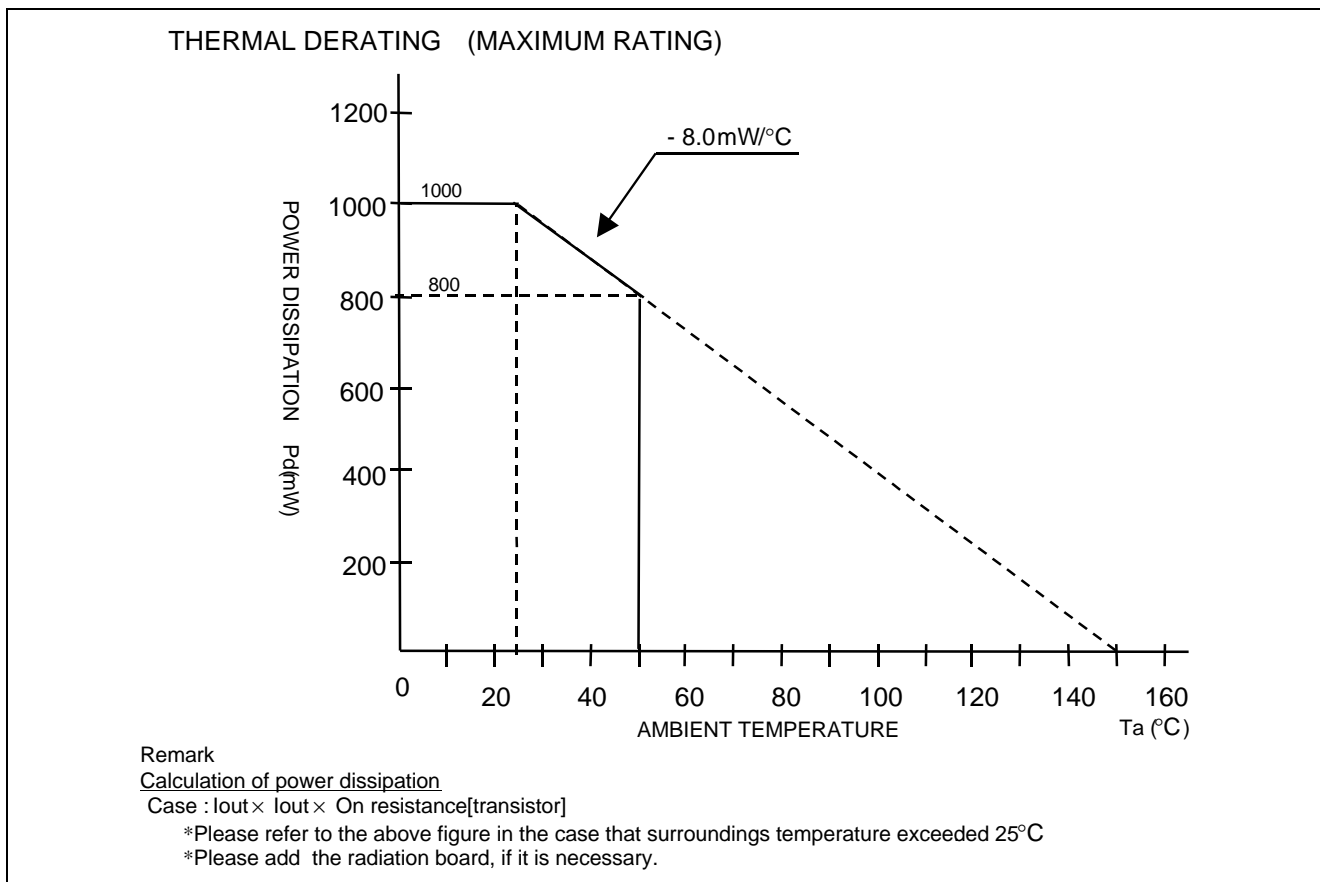
Parameter	Symbol	Ratings	Unit	Remark
Supply voltage1	VB	3.5	V	Note1
Supply voltage2	VDD	6.5	V	Note1
Supply voltage3	VDDH	VB+4.5	V	Note1
Voltage between BCIN and PGBC	VDSS	15	V	Note1 (VGS=0V)
Power dissipation	Pd	1000	mW	Note2 (Ta=25°C)
Thermal derating	Kθ	-8.0	mW/°C	Note2 (Ta≥25°C)
Pin input Voltage	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

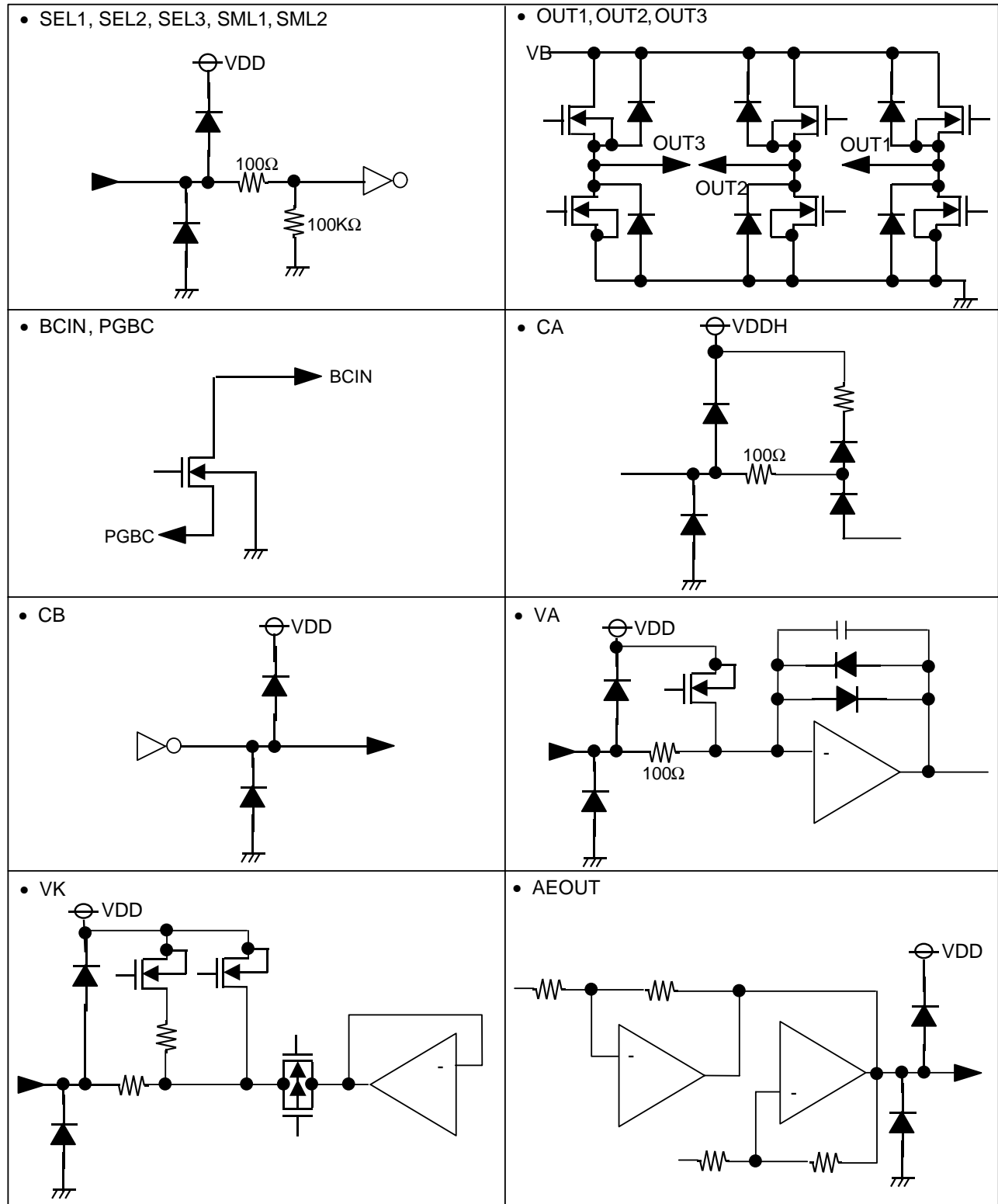
note2: Glass epoxy circuit board: 70mm x 70mm x 1.6mm 1layer circuit board Cu Share 10%

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

Thermal Derating (Maximum Rating)



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	-	0.5	2	μs	
	Turn off time	TvOFF Fig. 1	-	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			
Temperature output absolute value	VTE		.	2713	3392	mV		
AE circuit (Thermometer)	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	
	Input range	IA		50p	-	120u	A	
AE circuit (Light measurement circuit)	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		
TSD	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.

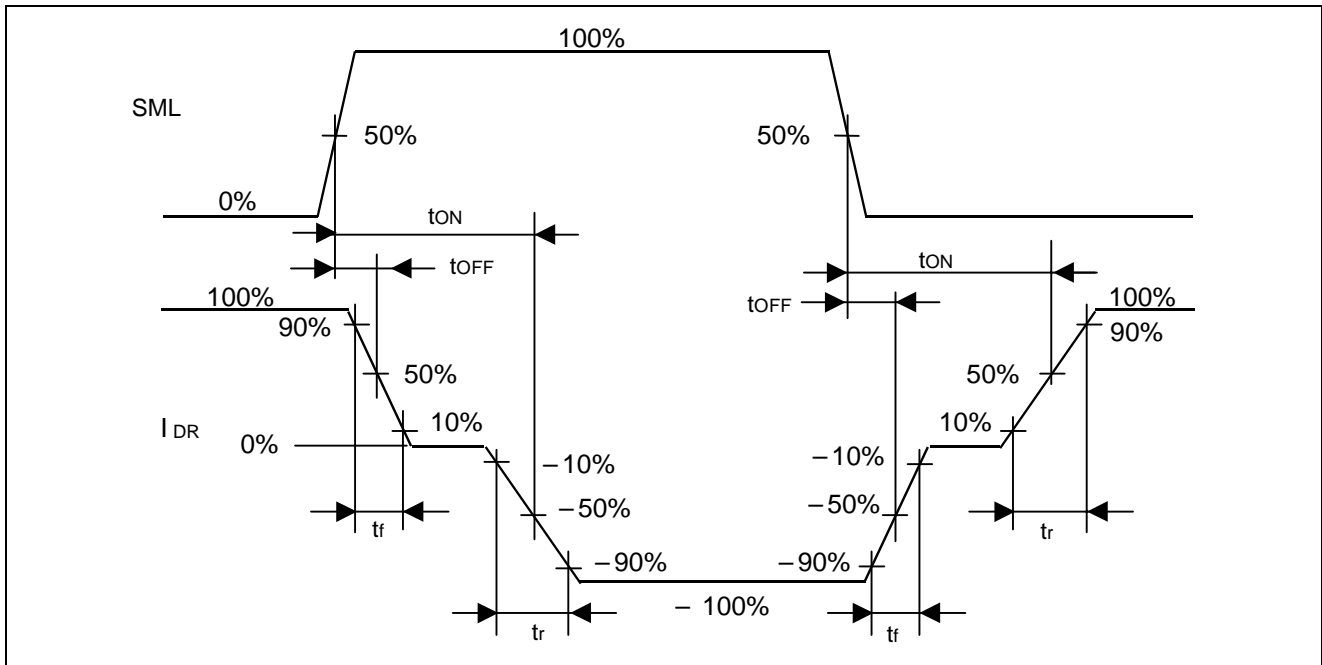
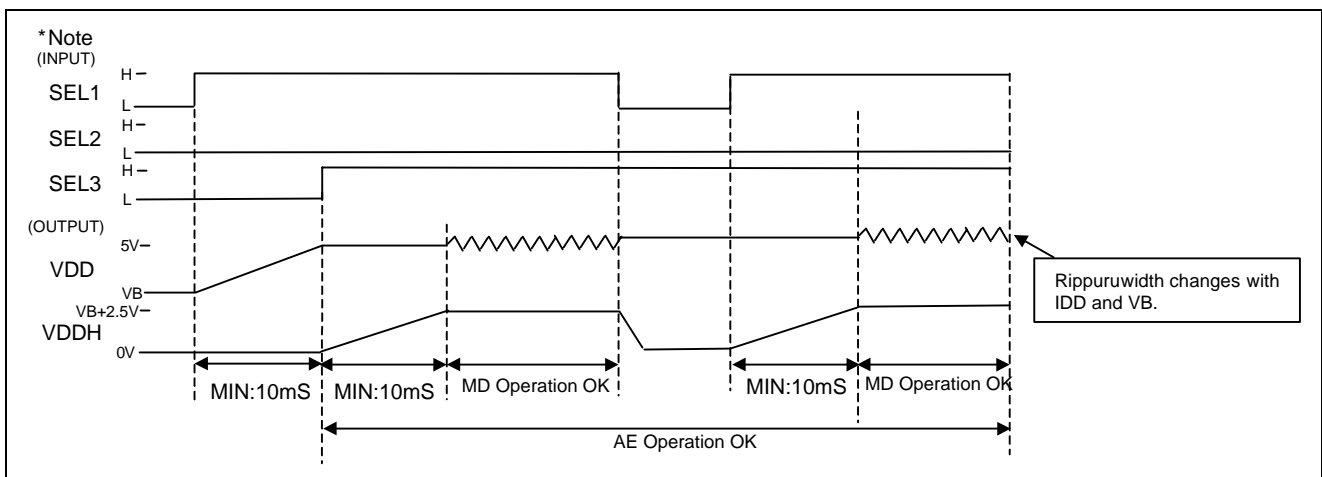


Fig 1 H bridge part switching characteristic waveform

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 (AEOU: right out)
H	H	H	DC/DC + AE circuit ON + motor2 control(AEOU: right out)
H	H	L	DC/DC + AE circuit ON + shutter control(AEOU : temperature out)
L	L	H	Only AE circuit ON (AEOU: right out)
L	H	H	Only AE circuit ON (AEOU: right out)
L	H	L	Only AE circuit ON (AEOU : 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

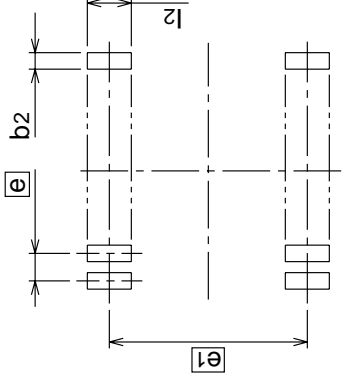
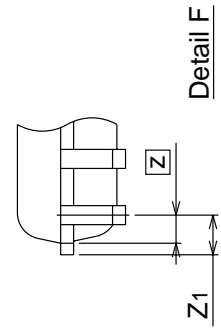
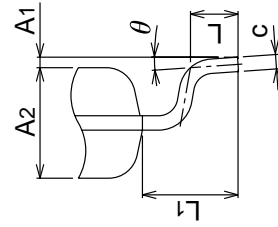
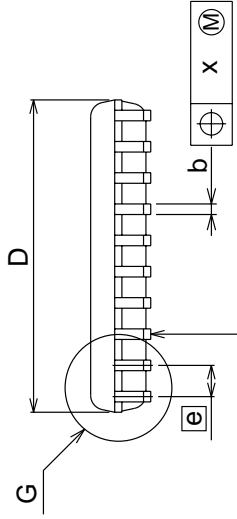
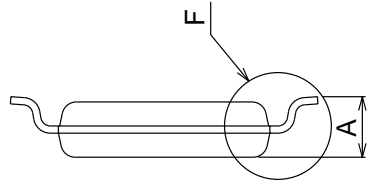
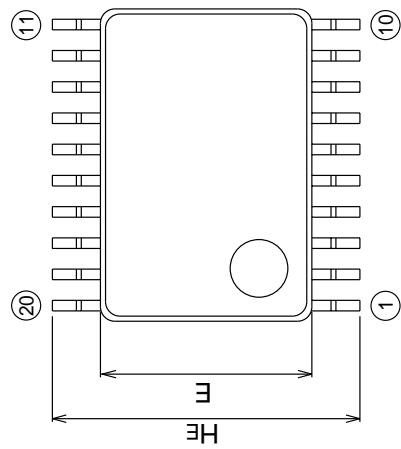
Package Dimensions

20P2F-A

(MMP)

Plastic 20pin 255mil SSOP

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

Symbol	Dimension in Millimeters		
	Min	Norm	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	—
L2	—	0.325	—
Z1	—	—	0.475
x	—	—	0.13
y	—	—	0.1
theta	0°	—	10°
b2	—	0.35	—
e1	—	5.8	—
l2	1.0	—	—

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