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

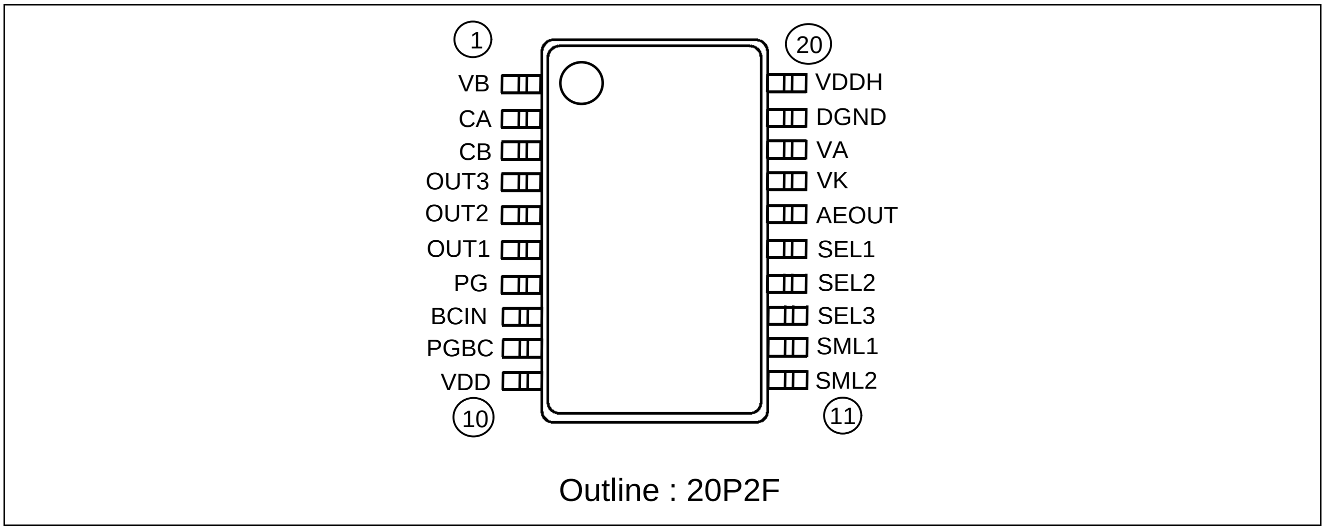
motor driver for cameras etc

Recommend Operating Condition

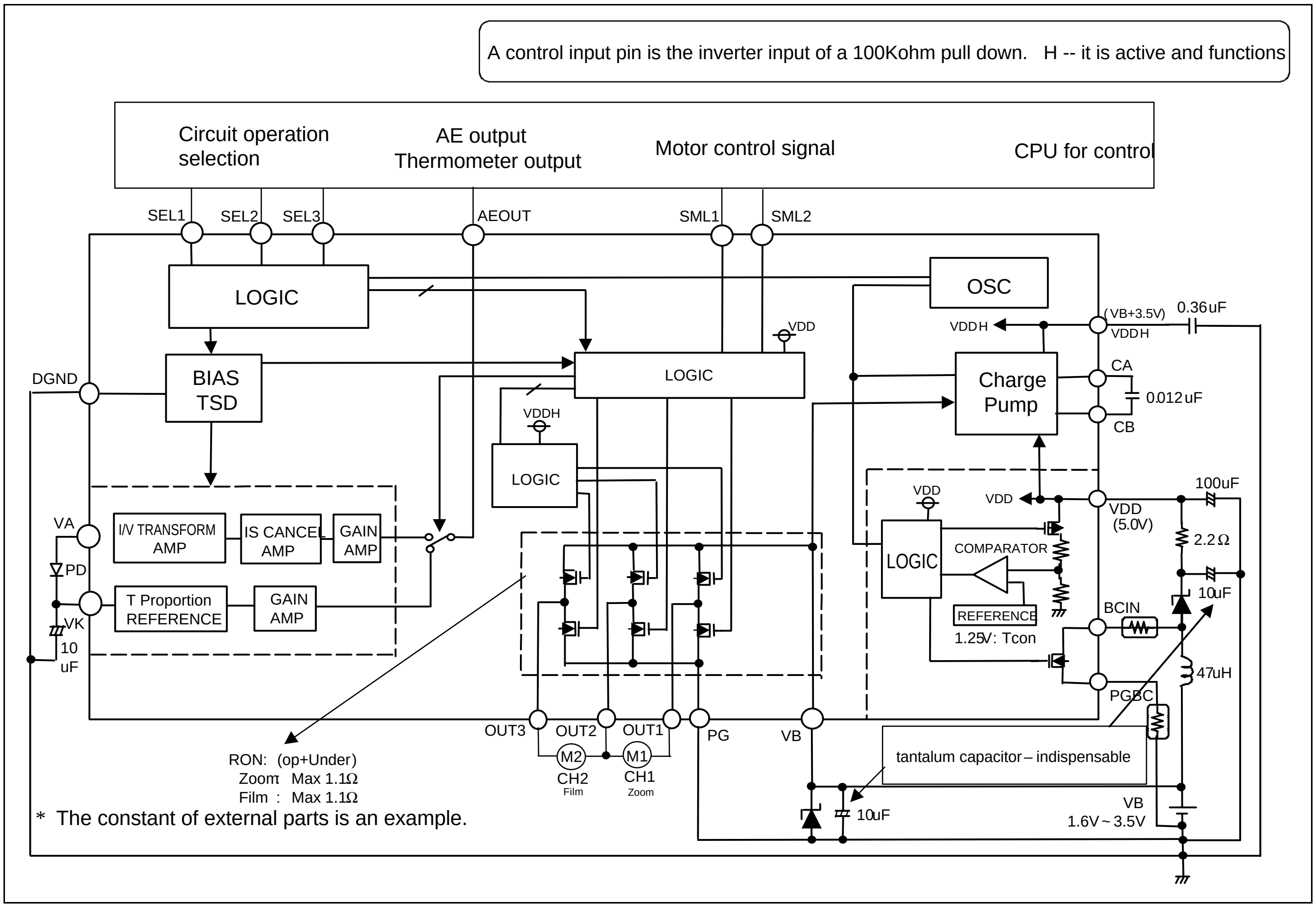
Supply voltage range........ VB:1.6V to 3.5V

Rated supply voltage VB:3.0V

Pin Configuration



Block Diagram



Absolute Maximum Ratings

(Ta=25°C, unless otherwise noted)

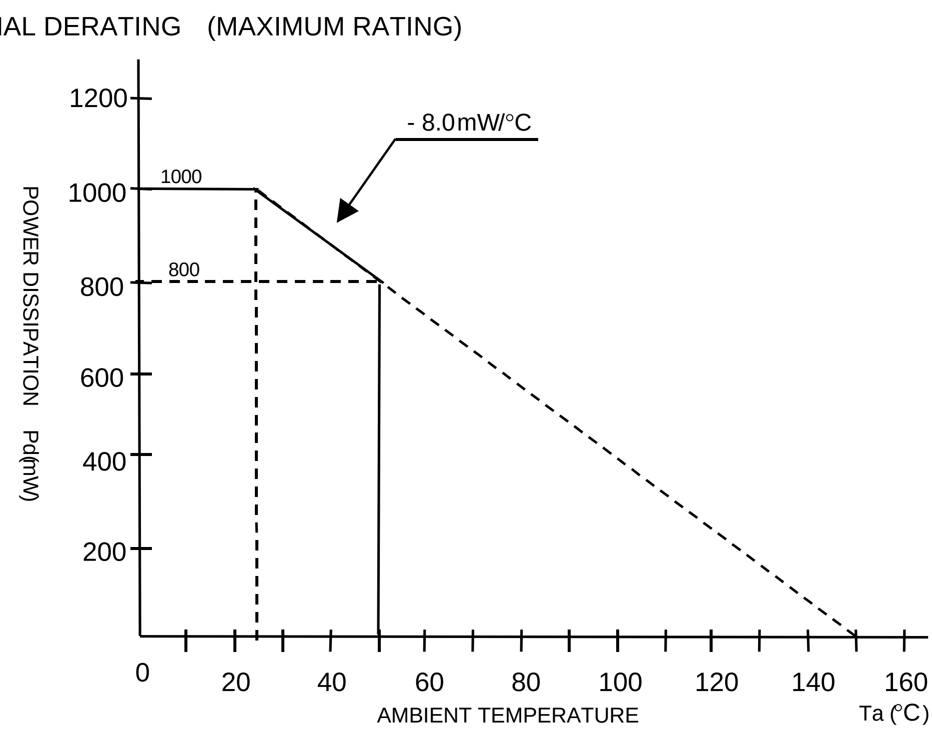
Parameter	Symbol	Ratings	Unit	Remark
Supply voltage1	VB	3.5	V	Note1
Supply voltage2	VDD	6.5	V	Note1
Supply voltage3	VDDH	VB+4.5	V	Note1
Voltage between BCIN and PGBC	VDSS	15	V	Note1 (VGS=0V)
Power dissipation	Pd	1000	mW	Note2 (Ta=25°C)
Thermal derating	Kθ	-8.0	mW/°C	Note2 (Ta≥25°C)
Pin input Voltage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



Remark

Calculation of power dissipation

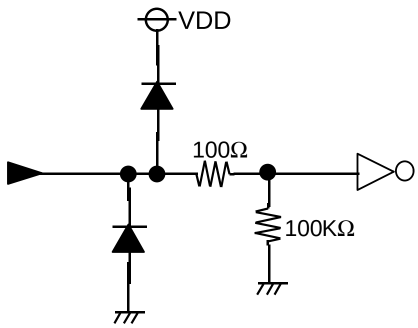
Case : Iout× Iout× On resistance[transistor]

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

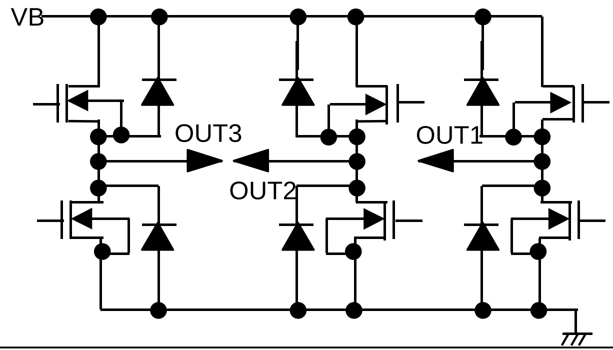
*Please add the radiation board, if it is necessary.

I/O Circuit Diagram

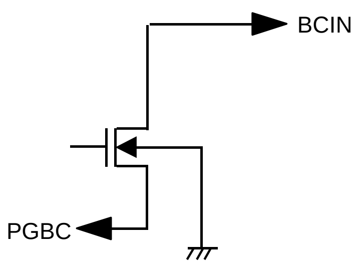
- SEL1, SEL2, SEL3, SML1, SML2



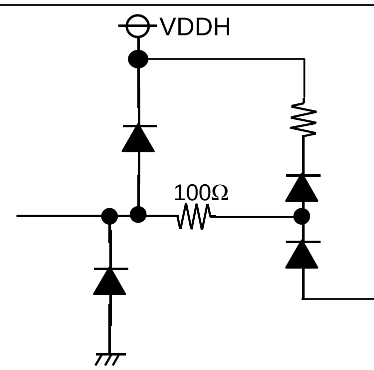
- OUT1, OUT2, OUT3



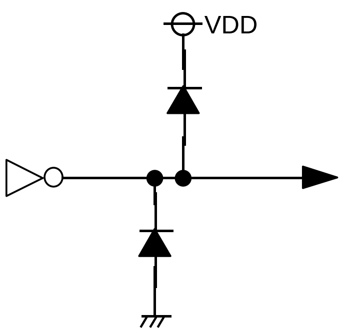
- BCIN, PGBC



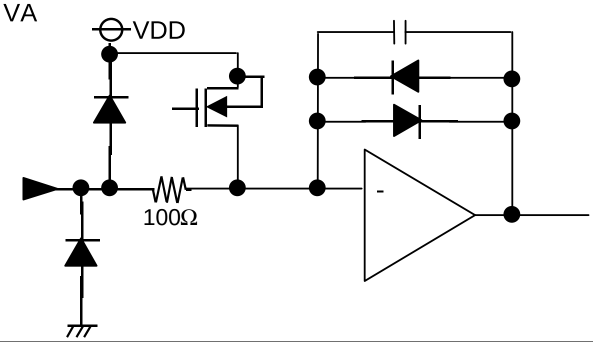
- CA



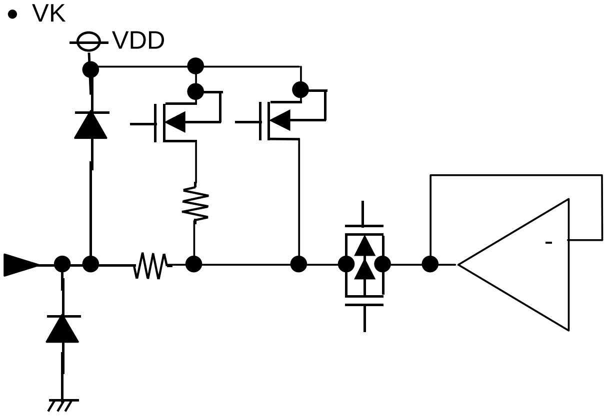
- CB



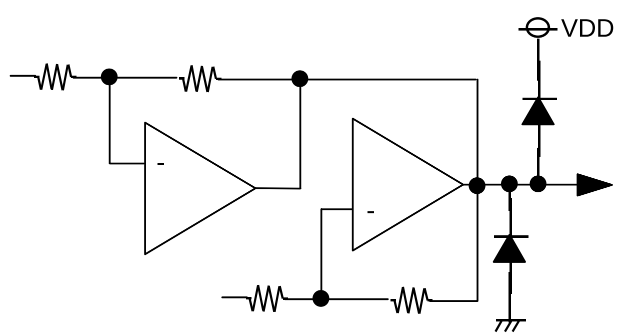
- VA



- VK



- AEOUT



Electrical Characteristics

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

	Parameter	Symbol	Test condition	Limits MIN	TYP	MAX	Unit	Note
	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 MIN	Limit TYP	Limit MAX	Unit	Note
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	
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.

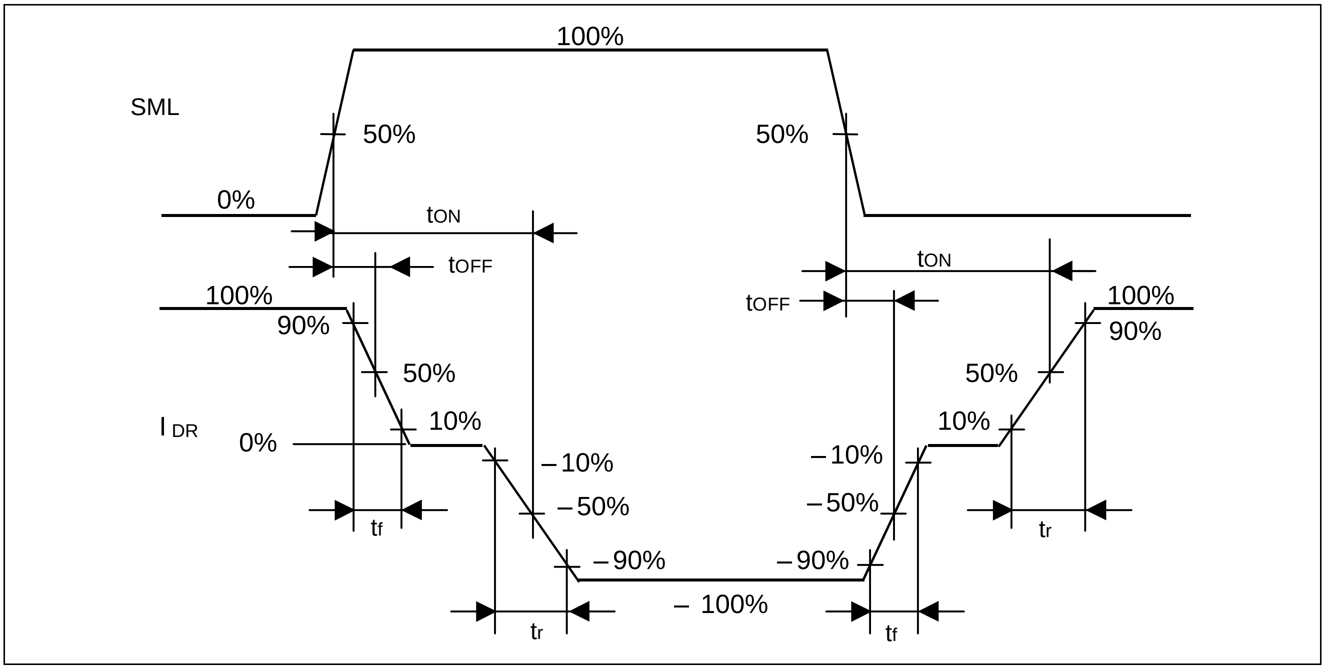
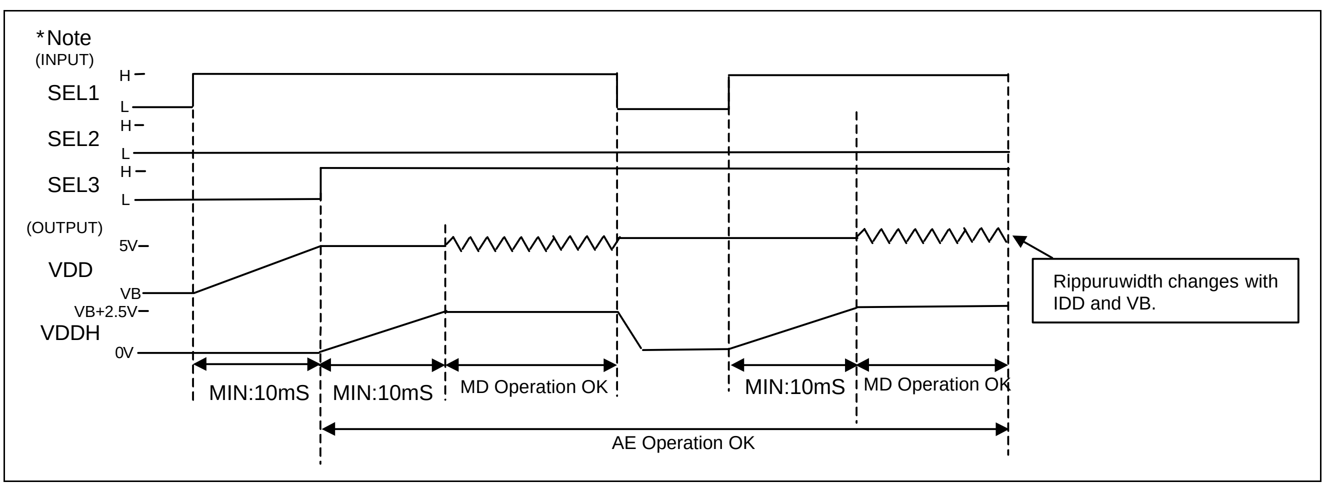


Fig 1 H bridge part switching characteristic waveform

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 contorol (AEOUT: right out)
H	H	H	DC/DC + AE circuit ON + motor2 contorol(AEOUT: right out)
H	H	L	DC/DC + AE circuit ON + shutter contorol(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 contorol (L=OFF, H=ON)



Motor control Truth value table

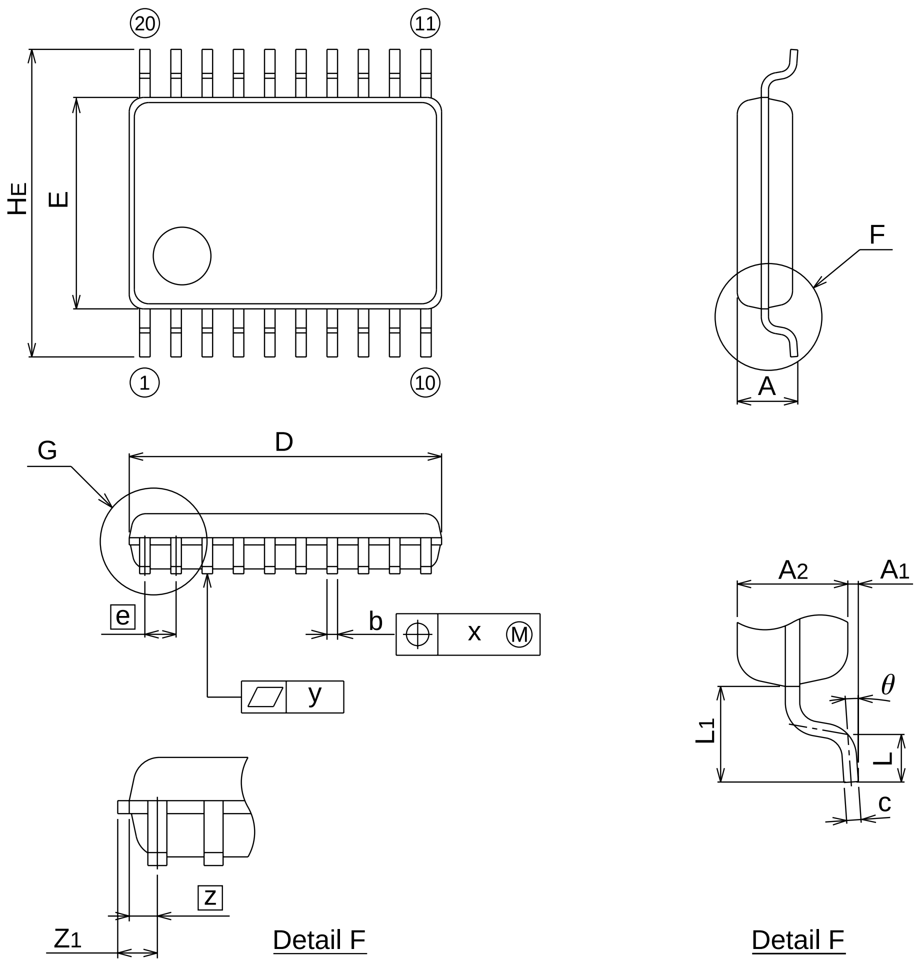
	INPUT								MOTOR Each output		
	SEL1	SEL2	SEL3	SML1	SML2	MOTOR1	MOTOR2	Shutter	OUT1	OUT2	OUT3
MOTOR1 Control	H	L	H	L	L	Standby	Standby	Standby	OFF	OFF	OFF
	H	L	H	H	L	Forward Rotation	Standby	Standby	L	H	OFF
	H	L	H	L	H	Reverse	Standby	Standby	H	L	OFF
	H	L	H	H	H	Brake	Standby	Standby	H	H	OFF
MOTOR2 Control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

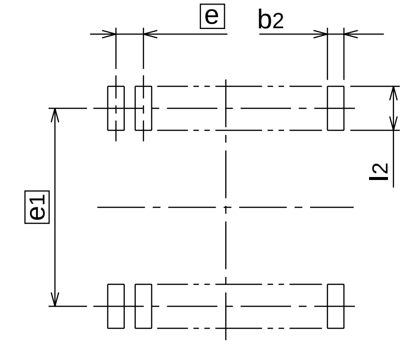
*: Please pass through the Brake or Stand-by mode by all means in case of moving from forward rotation to Reverse rotation or from
Reverse rotation to forward rotation by the motor control.
(ex.) Forward rotation -> Brake -> Reverse rotation,Reverse rotation -> Stand-by -> Forward rotation

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
A_1	0	0.1	0.2
A_2	—	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	—
H_E	6.2	6.4	6.6
L	0.3	0.5	0.7
L_1	—	1.0	—
z	—	0.325	—
Z_1	—	—	0.475
x	—	—	0.13
y	—	—	0.1
θ	0°	—	10°
b_2	—	0.35	—
e_1	—	5.8	—
l_2	1.0	—	—

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