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## 1-2-1 2-Phase Stepper Motor Unipolar Driver ICs

### SLA7070MR, MPR, MPRT/7071MR, MPR, MPRT/7072MR, MPR, MPRT/7073MR, MPR, MPRT 2-Phase/1-2 Phase Excitation Support, Built-in Sequencer

#### ■ Features

- Lineup of built-in current sense resistor and built-in protection circuit-type
- Power supply voltages,  $V_{BB}$ : 46 V (max), 10 to 44 V normal operating range
- Logic supply voltages,  $V_{DD}$ : 3.0 to 5.5 V
- Maximum output currents: 1 A, 1.5 A, 2 A, and 3 A
- Built-in sequencer
- Self-excitation PWM current control with fixed off-time
- Synchronous PWM chopping function prevents motor noise in Hold mode
- Sleep mode for reducing the IC input current in stand-by state
- ZIP type 23-pin molded package (SLA package)

#### ■ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Remarks
Motor Supply Voltage	$V_M$	46	V	
Driver Supply Voltage	$V_{BB}$	46	V	
Logic Supply Voltage	$V_{DD}$	6	V	
Output Current	$I_O$	*1	A	Mode F
Logic Input Voltage	$V_{IN}$	-0.3 to $V_{DD}+0.3$	V	
REF Input Voltage	$V_{REF}$	-0.3 to $V_{DD}+0.3$	V	
Sense Voltage	$V_{RS}$	$\pm 2$	V	Excluding $t_w < 1\mu s$
Power Dissipation	PD	4.7	W	When $T_a = 25^\circ C$
		17		When $T_c = 25^\circ C$
Junction Temperature	$T_j$	+150	$^\circ C$	
Operating Ambient Temperature	$T_a$	-20 to +85	$^\circ C$	
Storage Temperature	$T_{stg}$	-30 to +150	$^\circ C$	

\*1: Output current value may be limited for the SLA7070MR, MPR, MPRT (1.0 A), SLA7071MR, MPR, MPRT (1.5 A), SLA7072MR, MPR, MPRT (2.0 A), and SA7073MR, MPR, MPRT (3.0 A), depending on the duty ratio, ambient temperature, and heating conditions.

Be sure that junction temperature of  $T_j$  is not exceeded under any circumstances.

#### ■ Recommended Operating Conditions

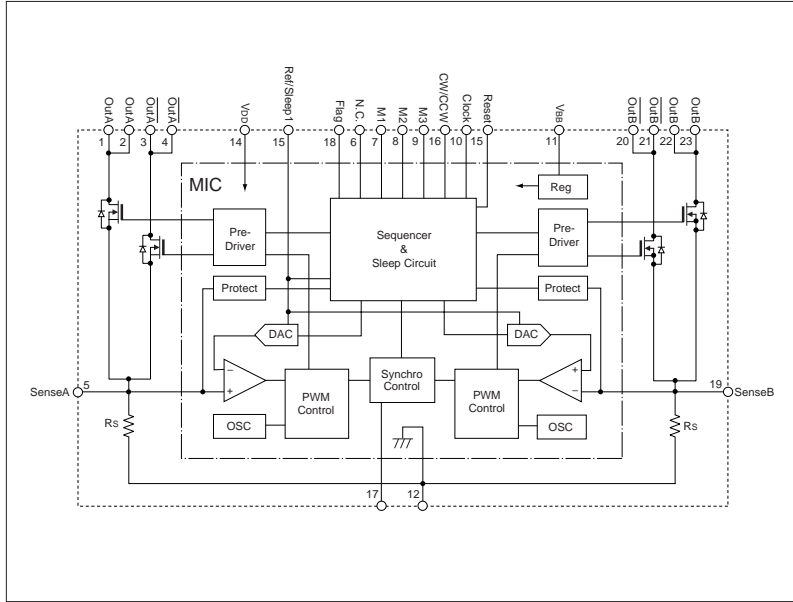
Parameter	Symbol	Rating		Unit	Remarks
		min.	max.		
Motor Supply Voltage	$V_M$		44	V	
Driver Supply Voltage	$V_{BB}$	10	44	V	
Logic Supply Voltage	$V_{DD}$	3.0	5.5	V	The $V_{DD}$ surge voltage should be 0.5 V or lower
Case Temperature	$T_c$		90	$^\circ C$	Temperature at Pin-12 Lead (without heatsink)

#### ■ Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min.	typ.	max.		
Main Supply Current	$I_{SS}$			15	mA	In operation
	$I_{SSS}$			100	$\mu A$	Sleep 1 and Sleep 2 modes
Logic Supply Current	$I_{DD}$			5	mA	
Output MOSFET Breakdown Voltage	$V_{(BR)DSS}$	100			V	$V_{BB}=44V, I_b=1mA$
Output MOSFET ON Resistance	$R_{DS(ON)}$		0.7	0.85	$\Omega$	SLA7070M, $I_b=1.0A$
			0.45	0.6		SLA7071M, $I_b=1.5A$
			0.25	0.4		SLA7072M, $I_b=2.0A$
			0.18	0.24		SLA7073M, $I_b=3.0A$
Output MOSFET Diode Forward Voltage	$V_F$		0.85	1.1	V	SLA7070M, $I_b=1.0A$
			1.0	1.25		SLA7071M, $I_b=1.5A$
			0.95	1.2		SLA7072M, $I_b=2.0A$
			0.95	2.1		SLA7073M, $I_b=3.0A$
Maximum Clock Frequency	$F_{clock}$	250			kHz	When Clock Duty = 50%
Logic Input Voltage	$V_{IL}$			0.25VDD	V	
	$V_{IH}$	0.75VDD				
Logic Input Current	$I_{IL}$		$\pm 1$		$\mu A$	
	$I_{IH}$		$\pm 1$			
REF Input Voltage	$V_{REF}$	0.04		0.3	V	SLA7070M, within the current setting range
		0.04		0.45		SLA7071M, within the current setting range
		0.04		0.4		SLA7072M, within the current setting range
		0.04		0.45		SLA7073M, within the current setting range
	$V_{REFS}$	2		VDD		Output OFF (Sleep 1)
REF Input Current	$I_{REF}$		$\pm 10$		$\mu A$	
Sense Voltage	$V_{SENSE}$		$V_{REF}$		V	When step reference current ratio is 100%
Sleep-Enable Recovery Time	$T_{SE}$	100			$\mu s$	Sleep1&Sleep2
Switching Time	$t_{con}$		2.0		$\mu s$	Clock $\rightarrow$ Out ON
	$t_{coff}$		1.5		$\mu s$	Clock $\rightarrow$ Out OFF
Sense Resistance	$R_s$	0.296	0.305	0.314	$\Omega$	SLA7070M, tolerance of $\pm 3\%$
		0.296	0.305	0.314		SLA7071M, tolerance of $\pm 3\%$
		0.199	0.205	0.211		SLA7072M, tolerance of $\pm 3\%$
		0.150	0.155	0.160		SLA7073M, tolerance of $\pm 3\%$
Overcurrent Sense Voltage	$V_{ocp}$	0.65	0.7	0.75	V	SLA7070xMPR, MPRT, when motor coil shorts out
			2.3			SLA7070MPR, MPRT/7071MPR, MPRT
			3.5			SLA7072MPR, MPRT
Overcurrent Sense Current	$I_{ocp}$		4.6		A	SLA7073MPR, MPRT
			140			SLA707xMPRT, Rear of case (at the saturation temperature)
Flag Output Voltage	$V_{FlagL}$			1.25	V	SLA707xMPR, MPRT, $I_{FlagL}=1.25mA$
	$V_{FlagH}$	1.25-VDD				SLA707xMPR, MPRT, $I_{FlagH}=-1.25mA$
Flag Output Current	$I_{FlagL}$			1.25	mA	SLA707xMPR, MPRT
	$I_{FlagH}$	-1.25				
Step Reference Current Ratio	ModeF		100		%	
	Mode8		70.7		%	
PWM Minimum ON Time	$t_{on(min)}$		3.2		$\mu s$	
PWM OFF Time	$t_{off}$		12		$\mu s$	

\* The direction in which current flows out of the device is regarded as negative.

Internal Block Diagram



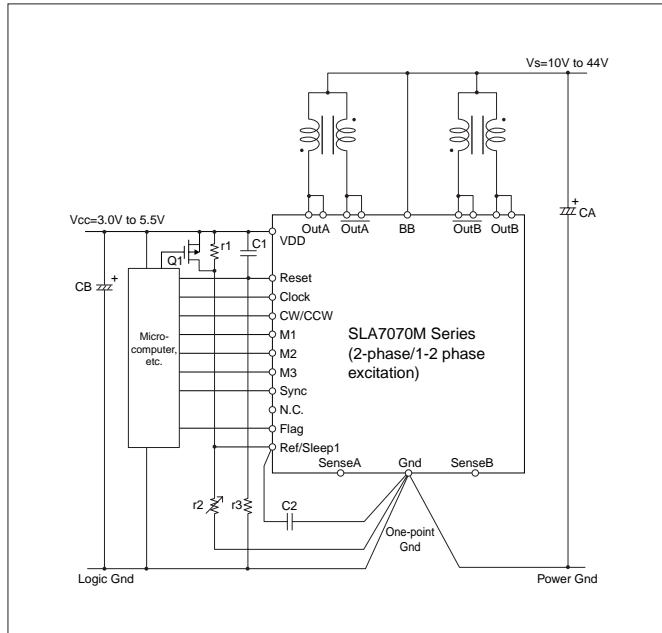
The protect circuit is deleted and the flag pin is N.C. for SLA7070MR, 7071MR, 7072MR, and 7073MR.

Pin Assignment

Pin No.	Symbol	Function
1	OutA	Phase A output
2		OutA/
3	OutA/	
4		SenseA
5	N.C.	
6		M1
7	M2	
8		M3
9	Clock	
10		V <sub>BB</sub>
11	Gnd	
12		Ref/Sleep1
13	V <sub>DD</sub>	
14		Reset
15	CW/CCW	
16		Sync
17	Flag <sup>1</sup>	
18		SenseB
19	OutB/	
20		OutB
21		
22		
23		

\*1: N.C. pin for SLA7070MR, 7071MR, 7072MR, and 7073MR.

Typical Connection Diagram



\* There is no Flag pin (Pin-18) for SLA7070MR, 7071MR, 7072MR, and 7073MR.

External Dimensions (ZIP23 with Fin[SLA23Pin])

