

2-Phase Stepper Motor Unipolar Driver ICs

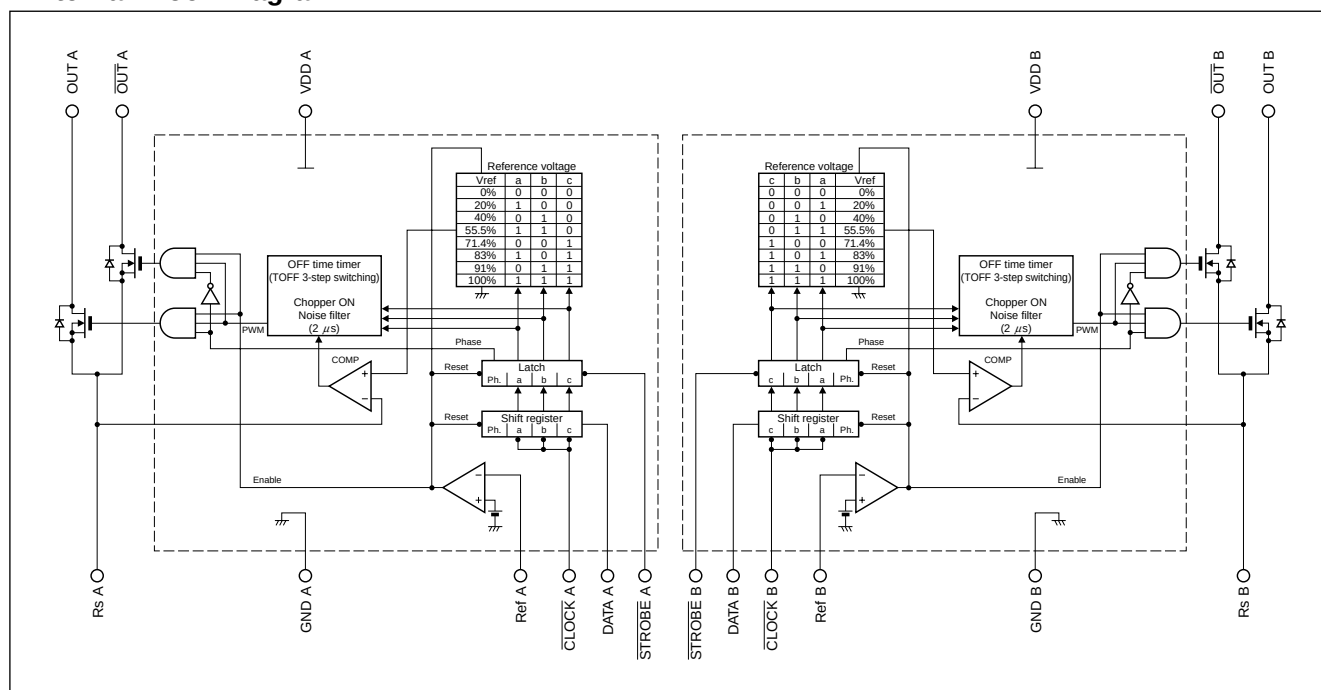
Absolute Maximum Ratings

Parameter	Symbol	Ratings		Units
		SLA7042M	SLA7044M	
Motor supply voltage	V_{CC}	46		V
FET Drain-Source voltage	V_{DSS}	100		V
Control supply voltage	V_{DD}	7		V
Input voltage	V_{IN}	-0.5 to $V_{DD}+0.5$		V
Output current	I_O	1.2	3	A
Power dissipation	P_D	4.5 (Without Heatsink)		W
Channel temperature	T_{ch}	+150		°C
Storage temperature	T_{stg}	-40 to +150		°C

Electrical Characteristics

Parameter			Symbol	Ratings						Units	
				SLA7042M			SLA7044M				
			min	typ	max	min	typ	max			
DC characteristics	Control supply current		I _{DD}			7			7	mA	
			Conditions	V _{DD} =5.5V			V _{DD} =5.5V				
	Control supply voltage		V _{DD}	4.5	5	5.5	4.5	5	5.5	V	
	Terminals DATA, CLOCK and STROBE	Input voltage	V _{IH}	3.5		5	3.5		5	V	
			Conditions	V _{DD} =5V			V _{DD} =5V				
			V _{IL}	0		1.5	0		1.5		
			Conditions	V _{DD} =5V			V _{DD} =5V				
		Input hysteresis voltage	V _H		1			1		V	
			Conditions	V _{DD} =5V			V _{DD} =5V				
		Input current	I _I				±1			±1	μA
			Conditions	V _{DD} =5V, V _I =0 or 5V			V _{DD} =5V, V _I =0 or 5V				
	REF terminal	Input voltage	V _{REF}	0.4		2.5	0.4		2.5	V	
			Conditions	V _{DD} =5V			V _{DD} =5V				
			V _{DISABLE}	V _{DD} -1		V _{DD}	V _{DD} -1		V _{DD}		
			Conditions	V _{DD} =5V			V _{DD} =5V				
		Input current	I _{REF}			±1			±1	μA	
			Conditions	V _{DD} =5V, V _I =0 or 5V			V _{DD} =5V, V _I =0 or 5V				
	Reference voltage selection output voltage		V _{ref}		0			0		%	
			Conditions	MODE 0			MODE 0				
			V _{ref}		20			20			
			Conditions	MODE 1			MODE 1				
			V _{ref}		40			40			
			Conditions	MODE 2			MODE 2				
			V _{ref}		55.5			55.5			
			Conditions	MODE 3			MODE 3				
			V _{ref}		71.4			71.4			
			Conditions	MODE 4			MODE 4				
			V _{ref}		83			83			
			Conditions	MODE 5			MODE 5				
			V _{ref}		91			91			
			Conditions	MODE 6			MODE 6				
	V _{ref}		100			100					
Conditions		MODE 7			MODE 7						
FET ON voltage		V _{DS}		0.8			1.4			V	
		Conditions	I _D =1.2A, V _{DD} =4.75V			I _D =3A, V _{DD} =4.75V					
FET Drain-Source voltage		V _{DSS}	100			100			V		
		Conditions	I _{DSS} =4mA, V _{DD} =5V			I _{DSS} =4mA, V _{DD} =5V					
FET drain leakage current		I _{DSS}			4			4	mA		
		Conditions	V _{DSS} =100V, V _{DD} =5V			V _{DSS} =100V, V _{DD} =5V					
FET diode forward voltage		V _{SD}			1.2			2.3	V		
		Conditions	I _D =1.2A			I _D =3A					
AC characteristics	Chopper off time		T _{OFF}		7			7		μs	
			Conditions	MODE 1, 2			MODE 1, 2				
			T _{OFF}		9			9			
			Conditions	MODE 3, 4, 5			MODE 3, 4, 5				
			T _{OFF}		11			11			
			Conditions	MODE 6, 7			MODE 6, 7				
	Switching time		T _r		0.5			0.5		μs	
			Conditions	V _{DD} =5V, I _D =1A			V _{DD} =5V, I _D =1A				
			T _{stg}		0.7			0.7			
			Conditions	V _{DD} =5V, I _D =1A			V _{DD} =5V, I _D =1A				
			T _f		0.1			0.1			
			Conditions	V _{DD} =5V, I _D =1A			V _{DD} =5V, I _D =1A				
	Data setup time "A"		t _s DAT	75			75			ns	
			Conditions	Inter-clock			Inter-clock				
	Data hold time "B"		t _h DAT	75			75				
			Conditions	Inter-clock			Inter-clock				
	Data pulse time "C"		t _w DAT	150			150				
			Conditions								
Clock pulse width "D"		t _w CLK	100			100					
		Conditions									
Stabilization time before strobe "E"		t _{ps} STB	100			100					
		Conditions	Strobe=L from clock			Strobe=L from clock					
Strobe pulse H width "F"		t _{wh} STB	100			100					
		Conditions									

Internal Block Diagram

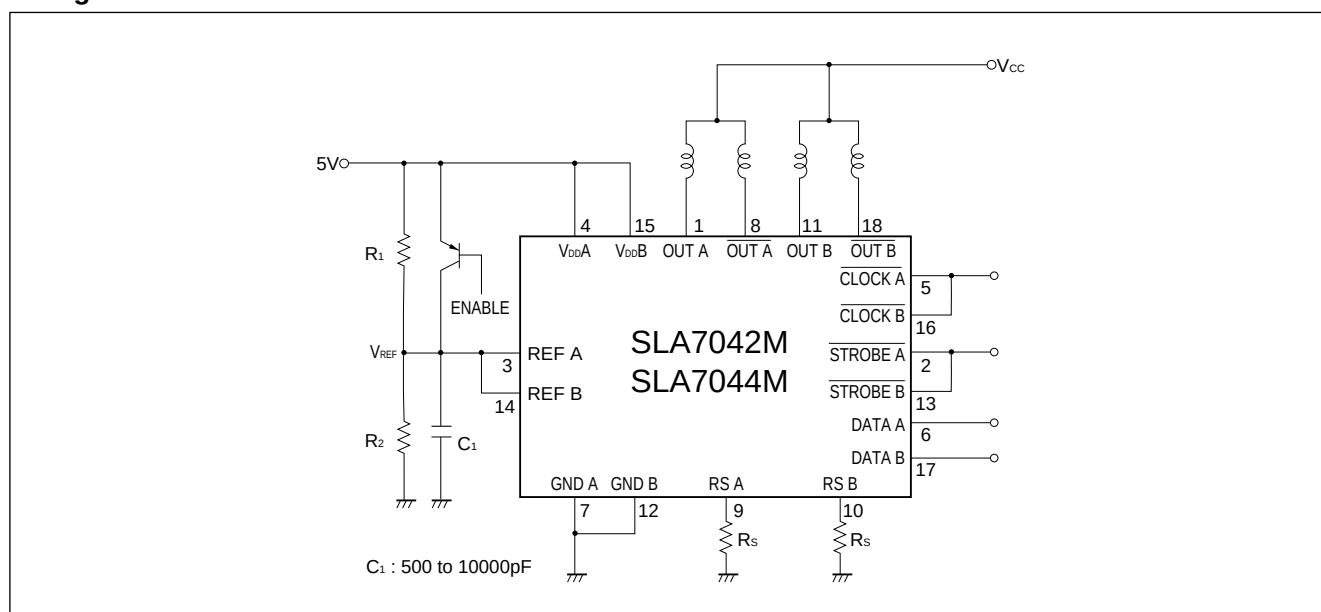


Output Current Formula

$$I_o = \frac{K}{3} \cdot \frac{V_{REF}}{R_s}$$

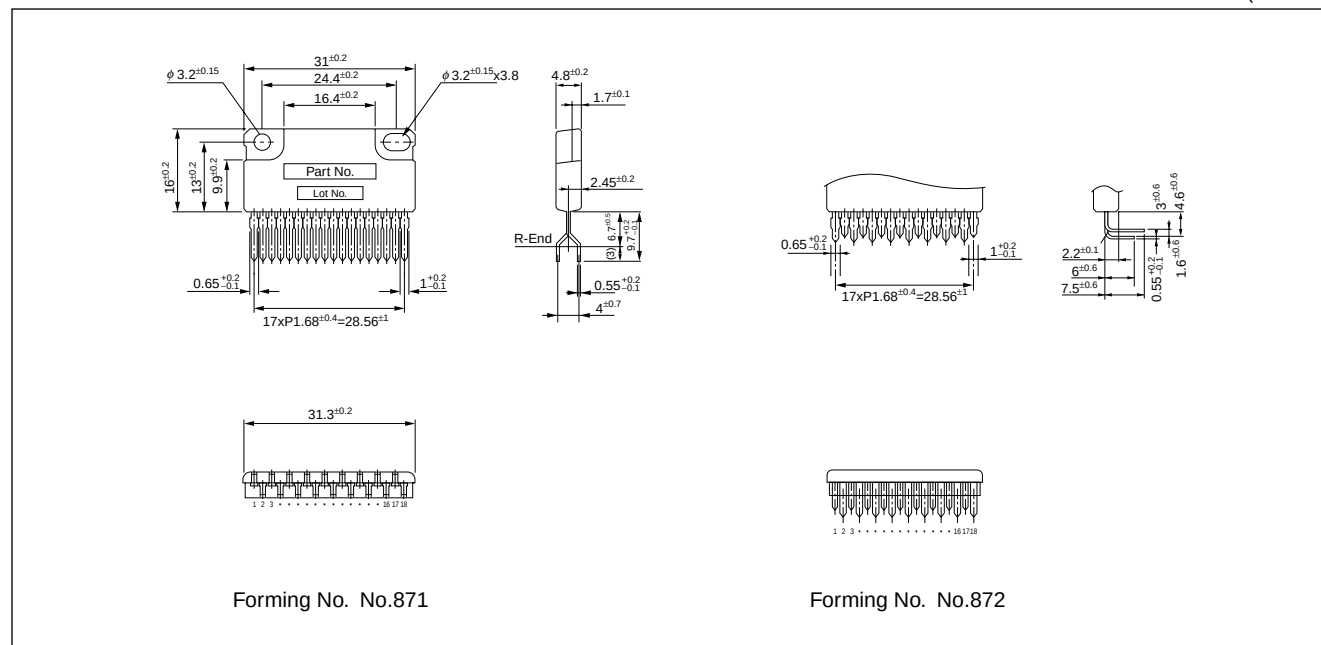
K: Reference voltage setting rate by serial signal
(See the internal block diagram)

Diagram of Standard External Circuit



External Dimensions

(Unit: mm)



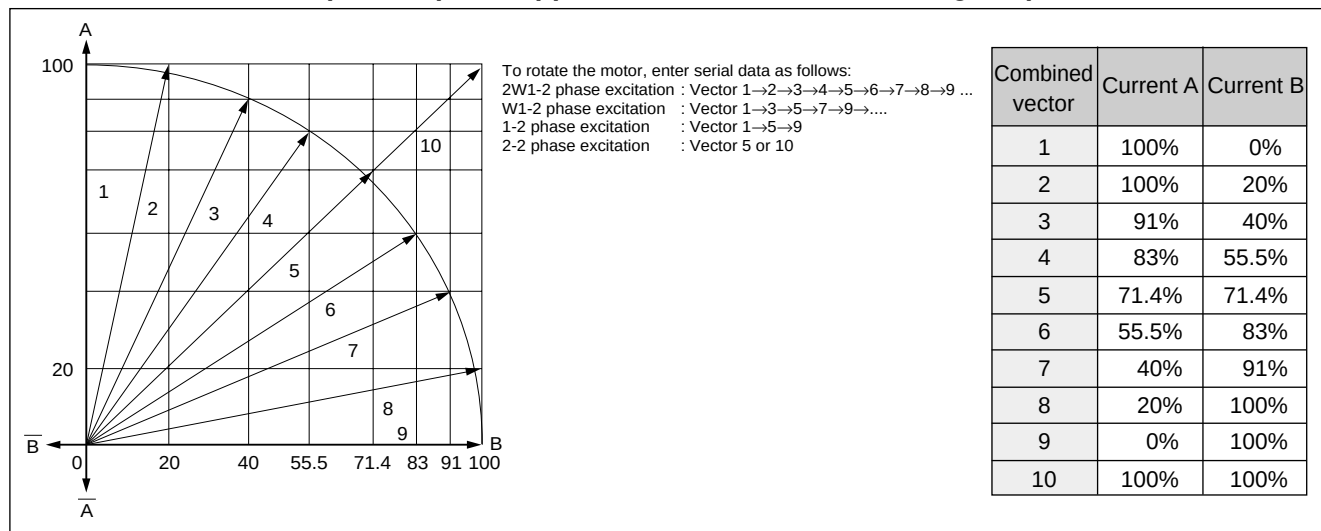
Serial Data Pattern

		OUT excitation (MODEX)	$\overline{\text{OUT}}$ excitation (MODE $\overline{\text{X}}$)
CLOCK		Phase a b c	Phase a b c
STROBE		0	0
DATA	MODE0 (0%)	0	0
	MODE1 (20%)	0	0
	MODE2 (40%)	0	0
	MODE3 (55.5%)	0	0
	MODE4 (71.4%)	0	0
	MODE5 (83%)	0	0
	MODE6 (91%)	0	0
	MODE7 (100%)	0	0

See page 48 for details of PG001M serial signal generator IC for SLA7042M and SLA7044M.

Successively output this serial data and set any current. Then, determine the step time of the reference voltage V_{ref} at $\overline{\text{STROBE}}$ signal intervals.

Current Vector Locus (One step of stepper motor normalized to 90 degrees)

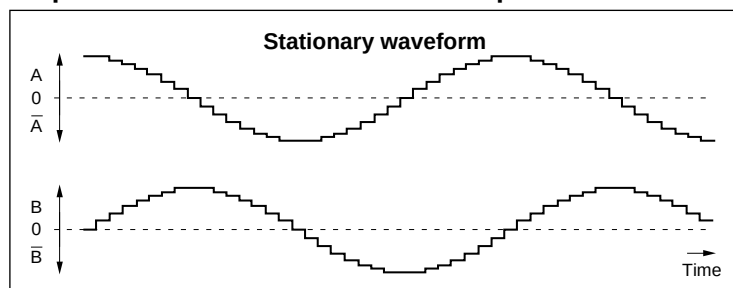
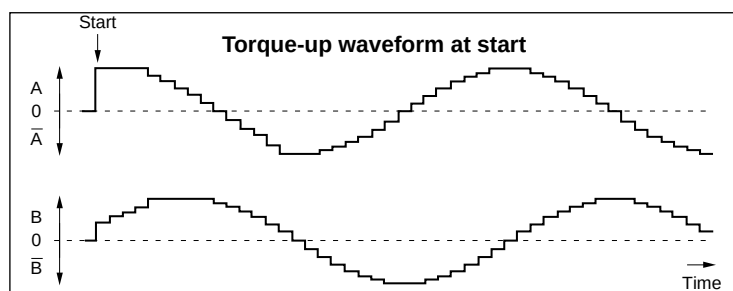
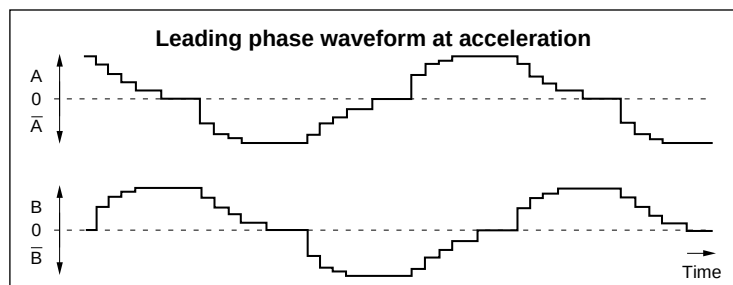


Serial Data Sequence Example (2W 1-2 Phase Excitation for CW)

Sequence	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	0
DATA-A MODE	4	3	2	1	0	$\bar{1}$	$\bar{2}$	$\bar{3}$	$\bar{4}$	$\bar{5}$	$\bar{6}$	$\bar{7}$	$\bar{7}$	$\bar{6}$	$\bar{5}$	$\bar{4}$	$\bar{3}$	$\bar{2}$	$\bar{1}$	$\bar{0}$	1	2	3	4	5	6	7	7	6	5	4		
DATA-B MODE	4	5	6	7	7	7	6	5	4	3	2	1	0	$\bar{1}$	$\bar{2}$	$\bar{3}$	$\bar{4}$	$\bar{5}$	$\bar{6}$	$\bar{7}$	$\bar{7}$	$\bar{7}$	$\bar{6}$	$\bar{5}$	$\bar{4}$	$\bar{3}$	$\bar{2}$	$\bar{1}$	0	1	2	3	4

A malfunction may occur just after the power (V_{DD}) is turned on because the internal logic is unstable. Therefore, set the RESET state (REF terminal voltage: $V_{DD}-1V$ to V_{DD}) after the power is turned on.)

Operation Current Waveform Examples



These three types of waveforms can all be set with a serial signal.