

# 2-Phase Stepper Motor Unipolar Driver ICs

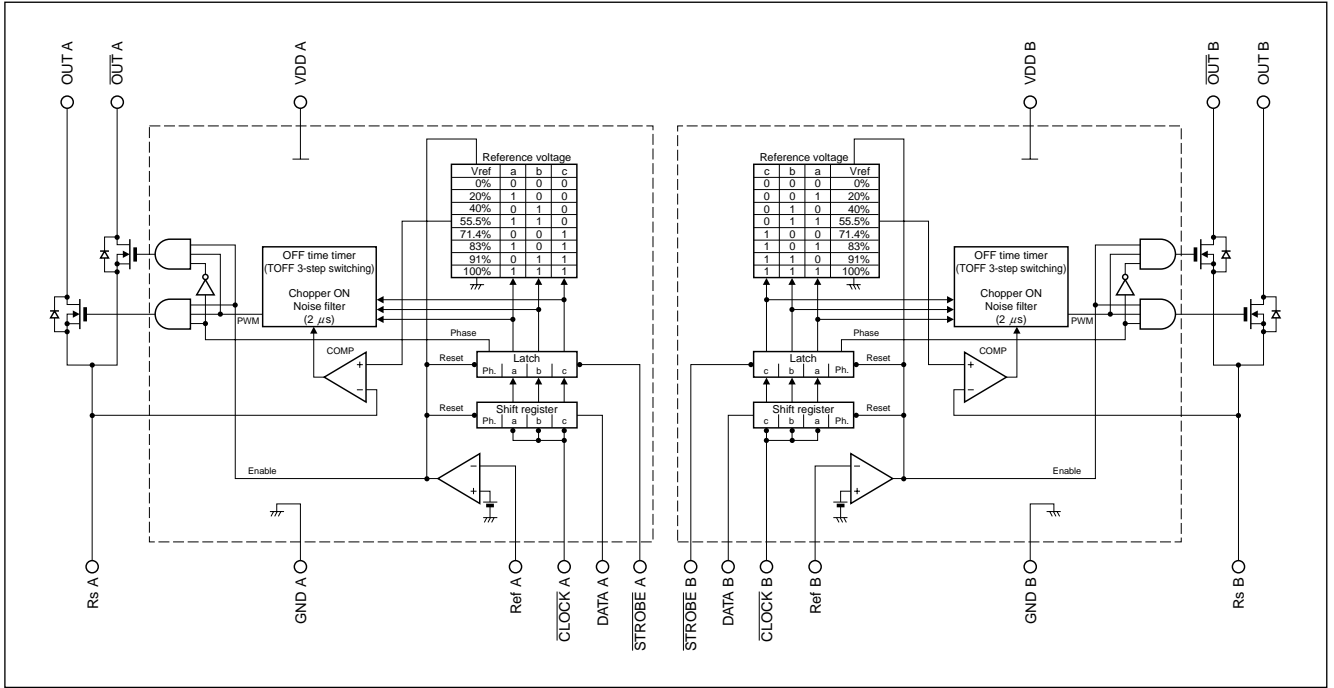
## Absolute Maximum Ratings

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		
Control supply current	$I_{DD}$	$V_{DD}=5.5V$			$V_{DD}=5.5V$			mA	
	Conditions								
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	5	3.5	5	V	
		Conditions	$V_{DD}=5V$			$V_{DD}=5V$			
	Input hysteresis voltage	$V_{IL}$	0		1.5	0		1.5	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	$V_{DD}=5V$			$V_{DD}=5V$			
	Input current	$I_{REF}$			±1			±1	μA
		Conditions	$V_{DD}=5V, V_I=0$ or 5V			$V_{DD}=5V, V_I=0$ or 5V			
DC characteristics	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	$I_D=1.2A$			$I_D=3A$				
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				
	Conditions	MODE 6, 7			MODE 6, 7				
Switching time	$T_r$	0.5			0.5			μs	
	Conditions	$V_{DD}=5V, I_D=1A$			$V_{DD}=5V, I_D=1A$				
	$T_{slg}$	0.7			0.7				
	Conditions	$V_{DD}=5V, I_D=1A$			$V_{DD}=5V, I_D=1A$				
	Conditions	$V_{DD}=5V, I_D=1A$			$V_{DD}=5V, I_D=1A$				
Data setup time "A"	$t_{sDAT}$	75			75			ns	
	Conditions	Inter-clock			Inter-clock				
	Conditions	Inter-clock			Inter-clock				
Data hold time "B"	$t_{thDAT}$	75			75			ns	
	Conditions	Inter-clock			Inter-clock				
Data pulse time "C"	$t_{wDAT}$	150			150			ns	
	Conditions								
Clock pulse width "D"	$t_{whCLK}$	100			100			ns	
	Conditions								
Stabilization time before strobe "E"	$t_{psSTB}$	100			100			ns	
	Conditions	Strobe=L from clock			Strobe=L from clock				
Strobe pulse H width "F"	$t_{whSTB}$	100			100			ns	
	Conditions								

Internal Block Diagram

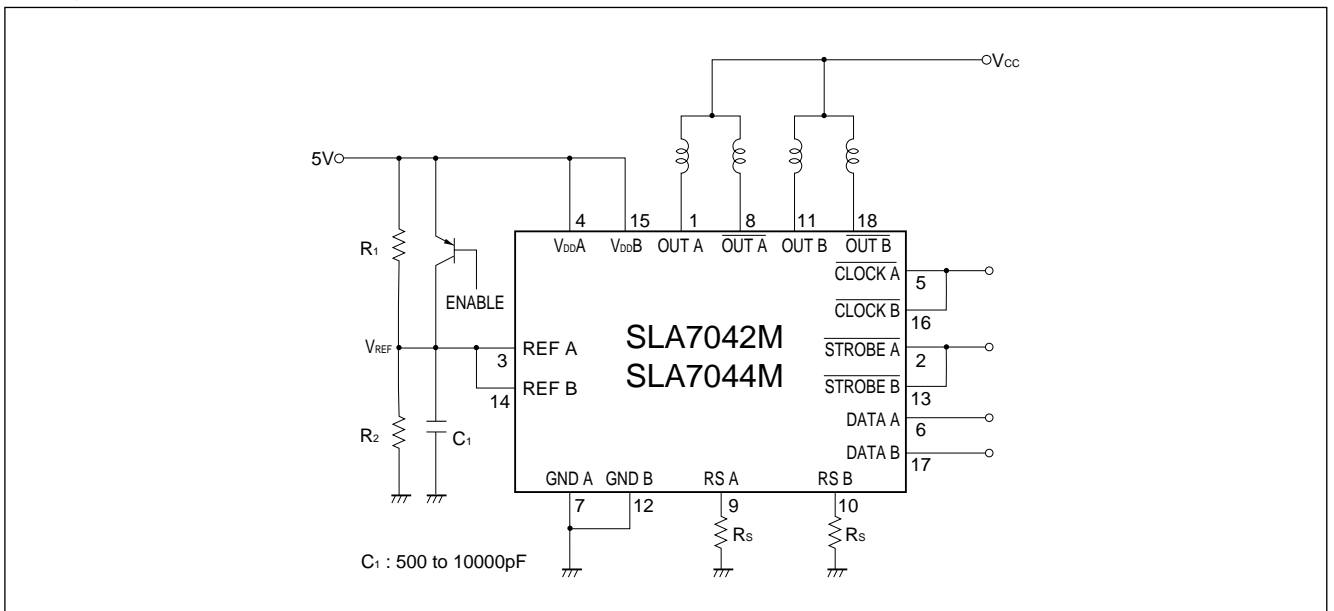


Output Current Formula

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

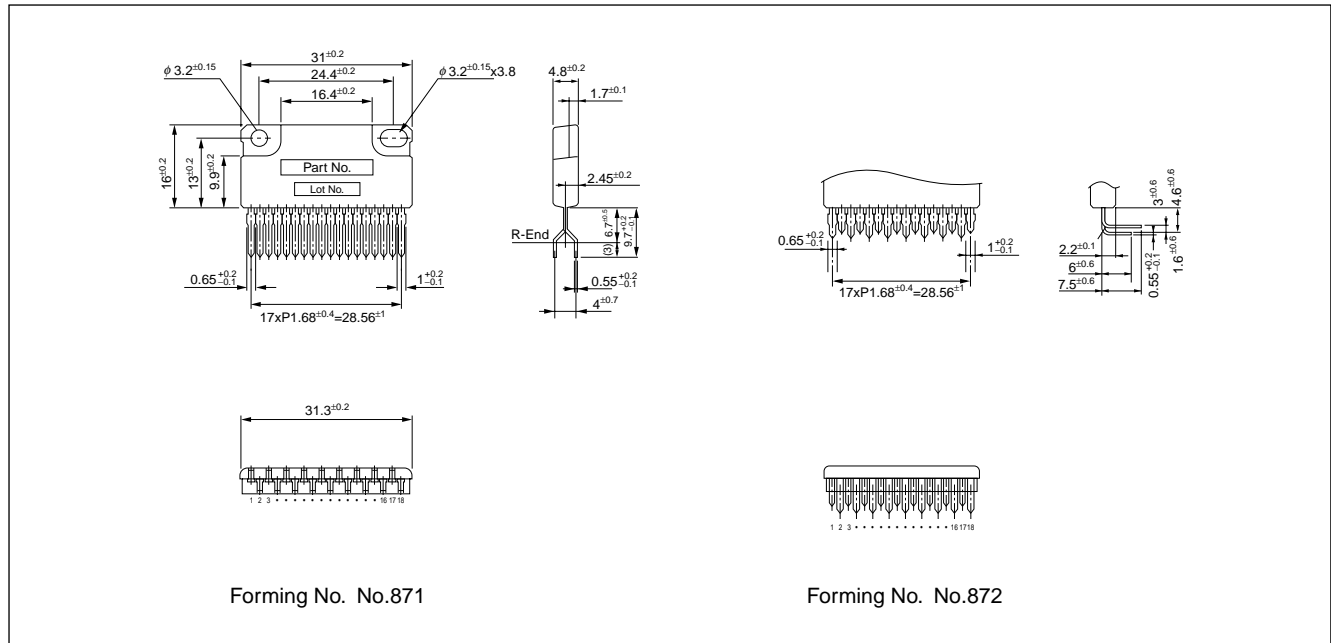
K: Reference voltage setting rate by serial signal  
(See the internal block diagram)

Diagram of Standard External Circuit



External Dimensions

(Unit: mm)



Forming No. No.871

Forming No. No.872

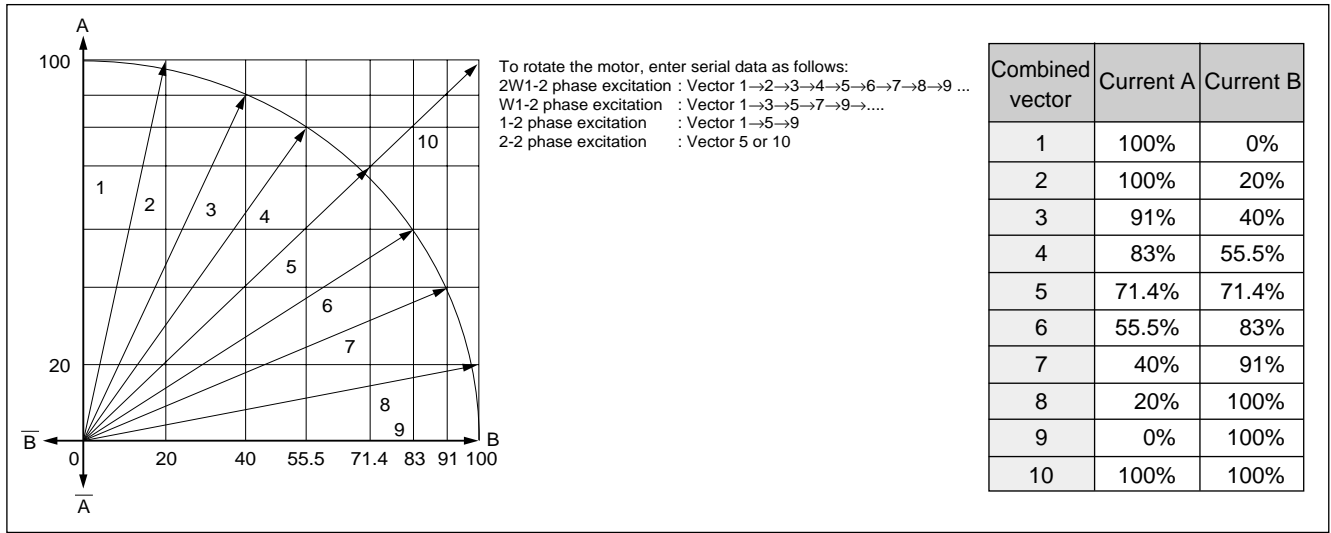
Serial Data Pattern

		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)**

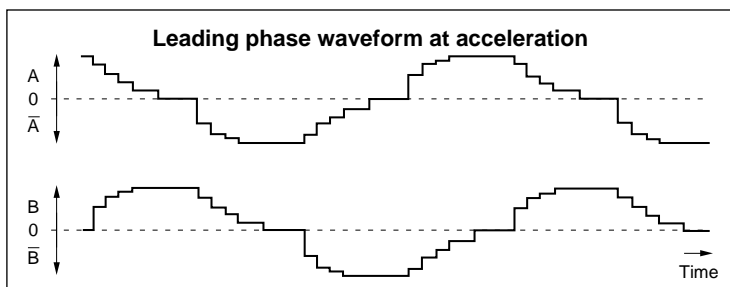
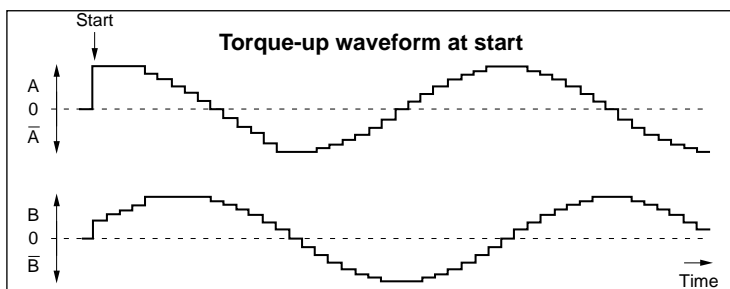
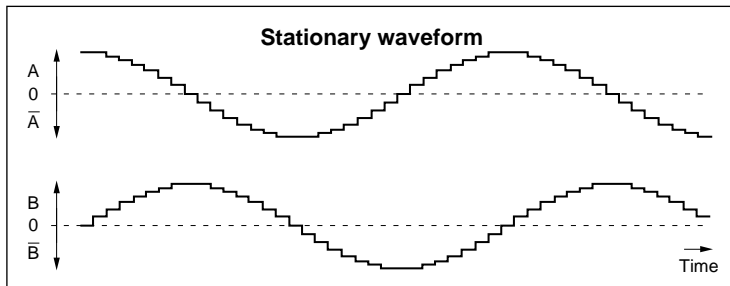


**Serial Data Sequence Example (2W 1-2 Phase Excitation for CW)**

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	7	6	5	4	
DATA-B MODE	4	5	6	7	7	7	6	5	4	3	2	1	0	$\bar{1}$	$\bar{2}$	$\bar{3}$	$\bar{4}$	$\bar{5}$	$\bar{6}$	$\bar{7}$	$\bar{7}$	$\bar{6}$	$\bar{5}$	$\bar{4}$	$\bar{3}$	$\bar{2}$	$\bar{1}$	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.