

# **Test Procedure for the LV8044LPGEVB Evaluation Board**







# (Circuit diagram of the evaluation board)



**ON Semiconductor**<sup>®</sup>



# **Evaluation Board Manual**

[Supply Voltage] VM (2.7 to 5.5V): Power Supply for LSI VCC (2.7 to 5.5V): Power Supply for LSI

[Toggle Switch State] Upper Side: High (VCC) Middle: Open, enable to external logic input Lower Side: Low (GND)

[Operation Guide]

For Stepper motor control

- 1. Initial Condition Setting: Set the toggle switchs Middle.
- 2. <u>Motor Connection:</u> Connect the stepper motor between OUT1, OUT2, OUT3 and OUT4.
- 3. **Power Supply:** Supply DC voltage to VM, VCC.
- 4. <u>Condition Setting:</u> Input the serial data signal to ST,SCLK,SDATA, and STB pins according to the purpose (See LV8044LP datasheet).
- 5. Motor Operation: Input the clock signal to STEP1 pin.

Stepper motor load VM=5V,VCC=3V Motor current waveform example





## Instruction Manual of Software of LV8044LP Evaluation

# **Explanations of Operation Screen**

🔜 LV8044 - CONNECTED			
_CH1-2 (1)		-CH5-6 (3)	
Excitation Mode	cw/ccw cw 💌	5ch Energization Direction	Ch Select
2 phase	Step/Hold Cancel 💌		ocn 💌
TEF VOItage	Reset 🛛 🗸	6ch Energization Direction	REF Voltage
100%(0.2V)	Enable 🛛 out OFF 🔽	UFF Y	0.300V 💙
Send serial code	Send serial code	Send serial code	Send serial code
		etc (4)	
CLKfreq 3.5kHz 💌	STEP1 ON/OFF	Photosensor1	PI3/MO SEL PI3 out 💌
CH2-4 (2)		OFF 🔽	MO SEL 1/2ch 🔽
Excitation Mode	PWM MicroStep	Photosensor2	MO pos 🛛 Initial 🗸
2 phase 🗸	3ch Energizaion Dir		Chopping Freq
REF Voltage	OFF 🗸	Photosensor3	130kHz 🗸
100%(0.2\/) 🗸	4ch Energization Dir	UFF V	
Saturation/Microstep>	OFF 🗸	Send serial code	Send serial code
PWM 🗸	PWM Decay Brake 🔽	(5)	
		IN51-62 (J)	
Send serial code	Send serial code	Mode 1-2 phase Cw	parallel output
		Freq 3.5kHz 💌	IN{51,52,61,62} = LLLL 🔽
CLK Freq 35kHz 💌	STEP2 ON/OFF	cont Parallel ON/OFF	Send parallel
PWM3 Freg 200k Hz 🗸	<->		
PWM3 Duty 0%	PWM3 ON/OFF		
PWM4 Freq 200kHz			(6)
PW/M4 Duty DW	PWM4 ON/OFF		
			EXI

(1) "CH1-2" setting field : the serial signal to drive the stepper motor between CH1 and CH2 is set.

(2) "CH3-4" setting field : the serial signal to drive the stepper motor or the DC motor between CH3 and

CH4 is set.

(3) "CH5-6" setting field : the serial signal to set the energization direction and the reference voltage of

CH5 and CH6 is set.

(4) "etc" setting field : the serial signals to set the PI output, the MO output and the chopping frequency

is set.

(5) "IN51-62" setting field : the sequence signal for stepper motor and the parallel signal are set to the

pins IN51, IN52, IN61 and IN62 respectively.

(6) "EXIT" button : end the program.



# **Explanations of Each Setting**

(1) "CH1-2" setting

This is set when the stepper motor is driven between CH1 and CH2.

 Excitation mode (2-phase excitation / 1-2phase excitation full torque / 1-2 phase excitation /

4W1-2phase excitation ).

- Internal reference voltage (0.200V to 0.066V)

When above conditions are selected, the data transfer of each setting values are executed by

clicking the "Send serial code" box.

UV8044 - CONNECTED		
CH1-2 Excitation Mode CW/CW CW 2 phase IEF VC 1-2 phase (full tro) 1-2 phase (full tro) 2 phase dW1-2 phase control to the sect Enable out OFF Send serial code Sind serial code	CH5-6 Sch Energization Direction OFF Che Energization Direction OFF Send serial code	Ch Select 5ch V REF Voltage 0300V V Send serial code
CLKfreq QEkHz STEP1 ON/OFF	Photosensor1 OFF	PI3/MO SEL PI3 out
OH3-4     PVM     MicroStep       2 phase     3ch Enereitation Dir       REF Voltage     OFF       100K(02V)     OFF       Saturation/Microstep     OFF       PWM     OFF       PWM     PFF	Photosensor2 OFF  Photosensor3 OFF  Send serial code DISI_62	MO pos Initial V Chopping Freq 130kHz V Send serial code
Send serial code Send serial code	Mode 1-2 phase CW	parallel output
CLK Freq         35kHz         STEP2 ON/OFF           PWM3 Freq         200kHz            PWM3 Duty         0%         PWM3 ON/OFF           PWM4 Freq         200kHz         PWM4 ON/OFF           PWM4 Duty         0%         PWM4 ON/OFF	cont Parallel ON/OFF	Send parallel

In the same way,

- Excitation direction (CW / CCW)
- Step hold (Cancel / Hold)
- Counter reset (Reset / Cancel)
- Output enable (OFF / ON)

When above condition is selected, the data transfer is executed by clicking the "Send serial code" box.





CH1-2       Excitation Mode       CW/JCW       CW       Soft Service       Ch1-2         Excitation Mode       Stort/Hold       CCW       Soft Service       Ch1-2       Ch1-2         REF Voltage       I00X02V/       Ensite       out OFF       Soft Service       Ch1-2       Ch1-2         Send serial code       Ch2-2       M0 pos       Initial         CH3-4       Excitation Mode       Immode Send serial code       Immode Send serial code       OFF       M0 pos       Initial       Chopping Freq       130kHz         CH5-62       Intercisation Dir       OFF       Immode Send serial code       Immode Send s	LV8044 - CONNECTED			
CLKfreq       35kHz       STEPI ON/OFF         CH3-4       PMM       MoroStep         2 phase       Sch Energizion Dir       OFF         2 phase       Sch Energizion Dir       OFF         OFF       MO pos       Initial         OFF       OFF       MO pos       Initial         OFF       OFF       OFF       Chopping Freq         IODK(02V)       OFF       OFF       INIt doesnoor3         OFF       PWM       OFF       Send serial code       Send serial code         PWM       PWM Decay Brake       INIt -62       INIt -62       Parallel output         CLK Freq       35kHz       STEP2 ON/OFF       Mode       Initial code       INIt 52.61.62] = LLLL         CLK Freq       35kHz       STEP2 ON/OFF       Send parallel       INIt 52.61.62] = LLLL       cont Parallel ON/OFF       Send parallel	Excitation Mode 2 phase REF Voltage 100%(02V) Send serial code	CW/96W CW V Sto/Hold CCW Rett Rest V Enable out OFF V Send vial code	5ch Bereization Direction 0 F  Gch Energization Direction 0 F  Gch Sendi Serial code	Ch Select Sch REF Voltage 0300V Send serial code
Send serial code     Send serial code     IN51-62       CLK Freq     35kHz     STEP2 ON/OFF       PWMS Freq     200kHz     (~)       PWMS ON/OFF     Send parallel	CLKfreq 35kHz V H3-4 Excitation Mode 2 phase V REF Voltage 100%(02V) V Saturation/Microstep>	STEPI ON/OFF PMM MicroStep 3ch Energication Dir OFF 4ch Energication Dir OFF WMM Documentation	etc Photosensor1 OFF V Photosensor2 OFF V Photosensor3 OFF V Send serial code	PI3/MO SEL PI3 out V MO SEL 1/2ch V MO pos Initial V Chopping Freq 130kHz V Send serial code
PWM4 Freq 200kHz V	PWM         Send serial code           CLK Freq         35kHz           PWM3 Freq         200kHz           PWM3 Duty         0%           PWM4 Freq         200kHz	Send serial code	IN51-62 Mode 1-2 phase CW V Freq 35kHz V cont Parallel ON/OFF	parallel output IN[51.52.61.62] = LLLL ♥ Send parallel

Also, when the stepper motor is driven, the frequency of the reference clock signal "STEP1" is set.

And, it is turned on / off by using the "STEP1 ON/OFF" button.

🔜 LV8044 - CONNECTED			
CHI-2 Excitation Mode 2 phase REF Voltage 100%(0.2V) V Send serial code	CW/CCW CW Step/Hold Cancel Reset Reset Enable out OFF Send serial code	CH5-6 Sch Energization Direction OFF v Ch Energization Direction OFF v Send serial code	Ch Select 5ch V REF Voltage 0300V V Send serial code
CLKfreq 35042 V CH3-4 25kHz 20hz 20hz 20hz 20hz 20hz 20hz 20hz 20h	PYM MicroS /p 3ch Energizatin Dir OFF 4ch Engelizatin Dir OFF	etc Photosensor1 OFF Photosensor2 OFF Photosensor3 OFF Send serial code	PI3/MO SEL PI3 out v MO SEL 1/2ch v MO pos Initial v Chopping Freq 130kHz v Send serial code
Send serial code	Send serial code	IN51-62 Mode 1-2 phase CW V Freq 35kHz V cont Parallel ON/OFF	parailel output [IN[51,52,61,62] = LLLL 💙 Send parailel
PWM4 Freq 200kHz PWM4 Duty 0%	PWM4 ON/OFF		EXIT

 $\rightarrow$  When the "STEP1" signal is output, the "STEP1 ON/OFF" button turns red in color.





LV8044 - CONNECTED			
Excitation Mode 2 phase REF Voltage 100%(0.2V) Send serial code	CW/CCW CW Step/Hold Cancel Reset Reset Enable out OFF Sand serial code	Sch Energization Direction OFF 6ch Energization Direction OFF Send serial code	Ch Select Sch V REF Voltage 0.300V V Send serial code
CLKfreq 35kHz V CH3-4 Excitation Mode 2 phase V REF Voltage 100%(02V) V Saturation/Microstep>	PWM NecroStep 3ch Energit ven Dir OFF 4ch Energization Dir OFF	etc Photos insor1 OFF V Photosensor2 OFF V Photosensor3 OFF V Send serial code	P13/MO SEL P13 out v MO SEL 1/2ch v MO pos Initial v Chopping Freq 130kHz v Send serial code
PWM        Send serial code       CLK Freq     35kHz       PWM3 Freq     200kHz       PWM3 Duty     NK	PWM Decay     Brake     Image: Control of the serial code       Step2 ON/OFF     (->       PWM3 ON/OFF	Mol -62 Mode 1-2 phase GW V Freq 35kHz V Cont Parallel ON/OFF	parallel output IN(51,52,61,62) = LLLL V Send parallel
PWM4 Freq 200kHz V PWM4 Duty 0% V	PWM4 ON/OFF		FXIT

(2) 'CH3-4' setting

When the stepper motor is driven between CH3 and CH4, the "Microstep " in the alternative of

"Saturation/Microstep" is selected, the data transfer is executed by clicking "Send serial code".

The setting method that follow is basically the same as (1).

EV8044 - CONNECTED			
CH1-2 Excitation Mode 2 phase REF Voltage 100%(02V) Send serial code CLKfreq 35kHz	CW/CCW CW Step/Hold Cancel Reset Reset Enable out OFF Send serial code STEP1 ON/OFF	CH5-6 Sch Energization Direction OFF Sch Energization Direction OFF Send serial code etc Photosensor1	Ch Select 5ch V REF Voltage 0300V V Send serial code P13/MO SEL P13 out V
CH3-4 Excitation Mode 2 phase REF Voltage 100%(02V) ~ Satureer/Nicrostep> PWM	PWM     MicroStep       3ch     Energizaion Dir       OFF     V       4ch     Energization Dir       DFF     V       PWM Dicay     Brake	Photosensor2 Photosensor3 Photosensor3 OFF V Send serial code	MO SEL 1/2ch V MO pos Initial V Chopping Freq 130kHz V Send serial code
CLK Freq 35kHz PWM3 Freq 200kHz PWM3 Duty 0% PWM4 DUty 0%	Svid serial code STEP2 ON/OFF <> PWM3 ON/OFF PWM4 ON/OFF	Nb1-62 Mode 1-2 phase CW V Freq 35kHz V Cont Parallel ON/OFF	parallel output IN(51,52,61,62) = LLLL V Send parallel

(3) 'CH3-4' setting

When the DC motor is driven between CH3 and CH4, the "PWM " in the alternative of





"Saturation/Microstep" is selected, the data transfer is executed by clicking "Send serial code".

- Drive polarity (standby / forward / reverse / brake)
- PWM Decay type (brake / standby)

The serial signal to set in the above condition is set.

🔜 LV8044 - CONNECTED			
CH1-2 Excitation Mode 2 phase V REF Voltage 100%(0.2V) V Send serial code	CW/CCW CW V Step/Hold Cancel V Reset Reset 0 Enable out OFF V Send serial code	CH5-6 Sch Energization Direction OFF OFF OFF Send serial code	Ch Select Sch V REF Voltage 0.500V V Send serial code
CLKfreq 35kHz  CLKfreq 35kHz  CH3-4 Excitation Mode 2 phase  REF Voltage 1000X02V)  Saturation/Microstep> PWM  Saturation/Microstep> PWM  PWM3 Freq 200kHz  PWM3 Freq 200kHz  PWM4 Freq	STEPI ON/OFF	etc Photosensor1 OFF • Photosensor2 OFF • Photosensor3 OFF • Dend serial code INUP-62 Mode 1-2 phase CW • Freq 35kHz • Cont Parallel ON/OFF	PB/MO SEL PB out v MO SEL 1/2ch v MO pos Initial v Chopping Freq 130kHz v Send serial code parallel output [N\51.52.61.62] = LLLL v Send parallel

Also, "Frequency" and "PWMduty" of the PWM signal are set to the pins "PWM3 STEP2" and "PWM4".

Then, it is turned on/off by using the buttons "PWM3ON/OFF" and "PWM4 ON/OFF".

 $\rightarrow$  When the "PWM" signal is output, the buttons "PWM3ON/OFF" and "PWM4 ON/OFF" of output turns

red in color.

(4) "CH5-6" setting field :

The setting method here is nearly the same as (3).

(5) "etc" setting field :

- PI output (OFF/ON)
- PI3 / MO output switching (PI3out / MO)
- MO output ch selection (1/2ch / 3/4ch)
- MO output position (Initial position / 1-2phase position)
- Chopping frequency (200KHz to 65KHz)

The setting is as below.



(6) "IN51-62" setting field :

When the stepper motor is driven between CH-5 and CH6, the signal is input to the pins IN51, IN52, IN61 and IN62 respectively.



• "1-2 phase excitation Forward" and "1-2phase excitation Reverse"

The drive of Forward and Reverse (per cycle) of 1-2phase excitation is set.  $\rightarrow$  The drive signal of per cycle is as below.



#### [In case of 1-2phase excitation]



- $\rightarrow\,$  The relation of IOUT1 and IOUT2 inverts at reversal.
- "2 phase excitation Forward" and "2phase excitation Reverse" The drive of Forward and Reverse (per cycle) of 2phase excitation is set.
   →The drive signal of per cycle is as below.



# [In case of 2phase excitation]



- •Drive Frequency

The Pulse rate of the stepper motor is set. ( "FREQ" of above timing chart is set.)

E LV8044 - CONNECTED			
CH1-2 Excitation Mode 2 phase V REF Voltage 100%(0.2V) V	CW/CCW CW V Step/Hold Cancel V Reset Reset V Enable out OFF V	CH5-6 Sch Energization Direction OFF Sch Energization Direction OFF	Ch Select 5ch 💌 REF Voltage
Send serial code	Send serial code	Send serial code	Send serial code
CLKfreq 35kHz V	STEP1 ON/OFF	Photosensor1 OFF	PI3/MO SEL PI3 out V MO SEL 1/2ch V
Excitation Mode 2 phase	PWM MicroStep 3ch Energizaion Dir OFF V 4ch Energization Dir	Photosensor2 OFF V Photosensor3 OFF V	MO pos Initial V Chopping Freq 130kHz V
Saturation/Microstep> PWM	OFF V PWM Decay Brake V	Send serial code	Send serial code
CLK Freq 3.5kHz V	Send serial code	Mode 1 phase CW V Freq 35kHz V	IN[5 52,61,62] = LLLL
PWM3 Freq 200kHz V PWM3 Duty 0% V	<-> PWM3 ON/OFF	15kHz 15kHz 10kHz 10kHz 100Hz	
PWM4 Freq 200kHz V PWM4 Duty 0% V	PWM4 ON/OFF	50Hz	EXIT



### •Parallel Signal Setting

The input parallel signal to the pins IN51, IN52, IN61 and IN62 respectively can be set.

LV8044 - CONNECTED			
CH1-2 Excitation Mode 2 phase REF Voltage 100%(0.2V) Send serial code	CW/CCW CW V Step/Hold Cancel V Reset Reset V Enable out OFF V Send serial code	CH5-6 Sch Energization Direction OFF Sch Energization Direction OFF Send serial code	Ch Select 5ch REF Voltage 0300V Send serial code
CLKfreq 35kHz 💌	STEP1 ON/OFF	etc Photosensor1	PI3/MO SEL PI3 out
CH3-4 Excitation Mode 2 phase REF Voltage 100%(0 2V) Saturation/Microstep>	PWM MicroStep 3ch Energizaion Dir OFF V 4ch Energization Dir OFF V	Photosensor2 OFF  Photosensor3 OFF Send serial code	MO SEL 172ch V MO pos Initial V Chopping Freq 130kHz V Send serial code
Send serial code	Send serial code	IN51-62 Mode 1-2 phase CW V Freq 35kHz V	para el output
CLK Freq 35kHz PWM3 Freq 200kHz PWM3 Duty 0% PWM4 Freq 200kHz PWM4 Duty 0%	STEP2 ON/OFF	cont Parallel ON/OFF	NST5251621 + HLL NST5251621 + HHL NST5251621

That's the end of the excitation relating to the setting of "Main Screen".





\*)Please supply voltage for actuator from external power source to VM12,VM34,VM5 and VM6 pins.