3-Phase Stepping Motor Drive IC for Universal Controller

PMM3101

Micro step

Outline

The PMM3101 IC for stepping motor drive is a power hybrid IC (HIC) that consists of an energization mode generation circuit and a switching device to drive 3-phase stepping motors in a single package. It has been developed to facilitate the use of 3-phase stepping motors more easily so that you can easily configure a micro step drive device only with this HIC and a few peripheral parts.

Features

- Micro step sine wave drive driver
- Built-in current detection resistor
- Adopting MOSFET as the power drive device to reduce heat generation
- All-in-one package reducing the number of parts of the peripheral circuit
- 4 energization modes available with an external bit signal

Maximum ratings (TC=25˚C)

Item	Symbol	Condition	Rating	Unit
Source voltage–1	$V_{CC1\ max}$	V_{CC2}=0V	37	V
Source voltage–2	$V_{CC2\ max}$	Without signal	7	V
Input voltage	$V_{in\ max}$	Logic input terminal	7	V
Phase current	$I_{O\ max}$	V_{CC2}=5V,Clock≧ 100Hz	2	A
Board temperature during operation	$T_{C\ max}$	———	+105	˚C
Joint temperature	$T_{j\ max}$	———	+150	˚C
Conservation temperature	T_{stg}	———	–40~+125	˚C

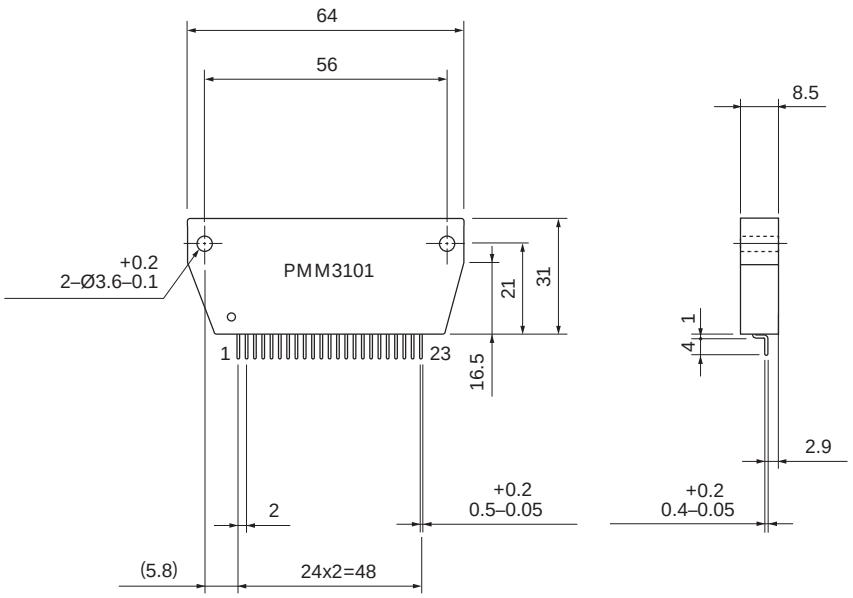
Recommended operating conditions (Ta=15˚C)

Item	Symbol	Condition	Rating	Unit
Source voltage–1	V_{CC1}	With signal	16~30	V
Source voltage–2	V_{CC2}	Without signal	5.0±5%	V
Input voltage	V_{IH}	———	0~V_{CC2}	V
Phase current–1	I_{O1}	Without heat sink	1.0	A
Phase current–2	I_{O2}	T_C=105˚C, Clock≧100Hz	1.5	A
Clock frequency	Clock	Pin 10 input frequency (rising time Tr and falling time Tf: 1.6É s or less)	DC~120	kHz
Phase driver withstand voltage	V_{DSS}	I_D=10mA(T_C=25˚C)	60	V

External Figures (unit: mm)

Pin connection

Pin No.	Name
1.	V_{CC1B}
2.	V_{CC1C}
3.	UO
4.	WO
5.	VO
6.	Vz
7.	V_{CC1A}
8.	GND2
9.	V_{ref}
10.	Clock
11.	Mode A
12.	Mode B
13.	Hold
14.	CW/CCW
15.	Enable
16.	Reset
17.	GND1
18.	V_{CC2}
19.	UI
20.	VI
21.	WI
22.	PGND A



Electrical characteristics (TC=25°C, VCC1=24V, VCC2=5V)

Item	Symbol	Condition	Rating			Unit
			Min	Standard	Max	
V_{CC2} source current	I_{CCO}	Enable="L"	–	6.1	12	mA
Effective output current	I_{oe}	Each phase R/L = 2Ω/6mH, 2W2-3 phase energization	0.32	0.37	0.42	A_{rms}
FET diode forward voltage	V_{df}	If=1A(RL=23Ω)	–	1.0	1.6	V
Output saturation voltage	V_{sat}	RL=23Ω	–	0.45	0.56	V
Output leak current	I_{OL}	RL=23Ω	–	–	0.1	mA
"H" level input voltage	V_{IH}	Pins 10 to 16	4.0	–	–	V
"L" level input voltage	V_{IL}	Pins 10 to 16	–	–	1.0	V
Input current	I_{IL}	Pins 10 to 16 = GND level Pull-up resistance: 20kΩ	115	250	550	µA
V_{ref} input voltage	V_{rH}	Pin 9	0	–	V_{CC2}/2	V
V_{ref} input current	I_r	Pin 9 = 2.5V Internal resistance: 4.0kΩ	440	625	810	µA
PWM frequency	Fc	–	23	31	39	kHz

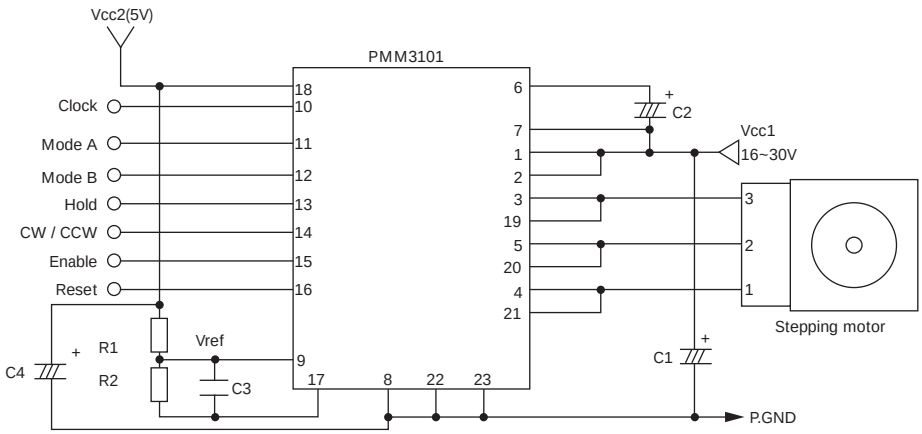
Function of each terminal

Terminal name	Function	Input condition for operation
V_{ref}	Motor current setting input	–
Clock	Pulse input for motor drive	Operates at the rising edge
Hold	Pause input	Hold = "L" level
CW/CCW	Motor rotational direction setting input	"H" level = CW rotation "L" level = CCW rotation
Enable	Power off input	Enable = "L" level
Reset	System reset	Reset = "L" level

Energization mode table

Input condition		Energization mode	1 step angle (degree)	Basic step division number
Mode A	Mode B			
L	L	2EX	1.2	1
L	H	2–3EX	0.6	2
H	L	W2–3EX	0.3	4
H	H	2W2–3EX	0.15	8

Example of Application Circuit



Recommended circuit part constants

C1	C2	C3	C4
220µF	2.2µF	0.1µF	10µF

- For the R1 and R2 constants, determine the Vref voltage according to the following equation.
  Vref (V) = motor current adjustment value (A/phase) x 1.3
  Notice that 100Ω is recommended for R2 due to the configuration of the internal circuit of the PMM3101.

- Place the GND side of the source by-pass capacitor of VCC1 (C1) as close to pins 22 and 23 as possible to reduce noise.