



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 (T_C=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

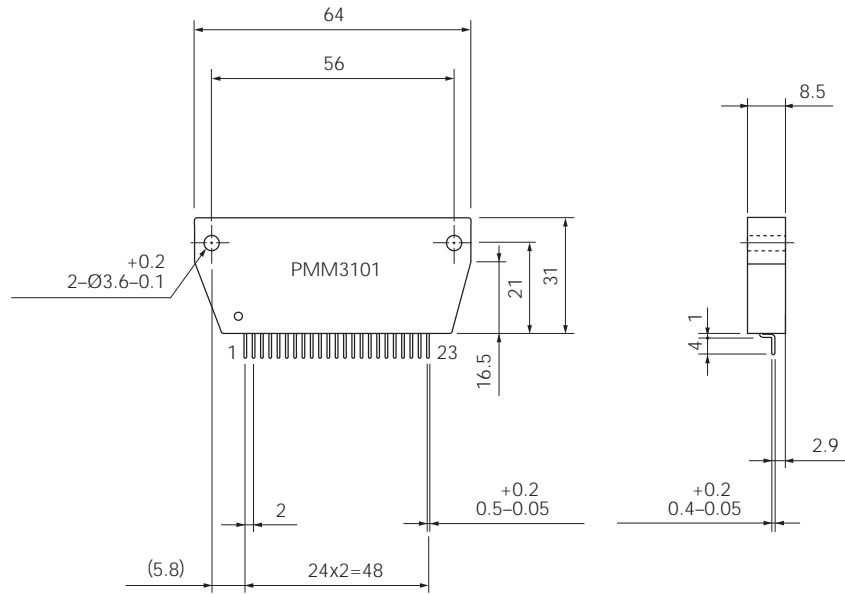
Recommended operating conditions (T_a=15°C)

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 T _r and falling time T _f : 1.6E-8 s or less)	DC~120	kHz
Phase driver withstand voltage	V _{BSS}	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.	V _Z
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 (T_C=25°C, V_{CC1}=24V, V_{CC2}=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}	I _f =1A(R _L =23Ω)	-	1.0	1.6	V
Output saturation voltage	V _{sat}	R _L =23Ω	-	0.45	0.56	V
Output leak current	I _{oL}	R _L =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 _{IH}	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	F _c	-	23	31	39	kHz

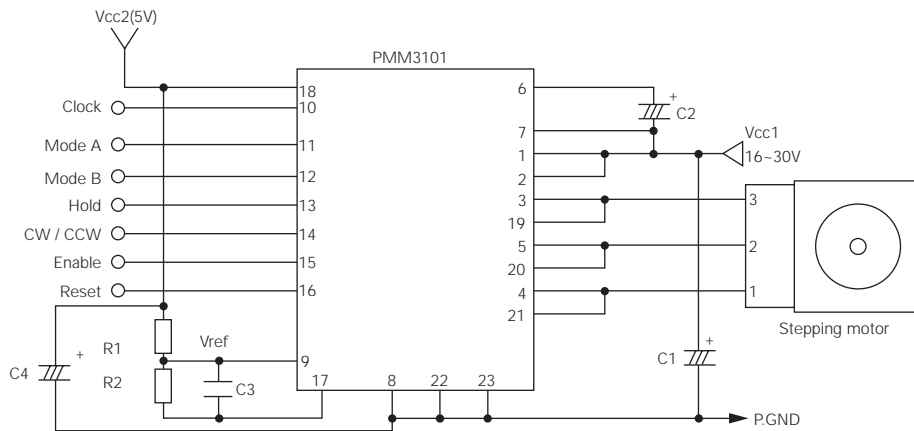
Function of each terminal

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
220 μ F	2.2 μ F	0.1 μ F	10 μ F

- For the R1 and R2 constants, determine the V_{ref} voltage according to the following equation.

$$V_{ref} (V) = \text{motor current adjustment value (A/phase)} \times 1.3$$
 Notice that 100 Ω 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.