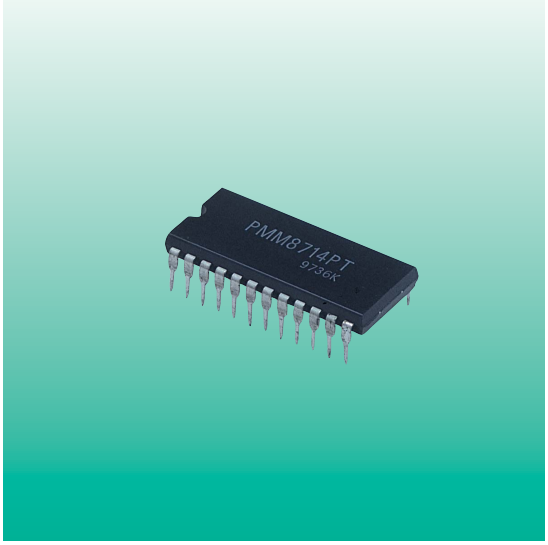


5-Phase Stepping Motor Drive IC for Universal Controller

PMM8714PT

Outline

"PMM8714PT" is a Bi-CMOS monolithic IC to be used for controlling 5-phase stepping motor.
This IC has been developed for the purpose to further simplify the usage of 5-phase stepping motor. When combined only with the switching elements or a power hybrid IC, this IC can configure a driver device for a 5-phase stepping motor.

Characteristics

- Universal controller : Selection is possible from the following three different excitation modes. 4EX/4-5EX/5EX
- Power voltage: : Vcc=4V~16V
- High output current: : 20mA min(source)
- High noise margin : Schmitt trigger circuit is integrated for the all input terminals
- two kinds of pulse input : double input system (CW, CCW input mode), single input system (CK,U/D input mode)
- Power-down functions : Makes all the output to "L" level.
- Reset functions : Shifts excitation status to the phase origin.
- Excitation mode preservation functions : Phase output does not change even when excitation mode is switched as follows: 4EX_4-5EX_5EX.
- Phase origin monitor : Outputs at the "H" level at the time of phase origin (the output in reset mode).
- Determination monitor for excitation status : Outputs monitor signal for the status of controller.
- Input pulse monitor : Outputs monitor signal for Vcc input pulse.

Maximum Rating (Ta = 25$∞$C)

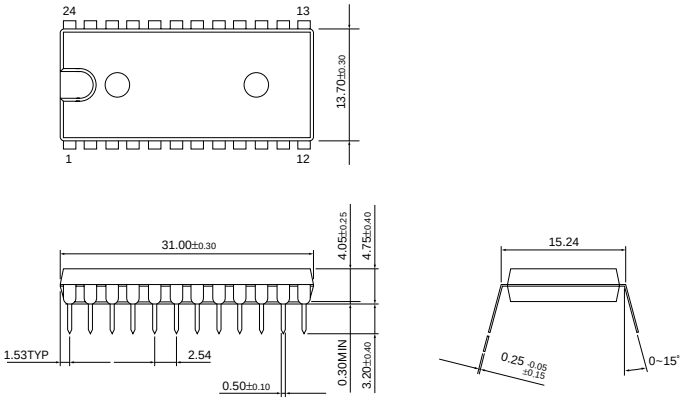
Item		Symbol	Rating	Unit
Power voltage		V_{CC}	-0.5~20	V
Output current øn	"H" level	I_{OH} ø	-30	mA
	"L" level	I_{OL} ø	2	
Output current C_O,E_M,Z_O	"H" level	I_{OH}	-50	µ A
	"L" level	I_{OL}	2	mA
Input voltage		V_{IN}	-0.5~V_{CC}	V
Input current		I_{IN}	±1	mA
Tolerated loss		P_D	1000	mW
Operating temperature		T_{opr}	-20~85	˚C
Storage temperature		T_{stg}	-55~150	˚C

Recommended Operating Conditions (Ta = -30 to 85~C)

Item		Symbol	Rating			Unit
			Min.	Standard	Max.	
Power voltage		V_{CC}	4	—	16	V
Output current ø n	"H" level	I_{OH} ø	—	—	-10	mA
	"L" level	I_{OL} ø	—	—	1.6	
Output current C_O,E_M,Z_O	"H" level	I_{OH}	—	—	-40	µ A
	"L" level	I_{OL}	—	—	1.6	mA
Input voltage		V_{IN}	0	—	V_{CC}	V
Clock frequency		—	0	—	250	kHz

Dimensions (unit: mm)

Pin No.	Name	Function
1.	C_U	Input pulse UP clock input
2.	C_D	Input pulse DOWN clock input
3.	C_K	Input pulse clock input
4.	U/D	Alters rotation direction
5.	E_A	Input to switch excitation mode
6.	E_B	Input to switch excitation mode
7.	E_C	Input to switch excitation mode
8.	P_D	Power down input
9.	Z_O	Phase origin monitor output
10.	C_O	Input pulse monitor output
11.	E_M	Excitation monitor output
12.	GND	0V
13.	$\overline{R}$	Reset input
14.	ø $\overline{E}$	ø $\overline{E}$ output
15.	ø $\overline{D}$	ø $\overline{D}$ output
16.	ø $\overline{C}$	ø $\overline{C}$ output
17.	ø $\overline{B}$	ø $\overline{B}$ output
18.	ø $\overline{A}$	ø $\overline{A}$ output
19.	ø E	ø E output
20.	ø D	ø D output
21.	ø C	ø C output
22.	ø B	ø B output
23.	ø A	ø A output
24.	V_{CC}	4~16V



Electrical characteristics

Direct Current Characteristics (Ta=25˚C)

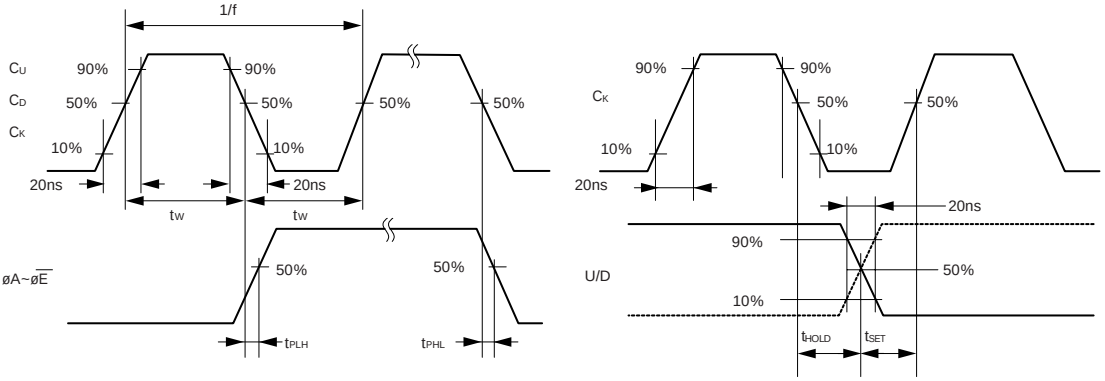
Item		Symbol	VCC [V]	Conditions	Standard Value Min.	Standard	Max.	Unit
Output current ø A~ø $\overline{E}$	"H" level	I_{OH}	5	V_O = V_{CC}-2.0	-20	—	—	mA
			10		-20	—	—	
	"L" level	I_{OL}	5	V_O = 0.3V	1.6	—	—	
			10		1.6	—	—	
Output voltage C_O,E_M,Z_O	"H" level	V_{OH}	5	I_O = -40µA	3.6	—	—	V
			10		8.6	—	—	
	"L" level	V_{OL}	5	I_O = 1.6mA	—	—	0.4	
			10		—	—	0.6	
Input voltage	"H" level	V_{IH}	5	————	3.0	2.5	—	V
			10		6.0	5.0	—	
	"L" level	V_{IL}	5	————	—	2.0	1.5	
			10		—	4.0	3.0	
Input voltage C_U,C_D,C_K	"H" level	I_{IH}	5	V_{IN} = VCC-0.5	—	—	0.4	mA
			10		—	—	0.7	
E_A,E_B,E_C	"L" level	I_{IL}	5	V_{IN}= 0V	—	—	±10	µA
			10		—	—	±10	
Input voltage U/D,PD,R	"H" level	I_{IH}	5	V_{IN} = VCC-0.5	—	—	-100	µA
			10		—	—	-100	
	"L" level	I_{IL}	5	V_{IN}= 0V	—	—	-0.4	mA
			10		—	—	-0.7	
Static current consumption		I_{CC}	5	All terminals open	—	—	25	mA
			10		—	—	35	

Electrical characteristics

Switching Characteristics (Ta=25˚C)

Item	Symbol	VCC [V]	Conditions	Standard Value Min.	Standard	Max.	Unit
Max. clock frequency	f_{MAX}	5	————	250	300	—	kHz
		10		270	350	—	
Min. clock pulse width	t_W	5	————	—	300	500	ns
		10		—	300	500	
Min. reset pulse width	t_{WR}	5	————	—	200	500	ns
		10		—	200	500	
Delay time	t_{PHL}	5	————	—	2500	3500	ns
(ø output from clock input)	t_{PLH}	10		—	2500	3500	
Delay time	t_{PHL}	5	————	—	3000	4000	ns
(Each monitoring from clock input)	t_{PLH}	10		—	3000	4000	
Preset time	t_{SET}	5	————	4000	3000	—	ns
		10		4000	3000	—	
Holding time	t_{HOLD}	5	————	500	0	—	ns
		10		500	0	—	

Switching Characteristics



Function table

Input mode and rotating direction

Input system	Input C_U	C_D	C_K	U/D	Rotation direction
Double input system	↓	L	L	L	CW
(CW,CCW)	L	↓	L	L	CCW
Single input system	L	L	↓	H	CW
(CK,U/D)	L	L	↓	L	CCW

Excitation mode

Energization system	Input $\overline{R}$	$\overline{P_D}$	E_A	E_B	E_C
4 EX	H	H	L	H	L
4-5EX	H	H	L	L	L
5 EX	H	H	H	L	L

Energization sequence

4EX

Pulse / Phase	0 (Reset)	1	2	3	4	5	6	7	8	9	10
ø A	1	0	0	0	0	0	0	1	1	1	1
ø B	1	1	0	0	0	0	0	0	1	1	1
ø C	1	1	1	0	0	0	0	0	0	1	1
ø D	1	1	1	1	0	0	0	0	0	0	1
ø E	0	1	1	1	1	0	0	0	0	0	0
ø $\overline{A}$	0	0	1	1	1	1	0	0	0	0	0
ø $\overline{B}$	0	0	0	1	1	1	1	0	0	0	0
ø $\overline{C}$	0	0	0	0	1	1	1	1	0	0	0
ø $\overline{D}$	0	0	0	0	0	1	1	1	1	0	0
ø $\overline{E}$	0	0	0	0	0	0	1	1	1	1	0
Z_O	1	0	0	0	0	0	0	0	0	0	1
E_M	0	0	0	0	0	0	0	0	0	0	0
UP	——→										
DOWN	←——										

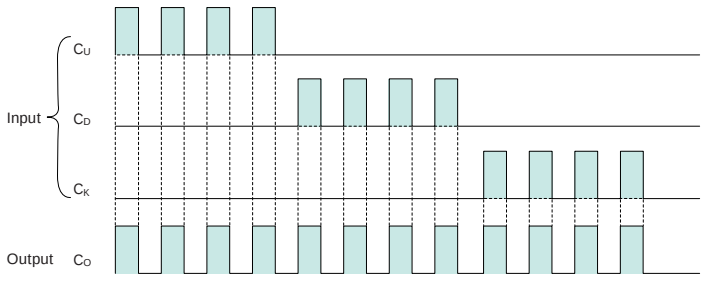
5EX

Pulse / Phase	0 (Reset)	1	2	3	4	5	6	7	8	9	10
ø A	1	1	0	0	0	0	0	1	1	1	1
ø B	1	1	1	0	0	0	0	0	1	1	1
ø C	1	1	1	1	0	0	0	0	0	1	1
ø D	1	1	1	1	1	0	0	0	0	0	1
ø E	0	1	1	1	1	1	0	0	0	0	0
ø $\overline{A}$	0	0	1	1	1	1	1	0	0	0	0
ø $\overline{B}$	0	0	0	1	1	1	1	1	0	0	0
ø $\overline{C}$	0	0	0	0	1	1	1	1	1	0	0
ø $\overline{D}$	0	0	0	0	0	1	1	1	1	1	0
ø $\overline{E}$	1	0	0	0	0	0	1	1	1	1	1
Z_O	1	0	0	0	0	0	0	0	0	0	1
E_M	1	1	1	1	1	1	1	1	1	1	1
UP	——→										
DOWN	←——										

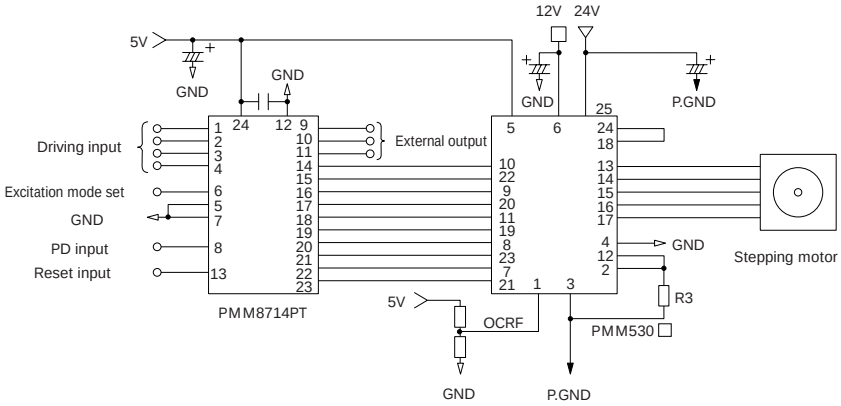
4-5EX

Pulse / Phase	0 (Reset)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
ø A	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
ø B	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
ø C	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
ø D	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1
ø E	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
ø $\overline{A}$	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
ø $\overline{B}$	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
ø $\overline{C}$	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0
ø $\overline{D}$	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0
ø $\overline{E}$	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
Z_O	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
E_M	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
UP	——→																				
DOWN	←——																				

Input pulse monitor



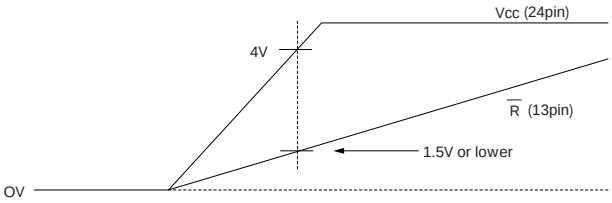
Example application circuit (full step/half step)



Excitation mode set

Pin No.	Terminal symbol	Input level	Motor operation
6	EB	H	Full step
		L	Half step

- When VCC is not stable, such as immediately after the power is on, normal initial reset can not always be performed. In order to perform firm reset, hold R terminal (13pin) at the "L" level until Vcc becomes stable.



- Refer to Page 343 for the specifications of power hybrid IC:PMM530□.
- Refer to Operation Manual of PMM8714PT for other applications.