HIC for 5-Phase Stepping Motor

PMM5301
PMM5303

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Outline

PMM530 □ is a single packaged power hybrid IC of the switching elements to be used for driving 5-phase stepping motor. This HIC has been developed for the purpose to further simplify the usage of 5-phase stepping motor. When combined only with the controller IC to generate the excitation mode, this HIC can configure a driver device for a 5-phase stepping motor.

Characteristics

- High speed and high torque rotation by 5-phase pentagon system.
- Constant voltage and constant current PWM driving system (excited by others).
- Power voltage (driving power) : VCC1=18~42V
- High output current : 4A max. (1A/phase)
- Reduced heat generation by using MOSFET for the power drive element.
- The all-in-one packaging reduces number of parts around peripheral circuits.
- Two package types are available, enabling flexible PCB designing.

Maximum rating (Tc = 25˚C)

Item	Symbol	Condition	Rated value	Unit
Power voltage-1	$V_{CC1\ max}$	Without signal (25pin terminal)	52	V
Power voltage-2	$V_{CC2\ max}$	Without signal (5pin terminal)	7	V
Power voltage-3	$V_{CC3\ max}$	FET drive power (6pin terminal)	15	V
Phase current	$I_{O\ max}$	1 pulse 100ms,Tc=25˚C	7	A
Loss-1	$P_{D\ max1}$	Single FET for phase switching,Tc=25˚C	12.5	W
Loss-2	$P_{D\ max2}$	Single FET for constant current control,Tc=25˚C	27	W
Operating temperature on PCB	Tc	No-condensing at a low temperature	0~105	˚C
Temperature at joint	$T_{j\ max}$	————	150	˚C
Storage temperature	Tstg	————	-40~125	˚C

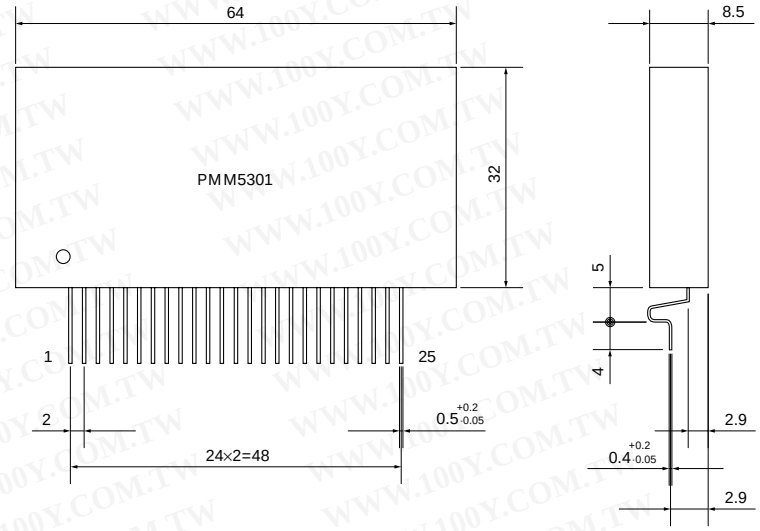
Recommended operation condition (Ta = 25˚C)

Item	Symbol	Condition	Rated value	Unit
Power voltage-1	V_{CC1}	With signal (25pin terminal)	18~42	V
Power voltage-2	V_{CC2}	With signal (5pin terminal)	5.0±5%	V
Power voltage-3	V_{CC3}	With signal (6pin terminal)	12.0±10%	V
Power voltage-4	V_{CCO}	With signal (24pin terminal)	10~42	V
Output current	$I_{O\ max}$	Total current	4	A
Phase driver withstanding voltage	V_{DSS}	ID=10mA(TC=25˚C)	60min	V

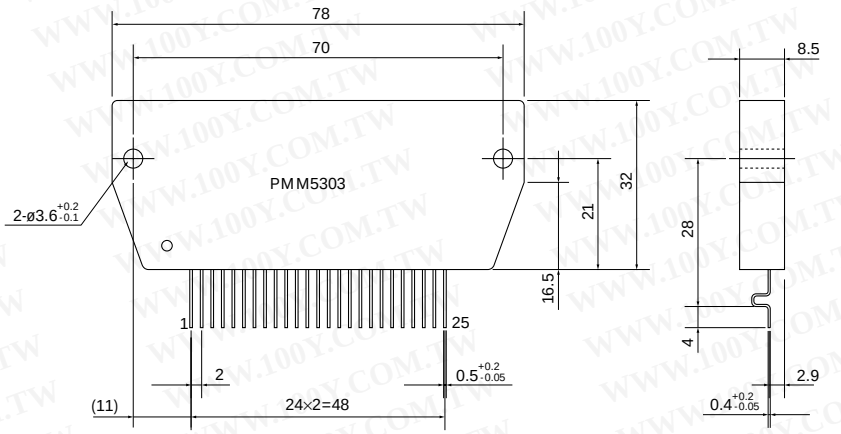
Dimensions (Unit: mm)

Pin No.	Code	Functions
1	OCRF	Set input for motor current
2.	RS2	Detecting terminal for motor current
3.	GND	0V
4.	RS3	0V
5.	V_{CC2}	5V system power
6.	V_{CC3}	12V system power
7.	NA	Lower arm drive input
8.	ND	Lower arm drive input
9.	NE	Lower arm drive input
10.	NC	Lower arm drive input
11.	NB	Lower arm drive input
12.	RS1	Input voltage applied to motor
13.	AO	Motor output
14.	BO	Motor output
15.	CO	Motor output
16.	DO	Motor output
17.	EO	Motor output
18.	V_M	Input voltage applied to motor
19.	PC	Upper arm drive input
20.	PA	Upper arm drive input
21.	PB	Upper arm drive input
22.	PD	Upper arm drive input
23.	PE	Upper arm drive input
24.	V_{CCO}	Output terminal for power source
25.	V_{CC1}	Power system input

● PMM5301



● PMM5303



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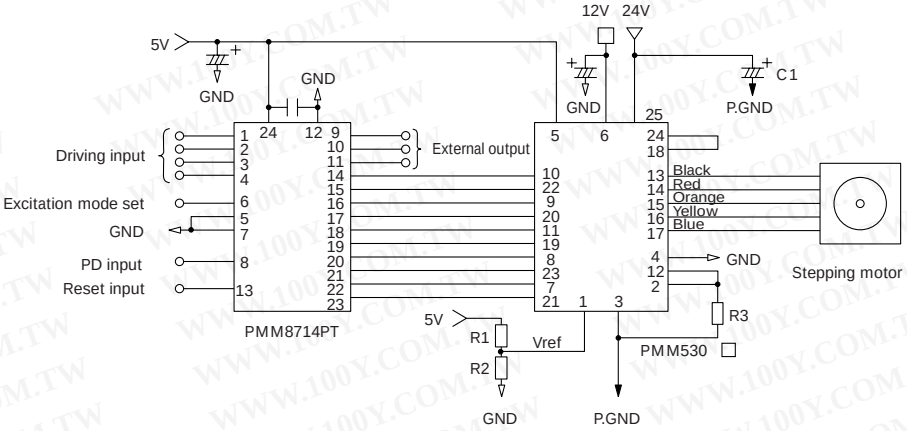
Electrical characteristics (T_C = 25°C, V_{CC1} = 24V, V_{CC2} = 5V, V_{CC3} = 12V)

Item	Symbol	Condition	Rating			Unit
			Min.	Standard	Max.	
Oscillation frequency	Fc	—	20	25	30	kHz
"H" level input voltage	V_{IH}	NA-NE terminals	2.0	—	—	V
"L" level input voltage	V_{IL}	NA-NE terminals	—	—	0.8	
"H" level input voltage	V_{IH}	PA-PE terminals	3.5	—	—	V
"L" level input voltage	V_{IL}	PA-PE terminals	—	—	1.5	
Input current	I_I	PA-PE terminals VIN=VCC2 or GND	—	—	±1	μA
"H" level input current	I_{OH}	NA-NE terminals V_{IN}=2.7V	—	—	20	μA
"L" level input current	I_{OL}	NA-NE terminals V_{IN}=0.4V	—	—	-0.4	mA
V_{CC2} current consumption	I_{CCO2}	5 pin terminal	—	23	45	mA
V_{CC3} current consumption	I_{CCO3}	6 pin terminal	—	15	25	mA

Example application circuit

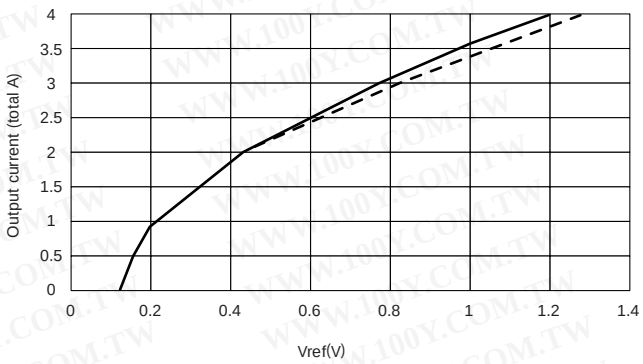


- Make common for the logic system grounding (GDN) and the driving power system grounding on the C1 minus side.
- Refer to Page 337 for the specifications of PMM8714PT.
- Recommended fixed numbers of circuit for PMM530 □ :

Applied for	Constant value
R3	5W 0.5Ω
C1	330 µF

- Select the fixed numbers R1 and R2 referring to the Vref-output current characteristics.
- The value shown in the graph was measured during operation of 103H7521-7051.
  The Vref voltage differs according to the combined motor, power voltage and pattern status of PCB.
  For protection of the motor and hybrid IC, actual motor current may have to be measured under the using conditions.

Vref-output current characteristics



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