MMP760xxx-75-R2

60mm, 100W to 400W, 75V, Motor Driver Module, PRS Series

DESCRIPTION

The MMP760xxx-75-R2 is part of a family of smart motor driver modules for servo motor applications. This module is designed to fit 60mm and 57mm (NEMA 23) motors. It integrates an angular sensor, servo controller, and power stage components.

The module supports four commonly used motion control modes: profile position (PP), profile velocity (PV), profile torque (PT), and homing (HM). Other advanced functions, such as parameter identification, loop auto-tuning, notch filtering, feed-forward control, and AccuFilter are also implemented to improve motion control performance. The MMP760xxx-75-R2 has six I/Os with selectable functions and polarity.

MotionLAB is an easy-to-use GUI software that allows users to flexibly optimize the design through the communication interface. The parameters are saved in the module's non-volatile memory (NVM).

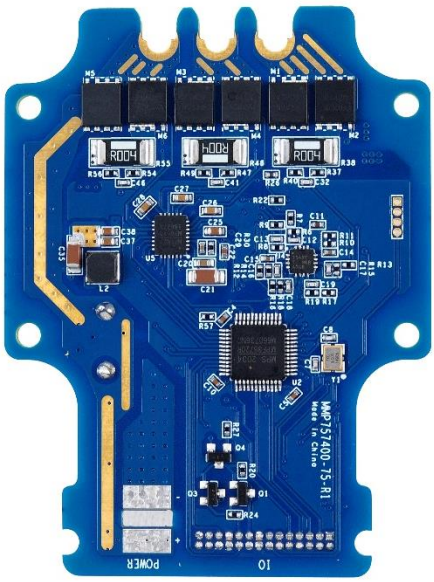
This motor driver module makes it simple to develop a motor control system.

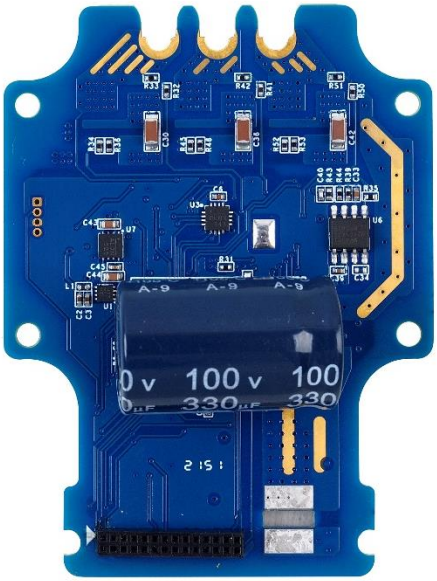
FEATURES

- RS-485 Interface with Modbus Protocol and Step/Direction Control Interface
- 12V to 75V Input Voltage (V_{IN}) Range
- 400W Maximum Continuous Output Power (P_{OUT})
- 5.8A to 10A Continuous Output Current (I_{OUT})
- 17.4A to 30A Peak Output Current (I_{OUT_MAX})
- 0.1° Position Resolution
- Four Control Modes: Profile Position (PP), Profile Velocity (PV), Profile Torque (PT), and Homing (HM)
- Motor and Load Parameter Identification and Loop Parameter Auto-Tuning
- AccuFilter for Low Noise and Vibration
- Advanced Motion Controller Enables Smooth Transition between Different Operational Modes
- Two Separate Notch Filters for Elastic Load Optimization
- Rich Protection Functions
- Six I/Os with Selectable Functions and Polarity
- Driver Module Temperature Sensing
- Applicable Motor Size: 57mm and 60mm (NEMA 23)

PRODUCT INFORMATION

Part Number	Dimensions (mm)	Power (W)	Maximum Voltage (V)	Control Mode	Control Interface
MMP760100-75-R2-1	54.3x72.2	100	75	PP, PV, PT, HM	Modbus, step/direction
MMP760200-75-R2-1	54.3x72.2	200	75	PP, PV, PT, HM	Modbus, step/direction
MMP760400-75-R2-1	54.3x72.2	400	75	PP, PV, PT, HM	Modbus, step/direction





ACCESSORIES

There are two accessory packages available for order that are used for driver module evaluation. The MMA01-1001 contains an I/O board with an RS485 interface. The MMA03-4001 contains the connectors matching with the MMA01-1001.

Part Number	Component	Description	Quantity
MMA01-1001	I/O board	I/O board with an RS485 interface	1
MMA03-4001	KF12EKD-2.5-6P-1G	2.5mm pitch, 6-position connector	1
	KF12EKD-2.5-8P-1G	2.5mm pitch, 8-position connector	1
	ZER-04V-S	1.5mm pitch, 4-position connector	2
	SZE-002T-P0.3	Socket contact tin, 24-28 AWG crimp	8

PRODUCT SPECIFICATIONS

Parameter	Condition	Value			Units
		100W	200W	400W	
Electrical Rating					
DC input voltage (V_{IN})		12 to 75			V
Continuous output power (P_{OUT})	0°C to 40°C	100	200	400	W
Continuous output current (I_{OUT})	0°C to 40°C	5.8	7	10	A
Peak output current (I_{OUT_MAX})	0°C to 40°C, <10s	17.4	21	30	A
Switching frequency (f_{SW})		20			kHz
Current-sense resistor		4			mΩ
Current-sense gain		5			V/V
Logic pin voltage range		-0.3 to +3.6			V
Voltage-sense lower resistor		10			kΩ
Voltage-sense upper resistor		402			kΩ
Maximum allowed speed	1 pole pair	60000			rpm
Position resolution		0.1			deg
Interfaces					
RS-485 baud rate	Configurable	9600 to 921600, default 115200			bps
USB 2.0		Full speed			
Pulse frequency		<500			kHz
Mechanical					
Dimension		54.3x72.2			mm
Direction of rotation		Rotates counterclockwise (CCW) when viewed from the load side with a forward run command			

RECOMMENDED OPERATING CONDITIONS

Input voltage (V_{IN}) .....12V to 75V
Logic pin voltage.....0V to 3.3V
Max pulse frequency..... 500kHz
Operation temperature.....0°C to 70°C
Storage temperature..... -20°C to +55°C

HARDWARE CONNECTIONS

To allow the MMP760xxx-75-R2 to drive a servo motor, plug an I/O board into this device. EZmotion provides the MMA01-1001, which serves as a reference design. The MMA01-1001 can be ordered to evaluate the motor driver module's performance (see Figure 1).

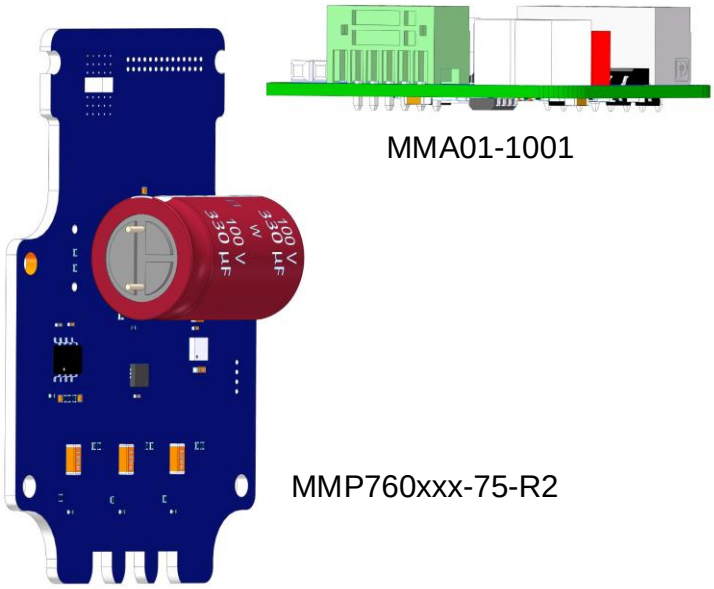


Figure 1: Assemble the Motor Driver Module with an I/O Board

Figure 2 shows how to install the motor driver module into a motor. The user can manufacture their own control board housing and magnet holder based on the actual motor dimensions.

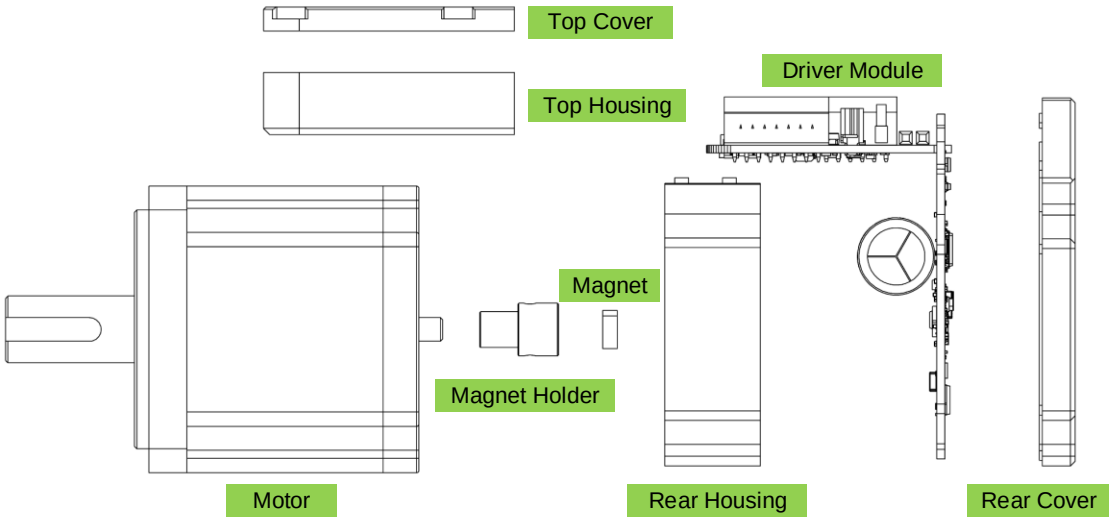


Figure 2: Installation of PCB Assembly in Motor

Table 1 on page 5 shows examples of recommended magnets that can be used with the MMP760xxx-75-R2, as well as the recommended minimum and maximum air gap spacing.

Table 1: Recommended Magnets and Air Gap

OD (mm)	H (mm)	Material	Remanence (Br) (T)	Magnetization	Min to Max Recommended Air Gap (z) (mm)
6.0	2.5	N35	1.2	Diametrical	1.5 to 3.5
6.0	2.5	Sm26/16	1.08	Diametrical	1.3 to 3.3
6.0	3.0	N35	1.2	Diametrical	1.8 to 3.8
6.0	3.0	Sm26/16	1.08	Diametrical	1.5 to 3.6
8.0	2.5	N35	1.2	Diametrical	1.8 to 4.5
8.0	2.5	Sm26/16	1.08	Diametrical	1.5 to 4.1
8.0	3.0	N35	1.2	Diametrical	2.1 to 4.8
8.0	3.0	Sm26/16	1.08	Diametrical	1.8 to 4.5

It is recommended to use a sintered neodymium (NdFeB) or samarium cobalt (SmCo) magnet with a diameter between 6mm and 8mm, a height between 2.5mm and 3mm, and a remanent field strength between 1T and 1.2T. The magnet's diameter depends on the specific motor shaft and holder design. In addition, the magnetization should be diametrically polarized.

The magnet air gap spacing to the sensor surface should be set to achieve a field strength between 30mT and 80mT (see Figure 3).

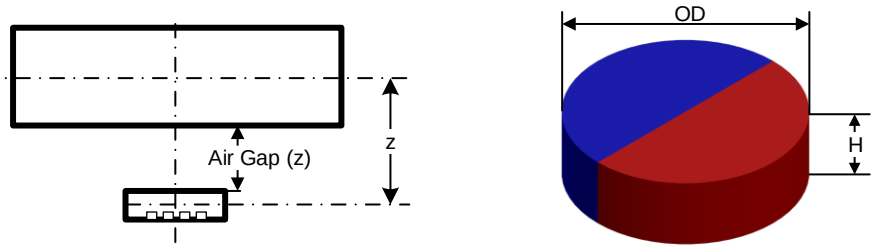


Figure 3: Magnet Dimensions and Air Gap

Select the material (NdFeB or SmCo) based on the target motor end application. SmCo magnets have a higher working temperature range and corrosion resistance.

Selecting the holder material is also important. The holder should be a nonmagnetic material (e.g. aluminum, brass, or plastic) so that it does not influence or distort the sensor's magnetic field.

Determine the attachment method for the shaft based on the motor's design criteria. To avoid detachment due to the different thermal expansion coefficients between the magnet, holder, and shaft, it is recommended to use a high-temperature industrial adhesive

The magnet holder requires a motor with a shaft that extends from the rear of the motor. To determine the required holder size and housing depth, contact your individual motor supplier to discuss what options they have for shaft diameter and length.

The PCB housing should be designed to meet proper heatsinking requirements for the motor driver components, clearance for power supply capacitor and EMC filtering, and any other requirements to meet the target specifications. The housing should axially align the angle sensor IC with the motor shaft magnet with a maximum axial displacement of ±0.4mm and in accordance with air gap recommendations noted in Table 1.

MotionLAB is a GUI software that allow users to flexibly configure control parameters and test system performance. To connect the module to MotionLAB, use a USB cable with USB mini Type-B port (see Figure 4 on page 6).

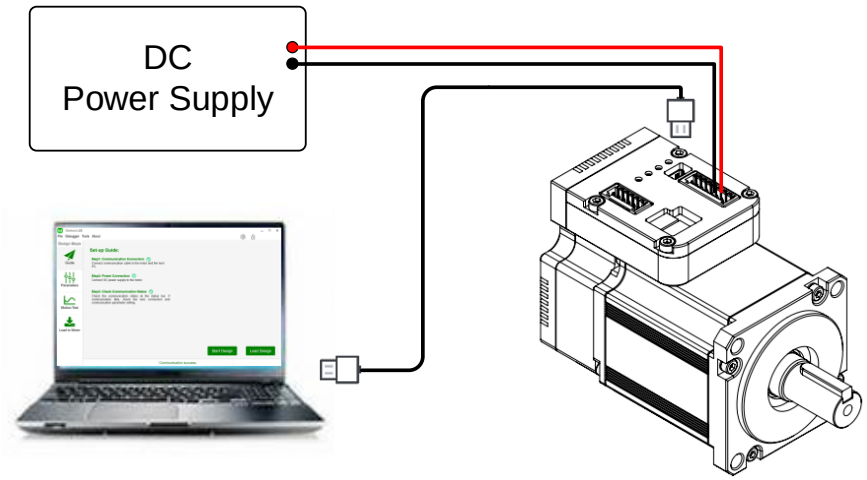
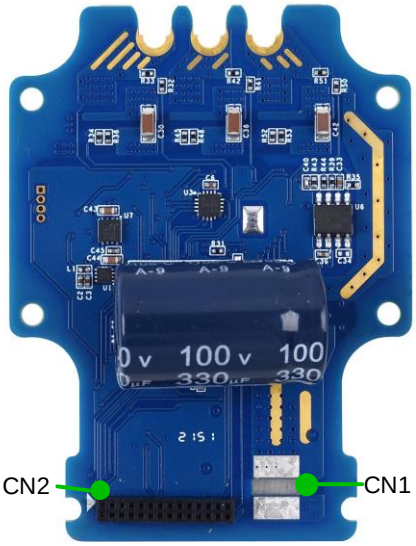
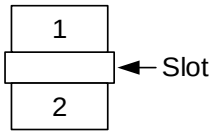


Figure 4: Connect Motor Driver Module to MotionLAB GUI

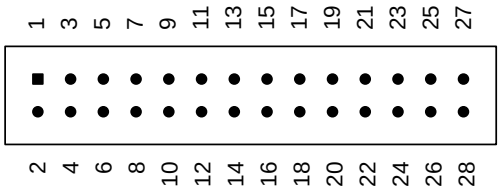
PIN CONFIGURATION



CN1: Power Interface



CN2: I/O Interface



MMP760xxx-75-R2 Pin Definitions

Power Interface (CN1)

CN1 Pin Number	Designation	Pin Description
1	GND	Power ground
2	VIN	Input power supply

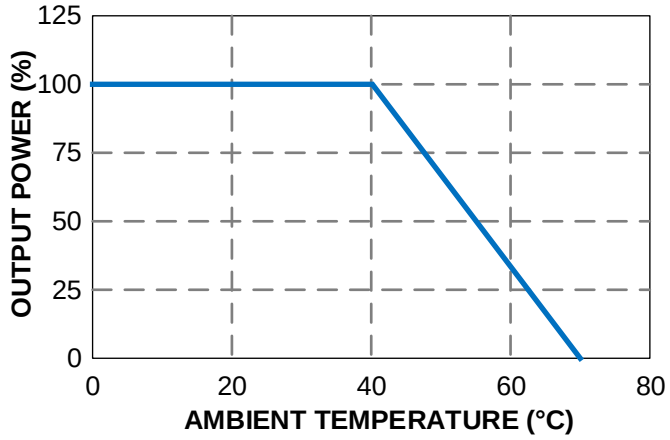
I/O Interface (CN2)

CN2 Pin Number	Designation	Pin Description
1	PWR	Power good output
2	ALARM	Alarm signal output
3	DI4	Digital input signal 4, default homing enable
4	DO1	Digital output signal 1, default PEND output
5	CAN_TX	CAN communication transmit pin
6	CAN_RX	CAN communication receive pin
7	CAN_LED2	CAN communication ERR status indication
8	CAN_LED1	CAN communication RUN status indication
9	DO4	Digital signal output 4, default UART TX
10	DI5	Digital signal input 5, default UART RX
11	DI2	Digital input signal 2, default PUL/PWM input
12	DO2	Digital output signal 2, default ALARM output
13	DI1	Digital input signal 1, default DIR input
14	DI3	Digital input signal 3, default ENA input
15, 16, 21, 22, 26	SGND	Signal ground pin
17	Reserved	Unused
18	+5V	+5V output pin
19	R-	DC link voltage limit switching output with push-pull circuit
20	DO3	Digital output signal 3. Default function is brake signal output to control brake relay
23	USBFS_DP	USB debug port DP signal
24	USBFS_DM	USB debug port DM signal
25	A	Encoder signal A output
27	Z	Encoder signal Z output
28	B	Encoder signal B output

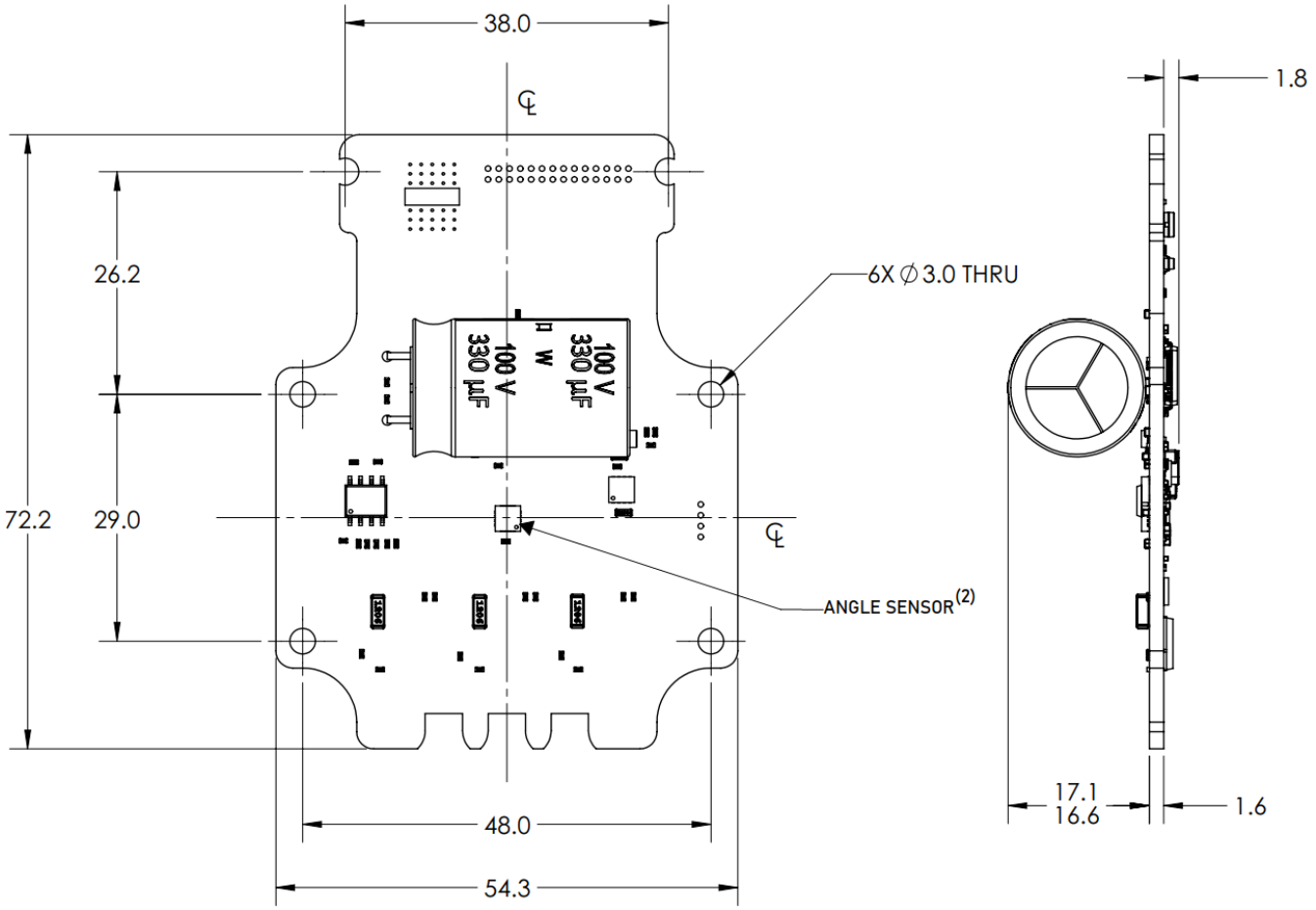
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 48V, unless otherwise noted.

Output Power vs. Ambient Temperature



MECHANICAL DRAWING (1) (2)



Note:

1) Units are in mm.
2) Refer to CAD model for the angle sensor location.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	2/8/2023	Initial Release	-