MMP757xxx-70-x1

57mm, 94W to 188W, 70V
Motor Driver Module, PRS and PSD Series

DESCRIPTION

The MMP757xxx-70-x1 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 MMP757xxx-70-x1 supports three control modes: profile position (PP), profile velocity (PV), and profile torque (PT).

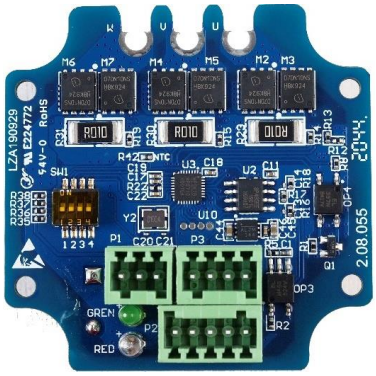
MotionLAB is an easy-to-use GUI software that allows users to flexibly optimize the design online via the RS-485 control interface. The parameters are saved in the module's non-volatile memory (NVM). The GUI and its user guide are available for download at www.EZmotion.co.

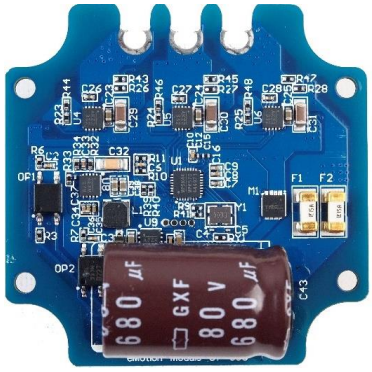
FEATURES

- PRS Series for RS-485 and Step/Direction Control Interface
- PSD Series for Step/Direction Control Interface
- 18V to 70V Input Voltage (V_{IN}) Range
- 94W to 188W Continuous Power Output (P_{OUT})
- 3.2A to 6.5A Continuous Output Current (I_{OUT})
- 9.6A to 19.5A Peak Output Current ($I_{OUT(MAX)}$)
- 0.3° Position Resolution
- Three Different Control Modes: Profile Position (PP), Profile Velocity (PV), and Profile Torque (PT)
- Driver Module Temperature Sensing
- Operating Temperature: 0°C to 70°C (Power Derated > 40°C)
- Storage Temperature: -40°C to +125°C
- Applicable Motor Size: 57mm (NEMA 23) and 60mm

PRODUCT INFORMATION

Part Number	Dimensions (mm)	Power (W)	Maximum Voltage (V)	Control Mode	Control Interface
MMP757094-70-R1-1	54.3x54.3	94	70	PP, PV, PT	RS-485, step/direction
MMP757094-70-S1-1	54.3x54.3	94	70	PP, PV, PT	Step/direction
MMP757141-70-R1-1	54.3x54.3	141	70	PP, PV, PT	RS-485, step/direction
MMP757141-70-S1-1	54.3x54.3	141	70	PP, PV, PT	Step/direction
MMP757188-70-R1-1	54.3x54.3	188	70	PP, PV, PT	RS-485, step/direction
MMP757188-70-S1-1	54.3x54.3	188	70	PP, PV, PT	Step/direction





PRODUCT SPECIFICATIONS

Parameter	Condition	Value			Units
		94W	141W	188W	
DC input voltage (V_{IN})		18 to 70			V
Continuous output power (P_{OUT})	0°C to 40°C	94	141	188	W
Continuous output current (I_{OUT})	0°C to 40°C	3.2	4.8	6.5	A
Peak output current ($I_{OUT(MAX)}$)	0°C to 40°C, <10s	9.6	14.4	19.5	A
Switching frequency (f_{SW})	Configurable	20 to 80			kHz
Current-sense resistor		10			mΩ
Current-sense gain		4	3	2	
Logic pin voltage range		0 to 5.5			V
Voltage-sense lower resistor		10			kΩ
Voltage-sense upper resistor		402			kΩ
Maximum allowed speed	1 pole pairs	60000			rpm
Position resolution		0.3			deg
Dimensions		54.3x54.3			mm
RS-485 baud rate		115200			bps
Pulse frequency		<500			kHz

There are two accessory packages available for order that are used for driver module evaluation. The MMA02-3001 includes the EZmotion communication kit and cable. The MMA03-3001 also includes the matching connectors for the MMP757xxx-70-x1.

Part Number	Component	Description	Quantity
MMA02-3001	EZmotion communication kit	USB to RS-485/I²C/SPI converter tool	1
	USB cable	1.5m, USB Type-A to USB Type-B cable	1
	Dupont line	Dupont wires, 3-pin	1
MMA03-3001	KF12EKD-2.5-3P-1G	2.5mm pitch, 3-position connector	1
	KF12EKD-2.5-4P-1G	2.5mm pitch, 4-position connector	1
	KF12EKD-2.5-5P-1G	2.5mm pitch, 5-position connector	1

RECOMMENDED OPERATING CONDITIONS

Input voltage (V_{IN}) .....18V to 70V
Control interface voltage.....0V to 5.5V
Max pulse frequency..... 500kHz
RS-485 A/B voltage .....0V to 5.5V
RS-485 common-mode voltage ..... ±15V
Operating temperature.....0°C to 70°C
Storage temperature..... -40°C to +125°C

HARDWARE CONNECTIONS

The motor driver module can be installed into a motor (see Figure 1).

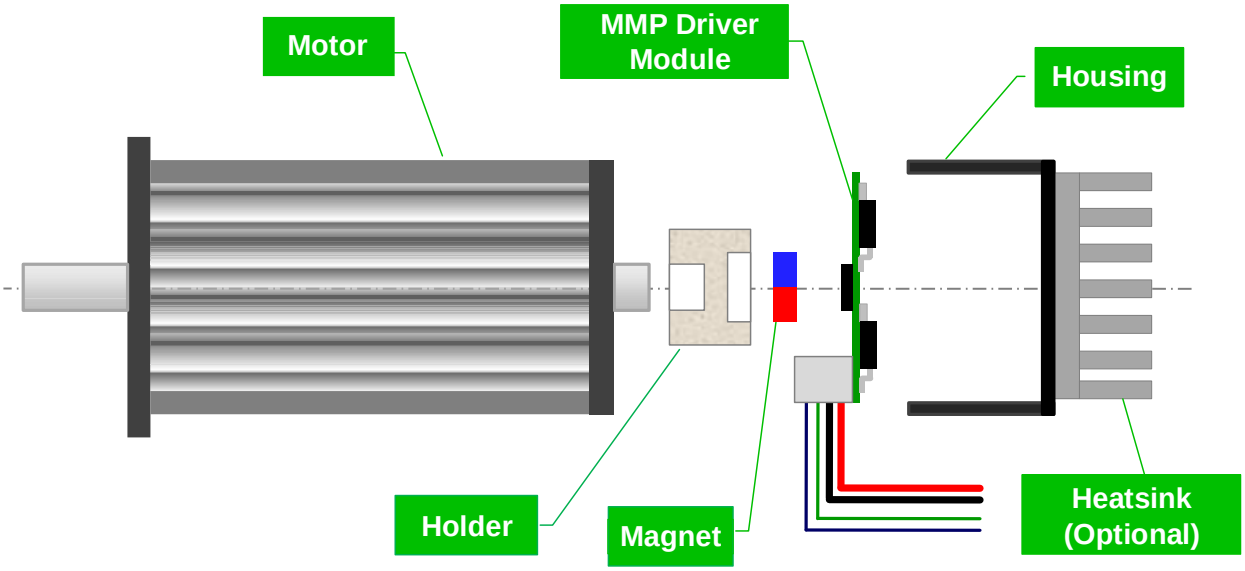


Figure 1: Installation of PCB Assembly in Motor

The user can manufacture custom control board housing and a magnet holder based on the actual motor dimensions. Table 1 lists recommended magnets to use with the MMP757xxx-70-x1, as well as the recommended minimum and maximum air gap spacing.

Table 1: Recommended Magnets and Air Gaps

OD (mm)	H (mm)	Material	Remanence (Br) (T)	Magnetization	Min/Max Recommended Air Gap (mm)
6	2.5	N35	1.2	Diametrical	1.5 to 3.5
6	2.5	SM26/16	1.08	Diametrical	1.3 to 3.3
6	3	N35	1.2	Diametrical	1.8 to 3.8
6	3	Sm26/16	1.08	Diametrical	1.5 to 3.6
8	2.5	N35	1.2	Diametrical	1.8 to 4.5
8	2.5	Sm26/16	1.08	Diametrical	1.5 to 4.1
8	3	N35	1.2	Diametrical	2.1 to 4.8
8	3	Sm26/16	1.08	Diametrical	1.8 to 4.5

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

The magnet air gap spacing to the sensor surface should be set to achieve a field strength between 30mT and 80mT. Figure 2 on page 4 shows the magnet dimensions and air gap.

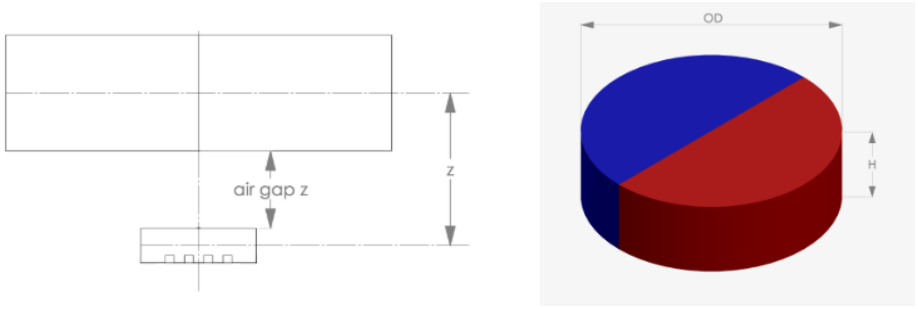


Figure 2: Magnet Dimensions and Air Gap

Selecting between NdFeB or SmCo material depends 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 material must be nonmagnetic, such as aluminum, brass, or plastic, in order to not influence or distort the sensor magnets field. The user can choose the attachment method to the shaft according to the motor design criteria. Using a high-temperature industrial adhesive is a possible approach to avoid detachment due to the magnet, holder, and shaft's different coefficients for thermal expansion.

The magnet holder requires a motor with a shaft that extends from its rear. Contact the motor supplier to discuss the options available for shaft diameter and length, which determine the required holder size and housing depth.

The PCB housing should be designed to consider any requirements regarding heatsinking for the motor driver components, additional bulk motor supply capacitance, and EMC filtering necessary to meet the target application specifications. The housing should align the central angle sensor IC with the motor shaft magnet holder in the center with a maximum ±0.4mm axial misalignment.

MotionLAB is a GUI software that allows users to configure flexible control parameters and test system performance. To connect the motor driver module to MotionLAB, a USB to RS-485 communication kit is required, which is available for download at www.EZmotion.co.

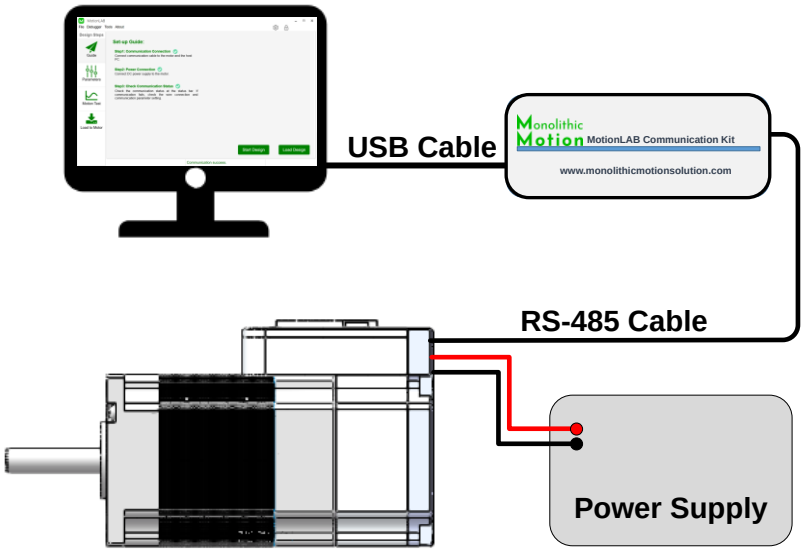
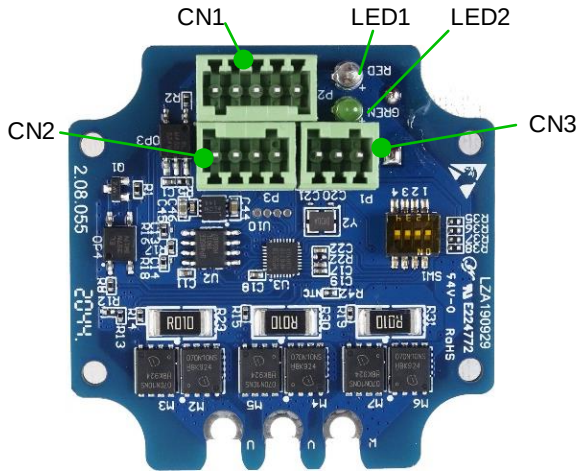


Figure 3: Connect Motor Driver Module to MotionLAB GUI

PIN CONFIGURATION



CN1: I/O Interface

CN2: RS-485 Interface

CN3: Power Interface

LED1: Fault Indicator

LED2: Power Indicator

MMP757xxx-70-x1 Pin Definitions (1)

I/O Interface (CN1)

CN1 Pin Number	Designation	Pin Description
1	COM-	Common return
2	DI1+	Digital input 1
3	DO1+	Digital output 1
4	DI2+	Digital input 2
5	DI3+	Digital input 3

RS-485 Interface (CN2)

CN2 Pin Number	Designation	Pin Description
1	EXT_5V	5V input for firmware configuration
2	B	RS-485 node B
3	AGND	RS-485 ground
4	A	RS-485 node A

Power Interface (CN3)

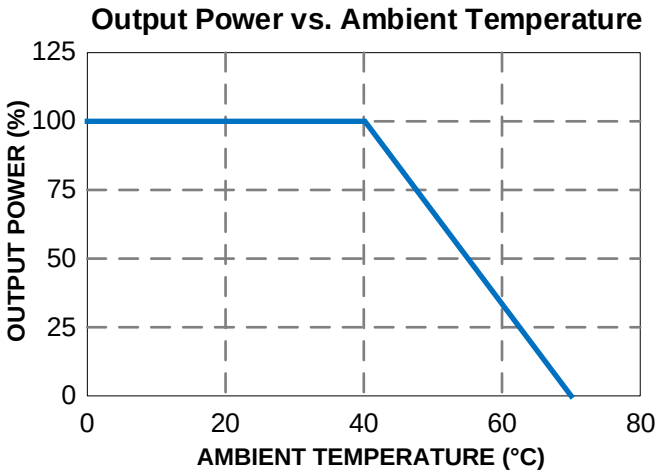
CN3 Pin Number	Designation	Pin Description
1	GND	Power ground
2	R-	Shunt resistor return node
3	VIN	Input power supply

Note:

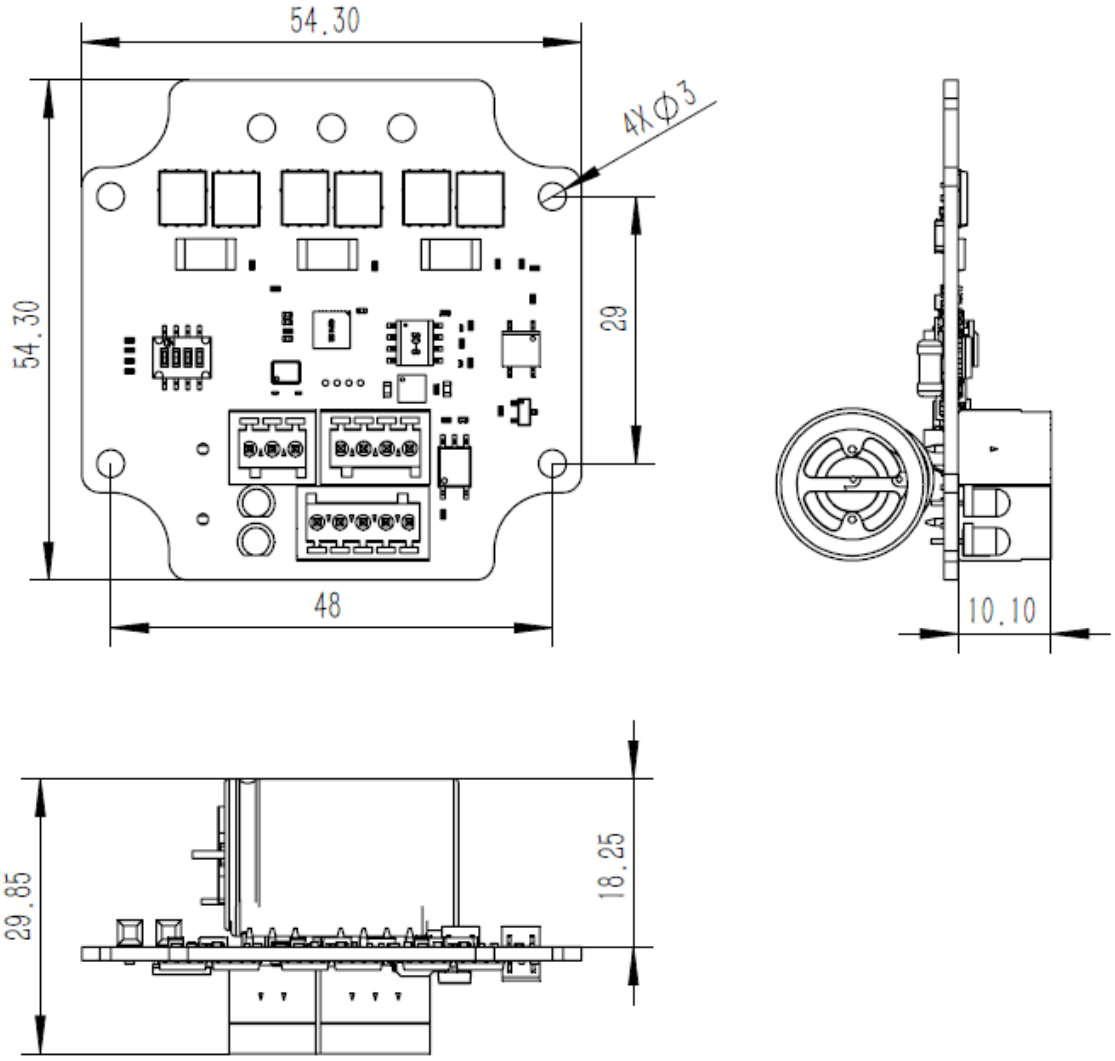
1) The leftmost pin of each connector is pin 1.

TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 36V, unless otherwise noted.



MECHANICAL DRAWING (2)



Note:

2) Units are mm.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	10/5/2022	Initial Release	-