MMP740xxx-55-C2

40mm, 50W to 100W, 50V, Motor Driver Module, PCN Series

DESCRIPTION

The MMP740xxx-55-C2 is part of a family of smart motor driver modules for servo motor applications. This module is designed to fit 40mm and 42mm (NEMA 17) motors. It integrates an angular sensor, servo controller, and power stage components.

The module supports seven commonly used motion control modes: profile position (PP), profile velocity (PV), profile torque (PT), homing (HM), cyclic synchronous position (CSP), cyclic synchronous velocity (CSV), and cyclic synchronous torque (CST). 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 MMP740xxx-55-C2 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 via the communication interface. The parameters are saved in the module's non-volatile memory (NVM).

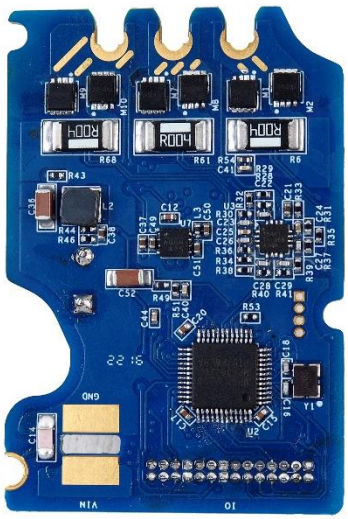
This motor driver module makes it simple to develop a motor control system.

FEATURES

- CAN Interface with CANopen Protocol and Step/Direction Control Interface
- 12V to 50V Input Voltage (V_{IN}) Range
- 100W Maximum Continuous Power Output (P_{OUT})
- 3.5A to 7A Continuous Output Current (I_{OUT})
- 10.5A to 21A Peak Output Current (I_{OUT_MAX})
- 0.1° Position Resolution
- Seven Control Modes: Profile Position (PP), Profile Velocity (PV), Profile Torque (PT), Homing (HM), Cyclic Synchronous Position (CSP), Cyclic Synchronous Velocity (CSV), Cyclic Synchronous Torque (CST)
- 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: 42mm (NEMA 17) and 40mm

PRODUCT INFORMATION

Part Number	Dimension (mm)	Power (W)	Maximum Voltage (V)	Control Mode	Control Interface
MMP740050-55-C2-1	36x54	50	50	PP, PV, PT, HM, CSP, CSV, CST	CANopen, step/direction
MMP740100-55-C2-1	36x54	100	50	PP, PV, PT, HM, CSP, CSV, CST	CANopen, step/direction



ACCESSORIES

There are two accessory packages available for order. The MMA01-1002 contains an I/O board with a CAN interface. The MMA03-4001 contains the connectors matching with the MMA01-1002.

Part Number	Component	Description	Quantity
MMA01-1002	I/O board	I/O board with a CAN 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
		50W	100W	
Electrical Rating				
DC input voltage (V_{IN})		12 to 50		V
Continuous output power (P_{OUT})	0°C to 40°C.	50	100	W
Continuous output current (I_{OUT})	0°C to 40°C.	3.5	7	A
Peak output current (I_{OUT_MAX})	0°C to 40°C, <7s	10.5	21	A
Switching frequency (f_{SW})		20		kHz
Current-sense resistor		4		mΩ
Current-sense gain		9		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				
CAN baud rate	Configurable	50 to 1000, default 1000		kbps
USB 2.0		Full speed		
Pulse frequency		<500		kHz
Mechanical				
Dimension		36x54		mm
Direction of rotation	Viewed from the load side with a forward run command.	Counterclockwise (CCW)		

RECOMMENDED OPERATING CONDITIONS

Input voltage (V_{IN}) .....12V to 50V
Logic pin voltage.....0V to 3.3V
Max pulse frequency..... 500kHz
Operation temperature.....0°C to 70°C
Storage temperature..... -20°C to +85°C

HARDWARE CONNECTIONS

To allow the MMP740xxx-55-C2 to drive a servo motor, plug an I/O board into this device. EZmotion provides an accessory (MMA01-1002) that serves as a reference design. The MMA01-1002 can be ordered to evaluate the motor driver module's performance (see Figure 1).

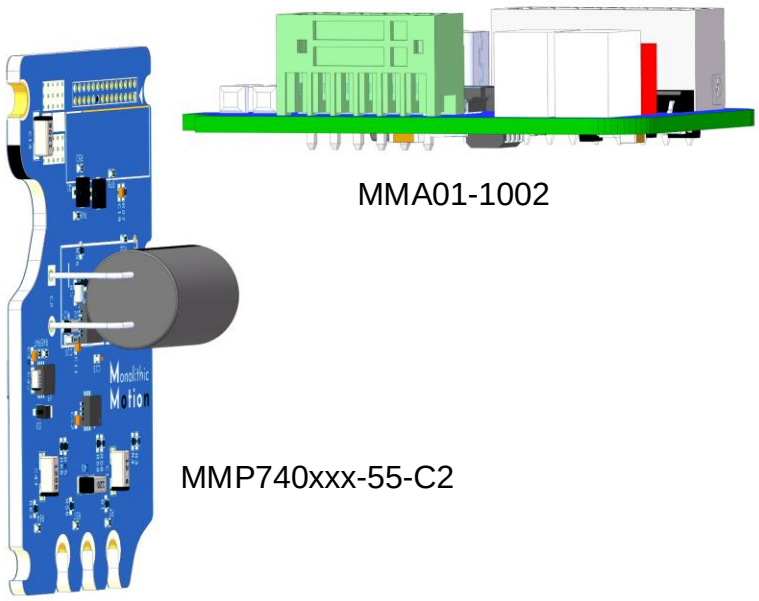


Figure 1: Assemble the Motor Driver Module with an I/O Board

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.

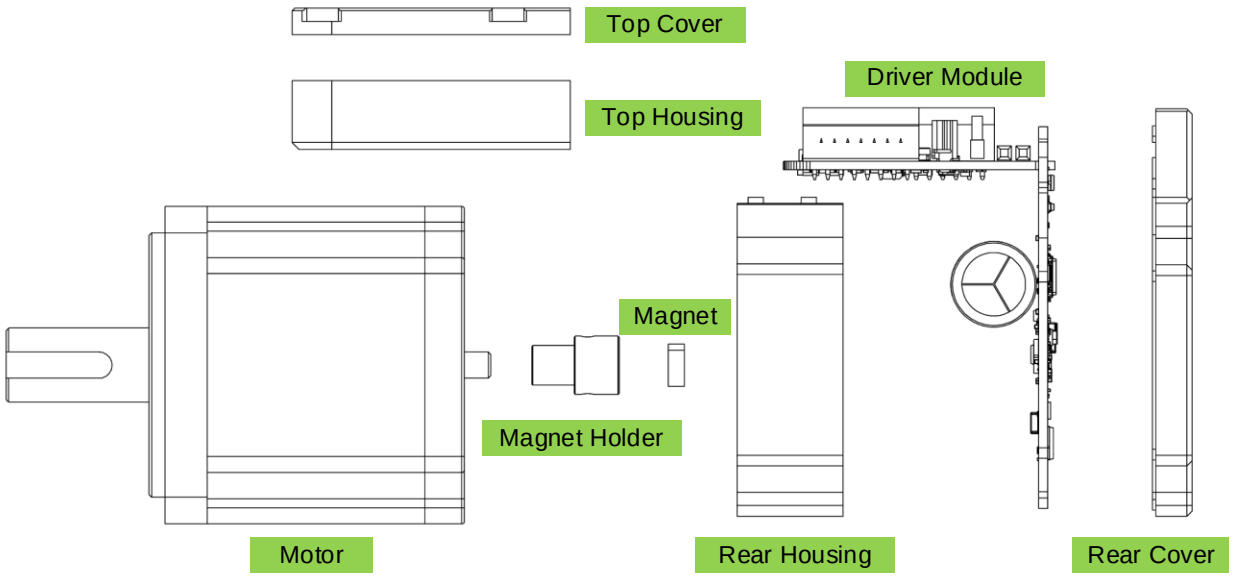


Figure 2: Installation of PCB Assembly in Motor

Table 1 on page 5 shows examples of recommended magnets that can be used with the MMP740xxx-55-C2, 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).

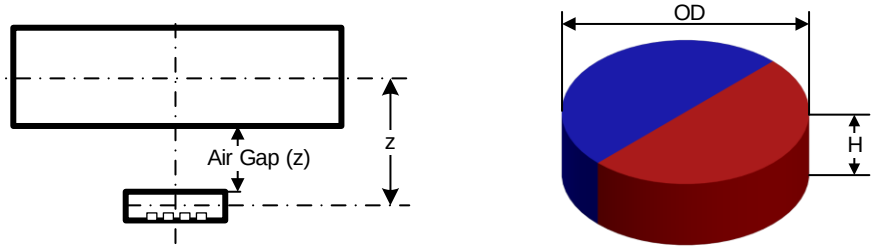


Figure 3: Magnet Dimensions and Air Gap

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 the air gap recommendations noted in Table 1.

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

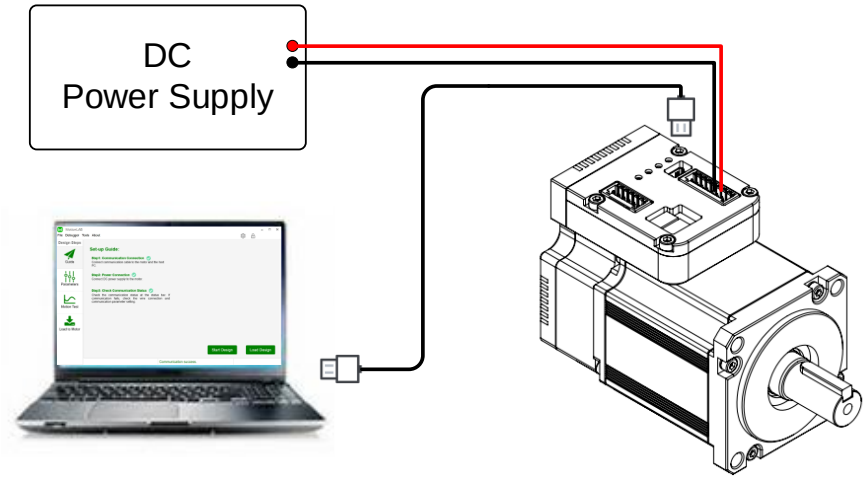
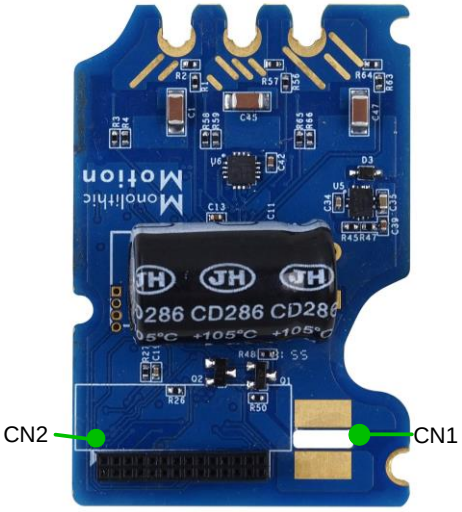
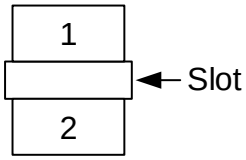


Figure 4: Connect Motor Driver Module to MotionLAB GUI

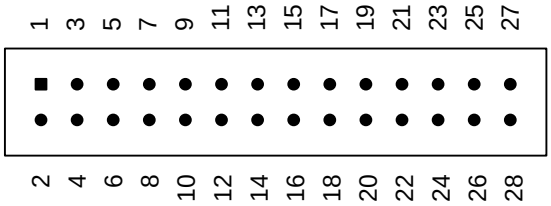
PIN CONFIGURATION



CN1: Power Interface



CN2: I/O Interface



MMP740xxx-55-C2 Pin Definitions

Power Interface (CN1)

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

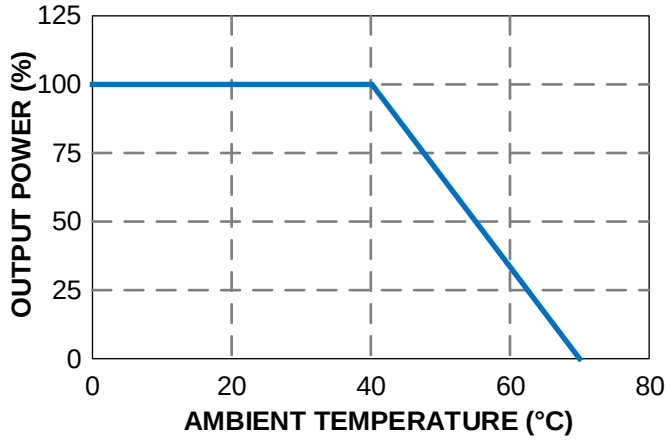
I/O Interface (CN2)

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

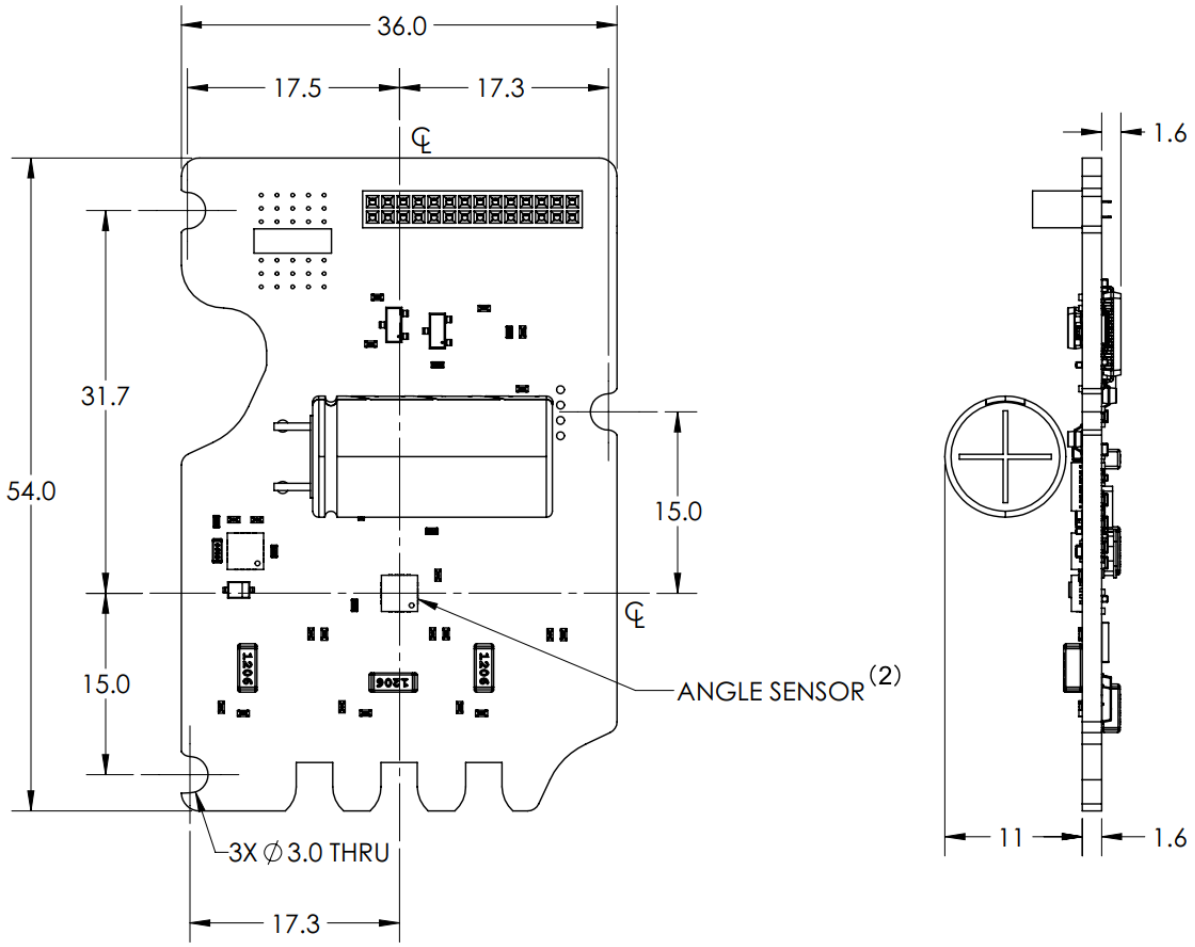
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 24V, unless otherwise noted.

Output Power vs. Ambient Temperature



MECHANICAL DRAWING (1) (2)



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MM TOLERANCES: ANGULAR (MACH) = ± 0.1° ANGULAR (BEND) = ± 0.5° XX = ± 0.5 XX.X = ± 0.1 XX.XX = ± 0.05

Note:

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

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	8/7/2023	Initial Release	-
1.1	9/27/2023	Corrected part number typo in Product Information table	1