

### DESCRIPTION

The MMP760xxx-75-E2 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, EtherCAT communication interface, advanced motion controller, power inverter, and multifunctional, external I/O pins.

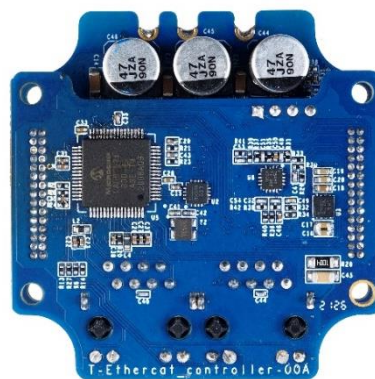
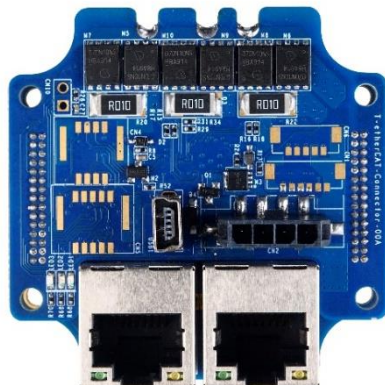
The motor driver module makes it easy to develop a motor control system.

The MMP760xxx-75-E2 includes AccuFilter, parameter identification, an auto-tune loop, load observation, a notch filter, and other advanced functions to improve motion control performance.

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

### PRODUCT INFORMATION

Part Number	Dimension (mm)	Power (W)	Maximum Voltage (V)	Control Mode	Interface
MMP760400-75-E2-1	54.3mmx54.3mm	400	75	PP, PV, PT, CSP, CSV, CST, HM	EtherCAT
MMP760200-75-E2-1	54.3mmx54.3mm	200	75	PP, PV, PT, CSP, CSV, CST, HM	EtherCAT
MMP760100-75-E2-1	54.3mmx54.3mm	100	75	PP, PV, PT, CSP, CSV, CST, HM	EtherCAT



### FEATURES

- PEC Series for EtherCAT Interface
- 100Mbps EtherCAT Communication Interface with Distributed Clock and CANopen over EtherCAT (CoE) Protocol
- Integrated High-Accuracy Angular Sensor
- Motor and System Parameter Identification and Auto-Tune Loop
- AccuFilter for Reduced Noise and Vibration
- On-the-Fly Mode Selection
- Two Separate Notch Filters for Elastic Load Optimization
- 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)
- Full Protection Features
- PWR, ERR, and BUS LED Status Indication
- NTC Input Temperature Sensing
- Max 400W Continuous Output Power ( $P_{OUT}$ )

## PRODUCT SPECIFICATIONS

Parameter	Conditions	Value			Units
		400W	200W	100W	
<b>Electrical Rating</b>					
DC input voltage ( $V_{IN}$ )		12 to 75			V
Continuous output power ( $P_{OUT}$ )	0°C to 40°C	400	200	100	W
Continuous output current ( $I_{OUT}$ )	0°C to 40°C	10	7	5.8	A
Peak output current ( $I_{OUT\_MAX}$ )	0°C to 40°C, <10s	30	21	17.4	A
Switching frequency ( $f_{sw}$ )		20			kHz
Current-sense resistor		4			mΩ
Current-sense gain		5			
ADC resolution		12			bits
Logic pin voltage range		-0.3 to +3.6			V
Voltage-sense lower resistor		10			kΩ
Voltage-sense upper resistor		402			kΩ
<b>Interfaces</b>					
USB 2.0		Full speed			
EtherCAT		100M bits/s, two ports			
<b>Mechanical</b>					
Dimension		54.3x54.3			mm

There is an accessory package available for order that that is used for driver module evaluation. The MMA03-2001 includes the matching connectors for the MMP760xxx-75-E2.

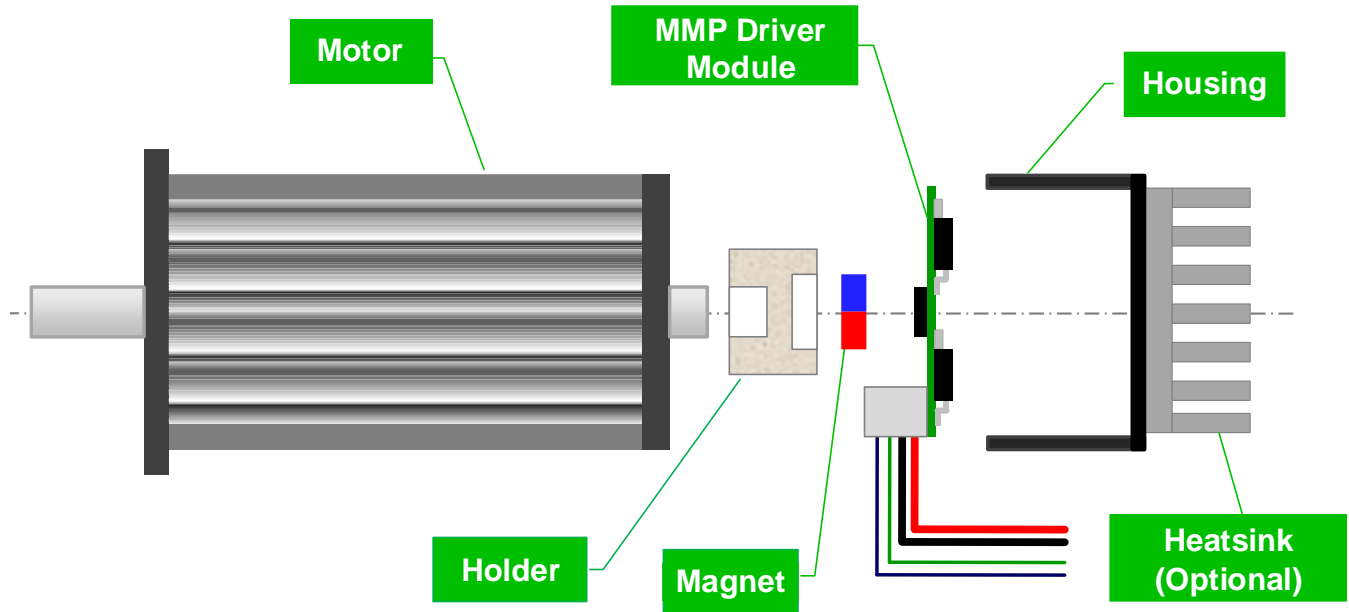
Part Number	Component	Description	Quantity
MMA03-2001	Molex, 436450400	Micro-fit 3.0 receptacle housing, single row, 4 circuits, UL 94V-0, black	1
	Molex, 430300001	Micro-Fit 3.0 crimp terminal with tin-plated (Sn) phosphor bronze contact, 20AWG to 24AWG	4

## RECOMMENDED OPERATING CONDITIONS

Input voltage ( $V_{IN}$ ) ..... 12V to 75V  
 Operating temperature.....0°C to 70°C  
 Storage temperature ..... -40°C to +85°C

## HARDWARE CONNECTIONS

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



**Figure 1: Installation of PCB Assembly in Motor**

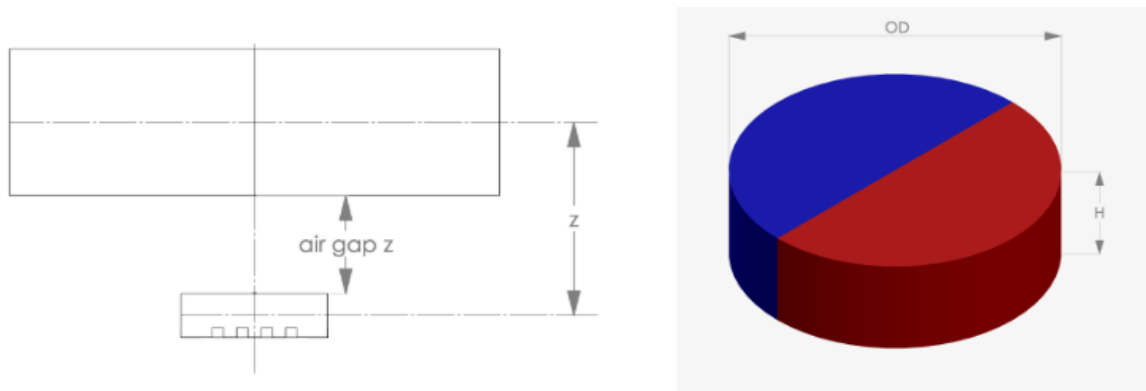
The user can manufacture custom control board housing and a magnet holder based on the actual motor dimensions. Table 1 lists recommended magnets to use with the MMP760xxx-75-E2, as well as the recommended minimum and maximum air gap spacing.

**Table 1: Recommend Magnets and Air Gap**

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.



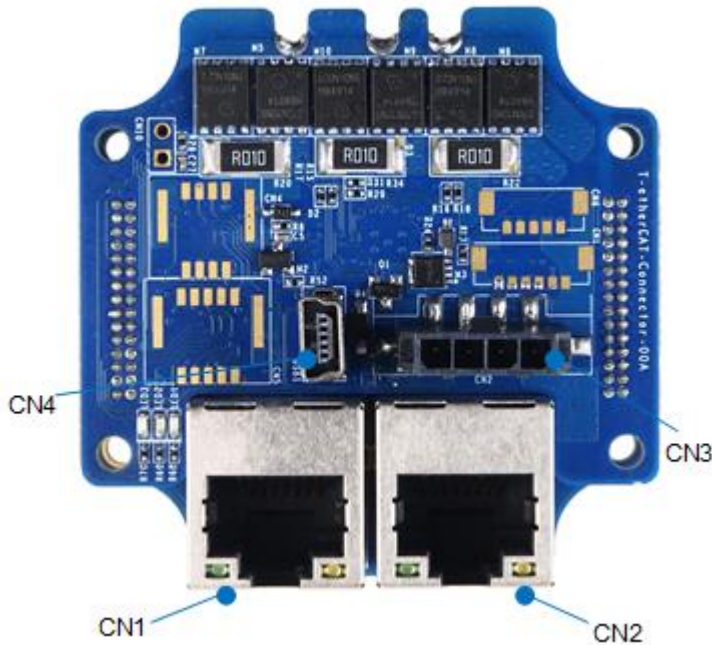
**Figure 2: Magnet Dimensions and Air Gap**

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  $\pm 0.4\text{mm}$  axial misalignment.

**PIN CONFIGURATION**


- CN1: EtherCAT IN
- CN2: EtherCAT OUT
- CN3: Power Supply
- CN4: USB 2.0 Interface

**MMP760xxx-75-E2 Pin Definitions <sup>(1)</sup>**
**Power Supply (CN3)**

CN1 Pin	Signal	Description
1	R-	Shunt resistor terminal 2
2	GND	Ground
3	BUS	Shunt resistor terminal 1
4	VIN	Power supply voltage (12V to 75V)

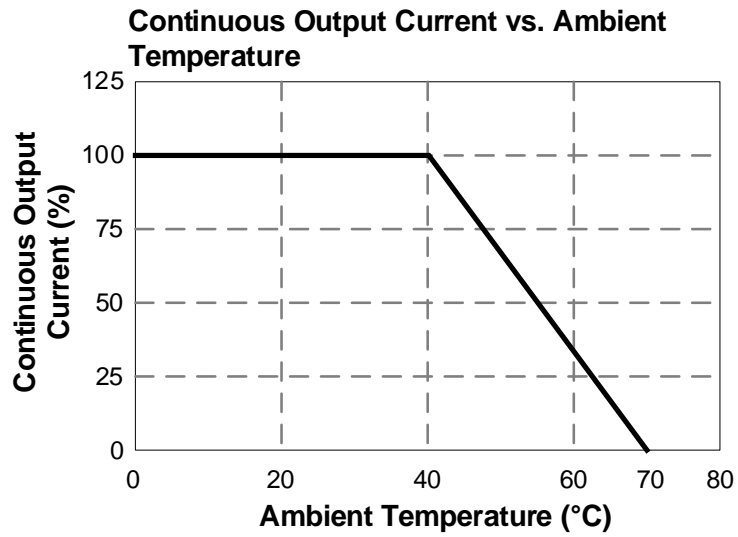
**Connectors and Plug Part Numbers**

Connector	Type	Plug PN
CN1	Plug	RJ45
CN2	Plug	RJ45
CN3	Housing	436450400 (Molex Micro-Fit)
	Contact	430300001 (Molex Micro-Fit)
CN4	Plug	USB mini-B

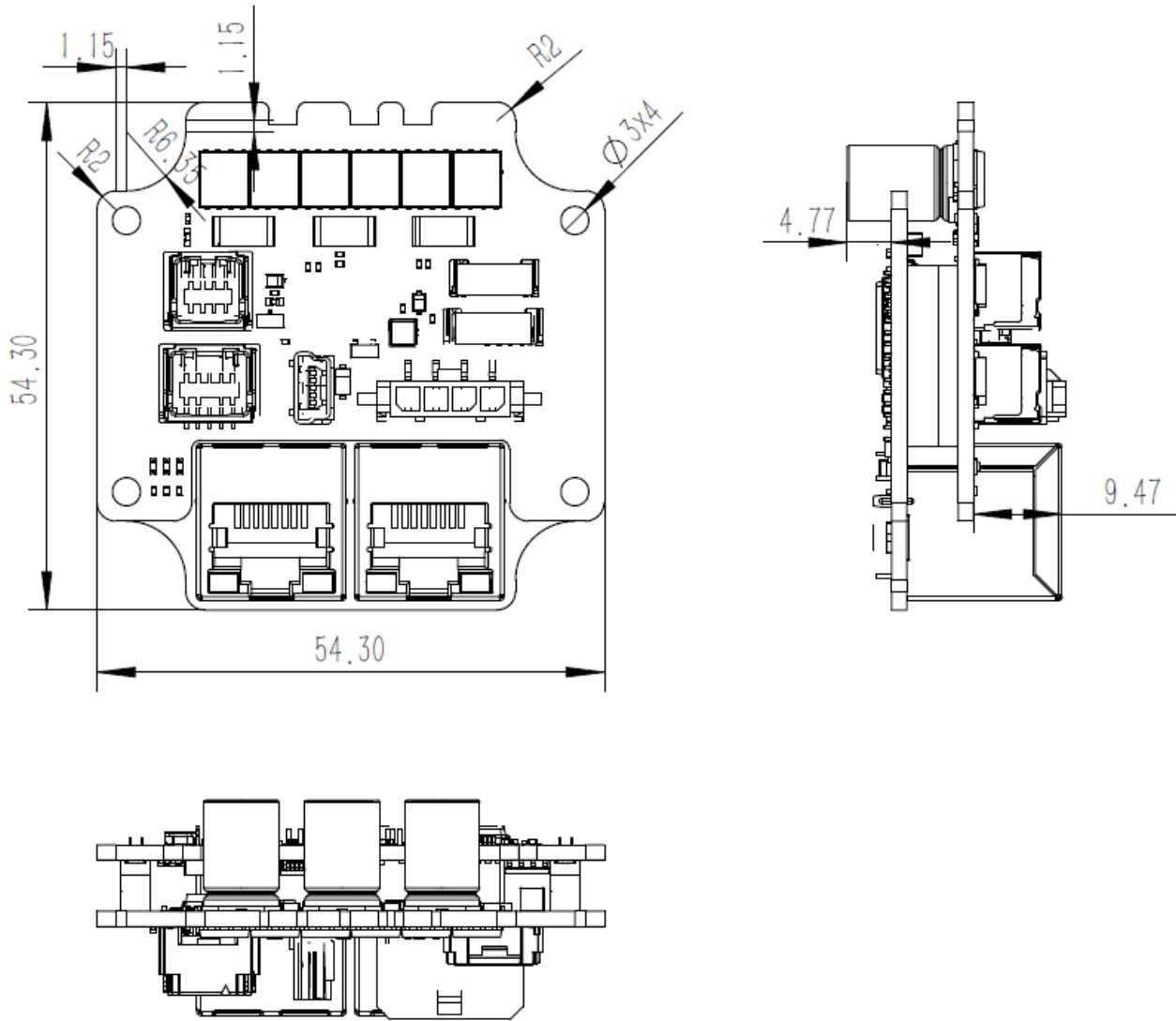
**Note:**

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

**TYPICAL PERFORMANCE CHARACTERISTICS**



**MECHANICAL DRAWING (2)**



**Note:**  
2) Units are mm.

## REVISION HISTORY

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

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