



User Guide

**MMA06-LA50
Regeneration Clamp**

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Overview

Applicable Products

Table 1 lists the products for which this user guide is applicable.

Table 1: Applicable Products

Item	Applicable Part Number
1	MMA06-LA50

Safety Warnings

To prevent personal injury or equipment damage, follow the guidelines listed below:

- Be sure to secure the device before powering it on to prevent accidental movement or falling.
- Do not open or disassemble the device.
- When the device is installed in the system, ensure that the enclosure is reliably grounded.
- Ensure that the connected power supply has a fuse or otherwise limits the current.

Section 1. Product Introduction

1.1 Introduction

The MMA06-LA50 is an accessory for use with the EZmotion all-in-one servo motors (see Figure 1). It can effectively absorb the energy feedback of the motor when braking, thereby preventing damage to the power supply and other equipment due to excessive voltage. Users can monitor the MMA06-LA50's run state and alarm conditions in real time.

The MMA06-LA50 can be configured through DIP switches or through the connection of a PC running MotionLab GUI via MLink Communication Kit (MMA02-2001). The program provides an easy-to-use visual interface for convenient configuration and monitoring. The MotionLab GUI can be downloaded and installed from the EZmotion website. The MLink Communication Kit is an optional accessory available for purchase with the current product.

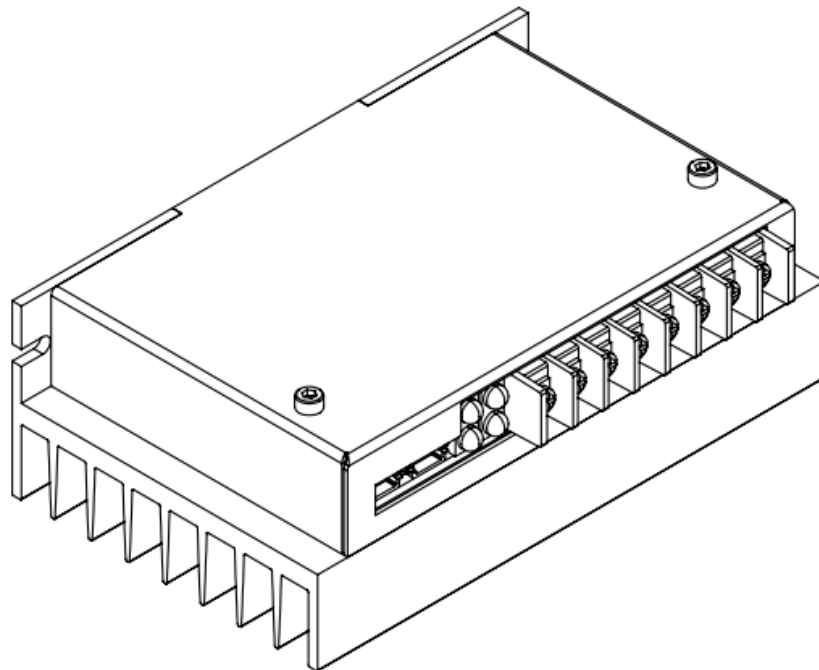


Figure 1: MMA06-LA50 Regeneration Clamp

1.2 Product Features:

- Prevents the regenerative current from being backfilled into the power supply
- Consumes the regenerative energy due to motor deceleration
- Real-time monitoring of system operating status
- Real-time temperature monitoring and alarms
- Supports external braking resistance and external fan
- Flexible configuration methods
- Abundant alarm functions
- Easy-to-use monitoring and configuration interface

1.3 Product Series

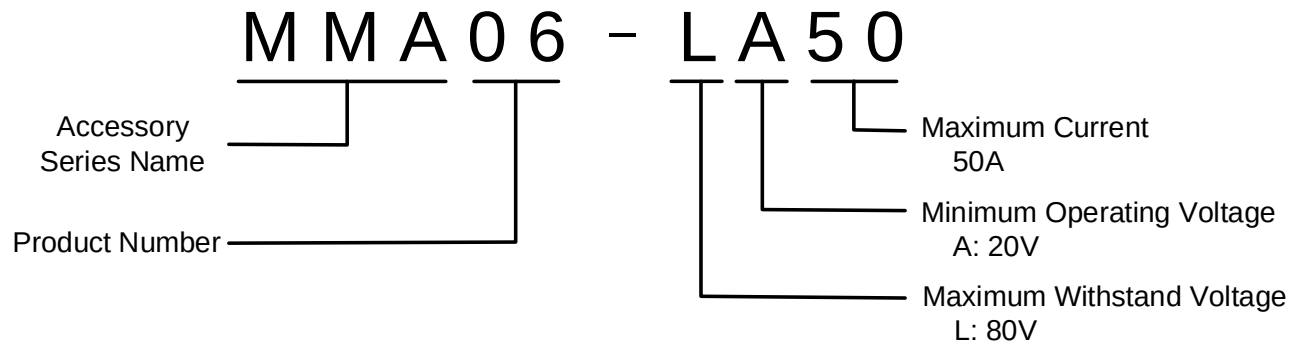


Figure 2: Naming Convention

1.4 Mechanical Dimensions

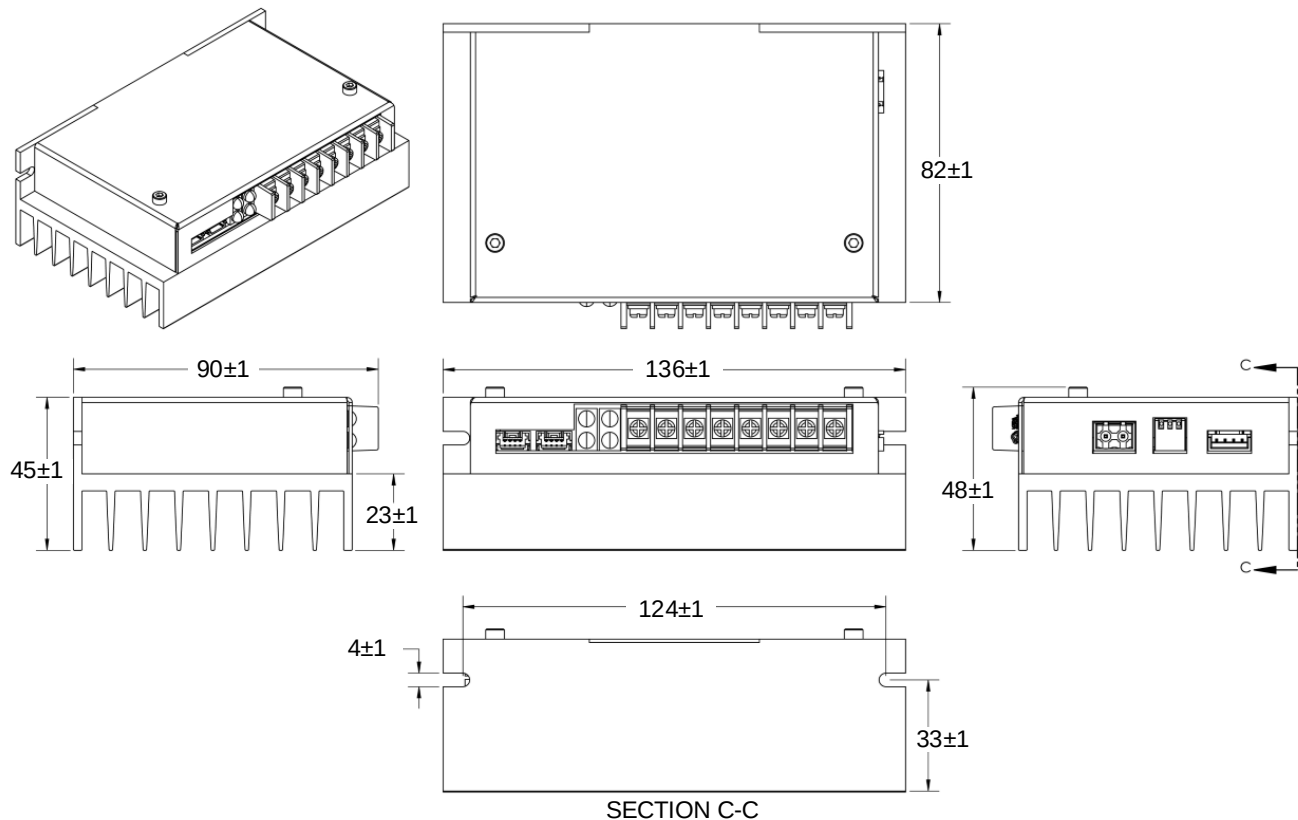


Figure 3: MMA06-LA50 Dimensions Schematic

Table 2: MMA06-LA50 Dimensions

Part Number	Length (mm)	Width (mm)	Height (mm)
MMA06-LA50	136 ±1	82 ±1	45 ±1

1.5 Interface Definition

Figure 4 shows all interfaces of the MMA06-LA50 device. Table 3 shows the functions of each interface, as well as the mating connectors. Table 4, Table 5, Table 6, Table 7, Table 8, Table 9, and Table 10 show the pin order and definitions of each interface.

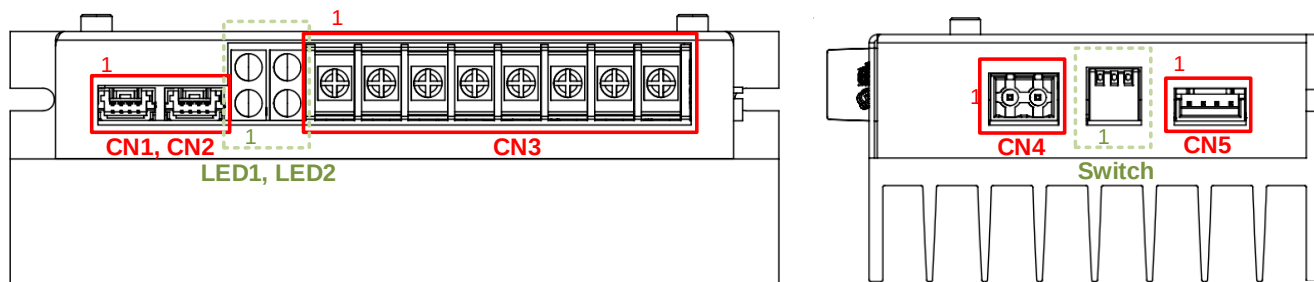


Figure 4: MMA06-LA50 Interface

Interface Function and Mating Connectors

Table 3: MMA06-LA50 Interface List

Tag	Interface Designation	Mating Connector	Description
CN1, CN2	MLink communication interface	ZER-04V-S	1.5mm pitch, 4-position connector
		SZE-002T-P0.3	Socket contact tin, 24-28 AWG crimp
CN3	Power interface	-	It is recommended to use lug terminals to connect the wires.
CN4	External braking resistor interface	WJ2EDGK-5.08-2P	Male plug
CN5	External fan interface	ZX-XH2.54-4PJK	2.54mm pitch, 4-position connector
		ZX-XH2.54-DZ	Socket contact tin, 22-30 AWG crimp
LED1, LED2	Status indicator	-	Indicates the working states
Switch	DIP switch	-	Sets the clamping voltage

MLink Communication Interface Pin Definition

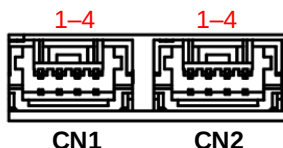


Figure 5: MLink Communication Interface Pins

Table 4: MLink Communication Interface Pin Definitions

Pin Number	Designation	Pin Description
1	RS485-A	RS-485 node A
2	GND	Ground
3	RS485-B	RS-485 node B
4	SHIELD	Shield

Power Interface Pin Definition

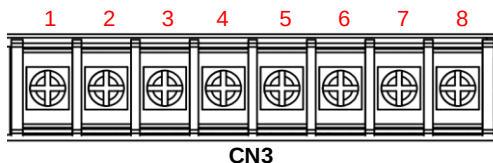


Figure 6: Power Interface Pins

Table 5: Power Interface Pin Definitions

Pin Number	Designation	Pin Description
1, 2	OUT+	Positive power output
3, 4	OUT-	Negative power output
5, 6	IN-	Negative power input
7, 8	IN+	Positive power input

External Braking Resistor Interface Pin Definition

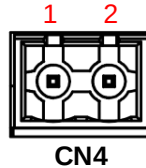


Figure 7: External Braking Resistor Interface Pins

Table 6: External Braking Resistor Interface Pin Definitions

Pin Number	Designation	Pin Description
1	R+	External braking resistance start node
2	R-	External braking resistance return node

External Fan Interface Pin Definition

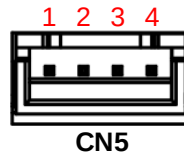


Figure 8: External Fan Interface Pins

Table 7: External Fan Interface Pin Definitions

Pin Number	Designation	Pin Description
1	FAN_10V	External fan power supply positive terminal
2	FAN_GND	External fan power supply negative terminal
3	FAN_FG	Fan speed feedback signal terminal
4	FAN_PWM	Fan speed control signal terminal

Status Indicator Definition

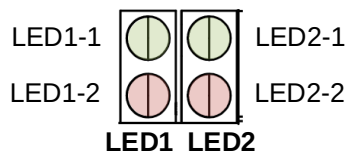


Figure 9: Status Indicator Diagram

Table 8: Status Indicator Definitions

Tag	Designation	Description
LED1-1	Warning	Green. When it is lit, it indicates an over-temperature (OT) warning.
LED1-2	Energy	Red. When it is lit, it indicates that the device is absorbing energy.
LED2-1	Power	Green. When it is lit, it indicates that the device is working.
LED2-2	Fault	Red. When it is lit, it indicates an over-current (OC), over-voltage (OV), and/or OT alarm.

DIP Switch Definition

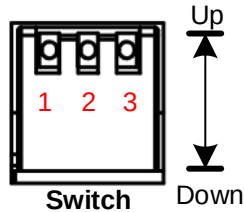


Figure 10: DIP Switch Diagram

Table 9: DIP Switch Definitions

Switch Number	Designation	Description
1	PV_H	Binary DIP switch high bit. Sets the clamping voltage when the switch configuration mode is active.
2	PV_L	Binary DIP switch low bit. Sets the clamping voltage when the switch configuration mode is active.
3	MODE	Toggles the clamping voltage configuration mode: - Up: Configuration mode via switches - Down: Configuration mode via software

Table 10: Relationship between the DIP Switch State and the Clamping Voltage

Switch Number			Clamping Voltage (V _{OUT} - V _{IN})
1 PV_H	2 PV_L	3 MODE	
Down	Up	Up	2V
Up	Down	Up	4V
Up	Up	Up	6V
N/A	N/A	Down	Set according to the 2010h register

1.6 Parameter List

Table 11: MMA06-LA50 Parameter List

Parameters		Value
Basic parameters	Rated operating voltage (V)	48
	Operating voltage range (V)	20 to 80
	Maximum input current (A)	50
	Absorption capacitance (μF)	1360
	Internal absorption resistance (Ω)	3
	Allowable continuous absorption power (W)	100
	Allowable peak absorbed power (W)	1600
Operating environment	Heat dissipation	Natural cooling or forced cooling by an external fan
	Ambient air conditions	Avoid dust, oil mist, and corrosive air
	Operating temperature (°C)	0 to 40
	Storage temperature (°C)	-40 to +85
	Operating humidity (non-condensing)	10% to 90%
	Storage humidity (non-condensing)	5% to 95%

1.7 Supporting Software and Documentation

EZmotion provides a user-friendly, PC-based graphical user interface (GUI) called MotionLAB, which provides an easy way to configure and test drives (see Figure 11).

Download the MotionLAB software and its driver installer from the EZmotion website. There is also a user guide for MotionLAB on the website. To install MotionLAB and its drivers, read its user guide carefully before using MotionLAB.

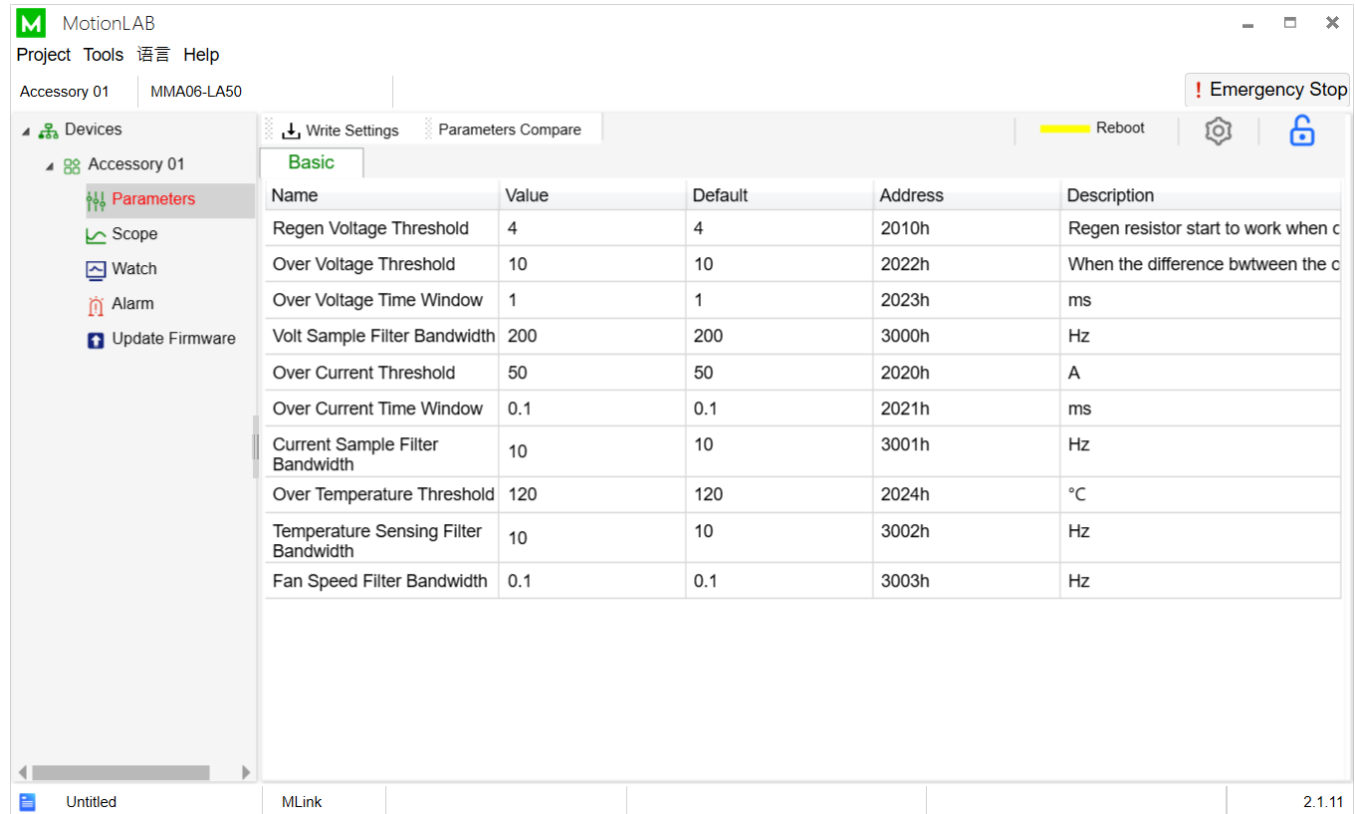


Figure 11: MotionLAB User Interface

Section 2. Hardware Connections

The MMA06-LA50's power input terminal is connected to the main DC power supply, and the output terminal is connected to each of the motor's power terminals (see Figure 12). When connecting multiple motors, ensure that the total current of all the motors does not exceed the maximum input current (I_{IN_MAX}) for the MMA06-LA50.

MLink supports simultaneous connection of multiple devices. Each target device reads the data addressed to it and passes it down. In this way, multiple MMA06-LA50 and EZmotion motors supporting MLink can be connected at the same time without using switches or hubs. The network structure is flexible and supports bus, tree, and star topologies.

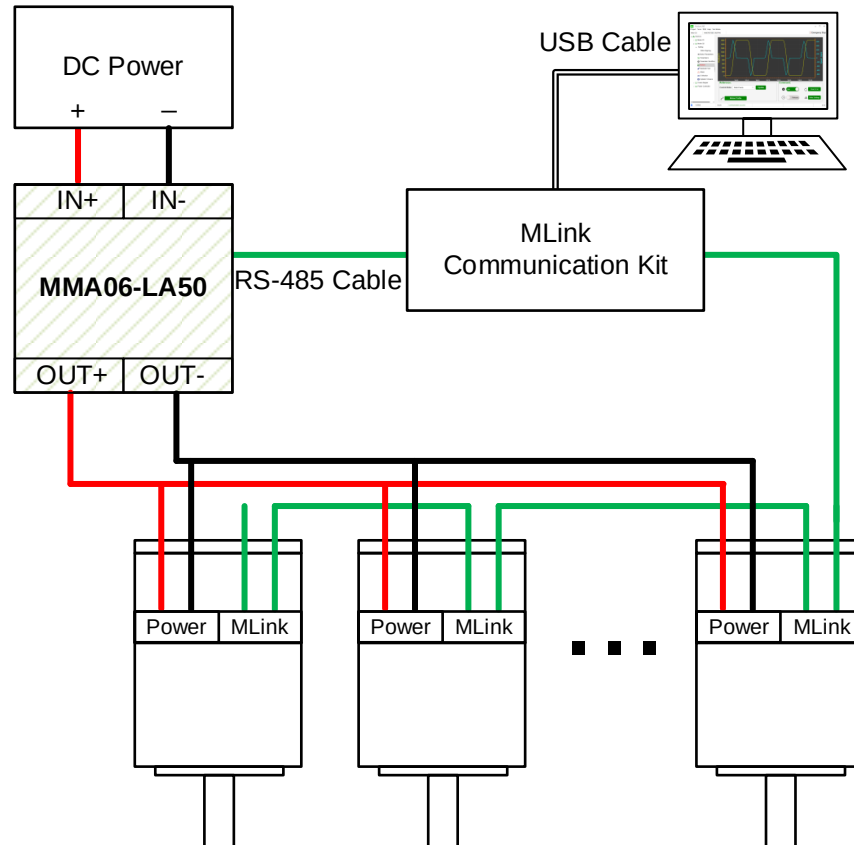


Figure 12: Hardware Connection Diagram

Section 3. Function Introduction

3.1 Description of the Function

In the servo control system, it is common for the motor to rapidly accelerate and decelerate. When the motor rapidly decelerates with a large inertia load, a large amount of energy is quickly poured into the motor power supply. If the power supply has no energy absorption function or insufficient energy absorption capacity, the power supply's output voltage is greatly increased. If this voltage exceeds the maximum voltage allowed by the power supply and other devices, it may damage the power supply and other devices connected to it. Figure 13 shows the voltage at the power supply output.

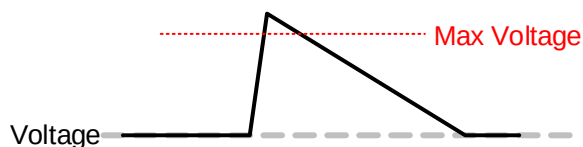


Figure 13: DC Power Supply Voltage Change Diagram when the Servo Motor Decelerates Sharply

The MMA06-LA50's main function is to absorb the energy generated by the motor feedback current in order to protect the power supply and other equipment. Figure 14 illustrates a voltage spike condition with and without the MMA06-LA50. V_{IN} is the power supply's output voltage, also known as the IN+/IN- on the MMA06-LA50. V_{OUT} is the servo motor's input voltage, also known as the OUT+/OUT- on the MMA06-LA50.

The potential voltage waveform at the power supply's output when the MMA06-LA50 is shown in gray. Since the device can stop current backflow, when the motor brakes the feedback energy, it can stop the energy from going to the power supply. This means that V_{IN} remains unaffected and the power supply's set output voltage is maintained, but V_{OUT} increases as a result of this energy (see Figure 14). When V_{OUT} rises to the set clamping voltage (2010h), the MMA06-LA50 begins to consume part of this energy through the braking resistor to prevent the voltage from continuing to rise.

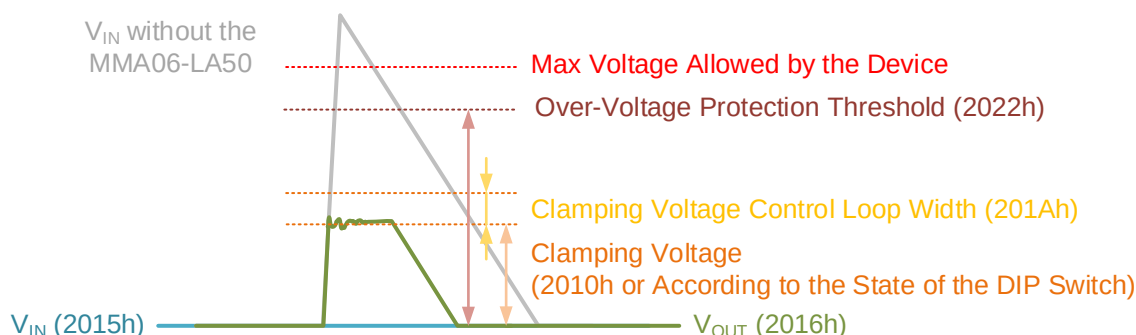


Figure 14: DC Power Supply Voltage Change Diagram after Connecting the MMA06-LA50 Braking Resistor

The MMA06-LA50 also features comprehensive monitoring capabilities. Using MLink, the user can monitor the input voltage, output voltage, current flow, and the temperature of key internal components in real time. In addition, it offers a wide range of alarm functions and peripheral interfaces, allowing it to be connected to external braking resistors and cooling fans. This enhances flexibility and adaptability for various application scenarios.

The device supports two methods of configuration: configuration via the switches or via the registers. The configuration mode is controlled by switch 3 (MODE) on the dial switch. When the MODE switch is turned on, the device operates in switch state configuration mode; when turned off, it operates in register value configuration mode. For more information, refer to Table 9 on page 9.

3.2 Register Value Configuration Mode

The MMA06-LA50 supports MLink communication, which can configure parameters and monitor the system operation status in real time through the MotionLAB GUI. Table 12 shows the object dictionary for the relevant registers and their units.

Table 12: Dictionary of Related Objects

Address	Description	Access	Data Type	Units	Range	Default
2010h	Clamping voltage	R/W	UINT16	$V_{OUT} - V_{IN}$	1 to 10	4
2011h	Error status	RO	UINT32	-	-	0
2012h	Capacitance temperature	RO	INT16	1°C	INT16	-
2013h	Braking resistance temperature	RO	INT16	1°C	INT16	-
2014h	MOS temperature	RO	INT16	1°C	INT16	-
2015h	Input voltage (V_{IN})	RO	UINT16	0.1V	UINT16	-
2016h	Output voltage (V_{OUT})	RO	UINT16	0.1V	UINT16	-
2017h	Output current (I_{OUT})	RO	UINT16	0.1A	UINT16	-
2018h	Brake duty cycle	RO	UINT16	%	UINT16	-
2019h	Real-time power	RO	UINT16	1W	UINT16	-
201Ah	Clamping voltage control bandwidth	R/W	UINT16	1V	1 to 10	2
201Bh	Maximum power (P_{MAX})	R/W	UINT16	1W	UINT16	0
201Ch	Average power	RO	UINT16	1W	UINT16	-
201Dh	Brake resistance load rate	RO	UINT16	0.1%	UINT16	-
201Eh	Fan speed	RO	UINT16	rpm	UINT16	-
2020h	Over-current protection (OCP) threshold	R/W	UINT16	A	UINT16	50
2021h	OCP detection time	R/W	UINT16	0.1ms	UINT16	1
2022h	Over-voltage protection (OVP) threshold	R/W	UINT16	$V_{OUT} - V_{IN}$	UINT16	10
2023h	OVP protection detection time	R/W	UINT16	0.1ms	UINT16	10
2024h	Over-temperature protection (OTP) threshold	R/W	UINT16	1°C	UINT16	120
3000h	Voltage sampling filter bandwidth	R/W	UINT16	1Hz	UINT16	200
3001h	Current-sense filter bandwidth	R/W	UINT16	1Hz	UINT16	10
3002h	Temperature sampling filter bandwidth	R/W	UINT16	1Hz	UINT16	10
3003h	Fan speed sampling filter bandwidth	R/W	UINT16	0.1Hz	UINT16	1
3004h	Braking load rate filter bandwidth	R/W	UINT16	0.1Hz	UINT16	1

3.3 Switch State Configuration

When the MMA06-LA50's operating status does not need to be monitored via MLink, clamping voltage can be configured via the DIP switch status. Three levels of configurable clamping voltages are available: 2V, 4V, and 6V. For details, see the DIP Switch Definition section on page 9.

3.4 Cooling Fan Related Functions

The MMA06-LA50 device has a cooling fan connector, which can drive a universal 4-pin fan and adjust the fan speed in real time according to the device temperature. The MotionLAB interface allows real-time monitoring of fan speed and other information.

Section 4. Fault Indication

4.1 Dictionary of Related Objects

The MMA06-LA50 offers detection functions that can promptly identify faults and risks, helping prevent damage to other devices. The specific fault type can be determined by the value of “Error Status” (2011h). When a fault occurs, the fault indication LED is illuminated in red.

Table 13: Description of the Error Status (2011h)

Bits	Description	Cause	Resolution
0	Reserved	-	-
1	Over-voltage (OV) error	The braking resistance is too large; the energy return is too large.	External braking resistor; reduce motor deceleration.
2	Hardware errors	The output is short-circuited.	Check the wiring on the output side.
3	Braking resistor over-temperature (OT)	Poor heat dissipation conditions.	Use a fan to dissipate the heat.
4	Capacitor OT	Poor heat dissipation conditions.	Use a fan to dissipate the heat.
5	MOSFET OT	The output current is too high.	Check the operation of the device connected to the output line.
6	Over-current (OC) error	The output current is too high.	Check the operation of the device connected to the output line.
8:31	Reserved	-	-

4.2 Error Descriptions

4.2.1 Over-Voltage Fault

An over-voltage error occurs if the MMA06-LA50’s output voltage exceeds its input voltage plus the over-voltage protection (OVP) threshold (2022h). If this occurs, the fault indicator light (LED2-2) remains red, Error Status register (2011h) bit[1] is set to 1, and the MotionLAB GUI displays an error message.

4.2.2 Hardware Fault

If the MMA06-LA50 encounters a hardware error, the fault lamp (LED2-2) illuminates solid red, Error Status register (2011h) has bit[2] is set to 1, and the MotionLAB GUI displays an error message. If this occurs, turn off the power and replace the MMA06-LA50 as soon as possible.

4.2.3 Over-Temperature Fault

The MMA06-LA50 monitors the temperature of key internal components in real time. If the temperature exceeds the over-temperature protection (OTP) threshold (2024h) minus 40°C, then an over-temperature warning is triggered. If this occurs, the warning light (LED2-1) illuminates solid green. If the temperature exceeds the OTP threshold (2024h), an over-temperature (OT) error for the corresponding device is activated, causing the fault light (LED2-2) to glow red and remain on. Specific OT information can be accessed by reading the Error Status register (2011h) or by utilizing the error message displayed in the MotionLAB GUI. In such cases, consider relocating the device to an environment with improved cooling conditions or connecting an external cooling fan.

4.2.4 Over-Current Fault

If the current flowing through the MMA06-LA50 exceeds the over-current protection (OCP) threshold (2020h) within the OCP detection time (2021h), an over-current (OC) error is triggered. The fault light (LED2-2) illuminates solid red, Error Status register (2011h) bit[6] is set to 1, and the MotionLAB GUI displays an OC error message. In the event of an OC error, it is essential to turn off the power immediately to prevent damage to the device.

4.2.5 Clear Errors

There are two ways to clear the error flag and reset the fault lamp state:

- Connect to MotionLAB via MLink and click the “Clear Errors” button on the screen.
- Turn off the MMA06-LA50’s power supply to reset the system status.

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	7/31/2025	Initial Release	-

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