BONITRON

Solutions for AC Drives

Model M3452-S100

Braking Transistor

Customer Reference Manual

Web: www.bonitron.com • Tel: 615-244-2825 • Email: info@bonitron.com

Bonitron, Inc.
Nashville, TN

An industry leader in providing solutions for AC drives.

ABOUT BONITRON

Bonitron designs and manufactures quality industrial electronics that improve the reliability of processes and variable frequency drives worldwide. With products in numerous industries, and an educated and experienced team of engineers, Bonitron has seen thousands of products engineered since 1962 and welcomes custom applications.

With engineering, production, and testing all in the same facility, Bonitron is able to ensure its products are of the utmost quality and ready to be applied to your application.

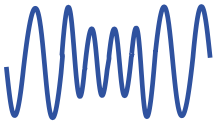
The Bonitron engineering team has the background and expertise necessary to design, develop, and manufacture the quality industrial electronic systems demanded in today's market. A strong academic background supported by continuing education is complemented by many years of hands-on field experience. A clear advantage Bonitron has over many competitors is combined on-site engineering labs and manufacturing facilities, which allows the engineering team to have immediate access to testing and manufacturing. This not only saves time during prototype development, but also is essential to providing only the highest quality products.

The sales and marketing teams work closely with engineering to provide up-to-date information and provide remarkable customer support to make sure you receive the best solution for your application. Thanks to this combination of quality products and superior customer support, Bonitron has products installed in critical applications worldwide.

AC Drive Options

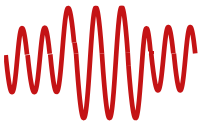
In 1975, Bonitron began working with AC inverter drive specialists at synthetic fiber plants to develop speed control systems that could be interfaced with their plant process computers. Ever since, Bonitron has developed AC drive options that solve application issues associated with modern AC variable frequency drives and aid in reducing drive faults. Below is a sampling of Bonitron's current product offering.

World Class Products



Undervoltage Solutions

Uninterruptible Power for Drives
(DC Bus Ride-Thru)
Voltage Regulators
Chargers and Dischargers
Energy Storage



Overvoltage Solutions

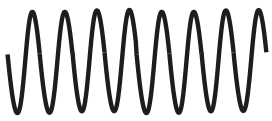
Braking Transistors
Braking Resistors
Transistor/Resistor Combo
Line Regeneration
Dynamic Braking for Servo Drives

Common Bus Solutions

Single Phase Power Supplies
3-Phase Power Supplies
Common Bus Diodes

Portable Maintenance Solutions

Capacitor Formers
Capacitor Testers



Power Quality Solutions

12 and 18 Pulse Kits

Green Solutions

Line Regeneration

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1. INTRODUCTION

1.1. WHO SHOULD USE

This manual is intended for use by anyone who is responsible for integrating, installing, maintaining, troubleshooting, or using this equipment with any AC drive system.

Please keep this manual for future reference.

1.2. PURPOSE AND SCOPE

This manual is a user's guide for the Model M3452 Braking Transistor. It will provide the user with the necessary information to successfully install, integrate, and use the M3452.

In the event of any conflict between this document and any publication and/or documentation related to the AC drive system, the latter shall have precedence.

1.3. MANUAL VERSION AND CHANGE RECORD

Original Version.

Figure 1-1: Model M3452

1.4. SYMBOL CONVENTIONS USED IN THIS MANUAL AND ON EQUIPMENT

	Earth Ground or Protective Earth
	AC Voltage
	DC Voltage
 DANGER!	DANGER: Electrical hazard - Identifies a statement that indicates a shock or electrocution hazard that must be avoided.
 DANGER!	DANGER: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.
 CAUTION!	CAUTION: Identifies information about practices or circumstances that can lead to property damage, or economic loss. Attentions help you identify a potential hazard, avoid a hazard, and recognize the consequences.
 CAUTION!	CAUTION: Heat or burn hazard - Identifies a statement regarding heat production or a burn hazard that should be avoided.

2. PRODUCT DESCRIPTION

The need for braking control occurs in applications where the frequency of an AC motor at times exceeds that of the variable frequency drive controlling it. When this happens, the motor acts as a generator. The energy produced in these circumstances may cause the drive to trip on an over-voltage condition or cause the motor to build up heat or run with an excessively high volts/Hertz ratio.

This regenerated energy must either be dissipated or returned to the power line. For applications where this condition occurs infrequently, dissipating the energy as heat through a Braking Transistor can be the most cost-effective solution.

The Model M3452 series of braking products is designed to provide dynamic braking control for applications utilizing a standard AC drive with a fixed DC bus. These modules have been designed for use with remotely mounted dynamic loads.

2.1. RELATED PRODUCTS

The M3452 series is one of several overvoltage solutions offered by Bonitron. Below are a few related products, including braking resistors that are used in conjunction with the M3452 series.

BRAKING TRANSISTORS

- Like the M3452 heavy duty braking transistors, Bonitron M3575T and M3675T standard duty braking transistors work with variable frequency drives (with DC bus connections) to monitor the DC bus. If overvoltage occurs, the M3575T or M3675T shunts the excess energy through an external braking resistor to prevent overvoltage faults. The M3575T series is rated up to 600A peak / 20% duty, while the M3675T series is rated up to 10A peak / 20% duty.

BRAKING RESISTORS

- Bonitron offers resistor solutions to complement its braking transistor selection. The M3575R series is rated up to 32A peak / 20% duty, while the M3775R series is rated up to 1600A / 100% duty. Custom resistors are also available.

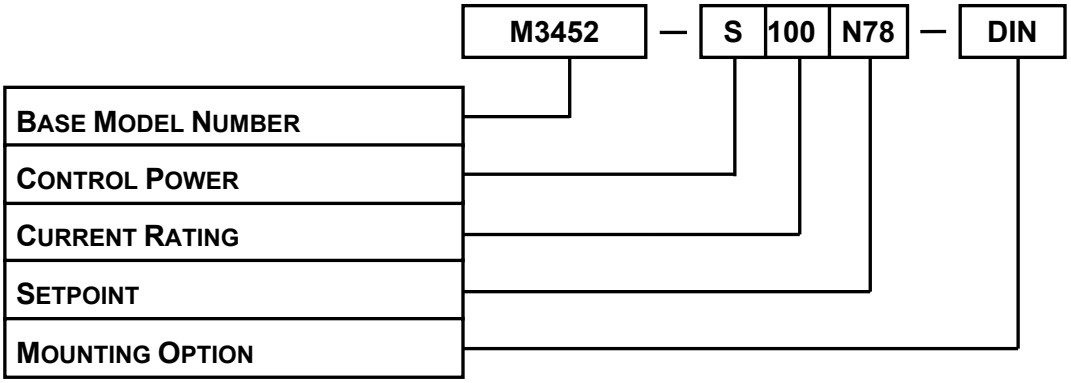
LINE REGENERATION

- Bonitron is famous for its industry-leading line regeneration solutions. The Bonitron M3645 line regen returns regenerative energy back onto the AC line instead of dissipating the energy as heat in a resistor, and is ideal for applications with high duty cycles, frequent deceleration, or where heat from a resistor may be an issue. The M3645 line regen features an interactive digital display with event logging.

Please contact your AC drive distributor or visit our website at www.bonitron.com for more information on these additional products.

2.2. PART NUMBER BREAKDOWN

Figure 2-1: Example of M3452 Part Number Breakdown



BASE MODEL NUMBER

The Base Model Number, M3452, indicates that the unit incorporates the braking transistor and its control circuitry only. An external braking resistor is required for proper function of the braking module.

CONTROL POWER

This unit uses DC Bus fed Control Power. The DC Voltage Rating of the braking unit is indicated by a code letter.

Table 2-1: Control Voltage Rating Chart

RATING CODE	LINE VOLTAGE INPUT
S	72VDC

DC CURRENT RATING

The DC Current Rating indicates the maximum DC current level safely handled by the braking unit. This M3452 module is rated for a maximum of 100 Amps DC at 15% duty cycle.

SETPOINT

The setpoint is indicated by the letter N followed by the trigger voltage.

MOUNTING OPTION

This unit mounts to a DIN rail.

2.3. GENERAL SPECIFICATIONS

Table 2-2: General Specifications Chart

PARAMETER	SPECIFICATION
Adjustments	Factory calibrated – no field adjustments necessary
Input Voltage	72VDC
Connections	Drive DC Bus Resistor
Enclosure	NEMA 1 Plastic DIN Rail Mounted Box
Panel Indicators	Control Power Ready Active Braking
Continuous Current	15 Amps
Peak Current	100 Amps
Duty Cycle	15% Maximum braking
Maximum On-Time	5 seconds on, 30 seconds off
Storage Temp	-30ºC to +65ºC
Operating Temp	0° to +40°C
Cooling	Internal fan
Humidity	Below 95% non-condensing
Atmosphere	Free of corrosive gas and dust
Altitude	2,000 meters above sea level maximum

2.4. General Precautions and Safety Warnings

DANGER!

- **High voltages may be present!**
- **Failure to heed these warnings may result in serious bodily injury or death!**

CAUTION!

- **This product generates heat during operation.**
- **This product should be installed accordingly on non-flammable surfaces with clearances of at least two inches in all directions.**
- **No user-serviceable parts are contained within this product. Inoperable units should be replaced or returned for evaluation and/or repair by qualified technicians.**
- **Before attempting installation or removal of this product, be sure to review all drive and/or resistive load documentation for pertinent safety precautions.**
- **Installation and/or removal of this product should only be accomplished by a qualified electrician in accordance with National Electrical Code or equivalent regulations.**

ANY QUESTIONS AS TO APPLICATION, INSTALLATION OR SERVICE SAFETY SHOULD BE DIRECTED TO THE EQUIPMENT SUPPLIER.

3. INSTALLATION INSTRUCTIONS

WARNING!

Installation and/or removal of this product should only be performed by a qualified electrician in accordance with National Electrical Code or local codes and regulations.

Proper installation of the Model M3452 Braking Transistor should be accomplished following the steps outlined below. Be sure to refer to your AC drive's instruction manual as you perform these steps. Please direct all installation inquiries that may arise during the installation and startup of this braking product to your supplier or system integrator.

3.1. ENVIRONMENT

The installation site for the module should be chosen with these considerations in mind:

- The mounting surface must be non-flammable, as the unit may generate high ambient temperatures during typical operation.
- The unit will require a minimum clearance of two inches in all directions around it.
- The unit will require adequate protection from the elements.

3.2. UNPACKING

Upon receipt of this product, please verify that the product received matches the product that was ordered and that there is no obvious physical damage to the unit. If the wrong product was received or the product is damaged in any way, please contact the supplier from which the product was purchased.

3.3. MOUNTING

Once the installation site has been selected as outlined above, the unit should be mounted on standard DIN rail. Refer to Figure 6-1 to determine the correct mounting dimensions for your unit.

3.4. WIRING AND CUSTOMER CONNECTIONS

This section provides information pertaining to the field connection of the DC bus inputs to the M3452 Braking Transistor. Actual connection points and terminal numbers for the AC drive module will be found in the documentation provided with the drive. **Be sure to review all pertinent drive and system documentation as well as the power wiring information in Section 3.4.1 before proceeding.**

3.4.1. POWER WIRING

WARNING!

Only qualified electricians should perform and maintain the interconnection wiring of this product. All wiring should be done in accordance with local codes.

WARNING!

DC bus polarity must be observed! Connecting the DC bus with the polarity reversed will cause damage to the equipment!

For the maximum wire size accepted by the individual field connection terminals, refer to Table 3-1: Power Wiring Specifications. Wire types and sizes should be chosen in accordance with national and local electrical codes

to meet the voltage and current levels present for your application.

Minimum load resistance requirements listed in Table 6-1: Module Ratings in the Engineering Section of this manual MUST be followed when selecting a dynamic load for use with the M3452 unit.

Figure 3-1 shows a typical interconnection of the M3452 with the M3775RC Resistor Module. For interconnection with other load modules, refer to the documentation supplied with them.

Table 3-1: Power Wiring Specifications

TERMINAL	MIN WIRE AWG	MAX WIRE AWG	MAX WIRE LENGTH	TORQUE
DC+	12	8	10 ft.	8 lb-in.
DC–	12	8	10 ft.	8 lb-in.
RES+	12	8	10 ft.	8 lb-in.
RES–	12	8	10 ft.	8 lb-in.

3.4.2. I/O WIRING

3.4.2.1. ENABLE INPUT

The Enable Input is an internally supplied input that enables or disables the operation of the braking transistor. This input is isolated and can be shorted with a jumper or an external switch.

3.4.2.2. STATUS OUTPUT

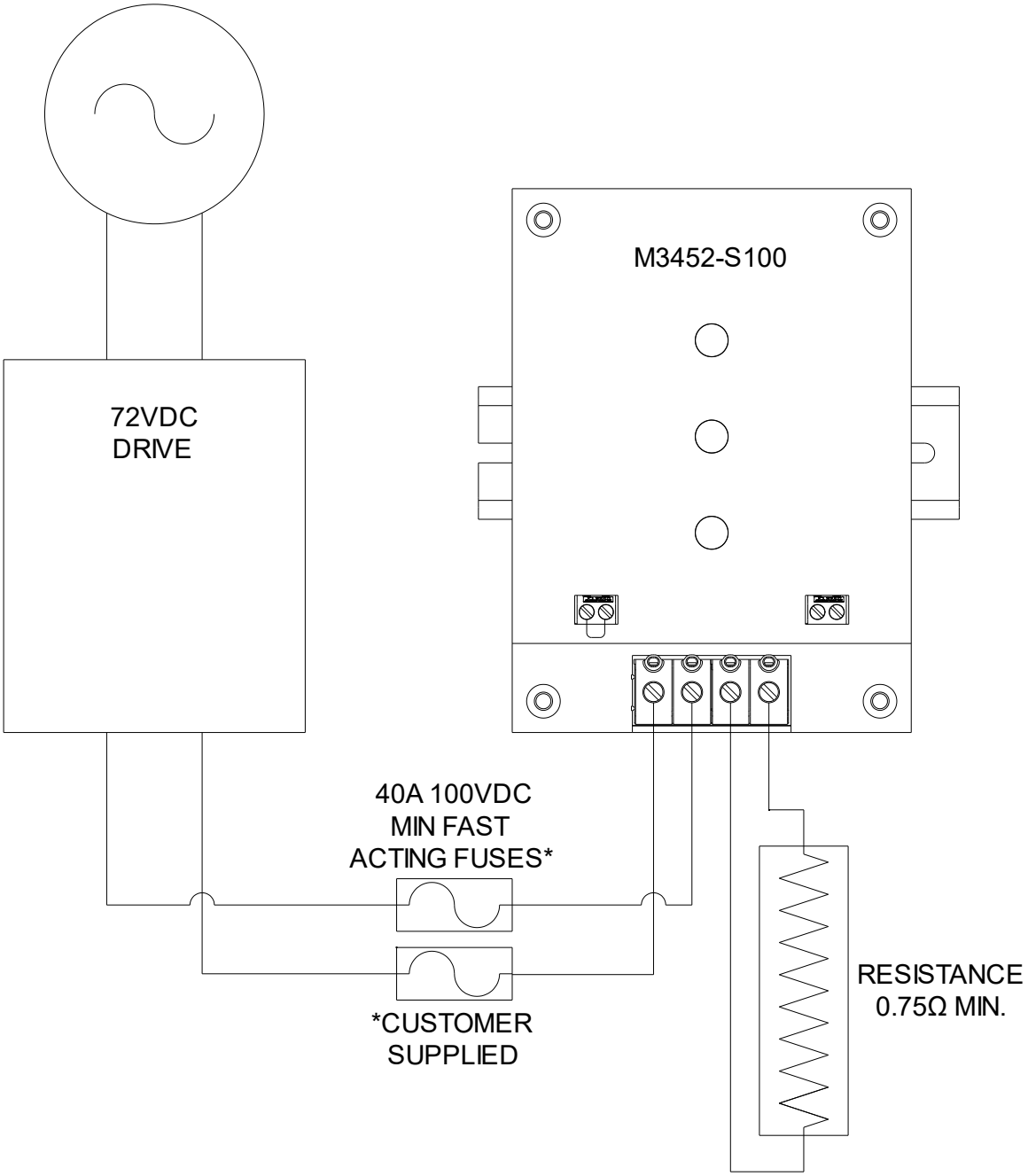
The Status Output is a normally open solid state output. When the unit is enabled and no faults detected, this contact will close.

Table 3-2: I/O Wiring Specifications

Terminal	Function	Electrical Specifications	Min Wire AWG	Max Wire AWG	Torque
TB1 1&2	Enable Input	Dry Contact (12V, 50mA)	22	18	4.5 lb-in
TB2 1&2	Status Output	140 VAC / 200 VDC @ 100mA Max	22	18	4.5 lb-in

3.5. TYPICAL CONFIGURATION

Figure 3-1: Typical Interconnection Diagram



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4. OPERATION

4.1. FUNCTIONAL DESCRIPTION

The M3452 Module controls the bus voltage of a variable frequency drive by transferring energy to a resistor.

When the drive's DC bus voltage exceeds a fixed setpoint, the Braking Transistor's control electronics turns on an IGBT transistor connecting a dynamic load across the DC bus. When the DC bus drops below another threshold, the IGBT turns off.

Table 4-1: Turn-On and Turn-Off Setpoints

RATING CODE	LINE VOLTAGE INPUT	TURN-ON SETPOINT	TURN-OFF SETPOINT
N78	N/A	78VDC	74VDC

4.2. FEATURES

4.2.1. INDICATORS

4.2.1.1. CONTROL POWER

The Control Power indicator illuminates when the voltage between the DC+ and DC- terminals is greater than 10VDC and the internal regulator is operating.

CAUTION!

Do not use this light as an indication that the DC bus is safe to work on! Always check the DC bus with a working voltmeter before servicing equipment, as the DC bus light may be broken!

4.2.1.2. READY

This indicator illuminates when the chopper is operational and no faults detected

4.2.1.3. ACTIVE BRAKING

This indicator illuminates when the chopper IGBT is on. When the drive is idle, this light should not be on. During braking, this light will be on or flashing, depending on the amount of braking energy.

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5. MAINTENANCE AND TROUBLESHOOTING

5.1. TROUBLESHOOTING

If a problem occurs on start-up or during normal operation, refer to the problems described below. If a problem persists after following the steps below, contact the product supplier or your system integrator for assistance.

Repairs or modifications to this equipment are to be performed by Bonitron approved personnel only. Any repair or modification to this equipment by personnel not approved by Bonitron will void any warranty remaining on this unit.

5.1.1. GREEN CONTROL POWER LED DOES NOT COME ON

Ensure proper DC Bus voltage at input terminals to the unit. If proper DC Bus voltage is present, return unit for repair or replace unit.

5.1.2. GREEN READY LIGHT DOES NOT COME ON

Must have Control Power first. Make sure Enable input is jumped or shorted with a switch. Verify load bank is connected and not open. Check for unit being warm or hot. Contact Bonitron

5.1.3. RED ACTIVE BRAKING LED STAYS ON OR FLASHES DURING MOTORING OPERATION

Ensure that the voltage rating of M3452 is correct and not high enough to reach the turn on voltage. If line voltage is abnormally high or low, the unit may require special calibration adjustments.

If correct input voltage is present on the M3452 and the module is still Active Braking, return unit for repair or replace unit.

5.1.4. DRIVE TRIPS ON OVER-VOLTAGE OR SELF-LIMITS ITS DECEL RATE

Ensure that the Green Control Power LED is **ON** (see above).

Ensure that the proper dynamic load value is connected to the M3452 unit and that the maximum current rating is not exceeded.

Most AC drives are capable of 150-200% output. If the AC Drive continues to trip and the application has been thoroughly reviewed, contact Bonitron.

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6. ENGINEERING DATA

6.1. RATINGS CHART

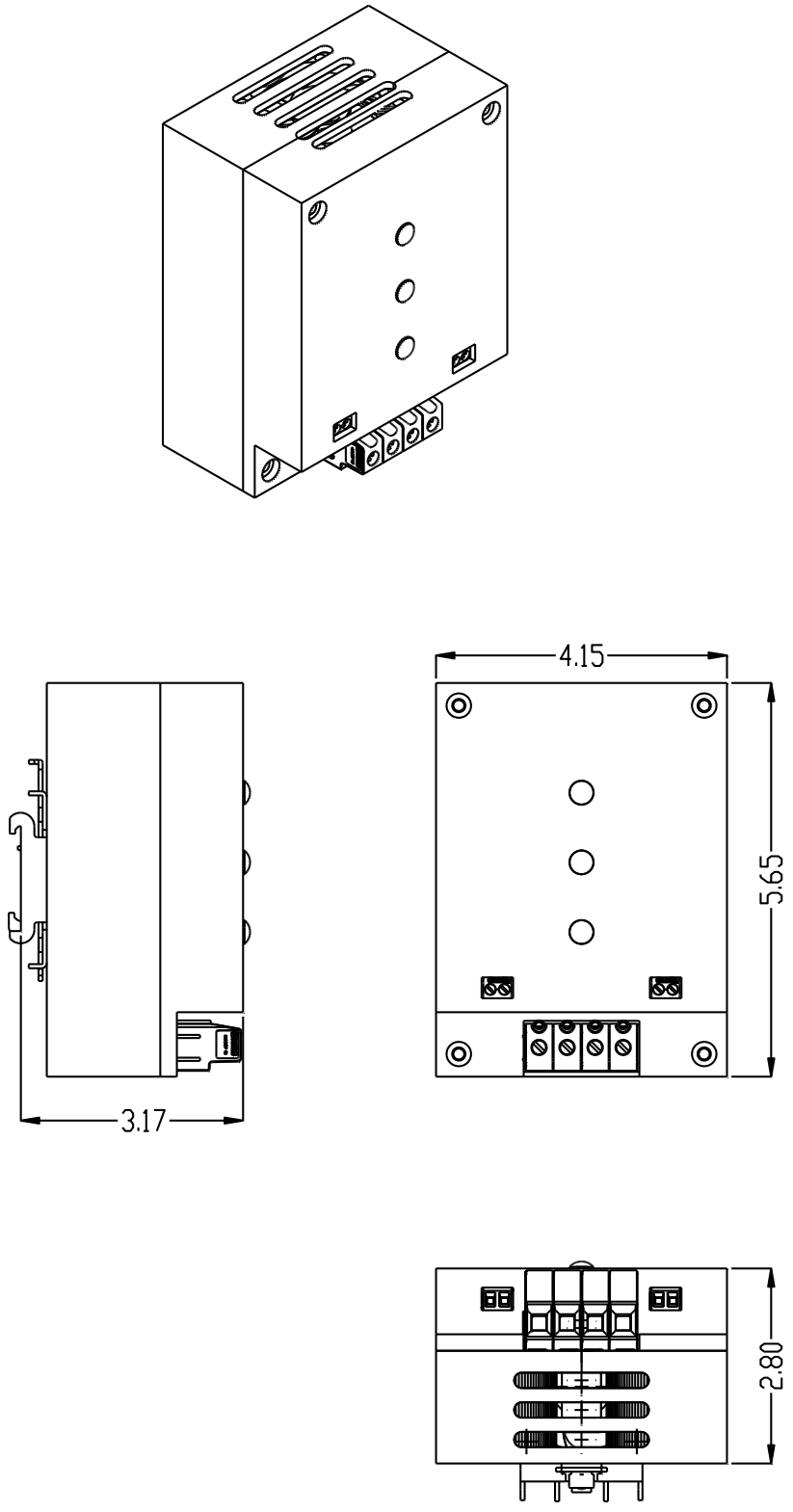
See Table 6-1 below for the ratings for all M3452 modules currently available. Units are rated for 15% duty or 15A RMS. If your module is not listed below, please contact your supplier or systems integrator for this information.

Table 6-1: Module Ratings

PART NUMBER	DRIVE VOLTAGE	BRAKING POWER (PEAK)	BRAKING CURRENT (PEAK)	BRAKING CURRENT (RMS)	MINIMUM RESISTANCE	FUSING
M3452-S100	72VDC	10HP	100A	15A	0.75Ω	40A 100VDC Min Fast Acting

6.2. DIMENSIONS AND MECHANICAL DRAWINGS

Figure 6-1: M3452 Dimensional Drawing



NOTES

521 Fairground Court ● Nashville, TN 37211 ● USA
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