- Supports MOT700x and MOT300-25 TEC Controller modules
- Very small footprint (72 x 45mm)
- 3V to 5V operation
- Standalone or host-controlled
- Complete evaluation and verification solution
- Fully RoHs compliant

Introduction:

The MOT705_OEM has all the functionality of the MOT701_OEM in a smaller footprint (72 x 44 mm). It also includes component footprint for a variable power supply for the Object board. This feature is not implemented normally unless it is requested when ordered.

The Object board can be used for test mounting the TEC, which includes a temperature feedback thermistor and diodes which can be driven by MOT705_OE to generate heat, simulating dissipation from a laser diode or other heat generating elements of the target system.

The MOT705_OEM is designed to allow the user to quickly evaluate and implement a Thermoelectric Cooler (TEC) design based on the MOT700x and MOT3000 series TEC controller modules.

It can be used standalone utilizing on-board potentiometers to set target temperature and power dissipation on the Object Board. Connection points are provided which can be used for monitoring object temperature, output current and temperature alarm status, as well as providing external control of temperature and module enable functions.

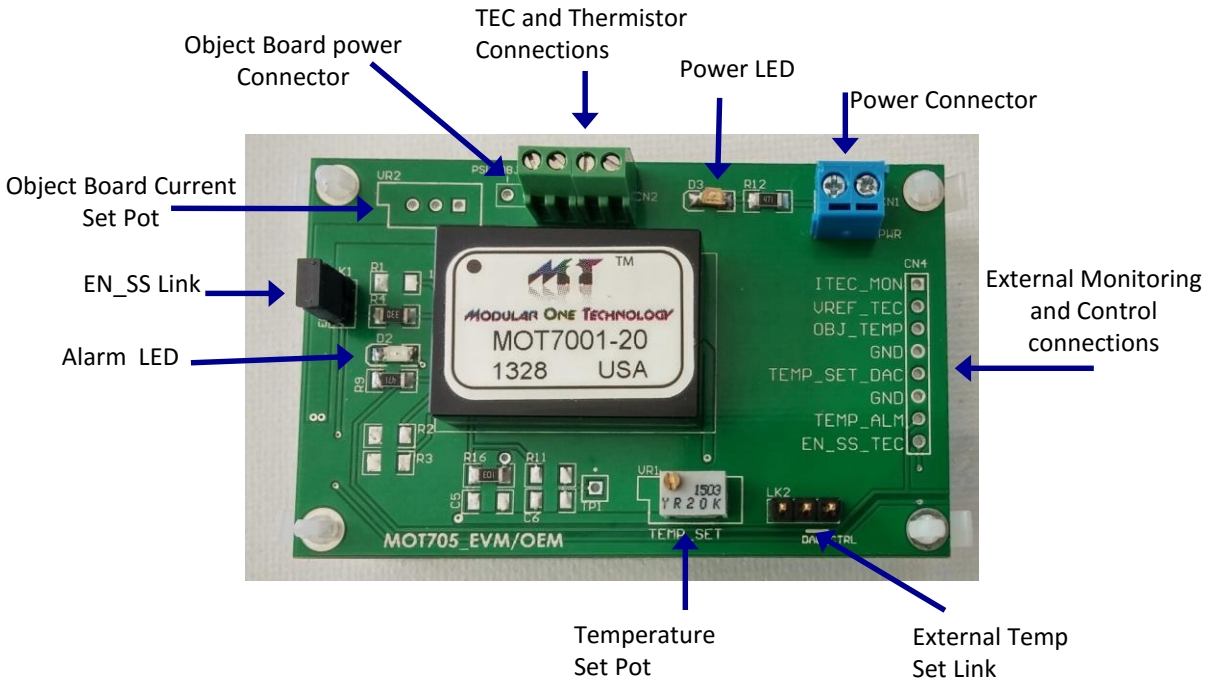
This User's Guide describes the various functions of the board, how to set it up and how to use it in a system.

Please also refer to the MOT700x & MOT3000-25 series datasheet for further description of the module functionality.

Before applying power to the EVM please ensure that jumpers are set and that VMAX , IMAXP, and IMAXN is limited if required for your TEC. (see following pages)

Contents

Component Identification



Quick Start

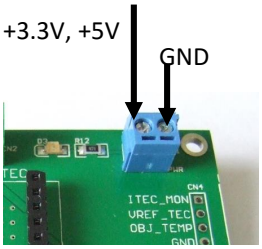
1. Verify the jumper settings:
   LK1: Leave open to enable the module
   LK2: In the default position uses VR2 to set temperature. Only move to the optional position if an external control voltage to be used.
3. Add R1 if necessary (default is open for maximum output voltage).
4. Add R2 and R3 if necessary (default is open for maximum positive & negative current)
5. Connect the TEC and thermistor and/or Object Board.
6. Attach the power supplies *(be sure to observe correct polarity – see below) and GO!*

Note: The Alarm LED will light until the object temperature reaches the set value at which time the LED will go out – typically within 30 seconds

FUNCTIONAL DESCRIPTIONS

Power Supply

An appropriate power supply should be connected to CN1. The supply voltage may be from 3.3V to 5V as required. When supply voltage is present D3 will illuminate green

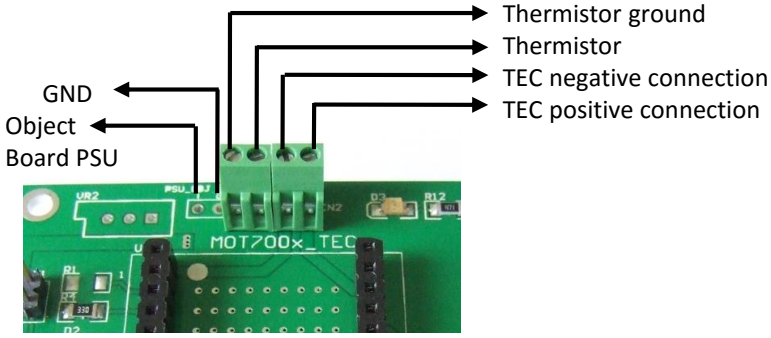


TEC Connection

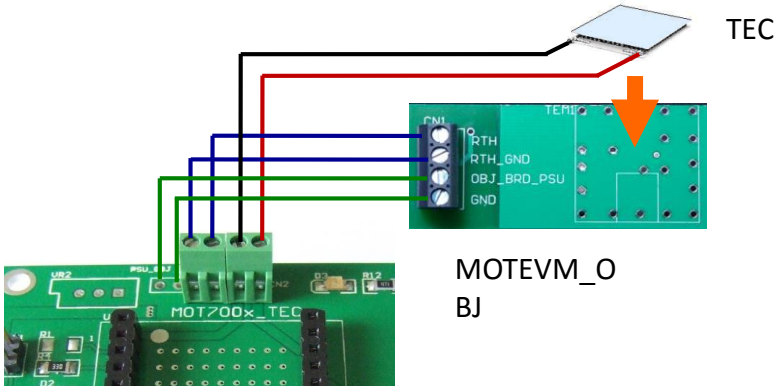
The TEC is connected via CN2. A temperature feedback thermistor connected to the object being controlled is also connected to CN2.

If the MOTEVM_OBJ board is being used the thermistor is already installed on the board. In addition, series diodes on the board can be used as a dummy heat source.

The current through these diodes is set by VR2 and the connection to them is via CN2. (see MOTEVM_OBJ Object Board)



Connection to MOTEVM_OBJ board

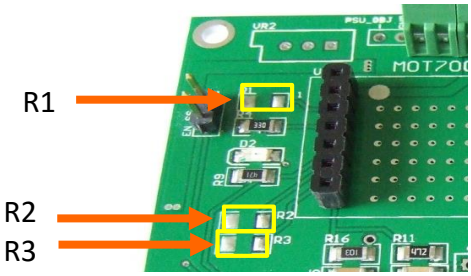


Be sure to observe the correct polarity for connections to the TEC and the load diodes on the MOTEVM-OBJ board.

To verify TEC polarity monitor the voltage on the RTH terminal and the center pin on LK2 (V_{TEMP_SET}). The voltage at RTH should be moving towards V_{TEMP_SET}. If it is moving away, towards 0V or 1.5V, then the connections are reversed.

Maximum Output Voltage

By default the MOT705_OEM ships with the VMAX_SET pin open, resulting in maximum output voltage swing. In some applications it may be desired to reduce the maximum voltage and this can be accomplished by the addition of a single resistor, R1.



See the MOT700x data sheet for calculating values for R1, R2, and R3.

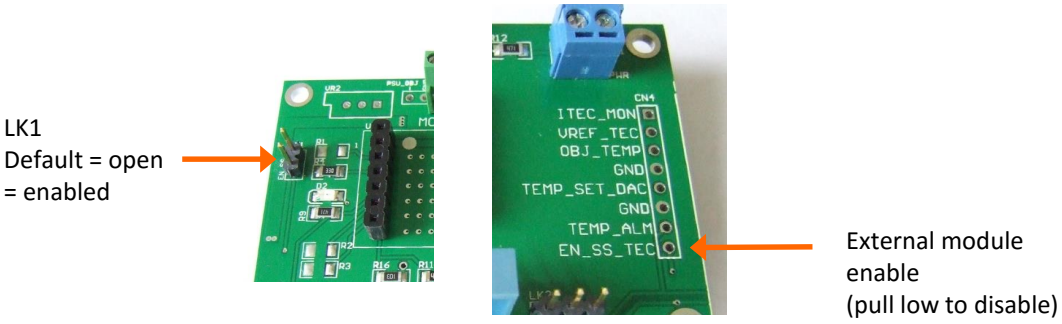
Maximum Output positive & negative currents

By default the MOT705_EVM ships with the IMAXP_SET & IMAXN_SET pin open, resulting in maximum output currents. In some applications it may be desired to reduce the maximum currents and this can be accomplished by the addition of a resistors, R2 and R3.

Module Enable

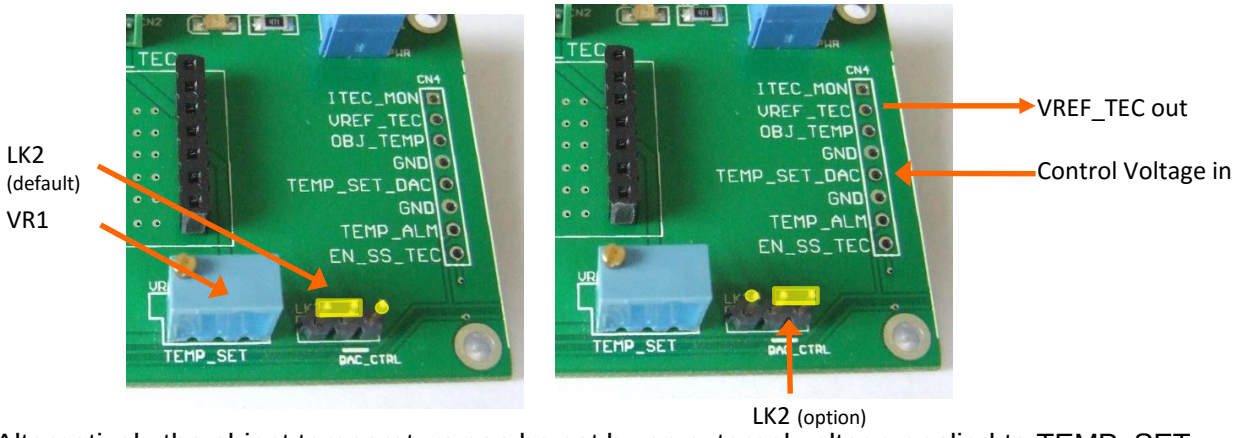
By default the module will power up when a supply voltage is applied (an internal pull-up means the pin may be left open for normal operation). If it is desired to disable the module the EN_SS pin should be connected to GND, which can be accomplished by closing LK1. When the link is removed the module will perform a soft start and resume operation.

The EN_SS signal line is also available on CN4 if external control is required (LK1 must be open in this case).



Temperature Setting

The required object temperature can be adjusted by means of VR1. LK2 should be set to the default position for this mode.



Alternatively the object temperature can be set by an external voltage applied to TEMP_SET_DAC on CN4. The reference voltage, VREF_TEC, is also available on CN4 and can be used as a reference for an external DAC. In this mode LK2 should be altered to the optional position.

Notes: Refer to the MOT700x data sheet for relationship between control voltage and object temperature.
If no control voltage is applied to TEMP_SET_DAC internal biasing will set the temperature to approximately 25˚C.

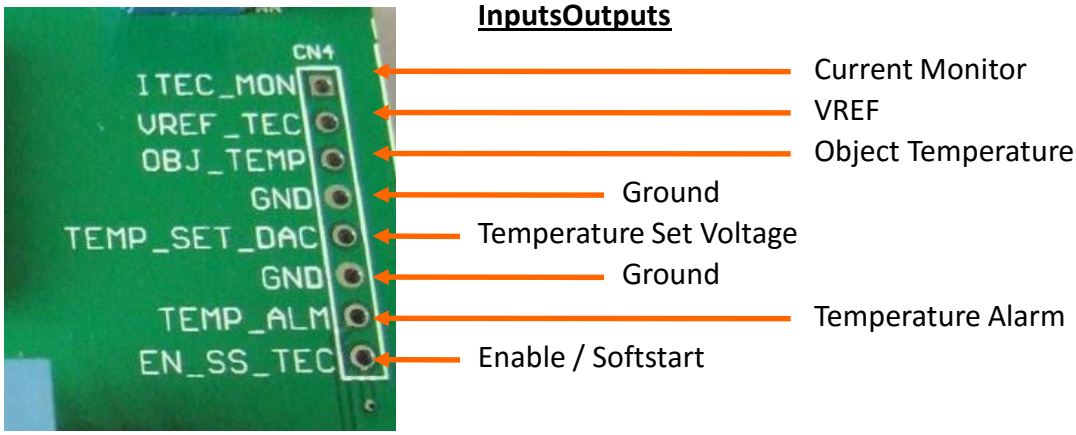
Temperature Alarm

Internal circuitry monitors the object temperature and will set an alarm flag when the temperature deviates by more than +/- 1.5˚ C. D2 will illuminate red when the alarm is set. The alarm status can also be monitored via TEMP_ALM at CN4.

Once the temperature returns to within limits the flag will automatically reset (D2 will go off).

External Monitoring and Control

A number of system parameters are available for monitoring, along with several control signal inputs, which would be used when the TEC controller module is connected to a host controller. For convenience these are grouped together on CN4.



Current Monitor

An analog voltage representing the output current to the TEC.

VREF_DAC

Reference voltage output (1.5V).

Object Temperature

An analog voltage representing the temperature of the object being monitored.

Temperature Set Voltage

An analog voltage to set the object temperature. Values from 0 – 1.1V may be applied.

Note: The actual "usable" range of voltage will be somewhat less according to the desired set temperature and module characteristics – see MOT700x data sheet.

Temperature Alarm

This pin is pulled low when the temperature falls outside a +/-1.5˚ C window.

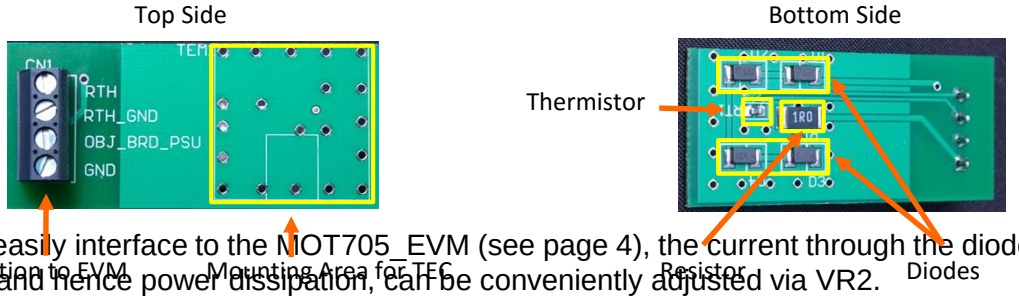
Enable / Softstart

A low level voltage puts the module in standby. When releases the module resumes normal operation.

MOTEVM_OBJ Object Board

This board is provided as a convenient way to evaluate system characteristics when using a MOT700x TEC Controller module with an appropriate Thermoelectric Module (TEC).

The board includes an area for mounting a TEC, and immediately underneath a 10K thermistor for temperature sensing. To simplify evaluation of system performance under various temperature / power dissipation conditions a series of diodes and a resistor on the board act as a heat source.



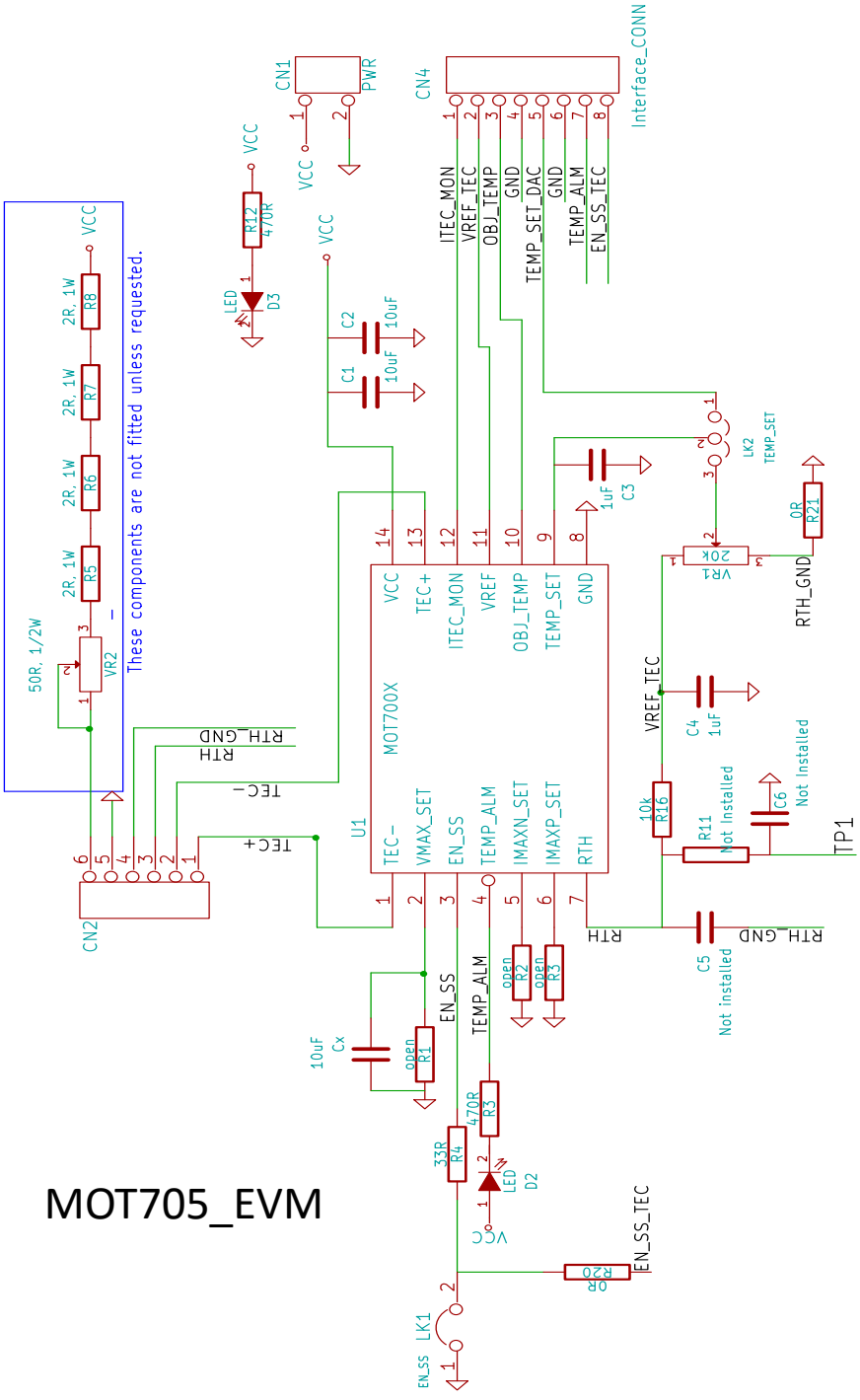
Designed to easily interface to the MOT705_EVM (see page 4), the current through the diodes and resistor, and hence power dissipation, can be conveniently adjusted via VR2.

For 3.3v operation:
Min current = 34mA, power dissipation = 43mW
Max current = 205mA, power dissipation = 336mW

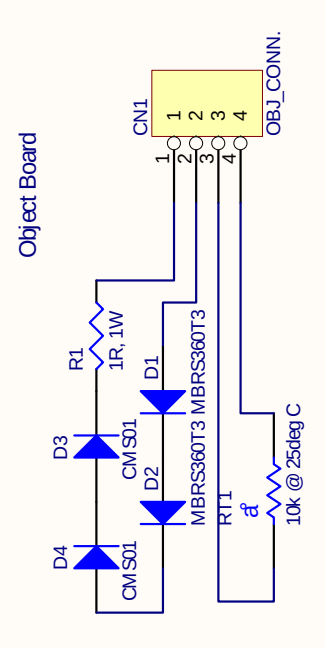
For 5V operation:
Min current = 60mA, power dissipation = 80mW
Max current = 370mA, power dissipation = 707mW

Note: For further information on using the Object Board please refer to application brief MOT7000ABr7, "Thermal Considerations when using the MOTEVM_OBJ Object Board"

Appendix 1 – Board Schematics



MOT705_EVM



MOTEVM_OBJ

IMPORTANT NOTICE

Modularone Technology, LLC, ("M1T") believes that the information contained herein was accurate and reliable at time of writing. However, the information is subject to change without notice and is provided "AS IS" without warranty of any kind (express or implied), and M1T reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time, and to discontinue any product or service without notice. Customers are advised to obtain the latest version of any and all relevant information to verify, before placing orders or beginning development of products based on M1T technologies, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, indemnification, and limitation of liability. No responsibility is assumed by M1T for the use of this information, including use of this information as the basis for development, manufacture or sale of any items, or for infringement of patents or other rights of third parties. This document is the property of M1T; by furnishing this information, M1T grants no license, express or implied, under any patents, mask work rights, copyrights, trademarks, trade secrets or other intellectual property rights. M1T owns the copyrights associated with the information contained herein and gives consent for copies to be made of the information only for use within your organization with respect to M1T modules, software, design files and any other products of M1T. This consent does not extend to other copying such as copying for general distribution, advertising or promotional purposes, or for creating any work for resale. Resale of M1T products or services with statements different from or beyond the parameters stated by M1T for that product or service voids all express and any implied warranties for the associated M1T product or service and is an unfair and deceptive business practice. M1T is not responsible or liable for any such statements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE.

CRITICAL APPLICATIONS. M1T PRODUCTS ARE NOT DESIGNED, AUTHORIZED OR WARRANTED FOR USE IN AIRCRAFT SYSTEMS, MILITARY APPLICATIONS, PRODUCTS SURGICALLY IMPLANTED INTO THE BODY, AUTOMOTIVE SAFETY OR SECURITY DEVICES, LIFE SUPPORT PRODUCTS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF M1T PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK AND M1T DISCLAIMS AND MAKES NO WARRANTY, EXPRESS, STATUTORY OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WITH REGARD TO ANY M1T PRODUCT THAT IS USED IN SUCH A MANNER. IF THE CUSTOMER OR CUSTOMER'S CUSTOMER USES OR PERMITS THE USE OF M1T PRODUCTS IN CRITICAL APPLICATIONS, CUSTOMER AGREES, BY SUCH USE, TO FULLY INDEMNIFY M1T, ITS OFFICERS, DIRECTORS, EMPLOYEES, DISTRIBUTORS AND OTHER AGENTS FROM ANY AND ALL LIABILITY, INCLUDING ATTORNEYS' FEES AND COSTS, THAT MAY RESULT FROM OR ARISE IN CONNECTION WITH THESE USES.

ModularOne Technology, M1T and the Modular One logo are trademarks of Modularone Technology, LLC. All other brand and product names in this document may be trademarks or service marks of their respective owners.

Contact Information:

Modular One Technology
5902 Wessex Court
Parker TX 75002

Phone: 214-566-3708
Email: info@modularonetechnology.com
Web: www.modularonetechnology.com