nano avionics

Magnetorquers MTQ3X

Data Sheet

NA-MTQ3X-G1-R0

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Document Revisions Traceability Sheet

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Contents

1 Introduction

NanoAvionics magnetorquers SatBus MTQ are a set of two (X and Y-axis) magnetorquer rods and one air core Z-axis magnetorquer coil which are mounted on a PC/104 form factor PCB to enable nanosatellite attitude control. The system is designed as a part of NanoAvionics “SatBus“ nanosatellite platform but can be used with any third party ADCS controllers that can provide 3 H-bridge PWM controlled voltage outputs to each torquer coil.

2 Feature overview

- 2 magnetorquer rods with soft magnetic cores and 1 air torquer coil
- Suitable for CubeSat detumbling & magnetic attitude control
- Compatible with PC/104 form factor and most Cubesat structures
- 3 separate 1.5 mm pitch PicoLock™ connectors for power input to each axis (connectors can be customized if required)
- PCB: Gold plated FR-4 (IPC-6012B)
- IPC – A600H class 3 assembly, soldering per ESA specification ECSS-Q-70-08
- Custom options available.

3 Product properties

- Operational temperature range: -40 °C to +85 °C
- Supply voltage: up to 5 V
- Power consumption (typ.): 0.4 W
- Dipole magnetic moment strength (typ.) @ 3.3 V: 0.34 Am2 (X & Y axis)
- Dipole magnetic moment strength (typ.) @ 3.3 V: 0.33 Am2 (Z axis).

4 Absolute maximum ratings

Table 1. Absolute Maximum Ratings

Parameter	Condition	Min	Max	Unit
Supply Voltage	X, Y, Z axis	-12	12	V
Temperatures				
Storage temperature		-50	125	°C
Operating temperature		-40	85	°C

5 Electrical characteristics

Table 2. Electrical Characteristics

Parameter	Condition	Min	Typ.	Max	Unit
X, Y-axis magnetorquer					
Supply Voltage		0	3.3	6	V
Resistance		-	28.0[1]	-	Ω
Power Consumption	U_{supply} = 3.3V	0	0.39[1]	-	W
Magnetic Dipole Moment Strength	U_{supply} = 3.3V	0	0.34[2][3]	-	Am^2
Residual Magnetic Dipole Moment Strength			6[2]		mAm^2
Z-axis Air Torquer					
Supply Voltage		0	3.3	6	V
Resistance		-	28.1[1]	-	Ω
Power Consumption	U_{supply} = 3.3V	0	0.39[1]	-	W
Magnetic Dipole Moment Strength	U_{supply} = 3.3V	0	0.33[2][4]	-	Am^2
Residual Magnetic Dipole Moment Strength			1[2]		mAm^2

[1] The value can vary ±5% of the base value.

[2] The measurements are ±10% accurate.

[3] For more detailed magnetic dipole moment strength refer to Figure 1.

[4] For more detailed magnetic dipole moment strength refer to Figure 2.

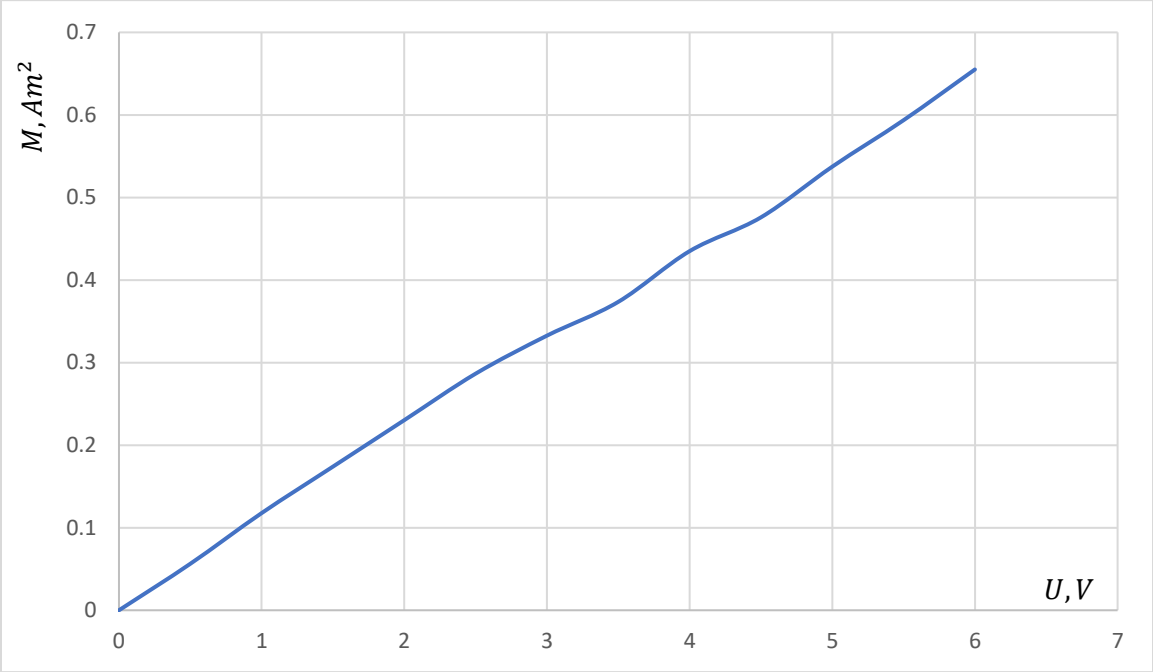

Figure 1. X, Y-axis MTQ Magnetic Dipole Moment Strength vs Supply Voltage.

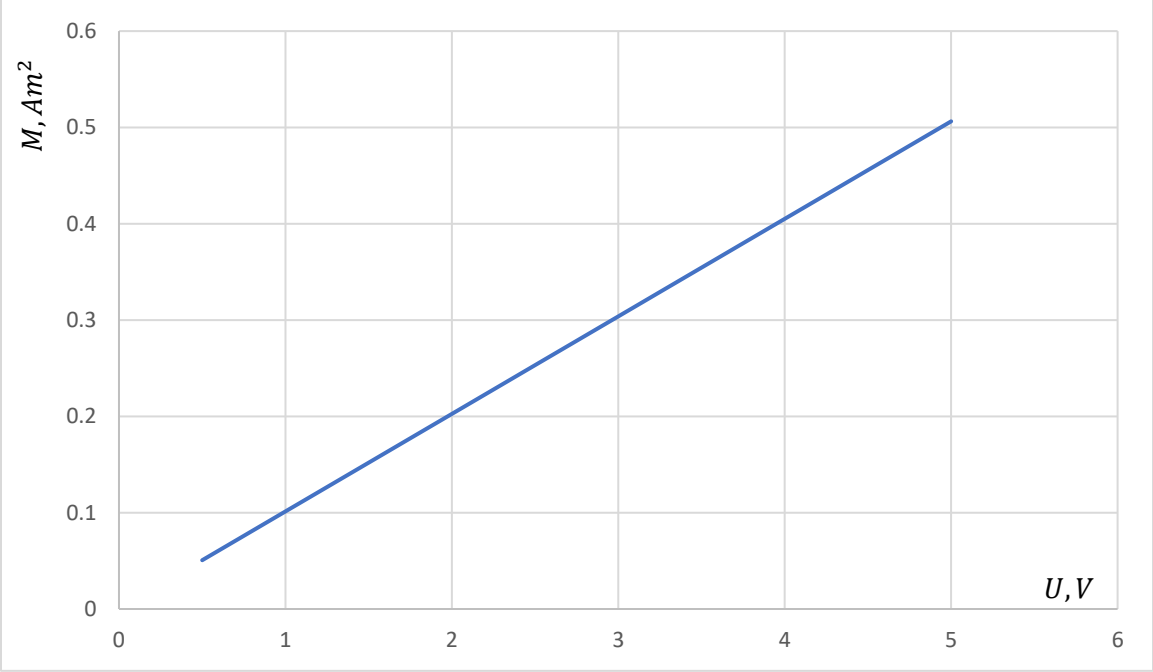

Figure 2. Z-axis MTQ Magnetic Dipole Moment Strength vs Supply Voltage.

6 Electrical interface

The default pin definition is provided in the Table 3, Table 4 and Table 5.

Table 3. MTQX Magnetorquer Wire Description

Pin #	Name
1	MTQ_X ++
2	MTQ_X ++
3	MTQ_X --
4	MTQ_X --

Table 4. MTQY Magnetorquer Wire Description

Pin #	Name
1	MTQ_Y ++
2	MTQ_Y ++
3	MTQ_Y --
4	MTQ_Y --

Table 5. MTQZ Magnetorquer Wire Description

Pin #	Name
1	MTQ_Z ++
2	MTQ_Z ++
3	MTQ_Z --
4	MTQ_Z --

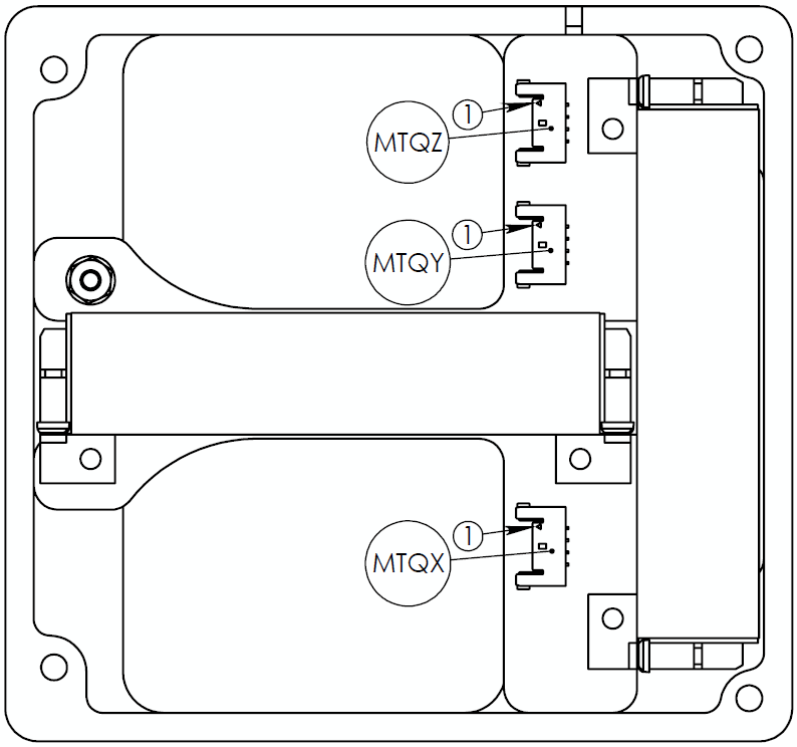

Figure 3. Magnetorquer Connector Pinout.

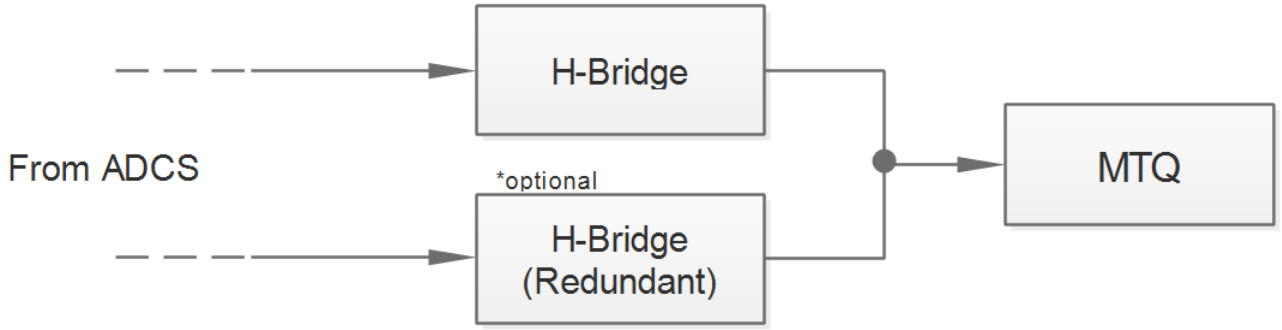

Figure 4. Typical Electrical Interfacing Block Diagram for Each Axis MTQ

7 Mechanical interface

The magnetorquers PCB complies with the PC/104 form factor, all dimensions are given in mm.

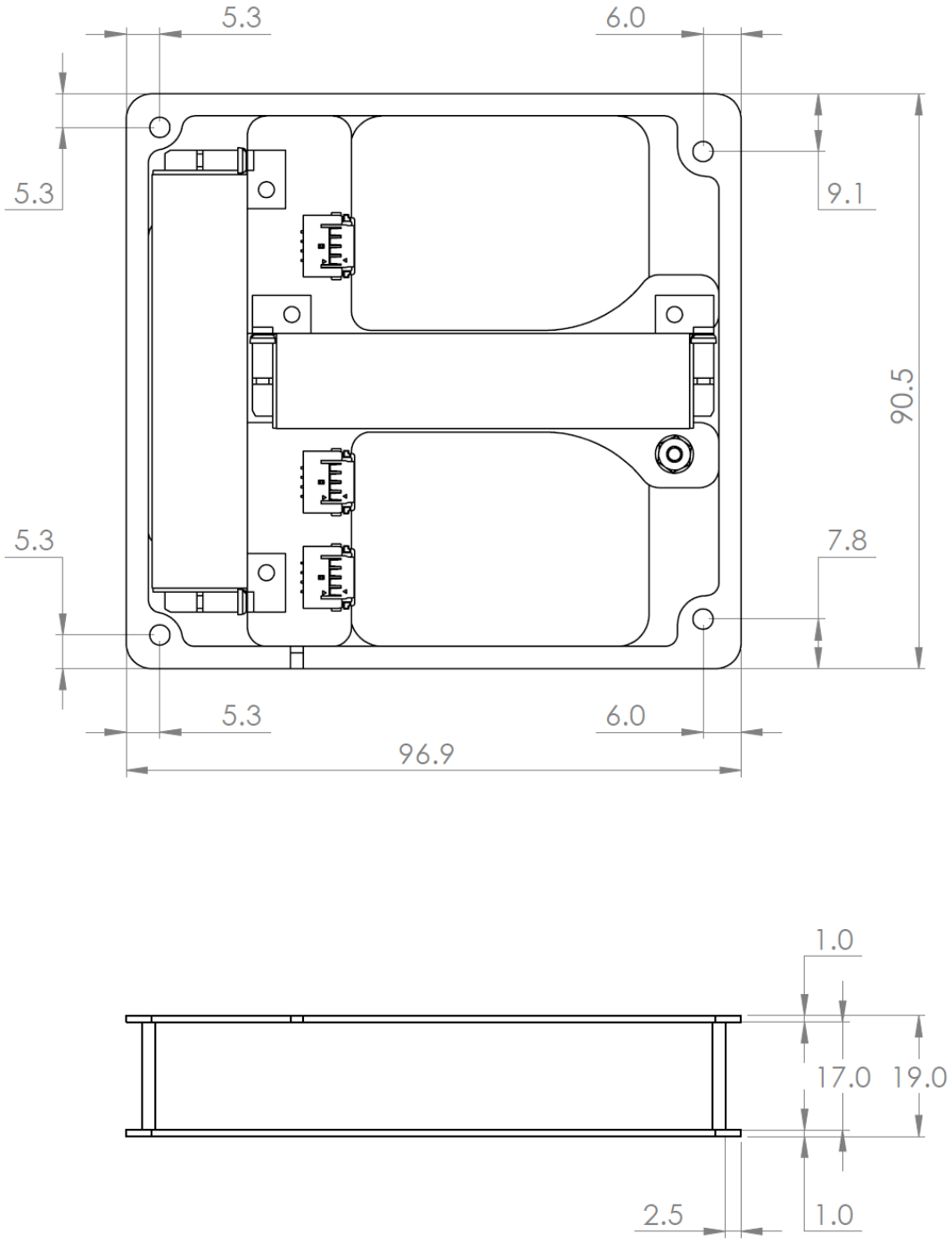

Figure 5. MTQ Assembly Drawing Dimensions [5]

[5] Drawing is not to scale.

8 Handling and Storage

NanoAvionics magnetorquers require specific guidelines to be observed for handling, transportation and storage. Failure to follow these guidelines may result in damage to the units or degradation in performance.

1.1 Protection for Electrostatic-Sensitive Devices (ESD)

It is essential to handle the device at static-safe workstations. ESD gloves and grounded antistatic wrist-strap as well as antistatic table surface will prevent damage from electrostatic discharge. Any accumulated charge on the body of the human operator should be discharged first before opening the protective container with ESD devices inside. The use of an antistatic smock for each worker is highly recommended.

1.2 General Handling

The magnetorquers are robust and designed to withstand flight conditions. However, care must be taken when handling the device. Do not drop the device as this can damage the magnetorquers. ESD compliant gloves should be worn when handling the hardware.

Flight hardware, which will be delivered conformal coted, should only be removed from packaging in an ISO 8 class (or better) clean room environment.

1.3 Shipping and Storage

The devices are shipped in anti-static packaging, enclosed in a Peli case. This case should be used for storage. Magnetorquers should be stored in anti-static containers at temperature from –20 °C to +50 °C and relative humidity should be not lower than 40 % and not higher than 60 %.

9 Disclaimer

The information in this document is subject to change without notice and should not be construed as a commitment by NanoAvionics, LLC. NanoAvionics assumes no responsibility for any errors that may appear in this document.