

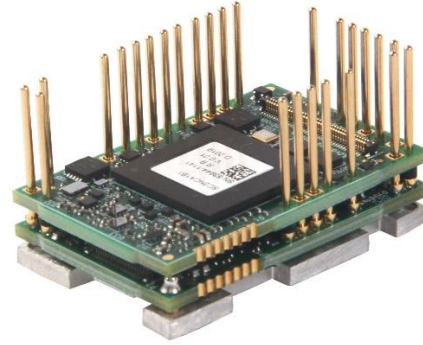
FE060-10-CM

FlexPro® Series

Product Status: Active

SPECIFICATIONS

| | |
|-----------------------|--------------------|
| Current Peak | 20 A |
| Current Continuous | 10 A |
| DC Supply Voltage | 10 – 55 VDC |
| Network Communication | CANopen |



The **FE060-10-CM** is a FlexPro® series servo drive with IMPACT™ architecture.

The **FE060-10-CM** offers full tuning control of all servo loops and is designed to drive brushed and brushless servo motors, stepper motors, and AC induction motors. The drive accepts a variety of external command signals, or can use the built-in Motion Engine, an internal motion controller used with Sequencing and Indexing commands. Programmable digital and analog I/O are included to enhance interfacing with external controllers and devices.

The **FE060-10-CM** features a CANopen interface for network communication and USB connectivity for drive configuration and setup. All drive and motor parameters are stored in non-volatile memory.

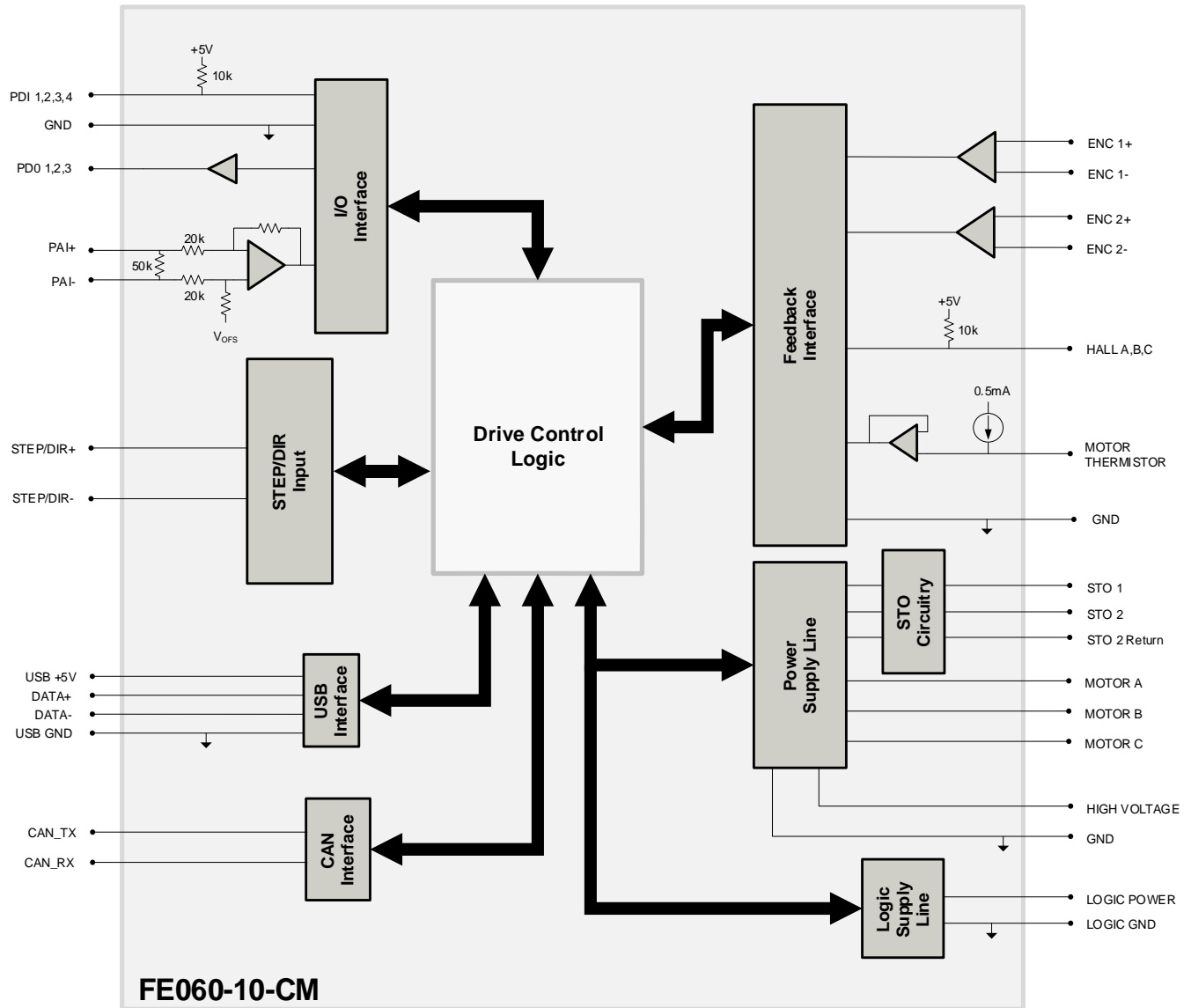
IMPACT™ (Integrated Motion Platform And Control Technology) combines exceptional processing capability and high-current components to create powerful, compact, feature-loaded servo solutions. IMPACT™ is used in all FlexPro® drives and is available in custom products as well.

FEATURES

- Follows the CAN in Automation (CiA) 301 Communications Profile and 402 Device Profile
- Four Quadrant Regenerative Operation
- Programmable Gain Settings
- PIDF Velocity Loop
- Space Vector Modulation (SVM) Technology
- Fully Configurable Current, Voltage, Velocity and Position Limits
- Compact Size, High Power Density
- On-the-Fly Mode Switching
- On-the-Fly Gain Set Switching
- Dedicated Safe Torque Off (STO) Inputs

| | | | | | |
|---------------------------|---|-------------------------|--|---------------------------|--|
| Feedback Supported | <ul style="list-style-type: none"> • Absolute Encoder <ul style="list-style-type: none"> ○ BiSS C-Mode ○ EnDat 2.2 • Incremental Encoder • Hall Sensors • Aux Incremental Encoder • ±10 VDC Position • Tachometer (±10V) | Motors Supported | <ul style="list-style-type: none"> • Three Phase • Single Phase • Stepper • AC Induction | Modes of Operation | <ul style="list-style-type: none"> • Profile Modes • Cyclic Synchronous Modes • Current • Velocity • Position • Interpolated Position Mode (PVT) |
| Command Sources | <ul style="list-style-type: none"> • Over the Network • ±10V Analog • Sequencing • Indexing • Jogging • Step & Direction • Encoder Following | Inputs / Outputs | <ul style="list-style-type: none"> • 4 Programmable Digital Inputs • 3 Programmable Digital Outputs • 1 Programmable Analog Input | Agency Approvals | <ul style="list-style-type: none"> • RoHS • UL (Pending) • CE (Pending) • TUV Rheinland (STO) (Pending) |

BLOCK DIAGRAM



INFORMATION ON APPROVALS AND COMPLIANCES



The RoHS Directive restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.

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SPECIFICATIONS

| Description | Electrical Specifications | | Value |
|---|---------------------------|--|-------|
| | Units | | |
| DC Supply Input Range | VDC | 10 – 55 | |
| DC Supply Undervoltage | VDC | 8 | |
| DC Supply Overvoltage | VDC | 58 | |
| Logic Supply Input Range (optional) | VDC | 10 – 55 | |
| Safe Torque Off Voltage (Default) | VDC | 5 | |
| Minimum Required External Bus Capacitance | μF | 500 | |
| Maximum Peak Current Output ¹ | A (Arms) | 20 (14.1) | |
| Maximum Continuous Current Output ² | A (Arms) | 10 (10) | |
| Efficiency at Rated Power | % | 99 | |
| Maximum Continuous Output Power | W | 545 | |
| Maximum Power Dissipation at Rated Power | W | 6 | |
| Minimum Load Inductance (line-to-line) ³ | μH | 150 (@ 48VDC supply); 75 (@24VDC supply); 40 (@12VDC supply) | |
| Switching Frequency | kHz | 20 | |
| Maximum Output PWM Duty Cycle | % | 85 | |

| Description | Control Specifications | | Value |
|-------------------------------------|------------------------|---|-------|
| | Units | | |
| Communication Interfaces | - | CANopen (USB for configuration) | |
| Command Sources | - | ±10 V Analog, Over the Network, Sequencing, Indexing, Jogging, Step & Direction, Encoder Following | |
| Feedback Supported | - | Absolute Encoder (BiSS C-Mode, EnDat 2.2), Hall Sensors, Incremental Encoder, Auxiliary Incremental Encoder, ±10 VDC Position, Tachometer (±10V) | |
| Commutation Methods | - | Sinusoidal, Trapezoidal | |
| Modes of Operation | - | Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT) | |
| Motors Supported ⁴ | - | Three Phase (Brushless Servo), Single Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector) | |
| Hardware Protection | - | 40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage | |
| Programmable Digital Inputs/Outputs | - | 4/3 | |
| Programmable Analog Inputs/Outputs | - | 1/0 | |
| Primary I/O Logic Level | - | 5 VDC, not isolated | |
| Current Loop Sample Time | μs | 50 | |
| Velocity Loop Sample Time | μs | 100 | |
| Position Loop Sample Time | μs | 100 | |
| Maximum Encoder Frequency | MHz | 20 (5 pre-quadrature) | |

| Description | Mechanical Specifications | | Value |
|--|---------------------------|---|-------|
| | Units | | |
| Size (H x W x D) | mm (in) | 38.1 x 25.4 x 11.5 (1.50 x 1.00 x 0.45) | |
| Weight | g (oz) | 19.8 (0.7) | |
| Ambient Operating Temperature Range ⁵ | °C (°F) | 0 – 65 (32 – 149) | |
| Storage Temperature Range | °C (°F) | -40 – 85 (-40 – 185) | |
| Relative Humidity | - | 0-95%, non-condensing | |
| Form Factor | - | PCB Mounted | |
| P1 SIGNAL CONNECTOR | - | 80-pin 0.4mm spaced connector | |
| TERMINAL PINS | - | 15x Terminal Pins | |

Notes

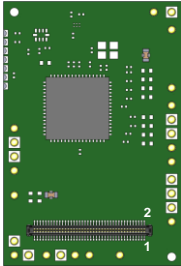
1. Capable of supplying drive rated peak current for 2 seconds with 10 second foldback to continuous value. Longer times are possible with lower current limits.
2. Continuous I_{Arms} value attainable when RMS Charge-Based Limiting is used.
3. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
4. Maximum motor speed for stepper motors is 600 RPM. Consult the hardware installation manual for 2-phase stepper wiring configuration.
5. Additional cooling and/or heatsink may be required to achieve rated performance.

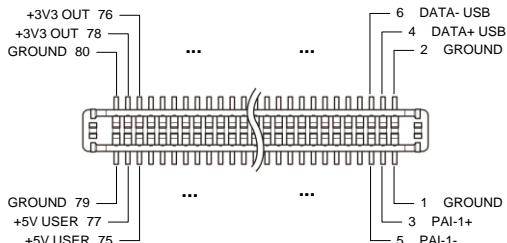
PIN FUNCTIONS

| P1 – Signal Connector | | | |
|-----------------------|------------------|--|-----|
| Pin | Name | Description / Notes | I/O |
| 1 | GROUND | Ground | GND |
| 3 | PAI-1+ | Differential Programmable Analog Input or Reference Signal Input (12-bit Resolution) | I |
| 5 | PAI-1- | | I |
| 7 | THERMISTOR | Motor Thermal Protection. | I |
| 9 | GROUND | Ground | GND |
| 11 | ENC 1 DATA+ / A+ | Differential Data Line for Absolute Encoders (BiSS: SLO+/-) or Differential Incremental Encoder A. | I/O |
| 13 | ENC 1 DATA- / A- | | I/O |
| 15 | ENC 1 CLK+ / B+ | Differential Clock Line for Absolute Encoders (BiSS: MA+/-) or Differential Incremental Encoder B. | I/O |
| 17 | ENC 1 CLK- / B- | | I/O |
| 19 | GROUND | Ground | GND |
| 21 | ENC 1 REF+ / I+ | Differential Reference Mark for Absolute Encoders (Leave open for BiSS) or Differential Incremental Encoder Index. | I |
| 23 | ENC 1 REF- / I- | | I |
| 25 | CAN_TX | CAN Transmit Line (requires external transceiver) | I/O |
| 27 | CAN_RX | CAN Receive Line (requires external transceiver) | I/O |
| 29 | CAN STANDBY | Low power CAN mode control | I/O |
| 31 | PDI-1 | Programmable Digital Input | I |
| 33 | PDI-2 | Programmable Digital Input | I |
| 35 | PDI-3 | Programmable Digital Input | I |
| 37 | PDI-4 | Programmable Digital Input | I |
| 39 | GROUND | Ground | GND |
| 41 | RESERVED | Reserved. Do not connect. | - |
| 43 | RESERVED | Reserved. Do not connect. | - |
| 45 | RESERVED | Reserved. Do not connect. | - |
| 47 | RESERVED | Reserved. Do not connect. | - |
| 49 | RESERVED | Reserved. Do not connect. | - |
| 51 | RESERVED | Reserved. Do not connect. | - |
| 53 | RESERVED | Reserved. Do not connect. | - |
| 55 | RESERVED | Reserved. Do not connect. | - |
| 57 | RESERVED | Reserved. Do not connect. | - |
| 59 | GROUND | Ground | GND |
| 61 | RESERVED | Reserved. Do not connect. | - |
| 63 | RESERVED | Reserved. Do not connect. | - |
| 65 | RESERVED | Reserved. Do not connect. | - |
| 67 | RESERVED | Reserved. Do not connect. | - |
| 69 | RESERVED | Reserved. Do not connect. | - |
| 71 | RESERVED | Reserved. Do not connect. | - |
| 73 | +5V_OUT | +5VDC unprotected supply (See Note 1) | O |
| 75 | +5V_USER | +5VDC User Supply for feedback and local logic (See Note 1) | O |
| 77 | +5V_USER | | O |
| 79 | GROUND | Ground | GND |

| Pin | Name | Description / Notes | I/O |
|-----|-----------|--|-----|
| 2 | GROUND | Ground | GND |
| 4 | DATA+ USB | USB Data Channel | I/O |
| 6 | DATA- USB | | I/O |
| 8 | GROUND | Ground | GND |
| 10 | SCLA | I ² C Data Signals for Addressing, Network Error LED, and Bridge Status LED. See Hardware Manual for more info. | O |
| 12 | SDAA | | I/O |
| 14 | HALL A | | I |
| 16 | HALL B | Single-ended Commutation Sensor Inputs | I |
| 18 | HALL C | | I |
| 20 | GROUND | Ground | GND |
| 22 | ENC 2 A+ | Differential Incremental Encoder A. | I |
| 24 | ENC 2 A- | | I |
| 26 | ENC 2 B+ | Differential Incremental Encoder B. | I |
| 28 | ENC 2 B- | | I |
| 30 | ENC 2 I+ | Differential Incremental Encoder Index. | I |
| 32 | ENC 2 I- | | I |
| 34 | PDO-1 | Programmable Digital Output (TTL/8mA) | O |
| 36 | PDO-2 | Programmable Digital Output (TTL/8mA) | O |
| 38 | PDO-3 | Programmable Digital Output (TTL/8mA) | O |
| 40 | GROUND | Ground | GND |
| 42 | RESERVED | Reserved. Do not connect. | - |
| 44 | RESERVED | Reserved. Do not connect. | - |
| 46 | RESERVED | Reserved. Do not connect. | - |
| 48 | RESERVED | Reserved. Do not connect. | - |
| 50 | RESERVED | Reserved. Do not connect. | - |
| 52 | RESERVED | Reserved. Do not connect. | - |
| 54 | RESERVED | Reserved. Do not connect. | - |
| 56 | RESERVED | Reserved. Do not connect. | - |
| 58 | RESERVED | Reserved. Do not connect. | - |
| 60 | GROUND | Ground | GND |
| 62 | RESERVED | Reserved. Do not connect. | - |
| 64 | RESERVED | Reserved. Do not connect. | - |
| 66 | RESERVED | Reserved. Do not connect. | - |
| 68 | STEP | Step Input. | I |
| 70 | DIR | Direction Input. | I |
| 72 | RESERVED | Reserved. Do not connect. | - |
| 74 | RESERVED | Reserved. Do not connect. | - |
| 76 | +3V3 OUT | +3.3VDC Supply Output for local logic signals (100 mA max) | O |
| 78 | +3V3 OUT | | O |
| 80 | GROUND | Ground | GND |

| | |
|---|--------------------------------|
| Connector Information | 80-pin, 0.4mm spaced connector |
| Mating Connector Details | PANASONIC: P/N AXT380224 |
| Mating Connector Included with Drive | No |





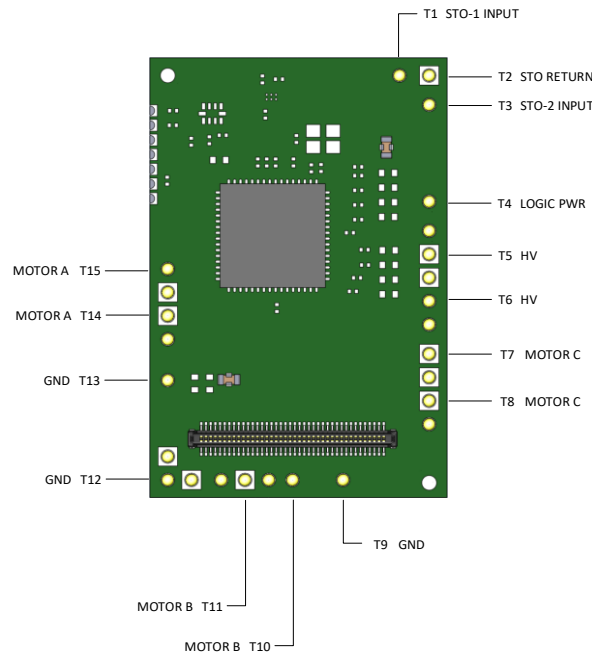
- Notes**
- Total current through pins P1-73/75/77 should not exceed 300mA, while no single pin should be loaded more than 150mA.

Drive Status LED and Node Addressing

SCLA (P1-10); SDAA (P1-12)
 The SCLA and SDAA pins allow Drive Status LED monitoring and Node Addressing to be performed with an I²C bus I/O expander. For more information on how to utilize and configure the I/O expander into an interface board, consult the hardware installation manual.

TERMINAL PIN LOCATIONS

The 15 Terminal Pins provide connection to the high power drive signals. Terminal Pins must be soldered to an interface board.



| Pin | Name | Description / Notes | I/O |
|-----|-------------|--|--------|
| T1 | STO-1 INPUT | Safe Torque Off – Input 1 | I |
| T2 | STO RETURN | Safe Torque Off Return | STORET |
| T3 | STO-2 INPUT | Safe Torque Off – Input 2 | I |
| T4 | LOGIC PWR | Logic Supply Input (10 – 55VDC) (optional) | I |
| T5 | HV | DC Supply Input (10 - 55 VDC). Minimum 500µF external capacitance required between HV and POWER GND. | I |
| T6 | HV | | I |
| T7 | MOTOR C | Motor Phase C. All provided motor phase output pins must be used. | O |
| T8 | MOTOR C | | O |
| T9 | GND | Ground. | GND |
| T10 | MOTOR B | Motor Phase B. All provided motor phase output pins must be used. | O |
| T11 | MOTOR B | | O |
| T12 | GND | Ground. | GND |
| T13 | GND | | GND |
| T14 | MOTOR A | Motor Phase A. All provided motor phase output pins must be used. | O |
| T15 | MOTOR A | | O |

Terminal Pin Details

Safe Torque Off (STO) Inputs

The Safe Torque Off (STO) inputs are dedicated +5VDC sinking single-ended inputs. For applications not using STO functionality, disabling of the STO feature is required for proper drive operation. STO may be disabled by following the STO Disable wiring instructions as given in the hardware installation manual. Consult the hardware installation manual for more information.

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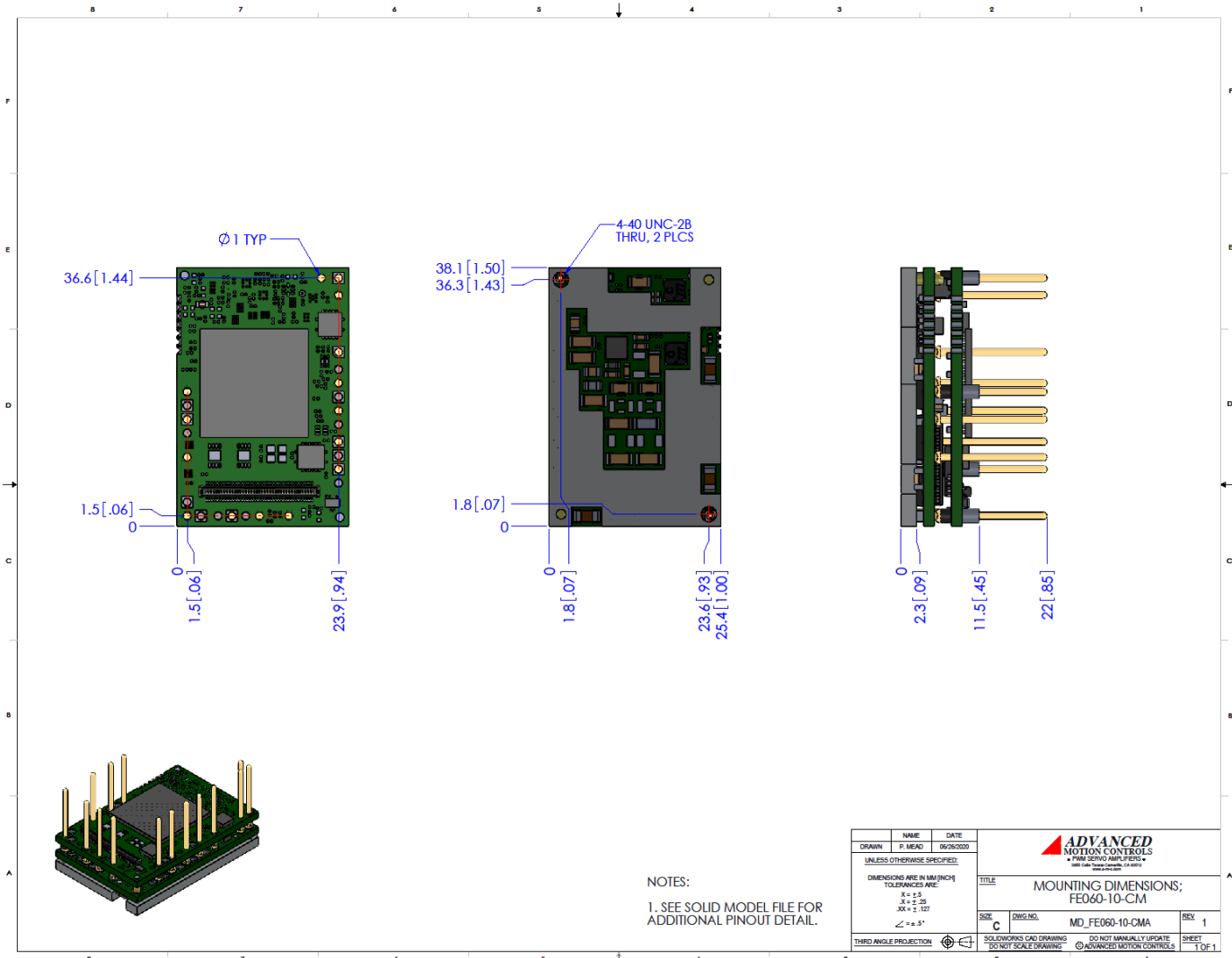


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MOUNTING DIMENSIONS



| | | | |
|--|---------|---|-----|
| NAME | DATE | ADVANCED MOTION CONTROLS • PRECISION APPLICATIONS • 4801 Lake Washington, CA 94015 www.advancedmotion.com | |
| DRAWN | J. MEAD | TITLE | |
| UNLESS OTHERWISE SPECIFIED: | | MOUNTING DIMENSIONS; FE060-10-CM | |
| DIMENSIONS ARE IN MILLIMETERS TOLERANCES ARE: X = ±.5 Y = ±.25 Z = ±.127 ∠ = ±.5° | | SIZE | REV |
| THIRD ANGLE PROJECTION | | C | 1 |
| SOLIDWORKS CAD DRAWING DO NOT SCALE DRAWING | | DO NOT MANUALLY UPDATE © ADVANCED MOTION CONTROLS | |
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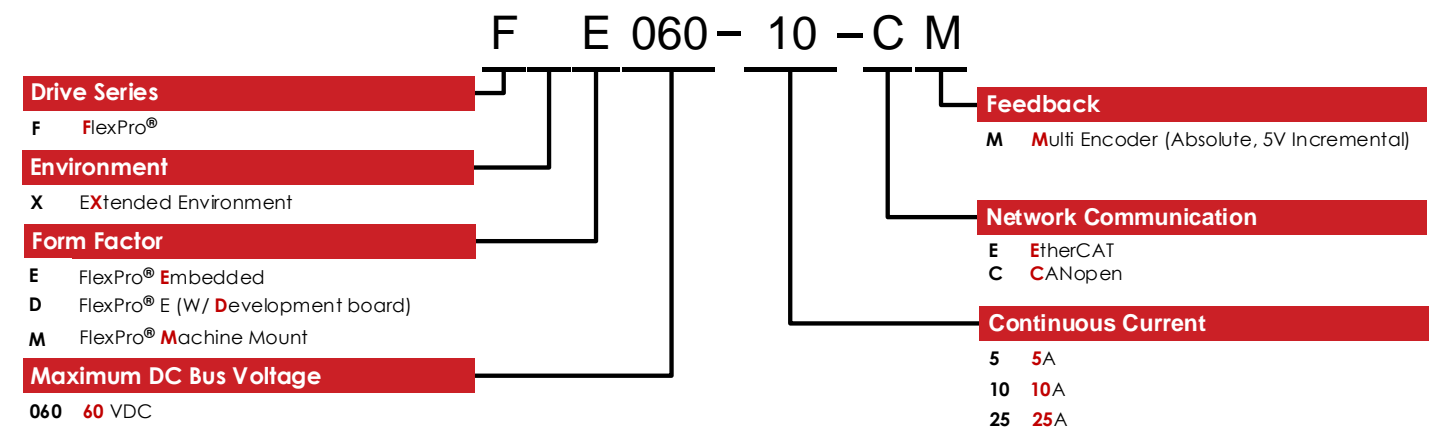
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PART NUMBERING AND CUSTOMIZATION INFORMATION



ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, ADVANCED Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

Examples of Customized Products

- | | |
|--|--|
| <ul style="list-style-type: none"> ▲ Optimized Footprint ▲ Private Label Software ▲ OEM Specified Connectors ▲ No Outer Case ▲ Increased Current Resolution ▲ Increased Temperature Range ▲ Custom Control Interface ▲ Integrated System I/O | <ul style="list-style-type: none"> ▲ Tailored Project File ▲ Silkscreen Branding ▲ Optimized Base Plate ▲ Increased Current Limits ▲ Increased Voltage Range ▲ Conformal Coating ▲ Multi-Axis Configurations ▲ Reduced Profile Size and Weight |
|--|--|

Feel free to contact us for further information and details!

Available Accessories

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit www.a-m-c.com to see which accessories will assist with your application design and implementation.

Development Board

The FE060-10-CM is offered in a pre-soldered development board assembly to provide easy connections to motor, power, and signal functions. The development board assembly can be ordered as model number **FD060-10-CM**.



All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.