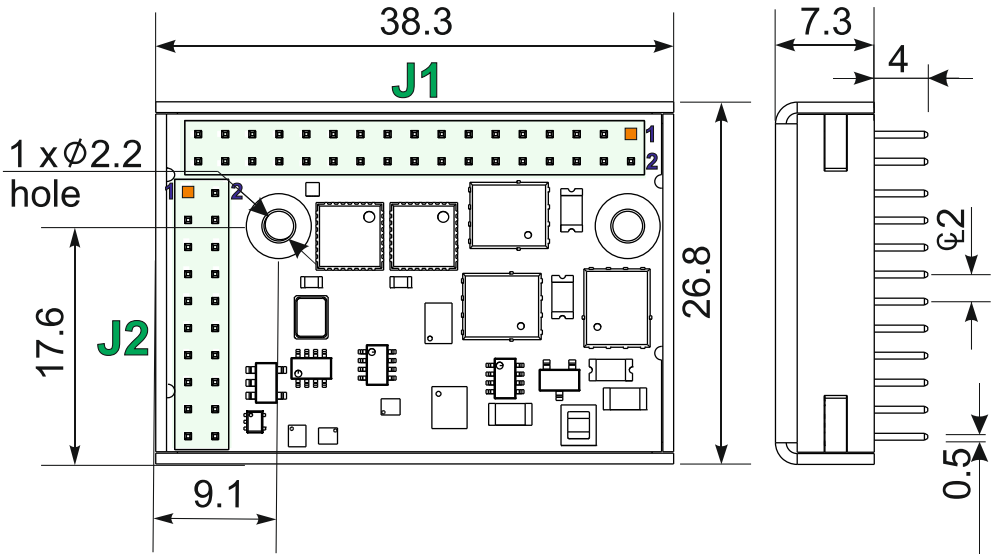
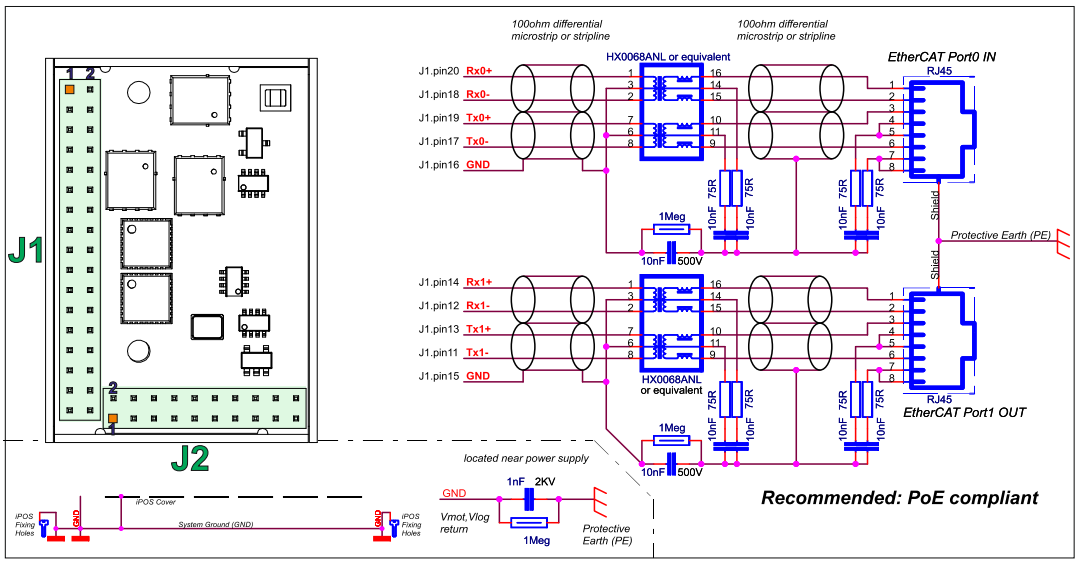


All dimensions are in mm. Drawing not to scale. Pins facing upward view.

Motor – sensor configurations			
Sensor \ Motor	PMSM	BLDC	DC BRUSH
Incr. Encoder	✓		✓
Incr. Encoder + Dig. Hall	✓	✓	
Linear Halls	✓		
Digital Halls control only	✓		
SSI / BiSS-C/ EnDAT/ TAMAGAWA/ Panasonic/ Nikon/ Sanyo Denki	✓	✓	✓
Tacho			✓

Mating Connectors			
Producer	Part No.	Connector	Description
Samtec	SQW-117-01-F-D(-VS)	J1	2x17, 2.0mm THT (SMD) socket
	CLT-117-02-F-D		2x17, 2.0mm SMD pass-through socket
	SQW-111-01-F-D(-VS)	J2	2x10, 2.0mm THT (SMD) socket
	CLT-111-02-F-D		2x10, 2.0mm SMD pass-through socket

- **Features**
- Motion controller and drive in a single compact unit based on MotionChip™ technology
- Universal solution for control of rotary and linear brushless and brushed motors
- Advanced motion control capabilities (CSP, PVT, S-curve, electronic gearing and cam)
- Motor supply: 48V nominal
- Motor output current:
  - Nominal:
  - $4A_{RMS}$ / 5.6A amplitude nominal when soldering pins directly to the motherboard;
  - Limited to $3A_{RMS}$ / 4.2A amplitude nominal using the recommended mating connectors;
  - Peak: $10A_{RMS}$ / 14A amplitude peak.
- Logic supply: 24V nominal, 48V max
- Feedback Options (up to 1x Hall sensors + 2x encoders)
  - 1 x Hall sensor interface (digital or linear)
  - Feedback#1 and Feedback#2 can be:
    - Incremental A / B (index Z available only for Encoder 1): differential or single-ended;
    - Absolute: differential or single-ended. Supported protocols: SSI, BiSS, EnDAT, Tamagawa, Panasonic, Nikon, Sanyo Denki;
- 1 x analogue input software selectable: 12-bit 0-5V or ±10V: Reference, Feedback or general purpose
- 3 x digital inputs: 2 for limit switches + one Enable, NPN, pull-to-GND to activate, pull-up on-board to +5V. Pull to GND to activate
- 3 x configurabile I/Os, each software selectable as:
  - Digital input, NPN, with pull-up on-board to +5V. Pull to GND to activate;
  - Digital output, NPN (open-collector), with pull-up on-board to +5V. Sink current: 1 x 1.5A to drive inductive loads (such as mechanical brake), 2 x 0.1A.
- Commissioning (set-up) possible through RS232, USB, FoE (file-over-EtherCAT) or EoE (Ethernet-over-EtherCAT)
- EtherCAT connection to standard RJ45: requires external magnetics (may be integrated into RJ45)
- 24k x 16 E2ROM to store setup data, TML motion programs, cam tables and other user data
- 16k x 16 SRAM memory for data acquisition
- Operating ambient temperature: 0-40°C (over 40°C with de-rating)
- Programmable protections: any short-circuit between motor phases, GND and/or supply, over/under-voltage, over-current, I2t, control error
- >99% voltage efficiency



J1 Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 VDC
2	A	O	**Phase A** for 3-ph motors, Motor+ for DC brush motors
3	GND	-	Ground return for logic supply
4	B	O	**Phase B** for 3-ph motors, Motor- for DC brush motors
5	GND	-	Shield for motor windings cable
6	C	O	**Phase C** for 3-ph motors
7	+Vmot	I	Positive terminal of the motor supply: 7 to 48 VDC
8	Rsvd.	-	Reserved.
9	BFS	-	Connect to GND to perform a firmware update after a critical firmware failure
10	ID2	I	*AxisID*[2] selection pin. See *AxisID* register settings table
11	TX1-	I/O	Transmit/Receive negative, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0-
12	RX1-	I/O	Receive/Transmit negative, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0-
13	TX1+	I/O	Transmit/Receive positive, OUT port. Connect to magnetics PHY TX1 or directly to nearby RX0+
14	RX1+	I/O	Receive/Transmit positive, OUT port. Connect to magnetics PHY RX1 or directly to nearby TX0+
15	GND	-	Ground shield for port 1
16	GND	-	Ground shield for port 0
17	TX0-	I/O	Transmit/Receive negative, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1-
18	RX0-	I/O	Receive/Transmit negative, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1-
19	TX0+	I/O	Transmit/Receive positive, IN port. Connect to magnetics PHY TX0 or directly to nearby RX1+
20	RX0+	I/O	Receive/Transmit positive, IN port. Connect to magnetics PHY RX0 or directly to nearby TX1+
21	ID0	I	*AxisID*[0] selection pin. See *AxisID* register settings table
22	ID1	I	*AxisID*[1] selection pin. See *AxisID* register settings table
23	232TX	O	RS-232 Data Transmission.
24	232RX	I	RS-232 Data Reception.
25	CAN Hi	-	CAN-Bus positive line (dominant high) — Not functional while in ECAT
26	CAN Lo	-	CAN-Bus negative line (dominant low)
27	IN2/LSP	I	5-60V digital NPN input. Positive limit switch input
28	IN3/LSN	I	5-60V digital NPN input. Negative limit switch input
29	IN5/Enable	I	5-60V digital NPN input. Drive Enable input
30	I/O0	I/O	5-50V NPN general-purpose digital programmable input IN0 /or NPN 1.5A output OUT0
31	I/O1	I/O	5-50V NPN general-purpose digital programmable input IN1 / or NPN 0.1A output OUT1
32	I/O4	I/O	5-50V NPN general-purpose digital programmable input IN4 / or NPN 0.1A output OUT4
33	GND	-	Ground return and shield
34	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)

J2 Pin	Name	Type	Description
1	+V USB	I	5V input from USB
2	GND	-	Ground return for USB
3	Hall1	I	Digital Hall, or Linear Hall sensor 1
4	Hall2	I	Digital Hall, or Linear Hall sensor 2
5	Hall3	I	Digital Hall, or Linear Hall sensor 3
6	GND	-	Ground return and shield
7	+5V	O	Supply for all feedback sensors
8	GND	-	Ground return and shield
9	EncA1+/EncA1/ Dt1+/Dt1	I	Encoder 1 A+/Data+ diff. input or single-ended input
10	EncA1-/Dt1-	I	Encoder 1 A-/Data- diff. input. Leave open for single-ended; Add externally 120Ω to pin 9 for differential
11	EncB1+/EncB1/ Clk1+/Clk1	I	Encoder 1 B+/Clock+ diff. input or single-ended input
12	EncB1/ Clk1-	I	Encoder 1 B-/Clock- diff. input. Leave open for single-ended; Add externally 120Ω to pin 11 for differential
13	EncA2+/EncA2/ Dt2+/Dt2	I	Encoder 2 A+/Data+ diff. input or single-ended input
14	EncA2-/Dt2-	I	Encoder 2 A-/Data- diff. input. Leave open for single-ended; Add externally 120Ω to pin 13 for differential
15	EncB2+/EncB2/ Clk2+/Clk2	I/O	Encoder 2 B+/Clock+ diff. input or single-ended input
16	EncB2-/ Clk2-	I	Encoder 2 B-/Clock- diff. input. Leave open for single-ended; Add externally 120Ω to pin 15 for differential
17	Z1+	I	Encoder 1 Z+ diff. input or single-ended input
18	Z1-	I	Encoder 1 Z- diff. input. Leave open for single-ended; Add externally 120Ω to pin 17 for differential
19	USB DM	I/O	USB data-
20	USB DP	I/O	USB data+

AxisID register

MSB								LSB
Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
ID2			ID1			ID0		

Nominal[V]	Minimum[V]	Maximum[V]	IDx* Bits	IDx* Value
0.000	0.00	0.53	**000**	**0**
1.057	0.53	1.41	**001**	**1**
1.756	1.41	2.01	**010**	**2**
2.254	2.01	2.43	**011**	**3**
2.600	2.43	2.75	**100**	**4**
2.894	2.75	3.01	**101**	**5**
3.128	3.01	3.22	**110**	**6**
3.319	3.22	3.35	**111**	**7**

Remarks:

*1. AxisID = (64*ID2_Value) + (8*ID1_Value) + ID0_Value*
2. If the AxisID pins are not connected, the AxisID value can't be determined.
3. If all "IDx" pins are connected to GND the AxisID value is 255 and the EtherCAT register called "configured station alias" will be 0.
4. Bit 8 (MSB of ID2) is ignored, and always considered as "0"

** where "x" can be 1, 2 or 3*

Electrical characteristics

All parameters measured under the following conditions (unless otherwise specified):

- VLOG = 24 VDC; VMOT = 48VDC; F_{PWM} = 20 kHZ
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude) = 5.6A

• **Operating Conditions**		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		0		40[1]	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Storage Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		-40		100	ºC
Ambient humidity	Non-condensing	0		100	%Rh
Ambient Pressure		0		10.0	atm
ESD capability (Human body model)	Not powered; applies to any accessible part			±0.5	kV
	Original packaging			±15	kV
Mechanical Mounting		**Min.**	**Typ.**	**Max.**	**Units**
Airflow		natural convection[3], closed box			
Spacing required for horizontal mounting	Between adjacent drives		10		mm
	Between drives and nearby walls		10		mm
	Space needed for drive removal		20		mm
	Between drives and roof-top		30		mm
Insertion force	Using recommended mating connectors		20		N
Extraction force			8		N
Environmental Characteristics		**Min.**	**Typ.**	**Max.**	**Units**
Size (Length x Width x Height)	Global size	38.3 x 26.8 x 11.3			mm
		~1.51 x 1.05 x 0.44			inch
Weight		8			g
Cleaning agents	Dry cleaning is recommended	Only Water- or Alcohol- based			
Protection degree	According to IEC60529	IP20			-

Logic Supply Input (+V_{LOG})		**Min**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values	6	24	48	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	4.9		60	V_{DC}
	Absolute maximum values, continuous	-0.5		63	V_{DC}
Supply current	+V_{LOG} = 12V		90	150	mA
	+V_{LOG} = 24V		60	90	
	+V_{LOG} = 48V		45	60	
Voltage Measurement	Total error			1.5	%
Utilization category	Acc. to 60947-4-1 (I_{PEAK}<=1.05*I_{NOM})	DC-1			

Motor Supply Input (+V_{MOT})		**Min.**	**Typ.**	**Max.**	**Units**
Supply voltage	Nominal values	7		48	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	6		60	V_{DC}
	Absolute maximum values, continuous	-0.5		63	V_{DC}
Supply current	Idle		25		mA
	Operating	-15	±3	+15	A
	Absolute maximum value, short-circuit condition (Duration ≤ 10ms) †			16.5	A
Voltage Measurement	Total error			1.5	%
Utilization category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})	DC-3			

Motor Outputs (A/A+, B/A-, C)			**Min.**	**Typ.**	**Max.**	**Units**
Nominal current	PMSM motors sinusoidal amplitude				5.6	A
	PMSM motors sinusoidal RMS				4	A_{RMS}
	DC/BLDC motors continuous[4]				4.85	A
Peak current	maximum 2.5s		-14		+14	A
Short-circuit protection threshold			±16.5		±18	A
Short-circuit protection delay			2		4	µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance			0.1		V
Off-state leakage current				0.3	**1**	mA
Voltage Efficiency				92		%
Motor inductance (phase-to-phase)		F_{PWM}				µH
	Recommended value, for current ripple max. ±5% of full range; +V_{MOT} = 48 V	20 kHz		900		
		40 kHz		480		
		60 kHz		320		
		80 kHz		240		
		100 kHz		200		
	Minimum value, limited by short-circuit protection; +V_{MOT} = 48 V	20 kHz		270		µH
		60 kHz		150		
		40 kHz		100		
		80 kHz		80		
		100 kHz		60		
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz		330		µs
		40 kHz		170		
		60 kHz		140		
		80 kHz		80		
		100 kHz		66		
Current measurement	FS = Full Scale accuracy			±2	±3	%FS

Encoder Inputs (A+, A-, B+, B-, Z+, Z-, A2+, A2-, B2+, B2-)[5]		**Min.**	**Typ.**	**Max.**	**Units**
Single-ended mode compliance	Leave A1-, B1-, Z1-, A2-, B2- floating	TTL/CMOS/Open-collector (NPN)			
Single-ended threshold	A1+, B1+, Z1+, A2+, B2+	1.2	1.3	1.5	V
Single-ended input current	Input pulled to GND against on-board 2.2 KΩ pull-up to 5V		2.2	2.5	mA
Differential mode compliance	For full RS422 compliance, see [2]	TIA/EIA-422-A			
Input voltage	Hysteresis	±0.03	±0.05	±0.2	V
	Differential mode	-15		+15	
	Common-mode range (A+ to GND, etc.)	-7		+12	
Input impedance, differential	A+, A2+, B+, B2+, Z+, Z2+		2.2		kΩ
	A-, A2-, B-, B2-, Z-, Z2-		4.4		
Input frequency	Differential mode	0		15	MHz
Minimum pulse width	Differential mode	33			ns
ESD protection	Human body model	±30			kV

Supply Output (+5V)		**Min.**	**Typ.**	**Max.**	**Units**
Output voltage	Current sourced = 400mA	5.05	5.2	5.25	V
Output current[6]		650			mA
	24V motor		800		
Short-circuit to GND protection		Yes / Drive resets at event			
Over-voltage protection		NOT protected			
ESD protection	Human body model	±1			KV

[1] Operating temperature at higher temperatures is possible with reduced current and power ratings
[2] Micro 4803 can be operated in vacuum (no altitude restriction), but at altitudes over 2,500m, current and power rating are reduced due to thermal dissipation efficiency.
[3] In case of forced cooling (conduction or ventilation) the spacing requirements may drop substantially down to zero as long as the ambient temperature is kept below the maximum operating limit
[4] For current values >3A_{RMS} pins needs to be soldered instead of socketed
[5] Full RS-422 compatibility, as well as noise rejection improvement requires an external 120Ω resistor connected across each signal pair (A1+/A1-, B1+/ B1-, Z1+/Z1-, A2+/A2-, B2+/B2-)
[6] For more details see the "Current de-rating with +5V output current" graph

Digital Outputs (OUT0, OUT1, OUT4)				**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance	All outputs (OUT0, OUT1, OUT4)				NPN 24V		
Default state	Not supplied (+V_{LOG} floating)				High-Z (floating)		
	Immediately after power-up				Logic "HIGH"		
Output voltage	Logic "LOW"; output current = 1.5A for OUT0/ 0.05A for the other digital outputs					0.4	V
	Logic "HIGH"; output current = 0, no load			4	4.5	5	
	Logic "HIGH", external load to +V_{LOG}				V_{LOG}		
	Absolute maximum, continuous (free-wheeling diodes to +V_{LOG} to GND)			-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1s) †			-1		V_{LOG}+1	
Output current	Logic "LOW", sink current, short duration, duty cycle <=1%	5s max	OUT1, OUT4			0.1	A
			OUT0			2	
		0.5s max	OUT1, OUT4			0.15	A
			OUT0			2.5	
	Logic "HIGH", source current; external load to GND; V_{OUT} >= 2.0V					5	mA
	Logic "HIGH", leakage current; external load to +V_{LOG}; V_{OUT} = V_{LOG} max = 40V				0.05	0.1	mA
Minimum pulse width				0.5			µs
ESD protection	Human body model			±15			kV

Hall Inputs (Hall1, Hall2, Hall3)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance	TTL / CMOS / Open-collector (NPN sink), or analog (linear) 0…5V					
Default state	Input floating (Wiring disconnected)		4.5	4.7	5	V
Input voltage	Digital	Logic "LOW"		1.5	1.7	
		Logic "HIGH"	3	2.5		
		Hysteresis		0.5		
	Analog		0	0.5…4.5	4.95	
Input current	Logic "LOW"; Pull to GND			2.3		mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to 5V			0		
Minimum pulse width				70		µs
ESD protection	Human body model			±15		kV

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5/ENA)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance				NPN		
Default state	Input floating (wiring disconnected)			Logic HIGH		
Input voltage	Logic "LOW"	IN0, IN1, IN4, IN5/ENA		1.4	1.8	V
	Logic "HIGH"		3.1	2.5		
	Hysteresis		0.9	1.1	1.4	
	Logic "LOW"	IN2/LSP, IN3/LSN		1.4	1.6	
	Logic "HIGH"		4	3.5		
	Hysteresis			0.6		
	Floating voltage (not connected)			4.5		
	Absolute maximum, continuous		-5		+55	
Input current	Logic "LOW"; Pulled to GND			9	10	mA
	Logic "HIGH"; Pulled to +24V				0.4	
Input frequency			0		500	kHz
Minimum pulse			1			µs
ESD protection	Human body model		±2			kV

RS-232		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		TIA/EIA-232-C			
Bit rate	Software selectable	9600		115200	Baud
Short-circuit	232TX short to GND	Guaranteed			
ESD protection	Human body model	±2			kV

Absolute encoder interface: SSI, BISS-C, EnDAT, Tamagawa, Nikon, Sanyo Denki		**Min.**	**Typ.**	**Max.**	**Units**
Differential mode (CLOCK, DATA)	For full RS422 compliance, see[1]	TIA/EIA-422-A			
CLOCK (DATA) Output voltage	Differential; 50Ω differential load	1.5	3.3		V
	Common-mode, referenced to GND	1	1.7	3	
CLOCK frequency	Software selectable	1000, 2000, 3000, 4000			kHz
CLOCK (DATA) Short-circuit protection	Common-mode voltage ±15V	Yes, protected			
DATA format	Software selectable	Binary / Gray			
		Single-turn / Multi-turn			
		Counting direction			
		CRC type			
DATA resolution	Single-turn			56	Bits
	Multi-turn and single-turn			56	
	If total resolution >31 bits, some bits must be ignored by software setting to achieve a max 31 bits resolution				

Analog Inputs (REF, FDBK)					
0…5V Mode		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0		4.95	V
	Absolute maximum values, continuous	-12		+18	
	Absolute maximum, surge (duration ≤ 1s)			±36	
Input impedance	To 1.447V		20		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[2]
Bandwidth (-3dB)	Software selectable	0		1.5	kHz
ESD protection	Human body model	±2			kV

±10V Mode		**Min.**	**Typ.**	**Max.**	**Units**
Differential voltage range			±10		V
Common-mode voltage range	Referenced to GND	-12	0…10	+50	V
Input impedance	To 1.447V		20		kΩ
Resolution			12		bits
Integral linearity				0.036	%FS[2]
Offset error	Common-mode voltage = 0…10 V		±0.2	±0.5	%FS[2]
Gain error			±0.5	±3	%FS[2]
Bandwidth (-3dB)	Software selectable	0		5.5	kHz

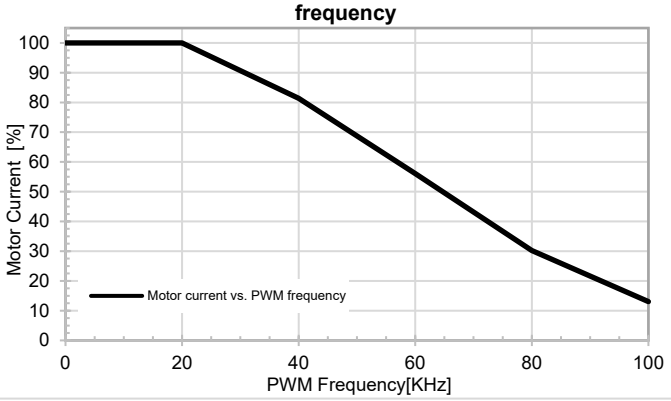
EtherCAT®		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		IEEE802.3, IEC61158			
Transmission line specification	According to TIA/EIA-568-5-A	Cat. 5e.UTP			
J1 pinout	EtherCAT® supports MDI/MDI-X auto-crossover	TIA/EIA-568-A or TIA/EIA-568-B			
Software protocols compatibility		CoE, CiA402, IEC61800-7-301			
Node addressing	By software	1 ÷ 255			-
	By Hardware				-
MAC addressing		none			-
ESD protection	Human body model	±15			kV

† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

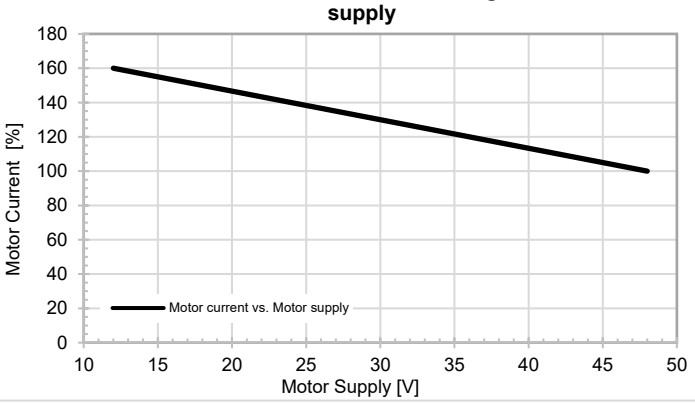
[1] Full RS-422 compatibility, as well as noise rejection improvement requires an external 120Ω resistor connected across each signal pair (A1+/A1-, B1+/ B1-, Z1+/Z1-, A2+/A2-, B2+/B2-)

[2] "FS" stands for "Full Scale"

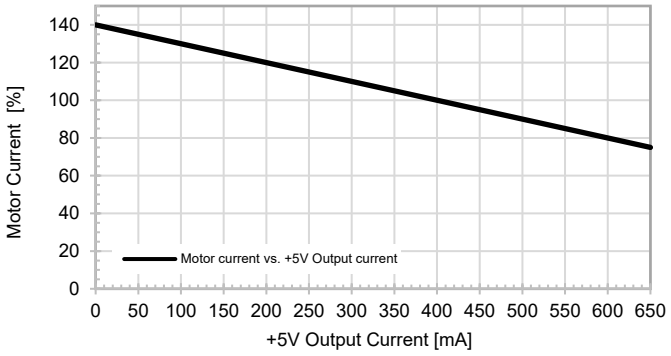
Micro 4803 PZ-CAT - Current de-rating with PWM frequency



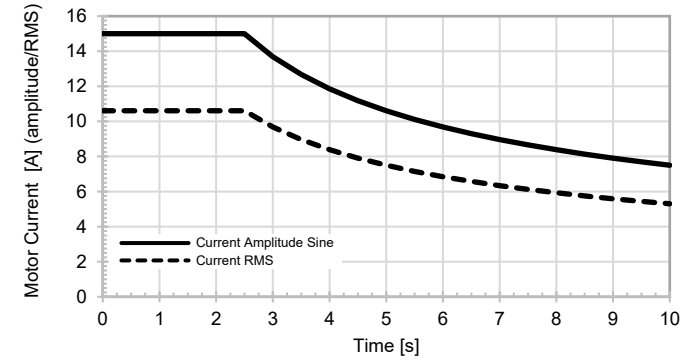
Micro 4803 PZ-CAT - Current de-rating with Motor supply



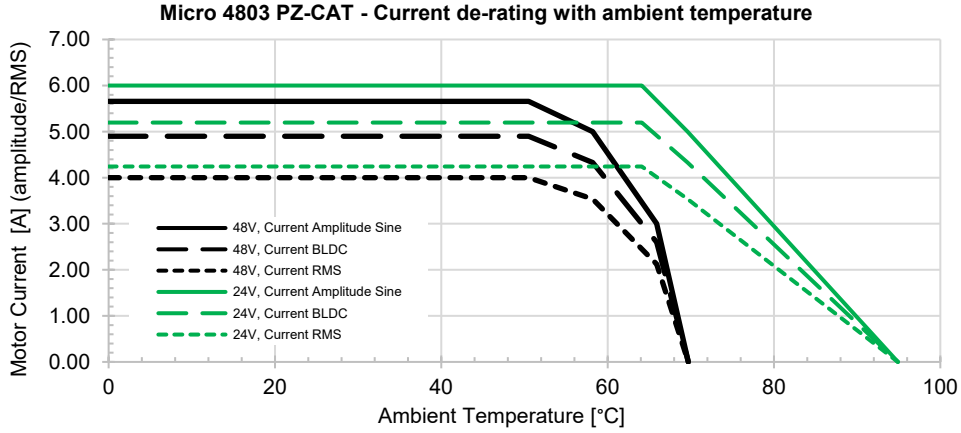
Micro 4803 PZ-CAT - Current de-rating with +5V output current



Micro 4803 PZ-CAT - Peak current vs. Time



Micro 4803 PZ-CAT - Current de-rating with ambient temperature



Micro 4803 PZ-CAT - Derating with altitude