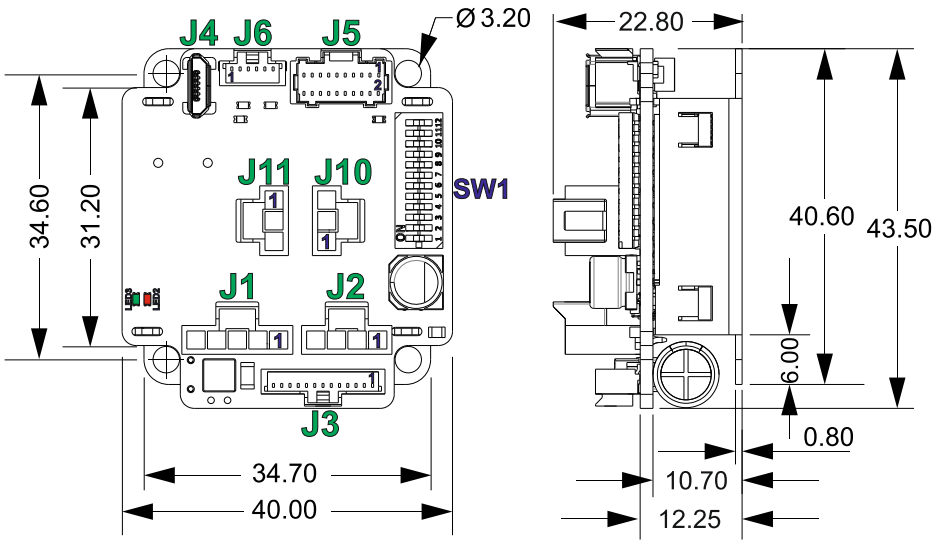
Micro 4804 CZ-CAN-STO
DATASHEET
P/N: P020.803.E202



All dimensions are in mm. Drawing not to scale.

Motor – sensor configurations

Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	✓		✓	✓	
Incr. Encoder + Dig. Hall	✓	✓			
Linear Halls	✓				
Digital Hall control only	✓				
BISS / SSI / EnDAT / TAMAGAWA / Nikon / Sanyo Denki / Panasonic	✓	✓	✓	✓	
Tacho			✓		
Open-loop (no sensor)				✓	✓

Mating Connectors

Producer	Part No.	Connector	Description	
Molex	1053071205	J1	1x5 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 5 circuits	
Molex	1053071203	J10, J11	1x3 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 3 circuits	
Molex	1053071204	J2	1x4 Nano-Fit, 2.50mm Pitch Nano-Fit Wire-to-Board Housing, 4 circuits	
Molex	5013301300	J3	1x13 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 13 Circuits	
Molex	5011892010	J5	2x10 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 20 Circuits	
Molex	5013300600	J6	1x6 Pico-Clasp, 1.00mm Pitch Pico-Clasp Wire-to-Board Housing, 6 Circuits	
Tensility International Corp	1002333	J4	USB cable, Cable USB A Male - Micro B Male, 1m, shielded, black, 9.6mm plastic width	
Molex	0797582140	J1, J2, J10, J11	Pre-Crimped wires for Nano-Fit	Cable Assembly, Nano-Fit Crimp Terminal Socket to Nano-Fit Crimp Terminal Socket, 300mm
Molex	0797581019	J3, J5, J6	Pre-Crimped wires for Pico-Clasp	Cable Assembly, Pico-Clasp Crimp Terminal Socket to Pico-Clasp Crimp Terminal Socket, 300mm
Molex	1053002400	J1, J2, J10, J11	Pins for Nano-Fit	Nano-Fit Crimp Terminal, Female, 0.76µm Gold (Au) Plating, Lubricated, 20-22 AWG
Molex	5011937000	J3, J5, J6	Pins for Pico-Clasp	1.00mm Pitch, Pico-Clasp Female Crimp Terminal, Gold Plating 0.10µm, 28-32 AWG, Reel
Molex	638275600	J1, J2, J10, J11	Crimp tool Nano Fit	Crimp Tool, Ratchet, Molex Nano-Fit 105300 Series 20-22AWG Socket Contacts, 207129 Series
Molex	638191500	J3, J5, J6	Crimp tool Pico-Clasp	Crimp Tool, Ratchet, Molex Pico-Clasp 501193 & 501334 Series 32-28AWG Contacts

Features

- Motion controller and drive in a single compact unit based on MotionChip™ technology
- Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors
- Advanced motion control features, including CSP, CSV, CST, PVT, S-curve, electronic gearing, camming, and more.
- Motor supply: 48V nominal
- Motor output current:
  - Nominal: 5.7A_{RMS} / 8A amplitude for PMSM motors
    7A for DC / BLDC / Step motors
  - Peak: 11.3A_{RMS} / 16A amplitude
- Logic supply: 24V nominal, 48V max
- Feedback#1 and Feedback#2 can be:
  - 1 x Hall sensor interface (digital or linear)
  - Feedback#1 and Feedback#2 can be:
    - Incremental encoder A / B (index Z only for Feedback #1): differential or single-ended;
    - Absolute encoder: differential or single-ended. Supported protocols: SSI, BiSS, EnDAT, Tamagawa, Panasonic, Nikon, Sanyo Denki.
- 1 x analogue input, 12-bit, software selectable: 0-5V or ±10V; Reference, Feedback or General purpose
- 3 x digital inputs: 2 for limit switches + one general-purpose, NPN, pull-up on-board to +5V. Pull to GND to activate.
- 3 x configurable 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 50mA.
- Communication interfaces: RS232; USB; TMLCAN and CANopen (CiA 301 v4.2, CiA 305 v.2.2.13 and CiA 402 v3.0) protocols
- STO: 2 safe torque-off inputs, safety integrity level (SIL3/Cat3/PLe) acc. to EN61800-5-1; -2/ EN61508-3; -4/ EN ISO 13849-1.
- 24Kwords E^2ROM to store setup data, TML motion programs, cam tables and other user data
- 16Kwords 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, I^2t drive & motor, control error
- >98% voltage efficiency, >98% power efficiency

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J1

Pin	Name	Type	Description
1	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
2	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
3	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
4	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers
5	PE	-	Earth connection

J2

Pin	Name	Type	Description
1	+Vmot	I	Positive terminal of the motor supply: 7 to 48 V_{DC}.
2	GND	-	Ground return.
3	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
4	PE	-	Earth connection

J3

Pin	Name	Type	Description
1	232TX	O	RS-232 Data Transmission.
2	232RX	I	RS-232 Data Reception.
3	GND	-	Ground return.
4	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V_{DC}.
5	IN2/LSP	I	5-48V digital NPN input. Positive limit switch input.
6	IN3/LSN	I	5-48V digital NPN input. Negative limit switch input.
7	I/O0	I/O	5-48V 1.5A NPN (sink) general-purpose digital programmable output OUT0 or input IN0
8	I/O1	I/O	5-48V 50mA NPN (sink) general-purpose digital programmable output OUT1 or input IN1
9	I/O4	I/O	5-48V 50mA NPN (sink) general-purpose digital programmable output OUT4 or input IN4
10	IN5	I	5-48V digital general-purpose NPN input
11	GND	-	Ground return.
12	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)
13	+5V	O	Supply for all feedback sensors.

J5

Pin	Name	Type	Description
1	GND	-	Ground return.
2	Hall1 / LH1	I	Digital Hall, or Linear Hall sensor 1.
3	+5V	O	5V supply for all feedback sensors.
4	Hall2 / LH2	I	Digital Hall, or Linear Hall sensor 2.
5	+5V	O	5V supply for all feedback sensors.
6	Hall3 / LH3	I	Digital Hall, or Linear Hall sensor 3.
7	EncA1+/EncA1 Dt1+/Dt1	I	Encoder 1 A / Data+ diff. input or single-ended input; set SW1 position 7 for differential.
8	GND	-	Ground return.
9	EncA1-/Dt1-	I	Encoder 1 A-/Data- diff. input.; set SW1 position 7 for differential.
10	+5V	O	5V supply for all feedback sensors.
11	EncB1+/EncB1 Clk1+/Clk1	I	Encoder 1 B+ / Clock+ diff. input or single-ended input; set SW1 position 8 for differential.
12	EncA2+/EncA2 Dt2+/Dt2	I	Incr. encoder 2 A / Data+ diff. input or single-ended input; set SW1 position 9 for differential.
13	EncB1/ Clk1-	I	Encoder 1 B- / Clock- diff. input.; set SW1 position 8 for differential.
14	EncA2-/Dt2-	I	Incr. encoder 2 A- diff. input; set SW1 position 9 for differential.
15	Z1+	I	Incr. encoder 1 Z / Z+ diff. input or single-ended input; set SW1 position 11 for differential.
16	EncB2+/EncB2 Clk2+/Clk2	I/O	Incr. encoder 2 B+ / Clock+ diff. input or single-ended input; set SW1 position 10 for differential.
17	Z1-	I	Incr. encoder 1 Z- diff. input; set SW1 position 11 for differential.
18	EncB2- Clk2-	I	Encoder 2 B- / Clock- diff. input; set SW1 position 10 for differential.
19	GND	-	Ground return.
20	+Vlog	I	Positive terminal of the logic supply: 6 to 48 V_{DC}.

J4

Pin	Name	Type	Description
1	+V USB	I	USB supply.
2	USB DM	I/O	USB data-.
3	USB DP	I/O	USB data+.
4	Rsvd	-	Reserved. Do not connect.
5	GND	-	Ground return.

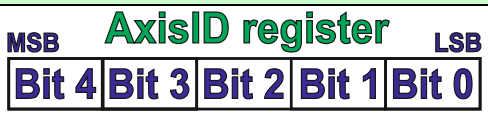
J6

Pin	Name	Type	Description	
1	STO2-	I	Safe Torque Off input 2, negative return (opto-isolated, 0V)	Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation
2	STO2+	I	Safe Torque Off input 2, positive input (opto-isolated, 18÷40V)	
3	PE	-	Earth connection	
4				
5	STO1+	I	Safe Torque Off input 1, positive input (opto-isolated, 18÷40V)	Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/ PELV power supply for motor PWM output operation
6	STO1-	I	Safe Torque Off input 1, negative return (opto-isolated, 0V)	

J10, J11

Pin	Name	Type	Description
1	GND	-	Ground return.
2	CAN Lo	-	CAN-Bus negative line (dominant low)
3	CAN Hi	-	CAN-Bus positive line (dominant high)

SW1



Position	Description	
1	AxisID register Bit 0.	**ON**: Bit x = 1. **OFF**: Bit x = 0. *The maximum AxisID value is 31. When all Bits are set to 0, AxisID value is 255. In CANOpen mode, if the AxisID is set to 255, the drive enters the "LSS inactive" state. In this state, the Green LED will flash at 1-second intervals.*
2	AxisID register Bit 1.	
3	AxisID register Bit 2.	
4	AxisID register Bit 3.	
5	AxisID register Bit 4.	
6	ON = TMLCAN mode is selected OFF = CANOpen mode is selected	
7	ON = Connect an 120Ω resistor between EncA1-/Dt1- and EncA1+/EncA1/Dt1+/Dt1 feedback pins.	
8	ON = Connect an 120Ω resistor between EncB1/Clk1- and EncB1+/EncB1/Clk1+/Clk1 feedback pins.	
9	ON = Connect an 120Ω resistor between EncA2-/Dt2- and EncA2+/EncA2/Dt2+/Dt2 feedback pins.	
10	ON = Connect an 120Ω resistor between EncB2/Clk2- and EncB2+/EncB2/Clk2+/Clk2 feedback pins.	
11	ON = Connect an 120Ω resistor between Z1- and Z1+ feedback pins.	
12	ON = Connect an 120Ω resistor between CAN Hi and CAN Lo signals.	

LEDs

No.	Name	Color	Description
LED2	TML ERR	RED	Turned on when the drive detects an error condition.
LED3	TML RDY	GREEN	Lit after power-on when the drive initialization ends. Turned off when an error occurs.

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Electrical characteristics

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

- V_{LOG} = 24 VDC; V_{MOT} = 48 VDC; F_{PWM} = 20 kHZ
- Ambient temperature = 25°C (typical values) / 0°C…40°C (min/max values)
- Supplies start-up / shutdown sequence: -any-
- Load current = nominal

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature		0		40[1]	°C
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0	0.75 ÷ 1	10.0	atm

Storage Conditions		Min	Typ	Max	Units
Ambient temperature		-40		100	°C
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			±5	kV
	Original packaging			±15	kV

Mechanical Mounting		Min	Typ	Max	Units
Airflow	natural convection, closed box				
Spacing required between adjacent drives		10			mm
Spacing required above drive	For counter-connectors & cable bending	30	80		

Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size		43.5 x 40 x 22.8		mm
			~ 1.7 x 1.6 x 0.9		inch
Weight			34.3		g
Cleaning agents	Dry cleaning is recommended		Only Water- or Alcohol- based		
Protection degree	According to IEC60529		IP20		-
Power dissipation	Idle (I_{MOT} = 0A)		1	1.2	W
	Full power (I_{MOT} = nominal)		2.0	2.4	
Power efficiency	Full power (I_{MOT} = nominal)		98.7		%
Voltage efficiency	f_{PWM} = 20KHz		98.3		
	f_{PWM} = 100KHz		91.4		
Surface temperature of metallic baseplate			40		°C

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		50	V_{DC}
	Absolute maximum values, continuous	-0.5		52	V_{DC}
Supply current	+V_{LOG} = 12V		90	150	mA
	+V_{LOG} = 24V		60	90	
	+V_{LOG} = 48V		45	60	
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		50	V_{DC}
	Absolute maximum values, continuous	-0.5		52	V_{DC}
Supply current	Idle		0.3		mA
	Operating	-16	±7	+16	A
Voltage measurement error			±0.15	±0.25	V
Utilization category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})		DC-3		

Supply Output (+5V)		Min.	Typ.	Max.	Units
Output voltage	Current sourced = 400mA	5.05	5.2	5.25	V
Output current	Output voltage ≥ 4.85V			1,200	mA
Short-circuit to GND protection		Yes / Drive resets at event			
Over-voltage protection		NOT protected			
ESD protection	Human body model	±1			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	4.8	5.2	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			2.4		mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to +5			0		
Minimum pulse width				66		µs
ESD protection - Human body model				±15		kV

Motor Outputs (A/A+, B/A-, C/B+, CR/B-)				Min.	Typ.	Max.	Units
Nominal current	PMSM motors sinusoidal amplitude					±8	A
	PMSM motors sinusoidal RMS					5.7	A_{RMS}
	DC/BLDC/STEP motors continuous					7	A
Peak current	maximum 4 seconds			-16		+16	A
Short-circuit protection threshold					±25	±28	A
Short-circuit protection delay				2.6		3.5	µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance				50	70	mV
Off-state leakage current					0.3	1	mA
Current measurement	Accuracy (FS = Full Scale)				±1	±1.5	%FS
	Noise (current ≤ 2A)				±4	±6	mA
	Noise (current ≥ 2A)				±30	±50	
	Offset drift (compensated @ AxisOn)					±0.16	mA/°C
Motor inductance (phase-to-phase)	Recommended value to avoid spurious short-circuit protection, triggered by ripple	Fast loop[3]	V_{MOT}				µH
		50µs	48V		133		
		100µs	48V		266		
		50µs	24V		66		
		100µs	24V		133		
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	F_{PWM} = 20 kHz			330		µs
		F_{PWM} = 40 kHz			170		
		F_{PWM} = 60 kHz			140		
		F_{PWM} = 80 kHz			80		
		F_{PWM} = 100 kHz			66		

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5)				Min.	Typ.	Max.	Units
Mode compliance				NPN (sink)			
Default state	Input floating (wiring disconnected)			Logic HIGH			
Input voltage	Logic "LOW"	IN0, IN1, IN4, IN5			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)				4.7		
	Absolute maximum, continuous	IN2/LSP, IN3/LSN, IN5		-2		+80	
		IN0, IN1, IN4		-0.5		V_{LOG}+0.5	
Input current	Logic "LOW"; Pulled to GND				6.5	8	mA
	Logic "HIGH"; Pulled to +24V				0.2	0.4	
Input frequency				0		500	kHz
Minimum pulse				1			µs
ESD protection - Human body model				±2			kV

Digital Outputs (OUT0, OUT1, OUT4)				Min.	Typ.	Max.	Units
Mode compliance				NPN (sink) 24V			
Load type				Resistive, Inductive			
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 OUT1, OUT4					0.4	V
	Logic "HIGH"; output current = 0, no load			4	4.7	5.2	
	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, continuous; V_{OUT} ≤ 0.4V	5s max	OUT1, OUT4			0.1	A
			OUT0			2	
		0.5s max	OUT1, OUT4			0.15	
			OUT0			2.5	
			OUT1, OUT4			0.05	
			OUT0			1.5	
	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		V_{LOG}=24V		0.18	0.2	mA
			V_{LOG}=48V		0.42	0.45	
Minimum pulse width				0.5			µs
ESD protection - Human body model				±25			kV

[1] Operating temperature at higher temperatures is possible with reduced current and power ratings
[2] Micro 4804 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] Fast loop period of 50µs is not possible with all feedback device types.

Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-)[1]		Min.	Typ.	Max	Units
Single-ended mode compliance	Leave A1-, B1-, Z1-, A2-, B2- floating	TTL / CMOS / Open-collector (NPN sink)			
Single-ended threshold	A1+, B1+, Z1+, A2+, B2+	1.3	1.4	1.5	V
Single-ended input current	Input pulled to GND against on-board 2.2 KΩ pull-up to +5V		2.4	2.7	mA
Differential mode compliance	For full RS422 compliance, see[1]	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	Common-mode (A1+ to GND, etc.)		2.2		kΩ
	Differential (A1+ to A1-, etc.)		4.4		
Input frequency	Differential mode	0		15	MHz
Minimum pulse width	Differential mode	33			ns
ESD protection	Human body model	±30			kV

RS-232		Min.	Typ.	Max.	Units
Compliance		TIA/EIA-232-C			
Bit rate	Default	9600			Baud
	Software selectable	9600		115200	
Output voltage		±5	±5.7		V
Short-circuit	232TX to GND	Guaranteed			
Input voltage	Absolute maximum, continuous	-30		+30	V
ESD protection	Human body model	±15			kV

Absolute encoder interface: SSI, BISS-C, EnDAT, Tamagawa, Nikon, Sanyo Denki		Min	Typ.	Max	Units
Single-ended mode	Not recommended, reduced robustness & speed				
Differential mode compliance	For full RS422 compliance, see[1]	TIA/EIA-422-A			
Output voltage	Differential; 50Ω differential load	1.5	3.3		V
	Common-mode, referenced to GND	1	1.7	3	
CLOCK frequency	Nikon, Sanyo Denki	2.5, 4			MHz
	Panasonic, Tamagawa	2.5			
	All others	1, 2, 3, 4			
Output 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	Including CRC, flags, …			64	Bits
	If total resolution >31 bits, some bits must be ignored by software setting to achieve a max. 31 bits resolution				

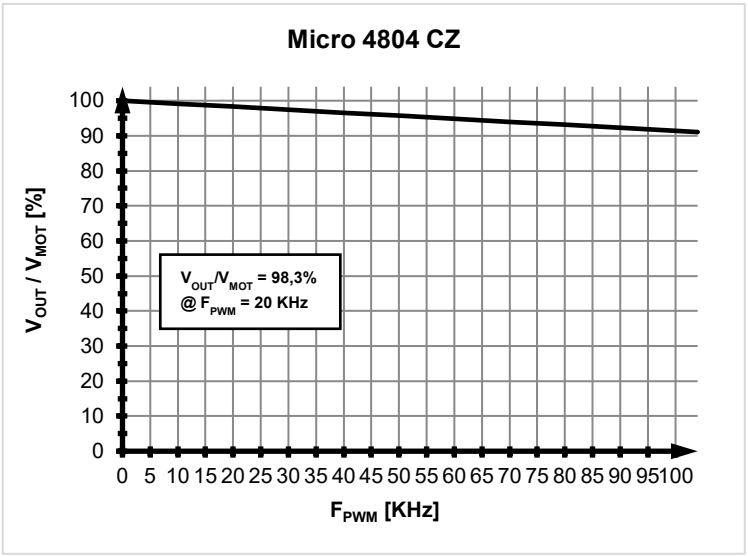
Analog Input (REF/ FDBK)		Min	Typ.	Max	Units
Input voltage	Operational range	0…5, -10…+10			V
	Absolute maximum values, continuous	-22		+26	
	Absolute maximum, surge (duration ≤ 1s)			±38	
Input impedance	To 1.44V		20		kΩ
Bandwidth (-3dB)	Software selectable	0		5.3	kHz
Resolution		12			bits
Integral linearity				±1	bits
Offset error	Range -10V … +10V		±10	±30	mV
	Range 0 …+5V		±15	±40	
Gain error	Range -10V … +10V		±30	±50	
	Range 0 …+5V		±25	±40	
ESD protection	Human body model	±1.5			kV

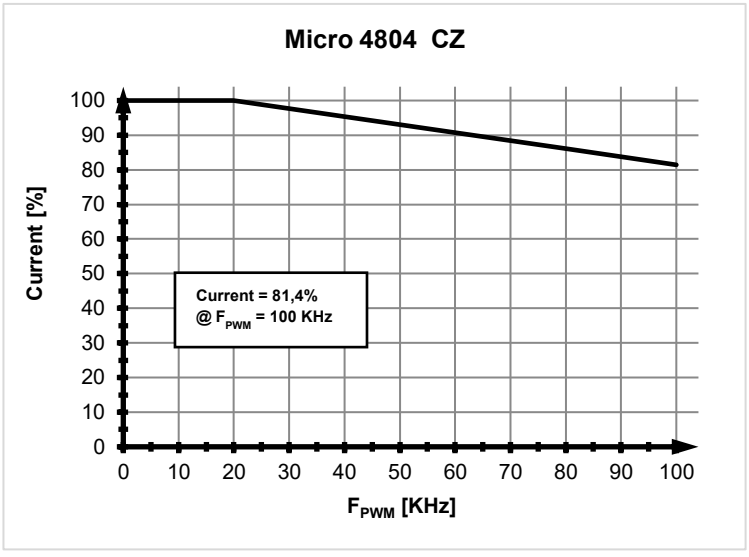
CAN-Bus		Min.	Typ.	Max.	Units
Compliance		CAN 2.0B, ISO 11898-2			
Software protocols compatibility		CiA301, CiA305, CiA402, TechnoCAN, TMLcan			
Bit rate	Software selectable	125, 250, 500, 1000			KBaud
Node addressing	TMLcan	1 ÷ 255			-
	CANopen	not configured, 1 ÷ 127			-
Voltage	Common-mode, operating	-12		+12	V
	Common-mode, max. continuous	-58		+58	V
	Differential, max. continuous	-45		+45	V
Input impedance	Differential	40		90	KΩ
	Common-mode	20		45	KΩ
Termination resistor (120Ω)		Included – SW1 Position 12			
ESD protection	Human body model	±10			kV

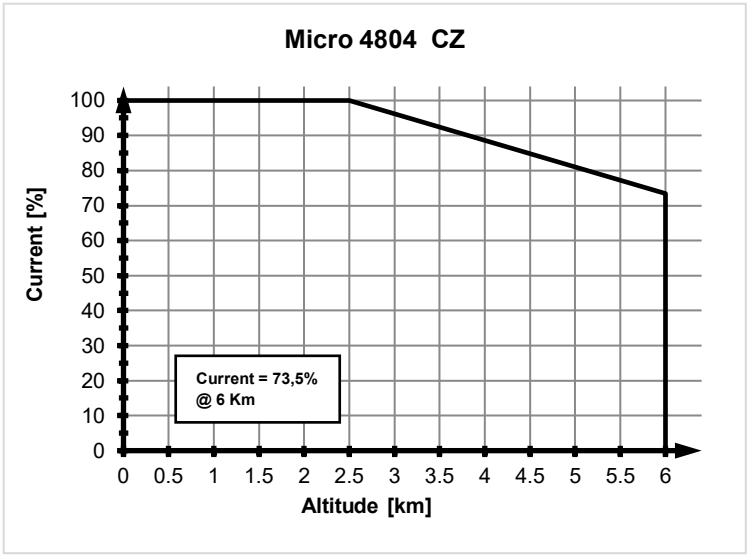
Safe Torque Off (STO) Inputs		Min.	Typ.	Max.	Units
Safety Integrity Level		SIL 3			
Performance Level		PL e			
Safety Category		Cat 3			
Reaction time				30	ms
Ignored diagnostic pulses	Duration			5	ms
	Repetition rate			20	Hz
MTTFd			377		years
DC			90		%
PFH			8E-10		hours
Lifetime			20		years
V_{LOG}	External power supply	SELV or PELV			
Pollution Degree				2	-
	Cabinet / Housing	IP54			-
STO wiring	Bundling / Grouping	Separate wiring for STO1, STO2			
	Shielding	Separate shield for STO1, STO2			
Compatibility	Each STO channels has separate + and - terminals	PNP (source) or NPN (sink), depending on user connection			
Isolation		Each STO channel is opto-isolated			
Voltage, STOx+ to STOx-	Inactive (torque off)		0	5.6	V
	Active (motor driven)	18	24		V
	Abs. maximum, continuous	-70		+70	V
Voltage	Isolation, STO1 to STO2	±2			KV
	Isolation, STOx to GND	±2			KV
Current	STOx+ - STOx- = 24V		3	5	mA
ESD protection	Human body model	±30			kV

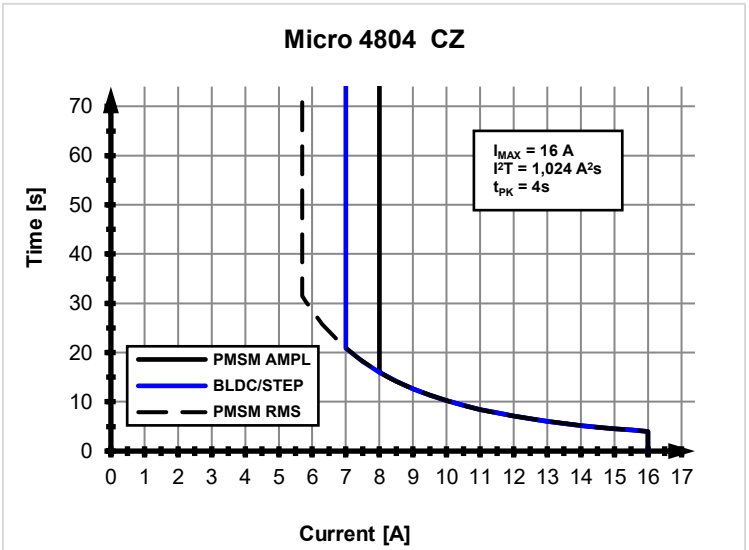
† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

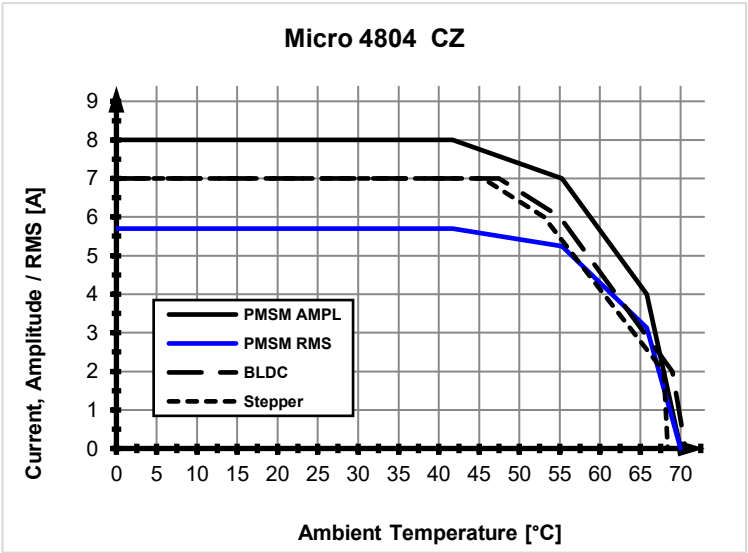
[1] To achieve full RS-422 compatibility and enhance noise rejection, it is necessary to connect an external 120Ω resistor across each signal pair (A1+/A1-, B1+/B1-, Z1+/Z1-, A2+/A2-, B2+/B2-). This can be done through SW1 positions 7 to 11.


Micro 4804 CZ
V_{OUT} / V_{MOT} [%]
V_{OUT}/V_{MOT} = 98,3%
@ F_{PWM} = 20 KHz
F_{PWM} [KHz]


Micro 4804 CZ
Current [%]
Current = 81,4%
@ F_{PWM} = 100 KHz
F_{PWM} [KHz]


Micro 4804 CZ
Current [%]
Current = 73,5%
@ 6 Km
Altitude [km]


Micro 4804 CZ
Time [s]
I_{MAX} = 16 A
I^2T = 1,024 A^2s
t_{PK} = 4s
PMSM AMPL
BLDC/STEP
PMSM RMS
Current [A]


Micro 4804 CZ
Current, Amplitude / RMS [A]
PMSM AMPL
PMSM RMS
BLDC
Stepper
Ambient Temperature [°C]