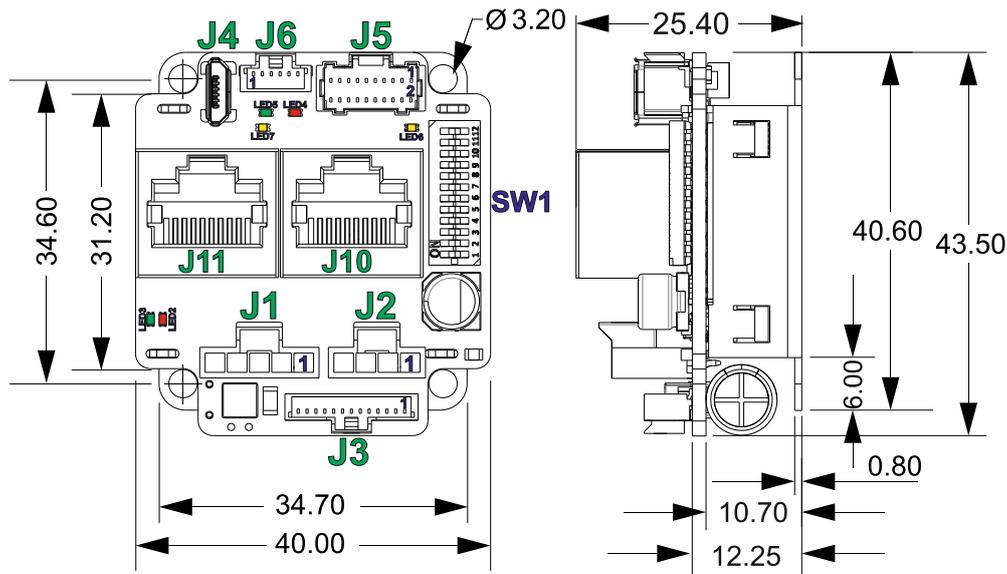




# Micro 4804 CZ-CAT DATASHEET P/N: P020.802.E222



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	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	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	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	Crimp Tool, Ratchet, Molex Nano-Fit 105300 Series 20-22AWG Socket Contacts, 207129 Series
Molex	638191500	J3, J5, J6	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<sub>RMS</sub> / 8A amplitude for PMSM motors  
7A for DC / BLDC / Step motors
  - Peak: 11.3A<sub>RMS</sub> / 16A amplitude
- Logic supply: 24V nominal, 48V max
- Feedback Options:
  - 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 Enable, 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.
- Commissioning (set-up) possible through RS232, USB, FoE (file-over-EtherCAT) or EoE (Ethernet-over-EtherCAT)
- EtherCAT connection: standard RJ45 ports
- 24Kwords E<sup>2</sup>ROM 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<sup>2</sup>t drive & motor, control error
- >98% voltage efficiency, >98% power efficiency

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Pin	Name	Type	Description
J1	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

Pin	Name	Type	Description
J2	1	+Vmot	I Positive terminal of the motor supply: 7 to 48 V <sub>DC</sub> .
	2	GND	- Ground return.
	3	+Vlog	I Positive terminal of the logic supply input: 6 to 48 V <sub>DC</sub> .
	4	PE	- Earth connection

Pin	Name	Type	Description
J3	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 <sub>DC</sub> .
	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/Enable	I 5-48V digital NPN input. Drive Enable 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.

Pin	Name	Type	Description
J5	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- / Data- 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 <sub>DC</sub> .

Pin	Name	Type	Description
J4	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.

Pin	Name	Type	Description
J6	Reserved.	-	Do not connect.

Port	Name	Type	Description
J10	ECAT IN	I	EtherCAT standard RJ45 Ethernet IN port.
J11	ECAT OUT	O	EtherCAT standard RJ45 Ethernet OUT port.

## SW1



Position	Description
1	AxisID register Bit 0.
2	AxisID register Bit 1.
3	AxisID register Bit 2.
4	AxisID register Bit 3.
5	AxisID register Bit 4.
6	AxisID register Bit 7.
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.

ON: Bit x = 1.  
OFF: Bit x = 0.  
Possible AxisID values: 1+31 and 128+159.  
When all Bits are set to 0, AxisID value is 255.  
When the AxisID value is 255, the EtherCAT register called "configured station alias" will be 0

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.
LED4	ECAT ERR	RED	EtherCAT® ERROR indicator.
LED5	ECAT RUN	GREEN	EtherCAT® RUN indicator.
LED6	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED7	ECAT ACT1	YELLOW	

## Electrical characteristics

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

- V<sub>LOG</sub> = 24 VDC; V<sub>MOT</sub> = 48 VDC; F<sub>PWM</sub> = 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 <sup>1</sup>	°C
Ambient humidity		0		90	%Rh
Altitude / pressure <sup>2</sup>	Altitude (vs. sea level)	-0.1	0 + 2.5	3	Km
	Ambient Pressure	0 <sup>2</sup>	0.75 ± 1	10.0	atm
Storage Conditions		Min	Typ	Max	Units
Ambient temperature		-40		100	°C
Ambient humidity		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

<sup>1</sup> Operating temperature at higher temperatures is possible with reduced current and power ratings

<sup>2</sup> 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.

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Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size	43.5 x 40 x 25.4			mm
		~ 1.7 x 1.6 x 1			inch
Weight		38.3			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 ( $I_{MOT} = \text{nominal}$ )		2.0	2.4	
Power efficiency	Full power ( $I_{MOT} = \text{nominal}$ )		98.7		%
Voltage efficiency	$f_{PWM} = 20KHz$		98.3		
	$f_{PWM} = 100KHz$		91.4		
Surface temperature of metallic baseplate			40		°C
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		
Logic Supply Input (+V <sub>LOG</sub> )		Min	Typ.	Max.	Units
Supply voltage	Nominal values	6	24	48	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	4.9		50	V <sub>DC</sub>
	Absolute maximum values, continuous	-0.5		52	V <sub>DC</sub>
Supply current	+V <sub>LOG</sub> = 12V		90	150	mA
	+V <sub>LOG</sub> = 24V		60	90	
	+V <sub>LOG</sub> = 48V		45	60	
Utilization category	Acc. to 60947-4-1 ( $I_{PEAK} \leq 1.05 \cdot I_{NOM}$ )	DC-1			
Motor Supply Input (+V <sub>MOT</sub> )		Min	Typ.	Max.	Units
Supply voltage	Nominal values	7		48	V <sub>DC</sub>
	Absolute maximum values, drive operating but outside guaranteed parameters	6		50	V <sub>DC</sub>
	Absolute maximum values, continuous	-0.5		52	V <sub>DC</sub>
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 ( $I_{PEAK} \leq 4.0 \cdot I_{NOM}$ )	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
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 <sub>RMS</sub>
	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	mA
	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 <sup>1</sup> V <sub>MOT</sub>			µH
		50µs 48V		133	
		100µs 48V		266	
		50µs 24V		66	
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	F <sub>PWM</sub> = 20 kHz		330	µs
		F <sub>PWM</sub> = 40 kHz		170	
		F <sub>PWM</sub> = 60 kHz		140	
		F <sub>PWM</sub> = 80 kHz		80	
		F <sub>PWM</sub> = 100 kHz		66	
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	
		Logic "HIGH"	3	2.5	
		Hysteresis		0.5	
Input current	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

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5/ENA)		Min.	Typ.	Max.	Units		
Mode compliance		NPN (sink)					
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
	Logic "HIGH"	IN2/LSP, IN3/LSN		1.4	1.6		
			Hysteresis		4		3.5
			Floating voltage (not connected)		4.7		
Input current	Absolute maximum, continuous	IN2/LSP, IN3/LSN, IN5/ENA	-2		+80		
		IN0, IN1, IN4	-0.5		V <sub>LOG</sub> +0.5		
Input current		Logic "LOW"; Pulled to GND		6.5	8		
		Logic "HIGH"; Pulled to +24V		0.2	0.4		
Input frequency			0		500		
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 <sub>LOG</sub> 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 <sub>LOG</sub>			V <sub>LOG</sub>			
	Absolute maximum, continuous (free-wheeling diodes to +V <sub>LOG</sub> to GND)		-0.5		V <sub>LOG</sub> +0.5		
Absolute maximum, surge (duration ≤ 1s) <sup>†</sup>		-1		V <sub>LOG</sub> +1			
Output current	Logic "LOW", sink current, short duration, duty cycle ≤ 1%	5s max	OUT1, OUT4		0.1	A	
			OUT0		2		
			OUT1, OUT4		0.15		
	Logic "LOW", sink current, continuous; V <sub>OUT</sub> ≤ 0.4V	0.5s max	OUT1, OUT4		0.05		
			OUT0		1.5		
			Logic "HIGH", source current; external load to GND; V <sub>OUT</sub> ≥ 2.0V				5
Logic "HIGH", leakage current; external load to +V <sub>LOG</sub> ; V <sub>OUT</sub> = V <sub>LOG</sub> max = 40V		V <sub>LOG</sub> =24V		0.18	0.2		
		V <sub>LOG</sub> =48V		0.42	0.45		
Minimum pulse width			0.5		µs		
ESD protection - Human body model			±25		kV		
Encoder Inputs (A1+, A1-, B1+, B1-, Z1+, Z1-, A2+, A2-, B2+, B2-) <sup>2</sup>		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 <sup>1</sup>	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		

<sup>1</sup> Fast loop period of 50µs is not possible with all feedback device types.

<sup>2</sup> 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-)

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EtherCAT®		Min.	Typ.	Max.	Units
Compliance		IEEE802.3, IEC61158			
Software protocols compatibility		CoE, FoE, EoE, IEC61800-7-301			
Transmission line	According to TIA/EIA-568-5-A	5	5e	6	Category Shield
		UTP	FTP	STP	
Auto	swap + / - inside a pair	Yes (MLT3 encoding)			
	swap Rx / Tx pairs	Yes (auto-MDI/MDIX)			
	Swap port0(IN) / port1(OUT)	NO (EtherCAT requirement)			
Configured Station Alias (using AxisID)		0+31 and 128+159		-	
ESD protection	Human body model	±5			kV
<b>Absolute encoder interface:</b>					
<b>SSI, BISS-C, EnDAT, Tamagawa, Nikon, Sanyo Denki</b>					
		Min	Typ.	Max	Units
Single-ended mode	Not recommended, reduced robustness & speed				
Differential mode compliance	For full RS422 compliance, see <sup>1</sup>	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				

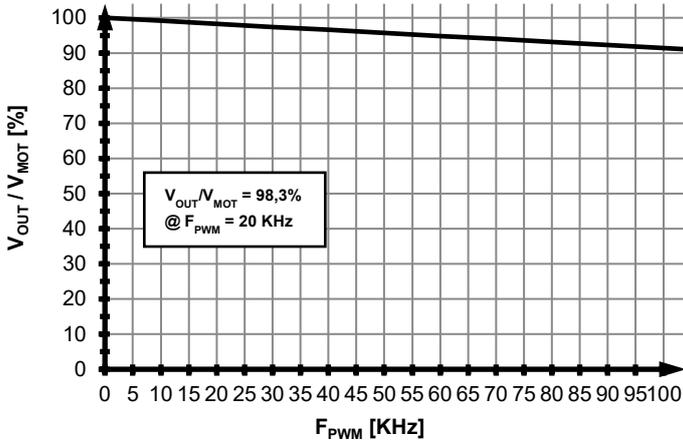
Analog Input (REF/ FDBK)		Min	Typ.	Max	Units
Input voltage	Operational range	0...5, -10...+10			
	Absolute maximum values, continuous	-22		+26	V
	Absolute maximum, surge (duration ≤ 1s)			±38	
Input impedance	To 1.44V		20		kΩ
Bandwidth (-3dB)	Software selectable	0		5.3	kHz
Resolution			12		bits
Integral 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

<sup>†</sup> 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.

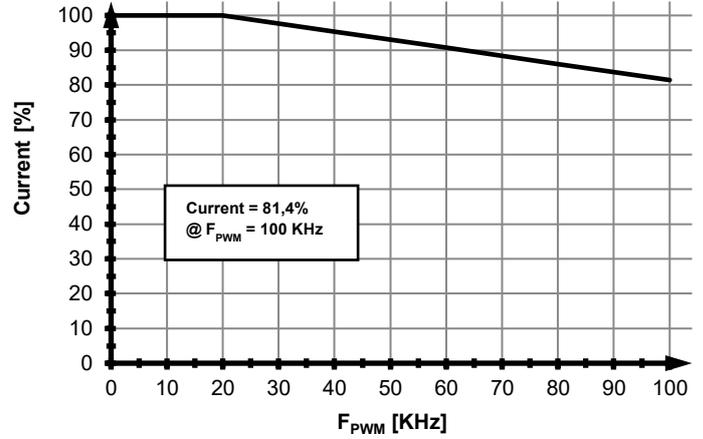
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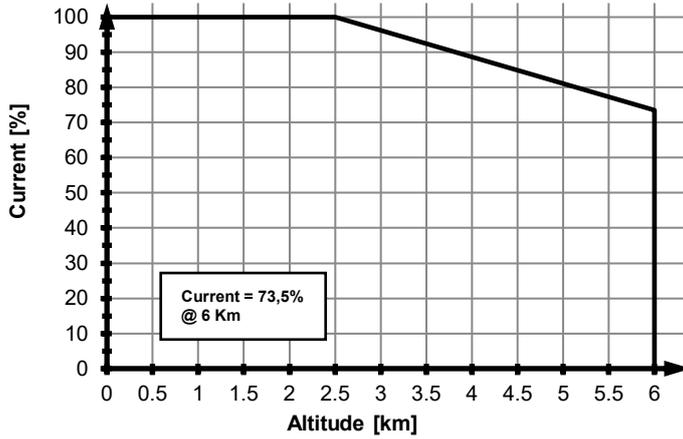
**Micro 4804 CZ**



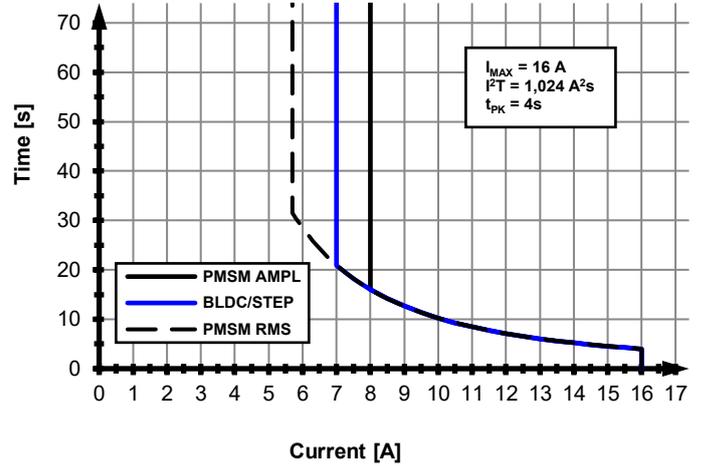
**Micro 4804 CZ**



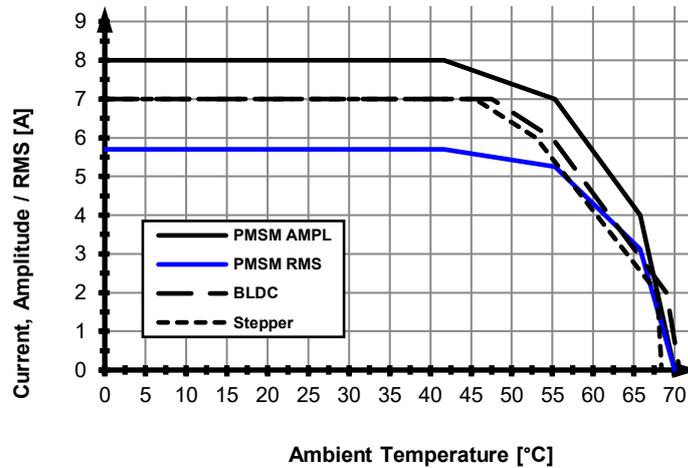
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