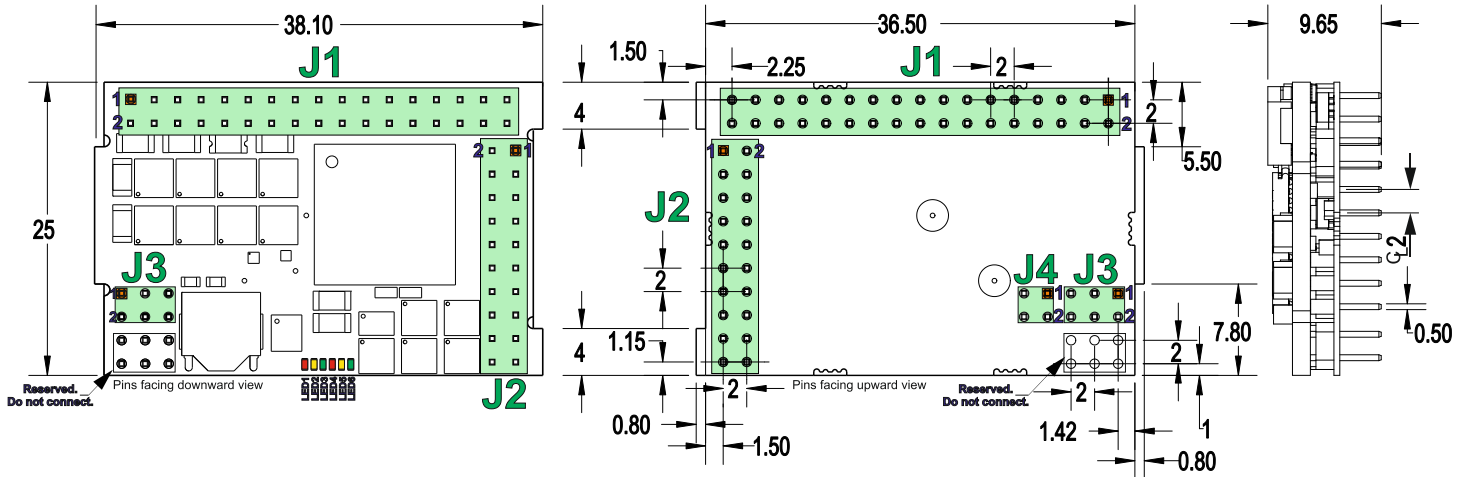


Micro 4804 MZ-CAT-STO DATASHEET P/N: P020.003.E122



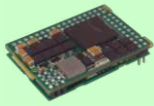
All dimensions are in mm. Drawing not to scale.

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
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-110-01-F-D(-VS)	J2	2x10, 2.0mm THT (SMD) socket
	CLT-110-02-F-D		2x10, 2.0mm SMD pass-through socket
	SQW-103-01-F-D(-VS)	J3	2x3, 2.0mm THT (SMD) socket
	CLT-103-02-F-D		2x3, 2.0mm SMD pass-through socket
	SQW-102-01-F-D(-VS)	J4	2x2, 2.0mm THT (SMD) socket
	CLT-102-02-F-D		2x2, 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, 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: 4.5A_{RMS} / 6.3A amplitude for PMSM motors
 - 5.5A for DC / BLDC / Step motors
 - Peak: 11.3A_{RMS} / 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 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 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)
 - 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 E²ROM 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, I²t drive & motor, control error
 - 3 AxisID inputs, for hardware-based address setting
 - >98% voltage efficiency, >98% power efficiency

Name ALN	First edition November 3, 2023	Document template: P099.TQT.564.0001	Last edition October 29, 2024	Visa:
		Title of document Micro 4804 MZ-CAT-STO PRODUCT DATA SHEET	N° document P020.003.E122.DSH.10B	
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Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 V _{DC}
2	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
3	GND	-	Ground return for logic supply
4	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5	GND	-	Ground return for motor supply & shield for motor windings cable
6	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
7	+Vmot	I	Positive terminal of the motor supply: 7 to 48 VDC
8	Cr/B-	O	Chopping resistor / Phase B- for 2-ph steppers
9	BFS	-	Boot Fail-Safe: Connect to GND to reprogram firmware in the improbable case when a power loss occurs during a firmware update and the normal firmware recovery fails
10	ID2	I	AxisID2 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	GND1*	-	Ground shield & center-tap for ECAT magnetics port 1
16	GND0*	-	Ground shield & center-tap for ECAT magnetics 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	AxisID0 selection pin. See AxisID register settings table.
22	ID1	I	AxisID1 selection pin. See AxisID register settings table.
23	232TX	O	RS-232 Data Transmission.
24	232RX	I	RS-232 Data Reception.
25	...	Rsvd.	Reserved. Do not connect.
26			
27	IN2/LSP	I	5-48V digital NPN input. Positive limit switch input
28	IN3/LSN	I	5-48V digital NPN input. Negative limit switch input
29	IN5	I	5-48V digital general-purpose NPN input
30	I/O0	I/O	5-48V 1.5A NPN (sink) general-purpose digital programmable input IN0 or output OUT0
31	I/O1	I/O	5-48V 0.1A NPN (sink) general-purpose digital programmable input IN1 or output OUT1
32	I/O4	I/O	5-48V 0.1A NPN (sink) general-purpose digital programmable input IN4 or output OUT4
33	GND	-	Ground return and shield
34	AnalogIn	I	Analog input (range software selectable 0-5V or ±10V)

* GND0, GND1, and all other GND pins are internally connected within the drive. However, it is strongly recommended to reserve GND0 and GND1 exclusively for EtherCAT-related functions, and avoid using them for any other purposes.

Pin	Name	Type	Description
1	ECAT ACT0	O	Shows the state of the physical link and activity for ECAT IN port. Active high, LV-TTL.
2	ECAT ACT1	O	Shows the state of the physical link and activity for ECAT OUT port. Active high, LV-TTL.
3	TML RDY	O	Lit after power-on when the drive initialization ends. Turned off when an error occurs. Active high, LV-TTL.
4	TML ERR	O	Turned on when the drive detects an error condition. Active high, LV-TTL.
5	ECAT RUN	O	EtherCAT® RUN indicator. Active high, LV-TTL.
6	ECAT ERR	O	EtherCAT® ERROR indicator. Active high, LV-TTL.

Pin	Name	Type	Description
1	STO1+	I	Safe Torque Off input 1, positive input (opto-isolated, 18+40V)
2	STO2-	I	Safe Torque Off input 2, negative return (opto-isolated, 0V)
3	STO1-	I	Safe Torque Off input 1, negative return (opto-isolated, 0V)
4	STO2+	I	Safe Torque Off input 2, positive input (opto-isolated, 18+40V)

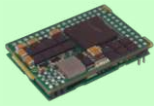
Apply between both STO1+, STO2+ and STO1-, STO2- 24V DC from SELV/PELV power supply for motor PWM output operation

Pin	Name	Type	Description
1	+V USB	I	USB 5V detect input
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+

No.	Name	Color	Description
LED1	TML ERR	RED	Turned on when the drive detects an error condition.
LED2	ECAT ACT1	YELLOW	Shows the state of the physical link and activity for ECAT OUT port.
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 ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN port.
LED6	ECAT RUN	GREEN	EtherCAT® RUN indicator.

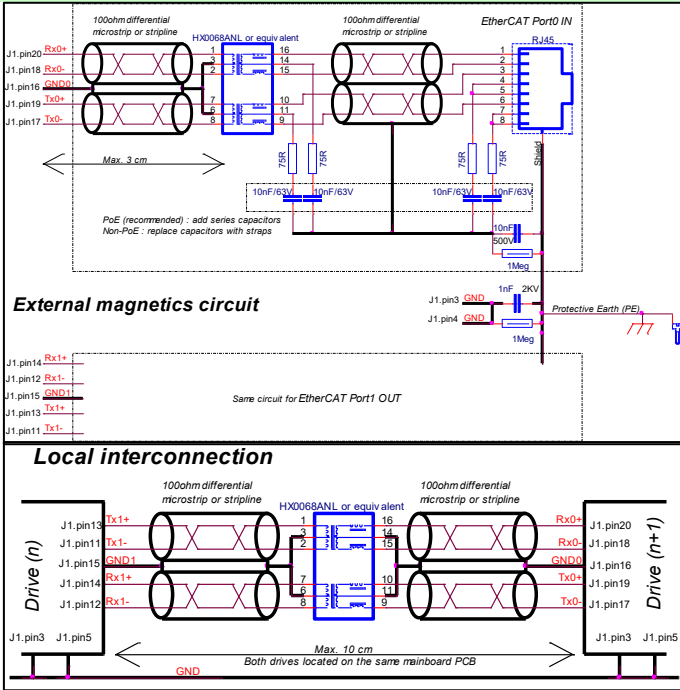
AxisID register										
MSB	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	LSB
ID2			ID1			ID0				
Nominal[V]	Minimum[V]	Maximum[V]	IDx* Bits	IDx* Value						
0.000	0.00	0.53	000	0						
1.06	0.53	1.41	001	1						
1.76	1.41	2.01	010	2						
2.25	2.01	2.43	011	3						
2.60	2.43	2.75	100	4						
2.89	2.75	3.01	101	5						
3.13	3.01	3.22	110	6						
3.32	3.22	3.30	111	7						

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



Micro 4804 MZ-CAT-STO DATASHEET

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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 ^{1,2}	°C
Ambient humidity		0		90	%Rh
Altitude / pressure ³		Altitude (vs. sea level)	0 -1 0 + 2.5	3	Km
		Ambient Pressure	0 ² 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		±0.5	kV
		Original packaging		±15	kV
Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)		38.1 x 25 x 9.6			mm
Weight		~1.5 x 1 x 0.4			inch
Cleaning agents		12			g
Protection degree		Dry cleaning is recommended			Only Water- or Alcohol- based
		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		
		$f_{PWM} = 20KHz$	98.3		%
		$f_{PWM} = 100KHz$	91.4		
Voltage efficiency		Idle ($I_{MOT} = 0A$)	55		
		Full power ($I_{MOT} = nominal$)		100	°C
Surface temperature ²					
Mechanical Mounting		Min.	Typ.	Max.	Units
Airflow		natural convection ² , closed box			
Spacing required for horizontal mounting ²		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			40
Extraction force		8			N

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	
Utilization category	Acc. to 60947-4-1 ($I_{PEAK} \leq 1.05 \cdot I_{NOM}$)				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		0.3		mA
	Operating	-16	±7	+16	
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 ⁴	PMSM motors sinusoidal amplitude			±6.3	A
	PMSM motors sinusoidal RMS			4.5	ARMS
	DC/BLDC/STEP motors continuous			5.5	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	V
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 ⁵ V _{MOT}			µH
		50µs 48V		133	
		100µs 48V		266	
		50µs 24V		66	
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		
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
Input voltage	Digital	Logic "LOW"		1.5	V
		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
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				kΩ
Bandwidth (-3dB)	Software selectable				0 5.3
Resolution					12
Integral linearity					±1
Offset error	Range -10V ... +10V		±3	±10	bits
	Range 0 ... +5V		±10	±30	
Gain error	Range -10V ... +10V		±0.3	±0.5	%
	Range 0 ... +5V		±0.5	±0.8	
ESD protection		Human body model		±1.5	kV

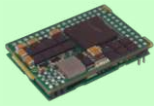
¹ Operating temperature at higher temperatures is possible with reduced current and power ratings
² In case of forced cooling (conduction or ventilation): a) the ambient temperature requirements may be extended substantially as long as the drive (PCB) temperature is kept below 85 °C; b) the spacing requirements can be dropped down to zero; c) the surface temperature will decrease accordingly

³ 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.

⁴ For current values >4A_{RMS}, pins J1/2...8 may need to be soldered instead of socketed, for long-term reliability - check socket manufacturer specifications.

⁵ Fast loop period of 50µs is not possible with all feedback device types.

Name	First edition	Document template: P099.TQT.564.0001	Last edition	Visa:
ALN	November 3, 2023		October 29, 2024	
TECHNOSOFT		Title of document	N° document	
		Micro 4804 MZ-CAT-STO	P020.003.E122.DSH.10B	
		PRODUCT DATA SHEET	Page: 3 of 5	



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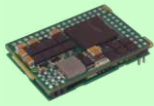
Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4, IN5)		Min.	Typ.	Max.	Units	
Mode compliance		NPN (sink)				
Default state		Logic HIGH				
Input voltage	Logic "LOW"	3.1	1.4	1.8	V	
	Logic "HIGH"		2.5	2.5		
	Hysteresis	0.9	1.1	1.4		
	Logic "LOW"		1.4	1.6		
	Logic "HIGH"	4	3.5			
	Hysteresis		0.6			
Floating 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)				
Immediately after power-up		High-Z (floating)				
		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		
Output current	Absolute maximum, surge (duration ≤ 1s)†	-1		V _{LOG} +1	A	
	Logic "LOW", sink current, short duration, duty cycle <=1%		5s max	0.1		
			0.5s max	0.15		
			max	2.5		
	Logic "LOW", sink current, continuous; V _{OUT} ≤ 0.4V			0.05		
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
			V _{LOG} =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-) ¹		Min.	Typ.	Max.	Units	
Single-ended mode compliance	Leave A1-, B1-, Z1-, A2-, B2- floating	TTL / CMOS / Open-collector floating (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				
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	Software selectable	9600		115200	Baud	
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	
BFS input		Min.	Typ.	Max.	Units	
Polarity		Active Low (0=fail-safe boot, 1=normal)				
Default state		High				
Voltage	Logic low (active)		0	1.1	V	
	Logic high (inactive)	2.0	3.3		V	
	Abs. max., continuous	-0.5		3.8	V	
Current	Logic low (2.2KΩ pull to +3.3V)		1.5	1.6	mA	
	Logic high		0		mA	
ESD protection		Human body model	±250		V	

LED outputs		Min.	Typ.	Max.	Units	
Polarity		Active high (high=LED lit)				
		Common cathode to GND				
Voltage	I _{OH} ≤ 0.9mA	2.9	3.3		V	
	I _{OH} ≤ 1.5mA	2.4			V	
	I _{OL} ≤ 2.0mA		0	0.4	V	
Abs. max., continuous		-0.5		3.8	V	
Current		Sink (I _{OL}) current larger than source (I _{OH}) current		-2.0	+1.5	mA
Short-circuit protection		NOT protected				
ESD protection		Human body model	±250		V	
EtherCAT®		Min.	Typ.	Max.	Units	
Compliance		IEEE802.3, IEC61158				
Software protocols compatibility		CoE, FoE, EoE, IEC61800-7-301				
		Required, external				
Magnetics	Turns ratio	1:1				
	Inductance	350			µH	
	Common mode rejection	-30			dB	
	Center tap	to J1 pins 15, 16				
Transmission line	According to TIA/EIA-568-5-A	5	5e	6	Category	
		UTP	FTP	STP	Shield	
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 = 255				
ESD protection		Human body model	±5		kV	
Absolute encoder interface:		Min	Typ.	Max	Units	
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			kHz	
	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, ...				
		If total resolution >31 bits, some bits must be ignored by software setting to achieve a max. 31 bits resolution				
AxisID inputs		Min.	Typ.	Max.	Units	
Default state		ID1, ID1, ID2 floating				
Internal pull-down to GND		95	100	105	kΩ	
ESD protection		Human body model	±250		V	
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				
Pollution Degree		SELV or PELV				
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, STO+ to STO-	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	

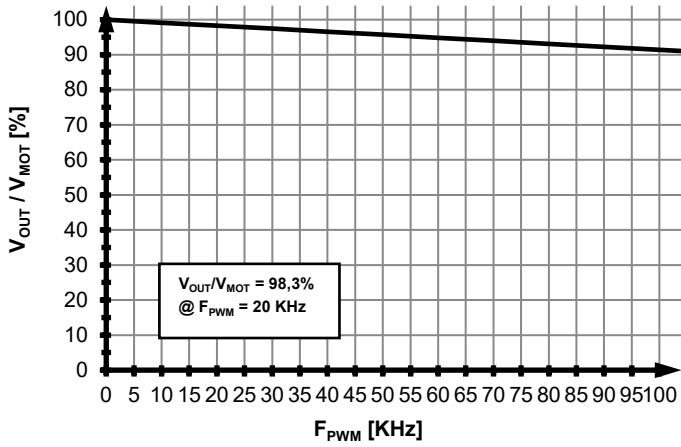
† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

¹ 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-)

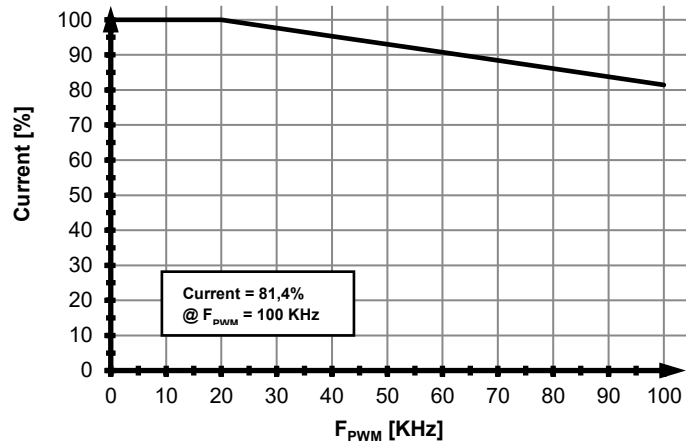
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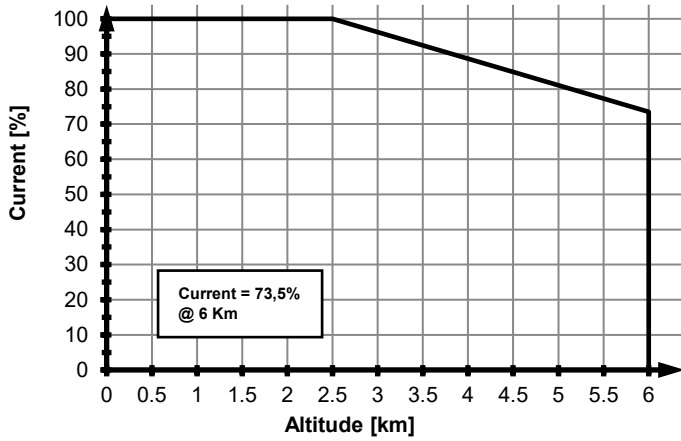
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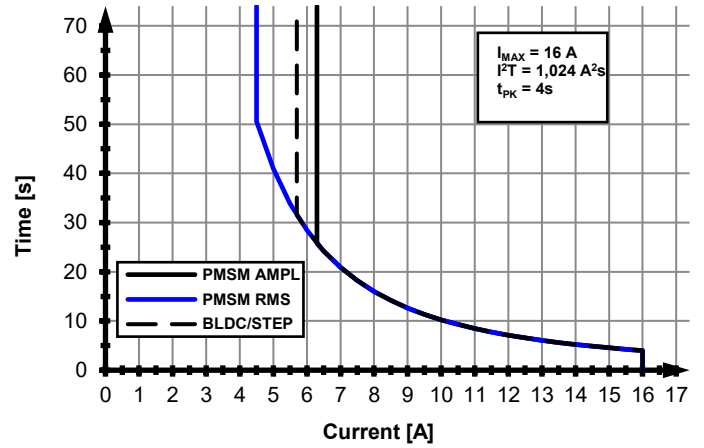
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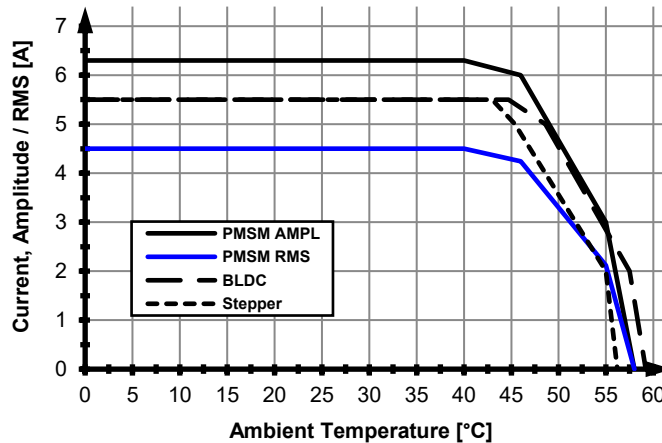
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