


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

Motor – sensor configurations					
Sensor	Motor				
	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	Ⓢ		Ⓢ	Ⓢ	
Incr. Encoder + Dig. Hall	Ⓢ	Ⓢ			
Digital Halls control only	Ⓢ				
Tacho			Ⓢ		
Open-loop (no sensor)				Ⓢ	Ⓢ

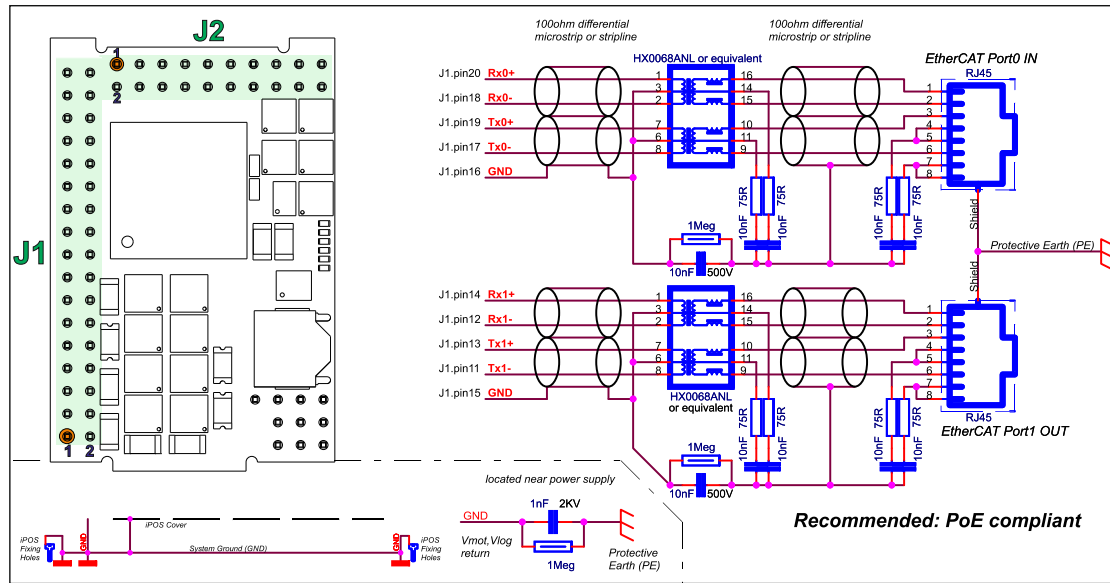
Mating Connectors			
Producer	Part No.	Connector	Description
Samtec	SQW-117-01-F-D(-VS)	J1	2x17, 2.0mm THT (SMD) socket
	CLT-117-02-F-D		2x17, 2.0mm SMD pass-through socket
	SQW-110-01-F-D(-VS)	J2	2x10, 2.0mm THT (SMD) socket
	CLT-110-02-F-D		2x10, 2.0mm SMD pass-through socket

Features
<ul style="list-style-type: none"> Motion controller and drive in a single compact unit based on MotionChip™ technology
<ul style="list-style-type: none"> Universal solution for control of rotary and linear brushless, brushed and 2 or 3-phase step motors Advanced motion control capabilities (CSP, PVT, S-curve, electronic gearing and cam)
<ul style="list-style-type: none"> Motor supply: 48V nominal
<ul style="list-style-type: none"> Motor output current: <ul style="list-style-type: none"> Nominal: 3A_{RMS} / 4.2A amplitude Peak: 10A_{RMS} / 14A amplitude
<ul style="list-style-type: none"> Logic supply: 24V nominal, 48V max
<ul style="list-style-type: none"> Feedback Options: <ul style="list-style-type: none"> 1 x Hall sensor interface (digital) Feedback: Incremental A / B (index Z): differential or single-ended;
<ul style="list-style-type: none"> 1 x analogue input software selectable: 12-bit 0-5V or ±10V: Reference, Feedback or general purpose
<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> 3 x configurable I/Os, each software selectable as: <ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Commissioning (set-up) possible through USB, FoE (file-over-EtherCAT) or EoE (Ethernet-over-EtherCAT)
<ul style="list-style-type: none"> EtherCAT connection to standard RJ45: requires external magnetics (may be integrated into RJ45)
<ul style="list-style-type: none"> 24k x 16 E²ROM to store setup data, TML motion programs, cam tables and other user data
<ul style="list-style-type: none"> 16k x 16 SRAM memory for data acquisition
<ul style="list-style-type: none"> Operating ambient temperature: 0-40°C (over 40°C with de-rating)
<ul style="list-style-type: none"> Programmable protections: any short-circuit between motor phases, GND and/or supply, over/under-voltage, over-current, I²t, control error
<ul style="list-style-type: none"> >99% voltage efficiency

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-preliminary-



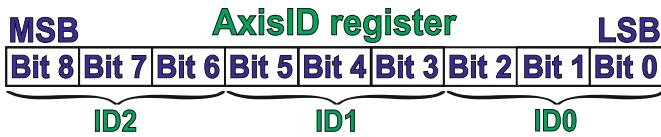
Pin	Name	Type	Description
1	+Vlog	I	Positive terminal of the logic supply input: 6 to 48 VDC
2	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors
3	GND	-	Ground return for logic supply
4	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors
5	GND	-	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	-	Connect to GND to perform a firmware update after a critical firmware failure
10	ID2	I	Axis/D ² selection pin. See Axis/D 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	Axis/D ² selection pin. See Axis/D register settings table
22	ID1	I	Axis/D ¹ selection pin. See Axis/D register settings table
23	...	Rsvd.	Reserved. Do not use.
26	...	Rsvd.	Reserved. Do not use.
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)

Pin	Name	Type	Description
1	+V USB	I	5V input from USB
2	GND	-	Ground return for USB
3	Hall1	I	Digital Hall sensor 1
4	Hall2	I	Digital Hall sensor 2
5	Hall3	I	Digital 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	I	Encoder 1 A+ diff. input or single-ended input
10	EncA1-	I	Encoder 1 A- diff. input. Leave open for single-ended; Add externally 120Ω to pin 9 for differential
11	EncB1+/EncB1	I	Encoder 1 B+ diff. input or single-ended input
12	EncB1-	I	Encoder 1 B- diff. input. Leave open for single-ended; Add externally 120Ω to pin 11 for differential
13	...	Rsvd.	Reserved. Do not use.
16	...	Rsvd.	Reserved. Do not use.
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	ECAT ERR	RED	EtherCAT® ERROR indicator.
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 RUN	GREEN	EtherCAT® RUN indicator.
LED5	ECAT ACT0	YELLOW	Shows the state of the physical link and activity for ECAT IN and OUT ports.
LED6	ECAT ACT1	YELLOW	

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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):

- V_{LOG} = 24 VDC; V_{MOT} = 48 VDC; F_{PWM} = 20 kHz
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude) = 4.2A

Operating Conditions		Min.	Typ.	Max.	Units	
Ambient temperature		0		40 ¹	°C	
Ambient humidity		Non-condensing		0	%Rh	
Altitude / pressure ²		Altitude (vs. sea level)		-0.1	0 ÷ 2.5	Km
		Ambient Pressure		0 ²	0.75 ÷ 1	10.0
Storage Conditions		Min.	Typ.	Max.	Units	
Ambient temperature		-40		100	°C	
Ambient humidity		Non-condensing		0	%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		38.35 x 25 x 9.71	mm	
				~1.51 x 0.98 x 0.38	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	
Nominal values		6	24	48	V _{DC}	
Supply voltage		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		
Nominal values		7		48	V _{DC}		
Supply voltage		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/B+, Cr/B-)		Min.	Typ.	Max.	Units		
Nominal current		PMSM motors sinusoidal amplitude		4.2	A		
		PMSM motors sinusoidal RMS		3	A _{RMS}		
		DC/BLDC/STEP motors continuous [‡]		3.65	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)		Recommended value, for current ripple max. ±5% of full range; +V _{MOT} = 48 V		F _{PWM}			µH
				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				
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	
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"		1.4	1.8	V	
		Logic "HIGH"		3.1	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)		4.5			
		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	
Supply Output (+5V)		Min.	Typ.	Max.	Units		
Output voltage		Current sourced = 400mA		5.05	5.2	5.25	V
Output current [§]				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 For more details see the "Current de-rating with +5V output current" graph

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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 ¹
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 ¹
Offset error	Common-mode voltage = 0...10 V		±0.2	±0.5	%FS ¹
Gain error	Common-mode voltage = 0...10 V		±0.5	±3	%FS ¹
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		-	
MAC addressing	By Hardware			-	
ESD protection	Human body model	±15			kV

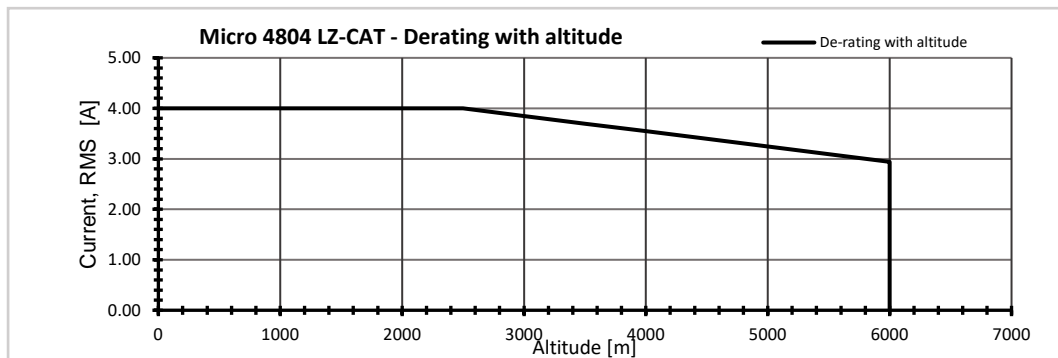
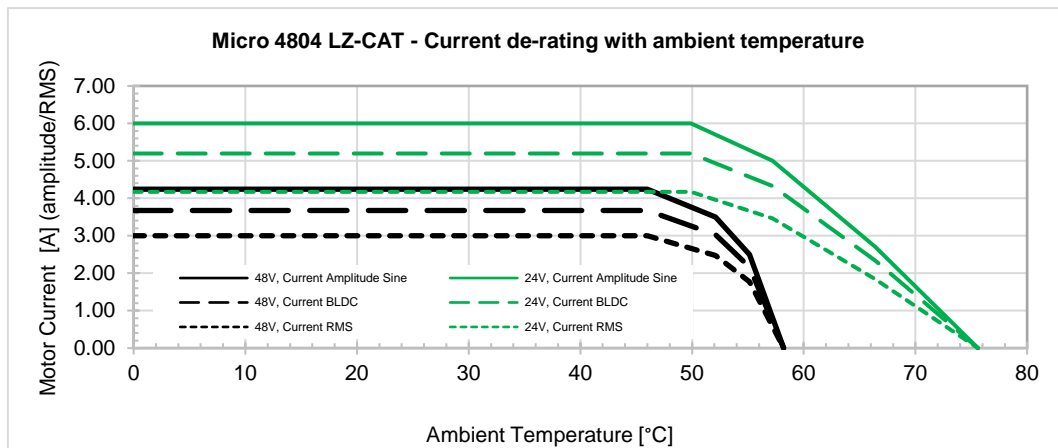
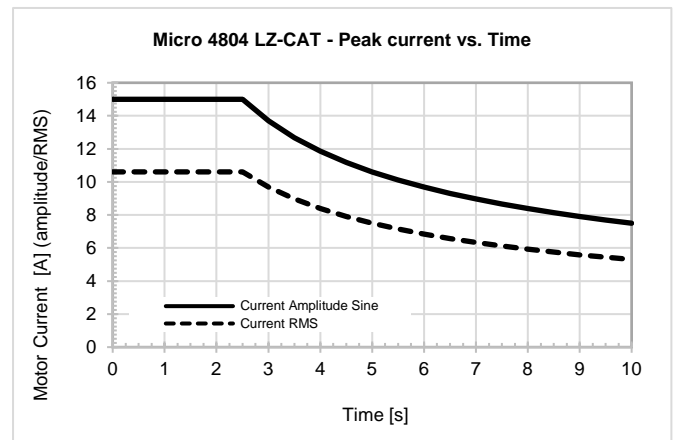
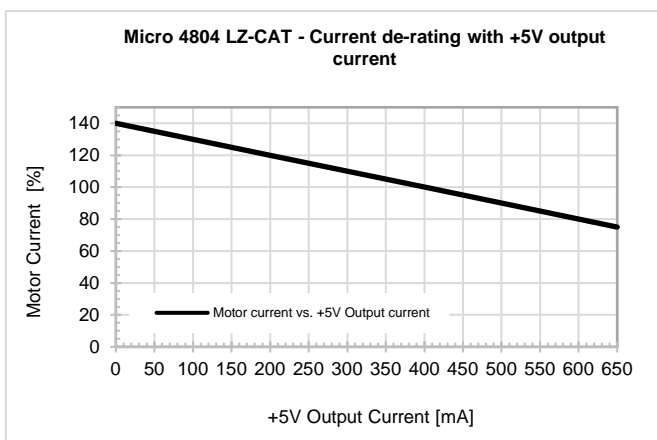
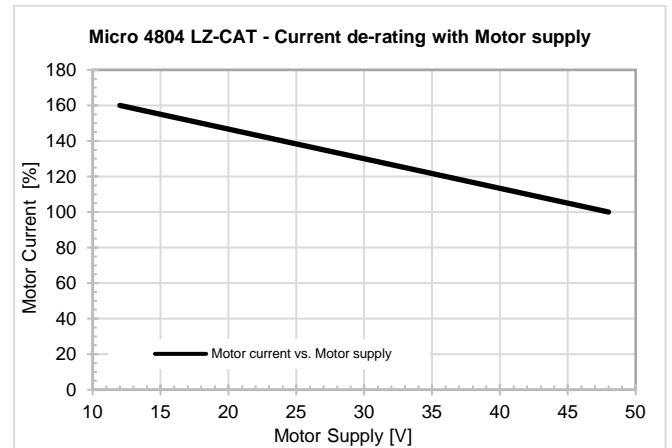
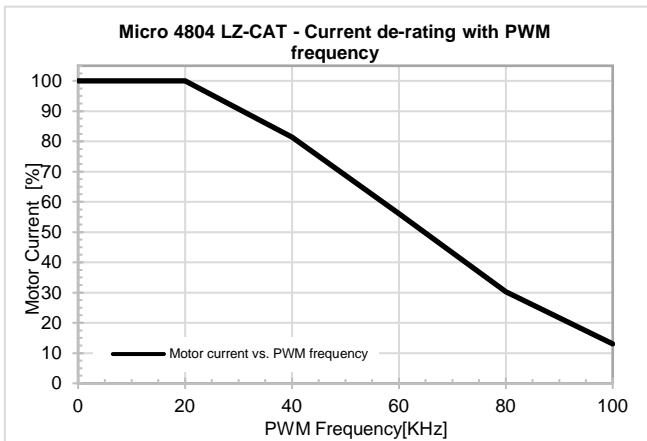
Digital Outputs (OUT0, OUT1, OUT4)				Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT0, OUT1, OUT4)			NPN 24V			
Default state	Not supplied (+V _{LOG} floating)			High-Z (floating)			
	Immediately after power-up			Logic "HIGH"			
Output voltage	Logic "LOW"; output current = 1.5A for OUT0/ 0.05A 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) 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		
Input current	Logic "LOW"; Pull to GND			2.3			mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to +5			0			
Minimum pulse width					70		µs
ESD protection	Human body model				±15		kV
Encoder Inputs(A+, A-, B+, B-, Z+, Z-) ²				Min.	Typ.	Max.	Units
Single-ended mode compliance	Leave A1-, B1-, Z1- floating			TTL/CMOS/Open-collector (NPN)			
Single-ended threshold	A1+, B1+, Z1+			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+, B+, Z+			2.2			kΩ
	A-, B-, Z-			4.4			
Input frequency	Differential mode			0		15	MHz
Minimum pulse width	Differential mode			33			ns
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 "FS" stands for "Full Scale"

² 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-)

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