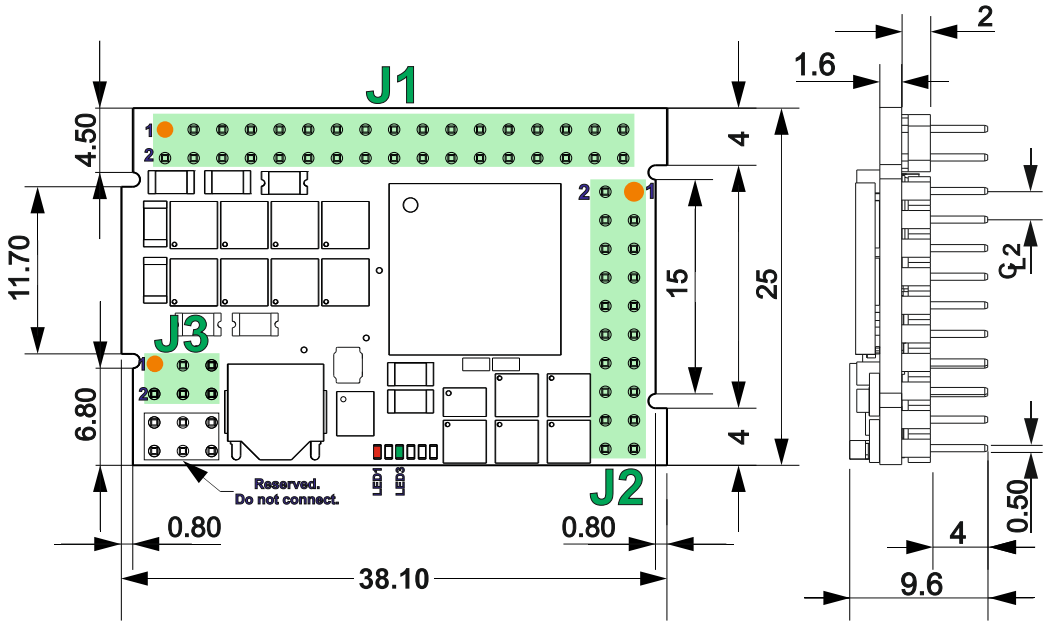
Micro 4804 LZ-CAN
DATASHEET
P/N: P020.022.E102



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**
- 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 can be:
  - 1 x Hall sensor interface (digital)
  - Feedback: Incremental A / B (index Z available): differential or single-ended;
- 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 0.1A.
  - 3 x digital inputs: 2 for limit switches + one Enable, NPN, pull-up on-board to +5V. Pull to GND to activate.
- Communication interfaces: RS232; USB; TMLCAN and CANopen (CiA 301 v4.2, CiA 305 v.2.2.13 and CiA 402 v3.0) protocols
- 24Kwords E^{2}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^{2}t drive & motor, control error
- 3 AxisID inputs, for hardware-based address setting
- >98% voltage efficiency, >98% power efficiency

J1

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	I	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 … 14	Rsvd.	-	Reserved. Do not connect.
15	GND	-	Ground return and shield
16	GND	-	Ground return and shield
17 … 20	Rsvd.	-	Reserved. Do not connect.
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	CAN Hi	O	CAN-Bus positive line (dominant high)
26	CAN Lo	I	CAN-Bus negative line (dominant low)
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/Enable	I	5-48V digital NPN input. Drive Enable 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)

J2

Pin	Name	Type	Description
1	+V USB	I	USB 5V detect input
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	EncA+/ EncA	I	Encoder A+ diff. input or single-ended input
10	EncA-	I	Encoder A- diff. input. Leave open for single-ended; Add externally 120Ω to pin 9 for differential
11	EncB+/ EncB	I	Encoder B diff. input or single-ended input
12	EncB-	I	Encoder B- diff. input. Leave open for single-ended; Add externally 120Ω to pin 11 for differential
13 … 16	Rsvd.	-	Reserved. Do not use.
17	EncZ+/EncZ	I	Encoder Z+ diff. input or single-ended input
18	EncZ-	I	Encoder 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+

LEDs

No.	Name	Color	Description
LED1	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.

J3

Pin	Name	Type	Description
1, 2	Rsvd.	-	Reserved. Do not connect.
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, 6	Rsvd.	-	Reserved. Do not connect.

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**
1.06	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. *If Bit 7 (ID2) = 1 -> TMLCAN mode is selected*
2. *If Bit 7 (ID2) = 0 -> CANopen mode is selected*
3. *Bit 8 (MSB of ID2) is ignored, and always considered as "0"*
4. *The maximum AxisID value is 127 (Bit 0 … Bit 6)*
5. *TMLCAN mode: AxisID = (64*ID2_Value - 128) + (8*ID1_Value) + ID0_Value*
6. *CANopen mode: AxisID = (64*ID2_Value) + (8*ID1_Value) + ID0_Value*
7. *If all "IDx" pins are left not connected or connected to GND, the AxisID value is 255 and CANopen mode is selected. In this case, the drive will be in "LSS inactive" state and the Green LED will flash at 1 second intervals*

** where "x" can be 0, 1 or 2*

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	Non-condensing	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	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[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	N
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}<=1.05*I_{NOM})	DC-1			

[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.

Micro 4804 LZ-CAN
DATASHEET
P/N: P020.022.E102

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	A
Voltage measurement error				±0.15	±0.25	V
Utilization category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})			DC-3		

Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Global size		38.1 x 25 x 9.6		mm
			~1.5 x 1 x 0.4		inch
Weight			8		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[1]	Idle (I_{MOT} = 0A)		55		ºC
	Full power (I_{MOT} = nominal)			100	

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[2]	PMSM motors sinusoidal amplitude					±6.3	A
	PMSM motors sinusoidal RMS					4.5	A_{RMS}
	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	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/ºC
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/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	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/ENA	-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

Hall Inputs (Hall1, Hall2, Hall3)			Min.	Typ.	Max.	Units
Mode compliance	TTL / CMOS / Open-collector (NPN sink)					
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

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, short duration, duty cycle <=1%	5s max	OUT1, OUT4			0.1	A
			OUT0			2	
		0.5s max	OUT1, OUT4			0.15	
			OUT0			2.5	
	Logic "LOW", sink current, continuous; V_{OUT} ≤ 0.4V		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

Encoder Inputs (A+, A-, B+, B-, Z+, Z-)[4]			Min.	Typ.	Max	Units
Single-ended mode compliance	Leave A-, B-, Z- floating		TTL / CMOS / Open-collector (NPN sink)			
Single-ended threshold	A+, B+, Z+		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 (A+ to GND, etc.)			2.2		kΩ
	Differential (A+ to A-, 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

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)			NOT included			
ESD protection	Human body model		±10			kV

[1] 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 ºC; b) the spacing requirements can be dropped down to zero; c) the surface temperature will decrease accordingly

[2] 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.

[3] Fast loop period of 50µs is not possible with all feedback device types.

[4] Full RS-422 compatibility, as well as noise rejection improvement requires an external 120Ω resistor connected across each signal pair (A+/A-, B+/ B-, Z+/Z-)

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

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

AxisID inputs		Min.	Typ.	Max.	Units
Default state	ID1, ID1, ID2 floating	Configured Station Alias = 0, AxisID=255			
Internal pull-down to GND		95	100	105	kΩ
ESD protection	Human body model		±250		V

BFS input		Min.	Typ.	Max.	Units
Polarity		Active Low (0=fail-safe boot, 1=normal)			
Default state	BFS floating	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

† 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.