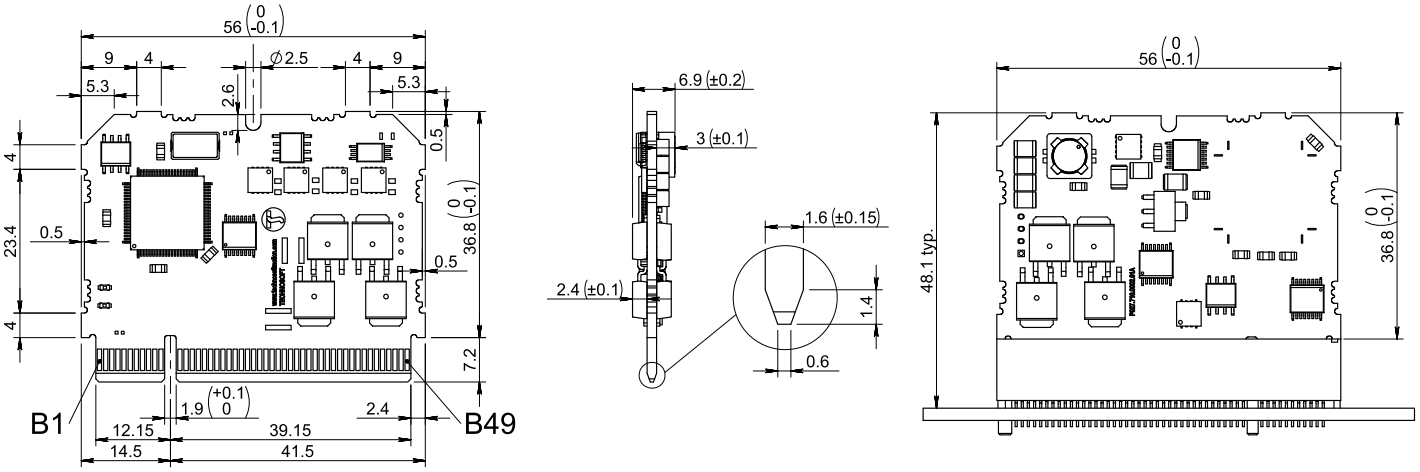
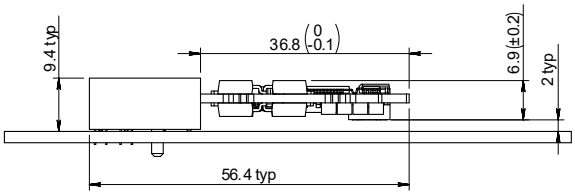
iPOS4808 VX-CAN DATASHEET
P/N: P027.014.E001



Overall dimensions for vertical mounting



Overall dimensions for horizontal mounting

Motor – sensor configurations					
Sensor \ Motor	PMSM	BLDC	DC BRUSH	STEP (2-ph)	STEP (3-ph)
Incr. Encoder	✓		✓	✓	
Incr. Encoder + Hall	✓	✓			
Analog Sin/Cos encoder	✓				
Linear Halls	✓				
Tacho			✓		
Open-loop (no sensor)				✓	✓

Mating Connector		
Producer	Part No.	Description
Tyco	3-1775801-4	PCIe 8x vertical card edge connector,1.0mm pitch, 2x49 contacts
Samtec	PCIE-098-02-F-D-TH	
Tyco	1761465-3	PCIe 8x horizontal card edge connector,1.0 mm pitch, 2x49 contacts
Samtec	PCIE-098-02-F-D-RA	

Features

- Motor supply: 11-50V. Logic supply: 9-36V
- Output current: 8A cont. (BLDC mode); $20A_{PEAK}$, up to 100KHz PWM
- Digital Hall sensor interface (single-ended and open collector)
- Incremental encoder interface (single-ended, open collector and differential)
- Linear Hall sensors interface
- Analogue sin/cos encoder interface (differential $1V_{PP}$)
- 8 digital inputs, 5-36V, NPN: Enable, 2 for limit switches, 5 general-purpose
- 5 digital outputs, 5-36V, 0.5A, NPN O.C.: Ready, Error, 3 general-purpose
- 2 analogue inputs: 12-bit, 0-5V: Reference, Feedback or gen. purpose
- RS-232 serial & CAN-bus 2.0B interfaces with h/w selectable addresses
- TMLCAN and CANopen (CiA 301v4.2 and 402v3.0) protocols
- 2K × 16 SRAM for data acquisition
- 4K × 16 E^2ROM to store TML motion programs and data
- Hardware Protections: short-circuit between motor phases and from motor phases to GND, over-voltage, under-voltage and I^2t
- Firmware: F508M+ or F523E+

Connector description

	Pin	Name	Type	Description
J1	A1	GND	-	Return ground for extension bus
	A2-3	reserved	O	Reserved for interface extensions†
	A4	reserved	I	Reserved for interface extensions†
	A5	reserved	I/O	Reserved for interface extensions†
	A6	OUT1	O	5-36V 0.5A digital output, NPN O.C. / TTL pull-up
	A7	reserved	I/O	Reserved for interface extensions†
	A8	Hall 1	I	Digital input Hall 1 sensor
	A9	Hall 2	I	Digital input Hall 2 sensor
	A10	Hall 3	I	Digital input Hall 3 sensor
	A11	+5V_{OUT}	O	5V supply for sensors - internally generated
	A12	GND	-	Return ground for sensors supply
	A13	A- /Sin-/LH1	I	Incr. encoder A- diff. input, or analogue encoder Sin- diff. input, or linear Hall 1 input
	A14	A/A+/Sin+	I	Incr. encoder A single-ended, or A+ diff. input, or analogue encoder Sin+ diff. input
	A15	B-/Cos/LH2	I	Incr. encoder B- diff. input, or analogue encoder Cos- diff. input, or linear Hall 2 input
	A16	B+/Cos+	I	Incr. encoder B single-ended, or B+ diff. input, or analogue encoder Cos+ diff. input
	A17	Z- /LH3	I	Incr. encoder Z- diff. input, or linear Hall 3 input
	A18	Z+	I	Incr. encoder Z (index) single-ended, or Z+ diff. input
	A19	Can-Hi	I/O	CAN-Bus positive line(dominant high)
	A20	GND	-	Negative return (ground) of the logic supply
	A21-22	reserved	O	Reserved for interface extensions†
	A23-26	reserved	I	Reserved for interface extensions†
	A27-33	GND	-	Negative return (ground) of the motor supply
	A34	reserved	-	Reserved, not connected
	A35-41	CR/B-	O	Chopping resistor / Phase B- for 2-ph steppers
	A42	reserved	-	Reserved, not connected
	A43-49	B/A-	O	Phase B for 3-ph motors, A- for 2-ph steppers, Motor- for DC brush motors

	Pin	Name	Type	Description
J2	B1	232TX	O	RS-232 Data Transmission
	B2	232RX	I	RS-232 Data Reception
	B3	GND	-	Return ground for CAN-Bus and RS-232 pins
	B4	OUT0	O	5-36V 0.5A general-purpose digital output, NPN open-collector / TTL pull-up
	B5	AxisID 0	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
	B6	AxisID 1	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
	B7	AxisID 2	I	Axis ID/Address input. 7 states: floating, strap to GND or +5V, resistor 4K7 or 22K to GND or +5V
	B8	REF	I	Analogue input, 12-bit, 0-5V. Used to read an analog position, speed or torque reference, or used as general purpose analogue input
	B9	FDBK	I	Analogue input, 12-bit, 0-5V. Used to read an analogue position or speed feedback (as tacho), or used as general purpose analogue input
	B10	+5V_{OUT}	O	5V output supply for I/O usage
	B11	OUT2/Error	O	5-36V 0.5A drive error output, active low, NPN open-collector/TTL pull-up. Also drives the red LED
	B12	OUT3/Ready	O	5-36V 0.5A drive ready output, active low, NPN open-collector/TTL pull-up. Also drives the green LED.
	B13	IN0	I	5-36V digital input General-purpose
	B14	IN1	I	5-36V digital input
	B15	IN2/LSP	I	5-36V digital input Positive limit switch input
	B16	IN3/LSN	I	5-36V digital input. Negative limit switch input
	B17	IN4/Enable	I	5-36V digital input. Drive enable input
	B18	Can-Lo	I/O	CAN-Bus negative line (dominant low)
	B19	+V_{LOG}	I	Positive terminal of the logic supply: 9 to 36V_{DC}
	B20	OUT5	O	5-36V 0.5A digital output, NPN O.C. / TTL pull-up
	B21	IN7/Tmot	I	5-36V digital input / analogue 0-3.3V for motor temperature sensor
	B22	reserved	-	Do not connect
	B23	reserved	I	Reserved for interface extensions†
	B24	IN5	I	5-36V digital input General-purpose
	B25	IN6	I	5-36V digital input General-purpose
	B26	reserved	-	Reserved, not connected
	B27-33	+V_{MOT}	I	Positive terminal of the motor supply: 11 to 50V_{DC}
	B34	reserved	-	Reserved, not connected
	B35-41	C/B+	O	Phase C for 3-ph motors, B+ for 2-ph steppers
	B42	reserved	-	Reserved, not connected
	B43-49	A/A+	O	Phase A for 3-ph motors, A+ for 2-ph steppers, Motor+ for DC brush motors

† Leave unconnected if interface extensions are not used

Electrical characteristics

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

- VLOG = 24 VDC; VMOT = 48VDC
- Supplies start-up / shutdown sequence: -any-
- Load current (sinusoidal amplitude / continuous BLDC, DC, stepper) = 8A

Operating Conditions		Min.	Typ.	Max.	Units
Ambient temperature		0		40[1]	ºC
Ambient humidity	Non-condensing	0		90	%Rh
Altitude / pressure[2]	Altitude (vs. sea level)	-0.1	0 ÷ 2.5	[2]	Km
	Ambient Pressure	0 [2]	0.75 ÷ 1	10.0	atm
Storage Conditions		**Min.**	**Typ.**	**Max.**	**Units**
Ambient temperature		-40		TBD	ºC
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[3], closed box			
Spacing required for vertical mounting	Between adjacent drives	30			mm
	Between drives and nearby walls	30			mm
	Between drives and roof-top	20			mm
Spacing required for horizontal mounting	Between adjacent drives	4			mm
	Between drives and nearby walls	5			mm
	Space needed for drive removal	10			mm
	Between drives and roof-top	15			mm
Insertion force	Using recommended mating connectors		31	55	N
Extraction force		8	16		N

Environmental Characteristics		Min.	Typ.	Max.	Units
Size (Length x Width x Height)	Without mating connector	56 x 44 x 6.9			mm
		~2.2 x 1.73 x 0.27			inch
	With recommended mating vertical connector. Height above PCB surface.	56 x 48.1 x 8.9			mm
		~2.2 x 1.89 x 0.35			inch
	With recommended mating horizontal connector. Height above PCB surface.	56 x 56.4 x 9.4			mm
		~2.2 x 2.22 x 0.37			inch
Weight		16			g
Cleaning agents	Dry cleaning is recommended	Only Water- or Alcohol- based			
Protection degree	According to IEC60529, UL508	IP00			-

Logic Supply Input (+V_{LOG})		Min.	Typ.	Max.	Units
Supply voltage	Nominal values	9		36	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	8		40	V_{DC}
	Absolute maximum values, continuous	-0.6		42	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms)†	-1		+45	V
Supply current	+V_{LOG} = 7V		125	320	mA
	+V_{LOG} = 12V		85	220	
	+V_{LOG} = 24V		50	145	
	+V_{LOG} = 40V		40	120	
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	11		50	V_{DC}
	Absolute maximum values, drive operating but outside guaranteed parameters	9		52	V_{DC}
	Absolute maximum values, continuous	-0.6		54	V_{DC}
	Absolute maximum values, surge (duration ≤ 10ms)†	-1		TBD	V
Supply current	Idle		1	5	mA
	Operating	-20	±8	+20	A
	Absolute maximum value, short circuit condition (duration ≤ 10ms)†			26	A
Utilization Category	Acc. to 60947-4-1 (I_{PEAK}<=4.0*I_{NOM})			DC-3	

Motor Outputs (A/A+, B/A-, C/B+, BR/B-)			Min.	Typ.	Max.	Units
Nominal output current, continuous	for DC brushed, steppers and BLDC motors with Hall-based trapezoidal control				8	A
	for PMSM motors with FOC sinusoidal control (sinusoidal amplitude value)				8	
	for PMSM motors with FOC sinusoidal control (sinusoidal effective value)				TBD	
Motor output current, peak	maximum 2.5s		-20		+20	A
Short-circuit protection threshold				±26	TBD	A
Short-circuit protection delay			5	10		µs
On-state voltage drop	Nominal output current; including typical mating connector contact resistance			±0.3	±0.5	V
Off-state leakage current				±0.5	±1	mA
Motor inductance (phase-to-phase)	Recommended value, for current ripple max. ±5% of full range; +V_{MOT} = 36 V	F_{PWM}				µH
		20 kHz	330			
		40 kHz	150			
		60 kHz	120			
		80 kHz	80			
		100 kHz	60			
	Minimum value, limited by short-circuit protection; +V_{MOT} = 36 V	20 kHz	120			µH
		40 kHz	40			
		60 kHz	30			
		80 kHz	15			
		100 kHz	8			
Motor electrical time-constant (L/R)	Recommended value for ±5% current measurement error	20 kHz	250			µs
		40 kHz	125			
		60 kHz	100			
		80 kHz	63			
		100 kHz	50			
Current measurement	FS = Full Scale accuracy			±4	±8	%FS

Digital Inputs (IN0, IN1, IN2/LSP, IN3/LSN, IN4/Enable)		Min.	Typ.	Max.	Units
Mode compliance		TTL / CMOS / LVTTL (3.3V) / Open-collector / NPN / 24V outputs			
Default state	Input floating (wiring disconnected)	Logic HIGH			
Input voltage	Logic "LOW"		0	0.8	V
	Logic "HIGH"	2	5÷24		
	Floating voltage (not connected)		3		
	Absolute maximum, continuous	-10		+30	
	Absolute maximum, surge (duration ≤ 1S)†	-20		+40	
Input current	Logic "LOW"; pulled to GND		0.6	1	mA
	Logic "HIGH"; Internal 4.7KΩ pull-up to +3.3	0	0	0	
	Logic "HIGH"; Pulled to +5V		0.15	0.2	
	Logic "HIGH"; Pulled to +24V		2	2.5	
Input frequency		0		150	kHz
Minimum pulse		3.3			µs
ESD protection	Human body model	±5			kV

Analog 0…5V Inputs (REF, FDBK)		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 GND		30		kΩ
Resolution			12		bits
Integral linearity				±2	bits
Offset error			±2	±10	bits
Gain error			±1%	±3%	% FS[4]
Bandwidth (-3dB)	Software selectable	0		1	kHz
ESD protection	Human body model	±5			kV

[1] Operating temperature at higher temperatures is possible with reduced current and power ratings

[2] iPOS4808 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] "FS" stands for "Full Scale"

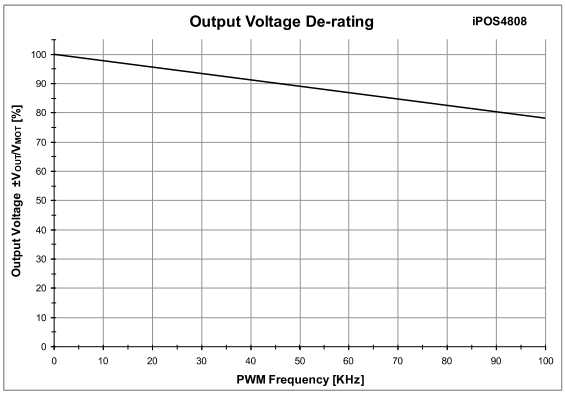
Digital Outputs (OUT0, OUT1, OUT2/Error, OUT3/ Ready)			Min.	Typ.	Max.	Units
Mode compliance	All outputs (OUT0, OUT1, OUT2/Error, OUT3/Ready)		TTL / CMOS / Open-collector / NPN 24V			
	Ready, Error		Same as above + LVTTL (3.3V)			
Default state	Not supplied (+V_{LOG} floating or to GND)		High-Z (floating)			
	Immediately after power-up	OUT0, OUT1	Logic "HIGH"			
		OUT2/Error, OUT3/ Ready	Logic "LOW"			
	Normal operation	OUT0, OUT1, OUT2/Error	Logic "HIGH"			
		OUT3/Ready	Logic "LOW"			
Output voltage	Logic "LOW"; output current = 0.5A			0.2	0.8	V
	Logic "HIGH"; output current = 0, no load	OUT2/Error, OUT3/ Ready	2.9	3	3.3	
		OUT0, OUT1	4	4.5	5	
	Logic "HIGH", external load to +V_{LOG}			V_{LOG}		
	Absolute maximum, continuous		-0.5		V_{LOG}+0.5	
	Absolute maximum, surge (duration ≤ 1S) †		-1		V_{LOG}+1	
Output current	Logic "LOW", sink current, continuous				0.5	A
	Logic "LOW", sink current, pulse ≤ 5 sec.				1	A
	Logic "HIGH", source current; external load to GND; V_{OUT} >= 2.0V	OUT2/Error, OUT3/ Ready			2	mA
		OUT0, OUT1			4	mA
	Logic "HIGH", leakage current; external load to +V_{LOG}; V_{OUT} = V_{LOG} max = 40V			0.1	0.2	mA
Minimum pulse width			TBD			µs
ESD protection	Human body model		±5			kV
Digital Hall Inputs (Hall1, Hall2, Hall3)			**Min.**	**Typ.**	**Max.**	**Units**
Mode compliance			TTL / CMOS / Open-collector			
Default state	Input floating (wiring disconnected)		Logic HIGH			
Input voltage	Logic "LOW"			0	0.8	V
	Logic "HIGH"		2	5		
	Floating voltage (not connected)			4.4		
	Absolute maximum, surge (duration ≤ 1S) †		-10		+15	
Input current	Logic "LOW"; Pull to GND				5	mA
	Logic "HIGH"; Internal 1KΩ pull-up to +5		0	0	0	
Minimum pulse width			2			µs
ESD protection	Human body model		±5			kV
Axis ID Inputs (AxisID 0, AxisID 1, AxisID 2)			**Min.**	**Typ.**	**Max.**	**Units**
External connections	7 levels		Not connected; Strap to GND; Strap to +5V; 4.7kΩ to GND; 4.7kΩ to +5V; 22kΩ to GND; 22kΩ to +5V;			
Pin current	Use to size PCB tracks				±0.5	mA
4.7kΩ/22kΩ resistor	Power rating		3			mW
	Tolerance				±5	%
ESD protection	Human body model		±5			kV
RS-232			**Min.**	**Typ.**	**Max.**	**Units**
Compliance			TIA/EIA-232-C			
Bit rate	Software selectable		9600		115200	Baud
Short-circuit	232TX short to GND		Guaranteed			
ESD protection	Human body model		±2			kV
Supply Output (+5V)			**Min.**	**Typ.**	**Max.**	**Units**
Output voltage	Current sourced = 250mA		4.8	5	5.2	V
Output current			600	650		mA
Short-circuit			NOT protected			
Over-voltage			NOT protected			
ESD protection	Human body model		±1			kV
Conformity			**Min.**	**Typ.**	**Max.**	**Units**
EU Declaration	2014/30/EU (EMC), 2014/35/EU (LVD),2011/65/EU (RoHS), 1907/2006/EC (REACH), 93/68/EEC (CE Marking Directive), EC 428/2009 (non dual-use item, output frequency limited to 590Hz)					

Encoder Inputs (A/A+, A-, B/B+, B-, Z/Z+, Z)		Min.	Typ.	Max.	Units
Single-ended mode compliance	Leave negative inputs disconnected	TTL / CMOS / Open-collector			
Input voltage, single-ended mode A/A+, B/B+	Logic "LOW"			1.6	V
	Logic "HIGH"	1.8			
	Floating voltage (not connected)		4.5		
Input voltage, single-ended mode Z/Z+	Logic "LOW"			1.2	V
	Logic "HIGH"	1.4			
	Floating voltage (not connected)		4.7		
Input current, single-ended mode A/A+, B/B+, Z/Z+	Logic "LOW"; Pull to GND		2.5	3	mA
	Logic "HIGH"; Internal 2.2KΩ pull-up to +5	0	0	0	
Differential mode compliance	For full RS422 compliance, see [1]	TIA/EIA-422-A			
Input voltage, differential mode	Hysteresis	±0.06	±0.1	±0.2	V
	Common-mode range (A+ to GND, etc.)	-7		+7	
Input impedance, differential	A+ to A-, B+ to B-	4.2	4.7		kΩ
	Z+ to Z-	6.1	7.2		
Input frequency	Single-ended mode, Open-collector / NPN	0		500	kHz
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	0		10	MHz
Minimum pulse width	Single-ended mode, Open-collector / NPN	1			µs
	Differential mode, or Single-ended driven by push-pull (TTL / CMOS)	50			ns
Input voltage, any pin to GND	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1S) †	-11		+14	
ESD protection	Human body model	±1			kV
Linear Hall Inputs (LH1, LH2, LH3)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage	Operational range	0	0.5÷4.5	4.9	V
Input voltage	Absolute maximum values, continuous	-7		+7	V
	Absolute maximum, surge (duration ≤ 1S) †	-11		+14	
Input current	Input voltage 0…+5V	-1	±0.9	+1	mA
Interpolation Resolution	Depending on software settings			11	bits
Frequency		0		1	kHz
ESD protection	Human body model	±1			kV
Sin-Cos Encoder Inputs (Sin+, Sin-, Cos+, Cos-)		**Min.**	**Typ.**	**Max.**	**Units**
Input voltage, differential	Sin+ to Sin-, Cos+ to Cos-		1	1.25	V_{PP}
Input voltage, any pin to GND	Operational range	-1	2.5	4	V
	Absolute maximum values, continuous	-7		+7	
	Absolute maximum, surge (duration ≤ 1S) †	-11		+14	
Input impedance	Differential, Sin+ to Sin-, Cos+ to Cos- [2]	4.2	4.7		kΩ
	Common-mode, to GND		2.2		kΩ
Resolution with interpolation	Software selectable, for one sine/cosine period	2		10	bits
Frequency	Sin-Cos interpolation	0		450	kHz
	Quadrature, no interpolation	0		10	MHz
ESD protection	Human body model	±1			kV
CAN-Bus		**Min.**	**Typ.**	**Max.**	**Units**
Compliance		ISO11898, CiA-301v4.2 & 402v3.0			
Bit rate	Software selectable	125		1000	Kbps
Bus length	1Mbps			25	m
	800Kbps			50	
	500Kbps			100	
	≤ 250Kbps			250	
Resistor	Between CAN-Hi, CAN-Lo	none on-board			
Node addressing	Strapping option (AxisID0,1,2)	1 ÷ 127 (CANopen); 1-195 & 255 (TMLCAN)			-
ESD protection	Human body model	±15			kV

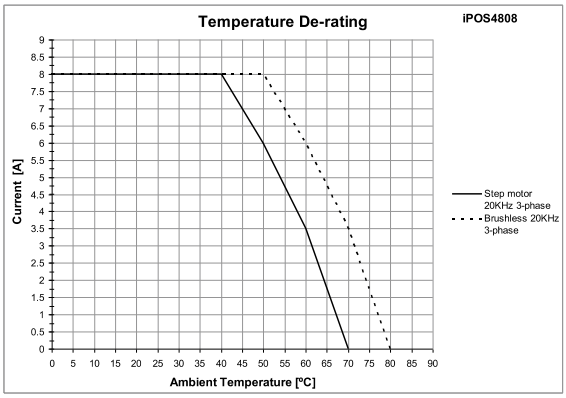
† Stresses beyond values listed under "absolute maximum ratings" may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

[1] For full RS-422 compliance, 120Ω termination resistors must be connected across the differential pairs, as close as possible to the drive input pins.

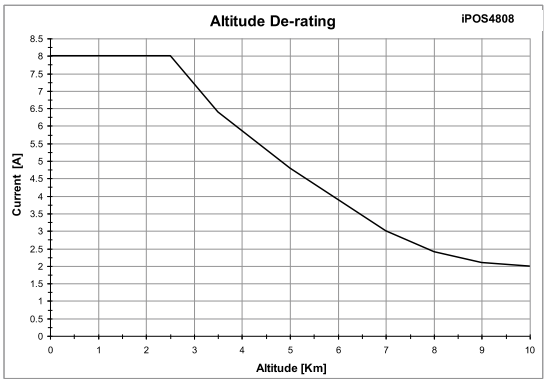
[2] For many applications, an 120Ω termination resistor should be connected across SIN+ to SIN-, and across COS+ to COS-. Please consult the feedback device datasheet for confirmation.



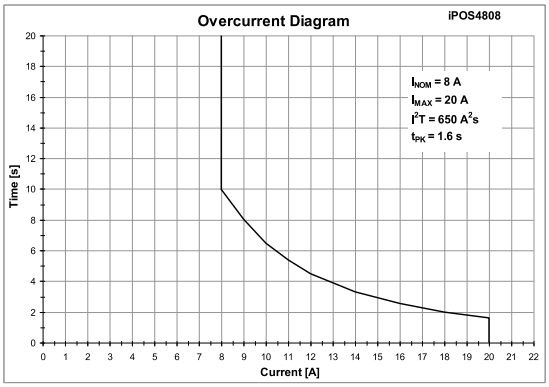
Output Voltage De-rating with PWM frequency



De-rating with ambient temperature



De-rating with altitude



Over-current diagram