

Features & Benefits

- 60W continuous power transmission
 - Unidirectional (Tx, Rx versions)
 - Bidirectional (Ux versions)
- 92% peak efficiency
- Input and Output Voltage
 - 12V & 24V versions
 - 85-264V AC input
 - USB-C (optional)
- Fast Dynamic Response
- Battery Management
 - Lilon/LiFePO Battery Charger
 - Power Path Control
 - SMBus interface
- Bidirectional data
 - GPIO, I²C, CAN or UART
- Foreign Object Detection
- Overvoltage (OVP), Undervoltage (UVP), Overcurrent (OCP) and Overtemperature (OTP) protection
- Low Standby Consumption
- Low Electromagnetic Emissions
- Compliance to
 - EN 55011/CISPR 11 class B
 - FCC, part 15 & 18
 - IEC / EN 61000-4-3,4,5,6,8
- RoHS/WEEE compliant



Typical Applications

- Medical
- Industrial
- Robotics
- Instrumentation
- Defense

Product Description

The exm module series is a easy to use plug and play solution for high performance wireless power transmission. The modules offer a compact design with up to 60W output power at high efficiency. The modules use advanced power processing, control and packaging technologies to provide the performance, flexibility, reliability and cost effectiveness of a mature power component.

Based on etatronix proprietary and patented technologies the exm60 series offers a fast output voltage and current regulation. The regulated output can be used to directly supply a connected load without the need for additional voltage post-regulation.

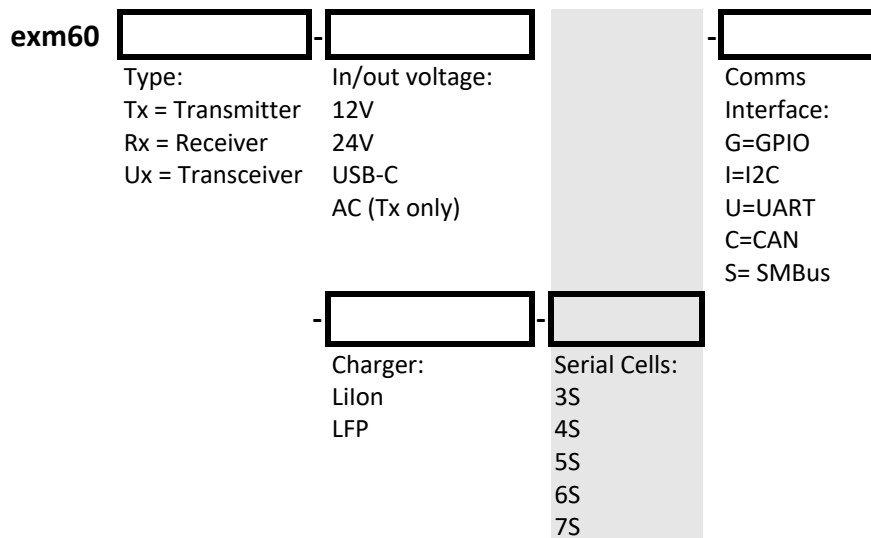
Battery Management versions of the exm60 are available which provide Lilon and LiFePo battery charging as well as power path control capabilities. The integrated battery charger supports Smart Battery System designs (SBS) that uses SMBus (System Management Bus). The battery connected to the exm60 can be charged while power is delivered to the load. The power path controller automatically switches from wireless power to the battery if power transfer from the power transmitter is not available. Combination

of Ux and Battery Management versions of the modules also allow discharge of the battery back into the power source.

The exm60 series offers various connectivity options. The GPIO version offers two GPIO signals which can be used for simple status indication or to control actuators. The I²C, SMB, UART and CAN versions allow module configuration and transfer of application data packages. Use of different interfaces on both sides of the wireless link can be combined e.g., it's possible to have a CAN interface on one the transmitter and a GPIO interface on the receiver. GPIO lines can be used as user interface to display device status (power, charging, error, etc.).

The modules are certified according to global safety and EMC standards. Compliance to CE and FCC regulations simplifies certification of the target application.

Part Numbering



Examples

exm60Tx-24V-I	Tx, 24V input, I2C interface
exm60Tx-AC-G	Tx, AC input, GPIO signals
exm60Rx-12V-C	Rx, 12V output, CAN interface
exm60Rx-USB-C-I	RX, USB-C output and I2C interface
exm60Rx-LFP-2s-I	RX, LiFePo battery charger for 2s battery packs, I2C interface

Connectors

DC Power Connector CN101 (12V and 24V versions)

Type: Würth 662105136022

Pin #	Signal Name	Function
1	V+	Protected by internal fuse
2	D1	GPIO, I ² C/SMBus SCL, CAN Rx or UART Rx depending on part number
3	D2	GPIO, I ² C/SMBus SDA, CAN Tx or UART Tx depending on part number
4	A	Analog Input, e.g. for battery temperature sensing
5	GND	Ground

AC Power Connector CN102 (AC versions)

Pin #	Signal Name	Function
1	L	AC mains line
2	N	AC mains neutral

USB Connector CN103 (USB-C versions)

Pin #	Signal Name	Function
A1, B1, A12, B12	GND	Ground
A4, A9, B4, B9	+V	Positive Supply Rail
A2, A3, A8, A10, A11, B2, B3, B8, B10, B11	NC	Not connected
A5, B5	CC1/CC2	Configuration channel pins
A6, B6	D+	USB Communication
A7, B7	D-	USB Communication

Electrical Specifications

Attribute	Min	Typ	Max	Unit	Notes
Rated Power			60	W	

DC Power Connector (12V and 24V versions)

Transmitter (Tx) Modules, Transceiver (Ux) Modules in transmit mode, 6mm air gap, axially aligned, with exm60Rx-24V

Version	Attribute	Min	Typ	Max	Unit	Notes
12V	Operating Input voltage		12		V	
	Undervoltage threshold			11.4	V	
	Oversvoltage threshold	12.6			V	
	Input Current			6.6	A	
	Total Efficiency		91		%	Tx Input to RX output
	Standby Power				mW	
24V	Operating Input voltage		24		V	
	Undervoltage threshold			22.8	V	
	Oversvoltage threshold	25.2			V	
	Input Current			3.3	A	
	Total Efficiency		92		%	Tx Input to RX output
	Standby Power				mW	

Receiver (Rx) Modules, Transceiver (Ux) Modules in receive mode

Version	Attribute	Min	Typ	Max	Unit	Notes
12V	Output Voltage	11.4	12	12.6	V	Steady state
	Output Current			5	A	
24V	Output Voltage	22.8	24	25.2	V	Steady state
	Output Current			2.5	A	

D1, D2 & A IO Signals

Attribute	Min	Typ	Max	Unit	Notes
Low level digital interface	-0.1		0.6	V	
High level digital interface	2.7		3.4	V	

AC power connector (AC versions)

Transmitter (Tx) Modules

Version	Attribute	Min	Typ	Max	Unit	Notes
AC	Operating Input Voltage	85		264	Vac	
	Frequency Range	47		63	Hz	
	Power Factor	0.94				230V, full load
	Standby Power				mW	

USB connector (USB-C versions)

Version	Attribute	Min	Typ	Max	Unit	Notes
USB-C	Voltage range	5		20	V	
	Output current			3	A	

Battery Connector (Battery Management Versions)

Attribute		Min	Typ	Max	Unit	Notes
Charge Voltage	3S		12.6		V	
	4S		16.8		V	
	5S		21.0		V	
	6S		25.2		V	
	7S		29.4		V	
Charge Current	3S			4.8	A	
	4S			3.6	A	
	5S			2.8	A	
	6S			2.4	A	
	7S			2.0	A	

Mechanical Specifications

Alignment

Attribute	Min	Typ	Max	Unit	Notes
Air gap	4	6	8	mm	Distance between coil surfaces
Lateral misalignment			5	mm	Distance of the coil axes

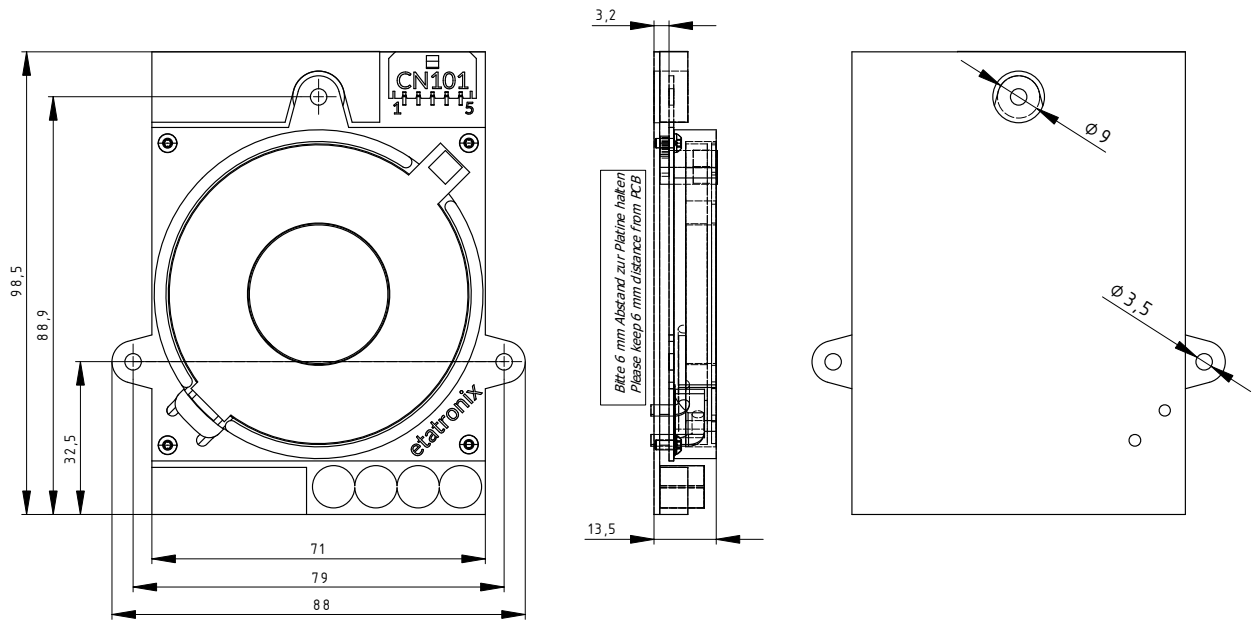
Dimensions

Length	Width	Height
98.5mm +/-0.2	71.0mm +/-0.2	13.6mm +/-0.5

Weight

Attribute	Min	Typ	Max	Unit	Notes
Weight	165	170	175	g	

Drawing (DC-Version)



Environmental Specifications

Attribute		Min	Typ	Max	Unit	Notes
Ambient Temperature	Operating	-25		70	°C	
	Storage	-40		85	°C	
Humidity	Operating	20		95	%	Relative Humidity, non-condensing
	Storage	10		95	%	Relative Humidity, non-condensing
Ambient Pressure		800			hPa	
Altitude				2000	m	

Reliability

Attribute	Min	Typ	Max	Unit	Notes
MTBF	200k			hours	Siemens SN29500 Standard
Lifetime		10		years	

Standards and Agency Approvals

Attribute		Notes
EMC	EN 55011/CISPR 11 class B	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
	47 CFR Part 15	Title 47 of the Code of Federal Regulations (CFR) Part 15 - RADIO FREQUENCY DEVICES
	IEC /EN 61000-3-2	Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
	IEC / EN 61000-4-3	Radiated, radio-frequency, electromagnetic field immunity test
	IEC / EN 61000-4-4	Electrical fast transient/burst immunity test
	IEC / EN 61000-4-5	Surge immunity test
	IEC / EN 61000-4-6	Immunity to conducted disturbances, induced by radio-frequency fields
	IEC / EN 61000-4-8	Power frequency magnetic field immunity test

	IEC / EN 61000-4-11	Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16A per phase
EMF	EN 50665	Generic standard for assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz)
	EN 62311	Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz to 300 GHz)
Agency Approvals	CE	EU, Low Voltage Directive
	FCC	USA

Revision History

Revision	Date	Description
0.1	2023-03-04	Initial Draft
0.2	2023-04-21	Connectors, electrical specification, part numbering updated, clarifications
0.3	2024-05-02	Weight added
0.4	2024-06-04	Technical Drawing updated

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