# X1 Series Battery Management System

ERX1-LFP12S30A, ERX1-LFP12S50A, ERX1-LFP12S70A, ERX1-LFP12S100A

### 1 Features

- Industrial grade BMS for 38.4V LFP battery
- AIS-156-A3 compliant
- Ultra-fast current response time: 8µS
- High tolerance to transient voltages
- Typical cell voltage accuracy of 4mV
- Supports 4 battery temperature sensors
- Onboard flash memory for up to 3 months of battery data storage
- Integrated audio alarm for fault indication
- CAN and RS-485 communication
- Dedicated peripheral attachment port with support for Display, GPRS, GPS and Bluetooth
- Parameter configuration through PC and mobile application

### 2 Applications

- Energy storage battery for inverters, UPS
- Low speed two-wheeler and threewheeler electric vehicle
- Solar grade batteries up to 10kWhr



### 3 Description

X1 series battery management system (BMS) is a robust and reliable industrial grade smart BMS with the right balance between accuracy, performance and price. The BMS has an outstanding ability to handle surge currents and transient voltages associated with inductive loads.

X1 BMS is AIS156-A3 complaint and IP-51 rated. It is supplied with 250°C PTFE wiring harness as standard with all models. Wired communication options include RS-485, UART and CAN that can work simultaneously. Along with the standard communication port, the BMS features a peripheral port that can connect to Bluetooth and IoT devices.

The BMS is compatible with RXN's computer and mobile software that facilitates seamless real time data monitoring, logging and crucial BMS parameter adjustment.

ERX1-LFP12S				
Cell Chemistry	LiFePO <sub>4</sub>			
Nominal Cell Voltage	3.2V			
Series Cells	12			
Nominal battery voltage	38.4V			

# 4.1 General Specification

SN	PARAMETER	VALUE	UNIT	REMARKS	
1	Nominal battery voltage	38.4	V	12S cell configuration	
2	Operating current – active	8	mA	Battery voltage 38V	
3	Operating current – Sleep	500	μΑ	Battery voltage 38V	
4	Power MOSFET configuration	SPST	-	Negative terminal, Low side	
		5.0		ERX1-LFP12S30A	
5	Internal resistance	3.0	mΩ	ERX1-LFP12S50A	Max resistance
	(Terminal to terminal)	1.5		ERX1-LFP12S70A	$T_{BMS} = 50^{\circ}C$
		1.1		ERX1-LFP12S100A	
6	Battery temperature sensors	4	-		
7	Onboard data logging period	90	Days		
8	Communication			CAN, RS-485	
9	Communication isolation	NO	_	Non isolated channels	

### 4.2 Absolute Maximum Rating

SN	PARAMETER	MIN	MAX	UNIT
1	Battery voltage	-1	50	V
2	Cell voltage $V_N - V_{N-1}$	-0.2	5	V
3	Operating ambient temperature	-20	70	°C
4	Maximum load inductance <sup>#1</sup>		100	μH

Operation beyond the absolute maximum rating may cause immediate damage to the device.

### 4.3 Measurement Accuracy

SN	PARAMETER	ТҮР	MAX	TEST CONDITION
1	Cell voltage accuracy	4mV	10mV	-10°C to 60°C, 0V to 4.5V
2	Battery voltage accuracy	0.2%	0.35%	-10°C to 60°C, 10V to 30V
3	Current accuracy (0A – 120%)	2% ± 0.1A	4% ± 0.2A	25°C ambient, $T_{BMS} < 60$ °C
4	Current accuracy (> 120%)	3%	5%	25°C ambient, $T_{BMS} < 60°C$
5	Current thermal drift	_	0.03%/°C	T <sub>BMS</sub> 25°C to 90°C
6	Temperature accuracy	1°C	3°C	-10°C to 60°C
7	Measurement bandwidth <sup>#2</sup>	5Hz		
8	Data readout frequency	1Hz		

**#1** Maximum load inductance is limited by the ability of the BMS to successfully interrupt currents as high as the short circuit limit without failure. If the nature of load is highly inductive, external TVS must be installed across the load. The clamping voltage of the TVS must not exceed the absolute maximum rated voltage of the BMS

**#2** Measurement bandwidth refers to the bandwidth of current and voltage signal provided by the BMS to the external host after internal digital filtering. The actual acquisition and measurement bandwidth of the BMS is much higher. High bandwidth data is used only for internal functioning of the BMS.

## 4.4 Electrical Specification

CN	DADAMETED	VALUE	LINIT	DEMADKS
314		VALUE		REMARKS
-	PACK VULTAGE SPECIFICATION	10.6		
1	Over-charge entry threshold	43.6	V	
2	Over-charge exit threshold	41.4	V	Equivalent to 3.45V/Cell
3	Over-discharge entry threshold	33.6	V	Equivalent to 2.80V/Cell
4	Over-discharge exit threshold	36.0	V	Equivalent to 3.00V/Cell
5	Sleep mode entry threshold	31.2	V	Equivalent to 2.60V/Cell
6	Sleep mode exit threshold	33.0	V	Equivalent to 2.75V/Cell
	CELL VOLTAGE SPECIFICATION			
7	High voltage entry threshold	3.65	V	
8	High voltage exit threshold	3.50	V	
9	Low voltage entry threshold	2.75	V	
10	Low voltage exit threshold	2.90	V	
	CURRENT SPECIFICATION			
		30 15		FRX1-LEP12S30A
11	Continuous current rating	50 25	А	ERX1-LFP12S50A
	Discharge   Charge	70 35		ERX1-LFP12S70A
		100 50		ERX1-LFP12S100A
		120		Overload duration: 60s
12	Over current capacity	150	%	Overload duration: 20s
		300		Overload duration: 1s
13	Short circuit current threshold	550	%	% of continuous rating
14	Short circuit reaction time	8	μs	
15	Short circuit auto-restart time	3	s	Auto restart after short removal
16	Over load auto-restart time	10	S	
17	Max output load for successful	70	%	% of rated load current
	hot–start after a fault trip			
10	PRECHARGE SPECIFICATION			
18	Precharge resistance	54	Ω	
19	Maximum precharge duration	2	S	
20	Precharge repeat time	5	S	
	Maximum load capacitance for	6,500	μF	
	successful one shot precharge			
01	BALANCER SPECIFICATION	Dessive		
21	Turical halansing sument	Passive		When heleneine neu ediscent celle
22	Typical balancing current	30	MA	when balancing non adjacent cells
23	Balancer ON $\Delta V_{Cell}$ threshold	40 20	m۷	Corse balancing
24	Balancer OFF $\Delta V_{coll}$ threshold	10	mV	
25	Low V Cell stop threshold	3.30	V	Balancing stops below this voltage
	High V Cell discharge threshold	3 65	v	Forced discharge is initiated on
26		0.00	×	cells above this voltage regardless
20				of cell voltage differential

# 4.5 Thermal Specification

SN	PARAMETER	VALUE	UNIT	REMARKS
1	Maximum heat dissipation at rated	5		ERX1-LFP12S30A
	current	8	W	ERX1-LFP12S50A
				70A,100A BMS to be updated
2	Thermal resistance $R\theta_{CA}$	5.0		ERX1-LFP12S30A
	Case to ambient (vertical mounting)	3.0	°C/W	ERX1-LFP12S50A
				70A,100A BMS to be updated
3	ΔT max at rated current	< 30	°C	
4	Working temperature range	-20 to 60	°C	Derate maximum permissible
	(ambient temperature)			current above 50°C

# 4.6 Mechanical Specification

SN	PARAMETER	VALUE	UNIT	REMARKS
1	Dimensions	126x63x20		ERX1-LFP12S30A
		126x63x32.5	mm	ERX1-LFP12S50A
				70A and 100A version to be updated
2	Weight	160		ERX1-LFP12S30A
		260	g	ERX1-LFP12S50A
				70A and 100A version to be updated
3	Waterproofing	IP51		Protected from limited dust and water droplets

### X1-Series 30A BMS Mechanical Drawing







#### X1-Series 50A BMS Mechanical Drawing

