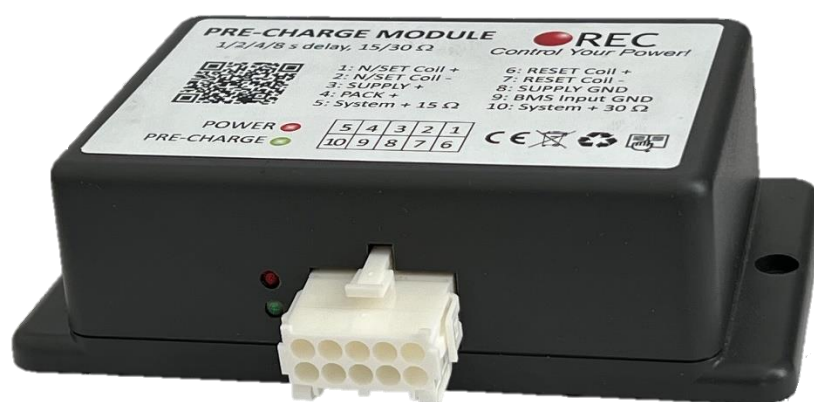


REC PRE-CHARGE UNIT V3_0



 **REC**
Control Your Power!

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Features:

- robust and small design
- low power consumption @ 11-80 V DC
- 1/2/4/8 s DIP switch delay settings
- Up to 120 V, 4.0 A pre-charge
- integrated 15 and 30 Ω power resistor + 10 Ohm NTC
- 6.0 A top side coil drive with over-current protection
- Single pole or bi-stable latching contactor drive
- reverse polarity protection
- over-voltage protection
- one-year warranty

General Description:

High input capacitance systems such as inverters, dc-dc converters, etc. can be exposed to large in-rush currents during the initial power up procedure. If appropriate measures are not employed, these currents can overly stress or even damage the system components. The pre-charge unit eliminates high in-rush currents by charging the input capacitor before the main contactor switches on, prolonging lifespan of the contactor and other components dramatically.

Parameters:

Table 1: Pre-charge parameter table.

Parameter	Value	Unit
Supply voltage range $V_{CC} - V_{SS}$	10 - 80	V
Supply current I_{STBY}	1 @ $V_{CC} = 10$ V	mA
	2 @ $V_{CC} = 30$ V	mA
	3 @ $V_{CC} = 60$ V	mA
	4 @ $V_{CC} = 80$ V	mA
Battery pack voltage range $V_{BAT} - V_{SYS}$	10 - 120 V	V
BMS input voltage range	$V_{SS} - (V_{SS} + 5.0)$	V
BMS input voltage enable threshold	$\leq (V_{SS} + 0.2)$	Ω
BMS input voltage disable threshold	$> (V_{SS} + 1.7)$	Ω
Pre-charge resistance output pin 5	15 + NTC 10	Ω
Pre-charge resistance output pin 10	30 + NTC 10	Ω
Pre-charge output voltage $V_{PRECHARGE}$	30 + NTC 10	Ω
Contactors + output coil voltage max	$V_{CC} - 0.7$	V
Contactors + output coil voltage min	$V_{CC} - 1.0$	V
Contactor coil fuse (slow)	6.3 slow blow	A
Pre-charge fuse (slow)	4.0 slow blow	A
Time delay	1/2/4/8	s
Contactors – to VSS resistance	100	m Ω
Dimensions	127x 70.6 x 35.5	mm
Weight	129	g
IP rating	20	n.a.

Pre-charge description:

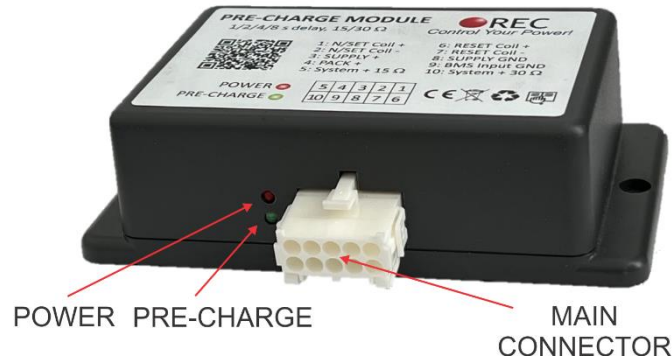


Figure 1:

Pre-charge connections:



Figure 2: Pre-charge connection description.

Table 2: Pre-charge pinout.

Pin	Tab	Single pole contactor connection	Bi-stable latching contactor connection
1	N/SET COIL +	Contactor coil +	Bi-stable latching contactor SET coil +
2	N/SET COIL -	Contactor coil -	Bi-stable latching contactor SET coil -
3	SUPPLY +	Supply positive 10 – 80 V	Supply positive 10 – 80 V
4	PACK +	Battery pack + (10 – 120 V)	Battery pack + (10 – 120 V)
5	SYSTEM + 15 Ω	System side + pre-charge 15 Ω	System side + pre-charge 15 Ω
6	RESET COIL +	-	Bi-stable latching contactor RESET coil +
7	RESET COIL -	-	Bi-stable latching contactor RESET coil -
8	SUPPLY GND	Supply GND	Supply GND
9	BMS Input GND	BMS input – pull down to Supply GND	BMS input – pull down to Supply GND
10	SYSTEM + 30 Ω	System side + pre-charge 30 Ω	System side + pre-charge 30 Ω

Typical System Overview:

Figure 1 shows the integration of the pre-charge unit in a typical power system. Only the connections relevant to the pre-charge unit operation are shown. The connection scheme is described in Table 2.

Table 3: Pre-charge pin description.

The power system consists of a contactor (NO), a battery pack, a current shunt, a PRE-CHARGE unit, a REC Q BMS unit and a high input capacitance system (SYSTEM). At system start up the REC Q BMS activates the charging procedure by powering the pre-charge unit. The pre-charge unit closes the power circuit through its internal relay (RELAY ON). The in-rush current flows entirely through the pre-charge 66 Ω internal resistor. After set delay the transient current should be decrease to a safe value. The pre-charge energizes the contactor coil through open collector circuit and after 1 second opens the internal relay (RELAY OFF). All of the system current now passes through the contactor. Normal system operation is achieved.

Measuring/Setting Pre-charge Delay:

To set the pre-charge delay properly, system voltage should be measured at the end of pre-charge timer phase. Connect all required connections except the N/SET COIL + connection to disable contactor engaging. Enable the pre-charge by pulling BMS Input GND to SUPPLY GND by the BMS or manually. Measure the system voltage @the system side of the contactor. After the pre-charge timer the system voltage should rise to at least 80% of the battery voltage. If the voltage stays below this value increase the Pre-charge delay or use the SYSTEM + 15 Ω output. Pre-charge current should be limited to maximum 4 A (Max battery voltage / pre-charge resistance).

Battery voltage [V]	Battery voltage range[V]	Pre-charge output
12	10 -16	SYSTEM + 15 Ω output
24	21 - 30 V	SYSTEM + 15 Ω output
48	43 - 67	SYSTEM + 15 Ω output
80	64 -88	SYSTEM + 30 Ω output
100 V +	90 to 120 V	SYSTEM + 30 Ω output + external 20 Ω 25 W

Please note: Some of the inverters/controllers on the system side may start to work with lower voltage and their power consumption prevent system voltage to rise.

$V_{SYS} > 80 \% V_{BAT}$ @ END OF PRE-CHARGE PHASE

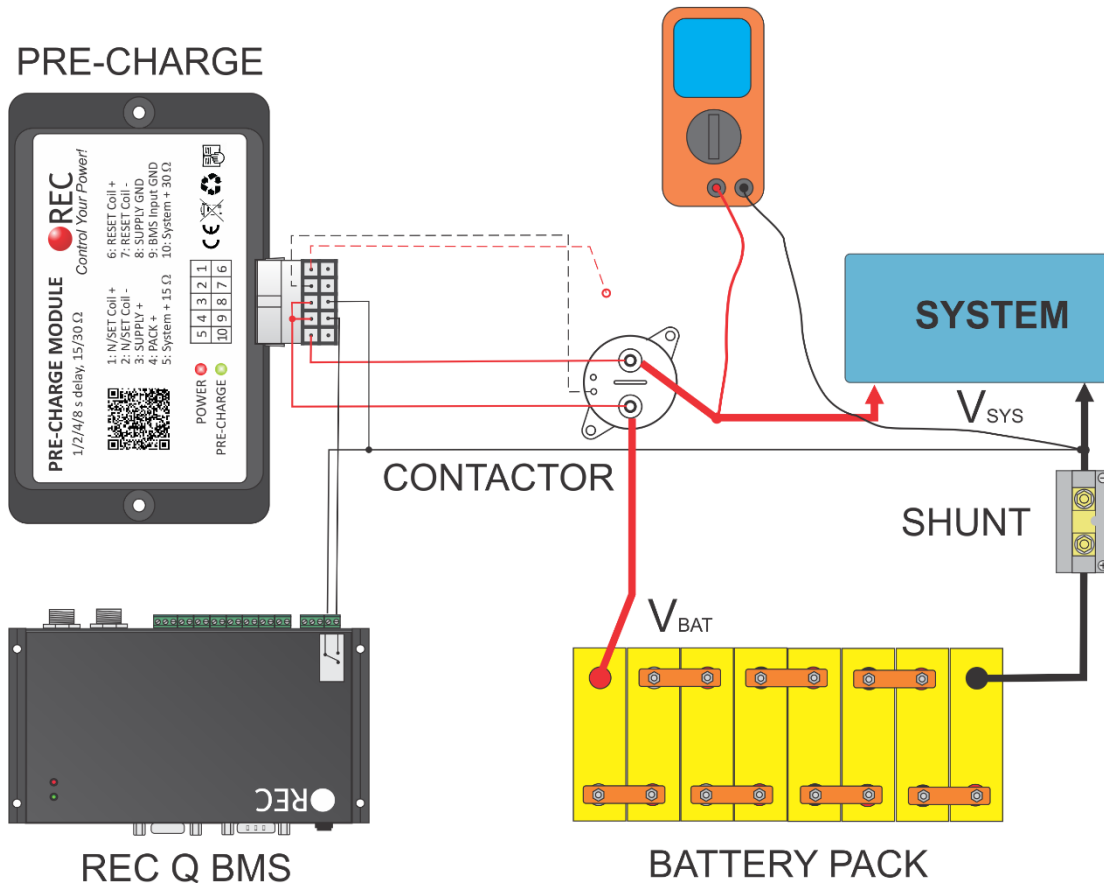


Figure 3: System voltage measuring procedure.

You can prolong the pre-charge time by changing DIP switches inside the Pre-charge unit without Pre-charge unit power disconnection. Pre-charge only requires to be disabled by the BMS input GND. Bellow you can find DIP switch settings description.

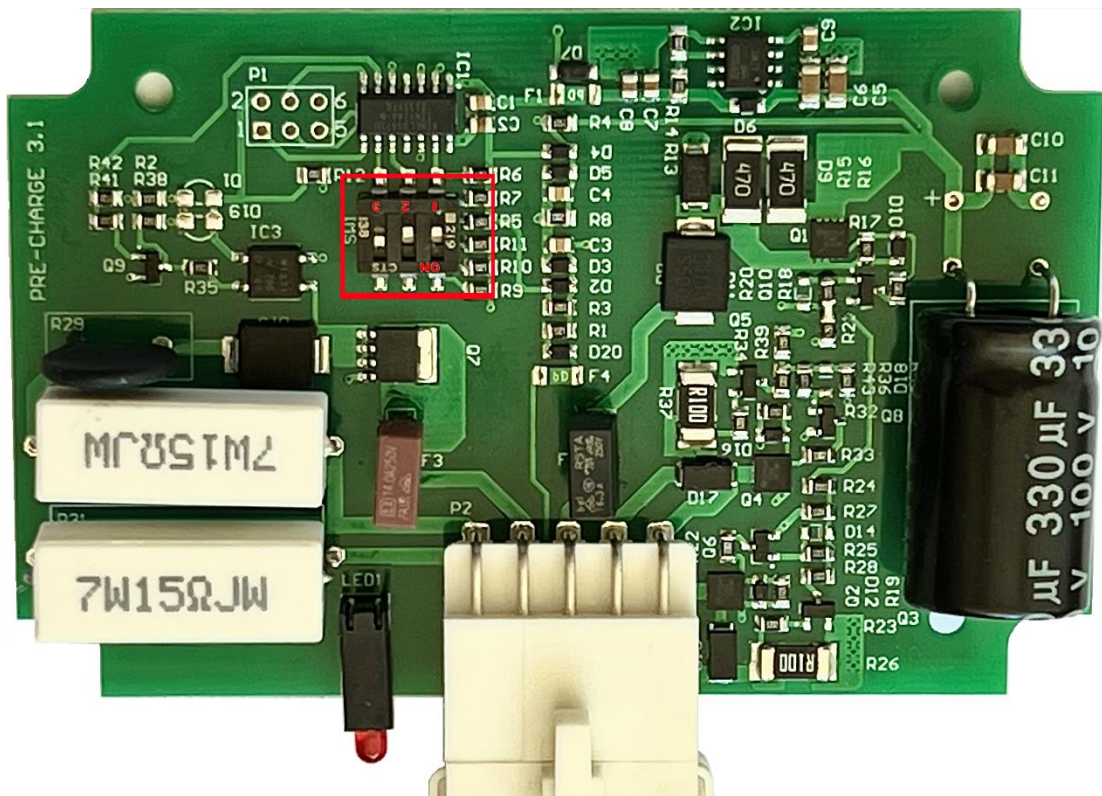
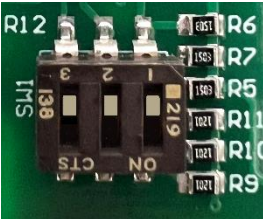
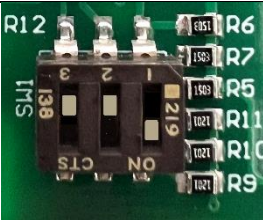
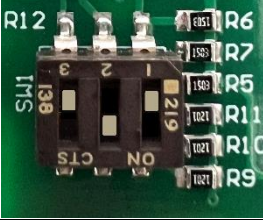
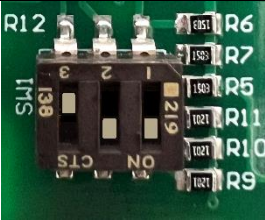
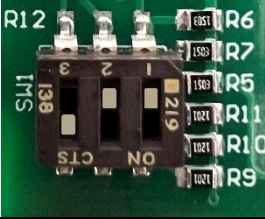





Figure 4: Pre-charge delay DIP switch selector.

Table 4: DIP switch function description.

Settings	DIP 3	DIP 2	DIP 1	Function
	OFF	OFF	OFF	Single pole contactor/relay 1 s pre-charge time
	OFF	OFF	ON	Single pole contactor/relay 2 s pre-charge time
	OFF	ON	OFF	Single pole contactor/relay 4 s pre-charge time

	OFF	ON	ON	Single pole contactor/relay 8 s pre-charge time
	ON	OFF	OFF	Bi-stable latching contactor/relay 1 s pre-charge time
	ON	OFF	ON	Bi-stable latching contactor/relay 2 s pre-charge time
	ON	ON	OFF	Bi-stable latching contactor/relay 4 s pre-charge time
	ON	ON	ON	Bi-stable latching contactor/relay 8 s pre-charge time

Dimensions:

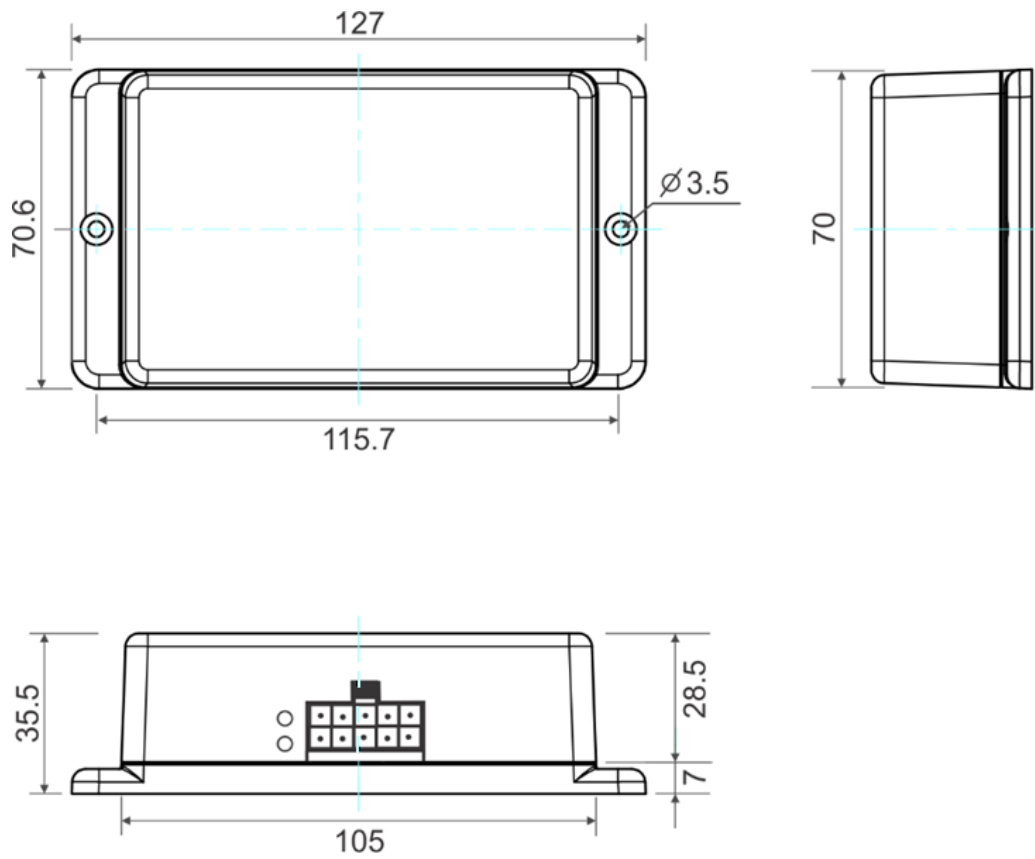


Figure 5: Pre-charge unit dimensions.