



- *Optimal charge algorithm*
- *State of charge / amps / AC LEDs*
- *Low standby battery drain*
- *SMBus Level 2 or Level 3 operation*
- *LED status indicators*
- *Reverse polarity protected*
- *Over temperature protected*
- *Low noise / variable speed fan*
- *Over current / voltage protected*
- *Universal input: 85 - 270VAC (47 - 400Hz)*
- *Optional status / control serial interface*
- *Two year warranty*

### Description

The APLC series is a rugged, intelligent and sophisticated 450 watt charger that can be programmed to charge lithium-ion (Li-ion) or lithium polymer (LiPo) batteries. With IEC and CE certification pending, optional universal AC input and a wide operating temperature range (-20°C to 70°C), this product is especially suited for high end industrial applications.

The APLC optional status and control signals can be user defined. An informative LED display indicates charging conditions, battery and AC status. The charger is controlled by an

embedded microcontroller that contains software developed by ChargeTek, allowing for application specific customization. Simplified fixed voltage/current chargers are also available.

The charger is available in a number of output voltage/current variations with optional SMBus Level 2, SMBus Level 3 communication and controls. Models are available for typical 2S, 4S, 8S, 10S and 12S applications, as well as custom configurations for less demanding applications. The charger is easily mountable in two orientations.

### Charging specifications

A three stage charge routine which is recommended by lithium-ion battery manufacturers is described below.

**Stage 1: Precharge.** If the battery is deeply discharged, a precharge of approximately 300mA is applied until the voltage is 2.8 volts/cell.

**Stage 2: Constant current mode.** The charger provides constant current until the battery voltage is 4.2 volts/cell.

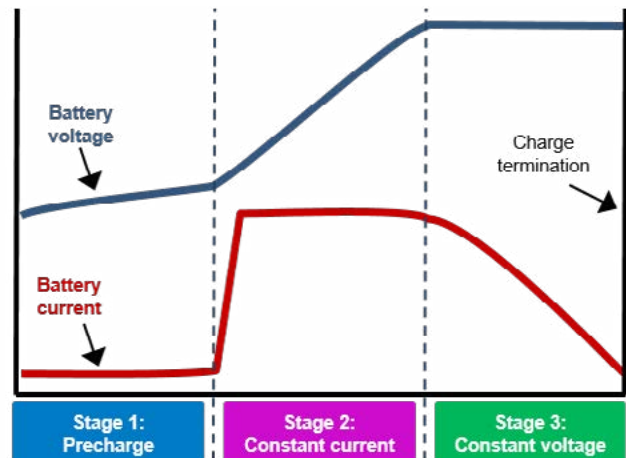
**Stage 3: Top off mode.** This is the final stage of the charging routine. The battery voltage is maintained at approximately 4.2 volts/cell. When the charging current decreases to 300mA, the charge is terminated until the next discharge cycle.

The APLC operates as a SMBus Level 3 charger, and, as such, supports all Level 2 charger protocols, having the ability to act as a SMBus slave responding to charging voltage, charge current and alarm messages sent by a smart battery. As a Level 3 charger, the APLC acts as a bus master and queries the battery for other relevant data such as temperature, remaining time to full charge, etc.

On power-up, the APLC looks for the presence of a battery via battery terminal voltage and waits for the charging voltage and charging current message data to be non-zero before

initiating charging. If the battery does not respond to commands or sends charging voltage/current messages for 145 seconds and the battery presence is indicated by the safety signal, the APLC can apply a 100ma wakeup charge to the battery. Relevant charger alarms originated by the battery will inhibit charging. Charging will restart when the battery indicates a non-zero charging voltage and current requests.

Lithium-ion charging curve



# APLC datasheet

## SMBus LED indicators

PARAMETER	RED	RED / GREEN	GREEN
Charging current requested by battery	> 0.8C	0.2C - 0.8C	< 0.2C
Charging current in amps	> 0.9C	0.1C - 0.9C	< 0.1C
SMBus activity	No communication	45 seconds of inactivity	SMBus interface active
Charging status	Precharge	Charging	Charge complete
Battery overtemp and overcharge alarm	Over temp	Over charge	Normal

## Optional interface specification

The following table describes the standard offering of discrete status signal characteristics. All charger output signals are uncommitted opto-coupler transistors (+10V / 10mA) which can be referenced to the external system's positive or negative rail. All charger input signals (1mA min, 10mA max) are uncommitted opto-coupler diodes which can be referenced to the user's positive or negative rail. These signal definitions can be customized, relay contacts are also available upon request, please contact factory.

SIGNAL NAME	PIN OUT	DESCRIPTION	ORIGIN / DESTINATION / TYPE
Charger active	1(+), 2(-)	Charger on / off; active low	Charger / battery / output
Charger enable	3(+), 4(-)	Nominal operation, active low	Battery / charger / input
+5 aux	5(+), 6(-)	Regulated +5V 100mA bias supply	Charger / battery / output
Fault	7(+), 8(-)	Fault condition, active low	Charger / battery / output

## Compliance specifications

PARAMETER	DESCRIPTION / CONDITIONS
DC input EMI	Cispr 22 Class B, FCC Class B pending
UL / CSA 60950	Pending

## Mechanical specifications

PARAMETER	(units are in inches and pounds)
Dimensions	9.50 (L) x 2.0 (H) x 5.0 (W)
Chassis material	Aluminum
Chassis finish	Black anodized
Clearance	Two inches front and back
Mounting	#6-32 (0.18 inch) screws at four locations
Input / output connector	IEC320 / Norcomp 684M13W3
Weight	Three pounds

## Environmental specifications

PARAMETER	DESCRIPTION / CONDITIONS
Storage temp.	-40°C - 80°C
Operating temp.	-25°C - 70°C at maximum output over entire DC voltage range
Humidity	0°C - 95°C relative humidity (non-condensing)
Operational altitude	10,000 feet
Vibration	MIL-STD-810
Shock	MIL-STD-810
Isolation	DC - chassis: 2KVDC DC - output: 2KVDC Output - chassis: 100VDC
DC leakage current	DC - chassis: < 20uA at 2KVDC DC - output: < 10uA at 2KVDC

# APLC datasheet

## Ordering information

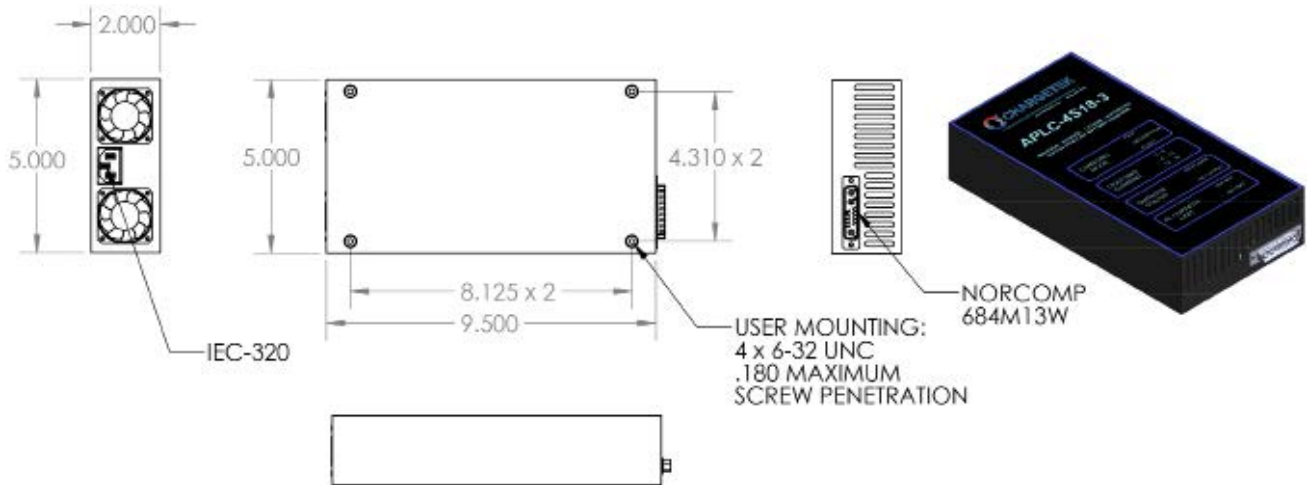
Model numbers are in the form APLC-wwSxx-y-Rz. Rz specifies options and several customization parameters such as temperature compensation, relay contacts and serial bus options. Please contact us for any variations required.

<b>xx (output voltage)</b>	3 (12V), 4 (16V), 5 (20V), 6 (24V), 7 (28V), 8 (32V), 9 (36V), 10 (40V), 11 (44V), 12 (48V), 13 (52V), 14 (56V), 15 (60V)
<b>yy (output current in amps)</b>	05 = 5 amps; 12 = 12 amps
<b>z (AC input voltage)</b>	1 = 85-132VAC; 2 = 180-270VAC; 3 = 85-270VAC

APLC part numbers are easily configured. For example, the APLC-4S18-1 denotes a standard 110VAC input, four series lithium cells (16V) and 18 amps of charging current. The suffix (R) is required for customization definition but not required for standard units.



## Outline and mounting



Dimensions in inches

**NOTE:** Chargetek products are not authorized for use as components in life support systems, hazardous environments, nuclear control systems or other similar applications without the express written consent of the President of Chargetek, Inc. The appearance of products, including safety agency certifications pictured on labels, may change depending on the date manufactured. Specifications are subject to change without notice.

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