# "Reliability Study of Battery Charger Circuit"
(Sponsored by Artificial Limbs Manufacturing Corporation of India (ALIMCO)

The Artificial Limbs Manufacturing Corporation (ALIMCO) manufactures motorised mobility solutions for differently abled people. These vehicles have an on board battery. From the initial trails, it was seen that the battery charger used to charge the system was unrealiable and had high failure rates. The objective of the project was to analyse the potential failure modes of the flyback converter based battery charger. A comprehensive test regime was designed to test the charger under various input and environmental conditions. The charger was tested for various abnormal conditions like input transient, input undervoltage and overvoltage, high ambient temperature, etc. The devices used in the charger were tested for operation within rated stresses. Modifications in the specification of the charger for improved reliability were suggested based on the test results.
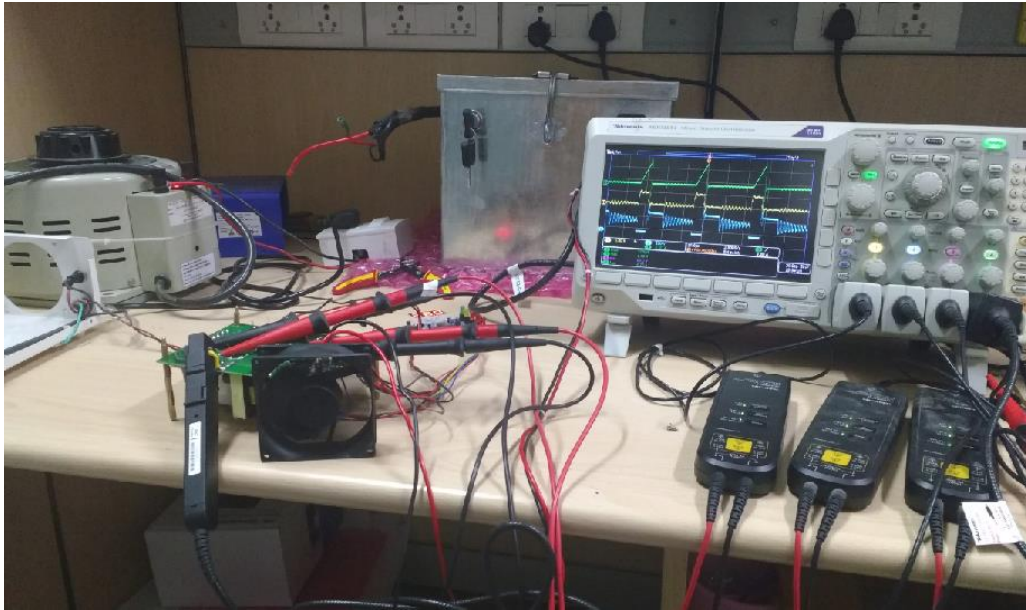
Devices' maximum voltage and current stress test

Device	Max Voltage Stress (from datasheet)	Max Voltage Stress (from actual operation)	Max Cont. Current Stress (from datasheet)	Max Current Stress (from actual operation)
Input Diode	1000 V	355 V (at 270 V AC input)	3 A	0.98 A(rms)
Primary MOSFET	600 V	670 V	7 A	1.4 A(rms)*
Sec Diode	600 V	114 V	15 A	4.5 A(avg)
Reverse Cut off MOSFET	60 V	28 V	50 A	4.5 A(avg)

The following are representative additions/modifications suggested in the specifications –

- Addition of current and voltage safety factor specification for power semiconductor devices.
- Inclusion of specification for high voltage isolation requirement between input and output
- Inclusion of specification requirement for output overvoltage, overload and short circuit protection
- Addition of mechanical shock and vibration test requirement specification for 1-5 G's of acceleration.
- Inclusion of operating relative humidity (RH) requirement.