


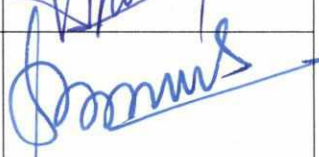
**SPECIFICATIONS FOR MANUFACTURING &**

**ASSEMBLY OF**

**ELECTRONICS CARDS:**

- 1. GDC-800-058-H**
- 2. GDC-800-058-HD**
- 3. GDC-500-ECM-C**

Specification No. : PS407298  
Revision No. : Rev 00  
Date : 01/02/2018

	Name:	Designation	Signature
Prepared By	Anupam Parikh	Sr. Design Engineer	
Approved By	S. K. Biswas	Sr. DGM-Deseign	

The specification is in two parts namely part-A related to **technical requirements** of this tender specification and part- B related to **commercial requirements** of this tender specifications.

Supplier to ensure the following while submitting the bid :

There should be one sealed envelope mentioning enquiry number and opening date on top of envelope. This envelop should consist of two sealed individual envelopes . **one** for technical bid and **another** for commercial bid . Enquiry No. , opening date and bid type i.e. Technical / Commercial should also be mentioned on each individual envelope.

On tender opening date only technical bid will be opened while commercial bid will only be opened for those parties who would be found technically suitable acceptable by BHEL in line with technical requirement of the specifications .

### **PART-A (Technical Requirements)**

#### **1. GENERAL**

This specification covers the requirements of infrastructure, quality of manpower considered essential for quality and reliability of design ,development , manufacturing testing & supply of various high tech Electronics cards//modules involving multilayer PCBs , ASICs , SMT components and digital electronics components.

The supplier should confirm availability of the required infrastructure and manpower in technical bid as given in this specifications.

#### **a INFRASTRUCTURE FACILITIES**

The supplier should have the following manufacturing facilities :

1. Dust Free environment for card assembly.
2. Stencil Printer .
3. Automatic Glue Dispenser
4. High speed component placement machine  
Following features would be preferred :
  - Board size capability - 400 mm x 300 mm min.
  - Placement Range - 0603 to SOICs , 0402 compatible
5. Dual wave Soldering machine
6. 4 zone Reflow oven
7. Digital / Analog Temperature controlled solder stations .
8. Component lead forming machines.
9. Details of Electrostatic discharge protection  
& ESD procedure adopted to be submitted with offer .
10. Semi Automatic component insertion machines.

**b. TESTING FACILITIES :**

The supplier should have the following test facilities :

- (a) Digital oscilloscope Dual channel Min.100 MHZ Band width with following advance features would be preferred. .
  - Advanced signal processing
  - TDR measurement
  - Eye pattern analyzer
  - Cross talk and ringing analysis
- (b) Spectrum analyzer with following features preferably :-
  - Electromagnetic Interference Analysis.
  - High frequency analysis.
  - Harmonic Distortion Measurement.
  - AM / FM Measurement
- (c) Multi channels / 100 MHZ band width logic analyzer
- (d) Multi channels Digital Pattern Generator.
- (e) Computer added Functional Testing facilities for electronic card.

**c. Qualified Manpower**

Supplier should have at least 1 engineering graduate (electronics) who would be responsible for execution of order . Experience in multilayer PCB manufacturing using latest state of art technology components like SMT , digital electronics components, ASICS & microcontrollers would be preferred. Technical persons responsible for the execution of the contract should be competent enough to substitute / suggest suitable alternatives for the components which are getting obsolete / not available in the market .

Based on technical bid received from supplier , BHEL may depute their team of engineers for on spot inspection at supplier works for confirmation of infrastructure facilities available with the party before considering them for assigning the contract.

**d. Experience**

Supplier to confirm at least 2 orders have been executed by them involving latest state of art components as mentioned in the specification. Supplier to submit copies of purchase order /contract of such orders executed in past involving SMT components, microcontroller/DSP or ASIC based cards .

**e. Willingness for Confidentiality Agreement**

Supplier to confirm their willingness for unconditional confidentiality agreement on stamp paper stating that any information received from BHEL against the enquiry and purchase order (if placed) would not be shared with any other party in part or in full without written permission from BHEL Bhopal. Moreover, we agree the documents generated during the process of execution would be the

property of BHEL and shall be provided to BHEL free of charge to BHEL. We also agree that parts developed/manufactured against the order will not be offered/supplied to any other party at (any form in parts or in full) without written permission from BHEL Bhopal. BHEL holds all rights for the items from conceptual design to the final products+. This is prerequisite to qualify for their consideration in technical scrutiny of tender..

**Supplier is required to submit the same duly signed on stamp paper along with technical offer.**

## 2. Document to be submitted with technical Bid

Following document duly filled must be submitted by the bidder party as annexure to their **technical bid** (to be kept in separate sealed envelope) . Otherwise bid will be technically rejected.

- Infrastructure details in format mentioned in Para-6 of this specification
- Qualified manpower details( see Para 1-c )
- Confirmation for Confidentiality agreement on Stamp paper ( see Para 1-e)
- Details of the order executed ( see Para 1-d )

## 3. SCOPE OF WORK & Technical requirement

### A. SCOPE OF WORK:

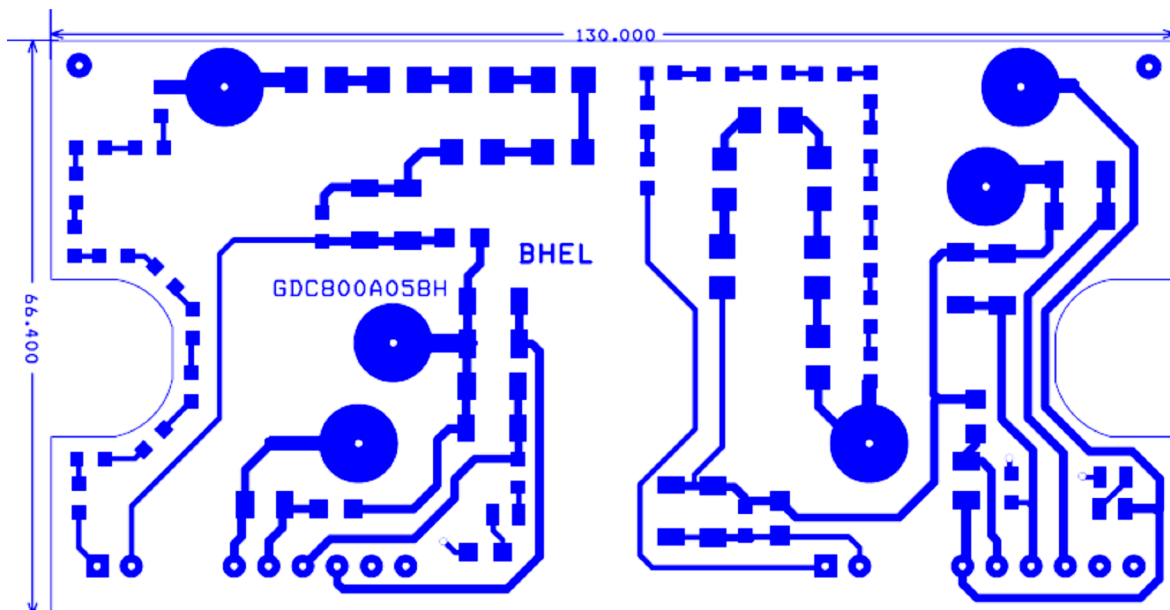
- Context** This specification applies to requirement of **Electronics cards**.

These cards are intended to be for traction application.

### 2. SCOPE OF SUPPLY:

**ITEM-1: BP9048683491:** Electronics card GDC-800-058-H

- PCB layout and dimensions:



b. PCB Thickness: 2.4mm

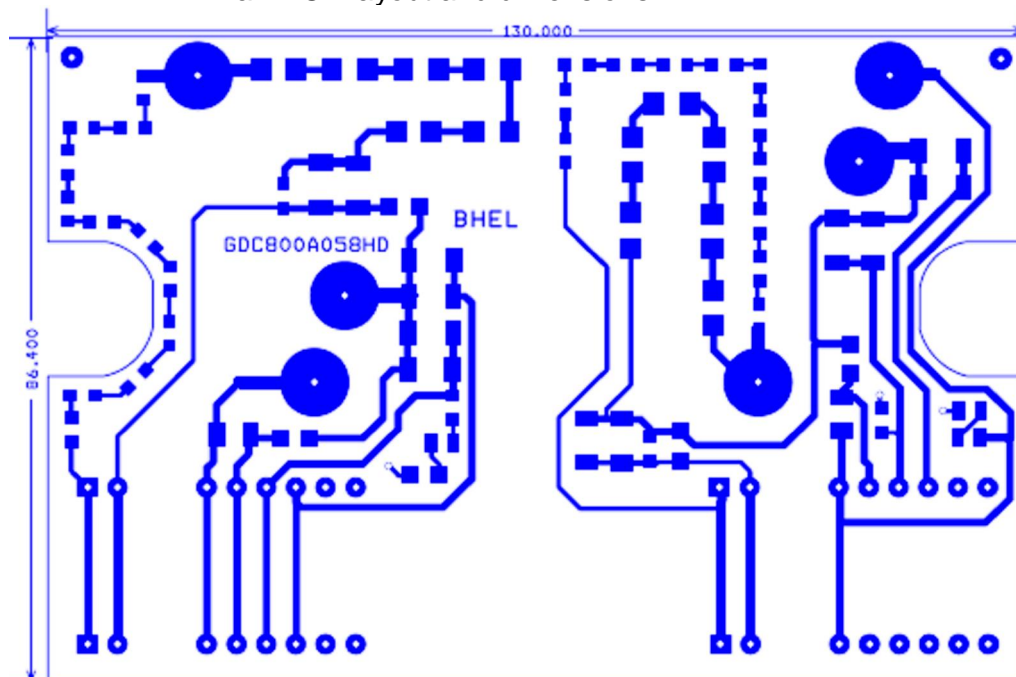
c. Bill of Material:

Item	Quantity	Part	Package
1	2	3n3 36V	SM/C_1206
2	2	4.7V50	SM/C_1812
3	2	LED	SM/D_1206_21
4	2	1N4007	SM/D_1206_21
5	3	MBRA340	SMA403D
6	1	MBRS340	SMA403D
7	2	CON10	3.96MM PITCH 10 PIN (MOLEX CONNECTOR)
8	4	220E 1W	SM/R_2512
9	4	3E9/4E7 1W	SM/R_2512
10	1	12E 1W	SM/R_2512
11	1	12E 1W	SM/R_2512
12	2	15E 1W	SM/R_2512
13	21	150K	SM/R_1206
14	2	4K7	SM/R_1206
15	7	1.5 SMC 220C	SM/DO214AA_12
16	2	1.5 SMC 440A,	SM/DO214AA_12

This is a preliminary BOM and final BOM along with the package details shall be provided to the supplier after placement of PO.

**ITEM-2: BP9048683505: Electronics card GDC-800-058-HD**

a. PCB layout and dimensions:



b. PCB Thickness: 2.4mm

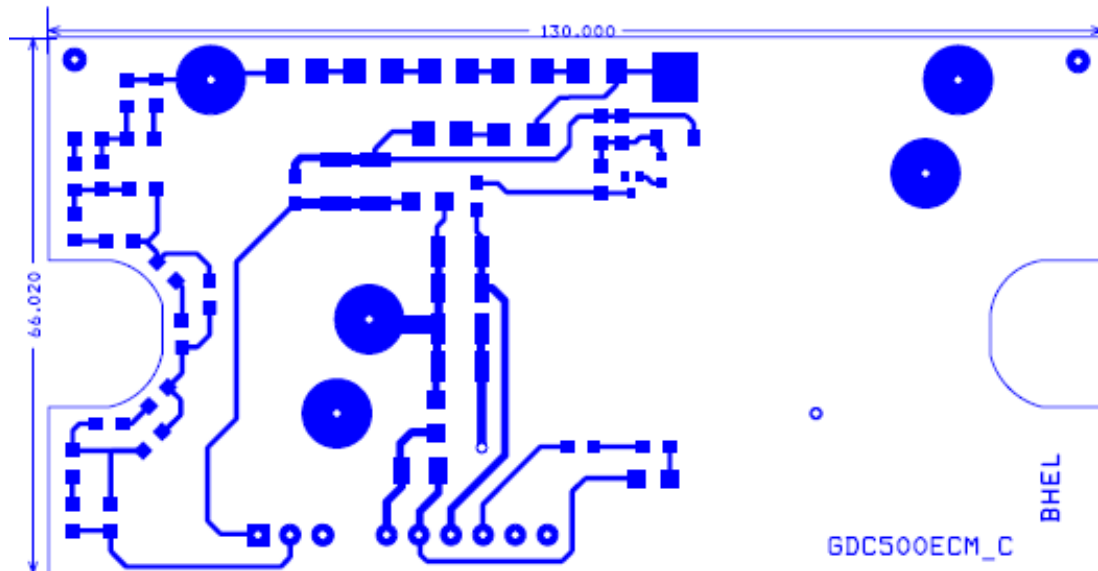
c. Bill of Material:

Item	Quantity	Part	Package
1	2	3n3 36V	SM/C_1206
2	2	4.7V50	SM/C_1812
3	2	LED	SM/D_1206_21
4	2	1N4007	SM/D_1206_21
5	3	MBRA340	SMA403D
6	1	MBRS340	SMA403D
7	4	CON10	3.96MM PITCH 10 PIN (MOLEX CONNECTOR)
8	4	220E 1W	SM/R_2512
9	4	3E9/4E7 1W	SM/R_2512
10	1	12E 1W	SM/R_2512
11	1	12E 1W	SM/R_2512
12	2	15E 1W	SM/R_2512
13	21	150K	SM/R_1206
14	2	4K7	SM/R_1206
15	7	1.5 SMC 220C	SM/DO214AA_12
16	2	1.5 SMC 440A	SM/DO214AA_12

This is a preliminary BOM and final BOM along with the package details shall be provided to the supplier after placement of PO.

**ITEM-3: BP9048683513: Electronics card GDC-500-ECM-C**

a. PCB layout and dimensions:



b. PCB Thickness: 2.4mm

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c. Bill of Material:

Item	Quantity	Part	Package
1	1	3n3 36V	SM/C_1206
2	6	MC1206N22J631CT	SM/C_1206
3	1	10nF	SM/C_1206
4	1	4.7uF50V	SM/C_1812
5	1	LED Y	SM/D_1206
6	1	1N4007	SM/D_1206_21
7	1	PMEG4010CEJ	SOD-123
8	1	BZX84C8V2	SM/SOT23_123
9	3	MBRA340	SMA403D
10	1	CON10	3.96MM PITCH 10 PIN (MOLEX CONNECTOR)
11	1	IGD06N60T	TO252AB/DPAK
12	2	40E 1W	SM/R_2512
13	4	3E9/4E7 1W	SM/R_2512
14	2	12E 1W	SM/R_2512
15	2	15E 1W	SM/R_2512
16	12	220K	SM/R_1206
17	1	4K7	SM/R_1206
18	1	3K3	SM/R_1206
19	1	2K2	SM/R_1206
20	1	20E	SM/R_1206
21	1	1.5 SMC 440C	SM/DO214AA_21
22	5	1.5 SMC 440A	SM/DO214AA_21

This is a preliminary BOM and final BOM along with the package details shall be provided to the supplier after placement of PO.

3. Complete Gerber and PCB manufacturing details shall be provided to the supplier after placement of PO.
4. Supplier shall get the final BOM and the source of each component with OEM part no. approved from BHEL before manufacturing.
5. Cards to be verified by the supplier for component placement and tracking interconnections only. Two copies of Test Certificate for each card to be provided by the party along with consignment for each of the card supplied by them after assembly and testing.

**B. QUALITY OF ELECTRONIC CARD ASSEMBLY:**

The module shall be used in power plants near HV area, the quality of the assembly , soldering, handling of the components & assembled cards(EMI/EMC), sourcing of semiconductor components are of vital importance. Therefore, each of the above

should be carefully monitored and sources of the components must be from OEM/reputed international firms who adhere to strict quality norm.

To improve, maintain Quality, and highest level of reliability, it is essential to generate statistical data of any failure during testing and also after burn in, rework done. So that improvement in the assembly and process can analyzed. Supplier should provide the statistical report to BHEL.

**C. FITTINGS OF CARDS & MECHANICAL ASSEMBLY:**

As quality of soldering is predominant in performance of the individual electronics card, final assembly like fixing heat sinks with MOSFETS, fixing of vertically mounted cards, electrolytic capacitors, fiber optic connectors are crucial for reliable functioning of the modules in traction application. Supplier must ensure use of proper size of hardware and insulating fixing material. All hardware are of stainless steel. Each fixing screw must contain proper plain washer & spring washer.

**D. CONFORMAL COATING OF THE PCB'S:**

Conformal coating is very essential for long life and trouble free operation in dusty and hazardous environment. The conformal coating should be in line with prevailing practice of relevant industry, It is recommended multiple layers of coating is applied on each PCB's and proper time delay between two layers of coating is followed.

**CAUTION:**

1. Before applying coating, the PCB's should be tested in all respect.
2. All contacts for connectors and test points & fiber optic ports must be protected thoroughly by providing suitable cover on it. This cover only be opened after the coating is dried up.
3. Standard EMI/EMC protective norms must be followed during the entire process.

**E.** All the PCBs should have BHEL monogram (copper) and should be UL certified and marked. The PCB manufacturing/fabrication should be done through one of the following reputed PCB manufacturers only:

1. AT&S India Pvt Ltd
2. Shogini Technoarts Pvt Ltd
3. Hi Q Electronics Pvt Ltd
4. Circuit Systems (India) Limited

**4. DOCUMENTS TO BE SUBMITTED TO BHEL FOR APPROVAL .**

While executing the PO, supplier shall submit to BHEL and take approval for the following documents for each of the modules mentioned in the enquiry.

1. Bill of material
2. SIZE ,Component location / Legend & Mounting details .
3. PCB Layout .
4. Gerber file & print out for every layer.



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**5. IEC Compliance**

<b>Type Testing / Environment Testing For electronics RACK</b>			
<b>Sr.No</b>	<b>Test</b>	<b>Standard</b>	<b>Specification</b>
<b>EMI / EMC Test</b>			
1	Radio freq interference test <input type="checkbox"/> RFI Susceptibility (common mode) <input type="checkbox"/> RFI Emission test(150 Khz-30 Mhz) <input type="checkbox"/> RFI Emission test(30MHz-1 GHz) <input type="checkbox"/> RF electromagnetic field amplitude modulated test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 10.2.9	<b>This test will be conducted as per IEC 60571-1 clause: 12.2.9</b>
2	Supply over voltage, Surge & ESD	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 12.2.7 & 12.2.8	<b>This test shall be conducted as per IEC 60571 Cl. No. 12.2.7 &amp; 12.2.8</b>
3	Transient Burst Susceptibility test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 12.2.8	This test shall be conducted as per IEC 60571 Cl. No. 12.2.8
<b>Environment Test</b>			
7	Cooling Test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 10.2.4	The EUT would be kept in cooling chamber for 16hours at -25deg C. The EUT shall be energized after two hours when the temperature of the chamber is stabilized.
8	Dry heat Test at 80 Degrees	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 10.2.5	The EUT will be placed in a chamber having temperature of 80 degrees for a period of 6 hours under energized condition without any load. After 6 hours the equipment is allowed to cool down to ambient, the assembled in the power cubicle and then Performance test will be done.
9	Damp Heat test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 10.2.6	The EUT will be placed in a damp heat chamber cycle for 24 hours. The equipment shall not be energized during damp heat. At the end of the Damp heat test following test will be conducted:- Insulation test:- 1)Voltage withstand test (Dielectric test) & IR measurement 2)Performance check shall be repeated.3)Visual inspection
	Salt Mist test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 12.2.11	This test will be conducted as per IEC 60571-1 clause: 12.2.11
<b>Mechanical Stress Test</b>			

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11	Vibration & Shock test	IEC 60571 edition 3.0 2012-09 CLAUSE NO. 12.2.12	a) Determination of resonance frequency .b) Test with forced vibration) Test to simulate effect of shunting shocks. The equipment will be energized and kept on a vibration machine producing vibration of sinusoidal form with adjustable amplitude and frequency.
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**6. WARRANTY.**

**PCB/ modules** along with all the components mounted thereon shall be guaranteed for 30 months from the date of supply or 24 months from date of commissioning whichever is earlier.

**7. Infrastructure details**

<b>SNo.</b>	<b>Description/Equipment</b>	<b>Make / details #</b>
1	Dust Free environment for card assembly	Area to be specified with temperature & humidity information.
2	Automatic Glue Dispenser	
3	High speed component placement machine	
4	Dual wave Soldering machine	
5	4 zone Reflow oven	
6	Digital / Analog Temperature controlled solder stations	
7	Component lead forming machine	
8	Details of Electrostatic discharge protection & ESD procedure adopted .	
9	Semi Automatic component insertion machines	
10	Digital sampling oscilloscope Dual channel Min.100 MHZ Band width .	
11	Digitizing oscilloscope with Min.100MHz band width	
12	Multi channel Spectrum analyzer	-
13	Multi channels , 100 MHZ band width logic analyzer	
14	Multi channels Digital Pattern Generator.	
15	Multi channel temperature scanner.	
16	Computer aided Functional Testing facilities for electronic card.	

# Machine details like model / Type No. make ,features ,capacity etc to be given.

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**PART-B (COMMERCIAL REQUIREMENTS)**

Bidder to submit commercial bid including details of scope of work , basis for scope of work and necessary price breakup for scope defined in 2 A/I & 2A/II of this specification and as BHEL enquiry calls for. Bid should also contain delivery time and payment terms ,warranty offered for bidder's scope of work etc.

The commercial bid to be kept in separate sealed envelope.