



Numeros Motors Private Limited

## **DC DC CONVERTOR TEARDOWN & VAVE REPORT**

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## 1. PROJECT OVERVIEW

### 1.1. Customer Introduction

M/s Numeros Motors is a cutting-edge OEM specializing in purpose-built electric vehicles designed for commercial applications. Catering to India's self-employed population, including local Kirana shop owners and gig-economy workers, Numeros vehicles offer the reliability and utility they need to thrive in their businesses. With a commitment to sustainability and innovation, Numeros Motors is dedicated to providing robust solutions that empower users to enhance their livelihoods. By integrating advanced technology with user-friendly designs, we ensure our electric vehicles meet the diverse needs of urban entrepreneurs. Together, we are driving a greener future while supporting the growth of small businesses across India.

## 2. PROJECT SCOPE AND ASSUMPTION

### 2.1. Scope of Work

The project scope involves disassembling (Complete Teardown) the DC-DC converter, examining its individual components, conducting should-costing analysis, and performing VAVE analysis.

### 2.2. Customer Inputs

M/s Numeros has provided their DC-DC converter physical model for analysis. The current demand for this product is 6,000 units per annum, and it is used in their electric two-wheelers. They procure this product from a domestic supplier, and since it is a proprietary part, they do not have a specific design for it.

## 3. PRODUCT OVERVIEW

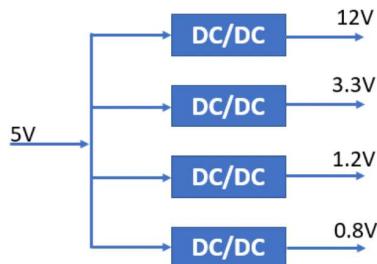
### 3.1. Product Introduction

A DC-to-DC converter is an electronic circuit that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. These converters play a crucial role in ensuring stable and reliable power delivery to various electronic devices and systems. They are used in applications ranging from portable devices like smartphones and laptops to large-scale power transmission systems. By dynamically adjusting voltage levels, DC-DC converters enhance system efficiency, minimize power losses, and ensure the proper functioning of electronic components.

### 3.2. Primary Function

The primary function of a DC-DC converter is to convert a direct current (DC) voltage from one level to another while maintaining efficiency and reliability. These converters are essential in situations where input voltage levels fluctuate due to battery discharge, varying loads, or power supply inconsistencies. Key advantages of DC-DC converters include:

- **Voltage Regulation:** Ensures a stable output voltage regardless of input fluctuations.
- **Power Efficiency:** Reduces energy losses through switching techniques.
- **Compact Design:** Allows integration into small and portable electronic devices.
- **Galvanic Isolation (in some cases):** Helps protect sensitive components from voltage spikes and noise.



*Step-up and step-down capability of DC-DC converters*

### 3.3. Working Principle

DC-DC converters operate using high-frequency power conversion techniques:

1. **Switching Mechanism:** Semiconductor switches (e.g., MOSFETs) rapidly turn the input DC voltage on and off.
2. **Energy Storage:** Inductors and capacitors store and regulate energy for smooth voltage conversion.
3. **Voltage Transformation:** The converter steps up (boost) or steps down (buck) voltage as needed.
4. **Energy Storage & Release:** Energy is temporarily stored in inductors, transformers, or capacitors before being released at a different voltage.
5. **Output Regulation:** Feedback circuits maintain constant output despite input or load changes.
6. **Power Flow Control:** The duty cycle (on/off ratio) of the switch adjusts power flow, ensuring stable voltage and current

### 3.4. Device Specification

Based on our market and tear down analysis, the device specification was

- **Input Voltage:** 36V - 72V DC
- **Output Voltage:** 12V ± 0.5V
- **Output Current:** 10A - 15A
- **Converter Type:** DC/DC Power Converter
  - **Wiring:** **Red:** Input, **Black:** Cathode, **Yellow:** Output



DC DC Convertor Image

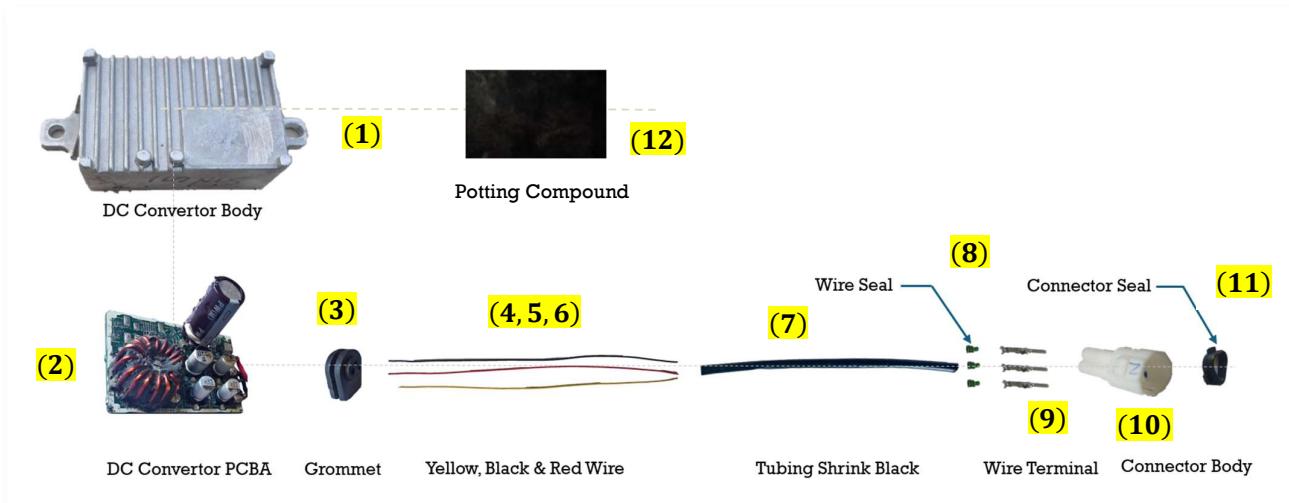
Overall Product Weight -252 Grams

Max Product Width-52 mm

Max product Length-310 mm

## 4. PRODUCT TEAR DOWN

### 4.1. Teardown View



### 4.2. Assembly Fitting Details

Balloon No	Component Name	Type Of Assembly	Equipment
2 to 1	PCBA to Body	Pick & place, Adhesive fit (Resin)	Resin melting & pouring
3 to 1	Grommet to Body	Snap fit	Manual
4,5,6 to 3	Wire to Grommet	Press fit	Manual
4,5,6 to 2	Wire to PCBA	Soldering	Solder
7 to 4,5,6	Tube Shrink to Wire	Free Fit	Manual
8 to 4,5,6	Wire to Wire Seal	Press fit	Manual
9 to 4,5,6	Terminal to Wire	Press fit	Crimping
10 to 9	Terminal to Connector	Snap fit	Manual
11 to 10	Seal to Connector	Free fit	Manual
12 to 1	Potting Compound to Body	Adhesive	Manual Pouring

## Potting Compound Consumptions Calculation

DC convertor body inside dimension – 80 x 54 x 25 mm

Volume – 108000 mm<sup>3</sup>

Required volume is 108 ml

Potting Compound Density -1.1 g/ml

Required potting component weight -118.8 grams

## 4.3. Top level BOM

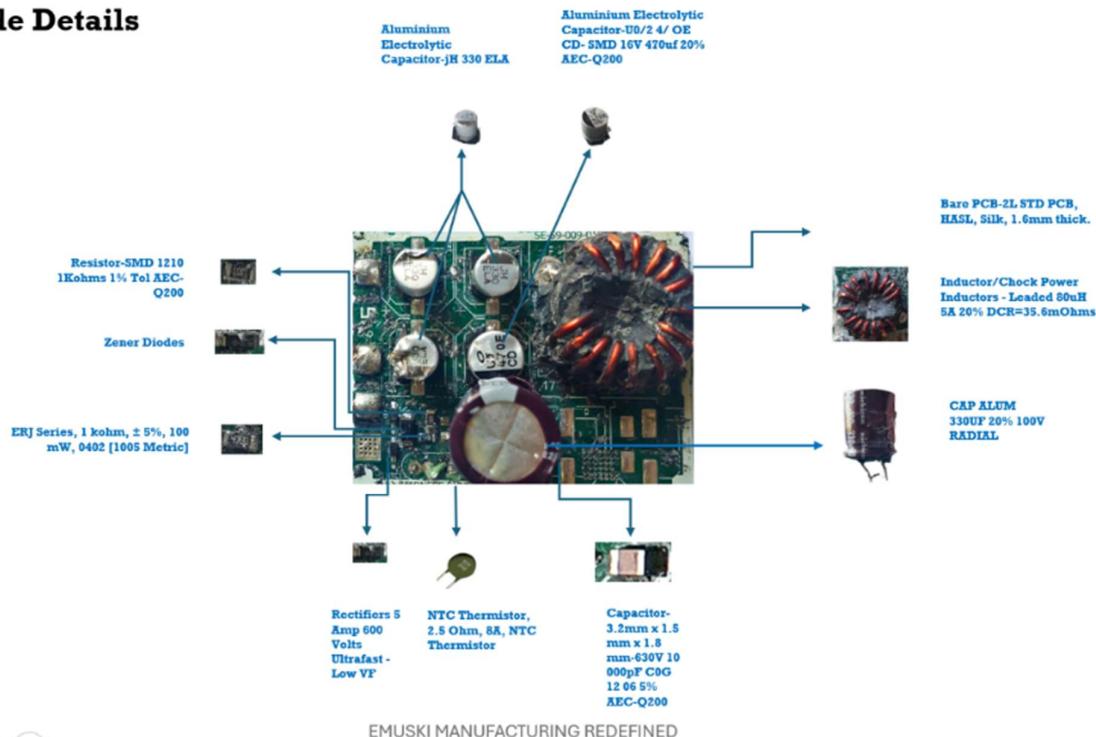
S.no	Level	Part Number	Description	Material Grade	Commodity	Qty/ Assy	UOM
1	L0	DC-00	Dc Dc Convertor Assy	-	EM Assy		
2	L1	DC-PCBA-00	DC Convertor PCBA	-	Electronics	1	EA
3	L1	DC-WH-00	Wiring Harness Assembly	-	Electrical	1	EA
4	L1	DC-ME-00	DC Convertor Body	ADC12	Casting	1	EA
5	L1	DC-C-00	Chemicals Black Epoxy, Encapsulating & Potting Compound	-	Chemical	108	ml

# Project Delivery Report

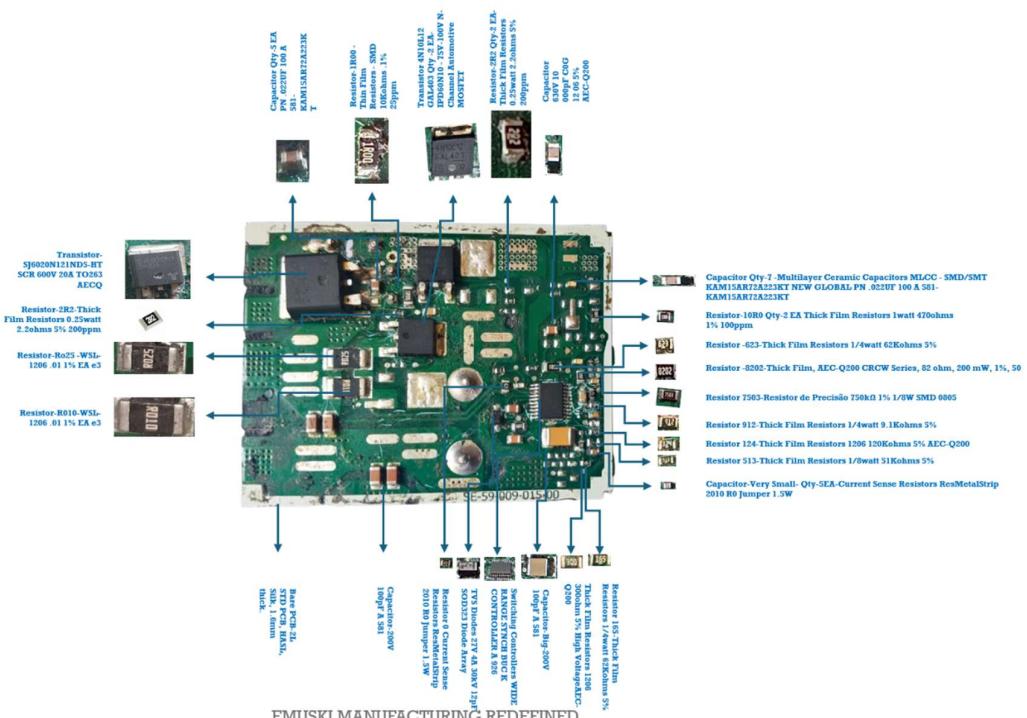
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#### **4.4. PCBA Component Identification and MPN Mapping**

## **PCB Top Side Details**



## **PCBA Bottom Side**



## 4.4.1. PCBA BOM Details with MPN

No.	PCB Side	Part Number	MPN	Reference Designator	Manufacturer	Part Family	Marking on SMD/TH Component	Mounting Type	PN	Image	Quantity	UOM
1	Bottom	DC-PCBA-1	SJ8020N1ATP	HT SCR 600V 20A TO263 AECQ	Utefuse Inc.	Transistor	5J8020N121ND5	SMD	3		1	EA
2	Bottom	DC-PCBA-2	06031C223H472A	Y8MUC - SMD/SMT KAM15A872A223KT NEW GLOBAL PN: 0321UF 14	KYOCERA AVX	Capacitor-Small	0.7x1.4 mm	SMD	2		5	EA
3	Bottom	DC-PCBA-3	W5L120R0100FEA	WS-1206_01 1% EA e3	Vishay	Resistor	R025	SMD	2		1	EA
4	Bottom	DC-PCBA-4	RUW73PAF9010TDF	Thick Film Resistors- SMD RLW73PA 1% R010 600ppm 1k RL	TT connectivity / os	Resistor	R010	SMD	2		1	EA
5	Bottom	DC-PCBA-5	KAM310CB2103U	630V 10.000pF C0G 12.06.5% AEC-Q200	KYOCERA AVX	Capacitor-Medium	3.2mm x 1.5 mm x 1.8 mm	SMD	2		5	EA
6	Bottom	DC-PCBA-6	IP60N10-75V-100V	IP60N10-75V-100V N-Channel Automotive MOSFET	infineon	Transistor	4N10112 GAL403	SMD	2		2	EA
7	Bottom	DC-PCBA-7		Thin Film Resistors- SMD 10Kohms 1% 25ppm	Vishay	Resistor	1R00	SMD	2		1	EA
8	Bottom	DC-PCBA-8	R30802KA2020N6A	Thick Film Resistors 0.25watt 2.0rms% 200ppm	Vishay / os	Resistor	2R2	SMD	2		2	EA
9	Bottom	DC-PCBA-9	06035F3024H474A	50V 1000pF X8 A 581-KAM1B981H102K-M	KYOCERA AVX	Capacitor-Very Small	2 mm x 1.2 mm	SMD	2		5	EA
10	Bottom	DC-PCBA-10	CR2010-U-000ELF	Current Sense Resistors ResMetalStrip 2010 R0 Jumper 1.5W	Souns	Resistor	0	SMD	2		1	EA
11	Bottom	DC-PCBA-11	CRF2015-U-000ELF	2010 R0 Jumper 1.5W	Souns	Resistor	0	SMD	2		1	EA
12	Bottom	DC-PCBA-12	A1227DM-01PTIG	TVS Diodes 27V 44.30kV 12pf 5000323 Diode Array	Utefuse	Diode	2v	SMD	2		1	EA
13	Bottom	DC-PCBA-13	CRCW1218A474RA7K	Thick Film Resistors 1watt 470ohms 1% 100ppm	Vishay / os	Resistor	1000	SMD	2		2	EA
14	Bottom	DC-PCBA-14	060301C223H472A	022UF 100 A 581	KYOCERA AVX	Capacitor-Very Small	0.7x1.4 mm	SMD	2		2	EA
15	Bottom	DC-PCBA-15	IA5116MH/K/NOPB	switching Controllers WIDE RANGE SYNCH BUCK IC CONTROLLER A 924	Texas Instruments	IC	SAABC30 LM5116 MH	SMD	20		1	EA
16	Bottom	DC-PCBA-16	060521U03FAT2A	200V 100pF A 581	KYOCERA AVX	Capacitor-Big	2x1 mm	SMD	2		1	EA
17	Bottom	DC-PCBA-17	AR0803P-072ML	1m Ohms 1/2W 0603% 1% AEC-Q200	VADeO	Resistor	01E	SMD	2		1	EA
18	Bottom	DC-PCBA-18		Resistor de Precídio 750Ω 0.1% 1/8W SMD-0805	Outros	Resistor	750Ω	SMD	2		1	EA
19	Bottom	DC-PCBA-19	R80816P-173-D	Thin Film Resistors- SMD 1/16W 27Kohm 0.5% 25ppm	SoluMu	Resistor	273	SMD	2		1	EA
20	Bottom	DC-PCBA-20	CRCW10282R0PKED+P	Thick Film, AEC-Q200 CRCW Series 82 ohm, 200 mW, 1%, 50	Vishay	Resistor	8202	SMD	5		1	EA
21	Bottom	DC-PCBA-21	CRCW1206K120NEA	Thick Film Resistor 1.1watt 62Kohms 5%	Vishay / os	Resistor	623	SMD	6		1	EA
22	Bottom	DC-PCBA-22	CRCW1206K120NEA	Thick Film Resistors 1/4watt 9.1Kohms 5%	Vishay / os	Resistor	912	SMD	5		1	EA
23	Bottom	DC-PCBA-23	ERU-05EY/124V	Thick Film Resistors 1206 120Kohms 5% AEC-Q200	Parasitic	Resistor	124	SMD	6		1	EA
24	Bottom	DC-PCBA-24	CRCW10282R0PKED+NEA	Thick Film Resistors 1.1watt 51Kohms 5%	Vishay / os	Resistor	513	SMD	7		2	EA
25	Bottom	DC-PCBA-25	KTR188ZFR301	Thick Film Resistors 1206 300 ohm 5% High Voltage AEC-Q200	ROHM Semiconductor	Resistor	300	SMD	8		1	EA
26	Bottom	DC-PCBA-26	ERU-05EY/124V	Thick Film Resistors 1206 120Kohms 5% AEC-Q200	Parasitic	Resistor	125	SMD	9		1	EA
27	Top	DC-PCBA-27	SHBC12-1R0A020BV	Power Inductors- Leaded 80uH 5A 20% DC=15.6mOhms	KEBET	Inductor/Choke	Dia-2.8 mm	TH	2		1	EA
28	Top	DC-PCBA-28	UP52A321M+D	CAP ALUM 330UF 20% 100V RADIAL	Nichicon	Capacitor	330UF 100V	TH	2		1	EA
28	Top	DC-PCBA-29	EM1250KA3A33MHA00	Aluminum Electrolytic Capacitors- SMD	Chemi-Con	Aluminum Electrolytic Capacitor	JH330 ELA	SMD	2		3	EA
28	Top	DC-PCBA-30	UQCL473ML105	SMD 16V 470uF 20% AEC-Q200	Nichicon	Aluminum Electrolytic Capacitor	U0.24/0.06 CD	SMD	2		1	EA
28	Top	DC-PCBA-31	SK-2R58	2.5 Ohm, 5A, NTC Thermistor	Vishay	NTC Thermistor	2.50-15 mm	TH	2		1	EA
28	Top	DC-PCBA-32	KAM310GG1203U	630V 10.000pF C0G 12.06.5% AEC-Q200	KYOCERA AVX	Capacitor	3.2mm x 1.5 mm x 1.8 mm	SMD	2		5	EA
28	Top	DC-PCBA-33	ERU-14RF1002U	SMD 1210 1Kohms 1% Tol AEC-Q200	Parasitic	Resistor	1001	SMD	2		1	EA
28	Top	DC-PCBA-34	ERU-20E1020X	ERU Series 1 kohm, ± 5%, 100 mA, 0402 [1005 Metric]	PANASONIC	Resistor	4700	SMD	2		1	EA
28	Top	DC-PCBA-35	V5-SECJ06-M/9AT	Rectifiers 5 Amp 600 Volts Ultrafast - Low VF	Vishay Semiconductors	Diode-Medium	SM45	SMD	2		1	EA
28	Top	DC-PCBA-36	MM125214C-HE3_A-08	Zener Diodes	Vishay	Diode-Small	WE	SMD	2		2	EA
29	Top	DC-PCBA-37	SE-59-309-018-00	2LSTD PCB, HASL, 1.6mm thick.		Bare PCB	64 x 50 x 1.5 mm	PCB			1	EA

## Design of Manufacturing for PCBA

OP No	Process Name	Symbol	Spec	Equipment Selection	Control Mechanism/Remarks
10	Child Parts Inward Inspection		As per QAP	-	Data Sheet Verification & Visual inspection
20	In loader		As per Work Instruction	SMT Assy line	Top Side
30	Laser Marking		As per Work Instruction	SMT Assy line	Top Side
40	Bar Code Reader		As per Work Instruction	SMT Assy line	Top Side
50	Solder Paste Printing		As per Work Instruction	SMT Assy line	Top Side
60	Solder Paste Inspection		As per Work Instruction	SMT Assy line	Top Side
70	Pick and Place		As per Work Instruction	SMT Assy line	Top Side
80	Reflow Soldering		As per Work Instruction	SMT Assy line	Top Side
90	AOI		As per Work Instruction	SMT Assy line	Top Side
100	Unloader		As per Work Instruction	SMT Assy line	Top Side

110	Conveyor				
120	In loader -Bottom Side		As per Work Instruction	SMT Assy line	Bottom Side
130	Solder Paste printing		As per Work Instruction	SMT Assy line	Bottom Side
140	Solder Paste Inspection		As per Work Instruction	SMT Assy line	Bottom Side
150	Pick and Place		As per Work Instruction	SMT Assy line	Bottom Side
160	Reflow Soldering		As per Work Instruction	SMT Assy line	Bottom Side
170	AOI		As per Work Instruction	SMT Assy line	Bottom Side
180	Unloader		As per Work Instruction	SMT Assy line	Bottom Side
190	Conveyor		As per Work Instruction		
200	Washing		As per Work Instruction		
210	Axial comp semi-Preforming		As per Work Instruction	Off line Process	For THT Line
220	Selective wave Soldering		As per Work Instruction	Off line Process	For THT Line

230	Hand Soldering		As per Work Instruction		For WH Assembly
240	Washing		As per Work Instruction		Cleaning Op
250	ICT		As per Work Instruction		Circuit Test
260	Deplane (Tab Routing)		As per Work Instruction		
280	Final Inspection		As pr QAP	Testing Equipment	Visual
290	Packing & Warehousing		As pr IC	Returnable packing	
300	Delivery		As per Inco terms		Road -

## Design of Manufacturing for Bare PCB

OP No	Process Name	Symbol	Spec	Equipment Selection	Control Mechanism/Remarks
10	Child Parts Inward Inspection		As per QAP	-	Data sheet Verification & Inhouse Inspection
20	Inner Layer Image			Exposing Machine	
30	Lamination		As per Work Instruction	Pressing Machine	

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40	Drilling		As per Work Instruction	Drilling Machine	
50	Plating		As per Work Instruction	Plating Bath	
60	Outer Layer image		As per Work Instruction	Exposing Machine	
70	Solder mask		As per Work Instruction	Curton coating	
80	Silk Screen		As per Work Instruction	Screen Printing	
90	Routing		As per Work Instruction	Milling	
100	Testing		As per Work Instruction	E-Testing	
110	Surface Finish Treatment			HASL line	
120	Final Inspection		As pr QAP		
130	Packing & Warehousing		As pr IC		
140	Delivery		As per Incoterms		

## 4.5. Wiring Harness Component identification & MPN Mapping

Sr. No.	Part Number	Part Family	Component Spec	Manufacturer	Image	Quantity/Assy	UOM
1	DC-WH-01	Connector	3 Pin male Connector	No Marking		1	EA
2	DC-WH-02	Terminal	Av Wire Terminal 2.3 mm	No Marking		3	EA
3	DC-WH-03	Seal	Wire Seal	No Marking		3	EA
4	DC-WH-04	Wire	Red-Wire Dia	No Marking		20	cm
5	DC-WH-05	Wire	Block -Wire Dia	No Marking		20	cm
6	DC-WH-06	Wire	Yellow -Wire Dia	No Marking		20	cm
7	DC-WH-07	Tube	TUBING SHRINK BLK OD-	No Marking		13	cm
8	DC-WH-08	Rubber	Rubber Cable Grommet	No Marking		1	EA



**Wire Harness Image**

## Design of Manufacturing

OP No	Process Name	Symbol	Spec	Equipment Selection	Control Mechanism/Remarks
10	Child Parts Inward Inspection		As per QAP	-	Data sheet Verification & Inhouse Inspection
20	Cavity Plug Insertion		As per Work Instruction	Hand Tools	Visual Inspection
30	Wire Cutting		As per Work Instruction	Wire cutting machine	Visual Inspection
40	Wire /cable Runing		As per Work Instruction	Wire cutting machine	Visual Inspection
50	Wire Threading & Wire Seal Fitting		As per Work Instruction	Wire cutting machine	Visual inspection
60	Machine Termination/Crimping		As per Work Instruction	Crimping machine	
70	Grommet Fitting		As per Work Instruction	Manual	-
80	Connector Terminal insertion		As per Work Instruction	Hand Tools	Dock Audit Check Sheet

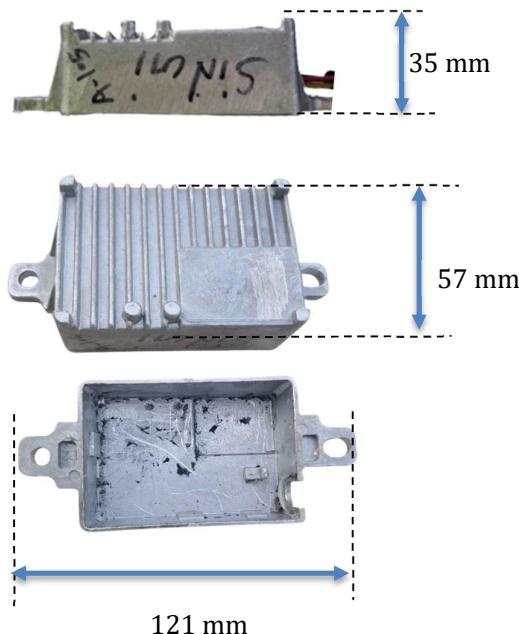
90	Connector placement Operation		As per Work Instruction	Manual	
100	PVC Tube Operations		As per Work Instruction	Manual	
110	Final Inspection & Testin		As pr QAP	Testing Equipment	Visual
120	Packing & Warehousing		As pr IC	Returnable packing	
130	Delivery		As per Inco terms		Road -

## 4.6. DC Convertor Body Dimensional Mapping

S.No	Description	Value	UOM/ Remarks
1	Part Identification number	DC-PCBA-38	
2	Part Name	DC Convertor Body	
4	Qty per Assembly	1	EA
5	Product Level	L1	
6	Commodity	Casting	
7	Material Grade	ADC 12	
8	Weight per unit	78	Grams
9	Overall Length	121	mm
10	Overall Width	57	mm
11	Overall, Height	35	mm
12	Average Wall thickness	2	mm
13	Finish	Shot Blasting	



## Weight Measurement



## Product Function

### 1. Support for PCBA (Printed Circuit Board Assembly)

- The casting body provides a sturdy structure for the PCBA. It serves to securely hold and support the board, ensuring that the components are properly mounted and protected during operation.
- This support may also help in isolating the board from external elements (like moisture or dust), especially if the casting body is made of aluminium (Assumption - ADC12)

### 2. Heat Dissipation (using Outside Fins)

- The casting body having external fins or heat sinks integrated into it. These fins increase the surface area, allowing for better heat dissipation from the DC converter.
- Since DC converters generate heat during operation, the heat sinks/fins help to transfer heat away from critical components (like transistors, capacitors, or inductors) to prevent overheating.
- This is crucial for maintaining the performance and longevity of the converter and ensuring the components do not get damaged by excess heat.

## Design of Manufacturing

OP No	Process Name	Symbol	Spec	Equipment Selection	Control Mechanism/Remarks
10	Raw Material Inward Inspection		ADC 12	Inhouse Spectro	MTC Verification & Inhouse Inspection
20	Melting		630 °C to 720 °C	Generic Furnace	Thermometer
30	HPDC		As per Control plan	150 Ton	Visual Inspection / Vernier Calliper
40	Trimming		As per Control plan	60 Ton	Visual Inspection / Vernier Calliper
50	Shot Blasting		As per Work instruction	General Machine	Visual inspection
60	Final Inspection		As per QAP	-	Vernier Calliper
70	Packing & Warehousing		Based on IC	-	-
80	Delivery		As per Incoterms	Road transport- 20 Feet EICHER 19 FEET	Dock Audit Check Sheet

## 5. SHOULD COSTING ANALYSIS

### 5.1. Consideration

#### For Mechanical Commodities

S.no	Attribute	Assumptions for Mech Commodities	Assumptions for EE & EC Commodities
1	Should costing Location (Manufacturing)	India	India
2	No of Shifts	Three	Three
3	Batch Volume	500 Nos	500 Nos
4	Tooling Cost Estimation	Required	NA
5	Incoterms	Ex Works	Ex Works
6	OH	13% on Process Cost	5 % on Total cost
7	Margin	10 % on Total Cost	10 % on Total Cost
8	ICC	1.5 % on RM cost	1.5 % on RM cost
9	Rejection	1 % on Overall cost	1 % on Overall cost
10	Raw Material Rate Reference	SIAM Report	Online Website
11	Scrap Recovery Rate %	40%	40%
12	All the Standard Parts	Considered as Bought out Part	Considered as Bought out Part

## Scenario-1

### Assumption

Component Procurement for PCBA & WH Batch Volume -1000 Nos

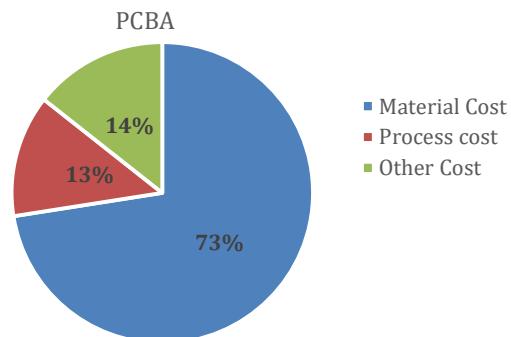
PCBA Assembly & Wire Harness Assembly Batch Volume -500 Nos (As per Customer demand)

## 5.2. Overall Cost Break Down (Scenario-1)



## Scenario -2

In the overall product cost, the PCBA contributes approximately 80%. Within the PCBA cost, the component cost accounts for 73%. To optimize the component cost, we are considering a higher procurement quantity of 5,000 units per batch. Most of the DC-DC converter components are common child parts, so we assume the supplier will consolidate all customer requirements and place a combined order for 5,000 units per batch



## Assumption

Component Procurement for PCBA & WH Batch Volume -5000 Nos

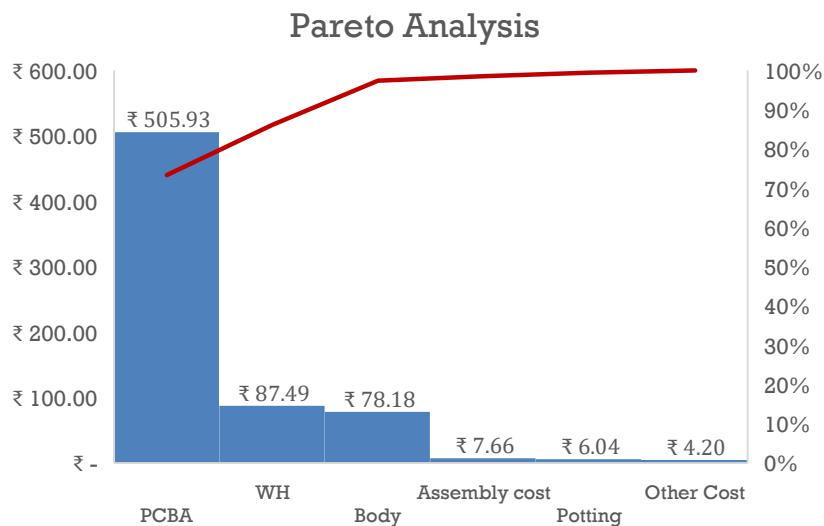
PCBA Assembly & Wire Harness Assembly Batch Volume -500 Nos (As per Customer demand)

Final Product cost based on Scenario-2

**Cost Break Down**

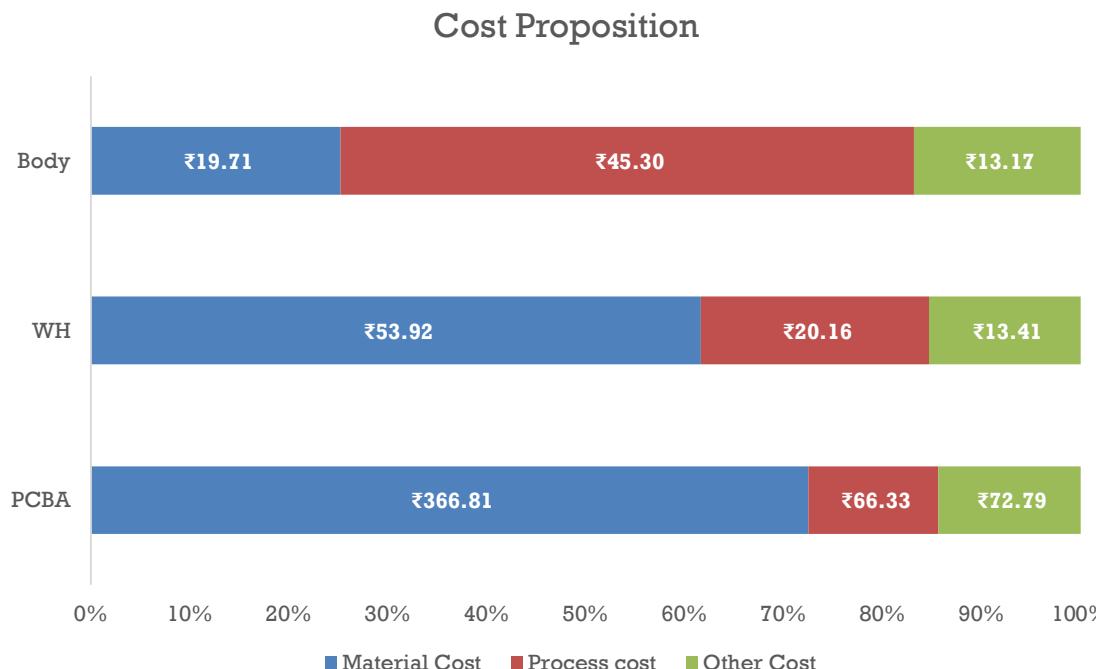


## 5.3. Pareto Analysis



**73 % of overall cost of the cost contributor is PCBA, and Top 3 major cost driver is PCBA, Body & WH**

## 5.4. Major cost driver cost proposition



**Material cost is the major cost driver for PCBA & WH, Process Cost is the major cost driver for Body**

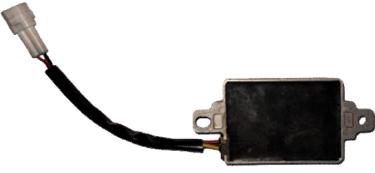
### Comparison between Scenario-1 & 2

S.no	Part Number	Description	Scenario-1		Scenario-2		Percentage of Reduction
			Batch Volume	Material Cost (Child Part)	Batch Volume	Material Cost (Child Part)	
1	DC-PCBA-00	DC Convertor PCBA	1000	₹ 442.64	5000	₹ 366.81	17%
2	DC-WH-00	Wiring Harness Assembly	1000	₹ 62.17	5000	₹ 53.92	13%
3	DC-00	Dc Dc Convertor Assy	1000	₹ 831.49	50000	₹ 689.49	17%

## **6. DETAILED SHOULD COSTING REPORTS**

## Assembly Cost Estimate

### GENERAL INFORMATION :

Part Number :	DC-00	
Part Description:	DC DC Convertor	
Currency:	INR	
Supplier Mfg. Location:	India	
Annual Volumes	6000	
Lot size	500	

### Product Images

### Components Cost

Sl.No.	Part Number	Description	Commodity	Quantity Per Assembly	Unit of Measure (UoM)	Part Cost /Unit	Total Cost (INR)
1	DC-PCBA-00	DC Convertor PCBA	Electronics	1	EA	₹ 505.93	₹ 505.93
2	DC-WH-00	Wiring Harness Assembly	Electrical	1	EA	₹ 87.49	₹ 87.49
3	DC-ME-00	DC Convertor Body	Casting	1	EA	₹ 78.18	₹ 78.18
4	DC-01	Potting Compound	Chemical	108	ml	₹ 0.06	₹ 6.04
						<b>Total Components Cost</b>	<b>₹ 677.63</b>

### Assembly Cost:

Operation Description	Equipment Description & Size	Quantity Per Assembly	Cycle Time (seconds)	Setup Time in Min	Batch Qty	LHR	MHR	Assembly Cost INR	Setup Cost INR	Total Cost INR
Body Pick & Place	Manual	1	10.0	30	500	149.64	0.00	₹ 0.42	₹ 0.15	₹ 0.57
PCBA with WH Pick & Place	Manual	1	15.0	30	500	149.64	0.00	₹ 0.62	₹ 0.15	₹ 0.77
Potting Componet Mixing	Manual	1	0.0	60	500	149.64	0.00	₹ -	₹ 0.30	₹ 0.30
De air -Vaccum Chamber	Vaccum Chamber	1	0.0	20	500	149.64	80.00	₹ -	₹ 0.15	₹ 0.15
Pour the mixture	Manual	1	5.0	30	500	149.64	0.00	₹ 0.21	₹ 0.15	₹ 0.36
Curing	Oven	1	60.0	30	500	149.64	120	₹ 4.49	₹ 0.27	₹ 4.76
Inspection	Manual	1	10.0	0	500	149.64	120	₹ 0.75	₹ -	₹ 0.75
								<b>Total Process Cost</b>	<b>₹ 7.66</b>	

### SUMMARY

COST COMPONENTS		INR
<b>Components Cost</b>		<b>₹ 677.63</b>
<b>Assembly Cost</b>		<b>₹ 7.66</b>
Assembly Scrap	0.25%	₹ 1.71
Assembly OH		₹ 0.77
<b>Final Manufactured Cost</b>		<b>₹ 687.77</b>
Packaging	0.25%	₹ 1.72
<b>Final EX-Works Cost</b>		<b>₹ 689.49</b>

Part Number	Description	Tool cost
DC-ME-00	DC Convertor Body	510672

# PCBA Cost Breakup

## PCB Assembly Process and Should Costing Report

Project	DC Convertor	Assembly Location	India	Measurement System	mm	SC Rev No.	-
Part No	DC-PCBA-00	Part Description	PCBA	Part Rev	1	Date	15-03-2025
Annual Qty	6,000	Batch Qty	500	Batch	Monthly	Terms of Delivery	Ex-Works Cost
SI. No	Description		Units	Cost			
1	BOM Cost		INR	348.247			
2	Setup Cost		INR	14.617			
3	Process Cost		INR	20.012			
4	Solder Paste Material Cost		INR	21.779			
5	Conformal Coating Material Cost		INR	0.000			
7	Cost of Rejection	1.0%	INR	0.564			
8	SG & A	5.0%	INR	20.233			
9	Profit	10.0%	INR	40.465			
10	ICC	1.5%	INR	5.224			
				₹ 471.14			

Process	Cycle time (Sec)
Solder Paste Process	5.23
SMD Process	8.06
TH Process	8.30
Depaneling	10.99
Testing Process	16.97
Manual Process	9.89
Total Product cycle time (Sec)	58.78

## Bare PCB Cost Breakup

### Should Cost Analysis Report - Summary

<b>Project:</b>	<b>DC Convertor</b>		
<b>Part:</b>	<b>DC-PCBA-37</b>	<b>SC. Date</b>	<b>15-03-2025</b>

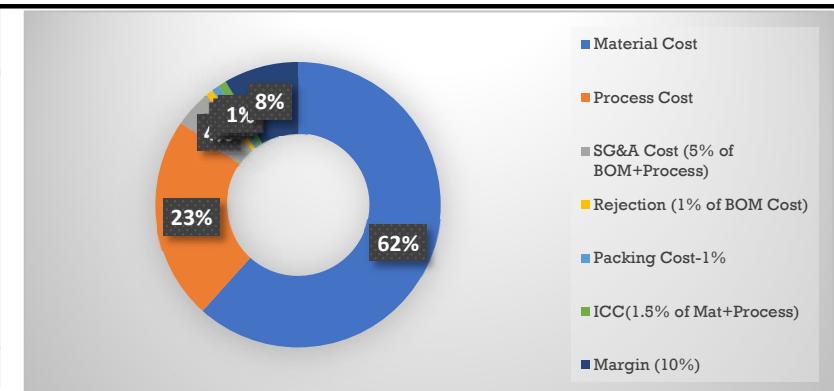
Electronics - Bare PCB Costing			Manufacturing Location		India
Part No.	Item Description	Dwg. Rev No.	Annual Quantity	Batch Quantity	SC. Ex-Works Cost)
1	PCB	-	6,000	500	34.78
<b>Manufacturing Cost Distribution</b>			<b>Process Cost Breakup</b>		
#	Categories	Cost in INR	#	Categories	Cost in INR
1	Bill of Material cost	18.561	1	Inner layer image	0.000
2	Process cost	9.919	2	Lamination	0.000
3	Scrap	0.854	3	Drilling	5.457
4	SG & A	2.278	4	Plating	1.142
5	Margin + Material Overhead	1.233	5	Outer layer image	0.721
6	ICC	0.278	6	Solder Mask	0.647
<b>TOTAL COST</b>		<b>34.785</b>	7	Silk Screen	0.928
<b>Bill of Material Cost Breakup</b>			8	Routing	0.735
#	Categories	Cost in INR	9		
1	Core laminate cost	10.814	Testing		
2	Prepreg cost	0.000	0.118		
3	Copper foil cost	0.000	10		
4	Consumable Material cost	7.510	Surface finish treatment		
5	Surface finish cost	0.237	0.170		
<b>TOTAL COST</b>		<b>18.562</b>	<b>TOTAL COST</b>		
			<b>9.919</b>		

## Should Costing Report (Wire Harness)

<b>Product Name</b>	<b>DC Convertor Wire Harness</b>
<b>Annual Quantity</b>	<b>6000</b>
<b>Batch</b>	<b>Monthly</b>
<b>Batch Qty</b>	<b>500</b>
<b>Region</b>	<b>India</b>



<b>COSTING FACTORS</b>	<b>UNITS</b>	<b>COST PER UNIT</b>
Material Cost	INR	53.92
Process Cost	INR	20.16
SG&A Cost (5% of BOM+Process)	INR	3.70
Rejection (1% of BOM Cost)	INR	0.74
Packing Cost-1%	INR	0.74
ICC(1.5% of Mat+Process)	INR	0.81
Margin (10%)	INR	7.41
<b>Ex Works Cost</b>	INR	<b>₹ 87.49</b>



Wirig Harness BOM Cost															
Sl.No.	Part No.	Remarks	Manufacturer	Class	Qty's	Total Qty	Discount %	Cost Per Pcs	Currency	INR	Amount(INR)	Freight	Duty	Landed Cost	Reference
1	DC-WH-01	3 Pin male Connector		HOUS	1	6000	50%	0.105	USD	9.053	9.053	0.000	0.000	₹ 9.053	<a href="https://prd.sws.co.jp/components/en/detail.php?number=s=61873231">https://prd.sws.co.jp/components/en/detail.php?number=s=61873231</a>
2	DC-WH-02	Av Wire Terminal 2.3 mm		TRML	3	18000	50%	0.012	USD	1.041	3.122	0.000	0.000	₹ 3.122	<a href="https://prd.sws.co.jp/components/en/detail.php?number=s=15000105">https://prd.sws.co.jp/components/en/detail.php?number=s=15000105</a>
3	DC-WH-03	Wire Seal		SEAL	3	18000	50%	0.010	USD	0.886	2.657	0.000	0.000	₹ 2.657	<a href="#">自動車用部品:Sumitomo Wiring Systems, Ltd</a>
4	DC-WH-04	TUBING SHRINK BLK OD-		TUBE	1	6000	70%	0.108	USD	9.307	9.307	0.000	0.000	₹ 9.307	<a href="https://www.mouser.com/ProductDetail/Panduit/TV105-38D20Y?qs=KwArP4cUoiZh3Qh202YFO%3D%3D">https://www.mouser.com/ProductDetail/Panduit/TV105-38D20Y?qs=KwArP4cUoiZh3Qh202YFO%3D%3D</a>
5	DC-WH-05	Rubber Cable Grommet		GROM	1	6000	70%	0.114	USD	9.778	9.778	0.000	0.000	₹ 9.778	<a href="https://www.esentra.com/productDetail/Essentra/1342664?qs=sGAEpiMZZMsAepjoiJLcxBr2lVp79XOMDJP%25252BK6iKRzPTiq9wiVAhw%3D%3D">https://www.esentra.com/productDetail/Essentra/1342664?qs=sGAEpiMZZMsAepjoiJLcxBr2lVp79XOMDJP%25252BK6iKRzPTiq9wiVAhw%3D%3D</a>
6	DC-WH-06	12 RED		CABL	0.66	3960	50%	0.117	USD	10.105	6.669	0.000	0.000	₹ 6.669	<a href="https://www.awcwire.com/product/gxl-12">https://www.awcwire.com/product/gxl-12</a>
7	DC-WH-07	12 YELLOW		CABL	0.66	3960	50%	0.117	USD	10.105	6.669	0.000	0.000	₹ 6.669	<a href="https://www.awcwire.com/product/gxl-12">https://www.awcwire.com/product/gxl-12</a>
8	DC-WH-08	12 BLACK		CABL	0.66	3960	50%	0.117	USD	10.105	6.669	0.000	0.000	₹ 6.669	<a href="https://www.awcwire.com/product/gxl-12">https://www.awcwire.com/product/gxl-12</a>

₹ 53.924

Wire ₹ 20.01  
Components ₹ 33.92

## PCBA BOM COST

NO	PART REF.	Qty	VALUE/SPECIFICATION	PACKAGE/PCB FOOTPRINT	SUPPLIER CODE	SUPPLIER NAME	ELECTROLYTE P/N	COMPONENT CLASS (A/B)	SUBSYSTEM CODE	Top/Bottom	SMID/TH	Category	Total Pin Count	Unit	EAU	Total Qty/Name	Manufacturer Name	DISCONTINUED PART NUMBER / Orderable Part Number	Volume Unit Price (\$)	Discount %	Unit price (\$)	Extended Unit Price (\$)	Priceing Source
1	DC-PCBA-1	1	H7 SCR 600V 20A TO263 AEQO	TO-263-3		Littelfuse Inc.	PB0000696-001	A		Top	SMD	Active	NA	each	6000	6000	Littelfuse Inc.	SMJ2021ATP	\$1.893	75%	\$0.4738	\$0.4738	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
2	DC-PCBA-2	5	Multilayer Ceramic Capacitors MLCC - SMD/SMF KAM15A1T2A1232ET NEW GOMBERG (SMD) KAM15A1T2A1232ET KAM15A1T2A1232ET	0603 (1608 metric)	XTR tolerance ±20%	KYOCERA AVX	VC9999880	B	SignalDrive	Top	SMD	Passive	2	each	6000	30000	KYOCERA AVX	06031C232E472A	\$0.0680	75%	\$0.0170	\$0.0880	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
3	DC-PCBA-3	1	WSL-120E 0.1% 1A e3	120E	COG tolerance ±5%	Vishay	VC9999719	B	SignalDrive	Top	SMD	Passive	2	each	6000	6000	Vishay	WSL120E010PEA	\$0.1414	75%	\$0.0383	\$0.0383	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
4	DC-PCBA-4	1	Thick Film Resistor - SMD 10Kohms 1%	1225	XTR tolerance ±20%	TE Connectivity / C26	VC9999582	B	Connectors	Top	SMD	Passive	2	each	6000	6000	TE Connectivity / C26	WT13PAJN010TD	\$0.3040	75%	\$0.0760	\$0.0760	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
5	DC-PCBA-5	5	630V 1000pF C1G 12.0 8% AEC-Q200	120E (3216 mm)	XTR tolerance ±20%	KYOCERA AVX	VC9999829	B	LevDecap	Top	SMD	Passive	2	each	6000	30000	KYOCERA AVX	KAM31GCQ2103U	\$0.1910	75%	\$0.0478	\$0.2388	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
6	DC-PCBA-6	2	IPD60110-15V-100V N-Channel Automotive MOSFET	PC-TQ025-3	2000s D=4.3mm H=6mm Rel. Part No. IPD60110-15V-100V N-Channel MOSFET UCL1V101MC16GS	Infineon	VC9999511	B	LevDecap	Top	SMD	Active	2	each	6000	12000	Infineon	IPDN1004L1ATM0	\$0.5120	75%	\$0.1280	\$0.2860	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
7	DC-PCBA-7	1	Thin Film Resistors - SMD 10Kohms 1%	603	XTR tolerance ±20%	Vishay	VC9999809	B	Decoupling	Top	SMD	Passive	2	each	6000	6000	Vishay		\$0.1460	75%	\$0.0365	\$0.0365	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
8	DC-PCBA-8	2	Thick Film Resistors 0.25w 2.2ohms 5%	603	XTR tolerance ±20%	Vishay / Dale	VC9999874	B	TOUCH	Top	SMD	Passive	2	each	6000	12000	Vishay / Dale	RC200032200JNEA	\$0.0180	75%	\$0.0045	\$0.0090	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
9	DC-PCBA-9	5	50V 100pF 33.882... KAM15B15H100XK	0808 (2012 metric)	XTR tolerance ±20%	KYOCERA AVX	VC99995438	B	LoadSwitch	Top	SMD	Passive	2	each	6000	30000	KYOCERA AVX	0805FT102K47VA	\$0.0370	75%	\$0.0093	\$0.0463	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
10	DC-PCBA-10	1	Current Sensors ResistMetalStrip 2010 80 Jumper 1.5W	2010	Tol. ±20%, Op. Temp. Range (-20 +100°C), 100Hzs, D=4.3mm, H=10.0mm MAX	Bourns	VC9999470	B	LoadSwitch	Top	SMD	Passive	2	each	6000	6000	Bourns	CRF2010-0-J-000ELF	\$0.1770	75%	\$0.0443	\$0.0443	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
11	DC-PCBA-11	1	2010 80 Jumper 1.5W	2010	COG tolerance ±5%	Bourns	VC1010928	B	TOUCH	Top	SMD	Passive	2	each	6000	6000	Bourns	CRF2010-0-J-000ELF	\$0.1770	75%	\$0.0443	\$0.0443	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
12	DC-PCBA-12	1	TVS Diodes ZTV 44.350V 12pF SOD323 - Diode Array	SOD-323-3	NPO tolerance ±5%	Littelfuse	VC9999838	B	TOUCH	Top	SMD	Active	2	each	6000	6000	Littelfuse	AQZTCOM-01PTG	\$0.0980	75%	\$0.0245	\$0.0245	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
13	DC-PCBA-13	2	Thick Film Resistors 1watt 470ohms 1% 100ppm	1218	XTR tolerance ±20%	Vishay / Dale	VC9999667	B	Microcontroller	Top	SMD	Passive	2	each	6000	12000	Vishay / Dale	CNCW1218470RPTX	\$0.1780	75%	\$0.0445	\$0.0890	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
14	DC-PCBA-14	2	022UF 100 uA 0.081	0603 (1608 metric)	XTR tolerance ±20%	KYOCERA AVX	VC1011809	B	Microcontroller	Top	SMD	Passive	2	each	6000	12000	KYOCERA AVX	06031C232E472A	\$0.0680	75%	\$0.0170	\$0.0340	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
15	DC-PCBA-15	1	Switching Controllers WIDE RANGE SYNC RX CONTROLLER A 926	HTSOP-20	COG tolerance ±5%	Texas Instruments	VC9999818	B	TOUCH	Top	SMD	Passive	2	each	6000	6000	Texas Instruments	LM5116MKS/NOPB	\$3.1500	75%	\$0.7875	\$0.7875	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
16	DC-PCBA-16	1	200V 100μF 0.981	0808(2012)		KYOCERA AVX	VC9999432	B	MACS	Top	SMD	Passive	2	each	6000	6000	KYOCERA AVX	0805SIU101PAT2A	\$0.1330	75%	\$0.0333	\$0.0333	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
17	DC-PCBA-17	1	1m Ohm 1/10 W 0%03% 1% AEC-Q200	603	IN4148 150mA 75V	YAGEO	VC9999547	B	ExternalInputs	Top	SMD	Passive	2	each	6000	6000	YAGEO	AR001NPB-071ML	\$0.0610	75%	\$0.0153	\$0.0153	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
18	DC-PCBA-18	1	Resistor de Precisión T501kl 1% 1.5W SMD 0805	805		Omron	VC9999426	B	Decoupling	Top	SMD	Passive	2	each	6000	6000	Omron		\$0.0300	75%	\$0.0075	\$0.0075	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
19	DC-PCBA-19	1	Thin Film Resistor - SMD 1/16W 47Kohm 0.5% 0.5% 10ppm	603	Schottky 0.5A 40V	Sanyo	VC9999806	B	LevDecap	Top	SMD	Passive	2	each	6000	6000	Sanyo	ER01010-0213-D	\$0.0170	75%	\$0.0043	\$0.0043	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
20	DC-PCBA-20	1	Thick Film AEC-Q200 CRWZ Series, 82 ohm, 200 mW, 1% , 5%	402		VEBRAY	VC9999461	B	LevDecap	Top	SMD	Passive	2	each	6000	6000	VEBRAY	RCW040282R0KED	\$0.0200	75%	\$0.0065	\$0.0065	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
21	DC-PCBA-21	1	Thick Film Resistors 1/4watt 62Kohms 5%	120E		Vishay / Dale	VC9999833	B	DAAS	Top	SMD	Passive	3	each	6000	6000	Vishay / Dale	CNCW120662K0JNE	\$0.0090	75%	\$0.0023	\$0.0023	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
22	DC-PCBA-22	1	Thick Film Resistors 1/4watt 5.1Kohms 5%	120E	LW-C1910DS	Vishay / Dale	VC1012556	A	LED/Mux	Top	SMD	Passive	2	each	6000	6000	Vishay / Dale	CNCW1205K10JNE-A	\$0.0090	75%	\$0.0023	\$0.0023	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
23	DC-PCBA-23	1	Thick Film Resistors 120E 120Kohms 5% AEC-Q200	120E	AM-A10961201	Panasonic	VC1008215	B	Touch	Top	SMD	Passive	1	each	6000	6000	Panasonic	EEG-8GET124V	\$0.0140	75%	\$0.0038	\$0.0038	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
24	DC-PCBA-24	2	Thick Film Resistors 1/4watt 5.1Kohms 5%	805	LTC-1628SM-01-Z1	Vishay / Dale	VC1006352	A	LED/Mux	Top	SMD	Passive			6000	6000	Vishay / Dale	CNCW080551K0JNE	\$0.0050	75%	\$0.0013	\$0.0013	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
25	DC-PCBA-25	1	Thick Film Resistors 120E 100Kohms 5% High Voltage AEC-Q200	120E	LTC-1628SM-01-Y2	ROHM Semiconductor	VC1006352	A	LED/Mux	Top	SMD	Passive	19	each	6000	6000	ROHM Semiconductor	KTR1629P301	\$0.0190	75%	\$0.0048	\$0.0048	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
26	DC-PCBA-26	1	Thick Film Resistors 120E 120Kohms 5% AEC-Q200	120E	PLCS1212E4001-R1	Panasonic	VC9999005	A	Funnel	Top	SMD	Passive	2	each	6000	6000	Panasonic	EEG-8GEY1124V	\$0.0140	75%	\$0.0038	\$0.0038	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
27	DC-PCBA-27	1	Power Inductors - Leadless SMD 56mH 35.1mΩ	Trey	Ref component: NXP BC807-25	KEMET	VC9999447	B	SignalDrive	Top	TH	Passive	3	each	6000	6000	KEMET	SHBC15-100A0050V	\$2.0780	75%	\$0.5195	\$0.5195	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
28	DC-PCBA-28	1	CAP ALUM 330UF 20% 100V RADIAL	Radial, Can	LP20301BLT1G	Nichicon	VC9997811	A	LED/Mux	Bot	TH	Passive	3	each	6000	6000	Nichicon	UP28A331MHD	\$0.4543	75%	\$0.1211	\$0.1211	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
29	DC-PCBA-29	3	Aluminum Electrolytic Capacitors - SMD	Aluminum Electrolytic Capacitors - SMD	Ref. Pn: ON SEMICONDUCTOR BC817-2H71G	Chemi-Con	VC9999554	B	LevDecap/Driver	Bot	SMD	Passive	3	each	6000	18000	Chemi-Con	4LA280RAA31MHS	\$0.1780	75%	\$0.0445	\$0.1333	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
30	DC-PCBA-30	1	SMD 14V 470uf 20% AEC-Q200	Reel		Nichicon	VC9997372	B	SignalDrive	Bot	SMD	Passive	2	each	6000	6000	Nichicon	UCQ14C41MCL1G	\$0.4700	75%	\$0.1175	\$0.1175	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
31	DC-PCBA-31	1	2.5 Ohm, 0.5W NTC Thermistor	Reel		Volts	VC9997159	B	SignalDrive	Bot	TH	Passive	2	each	6000	6000	Volts	9CK-3RS8	\$0.0792	75%	\$0.0448	\$0.1448	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>
32	DC-PCBA-32	5	0.00V 10 000pF C1G 12.0 8% AEC-Q200	120E (3216 mm)		KYOCERA AVX	VC9997393	B	LevDecap	Bot	SMD	Passive	2	each	6000	30000	KYOCERA AVX	KAM31GCQ2103U	\$0.1910	75%	\$0.0478	\$0.2388	<a href="http://www.digita.com/datasheets/2010/06/20100624121531.pdf">http://www.digita.com/datasheets/2010/06/20100624121531.pdf</a>



Should Costing Report For DC Convertor Body	
Part Number :	DC-ME-00
Part Description :	DC Convertor Body
Annual Volume (#) :	6,000
Commodity :	Casting
Process Name :	High Pressure Die Casting
Current Supplier Name :	-
Current Manufacturing Country :	INDIA
Delivery Country :	INDIA
BOM Qty (No's)	1
Part Complexity :	Low
Lot size (#) :	500
Supply Chain Model :	Buy
Packaging Type :	Reusable
HS Code :	N/A
Incoterms :	EX-W
Payment Terms :	30 Days

Material Information 1:	
Category :	Non Ferrous
Family :	Aluminum
Description/Grade :	ADC 12
Density (g/cc) :	2.74
Material price (₹/Kg) :	230.00
Scrap price (₹/Kg) :	92.00
Part Envelope Length (mm)	121.00
Part Envelope Width (mm)	57.00
Part Envelope Height (mm)	35.00
Part Surface Area (mm^2)	21,774.00
Part Volume (mm3):	28,467.15
Cavities	1.00
Plunger & Gating:	Cold Plunger, Tab Gating
Finish Part Weight: gms	78.00
Runner & Sprue Weight: gms	12.00
Shot Weight:gms	90.00
Scrap Reuse:	No
Scrap weight per shot(g) :	12.00
Utilisation %	-
Scrap Recovery %	0.90
Gross Material cost Per Part (₹) :	20.70
Scrap Rec Cost Per Part (₹) :	0.99
Net RM Cost Per Part:	19.71

Total Material Cost	₹19.71
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Operation : 20	
Process Type :	Melting
Machine Name :	Generic Furnace
M/c Automation :	Semi Auto
Cycle Time (sec) :	28.88
Setup Time (min/piece) :	0.24
Total tool loading time (min)	120.00
Furnace output (kg/hr):	32.00
Melting wt/batch (kg):	45.00
Melting time/batch (min):	84.38
Charge into furnace (min):	30.00
Liquid metal transfer to holding furnace (min):	30.00
Total melting cycle time without efficiency (min)	144.38
Efficiency %:	0.60
Total melting cycle time with efficiency factor (min):	240.63
Per Part melting Cycle time (min):	0.48
Per Part melting Cycle time (sec):	28.88
# of Direct Labors :	1.00
# of Skilled Labors :	- .0
# of QA Inspector :	1.00
Direct Labor Rate /hr	102.00
Skilled Labor Rate /hr	115.00
QA Inspector Rate /hr:	115.00
Sampling Rate (%)	0.01
Inspection time (min) :	5.00
Yield (Net Good Parts) (%) :	0.99
Machine hour Rate (₹) :	240.00
Machine Cost (₹) :	1.93
Setup Cost (₹) :	1.37
Labor Cost (₹) :	0.82
Inspection Cost (₹) :	0.10
Yield Cost (Rejected Parts Scrap Rate) (₹)	0.17
Net Process cost (₹) :	₹4.37

Operation : 30	
Process Type :	HPDC
Recommended Force : (Ton)	136 Ton
Selected Tonnage (Ton) :	150 Ton
Machine Name :	Generic HPDC Machine
M/c Automation :	Semi Auto
No Of Cavities	1.00
Cycle Time (sec) :	79.00
Setup Time (min/piece) :	0.24

Total tool loading time (min)	120.00
# of Direct Labors :	2.00
# of Skilled Labors :	- .0
# of QA Inspector :	1.00
Direct Labor Rate /hr	102.00
Skilled Labor Rate /hr	192.64
QA Inspector Rate /hr:	192.64
Sampling Rate (%)	0.01
Inspection time (min) :	5.00
Yield (Net Good Parts) (%) :	0.99
Machine hour Rate (₹) :	1,200.00
Machine Cost (₹) :	26.33
Setup Cost (₹) :	5.62
Labor Cost (₹) :	4.48
Inspection Cost (₹) :	0.16
Yield Cost (Rejected Parts Scrap Rate) (₹)	0.49
Net Process cost (₹) :	<b>₹37.08</b>

<b>Operation : 40</b>	
Process Type :	Trimming Press
Recommended Force : (Ton)	56 Ton
Selected Tonnage (Ton) :	60 Ton
Machine Name :	Generic Trim Press
M/c Automation :	Semi Auto
Stroke Time (sec) :	15.00
Stroke Time (sec) :	5.00
Part Loading/Unloading time (sec)	10.00
Setup Time (min/piece) :	0.24
Total tool loading time (min)	120.00
# of Direct Labors :	1.00
# of Skilled Labors :	- .0
# of QA Inspector :	1.00
Direct Labor Rate /hr	102.00
Skilled Labor Rate /hr	115.00
QA Inspector Rate /hr:	115.00
Sampling Rate (%)	0.01
Inspection time (min) :	5.00
Yield (Net Good Parts) (%) :	0.99
Machine hour Rate (₹) :	80.00
Machine Cost (₹) :	0.33
Setup Cost (₹) :	0.73
Labor Cost (₹) :	0.43
Inspection Cost (₹) :	0.10
Yield Cost (Rejected Parts Scrap Rate) (₹)	0.14
Net Process cost (₹) :	<b>₹1.72</b>

Operation : 50	
Process Type :	Shot Blasting
Machine Name :	Dip Type
M/c Automation :	Semi Auto
Cost/ Kg(₹):	15.00
Cost/Part (₹):	₹1.17

Operation : 60	
Process Type :	Final/PDI Inspection
Machine Name :	Manual
M/c Automation :	NA
# of QA Inspector :	1.00
QA Inspector Rate /hr:	115.00
Cycle time in Sec	30.00
Inspection cost	₹0.96

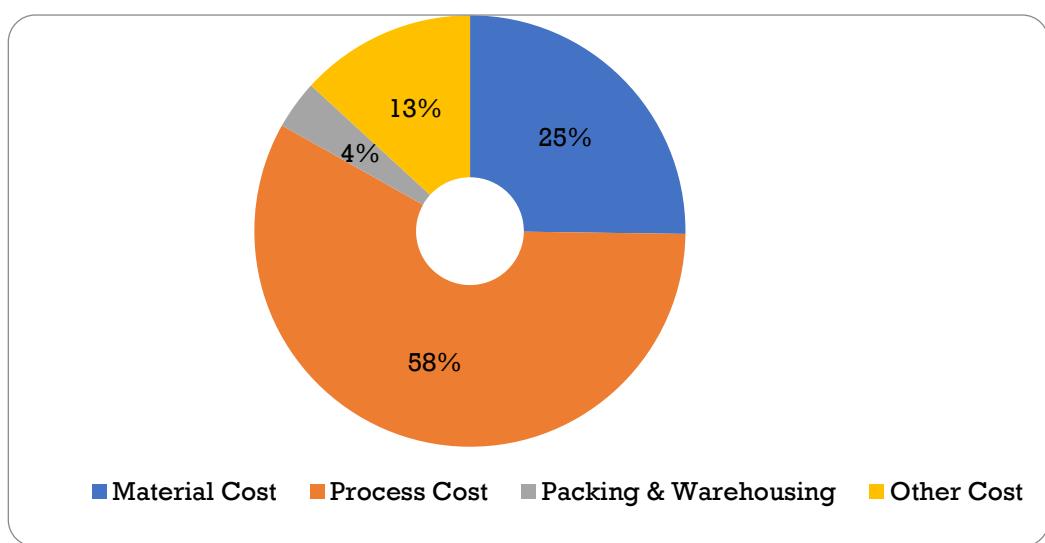
Total Process cost	₹45.30
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Operation : 70	
Process Type :	Packing & Warehousing
Packing Type	SS Mesh Wire + PP Sheet Container
Part Dimension (mm)	121 x 57 x 35
Pallet Dimension (mm)	800 x 600 x 400
Volume of the part (CBM )	0.00
Volume of the Pallet (CBM )	0.19
No of Parts per Pallet	302.00
Pallet cost + Partition cost per Unit	30,000.00
Life of Pallet	5.00
Monthly volume	500.00
Inventory at Customer end-3 Days Stock	60.00
Inventory at Supplier end-6 Days Stock	120.00
Transit Stock	20.00
Total No of Qty in one Cycle	200.00
No of Pallet Required	-
Total Pallet cost	-
Total 5 Year Volume	30,000.00
Packing cost per unit	₹0.00
No of days inventory required	6.00
Bank Interest Rate	0.15
RM + Process Cost per Unit	65.01
ICC cost for 6 days	0.00
ICC cost per unit	₹0.16

Pallet area in Sqm		0.48
Pallet area in Sft		5.16
Total area required to storage 6 days stock		15.49
Rental cost per Sqft		20.83
Rental cost per unit		2.69
<b>Total cost per Unit</b>		<b>₹2.85</b>

<b>Over Heads</b>		
ICC 1.5%	₹	0.9853
Material OH 5%	₹	0.9853
Machine OH 3%	₹	0.7900
Labor OH 2%	₹	0.0895
Admin OH 3%	₹	1.9503
Profit 10%	₹	6.5010
<b>Total OH</b>	<b>₹</b>	<b>10.3162</b>

<b>Summary</b>		
Material Cost	₹	19.71
Process Cost	₹	45.30
Packing & Warehousing	₹	2.85
Other Cost	₹	10.32
<b>Total Part Cost</b>	<b>₹</b>	<b>78.18</b>



<b>Tool Information</b>	
Estimated Tool Size: (L*W*H) mm	260.5 X 278.5 X 525
Cost For One Tool (Estimated)	5.1 Lakh INR
No of Side Core /Part	0
No Of Cavities	1
No Of Shots	1,50,000
Mold Utilisation For 5 Year Program	20%
No Of Molds For Project Life	1
Investment For Project Life	5.1 Lakh INR

### Runner Volume Estimation

Description	UOM	Value
Sprue Length	mm	100.00
Sprue Dia	mm	5.00
Sprue Volume	mm <sup>3</sup>	1,963.50
Runner Length	mm	67.00
Runner Dia	mm	6.00
Runner Volume	mm <sup>3</sup>	1,894.38
Gate Length	mm	20.00
Avg Gate Dia	mm	4.00
Number Of Gates		1.00
Gate Volume	mm <sup>3</sup>	251.33
Total Runner Volume	mm <sup>3</sup>	4,109.20
Material Density	Kg/m <sup>3</sup>	2,740.00
Runner Weight	g	12.00

### HPDC Tonnage Recommendation

Description	UOM	Value
Number of cavities	Nos	1.00
Part projected area	mm <sup>2</sup>	6897.00
Runner projected area	mm <sup>2</sup>	2740.00
Min wall thickness	mm	2.00
Max length of flow	mm	121.00
Flow path/wall thickness Ratio		60.50
Cavity pressure theoretical	bar	400.00
Viscosity grade (Material Flowability)	1 - 1.9	1.00
Cavity pressure actual	Kg/cm <sup>2</sup>	408.00
Saftey factor		1.10
Shot projected area	mm <sup>2</sup>	9637.00
<b>Clamping tonnage</b>	<b>Ton</b>	<b>43</b>

### Trimming Press Tonnage recommendation

Description	UOM	Value
Trim Perimeter	mm <sup>2</sup>	427.20
Flash / Gate Thickness	mm	4.00
UTS	Mpa	290.00
Safety factor		1.10
<b>Clamping tonnage</b>	<b>Ton</b>	<b>56</b>

Cycle Time Estimate		
Description	UOM	Value
Pouring Into Plunger	s	15
Injection Rate	kg/hr	800
Shot Weight	g	90
Injection Time	s	1
Cooling Time	s	20
Pressure Holding Time	s	8
Ejection Time	s	10
Mold Clean & Lube Time	s	15
Dry Cycle Time	s	10
Slide / Core Action Time	s	-
<b>Total Cycle Time</b>	<b>s</b>	<b>79</b>

Material Cost Calculation		
ADC12 Chemical Composition	%	Rate/kg
Aluminum: 77.3–86.5%	86%	223.60
Copper: 3.0–4.5%	3.00%	799.80
Iron: ≤1.3%	1%	40
Magnesium: ≤0.10%	0.05%	180.60
Manganese: ≤0.5%	0.03%	94.60
Nickel: ≤0.5%	0.03%	1308.06
Silicon: 9.600–12.000%	10%	129.00
<b>Process Cost</b>	<b>100%</b>	
<b>Total</b>		

## MOLD COST ESTIMATION

Part Description		
Description	UOM	Value
Length	mm	121
Width	mm	57
Height	mm	35
No Of Cavities		1
Die Base Length	mm	260.5
Die Base Width	mm	228.5

Mold Material Estimate					
Line Item	L	W	H	Qty	Weight
UOM	mm	mm	mm	PC	Kg
Core Plate	260.5	228.5	125	1	58.41
Cavity Plate	260.5	228.5	125	1	58.41
Core Back Plate	260.5	228.5	45	1	21.03
Top Plate	260.5	278.5	25	1	14.24
Bottom Plate	260.5	278.5	25	1	14.24
Ejector Plate	260.5	198.5	25	1	10.15
Ejector Back Plate	260.5	198.5	30	1	12.18
Spacer Block	260.5	80	180	2	58.89
Core Insert	241	177	85	0	-
Cavity Insert	241	177	85	0	-
Lifter / Slide	400	400	200	0	-

Mold RM Cost Estimate				
Line Item	Material	Cost	Weight	Cost
UOM	-	Rs/Kg	Kg	INR
Mold Base	C45	120.00	273.00	32,760.00
Electrodes	Copper	1,000.00	25.00	25,000.00
Cavity	H13	750.00	- .00	- .00
Core	H13	750.00	- .00	- .00
Sub Inserts	H13	750.00	- .00	- .00
Standard Parts		1.00	1,50,000.00	1,50,000.00
<b>Total</b>				<b>2,07,760.00</b>

Mold Manufacturing Cost Estimate				
Line Item	MHR	Machining Time Core	Machining Time Cavity	Cost
UOM	Rs/hr	hr	hr	INR
Generic Machining	400	12	12	9,600.00
Core / Cavity Machining	500	50	50	50,000.00
Electrodes Machining	500	15	15	15,000.00
Slide / Lift Machining	500		0	- .00
Base Machining	500	5	5	5,000.00
EDM	400	42	42	33,600.00
Wire Cut	400	5	50	22,000.00
Polishing	400	12	12	9,600.00
Spotting	500	8	8	8,000.00
Assembly	400		50	20,000.00
Grain / Texture				- .00
Hardening	225	-		- .00
Trail	10000	3		30,000.00
<b>Total</b>				<b>2,02,800.00</b>

OH & Profit		
Line Item	%	Cost
OH	10%	41,056
Profit	10%	41,056
RM For Trial	360	18,000
<b>Total</b>		<b>₹ 1,00,112</b>

Estimated Mold Size (L X W X H)	260.5 X 278.5 X 525
Estimated Mold Cost	₹ 5,10,672

## 7. VALUE ANALYSIS AND VALUE ENGINEERING

### 7.1. Ideas Generation

S.no	Ideas	Method	Affected part	Current Cost	Expected cost	Potential savings	Ideas Validation status	Type of Change
1	Surface finish changes from HASL to OSP	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-PCBA-37- Bare PCB-	0.212			YTC	Process
2	Removing the 3 slots in PCB profile and make it rectangle	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-PCBA-37- Bare PCB-	9.67			YTC	Design
3	Changing from Soldering to Press fit process/ Avoid THT components	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-PCBA-2, DC-PCBA-27 & DC-PCBA-31	8.30			YTC	Design
4	Changing the WH soldering to connector assembly	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-PCBA-00				YTC	Design
5	Identifying the local supplier for ICs	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-PCBA-15	89			YTC	Supplier
6	2 <sup>nd</sup> source for A components	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$					YTC	Supplier
7	Body Material change Al to Plastic	$V = \frac{P^{\rightarrow}}{C^{\downarrow}}$	DC-ME-00	85.47			YTC	Material

8	Manufacturing Process change to Al Extrusion	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-ME-00	85.47			YTC	Process
9	Manufacturing Process change to Sheet Metal	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-ME-00	85.47			YTC	Process
10	Casting Part supplier changes into Coimbatore	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-ME-00	85.47			YTC	Supplier
11	PCBA Assembly supplier change into local supplier	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-PCBA-00	601.52			YTC	Supplier
12	Wire Harness Supplier change into local supplier	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-WH-00	118.50			YTC	Supplier
13	Potting Compound replace with Screw	$V = \frac{P^\rightarrow}{C^\downarrow}$	DC-C-011	10.06			YTC	Design

## 7.2. Cost Reduction through Supplier Change

### DC DC Convertor Assembly

Based on our market research, DC-DC converters are proprietary parts, and many electronics manufacturing companies produce and supply them. The following suppliers are major providers of DC-DC converter assemblies

S.No	Manufacturer Name	Tentative Selling Price
1	Ucal Fuel Systems Ltd.	1050
2	Mind Corporation Ltd	1500
3	Foxconn India Pvt Ltd	780

## DC Convertor Body

Part Number -**DC-ME-00**

Material Grade – **ADC 12**

Supplier Name – **Enkey Engineering Works**

Location -**Coimbatore**

Supplier Scope -**Raw material, HDPC, Shot Blasting, Inspection & Packing**

Incoterms -**Ex Works**

Initial Quoted Cost – **115 INR / Unit**

Development cost -**Additional**

### Negotiation Point

During the negotiation with the supplier, we identified key areas for cost optimization. In the initial quote, the supplier had considered a higher input weight and a higher tonnage machine, leading to increased costs. However, based on our should-cost analysis, we determined that a 150-tonnage machine is sufficient for producing the part efficiently. Additionally, an input weight of 90 grams is more than adequate to meet the required specifications. By leveraging these insights, we successfully negotiated with Supplier.

Negotiated Cost -**70 INR / Unit**

Percentage of Reduction -**39%**

## DC Convertor PCBA

Part Number -**DC-PCBA-00**

Supplier Name – **OMGVH ELECTRONICS PVT LTD**

Location -**Bangalore**

**Supplier Scope -Bare PCB Manufacturing, Component Procurement, PCBA Manufacturing, Inspection, Testing and Final Assembly**

**Initial Quoted Cost –1450 INR / Unit (Without Wire Harness & Body Cost).**

**Development cost -Additional**

### **Negotiation point**

Based on our discussion with the supplier, we identified that the PCBA component cost in their initial quote was higher compared to our should-cost analysis. This was primarily due to their consideration of a lower batch quantity of 500 units for both unique parts and common parts, to optimize the BOM cost, they have now increased the batch quantity for these common parts by combining demand from multiple customers, enabling them to secure higher discounts from the OEM (PCBA Component). Additionally, we collaboratively explored opportunities to further reduce costs by considering alternative components in the PCBA

**Negotiated Cost -1050 INR / Unit (Without Wire Harness & Body Cost).**

### **DC Convertor Wiring Harness**

**Part Number -DC-WH-00**

**Supplier -1 Name – WH technology private limited**

**Location – Bangalore**

**Supplier Scope -WH Component Procurement, Assembly, Inspection, Testing and Packing**

**Initial Quoted Cost –98 INR /Unit**

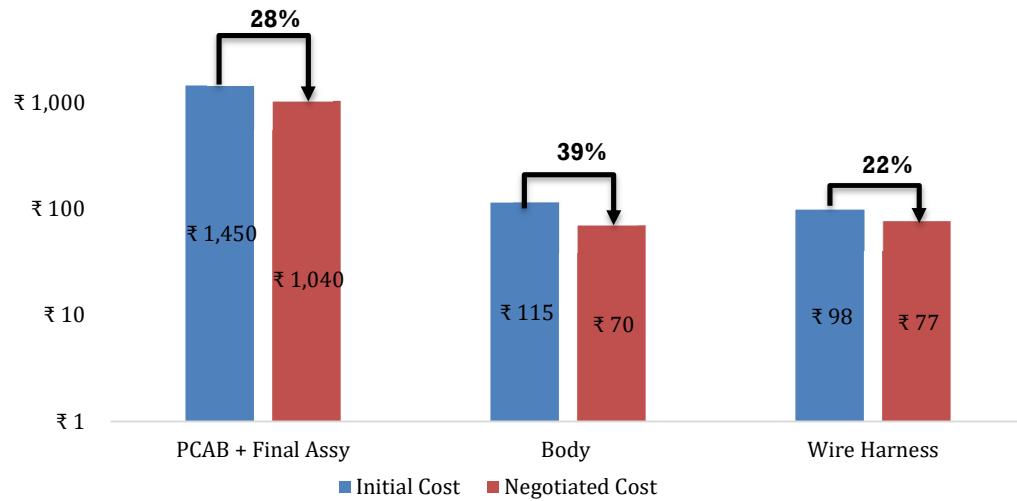
**Supplier -2 Name – AAYS Solutions Private Limited**

**Location – Bangalore**

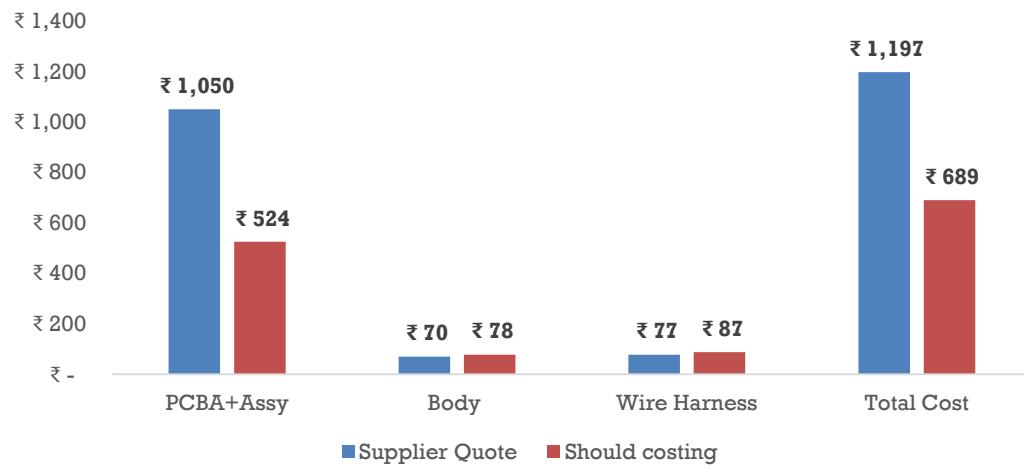
## Supplier Scope -WH Component Procurement, Assembly, Inspection, Testing and Packing

Initial Quoted Cost – 76.53 INR /Unit

### Reduction Summary



### Supplier Quote Vs Should Costing Comparison



## Take Aways

- **Major Cost Driver:** Based on Should Costing analysis and discussions with the local manufacturer, the primary cost driver in the DC-DC converter is electronic components (ICs, capacitors, resistors, etc.). The pricing of these components depends on purchase volume.
- **Wiring Harness & Casting Parts:** Better pricing can be obtained through local suppliers.
- **PCBA Sourcing: OEM vs. Local Manufacturer Pricing:** The local manufacturer is unable to match OEM pricing because OEMs procure large quantities by consolidating demand across multiple products, achieving significantly lower costs compared to local suppliers.
- Exploring sourcing options in China could be beneficial since most electronic components are manufactured there, and China has advanced PCBA manufacturing technologies.
- Transportation and duty costs from China to India add approximately 20% to 25%.
- **For moderate volume and complex PCBA parts (more than 6 layers),** sourcing from China is more cost-effective than from India. Additionally, the government imposes lower duties on complex parts compared to low-complexity parts

S.no	Part Number	Description	Suggestions
1	DC-PCBA-00	DC Convertor PCBA	It is suggested to source from a supplier who procures PCBA components in higher volumes, or alternatively, place the entire 6,000 units as a single batch. Implementation of VAVE ideas can lead to further cost reduction
2	DC-WH-00	Wiring Harness Assembly	Suggesting to be sourced from Local Supplier
3	DC-ME-00	DC Convertor Body	Suggesting to be sourced from Local Supplier (Coimbatore)
4	DC-C-00	Potting Compound	Suggesting to be sourced from Local Manufacture with higher volume batch Qty
5	DC-00	Dc Dc Convertor Assy	Suggesting to be add Scope to PCBA supplier itself