INDIA NIPPON ELECTRICALS LTD., HOSUR-635114	CUSTOMER REPORT	REP.REF : JD/24/003 SHEET : 1 of 13

Customer : JD **Application : 24V 150W**

Product : 1. DC-DC CONVERTER

Summary :

Electrical performance of the samples were found to be satisfactory.

Samson G	Smijesh N.V	Not Reviewed	Not Approved
Prepared [Product Engineer]	Checked [Product Lead]	Checked [Engg QA]	Approved [Incharge]

INDIA NIPPON ELECTRICALS LTD., HOSUR	CUSTOMER SAMPLES	REP REF : JD/24/003 SHEET : 02 of 13 DATE : 23-09-2024

CUSTOMER : **JOHN DEERE** **CUSTOMER OUTLINE REF** : **CN5310017**

PRODUCT : **DC - DC CONVERTER (24V/8A)** **CUSTOMER PRD REF** : **UC41337 dt.25-04-2024.**

APPLICATION : **Turf Utility Vehicle**

QUANTITY : **08nos**

REFERENCE:

1 INEL received RFQ along with initial requirement document from customer vide mail dated on 09-09-2022.

2 Dispatched 8nos of concept samples to customer vide report ref JD/23/002 dt.06-01-2023.

3 Dispatched 8 more nos of samples inline with previous condition to customer vide report ref JD/23/006 dt.08-05-2023.

4 INEL received updated requirement document for 6.5A to 8A output current rating from customer vide mail dt. 24-08-2023.

5 Dispatched 20nos of samples with 8A current rating vide report ref JD/23/008 dt. 26-10-2023.

6 Dispatched 5nos of more samples inline with previous condition vide report ref JD/23/009 dt.24-11-2023.

7 Dispatched 30nos of more samples inline with previous condition vide report ref JD/24/002 dt.04-03-2024.

8 INEL received 8nos samples requirement from customer with new updated molex w/h connectors vide PO Ref : 4514001294, 4513849274 dt 15-07-2024.

DETAILS:

1 As required by customer 08nos of samples were made with new w/h connectors as per outline drawing CN5310017.

2 Performance of the samples were found to be satisfactory.

3 Samples are dispatched to customer dated on 13-09-2024 through DHL courier (AWB NO : 5480689001).

INDEX

Conclusion:

Samples are made through proto route and are being submitted for proving concept and basic performance requirements.

Since samples are made to prove customer basic performance ,recommended for limited validation.

Request customer to provide approval for product design and proceed further for tooled up samples build.

INDIA NIPPON ELECTRICALS LTD., HOSUR	PERFORMANCE REPORT	REP REF : JD/24/003 SHEET : 03 of 13 DATE : 23-09-2024

CUSTOMER : **JOHN DEERE** **CUSTOMER OUTLINE REF** : **CN5310017**

PRODUCT : **DC - DC CONVERTER (24V/8A)** **CUSTOMER PRD REF** : **UC41337 dt.25-04-2024.**

APPLICATION : **Turf Utility Vehicle**

QUANTITY : **08nos**

S.No	DESCRIPTION	UNIT	SPECIFICATION	SAMPLES								REMARKS
				01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	
ELECTRICAL REQUIREMENTS												
P1	**Customer requirement no 2.1.2:** Efficiency of converter shall be greater than 90% at greater than 50% total output current.	%	≥ 90% (>50% load with 50V input)	94.51 ~ 94.93	94.69 ~ 94.89	94.85 ~ 95.38	95.00 ~ 95.37	95.30 ~ 95.36	94.90 ~ 95.27	93.94 ~ 94.31	95.51 ~ 95.73	Meeting the specification
P2	**Customer requirement no 2.1.3 :** The conductive parts of the converter housing shall have a minimum electrical resistance of 1 MΩ from all electrical input and output terminals.	MΩ	Isolation resistance between input terminal & Case, output terminal & Case shall be >1Mohm when measured with 500V DC	>2000								Meeting the specification
P3	**Customer requirement no 2.1.4 :** No single point failure shall allow the input voltage to conduct to the output terminal. **Rationale:** For example, consider a shorted switching transistor; the input voltage shall not be present on the output terminal in this case.	-	-	Not Provided								Protection feature will be provided on next batch of samples.
P4	**Customer requirement no 2.1.5 :** Voltage applied to the output terminals shall not be conducted to the input terminals when the converter is unpowered or not enabled	-	-	Output voltage did not appear at the input terminal								Meeting the specification.
P5	**Customer requirement no 2.1.6.1 :** The converter shall have an enable feature allowing remote control of the output voltage. The enable signal shall be pulled low, and be active high.	-	-	Convertor is ON when enable pin is pulled to high								Meeting the specification.
P6	**Customer requirement no 2.1.6.2:** The enable signal shall be present in the input and output connector	-	-	Provided both at input and output								Meeting the specification.
P7	**Customer requirement no 2.1.6.3 :** The enable signal pin shall sink less than 10 mA	mA	<10mA	1.15 ~ 1.79	1.15 ~ 1.17	1.15 ~ 1.17	1.15 ~ 1.17	1.16 ~ 1.18	1.16 ~ 1.18	1.16 ~ 1.18	1.16 ~ 1.18	Meeting the specification.

INDIA NIPPON ELECTRICALS LTD., HOSUR	PERFORMANCE REPORT	REP REF : JD/24/003 SHEET : 04 of 13 DATE : 23-09-2024

CUSTOMER : **JOHN DEERE** **CUSTOMER OUTLINE** : **CN5310017**

PRODUCT : **DC - DC CONVERTER (24V/8A)** **CUSTOMER PRD REF** : **UC41337 dt.25-04-2024.**

APPLICATION : **Turf Utility Vehicle**

QUANTITY : **08nos**

S.No	DESCRIPTION	UNIT	SPECIFICATION	SAMPLES								REMARKS
				01/08	02/08	03/08	04/08	05/08	06/8	07/08	08/08	
P8	**Customer requirement no 2.1.6.4 :** The enable signal shall be compatible with the input and output voltage ranges.	-	-	Compatible at both input and output voltage range								Meeting the specification.
P9	**Customer requirement no 2.1.6.5 :** The converter shall turn on if either enable signal is above 5 V.	V	>5V	5								Meeting the specification.
P10	**Customer requirement no 2.1.6.6:** The converter shall turn off if either enable signal is below 4 V.	V	<4V	4								Meeting the specification.
P11	**Customer requirement no 2.1.6.7 :** The enable signal shall be present in the input and output connector. A current limiting resistor shall be used to limit current flow from enable pin 1 and enable pin 2 to less than 10mA.	mA	<10mA	3.45 ~ 5.90	3.46 ~ 5.51	3.39 ~ 5.90	3.44 ~ 5.91	3.39 ~ 5.90	3.44 ~ 5.89	3.45 ~ 5.90	3.43 ~ 5.91	Meeting the specification.
P12	**Customer requirement no 2.1.7.1 :** The operating input voltage range shall be Vbat = 35 V – 60 V. **Rationale:** Typical Vbat = 50V. The converter will be used with a battery, so the input voltage will regularly vary within this range.	V	35V ~ 60V	Converter will provide continious power while the input voltage between 35V and 60V								Meeting the specification.
P13	**Customer requirement no 2.1.7.2 :** The converter shall not allow input currents to exceed the ratings of the connector terminals.	-	-	Convertor consumes maximum input current 6A at 35Vin which lesser than the current rating 22A of the input connector terminals								Meeting the specification.
P14	**Customer requirement no 2.1.7.3 :** No damage shall occur if the input voltage falls under the operating range. The output may switch off	V	<35V	32.6	32.7	32.5	32.5	32.3	32.7	32.2	32.6	Meeting the specification.
P15	**Customer requirement no 2.1.7.4 :** No damage shall occur if the input polarity is incorrect.	-	-	Poka Yoke is available in connector								Meeting the specification.
P16	**Customer requirement no 2.1.7.5 :** If voltage is present on the output and is higher than the voltage on the input, no current shall flow from the output to the input.	-	-	No current flow occurred								Meeting the specification.

INDIA NIPPON ELECTRICALS LTD., HOSUR	PERFORMANCE REPORT	REP REF : JD/24/003 SHEET : 05 of 13 DATE : 23-09-2024

CUSTOMER : **JOHN DEERE**

CUSTOMER OUTLINE REF : **CN5310017**

PRODUCT : **DC - DC CONVERTER (24V/8A)**

CUSTOMER PRD REF : **UC41337 dt.25-04-2024.**

APPLICATION : **Turf Utility Vehicle**

QUANTITY : **08nos**

S.No	DESCRIPTION	UNIT	SPECIFICATION	SAMPLES								REMARKS
				01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	
P17	**Customer requirement no 2.1.8.1 :** Output voltage shall be Vout = 24 V ± 5%	V	22.8 ~ 25.2 @ Vin = 35V ~ 60V input voltage range and 0 ~ 8A output current range.	24.10 ~ 24.20	24.15 ~ 24.25	24.14 ~ 24.23	24.05 ~ 24.15	23.89 ~ 23.99	24.27 ~ 24.36	24.02 ~ 24.11	24.07 ~ 24.16	1.Meeting the specification. 2.Output voltage measured at output coupler end.
P18	**Customer requirement no 2.1.8.2 :** Output voltage shall not drop below 0 V during any operation of the converter.	-	-	Voltage did not drop below 0V								Meeting the specification.
P19	**Customer requirement no 2.1.8.3 :** Continuous output current shall be at least 8 A.	A	8 Max	8								Meeting the specification.
P20	**Customer requirement no 2.1.8.4 :** Maximum ripple voltage present in the output shall be 50 mV peak-to-peak	mV	Vbatt-50V, (Oscilloscope Bandwidth-20KHZ) <50mV	15.5 ~ 16.7	11.8 ~ 12.5	18.8 ~ 20.7	17.3 ~ 19.2	17.7 ~ 19.2	21.3 ~ 22.5	19.5 ~ 22.0	18.0 ~ 19.3	Meeting the specification.
P21	**Customer requirement no 2.1.8.5 :** Load regulation shall be less than 600 mV at full load	mV	(Vbatt-50V) <600mV	420	410	390	410	390	370	370	400	Meeting the specification.
P22	**Customer requirement no 2.1.8.6 :** The output shall have over-current protection with automatic recovery. The converter shall enter constant-current mode when the design current is exceeded.	A	>12A	13	13.5	12.5	12.4	12.5	12.3	13	12.5	Meeting the specification.

CUSTOMER : **JOHN DEERE**
CUSTOMER OUTLINE REF : **CN5310017**
PRODUCT : **DC - DC CONVERTER (24V/8A)**
CUSTOMER PRD REF : **UC41337 dt.25-04-2024.**
APPLICATION : **Turf Utility Vehicle**
QUANTITY : **08nos**

S.No	DESCRIPTION	UNIT	SPECIFICATION	SAMPLES								REMARKS
				01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	
	MECHANICAL REQUIREMENTS											
P23	**Customer requirement no 2.2.1.1 :** The converter dimensions shall not exceed 100 mm x 150 mm x 50 mm. If the converter has a pigtail, it may not be considered in the dimension envelope.	mm	shall not exceed 100mm*150mm*50mm	87.5mm*121mm*35mm								Meeting the specification.
P24	**Customer requirement no 2.2.2.1 :** The mounting surface for the converter in the end application will be a flat bracket, panel or frame member.	-	-	Noted								Meeting the specification.
P25	**Customer requirement no 2.2.2.2 :** The converter shall have at least two mounting points compatible with M6 fasteners.	-	-	Provided								Meeting the specification.
P26	**Customer requirement no 2.2.3.1 :** The converter shall have two connectors, one for input signals and one for output signals.		-	Provided								Meeting the specification.
P27	**Customer requirement no 2.2.3.2 :** All connectors shall survive at least 100 mate/un-mate cycles.	-	100mate/un-mate cycles	-								To be tested during validation.
P28	**Customer requirement no 2.2.3.3 :** All connectors shall be sealed when mated. All unused cavities shall be plugged.	-	-	Provided								Meeting the specification.
P29	**Customer requirement no 2.2.3.4 :** The mated connectors shall be rated at least IP65.	-	IP65	-								To be tested during validation.

CUSTOMER : **JOHN DEERE**
CUSTOMER OUTLINE REF : **CN5310017**
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S.No	DESCRIPTION	UNIT	SPECIFICATION	SAMPLES								REMARKS
				01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	
P30	**Customer requirement no 2.2.3.5 :** The connector may be molded in the housing or provided on a pigtail. If a pigtail is used, the pigtail shall be no longer than 150 mm.	-	<150mm	Pigtail provided with length of 100mm								Meeting the specification
P31	**Customer requirement no 2.2.3.6 :** All connectors shall be rated for the maximum voltage of the circuits they contain.	-	-	*All connectors are sized to handle full rated voltage across all operating conditions								Meeting the specification
P32	**Customer requirement no 2.2.3.7 :** The both the input and output connectors on this converter shall be different than TE Part #:282088-1 and 282105-1 or equivalent	-	-	Molex manufacturer connectors were used								Meeting the specification
P33	**Customer requirement no 2.2.4.1 :** Plastic part color shall be black, as defined in JDM F9A.	-	BLACK	BLACK								Meeting the specification
P34	**Customer requirement no 2.2.4.2 :** Aluminum enclosure components of the converter shall be anodized per MIL-A-8625, Type II.	-	-	Converter case anodized as per MIL-A-8625, TYPE II								Meeting the specification
P35	**Customer requirement no 2.2.5.1 :** The converter shall rely solely on natural convection for cooling.	-	-	Natural cooling upto 40degC operating temp.								Meeting the specification.
P36	**Customer requirement no 2.2.5.2 :** If cooling features exist, the converter will be expected to operate with organic matter filling the spaces in the cooling features.	-	-	NOT PROVIDED								Not applicable
P37	**Customer requirement no 2.2.5.3 :** The temperature shall not exceed 80°C for metal surfaces and 90°C for non-metal surfaces.	-	-	-								Test will be performed on next batch of samples.
P38	**Customer requirement no 2.2.5.4 :** The converter shall have over-temperature protection with automatic recovery.		Unit shall turn Off if incase temperature exceeds 80degC	-								Test will be performed on next batch of samples.
			Unit shall turn ON if incase temperature is lesser than 80degC	-								Test will be performed on next batch of samples.

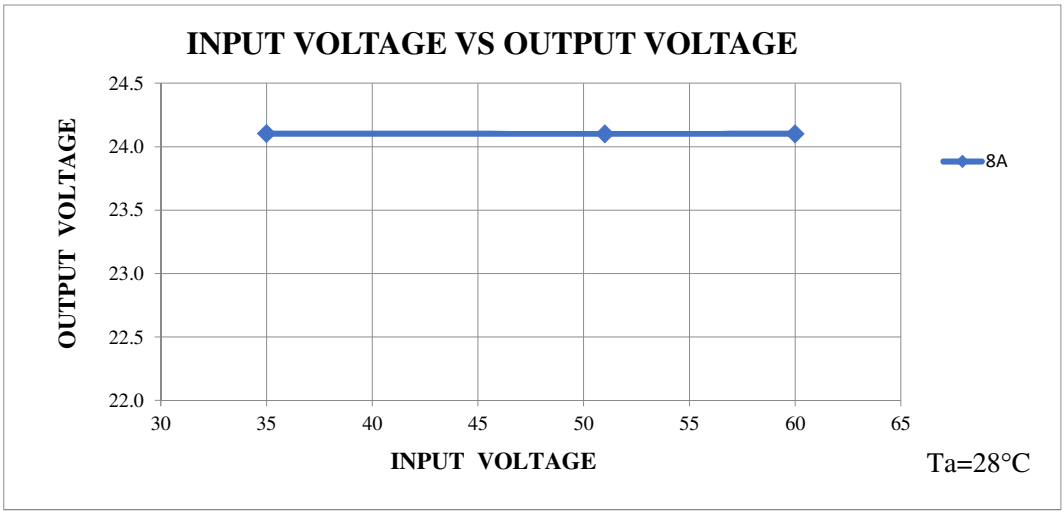
*Datasheet provided parameter to be verified and confirmed with molex manufacturer.

INDIA NIPPON ELECTRICALS LTD., HOSUR	PERFORMANCE GRAPH	REP REF : JD/24/003 SHEET : 08 of 13 DATE : 23-09-2024

CUSTOMER	**: JOHN DEERE**	**CUSTOMER OUTLINE REF**	**: CN5310017**
PRODUCT	**: DC - DC CONVERTER (24V/8A)**	**CUSTOMER PRD REF**	**: UC41337 dt.25-04-2024.**
APPLICATION	**: Turf Utility Vehicle**		
QUANTITY	**: 08nos**		

PERFORMANCE GRAPH:

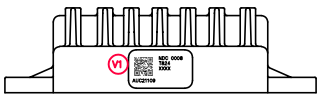
Fig.1 Performance Graph (SAMPLE 01/08)

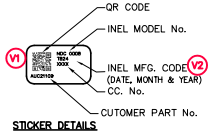


DRG. No.	DO NOT SCALE		DIMENSIONS IN mm	SPECIAL CHARACTERISTICS LEGEND	ROUGHNESS VALUE UNLESS SPECIFIED			
CN 53 10017				⚠ MAJOR CHARACTERISTIC ⚠ CRITICAL CHARACTERISTIC	SYMBOL	▽	▽▽	▽▽▽
					Ra VALUE in µm	12.5	3.2	0.8

DRN No.	DRP 24-4108	DATE: 03.09.2024
SYM.	ALTERATIONS	DCP Ref.

REP.REF: JHON JD/24/003, DATE: 23.09.2024, SHEET: 09 of 13





STICKER DETAILS

QR CODE DETAILS

AUC21109 XX 375813 T 8 24 B P 1 1103 0012

- AUC21109 — CUSTOMER PART NO.
- XX — JOHN DEERE PART NO. REVISION
- 375813 — VENDOR CODE
- T — DAY CODE
- 8 — MONTH CODE
- 24 — YEAR CODE
- B — SHIFT CODE
- P — MFG. LOCATION *
- 1 — MFG. LOCATION
- 1103 — PRODN. LINE
- 0012 — CC No.
- SERIAL No.

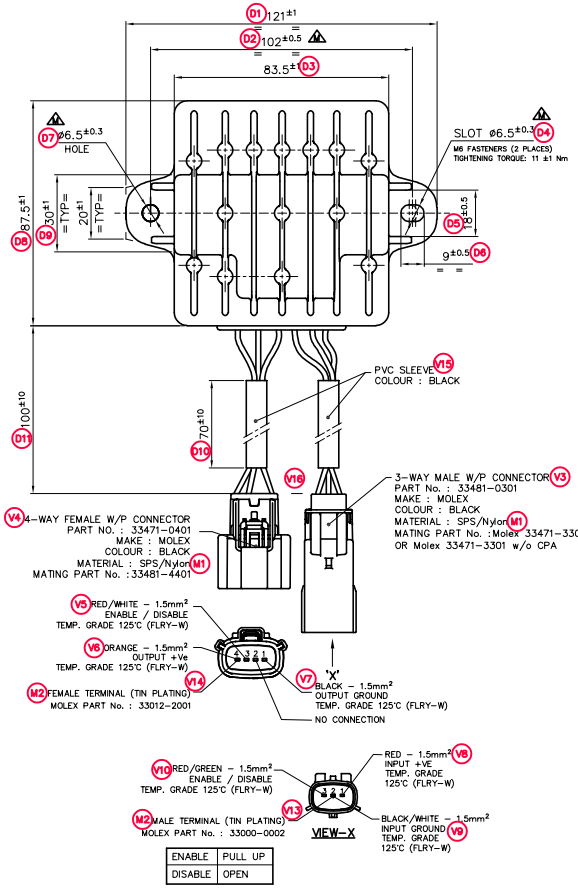
NOTE : I, O AND Q ARE REMOVED

EXAMPLE : (DAY&MONTH)

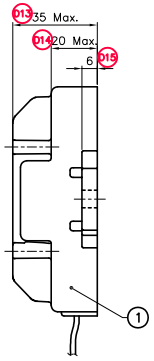
DAY	1~9	10~17	18~31
CODE	1~9	A~H	J~Y

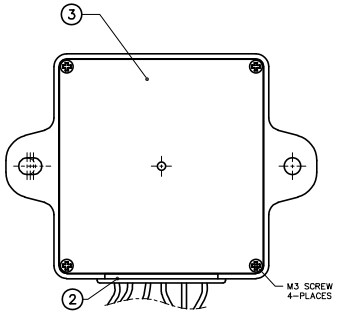
MONTH	JAN~SEP	OCT~DEC
CODE	1~9	A~C

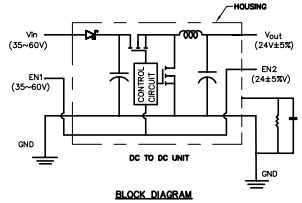
* MFG. LOCATION CODE
H – HOSUR
P – PONDICHERRY



ENABLE	PULL UP
DISABLE	OPEN







BLOCK DIAGRAM

ENABLE	PULL UP
DISABLE	OPEN

I. GENERAL

NAME : DC DC CONVERTER
TYPE : NON ISOLATED
OPERATING TEMPERATURE :–20 to +40°C

II. PERFORMANCE (Ta – 25±15°C)

S.No.	ITEM	SPECIFICATION
1	CONVERTER TYPE	NON-ISOLATED
2	OUTPUT VOLTAGE (Vbat–35~60V,8A)	24V ± 5%
3	RIPPLE VOLTAGE (Vbat–50V,Io~8A,) (OSCILLOSCOPE BANDWIDTH–20KHZ)	<50 mV
4	LOAD REGULATION (Vbat–50V)	<600 mV
5	EFFICIENCY (Vbat–50V,Io >4A)	>90% (if >50% load)
6	NOMINAL OUTPUT CURRENT(Vbat–35~60V, Vo–24V ±5%)	8A
7	SOFT START TIME(Vbat–50V, Io–8A)	<300 ms
8	OVER LOAD CURRENT	>12A
9	OVER TEMPERATURE PROTECTION (Vbat–50V)	1.UNIT SHALL TURN TO OFF IF CASE TEMPERATURE EXCEEDS 80°C. 2.UNIT SHALL TURN TO ON IF CASE TEMPERATURE IS LESSER THAN 80°C.
10	FUNCTION OF ENABLE PIN–1 & 2	1.CONVERTOR SHALL TURN ON WHEN VOLTAGE AT ENABLE PIN 1 & 2 IS >5V. 2.CONVERTOR SHALL TURN OFF WHEN VOLTAGE AT ENABLE PIN 1 & 2 IS <4V.
11	ISOLATION RESISTANCE PERFORMANCE	ISOLATION RESISTANCE BETWEEN INPUT TERMINAL & CASE, OUTPUT TERMINAL & CASE SHALL BE >1MOHM WHEN MEASURED WITH 500V DC FOR 1MIN.
12	INGRESS PROTECTION	IP66

NOTE:

1. MIL–A–8625 TYPE–II FOLLOWED FOR ANODIZING.
2. METAL HOUSING ELECTRICALLY TIED OR COUPLED TO INTERNAL CIRCUIT (PCB).
3. PRODUCT SHALL CONFIRM TO ROHS
4. RESTRICTED MATERIALS LIST SHALL CONFIRM JDM H30
5. CHEMICAL RESTRICTION AT THE HOMOGENEOUS MATERIAL LEVEL SHALL CONFIRM JDM H31
6. CONNECTER(33471–0401,33481–0301) HV RATING UP TO 65VDC AS PER MOLEX

Det. No.	DESCRIPTION	MATERIAL	QTY.	REMARKS
3	PLATE M3	STEEL OR ALUMINUM		
2	GROMMET M4	EPDM	1	HARDNESS 70±5 SHORE 'A', BLACK D12 V11
1	CONVERTER CASE M5	ALUMIUNIUM ADC–12 OR EQUI.	1	BLACK ANODIZING V12

LIMITS UNLESS STATED
DIMENSIONS WITH:
NO DECIMALS (eg. 22) ±0.4 mm
ONE DECIMALS (eg. 22.1) ±0.2 mm
TWO DECIMALS (eg. 22.12) ±0.10 mm
ANGLES ± 0 Degs. 30 Minutes.

MATL. | SPECN. | TREATMENT | FINISH | REF.

WEIGHT 0.370 Kg (APPROX) D16

DC–DC CONVERTER
(CUSTOMER OUTLINE)

USED ON JOHN DEERE – 24V/8A

INDIA NIPPON ELECTRICALS LIMITED., HOSUR.

SUPERSEDES

SCALE	1 : 1	DATE
DRAWN		
CHECKED		
APPROVED		

DRG. No. CN 53 10017

ENG/FR/14 REV 03 A1 SHEET 1 of 2

I. ELECTRICAL REQUIREMENTS:

	S.No.	CUSTOMER REQUIREMENT NO.	SPECIFICATION
	1	2.1.1	Unless otherwise specified, the converter shall meet all requirements listed in this document across all worst-case voltage, current and temperature ranges.
P1	2	2.1.2	Efficiency of converter shall be greater than 90% at greater than 50% total output current.
P2	3	2.1.3	The conductive parts of the converter housing shall have a minimum electrical resistance of 1 MΩ from all electrical input and output terminals. Rationale: This is to avoid multiple points of termination between the ground wiring and vehicle chassis.
P3	4	2.1.4	No single point failure shall allow the input voltage to conduct to the output terminal. Rationale: For example, consider a shorted switching transistor; the input voltage shall not be present on the output terminal in this case.
P4	5	2.1.5	Voltage applied to the output terminals shall not be conducted to the input terminals when the converter is unpowered or not enabled.
P5	6	2.1.6.1	The converter shall have an enable feature allowing remote control of the output voltage. The enable signal shall be pulled low, and be active high. Rationale: If the designer chooses not to use this enable feature, it shall be tied to Vbat, allowing the converter to turn on as soon as voltage is applied to the input. If enable is left floating, the converter shall not turn on.
P6	7	2.1.6.2	The enable signal shall be present in the input and output connector. Rationale: The end application will only utilize one enable signal at a time.
P7	8	2.1.6.3	The enable signal pin shall sink less than 10 mA.
P8	9	2.1.6.4	The enable signal shall be compatible with the input and output voltage ranges.
P9	10	2.1.6.5	The converter shall turn on if either enable signal is above 5 V.
P10	11	2.1.6.6	The converter shall turn off if either enable signal is below 4 V.
P11	12	2.1.6.7	The enable signal shall be present in the input and output connector. A current limiting resistor shall be used to limit current flow from enable pin 1 and enable pin 2 to less than 10mA.
P12	13	2.1.7.1	The operating input voltage range shall be V_{bat} = 35 V ~ 60 V. Rationale: Typical V_{bat} = 50 V. The converter will be used with a battery, so the input voltage will regularly vary within this range
P13	14	2.1.7.2	The converter shall not allow input currents to exceed the ratings of the connector terminals.
P14	15	2.1.7.3	No damage shall occur if the input voltage falls under the operating range. The output may switch off.
P15	16	2.1.7.4	No damage shall occur if the input polarity is incorrect.
P16	17	2.1.7.5	If voltage is present on the output and is higher than the voltage on the input, no current shall flow from the output to the input. Rationale: The vehicle will normally have 9 V to 16 V present on the low voltage bus (connected to the converter output) during the end of charging. The high voltage will be off during this time. The low voltage should not be able to pass through the converter.
P17	18	2.1.8.1	Output voltage shall be Vout = 24 V ± 5%
P18	19	2.1.8.2	Output voltage shall not drop below 0 V during any operation of the converter. Rationale: Operation to mean power-up, power-down, recovery from a fault, etc.
P19	20	2.1.8.3	Continuous output current shall be at least 8 A.
P20	21	2.1.8.4	Maximum ripple voltage present in the output shall be 50 mV peak-to-peak.
P21	22	2.1.8.5	Load regulation shall be less than 600 mV at full load.
P22	23	2.1.8.6	The output shall have over-current protection with automatic recovery. The converter shall enter constant-current mode when the design current is exceeded.

II. MECHANICAL REQUIREMENTS

	S.No.	CUSTOMER REQUIREMENT NO.	SPECIFICATION
P23	1	2.2.1.1	The converter dimensions shall not exceed 100 mm x 150 mm x 50 mm. If the converter has a pigtail, it may not be considered in the dimension envelope.
P24	2	2.2.2.1	The mounting surface for the converter in the end application will be a flat bracket, panel or frame member.
P25	3	2.2.2.2	The converter shall have at least two mounting points compatible with M6 fasteners.
P26	4	2.2.3.1	The converter shall have two connectors, one for input signals and one for output signals.
P27	5	2.2.3.2	All connectors shall survive at least 100 mate/un-mate cycles. Rationale: The expectation is for the connectors to last the life of the machine.
P28	6	2.2.3.3	All connectors shall be sealed when mated. All unused cavities shall be plugged.
P29	7	2.2.3.4	The mated connectors shall be rated at least IP65.
P30	8	2.2.3.5	The connector may be molded in the housing or provided on a pigtail. If a pigtail is used, the pigtail shall be no longer than 150 mm.
P31	9	2.2.3.6	All connectors shall be rated for the maximum voltage of the circuits they contain.
P32	10	2.2.3.7	The both the input and output connectors on this converter shall be different than TE Part #: 282088-1 and 282105-1 or equivalent. Rationale: This is to prevent confusion between the 56/12V converter variant
P33	11	2.2.4.1	Plastic part color shall be black, as defined in JDM F9A.
P34	12	2.2.4.2	Aluminum enclosure components of the converter shall be anodized per MIL-A-8625, Type II.
P35	13	2.2.5.1	The converter shall rely solely on natural convection for cooling. Rationale: Converter may be enclosed in areas of poor air flow or subject to collection of debris. No consistent air flow over component is guaranteed.
P36	14	2.2.5.2	If cooling features exist, the converter will be expected to operate with organic matter filling the spaces in the cooling features.
P37	15	2.2.5.3	The temperature shall not exceed 80°C for metal surfaces and 90°C for non-metal surfaces.
P38	16	2.2.5.4	The converter shall have over-temperature protection with automatic recovery.

LIMITS UNLESS STATED
DIMENSIONS WITH:
NO DECIMALS (eg. 22) ±0.4 mm
ONE DECIMALS (eg. 22.1) ±0.2 mm
TWO DECIMALS (eg. 22.12) ±0.10 mm
ANGLES ± 0 Degs. 30 Minutes.

MATL. | SPECN. | TREATMENT | FINISH | REF.

WEIGHT 0.370 Kg (APPROX)

INDIA NIPPON ELECTRICALS LIMITED., HOSUR.

DC-DC CONVERTER
(CUSTOMER OUTLINE)

USED ON JOHN DEERE 24V/8A

SUPERSEDES

SCALE 1 : 1 | DATE
DRAWN
CHECKED
APPROVED

DRG. No. CN 53 10017

INDIA NIPPON ELECTRICALS LTD., HOSUR - 635 114	LAYOUT INSPECTION REPORT	REP REF : JD/24/003 SHEET : 11 of 13 DATE : 23-09-2024

CUSTOMER : JOHN DEERE

PRODUCT : DC-DC CONVERTER 24V- 8A

INEL DWG REF : CN 53 10017

APPLICATION : Turn Utility Vehicle

QUANTITY : 08nos

Ref No.	Specification	Unit	Samples					Remarks
			01/08	02/08	03/08	04/08	05/08	
DIMENTION.								
D1	121 ± 1	mm	121.39	121.42	121.39	121.41	121.42	OK
D2	M 102 ± 0.5	mm	101.80	101.79	101.65	101.74	101.81	OK
D3	83.5 ± 1	mm	83.17	83.24	83.31	83.21	83.26	OK
D4	M Ø6.5 ± 0.3	mm	6.50 ~ 6.64 STD PIN					OK
D5	18 ± 0.5	mm	18.17 ~ 18.24	18.11~18.30	18.14 ~18.27	18.09 ~ 18.19	18.10 ~ 18.21	OK
D6	9 ± 0.5	mm	9.42	9.19	9.22	9.10	74.14	OK
D7	M Ø6.5 ± 0.3	mm	6.36 ~ 6.54 STD PIN					OK
D8	87.5 ± 1	mm	87.71	87.70	87.81	87.89	87.79	OK
D9	30 ± 1	mm	29.40	29.44	29.59	29.51	29.71	OK
D10	70 ± 10	mm	71	74	70	73	72	OK
D11	100 ± 10	mm	100 ~ 95	100 ~ 96	100 ~ 94	100 ~ 96	100 ~ 95	OK
D12	70 ± 5	Shore - A	75	74	75	75	75	OK
D13	35 MAX	mm	33.77	33.67	33.53	33.50	33.58	OK
D14	20 MAX	mm	18.39	18.44	18.53	18.38	18.46	OK
D15	6	mm	6.07 ~ 6.22	6.09 ~ 6.24	6.10 ~ 6.23	6.14 ~ 6.26	6.11 ~ 6.30	OK
D16	0.246 WEIGHT APPROX	Kg	0.419 ~ 0.424					OK

INDIA NIPPON ELECTRICALS LTD., HOSUR - 635 114	LAYOUT INSPECTION REPORT	REP REF : JD/24/003 SHEET : 12 of 13 DATE : 23-09-2024

CUSTOMER : JOHN DEERE

PRODUCT : DC-DC CONVERTER 24V- 8A

INEL DWG REF : CN 53 10017

APPLICATION : Turf Utility Vehicle

QUANTITY : 08nos

Ref No.	Specification	Unit	Sample					Remarks
			01/08	02/08	03/08	04/08	05/08	
VISUAL ASSLY.								
V1	2D - DATA MATRIX STICKER	Visual	NOT PROVIDED					*
V2	INEL MFG - CODE , DATE , MONTH , YEAR	Visual	03.09.2024 PROVIDED					OK
V3	3WAY MALE W/P COONECTOR COLOUR - BLACK	Visual	3WAY MALE W/P COONECTOR COLOUR - BLACK FOUND OK					OK
V4	4WAY FEMALE W/P COONECTOR COLOUR - BLACK	Visual	4WAY FEMALE W/P COONECTOR COLOUR - BLACK FOUND OK					OK
V5	1.5 Sq.mm LEAD WIRE COLOUR RED / WHITE (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR RED / WHITE (FLRY-W) FOUND OK					OK
V6	1.5 Sq.mm LEAD WIRE COLOUR ORANGE (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR ORANGE (FLRY-W) FOUND OK					OK
V7	1.5 Sq.mm LEAD WIRE COLOUR BLACK (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR BLACK (FLRY-W) FOUND OK					OK
V8	1.5 Sq.mm LEAD WIRE COLOUR RED (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR RED/GREEN (FLRY-W) PROVIDED					*
V9	1.5 Sq.mm LEAD WIRE COLOUR BLACK / WHITE (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR BLACK / WHITE (FLRY-W) FOUND OK					OK
V10	1.5 Sq.mm LEAD WIRE COLOUR RED / GREEN (FLRY-W)	Visual	1.5 Sq.mm LEAD WIRE COLOUR RED / GREEN (FLRY-W) FOUND OK					OK
V11	GROMMET COLOUR - BLACK	Visual	GROMMET COLOUR - BLACK FOUND OK					OK
V12	CONVERTER CASE	Visual	CONVERTER CASE - BLACK ANODIZING FOUND OK					OK
V13	MALE TERMINAL TIN - PLATING	Visual	MALE TERMINAL TIN - PLATING					OK
V14	FEMALE TERMINAL TIN - PLATING	Visual	FEMALE TERMINAL TIN - PLATING FOUND OK					OK
V15	PVC SLEEVE COLOUR - BLACK	Visual	PVC SLEEVE COLOUR - BLACK FOUND OK					OK
V16	OVER ALL CABLE POSITION	Visual	OVER ALL CABLE POSITION FOUND OK					OK
MATERIAL ASSLY.								
M1	ALL COUPLER	NYLON	NYLON					OK
M2	ALL COUPLER TERMINAL BRASS	BRASS	BRASS					OK
M3	PLATE	STEEL	STEEL					OK
M4	GROMMET	EPDM	EPDM					OK
M5	CONVERTER CASE	ALUMINIUM ADC - 12 OR EQUI	ALUMINIUM ADC - 12 OR EQUI					OK

NOTE :
Visual deviation :
1. "*" Visual observation " V1 " 2D - data matrix sticker Not provided, it will be corrected in tooledup samples.
2. "*" Visual observation " V8 " as per drawing red flry-w cable but using red/green flry-w cable , it will be corrected in tooledup samples.

INDIA NIPPON ELECTRICALS LTD., HOSUR	DEVELOPMENT ROUTE & SAMPLE PHOTOGRAPHS	REP REF : JD/24/003 SHEET : 13 of 13 DATE : 23-09-2024

CUSTOMER : **JOHN DEERE** **CUSTOMER OUTLINE REF** : **CN5310017**

PRODUCT : **DC - DC CONVERTER (24V/8A)** **CUSTOMER PRD REF** : **UC41337 dt.25-04-2024.**

APPLICATION : **Turf Utility Vehicle**

QUANTITY : **8nos**

DEVELOPMENT ROUTE:

Sl.No	Child part	Development route
1	Converter case	Tooled up
2	PCB	Tooled up
3	Wiring Harness Assembly	Proto Route
4	Top Plate	Tooled up

MANUFACTURING ROUTE

Sl.No	Process	Manufacturing route
1	SMD assy	Carried out at production plant.
2	Manual Discrete assy	Carried out at Engineering manually. In production, Assy will be done with tools and fixtures.
3	Manual Soldering of discrete component	Carried out at Engineering manually. In production, soldering will be done with tools and fixtures.
4	Manual wiring harness assy	Carried out at Engineering.
5	Testing - Before potting	Carried out at Engineering.
6	Potting (PU)	Carried out at Engineering manually. In production, potting will be done using machine
7	Manual - Top plate assy	Carried out at Engineering.
8	Testing - After potting	Carried out at Engineering.

SAMPLE PHOTOGRAPH

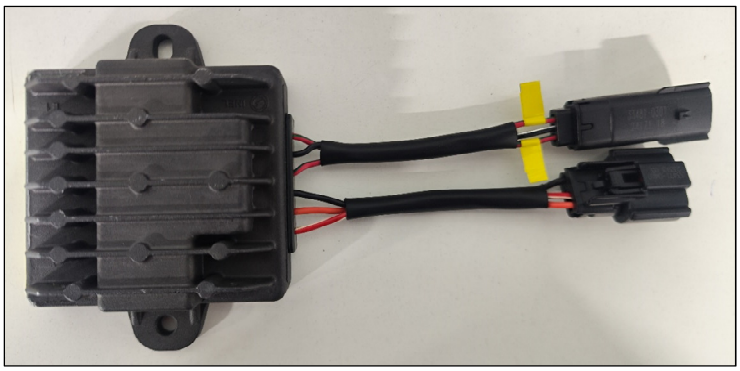


Fig.1 Front View

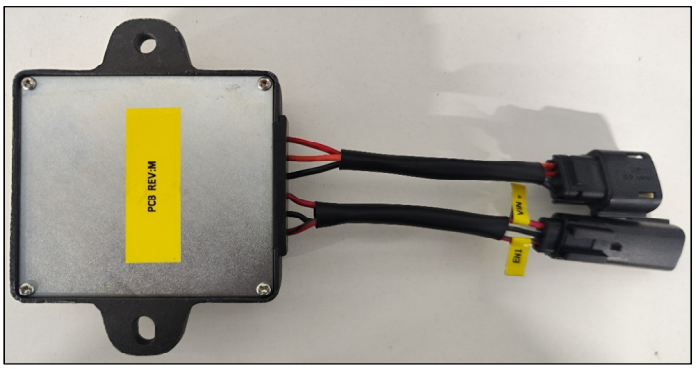


Fig. 2 Back view

Fig.3 Side View