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Summary

Table 1 Product information

bZ4X is Toyota's first mass-produced EV. The platform uses a BEV-specific platform based on the e-TNGA concept jointly developed with Subaru. There are two types of drive systems: FWD and 4WD, and the first generation whole jointly developed by BluE Nexus, DENSO, and Aisin is used. FWD models are equipped with a front axle (maximum output 110kW), while 4WD models are equipped with a front axle (maximum output 80kW) and a rear axle (maximum output 80kW). Optimal design of the magnetic circuit, adoption of low viscosity oil for electric vehicles in the transmission, and adoption of newly developed SiC IGBT in the inverter have resulted in an improvement of approximately 10% compared to conventional products. This reduces losses and makes it possible to improve mileage.

Model	
Manufacture	TOYOTA
Model name	bZ4X
Model name	ZAA-YEAM15-MWDHS
Transmission	eAxle
Drive	4WD
Motor	
Max output power[kW]	150[Fr:80+Rr:80]
Max torque [N·m]	266[Fr:169+Rr:169]
Battery	LiB
Number of cell	96
Voltage [V]	355.2
Capacity [kWh]	71.4

eAxle for Front	
Manufacture	BluE Nexus
function	eAxle
Part number	30610-42020
marking	-
size	(W)492mm (L)110mm x (H)420mm
weight	-

Inverter Module	
Manufacture	BLUENEXUS
function	Inverter
Part number	308W35312200
marking	-
size	(W)267.6mm x (L)278.9mm x (H)83.7mm
weight	3.52kg

IGBT drive PCB	
size	(W)154.0mm x (L)161.0mm x (t)1.7mm
weight	140g
Layer	6
I/O Connector Pin	1pin x 9, 2pin x 1, 5pin x 7, 8pin x 1, 10pin x 1, 20pin x 1, 24pin x 1, 30pin x 1

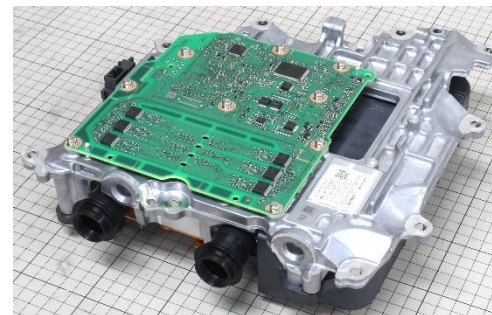
Components of GBT drive PCB	
Function	count
Capacitor	1
Connector	2
Diode	1
Filter	3
IC	1
Inductor	5
Resistor	4
Surge Protection	2
Timing Device	1
Transformer	2
Transistor	5
Zener Diode	1
Total	34



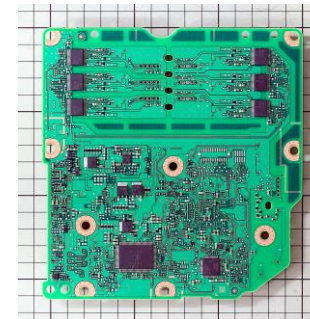
bZ4X
Toyota website



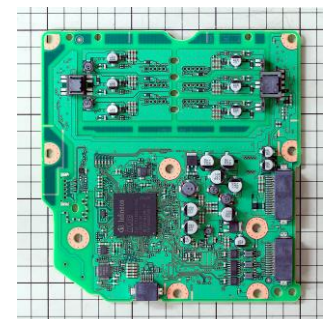
eAxle
Toyota website



Inverter module



Top View

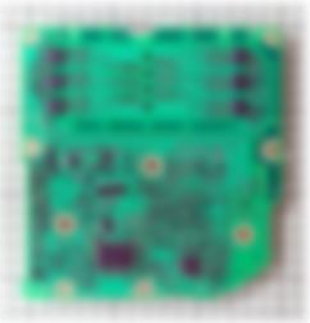
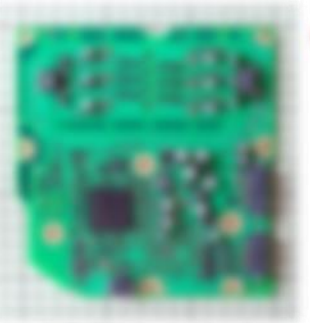
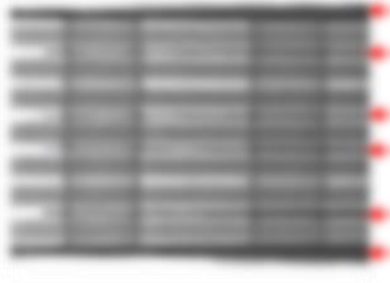
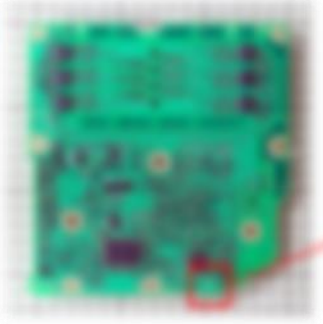

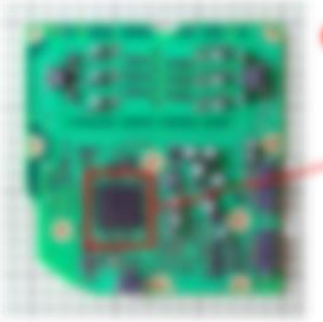
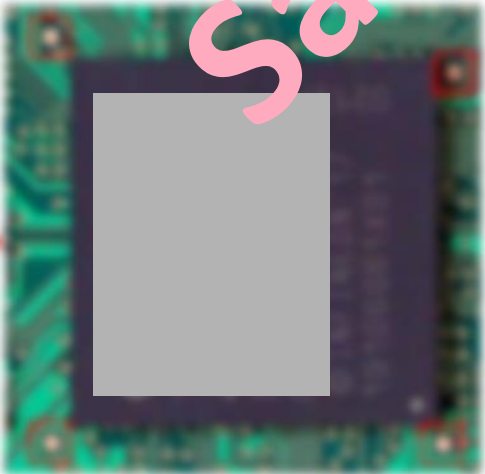




Bottom View

IGBT drive PCB

PCB abstract

Table 2 PCB abstract

Analysis summary	Comments																
   <p>PCB Size</p> <table border="1" data-bbox="268 655 604 776"> <tr> <td>Size</td> <td>100.0mm x 100.0mm</td> </tr> </table> <table border="1" data-bbox="766 655 1330 917"> <thead> <tr> <th>Layer</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1.1</td> <td>Impregment</td> </tr> <tr> <td>1.2</td> <td>Prepreg, 0.15mm, 100% prepreg</td> </tr> <tr> <td>1.3</td> <td>Prepreg, 0.15mm, 100% prepreg</td> </tr> <tr> <td>1.4</td> <td>Prepreg, 0.15mm, 100% prepreg</td> </tr> <tr> <td>1.5</td> <td>Prepreg, 0.15mm, 100% prepreg</td> </tr> <tr> <td>1.6</td> <td>Impregment</td> </tr> </tbody> </table>    	Size	100.0mm x 100.0mm	Layer	Function	1.1	Impregment	1.2	Prepreg, 0.15mm, 100% prepreg	1.3	Prepreg, 0.15mm, 100% prepreg	1.4	Prepreg, 0.15mm, 100% prepreg	1.5	Prepreg, 0.15mm, 100% prepreg	1.6	Impregment	<p>The PCB to be analyzed is installed in the inverter of Toyota Motor Corporation bZ4X, 400V drive PCB.</p> <p>8-layer all layer through-hole, double-sided implementation.</p> <p>Layer composition and size are as shown in the table.</p> <p>*This analysis is a partial circuit analysis, and the analysis area is the red frame below.</p>  
Size	100.0mm x 100.0mm																
Layer	Function																
1.1	Impregment																
1.2	Prepreg, 0.15mm, 100% prepreg																
1.3	Prepreg, 0.15mm, 100% prepreg																
1.4	Prepreg, 0.15mm, 100% prepreg																
1.5	Prepreg, 0.15mm, 100% prepreg																
1.6	Impregment																

Sample Report

PCB abstract

Table 2 PCB abstract

<p>The image displays several PCB layout diagrams. At the top, there are two side-by-side views of the PCB, likely representing different layers or orientations. Below these are two larger, more detailed views of the PCB, possibly showing the top and bottom layers. In the lower section, there are four smaller diagrams arranged in a 2x2 grid, with red lines indicating specific components or areas of interest across different views. The diagrams show various traces, pads, and component footprints on a copper-colored substrate.</p>	<p>The content of this column is mostly illegible due to the 'Sample Report' watermark. It appears to contain technical specifications or descriptions related to the PCB layout shown in the adjacent column.</p>	<p>The content of this column is also illegible due to the watermark. It likely contains additional technical details or a summary of the PCB analysis.</p>
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Sample Report

PCB abstract

The diagram illustrates the PCB circuit analysis for the BluE Nexus inverter. It shows a power supply section (yellow), a control section (green), a protection section (pink), and a motor section (cyan). The power supply section includes a main power supply and a pre-charge circuit. The control section includes a microcontroller and various support components. The protection section includes a fuse and a thermal protection circuit. The motor section includes a motor winding and a motor protection circuit. The diagram is color-coded to show the different functional blocks and their connections.

Legend:

- Internal Power Supply
- Pre-charge
- Control
- Protection
- Motor

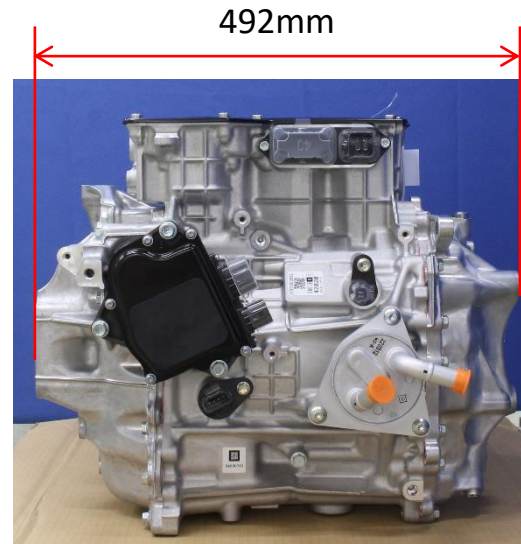
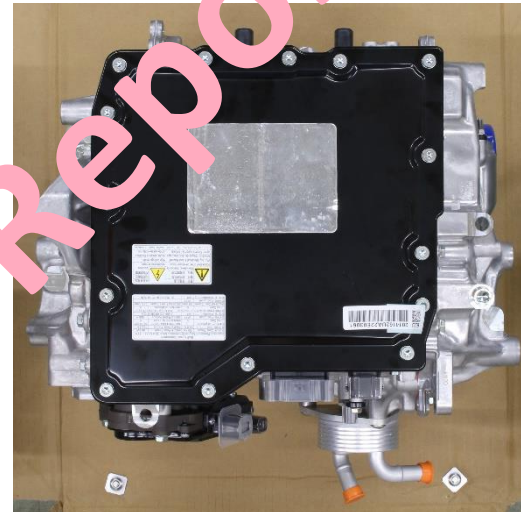
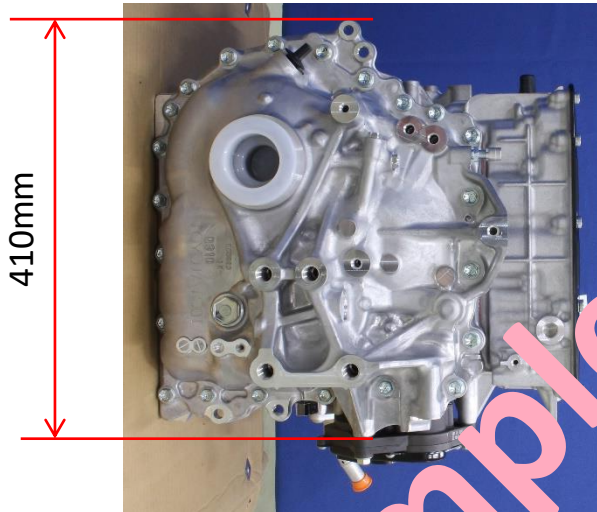
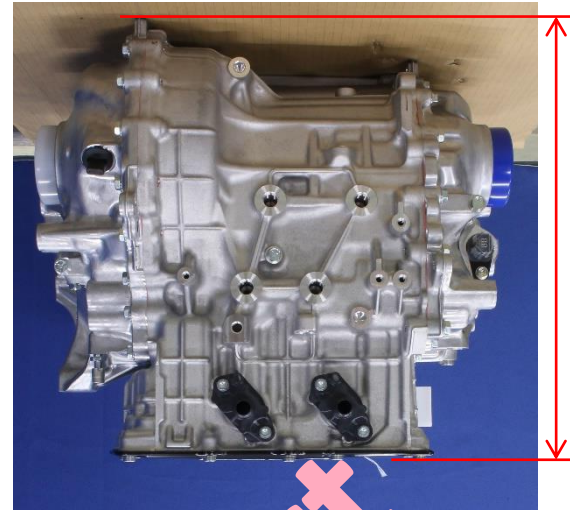
Notes:

The power supply for the inverter is provided by the DC link capacitor (2000µF) connected internally to the inverter. The inverter power supply voltage is approximately 400V. The inverter is designed to operate at a maximum current of 100A. The inverter is designed to operate at a maximum speed of 10000 RPM. The inverter is designed to operate at a maximum torque of 100 Nm. The inverter is designed to operate at a maximum efficiency of 95%.

Overview



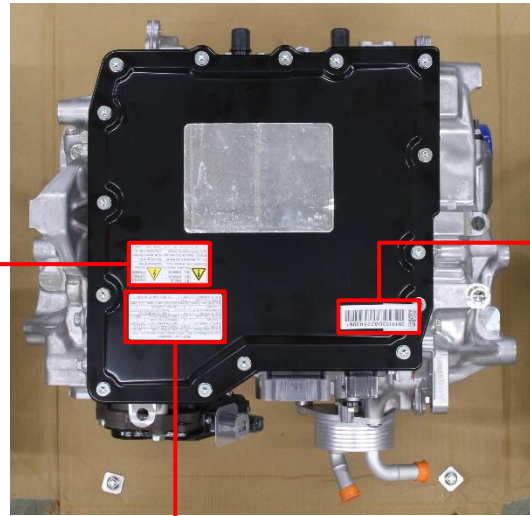
Product (Bird View)



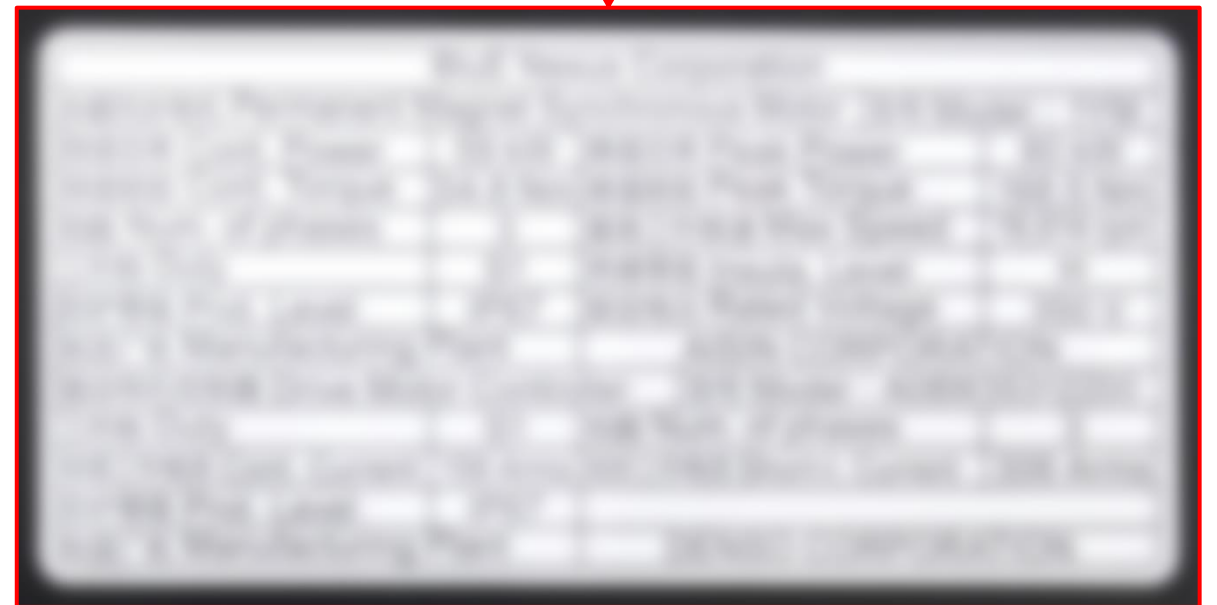
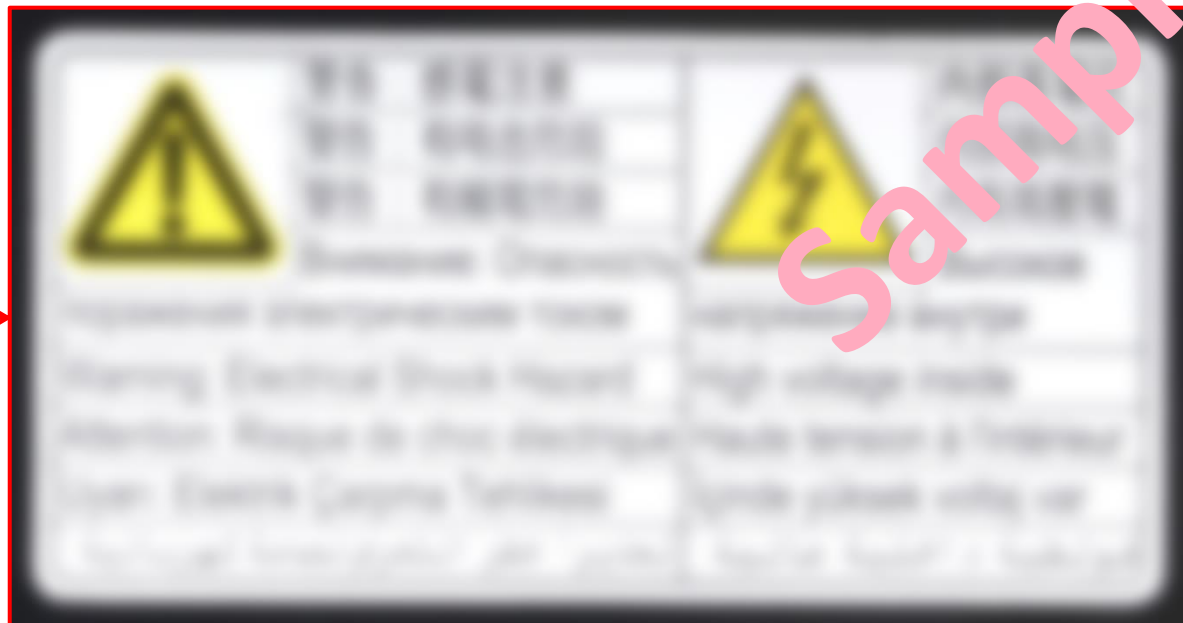
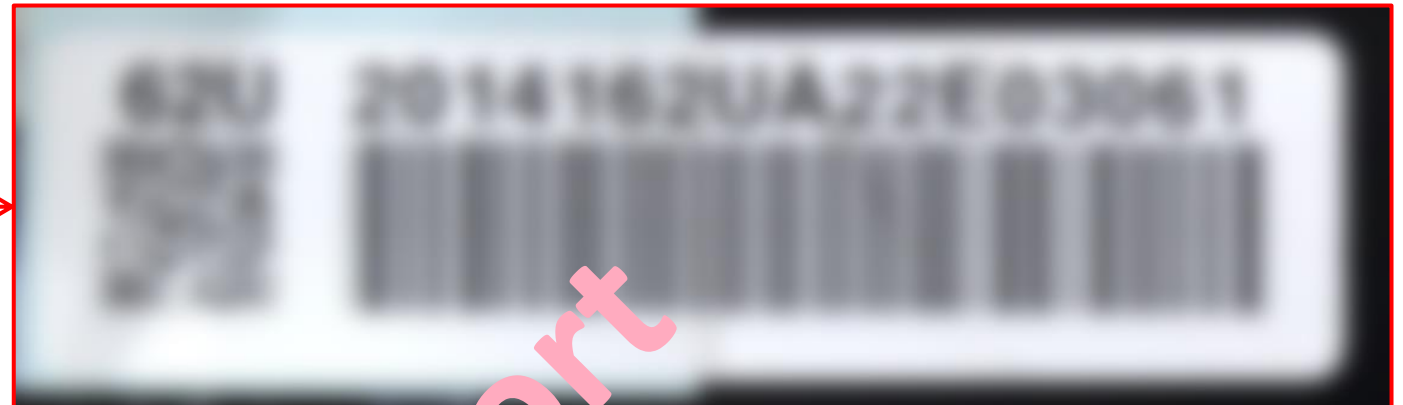
Sample Report

Fig. 1 Product outline

Overview



Product (Top View)



※180度回転

Fig. 2-1 Label 1

Overview

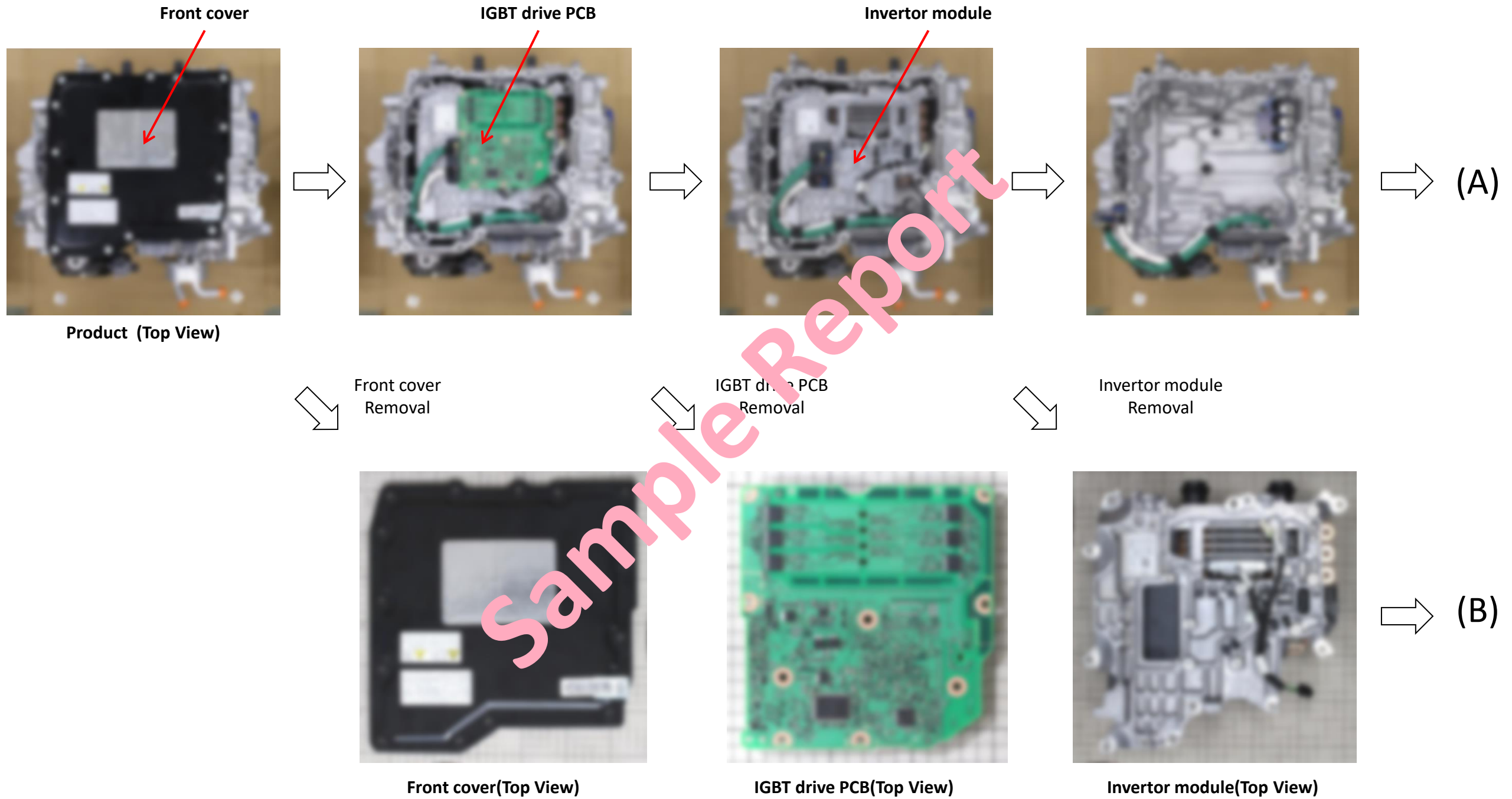


Fig. 3-1 Product Teardown 1

Overview

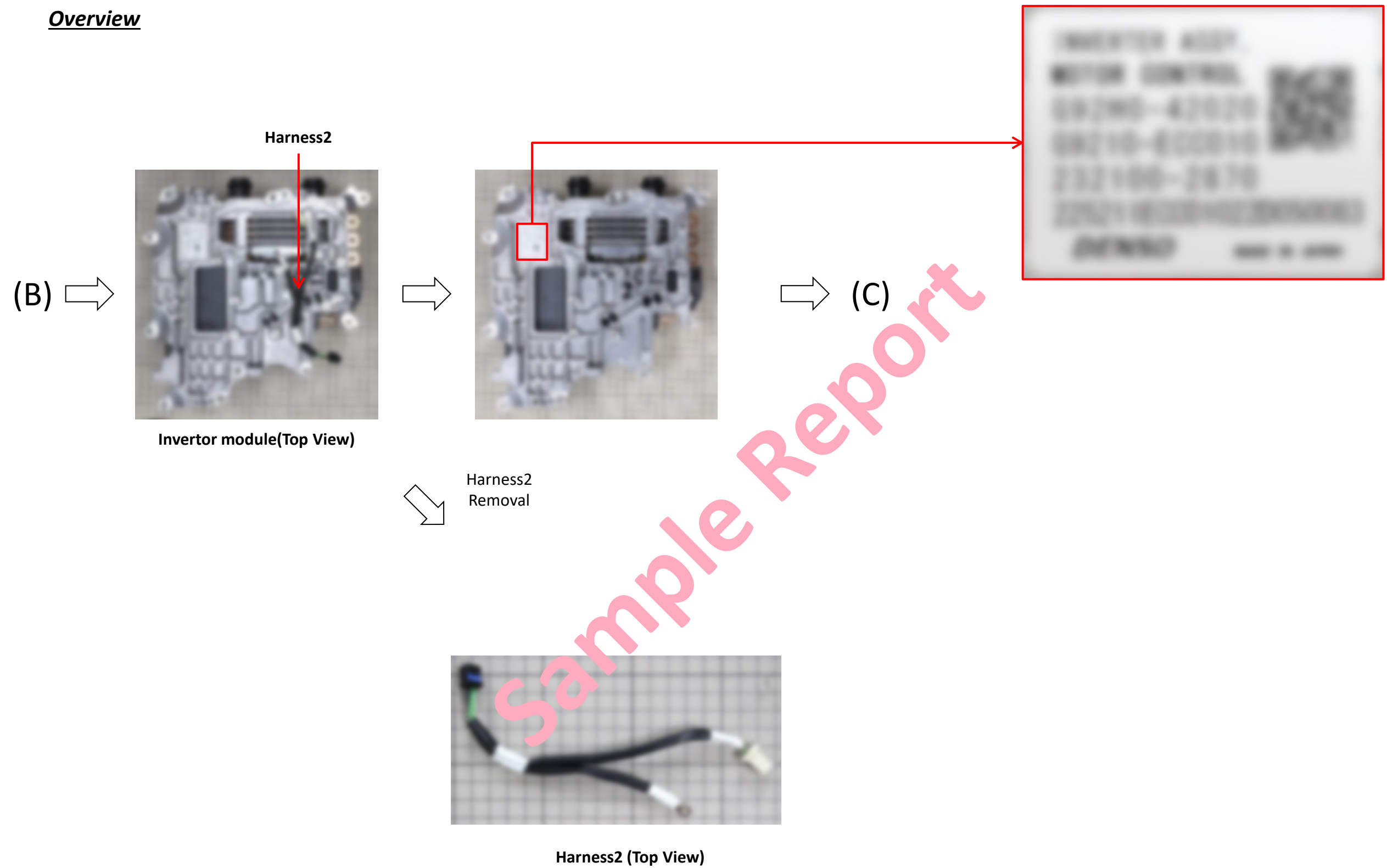


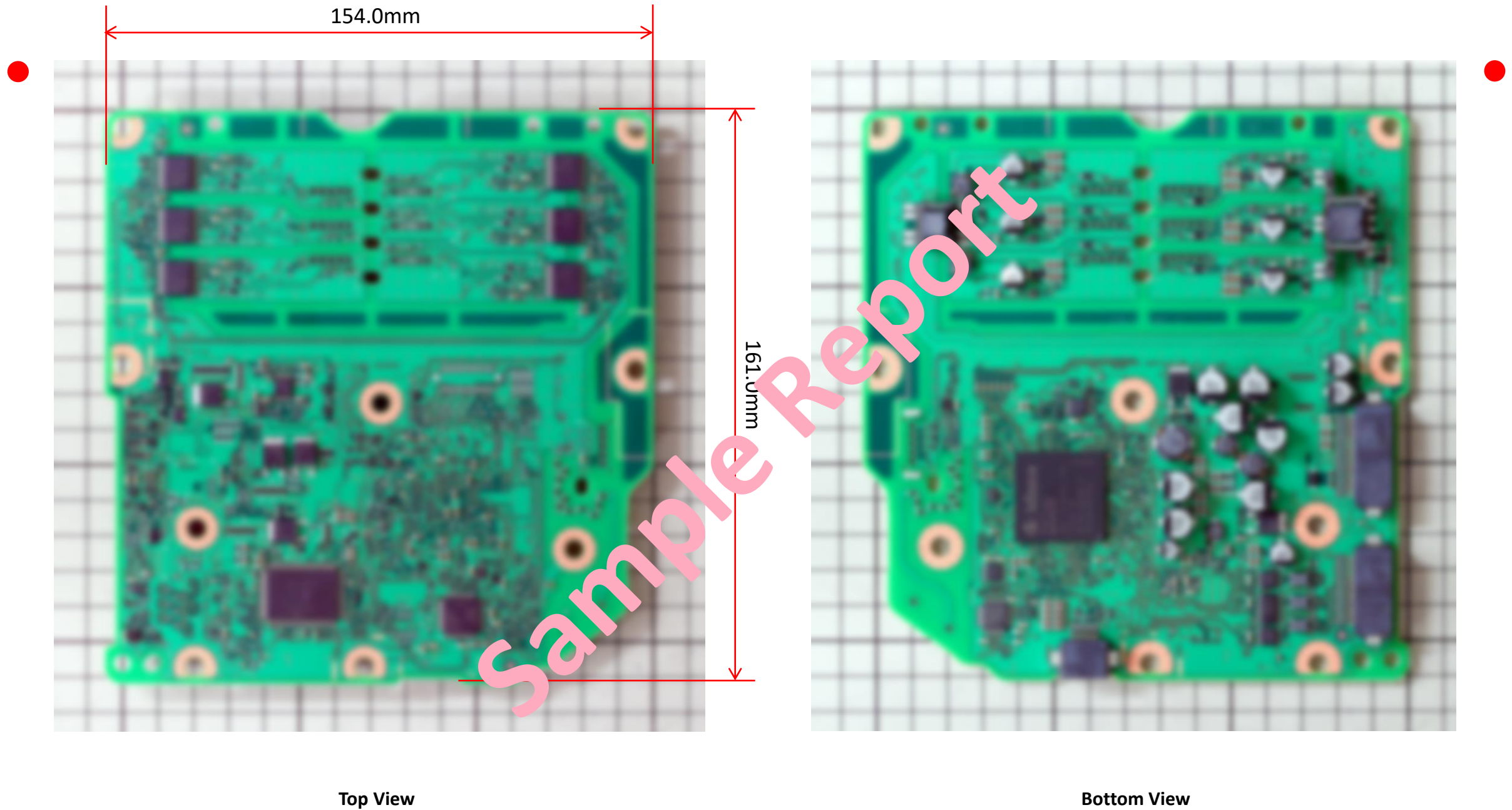
Fig. 3-3 Product Teardown 3

Overview



Fig. 3-4 Product Teardown 4

Overview



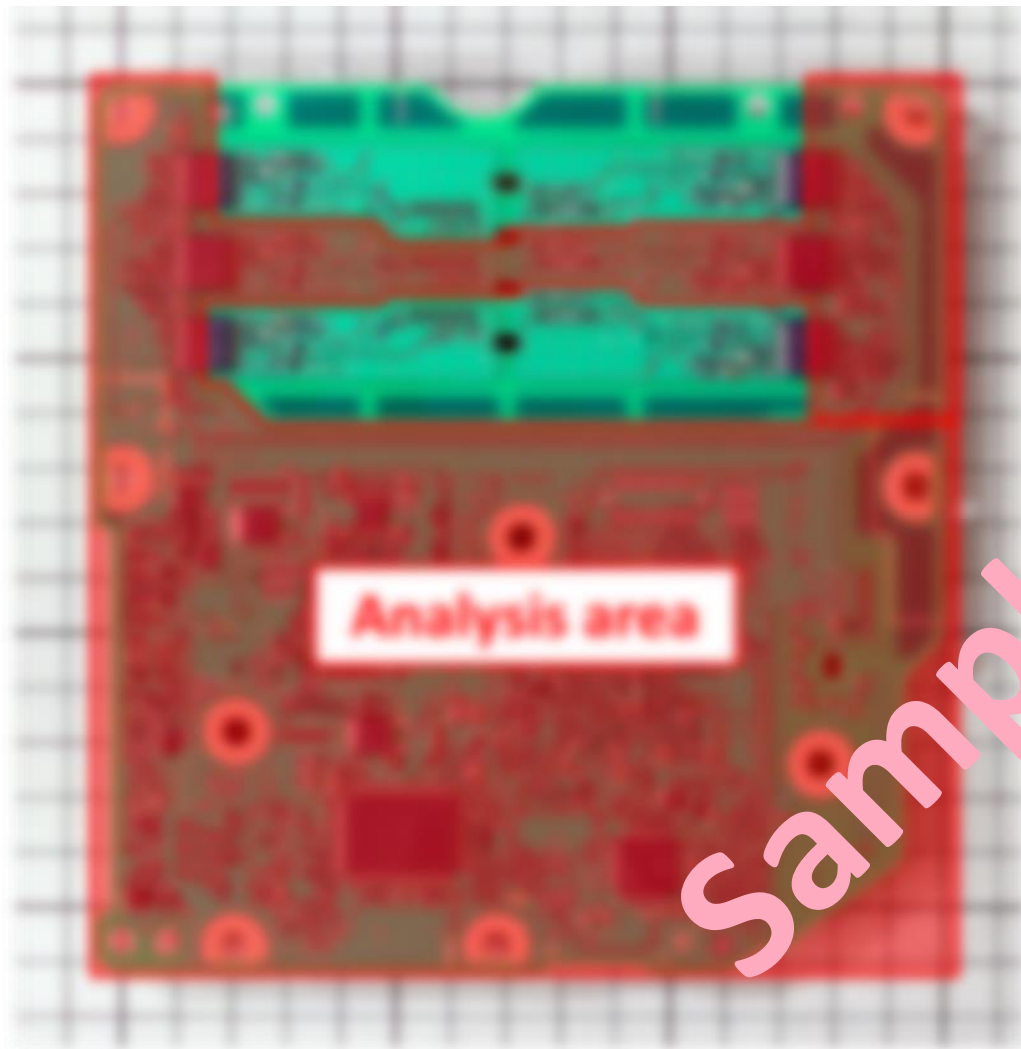
Top View

Bottom View

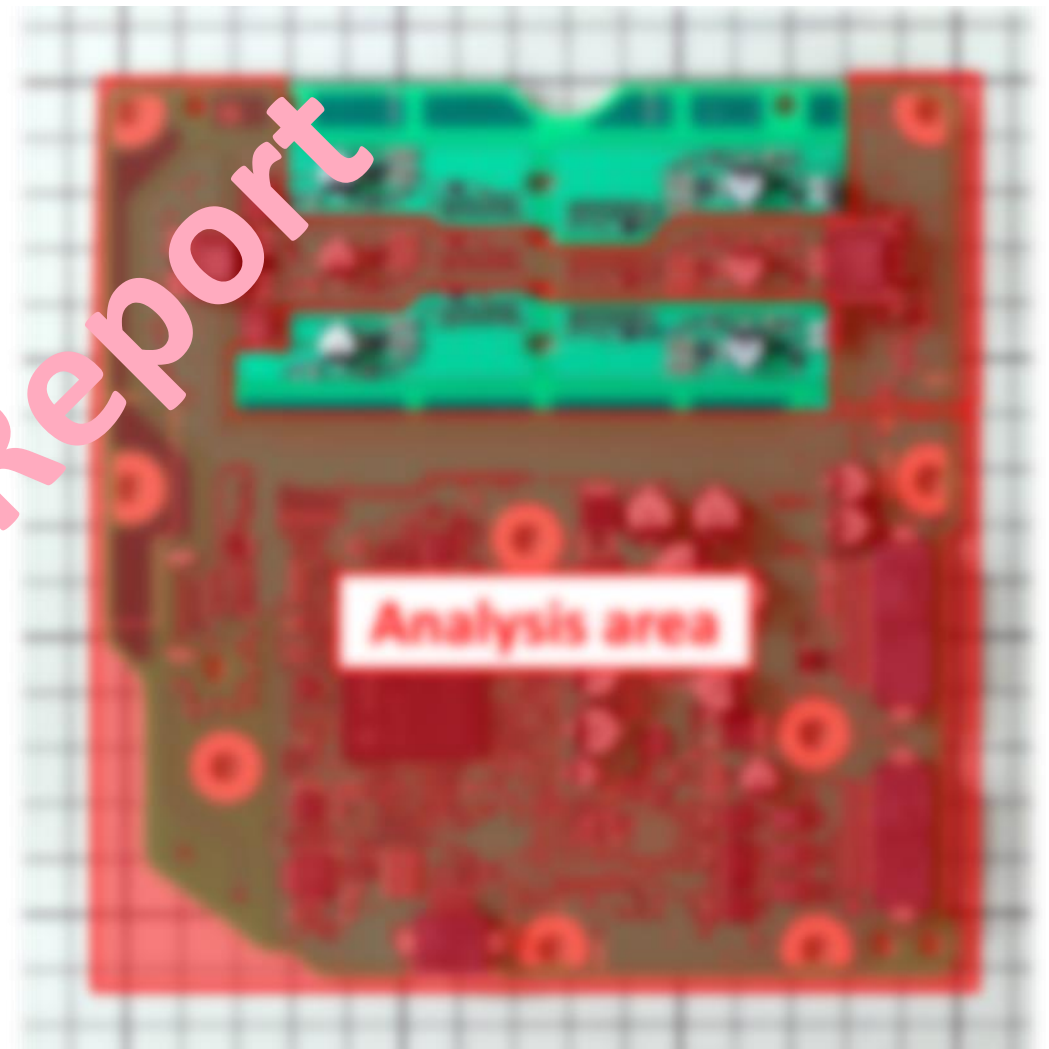
t= 1.7mm

Fig. 4 PCB Outline

Overview



Top View



Bottom View

Sample Report

Fig. 5 Analysis area

Overview

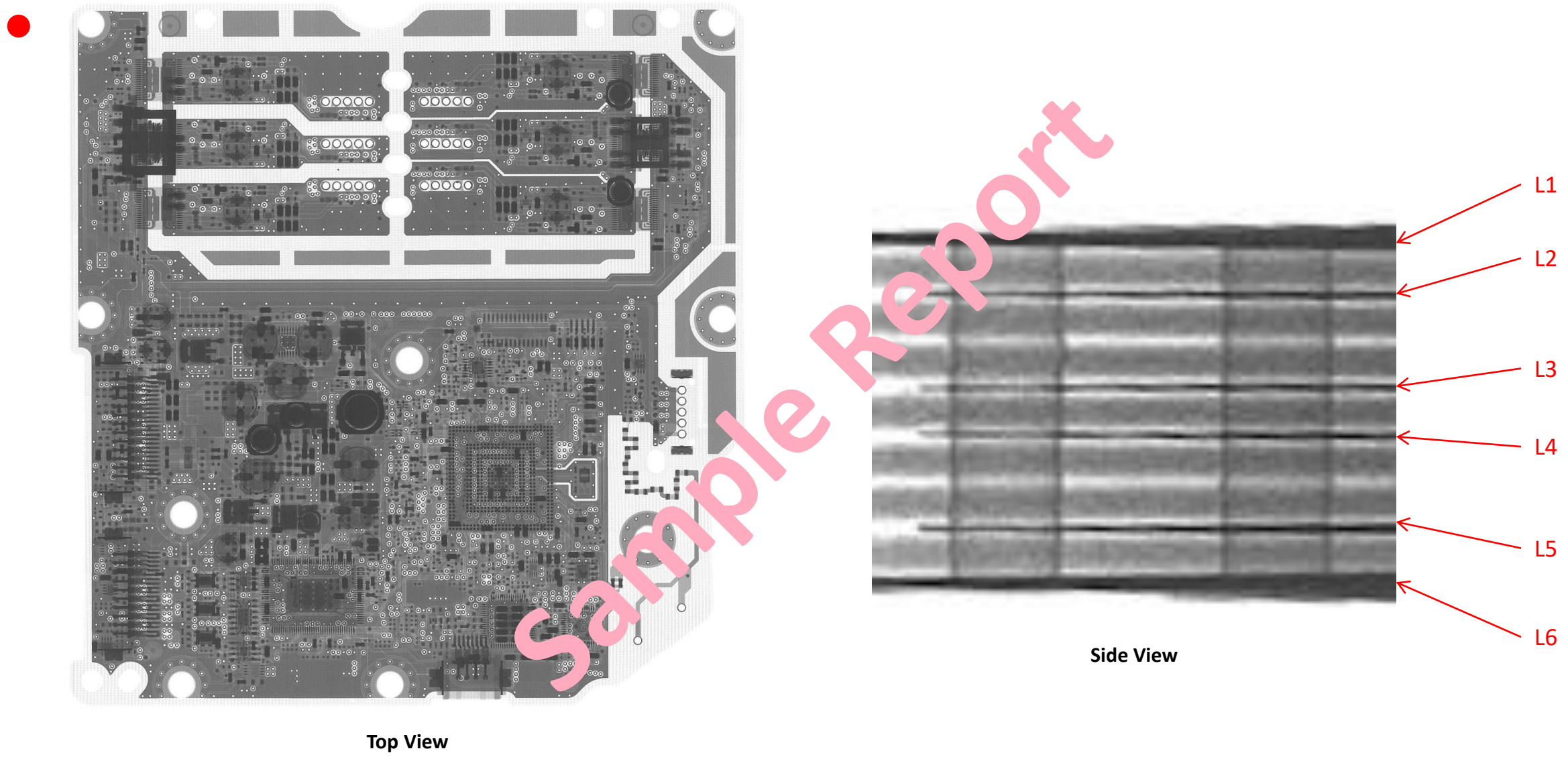


Fig. 6 PCB X-Ray

Overview

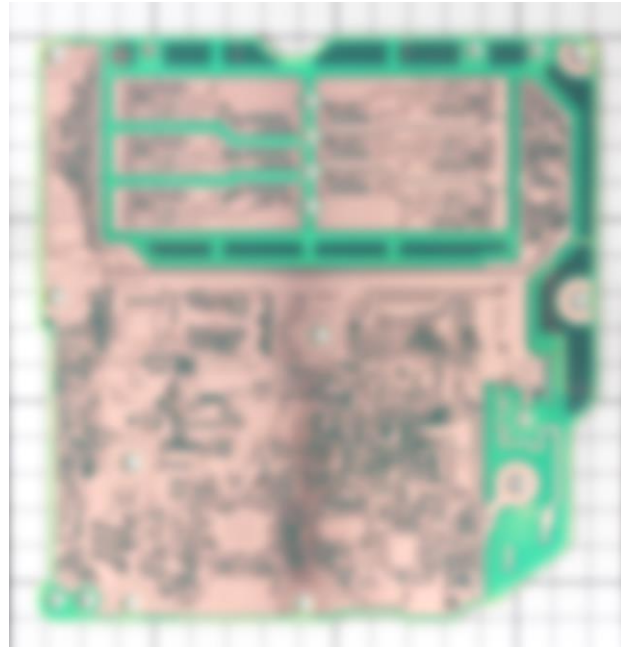


Fig. 8-1 Each layer image L1 (Top View)

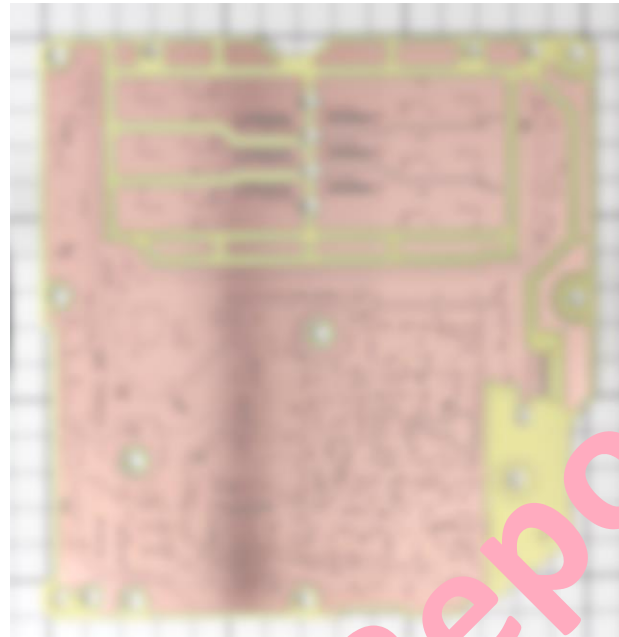


Fig. 8-2 Each layer image L2 (Top View)

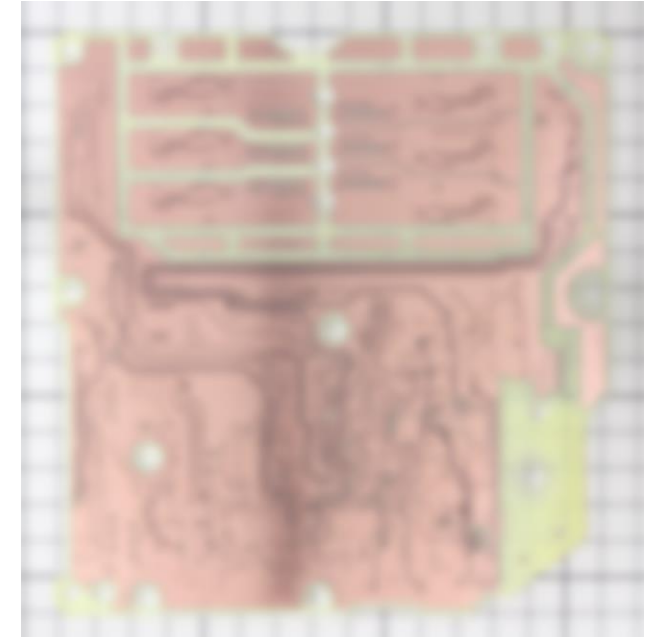


Fig. 8-3 Each layer image L3 (Top View)

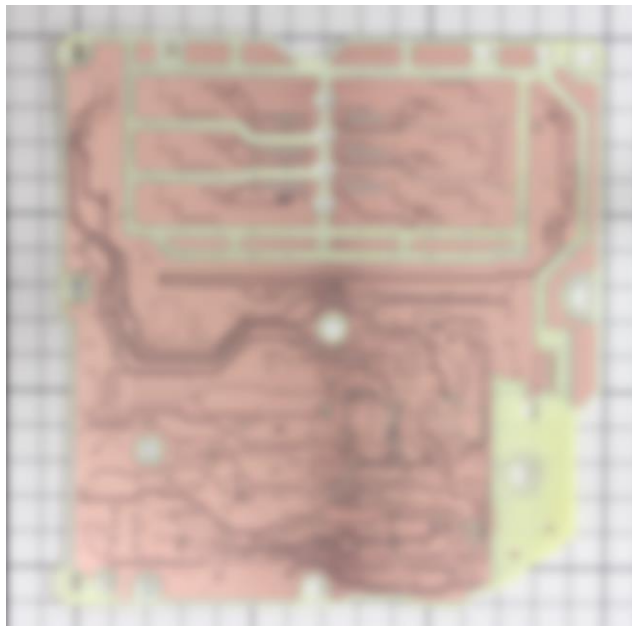


Fig. 8-4 Each layer image L4 (Top View)

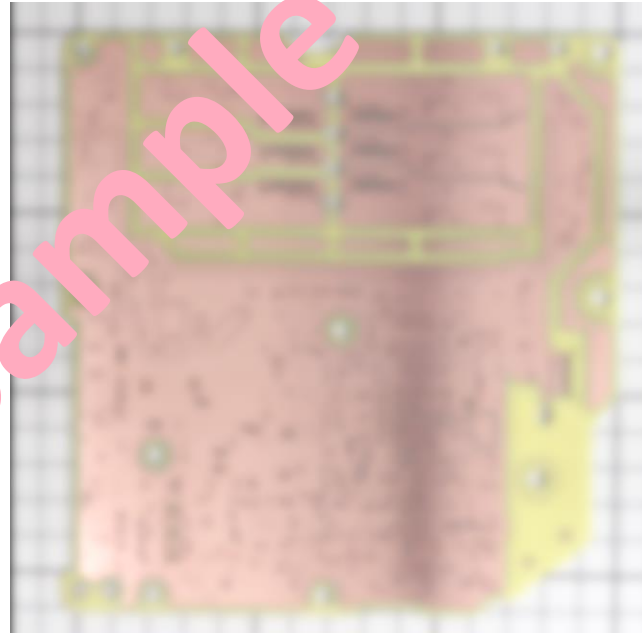


Fig. 8-5 Each layer image L5 (Top View)

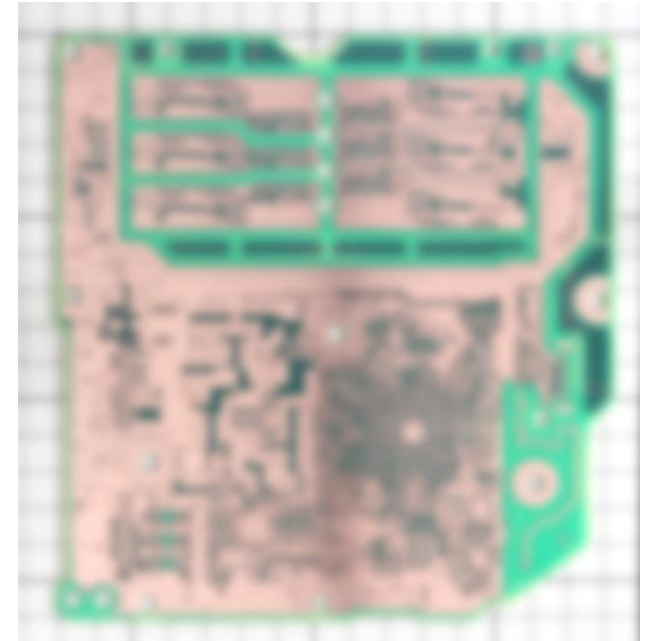


Fig. 8-6 Each layer image L6 (Top View)

Sample Report

Components position

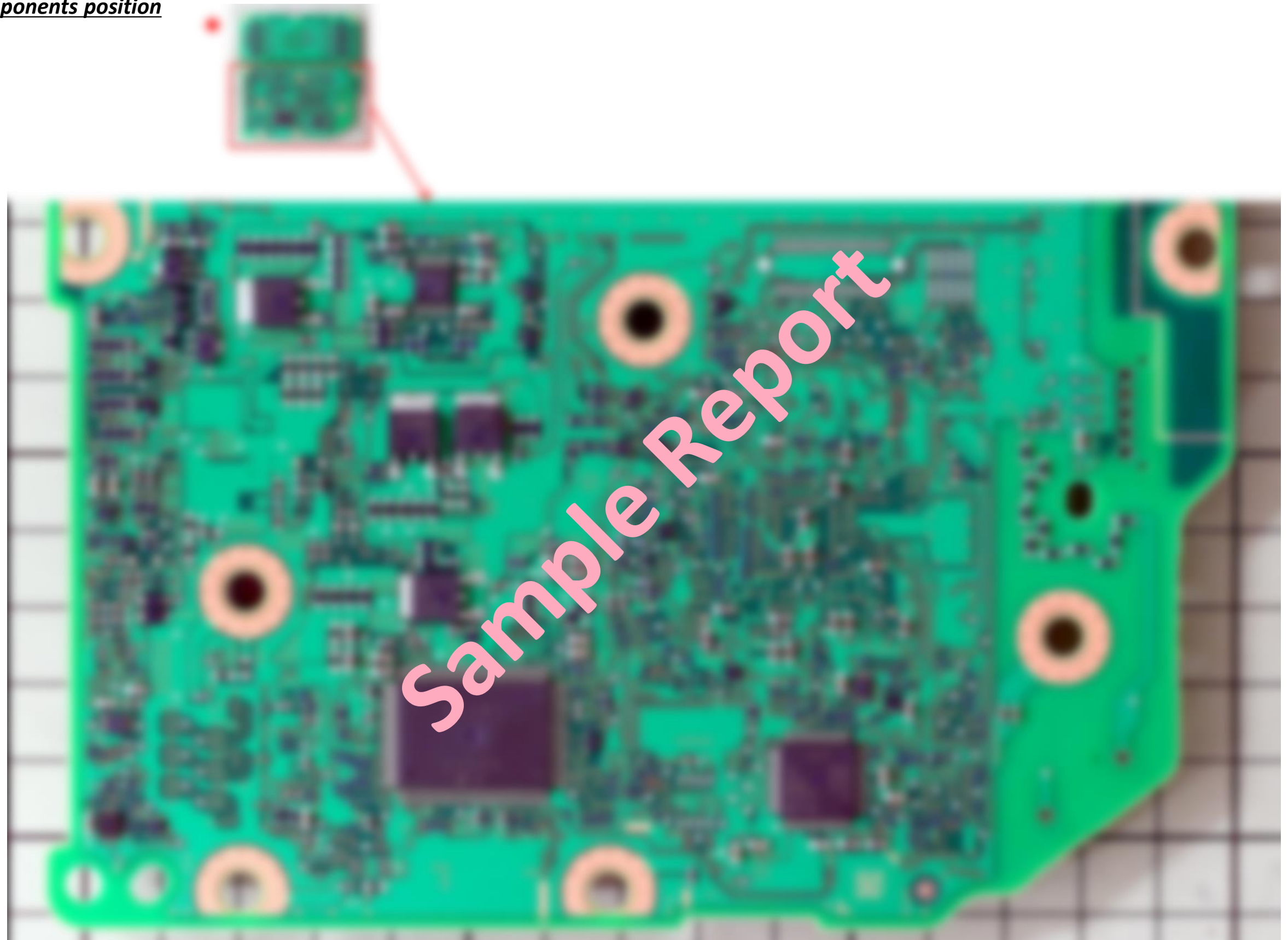


Fig. 9-2 Components position2 (Top View)

NM : No Mount

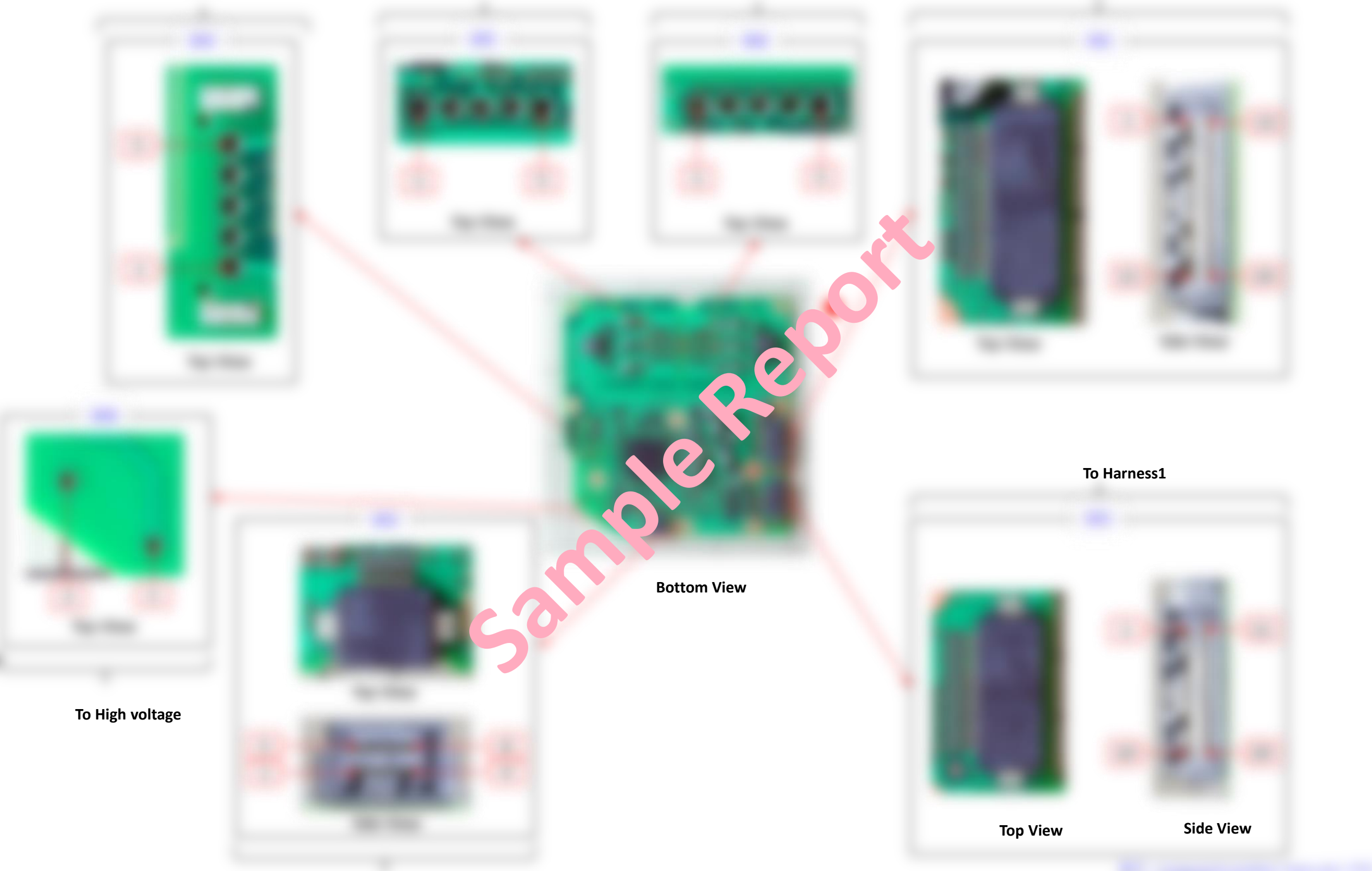
Interface

To Current sensor

To Power Card

To Power Card

To Harness1



Bottom View

To Harness1

To High voltage

Top View

Side View

To Harness2

Fig. 11-1 Connector 1

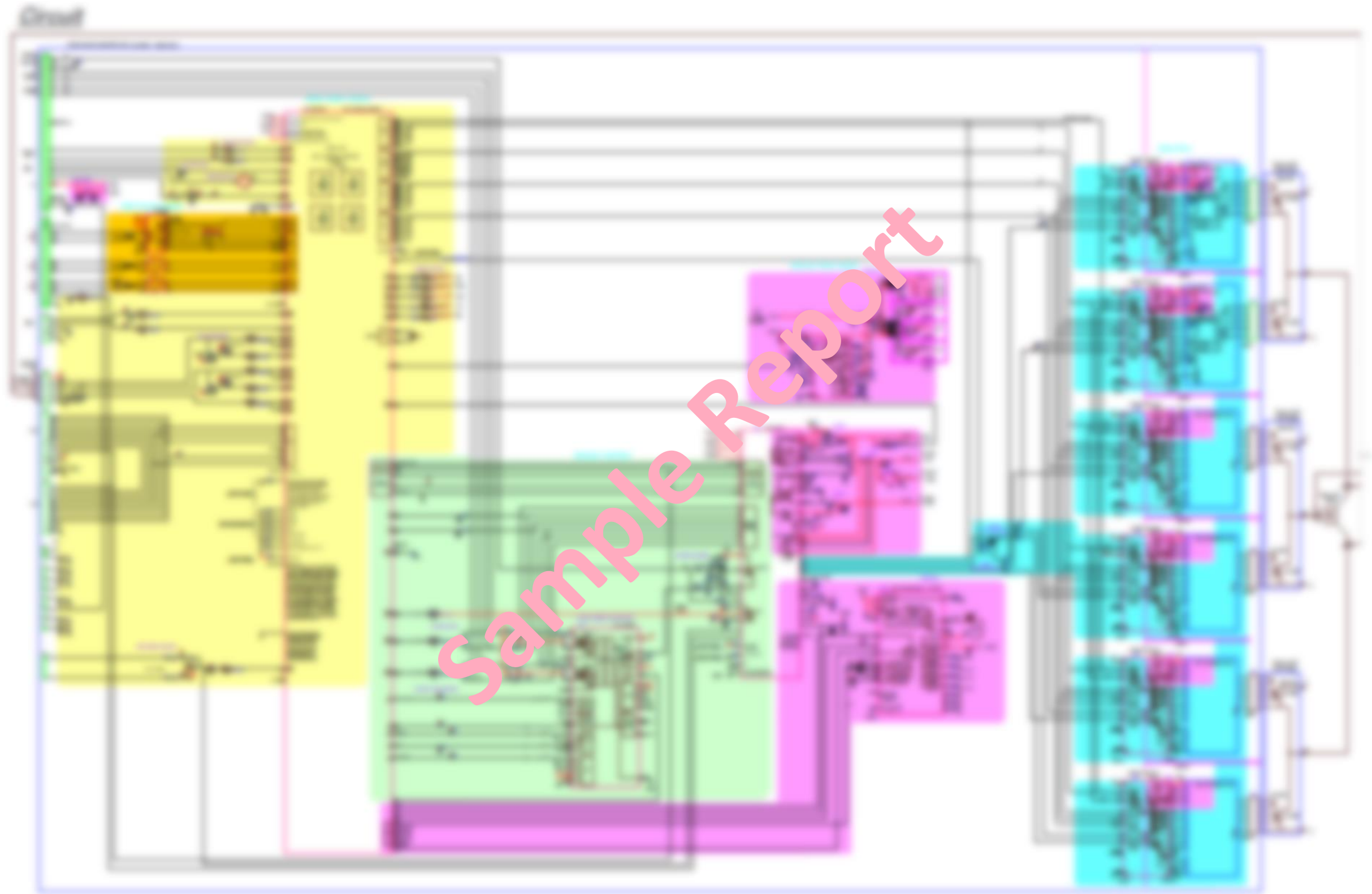


Fig. A-1 Block Diagram

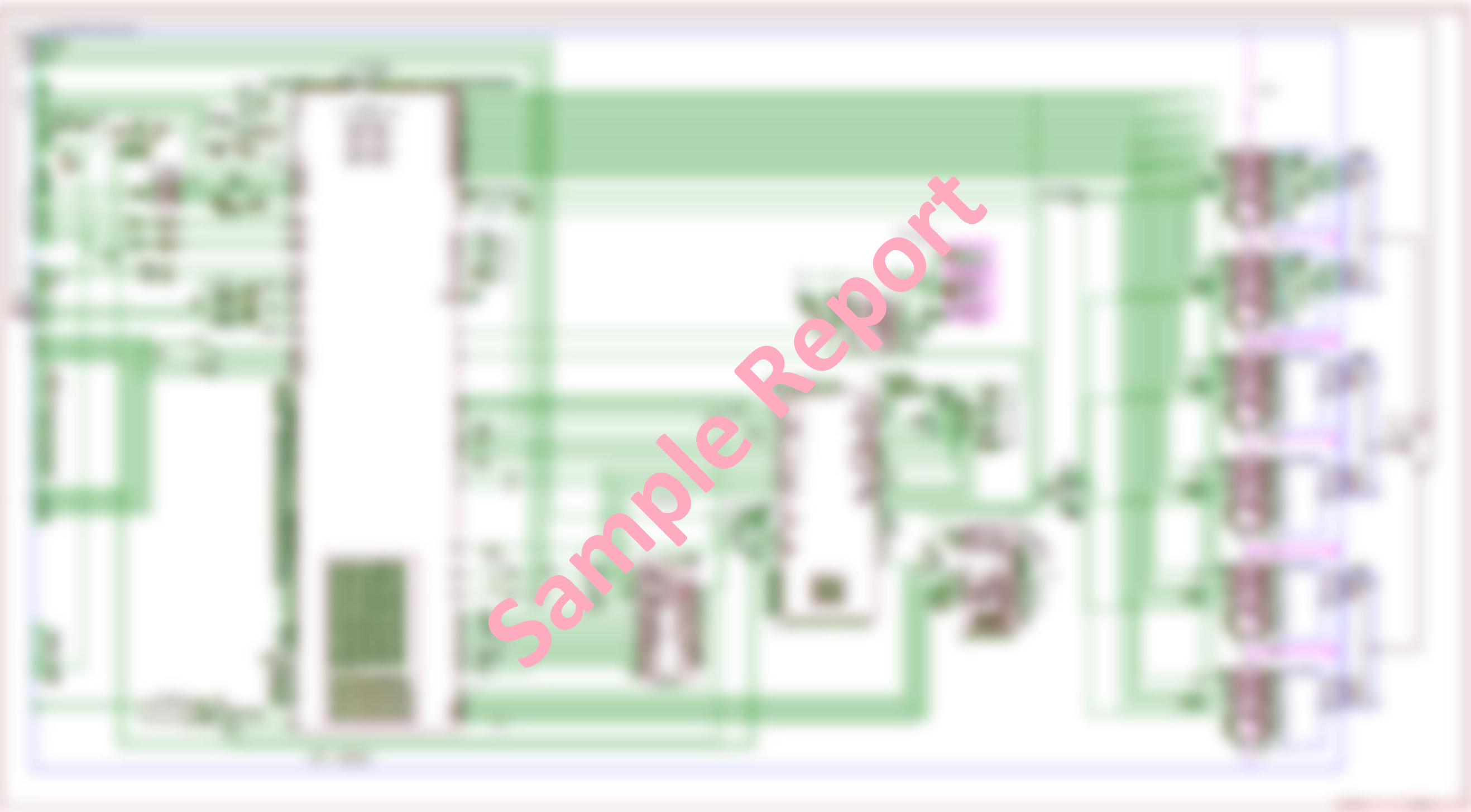


Fig. A-2 Schematic

PART		TYPE		DESCRIPTION		QTY	
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01

PART		TYPE		DESCRIPTION		QTY	
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01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
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01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01
01	01	01	01	01	01	01	01

Sample Report

Fig. B-1 Parts list