Design Standard

FOR EDUCATIONAL USE ONLY

What is a miniPCB?

A miniPCB is a printed circuit board that contains a layout of an electronic circuit.

A miniPCB has a mechanical design that is consistent with numerous similar miniPCBs.

A miniPCB has an interface connector that is simple and economical.

A miniPCB has educational documentation that is approved by an engineer.

A miniPCB is sold in minimum-order-quantities determined by the PCB panel size.

This document is available for free as a download from the GitHub repository:

https://github.com/miniPCB

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1. INTRODUCTION

This document provides specifications for small modular electronic assemblies. The specifications enable interchangeable circuit board assemblies which are ideal for educational applications.

2. SCOPE

2.1. DESIGN

miniPCBs will adhere to this specification regarding their design and fabrication.

2.2. APPLICATIONS

miniPCBs may be used for (a) educational kits and products, (b) evaluation and demonstration boards for components, circuits, and assemblies, and (c) rapid prototyping and experimentation boards for electronic system components.

miniPCBs are not to be used for any application where significant loss or harm might result from a failure of the miniPCB design.

3. BOARD IDENTIFICATION NUMBER

3.1. INTRODUCTION

This section specifies the Board Identification Number (BIN). The BIN provides information concerning the board's outline, pinmap, and pin count.

The BIN is in the following form:

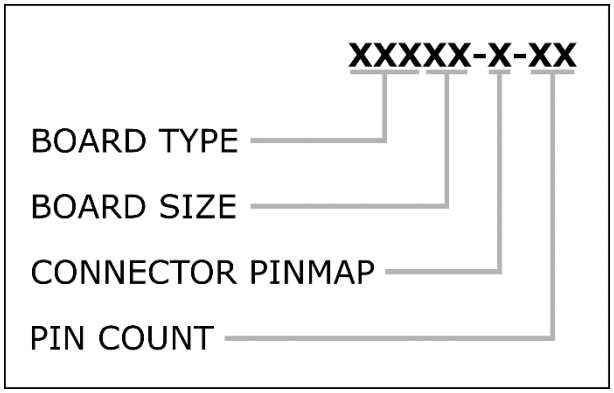

Figure 1 – Board Identification Number

MODULE PREFIX	MECHANICAL DIMENSIONS	PINMAP AND PIN COUNT
per Section 3.2.1	per Section 3.2.2	per Section 3.2.3

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3.2. BIN CLASSIFICATIONS

3.2.1. MODULE PREFIX

CLASSIFICATION ID	MODULE PREFIX
PCB15-X-XX	Circuit device board
IDB20-X-XX	Interface device board

3.2.2. MECHANICAL DIMENSIONS

CLASSIFICATION ID	MECHANICAL DIMENSIONS
PCB**15**-X-XX	per Section 4.2
PCB**20**-X-XX	
PCB**25**-X-XX	
PCB**33**-X-XX	
PCB**50**-X-XX	
IDA**20**-X-XX	

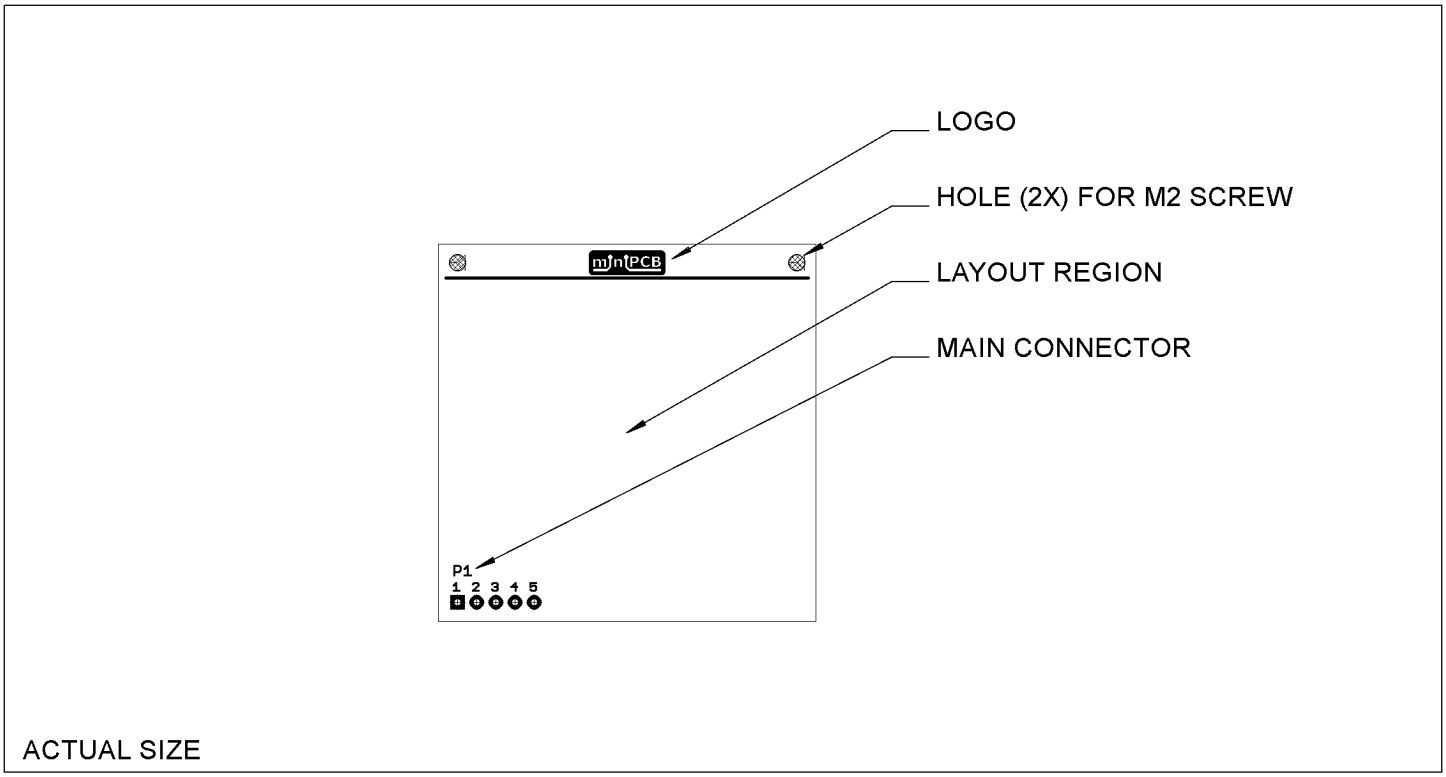
3.2.3. FUNCTION AND PINMAP

CLASSIFICATION ID	FUNCTION AND PIN COUNT	PINMAP
XXXXX-**A-05**	Analog, 5 pins	Per Section 4.3
XXXXX-**A-07**	Analog, 7 pins	
XXXXX-**A-09**	Analog, 9 pins	
XXXXX-**D-05**	Digital, 5 pins	
XXXXX-**D-07**	Digital, 7 pins	
XXXXX-**D-09**	Digital, 9 pins	
XXX50-**D-15**	Digital, 15 pins	
XXXXX-**W-05**	Wild, 5 pins	
XXXXX-**W-07**	Wild, 7 pins	
XXXXX-**W-09**	Wild, 9 pins	
XXX50-**W-15**	Wild, 15 pins	

4. BOARD DESIGN

4.1. INTRODUCTION

This section specifies mechanical dimensions, main connectors, and layout features.



4.2. MECHANICAL DIMENSIONS

4.2.1. PCB15-X-05

Dimensions are in millimeters.

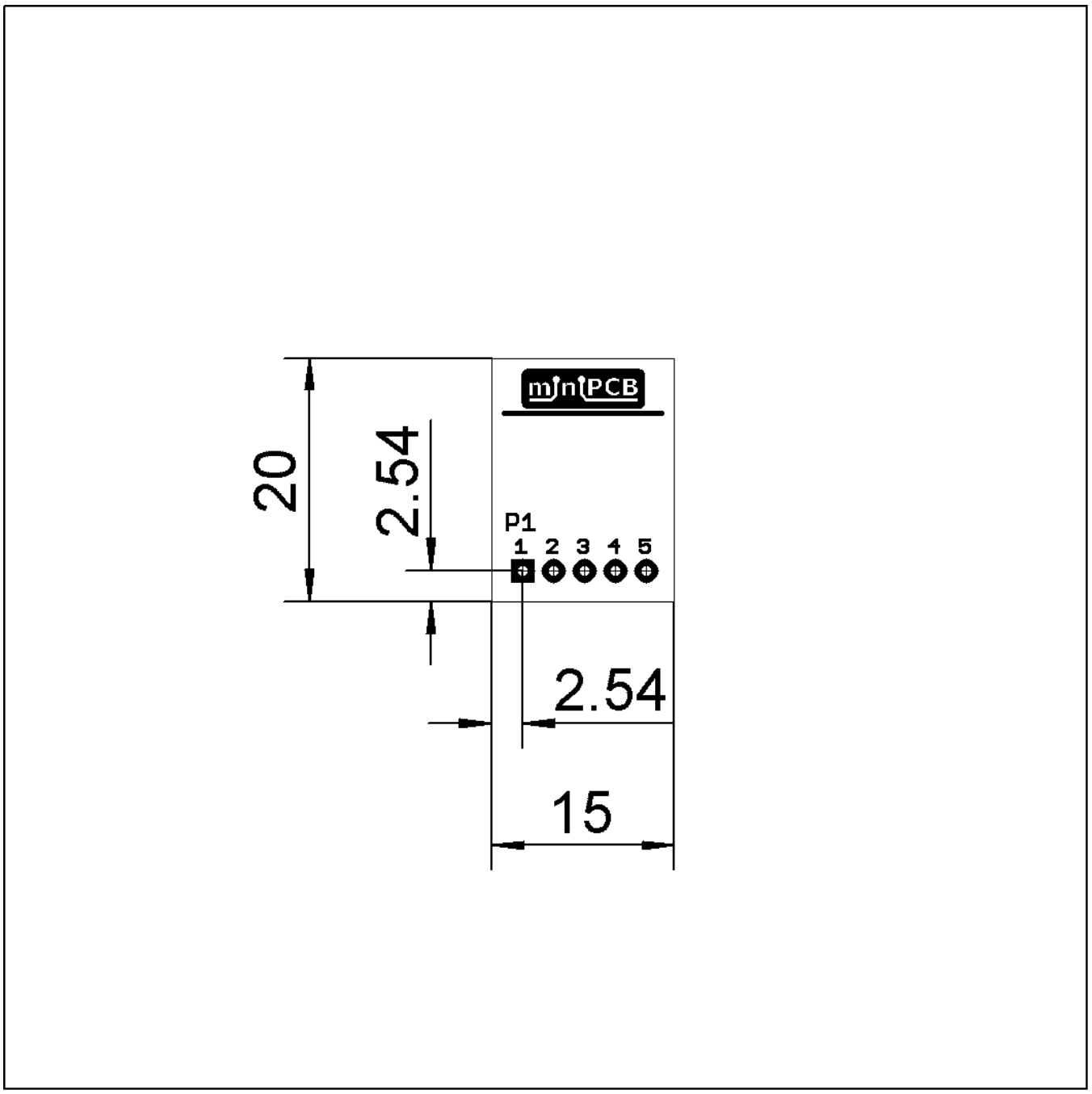


Figure 2 – PCB15-X-05, Mechanical Dimensions

4.2.2. PCB20-X-05

Dimensions are in millimeters.

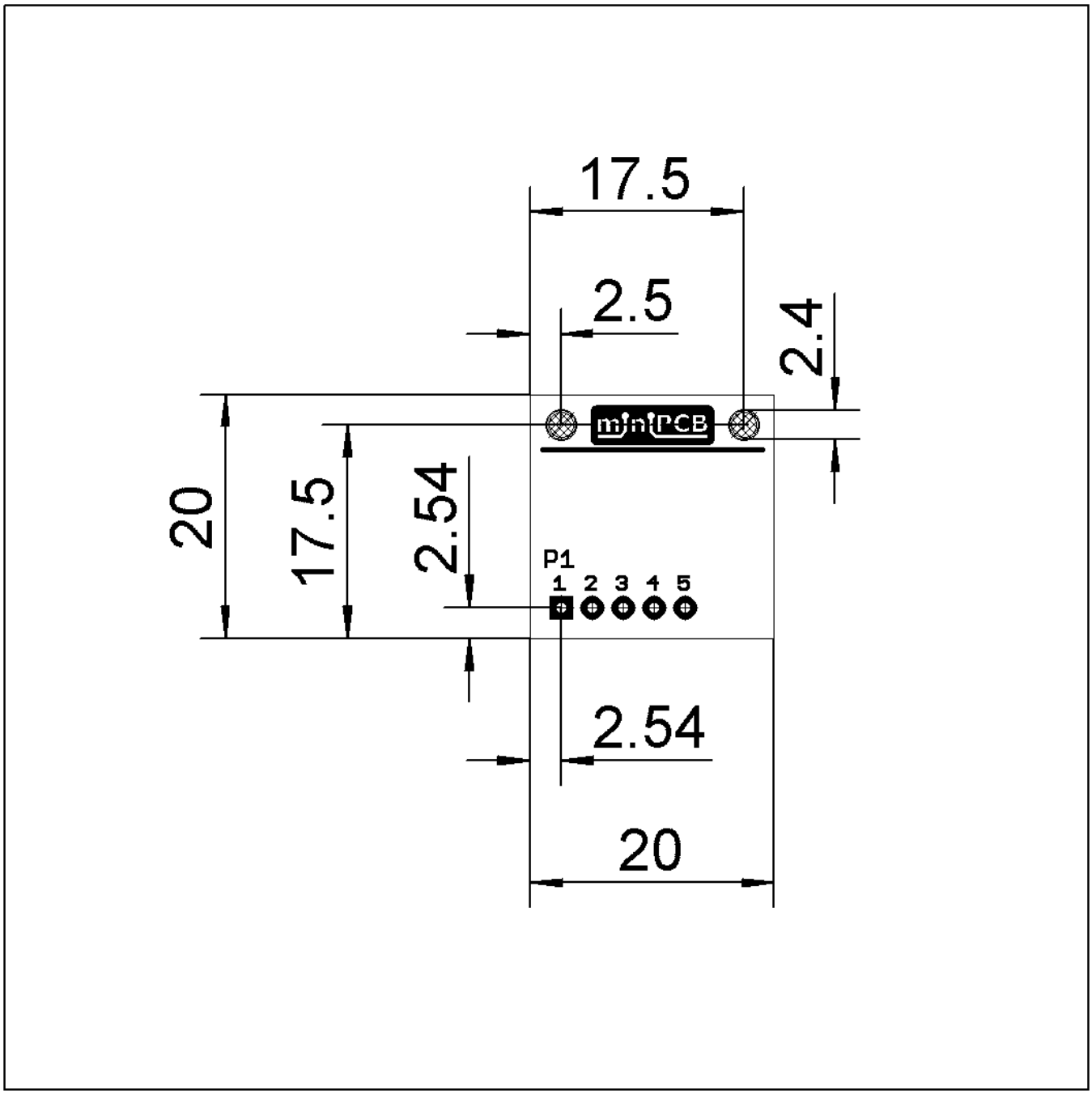


Figure 3 – PCB20-X-05, Mechanical Dimensions

4.2.3. PCB20-X-07

Dimensions are in millimeters.

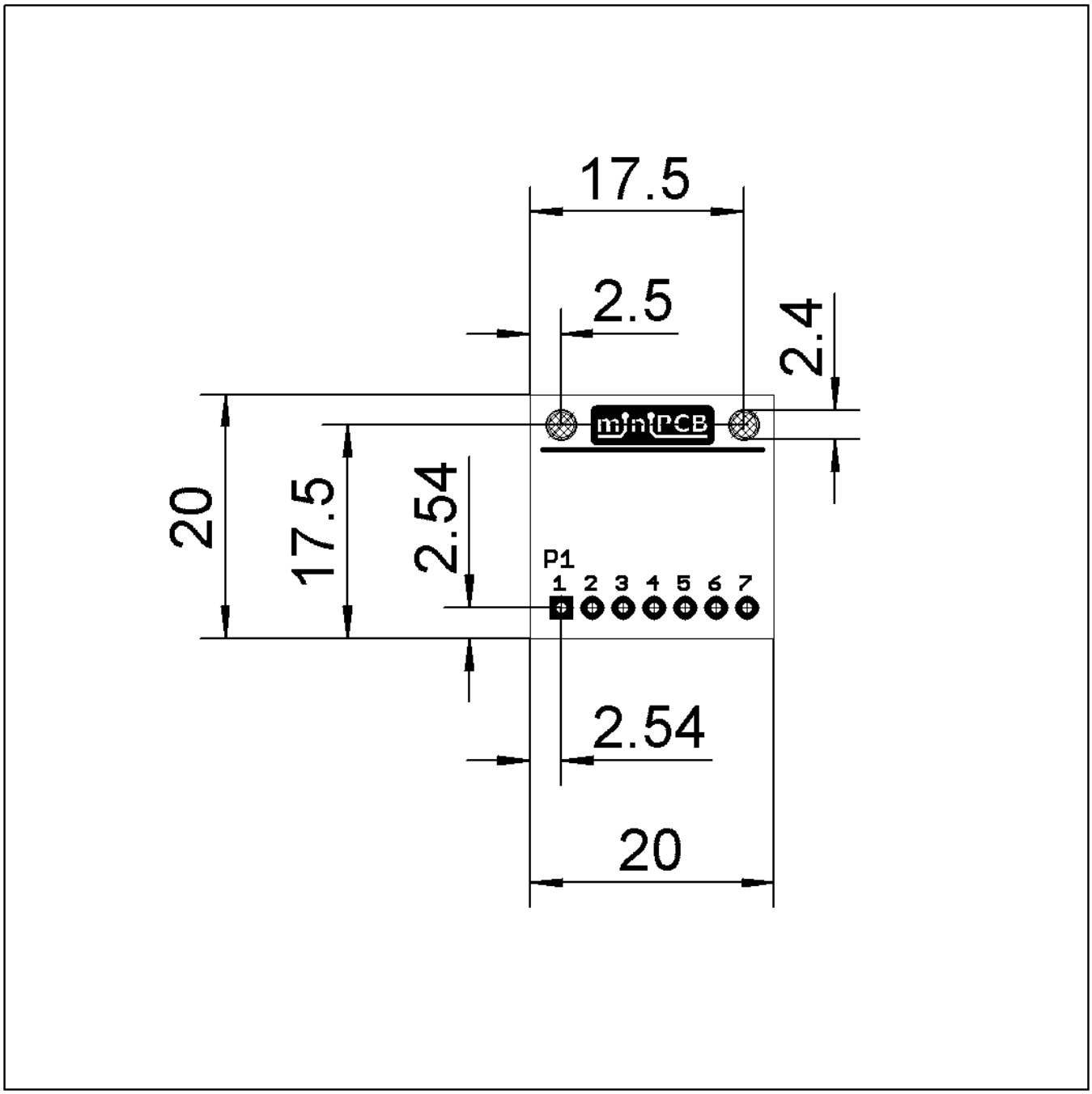


Figure 4 – PCB20-X-07, Mechanical Dimensions

4.2.4. PCB25-X-05

Dimensions are in millimeters.

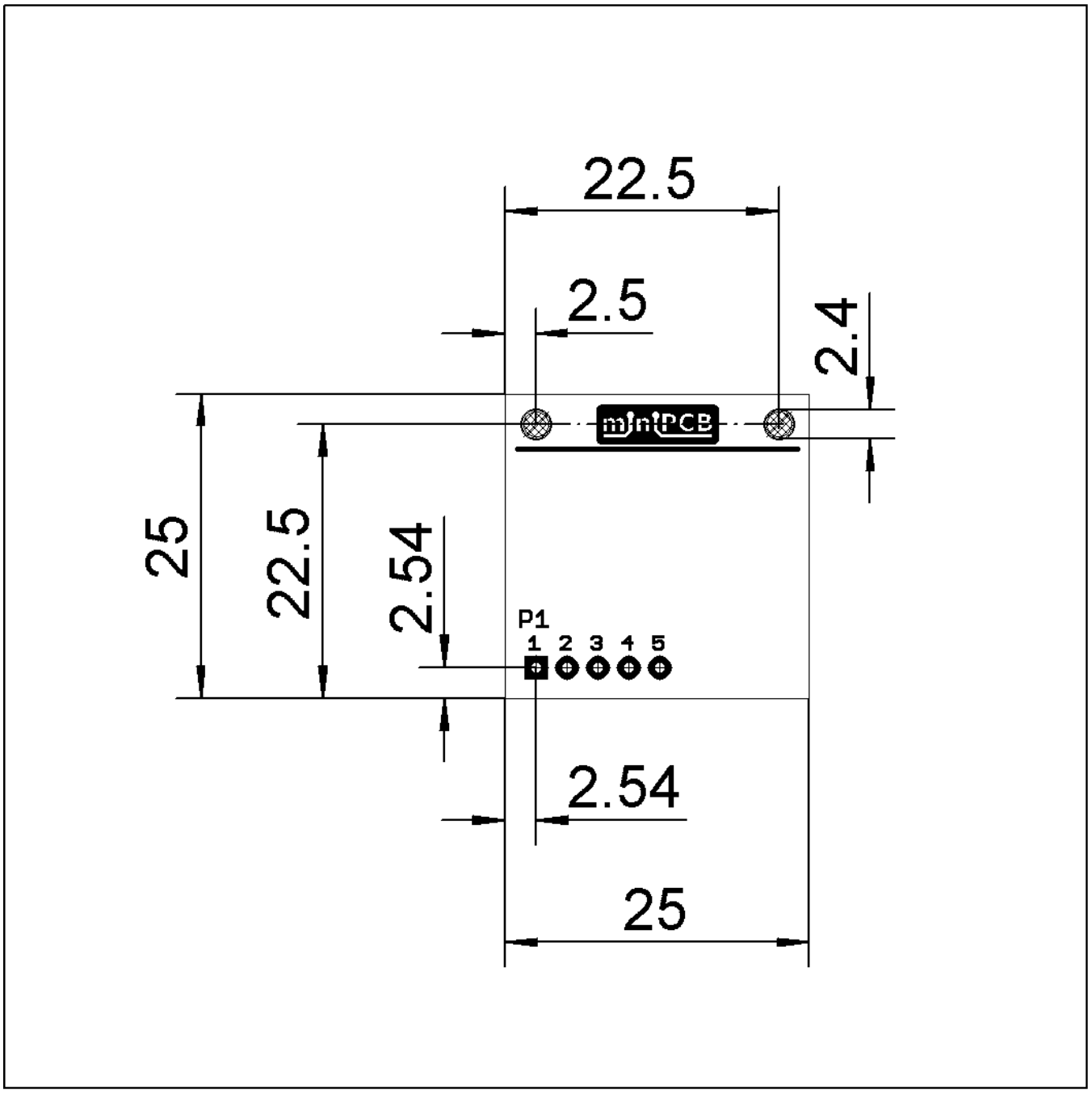


Figure 5 – PCB25-X-05, Mechanical Dimensions

4.2.5. PCB25-X-07

Dimensions are in millimeters.

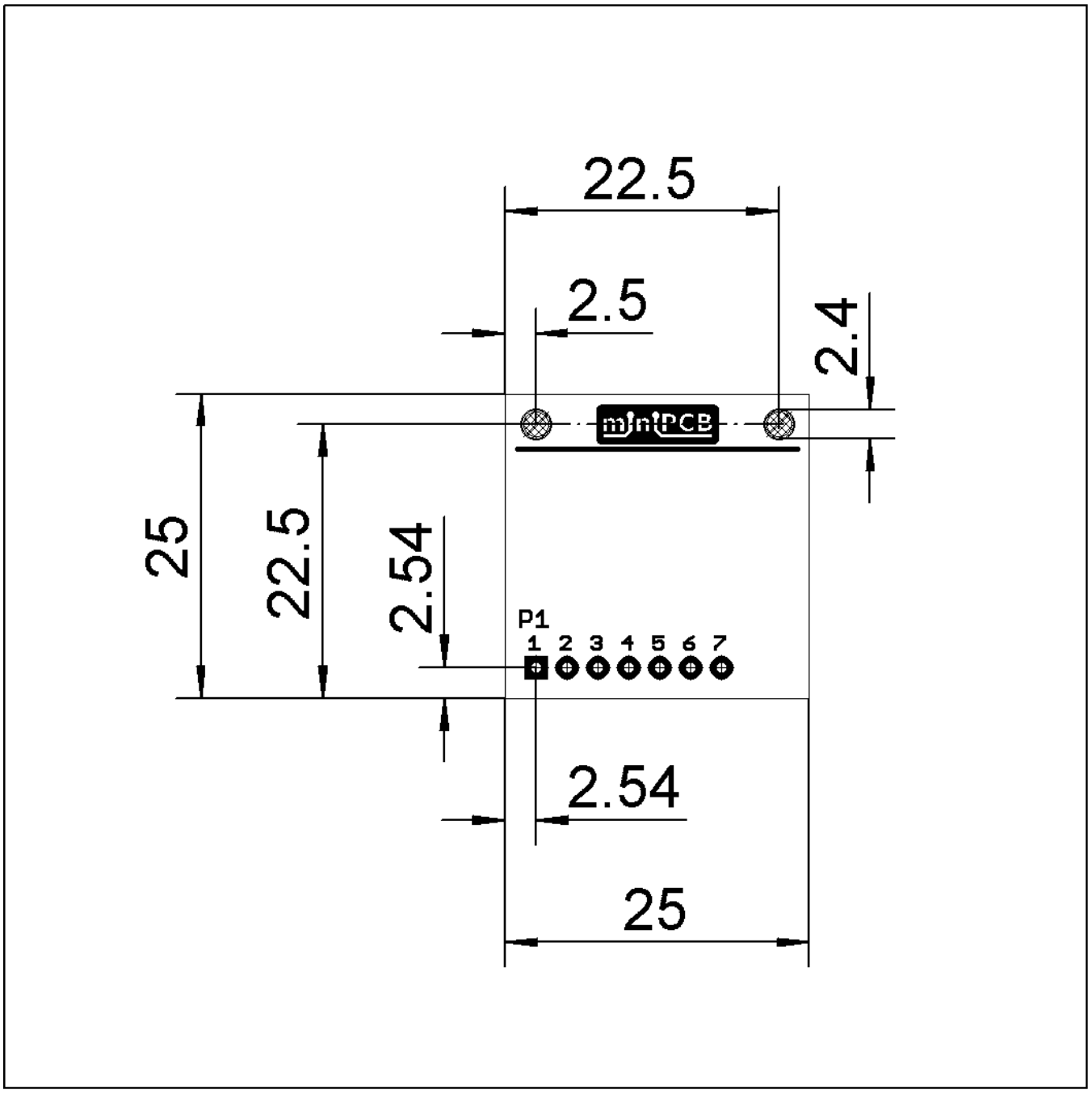


Figure 6 – PCB25-X-07, Mechanical Dimensions

4.2.6. PCB25-X-09

Dimensions are in millimeters.

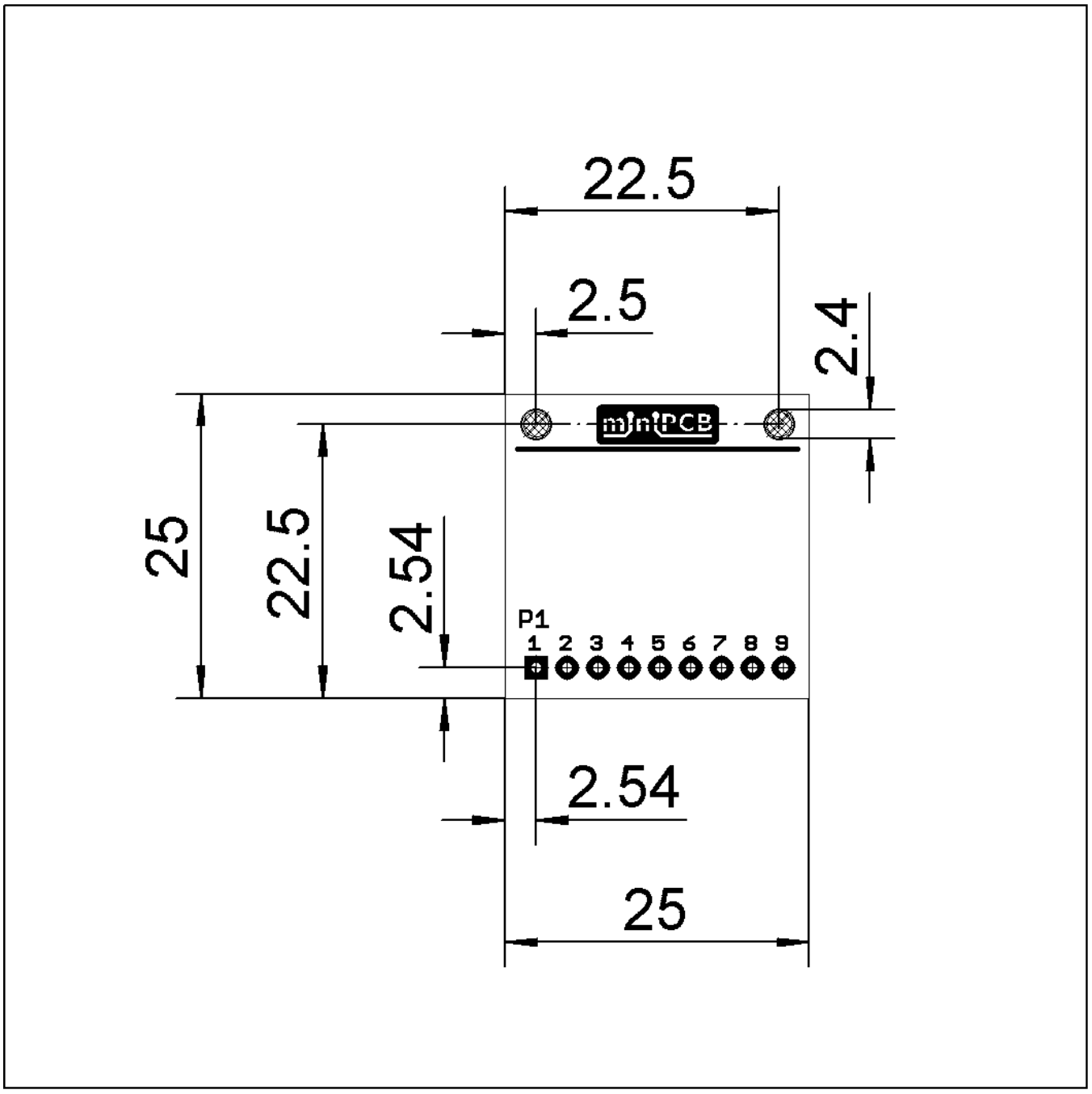


Figure 7 – PCB25-X-09, Mechanical Dimensions

4.2.7. PCB33-X-05

Dimensions are in millimeters.

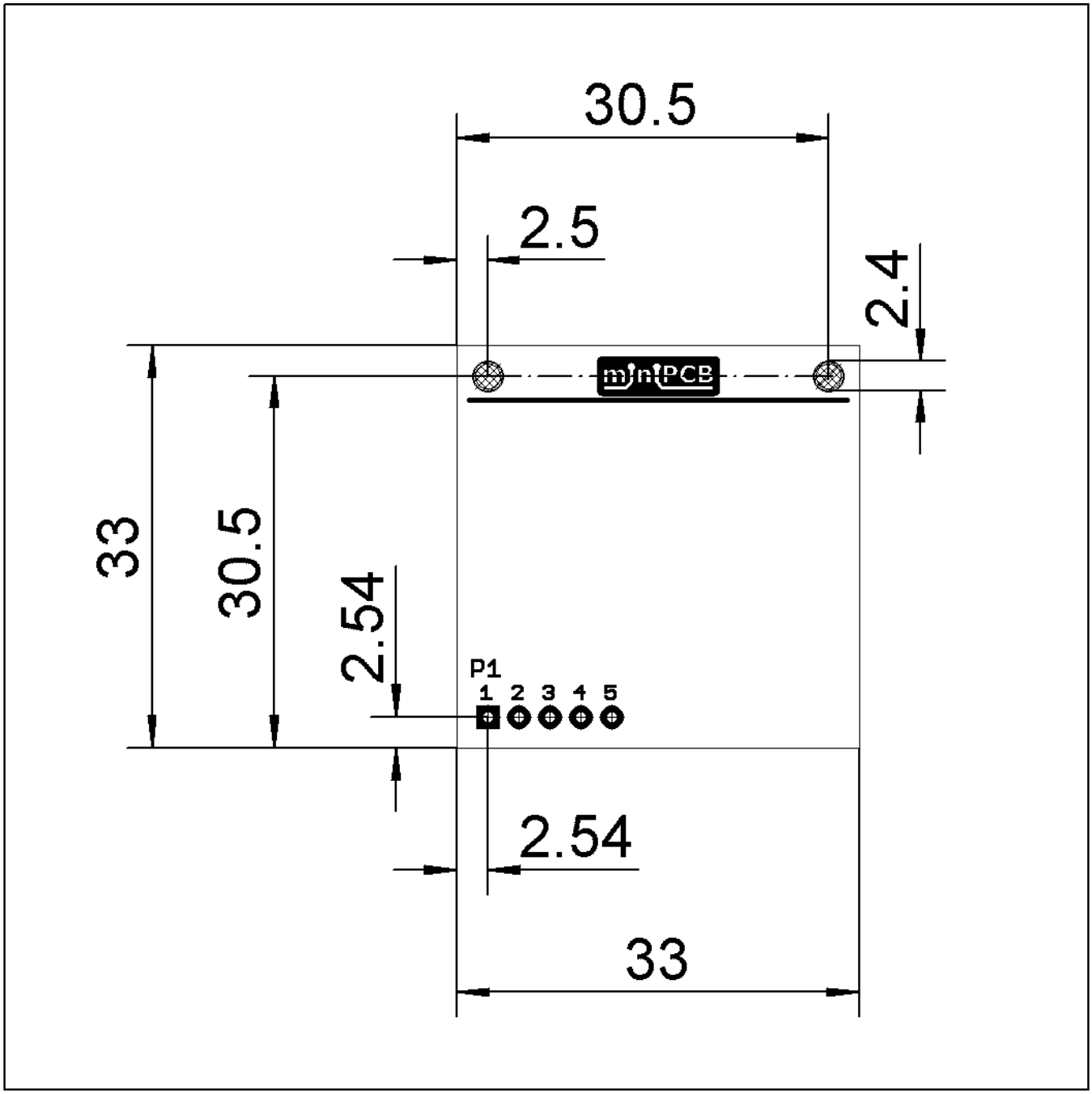


Figure 8 – PCB33-X-05, Mechanical Dimensions

4.2.8. PCB33-X-07

Dimensions are in millimeters.

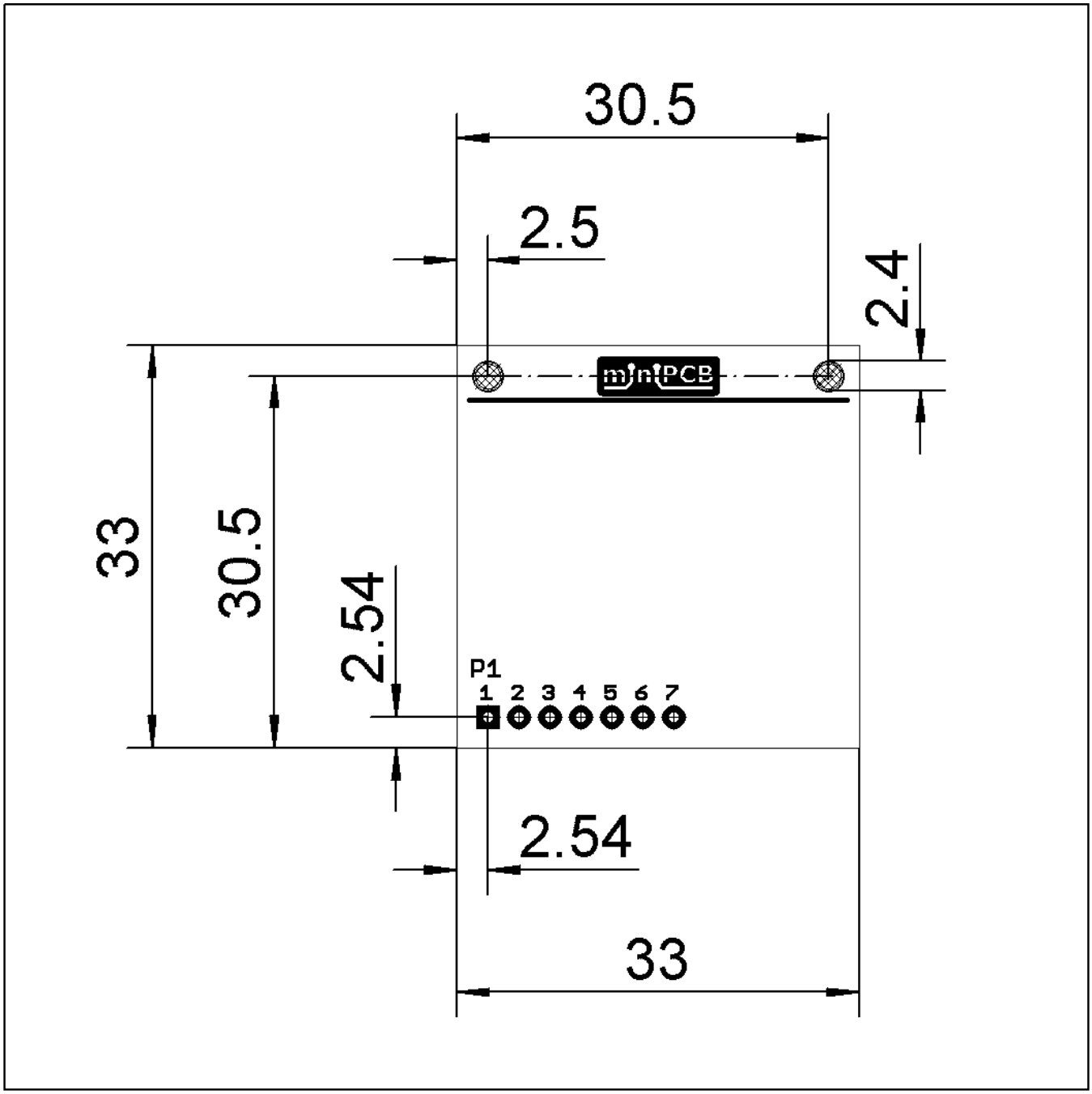


Figure 9 – PCB33-X-07, Mechanical Dimensions

4.2.9. PCB33-X-09

Dimensions are in millimeters.

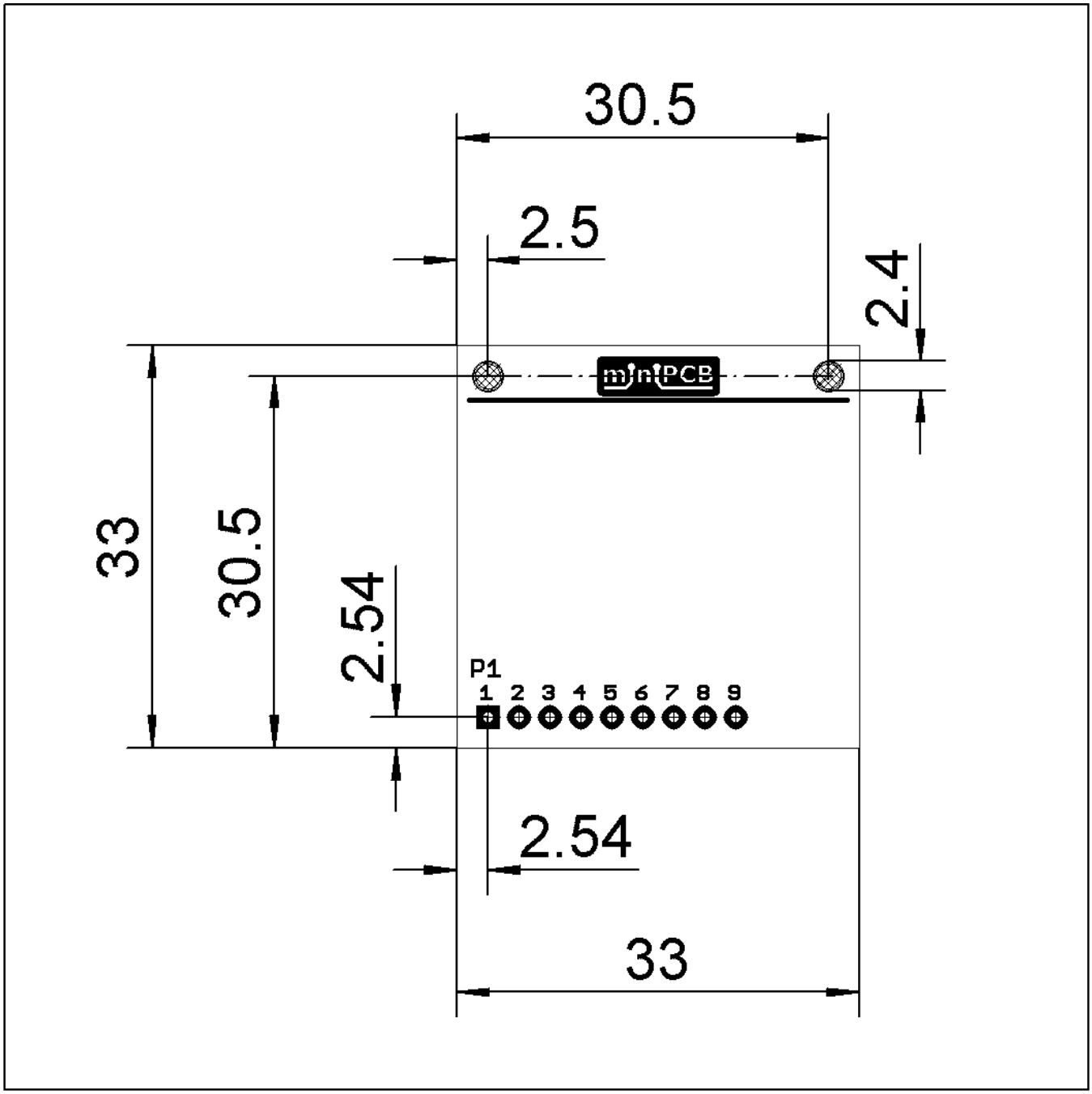


Figure 10 – PCB33-X-09, Mechanical Dimensions

4.2.10. PCB50-X-05

Dimensions are in millimeters.

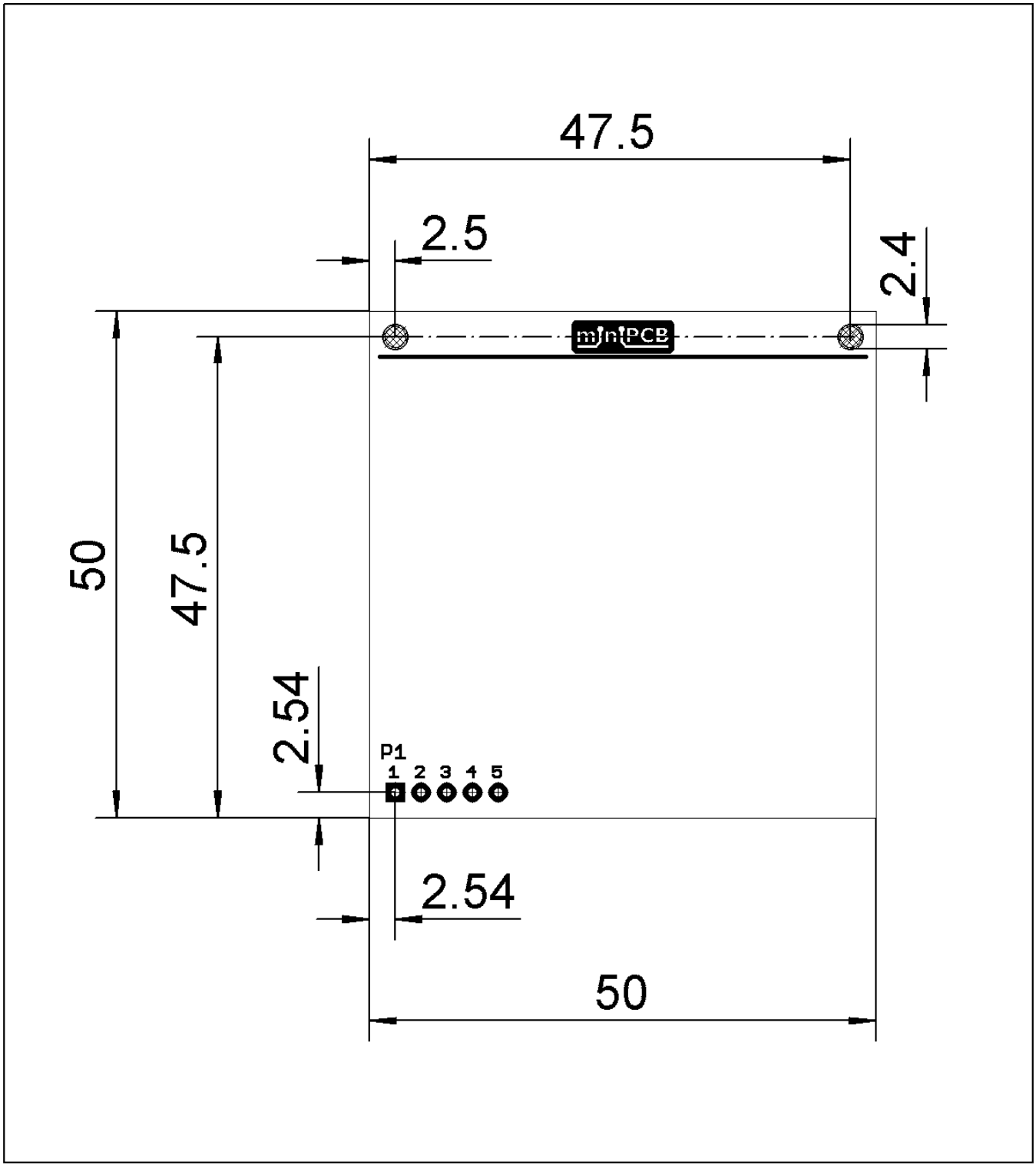


Figure 11 – PCB50-X-05, Mechanical Dimensions

4.2.11. PCB50-X-07

Dimensions are in millimeters.

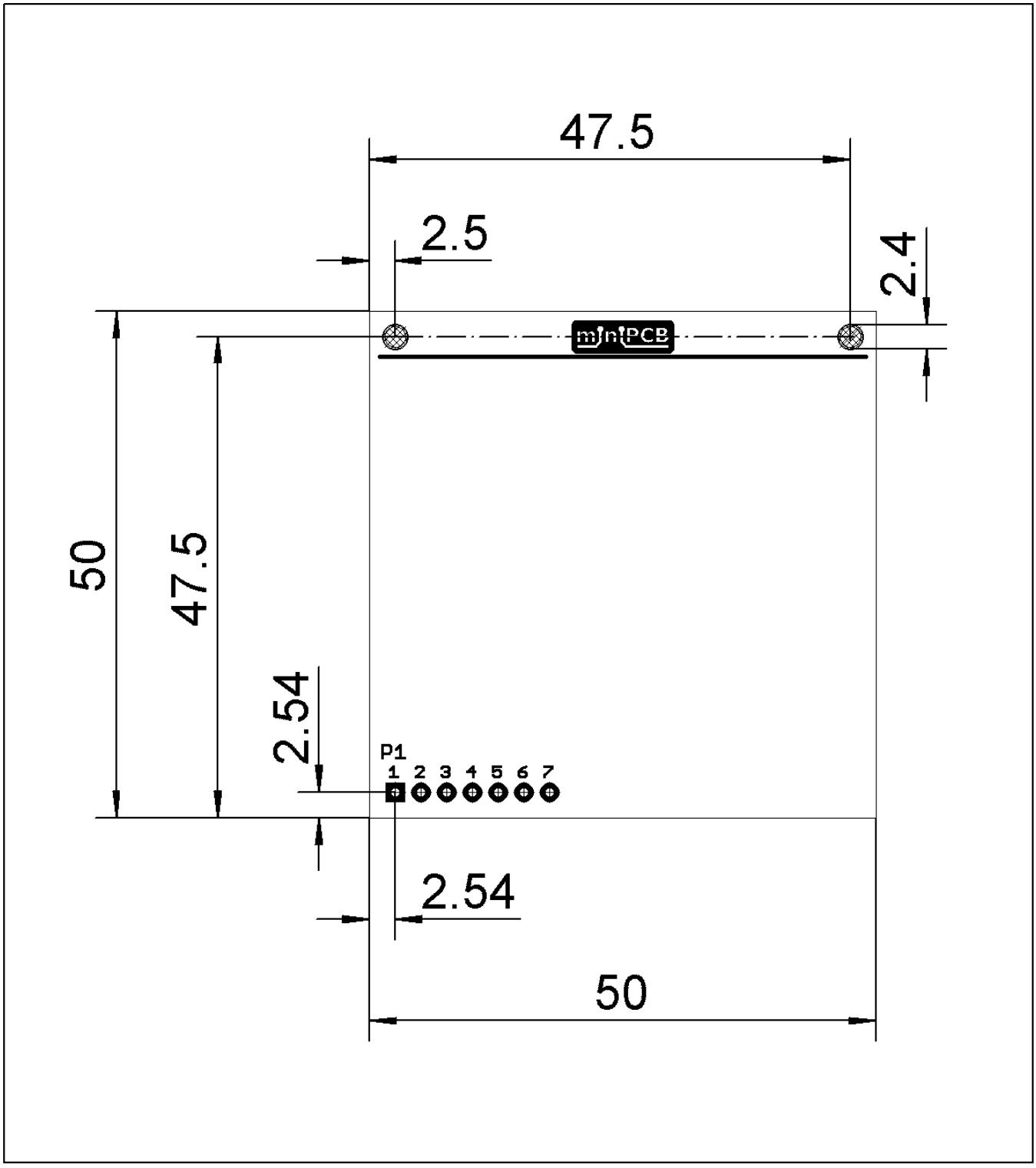


Figure 12 – PCB50-X-07, Mechanical Dimensions

4.2.12. PCB50-X-09

Dimensions are in millimeters.

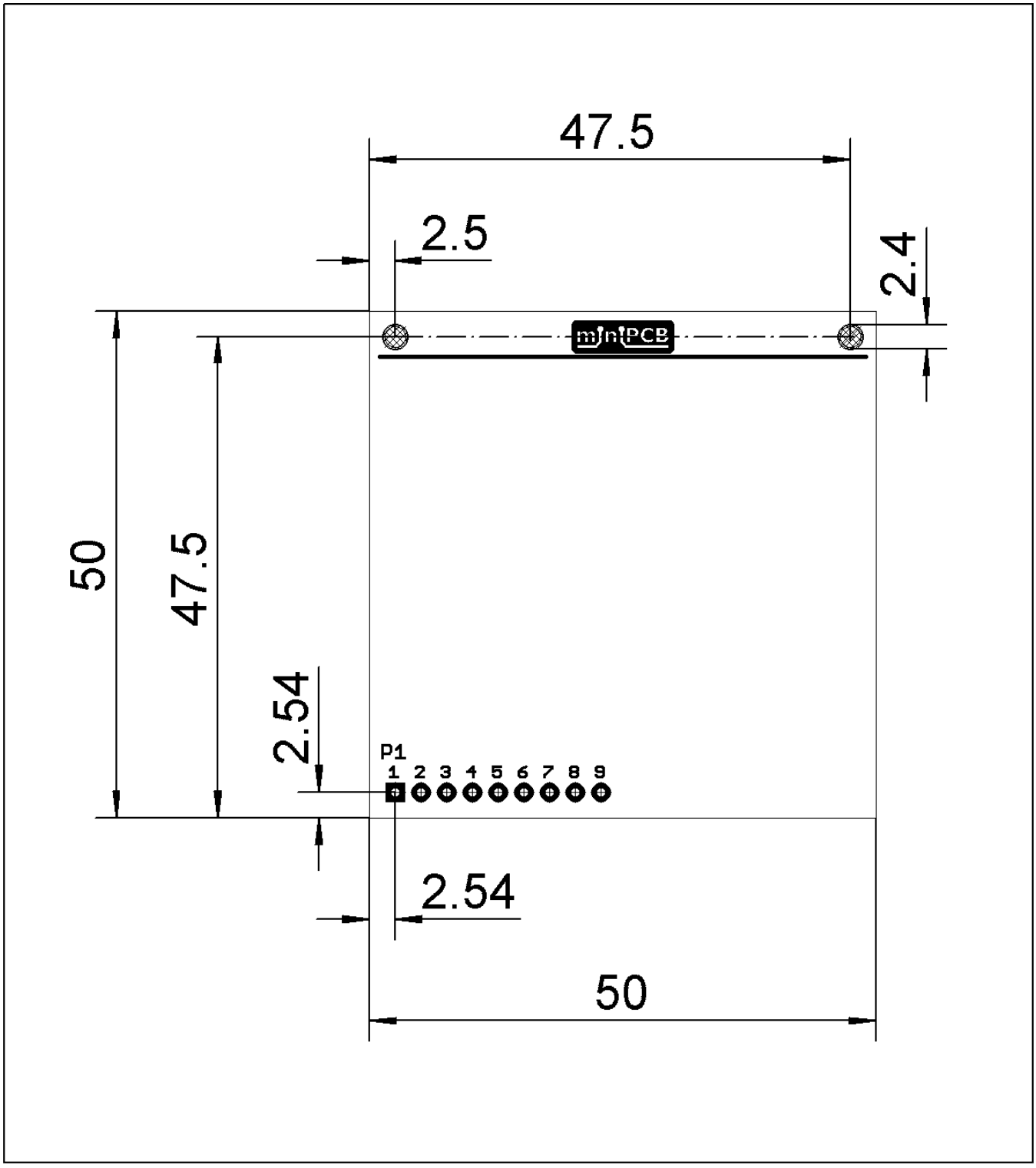


Figure 13 – PCB50-X-09, Mechanical Dimensions

4.2.13. PCB50-X-15

Dimensions are in millimeters.

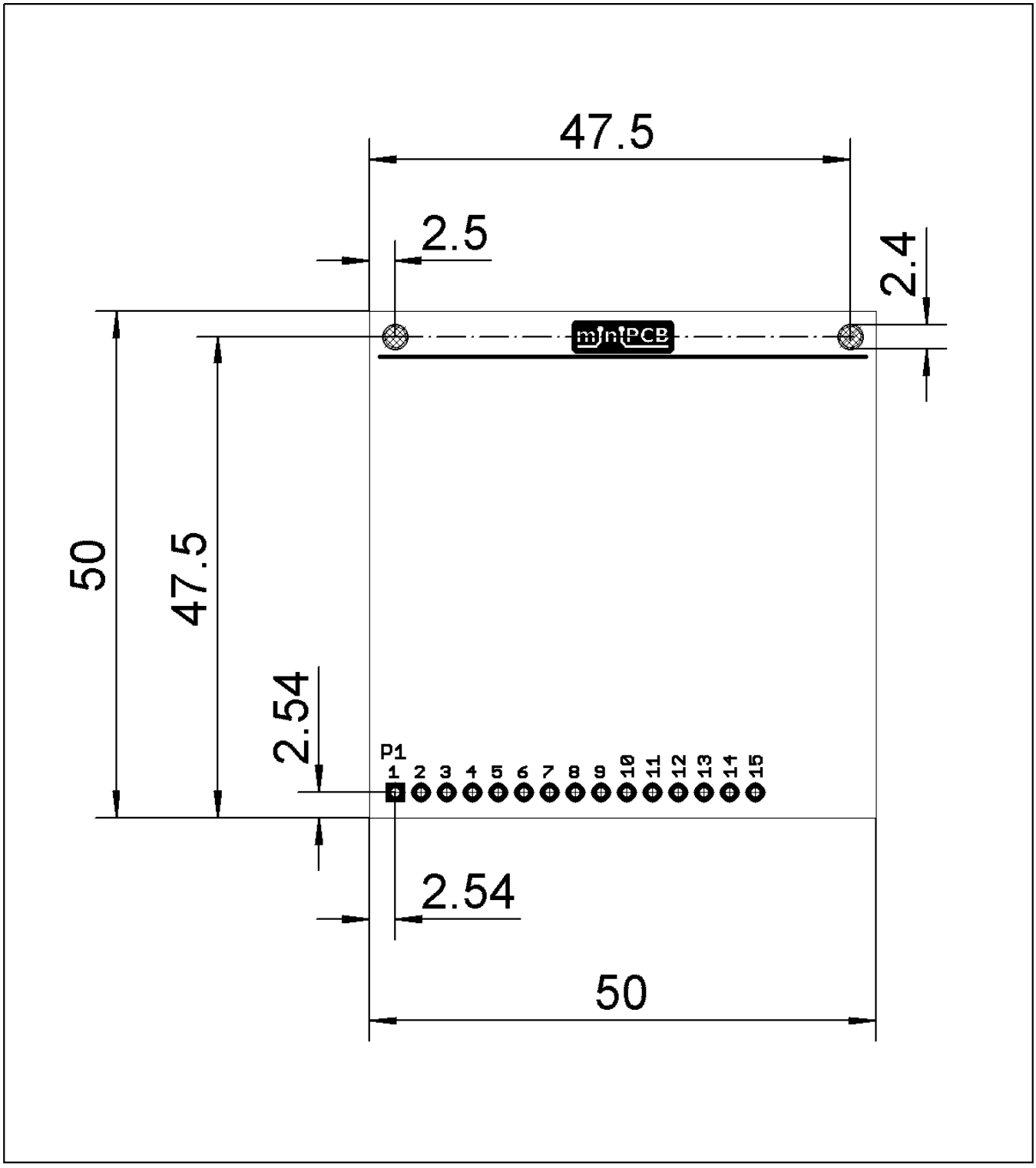


Figure 14 – PCB50-X-15, Mechanical Dimensions

4.2.14. IDB20-X-05

Dimensions are in millimeters.

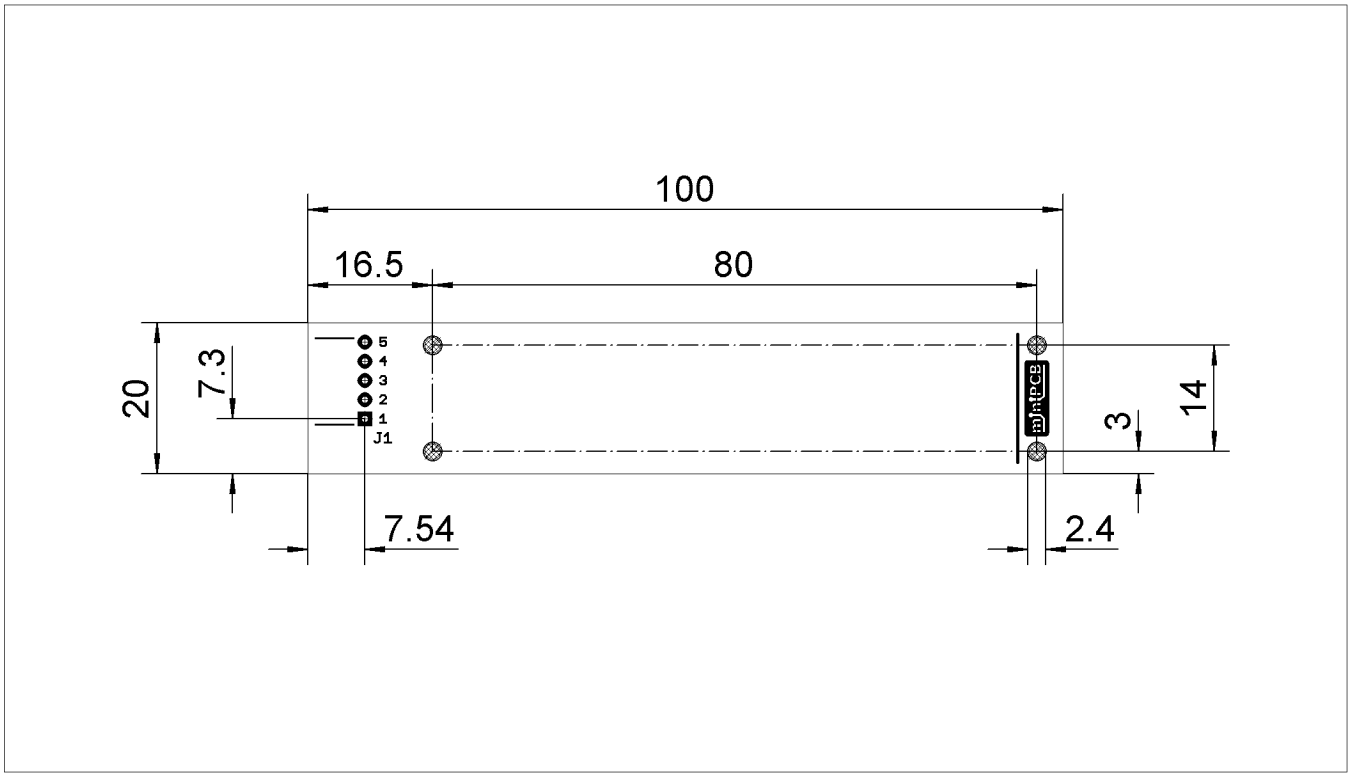


Figure 15 – IDB20-X-05, Mechanical Dimensions

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4.2.15. IDB25-X-05

Dimensions are in millimeters.

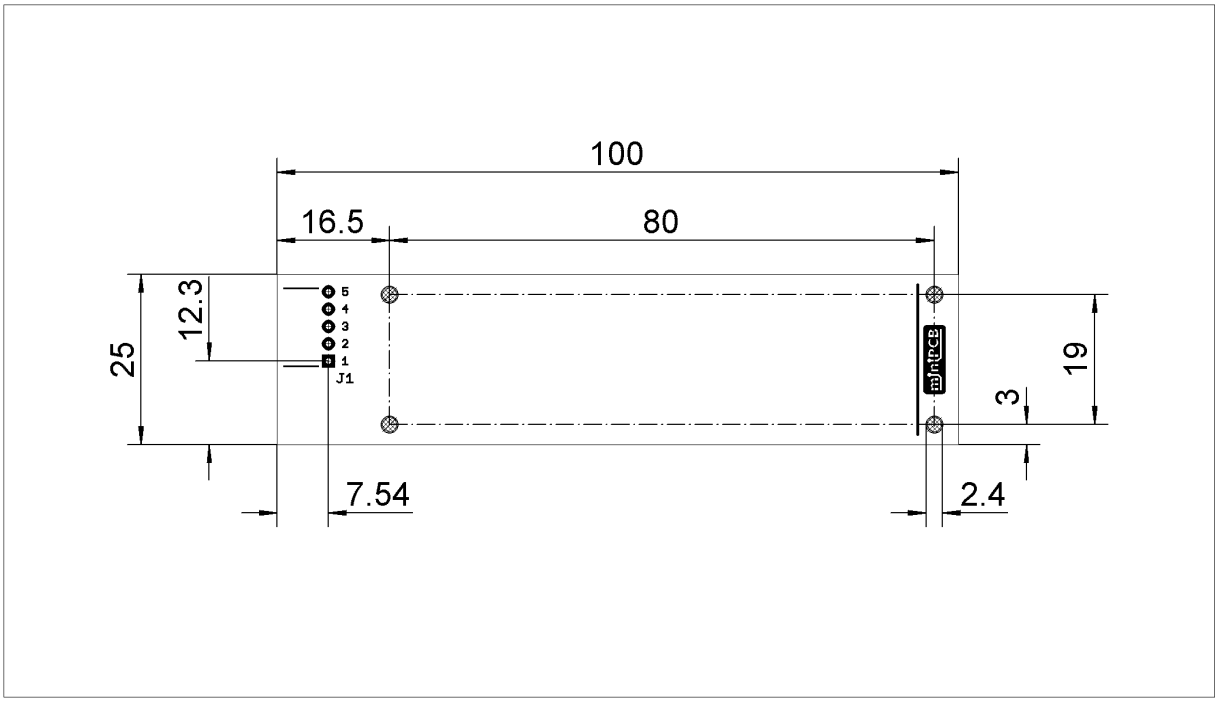

Figure 16 – IDB25-X-05, Mechanical Dimensions

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4.3. MAIN CONNECTOR

4.3.1. REFERENCE DESIGNATOR

- The reference designator for the main connector is always J1 or P1.
- The prefix “J” is used when the board/cable is intended to be less movable. This is typically the socket, or receptacle, side on the interface device assembly.
- The prefix “P” is used when the board/cable is intended to be more movable. This is typically the pin, or plug, side on the circuit board assembly.

4.3.2. PARTS

- Right-angle orientation is standard; any orientation may be used.
- The part numbers listed here are unique to the miniPCB venture.

4.3.2.1. PINS, P1

PART NUMBER	DESCRIPTION
P1-05	Five (5) contact, plug header, header pins, 0.1” pitch
P1-07	Seven (7) contact, plug header, header pins, 0.1” pitch
P1-09	Nine (9) contact, plug header, header pins, 0.1” pitch
P1-15	Fifteen (15) contact, plug header, header pins, 0.1” pitch

4.3.2.2. RECEPTACLES, J1

PART NUMBER	DESCRIPTION
J1-05	Five (5) contact, receptacle header, header socket, 0.1” pitch
J1-07	Seven (7) contact, receptacle header, header socket, 0.1” pitch
J1-09	Nine (9) contact, receptacle header, header socket, 0.1” pitch
J1-15	Fifteen (15) contact, receptacle header, header socket, 0.1” pitch

4.3.3. PINMAPS

4.3.3.1. ANALOG, 5 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	AI+	Input, Analog	
5	AO+	Output, Analog	

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4.3.3.2. ANALOG, 7 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	AI1+	Input, Analog	
5	AO1+	Output, Analog	
6	AI2+	Input, Analog	
7	AO2+	Output, Analog	

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4.3.3.3. ANALOG, 9 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	AI1+	Input, Analog	
5	AO1+	Output, Analog	
6	AI2+	Input, Analog	
7	AO2+	Output, Analog	
8	AI3+	Input, Analog	
9	AO3+	Output, Analog	

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4.3.3.4. DIGITAL, 5 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Digital signal
5	*	*	Digital signal

*Defined on an individual basis in respective datasheets.

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4.3.3.5. DIGITAL, 7 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Digital signal
5	*	*	Digital signal
6	*	*	Digital signal
7	*	*	Digital signal

*Defined on an individual basis in respective datasheets.

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4.3.3.6. DIGITAL, 9 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Digital signal
5	*	*	Digital signal
6	*	*	Digital signal
7	*	*	Digital signal
8	*	*	Digital signal
9	*	*	Digital signal

*Defined on an individual basis in respective datasheets.

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4.3.3.7. DIGITAL, 15 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	SPI.MOSI, I2C.SDA, UART.P1.RX
5	*	*	SPI.SCK, I2C.SCL, UART.P1.TX
6	*	*	SPI.MISO
7	*	*	SPI.CS
8	D0	Digital input output, bit 0 (lsb)	Least significant bit
9	D1	Digital input output, bit 1	
10	D2	Digital input output, bit 2	
11	D3	Digital input output, bit 3	
12	D4	Digital input output, bit 4	
13	D5	Digital input output, bit 5	
14	D6	Digital input output, bit 6	
15	D7	Digital input output, bit 7 (msb)	Most significant bit

*Defined on an individual basis in respective datasheets.

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4.3.3.8. WILD, 5 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Analog or digital
5	*	*	Analog or digital

*Defined on an individual basis in respective datasheets.

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4.3.3.9. WILD, 7 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Analog or digital
5	*	*	Analog or digital
6	*	*	Analog or digital
7	*	*	Analog or digital

*Defined on an individual basis in respective datasheets.

The remainder of this page intentionally blank.

4.3.3.10. WILD, 9 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Analog or digital
5	*	*	Analog or digital
6	*	*	Analog or digital
7	*	*	Analog or digital
8	*	*	Analog or digital
9	*	*	Analog or digital

*Defined on an individual basis in respective datasheets.

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4.3.3.11. WILD, 15 PIN

PIN	PIN NAME	FUNCTION	NOTES
1	GND	Ground	
2	+V	Supply, DC, Positive	No greater than +60 VDC
3	-V	Supply, DC, Negative	No greater than -60 VDC
4	*	*	Analog or digital
5	*	*	Analog or digital
6	*	*	Analog or digital
7	*	*	Analog or digital
8	*	*	Analog or digital
9	*	*	Analog or digital
10	*	*	Analog or digital
11	*	*	Analog or digital
12	*	*	Analog or digital
13	*	*	Analog or digital
14	*	*	Analog or digital
15	*	*	Analog or digital

*Defined on an individual basis in respective datasheets.

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4.4. BOARD LAYOUT

4.4.1. COMPONENT PLACEMENT

As possible, components will be placed on the top (logo) side of the board and reference designators will be placed next to component outlines. Reference designators will be formatted similar to these settings:

Table 1 – Reference Designator Properties

PROPERTY	SETTING
Font	Vector
Font Size	1.5 mm
Font Width	12%
Layer	tNames bNames

4.4.2. THROUGH HOLE DEVICE (THD) LAYOUTS

As possible for Through Hole Device (THD) miniPCBs, traces will be routed on the bottom (part number) side of the board and the ground plane on the top side will remain as "uncut" as possible to provide an optimal ground plane return path.

Table 2 – Layout Rules, THD

PROPERTY	MIN	TYP	MAX
Trace width	0.3 mm	0.4 mm	0.5 mm
Via drill diameter	0.3 mm	0.5 mm	
Grid for component placement	0.5 mm	1 mm	
Edge keepout	1 mm	1.5 mm	

4.4.3. SURFACE MOUNT DEVICE (SMD) LAYOUTS

As possible for Surface Mount Device (SMD) miniPCBs, traces will be routed on the top (logo) side of the board and the ground plane on the bottom side will remain as "uncut" as possible to provide an optimal ground plane return path.

Table 3 – Layout Rules, SMD

PROPERTY	MIN	TYP	MAX
Trace width	0.2 mm	0.3 mm	0.4 mm
Via drill diameter	0.3 mm	0.5 mm	
Grid for component placement	0.1 mm	1 mm	
Edge keepout	1 mm	1.5 mm	

4.4.4. MIXED DEVICE (THD, SMD) LAYOUTS

As possible for mixed device miniPCBs, THD components will be placed on the logo-side of the board, SMD components will be placed on the part-number-side of the board, traces will be routed on the part-number-side of the board, and the ground plane on the logo-side of the board will remain as "uncut" as possible to provide an optimal ground plane return path.

4.4.5. TEST POINTS

Test points will be included when they are needed to test or adjust the circuit.

4.4.6. PART NUMBER

A part number will be placed on the bottom side of the board, in the region furthest away from the main connector. The part number will be placed in both copper and silkscreen.

4.4.7. LOGO

A logo will be placed on the top side of the board, in the region furthest away from the main connector. The logo will be placed in copper and exposed by the soldermask.

5. PART IDENTIFICATION NUMBER

5.1. INTRODUCTION

This section specifies the Part Identification Number (PIN). The PIN provides information concerning the part's circuit, component sizes, and miniPCB revision.

The PIN is in the following form:

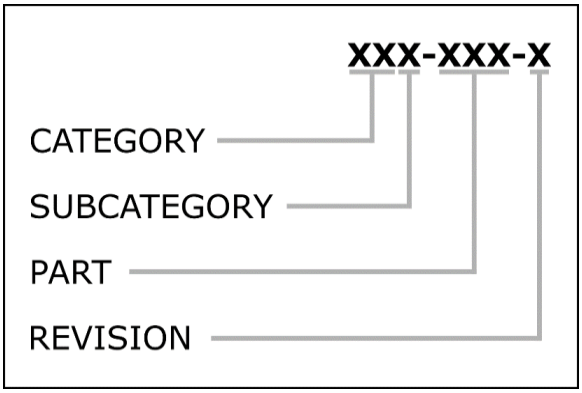

Figure 17 – Part Identification Number

CATEGORY	SUBCATEGORY	PART	REVISION
per Section 5.2.1	per Section 5.2.2	per Section 5.2.3	per Section 5.2.4

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5.2. PIN CLASSIFICATIONS

5.2.1. CATEGORY

Categories are identified by two (2) digits.

CLASSIFICATION ID	TITLE	DESCRIPTION
00X-XXX-X	Test Boards	PCBs that enable electronic test setups
01X-XXX-X	Components	PCBs that enable component test setups
02X-XXX-X	Sensors	PCBs with layouts of sensing circuits
03X-XXX-X	Actuators	PCBs with layouts of actuator circuits
04X-XXX-X	Amplifiers	PCBs with layouts of amplifier circuits
05X-XXX-X	Filters	PCBs with layouts of filter circuits
06X-XXX-X	Oscillators	PCBs with layouts of oscillators
07X-XXX-X	Radio	PCBs with layouts of radio frequency circuits
08X-XXX-X	Signal Converters	PCBs with layouts of signal converter circuits
09X-XXX-X	Power	PCBs with layouts of power circuits
10X-XXX-X	Digital	PCBs with layouts of digital circuits
11X-XXX-X	Computing	PCBs with layouts of computer circuits
12X-XXX-X	Communication	PCBs with layouts of communication circuits

5.2.2. SUBCATEGORY

Subcategories are identified by a single letter. Each subcategory can hold up to two hundred (200) unique circuits. Categories and subcategories will be added as more circuits are desired.

5.2.2.1. TEST BOARDS, 00

- 00A, Probe and prototyping
- 00B; Test device and setup boards
- 00C; Signal generation and acquisition boards

5.2.2.2. COMPONENTS, 01

- 01A; Discrete
- 01B; Integrated
- 01C; Modular

5.2.2.3. SENSORS, 02

- 02A; Human interface
- 02B; Environment interface
- 02C; Device interface

5.2.2.4. ACTUATORS, 03

- 03A; Mechanical
- 03B; Thermal
- 03C; Photic

5.2.2.5. AMPLIFIERS, 04

- 04A; Operational amplifiers
- 04B; Transistor amplifiers
- 04C; Application specific amplifiers

5.2.2.6. FILTERS, 05

- 05A; Passive
- 05B; Active

5.2.2.7. OSCILLATORS, 06

- 06A; Harmonic (Linear)
- 06B; Relaxation (Nonlinear)

5.2.2.8. RADIO, 07

- 07A; Transmitters
- 07B; Receivers
- 07C; Transceivers

5.2.2.9. SIGNAL CONVERTERS, 08

- 08A; Analog to Digital
- 08B; Digital to Analog
- 08C; Voltage to Current
- 08D; Current to Voltage
- 08E; Voltage to Frequency
- 08F; Frequency to Voltage
- 08G; Time to Voltage

5.2.2.10. POWER, 09

- 09A; Voltage limiters, references, regulators
- 09B; Current limiters, mirrors, regulators
- 09C; Power converters, isolators
- 09D; Fuses, rectifiers, filters, transformers
- 09E; RESERVED
- 09F; Optoisolators

5.2.2.11. DIGITAL, 10

- 10A; Logic Gates
- 10B; Logic Devices (clocks, registers, flip-flops, etc.)
- 10C; Digital Systems

5.2.2.12. COMPUTING, 11

- 11A; Math
- 11B; Processors
- 11C; Learning Machines

5.2.2.13. COMMUNICATION, 12

- 12A; Wired
- 12B; Wireless Radio
- 12C; Wireless Optical

5.2.3. PART

Each circuit is allotted five (5) part numbers, 0-4 or 5-9, to allow for different layouts with various component sizes.

CLASSIFICATION ID	TITLE	DESCRIPTION
XXX-XX**0**-X	THD	Layout uses through hole device components.
XXX-XX**1**-X	SMD, 1206	Layout uses 1206 surface mount device components
XXX-XX**2**-X	SMD, 0805	Layout uses 0805 surface mount device components
XXX-XX**3**-X	SMD, 0402	Layout uses 0402 surface mount device components
XXX-XX**4**-X	RESERVED	Reserved for future use.
XXX-XX**5**-X	THD	Layout uses through hole device components.
XXX-XX**6**-X	SMD, 1206	Layout uses 1206 surface mount device components
XXX-XX**7**-X	SMD, 0805	Layout uses 0805 surface mount device components
XXX-XX**8**-X	SMD, 0402	Layout uses 0402 surface mount device components
XXX-XX**9**-X	RESERVED	Reserved for future use.

5.2.4. REVISION

CLASSIFICATION ID	TITLE	DESCRIPTION
XXX-XXX-**DRAFT**	Draft	Not approved.
XXX-XXX-**A**	Initial Release	Approved, initial release.
XXX-XXX-**B, etc.**	Revision Release	Approved, modifies previous release.

6. ENGINEERING DOCUMENTATION

6.1. INTRODUCTION

This section specifies features of controlled documents such as schematics, datasheets, procedures, forms, and reports.

6.2. DOCUMENT CONTROL

6.2.1. REVISION HISTORY

Revisions will increment from A at the initial release to B, C, D, etc.

Documents created in a CAD tool will have a revision history table similar to this:

REV	DESCRIPTION	ECO	DATE
A	INITIAL RELEASE		

Figure 18 – Exemplar Revision History Table

Documents created in Microsoft Word will have a revision history table similar to this:

Table 4 – Exemplar Revision History Table

REV	DESCRIPTION	ECO	DATE
A	Initial Release	###	DDMMMYYYY

6.2.2. REVIEW AND APPROVAL

Engineering documentation will be reviewed, approved, and signed by a qualified engineer prior to release.

6.2.3. ELECTRONIC SIGNATURES

Documents created in CAD tools will be signed electronically within the CAD tool.

Documents created in Microsoft Office will be signed electronically within Microsoft Office.

6.2.4. ENGINEERING CHANGE ORDERS

A description of approved changes to engineering documentation will be recorded on an Engineering Change Order (ECO) form.

6.2.5. ENGINEERING RECORDS

RECORD	DESCRIPTION
Source Files	Gerbers, CAD files, Word documents, Excel documents, etc.
Schematics	PDF document (from CAD)
Datasheets	PDF document (from Word)
FMEA Reports	PDF document
Testing Procedure	PDF document
Testing Report	PDF document
Engineering Change Orders	PDF documents

6.2.6. FILE REPOSITORY

Engineering files and records will be saved in a GitHub repository owned by Nolan Manteufel.

6.2.7. PUBLIC DISEMINATION

Engineering files and records will be published to a public GitHub repository owned by Nolan Manteufel. Current and obsolete revisions will be available according to GitHub file version history capabilities.

Table 5 – GitHub Repository

REPOSITORY	LOCATION
GitHub	https://github.com/miniPCB

6.3. SCHEMATICS

6.3.1. PIN NAMES FOR J1 AND P1

Used pins will be labeled with pin names. Unused pins will be labeled with “NO CONNECT”.

6.3.2. PARTS LIST

Include a parts list table with these columns:

- FIND NO
- REF DES
- COMPONENT
- PACKAGE
- PINOUT
- COMMENTS

The remainder of this page intentionally blank.

6.3.3. SHEETS

6.3.3.1. MINIPCB SIZE A, HORIZONTAL

Dimensions are in millimeters.

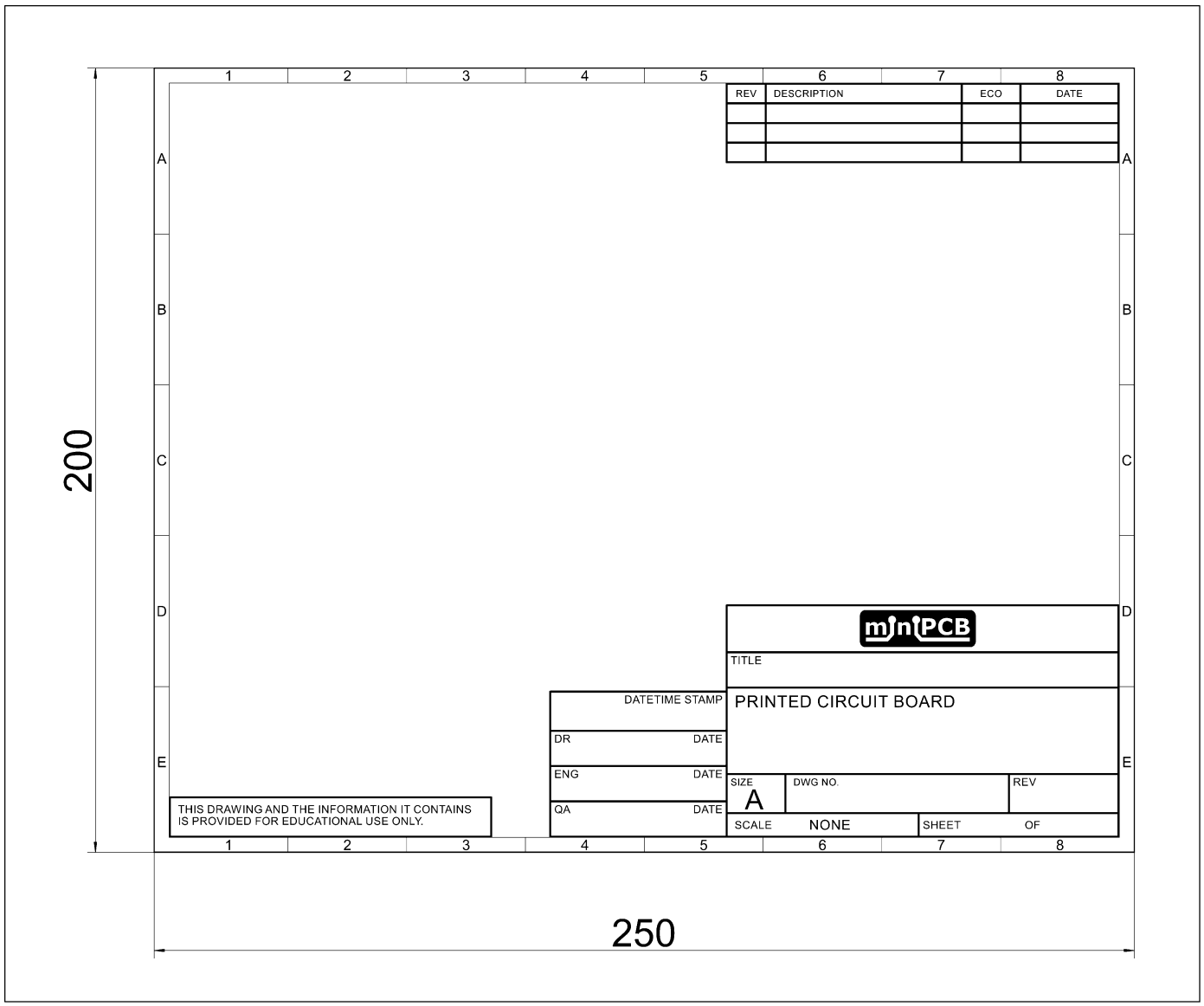

Figure 19 – miniPCB Size A, Horizontal

6.3.3.2. MINIPCB SIZE A CONTINUED, HORIZONTAL

Dimensions are in millimeters.

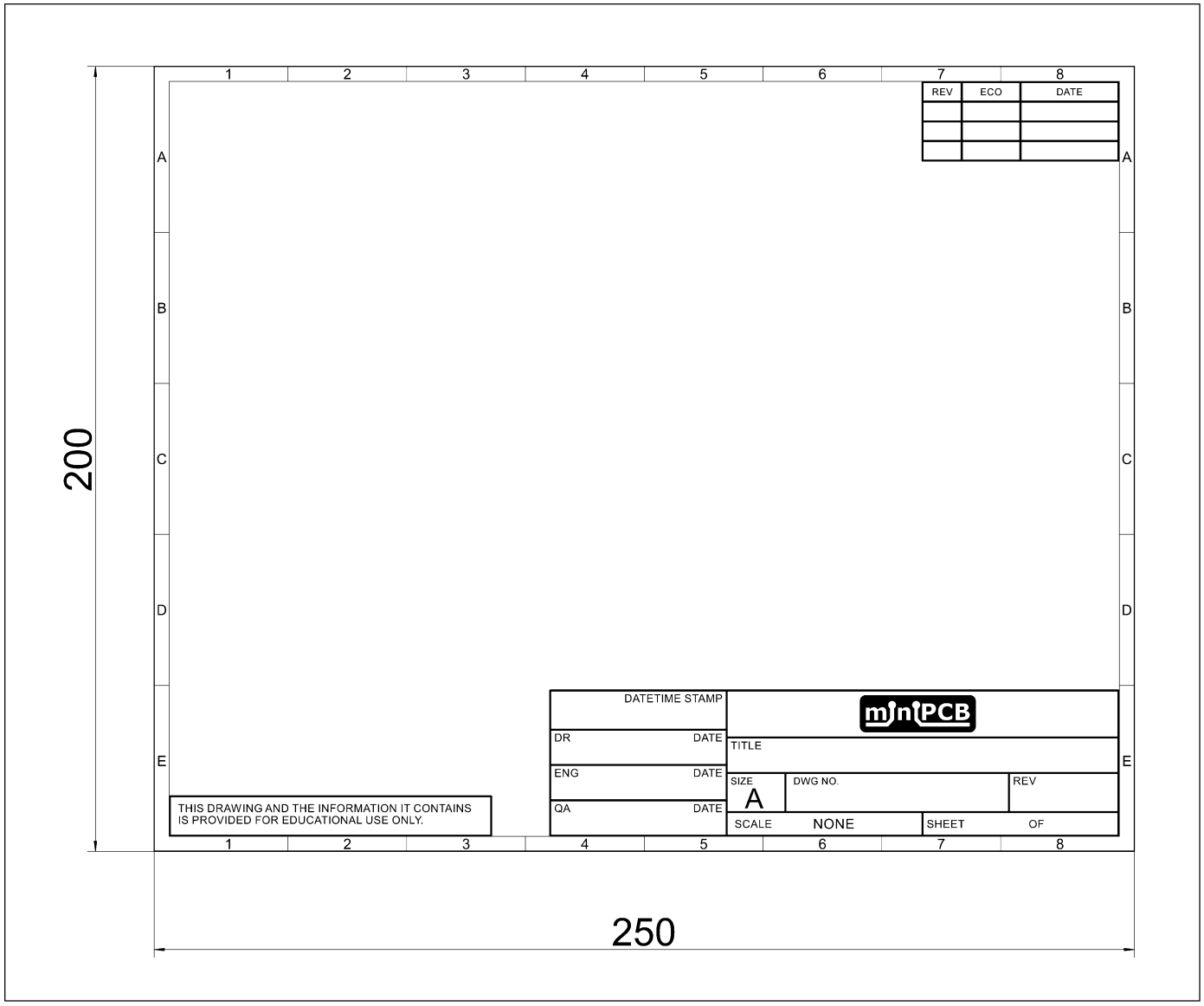

Figure 20 – miniPCB Size A Continued, Horizontal

6.3.3.3. MINIPCB SIZE A, VERTICAL

Dimensions are in millimeters.

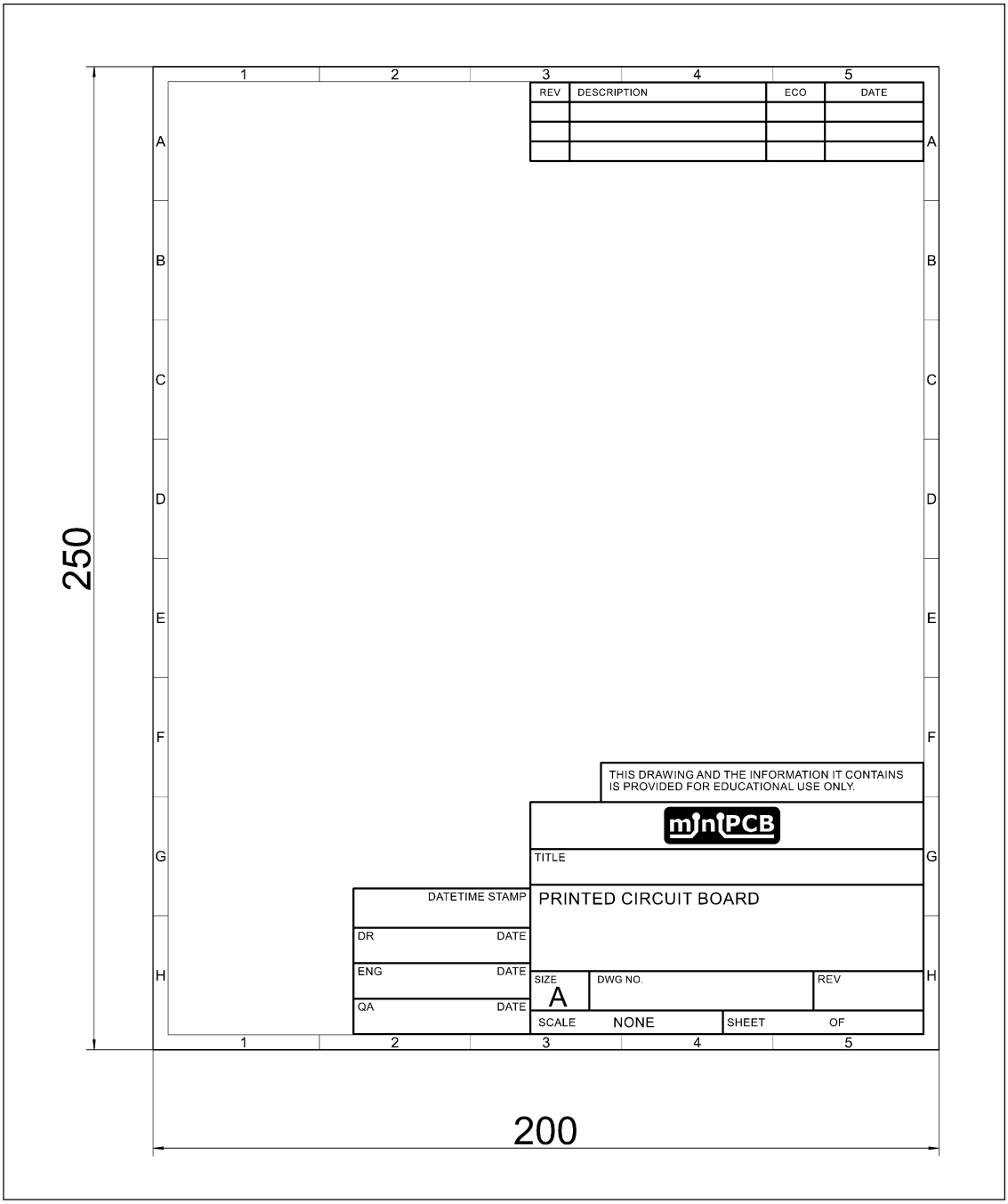

Figure 21 – miniPCB Size A, Vertical

6.3.3.4. MINIPCB SIZE A CONTINUED, VERTICAL

Dimensions are in millimeters.

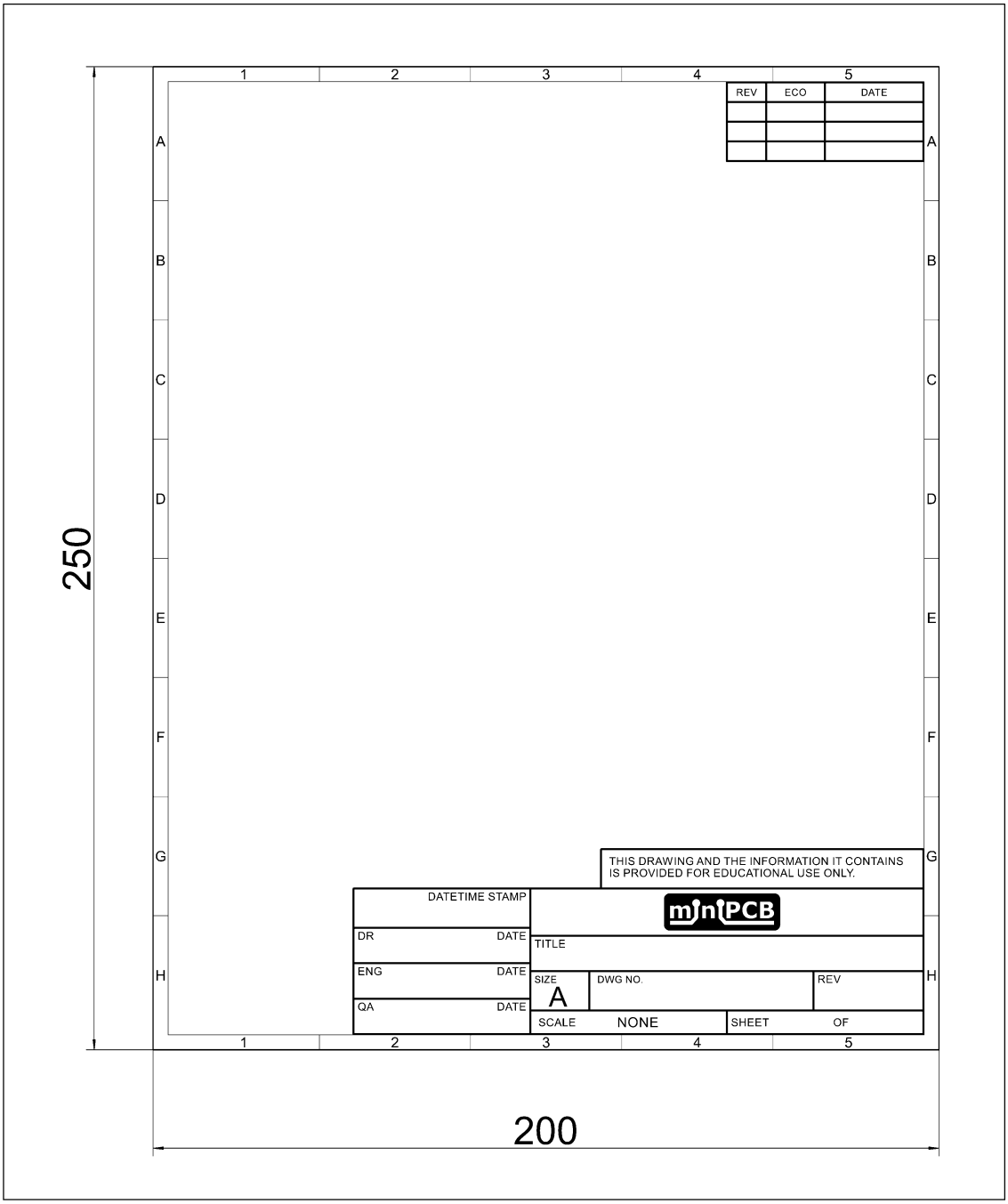

Figure 22 – miniPCB Size A Continued, Vertical

6.3.3.5. MINIPCB SIZE A EXPERIMENTAL, VERTICAL

Dimensions are in millimeters.

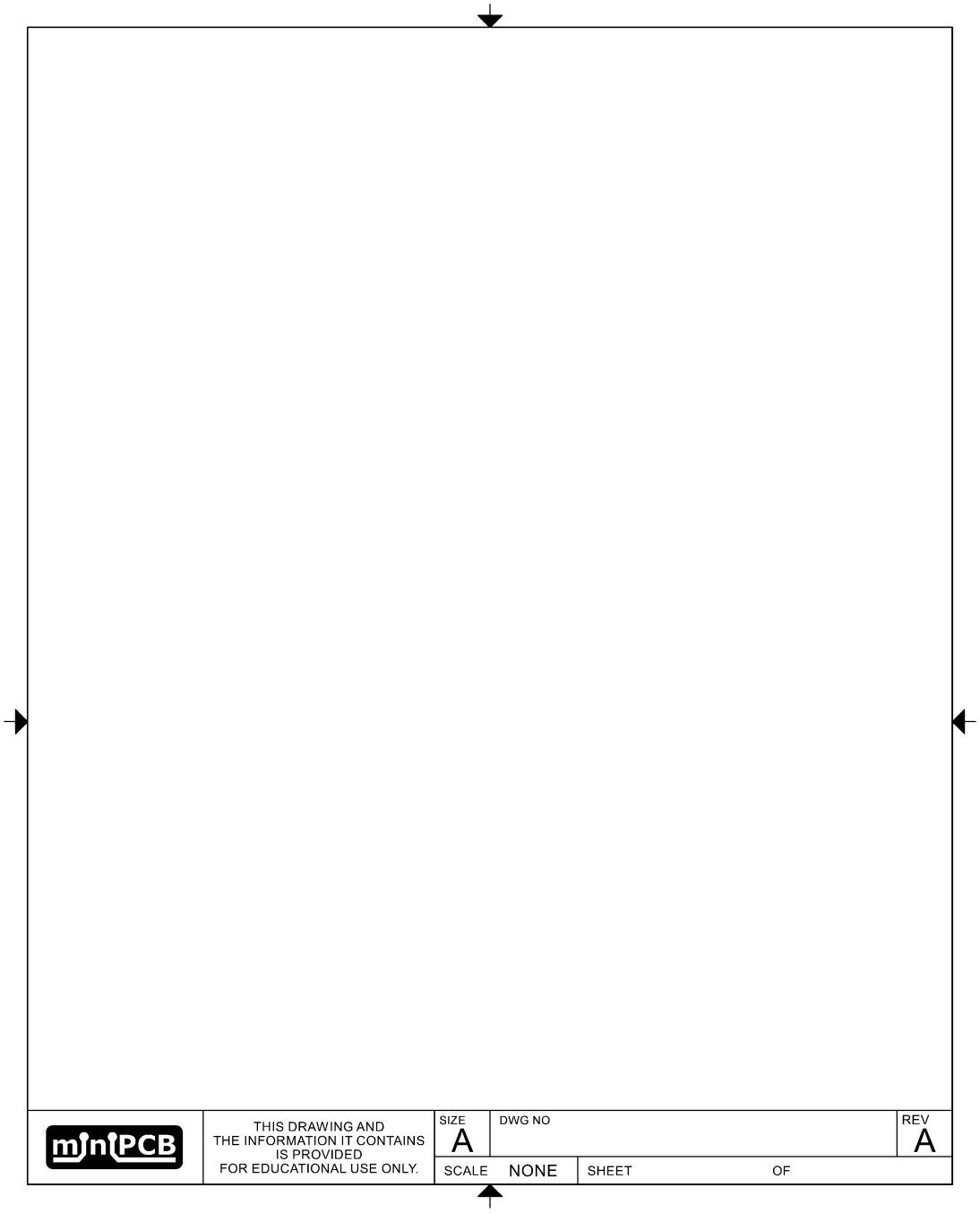

Figure 23 – miniPCB Size A Experimental, Vertical

6.3.3.6. MINIPCB PART SPECIFICATION

Dimensions are in millimeters.

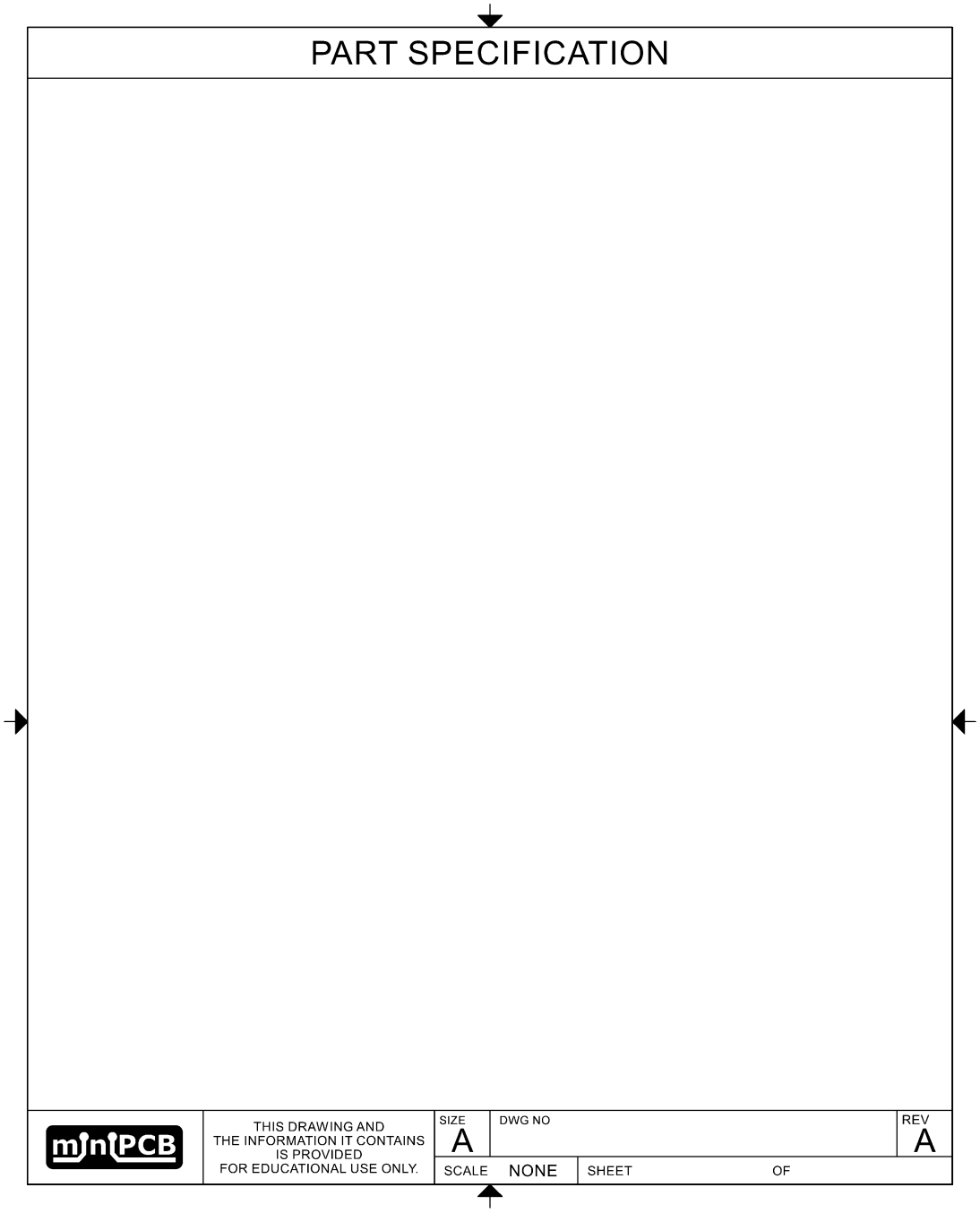

Figure 24 – miniPCB Part Specification

6.3.3.7. MINIPCB SIZE B, HORIZONTAL

Dimensions are in millimeters.

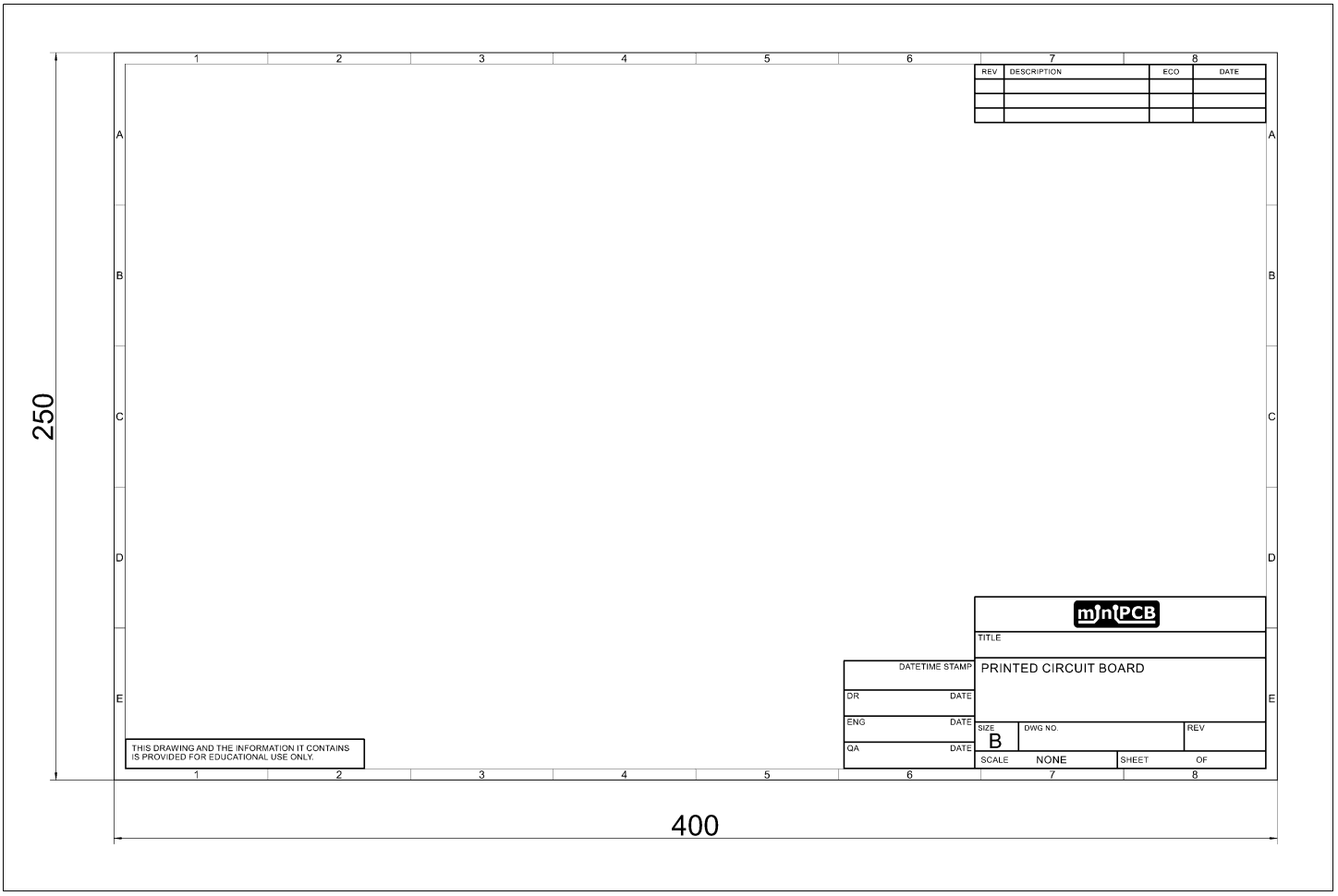

Figure 25 – miniPCB Size B, Horizontal

6.3.3.8. MINIPCB SIZE B CONTINUED, HORIZONTAL

Dimensions are in millimeters.

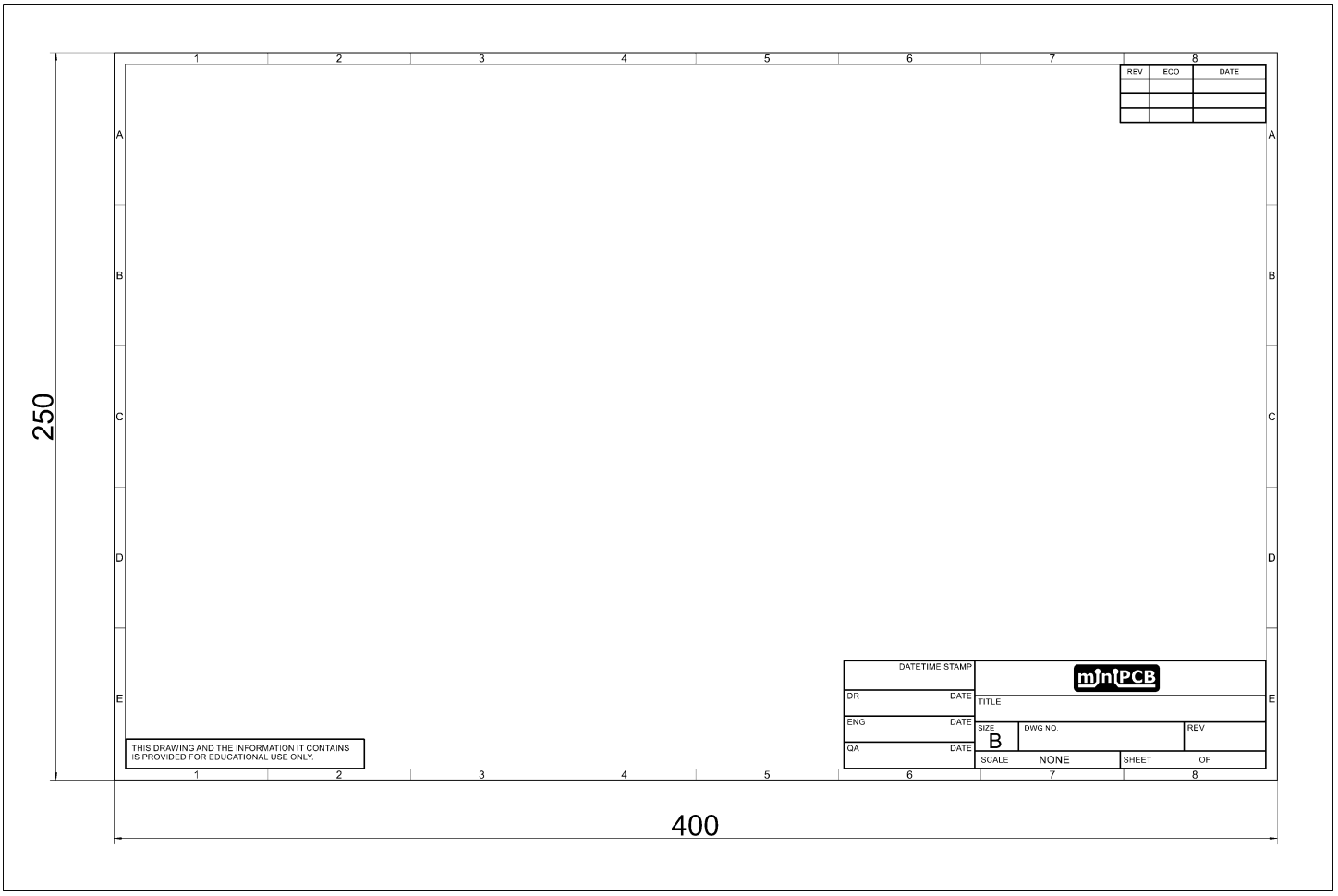

Figure 26 – miniPCB Size B Continued, Horizontal

6.3.4. SYMBOLS

Need to develop EAGLE library parts and place an image of each symbol here.

6.3.5. COMPONENT REFERENCE DESIGNATORS

Use reference designators per this list.

REF. DES.	COMPONENT
A	Gyroscope Computational device such as adder, subtractor, multiplier, divider, integrator, differentiator Sensor device that transduces to electric power
AR	Amplifier Repeater
AT	Attenuator Fixed attenuator Variable attenuator
B	Blower Fan Fan motor
BT	Battery Photovoltaic transducer
C	Capacitor
CB	Circuit breaker Network protector
CP	Connector adaptor Conductor junction
CR	Current regulator
D	Diode Zener diode Photodiode
D or CR	Crystal diode
D or VR	Breakdown-diode (voltage regulator)
DC	Directional coupler
DL	Delay line Delay function
DS	Display device
	THIS CELL INTENTIONALLY BLANK

REF. DES.	COMPONENT
E	Antenna Armature Binding post Carbon block Circuit terminal Conductivity cell Electrolytic cell
EQ	Equalizing network
F	Fuse Fuse breaker
FL	Filter
G	Circuit oscillator Electric generator
H	Hardware such as common fasteners
HP	Hydraulic part
HR	Heater
HS	Handset
HT	Earphone
HW	Human interface device, wearable
HX	Human interface device not described by **HS**, **HT**, or **HW**
J	Plug, stationary portion connector
K	Relay Contactor
L	Inductor Coil Solenoid Winding
LED	Light emitting diode
LS	Audible alarm Buzzer Loudspeaker
M	Meter Oscilloscope Instrument
MG	Electric motor

REF. DES.	COMPONENT
MK	Microphone
MP	Mechanical part Brake Clutch Lock
MT	Measurement transducer Primary detector
P	Plug, movable portion connector
PS	Power supply
Q	Transistor
R	Resistor Potentiometer Shunt
RT	Thermistor Thermal resistor
S	Switch Contactor
T	Transformer
TB	Test block Terminal board
TP	Test point
U	Integrated circuit Photo-isolator
VR	Voltage regulator Voltage regulator integrated circuit Voltage regulator module
W	Cable Wire Conductor Transmission path
WT	Wiring tie point
X	Fuse holder Socket
Y	Crystal oscillator Crystal resonator

6.4. DATASHEETS

6.4.1. BOARD VIEWS

Include board views of the top and bottom sides. If test points are present, include dimensions to each test point.

6.4.2. CONNECTOR PINMAPS

For each connector, include a pinmap table similar to this:

Table 6 – Exemplar Pinmap Table

PIN	PIN NAME	FUNCTION	NOTE
1	GND	Ground	
2	+V	DC Supply, Positive	Limited by component ratings
3	NC	No Connect	
4	AI+	Analog input	AC coupled
5	AO+	Analog output	DC coupled

6.4.3. COMPONENT PINOUTS

For components with pinouts that need to be known during component selection, include a pinout table similar to this:

Table 7 – Exemplar Pinout Table

PIN	PIN NAME	FOOTPRINT (TOP VIEW)
1		
2		
3		
4		
5		
6		
7		
8		

6.4.4. PARTS LIST

Include a parts list table similar to this:

Table 8 – Exemplar Parts List

FIND	REF. DES.	COMPONENT	FOOTPRINT	PART VALUE	COMMENTS
1	R1	Resistor	0805		
2	R2	Resistor	0805		
3	R3	Resistor	0805		
4	C1	Capacitor	0805		
5	C2	Capacitor	0805		
6	C3	Capacitor	0805		
7	Q1	Transistor	SOT-23		Pinout (123: BEC|GSD)
8	P1	Header Pins	5-pin		

The remainder of this page intentionally blank.

7. BOARD FABRICATION

7.1. INTRODUCTION

This section specifies manufacturing options and panels.

7.2. MANUFACTURING OPTIONS

Table 9 – PCB Manufacturing Options

PCB PROPERTY	SETTING
Board Material	FR4 / Tg130
Number of Layers	2
Board Thickness	1.6 mm
PCB Color	Green
Surface Finish	HASL
Copper Weight	1 oz.
Minimum Hole Size	0.3 mm
Trace Width Spacing	6/6 mil

Table 10 – Stencil Manufacturing Options

STENCIL PROPERTY	SETTING
Thickness	0.12 mm
Polishing Technique	Polished

7.3. PANELS

miniPCBs will be panelized so that they are within 100 x 100 mm overall dimensions and can be v-scored.

7.3.1. PCB15-X-05 PANEL

Dimensions are in millimeters.

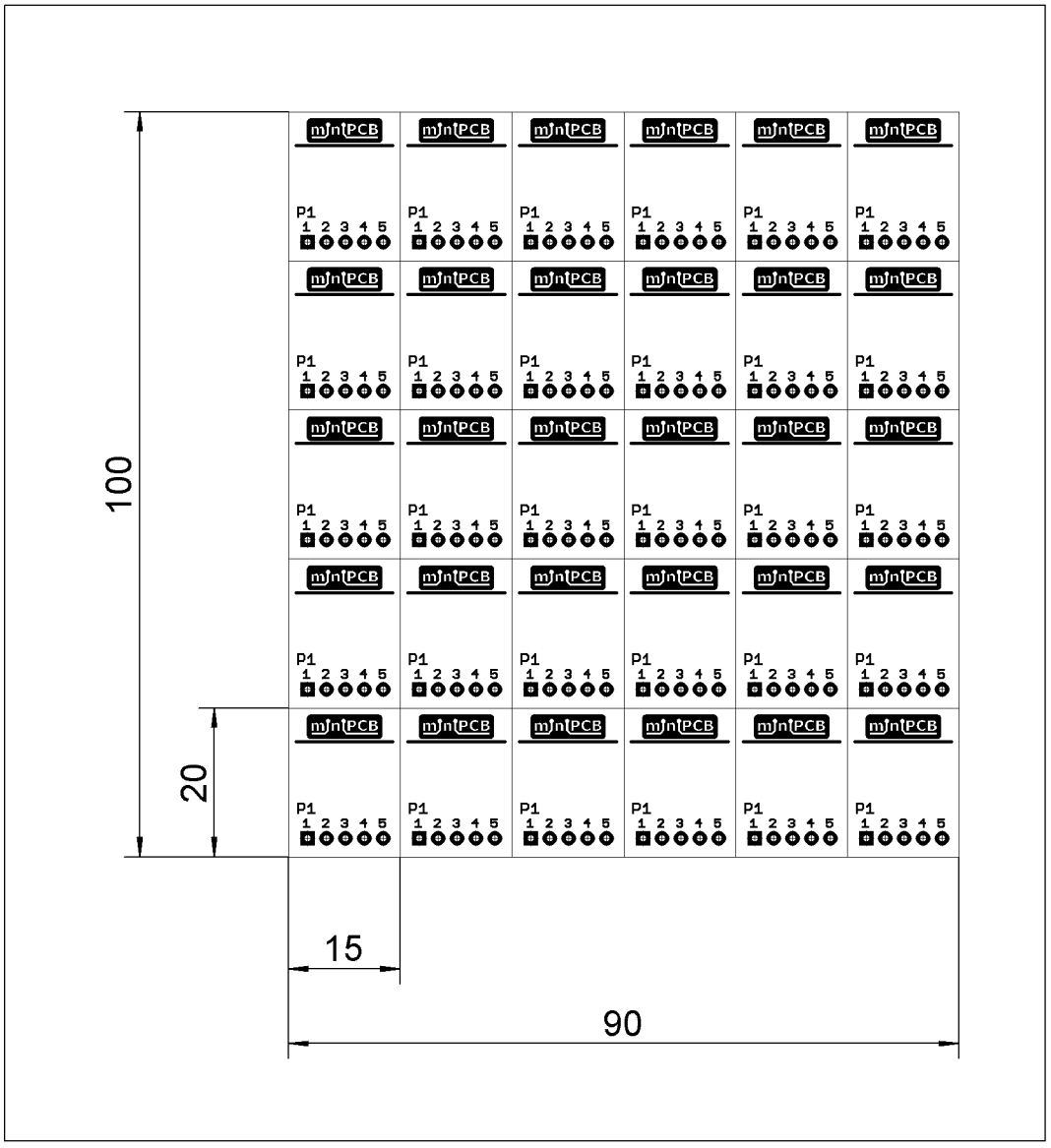

Figure 27 – PCB15-X-05 Panel

7.3.2. PCB20-X-XX PANEL

Dimensions are in millimeters.

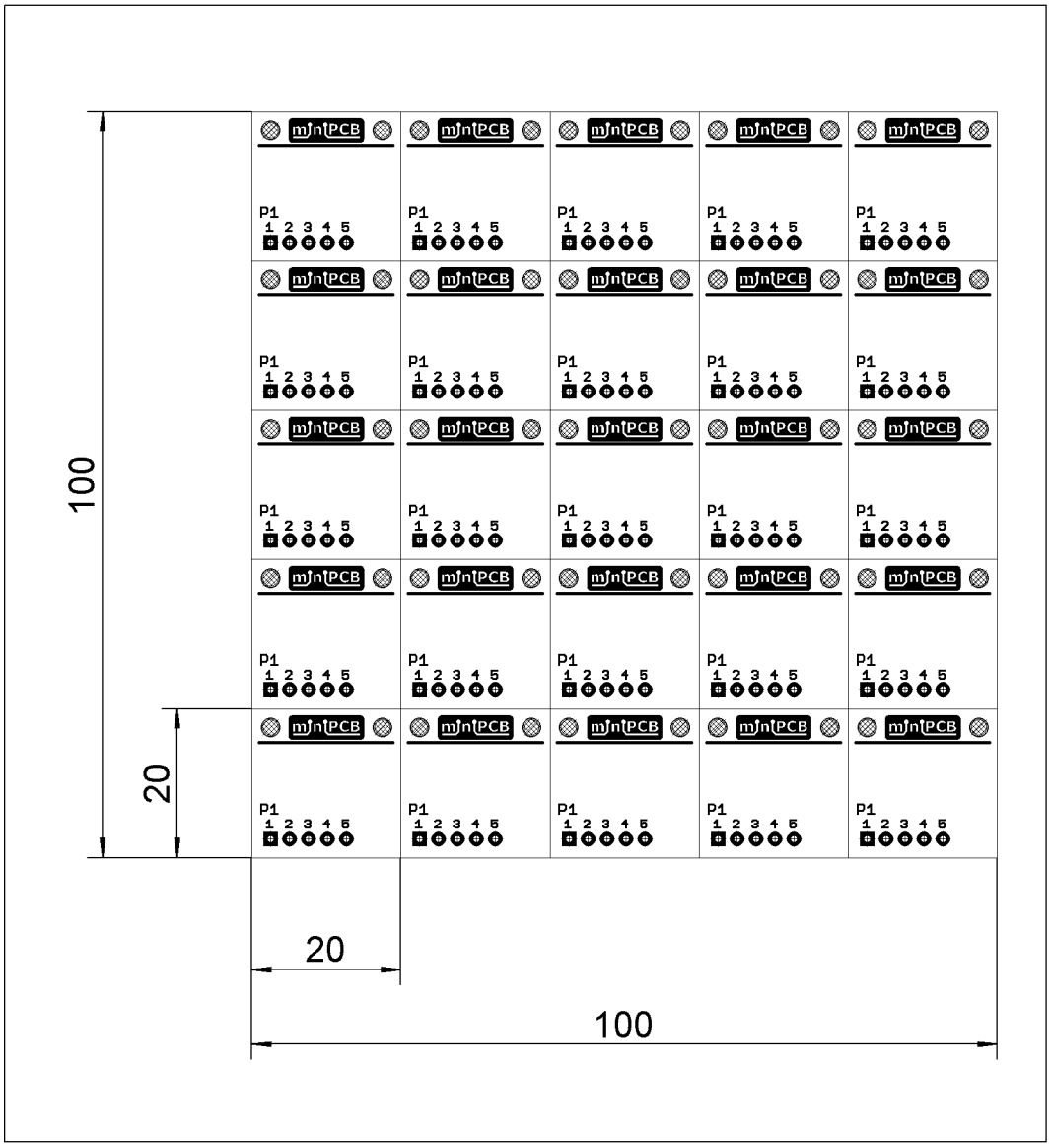

Figure 28 – PCB20-X-05 Panel

7.3.3. PCB25-X-XX PANEL

Dimensions are in millimeters.

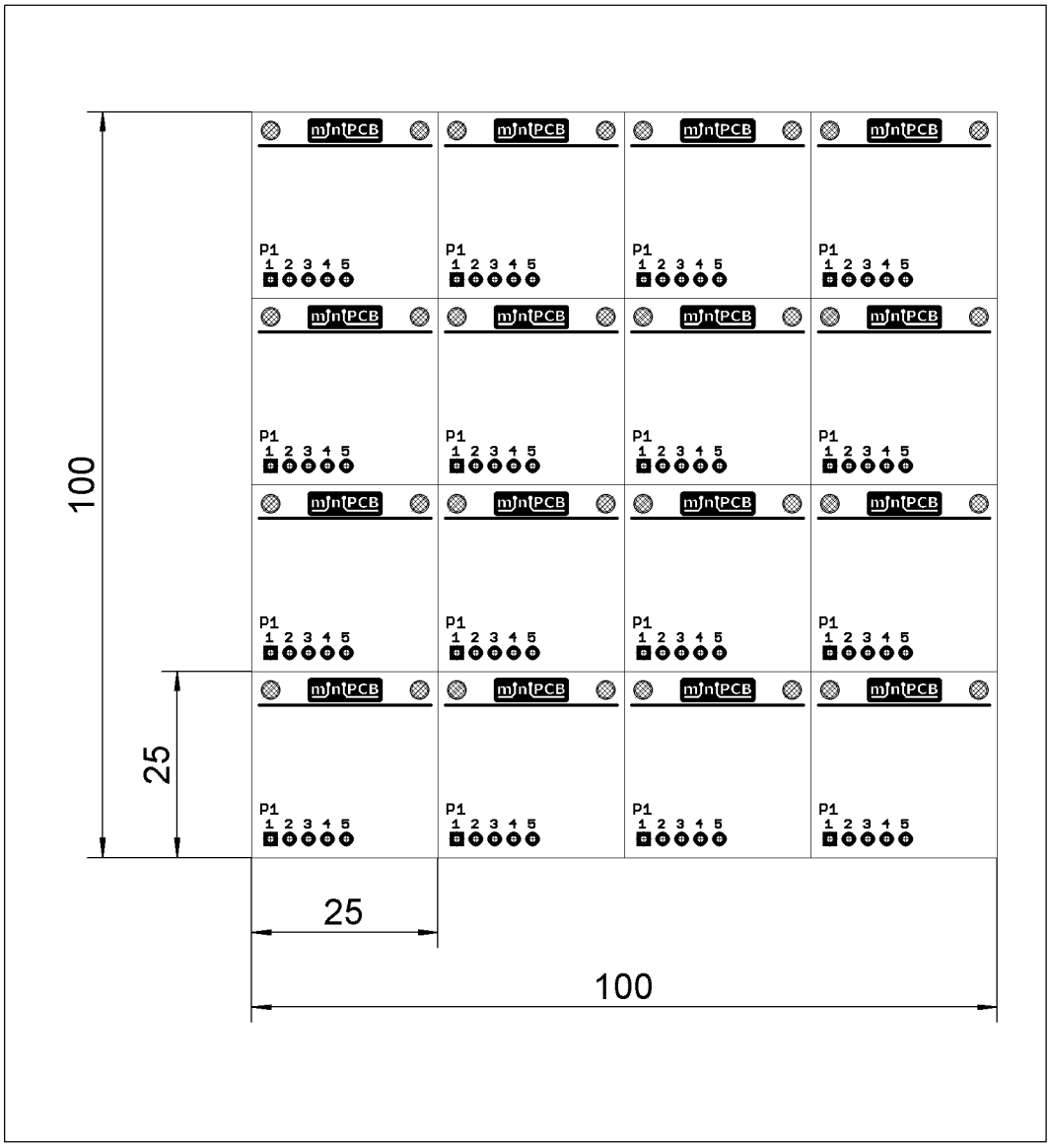

Figure 29 – PCB25-X-05 Panel

7.3.4. PCB33-X-XX PANEL

Dimensions are in millimeters.

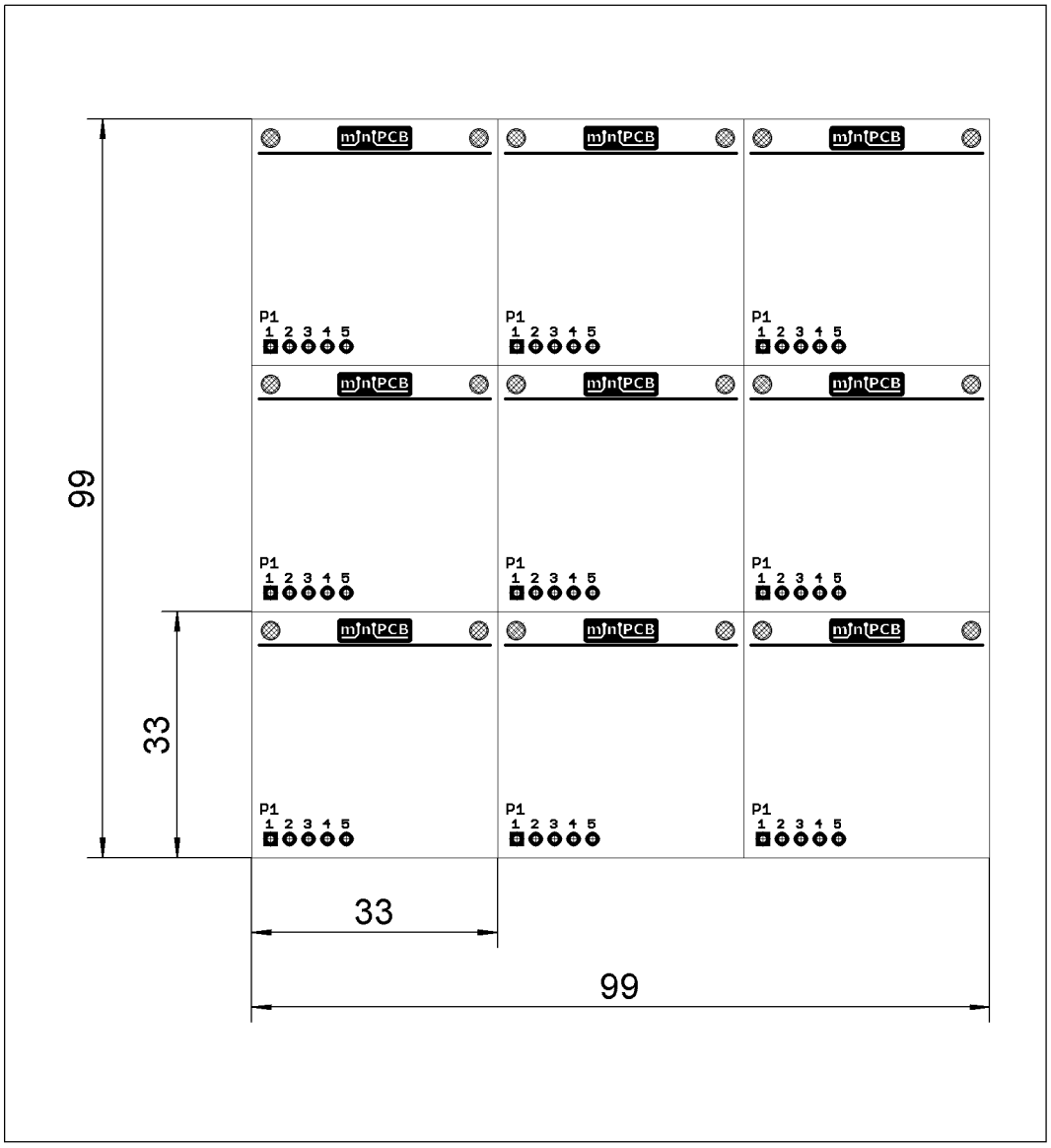

Figure 30 – PCB33-X-05 Panel

7.3.5. PCB50-X-XX PANEL

Dimensions are in millimeters.

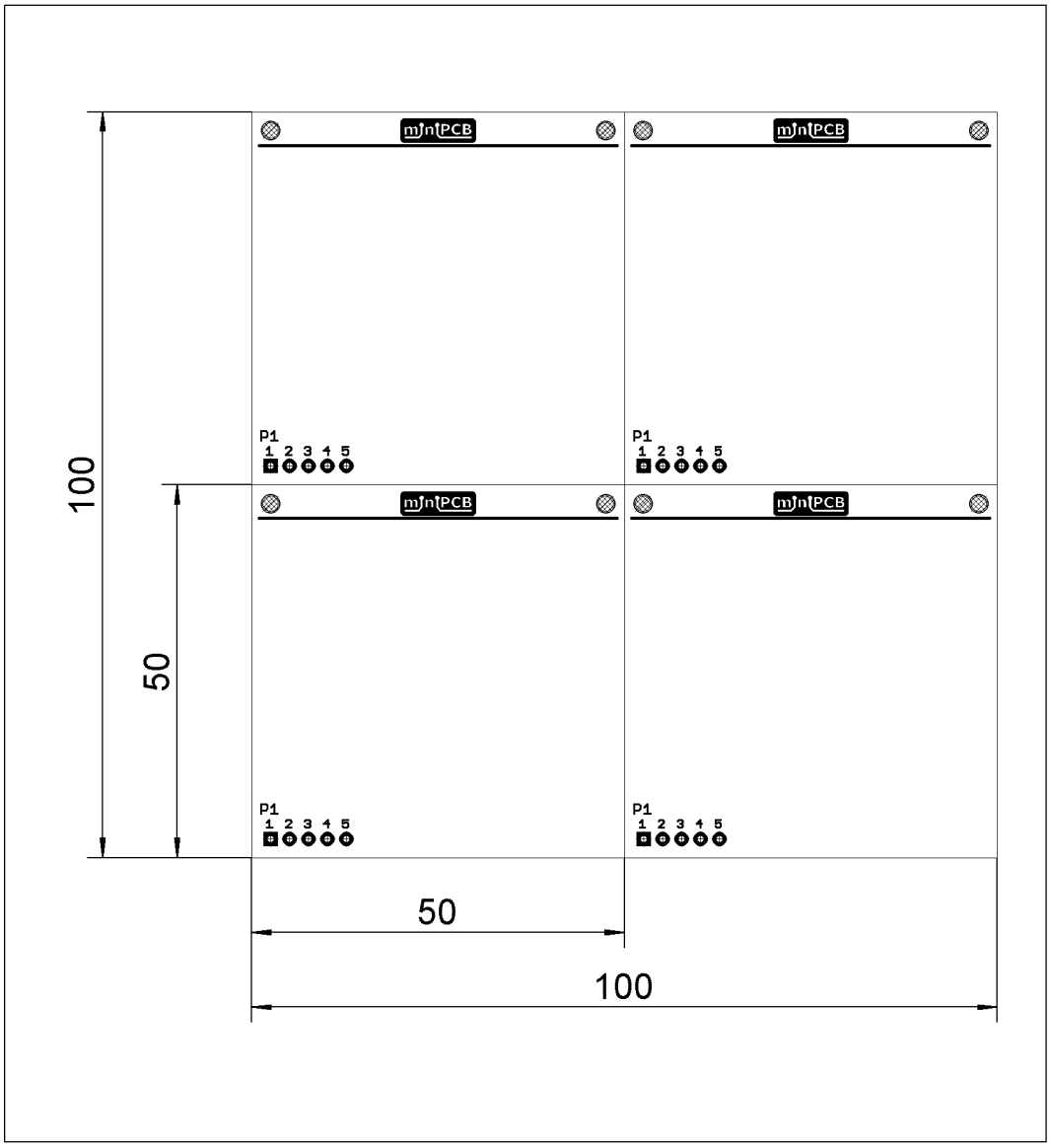

Figure 31 – PCB50-X-05 Panel

7.3.6. IDB20-X-XX PANEL

Dimensions are in millimeters.

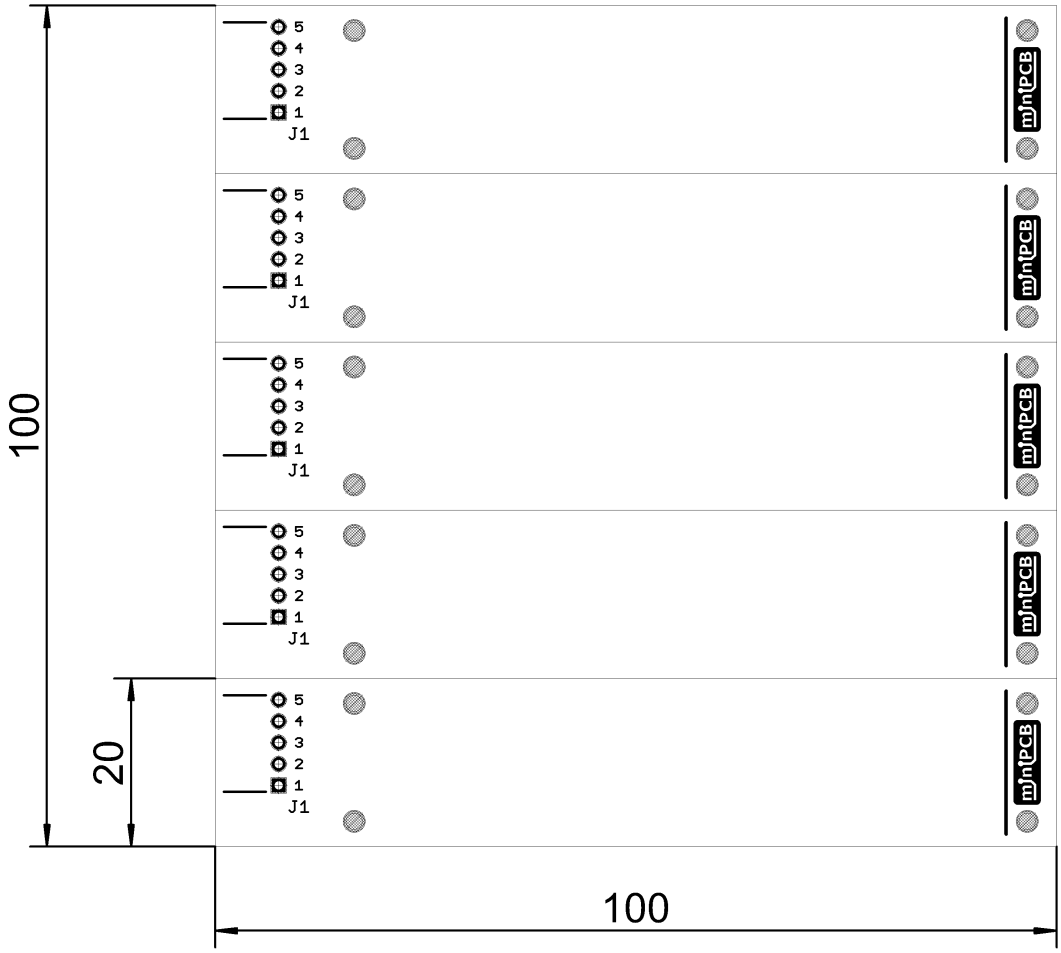

Figure 32 – IDB20-X-05 Panel

7.3.7. IDB25-X-XX PANEL

Dimensions are in millimeters.

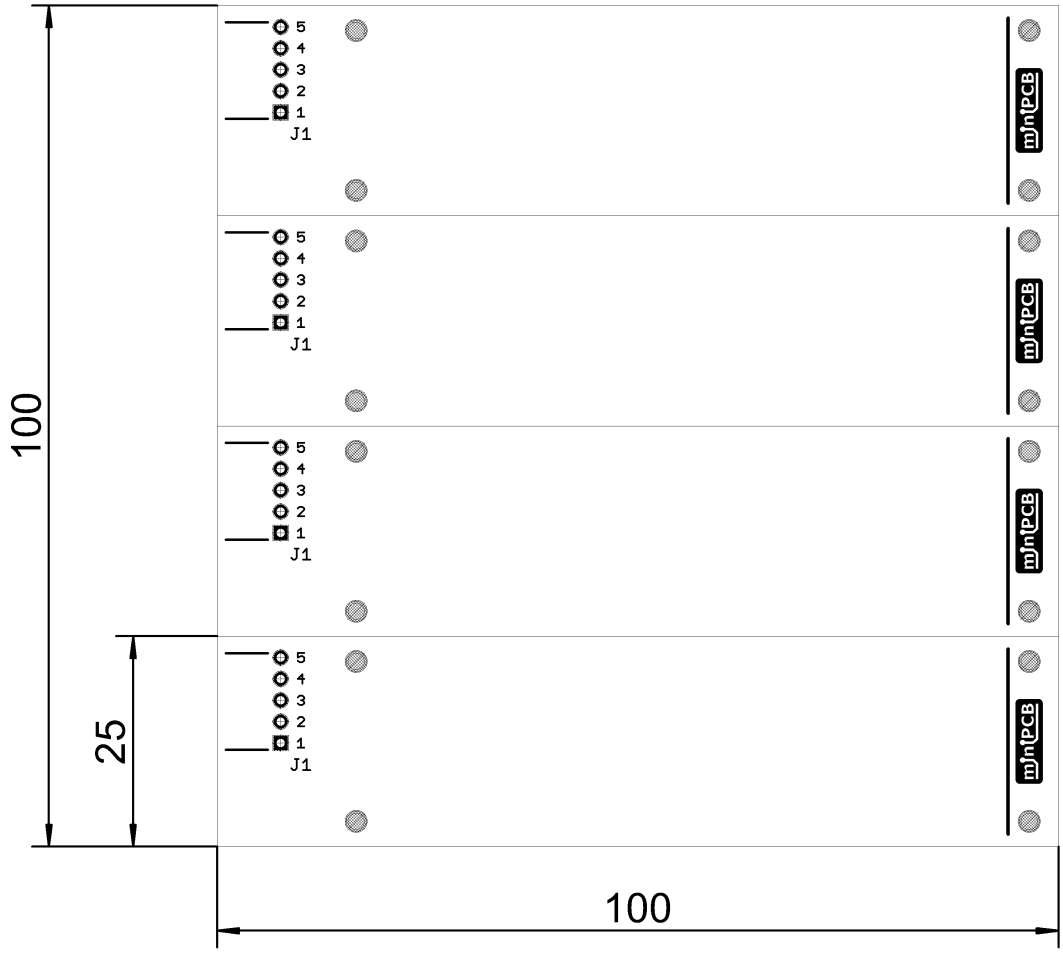

Figure 33 – IDB25-X-05 Panel

8. CHANGE AND LIABILITY NOTICE

This document is subject to change without notice. While effort has been made to ensure the accuracy of the material contained within this document, Nolan Manteufel shall under no circumstances be liable for incidental or consequential damages or related expenses resulting from the use of this document.

9. TRADEMARK NOTICE

miniPCB is a trademark of Nolan Manteufel.

This specification does not constitute permission to use the miniPCB trademark.

WORDMARK	FIGUREMARK	FIGUREMARK
miniPCB™		

10. REVISION HISTORY

REV	DESCRIPTION	ECO	DATE
A	Initial Release	N/A	19AUG2022
B	Added images for BIN, PIN, and IDB panels.	N/A	20AUG2022
C	Added URL to the newly created miniPCB GitHub. Added ENGINEERING DOCUMENTATION section. Added circuit category 12; COMMUNICATION. NEED TO revise IDB panel drawings.	N/A	10NOV2022