
Design Standard



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<https://github.com/miniPCB>

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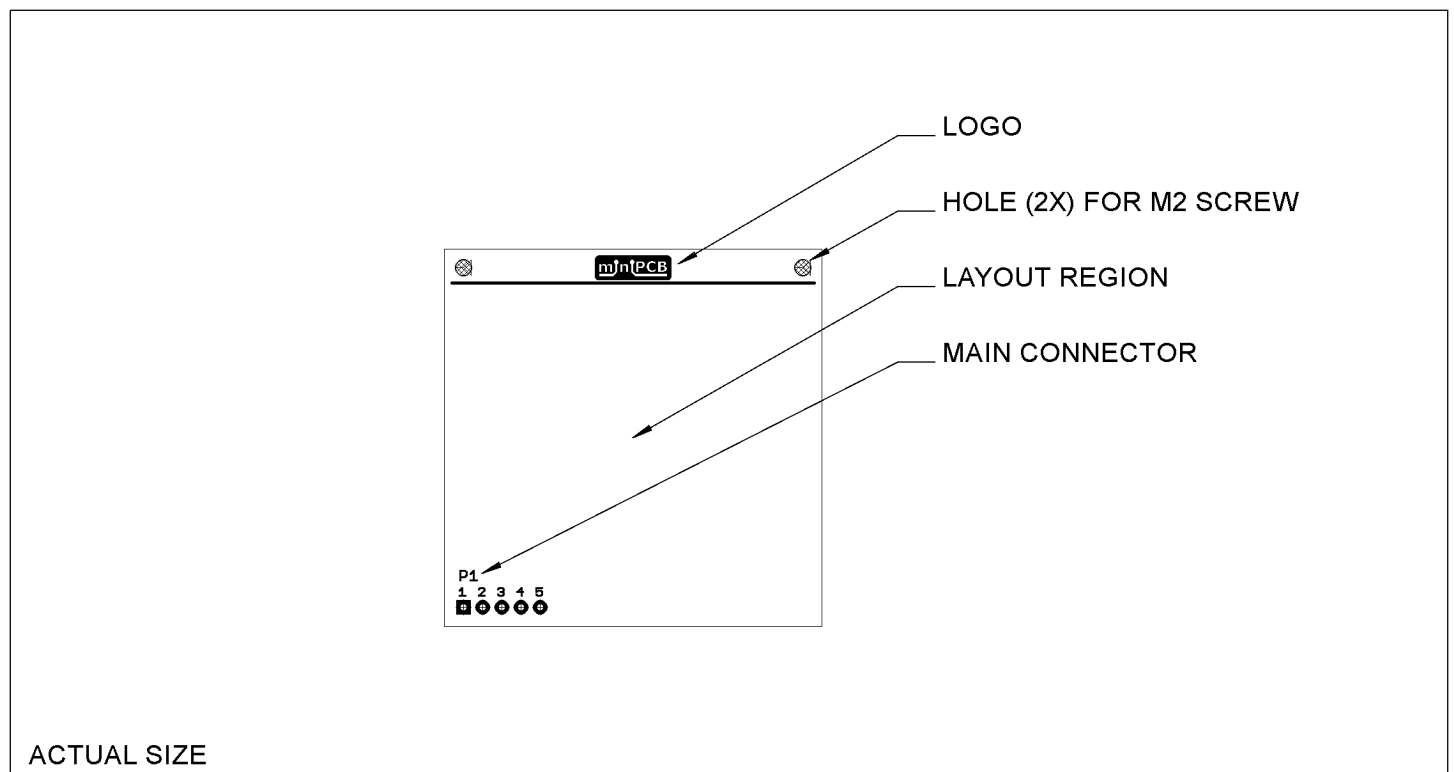
1. INTRODUCTION

This document outlines specifications for compact, modular electronic assemblies that facilitate the use of interchangeable circuit board assemblies, making them particularly well-suited for educational purposes.

2. BOARD DESIGN

2.1. INTRODUCTION

Most boards include a logo, mounting holes, layout region and main connector.



2.2. MAIN CONNECTOR

2.2.1. REFERENCE DESIGNATOR

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

2.2.2. PARTS

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

2.2.3. PINMAPS

The first three pins are dedicated to power and ground. Subsequent pins are consistent with VIVA header pinouts. A pinout table similar to this may be used in datasheet documentation.

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			
5			
6			
7			

The remainder of this page intentionally blank.

2.3. BOARD LAYOUT

2.3.1. REFERENCE DESIGNATORS

Reference designators will be formatted similar to these settings:

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

2.3.2. LAYOUT SPECIFICATIONS

PROPERTY	SMD	THD
Component Placement	Top Side	Top Side
Grid for Component Placement	0.5 mm	0.5 mm
Uncut Ground Plane	Bottom	Top
Trace Side	Top Side	Bottom Side
Trace Width	0.3 mm	0.5 mm
Via Drill Diameter	0.5 mm	0.5 mm
Edge Keepout	1.5 mm	1.5 mm

2.3.3. TEST POINTS

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

2.3.4. 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.

2.3.5. 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

3. PART IDENTIFICATION NUMBER

3.1. 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:

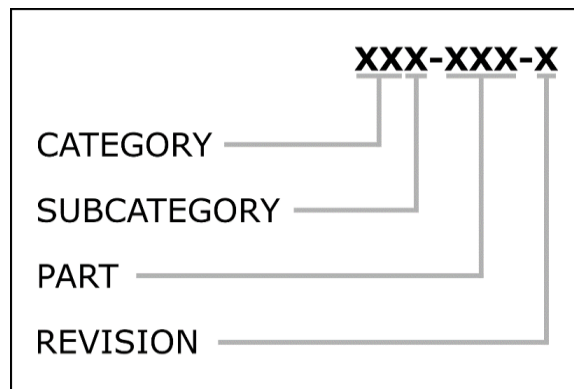


Figure 1 – Part Identification Number

CATEGORY	SUBCATEGORY	PART	REVISION
per Section 3.2.1	per Section 3.2.2	per Section 3.2.2.15	per Section 3.2.4

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3.2. PIN CLASSIFICATIONS

3.2.1. CATEGORY

Categories are identified by two (2) digits.

CLASSIFICATION ID	TITLE	DESCRIPTION
00X-XXX	Test Boards	PCBs that enable electronic test setups
01X-XXX	Components	PCBs that enable component test setups
02X-XXX	Sensors	PCBs with layouts of sensing circuits
03X-XXX	Actuators	PCBs with layouts of actuator circuits
04X-XXX	Amplifiers	PCBs with layouts of amplifier circuits
05X-XXX	Filters	PCBs with layouts of filter circuits
06X-XXX	Oscillators	PCBs with layouts of oscillators
07X-XXX	Radio	PCBs with layouts of radio frequency circuits
08X-XXX	Signal Converters	PCBs with layouts of signal converter circuits
09X-XXX	Power	PCBs with layouts of power circuits
10X-XXX	Digital	PCBs with layouts of digital circuits
11X-XXX	Computing	PCBs with layouts of computer circuits
12X-XXX	Communication	PCBs with layouts of communication circuits
13X-XXX	Games	PCBs with layouts for game circuits
14X-XXX	Home Automation	
15X-XXX	Wearables	

3.2.2. 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.

3.2.2.1. TEST BOARDS, 00

- 00A; Probe and prototyping
- 00B; Test device and setup boards
- 00C; Signal Data

3.2.2.2. COMPONENTS, 01

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

3.2.2.3. SENSORS, 02

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

3.2.2.4. ACTUATORS, 03

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

3.2.2.5. AMPLIFIERS, 04

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

3.2.2.6. FILTERS, 05

- 05A; Passive
- 05B; Active

3.2.2.7. OSCILLATORS, 06

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

3.2.2.8. RADIO, 07

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

3.2.2.9. 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

3.2.2.10. 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

3.2.2.11. DIGITAL, 10

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

3.2.2.12. COMPUTING, 11

- 11A; Educational
- 11B; Developmental
- 11C; Industrial

3.2.2.13. COMMUNICATION, 12

- 12A; Wired
- 12B; Wireless

3.2.2.14. GAMES, 13

- 13A; Luck Games (i.e. chance)
- 13B; Computation Games (i.e. strategy)
- 13C; Empathy Games (i.e. bluffing)

3.2.2.15. HOME AUTOMATION, 14

- 14A; Power
- 14B; Sensors
- 14C; Actuators

3.2.2.16. WEARABLES, 15

- 15A; Microphones
- 15B; Bio sensors

3.2.3. PART

Each circuit is allotted five (5) sequential part numbers, 0-4 or 5-9.

PART NUMBER	LAYOUT	DESCRIPTION
XXX-XX0	THD	Layout uses through hole device components.
XXX-XX1	SMD, 1206	Layout uses 1206 surface mount device components
XXX-XX2	SMD, 0805	Layout uses 0805 surface mount device components
XXX-XX3	SMD, 0402	Layout uses 0402 surface mount device components
XXX-XX4	RESERVED	Reserved for future use.
XXX-XX5	THD	Layout uses through hole device components.
XXX-XX6	SMD, 1206	Layout uses 1206 surface mount device components
XXX-XX7	SMD, 0805	Layout uses 0805 surface mount device components
XXX-XX8	SMD, 0402	Layout uses 0402 surface mount device components
XXX-XX9	RESERVED	Reserved for future use.

3.2.4. REVISION IDENTIFICATION

Final release revision identification increments A1, A2, A3, etc. for minor revisions, and A1, B1, C1, etc. for major revisions. Prototype revisions increment similar to: A1-01, A1-02, A1-03, etc.

3.2.5. REVISION HISTORY TABLES

A revision history table will be included on schematic engineering drawings.

REV	DESCRIPTION	ECO	DATE
A	INITIAL RELEASE		

Figure 2 – Exemplar Revision History Table

A revision history table will be included in documents.

Table 1 – Exemplar Revision History Table

REV	DESCRIPTION	ECO	DATE
A	Initial Release	###	DDMMYYYY

3.2.6. REVIEW AND APPROVAL

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

3.2.7. ENGINEERING CHANGE ORDERS

ECObase will be used to record engineering change orders.

3.2.8. FILE REPOSITORY

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

3.2.9. PUBLIC DISEMINATION

Engineering files and records will be published to a public GitHub repository owned by Nolan Manteufel.

Table 2 – GitHub Repository

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

3.3. DATASHEETS

3.3.1. BOARD VIEWS

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

3.3.2. CONNECTOR PINMAPS

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

Table 3 – Exemplar Pinmap Table

PIN	PIN NAME	FUNCTION	NOTE
1	GND	Ground	Reference for signal measurements.
2	+V	DC Supply, Positive	Limited by component ratings.
3	-V	DC Supply, Negative	Limited by component ratings.
4			
5			

3.3.3. COMPONENT PINOUTS

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

Table 4 – Exemplar Pinout Table

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

3.3.4. PARTS LIST

Include a parts list table similar to this:

Table 5 – 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		

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4. BOARD FABRICATION

4.1. INTRODUCTION

This section specifies manufacturing options and panels.

4.2. MANUFACTURING OPTIONS

Table 6 – 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 7 – Stencil Manufacturing Options

STENCIL PROPERTY	SETTING
Thickness	0.12 mm
Polishing Technique	Polished

4.3. PANELS

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

5. 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.

6. TRADEMARK NOTICE

miniPCB is a trademark of Nolan Manteufel.

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

WORDMARK	FIGUREMARK	FIGUREMARK
miniPCB™		

7. 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.	N/A	10NOV2022
D	Added miniPCB board designs (e.g. PCB50 and PCB100). Modify pin pitch on P1 connector from 2.54 to 2.5 mm. Added URL to miniPCB Channel on YouTube. Added COMPONENT FOOTPRINTS section. Added circuit category 13; GAMES. Modified circuit category 11; COMPUTING. Added circuit category 14; HOME AUTOMATION. Added circuit category 15; WEARABLES.	N/A	04OCT2023
E	Rewrote introduction. Removed Mechanical and Schematic sections.	N/A	26OCT2023