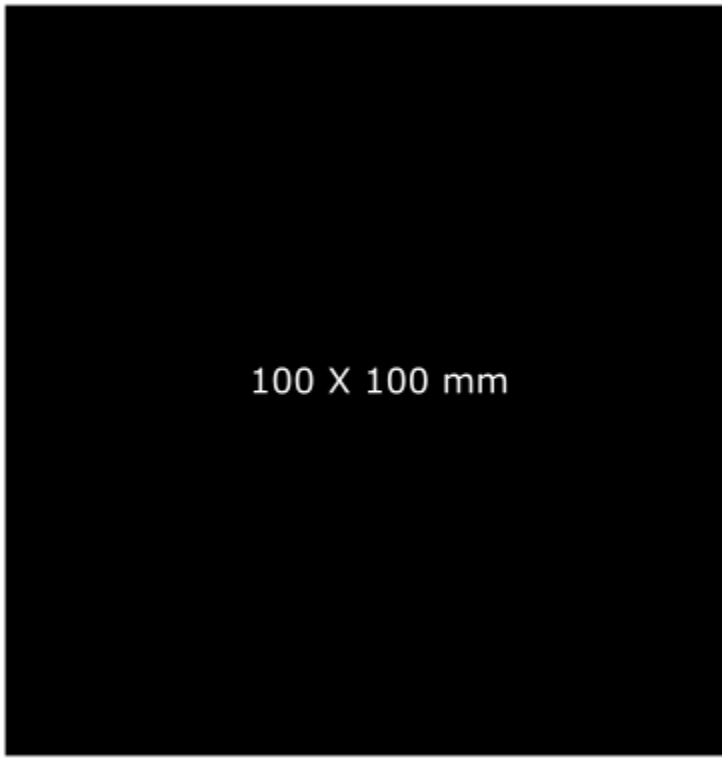
# Common Emitter Amplifier

| | |
|---|---|
| **PART NUMBER** | 04B-005 |
| **GROUP NAME** | Transistor Amplifers (04B) |
| **CIRCUIT NAME** | Common Emitter Amplifier |
| **VARIANT DESCRIPTION** | Single Transistor, Single Supply, THD, Trimmers, Testpoints |
| **BOARD DESIGN** | PCB50-A-05 |
| **PRODUCT DESCRIPTION** | Panel of #04B-005 miniPCBs, v-scored (1 Panel = 4 Pieces) |

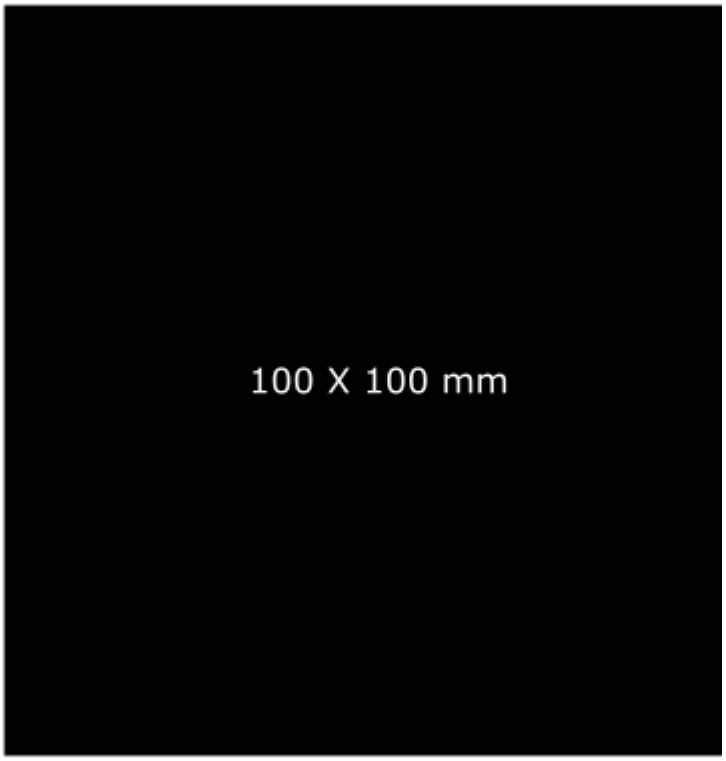
## Circuit Description

This circuit amplifies a small voltage signal.

## Panel Board




TOP VIEW



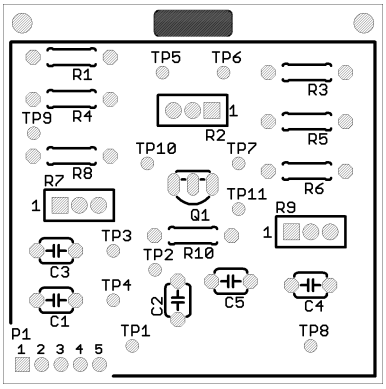

BOTTOM VIEW

## Single Board

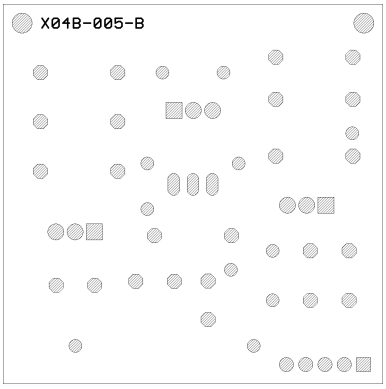

TOP VIEW


BOTTOM VIEW

## Part Locations

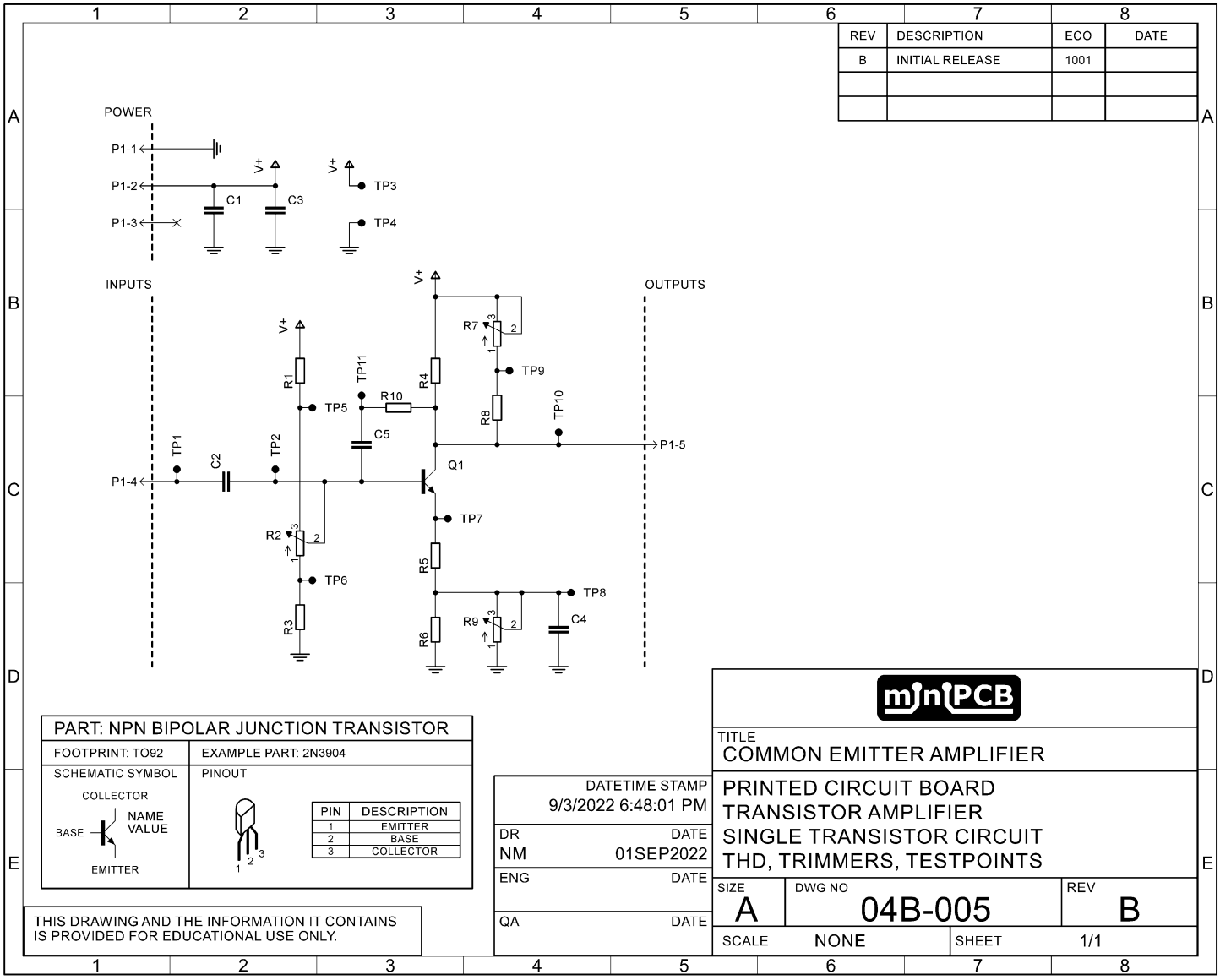



TOP VIEW




BOTTOM VIEW

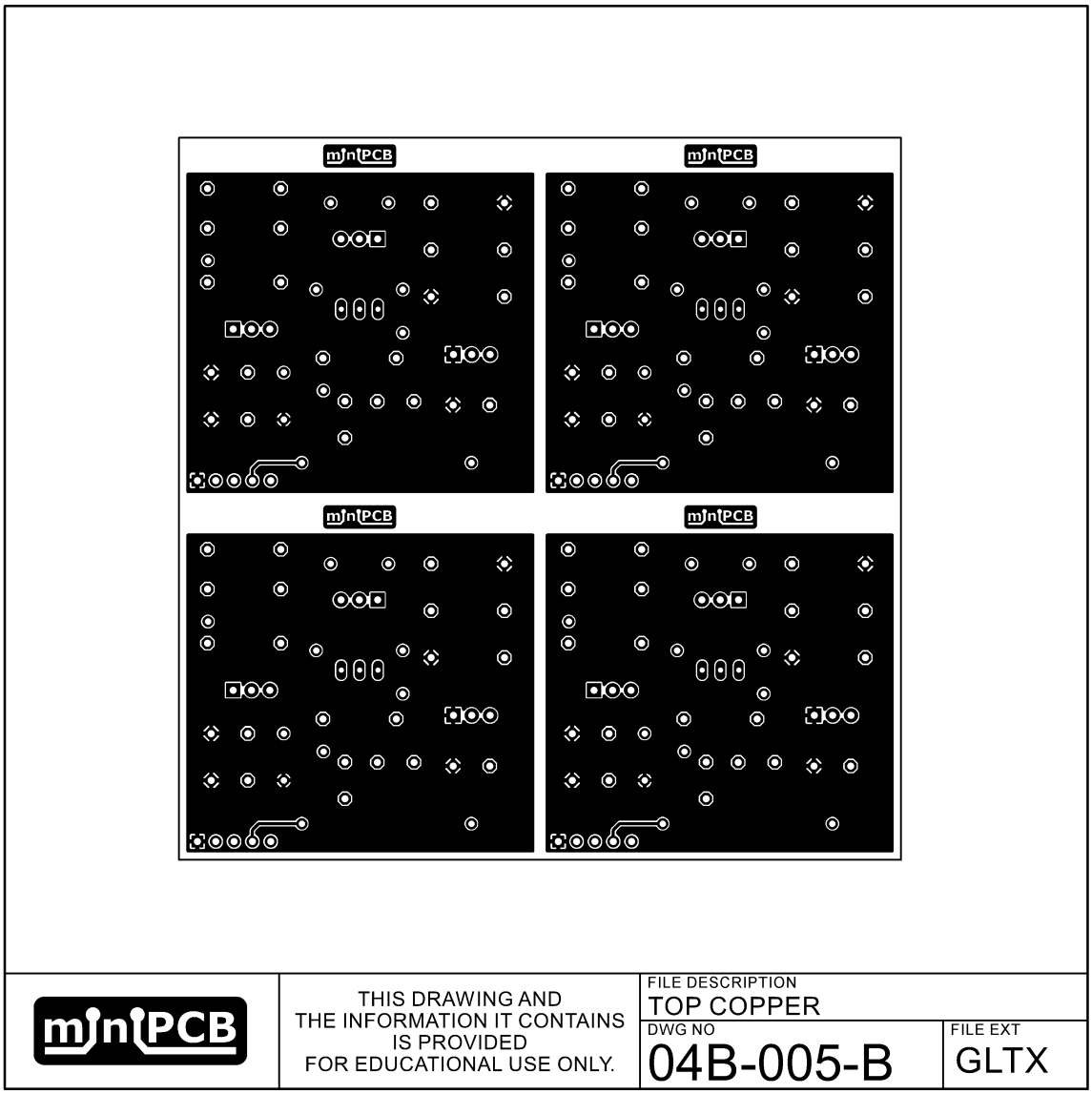
## Schematic


REV | DESCRIPTION | ECO | DATE
B | INITIAL RELEASE | 1001
POWER
P1-1
P1-2
P1-3
V+
C1
C3
TP3
TP4
INPUTS
OUTPUTS
P1-4
P1-5
TP1
C2
TP2
R1
TP5
TP11
R10
C5
R4
R7
TP9
R8
TP10
Q1
R2
TP6
R3
TP7
R5
TP8
R9
C4
R6
PART: NPN BIPOLAR JUNCTION TRANSISTOR
FOOTPRINT: TO92
EXAMPLE PART: 2N3904
SCHEMATIC SYMBOL
COLLECTOR
BASE
NAME
VALUE
EMITTER
PINOUT
PIN | DESCRIPTION
1 | EMITTER
2 | BASE
3 | COLLECTOR
THIS DRAWING AND THE INFORMATION IT CONTAINS IS PROVIDED FOR EDUCATIONAL USE ONLY.
DATETIME STAMP 9/3/2022 6:48:01 PM
DR NM DATE 01SEP2022
ENG DATE
QA DATE
TITLE
COMMON EMITTER AMPLIFIER
PRINTED CIRCUIT BOARD
TRANSISTOR AMPLIFIER
SINGLE TRANSISTOR CIRCUIT
THD, TRIMMERS, TESTPOINTS
SIZE A
DWG NO 04B-005
REV B
SCALE NONE
SHEET 1/1

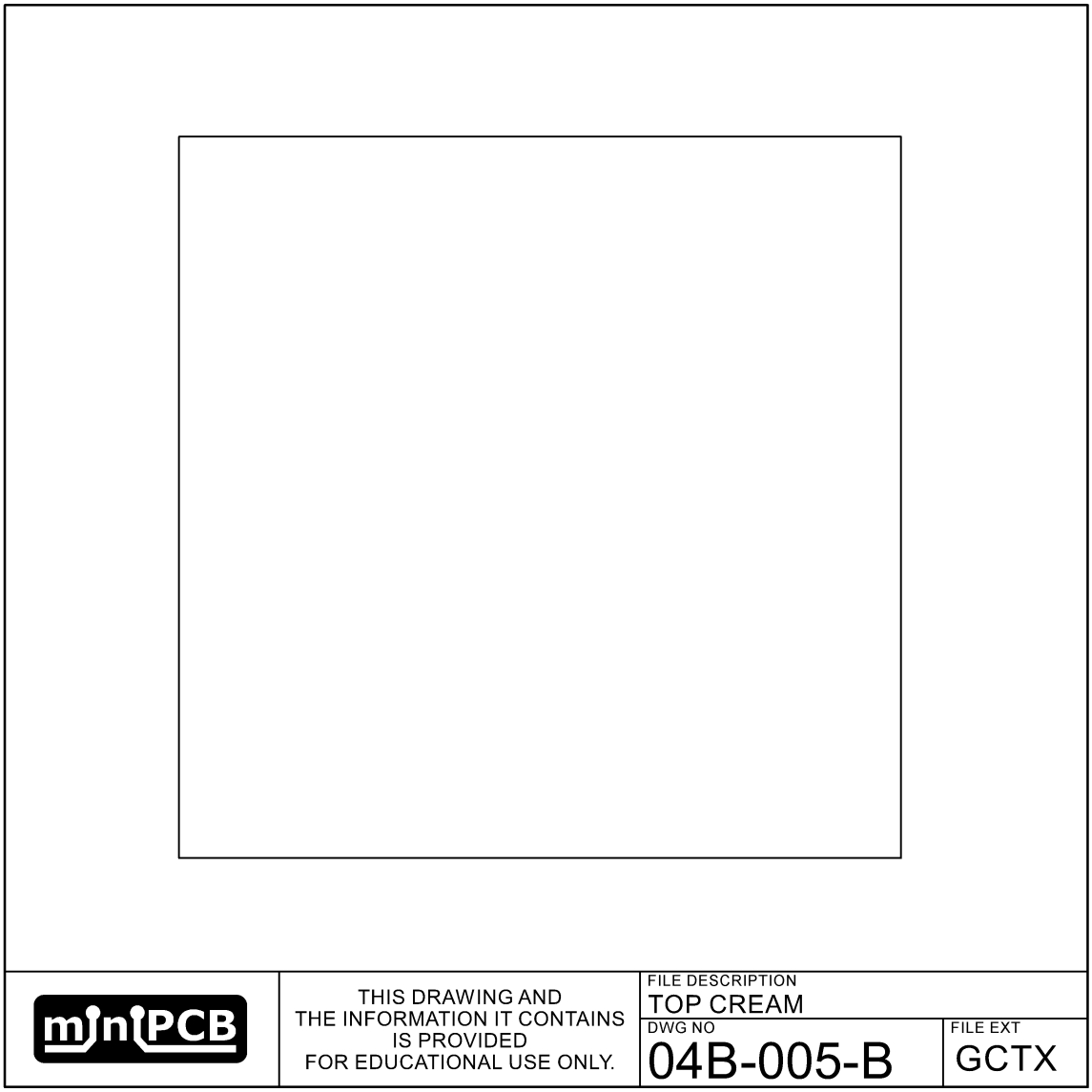
# Gerber Files

This section contains images of the layers included in each Gerber file.

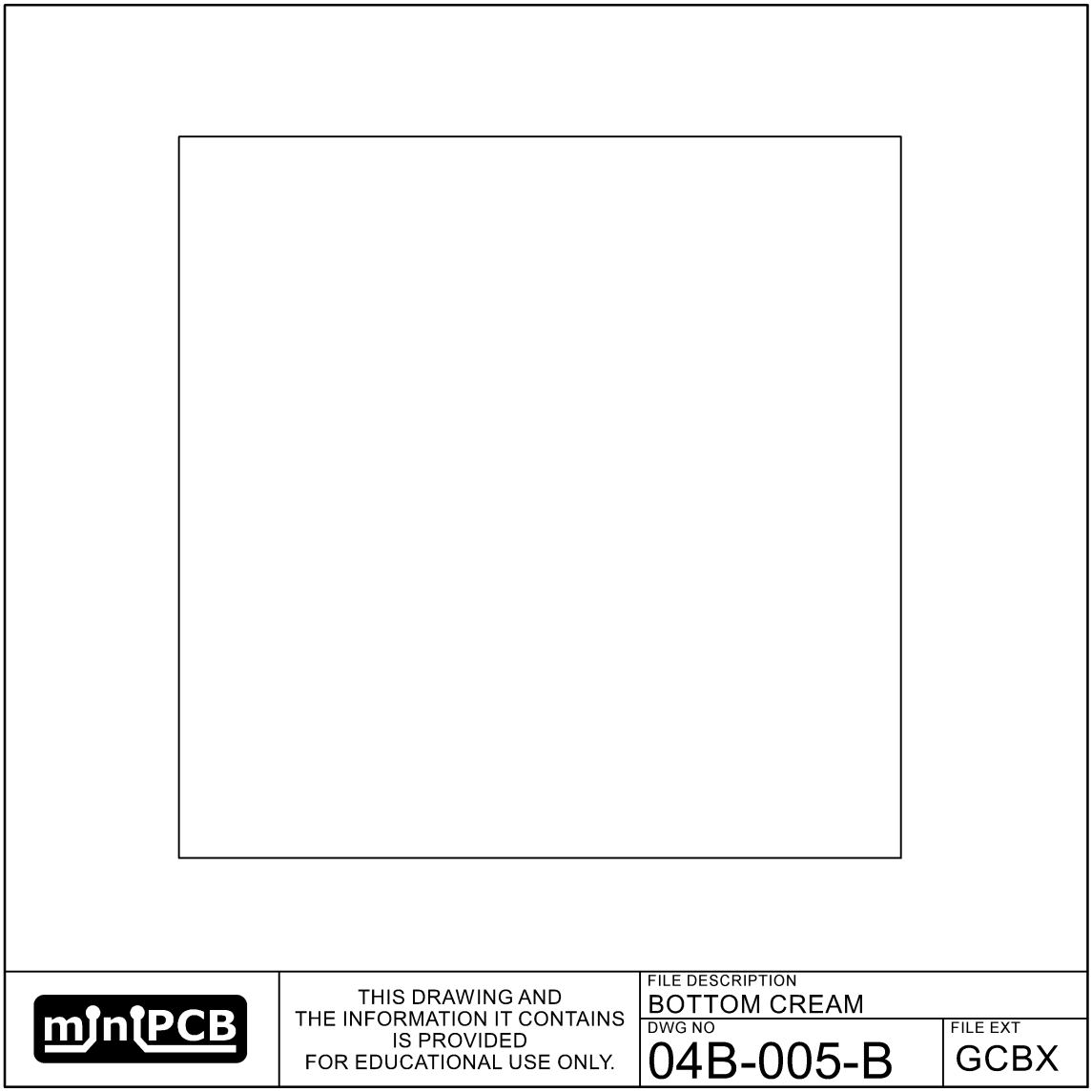
## TOP COPPER (GLTX)



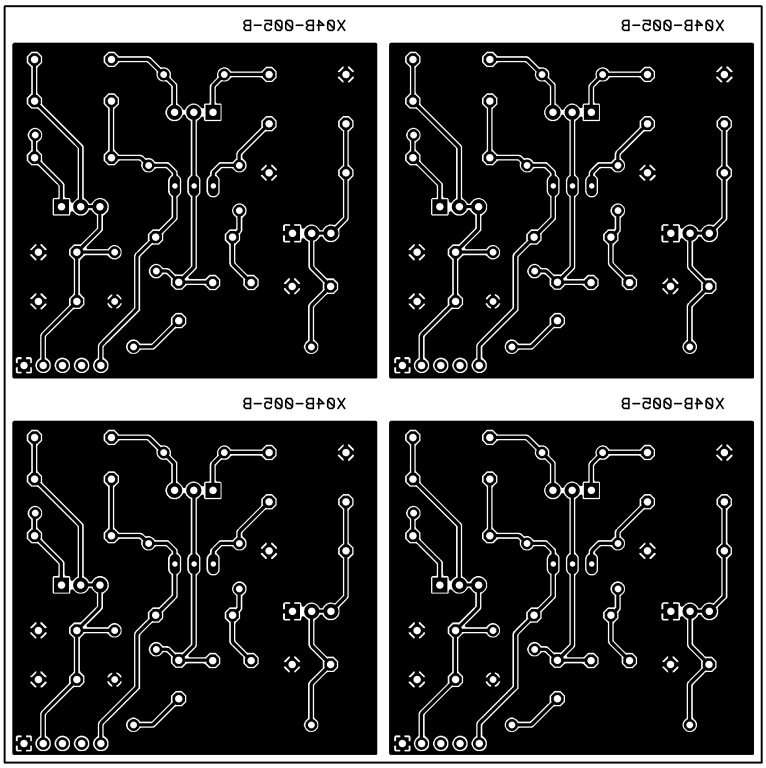
## TOP CREAM (GCTX)



## BOTTOM CREAM (GCBX)

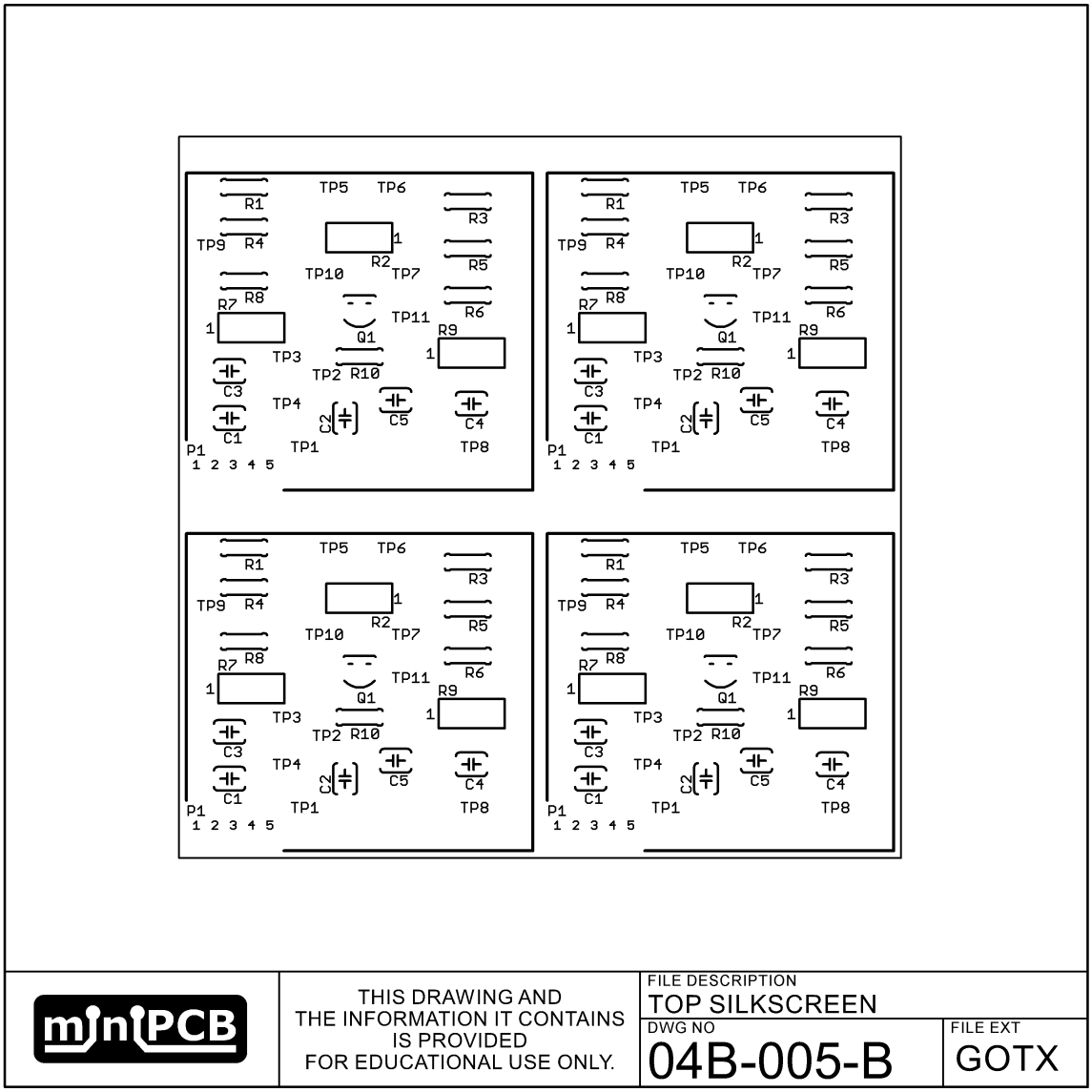


## BOTTOM COPPER (GLBX)

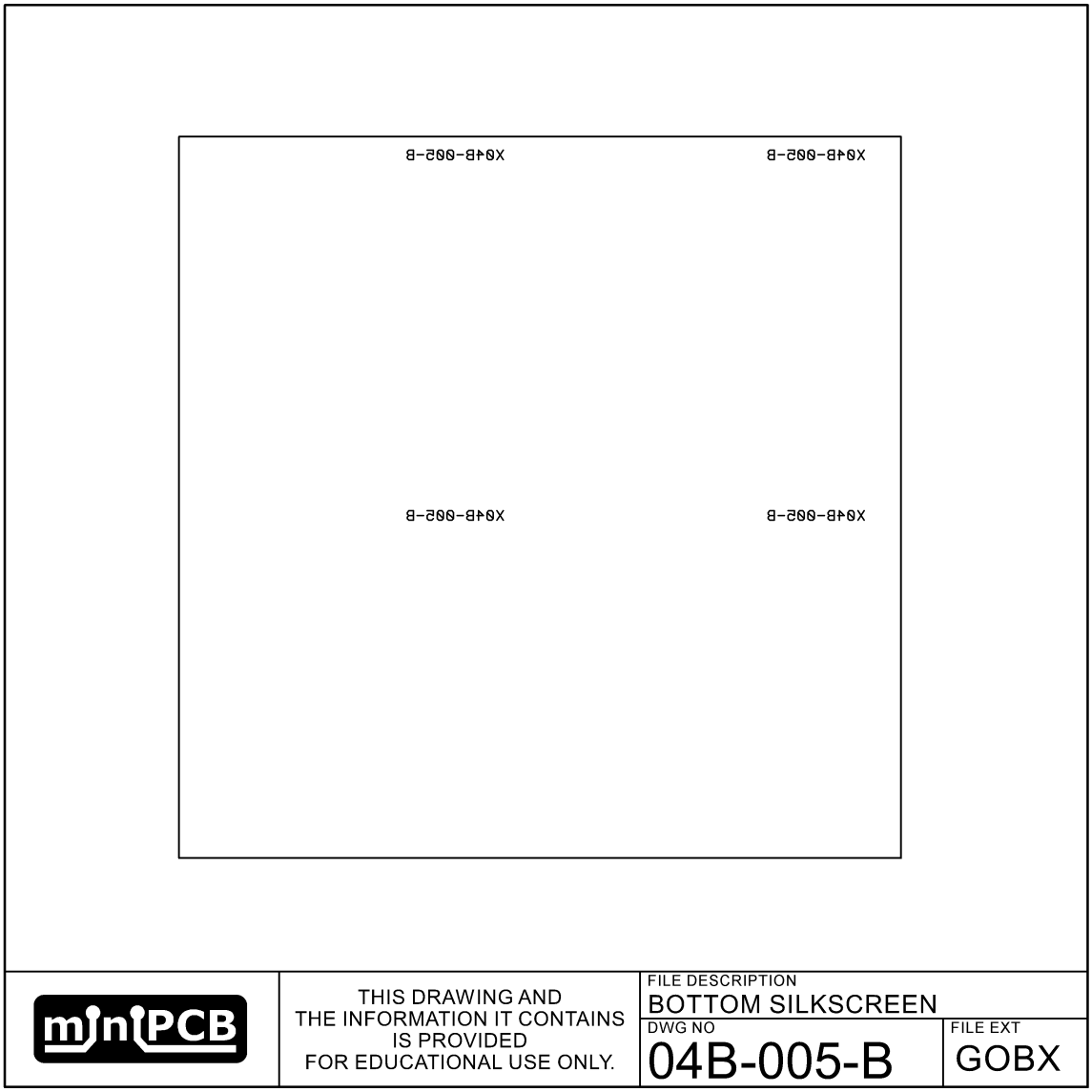


| | | | |
|---|---|---|---|
| | THIS DRAWING AND THE INFORMATION IT CONTAINS IS PROVIDED FOR EDUCATIONAL USE ONLY. | FILE DESCRIPTION: BOTTOM COPPER | |
| | | DWG NO: 04B-005-B | FILE EXT: GLBX |

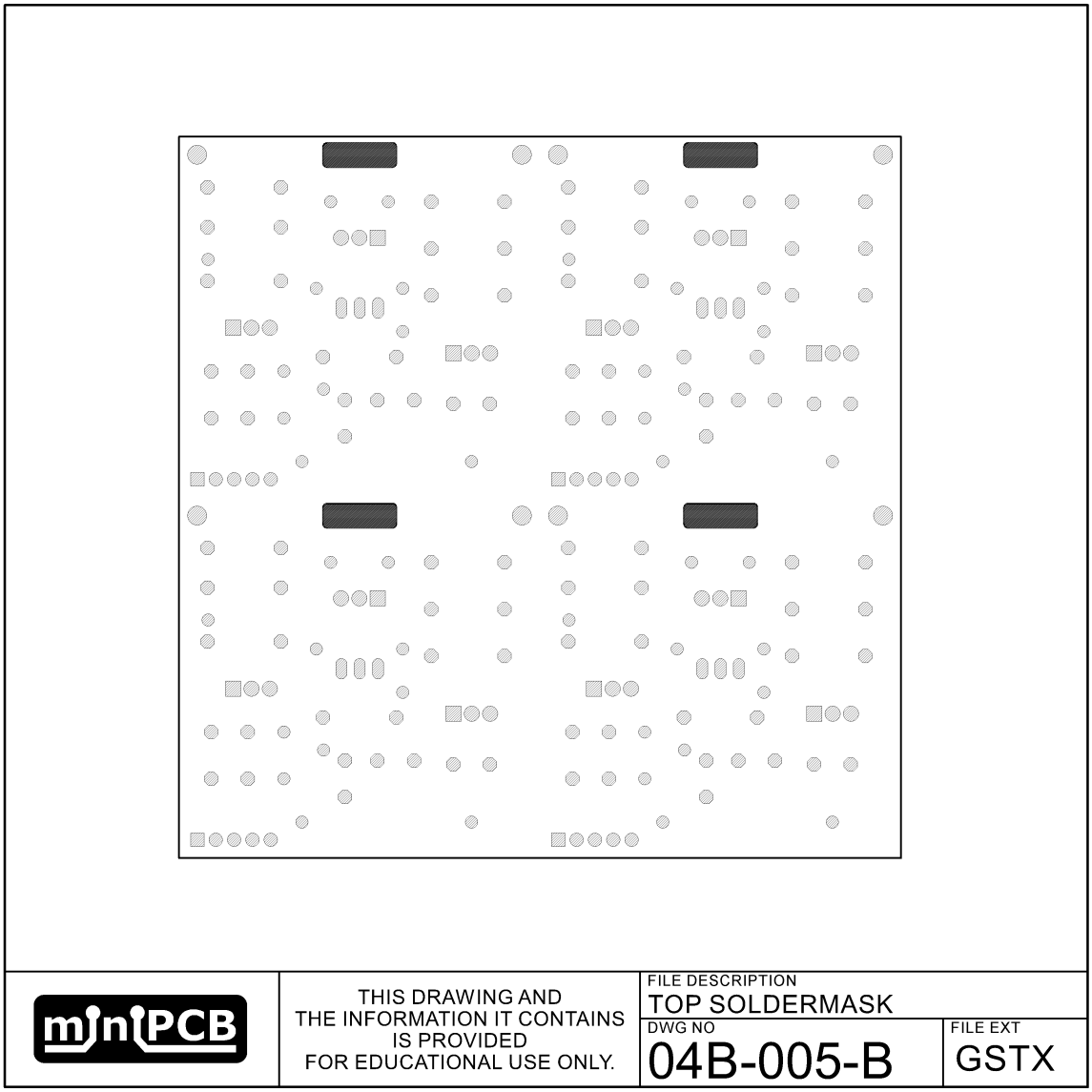
## TOP SILKSCREEN (GOTX)



## BOTTOM SILKSCREEN (GOBX)

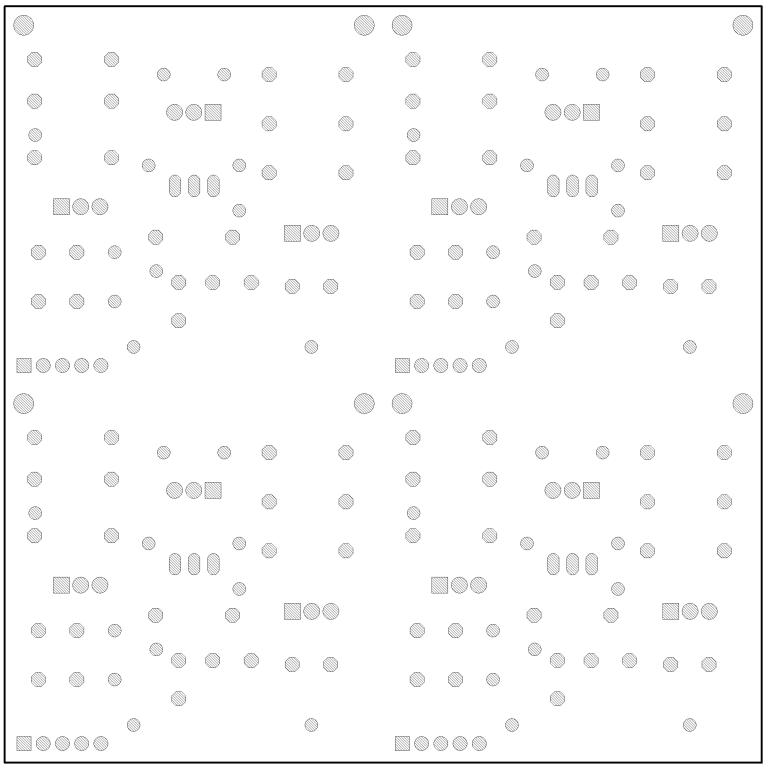


## TOP SOLDERMASK (GSTX)



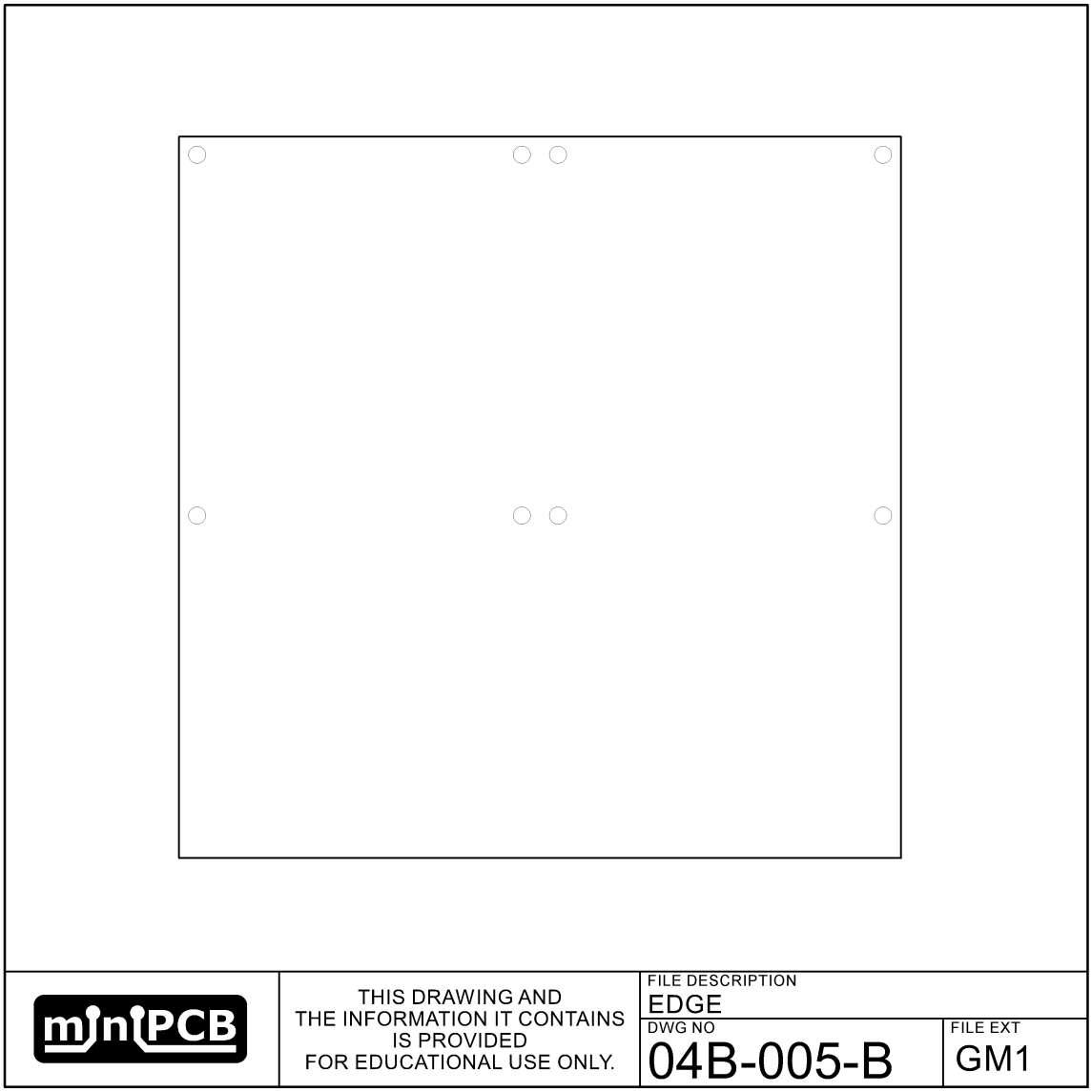
| | | | |
|---|---|---|---|
| miniPCB | THIS DRAWING AND THE INFORMATION IT CONTAINS IS PROVIDED FOR EDUCATIONAL USE ONLY. | FILE DESCRIPTION: TOP SOLDERMASK | |
| | | DWG NO: 04B-005-B | FILE EXT: GSTX |

## BOTTOM SOLDER MASK (GSBX)



| | | | |
|---|---|---|---|
| miniPCB | THIS DRAWING AND THE INFORMATION IT CONTAINS IS PROVIDED FOR EDUCATIONAL USE ONLY. | FILE DESCRIPTION: BOTTOM SOLDERMASK | |
| | | DWG NO: 04B-005-B | FILE EXT: GSBX |

## EDGE (GM1)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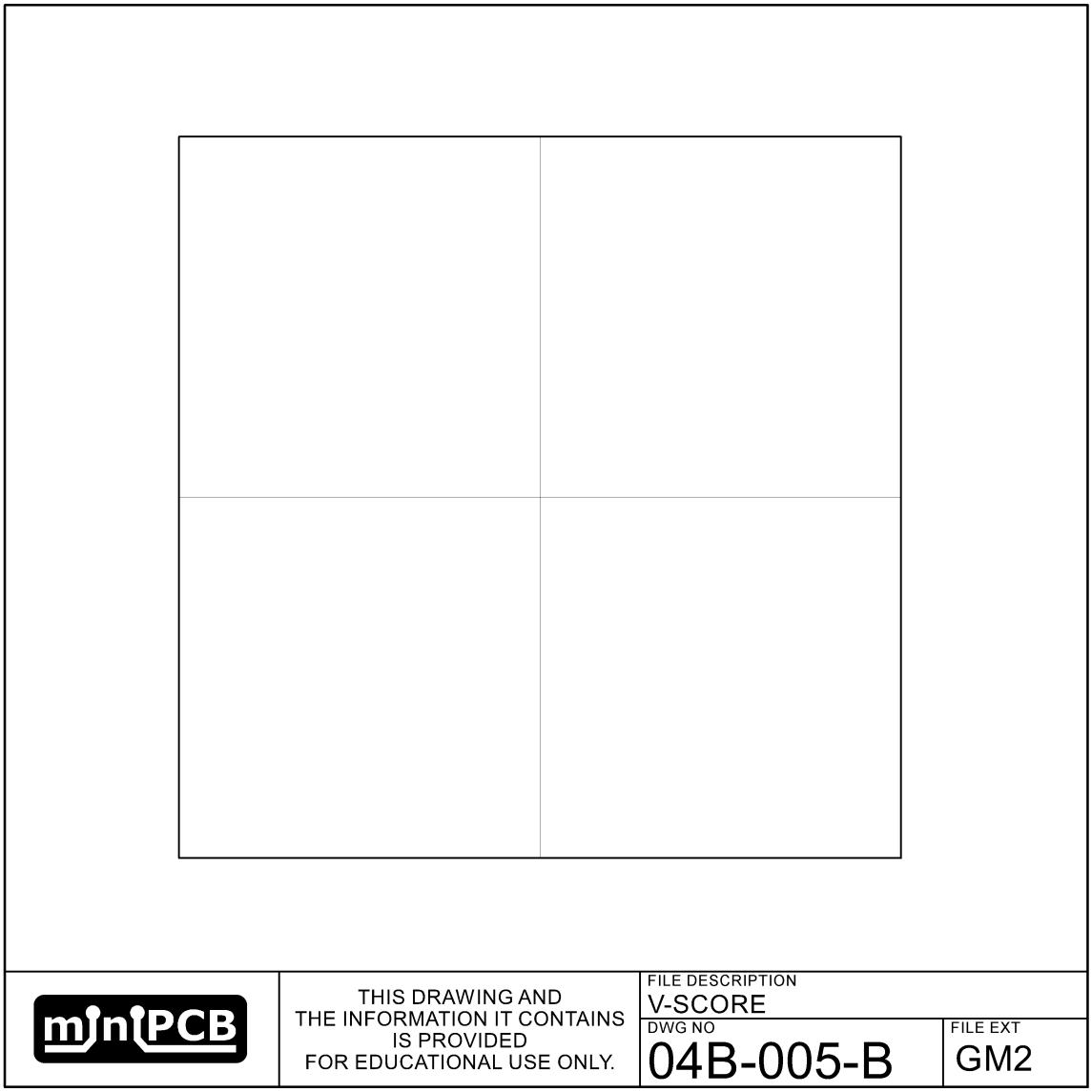
FOR EDUCATIONAL USE ONLY.
FILE DESCRIPTION
EDGE
DWG NO
04B-005-B
FILE EXT
GM1

## VSCORE (GM2)


THIS DRAWING AND
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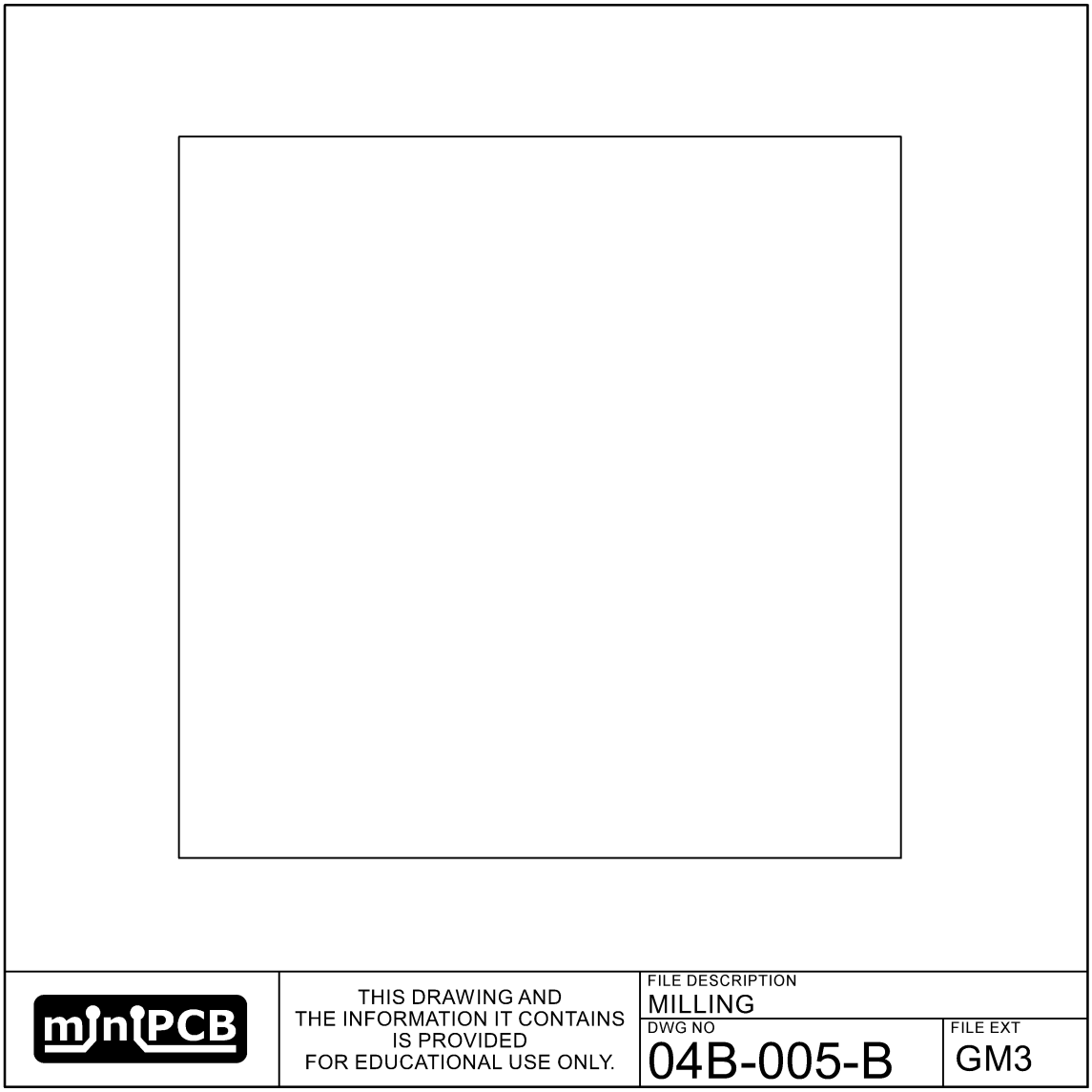
FOR EDUCATIONAL USE ONLY.
FILE DESCRIPTION
V-SCORE
DWG NO
04B-005-B
FILE EXT
GM2

## MILLING (GM3)


THIS DRAWING AND
THE INFORMATION IT CONTAINS
IS PROVIDED
FOR EDUCATIONAL USE ONLY.
FILE DESCRIPTION
MILLING
DWG NO
04B-005-B
FILE EXT
GM3

# Design Inputs

## Design Requirements Form

**POWER REQUIREMENTS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Postive DC Supply | +V | V | | | |
| Negative DC Supply | -V | V | | | |

**STIMULI REQUIREMENTS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Signal Voltage, Peak to Peak | $V_s$ | V | | | |
| Signal Frequency | $f_s$ | Hz | | | |
| Common Mode | $V_{cm}$ | V | | | |
| Source Impedance | $R_s$ | Ω | | | |

**PERFORMANCE CHARACTERISTICS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Quiescient Current | $I_q$ | A | | | |
| Voltage Gain | $A_v$ | V/V | | | |
| Current Gain | $A_i$ | A/A | | | |
| Power Gain | $A_p$ | P/P | | | |
| Input Impedance | $R_i$ | Ω | | | |
| Output Impedance | $R_i$ | Ω | | | |

# Design Outputs

## Parts List Form

| REF DES | PART TYPE | MFG PART NUMBER | PART DESCRIPTION | FIND |
|---|---|---|---|---|
| | | | | 1 |
| | | | | 2 |
| | | | | 3 |
| | | | | 4 |
| | | | | 5 |
| | | | | 6 |
| | | | | 7 |
| | | | | 8 |
| | | | | 9 |
| | | | | 10 |
| | | | | 11 |

# Testing Plans

## Developmental Testing

1. Plan each calibration and service test.
2. Predict expected values for each test measurement.
3. Determine if expected values satisfy design requirements.
4. Assemble a prototype that is representative of what might be the final design.
5. Perform the calibration and service testing plans.
6. Determine if the design outputs satisfy design requirements.

## Calibration and Service Testing

1. With power off, measure resistances between each pin.
2. If measured resistances are not as expected, end testing fail, components need to be replaced.
3. With power on, measure voltages at each pin.
4. If measured voltages are not as expected, end testing fail, components need to be replaced.
5. With power on, adjust potentiometer PX such that the voltage at test point TPX is ##.
6. If measured voltages cannot be adjusted to an expected value, end testing fail, components need to be replaced.
7. With power on, apply stimuli and measure outputs.
8. If measured output signals are not as expected, end testing fail, components need to be replaced.
9. If measured output signals are as expected, end testing pass.-

# Design Example

## Design Inputs

**POWER REQUIREMENTS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Postive DC Supply | +V | V | 4.9 | 5 | 5.1 |
| Negative DC Supply | -V | V | | | |

**STIMULI REQUIREMENTS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Signal Voltage, Peak to Peak | $V_s$ | V | 0.015 | 0.02 | 0.025 |
| Signal Frequency | $f_s$ | Hz | | | |
| Common Mode | $V_{cm}$ | V | | | |
| Source Impedance | $R_s$ | Ω | | | |

**PERFORMANCE CHARACTERISTICS**

| PARAMETER NAME | SYMBOL | UNITS | LOWER LIMIT | TARGET VALUE | UPPER LIMIT |
|---|---|---|---|---|---|
| Quiescient Current | $I_q$ | A | | | |
| Voltage Gain | $A_v$ | V/V | | | |
| Current Gain | $A_i$ | A/A | | | |
| Power Gain | $A_p$ | P/P | | | |
| Input Impedance | $R_i$ | Ω | | | |
| Output Impedance | $R_i$ | Ω | | | |

## Design Outputs

**PARTS LIST**

| QTY REQ | REFERENCE DESIGNATORS | MFG PART NUMBER | PART DESCRIPTION | FIND |
|---|---|---|---|---|
| 3 | R1, R2, R5 | | RESISTOR, 1.5K, 1/4W, 1% | 1 |
| 2 | R3, R4 | | 100 | 2 |
| 1 | Q1 | | 2N2222 | 3 |
| 1 | C1 | | 10u | 4 |
| 1 | C2 | | 1u | 5 |
| 1 | C3 | | 0.1u | 6 |
| | | | | |

## Developmental Tests per Example

## Test Report per Example

## Change and Liability Notice

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| WORDMARK | FIGUREMARK | FIGUREMARK |
|---|---|---|
| **miniPCB™** |  |  |

## Revision History

| REV | DESCRIPTION | ECO | DATE |
|---|---|---|---|
| **A** | Initial Release | | |
| | | | |