Current-to-Voltage Signal Converter

Introduction

A current-to-voltage (I-V) circuit, also known as a current amplifier or transimpedance amplifier, is an electronic circuit that converts an input current into an output voltage. This type of circuit is commonly used in various applications, such as photodetectors, sensors, and feedback control systems.

Applications

- Current sensing
- Feedback processing

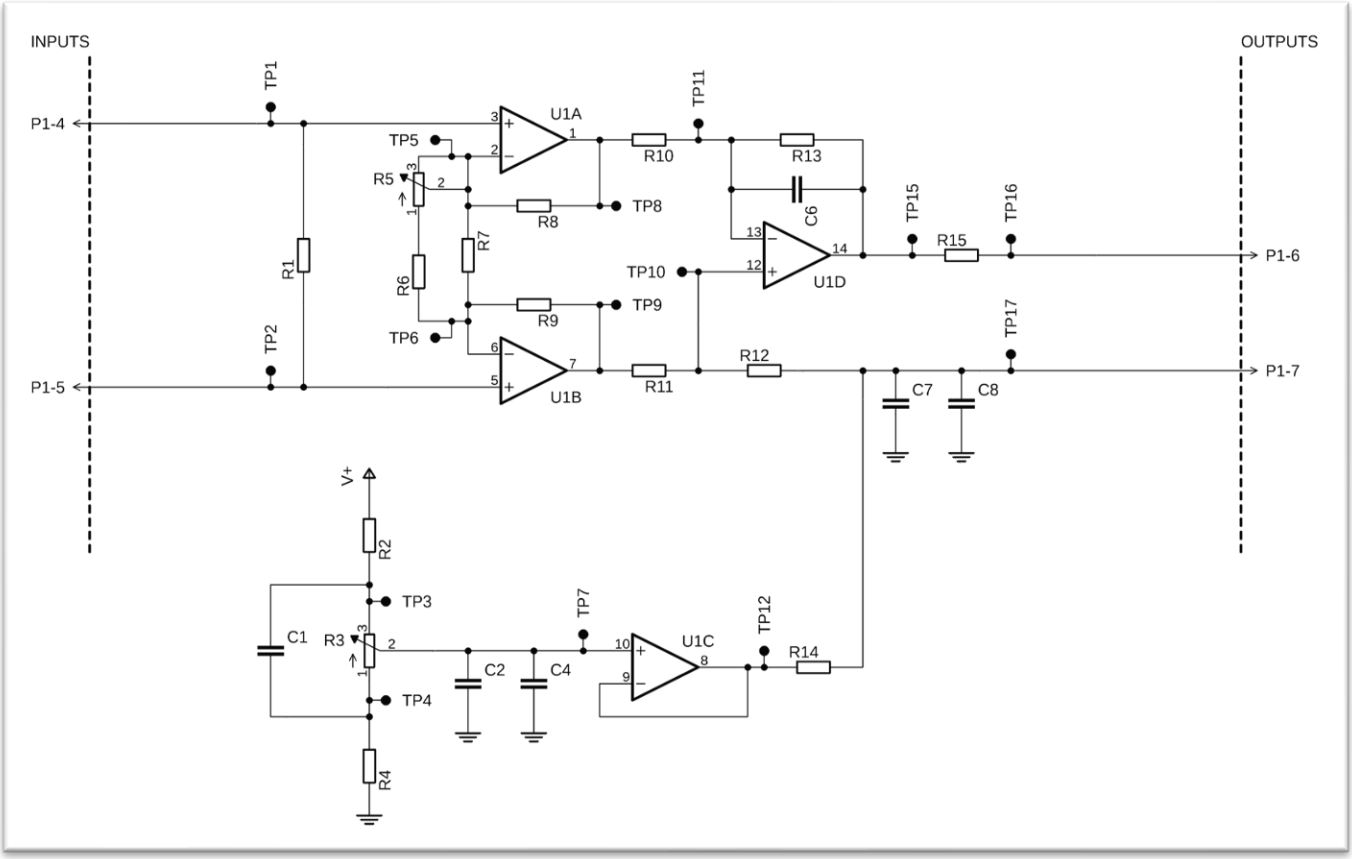
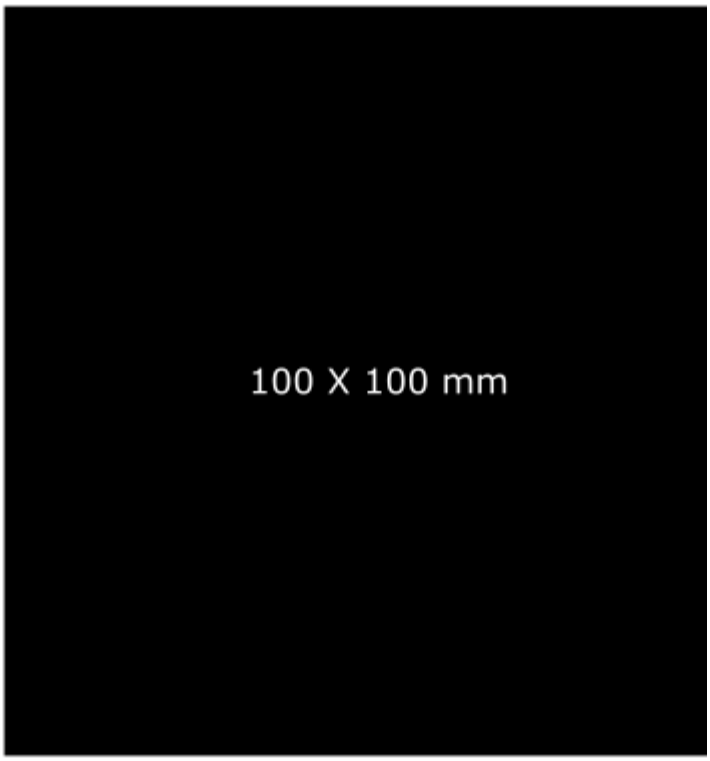
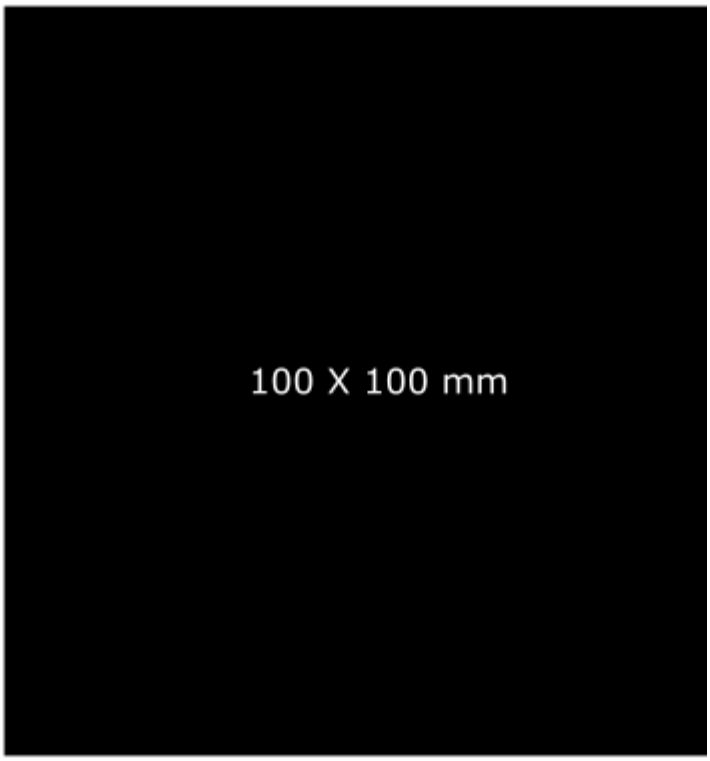


Figure 1 – Current to Voltage Converter

Panel Board



TOP VIEW



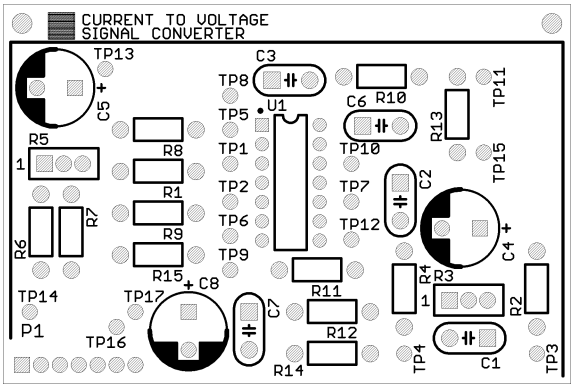
BOTTOM VIEW

Single Board

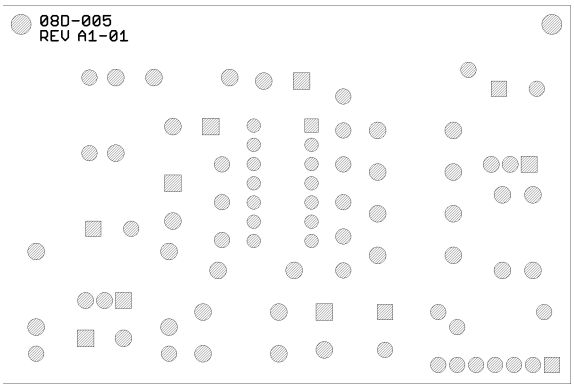
TOP VIEW

BOTTOM VIEW

Part Locations

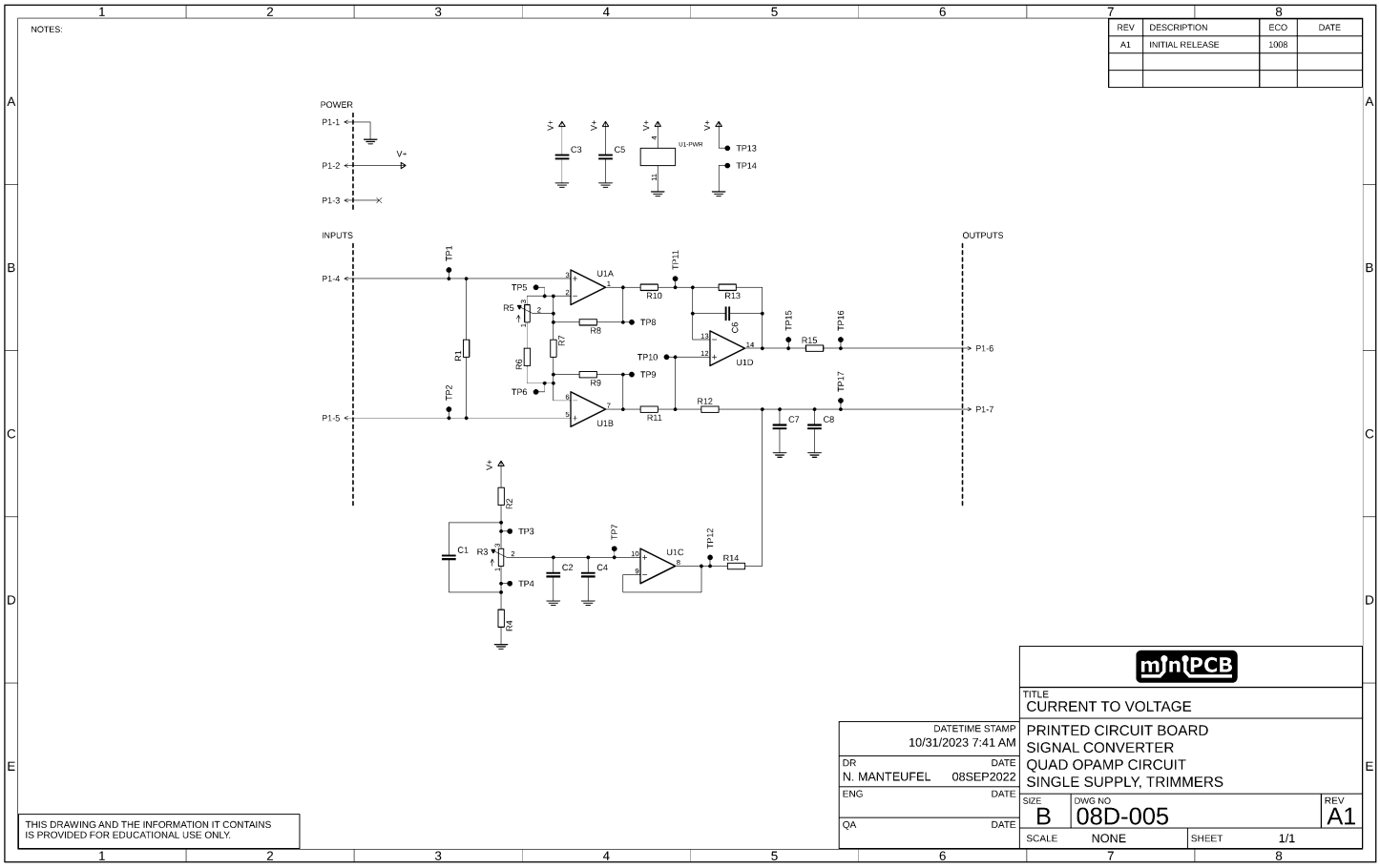


TOP VIEW



BOTTOM VIEW

Schematic


NOTES:
REV DESCRIPTION ECO DATE
A1 INITIAL RELEASE 1008
POWER
P1-1
P1-2
P1-3
V+
C3
C5
U1-PWR
TP13
TP14
INPUTS
P1-4
P1-5
OUTPUTS
P1-6
P1-7
TP1
TP2
TP5
TP6
TP8
TP9
TP10
TP11
TP15
TP16
TP17
U1A
U1B
U1D
R1
R5
R6
R7
R8
R9
R10
R11
R12
R13
R15
C6
C7
C8
TP3
TP4
TP7
TP12
U1C
R2
R3
R4
R14
C1
C2
C4
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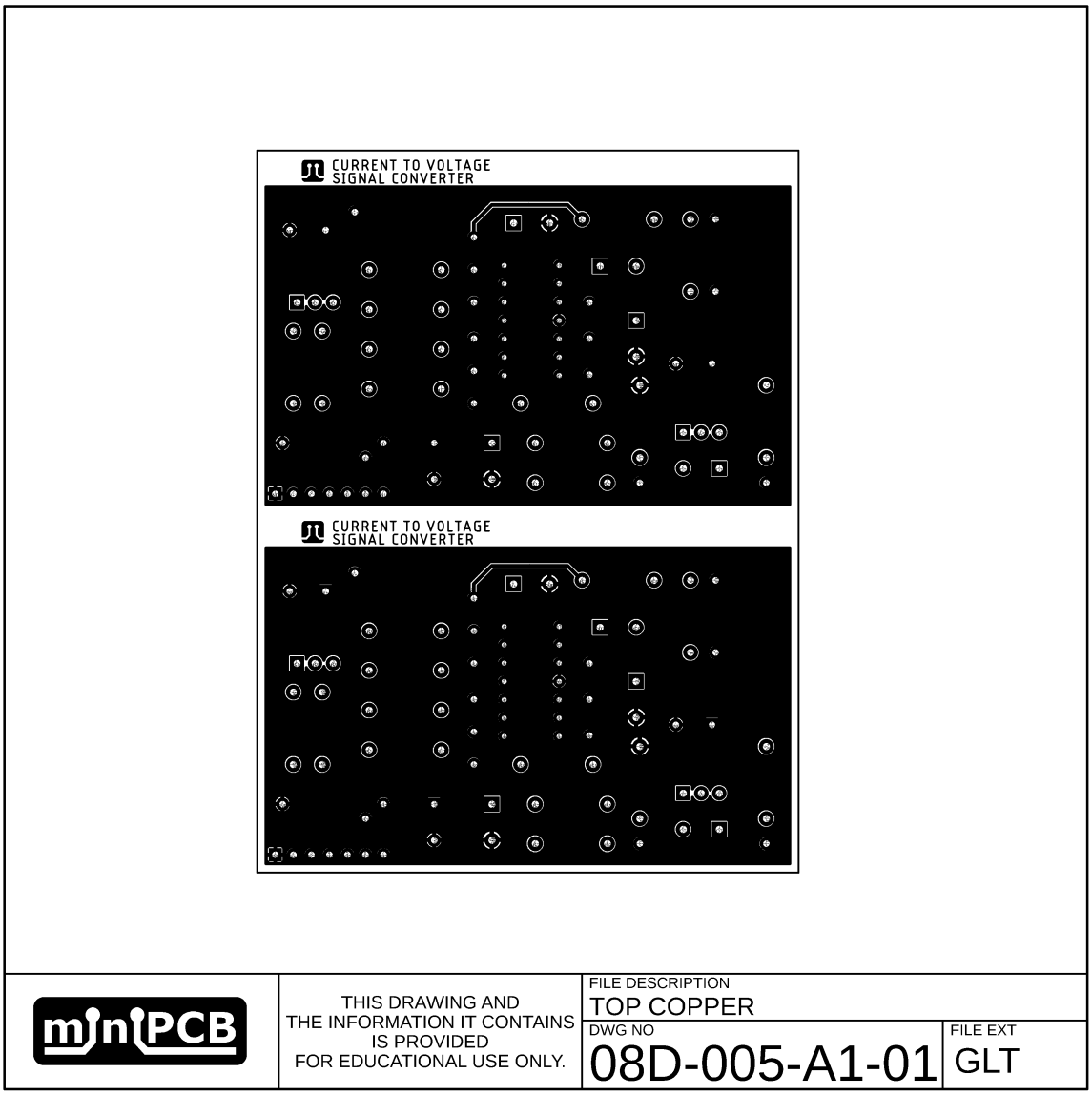
DATETIME STAMP 10/31/2023 7:41 AM
DR N. MANTEUFEL DATE 08SEP2022
ENG DATE
QA DATE
TITLE
CURRENT TO VOLTAGE
PRINTED CIRCUIT BOARD
SIGNAL CONVERTER
QUAD OPAMP CIRCUIT
SINGLE SUPPLY, TRIMMERS
SIZE B
DWG NO 08D-005
REV A1
SCALE NONE
SHEET 1/1

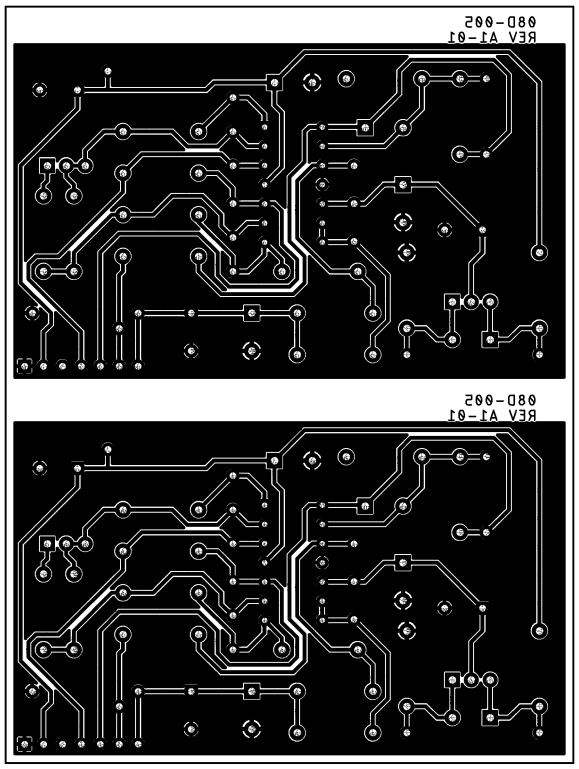
Gerber Files

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

TOP COPPER (GLTX)



BOTTOM COPPER (GLBX)



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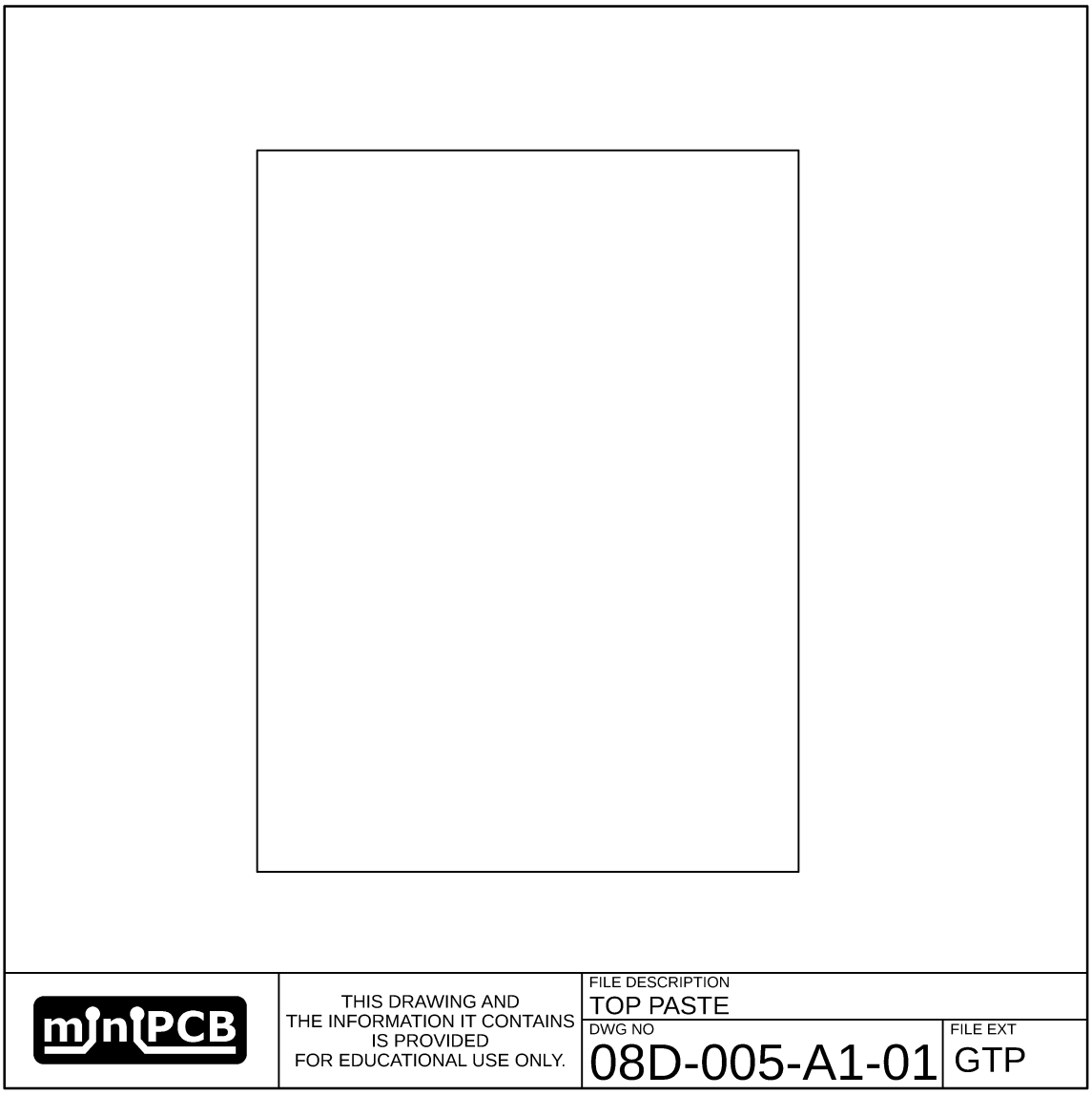
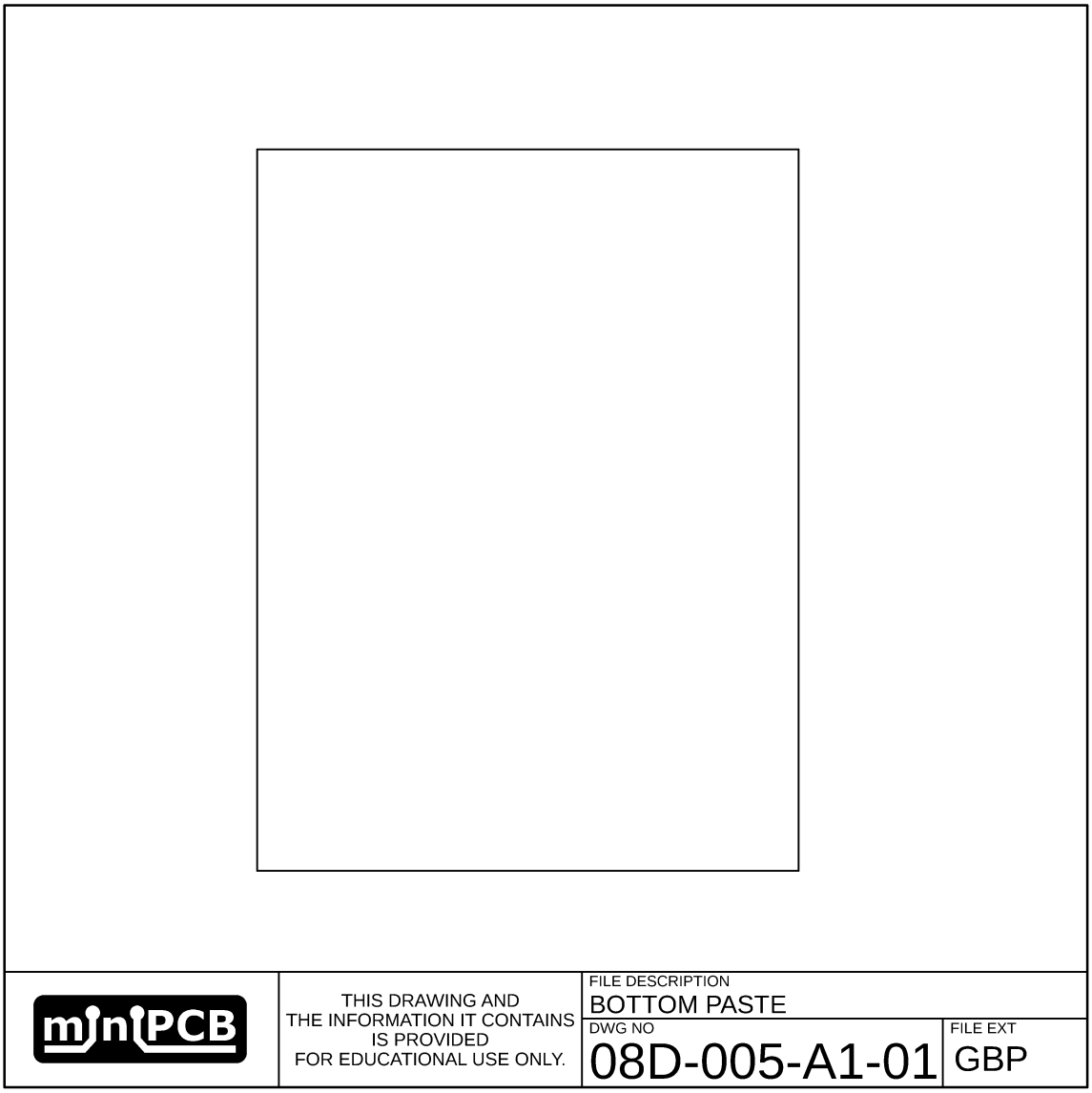
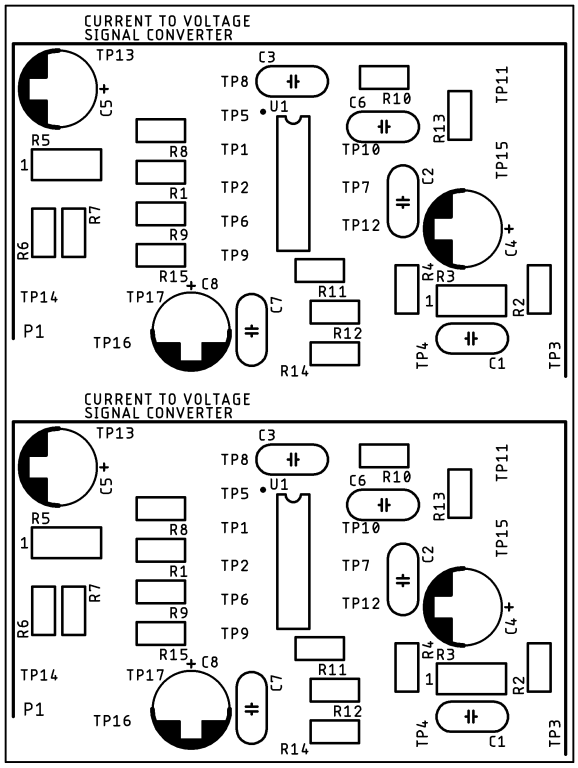


BOTTOM CREAM (GCBX)



TOP SILKSCREEN (GOTX)



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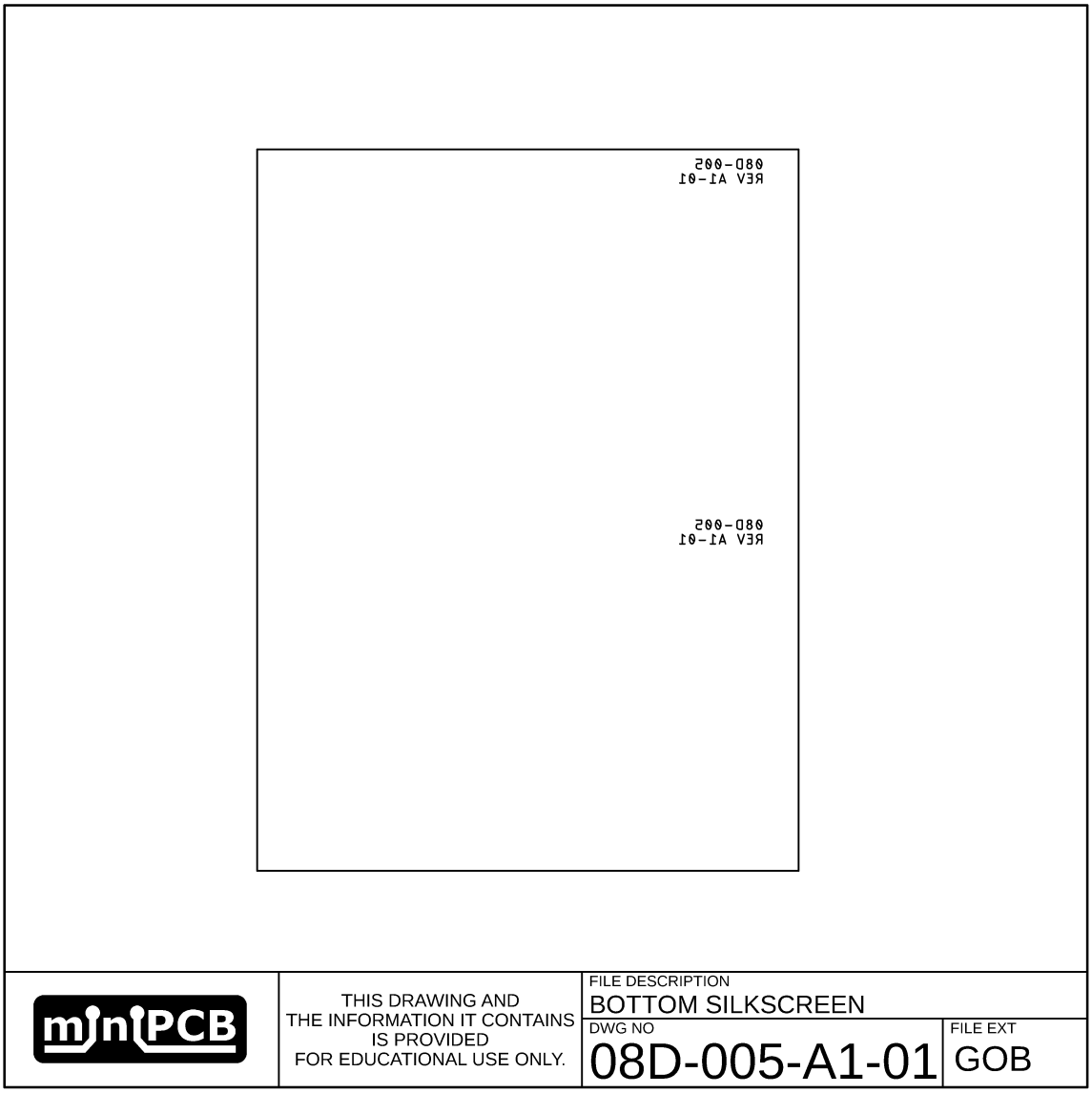
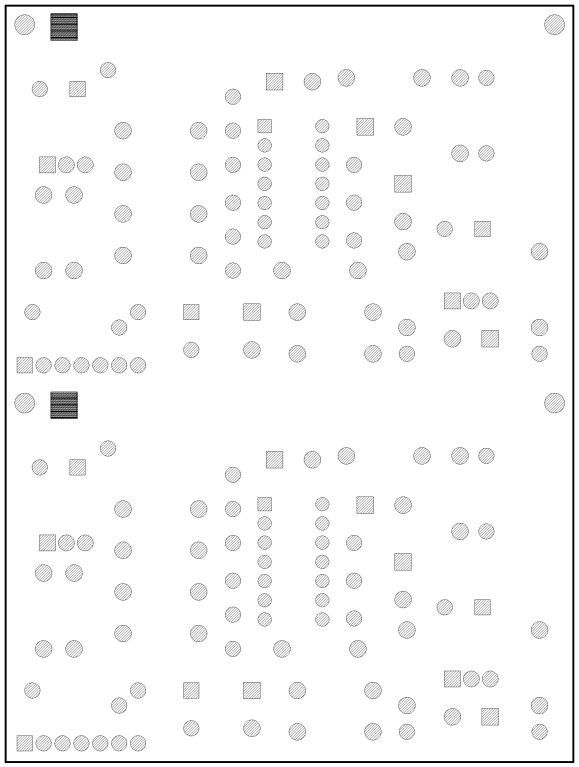
BOTTOM SILKSCREEN (GOBX)



TOP SOLDERMASK (GSTX)



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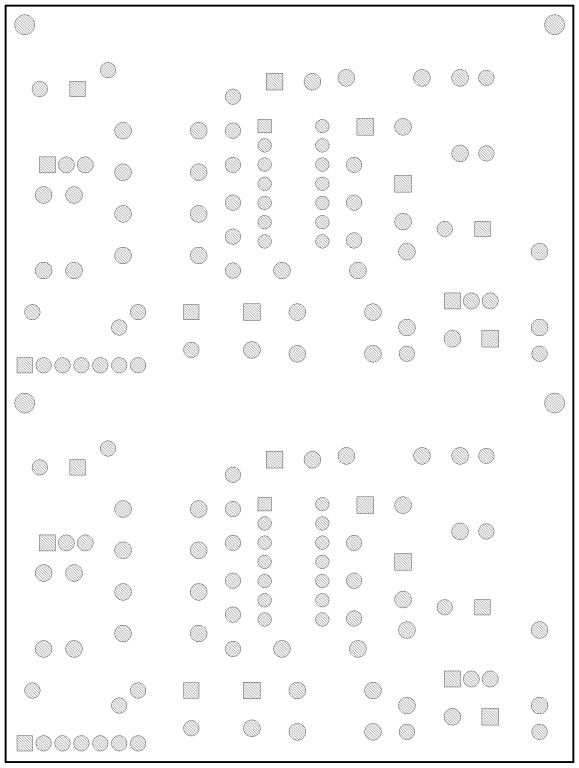
BOTTOM SOLDER MASK (GSBX)



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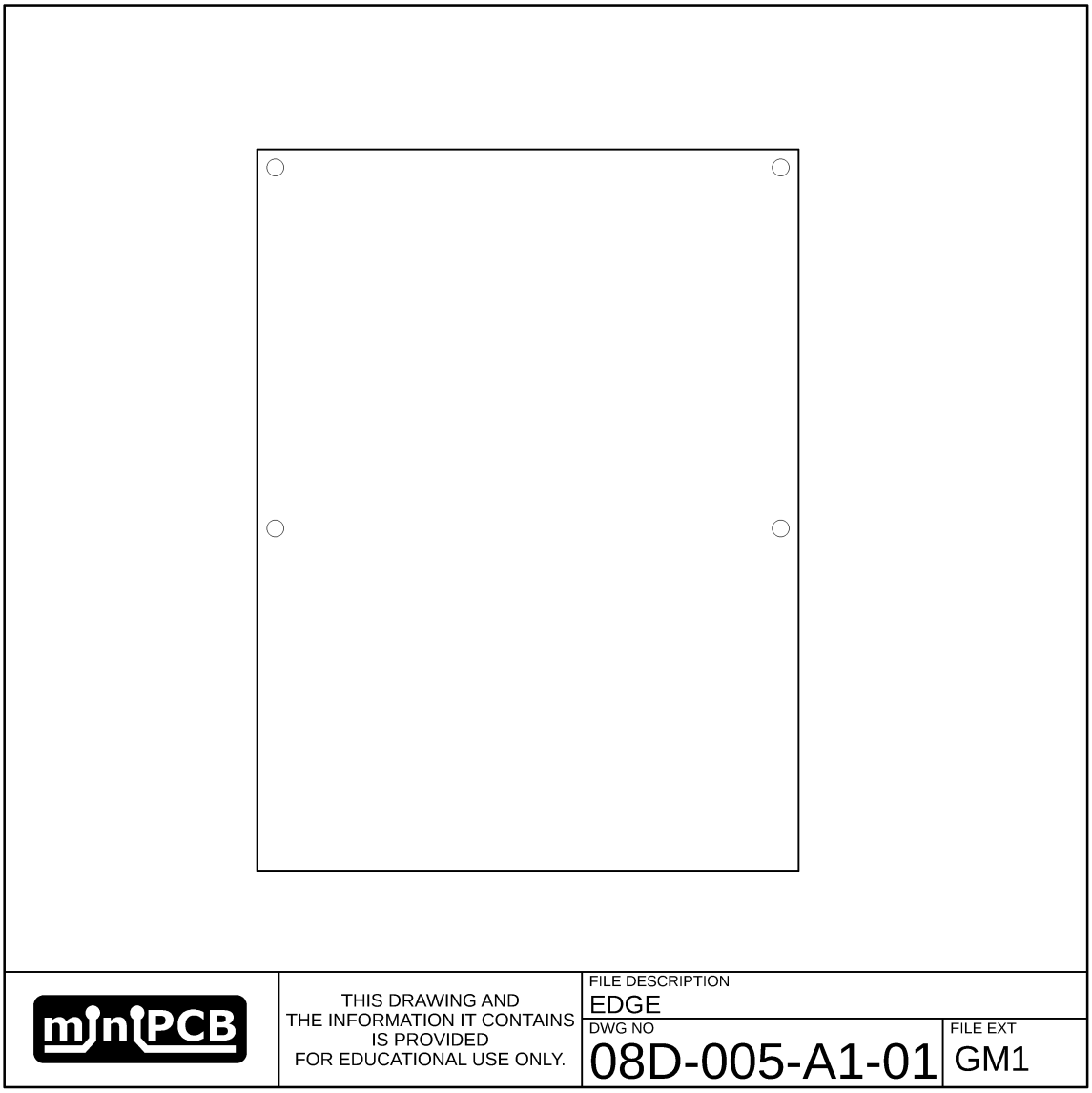
EDGE (GM1)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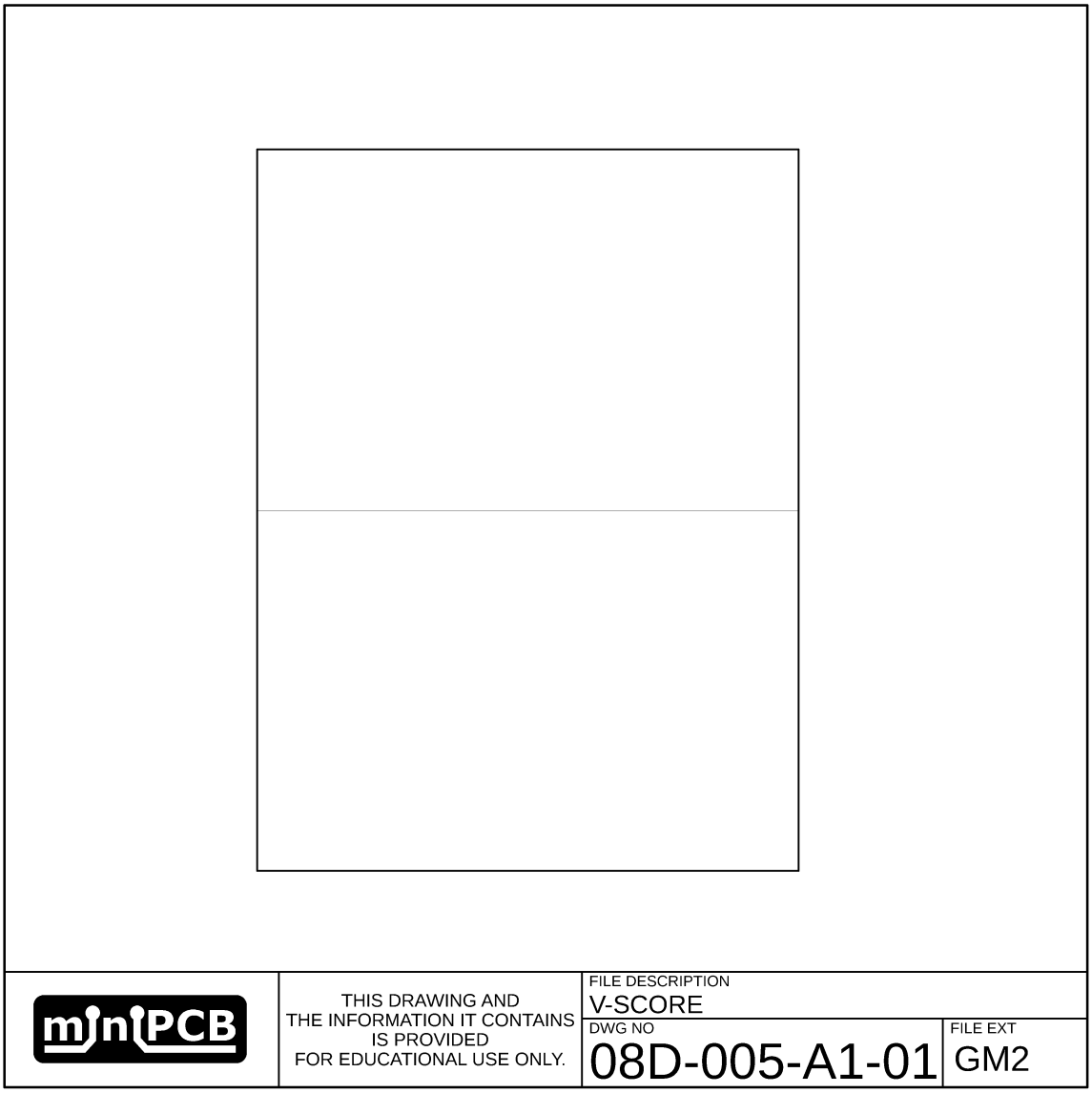
FILE EXT
GM1

VSCORE (GM2)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DWG NO
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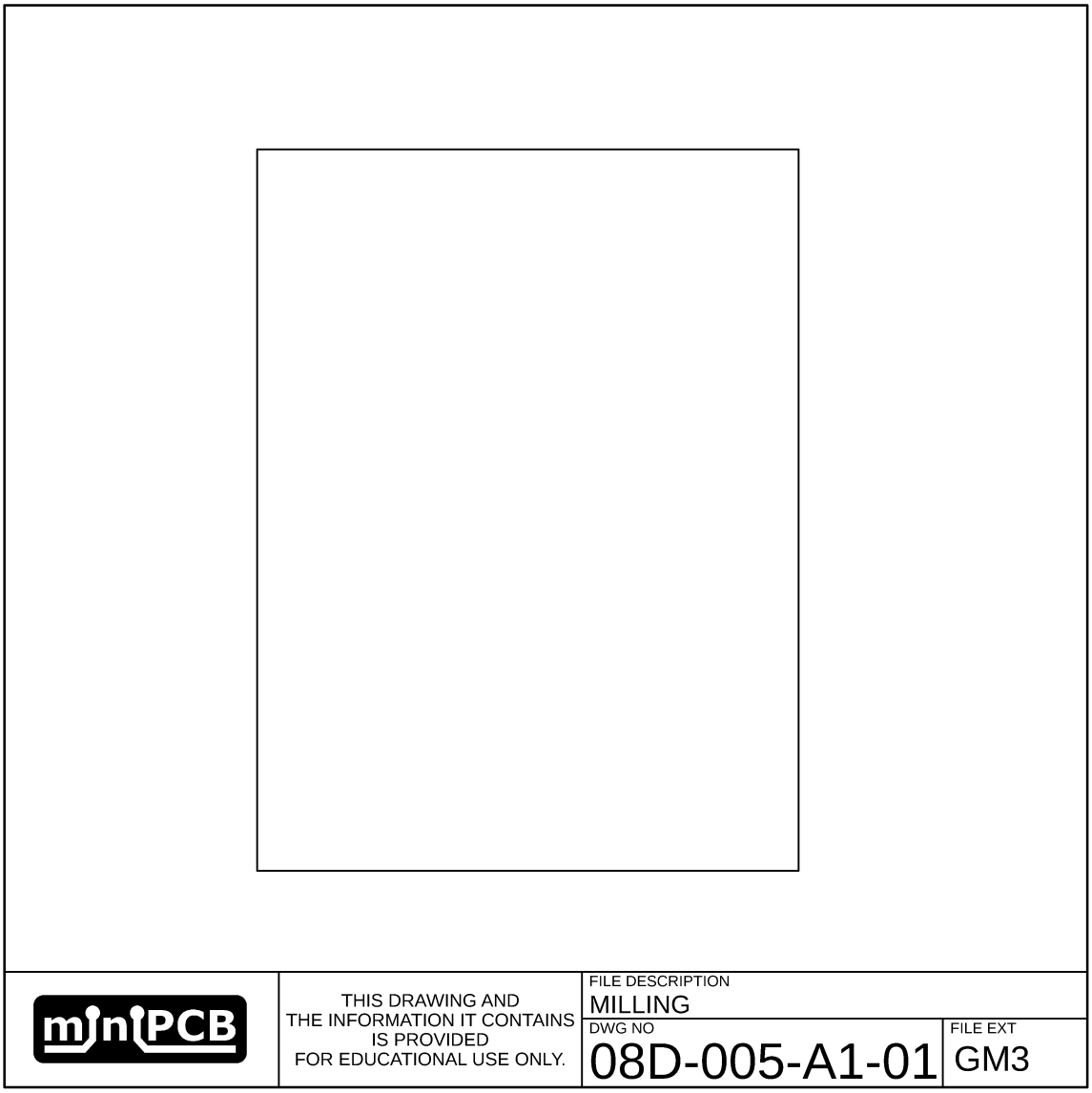
FILE EXT
GM2

MILLING (GM3)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FILE DESCRIPTION
MILLING
DWG NO
08D-005-A1-01
FILE EXT
GM3

Theory of Operation

The purpose of this circuit is to…

This circuit is supplied with a positive DC voltage…

The input stimuli is DC coupled…

The output signal is DC coupled…

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

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WORDMARK	FIGUREMARK	FIGUREMARK
miniPCB™		

Appendix

PART NUMBER	08D-005
GROUP NAME	Signal Conditioners (08)
CIRCUIT NAME	Current-to-Voltage Signal Converter
VARIANT DESCRIPTION	Single Supply, THD, DC Bias Trimmer, Calibration Trimmer
BOARD DESIGN	PCB50/100-A-07
PRODUCT DESCRIPTION	Panel of #08D-005 miniPCBs, v-scored (1 Panel = 2 Pieces)

Revision History

REV	DESCRIPTION	ECO	DATE
A	Initial Release		