

Opamp Inverting Amplifier

PART NUMBER	04A-005
GROUP NAME	Opamp Amplifiers (04A)
CIRCUIT NAME	Inverting Amplifier
VARIANT DESCRIPTION	Single supply, DC Bias Trimmer
BOARD DESIGN	PCB50
PRODUCT DESCRIPTION	Panel of 04A-005 miniPCBs, v-scored (1 Panel = 4 Pieces)

Basic Circuit Diagram

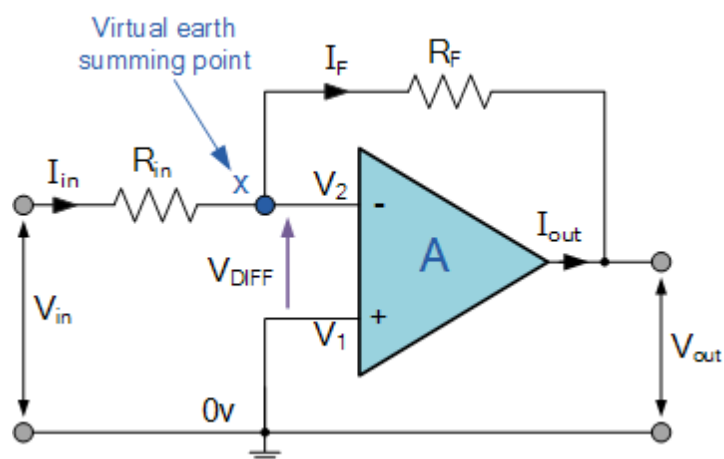
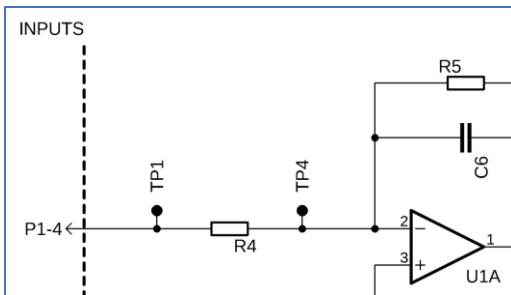


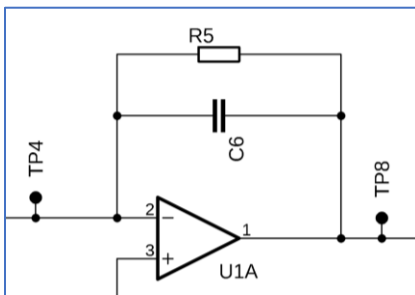
Figure 1 – Source: https://www.electronics-tutorials.ws/opamp/opamp_2.html

Theory of Operation

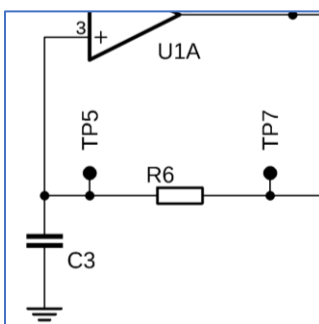
This circuit amplifies a small voltage signal. Since there is no DC blocking capacitor on the signal input pin P1-4, the difference between the DC component of the input signal and the reference voltage set by the potentiometer R2 will be amplified.



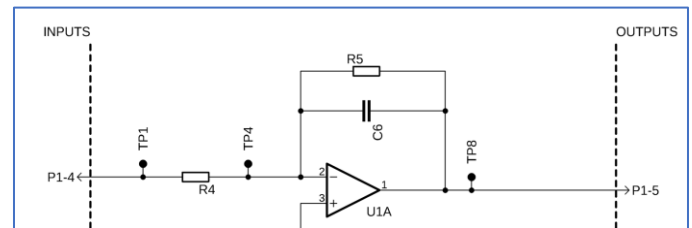
The feedback capacitor C6 allows larger feedback resistor values to be used without decreasing the amplifier's gain bandwidth.



A low-pass Butterworth filter is formed by resistor R6 and capacitor C3 to minimize noise on the non-inverting opamp input.

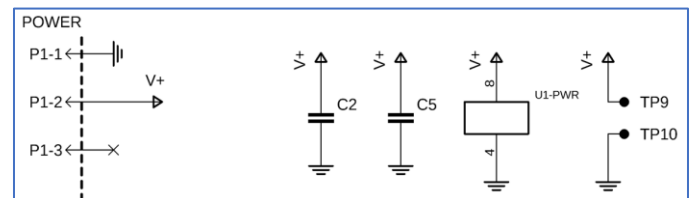


The input impedance is largely determined by resistor R4. The output impedance is largely determined by the opamp U1.

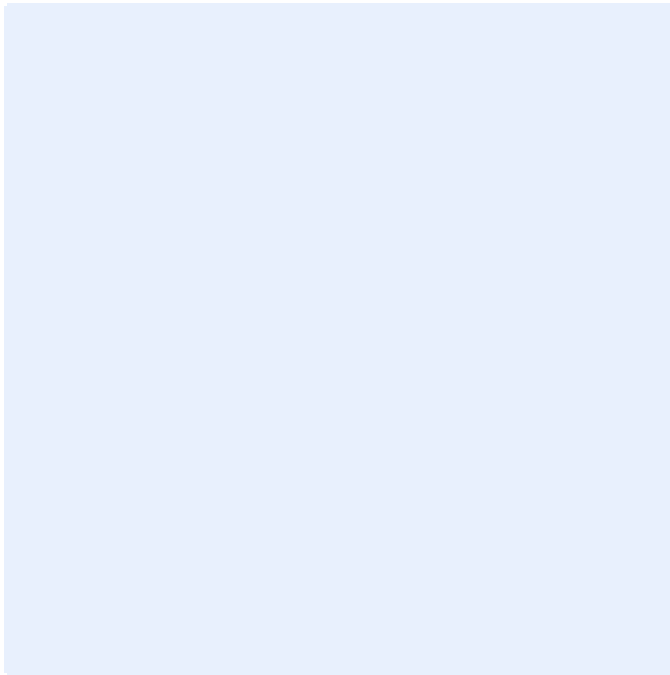


The minimum and maximum supply voltage is largely determined by the opamp U1. Only the V+ power source is needed to operate this circuit.

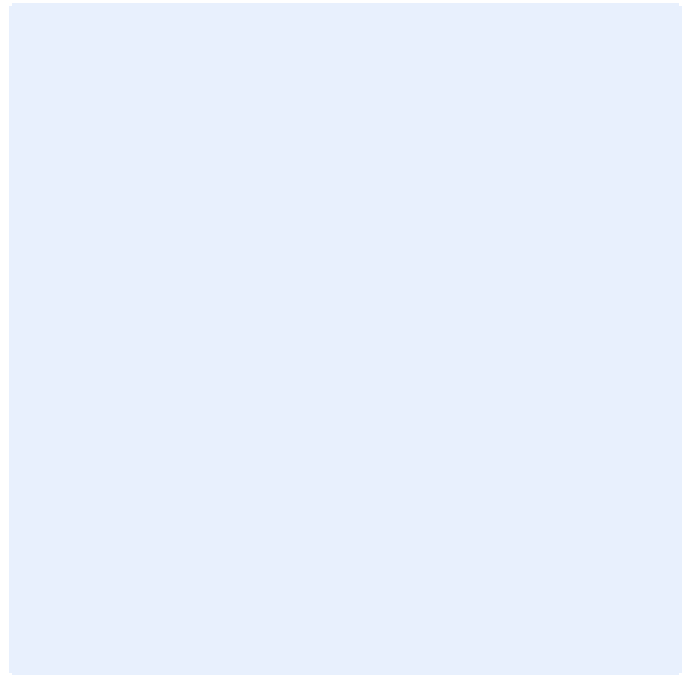
Capacitors C2 and C5 filter the V+ power rail. Using capacitors with different values, generally between 10X and 1000X different, will provide better performance than two capacitors with similar values. The smaller capacitor should be used for C2 since C2 is closer to the opamp pin than C5.



Panel Board

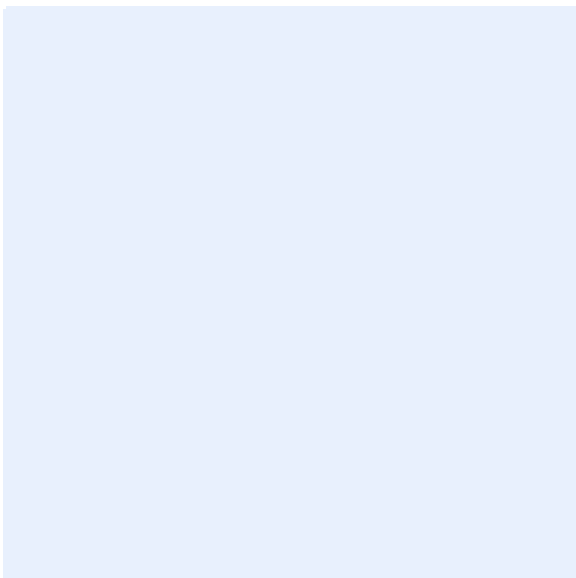


TOP VIEW

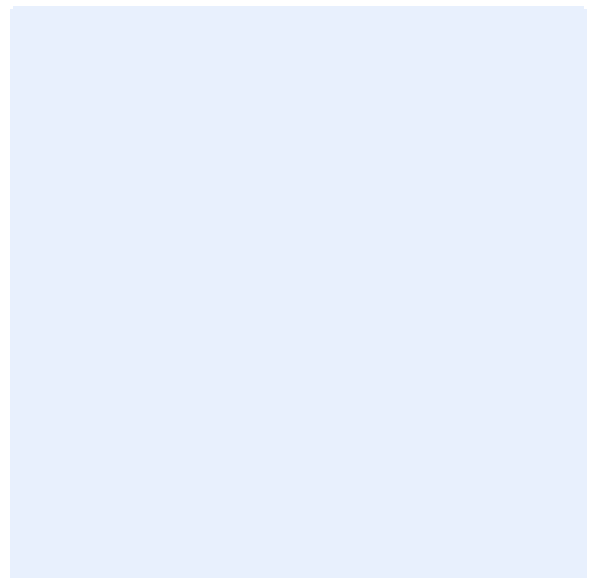


BOTTOM VIEW

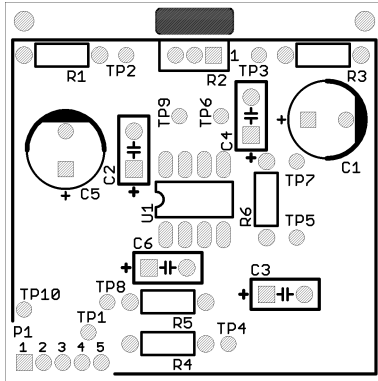
Single Board



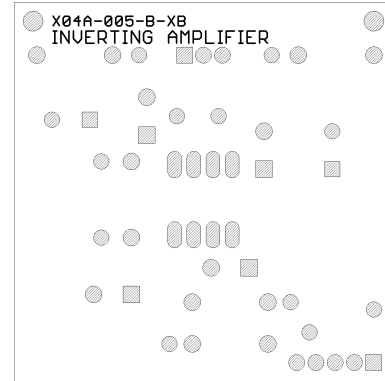
TOP VIEW



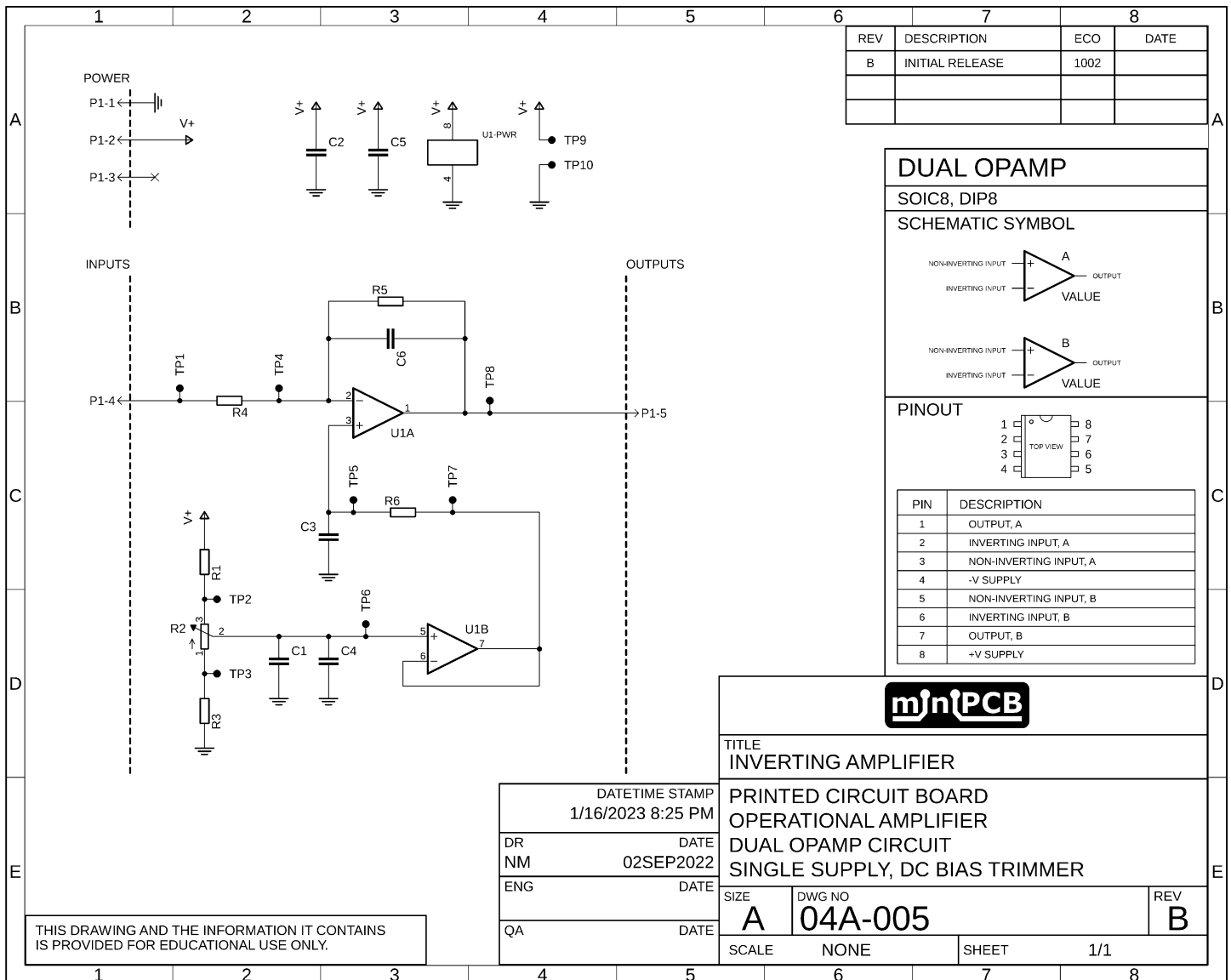
BOTTOM VIEW



TOP VIEW



BOTTOM VIEW



Design Example

Pictures

Parts List

QTY REQ	PART	REF DES	MFG	MFG PN	VALUE	FIND
1	PCB	-	miniPCB	04A-005	N/A	1
1	CAPACITOR	C1	NICHICON	UFW2A470MPD	47 uF	2
1	CAPACITOR	C2	TDK	FA28X7S2A473KRU06	47 nF	3
1	CAPACITOR	C3	TDK	FA28X7S2A473KRU06	47 nF	4
1	CAPACITOR	C4	TDK	FA28X7S2A473KRU06	47 nF	5
1	CAPACITOR	C5	NICHICON	UFW2A470MPD	47 uF	6
1	CAPACITOR	C6	TDK	FA24NP02W102JNU06	1000pF	7
1	PINS, 2mm	P1	MOLEX	87754-0552	N/A	8
1	RESISTOR	R1	VISHAY	RL07S101GRE6	100 Ω	9
1	TRIMMER	R2	VISHAY	T93YA104KT20	100 K Ω	10
1	RESISTOR	R3	VISHAY	RL07S101GRE6	100 Ω	11
1	RESISTOR	R4	VISHAY	PTF6550R000BYEK	50 Ω	12
1	RESISTOR	R5	VISHAY	PTF56500R00BYEB	500 Ω	13
1	RESISTOR	R6	VISHAY	RL07S101GRE6	100 Ω	14
1	OPAMP, DUAL	U1	NISSHINBO	NJM2904D	N/A	15
			NISSHINBO	NJM14558D		
			TAIWAN SEMICONDUCTOR	TS358		
			MICROCHIP	MCP6002-I/P		
			ANALOG DEVICES	AD827JNZ		
			TEXAS INSTRUMENTS	LF412CP		
10	TEST POINT	TP*	KEYSTONE ELECTRONICS	5000	N/A	16

Absolute Maximum Ratings

POWER REQUIREMENTS

PARAMETER NAME	SYMBOL	UNITS	LOWER LIMIT	TARGET VALUE	UPPER LIMIT
Postive DC Supply	+V	V	3.1	3.3	3.5
Negative DC Supply	-V	V	N/A	N/A	N/A

STIMULI REQUIREMENTS

PARAMETER NAME	SYMBOL	UNITS	LOWER LIMIT	TARGET VALUE	UPPER LIMIT
Maximum Voltage Gain	A_v	$\frac{V}{V}$			
Bandwidth	f_{-3dB}	Hz			
Common-Mode Offset	V_{cm}	$\frac{V}{V}$			
Common-Mode Gain	A_{cm}	$\frac{V}{V}$			
Maximum Input Bias Current	I_{bias}	A			
Maximum Phase Shift	ϕ_{max}	°			
Source Impedance	R_s	Ω			

PERFORMANCE CHARACTERISTICS

PARAMETER NAME	SYMBOL	UNITS	LOWER LIMIT	TARGET VALUE	UPPER LIMIT
Quiescent Current	I_q	A			
Voltage Gain	A_v	$\frac{V}{V}$			
Input Impedance	R_i	Ω			
Output Impedance	R_o	Ω			

Test Documentation

Test List

TEST #	TEST NAME	TEST DESCRIPTION
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		

Test Results

Test Conclusions

Engineering Forms

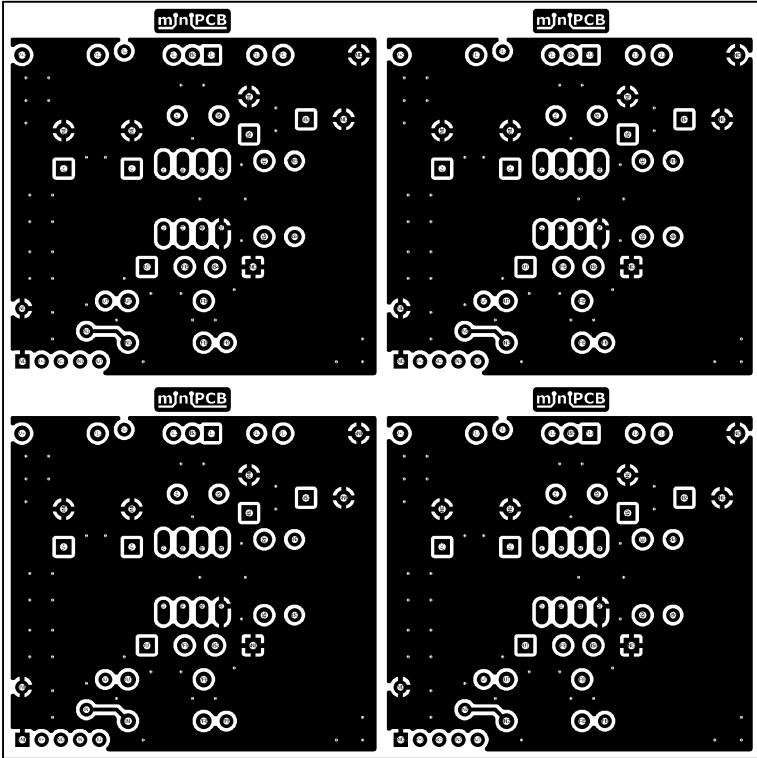
FORM: Parts List


QTY REQ	PART	REF DES	MFG	MFG PN	VALUE	FIND
1	PCB	-	miniPCB	04A-005	N/A	1
1	CAPACITOR	C1				2
1	CAPACITOR	C2				3
1	CAPACITOR	C3				4
1	CAPACITOR	C4				5
1	CAPACITOR	C5				6
1	CAPACITOR	C6				7
1	PINS, 2mm	P1			N/A	8
1	RESISTOR	R1				9
1	TRIMMER	R2				10
1	RESISTOR	R3				11
1	RESISTOR	R4				12
1	RESISTOR	R5				13
1	RESISTOR	R6				14
1	OPAMP, DUAL	U1			N/A	15
10	TEST POINT	TP*	KEYSTONE ELECTRONICS	5000	N/A	16

Gerber Files


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TOP COPPER (GLTX)

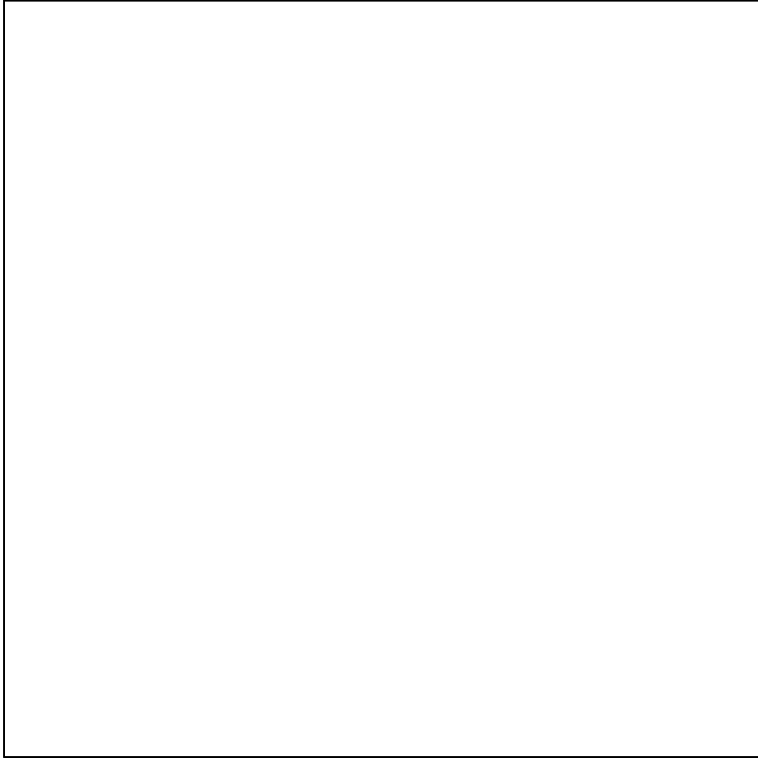



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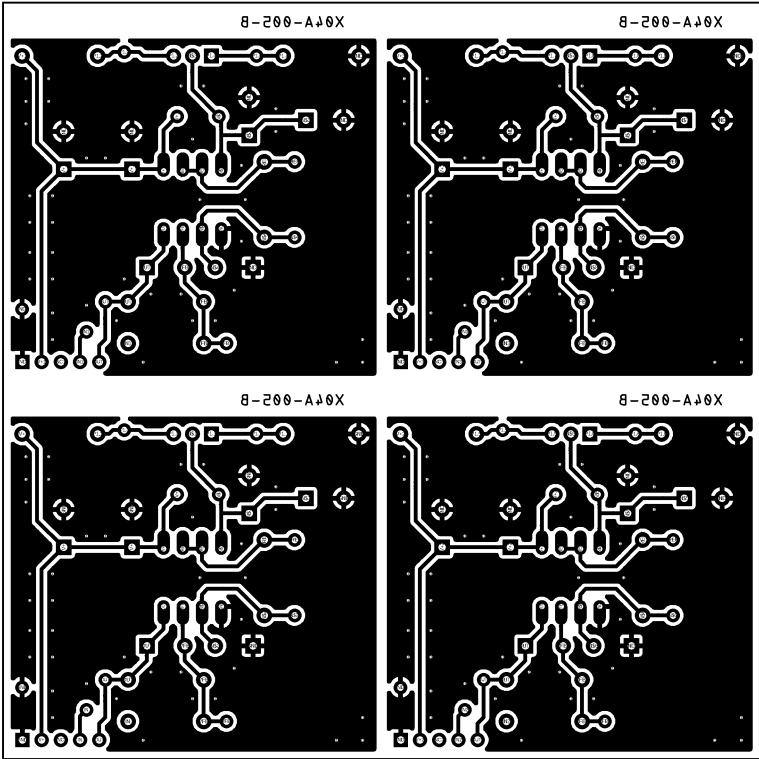
TOP CREAM (GCTX)

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BOTTOM CREAM (GCBX)

			
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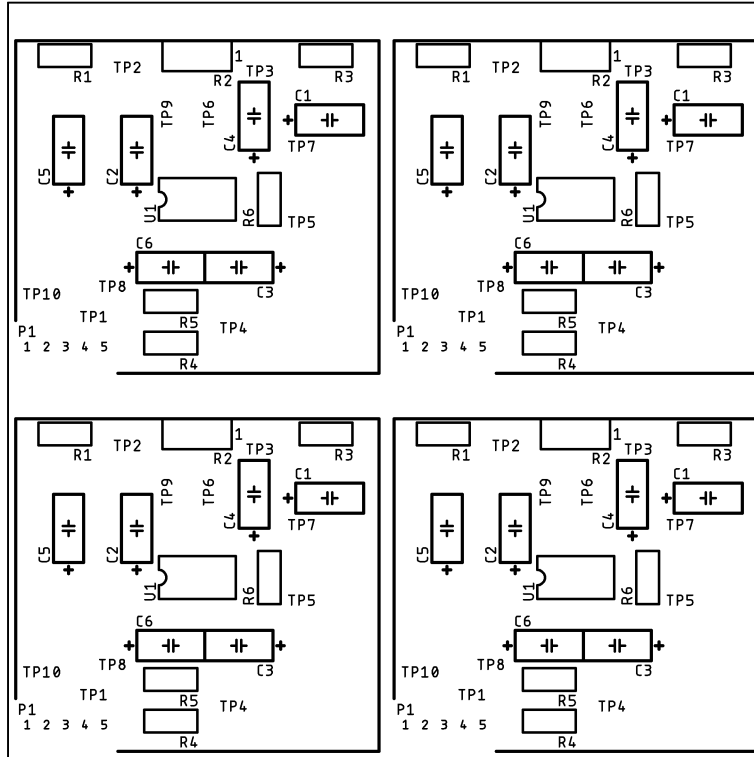
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FILE EXT
XGBX

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TOP SILKSCREEN

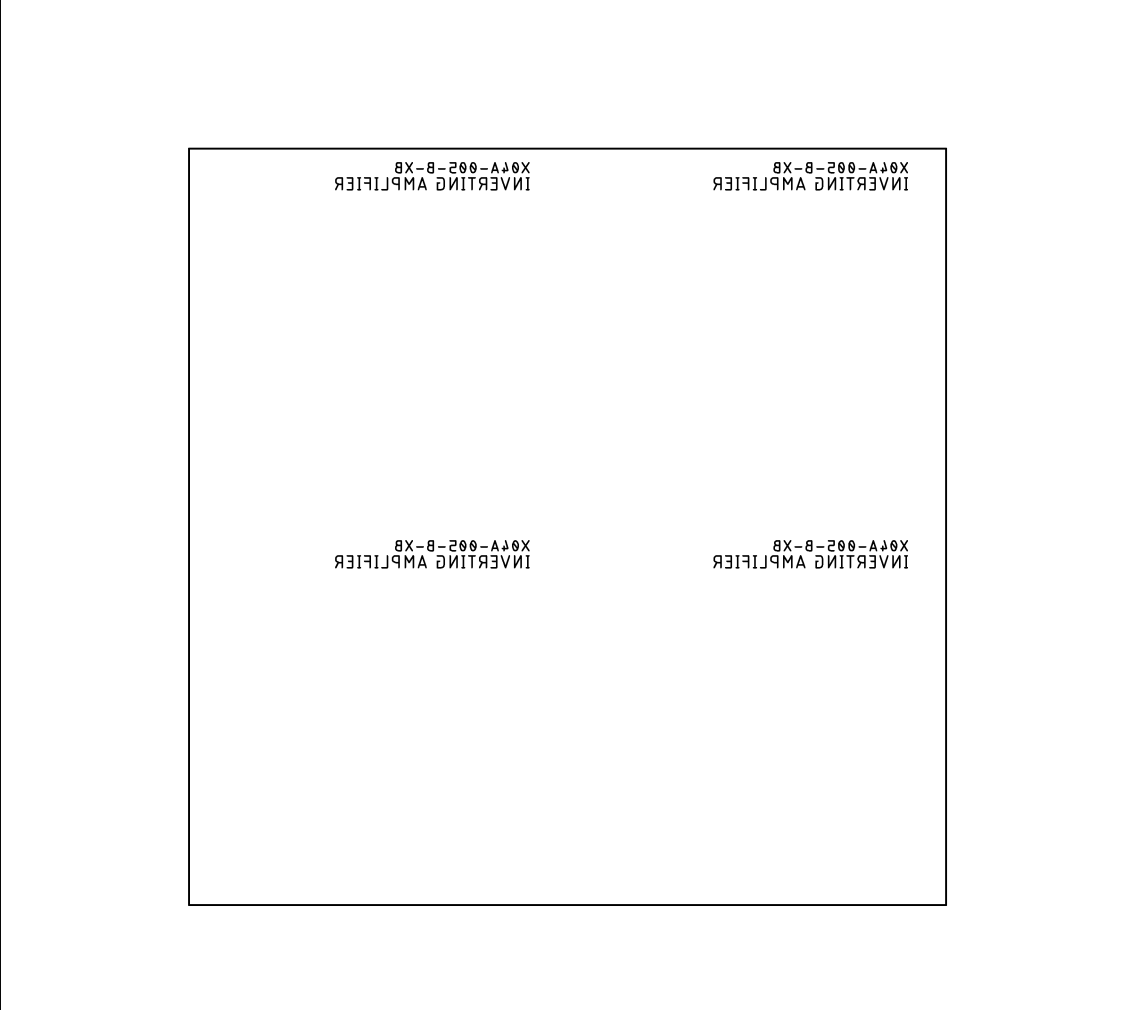

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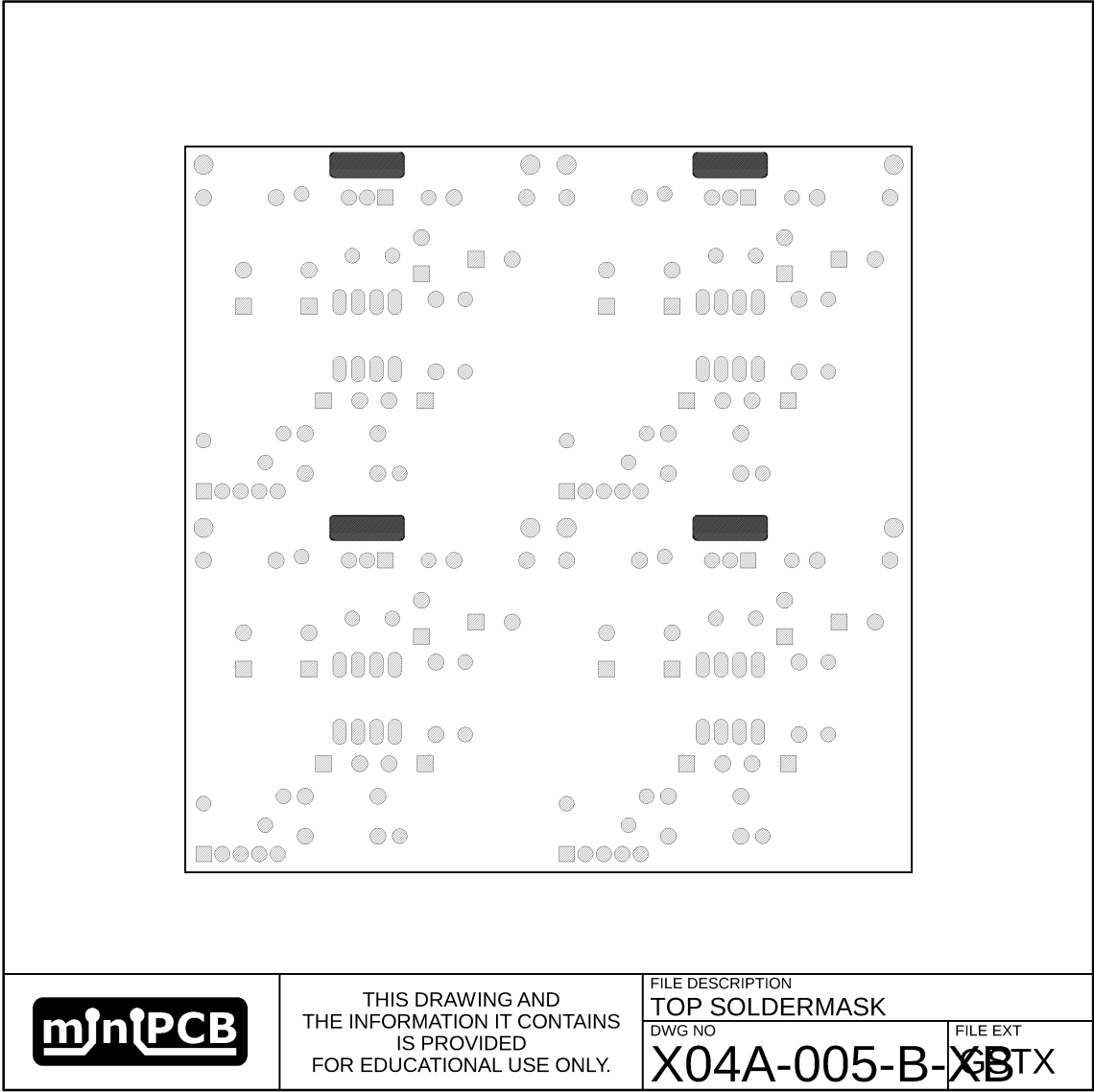
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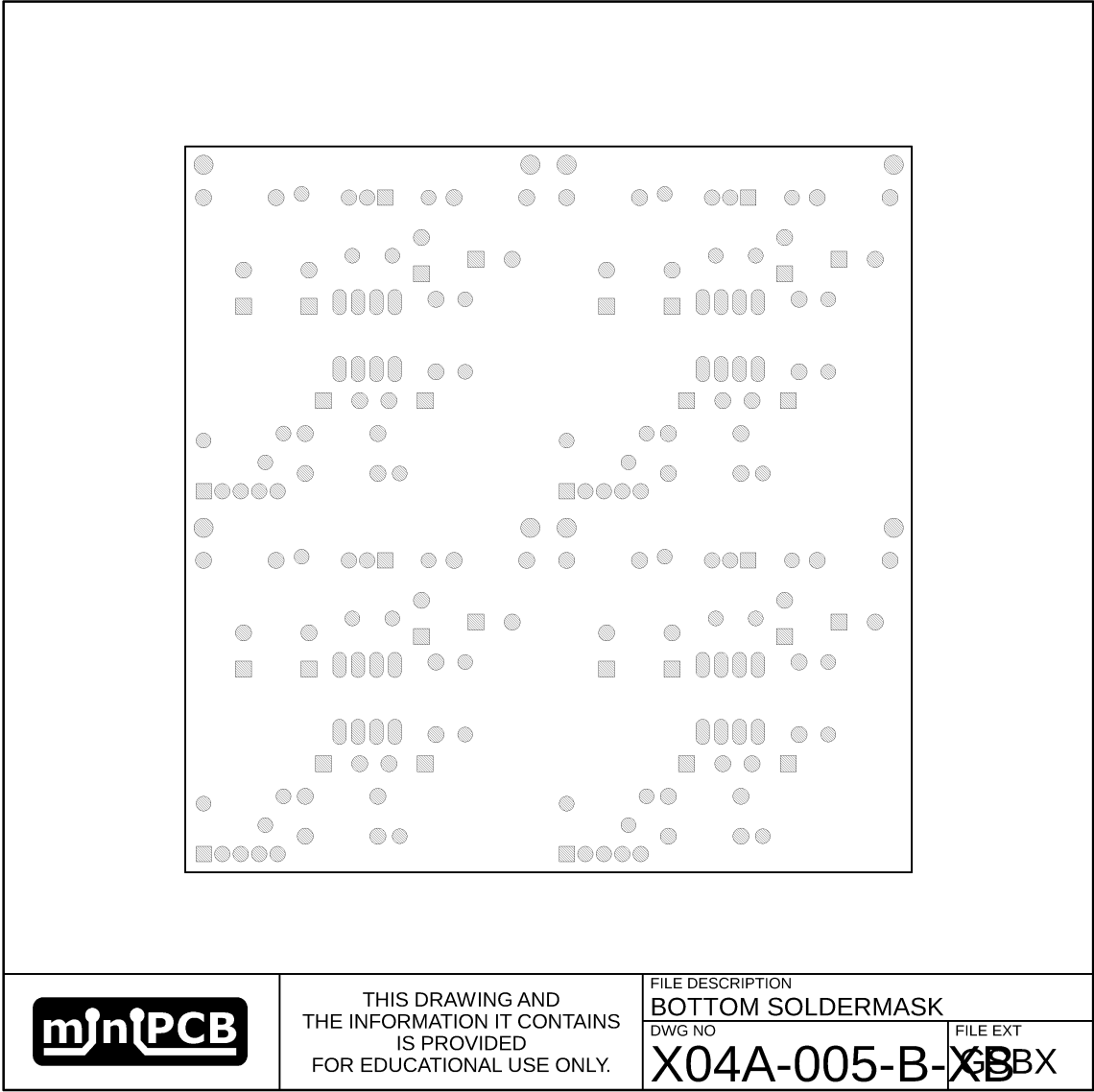
BOTTOM SILKSCREEN (GOBX)

		
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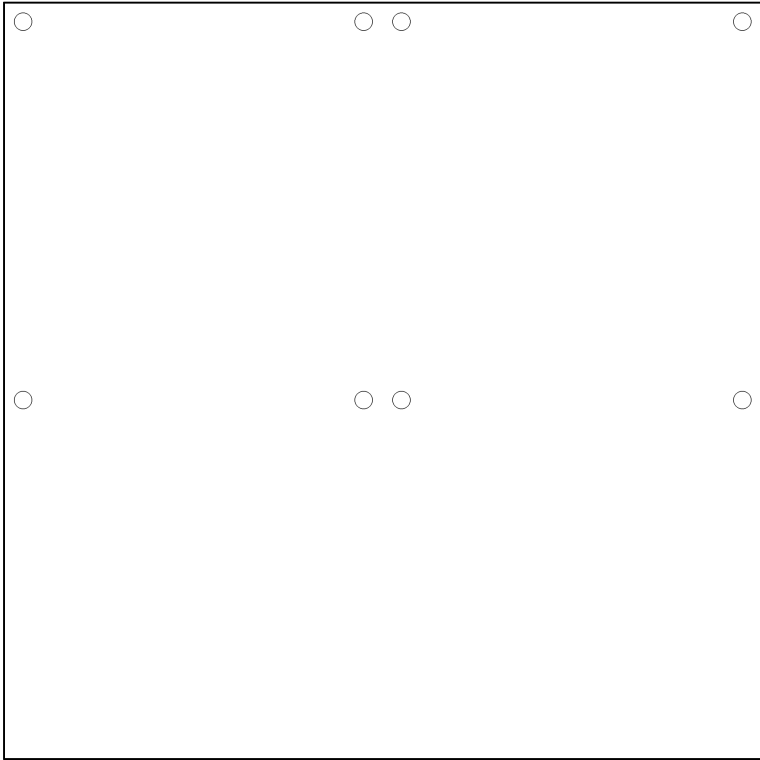
TOP SOLDERMASK (GSTX)




BOTTOM SOLDER MASK (GSBX)




EDGE (GM1)




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Revision History

REV	DESCRIPTION	ECO	DATE
A	Initial Release	1002	