

**Evaluation Kit**

**APPLICABLE PARTS**

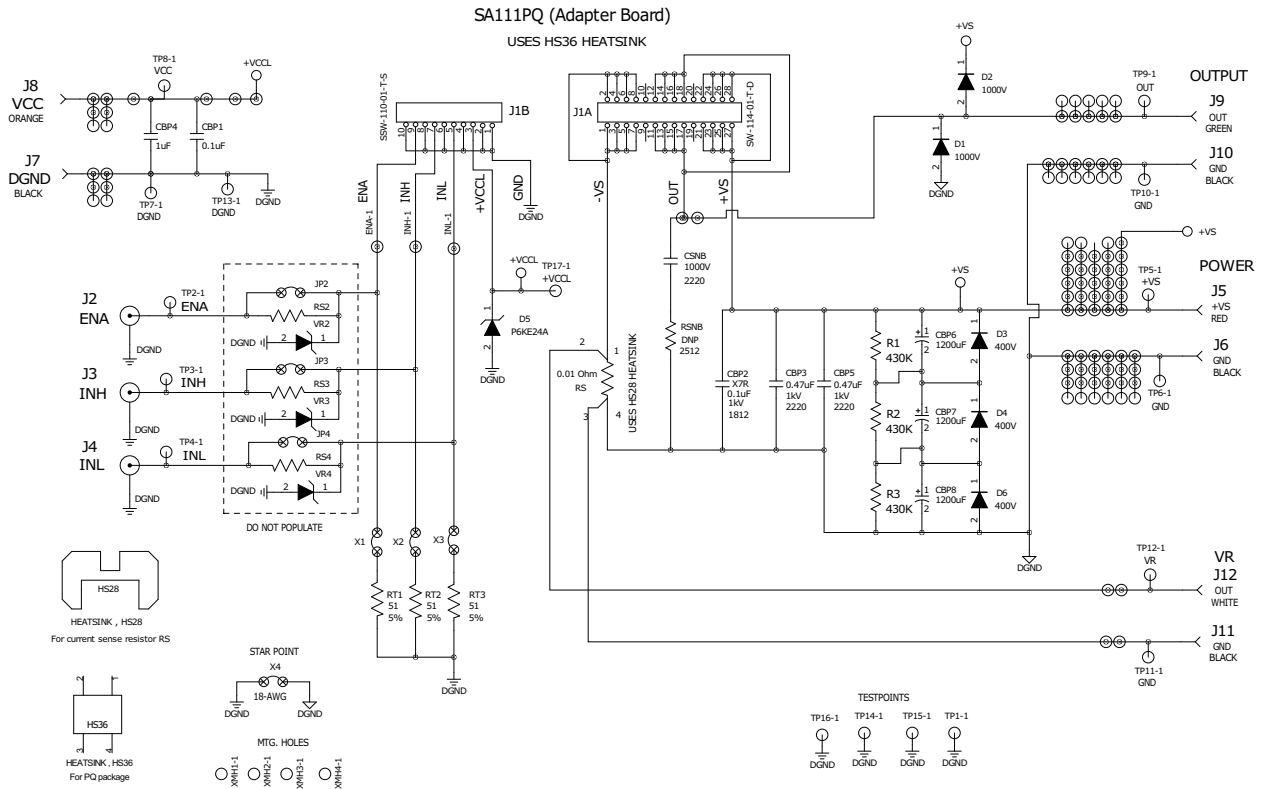
- SA111PQ

**INTRODUCTION**

This easy to use kit provides a platform with good circuit board layout and grounding to evaluate the SA111. The evaluation board provides a flexible prototyping area which can be used to connect the SA111 to additional external circuitry for providing input PWM to the SA111. All necessary components are provided with the evaluation kit. External connections to the evaluation kit can be made through the connectors at the edges of the circuit. The circuit provides a line termination of 50Ω for input signals provided through a function generator.

All specifications listed in the SA111PQ datasheet apply to this PCB.

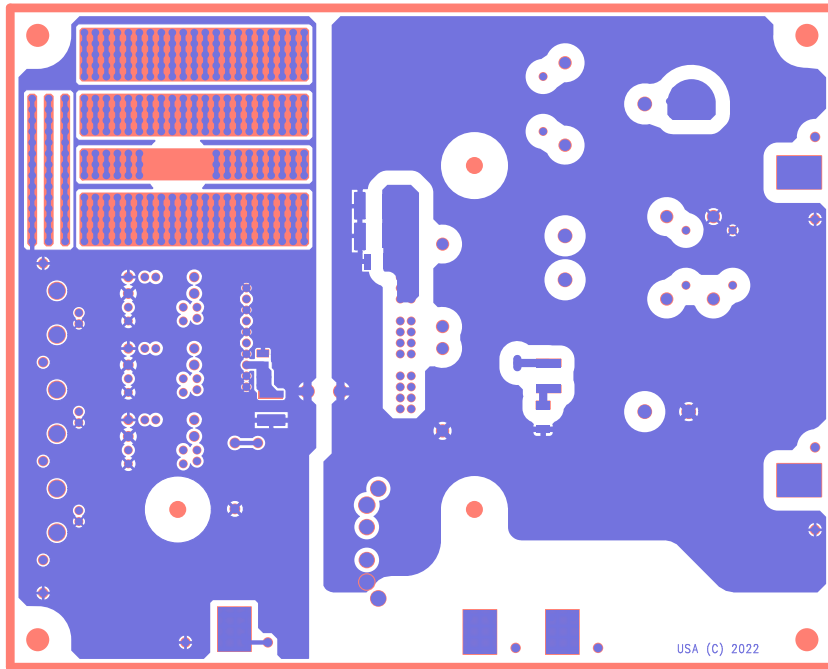
**Figure 1: Circuit Diagram (Main PCB/EVAL111)**





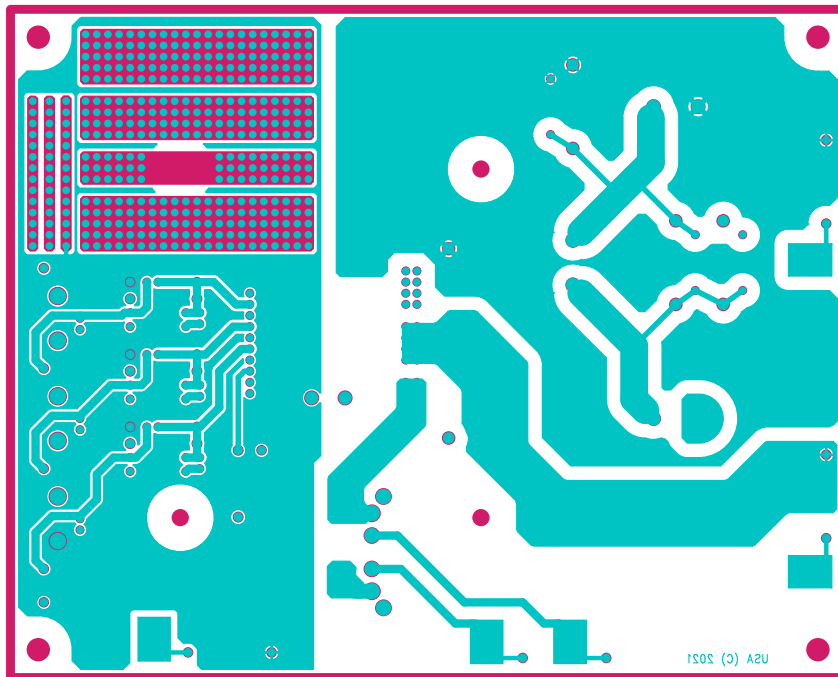


Top Metal Layer



TOP SOLDER MASK  
TOP

Bottom Metal Layer



BOTTOM  
BOTTOM SOLDER MASK

**PARTS LIST**

Reference	Manufacturer Part #	Description	QTY
<b><u>Printed Circuit Board</u></b>			
EVAL111	EVAL111	Printed Circuit Board	1
<b><u>Resistors</u></b>			
RT1, RT2, RT3	PR01000105109JR500	51Ω, 1W, 5%	3
R1, R2, R3	MBB02070C4303FCT00	RES 430K OHM 1% 0.6W AXIAL	3
RSNB	Not included, User defined	Resistor, SMD, 2512 size, 1000V	1
<b><u>Capacitors</u></b>			
CBP1	C1210V104KCRACU	0.1 μF ±10% 500V, Ceramic Capacitor X7R 1210 (3225 Metric)	1
CBP2	C1812C104KDRACAU0	0.1 μF, ±10% 1kV Ceramic Capacitor XR7 1812	4
CBP3, CBP5	2220Y1K00474KXTWS2	0.47 μF, ±10% 1kV Ceramic Capacitor XR7 2220	2
CBP4	C5750X7R2E105K130KA	1 μF, 500V, Ceramic Capacitor	1
CBP6, CBP7, CBP8	380LX122M400A082	CAP, ELEC 1200 μF, 400V	3
CSNB	Not included, User defined	Capacitor, SMD, 2220 size, 1000V	1
<b><u>Diodes</u></b>			
D1, D2	MUR4100EG	Diode, GEN PURP 1000V 4A DO201AD	2
D3, D4, D6	MUR440RLG	Diode, GEN PURP 400V 4A	3
D5	P6KE24A	TVS Diode 20VWM 42.8VC DO15	1
<b><u>Hardware</u></b>			
	EK85-1	Daughter Evaluation Card for SA111	1
J1A	SSW-114-01-T-D	CONN RCPT .100" 28POS DUAL TIN	1
J1B	SSW-110-01-T-S	CONN RCPT .100" 10POS SNGL TIN	1
J2, J3, J4	146510CJ	BNC CONN RT ANGLE	3
J5	108-0902-001	CONN, BANANA, SMT, RED	1
J6, J7, J10, J11	108-0903-001	CONN, BANANA, SMT, BLACK	4
J8	108-0906-001	CONN, BANANA, SMT, ORANGE	1
J9	108-0904-001	CONN, BANANA, SMT, GREEN	1
TP1-TP17	5001	TEST POINT MINI .040 DIA.	16
X1, X2, X3	PRPC002SAAN-RC	2-POS HEADER .100 SP	3
X1, X2, X3	SPC02SVJN-RC	JUMPER, SLIP ON	3
HS28	HS28	Heatsink for current sense resistor RS	1
RS	CSR20	Resistor, 10 mOhm, 10W	1
J12	108-901-001	CONN, BANANA, SMT, WHITE	1
	91735A190	Screw, Panhead, #8 X .25"	4
	91249A126	4-40 Thread Size, 1-1/2" Long	4
	94758A101	18-9 Stainless Flange Nut, 4-40	4

# EK84



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2221	Standoff, HEX, #8 X 2.00"	4
91772A110	Screw Pan head, #4	1
96537A130	18-8 stainless steel Hex Nut	1

## BEFORE YOU GET STARTED

- All Apex Microtechnology amplifiers should be handled using proper ESD precautions.
- Always use the heat sink included in this kit.
- Always use adequate power supply bypassing.
- Do not change the connections while the circuit is powered.
- Initially set all power supplies to the minimum operations levels allowed in the device data sheet.
- Check for oscillations.
- Please refer to Application Note, AN01 for general operating conditions.

## ASSEMBLY INSTRUCTIONS

During the assembly, please refer to the circuit schematics, assembly drawings, and the data sheet of the part being used on the evaluation kit.

1. All surface mount components should be placed on board first. These include CBP1 through CBP5(CSNB and RSNB can also be installed at this point if they have already been chosen and procured by user).
2. All through hole components are to be installed on the component side of the board and soldered on the bottom(DUT) side, except for the mating sockets which are inserted on the bottom(DUT) side and then soldered from the component side. Do not solder CBP6, CBP7 or CBP8 yet. When completing this step, install all small through hole components like capacitors, resistors, and test points on the PCB first. This is done because it becomes difficult to install a smaller component on the board once all the larger components are installed. When cutting the excess lead lengths of the various through hole resistors, save one of the pieces of lead wire in order to use for the X4 designator shorting connection which creates a star point ground.
3. Insert the mating sockets on the DUT side of the board. Once they are inserted, solder the mating sockets from the top side of the board.
4. Install diodes D1, D2, D3, D4 and D5 on the evaluation board. Ensure that the orientation of the components match the circuit schematic drawing.
5. Mount the BNC connectors(J2 – J4) provided with the kit (part #146510CJ) and solder them to the board. Also mount the banana jacks(J5 – J12) on the board.
6. From the DUT side of the PCB, insert #8 panhead screws into the holes at the four corners of the PCB. Connect the hexagonal standoffs from the bottom side of the board.
7. Mount the current sense resistor RS on heat sink HS28 using #4 round head screw and 4-40 hex nut. Install the heatsink + resistor assembly on the PCB.
8. Once all the components are mounted on the EVAL111 PCB, mount the EK85-1 daughter card subassembly, which has the SA111 unit attached to a heatsink(HS36), into the mating sockets on the EVAL111 PCB on the DUT side.
9. After mounting the EK85-1 on EVAL111, use 91249A126 (4-40 thread, 1.5" long) screws through EVAL111 to hold EK85-1 assembly in place. 4-40 flange nuts are provided for these screws.
10. Connect the external connections via the BNC connector and banana jacks. Hook up power supplies and signals as necessary. The amplifier is now ready for evaluation.

## CIRCUIT DESCRIPTION

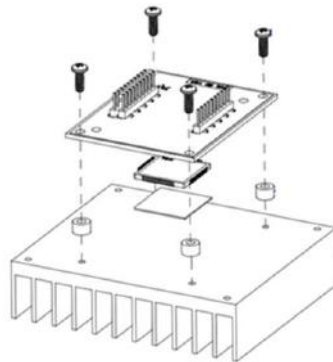
The EK84 evaluation kit is designed to drive the SA111 in a singly supply operation where the  $-V_S$  pin is connected to ground through a current sense resistor. If necessary,  $R_{SNB}$  and  $C_{SNB}$  can be chosen by the user based on given output conditions to enhance stability. If  $R_{SNB}$  and  $C_{SNB}$  are used in circuit, be sure that the components chosen are rated for 1kV or more. Input pulses can be provided via BNC connectors on the edge of the board. However, one can use a microcontroller to provide input PWM pulses to the EK84 evaluation kit. The flexible prototyping area can be used in this case. Connections from the microcontroller can be made through the INH, INL and ENA through holes provided on the board. If a microcontroller is used, remove jumpers X1, X2 and X3 so that the termination resistors do not load the microcontroller.

## HEATSINK MOUNTING DIAGRAM

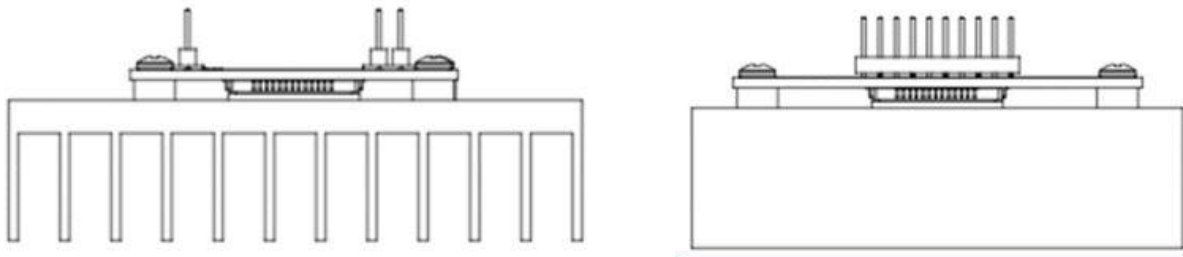
**FIGURE 3**

**(EK85-1)**

**Top View**



**Side View(s)**



## TEST ASSEMBLY

### EQUIPMENT NEEDED

1. Power Supplies
2. Digital Multimeter
3. Oscilloscope
4. Proper Device Heatsinking

## TEST SETUP

1. Connect the power supply to +V<sub>S</sub> port. Refer to product datasheet for voltage specifications.
2. Connect BNC cables from the function generators or connect a micro controller to the inputs of the SA111.
3. Connect a 5V power supply to the ENA input connection.
4. Do not insert the part yet. Next, power on the input signal and power supplies.
5. Measure voltages on all pins on the DUT side to ensure that there is not a short and to check that all the pins read correct voltages.
6. Mount the amplifier + Heatsink assembly on the PC board.
7. Input and output waveforms can be checked on an Oscilloscope by connecting it to the test points mounted on the board.
8. Begin the test with minimum values of switching frequency and supply voltages.

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## NEED TECHNICAL HELP? CONTACT APEX SUPPORT!

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