

**harman/kardon**

# HKTS 200 SUB

(HKTS 20/HKTS 30/HKTS 60 SUBWOOFER)

## SERVICE MANUAL



harman/kardon, Inc.

8500 Balboa Blvd.

Northridge, CA. 91329

Released 2010

Discontinued XXXX

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## HKTS 200 SUB SPECIFICATIONS

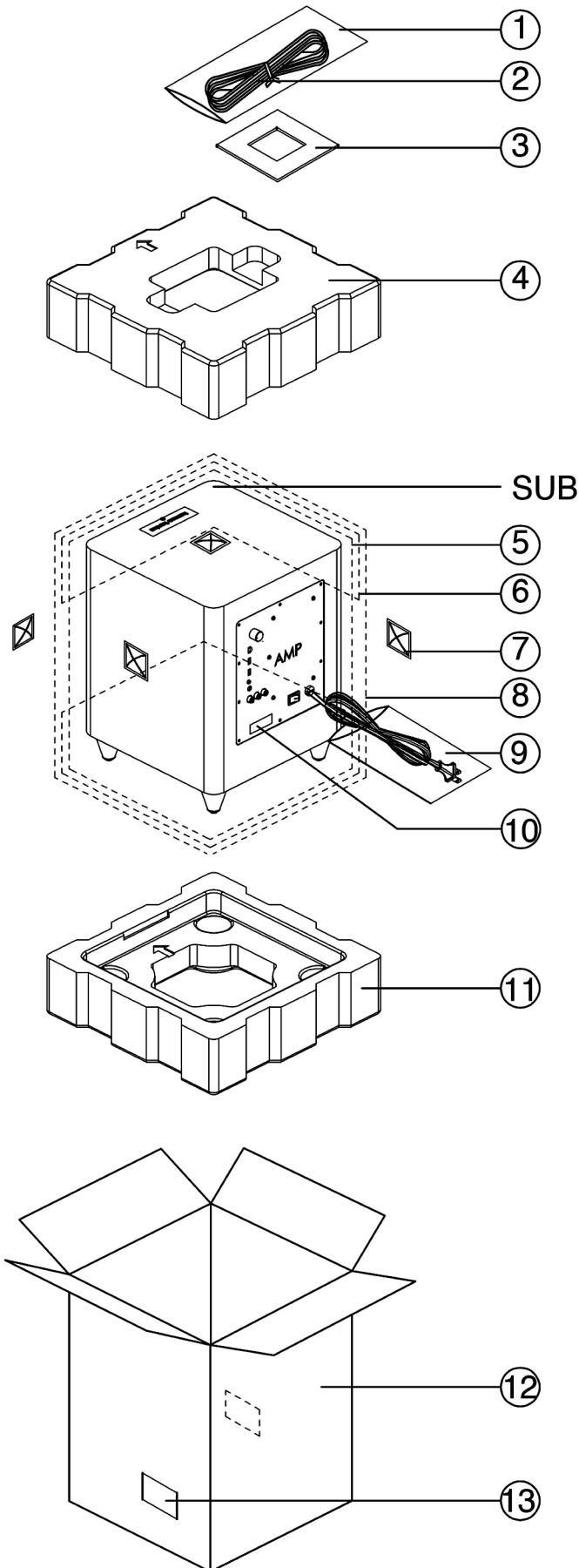
Amplifier Power (RMS)	200 Watts
Driver	8" woofer, Sealed Enclosure
Inputs	Stereo Line Level and dedicated Subwoofer (LFE)
Frequency Response	45Hz – 200Hz
External Trigger Input Voltage	3 ~ 30 volts AC/DC
Dimensions (H x W x D)	13-29/32" x 10-1/2" x 10-1/2" (353mm x 267mm x 267mm)
Weight	19.8 lb (9kg)

Occasional refinements may be made to existing products without notice but will always meet or exceed original specifications unless otherwise stated.

HKTS200SUB Amplifier Specifications				
Parameter	Specification	Unit	QA Test Limits	Test Conditions, Notes, and Comments
<b>Amplifier Section</b>				
Type (Class AB, D, other)	D	-	-	No external heat sink required. Digital 192 kHz ternary mode PWM.
Load Impedance (speaker)	4	Ohm	-	Minimum rated load impedance
Rated Output Power	200	W	200	50 Hz
THD @ Rated Power	<0.5	%	<1	AUX-0025 + AP DSP Audio Analyzer + 20kHz LP
THD @ 1 Watt	<0.2	%	<0.4	AUX-0025 + AP DSP Audio Analyzer + 20kHz LP
DC Offset	<25	mV	<35	
Damping Factor	>10	DF	-	Measured at amplifier board, damping factor dependant on H bridge Rds + output filter impedance + SMPS, typically 0.1 + 0.2 + 0.05 Ohm.
<b>Input Sensitivity</b>				
Input Reference Frequency	50	Hz	-	L, R or LFE Input
Input for 1 Watt Output	11.2	mVrms	±1dB	RCA input to speaker output, Single input driven
Gain (L, R and LFE inputs)	45	dB	-	RCA input to speaker output, Single input driven
<b>Signal to Noise</b>				
SNR-A-Weighted	70	dBA	67.5	(broad band noise from the ADC is present at the output but not audible) relative to 1W, AUX-0025 + AP DSP Audio Analyzer + 20kHz LP + A-Weighting filter, PV measured ~350 uV
SNR-un-weighted	60	dBr	-	relative to 1W, AUX-0025 + AP DSP Audio Analyzer + 20kHz LP, PV measured 2mV
Residual Noise Floor	<1	mVrms	-	Band-pass Measurement at Line freq. + harmonics, AUX-0025 + 22K + 20 brick wall filters, Line level inputs may be terminated using 1K Ohm
<b>Input Impedance</b>				
Line Input	10K	Ohms	-	Applies to L, R or LFE Inputs
<b>Filters &amp; EQ</b>				
Amplifier frequency response	30-300	Hz	+/-1dB	Implemented using DSP QA limits are relative to reference response
Amplifier frequency response	20-500	Hz	+/-3dB	QA limits are relative to reference response
LP filter	~160	Hz	-	Fixed, 4th order
HP Filter	~40	Hz	-	Fixed, 6th order
LF Boost	~50	Hz	-	Selectable, 2nd order parametric, +3 dB
AP Filter	80	Hz	-	Crossover phase alignment.
<b>Limiter</b>				
Limiter	Yes	-	-	Digital limiter integral to audio processor IC.
Maximum THD Under Limiting	5	%	7	QA tests THD at up to 15 dB into limiter.
<b>Features</b>				
Volume Control Taper	LOG	-	Functional	
Crossover Control	No	-	-	Optional, 3-pin header on PCBA for future models.
Phase Control	0/180	Deg.	+/-10	2 position, 0 & 180
LF Boost Control	Yes	-	Functional	2 position, On & Off
LED Indicator	Yes	-	Functional	2 state, Blue = On, Off = Off
Trigger Input	Yes	-	Functional	3.5mm Mono Jack, Jack Sensing
ATO Control	Yes	-	Functional	2 position, On & Auto
<b>Input Configuration</b>				
Line In (R / L)	Yes	-	Functional	RCA Jacks, Red, White (Right and Left)
LFE In	Yes	-	Functional	RCA Jack, Purple
<b>Signal Sensing (ATO)</b>				
Auto-Turn-On (yes/no)	Yes	-	Functional	
ATO Input test frequency	50	Hz	Functional	
ATO Line input level	1.5	mV	Functional	QA Test is 1mV verify amplifier is off, 2.5 mV verify amplifier turns on.
ATO Turn-on time	<1	s	Functional	
Time to Turn Off	15	min	Functional	Time is measured by MCU, PV units measured 14 min.
<b>Ext. Trigger input</b>				
Activation Voltage	>3	V	Functional	Designed to trigger from 3.3 - 30 V sources, AC or DC, QA test uses 3 V DC for fuction test. PV amplifiers measured 2.9 V AC, 1.6 V DC.
Activation current	<3	mA	Functional	~30k input impedance
<b>Transients/Pops</b>				
ATO Transient	<0.5	V-pp	Functional	Speaker Output, Amplifier wake from standby, PV sample < 0.1 V, not audible
Turn-on Transient	<0.5	V-pp	Functional	AC Line Connect, PV sample < 0.1 V, not audible
Turn-off Transient	<0.5	V-pp	Functional	AC Line Disconnect, PV sample < 0.1 V, not audible
<b>Protections</b>				
Output Short Circuit Protection	Yes	-	-	Direct short between output terminal, recoverable @ 1 W, 50 Hz
Output Over Current protection	12	A	-	Integral to power IC
Output DC Protection	Yes	-	-	Detects shorts to ground or VCC on outputs (H-Bridge Failure), LED blinks rapidly, SMPS is shut down to prevent, checks and attempts recovery every 20 seconds
Thermal Protection	Yes	-	-	NTC sensor adjacent power amplifier IC.
Mains Fuse Rating (120v)	6.3	A	slo-blo	250V, Internal Fuse, SMPS PCBA mounted (pigtail, soldered in place).
Mains Fuse Rating (230v)	5	A	slo-blo	250V, Internal Fuse, SMPS PCBA mounted (pigtail, soldered in place).
<b>Efficiency</b>				
Efficiency at rated power	75	%	-	Nominal Line voltage, Mains input to speaker outputs.
Efficiency at 1/8 of rated power	60	%	-	
Standby Input power	0.8	W	<1	
Idle input power	8	W	<10	

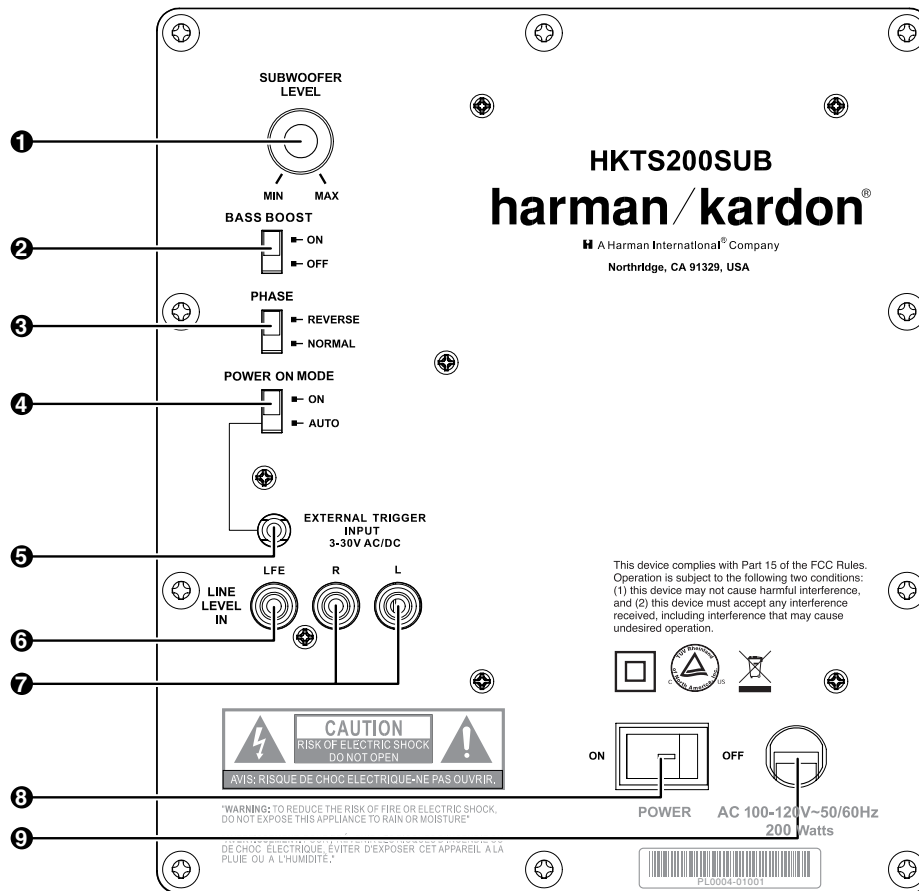
Parameter	Specification	Unit	QA Test Limits	Test Conditions, Notes, and Comments
<b>Power supply</b>				
Type	SMPS	-	-	Half bridge, with auxiliary fly back standby supply. 1/2 rated power continuous, and rated power for > 1 Minute, 25 degree ambient, rated resistive load measured on bench top.
Voltage Range	220-240 or 100-120	Vac	190 & 264	IQC to test power supply at 264 V, 50 Hz input voltage, shall operate at +/- 10 % of the rated values
Operating frequency	50-60	Hz	-	
Efficiency	>80%	-	-	At rated power output
Detachable AC power cord	No	-	-	Fixed Euro Plug for 220-240 V units, and fixed US plug for 100-120 V units
Standby power draw	<0.5	W	-	
<b>ATO / Trigger Truth Table</b>				
Trigger Jack Sense	Trigger Input State	Power Mode SW	Input Signal Sense	System State
(1=jack, 0=no jack)	(1 = high, 0=low)	(1=ON, 0=Auto)	(1=signal, 0=no signal)	
1	1	x	x	On
1	0	x	x	Off
0	x	1	x	On
0	x	0	1	On
0	x	0	0	Off

# PACKAGING



Item	Description	Part Number	Qty
1	Plastic bag		2
2	RCA/Trigger cable	VRC202001-0010	1
3	Foam Pad		1
4	Foam End (top)	ITFA30086-0001	1
5	Cloth bag		1
6	Cloth bag		2
7	Desiccant		4
8	Plastic bag		1
9	Plastic bag		1
10	Label		1
11	Foam End (bottom)	ITFA30086-0002	1
12	Outer Carton	ICCA00227-0001	1
13	Label		2

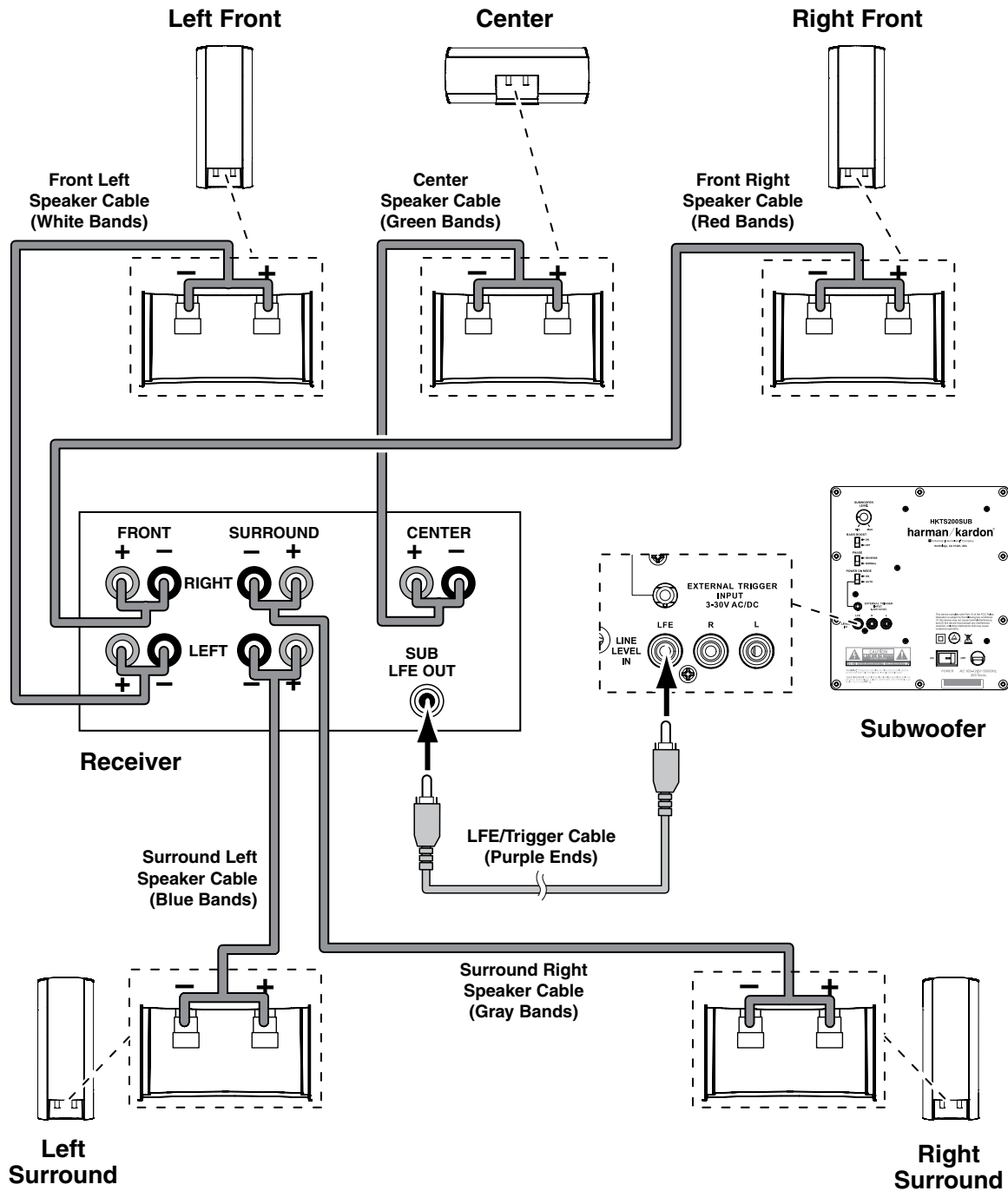
## HKTS200SUB Rear-Panel Connections



- ❶ **Subwoofer Level Control:** Use this control to adjust the HKTS200SUB's volume. Turn clockwise to increase the volume; turn counterclockwise to decrease the volume.
- ❷ **Bass Boost Switch:** Set this switch to **ON** to enhance the HKTS200SUB's low-frequency performance. Set this switch to **OFF** for normal low-frequency performance.
- ❸ **Phase Switch:** The **Phase Switch** ❸ determines whether the HKTS200SUB's piston-like action moves in and out in phase with the satellite speakers. If the subwoofer were to play out of phase with the satellite speakers, the sound waves produced by the subwoofer could be canceled out, reducing bass performance and sonic impact. This phenomenon depends in part on the relative placement of all the speakers in the room. In most cases the **Phase Switch** ❸ should be left in the **NORMAL** position. However, it does no harm to experiment, and you can leave the **Phase Switch** ❸ in the position that maximizes bass response and impact.
- ❹ **Power On Mode Switch:** When set in the **AUTO** position and when the **Power Switch** ❸ is set to **ON**, the HKTS200SUB will automatically turn itself on when it receives an audio signal, and will enter the standby mode once no audio signal has been received for about 15 minutes. When this switch is set in the **ON** position, the HKTS200SUB will remain on whether or not it is receiving an audio signal.  
An LED on the HKTS200SUB's top panel indicates whether the subwoofer is in the on or standby state:
  - When the LED is illuminated white, the HKTS200SUB is turned on.
  - When the LED is not illuminated, the HKTS200SUB is in standby mode.
 When the **Master Power Switch** ❸ is set to **OFF**, the LED will not be illuminated, no matter what setting the **Power On Mode Switch** ❹ is in.
- ❺ **External Trigger Input:** Use the mini-plug of the supplied combination LFE and trigger cable to connect the **External Trigger Input** to the trigger output of another compatible component. Whenever a trigger signal between 3 and 30V (AC or DC) is detected, the HKTS200SUB's amplifier will turn on. The HKTS200SUB's amplifier will turn off after

the trigger signal ceases. (This will occur even when the **Power On Mode Switch** ❹ is in the **AUTO** position.)

- ❻ **Line-Level LFE In Connector:** Use the LFE (purple) connector of the supplied combination LFE and trigger cable to connect the **Line-Level LFE In** to the dedicated subwoofer output of a receiver or preamp/processor. This input bypasses the HKTS200SUB's internal crossover circuitry, so it should only be used with a subwoofer output that has been low-pass filtered. If your receiver or preamp/processor does not have a dedicated subwoofer output that is low-pass filtered you should use the HKTS200SUB's **Line-Level L/R In Connectors** ❼ instead.
- ❼ **Line-Level L/R In Connectors:** Use these connectors if your receiver or preamp/processor does not have digital surround sound decoding or a subwoofer output that is low-pass filtered.
  - If your receiver or preamp/processor has a separate subwoofer output, use the LFE (purple) connector of the supplied combination LFE and trigger cable to connect it to either one of the HKTS200SUB's **Line-Level L/R In Connectors**.
  - If your receiver or preamp/processor does not have a separate subwoofer output, use two Y-adapters (not supplied). Connect an adapter's single end to the unit's preamp output for that channel. Connect one of the adapter's dual ends to the main amp input for that channel, and connect the adapter's other dual end to one of the HKTS200SUB's **Line-Level L/R In Connectors**. Repeat with the other Y-adapter, preamp channel, main amp input and HKTS200SUB **Line-Level L/R In Connector**.
- ❸ **Power Switch:** Set this switch in the **ON** position to turn the HKTS200SUB on. The subwoofer will then either be on or in standby mode, depending on the setting of the **Power On Mode Switch** ❹.
- ❹ **Power Cord (Non-Detachable):** After you have made and verified all subwoofer and speaker connections described in this manual, plug this cord into an active, *unswitched* electrical outlet for proper operation of the HKTS200SUB. **DO NOT** plug this cord into the accessory outlets found in some audio components.



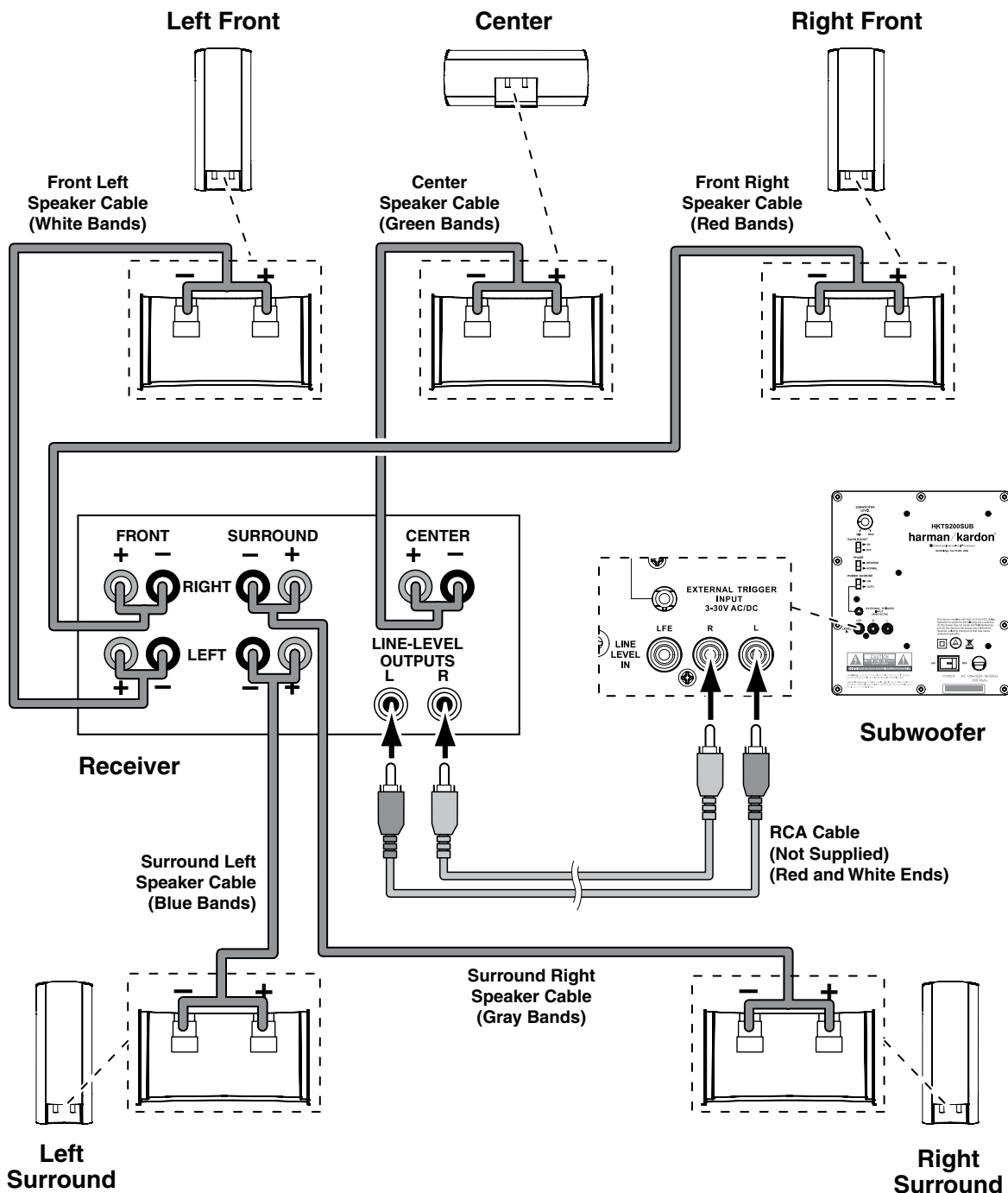
**Connecting the Subwoofer to a Receiver or Preamp/Processor With a Dedicated Subwoofer Output**

Use this installation method for receivers and preamp/processors that have a dedicated subwoofer output with low-pass filtering (also called bass management). If the dedicated subwoofer output does not have low-pass filtering, follow the instructions in *Connecting the Subwoofer to a Receiver or Preamp/Processor With Line Outputs*, on page 9.

Use the LFE (purple) connector of the supplied combination LFE and trigger cable to connect the HKTS200SUB's **Line-Level LFE In Jack** to the dedicated subwoofer output (or LFE output) of your receiver or preamp/processor.

Connect each satellite speaker and the center speaker to the corresponding speaker terminals on your receiver or amplifier.

In your receiver or preamp/processor's setup menu, configure it for *Subwoofer ON*, and set the front left, front right, center, and surround speakers to *Small*. After you have made and verified all connections, plug the HKTS200SUB's **AC Power Cord** into an active AC outlet.



### Connecting the Subwoofer to a Receiver or Preamp/Processor With Line Outputs

Use this installation method for receivers and preamp/processors that do not have a dedicated subwoofer output, but do have preamp-level (volume-controlled) line outputs. If the receiver or preamp/processor has a dedicated subwoofer output with low-pass filtering, see *Connecting the Subwoofer to a Receiver or Preamp/Processor With a Dedicated Subwoofer Output*, on page 8.

If you're connecting to a receiver with left and right line outputs that are not connected to amplifier inputs, connect the LFE (purple) connector of the supplied combination LFE and trigger cable to one of those outputs and to either of the HKTS200SUB's **Line-Level L/R In Connectors** ⑦. Use a second RCA cable (not supplied) to connect the other receiver or preamp line output to the other of the HKTS200SUB's **Line-Level L/R In Connectors** ⑦.

If you're connecting to a receiver or preamp/processor with left and right line outputs that are connected to amplifier front left and right

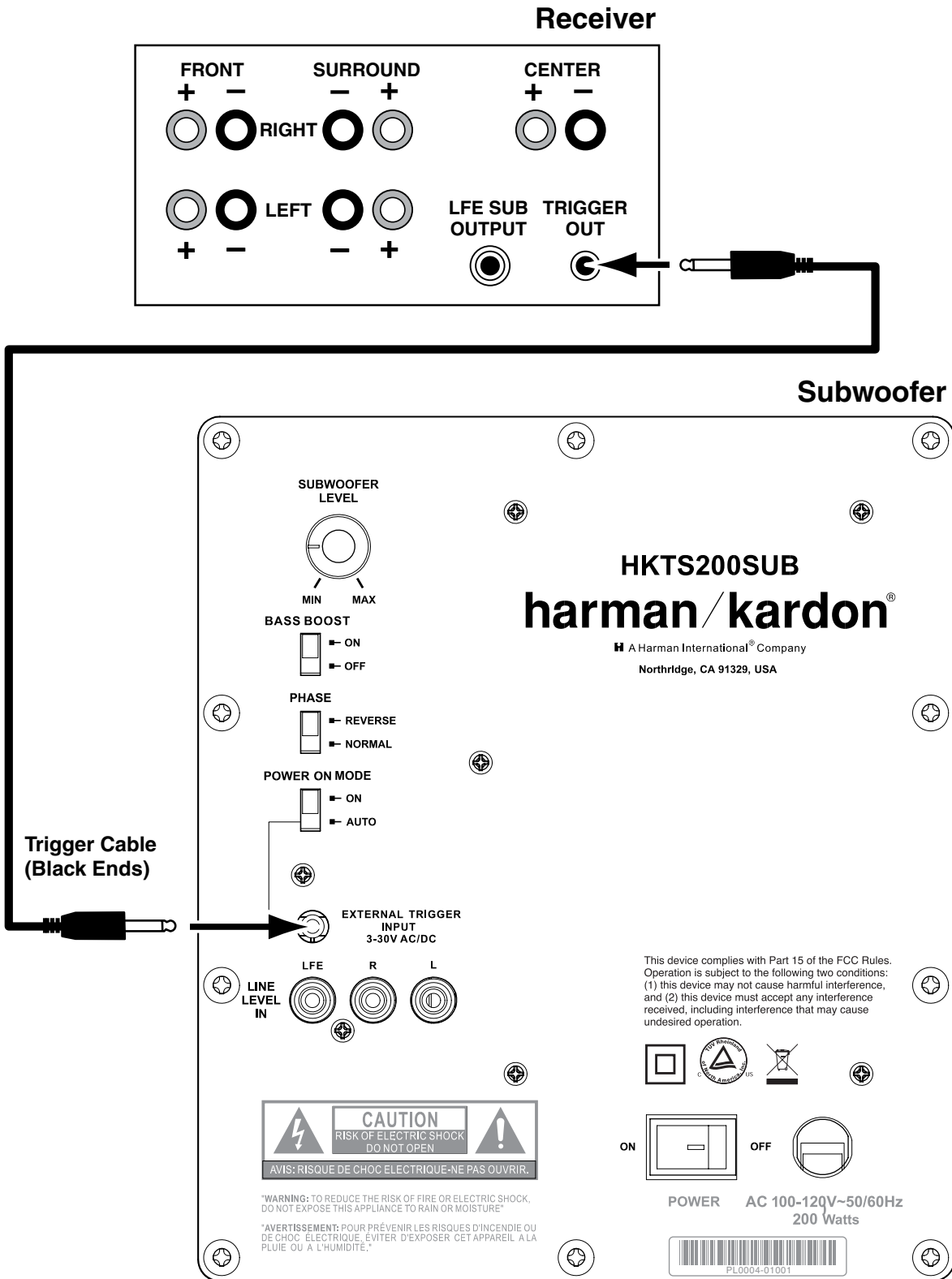
inputs, connect the single ends of Y-adapters (not supplied) to the receiver's or processor's left and right line outputs. Connect one of the Y-adapter's double ends to the HKTS200SUB's **Line-Level L/R In Connectors** ⑦, and connect the other double end to your amplifier's front left and right inputs.

Connect each satellite speaker and the center speaker to the corresponding speaker terminals on your receiver or amplifier.

In your receiver or preamp/processor's setup menu, configure it for *Subwoofer ON*, and set the front left, front right, center, and surround speakers to *Small*.

After you have made and verified all connections, plug the HKTS200SUB's AC Power Cord ⑧ into an active AC outlet.





**Connecting to a Trigger Voltage Source**

If your preamp/processor or another audio/video component has a trigger voltage connection that supplies between 3 and 30V (AC or DC), connect it to the HKTS200SUB's **External Trigger Input Connector** ⑤. If the component's trigger voltage connection has a 3.5mm mini jack you can use the supplied combination LFE/trigger cable to make the connection.

**NOTE:** Please do not connect the subwoofer ON/OFF trigger cable to the Remote Control Output (IR Out) of your home cinema system or surround receiver. This could lead to malfunction.

## Operation

### Turning the Subwoofer On and Off

Set the HKTS200SUB's **Power Switch** ① to the **ON** position.

- If the **Power On Mode Switch** ② is set to **AUTO**, the HKTS200SUB will automatically turn itself on when it receives an audio signal, and it will go into standby mode when it has received no audio signal for 15 minutes. The HKTS200 SUB's LED will illuminate white when the subwoofer is on, and will not be illuminated when the subwoofer is in standby.
- If the **Power On Mode Switch** ② is set to **ON**, the HKTS200SUB will remain on at all times. The HKTS200 SUB's LED will illuminate white.
- If the **External Trigger Input Connector** ③ is connected to a trigger voltage source, the HKTS200SUB will turn on whenever a trigger voltage is present, and will turn off after the trigger voltage ceases, regardless of the position of the Power On Mode Switch ②.

If you will be away from home for an extended period of time, or if you will not be using the subwoofer for an extended period, switch the **Power Switch** ① to the **OFF** Position.

### Subwoofer Adjustments: Volume

Use the **Subwoofer Level Control** ④ to set the HKTS200SUB's volume. Turn the knob clockwise to increase the subwoofer's volume; turn the knob counterclockwise to decrease the subwoofer's volume.

### Subwoofer Adjustments: Phase

The **Phase Switch** ⑤ determines whether the HKTS200SUB's piston-like action moves in and out in phase with the satellite speakers. If the subwoofer were to play out of phase with the satellite speakers, the sound waves produced by the subwoofer could be canceled out, reducing bass performance and sonic impact. This phenomenon depends in part on the relative placement of all the speakers in the room.

Although in most cases the **Phase Switch** ⑤ should be left in the **NORMAL** position, there is no absolute correct setting for the **Phase Switch** ⑤. When the HKTS200SUB is properly in phase with the satellite speakers, the sound will be clearer and have maximum impact. This will make percussive sounds like drums, piano and plucked strings sound more lifelike. The best way to set the **Phase Switch** ⑤ is to listen to music that you are familiar with and set the switch in the position that gives drums and other percussive sounds maximum impact.

### Subwoofer Adjustments: Bass Boost

When set to the **ON** position, the **Bass Boost Switch** ⑥ enhances low-frequency performance, resulting in bass with more impact, which you may prefer while watching movies or listening to music. There is no harm in experimenting with this control – setting the switch to the **OFF** position will return normal low-frequency performance.

## Troubleshooting

### If there is no sound from *any* of the speakers:

- Check that the receiver/amplifier is on and a source is playing.
- Make sure that all wires and connections between the receiver/amplifier and the speakers are connected properly.
- Make sure none of the speaker wires is frayed, cut or punctured.
- Review the proper operation of your receiver/amplifier.

### If there is no sound coming from *one* speaker:

- Check that the balance control on your receiver/amplifier is not set all the way to one channel.
- Check your receiver/amplifier's speaker setup procedure to make sure that the speaker in question has been enabled and its volume level has not been turned all the way down.
- Make sure that all wires and connections between the receiver/amplifier and the speaker are connected properly.
- Make sure the speaker wires are not frayed, cut or punctured.

### If there is no sound coming from the *center* speaker:

- Check your receiver/amplifier's speaker setup procedure to make sure that the center speaker has been enabled and its volume level has not been turned all the way down.
- Make sure that all wires and connections between the receiver/amplifier and the center speaker are connected properly.
- Make sure the speaker wires are not frayed, cut or punctured.
- If your receiver is operating in Dolby® Pro Logic® mode, make sure that the center speaker is not set to Phantom.

### If there is no sound coming from the *surround* speakers:

- Check your receiver/amplifier's speaker setup procedure to make sure that the surround speakers have been enabled and their volume levels have not been turned all the way down.
- Make sure that all wires and connections between the receiver/amplifier and the surround speakers are connected properly.
- Make sure the speaker wires are not frayed, cut or punctured.
- Review proper operation of your receiver/processor and its surround-sound features.
- Make sure the movie or TV show you're watching has been recorded in a surround-sound mode. If it is not, check to see if your receiver/amplifier has a different surround-sound mode that you can use.
- Review the operation of your DVD player and the DVD jacket to make sure the DVD features the desired Dolby Digital or DTS® surround-sound mode, and that you have properly selected that mode using both the DVD player's menu and the disc's menu.

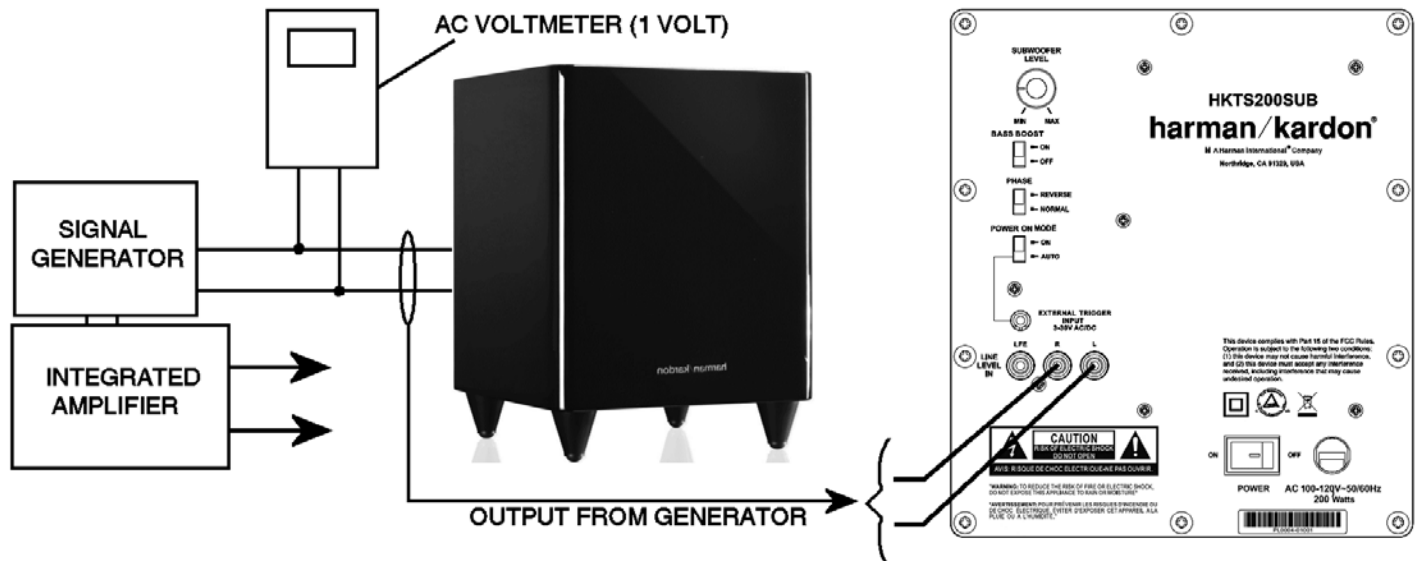
### If there is no sound coming from the *subwoofer*:

- Check that the subwoofer's **Power Cord** ⑦ is plugged into a working AC outlet.
- Check that the subwoofer's **Power Switch** ① is in the **ON** position.
- Check that the **Subwoofer Level Control** ④ is not turned all the way down (fully counterclockwise).
- Check the audio connection between your receiver/processor and the subwoofer.
- Check your receiver/amplifier's speaker setup procedure to make sure that the subwoofer has been enabled and its volume level has not been turned all the way down.

### If the system plays at low volumes but shuts off as volume is increased:

- Make sure that all wires and connections between the receiver/amplifier and the speakers are connected properly.
- Make sure none of the speaker wires is frayed, cut or punctured.
- If you're using more than one pair of main speakers, check to be sure that you're not operating the system below the receiver/amplifier's minimum impedance requirements.

## Test Set Up and Procedure



### Equipment needed:

- Function/signal generator/sweep generator
- Integrated amplifier
- Multimeter

### Initial Control Settings:

- Power Switch OFF; Bass Mode OFF
- Level MIN (Full CCW)
- Phase, Auto/On switches do not matter

### General Unit Function (UUT = Unit Under Test)

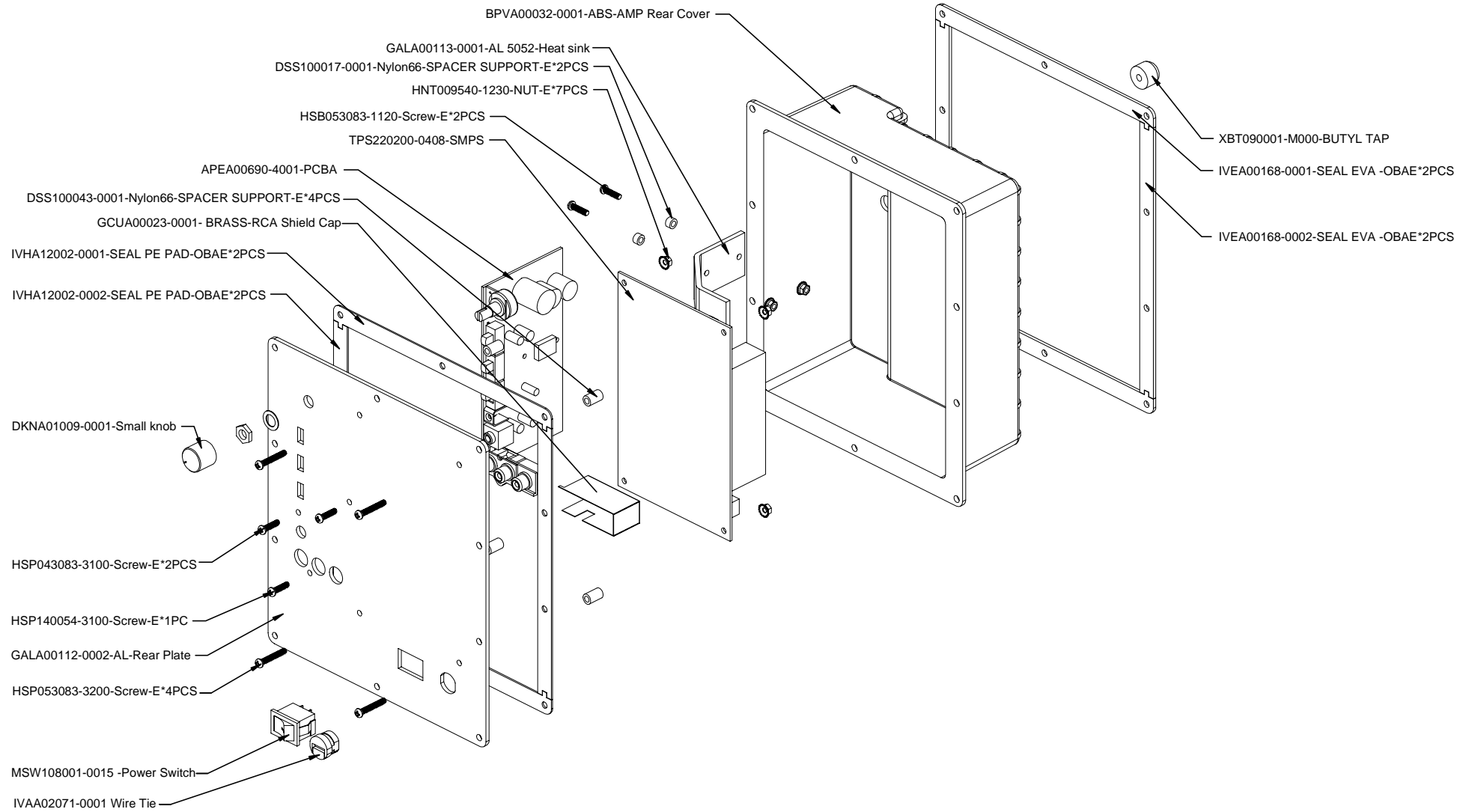
- 1) From the signal generator, connect one line level (RCA) cable to the Subwoofer Line Level Input jacks L/R on the UUT. Use a Y-cable from a mono source if necessary to connect to both inputs. Do not connect to the single, purple SUB input.
- 2) Turn on generator; adjust to **100mV, 50 Hz**.
- 3) Plug in UUT; turn the power switch ON. Turn LEVEL control full clockwise (MAX)
- 4) LED should be white (on top of UUT); immediate and vigorous bass response should be heard and felt from woofer on bottom of subwoofer.

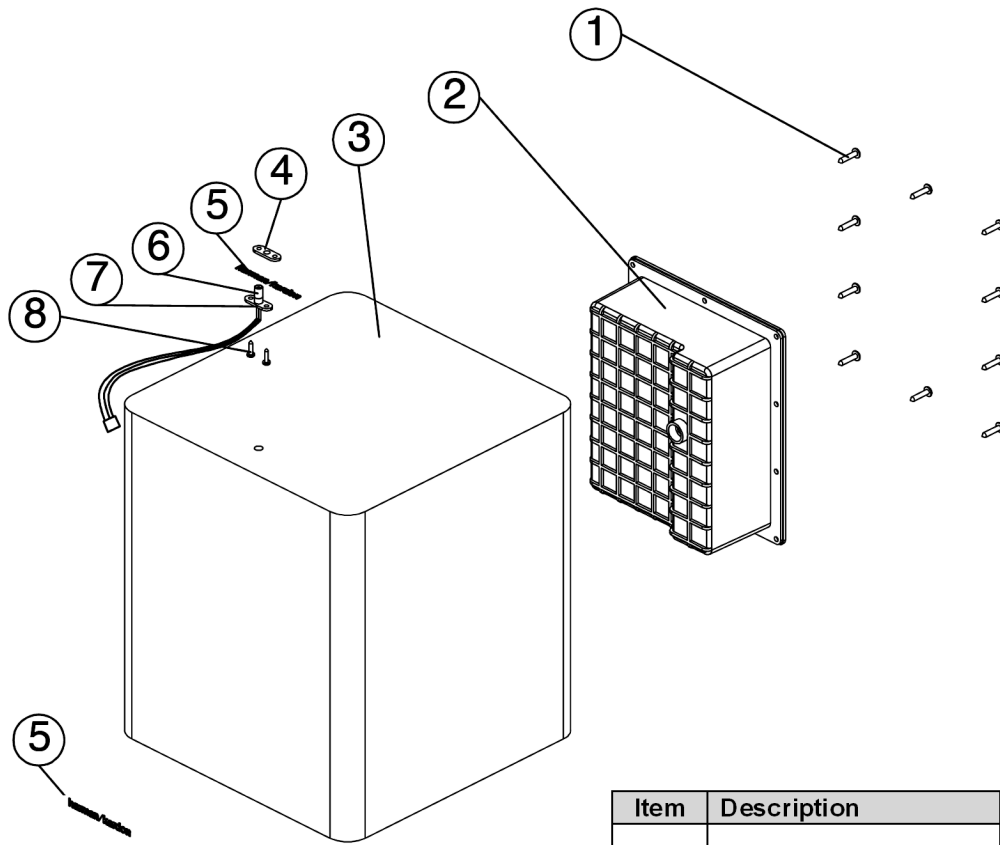
### Sweep Function

- 1) Follow steps 1-4 above, using a sweep generator as a signal source.
- 2) Sweep generator from 20Hz to 300Hz. Listen to the cabinet and drivers for any rattles, clicks, buzzes or any other noises. If any unusual noises are heard, remove woofers and test.

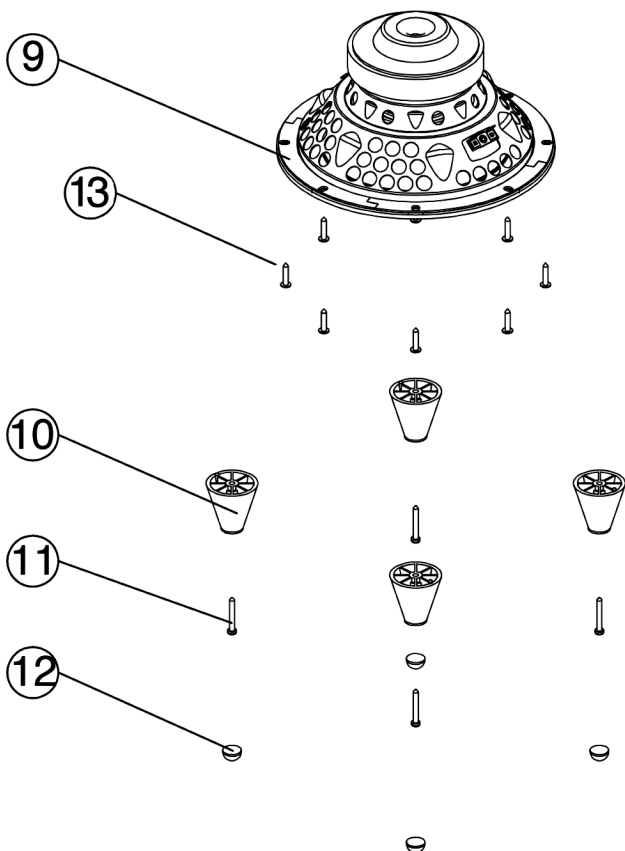
### Driver Function

- 1) Remove woofer from cabinet; detach + and - wire clips.
- 2) Check DC resistance of woofer; it should be **3.4 ohms ±10%**
- 3) Connect a pair of speaker cables to driver terminals. Cables should be connected to an integrated amplifier fed by a signal generator. Turn on generator and adjust so that speaker level output is **5.0V**.
- 4) Sweep generator from 20Hz to 1kHz. Listen to driver for any rubbing, buzzing, or other unusual noises.

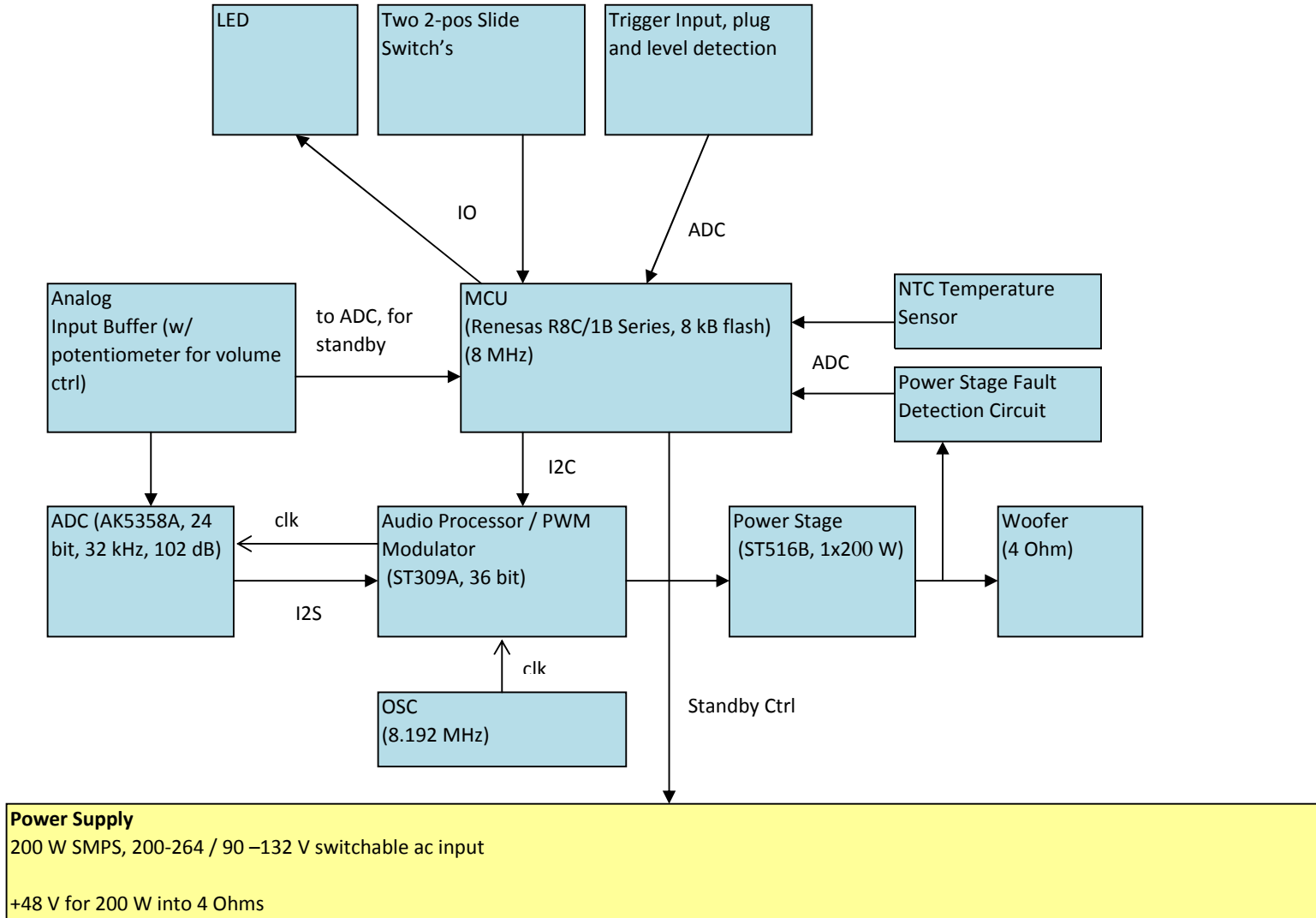


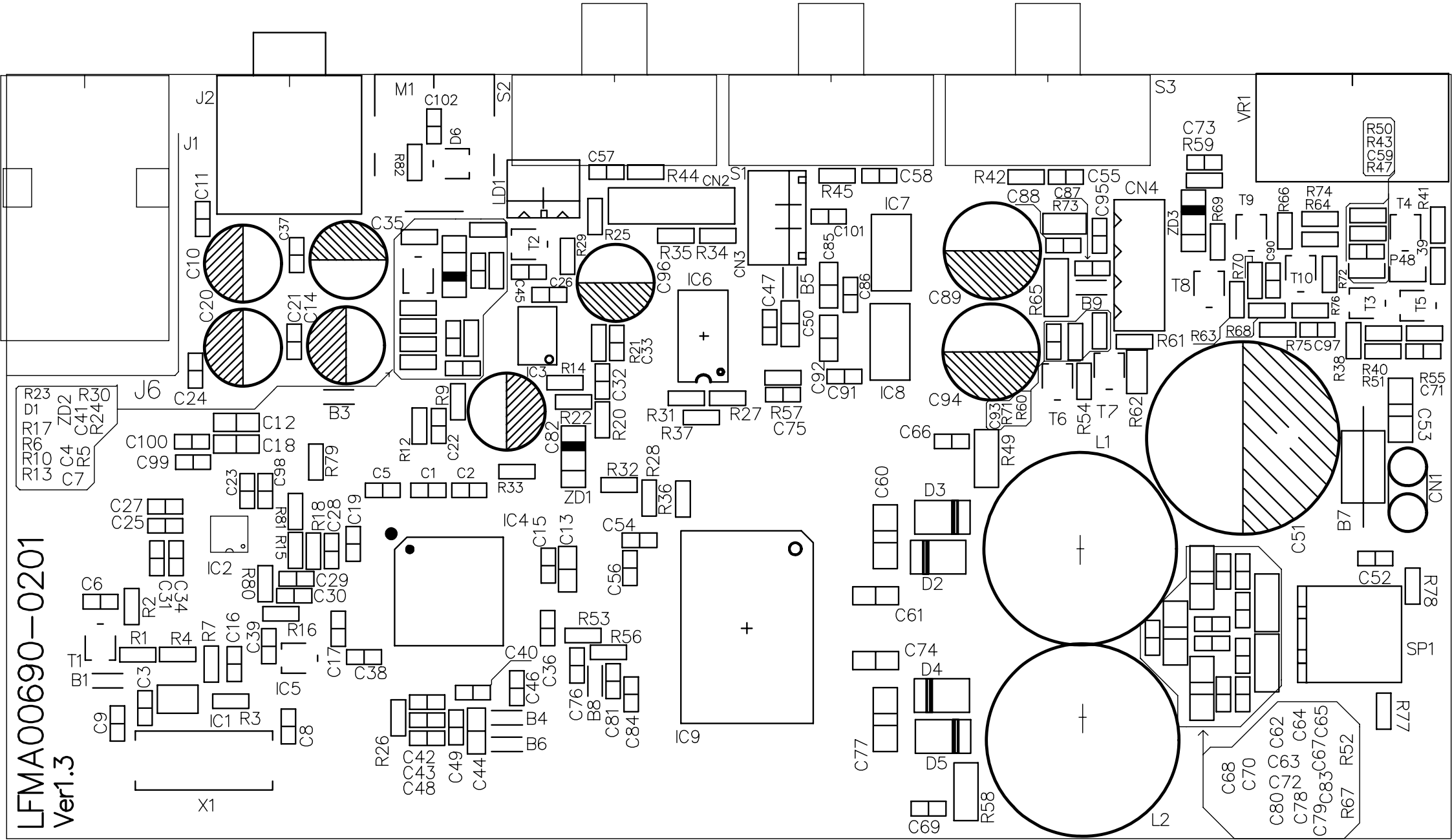


Item	Description	Part Number	Qty
1	Screw, amp ass'y	HSBA50431-3201	10
2	Amplifier		1
3	Cabinet		1
4	Pad, LED carrier		1
5	hk Logo	GALA00198-0001	2
6	LED	BPNA00008-0001	1
7	LED carrier	BPSA02012-0001	1
	LED cable	VOT050001-0010	1
8	Screw, LED holder	HSBA70051-3120	2
9	8" Woofer 3.4Ω DCR	FSBA2B080-0401	1
10	Foot, main	BPEA00006-0001	4
11	Screw, foot	HSPA50352-4300	4
12	Rubber tip for foot	BRFA00049-0001	4
13	Screw, Woofer	HSBA50431-3201	8



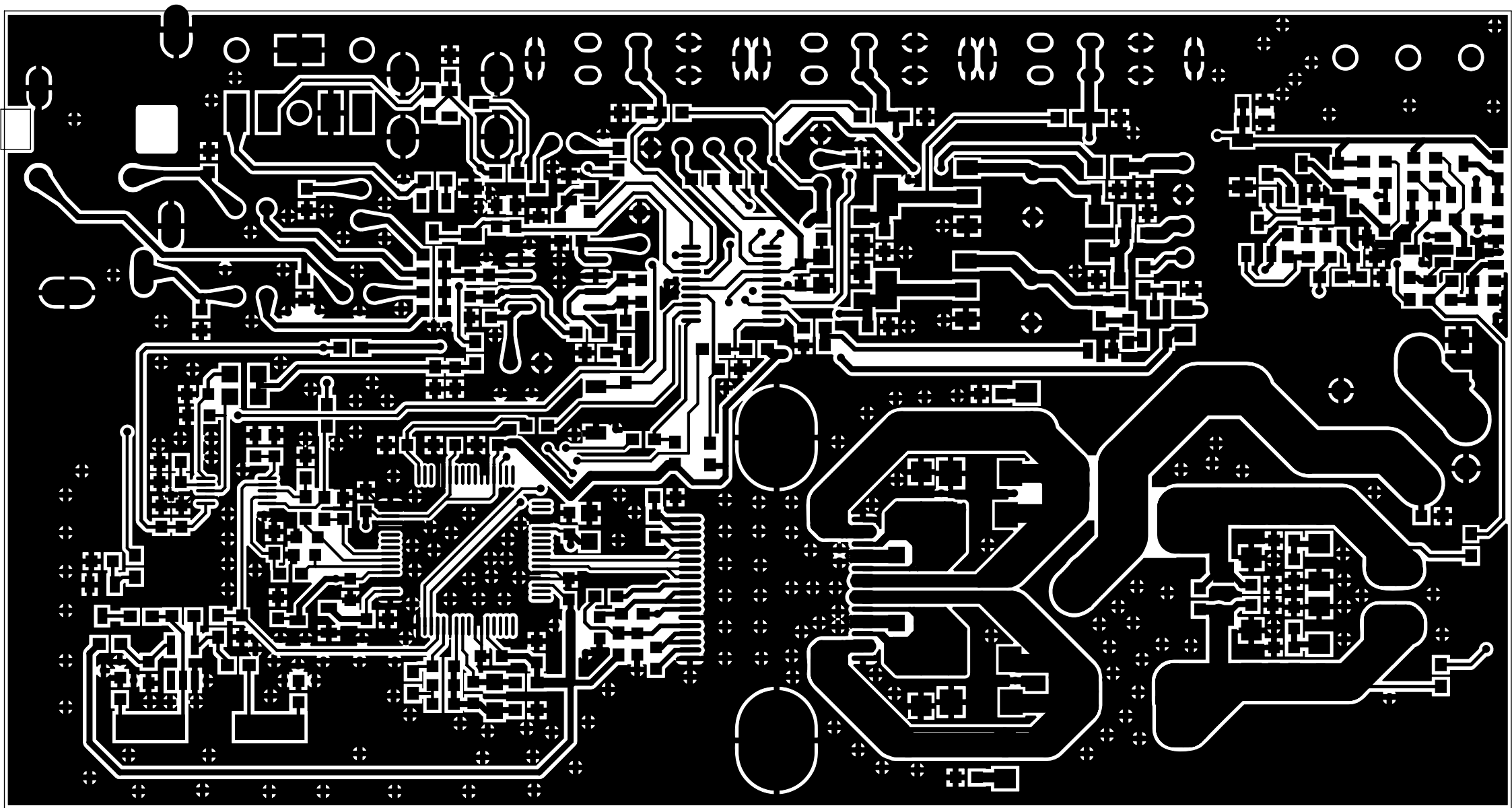
HKTS200SUB Subwoofer Block Diagram



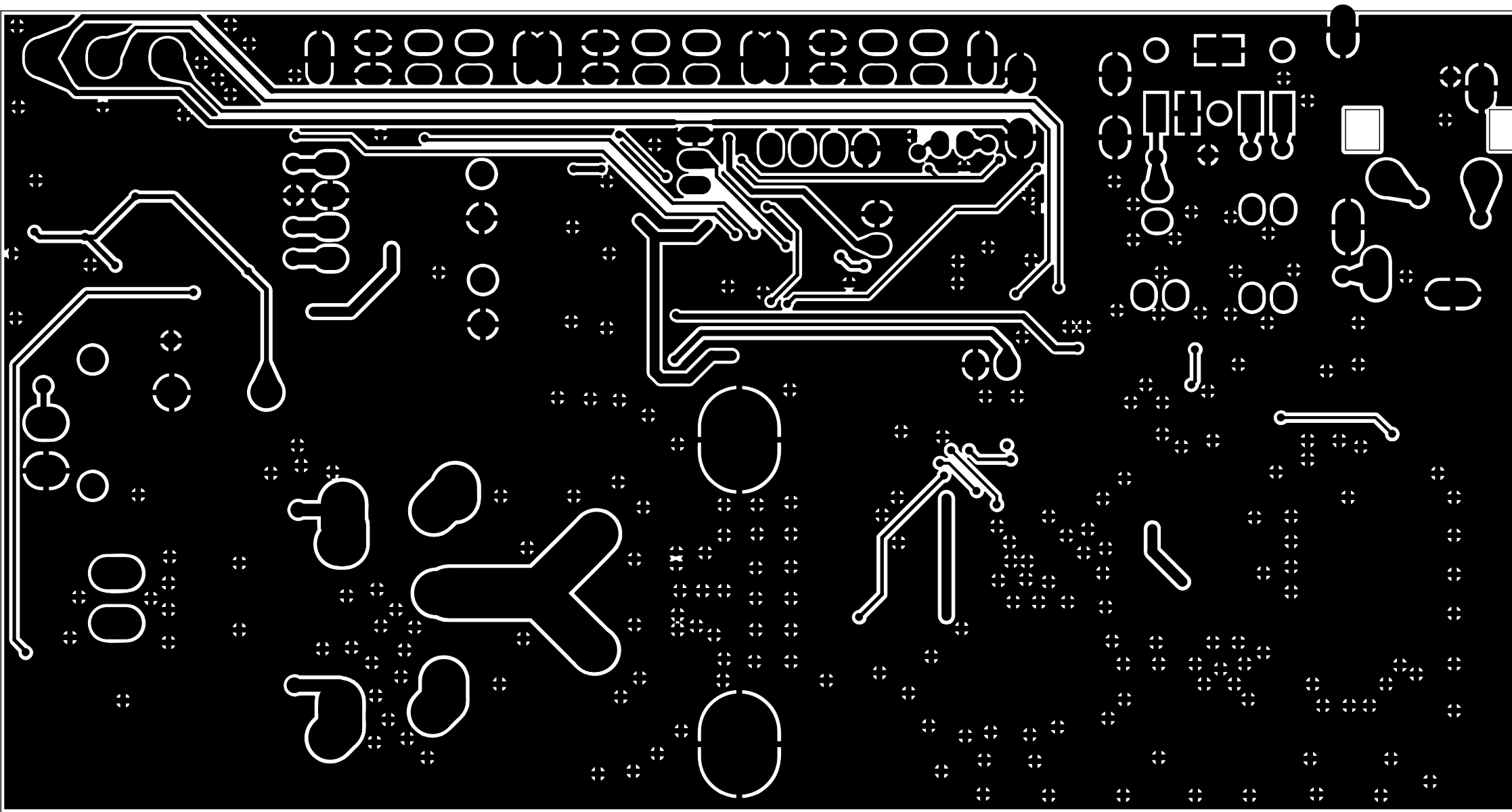


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Ver1.3

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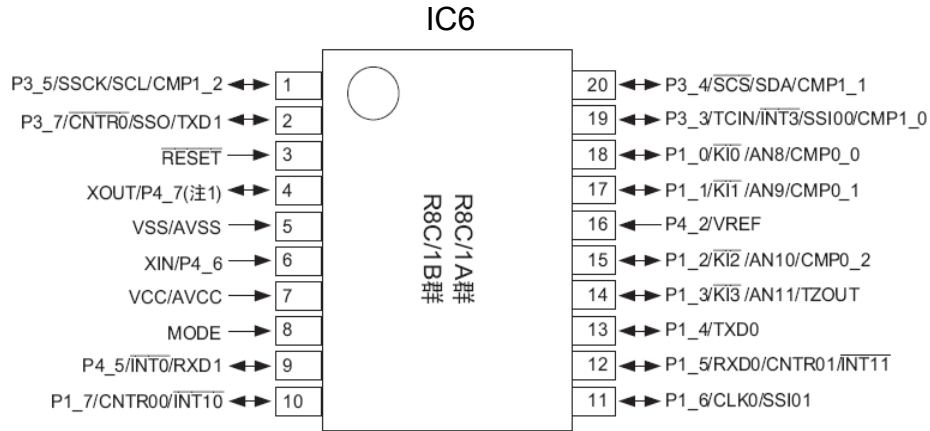




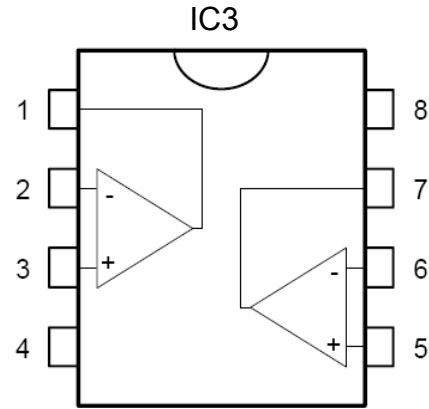
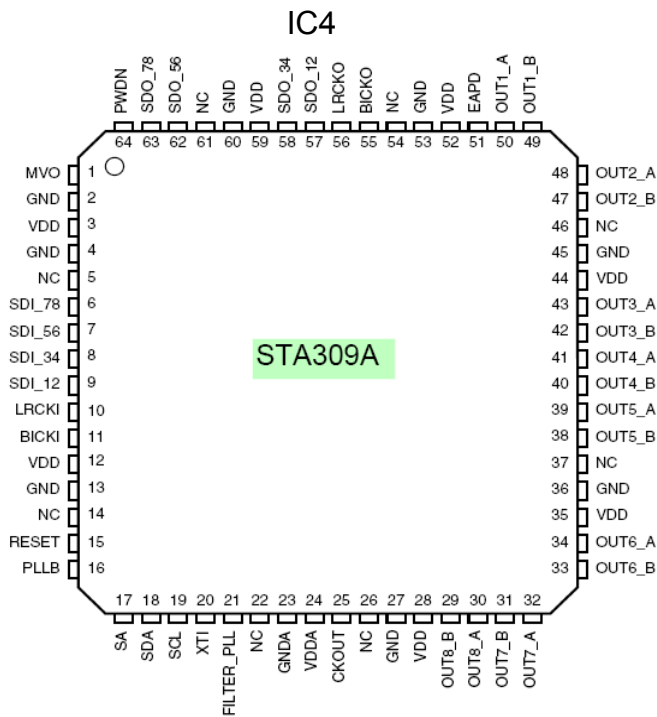
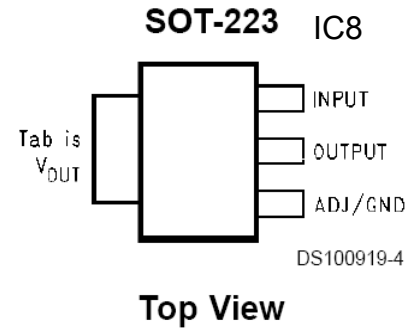


HKTS200SUB Electrical Parts list			
Part number	Description	Qty	Reference Designator
<b>MAIN PCB</b>			
<i>Resistors</i>			
QCF015030-0000	GP CHIP RES. 0 OHM 1/10W 5% 0603	2	R77 R78
QCF011030-1801	GP CHIP RES. 1.8K OHM 1/10W 1% 0603	1	R3
QCF011030-1002	GP CHIP RES. 10K OHM 1/10W 1% 0603	18	R2 R5 R6 R10 R13 R20 R27 R28 R29 R34 R35 R42 R44 R45 R53 R54 R56 R79
QCF011030-1004	GP CHIP RES. 1M OHM 1/10W 1% 0603	6	R4 R30 R40 R47 R68 R70
QCF015030-5100	GP CHIP RES. 51 OHM 1/10W 5% 0603	6	R7 R15 R16 R18 R31 R32
QCF011030-4991	GP CHIP RES. 4.99K OHM 1/10W 1% 0603	3	R9 R14 R17
QCF011030-4992	GP CHIP RES. 49.9K OHM 1/10W 1% 0603	2	R12 R22
QCF011030-1003	GP CHIP RES. 100K OHM 1/10W 1% 0603	5	R21 R57 R61 R80 R81
QCF011030-2202	GP CHIP RES. 22K OHM 1/10W 1% 0603	4	R25 R23 R24 R82
QCF011030-3301	GP CHIP RES. 3.3K OHM 1/10W 1% 0603	1	R26
QCF011030-1000	GP CHIP RES. 100 OHM 1/10W 1% 0603	2	R33 R60
QCF011030-1001	GP CHIP RES. 1K OHM 1/10W 1% 0603	1	R37
QCF011030-4703	CHIP RES. 470K OHM 1/10W 1% 0603	12	R38 R39 R41 R43 R48 R50 R63 R64 R66 R69 R72 R74
QCF045010-2200	GP CHIP RES. 22 OHM 1/4W 5% 1206	3	R49 R58 R65
QCF011030-2204	GP CHIP RES. 2.2M OHM 1/10W 1% 0603	2	R51 R75
QCF045010-6290	GP CHIP RES. 6.2 OHM 1/4W 5% 1206	2	R52 R67
QCF011030-1333	GP CHIP RES. 133K OHM 1/10W 1% 0603	1	R59
QCF081020-1009	GP CHIP RES. 10 OHM 1/8W 1% 0805	2	R62 R73
QCF011030-1009	GP CHIP RES. 10 OHM 1/10W 1% 0603	1	R71
MVRA02202-1020	CNTL ROTRY 1K OHM LEVEL	1	VR1
<i>Capacitors</i>			
PXL456470-1040	GP CHIP CAP 0.1uF 50V 10%	35	C1 C2 C3 C7 C15 C17 C19 C25 C26 C34 C36 C38 C39 C40 C45 C46 C47 C49 C54 C55 C56 C57 C58 C76 C81 C84 C86 C87 C88 C91 C93 C95 C23 C101 C102
PXL410370-1220	GP CHIP CAP 1.2nF 50V 5%	4	C4 C5 C33 C48
PXL410370-2200	GP CHIP CAP 22pF 50V 5%	6	C8 C9 C16 C28 C29 C30
PXL456470-1010	GP CHIP CAP 100pF 50V 10%	9	C11 C21 C22 C24 C37 C43 C99 C100 C6
PYL456420-1060	CHIP CAP 10uF 6.3V 10% 0805 X7R	4	C13 C44 C12 C18
PXL456470-2240	CHIP CAP 220nF 50V 10%	1	C32
PXL456470-4740	GP CHIP CAP 470NF 50V 10%	3	C41 C71 C97
PXL456470-2210	GP CHIP CAP 220pF 50V 10%	1	C42
PYL439520-2260	CHIP CAP 22uF 6.3V 20%	3	C50 C85 C92
PXL4564A0-1040	CHIP CAP 0.1uF 100V 10%	5	C52 C65 C67 C79 C83
PXL456470-1030	GP CHIP CAP 0.01uF 50V 10%	2	C59 C90
PXL4564A0-3310	CHIP CAP 330pF 100V 10%	4	C63 C66 C69 C72
PXL4564A0-1020	CHIP CAP 1nF 100V 10%	3	C64 C68 C78
PXL456440-1050	GP CHIP CAP 1uF 16V 10%	4	C73 C27 C31 C98
PXL456470-1020	GP CHIP CAP 0.001 uF 50V 10%	1	C75
PYL4564A0-4740	GP CHIP CAP 470NF 100V 10%	2	C61 C74
PZL4564A4-1051	GP CHIP CAP 1uF 100V 10% 1206 X7R	3	C62 C70 C80
PZL4564A0-2250	GP CHIP CAP 2.2uF 100V 10%	3	C53 C60 C77
PME099540-2200	GP COND ELECT 22uF 16V 20% 5x11mm	4	C10 C14 C20 C82
PME099540-1010	GP COND ELECT 100uF 16V 20% 5X11	2	C89 C94
PME099540-2200	COND ELECT 22uF 16V 20% 105' 4x7	1	C96
PLE599580-1020	COND ELECT 1000uF 63V 20% 105' 16x25	1	C51
<i>Semiconductors</i>			
RCI700405-0002	IC 5P NC7SZ04M5X MA05B TinyLogic UHS Inverter	1	IC1
RCI005343-0001	IC ADC 10 PIN CS5343 CIRRUS Multi-Bit Audio A/D Converter	1	IC2
RCI000720-0001	IC 8P TL072CDR SOIC ST DUAL OP AMP	1	IC3
RCI000309-0001	GP IC 64P STA309A Multi-channel digital audio processor	1	IC4
RCI000809-0008	GP IC 3P AZ809ANSTR-E1 MICRO RESET CIRCUIT	1	IC5
RCI052114-0001	IC 20P R5F211B4DD48S PLSP0020JB-A RENESAS PROCESSOR	1	IC6

Part number	Description	Qty	Reference Designator
RCI111733-1102	3P AP1117E33LA SOT223 Low Drop Pos Adjustable/Fixed-Mode Regulator	1	IC7
RCI111750-0001	3P LM1117MPX-5.0 SOT-223 Low-Dropout Linear Regulator	1	IC8
RCI000516-0001	IC 36P STA516B SO36 60 V 6 A quad power half bridge	1	IC9
RCP000856-0001	GP TRANSISTOR PNP BC856B SOT-23	2	T3 T8
RCP003906-0002	CHIP TRANSISTOR 3P PNP MMBT3906 PNP SOT23	1	T7
RCN000846-0001	GP TRANSISTOR NPN BC846B SOT23	4	T4 T5 T9 T10
RCN003904-0008	TRANSISTOR NPN MMBT3904 SOT-23 FAIRCHILD	2	T2 T6
RCD100540-0010	GP DIODE CHIP BAT54S (3PIN)	2	D1 D6
RCZ005002-0020	CHIP ZENER 2.7V 5% 0.5W LL34	2	ZD1 ZD2
<b>TPS220200-0407</b>	<b>SMPS power supply (120v)</b>	<b>1</b>	
<b>TPS220200-0408</b>	<b>SMPS power supply (230v)</b>	<b>1</b>	
Miscellaneous			
RNT000030-1002	NTC 10k Ohm 1%,0603, MURATA	1	R36
SCB008051-6010	CHIP BEAD 600 OHM 25% AT 100MHZ SMD 0805	7	B1 B3 B4 B5 B6 B8 B9
JCQA13010-1251	SMD CHIP CRYSTAL 12.288MHz 30ppm	1	X1
CCP254260-0104	HEAD PIN 4P P2.54xH11.5MM	1	CN2
CCN396020-0102	GP CONNECTOR 2 PIN LEOCO 3951	1	SP1
CJRA03401-0010	RCA JACK RCA313 WHITE/RED/PURPLE	1	J1
CJMA35002-3010	PHONE JACK 3.5mm HSJ-035-09-K	1	J2
VWA310054-0002	C/W 2P 100mm 2468#18 RED-BLACK	1	CN1
VWA010034-0001	C/W 4P 90mm 1007#26 BLACK/WHITE/RED	1	CN4
VWA200056-0001	C/W 2P 210mm 2468#26 RED/BLACK	1	LD1
SINA03701-1000	INDUCTOR 10UH 20% D0.9x8.5TS	2	L1 L2
DHU109001-0001	PCB HOUSING L11.5xW8.5xH11.2xT0.8	1	M1
MSWA04001-0010	SLIDE SWITCH SK-22F03 6 PIN BASS/PHASE/AUTO	3	S1 S2 S3
GCUA00023-0001	HKTS30-RCA SHIELD CAP	1	J6
SFB005002-6000	BEAD FERIT 60 OHM 100MHz 3.5x6mm	1	B7
VPAA14013-0010	AC power cord (120v)	1	
MSW108001-0015	AC power switch	1	
GALA00112-0001	Aluminum amp plate (silkscreened)	1	
BPVA00032-0001-ABS-AMP	Plastic amp cover	1	
GALA00113-0001-AL	Heatsink	1	
DKNA01009-0001	Level knob	1	
IVAA02071-0001	Strain Relief Plug	1	



**LM1117-3.3/5.0**

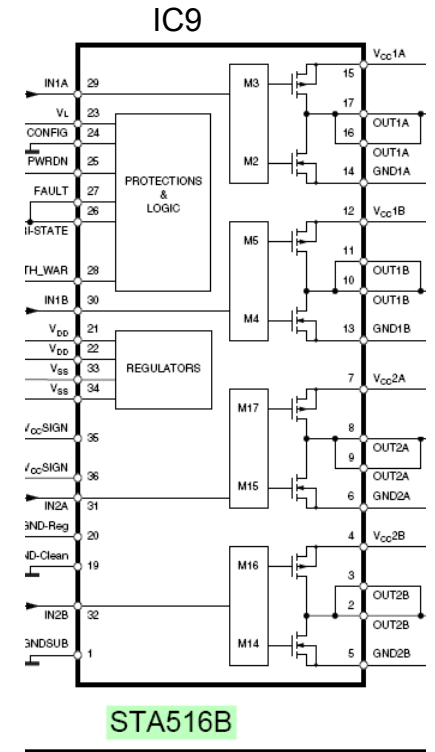
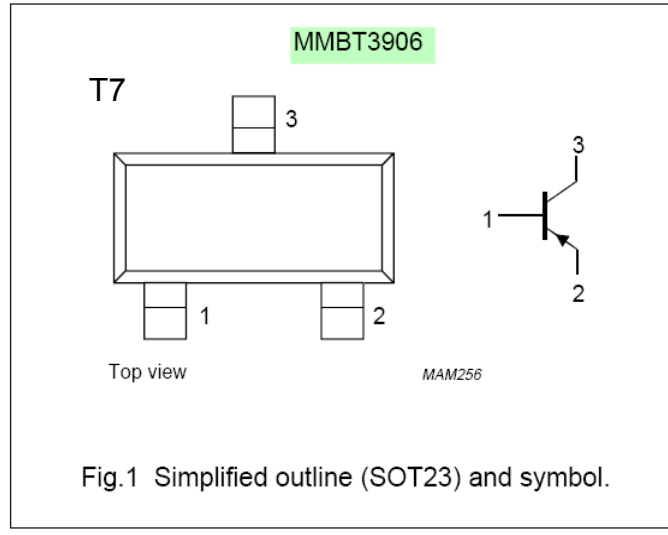
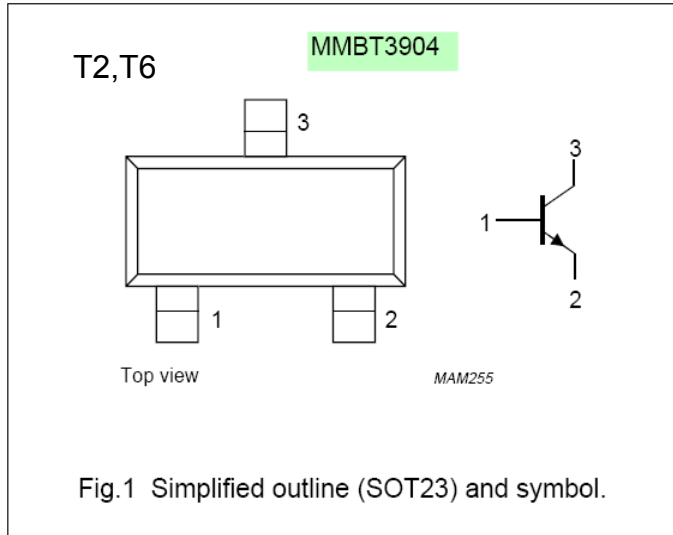


- 1 - Offset null 1
- 2 - Inverting input 1
- 3 - Non-inverting input 1
- 4 -  $V_{CC}^-$
- 5 - Non-inverting input 2
- 6 - Inverting input 2
- 7 - Output 2
- 8 -  $V_{CC}^+$

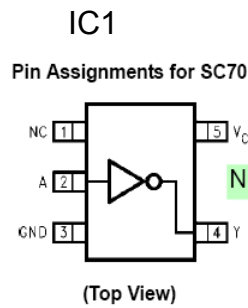
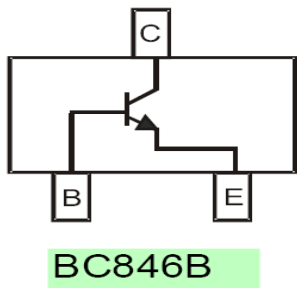
**TL072**

PIN	DESCRIPTION
1	base
2	emitter
3	collector

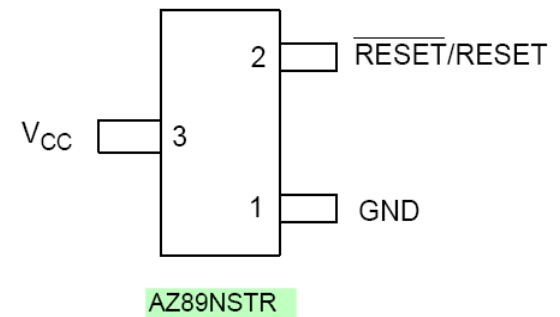
PIN	DESCRIPTION
1	base
2	emitter
3	collector

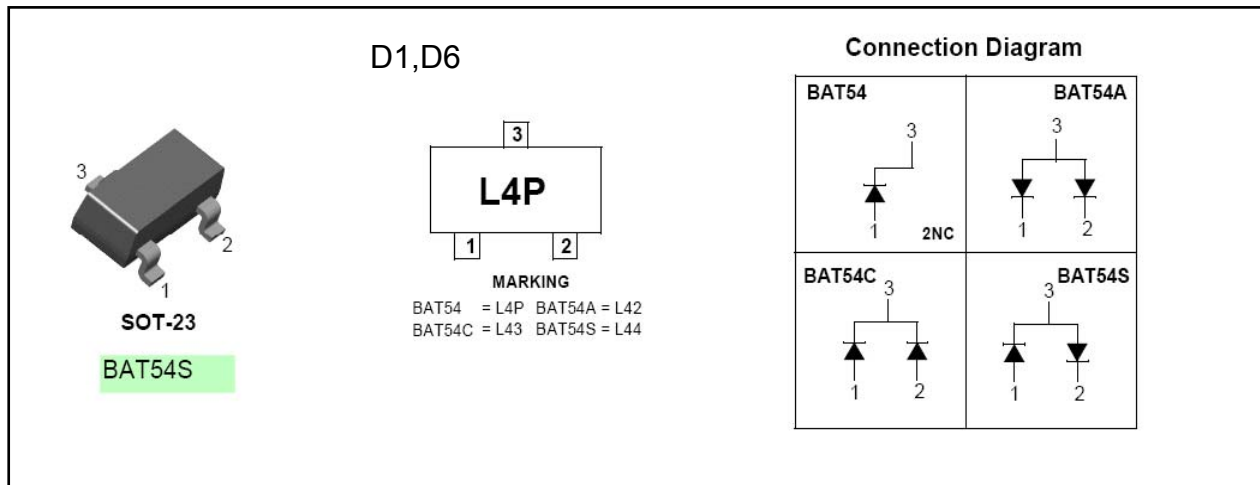
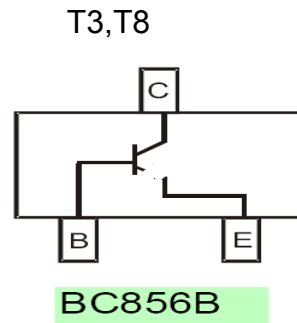
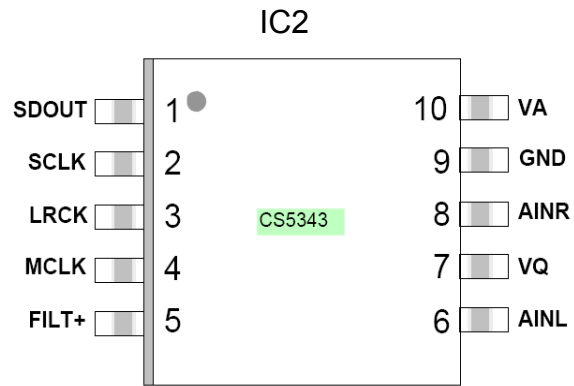


T4, T5, T9, T10



N Package  
(SOT-23-3) IC5





REJ09B0252-0110

Everywhere you imagine. **RENESAS****16**

# R8C/1A Group, R8C/1B Group

## Hardware Manual

RENESAS 16-BIT SINGLE-CHIP MICROCOMPUTER  
M16C FAMILY / R8C/Tiny SERIES

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Technology Corp. without notice. Please review the latest information published by Renesas Technology Corp. through various means, including the Renesas Technology Corp. website (<http://www.renesas.com>).

Rev.1.10

R8C/1A Group, R8C/1B Group  
SINGLE-CHIP 16-BIT CMOS MICROCOMPUTER

REJ09B0252-0110  
Rev.1.10  
Mar 17, 2006

1. Overview

These MCUs are fabricated using the high-performance silicon gate CMOS process, embedding the R8C/Tiny Series CPU core, and is packaged in a 20-pin molded-plastic LSSOP, SDIP or a 28-pin plastic molded-HWQFN. It implements sophisticated instructions for a high level of instruction efficiency. With 1 Mbyte of address space, they are capable of executing instructions at high speed. Furthermore, the R8C/1B Group has on-chip data flash ROM (1 KB × 2 blocks). The difference between the R8C/1A Group and R8C/1B Group is only the presence or absence of data flash ROM. Their peripheral functions are the same.

1.1 Applications

Electric household appliances, office equipment, housing equipment (sensors, security systems), general industrial equipment, audio equipment, etc.

R8C/1A Group, R8C/1B Group

1. Overview

1.5 Pin Assignments

Figure 1.4 shows Pin Assignments for PLSP0020JB-A Package (Top View), Figure 1.5 shows Pin Assignments for PRDP0020BA-A Package (Top View) and Figure 1.6 shows Pin Assignments for PWQN0028KA-B Package (Top View).

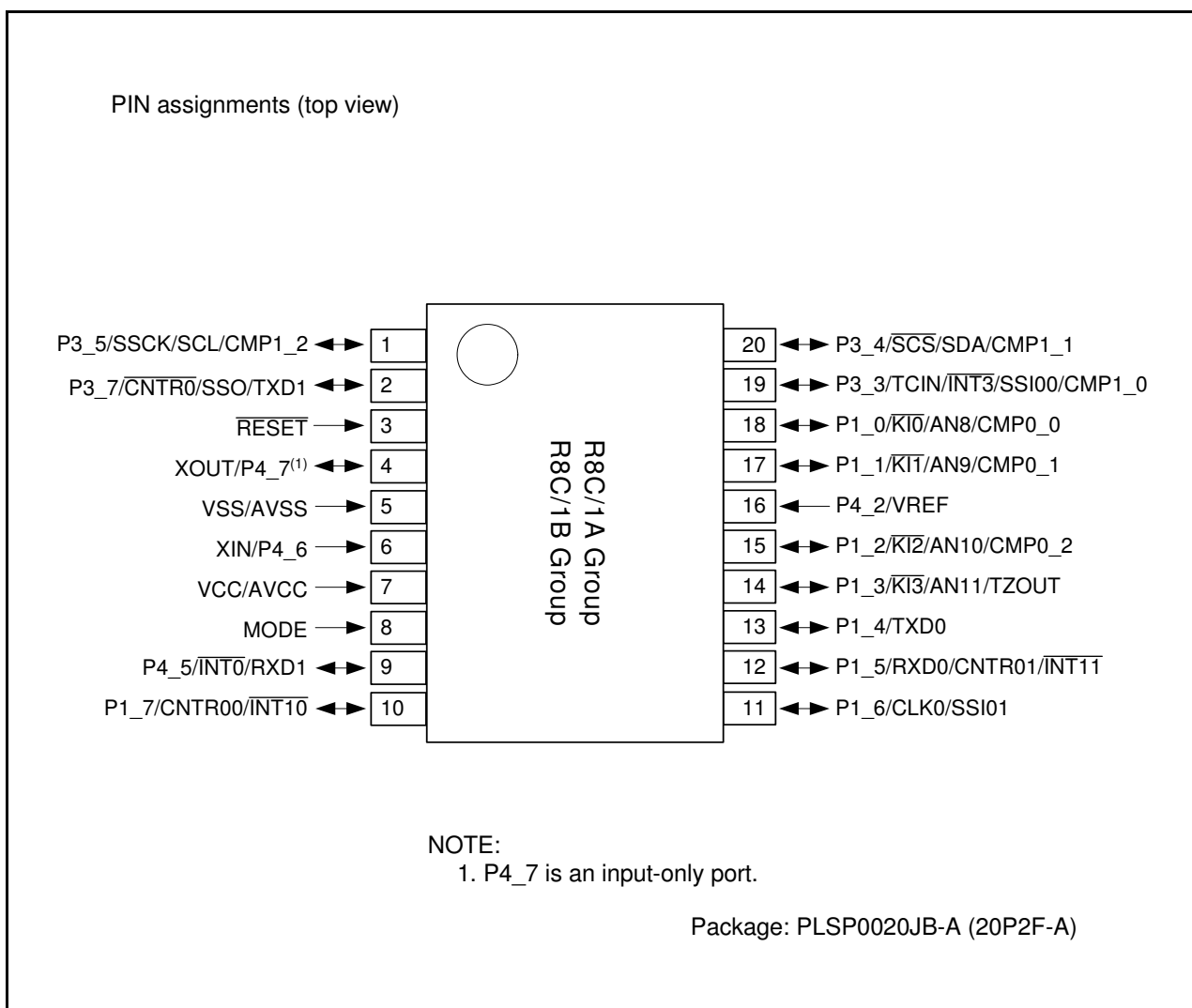


Figure 1.4 Pin Assignments for PLSP0020JB-A Package (Top View)



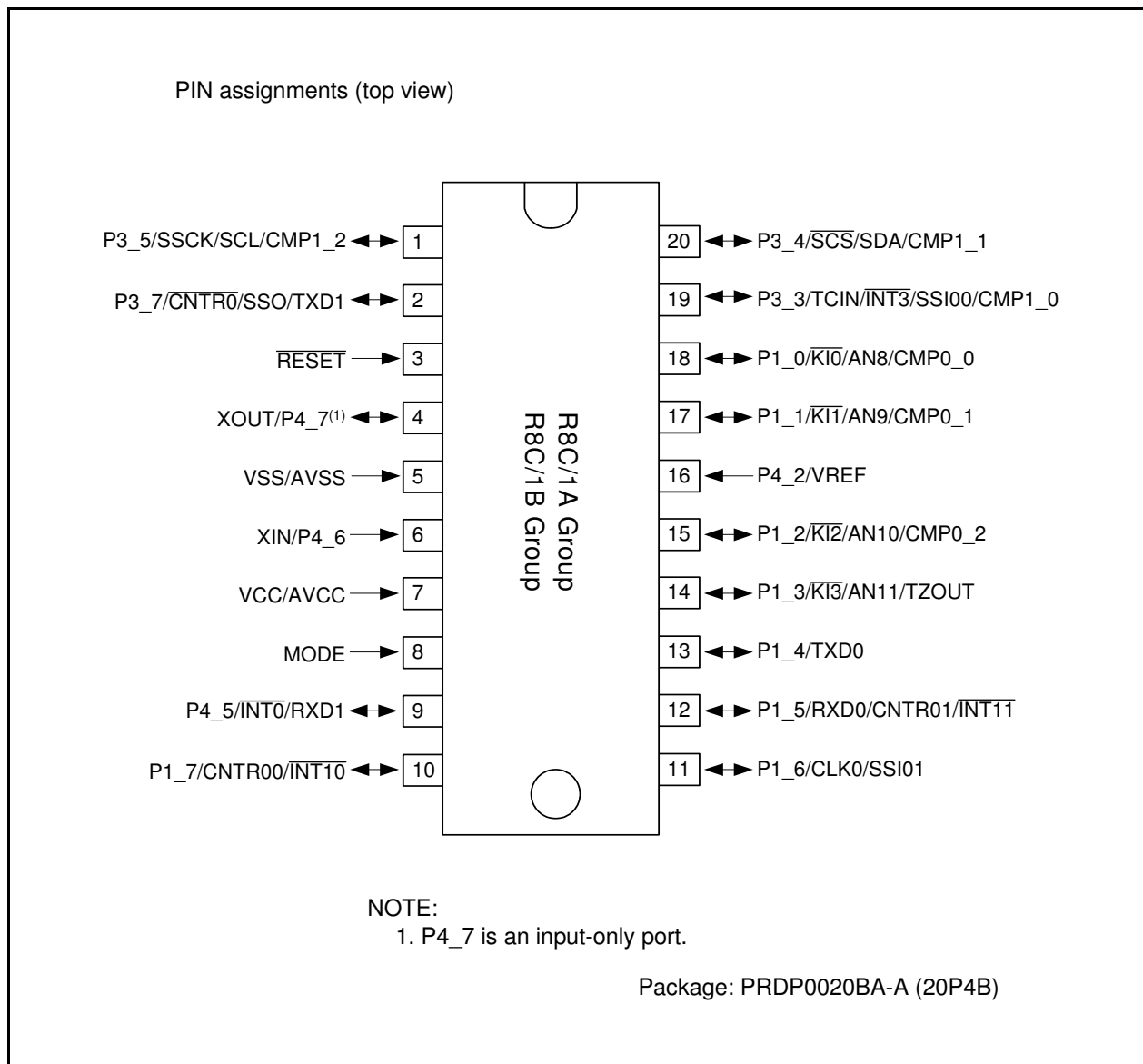


Figure 1.5 Pin Assignments for PRDP0020BA-A Package (Top View)

## 1.6 Pin Functions

Table 1.5 lists Pin Functions, Table 1.6 lists Pin Name Information by Pin Number of PLSP0020JB-A, PRDP0020BA-A Packages and Table 1.7 lists Pin Name Information by Pin Number of PWQN0028KA-B Package.

**Table 1.5 Pin Functions**

Type	Symbol	I/O Type	Description
Power Supply Input	VCC, VSS	I	Apply 2.7 V to 5.5 V to the VCC pin.
			Apply 0 V to the VSS pin.
Analog Power Supply Input	AVCC, AVSS	I	Power supply for the A/D converter
Reset Input	<u>RESET</u>	I	Connect a capacitor between AVCC and AVSS. Input "L" on this pin resets the MCU.
MODE	MODE	I	Connect this pin to VCC via a resistor.
Main Clock Input	XIN	I	These pins are provided for main clock generation circuit I/O. Connect a ceramic resonator or a crystal oscillator between the XIN and XOUT pins. To use an external clock, input it to the XIN pin and leave the XOUT pin open.
Main Clock Output	XOUT	O	
INT Interrupt	<u>INT0, INT1, INT3</u>	I	INT interrupt input pins
Key Input Interrupt	<u>KI0 to KI3</u>	I	Key input interrupt input pins
Timer X	<u>CNTR0</u>	I/O	Timer X I/O pin
	<u>CNTR0</u>	O	Timer X output pin
Timer Z	<u>TZOUT</u>	O	Timer Z output pin
Timer C	<u>TCIN</u>	I	Timer C input pin
	<u>CMP0_0 to CMP0_2, CMP1_0 to CMP1_2</u>	O	Timer C output pins
Serial Interface	<u>CLK0</u>	I/O	Transfer clock I/O pin
	<u>RXD0, RXD1</u>	I	Serial data input pins
	<u>TXD0, TXD1</u>	O	Serial data output pins
Clock synchronous serial I/O with chip select (SSU)	<u>SSI00, SSI01</u>	I/O	Data I/O pin.
	<u>SCS</u>	I/O	Chip-select signal I/O pin
	<u>SSCK</u>	I/O	Clock I/O pin
	<u>SSO</u>	I/O	Data I/O pin
I <sup>2</sup> C bus Interface	<u>SCL</u>	I/O	Clock I/O pin
	<u>SDA</u>	I/O	Data I/O pin
Reference Voltage Input	<u>VREF</u>	I	Reference voltage input pin to A/D converter
A/D Converter	<u>AN8 to AN11</u>	I	Analog input pins to A/D converter
I/O Port	<u>P1_0 to P1_7, P3_3 to P3_5, P3_7, P4_5</u>	I/O	CMOS I/O ports. Each port has an I/O select direction register, allowing each pin in the port to be directed for input or output individually. Any port set to input can be set to use a pull-up resistor or not by a program. P1_0 to P1_3 also function as LED drive ports.
Input Port	<u>P4_2, P4_6, P4_7</u>	I	Input-only ports
I: Input	O: Output	I/O: Input and output	

**Table 1.6 Pin Name Information by Pin Number of PLSP0020JB-A, PRDP0020BA-A Packages**

I/O Pin Functions for Peripheral Modules

Pin Number	Control Pin	Port	Clock					
			Interrupt	Timer	Serial Interface	Synchronous Serial I/O with Chip Select	I <sup>2</sup> C bus Interface	A/D Converter
1		P3_5		CMP1_2		SSCK	SCL	
2		P3_7		CNTR0	TXD1	SSO		
3	<u>RESET</u>							
4	XOUT	P4_7						
5	VSS/AVSS							
6	XIN	P4_6						
7	VCC/AVCC							
8	MODE							
9		P4_5	<u>INT0</u>		RXD1			
10		P1_7	<u>INT10</u>	CNTR00				
11		P1_6			CLK0	SSI01		
12		P1_5	<u>INT11</u>	CNTR01	RXD0			
13		P1_4			TXD0			
14		P1_3	<u>KI3</u>	TZOUT				AN11
15		P1_2	<u>KI2</u>	CMP0_2				AN10
16	VREF	P4_2						
17		P1_1	<u>KI1</u>	CMP0_1				AN9
18		P1_0	<u>KI0</u>	CMP0_0				AN8
19		P3_3	<u>INT3</u>	TCIN/		SSI00		
20		P3_4		CMP1_0 CMP1_1		<u>SCS</u>	SDA	

**Table 1.7 Pin Name Information by Pin Number of PWQN0028KA-B Package**

## I/O Pin Functions for Peripheral Modules

Pin Number	Control Pin	Port	Clock						
			Interrupt	Timer	Serial Interface	Synchronous Serial I/O with Chip Select	I <sup>2</sup> C bus Interface	A/D Converter	
1	NC								
2	XOUT	P4_7							
3	VSS/AVSS								
4	NC								
5	NC								
6	XIN	P4_6							
7	NC								
8	VCC/AVCC								
9	MODE								
10		P4_5	<u>INT0</u>		RXD1				
11		P1_7	<u>INT10</u>	CNTR00					
12		P1_6			CLK0	SSI01			
13		P1_5	<u>INT11</u>	CNTR01	RXD0				
14		P1_4			TXD0				
15	NC								
16		P1_3	<u>KI3</u>	TZOUT					AN11
17		P1_2	<u>KI2</u>	CMP0_2					AN10
18	NC								
19	NC								
20	VREF	P4_2							
21	NC								
22		P1_1	<u>KI1</u>	CMP0_1					AN9
23		P1_0	<u>KI0</u>	CMP0_0					AN8
24		P3_3	<u>INT3</u>	TCIN/CMP1_0		SSI00			
25		P3_4		CMP1_1		<u>SCS</u>	SDA		
26		P3_5		CMP1_2		SSCK	SCL		
27		P3_7		<u>CNTR0</u>	TXD1	SSO			
28	<u>RESET</u>								



**CS5343/4**

**98 dB, 96 kHz, Multi-Bit Audio A/D Converter**

**Features**

- ◆ Advanced Multi-Bit  $\Delta\Sigma$  Architecture
- ◆ 24-bit Conversion
- ◆ Supports Audio Sample Rates Up to 108 kHz
- ◆ 98 dB Dynamic Range at 5 V
- ◆ -90 dB THD+N
- ◆ Low-Latency Digital Filter
- ◆ High-Pass Filter to Remove DC Offsets
- ◆ Single +3.3 V or +5 V Power Supply
- ◆ Power Consumption Less Than 50 mW
- ◆ Master or Slave Operation
- ◆ Slave Mode Speed Auto-Detect
- ◆ Master Mode Default Settings
- ◆ 256x or 384x MCLK/LRCK Ratio
- ◆ CS5343 Supports I<sup>2</sup>S Audio Format
- ◆ CS5344 Supports Left-Justified Audio Format

**General Description**

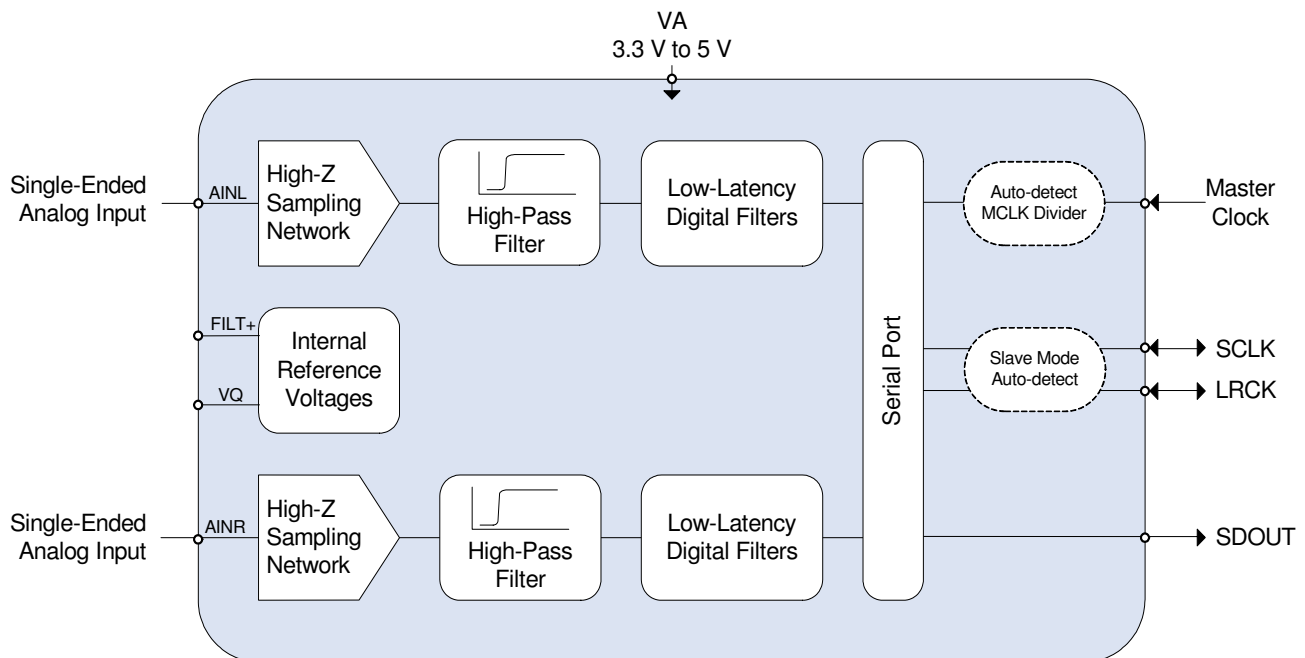
The CS5343/4 is a complete analog-to-digital converter for digital audio systems. It performs sampling, analog-to-digital conversion, and anti-alias filtering, generating 24-bit values for both left and right inputs in serial form at sample rates up to 108 kHz per channel.

The CS5343/4 uses a 3rd-order, multi-bit Delta-Sigma modulator followed by a digital filter, which removes the need for an external anti-alias filter.

The CS5343/4 also features a high-impedance sampling network which eliminates costly external components such as op-amps.

The CS5343/4 is available in a 10-pin TSSOP package for both Commercial (-10° to +70° C) and Automotive grades (-40° to +85° C). The CDB5343 Customer Demonstration Board is also available for device evaluation and implementation suggestions. Please refer to the "Ordering Information" on page 21 for complete details.

The CS5343/4 is ideal for audio systems requiring wide dynamic range, negligible distortion and low noise, such as set-top boxes, DVD-karaoke players, DVD recorders, A/V receivers, and automotive applications.



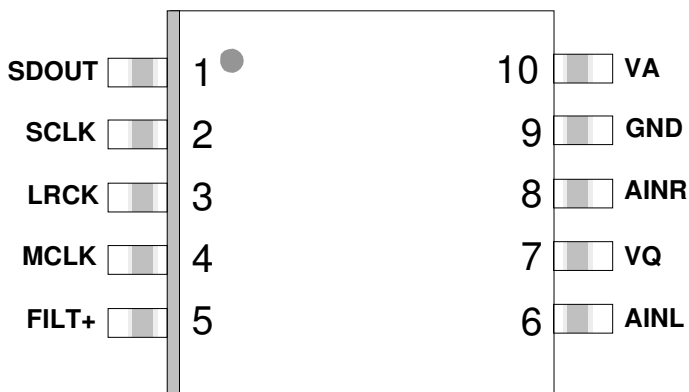
**Advance Product Information**

This document contains information for a new product. Cirrus Logic reserves the right to modify this product without notice.



# 1. PIN DESCRIPTIONS

CS5343/4



Pin Name	Pin #	Pin Description
SDOUT	1	<b>Serial Audio Data Output</b> ( <i>Output</i> ) - Output for two's complement serial audio data. Also selects Master or Slave Mode.
SCLK	2	<b>Serial Clock</b> ( <i>Input/Output</i> ) - Serial clock for the serial audio interface.
LRCK	3	<b>Left Right Clock</b> ( <i>Input/Output</i> ) - Determines which channel, Left or Right, is currently active on the serial audio data line.
MCLK	4	<b>Master Clock</b> ( <i>Input</i> ) - Clock source for the delta-sigma modulator and digital filters.
FILT+	5	<b>Positive Voltage Reference</b> ( <i>Output</i> ) - Positive reference voltage for the internal sampling circuits.
AINL AINR	6 8	<b>Analog Input</b> ( <i>Input</i> ) - The full-scale analog input level is specified in the Analog Characteristics specification table.
VQ	7	<b>Quiescent Voltage</b> ( <i>Output</i> ) - Filter connection for the internal quiescent reference voltage.
GND	9	<b>Ground</b> ( <i>Input</i> ) - Ground reference. Must be connected to analog ground.
VA	10	<b>Power</b> ( <i>Input</i> ) - Positive power supply for the digital and analog sections.

**FAIRCHILD**  
SEMICONDUCTOR™

October 1996  
Revised June 2000

## NC7SZ04 TinyLogic™ UHS Inverter

### General Description

The NC7SZ04 is a single inverter from Fairchild's Ultra High Speed Series of TinyLogic™. The device is fabricated with advanced CMOS technology to achieve ultra high speed with high output drive while maintaining low static power dissipation over a very broad  $V_{CC}$  operating range. The device is specified to operate over the 1.8V to 5.5V  $V_{CC}$  range. The inputs and output are high impedance when  $V_{CC}$  is 0V. Inputs tolerate voltages up to 6V independent of  $V_{CC}$  operating voltage.

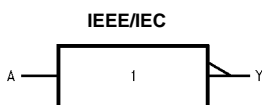
### Features

- Space saving SOT23 or SC70 5-lead package
- Ultra High Speed;  $t_{PD}$  2.4 ns typ into 50 pF at 5V  $V_{CC}$
- High Output Drive;  $\pm 24$  mA at 3V  $V_{CC}$
- Broad  $V_{CC}$  Operating Range; 1.8V to 5.5V
- Matches the performance of LCX when operated at 3.3V  $V_{CC}$
- Power down high impedance inputs/output
- Overvoltage tolerant inputs facilitate 5V to 3V translation
- Patented noise/EMI reduction circuitry implemented

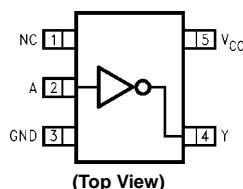
### Ordering Code:

Order Number	Package Number	Product Code Top Mark	Package Description	Supplied As
NC7SZ04M5	MA05B	7Z04	5-Lead SOT23, JEDEC MO-178, 1.6mm	250 Units on Tape and Reel
NC7SZ04M5X	MA05B	7Z04	5-Lead SOT23, JEDEC MO-178, 1.6mm	3k Units on Tape and Reel
NC7SZ04P5	MAA05A	Z04	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	250 Units on Tape and Reel
NC7SZ04P5X	MAA05A	Z04	5-Lead SC70, EIAJ SC-88a, 1.25mm Wide	3k Units on Tape and Reel

### Logic Symbol



### Connection Diagram



### Pin Descriptions

Pin Names	Description
A	Input
Y	Output
NC	No Connect

### Function Table

$$Y = \bar{A}$$

Input	Output
A	Y
L	H
H	L

H = HIGH Logic Level  
L = LOW Logic Level

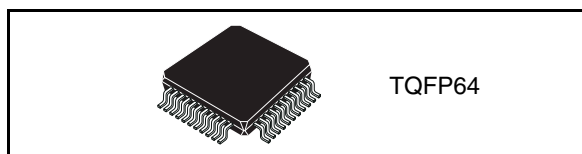


## STA309A

### Multi-channel digital audio processor with DDX®

#### Features

- 8 channels of 24-bit DDX®
- >100 dB SNR and dynamic range
- Selectable 32 kHz - 192 kHz input sample rates
- 6 channels of DSD/SACD input
- Digital gain/attenuation +58 dB to -100 dB in 0.5 dB steps
- Soft volume update
- Individual channel and master gain/attenuation plus channel trim (-10 dB to +10 dB)
- Up to 10 independent 32-bit user programmable biquads (EQ) per channel
- Bass/treble tone control
- Pre and post EQ full 8-channel input mix on all 8 channels
- Dual independent limiters/compressors
- Dynamic range compression or anti-clipping modes
- AutoModes:
  - 5-band graphic EQ
  - 32 preset EQ curves (rock, jazz, pop, etc.)
  - Automatic volume controlled loudness
  - 5.1 to 2-channel downmix
  - Simultaneous 5.1- and 2-channel downmix outputs
  - 3 preset volume curves
  - 2 preset anti-clipping modes
  - Preset movie nighttime listening mode
  - Preset TV channel/commercial AGC mode
  - 5.1, 2.1 bass management configurations
  - AM frequency automatic output PWM frequency shifting
  - 8 preset crossover filters
- Individual channel and master soft/hard mute
- Automatic zero-detect and invalid input mute
- Automatic invalid input detect mute



- Advanced PopFree operation
- Advanced AM interference frequency switching and noise suppression modes
- I<sup>2</sup>S output channel mapping function
- Independent channel volume and DSP bypass
- Channel mapping of any input to any processing/DDX® channel
- DC blocking selectable high-pass filter
- Selectable per-channel DDX® damped ternary or binary PWM output
- Max power correction for lower full-power THD
- Variable per channel DDX® output delay control
- 192 kHz internal processing sample rate, 24-bit to 36-bit precision

#### Description

The STA309A is a single chip solution for digital audio processing and control in multi-channel applications. It provides output capabilities for DDX® (direct digital amplification). In conjunction with a DDX® power device, it provides high-quality, high-efficiency, all digital amplification. The device is extremely versatile, allowing for input of most digital formats including 6.1/7.1-channel and 192 kHz, 24-bit DVD-audio, DSD/SACD. In 5.1 application the additional 2 channels can be used for audio line-out or headphone drive. In speaker mode, with 8 channel outputs in parallel, the STA309A can deliver more than 1 W.

**Table 1. Device summary**

Order code	Package
STA309A	TQFP64



# 1 Block diagram

Figure 1. Block diagram

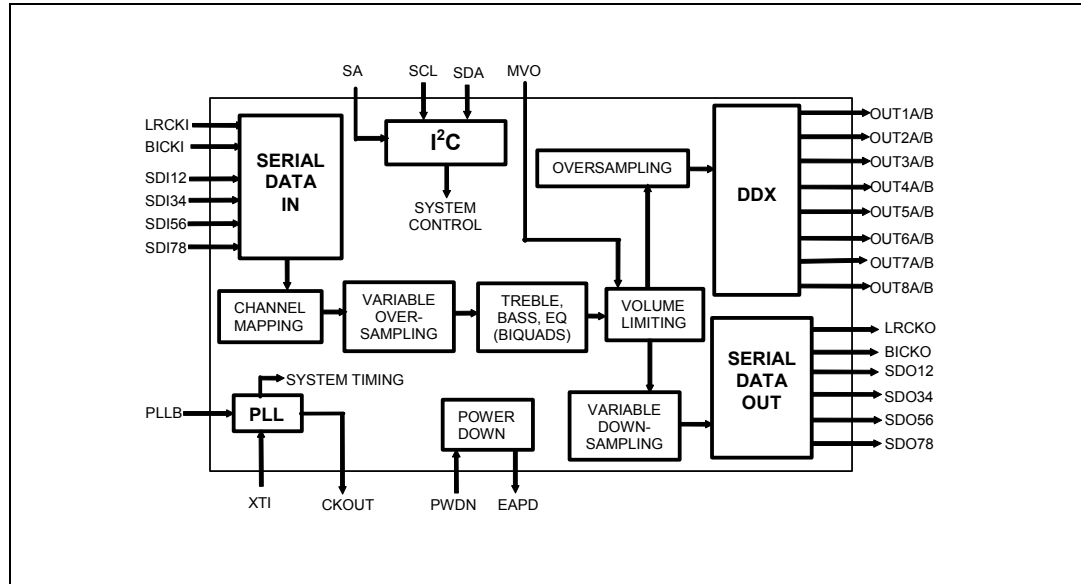
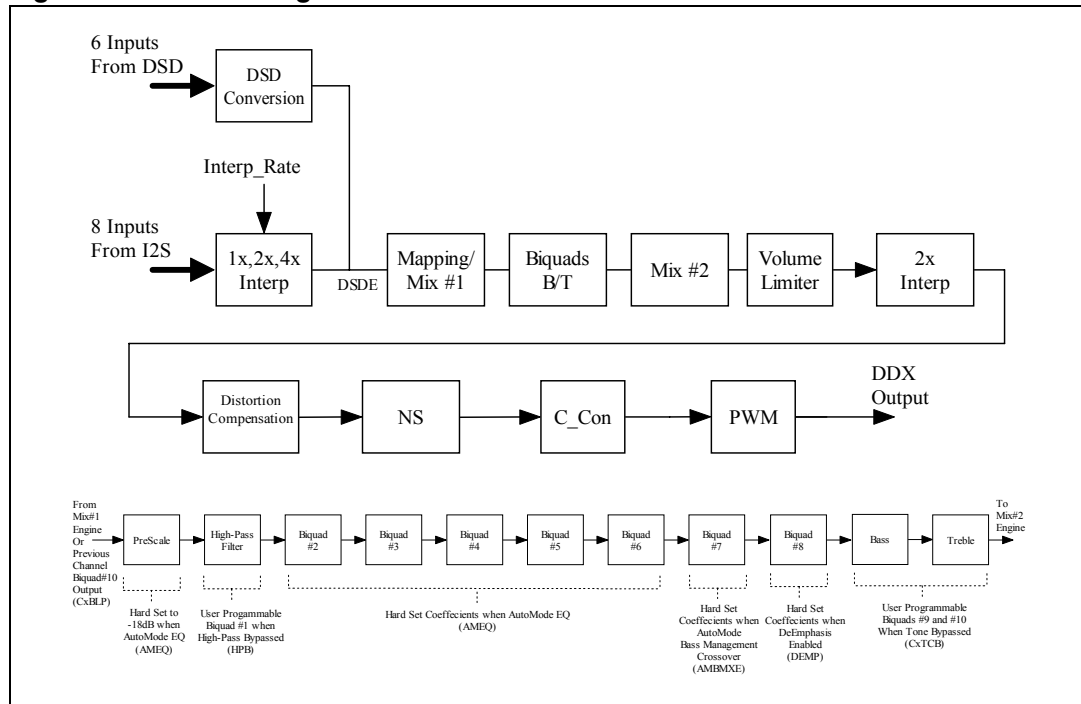


Figure 2. Channel signal flow



## 2 Pin connections

Figure 3. Pin connection (top view)

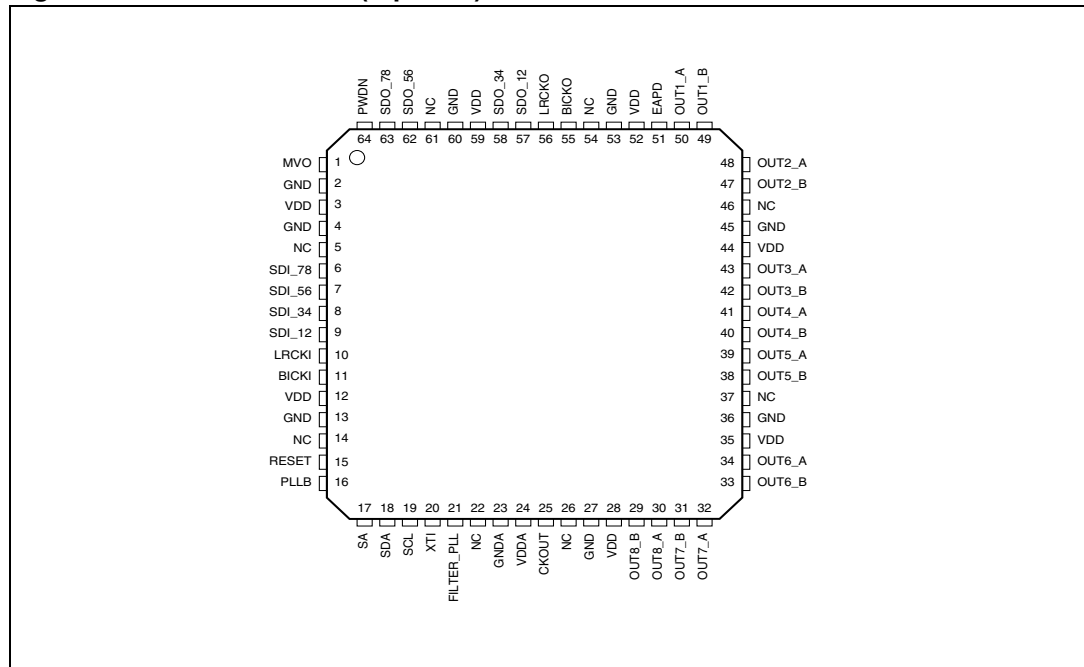


Table 2. Pin description

Pin	Type	Name	Description
1	5-V tolerant TTL input buffer	MVO/DSD_CLK	Master volume override/ DSD input clock
6	5-V tolerant TTL input buffer	SDI_78/DSD_6	Input serial data channels 7 & 8/ DSD input channel 6
7	5-V tolerant TTL input buffer	SDI_56/DSD_5	Input serial data channels 5 & 6/ DSD input channel 5
8	5-V tolerant TTL input buffer	SDI_34/DSD_4	Input serial data channels 3 & 4/ DSD input channel 4
9	5-V tolerant TTL input buffer	SDI_12/DSD_3	Input serial data channels 1 & 2/ DSD input channel 3
10	5-V tolerant TTL input buffer	LRCKI/DSD_2	Input left/right clock/ DSD input channel 2
11	5-V tolerant TTL input buffer	BICKI/DSD_1	Input serial clock/ DSD input channel 1
15	5-V tolerant TTL schmitt trigger input buffer	RESET	Global reset
16	CMOS input buffer with pull-down	PLL_BYPASS	Bypass phase locked loop

## STA309A

## Pin connections

Table 2. Pin description (continued)

Pin	Type	Name	Description
17	CMOS input buffer with pull-down	SA	Select address (I <sup>2</sup> C)
18	Bidirectional buffer: 5-V tolerant TTL schmitt trigger input; 3.3-V capable 2mA slew-rate controlled output.	SDA	Serial data (I <sup>2</sup> C)
19	5-V tolerant TTL schmitt trigger input buffer	SCL	Serial clock (I <sup>2</sup> C)
20	5-V tolerant TTL schmitt trigger input buffer	XTI	Crystal oscillator input (clock input)
21	Analog pad	FILTER_PLL	PLL filter
23	Analog ground	GNDA	PLL ground
24	3.3V analog supply voltage	VDDA	PLL supply
25	3.3-V capable TTL tristate 4mA output buffer	CKOUT	Clock output
29	3.3-V capable TTL 16mA output buffer	OUT8B	PWM channel 8 output B
30	3.3-V capable TTL 16mA output buffer	OUT8A	PWM channel 8 output A
31	3.3-V capable TTL 16mA output buffer	OUT7B	PWM channel 7 output B
32	3.3-V capable TTL 16mA output buffer	OUT7A	PWM channel 7 output A
33	3.3-V capable TTL 16mA output buffer	OUT6B	PWM channel 6 output B
34	3.3-V capable TTL 16mA output buffer	OUT6A	PWM channel 6 output A
38	3.3-V capable TTL 16mA output buffer	OUT5B	PWM channel 5 output B
39	3.3-V capable TTL 16mA output buffer	OUT5A	PWM channel 5 output A
40	3.3-V capable TTL 16mA output buffer	OUT4B	PWM channel 4 output B
41	3.3-V capable TTL 16mA output buffer	OUT4A	PWM channel 4 output A
42	3.3-V capable TTL 16mA output buffer	OUT3B	PWM channel 3 output B
43	3.3-V capable TTL 16mA output buffer	OUT3A	PWM channel 3 output A
47	3.3-V capable TTL 16mA output buffer	OUT2B	PWM channel 2 output B

## Pin connections

## STA309A

Table 2. Pin description (continued)

Pin	Type	Name	Description
48	3.3-V capable TTL 16mA output buffer	OUT2A	PWM channel 2 output A
49	3.3-V capable TTL 16mA output buffer	OUT1B	PWM channel 1 output B
50	3.3-V capable TTL 16mA output buffer	OUT1A	PWM channel 1 output A
51	3.3-V capable TTL 4mA output buffer	EAPD	Ext. amp power-down
55	3.3-V capable TTL 2mA output buffer	BICKO	Output serial clock
56	3.3-V capable TTL 2mA output buffer	LRCKO	Output left/right clock
57	3.3-V capable TTL 2mA output buffer	SDO_12	Output serial data channels 1&2
58	3.3-V capable TTL 2mA output buffer	SDO_34	Output serial data channels 3&4
62	3.3-V capable TTL 2mA output buffer	SDO_56	Output serial data channels 5&6
63	3.3-V capable TTL 2mA output buffer	SDO_78	Output serial data channels 7&8
64	5-V tolerant TTL schmitt trigger input buffer	PWDN	Device power-down
3,12,28,35, 44,52,59	3.3-V digital supply voltage	VDD	3.3-V supply
2,4,13,27, 36,45,53,60	Digital ground	GND	Ground
5, 14, 22, 26,37,46,54, 61		NC	Not connected



# STA516B

## 70V 6A QUAD POWER HALF BRIDGE

### TARGET SPECIFICATION

### 1 FEATURES

- MINIMUM INPUT OUTPUT PULSE WIDTH DISTORTION
- 200mΩ R<sub>dsON</sub> COMPLEMENTARY DMOS OUTPUT STAGE
- CMOS COMPATIBLE LOGIC INPUTS
- THERMAL PROTECTION
- THERMAL WARNING OUTPUT
- UNDER VOLTAGE PROTECTION

### 2 DESCRIPTION

STA516B is a monolithic quad half bridge stage in Multipower BCD Technology. The device can be used as dual bridge or reconfigured, by connecting CONFIG pin to V<sub>dd</sub> pin, as single bridge with double current capability, and as half bridge (Binary mode) with half current capability.

Figure 1. Package



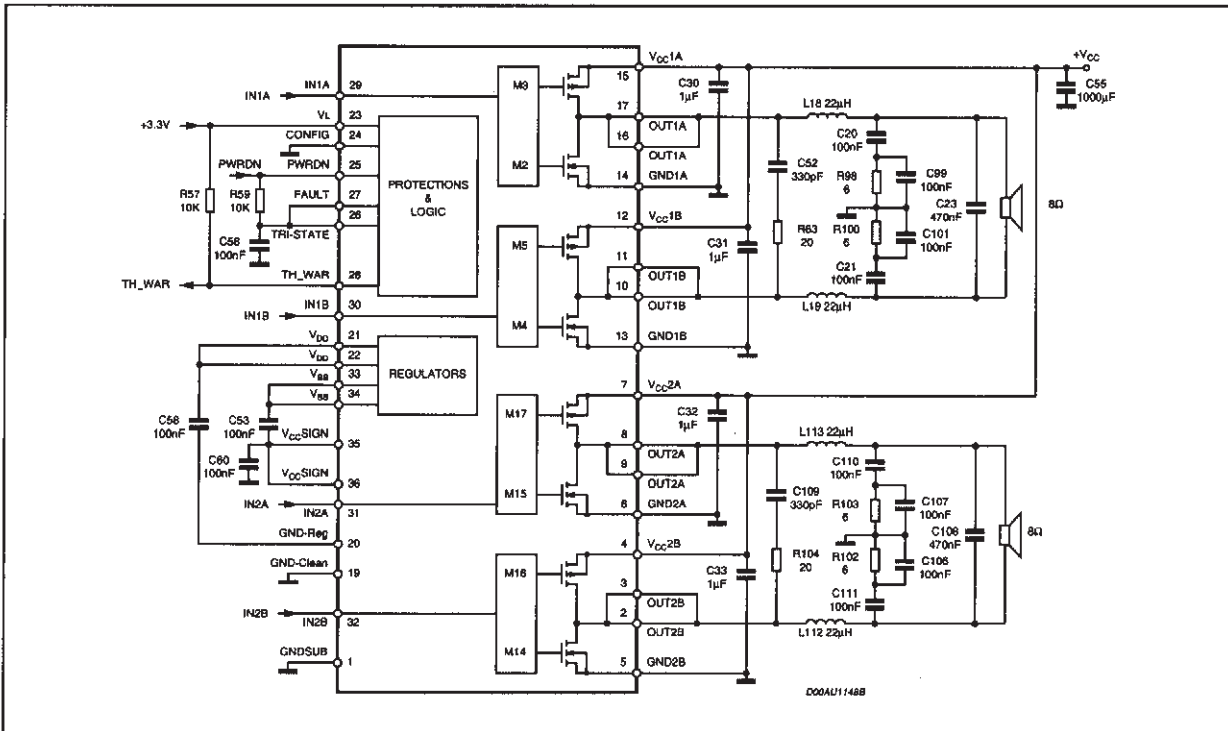
Table 1. Order Codes

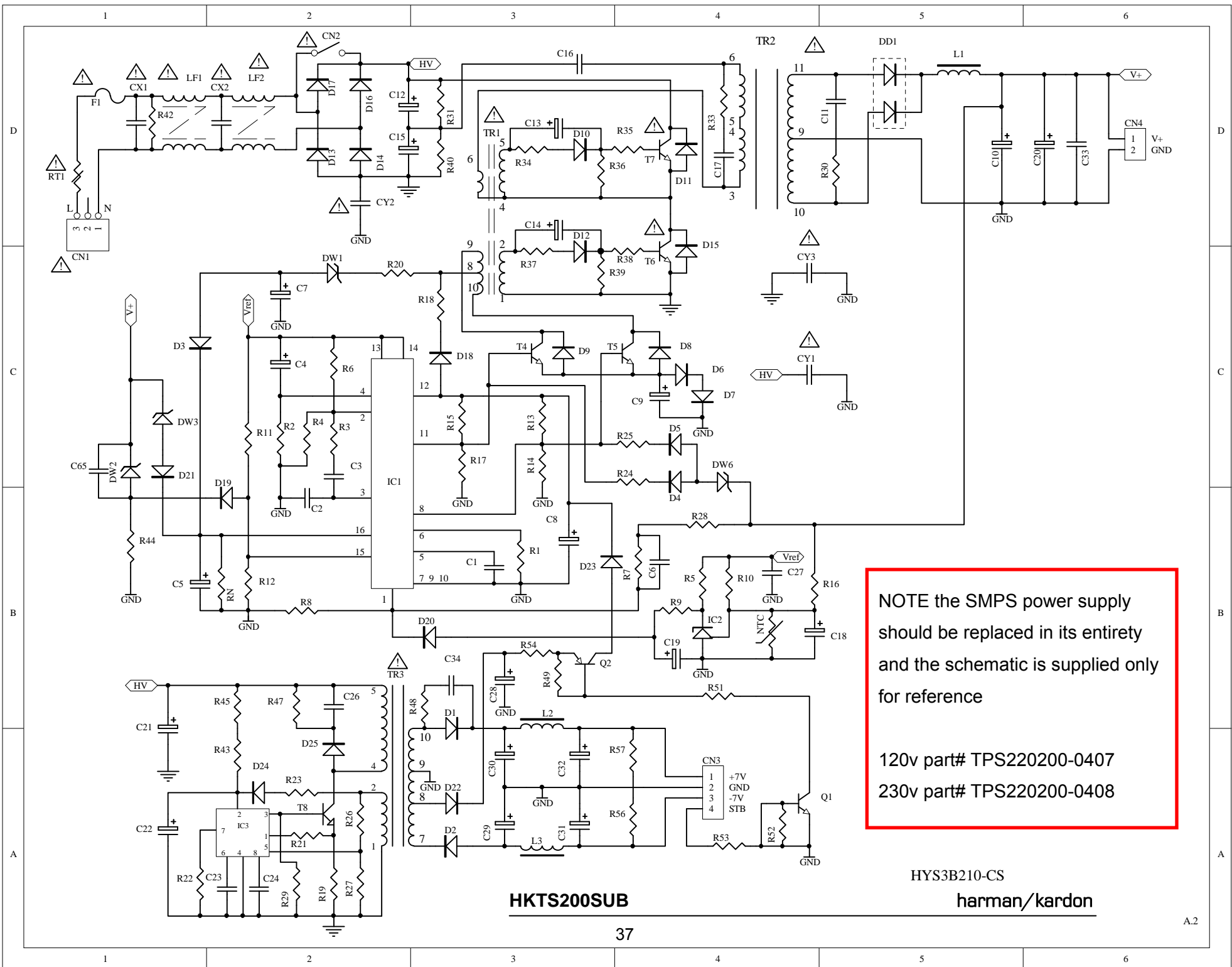
Part Number	Package
STA516B	Power SO36 Slug Up

The device is particularly designed to make the output stage of a stereo All-Digital High Efficiency (DDX™) amplifier capable to deliver 160 + 160W @ THD = 10% at V<sub>CC</sub> 50V output power on 8Ω load and 320W @ THD = 10% at V<sub>CC</sub> 50V on 4Ω load in single BTL configuration.

The input pins have threshold proportional to V<sub>L</sub> pin voltage.

Figure 2. Audio Application Circuit (Dual BTL)





NOTE the SMPS power supply should be replaced in its entirety and the schematic is supplied only for reference

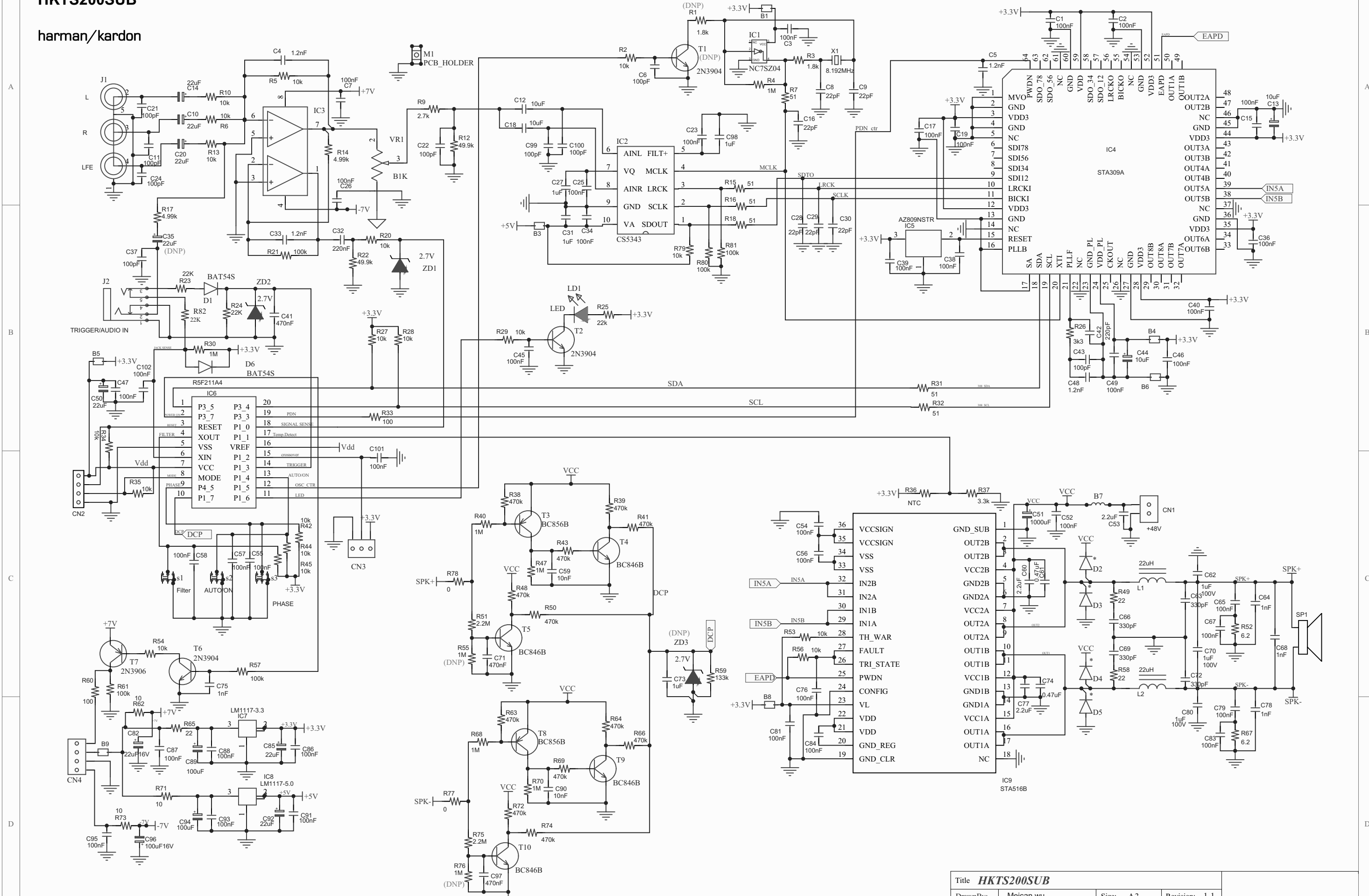
120v part# TPS220200-0407  
 230v part# TPS220200-0408

HKTS200SUB

HYS3B210-CS  
 harman/kardon

# HKTS200SUB

harman/kardon



Title <b>HKTS200SUB</b>			
DrawnBy: Meican.wu	Size: A3	Revision: 1.1	
ApprovedBy: Ruben Millyard	Date: 2009-7-23	Sheet 1 of 1	
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