OKI Semiconductor

MSM7617 Evaluation Board

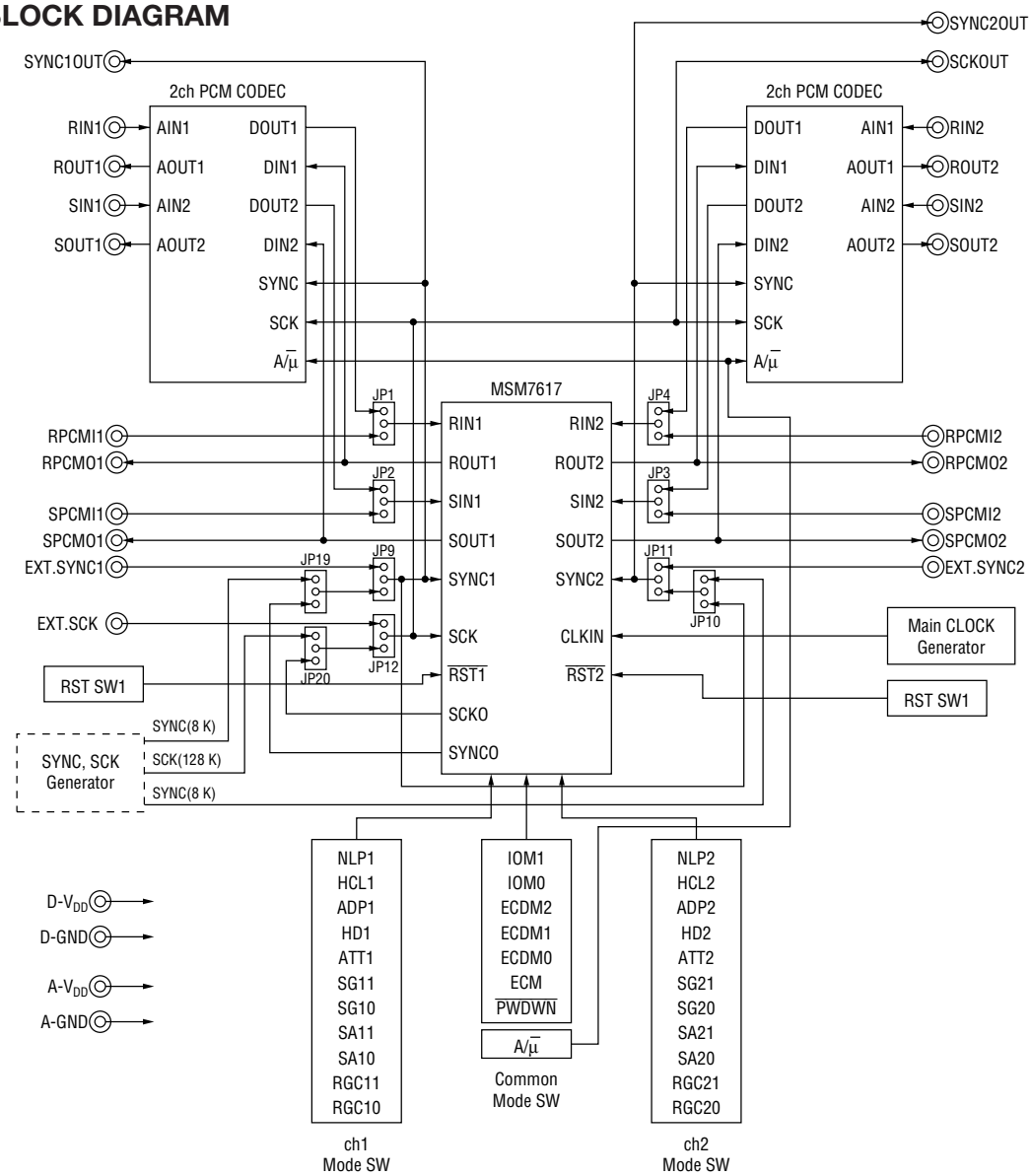
2-Channel Echo Canceller LSI

GENERAL DESCRIPTION

This evaluation board is used to evaluate the characteristics of the MSM7617 (64-pin QFP), a 2-channel echo canceller LSI device.

Separate channels are provided for both analog and digital (PCM) input/output interface, so this evaluation board will work with all I/O modes of the MSM7617 and a wide variety of evaluation circuits.

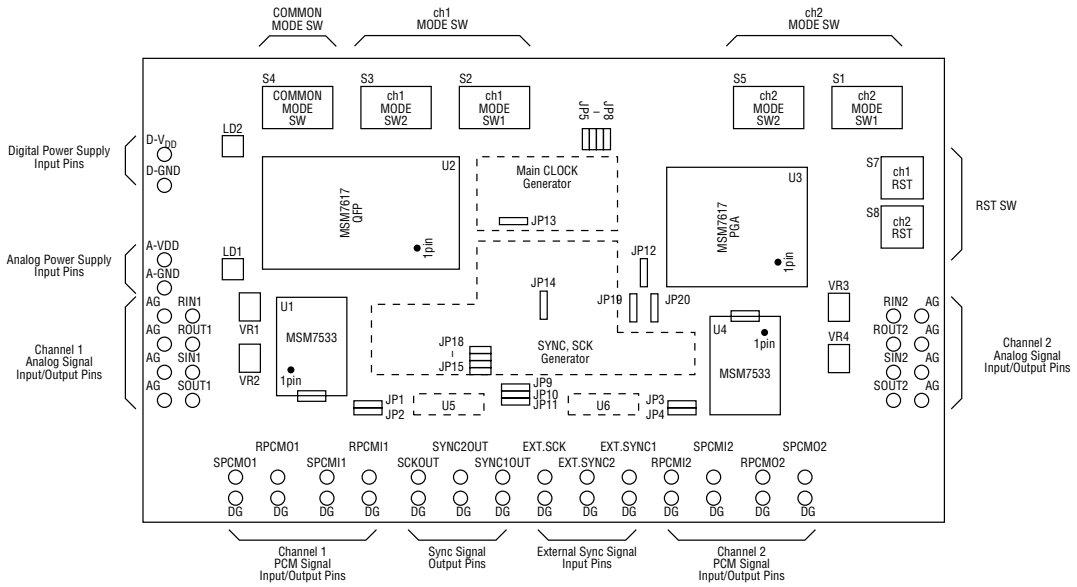
BLOCK DIAGRAM



SPECIFICATIONS

CODEC used		MSM7533VGS-VK
Channels		2 channels (can be set by I/O mode as below) 2-channel parallel mode 2-channel serial mode 1-channel cross-connected mode (FTF mode)
Analog input		
Maximum input level		3.4 Vp-p
Input impedance		600 Ω
Analog output		
Maximum output level		3.4 Vp-p
Output load resistance		600 Ω (min) AOUT of PCM CODEC is output directly Note: A 600 Ω resistor is mounted on the board, but the surface trace of the back side bypasses it. By cutting the pattern, the 600Ω can be inserted in series.
Digital input	V_{IH}	2.4 V to V_{DD}
	V_{IL}	0 V to 0.8V
Digital output	V_{OH}	4.2 V to V_{DD}
	V_{OL}	0 V to 0.4 V
Power supply voltage		4.75 V to 5.25 V
Current consumption		200 mA (max)
Operating temperature		–30 to +85°C
Board size		21.1 (W) ×3.5 (H) ×13.9 (D) (cm)
Echo canceller characteristics		
Echo attenuation		30 dB or higher Input signal : –10 dBm0 white noise ERL : 6 dB Delay : 50 ms Mode settings : ATT, NLP, GC all off
Cancelable delay time		59 ms (Calculated Value) This value is measurable. For possible 30 dB cancellation, deduct 5 ms from the value.

EXTERNAL VIEW & COMPONENT LAYOUT



PIN AND COMPONENT DESCRIPTIONS

Pin Descriptions (1/3)

Pin	Type	Description
RIN1	I	Analog input pin for channel 1 RIN signal. The input analog signal is converted to a PCM signal by a PCM CODEC to be provided as the RIN1 signal to the MSM7617. To use the RIN1 pin, set JP1 (RIN1 SEL) to ANLG (refer to the description of JP1). This input can be amplified about 0 to +12 dB by VR1.
ROUT1	O	Analog output pin for channel 1 ROUT signal. The MSM7617's ROUT1 signal is converted to the analog signal by a PCM CODEC and output on this pin.
SIN1	I	Analog input pin for channel 1 SIN signal. The input analog signal is converted to a PCM signal by a PCM CODEC to be provided as the SIN1 signal to the MSM7617. To use the SIN1 pin, set JP2 (SIN1 SEL) to ANLG (refer to the description of JP2). This input can be amplified about 0 to +12 dB by VR2.
SOUT1	O	Analog output pin for channel 1 SOUT signal. The MSM7617's SOUT1 signal is converted to the analog signal by a PCM CODEC and output on this pin.

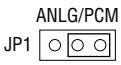
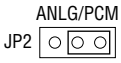
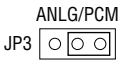
Pin Descriptions (2/3)

Pin	Type	Description
RPCMO1	O	Output pin for channel 1 ROUT PCM signal. The MSM7617's ROUT1 signal is directly output on this pin. This pin is used for the PCM interface.
SPCMO1	O	Output pin for channel 1 SOUT PCM signal. The MSM7617's SOUT1 signal is directly output on this pin. This pin is used for the PCM interface.
RPCMI1	I	Input pin for channel 1 RIN PCM signal. The signal is directly input to the MSM7617's RIN1. To use the RPCMI1 pin, set JP1 (RIN1 SEL) to PCM (refer to the description of JP1). This pin is used for the PCM interface.
SPCMI1	I	Input pin for channel 1 SIN PCM signal. The signal is directly input to the MSM7617's SIN1. To use the SPCMI1 pin, set JP2 (SIN1 SEL) to PCM (refer to the description of JP2). This pin is used for the PCM interface.
RIN2	I	Analog input pin for channel 2 RIN signal. The input analog signal is converted to a PCM signal by a PCM CODEC to be provided as the RIN2 signal to the MSM7617. To use the RIN1 pin, set JP4 (RIN2 SEL) to ANLG (refer to the description of JP4). This input can be amplified about 0 to +12 dB by VR3.
ROUT2	O	Analog output pin for channel 2 ROUT signal. The MSM7617's ROUT2 signal is converted to the analog signal by a PCM CODEC and output on this pin.
SIN2	I	Analog input pin for channel 2 SIN signal. The input analog signal is converted to a PCM signal by a PCM CODEC to be provided as the SIN2 signal to the MSM7617. To use the SIN1 pin, set JP3 (SIN2 SEL) to ANLG (refer to the description of JP3). This input can be amplified about 0 to +12 dB by VR4.
SOUT2	O	Analog output pin for channel 2 SOUT signal. The MSM7617's SOUT2 signal is converted to analog by a PCM codec and output on this pin.
RPCMO2	O	Output pin for channel 2 ROUT PCM signal. The MSM7617's ROUT2 signal is directly output on this pin. This pin is used for the PCM interface.
SPCMO2	O	Output pin for channel 2 SOUT PCM signal. The MSM7617's SOUT2 signal is directly output on this pin. This pin is used for the PCM interface.

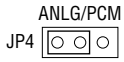
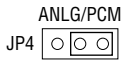
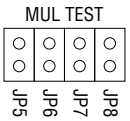
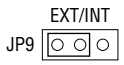
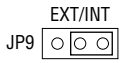
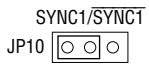
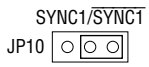
Pin Descriptions (3/3)

Pin	Type	Description
RPCMI2	I	Input pin for channel 2 RIN PCM signal. The signal is directly input to the MSM7617's RIN2. To use the RPCMI2 pin, set JP4 (RIN2 SEL) to PCM (refer to the description of JP4). This pin is used for the PCM interface.
SPCMI2	I	Input pin for channel 2 SIN PCM signal. The signal is directly input to the MSM7617's SIN2. To use the SPCMI2 pin, set JP3 (SIN2 SEL) to PCM (refer to the description of JP3). This pin is used for the PCM interface.
SCKOUT	O	Directly outputs the SCK signal being used. This pin is used for the PCM interface.
SYNC1OUT	O	Directly outputs the SYNC signal being used on channel 1. This pin is used for the PCM interface.
SYNC2OUT	O	Directly outputs the SYNC signal being used on channel 2. This pin is used for the PCM interface.
EXT.SCK	I	SCK input pin when an external sync signal is used. To use the EXT.SCK pin, set JP12 (SCK SEL) to EXT (refer to the description of JP12). For external synchronization, SYNC1 or SYNC2 also should be input externally. The input frequency to EXT.SCK is 64 to 2048 kHz.
EXT.SYNC1	I	SYNC1 input pin when an external sync signal is used. To use the EXT.SYNC1 pin, set JP9 (SYNC1 SEL) to EXT (refer to the description of JP9). For external synchronization, SCK also should be input externally.
EXT.SYNC2	I	SYNC2 input pin when using an external sync signal is used. To use the EXT.SYNC2 pin, set JP11 (SYNC2 SEL) to EXT (refer to the description of JP11). To use the same signal as EXT.SYNC1 without the need for another external input signal, set JP10 (INT.SYNC2 SEL) to SYNC1 and set JP11 (SYNC2 SEL) to INT (refer to the descriptions of JP10 and JP11). For external synchronization, SCK also should be input externally.
D - V_{DD}	I	Power supply for digital circuits. Input 5 V.
A - V_{DD}	I	Power supply for analog circuits. Input 5 V.
D - GND DG	I —	Ground for digital signals. This is separate from analog ground, but just the AG and DG pins of the PCM CODEC are tied together.
A - GND AG	I —	Ground for analog signals. This is separate from digital ground, but just the AG and DG pins of the PCM CODEC are tied together.

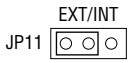
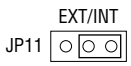
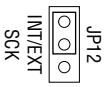
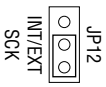
Component Descriptions (1/8)

Component Number	Component Name	Description
U2	MSM7617 QFP socket	Insert MSM7617 (64-pin QFP).
U3	MSM7617 PGA socket	Not used (used only by Oki Electric for test).
U1, U4	MSM7533 SOP socket	Insert MSM7533VGS-VK.
JP1	RIN1 SEL	Jumper pins for setting RIN1 (channel 1 RIN) input.  Analog input mode: PCM data obtained by converting the analog input signal from the RIN1 pin will be used for channel 1 RIN data.  PCM input mode: PCM input data from the RPCMI1 pin will be used directly for channel 1 RIN data.
JP2	SIN1 SEL	Jumper pins for setting SIN1 (channel 1 SIN) input.  Analog input mode: PCM data obtained by converting the analog input signal from the SIN1 pin will be used for channel 1 SIN data.  PCM input mode: PCM input data from the SPCMI1 pin will be used directly for channel 1 SIN data.
JP3	SIN2 SEL	Jumper pins for setting SIN2 (channel 2 SIN) input.  Analog input mode: PCM data obtained by converting the analog input signal from the SIN2 pin will be used for channel 2 SIN data.  PCM input mode: PCM input data from the SPCMI2 pin will be used directly for channel 2 SIN data.

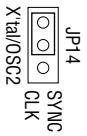
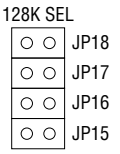
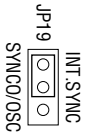
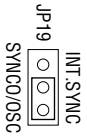
Component Descriptions (2/8)

Component Number	Component Name	Description
JP4	RIN2 SEL	Jumper pins for setting RIN2 (channel 2 RIN) input.  Analog input mode: PCM data obtained by converting the analog input signal from the RIN2 pin will be used for channel 2 RIN data.  PCM input mode: PCM input data from the RPCMI2 pin will be used directly for channel 2 RIN data.
JP5 JP6 JP7 JP8	MUL. TEST	Not used (used only by Oki Electric for test).  Open
JP9	SYNC1 SEL	Jumper pins for setting SYNC1 (channel 1 SYNC) input.  External input mode: The external sync signal from the EXT.SYNC1 pin will be used for SYNC1. SYNC1 and SCK must be synchronized, so if EXT.SYNC1 is used then SCK must also be input externally. Internal input mode:  Depending on JP19 (INT SYNC SEL), either the internal sync (SYNC0) or the sync signal from the sync generator will be used for SYNC1.
JP10	INT. SYNC2 SEL	Jumper pins for setting SYNC2 (channel 2 SYNC) input when JP11 has been set to INT mode.  SYNC1 mode: The SYNC1 signal will be used as SYNC2.  $\overline{\text{SYNC1}}$ mode: The inverted SYNC1 signal will be used as SYNC2. This setting is valid only when JP19 (INT SYNC SEL) has been set to OSC mode. The SYNC generator is used only by Oki Electric for test, so it has not been mounted on the board. $\overline{\text{SYNC1}}$ mode is not used.

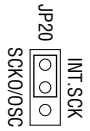
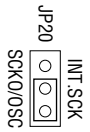
Component Descriptions (3/8)

Component Number	Component Name	Description
JP11	SYNC2 SEL	Jumper pins for setting SYNC2 (channel 2 SYNC) input.  External input mode: The external sync signal from the EXT.SYNC2 pin will be used for SYNC2. SYNC2 and SCK must be synchronized, so if EXT.SYNC2 is used then SCK must also be input externally.  Internal input mode: The sync signal set by JP10 (INT.SYNC2) will be used for SYNC2.
JP12	SCK SEL	Jumper pins for setting SCK input (channel 1 and channel 2 are common).  Internal mode: Depending on the setting of JP20 (INT SCK SEL), either the internal SCK (SCKO) or the SCK generator's SCK signal will be used for SCK.  External mode: The SCK signal input from the EXT.SCK pin will be used for SCK. SCK and SYNC must be synchronized, so SYNC1 and SYNC2 must also be input externally.
JP13	CLKIN SEL	Jumper pins for switching the oscillator circuit used as the MSM7617's CLKIN input.  OSC mode: The OSC1 (crystal oscillator) will be used for CLKIN. This mode is not used because OSC1 (liquid crystal oscillator) is not mounted on the board.  X'tal mode: The Y1 (crystal resonator) oscillator output will be used for CLKIN.

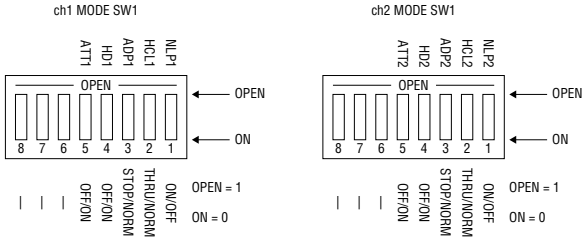
Component Descriptions (4/8)

Component Number	Component Name	Description
JP14	SYNC, CLK SEL	This jumper is not used because the SYNC and SCK generator are used only by Oki Electric for test and are not mounted on the board. It should be left open. Jumper pins for switching the SYNC and SCK generator's basic clock oscillator circuit.  X'tal mode: The Y2 (crystal resonator) oscillator circuit will be used for the internal SYNC and SCK generator's basic clock.  OSC mode: The OSC2 (crystal oscillator) will be used for the internal SYNC and SCK generator's basic clock.
JP15 JP16 JP17 JP18	128K SEL	These jumpers are not used because the SYNC and SCK generator are used only by Oki Electric for test and are not mounted on the board. They all should be left open. Jumper pins for switching the SYNC and SCK generator's basic clock frequency.  Select OSC2 or Y2 oscillation frequency from the following four possibilities, and set the jumper corresponding to that frequency. JP18 : 32.768 MHz JP17 : 16.384 MHz JP16 : 8.192 MHz JP15 : 4.096 MHz Based on this setting, the SYNC and SCK generator will output SYNC = 8 kHz and SCK = 128 kHz. Both SYNC and SCK are 50% duty waveforms.
JP19	INT. SYNC SEL	Jumper pins for switching the SYNC signal when INT SYNC is being used.  SYNCO mode: The internal SYNC output by MSM7617 (SCKO) will be used.  OSC mode: The SYNC output by the SYNC and SCK generator will be used. The SYNC and SCK generator is used only by Oki Electric for test, so it has not been mounted on the board. OSC mode is not used.

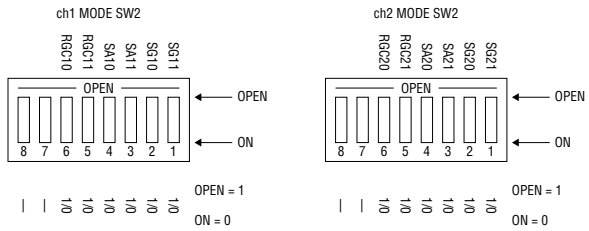
Component Descriptions (5/8)

Component Number	Component Name	Description
JP20	INT.SCK SEL	Jumper pins for switching the SCK signal when INT SCK is being used.  SCK mode: The internal SCK output by MSM7617 (SCKO) will be used.  OSC mode: The SCK output by the SYNC and SCK generator will be used. The SYNC and SCK generator is used only by Oki Electric for test, so it has not been mounted on the board. OSC mode is not used.
VR1	VR1	Volume for RIN1 pin amp. This pin can amplify approximately 0 to +12 dB.
VR2	VR2	Volume for SIN1 pin amp. This pin can amplify approximately 0 to +12 dB.
R13	VR3	Volume for RIN2 pin amp. This pin can amplify approximately 0 to +12 dB.
R14	VR4	Volume for SIN2 pin amp. This pin can amplify approximately 0 to +12 dB.
S7	ch1 RST SW	Reset switch for channel 1 echo canceller. Press the reset switch after power is applied.
S8	ch2 RST SW	Reset switch for channel 2 echo canceller. Press the reset switch after power is applied.
LD1	LD1	Analog power supply lamp (lights when power is applied).
LD2	LD2	Digital power supply lamp (lights when power is applied).
U5	74HC541	Not normally used (requires a pattern cut for use). SYNC1OUT, SYNC2OUT and SCKOUT output buffer. To use, cut the following lines at U5 on the solder side. Lines between pin2 and pin18, between pin3 and pin17, between pin4 and pin16
U6	74HC541	Not normally used (requires a pattern cut for use). EXT.SYNC1, EXT.SYNC2, and EXT.SCK input buffer. To use, cut the following lines at U6 on the solder side. Lines between pin2 and pin18, between pin3 and pin17, between pin4 and pin16

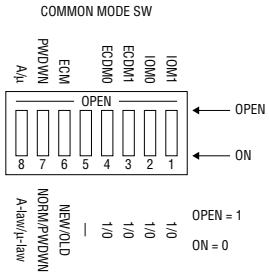
Component Descriptions (6/8)

<table>
<tr><th colspan="2">Component Number
Component Name</th><th colspan="4">Description</th></tr>
<tr><td>S2</td><td>ch1 MODE
SW1</td><td colspan="4">Switches for setting channel 1 control pins.</td></tr>
<tr><td>S1</td><td>ch2 MODE
SW1</td><td colspan="4">Switches for setting channel 2 control pins.
 
</td></tr>
<tr><td colspan="2"></td><td>SW</td><td colspan="2">Setting</td></tr>
<tr><td colspan="2"></td><td>1 NLP1
NLP2</td><td>ON</td><td>Center clipping off</td></tr>
<tr><td colspan="2"></td><td></td><td>OPEN</td><td>Center clipping on
When SOUT is below –57 dBm0, the smallest positive value FF (hex) will be forcibly output, eliminating low-level noise.</td></tr>
<tr><td colspan="2"></td><td>2 HCL1
HCL2</td><td>ON</td><td>Normal mode
Echo canceller operates.</td></tr>
<tr><td colspan="2"></td><td></td><td>OPEN</td><td>Through mode</td></tr>
<tr><td colspan="2"></td><td>3 ADP1
ADP2</td><td>ON</td><td>Normal mode
Echo cancellation is performed by varying AFF coefficients.</td></tr>
<tr><td colspan="2"></td><td></td><td>OPEN</td><td>Fixed AFF coefficient mode
Coefficients are not varied. Echo cancellation is performed with the coefficients at the point variation was stopped.</td></tr>
<tr><td colspan="2"></td><td>4 HD1
HD2</td><td>ON</td><td>Howling detector on
Howling will be detected and canceled.</td></tr>
<tr><td colspan="2"></td><td></td><td>OPEN</td><td>Howling detector off</td></tr>
<tr><td colspan="2"></td><td>5 ATT1
ATT2</td><td>ON</td><td>Attenuator on
RIN and SOUT will be input through the provided attenuators (6 dB).</td></tr>
<tr><td colspan="2"></td><td></td><td>OPEN</td><td>Attenuator off</td></tr>
<tr><td colspan="2"></td><td>6</td><td></td><td>Not used</td></tr>
<tr><td colspan="2"></td><td>7</td><td></td><td>Not used</td></tr>
<tr><td colspan="2"></td><td>8</td><td></td><td>Not used</td></tr>
</table>

Component Descriptions (7/8)

<table>
<tr><th colspan="2">Component Number
Component Name</th><th colspan="5">Description</th></tr>
<tr><td>S3</td><td>ch1 MODE SW2</td><td colspan="5">Switches for setting channel 1 control pins.</td></tr>
<tr><td>S5</td><td>ch2 MODE SW2</td><td colspan="5">Switches for setting channel 2 control pins.
 
</td></tr>
<tr><td></td><td></td><td>SW</td><td colspan="3">Setting</td></tr>
<tr><td></td><td></td><td>1
2</td><td>SG10
SG11</td><td colspan="3">Switches for setting gain amplifier provided for SOUT. Control takes 2 bits.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>SGx1</td><td>SGx0</td><td>Operation</td></tr>
<tr><td></td><td></td><td></td><td>SG20
SG21</td><td>0</td><td>0</td><td>SOUT GAIN AMP OFF</td></tr>
<tr><td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>SOUT GAIN AMP +6 dB</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>SOUT GAIN AMP +12 dB</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>1</td><td>SOUT GAIN AMP +18 dB</td></tr>
<tr><td></td><td></td><td>3
4</td><td>SA11
SA10</td><td colspan="3">Switches for setting attenuator provided for SIN. Control takes 2 bits.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>SAx1</td><td>SAx0</td><td>Operation</td></tr>
<tr><td></td><td></td><td></td><td>SA21
SA20</td><td>0</td><td>0</td><td>SIN ATT OFF</td></tr>
<tr><td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>SIN ATT –6 dB</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>SIN ATT –12 dB</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>1</td><td>SIN ATT –18 dB</td></tr>
<tr><td></td><td></td><td>5
6</td><td>RGC11
RGC10</td><td colspan="3">Switches for setting operating level and level regulation of the GC provided for RIN. Control takes 2 bits.</td></tr>
<tr><td></td><td></td><td></td><td></td><td>RGCx1</td><td>RGCx0</td><td>Operation</td></tr>
<tr><td></td><td></td><td></td><td>RGC21
RGC20</td><td>0</td><td>0</td><td>GC : OFF
LR : OFF</td></tr>
<tr><td></td><td></td><td></td><td></td><td>0</td><td>1</td><td>GC : ON
Operating level : ≥ –20 dBm0</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>0</td><td>GC : ON
Operating level : ≥ –3 dBm0</td></tr>
<tr><td></td><td></td><td></td><td></td><td>1</td><td>1</td><td>LR : ON
RIN and SIN are attenuated –6 dB; ROUT and SOUT are amplified +6 dB.</td></tr>
<tr><td></td><td></td><td>7</td><td></td><td colspan="3">Not used</td></tr>
<tr><td></td><td></td><td>8</td><td></td><td colspan="3">Not used</td></tr>
</table>

Component Descriptions (8/8)

<table>
<tr><th colspan="2">Component Number
Component Name</th><th colspan="4">Description</th></tr>
<tr><td>S4</td><td>COMMON
MODE SW</td><td colspan="4">Switches for setting both channel 1 and channel 2 control pins.
 
</td></tr>
<tr><td></td><td></td><td></td><td>SW</td><td colspan="2">Setting</td></tr>
<tr><td></td><td></td><td>1
2</td><td>IOM1
IOM0</td><td colspan="2">I/O mode control switches. Control takes 2 bits.
<table><tr><th>IOM1</th><th>IOM0</th><th>Operation</th></tr><tr><td>0</td><td>0</td><td>Parallel I/O mode</td></tr><tr><td>0</td><td>1</td><td>Serial I/O mode</td></tr><tr><td>1</td><td>0</td><td>1-channel cross-connected</td></tr><tr><td>1</td><td>1</td><td>Not used</td></tr></table></td></tr>
<tr><td></td><td></td><td>3
4</td><td>ECDM1
ECDM0</td><td colspan="2">Tone disable switches. Control takes 2 bits.
<table><tr><th>ECDM1</th><th>ECDM0</th><th>Operation</th></tr><tr><td>0</td><td>0</td><td>Tone disable off</td></tr><tr><td>0</td><td>1</td><td>Tone disable on
2100 Hz detection</td></tr><tr><td>1</td><td>0</td><td>Tone disable on
2100 Hz phase reversal detection</td></tr><tr><td>1</td><td>1</td><td>Not used</td></tr></table></td></tr>
<tr><td></td><td></td><td>6</td><td>ECM</td><td colspan="2">Switch to select old or new method for improving echo canceller acquisition.
<table><tr><td>ON</td><td>Echo canceller operates with old method</td></tr><tr><td>OPEN</td><td>Echo canceller operates with new method</td></tr></table></td></tr>
<tr><td></td><td></td><td>7</td><td>PWDWN</td><td colspan="2">MSM7617 power-down switch.
<table><tr><td>ON</td><td>Power-down
Reset after releasing power-down.</td></tr><tr><td>OPEN</td><td>Normal mode
Operate in accordance with control mode settings.</td></tr></table></td></tr>
<tr><td></td><td></td><td>8</td><td>A/μ</td><td colspan="2">Switch to select MSM7533V A-law or μ-law.
Set to correspond to MSM7617 used.
<table><tr><td>ON</td><td>PCM CODEC uses μ-law.</td></tr><tr><td>OPEN</td><td>PCM CODEC uses A-law.</td></tr></table></td></tr>
</table>

USAGE METHOD

1. Set the I/O mode of the MSM7617.

   COMMON MODE SW-1,2: 2-channel parallel I/O, serial I/O or 1-channel cross-connected mode.

2. Set jumper pins in accordance with the interface circuit.

   1) SYNC, SCK setting: external synchronization or internal synchronization
      JP9 (SYNC1 SEL) EXT/INT
      JP11 (SYNC2 SEL) EXT/INT
      JP12 (SCK SEL) EXT/INT
   2) Input signal setting: analog or PCM
      JP1 (RIN1 SEL) ANLG/PCM
      JP2 (SIN1 SEL) ANLG/PCM
      JP3 (SIN2 SEL) ANLG/PCM
      JP4 (RIN2 SEL) ANLG/PCM
   3) Pins below are fixed
      JP10 (INT.SYNC2 SEL) SYNC1
      JP13 (CLKIN SEL) X'tal
      JP19 (INT.SYNC SEL) SYNCO
      JP20 (INT.SCK SEL) SCKO

3. Set the mode switches.

Note: Don't turn on power with COMMON MODE SW-7 (PWDWN SW) set to ON (PWDWN). (Otherwise the clock is not distributed within the IC, and the internal states will not stabilize, which could damage the chip.)

4. Connect power supply and ground.

   The evaluation board is basically divided into analog and digital portions. The analog circuit's characteristics affect echo canceller characteristics, so use an analog power supply and ground with little noise. If the power supply does have little noise, then it is acceptable to use the same power supply and ground for the analog and digital portions.

Note: Always reset after applying power.

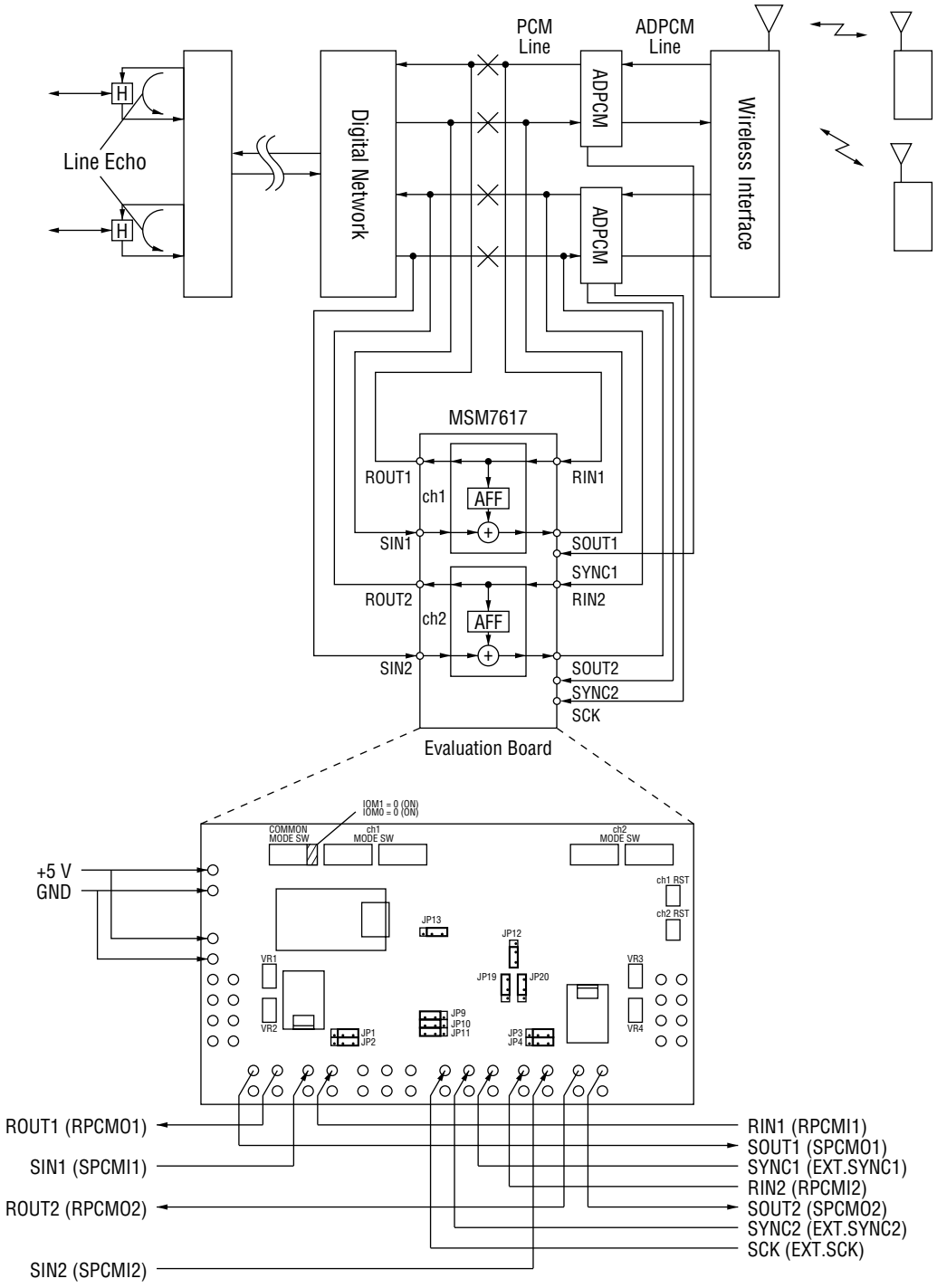
5. Connect external circuits and adjust levels.

   When using the analog interface, adjust input levels as needed with the VR1 to VR4 volume controls. Amplifier gain can be in the range 0 to +12 dB, but make sure there are no excessive inputs. Level adjustments should be done in a single direction at a time.

6. The evaluation board settings are complete.

*** Usage Example 1: 2-Channel PCM Interface With 2-Channel Parallel I/O**

Evaluation is performed after connected to the existing PCM interface.
Settings : 2-channel parallel I/O, PCM interface, external synchronization.



1. Set the evaluation board.

   Set the COMMON MODE SW's I/O Mode (IOM1, IOM0) to 2-channel parallel I/O mode (IOM1,0 = 0,0).

   Set JP1, JP2, JP3, and JP4 to PCM mode.

   Set JP9, JP11, and JP12 to EXT mode.

   Fix JP10 to SYNC1 mode and JP13 to X'tal mode.

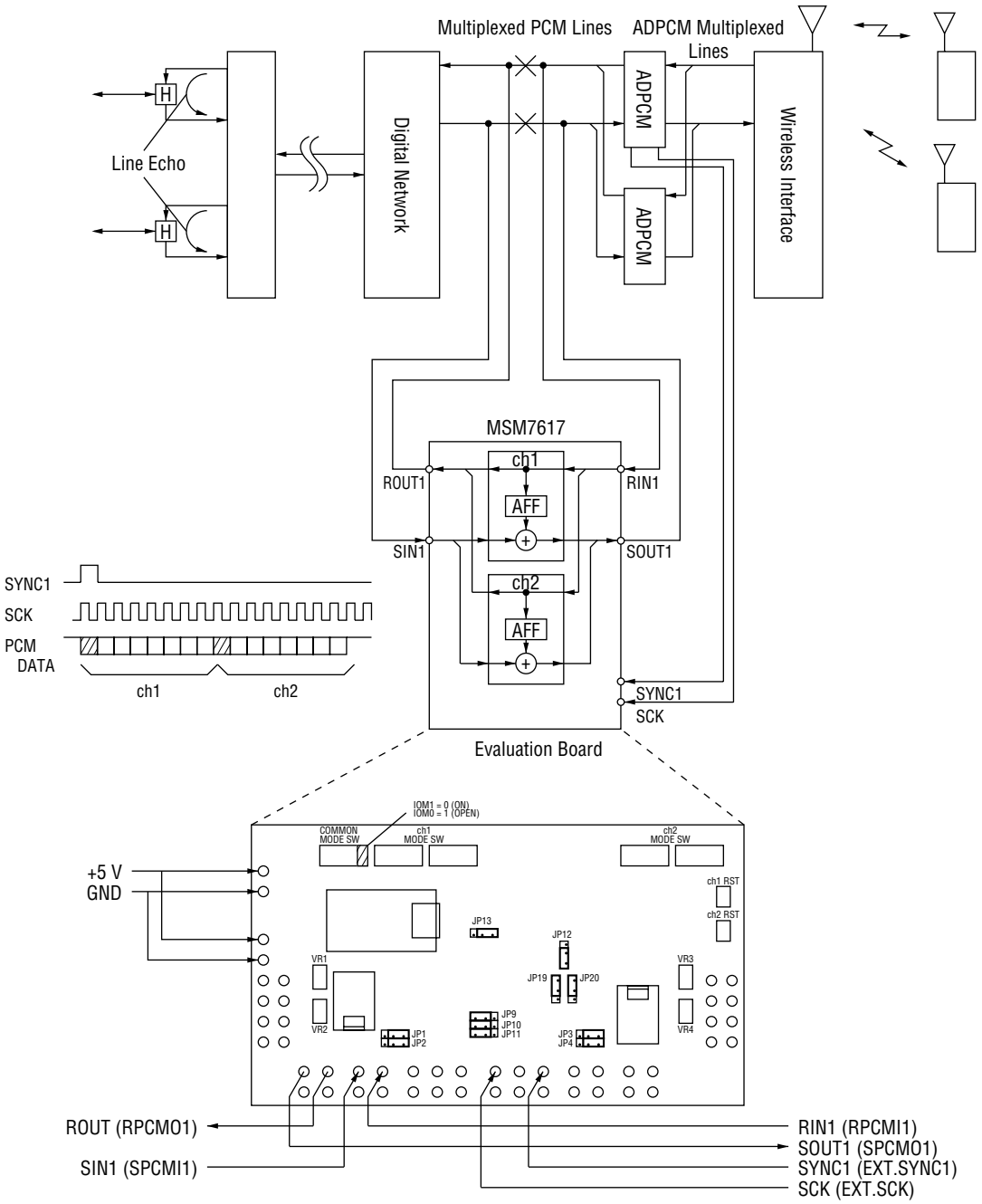
2. Referring to the diagram, connect the equipment under test to the evaluation board.

   Use wires as short as possible to connect the equipment under test to the evaluation board. If the connecting lines are long, noise or other factors can cause malfunction.

3. Apply power and reset the test system, set the mode switches, and start evaluation.

*** Usage Example 2: 2-Channel PCM Interface With 2-Channel Serial I/O**

Evaluation is performed after connected to the existing multiplex PCM interface.
Settings : 2-channel serial I/O, PCM interface, external synchronization.



1. Set the evaluation board.

   Set the COMMON MODE SW's I/O Mode (IOM1, IOM0) to 2-channel serial I/O mode (IOM1,0 = 0,1).

   Set JP1, JP2, JP3, and JP4 to PCM mode.

   Set JP9 and JP12 to EXT mode.

   SYNC2 is not used in serial I/O mode, so set the JP11 to PCM mode or EXT mode.

   Fix JP10 to SYNC1 mode and JP13 to X'tal mode.

2. Referring to the diagram, connect the equipment under test to the evaluation board.

   Serial I/O mode is a multiplexed mode for input/output of continuous serial data on two channels. If data is not continuous, test with parallel I/O mode.

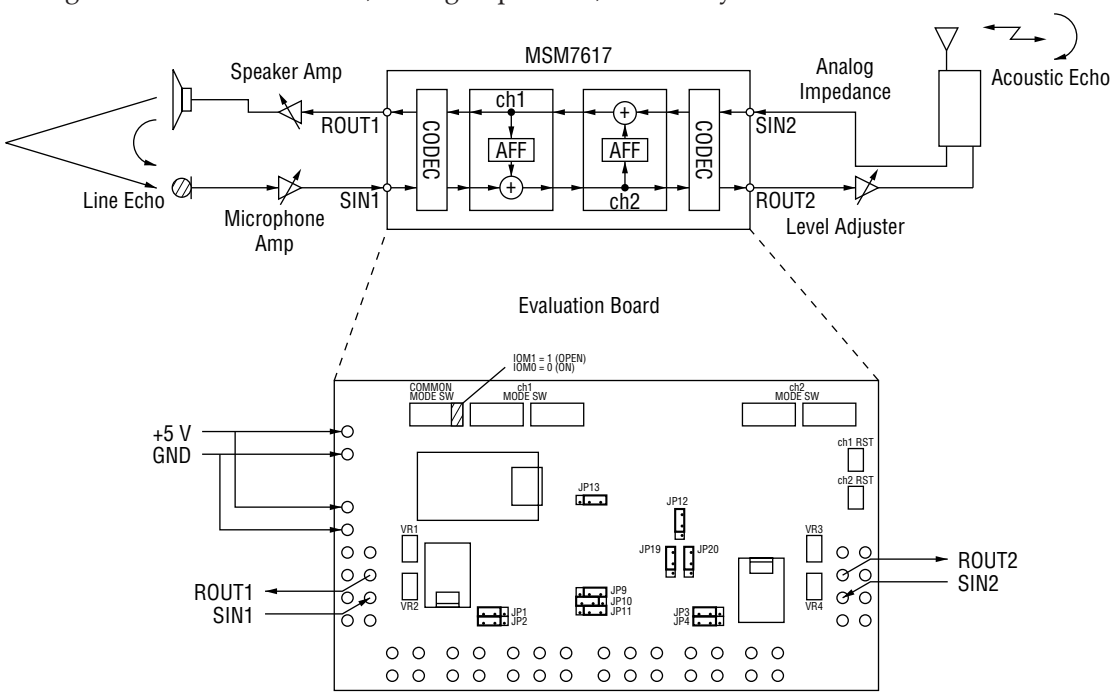
   Use wires as short as possible to connect the equipment under test to the evaluation board. If the connecting lines are long, noise or other factors can cause malfunction.

3. Apply power and reset the test system, set the mode switches, and start evaluation.

Usage Example 3: 1-Channel Cross-Connected Mode

This mode confirms the effectiveness of using both acoustic and line echo cancellation for hands-free telephone sets.

Settings: cross-connected mode, analog impedance, internal synchronization



1. Set the evaluation board.

   Set the COMMON MODE SW's I/O Mode (IOM1, IOM0) to 1-channel cross-connected mode (IOM1,0 = 1,0).

   Set JP1, JP2, JP3, and JP4 to ANLG mode.

   Set JP9 and JP12 to INT mode.

   SYNC2 is not used in 1-channel cross-connected mode, so set the JP11 to ANLG mode or INT mode.

   Set JP19 to SYNC0 mode and JP20 to SCK0 mode.

   Fix JP10 to SYNC1 mode and JP13 to X'tal mode.

2. Referring to the diagram, connect the equipment under test to the evaluation board.

3. Apply power and reset the test system, set the mode switches, and adjust analog levels. Do level adjustment for each side in through mode.
   VR2 can amplify the input level of SIN1, and VR4 can amplify the input level of SIN2.

4. When level adjustment is complete, start evaluation.