Sanyo LC75411ES Manual

Electronic volume controller for car audio systems

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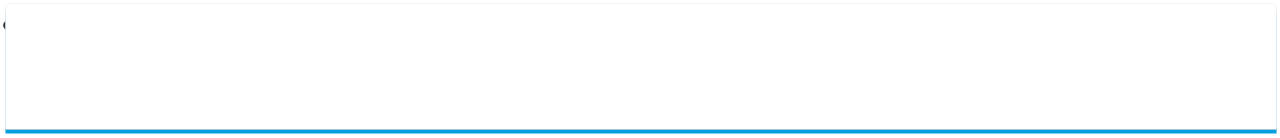

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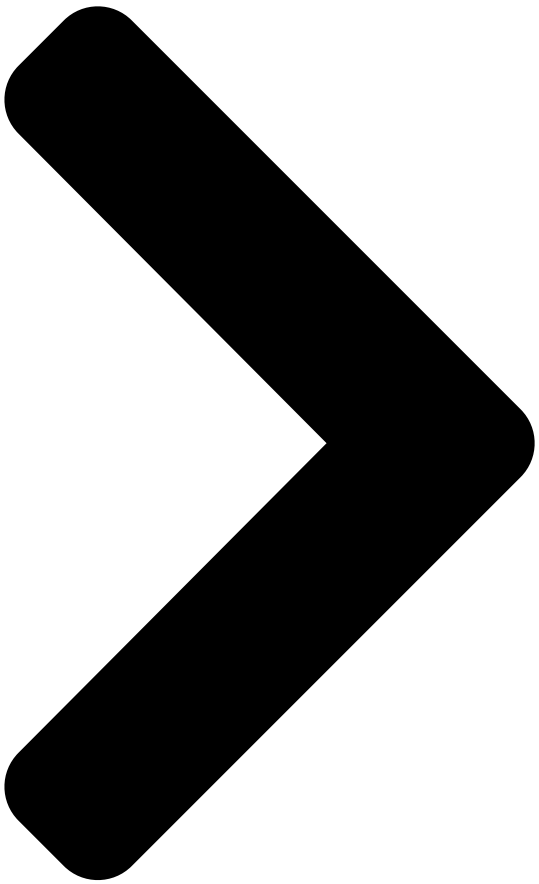

Ordering number : ENN6928

Overview

The LC75411ES and 75411WS are electronic volume controllers that enable control of volume, balance, fader, bass/treble, loudness, input switching, and input gain using only a small number of external components.

Functions

• Volume: 0 dB to –79.5 dB in 0.5-dB steps, and –∞ (161 positions) Balance function with separate L/R control

• Fader: rear output or front output can be attenuated across 16 positions (in 1-dB steps from 0 dB to –2 dB, 2-dB steps from –2 dB to 20 dB, 10-dB steps from –20 dB to –30 dB, and –45 dB, –60 dB, –∞)

• Bass/treble: Both bass and treble can be controlled in 1-dB steps from 0 dB to ±6 dB, and in 2-dB steps from ±8 dB to ±12 dB.
• Input gain: 0 dB to +18.75 dB (1.25-dB steps) amplification is possible for the input signal.
• Input switching: four input signals can be selected for Left and for Right
• Loudness: A tap is output from the –32 dB position of a 2 dB step volume control resistor ladder. A loudness function can be implemented by connecting an external RC circuit.
• CCB is a trademark of SANYO ELECTRIC CO., LTD.
• CCB is SANYO's original bus format and all the bus addresses are controlled by SANYO.

LC75411ES, 75411WS

Electronic Volume Controller for Car Audio Systems

Features

• On-chip buffer amplifier cuts down number of external components
• Low switching noise generated by on-chip switch through use of silicon gate CMOS process, for low switching noise when there is no signal
• Low switching noise when there is a signal due to use of on-chip zero-cross switching circuit
• On-chip 1/2 VDD reference voltage circuit
• Controls performed with serial input (CCB)

CMOS IC

62901RM (OT) No. 6928-1/34

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Related Manuals for Sanyo LC75411ES

Controller Sanyo SDNR Manual

Computer controlled ac servo nutrunner (256 pages)

Controller Sanyo SHA TM64 AGB Instruction Manual

Control system for spw air conditioner system (27 pages)

Controller Sanyo VSP-9000 Instruction Manual

System controller (96 pages)

Controller Sanyo VSP-3000 Service Manual

(8 pages)

Summary of Contents for Sanyo LC75411ES

Page 1 • CCB is SANYO's original bus format and all the bus addresses are controlled by SANYO. Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage.

Page 2: Package Dimensions

LC75411ES, 75411WS Package Dimensions unit: mm unit: mm 3148-QIP44MA 3163A-SQFP48 [LC75411ES] [LC75411WS] 13.2 10.0 0.75 0.18 0.75 0.15 0.35 11.6 SANYO: SQFP48 SANYO: QIP44MA Pin Assignment [LC75411ES] LSELO LFOUT LROUT LC75411ES Vref TEST RROUT RFOUT RFIN No. 6928-2/33...

Page 3 LC75411ES, 75411WS Equivalent Circuit Block Diagram [LC75411ES] Microcontroller LVref RVref LTOUT RTOUT 2700pF LF3C1 2700pF RF3C1 LF1C3 RF1C3 0.1µF 0.1µF LF1C2 RF1C2 0.1µF 0.1µF LF1C1 RF1C1 LTIN RTIN 10µF 10µF LVROUT RVROUT LCOM RCOM 10µF 10µF 68kΩ 68kΩ LVRIN RVRIN...

Page 4 LC75411ES, 75411WS Sample Application Circuit [LC75411ES] 0.1µF 2700pF 4.7kΩ 68kΩ 10µF 10µF 220pF 10µF 0.1µF 0.1µF 1µF 10µF LSELO LFOUT 1µF LROUT 10µF 1µF DVSS 1µF 1µF Micro- controller LC75411ES 22µF Vref TEST 1µF 0.033µF 10µF 1µF RROUT 1µF RFOUT 10µF...

Page 5 LC75411ES, 75411WS Pin Assignment [LC75411WS] LFIN LFOUT LROUT LC75411WS Vref TEST RROUT RFOUT RFIN No. 6928-5/33...

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Page 7 LC75411ES, 75411WS Sample Application Circuit [LC75411WS] 0.1µF 2700pF 4.7kΩ 68kΩ 10µF 220pF 10µF 0.1µF 0.1µF 10µF 1µF 1µF LFIN 10µF 1µF LFOUT 1µF LROUT 10µF 1µF Micro- controller LC75411WS 22µF Vref TEST 1µF 10µF 1µF RROUT 1µF RFOUT 10µF 1µF RFIN 1µF...

Page 8: Specifications

LC75411ES, 75411WS Specifications Absolute Maximum Ratings at Ta = 25°C, V = 0 V Parameter Symbol Conditions Ratings Unit Maximum supply voltage Maximum input voltage All input pins – 0.3 to V + 0.3 LC75411ES Ta ≤ 85°C, when mounted on board...

Page 9 Control Timing and Data Format To control the LC75411ES and LC75411WS input

specified serial data to the CE, CL, and DI pins. The data configuration consists of a total of 52 bits broken down into 8 address bits and 44 data bits.

Page 10: Address Code

LC75411ES, 75411WS Address code (B0 to A3) The LC75411ES and 75411WS use 8-bit address code and can be used in common with ICs that support SANYO's CCB serial bus. Address Code (LSB) (81HEX) Control code allocation Input Switching Control Setting...

Page 11 LC75411ES, 75411WS Volume Control (0 to –20.5dB) Operation –0.5dB –1dB –1.5dB –2dB –2.5dB –3dB –3.5dB –4dB –4.5dB –5dB –5.5dB –6dB –6.5dB –7dB –7.5dB –8dB –8.5dB –9dB –9.5dB –10dB –10.5dB –11dB –11.5dB –12dB –12.5dB –13dB –13.5dB –14dB –14.5dB –15dB –15.5dB –16dB –16.5dB...

Page 12 LC75411ES, 75411WS Volume Control (–21 to –40.5dB) Operation –21dB –21.5dB –22dB –22.5dB –23dB –23.5dB –24dB –24.5dB –25dB –25.5dB –26dB –26.5dB –27dB –27.5dB –28dB –28.5dB –29dB –29.5dB –30dB –30.5dB –31dB –31.5dB –32dB –32.5dB –33dB –33.5dB –34dB –34.5dB –35dB –35.5dB –36dB –36.5dB –37dB...

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Page 14 LC75411ES, 75411WS Volume Control (–60 to –∞) Operation –60dB –60.5dB –61dB –61.5dB –62dB –62.5dB –63dB –63.5dB –64dB –64.5dB –65dB –65.5dB –66dB –66.5dB –67dB –67.5dB –68dB –68.5dB –69dB –69.5dB –70dB –70.5dB –71dB –71.5dB –72dB –72.5dB –73dB –73.5dB –74dB –74.5dB –75dB –75.5dB –76dB...

Page 15: Tone Control

LC75411ES, 75411WS Tone Control Bass Treble +12dB +10dB +8dB +6dB +5dB +4dB +3dB +2dB +1dB –1dB –2dB –3dB –4dB –5dB –6dB –8dB –10dB –12dB Setting Set to 0 Fader Volume Control Operation –1dB –2dB –4dB –6dB –8dB –10dB –12dB –14dB –16dB...

Page 16 LC75411ES, 75411WS Fader Rear/Front Control Setting Rear Front Loudness Control Setting Zero-Cross Control Setting Data write through zero-cross detection Zero-cross detection stopped (data write at falling edge of CE) Zero-Cross Signal Detection Block Control Setting Selector Volume Tone Fader Test Mode Control Setting For IC testing.

Page 17: Pin Functions

LC75411ES, 75411WS Pin Functions Pin No. Pin Name Function Equivalent circuit LC75411ES LC75411WS • Single-end input pin LVref RVref LSEL0 • Input selector output pins RSEL0 LVRIN • 2-dB step volume input pins RVRIN • Perform input at low-impedance. LVref RVref •...

Page 18 LC75411ES, 75411WS Continued from preceding page. Pin No. Pin Name Function Equivalent circuit LC75411ES LC75411WS Vref LF1C1 • Equalizer F1 band filter configuration capacitor LF1C2 connection pins. LF1C3 Connect capacitor between RF1C1 LF1C1 (RF1C1) and LF1C2 (RF1C2) RF1C2 FnC1 LF1C2 (RF1C2) and LF1C3 (RF1C3)

Page 19 LC75411ES, 75411WS Continued from preceding page. Pin No. Pin Name Function Equivalent circuit LC75411ES LC75411WS • Power supply pin • Ground pin • Dedicated IC test pin TEST • Normally this pin is used connected to GND. • Timer pin when there is no signal in the zero-cross circuit.

Page 20 LC75411ES, 75411WS Internal Equivalent Circuit Block Diagram Selector Block Equivalent Circuit Block Diagram LSELO LVref 6.702k 1.25dB 5.804k 2.50dB LVref 5.026k 3.75dB 4.352k 5.00dB LVref 3.769k 6.25dB 3.264k 7.50dB LVref 2.826k INMUTE SW 8.75dB 2.447k 10.0dB LVref 2.119k 11.25dB 1.835k Total resistance: 50 kΩ...

Page 21 LC75411ES, 75411WS 2-dB Volume Block Equivalent Circuit Block Diagram LVRIN To left channel 41.139k –2dB 0.5–dB block 32.678k –4dB 25.957k –6dB 20.618k –8dB 16.378k –10dB 13.009k –12dB Total resistance of 10.334k 195 kΩ over tap –14dB 8.208k –16dB 6.520k –18dB 5.179k...

Page 22 LC75411ES, 75411WS 0.5-dB Volume Block Equivalent Circuit Block Diagram From left channel LVROUT 2-dB block 2.797k –0.5dB 2.640k Unit: Ω Initial setting switch –1dB Total resistance: 50 kΩ 2.493k Same for right channel –1.5dB 42.070k –∞dB Vref Initial setting switch LCOM No.

Page 23 LC75411ES, 75411WS Tone Block Equivalent Circuit Diagram LTOUT LTIN LVref 0.027k 12.840k 12dB 12dB 3.373k 3.373k 10dB 10dB 4.246k 4.246k 5.346k 5.346k 3.172k 3.172k 3.558k 3.558k 3.993k 3.993k 4.480k 4.480k 5.027k 5.027k 5.640k 5.640k 6.50k LF1C2 LF1C3 LF1C1 LF3C1 Unit: Ω...

Page 24 LC75411ES, 75411WS Tone Circuit Constant Calculation Example Bass Band Circuit The equivalent circuit and the formula for calculating the external RC with a mean frequency of 100 Hz are shown below. • Bass band equivalent circuit block diagram • Calculation example...

Page 25 LC75411ES, 75411WS Treble Band Circuit The shelving characteristics for the treble band can be obtained. The equivalent circuit and the calculation formula during boost are shown below. • Calculation example Specification Setting frequency: f = 26000 Hz Gain during maximum boost: G = 12 dB Let us use R1 = 12.840 kΩ...

Page 26 LC75411ES, 75411WS Fader Volume Block Equivalent Circuit Block Diagram LFIN LFOUT 5.437k –1dB 4.846k LROUT –2dB 8.169k –4dB 6.489k –6dB 5.154k –8dB When FADER = "1", S2 and S3 are ON. 4.094k When FADER = "0", S1 and S4 are ON.

Page 27 (2) Description of zero-cross switching circuit operation The LC75411ES and 75411WS have a function to switch zero-cross comparator signal detection locations, enabling the selection of the optimum detection location for blocks whose data is to be updated. Basically, the switching noise can be minimized by inputting the signal immediately following the block whose data is to be updated to the zero- cross comparator, so it is necessary to switch the detection location every time.

Page 28 2. The data format of the LC75411ES and 75411WS uses 8-bit addresses and 44-bit data. When sending data using multiples of 8 (when sending 48 bits), use the method described in Figure 1.

Page 29 LC75411ES, 75411WS Gain Step Characteristics Gain Step Characteristics LC75411ES LC75411WS =–30dBV =–30dBV Input L1 Input L1 Output LFOUT Output LFOUT f=1kHz f=1kHz Step setting — dB Step setting — dB Main Volume Control Step Characteristics Main Volume Control Step Characteristics...

Page 30 LC75411ES, 75411WS Fader Volume Control Step Characteristics Fader Volume Control Step Characteristics LC75411ES LC75411WS =0dBV =0dBV Input L1 Input L1 Output LFOUT Output LFOUT f=1kHz f=1kHz Step setting — dB Step setting — dB THD — Frequency Characteristics THD — Frequency Characteristics...

Page 31 LC75411ES, 75411WS THD — Input Level Characteristics THD — Input Level Characteristics LC75411ES LC75411WS 80kHz LPF 80kHz LPF Input L1, Output LFOUT Input L1, Output LFOUT With MV=0dB With MV=0dB Input level, V IN — dBV Input level, V IN — dBV...

Page 32 LC75411ES, 75411WS Bass Control Characteristics Bass Control Characteristics LC75411ES LC75411WS =–20dBV =–20dBV Input L1 Input L1 Output LFOUT Output LFOUT Frequency, f — Hz Frequency, f — Hz Treble Control Characteristics Treble Control Characteristics LC75411ES LC75411WS =–20dBV =–20dBV Input L1...

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