PRODUCTS

Semiconductor Integrated Circuit

TYPE

BU9431-D1

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Structure

Silicon monolithic integrated circuit

Product name

USB host MP3 Decoder

Model

BU9431-D1

Outline drawing

Figure-1

Terminal block diagram

Figure-2

Functions

BU9431-D1 is MP3 decoder IC which contains USB host and headphone

output function.

(1) MP3 decode function contained. (available for MPEG1, 2 and 2.5, Layer 1.

(2) USB 2.0 Full Speed host function contained.

(3) Headphone amp output contained.

(4) TQFP64 pin (0.5mm pitch)

Absolute maximum ratings (Ta=25°C)

Item	Symbol	Rating	Unit
Power-supply Voltage (Analog block, IO)	V _{DD1MAX}	4.5	V
Power-supply Voltage (CORE)	V _{DD2MAX}	2.1	V
Terminal Voltage	VINOUT	-0.3~V _{DD1} +0.3	V
Storage Temperature Range	Tstg	$-55 \sim +125$	℃
Operating Temperature Range	Topr	-40 ~ 85	℃
Allowable dissipation*1	Pd	1000	mW

*1 For an operation with Ta = 25°C or more, it shall be reduced 10mW per °C.

Operating conditions

Item	Symbol	Rating	Unit	Applicable pins
Power Supply Voltage (Analog block, IO)	$V_{\rm DD1}$	3.0~3.6	V	DVDDIO, DCVDD, DAVDD, AVDDC, VDD_PLL
Power Supply Voltage (CORE)	V_{DD2}	1.45 ~ 1.65	V	DVDD, BATT

^{*} This product is not designed for protection against radioactive rays.

MPEG Layer-3 audio decoding technology licensed from Fraunhofer IIS and Thomson.

Status of this document

The Japanese version of this document is the official specification. Please use t he translation version of this document as reference to expedite understanding of the official version. If there is any uncertainty in translation version of this document, official version takes priority.

Application example

The application circuit is recommended for use. Make sure to confirm the adequacy of the characteristics.

When using the circuit with changes to the external circuit constants, make sure to leave an adequate margin for external components including static and transitional characteristics as well as dispersion of the IC.

Note that ROHM cannot provide adequate confirmation of patents.

The product described in this specification is designed to be used with ordinary electronic equipment or devices (such as audio-visual equipment, office-automation equipment, communications devices, electrical appliances, and electronic toys).

Should you intend to use this product with equipment or devices which require an extremely high level of reliability and the malfunction of which would directly endanger human life (such as medical instruments, transportation equipment, aerospace machinery, nuclear-reactor controllers, fuel controllers and other safety devices), please be sure to consult with our sales representative in advance.

ROHM assumes no responsibility for use of any circuits described herein, conveys no license under any patent or other right, and makes no representations that the circuits are free from patent infringement.

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Electrical characteristics

(Unless otherwise specified Ta=25°C, V_{DD1}=3.3V, V_{DD2}=1.6V, XIN_PLL=16.9344MHz, XIN_USB=12.0MHz)

Item	Symbol	Limit			Unit	Applicable pins,
		MIN.	TYP.	MAX.	UIII	conditions
Total	T			,		
Circuit current (V _{DD1})	Iddi	-	25.0	60.0	mA	*1
Circuit current (V _{DD2})	I_{DD2}	-	23.0	40.0	mA	*2
Digital block						
H-level input voltage 1	$ m V_{IH1}$	V _{DD1} *0.7	-	V _{DD1}	V	*3
L-level input voltage 1	$V_{\rm IL1}$	DVSSIO	-	V _{DD1} *0.3	V	*3
H-level input voltage 2	$ m V_{IH2}$	V _{DD1} *0.7	-	V _{DD1}	V	*4
L-level input voltage 2	$ m V_{IL2}$	DVSSIO	-	V _{DD1} *0.3	V	*4
H-level output voltage 1	V _{OH1}	V _{DD1} - 0.4	-	V_{DD1}	V	I _{OH} =-0.6mA, *5
L-level output voltage 1	$ m V_{OL1}$	0	-	0.4	V	IoL=0.6mA, *5
H-level output voltage 2	V _{OH2}	$V_{DD1} - 0.4$	-	V _{DD1}	V	I _{OH} =-1.6mA, *6
L-level output voltage 2	$ m V_{OL2}$	0	-	0.4	V	IoL=1.6mA, *6
H-level output voltage 3	Vонз	V _{DD1} - 1.0	-	V _{DD1}	V	Iон=-0.6mA, *7
L-level output voltage 3	$ m V_{OL3}$	0	-	1.0	V	I _{OL} =0.6mA, *7
USB HOST						
H-level input voltage	Vihusb	V _{DD1} *0.6	-	V _{DD1}	V	*8
L-level input voltage	VILUSB	AVSSC	-	V _{DD1} *0.3	V	*8
Output impedance (H)	Zoh	22.0	45.0	60.0	Ω	*8
Output impedance (L)	Zol	22.0	45.0	60.0	Ω	*8
H-level output voltage	Vohusb	$V_{\rm DD1}$ – 0.5	-	V _{DD1}	V	*8
L-level output voltage	Volusb	0	-	0.3	V	*8
Rise/Fall time	$T_{\rm r}/T_{\rm f}$	-	11	-	ns	*8, Output capacity 50pF
Voltage of crossing point	Vcrs	-	V _{DD1} /2	-	V	*8, Output capacity 50pF
Range of differential input	$ m V_{diff}$	0.8	-	2.5	V	*8
Differential input sensitivity	$V_{ m sens}$	0.2	-	-	V	*8
Pull-down resistance	$ m R_{PD}$	10.0	15.0	20.0	$\mathbf{k}\Omega$	*8
Head Phone AMP						
Distortion rate	THD	-	0.03	-	%	1kHz, 0dB, sine, *9
Dynamic range	DR	-	88	-	dB	1kHz, -60dB, sine, *9
S/N ratio	S/N	-	93	-	dB	*9
Max output level	V_{smax}	-	0.67	-	Vrms	RL=32Ω,1kHz,0dB, sine, *9

^{*1 3.3}V system IO, Analog power supply DVDDIO, DCVDD, DAVDD, AVDDC, VDD_PLL

^{*9} LHPO, RHPO

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^{*2 1.6}V system CORE power supply DVDD, BATT

^{*3} PWR_SEL, VOL_SEL, KEY0-1, HOST_CLK, HIDF_SEL, MP3_SEL, HOST_DATA.

^{*4} XIN_PLL, XIN_USB

^{*5} KEY2-5, AMUTE, MP3_EN, HOST_STS

^{*6} ACC_LED, ERR_LED, PLAY_LED

^{*7} XOUT_PLL, XOUT_USB

^{*8} USB_DP, USB_DM



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Description of Terminals

No.	Name	I/O	Description of terminals
1	PWR SEL	ī	Auto play start selection at power on, device connect (H: Stop, L: Playback)
2	VOL_SEL	ī	VOL operation selection (H: VOL+, -Validity, L: VOL+, -Invalidity)
3	KEY0	Ī	Matrix 0 for KEY operation terminal
4	KEY1	I	Matrix 1 for KEY operation terminal
5	DVDDIO	•	IO Power supply (V _{DDI}) terminal
6	KEY2	0	Matrix 2 for KEY operation terminal
7	KEY3	0	Matrix 3 for KEY operation terminal
8	KEY4	0	Matrix 4 for KEY operation terminal
9	KEY5	0	Matrix 5 for KEY operation terminal
10	HOST_CLK	Ť	Host serial command clock input terminal
11	HIDF_SEL	Ţ	Hidden file playback selection (H: It playback, L: It doesn't playback)
12	MP3 SEL	T T	MPEG Audio Layer selection (H: Only MP3 is playback, L: MP1, MP2, and MP3 can be playback)
13	TEST1	I	Connect to V _{DD1} system power supply terminal (TEST PIN)
14	HOST_DATA	I	Host serial command data input terminal
15	DVDD		CORE Power supply (VDD2) terminal
16	DVDDIO		IO Power supply (V _{DDI}) terminal
17	AMUTE	0	
18	MP3_EN		Audio mute output terminal (H: Mute release, L: Mute)
19	DVSSIO	0	MP3 playback standby terminal (H: system initialization)
			IO GND terminal
20 21	TEST2	-	Connect to V _{DD2} system power supply terminal (TEST PIN)
	TEST3		Connect to DCVSS terminal (TEST PIN)
22	TEST4	•	Connect to V _{DD2} system power supply terminal (TEST PIN)
23	TEST5	-	Connect to DCVSS terminal (TEST PIN)
24	TEST6	-	Connect to V _{DD2} system power supply terminal (TEST PIN)
25	TEST7		Connect to DCVSS terminal (TEST PIN)
26	DCVSS	-	GND terminal
27	TEST8	ļ <u>.</u>	OPEN (TEST_PIN)
28	TEST9	-	OPEN (TEST_PIN)
29	TEST10	•	OPEN (TEST_PIN)
30	DCVDD	-	Power supply (V _{DD1}) terminal
31	TEST11	-	OPEN (TEST_PIN)
32	PWSW	I	Connect to DCVSS.
33	BATT		Power supply (V _{DD2}) terminal
34	DAVDD	-	Head Phone AMP power supply (V _{DD1}) terminal
35	RHPO	0	Head Phone AMP Rch output terminal
36	DAVSS	-	Head Phone AMP GND terminal
37	VCDACO	0	Head Phone AMP reference voltage output terminal
38	CPOP	0	Head Phone AMP POP noise prevention output terminal
39	CMUTE	0	Head Phone AMP Soft mute output terminal
40	DAVSS	-	Head Phone AMP GND terminal
41	LHPO	0	Head Phone AMP Lch output terminal
42	DAVDD	<u> </u>	Head Phone AMP power supply (V_{DD1}) terminal
43	REXTI	0	USB bias resistor (12kΩ) connecting terminal
44	XIN_USB	I	X 'tal(12MHz) connecting input terminal
45	XOUT_USB	0	X 'tal(12MHz) connecting terminal
46	AVDDC		USB Power supply (V _{DD1}) terminal
47	USB_DP	I/O	USB D+ I/O terminal
48	USB_DM	I/O	USB D· I/O terminal
49	AVSSC		USB GND terminal
50	VSS_PLL	•	PLL GND terminal
51	XIN_PLL	I	X 'tal(16.9344MHz) connecting input terminal
52	XOUT_PLL	0	X 'tal(16.9344MHz) connecting terminal
53	VDD_PLL	-	PLL Power supply (V _{DD1}) terminal
54	DVDD		CORE Power supply (V _{DD2}) terminal
55	HOST_STS	О	Host serial command status output terminal
56	TEST12	I	Connect to V _{DD1} system power supply terminal (TEST PIN)
57	TEST13	I	Connect to V _{DD1} system power supply terminal (TEST PIN)
58	TEST14	Ī	Connect to V _{DD1} system power supply terminal (TEST PIN)
59	ACC_LED	0	LED lighting output when USB memory is being accessed
60	ERR_LED	0	Error generation LED lighting output
61	PLAY_LED	0	LED lighting output at PLAY
62	DVSS	·	CORE GND terminal
63	TMODEX	I	Test mode input terminal. Connect to V _{DD1} system power supply terminal
64	DVSSIO	-	IO GND terminal
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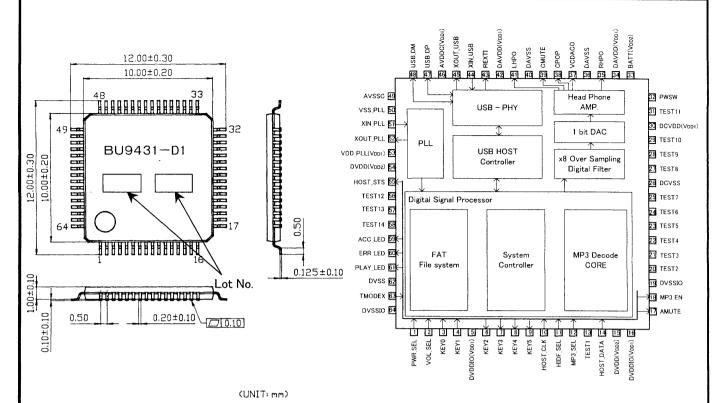


Figure-1 Outline Drawing

Figure-2 Terminal block diagram(Top view)

Directions

(1)Power on Reset

Please note the following points to operate power on reset with which internal is generated normally when the power supply starts.

- ①After 1.6V power supply are turned on, 3.3V power supply are turned on, when the power supply starts.
- ②Power on reset might not operate normally when 1.6V power supply are momentarily turned off. In this case, please turn on the power supply again by the method of ① after turning off all power supply system.

(2) Absolute Maximum Ratings

An excess in the absolute maximum ratings, such as power-supply voltage, operating temperature range, etc., can break down devices, thus making impossible to identify breaking mode such as a short circuit or an open circuit. If any special mode exceeding the absolute maximum ratings is assumed, consideration should be given to take physical safety measures including the use of fuses, etc.

(3) Power supply line

Design PCB pattern to provide low impedance for the wiring between the power supply and the GND lines. In this regard, for the digital block power supply and the analog block power supply, even though these power supplies has the same level of potential, separate the power supply pattern for the digital block from that for the analog block, thus suppressing the diffraction of digital noises to the analog block power supply resulting from impedance common to the wiring patterns. For the GND line, give consideration to design the patterns in a similar manner.

Furthermore, for all power supply terminals to ICs, mount a capacitor between the power supply and the GND terminal. At the same time, in order to use an electrolytic capacitor, thoroughly check to be sure the characteristics of the capacitor to be used present no problem including the occurrence of capacity dropout at a low temperature, thus determining the constant

(4) Operation in strong electromagnetic field

Be noted that using ICs in the strong electromagnetic field can malfunction them.

(5) Input terminals

In terms of the construction of IC, parasitic elements are inevitably formed in relation to potential. The operation of the parasitic element can cause interference with circuit operation, thus resulting in a malfunction and then breakdown of the input terminal. Therefore, pay thorough attention not to handle the input terminals, such as to apply to the input terminals a voltage lower than the GND respectively, so that any parasitic element will operate. Furthermore, do not apply a voltage to the input terminals when no power supply voltage is applied to the IC. In addition, even if the power supply voltage is applied, apply to the input terminals a voltage lower than the power supply voltage or within the guaranteed value of electrical characteristics.

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