Hardware Documentation

ADP-OSM-BB

for HW Revision 1.30

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Elektronik Systeme

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About This Document

This document describes how to use the ADP-OSMBB with mechanical and electrical information. The latest version of this document can be found at: www.fsembedded.com.

ESD Requirements

All F&S hardware products are electrostatic discharge (ESD) sensitive. All products are handled and packaged according to ESD guidelines. Please do not handle or store ESD sensitive material in ESD unsafe environments. Negligent handling will harm the product and warranty claims become void.

Review Service

F&S provide a schematic review service for your baseboard implementation. Please send your schematic as searchable PDF to support@fs-net.de.

History

Version	Date	Platform	Added (A) Removed (R) Modified (M)	Chapter	Description	Author
000/06.2024	03.07.2024	-	-	All	Initial Version	TM
002/07.2025	22.07.20252 3.07.2025	-	M	All	Updated template, new hardware revision	GI

Table of Content

Tables

Figures

1 Overview

1.1 Additional Documentation

The latest versions of the documents can be found on www.fsembedded.com.

The Open Standard Module specification can be found here

1.2 Description

ADP-OSM-BB is a adapter solution to convert Open Standard Module™ (OSM) to PicoCore™ standard with PicoCore™ B2B connectors.

1.3 General Parameter

Parameter	Description
Dimension	35.0 mm x 40.0 mm x 4.60 mm
Weight	≈ 10.0 g (with mounted OSM93)
Operating Temperature	-40.0 °C … +85.0 °C, also depending on OSM
Mounting Holes	2x Ø 2.3 mm

Table 1: General parameter

1.4 Dimensions and Connectors

1.4.1 Technical Drawing

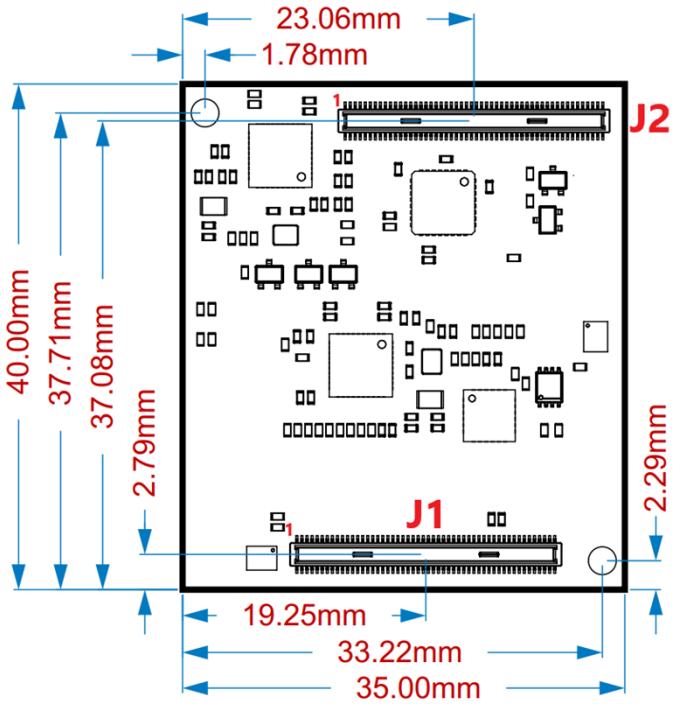

Figure 1: Technical drawing (view from bottom)

1.4.2 Connectors[1]

Ref.	Description	Connector Type	Counter Part
J1	Board to board connector	DF40C-100DP-0.4V(51)	DF40C-100DS-0.4V(51)
J2	Board to board connector	DF40C-100DP-0.4V(51)	DF40C-100DS-0.4V(51)

[1]Connectors and preassembled cables are available for purchase at www.fsembedded.com.

Table 2: Connector description

2 Connector Signal Description

2.1 Contact type definition

Contact Type	Description
I	Input to the module
O	Output from the module
I/O	Bi-directional input / output signal
N.C.	Not connected
PU	Pull up resistor
PD	Pull down resistor

Table 3: Contact Types

2.2 B2B J1 (Serial, SPI, CAN, I²C, MIPI-CSI&DSI, mPCIe)

The following table shows the contact signal description of the board to board connectors

Pin	Signal	OSM PIN	Voltage	I/O	PU/PD	Description
1	I2C_CAM_IRQ	D17	3.3V	I		I²C interrupt
2	!TOUCH_RESET	-	3.3V	O		Signal from I/O expander, low active
3	I2C_CAM_CLK	C4	3.3V	I/O	PU 2.2K	I²C Clock
4	I2C_A_SCL	AA15	1.8V	I/O		I²C channel A Clock
5	I2C_CAM_SDA	C3	3.3V	I/O	PU 2.2K	I²C Data
6	I2C_A_SDA	AA16	1.8V	I/O		I²C channel A Data
7	!MIPI_RESET	-	3.3V	O		Signal from I/O expander, low active
8	GND					
9	BL_ON	-	3.3V	O		Backlight ON, Signal from I/O expander
10	CAN_A_RX	AB17	3.3V	O		CAN channel A receive
11	BL_PWM	E18	3.3V	O		Backlight PWM
12	CAN_A_TX	AC17	3.3V	I		CAN channel A Transmit
13	VLCD_ON	-	3.3V	O		Power Enable for display, Signal from I/O expander
14	N.C.	-				
15	GND					
16	N.C.	-				
17	DSI_A_CLK_P	AB7	MIPI DSI	O		Display Serial Interface Clock positive
18	UART_A_RXD	D22	3.3V	O		RS232 channel A receive
19	DSI_A_CLK_N	AB8	MIPI DSI	O		Display Serial Interface Clock negative
20	UART_A_TXD	D23	3.3V	I		RS232 channel A transmit
21	GND					
22	UART_B_RTS	D15	3.3V	O		RS232 channel B ready to send
23	DSI_A_DATA0_P	AB10	MIPI DSI	O		Display Serial Interface Data 0 positive

Pin	Signal	OSM PIN	Voltage	I/O	PU/PD	Description
24	UART_B_CTS	C14	3.3V	O		RS232 channel B clear to send
25	DSI_A_DATA0_N	AB11	MIPI DSI	O		Display Serial Interface Data 0 negative
26	UART_B_RXD	D14	3.3V	O		RS232 channel B receive
27	GND					
28	UART_B_TXD	D13	3.3V	I		RS232 channel B transmit
29	DSI_A_DATA1_P	AC8	MIPI DSI	O		Display Serial Interface Data 1 positive
30	N.C.	-				
31	DSI_A_DATA1_N	AC9	MIPI DSI	O		Display Serial Interface Data 1 negative
32	N.C.	-				
33	GND					
34	UART_D_RXD	A22	3.3V	O		RS232 channel D receive
35	DSI_A_DATA2_P	AC5	MIPI DSI	O		Display Serial Interface Data 2 positive
36	UART_D_TXD	B23	3.3V	I		RS232 channel D transmit
37	DSI_A_DATA2_N	AC6	MIPI DSI	O		Display Serial Interface Data 2 negative
38	GND					
39	GND					
40	MPCIE_SMCLK	T1	1.8V	I/O		PCIe system management I^2C Clock
41	DSI_A_DATA3_P	AB4	MIPI DSI	O		Display Serial Interface Data 3 positive
42	MPCIE_SMDAT	U1	1.8V	I/O		PCIe system management I^2C Data
43	DSI_A_DATA3_N	AB5	MIPI DSI	O		Display Serial Interface Data 3 negative
44	GPIO_J1_44	-	3.3V	I/O		Signal from I/O expander
45	GND					
46	GPIO_J1_46	-	3.3V	I/O		Signal from I/O expander
47	N.C.	-				
48	I2C_D_SCL	AA15	3.3V	I/O		I^2C channel D Clock
49	N.C.	-				
50	I2C_D_SDA	AA16	3.3V	I/O		I^2C channel D Data
51	GND					
52	N.C.	-				
53	N.C.	-				
54	N.C.	-				
55	N.C.	-				
56	SPI_B_SS0	AA23	1.8V	O		SPI channel B master chip select 0
57	GND					
58	SPI_B_MISO	Y22	1.8V	I		SPI channel B master in slave out
59	N.C.	-				

Pin	Signal	OSM PIN	Voltage	I/O	PU/PD	Description
60	SPI_B_MOSI	Y23	1.8V	O		SPI channel B master out slave in
61	N.C.	-				
62	SPI_B_SCLK	Y21	1.8V	O		SPI channel B Clock
63	GND					
64	SPI_A_SS0	Y15	1.8V	O		SPI channel A master chip select 0
65	N.C.	-				
66	SPI_A_MISO	V15 / U15	1.8V	I		SPI channel A master in slave out, exchangeable with J1 68 SPI_A_MOSI via jumper
67	N.C.	-				
68	SPI_A_MOSI	V15 / U15	1.8V	O		SPI channel A master out slave in, exchangeable with J1 66 SPI_A_MISO via jumper
69	GND					
70	SPI_A_SCLK	U16	1.8V	O		SPI channel A Clock
71	N.C.	-				
72	GND					
73	N.C.	-				
74	CSI_A_CLK_P	B4	MIPI CSI	O		Camera Serial Interface channel A clock positive
75	GND					
76	CSI_A_CLK_N	B3	MIPI CSI	O		Camera Serial Interface channel A clock negative
77	MPCIE_CTX_P	AC2	mPCIe	I		mPCIe transmit positive
78	GND					
79	MPCIE_CTX_N	AC3	mPCIe	I		mPCIe transmit negative
80	CSI_A_DATA0_P	B1	MIPI CSI	O		Camera Serial Interface channel A data 0 positive
81	GND					
82	CSI_A_DATA0_N	C1	MIPI CSI	O		Camera Serial Interface channel A data 0 negative
83	MPCIE_CRX_P	AB1	mPCIe	O		mPCIe receive positive
84	GND					
85	MPCIE_CRX_N	AB2	mPCIe	O		PCIe receive negative
86	CSI_A_DATA1_P	A3	MIPI CSI	O		Camera Serial Interface channel A data 1 positive
87	GND					
88	CSI_A_DATA1_N	A2	MIPI CSI	O		Camera Serial Interface channel A data 1 negative
89	MPCIE_CLK_P	W1	mPCIe	I		mPCIe clock positive
90	GND					
91	MPCIE_CLK_N	Y1	mPCIe	I		mPCIe clock negative
92	CSI_A_DATA2_P	A6	MIPI CSI	O		Camera Serial Interface channel A data 2 positive
93	GND					
94	CSI_A_DATA2_N	A5	MIPI CSI	O		Camera Serial Interface channel A data 2 negative

Pin	Signal	OSM PIN	Voltage	I/O	PU/PD	Description
95	MPCIE_PERST	V2	1.8V	O		mPCIe reset signal
96	GND					
97	MPCIE_WAKE	T2	1.8V	O		mPCIe wake signal
98	CSI_A_DATA3_P	B7	MIPI CSI	O		Camera Serial Interface channel A data 3 positive
99	GND					
100	CSI_A_DATA3_N	B6	MIPI CSI	O		Camera Serial Interface channel A data 3 negative

Table 4: Pinout J1

2.3 B2B J2 (Audio, USB OTG, USB Host, Ethernet A, Ethernet B, SD Card, ADC)

Pin	Signal	OSM Pin	Voltage	I/O	PU/PD	Description
1	ETH_A_D1_P	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 1 positive (Ethernet Phy Gbit)
2	AUDIO_A_VCC	-	3.0V	I		Audio power (Audio Codec)
3	ETH_A_D1_N	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 1 negative (Ethernet Phy)
4	AUDIO_A_GND	-		I		Audio ground (Audio Codec), do not connect system ground
5	ETH_A_D2_P	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 2 positive (Ethernet Phy)
6	AUDIO_A_LOUT_L	I²S_A		I		Audio channel A Line Out Left (Audio Codec)
7	ETH_A_D2_N	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 2 negative (Ethernet Phy)
8	AUDIO_A_LOUT_R	I²S_A		I		Audio channel A Line Out Right (Audio Codec)
9	ETH_A_D3_P	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 3 positive (Ethernet Phy)
10	AUDIO_A_MIC	I²S_A		O		Audio channel A microphone (Audio Codec)
11	ETH_A_D3_N	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 3 negative (Ethernet Phy)
12	AUDIO_A_LIN_L	I²S_A		O		Audio channel A Line In Left (Audio Codec)
13	ETH_A_D4_P	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 4 positive (Ethernet Phy)
14	AUDIO_A_LIN_R	I²S_A		O		Audio channel A Line In Right (Audio Codec)
15	ETH_A_D4_N	ETH_A	IEEE 802.3ab	I/O		Ethernet channel A data 4 negative (Ethernet Phy)
16	GND					
17	ETH_A_LED	-	3.3V	O		ETH channel A LED Signal (Ethernet Phy)
18	AUDIO_A_HP_L	I²S_A		O		Audio channel A Headphone Left (Audio Codec)
19	GND					
20	AUDIO_A_HP_R	I²S_A		O		Audio channel A Headphone Right (Audio Codec)
21	ETH_B_LED	ETH_B	3.3V	O		ETH channel B LED Signal (Ethernet Phy)
22	AUDIO_A_HP_GND	-		I		Audio channel A Headphone Ground (Audio Codec) Do not connect to system ground

Pin	Signal	OSM Pin	Voltage	I/O	PU/PD	Description
23	ETH_B_D1_P	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 1 positive (Ethernet Phy)
24	VDD_5V0	VCC_IN	5.0V	I		Power Input
25	ETH_B_D1_N	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 1 negative (Ethernet Phy)
26	VDD_5V0	VCC_IN	5.0V	I		Power Input
27	ETH_B_D2_P	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 2 positive (Ethernet Phy)
28	VDD_5V0	VCC_IN	5.0V	I		Power Input
29	ETH_B_D2_N	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 2 negative (Ethernet Phy)
30	GND					
31	ETH_B_D3_P	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 3 positive (Ethernet Phy)
32	GND					
33	ETH_B_D3_N	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 3 negative (Ethernet Phy)
34	GND					
35	ETH_B_D4_P	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 4 positive (Ethernet Phy)
36	VDD_VBAT	W17	3.3V	I		Connect Battery or 3.3V for Real Time Clock
37	ETH_B_D4_N	ETH_B	IEEE 802.3ab	I/O		Ethernet channel B data 4 negative (Ethernet Phy)
38	N.C.	-				
39	GND					
40	VDD_3V3	-	3.3V	O		3.3V power output (max. 1A)
41	USB_HOST_VBUS	AB20	5V	O		USB Host power delivery
42	!RESET_IN	U17		I	PU 10.0K	Reset input, low active
43	USB_HOST_D_P	AC22	I/O USB	I/O		USB Host data positive
44	!CARRIER_PWR_EN	V17	3.3V	O	PU 10.0K	Carrier power enable signal, low active
45	USB_HOST_D_N	AB23	I/O USB	I/O		USB Host data negative
46	N.C.	-				
47	USB_HOST_EN	AC20	3.3V	O		USB Host enable
48	!ON_OFF	AA9	1.8V	I	PU 10.0K	ON / OFF signal, low active
49	GND					
50	!BOOTSEL	T17	1.8V	I	PU 10.0K	Bootselect signal, low active
51	USB_OTG_VBUS	AB16	5V	O		USB OTG power delivery
52	SD_A_VCC	C20	1.8V / 3.3V	I		SDIO A voltage level. Connect 1.8V or 3.3V
53	USB_OTG_EN	AV16	1.8V / 3.3V	O		USB OTG enable signal
54	N.C.	-				

Pin	Signal	OSM Pin	Voltage	I/O	PU/PD	Description
55	USB_OTG_ID	AB14		O	PU 10.0K	USB OTG ID signal (connect PU / PD)
56	SD_A_RST	D21	SD_A_ VCC	O		SD Card reset signal
57	USB_OTG_D_P	AC14	USB2.0	I/O		USB OTG data positive
58	SD_A_WP	D20	SD_A_ VCC	O		SD Card write protect signal
59	USB_OTG_D_N	AB13	USB2.0	I/O		USB OTG data negative
60	SD_A_CD	J21	SD_A_ VCC	I		SD Card Card Detect signal
61	GND					
62	SD_A_CMD	E20	SD_A_ VCC	O		SD Card command
63	PWM	F18	1.8V	O		PWM output signal
64	SD_A_CLK	F21	SD_A_ VCC	O		SD Card clock
65	N.C.	-				
66	SD_A_DATA0	G20	SD_A_ VCC	I/O		SD Card Data 0
67	N.C.	-				
68	SD_A_DATA1	G21	SD_A_ VCC	I/O		SD Card Data 1
69	N.C.	-				
70	SD_A_DATA2	H20	SD_A_ VCC	I/O		SD Card Data 2
71	GND					
72	SD_A_DATA3	H21	SD_A_ VCC	I/O		SD Card Data 3
73	ADC0	M18	0 – 1.8V	I		Analog Digital Converter input 0
74	N.C.	-				
75	ADC1	N18	0 – 1.8V	I		Analog Digital Converter input 1
76	N.C.	-				
77	!USB_TYPEC_ALERT	-	3.3V			Signal from I/O expander, low active
78	N.C.	-				
79	N.C.	-				
80	N.C.	-				
81	GND					
82	GND					
83	N.C.	-				
84	N.C.	-				
85	N.C.	-				
86	N.C.	-				

Pin	Signal	OSM Pin	Voltage	I/O	PU/PD	Description
87	N.C.	-				
88	N.C.	-				
89	N.C.	-				
90	N.C.	-				
91	N.C.	-				
92	N.C.	-				
93	JTAG_TCK	N17	1.8V	I/O		JTAG Clock
94	N.C.	-				
95	JTAG_TMS	N19	1.8V	I/O		JTAG Mode Select
96	N.C.	-				
97	JTAG_TDI	P17	1.8V	I/O		JTAG Data In
98	N.C.	-				
99	JTAG_TDO	R17	1.8V	I/O		JTAG Data Out
100	N.C.	-				

Table 5: Pinout J2

3 Detailed Description

3.1 Ethernet

The module uses 2 RTL8211 Ethernet PHYs (Physical Layer Transceiver) which converts CPU RGMII Signals to standard Ethernet signals over twisted-pair copper cables (1000BASE-T, 100BASE-TX, or 10BASE-T).

OSM Pin	OSM Signal	IC (conversion)	PicoCore™ Signal
J15	ETH_A_(R)(G)MII_TX_CLK	RTL8211	ETH_A_D1_P
K16	ETH_A_(R)(G)MII_TX_EN(_ER)		ETH_A_D1_N
H15	ETH_A_(S)(R)(G)MII_TXD0		ETH_A_D2_P
G15	ETH_A_(S)(R)(G)MII_TXD1		ETH_A_D2_N
H16	ETH_A_(S)(R)(G)MII_TXD2		ETH_A_D3_P
G16	ETH_A_(S)(R)(G)MII_TXD3		ETH_A_D3_N
R15	ETH_A_(R)(G)MII_RX_CLK		ETH_A_D4_P
M15	ETH_A_(R)(G)MII_RX_DV(_ER)		ETH_A_D4_N
K15	ETH_A_(S)(R)(G)MII_RXD0		ETH_A_LED
L15	ETH_A_(S)(R)(G)MII_RXD1		-
N15	ETH_A_(R)(G)MII_RXD2		-
P15	ETH_A_(R)(G)MII_RXD3		-
T16	ETH_A_MDC		-
T15	ETH_A_MDIO		-

Table 6: Ethernet A (Gbit) used OSM Pins

OSM Pin	OSM Signal	IC (conversion)	PicoCore™ Signal
H1	ETH_B_(R)(G)MII_TX_CLK	RTL8211	ETH_B_D1_P
J2	ETH_B_(R)(G)MII_TX_EN(_ER)		ETH_B_D1_N
G1	ETH_B_(S)(R)(G)MII_TXD0		ETH_B_D2_P
F1	ETH_B_(S)(R)(G)MII_TXD1		ETH_B_D2_N
G2	ETH_B_(S)(R)(G)MII_TXD2		ETH_B_D3_P
F2	ETH_B_(S)(R)(G)MII_TXD3		ETH_B_D3_N
P1	ETH_B_(R)(G)MII_RX_CLK		ETH_B_D4_P
L1	ETH_B_(R)(G)MII_RX_DV(_ER)		ETH_B_D4_N
J1	ETH_B_(S)(R)(G)MII_RXD0		ETH_B_LED
K1	ETH_B_(S)(R)(G)MII_RXD1		-
M1	ETH_B_(R)(G)MII_RXD2		-
N1	ETH_B_(R)(G)MII_RXD3		-
C6	ETH_B_MDC		-
C7	ETH_B_MDIO		-

Table 7: Ethernet B (Gbit) used OSM Pins

3.2 I/O Expander

To reach the required number of GPIOs, 1 GPIO expander is used (PCAL6416A).

This expander can be accessed over I²C Channel D (OSM I²C_B) (write 0x40, read 0x41)

It provides following I/Os

Pin	Signal	Voltage	I/O	PU/PD	Description
1	!PHY_RST_A	3.3V	O	PU 10.0K	Low active, necessity for ETH RTL8211
2	!PHY_RST_B	3.3V	O	PU 10.0K	Low active, necessity for ETH RTL8211
3	!PHY_IRQ_A	3.3V	I	PU 10.0K	Low active, necessity for ETH RTL8211
4	PHY_IRQ_B	3.3V	I	PU 10.0K	Low active, necessity for ETH RTL8211
5	!USB_TYPEC_ALERT		I		Low active, required for USB alert
6	!MIPI_RESET		O		Low active, MIPI display reset
7	!TOUCH_RESET		O		Low active, touch reset
8	BL_ON	3.3V	O		Backlight on signal (default: from I/O expander, OSM otherwise)
10	VLCD_ON	3.3V	O		Display power on signal (default: from I/O expander, OSM otherwise)
11	GPIO_J1_44	3.3V	I/O		General Purpose Input/Output
12	GPIO_J1_46	3.3V	I/O		General Purpose Input/Output

Table 8: I/O expander (PCAL6416A)

Note: PCAL6416A uses OSM AA20 I2C_B_SCL , AA21 I2C_B_SDA and E17 GPIO_A_1 for full functionality

3.3 Serial level shifter

Since the OSM module provides a 1.8 V TTL UART interface, we use a level shifter (TXB0108YZP) to translate the signal levels up to 3.3 V. The level shifter ensures that the OSM module is electrically compatible with the PicoCore™ standard.

3.4 Level shifter

TCA39306-Q1 is a level shifter specialized for I²C. OSM provides a 1.8V I²C (I2C_CAM_CLK / SDA) which is translated to a signal level of 3.3V

The second level shifter is used for translating the CAN interface (1.8 V to 3.3 V) as well as the control signals BL_ON, BL_PWM, and VLCD_ON. The level shifter ensures that the OSM module is electrically compatible with the PicoCore™ standard.

3.5 Audio

For audio, we use an audio codec that converts I²S digital audio signals into analog output. Control and configuration of the codec are handled via the I²C_D interface (OSM I²C_B).

OSM Pin	OSM Signal	IC (conversion)	PicoCore™ Signal
V21	I2S_A_DATA_IN	SGTL5000	AUDIO_A_MIC
W21	I2S_DATA_OUT		AUDIO_A_LIN_R
W18	I2S_LRCLK		AUDIO_A_LIN_L
W20	I2S_BITCLK		AUDIO_A_LOUT_R
V18	I2S_MCLK		AUDIO_A_LOUT_L
-			AUDIO_A_HP_R
-			AUDIO_A_HP_L

4 Characteristics

4.1 Absolute Maximum Ratings[1]

Description	Min	Max	Unit
Supply Voltage	-0.50	6.00	V
Audio supply voltage	-0.30	3.60	V
Real Time Clock (RTC) supply voltage	-0.50	6.50	V

Table 9: Absolute maximum ratings

4.2 Recommended Operating Conditions

Parameter	Description	Min	Typ	Max	Unit
General					
VDD_5V0	Module main supply voltage	4.50	5.00	5.50	V
AUDIO_A_VCC	Supply voltage for SGTL5000	1.62	3.00	3.60	V
V_RTC	Real time clock voltage	Depends on OSM			
Analog Input / Output					
ADC0 & ADC1	ADC full scale input voltage range	Depends on OSM			

Table 10: Recommended operate conditions

[1] Stresses beyond the listed values may affect reliability or cause permanent damage to the module

5 Packaging & Labels

5.1 ESD

All F&S electrostatic discharge sensitive (ESDS) products are marked and will be shipped in ESD protective packaging.

5.2 Serial Number

All shipped F&S products are labeled with a matrix code sticker that includes the serial number. For product information visit www.fsembedded.com/en/support/serial-number-info-and-rma/.

6 Appendix

6.1 Second source rules

The qualifications of products from a second source are done autonomously by F&S. This is necessary to guarantee delivery times and product life. A setup of release samples with released second sources is not possible. F&S does not use broker components without the consent of the customer.

6.2 RoHS and REACH statement

Please see the following webpage: www.fsembedded.com/en/support/certifications/

6.3 Important Notice

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