

# AP72598V

## User Manual

# Revision

Revision	Date	Description	Revised By
0.0	2021/04/21	- Initial Released	Darren
0.1	2021/09/24	- Modify Block diagram - Modify Wi-Fi RF Specification	Darren
0.2	2021/10/29	- Modify Wi-Fi RF Specification - Modify Bluetooth Specification	Darren

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# 1. Introduction

## 1.1 Overview

AP72598V is an advanced application processor designed for smart audio and smart home applications. It integrates a powerful subsystem with Wi-Fi / BT, advanced multi-format audio processing unit, a secured runtime environment and all major peripherals for versatile smart home applications.

It has rich advanced network and peripheral interfaces, including 10/100/1000M Ethernet MAC, USB 2.0 high-speed OTG port, MIPI panel interface, UARTs, I2Cs, high-speed SPIs, PWMs and low-speed 10-bit ADC. Built In 4Gb SPI-NAND FLASH and 4Gb DDR4 DRAM .

The wireless module complies with IEEE 802.11a/b/g/n/ac 2x2MIMO standard and it can achieve up to a speed of 867Mbps with dual stream in 802.11 to connect the wireless LAN.

With Bluetooth Class 1 or Class2 transmitter operation.

AP72598V\_H is support Dolby & DTS audio.

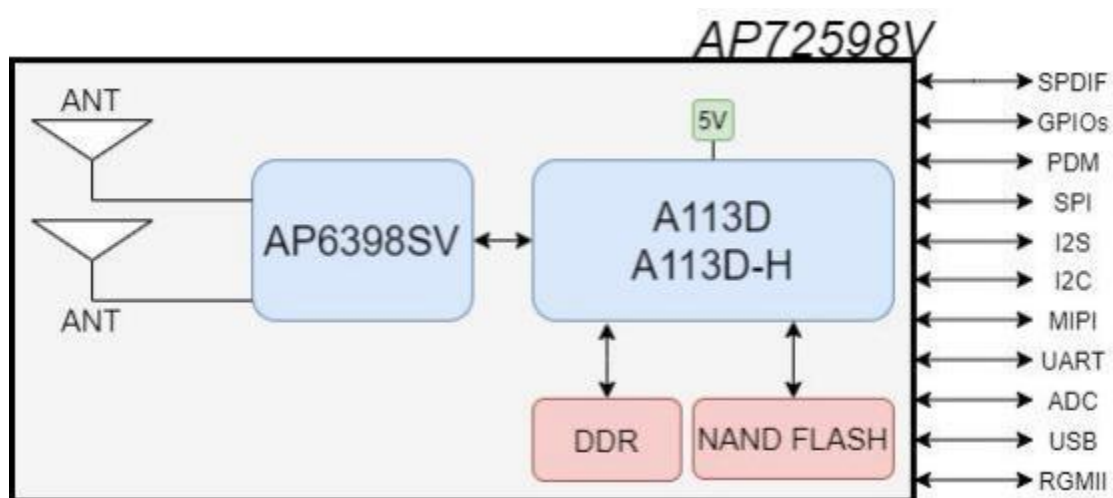


Figure 1-1 Block diagram

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### 1.2 Product Features

- Lead Free design which is compliant with ROHS requirements.
- 802.11a/b/g/n/ac dual-band radio with virtual-simultaneous dual-band operation
- Dual-stream spatial multiplexing up to 867 Mbps data rate.
- Quad core ARM Cortex-A53 CPU up to 1.5GHz (DVFS)
- Audio Decoder and Input / Output
- Panel Output Interface
- Integrated IEEE 802.3 10/100/1000M Ethernet MAC with RGMII interface
- Integrated I/O Controllers and Interfaces
- Supports Transmit Power Control on the STA together with standard Bluetooth TPC to limit mutual interference and receiver desensitization. Support Bluetooth 5.1 compliant with Bluetooth 3.0, Bluetooth 2.1+EDR and Low Energy (BLE).

## 2. General Specification

### 2.1 General Specification

Model Name	AP72598V
Product Description	Support Wi-Fi / BT functionality
Dimension	L x W x H : 69.6(±0.15) x 50(±0.15) mmx 5.50(±0.2)mm
Operating temperature	-10°C to 65°C
Storage temperature	-40°C to 85°C
Humidity	Operating Humidity 10% to 95% Non-Condensing Storage Humidity 5% to 95% Non-Condensing

### 2.2 Recommended Operating Rating

	Min.	Typ.	Max.	Unit
Operating Temperature	-10	25	65	deg. C
VDD	4.5	5	5.5	V

### 2.3 Product current consumption

Item	Typ.
work mode: CPU load 80%, TX or RX throughput 20Mbps,	TBD
idle mode: CPU load 0%, keep connection to AP but nowifi stream,	TBD
EUP mode: the lowest power,can wake up by Wifi and BT.	TBD

### 3. Wi-Fi RF Specification

#### 3.1 2.4GHzRF Specification

Conditions :VDDIO=3.3V ; Temp:25°C

Feature		Description				
<b>WLAN Standard</b>		IEEE 802.11 b/g/n WiFi compliant				
<b>Frequency Range</b>		2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)				
<b>Number of Channels</b>		2.4GHz: Ch1 ~ Ch13				
<b>Modulation</b>		802.11b : DQPSK, DBPSK, CCK 802.11 g/n : OFDM /64-QAM,16-QAM, QPSK, BPSK				
<b>Output Power , tolerance <math>\pm</math> 1.5 dB</b>						
<b>The transmit EVM quality &amp; spectrum mask are compliant with IEEE 802.11 standard</b>						
<b>802.11 b</b>	<b>1Mbps</b>	<b>2Mbps</b>	<b>5.5Mbps</b>	<b>11Mbps</b>		
	11.5	11.5	17.5	17.5		
<b>802.11 g</b>	<b>6、 9Mbps</b>	<b>12、 18Mbps</b>	<b>24Mbps</b>	<b>36Mbps</b>	<b>48Mbps</b>	
	10	17.5	17	17	16.5	
	<b>54Mbps</b>					
	16.5					
<b>802.11 n</b>	<b>MCS0~2</b>	<b>MCS3</b>	<b>MCS4</b>	<b>MCS5</b>	<b>MCS6</b>	
	10	16.5	16	16	15.5	
	<b>MCS7</b>					
	15.5					
<p>Note:The specifications of RF output power are subject to change to fulfill the safety regulation and requirements</p> <p>in end-user product.</p>						

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<b>Sensitivity, tolerance <math>\pm 2</math> dB</b>				
<b>CCK modulation PER <math>\leq 8\%</math>、OFDM modulation PER <math>\leq 10\%</math></b>				
<b>802.11b</b>	<b>Data Rate</b>	<b>Spec. (dBm)</b>		
	<b>1Mbps</b>	TBD		
	<b>2Mbps</b>	TBD		
	<b>5.5Mbps</b>	TBD		
	<b>11Mbps</b>	TBD		
<b>802.11g SISO</b>	<b>Data Rate</b>	<b>Spec. (dBm)</b>	<b>Data Rate</b>	<b>Spec. (dBm)</b>
	<b>6Mbps</b>	TBD	<b>24Mbps</b>	TBD
	<b>9Mbps</b>	TBD	<b>36Mbps</b>	TBD
	<b>12Mbps</b>	TBD	<b>48Mbps</b>	TBD
	<b>18Mbps</b>	TBD	<b>54Mbps</b>	TBD
<b>802.11g MIMO</b>	<b>6Mbps</b>	TBD	<b>24Mbps</b>	TBD
	<b>9Mbps</b>	TBD	<b>36Mbps</b>	TBD
	<b>12Mbps</b>	TBD	<b>48Mbps</b>	TBD
	<b>18Mbps</b>	TBD	<b>54Mbps</b>	TBD
<b>802.11n HT20 SISO</b>	<b>MCS=0</b>	TBD	<b>MCS=4</b>	TBD
	<b>MCS=1</b>	TBD	<b>MCS=5</b>	TBD
	<b>MCS=2</b>	TBD	<b>MCS=6</b>	TBD
	<b>MCS=3</b>	TBD	<b>MCS=7</b>	TBD
<b>802.11n HT20 MIMO</b>	<b>MCS=0</b>	TBD	<b>MCS=5</b>	TBD
	<b>MCS=1</b>	TBD	<b>MCS=6</b>	TBD
	<b>MCS=2</b>	TBD	<b>MCS=7</b>	TBD
	<b>MCS=3</b>	TBD	<b>MCS=8</b>	TBD
	<b>MCS=4</b>	TBD	<b>MCS=15</b>	TBD
		802.11b : TBD		



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Maximum InputLevel	802.11g/n : TBD
AntennaReference	Small antennas with 0~2 dBipeak gain

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### 3.2 5GHz RF Specification

Conditions : VDD=3.3V ; Temp:25°C

Feature	Description				
<b>WLAN Standard</b>	IEEE 802.11a /n / ac 2x2 &Wi-Fi compliant				
<b>Frequency Range</b>	4.900 GHz ~ 5.845 GHz (5.0GHz ISM Band)				
<b>Number of Channels</b>	5.0GHz: Please see the table <sup>1</sup>				
<b>Modulation</b>	802.11a: OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11n : OFDM /64-QAM,16-QAM, QPSK, BPSK 802.11ac : OFDM /256-QAM				
<b>Output Power , tolerance <math>\pm</math> 1.5 dB</b>					
<b>The transmit EVM quality &amp; spectrum mask are compliant with IEEE 802.11 standard</b>					
<b>802.11 a</b>	<b>6、9Mbps</b>	<b>12、18Mbps</b>	<b>24Mbps</b>	<b>36Mbps</b>	<b>48Mbps</b>
	11	11	16	16	15.5
	<b>54Mbps</b>				
	15.5				
<b>802.11 n</b>	<b>MCS0~2</b>	<b>MCS3</b>	<b>MCS4</b>	<b>MCS5</b>	<b>MCS6</b>
	11	15.5	15	15	14.5
	<b>MCS7</b>				
	14.5				
<b>802.11 ac</b>	<b>MCS0~2</b>	<b>MCS3</b>	<b>MCS4</b>	<b>MCS5</b>	<b>MCS6</b>
	12.5	15.5	15	15	14.5
	<b>MCS7</b>	<b>MCS8</b>	<b>MCS9</b>		
	14	12	11		

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<p>Note: The specifications of RF output power are subject to change to fulfill the safety regulation and requirements in end-user product.</p>				
<p><b>Sensitivity, tolerance <math>\pm 2</math> dB</b></p> <p><b>CCK modulation PER <math>\leq 8\%</math>、OFDM modulation PER <math>\leq 10\%</math></b></p>				
<p><b>802.11a</b> <b>SISO</b></p>	<p><b>Data Rate</b></p>	<p><b>Spec. (dBm)</b></p>	<p><b>Data Rate</b></p>	<p><b>Spec. (dBm)</b></p>
	<p><b>6Mbps</b></p>	<p>TBD</p>	<p><b>24Mbps</b></p>	<p>TBD</p>
	<p><b>9Mbps</b></p>	<p>TBD</p>	<p><b>36Mbps</b></p>	<p>TBD</p>
	<p><b>12Mbps</b></p>	<p>TBD</p>	<p><b>48Mbps</b></p>	<p>TBD</p>
	<p><b>18Mbps</b></p>	<p>TBD</p>	<p><b>54Mbps</b></p>	<p>TBD</p>
<p><b>802.11a</b> <b>MIMO</b></p>	<p><b>6Mbps</b></p>	<p>TBD</p>	<p><b>24Mbps</b></p>	<p>TBD</p>
	<p><b>9Mbps</b></p>	<p>TBD</p>	<p><b>36Mbps</b></p>	<p>TBD</p>
	<p><b>12Mbps</b></p>	<p>TBD</p>	<p><b>48Mbps</b></p>	<p>TBD</p>
	<p><b>18Mbps</b></p>	<p>TBD</p>	<p><b>54Mbps</b></p>	<p>TBD</p>
<p><b>802.11n HT20</b> <b>SISO</b></p>	<p><b>MCS=0</b></p>	<p>TBD</p>	<p><b>MCS=4</b></p>	<p>TBD</p>
	<p><b>MCS=1</b></p>	<p>TBD</p>	<p><b>MCS=5</b></p>	<p>TBD</p>
	<p><b>MCS=2</b></p>	<p>TBD</p>	<p><b>MCS=6</b></p>	<p>TBD</p>
	<p><b>MCS=3</b></p>	<p>TBD</p>	<p><b>MCS=7</b></p>	<p>TBD</p>
<p><b>802.11n HT20</b> <b>MIMO</b></p>	<p><b>MCS=0</b></p>	<p>TBD</p>	<p><b>MCS=5</b></p>	<p>TBD</p>
	<p><b>MCS=1</b></p>	<p>TBD</p>	<p><b>MCS=6</b></p>	<p>TBD</p>
	<p><b>MCS=2</b></p>	<p>TBD</p>	<p><b>MCS=7</b></p>	<p>TBD</p>
	<p><b>MCS=3</b></p>	<p>TBD</p>	<p><b>MCS=8</b></p>	<p>TBD</p>
	<p><b>MCS=4</b></p>	<p>TBD</p>	<p><b>MCS=15</b></p>	<p>TBD</p>
<p><b>802.11n HT40</b> <b>SISO</b></p>	<p><b>MCS=0</b></p>	<p>TBD</p>	<p><b>MCS=4</b></p>	<p>TBD</p>
	<p><b>MCS=1</b></p>	<p>TBD</p>	<p><b>MCS=5</b></p>	<p>TBD</p>
	<p><b>MCS=2</b></p>	<p>TBD</p>	<p><b>MCS=6</b></p>	<p>TBD</p>

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	MCS=3	TBD	MCS=7	TBD
802.11n HT40  MIMO	MCS=0	TBD	MCS=5	TBD
	MCS=1	TBD	MCS=6	TBD
	MCS=2	TBD	MCS=7	TBD
	MCS=3	TBD	MCS=8	TBD
	MCS=4	TBD	MCS=15	TBD
802.11 ac HT20  SISO	MCS=0,NSS1	TBD	MCS=5,NSS1	TBD
	MCS=1,NSS1	TBD	MCS=6,NSS1	TBD
	MCS=2,NSS1	TBD	MCS=7,NSS1	TBD
	MCS=3,NSS1	TBD	MCS=8,NSS1	TBD
	MCS=4,NSS1	TBD		
802.11 ac HT20  MIMO	MCS=0,NSS1	TBD	MCS=6,NSS1	TBD
	MCS=1,NSS1	TBD	MCS=7,NSS1	TBD
	MCS=2,NSS1	TBD	MCS=8,NSS1	TBD
	MCS=3,NSS1	TBD	MCS=0,NSS2	TBD
	MCS=4,NSS1	TBD	MCS=8,NSS2	TBD
	MCS=5,NSS1	TBD		
802.11 ac HT40  SISO	MCS=0,NSS1	TBD	MCS=5,NSS1	TBD
	MCS=1,NSS1	TBD	MCS=6,NSS1	TBD
	MCS=2,NSS1	TBD	MCS=7,NSS1	TBD
	MCS=3,NSS1	TBD	MCS=8,NSS1	TBD
	MCS=4,NSS1	TBD	MCS=9,NSS1	TBD
802.11 ac HT40	MCS=0,NSS1	TBD	MCS=6,NSS1	TBD

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<b>MIMO</b>	<b>MCS=1,NSS1</b>	TBD	<b>MCS=7,NSS1</b>	TBD
	<b>MCS=2,NSS1</b>	TBD	<b>MCS=8,NSS1</b>	TBD
	<b>MCS=3,NSS1</b>	TBD	<b>MCS=9,NSS1</b>	TBD
	<b>MCS=4,NSS1</b>	TBD	<b>MCS=0,NSS2</b>	TBD
	<b>MCS=5,NSS1</b>	TBD	<b>MCS=9,NSS2</b>	TBD
<b>802.11 ac HT80</b> <b>SISO</b>	<b>MCS=0,NSS1</b>	TBD	<b>MCS=5,NSS1</b>	TBD
	<b>MCS=1,NSS1</b>	TBD	<b>MCS=6,NSS1</b>	TBD
	<b>MCS=2,NSS1</b>	TBD	<b>MCS=7,NSS1</b>	TBD
	<b>MCS=3,NSS1</b>	TBD	<b>MCS=8,NSS1</b>	TBD
	<b>MCS=4,NSS1</b>	TBD	<b>MCS=9,NSS1</b>	TBD
<b>802.11 ac HT80</b> <b>MIMO</b>	<b>MCS=0,NSS1</b>	TBD	<b>MCS=6,NSS1</b>	TBD
	<b>MCS=1,NSS1</b>	TBD	<b>MCS=7,NSS1</b>	TBD
	<b>MCS=2,NSS1</b>	TBD	<b>MCS=8,NSS1</b>	TBD
	<b>MCS=3,NSS1</b>	TBD	<b>MCS=9,NSS1</b>	TBD
	<b>MCS=4,NSS1</b>	TBD	<b>MCS=0,NSS2</b>	TBD
	<b>MCS=5,NSS1</b>	TBD	<b>MCS=9,NSS2</b>	TBD

Maximum Input Level	802.11a/n : TBD
Antenna Reference	Small antennas with 0~2 dBipeak gain

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5 GHz (20MHz) Channel table

<b>Band (GHz)</b>	<b>Operating Channel Numbers</b>	<b>Channel center frequencies(M Hz)</b>
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5.725GHz~5.825GHz	149	5745
	153	5765
	157	5785
	161	5805

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## 4. Bluetooth Specification

Conditions : VDD=3.3V ; Temp:25°C

Feature	Description		
<b>General Specification</b>			
Bluetooth Standard	Bluetooth V5.1 of 1, 2 and 3 Mbps.		
Antenna Reference	Small antennas with 0~2 dBipeak gain		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels		
Modulation	GFSK, DPSK, DQPSK		
<b>RF Specification</b>			
	<b>Min.</b>	<b>Typical.</b>	<b>Max.</b>
Output Power <sup>1</sup>	0		10
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-86 dBm	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-88 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-84 dBm	
Maximum Input Level	GFSK (1Mbps):9.05dBm		
	$\pi/4$ -DQPSK (2Mbps) :10.49dBm		
	8DPSK (3Mbps) :10.95dBm		
Note <sup>1</sup> : Output power can be configured by HCD firmware.			



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## 5. Pin Definition

### 5.1 Pin Outline

U12		SODIMM 260PPIN	
1	GND		2
3	GND	GND	4
5	GND	GND	6
7	GND	GND	8
9	GND	GND	10
11	GND	GND	12
13	GND	GND	14
15	GND	GND	16
17	GND	GND	18
19	GND	GND	20
21	GND	GND	22
23	GND	GND	24
25	GND	GND	26
27	GND	GND	28
29	GND	GND	30
31	GND	GND	32
33	GND	GND	34
35	GND	GND	36
37	GND	GND	38
39	GND	GND	40
41	GND	GND	42
43	GND	GND	44
45	GND	GND	46
47	VDD	VDD	48
49	VDD	VDD	50
51	VDD	VDD	52
53	VDD	VDD	54
55	GND	GND	56
57	GND	GND	58
59	USB_DM	GND	60
61	USB_DP	GND	62
63	GND	GND	64
65	USB_ID	GND	66
67	USB_VBUS	GND	68
69	GND	GND	70
71	I2SC_LRCLK	GND	72
73	GND	GND	74
75	I2SC_SCLK	GND	76
77	GND	GND	78
79	I2SC_DOUT_DIN_0	I2SC_DOUT_DIN_2	80
81	I2SC_DOUT_DIN_1	I2SC_DOUT_DIN_3	82
83	GND	GND	84
85	I2S_MCLK_C	GND	86
87	GND	GND	88
89	I2S_MCLK_B	GND	90
91	GND	GND	92
93	I2SB_SCLK	GND	94
95	GND	GND	96
97	I2SB_LRCLK	GND	98
99	GND	GND	100
101	I2SB_DOUT_DIN_0	I2SB_DOUT_DIN_2	102
103	I2SB_DOUT_DIN_1	I2SB_DOUT_DIN_3	104
105	GND	GND	106
107	PDM_CLK	GND	108
109	GND	GND	110
111	PDM_DIN0	PDM_DIN2	112
113	PDM_DIN1	PDM_DIN3	114
115	GND	GND	116
117	MIPI_D3_N	GND	118
119	MIPI_D3_P	GND	120
121	GND	GND	122
123	MIPI_D2_N	GND	124
125	MIPI_D2_P	GND	126
127	GND	GND	128
129	MIPI_D1_N	SPDIF_OUT	130
	MIPI_D1_P	SPDIF_IN	

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131			132
133	GND	GND	134
135	MIPI_D0_N	GND	136
137	MIPI_D0_P	ADC_CH3	138
139	GND	ADC_CH2	140
141	MIPI_CLK_N	ADC_CH0	142
143	MIPI_CLK_P	ADC_CH1	144
145	GND	GND	146
147	GND	GND	148
149	JTAG_TDO	GPIOZ_4	150
151	JTAG_TDI	GPIOZ_5	152
153	JTAG_TMS	GPIOZ_6	154
155	GND	GPIOZ_7	156
157	JTAG_CLK	I2C_SCK_B	158
159	GND	I2C_SDA_B	160
161	I2C_AO_SCK	GND	162
163	I2C_AO_SDA	GPIOZ_10	164
165	GND	GND	166
167	CPU_RST_M	RGMII_MDC	168
169	GND	RGMII_MDIO	170
171	GPIOAO_6	GND	172
173	GND	RGMII_RX_CLK	174
175	UART_RX_A	GND	176
177	UART_TX_A	RGMII_RXDV	178
179	GND	RGMII_RXD0	180
181	NC	RGMII_RXD1	182
183	GND	RGMII_RXD2	184
185	32K_IN	RGMII_RXD3	186
187	GND	GND	188
189	SPI_CLK_B	RGMII_TX_CLK	190
191	GND	GND	192
193	SPI_MISO_B	RGMII_TXEN	194
195	SPI_MOSI_B	RGMII_TXD0	196
197	SPI_CS_B	RGMII_TXD1	198
199	GND	RGMII_TXD2	200
201	SPI_SCLK_A	RGMII_TXD3	202
203	GND	GND	204
205	SPI_MISO_A	RGMII_INT	206
207	SPI_MOSI_A	RGMII_RST#	208
209	SPI_CS_A	GND	210
211	GND	NAND_D5_M	212
213	GND	GND	214
215	GND	Reserve	216
217	Reserve	Reserve	218
219	GND	GND	220
221	GND	GND	222
223	Reserve	Reserve	224
225	Reserve	Reserve	226
227	GND	GND	228
229	GND	Reserve	230
231	GND	Reserve	232
233	VDD	GND	234
235	VDD	GND	236
237	VDD	GND	238
239	VDD	VDD	240
241	GND	VDD	242
243	GND	VDD	244
245	GND	VDD	246
247	GND	GND	248
249	GND	GND	250
251	GND	GND	252
253	GND	GND	254
255	GND	GND	256
257	GND	GND	258
259	GND	GND	260

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5.2 Pin Assignment

NO	Name	Type	Description
<b>TOP</b>			
1	GND	-	Ground connections
3	GND	-	Ground connections
5	GND	-	Ground connections
7	GND	-	Ground connections
9	GND	-	Ground connections
11	GND	-	Ground connections
13	GND	-	Ground connections
15	GND	-	Ground connections
17	GND	-	Ground connections
19	GND	-	Ground connections
21	GND	-	Ground connections
23	GND	-	Ground connections
25	GND	-	Ground connections
27	GND	-	Ground connections
29	GND	-	Ground connections
31	GND	-	Ground connections

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3 3	GND	-	Ground connections
3 5	GND	-	Ground connections
3 7	GND	-	Ground connections
3 9	GND	-	Ground connections
4 1	GND	-	Ground connections
4 3	GND	-	Ground connections
4 5	VDD	P	VDD 5V system power supply input
4 7	VDD	P	VDD 5V system power supply input
4 9	VDD	P	VDD 5V system power supply input
5 1	VDD	P	VDD 5V system power supply input
5 3	GND	-	Ground connections
5 5	GND	-	Ground connections
5 7	USB_DM	DI O	USB negative data signal
5 9	USB_DP	DI O	USB positive data signal
6 1	GND	-	Ground connections
6 3	USB_ID	DI O	USB mini-receptacle identifier
6 5	USB_VBUS	DI O	USB cable power detection (5V tolerance)

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6 7	GND	-	Ground connections
6 9	I2SC_LRCLK	DI O	Word clock of I2S port C
7 1	GND	-	Ground connections
7 3	I2SC_SCLK	DI O	Bit clock input/output of I2S port C
7 5	GND	-	Ground connections
7 7	I2SC_DOUT_DIN_0	DI O	Data 0 input/output of I2S port C
7 9	I2SC_DOUT_DIN_1	DI O	Data 1 input/output of I2S port C
8 1	GND	-	Ground connections
8 3	I2S_MCLK_C	D O	Master clock output C, for I2S master mode
8 5	GND	-	Ground connections
8 7	I2S_MCLK_B	D O	Master clock output B, for I2S master mode
8 9	GND	-	Ground connections
9 1	I2SB_SCLK	DI O	Bit clock input/output of I2S port B
9 3	GND	-	Ground connections
9 5	I2SB_LRCLK	DI O	Word clock of I2S port B
9 7	GND	-	Ground connections
9 9	I2SB_DOUT_DIN_0	DI O	Data 0 input/output of I2S port B
10 1	I2SB_DOUT_DIN_1	DI O	Data 1 input/output of I2S port B

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10 3	GND	-	Ground connections
10 5	PDM_CLK	D O	PDM output clock signal
10 7	GND	-	Ground connections
10 9	PDM_DIN0	DI	PDM input data 0 signal
11 1	PDM_DIN1	DI	PDM input data 1 signal
11 3	GND	-	Ground connections
11 5	MIPI_D3_N	DI O	MIPI negative signal data 3
11 7	MIPI_D3_P	DI O	MIPI positive signal data 3
11 9	GND	-	Ground connections
12 1	MIPI_D2_N	DI O	MIPI negative signal data 2
12 3	MIPI_D2_P	DI O	MIPI positive signal data 2
12 5	GND	-	Ground connections
12 7	MIPI_D1_N	DI O	MIPI negative signal data 1
12 9	MIPI_D1_P	DI O	MIPI positive signal data 1
13 1	GND	-	Ground connections
13 3	MIPI_D0_N	DI O	MIPI negative signal data 0
13 5	MIPI_D0_P	DI O	MIPI positive signal data 0
13 7	GND	-	Ground connections



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13 9	MIPI_CLK_N	DI O	MIPI clock negative signal
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14 1	MIPI_CLK_P	DI O	MIPI clock positive signal
14 3	GND	-	Ground connections
14 5	GND	-	Ground connections
14 7	JTAG_TDO	D O	JTAG data output
14 9	JTAG_TDI	DI	JTAG data input
15 1	JTAG_TMS	DI	JTAG Test mode select input
15 3	GND	-	Ground connections
15 5	JTAG_CLK	DI	JTAG Test clock input
15 7	GND	-	Ground connections
15 9	I2C_AO_SCK	D O	I2C port AO clock output, Master
16 1	I2C_AO_SDA	DI O	I2C port AO data, Master
16 3	GND	-	Ground connections
16 5	CPU_RST_M	DI	System reset input
16 7	GND	-	Ground connections
16 9	IR_IN	DI	IR_REMOTE_INPUT
17 1	GND	-	Ground connections
17 3	UART_RX_A	DI	UART Port AO A data input
17 5	UART_TX_A	D O	UART Port AO A data output



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17 7	GND	-	Ground connections
17 9	NC	-	No connect
18 1	GND	-	Ground connections
18 3	32K_IN	DI	CLK_32K_IN
18 5	GND	-	Ground connections
18 7	SPI_CLK_B	DI O	SPI serial clock B, master output, slave input
18 9	GND	-	Ground connections
19 1	SPI_MISO_B	DI O	SPI DATA, master input, slave output B
19 3	SPI_MOSI_B	DI O	SPI DATA, master output, slave input B
19 5	SPI_CS_B	DI O	SPI slave select B, master output, slave input
19 7	GND	-	Ground connections
19 9	SPI_CLK_A		SPI serial clock A, master output, slave input
20 1	GND	-	Ground connections
20 3	SPI_MISO_A	DI O	SPI DATA, master input, slave output A
20 5	SPI_MOSI_A	DI O	SPI DATA, master output, slave input A
20 7	SPI_CS_A	DI O	SPI slave select A, master output, slave input
20 9	GND	-	Ground connections
21 1	GND	-	Ground connections



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21 3	GND	-	Ground connections
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215	NC	-	No connect
217	GND	-	Ground connections
219	GND	-	Ground connections
221	NC	-	No connect
223	NC	-	No connect
225	GND	-	Ground connections
227	GND	-	Ground connections
229	GND	-	Ground connections
231	VDD	P	VDD 5V system power supply input
233	VDD	P	VDD 5V system power supply input
235	VDD	P	VDD 5V system power supply input
237	VDD	P	VDD 5V system power supply input
239	GND	-	Ground connections
241	GND	-	Ground connections
243	GND	-	Ground connections
245	GND	-	Ground connections
247	GND	-	Ground connections
249	GND	-	Ground connections

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25 1	GND	-	Ground connections
25 3	GND	-	Ground connections
25 5	GND	-	Ground connections
25 7	GND	-	Ground connections
25 9	GND	-	Ground connections
<b>BOTTOM</b>			
2	GND	-	Ground connections
4	GND	-	Ground connections
6	GND	-	Ground connections
8	GND	-	Ground connections
1 0	GND	-	Ground connections
1 2	GND	-	Ground connections
1 4	GND	-	Ground connections
1 6	GND	-	Ground connections
1 8	GND	-	Ground connections
2 0	GND	-	Ground connections
2 2	GND	-	Ground connections
2 4	GND	-	Ground connections
2 6	GND	-	Ground connections

*AP72598V Series Datasheet*

28	GND	-	Ground connections
30	GND	-	Ground connections
32	GND	-	Ground connections
34	GND	-	Ground connections
36	GND	-	Ground connections
38	GND	-	Ground connections
40	GND	-	Ground connections
42	GND	-	Ground connections
44	GND	-	Ground connections
46	VDD	P	VDD 5V system power supply input
48	VDD	P	VDD 5V system power supply input
50	VDD	P	VDD 5V system power supply input
52	VDD	P	VDD 5V system power supply input
54	GND	-	Ground connections
56	GND	-	Ground connections
58	GND	-	Ground connections
60	GND	-	Ground connections
62	GND	-	Ground connections

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6 4	GND	-	Ground connections
6 6	GND	-	Ground connections
6 8	GND	-	Ground connections
7 0	GND	-	Ground connections
7 2	GND	-	Ground connections
7 4	GND	-	Ground connections
7 6	GND	-	Ground connections
7 8	I2SC_DOUT_DIN_2	DI O	Data 2 input/output of I2S port C
8 0	I2SC_DOUT_DIN_3	DI O	Data 3 input/output of I2S port C
8 2	GND	-	Ground connections
8 4	GND	-	Ground connections
8 6	GND	-	Ground connections
8 8	GND	-	Ground connections
9 0	GND	-	Ground connections
9 2	GND	-	Ground connections
9 4	GND	-	Ground connections
9 6	GND	-	Ground connections
9 8	GND	-	Ground connections



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10 0	I2SB_DOUT_DIN_2	DI O	Data 2 input/output of I2S port B
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10 2	I2SB_DOUT_DIN_3	DI O	Data 3 input/output of I2S port B
10 4	GND	-	Ground connections
10 6	GND	-	Ground connections
10 8	GND	-	Ground connections
11 0	PDM_DIN_2	DI O	PDM input data 2 signal
11 2	PDM_DIN_3	DI O	PDM input data 3 signal
11 4	GND	-	Ground connections
11 6	GND	-	Ground connections
11 8	GND	-	Ground connections
12 0	GND	-	Ground connections
12 2	GND	-	Ground connections
12 4	GND	-	Ground connections
12 6	GND	-	Ground connections
12 8	SPDIF_OUT	D O	SPDIF output signal
13 0	SPDIF_IN	DI	SPDIF input signal
13 2	GND	-	Ground connections
13 4	GND	-	Ground connections
13 6	ADC_CH3		ADC channel 3 input



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138	ADC_CH2		ADC channel 2 input
140	ADC_CH1		ADC channel 1 input
142	ADC_CH0	I	ADC channel 0 input
144	GND	-	Ground connections
146	GND	-	Ground connections
148	GPIOZ_4	DI O	General purpose input/output signal
150	GPIOZ_5	DI O	General purpose input/output signal
152	GPIOZ_6	DI O	General purpose input/output signal
154	GPIOZ_7	DI O	General purpose input/output signal
156	I2C_SCK_B	D O	I2C port B clock output, Master
158	I2C_SDA_B	DI O	I2C port B data, Master
160	GND	-	Ground connections
162	GPIOZ_10	DI O	General purpose input/output signal
164	GND	-	Ground connections
166	RGMII_MDC	D O	Ethernet MDC signal
168	RGMII_MDIO	DI O	Ethernet MDIO signal
170	GND	-	Ground connections
172	RGMII_RX_CLK	DI	Ethernet RGMII input clock signal



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17 4	GND	-	Ground connections
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17 6	RGMII_RXDV	DI	Ethernet input data valid signal
17 8	RGMII_RXD0	DI	Ethernet input data 0 signal
18 0	RGMII_RXD1	DI	Ethernet input data 1 signal
18 2	RGMII_RXD2	DI	Ethernet input data 2 signal
18 4	RGMII_RXD3	DI	Ethernet input data 3 signal
18 6	GND	-	Ground connections
18 8	RGMII_TX_CLK	DO	Ethernet RGMII output clock signal
19 0	GND	-	Ground connections
19 2	RGMII_TXEN	DO	Ethernet output enable signal
19 4	RGMII_TXD0	DO	Ethernet output data 0 signal
19 6	RGMII_TXD1	DO	Ethernet output data 1 signal
19 8	RGMII_TXD2	DO	Ethernet output data 2 signal
20 0	RGMII_TXD3	DO	Ethernet output data 3 signal
20 2	GND	-	Ground connections
20 4	RGMII_INT	DI	Ethernet interrupt input
20 6	RGMII_RST#	DI	Ethernet reset input
20 8	GND	-	Ground connections
21 0	NAND_D5_M	DI	Boot input

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21 2	GND	-	Ground connections
21 4	NC	-	No connect
21 6	NC	-	No connect
21 8	GND	-	Ground connections
22 0	GND	-	Ground connections
22 2	NC	-	No connect
22 4	NC	-	No connect
22 6	GND	-	Ground connections
22 8	NC	-	No connect
23 0	NC	-	No connect
23 2	GND	-	Ground connections
23 4	GND	-	Ground connections
23 6	GND	-	Ground connections
23 8	VDD	P	VDD 5V system power supply input
24 0	VDD	P	VDD 5V system power supply input
24 2	VDD	P	VDD 5V system power supply input
24 4	VDD	P	VDD 5V system power supply input
24 6	GND	-	Ground connections



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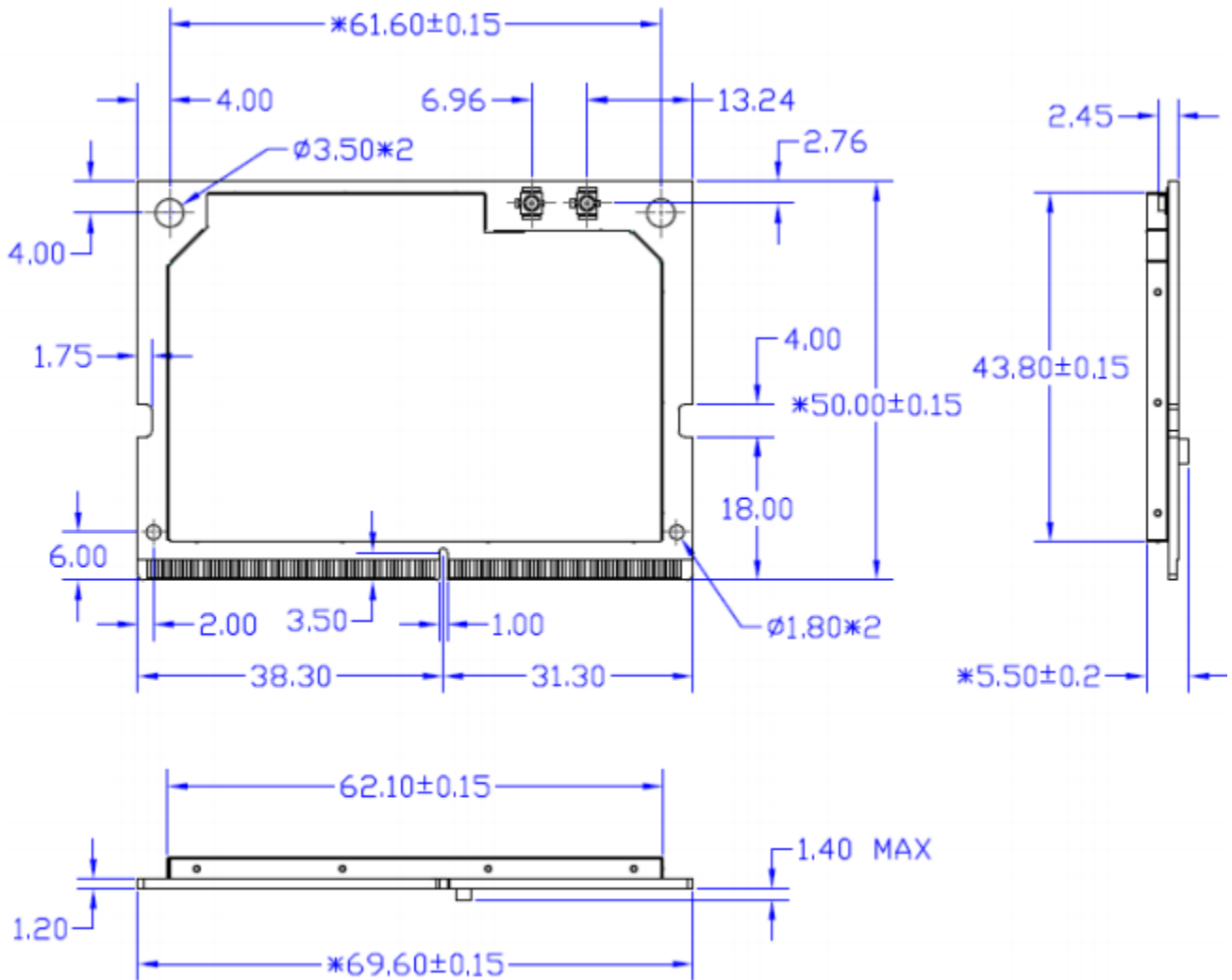
24 8	GND	-	Ground connections
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25 0	GND	-	Ground connections
25 2	GND	-	Ground connections
25 4	GND	-	Ground connections
25 6	GND	-	Ground connections
25 8	GND	-	Ground connections
26 0	GND	-	Ground connections

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5.3 Physical Dimensions



**Tolerance  $\pm 0.15$ mm**

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5.4 Sample Picture

< TOP VIEW >



< BOT VIEW >



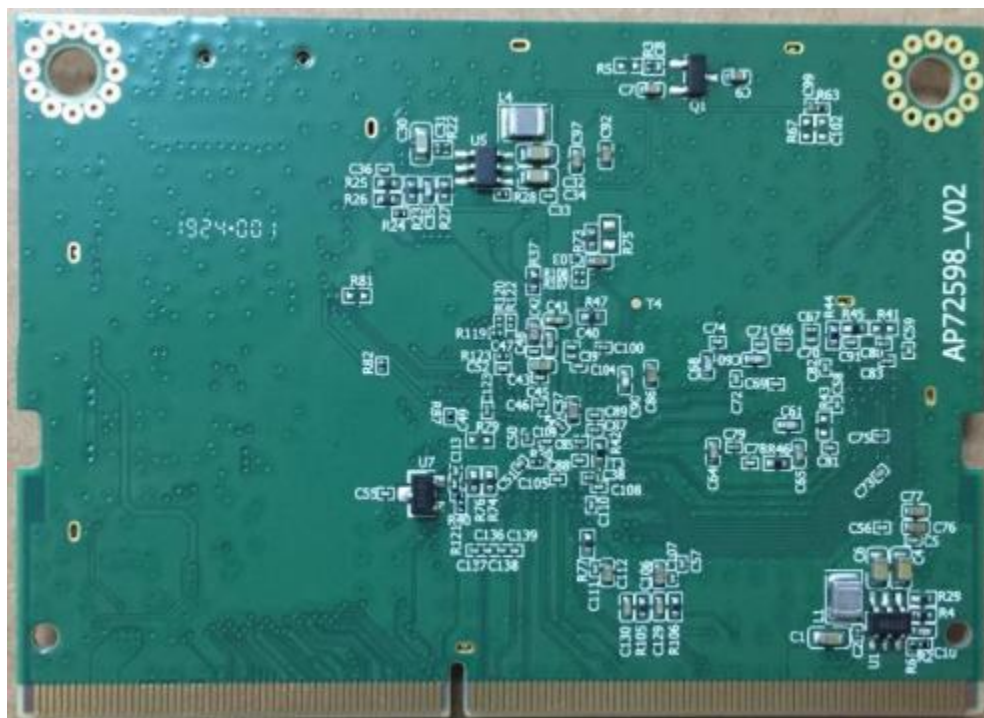


*AP72598V Series Datasheet*

< TOP VIEW >



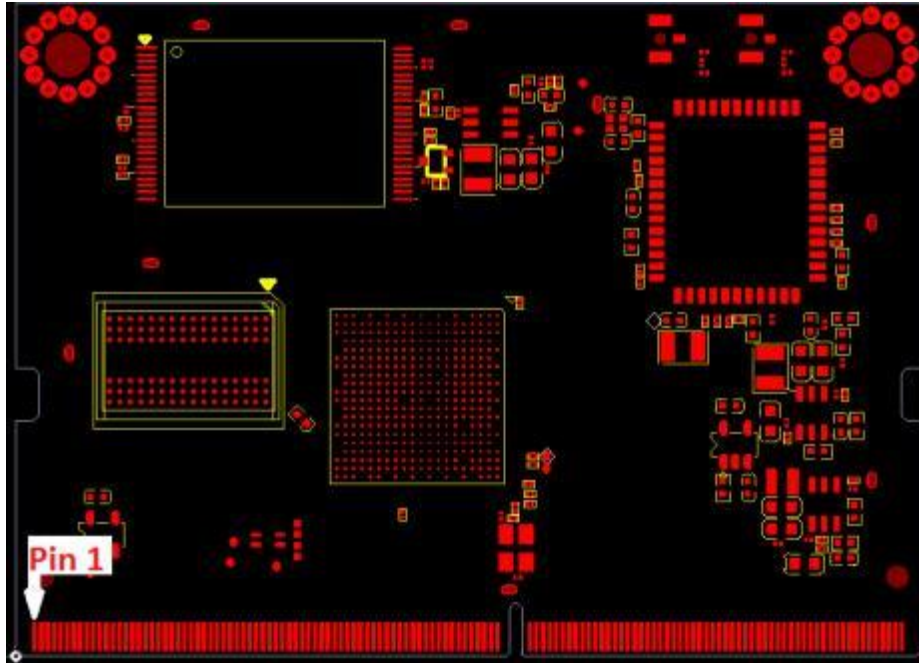
< BOT VIEW >



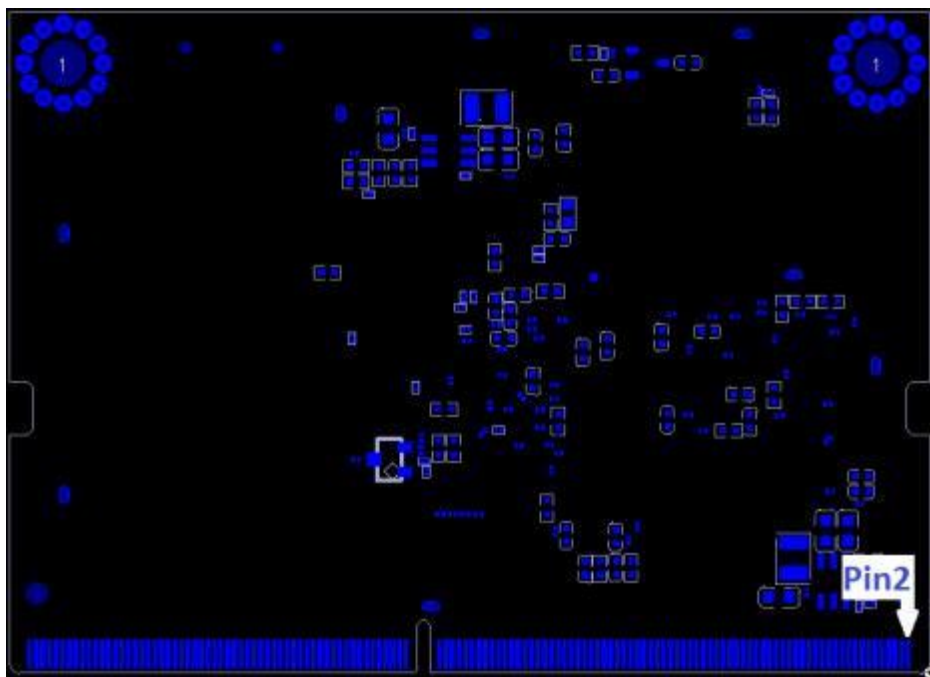
*AP72598V Series Datasheet*

5.5 Pin position

< TOP VIEW >



< BOT VIEW >



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5.6 Label Information



## 6. Package Information

### 6.1 Label A Inner box label

<b>PKG S/N :</b>	
<b>AMK Device:</b>	
<b>Model:</b>	 AP72598.WL_HN.T (HF)
<b>P/N :</b>	 99P-W02-0510R
<b>Qty :</b>	 100
<b>Date Code :</b>	 1836
<b>Lot Code :</b>	 G312804A
<b>Made in Taiwan</b>	



### 6.2 Label B Carton box label

<b>AMPAK Technology Inc.</b>	
<b>PO :</b>	
<b>AMK DEVICE:</b>	
<b>Model Name:</b>	 AP72598.WL_HN.T (HF)
<b>Part No :</b>	 99P-W02-0510R
<b>Quantity:</b>	 200
<b>Lot D/C :</b>	 G2125001 1831
<b>Manufacture:</b>	 2018/05/31 <b>Made in Taiwan</b>



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### 6.3 Package Manner

- 1 Tray: 10 PCS



10 Trays / 100PCS (cover with an empty tray)



Bound with packaging strap externally



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- 1 Box: 100 PCS (cover with a foamed rubber)



- 1Carton: 2 Boxes

- Surrounded with foamed rubber



- Covered with a foamed rubber



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## 7. Note

**AP72598V used DDR4 CON TYPE: ASAA826-E8SB0-7H (Foxconn) connects to EVB board**

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## 8 FCC & IC Statement

**FCC ID : APIAP72598V**

**FCC Statement:**



Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.



If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the

interference by one of the following measures:

-  Reorient or relocate the receiving antenna.
-  Increase the separation between the equipment and receiver.



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-  Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-  Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

This device and its antennas(s) must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

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This device is restricted for indoor use.

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**IMPORTANT NOTE:**

**FCC Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

**USERS MANUAL OF THE END PRODUCT:**

The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the device is small or for such use that it is not practicable to place the statement on the product, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules. Operation is subject to the

following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

**LABEL OF THE END PRODUCT:**

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The final end product must be labeled in a visible area with the following " Contains FCC ID : APIAP72598V". If the device is small or for such use that it is not practicable to place the statement on the product, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

*AP72598V Series Datasheet***IC Statement:**

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

For product available in the USA/Canada market, only channel 1~11 can be operated. Selection of other channels is not possible.

Pour les produits disponibles aux États-Unis / Canada du marché, seul le canal 1 à 11 peuvent être exploités. Sélection d'autres canaux n'est pas possible.

This device and it's antennas(s) must not be co-located or

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operating in conjunction with any other antenna or transmitter except in accordance with IC multi-transmitter product procedures.

Cet appareil et son antenne (s) ne doit pas être co-localisés ou fonctionner en association avec une autre antenne ou transmetteur.

Dynamic Frequency Selection (DFS) for devices operating in the bands 5250- 5350 MHz,  
5470-5600 MHz and 5650-5725 MHz

Sélection dynamique de fréquences (DFS) pour les dispositifs fonctionnant dans les bandes 5250-5350 MHz, 5470-5600 MHz et 5650-5725 MHz

The device for operation in the band 5150 5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les

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mêmes canaux.

The maximum antenna gain permitted for devices in the bands 5250-5350 MHz and 5470-5725 MHz shall be such that the equipment still complies with the e.i.r.p. limit.

le gain maximal permis pour les dispositifs utilisant les bandes 5250-5350 MHz et 5470-5725 MHz doit se conformer à la limite de p.i.r.e.

The maximum antenna gain permitted for devices in the band 5725-5850 MHz shall be such that the equipment still complies with the e.i.r.p. limits specified for point-to-point and non-point-to-point operation as appropriate.

le gain maximal permis (pour les dispositifs utilisant la bande 5725-5850 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour point à point et non point à point, selon le cas.

Users should also be advised that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350 MHz and 5650-5850 MHz and that these radars could cause interference and/or damage to LE-LAN devices.

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De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

For indoor use only.

Pour une utilisation en intérieur uniquement.

**IMPORTANT NOTE:**

**IC Radiation Exposure Statement:**

This equipment complies with IC RSS-102 radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre





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corps.

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This radio transmitter(IC No: 6132A-AP72598V) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio(IC No: 6132A-AP72598V) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne.

Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

**USERS MANUAL OF THE END PRODUCT:**

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the IC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The

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end user has to also be informed that any changes or

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modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the device is small or for such use that it is not practicable to place the statement on the product, then following IC statement is required to be available in the users manual: IC statement is required to be available in the users manual: This device complies with Industry Canada license-exempt RSS standard(s). This Class B digital apparatus complies with Canadian ICES-003. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

**LABEL OF THE END PRODUCT:**

The final end product must be labeled in a visible area with the following

" Contains IC : 6132A-AP72598V

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## 9 Antenna list

N O	Antenna P/N	Manufacturer	Peak Gain(dBi)	
			2.4GH Z	5.0GH Z
1	NDX-181025	SOUTH STAR  TECHNOLOGY HONG  KONG COMPANY  LIMITED	1.55d Bi	3.32dB i
2	N12-7722-R0A	SOUTH STAR  TECHNOLOGY HONG  KONG COMPANY  LIMITED	3.19d Bi	3.94dB i
3	N12-5672-R0A	SOUTH STAR  TECHNOLOGY HONG  KONG COMPANY  LIMITED	2.53d Bi	3.75dB i

*AP72598V Series Datasheet*

4	CSA3A020Z	SUNG NAM  ELECTRONICS	1.83d Bi	2.79dB i
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