Specification for Production

Applicant / Manufacturer Hardware	Panasonic Electronic Devices Europe GmbH Zeppelinstrasse 19 21337 Lüneburg Germany
Applicant / Manufacturer Software	Stollmann Entwicklungs- und Vertriebs-GmbH Mendelssohnstrasse 15 D 22761 Hamburg Germany
Software Version	e.g. BlueRS+ SPP
Contents	Approval for Mass Production
Customer	

By signing this document, Customer accepts the validity of the below-mentioned contents and declares his full notice to it. Some passages may be changed if required; the validity shall not be affected thereby.

CHECKED / APPROVED:

DATE:	NAME:	SIGNATURE:

NOTE:

AT LEAST ONE SET OF APPROVED SPECIFICATIONS SHOULD BE RETURNED TO THE ADDRESS OF THE ISSUING PARTY.

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PRELIMINARY

1. KEY FEATURES
Schlüsseleigenschaften

- Bluetooth specification v2.0 + EDR (**E**nhanced **D**ata **R**ate)
- CSR BlueCore6-ROM inside
- Complete Co-location and Co-existence with IEEE 802.11 (AWMA, AFH and SFH)
- Fast Connection Setup
- Extended SCO Link
- RF output power class 2 with power control
- Supply Voltage 3.0V to 3.6V
- Internal crystal oscillator (26MHz, 14.7456 MHz and 32 kHz for deep sleep)
- Surface mount type
    - PAN1455: 13.5 x 18.75 x 2.85 mm
    - PAN1555: 13.5 x 22.75 x 2.85 mm
- Built-in shielding to be compliant to FCC
- Full Bluetooth data rate up to 2178kbps asymmetric
- Support for all Bluetooth power saving modes (Park, Sniff, Hold)
- Support for very low-power modes (deep sleep and power down)
- Otional support for ultra-low-power mode. Standby with Battery-Backup
- PCM Interface Master / Slave supporting 13 or 16 bit linear, 8 bit µ-law or A-law Codecs and CVSD transcoders on up to 3 SCO channels
- Full 8- to 128-bit encryption
- High sensitivity design (-86 dBm typ.)
- 3 UART, USB, I2C and SPI Interface
- 18 GPIO's for individual usage for your embedded software
- 3 Channel ADC and 1 Channel DAC
- Cortex-M3 ST32F103 core for embedded profiles or application software
- Manufactured in conformance with RoHS

2. APPLICATIONS FOR THE MODULE
Applikationen für das Modul

All Embedded Wireless Applications

- Access Points
- Printer Adapters
- Printers
- Scanners
- Wireless Sensors
- Cable Replacement
- Personal Digital Assistants (PDAs)
- Access Points
- Computers and Peripherals
- Industrial Control Applications

PRELIMINARY

3. DESCRIPTION FOR THE MODULE
Modulbeschreibung

PAN1455/1555 is a short-range class 2 module for implementing Bluetooth functionality into various electronic devices. The module consists of three major parts; a baseband controller, a EEPROM memory and a radio that operates in the license-free 2.45 GHz ISM band.

Communication between the module and the host controller is carried out normally via UART. Otional via below interfaces. Please contact your local sales office for further details on additional options.

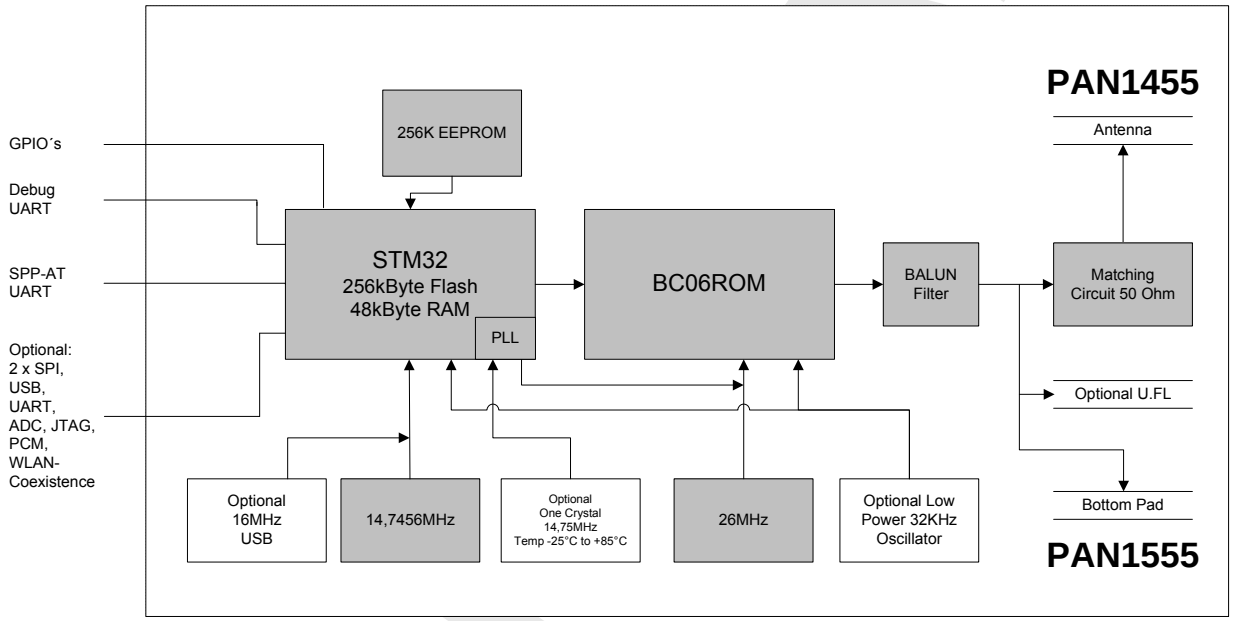


Figure 3.1 PAN1455/1555 Block-Diagram

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4. SCOPE OF THIS DOCUMENT
Umfang dieses Dokumentes

This product specification applies to the class 2 bluetooth module ENW89815C3KF/ENW89815A3KF.
The different characters indicates different versions (refer to chapter 24 Ordering Information)
The used bluetooth chip is the BlueCore6 from the company CSR. (www.csr.com).

Diese Produktionsunterlagen beziehen sich auf das Class 2 Bluetooth Modul ENW89815C3KF/ENW89815A3KF.
Die unterschiedlichen Zeichen bezeichnen verschiedene Versionen (Erklärung im Kapitel 24 Ordering Information)
Der verwendete Bluetooth Chip ist der BlueCore6 der Firma CSR.

5. HISTORY FOR THIS DOCUMENT
Versionsverwaltung dieses Dokumentes

Revision Version	Date Datum	Modification / Remarks Änderungen / Bemerkungen
0.90	06.03.2009	Preliminary release.
0.91	30.03.2009	Add FCC Notice
0.92	04.05.2009	Include RF-Performance and current consumption
0.93	06.05.2009	Do minor changes in formatting, content links now included.
0.94	29.05.2009	Include final tables and Interface description

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6. TERMINAL LAYOUT
Anschlußbelegung

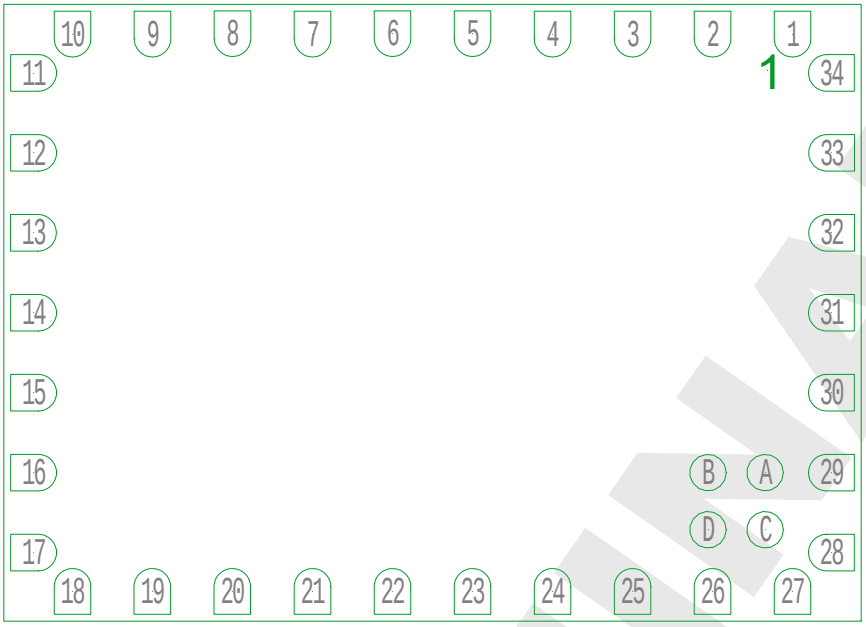


Figure 6.1 PAN1455/1555 Pin Numbering Bottom View

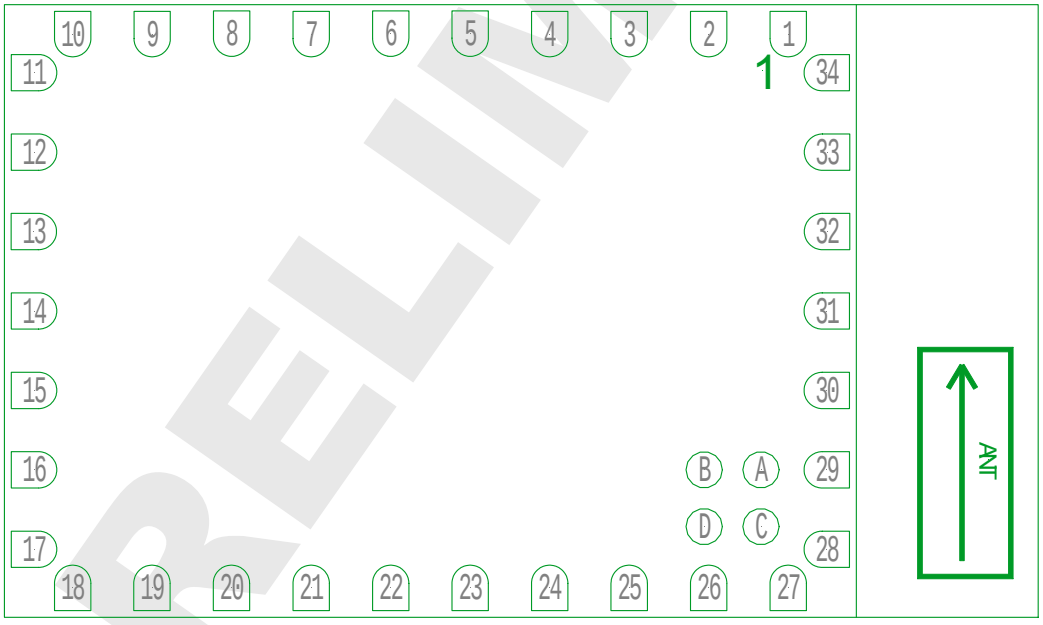


Figure 6.2 PAN1455/1555 Pin Numbering Bottom View

PRELIMINARY

6.1. GENERAL PIN ASSIGNMENT

No	Pin Name	Type	PU/PD	Active	Description
1	GND1	P	-	-	Connect to Ground
2	ANT	I/O	-	-	Antenna Connector
3	UART_RTS#	I	PD	H	UART Request To Send (active low)
4	UART_TXD	I	PD	L	UART Data Input, weak internal Pull-Down
5	UART_RXD	O	-	L	UART Data Output
6	UART_CTS#	O	-	H	UART Clear To Send, internal Pull-Up
7	GPIO[9]/PCM_CLK	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Clock Output
8	GPIO[10]/PCM_O/TXD3	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Output/ UART3 DATA Output
9	GPIO[7]/PCM_SYNC	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / PCM Data Sync Output
10	GND2	P	-	-	Connect to Ground
11	ATRST/SPI2_MISO	I/O	PU	H	JTAG reset, internal Pull-Up / SPI2 Master In - Slave Out
12	GPIO[8]/PCM_I/RXD3	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / PCM Data Input / UART3 DATA Input
13	ATDI/SPI2_CS	I/O	PU	-	JTAG test data input, weak internal Pull-Up / SPI2 Chip Select
14	ATMS	I	PU	-	JTAG mode select, weak internal Pull-Up
15	reserved	I	PD	-	for Debug-Use only, nc
16	VCC	P	-	-	VCC
17	RESET#	I	PU	L	Reset input
18	GND3	P	-	-	Connect to Ground
19	GPIO[14]	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up
20	GPIO[13]	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down
21	GPIO[15]	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up
22	GPIO[6]/ADC	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Up / ADC Input
23	ATDO/SPI2_SCK	O	PU	-	JTAG test data output
24	ATCK	O	PD	-	JTAG clock, weak internal Pull-Down
25	GPIO[3]/SPI_CLK	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Clock
26	GPIO[0]/SPI_MOSI	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Master Out – Slave In
27	GND4	P	-	-	Connect to Ground
28	GPIO[2]/SPI_CS	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Chip Select
29	GPIO[1]/SPI_MISO	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / SPI Master In – Slave Out
30	GPIO[5]/TXD2	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / UART2 DATA Output
31	GPIO[4]/RXD2	I/O	PD	H	General Purpose Input/Output, weak internal Pull-Down / UART2 DATA Input
32	USB_DM	I/O	PD	-	USB Data Minus Terminal
33	USB_DP	I/O	PD	-	USB Data Plus Terminal
34	GPIO[17]/TAMPER	I/O	PD	-	General Purpose Input/Output, weak internal Pull-Down, do not use as current source! / TAMPER In
A	GPIO[16]/SPI2_MOSI	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / SPI2 Master Out – Slave In
B	GPIO[12]/I2C_SCL	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / I2C Serial Clock Line
C	GPIO[11]/I2C_SDA	I/O	PU	L	General Purpose Input/Output, weak internal Pull-Up / I2C Serial Data Line
D	VBAT	P	-	-	Optional Batterie Backup

Type: PU - Pulled up; PD – pulled down; P – Power; I – Input; O – Output; I/O - bidirectional

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6.2. APPLICATION SPECIFIC PIN DESCRIPTION

6.2.1. SPP configuration DCE Mode

No	Pin Name	SPP-Function	Type	PU/PD	Active	Description
1	GND1	Power	P	-	-	Connect to Ground
2	ANT	Antenna	I/O	-	-	Antenna Connector
3	UART_RTS#	/RTS	I	PU	L	UART Request To Send
4	UART_TXD	TXD	I	PD	H	UART Data Input
5	UART_RXD	RXD	O		H	UART Data Output
6	UART_CTS#	/CTS	O		L	UART Clear To Send
7	GPIO[9]/PCM_CLK	/LED2	O		L	Bluetooth connected. Active if a Bluetooth connection exists. Inactive in idle state. Flashes during startup.
8	GPIO[10]/PCM_O/TXD3	UA2	O			User Output 2
9	GPIO[7]/PCM_SYNC	/LED1	O		L	Device Ready
10	GND2	Power	-	-	-	Connect to Ground
11	ATRST/SPI2_MISO	reserved	I/O	PU	H	leave open
12	GPIO[8]/PCM_I/RXD3	/UE1	I	PU	L	User Input 1
13	ATDI/SPI2_CS	reserved	I/O	PU	-	leave open
14	ATMS	reserved	I	PU	-	leave open
15	BOOT0	reserved	I	PD	H	for Debug-Use only, nc
16	VCC	Power	-	-	-	VCC
17	RESET#	/RESET	I	PU	L	Reset input (active low for 5 ms); Schmitt triggered
18	GND3	Power	-		-	Connect to Ground
19	GPIO[14]	/RTC-OUT	O		L	DSR in DCE mode, DTR in DTE mode
20	GPIO[13]	/RTC-IN	I	PU	L	DTR in DCE mode, DSR in DTE mode
21	GPIO[15]	/DCD or /DCD-DTE	I/O	PU	L	Data Carrier Detect , Input in DTE mode Output in DCE mode
22	GPIO[6]/ADC	/RI	I/O	PU	L	Ring Indicator, Input in DTE mode Output in DCE mode
23	ATDO/SPI2_SCK	reserved	O	PU	-	JTAG
24	ATCK	reserved	O	PD	-	JTAG
25	GPIO[3]/SPI_CLK	reserved	I/O	PD	H	leave open
26	GPIO[0]/SPI_MOSI	reserved	I/O	PD	H	leave open
27	GND4	Power	-		-	Connect to Ground
28	GPIO[2]/SPI_CS	reserved	O			leave open
29	GPIO[1]/SPI_MISO	/UE2	I	PD	H	User Input 2, Break Detect (1)
30	GPIO[5]/TXD2	reserved	O			leave open
31	GPIO[4]/RXD2	DTE-/DCE Select	I	PD	H	DTE (high) DCE (low) mode selector
32	USB_DM	reserved	I/O	PD	-	leave open
33	USB_DP	reserved	I/O	PD	-	leave open
34	GPIO[17]/TAMPER	reserved	I/O	PD	-	leave open
A	GPIO[16]/SPI2_MOSI	reserved	I/O	PU	L	leave open
B	GPIO[12]/I2C_SCL	reserved	I/O	PU	L	leave open
C	GPIO[11]/I2C_SDA	reserved	I/O	PU	L	leave open
D	VBAT	Power	-		-	Optional Batterie Backup

Type: PU - Pulled up; PD – pulled down; P – Power; I – Input; O – Output; I/O - bidirectional

All other pins do not have a dedicated functionality in SPP mode. See 6.1 General Pin Assignment for all other terminals.

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7. TERMINAL SPECIFICS
Interfacebeschreibungen

7.1. RF-INTERFACE - ANT

The PAN1455 presents a 50Ω impedance on the antenna pin. If you need antenna support please e-mail to wireless@ecom.panasonic.de or use the PAN1555 with integrated ceramic antenna.

7.2. POWER SUPPLY

PAN1455/1555 require a power supply with the following characteristics:

Typical : 3.3VDC, min.: 3.0VDC – max.: 3.6VDC, low noise (≤10mV), >80mA peak

Due to the technological requirements and the pulsed radio transmission the supply needs to be fed by an ultra fast (response time ≤20µs) linear regulator placed as close as possible to the VSUP pin (16). Functionality has been verified with the following types: TOREX: XC6204x332xx or XC6401xx42xx

It is also recommended to place a low ESR capacitor with at least 10µF as close as possible to the VSUP pin (16).

NOTE: You must ensure that during operation the supply voltage never drops below 2.8 VDC. Otherwise the flash contents (firmware and/or configuration data) can get lost

7.3. POWER-ON-RESET

PAN1455/1555 are equipped with circuitry for generating Power ON/-OFF Reset from the internal core voltage. A reset is generated when the core voltage falls below typically 1.88V and is released when it rises above typically 1.92V.

In case of Power-On, Power-Off, Watchdog, Low-Power or Software, RESET# acts as an Output by holding RESET# at ≤ 0.3V for min. 1,5ms and max. 3,5ms.

In an application with an external Reset as an Input, for example external Reset-Controller, we recommend to use Open-Drain-Output for this circuit. An external reset shall be generated at RESET# ≤ 0.3V for ≥ 5ms after VSUP has stabilized in the recommended voltage range.

The following table shows the pin states of PAN1455/1555 on reset.

Pin Name	State: PAN1455/1555
UART_RTS#	Input Floating
UART_TXD	Input Floating
UART_RXD	Input Floating
UART_CTS#	Input Pull-Up
GPIO[0] – GPIO[13], GPIO[16], GPIO[17]	Input Floating
GPIO[14]	Input Pull-Up
GPIO[15]	Input Pull-Up
Boot0	Input Pull-Down
ATRST	Input Pull-Up
ATDI	Input Pull-Up
ATMS	Input Pull-Up
ATDO	Input Floating
ATCK	Input Pull-Down
USB_DM	Input Floating
USB_DP	Input Floating

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7.4. UART INTERFACE – TXD, RXD, CTS, RTS

The functionality of the interface corresponds to the V.24 / RS-232 standard on TTL-level.

Transmission speeds:

- 1200 bps
- 2400 bps
- 4800 bps
- 9600 bps
- 19200 bps
- 38400 bps
- 57600 bps
- 115200 bps
- 230400 bps
- 460800 bps
- 921200 bps

Character representation:

- 8 or 9 Bit, even/odd/no Parity, 1or 2 stop bits
- 7 Bit, even/odd Parity, 1 or 2 stop bits
- 7 Bit no Parity, 2 or 3 stop bits

Hardware flow-control with UART_RTS and UART_CTS (active low)

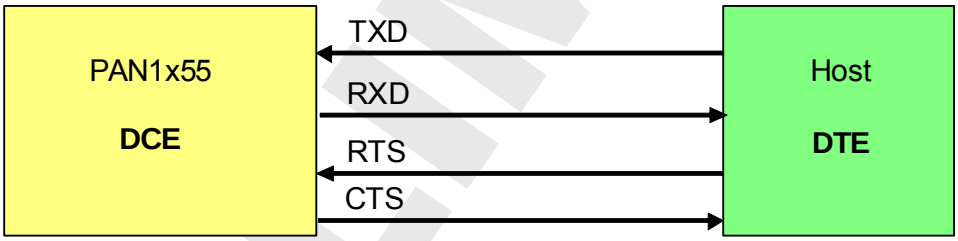


Figure 7.1 UART Signal Connections

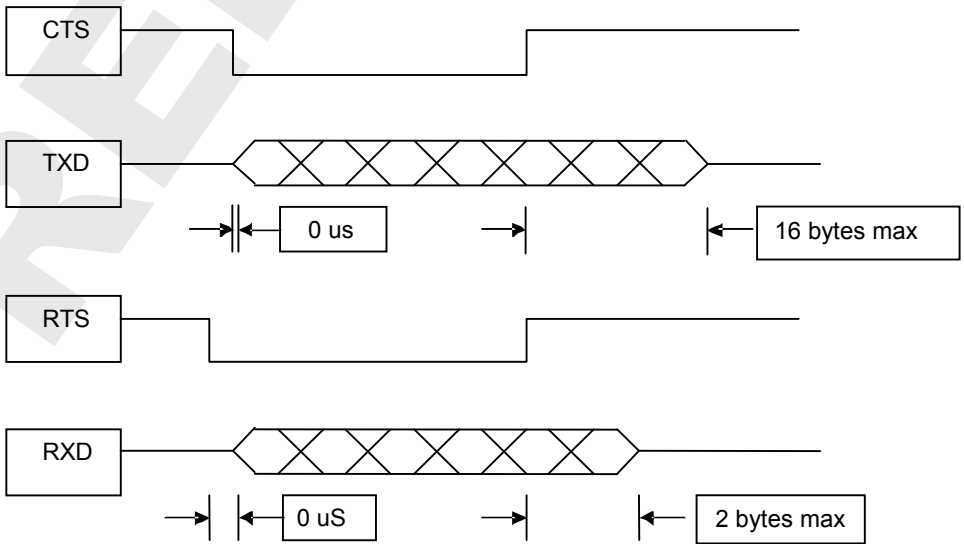


Figure 7.2 UART Timing Diagram

PRELIMINARY

7.5. 3-WIRE SERIAL INTERFACE

When using only GND and UART_Rx, UART_Tx serial lines, you may leave UART_RTS# and UART_CTS# open.

Note: Not using flow control can result in loss of data.

7.6. USB INTERFACE[1,2]

7.6.1. USB_DP, USB_DN

PAN1455/1555 contain a full speed USB version 2.0 compliant interface capable of directly driving an USB cable. The PAN1455/1555 operates as a USB peripheral and responds to requests from a USB master host controller.

7.7. GPIO INTERFACE

It is possible to use the programmable digital I/Os GPIO[0:17]. The Current from GPIO[17] is limited to 3mA max.

For 5V tolerant GPIO´s refer to chapter 6.2.1SPP configuration DCE Mode

7.8. ADC[3]

It is possible to use the programmable I/Os PIO[0:3,6,7,13:15] as ADC.

The 12-bit ADC is a successive approximation analogue-to-digital converter. A/D conversion can be performed in single, continuous, scan or discontinuous mode.

7.9. DAC[4]

It is possible to use the programmable I/Os PIO[2,3] as ADAC

The DAC module is a 12-bit, voltage output digital-to-analogue converter. The DAC can be configured in 8- or 12-bit mode and may be used in conjunction with the DMA controller.

7.10. PCM INTERFACE[5]

PCM or Pulse Code Modulation is a sampling technique for digitising analogue signals.

The PCM interface for voice applications is provided via the PCM_OUT, PCM_IN, PCM_CLK and PCM_SYNC pins.

The PCM interface can act as master or as slave device.

In master mode, clock frequencies of 128kHz, 256kHz or 512kHz can be generated, when using the internal 4MHz clock. In slave mode, clock frequencies up to 2048kHz are accepted.

The Frame Clock is 8kHz. Long and Short Frame Sync are supported.

PAN1455/1555 interface directly to PCM audio devices including the following:

[1] subject to firmware support, contact Stollmann for current status.

[2] subject to hardware support, contact Stollmann for availability of variants

[3] subject to firmware support, contact Stollmann for current status

[4] subject to firmware support, contact Stollmann for current status

[5] subject to firmware support, contact Stollmann for current status

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- Qualcom MSM3000 series and MSM5000 series CDMA base band devices
- OKI MSM7705 four channel A-law and μ-law codec
- WINBOND W681310 8-bit A-law and μ-law codec
- WINBOND W681360 13-bit linear codec
- STW 5093 5094 14-bit linear codec

8. KEY PARTS LIST
Liste der Schlüsselkomponenten

Part Name Teilenummer	Material Material
P.W.Board	Glass cloth epoxide resin with gold plating
BT-IC part name	BC63B239A04Q (Cambridge Silicon Radio Ltd www.csr.com) You have to register, before you can download the data sheet.
μ-Controller	ST32F103xxxx (Cortex baseed STMiroelectronics www.stm.com)

PRELIMINARY

9. TEST CONDITIONS
Meßbedingungen

Measurements shall be made under room temperature and humidity unless otherwise specified.
Messungen unter normalen Bedingungen, Abweichungen sind gesondert notiert.

Temperature	25 ± 10°C	Humidity	40 to 85%RH
Temperatur	25 ± 10°C	Luftfeuchtigkeit	40 to 85%RH

10. ABSOLUTE MAXIMUM RATINGS (1)
Absolute Grenzwerte

The maximum ratings may not be exceeded under any circumstances, not even momentarily and individually, as permanent damage to the module will result.

No.	Item Punkt	Symbol Zeichen	Absolute Maximum Ratings Absolute Grenzwerte	Unit Einheit
1	Supply voltage Versorgungsspannung	V_{cc}	-0.4 to +3.7	V
2	Voltage on any pin Spannung an jedem Pin	V_{Pin}	GND -0.3 to Vcc+0.40	V
3	Storage temperature range Lagertemperatur	T_{stg}	-40 to +105	°C
4	Operating temperature range Betriebstemperatur	T_{op}	-40 to +85	°C
6	Lead temperature Löttemperatur	T_{Death}	See chapter 17.2	°C
7	ESD on any pin ESD Festigkeit	V_{ESD}	max 2000 V (C_{Load}=150pF, R_{Load}=330Ω)	V

Notes:

(1) ABSOLUTE MAXIMUM RATINGS indicate limits beyond which damage to the device may occur.

11. ELECTRICAL REQUIREMENTS

Vcc = 3.3V, T_{amb} = 25°C if nothing else stated

No Nr.	Item Punkt	Condition Bedingung	Limit / Grenzen Min	Typ	Max	Unit Einheit
1	Frequency Range Frequenzbereich		2400		2483.5	MHz
2	Load impedance Ausgangsimpedanz	Measured with network analyzer in the frequency range at antenna pin		50		Ω
3	Output return loss Ausgangsanpassung	Receive Mode to 50Ω load Transmit Mode to 50Ω load	-10 -10			dBm
4	Supply voltage Versorgungsspg.	The typical voltage is recommended Vcc at voltage pin	3.0	3.3	3.6	Vdc
5	Ripple on Vcc AC Anteil auf Vcc	Ripple frequency ≥200kHz Ripple frequency <200kHz			10	mVms

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12. I/O OPERATING CHARACTERISTICS

Vcc = 3.3V, T_{amb} = 25°C if nothing else stated

Symbol	Item	Condition	Limit			Unit
			Min	Typ	Max	
V_{IL}	Low-Level Input Voltage	VSUP = 3.3V	- 0.5	-	0.8	V
V_{IH}	High-Level Input Voltage		2.0	-	VSUP +0.5	V
V_{OL}	Low-Level Output Voltage	I_{OL} = mA	-	-	0.2	V
V_{OH}	High-Level Output Voltage	I_{OH} = -4mA	VSUP-0.2	-	-	V
I_{OL}	Low -Level Output Current (except GPIO[17])	V_{OL} = 0.4V	-	-	8	mA
I_{OH}	High-Level Output Current (except GPIO[17])	V_{OH} = 2.4V	-	-	8	mA
$I_{OL\ (GPIO[17])}$	Low -Level Output Current at GPIO[17]	V_{OL} = 0.4V	-	-	3	mA
$I_{OH\ (GPIO[17])}$	High-Level Output Current at GPIO[17]	V_{OH} = 2.4V	-	-	3	mA
I_{wp-u}	Input-current	Weak pull-up typ. 40kΩ	–5.0	–1.0	–0.2	µA
I_{wp-d}	Input-current	Weak pull-down typ. 40kΩ	+0,2	+1.0	+5.0	µA
I_{lc}	I/O pad leakage current	Standard I/Os	–1.0	0	+1.0	µA
I_{lc}	I/O pad leakage current	Vin = 5V	-3,0	0	+3,0	µA
C_I	Input Capacitance		-	5	-	pF

13. USB INTERFACE

Vcc = 3.3V, T_{amb} = 25°C if nothing else stated

Item			Unit
	Min	Max	
Input logic level low	-	0.3xVSUP	V
Input logic level high	0.7xVSUP	5.5	V
Output logic level low)*	0	0.2	V
Output logic level high)*	2.8	VSUP	V

)* connected to correctly terminated USB cable

PRELIMINARY

14. TYPICAL CURRENT CONSUMPTION

14.1. SPP CONFIGURATION

14.1.1. Deep Sleep State

The Bluetooth RF is completely deactivated, no paging requests from other Bluetooth devices will be recognized. Only rising control line DTR will activate the PAN1455/1555 and may initiate a Bluetooth link dependent on other parameters.

Note: In Deep Sleep state the AT command set is not active, CTS line is low.

14.1.2. Power Down State

The Bluetooth RF is activated every 1.25 seconds, paging requests from other Bluetooth devices will be recognized after that intervals and accepted if allowed. Additionally rising control line DTR will activate the PAN1455/1555 and may initiate a Bluetooth link dependent on other parameters.

Note: In Power down state the AT command set is not active, CTS line is low.

14.1.3. Idle State

No power down mode activated.

All functionality is available immediately including connection control using AT command set.

14.2. POWER CONSUMPTION

The following values are approximate power consumption values in the different states:

VSUP = 3.3V, T_{amb} = 25°C

Condition	**Current Consumption**		**Unit**
	I_{MEAN}	I_{PEAK}	
Idle, no page scan, no inquiry scan, Uart baud rate: 1200 baud	7,5	15	mA
Idle, all functions available, no Bluetooth link, page scan & inquiry scan interval 1,28s	8	56	mA
Idle, all functions available, no Bluetooth link, continuous page scans	50	60	mA
Bluetooth connected, no data traffic – close range (Slave)	10	56	mA
Bluetooth connected, data traffic 115 kbit/s – close range (Slave)	33	61	mA
ACL connected DH5 max PWR, shortest Poll Period (Slave)	43	68	mA
ACL connected DH5 min PWR, shortest Poll Period (Slave)	42	67	mA
ACL connected DH1 max PWR, shortest Poll Period (Slave)	43	69	mA
ACL connected DH1 min PWR, shortest Poll Period (Slave)	41	67	mA
Power Down	7,5	--	mA
Device in reset	1,5	--	mA

PRELIMINARY

14.3. POWER-UP TIME

The time until the PAN1455/1555 is able to accept link requests or serial data depends on the firmware version and the software parameters RSTTIM and RSTMSG. In the SPP firmware version 1.001 the module is command ready after at least 0,3s (RSTTIM=3 / RSTMSG=0) and 2,16s (RSTTIM=40 / RSTMSG=1) maximum. Bluetooth links are accepted 2,3s after reset.

15. ELECTRICAL RF-CHARACTERISTICS

Vcc = 3.0V to 3.6V, Tamb = - 40°C to +85°C

Receiver	Frequency [GHz]	Limit			BT	Unit
		Min	Typ	Max	Spec	
Sensitivity at 0.1% BER DH1	2.402	-70,0	-85,3		≤-70	dBm
	2.441	-70,0	-85,4			
	2.480	-70,0	-86,0			
Sensitivity at 0.1% BER DH5	2.402	-70,0	-84,4		≤-70	dBm
	2.441	-70,0	-84,9			
	2.480	-70,0	-85,6			
Sensitivity at 0.1% BER EDR2, PI/4 DQPSK	2.402	-70,0	-88,1		≤-70	dBm
	2.441	-70,0	-88,3			
	2.480	-70,0	-88,1			
Sensitivity at 0.1% BER EDR3, 8DPSK	2.402	-70,0	-82,0		≤-70	dBm
	2.441	-70,0	-82,7			
	2.480	-70,0	-82,4			
Maximum received signal at 0.1% BER with DH1		-20,0	>10		≥-20	dBm
Maximum received signal at 0.1% BER with DH5		-20,0	>10		≥-20	dBm
Maximum received signal at 0.1% BER with EDR2, PI/4 DQPSK		-20,0	>0		≥-20	dBm
Maximum received signal at 0.1% BER with EDR3, 8DPSK		-20,0	>0		≥-20	dBm
C/I co-channel [a)]			6	11	≤ 11	dB
Adjacent channel selectivity C/I f = f_0 + 1MHz [a)]			-5	0	≤ 0	dB
Adjacent channel selectivity C/I f = f_0 - 1MHz [a)]			-5	0	≤ 0	dB
Adjacent channel selectivity C/I f ≥ f_0 + 2MHz [a)]			-38	-30	≤ -30	dB
Adjacent channel selectivity C/I f ≤ f_0 - 2MHz [a)]			-22	-20	≤ -20	dB
Adjacent channel selectivity C/I f ≥ f_0 + 3MHz [a)]			-42	-40	≤ -40	dB
Adjacent channel selectivity C/I f ≤ f_0 - 5MHz [a)]			-45	-40	≤ -40	dB
Adjacent channel selectivity C/I f = f_{image} [a)]			-15	-9	≤ -9	dB

Notes: a) For BER less then 0,1%. Applies according to BT Test Specification Ver. 1.2/2.0/2.0 + EDR only for Tamb = 20°C

PRELIMINARY

Vcc = 3.0V to 3.6V, Tamb = - 40°C to +85°C

Transmitter	Frequency [GHz]	Limit			BT	Unit
		Min	Typ	Max	Spec	
RF transmit power 50 Ω load, at antenna Class 1 device GFSK [b)]	2.402	2,3	3,9	3,9		dBm
	2.441	2,5	3,2	4,0		
	2.480	2,2	3,0	4,0		
RF transmit power 50 Ω load, at antenna Class 1 device EDR2, PI/4 DQPSK [b)]	2.402 GFSK		2,7			dBm
	2.402 DPSK		1,6			
	2.441 GFSK		2,7			
	2.441 DPSK		1,6			
	2.480 GFSK		2,2			
	2.480 DPSK		1,0			
RF transmit power 50 Ω load, at antenna Class 1 device EDR3, 8DPSK [b)]	2.402 GFSK		2,6			dBm
	2.402 DPSK		1,6			
	2.441 GFSK		2,7			
	2.441 DPSK		1,6			
	2.480 GFSK		2,2			
	2.480 DPSK		1,0			
RF power control range		-21	-	4,0		dB
RF power range control resolution		3,2	3,9	4,6	2 to 8	dB
20 dB bandwidth for modulated carrier		920	924	1000	≤1000	kHz
Initial carrier frequency tolerance		-75	-10	75	≤ ±75	kHz
Carrier frequency drift (packet DH1)		-25	11	25	≤ ±25	kHz
Drift Rate		-20	0	20	20	kHz/ 50µs
$\Delta f1_{avg}$ "Maximum Modulation"		140	166	175	≥140 to ≤175	kHz
$\Delta f2_{avg}$ "Minimum Modulation"		115	155	-	≥ 115	kHz

Notes: b) excluding +2dBi antenna gain

16. MECHANICAL REQUIREMENTS
Mechanische Anforderungen

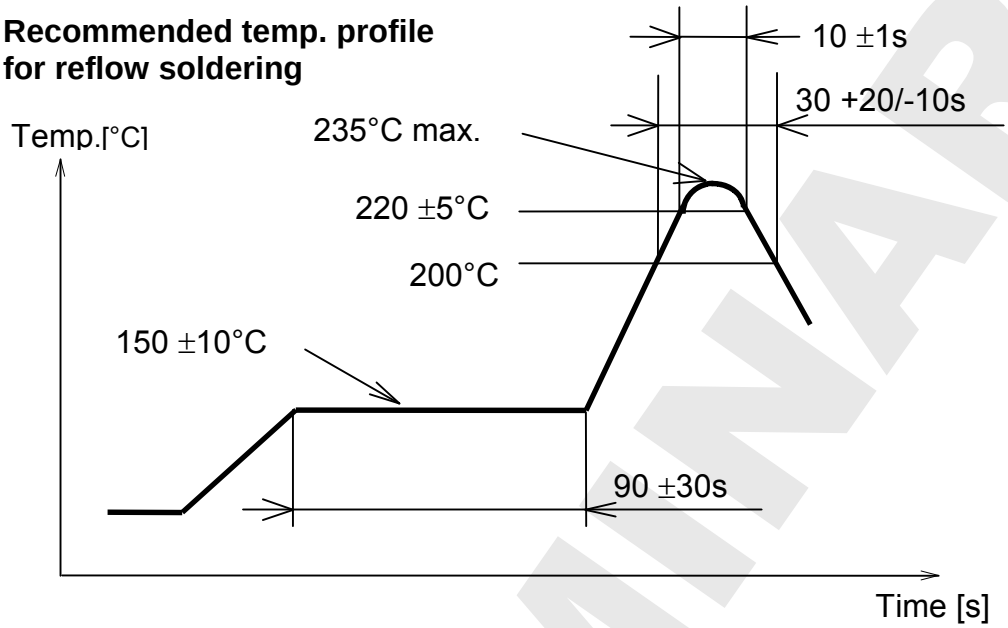
No.	Item Punkt	Limit Grenzwerte	Condition Bedingung
1	Solderability Lötfähigkeit	More than 75% of the soldering area shall be coated by solder Mehr als 75% der Lötfläche soll mit Lötpaste bedeckt sein.	Reflow soldering with recommendable temperature profile
2	Resistance to soldering heat	It shall be satisfied electrical requirements and not be mechanical damage	See chapter 17.2

PRELIMINARY

17. SOLDERING TEMPERATURE-TIME PROFILE (FOR REFLOW SOLDERING)
Temperatur-Zeit Profil für die Reflowlötung

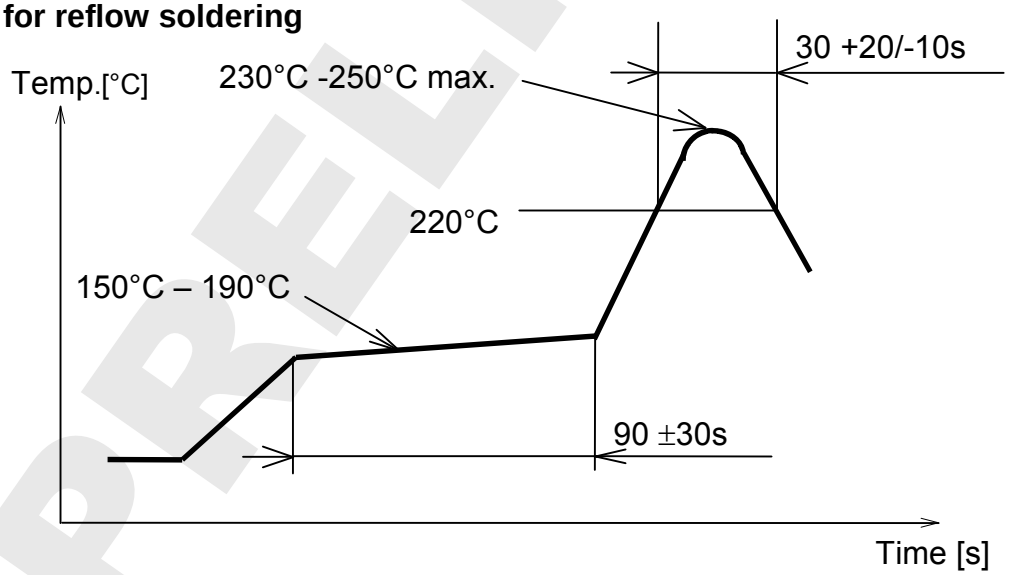
17.1. FOR LEAD SOLDER

Recommended temp. profile for reflow soldering



17.2. FOR LEADFREE SOLDER

Our used temp. profile for reflow soldering



Reflow permissible cycle: 2
Opposite side reflow is prohibited due to module weight.

PRELIMINARY

18. MODULE DIMENSION
Modulabmessungen

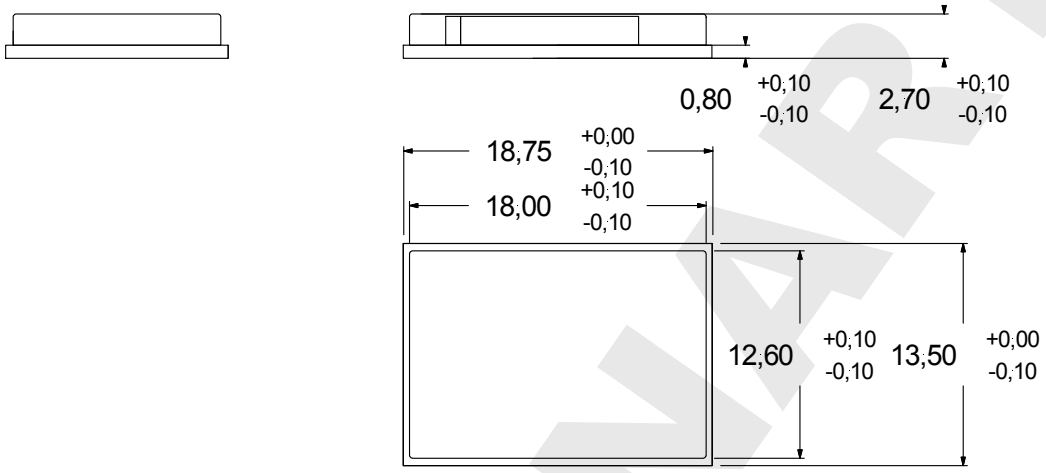


Figure 18.1 PAN1455 dimensions

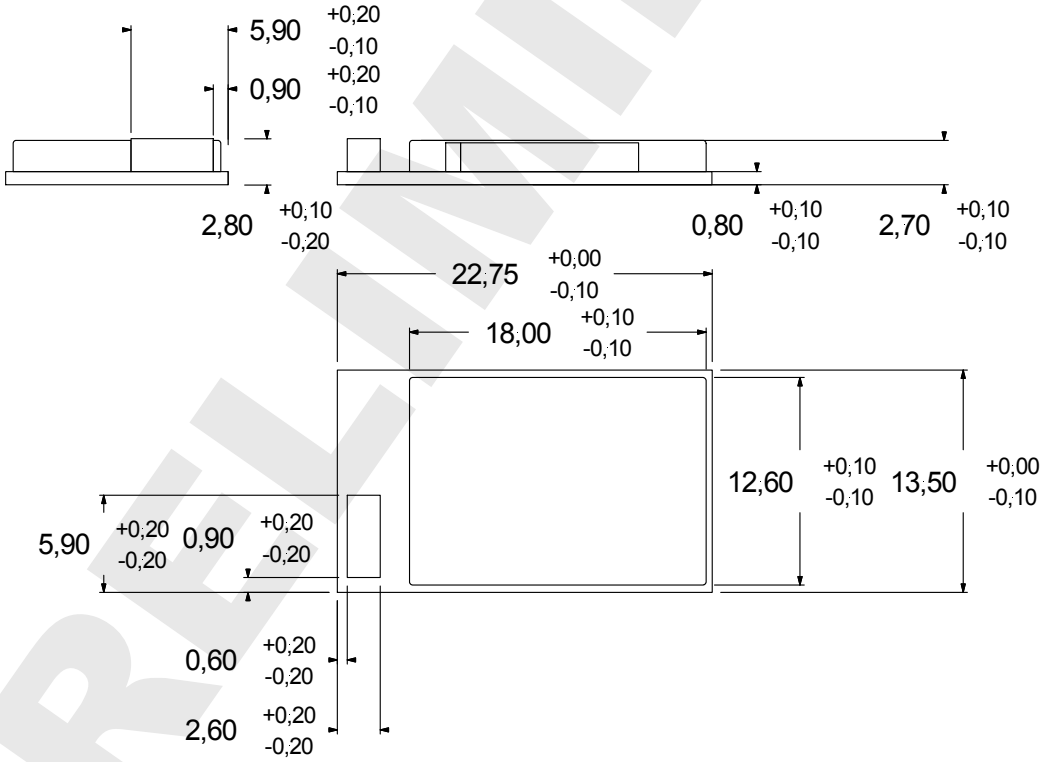


Figure 18.2 PAN1555 dimensions

PRELIMINARY

19. RECOMMENDED FOOT PATTERN
Empfohlenes Land Pattern

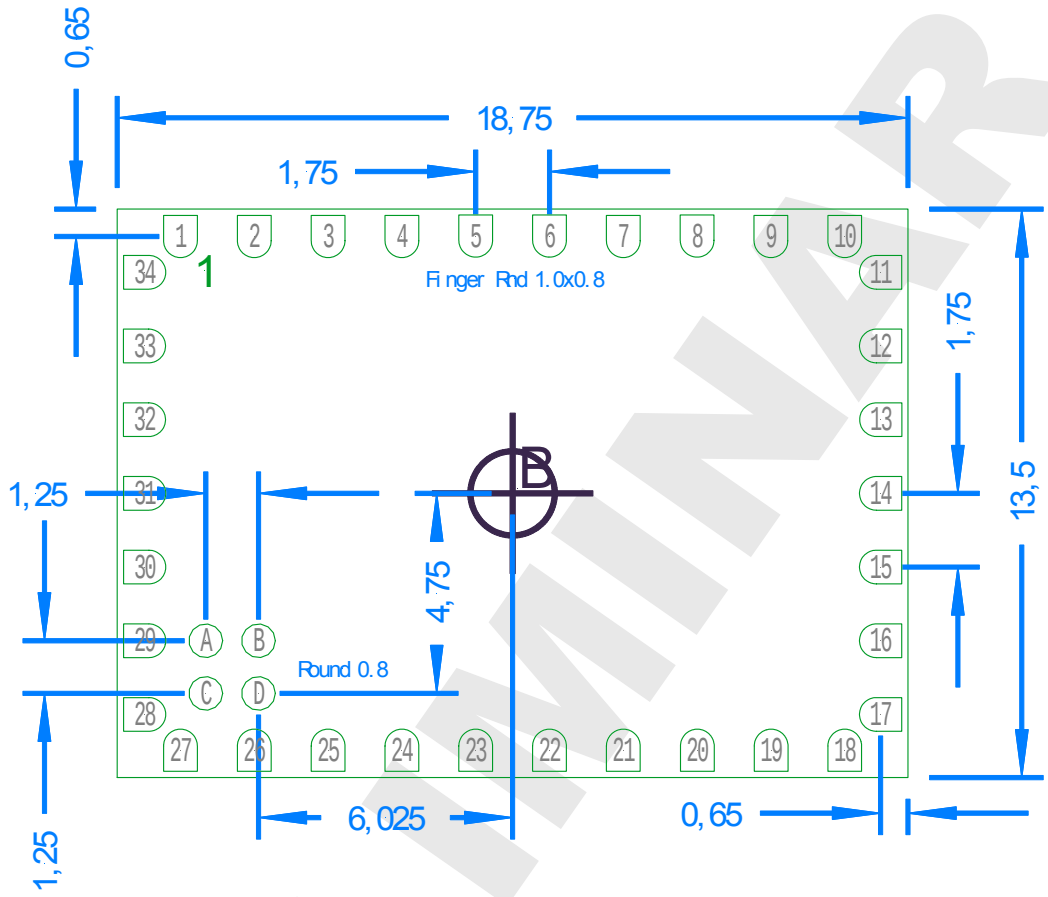


Figure 19.1 PAN1455 Recommended Land pattern
(Top-View not scaled)

Dimensions in mm.

PRELIMINARY

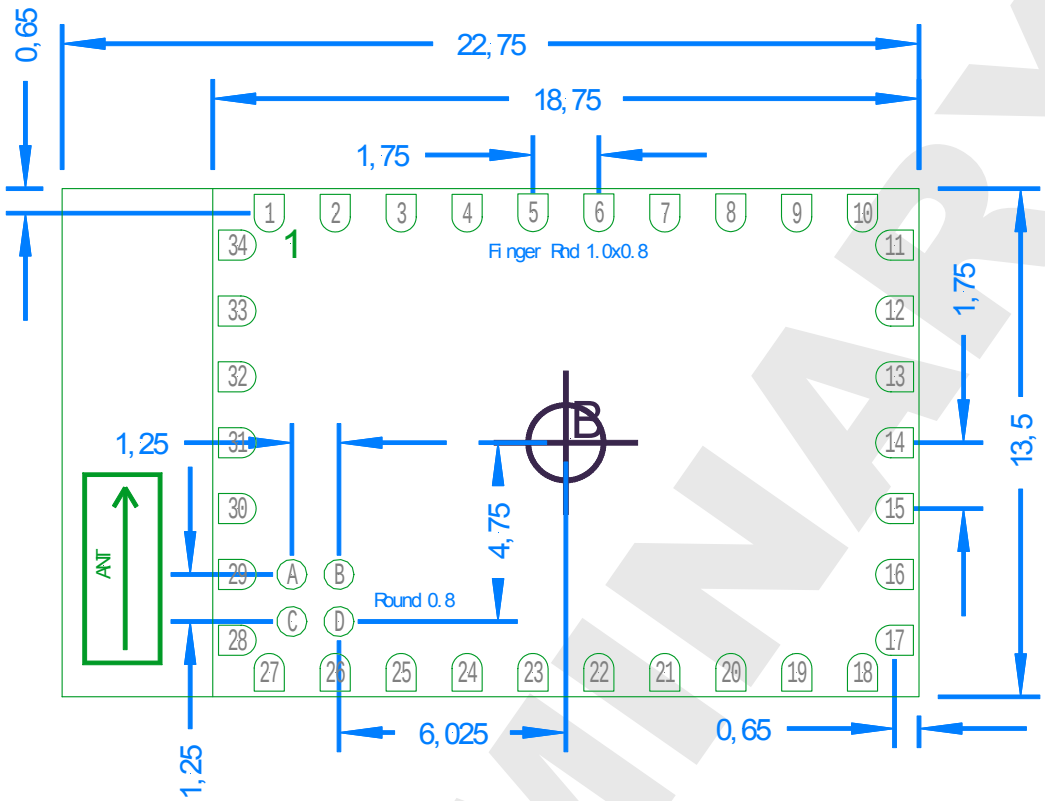


Figure 19.2 PAN1555 Recommended Land pattern
(Top-View not scaled)

Dimensions in mm.

If you have no experience about the land pattern, this figure can guide you, but this information is given without any legal responsibility.

We recommend the same dimension for the solder paste screen.
The solder screen thickness depends on your production standard, we recommend 120µm to 150µm.

IMPORTANT:

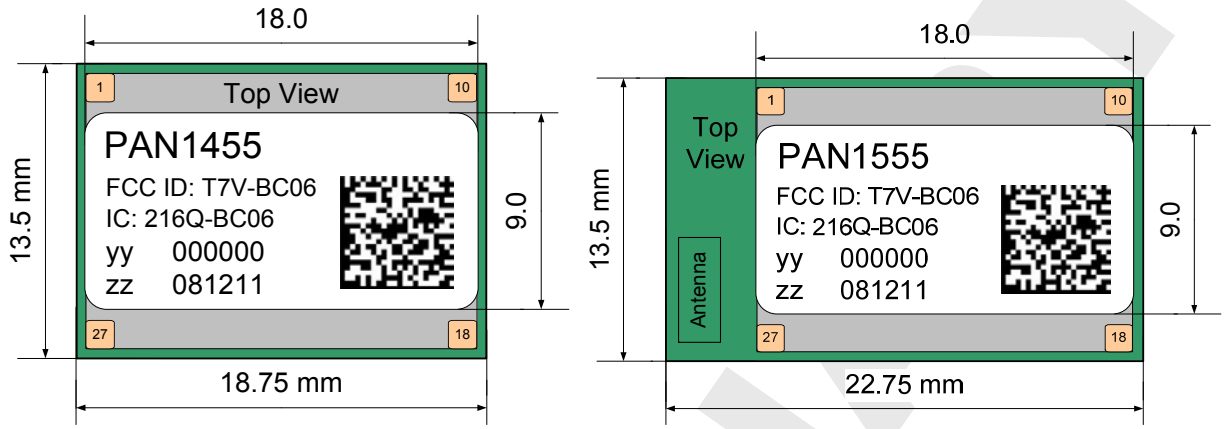
Please be careful with the area under the module to avoid short cuts.

The bottom side from the PAN1455/1555 is fully coated, **also** the vias!

If you have any questions on this point, we are open to discuss your individual situation.

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20. LABELLING DRAWING
Kennzeichnung des Modules durch Label



This label is suitable for reflow soldering and designed for the engineering sample status.

Information in the 2D-Barcode are the date code in the format

- BT-address [12 signs, here 000000000000], (only last six digits are typed on label);
- Ordering number [12 signs, please refer also to chapter 24];
- The identifier for the software release (2 signs, here yy);
- Datecode: Year-Month-Day [6 signs, here 081211].

All items are separated by a semicolon.

ES stands for Engineering Samples, please refer to chapter General Information.

In mass production status, the ES will be eliminated.

As a summary:

zz	Identifier for the hardware version
yy	Identifier for the software version
000000	BT-Address last six digits
081211	Datecode

21. SOFTWARE
Software

We are able to deliver our modules with different software, for different customer application. Before you start your mass production, please check to your best knowledge, that the used software meets your requirements.

21.1. SPP SOFTWARE
This SPP software is from our software partner company Stollmann www.stollmann.de.

Please refer to Reference [1] .

21.2. HDP SOFTWARE
The Health Device Profile is under development and will be released soon.

21.3. HID SOFTWARE
The Human Inteface Device Software is under development and will be released soon.

PRELIMINARY

22. CAUTIONS
Warnungen

Failure to do so may result in degrading of the product's functions and damage to the product.

22.1. DESIGN NOTES
Designhinweise

(1) Please follow the condition written in this specification, especially the control signals of this module.
(2) The supply voltage has to be free of ac ripple voltage, as for example from a battery or a low noise regulator output. For noisy supply voltages provide a decoupling circuit as for example a ferrite in series connection and a blocking capacitor to ground of at least 47uF directly at the module.
(3) This product should not be stressed when installed.
(4) Heat is the major cause of shortening the life of these products. Please keep this product away from heat.
Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum allowable.
(5) The supply voltage should not be exceeding or reverse, and should not carry noise and spike.
(6) Please keep this product away from other high frequency circuits.

22.2. INSTALLATION NOTES
Verarbeitungshinweise

(1) Reflow soldering is possible for twice on the condition in chapter 15.
Please set up the temperature at the soldering portion of this product according to this reflow profile.
(2) Carefully position the products so that their heat will not burn into printed circuit boards or affect the other components that are susceptible to heat.
(3) Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.
(4) If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
(5) This product should not be stressed or vibrated when reflowed.
(6) Please keep the following conditions when you install this product for reparation by hand soldering.
(7) Please do not wash this product.
(8) Please refer to the recommended pattern when designing a board.
(9) Pressing on parts of the metal cover or fastening objects to the metal cover is not allowed.

22.3. USAGE CONDITIONS NOTES
Benutzerhinweise

(1) Please take measure against static electricity.
If pulses or other transient loads (a large load applied in a short time) are applied to the products, then before use, check and evaluate their operation when assembled on your products.
(2) Please do not use the fallen product.

PRELIMINARY

(3) Please do not put on damage and dirt to the pin , and don't touch the electric components.
(4) Please follow the condition written in the ratings , about the power supply instruments applied to this product.
(5) Electrode peeling strength: Do not add pressure of more than 4.9N when soldered on PCB
(6) Pressing on parts of the metal cover or fastening objects to the metal cover is not allowed.
(7) These products are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information and communication equipment.

22.4. STORAGE NOTES
Lagerhinweise

(1) The module may not be stressed mechanically during storage.
(2) Do not store these products in the following conditions or the performance characteristics of the product, such as RF performance will be adversely affected:
- Storage in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX
- Storage in direct sunlight
- Storage in an environment where the temperature may be outside the range of 5°C to 35°C range, or where the humidity may be outside the 45 to 85% range.
- Storage of the products for more than one year after the date of delivery at your company if the avoidance all the above conditions (1) to (3) have been met.

(3) Storage period: Please check the adhesive strength of the embossed tape and soldering after 6 months of storage.
(4) Please keep this product away from water, poisonous gas and corrosive gas.
(5) This product should not be stressed or shocked when transported.
(6) Please follow the specification when piling up the packed crate (max. 10).

22.5. SAFETY CAUTIONS
Sicherheitshinweise

These specifications are intended to preserve the quality assurance of products as individual components.

Before use, check and evaluate their operation when mounted on your products. Abide by these specifications, without deviation when using the products.These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, then at least, provide the following failsafe functions, as a minimum.

(1) Ensure the safety of the whole system by installing a protection circuit and a protection device.
(2) Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a single fault causing an unsafe status.

PRELIMINARY

22.6. OTHER CAUTIONS
Weitere Hinweise

(1) This specification sheet is copyrighted. Please do not open it to the third party.
(2) Please do not use this product of our company for another purpose.
(3) Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.
(4) This product has not been manufactured with any ozone chemical controlled under the Montreal Protocol.
(5) These products are not intended for other uses, other than under the special conditions shown below. Before using these products under such special conditions, check their performance and reliability under the said special conditions carefully to determine whether or not they can be used in such a manner.
- In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash.
- In direct sunlight, outdoors, or in a dusty environment
- In an environment where condensation occurs.
- In an environment with a high concentration of harmful gas (e.g. salty air, HCl, Cl2, SO2, H2S, NH3, and NOX)

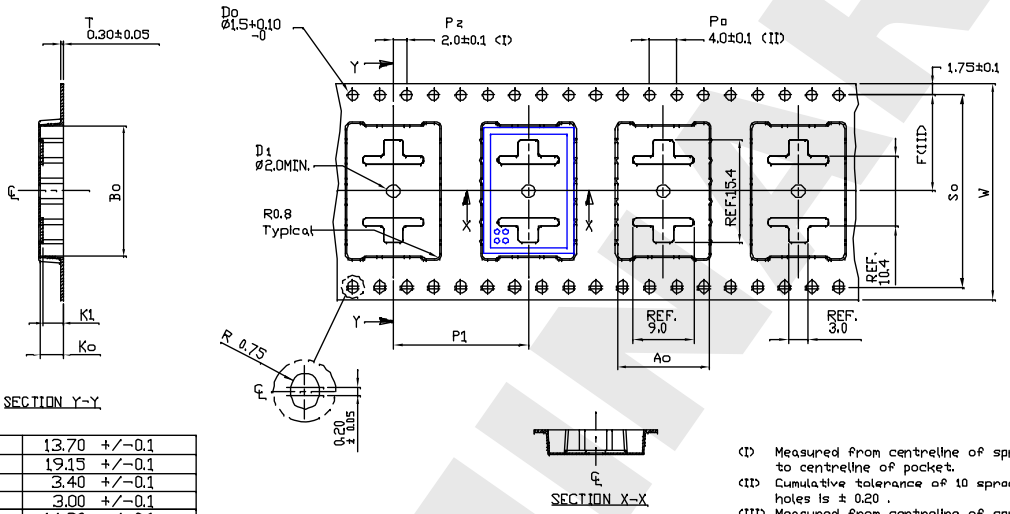
(6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.
(7) When you have any question or uncertainty , both of you and Panasonic sincerely cope with it.

PRELIMINARY

23. PACKAGING
Verpackung

23.1. EMBOSSED TAPE / BLISTERGURT

(1) Dimension of the tape / Abmessungen des Gurtes (EIAJ-tbd)

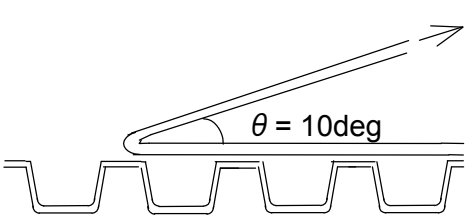


Ao	13.70	+/-0.1
Bo	19.15	+/-0.1
Ko	3.40	+/-0.1
K1	3.00	+/-0.1
F	14.20	+/-0.1
P1	20.00	+/-0.1
So	28.40	+/-0.1
W	32.00	+/-0.3

(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

(2) Cover tape reel strength / Abzugskräfte Blistergurt Deckfolie

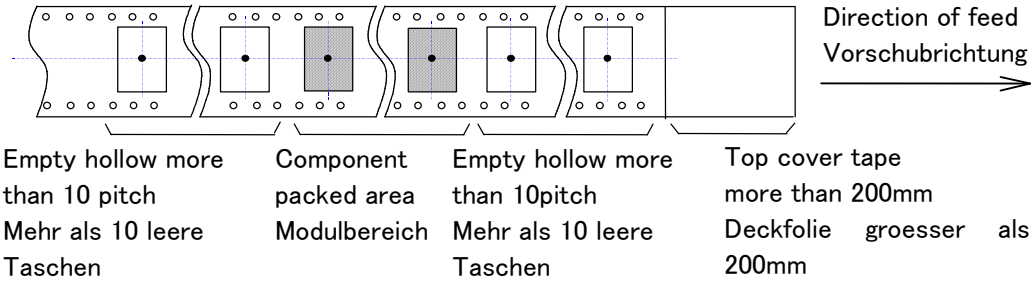


Speed = 300mm/min.

Cover tape reel strength
=0.098～0.68N (10～70g)

PRELIMINARY

(3) Empty hollow / leere Taschen



Empty hollow in component packed area shall be less than two per reel and those hollows shall not be consecutive.
Es dürfen minimal 2 leere Taschen im Bereich der Komponenten vorhanden sein, diese dürfen aber nicht aufeinander folgen.

23.2. COMPONENT DIRECTION
Komponentenanordnung

Top cover tape shall not be found on reel holes and shall not stick out from reel.
Deckfolien darf nicht durch die Löcher der Spule und nicht außerhalb der Spule geführt werden.

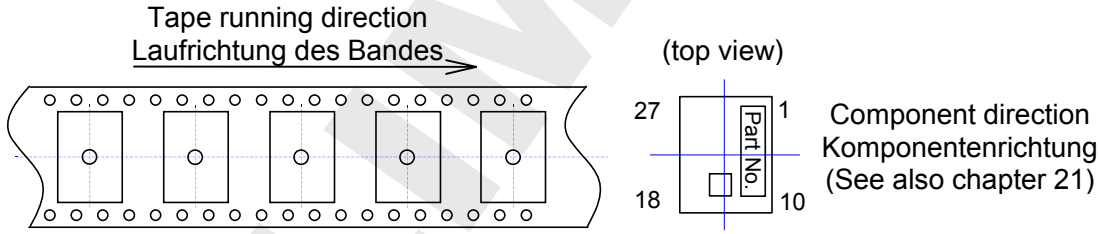


Figure 1

23.3. REEL DIMENSION
Abmaße der Rolle

(1) Quantity per reel : 500 pieces
Anzahl pro Rolle : 500 Stück

(2) Marking : Customer's part No. / Quantity / Lot No. and Our part# with bar-code shall be on the reel.
Kennzeichnung : Kundennummer / Anzahl / Losnummer und unsere Komponentennummer als Barcode wird auf die Rolle gedruckt
Refer to figure 2
Bezugnehmend zur Zeichnung 2

PRELIMINARY

23.4. PACKAGE
Umverpackung

(1) Package box : 1 or 2 reel (depends on quantity)
Paketbox.: 1 oder 2 Rollen (abhängig von der Liefermenge)

(2) Marking : Customer's part No. / Quantity / Lot No. and Our part# with bar-code shall be on the package box.

Kennzeichnung : Kundennummer / Anzahl / Losnummer und unsere Komponentennummer als Barcode wird auf die Verpackung gedruckt
Refer to figure 2 and 3
Bezugnehmend zur Zeichnung 2 und 3

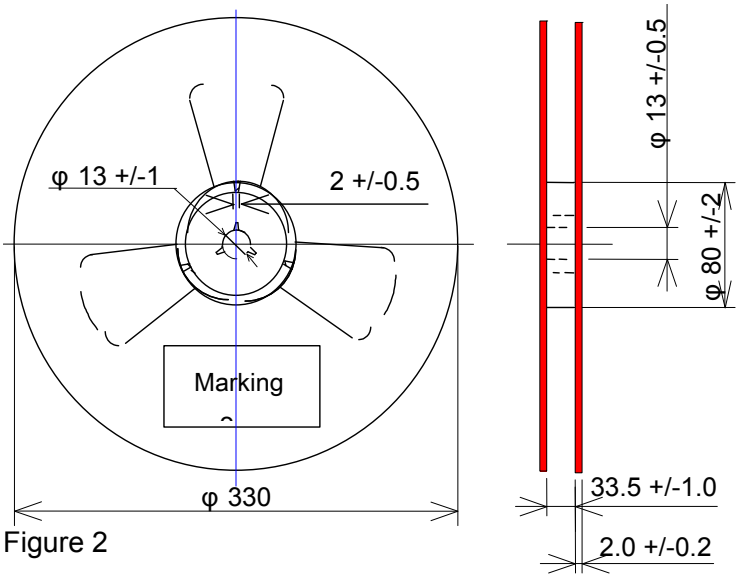
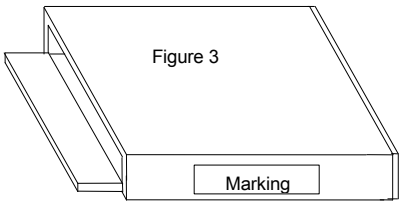


Figure 2



PRELIMINARY

24. ORDERING INFORMATION
Bestellinformationen

Ordering part number	Description	MOQ [1]
ENW89815C3KF	PAN1455 256kByte Flash Memory, without Antenna Software: SPP[2]	500
ENW89815A3KF	PAN1555 256kByte Flash Memory, with Antenna Software: SPP[2]	500

Notes:

(1) Abbreviation for Minimum Order Quantity (MOQ). The standard MOQ for mass production are 500 pieces, fewer only on customer demand. Samples for evaluation can be delivered at any quantity.

(2) This software is licensed by the company Stollmann please refer to [1] .

25. ROHS DECLARATION
RoHS-Erklärung

Declaration of environmental compatibility for supplied products:

Hereby we declare to our best present knowledge based on declaration of our suppliers that this product do not contain by now the following substances which are banned by Directive 2002/95/EC (RoHS) or if contain a maximum concentration of 0,1% by weight in homogeneous materials for

- Lead and lead compounds
- Mercury and mercury compounds
- Chromium (VI)
- PBB (polybrominated biphenyl) category
- PBDE (polybrominated biphenyl ether) category

And a maximum concentration of 0,01% by weight in homogeneous materials for

- Cadmium and cadmium compounds

26. DATA SHEET STATUS
Datenblatt Status

This data sheet contains preliminary product specification. Panasonic reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.

Please consult the most recently issued data sheet before initiating or completing a design.

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27. REGULATORY INFORMATION

27.1. FCC NOTICE



The device PAN1555, including the ceramic antenna (ENW89815C3KF) and also the SMD type PAN1455 (ENW89815A3KF), including with the antennas, which are listed in 27.5, complies with Part 15 of the FCC Rules. The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.transmitter
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.

27.2. CAUTION



The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Panasonic Electronic Devices Europe GmbH may void the user's authority to operate the equipment.

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 or more of the following measures:

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

27.3. LABELING REQUIREMENTS



The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Panasonic FCC identifier for this product as well as the FCC Notice above. The FCC identifier are **FCC ID: T7V-BC06**. This FCC identifier is valid for both versions, for details, please see the chapter 24. Ordering Information.

In any case end product must be labelled exterior with "Contains FCC ID: T7V-BC06"

PRELIMINARY

27.4. ANTENNA WARNING



The related part number for this device is ENW89815A3KF (PAN1455 with SMD pad). For details, please see the chapter 24. Ordering Information. This device are tested with a standard SMA connector and with the antennas listed below. When integrated in the OEMs product, these fixed antennas require installation preventing end-users from replacing them with non-approved antennas. Any antenna exceeding 2dBi not in the following table must be tested to comply with FCC Section 15.203 for unique antenna connectors and Section 15.247 for emissions. The FCC identifier for this device with the antenna listed in item 1 are the same (FCC ID: T7V-BC06).

27.5. APPROVED ANTENNA LIST

Note: We are able to qualify your antenna and will add to this list as that process is completed.

Item	Part Number	Manufacturer	Frequency Band	Type	Gain (dBi)
1	WIMO17010.10	Wimo	2.4GHz	ROD	+2
2					

27.6. RF EXPOSURE PAN1455/PAN1555



To comply with FCC RF Exposure requirements, the Original Equipment Manufacturer (OEM) must ensure that the approved antenna in the previous table must be installed.

The preceding statement must be included as a CAUTION statement in manuals for products operating with the approved antennas in the previous table to alert users on FCC RF Exposure compliance.

Any notification to the end user of installation or removal instructions about the integrated radio module is not allowed.

The radiated output power of PAN1455 with mounted ceramic antenna (FCC ID: T7V-BC06) is far below the FCC radio frequency exposure limits. Nevertheless, the PAN1455 shall be used in such a manner that the potential for human contact during normal operation is minimized.

End users may not be provided with the module installation instructions. OEM integrators and end users must be provided with transmitter operating conditions for satisfying RF exposure compliance.

27.7. INDUSTRY CANADA CERTIFICATION

PAN1455/PAN1555 comply with the regulatory requirements of Industry canada (IC), license:

IC: 216Q-BC06

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from

www.ic.gc.ca

This device has been designed to operate with the antenna listed in section 27.5 above, having a maximum gain of 2.0 dBi. Antennas not included in this list or having a gain greater than 2.0 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms. The antenna used for this transmitter must not be colocated or operating in conjunction with any other antenna or transmitter.

PRELIMINARY

28. RELATED DOCUMENTS
Mitgeltende Dokumente

[1] BlueRS+_ATCommand_Reference

29. GENERAL INFORMATION
Allgemeine Informationen

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All rights reserved.
This product description does not lodge the claim to be complete and free of mistakes.
Please contact the related product manager in every case.

If we deliver ES samples to the customer, these samples have the status Engineering Samples. This means, the design of this product is not yet concluded. Engineering Samples may be partially or fully functional, and there may be differences to be published Data Sheet.
Engineering Samples are not qualified and are not to be used for reliability testing or series production.

Disclaimer:
Customer acknowledges that samples may deviate from the Data Sheet and may bear defects due to their status of development and the lack of qualification mentioned above.
Panasonic rejects any liability or product warranty for Engineering Samples. In particular, Panasonic disclaims liability for damages caused by

- the use of the Engineering Sample other than for Evaluation Purposes, particularly the installation or integration in an other product to be sold by Customer,
- deviation or lapse in function of Engineering Sample,
- improper use of Engineering Samples.

Panasonic disclaimes any liability for consequential and incidental damages.
In case of any questions, please contact your local sales partner or the related product manager.

30. LIFE SUPPORT POLICY
Politik für Lebenserhaltungssysteme

This Panasonic product is not designed for use in life support appliances, devices, or systems where malfunction can reasonably be expected to result in a significant personal injury to the user, or as a critical component in any life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness. Panasonic customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Panasonic for any damages resulting.

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