

CLASSIFICATION Einstufung	PRODUCT SPECIFICATION Produktspezifikation	No. DS-2355-900-102	REV. 1.00
SUBJECT Thema	ISM MODULE PAN2355 868/915MHZ 500KBAUD Basis is CC1101 from Chipcon	PAGE Seite	1 of 22
CUSTOMER'S CODE PAN2355	PANASONIC CODE ENW59611N3A	DATE Datum	28.01.2008

Specification for Production

Applicant / Manufacturer Panasonic Electronic Devices Europe GmbH
Hardware Zeppelinstrasse 19
 21337 Lüneburg
 Germany

Contents Approval for Mass Production

Customer

End-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:
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NOTE:

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

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RELEASE

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1. KEY FEATURES

Schlüsseleigenschaften

- Module using CC1101-RF-Transceiver
- generally 300-1000 MHz Frequency Range (upon request, standard frequency is 868 MHz)
- up to +10 dBm Output Power (programmable)
- Data rate up to 500 kbps
- all configuration and data access via SPI bus
- Wide Supply voltage range of 2.1 – 3.6 V
- extremely small size (8 x 8.2 x 2 mm)

2. APPLICATIONS FOR THE MODULE

Anwendungen für das Modul

All kinds of wireless applications, as for example:

- Wireless sensor and actor networks
- Remote control Home automation systems
- Wireless alarms and security systems
- Wireless serial cable replacement
- Automatic Meter Reading
- Low Power Telemetry

3. DESCRIPTION FOR THE MODULE

Modulbeschreibung

The PAN2355 provides a complete RF transceiver module utilizing a powerful transceiver for all kind of wireless applications. This module is specifically suited for low-power operation and small-size applications.

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4. SCOPE OF THIS DOCUMENT Umfang dieses Dokumentes

This document applies to the PAN2355 module. The module is based upon a Chipcon/TI (based in Oslo/Norway) CC1101 transceiver.

Dieses Dokument bezieht sich auf das Funkmodul PAN2355. Es basiert auf einem Chipcon/TI CC1101 Transceiver.

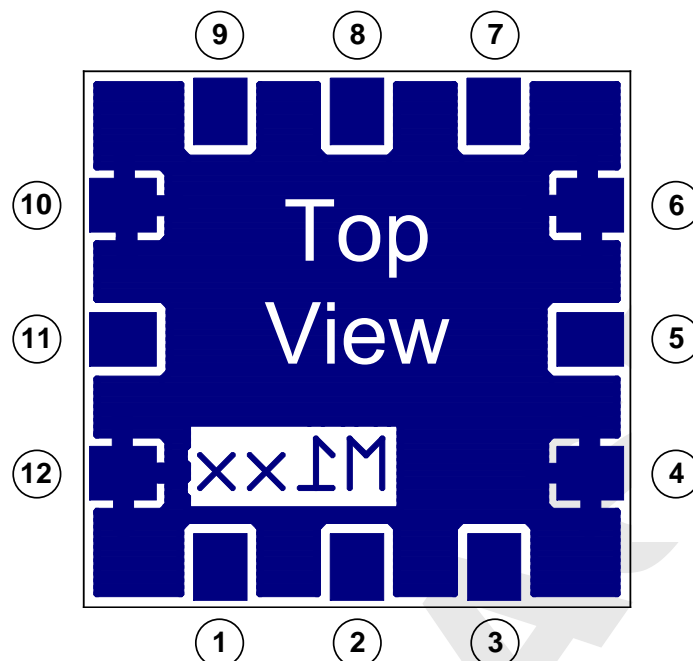
5. HISTORY FOR THIS DOCUMENT Versionsverwaltung dieses Dokumentes

Revision Version	Date Datum	Modification / Remarks Änderungen / Bemerkungen
A	04.05.2006	Initial DRAFT
B	30.06.2006	Change of Supply Voltage and Temperature Range
C	10.07.2006	Adapt specification to the newest data sheet from Chipcon, please refer to [1] in chapter Related Documents.
D	28.07.2006	Correct link to number [1] in chapter Related Documents and add chapter 23 Packaging, 17 Module Dimension and 19 Labelling , revised chapter 18 Foot Print and Size of the Module
E	01.12.2006	Add chapter Cautions and RoHS Declaration
F	08.05.2007	Revised chapter 7, 14 (sensitivity part), 19, 23, 24 and add footnote 3 in chapter 10. Add MSL in chapter 10 and correct mistake for maximum power, set from 10dBm to 5dBm
G	11.09.2007	<ul style="list-style-type: none"> - Add end customer name on the front page - Change IC name from CC1100 to CC1101 - Change picture in chapter 6. - Revised footnote 2 in chapter 6. - Add max. voltage ramp-up time in chapter 10. - Updated footnote 3 in chapter 10. - Delete the ripple on the Vdd (#5 in chapter 11) - Add frequency tolerances for the crystal as a footnote (#5 in chapter 11) - Reduced frequency accuracy from typical ± 20ppm to ± 10ppm (#3 in chapter 11) - Change maximum output power from +5dBm to +10dBm in chapter 14. - Add typical power step size (#9 in chapter 14) - Change the minimum output power from -52dBm to -30dBm in chapter 14, in according to [1]. - Update chapter Related Documents. - Update chapter 19. for Labelling on Case and 23.5 for Label on Package
1.00	28.01.2008	<ul style="list-style-type: none"> - RELEASE version - No electrical and mechanical changes between revision G and 1.00 - Revised chapter 19.2 Mass Produktion (MP) Status (top view) - Revised chapter 23.5 Label for Package (Mass Production Status)

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6. TERMINAL LAYOUT Anschlußbelegung



Pin no.	Pin Name	Pin Type	Description
1	SPI SI	I	SPI Slave Data In
2	SPI CLK	I	SPI Clock
3	SPI SO	O	SPI Slave Data Out
4	GND	PWR	Ground
5	GDO0	O	General Purpose Output ¹
6	GND	PWR	Ground
7	SPI CSN	I/O	SPI Chip Select
8	Vdd	PWR	Supply Voltage
9	GDO2	O	General Purpose Output ¹
10	GND	PWR	Ground
11	RF	I/O	50 Ω RF Port ²
12	GND	PWR	Ground

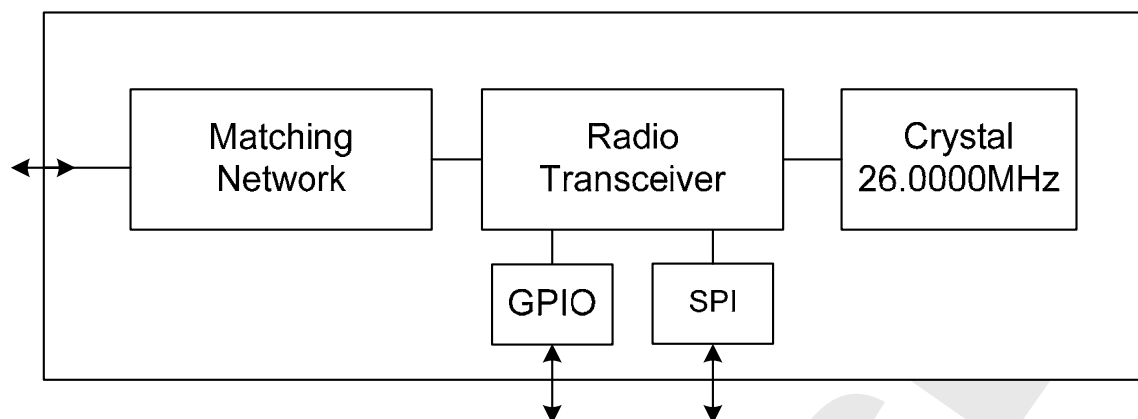
¹ See CC1101 Datasheet in [1] for details on how to configure this output

² This version has a DC blocking capacitor in line to avoid any DC shortage in Tx mode.

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7. BLOCK DIAGRAM Blockdiagramm



8. KEY PARTS LIST Liste der Schlüsselkomponenten

Part Name Teilenummer	Material Material
P.W.Board Leiterplatte	Glass cloth epoxide resin with gold plating FR4 mit Goldauflage
Casing Deckel	Material: CuNi18ZN20, thickness 0.15mm Material: Weißblech 0,15mm Dicke
IC part name IC Name	CC1101 (Chipcon AS www.chipcon.com) All information are based on [1] in chapter Related Documents

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

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10. ABSOLUTE MAXIMUM RATINGS

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	Vdd	-0.3 to +3.6	V
2	Voltage on any pin Spannung an jedem Pin	Vpin	-0,3 to Vdd +0.3 (3.6 V max.)	V
3	Voltage ramp-up Anstiegszeit der Spannung	Vramp-up	120	3
4	Storage temperature range Lagertemperatur	Tstg	-40 to +125	°C
5	Operating temperature range Betriebstemperatur	Top	-40 to +85	°C
6	Input RF level Eingangs HF-Leistung	Pmax	10	dBm
7	Lead temperature Löttemperatur	Tdeath	Please refer to chapter 16	°C
8	ESD on any pin ESD Festigkeit	V ESD	750 ³	V
9	Moisture Sensitivity Level	MSL	3	

11. ELECTRICAL REQUIREMENTS

Vdd = 3.0V, T_{amb} = 25°C if nothing else stated

No Nr.	Item Punkt	Condition Bedingung	Limit / Grenzen			Unit Einheit
			Min	Typ	Max	
1	Frequency Range Frequenzbereich	Available upon request	300		348	MHz
	Frequency Range Frequenzbereich	Available upon request	400		464	MHz
	Frequency Range Frequenzbereich	Available upon request	800		928	MHz
2 ⁴	Frequency Range Frequenzbereich	Default Frequency range	863		928	MHz
3	Frequency Accuracy Frequenzgenauigkeit	Settings are done with SMART RF Studio from Chipcon		±10 ⁵		ppm
4	Supply voltage Versorgungsspg.	The typical voltage is recommended Vdd at voltage pin	2.1	3.0	3.6	Vdc

³ This value is based on the actual data sheet from CC1101, according to JEDEC STD 22, method A114, Human Body Model (HBM).

⁴ Standard Frequency range. Frequencies as indicated in No. 1 are available upon request.

⁵ Frequency accuracy for the used 26.0000 MHz crystal at 25°C are ±10ppm. The accuracy from the crystal over temperature (-40°C to +85°C) and aging over 10 years is ca. ±20ppm.

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12. I/O OPERATING CHARACTERISTICS

Vdd = 3.0V, T_{amb} = 25°C if nothing else stated

No Nr.	Item Punkt	Condition Bedingung	Min	Max	Unit
1	Low-Level Input Voltage	Vdd > 2.3V		0.35 x Vdd	V
2	High-Level Input Voltage	Vdd > 2.3V		0.70 x Vdd	V
3	Input hysteresis (all digital inputs)			0.09 x Vdd	V
4	Input leakage current per pin			1.0	µA
5	Maximum total current for all pins			60	mA
6	DC injection current for a single pin			0.2	mA
7	DC injection current For the complete module			5.0	mA
8	Input capacitance			7	pF

13. TYPICAL CURRENT CONSUMPTION

Vdd = 3.0V, T_{amb} = 25°C, 50Ω Output

No Nr.	Modes Modi	Average Durchschnitt	Unit Einheit
1	Sleep Mode (lowest power) ⁶	0.09	µA
2	Standby Mode ⁶	5.7	µA
3	Idle Mode ⁶	1.7	mA
4	Receiving ⁶	18.3	mA
5	Transmitting -10 dBm ⁶	14.2	mA
6	Transmitting 0 dBm ⁶	16.8	mA
7	Transmitting +10 dBm ⁶	36	mA

⁶ Current values may differ with register settings, please refer also to [1] chapter Electrical Specifications.

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14. ELECTRICAL RF-CHARACTERISTICS

Vdd = 3.0V, T_{amb} = 25°C, 50Ω Output

No Nr.	Receiver Empfänger	Data rate Datenrate	Limit / Grenzen			Spec	Unit Einheit
			Min	Typ	Max		
1	Sensitivity at 1% PER (FSK Modulation) Please refer also to [1]	1.2 kbps	-	-108	-		dBm
2		38.4 kbps	-	-100	-		
3		115 kbps	-	-88	-		
4	Maximum input power		-		-15		dBm

No Nr.	Transmitter Sender	Frequency [MHz] Frequenz [MHz]	Limit / Grenzen			Spec	Unit Einheit
			Min	Typ	Max		
5	RF transmit power	300-348	-30		10 ⁷		dBm
6		400-464	-30		10 ⁷		
7		800-928	-30		10 ⁷		
8	RF power control range		-	40			dB
9	Output power step size		-	5 ⁸			dB
10	2 nd Harmonics content		-102 ⁹	-50 ¹⁰	-30 ¹¹	-30	dBm
11	3 rd Harmonics content		-111 ⁹	-60 ¹⁰	-30 ¹¹	-30	dBm

15. 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 16.2

⁷ Please refer to [3] and [4]. Other EN300220 regulation are -30dBm for the 2nd Harmonic. See also note 11.

⁸ This is only a typical usage value and refers to table 30 in [1]. If needed, the step size can also reduced by different power register settings.

⁹ RF Output set to -52 dBm (50 Ω conducted measurement)

¹⁰ RF Output set to 0 dBm (50 Ω conducted measurement)

¹¹ RF Output set to +5 dBm (50 Ω conducted measurement, please use Smart RF Studio for the right settings).

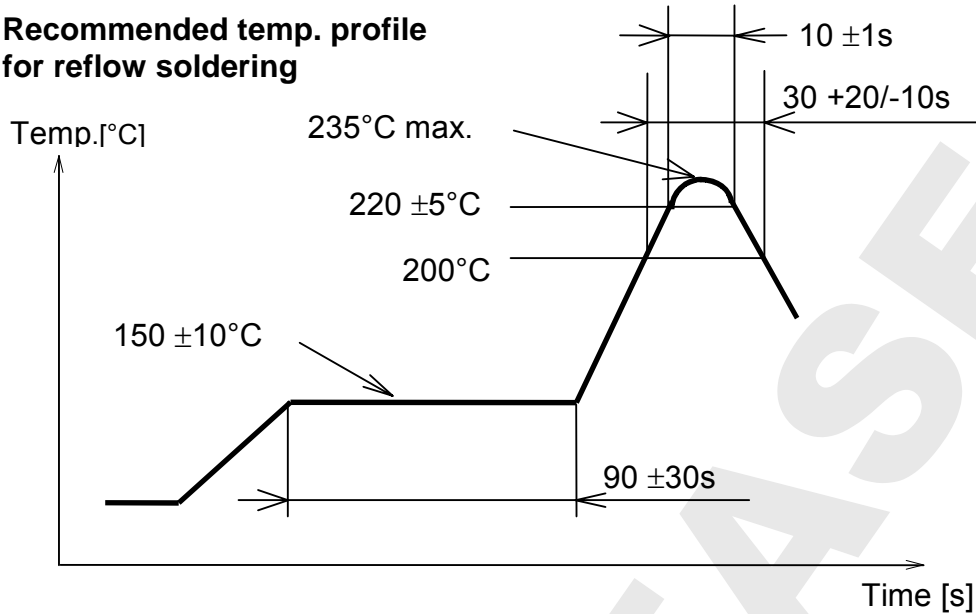
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16. SOLDERING TEMPERATURE-TIME PROFILE (FOR REFLOW SOLDERING)
Temperatur-Zeit Profil für die Reflowlötung

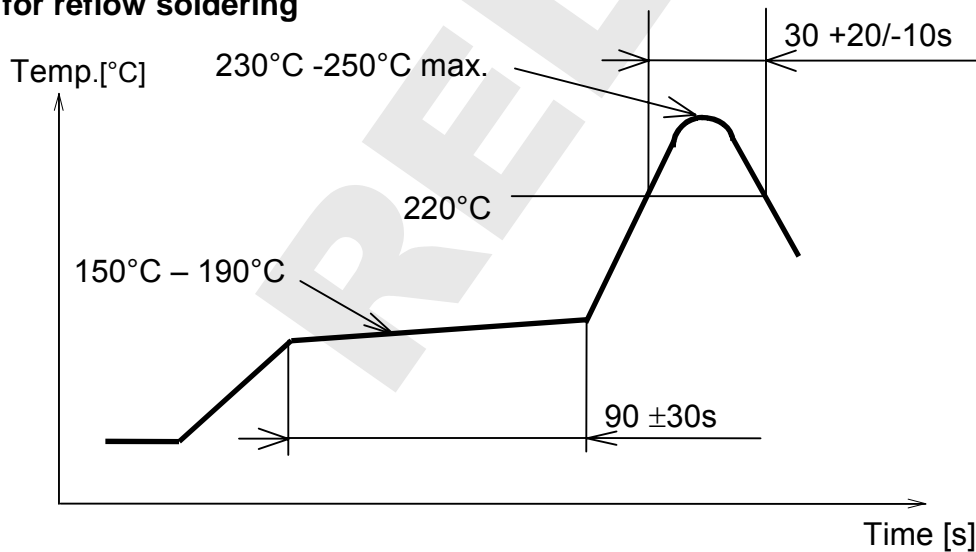
16.1. FOR LEAD SOLDER

**Recommended temp. profile
for reflow soldering**



16.2. FOR LEADFREE SOLDER

**Our used temp. profile
for reflow soldering**



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

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19. LABELLING DRAWING (TOP VIEW)

19.1. ENGINEERING SAMPLE (ES) STATUS (TOP VIEW)



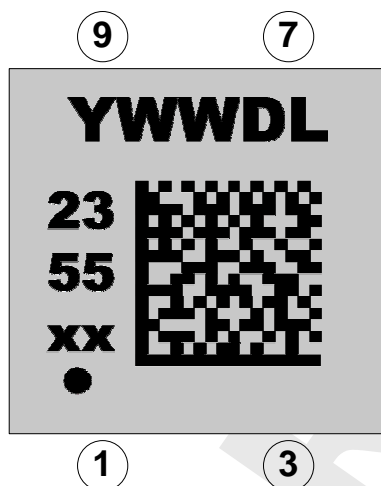
This synthetic label is suitable for reflow soldering and designed for the engineering sample status.

Information in the 2D-Barcode are the date code in the format Year-Month-Day [6 signs], serial number [5 signs] and the identifier for the hardware release [2 signs, here xx], separated by a semicolon.

The point on the label is the identifier for pin 1 of the module.

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

19.2. MASS PRODUKTION (MP) STATUS (TOP VIEW)



Information in the 2D-Barcode are the date code in the format Year-Weak-Day [4 signs], followed by the daily Lot number [1 sign].

This Lot number is always 1, if the daily production is less than the maximum Lot size.

In the 2D-Barcode is also included the identifier for the PAN type (4 signs, here 2355), the hardware release [2 signs, here xx, actual 05] and the serial number [7 signs], separated by a semicolon.

The point on the marking is the identifier for pin 1 of the module.

If there is no ES on the label, it is mass production status, please refer to chapter General Information.

Below you will find an example for the 2D-Barcode. This information you should get after scanning this label. The week starts on Monday with 1 and ends on Sunday with 7.

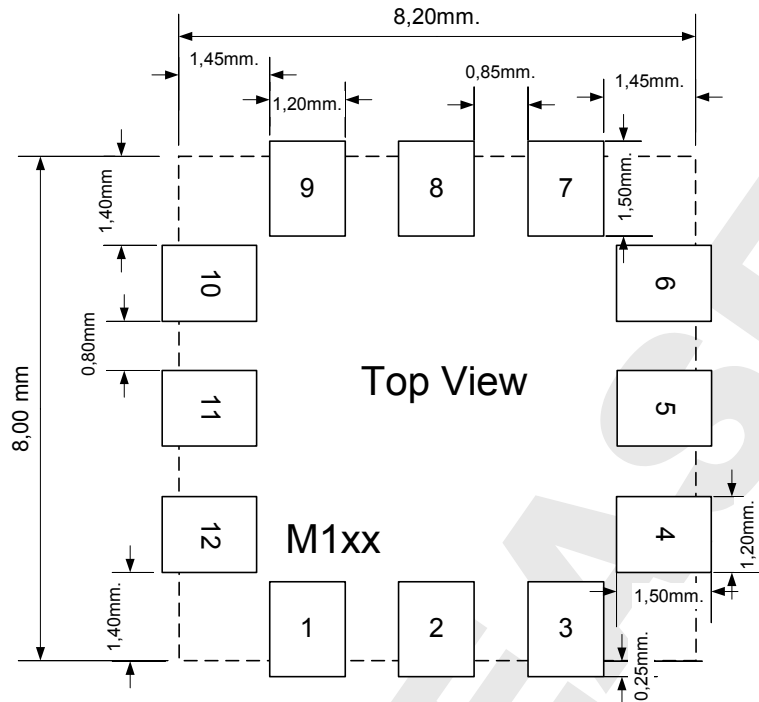
Example for day 23.09.2007 (Sunday), hardware release 05 with serial number 5800.

73871;2355;05;0005800

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20. RECOMMENDED FOOT PATTERN
Empfohlenes Land Pattern



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21. RELIABILITY TESTS

Zuverlässigkeitstests

The measurement should be done after storage room temperature and normal humidity for 1 hour.
Die Messungen sollten erst nach einer Stunde Lagerung unter normalen Bedingungen erfolgen.

No.	Item Punkt	Limit Grenzwerte	Condition Bedingung
1	Vibration test	Electrical parameter should be in specification	a) Freq.:10~50Hz, Amplitude:1.5mm a) 20min. / cycle, 1hrs. each of XYZ axis b) Freq.:30~100Hz, 6G b) 20min. / cycle, 1hrs. each of XYZ axis
2	Shock test	the same as the above	Dropped onto hard wood from height of 50cm for 3 times
3	Heat cycle test	the same as the above	-40°C for 30min. and +85°C for 30min.; each temperature 300 cycles
4	Moisture test	the same as the above	+60°C, 90% RH, 300h
5	Low temp. test	the same as the above	-40°C, 300h
6	High temp. test	the same as the above	+85°C, 300h

22. CAUTIONS

Warnungen

22.1. NOTES OF DESIGN

Designhinweise

- (1) Please follow the condition written in this specification.
- (2) This product should not be stressed when installed.
- (3) Please keep this product the module away from heat.
- (4) The supply voltage should not be exceeding or reverse, and should not carry noise and spike.
- (5) Please keep this product away from other high frequency circuits.
- (6) Please follow the condition written in this interface specification, about the control signals of this module.

22.2. NOTES OF INSTALLATION

Verarbeitungshinweise

- (1) Reflow soldering is possible for twice on the condition in chapter 16.
Please set up the temperature at the soldering portion of this product according to this reflow profile.
- (2) This product should not be stressed or vibrated when reflowed.
- (3) Please keep the following conditions when you install this product for reparation by hand soldering.
- (4) Please do not wash this product.
- (5) Please refer to the recommended pattern when designing a board.

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22.3. NOTES OF USAGE CONDITIONS

Benutzerhinweise

- (1) Please take measure against static electricity.
- (2) Please do not use the fallen product.
- (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

22.4. NOTES OF STORAGE

Lagerhinweise

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

22.5. 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) When you have any question or uncertainty , both of you and Panasonic sincerely cope with it.

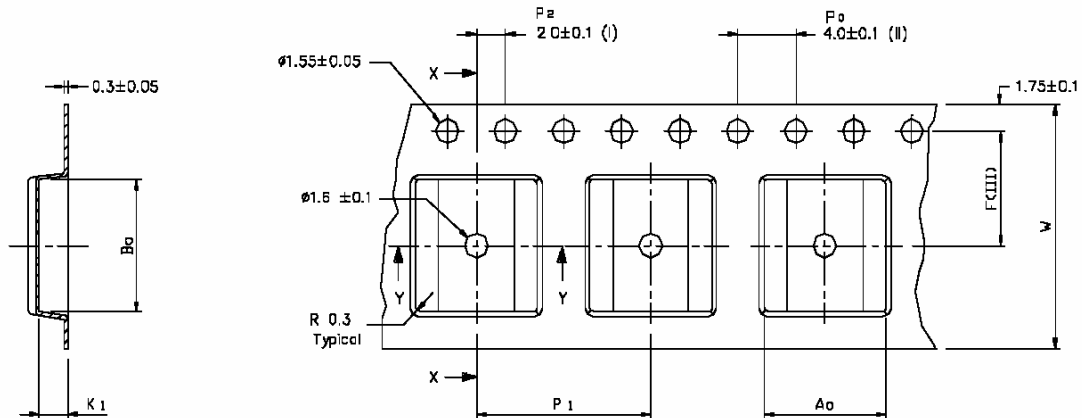
HIGH FREQUENCY PRODUCTS DIVISION Module Business PANASONIC ELECTRONIC DEVICES EUROPE GmbH	APPROVED genehmigt	CHECKED geprüft	DESIGNED erstellt
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23. PACKAGING

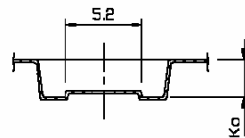
Verpackung

23.1. TAPE DIMENSION



SECTION X - X

Ao	8.40 +/-0.1
Bo	8.70 +/-0.1
Ko	2.50 +/-0.1
K1	2.00 +/-0.1
F	7.50 +/-0.1
P1	12.00 +/-0.1
W	16.00 +/-0.3

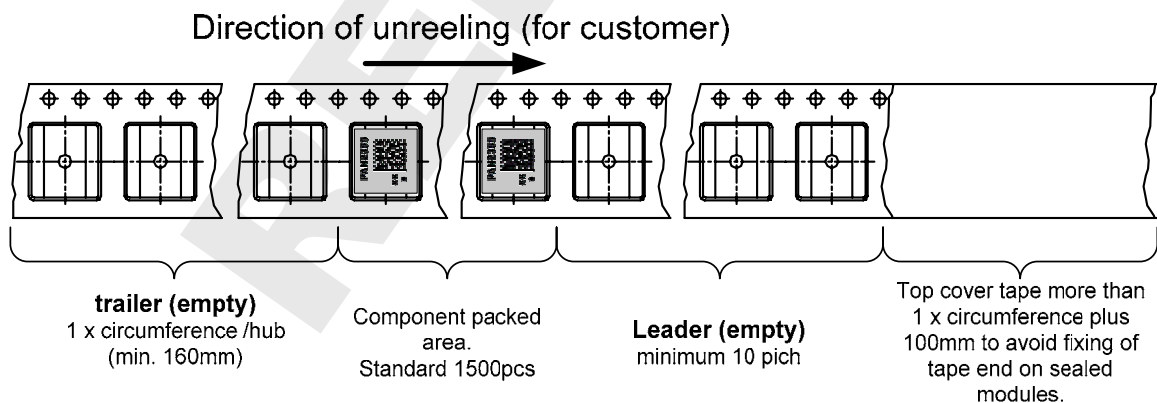


SECTION Y - Y

- (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.

23.2. PACKING IN TAPE



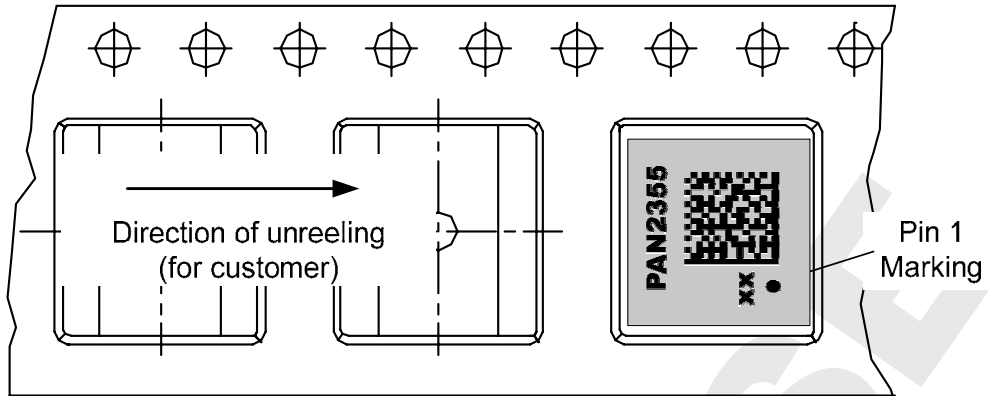
Empty hollow in component packed area shall be less than two per reel and those hollows shall not be consecutive.

Top cover tape shall not be found on reel holes and shall not stick out from reel.

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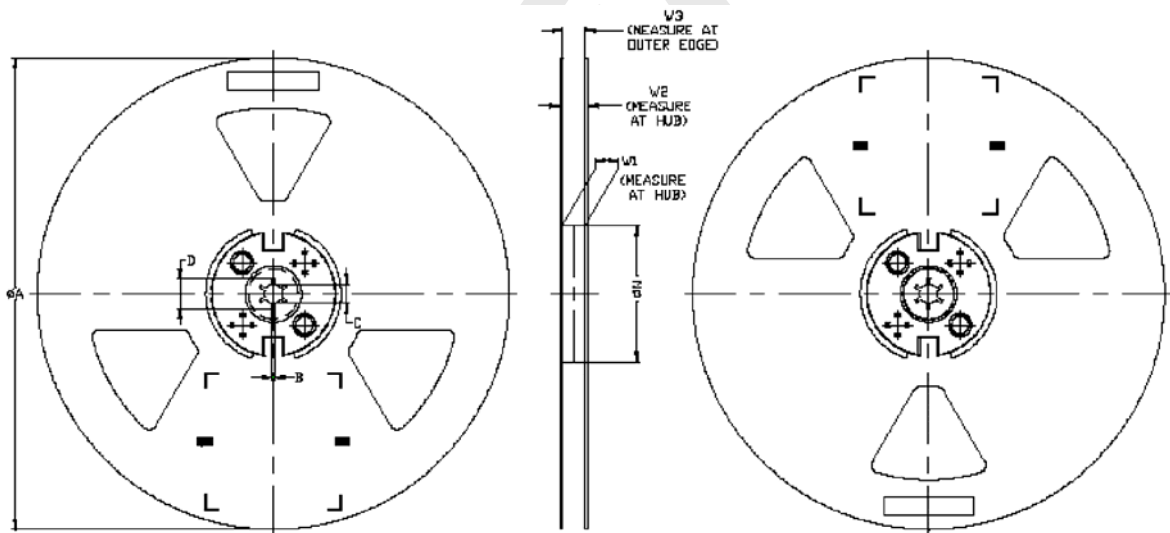
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23.3. COMPONENT DIRECTION Komponentenanordnung



Please refer also to chapter 19. Labelling Drawing (top view)

23.4. REEL DIMENSION



TAPE SIZE	A MAX	B MIN	C	D MIN	N ±1.0	W1	W2 MAX	W3	Assembly Method
16mm	330.0	1.5	13 ^{+0.5} _{-0.2}	20.2	100.0	17.0 ^{+2.0} _{-0.0}	22.4	16.4 ^{+3.0} _{-0.5}	*Latch

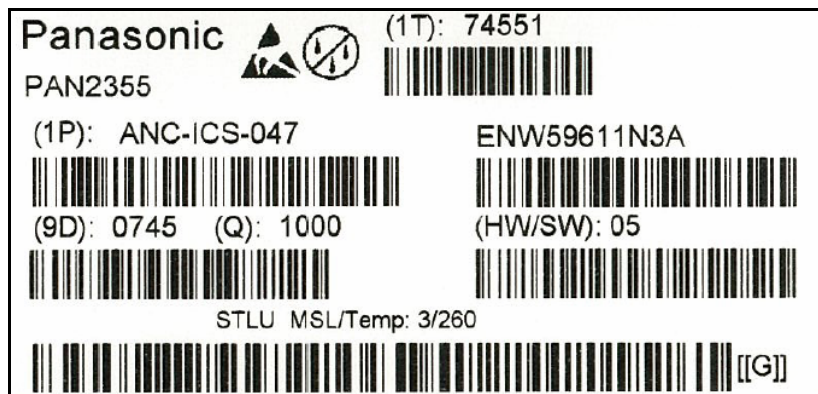
All dimensions in millimeters unless otherwise stated

*Latch (2PC)

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23.5. LABEL FOR PACKAGE (MASS PRODUCTION STATUS)

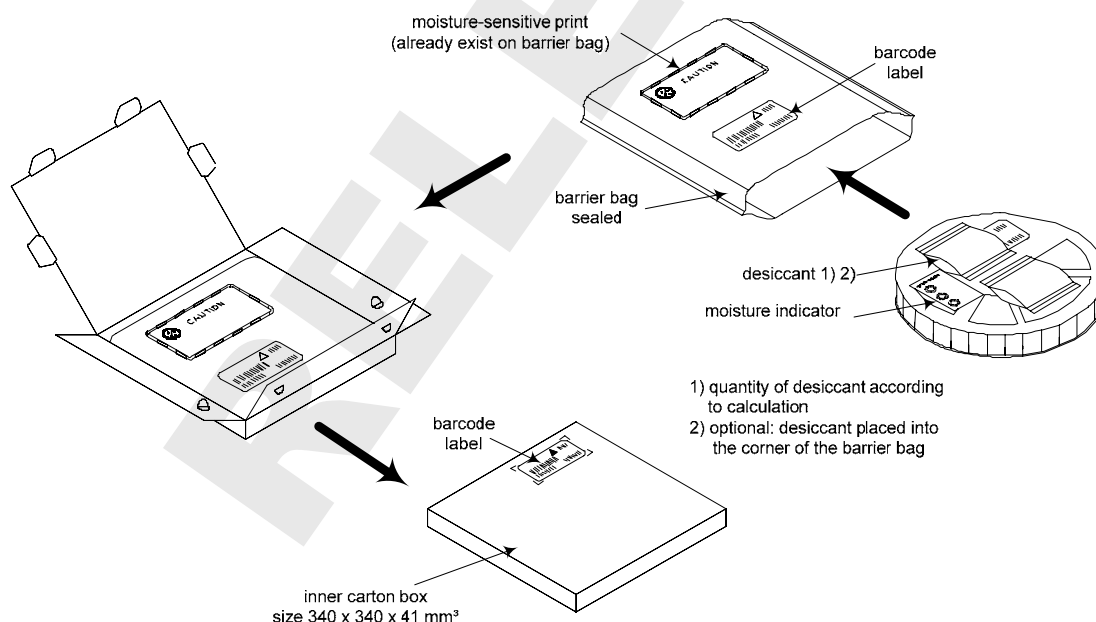


(1T): Lotcode [YWWDL]
[1xYear, 2xWeek, 1xDay, 1xLot]
(1P): Customer Order Code
(Only example!)
(9D): Datecode [YYWW]
(Q): Quantity on Real [XXXX]
ENW-Number
(HW/SW): Hardware Release
Size: 105mm x 51mm

The label must be stick 3 times, reel, barrier bag and inner carton box.

The above label shows only an example, it may differ from the production location and also on the customer specification, if any.

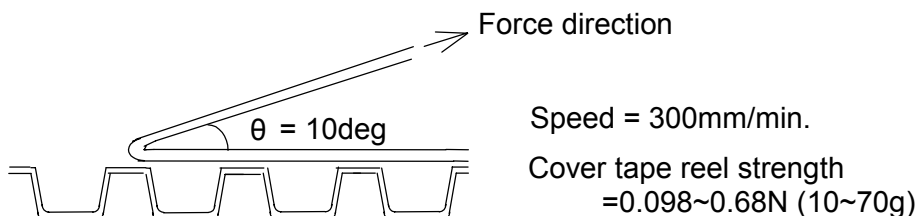
23.6. TOTAL PACKING HANDLING



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23.7. COVER TAPE REEL STRENGTH



24. ORDERING INFORMATION

Bestellinformationen

Ordering part number	Description	MOQ ⁽¹⁾
ENW5Z611N3A	Engineering Sample for PAN2355	1
ENW59611N3A ⁽²⁾	Mass production sample for PAN2355	1500 ⁽³⁾

Note:

- (1) Minimum order quantity.
- (2) Could only be ordered, if we released the mass production status.
If we finishing, this document will change from PRELIMINARY to RELEASE also the revision status will move from alphabetic numbering to 1.0.
- (3) On special agreement we can also deliver in lower quantity!

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

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26. DATA SHEET STATUS

Datenblatt Status

This data sheet contains the final specification (RELEASE).

Panasonic reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

Supplementary data will be published at a later date.

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

27. RELATED DOCUMENTS

Mitgeltende Dokumente

- [1] CC1101 Data Sheet, Rev [SWRS061B](#)
- [2] CC1101 Errata Notes, Rev [SWRZ020](#)
- [3] Application Note [AN039](#) (Using the CC1100/CC1150 in the European 433 and 868 MHz ISM bands)
- [4] Application Note [AN050](#) (Using the CC1101 in the European 868 MHz SRD band)
- [5] Design Note [DN009](#) (Upgrade from CC1100 to CC1101)

RELEASE

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28. GENERAL INFORMATION

Allgemeine Informationen

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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 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.

Waiver:

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 waives 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 waives any liability for consequential and incidental damages.

In case of any questions, please contact your local sales partner or the related product manager.

29. 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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