

Data sheet

SAW duplexer LTE / 5G band 28a

Part number: B1299

Ordering code: B39781B1299L210

Date: September 22, 2021

Version: 2.0

DCN: 80-PA243-584 Rev. A

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Table of contents

| 1 | Application | 4 |
|----|---------------------------------|----|
| 2 | Features. | 4 |
| 3 | <u>Package</u> | 5 |
| | Pin configuration. | |
| | Matching circuit. | |
| 6 | Characteristics | 7 |
| | Maximum ratings | |
| 8 | Transmission coefficients. | 12 |
| 9 | Transmission coefficients (LTE) | 14 |
| 10 | Reflection coefficients. | 17 |
| | Packing material | |
| 12 | Marking | 22 |
| 13 | Soldering profile | 23 |
| | Annotations. | |
| 15 | Cautions and warnings. | 25 |
| 16 | Important notes | 26 |



1 Application

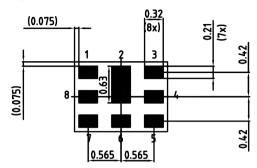
- Low-loss SAW duplexer for mobile telephone for 4G and 5G Band 28a
- LTE band 28a uplink: 718 MHz (pass band 30 MHz)
- LTE band 28a downlink: 773 MHz (pass band 30 MHz)
- Qualcomm® micro-Acoustic Power Management (MAPM)
- Low insertion attenuation
- Low amplitude ripple
- Usable pass band 30 MHz
- Duplexer for lower part of Band 28

2 Features

- Package size 1.6±0.05 mm × 1.2±0.05 mm
- Package height 0.6 mm (max.)
- Approximate weight 4 mg
- RoHS compatible
- Package for Surface Mount Technology (SMT)
- Ni/Au-plated terminals
- Electrostatic Sensitive Device (ESD)
- Moisture Sensitivity Level 3 (MSL3)

3 Package

BOTTOM VIEW



4 Pin configuration

1 RX

■ 3 TX

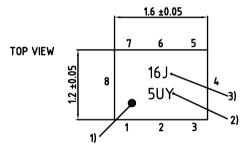
■ 6 ANT

■ 2, 4, 5, 7, Ground 8

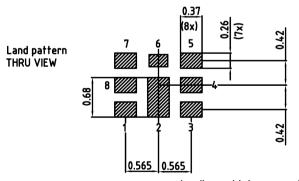
Pad and pitch tolerance ±0.05

SIDE VIEW





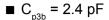
- 1) Marking for pad number 1
- 2) Example of encoded lot number
- 3) Example of encoded filter type number



Landing pad tolerance -0.02

Figure 1: Drawing of package with package height A = 0.6 mm (max.). See Sec. Package information (p. 25).

5 Matching circuit



Europe GmbH

■ $L_{s1} = 3.6 \text{ nH}$

■
$$L_{p6}$$
 = 8.0 nH

■ L_{s3a} = 10.3 nH

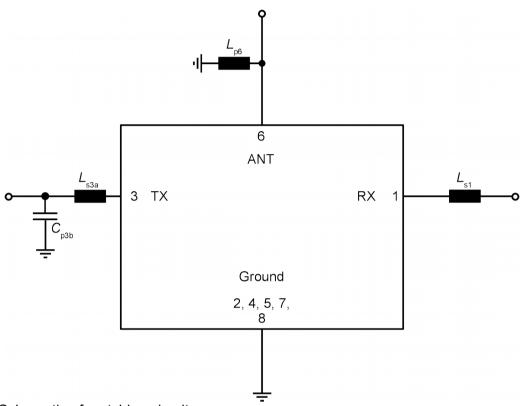


Figure 2: Schematic of matching circuit.

External shunt inductor for ESD protection is recommended at any ports towards antenna.



6 Characteristics

6.1 TX - ANT

Temperature range for specification $T_{\text{SPEC}} = -30 \, ^{\circ}\text{C} \dots +85 \, ^{\circ}\text{C}$ TX terminating impedance $Z_{\text{TX}} = 50 \, \Omega$ with ext. circuitry.¹⁾

ANT terminating impedance $Z_{\rm ANT} = 50~\Omega~//~8.0~{\rm nH}^{1)}$ RX terminating impedance $Z_{\rm RX} = 50~\Omega + 3.6~{\rm nH}^{1)}$

| Center frequency F C T18 Hz Hz | Characteristics TX – ANT | | | | $\begin{array}{c} \text{min.} \\ \text{for } T_{\text{SPEC}} \end{array}$ | typ. @ +25 °C | $\begin{array}{c} \text{max.} \\ \text{for } T_{\text{\tiny SPEC}} \end{array}$ | |
|---|-------------------------------|---------------|-----|------------------------------------|---|-------------------------|---|----|
| Maximum Insertion attenuation 703 733 MHz α _{NH,max} | Center frequency | | | f _C | | | — | |
| Total | Maximum insertion attenuation | | | · · | | | | |
| Topic Top | | 703 733 | MHz | $\alpha_{\text{INT.max}}^{2)}$ | _ | 1.1 | 2.23) | dB |
| Total Control of the control of t | | 703 733 | MHz | | _ | 1.1 | 2.5 | dB |
| Total Part | | 703.24 732.76 | MHz | | _ | 1.5 | 2.5 ³⁾ | dB |
| Amplitude ripple (p-p) ∆α − 0.7 2.2 dB Maximum VSWR VSWR _{max} − 1.6 2.0 − 1.6 | | 703.24 732.76 | MHz | | | 1.5 | 2.8 | dB |
| Maximum VSWR VSWR _{max} — 1.6 2.0 @ TX port 703 733 MHz — 1.6 2.0 @ ANT port 703 733 MHz — 1.6 2.0 Minimum attenuation — MHz 28 31 — dB 670 694 MHz 28 32 — dB 692 698 MHz 4 24 — dB 758.24 787.76 MHz 42 47 — dB 815 849 MHz 26 30 — dB 815 849 MHz 26 30 — dB 820 894 MHz 30 34 — dB 880 915 MHz 30 34 — dB 925 960 MHz 28 32 — dB 1266 1187 MHz 37 44 — dB 1427.9 1466 MHz 35 | Amplitude ripple (p-p) | | | | | | | |
| @ TX port 703 733 MHz − 1.6 2.0 @ ANT port 703 733 MHz − 1.6 2.0 Minimum attenuation | | 703.24 732.76 | MHz | | _ | 0.7 | 2.2 | dB |
| @ TX port 703 733 MHz − 1.6 2.0 @ ANT port 703 733 MHz − 1.6 2.0 Minimum attenuation | Maximum VSWR | | | $VSWR_{max}$ | | | | |
| Minimum attenuation 10 670 MHz 670 694 MHz 28 32 — dB 692 698 MHz 4 24 — dB 758.24 787.76 MHz 791 821 MHz 22 25 — dB 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 26 30 — dB 860 894 MHz 30 34 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1427.9 1462.9 MHz 38 38 — dB 1457.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB | @ TX port | 703 733 | MHz | | _ | 1.6 | 2.0 | |
| 10 670 MHz | @ ANT port | 703 733 | MHz | | _ | 1.6 | 2.0 | |
| 670 694 MHz 28 32 — dB 692 698 MHz 4 24 — dB 758.24 787.76 MHz 42 47 — dB 791 821 MHz 22 25 — dB 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB | Minimum attenuation | | | $\boldsymbol{\alpha}_{\text{min}}$ | | | | |
| 692 698 MHz 4 24 — dB 758.24 787.76 MHz 42 47 — dB 791 821 MHz 22 25 — dB 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — | | 10 670 | MHz | | 28 | 31 | _ | dB |
| 758.24 787.76 MHz 42 47 — dB 791 821 MHz 22 25 — dB 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 | | 670 694 | MHz | | 28 | 32 | _ | dB |
| 791 821 MHz 22 25 — dB 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1575 1563 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.55 1605.89 MHz 35 37 — dB | | 692 698 | MHz | | 4 | 24 | _ | dB |
| 815 849 MHz 26 30 — dB 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1573.37 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1577.55 1605.89 MHz 35 37 — dB | | 758.24 787.76 | MHz | | 42 | 47 | _ | dB |
| 832 862 MHz 28 32 — dB 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | 791 821 | MHz | | 22 | 25 | _ | dB |
| 860 894 MHz 30 34 — dB 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1577.37 1577.47 MHz 35 38 — dB 1577.55 1605.89 MHz 35 38 — dB | | 815 849 | MHz | | 26 | 30 | _ | dB |
| 880 915 MHz 25 29 — dB 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | 832 862 | MHz | | 28 | 32 | _ | dB |
| 925 960 MHz 28 32 — dB 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 38 — dB | | 860 894 | MHz | | 30 | 34 | _ | dB |
| 1166 1187 MHz 37 44 — dB 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 38 — dB | | 880 915 | MHz | | 25 | 29 | _ | dB |
| 1226 1250 MHz 37 42 — dB 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 MHz 35 38 — dB | | | | | 28 | 32 | _ | dB |
| 1406 1466 MHz 35 38 — dB 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1427.9 1462.9 MHz 35 38 — dB 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1452 1496 MHz 35 38 — dB 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1475.9 1510.9 MHz 35 38 — dB 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1559 1563 MHz 35 38 — dB 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1565.42 1573.37 MHz 35 38 — dB 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1573.37 1577.47 MHz 35 38 — dB 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1577.47 1585.42 MHz 35 38 — dB 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| 1597.55 1605.89 MHz 35 37 — dB | | | | | | | _ | |
| | | | | | | | | |
| | | 1710 1785 | MHz | | 30 | 37 | _ | dB |



| Characteristics TX – ANT | | | $\begin{array}{c} \textbf{min.} \\ \textbf{for } T_{\texttt{SPEC}} \end{array}$ | typ. @ +25 °C | $\begin{array}{c} \text{max.} \\ \text{for } T_{\text{\tiny SPEC}} \end{array}$ | |
|--------------------------|-----------|-----|---|-------------------------|---|----|
| | 1805 1880 | MHz | 30 | 37 | _ | dB |
| | 1930 1995 | MHz | 30 | 37 | _ | dB |
| | 2010 2025 | MHz | 30 | 38 | _ | dB |
| | 2109 2199 | MHz | 35 | 38 | _ | dB |
| | 2300 2400 | MHz | 30 | 38 | _ | dB |
| | 2400 2484 | MHz | 35 | 38 | _ | dB |
| | 2496 2690 | MHz | 35 | 39 | _ | dB |
| | 2812 2932 | MHz | 30 | 39 | _ | dB |
| | 3300 3800 | MHz | 35 | 40 | _ | dB |
| | 3300 4200 | MHz | 35 | 40 | _ | dB |
| | 4400 5000 | MHz | 35 | 39 | _ | dB |
| | 4900 5950 | MHz | 25 | 39 | _ | dB |

See Sec. Matching circuit (p. 6).

Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

³⁾ Valid for typical temperature T = +25 °C.



6.2 ANT - RX

Temperature range for specification $T_{\rm SPEC} = -30~^{\circ}{\rm C}$... +85 $^{\circ}{\rm C}$ TX terminating impedance $Z_{\rm TX} = 50~\Omega$ with ext. circuitry. ¹⁾ ANT terminating impedance $Z_{\rm ANT} = 50~\Omega$ // 8.0 nH ¹⁾ RX terminating impedance $Z_{\rm RX} = 50~\Omega + 3.6~{\rm nH}$ 1)

| Characteristics ANT – RX | | | | $\begin{array}{c} \text{min.} \\ \text{for } T_{\text{SPEC}} \end{array}$ | typ. @ +25 °C | $\begin{array}{c} \text{max.} \\ \text{for } T_{\text{\tiny SPEC}} \end{array}$ | |
|-------------------------------|---------------|-----|---------------------------------------|---|-------------------------|---|-----|
| Center frequency | | | f _C | _ | 773 | _ | MHz |
| Maximum insertion attenuation | | | | | | | |
| | 758 788 | MHz | $\alpha_{\text{INT,max}}^{\qquad 2)}$ | _ | 1.6 | 2.23) | dB |
| | 758 788 | MHz | $\alpha_{\text{INT,max}}^{\qquad 2)}$ | _ | 1.6 | 2.5 | dB |
| | 758.24 787.76 | MHz | $\alpha_{_{max}}$ | _ | 1.9 | 2.53) | dB |
| | 758.24 787.76 | MHz | α_{max} | _ | 1.9 | 2.8 | dB |
| Amplitude ripple (p-p) | | | Δα | | | | |
| | 758.24 787.76 | MHz | | _ | 0.7 | 1.8 | dB |
| Maximum VSWR | | | $VSWR_{max}$ | | | | |
| @ ANT port | 758 788 | MHz | | _ | 1.7 | 2.1 | |
| @ RX port | 758 788 | MHz | | _ | 1.9 | 2.2 | |
| Minimum attenuation | | | $\boldsymbol{\alpha}_{\text{min}}$ | | | | |
| | 10 699 | MHz | | 40 | 52 | _ | dB |
| | 45 65 | MHz | | 50 | 93 | _ | dB |
| | 703.24 732.76 | MHz | | 50 | 62 | _ | dB |
| | 733.24 747.76 | MHz | | 30 | 48 | _ | dB |
| | 814 2400 | MHz | | 40 | 48 | _ | dB |
| | 2400 2483 | MHz | | 30 | 64 | _ | dB |
| | 2496 2690 | MHz | | 30 | 63 | _ | dB |
| | 3300 3800 | MHz | | 46 | 52 | _ | dB |
| | 3300 4200 | MHz | | 42 | 47 | _ | dB |
| | 4400 5000 | MHz | | 32 | 37 | _ | dB |
| | 4900 5950 | MHz | | 27 | 32 | _ | dB |

See Sec. Matching circuit (p. 6).

Integrated attenuation α_{INT} : Averaged power $|S_{ij}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

³⁾ Valid for typical temperature T = +25 °C.



6.3 TX - RX

Temperature range for specification $T_{\rm SPEC} = -30~^{\circ}{\rm C}$... +85 $^{\circ}{\rm C}$ TX terminating impedance $Z_{\rm TX} = 50~\Omega$ with ext. circuitry. ¹⁾ ANT terminating impedance $Z_{\rm ANT} = 50~\Omega$ // 8.0 nH ¹⁾ RX terminating impedance $Z_{\rm RX} = 50~\Omega + 3.6~{\rm nH}$ 1)

| Characteristics TX – RX | | | | min. | typ. | max. | |
|-------------------------|---------------|-----|--------------------------------|--------------------|----------|-----------------------|----|
| | | | | for $T_{\rm SPEC}$ | @ +25 °C | for T_{SPEC} | |
| Minimum isolation | | | $\alpha_{\text{INT,min}}^{2)}$ | | | | |
| | 703.24 732.76 | MHz | | 55 ³⁾ | 60 | _ | dB |
| | 703.24 732.76 | MHz | | 55 | 60 | _ | dB |
| | 758.24 787.76 | MHz | | 53 ³⁾ | 58 | _ | dB |
| | 758.24 787.76 | MHz | | 53 | 58 | _ | dB |

See Sec. Matching circuit (p. 6).

Integrated attenuation α_{INT} : Averaged power $|S_{ii}|^2$ over the center 4.5 MHz of LTE 5 MHz (25 RB) channels.

Valid for typical temperature T = +25 °C.



7 **Maximum ratings**

| Storage temperature | T _{STG} ¹) = −40 °C +85 °C | |
|------------------------|---------------------------------------|---|
| DC voltage | $ V_{DC} = 5.0 \text{ V (max.)}^{2}$ | |
| ESD voltage | | |
| | $V_{ESD}^{3)} = 100 \text{ V (max.)}$ | Machine model. |
| | $V_{ESD}^{4)} = 150 \text{ V (max.)}$ | Human body model. |
| | $V_{ESD}^{5} = 700 \text{ V (max.)}$ | Charged device model. |
| Input power | P _{IN} | |
| @ TX port: 703 733 MHz | 29.5 dBm | ■ 5 MHz LTE uplink signal (1 RB) for 5000 h @ 50 °C. |
| | | ■ 5 MHz 5G-NR (DFT-s-OFDM) (1 RB) for 5000 h @ 50 °C. |
| @ TX port: 703 733 MHz | 28.5 dBm | 5 MHz 5G-NR (CP-OFDM) (1 RB) for 5000 h @ 50 °C. |

¹⁾ Not valid for packaging material. Storage temperature for packaging material is -25 °C to +40 °C.

²⁾ 168h Damp Heat Steady State acc. IEC 60068-2-67 Cy.

³⁾

⁴⁾

According to JESD22-A115B (MM – Machine Model), 10 negative & 10 positive pulses.

According to JESD22-A114F (HBM – Human Body Model), 1 negative & 1 positive pulse.

According to JESD22-C101C (CDM – Field Induced Charged Device Model), 3 negative & 3 positive pulses.



8 Transmission coefficients

8.1 TX – ANT

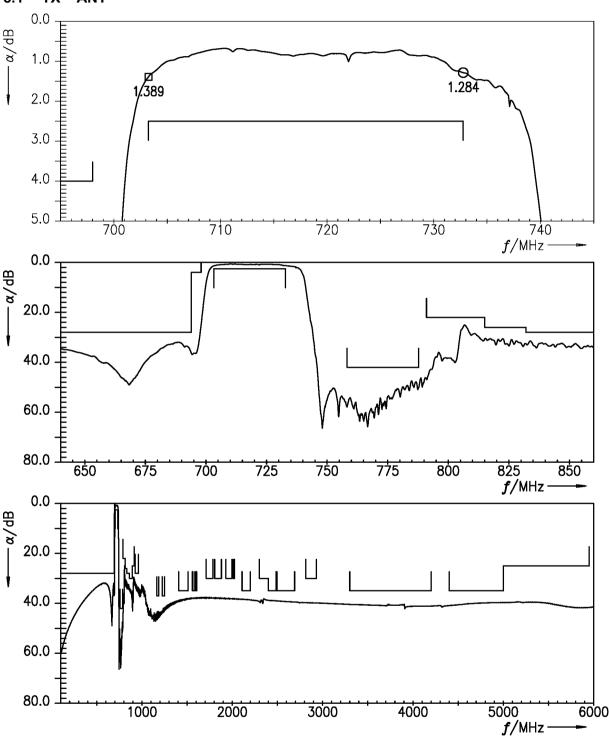


Figure 3: Attenuation TX – ANT.

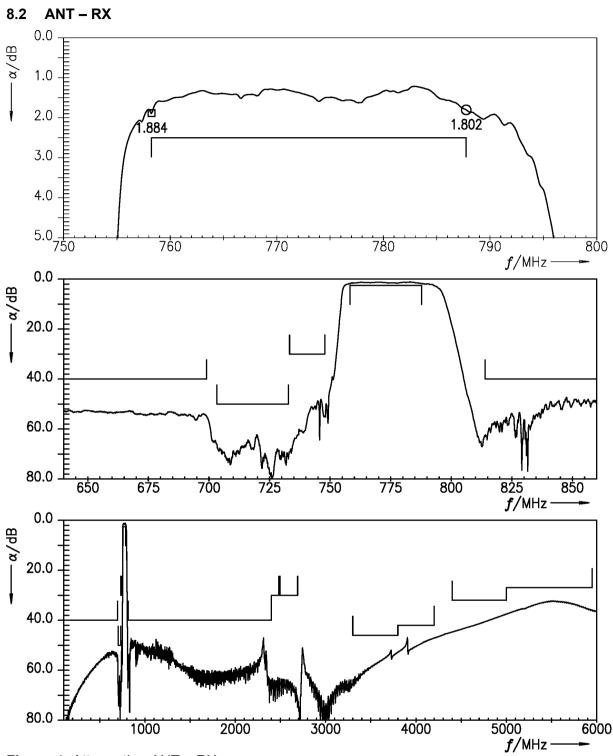


Figure 4: Attenuation ANT – RX.



9 Transmission coefficients (LTE)



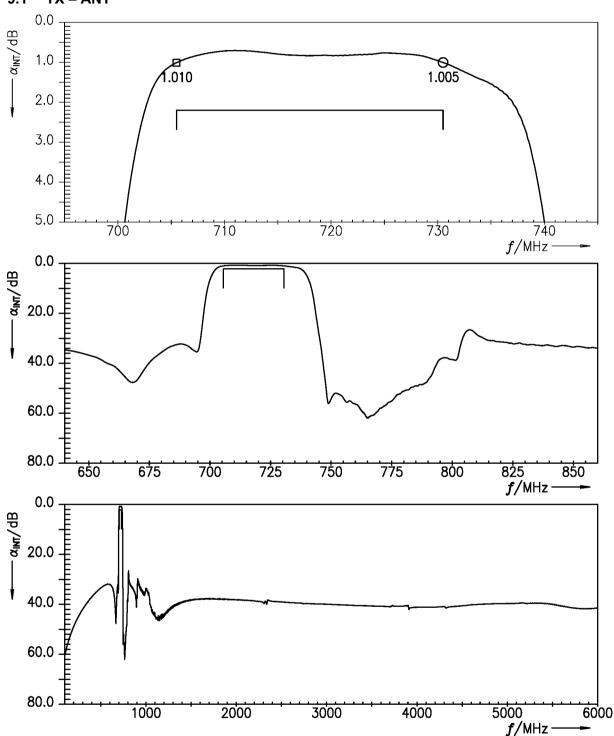


Figure 5: Attenuation (LTE) (integration window = 5 MHz) TX – ANT.

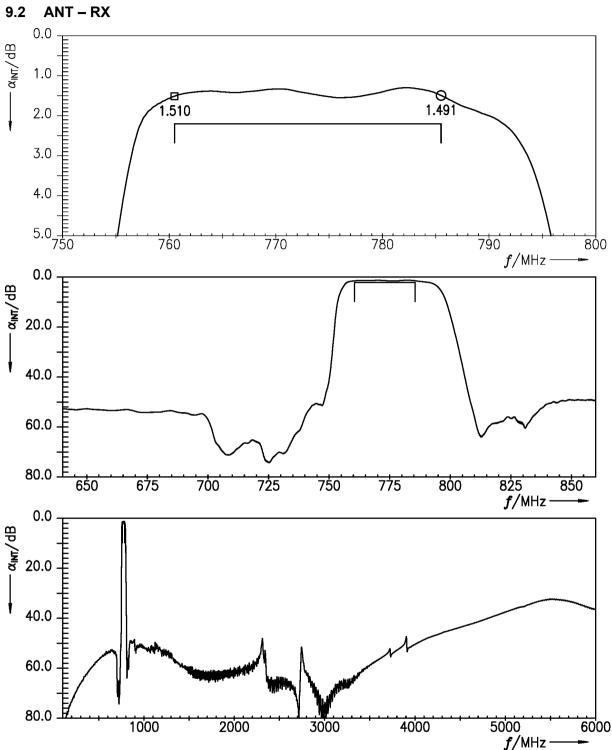


Figure 6: Attenuation (LTE) (integration window = 5 MHz) ANT – RX.

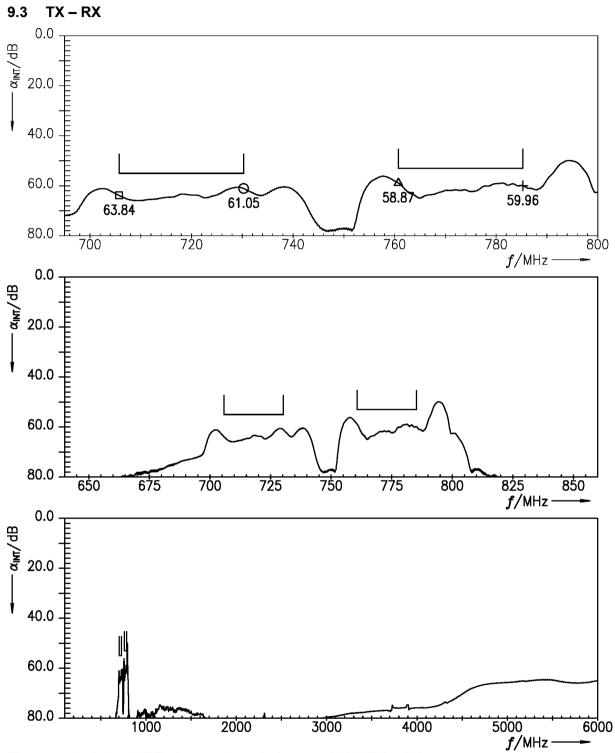
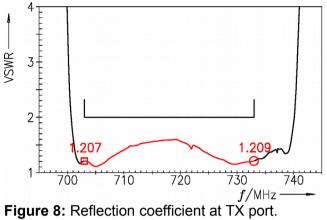
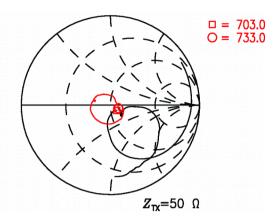


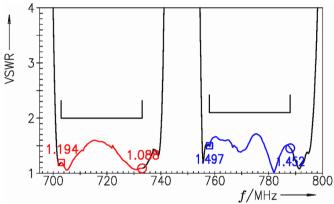
Figure 7: Isolation (LTE) (integration window = 5 MHz) TX – RX.



Reflection coefficients







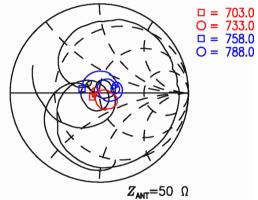
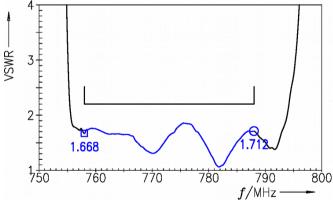


Figure 9: Reflection coefficient at ANT port (TX and RX frequencies).



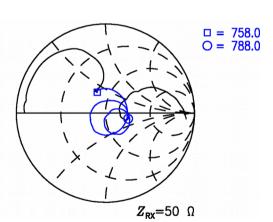


Figure 10: Reflection coefficient at RX port.



11 Packing material

11.1 Tape

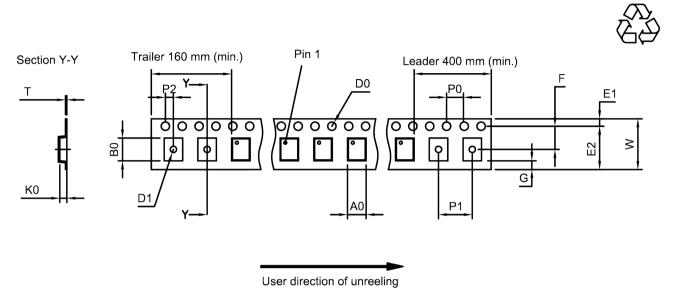


Figure 11: Drawing of tape (first-angle projection) for illustration only and not to scale. The valid tape dimensions are listed in Table 1.

| A ₀ | 1.4±0.05 mm | _ | E ₂ | 6.25 mm (min.) | _ | P ₁ | 4.0±0.1 mm |
|-----------------------|---------------|---|----------------|----------------|---|----------------|-----------------|
| B ₀ | 1.8±0.05 mm | | F | 3.5±0.05 mm | | P_2 | 2.0±0.05 mm |
| D_0 | 1.5+0.1/-0 mm | | G | 0.75 mm (min.) | | Т | 0.25±0.03 mm |
| D ₁ | 0.6+0.1/-0 mm | | K_0 | 0.7±0.05 mm | _ | W | 8.0+0.3/-0.1 mm |
| E ₁ | 1.75±0.1 mm | | P ₀ | 4.0±0.1 mm | _ | | |

Table 1: Tape dimensions.

11.2 Reel with diameter of 180 mm

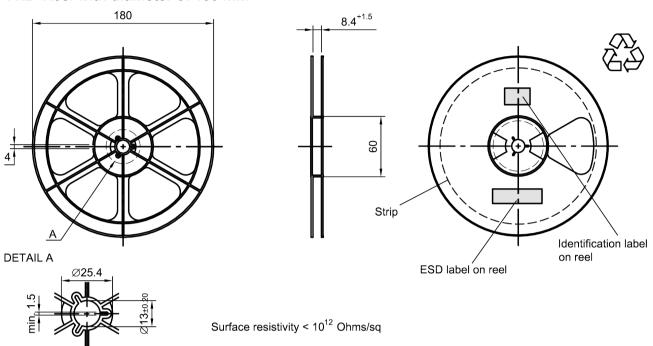


Figure 12: Drawing of reel (first-angle projection) with diameter of 180 mm.

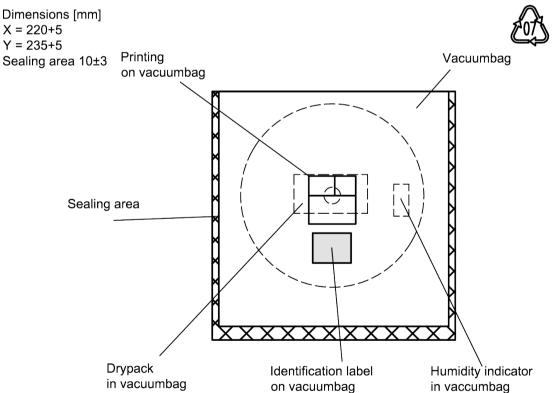


Figure 13: Drawing of moisture barrier bag (MBB) for reel with diameter of 180 mm.

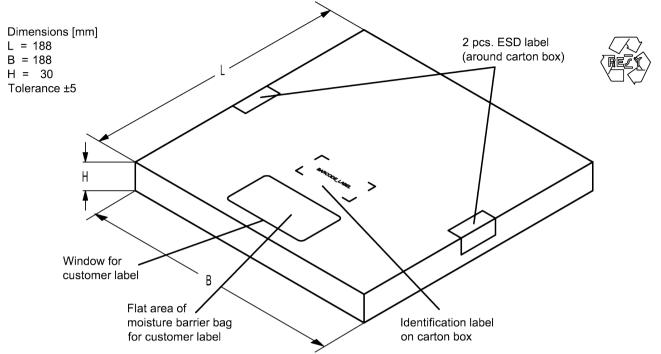


Figure 14: Drawing of folding box for reel with diameter of 180 mm.

11.3 Reel with diameter of 330 mm

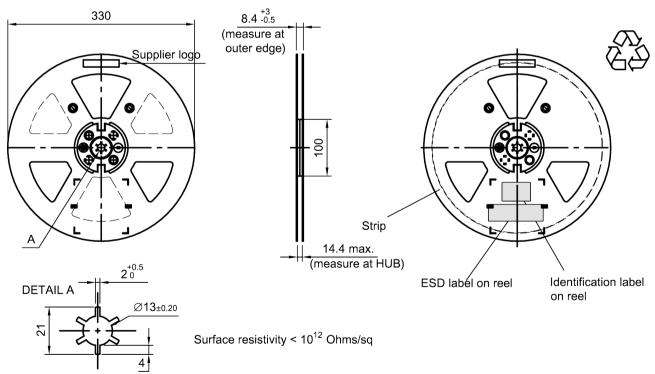


Figure 15: Drawing of reel (first-angle projection) with diameter of 330 mm.

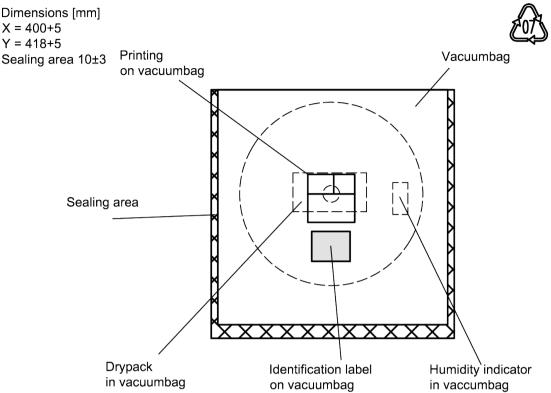


Figure 16: Drawing of moisture barrier bag (MBB) for reel with diameter of 330 mm.

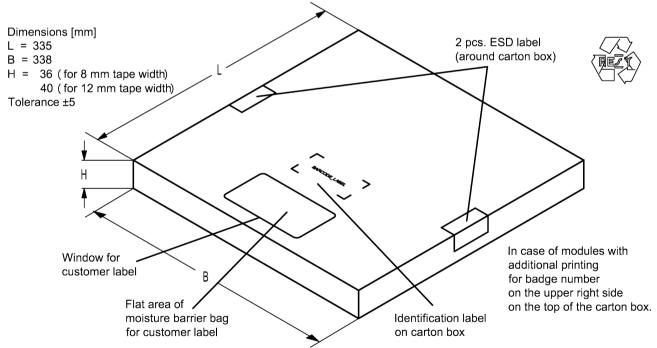


Figure 17: Drawing of folding box for reel with diameter of 330 mm.



12 Marking

Products are marked with product type number and lot number encoded according to Table 2:

■ Type number:

The 4 digit type number of the ordering code, e.g., B3xxxxB1234xxxx, is encoded by a special BASE32 code into a 3 digit marking.

Example of decoding type number marking on device in decimal code.

16J => 1234 1 x 32^2 + 6 x 32^1 + 18 (=J) x 32^0 = 1234

The BASE32 code for product type B1299 is 18K.

■ Lot number:

The last 5 digits of the lot number, e.g., are encoded based on a special BASE47 code into a 3 digit marking.

Example of decoding lot number marking on device in decimal code.

5UY => 12345

 $5 \times 47^2 + 27 = (-1) \times 47^1 + 31 = (-1) \times 47^0 = (-1) \times 47^1 + 31 = (-1) \times 47^0 = (-$

| Adopted BASE32 code for type number | | | | | | | |
|-------------------------------------|----------------|-------|--------|--|--|--|--|
| Decimal | Decimal Base32 | | Base32 | | | | |
| value | code | value | code | | | | |
| 0 | 0 | 16 | G | | | | |
| 1 | 1 | 17 | Н | | | | |
| 2 | 2 | 18 | J | | | | |
| 3 | 3 | 19 | K | | | | |
| 4 | 4 | 20 | M | | | | |
| 5 | 5 | 21 | N | | | | |
| 6 | 6 | 22 | Р | | | | |
| 7 | 7 | 23 | Q | | | | |
| 8 | 8 | 24 | R | | | | |
| 9 | 9 | 25 | S | | | | |
| 10 | Α | 26 | Т | | | | |
| 11 | В | 27 | V | | | | |
| 12 | С | 28 | W | | | | |
| 13 | D | 29 | Х | | | | |
| 14 | E | 30 | Y | | | | |
| 15 | F | 31 | Z | | | | |

| Adopted BASE47 code for lot number | | | | | | | |
|------------------------------------|-------------|---------------|-------------|--|--|--|--|
| Decimal value | Base47 code | Decimal value | Base47 code | | | | |
| 0 | 0 | 24 | R | | | | |
| 1 | 1 | 25 | S | | | | |
| 2 | 2 | 26 | Т | | | | |
| 3 | 3 | 27 | U | | | | |
| 4 | 4 | 28 | V | | | | |
| 5 | 5 | 29 | W | | | | |
| 6 | 6 | 30 | Х | | | | |
| 7 | 7 | 31 | Y | | | | |
| 8 | 8 | 32 | Z | | | | |
| 9 | 9 | 33 | b | | | | |
| 10 | Α | 34 | d | | | | |
| 11 | В | 35 | f | | | | |
| 12 | C | 36 | h | | | | |
| 13 | D | 37 | n | | | | |
| 14 | Е | 38 | r | | | | |
| 15 | F | 39 | t | | | | |
| 16 | G | 40 | V | | | | |
| 17 | Н | 41 | \ | | | | |
| 18 | J | 42 | ? | | | | |
| 19 | K | 43 | { | | | | |
| 20 | L | 44 | } | | | | |
| 21 | М | 45 | < | | | | |
| 22 | Ν | 46 | > | | | | |
| 23 | Р | | | | | | |

Table 2: Lists for encoding and decoding of marking.



13 Soldering profile

The recommended soldering process is in accordance with IEC $60068-2-58-3^{rd}$ edit and IPC/JEDEC J-STD-020B.

| ramp rate | ≤ 3 K/s |
|------------------------------------|--|
| preheat | 125 °C to 220 °C, 150 s to 210 s, 0.4 K/s to 1.0 K/s |
| T > 220 °C | 30 s to 70 s |
| T > 230 °C | min. 10 s |
| T > 245 °C | max. 20 s |
| <i>T</i> ≥ 255 °C | - |
| peak temperature T_{peak} | 250 °C +0/-5 °C |
| wetting temperature T_{\min} | 230 °C +5/-0 °C for 10 s ± 1 s |
| cooling rate | ≤ 3 K/s |
| soldering temperature T | measured at solder pads |

Table 3: Characteristics of recommended soldering profile for lead-free solder (Sn95.5Ag3.8Cu0.7).

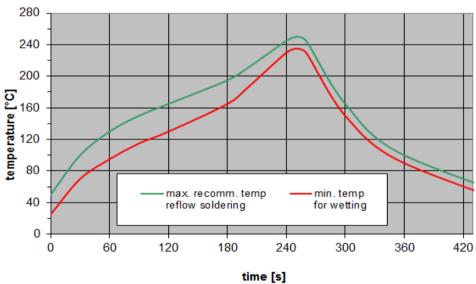


Figure 18: Recommended reflow profile for convection and infrared soldering – lead-free solder.



14 Annotations

14.1 RoHS compatibility

ROHS-compatible means that products are compatible with the requirements according to Art. 4 (substance restrictions) of Directive 2011/65/EU of the European Parliament and of the Council of June 8th, 2011, on the restriction of the use of certain hazardous substances in electrical and electronic equipment ("Directive") with due regard to the application of exemptions as per Annex III of the Directive in certain cases.

14.2 Scattering parameters (S-parameters)

The pin/port assignment is available in the headers of the S-parameter files. Please contact your local RF360 sales office.

14.3 Ordering codes / product IDs and packing units

| Ordering code / product ID | RF360 label | Packing unit |
|----------------------------|-----------------------|--------------|
| B39781B1299L210S 5 | B39781-B1299-L210-S05 | 5000 pcs |

Table 4: Ordering codes / product IDs and packing units.



15 Cautions and warnings

15.1 Display of ordering codes for RF360 products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications and the website of RF360, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products. Detailed information can be found on the Internet under https://rffe.gualcomm.com/.

15.2 Material information

Due to technical requirements components may contain dangerous substances. For information on the type in question please also contact one of our sales offices.

For information on recycling of tapes and reels please contact one of our sales offices.

15.3 Moldability

Before using in overmolding environment, please contact your local RF360 sales office.

15.4 Package information

Landing area

The printed circuit board (PCB) land pattern (landing area) shown is based on RF360 internal development and empirical data and illustrated for example purposes, only. As customers' SMD assembly processes may have a plenty of variants and influence factors which are not under control or knowledge of RF360, additional careful process development on customer side is necessary and strongly recommended in order to achieve best soldering results tailored to the particular customer needs.

Dimensions

Unless otherwise specified all dimensions are understood using unit millimeter (mm).

Projection method

Unless otherwise specified first-angle projection is applied.



16 Important notes

The following applies to all products named in this publication:

- 1. Some parts of this publication contain statements about the suitability of our products for certain areas of application. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application. As a rule, RF360 Europe GmbH and its affiliates are either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an RF360 product with the properties described in the product specification is suitable for use in a particular customer application.
- 2. We also point out that in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified. In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
- 3. The warnings, cautions and product-specific notes must be observed.
- 4. In order to satisfy certain technical requirements, some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous). Useful information on this will be found in our Material Data Sheets on the Internet (https://rffe.qualcomm.com). Should you have any more detailed questions, please contact our sales offices.
- 5. We constantly strive to improve our products. Consequently, the products described in this publication may change from time to time. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order. We also reserve the right to discontinue production and delivery of products. Consequently, we cannot guarantee that all products named in this publication will always be available.

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