

BGSX22GN10

RF Antenna Cross Switch

Data Sheet

Revision 3.5, 2016-02-02

Industrial and Multi-Market

Edition February 2, 2016

**Published by Infineon Technologies AG
81726 Munich, Germany**

**©2016 Infineon Technologies AG
All Rights Reserved.**

LEGAL DISCLAIMER

THE INFORMATION GIVEN IN THIS APPLICATION NOTE IS GIVEN AS A HINT FOR THE IMPLEMENTATION OF THE INFINEON TECHNOLOGIES COMPONENT ONLY AND SHALL NOT BE REGARDED AS ANY DESCRIPTION OR WARRANTY OF A CERTAIN FUNCTIONALITY, CONDITION OR QUALITY OF THE INFINEON TECHNOLOGIES COMPONENT. THE RECIPIENT OF THIS APPLICATION NOTE MUST VERIFY ANY FUNCTION DESCRIBED HEREIN IN THE REAL APPLICATION. INFINEON TECHNOLOGIES HEREBY DISCLAIMS ANY AND ALL WARRANTIES AND LIABILITIES OF ANY KIND (INCLUDING WITHOUT LIMITATION WARRANTIES OF NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS OF ANY THIRD PARTY) WITH RESPECT TO ANY AND ALL INFORMATION GIVEN IN THIS APPLICATION NOTE.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office. Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History

Document No.: BGSX22GN10_data_sheet_v3.5.pdf

Revision History: 3.5

Previous Version: 3.4

Page	Subjects (major changes since last revision)
6,8	RF frequency range updated
8	Ambient temperature updated
9	Insertion loss, return loss and isolation performance updated

Trademarks of Infineon Technologies AG

AURIX™, C166™, CanPAK™, CIPOS™, CIPURSE™, CoolGaN™, CoolMOS™, CoolSET™, CoolSiC™, CORECONTROL™, DAVE™, DI-POL™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, ISOFACE™, I²RF™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OptiMOS™, ORIGA™, OPTIGA™, PROFET™, PRO-SIL™, PRIMARION™, PrimePACK™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SIPMOS™, SOLID FLASH™, SmartLEWIS™, TEMPFET™, thinQ!™, TriCore™, TRENCHSTOP™.

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, PRIMECELL™, REALVIEW™, THUMB™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-iq™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. Mifare™ of NXP. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Sattelite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

Last Trademarks Update 2012-12-13

Contents

1 Features	6
2 Product Description	6
3 Maximum Ratings	8
4 Operation Ranges	8
5 RF Characteristics	9
6 Application Circuit Diagram	11
7 Pin Description	12
8 Package Information	13

List of Figures

1	BGSX22GN10 block diagram	7
2	Application circuit	11
3	Pin configuration (top view)	12
4	Package Outline	13
5	Laser marking	13
6	Land pattern / stencil mask	14
7	Carrier tape	14

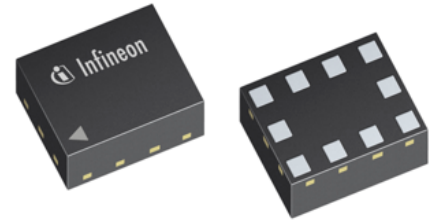
List of Tables

1	Ordering information	6
2	Truth table	7
3	Maximum ratings	8
4	Operation ranges	8
5	RF input power	8
6	RF Characteristics	9
7	RF characteristics II	10
8	Pin description	12
9	Mechanical data	13

BGSX22GN10 RF Antenna Cross Switch

1 Features

- Antenna cross switch with power handling capability of up to 35 dBm
- Low insertion loss
- Low harmonic generation
- High port-to-port-isolation
- 0.1 to 3.8 GHz coverage
- High ESD robustness
- On-chip control logic
- Very small leadless and halogen free package TSNP-10-1 (1.1x1.5 mm²) with super low height of 0.375 mm
- No decoupling capacitors required if no DC applied on RF lines
- RoHS compliant package



2 Product Description

The BGSX22GN10 RF MOS switch is specifically designed for dual antenna applications.

This single supply chip integrates on-chip CMOS logic driven by a simple, single-pin CMOS or TTL compatible control input signal. The 0.1 dB compression point exceeds the switch's maximum input power level, resulting in linear performance at all signal levels. The RF switch has a very low insertion loss of 0.35 dB in the 1 GHz and 0.60 dB in the 2.5 GHz range.

Unlike GaAs technology, external DC blocking capacitors at the RF ports are only required if DC voltage is applied externally.

The BGSX22GN10 RF switch is manufactured in Infineon's patented MOS technology, offering the performance of GaAs with the economy and integration of conventional CMOS including the inherent higher ESD robustness.

The device has a very small size of only 1.1x1.5mm² and a maximum height of 0.375 mm.

Table 1: Ordering Information

Type	Package	Marking
BGSX22GN10	TSNP-10-1	X2

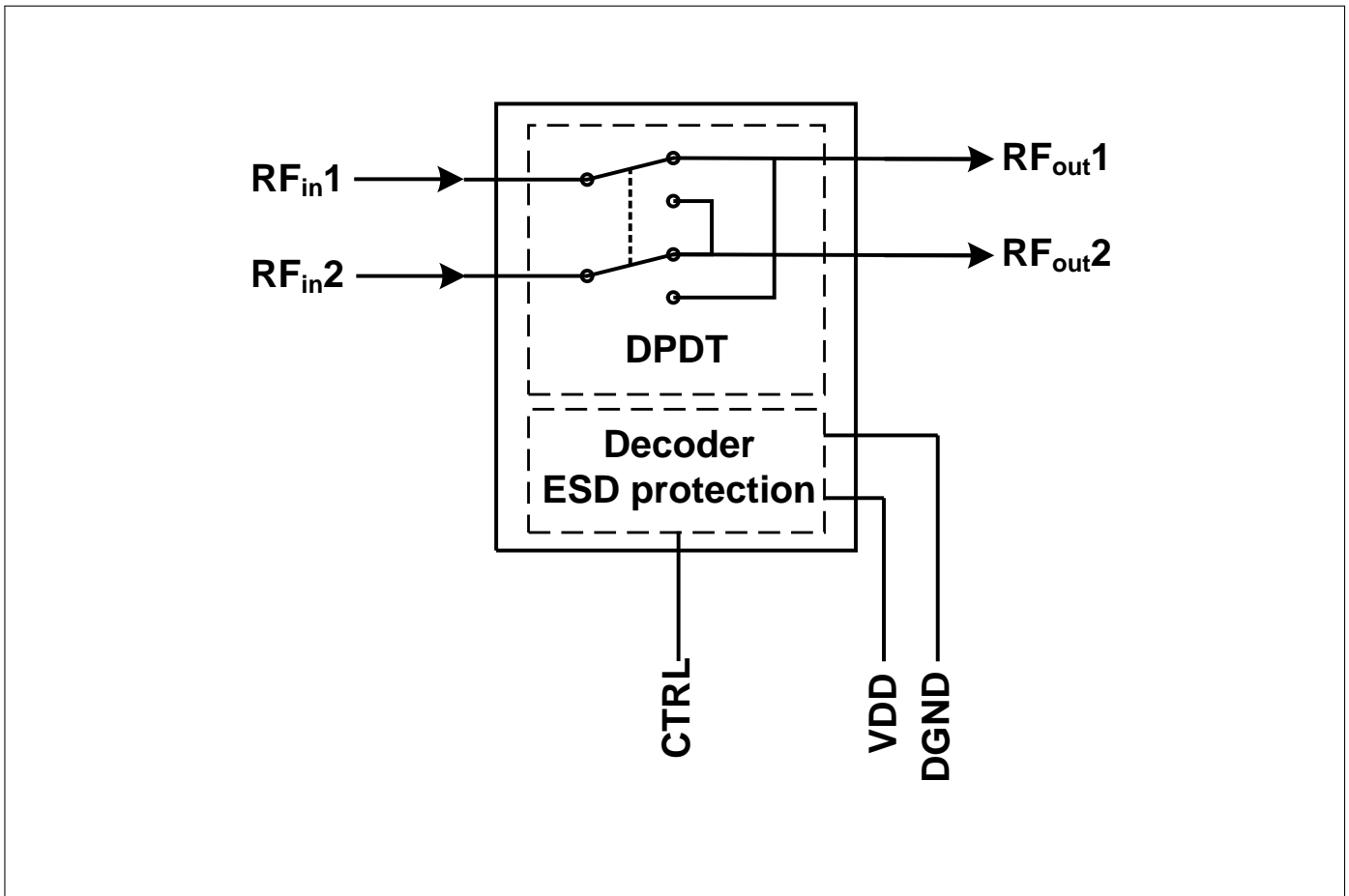


Figure 1: BGSX22GN10 block diagram

Table 2: Truth Table

Switched Paths	Ctrl
RFin1/2 - RFout1/2	0
RFin1/2 - RFout2/1	1

Note: When V_{dd} is applied the control pin has to be set to a defined logic level to ensure a proper operation of the switch.

3 Maximum Ratings

Table 3: Maximum Ratings at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_{dd}	-0.5	–	3.6	V	–
Maximum DC voltage on other pins	V_{DC}	0	–	0	V	No external DC voltage allowed
Storage temperature range	T_{STG}	-65	–	150	$^\circ\text{C}$	–
RF input power	P_{RF}	–	–	36	dBm	–
Junction temperature	T_j	–	–	125	$^\circ\text{C}$	–
ESD Capability						
Human body model ¹⁾	V_{ESD_HBM}	–1	–	+1	kV	–
ESD capability RFin Port ²⁾	V_{ESD_RFin}	–8	–	–8	kV	RFin versus GND, with 27 nH shunt inductor

¹⁾ Human Body Model ANSI/ESDA/JEDEC JS-001-2012 ($R = 1.5\text{ k}\Omega$, $C = 100\text{ pF}$).

²⁾ IEC 61000-4-2 ($R = 330\text{ }\Omega$, $C = 150\text{ pF}$), contact discharge.

Attention:

Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

4 Operation Ranges

Table 4: Operation Ranges

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Ambient temperature	T_A	-40	25	85	$^\circ\text{C}$	–
RF frequency	f	0.1	–	3.8	GHz	–
Supply voltage	V_{dd}	1.8	–	3.3	V	–
Control voltage low	V_{Ctrl_L}	-0.3	–	0.45	V	–
Control voltage high	V_{Ctrl_H}	1.35	–	V_{DD}	V	–

Table 5: RF Input Power

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
RF input power (50 Ω)	P_{In}	–	–	35	dBm	50 % Duty Cycle

5 RF Characteristics

Table 6: RF Characteristics at $T_A = -40 \dots +85 \text{ }^\circ\text{C}$, $P_{IN} = 0 \text{ dBm}$, supply voltage $V_{DD} = 1.8 \dots 3.3 \text{ V}$, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Insertion Loss						
All RF ports	<i>IL</i>	0.25	0.35	0.50	dB	824-915 MHz
		0.40	0.50	0.65	dB	1710-1910 MHz
		0.45	0.60	0.80	dB	2170-2690 MHz
		0.70	0.85	1.10	dB	3400-3600 MHz
		0.75	0.95	1.20	dB	3600-3800 MHz
Return Loss						
All RF ports	<i>RL</i>	22	25	29	dB	824-915 MHz
		19	22	25	dB	1710-1910 MHz
		15	18	20	dB	2170-2690 MHz
		10	14	17	dB	3400-3600 MHz
		10	13	16	dB	3600-3800 MHz
Isolation						
RFin1/2 to RFout1/2	<i>ISO</i>	22	25	29	dB	824-915 MHz
		19	22	25	dB	1710-1910 MHz
		15	18	20	dB	2170-2690 MHz
		14	15	16	dB	3400-3600 MHz
		13	14	15	dB	3600-3800 MHz
Harmonic Generation up to 12.75 GHz						
All RF ports, 2 nd harmonic	<i>P_{Harm}</i>	-98	-108	-111	dBc	$f = 786.5 \text{ MHz}$, $P_{in} = 26 \text{ dBm}$, CW, 50Ω
		-105	-114	-122	dBc	$f = 824 \text{ MHz}$, $P_{in} = 25 \text{ dBm}$, CW, 50Ω
		-99	-106	-111	dBc	$f = 824 \text{ MHz}$, $P_{in} = 35 \text{ dBm}$, CW, 50Ω
		-112	-122	-128	dBc	$f = 1800 \text{ MHz}$, $P_{in} = 25 \text{ dBm}$, CW, 50Ω
		-102	-115	-121	dBc	$f = 1800 \text{ MHz}$, $P_{in} = 35 \text{ dBm}$, CW, 50Ω
All RF ports, 3 rd harmonic	<i>P_{Harm}</i>	-102	-112	-115	dBc	$f = 786.5 \text{ MHz}$, $P_{in} = 26 \text{ dBm}$, CW, 50Ω
		-108	-110	-113	dBc	$f = 824 \text{ MHz}$, $P_{in} = 25 \text{ dBm}$, CW, 50Ω
		-92	-97	-104	dBc	$f = 824 \text{ MHz}$, $P_{in} = 35 \text{ dBm}$, CW, 50Ω
		-109	-116	-122	dBc	$f = 1800 \text{ MHz}$, $P_{in} = 25 \text{ dBm}$, CW, 50Ω
		-88	-94	-105	dBc	$f = 1800 \text{ MHz}$, $P_{in} = 35 \text{ dBm}$, CW, 50Ω

Table 7: RF Characteristics II

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
All RF ports, all other harmonics	P_{Harm}	–	–	-90	dBc	$P_{in} = 25 \text{ dBm}$, CW, 50Ω
		–	–	-83	dBc	$P_{in} = 35 \text{ dBm}$, CW, 50Ω
Intermodulation Distortion in Rx Band¹						
2nd order input referred intercept point (all TRx Ports)	$IIP2$	102	120	127	dBm	$f = 0.1 - 2.7 \text{ GHz}$, Tx = 20 dBm, Interferer = -15 dBm, 50Ω
3rd order input referred intercept point (TRX Ports)	$IIP3$	65	75	84	dBm	
Switching Time and Current Consumption						
RF rise time	$t_{10\%-90\%}$	–	1.0	1.5	μs	10% - 90% of RF signal
Ctrl to RF time	$t_{Ctrl-RF}$	–	3.5	5	μs	50% of Ctrl signal to 90% of RF signal
Supply current	I_{dd}	75	100	200	μA	–
Control current	I_{Ctrl}	–	1	–	μA	–

Note: All electrical characteristics are measured with all RF ports terminated by 50Ω loads.

¹ $T_A = +25^\circ\text{C}$, $V_{DD} = 2.6 \text{ V}$

6 Application Circuit Diagram

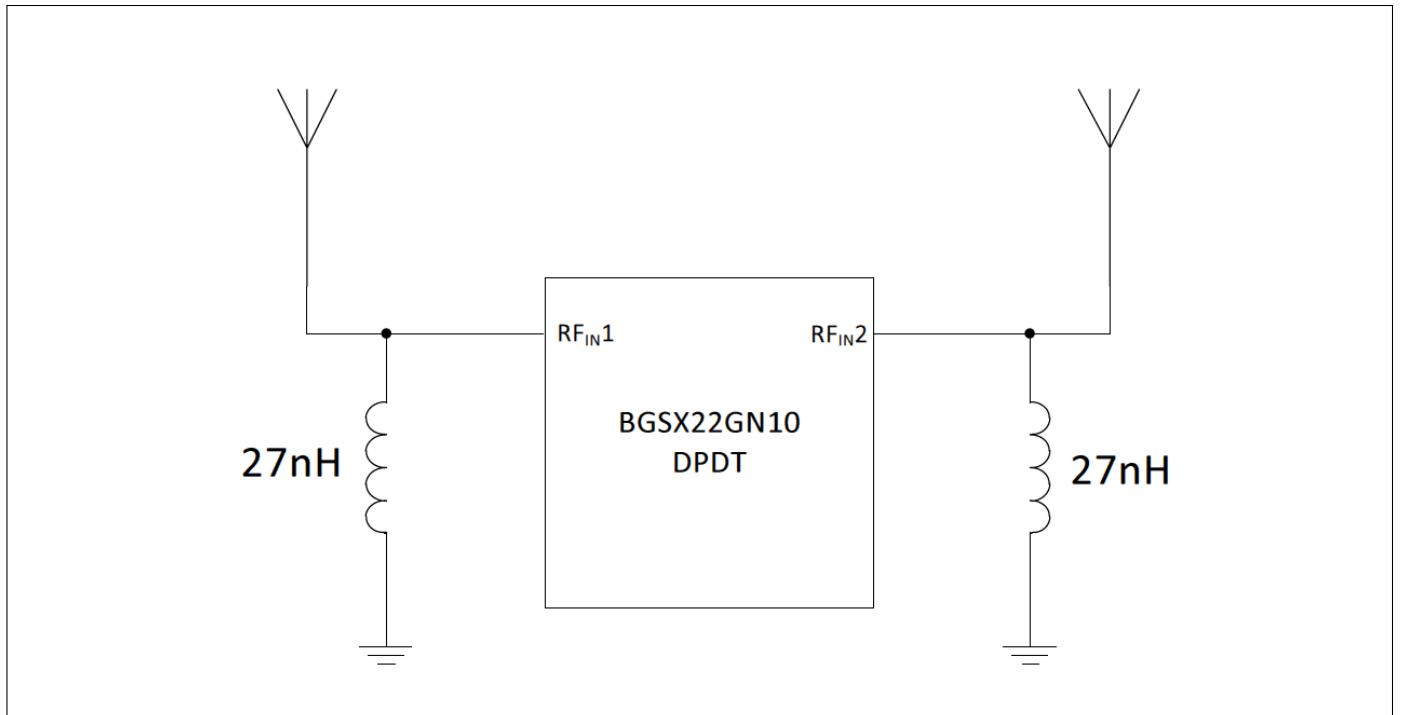


Figure 2: Application circuit

7 Pin Description

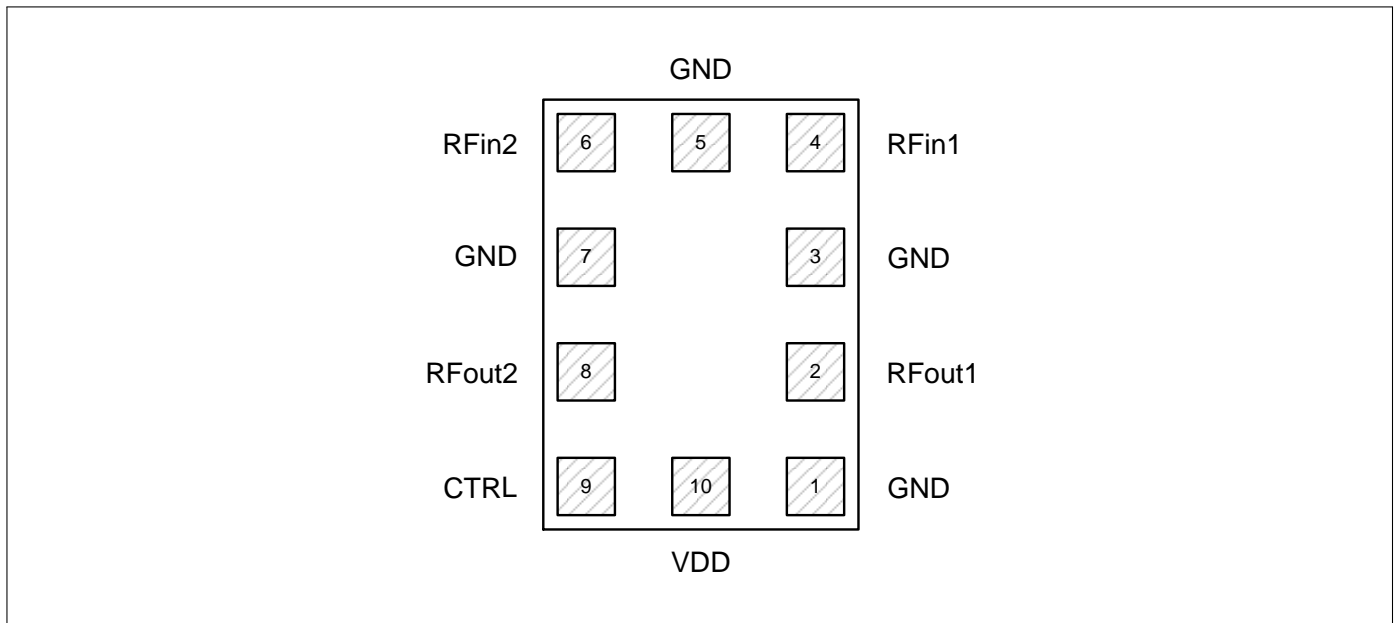


Figure 3: Pin configuration (top view)

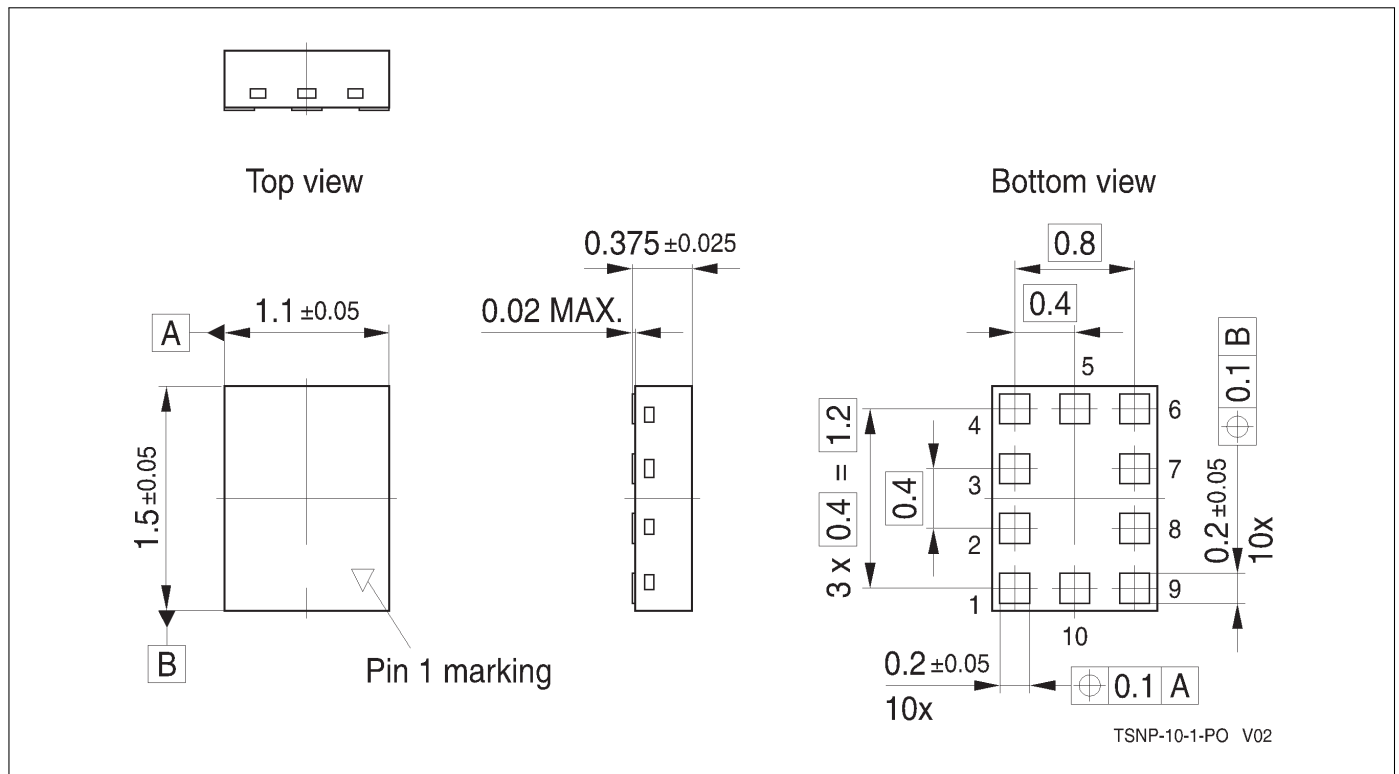
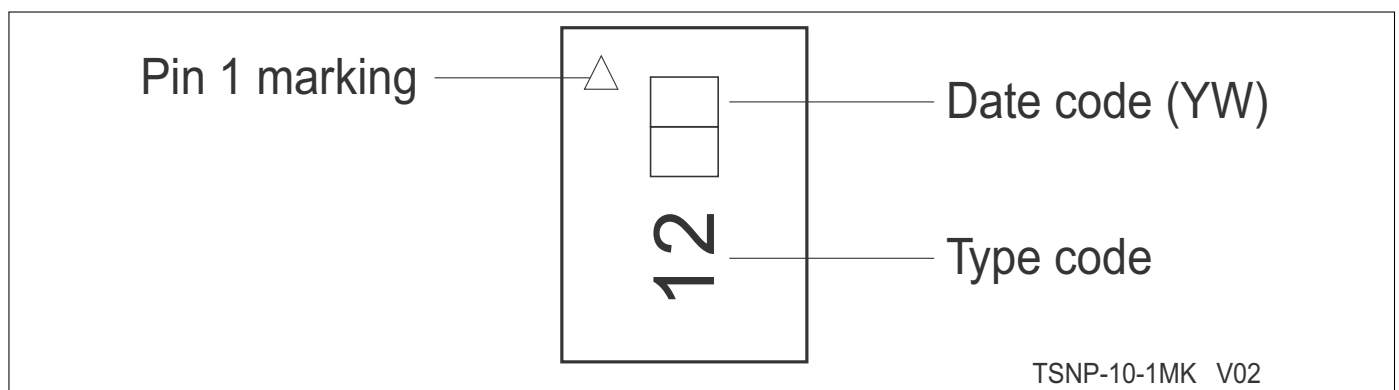
Table 8: Pin Description

Pin No.	Name	Pin Type	Buffer Type	Function
1	GND	GND		Ground
2	RFout1	I/O		RF out 1
3	GND	GND		Ground
4	RFin1	I/O		RF in 1
5	GND	GND		Ground
6	RFin2	I/O		RF in 2
7	GND	GND		Ground
8	RFout2	I/O		RF out 2
9	CTRL	I		Control pin
10	Vdd	PWR		Supply voltage

8 Package Information

Table 9: Mechanical Data

Parameter	Symbol	Value	Unit
X-Dimension	<i>X</i>	1.1 ± 0.05	mm
Y-Dimension	<i>Y</i>	1.5 ± 0.05	mm
Size	<i>Size</i>	1.65	mm ²
Height	<i>H</i>	0.375	mm


Figure 4: Package Outline

Figure 5: Laser marking

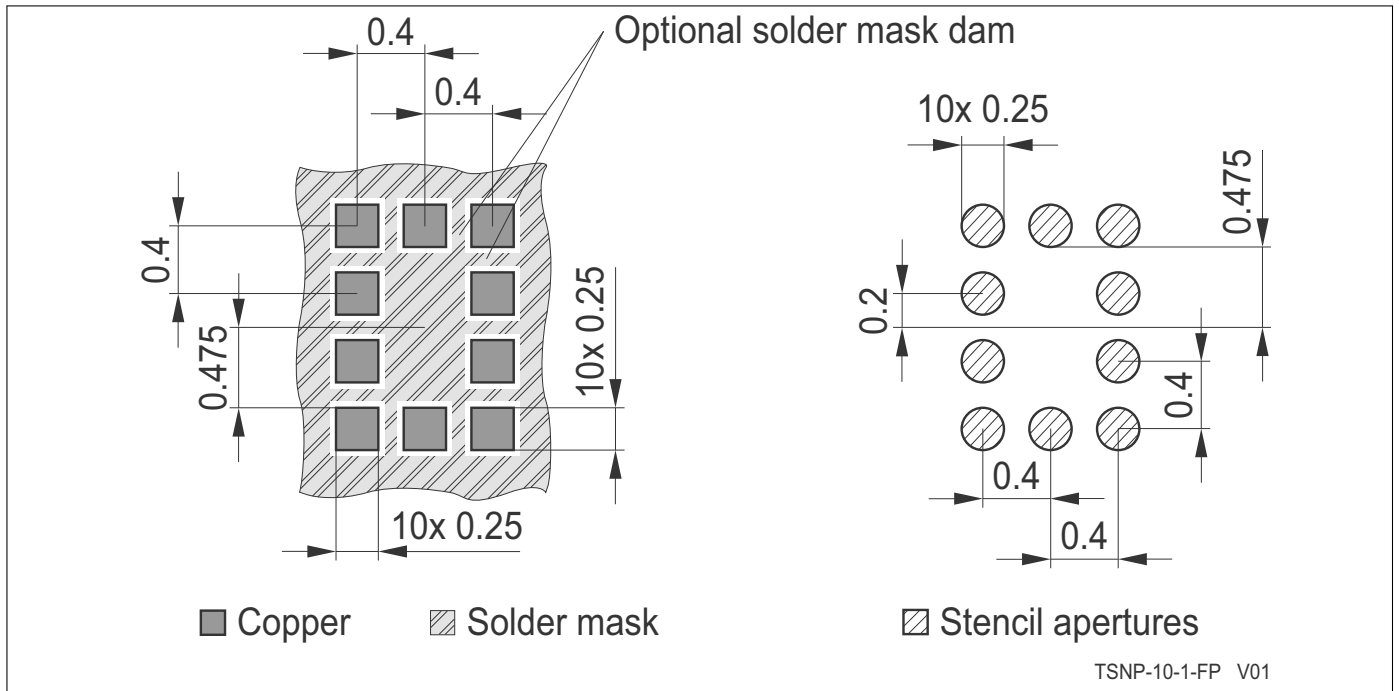


Figure 6: Land pattern / stencil mask

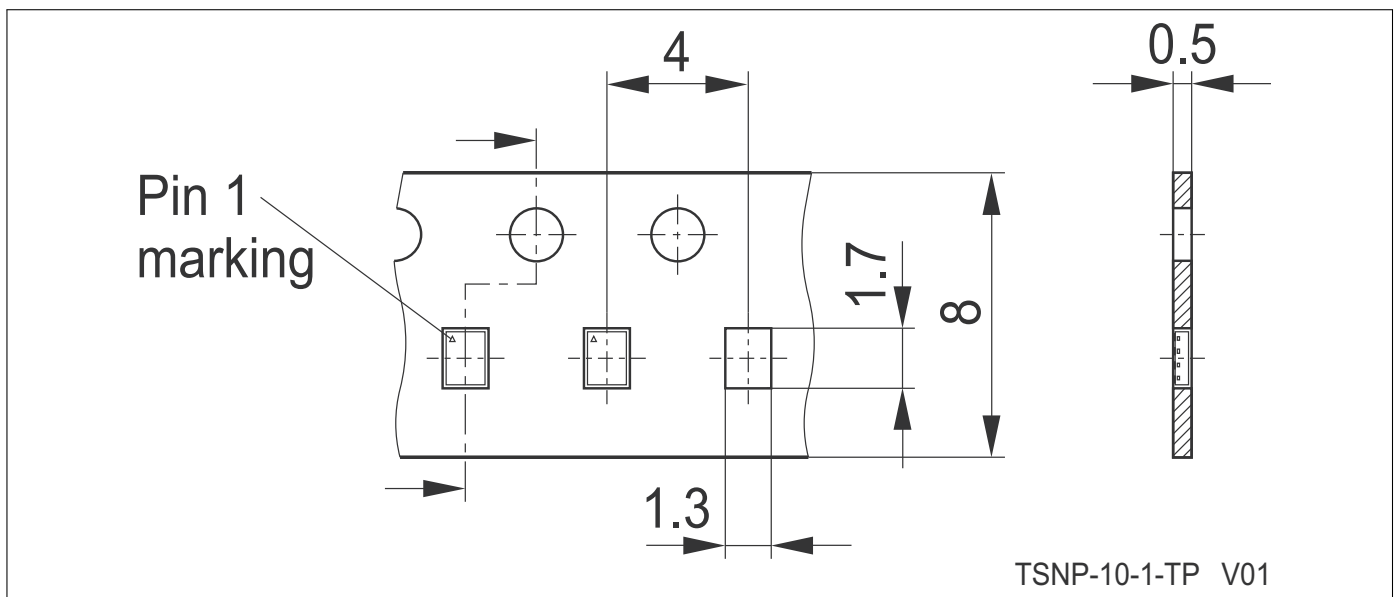


Figure 7: Carrier tape

www.infineon.com

Published by Infineon Technologies AG