BGSA14GN10

Single-Pole Quad Throw Antenna Tuning Switch

Data Sheet

Revision 2.1 - 2016-06-06

Power Management & Multimarket

Edition 2016-06-06

Published by
Infineon Technologies AG
81726 Munich, Germany

©2012 Infineon Technologies AG
All Rights Reserved.

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, 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.

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.: BGSA14GN10.pdf	
Revision History: 2.0	
Previous Version: 1.2 - 2015-08-04	
Page	**Subjects (major changes since last revision)**
6	added on Table. 3 Absolute Maximum RF Voltage
9	deleted RF Operating Voltage on Table. 7
12	Package Dimensions Drawing figure updated (Figure3)

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 **5**

2 Product Description **5**

3 Maximum Ratings **6**

4 Operation Ranges **7**

5 Logic Table **7**

6 RF small signal parameter **8**

7 RF large signal parameter **9**

8 Package Outline and Pin Configuration **11**

List of Figures

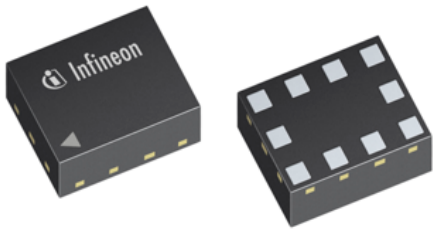
1 BGSA14GN10 block diagram 6
2 Pinout (top view) 11
3 Package Dimensions Drawing (TSNP-10-1) 12
4 Package Dimensions Drawing (TSNP-10-2) 12
5 Land pattern and stencil mask (TSNP-10-1/-2) 13
6 Tape drawing (TSNP-10-1) 13
7 Tape drawing (TSNP-10-2) 13
8 Package marking (TSNP-10-1): Date code digits Y and W are found in Table 13/14 14
9 Package marking (TSNP-10-2): Date code digits Y and W are found in Table 13/14 14

List of Tables

1 Ordering Information 5
2 Maximum Ratings, Table I 6
3 Maximum Ratings, Table II 7
4 Operation Ranges 7
5 Logic Table 7
6 RF small signal parameter 8
7 RF large signal Specifications 9
8 IIP2 conditions table 10
9 IIP3 conditions table 10
10 SV-LTE conditions table 10
11 Pin description 11
12 Mechanical data 11
13 Year date code marking 14
14 Week date code marking 14

BGSA14GN10 Single-Pole Quad Throw Antenna Tuning Switch

1 Features



- High-linearity SP4T for antenna aperture switching applications
- Ultra-Low R_{ON} of 1.6 Ω in ON state
- Ultra-Low C_{OFF} of 120 *fF* in OFF state
- High max RF voltage state handling
- Low harmonic generation
- No DC decoupling components required, if no external DC is applied on RF ports
- Supply voltage range: 1.8 to 3.6 V
- No insertion loss change within supply voltage range
- No linearity change within supply voltage range
- Suitable for EDGE / C2K / LTE / WCDMA Applications
- 0.1 to 5.0 GHz coverage
- Small form factor 1.1 mm x 1.5 mm
- 400 μm pad pitch
- RoHS and WEEE compliant package

2 Product Description

The BGSA14GN10 is a Single Pole Quad Throw (SP4T) RF antenna aperture switch optimized for low C_{off} enabling applications up to 5.0 GHz. This single supply chip integrates on-chip CMOS logic driven by a simple, single-pin CMOS or TTL compatible control input signal. Unlike GaAs technology, the 0.1 dB compression point exceeds the switch maximum input power level, resulting in linear performance at all signal levels and external DC blocking capacitors at the RF ports are only required if DC voltage is applied externally. Due to its very high RF voltage ruggedness it is suited for switching any reactive devices such as inductors and capacitors in RF matching circuits without significant losses in quality factors.

Table 1: Ordering Information

Type	Package	Marking	Chip
BGSA14GN10	TSNP10-1/-2	A4	BGSA14GN10

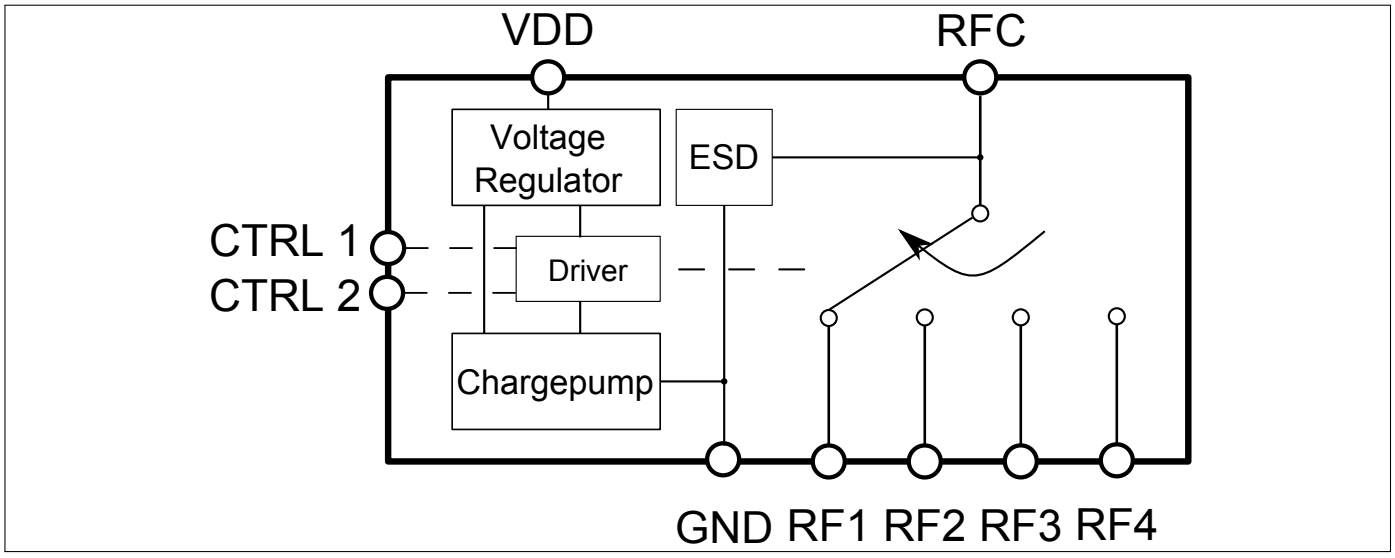


Figure 1: BGSA14GN10 block diagram

3 Maximum Ratings

Table 2: Maximum Ratings, Table I at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Frequency Range	f	0.1	–	–	GHz	[1]
Supply voltage [2]	V_{DD}	-0.5	–	3.6	V	–
Storage temperature range	T_{STG}	-55	–	150	°C	–
RF input power	P_{RF_TRx}	–	–	39	dBm	25 % Duty Cycle
RF voltage[3]	V_{RF_max}	–	–	48	V	All switch throws operated in isolation mode.
ESD capability, CDM [4]	$V_{ESD_{CDM}}$	-1.5	–	+1.5	*kV*	
ESD capability, HBM [5]	$V_{ESD_{HBM}}$	-1	–	+1	*kV*	
ESD capability, system level (RFC port) [6]	$V_{ESD_{ANT}}$	-8	–	+8	*kV*	RFC vs system GND, with 27 nH shunt inductor
Junction temperature	T_j	–	–	125	°C	–

[1] Switch has no highpass response. There is also a high ohmic DC to the RF path. The DC voltage at RF ports V_{RFDC} has to be 0V.
[2] Note: Consider any ripple voltages on top of V_{DD}. A high RF ripple at the V_{DD} can exceed the maximum ratings by $V_{DD} = V_{DC} + V_{Ripple}$.
[3] 1000h over 8 years lifetime-short pulse duration
[4] Field-Induced Charged-Device Model JESD22-C101. Simulates charging/discharging events that occur in production equipment and processes. Potential for CDM ESD events occurs whenever there is metal-to-metal contact in manufacturing.
[5] Human Body Model ANSI/ESDA/JEDEC JS-001-2012 (R = 1.5 kΩ, C = 100 pF).
[6] IEC 61000-4-2 (R = 330 Ω, C = 150 pF), contact discharge.

Warning: 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.

Table 3: Maximum Ratings, Table II at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Maximum DC-voltage on RF-Ports and RF-Ground	V_{RFDC}	0	–	0	V	No DC voltages allowed on RF-Ports
Control Voltage Levels	V_{CTRL}	-0.7	–	3.3	V	–

4 Operation Ranges

Table 4: Operation Ranges

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	V_{DD}	1.8	2.85	3.6	V	–
Supply current[1)]	I_{DD}	–	80	150	μA	–
Control voltage low	$V_{Ctrl,low}$	0		0.45	V	–
Control voltage high	$V_{Ctrl,high}$	1.2	1.8	2.85	V	$V_{Ctrl,high} \ll V_{DD}$
Control current low	$I_{Ctrl,low}$	-1	0	1	μA	–
Control current high	$I_{Ctrl,high}$	-1	0	1	μA	$V_{Ctrl,high} \ll V_{DD}$
Ambient temperature	T_A	-30	25	85	°C	–
RF switching time	t_{sw}	2	5	7	μs	–
Startup time	t_{sw}		20	30	μs	–

[1)] T_A = -30 °C – +85 °C, V_{VDD} = 1.8 – 3.6 V

5 Logic Table

Table 5: Logic Table

CTRL 1	CTRL 2	Mode
0	0	RF1 connected to RFC
0	1	RF2 connected to RFC
1	0	RF3 connected to RFC
1	1	RF4 connected to RFC

6 RF small signal parameter

Table 6: RF small signal parameter

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Frequency range	f	0.1	–	5.0	GHz	–
Switch ON resistance	R_{ON}	–	1.6		Ω	RFx to RFC
Switch OFF capacitance	C_{OFF}	–	120		fF	RFx to RFC
Parasitic RF shunt capacitance	$C_{SH,PAR}$	–	42		fF	RFx to GND, extracted value for 2 GHz
Switch series inductance	L_{SER}	–	0.1		nH	
Insertion Loss (1,2,3)						
698 - 960 MHz	*IL*	0.16	0.26	0.36	dB	V_{DD} = 1.8 – 3.6 *V*, T_A = -30 ... +85 °C, Z_0 = 50 Ω
1710 - 1980 MHz		0.23	0.37	0.47	dB	
1980 - 2170 MHz		0.29	0.39	0.49	dB	
2170 - 2690 MHz		0.36	0.46	0.59	dB	
Return Loss(1,2,3)						
All Ports @ 698 - 960 MHz	*RL*	19	22	26	dB	V_{DD} = 1.8 – 3.6 *V*, T_A = -30 ... +85 °C, Z_0 = 50 Ω
All Ports @ 1710 - 2690 MHz		17	21	25	dB	
Isolation RFx to RFC(1,2,3)						
698 - 960 MHz	*ISO*	28	31	38	dB	V_{DD} = 1.8 – 3.6 *V*, T_A = -30 ... +85 °C, Z_0 = 50 Ω
1710 - 1980 MHz		21	25	35	dB	
1980 - 2170 MHz		20	23	35	dB	
2170 - 2690 MHz		17	20	27	dB	

[1] Valid for all RF power levels, no compression behavior
[2] Network analyser input power: $P_{IN} = -20\,dBm$
[3] On application board without any matching components

7 RF large signal parameter

Table 7: RF large signal specifications

Harmonic Generation up to 12.75 GHz[1,2,3]						
Parameter	**Symbol**	**Values**			**Unit**	**Note / Test Condition**
		Min.	**Typ.**	**Max.**		
All RF Ports - Second Order Harmonics	P_{H2}	–	105	–	dBc	25 dBm, 50Ω, f_0 = 786 MHz
All RF Ports - Third Order Harmonics	P_{H3}	–	115	–	dBc	25 dBm, 50Ω, f_0 = 786 MHz
All RF Ports - Second Order Harmonics	P_{H2}	–	93	–	dBc	33 dBm, 50Ω, f_0 = 824 MHz
All RF Ports - Third Order Harmonics	P_{H3}	–	94	–	dBc	33 dBm, 50Ω, f_0 = 824 MHz
All RF Ports	P_{Hx}	105	–	–	dBc	25 dBm, 50Ω
Intermodulation Distortion IMD2 [1,2,3]						
IIP2, low	IIP2,l	–	110	–	dBm	IIP2 conditions table 8
IIP2, high	IIP2,h	–	120	–	dBm	
Intermodulation Distortion IMD3 [1,2,3]						
IIP3	IIP3	–	75	–	dBm	IIP3 conditions table 9
SV LTE Intermodulation [1,2,3]						
IIP3,SVLTE	IIP3,SV	–	75	–	dBm	SV-LTE conditions table 10

[1] Terminating Port Impedance: Z_0 = 50 Ω
[2] Supply Voltage: V_{DD} = 1.8 – 3.6 V
[3] On application board without any matching components

Table 8: IIP2 conditions table

Band	In-Band Frequency [MHz]	Blocker Frequency 1 [MHz]	Blocker Power 1 [dBm]	Blocker Frequency 2 [MHz]	Blocker Power 2 [dBm]
Band 1 Low	2140	1950	20	190	-15
Band 1 High	2140	1950	20	4090	-15
Band 5 Low	881.5	836.5	20	45	-15
Band 5 High	881.5	836.5	20	1718	-15

Table 9: IIP3 conditions table

Band	In-Band Frequency [MHz]	Blocker Frequency 1 [MHz]	Blocker Power 1 [dBm]	Blocker Frequency 2 [MHz]	Blocker Power 2 [dBm]
Band 1	2140	1950	20	1760	-15
Band 5	881.5	836.5	20	791.5	-15

Table 10: SV-LTE conditions table

Band	In-Band Frequency [MHz]	Blocker Frequency 1 [MHz]	Blocker Power 1 [dBm]	Blocker Frequency 2 [MHz]	Blocker Power 2 [dBm]
Band 5	872	827	23	872	14
Band 13	747	786	23	747	14
Band 20	878	833	23	2544	14

8 Package Outline and Pin Configuration

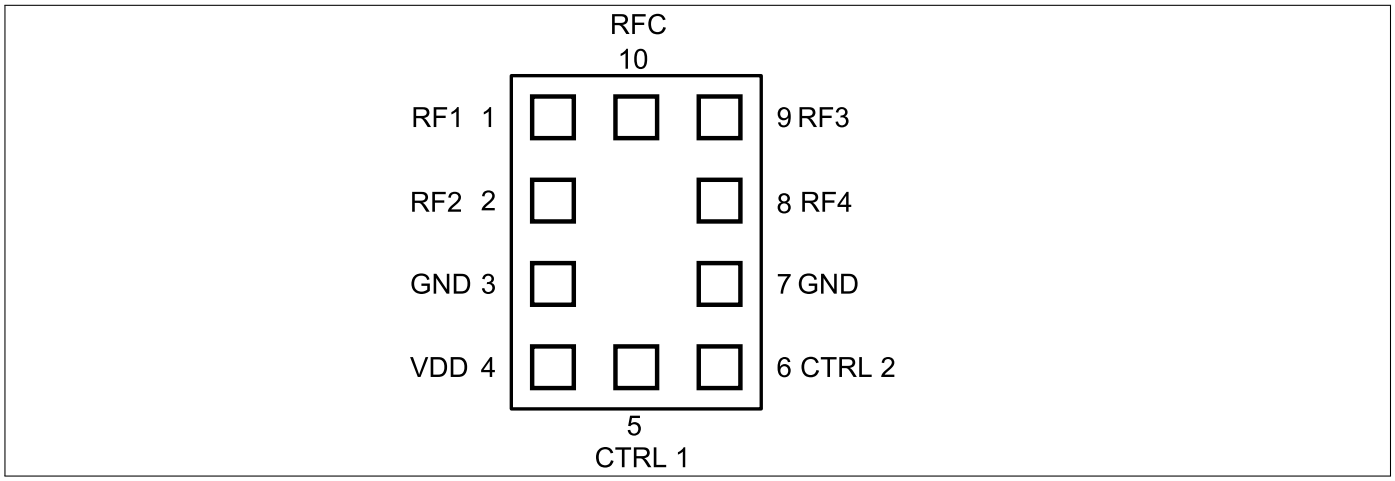


Figure 2: Pinout (top view)

Table 11: Pin Description

Pin No.	Name	Pin Type	Buffer Type	Function
1	RF1	I/O		RF1
2	RF2	I/O		RF2
3	GND	GND		Ground
4	VDD	PWR		Supply voltage
5	CTRL1	I		Control 1 Pin
6	CTRL2	I		Control 2 Pin
7	GND	GND		Ground
8	RF4	I/O		RF4
9	RF3	I/O		RF3
10	RFC	I/O		Common RF

Table 12: Mechanical Data

Parameter	Symbol	Value	Unit
X-Dimension	*X*	1.1 $\pm$ 0.05	*mm*
Y-Dimension	*Y*	1.5 $\pm$ 0.05	*mm*
Size	*Size*	1.65	mm^2
Height	*H*	0.375	*mm*

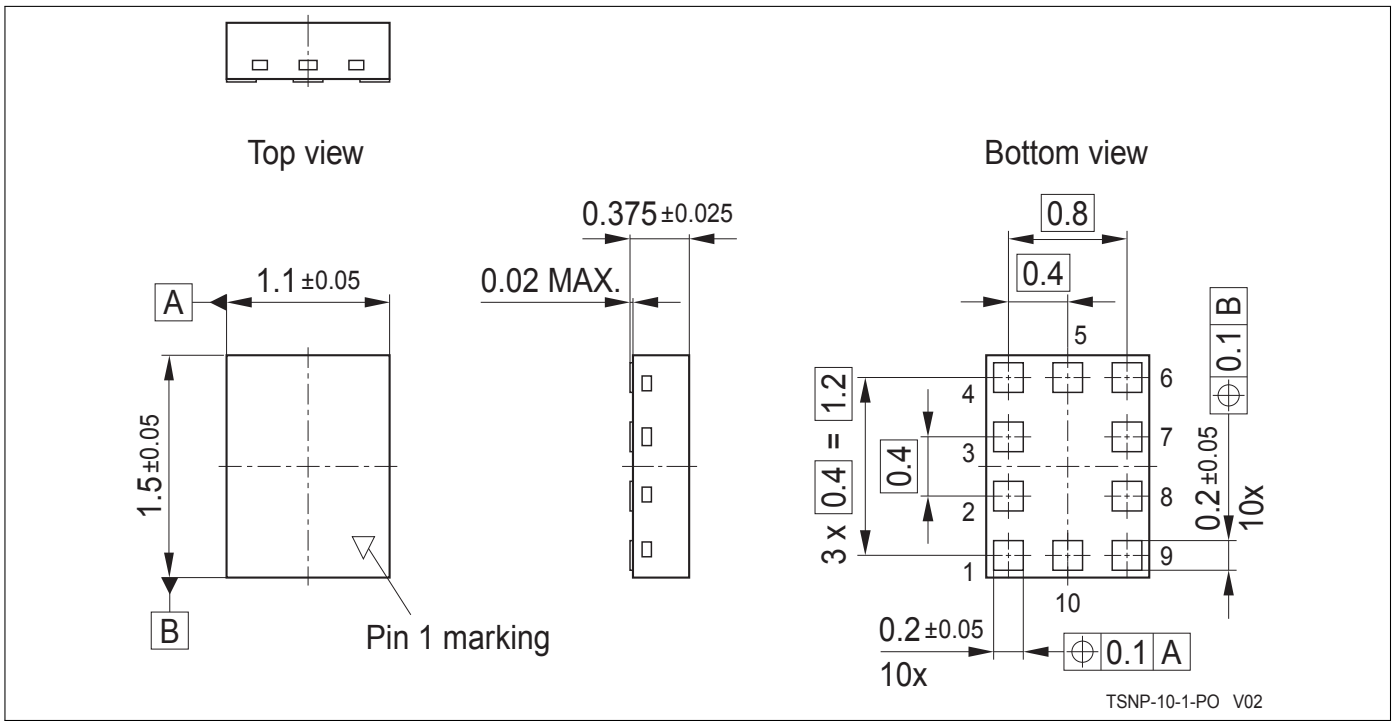


Figure 3: Package Dimensions Drawing (TSNP-10-1)

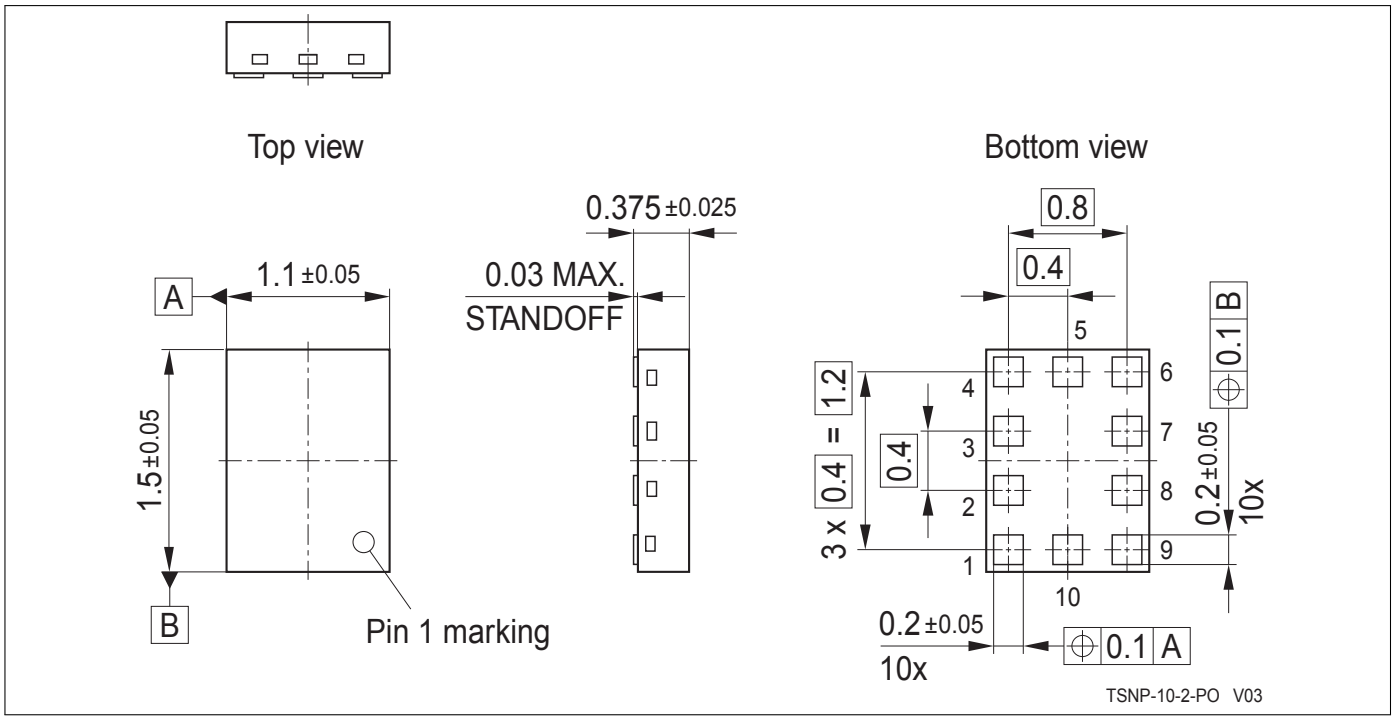


Figure 4: Package Dimensions Drawing (TSNP-10-2)

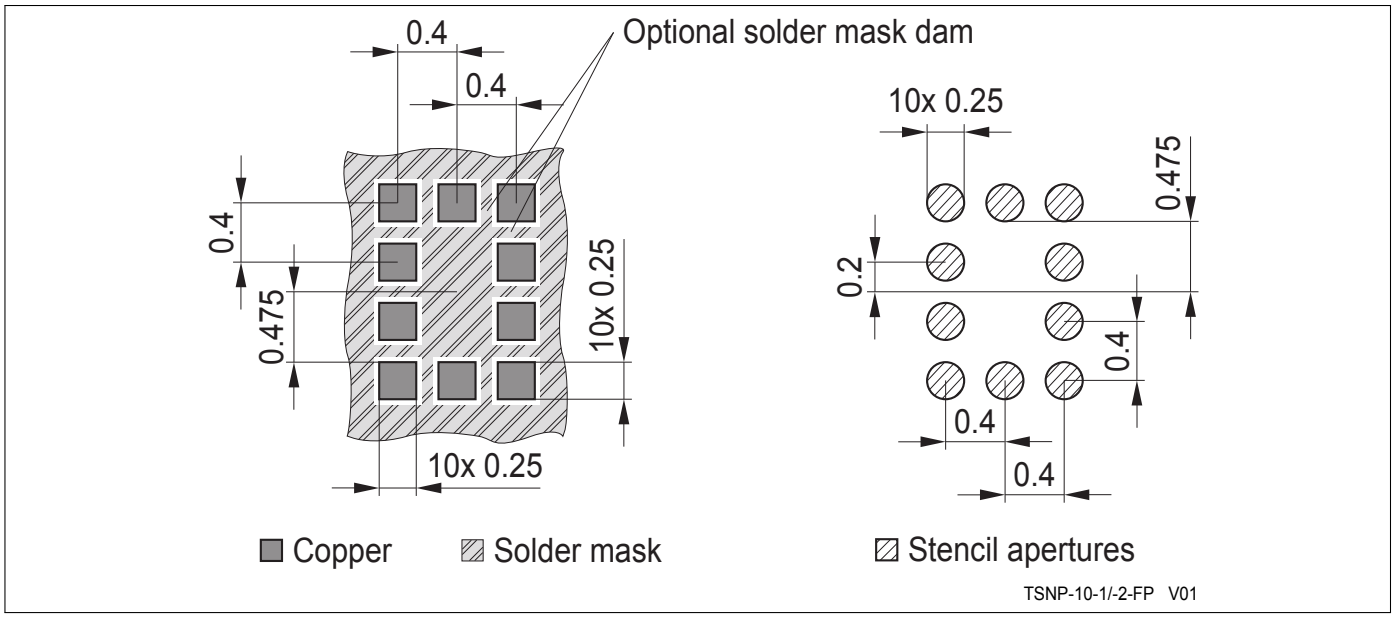


Figure 5: Land pattern and stencil mask (TSNP-10-1/-2)

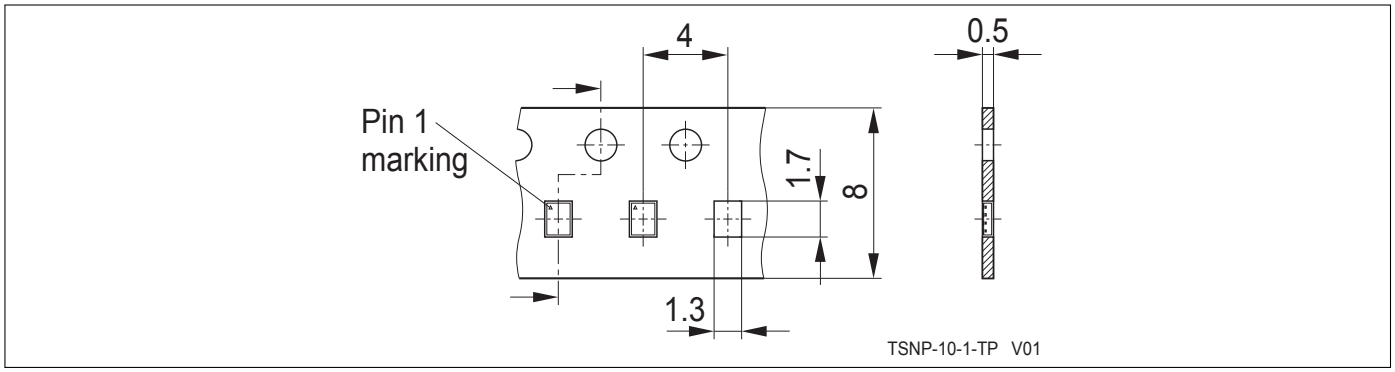


Figure 6: Tape drawing (TSNP-10-1)

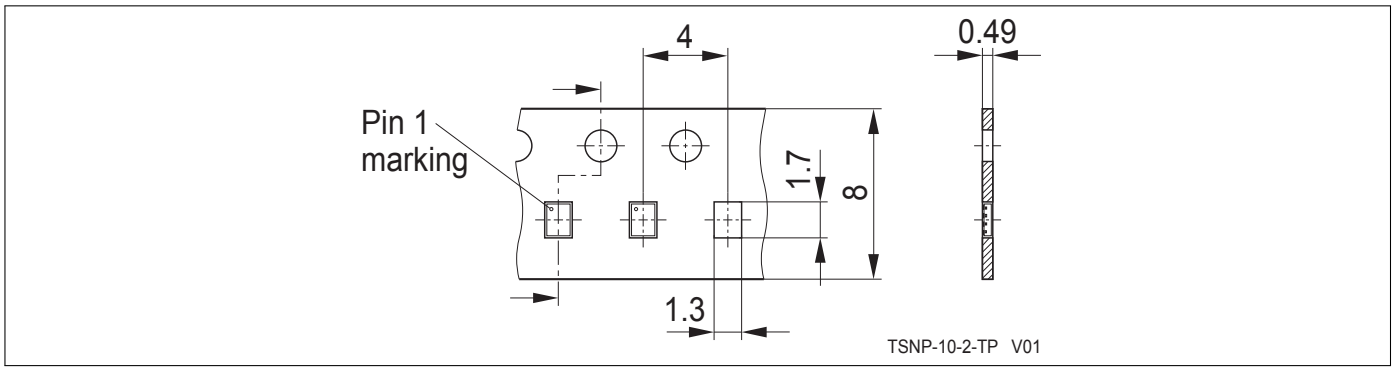


Figure 7: Tape drawing (TSNP-10-2)

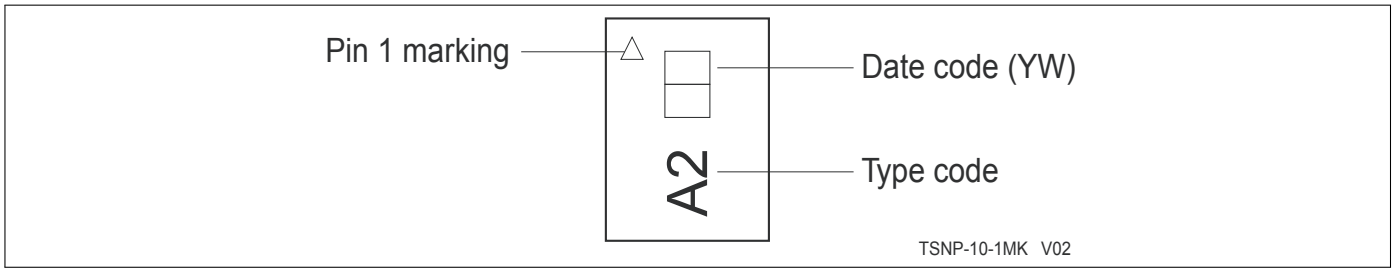


Figure 8: Package marking (TSNP-10-1): Date code digits Y and W are found in Table 13/14

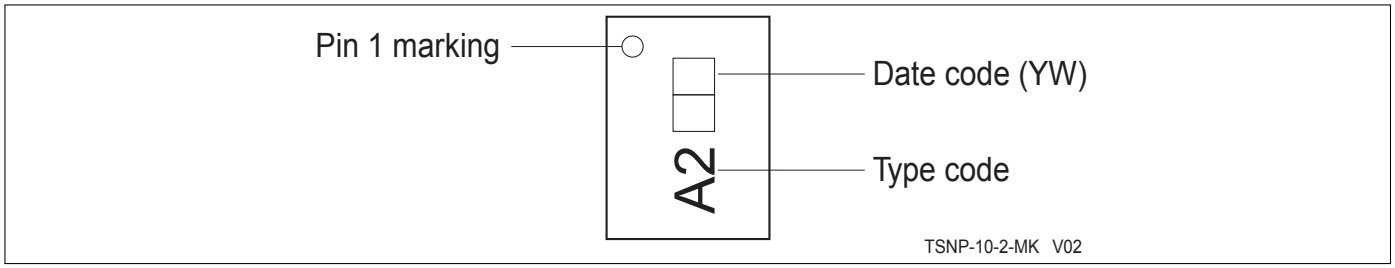


Figure 9: Package marking (TSNP-10-2): Date code digits Y and W are found in Table 13/14

Table 13: Year date code marking - digit "Y"

Year	"Y"	Year	"Y"	Year	"Y"
2000	0	2010	0	2020	0
2001	1	2011	1	2021	1
2002	2	2012	2	2022	2
2003	3	2013	3	2023	3
2004	4	2014	4	2024	4
2005	5	2015	5	2025	5
2006	6	2016	6	2026	6
2007	7	2017	7	2027	7
2008	8	2018	8	2028	8
2009	9	2019	9	2029	9

Table 14: Week date code marking - digit "W"

Week	"W"	Week	"W"	Week	"W"	Week	"W"	Week	"W"
1	A	12	N	23	4	34	h	45	v
2	B	13	P	24	5	35	j	46	x
3	C	14	Q	25	6	36	k	47	y
4	D	15	R	26	7	37	l	48	z
5	E	16	S	27	a	38	n	49	8
6	F	17	T	28	b	39	p	50	9
7	G	18	U	29	c	40	q	51	2
8	H	19	V	30	d	41	r	52	3
9	J	20	W	31	e	42	s		
10	K	21	Y	32	f	43	t		
11	L	22	Z	33	g	44	u		

w w w . i n f i n e o n . c o m

Published by Infineon Technologies AG

LifeElectronics
Живое партнерство

ООО «ЛайфЭлектроникс» **“LifeElectronics” LLC**

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- *Конкурентоспособные цены и скидки постоянным клиентам.*
- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
- *Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.*

- *Приемлемые сроки поставки, возможна ускоренная поставка.*
- *Доставку товара в любую точку России и стран СНГ.*
- *Комплексную поставку.*
- *Работу по проектам и поставку образцов.*
- *Формирование склада под заказчика.*

- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

Тел: +7 (812) 336 43 04 (многоканальный)
Email: org@lifeelectronics.ru

www.lifeelectronics.ru