

# BGSF110GN26

SP10T Antenna Switch Module with integrated GPIO controller, 2 GSM-TX and 8 TRX Ports for multi-mode GSM/EDGE, WCDMA or LTE applications

## Preliminary Datasheet

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Revision History: 2013-03-29, Rev. 1.3

**Previous Revision:1.1**

Page	Subjects (major changes since last revision)
12	Electrical characteristics updated
15	Package outline drawing added

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Last Trademarks Update 2011-11-11

## 1 Features

### Main Features

- Suitable for multi-mode GSM / EDGE / C2K / WCDMA / LTE applications
- 0.1 to 3.8 GHz coverage
- Ultra-low insertion loss and harmonics generation
- Integrated GSM transmit filters
- 2 high-linearity GSM TX paths
- 8 high-linearity, interchangeable WCDMA TRX ports
- 2 TRX ports also function as high-linearity GSM RX ports
- High port-to-port isolation
- Integrated GPIO decoder supporting logic levels from 1.35 V to 3.1 V
- No decoupling DC capacitors required, if no DC applied on RF lines
- Small form factor 3.4 mm x 2.6 mm x 0.73 mm
- 1kV HBM ESD protection



### Description

The BGSF110GN26 is a Single Pole Ten Throw (SP10T) Antenna Switch Module (ASM) optimized for wireless applications up to 3.8 GHz. It is a perfect solution for multi-mode handsets based on quadband GSM, WCDMA and LTE. The switch module configuration is shown in [Figure 1](#).

The module comes in a miniature TSNP package and comprises of a high power CMOS SP10T switch with integrated GPIO controller and harmonic filters for GSM high and low band transmit paths. The on-chip controller integrates CMOS logic and level shifters, driven by control inputs from 1.35 to 3.1 V.

No external DC blocking capacitors are required in typical applications as long as no DC is applied to any RF port.

Product Name	Package	Marking
BGSF110GN26	PG-TSNP-26-2	F10G

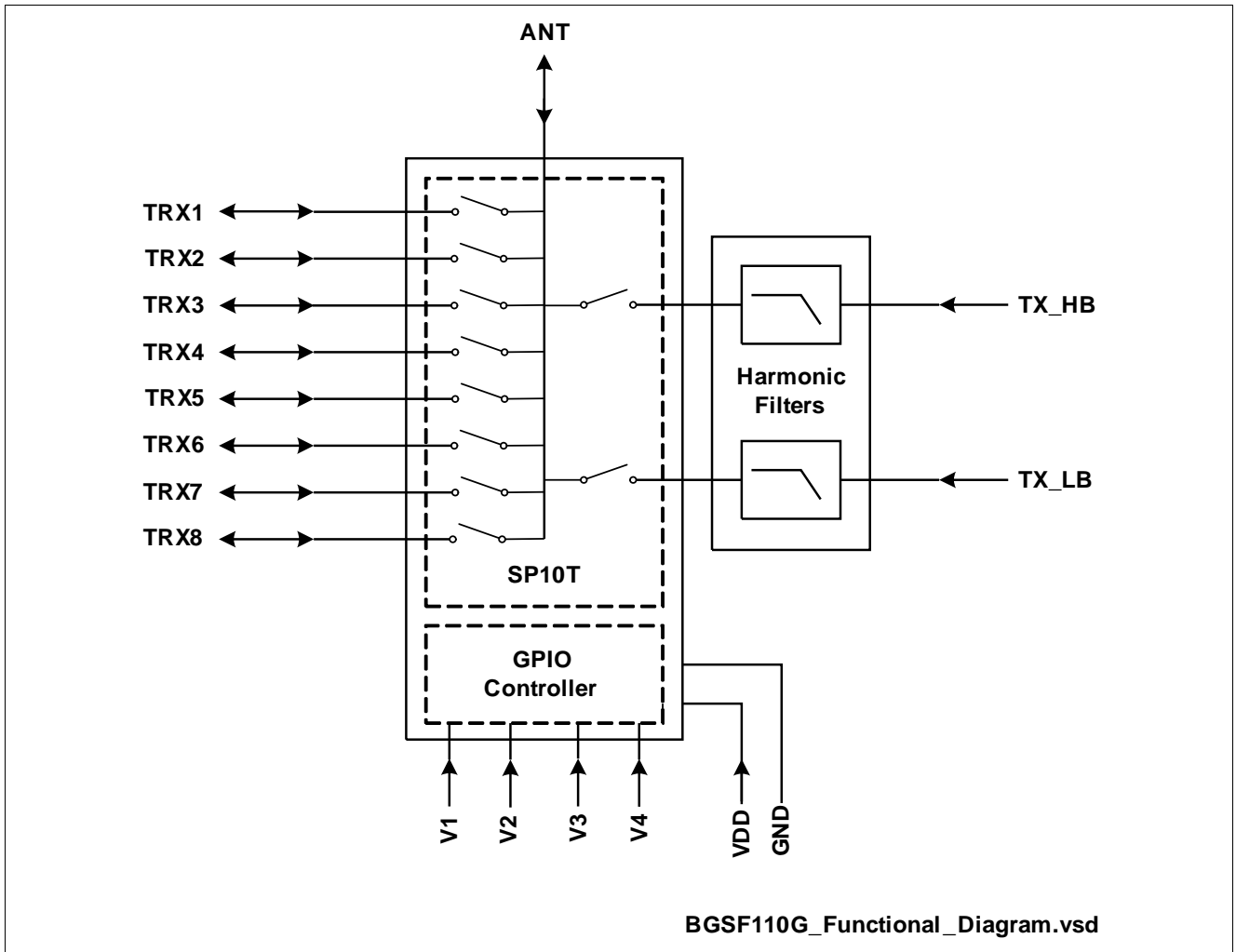


Figure 1 Functional diagram

## 2 Maximum Ratings

**Table 1** Maximum Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply voltage	$V_{dd}$	-0.5	–	3.6	V	–
GPIO control voltage levels	$V_{CtrlX}$	-0.7	–	$V_{dd}+0.7$	V	–
Maximum DC-voltage on RF-ports and RF-grounds	$V_{RFDC}$	0	–	0	V	–
Storage Temperature Range	$T_{stg}$	-65	–	150	°C	–
Junction temperature	$T_j$	–	–	125	°C	–
Thermal resistance junction - soldering point	$R_{thJS}$	–	32	–	K/W	–
RF input power at all GSM TX ports	$P_{RF\_TX}$	–	–	36	dBm	CW
RF input power at all TRX ports	$P_{RF\_TRX}$	–	–	30	dBm	CW

**Table 2** ESD Ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
ESD capability Human Body Model	$V_{ESD\_HBM}$	–	1000	–	V	–
ESD capability ANT port (according IEC 6100-4-2 contact)	$V_{ESD\_ANT}$	–	tbd	–	V	Using external shunt inductor on ANT port

**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.

### 3 Operation Ranges

**Table 3 Operation Ranges**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Supply Voltage	$V_{dd}$	2.4	3.0	3.3	V	–
Supply current	$I_{dd}$	–	100	200	$\mu$ A	–
Ambient temperature range	$T_A$	-30	–	+85	$^{\circ}$ C	–
Extended temperature range	$T_E$	-40	–	+95	$^{\circ}$ C	Functional only
Control voltage High	$V_{CtrlH}$	1.35	1.8	$V_{dd}$	V	–
Control voltage Low	$V_{CtrlL}$	0	–	0.45	V	–
<b>Input Power</b>						
TRX ports	$P_{in\_TRX}$	–	–	27	dBm	–
GSM TX LB port	$P_{in\_GSM\_LB}$	–	–	36	dBm	50% duty cycle
GSM TX HB port	$P_{in\_GSM\_HB}$	–	–	34	dBm	50% duty cycle



## 4 Electrical Characteristics

Terminating port impedance:  $Z_0 = 50 \Omega$

Temperature:  $T = -25 \text{ }^\circ\text{C} - +85 \text{ }^\circ\text{C}$

Supply voltage:  $V_{dd} = 2.4 \text{ V}.. 3.3 \text{ V}$

Unless otherwise specified

**Table 4 RF Characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
<b>Insertion Loss</b>						
TRX1-8	IL	–	0.50	0.70	dB	698 to 960 MHz
		–	0.58	0.78	dB	1428 to 1990 MHz
		–	0.62	0.82	dB	1990 to 2170 MHz
		–	0.75	1.00	dB	2170 to 2690 MHz
		–	1.12	1.42	dB	2690 to 3500 MHz
		–	1.35	1.63	dB	3600 to 3800 MHz
TXLB	IL	–	0.90	1.20	dB	824 to 915 MHz
TXHB	IL	–	1.00	1.30	dB	1710 to 1910 MHz
<b>Return Loss</b>						
	RL	25	30	–	dB	698 to 960 MHz
		23	27	–	dB	1710 to 1990 MHz
		21	25	–	dB	1990 to 2170 MHz
		18	23	–	dB	2170 to 2690 MHz
		13	16	–	dB	2690 to 3500 MHz
<b>Isolation (f = 698-2690 MHz unless noted otherwise)</b>						
	ISO	32	40	–	dB	TRX1,2,3,7,8 to TRX4,5,6 (f = 698 - 2400 MHz)
		28	32	–	dB	TRX1,2,3,7,8 to TRX4,5,6 (f = 2400- 2690 MHz)
		37	46	–	dB	TX1 to all TRXports (f = 824-915 MHz)
		37	40	–	dB	TX2 to all TRXports (f = 1710-1910 MHz)
		27	37	–	dB	TRX4 to TRX6
		19	25	–	dB	TRX1 to TRX2, TRX2 to TRX3, TRX4 to TRX5, TRX5 to TRX6
		34	35	–	dB	ANT to TRX7 (RX1) (active path: ANT - TRX8) (f = 1805-1910 MHz)
		37	40	–	dB	ANT to TRX8 (RX2) (active path: ANT - TRX7) (f = 1805-1910 MHz)
<b>Switching Time</b>						
On/Off	$t_{on/off}$	–	1	–	$\mu\text{s}$	90% OFF to 90% ON; 90% ON to 90% OFF



**Table 4 RF Characteristics (cont'd)**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Boost Converter Settling Time	$t_{BC}$	–	–	25	$\mu$ s	After power down mode
<b>Intermodulation Distortion (UMTS Band 1, Band 5)</b>						
IMD2, low	IMD2 low	–	-102	-97	dBm	Tx = 20 dBm, Interferer = -15 dBm
IMD2, high	IMD2 high	–	-105	-97	dBm	Tx = 20 dBm, Interferer = -15 dBm
IMD3	IMD3	–	-115	-97	dBm	Tx = 20 dBm, Interferer = -15 dBm
<b>Harmonic Generation up to 12.75 GHz</b>						
TXLB, H2	$P_{Harm}$	77	88	–	dBc	35 dBm, 50 $\Omega$ , 50% duty cycle
TXLB, H3		86	100	–	dBc	35 dBm, 50 $\Omega$ , 50% duty cycle
TXHB, H2		82	98	–	dBc	32 dBm, 50 $\Omega$ , 50% duty cycle
TXHB, H3		77	82	–	dBc	32 dBm, 50 $\Omega$ , 50% duty cycle
TRX1-8, H2		81	88	–	dBc	25 dBm, 50 $\Omega$
TRX1-8, H3		85	97	–	dBc	25 dBm, 50 $\Omega$
<b>Harmonic Attenuation</b>						
TXLB	$P_{att}$	27	38	–	dB	1648 to 1830 MHz
		27	33	–	dB	2472 to 2745 MHz
		20	27	–	dB	2746 to 12750 MHz
TXHB		27	38	–	dB	3420 to 3820 MHz
		25	30	–	dB	5130 to 5730 MHz
		23	27	–	dB	5731 to 12750 MHz

Note: All electrical characteristics are measured with all RF ports terminated in 50  $\Omega$  and recommended circuit.

## 5 Pin Definition and Package Outline

**Table 5 Pin Configuration**

Pin No.	Name	Pin Type	Buffer Type	Function
0	GND	GND		Ground, Die Pad
1	GND	GND		RF Ground
2	TRX4	I/O		WCDMA TRX-Port
3	TRX5	I/O		WCDMA TRX-Port
4	TRX6	I/O		WCDMA TRX-Port
5	GND	GND		RF Ground
6	GND	GND		RF Ground
7	ANT	I/O		Antenna Port
8	GND	GND		RF Ground
9	GND	GND		RF Ground
10	TX2	I		GSM HB-Port
11	GND	GND		RF Ground
12	GND	GND		RF Ground
13	TX1	I		GSM LB-Port
14	GND	GND		RF Ground
15	TRX8	I/O		WCDMA TRX-Port (GSM RX-Port)
16	GND	GND		RF Ground
17	TRX7	I/O		WCDMA TRX-Port (GSM RX-Port)
18	TRX1	I/O		WCDMA TRX-Port
19	TRX2	I/O		WCDMA TRX-Port
20	TRX3	I/O		WCDMA TRX-Port
21	GND	GND		DC Ground
22	VDD	PWR		Supply Voltage
23	V4	I		GPIO Control Ping
24	V3	I		GPIO Control Pin
25	V2	I		GPIO Control Pin
26	V1	I		GPIO Control Pin

**Table 6 Mechanical Data**

Parameter	Symbol	Value	Unit
Package size	Size	3.4 x 2.6	mm
Package height	H	0.73	mm

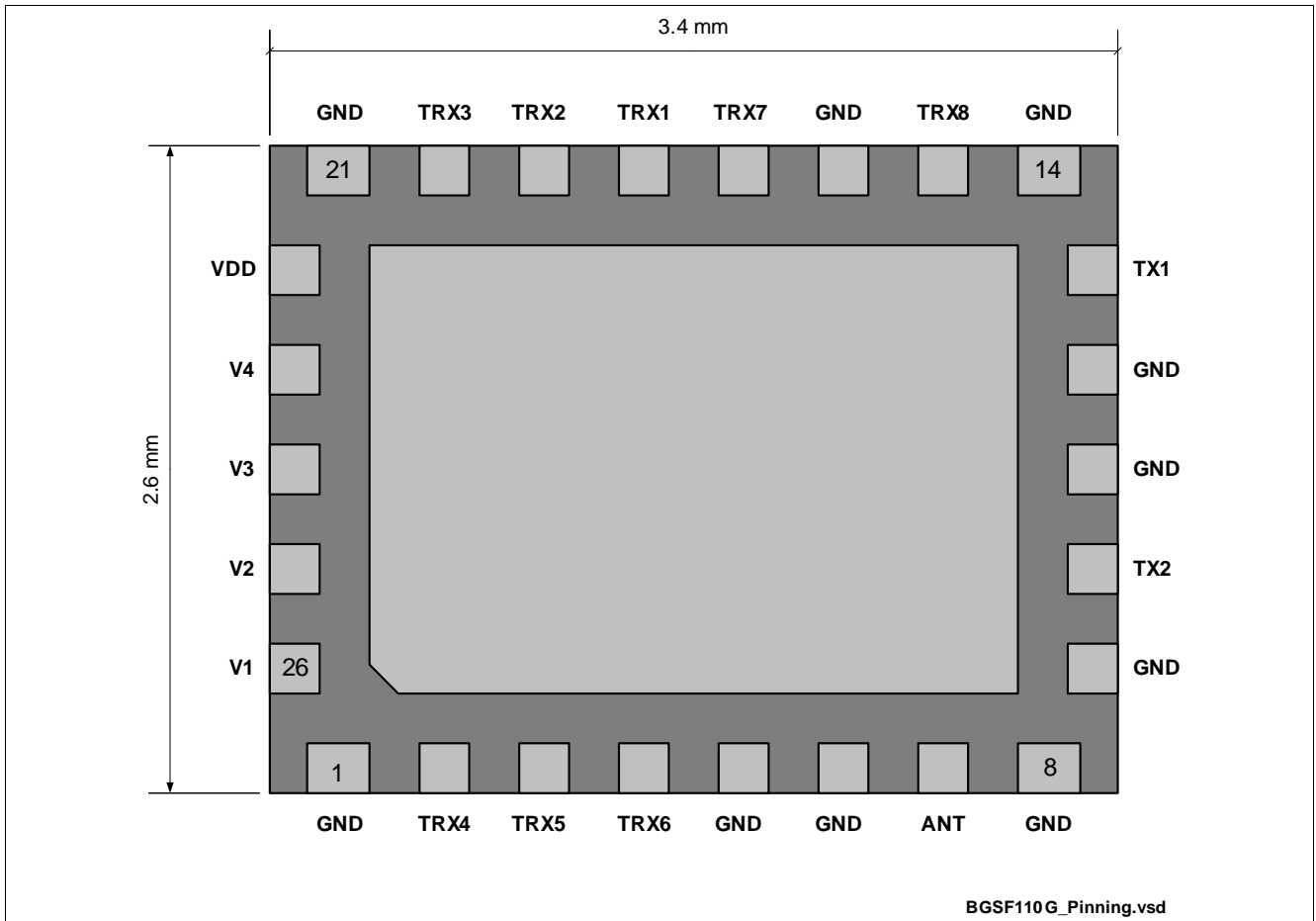
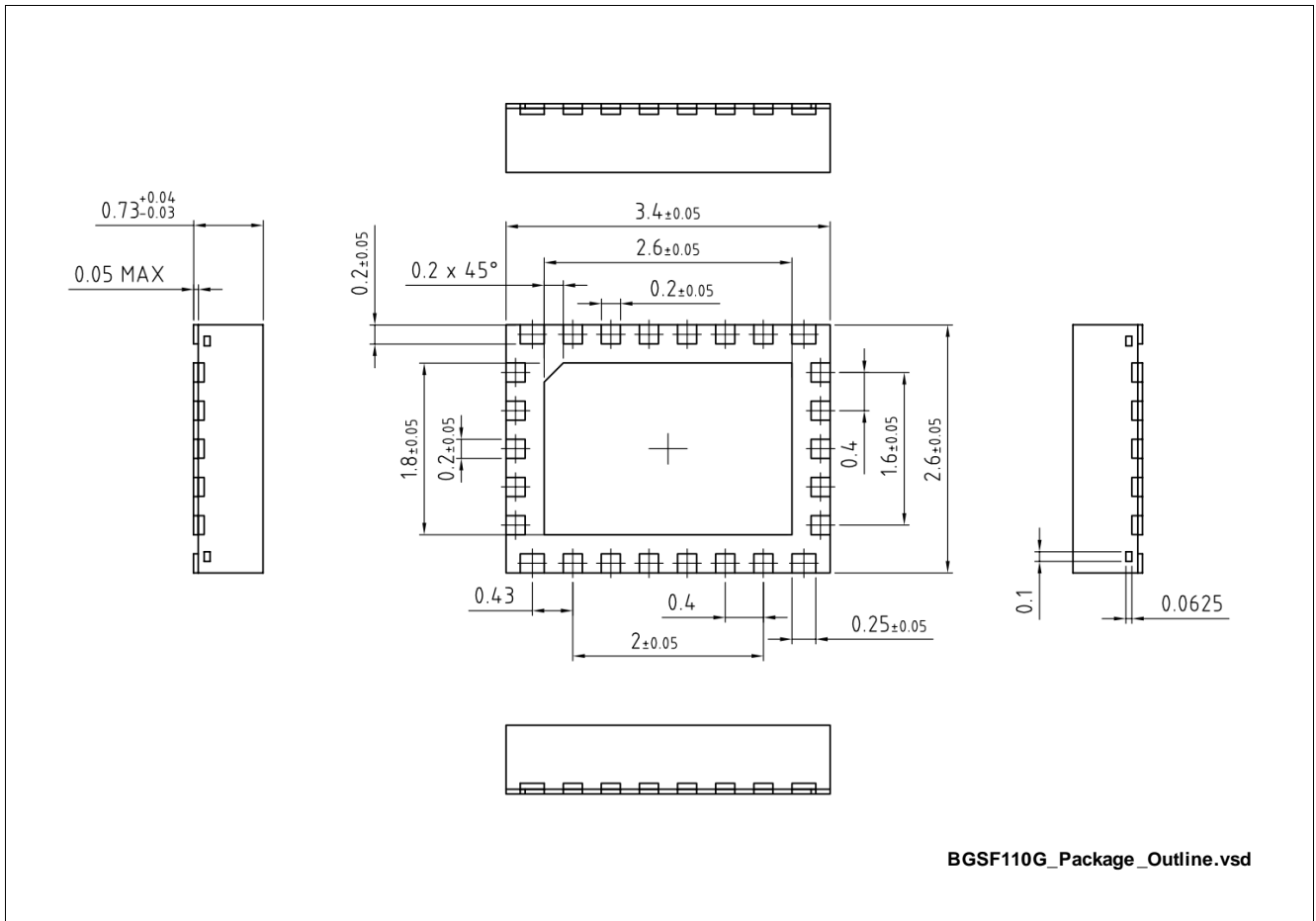


Figure 2 Pin Configuration (Top View)



**Figure 3** Package Outline

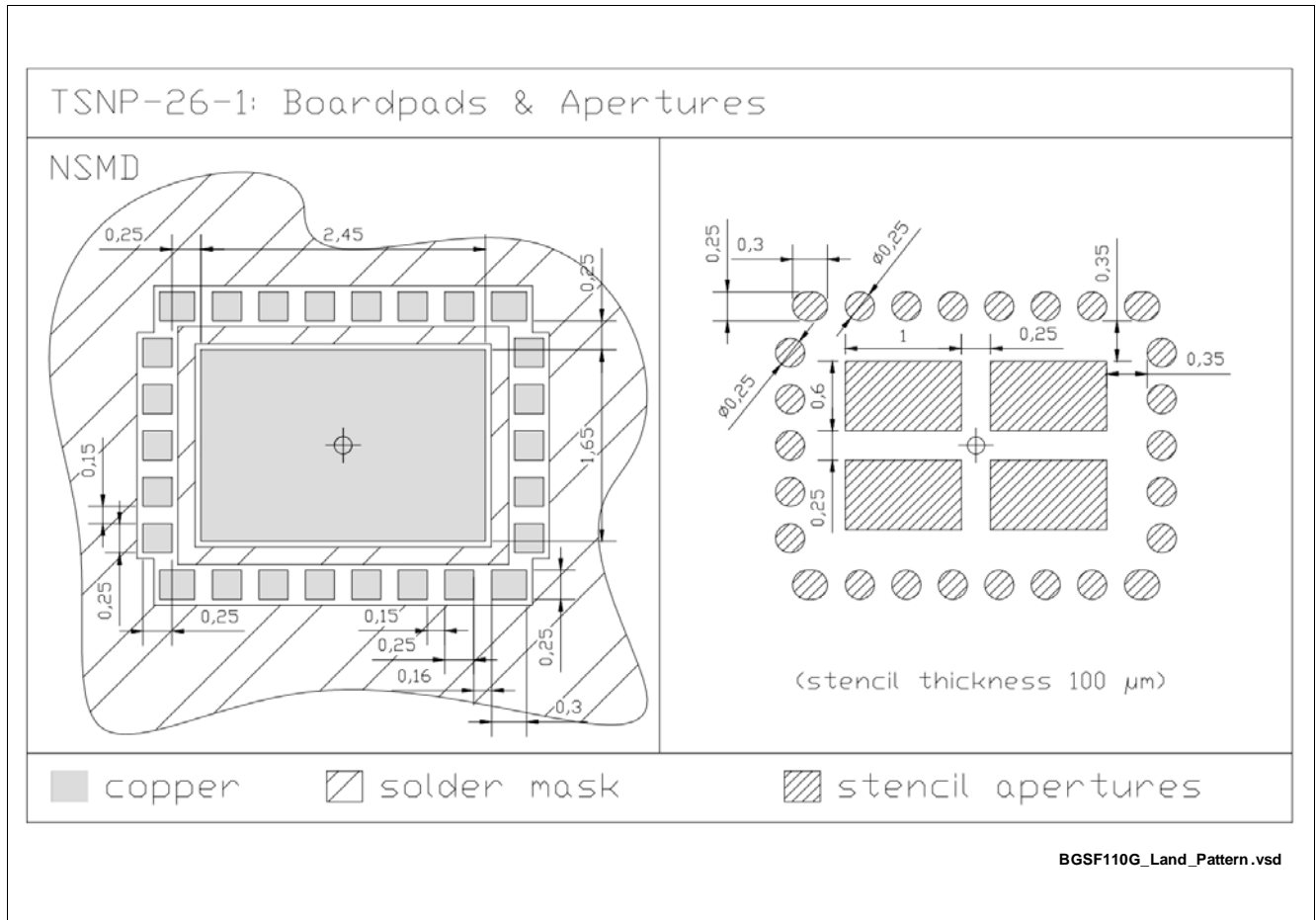


Figure 4 Land pattern

## 6 Band selection truth table

**Table 7** GPIO truth table

Mode	V1	V2	V3	V4
ANT - TXLB	H	H	L	L
ANT - TXHB	H	L	L	L
ANT - TRX1	L	L	H	L
ANT - TRX2	H	L	H	L
ANT - TRX3	H	H	H	L
ANT - TRX4	H	L	H	H
ANT - TRX5	H	H	H	H
ANT - TRX6	H	L	L	H
ANT - TRX7	L	H	H	L
ANT - TRX8	L	H	L	L
Isolation	L	L	L	L

Note:  $H = V_{CtrlH}$ ,  $L = V_{CtrlL}$

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