

TOSHIBA CMOS Linear Integrated Circuit Silicon Monolithic

## TCWA1225G

### 1. RF SPDT Switch

High power antenna Switch

### 2. Features

TarfSOI™

GPIO Control I/F

Wide band (0.7-5.0 GHz)

Low Insertion Loss

WCSP package (1.9 mm×1.9 mm)

### 3. Pad Assignment

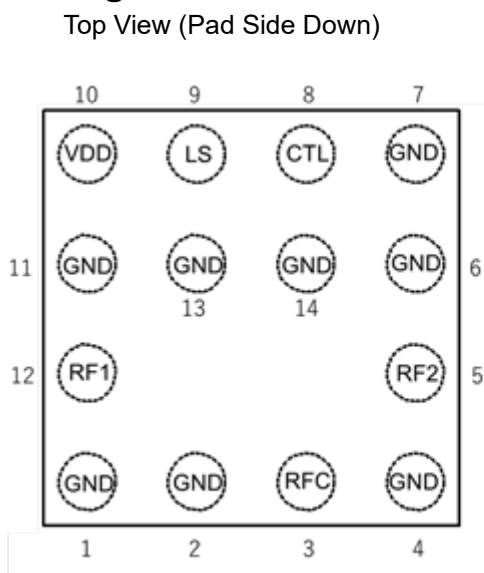


Figure 1 Pad Assignment

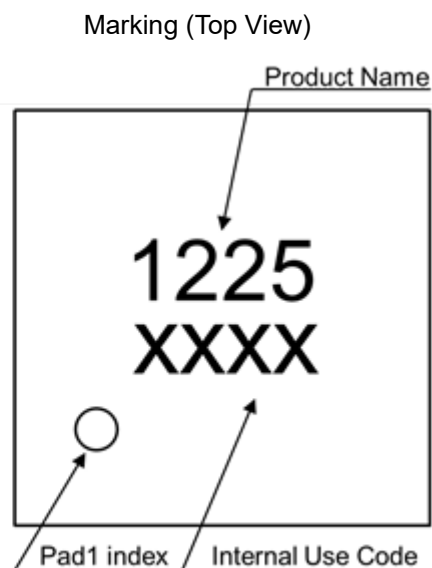


Figure 2 Marking

### 4. Notice

This device is sensitive to electrostatic discharge. Please ensure equipment and tools are adequately earthed when handling.

TarfSOI™ (Toshiba advanced RF SOI) is a trademark of TOSHIBA CORPORATION

Start of commercial production  
2024-04

## 5. Block Diagram

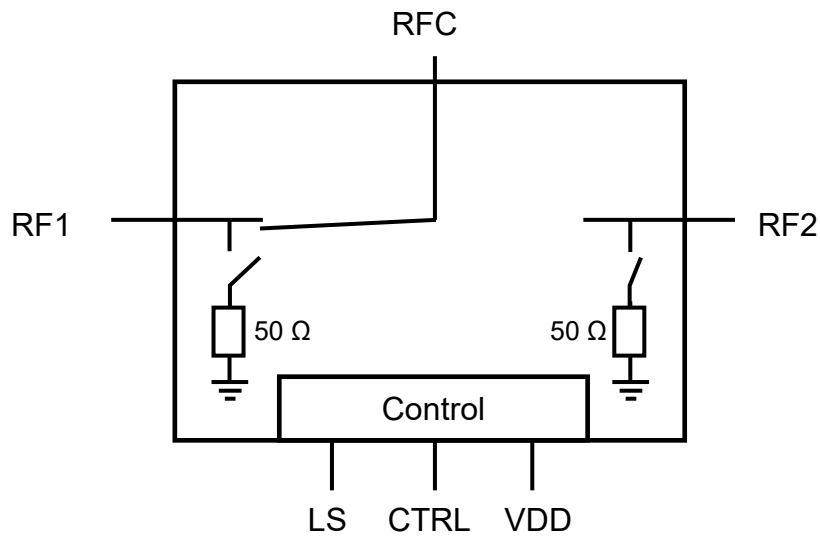


Figure 3 Function Block Diagram

## 6. Control Logic

Table 1 Control Logic

LS	CTRL	RFC-RF1	RFC-RF2
0	0	OFF	ON
0	1	ON	OFF
1	0	ON	OFF
1	1	OFF	ON

## 7. Pad Description

Table 2 Pad Description

Pad No.	Symbol	Description
1	GND	Ground
2	GND	Ground
3	RFC	RF common port
4	GND	Ground
5	RF2	RF port2
6	GND	Ground
7	GND	Ground
8	CTRL	Control
9	LS	Logic select
10	VDD	Voltage Supply
11	GND	Ground
12	RF1	RF port1
13	GND	Ground
14	GND	Ground

## 8. Absolute Maximum Ratings (Note)

Ta = +25 °C, otherwise noted.

**Table 3 Absolute Maximum Ratings**

Item	Symbol	Rating	Unit	
Supply Voltage Range	V <sub>DD</sub>	-0.3 to 3.9	V	
Logic Input (LS, CTRL Pad)	V <sub>I</sub>	-0.3 to 3.9	V	
Peak Power Handling (8 dB PAR)	P <sub>pk</sub>	46	dBm	
50 Ω Termed Port Power Handling (CW)	P <sub>TP</sub>	24	dBm	
Power Disipation	T <sub>c</sub> = +25 °C	PD <sub>25</sub>	1.015	W
	T <sub>c</sub> = +95 °C	PD <sub>95</sub>	0.305	W
Storage Temperature Range	T <sub>stg</sub>	-40 to 150	°C	
Junction Temperature	T <sub>j</sub>	125	°C	

Note1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Note 2: Using continuously under heavy loads (e.g. the application of high temperature/ current/ voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/ current/ voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductors Reliability Handbook (“Handling Precautions”/ “Derating Concept and Methods”) and individual reliability data (i.e. reliability test Report and estimated failure rate, etc.).

## 9. Operating Ranges (Note)

**Table 4 Operating Ranges**

Item	Symbol	Min	Typ.	Max	Unit	
Supply Voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	
Logic Input Voltage	High Level	V <sub>IH</sub>	1.65	-	3.6	V
	Low Level	V <sub>IL</sub>	-0.3	-	0.4	V
Operation Temperature	T <sub>opr</sub>	-40	25	95	°C	

Note 3: The operating ranges should be maintained to ensure the normal operation of the device.

## 10. Electrical Characteristics

### 10.1. DC Characteristics

Ta = +25 °C

**Table 5 DC Characteristics**

Item	Symbol	Test Condition	Min	Typ.	Max	Unit
Power Consumption Current	I <sub>DC</sub>	V <sub>DD</sub> = 3.6 V	-	50	200	μA

### 10.2. AC Characteristics

Ta = +25 °C, V<sub>DD</sub> = 3.0 to 3.6 V, V<sub>IH</sub> = 3.3 V, V<sub>IL</sub> = 0 V

**Table 6 AC Characteristics**

Item	Symbol	Test Condition	Min	Typ.	Max	Unit
Switching time	T <sub>sw</sub>	50 % CTRL to 10 % or 90 % of final value of RF signal	-	750	1500	ns

## 11. RF Characteristics1

Ta = +25 °C, V<sub>DD</sub> = 3.0 to 3.6 V, V<sub>IH</sub> = 3.3 V, V<sub>IL</sub> = 0 V, Z<sub>s</sub> = Z<sub>l</sub> = 50 Ω, CW signal

**Table 7 RF Characteristics1**

Item	Symbol	Path	Test Condition	Min	Typ.	Max	Unit
Insertion loss	IL	RFC to RFX	0.7 to 3 GHz	-	0.5	0.7	dB
		RFC to RFX	3 to 5 GHz	-	0.6	0.9	dB
Isolation	ISO	RFC to RFX	0.7 to 3 GHz	45	50	-	dB
		RFC to RFX	3 to 5 GHz	41	46	-	dB
VSWR	VSWR	VSWR of RFX	0.7 to 5 GHz, RF1/2 ON-State	-	1.2	1.4	-
Input 1dB compression	IP1dB	RFC to RFX	at 2.6 GHz, Duty ratio 5 %	38.5	47.0	-	dBm
Input IP3	IIP3	RFC to RFX	2.6 GHz, 24 dBm	66.5	74.0	-	dBm
Input IP2	IIP2	RFC to RFX	2.6 GHz, 24 dBm	119	128	-	dBm

## 12. RF Characteristics2

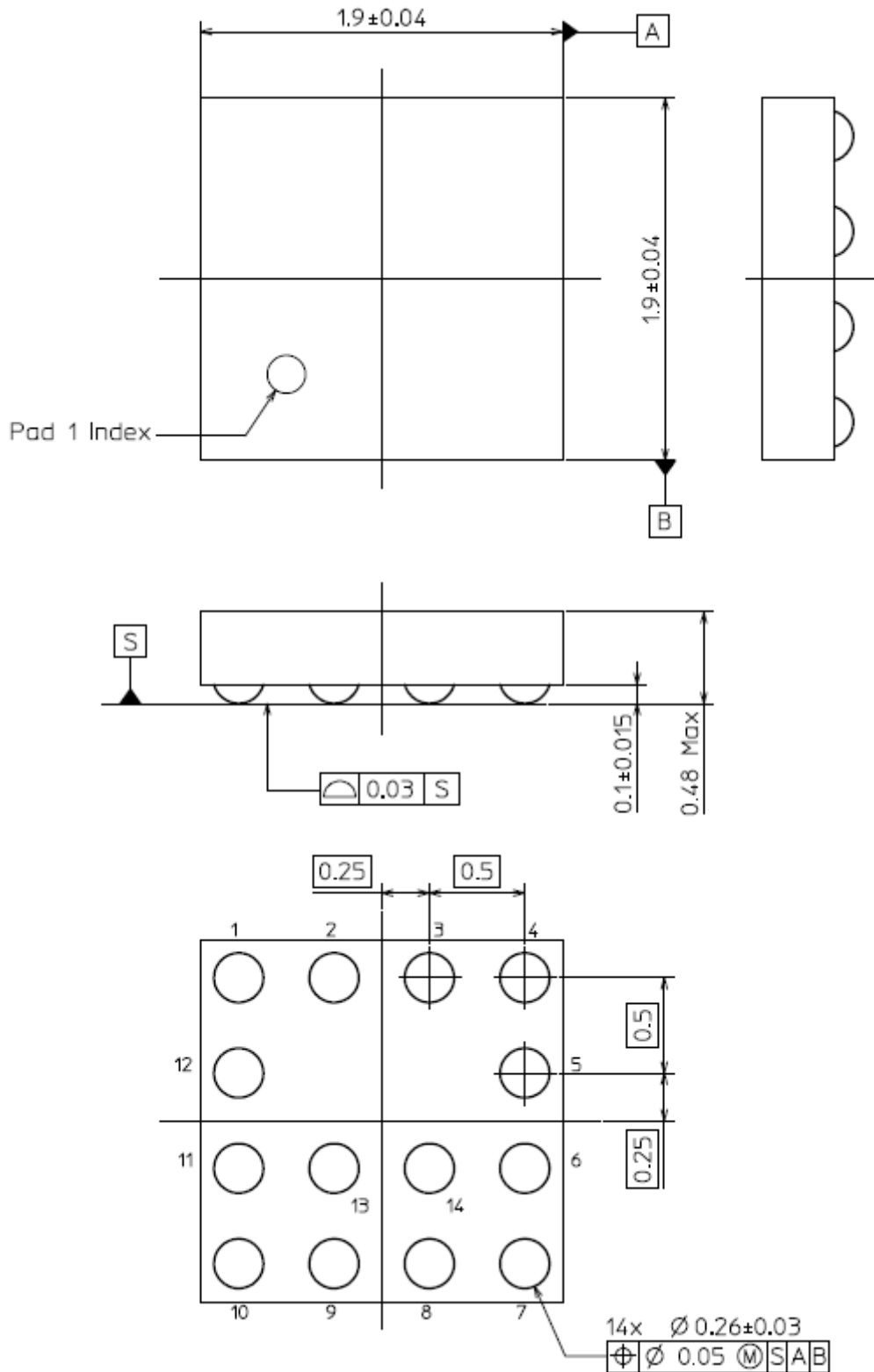
Tc = -40 to +95 °C, V<sub>DD</sub> = 3.0 to 3.6 V, V<sub>IH</sub> = 3.3 V, V<sub>IL</sub> = 0 V, Z<sub>s</sub> = Z<sub>l</sub> = 50 Ω, CW signal

**Table 8 RF Characteristics2**

Item	Symbol	Path	Test Condition	Min	Typ.	Max	Unit
Insertion loss	IL	RFC to RFX	0.7 to 3 GHz	-	-	0.8	dB
		RFC to RFX	3 to 5 GHz	-	-	1.0	dB
Isolation	ISO	RFC to RFX	0.7 to 3 GHz	43	-	-	dB
		RFC to RFX	3 to 5 GHz	39	-	-	dB
VSWR	VSWR	VSWR of RFX	0.7 to 5 GHz, RF1/2 ON-State	-	-	1.5	-
Input 1dB compression	IP1dB	RFC to RFX	at 2.6 GHz, Duty ratio 5 %	38	-	-	dBm
Input IP3	IIP3	RFC to RFX	2.6 GHz, 24 dBm	65	-	-	dBm
Input IP2	IIP2	RFC to RFX	2.6 GHz, 24 dBm	116	-	-	dBm

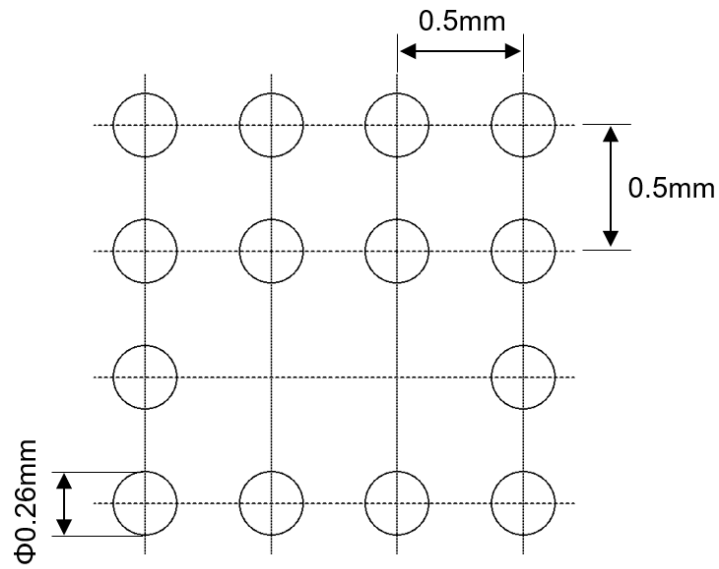
## 13. Packaging Dimensions

Unit : mm



Weight: 3.3 mg (typ.)

## 14. Land pattern dimensions for reference only



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