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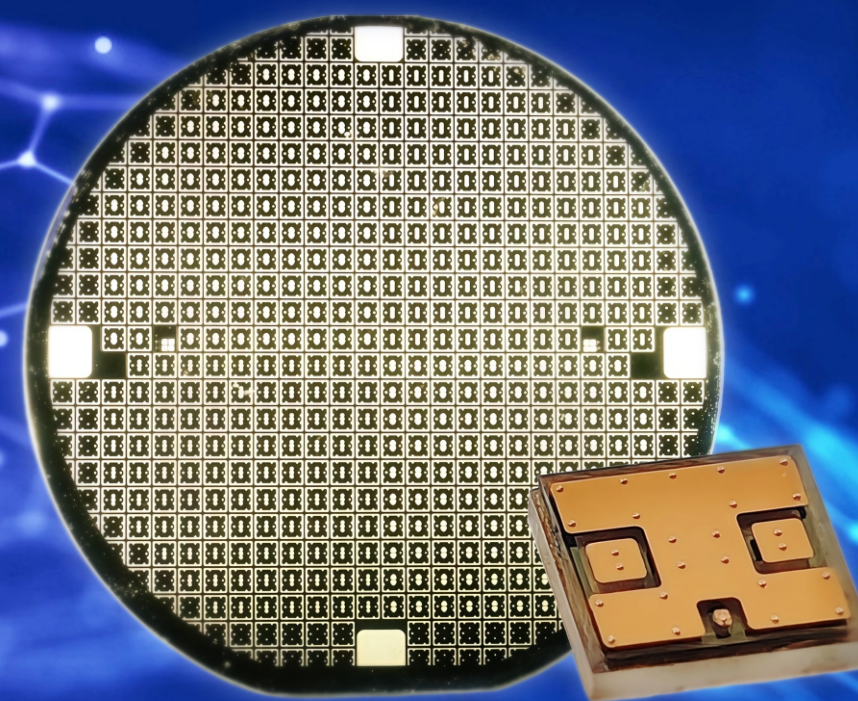
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Product Manual

Self-Superlubric RF MEMS Switch



SSL 2010

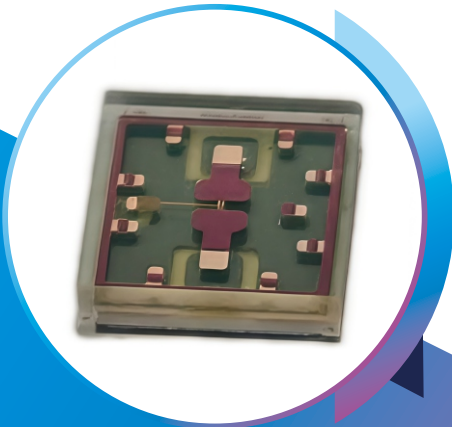
DC to 20GHz RF MEMS Switch

Description

The SSL 2010 is a wideband, high-power single pole, single throw (SPST) microelectro-mechanical system(MEMS) switch. With the innovative R&D and fabricating technology of FrictionX, the ssl 2010 achieve ultra-low insertion loss and high linearity from DC to 20GHz, and enable to handle 10W RF power for more than 40 million switching cycles. It s an ideal alternative for solid-state RF switches and EM relays in multiple application scenarios such as wireless communication, semiconductor test, etc.

Features

- DC to 20 GHz Frequency Range
- 10 W (CW), 10 W (Pulsed) Max Power Handling
- Low On-State Insertion Loss: 0.15 dB @ 3.0 GHz
- High Linearity: IIP3 102 dBm Typical
- 25 dB Isolation @ 3.0 GHz
- High Reliability > 4 × 10⁷ Switching Operations
- 3.8 mm × 3.6 mm WLCSP Package

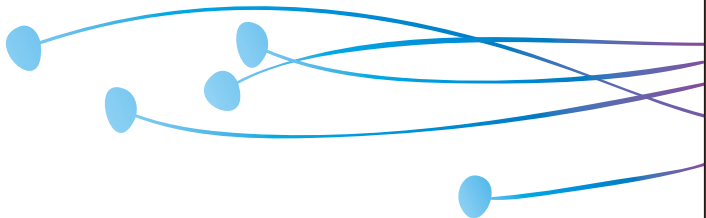


Applications

- Test and Measurement
- Wireless Infrastructure
- Medical Equipment
- Defense and Aerospace

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Specification

Absolute Maximum Ratings

Parameters	Min.	Max.	Unit
Open State Voltage Rating / RF1 to RFC	-50	50	V
GATE pin to GND Potential	-150	150	V
DC Current Rating/Switch	-	500	mA
Operating Temperature Range	-40	85	°C
Storage Temperature Range	-40	85	°C
CW Power	-	10	W
Peak Power	-	10	W

Notes:
1.All parameters must be within recommended operating conditions. Maximum DC and RF power can only be applied during the on-state condition.

Electrical Characteristics

Parameters	Min.	Typ.	Max.	Unit
Operating Frequency				
Operating Frequency Range	DC	-	20	GHz
On/Off Switching Time				
Turn On Time	-	13	17	us
Turn Off Time	-	3.5	6	us
On-State Characteristics				
On-state Resistance	0.5	-	1.5	Ohm
Return Loss@3GHz	-	-20	-	dB
Return Loss@10GHz	-	-20	-	dB
Insertion Loss@3GHz	-	0.15	-	dB
Insertion Loss@10GHz	-	0.5	-	dB
DC Steady State Carry Current	-	-	500	mA
Off-State Characteristics				
Off-state Capacitance	-	30	-	fF
Isolation@3GHz	-	25	-	dB
Isolation@10GHz	-	15	-	dB
Off-State RFC to RF1 Leakage Current	-	1	3	nA
Interception and Harmonics				
IIP3	-	102	-	dBm
H2	-	-120	-	dBc
H3	-	-120	-	dBc
Gate Characteristics				
Gate Bias Voltage	80	-	120	V
Gate Bias Current	-	100	-	nA
Duration				
On/Off Switch Operations	4×10 ⁷	1	1×10 ⁸	Cycles

Notes:
1.All parameters must be within recommended operating conditions. Maximum DC and RF power can only be applied during the on-state condition.

Typical Characteristics

RF Performance

Typical device performance measured on evaluation board.

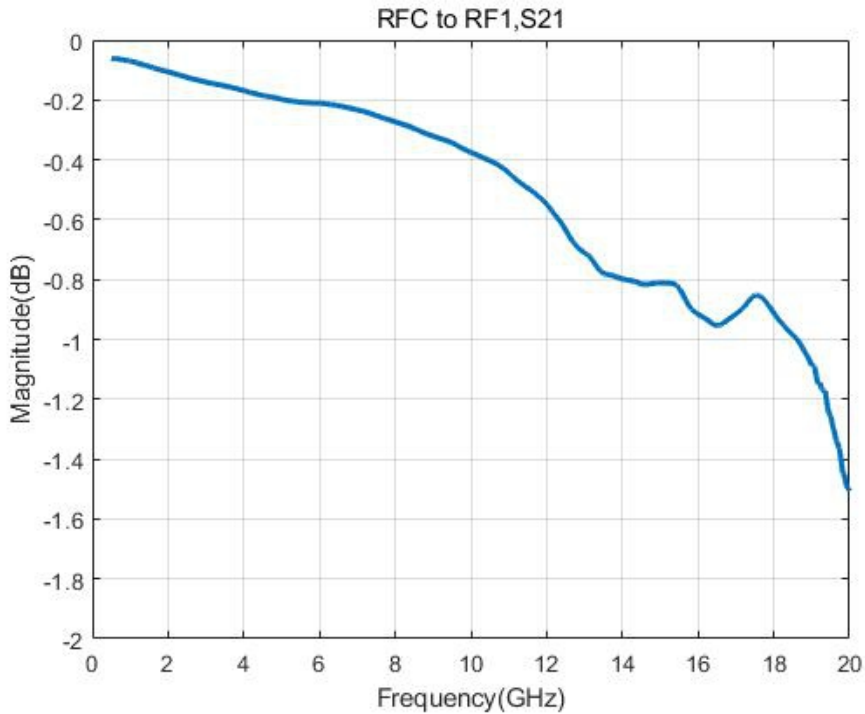


Figure 1: Insertion Loss/S21

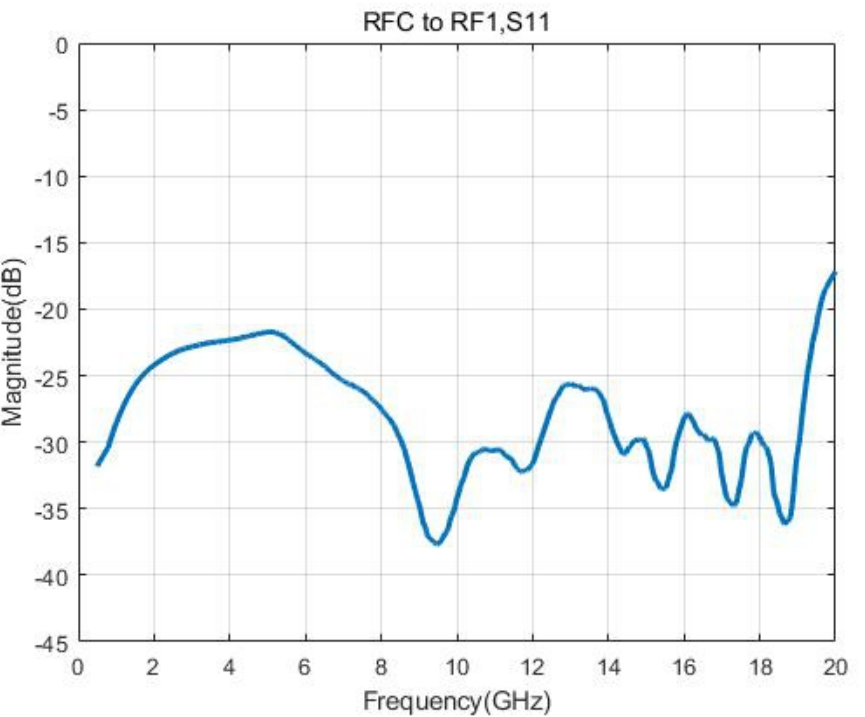


Figure 2: Return Loss/S11

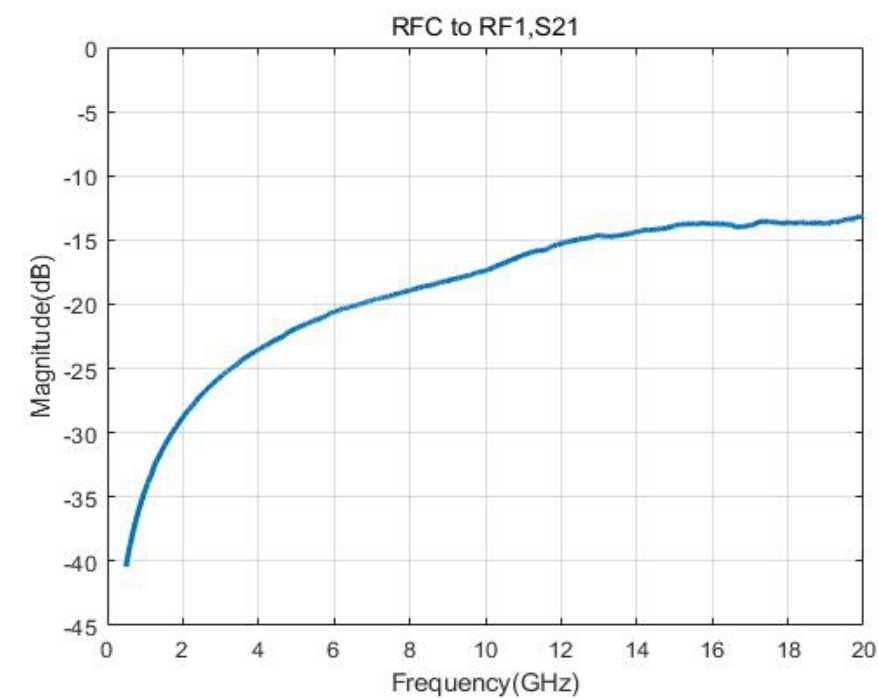


Figure 3: Off-State Isolation/S21

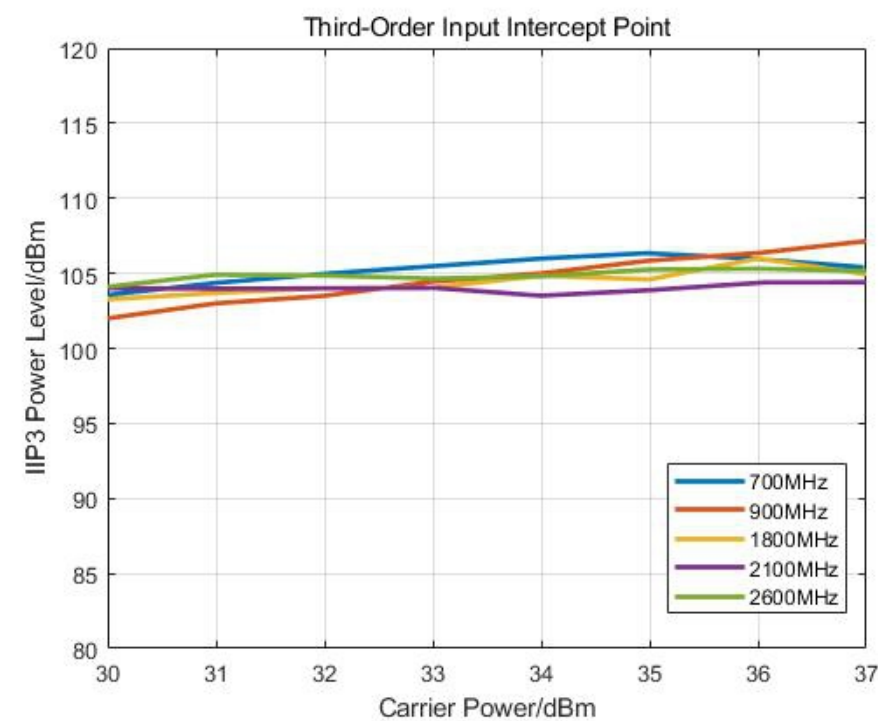


Figure 4: Third Order Input Intercept Power/dBm

On/Off Switching Time

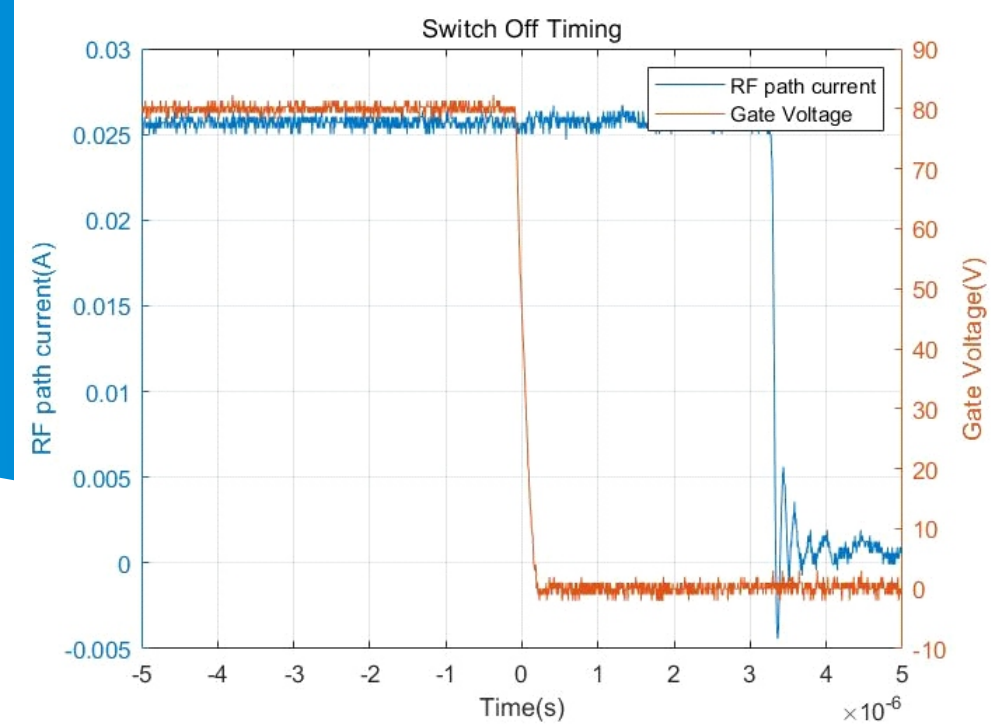


Figure 5: Switch Off Timing

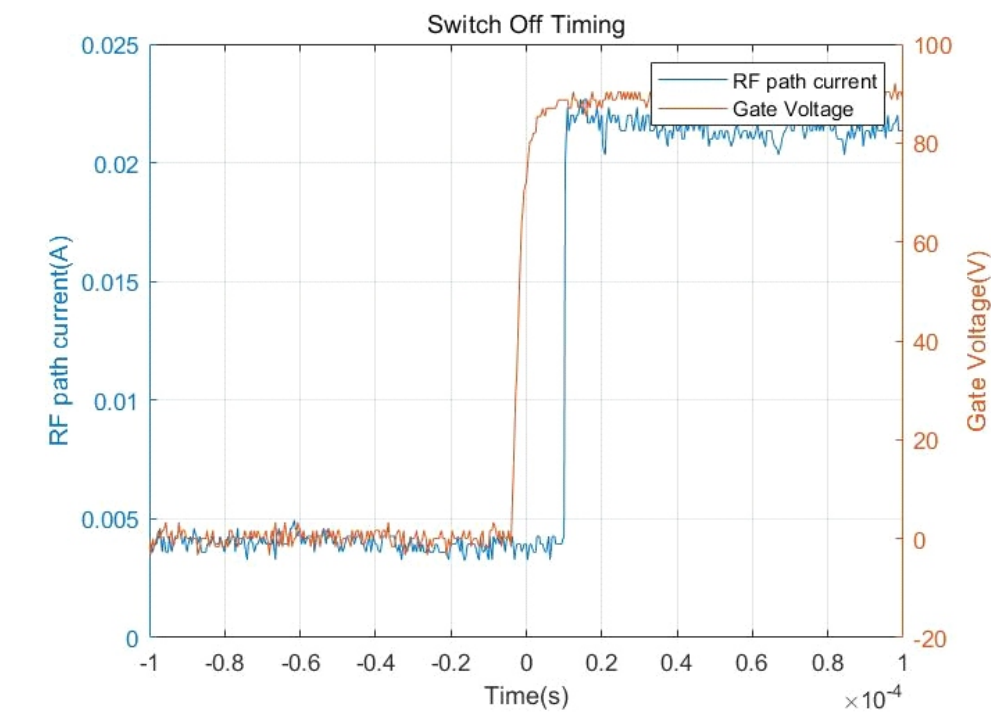


Figure 6: Switch On Timing

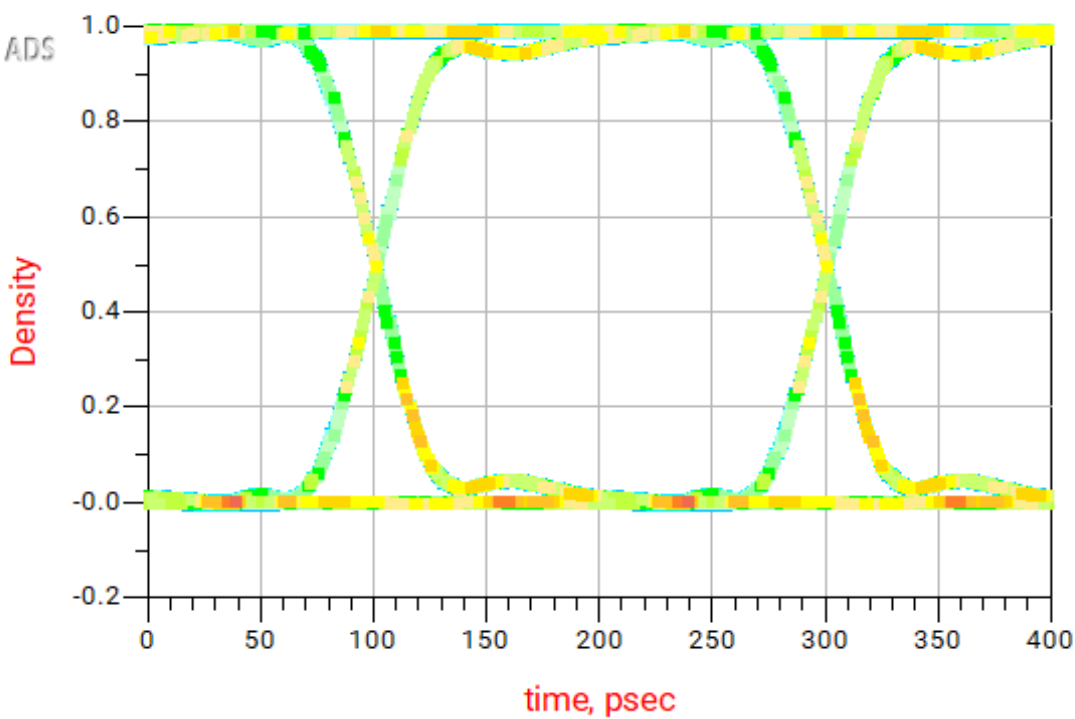


Figure 7: Single-Ended Eye Diagram(5Gbps)

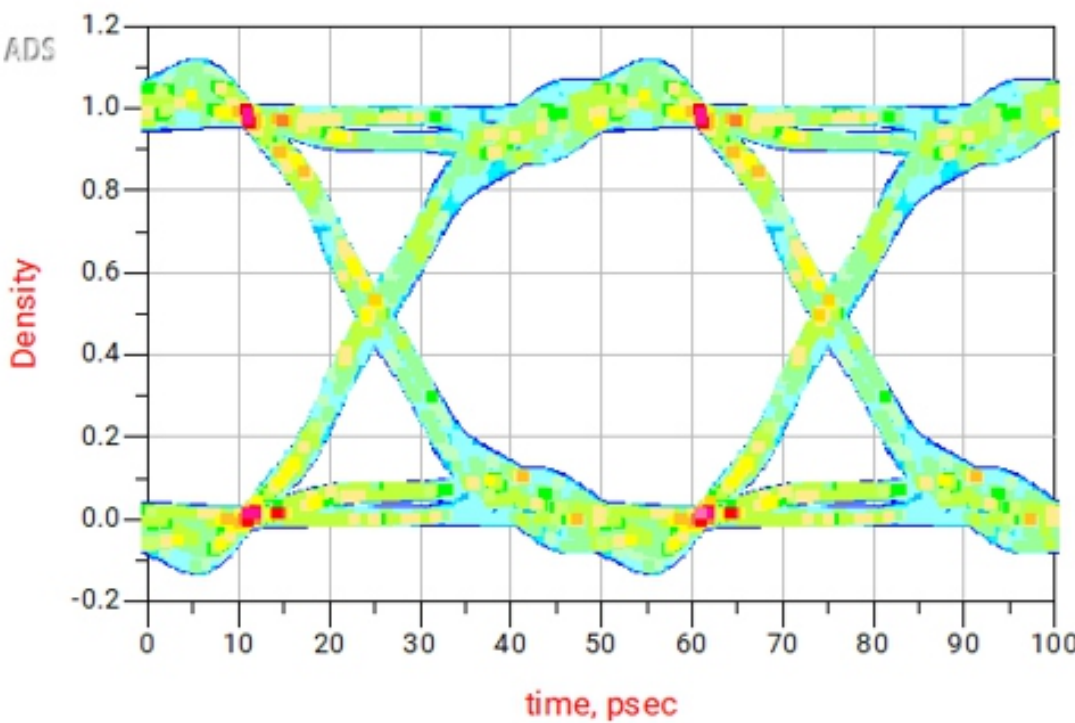


Figure 8: Single-Ended Eye Diagram(20Gbps)

Switch Reliability

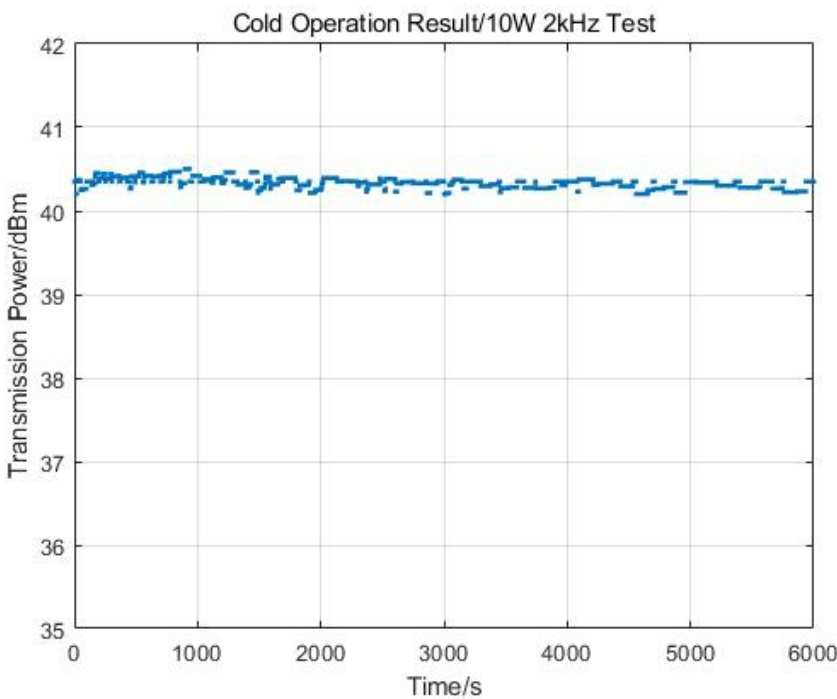


Figure 9: Switch Reliability

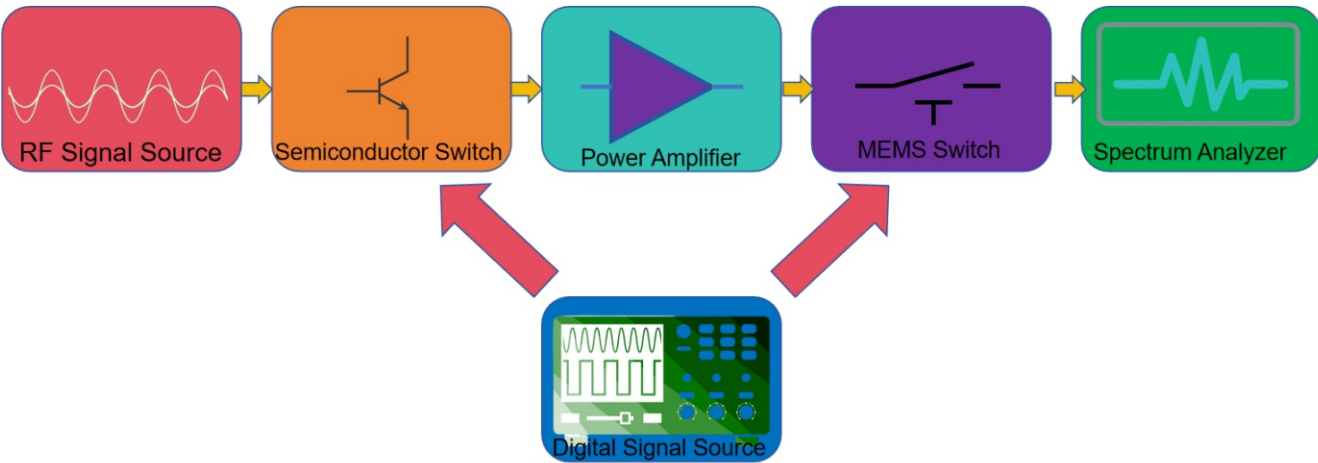


Figure 10: Power Testing Diagram

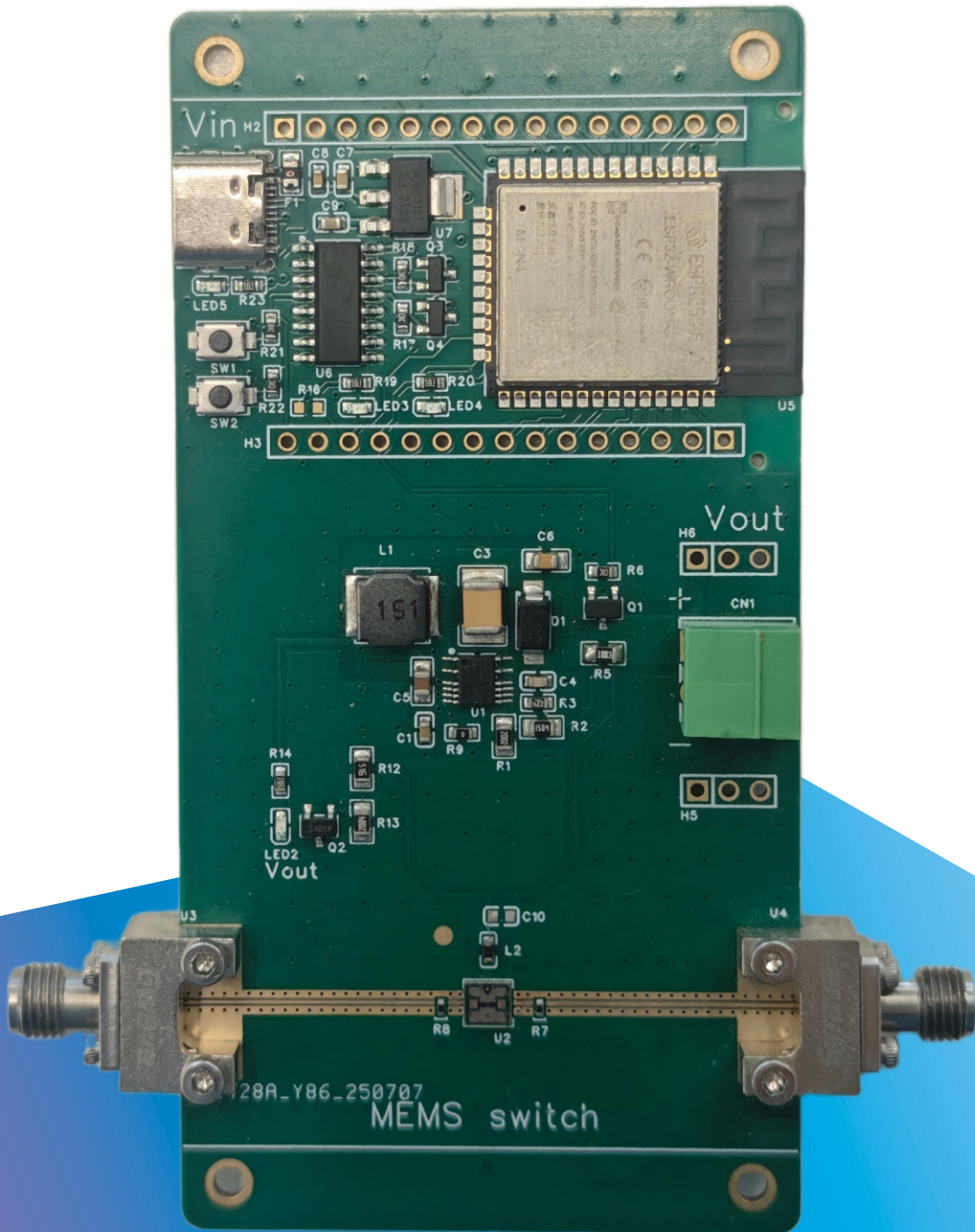


Figure 11: Drive Control Board

Pin Configurations and Functions

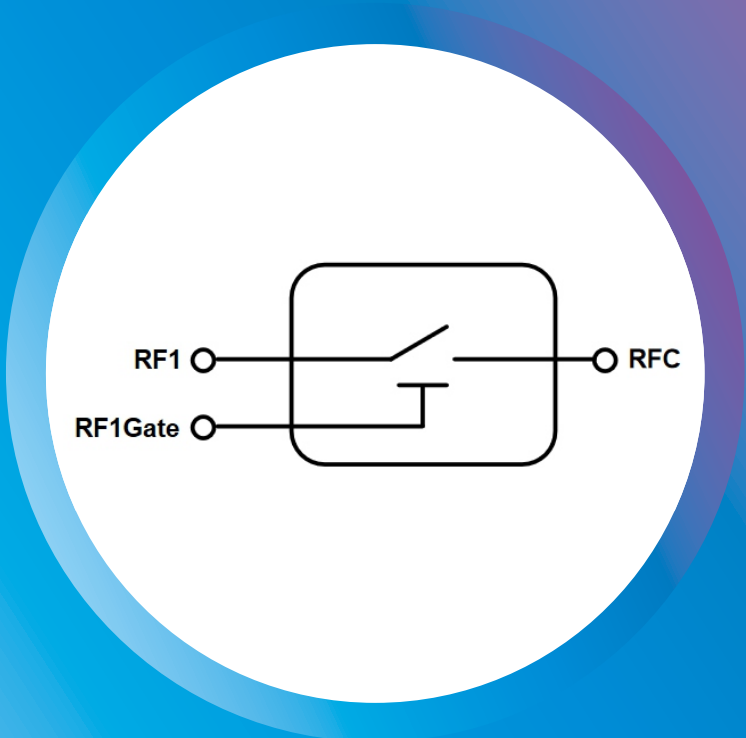


Figure 12: Functional Block Diagram

Pin Name	Pin No.	Descriptions
GND	1-14,16,17,19,21-24	RF Ground
RFC	18	RF Common
RF1	15	RF Switch 1
RF1Gate	20	Control of RF Switch 1

Package Information

Package Outline

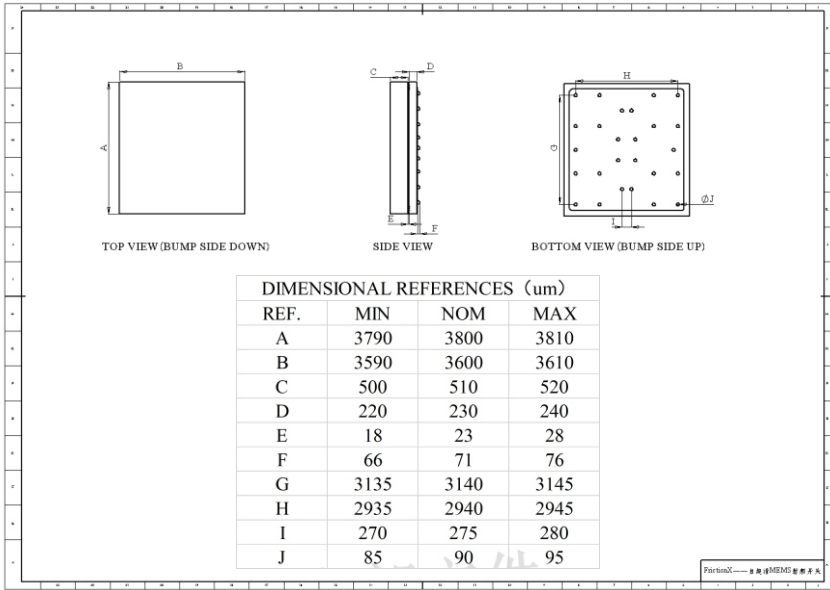


Figure 13: Package Outline

Bump Coordinate

Pin	X(μm)	Y(μm)	Pin	X(μm)	Y(μm)	Pin	X(μm)	Y(μm)
1	1570	1470	9	-1570	-780	17	-680	-780
2	1570	780	10	-1570	780	18	-1130	0
3	1570	-780	11	-1570	1470	19	-680	780
4	1570	-1470	12	-680	1470	20	0	1350
5	680	-1470	13	680	1470	21	300	250
6	0	-1470	14	680	780	22	300	-250
7	-680	-1470	15	1130	0	23	-300	-250
8	-1570	-1470	16	680	-780	24	-300	250

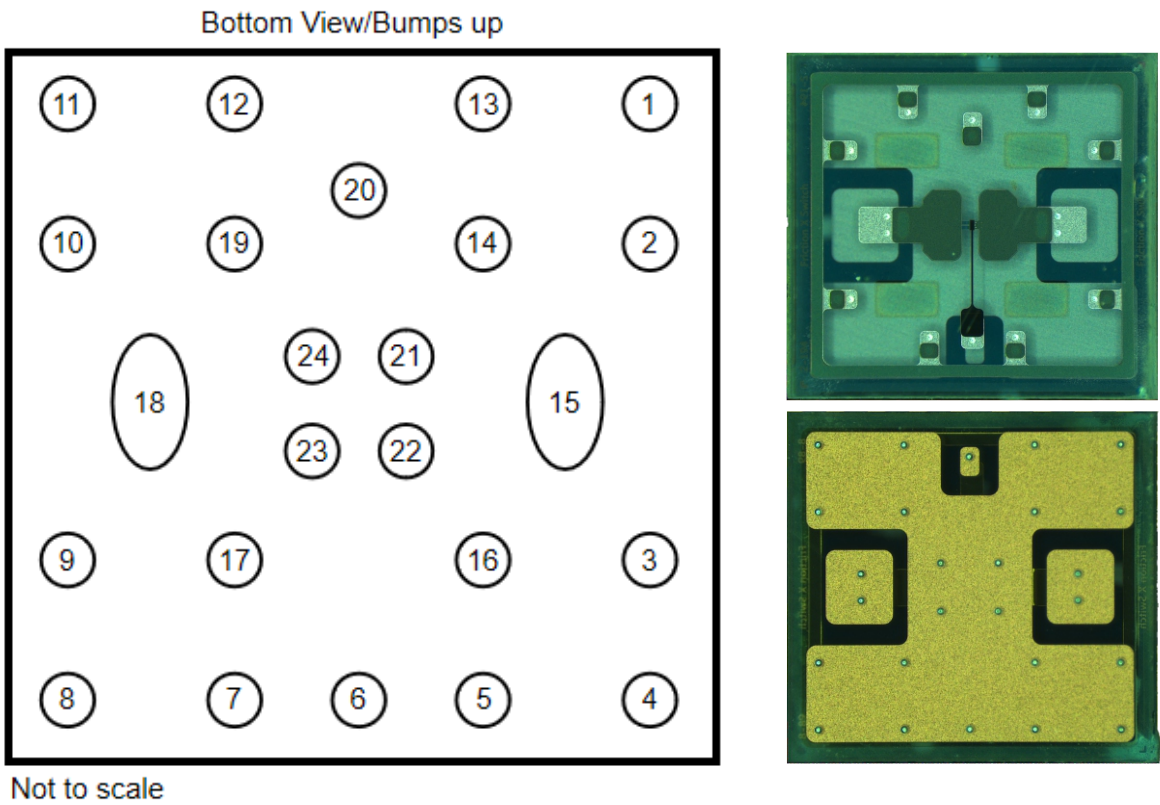


Figure 14: Bottom View/Bumps Up(0,0 at Die Center um to Scale)

Recommended PCB Layout

Layout recommendation for connecting the SSL2010 with grounded co-planar waveguide(GCPW) is used for the evaluation board.The evaluation board is based on the Taconic RF-30 board with the dielectric constant of 3.0, board thickness of 0.762 mm, and copper of 1 Oz. The taper is recommended to optimize the impedance discontinuity from GCPW to RF pad.

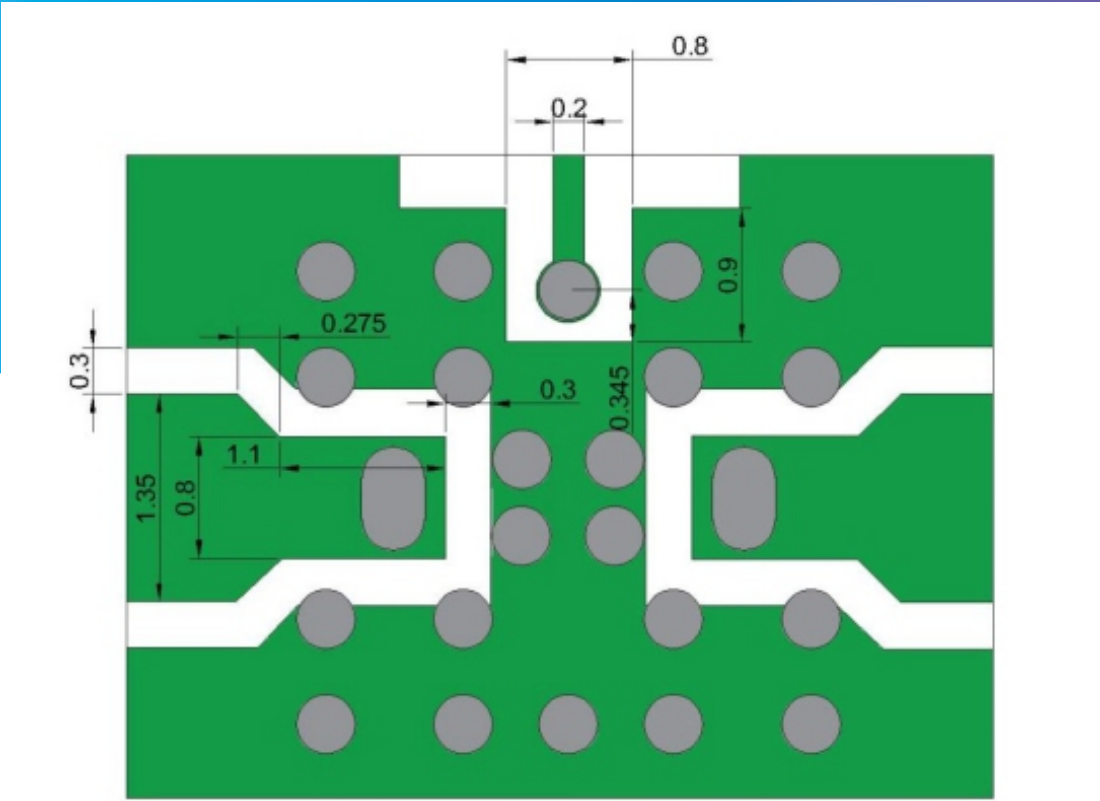


Figure 15: Recommended PCB Layout (Unit: mm)

Recommended Solder Reflow Profile

