Product Specification

RS1165 High Power SP6T

General Description

The RS1165 is a SP6T ,high power, RF reflective switch ,supporting wireless applications up to 2 GHz. It offers maximum power handling of 42 dBm continuous wave (CW). It delivers high linearity and excellent harmonics performance. No blocking capacitors are required if DC voltage is not present on the RF ports.

Applications

- Wireless infrastructure
- Military and high reliability applications
- Test equipment
- Pin diode replacement
- Land Mobile Radio

Features

- Low insertion loss: 0.45 dB typical to 1 GHz
- High linearity: -78dBc harmonics at 42dBm input power
- High power handling at T_{CASE} = 85°C, VDD= 5.0V
  - CW power: 42 dBm
  - Peak power: 45.5 dBm
- High ESD
  - 2kV HBM on all pins
- Single positive supply: 5 V
- Logic select pin provides maximum control logic flexibility
- Positive control, CMOS/TTL compatible
- 32-leads, 5 mm × 5 mm QFN package

Functional Block Diagram

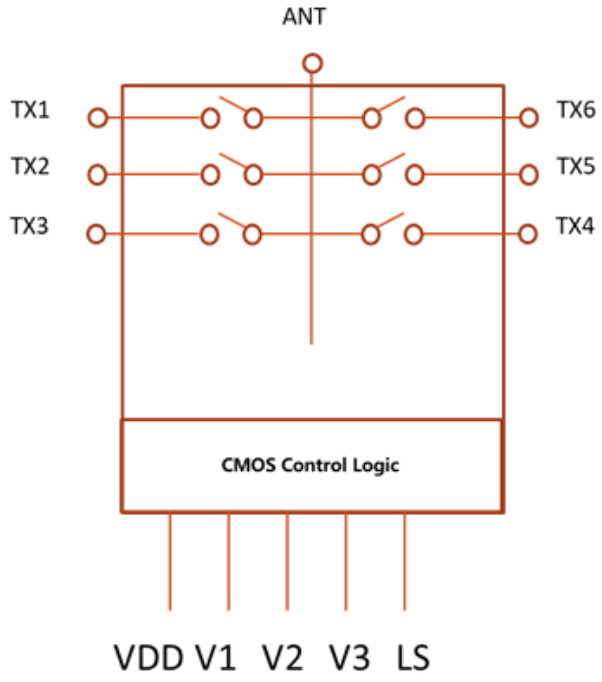


Figure 1

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Absolute Maximum Ratings

Table 1

Parameter	Min	Max	Units
VDD to GND	-0.3	5.5	V
VCTRL to GND	-0.3	5.5	V
VSS_EXT	-3.6	0	V
Maximum Junction Temperature		120	°C
Storage Temperature Range	-65	150	°C
Lead Temperature (soldering, 10s)		260	°C
ESD Voltage– HBM (Per JESD22-A114)		Class 2 (2000V)	
ESD Voltage – CDM (Per JESD22-C101)		Class IV (500V)	

Stresses above those listed above may cause permanent damage to the device. Functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Table 2

Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage		3		5.25	V
VSS_EXT***		-3.6		-3.2***	
Operating Temp Range	Case Temperature	-40		85	°C
RF Frequency Range		30		2000	MHz
Input CW Power, TX mode	800MHz, VDD=5.0V			42	dBm
Input pulse Power, TX mode	800MHz, 10%Pulse Signal(500us-50us),VDD=5.0V			45	dBm

*Note:****If better spur performance is required, an external negative voltage is recommended to be applied on VSS_EXT pin. Otherwise, VSS_EXT should be connected to ground*

Operation should be restricted to the limits in the Recommended Operating Conditions table. Operation between operating range maximum and absolute maximum for extended periods may reduce reliability.

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Specification

Typical Application Circuit without matching, Normal mode (VDD=5.0V, VSS=0V), TC = +25°C, RF = 1000MHz, Input power = 0dBm per tone unless otherwise stated. PCB board trace and connector losses are de-embedded unless otherwise noted.

Table 3

Parameter	Conditions	Min	Typ	Max	Units
Insertion Loss	100kHz - 30MHz		0.25		dB
	30MHz - 700MHz		0.35		
	700MHz - 2000MHz		0.65		
TX - TX Isolation	100kHz - 30MHz		65		dB
	30MHz - 700MHz		40		
	700MHz - 2000MHz		30		
ANT - TX Isolation	100kHz - 30MHz		65		dB
	30MHz - 700MHz		40		
	700MHz - 2000MHz		35		
Return Loss (RFC)	30MHz – 700MHz		-30		dB
Return Loss (RFX)	30MHz – 700MHz		-30		dB
Input 0.1dB Compression	800MHz		46		dBm
Input IP2	750MHz@30dBm		136		dBm
Input IP3	750MHz@30dBm		78		dBm
2nd and 3rd Harmonic (50ohm load)	40dBm input power @ 700MHz		-80		dBc
Switching Time	50% CTRL to 90% RF		4		us
	50% CTRL to 10% RF		4		
Logic Input High Threshold		1.4		5	V
Logic Input Low Threshold		-0.3		0.6	V
Logic Current	For each control pin		7		µA
DC Current (VDD)	3.3V Logic		85		µA

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Pin Diagram

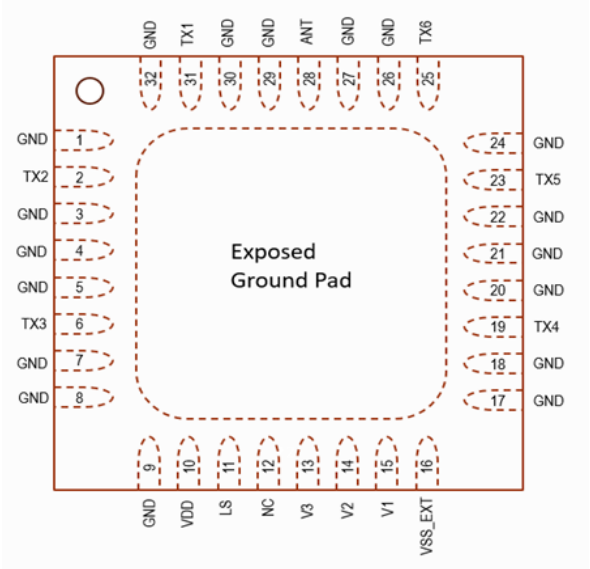


Figure 2

Pin Description

Table 4

Pin No.	Label	Description
1, 3, 4, 5, 7, 8, 9, 17, 18, 20, 21, 22, 24, 26, 27, 29, 30, 32	GND	Ground.
31	TX1	Transmit pin 1
2	TX2	Transmit pin 2
6	TX3	Transmit pin 3
11	LS	Logic select. Invert logic table when pull high
19	TX4	Transmit pin 4
23	TX5	Transmit pin 5
25	TX6	Transmit pin 6
28	ANT	RF common port
10	VDD	Positive power supply voltage.
13	V3	Digital control logic input 3
14	V2	Digital control logic input 2
15	V1	Digital control logic input 1
16****	VSS_EXT***	external Vss negative voltage

*Note:****If better spur performance is required, an external negative voltage is recommended to be applied on VSS_EXT pin. Otherwise, VSS_EXT should be connected to ground*

Control Logic

Table 5

LS	V3	V2	V1	Path
0	0	0	0	TX1
0	0	0	1	TX2
0	0	1	1	TX3
0	1	0	0	TX4
0	1	1	0	TX5
0	1	1	1	TX6
LS	**V3**	**V2**	**V1**	**Path**
1	0	0	0	TX6
1	0	0	1	TX5
1	0	1	1	TX4
1	1	0	0	TX3
1	1	1	0	TX2
1	1	1	1	TX1

Application Information

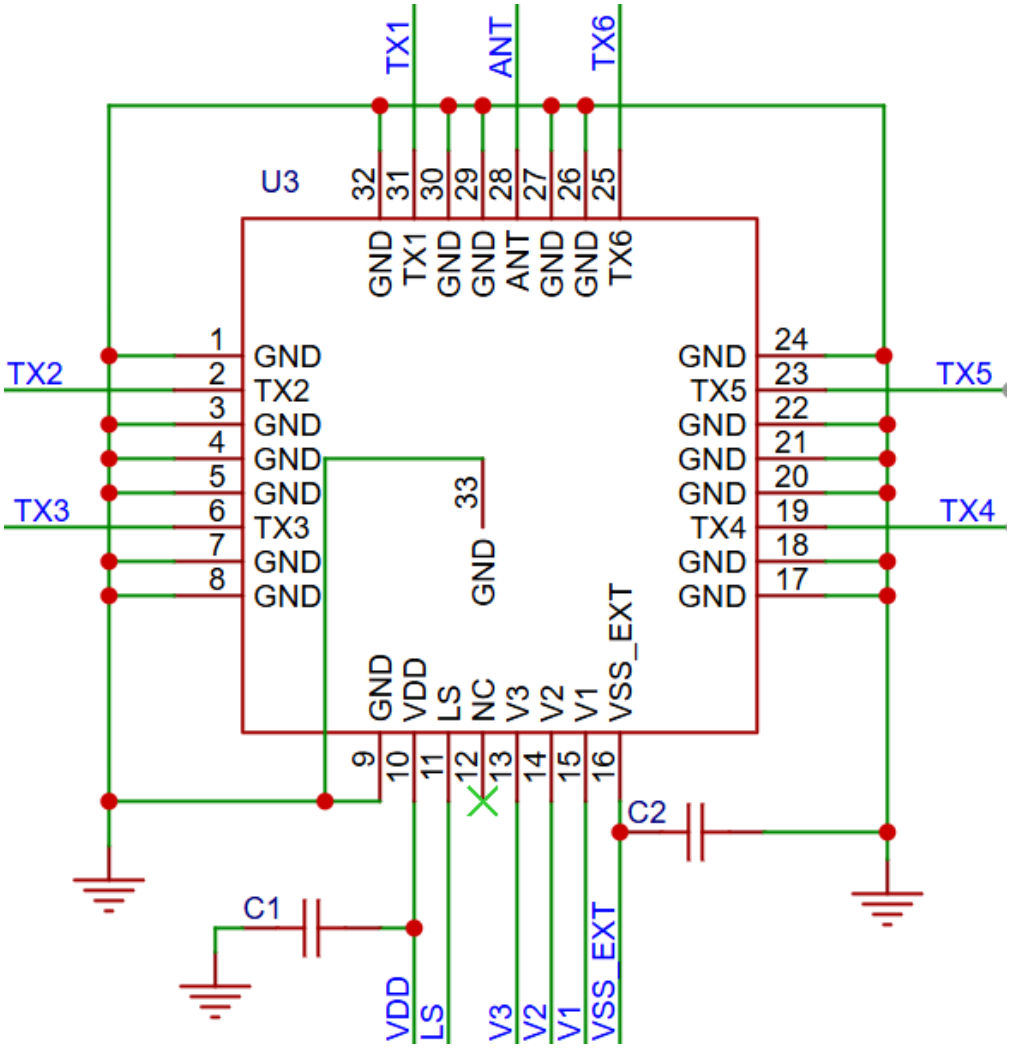


Figure 3

BOM LIST

Table 6

No.	Quantity	Part Lable	Value	Footprint
1	2	C1,C2	100nF	C0402
2	1	U1	RS1165	

Typical Performance Characteristics

Figure 4. Insertion Loss

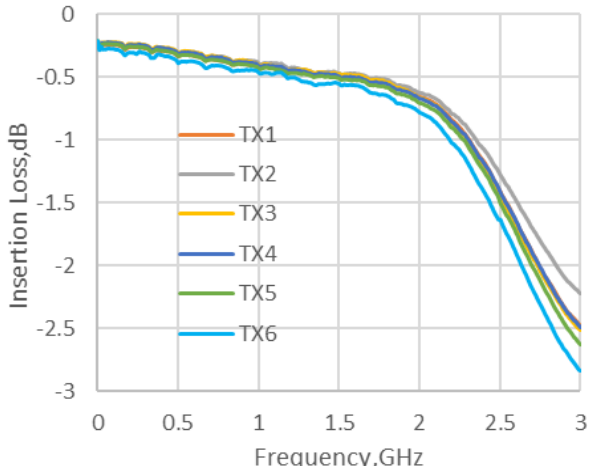


Figure 5. Return Loss

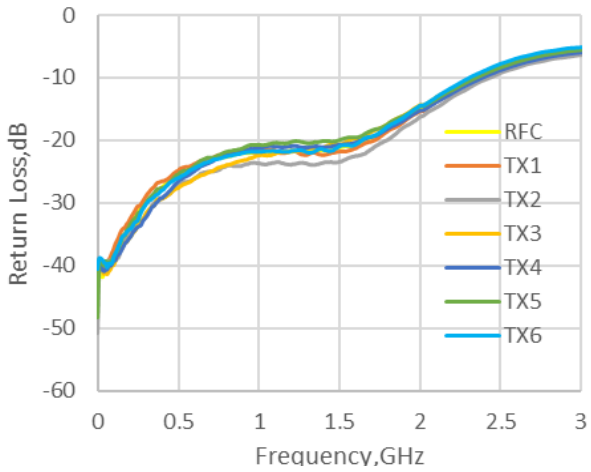


Figure 6. ANT-TX Isolation

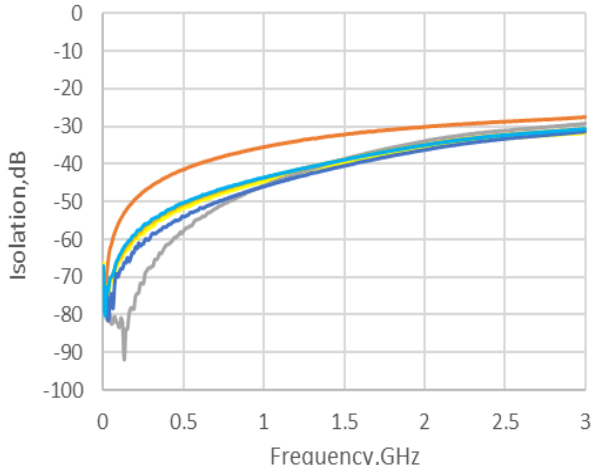


Figure 7. TX-TX Isolation

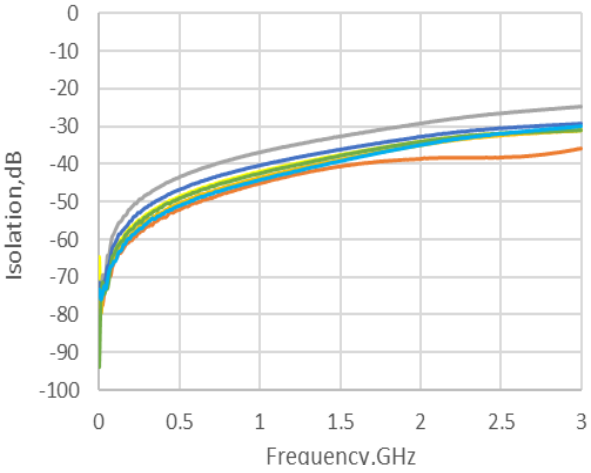


Figure 8. TX1 Insertion Loss

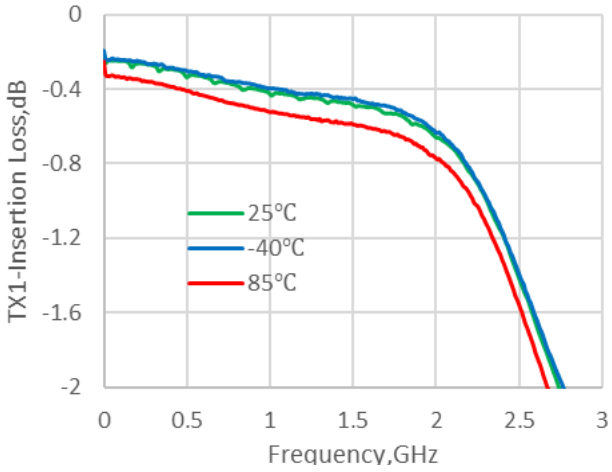
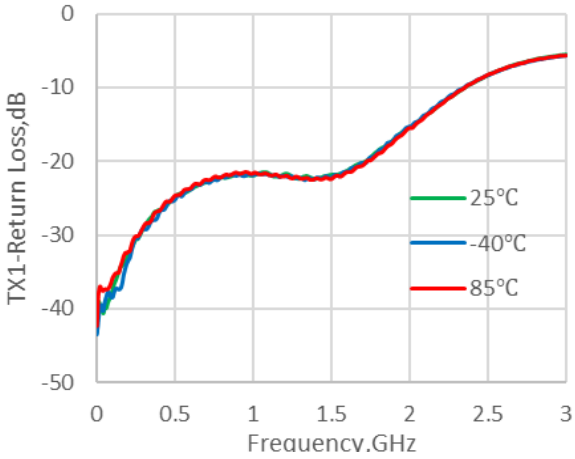


Figure 9. TX1 Return Loss



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Typical Performance Characteristics

Figure 10. TX1-TX2 Isolation

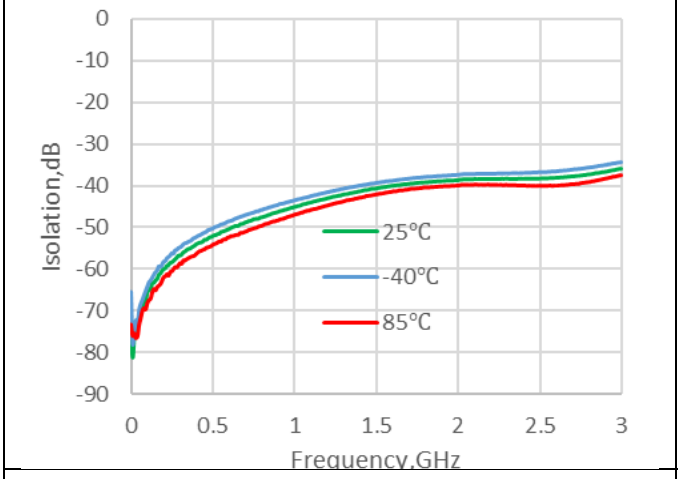


Figure 11. ANT-TX1 Isolation

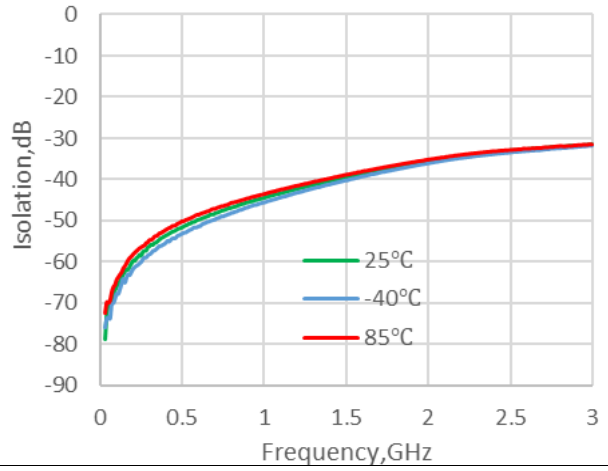


Figure 12. NoiseFigure

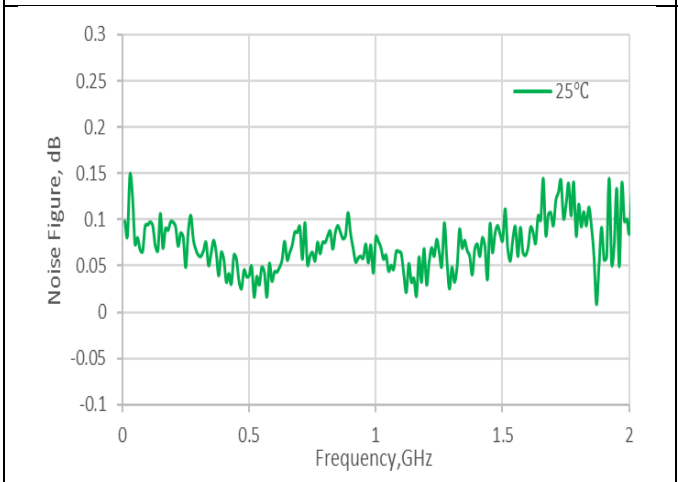


Figure 13. Spur_0.1GHz***

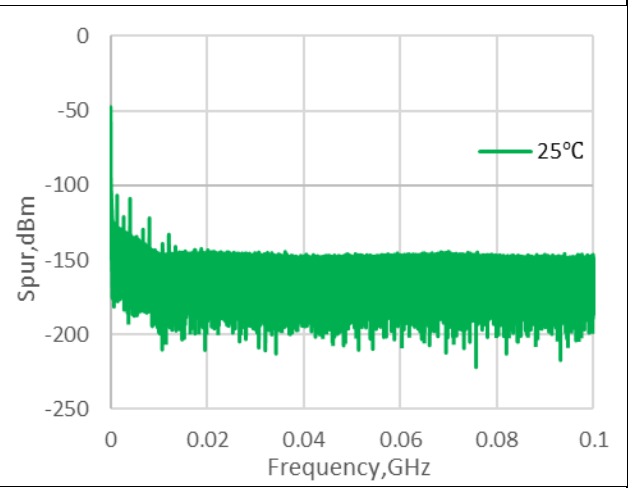


Figure 14. Spur_0.1-0.5GHz***

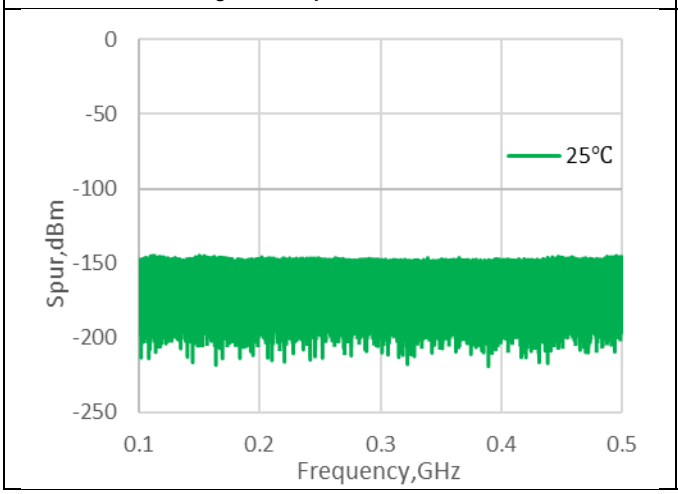
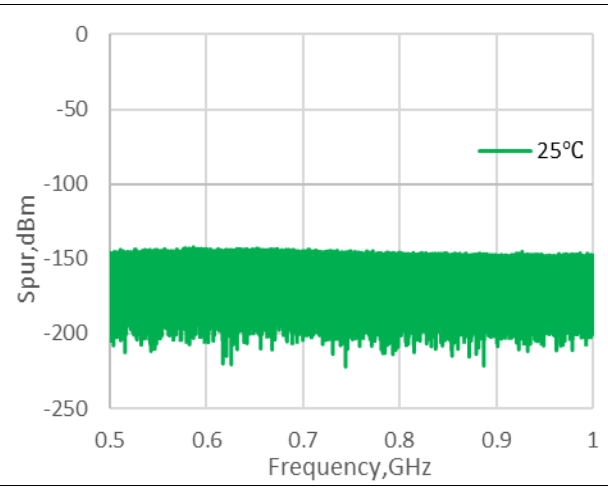


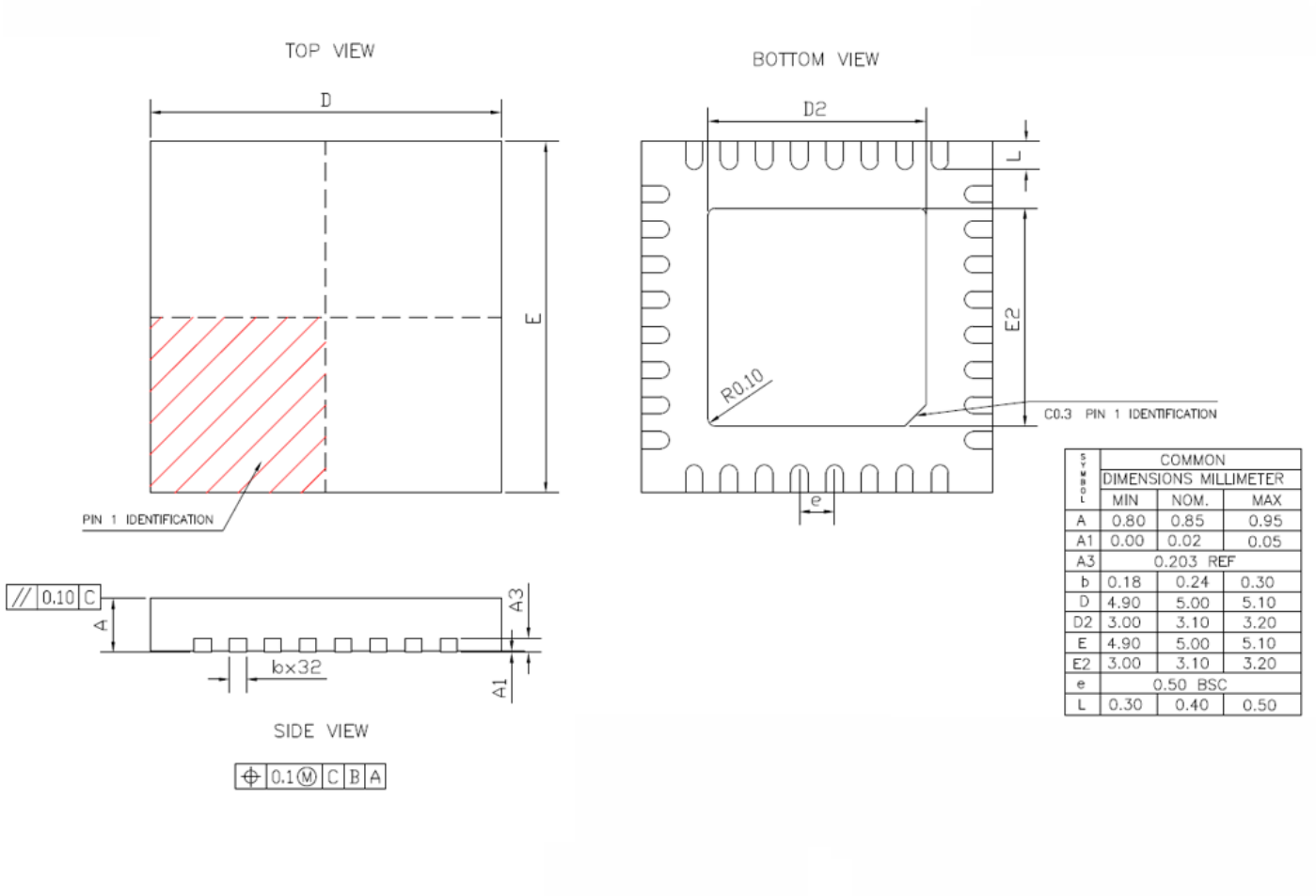
Figure 15. Spur_0.5-1GHz***



*Note:*** spur's test condition in noise floor:RBW=VBW=100Hz*

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Package Drawing



SYMBOL	COMMON DIMENSIONS MILLIMETER		
	MIN	NOM.	MAX
A	0.80	0.85	0.95
A1	0.00	0.02	0.05
A3		0.203 REF	
b	0.18	0.24	0.30
D	4.90	5.00	5.10
D2	3.00	3.10	3.20
E	4.90	5.00	5.10
E2	3.00	3.10	3.20
e		0.50 BSC	
L	0.30	0.40	0.50

Figure 16

Ordering Information

Table 7

Order Code	Part Marking	Package	Shipping Method
RS1165-250	1165	QFN5X5_32PIN	250 units
RS1165-3000	1165	QFN5X5_32PIN	3000 units

Revision History

Table8

Revision Number	Revision Date	Description	Modifications
0	2023/3/7	Draft	—
0.1	2023/6/29	Initial release	
1.0	2024/4/6	Released	
1.1	2024/6/6	Update data	
1.2	2024/8/26	Update data	
1.3	2024/9/6	Update data	
1.4	2024/11/29	Released	Modify Package Drawing
1.5	2025/05	Update data	
1.6	2025/10/12	Update data	

Document Categories

Advance Information

The product is in a formative or design stage. The datasheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The datasheet contains preliminary data. Additional data may be added at a later date. RFone Technology reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

The datasheet contains final data. In the event RFone Technology decides to change the specifications, RFone Technology will notify customers of the intended changes by issuing a CNF (Customer Notification Form).

Sales Contact

For additional information, contact Sales at sales@rfonetech.com.

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