APPROVAL SHEET

RF Switch Series – RoSH Compliance

SPDT GPIO Switch

Halogens Free Product

Any 2G/3G/4G Band for TRx System

P/N: RFASWA141ATF09

*Contents in this sheet are subject to change without prior notice.

FEATURES

- Low Insertion Loss and Low Distortion
- Broadband frequency range：0.4 to 2.7 GHz
- Low ON-state resistance and OFF-state capacitance
- High power and peak voltage handling
- Low control voltage：1.2V to 2.8V
- High ESD tolerance of 2kV HBM at all pins
- Miniature footprint：1.67 x 1.47 x 0.55 mm^3
- **M**oisture **S**ensitive **L**evel 3 (MSL3)

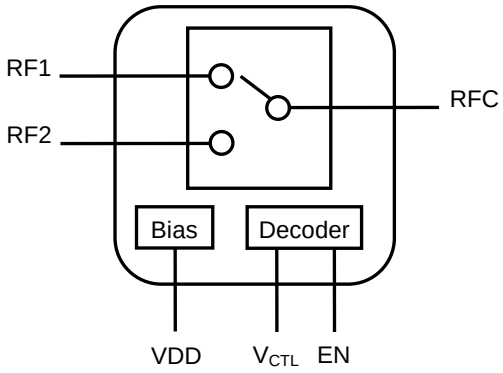
Description

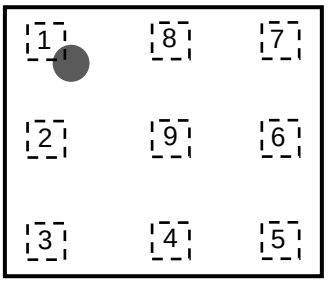
- The RFASWA141ATF09 is a Single-Pole, Double-Throw (SPDT) switch designed for antenna tuning applications that require very low R_{ON} and C_{OFF}. The RFASWA141ATF09 provides rugged power handling and simple 1-bit GPIO control. The EN pin configures an “all-off state” as well as low power mode. The RFASWA141ATF09 is manufactured in LGA-9 (1.67 x 1.47 x 0.55 mm^3) package
- The RFASWA141ATF09 features very low DC power consumption.
- The RFASWA141ATF09 has ESD protection devices to achieve excellent ESD performances. No DC Blocking capacitors are required for all RF ports unless DC is biased externally.

Application

- Antenna Tuning
- Band Switching
- Impedance Tuning

Block Diagram and Pin Out (Top View)

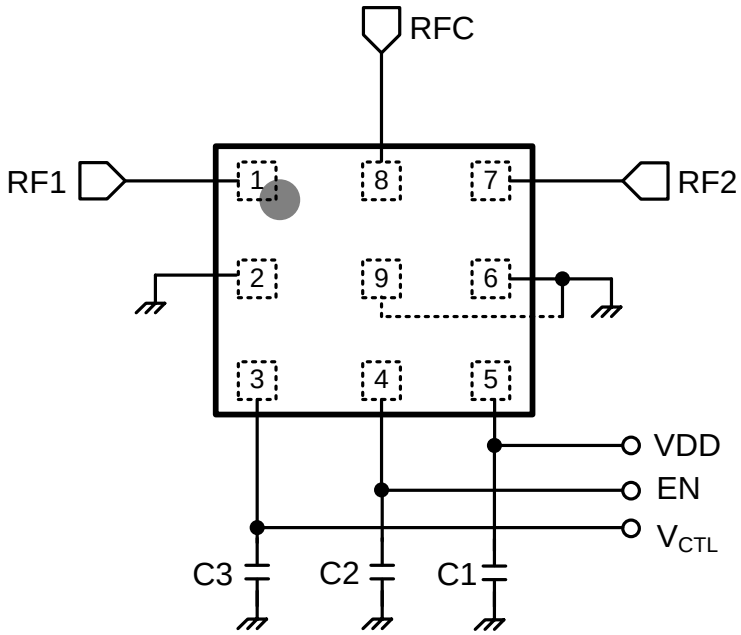




Pin Names and Descriptions

Pin	Name	Description	Pin	Name	Description
1	RF1	RF path 1	6	GND	Ground
2	GND	Ground	7	RF2	RF path 2
3	V_{CTL}	DC control voltage	8	RFC	RF common port
4	EN	Enable	9	GND	Ground
5	VDD	DC power supply			

Application Circuit



Parts List

Parts No.	Value
C1	100 F
C2-C3	No placement, do not populate

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
RFx Input Power, 50Ω	Pin		+41	dBm
DC Supply Voltage	VDD		+5.2	V
DC Control Voltage	V_{CTL}		+3.0	V
Enable Voltage	EN		+5.2	V
Max differential RF voltage between the RF ports V_{RF}	V_P	40		V
Storage temperature	T_{STG}	-55	+150	°C
Operating temperature	T_{OP}	-30	+85	°C
HBM ESD Voltage, All Pins	V_{ESD} [1]	-	+2000	V

Note 1：Human Body Model ESD Voltage

Exceeding absolute maximum ratings may cause permanent damage. Operation between operating range maximum and absolute maximum for extended periods may reduce reliability.

Electrical Specifications

(Top= 25°C, VDD=2.85V, EN & V_{CTL}=0/1.8V, Characteristic Impedance ZO= 50 Ω, Unless Otherwise Noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
RF Specifications						
Operating Frequency	f		400		3000	MHz
Insertion Loss (RFC to RF1/2 port)	IL	700 MHz 915 MHz 1910 MHz 2700 MHz		0.20 0.20 0.30 0.35	0.35 0.40 0.60 0.70	dB dB dB dB
Isolation (RFC to RF1/2 port) Logic State 1&2	Iso	700 MHz 915 MHz 1910 MHz 2700 MHz	21 20 14 11	25 23 17 14		dB dB dB dB
Isolation (RFC to RF1/2 port) Logic State 3	Iso	700 MHz 915 MHz 1910 MHz 2700 MHz	16 14 9 7	20 18 12 10		dB dB dB dB
Isolation (RF1 to RF2 port) Logic State 3	Iso	700 MHz 915 MHz 1910 MHz 2700 MHz	40 35 25 20	45 40 29 24		dB dB dB dB
On state match	VSWR	915 MHz 1910 MHz	1.43 1.43	1.22 1.22		-
On resistance (RFC to RF1/2 port) Logic State 1&2	R_{ON}			1.1	1.4	Ω
Off capacitance (RFC to RF1/2 port) Logic State 1&2	C_{OFF}			0.22	0.27	pF
RFx Harmonics	2f0	PIN = +23dBm, f = 700MHz PIN = +35dBm, f = 915MHz PIN = +23dBm, f = 2570MHz		-97 -73 -90		dBm dBm dBm
	3f0	PIN = +23dBm, f = 700MHz PIN = +35dBm, f = 915MHz PIN = +23dBm, f = 2570MHz		-98 -73 -93		dBm dBm dBm
2nd Order Input Intercept Point	IIP2	See IIP2 test conditions Table	110	120		dBm
3rd Order Input Intercept Point	IIP3	See IIP3 test conditions Table	72	75		dBm
DC Specification (Decoder)						
Supply Voltage	VDD		2.4	2.85	5.0	V
Supply Current	I_{DD}	Active Mode, VDD= 2.85V		55	75	μA
		Low Power Mode, VDD= 2.85V		2.5	5	μA
Enable Control Voltage	V_{EN}		1.2	1.8	5.0	V
Enable Control Current	I_{EN}	EN= 1.8V			5	μA
Control Voltage(High)	$V_{CTL(H)}$		1.2	1.8	2.8	V
Control Voltage(Low)	$V_{CTL(L)}$		0		0.45	V
Control Current	I_{CTL}	V_{CTL}= 1.8V			5	μA
Switching Specification						
On switching speed	T_{SW}	50% V_{CTL} to 90% RF On		8	10	μs
Off switching speed	T_{SW}	50% V_{CTL} to 90% RF Off		8	10	μs

Note：All measurements made in a 50Ω system with 0/+1.8V control voltages, unless otherwise specified.

IIP2 Test Conditions

Band	In-Band Freq (MHz)	CW tone 1 (MHz)	CW tone 1 (dBm)	CW tone 2 (MHz)	CW tone 2 (dBm)
1	2140.0	1950.0	+20	190.0	–15
			+26	4090.0	–20
2	1960.0	1880.0	+20	80.0	–15
			+26	3840.0	–20
5	881.5	836.5	+20	45.0	–15
			+26	1718.0	–20
8	942.5	897.5	+20	45.0	–15
			+26	1840.0	–20

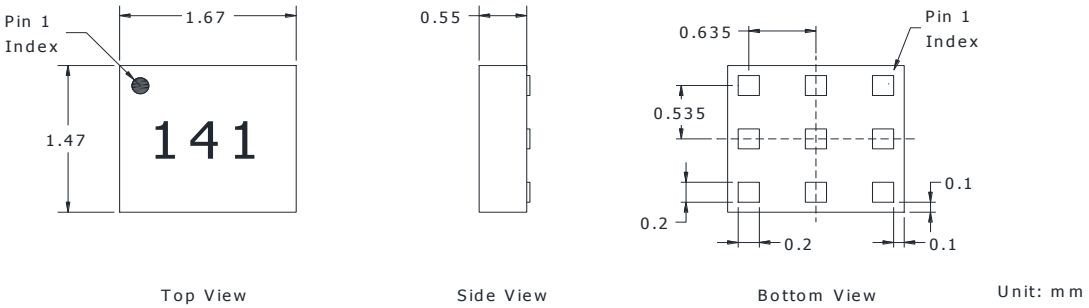
IIP3 Test Conditions

Band	In-Band Freq (MHz)	CW tone 1 (MHz)	CW tone 1 (dBm)	CW tone 2 (MHz)	CW tone 2 (dBm)
1	2140.0	1950.0	+20	1760.0	–15
2	1960.0	1880.0	+20	1800.0	–15
5	881.5	836.5	+20	791.5	–15
8	942.5	897.5	+20	852.5	–15

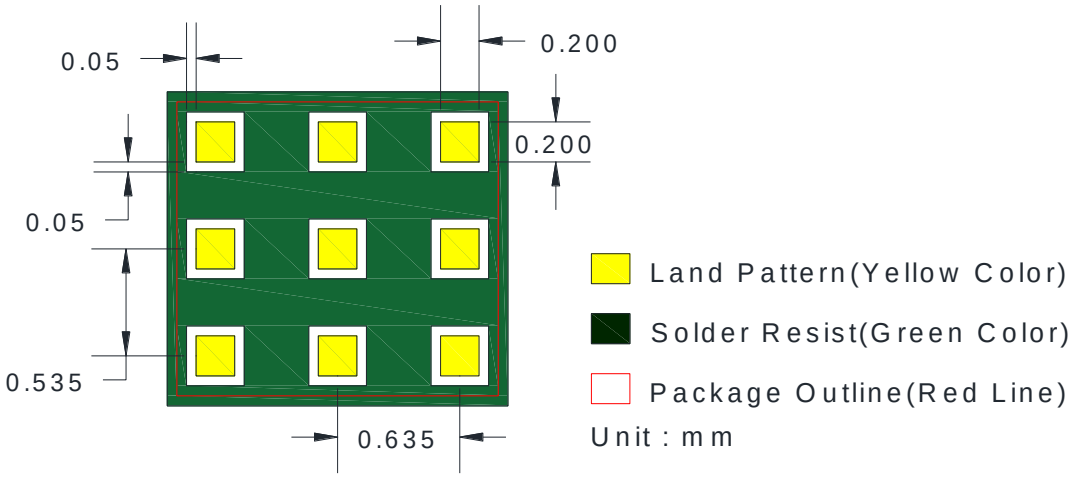
Logic Table for Switch On-Path (High=1.8V ,Low= 0V)

Logic State	EN	V_{CTL}	RF1	RF2
1	1	0	on	off
2	1	1	off	on
3	0	1	off	off
4	0	0	Low Power Mode	

Package Dimensions



Solder Land Pattern



Reliability test

TEST	PROCEDURE / TEST METHOD	REQUIREMENT
Solderability JIS C 0050-4.6 JESD22-B102D	*Solder bath temperature：255 ± 5°C *Immersion time：5 ± 0.5 sec Solder：Sn3Ag0.5Cu for lead-free	At least 95% of a surface of each terminal electrode must be covered by fresh solder.
High temperature JIS C 0021	*Temperature：90°C±2°C *Test duration：1000+24/-0 hours Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -30 ~ 90°C.
Low temperature JIS C 0020	*Temperature：-30°C±2°C *Test duration：1000+24/-0 hours Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -30 ~ 90°C.
Temperature cycle JIS C 0025	1. 30±3 minutes at -30±3°C, 2. 10~15 minutes at room temperature, 3. 30±3 minutes at +90±3°C, 4. 10~15 minutes at room temperature, Total 100 continuous cycles Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -30 ~ 90°C.
High temperature operation life (HTOL)	*Temperature：90°C *VDD = 4.8V *Time：1000+24/-0 hrs. Measurement to be made after keeping at room temperature for 24±2 hrs	No mechanical damage. Electrical specification shall satisfy the descriptions in electrical characteristics under the operational temperature range within -30 ~ 90°C.

Soldering condition

Typical examples of soldering processes that provide reliable joints without any damage are given in Figure 11.

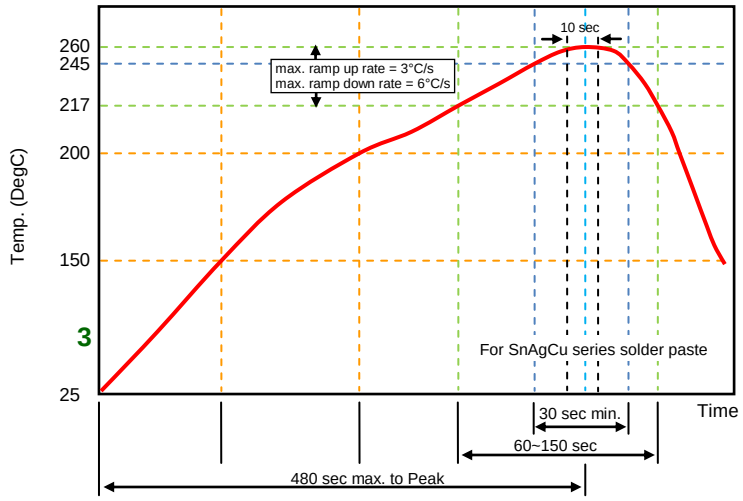


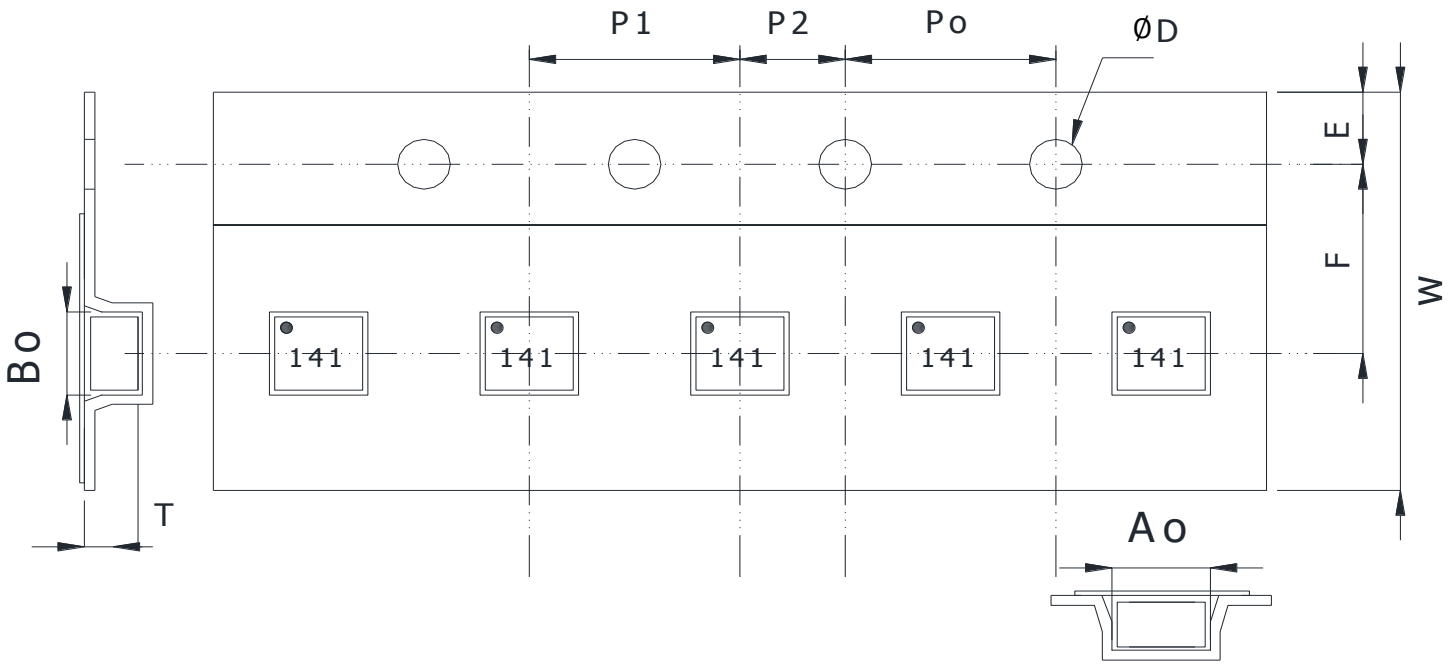
Figure 11. Infrared soldering profile

Ordering code

RF	ASW	A	141A	T
RF module RM: Walsin RF Switch Device	**Module type** ASW: Antenna Switch	**Application** K : SPDT	**Design Code**	**Packing** T: Taping

Minimum Ordering Quantity: 3000 pcs per reel.

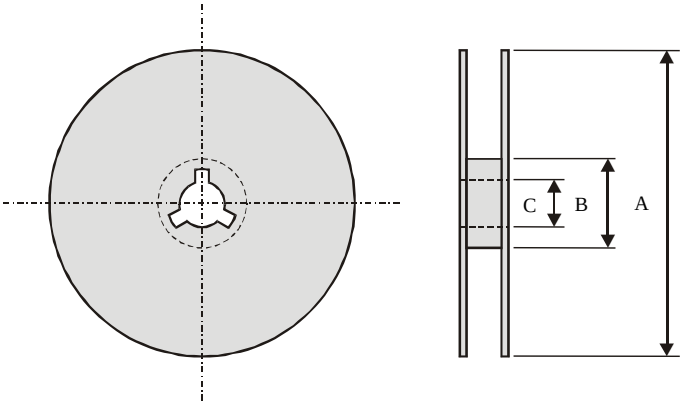
Packaging



Plastic Tape specifications (unit :mm)

Index	Ao	Bo	ΦD	T	W
Dimension (mm)	1.87 ± 0.05	1.67 ± 0.05	0.80 ± 0.01	0.75 ± 0.05	8.00 + 0.3/-0.1
Index	E	F	Po	P1	P2
Dimension (mm)	1.75 ± 0.05	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05

Reel dimensions



Index	A	B	C
Dimension (mm)	Φ178.0	Φ54.0	Φ13.2

Taping Quantity : 3000 pieces per 7" reel

Caution of handling

Limitation of Applications

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects, which might directly cause damage to the third party's life, body or property.

(1) Aircraft equipment
(2) Aerospace equipment
(3) Undersea equipment
(4) Medical equipment
(5) Disaster prevention / crime prevention equipment
(6) Traffic signal equipment
(7) Transportation equipment (vehicles, trains, ships, etc.)
(8) Applications of similar complexity and /or reliability requirements to the applications listed in the above.

Storage condition

(1) Products should be used in 6 months from the day of WALSIN outgoing inspection, which can be confirmed.

(2) Storage environment condition.

- Products should be storage in the warehouse on the following conditions.
- Temperature : -10 to +40°C
- Humidity : 30 to 70% relative humidity
- Don't keep products in corrosive gases such as sulfur. Chlorine gas or acid or it may cause oxidization of electrode, resulting in poor solderability.
- Products should be storage on the palette for the prevention of the influence from humidity, dust and son on.
- Products should be storage in the warehouse without heat shock, vibration, direct sunlight and so on.
- Products should be storage under the airtight packaged condition.