UPG2163T5N

Data Sheet

GaAs Integrated Circuit
Broadband SPDT Switch for Dual-Band Wireless LAN

R09DS0019EJ0300
Rev.3.00
May 19, 2011

DESCRIPTION

The UPG2163T5N is GaAs MMIC SPDT (Single Pole Double Throw) switch which was developed for 2.4 GHz and 6 GHz dual-band wireless LAN. This device can operate at frequencies from 0.5 to 2.5 GHz, 4.9 to 6.0 GHz and 8.0 GHz, with low insertion loss and high isolation.

This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) package. And this package is able to high-density surface mounting.

<R> FEATURES

- Operating frequency : f = 0.5 to 2.5 GHz, 4.9 to 6.0 GHz and 8.0 GHz
- Switch control voltage : $V_{cont\ (H)}$ = 2.8 to 5.0 V (3.0 V TYP.)
  : $V_{cont\ (L)}$ = −0.3 to 0.3 V (0 V TYP.)
- Low insertion loss : $L_{ins}1$ = 0.40 dB TYP. @ f = 2.4 to 2.5 GHz
  : $L_{ins}2$ = 0.50 dB TYP. @ f = 4.9 to 6.0 GHz
  : $L_{ins}3$ = 0.90 dB TYP. @ f = 8.0 GHz
  : $L_{ins}4$ = 0.50 dB TYP. @ f = 0.5 to 2.5 GHz
- High isolation : ISL1 = 38 dB TYP. @ f = 2.4 to 2.5 GHz
  : ISL2 = 30 dB TYP. @ f = 4.9 to 6.0 GHz
  : ISL3 = 23 dB TYP. @ f = 8.0 GHz
  : ISL4 = 43 dB TYP. @ f = 0.5 to 1.0 GHz
  : ISL5 = 38 dB TYP. @ f = 1.0 to 2.5 GHz
- Handling power : $P_{in\ (1\ dB)}$ = +31.0 dBm TYP. @ f = 2.5 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $P_{in\ (1\ dB)}$ = +29.0 dBm TYP. @ f = 6.0 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- High-density surface mounting : 6-pin plastic TSON package (1.5 × 1.5 × 0.37 mm)

<R> APPLICATIONS

- Dual-band wireless LAN (IEEE802.11a/b/g/n), etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
UPG2163T5N-E2	UPG2163T5N-E2-A	6-pin plastic TSON (Pb-Free)	G4X	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: UPG2163T5N

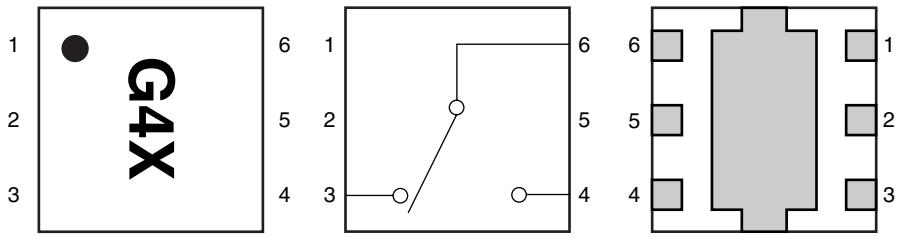
CAUTION

Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View) (Top View) (Bottom View)



Pin No.	Pin Name
1	GND
2	$V_{cont}2$
3	OUT2 (RX)
4	OUT1 (TX)
5	$V_{cont}1$
6	IN (ANT)

Remark Exposed pad : GND

TRUTH TABLE

$V_{cont}1$	$V_{cont}2$	IN (ANT)–OUT1 (TX)	IN (ANT)–OUT2 (RX)
High	Low	OFF	ON
Low	High	ON	OFF

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	–6.0 to +6.0	V
Input Power	P_{in}	+32	dBm
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +135	°C

<R> RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	$V_{cont\ (H)}$	2.8	3.0	5.0	V
Switch Control Voltage (L)	$V_{cont\ (L)}$	–0.3	0	0.3	V
Operating Frequency 1 Note 1	f1	2.4	–	2.5	GHz
Operating Frequency 2 Note 1	f2	4.9	–	6.0	GHz
Operating Frequency 3 Note 2	f3	–	8.0	–	GHz
Operating Frequency 4 Note 3	f4	0.5	–	1.0	GHz
Operating Frequency 5 Note 3	f5	1.0	–	2.4	GHz

Notes 1. DC blocking capacitors = 4 pF
2. DC blocking capacitors = 2 pF
3. DC blocking capacitors = 100 pF

<R> ELECTRICAL CHARACTERISTICS

(T_A = +25°C, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V, Z_0 = 50 Ω, DC blocking capacitors = 4 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 2.4 to 2.5 GHz	–	0.40	0.60	dB
Insertion Loss 2	$L_{ins}2$	f = 4.9 to 6.0 GHz	–	0.50	0.80	dB
Insertion Loss 3	$L_{ins}3$	f = 8.0 GHz Note 1	–	0.90	–	dB
Insertion Loss 4	$L_{ins}4$	f = 0.5 to 2.5 GHz Note 2	–	0.50	–	dB
Isolation 1	ISL1	f = 2.4 to 2.5 GHz	35	38	–	dB
Isolation 2	ISL2	f = 4.9 to 6.0 GHz	27	30	–	dB
Isolation 3	ISL3	f = 8.0 GHz Note 1	–	23	–	dB
Isolation 4	ISL4	f = 0.5 to 1.0 GHz Note 2	40	43	–	dB
Isolation 5	ISL5	f = 1.0 to 2.5 GHz Note 2	35	38	–	dB
Input Return Loss 1	$RL_{in}1$	f = 2.4 to 2.5 GHz	–	15	–	dB
Input Return Loss 2	$RL_{in}2$	f = 4.9 to 6.0 GHz	–	15	–	dB
Input Return Loss 3	$RL_{in}3$	f = 8.0 GHz Note 1	–	15	–	dB
Input Return Loss 4	$RL_{in}4$	f = 0.5 to 2.5 GHz Note 2	–	20	–	dB
Output Return Loss 1	$RL_{out}1$	f = 2.4 to 2.5 GHz	–	15	–	dB
Output Return Loss 2	$RL_{out}2$	f = 4.9 to 6.0 GHz	–	15	–	dB
Output Return Loss 3	$RL_{out}3$	f = 8.0 GHz Note 1	–	15	–	dB
Output Return Loss 4	$RL_{out}4$	f = 0.5 to 2.5 GHz Note 2	–	20	–	dB
1 dB Loss Compression Input Power 1 Note 3	$P_{in\ (1\ dB)}$ 1	f = 2.4 to 2.5 GHz	–	+31.0	–	dBm
1 dB Loss Compression Input Power 2 Note 3	$P_{in\ (1\ dB)}$ 2	f = 4.9 to 6.0 GHz	–	+29.0	–	dBm
Input 3rd Order Intercept Point	IIP_3		–	+55	–	dBm
Switch Control Current	I_{cont}		–	0.1	1.0	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10%	–	50	–	ns

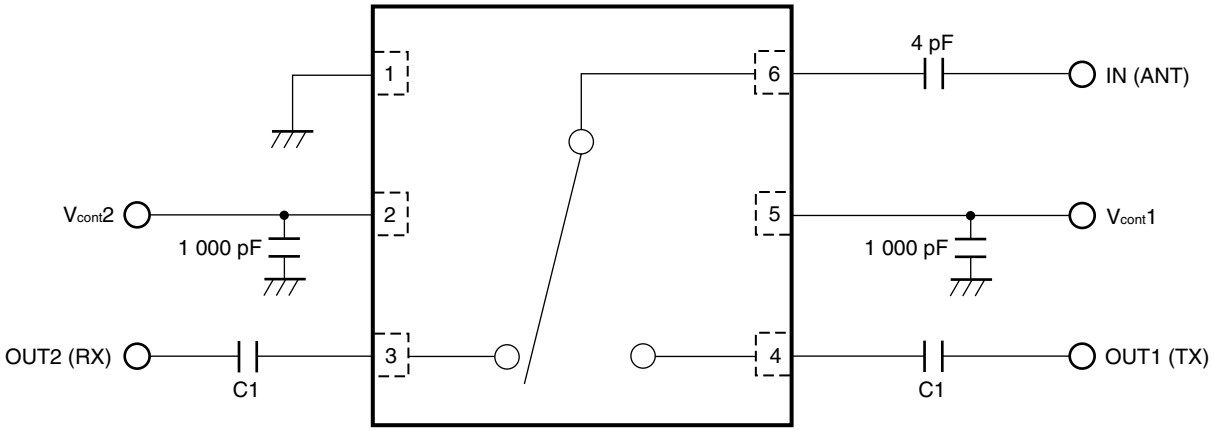
Notes 1. DC blocking capacitors = 2 pF

2. DC blocking capacitors = 100 pF

3. $P_{in\ (1\ dB)}$ is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

Caution This device is used it is necessary to use DC blocking capacitors.

<R> EVALUATION CIRCUIT



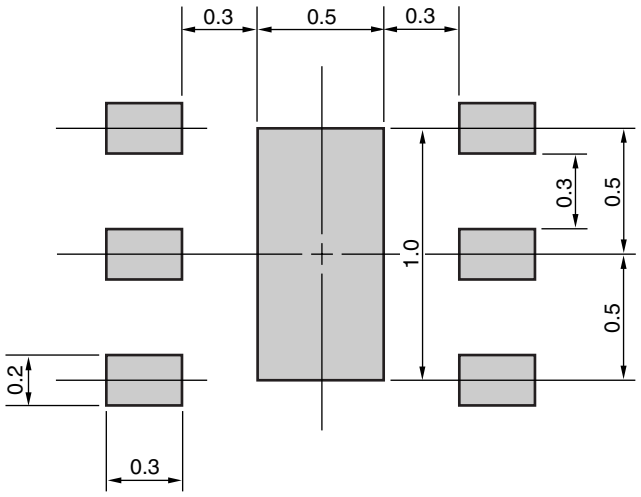
Remark C1: 2.4 to 2.5 GHz and 4.9 to 6.0 GHz 4 pF
8.0 GHz 2 pF
0.5 to 2.5 GHz 100 pF

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

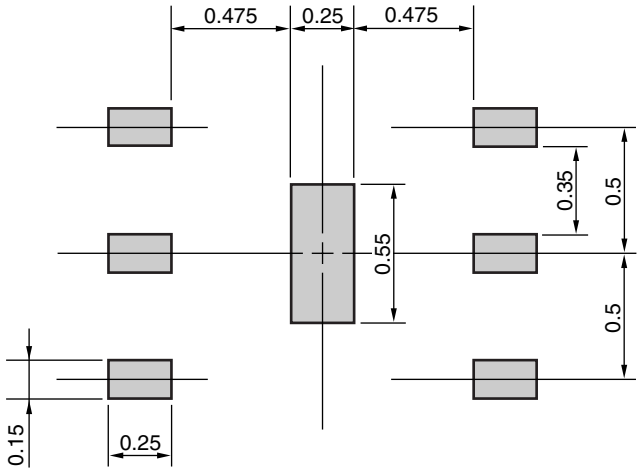
MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

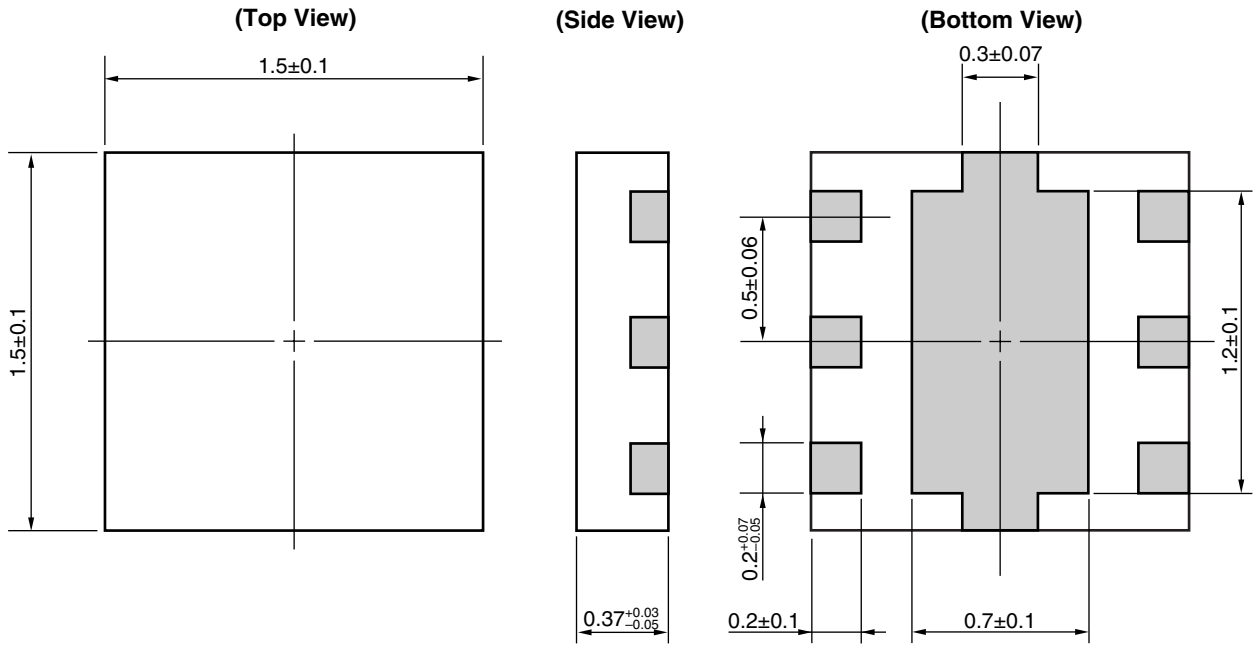


Solder thickness : 0.08 mm

Remark The mounting pad and solder mask layouts in this document are for reference only.
When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (UNIT: mm)



<R> ## RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Partial Heating	Peak temperature (terminal temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

Caution Do not use different soldering methods together (except for partial heating).

Caution GaAs Products	This product uses gallium arsenide (GaAs). GaAs vapor and powder are hazardous to human health if inhaled or ingested, so please observe the following points. • Follow related laws and ordinances when disposing of the product. If there are no applicable laws and/or ordinances, dispose of the product as recommended below. 1. Commission a disposal company able to (with a license to) collect, transport and dispose of materials that contain arsenic and other such industrial waste materials. 2. Exclude the product from general industrial waste and household garbage, and ensure that the product is controlled (as industrial waste subject to special control) up until final disposal. • Do not burn, destroy, cut, crush, or chemically dissolve the product. • Do not lick the product or in any way allow it to enter the mouth.

Revision History	*U*PG2163T5N Data Sheet

Rev.	Date	Description	
		Page	Summary
–	Feb 2008	–	Previous No. :PG10626EJ02V0DS
3.00	May 19, 2011	Throughout	Modification of operating frequencies f = 2.4 to 2.5 GHz and 4.9 to 6.0 GHz -> f = 0.5 to 2.5 GHz, 4.9 to 6.0 GHz and 8.0 GHz
		p.1	Modification of APPLICATIONS
		p.7	Modification of RECOMMENDED SOLDERING CONDITIONS

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