CEL

GaAs INTEGRATED CIRCUIT

μPG2150T5L

SP3T SWITCH FOR Bluetooth™ AND 802.11b/g

DESCRIPTION

The μPG2150T5L is a GaAs MMIC SP3T switch which was developed for Bluetooth and wireless LAN.

This device can operate frequency from 0.5 to 2.5 GHz, having the low insertion loss and high isolation.

This device is housed in a 12-pin plastic TSQFN (Thin Small Quad Flat Non-leaded) package. And this package is able to high-density surface mounting.

FEATURES

- Operation frequency : f_{opt} = 0.5 to 2.5 GHz
- Control voltage : $V_{cont\ (H)}$ = 2.3 to 3.6 V (2.85 V TYP.)
  : $V_{cont\ (L)}$ = −0.2 to 0.2 V (0 V TYP.)
- Low insertion loss : $L_{ins}3$ = 0.50 dB TYP. @ f = 2.5 GHz, ANT to RF1, 2, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins}6$ = 0.60 dB TYP. @ f = 2.5 GHz, ANT to RF3, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
- High isolation : ISL3 = 35 dB TYP. @ f = 2.5 GHz, ANT to RF3, On port ANT to RF1, 2, RF1 to RF3, On port ANT to RF1, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
  : ISL6 = 18 dB TYP. @ f = 2.5 GHz, ANT to RF1, On port ANT to RF2, 3, ANT to RF2, On port ANT to RF1, 3, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
- Handling power : $P_{in\ (1\ dB)}$ = +31.0 dBm TYP. @ f = 2.5 GHz, ANT to RF1, 2, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
  : $P_{in\ (1\ dB)}$ = +25.0 dBm TYP. @ f = 2.5 GHz, ANT to RF3, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V
- High-density surface mounting : 12-pin plastic TSQFN package (2.0 × 2.0 × 0.37 mm)

APPLICATIONS

- Antenna switch for Bluetooth and 802.11b/g

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2150T5L-E2	μPG2150T5L-E2-A	12-pin plastic TSQFN (Pb-Free)	2150	• Embossed tape 8 mm wide • Pin 10, 11, 12 face the perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPG2150T5L-A

Caution: Observe precautions when handling because these devices are sensitive to electrostatic discharge

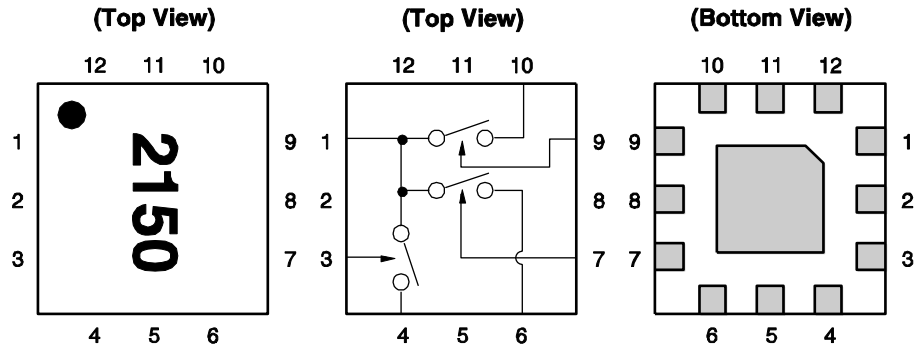
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The mark <R> shows major revised points.

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



Pin No.	Pin Name
1	ANT
2	GND
3	$V_{cont}2$
4	RF2
5	GND
6	RF3
7	$V_{cont}3$
8	GND
9	$V_{cont}1$
10	RF1
11	N.C.
12	N.C.

Remark Exposed pad : GND

TRUTH TABLE

$V_{cont}1$	$V_{cont}2$	$V_{cont}3$	ANT–RF1	ANT–RF2	ANT–RF3
High	Low	Low	ON	OFF	OFF
Low	High	Low	OFF	ON	OFF
Low	Low	High	OFF	OFF	ON

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

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V_{cont}	–6.0 to +6.0 **Note**	V
Input Power1 (ANT–RF1, ANT–RF2)	$P_{in}1$	+31.5	dBm
Input Power2 (ANT–RF3)	$P_{in}2$	+25.5	dBm
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note $|V_{cont\,(H)} - V_{cont\,(L)}| \leq 6.0$ V

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

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f_{opt}	0.5	–	2.5	GHz
Switch Control Voltage (H)	$V_{cont\,(H)}$	2.3	2.85	3.6	V
Switch Control Voltage (L)	$V_{cont\,(L)}$	–0.2	0	0.2	V

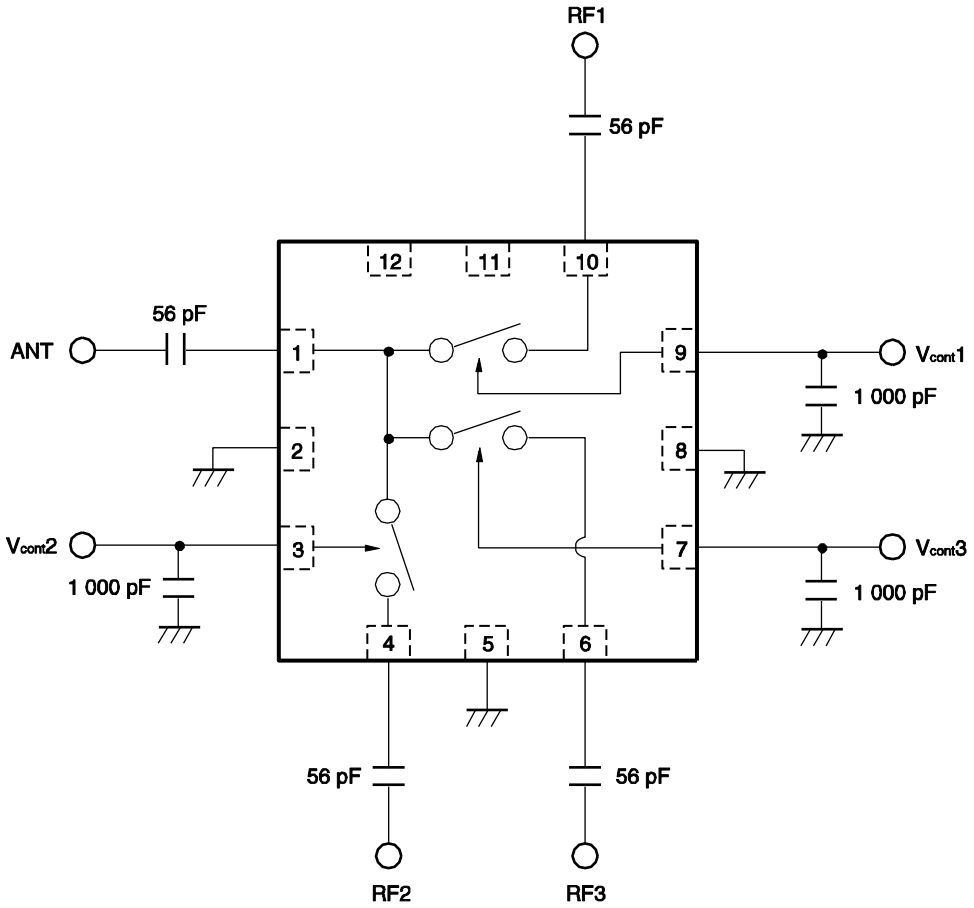
ELECTRICAL CHARACTERISTICS

(T_A = +25°C, $V_{cont\ (H)}$ = 2.85 V, $V_{cont\ (L)}$ = 0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

Parameter	Symbol	Pass	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	ANT to RF1, 2	f = 0.5 to 1.0 GHz	–	0.40	0.55	dB
Insertion Loss 2	$L_{ins}2$		f = 1.0 to 2.0 GHz	–	0.45	0.60	dB
Insertion Loss 3	$L_{ins}3$		f = 2.0 to 2.5 GHz	–	0.50	0.65	dB
Insertion Loss 4	$L_{ins}4$	ANT to RF3	f = 0.5 to 1.0 GHz	–	0.45	0.60	dB
Insertion Loss 5	$L_{ins}5$		f = 1.0 to 2.0 GHz	–	0.55	0.70	dB
Insertion Loss 6	$L_{ins}6$		f = 2.0 to 2.5 GHz	–	0.60	0.75	dB
Isolation 1	ISL1	ANT to RF3 On port ANT to	f = 0.5 to 1.0 GHz	29	32	–	dB
Isolation 2	ISL2	RF1, 2 RF1 to RF3	f = 1.0 to 2.0 GHz	29	32	–	dB
Isolation 3	ISL3	On port ANT to RF1	f = 2.0 to 2.5 GHz	30	35	–	dB
Isolation 4	ISL4	ANT to RF1 On port ANT to	f = 0.5 to 1.0 GHz	23	26	–	dB
Isolation 5	ISL5	RF2, 3 ANT to RF2	f = 1.0 to 2.0 GHz	17	20	–	dB
Isolation 6	ISL6	On port ANT to RF1, 3	f = 2.0 to 2.5 GHz	15	18	–	dB
Input Return Loss	RL_{in}	ANT to RF1, 2, 3	f = 0.5 to 2.5 GHz	15	20	–	dB
Output Return Loss	RL_{out}	ANT to RF1, 2, 3	f = 0.5 to 2.5 GHz	15	20	–	dB
1 dB Loss Compression Input Power **Note**	$P_{in\ (1\ dB)}$	ANT to RF1, 2	f = 1.0 GHz	+28.0	+31.0	–	dBm
			f = 2.0 GHz	+28.0	+31.0	–	dBm
			f = 2.5 GHz	+28.0	+31.0	–	dBm
		ANT to RF3	f = 1.0 GHz	+22.0	+25.0	–	dBm
			f = 2.0 GHz	+22.0	+25.0	–	dBm
			f = 2.5 GHz	+22.0	+25.0	–	dBm
Switch Control Current	I_{cont}	ANT to RF1, 2, 3	RF None	–	0.05	1.0	μA
Switch Control Speed	t_{SW}	ANT to RF1, 2, 3	50% CTL to 90/10% RF	–	50	–	ns

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

EVALUATION CIRCUIT

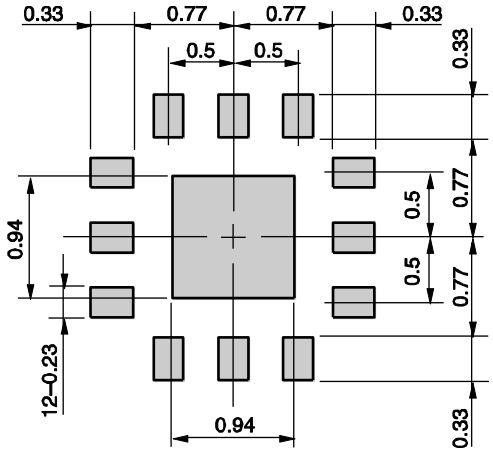


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

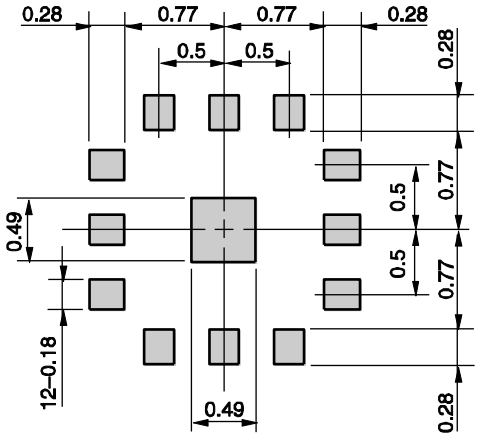
<R> **MOUNTING PAD AND SOLDER PAD LAYOUT DIMENSIONS**

12-PIN PLASTIC TSQFN (UNIT: mm)

MOUNTING PAD



SOLDER PAD

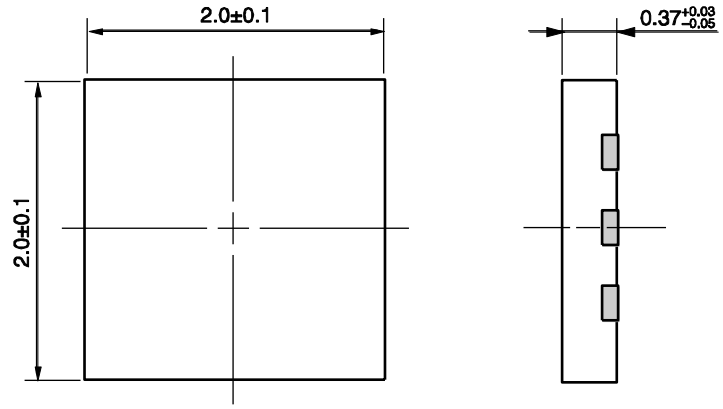


Solder thickness : 0.08 mm

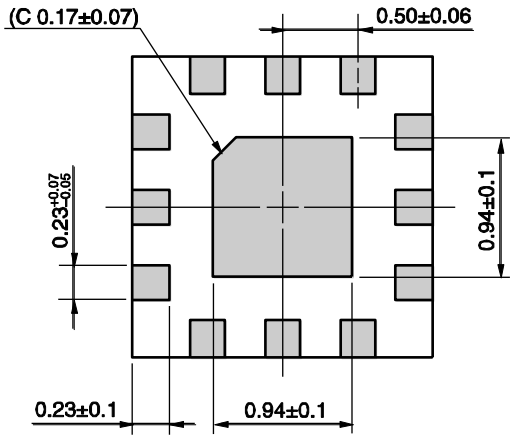
Remark The mounting pad and solder pad layouts in this document are for reference only.

PACKAGE DIMENSIONS

12-PIN PLASTIC TSQFN (UNIT: mm)



(Bottom View)



Remark ( ) : Reference value

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
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
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.

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