



# GaAs INTEGRATED CIRCUIT

## $\mu$ PG2150T5L

### SP3T SWITCH FOR Bluetooth™ AND 802.11b/g

#### DESCRIPTION

The  $\mu$ PG2150T5L is a GaAs MMIC SP3T switch which was developed for Bluetooth and Wireless LAN.

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

This device is housed in a 12-pin plastic TSQFN (Thin Small Quad Flat Non-leaded) package, which is suitable for 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 :  $L_{ins3} = 0.50$  dB TYP. @  $f = 2.5$  GHz, ANT to RF1, 2,  $V_{cont(H)} = 2.85$  V,  $V_{cont(L)} = 0$  V  
:  $L_{ins6} = 0.60$  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
- Power handling :  $P_{in(1\text{ dB})} = +31.0$  dBm TYP. @  $f = 2.5$  GHz, ANT to RF1, 2,  $V_{cont(H)} = 2.85$  V,  $V_{cont(L)} = 0$  V  
:  $P_{in(1\text{ dB})} = +25.0$  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
$\mu$ PG2150T5L-E2	$\mu$ PG2150T5L-E2-A	12-pin plastic TSQFN (Pb-Free)	2150	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 10, 11, 12 face the perforation side of the tape</li><li>• Qty 3 kpcs/reel</li></ul>

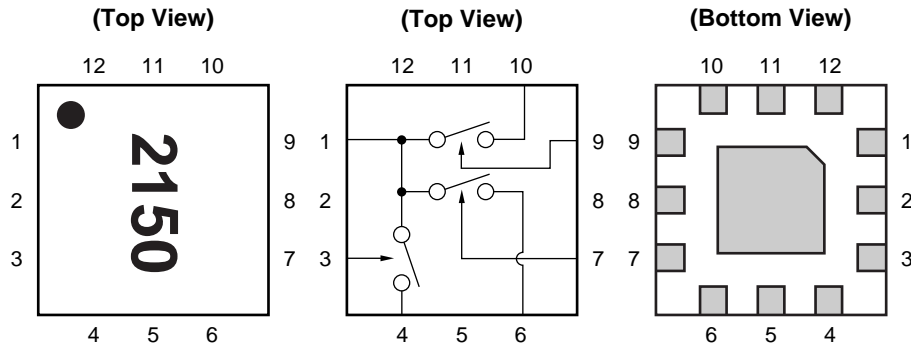
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PG2150T5L-A

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



Pin No.	Pin Name
1	ANT
2	GND
3	V <sub>cont2</sub>
4	RF2
5	GND
6	RF3
7	V <sub>cont3</sub>
8	GND
9	V <sub>cont1</sub>
10	RF1
11	N.C.
12	N.C.

**Remark** Exposed pad : GND

**TRUTH TABLE**

V <sub>cont1</sub>	V <sub>cont2</sub>	V <sub>cont3</sub>	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<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V <sub>cont</sub>	-6.0 to +6.0 <sup>Note</sup>	V
Input Power1 (ANT-RF1, ANT-RF2)	P <sub>in1</sub>	+31.5	dBm
Input Power2 (ANT-RF3)	P <sub>in2</sub>	+25.5	dBm
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

**Note** |V<sub>cont (H)</sub> - V<sub>cont (L)</sub>| ≤ 6.0 V

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt</sub>	0.5	-	2.5	GHz
Switch Control Voltage (H)	V <sub>cont (H)</sub>	2.3	2.85	3.6	V
Switch Control Voltage (L)	V <sub>cont (L)</sub>	-0.2	0	0.2	V

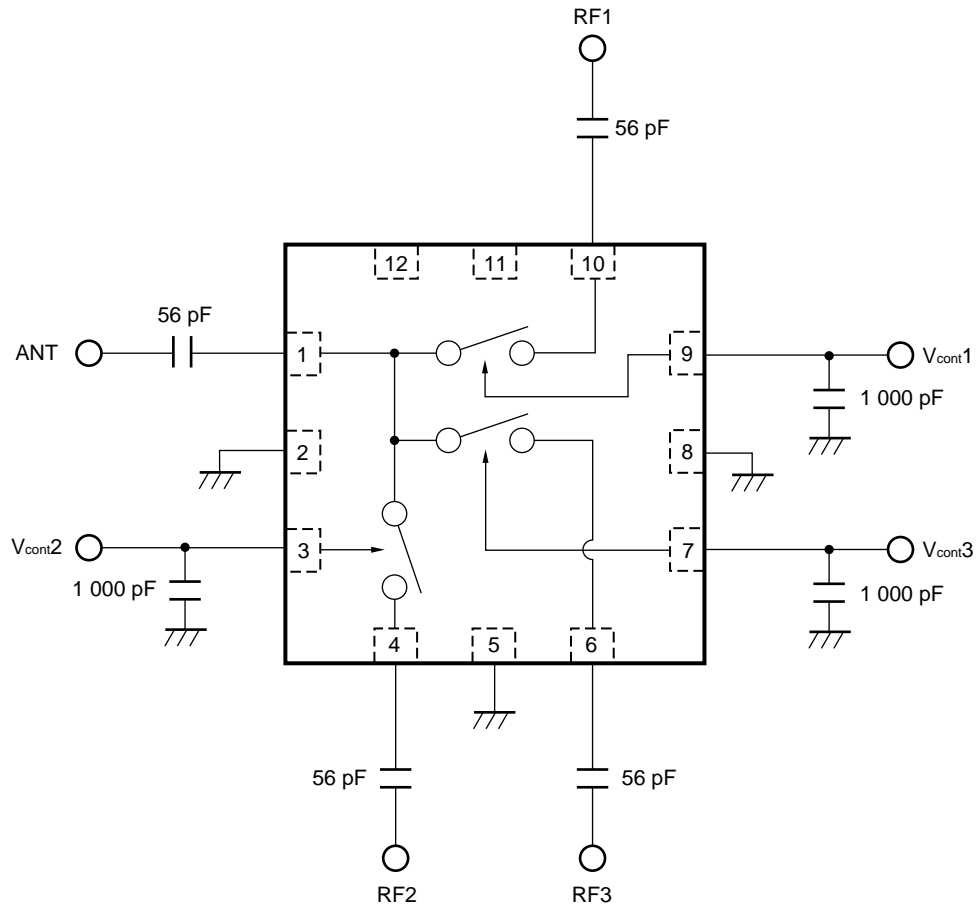
**ELECTRICAL CHARACTERISTICS**

(T<sub>A</sub> = +25°C, V<sub>cont</sub> (H) = 2.85 V, V<sub>cont</sub> (L) = 0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

Parameter	Symbol	Pass	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	L <sub>ins1</sub>	ANT to RF1, 2	f = 0.5 to 1.0 GHz	–	0.40	0.55	dB
Insertion Loss 2	L <sub>ins2</sub>		f = 1.0 to 2.0 GHz	–	0.45	0.60	dB
Insertion Loss 3	L <sub>ins3</sub>		f = 2.0 to 2.5 GHz	–	0.50	0.65	dB
Insertion Loss 4	L <sub>ins4</sub>	ANT to RF3	f = 0.5 to 1.0 GHz	–	0.45	0.60	dB
Insertion Loss 5	L <sub>ins5</sub>		f = 1.0 to 2.0 GHz	–	0.55	0.70	dB
Insertion Loss 6	L <sub>ins6</sub>		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 <sub>in</sub>	ANT to RF1, 2, 3	f = 0.5 to 2.5 GHz	15	20	–	dB
Output Return Loss	RL <sub>out</sub>	ANT to RF1, 2, 3	f = 0.5 to 2.5 GHz	15	20	–	dB
1 dB Loss Compression Input Power <sup>Note</sup>	P <sub>in</sub> (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 <sub>cont</sub>	ANT to RF1, 2, 3	RF None	–	0.05	1.0	μA
Switch Control Speed	t <sub>sw</sub>	ANT to RF1, 2, 3	50% CTL to 90/10% RF	–	50	–	ns

**Note** P<sub>in</sub> (1 dB) is the input power level when the insertion loss increases 1 dB more than that of linear the range.

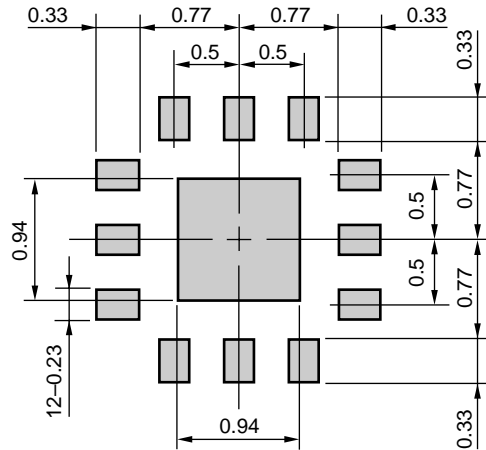
EVALUATION CIRCUIT



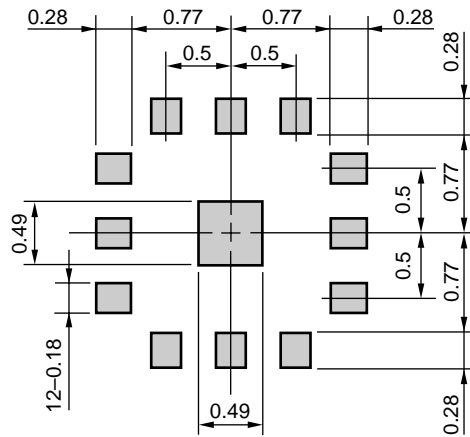
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

<R> MOUNTING PAD AND SOLDER PAD LAYOUT DIMENSIONS  
 12-PIN PLASTIC TSQFN (UNIT: mm)

MOUNTING PAD



SOLDER PAD

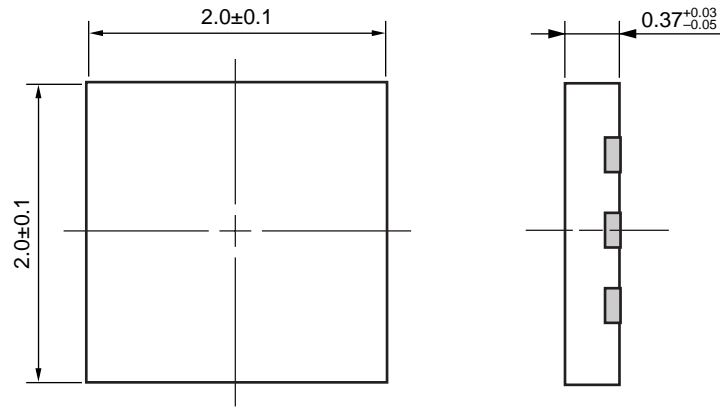


Solder thickness : 0.08 mm

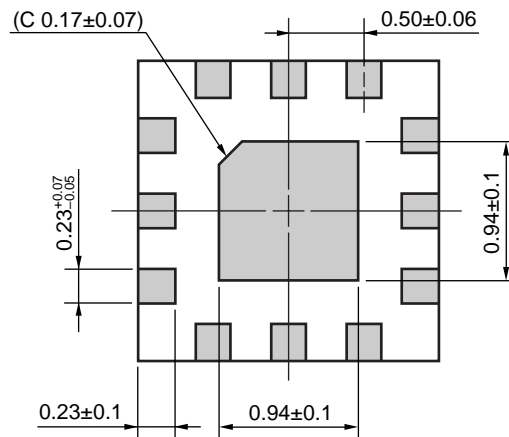
**Remark** The mounting pad and solder pad layouts in this document are for reference only.

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) : 260°C or below Time at peak temperature : 10 seconds or less Time at temperature of 220°C or higher : 60 seconds or less Preheating time at 120 to 180°C : 120±30 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below Time at peak temperature : 10 seconds or less Preheating temperature (package surface temperature) : 120°C or below Maximum number of flow processes : 1 time Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (terminal temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350

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

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M8E 02.11-1



<p><b>Caution</b> GaAs Products</p>	<p>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.</p> <ul style="list-style-type: none"> <li>• 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.             <ol style="list-style-type: none"> <li>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.</li> <li>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.</li> </ol> </li> <li>• Do not burn, destroy, cut, crush, or chemically dissolve the product.</li> <li>• Do not lick the product or in any way allow it to enter the mouth.</li> </ul>
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Subject: Compliance with EU Directives

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This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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