

### μPG2411T6R

## GaAs Integrated Circuit SPDT Switch for 1 GHz to 8 GHz

R09DS0020EJ0100 Rev.1.00 Apr 25, 2011

### **DESCRIPTION**

The  $\mu$ PG2411T6R is a GaAs MMIC SPDT (Single Pole Double Throw) switch which was designed for 1 GHz to 8 GHz applications, including dual-band wireless LAN.

This device operates with dual control switching voltages of 1.8 to 3.6 V and can operate at frequencies from 1 GHz to 8 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin plastic TSSON ( $\underline{T}$ hin  $\underline{S}$ hrink  $\underline{S}$ mall  $\underline{O}$ ut-line  $\underline{N}$ on-leaded) and is suitable for high-density surface mounting.

### **FEATURES**

• Switch control voltage :  $V_{cont (H)} = 1.8 \text{ to } 3.6 \text{ V } (3.0 \text{ V TYP.})$ 

 $V_{\text{cont}(L)} = 0 \text{ V TYP}.$ 

• Low insertion loss :  $L_{ins} = 0.5 \text{ dB TYP.}$  @ f = 2.5 GHz

:  $L_{ins} = 0.6 \text{ dB TYP.}$  @ f = 6 GHz

• High isolation : ISL = 25 dB TYP. @ f = 2 to 6 GHz

• Handling power :  $P_{in (1 dB)} = +30.5 dBm TYP$ . @  $V_{cont (H)} = 3.0 V$ , f = 2.5 GHz and 6 GHz

:  $P_{\text{in }(0.1 \text{ dB})} = +28 \text{ dBm TYP.}$  @  $V_{\text{cont }(H)} = 3.0 \text{ V}$ , f = 2.5 GHz and 6 GHz

• High-density surface mounting : 6-pin plastic TSSON package  $(1.0 \times 1.0 \times 0.37 \text{ mm})$ 

### **APPLICATIONS**

• Wireless LAN (IEEE802.11a/b/g/n), etc.

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2411T6R-E2	μPG2411T6R-E2-A	6-pin	GC	Embossed tape 8 mm wide
		plastic TSSON		Pin 1, 6 face the perforation side of the tape
		(Pb-Free)		Qty 5 kpcs/reel

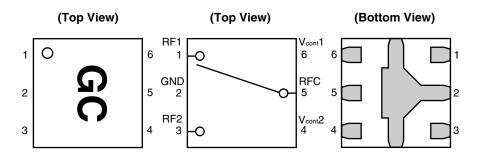
Remark To order evaluation samples, please contact your nearby sales office.

Part number for sample order: µPG2411T6R

### **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.

### PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



Pin No.	Pin Name
1	RF1
2	GND
3	RF2
4	V <sub>cont</sub> 2
5	RFC
6	V <sub>cont</sub> 1

Remark Exposed pad: GND

### **SW TRUTH TABLE**

ON Path	V <sub>cont</sub> 1	V <sub>cont</sub> 2
RFC-RF1	High	Low
RFC-RF2	Low	High

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	$V_{cont}$	+6.0 Note	V
Input Power	Pin	+31.0	dBm
Power Dissipation	$P_D$	150	mW
Operating Ambient Temperature	T <sub>A</sub>	-40 to +90	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

Note:  $|V_{cont}1 - V_{cont}2| \le 6.0 \text{ V}$ 

### **RECOMMENDED OPERATING RANGE (TA = +25°C, unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f	1.0	_	8.0	GHz
Switch Control Voltage (H)	V <sub>cont (H)</sub>	1.8	3.0	3.6	<b>V</b>
Switch Control Voltage (L)	V <sub>cont (L)</sub>	-0.2	0	0.2	<b>V</b>
Control Voltage Difference	∠V <sub>cont (H)</sub> ,	-0.1	0	0.1	V
	△V <sub>cont (L)</sub> Note				

 $\begin{aligned} \text{Note:} \quad & \varDelta V_{cont \ (H)} = V_{cont} \mathbf{1}_{ \ (H)} - V_{cont} \mathbf{2}_{ \ (H)} \\ & \varDelta V_{cont \ (L)} = V_{cont} \mathbf{1}_{ \ (L)} - V_{cont} \mathbf{2}_{ \ (L)} \end{aligned}$ 

# ELECTRICAL CHARACTERISTICS 1 (T<sub>A</sub> = +25°C, V<sub>cont (H)</sub> = 3.0 V, V<sub>cont (L)</sub> = 0 V, Z<sub>O</sub> = 50 $\Omega$ , DC blocking capacitors = 8 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	L <sub>ins</sub> 1	f = 1.0 to 2.0 GHz	_	0.50	-	dB
Insertion Loss 2	L <sub>ins</sub> 2	f = 2.0 to 2.5 GHz	_	0.50	0.80	dB
Insertion Loss 3	L <sub>ins</sub> 3	f = 2.5 to 6.0 GHz	_	0.60	0.90	dB
Insertion Loss 4	L <sub>ins</sub> 4	f = 6.0 to 8.0 GHz	_	0.80	-	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 1.0 to 2.0 GHz	_	27	-	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 2.0 to 6.0 GHz	21	25	-	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 6.0 to 8.0 GHz	-	22	-	dB
Isolation 4 (RF1-RF2)	ISL4	f = 1.0 to 2.0 GHz	_	27	-	dB
Isolation 5 (RF1-RF2)	ISL5	f = 2.0 to 6.0 GHz	21	25	-	dB
Isolation 6 (RF1-RF2)	ISL6	f = 6.0 to 8.0 GHz	_	26	-	dB
Return Loss 1	RL1	f = 1.0 to 2.0 GHz	_	20	-	dB
Return Loss 2	RL2	f = 2.0 to 2.5 GHz	17	25	-	dB
Return Loss 3	RL3	f = 2.5 to 4.9 GHz	13	20	-	dB
Return Loss 4	RL4	f = 4.9 to 6.0 GHz	14	22	-	dB
Return Loss 5	RL5	f = 6.0 to 8.0 GHz	_	20	-	dB
0.1 dB Loss Compression	P <sub>in (0.1 dB)</sub>	f = 2.5 GHz	25	28	-	dBm
Input Power Note1		f = 6.0 GHz	25	28	-	dBm
1 dB Loss Compression	P <sub>in (1 dB)</sub>	f = 2.5 GHz	_	30.5	-	dBm
Input Power Note2		f = 6.0 GHz	_	30.5	-	dBm
Input 3rd Order Intercept Point	IIP <sub>3</sub>	f = 2.5 GHz	_	50	_	dBm
Switch Control Current	I <sub>cont</sub>	No RF input	_	0.1	1.0	μΑ
Switch Control Speed	t <sub>SW</sub>	50% CTL to 90/10% RF	-	20	100	ns

Notes 1.  $P_{in (0.1 dB)}$  is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.

### **CAUTION**

It is necessary to use DC blocking capacitors with this device.

The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

<sup>2.</sup>  $P_{in\,(1\,dB)}$  is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

# ELECTRICAL CHARACTERISTICS 2 $(T_A = +25^{\circ}\text{C}, V_{\text{cont (H)}} = 1.8 \text{ V}, V_{\text{cont (L)}} = 0 \text{ V}, Z_O = 50 \Omega$ , DC blocking capacitors = 8 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	L <sub>ins</sub> 1	f = 1.0 to 2.0 GHz	-	0.50	-	dB
Insertion Loss 2	L <sub>ins</sub> 2	f = 2.0 to 2.5 GHz	-	0.50	0.80	dB
Insertion Loss 3	L <sub>ins</sub> 3	f = 2.5 to 6.0 GHz	-	0.60	0.90	dB
Insertion Loss 4	L <sub>ins</sub> 4	f = 6.0 to 8.0 GHz	-	0.80	_	dB
Isolation 1 (RFC-OFF Port)	ISL1	f = 1.0 to 2.0 GHz	-	27	_	dB
Isolation 2 (RFC-OFF Port)	ISL2	f = 2.0 to 6.0 GHz	21	25	_	dB
Isolation 3 (RFC-OFF Port)	ISL3	f = 6.0 to 8.0 GHz	-	22	_	dB
Isolation 4 (RF1-RF2)	ISL4	f = 1.0 to 2.0 GHz	-	27	_	dB
Isolation 5 (RF1-RF2)	ISL5	f = 2.0 to 6.0 GHz	21	25	_	dB
Isolation 6 (RF1-RF2)	ISL6	f = 6.0 to 8.0 GHz	-	26	_	dB
Return Loss 1	RL1	f = 1.0 to 2.0 GHz	-	20	_	dB
Return Loss 2	RL2	f = 2.0 to 2.5 GHz	17	25	_	dB
Return Loss 3	RL3	f = 2.5 to 4.9 GHz	13	20	_	dB
Return Loss 4	RL4	f = 4.9 to 6.0 GHz	14	22	_	dB
Return Loss 5	RL5	f = 6.0 to 8.0 GHz	-	20	_	dB
0.1 dB Loss Compression	P <sub>in (0.1 dB)</sub>	f = 2.5 GHz	20	23	_	dBm
Input Power Note1		f = 6.0 GHz	19	23	_	dBm
1 dB Loss Compression	P <sub>in (1 dB)</sub>	f = 2.5 GHz	_	28	_	dBm
Input Power Note2		f = 6.0 GHz	-	27	_	dBm
Input 3rd Order Intercept Point	IIP <sub>3</sub>	f = 2.5 GHz	-	50	_	dBm
Switch Control Current	I <sub>cont</sub>	No RF input	_	0.1	1.0	μΑ
Switch Control Speed	t <sub>SW</sub>	50% CTL to 90/10% RF	-	20	100	ns

Notes 1.  $P_{in (0.1 dB)}$  is the measured input power level when the insertion loss increases 0.1 dB more than that of the linear range.

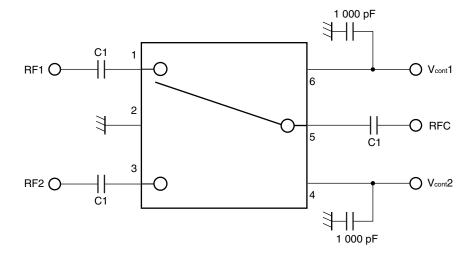
#### **CAUTION**

It is necessary to use DC blocking capacitors with this device.

The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system.

<sup>2.</sup>  $P_{in \, (1 \, dB)}$  is the measured input power level when the insertion loss increases 1 dB more than that of the linear range.

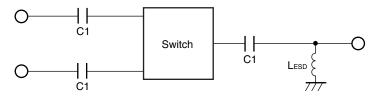
### **EVALUATION CIRCUIT**



Remark C1: 8 pF

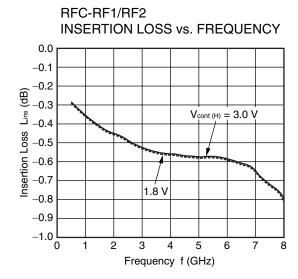
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

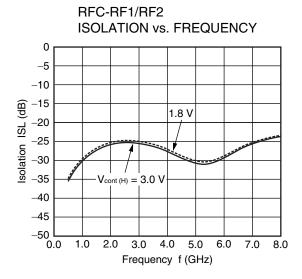
### **APPLICATION INFORMATION**

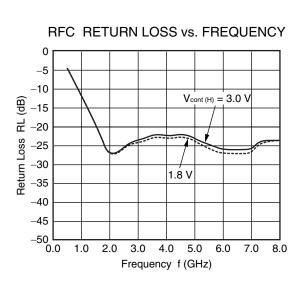


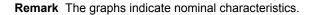
- C1 are DC blocking capacitors external to the device. The value may be tailored to provide specific electrical responses.
- The RF ground connections should be kept as short as possible and connected to directly to a good RF ground for best performance.
- L<sub>ESD</sub> provides a means to increase the ESD protection on a specific RF port, typically the port attached to the
  antenna.

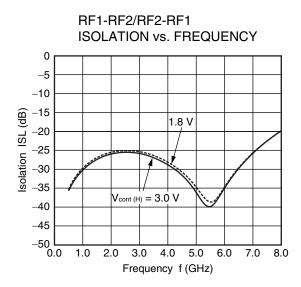
## TYPICAL CHARACTERISTICS ( $T_A$ = +25°C, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0 V, $Z_O$ = 50 $\Omega$ , DC blocking capacitors = 8 pF, unless otherwise specified)

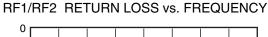


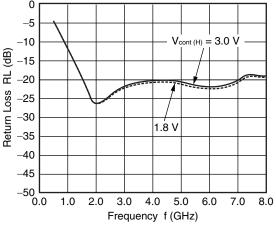




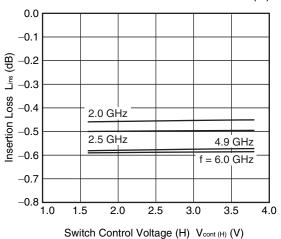




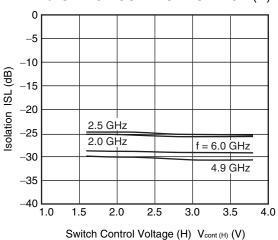




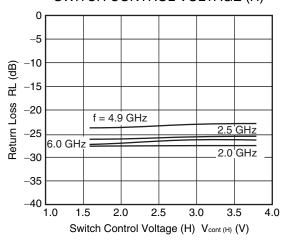
### RFC-RF1/RF2 INSERTION LOSS, vs. SWITCH CONTROL VOLTAGE (H)



### RFC-RF1/RF2 ISOLATION vs. SWITCH CONTROL VOLTAGE (H)

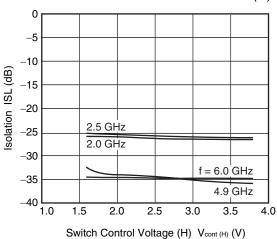


### RFC RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)

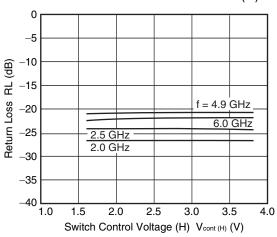


#### Remark The graphs indicate nominal characteristics.

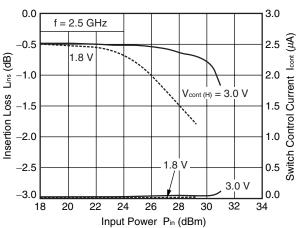
### RF1-RF2/RF2-RF1 ISOLATION vs. SWITCH CONTROL VOLTAGE (H)



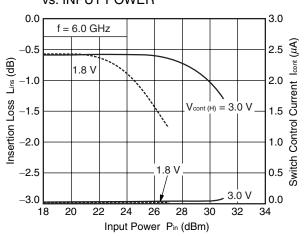
### RF1/RF2 RETURN LOSS vs. SWITCH CONTROL VOLTAGE (H)



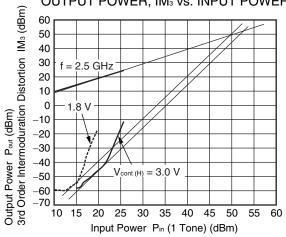
### RFC-RF1/RF2 INSERTION LOSS, Icont vs. INPUT POWER



### RFC-RF1/RF2 INSERTION LOSS, Icont vs. INPUT POWER



### RFC-RF1/RF2 OUTPUT POWER, IM₃ vs. INPUT POWER

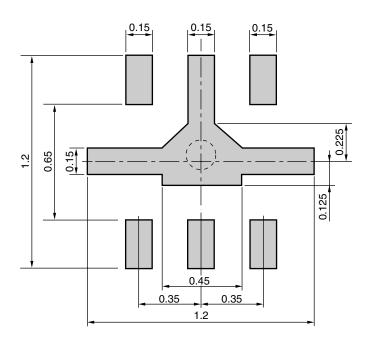


**Remark** The graphs indicate nominal characteristics.

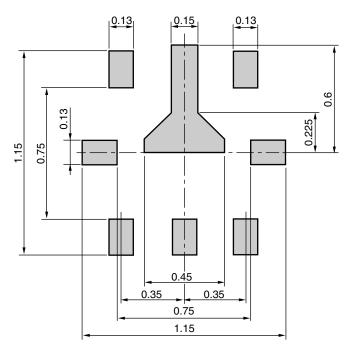
### MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS

### 6-PIN PLASTIC TSSON (T6R) (UNIT: mm)

### **MOUNTING PAD**



### **SOLDER MASK**



Solder thickness: 0.08 mm

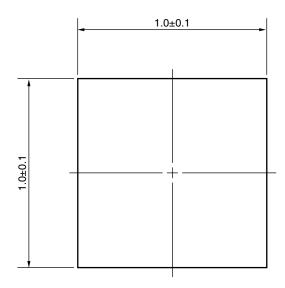
**Remark** The mounting pad and solder mask layouts in this document are for reference only.

When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

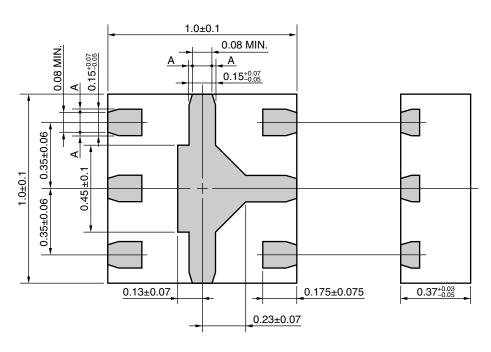
### **PACKAGE DIMENSIONS**

### 6-PIN PLASTIC TSSON (T6R) (UNIT: mm)

### (Top View)



### (Bottom View)



Remark A>0

### 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	IR260
	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	
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

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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.
  - 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** 

### $\mu$ PG2411T6R Data Sheet

			Description			
Rev.	Date	Page Summary				
1.00	Apr 25, 2011	_	First edition issued			

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### CEL:

UPG2411T6R-A UPG2411T6R-E2-A UPG2411T6R-EVAL-A



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

### Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов:
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001:
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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