



# GaAs INTEGRATED CIRCUIT

## uPG2181T5R

### HIGH POWER DP4T SWITCH FOR WiMAX

#### DESCRIPTION

The uPG2181T5R is a GaAs MMIC high power DP4T switch which was developed for WiMAX.

This device can operate from 2.3GHz to 3.8GHz, with low insertion loss and high isolation.

This device is housed in a 20-pin RQFN (Rectangle Quad Flat Non-Leaded) package, and this is suitable for high-density surface mounting.

#### FEATURES

- Supply Voltage :  $V_{DD} = 2.8$  to  $3.2V$  (3.0V TYP.)
- Control Voltage :  $V_{cont(H)} = 1.5$  to  $V_{DD}$  ( $V_{DD}$  TYP.)  
:  $V_{cont(L)} = 0$  to  $0.2V$  (0V TYP.)
- Low Insertion Loss :  $L_{ins1} = 0.8dB$  TYP. @  $f = 2.3$  to  $2.7GHz$ ,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $L_{ins2} = 1.0dB$  TYP. @  $f = 3.3$  to  $3.8GHz$ ,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$
- High Isolation :  $ISL1 = 28dB$  TYP. @  $f = 2.3$  to  $2.7GHz$ , Tx to Rx,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $ISL2 = 24dB$  TYP. @  $f = 3.3$  to  $3.8GHz$ , Tx to Rx,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $ISL3 = 25dB$  TYP. @  $f = 2.3$  to  $2.7GHz$ , Tx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $ISL4 = 21dB$  TYP. @  $f = 3.3$  to  $3.8GHz$ , Tx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $ISL5 = 25dB$  TYP. @  $f = 2.3$  to  $2.7GHz$ , Rx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$   
:  $ISL6 = 22dB$  TYP. @  $f = 3.3$  to  $3.8GHz$ , Rx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  $V_{cont(L)} = 0V$
- Power Handling :  $P_{in(1dB)} = +40.0dBm$  TYP. @  $f = 2.5/3.5GHz$ , Tx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  
 $V_{cont(L)} = 0V$   
:  $P_{in(1dB)} = +35.0dBm$  TYP. @  $f = 2.5/3.5GHz$ , Rx to ANT,  $V_{DD} = 3.0V$ ,  $V_{cont(H)} = 3.0V$ ,  
 $V_{cont(L)} = 0V$
- High-density surface mounting : 20-pin RQFN package (2.5 × 3.5 × 0.6 mm)

#### APPLICATION

- Antenna Switch for WiMAX CPE (Customer Premises Equipment)

#### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
uPG2181T5R – E2	uPG2181T5R – E2 – A	20-pin plastic RQFN (Pb-Free)	2181	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin1,6 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.

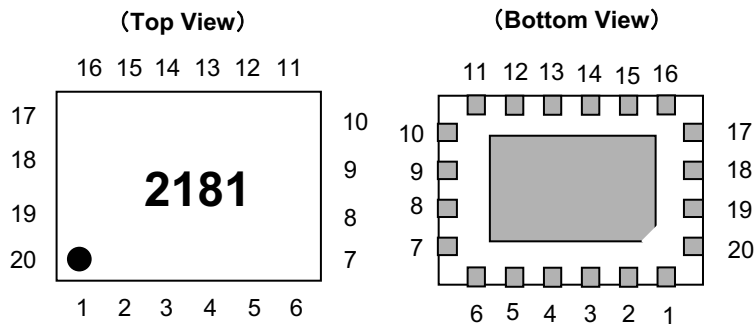
Part number for sample order : uPG2181T5R-A

**Caution Electro-static sensitive devices**

The information in this document is being issued in advance of the production cycle for device.

The parameters for the device may change before final production or NEC Compound Semiconductor Devices, at its own discretion, may withdraw the device prior to its production.

**PIN CONNECTIONS**



Pin NO.	Pin Name	Pin No.	Pin Name
1	GND	11	GND
2	GND	12	ANT1
3	Rx	13	GND
4	GND	14	Tx
5	ANT4	15	GND
6	GND	16	GND
7	ANT3	17	V <sub>DD</sub>
8	GND	18	V <sub>cont2</sub>
9	GND	19	V <sub>cont1</sub>
10	ANT2	20	V <sub>cont0</sub>

Exposed pad : GND

**TRUTH TABLE**

CONTROL VOLTAGE				ON PATH							
				Tx				Rx			
V <sub>DD</sub>	V <sub>cont0</sub>	V <sub>cont1</sub>	V <sub>cont2</sub>	ANT1	ANT2	ANT3	ANT4	ANT1	ANT2	ANT3	ANT4
High	Low	Low	Low	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
High	High	Low	Low	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
High	Low	High	Low	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
High	High	High	Low	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF
High	Low	Low	High	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF
High	High	Low	High	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF
High	Low	High	High	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF
High	High	High	High	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>DD</sub>	4.2	V
Switch Control Voltage	V <sub>cont</sub>	4.2	V
Input Power-Tx (ON Port)	P <sub>in-Tx</sub>	+41	dBm
Input Power-Rx (ON Port)	P <sub>in-Rx</sub>	+36	dBm
Input Power-Tx (OFF Port)	P <sub>in-Tx (OFF)</sub>	+25	dBm
Input Power-Rx (OFF Port)	P <sub>in-Rx (OFF)</sub>	+25	dBm
Power Dissipation	P <sub>D</sub>	800	mW
Operating Ambient Temperature	T <sub>A</sub>	-45 to +85	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C

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

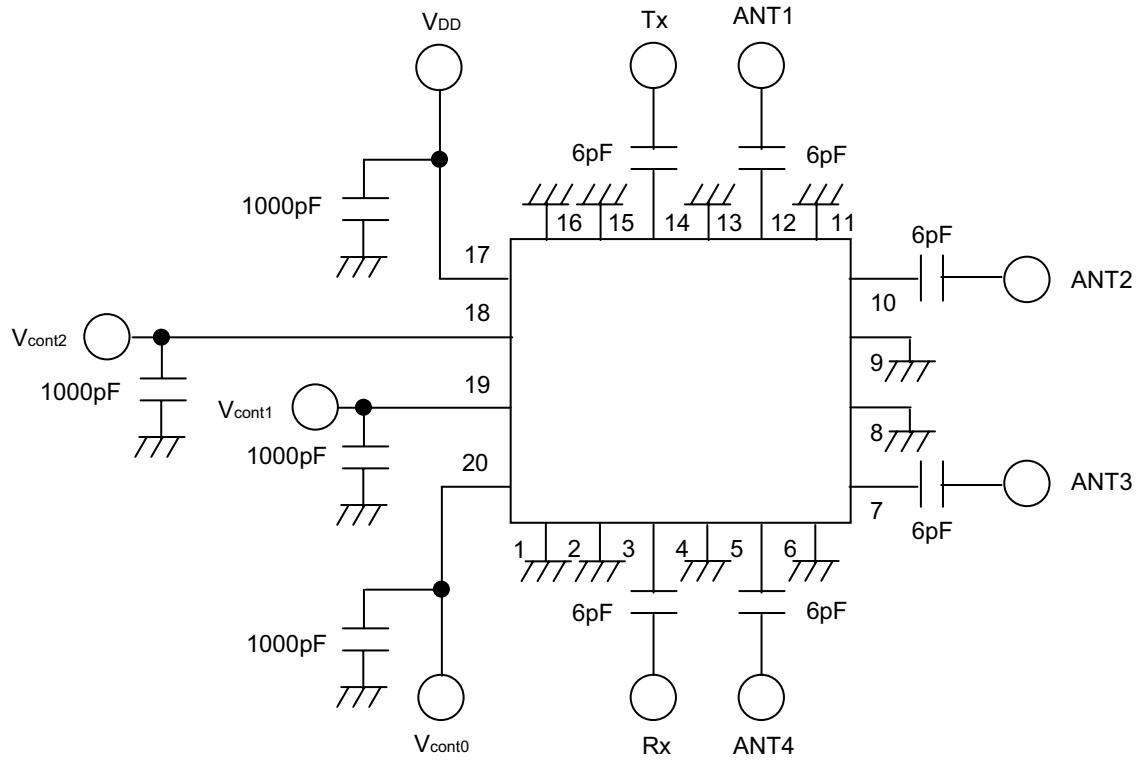
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f <sub>opt1</sub>	2.3	-	2.7	GHz
	f <sub>opt2</sub>	3.3	-	3.8	GHz
Supply Voltage	V <sub>DD</sub>	2.8	3.0	3.2	V
Switch Control Voltage (H)	V <sub>cont (H)</sub>	1.5	V <sub>DD</sub>	V <sub>DD</sub>	V
Switch Control Voltage (L)	V <sub>cont (L)</sub>	0	0	0.2	V

**ELECTRICAL CHARACTERISTICS**(TA = +25°C, V<sub>cont (H)</sub> = 3.0V, V<sub>cont (L)</sub> = 0V, DC blocking capacitor = 6pF, Z<sub>0</sub> = 50Ω, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss1	L <sub>ins1</sub>	f = 2.3 to 2.7GHz, Tx to ANT1/2/3/4	-	0.80	1.05	dB
Insertion Loss2	L <sub>ins2</sub>	f = 3.3 to 3.8GHz, Tx to ANT1/2/3/4	-	1.00	1.30	dB
Insertion Loss3	L <sub>ins3</sub>	f = 2.3 to 2.7GHz, Rx to ANT1/2/3/4	-	0.80	1.05	dB
Insertion Loss4	L <sub>ins4</sub>	f = 3.3 to 3.8GHz, Rx to ANT1/2/3/4	-	1.00	1.30	dB
Isolation1	ISL1	f = 2.3 to 2.7GHz, Tx to Rx	25	28	-	dB
Isolation2	ISL2	f = 3.3 to 3.8GHz, Tx to Rx	21	24	-	dB
Isolation3	ISL3	f = 2.3 to 2.7GHz, Tx to ANT1/2/3/4	22	25	-	dB
Isolation4	ISL4	f = 3.3 to 3.8GHz, Tx to ANT1/2/3/4	18	21	-	dB
Isolation5	ISL5	f = 2.3 to 2.7GHz, Rx to ANT1/2/3/4	22	25	-	dB
Isolation6	ISL6	f = 3.3 to 3.8GHz, Rx to ANT1/2/3/4	19	22	-	dB
On Port Return Loss1	RL <sub>in1</sub>	f = 2.3 to 2.7GHz, All port	-	15	-	dB
On Port Return Loss2	RL <sub>in2</sub>	f = 3.3 to 3.8GHz, All port	-	15	-	dB
Unused Port Return Loss1	URL <sub>in1</sub>	f = 2.3 to 2.7GHz, Tx / Rx port	-	13	-	dB
Unused Port Return Loss2	URL <sub>in2</sub>	f = 3.3 to 3.8GHz, Tx / Rx port	-	13	-	dB
1dB Loss Compression Input Power <sup>Note</sup>	P <sub>in(1dB)</sub>	f = 2.5GHz, Tx to ANT1/2/3/4	-	+40.0	-	dBm
		f = 3.5GHz, Tx to ANT1/2/3/4	-	+40.0	-	dBm
		f = 2.5GHz, Rx to ANT1/2/3/4	-	+35.0	-	dBm
		f = 3.5GHz, Rx to ANT1/2/3/4	-	+35.0	-	dBm
3rd Order Output Intercept Point	OIP <sub>3 1</sub>	f = 2.5GHz, Tx to ANT1/2/3/4	-	+63.0	-	dBm
	OIP <sub>3 2</sub>	f = 2.5GHz, Rx to ANT1/2/3/4	-	+57.0	-	dBm
Supply Current	I <sub>DD</sub>	RF None	-	600	1100	uA
Switch Control Current	I <sub>cont</sub>	RF None	-	1	2	uA
Switch Control Speed	t <sub>sw</sub>	50% CTL to 90/10% RF	-	250	-	ns

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

EVALUATION CIRCUIT

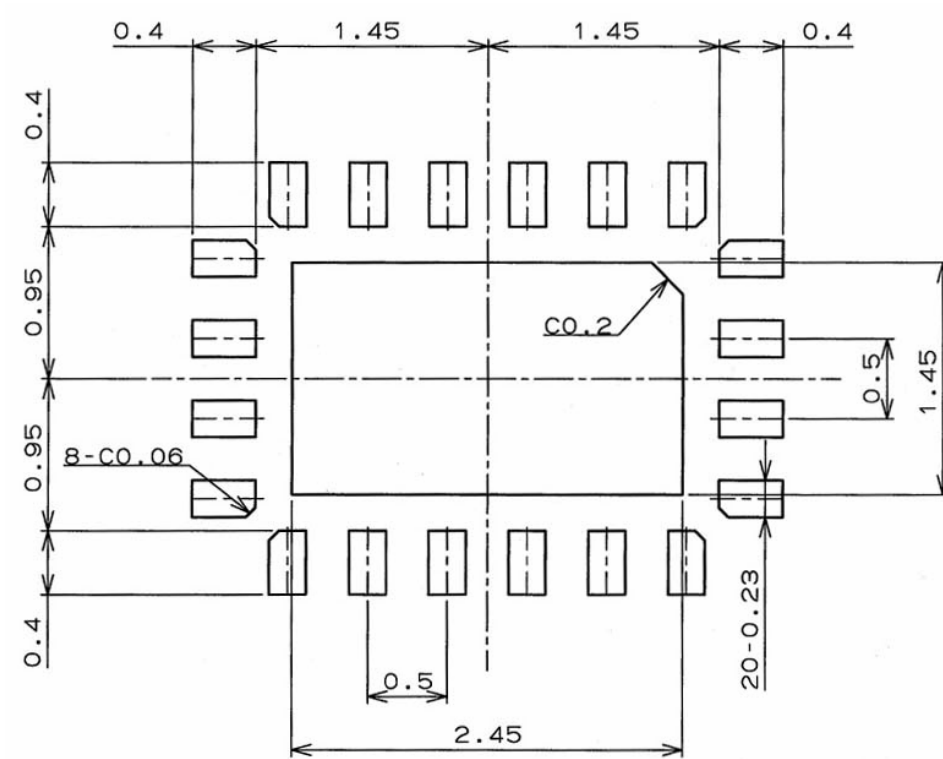


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

MOUNTING PAD DIMENSIONS

20-PIN PLASTIC RQFN (UNIT: mm)

MOUNTING PAD

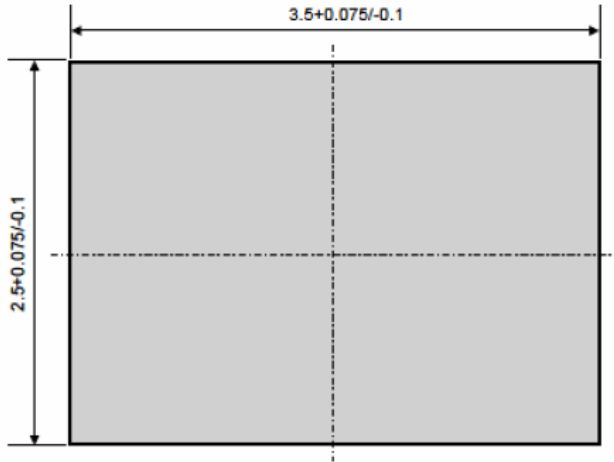


**Remark** The mounting pad layouts in this document are for reference only.

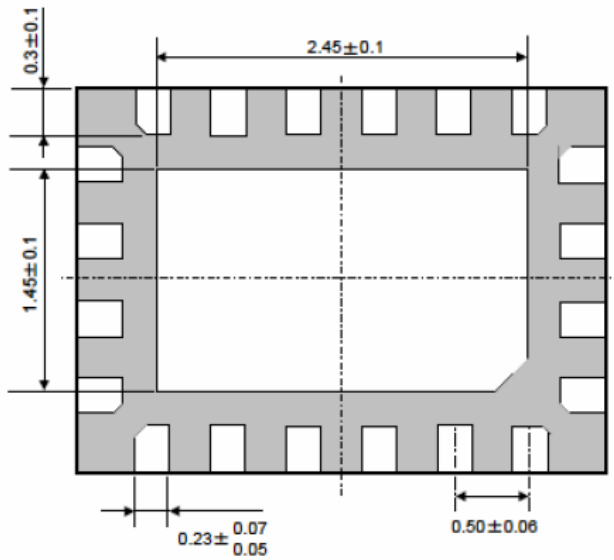
**PACKAGE DIMENSIONS**

**20-PIN PLASTIC RQFN (UNIT: mm)**

**(Top View)**



**(Bottom View)**



**(Side View)**



**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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		-A	-AZ
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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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