HIGH POWER DP4T SWITCH FOR WiMAX

DESCRIPTION

The μPG2181T5R is a GaAs MMIC high power DP4T switch which was developed for WiMAX.

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

This device is housed in a 20-pin plastic RQFN (Rectangle Quad Flat Non-leaded) package. And this package is able to high-density surface mounting.

FEATURES

- Supply voltage : V_{DD} = 2.8 to 3.2 V (3.0 V TYP.)
- Control voltage : $V_{cont\,(H)}$ = 1.5 to V_{DD} (V_{DD} TYP.)
  : $V_{cont\,(L)}$ = 0 to 0.2 V (0 V TYP.)
- Low insertion loss : $L_{ins}1$ = 0.8 dB TYP. @ f = 2.3 to 2.7 GHz, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ =0 V
  : $L_{ins}2$ = 1.0 dB TYP. @ f = 3.3 to 3.8 GHz, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ =0 V
- High isolation : ISL1 = 28 dB TYP. @ f = 2.3 to 2.7 GHz, Tx to Rx, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
  : ISL2 = 24 dB TYP. @ f = 3.3 to 3.8 GHz, Tx to Rx, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
  : ISL3 = 25 dB TYP. @ f = 2.3 to 2.7 GHz, Tx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
  : ISL4 = 21 dB TYP. @ f = 3.3 to 3.8 GHz, Tx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
  : ISL5 = 25 dB TYP. @ f = 2.3 to 2.7 GHz, Rx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
  : ISL6 = 22 dB TYP. @ f = 3.3 to 3.8 GHz, Rx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0V
- Handling power : $P_{in\,(1\,dB)}$ = +40.0 dBm TYP. @ f = 2.5/3.5 GHz, Tx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0 V
  : $P_{in\,(1\,dB)}$ = +35.0 dBm TYP. @ f = 2.5/3.5 GHz, Rx to ANT, V_{DD} = 3.0 V, $V_{cont\,(H)}$ = 3.0 V, $V_{cont\,(L)}$ = 0 V
- High-density surface mounting : 20-pin plastic RQFN package (2.5 × 3.5 × 0.6 mm)

APPLICATION

- Antenna switch for WiMAX CPE (Customer Premise Equipment)

ORDERING INFORMATION

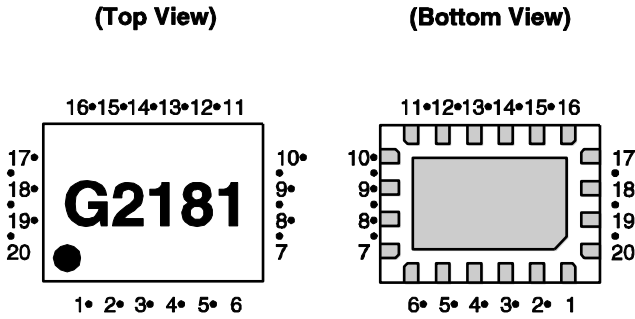| Part Number	Order Number	Package	Marking	Supplying Form
μPG2181T5R-E2	μPG2181T5R-E2-A	20-pin plastic RQFN (Pb-Free)	G2181	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

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

Part number for sample order: μPG2181T5R-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

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

16•15•14•13•12•11

17•
18•
19•
20   **G2181**   10•
                      9•
                      8•
                      7

1• 2• 3• 4• 5• 6

11•12•13•14•15•16

10•   17
9•   18
8•   19
7   20

6• 5• 4• 3• 2• 1

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_{DD}
8	GND	18	$V_{cont}2$
9	GND	19	$V_{cont}1$
10	ANT2	20	$V_{cont}0$

Remark Exposed pad : GND

TRUTH TABLE

CONTROL VOLTAGE				ON PATH							
				Tx				Rx			
V_{DD}	$V_{cont}0$	$V_{cont}1$	$V_{cont}2$	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$_A$ = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Supply Voltage	V$_{DD}$	4.2	V
Switch Control Voltage	V$_{cont}$	4.2	V
Input Power-Tx (ON Port)	P$_{in-Tx}$	+41	dBm
Input Power-Rx (ON Port)	P$_{in-Rx}$	+36	dBm
Input Power-Tx (OFF Port)	P$_{in-Tx (OFF)}$	+25	dBm
Input Power-Rx (OFF Port)	P$_{in-Rx (OFF)}$	+25	dBm
Power Dissipation	P$_D$	800	mW
Operating Ambient Temperature	T$_A$	−45 to +85	°C
Storage Temperature	T$_{stg}$	−55 to +150	°C

RECOMMENDED OPERATING RANGE (T$_A$ = +25°C, unless otherwise specified)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f$_{opt}$1	2.3	–	2.7	GHz
	f$_{opt}$2	3.3	–	3.8	GHz
Supply Voltage	V$_{DD}$	2.8	3.0	3.2	V
Switch Control Voltage (H)	V$_{cont (H)}$	1.5	V$_{DD}$	V$_{DD}$	V
Switch Control Voltage (L)	V$_{cont (L)}$	0	0	0.2	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{DD} = 3.0 V, $V_{cont (H)}$ = 3.0 V, $V_{cont (L)}$ = 0 V, DC blocking capacitors = 6 pF, Z_0 = 50 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 2.3 to 2.7 GHz, Tx to ANT1/2/3/4	–	0.80	1.05	dB
Insertion Loss 2	$L_{ins}2$	f = 3.3 to 3.8 GHz, Tx to ANT1/2/3/4	–	1.00	1.30	dB
Insertion Loss 3	$L_{ins}3$	f = 2.3 to 2.7 GHz, Rx to ANT1/2/3/4	–	0.80	1.05	dB
Insertion Loss 4	$L_{ins}4$	f = 3.3 to 3.8 GHz, Rx to ANT1/2/3/4	–	1.00	1.30	dB
Isolation 1	ISL1	f = 2.3 to 2.7 GHz, Tx to Rx	25	28	–	dB
Isolation 2	ISL2	f = 3.3 to 3.8 GHz, Tx to Rx	21	24	–	dB
Isolation 3	ISL3	f = 2.3 to 2.7 GHz, Tx to ANT1/2/3/4	22	25	–	dB
Isolation 4	ISL4	f = 3.3 to 3.8 GHz, Tx to ANT1/2/3/4	18	21	–	dB
Isolation 5	ISL5	f = 2.3 to 2.7 GHz, Rx to ANT1/2/3/4	22	25	–	dB
Isolation 6	ISL6	f = 3.3 to 3.8 GHz, Rx to ANT1/2/3/4	19	22	–	dB
On Port Return Loss 1	$RL_{in}1$	f = 2.3 to 2.7 GHz, All Port	–	15	–	dB
On Port Return Loss 2	$RL_{in}2$	f = 3.3 to 3.8 GHz, All Port	–	15	–	dB
Unused Port Return Loss 1	URL1	f = 2.3 to 2.7 GHz, Tx/Rx Port	–	13	–	dB
Unused Port Return Loss 2	URL2	f = 3.3 to 3.8 GHz, Tx/Rx Port	–	13	–	dB
1 dB Loss Compression Input Power **Note**	$P_{in (1 dB)}$	f = 2.5 GHz, Tx to ANT1/2/3/4	–	+40.0	–	dBm
		f = 3.5 GHz, Tx to ANT1/2/3/4	–	+40.0	–	dBm
		f = 2.5 GHz, Rx to ANT1/2/3/4	–	+35.0	–	dBm
		f = 3.5 GHz, Rx to ANT1/2/3/4	–	+35.0	–	dBm
Output 3rd Order Intercept Point	OIP_31	f = 2.5 GHz, Tx to ANT1/2/3/4	–	+63.0	–	dBm
	OIP_32	f = 2.5 GHz, Rx to ANT1/2/3/4	–	+57.0	–	dBm
Supply Current	I_{DD}	RF None	–	600	1 100	μA
Switch Control Current	I_{cont}	RF None	–	1	2	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	250	–	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.
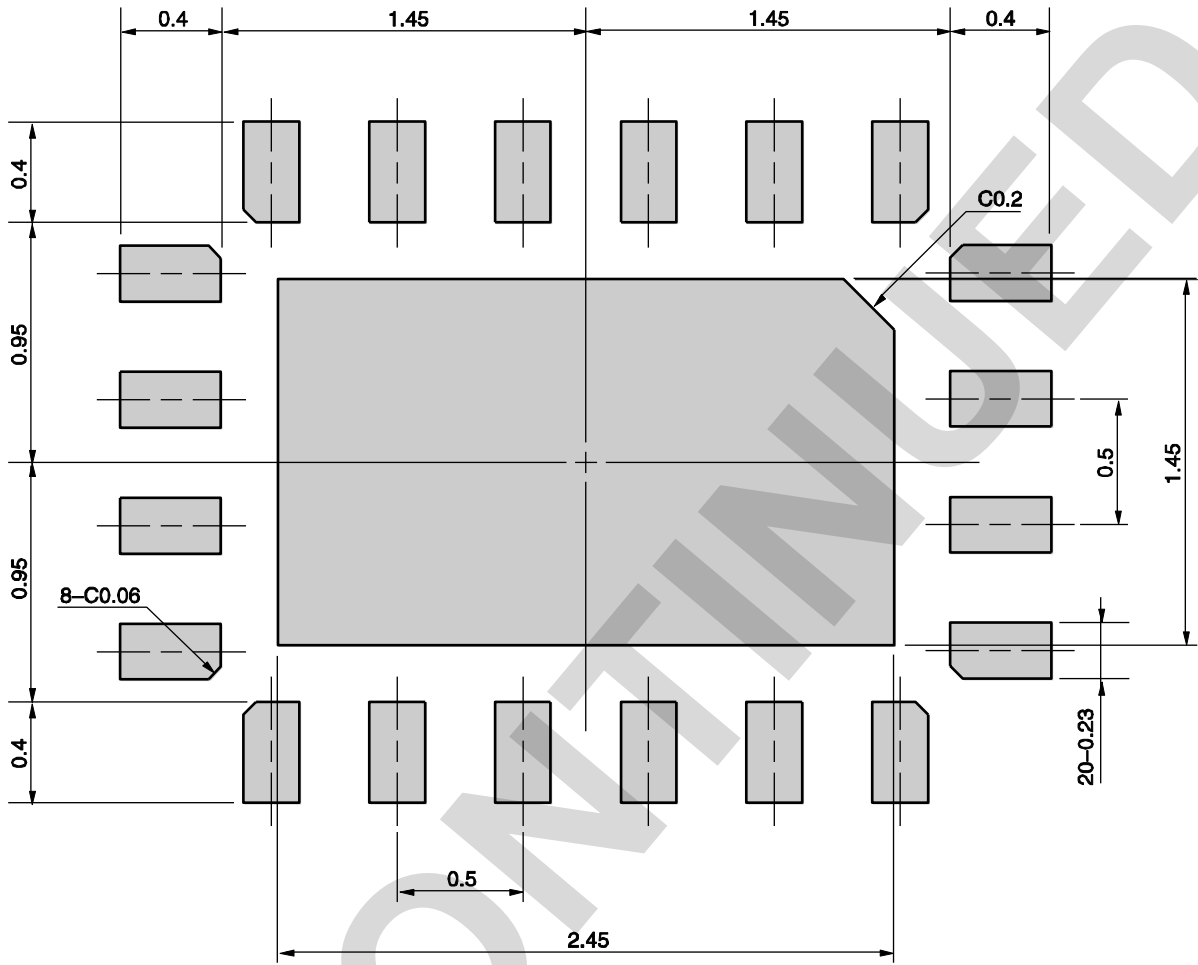
EVALUATION CIRCUIT
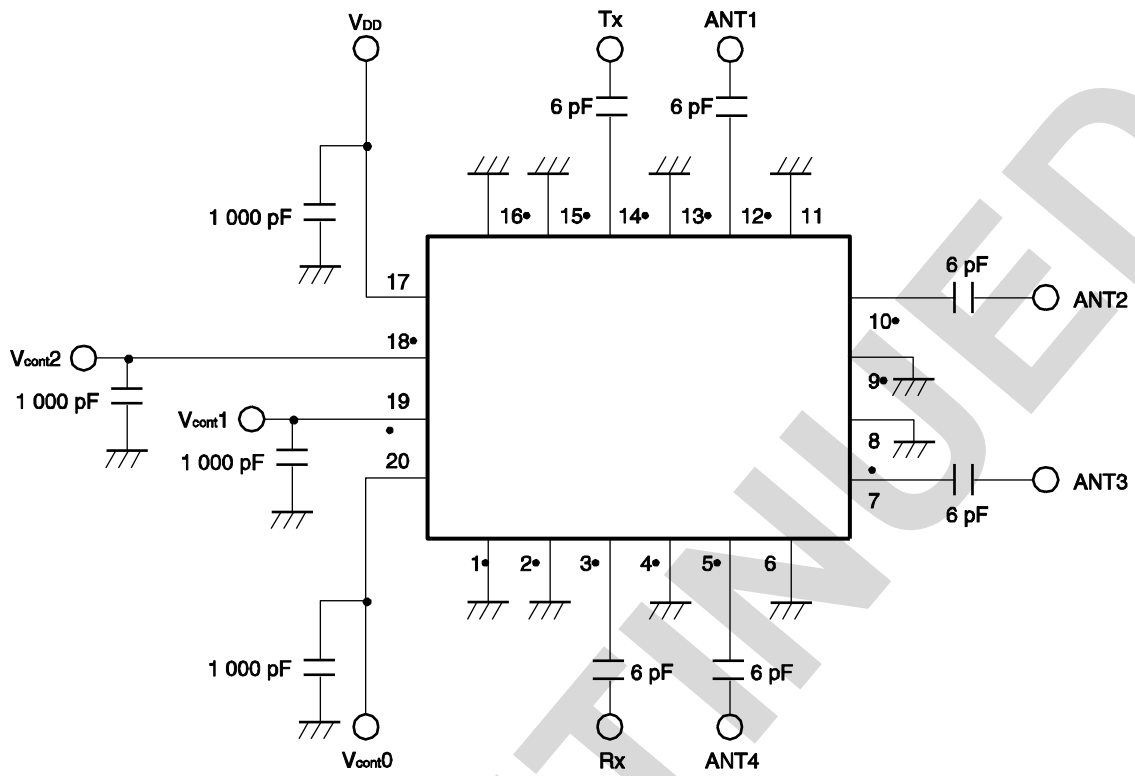
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

MOUNTING PAD DIMENSIONS

20-PIN PLASTIC RQFN (UNIT: mm)

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

PACKAGE DIMENSIONS

20-PIN PLASTIC RQFN (UNIT: mm)

(Top View)   **(Side View)**   **(Bottom View)**

$3.5^{+0.075}_{-0.1}$

$2.5^{+0.075}_{-0.1}$

0.55 ± 0.05

0.3 ± 0.1

2.45 ± 0.1

1.45 ± 0.1

$0.23^{+0.07}_{-0.05}$

0.50 ± 0.06

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	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	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	
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	

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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