DATA SHEET

NEC

GaAs INTEGRATED CIRCUIT

μPG2176T5N

50 Ω TERMINATION TYPE HIGH POWER SPDT SWITCH FOR WiMAX

DESCRIPTION

The μPG2176T5N is a GaAs MMIC 50 Ω termination type high power SPDT (Single Pole Double Throw) switch which was developed for WiMAX. This device can operate frequency from 2.3 to 5.85 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin plastic TSON (Thin Small Out-line Non-leaded) package. And this package is able to high-density surface mounting.

FEATURES

- Control voltage : $V_{cont\ (H)}$ = 2.5 to 5.0 V (3.0 V TYP.)
  : $V_{cont\ (L)}$ = –0.3 to 0.3 V (0 V TYP.)
- Low insertion loss : $L_{ins}1$ = 0.45 dB TYP. @ f = 2.3 to 2.7 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins}2$ = 0.55 dB TYP. @ f = 3.3 to 3.8 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $L_{ins}3$ = 0.70 dB TYP. @ f = 4.9 to 5.85 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- High isolation : ISL1 = 27 dB TYP. @ f = 2.3 to 2.7 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : ISL2 = 24 dB TYP. @ f = 3.3 to 3.8 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : ISL3 = 21 dB TYP. @ f = 4.9 to 5.85 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- Handling power : $P_{in\ (1\ dB)}$ = +37.0 dBm TYP. @ f = 2.3 to 2.7 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $P_{in\ (1\ dB)}$ = +37.0 dBm TYP. @ f = 3.3 to 3.8 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
  : $P_{in\ (1\ dB)}$ = +37.0 dBm TYP. @ f = 4.9 to 5.85 GHz, $V_{cont\ (H)}$ = 3.0 V, $V_{cont\ (L)}$ = 0 V
- High-density surface mounting : 6-pin plastic TSON package (1.5 × 1.5 × 0.37 mm)

APPLICATION

- WiMAX and wireless LAN (IEEE802.11a/b/g/n)

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPG2176T5N-E2	μPG2176T5N-E2-A	6-pin plastic TSON (Pb-Free)	G4Y	• 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: μPG2176T5N

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

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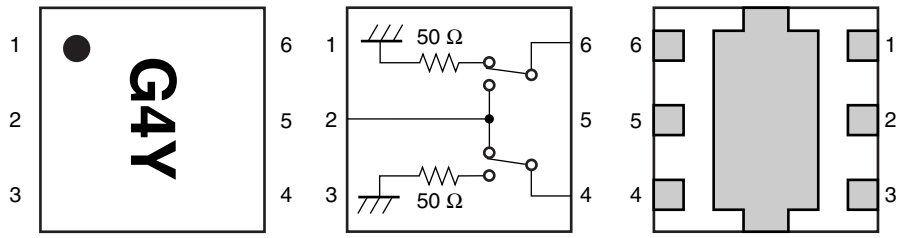
The mark <R> shows major revised points.

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

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



Pin No.	Pin Name
1	$V_{cont}1$
2	INPUT
3	$V_{cont}2$
4	OUTPUT2
5	GND
6	OUTPUT1

Remark Exposed pad : GND

TRUTH TABLE

$V_{cont}1$	$V_{cont}2$	INPUT–OUTPUT1	INPUT–OUTPUT2
High	Low	ON	OFF
Low	High	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 Power (ON Port, peak)	P_{in}	+38	dBm
Input Power (ON Port, average)	P_{in}	+28	dBm
Input Power (OFF Port)	$P_{in\ (OFF)}$	+20	dBm
Power Dissipation (average)	P_D	150	mW
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note $|V_{cont}1 - V_{cont}2| \leq 6.0$ V

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
	$f_{opt}3$	4.90	–	5.85	GHz
Switch Control Voltage (H)	$V_{cont\ (H)}$	+2.5	+3.0	+5.0	V
Switch Control Voltage (L)	$V_{cont\ (L)}$	–0.3	0	+0.3	V

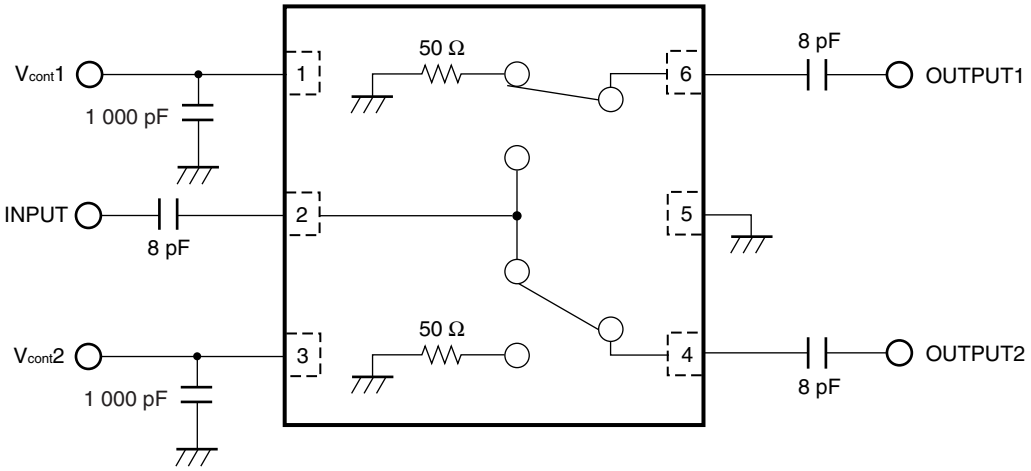
ELECTRICAL CHARACTERISTICS

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

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 2.3 to 2.7 GHz	–	0.45	0.70	dB
Insertion Loss 2	$L_{ins}2$	f = 3.3 to 3.8 GHz	–	0.55	0.80	dB
Insertion Loss 3	$L_{ins}3$	f = 4.9 to 5.85 GHz	–	0.70	0.95	dB
Isolation 1 (INPUT–OFF Port)	ISL1	f = 2.3 to 2.7 GHz	24	27	–	dB
Isolation 2 (INPUT–OFF Port)	ISL2	f = 3.3 to 3.8 GHz	21	24	–	dB
Isolation 3 (INPUT–OFF Port)	ISL3	f = 4.9 to 5.85 GHz	18	21	–	dB
Isolation 4 (OUTPUT1–OUTPUT2)	ISL4	f = 2.3 to 2.7 GHz	22	25	–	dB
Isolation 5 (OUTPUT1–OUTPUT2)	ISL5	f = 3.3 to 3.8 GHz	20	23	–	dB
Isolation 6 (OUTPUT1–OUTPUT2)	ISL6	f = 4.9 to 5.85 GHz	17	20	–	dB
Input Return Loss 1	$RL_{in}1$	f = 2.3 to 2.7 GHz	10	15	–	dB
Input Return Loss 2	$RL_{in}2$	f = 3.3 to 3.8 GHz	10	15	–	dB
Input Return Loss 3	$RL_{in}3$	f = 4.9 to 5.85 GHz	10	15	–	dB
Output Return Loss 1	$RL_{out}1$	f = 2.3 to 2.7 GHz	10	15	–	dB
Output Return Loss 2	$RL_{out}2$	f = 3.3 to 3.8 GHz	10	15	–	dB
Output Return Loss 3	$RL_{out}3$	f = 4.9 to 5.85 GHz	10	15	–	dB
Unused Port Return Loss 1	URL1	f = 2.3 to 2.7 GHz	10	15	–	dB
Unused Port Return Loss 2	URL2	f = 3.3 to 3.8 GHz	10	15	–	dB
Unused Port Return Loss 3	URL3	f = 4.9 to 5.85 GHz	10	15	–	dB
1 dB Loss Compression Input Power [Note]	$P_{in\ (1\ dB)}$	f = 2.3 to 2.7 GHz	+35.0	+37.0	–	dBm
		f = 3.3 to 3.8 GHz	+35.0	+37.0	–	dBm
		f = 4.9 to 5.85 GHz	+35.0	+37.0	–	dBm
Switch Control Current	I_{cont}	RF None	–	16	30	μA
Switch Control Speed	t_{SW}	50% CTL to 90/10% RF	–	100	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

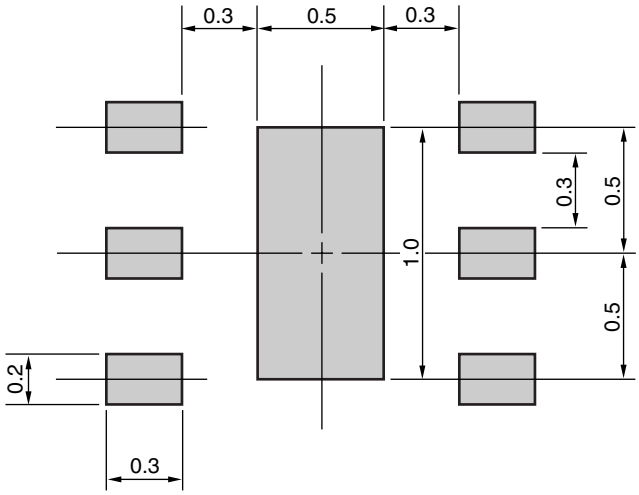


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

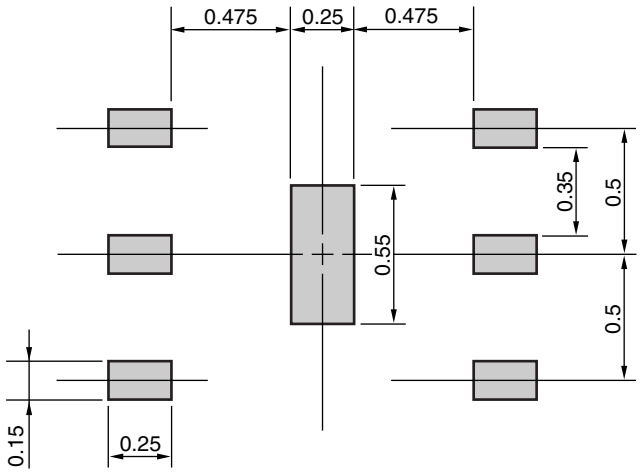
<R> **MOUNTING PAD AND SOLDER MASK LAYOUT DIMENSIONS**

6-PIN PLASTIC TSON (UNIT: mm)

MOUNTING PAD



SOLDER MASK

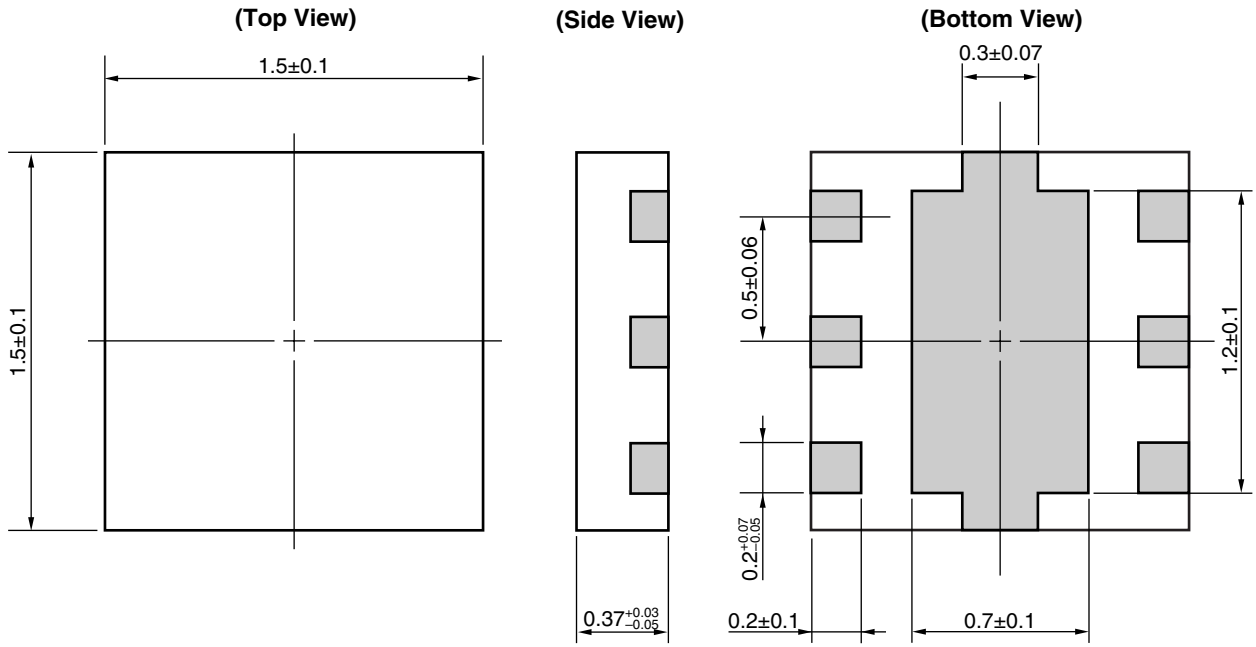


Solder thickness : 0.08 mm

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

<R> **PACKAGE DIMENSIONS**

6-PIN PLASTIC TSON (UNIT: mm)



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).

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