



NEC's 4.8 TO 5.85 GHz HIGH POWER GaAs MMIC SPDT SWITCH

UPG2022TB

FEATURES

- **OPERATING FREQUENCY:**
 $f = 4.8$ to 5.85 GHz
- **LOW INSERTION LOSS:**
0.8 dB TYP. @ 4.9 to 5.2 GHz
0.9 dB TYP. @ 5.8 GHz
- **POWER HANDLING:**
 $P_{in} (0.1dB) = +30$ dBm TYP. @ 4.9 to 5.2 GHz
 $P_{in} (0.1dB) = +31$ dBm TYP. @ 5.2 to 5.85 GHz
- **CONTROL VOLTAGE:**
 $V_{cont} = +2.8$ V/0 V
- **HIGH ISOLATION:**
(Between INPUT and OUTPUT) = 29 dB TYP. @ 5.85 GHz
(Between OUTPUT1 and OUTPUT2) = 18 dB TYP. @ 5.85 GHz
- **INPUT/OUTPUT RETURN LOSS:**
10 dB MIN. @ 4.8 to 5.85 GHz
- **SWITCHING SPEED:**
20 ns @ t_{RISE}/t_{FALL} (10/90% RF)
- **6-PIN SUPER MINIMOLD PACKAGE:**
($2.0 \times 1.25 \times 0.9$ mm)
- **LEAD FREE**

DESCRIPTION

NEC's UPG2022TB is a high power GaAs MMIC SPDT (Single Pole Double Throw) switch. This device can operate from 4.8 to 5.85 GHz with low insertion loss. It is housed in a compact, lead free 6-pin super minimold package.

APPLICATIONS

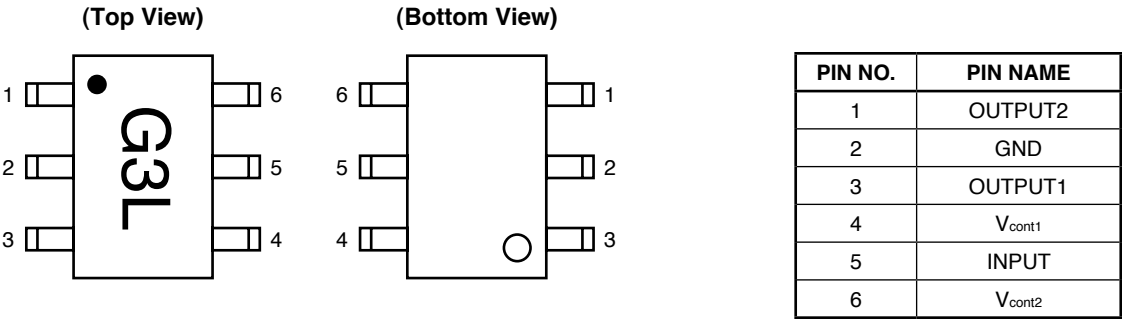
- 5 GHz BAND WLAN
- 5 GHz CORDLESS PHONES
- 5 GHz ELECTRONIC TOLL COLLECTION
- 5 GHz FIXED WIRELESS ACCESS

ORDERING INFORMATION

PART NUMBER	PACKAGE	MARKING	SUPPLYING FORM
UPG2022TB-E4-A	6-pin super minimold	G3L	• Embossed tape 8 mm wide • Pin 4,5,6 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: UPG2022TB-A

PIN CONNECTIONS



ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Switch Control Voltage	V _{cont1, 2}	−6.0 to +6.0 ^{Note1}	V
Input Power	P _{in}	+36	dBm
Total Power Dissipation	P _{tot}	0.15 ^{Note2}	W
Operating Ambient Temperature	T _A	−45 to +85	°C
Storage Temperature	T _{stg}	−65 to +150	°C

- Notes** 1. | V_{cont1} − V_{cont2} | ≤ 6.0 V
2. Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RANGE (T_A = +25°C, unless otherwise specified)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Switch Control Voltage (H)	V _{cont} (H)	2.7	2.8	3.3	V
Switch Control Voltage (L)	V _{cont} (L)	−0.2	0	0.2	V
Operating Frequency	f	4.8		5.85	GHz
Operating Ambient Temperature	T _A	−40	+25	+85	°C

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{\text{cont}} = 2.8 \text{ V/0 V}$, $Z_0 = 50 \Omega$, DC blocking capacitors = 3 pF, Each port, unless otherwise specified)

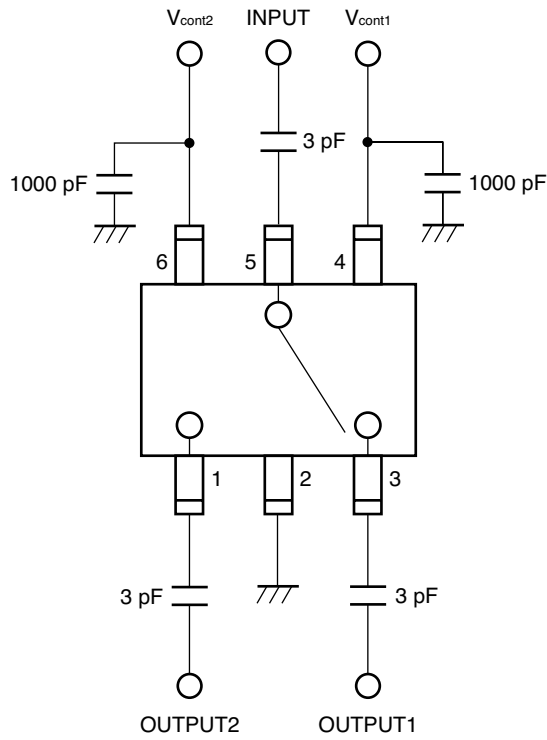
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Insertion Loss	L_{INS}	$f = 4.9 \text{ GHz}$	–	0.8	1.1	dB
		$f = 5.2 \text{ GHz}$	–	0.8	1.1	dB
		$f = 5.8 \text{ GHz}$	–	0.9	1.1	dB
Isolation 1 (between OUTPUT1 and OUTPUT2)	$ISL1$	$f = 4.9 \text{ GHz}$	12	15	–	dB
		$f = 5.2 \text{ GHz}$	13	16	–	dB
		$f = 5.8 \text{ GHz}$	15	18	–	dB
Input Return Loss	RL_{in}	$f = 4.9 \text{ GHz}$	10	17	–	dB
		$f = 5.2 \text{ GHz}$	10	18	–	dB
		$f = 5.8 \text{ GHz}$	10	15	–	dB
Output Return Loss	RL_{out}	$f = 4.9 \text{ GHz}$	10	19	–	dB
		$f = 5.2 \text{ GHz}$	10	21	–	dB
		$f = 5.8 \text{ GHz}$	10	19	–	dB
0.1 dB Gain Compression Input Power	$P_{\text{in}} (0.1 \text{ dB})$	$f = 4.9 \text{ to } 5.2 \text{ GHz}$	28	30	–	dBm
		$f = 5.2 \text{ to } 5.85 \text{ GHz}$	30	31	–	
Switching Control Speed	t_{sw}	$t_{\text{RISE}}/t_{\text{FALL}} (10/90\% \text{ RF})$	–	20	–	ns
Switching Control Current	I_{cont}		–	0.5	1	μA

STANDARD CHARACTERISTICS FOR REFERENCE

($T_A = +25^\circ\text{C}$, $V_{\text{cont}} = 2.8 \text{ V/0 V}$, $Z_0 = 50 \Omega$, DC blocking capacitors = 3 pF, Each port, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Isolation 2 (between INPUT and OUTPUT)	$ISL2$	$f = 4.9 \text{ GHz}$	–	17	–	dB
		$f = 5.2 \text{ GHz}$	–	20	–	dB
		$f = 5.8 \text{ GHz}$	–	29	–	dB

EVALUATION CIRCUIT



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

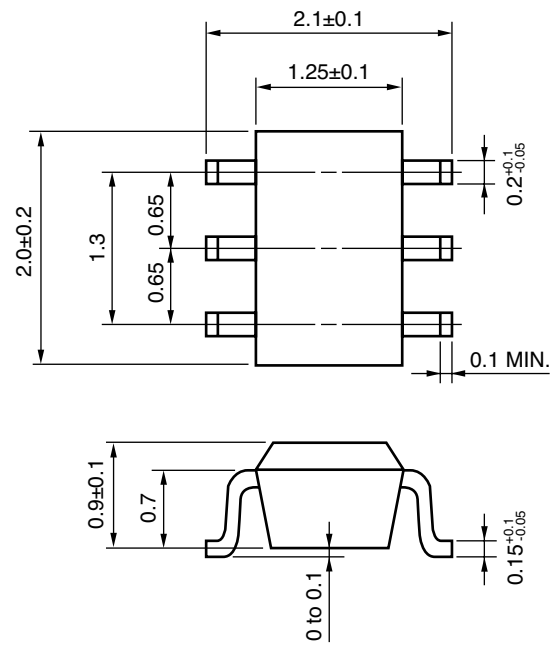
TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE

		V _{CONT1}	
		V _{CONT} (H)	V _{CONT} (L)
V _{CONT2}	V _{CONT} (H)	Note INPUT —●— ●— OUTPUT1 ●— OUTPUT2	INPUT —●— ●— OUTPUT1 ●— OUTPUT2
	V _{CONT} (L)	INPUT —●— ●— OUTPUT1 ●— OUTPUT2	Note ●— OUTPUT1 ●— OUTPUT2

Note In case of V_{CONT1} = V_{CONT2} = High or V_{CONT1} = V_{CONT2} = Low, (that is same control voltage for both pins), input signal of INPUT (Pin 5) is output from OUTPUT1 (Pin 3) and OUTPUT2 (Pin 1).

PACKAGE DIMENSIONS

6-PIN SUPER MINIMOLD (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)	: 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	
VPS	Peak temperature (package surface temperature)	: 215°C or below	VP215
	Time at temperature of 200°C or higher	: 25 to 40 seconds	
	Preheating time at 120 to 150°C	: 30 to 60 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 (pin 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).

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • FAX (408) 988-0279 • www.cel.com

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05/26/2004

NEC

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Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

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	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9