NEC's ¼ W SINGLE CONTROL L, S-BAND SPDT SWITCH

UPG2012TK

FEATURES

- **SUPPLY VOLTAGE:**
  V_{DD} = 2.7 to 3.0 V (2.8 V TYP.)
- **SINGLE SWITCH CONTROL VOLTAGE:**
  $V_{cont\ (H)}$ = 2.7 to 3.0 V (2.8 V TYP.)
  $V_{cont\ (L)}$ = –0.2 to +0.2 V (0 V TYP.)
- **LOW INSERTION LOSS:**
  L_{INS1} = 0.27 dB TYP. @ f = 0.5 to 1.0 GHz, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V
  L_{INS2} = 0.30 dB TYP. @ f = 2.0 GHz, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V
  L_{INS3} = 0.30 dB TYP. @ f = 2.5 GHz, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V
  (Reference value)
- **HIGH ISOLATION:**
  I_{SL1} = 30 dB TYP. @ f = 0.5 to 2.0 GHz, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V
  I_{SL2} = 30 dB TYP. @ f = 2.5 GHz, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V
  (Reference value)
- **HIGH-DENSITY SURFACE MOUNTING:**
  6-pin lead-less minimold package

DESCRIPTION

NEC's UPG2012TK is a single control GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch for mobile phone and L, S-band applications.

This device can operate frequency from 0.5 GHz to 2.5 GHz, with low insertion loss and high isolation.

This device is housed in a 6-pin lead-less minimold package suitable for high-density surface mounting.

APPLICATIONS

- **L, S-band digital cellular or cordless handsets**
- **Bluetooth™ , W-LAN and WLL**
- **Short Range Wireless**

ORDERING INFORMATION

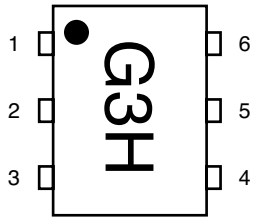
Part Number	Package	Marking	Supplying Form
UPG2012TK-E2-A	6-pin lead-less minimold (1511)	G3H	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: UPG2012TK

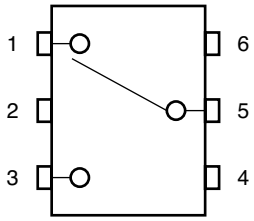
Caution **Observe precautions when handling because these devices are sensitive to electrostatic discharge.**

PIN CONNECTIONS

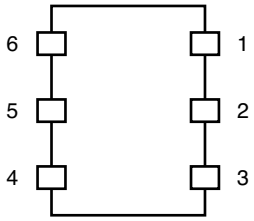
(Top View)



(Top View)



(Bottom View)



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

TRUTH TABLE

V_{cont}	INPUT–OUTPUT1	INPUT–OUTPUT2
Low	OFF	ON
High	ON	OFF

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

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{DD}	+6.0	V
Switch Control Voltage	V_{cont}	+6.0	V
Input Power	P_{in}	+26	dBm
Power Dissipation	P_D	150 **Note**	mW
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

Note 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)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{DD}	2.7	2.8	3.0	V
Switch Control Voltage (H)	$V_{cont(H)}$	2.7	2.8	3.0	V
Switch Control Voltage (L)	$V_{cont(L)}$	–0.2	0	0.2	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss1	L_{INS1}	f = 0.5 to 1.0 GHz	–	0.27	0.50	dB
Insertion Loss2	L_{INS2}	f = 2.0 GHz	–	0.30	0.50	dB
Isolation1	ISL1	f = 0.5 to 2.0 GHz	24	30	–	dB
Input Return Loss	RL_{in}	f = 0.5 to 2.5 GHz	15	20	–	dB
Output Return Loss	RL_{out}	f = 0.5 to 2.5 GHz	15	20	–	dB
0.1 dB Gain Compression Input Power **Note**	$P_{in(0.1\ dB)}$	f = 2.0 GHz	+17.5	+20.5	–	dBm
Supply Current	I_{DD}		–	50	100	μA
Switching Control Current	I_{cont}		–	4	20	μA

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

STANDARD CHARACTERISTICS FOR REFERENCE

(T_A = +25°C, V_{DD} = 2.8 V,V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

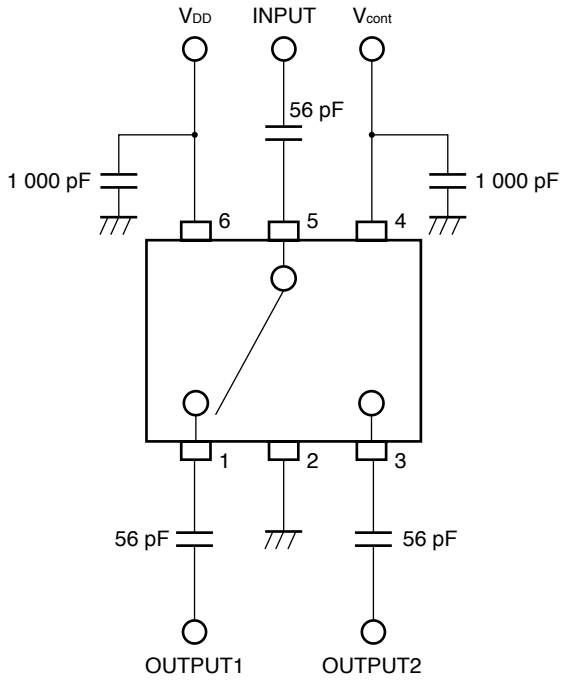
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss3	L_{INS3}	f = 2.5 GHz	–	0.30	–	dB
Isolation2	ISL2	f = 2.5 GHz	–	30	–	dB
1 dB Gain Compression Input Power **Note**	$P_{in(1\ dB)}$	f = 2.0 GHz	–	+24.0	–	dBm
Switching Control Speed	t_{SW}		–	300	–	ns

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

Caution It is necessary to use DC blocking capacitors with the device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with the actual board of the system. The range of recommended DC blocking capacitor value is less than 100 pF.

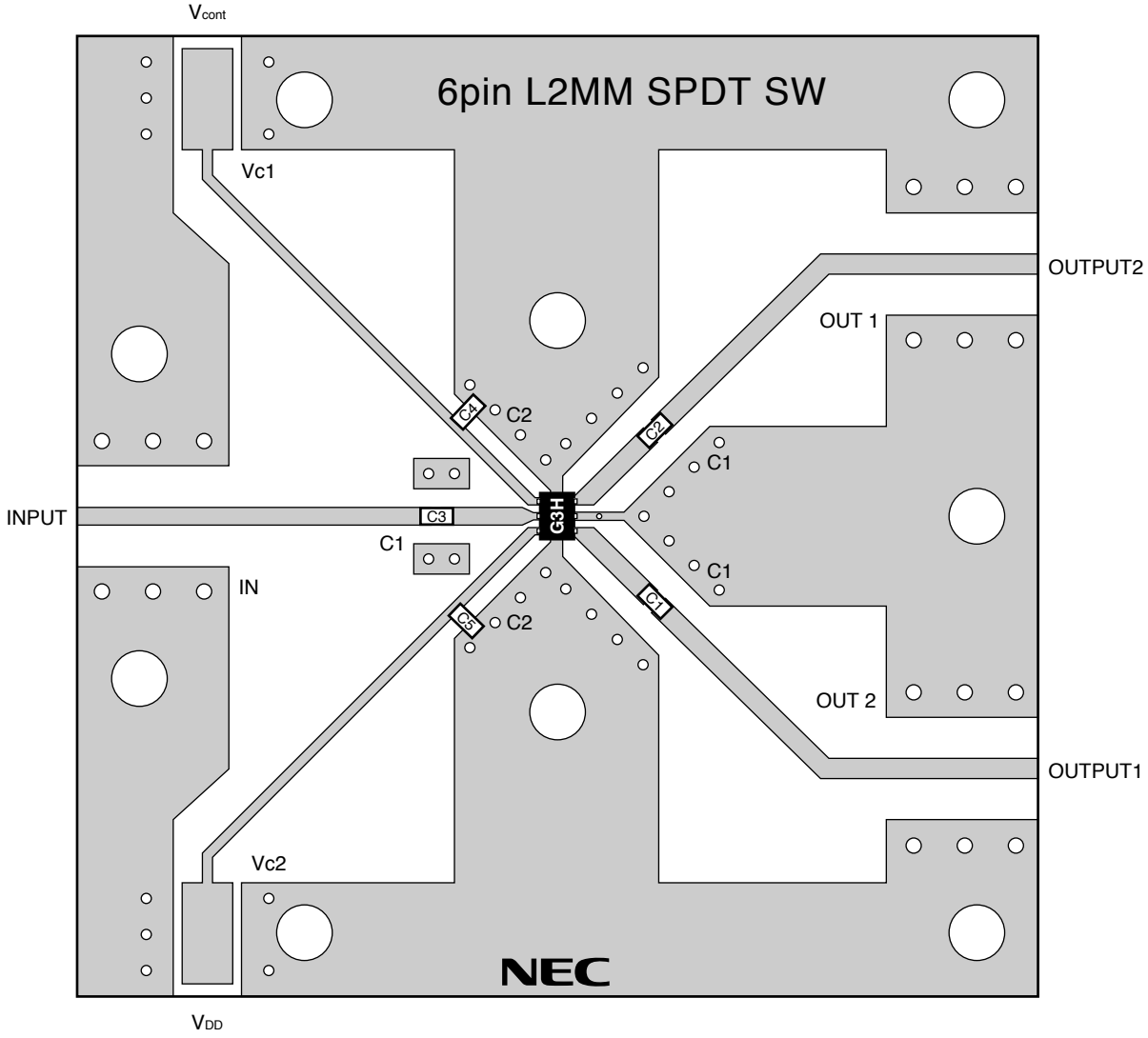
EVALUATION CIRCUIT

(V_{DD} = 2.8 V, V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF)



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

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

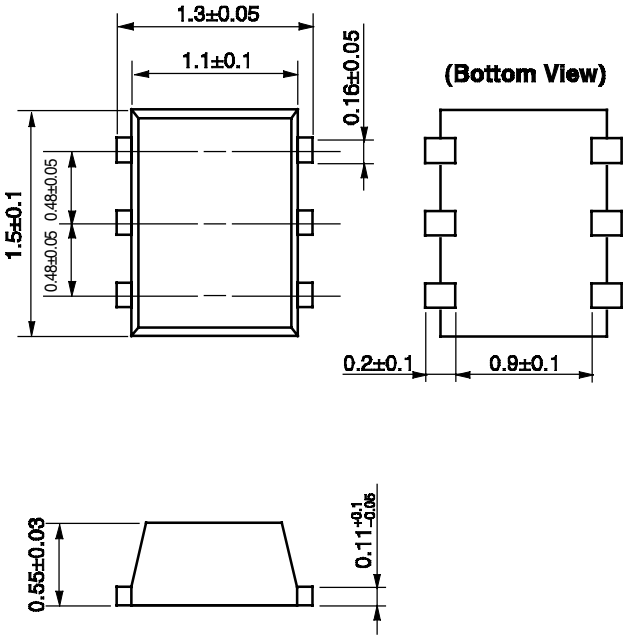


USING THE NEC EVALUATION BOARD

Symbol	Values
C1, C2, C3	56 pF
C4, C5	1 000 pF

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (1511) (UNIT: mm)



Remark ( ): Reference value

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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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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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