



# NEC's L-BAND SP3T SWITCH UPG2227T5F

## FEATURES

- **LOW INSERTION LOSS:**  
0.45 dB TYP. @ 1.0 GHz  
0.50 dB TYP. @ 2.0 GHz
- **HIGH ISOLATION:**  
21 dB TYP. @ 1.0 GHz
- **HIGH POWER:**  
 $P_{in(0.1\text{ dB})} = 33.0\text{ dBm TYP. @ } +2.7\text{ V, } 1.0\text{ GHz}$
- **PACKAGE:**  
12-pin plastic QFN package (3.0 × 3.0 × 0.75 mm)
- **Pb FREE**

## DESCRIPTION

NEC's UPG2227T5F is a L-band SP3T GaAs FET switch for CDMA/PCS/GPS triple mode digital cellular telephone application. The device can operate from 500 MHz to 2.5 GHz with low insertion loss and high linearity.

## APPLICATIONS

- CDMA/PCS/GPS triple mode digital cellular telephone
- Short Range Wireless

## ORDERING INFORMATION

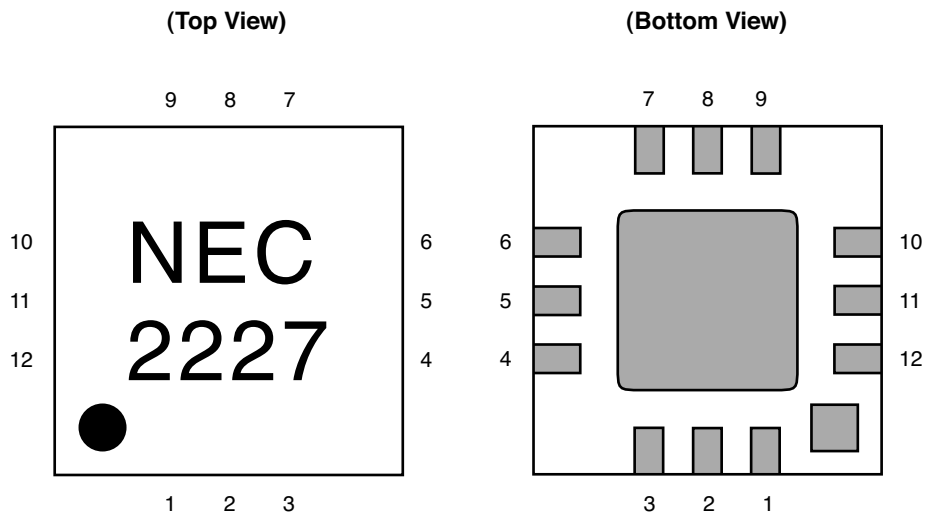
PART NUMBER	PACKAGE	MARKING	SUPPLYING FORM
UPG2227T5F-E2-A	12-pin plastic QFN	2227	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin 1 indicates roll-in direction of tape</li><li>• Qty 3 kpcs/reel</li><li>• Pb Free</li></ul>

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

Part number for sample order: UPG2227T5F-A

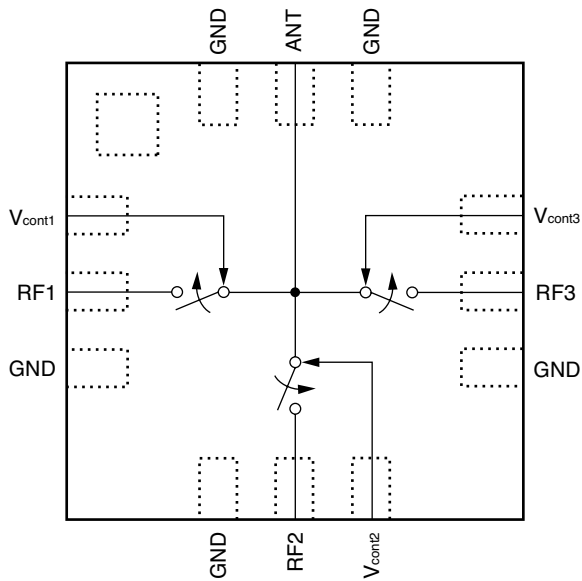
**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

**PIN CONNECTIONS**



PIN NO.	PIN NAME
1	V <sub>cont1</sub>
2	RF1
3	GND
4	GND
5	RF2
6	V <sub>cont2</sub>
7	GND
8	RF3
9	V <sub>cont3</sub>
10	GND
11	ANT
12	GND

**TRUTH TABLE**



V <sub>cont1</sub>	V <sub>cont2</sub>	V <sub>cont3</sub>	ANT-RF1	ANT-RF2	ANT-RF3
H	L	L	ON	OFF	OFF
L	H	L	OFF	ON	OFF
L	L	H	OFF	OFF	ON

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ )

PARAMETER	SYMBOL	RATINGS	UNIT
Switch Control Voltage	$V_{\text{cont}}$	-8.0 to +8.0	V
Input Power	$P_{\text{in}}$	+36	dBm
Operating Ambient Temperature	$T_A$	-45 to +85	$^\circ\text{C}$
Storage Temperature	$T_{\text{stg}}$	-55 to +150	$^\circ\text{C}$

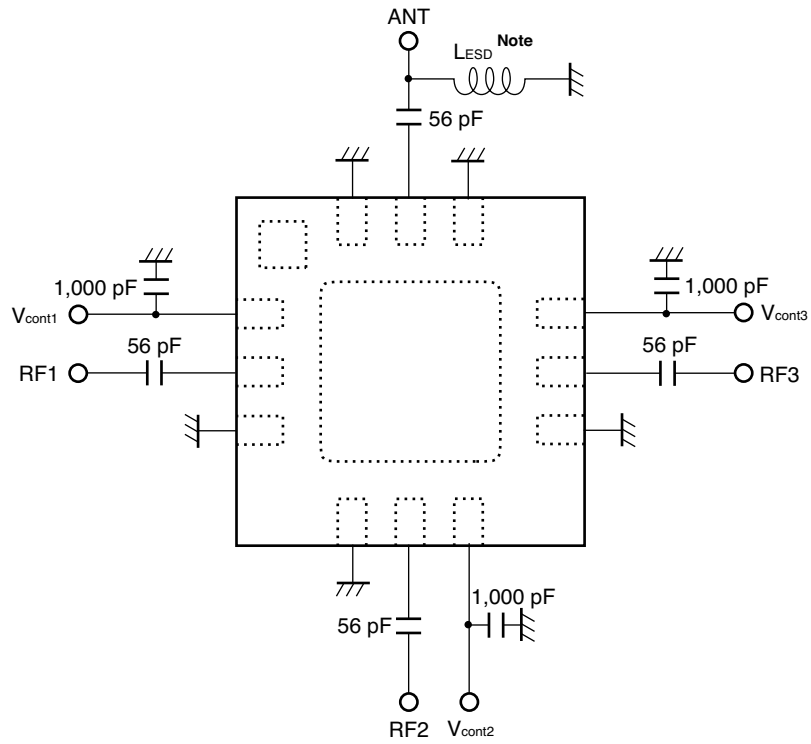
**RECOMMENDED OPERATING RANGE** ( $T_A = 25^\circ\text{C}$ )

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	$V_{\text{cont(H)}}$	+2.4	+2.7	+5.0	V
Switch Control Voltage (L)	$V_{\text{cont(L)}}$	-0.2	0	+0.2	V

**ELECTRICAL CHARACTERISTICS**(TA = +25°C, V<sub>cont</sub> = +2.7 V/0 V, Z<sub>0</sub> = 50 Ω, Off chip DC blocking capacitors value = 56 pF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Insertion Loss	L <sub>INS</sub>	f = 0.5 to 1.0 GHz	–	0.45	0.60	dB
		f = 1.0 to 2.0 GHz	–	0.50	0.70	dB
		f = 2.0 to 2.5 GHz	–	0.55	–	dB
Isolation	ISL	f = 0.5 to 1.0 GHz	22	26	–	dB
		f = 1.0 to 2.0 GHz	17	21	–	dB
		f = 2.0 to 2.5 GHz	–	20	–	dB
Input Return Loss	RL <sub>in</sub>	f = 0.5 to 2.0 GHz	15	20	–	dB
		f = 2.0 to 2.5 GHz	–	20	–	dB
Output Return Loss	RL <sub>out</sub>	f = 0.5 to 2.0 GHz	15	20	–	dB
		f = 2.0 to 2.5 GHz	–	20	–	dB
0.1 dB Gain Compression Input Power	P <sub>in (0.1 dB)</sub>	f = 1.0 GHz	31.0	33.0	–	dBm
1 dB Gain Compression Input Power	P <sub>in (1 dB)</sub>	f = 1.0 GHz	–	34	–	dBm
2nd Harmonics	2f <sub>0</sub>	f = 1.0 GHz @ P <sub>in</sub> = +27 dBm	65	75	–	dBc
		f = 2.0 GHz @ P <sub>in</sub> = +24 dBm	–	75	–	dBc
3rd Harmonics	3f <sub>0</sub>	f = 1.0 GHz @ P <sub>in</sub> = +27 dBm	65	75	–	dBc
		f = 2.0 GHz @ P <sub>in</sub> = +24 dBm	–	75	–	dBc
3rd Order Distortion Input Intercept Point	IIP <sub>3</sub>	f = 837 MHz/838 MHz @ 1 MHz Spacing P <sub>in</sub> = +22 dBm each @ 2 Tone	–	64	–	dBm
		f = 1 880 MHz/1 881 MHz @ 1 MHz Spacing P <sub>in</sub> = +21 dBm each @ 2 Tone	–	63	–	dBm
Cross Modulation	X-Mod	f = 837 MHz/838 MHz @ 1 MHz Spacing P <sub>in</sub> = +22 dBm each @ 2 Tone f = 880 MHz P <sub>in</sub> = –27 dBm	–	–108	–	dBm
		f = 1 880 MHz/1 881 MHz @ 1 MHz Spacing P <sub>in</sub> = +21 dBm each @ 2 Tone f = 1 960 MHz P <sub>in</sub> = –27 dBm	–	–110	–	dBm
Switch Control Speed	t <sub>sw</sub>		–	150	–	ns
Switch Control Current	I <sub>cont</sub>	RF Non	–	1	20	μA

EVALUATION CIRCUIT

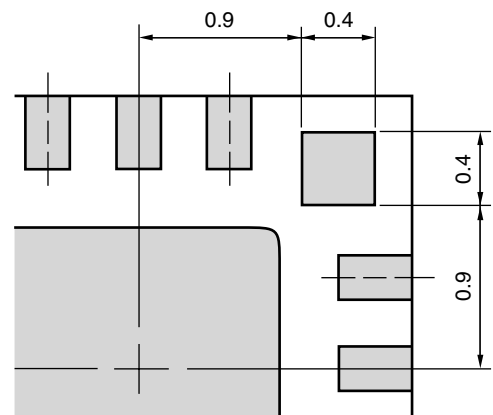
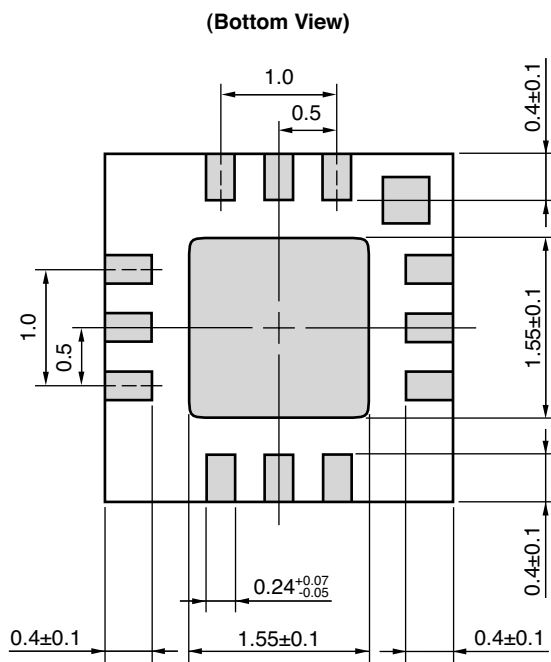
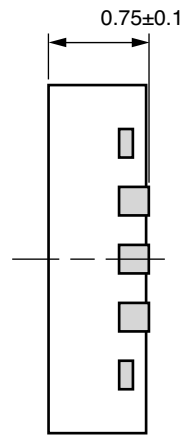
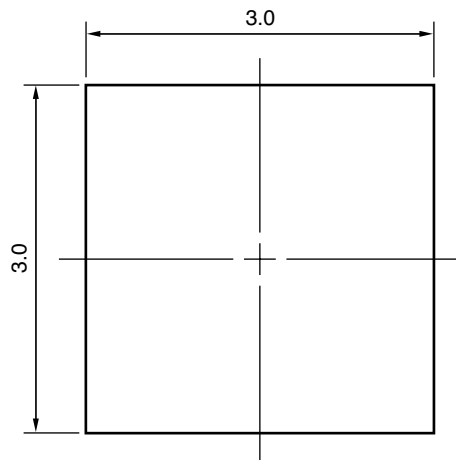


**Note** Recommend attached L<sub>ESD</sub> to antenna port for ESD protection.

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

PACKAGE DIMENSIONS

12-PIN PLASTIC QFN (UNIT: mm)



Dimensions of pin No.1 indication

**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
VPS	Peak temperature (package surface temperature) : 215°C or below 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	VP215
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 (pin 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).**

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.

**CEL California Eastern Laboratories**, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.

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DATA SUBJECT TO CHANGE WITHOUT NOTICE

05/10/2005

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	
		-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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