



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# μPD5902T7K

**Data Sheet**  
R09DS0046EJ0200  
Rev.2.00  
Nov 19, 2012

## CMOS Integrated Circuits High Power SPDT Switch

### DESCRIPTION

The μPD5902T7K is a CMOS MMIC SPDT (Single Pole Double Throw) switch for GSM and UMTS/LTE main Antenna switching and other High Power RF switching applications up to +35 dBm.

This device can operate frequency from 0.05 to 6.0 GHz, having low insertion loss and high isolation.

This device is housed in a 12-pin plastic QFN (Quad Flat Non-Leaded) (T7K) package.

### FEATURES

- Low control voltage :  $V_{cont} = 1.3 \text{ V MIN.}, V_{DD} = 2.3 \text{ V MIN.}$
- Low insertion loss :  $L_{ins} = 0.35/0.40 \text{ dB TYP. @ } f = 1.0/2.0 \text{ GHz}$
- High isolation :  $ISL = 45/37 \text{ dB TYP. @ } f = 1.0/2.0 \text{ GHz}$
- High Handling power :  $P_{in(0.1dB)} = +38 \text{ dBm TYP. @ } f = 0.9/2.0 \text{ GHz}$
- High-density surface mounting : 12-pin plastic QFN (T7K) package (2.0 × 2.0 × 0.6 mm)
- No DC blocking capacitors required.

### APPLICATIONS

- GSM and UMTS/LTE main Antenna switching etc.
- Other RF switching Applications.
- Antenna tuning Applications.

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPD5902T7K-E2	μPD5902T7K-E2-A	12-pin plastic QFN (T7K) (Pb-Free)	5902	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin 10, 11 and 12 face the perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul>

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

Part number for sample order: μPD5902T7K-A

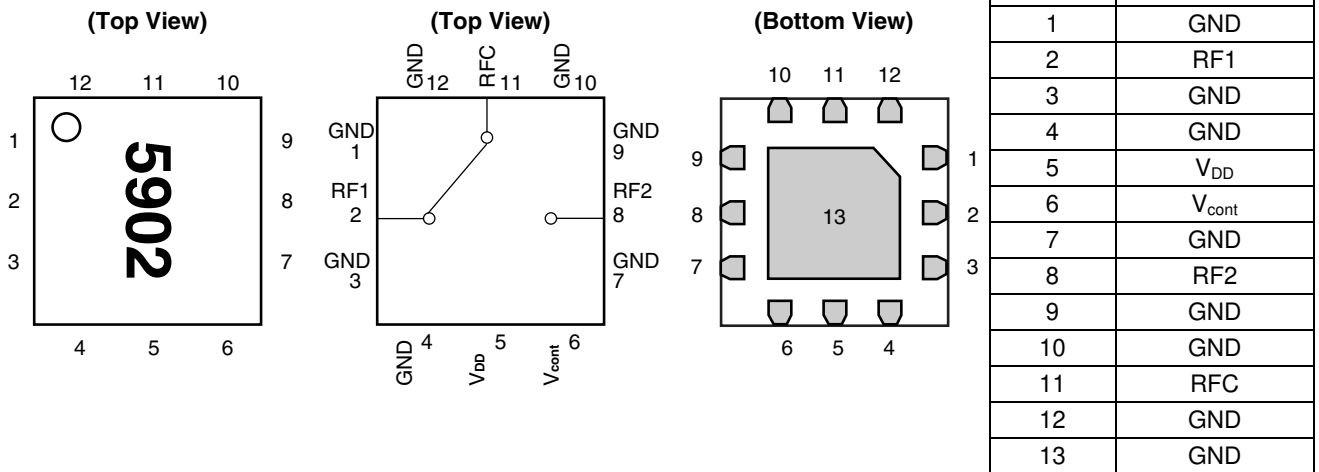
### CAUTION

Although this device is designed to be as robust as possible, ESD (Electrostatic Discharge) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions must be employed at all times.

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.

<R> **PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



**SW TRUTH TABLE**

V <sub>cont</sub>	RFC–RF1	RFC–RF2
High	ON	OFF
Low	OFF	ON

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Ratings	Unit
Supply Voltage	V <sub>DD</sub>	3.6	V
Control Voltage	V <sub>cont</sub>	3.6	V
Input Power	P <sub>in</sub>	+38	dBm
Operating Ambient Temperature	T <sub>A</sub>	–40 to +85	°C
Storage Temperature	T <sub>stg</sub>	–55 to +125	°C

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating Frequency	f	0.05	–	6.0	GHz
Supply Voltage	V <sub>DD</sub>	2.3	–	3.3	V
Control Voltage (High)	V <sub>cont (H)</sub> <sup>Note</sup>	1.3	–	V <sub>DD</sub>	V
Control Voltage (Low)	V <sub>cont (L)</sub>	0	–	0.4	V

Note: V<sub>cont</sub> ≤ V<sub>DD</sub>

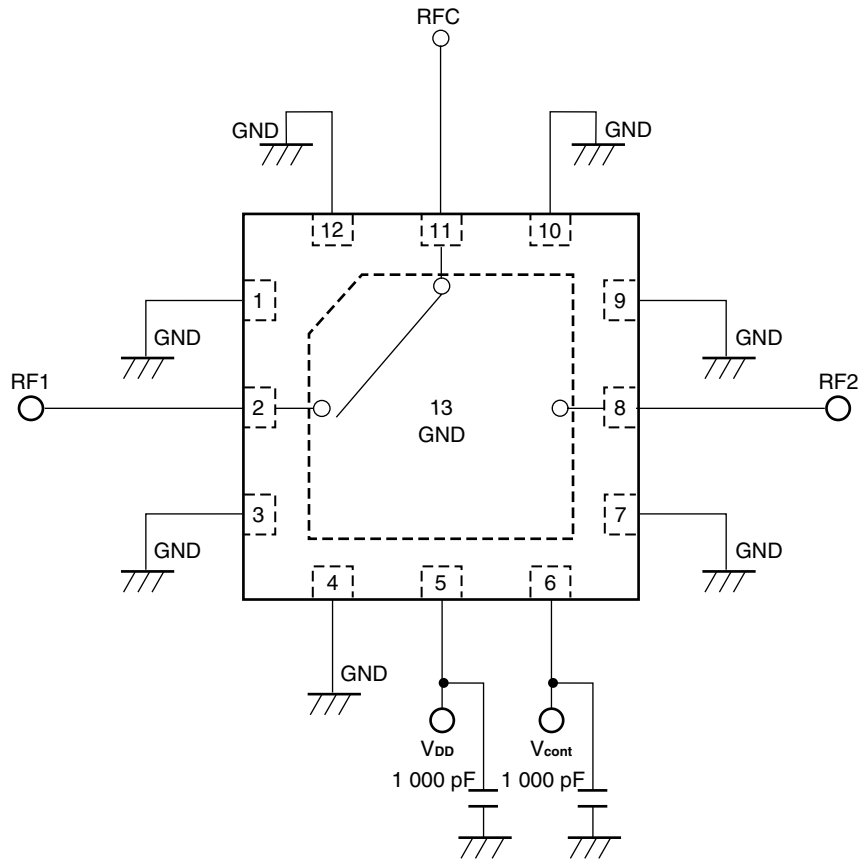
**ELECTRICAL CHARACTERISTICS**

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 2.5\text{ V}$ ,  $V_{\text{cont}}(\text{H}) = 1.8\text{ V}$ ,  $V_{\text{cont}}(\text{L}) = 0\text{ V}$ ,  $Z_0 = 50\ \Omega$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss	$L_{\text{ins}1}$	$f = 0.05$ to $0.5\text{ GHz}$ , $P_{\text{in}} = 0\text{ dBm}$	–	0.30	0.45	dB
	$L_{\text{ins}2}$	$f = 0.5$ to $1.0\text{ GHz}$	–	0.35	0.50	
	$L_{\text{ins}3}$	$f = 1.0$ to $2.0\text{ GHz}$	–	0.40	0.55	
	$L_{\text{ins}4}$	$f = 2.0$ to $2.7\text{ GHz}$	–	0.45	0.75	
	$L_{\text{ins}5}$	$f = 2.7$ to $3.8\text{ GHz}$	–	0.50	0.80	
	$L_{\text{ins}6}$	$f = 3.8$ to $6.0\text{ GHz}$	–	0.60	0.95	
<R> Isolation (RFC – RF1,2)	ISL1	$f = 0.05$ to $0.5\text{ GHz}$ , $P_{\text{in}} = 0\text{ dBm}$	45	50	–	dB
	ISL2	$f = 0.5$ to $1.0\text{ GHz}$	40	45	–	
	ISL3	$f = 1.0$ to $2.0\text{ GHz}$	32	37	–	
	ISL4	$f = 2.0$ to $2.7\text{ GHz}$	30	35	–	
	ISL5	$f = 2.7$ to $3.8\text{ GHz}$	25	30	–	
	ISL6	$f = 3.8$ to $6.0\text{ GHz}$	–	23	–	
Return Loss (RFC)	RL1	$f = 0.05$ to $3.8\text{ GHz}$	15	18	–	dB
	RL2	$f = 3.8$ to $6.0\text{ GHz}$	–	15	–	
Return Loss (RF1,2)	RL1	$f = 0.05$ to $3.8\text{ GHz}$	15	18	–	dB
	RL2	$f = 3.8$ to $6.0\text{ GHz}$	–	15	–	
0.1 dB Loss Compression Input Power	$P_{\text{in}(0.1\text{dB})1}$	$f = 0.9\text{ GHz}$	+36.0	+38.0 Note	–	dBm
	$P_{\text{in}(0.1\text{dB})2}$	$f = 2.0\text{ GHz}$	+36.0	+38.0 Note	–	
Harmonics	2f0	$f = 0.9\text{ GHz}$ , $P_{\text{in}} = +35\text{ dBm}$	75	80	–	dBc
	3f0		70	75	–	
	2f0	$f = 2.0\text{ GHz}$ , $P_{\text{in}} = +33\text{ dBm}$	75	85	–	
	3f0		70	80	–	
2nd Order Inter Modulation Distortion	IMD2	$f = 835\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$ $f = 45\text{ MHz}$ , $P_{\text{in}} = -15\text{ dBm}$	–	–98	–93	dBm
		$f = 1\ 950\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$ $f = 190\text{ MHz}$ , $P_{\text{in}} = -15\text{ dBm}$	–	–105	–100	
3rd Order Inter Modulation Distortion	IMD3	$f = 835\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$ $f = 790\text{ MHz}$ , $P_{\text{in}} = -15\text{ dBm}$	–	–110	–105	dBm
		$f = 1\ 950\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$ $f = 1\ 760\text{ MHz}$ , $P_{\text{in}} = -15\text{ dBm}$	–	–110	–105	
Input 3rd order Intercept Point	IIP <sub>3</sub>	$f = 2\ 500\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$ $f = 2\ 501\text{ MHz}$ , $P_{\text{in}} = +20\text{ dBm}$	65	70	–	dBm
Switch Control Speed	$T_{\text{sw}}$	50% CTL to 90/10%	–	2.0	5.0	$\mu\text{sec}$
Supply Current	$I_{\text{DD}}$	Active Mode No RF	–	130	250	$\mu\text{A}$
Control Current	$I_{\text{cont}}(\text{H})$	$V_{\text{cont}}$ : High No RF	–	–	1	
	$I_{\text{cont}}(\text{L})$	$V_{\text{cont}}$ : Low No RF	–	–	1	

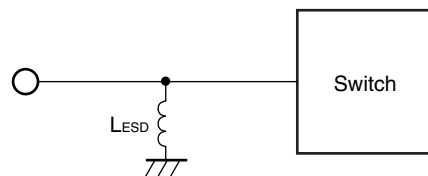
Note: Absolute Maximum Ratings

## &lt;R&gt; EVALUATION CIRCUIT



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

## APPLICATION INFORMATION

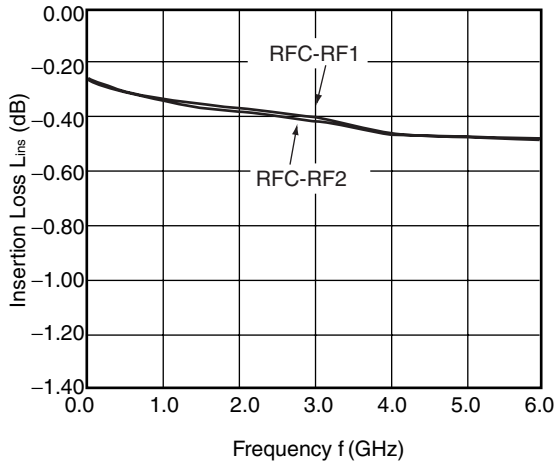


- $L_{ESD}$  provides a means to increase the ESD protection on a specific RF port, typically the port attached to the antenna.

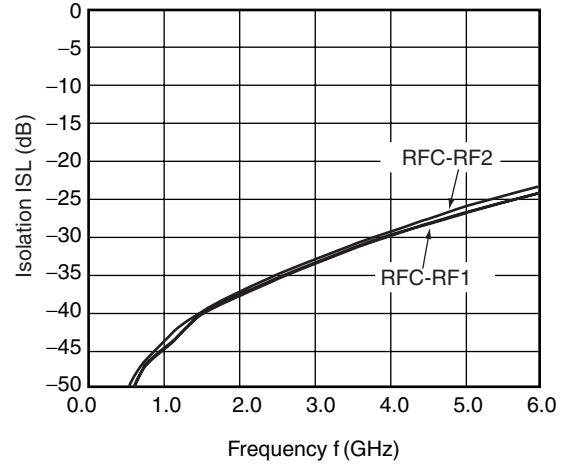
**TYPICAL CHARACTERISTICS**

( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 2.5\text{ V}$ ,  $V_{\text{cont (H)}} = 1.8\text{ V}$ ,  $V_{\text{cont (L)}} = 0\text{ V}$ ,  $Z_0 = 50\ \Omega$ , unless otherwise specified)

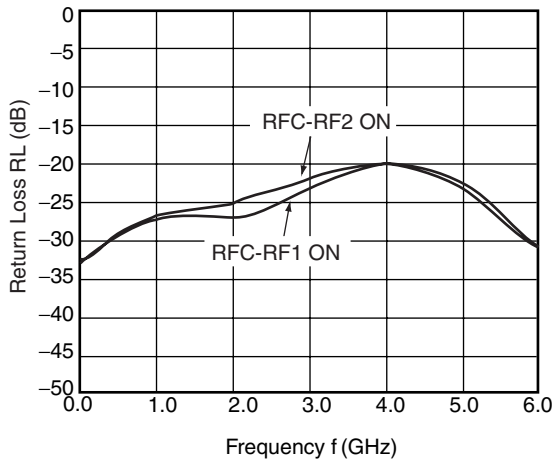
RFC-RF1/RF2  
INSERTION LOSS vs. FREQUENCY



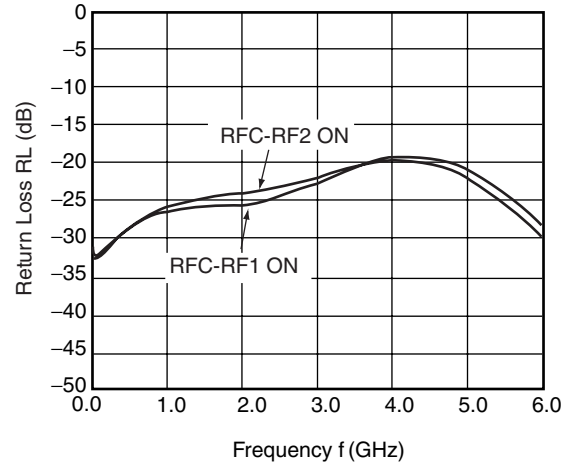
RFC-RF1/RF2  
ISOLATION vs. FREQUENCY



RFC  
RETURN LOSS vs. FREQUENCY

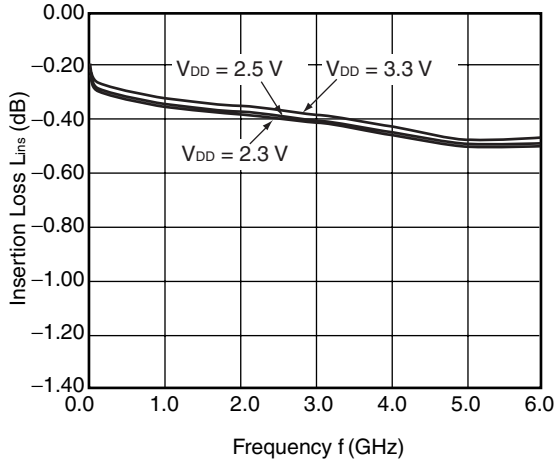


RF1/RF2  
RETURN LOSS vs. FREQUENCY

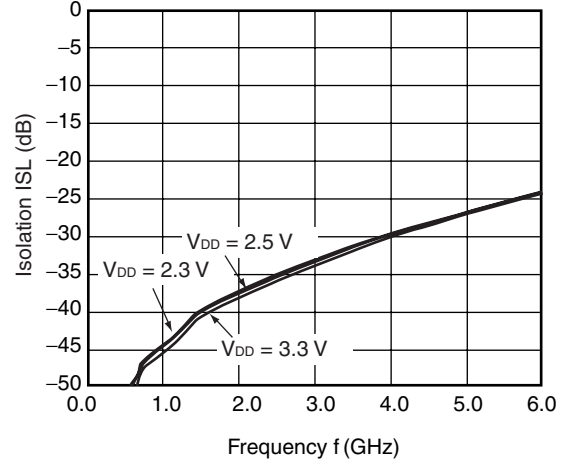


**Remark** The graphs indicate nominal characteristics.

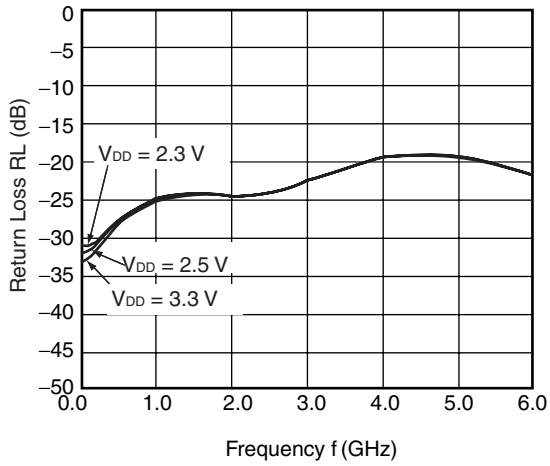
**RFC-RF1/RF2  
INSERTION LOSS vs. FREQUENCY**



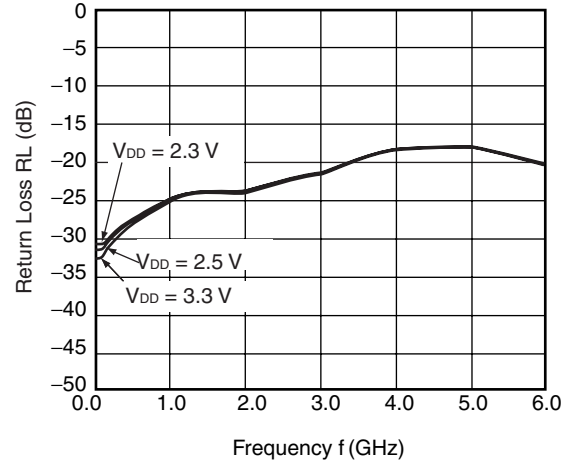
**RFC-RF1/RF2  
ISOLATION vs. FREQUENCY**



**RFC  
RETURN LOSS vs. FREQUENCY**

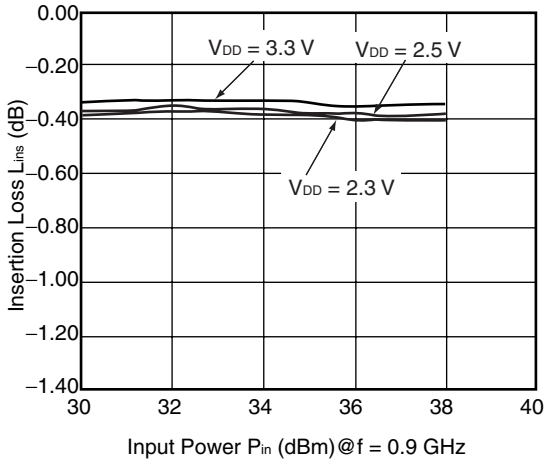


**RF1/RF2  
RETURN LOSS vs. FREQUENCY**

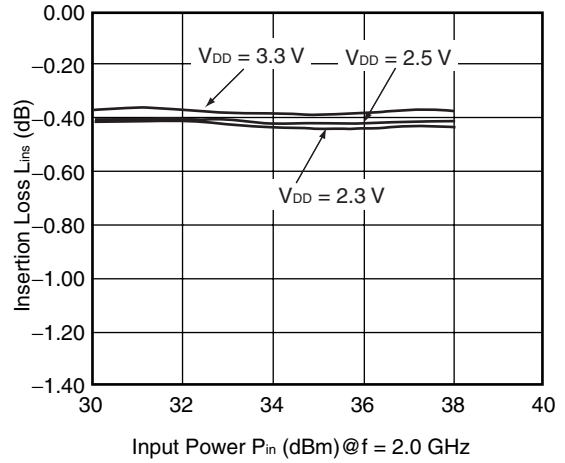


**Remark** The graphs indicate nominal characteristics.

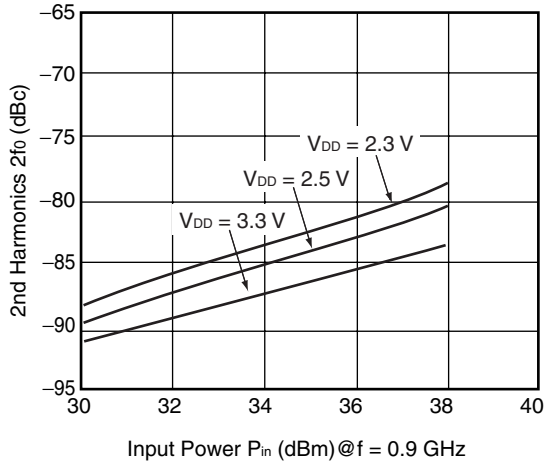
RFC-RF1/RF2  
INSERTION LOSS vs. INPUT POWER



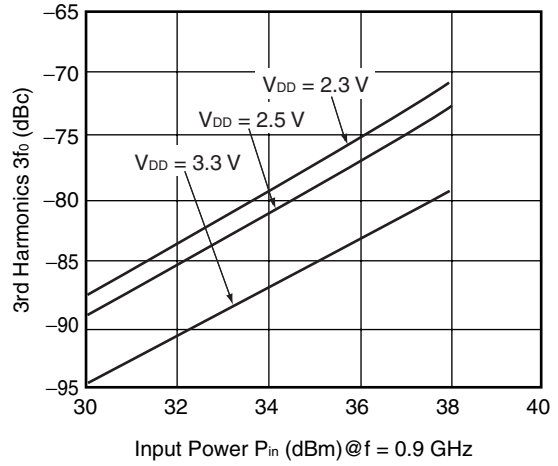
RFC-RF1/RF2  
INSERTION LOSS vs. INPUT POWER



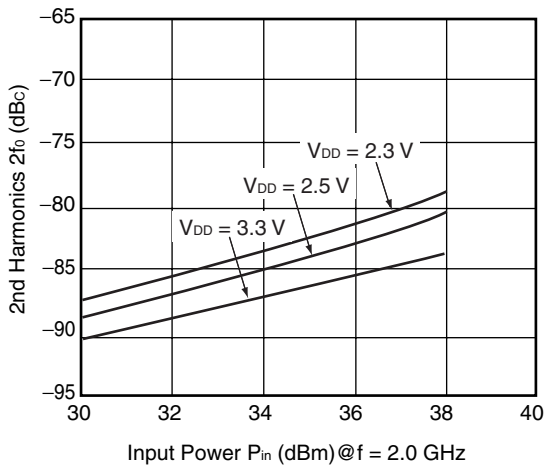
RFC-RF1/RF2  
2nd HARMONICS vs. INPUT POWER



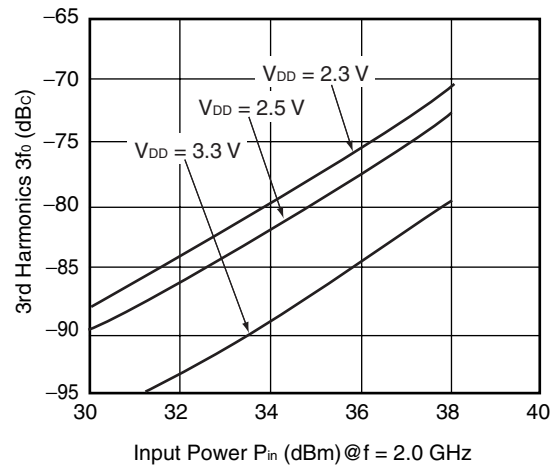
RFC-RF1/RF2  
3rd HARMONICS vs. INPUT POWER



RFC-RF1/RF2  
2nd HARMONICS vs. INPUT POWER



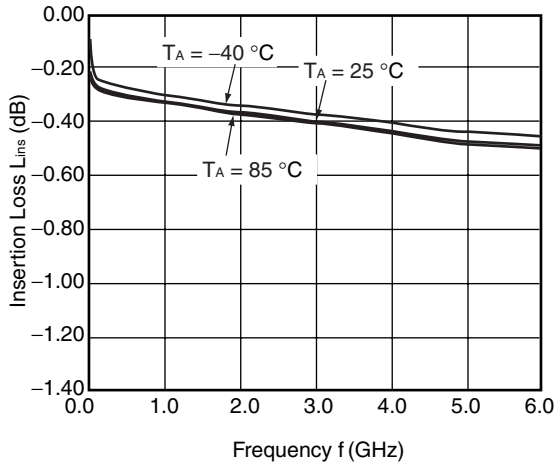
RFC-RF1/RF2  
3rd HARMONICS vs. INPUT POWER



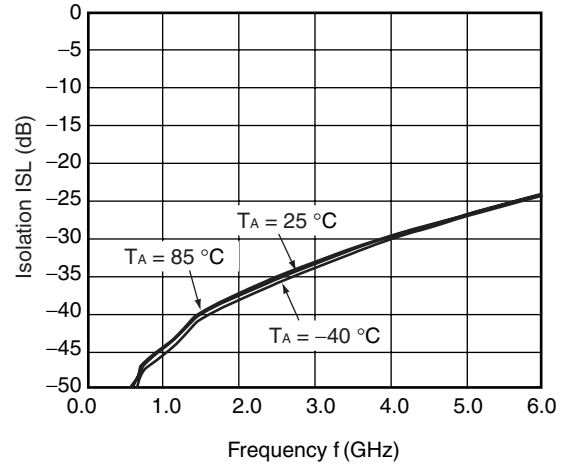
**Remark** The graphs indicate nominal characteristics.



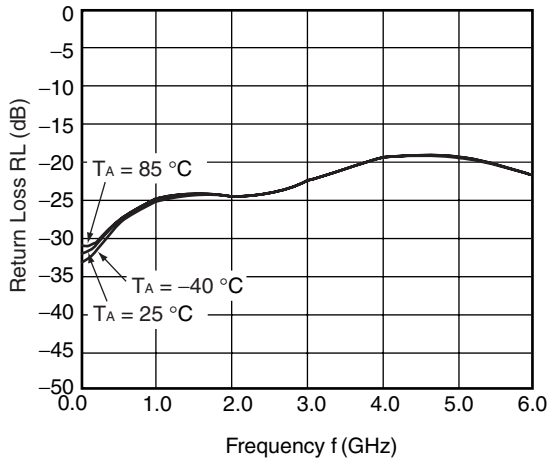
RFC-RF1/RF2  
INSERTION LOSS vs. FREQUENCY



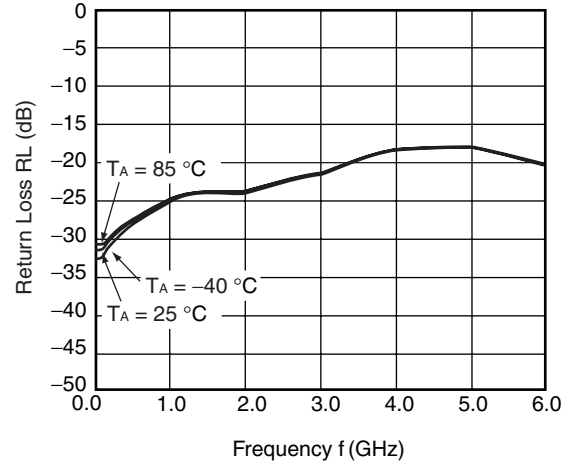
RFC-RF1/RF2  
ISOLATION vs. FREQUENCY



RFC  
RETURN LOSS vs. FREQUENCY

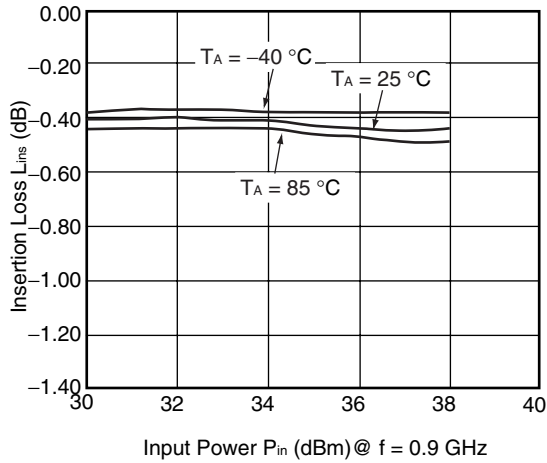


RF1/RF2  
RETURN LOSS vs. FREQUENCY

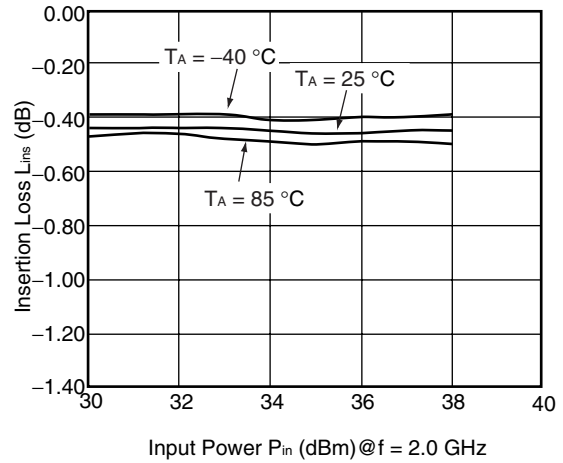


**Remark** The graphs indicate nominal characteristics.

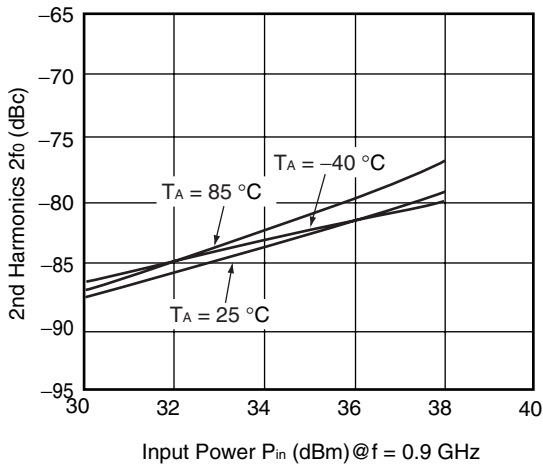
RFC-RF1/RF2  
INSERTION LOSS vs. INPUT POWER



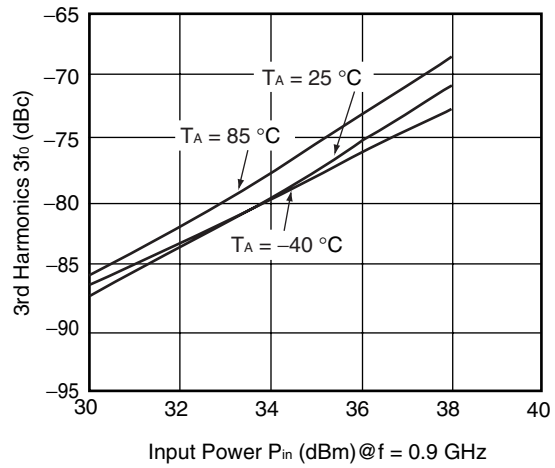
RFC-RF1/RF2  
INSERTION LOSS vs. INPUT POWER



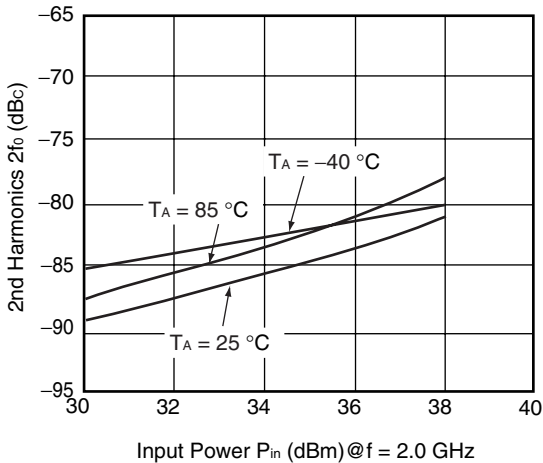
RFC-RF1/RF2  
2nd HARMONICS vs. INPUT POWER



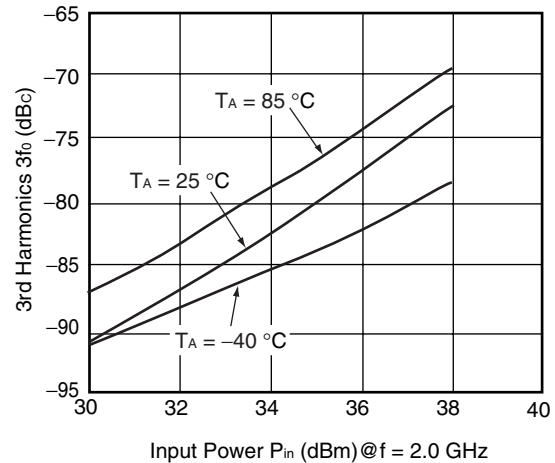
RFC-RF1/RF2  
3rd HARMONICS vs. INPUT POWER



RFC-RF1/RF2  
2nd HARMONICS vs. INPUT POWER



RFC-RF1/RF2 3rd HARMONICS vs.  
INPUT POWER

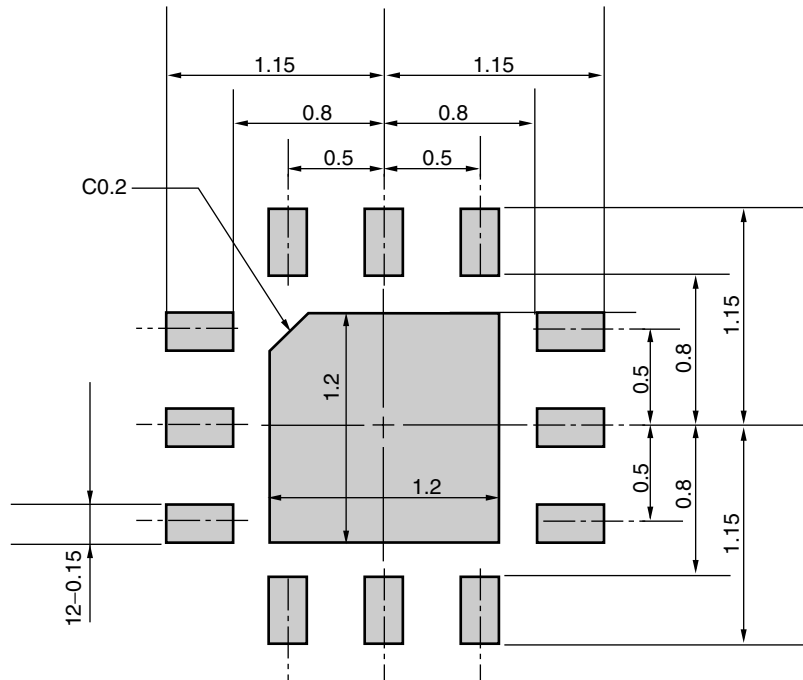


**Remark** The graphs indicate nominal characteristics.

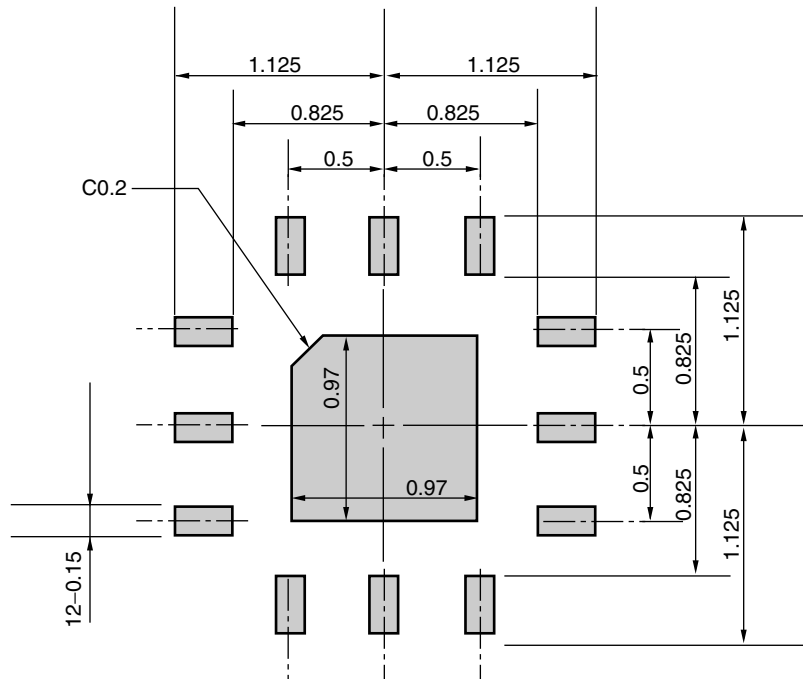
## MOUNTING PAD LAYOUT DIMENSIONS

12-PIN PLASTIC QFN (T7K) (UNIT: mm)

### MOUNTING PAD



### SOLDER MASK



Solder thickness : 0.1 mm

**Remark** The mounting pad layout in this document is for reference only.  
 When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.



**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.

<b>Soldering Method</b>	<b>Soldering Conditions</b>	<b>Condition Symbol</b>
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
Partial Heating	Peak temperature (terminal 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).

<b>Revision History</b>	<b>μPD5902T7K Data Sheet</b>
-------------------------	------------------------------

Rev.	Date	Description	
		Page	Summary
1.00	Sep 10, 2012	–	First edition issued
2.00	Nov 19, 2012	p.2	The block diagram is changed.
		p.3	The symbol indicating the range between terminals is changed from “to” to “-”.
		p.4	The evaluation circuit is changed.

All trademarks and registered trademarks are the property of their respective owners.