

## Features

- Supply-voltage Range: 2.7 V to 5.5 V
- Single-ended Output, no Balun Required
- Single-ended Input for RF and LO
- Excellent Isolation Characteristics
- Power-down Mode
- IP3 and Compression Point Programmable
- 2.5-GHz Operating Frequency

## Benefits

- Reduced System Costs as only Few External Component (no Balun) are Required
- Small Package
- Very Low Current Consumption
- Easy to Use

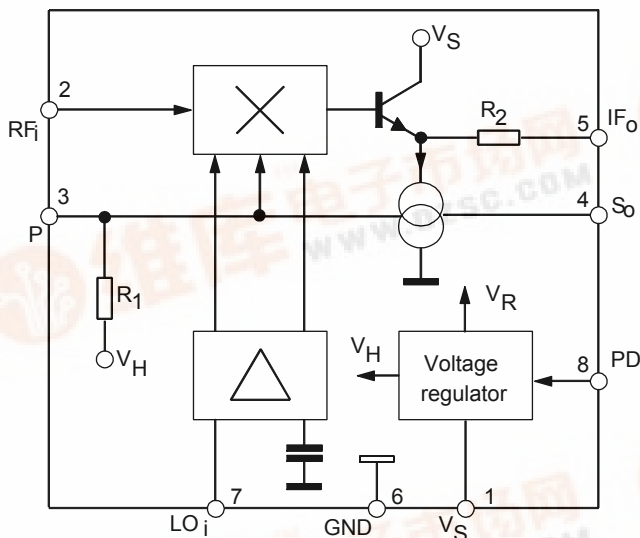
Electrostatic sensitive device.  
Observe precautions for handling.



## Description

The U2795B is a 2.5-GHz mixer for WLAN and RF telecommunications equipment, e.g., DECT and PCN. The IC is manufactured using Atmel's advanced bipolar technology. A double-balanced approach was chosen to assure good isolation characteristics and a minimum of spurious products. The input and output are single-ended, and their characteristics are programmable. No output transformer or balun is required.

Figure 1. Block Diagram



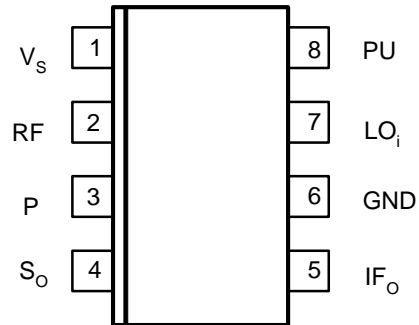
## 2.5-GHz Double- balanced Mixer

## U2795B



## Pin Configuration

Figure 2. Pinning



## Pin Description

Pin	Symbol	Function
1	$V_s$	Supply voltage
2	$RF_i$	RF input
3	P	Progammig port IP3, CP
4	$S_o$	Output symmetry
5	$IF_o$	IF output
6	GND	Ground
7	$LO_i$	LO input
8	PU	Power-up

## Functional Description

### Supply Voltage

The IC is designed for a supply-voltage range of 2.7 V to 5.5 V. As the IC is internally stabilized, the performance of the circuit is nearly independent of the supply voltage.

### Input Impedance

The input impedance,  $Z_{RFi}$ , is about 700  $\Omega$  with an additional capacitive component. This condition provides the best noise figure in combination with a matching network.

### 3rd Order Intercept Point (IP3)

The voltage divider,  $R_p/R_1$ , determinates both the input and output intercept point, IIP3 and OIP3. If the value of RP is infinite, the maximum value of IIP3 reaches about -4 dBm. The IP3/ $R_p$  characteristics are shown in Figure 3 and Figure 4.

### Output Impedance and Intercept Point

The output impedance is shown in Figure 11. Both low output impedance and a high intercept point are defined to a high value of  $R_p$ .

### Current Consumption, $I_S$

Depending on the chosen input and output conditions of the IC, the current consumption,  $I_S$ , is between 4 mA and 10 mA. The current consumption in dependence of  $R_p$  is shown in Figure 6.

### Power-up

This feature provides extended battery lifetime. If this function is not used, Pin 8 has to be connected to  $V_S$  (Pin 1).

### Output Symmetry

The symmetry of the load current can be matched and thus optimized for a given load impedance.

## Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	$V_S$	6	V
Input voltage	$V_I$	0 to $V_S$	V
Junction temperature	$T_j$	125	$^{\circ}\text{C}$
Storage-temperature range	$T_{stg}$	-40 to +125	$^{\circ}\text{C}$

## Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient SO8	$R_{thJA}$	175	K/W

## Operating Range

Parameters	Symbol	Value	Unit
Supply-voltage range	$V_S$	2.7 to 5.5	V
Ambient-temperature range	$T_{amb}$	-40 to +85	$^{\circ}\text{C}$



## Electrical Characteristics

$V_S = 3\text{ V}$ ,  $f_{LOi} = 1\text{ GHz}$ ,  $IF = 900\text{ MHz}$ ,  $RF = 100\text{ MHz}$ ,  $R_P = \infty$ , system impedance  $Z_o = 50\ \Omega$ ,  $T_{amb} = 25^\circ\text{C}$ ,  $R_T = 56\ \Omega$  reference point Pin 6, unless otherwise specified

No.	Parameters	Test Conditions	Pin	Symbol	Min.	Typ.	Max.	Unit	Type*	
1.1	Supply voltage range		1	$V_S$	2.7		5.5	V	A	
1.2	Supply Current	$V_S = 2.7\text{ V}$	1	$I_S$	9		13	mA	A	
			1	$I_S$	3		6.2	mA	A	
1.3	Conversion Supply Current	$R_L = 50\ \Omega$ , $R_T = \infty$ $R_L = 50\ \Omega$ , $R_T = 56\ \Omega$	1	$PG_C$ $PG_C$		9			dB	B
						4			dB	
<b>2</b>	<b>Operating Frequencies</b>									
2.1	$RF_i$ frequency		2	$RF_i$	10		2500	MHz	D	
2.2	$LO_i$ frequency		7	$f_{LOi}$	50		2500	MHz	D	
2.3	$IF_o$ frequency		5	$f_{IFo}$	50		2500	MHz	D	
<b>3</b>	<b>Isolation</b>									
3.1	LO spurious at $RF_i$	$P_{ILO} = -10\text{ to }0\text{ dBm}$	7, 2	$IS_{LO-RF}$		-30		dBm	D	
3.2	$RF_i$ to $LO_i$	$P_{IRF} = -25\text{ dBm}$	2, 7	$IS_{RF-LO}$		35		dB	D	
3.3	LO spurious at $IF_o$	$P_{ILO} = -10\text{ to }0\text{ dBm}$	5, 7	$IS_{LO-IF}$		-25		dBm	D	
3.4	$IF_o$ to $LO_i$		5, 7	$IS_{IF-LO}$		30		dB	D	
<b>4</b>	<b>Output (IF)</b>									
4.1	Output compression point		5	$CP_o$		-10		dBm	D	
<b>5</b>	<b>Input (RF)</b>									
5.1	Input impedance		2	$Z_{RFi}$		$700\parallel 0.8$		$\Omega\parallel pF$	D	
5.2	Input compression point		2	$CP_i$		-14		dBm	D	
5.3	3rd-order input intercept point		2	IIP3		-4		dBm	D	
<b>6</b>	<b>Input (LO)</b>									
6.1	LO level		7	$P_{ILO}$		-6		dBm	D	
<b>7</b>	<b>Voltage Standing Wave Ratio (VSWR)</b>									
7.1	Input LO		7	$VSWR_{LOi}$		< 2			D	
7.2	Output IF		4	$VSWR_{IFo}$		< 2			D	
<b>8</b>	<b>Noise Performance</b>									
8.1	Noise figure	$P_{ILO} = 0\text{ dBm}$ , $R_T = \infty$		NF		10		dB	D	
<b>9</b>	<b>Power-down Mode</b>									
9.1	Supply current	$V_{PU} < 0.5\text{ V}$ $V_{PU} = 0\text{ V}$	1	$I_{SPU}$			30	$\mu\text{A}$	B	
						< 5		$\mu\text{A}$	B	
<b>10</b>	<b>Power-down Voltage</b>									
10.1	"Power ON"	$V_S = 3.5\text{ to }5.5\text{ V}$ $V_S = 2.7\text{ to }3.5\text{ V}$	8	$V_{PON}$	$V_S - 0.5$ $V_S$		$V_S + 0.5$ $V_S + 0.5$	V V	D D	
							1	V	D	
10.2	"Power DOWN"		8	$V_{PDN}$				V	D	
10.3	Power-down current	Power ON Power DOWN	8	$I_{PON}$ $I_{PDN}$		0.15 < 5	0.22	mA $\mu\text{A}$	A D	
						< 30		$\mu\text{s}$	D	
10.4	Settling time		5,8	$t_{SPD}$		< 30		$\mu\text{s}$	D	

\*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

Figure 3. IIP3 versus Resistor  $R_p$ , IF: 900 MHz

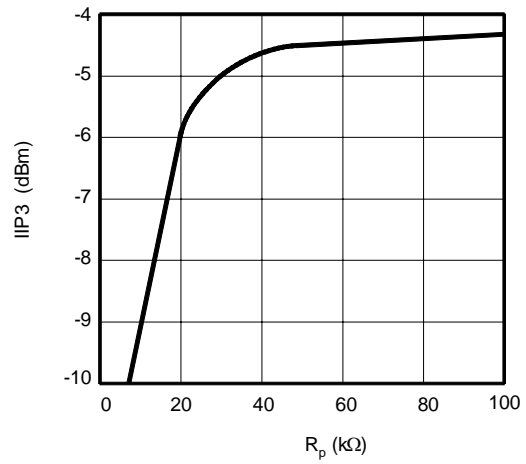
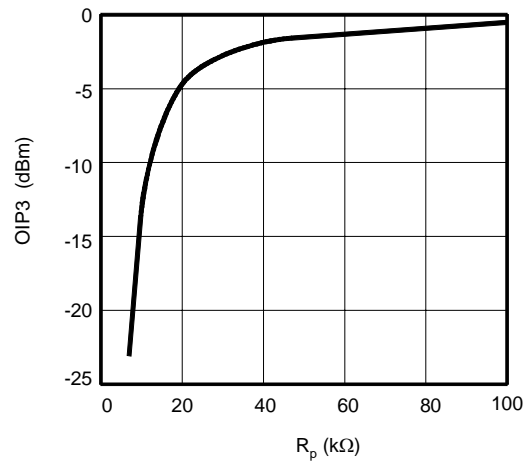
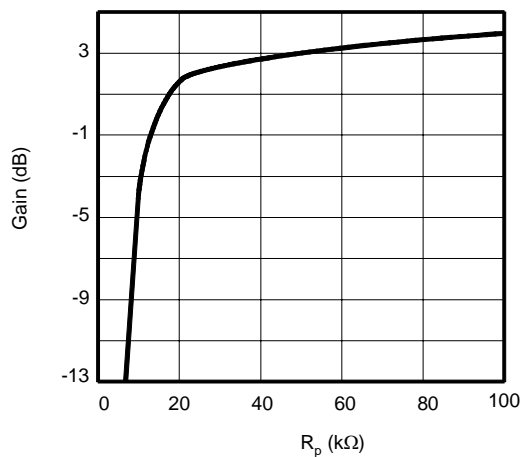


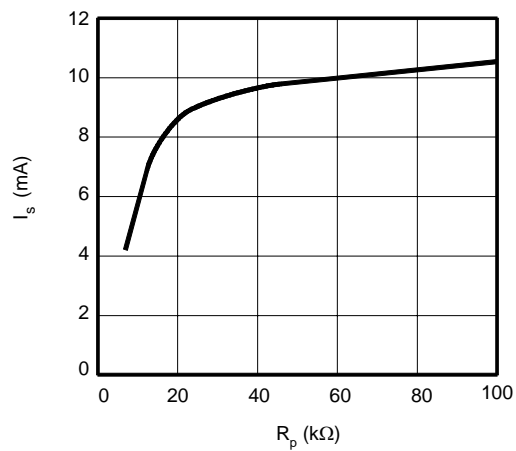
Figure 4. OIP3 versus Resistor  $R_p$ , IF: 900 MHz



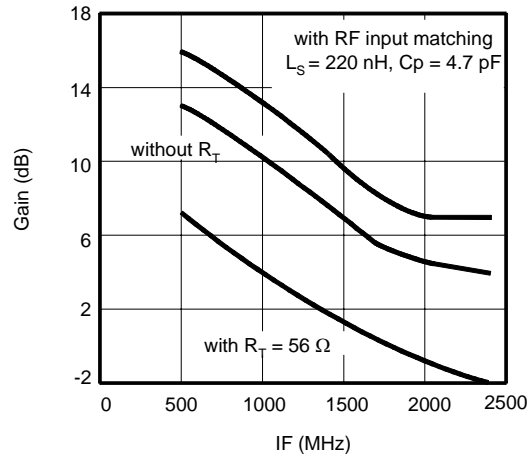
**Figure 5.** Gain versus Resistor  $R_p$ , LO: 1030 MHz, level -10 dBm; RF: 130 MHz, -30 dBm,  $R_T = 56 \Omega$



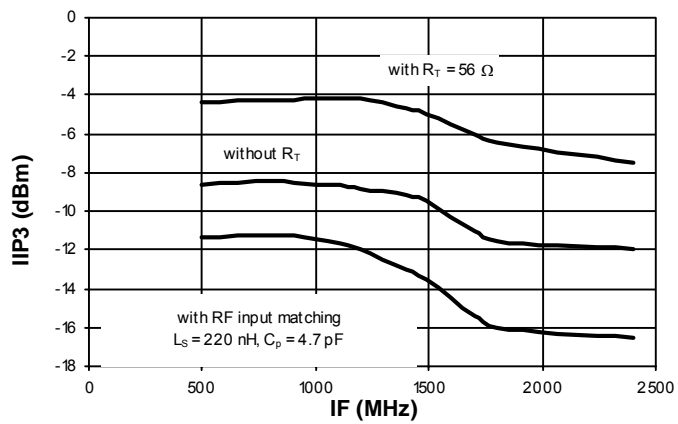
**Figure 6.** Supply Current  $I_s$  versus Resistor  $R_p$



**Figure 7.** Gain versus IF Output Frequency, LO Level: -6 dBm, RF: 130 MHz, -35 dBm; Parameter: RF Input Termination

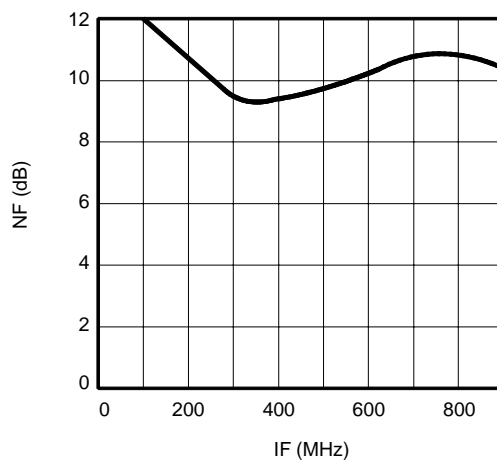


**Figure 8.** IIP3 versus IF Output Frequency, LO Level: -6 dBm; RF: 130 MHz/130.1 MHz, -35 dBm; Parameter: RF Input Termination

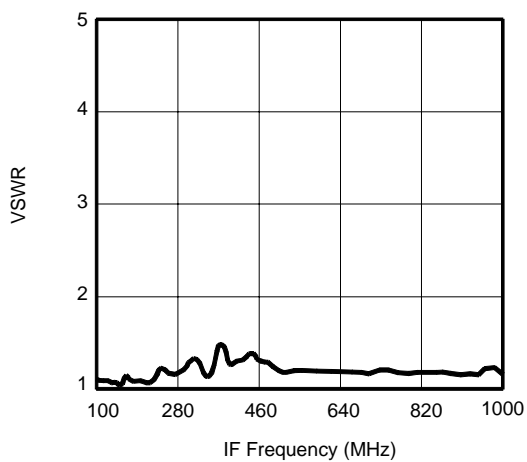




**Figure 9.** Double Sideband Noise Figure versus IF Output Frequency; LO: 1000 MHz, Level 0 dBm; no RF Input Matching,  $R_T$  Left Out

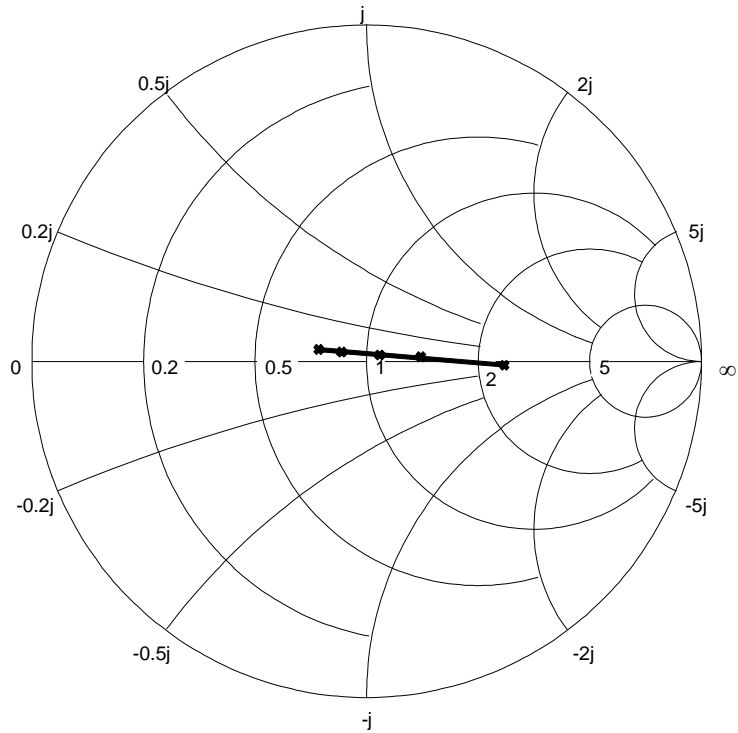


**Figure 10.** Typical VSWR Frequency Response of the IF Output,  $R_P = \infty$

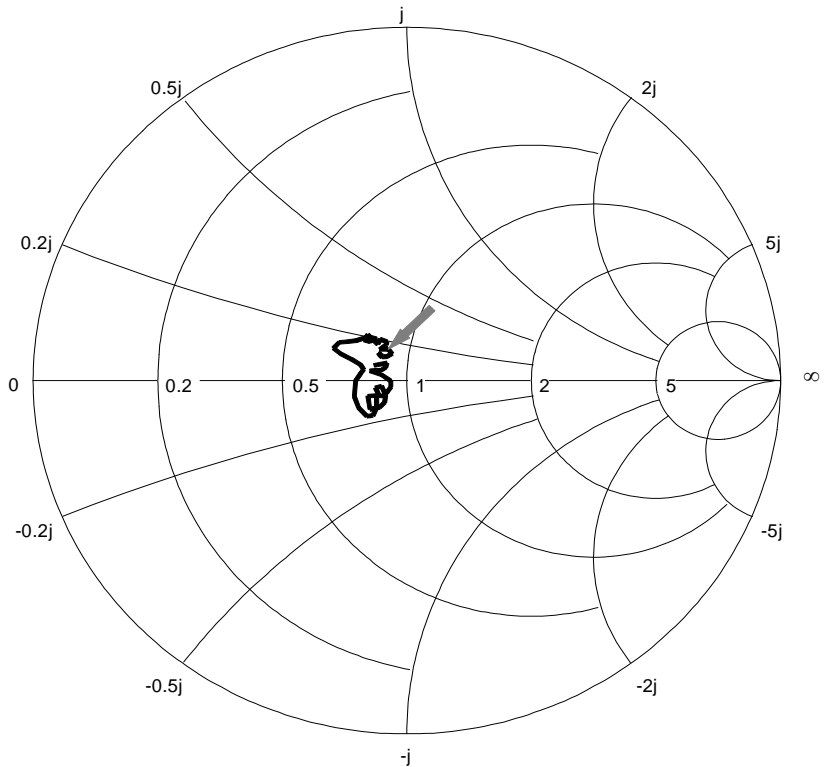




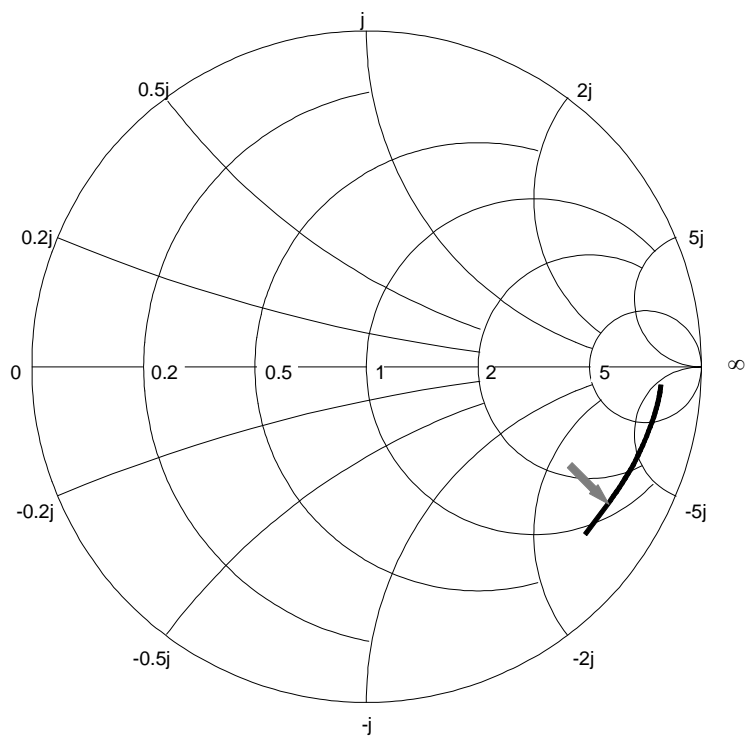
**Figure 11.** Typical Impedance of the Output versus  $R_P$  at Frequency  $f_{IF0} = 900$  MHz  
 Markers (from Left to Right):  $R_P = \infty/22\text{ k}\Omega/10\text{ k}\Omega/8.2\text{ k}\Omega/5.6\text{ k}\Omega$



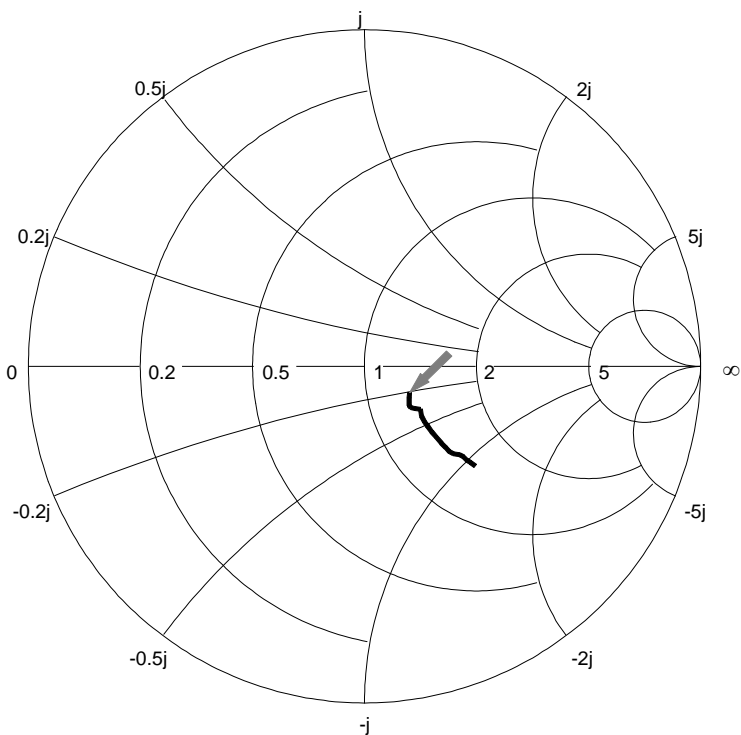
**Figure 12.** Typical S11 Frequency Response of the IF Output,  $R_P = \infty$ , IF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz



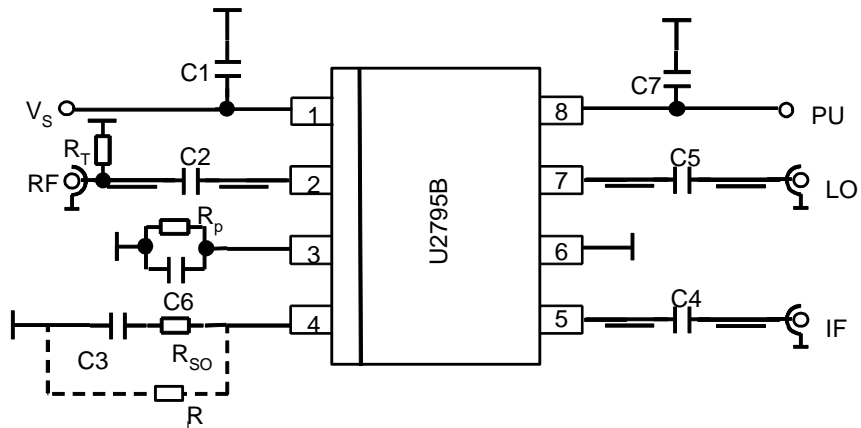
**Figure 13.** Typical S11 Frequency Response of the RF Input,  $R_p = \infty$ ,  $R_T = \infty$   
RF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz



**Figure 14.** Typical S11 Frequency Response of the LO Input,  $R_p = \infty$ , LO Frequency  
from 100 MHz to 1000 MHz, Marker: 900 MHz



## Application



**Table 1. Part List**

Part	Value
C 1	10 nF
C2, C3, C4, C5, C6, C7	100 pF
*R <sub>P</sub>	
=====	50-Ω Microstrip
*R <sub>S0</sub>	68 Ω
---	optional
R <sub>T</sub>	56 Ω

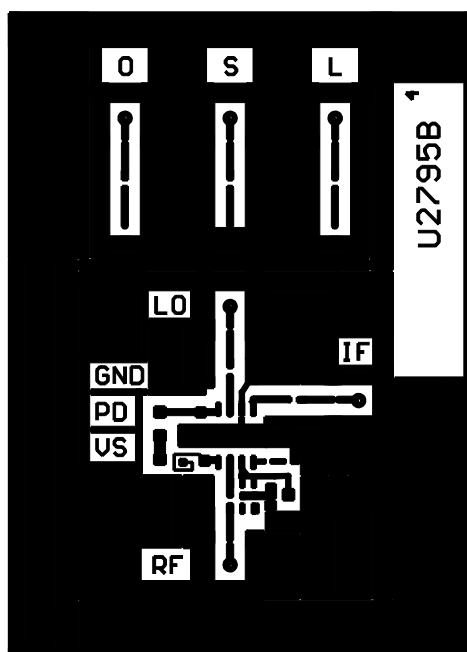
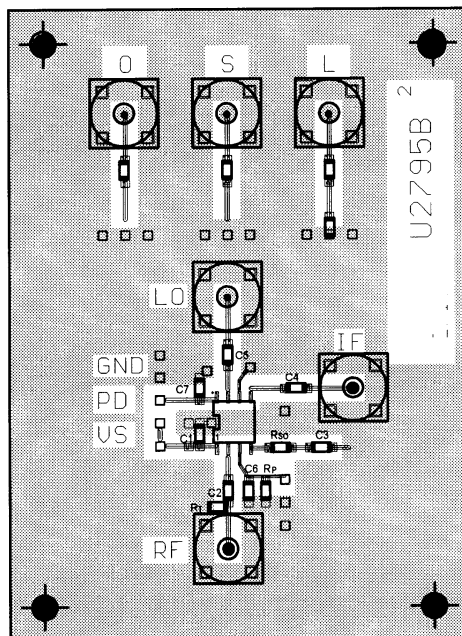
If the part-list values are used, the PU settling time is < 20 μs. Using other values, time requirements in burst-mode applications have to be considered.

The values of R<sub>S0</sub> and R<sub>P</sub> depend on the input and output condition requirements. For R<sub>S0</sub>, 68 Ω is recommended.

By means of the optional R<sub>I</sub>, the intercept and compression point can be slightly increased; values between 500 Ω and 1 kΩ are suitable. Please note that such modification will also increase the supply current.



# Application Circuit (Evaluation Board)

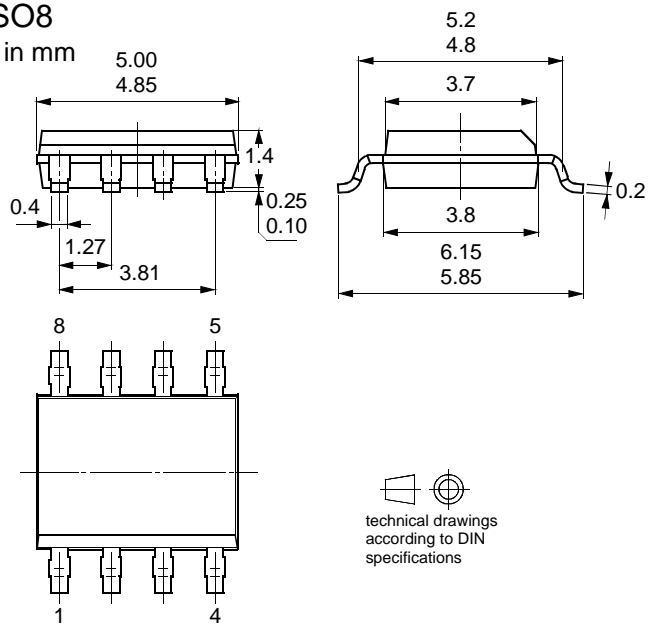


**Ordering Information**

Extended Type Number	Package	Remarks
U2795B-MFP	SO8	Tube
U2795B-MFPG3	SO8	Taped and reeled

**Package Information**

Package SO8  
Dimensions in mm





## Atmel Headquarters

**Corporate Headquarters**  
2325 Orchard Parkway  
San Jose, CA 95131  
TEL 1(408) 441-0311  
FAX 1(408) 487-2600

**Europe**  
Atmel Sarl  
Route des Arsenaux 41  
Case Postale 80  
CH-1705 Fribourg  
Switzerland  
TEL (41) 26-426-5555  
FAX (41) 26-426-5500

**Asia**  
Room 1219  
Chinachem Golden Plaza  
77 Mody Road Tsimhatsui  
East Kowloon  
Hong Kong  
TEL (852) 2721-9778  
FAX (852) 2722-1369

**Japan**  
9F, Tonetsu Shinkawa Bldg.  
1-24-8 Shinkawa  
Chuo-ku, Tokyo 104-0033  
Japan  
TEL (81) 3-3523-3551  
FAX (81) 3-3523-7581

## Atmel Operations

**Memory**  
2325 Orchard Parkway  
San Jose, CA 95131  
TEL 1(408) 441-0311  
FAX 1(408) 436-4314

**Microcontrollers**  
2325 Orchard Parkway  
San Jose, CA 95131  
TEL 1(408) 441-0311  
FAX 1(408) 436-4314  
  
La Chantrerie  
BP 70602  
44306 Nantes Cedex 3, France  
TEL (33) 2-40-18-18-18  
FAX (33) 2-40-18-19-60

**ASIC/ASSP/Smart Cards**  
Zone Industrielle  
13106 Rousset Cedex, France  
TEL (33) 4-42-53-60-00  
FAX (33) 4-42-53-60-01

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906  
TEL 1(719) 576-3300  
FAX 1(719) 540-1759

Scottish Enterprise Technology Park  
Maxwell Building  
East Kilbride G75 0QR, Scotland  
TEL (44) 1355-803-000  
FAX (44) 1355-242-743

**RF/Automotive**  
Theresienstrasse 2  
Postfach 3535  
74025 Heilbronn, Germany  
TEL (49) 71-31-67-0  
FAX (49) 71-31-67-2340

1150 East Cheyenne Mtn. Blvd.  
Colorado Springs, CO 80906  
TEL 1(719) 576-3300  
FAX 1(719) 540-1759

**Biometrics/Imaging/Hi-Rel MPU/  
High Speed Converters/RF Datacom**  
Avenue de Rochepleine  
BP 123  
38521 Saint-Egreve Cedex, France  
TEL (33) 4-76-58-30-00  
FAX (33) 4-76-58-34-80

---

**e-mail**  
[literature@atmel.com](mailto:literature@atmel.com)

**Web Site**  
<http://www.atmel.com>

### © Atmel Corporation 2003.

Atmel Corporation makes no warranty for the use of its products, other than those expressly contained in the Company's standard warranty which is detailed in Atmel's Terms and Conditions located on the Company's web site. The Company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. No licenses to patents or other intellectual property of Atmel are granted by the Company in connection with the sale of Atmel products, expressly or by implication. Atmel's products are not authorized for use as critical components in life support devices or systems.

Atmel® is the registered trademark of Atmel.

Other terms and product names may be the trademarks of others.

