

## 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

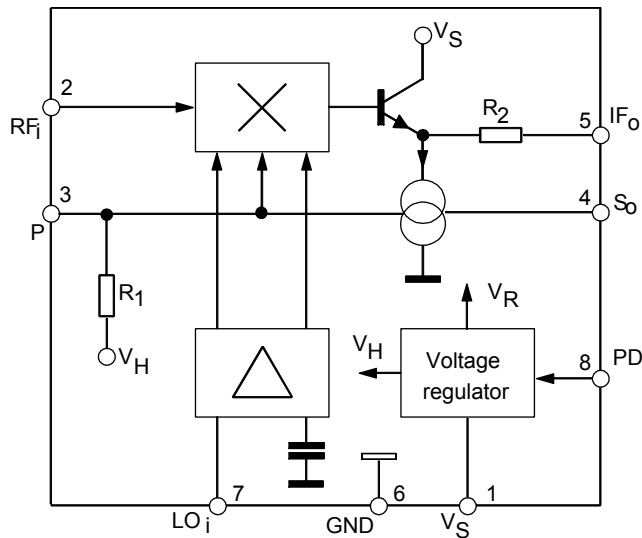
Electrostatic sensitive device.  
Observe precautions for handling.



## 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

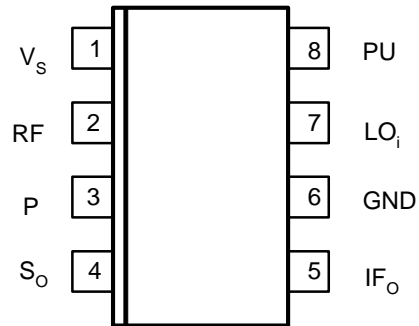


## 2.5-GHz Double- balanced Mixer

## 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  $R_p$  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	°C
Storage-temperature range	$T_{stg}$	-40 to +125	°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	°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	$PG_C$		9		dB	B
				$PG_C$		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 $R_{Fi}$	$P_{ILO} = -10\text{ to }0\text{ dBm}$	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  0.8		$\Omega  pF$	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	$I_{SPU}$		< 5	30	$\mu\text{A}$	B
								$\mu\text{A}$	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	$V_{PON}$	$V_S - 0.5$		$V_S + 0.5$	V	D
					$V_S$		$V_S + 0.5$	V	D
10.2	"Power DOWN"		8	$V_{PDN}$			1	V	D
10.3	Power-down current	Power ON Power DOWN	8	$I_{PON}$		0.15	0.22	mA	A
				$I_{PDN}$		< 5		$\mu\text{A}$	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

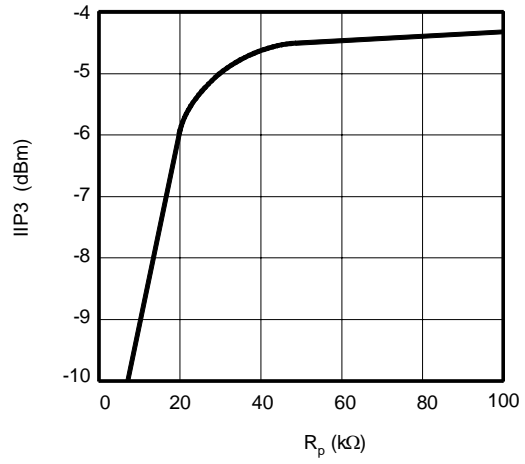
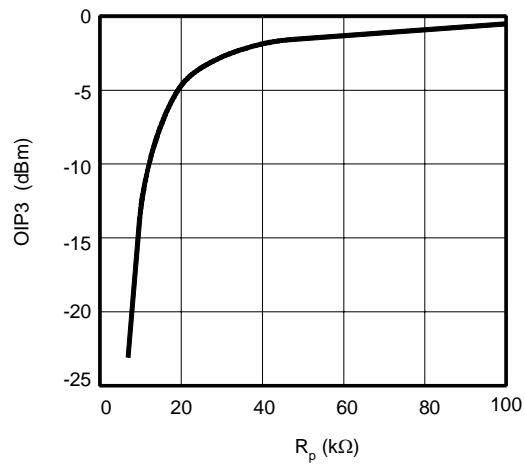
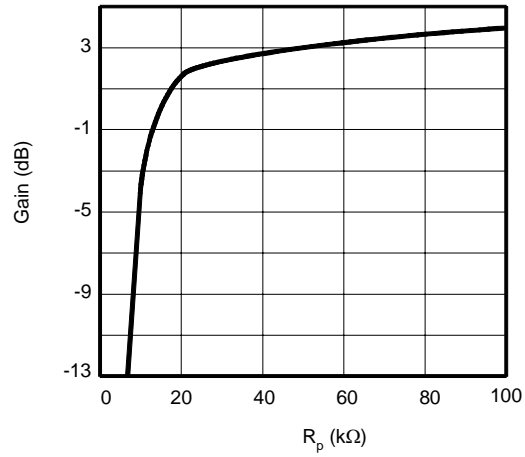


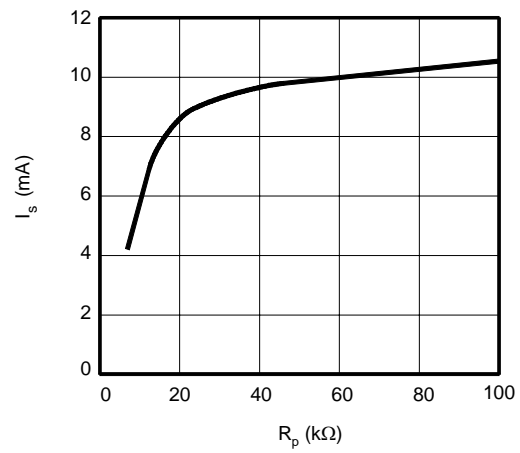
Figure 4. OIP3 versus Resistor  $R_p$ , IF: 900 MHz



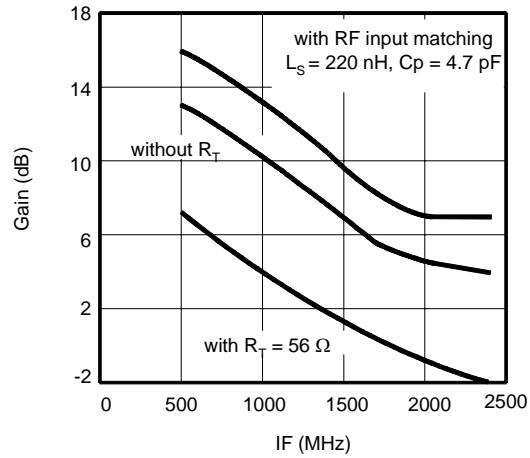
**Figure 5.** Gain versus Resistor  $R_p$ , LO: 1030 MHz, level -10 dBm; RF: 130 MHz, -30 dBm,  $R_T = 56 \Omega$



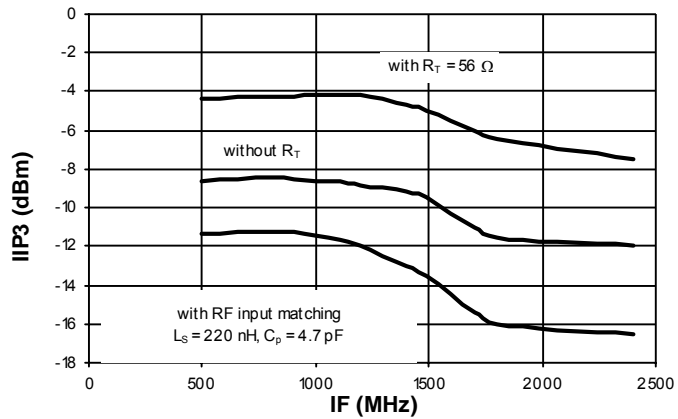
**Figure 6.** Supply Current  $I_s$  versus Resistor  $R_p$



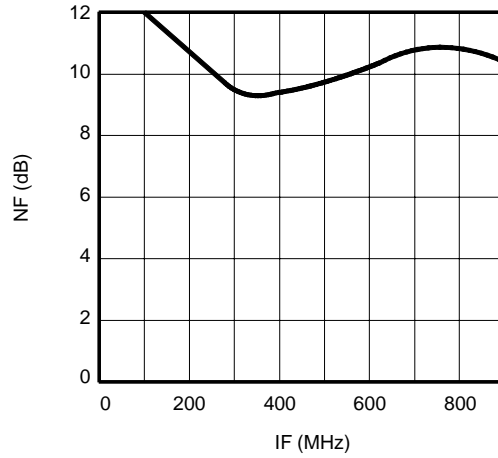
**Figure 7.** Gain versus IF Output Frequency, LO Level: -6 dBm, RF: 130 MHz, -35 dBm; Parameter: RF Input Termination



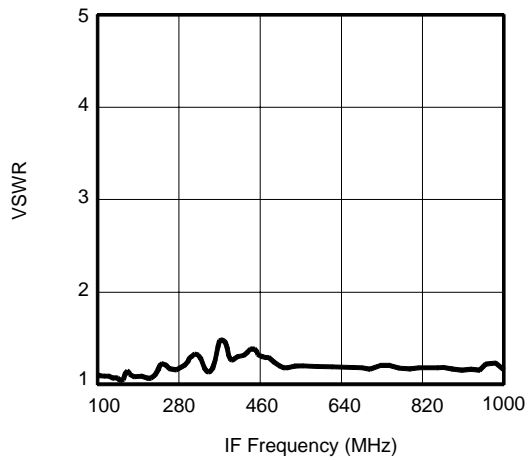
**Figure 8.** IIP3 versus IF Output Frequency, LO Level: -6 dBm; RF: 130 MHz/130.1 MHz, -35 dBm; Parameter: RF Input Termination



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

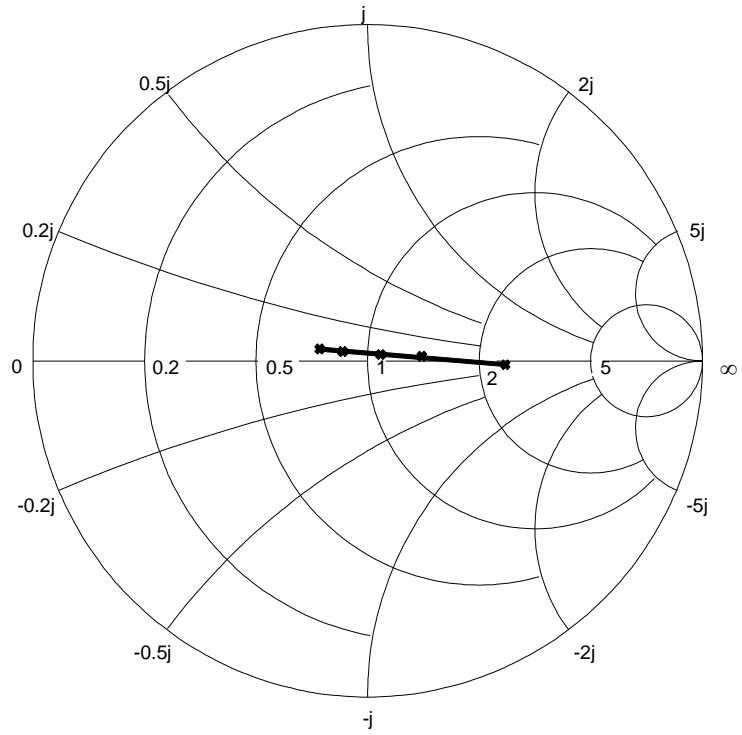


**Figure 10.** Typical VSWR Frequency Response of the IF Output,  $R_P = \infty$

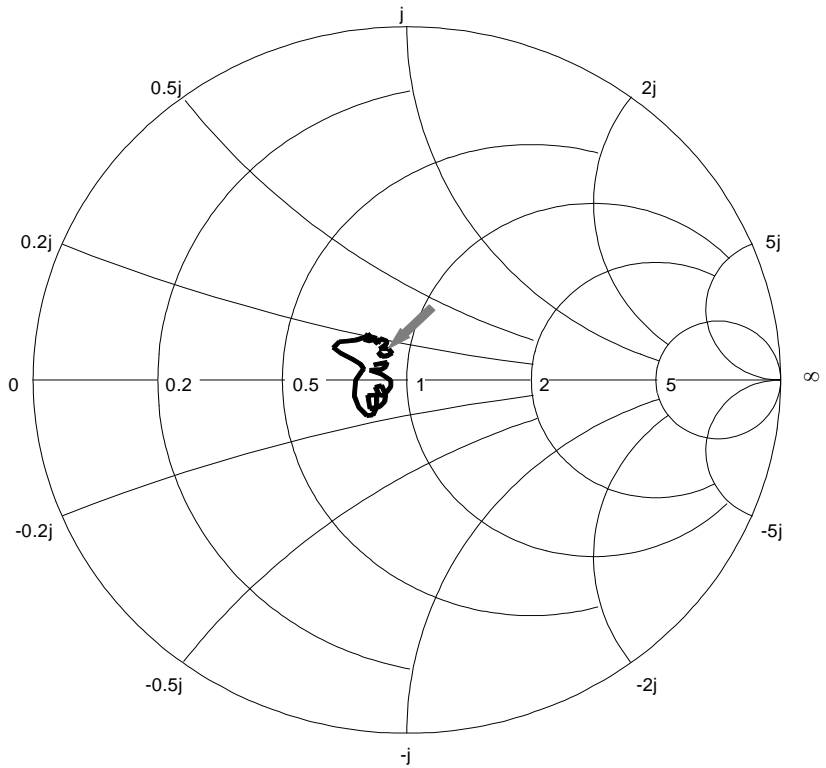




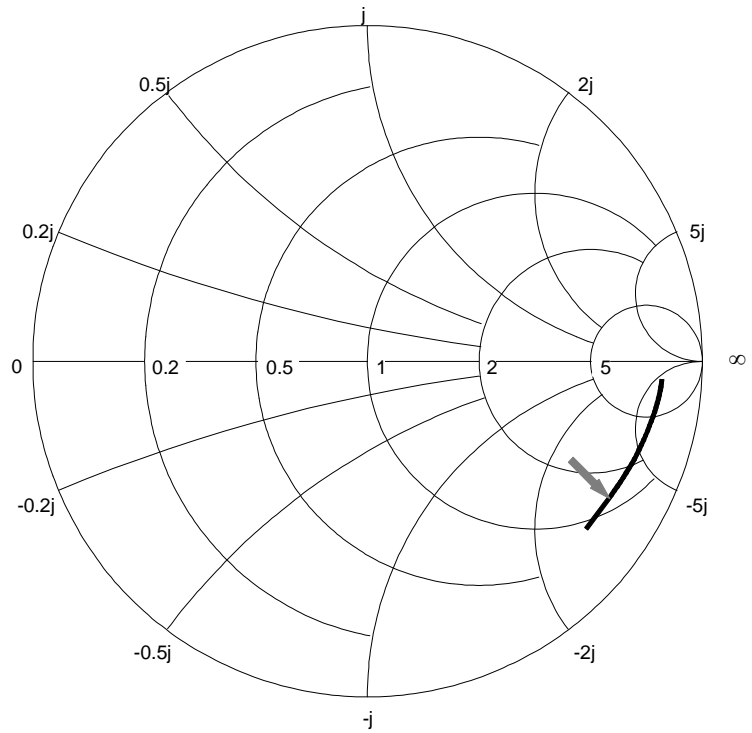
**Figure 11.** Typical Impedance of the Output versus RP at Frequency  $f_{IF0} = 900$  MHz  
 Markers (from Left to Right):  $R_P = \infty/22\text{ k}\Omega/10\text{ k}\Omega/8.2\text{ k}\Omega/5.6\text{ k}\Omega$



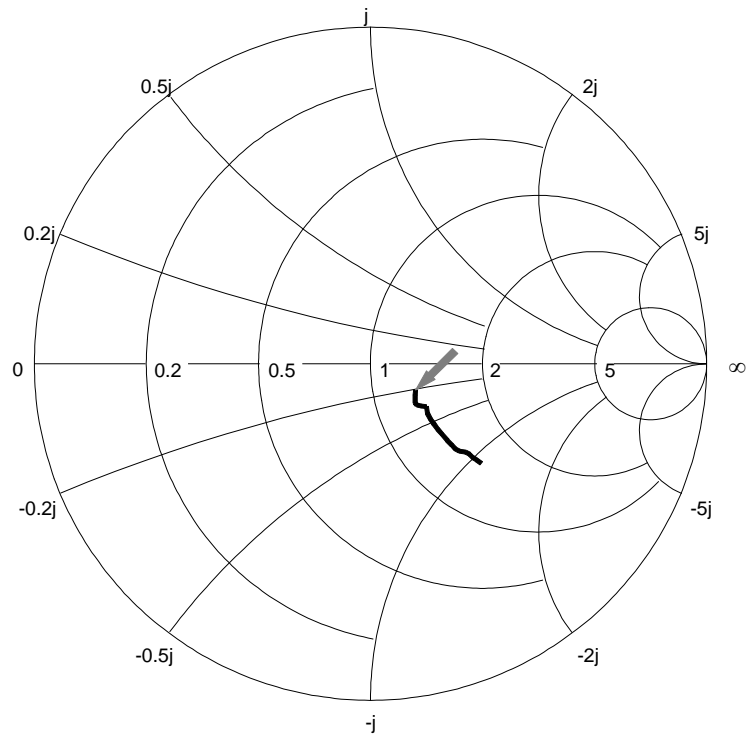
**Figure 12.** Typical S11 Frequency Response of the IF Output,  $R_P = \infty$ , IF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz



**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

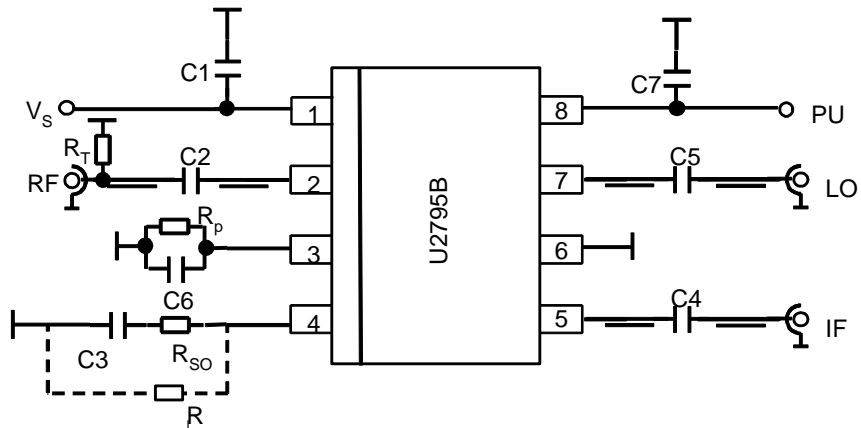


Table 1. Part List

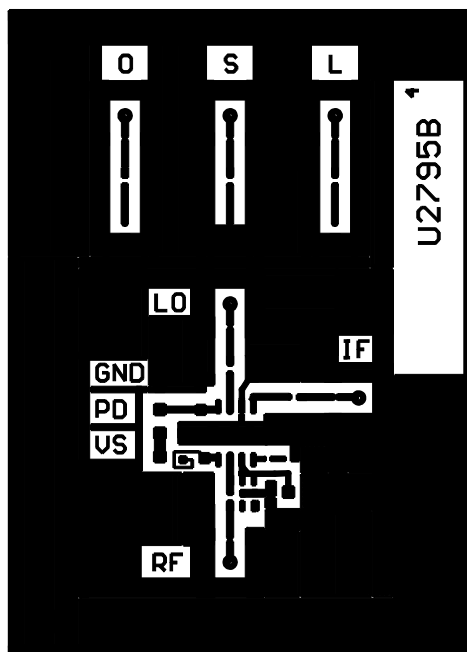
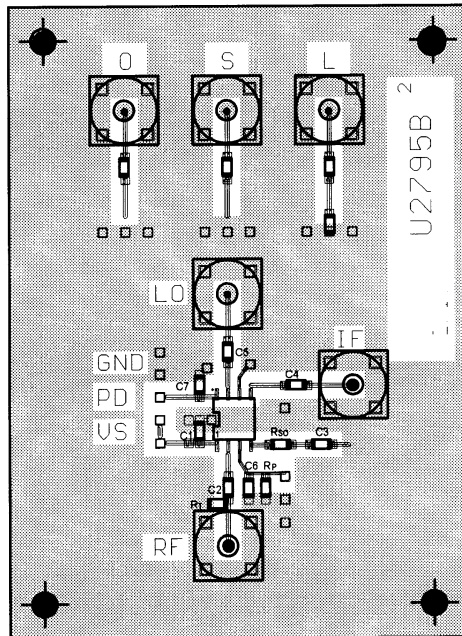
Part	Value
C 1	10 nF
C2, C3, C4, C5, C6, C7	100 pF
*R <sub>P</sub>	
=====	50-Ω Microstrip
*R <sub>SO</sub>	68 Ω
-----	optional
R <sub>T</sub>	56 Ω

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>SO</sub> and R<sub>P</sub> depend on the input and output condition requirements. For R<sub>SO</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)

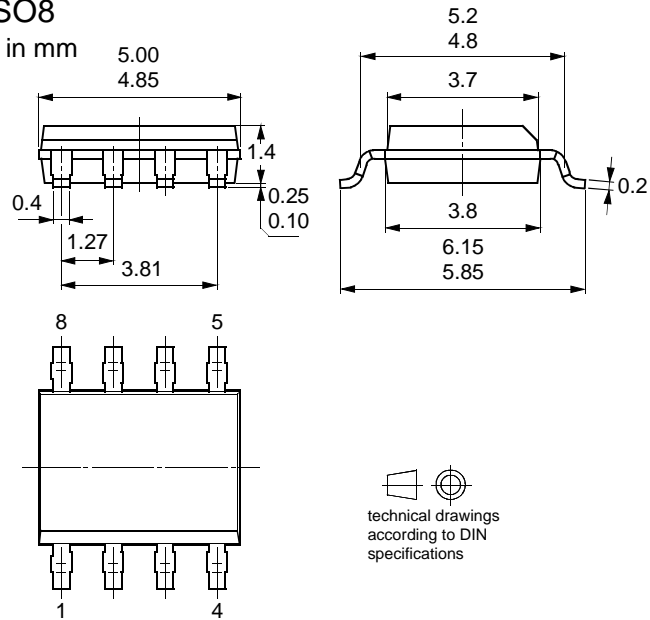


### Ordering Information

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

### Package Information

Package SO8  
Dimensions in mm





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