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.

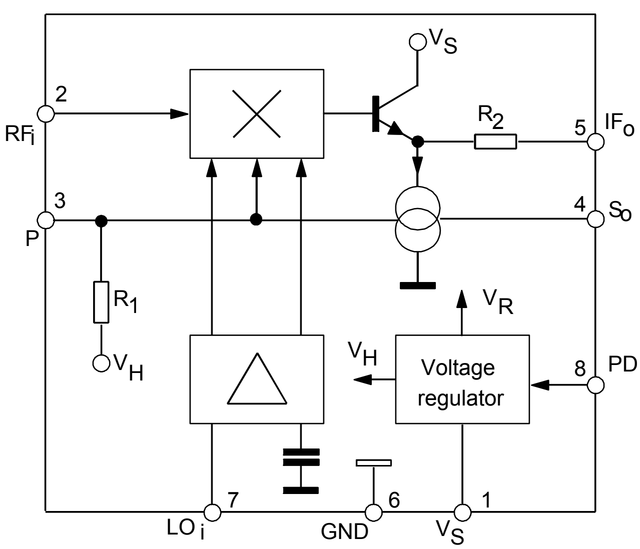
2.5-GHz Double-balanced Mixer

U2795B

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



Rev. 4654A–CELL–01/03

Pin Configuration

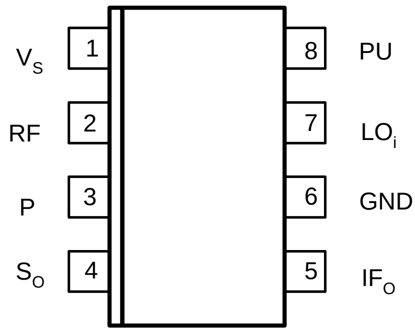


Figure 2. Pinning

Pin Description

Pin	Symbol	Function
1	V_S	Supply voltage
2	RF_i	RF input
3	P	Progamming 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 Ω 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 reachs 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 Rp 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 V, f_{LOi} = 1 GHz, IF = 900 MHz, RF = 100 MHz, $R_P = \infty$, system impedance Zo = 50 Ω, T_{amb} = 25°C, R_T = 56 Ω 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	VS = 2.7 V	1 1	I_S I_S	9 3		13 6.2	mA mA	A A
1.3	Conversion Supply Current	R_L = 50 Ω, $R_T = \infty$ R_L = 50 Ω, R_T = 56 Ω	1	PG_C PG_C		9 4		dB dB	B
2	**Operating Frequencies**								
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
3	**Isolation**								
3.1	LO spurious at R_{Fi}	P_{iLO} = -10 to 0 dBm	7, 2	$IS_{LO–RF}$		-30		dBm	D
3.2	RF_i to LO_i	P_{iRF} = -25 dBm	2, 7	$IS_{RF–LO}$		35		dB	D
3.3	LO spurious at IF_o	P_{iLO} = -10 to 0 dBm	5, 7	$IS_{LO–IF}$		-25		dBm	D
3.4	IF_o to LO_i		5, 7	$IS_{IF–LO}$		30		dB	D
4	**Output (IF)**								
4.1	Output compression point		5	CP_O		-10		dBm	D
5	**Input (RF)**								
5.1	Input impedance		2	Z_{RFi}		700‖0.8		Ω‖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
6	**Input (LO)**								
6.1	LO level		7	P_{iLO}		-6		dBm	D
7	**Voltage Standing Wave Ratio (VSWR)**								
7.1	Input LO		7	$VSWR_{LOi}$		< 2			D
7.2	Output IF		4	$VSWR_{IFo}$		< 2			D
8	**Noise Performance**								
8.1	Noise figure	P_{iLO} = 0 dBm, $R_T = \infty$		NF		10		dB	D
9	**Power-down Mode**								
9.1	Supply current	V_{PU} < 0.5V V_{PU} = 0 V	1	I_{SPU}		 < 5	30	µA µA	B B
10	**Power-down Voltage**								
10.1	"Power ON"	V_S = 3.5 to 5.5 V V_S = 2.7 to 3.5 V	8	V_{PON}	V_S -0.5 V_S		V_S + 0.5 V_S + 0.5	V V	D D
10.2	"Power DOWN"		8	V_{PDN}			1	V	D
10.3	Power-down current	Power ON Power DOWN	8	I_{PON} I_{PDN}		0.15 < 5	0.22	mA µA	A D
10.4	Settling time		5,8	t_{sPD}		< 30		µs	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

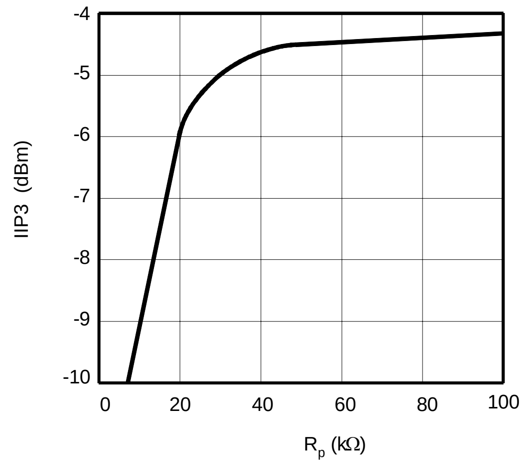


Figure 4. OIP3 versus Resistor R_p, IF: 900 MHz

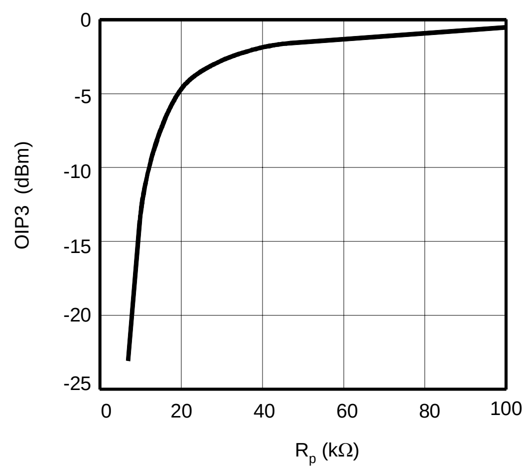


Figure 5. Gain versus Resistor R_p, LO: 1030 MHz, level -10 dBm; RF: 130 MHz, -30 dBm, R_T = 56 Ω

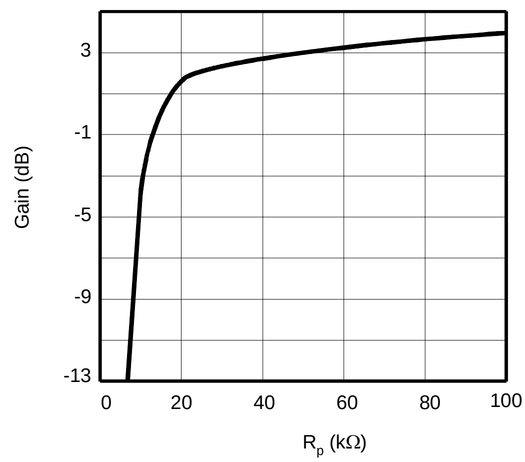


Figure 6. Supply Current IS versus Resistor R_p

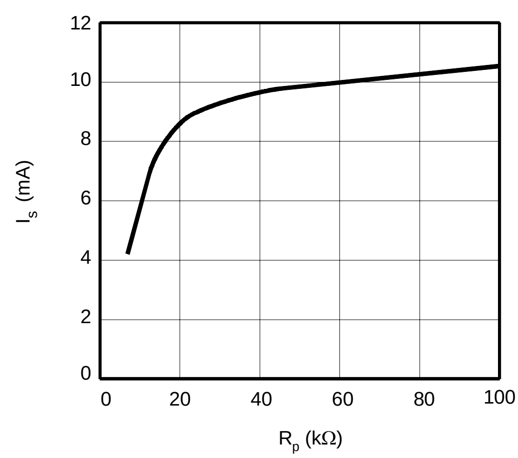


Figure 7. Gain versus IF Output Frequency, LO Level: -6 dBm, RF: 130 MHz, -35 dBm; Parameter: RF Input Termination

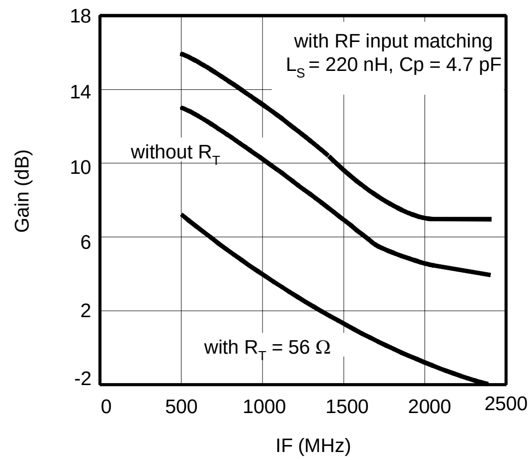


Figure 8. IIP3 versus IF Output Frequency, LO Level: -6 dBm; RF: 130 MHz/ 130.1 MHz, -35 dBm; Parameter: RF Input Termination

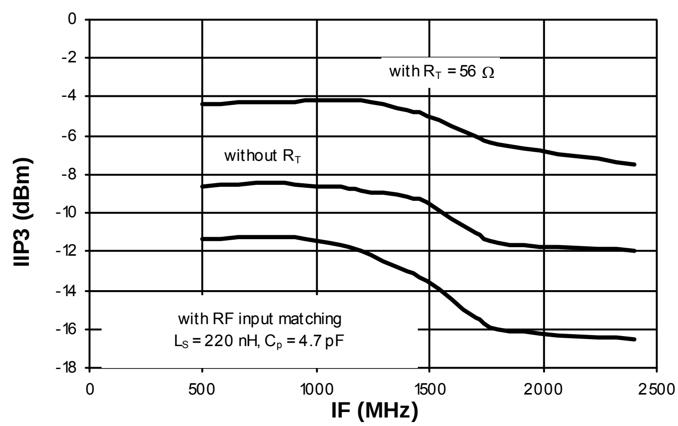


Figure 9. Double Sideband Noise Figure versus IF Output Frequency; LO: 1000 MHz, Level 0 dBm; no RF Input Matching, R_T Left Out

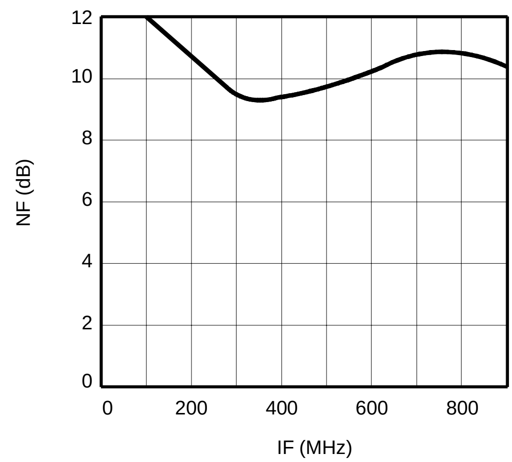


Figure 10. Typical VSWR Frequency Response of the IF Output, RP = ∞

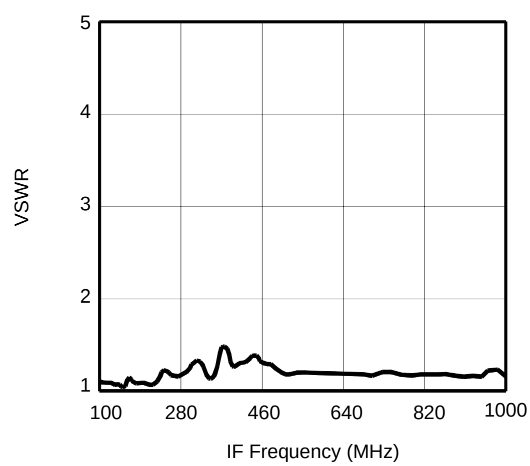


Figure 11. Typical Impedance of the Output versus RP at Frequency f_{IFo} = 900 MHz Markers (from Left to Right): RP = ∞/22 kΩ/10 kΩ/8.2 kΩ/5.6 kΩ

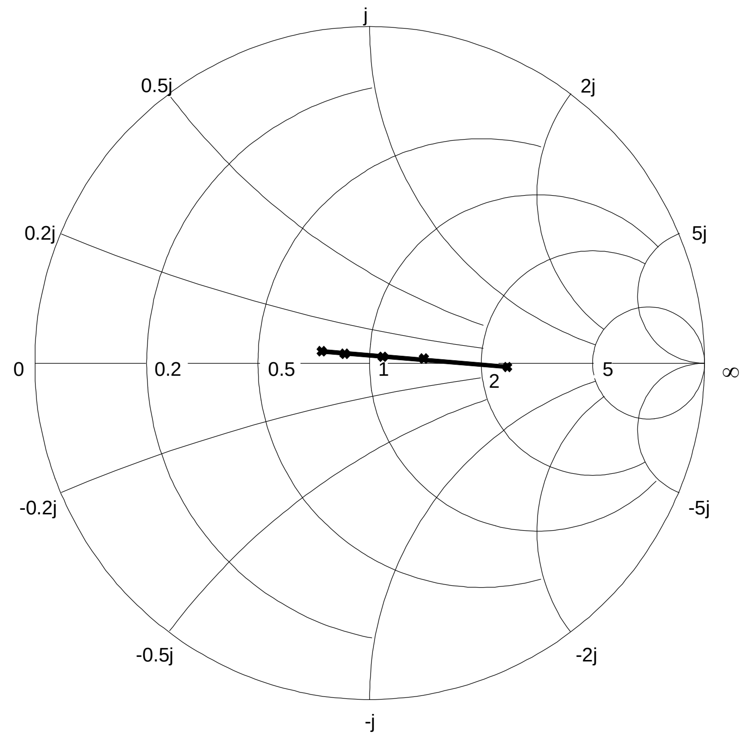


Figure 12. Typical S11 Frequency Response of the IF Output, R_P = ∞, IF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz

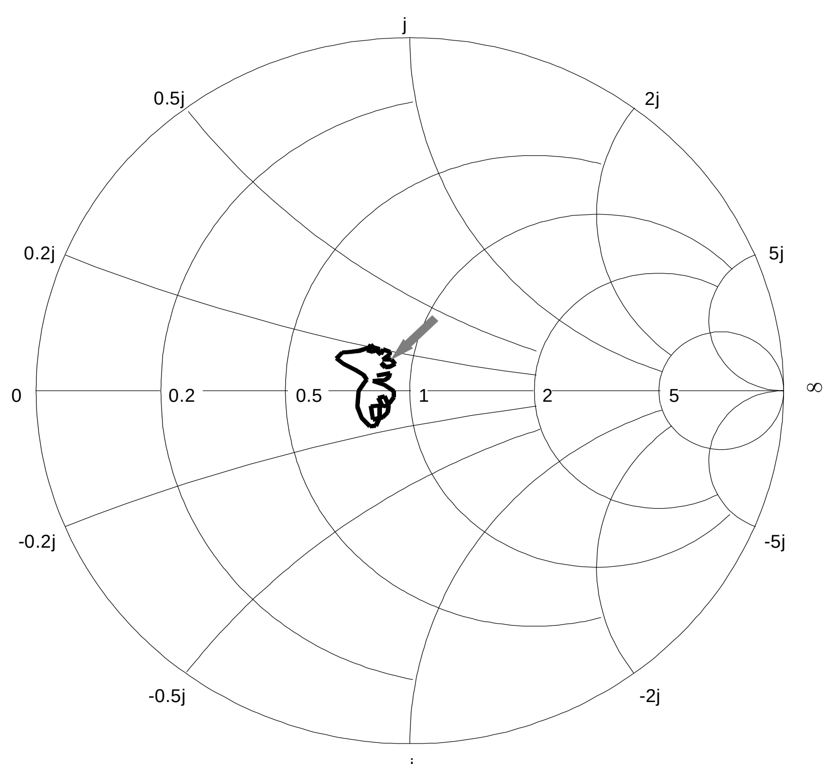


Figure 13. Typical S11 Frequency Response of the RF Intput, $R_P = \infty$, $R_T = \infty$ RF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz

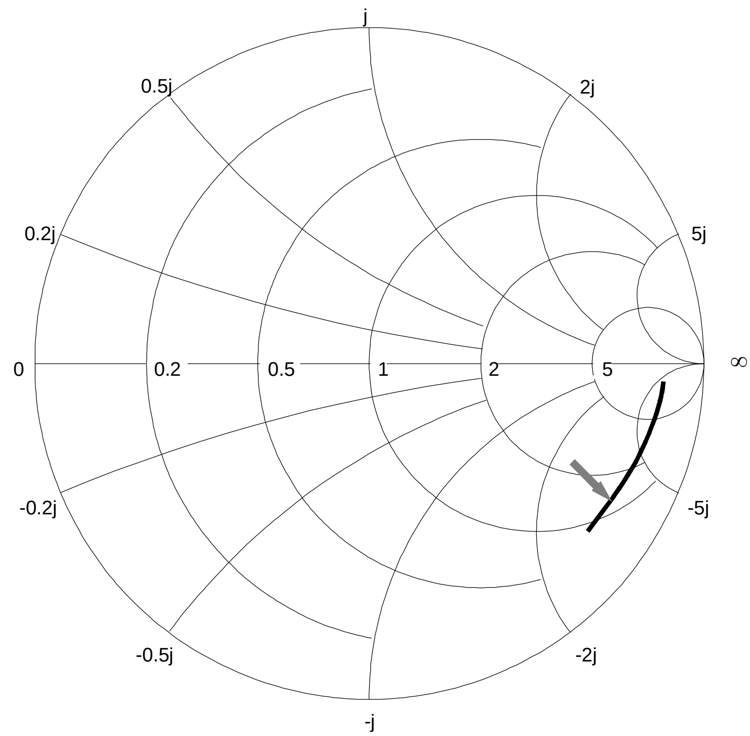
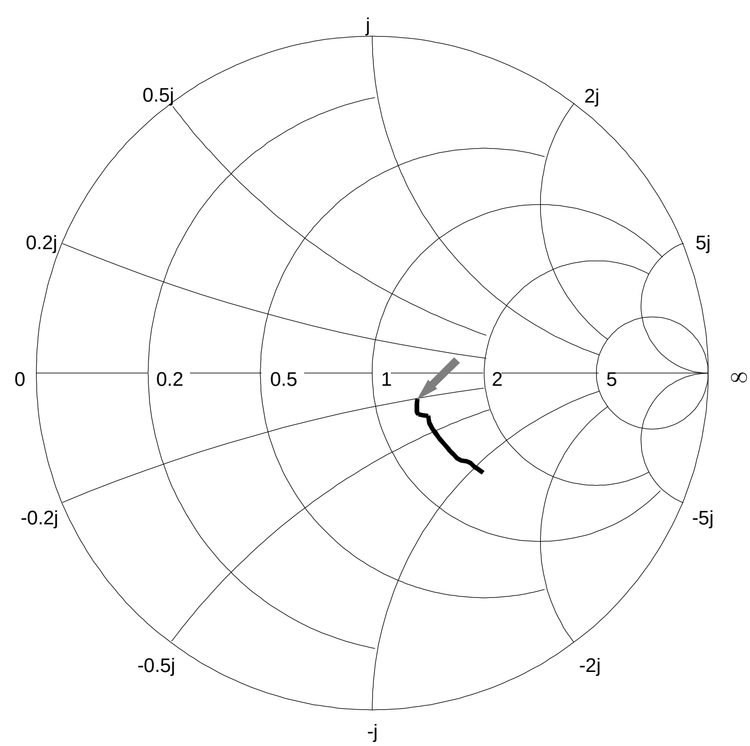


Figure 14. Typical S11 Frequency Response of the LO Intput, $R_P = \infty$, LO Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz



Application

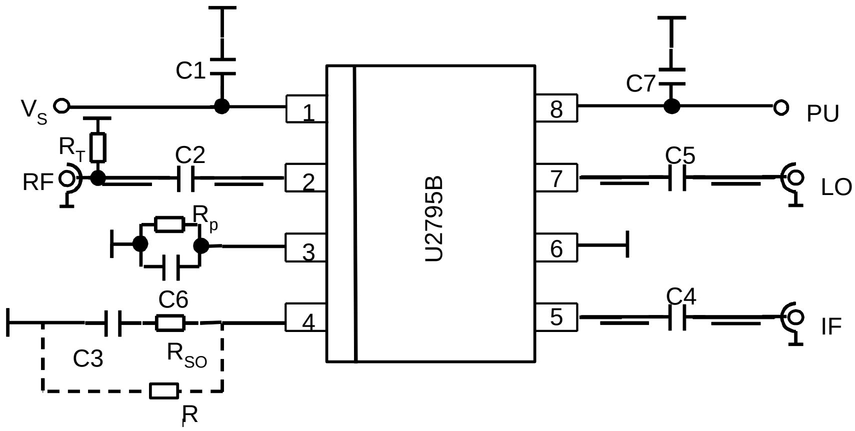


Table 1. Part List

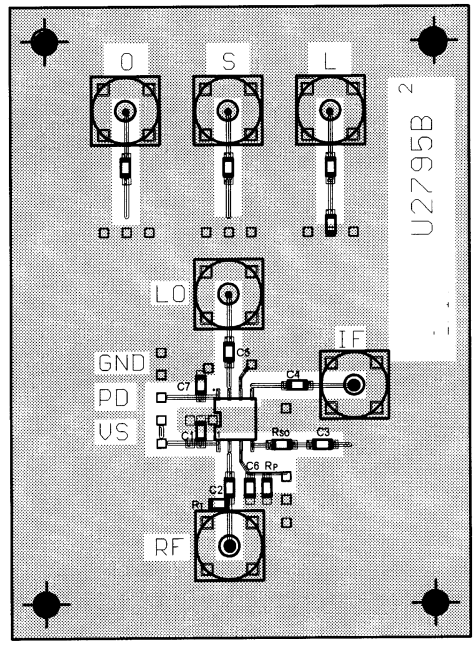
Part	Value
C 1	10 nF
C2, C3, C4, C5, C6, C7	100 pF
*R_P	
═══	50-Ω Microstrip
*R_{SO}	68 Ω
— — —	optional
R_T	56 Ω

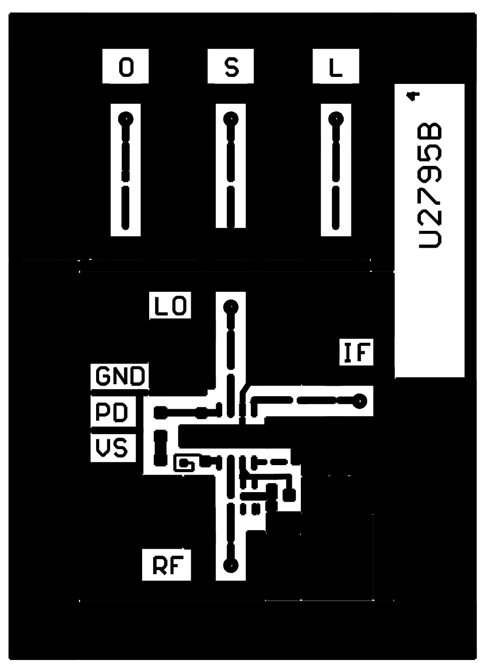
If the part-list values are used, the PU settling time is < 20 µs. Using other values, time requirements in burst-mode applications have to be considered.

The values of R_{SO} and R_P depend on the input and output condition requirements. For R_{SO}, 68 Ω is recommended.

By means of the optional R_I, 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)



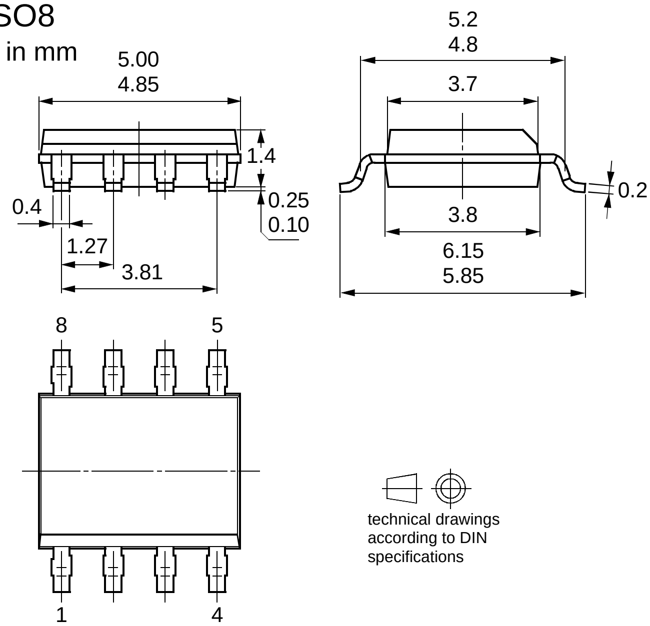


Ordering Information

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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