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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.

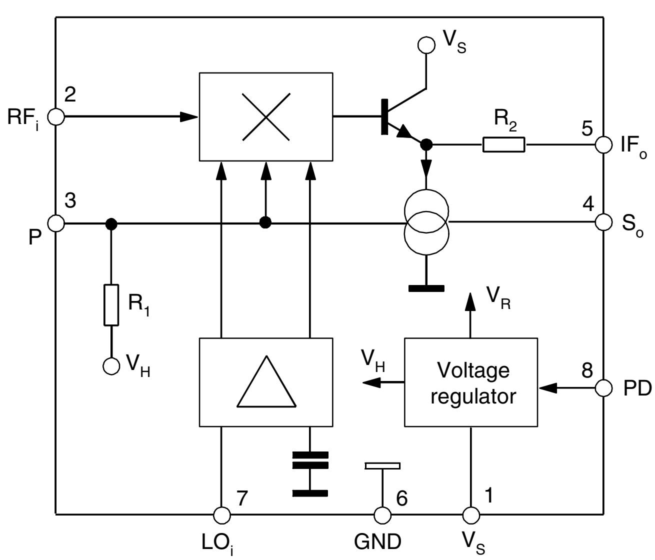
2.5-GHz Double-balanced Mixer

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.

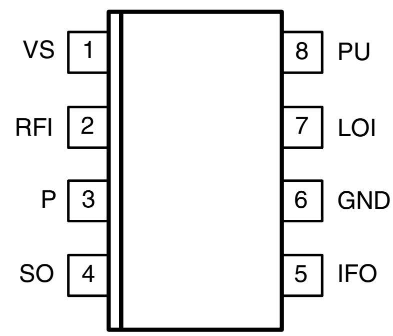
Figure 1. Block Diagram



Rev. 4654B–CELL–07/04

Pin Configuration

Figure 2. Pinning



Pin Description

Pin	Symbol	Function
1	VS	Supply voltage
2	RFI	RF input
3	P	Programming port IP3, CP
4	SO	Output symmetry
5	IFO	IF output
6	GND	Ground
7	LOI	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 R_P is infinite, the maximum value of IIP3 reach 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 on page 8. 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 on page 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

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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 = ∞, 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	V_S = 2.7 V, R_P = 10 kΩ	1	I_S	9		13	mA	A
		V_S = 3.0 V, R_P = ∞	1	I_S	3		6.2	mA	A
1.3	Conversion Power Gain	R_L = 50 Ω, R_T = ∞	1	PG_C		9		dB	B
		R_L = 50 Ω, R_T = 56 Ω		PG_C		4		dB	
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 = ∞		NF		10		dB	D
9	**Power-down Mode**								
9.1	Supply current	V_{PU} < 0.5V	1	I_{SPU}			30	µA	B
		V_{PU} = 0 V				< 5		µA	B
10	**Power-down Voltage**								
10.1	"Power ON"	V_S = 3.5 to 5.5 V	8	V_{PON}	V_S -0.5		V_S + 0.5	V	D
		V_S = 2.7 to 3.5 V			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	8	I_{PON}		0.15	0.22	mA	A
		Power DOWN		I_{PDN}		< 5		µA	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

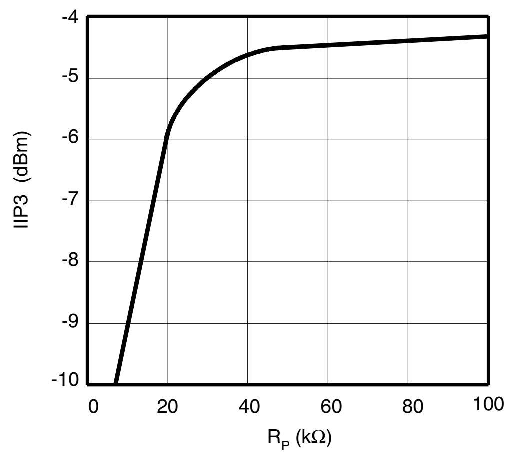


Figure 4. OIP3 versus Resistor R_p, IF: 900 MHz

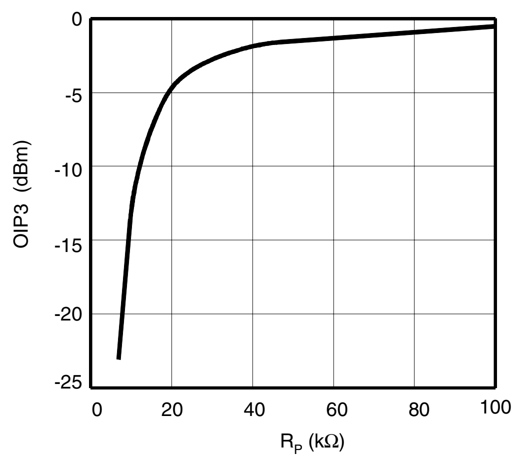


Figure 5. Gain versus Resistor R_p, LO: 1030 MHz, level -10 dBm; RF: 130 MHz, -30 dBm, R_T = 56 Ω

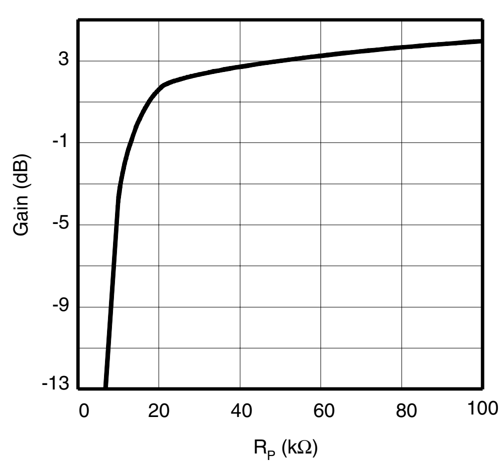


Figure 6. Supply Current I_S versus Resistor R_p

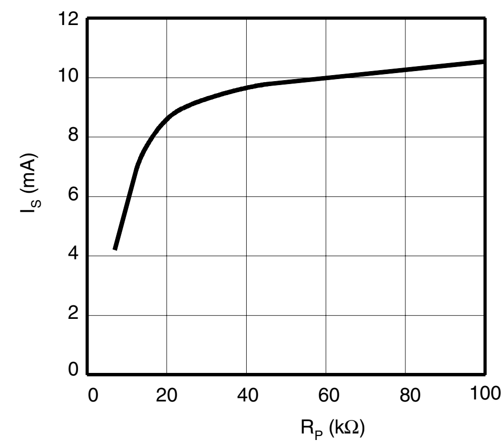


Figure 7. Gain versus IF Output Frequency, LO Level: -6 dBm, RF: 130 MHz, -35 dBm; Parameter: RF Input Termination

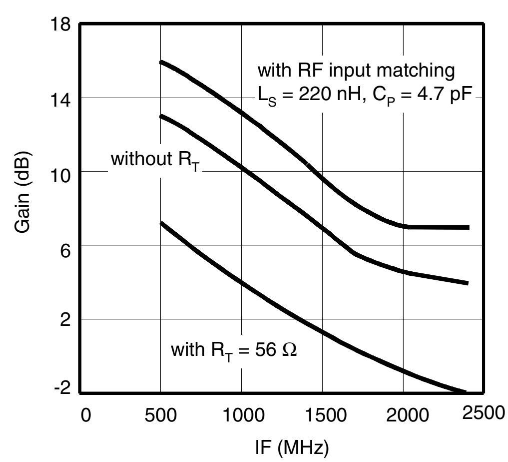


Figure 8. IIP3 versus IF Output Frequency, LO Level: -6 dBm; RF: 130 MHz/ 130.1 MHz, -35 dBm; Parameter: RF Input Termination

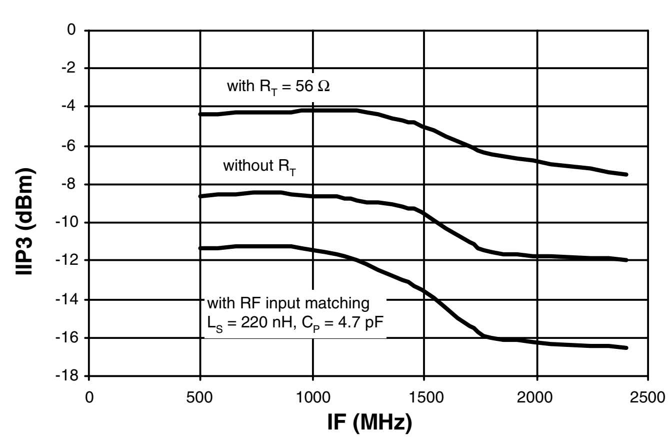


Figure 9. Double Sideband Noise Figure versus IF Output Frequency; LO: 1000 MHz, Level 0 dBm; no RF Input Matching, R_T Left Out

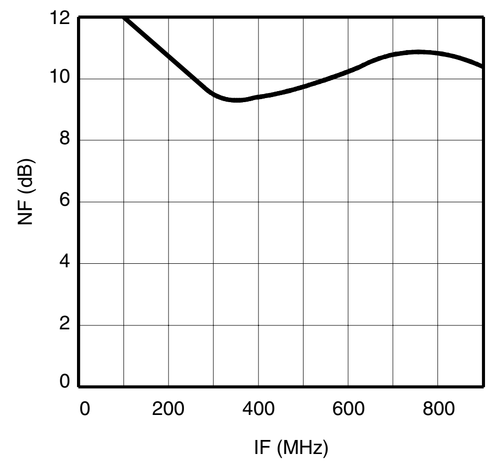


Figure 10. Typical VSWR Frequency Response of the IF Output, $R_P = \infty$

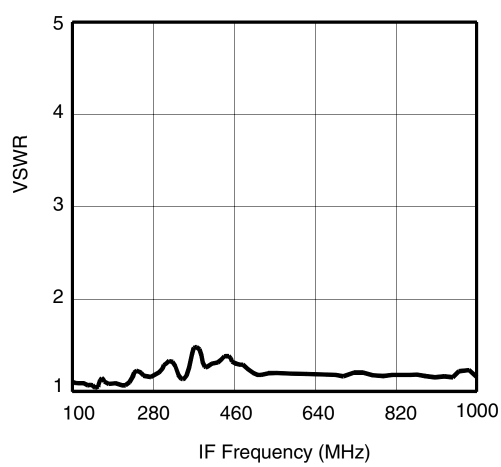


Figure 11. Typical Impedance of the Output versus R_P at Frequency f_{IFo} = 900 MHz Markers (from Left to Right): R_P = ∞/22 kΩ/10 kΩ/8.2 kΩ/5.6 kΩ

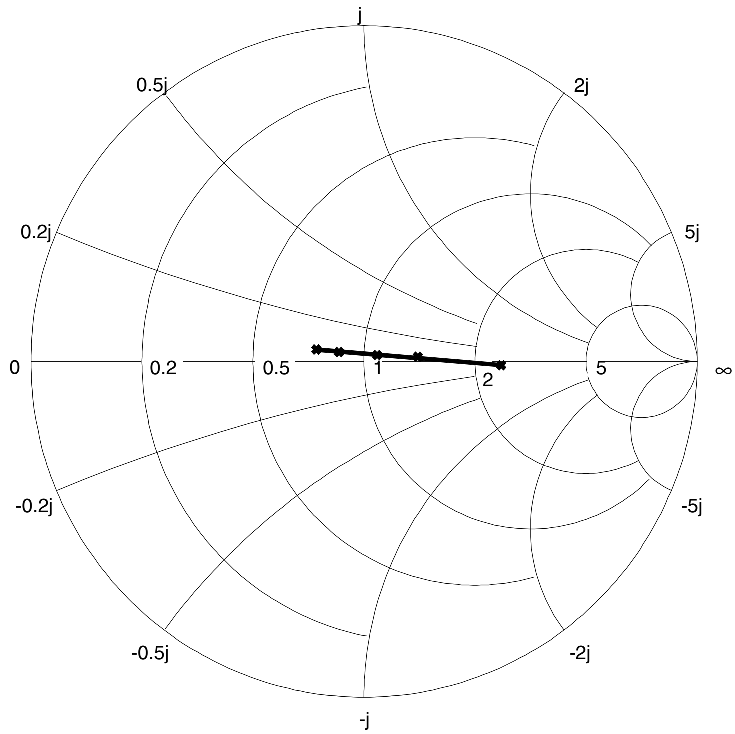


Figure 12. Typical S11 Frequency Response of the IF Output, R_P = ∞, IF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz

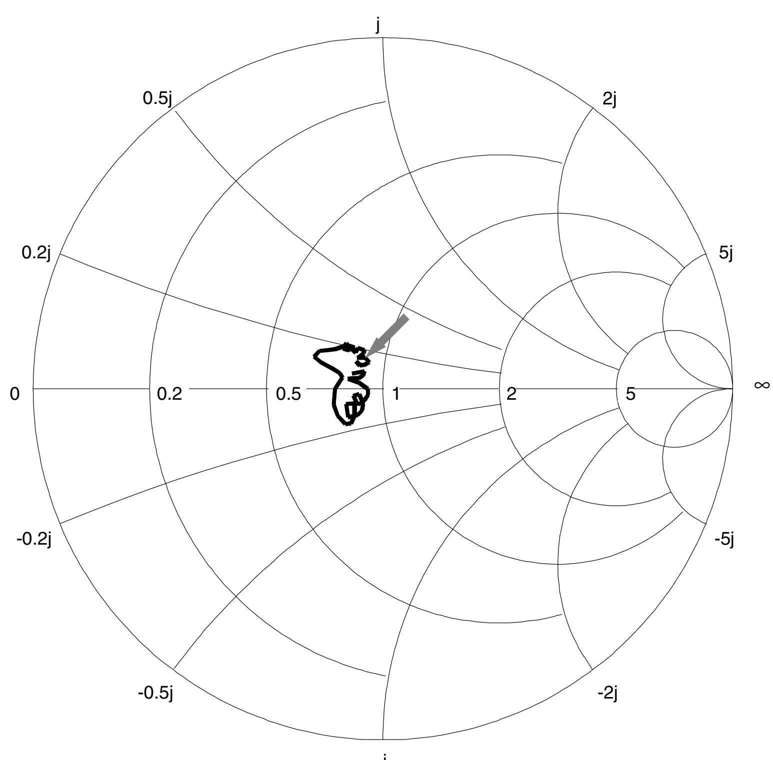


Figure 13. Typical S11 Frequency Response of the RF Input, $R_P = \infty$, $R_T = \infty$ RF Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz

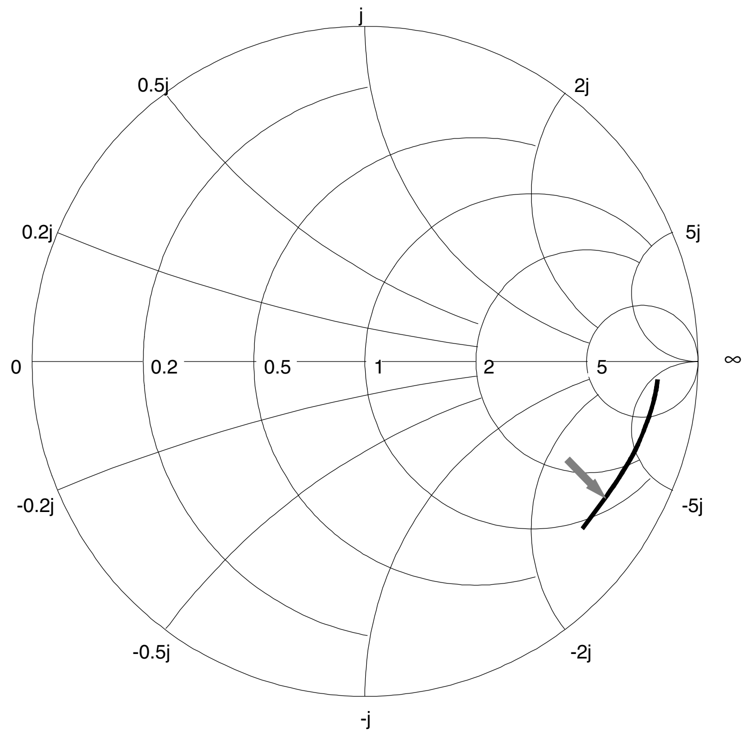
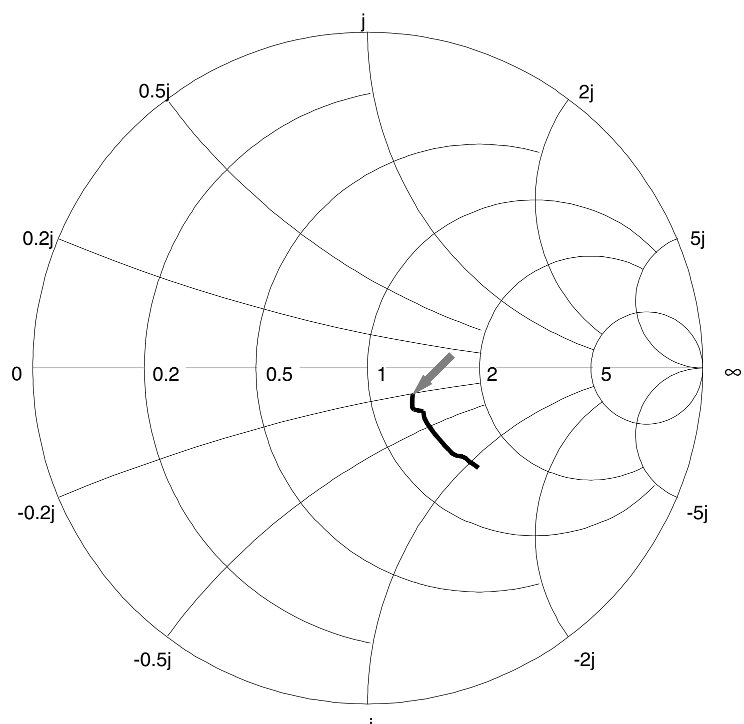


Figure 14. Typical S11 Frequency Response of the LO Input, $R_P = \infty$, LO Frequency from 100 MHz to 1000 MHz, Marker: 900 MHz



Application

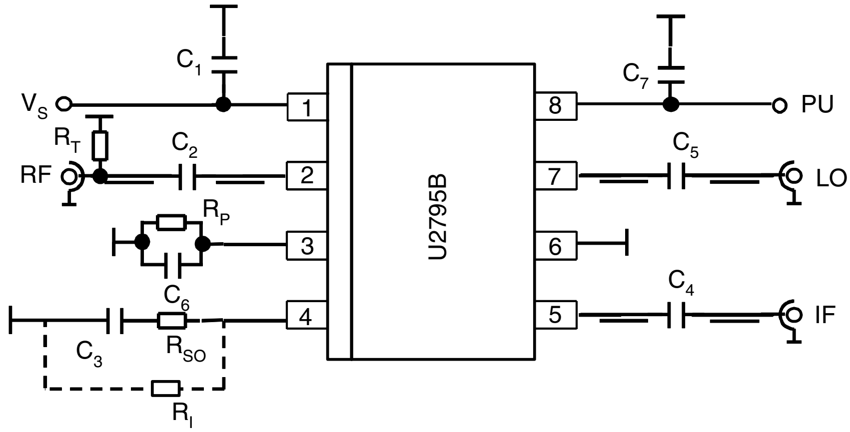


Table 1. Part List

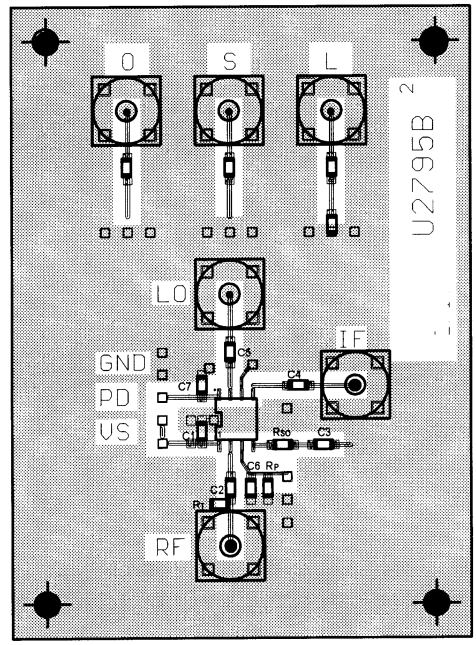
Part	Value
C_1	10 nF
C_2, C_3, C_4, C_5, C_6, C_7	100 pF
*R_P	
═══	50-Ω Microstrip
*R_{SO}	68 Ω
— — —	optional
R_T	56 Ω

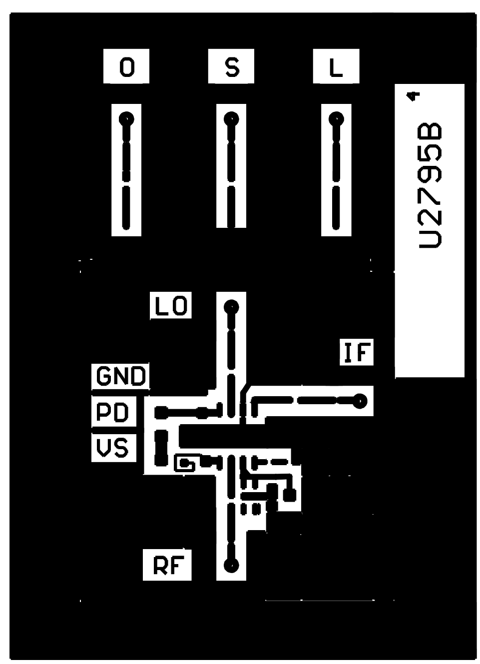
If the part-list values are used, the PU settling time is < 20 µs. Using other values, time requirements in burst-mode applications have to be considered.

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)

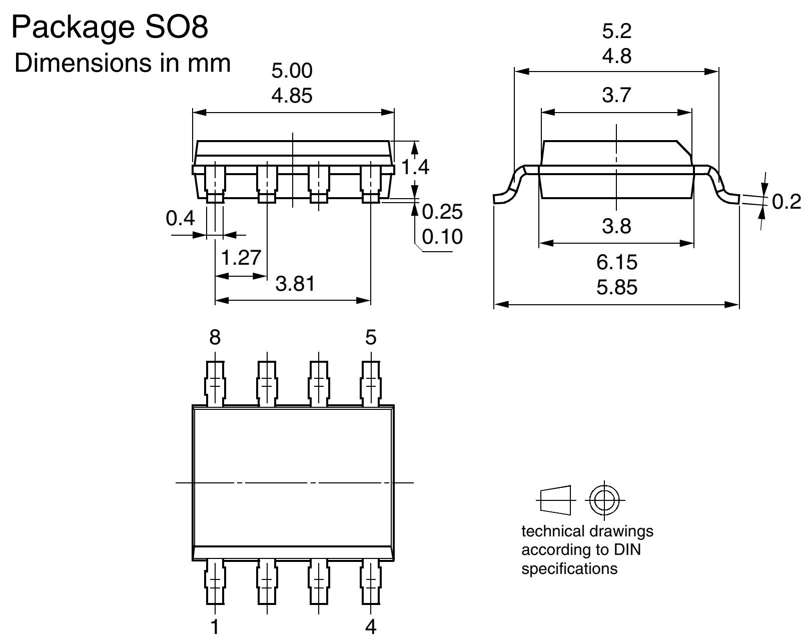




Ordering Information

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

Package Information



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