2-GHz Single-Balanced Mixer

Description

The U2796B-FP is a 2-GHz down-conversion mixer for telecommunication systems, e.g. cellular radio, CT1, CT2, DECT, PCN, using TEMIC Semiconductors' advanced bipolar UHF technology. The U2796B is well suited for the receiver portion of the RF circuit. Single-balanced structure has been chosen for best noise performance and low current consumption. The IIP3 is programmable.

Electrostatic sensitive device.
Observe precautions for handling.

Features

- Supply-voltage range: 2.7 V to 5.5 V
- Excellent isolation characteristics
- Low current consumption: 3.2 mA without R_{IP3}
- IIP3 programmable
- Input frequency operating range up to 2 GHz
- RF characteristic nearly independent of supply voltage

Benefits

- Stand-alone product
- Low current consumption extends talk time
- 3-V operation requires only small space for batteries

Block Diagram

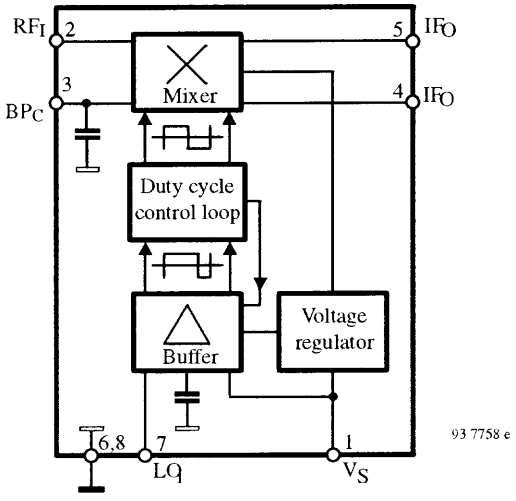

Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
U2796B-MFP	SO8	Tube
U2796B-MFPG3	SO8	Taped and reeled

Pin Description

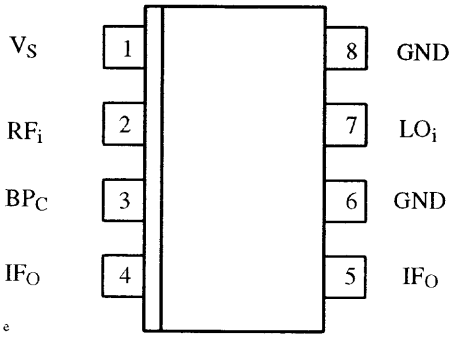

Figure 2. Pinning

Pin	Symbol	Function
1	V_S	Supply voltage
2	RF	RF input and IIP3 programming port
3	BP_C	Bypass capacitor
4	IFo	IF output
5	IFo	IF output
6	GND	Ground
7	LO_i	Local oscillator input
8	GND	Ground

Absolute Maximum Ratings

Parameters		Symbol	Value	Unit
Supply voltage	Pin 1	V_S	6	V
Input voltage	Pins 2, 3, 4, 5 and 7	V_i	0 to V_S	V
Junction temperature		T_j	125	°C
Storage temperature		T_{stg}	–40 to +125	°C

Operating Range

Parameters		Symbol	Value	Unit
Supply-voltage range	Pin 1	V_S	2.7 to 5.5	V
Ambient temperature		T_{amb}	–40 to +85	°C

Thermal Resistance

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

Electrical Characteristics

Test conditions (unless otherwise specified):
V_S = 3 V, f_{LO} = 900 MHz; I_M = 1.2 mA, T_{amb} = 25°C. System impedance Z_O = 50 Ω

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Pin 1	V_S	2.7		5.5	V
Supply current	R_{IP3} = ∞, Pin 1	I_S	2.8	3.2	3.7	mA
Conversion power gain	RL = 3 kΩ R_{IP3} = ∞ f_{LO} = 900 MHz	PG_C		9		dB
Figure 4	f_{LO} = 1700 MHz f_{IF} = 45 MHz			9		
Isolation						
LO spurious at RF_{in}	Pi_{LO} = –10 dBm Figure 5 Pin 7 to 2	IS_{LORF}			–35	dBm
RF to LO	Pi_{RF} = –25 dBm Pin 2 to 7 f_{LO} = 900 MHz	IS_{RFLO}	30	40		dB
Figure 6	f_{LO} = 1700 MHz			20		

Electrical Characteristics (continued)

Parameters	Test conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Operating frequencies						
RF frequency	Pin 2	RF_i			2000	MHz
LO_{in} frequency	Pin 7	LO_i			2000	MHz
IF_{out} frequency	Pins 4 and 5	IF_o			300	MHz
Input level						
RF input (–1 dB comp.)	RL = 50 Ω, Pin 2	Pi_{RF}		–15		dBm
3rd-order intercept point	Pi_{LO} = –10 dBm, R_{IP3} = ∞ Figure 2 Pin 2	IIP3		–4		dBm
LO input	Pin 7	P_{iLO}		–6	0	dBm
Impedances						
RF input	Pin 2	Z_{iRF}		25		Ω
LO input	Pin 7	Zi_{LO}		50		Ω
IF output	Pins 4 and 5	Z_{oIF}		> 10 kΩ// 0.9 pF		
Noise figure (DSB) Figure 7	Pi_{LO} = 0 dBm, RL > 3 kΩ f_{LO} = 900 MHz	NF_{50}		9		dB
	f_{LO} = 1700 MHz			12		
Voltage standing wave ratio LO	Pin 7	VSWR-LO		1.3	2	

Note: I_M = Internal mixer current (see figure 3)

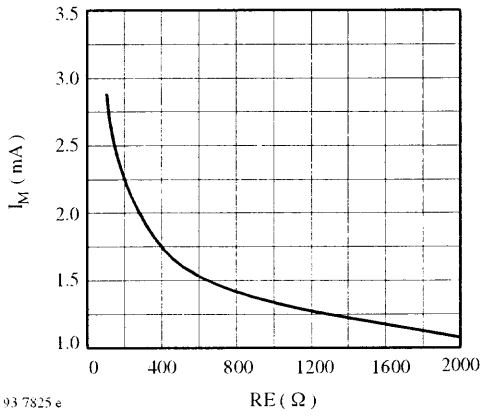

Figure 3. Mixer current (I_M) versus RE

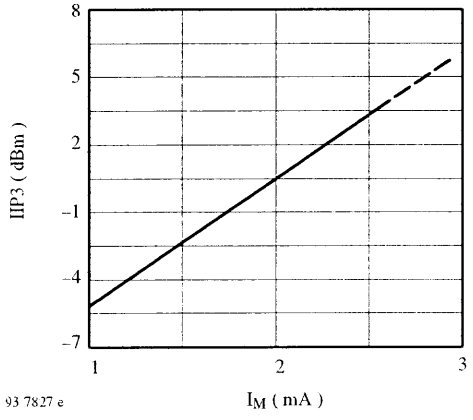

Figure 4. Third-order input intercept IIP3 point versus I_M

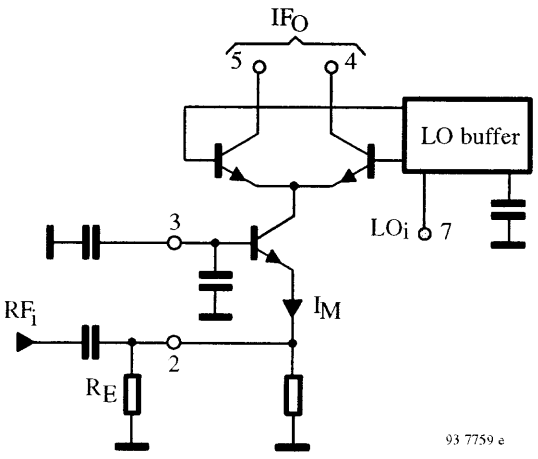

Figure 5. Mixer circuitry

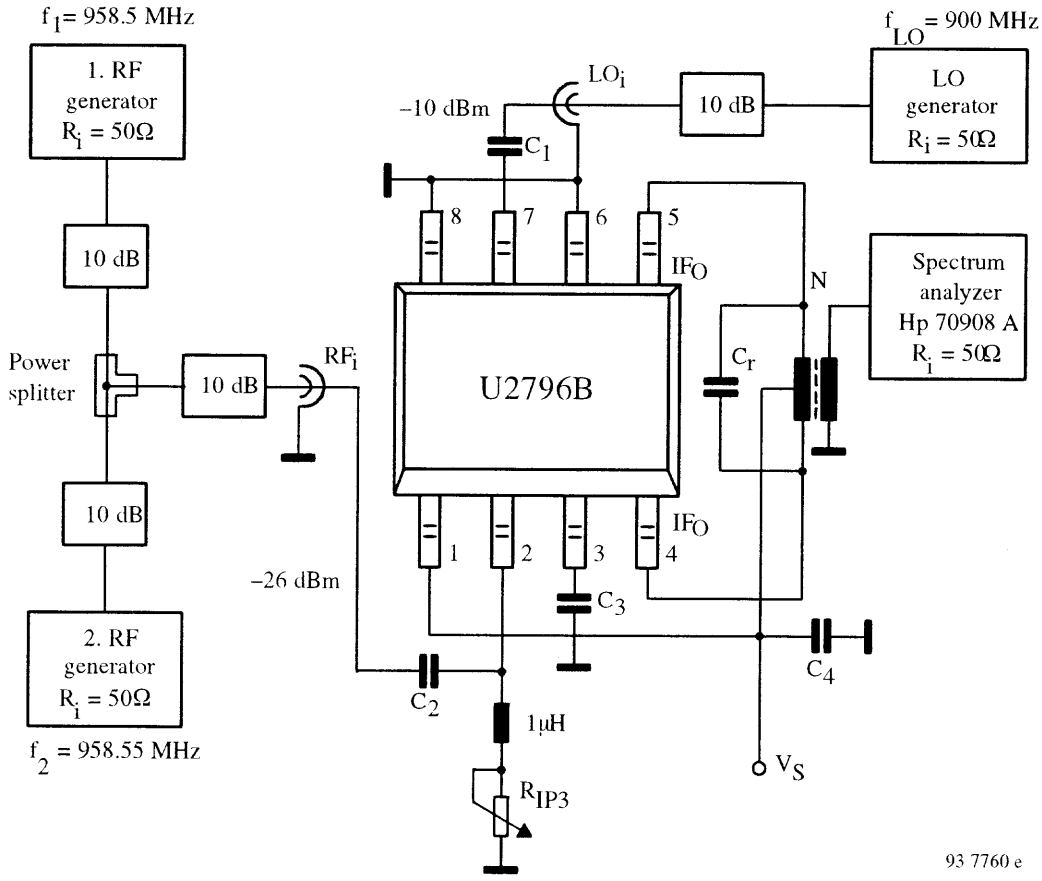

Figure 6. Test circuit conversion power gain (PG_C) and 3rd-order input intercept point (IIP3)

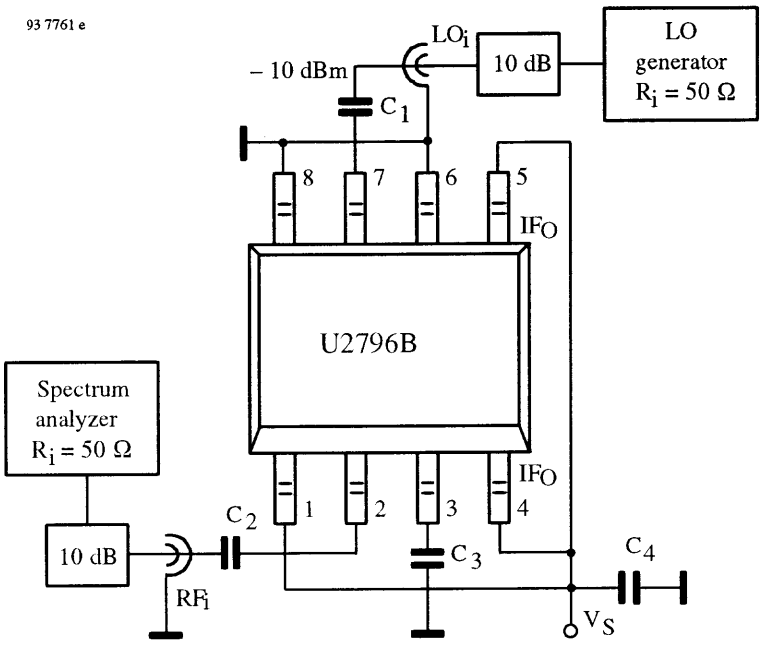

Figure 7. Test circuit isolation LO to RF

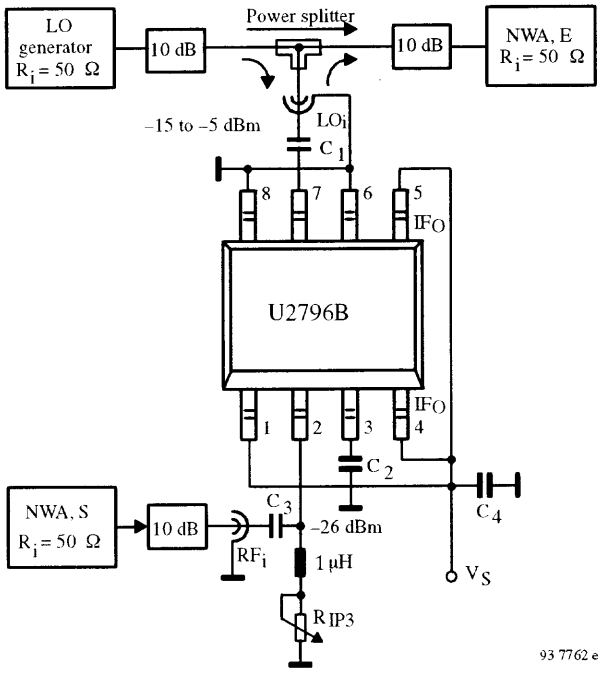

Figure 8. Test circuit isolation RF to LO

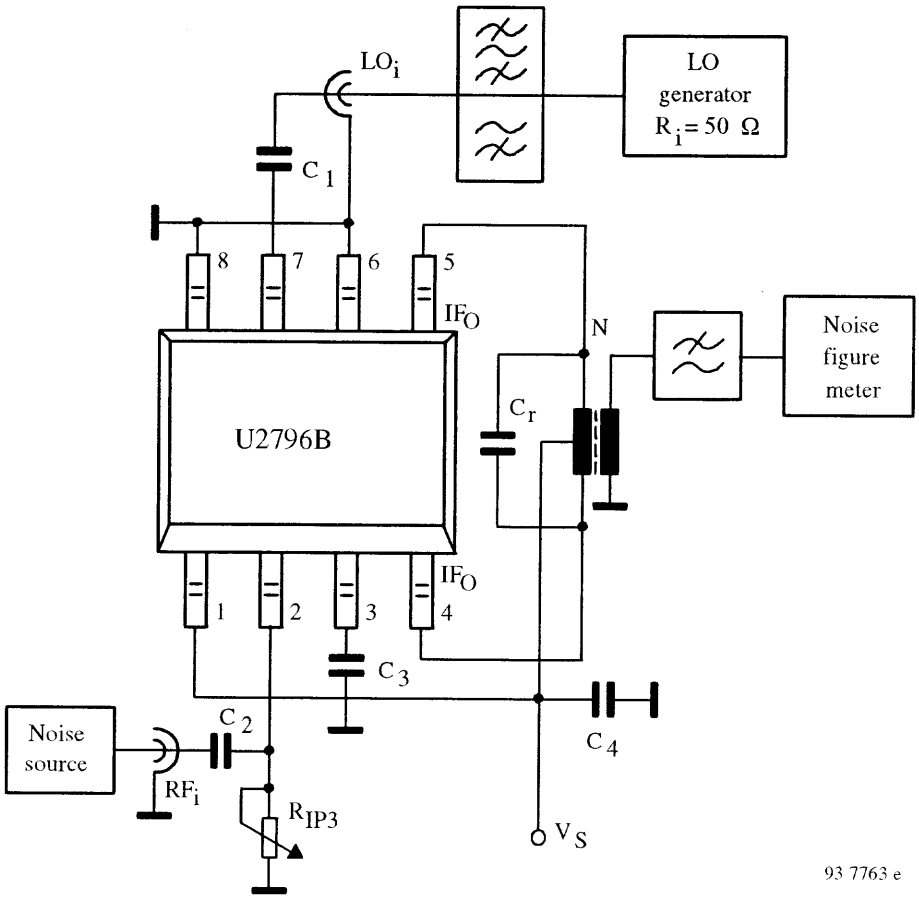

Figure 9. Test circuit noise figure

Note:

1. The noise floor of the LO generator might influence the noise figure test result. In order to avoid this, either a bandpass or a highpass filter with fc > f_{IF} should be implemented.
2. If IF output network does not provide sufficient suppression of the LO component, a lowpass filter should be inserted to avoid overdriving the noise figure meter.
3. For best noise performance 0 dBm LO power level is required.