2.5 GHz Quadrature Up-Converter

Description

The U2891B is a silicon monolithic IC made with TELEFUNKEN's advanced UHF process. The IC consists of a 500 MHz I/Q quadrature modulator and a 2.5 GHz mixer. Both parts can be connected via an external filter in order to suppress harmonics and spurious products. The device features 3 V operation, a low current consumption and furthermore two separate power-down functions for modulator and mixer. The RF ports are single ended and the device can be operated adjustment free. These features and the double conversion concept of U2891B make this device perfectly suited for all digital radio applications from 900 MHz up to 2.5 GHz (e.g., GSM, DCS 1800, JDC, PHP and WLAN).

Features

- Low power consumption: 25 mA / 3 V (typical at –8 dBm output level)
- 2.5 GHz output frequency
- Excellent sideband suppression by means of duty cycle regeneration and 90° phase control
- Separate power-down mode for modulator and mixer
- Low LO input level: –10 dBm (typical)
- LO and RF port 50-Ω single-ended

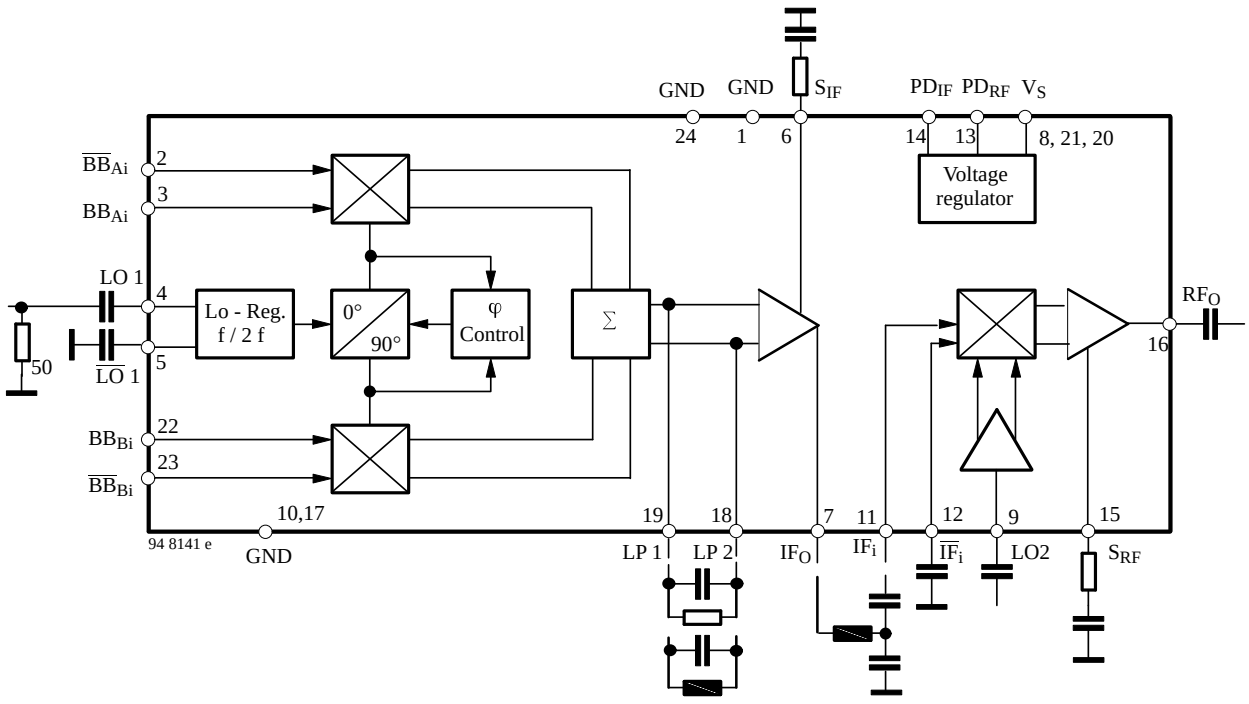
Benefits

- Extended talk time due to increased battery life
- Few external components results in cost and board space saving
- Adjustment free, hence saves time and cost
- One TX Platform for different systems
- Reduced costs and space for battery (3-V operation)

Case: SSO-24 package

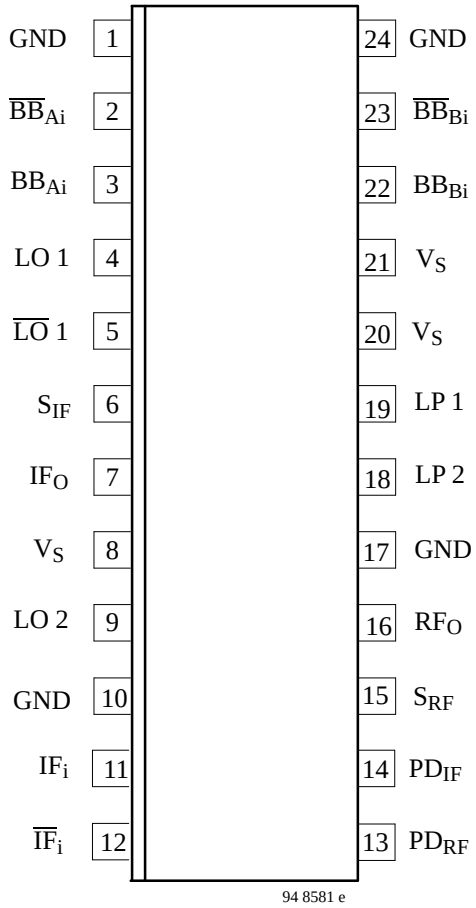
Ordering Information:
U2891B-AFS, U2891B-AFSG3 (see page 5)

Block Diagram



U2891B

Pin Description



Pin	Symbol	Function
1	GND	Ground
2	$\overline{BB}_{Ai}$	Baseband input B inverse
3	BB_{Ai}	Baseband input B
4	LO 1	LO 1 input
5	$\overline{LO}$ 1	LO 1 input inverse
6	S_{IF}	Output symmetry IF
7	IF_O	IF output
8	V_S	Supply voltage
9	LO 2	LO 2 input
10	GND	Ground
11	IF_i	IF input
12	$\overline{IF}_i$	IF input inverse
13	PD_{RF}	Power-down RF
14	PD_{IF}	Power-down IF
15	S_{RF}	Output symmetry RF
16	RF_O	RF output
17	GND	Ground
18	LP 2	Filter and IF level adjustment
19	LP 1	Filter and IF level adjustment
20	V_S	Supply voltage
21	V_S	Supply voltage
22	BB_{Bi}	Baseband input B
23	$\overline{BB}_{Bi}$	Baseband input B inverse
24	GND	Ground

Absolute Maximum Ratings

Parameters		Symbol	Value	Unit
Supply voltage	Pins 8, 20 and 21	V_S, V_{SRF}	6	V
Input voltage	Pins 2, 3, 4, 5, 9, 11, 12, 22 and 23	V_i	0 to V_S	V
Junction temperature		T_j	125	°C
Storage temperature range		T_{stg}	−40 to +125	°C

Operating Range

Parameters		Symbol	Value	Unit
Supply voltage	Pins 8, 20 and 21	V_S, V_{SRF}	2.7 to 5.5	V
Ambient temperature range		T_{amb}	−40 to +85	°C

Thermal Resistance

Parameters		Symbol	Value	Unit
Junction ambient	SSO-24	R_{thja}	140	K/W

Electrical Characteristics: General Data

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Power supply						
Supply voltage range	Pin 8, 20 and 21	V_S, V_{SRF}	2.7		5.5	V
Supply current	Pin 8, 20 and 21, V_S = 3 V	I_S, I_{SRF}		25		mA

Electrical Characteristics: I/Q Modulator

Test conditions (unless otherwise specified): V_S = 3 V, T_{amb} = 25°C, referred to test circuit.
System impedance Zo = 50 Ω, f_{LO1} = 100 MHz, P_{LO1} = –10 dBm.

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
IF output Pin 7						
Output level	R_{LP} = ∞	P_{IFo}		– 8		dBm
LO1 suppression		LO_{RFo}		40		dB
Voltage standing wave ratio		$VSWR_{IFo}$		1.4	2	
Sideband suppression		SBS_{IFo}		45		dB
Baseband inputs Pins 2, 3, 22 and 23						
Input voltage range (differential)		V_{BBi}		500	900	mVpp
Input impedance		Z_{BBi}		150		kΩ
Input frequency		f_{BBi}			200	MHz
LO1 input Pins 4 and 5						
Frequency range		f_{LOi}	30		500	MHz
Input level [1]		P_{LOi}		–10	–2	dBm
Input impedance		Z_{iLO}		tbd.		Ω
Duty cycle range		DCR_{LO1}	0.4		0.6	
Power-down mode						
Supply current	$V_{PD} \leq$ 0.5 V Pin 14	I_{PD}		<5		µA
Settling time	C_{SPD} 100 pF, C_{LO} = 100 pF, C_{RFo} = 1 nF	t_S		10		µs
Power down voltage Pin 14						
“Power on”	V_S = 3.5 to 5.5 V V_S = 2.7 to 3.5 V	V_{PON}	V_S – 0.5 V_S		V_S +0.5 V_S +0.5	V V
“Power down”		V_{PDN}			1	V
Power down current	Power on Power down	I_{PON} I_{PDN}		0.15 < 1		mA µA

Note:
[1]) Required LO level is a function of the LO frequency

Electrical Characteristics: Mixer

V_S = 3 V, f_{LO2} = 800 MHz, f_{IF} = 100 MHz, P_{LO2} = – 10dBm, system impedance Zo = 50 Ω, T_{amb} = 25 °C, reference point Pin 10, unless otherwise specified

Parameters	Test Conditions / Pin	Symbol	Min.	Typ.	Max.	Unit
Operating frequencies						
RF_O frequency	Pin 16	RF_O	50		2500	MHz
LO2 frequency	Pin 9	f_{LO2}	50		2500	MHz
Isolation						
LO2 spurious at RF_o	Pin 9–16 P_{iLO} = –10 to 0 dBm	$IS_{LO2\text{-}RFo}$		–30		dBm
RF_o to LO2	Pin 16–9	$IS_{RFo\text{-}LO2}$		tbd.		dB
Output level						
Output compression point	Pin 16 R_{Po} = ∞	CP_o – 1 dB		–7		dBm
Input level						
Input compression point [1]	Pins 11 and 12	CP_i – 1dB		–15		dBm
Input LO2	Pin 9	P_{LO2}		–10		dBm
Third order input intercept point [1]	Pins 11 and 12	P_{iIIP3}		–6		dBm
Voltage standing wave ratio (VSWR)						
Input IF	Pins 11 and 12	$VSWR_{IFi}$		tbd.		
Input LO2	Pin 9	$VSWR_{LO2}$		tbd.		
Output RF	Pin 16	$VSWR_{RF}$		tbd.		
Conversion power gain	R_L = 50 Ω	PG_C		9		dB
Noise Figure (SSB) [2]	P_{iLO} = – 6 dBm	NF50		13		dB
Power-down mode						
Supply current	$V_{PD} \leq$ 0.5 V Pin 13	I_{PD}		<5		µA
Settling time	C_{SPD} 100 pF, C_{LO} = 100 pF, C_{RFo} = 1 nF	t_S		10		µs
Power down voltage	**Pin 13**					
“Power on”	V_S = 3.5 to 5.5 V V_S = 2.7 to 3.5 V	V_{PON}	V_S – 0.5 V_S		V_S +0.5 V_S +0.5	V V
“Power down”		V_{PDN}			1	V
Power down current	Power on Power down	I_{PON} I_{PDN}		0.15 < 1		mA µA

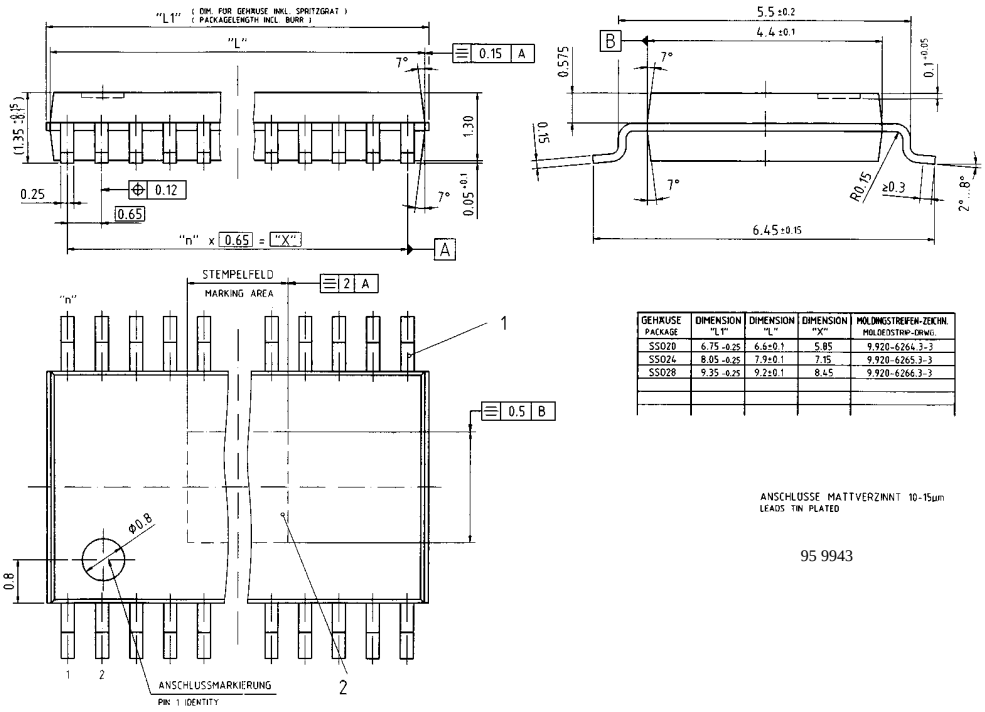
Note:
[1] with 50 Ω termination resistor at Pin 11
[2] without termination resistor

Ordering Information

Extended Type Number	Package	Remarks
U2891B-AFS	SSO24	Rail, MOQ 690 pcs.
U2891B-AFSG3	SSO24	Tape & reel, MOQ 4000 pcs.

Dimensions in mm

Package: SSO-24



Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC TELEFUNKEN microelectronic GmbH** to

1. Meet all present and future national and international statutory requirements.

2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

TEMIC TELEFUNKEN microelectronic GmbH semiconductor division has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively

2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA

3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

TEMIC can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

TEMIC TELEFUNKEN microelectronic GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax number: 49 (0)7131 67 2423