DECT RF / IF IC

Description

The U2761B is an integrated circuit manufactured in Atmel Wireless & Microcontrollers' UHF5S technology, designed for DECT application. It contains rejection mixer, IF amplifier, FM demodulator working at f = $f_{IF}/2$, baseband filter, RSSI, TX preamplifier and power-ramping generator for power amplifier.

Features

- Supply-voltage range 2.7 V to 4.7 V
- Low current consumption
- Few external components
- On-chip baseband filter
- LO switch and TX preamplifier
- Ramp-signal generator for power amplifier

Block Diagram

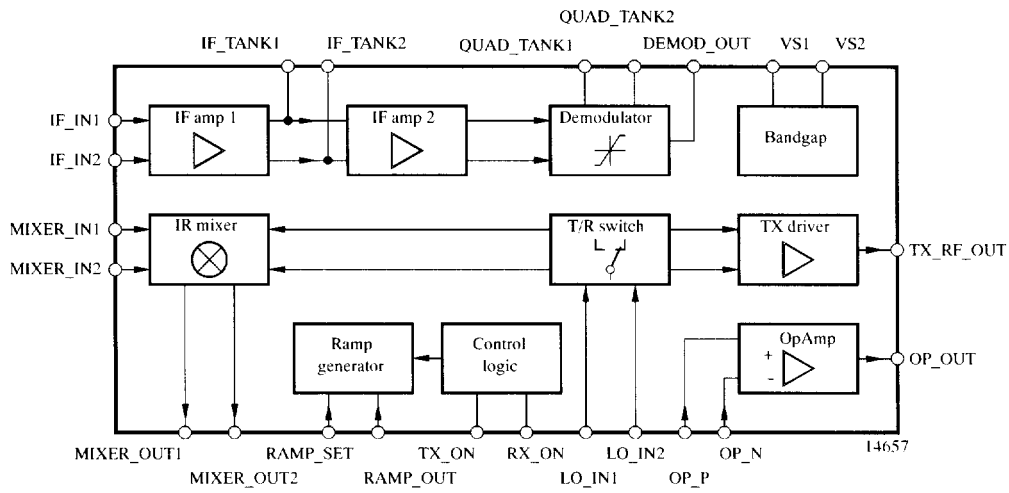


Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
U2761B-MFS	SSO28	Tube
U2761B-MFSG3	SSO28	Taped and reeled

Pin Description

Pin	Symbol	Function
1	RSSI	Received signal strength indicator output
2	PU	Hardware power-up input
3	IF_TANK1	IF tank circuit Pin 1
4	IF_TANK2	IF tank circuit Pin 2
5	GND1	Ground
6	MIXER_IN1	Mixer RF differential input 1
7	MIXER_IN2	Mixer RF differential input 2
8	GND2	Ground
9	TX_RF_OUT	Output of TX driver amplifier
10	VS1	Supply voltage input 1
11	IF_IN1	IF amplifier differential input 1
12	IF_IN2	IF amplifier differential input 2
13	RAMP_OUT	Ramp-signal output for PA
14	RAMP_SET	Slew-rate setting of ramp signal
15	RX_ON	RX control input
16	TX_ON	TX control input
17	MIXER_OUT1	Mixer IF differential output 1
18	MIXER_OUT2	Mixer IF differential output 2
19	VS2	Supply voltage input 2
20	LO_IN1	Local oscillator input 1
21	LO_IN2	Local oscillator input 2
22	GND3	Ground
23	QUAD_TANK1	Quadrature tank circuit 1
24	QUAD_TANK2	Quadrature tank circuit 2
25	DEMOD_OUT	Output of demodulator
26	OP_N	OP - Input inverting
27	OP_P	OP - Input non-inverting
28	OP_OUT	OP - Output

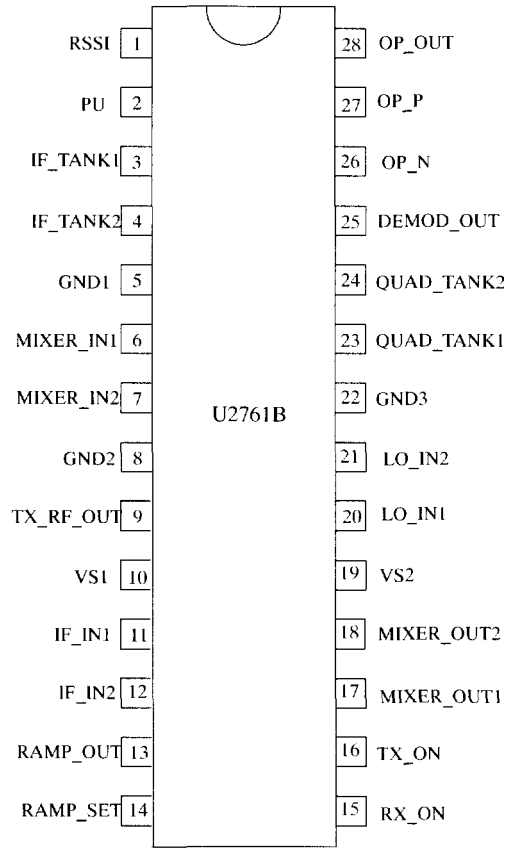


Figure 2. Pinning

Absolute Maximum Ratings

All voltages refer to GND (Pins 5, 8 and 22)

Parameter		Symbol	Value	Unit
Supply voltage	Pins 10 and 19	V_S	5.0	V
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	-40 to +125	°C

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction ambient	R_{thJA}	130	K/W

Operating Range

All voltages refer to GND (Pins 5, 8 and 22)

Parameter		Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Pins 10 and 19	V_S	2.7	3.0	4.7	V
Ambient temperature		T_{amb}	-25	+25	+85	°C

Electrical Characteristics

Test conditions: V_S = 3.0 V, T_{amb} = 25°C, unless otherwise specified

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Power supply						
Total supply current	TX	I_S		30		mA
	RX			50		mA
	RX (RSSI only)			47		mA
	Standby, PU = GND			1	10	µA
IR mixer	**Pins 6, 7, 17 and 18**					
Image-rejection ratio	Pins 17 and 18	IRR		20		dB
DSB noise figure	Pins 17 and 18	NFDSB= NFSSB		10		dB
Conversion gain	R_{load} = 200 Ω	G_{conv}		12		dB
Output interception point	Pins 17 and 18	OIP3		10		dBm
Input impedance	Pins 6 and 7	Z_{in}		50		Ω
Input matching	Pins 6 and 7	$VSWR_{in}$		<2:1		
LO switch and TX driver	**Pin 9, 20 and 21**					
Power gain (high)	@ P_{in} = -40 dBm	G_p		30		dB
Input impedance	Pin 20 or Pin 21 to GND	Z_{in}		50		Ω
Input matching	Pins 20 and 21	$VSWR_{in}$		<2:1		
Isolation LO-TX	RX mode: LO Pin 20 or Pin 21 to Pin 9	Isol		37		dB

Electrical Characteristics (continued)

Test conditions: V_S = 3.0 V, T_{amb} = 25°C, unless otherwise specified

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Output impedance	Pin 9	Z_{out}		100		Ω
Maximum output power	Pin 9	P_{max}		3		dBm
Gain compression	@ TX_RF_OUT Pin 9	P_{1dB}		1		dBm
Output interception point	Pin 9	OIP3		10		dBm
IF amplifier	**Pins 3, 4, 11 and 12**					
Input impedance	Pins 11 and 12	Z_{in}	200		400	Ω
Lower cut-off frequency		fl_{3dB}		90		MHz
Upper cut-off frequency		fu_{3dB}		130		MHz
Power gain		G_p		85		dB
Bandwidth of external tank circuit	Pins 3 and 4	BW_{3dB}		10		MHz
Noise figure		NF		9		dB
RSSI	**Pins 1, 6 and 7**					
RSSI sensitivity	At IF_IN1, IF_IN2, Pins 6 and 7	P_{min}		20		dBµV
RSSI compression	At IF_IN1, IF_IN2, Pins 6 and 7	P_{max}		100		dBµV
RSSI dynamic range		DR		80		dB
RSSI resolution	Slope of the RSSI has to be steady	Acc		±2		dB
RSSI rise time	P_{in} = 30 dBµV to 100 dBµV, Pin 1	t_r		1		µs
RSSI fall time	P_{in} = 100 dBµV to 30 dBµV, Pin 1	t_f		1		µs
Quiescent output current	@ P_{in} < 20 dBµV at IF_IN1, IF_IN2 Pin 1	I_{out}		30		µA
Max. output current	@ P_{in} = 100 dBµV at IF_IN1, IF_IN2 Pin 1	I_{out}		150		µA
FM demodulator	**Pins 23, 24 and 25**					
Co-channel rejection ratio	@ P_{in} = -75 dBm at IR-mixer input	CCRR		10		dB
Sensitivity	Quality factor of external tank circuit approx. 20, $f_{res} = f_{IF}/2$	S		0.5		V/MHz
Amplitude of recovered signal	Nominal deviation of signal ±288 kHz	A		288		mVss
Output-voltage DC range	Pin 25	$FMout_{DC}$	0.4		V_S - 0.4	V
Output impedance	Pin 25	Z_{out}		13		kΩ
AM rejection ratio	Pin 25	AMRR		tbd		dB
OpAmp	**Pins 26, 27 and 28**					
Power gain bandwidth		PGBW		10		MHz
Excess phase	R_{load} = 1 kΩ, C_{load} = 15 pF	d		80		°
Input offset voltage	Pins 26 and 27	V_{offs}		± 1		mV
Open-loop gain		g		70		dB

Electrical Characteristics (continued)

Test conditions: V_S = 3.0 V, T_{amb} = 25°C, unless otherwise specified

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Output-voltage range	Pin 28	V_{out}	0.3		V_S - 0.3	V
Common mode input voltage	Pins 26 and 27	V_{in}	0.3		V_S - 0.3	V
Common mode rejection ratio	Pin 28	CMRR		t.b.d.		dB
Total harmonic distortion	Pin 28	THD		t.b.d.		%
Ramp generator	**Pins 13 and 14**					
Min. output voltage	Accord. to PA RAMP input	V_{min}		0.2		V
Max. output voltage	Accord. to PA RAMP input	V_{max}		1.95		V
Rise time	C_{RAMP} = 270 pF at Pin 14	t_r		5		µs
Fall time	C_{RAMP} = 270 pF at Pin 14	t_f		5		µs
Logic input levels (RX_ON, TX_ON)	**Pins 15 and 16**					
High input level	= '1'	V_{iH}	1.5			V
Low input level	= '0'	V_{iL}			0.5	V
High input current	= '1'	I_{iH}	-5		5	µA
Low input current	= '0'	IiL	-5		5	µA
Power / standby	**Pin 2**					
Power-up high input level	PU = '1'	V_{PU}	2.0			V
Standby low input level	PU = '0'	$V_{PU.OFF}$			0.7	V
Power-up high input current	PU = '1' V_{PU} = 3 V, V_{PU} = 4.6 V	I_{PU}	20 40	30 60	40 80	µA
Standby low input current	PU = '0' V_{PU} = 0 V, V_{PU} = 0.5 V	$I_{PU.OFF}$			0.1 1	µA
Settling time VS = 0 -> active operation	Switched VS = 0 to VS = 3 V	t_{soa}		< 10		µs
Settling time standby -> active operation	Switched PU = 0 to PU = 1	t_{ssa}		< 10		µs
Settling time active operation -> standby	Switched VS = 3 V to VS = 0	t_{sas}		< 2		µs

Active Blocks Corresponding to RX / TX

	Logic			Active Parts								
	PU	RX_ON	TX_ON	OP	Demo-dulator	IF amplifiers	IR mixer	RSSI	RX switch	TX switch	TX driver	Ramp generator
TX mode	1	0	1	off	off	off	off	off	off	on	on	on
RX mode	1	1	0	on	on	on	on	on	on	off	off	off
RSSI	1	1	1	off	off	on	on	on	on	off	off	off
Standby	0	X	X	off	off	off	off	off	off	off	off	oft
	1	0	0	off	off	off	off	off	oft	on	off	off

Typical Application Circuit

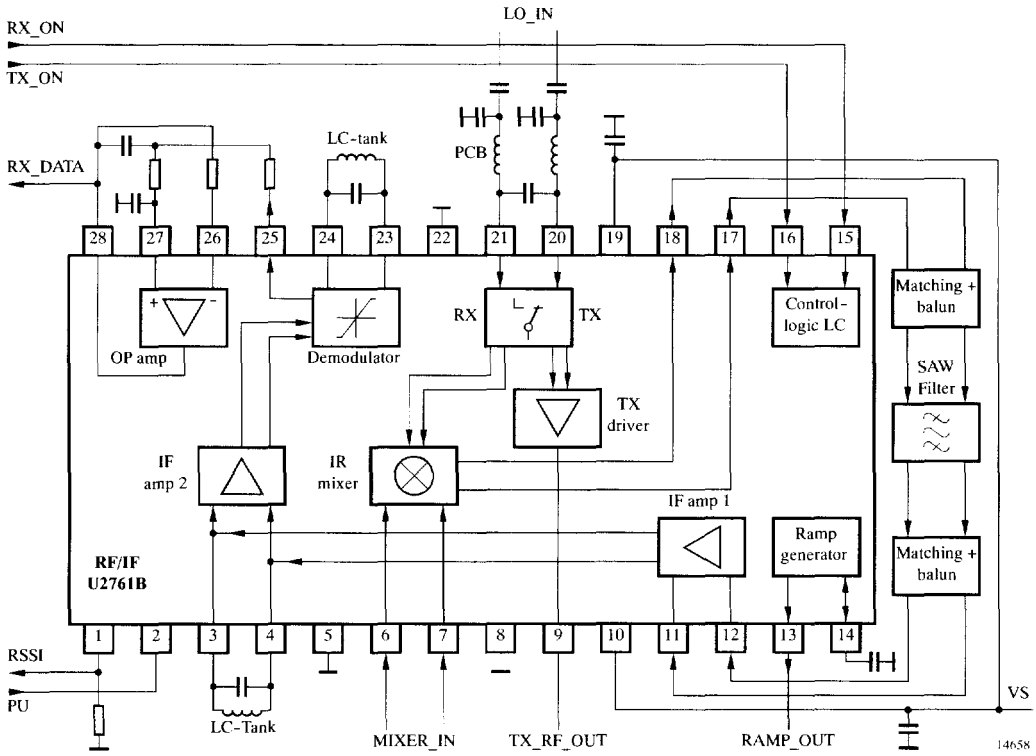


Figure 3. Typical application circuit

Recommended Baseband Filter ($f_{3dB} \approx 570$ kHz)

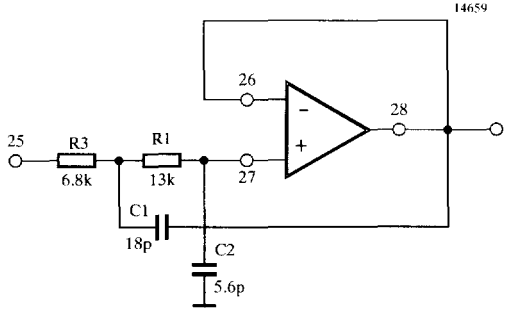


Figure 4. Recommended baseband filter

Input / Output Interface Circuits

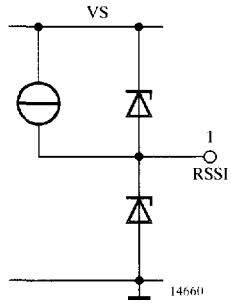


Figure 5.

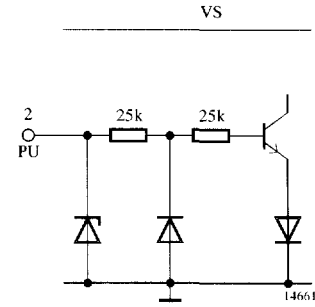


Figure 8.

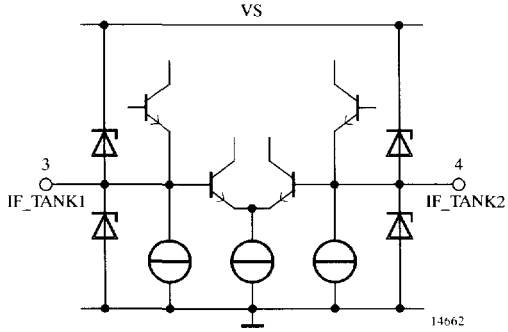
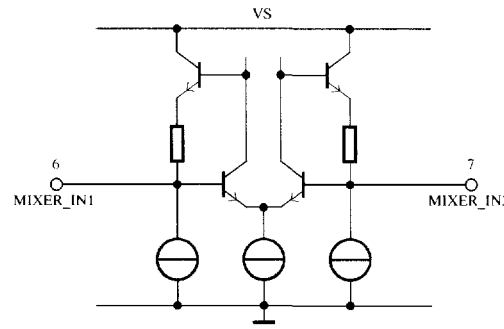


Figure 6.



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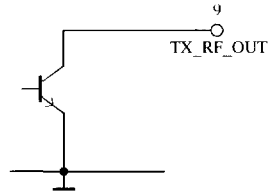

Figure 7.

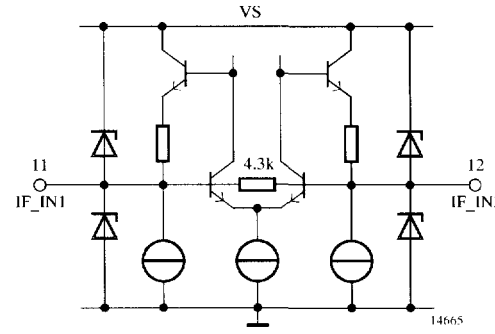

Figure 10.

Input / Output Interface Circuits (continued)

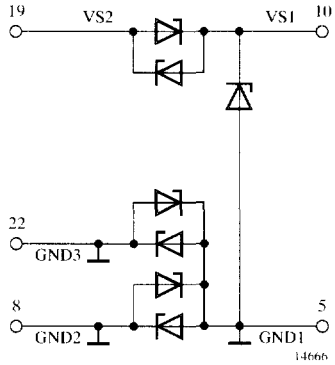

Figure 11.

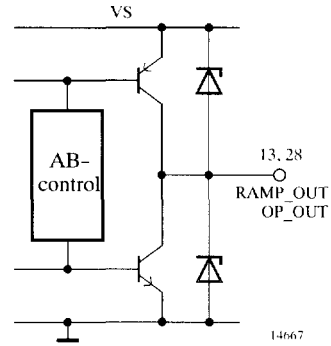

Figure 14.

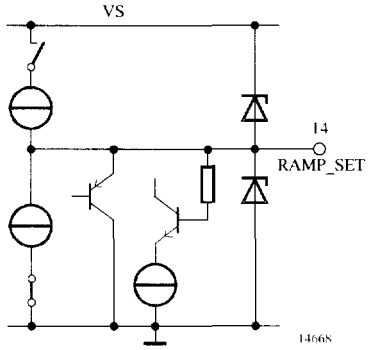

Figure 12.

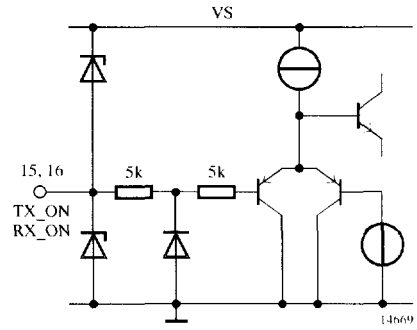

Figure 15.

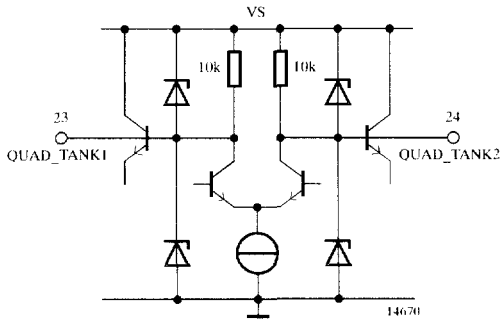

Figure 13.

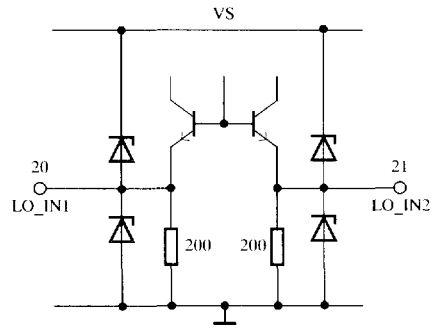

Figure 16.

Input / Output Interface Circuits (continued)

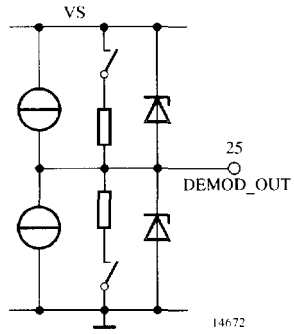

Figure 17.

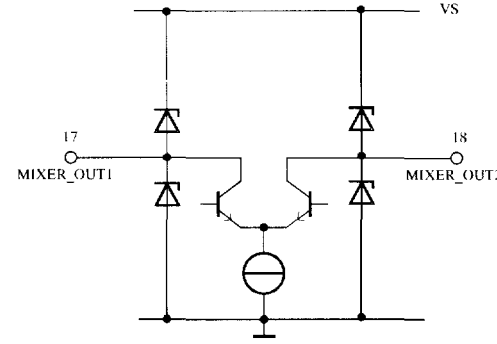

Figure 19.

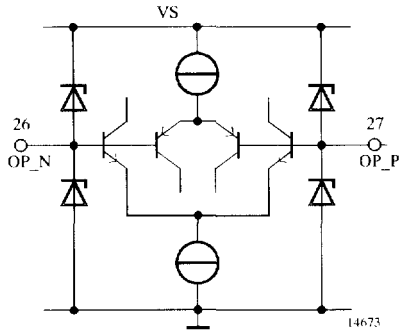

Figure 18.

Package Information

Package SSO28
Dimensions in mm