

## 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

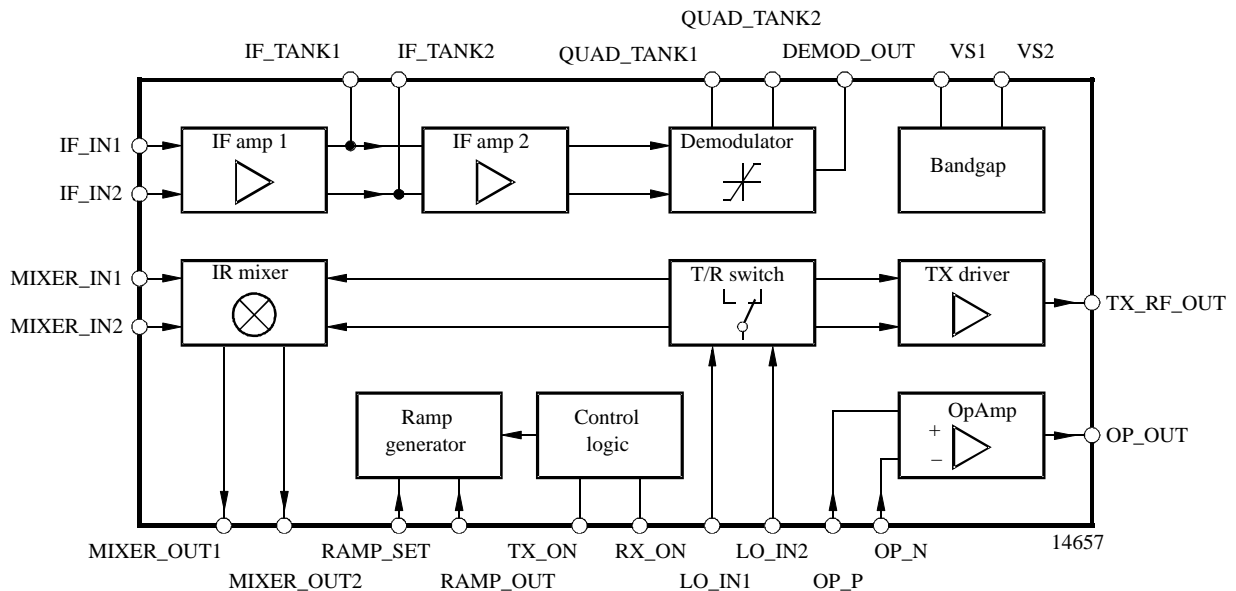


Figure 1. Block diagram

### 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

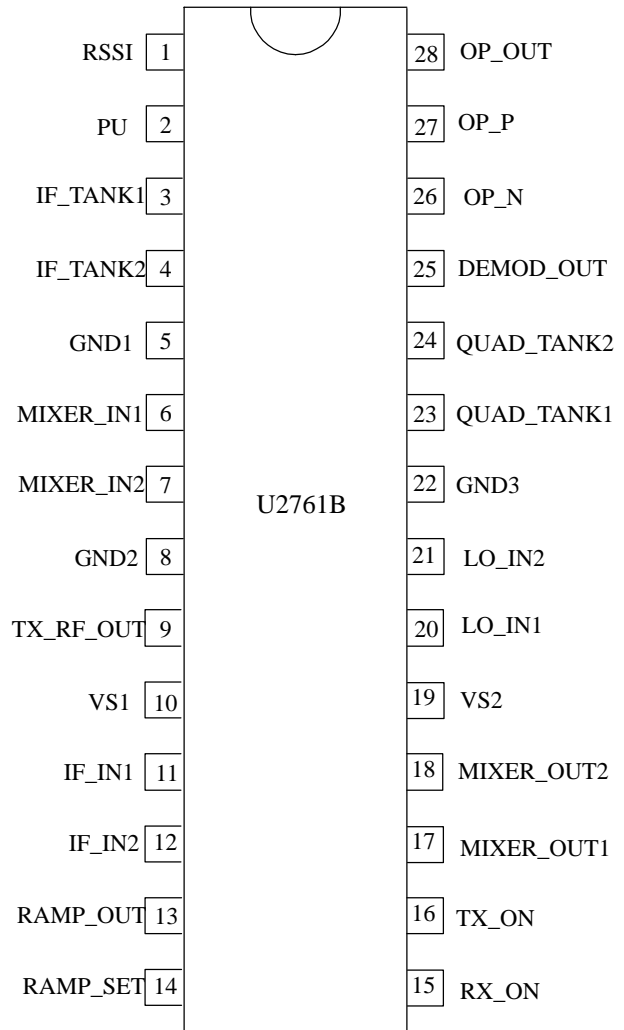


Figure 2. Pinning

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

## Electrical Characteristics (continued)

Test conditions:  $V_S = 3.0\text{ V}$ ,  $T_{\text{amb}} = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Output impedance	Pin 9	$Z_{\text{out}}$		100		$\Omega$
Maximum output power	Pin 9	$P_{\text{max}}$		3		dBm
Gain compression	@ TX_RF_OUT Pin 9	$P_{1\text{dB}}$		1		dBm
Output interception point	Pin 9	OIP3		10		dBm
<b>IF amplifier Pins 3, 4, 11 and 12</b>						
Input impedance	Pins 11 and 12	$Z_{\text{in}}$	200		400	$\Omega$
Lower cut-off frequency		$f_{l3\text{dB}}$		90		MHz
Upper cut-off frequency		$f_{u3\text{dB}}$		130		MHz
Power gain		$G_p$		85		dB
Bandwidth of external tank circuit	Pins 3 and 4	$BW_{3\text{dB}}$		10		MHz
Noise figure		NF		9		dB
<b>RSSI Pins 1, 6 and 7</b>						
RSSI sensitivity	At IF_IN1, IF_IN2, Pins 6 and 7	$P_{\text{min}}$		20		$\text{dB}\mu\text{V}$
RSSI compression	At IF_IN1, IF_IN2, Pins 6 and 7	$P_{\text{max}}$		100		$\text{dB}\mu\text{V}$
RSSI dynamic range		DR		80		dB
RSSI resolution	Slope of the RSSI has to be steady	Acc		$\pm 2$		dB
RSSI rise time	$P_{\text{in}} = 30\text{ dB}\mu\text{V}$ to $100\text{ dB}\mu\text{V}$ , Pin 1	$t_r$		1		$\mu\text{s}$
RSSI fall time	$P_{\text{in}} = 100\text{ dB}\mu\text{V}$ to $30\text{ dB}\mu\text{V}$ , Pin 1	$t_f$		1		$\mu\text{s}$
Quiescent output current	@ $P_{\text{in}} < 20\text{ dB}\mu\text{V}$ at IF_IN1, IF_IN2 Pin 1	$I_{\text{out}}$		30		$\mu\text{A}$
Max. output current	@ $P_{\text{in}} = 100\text{ dB}\mu\text{V}$ at IF_IN1, IF_IN2 Pin 1	$I_{\text{out}}$		150		$\mu\text{A}$
<b>FM demodulator Pins 23, 24 and 25</b>						
Co-channel rejection ratio	@ $P_{\text{in}} = -75\text{ dBm}$ at IR-mixer input	CCRR		10		dB
Sensitivity	Quality factor of external tank circuit approx. 20, $f_{\text{res}} = f_{\text{IF}}/2$	S		0.5		$\text{V}/\text{MHz}$
Amplitude of recovered signal	Nominal deviation of signal $\pm 288\text{ kHz}$	A		288		$\text{mV}_{\text{SS}}$
Output-voltage DC range	Pin 25	$\text{FM}_{\text{outDC}}$	0.4		$V_S - 0.4$	V
Output impedance	Pin 25	$Z_{\text{out}}$		13		$\text{k}\Omega$
AM rejection ratio	Pin 25	AMRR		tbd		dB
<b>OpAmp Pins 26, 27 and 28</b>						
Power gain bandwidth		PGBW		10		MHz
Excess phase	$R_{\text{load}} = 1\text{ k}\Omega$ , $C_{\text{load}} = 15\text{ pF}$	d		80		$^\circ$
Input offset voltage	Pins 26 and 27	$V_{\text{offs}}$		$\pm 1$		mV
Open-loop gain		g		70		dB

## Electrical Characteristics (continued)

Test conditions:  $V_S = 3.0\text{ V}$ ,  $T_{\text{amb}} = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Output-voltage range	Pin 28	$V_{\text{out}}$	0.3		$V_S - 0.3$	V
Common mode input voltage	Pins 26 and 27	$V_{\text{in}}$	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.		%
<b>Ramp generator Pins 13 and 14</b>						
Min. output voltage	Accord. to PA RAMP input	$V_{\text{min}}$		0.2		V
Max. output voltage	Accord. to PA RAMP input	$V_{\text{max}}$		1.95		V
Rise time	$C_{\text{RAMP}} = 270\text{ pF}$ at Pin 14	$t_r$		5		$\mu\text{s}$
Fall time	$C_{\text{RAMP}} = 270\text{ pF}$ at Pin 14	$t_f$		5		$\mu\text{s}$
<b>Logic input levels (RX_ON, TX_ON) Pins 15 and 16</b>						
High input level	= '1'	$V_{\text{iH}}$	1.5			V
Low input level	= '0'	$V_{\text{iL}}$			0.5	V
High input current	= '1'	$I_{\text{iH}}$	-5		5	$\mu\text{A}$
Low input current	= '0'	$I_{\text{iL}}$	-5		5	$\mu\text{A}$
<b>Power / standby Pin 2</b>						
Power-up high input level	PU = '1'	$V_{\text{PU}}$	2.0			V
Standby low input level	PU = '0'	$V_{\text{PU,OFF}}$			0.7	V
Power-up high input current	PU = '1' $V_{\text{PU}} = 3\text{ V}$ , $V_{\text{PU}} = 4.6\text{ V}$	$I_{\text{PU}}$	20 40	30 60	40 80	$\mu\text{A}$
Standby low input current	PU = '0' $V_{\text{PU}} = 0\text{ V}$ , $V_{\text{PU}} = 0.5\text{ V}$	$I_{\text{PU,OFF}}$			0.1 1	$\mu\text{A}$
Settling time VS = 0 → active operation	Switched VS = 0 to VS = 3 V	$t_{\text{soa}}$		< 10		$\mu\text{s}$
Settling time standby → active operation	Switched PU = 0 to PU = 1	$t_{\text{ssa}}$		< 10		$\mu\text{s}$
Settling time active operation → standby	Switched VS = 3 V to VS = 0	$t_{\text{sas}}$		< 2		$\mu\text{s}$

## 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	off
	1	0	0	off	off	off	off	off	off	on	off	off

## Typical Application Circuit

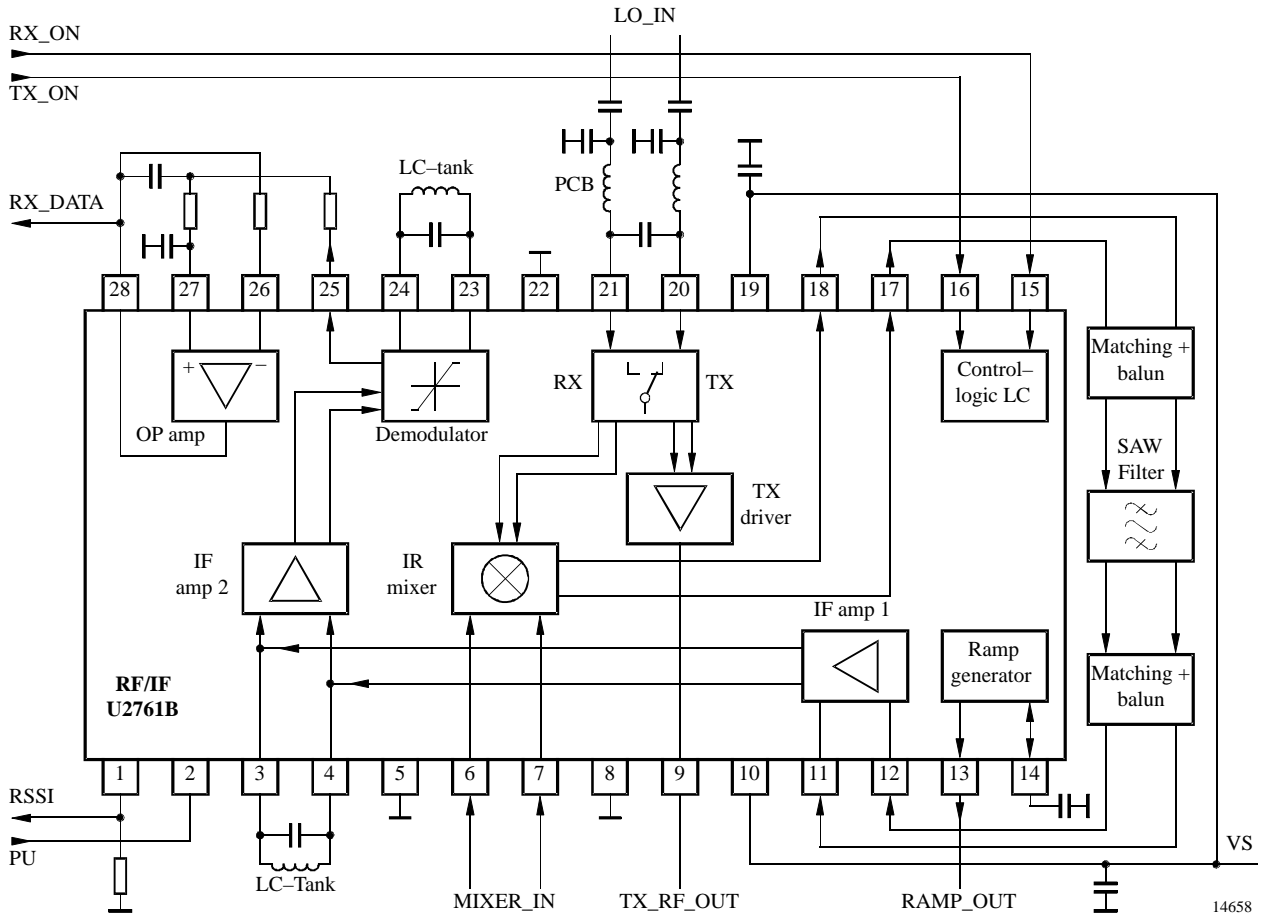


Figure 3. Typical application circuit

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

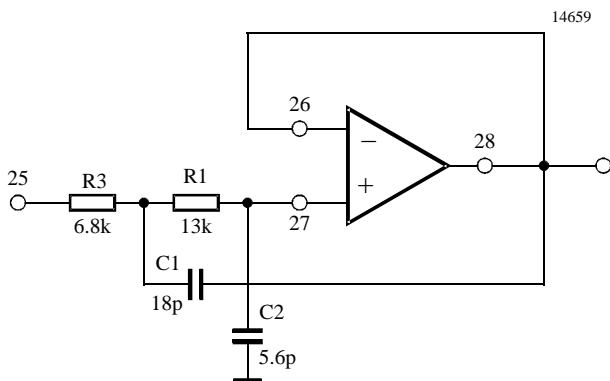


Figure 4. Recommended baseband filter

**Input / Output Interface Circuits**

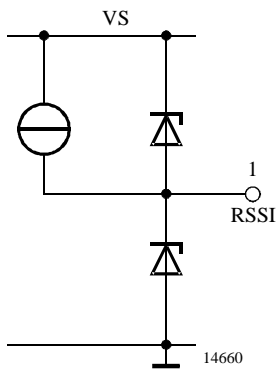


Figure 5.

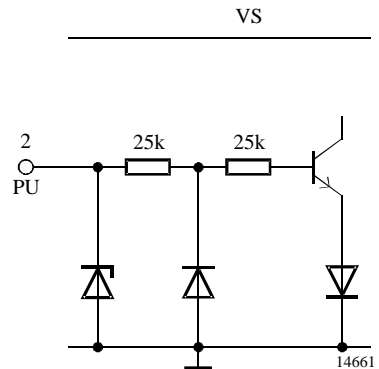


Figure 8.

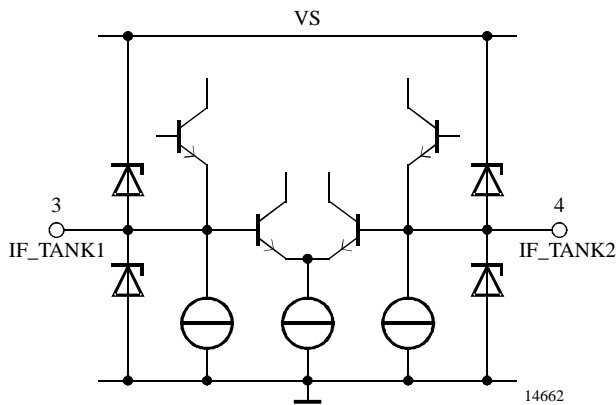


Figure 6.

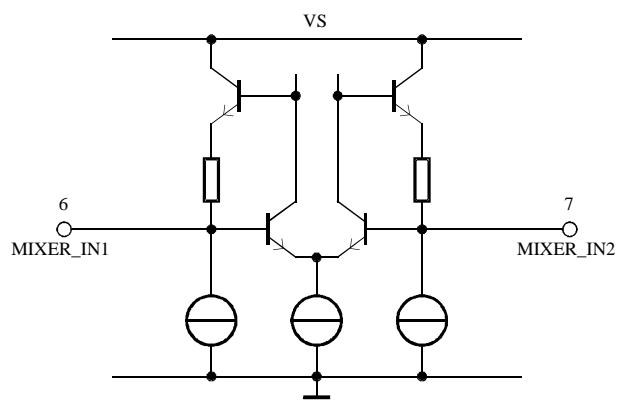


Figure 9.

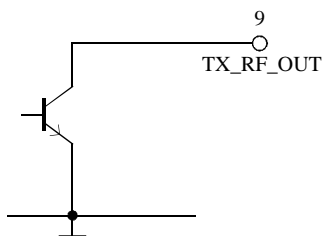


Figure 7.

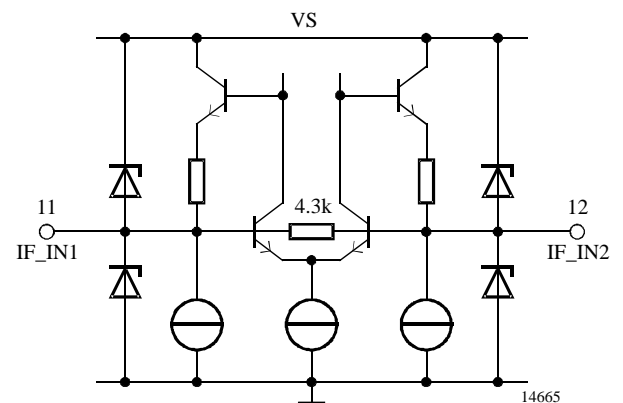


Figure 10.

## Input / Output Interface Circuits (continued)

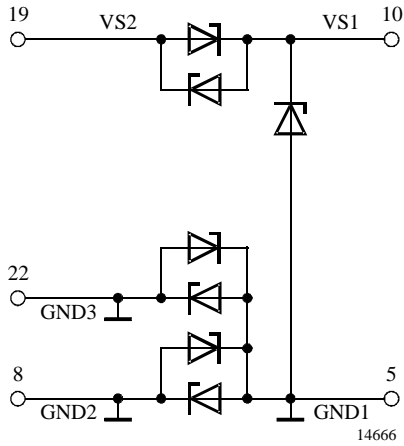


Figure 11.

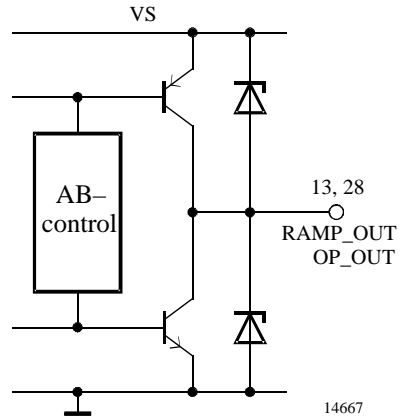


Figure 14.

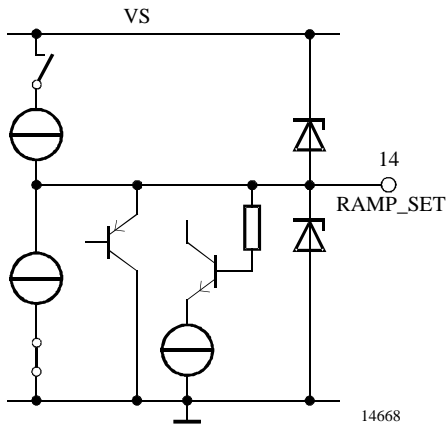


Figure 12.

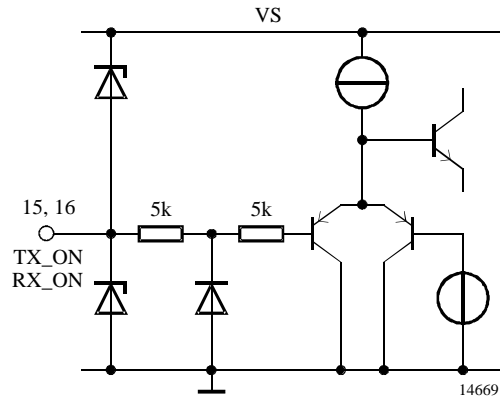


Figure 15.

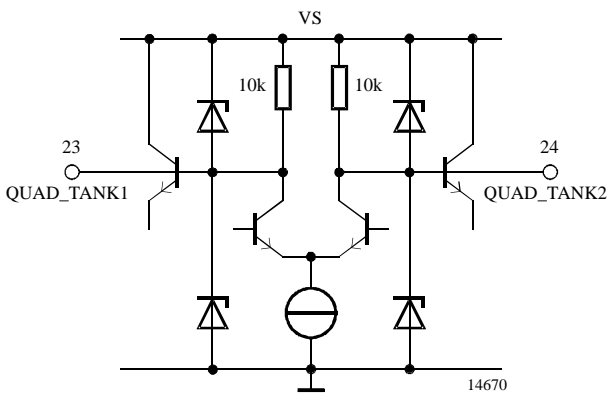


Figure 13.

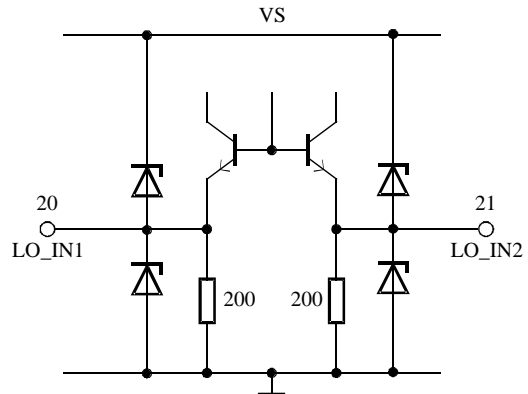


Figure 16.



**Input / Output Interface Circuits (continued)**

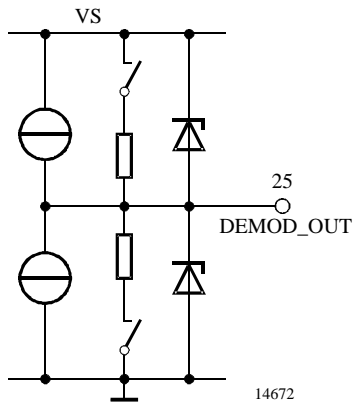


Figure 17.

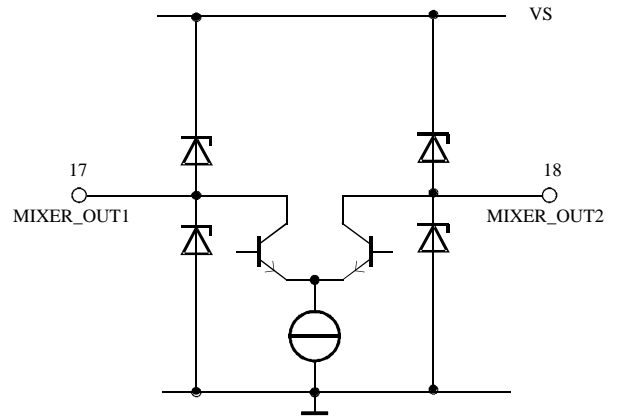


Figure 19.

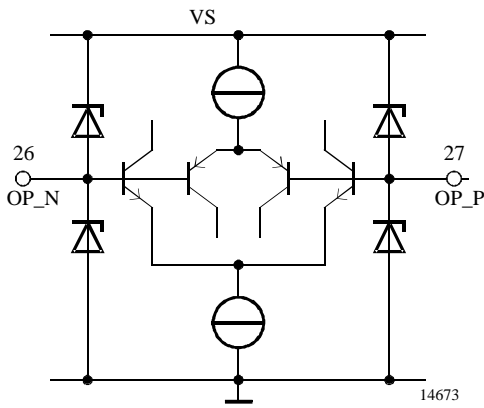
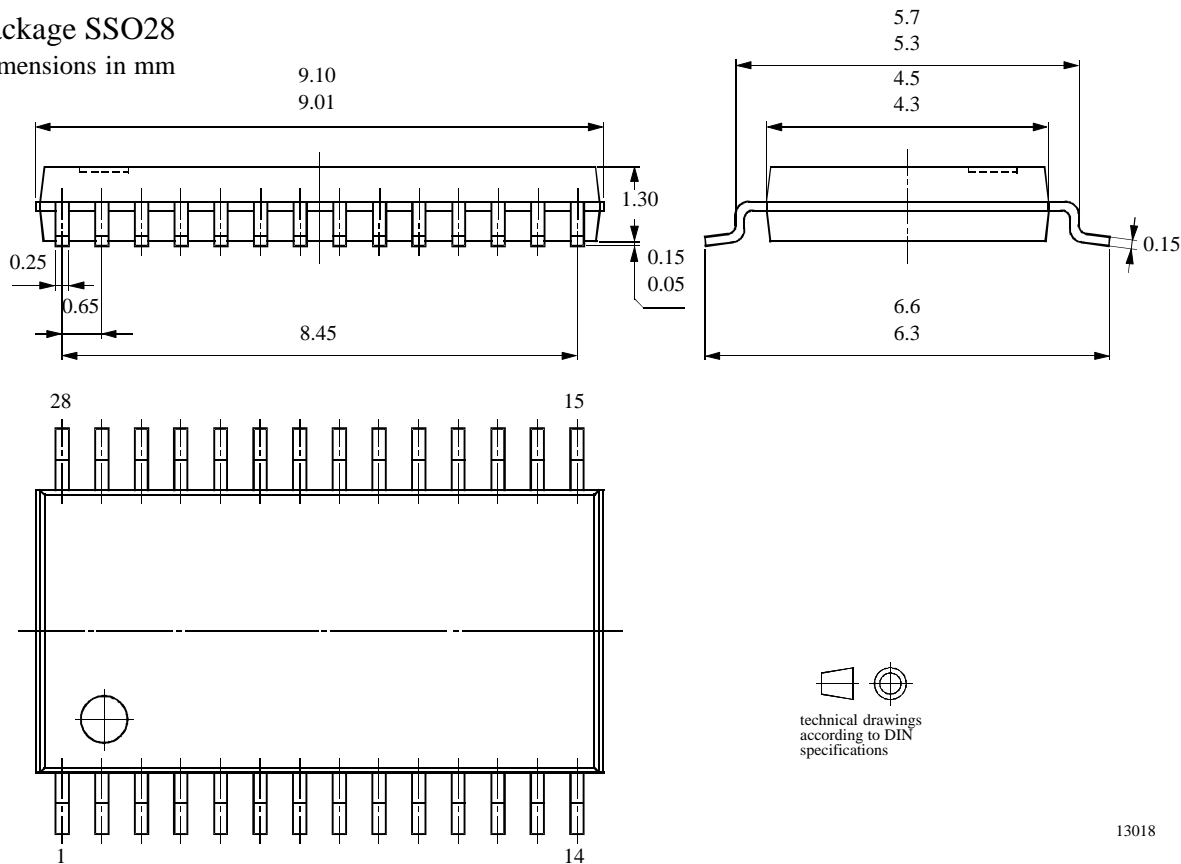


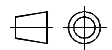
Figure 18.

## Package Information

### Package SSO28

Dimensions in mm



  
technical drawings  
according to DIN  
specifications

13018

## Ozone Depleting Substances Policy Statement

It is the policy of **TEMIC Semiconductor 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 Semiconductor GmbH** 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 Semiconductor GmbH** can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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