

900-MHz ISM Band Receiver

Description

The receiver IC U2762B-B is specifically designed for cordless telephone applications in the 900-MHz ISM band. It is manufactured using Atmel Wireless & Microcontrollers' advanced UHF process. The IC consists of a 900-MHz RF amplifier and mixer, 10.7-MHz IF amplifier, limiter, RSSI, quadrature demodulator and comparator for the bit-slicer function. The device features 2.9-V operation. In conjunction with Atmel

Wireless & Microcontrollers' transmitter IC U2763B-B and the PLL U2781B, a complete ISM RF IC kit is available which fits perfectly with AMD's PhoX controllers AM79C432A and AM79C433.

Electrostatic sensitive device.

Observe precautions for handling.



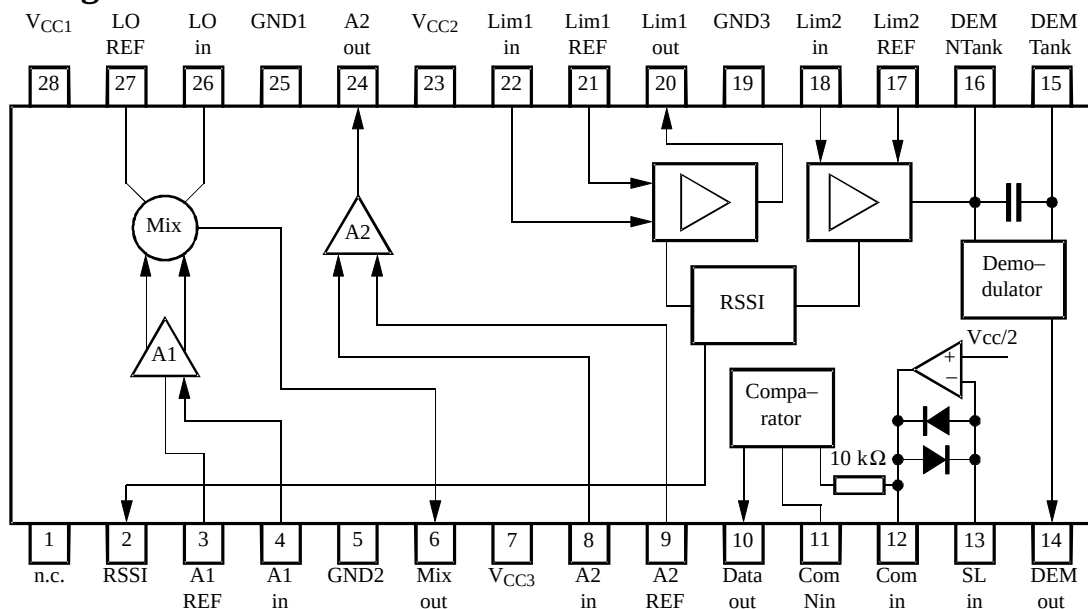
Features

- Single-conversion receiver with 10.7-MHz IF
- Comparator for bit slicer integrated
- Temperature-compensated RSSI with 65 dB dynamic range
- Supply-voltage range 2.7 V to 3.3 V
- Only 17 mA typical current consumption
- Few external components
- SSO28 package

Benefits

- Low filter costs due to 10.7-MHz single conversion
- Very low count of external components saves PCB space and costs
- Low current consumption results in very long stand-by time of approximately 7 days

Block Diagram



13951

Figure 1. Block diagram

Ordering Information

Extended Type Number	Package	Remarks
U2762B-BFS	SSO28	Tube, MOQ 600 pcs
U2762B-BFSG3	SSO28	Taped and reeled, MOQ 4000 pcs

Pin Description

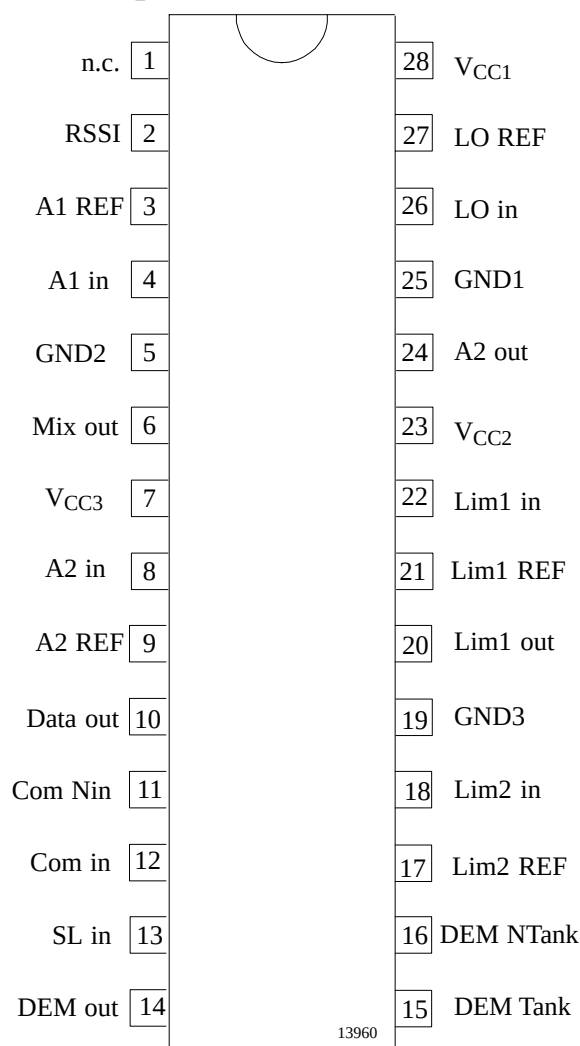


Figure 2. Pinning

Pin	Symbol	Function
1	n.c.	Not connected
2	RSSI	Signal-strength indicator
3	A1 REF	RF reference
4	A1 in	RF input
5	GND2	IF ground
6	Mix out	Mixer output
7	V _{CC3}	IF and AF power supply
8	A2 in	IF amplifier A2 input
9	A2 REF	IF amplifier A2 reference
10	Data out	Data output
11	Com Nin	Comparator reference
12	Com in	Comparator input / slicer output
13	SL in	Slicer input
14	DEM out	Demodulator output
15	DEM Tank	Quadrature filter
16	DEM NTank	Quadrature filter
17	Lim2 REF	Limiter 2 reference
18	Lim2 in	Limiter 2 input
19	GND3	IF and AF Ground
20	Lim1 out	Limiter 1 output
21	Lim1 REF	Limiter 1 reference
22	Lim1 in	Limiter 1 input
23	V _{CC2}	IF power supply 1
24	A2 out	IF amplifier A2 output
25	GND1	RF ground
26	LO in	Local oscillator input
27	LO REF	Local oscillator reference
28	V _{CC1}	RF power supply

Functional Description

RF Amplifier / Mixer

The RF amplifier / mixer down-converts the antenna signal to the IF frequency. It has asymmetrical RF and IF ports. The LO input includes an amplifier for good sensitivity and can be used in symmetrical- as well as asymmetrical configuration.

IF Amplifier A2

An additional gain stage enables an application-specific insertion point for IF filtering.

Limiter 1 / 2

The two-stage limiting amplifier is designed to be directly coupled to low-cost 10.7-MHz ceramic IF filters in front of each stage. The total dynamic range is 65 dB.

Demodulator

The quadrature demodulator in the receiving path contains an internal 7-pF quadrature capacitor to couple the IF signal to the external tank providing the 90-degree phase shift. The tank may be either an LC-tank circuit or an alignment-free discrete ceramic resonator.

Bit-Slicer Amplifier and Comparator

The bit-slicer limits the baseband signal. Furthermore it eliminates the DC-offset by an AC-coupled lowpass filter to the demodulator output. A second lowpass filter recovers the exact comparator threshold value of the bit-slicer's output. The time constants of both lowpass filters can be selected independently from each other to optimize power-up timing.

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage Pins 7, 23, 28	V_{CC}	0 to 3.5	V
Input voltages Pins 1, 2, 6, 10, 14, 20 and 24	V_{in}	0 to V_{CC}	V
Input voltages Pins 3, 4, 8, 9, 11, 12, 13, 15, 16, 18, 21, 22, 26 and 27	V_{in}	0 to $V_{CC} - 1$ V	V
Junction temperature	T_j	125	°C
Storage temperature	T_{stg}	-40 to +125	°C

Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient SSO28	R_{thJA}	130	K/W

Operating Range

Parameters	Symbol	Value	Unit
Supply voltage	V_S	2.7 to 3.3	V
Ambient temperature	T_{amb}	0 to 70	°C

Electrical Characteristics Cascaded A1 and MX1

Temperature range: 0°C to 70°C

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range		V_{CC}	2.7	2.9	3.3	V
Supply current	Pin 28	I_{SA1on}		6.5		mA
A1MX1 turn-on time		$t_{A1MX1on}$		2.5		µs
RF input impedance	Pin 4			50		Ω
RF input SWR	Pin 4	Z_{A1in}		< 2:1		VSWR
RF input frequency		f_{in}	800		1200	MHz
LO input impedance	Pins 26, 27			2		kΩ
LO input frequency		f_{LOin}	800		1200	MHz
A1/MX1 cascaded insertion voltage gain	MX1 _{LO} = 916.8 MHz MX1 _{RF} = 927.5 MHz P_{in} = -40 dBm P_{LOin} = -20 dBm	G_{VA1MX1}	21	24	27	dB
Noise figure	SSB	N_F		11.5		dB
1-dB compression point	Input Pin 4	P_{1dB}		-27		dBm
Output voltage @ 1 dB compression	MX1 _{LO} = 916.8 MHz, MX1 _{RF} = 927.5 MHz, Pin 6	P_{1dBout}		104		dBµV
3rd-order intercept point	f_{LO} = 980 MHz P_{LO} = -20 dBm f_{RF1} = 1 GHz f_{RF2} = 995 MHz P_{RF} = -40 dBm, Pin 4	IIP3		-15		dBm
LO to RF leakage	P_{LO} = -20 dBm Pin 4			-50		dBm
LO to IF leakage	P_{LO} = -20 dBm Pin 6			62		dBµV
IF output impedance	@10.7-MHz IF single ended Pin 6	$L_{MX1Zout}$		330		Ω

Electrical Characteristics A2

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
A2 turn-on time		t_{A2on}		2.5		µs
IF input impedance	@10.7 MHz Pin 8	Z_{MX2in}	260	330	400	Ω
Input frequency		f_{MX2in}		10.7	22	MHz
Output frequency	Pin 24	f_{MX2out}		10.7	22	MHz
Gain	@10.7 MHz	G_p	8	10	12	dB
Noise figure		N_F		8		dB
1-dB compression point	Pin 8	P_{1dB}		95		dBµV
3rd-order intercept point	Pin 8	IIP3		112		dBµV
Output voltage @ 1 dB compression	@10.7 MHz Pin 24	P_{1dBout}		104		dBµV
Output load	Single ended Pin 24	L_{MX2out}	260	330	400	Ω

Common Electrical Characteristics IF/AF System

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pins 7, 23	V_7, V_{23}	2.7	2.9	3.3	V
Supply current	Pin 7	I_7		4.9		mA
Supply current	Pin 23	I_{23}		6.0		mA

Electrical Characteristics RSSI/Lim1 and Lim2

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
-3 dB limiting at Lim1 input	Valid for -5 dB insertion loss for 2nd IF filter Pin 22	P_{3dB}			8	dBμV
Lim1/Lim2 cascaded voltage gain	$f_{IF} = 10.7$ MHz, $P_{IFin} = -110$ dBm	G_{LIM12}		110		dB
Limiter 1						
Lim1 input impedance	Pin 22	Z_{LIM1in}	260	330	400	Ω
Lim1 input frequency	Pin 22	f_{LIM1BW}	1		22	MHz
Lim1 output impedance	Pin 22	$f_{LIM1out}$	260	330	400	Ω
Voltage gain		G_{LIM1}		45		dB
Limiter 2						
Lim2 input impedance	Pin 18	Z_{LIM2in}	260	330	400	Ω
Lim2 input frequency	Pin 18	f_{LIM2BW}	1		22	MHz
RSSI						
Dynamic range		D_{RSSI}	20		85	dBμV
Output voltage	@ 20 dBμV @ 85 dBμV	V_{out}	0.1 1.7	0.2 1.8	0.3 1.9	V V
RSSI fall time	Pin 2	t_{fRSSI}			50	μs
RSSI rise time	Pin 2	t_{rRSSI}			50	μs
Output impedance	Pin 2	Z_{RSSI}		10 3		k Ω pF

Electrical Characteristics Demodulator

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Demodulator 3 db BW	Pin 14	$f_{DEMODBW}$		200		kHz
Demodulator total harmonic distortion	$f_{mod} = 36$ kHz $f_{dev} = 40$ kHz $f_{IFin} = 10.7$ MHz Pin 14	THD		< 3		%
Demodulator output voltage	$f_{mod} = 36$ kHz $f_{dev} = 40$ kHz $f_{IFin} = 10.7$ MHz Pin 14	V_{Dout}		150		mV _{rms}
DC output voltage	Pin 14			1.5		V
Output load	Pin 14	L_{Dout}	10			k Ω

Electrical Characteristics Comparator

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Ref. input impedance	Pin 11	$Z_{COMP_{in}}$		100		$k\Omega$
Output voltage 'high'	$R_{LOAD} > 10 k\Omega$ Pin 10	V_{outH}	$V_{CC}-0.3$			V
Output voltage 'low'	$R_{LOAD} > 10 k\Omega$ Pin 10	V_{outL}			0.3	V
Output low-to-high rise time	$R_{LOAD} = 10 k\Omega$ Pin 10 $C_{LOAD} = 10 pF$	t_r			500	ns
Output high-to-low fall time	$R_{LOAD} = 10 k\Omega$ Pin 10 $C_{LOAD} = 10 pF$	t_f			500	ns
Hysteresis	Pin 12	V_{HYST}		25		mV

Electrical Characteristics Slicer Amplifier

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Open loop gain	Pin 13 to 12	G_{Sol}		40		dB
Output load	AC load Pin 12	L_{Sout}	10			$k\Omega$
Output swing	Pin 12			0.7		V

Internal Pin Configuration

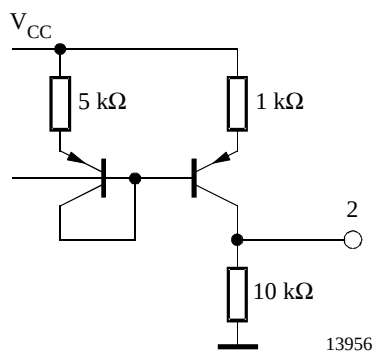


Figure 3. Pin 2: Signal strength indicator (RSSI)

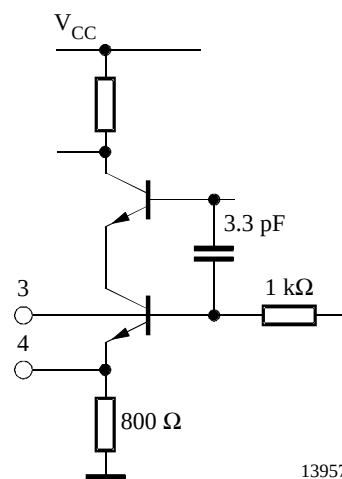


Figure 4. Pins 3/4: RF reference / RF input

Internal Pin Configuration (continued)

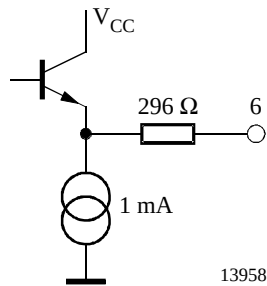


Figure 5. Pin 6: Mixer output

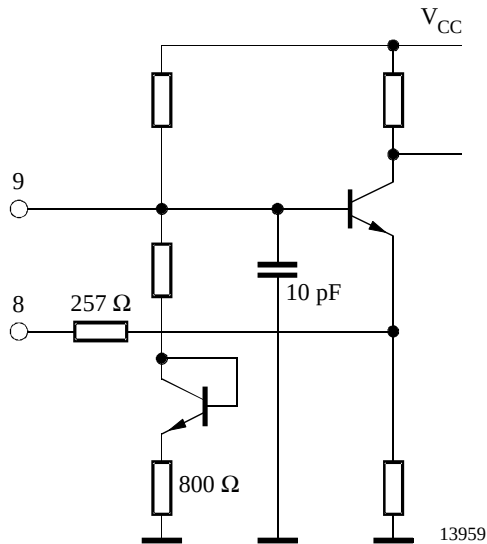


Figure 6. Pins 8/9: IF amplifier A2 input / reference

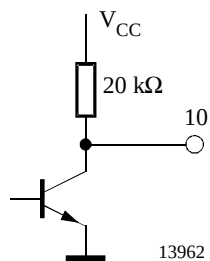


Figure 7. Pin 10: Data output

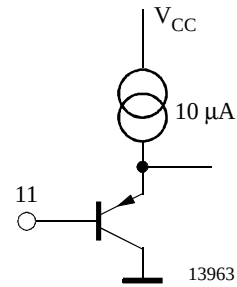


Figure 8. Pin 11: Comparator reference

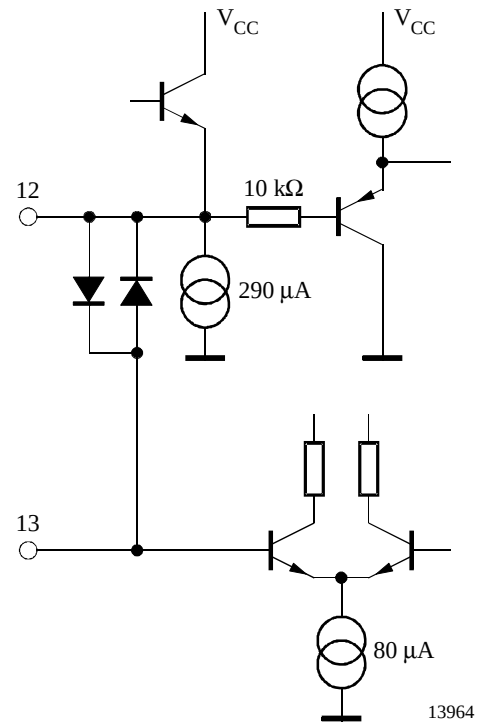


Figure 9. Pin 12: Comparator input / Slicer output
Pin 13: Slicer input

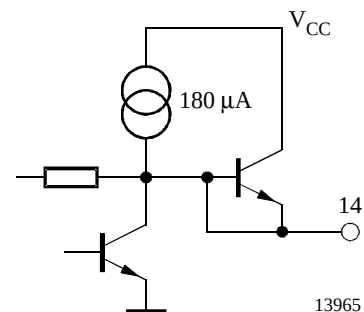


Figure 10. Pin 14: Demodulator output

Internal Pin Configuration (continued)

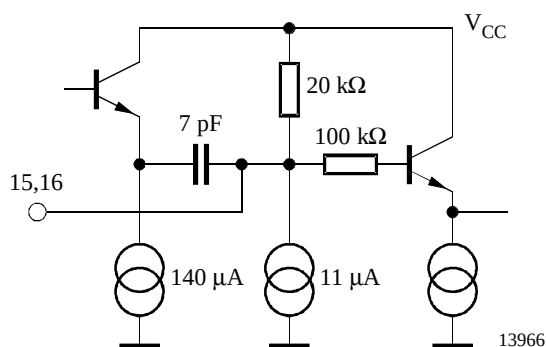


Figure 11. Pin 15/16: Quadrature filter

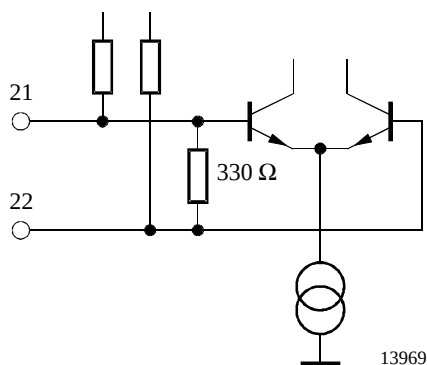


Figure 14. Pins 21/22: Limiter 1 input / reference

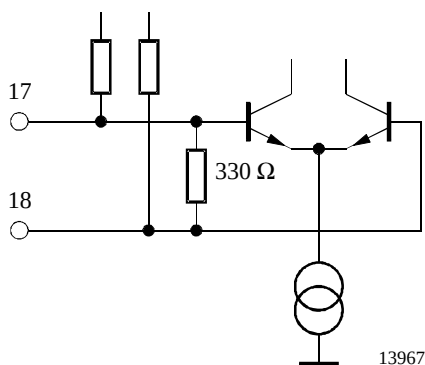


Figure 12. Pins 17/18: Limiter 2 input / reference

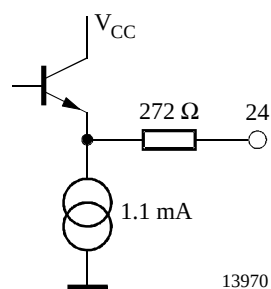


Figure 15. Pin 24: IF amplifier A2 output

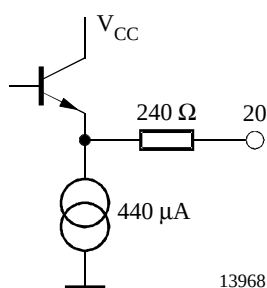


Figure 13. Pin 20: Limiter 1 output

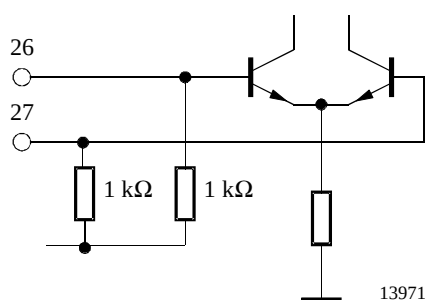


Figure 16. Pins 26/27: Local oscillator input / reference

Application Circuit

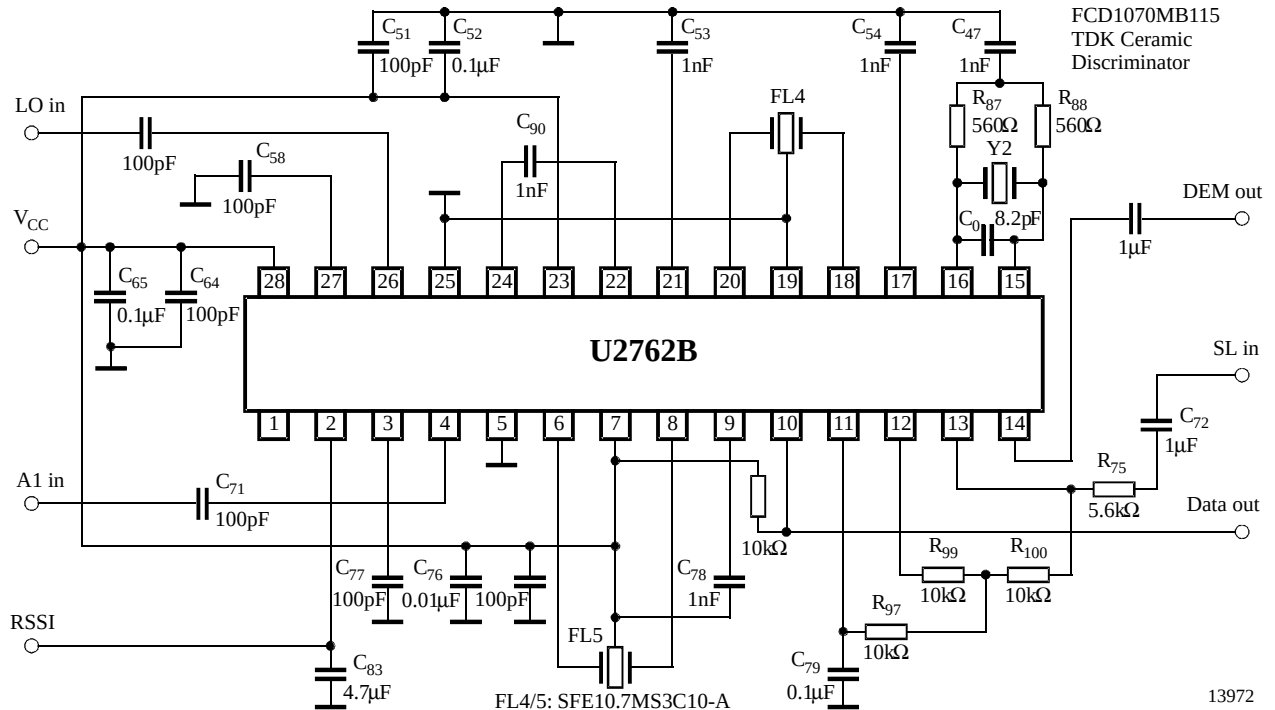
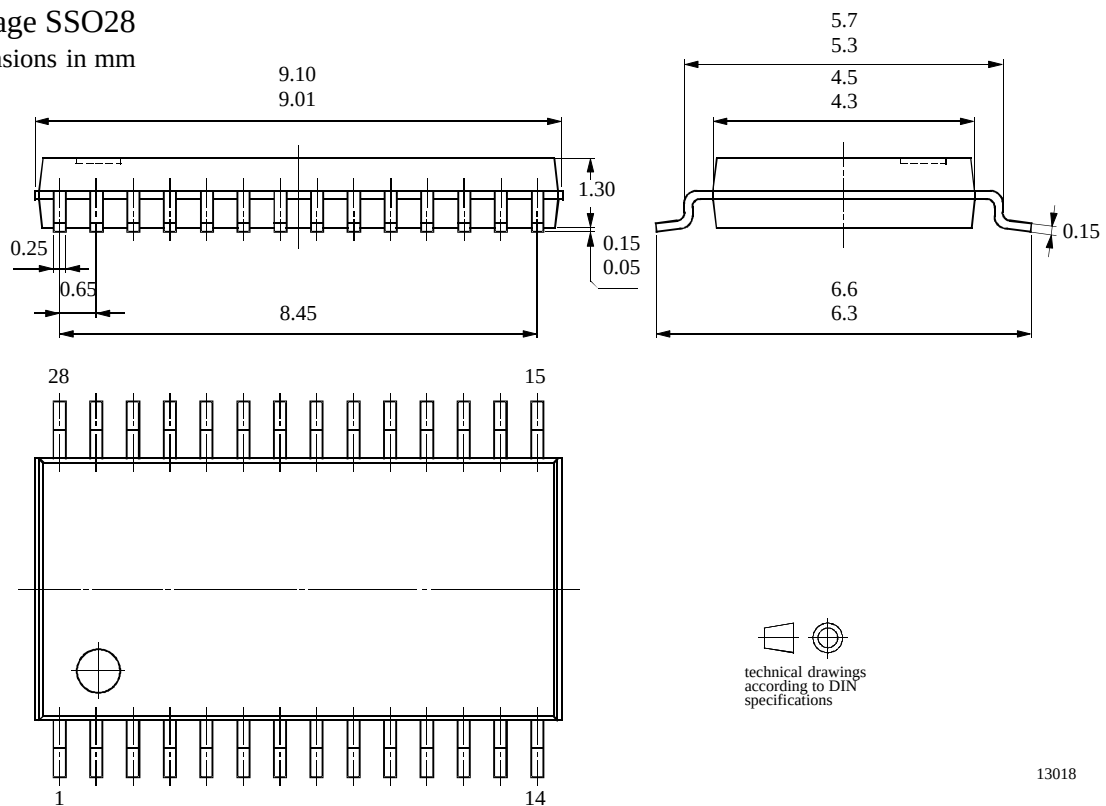


Figure 17. Application circuit

Package Information

Package SSO28

Dimensions in mm



13018

Ozone Depleting Substances Policy Statement

It is the policy of **Atmel Germany 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.

Atmel Germany 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.

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

We reserve the right to make changes to improve technical design and may do so without further notice.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Atmel Wireless & Microcontrollers products for any unintended or unauthorized application, the buyer shall indemnify Atmel Wireless & Microcontrollers against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

Data sheets can also be retrieved from the Internet: <http://www.atmel-wm.com>

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