

CT2 RX/TX IC

Description

The IC U2760B for digital cordless telephone applications is fabricated using Atmel Wireless & Microcontrollers' most advanced UHF process. It covers the CT2 band (864 MHz to 868 MHz) as well as the CT2 Plus band (up to 952 MHz). The RX/TX circuit provides the down-conversion to the data stream and the up conversion from the first IF. Along with Atmel Wireless

& Microcontrollers' RF front end, Twin PLL, I/Q modulator and AMDs CT2 PhoX™ controller AM 79C4xx, a complete CT2 IC kit is available.

Electrostatic sensitive device.

Observe precautions for handling.



Features

- Low supply voltage 2.9 V typical (min. 2.7 V)
- Provides down-conversion to the data stream, up-conversion from the first IF
- Integrated UHF and VHF VCOs
- Low noise figure of RX path ($NF \leq 10$ dB)
- RX and TX power down
- First IF filter used for transmit as well receive mode
- Temperature-compensated logarithmic Receiver Signal Strength Indicator (RSSI) with a dynamic range of 75 dB
- Low power consumption in RX and TX mode (<20 mA typ.)
- SSO28 plastic package

Benefits

- Low power consumption results in extended talk time
- Few external components and very small package save space

Block Diagram (Simplified Schematic)

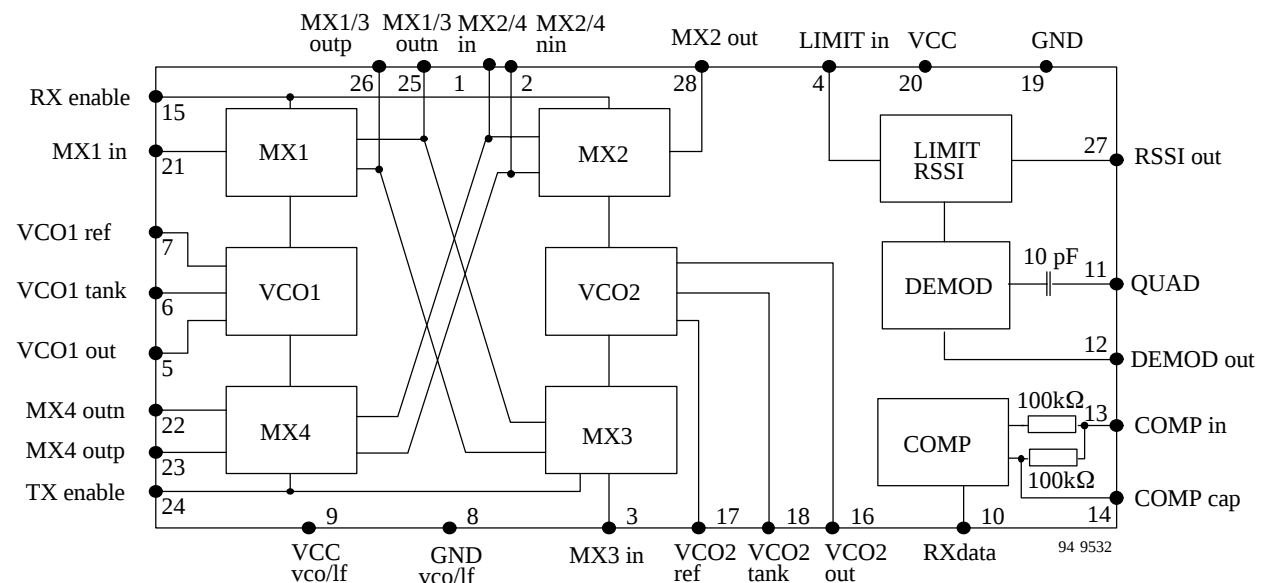


Figure 1. Block diagram (simplified schematic)

Ordering Information

Extended Type Number	Package	Remarks
U2760B-AFS	SSO28	Tube, MOQ 600 pcs.
U2760B-AFSG3	SSO28	Taped and reeled, MOQ 4000 pcs.

Functional Description

MX1

Mixer 1 converts the RF signal to the first IF. It has a high impedance, asymmetrical input and a symmetrical open collector output.

MX2

The second mixer provides the down conversion to the second IF. An external SAW filter is connected to the input to provide rejection of the image frequency and spurious signals that went through the RF filtering.

LIMITER / RSSI

This block contains a high-gain (100 dB) amplifier, providing a limited signal at the second IF frequency for the demodulation, as well as a signal-strength indicator providing an output voltage proportional to the input power.

DEMODO

The quadrature demodulator in the receiving path contains an internal 10-pF quadrature capacitor to couple the IF signal to the external tank providing the 90 degree phase shift. An external bit slicer reshapes the bits, a sample and hold circuit maintains the average DC value at the demodulator when switching the signal between transmission and reception.

COMP

The comparator circuit with 100-k Ω input resistor and external input biasing has a 10-mV hysteresis. It is designed to square up the demodulated data signal.

MX3

The third mixer converts the 800-kHz signal coming from the modulator circuit to the IF frequency. It has a high impedance, asymmetrical input and a symmetrical open collector output.

MX4

This mixer is designed for the up conversion of the RF frequency. It has a high impedance, unsymmetrical input and a symmetrical open collector output. The image rejection is obtained by external RF filtering.

The same first IF filter is used for the transmit as well as the receive path. In the transmit path, this filter is supposed to eliminate the mixing products from MX3, in particular, the harmonics of the IF frequency.

VCO1

The UHF VCO covers the frequency band up to 700 MHz. For external VCO applications this circuit can be used as a buffer stage.

VCO2

This VCO covers a frequency band up to 400 MHz.

Pin Description

Pin	Symbol	Function
1	MX2/4in	Mixer 2/ Mixer 4 input
2	MX2/4nin	Mixer 2/ Mixer 4 ref. input
3	MX3in	Mixer 3 input
4	LIMITin	Limiter/RSSI input
5	VCO1out	VCO1 output (to PLL)
6	VCO1tank	VCO1 resonator
7	VCO1ref	VCO1 resonator, to be blocked
8	GNDvco/lf	Ground VCO, low frequency parts
9	VCCvco/lf	Power supply VCO/LF parts
10	RXdata	RX data output
11	QUAD	Quadrature filter
12	DEMODOut	Demodulator output
13	COMPin	Comparator input
14	COMPcap	Comparator blocking capacitor
15	RXenable	RX enable
16	VCO2out	VCO2 output (to PLL)
17	VCO2ref	VCO2 resonator, to be blocked
18	VCO2tank	VCO2 resonator
19	GND	Ground
20	VCC	Power-supply voltage
21	MX1in	Mixer 1 input
22	MX4outn	Mixer 4 output n
23	MX4outp	Mixer 4 output p
24	TXenable	TX enable
25	MX1/3outn	Mixer 1/ Mixer 3 output n
26	MX1/3outp	Mixer 1/ Mixer 3 output p
27	RSSIout	Signal-strength output
28	MX2out	Mixer 2 output

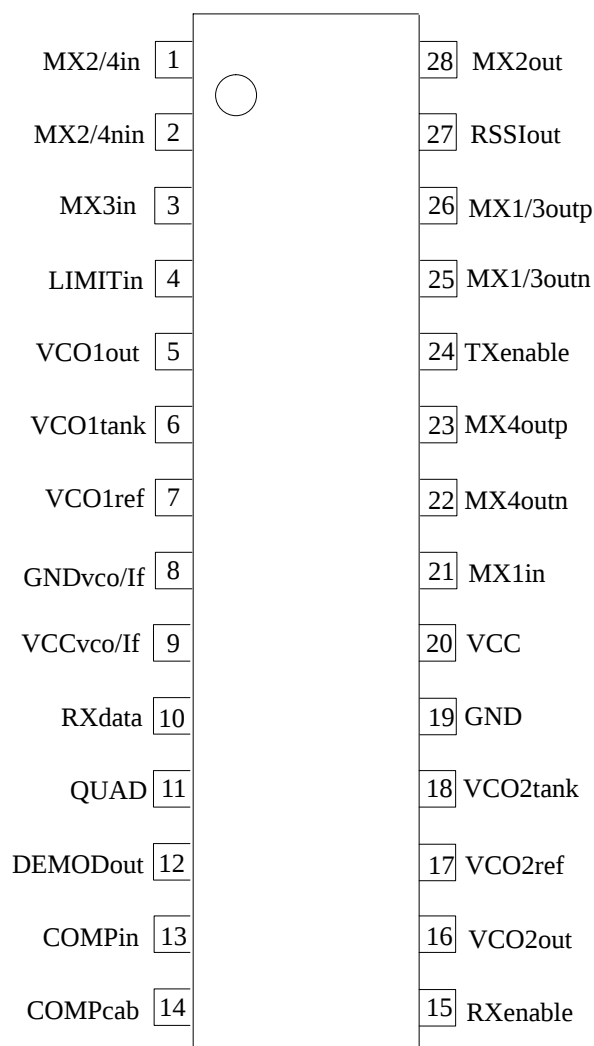
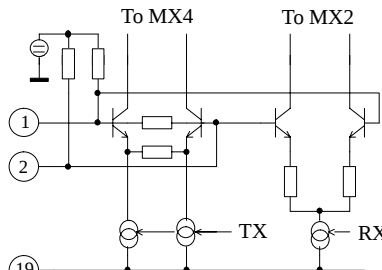
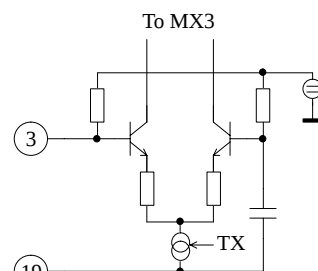
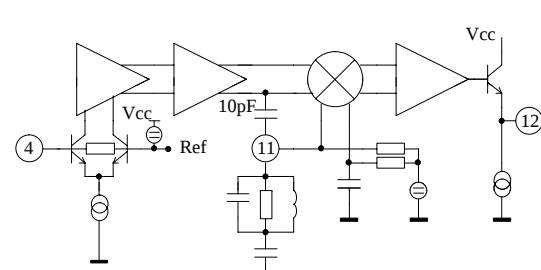
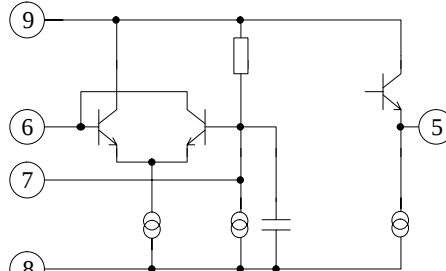
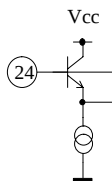
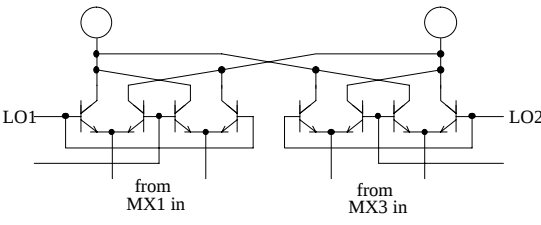
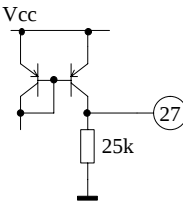
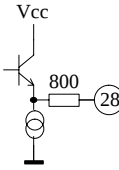


Figure 2. Pinning

Pin Functions

Pin	Symbol	Pin Voltage	Function	Equivalent Circuit
1	MX2/4in	1.5	Mixer 2/ Mixer 4 input	
2	MX2/4nin	1.5	Mixer 2/ Mixer 4 complementary input Pin 1 is the input of the mixers, Pin 2 can either be used for differential input signals, or should be connected to GND via a bypass capacitor	
3	MX3in	1.7 (RX) 2.4 (TX)	Mixer 3 input complementary input is internally connected to GND via a bypass capacitor	
4	LIMITin	2.1	Limiter/RSSI input	
11	QUAD	1.5	Quadrature filter	
12	DEMODOout	1.2	Demodulator output	
5	VCO1out	1.1	VCO1 output (to PLL)	
6	VCO1tank	1.5	VCO1 resonator	
7	VCO1ref	1.5	VCO1 reference, to be blocked. This Pin is also internally connected to GND via a bypass capacitor	
8	GNDvco/lf	–	Ground VCO, low frequency parts	
9	VCCvco/lf	–	Power supply VCO/LF parts	

Pin	Symbol	Pin Voltage	Function	Equivalent Circuit
10	RXdata	0 to 2.9	RX data output	
13	COMPIn	1.2	Comparator input	
14	COMPcap	1.2	Comparator blocking capacitor	
15	RXenable	–	RX enable	
16	VCO2out	1.1	VCO2 output (to PLL)	
17	VCO2ref	1.6	VCO2 resonator, to be blocked	
18	VCO2tank	1.6	VCO2 resonator	
19	GND	–	Ground (mixer parts)	
20	VCC	–	Power supply (mixer parts)	
21	MX1in	1.5	Mixer 1 input complimentary input is internally connected to GND via a bypass capacitor	
22	MX4outn	–	Mixer 4 output n	
23	MX4outp	–	Mixer 4 output p	

Pin	Symbol	Pin Voltage	Function	Equivalent Circuit
24	TXenable	–	TX enable	
25	MX1/3outn	–	Mixer 1/ Mixer 3 output n	
26	MX1/3outp	–	Mixer 1/ Mixer 3 output p	
27	RSSIout	0.2 to 2.7	Signal-strength output	
28	MX2out	1.0 (RX) 2.4 (TX)	Mixer 2 output	

Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage	V_{CC}	0 to +5	V
Input voltages Pins 1, 2, 3, 4, 13, 14, 15, 21 and 24	V_{in}	0 to V_{CC}	V
Input voltages Pins 6, 7, 17 and 18	V_{in}	1.5	V
Junction temperature	T_j	125	°C
Storage1–temperature range	T_{stg}	–40 to +125	°C

Thermal Resistance

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

Operating Conditions

Parameters	Symbol	Value	Unit
Supply voltage	V_{CC}	2.7 to 3.6	V
Operating temperature	T_{amb}	–5 to +45	°C

Electrical Characteristics: Receiver Input Mixer (MX1)

Test conditions (unless otherwise specified): $V_{CC} = 2.9$ V, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{RF} = 866.05$ MHz, $f_{IF1} = 240.05$ MHz.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pin 20	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9$ V, Pin 20	I_s		3		mA
Input impedance	Pin 21	Z_{in}		3		k Ω
Input frequency	Pin 21	f_{in}			1000	MHz
Output frequency	Pins 25 and 26	f_{out}		240	300	MHz
Power gain	Pins 21, 25 and 26	G_p		8		dB
Noise figure	Pins 21, 25 and 26	NF		8	10	dB
Compression	Pins 21, 25 and 26	P_{1dB}	–18			dBm
Third-order input intercept point	Pins 21, 25 and 26	IIP3	–8			dBm
LO to RF isolation	Pin 21	IsolLO	20			dB
LO $\pm$ (IF/2) response	@ $P_{in} = -84$ dBm, Pin 21				–10	dB

Electrical Characteristics: Receiver IF Mixer (MX2)

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{IF1} = 240.05\text{ MHz}$, $f_{IF2} = 800\text{ kHz}$.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pin 20	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 20	I_s		3		mA
Input impedance	Pin 1	Z_{in}	130	200	300	Ω
Input frequency	Pin 1	f_{in}			300	MHz
Output frequency	Pin 28	f_{out}		0.8	15	MHz
Power gain	Pins 1 and 28	G_p	10	11		dB
Noise figure	Pins 1 and 28	NF			20	dB
Compression	Pins 1 and 28	P_{1dB}	-20			dBm
Third-order input intercept point	Pins 1 and 28	IIP3	-10			dBm
LO to RF isolation	Pin 1	IsolLO	20			dB
LO $\pm$ (IF/2) response	@ $P_{in} = -40\text{ dBm}$, Pin 1				-35	dB

Electrical Characteristics: RSSI/Limiter Amplifier

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{LIMIT} = 800\text{ kHz}$.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pin 9	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 9	I_s		1.5		mA
Input impedance	Pin 4	Z_{in}		1500		Ω
Voltage gain	Pin 4	G_v		100		dB
Frequency range	Pin 4	f_{Limit}	0.5	0.8	5	MHz
RSSI range	Pins 4 and 27		-90		-15	dBm
RSSI voltage	@ P_{min} Pins 4 and 27	$V_{RSSImin}$	0.2		0.4	V
RSSI voltage	@ P_{max} Pins 4 and 27	$V_{RSSImax}$	2.4		2.6	V
RSSI accuracy	Pins 4 and 27		-2		2	dB
Output impedance	Pins 27	R_{RSSI}	19	24	29	$k\Omega$
Rise time	$C_{RSSI} = 1\text{ nF}$, Pin 27	t_r			50	μs
Fall time	$C_{RSSI} = 1\text{ nF}$, Pin 27	t_f			50	μs

Electrical Characteristics: Demodulator

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{LIMIT} = 800\text{ kHz}$.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pin 9	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 9	I_s		0.2		mA
Output voltage	$\pm 18\text{ kHz}$ deviation, Pins 4 and 12	V_{out}		120		mV _{rms}

Electrical Characteristics: Comparator

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pin 9	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 9	I_s		0.15		mA
Input hysteresis	Pins 13 and 14			10		mV
Output HIGH voltage	R_{Load} to GND $\geq 500\text{ k}\Omega$, Pin 10		2.3			V
Output LOW voltage	R_{Load} to $V_{CC} \geq 50\text{ k}\Omega$, Pin 10				0.6	V

Electrical Characteristics: Transmitter IF Mixer (MX3)

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{in} = 800\text{ kHz}$, $f_{IF} = 240.05\text{ MHz}$.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply voltage range	Pin 20	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 20	I_s		1.3		mA
Input impedance	Pin 2	Z_{in}		5		$\text{k}\Omega$
Input frequency	Pin 3	f_{in}		0.8	15	MHz
Output frequency	Pins 25 and 26	f_{out}		250	300	MHz
Output power	$V_{inpp} = 320\text{ mV}$ Pins 25 and 26	P_{out}		-16		dBm
Noise figure	Pins 2, 25 and 26	NF			25	dB

Electrical Characteristics: Transmitter Output Mixer (MX4)

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f_{IF} = 240.05\text{ MHz}$, $f_{RF} = 866.05\text{ MHz}$.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply-voltage range	Pin 20	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 20	I_S		3.5	4	mA
Input impedance	Pin 1	Z_{in}	130	200	300	Ω
Input frequency	Pin 1	f_{in}			300	MHz
Output frequency	Pins 22 and 23	f_{out}			900	MHz
Output power	$P_{In} = -22\text{ dBm}$, Pins 22 and 23	P_{out}	-16	-14		dBm
Noise figure	Pins 1, 22 and 23	NF			12	dB
LO leakage	Pins 22 and 23	Lk_{LO}			-34	dBm
IF leakage	Pins 22 and 23	Lk_{IF}			-45	dBm
(2 × IF) leakage	Pins 22 and 23	Lk_{2IF}			-55	dBm
(3 × IF) leakage	Pins 22 and 23	Lk_{3IF}			-65	dBm
(n × IF) leakage, $n > 3$	Pins 22 and 23	Lk_{nIF}			-60	dBm

Electrical Characteristics: UHF Voltage-Controlled Oscillator (VCO1)

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f = 626\text{ MHz}$

Parameters	Test Conditions / Pins	Symbol	Min	Typ	Max	Unit
Supply-voltage range	Pin 9	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 9	I_S		3		mA
Frequency bandwidth	Pins 5, 6 and 7	f_{Bw}			700	MHz
Phase noise $\pm 100\text{ kHz}$	Pins 5, 6 and 7	P_N			-86	dBc/Hz
Phase noise $\pm 200\text{ kHz}$	Pins 5, 6 and 7	P_N			-104	dBc/Hz
Phase noise $\pm 300\text{ kHz}$	Pins 5, 6 and 7	P_N			-109	dBc/Hz
Phase noise $\pm 400\text{ kHz}$	Pins 5, 6 and 7	P_N			-125	dBc/Hz
Phase noise @ 50 MHz	Pins 5, 6 and 7	P_N			-150	dBc/Hz
Output power	50- Ω termination, Pin 5	P_{out}	-15			dBm

Electrical Characteristics: VHF Voltage-Controlled Oscillator (VCO2)

Test conditions (unless otherwise specified): $V_{CC} = 2.9\text{ V}$, $T_{amb} = 25^{\circ}\text{C}$, referred to application circuit, $f = 239.25\text{ MHz}$

Parameters	Test Conditions / Pins	Symbol	Min	Typ	Max	Unit
Supply-voltage range	Pin 9	V_{CC}	2.7	2.9	3.6	V
Supply current	@ $V_{CC} = 2.9\text{ V}$, Pin 9	I_S		2.5		mA
Frequency bandwidth	Pins 16, 17 and 18	f_{BW}			400	MHz
Phase noise 100 kHz	Pins 16, 17 and 18	P_N			– 86	dBc/Hz
Phase noise 200 kHz	Pins 16, 17 and 18	P_N			– 114	dBc/Hz
Phase noise 300 kHz	Pins 16, 17 and 18	P_N			– 119	dBc/Hz
Phase noise 400 kHz	Pins 16, 17 and 18	P_N			– 135	dBc/Hz
Phase noise @ 50 MHz	Pins 16, 17 and 18	P_N			– 150	dBc/Hz
Output power	50 Ω termination, Pin 16	P_{out}	– 15			dBm

Application Circuit

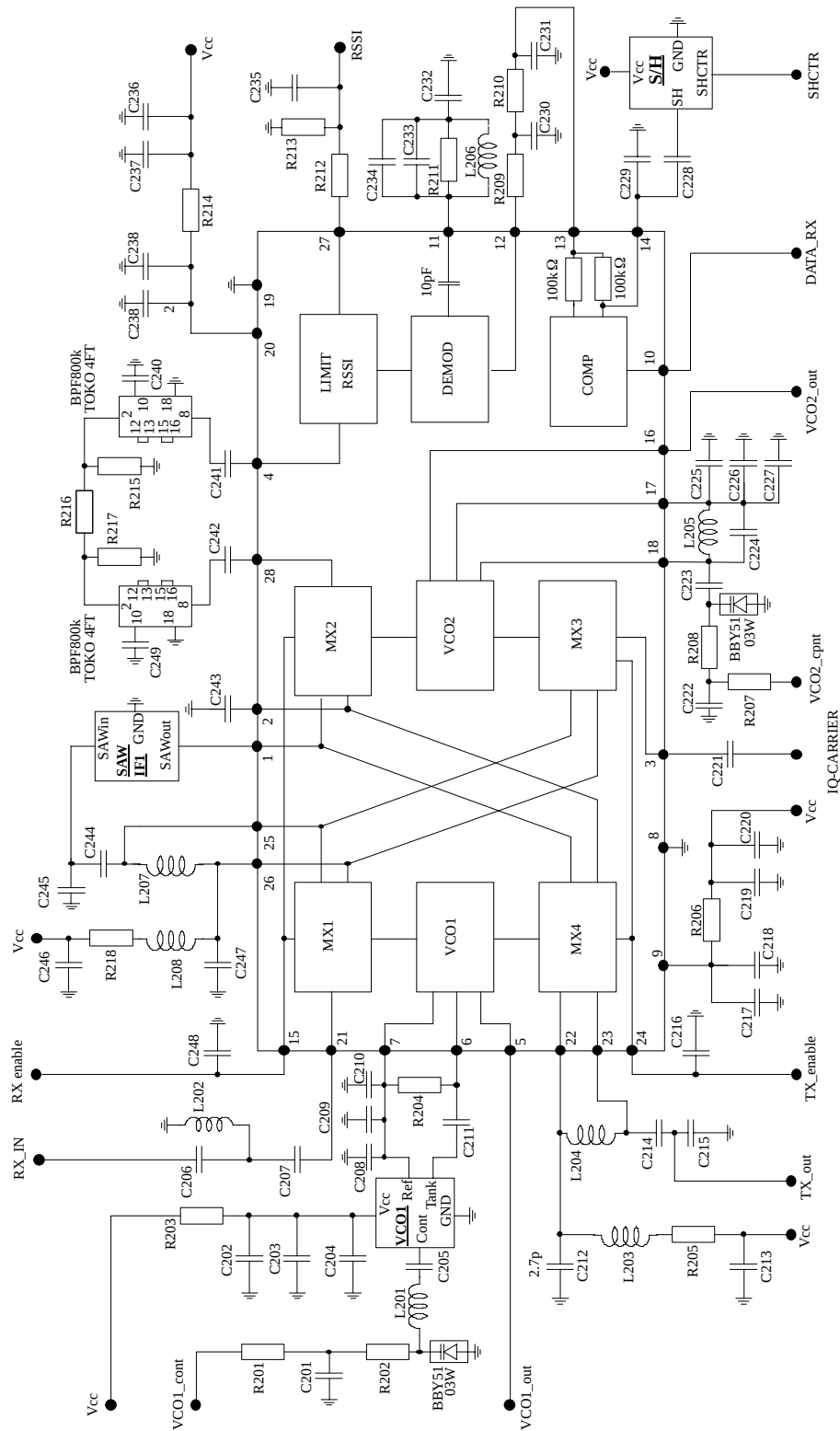


Figure 3. Application circuit

Applications Information

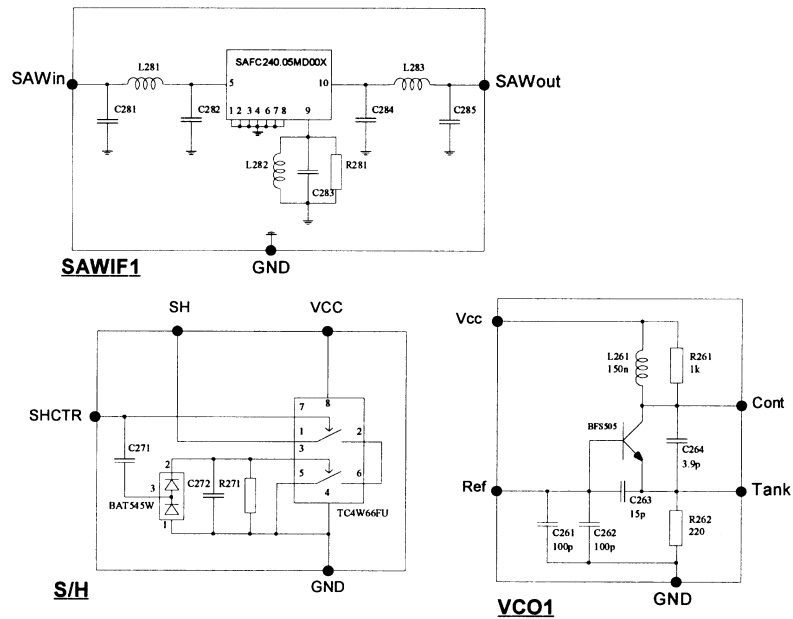
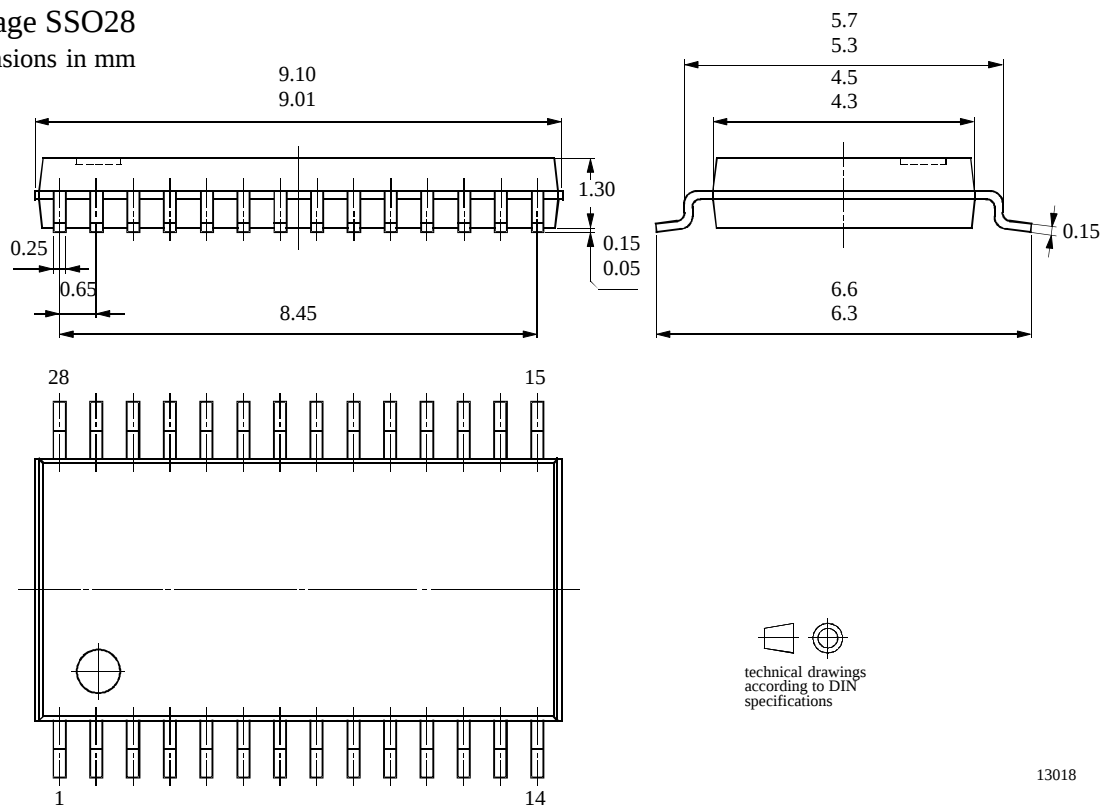


Figure 4. Application information

Package Information

Package SSO28

Dimensions in mm



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.

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

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

TEMIC Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2594, Fax number: 49 (0)7131 67 2423