# VHF/ UHF-Tuner-IC

## Description

This tuner IC requires a power supply of 12 V and performs the function of three separate oscillators and mixers, SAWF-driver, L.O.-output and tri-state band switch. Applications are 12 V TV- and VCR-tuners.

## Features

- Frequency range from 48 to 860 MHz
- Band A: balanced high impedance mixer input and amplitude controlled oscillator
- Band B + C: balanced low impedance mixer input and symmetrical oscillator
- Balanced L.O.-output for prescalers or PLL
- SAW filter driver with low impedance output
- Voltage regulator for stable operating characteristics
- ESD protection on all pins except oscillator pins and RF-inputs

## Benefits

- The integration of 3 bands allows to design economical 3-band tuners

## Block Diagram

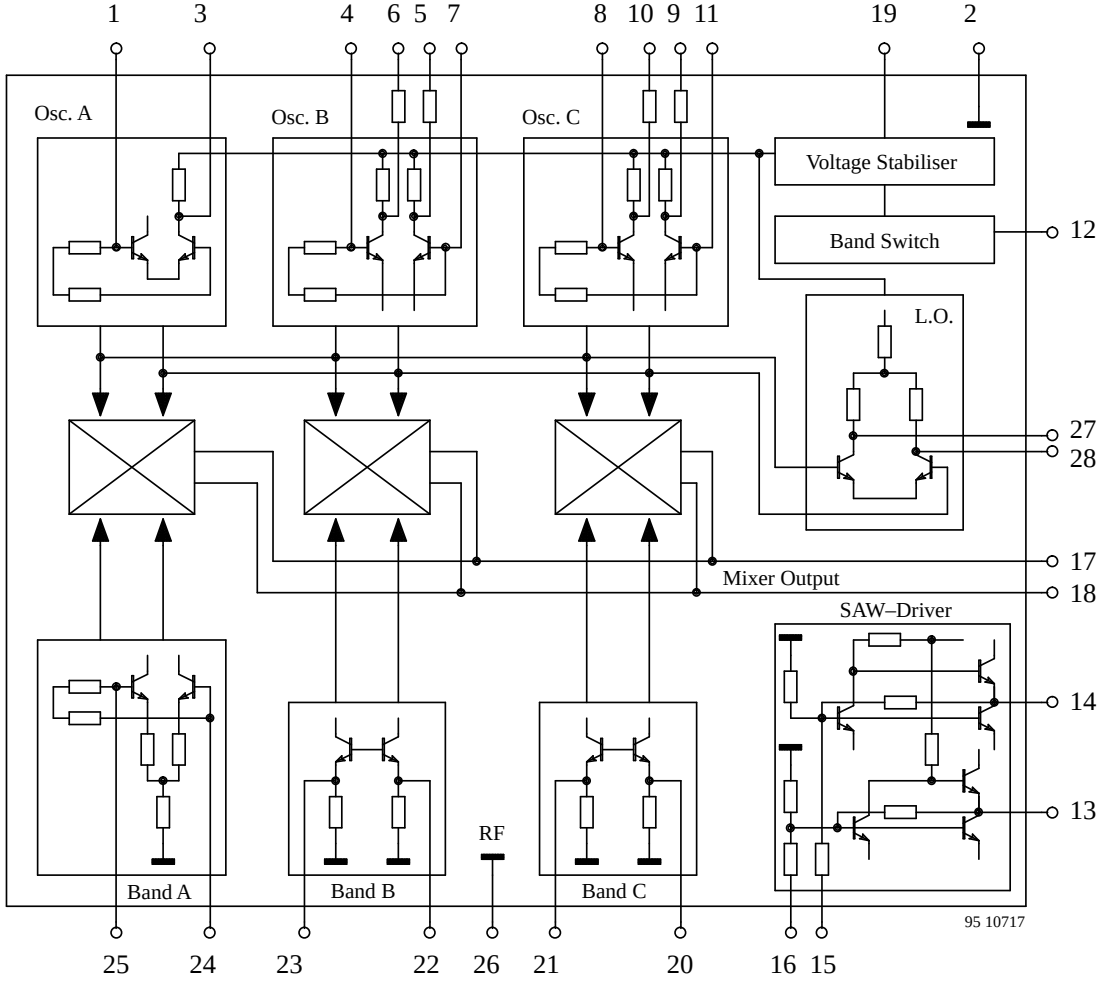
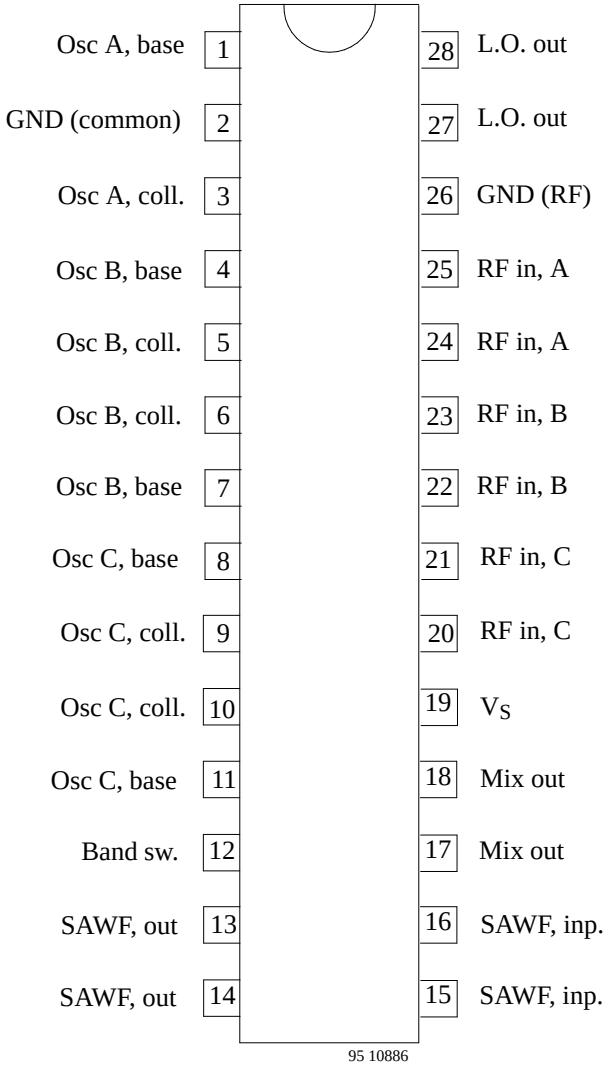



Figure 1. Block diagram

## Pin Description




| Pin | Symbol | Function |
|---|---|---|
| 1 | Osc A, base | Oscillator band A, base |
| 2 | GND (common) | Ground, common |
| 3 | Osc A, coll. | Oscillator band A, collector |
| 4, 7 | Osc B, base | Oscillator band B, bases |
| 5, 6 | Osc B, coll. | Oscillator band B, collectors |
| 8, 11 | Osc C, base | Oscillator band C, bases |
| 9, 10 | Osc C, coll. | Oscillator band C, collectors |
| 12 | Band sw. | Tri-state band switch |
| 13, 14 | SAWF, out | SAW filter driver outputs |
| 15, 16 | SAWF, inp. | SAW filter driver inputs |
| 17, 18 | Mix out | Mixer outputs, open collector |
| 19 | $V_S$ | Supply voltage $V_s$ |
| 20, 21 | RF in, C | RF inputs, band C |
| 22, 23 | RF in, B | RF inputs, band B |
| 24, 25 | RF in, A | RF inputs, band A |
| 26 | GND (RF) | Ground, RF part |
| 27, 28 | L.O. out | L.O.-outputs |

## Ordering Information

| Extended Type Number | Package | Remarks |
|---|---|---|
| U2300B-FLG3 | SO28 | Taped and reeled |

## Absolute Maximum Ratings

All voltages are referred to GND, Pin 2

| Parameters | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply voltage | Pin 19 | $V_s$ | | | 13.5 | V |
| RF inputs | Pin 20-25 | | | | 5.0 | V |
| IF outputs | Pin 17-18 | | | | 13.5 | V |
| Tri-state switch voltage | Pin 12 | ViDSW | | | 13.5 | V |
| Junction temperature | | $T_{jmax}$ | | | 125 | °C |
| Storage temperature | | $T_{stg}$ | –40 | | 125 | °C |

## Operating Range

All voltages are referred to GND, Pin 2

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply voltage | Pin 17-19 | $V_s$ | 10.8 | 12 | 13.2 | V |
| Ambient temperature | | $T_{amb}$ | –25 | | 75 | °C |
| Thermal resistance | Test conditions page 5, Package SO-28 | $R_{thJA}$ | | 70 | | K/W |

## Electrical Characteristics

Test conditions: $V_s$ = 12 V, $T_{amb}$ = 25°C, unless otherwise specified, reference point Pin 2, referred to test circuit page 5

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply voltage | Pin 17-19 | $V_S$ | 10.8 | 12.0 | 13.2 | V |
| Supply current | Pin 17-19 | $I_S$ | | 42 | 50 | mA |
| **Band switch** | | | | | | |
| Voltage Band A | Pin 12 | VSWA | 0 | 0 | 1.0 | V |
| Voltage Band B | Pin 12 | VSWB | 1.6 | 2.0 | 2.4 | V |
| Voltage Band C | Pin 12 | VSWC | 3.4 | 4.0 | 5.0 | V |
| Switching current | VSW = 5 V Pin 12 | ISW | | | 100 | µA |
| L.O.-output | | | | | | |
| L.O. level each output | $R_L$ = 50 Ohm Pin 27, 28 | PLO | –25 | | –17 | dBm |
| **SAW filter driver** fi = 36 MHz | | | | | | |
| Input impedance | Pin 15, 16 | ZiSAW | | 450 | | Ohm |
| Output impedance | Pin 13, 14 | ZoSAW | | 70 | | Ohm |
| Voltage gain | 15, 16 → 13, 14 | GvSAW | | 18 | | dB |
| **Band A** | | | | | | |
| Input frequency range | Pin 24 | fiA | 48 | | 170 | MHz |
| Input impedance | Figure 3 Pin 24 | S11A | | | | |
| Gain (note 4) | Pin I/P to O/P | GA | | 29 | | dB |
| Noise figure DSB (note 2) | Pin I/P to O/P<br>fiA = 50 MHz<br>fiA = 150 MHz | <br>NF<br>NF | | <br>11.5<br>12 | | <br>dB<br>dB |
| Input level for (note 3): | Each carrier | | | | | |
| IM3 (interm. of 3rd order | fiA = 71 MHz Pin I/P | ViA | | –21 | | dBm |
| IM2 (interm. of 2nd order) | fiA = 71 MHz Pin I/P | ViA | | –21 | | dBm |
| **Band B (note 1)** | | | | | | |
| Input frequency range | Pin 22, 23 | fiB | 170 | | 470 | MHz |
| Input impedance | Figure 3 Pin 22, 23 | S11B | | | | |
| Gain (note 4) | Pin I/P to O/P | GB | | 33 | | dB |
| Noise figure DSB (note 2) | Pin I/P to O/P<br>fiB = 200 MHZ<br>fiB = 450 MHz | <br>NF<br>NF | | <br>9.5<br>10 | | <br>dB<br>dB |
| Input level for (note 3) | Each carrier | | | | | |
| IM3 (interm. of 3rd order) | fiB = 300 MHz Pin I/P | ViB | | –26 | | dBm |

| Parameters | Test Conditions / Pins | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Band C (note 1)** | | | | | | |
| Input frequency range | Pin 20, 21 | fiC | 470 | | 860 | MHz |
| Input impedance | Figure 3 Pin 20, 21 | S11C | | | | |
| Gain | Pin I/P to O/P | GC | | 33 | | dB |
| Noise figure DSB (note 2) | Pin I/P to O/P | | | | | |
| | fiC = 500 MHZ | NF | | 10.5 | | dB |
| | fiC = 800 MHz | NF | | 11.5 | | dB |
| Input level for (note 3): | Each carrier | | | | | |
| IM3 (interm. of 3rd order) | fiC = 600 MHz Pin I/P | ViC | | –26 | | dBm |

**Notes**

1 The RF input B and C are symmetrical driven by means of a hybrid for 180° phase shifting, consequently the source impedance is 100 Ω. All other impedance for RF tests is 50 Ω.

2 The noise figure (NF) is the value for double-side-band measurement.

3 The intermodulation test (2-carrier-method) which is made on IF-centre is in reference to a signal-to-IM ratio of 60 dB.

4 Gain is the ratio of the voltage at the primary coil of L5 to the available voltage at the input.

## Test and Principle Application Circuit

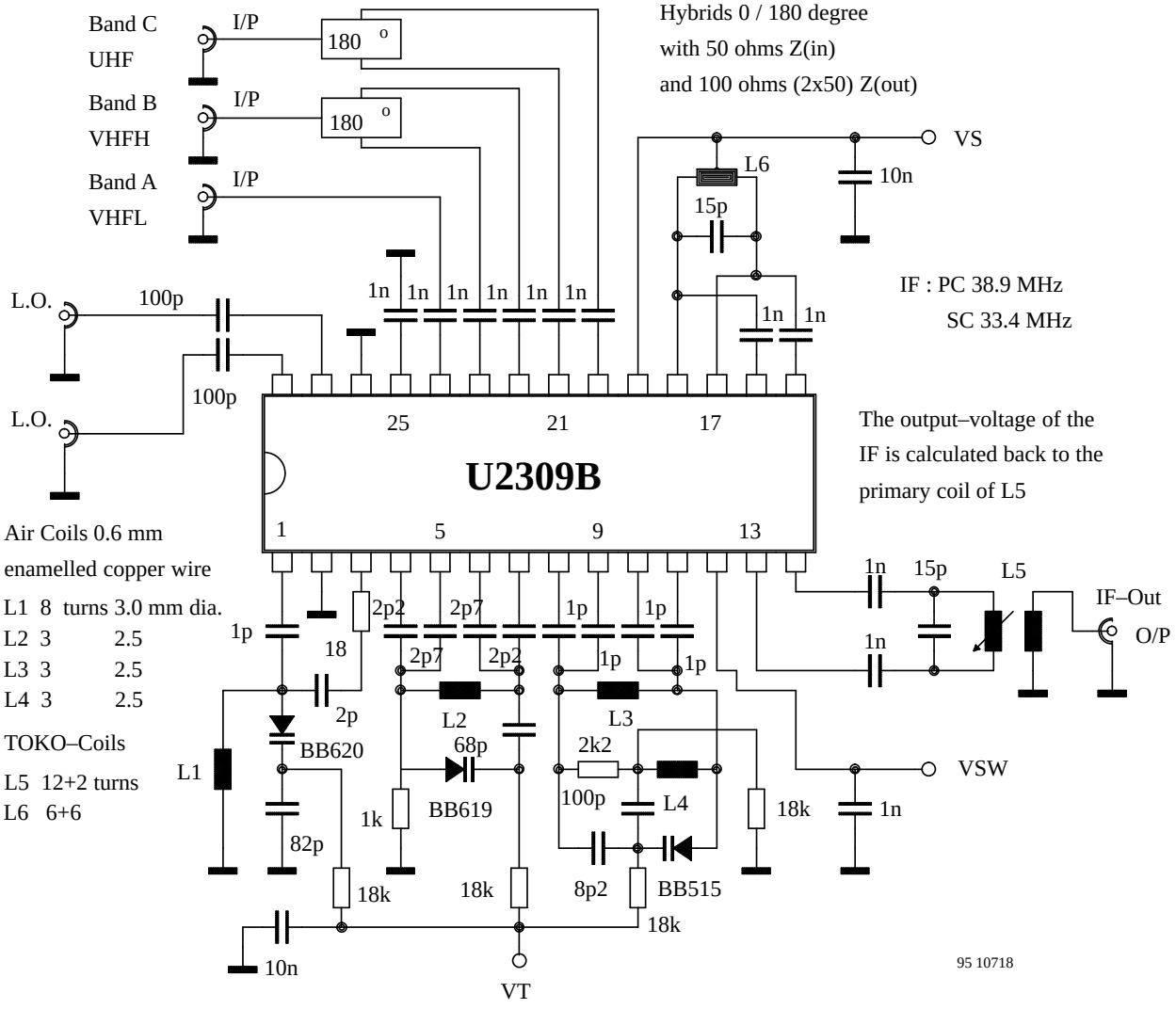



Figure 1. Test and principle application circuit

## PCB for the $R_{thJA}$-Measurement

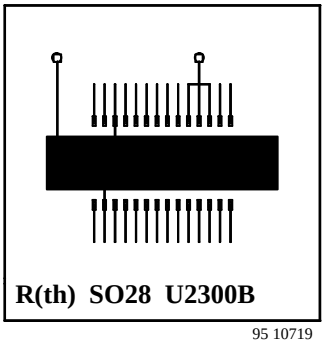
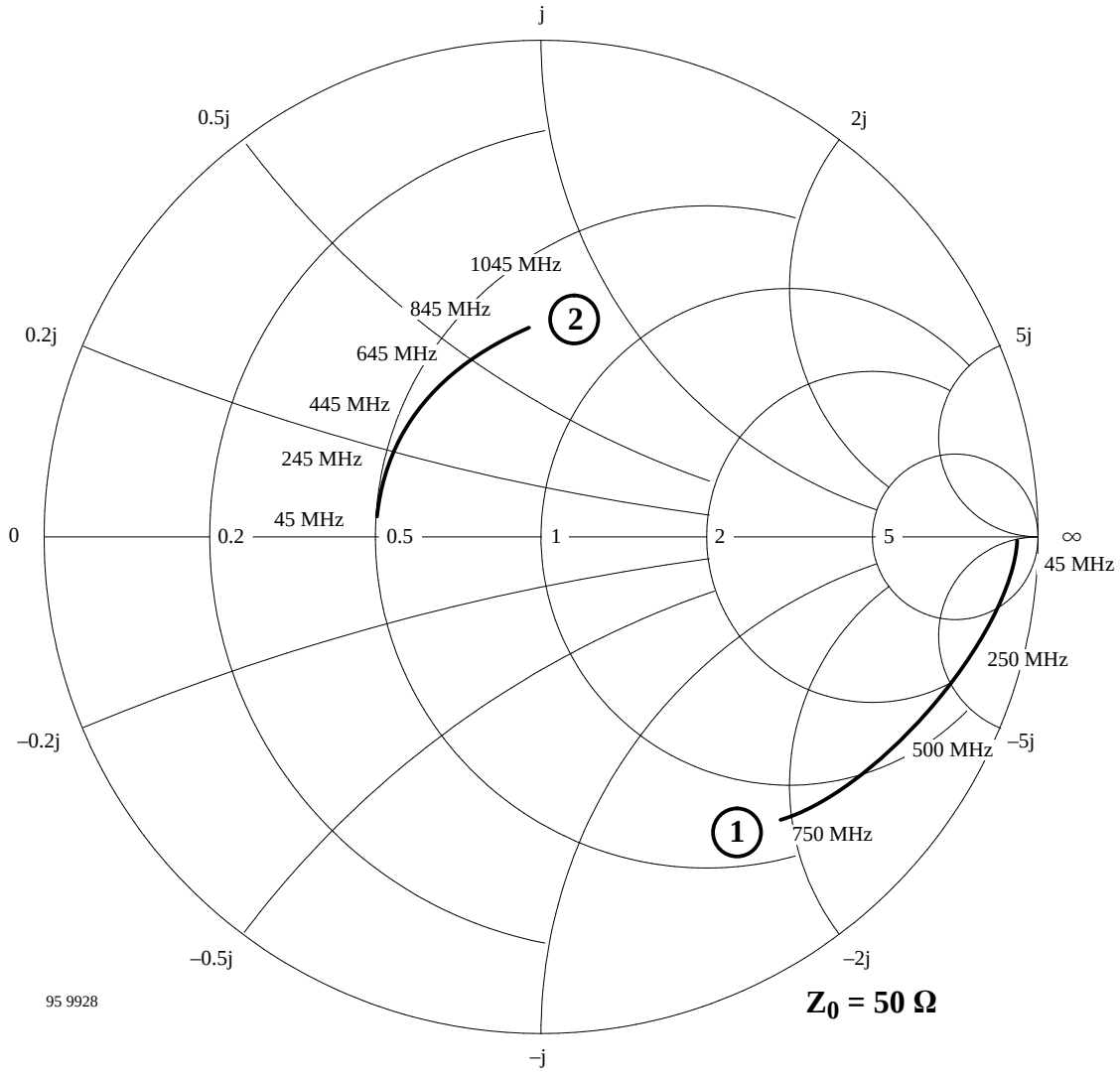



Figure 2. **PCB for the $R_{thJA}$-Measurement**

## Input Impedance Mixer Band A (S11A), B and C (S11B/C)



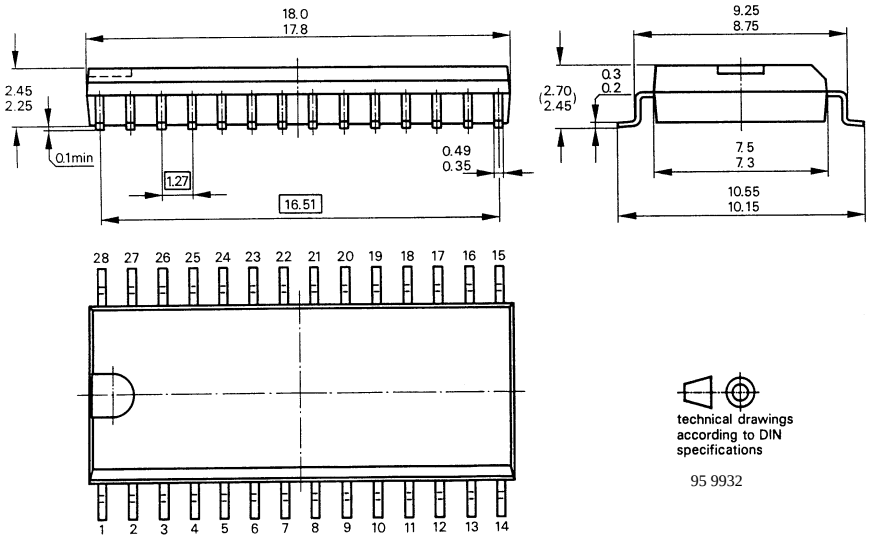

1 **VHF-Low**
Normalised to 50 Ω, measuring range 45 MHz to 750 MHz.

2 **UHF-High and UHF**
Normalised to 50 Ω, measuring range 45 MHz to 1045 MHz. Both inputs are driven symmetrical.
The output impedance of hybrid is 100 Ω, the measured levels are then calculated in reference to 50 Ω.

Figure 3. Input impedance mixer band A (S11A), B and C (S11B/C)

## Dimensions in mm

Package: SO28



## 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