

## VHF/ UHF-Tuner-IC

### Description

This tuner IC requires a power supply of 9 V and performs the function of three separate oscillators an mixers, SAWF-driver, L.O.-output and tri-state band switch.

Additional to TV-tuner application this IC is usable for DAB (Digital Audio Broadcast) tuners.

### Features

- 9 V supply voltage
- 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.-outputs 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 and the small SSO28 package allows to design very small and economical 3-band tuners with high performance.

### Block Diagram

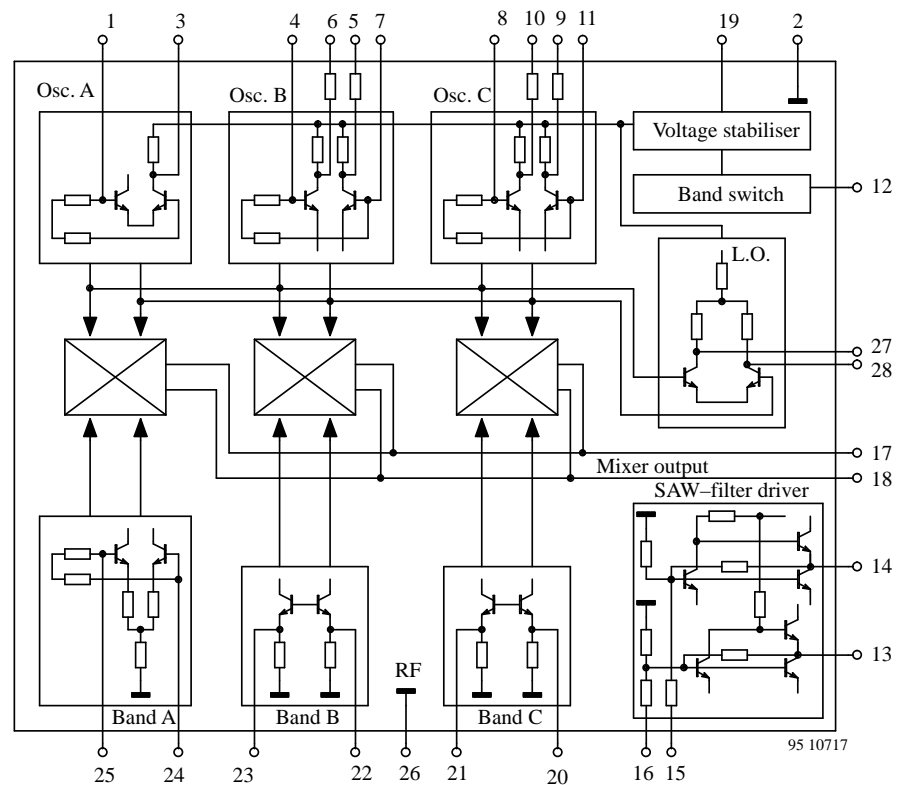
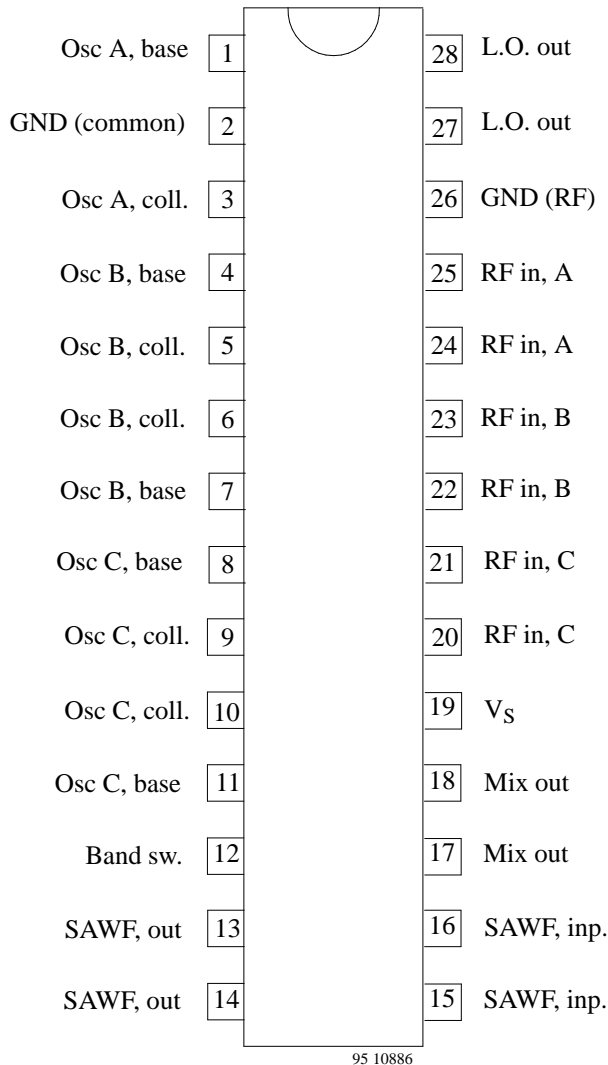


Figure 1. Block diagram

## 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 <sub>S</sub>	Supply voltage V <sub>S</sub>
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
U2309B-FLG3	SO28	Taped and reeled
U2309B-FSG3	SSO28	Taped and reeled

## Absolute Maximum Ratings

All voltages are referred to GND, Pin 2

Parameters	Symbol	Min.	Typ.	Max.	Unit
Supply voltage Pin 19	$V_S$			10.5	V
RF inputs Pin (20-25)				5.0	V
IF outputs Pin 17-18				10.5	V
Tri-state switch voltage Pin 12	$V_{ITRI}$			10.5	V
Junction temperature	$T_j$			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	$V_S$	8.1	9	9.9	V
Ambient temperature		$T_{amb}$	-25		75	°C

## Thermal Resistance

Parameters	Symbol	Typ	Unit
Junction ambient Package SO28 soldered to PCB Package SSO28 soldered to PCB (see layout page 5)	$R_{thJA}$	70 128	K/W

## Electrical Characteristics

Test conditions (unless otherwise specified):  $V_S = 9$  V.  $T_{amb} = 25$  °C. Reference point Pin 2

Parameters	Test Conditions / Pins	Symbol	Min	Typ	Max	Unit
Supply voltage	Pin 17-19	$V_S$	8.1	9.0	9.9	V
Supply current	Pin 17-19	$I_S$		42	50	mA
<b>Band switch</b>						
Voltage band A	Pin 12	$V_{SWA}$	0	0	1.0	V
Voltage band B	Pin 12	$V_{SWB}$	1.6	2.0	2.4	V
Voltage band C	Pin 12	$V_{SWC}$	3.4	4.0	5.0	V
Switching current	$V_{SW} = 5$ V Pin 12	$I_{SW}$			100	μA
<b>L. O. -output</b>						
L. O. level each output	$R_L = 50$ Ohm Pin 27, 28	$P_{LO}$	-25		-17	dBm
<b>SAW filter driver</b> $f_i = 36$ MHz						
Input impedance	Pin 15, 16	$Z_{iSAW}$		450		Ohm
Output impedance	Pin 13, 14	$Z_{oSAW}$		70		Ohm
Voltage gain	Pin 15, 16 → 13, 14	$G_{vSAW}$		17		dB

## Electrical Characteristics (continued)

Parameters	Test Conditions / Pins	Symbol	Min	Typ	Max	Unit
<b>Band A</b>						
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		28		dB
Noise figure DSB (note 2)	Pin I/P to O/P fiA = 50 MHz	NF		11.5		dB
		NF		12		dB
Input level for (note 3):	Each carrier					
IM3 (interm. of 3rd order)	fiA = 71 MHz Pin I/P	ViA		-23		dBm
IM2 (interm. of 2nd order)	fiA = 71 MHz Pin I/P	ViA		-22		dBm
<b>Band B (note 1)</b>						
Input frequency range	Pin 22, 23	fiA	170		470	MHz
Input impedance	Pin 22, 23	S11B		see Fig. 3		
Gain (note 4)	Pin I/P to O/P	GB		32		dB
Noise figure DSB (note 2)	Pin I/P to O/P fiB = 200 MHz	NF		9.5		dB
		NF		10		dB
Input level for (note 3):	Each carrier					
IM3 (interm. of 3rd order)	fiB = 300 MHz Pin I/P	ViB		-28		dBm
<b>Band C (note 1)</b>						
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		32		dB
Noise figure DSB (note 2)	Pin I/P to O/P fiC = 500 MHz	NF		10.5		dB
		NF		11.5		dB
Input level for IM3 (interm. of 3rd order, note 3)	Each carrier fiC = 600 MHz Pin I/P	ViC		-28		dBm

### Notes

- 1) The RF inputs 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**

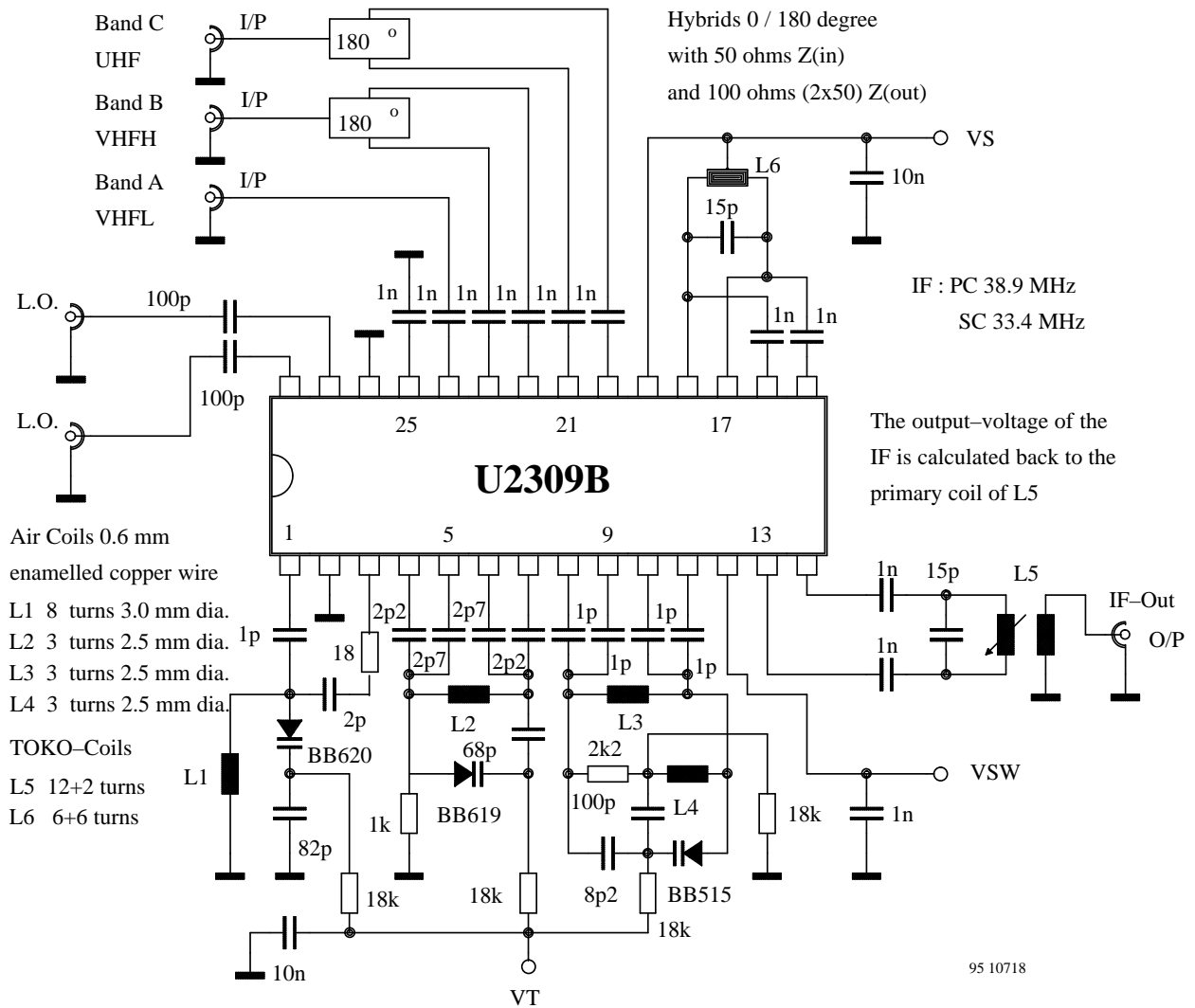
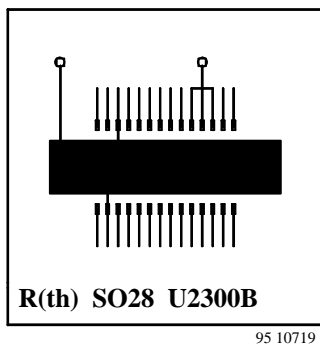


Figure 2. Test and principle application circuit

**PCB for the R<sub>thJA</sub>-Measurement**



Material: 35 μm one-sided Cu-coated epoxy PCB, 40 mm × 40 mm × 1.5 mm

Figure 3. PCB for the R<sub>thJA</sub>-measurement

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

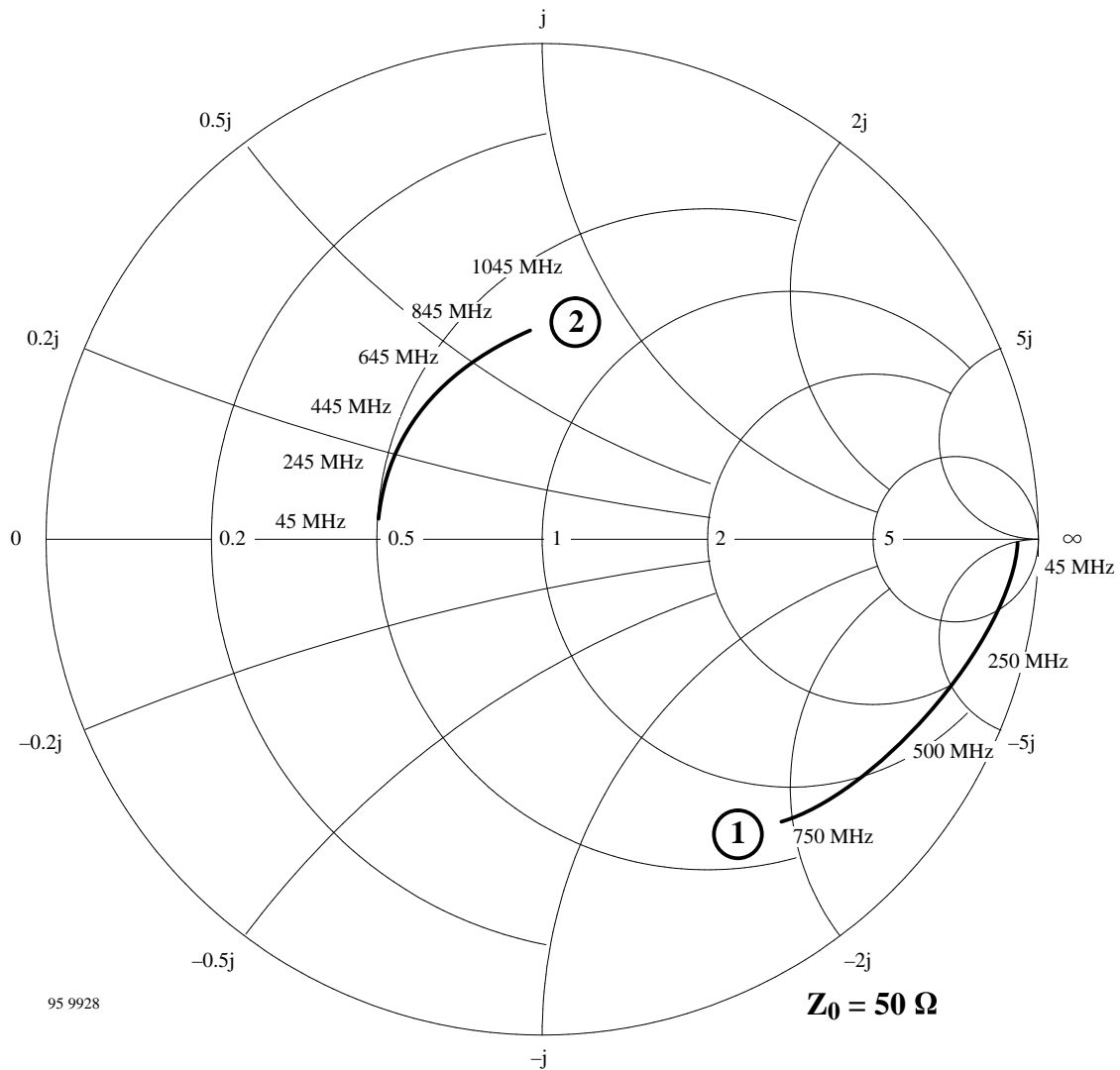
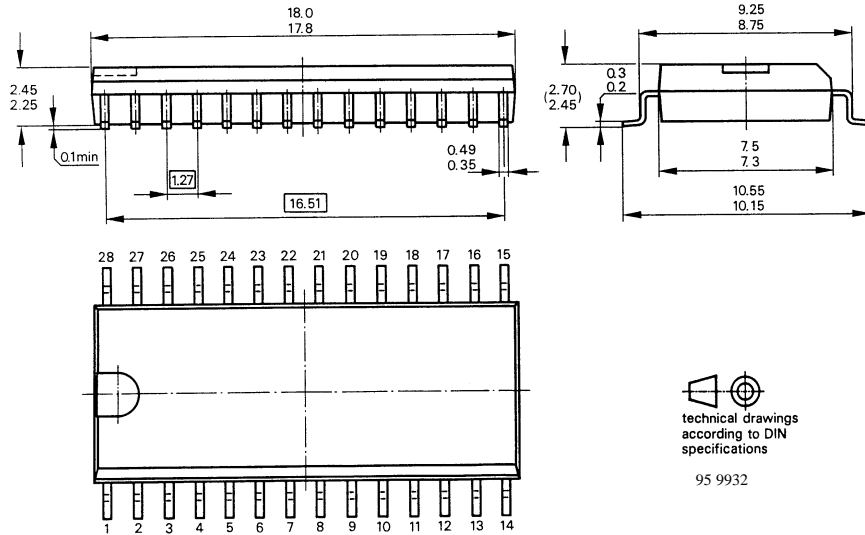


Figure 4. Input impedance mixer band A (S11A), B and C (S11B/C)

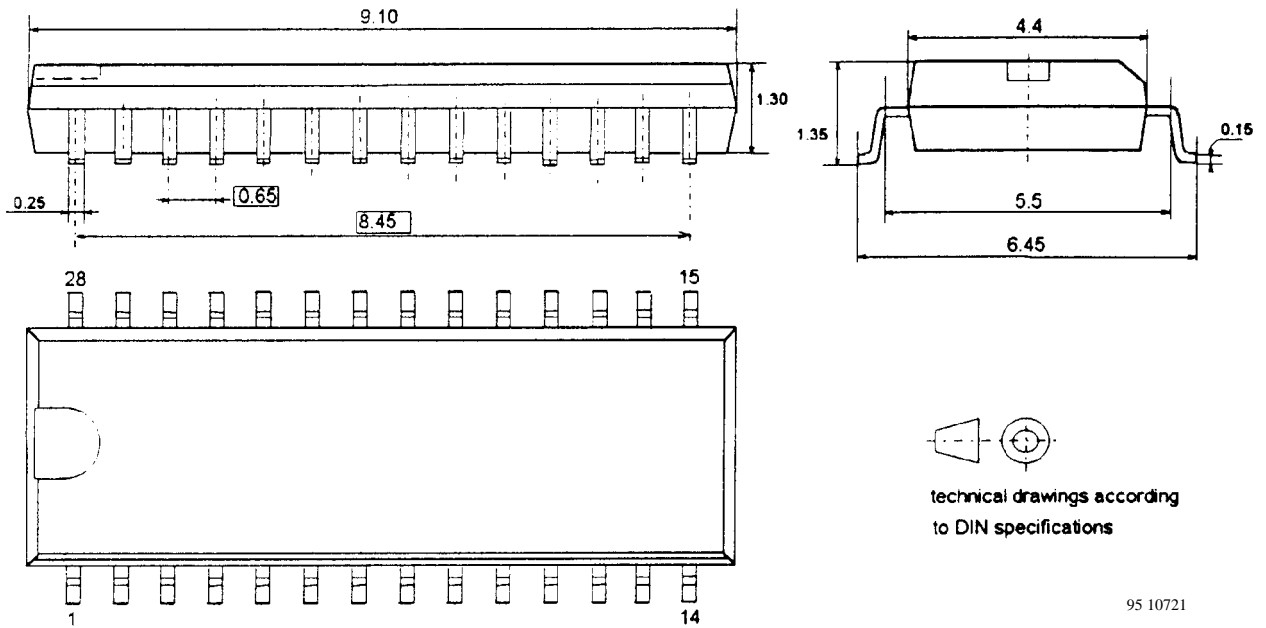
- 1) **VHF-low**  
Normalised to 50  $\Omega$ , measuring range 45 MHz to 750 MHz.
- 2) **VHF-high and UHF**  
Normalised to 50  $\Omega$ , measuring range 45 MHz to 1045 MHz. Both inputs are driven symmetrical. The output impedance of hybrid is 100  $\Omega$ , the measured levels are then calculated in reference to 50  $\Omega$ .

**Dimensions in mm:**

Package: SO28



Package: SSO28



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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.

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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.

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