TEMIC
Semiconductors

U6216B

Frequency Synthesizer for TV Tuner

Description

The U6216B is a single chip frequency synthesizer with unidirectional I²C bus control.

This IC contains a high frequency prescaler which can be switched off.

Features

- Non oscillating
- 1.3 GHz divide-by-8 prescaler integrated (can be ommitted)
- 15-bit counter accepts input frequencies up to 170 MHz
- µP-controlled by I²C-Bus
- 5 switching outputs (open collector)
- 4 addresses selectable at pin 8 for multituner application
- 62.5 kHz (–1.3 GHz)/ 7. 8125 kHz (–170 MHz) tuning steps
- Electrostatic protection according to MIL-STD 883

Block Diagram

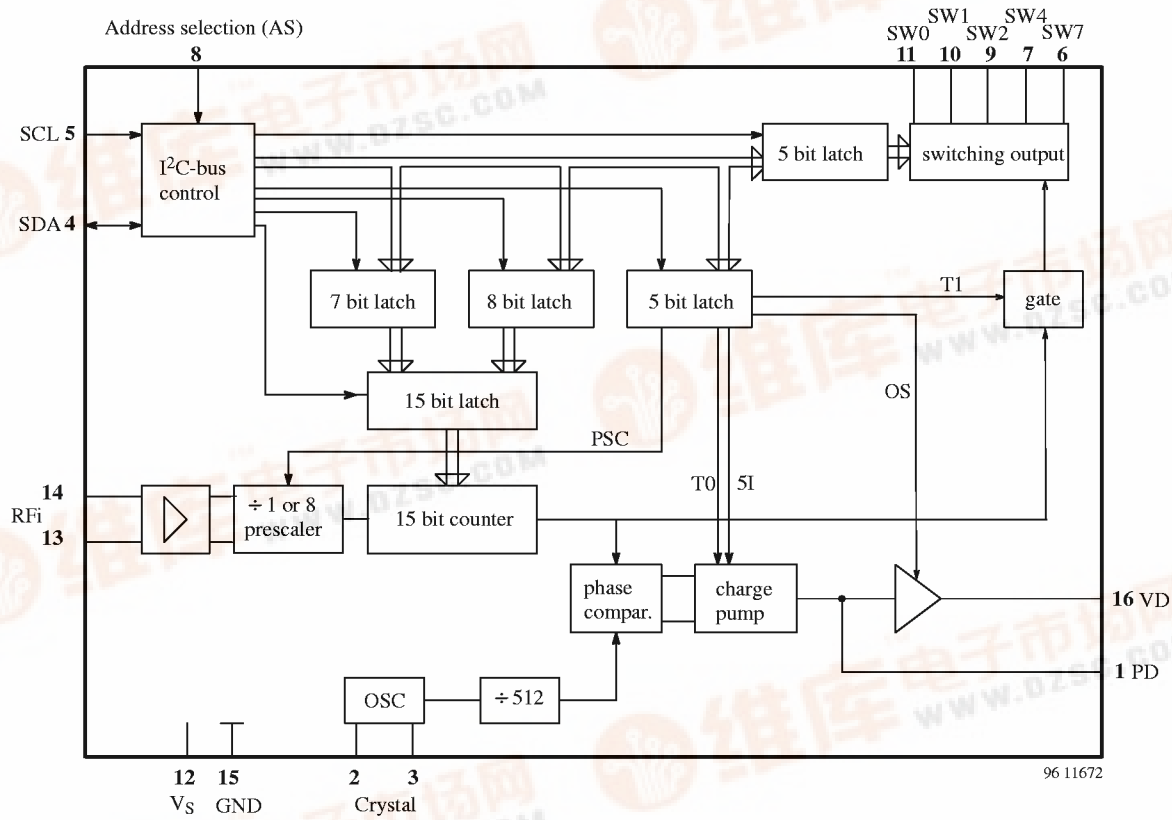
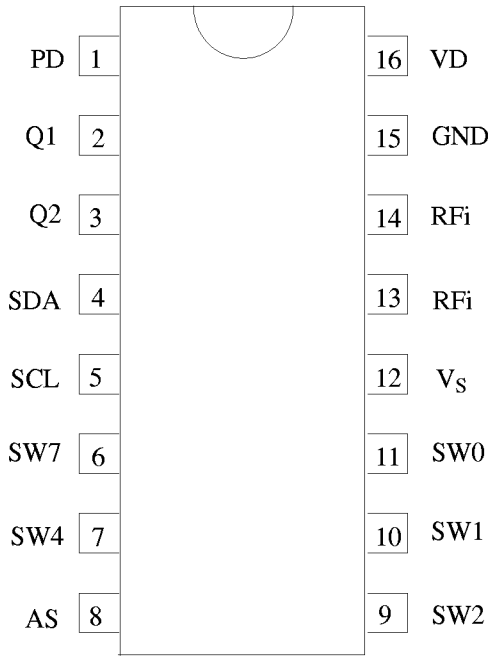


Figure 1.

Ordering Information

Extended Type Number	Package	Remarks
U6216B-FPG3	SO16 plastic package	Taped and reeled

Pin Description



Pin	Symbol	Function
1	PD	Charge pump output
2	Q1	Crystal
3	Q2	Crystal
4	SDA	Data in/output
5	SCL	Clock
6	SW7	Switching output open collector
7	SW4	Switching output open collector
8	AS	Address select
9	SW2	Switching output open collector
10	SW1	Switching output open collector
11	SW0	Switching output open collector
12	V_S	Supply voltage
13	RFi	RF input
14	RFi	RF input
15	GND	Ground
16	VD	Active filter output

Absolute Maximum Ratings

All voltages are referred to GND (Pin 15).

Parameters	Test Conditions / Pins	Symbol	Min.	Max.	Unit
Supply voltage	Pin 12	Vs	–0.3	6	V
RF input voltage	Pin 13, 14	RFi	–0.3	V_S	V
Bus input/output voltage	Pin 4 Pin 5	VSDA VSCL	–0.3 –0.3	V_S V_S	V V
SDA output current	Open collector Pin 4	ISDA	–1	5	mA
Address select voltage	Pin 8	VAS	–0.3	V_S	V
Current switching outputs	Open collector Pin 11, 10, 9, 7, 6	SW 0, 1, 2, 4, 7	–1	15	mA
Junction temperature		T_{jmax}	–40	125	°C
Storage temperature		T_{stg}	–40	125	°C

Operating Range

All voltages are referred to GND (Pin 15).

Parameters	Test Conditions / Pins	Symbol	Min.	Max.	Unit
Supply voltage	Pin 12	V_S	4.5	5.5	V
Ambient temperature		T_{amb}	0	70	°C
Input frequency	PSC = 1 Pin 13, 14	RFi	64	1300	MHz
Input frequency	PSC = 0 Pin 13, 14	RFi	1	170	MHz
Progr. divider		SF	256	32767	

Thermal Resistance

Parameters	Test Conditions	Symbol	Value	Unit
Junction-Ambient	Soldered to PCB	R_{thJA}	110	K/W

Electrical Characteristics

Test conditions (unless otherwise specified): V_S = 5 V, T_{amb} = 25°C.

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Supply current	SW 0, 1, 2, 4, 7 = 0; PSC = 1 Pin 12	Is	32	42	52	mA
	SW 0, 1, 2, 4, 7 = 0; PSC = 0 Pin 12	Is	22	28	35	mA
Input sensitivity						
fi = 80-1000 MHz	PSC = 1 Pin 13	Vi[1)]			10	mV
fi = 1300 MHz	PSC = 1 Pin 13	Vi[1)]			40	mV
fi = 10-170 MHz	PSC = 0 Pin 13	Vi[1)]			10	mV
Maximum input signal	PSC = 0/1 Pin 13	Vimax[1)]	315			mV
Open coll. sw. outputs SW 0, 1, 2, 4 7 Pins 11, 10, 9, 7 and 6						
Reverse current	VH = 13.5 V	IRH			10	µA
Saturation voltage	IL = 10 mA	VSL[2)]			0.5	V
Phase detector output		PD				
Charge pump current "H"	5I = 1, VPD = 2 V	IPDH		±180		µA
Charge pump current "L"	5I = 0, VPD = 2 V	IPDL		±50		µA
Charge pump leackage current	T0 = 1, VPD = 2 V	IPDTRI		±5		nA
Bus inputs SDA, SCL						
Input voltage	Pin 4, 5	Vi"H"	3		5.5	V
	Pin 4, 5	Vi"L"			1.5	V
Input current	VSCL"H" = Vs Pin 4, 5	Ii"H"			10	µA
	VSCL"L" = 0 V Pin 4, 5	Ii"L"	–20			µA
Output voltage SDA (open collector)	ISDA"L" = 2 mA Pin 4	VSDA "L"			0.4	V
Address selection AS						
Input current	VAS"H" = Vs Pin 8	IiAS"H"			10	µA
	VAS"L" = 0 V Pin 8	IiAS"L"	–100			µA

I²C Bus Description

Notes 1) RMS-voltage calculated from the measured available power on 50 Ω.
2) Tested with one switch active

Data Formats

Description	DATA FORMAT								
	MSB								LSB
Address byte	1	1	0	0	0	AS1	AS2	0	A
Programmable divider byte 1	0	n14	n13	n12	n11	n10	n9	n8	A
Programmable divider byte 2	n7	n6	n5	n4	n3	n2	n1	n0	A
Control byte 1	1	5I	T1	T0	X	X	PSC	OS	A
Control byte 2	SW7	X	X	SW4	X	SW2	SW1	SW0	A

A = Acknowledged; X = not used; unused bits of controlbyte 2 should be 0 for lowest power consumption.

n0 ... n14:	Scaling factor (SF)	SF = 16384 × n14 + 8192 × n13 + ... + 2 × n1 + n0
PSC:	Prescaler on/off	PSC = 1: prescaler on (PSF = 8) PSC = 0: prescaler off (PSF = 1)
T0, T1:	Testmode selection	T1 = 1: divider test mode on T1 = 0: divider test mode off T0 = 1: charge pump disable T0 = 0: charge pump enable
SW0, 1, 2, 4, 7:	Switching outputs	SW0, SW1, SW2, SW4, SW7 = 1: open collector active
5I:	Charge pump current switch	5I = 1: high current 5I = 0: low current
OS:	Output switch	OS = 1: varicap drive disable OS = 0: varicap drive enable

AS1, AS2: Address selection Pin 8

AS1	AS2	Address	Dec. Value	Voltage at Pin 8
0	1	1	194	open
0	0	2	192	0 to 10% Vs
1	0	3	196	40 to 60% Vs
1	1	4	198	90 to 100% Vs

Oscillator Frequency Calculation

$$f_{OSC} = f_{ref} \times SF \times PSF$$

f_{OSC}: Locked oscillator frequency
f_{ref}: Reference frequency 4 MHz/512 = 7.8125 kHz
SF: Scaling factor of programmable 15-bit-divider
PSF: Scaling factor of prescaler

I²C Bus Description (continued)

Pulse Diagram

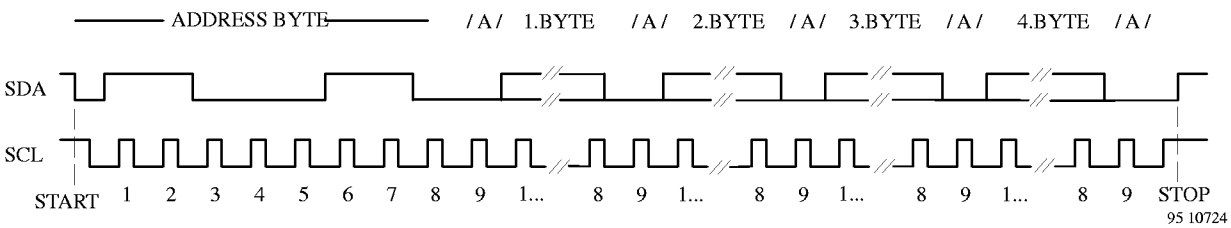


Figure 2.

Data transfer examples
START – ADR – PDB1 – PDB2 – CB1 – CB2 – STOP
START – ADR – CB1 – CB2 – PDB1 – PDB2 – STOP
START – ADR – PDB1 – PDB2 – CB1 – STOP
START – ADR –PDB1 – PDB2 –STOP
START –ADR – CB1 – CB2 – STOP
START – ADR – CB1 –STOP

	Description
START=	Start condition
ADR =	Address byte
PDB1 =	Programmable divider byte 1
PDB2 =	Programmable divider byte 2
CB1 =	Control byte 1
CB2 =	Control byte 2
STOP =	Stop condition

Bus Timing

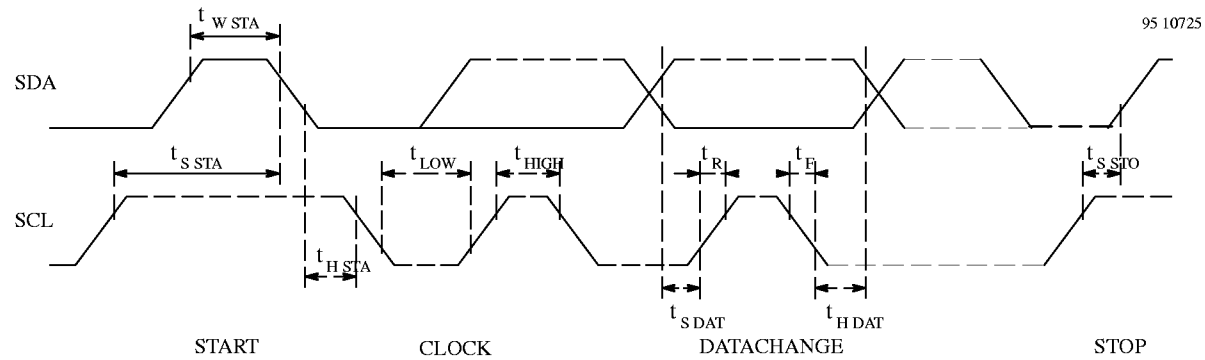


Figure 3.

tS STA – Set-up time start
tW STA – Waiting-time start
tH STA – Hold-time start
tLow – "L"-pulse width clock
tHigh – "H"-pulse width clock
tS DAT – Set-up time data
tH DAT – Hold-time data
tS STO – Set-up time stop
tR – Rise time

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
Bus timing						
Rise time SDA, SCL		tR			15	µs
Fall time SDA, SCL		tF			15	µs
Clock frequency SCL		fSCL	0		100	kHz
Clock "H" pulse		tHIGH	4			µs
Clock "L" pulse		tLOW	4			µs
Hold-time start		tHSTA	4			µs
Set-up time stop		tSSTO	4			µs
Set-up time data		tSDAT	0.3			µs
Hold-time data		tHDAT	0			µs

Typical Prescaler Input Sensitivity (PSC = 1)

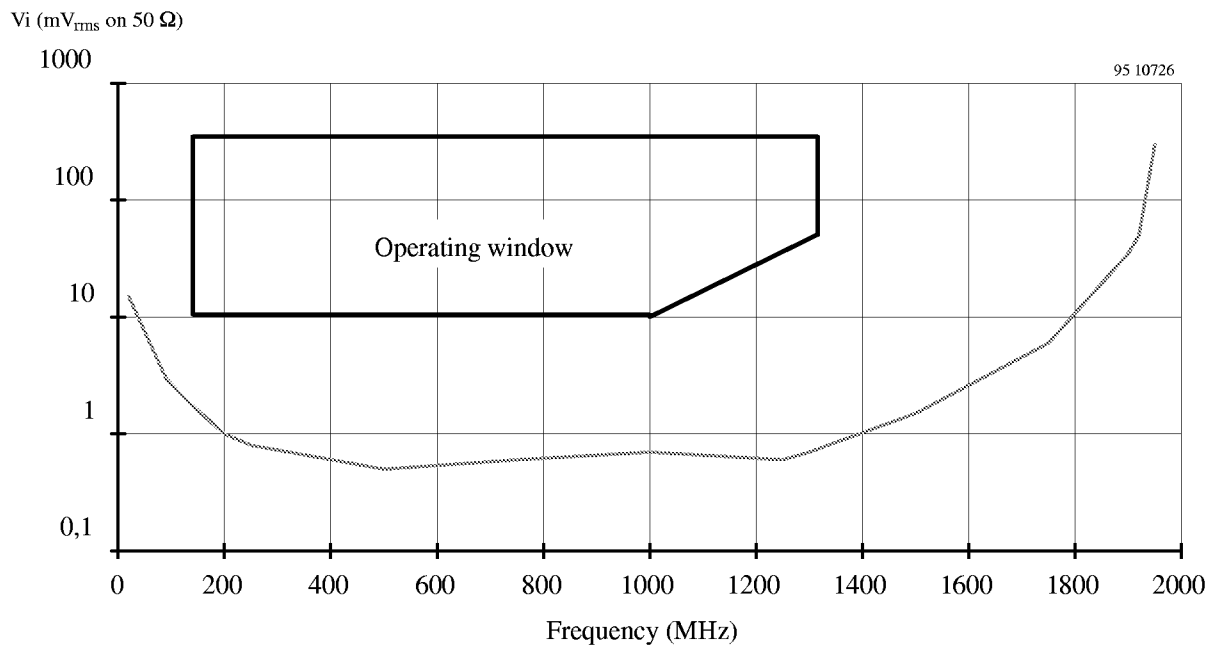


Figure 4.

Typical Prescaler Input Sensitivity (PSC = 0)

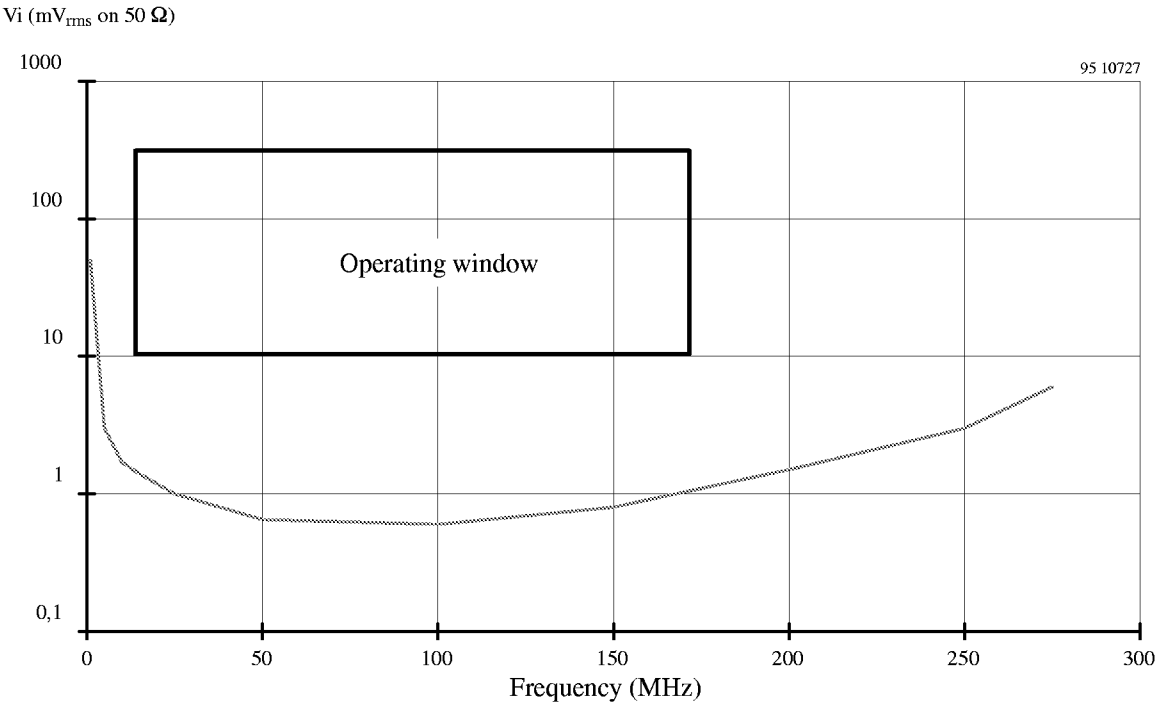


Figure 5.

Application Circuit

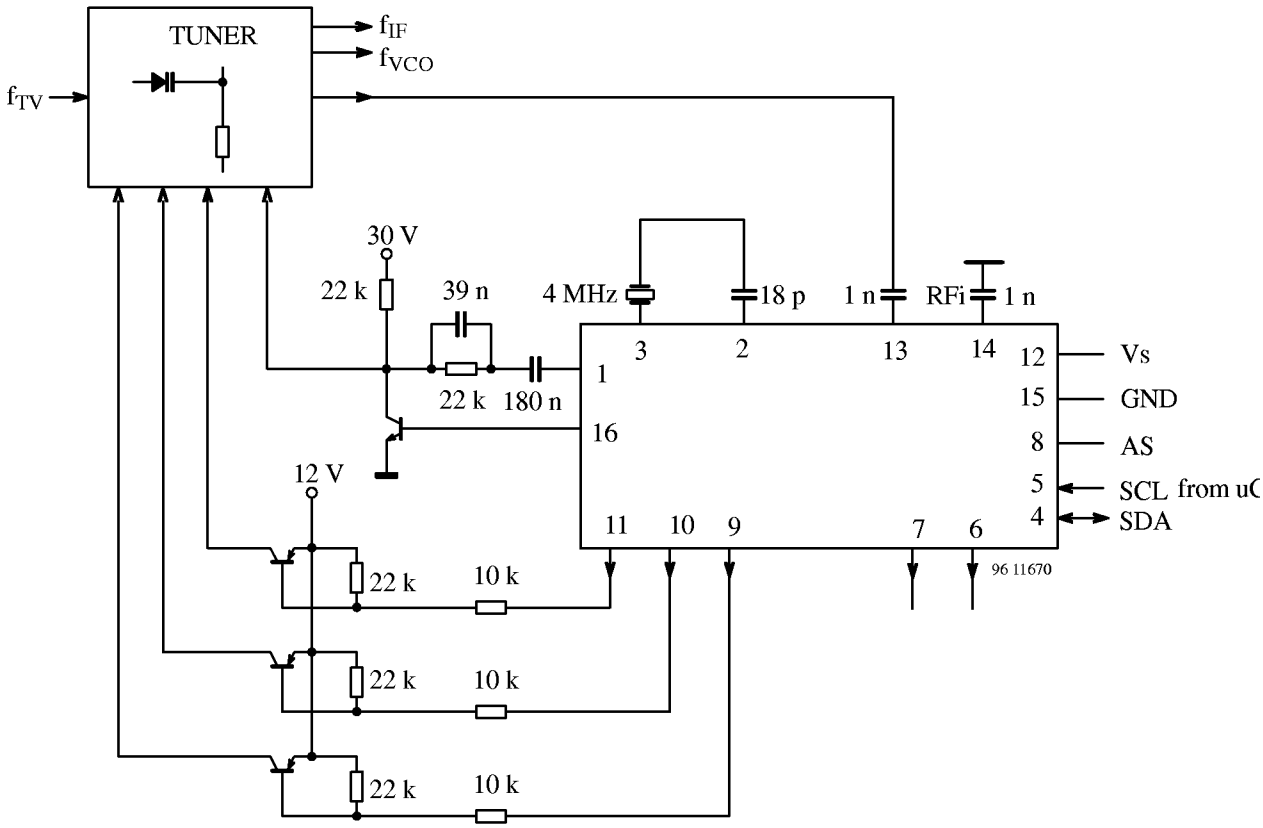
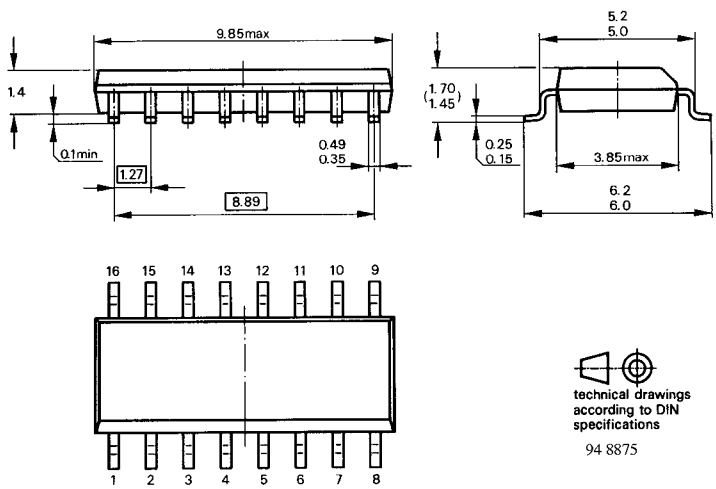


Figure 6.

Package Dimensions

Small outline plastic package, 16 pin-SO16
Dimensions in mm



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.

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