TEMIC
Semiconductors

TFMS 5..0

Photo Modules for PCM Remote Control Systems

Available types for different carrier frequencies

| Type	f_0	Type	f_0
TFMS 5300	30 kHz	TFMS 5330	33 kHz
TFMS 5360	36 kHz	TFMS 5370	36.7 kHz
TFMS 5380	38 kHz	TFMS 5400	40 kHz
TFMS 5560	56 kHz		
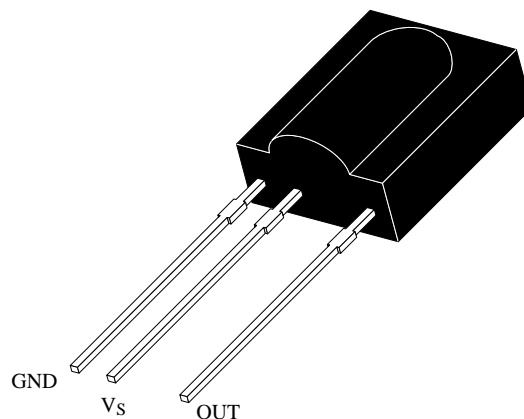
Description

The TFMS 5..0 – series are miniaturized receivers for infrared remote control systems. PIN diode and preamplifier are assembled on lead frame, the epoxy package is designed as IR filter.

The demodulated output signal can directly be decoded by a microprocessor. The main benefit is the reliable function even in disturbed ambient and the protection against uncontrolled output pulses.

GND

V_S

OUT

94 8691

Features

- Photo detector and preamplifier in one package
- Output active low
  (active high modules: TFMS 5..9)
- Internal filter for PCM frequency
- High immunity against ambient light

- Improved shielding against electric field disturbance
- 5 Volt supply voltage, low power consumption
- TTL and CMOS compatibility
- Continuous transmission possible ($t_{pi}/T \leqq 0.4$)

Block Diagram
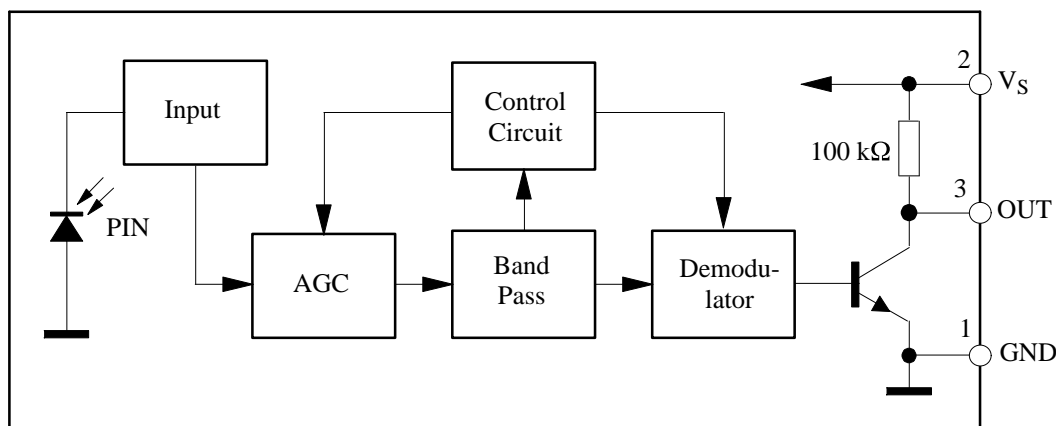

94 8136

Absolute Maximum Ratings

$T_{amb} = 25°C$

Parameter	Test Conditions	Symbol	Value	Unit
Supply Voltage	(Pin 2)	V_S	–0.3...6.0	V
Supply Current	(Pin 2)	I_S	5	mA
Output Voltage	(Pin 3)	V_O	–0.3...6.0	V
Output Current	(Pin 3)	I_O	5	mA
Junction Temperature		T_j	100	°C
Storage Temperature Range		T_{stg}	–25...+85	°C
Operating Temperature Range		T_{amb}	–25...+85	°C
Power Consumption	($T_{amb} \leqq 85 °C$)	P_{tot}	50	mW
Soldering Temperature	$t \leqq 10$ s, 1 mm from case	T_{sd}	260	°C

Basic Characteristics

$T_{amb} = 25°C$

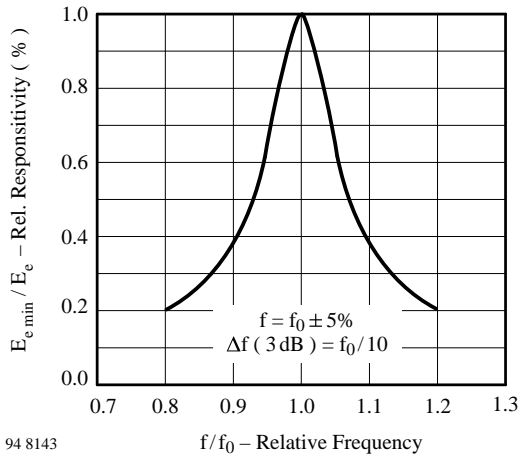| Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
Supply Current (Pin 2)	$V_S = 5$ V, $E_v = 0$	I_{SD}	0.4	0.5	0.8	mA
	$V_S = 5$ V, $E_v = 40$ klx, sunlight	I_{SH}		1.0		mA
Transmission Distance	$E_v = 0$, test signal see fig.7, IR diode TSIP5201, $I_F = 1.5$ A	d		35		m
Output Voltage Low (Pin 3)	$I_{OSL} = 0.5$ mA, $E_e = 0.7$ mW/m^2, $f = f_o$, $t_p/T = 0.4$	V_{OSL}			250	mV
Irradiance (30 – 40 kHz)	Pulse width tolerance: $t_{po} = t_{pi} \pm 160\mu s$, test signal (see fig.7)	$E_{e\ min}$		0.3	0.5	mW/m^2
Irradiance (56 kHz)	Pulse width tolerance: $t_{po} = t_{pi} \pm 160\mu s$, test signal (see fig.7)	$E_{e\ min}$		0.4	0.7	mW/m^2
Irradiance		$E_{e\ max}$	20			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		±55		deg

Application Circuit
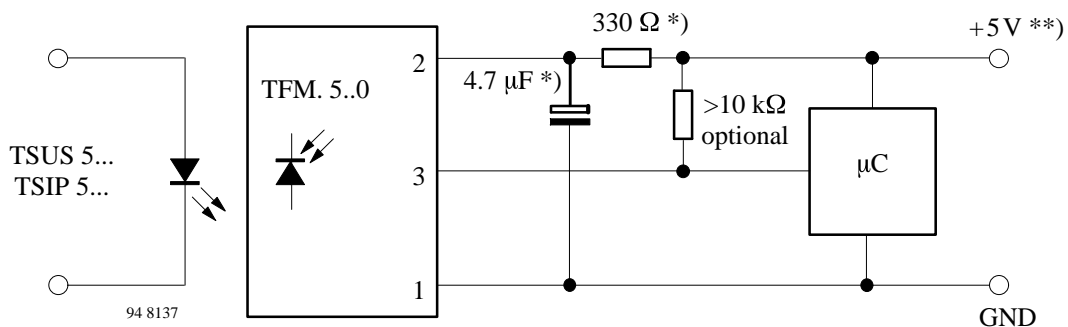
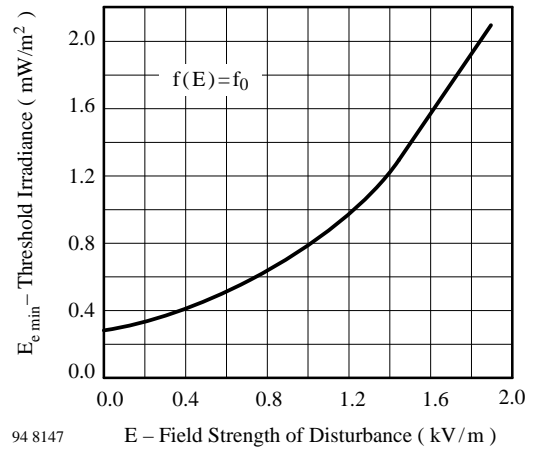*) only necessary to suppress power supply disturbances
**) tolerated supply voltage range : $4.5\,V < V_S < 5.5\,V$

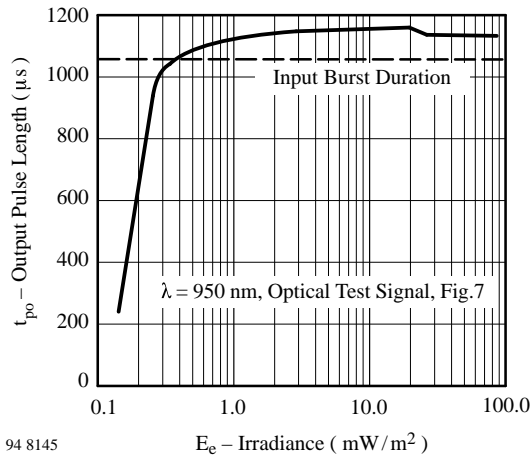## Typical Characteristics ($T_{amb} = 25\,°C$ unless otherwise specified)

94 8143

Figure 1. Frequency Dependence of Responsivity

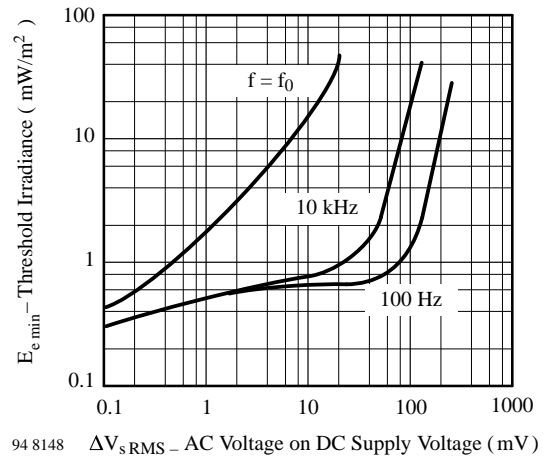Vertical axis: $E_{e\,min}/E_e$ – Rel. Responsitivity (%)

Horizontal axis: f/f_0 – Relative Frequency

$f = f_0 \pm 5\%$
$\Delta f\,(3\,dB) = f_0/10$

94 8145

Figure 2. Sensitivity in Dark Ambient

Vertical axis: t_{po} – Output Pulse Length (μs)

Horizontal axis: E_e – Irradiance (mW/m^2)

Input Burst Duration

$\lambda = 950$ nm, Optical Test Signal, Fig.7

94 8146

Figure 3. Sensitivity in Bright Ambient

Vertical axis: $E_{e\,min}$ – Threshold Irradiance (mW/m^2)

Horizontal axis: E – Irradiance (W/m^2)

Correlation with Ambient Light Sources
(Disturbance Efect) : 1 0 W/m2 $\cong$ 1.4 klx
(Stand. Illum. A, T = 2855 K) $\cong$ 8.2 klx
(Daylight, T = 5900 K)

Ambient, $\lambda = 950$ nm

94 8147

Figure 4. Sensitivity vs. Electric Field Disturbances

Vertical axis: $E_{e\,min}$ – Threshold Irradiance (mW/m^2)

Horizontal axis: E – Field Strength of Disturbance (kV/m)

$f(E) = f_0$

94 8148

Figure 5. Sensitivity vs. Supply Voltage Disturbances

Vertical axis: $E_{e\,min}$ – Threshold Irradiance (mW/m^2)

Horizontal axis: $\Delta V_{s\,RMS}$ – AC Voltage on DC Supply Voltage (mV)

$f = f_0$

10 kHz

100 Hz

94 8149

Figure 6. Sensitivity vs. Ambient Temperature

Vertical axis: $E_{e\,min}$ – Threshold Irradiance (mW/m^2)

Horizontal axis: T_{amb} – Ambient Temperature (°C)

Sensitivity in dark Ambient

Optical Test Signal
(IR diode TSIP 5201, I_F = 1.5 A, 30 pulses, f = f_0, T = 10 ms)

E_e

t_{pi} *

T

* $t_{pi} \geq$ 400 µs is recommended for optimal function

94 8133

Output Signal

V_O

V_{OH}

$t_{po} = t_{pi} \pm 160$ µs

V_{OL}

t_{po}
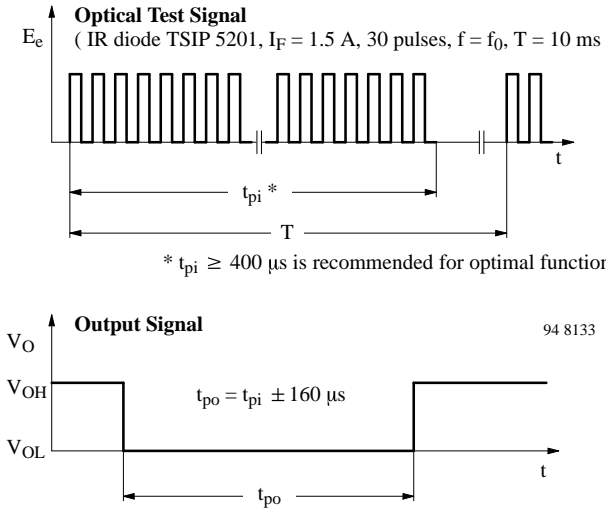
Figure 7. Output Function

Optical Test Signal

E_e

600 µs

600 µs

T = 60 ms

94 8134

Output Signal, (see Fig.10)

V_O

V_{OH}

V_{OL}

T_{on}

T_{off}
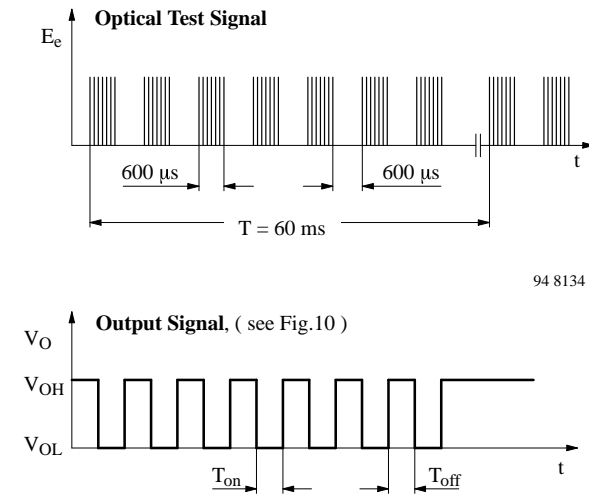
Figure 8. Output Function
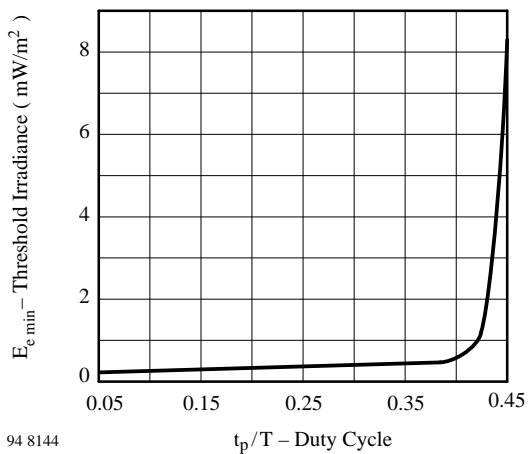
Figure 9. Sensitivity vs. Duty Cycle

$E_{e\,min}$ – Threshold Irradiance (mW/m^2)

t_p/T – Duty Cycle

94 8144

T_{on}, T_{off} - Output Pulse Length (ms)

T_{on}

T_{off}

λ = 950 nm, Optical Test Signal, Fig.8

E_e – Irradiance (mW/m^2)
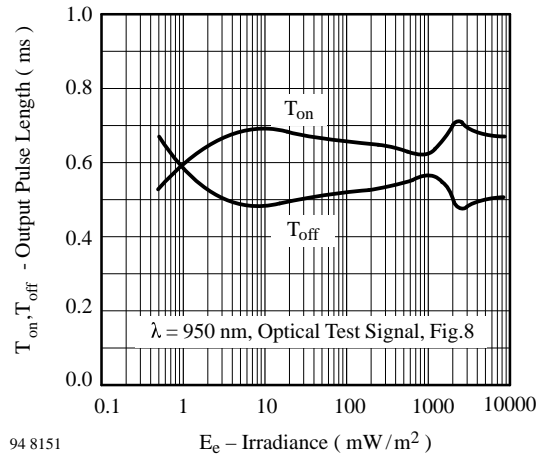
94 8151

Figure 10. Output Pulse Diagram

I_s – Supply Current (mA)

V_s = 5 V

T_{amb} – Ambient Temperature (°C)
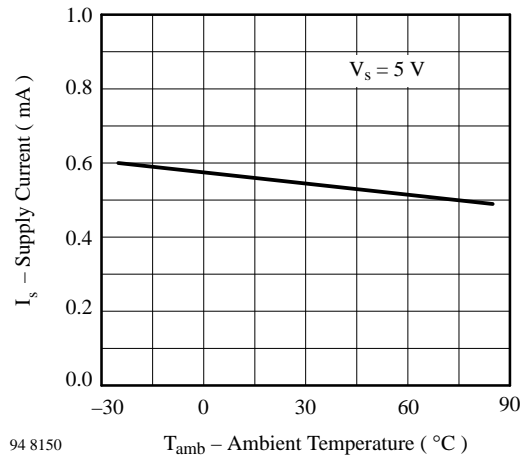
94 8150

Figure 11. Supply Current vs. Ambient Temperature

s_{rel} – Relative Responsitivity (%)

λ – Wavelength (nm)

94 8154
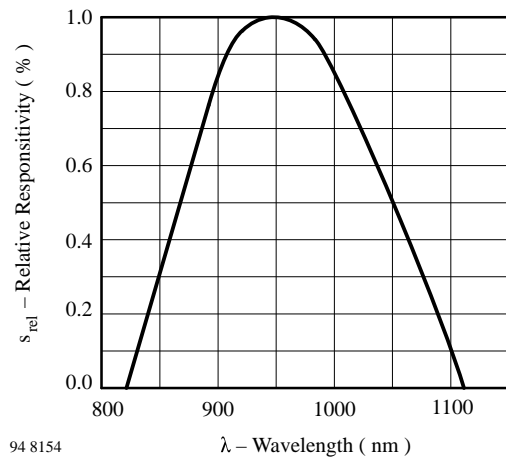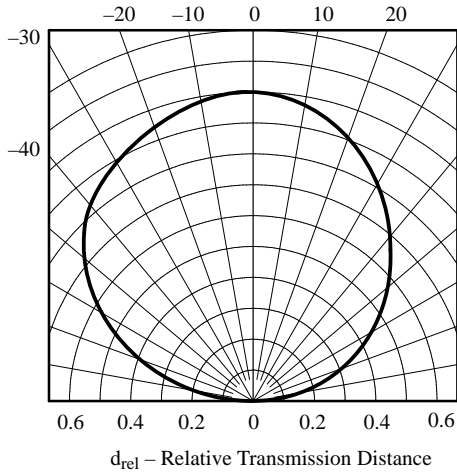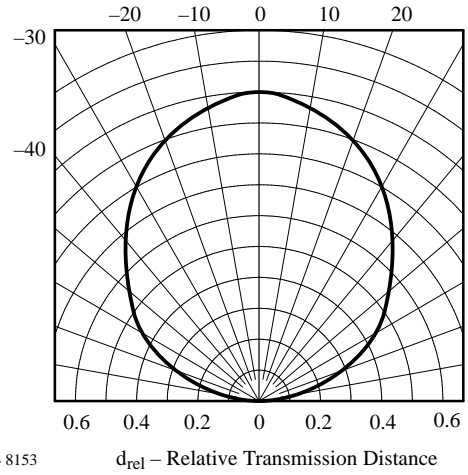
Figure 12. Spectral Response
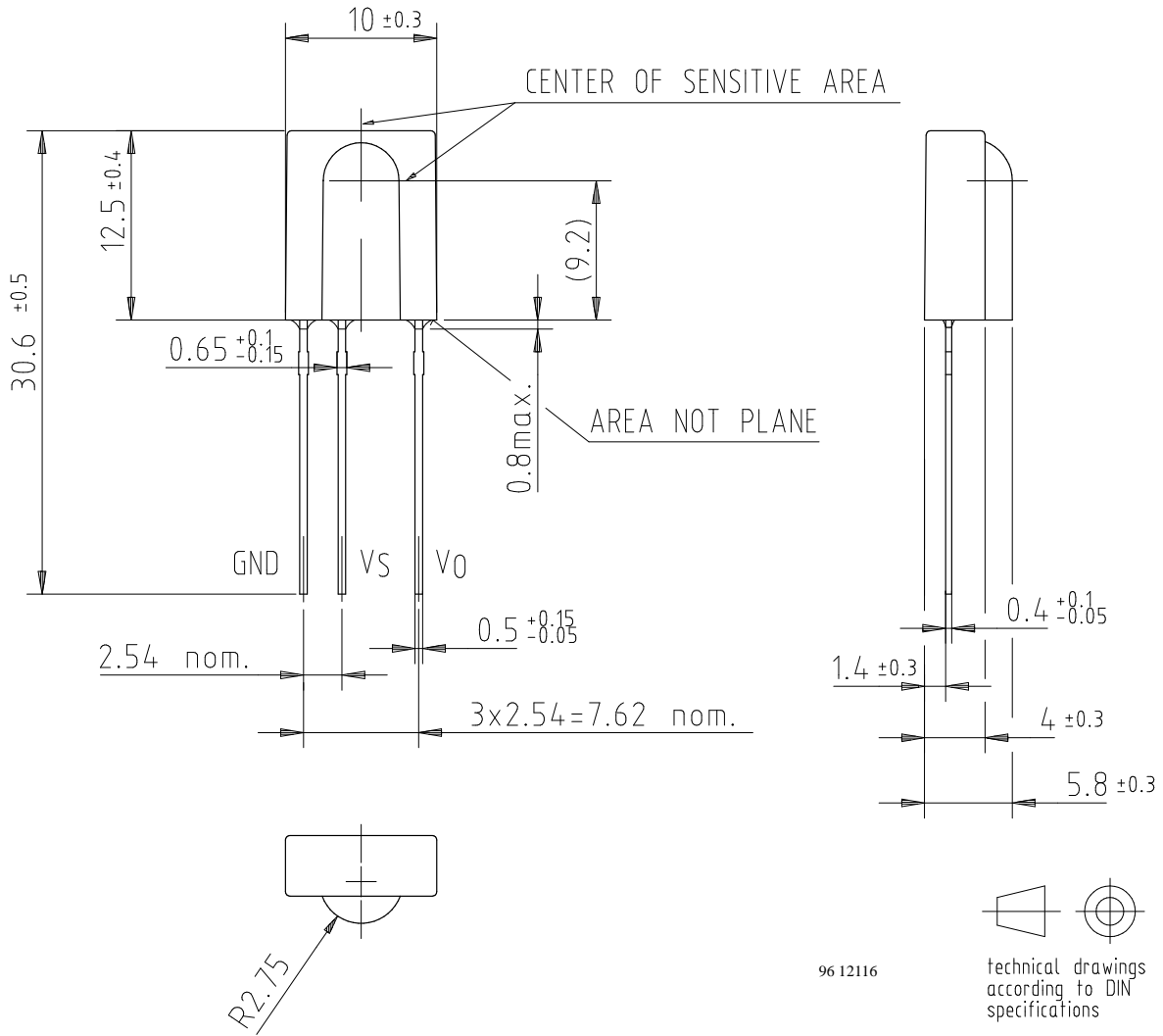
Figure 13. Vertical Directivity φy

Figure 14. Horizontal Directivity φx

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.