# TEMIC

TFMS 1..0

Photo Modules for PCM Remote Control Systems

Special series with short integration time for short burst codes or enhanced data rates

Available types for different carrier frequencies

| Type	f_0	Type	f_0
TFMS 1300	30 kHz	TFMS 1330	33 kHz
TFMS 1360	36 kHz	TFMS 1370	36.7 kHz
TFMS 1380	38 kHz	TFMS 1400	40 kHz
TFMS 1560	56 kHz		
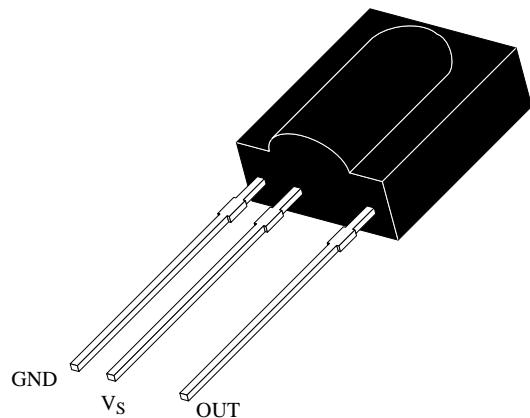
Description

The TFMS 1..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

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Features

- Receiver module for transmission codes with short bursts (N $\geqq$ 6 pulses per bit)

- Photo detector and preamplifier in one package

- Output active low (active high modules: TFMS 1..9)

- Internal filter for PCM frequency

- High immunity against ambient light, optimized against burst noise

- Improved shielding against electric field disturbance

- 5 Volt supply voltage, low power consumption

- TTL and CMOS compatibility

- Low power consumption (typical 2.5 mW)

- 2.4 kbit/s data transmission rate possible (N=6, f_0=56 kHz)

Block Diagram

Input

Control Circuit

2 V_S

100 kΩ

3 OUT

PIN

AGC

Band Pass

Demodulator

1 GND
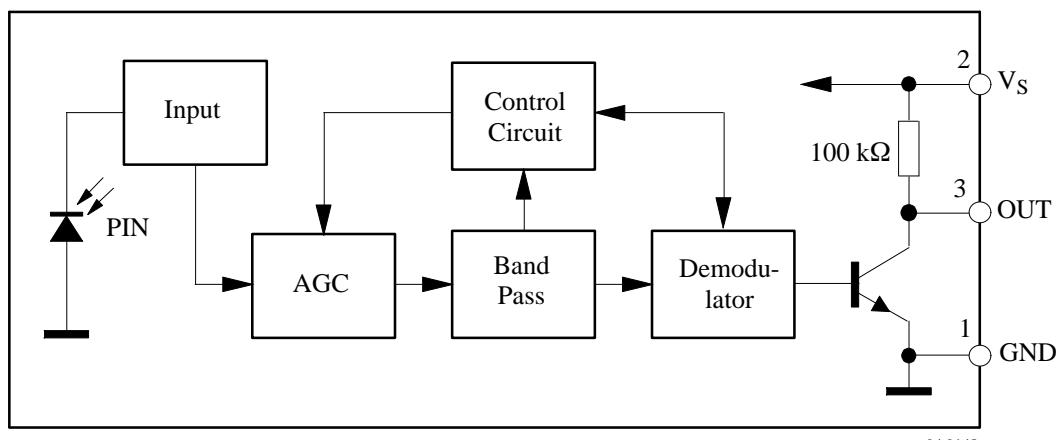
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Absolute Maximum Ratings

$T_{amb} = 25°C$

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
Supply Current (Pin 2)	$V_S = 5\ V$, $E_v = 40$ 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		32		m
Output Voltage Low (Pin 3)	$I_{OSL} = 0.5\ mA$, $E_e = 0.7\ mW/m^2$, $f = f_o$, Test signal see Fig.7	V_{OSL}			250	mV
Irradiance (30 – 40 kHz)	Test signal see Fig.7	$E_{e\ min}$		0.4	0.6	mW/m^2
Irradiance (56 kHz)	Test signal see Fig.7	$E_{e\ min}$		0.45	0.7	mW/m^2
Irradiance	Test signal see Fig.7	$E_{e\ max}$	20			W/m^2
Directivity	Angle of half transmission distance	$\varphi_{1/2}$		±55		deg

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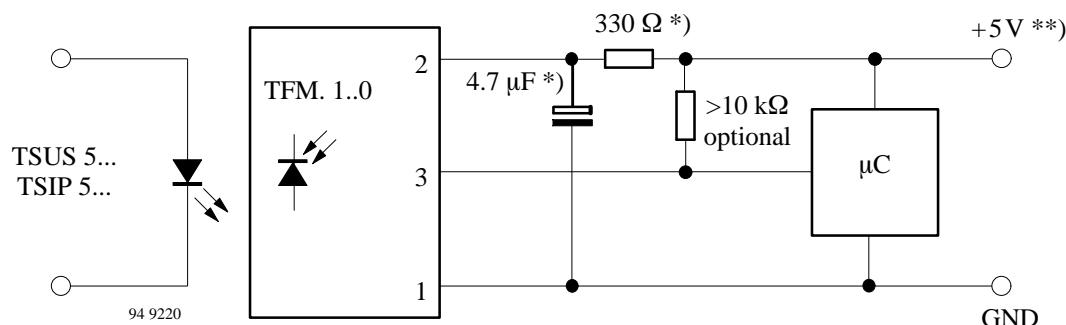
*) only necessary to supress power supply disturbances
**) tolerated supply voltage range : $4.5\,V < V_S < 5.5\,V$

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

f = $f_0 \pm 5\%$
Δf (3 dB) = $f_0/7$

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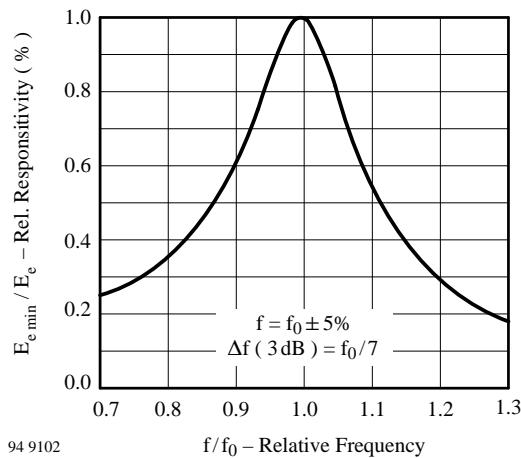
Figure 1 : Frequency Dependence of Responsivity

Input Burst Duration

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

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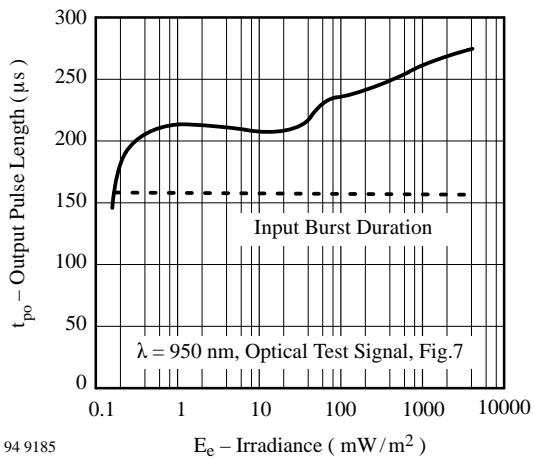
Figure 2 : Sensitivity in Dark Ambient

Correlation with Ambient Light Sources
(Disturbance Effect) : $10 \, W/m2 \cong 1.4$ klx
(Stand. Illum. A, T = 2855 K) $\cong 8.2$ klx
(Daylight, T = 5900 K)

Ambient, $\lambda = 950$ nm

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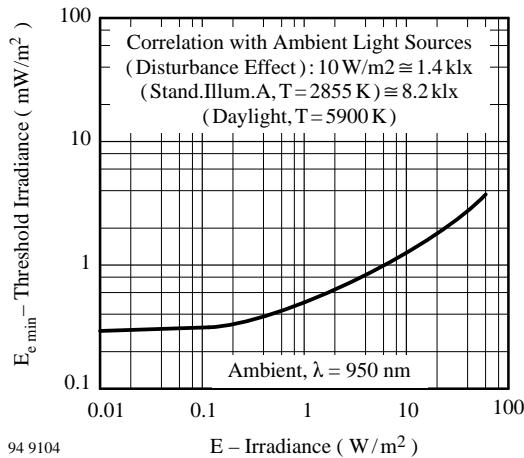
Figure 3 : Sensitivity in Bright Ambient

f (E) = f_0

f (E) = 10 kHz

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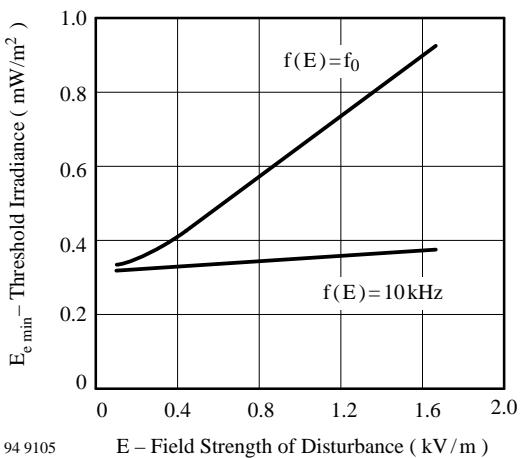
Figure 4 : Sensitivity vs. Electric Field Disturbances

f = f_0

1 kHz

10 kHz

100 Hz

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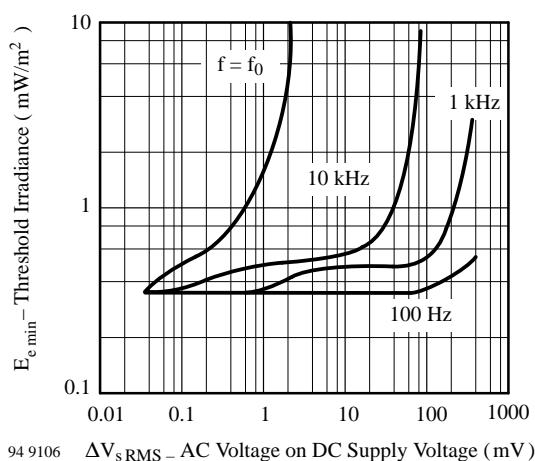
Figure 5 : Sensitivity vs. Supply Voltage Disturbances

Sensitivity in dark Ambient

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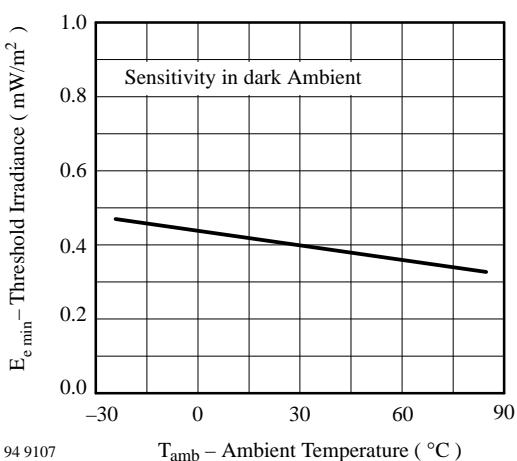
Figure 6 : Sensitivity vs. Ambient Temperature

Optical Test Signal
(IR diode TSIP 5201, I_F=1.5 A, N=6 pulses, f=f_0, T=10 ms)

E_e

t_{pi} *

T

N $\geq$ 6 Pulses is recommended for optimal function

Output Signal

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V_O

V_{OH}

V_{OL}

1) $4/f_0 < t_d < 10/f_0$
2) $t_{pi} - 3/f_0 < t_{po} < t_{pi} + 6/f_0$

t_d 1)

t_{po} 2)
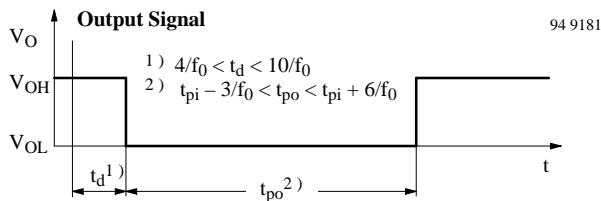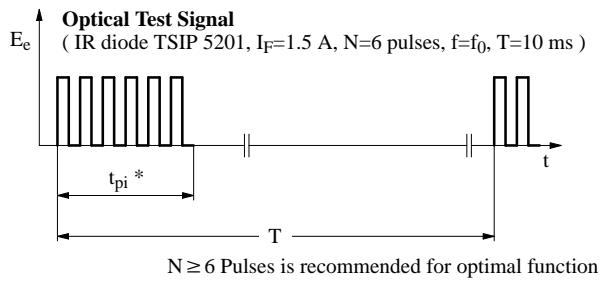
Figure 7 : Output Function

Optical Test Signal

E_e

600 µs   600 µs

T = 60 ms

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Output Signal, (see Fig.10)

V_O

V_{OH}

V_{OL}

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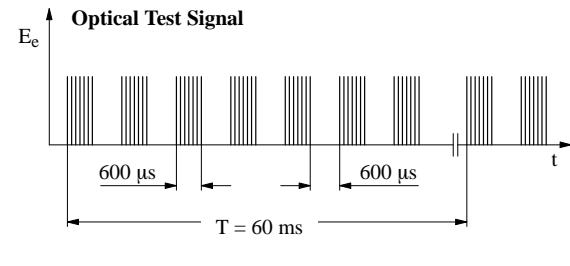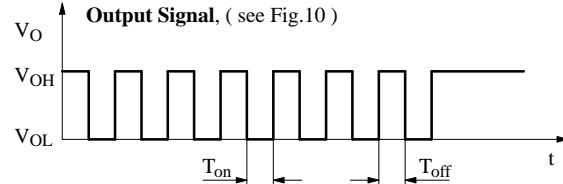
Figure 8 : Output Function
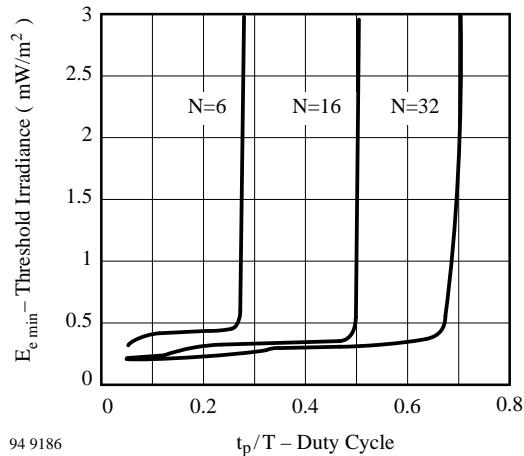
Figure 9 : Sensitivity vs. Duty Cycle

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

N=6   N=16   N=32

t_p/T – Duty Cycle

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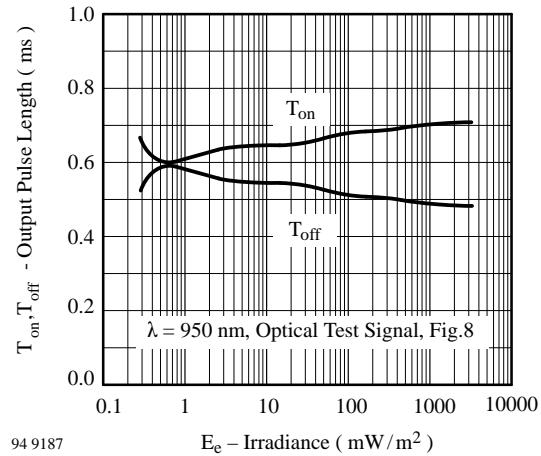
Figure 10 : Output Pulse Diagram

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)

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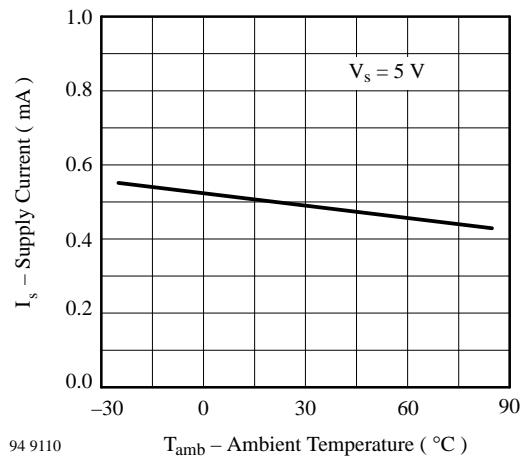
Figure 11 : Supply Current vs. Ambient Temperature

I_s – Supply Current (mA)

V_s = 5 V

T_{amb} – Ambient Temperature (°C)

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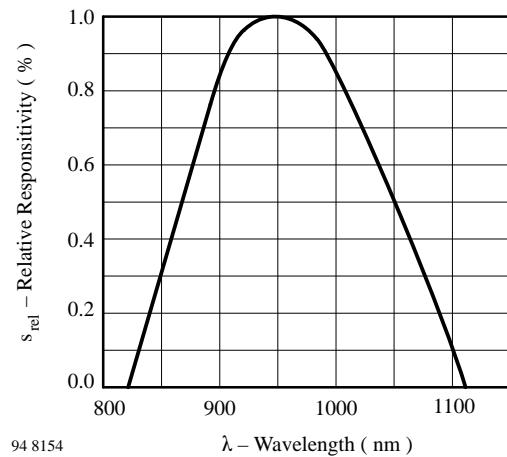
Figure 12 : Spectral Response

s_{rel} – Relative Responsitivity (%)

λ – Wavelength (nm)

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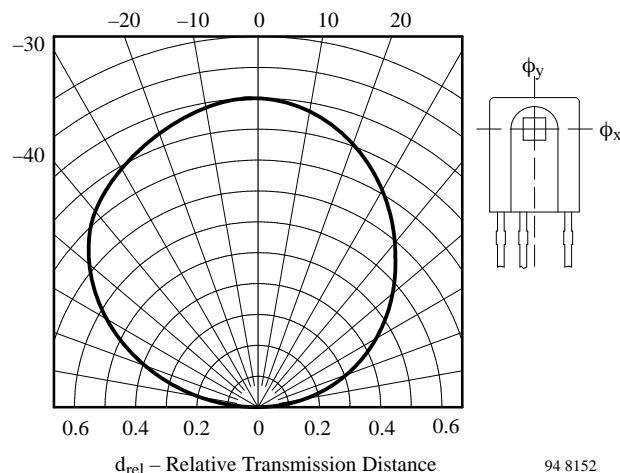
Figure 13 : Vertical Directivity φ_y
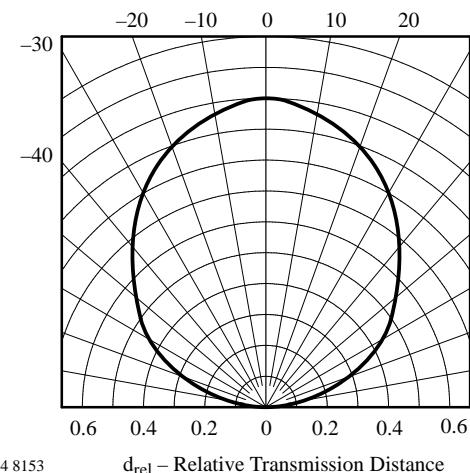
Figure 14 : Horizontal Directivity φ_x

Dimensions in mm

Sensitive Area (2.4×2.4 mm)

10.3
9.7

3.85
4.45

12.9
12.1

9.7
8.7

16.3
15.9

31.1
30.1

1.5

0.8 max.

Surface not flat

GND   **V$_S$**   **V$_O$**

0.65
0.50

0.50

0.4

1.7
1.1

4.3
3.7

2.54

$3 \times 2.54 = 7.62$

6.1
5.5

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R = 2.75

technical drawings
according to DIN
specifications