TEMIC

TELEFUNKEN Semiconductors

TFMT 5..0

Photo Modules for PCM Remote Control Systems

Available types for different carrier frequencies

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

Description

TFMT 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

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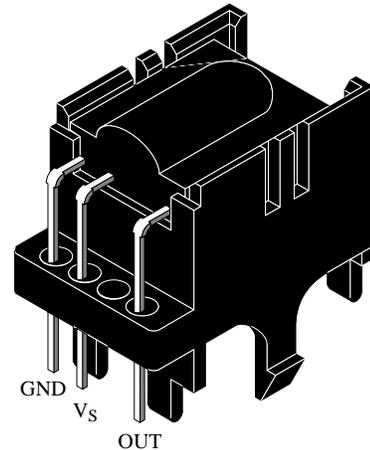
Features

- Photo detector and preamplifier in one package
- Output active low. (active high modules: TFMT 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

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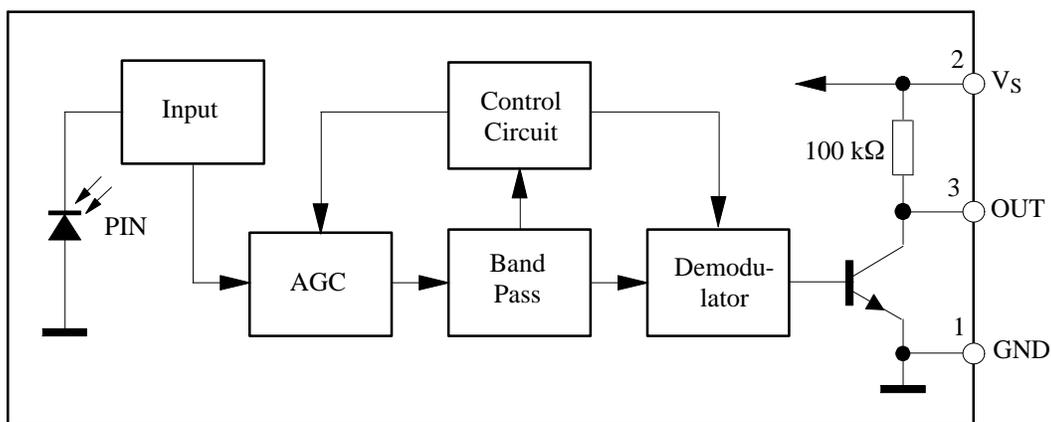
Absolute Maximum Ratings

$T_{amb} = 25°C$

| 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	$t \leqq 10 s$	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, $E_v = 0$	Is_D	0.4	0.5	0.8	mA
Supply Current (Pin 2)	$V_S = 5$ V, $E_v = 40$ klx, sunlight	Is_H		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, $f = f_0$, $t_p/T = 0.4$	V_{OSL}			250	mV
Irradiance (30 – 40 kHz)	Pulse width tolerance: $t_{po}=t_{pi}\pm160\mu s$, Test signal (see Fig.7)	$E_{e\ min}$		0.3	0.5	mW/m^2
Irradiance (56 kHz)	Pulse width tolerance: $t_{po}=t_{pi}\pm160\mu s$, 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

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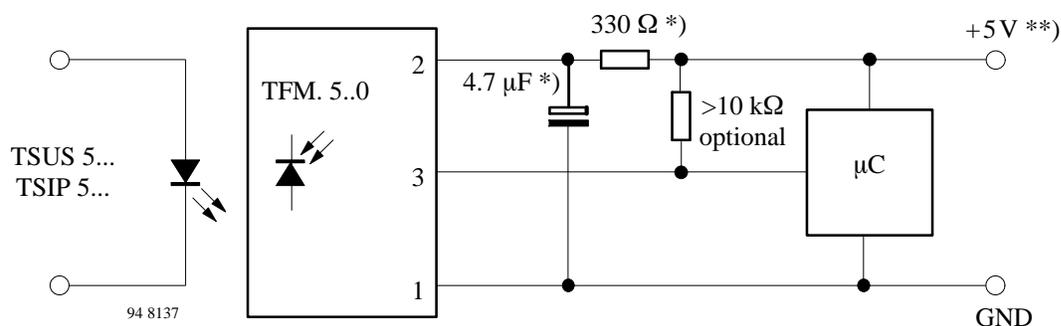
*) only necessary to supress power supply disturbances
**) tolerated supply voltage range : 4.5 V < V_S < 5.5 V

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TFMT 5..0

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

Figure 1 plot axes: $E_{e\,min}/E_e$ – Rel. Responsivity (%) vs. f/f_0 – Relative Frequency

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

94 8143
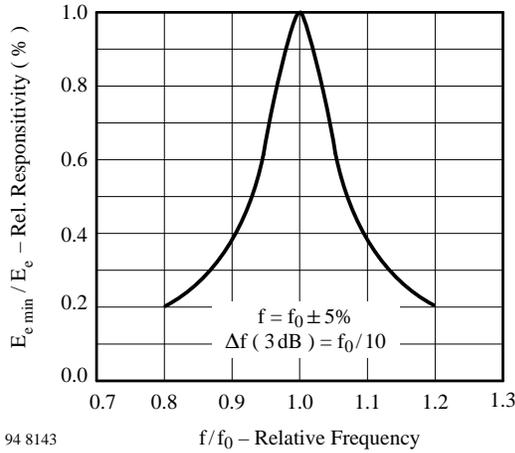
Figure 1 : Frequency Dependence of Responsivity

Figure 2 plot axes: t_{po} – Output Pulse Length (µs) vs. E_e – Irradiance (mW/m²)

Input Burst Duration

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

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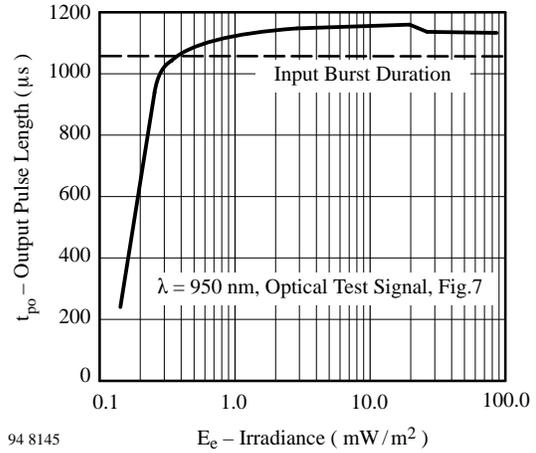
Figure 2 : Sensitivity in Dark Ambient

Figure 3 plot axes: $E_{e\,min}$ – Threshold Irradiance (mW/m²) vs. E – Irradiance (W/m²)

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

Ambient, $\lambda = 950$ nm

94 8146
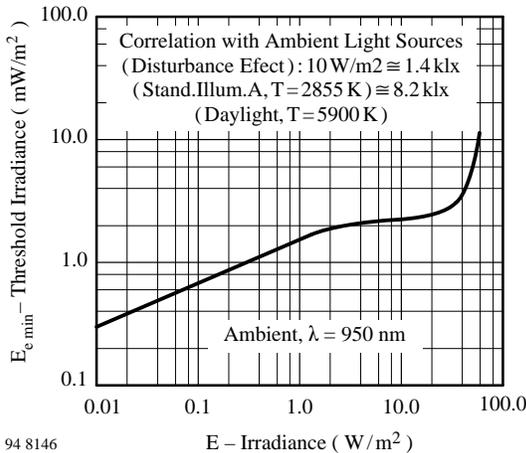
Figure 3 : Sensitivity in Bright Ambient

Figure 4 plot axes: $E_{e\,min}$ – Threshold Irradiance (mW/m²) vs. E – Field Strength of Disturbance (kV/m)

$f(E) = f_0$
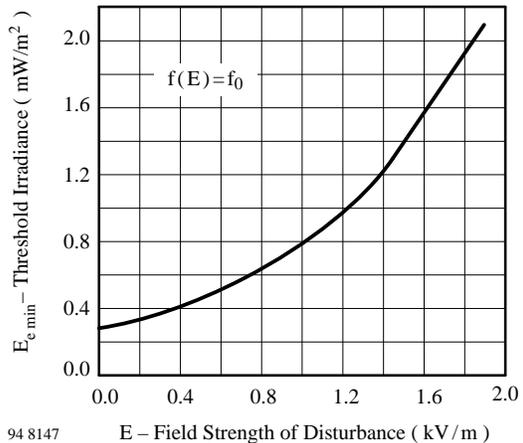
94 8147

Figure 4 : Sensitivity vs. Electric Field Disturbances

Figure 5 plot axes: $E_{e\,min}$ – Threshold Irradiance (mW/m²) vs. $\Delta V_{s\,RMS}$ – AC Voltage on DC Supply Voltage (mV)

$f = f_0$

10 kHz

100 Hz
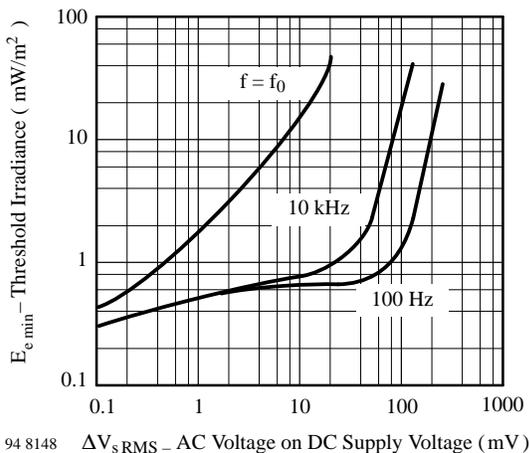
94 8148

Figure 5 : Sensitivity vs. Supply Voltage Disturbances

Figure 6 plot axes: $E_{e\,min}$ – Threshold Irradiance (mW/m²) vs. T_{amb} – Ambient Temperature (°C)

Sensitivity in dark Ambient
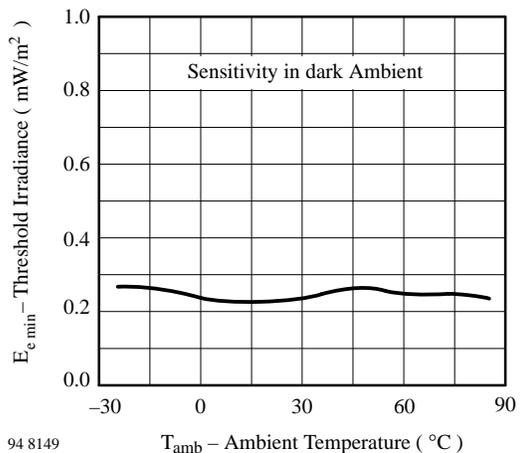
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Figure 6 : Sensitivity vs. Temperature

Rev. A3: 25.1.1995

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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}

V_{OL}

$t_{po} = t_{pi} \pm 160$ μs

t_{po}
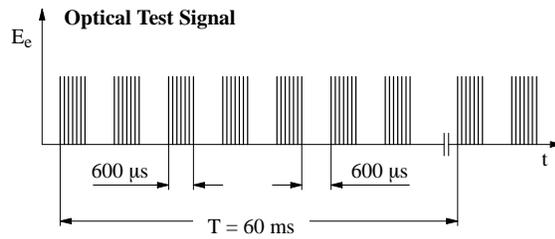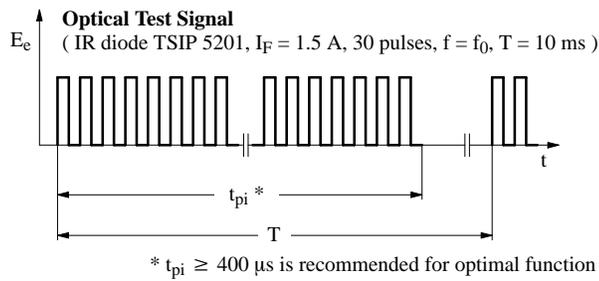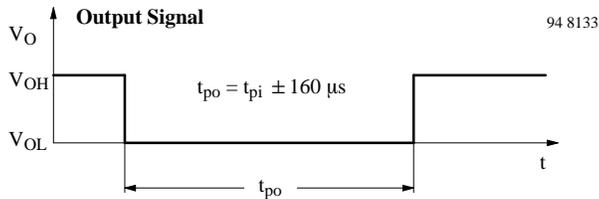
Figure 7 : Output Function

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}

t
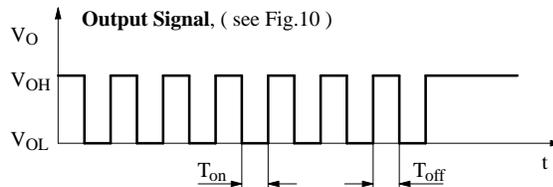
Figure 8 : Output Function

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

8

6

4

2

0

0.05   0.15   0.25   0.35   0.45
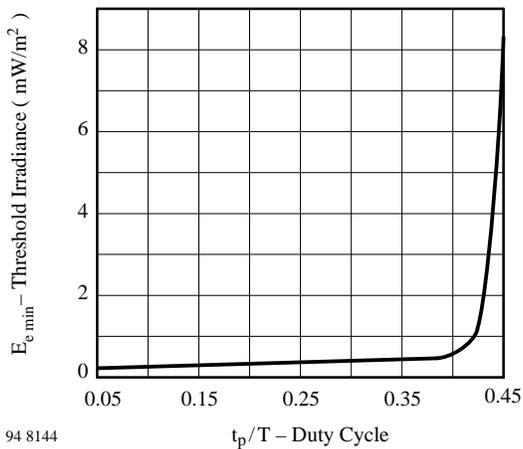
94 8144

t_p/T – Duty Cycle

Figure 9 : Sensitivity vs. Duty Cycle

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

1.0

0.8

0.6

0.4

0.2

0.0

T_{on}

T_{off}

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

0.1   1   10   100   1000   10000

94 8151

E_e – Irradiance (mW/m^2)
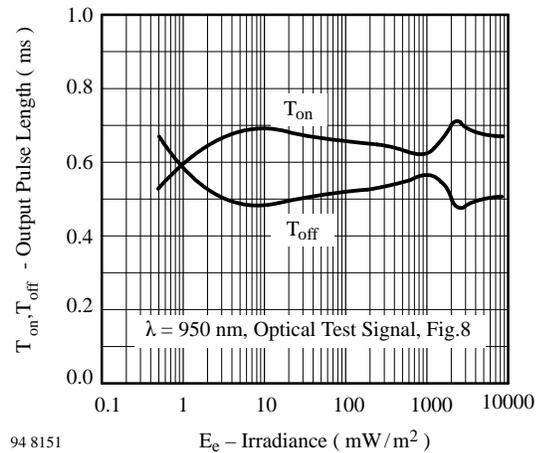
Figure 10 : Output Pulse Diagram

I_s – Supply Current (mA)

1.0

0.8

0.6

0.4

0.2

0.0

V_s = 5 V

−30   0   30   60   90

94 8150

T_{amb} – Ambient Temperature (°C)
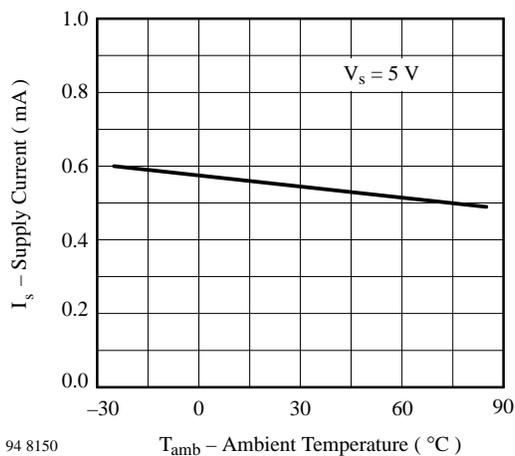
Figure 11 : Supply Current vs. Temperature

s_{rel} – Relative Responsitivity (%)

1.0

0.8

0.6

0.4

0.2

0.0

800   900   1000   1100

94 8154

λ – Wavelength (nm)
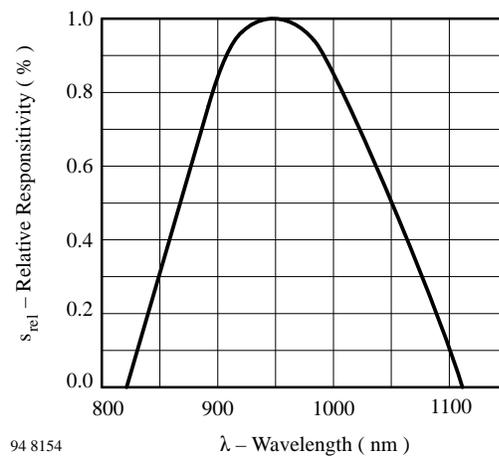
Figure 12 : Spectral Responce

94 8152
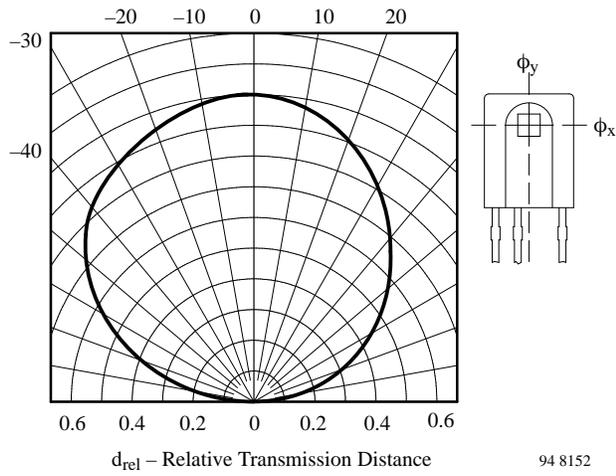
Figure 13 : Vertical Directivity ϕ_y

d_{rel} – Relative Transmission Distance

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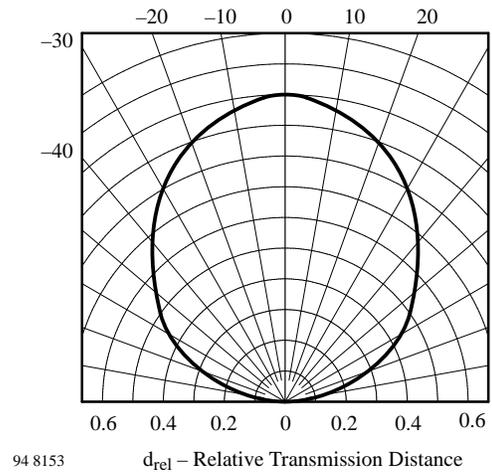
Figure 14 : Horizontal Directivity ϕ_x

d_{rel} – Relative Transmission Distance

Board Hole Diagram (Solder side, dimensions in mm, tolerances ± 0.3 mm)

94 8135

Dimensions in mm

94 8132

14.6 / 14.0   12.8 / 12.2   9.6 / 9.2

10.4 / 10.0

7.4 / 7.0

0.50 / 0.35

3.9 / 2.9

3.1 / 2.1

3.2 / 2.9   3.4 / 3.1

3.7 / 3.1

V_O   V_S   GND

9.15 / 10.15

20.3 / 19.7

15.7 / 15.1

7.2 / 6.9

14.1 / 13.1

2.6 / 2.4

8.7 / 8.4

2.2 / 1.8

3.4 / 3.1

1.1 / 0.5

1.1 / 0.9

2.15 / 3.15

11.3 / 10.7

Sensitive Area

15.3 / 14.7

technical drawings according to DIN specifications

18.8 / 18.2

19.5 / 18.9

1.95 / 1.75

0.9 / 0.7

1.95 / 1.65

7.62

2.54

0.60 / 0.45
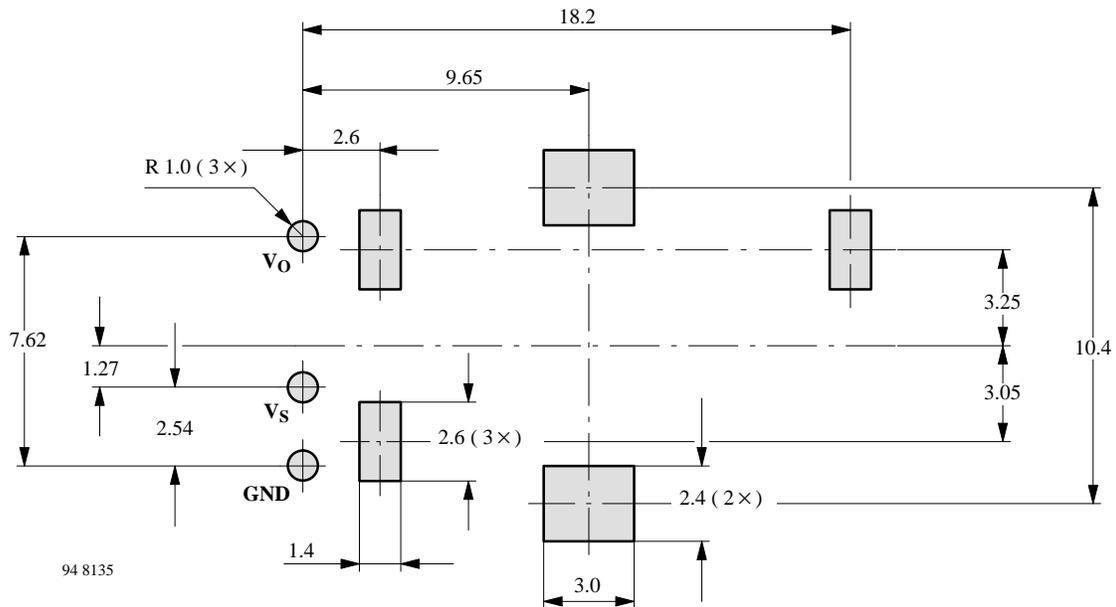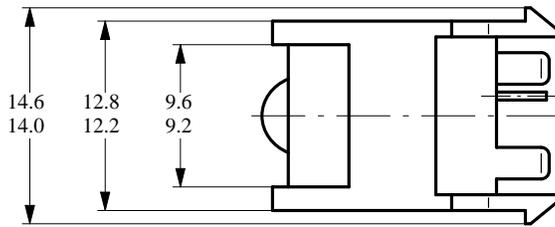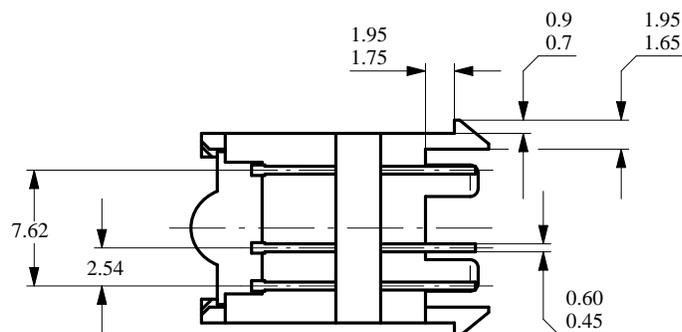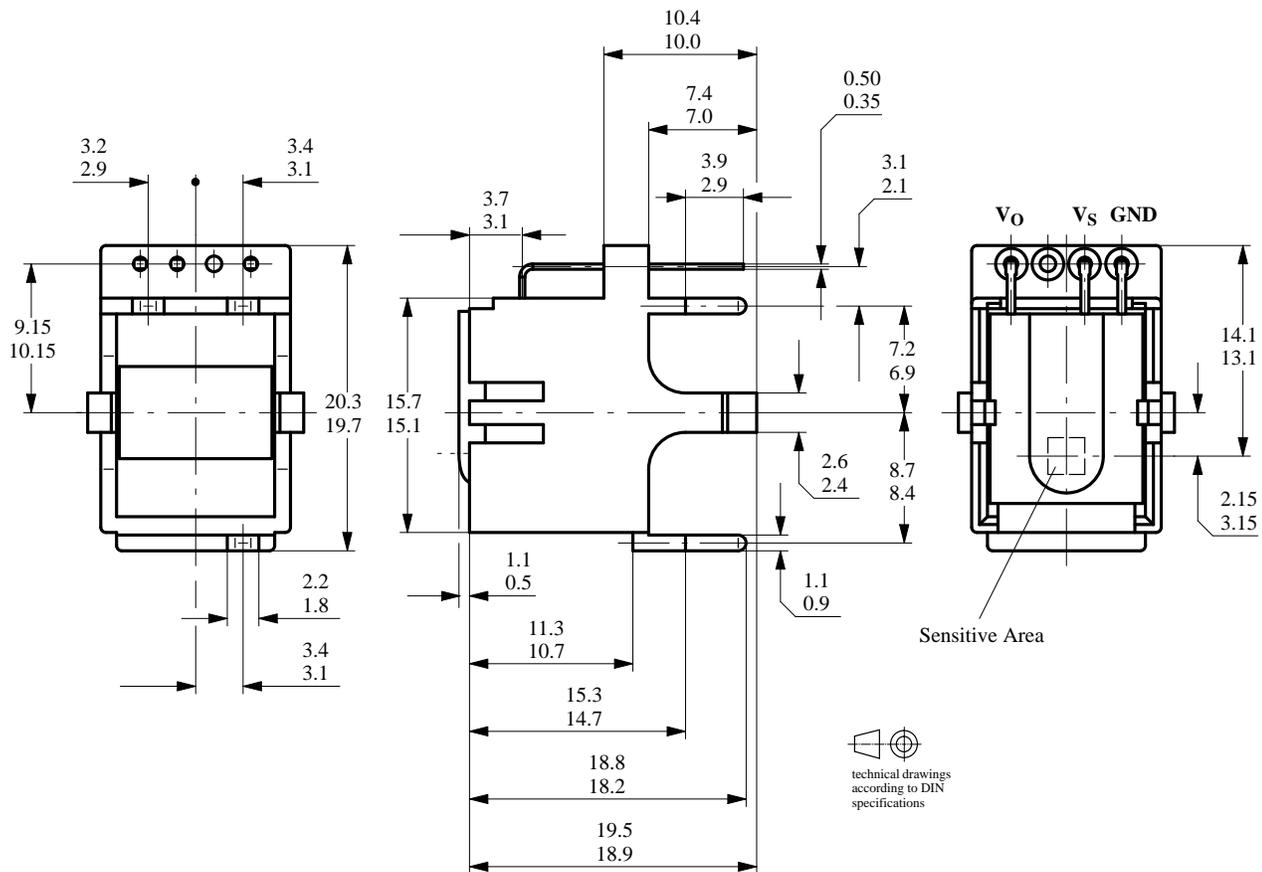
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TEMIC TELEFUNKEN microelectronic GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany
Telephone: 49 (0)7131 67 2831, Fax Number: 49 (0)7131 67 2423