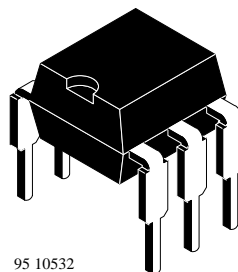


## Optocoupler with Photodarlington Output

### Description

The 4N32 and 4N33 consist of a photodarlington optically coupled to a gallium arsenide infrared emitting diode in a 6 lead plastic dual inline package.

The elements are mounted on one leadframe using a coplanar technique, providing a fixed distance between input and output for highest safety requirements.



95 10532

### Applications

Galvanically separated circuits, non-interacting switches



### Features

- High isolation resistance
- High Current Transfer Ratio
- Low coupling capacity typical 0.3 pF
- Low temperature coefficient of CTR
- UL recognized; file No. E 76222

### Order Schematic

Part Numbers	CTR-Ranking
4N32/ 4N32S/ 4N33/ 4N33S	> 500%

Suffix: S = Waterproofed device

### Remarks

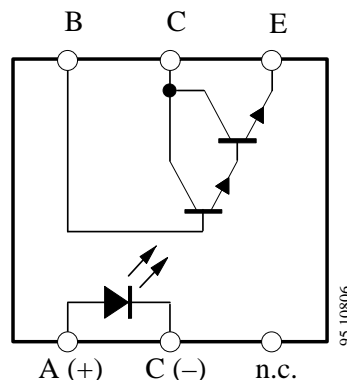
A waterproof construction is recommended for couplers where a pure water cleaning process is used instead of a standard-soldering/ cleaning process. In this case please order the part numbers with the suffix "S".

The waterproof construction corresponds with the coupling system "S", and does not belong to the part number itself.

Standard parts are marked with the letter "A".

This coupling system indicator "A" or "S" is in a separate (second) line of the marking.

### Pin Connections



## Absolute Maximum Ratings

### Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Reverse voltage		$V_R$	5	V
Forward current		$I_F$	80	mA
Forward surge current	$t_p \leq 10 \mu\text{s}$	$I_{FSM}$	3	A
Power dissipation	$T_{amb} \leq 25^\circ\text{C}$	$P_V$	100	mW
Junction temperature		$T_j$	125	$^\circ\text{C}$

### Output (Detector)

Parameters	Test Conditions	Symbol	Value	Unit
Collector base voltage		$V_{CBO}$	50	V
Collector emitter voltage		$V_{CEO}$	30	V
Emitter collector voltage		$V_{ECO}$	5	V
Collector current		$I_C$	150	mA
Peak collector current	$t_p/T = 0.5, t_p \leq 10 \text{ ms}$	$I_{CM}$	200	mA
Power dissipation	$T_{amb} \leq 25^\circ\text{C}$	$P_V$	150	mW
Junction temperature		$T_j$	125	$^\circ\text{C}$

### Coupler

Parameters	Test Conditions	Symbol	Value	Unit
Isolation test voltage (RMS)		$V_{IO}^{1)}$	3.75	kV
Total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	$P_{tot}$	250	mW
Ambient temperature range		$T_{amb}$	-55 to +100	$^\circ\text{C}$
Storage temperature range		$T_{stg}$	-55 to +125	$^\circ\text{C}$
Soldering temperature	2 mm from case, $t \leq 10 \text{ s}$	$T_{sd}$	260	$^\circ\text{C}$

1) Related to standard climate 23/50 DIN 50014

## Electrical Characteristics

$T_{amb} = 25^{\circ}\text{C}$

### Input (Emitter)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	$I_F = 50 \text{ mA}$	$V_F$		1.25	1.5	V
Breakdown voltage	$I_R = 100 \text{ }\mu\text{A}$	$V_{(BR)}$	5			mW
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	$C_j$		50		pF

### Output (Detector)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector base breakdown voltage	$I_C = 100 \text{ }\mu\text{A}$	$V_{(BR)CBO}$	50			V
Collector emitter breakdown voltage	$I_C = 1 \text{ mA}$	$V_{(BR)CEO}$	30			V
Emitter collector breakdown voltage	$I_C = 100 \text{ }\mu\text{A}$	$V_{(BR)ECO}$	5			V
Collector dark current	$V_{CE} = 10 \text{ V}, I_F = 0, E = 0$	$I_{CEO}$			100	nA

### Coupler

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Isolation test voltage (RMS)	$f = 50 \text{ Hz}, t = 2 \text{ s}$	$V_{IO}^{1)}$	3.75			kV
Isolation resistance	$V_{IO} = 1000 \text{ V},$ 40% relative humidity	$R_{IO}^{1)}$		$10^{12}$		$\Omega$
$I_C/I_F$	$I_F = 10 \text{ mA},$ $V_{CE} = 10 \text{ V},$ $t_p/T = 0.01, t_p = 0.3 \text{ ms}$	CTR	5			
Collector emitter saturation voltage	$I_F = 8 \text{ mA}, I_C = 2 \text{ mA}$	$V_{CEsat}$			1	V
Cut-off frequency	$I_F = 2 \text{ mA}, V_{CE} = 10 \text{ V},$ $R_L = 100 \text{ }\Omega$	$f_c$		30		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	$C_k$		0.3		pF

<sup>1)</sup> Related to standard climate 23/50 DIN 50014

## Switching Characteristics

$V_S = 10\text{ V}$

Type	$R_L = 100\ \Omega$ (see figure 1)							$R_L = 1\text{ k}\Omega$		
	$t_d[\mu\text{s}]$	$t_r[\mu\text{s}]$	$t_{on}[\mu\text{s}]$	$t_s[\mu\text{s}]$	$t_f[\mu\text{s}]$	$t_{off}[\mu\text{s}]$	$I_C[\text{mA}]$	$t_{on}[\mu\text{s}]$	$t_{off}[\mu\text{s}]$	$I_F[\text{mA}]$
4N32/ 4N32S			50			40	50			
4N33/ 4N33S			50			40	50			

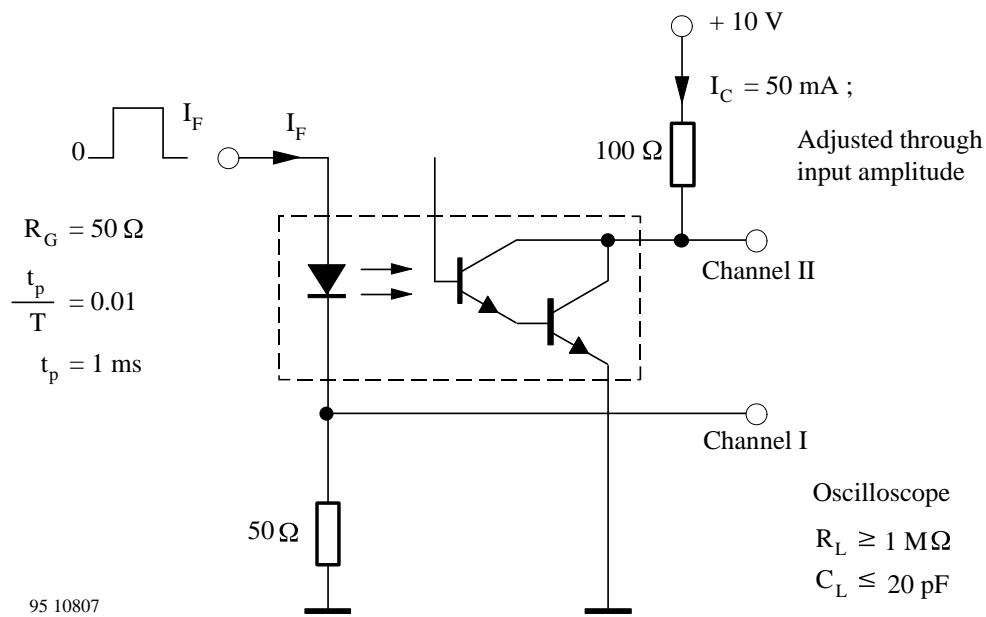


Figure 1. Test circuit

**Typical Characteristics** ( $T_{amb} = 25^{\circ}C$ , unless otherwise specified)

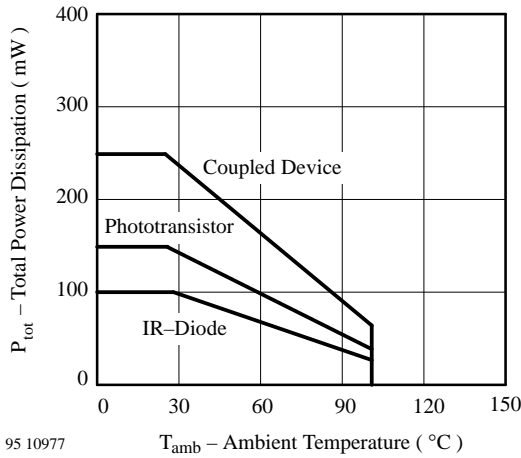


Figure 2. Total Power Dissipation vs. Ambient Temperature

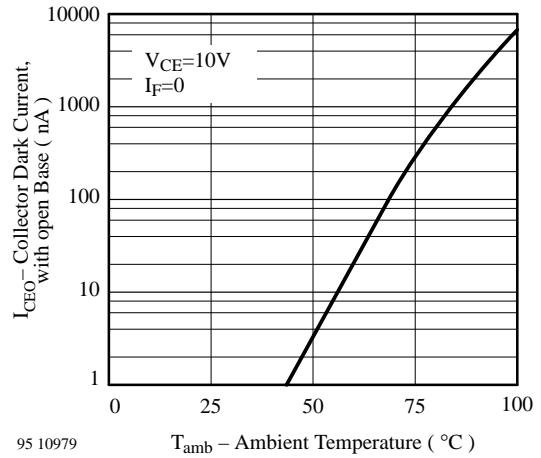


Figure 5. Collector Dark Current vs. Ambient Temperature

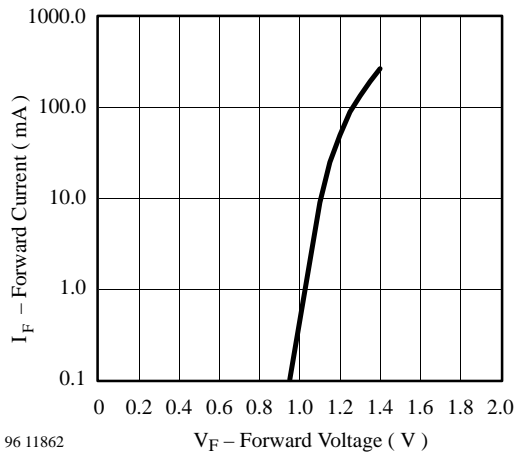


Figure 3. Forward Current vs. Forward Voltage

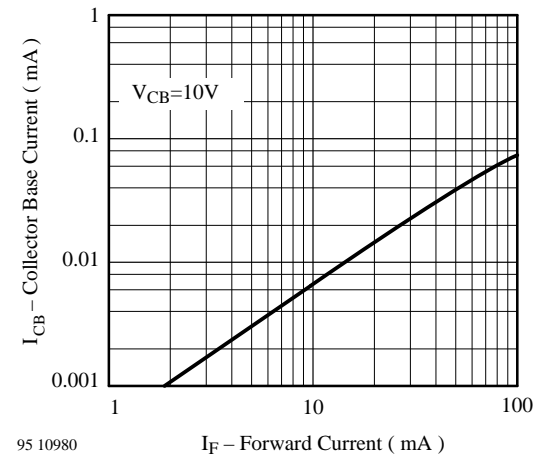


Figure 6. Collector Base Current vs. Forward Current

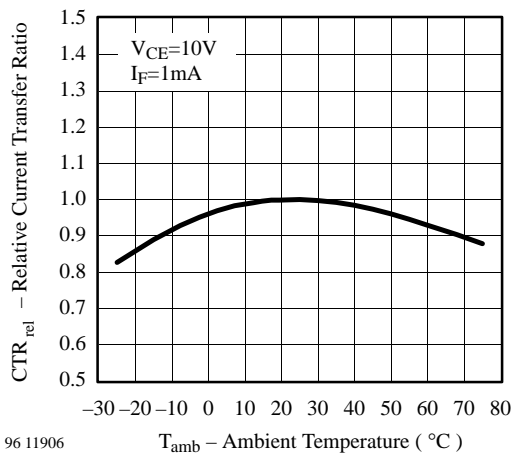


Figure 4. Rel. Current Transfer Ratio vs. Ambient Temperature

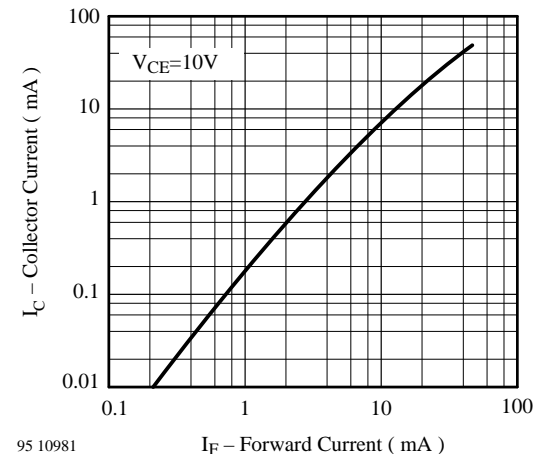


Figure 7. Collector Current vs. Forward Current

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

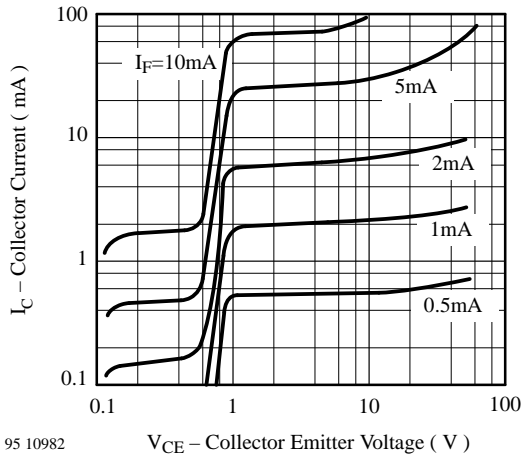


Figure 8. Collector Current vs. Collector Emitter Voltage

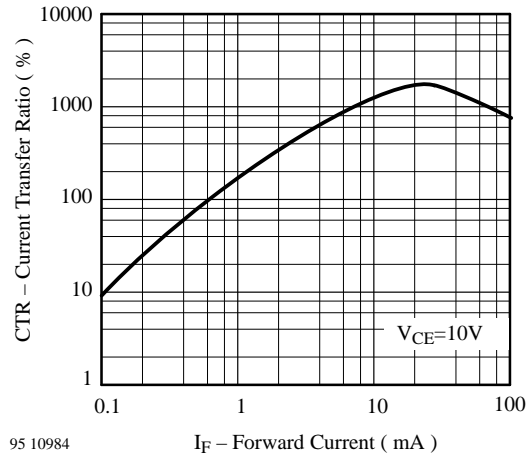


Figure 10. Current Transfer Ratio vs. Forward Current

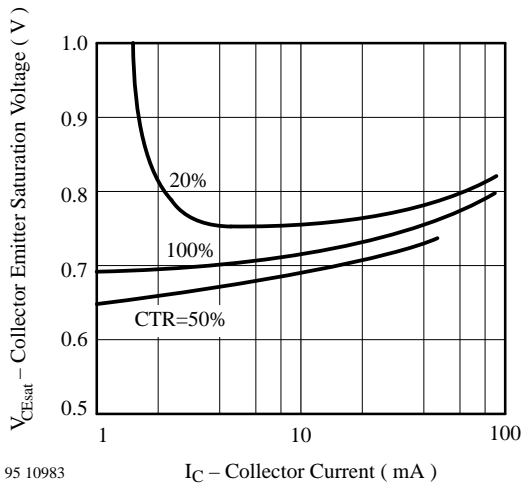
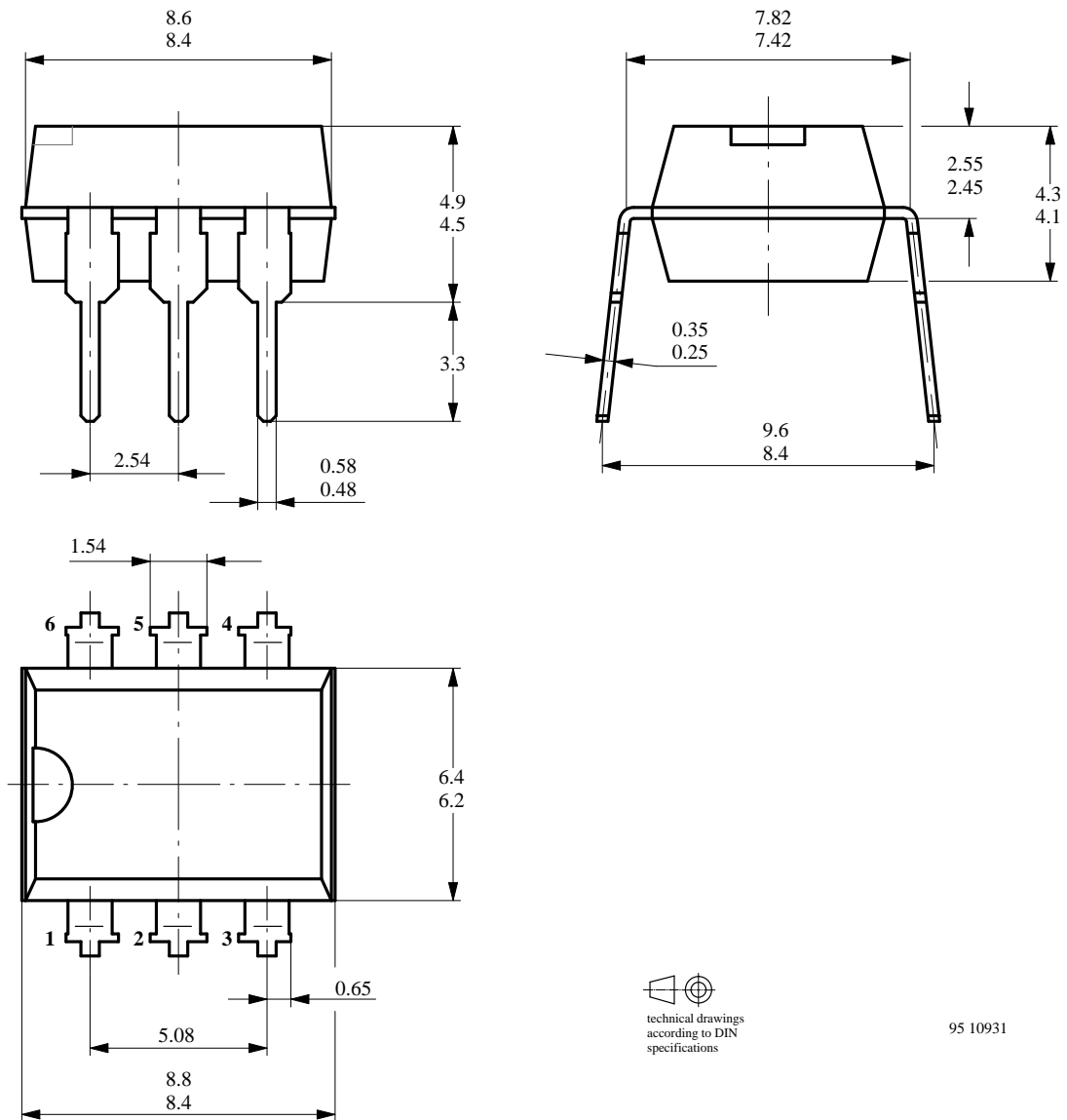


Figure 9. Collector Emitter Sat. Voltage vs. Collector Current

**Dimensions in mm**



technical drawings  
according to DIN  
specifications

95 10931

## 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.

**We reserve the right to make changes to improve technical design and may do so without further notice.**

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use TEMIC products for any unintended or unauthorized application, the buyer shall indemnify TEMIC against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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