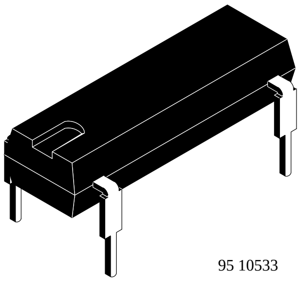
Optocoupler with Phototransistor Output

Description

The CNY21Exi consists of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead plastic dual inline package.

The single components are mounted on one leadframe in opposite oneanother, providing a fixed distance between input and output for highest safety requirements of > 3 mm.



Applications

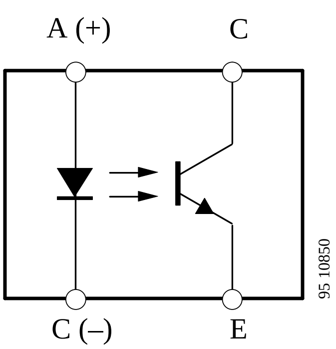
Used for circuits with intrinsic safety Ex-i (G5).

PTB-approval-file number Ex-90.C.2106 U confirms that this coupler can be used for intrinsic circuits up to a line in the voltage range ≤ 375 V.

Features

- UL-recognized file No: E 76414
- DC isolation test voltage: 10 kV
- Creepage current resistance of isolation material according to VDE 0303/DIN 53480: KB ≥ 150/KC ≥ 175
- Isolation material according to UL 94 – flammability class
- Test class 25/100/21 DIN 40045
- Very low coupling capacity of typical 0.3 pF, therefore high noise voltage resistant
- **C**urrent **T**ransfer **R**atio (CTR) of typical 80%
- Low temperature coefficient of CTR

Pin Connection



Absolute Maximum Ratings

Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	5	V
Forward current		I_F	50	mA
Forward surge current	$t_p \leq 1$ μs	I_{FSM}	1.5	A
Power dissipation	$T_{amb} \leq 25°C$	P_V	120	mW
Junction temperature		T_j	100	°C

Output (Detector)

Parameters	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	32	V
Emitter collector voltage		V_{ECO}	5	V
Collector current		I_C	50	mA
Collector peak current	$t_p/T = 0.5$, $t_p \leq 10$ ms	I_{CM}	100	mA
Power dissipation	$T_{amb} \leq 25°C$	P_V	130	mW
Junction temperature		T_j	100	°C

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
DC isolation test voltage	t = 1 min	V_{IO} [1)]	10	kV
Total power dissipation	$T_{amb} \leq 25°C$	P_{tot}	250	mW
Ambient temperature range		T_{amb}	–55 to +85	°C
Storage temperature range		T_{stg}	–55 to +100	°C
Soldering temperature	2 mm from case, t ≤ 10 s	T_{sd}	260	°C

1) Related to standard climate 23/50 DIN 50014

Electrical Characteristics

T_{amb} = 25°C

Input (Emitter)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	I_F = 50 mA	V_F		1.25	1.6	V
Breakdown voltage	I_R = 100 μA	$V_{(BR)}$	5			V
Junction capacitance	V_R = 0, f = 1 MHz	C_j		50		pF

Output (Detector)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter breakdown voltage	I_C = 1 mA	$V_{(BR)CE0}$	32			V
Emitter collector breakdown voltage	I_E = 100 μA	$V_{(BR)EC0}$	5			V
Collector dark current	V_{CE} = 20 V, I_f = 0, E = 0	I_{CE0}			200	nA

Coupler

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
DC isolation test voltage	t = 1 min	V_{IO}	10			kV
Isolation resistance	V_{IO} = 1000 V, 40% relative humidity	R_{IO}		10^{14}		Ω
I_C/I_F	I_F = 10 mA, V_{CE} = 5 V	CTR	0.5	0.8		
Collector emitter saturation voltage	I_F = 10 mA, I_C = 1 mA	V_{CEsat}			0.3	V
Cut-off frequency	V_{CE} = 5 V, I_F = 5 mA, R_L = 100 Ω	f_c		170		kHz
Coupling capacitance	f = 1 MHz	C_k		0.3		pF

Switching Characteristics

$V_S = 5$ V

Type	$R_L = 100\ \Omega$ (see figure 1)							$R_L = 1\ k\Omega$ (see figure 2)		
	t_d[µs]	t_r[µs]	t_{on}[µs]	t_s[µs]	t_f[µs]	t_{off}[µs]	I_C[mA]	t_{on}[µs]	t_{off}[µs]	I_F[mA]
CNY21Exi	2.6	2.4	5.0	0.3	2.7	3.0	5	11	13.5	20

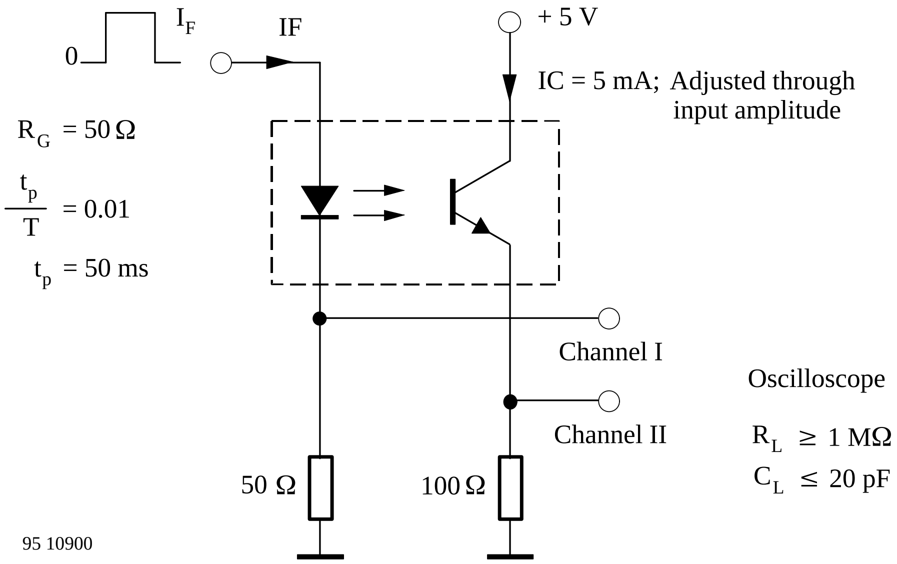


Figure 1. Test circuit, non-saturated operation

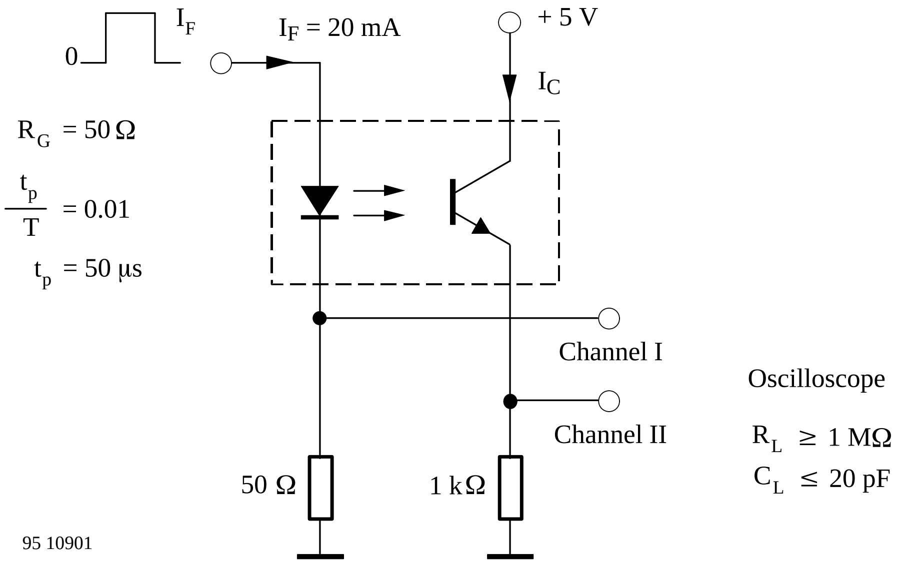


Figure 2. Test circuit, saturated operation

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

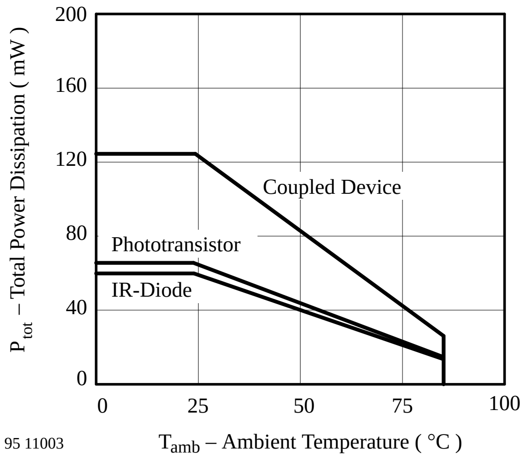


Figure 3. Total Power Dissipation vs. Ambient Temperature

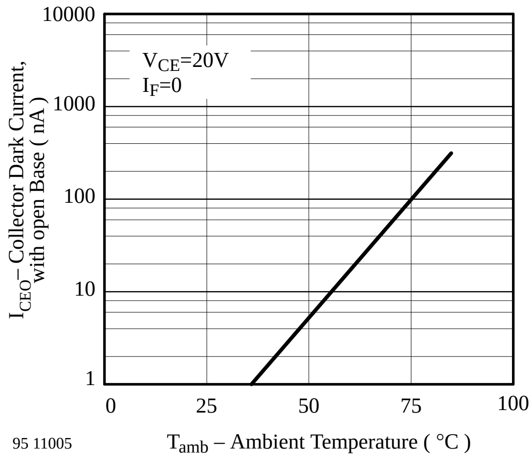


Figure 6. Collector Dark Current vs. Ambient Temperature

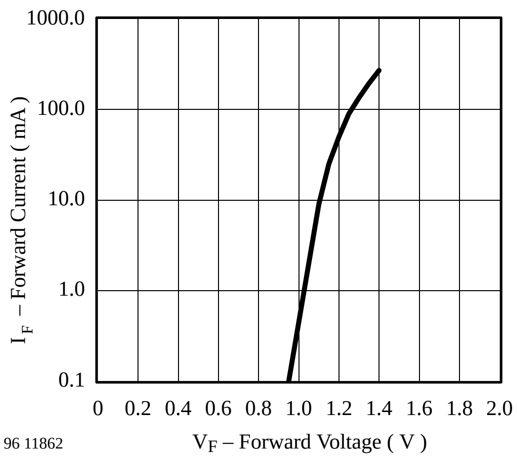


Figure 4. Forward Current vs. Forward Voltage

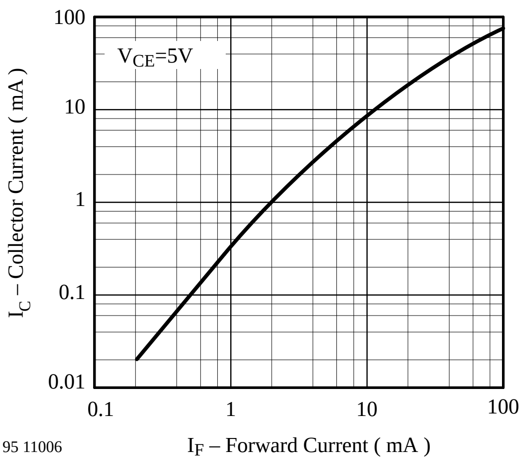


Figure 7. Collector Current vs. Forward Current

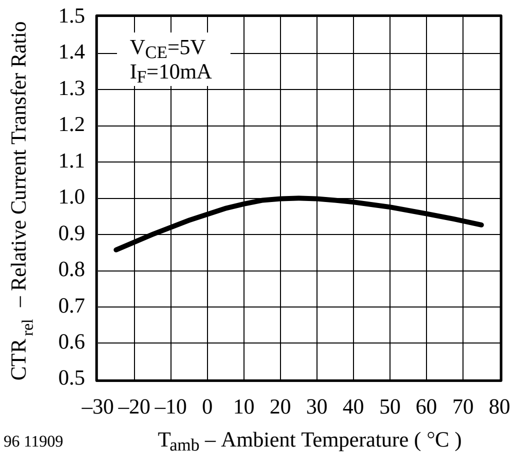


Figure 5. Rel. Current Transfer Ratio vs. Ambient Temperature

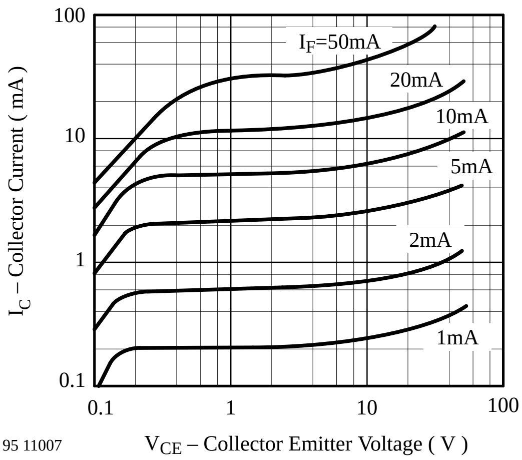


Figure 8. Collector Current vs. Collector Emitter Voltage

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

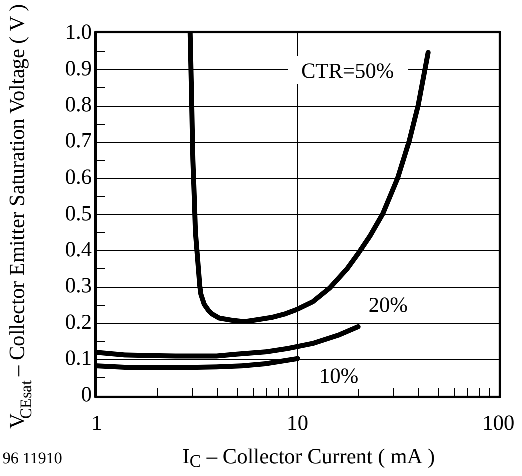


Figure 9. Collector Emitter Sat. Voltage vs. Collector Current

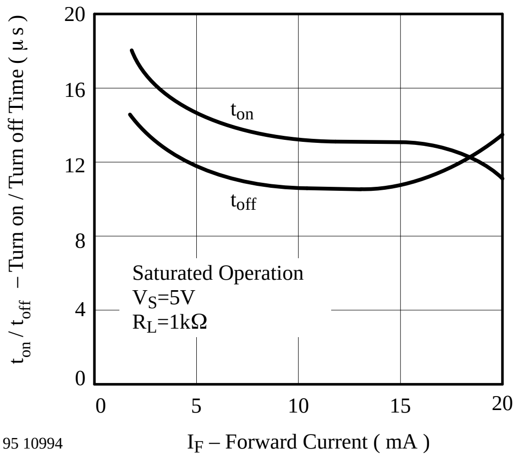


Figure 11. Turn on / off Time vs. Forward Current

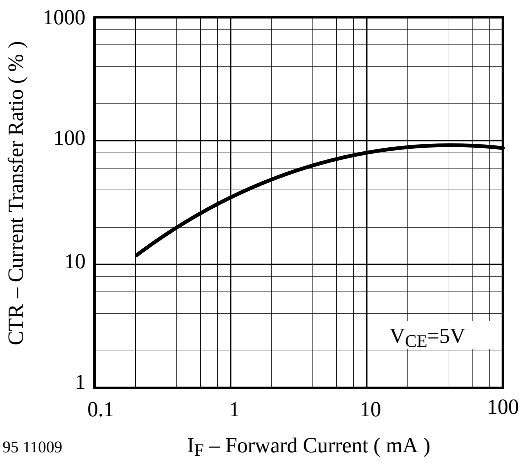


Figure 10. Current Transfer Ratio vs. Forward Current

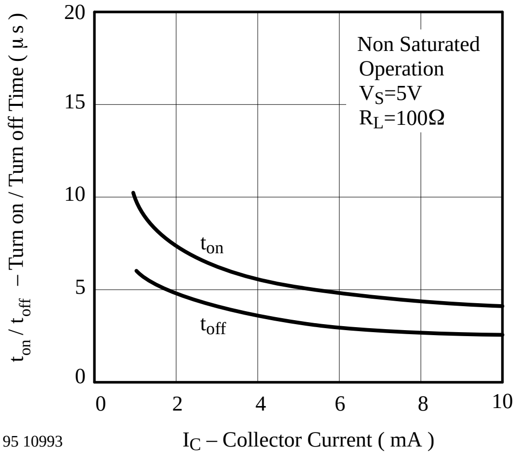
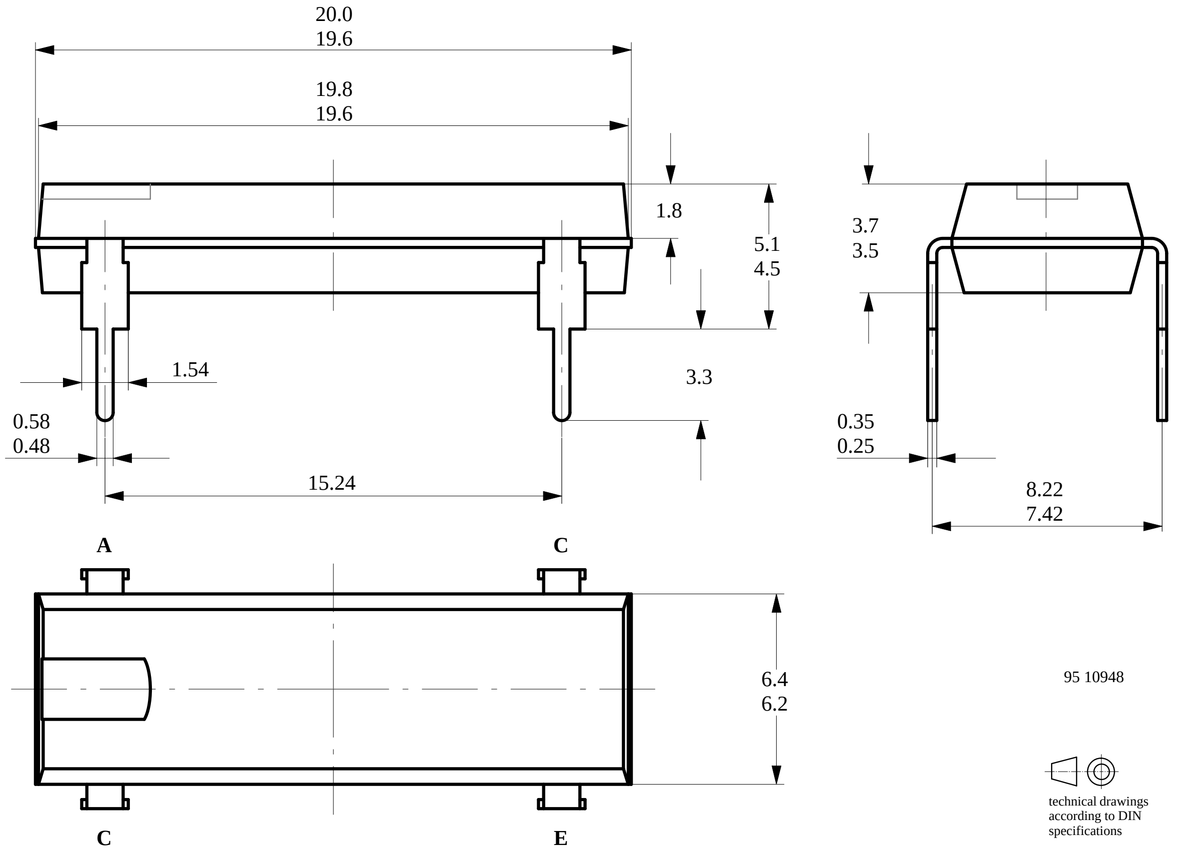


Figure 12. Turn on / off Time vs. Collector Current

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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