

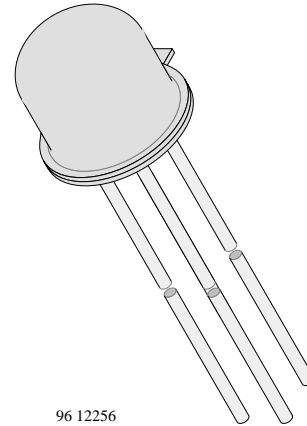
## Optocoupler with Phototransistor Output

### Description

The 3C91C/ 3C92C consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 4-lead hermetically sealed metal can.

### Applications

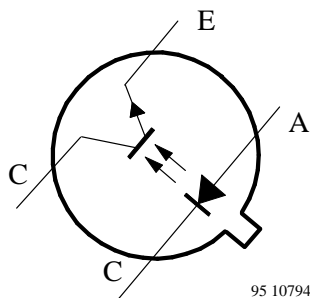
Galvanically separated circuits for general purposes



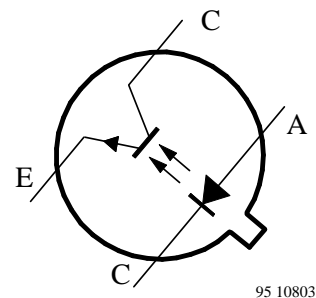
### Features

- Hermetically-sealed case
- High isolation resistance
- DC isolation test voltage 1000 V
- Coupling capacitance of typical 1.5 pF
- Low temperature coefficient of CTR
- High operation temperature range
- Current Transfer Ratio (CTR) of typical 100%

### Pin Connection



3C91C



3C92C

## Absolute Maximum Ratings

### Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Reverse voltage		$V_R$	7	V
Forward current		$I_F$	60	mA
Forward surge current	$t_p \leq 10 \mu s$	$I_{FSM}$	3	A
Power dissipation	$T_{amb} \leq 25^\circ C$	$P_V$	100	mW
Junction temperature		$T_j$	125	$^\circ C$

### Output (Detector)

Parameters	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		$V_{CEO}$	50	V
Emitter collector voltage		$V_{ECO}$	7	V
Collector current		$I_C$	100	mA
Power dissipation	$T_{amb} \leq 25^\circ C$	$P_V$	200	mW
Junction temperature		$T_j$	125	$^\circ C$

### Coupler

Parameters	Test Conditions	Symbol	Value	Unit
DC isolation test voltage		$V_{IO}^{1)}$	1000	V
Total power dissipation	$T_{amb} \leq 25^\circ C$	$P_{tot}$	300	mW
Ambient temperature range		$T_{amb}$	-55 to +100	$^\circ C$
Storage temperature range		$T_{stg}$	-55 to +125	$^\circ C$
Soldering temperature	2 mm from case, $t \leq 10 s$	$t_{sd}$	260	$^\circ C$

1) Related to standard climate 23/50 DIN 50014

## Electrical Characteristics

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

### Input (Emitter)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	$I_F = 50 mA$	$V_F$		1.25	1.5	V
Breakdown voltage	$I_R = 100 \mu A$	$V_{(BR)}$	7			V
Reverse current	$V_R = 3 V$	$I_R$		0.35	1	$\mu A$
Junction capacitance	$V_R = 0, f = 1 MHz$	$C_j$		25		pF

### Output (Detector)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter breakdown voltage	$I_C = 0.1 \text{ mA}$	$V_{(BR)CEO}$	50			V
Emitter collector breakdown voltage	$I_E = 10 \mu\text{A}$	$V_{(BR)ECO}$	7			V
Collector dark current	$V_{CE} = 10 \text{ V}$ $V_{CB} = 10 \text{ V}$	$I_{CEO}$ $I_{CBO}$		0.1	10 20	nA nA

### Coupler

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
DC isolation test voltage	$t = 1 \text{ min}$	$V_{IO}^{1)}$	1000			V
Isolation resistance	$V_{IO} = 1 \text{ kV}$ , 40% relative humidity	$R_{IO}^{1)}$	$10^9$	$10^{10}$		$\Omega$
Collector current	$V_{CE} = 5 \text{ V}$ , $I_F = 10 \text{ mA}$ $V_{CE} = 0.4 \text{ V}$ , $I_F = 10 \text{ mA}$	$I_C$ $I_C$	4 3	10 8	20	mA mA
$I_C/I_F$	$V_{CE} = 5 \text{ V}$ , $I_F = 10 \text{ mA}$	CTR	0.4	1		
Collector emitter saturation voltage	$I_F = 20 \text{ mA}$ , $I_C = 2.5 \text{ mA}$ $I_F = 10 \text{ mA}$ , $I_C = 0.5 \text{ mA}$	$V_{CEsat}$ $V_{CEsat}$		0.1	0.3	V V
Cut-off frequency	$V_{CE} = 5 \text{ V}$ , $I_f = 10 \text{ mA}$ , $R_L = 100 \Omega$	$f_g$		110		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	$C_k$			2.5	pF

1) Related to standard climate 23/50 DIN 50014

### Switching Characteristics

$V_S = 5 \text{ V}$ ,  $I_C = 2 \text{ mA}$ ,  $R_L = 100 \Omega$  (see figure 1)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Turn-on time	3C91C	$t_{on}$		10		$\mu\text{s}$
	3C92C	$t_{on}$		6		$\mu\text{s}$
Turn-off time	3C91C	$t_{off}$		8		$\mu\text{s}$
	3C92C	$t_{off}$		5		$\mu\text{s}$

$V_S = 5 \text{ V}$ ,  $I_F = 10 \text{ mA}$ ,  $R_L = 1 \text{ k}\Omega$  (see figure 2)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Turn-on time	3C91C	$t_{on}$		14		$\mu\text{s}$
	3C92C	$t_{on}$		9		$\mu\text{s}$
Turn-off time	3C91C	$t_{off}$		22.5		$\mu\text{s}$
	3C92C	$t_{off}$		18		$\mu\text{s}$

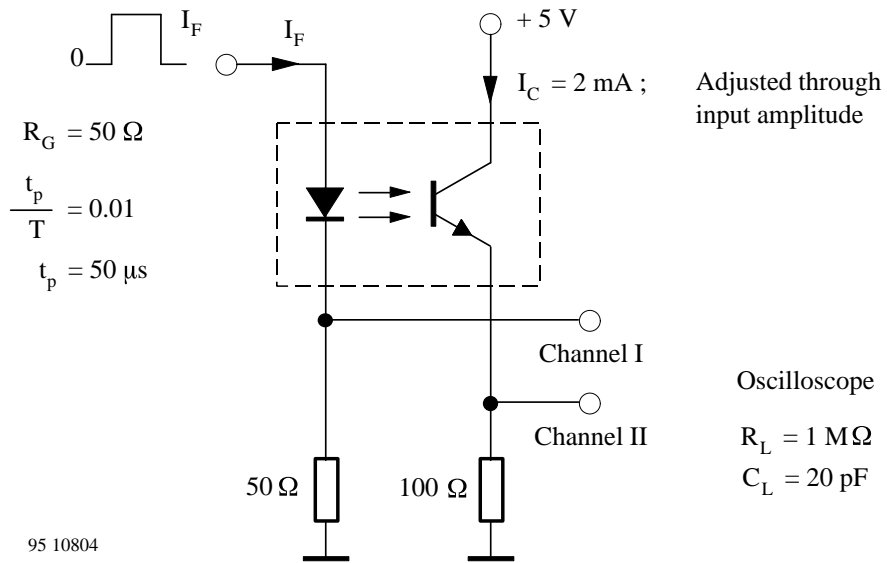


Figure 1. Test circuit, non-saturated operation

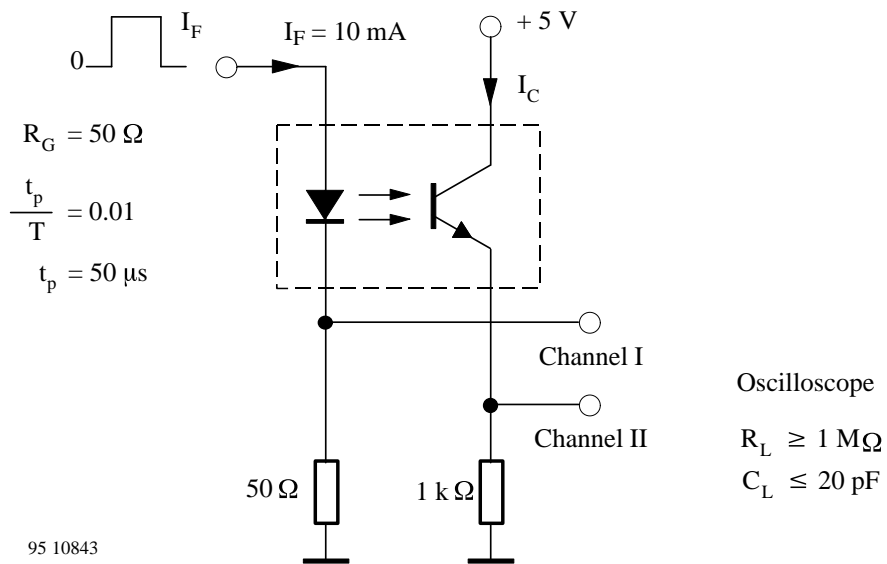


Figure 2. Test circuit, saturated operation

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

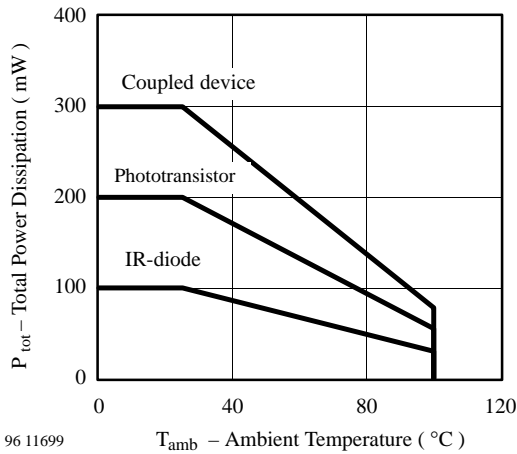


Figure 3. Total Power Dissipation vs. Ambient Temperature

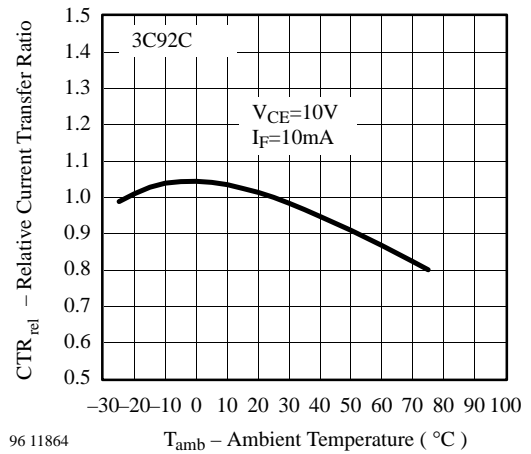


Figure 6. Rel. Current Transfer Ratio vs. Ambient Temperature

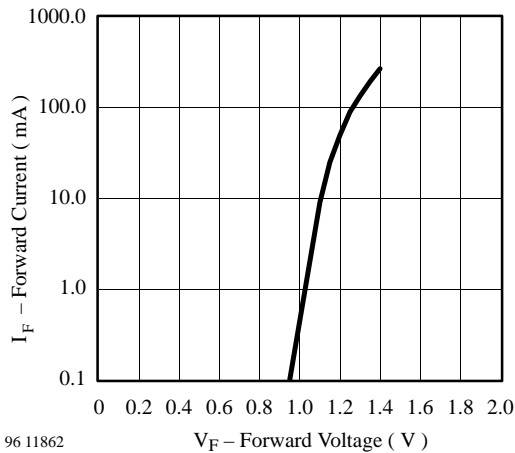


Figure 4. Forward Current vs. Forward Voltage

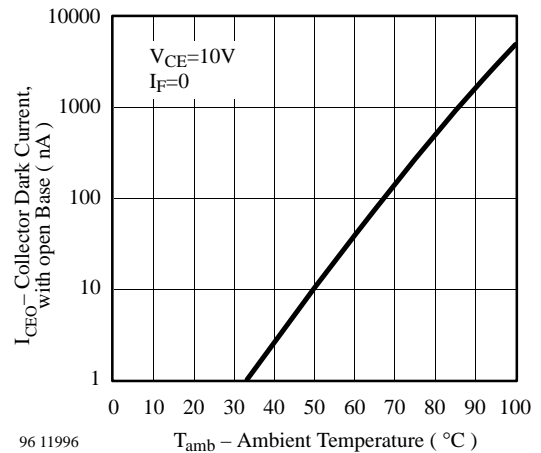


Figure 7. Collector Dark Current vs. Ambient Temperature

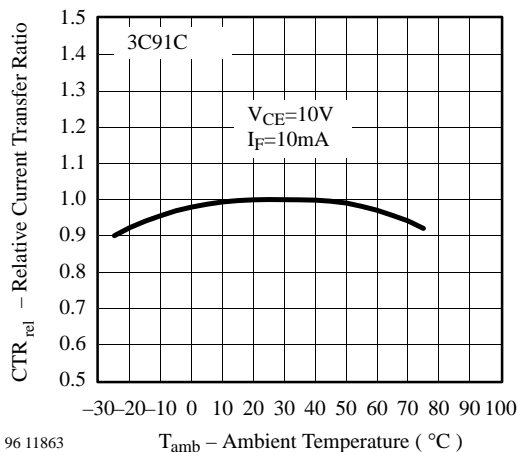


Figure 5. Rel. Current Transfer Ratio vs. Ambient Temperature

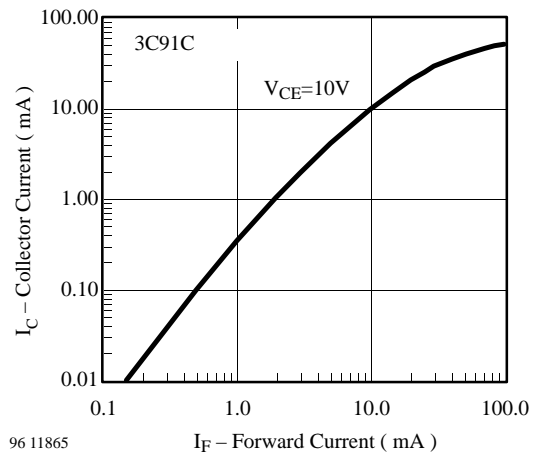


Figure 8. Collector Current vs. Forward Current

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

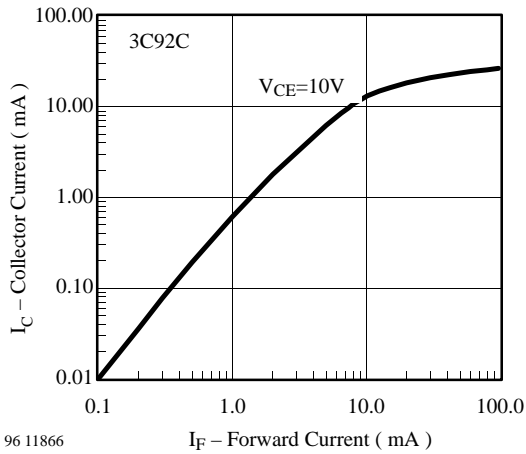


Figure 9. Collector Current vs. Forward Current

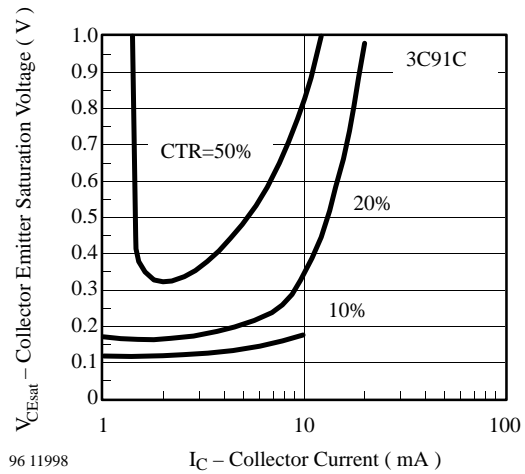


Figure 12. Collector Emitter Sat. Voltage vs. Collector Current

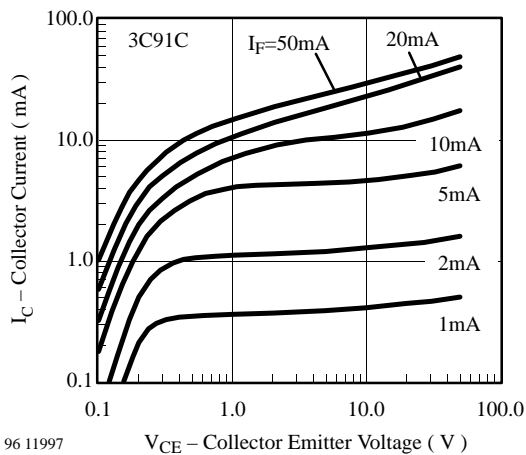


Figure 10. Collector Current vs. Collector Emitter Voltage

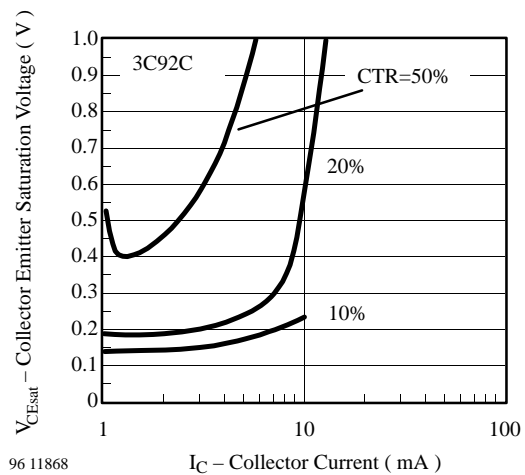


Figure 13. Collector Emitter Sat. Voltage vs. Collector Current

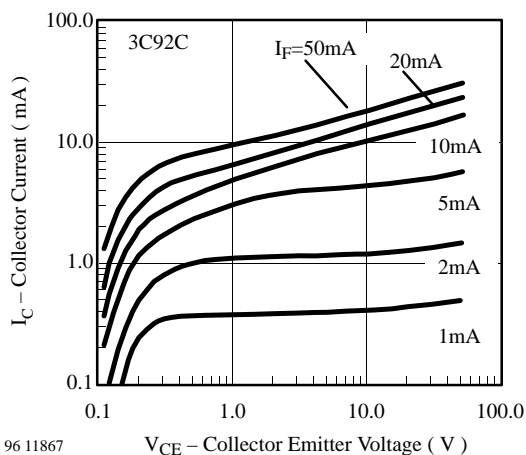


Figure 11. Collector Current vs. Collector emitter Voltage

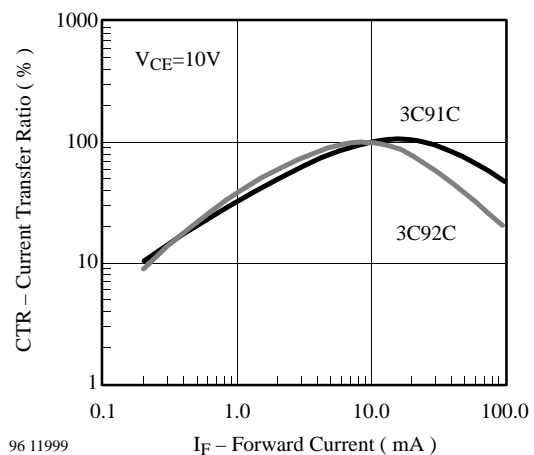


Figure 14. Current Transfer Ratio vs. Forward Current

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

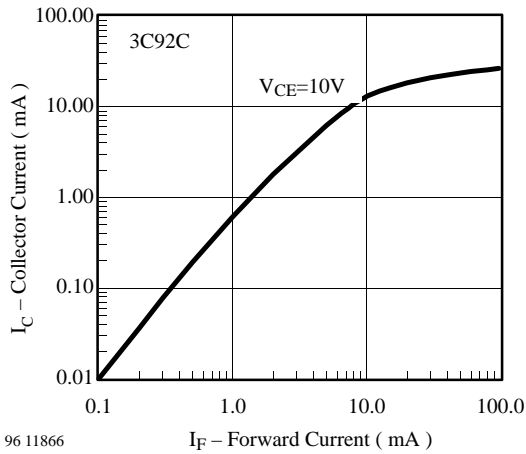


Figure 15. Collector Current vs. Forward Current

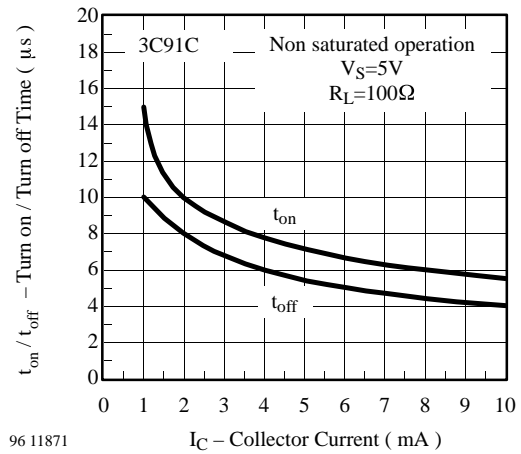


Figure 18. Turn on / off Time vs. Collector Current

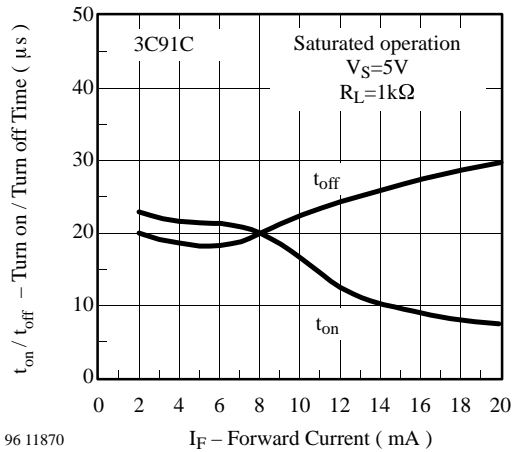


Figure 16. Turn on / off Time vs. Forward Current

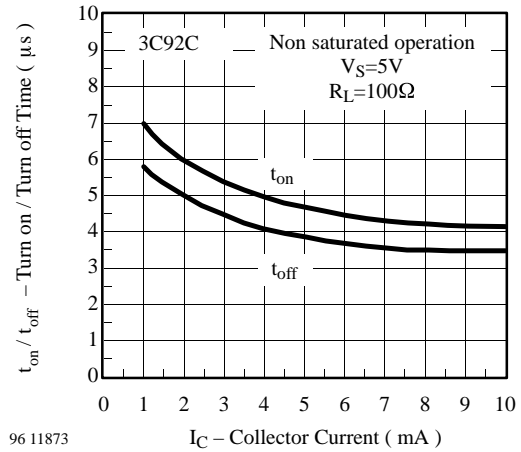


Figure 19. Turn on / off Time vs. Collector Current

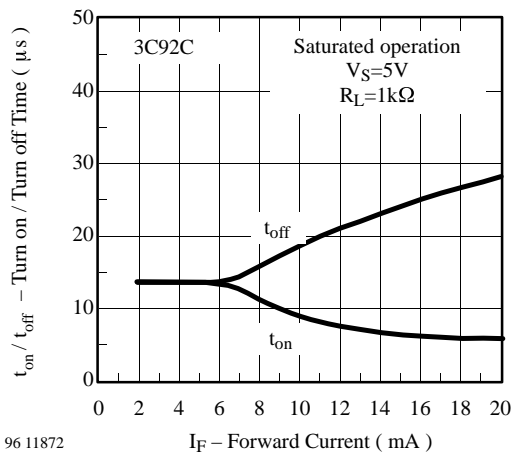
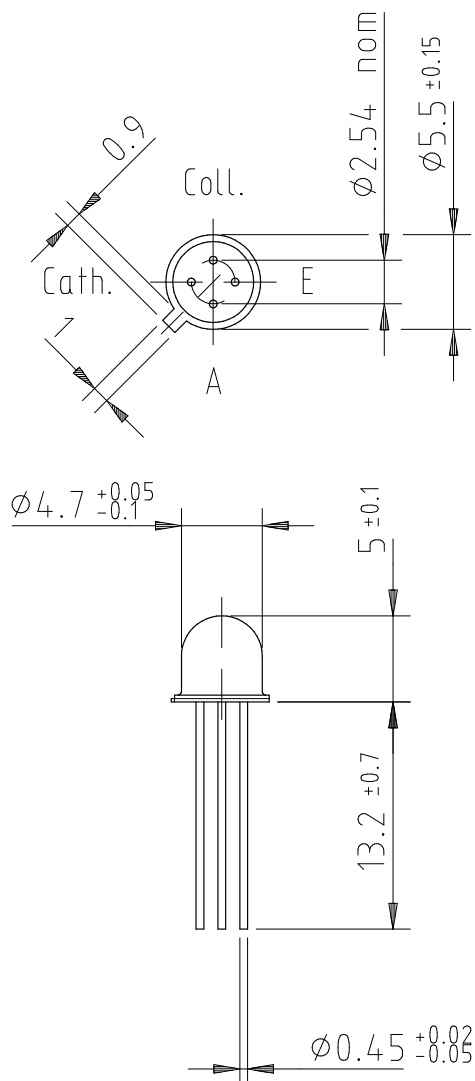
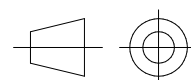


Figure 17. Turn on / off Time vs. Forward Current

## Dimensions of 3C91C in mm



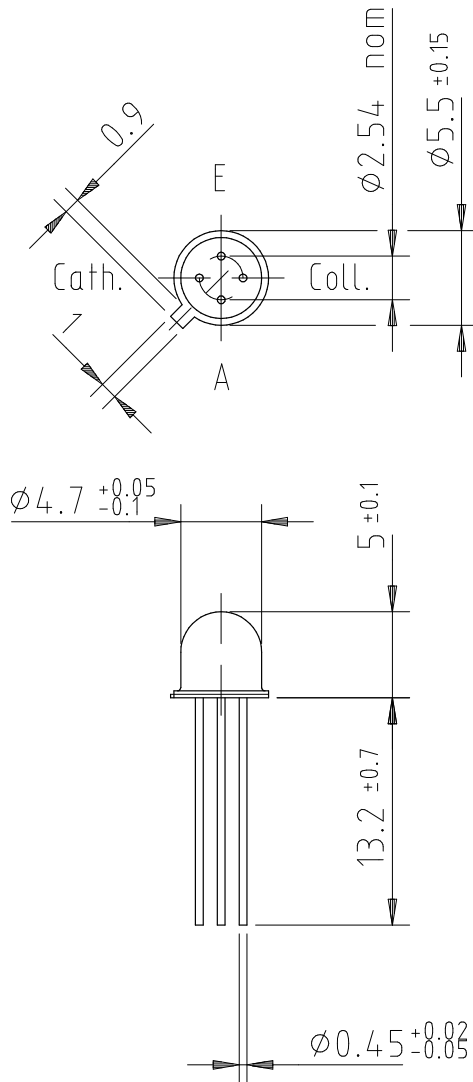
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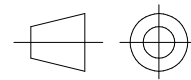
technical drawings  
according to DIN  
specifications



**Dimensions of 3C92C in mm**



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technical drawings  
according to DIN  
specifications

## 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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