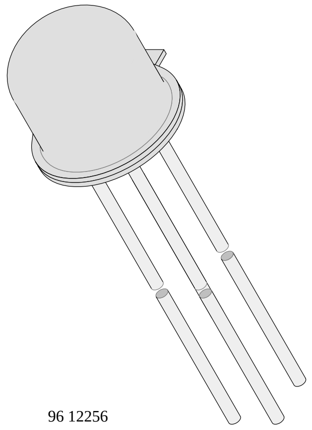
Optocoupler with Phototransistor Output

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.



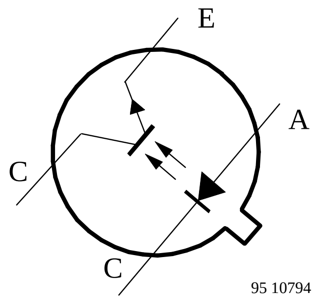
Applications

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
- **C**urrent **T**ransfer **R**atio (CTR) of typical 100%

Pin Connection



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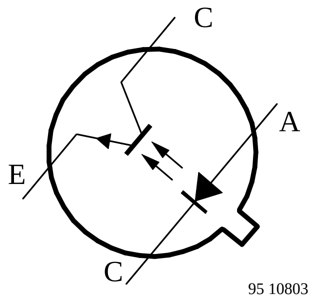

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Absolute Maximum Ratings

Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	7	V
Forward current		I_F	60	mA
Forward surge current	$t_p \leq 10$ µs	I_{FSM}	3	A
Power dissipation	$T_{amb} \leq 25$°C	P_V	100	mW
Junction temperature		T_j	125	°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	$T_{amb} \leq 25$°C	P_V	200	mW
Junction temperature		T_j	125	°C

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
DC isolation test voltage		V_{IO} [1)]	1000	V
Total power dissipation	$T_{amb} \leq 25$°C	P_{tot}	300	mW
Ambient temperature range		T_{amb}	–55 to +100	°C
Storage temperature range		T_{stg}	–55 to +125	°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	1.5	V
Breakdown voltage	$I_R = 100$ µA	$V_{(BR)}$	7			V
Reverse current	$V_R = 3$ V	I_R		0.35	1	µA
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 mA	$V_{(BR)CEO}$	50			V
Emitter collector breakdown voltage	I_E = 10 µA	$V_{(BR)ECO}$	7			V
Collector dark current	V_{CE} = 10 V V_{CB} = 10 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 min	V_{IO} 1)	1000			V
Isolation resistance	V_{IO} = 1 kV, 40% relative humidity	R_{IO} 1)	10^9	10^{10}		Ω
Collector current	V_{CE} = 5 V, I_F = 10 mA V_{CE} = 0.4 V, I_F = 10 mA	I_C I_C	4 3	10 8	 20	mA mA
I_C/I_F	V_{CE} = 5 V, I_F = 10 mA	CTR	0.4	1		
Collector emitter saturation voltage	I_F = 20 mA, I_C = 2.5 mA I_F = 10 mA, I_C = 0.5 mA	V_{CEsat} V_{CEsat}		 0.1	0.3 	V V
Cut-off frequency	V_{CE} = 5 V, I_f = 10 mA, R_L = 100 Ω	f_g		110		kHz
Coupling capacitance	f = 1 MHz	C_k			2.5	pF

1) Related to standard climate 23/50 DIN 50014

Switching Characteristics

V_S = 5 V, I_C = 2 mA, R_L = 100 Ω (see figure 1)

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

V_S = 5 V, I_F = 10 mA, R_L = 1 kΩ (see figure 2)

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

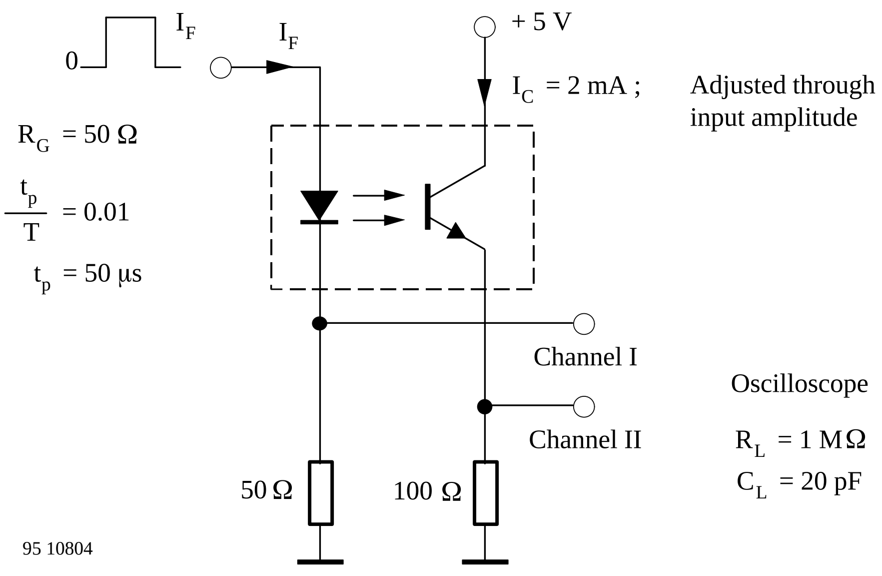


Figure 1. Test circuit, non-saturated operation

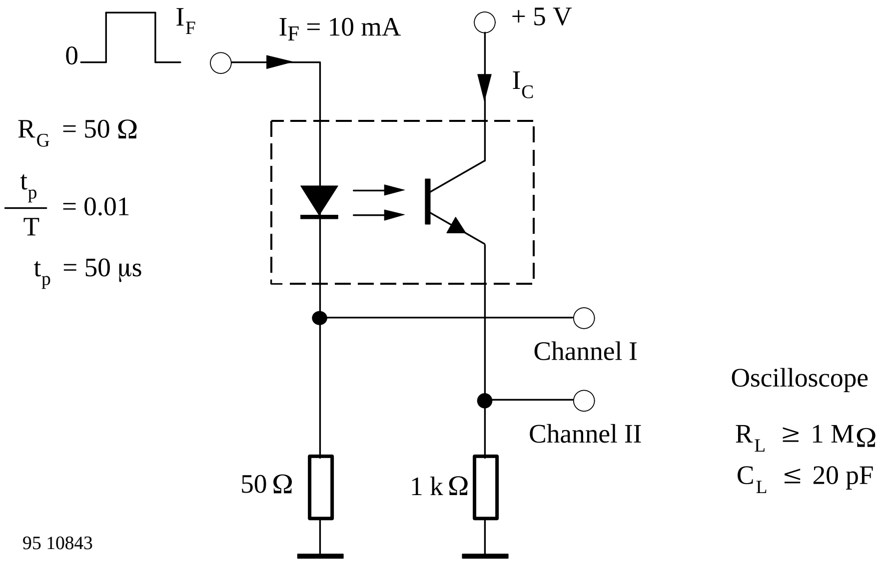


Figure 2. Test circuit, saturated operation

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

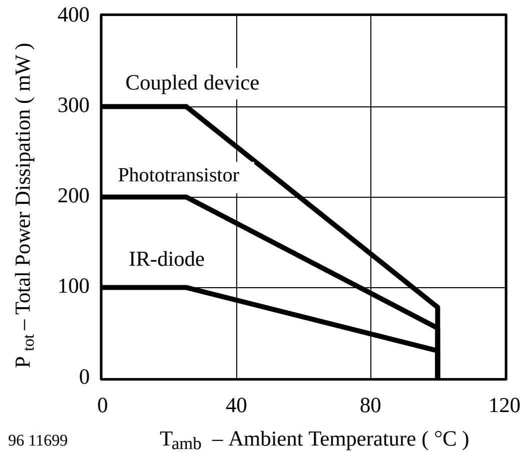


Figure 3. Total Power Dissipation vs. Ambient Temperature

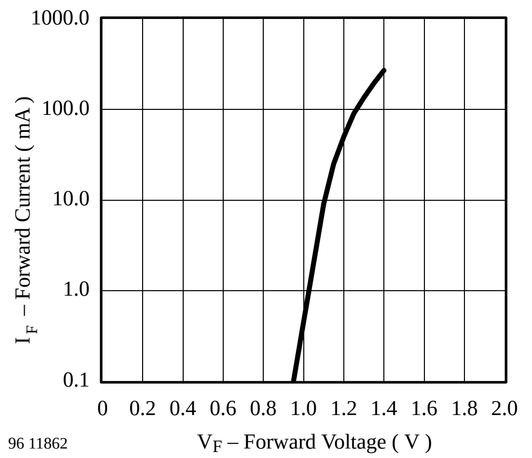


Figure 4. Forward Current vs. Forward Voltage

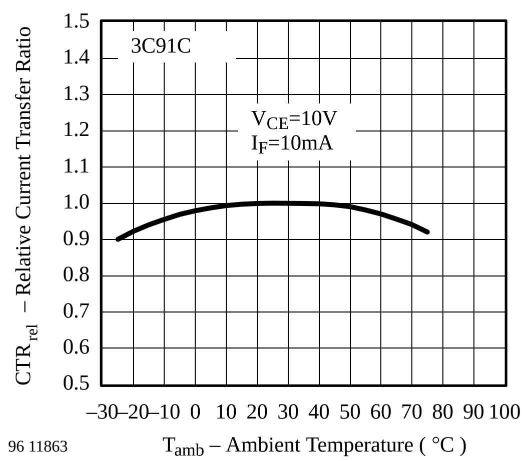


Figure 5. Rel. Current Transfer Ratio vs. Ambient Temperature

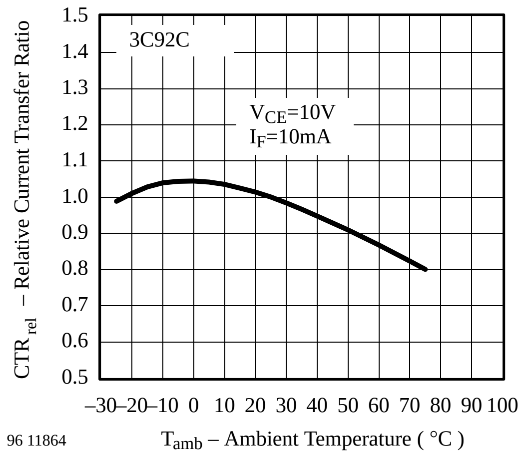


Figure 6. Rel. Current Transfer Ratio vs. Ambient Temperature

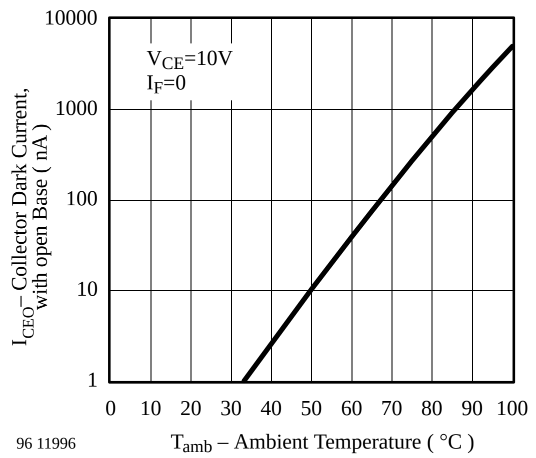


Figure 7. Collector Dark Current vs. Ambient Temperature

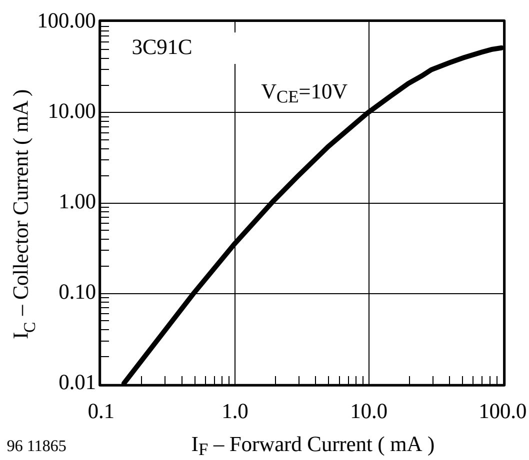


Figure 8. Collector Current vs. Forward Current

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

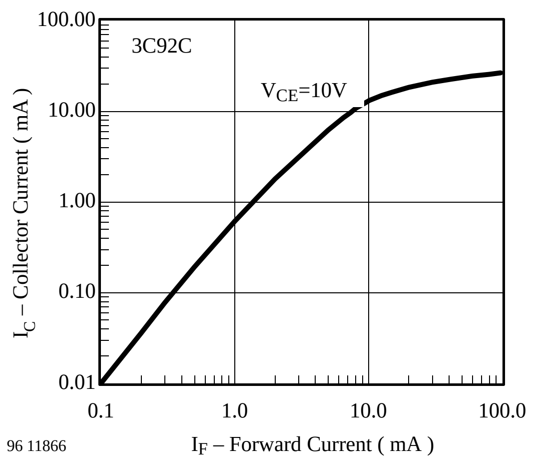


Figure 9. Collector Current vs. Forward Current

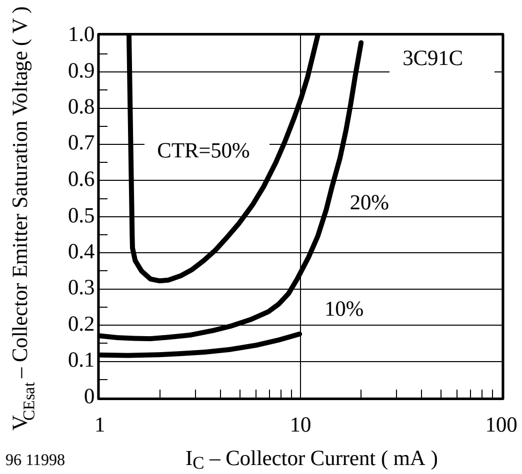


Figure 12. Collector Emitter Sat. Voltage vs. Collector Current

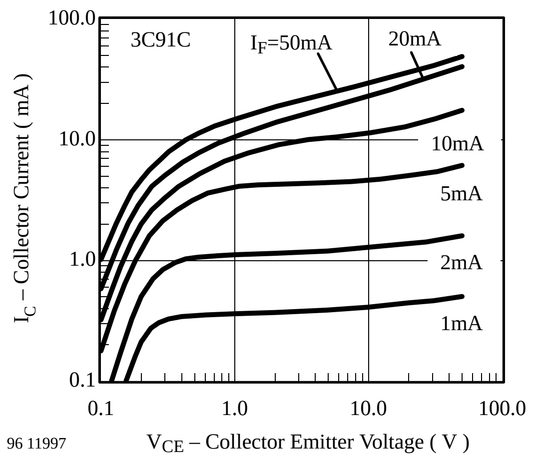


Figure 10. Collector Current vs. Collector Emitter Voltage

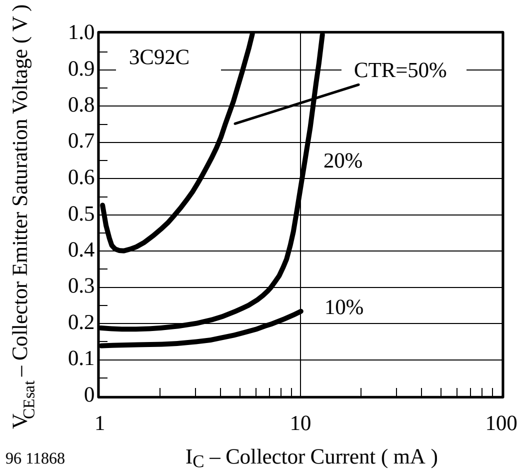


Figure 13. Collector Emitter Sat. Voltage vs. Collector Current

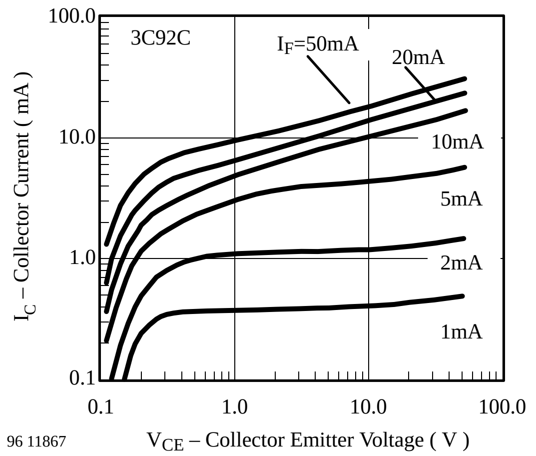


Figure 11. Collector Current vs. Collector emitter Voltage

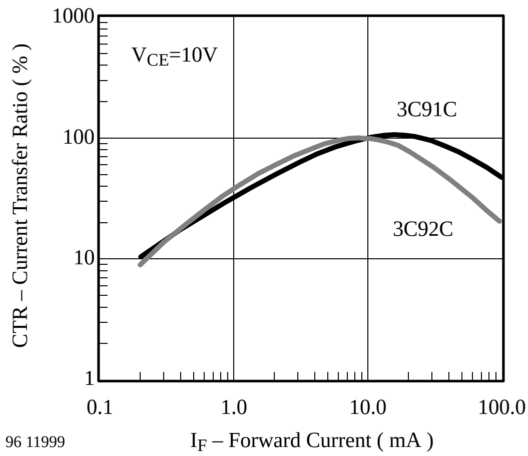


Figure 14. Current Transfer Ratio vs. Forward Current

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

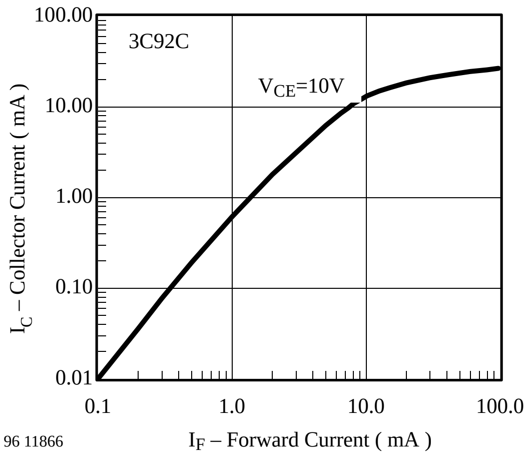


Figure 15. Collector Current vs. Forward Current

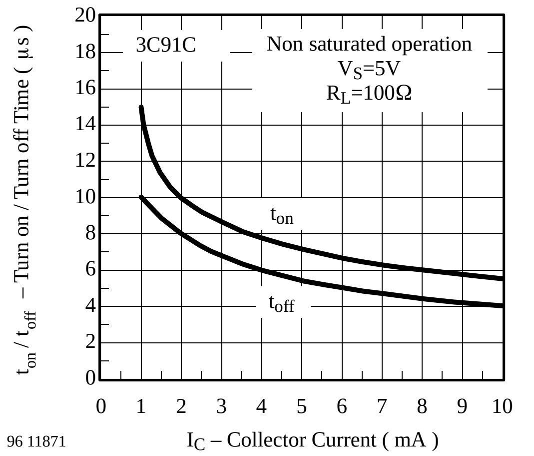


Figure 18. Turn on / off Time vs. Collector Current

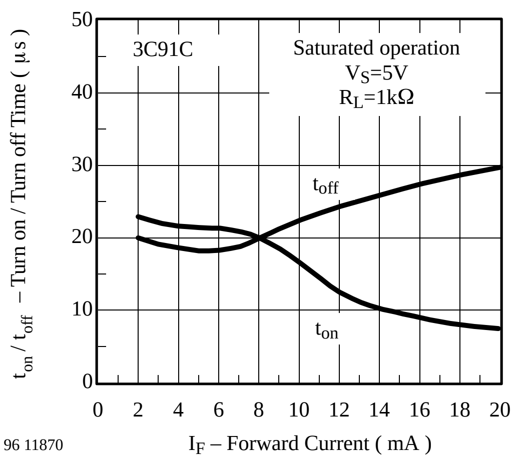


Figure 16. Turn on / off Time vs. Forward Current

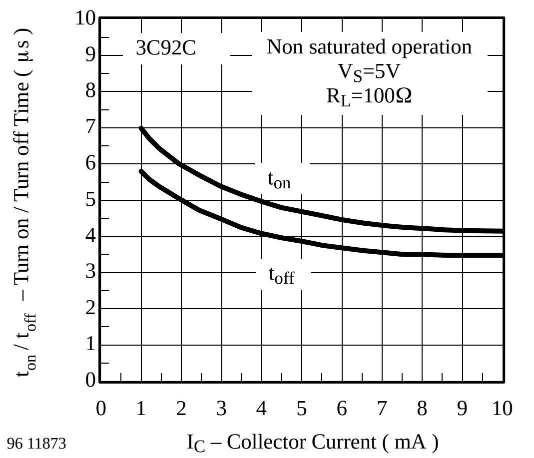


Figure 19. Turn on / off Time vs. Collector Current

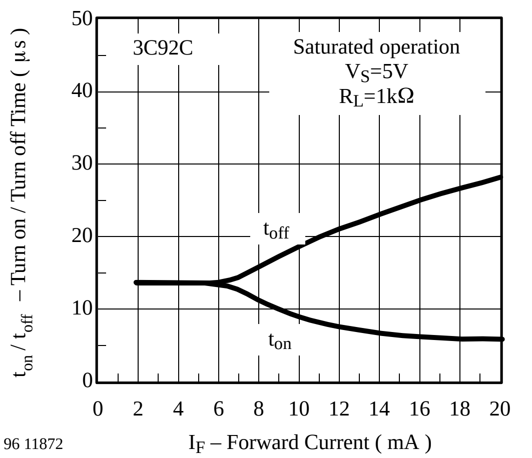
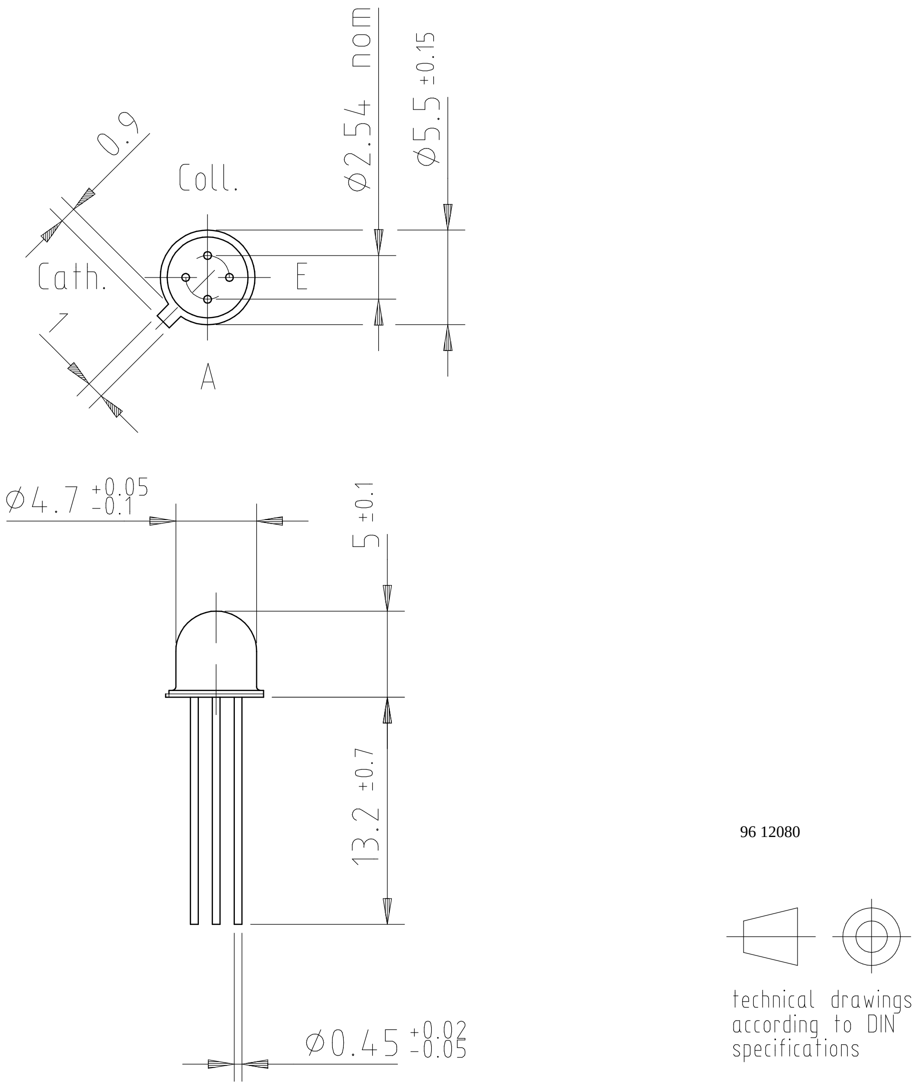


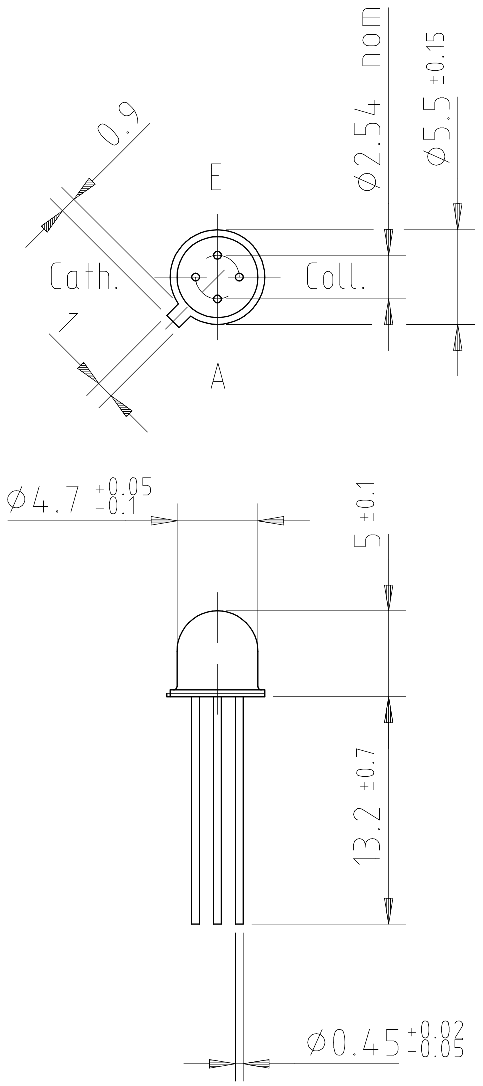
Figure 17. Turn on / off Time vs. Forward Current

TEMIC
Semiconductors

Dimensions of 3C91C in mm



Dimensions of 3C92C in mm



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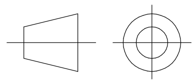

Ozone Depleting Substances Policy Statement

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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