

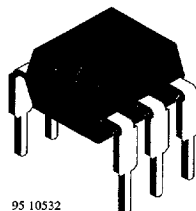
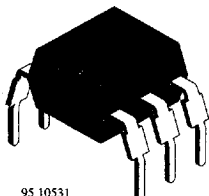
Optocoupler with Phototransistor Output

Order Nos. and Classification table is on sheet 2.

Description

The 4N25V(G)/ 4N35V(G) series consists of a photo-transistor 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.



Applications

Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):

- For application class I – IV at mains voltage < 300 V
- For application class I – III at mains voltage < 600 V according to VDE 0884, table 2, suitable for:

Switch-mode power supplies, computer peripheral interface, microprocessor system interface, line receiver.



These couplers perform safety functions according to the following equipment standards:

- **VDE 0884**
Optocoupler providing protective separation
- **VDE 0804**
Telecommunication apparatus and data processing
- **VDE 0805/IEC 950/EN 60950**
Office machines (applied for reinforced isolation for mains voltage $\leq 400 \text{ V}_{\text{RMS}}$)
- **VDE 0860/IEC 65**
Safety for mains-operated electronic and related household apparatus

4N25V(G)/ 4N35V(G) Series

Features

According to VDE 0884

- Rated impulse voltage (transient overvoltage)
 $V_{IOTM} = 6 \text{ kV peak}$
- Isolation test voltage (partial discharge test voltage)
 $V_{pd} = 1.6 \text{ kV}$
- Rated isolation voltage (RMS includes DC)
 $V_{IOWM} = 600 \text{ V}_{RMS} (848 \text{ V peak})$
- Rated recurring peak voltage (repetitive)
 $V_{IORM} = 600 \text{ V}_{RMS}$
- Creeping-current resistance according to VDE 0303/IEC 112
Comparative Tracking Index: **CTI = 275**
- Thickness through insulation $\geq 0.75 \text{ mm}$
- Further approvals:
BS 415, BS 7002, SETI: IEC 950,
UL 1577: File No: E 76222
- Isolation materials according to UL94-VO
- Pollution degree 2 (DIN/VDE 0110 part 1 resp. IEC 664)
- Climatic classification
55/100/21 (IEC 68 part 1)
- Special construction:
Therefore extra low coupling capacity
typical 0.2 pF , high Common Mode Rejection
- Low temperature coefficient of CTR

Order Schematic

Part Numbers	CTR-Ranking
4N25V/ 4N25GV/ 4N25VS/ 4N25GVS	>20%
4N35V/ 4N35GV/ 4N35VS/ 4N35GVS	>100%

Suffix: G = Leadform 10.16 mm
 S = Waterproofed device

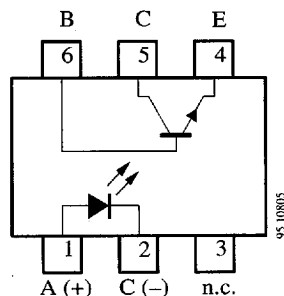
Remarks

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 Connection



Absolute Maximum Ratings

Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Reverse voltage		V_R	5	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_{tot}	100	mW
Junction temperature		T_j	125	$^\circ C$

Output (Detector)

Parameters	Test Conditions	Symbol	Value	Unit
Collector emitter voltage		V_{CEO}	32	V
Emitter collector voltage		V_{CEO}	7	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	$T_{amb} \leq 25^\circ C$	P_{tot}	150	mW
Junction temperature		T_j	125	$^\circ C$

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
Isolation test voltage (RMS)		V_{IO}	3.75	kV
Total power dissipation	$T_{amb} \leq 25^\circ C$	P_{tot}	250	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	$^\circ C$

4N25V(G)/ 4N35V(G) Series

Maximum Safety Ratings¹⁾ (according to VDE 0884)

Input (Emitter)

Parameters	Test Conditions	Symbol	Value	Unit
Forward current		I_{Si}	130	mA

Output (Detector)

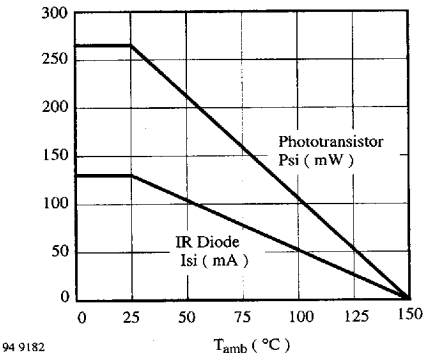
Parameters	Test Conditions	Symbol	Value	Unit
Power dissipation	$T_{amb} \leq 25^{\circ}C$	P_{Si}	265	mW

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
Rated impulse voltage		V_{IOTM}	6	kV
Safety temperature		T_{Si}	150	$^{\circ}C$

- 1) This device is used for protective separation against electrical shock only within the maximum safety ratings. This must be ensured by using protective circuits in the applications.

Derating Diagram



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Electrical Characteristics

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

Input (Emitter)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Forward voltage	$I_F = 50 \text{ mA}$ ²⁾	V_F		1.2	1.4	V
Breakdown voltage	$I_C = 10 \text{ }\mu\text{A}$	$V_{(BR)}$	6			V
Junction capacitance	$V_R = 0, f = 1 \text{ MHz}$	C_j		50		pF

Output (Detector)

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Collector emitter breakdown voltage	$I_C = 1 \text{ mA}$	$V_{(BR)CEO}$	32			V
Emitter collector breakdown voltage	$I_E = 100 \text{ }\mu\text{A}$	$V_{(BR)ECO}$	7			V
Collector emitter cut-off current	$V_{CE} = 10 \text{ V}, I_F = 0$ ²⁾	I_{CEO}			50	nA
	$V_{CE} = 30 \text{ V}, I_F = 0$ ²⁾	I_{CEO}			500	μA

Coupler

Parameters	Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Isolation test voltage (RMS)	$f = 50 \text{ Hz}, t = 1 \text{ s}$	V_{IO}	3.75			V
Collector emitter saturation voltage	$I_F = 50 \text{ mA}, I_C = 2 \text{ mA}$	V_{CEsat}			0.3	V
Cut-off frequency	$V_{CE} = 5 \text{ V}, I_F = 10 \text{ mA}, R_L = 100 \text{ }\Omega$	f_c		110		kHz
Coupling capacitance	$f = 1 \text{ MHz}$	C_k		1		pF

²⁾ $T_{amb} = 100^{\circ}\text{C}$

Current Transfer Ratio (CTR)

Parameters	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
I_C/I_F	$V_{CE} = 10 \text{ V}, I_F = 10 \text{ mA}$	4N25V(G)	CTR	0.20	1		
I_C/I_F	$V_{CE} = 10 \text{ V}, I_F = 10 \text{ mA}$	4N35V(G)	CTR	1.00	1.5		
I_C/I_F	$V_{CE} = 10 \text{ V}, I_F = 10 \text{ mA}, T_{amb} = 100^{\circ}\text{C}$	4N35V(G)	CTR	0.40			

4N25V(G)/ 4N35V(G) Series

TEMIC
Semiconductors

Switching Characteristics (Typical Values)

$V_S = 5\text{ V}$

Type	$R_L = 100\ \Omega$ (see figure 1)							$R_L = 1\text{ k}\Omega$ (see figure 2)		
	$t_d[\mu\text{s}]$	$t_r[\mu\text{s}]$	$t_{on}[\mu\text{s}]$	$t_s[\mu\text{s}]$	$t_f[\mu\text{s}]$	$t_{off}[\mu\text{s}]$	$I_C[\text{mA}]$	$t_{on}[\mu\text{s}]$	$t_{off}[\mu\text{s}]$	$I_F[\text{mA}]$
4N25V(G) 4N25GVS	4.0	7.0	11.0	0.3	6.7	7.0	5.0	25.0	42.5	10.0
4N35V(G) 4N35GVS	2.5	3.0	< 10	0.3	4.2	< 10	2.0	9.0	25.0	10.0

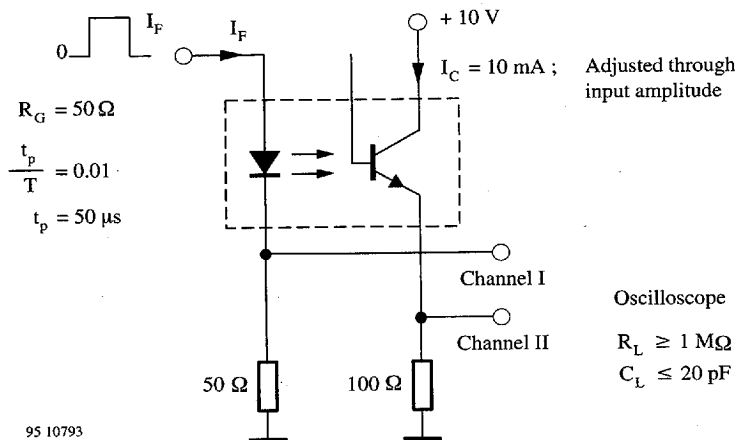


Figure 1. Test circuit, non-saturated operation

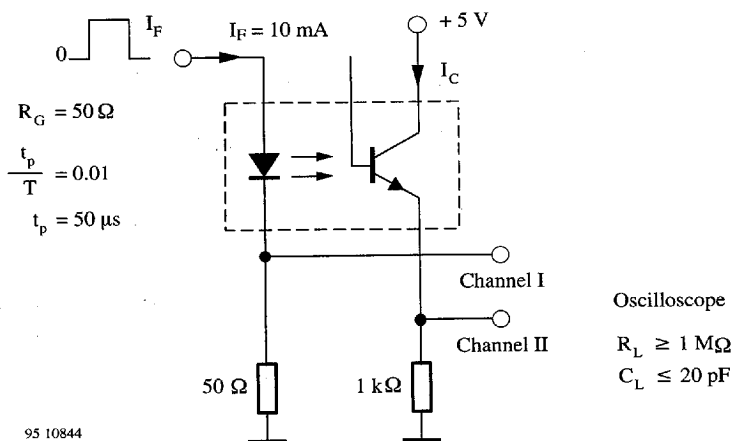


Figure 2. Test circuit, saturated operation

Insulation Rated Parameters (according to VDE 0884)

Parameters		Test Conditions	Symbol	Min.	Typ.	Max.	Unit
Partial discharge test voltage	Routine test	100%, $t_{\text{test}} = 1 \text{ s}$	V_{pd}	1.6			kV
	Lot test (sample test)	$t_{\text{Tr}} = 10 \text{ s}$, $t_{\text{test}} = 60 \text{ s}$	V_{IOTM}	6			kV
		(see figure 3)	V_{pd}	1.3			kV
		Insulation resistance		$V_{\text{IO}} = 500 \text{ V}$	R_{IO}	10^{12}	
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 100^{\circ}\text{C}$		R_{IO}	10^{11}			Ω
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 150^{\circ}\text{C}$		R_{IO}	10^9			Ω
	(construction test only)						

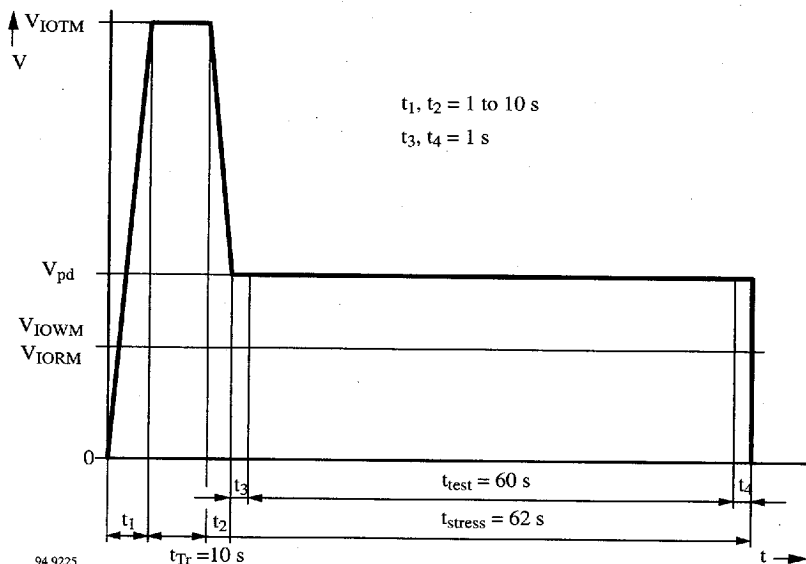


Figure 3. Test pulse diagram for sample test according to DIN VDE 0884

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

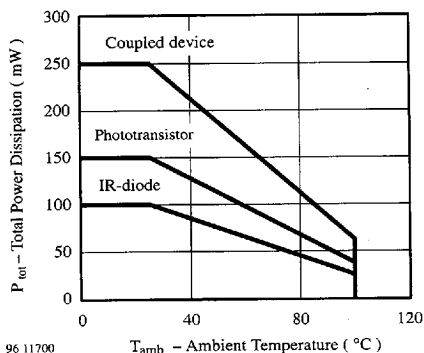


Figure 4. Total Power Dissipation vs. Ambient Temperature

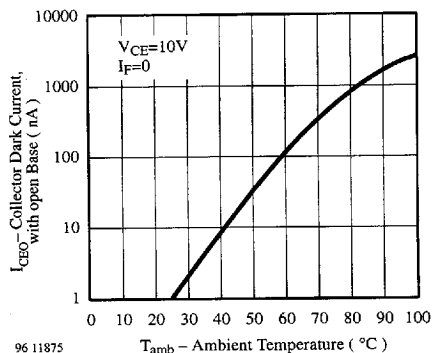


Figure 7. Collector Dark Current vs. Ambient Temperature

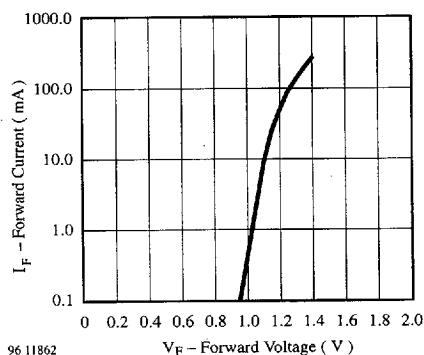


Figure 5. Forward Current vs. Forward Voltage

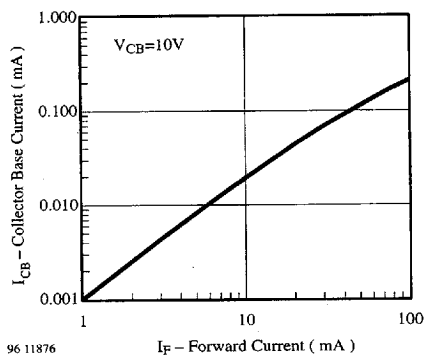


Figure 8. Collector Base Current vs. Forward Current

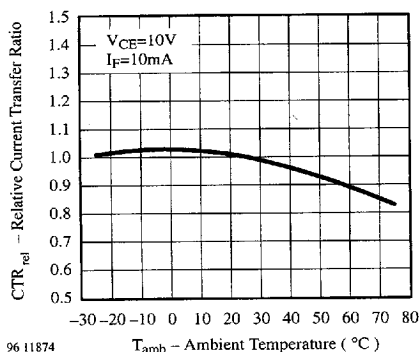


Figure 6. Rel. Current Transfer Ratio vs. Ambient Temperature

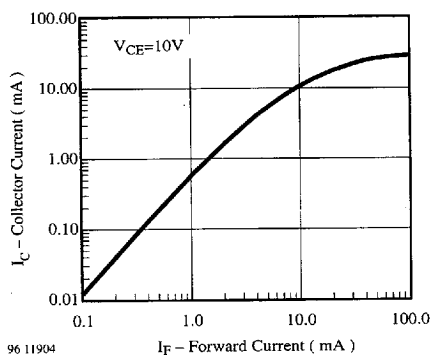


Figure 9. Collector Current vs. Forward Current

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

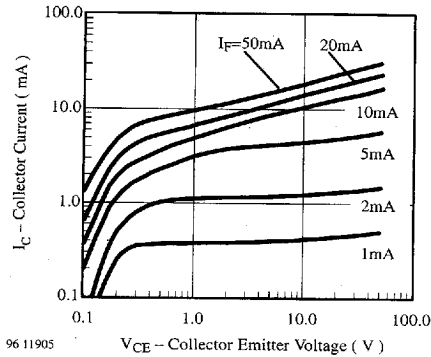


Figure 10. Collector Current vs. Collector Emitter Voltage

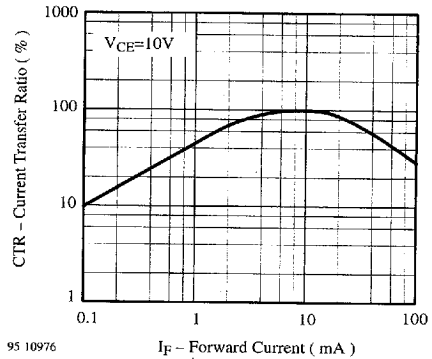


Figure 13. Current Transfer Ratio vs. Forward Current

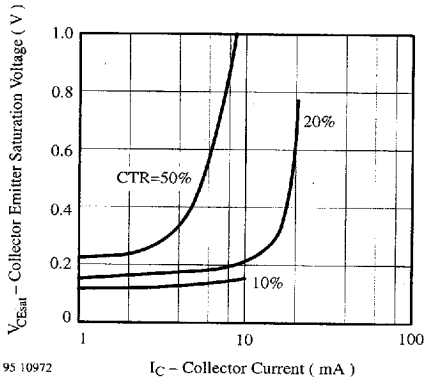


Figure 11. Collector Emitter Sat. Voltage vs. Collector Current

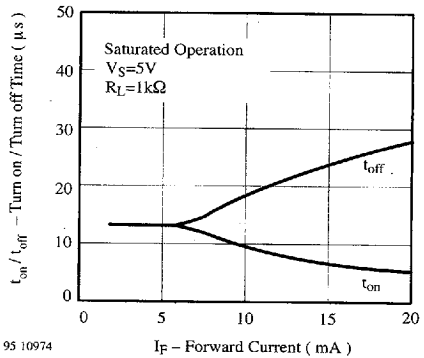


Figure 14. Turn on/ off Time vs. Forward Current

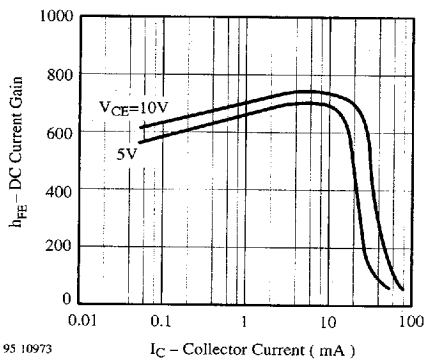


Figure 12. DC Current Gain vs. Collector Current

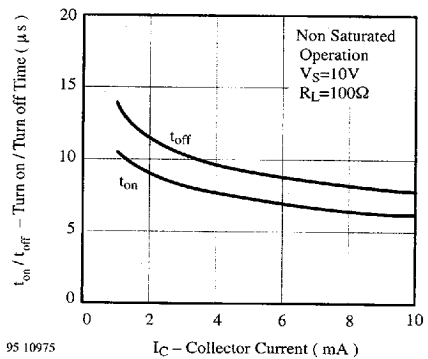


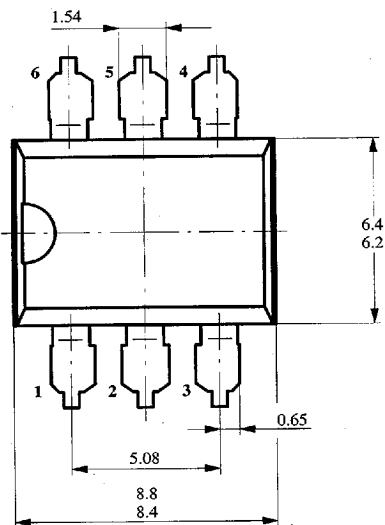
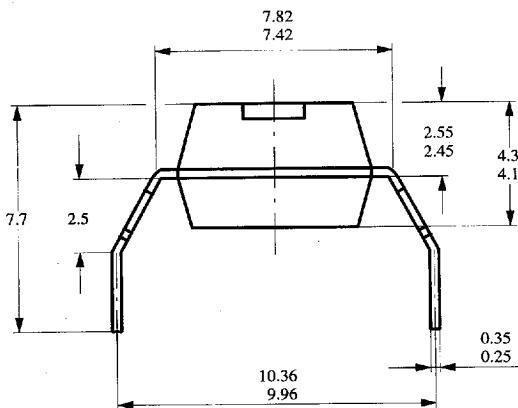
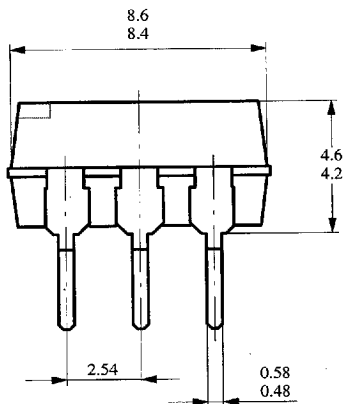
Figure 15. Turn on/ off Time vs. Collector Current

4N25V(G)/ 4N35V(G) Series

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Dimensions in mm

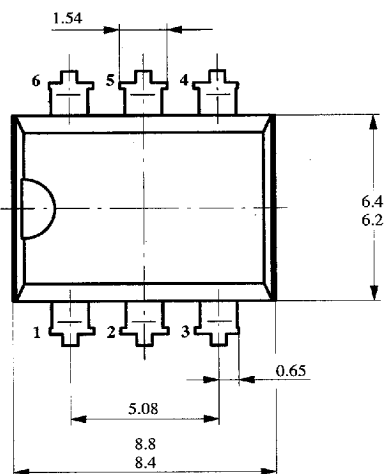
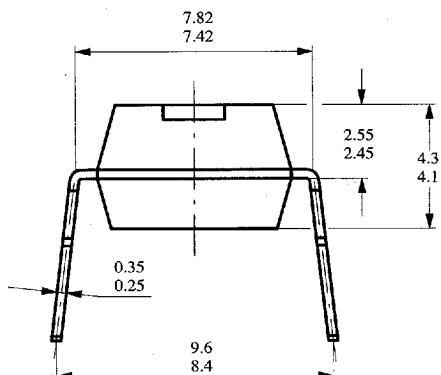
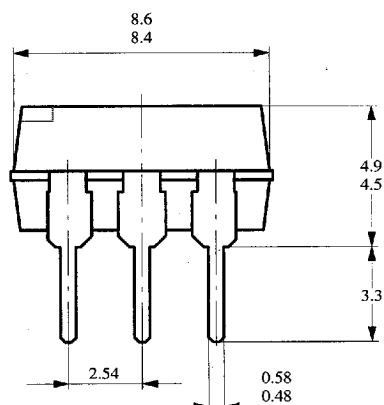
Leadform 10.16. mm (G-type)



Technical drawings
according to DIN
specifications

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Dimensions in mm



technical drawings
according to DIN
specifications

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