CNY75(G) Series

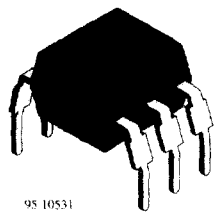
Optocoupler with Phototransistor Output

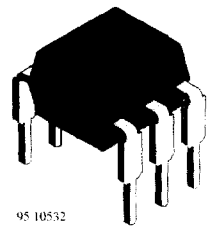
Order Nos. and Classification table is on sheet 2.

Description

The CNY75(G) series consists of a phototransistor 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.

0884

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/ 60950**
  Office machines (applied for reinforced isolation for mains voltages ≤ 400 V_{RMS})
- **VDE 0860/IEC 65**
  Safety for mains-operated electronic and related household apparatus

CNY75(G) Series

Features

According to VDE 0884

- Rated impulse voltage (transient overvoltage)
  V_{IOTM} = 6 kV peak
- Isolation test voltage (partial discharge test voltage)
  V_{pd} = 1.6 kV
- Rated isolation voltage (RMS includes DC)
  V_{IOWM} = 600 V_{RMS} (848 V peak)
- Rated recurring peak voltage (repetitive)
  V_{IORM} = 600 V_{RMS}
- Creeping current resistance according to VDE 0303/IEC 112
  Comparative Tracking Index: **CTI** = 275
- Thickness through insulation ≥ 0.75 mm
- Further approvals:
  BS 415, BS 7002, SETI: IEC 950,
  UL 1577: File No: E 76222
- CTR offered in 3 groups
- Isolation materials according to UL94-VO
- Pollution degree 2 (DIN/VDE 0110 resp. IEC 664)
- Climatic classification
  55/100/21 (IEC 68 part 1)
- Special construction:
  Therefore extra low coupling capacity typical 0.3 pF, high Common Mode Rejection
- Low temperature coefficient of CTR

Order Schematic

Part Numbers	CTR-Ranking
CNY75A/ CNY75(G)A/ CNY75(G)AS	63 to 125%
CNY75B/ CNY75(G)B/ CNY75(G)BS	100 to 200%
CNY75C/ CNY75(G)C/ CNY75(G)CS	160 to 320%

Suffix: G = Leadform 10.16 mm
S = Waterproof device

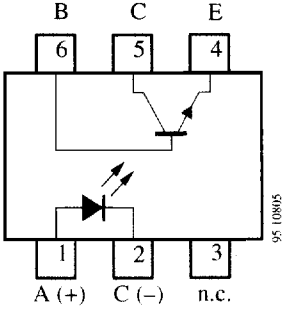
Remarks

A waterproof construction is recommended for couplers where a pure water cleaning process is used insteal 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	$T_{amb} \leq 25°C$	P_{tot}	100	mW
Junction temperature		T_j	125	°C

Output (Detector)

Parameters	Test Conditions	Symbol	Value	Unit
Collector base voltage		V_{CBO}	90	V
Collector emitter voltage		V_{CEO}	90	V
Emitter collector voltage		V_{ECO}	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	$T_{amb} \leq 25°C$	P_{tot}	150	mW
Junction temperature		T_j	125	°C

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
AC isolation test voltage (RMS)		V_{IO}	3.75	kV
Total power dissipation	$T_{amb} \leq 25°C$	P_{tot}	250	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, $t \leq 10$ s	T_{sd}	260	°C

Maximum Safety Ratings[1] (according to VDE 0884)

Input (Emitter)

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

Output (Detector)

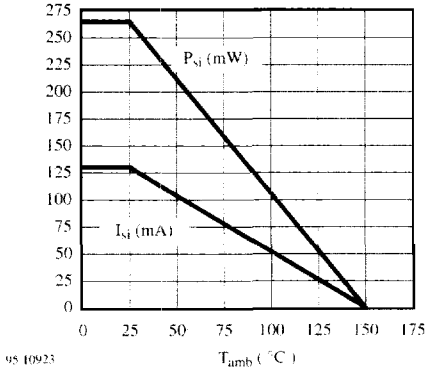
Parameters	Test Conditions	Symbol	Value	Unit
Power dissipation	$T_{amb} \leq 25°C$	P_{si}	265	mW

Coupler

Parameters	Test Conditions	Symbol	Value	Unit
Rated impulse voltage		V_{IOTM}	6	kV
Safety temperature		T_{si}	150	°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



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 base breakdown voltage	I_C = 100 µA	$V_{(BR)CBO}$	90			V
Collector emitter breakdown voltage	I_C = 1 mA	$V_{(BR)CEO}$	90			V
Emitter collector breakdown voltage	I_E = 100 µA	$V_{(BR)ECO}$	7			V
Collector emitter cut-off current	V_{CE} = 20 V, I_F = 0	I_{CEO}			150	nA

Coupler

Parameters	Test Conditions	Type	Symbol	Min.	Typ.	Max.	Unit
AC isolation test voltage (RMS)	f = 50 Hz, t = 1 s		V_{IO}	3.75			kV
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 = 10 mA, R_L = 100 Ω		f_c		110		kHz
Coupling capacitance	f = 1 MHz		C_k		0.3		pF
I_C/I_F	V_{CE} = 5 V, I_F = 1 mA	CNY75A CNY75B CNY75C	CTR CTR CTR	0.15 0.3 0.6			
I_C/I_F	V_{CE} = 5 V, I_F = 10 mA	CNY75A CNY75B CNY75C	CTR CTR CTR	0.63 1 1.6		1.25 2 3.2	

Switching Characteristics (Typical Values)

V_S = 5 V

Type	R_L = 100 Ω (see figure 1)							R_L = 1 kΩ (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]
CNY75A CNY75(G)A CNY75(G)AS	2.0	2.5	4.5	0.3	2.7	3.0	10	10.0	25.0	10
CNY75B CNY75(G)B CNY75(G)BS	2.5	3.0	5.5	0.3	3.7	4.0	10	16.5	20.0	10
CNY75C CNY75(G)C CNY75(G)CS	2.8	4.2	7.0	0.3	4.7	5.0	10	11	37.5	10

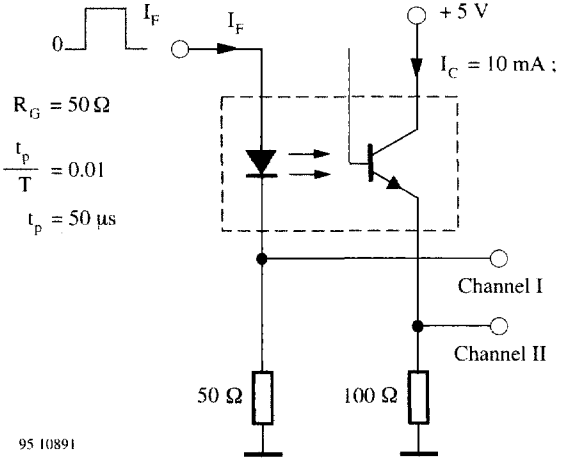


Figure 1. Test circuit, non-saturated operation

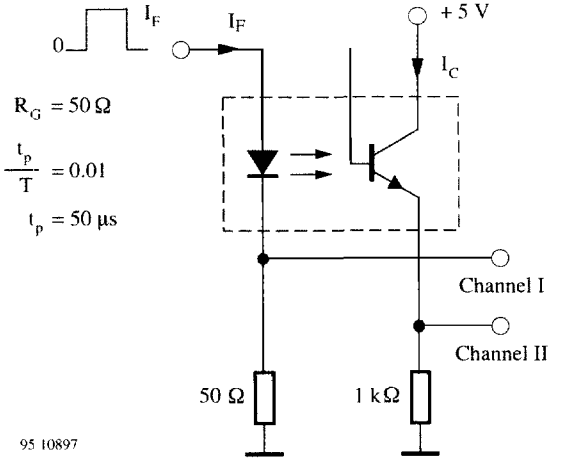


Figure 2. Test circuit, saturated operation

Insulation Rated Parameters (according to VDE 0884)

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

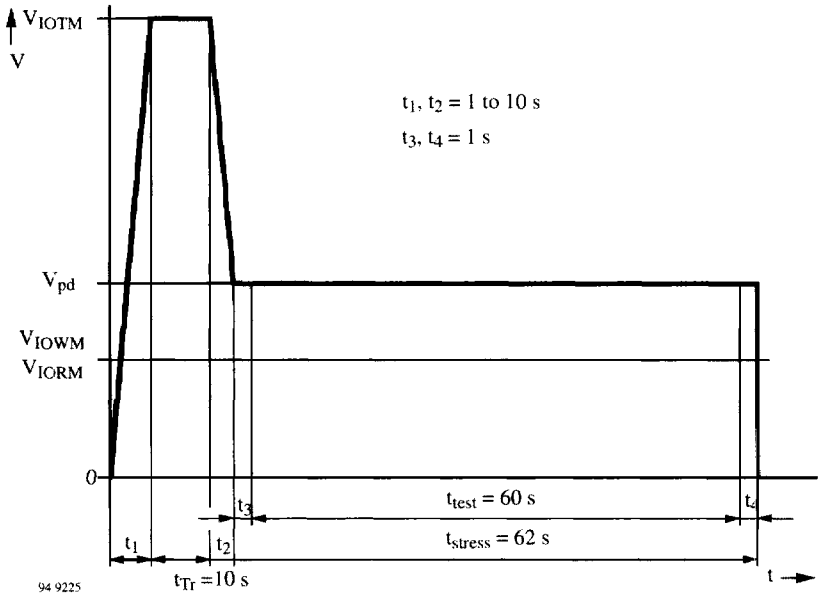


Figure 3. Test pulse diagram for sample test according to DIN VDE 0884

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

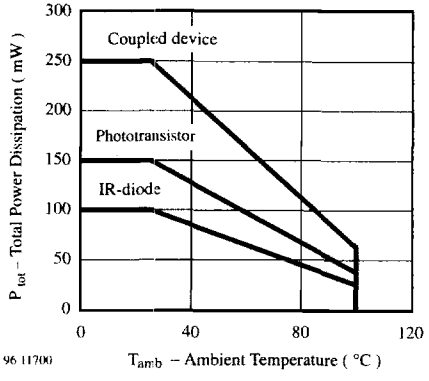


Figure 4. Total Power Dissipation vs. Ambient Temperature

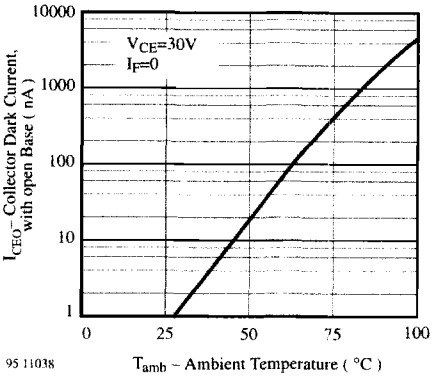


Figure 7. Collector Dark Current vs. Ambient Temperature

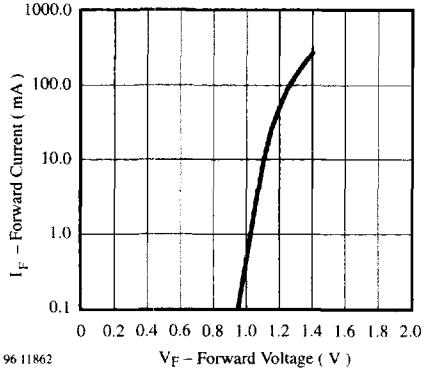


Figure 5. Forward Current vs. Forward Voltage

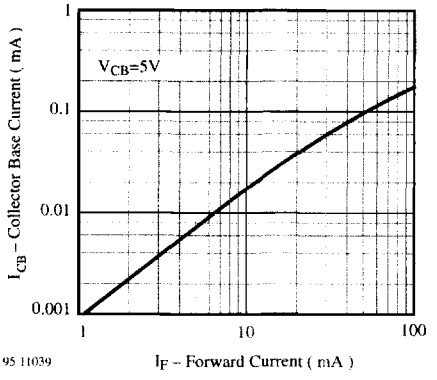


Figure 8. Collector Base Current vs. Forward Current

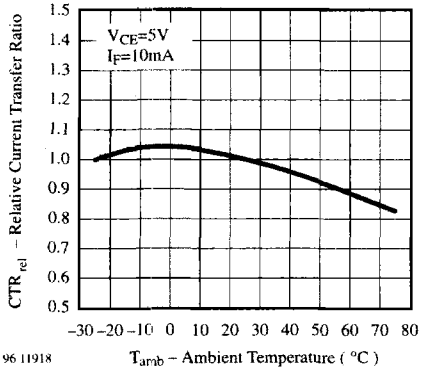


Figure 6. Rel. Current Transfer Ratio vs. Ambient Temperature

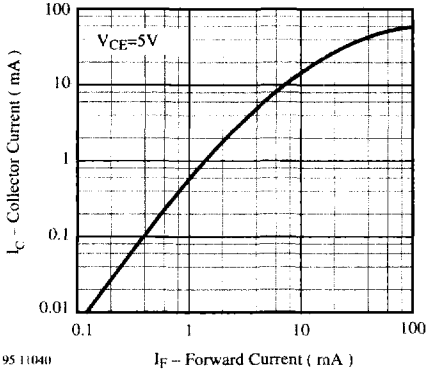


Figure 9. Collector Current vs. Forward Current

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

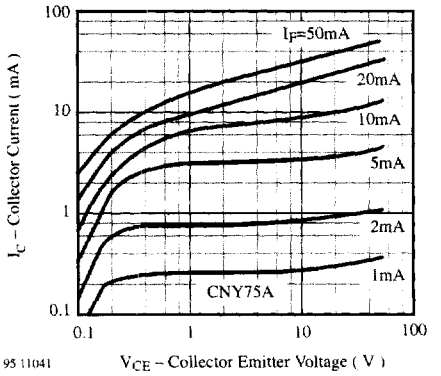


Figure 10. Collector Current vs. Collector Emitter Voltage

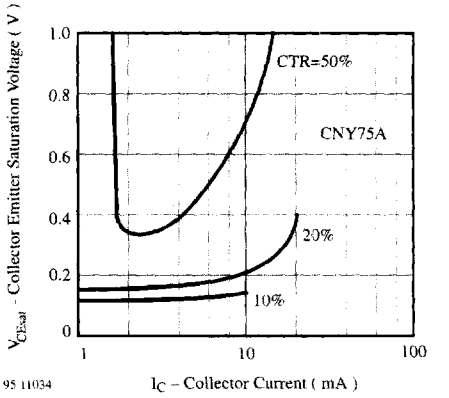


Figure 13. Collector Emitter Sat. Voltage vs. Collector Current

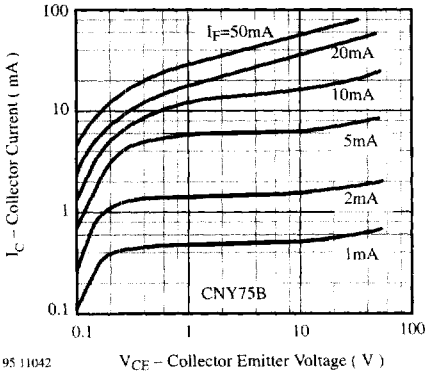


Figure 11. Collector Current vs. Collector Emitter Voltage

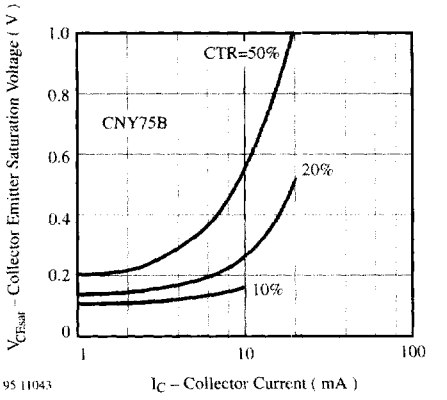


Figure 14. Collector Emitter Sat. Voltage vs. Collector Current

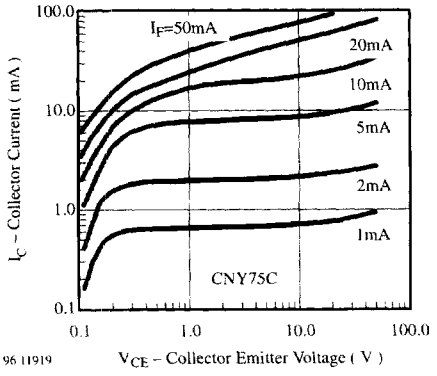


Figure 12. Collector Current vs. Collector Emitter Voltage

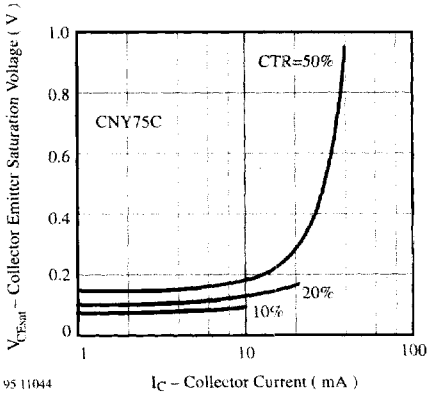


Figure 15. Collector Emitter Sat. Voltage vs. Collector Current

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

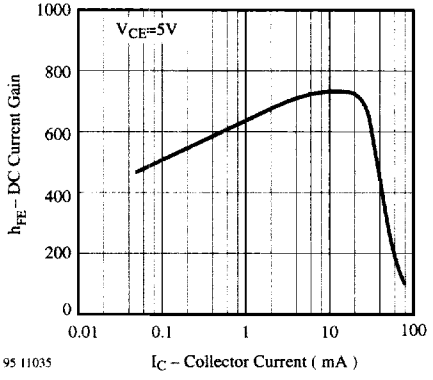


Figure 16. DC Current Gain vs. Collector Current

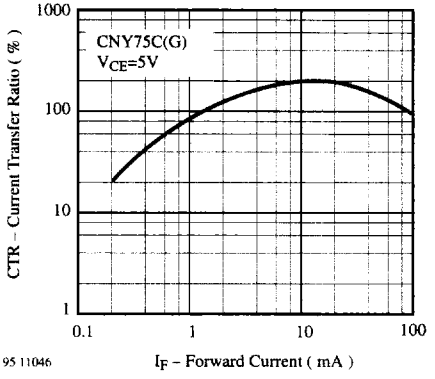


Figure 19. Current Transfer Ratio vs. Forward Current

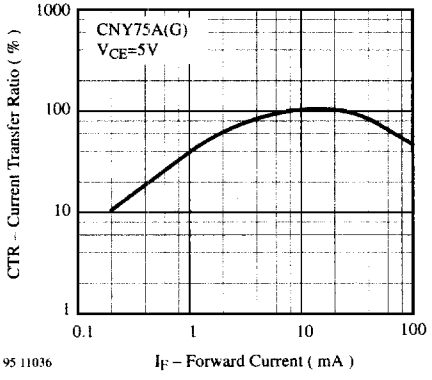


Figure 17. Current Transfer Ratio vs. Forward Current

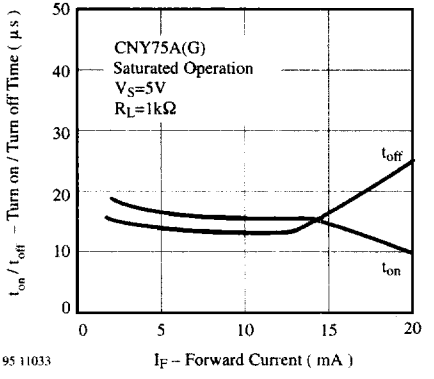


Figure 20. Turn on / off Time vs. Forward Current

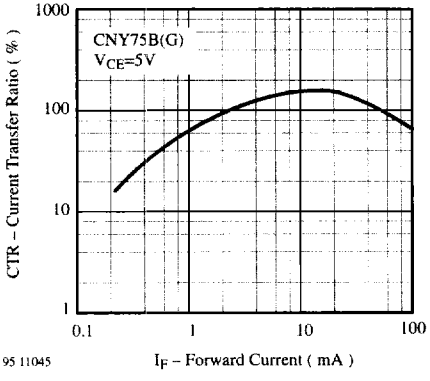


Figure 18. Current Transfer Ratio vs. Forward Current

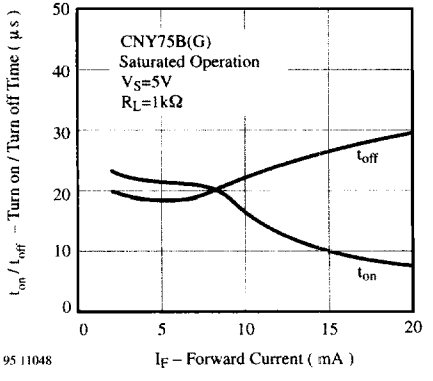


Figure 21. Turn on / off Time vs. Forward Current

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

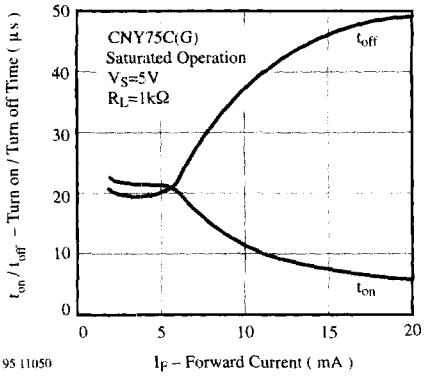


Figure 22. Turn on / off Time vs. Forward Current

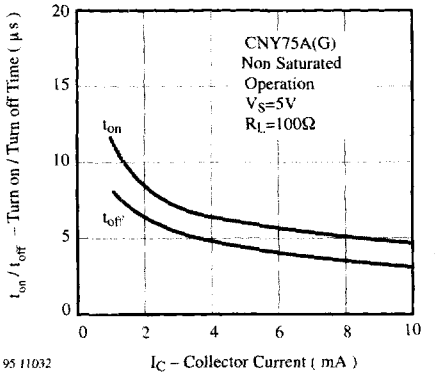


Figure 23. Turn on / off Time vs. Collector Current

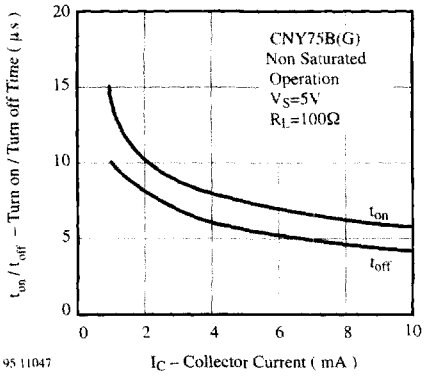


Figure 24. Turn on / off Time vs. Collector Current

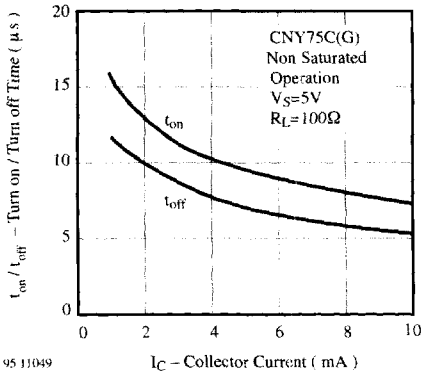
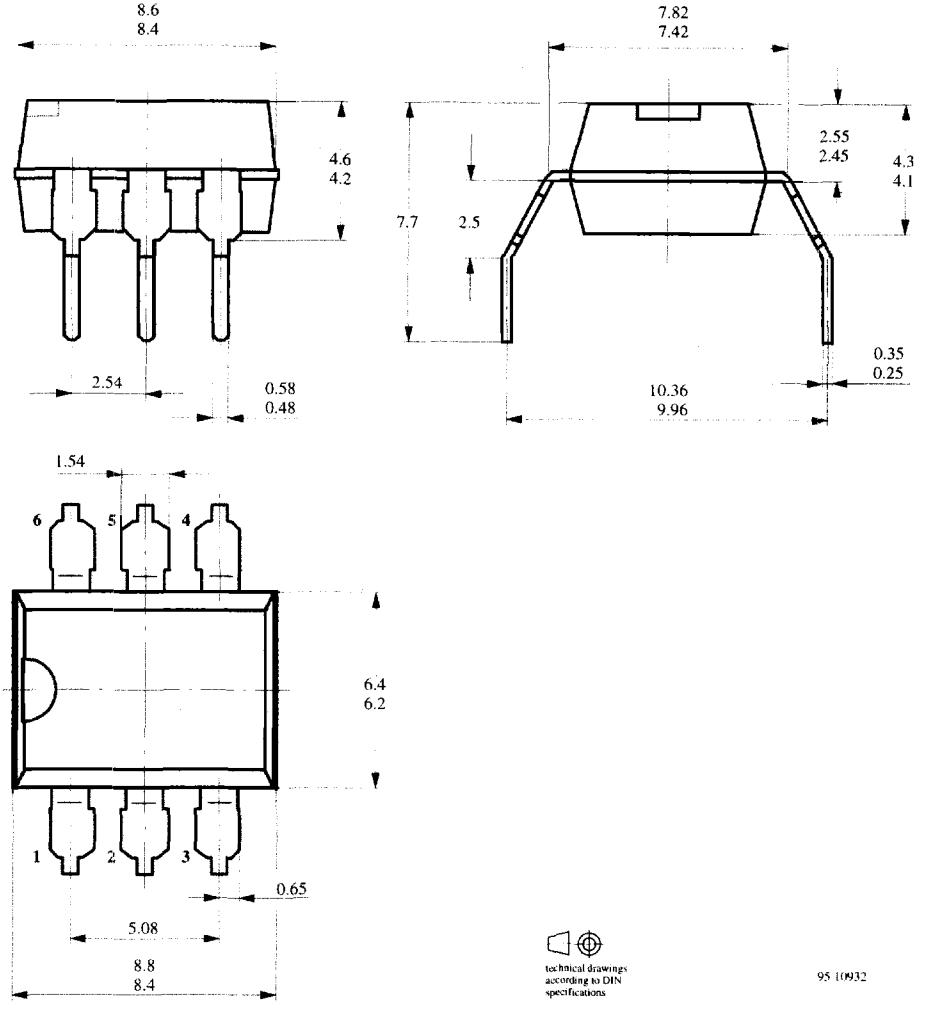


Figure 25. Turn on / off Time vs. Collector Current

Dimensions in mm

Leadform 10.16. mm (G-type)



Dimensions in mm