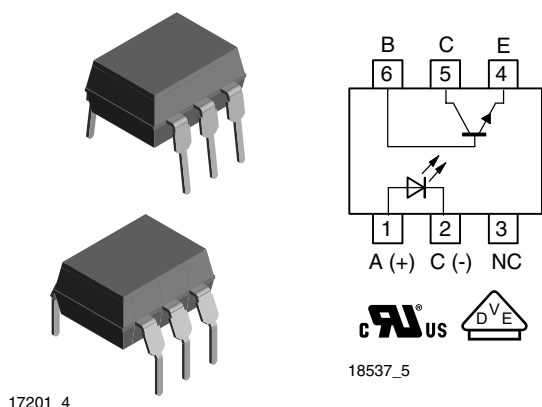


Optocoupler, Phototransistor Output, with Base Connection



17201_4

DESCRIPTION

The CQY80N(G) series consist of a phototransistor optically coupled to a gallium arsenide infrared-emitting diode in a 6 pin plastic dual inline package.

AGENCY APPROVALS

- UL1577, file no. E52744, double protection
- BSI: BS EN 41003, BS EN 60065, BS EN 60950
- DIN EN 60747-5-5 (VDE 0884)
- FIMKO (SETI): EN 60950, certificate no. FI25155

FEATURES

- Isolation materials according to UL94-VO
- Pollution degree 2 (DIN/VDE 0110/resp. IEC 60664)
- Special construction: therefore, extra low coupling capacity of typical 0.3 pF, high common mode rejection
- Low temperature coefficient of CTR
- Climatic classification 55/100/21 (IEC 60068 part 1)
- 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) $V_{IOWM} = 600 V_{RMS}$
- Rated recurring peak voltage (repetitive) $V_{IORM} = 600 V_{RMS}$ (848 V peak)
- Creepage current resistance according to VDE 0303/IEC 60112 comparative tracking index: CTI = 275
- Thickness through insulation $\geq 0.75 \text{ mm}$
- Compliant to RoHS directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

APPLICATIONS

- Switch-mode power supplies
- Line receiver
- Computer peripheral interface
- Microprocessor system interface
- Circuits for safe protective separation against electrical shock according to safety class II (reinforced isolation):
 - for appl. class I - IV at mains voltage $\leq 300 \text{ V}$
 - for appl. class I - III at mains voltage $\leq 600 \text{ V}$ according to DIN EN 60747-5-5 (VDE 0884)

ORDER INFORMATION

PART	REMARKS
CQY80N	CTR > 50 %, DIP-6
CQY80NG	CTR > 50 %, DIP-6

Note

G = leadform 10.16 mm; G is not marked on the body.

ABSOLUTE MAXIMUM RATINGS ⁽¹⁾				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	5	V
Forward current		I_F	60	mA
Power dissipation		P_{diss}	70	mW
Junction temperature		T_j	125	°C
Forward surge current	$t_p \leq 10 \mu s$	I_{FSM}	1.5	A
OUTPUT				
Collector emitter voltage		V_{CEO}	32	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		P_{diss}	70	mW
Junction temperature		T_j	125	°C
COUPLER				
Isolation test voltage (RMS)	$t = 1 min$	V_{ISO}	5000	V_{RMS}
Total power dissipation		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⁾	2 mm from case, $t \leq 10 s$	T_{sld}	260	°C

Notes

⁽¹⁾ $T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified.

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

⁽²⁾ Refer to wave profile for soldering conditions for through hole devices.

ELECTRICAL CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward voltage	$I_F = 50 mA$	V_F		1.25	1.6	V
Junction capacitance	$V_R = 0 V, f = 1 MHz$	C_j		50		pF
OUTPUT						
Collector emitter voltage	$I_C = 1 mA$	V_{CEO}	32			V
Emitter collector voltage	$I_E = 100 \mu A$	V_{ECO}	7			V
Collector emitter leakage current	$V_{CE} = 20 V, I_F = 0 A, E = 0$	I_{CEO}		10	200	nA
COUPLER						
Collector emitter saturation voltage	$I_F = 10 mA, I_C = 1 mA$	V_{CEsat}			0.3	V
Cut-off frequency	$V_{CE} = 5 V, I_F = 10 mA, R_L = 100 \Omega$	f_c		110		kHz
Coupling capacitance	$f = 1 MHz$	C_k		0.3		pF

Note

$T_{amb} = 25 \text{ }^\circ\text{C}$, unless otherwise specified.

Minimum and maximum values were tested requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

CURRENT TRANSFER RATIO						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
I_C/I_F	$V_{CE} = 5 V, I_F = 10 mA$	CTR	50	90		%

MAXIMUM SAFETY RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
Forward current		I _F			130	mA
OUTPUT						
Power dissipation		P _{diss}			265	mW
COUPLER						
Rated impulse voltage		V _{IOTM}			6	kV
Safety temperature		T _{si}			150	°C

Note

According to DIN EN 60747-5-5 (see figure 2). This optocoupler is suitable for safe electrical isolation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

INSULATION RATED PARAMETERS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Partial discharge test voltage - routine test	100 %, $t_{\text{test}} = 1 \text{ s}$	V_{pd}	1.6			kV
Partial discharge test voltage - lot test (sample test)	$t_{\text{Tr}} = 60 \text{ s}$, $t_{\text{test}} = 10 \text{ s}$, (see figure 2)	V_{IOTM}	6			kV
		V_{pd}	1.3			kV
Insulation resistance	$V_{\text{IO}} = 500 \text{ V}$	R_{IO}	10^{12}			Ω
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 100 \text{ }^{\circ}\text{C}$	R_{IO}	10^{11}			Ω
	$V_{\text{IO}} = 500 \text{ V}$, $T_{\text{amb}} = 150 \text{ }^{\circ}\text{C}$ (construction test only)	R_{IO}	10^9			Ω

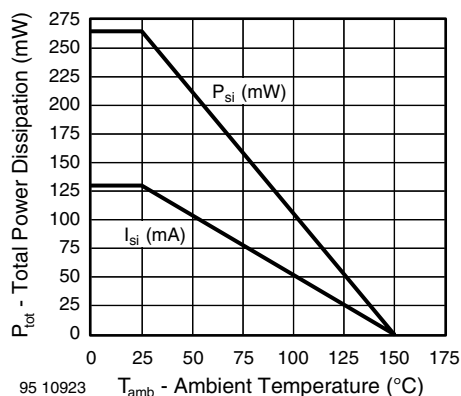


Fig. 1 - Derating Diagram

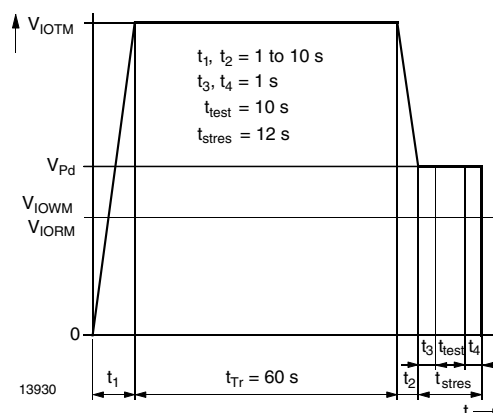


Fig. 2 - Test Pulse Diagram for Sample Test according to DIN EN 60747-5-5 (VDE 0884)/DIN EN 60747-; IEC 60747

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Delay time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_d		4		μs
Rise time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_r		7		μs
Fall time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_f		6.7		μs
Storage time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_s		0.3		μs
Turn-on time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_{on}		11		μs
Turn-off time	$V_S = 5\text{ V}$, $I_C = 5\text{ mA}$, $R_L = 100\ \Omega$, (see figure 3)	t_{off}		7		μs
Turn-on time	$V_S = 5\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 1\text{ k}\Omega$, (see figure 4)	t_{on}		25		μs
Turn-off time	$V_S = 5\text{ V}$, $I_F = 10\text{ mA}$, $R_L = 1\text{ k}\Omega$, (see figure 4)	t_{off}		42.5		μs

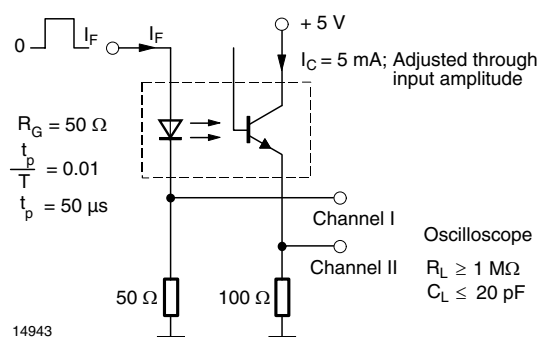


Fig. 3 - Test Circuit, Non-Saturated Operation

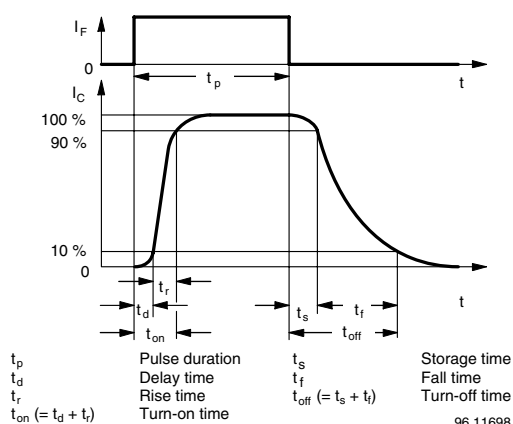


Fig. 5 - Switching Times

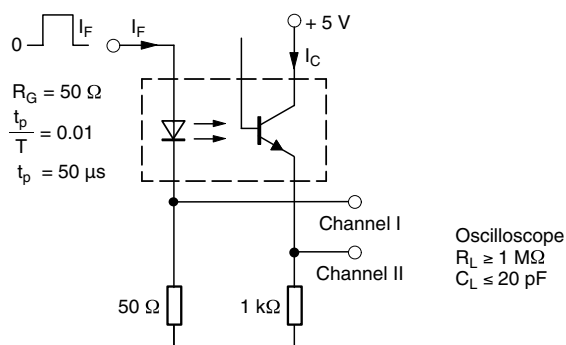


Fig. 4 - Test Circuit, Saturated Operation

TYPICAL CHARACTERISTICS

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

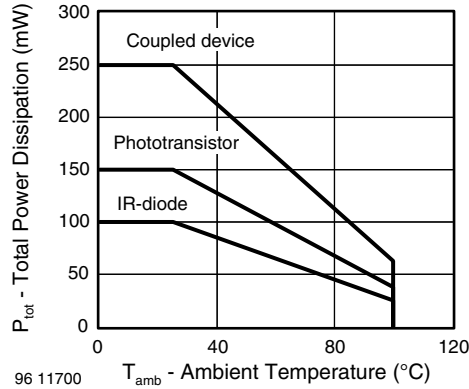


Fig. 6 - Total Power Dissipation vs. Ambient Temperature

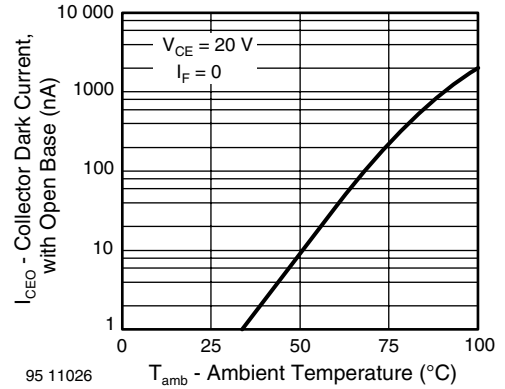


Fig. 9 - Collector Dark Current vs. Ambient Temperature

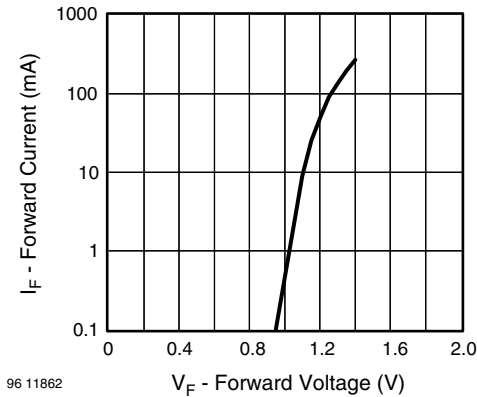


Fig. 7 - Forward Current vs. Forward Voltage

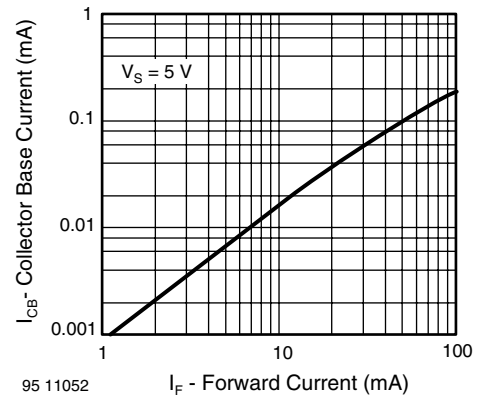


Fig. 10 - Collector Base Current vs. Forward Current

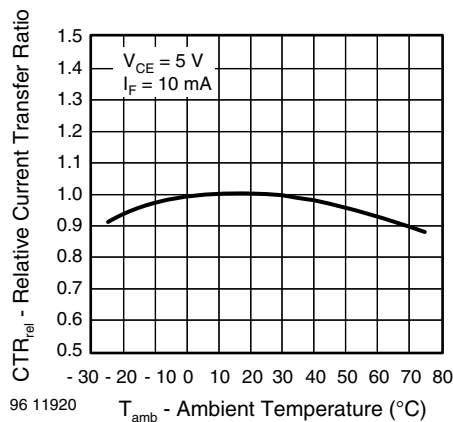


Fig. 8 - Relative Current Transfer Ratio vs. Ambient Temperature

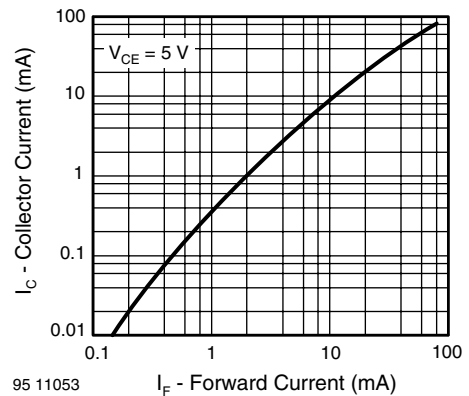


Fig. 11 - Collector Current vs. Forward Current

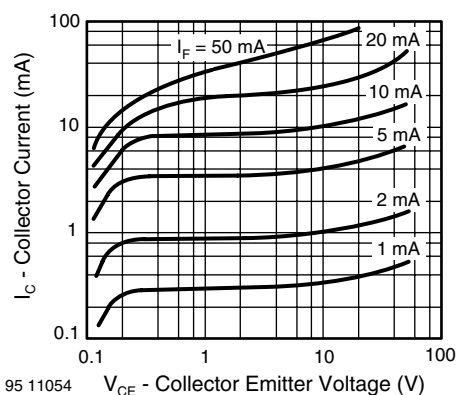


Fig. 12 - Collector Current vs. Collector Emitter Voltage

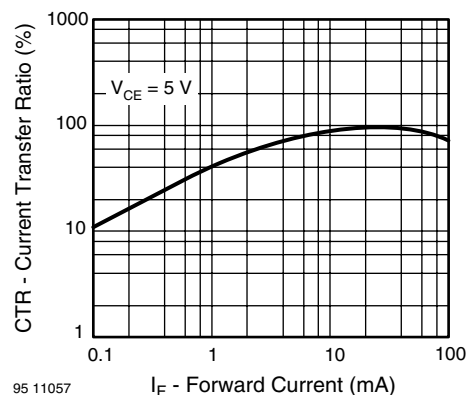


Fig. 15 - Current Transfer Ratio vs. Forward Current

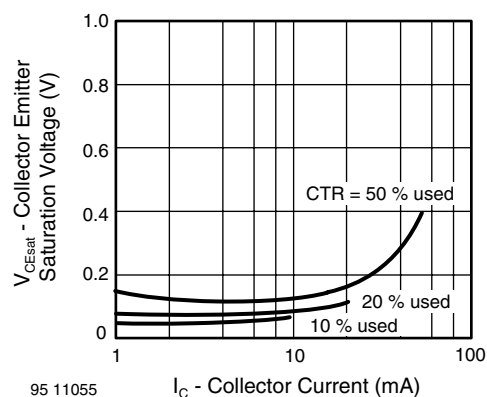


Fig. 13 - Collector Emitter Saturation Voltage vs. Collector Current

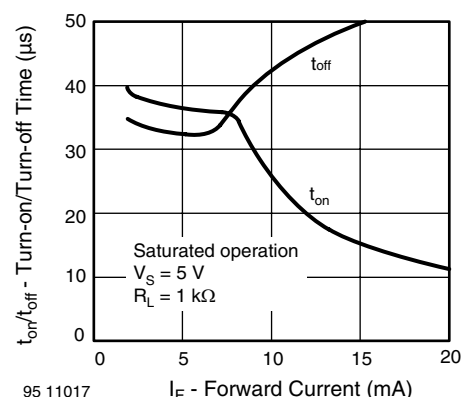


Fig. 16 - Turn-on/off Time vs. Forward Current

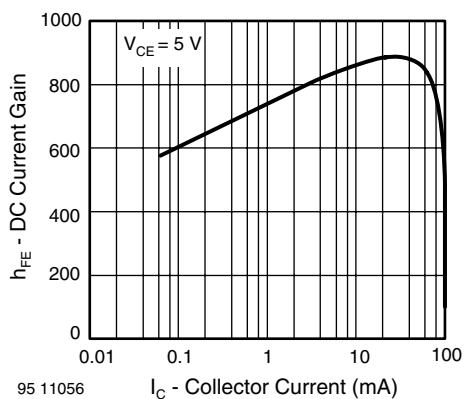


Fig. 14 - DC Current Gain vs. Collector Current

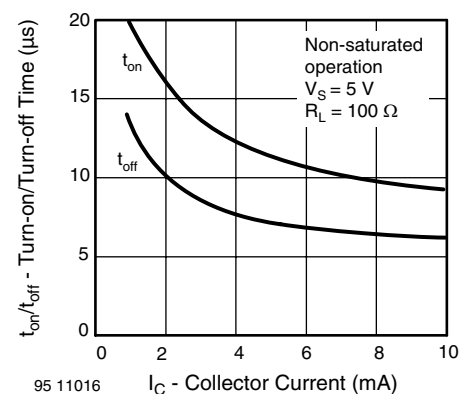


Fig. 17 - Turn-on/off Time vs. Collector Current

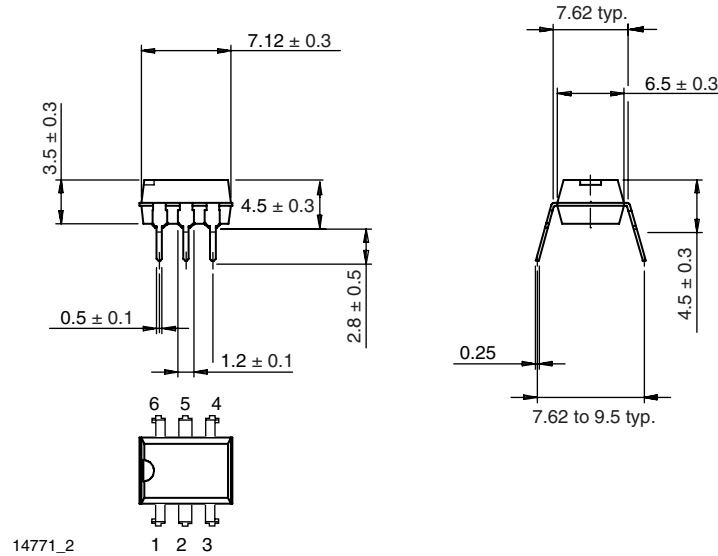


CQY80N, CQY80NG

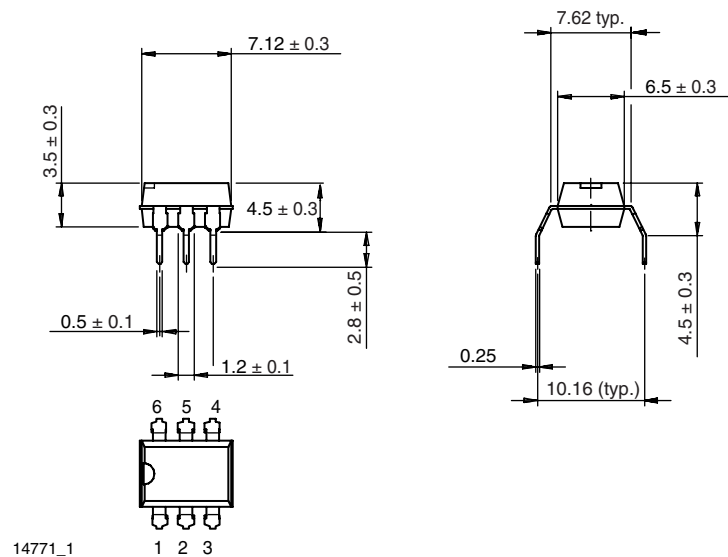
Optocoupler, Phototransistor Output, Vishay Semiconductors
with Base Connection

PACKAGE DIMENSIONS in millimeters

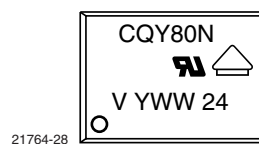
DIP-6



DIP-6, 400 mil



PACKAGE MARKING





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