Semiconductors

Book S8a 1986

Light emitting diodes

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LIGHT EMITTING DIODES

DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The contents of each series are listed on pages iv to viii.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

When ratings or specifications differ from those published in the preceding edition they are indicated with arrows in the page margin. Where application information is given it is advisory and does not form part of the product specification.

Condensed data on the preferred products of Philips Electronic Components and Materials Division is given in our Preferred Type Range catalogue (issued annually).

Information on current Data Handbooks and on how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.
Product specialists are at your service and enquiries will be answered promptly.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

T1	**Tubes for r.f. heating**
T2a	**Transmitting tubes for communications, glass types**
T2b	**Transmitting tubes for communications, ceramic types**
T3	**Klystrons**
T4	**Magnetrons for microwave heating**
T5	**Cathode-ray tubes** Instrument tubes, monitor and display tubes, C.R. tubes for special applications
T6	**Geiger-Müller tubes**
T8	**Colour display systems** Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
T9	**Photo and electron multipliers**
T10	**Plumbicon camera tubes and accessories**
T11	**Microwave semiconductors and components**
T12	**Vidicon and Newvicon camera tubes**
T13	**Image intensifiers and infrared detectors**
T15	**Dry reed switches**
T16	**Monochrome tubes and deflection units** Black and white TV picture tubes, monochrome data graphic display tubes, deflection units

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

S1 **Diodes**
Small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2a **Power diodes**

S2b **Thyristors and triacs**

S3 **Small-signal transistors**

S4a **Low-frequency power transistors and hybrid modules**

S4b **High-voltage and switching power transistors**

S5 **Field-effect transistors**

S6 **R.F. power transistors and modules**

S7 **Surface mounted semiconductors**

S8a **Light-emitting diodes**

S8b **Devices for optoelectronics**
Optocouplers, photosensitive diodes and transistors, infrared light-emitting diodes and infrared sensitive devices, laser and fibre-optic components

S9 **Power MOS transistors**

S10 **Wideband transistors and wideband hybrid IC modules**

S11 **Microwave transistors**

S12 **Surface acoustic wave devices**

S13 **Semiconductor sensors**

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks comprises:

EXISTING SERIES		Superseded by:
IC1	**Bipolar ICs for radio and audio equipment**	IC01N
IC2	**Bipolar ICs for video equipment**	IC02Na and IC02Nb
IC3	**ICs for digital systems in radio, audio and video equipment**	IC01N, IC02Na and IC02Nb
IC4	**Digital integrated circuits** CMOS HE4000B family	
IC5	**Digital integrated circuits – ECL** ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs	IC08N
IC6	**Professional analogue integrated circuits**	IC03N and Supplement to IC11N
IC7	**Signetics bipolar memories**	
IC8	**Signetics analogue circuits**	IC11N
IC9	**Signetics TTL logic**	IC09N and IC15N
IC10	**Signetics Integrated Fuse Logic (IFL)**	IC13N
IC11	**Microprocessors, microcomputers and peripheral circuitry**	IC14N

NEW SERIES

IC01N	**Radio, audio and associated systems** Bipolar, MOS	(published 1985)
IC02Na	**Video and associated systems** Bipolar, MOS Types MAB8031AH to TDA1524A	(published 1985)
IC02Nb	**Video and associated systems** Bipolar, MOS Types TDA2501 to TEA1002	(published 1985)
IC03N	**Integrated circuits for telephony**	(published 1985)
IC04N	**HE4000B logic family** CMOS	
IC05N	**HE4000B logic family — incased ICs** CMOS	(published 1984)
IC06N*	**High-speed CMOS; PC74HC/HCT/HCU** Logic family	(published 1986)
IC07N	**High-speed CMOS; PC54/74HC/HCT/HCU — uncased ICs** Logic family	
IC08N	**ECL 10K and 100K logic families**	(published 1984)
IC09N	**TTL logic series**	(published 1984)
IC10N	**Memories** MOS, TTL, ECL	
IC11N	**Linear LSI**	(published 1985)
Supplement to IC11N	**Linear LSI**	(published 1986)
IC12N	**Semi-custom gate arrays & cell libraries** ISL, ECL, CMOS	
IC13N	**Semi-custom** Integrated Fuse Logic	(published 1985)
IC14N	**Microprocessors, microcontrollers & peripherals** Bipolar, MOS	(published 1985)
IC15N	**FAST TTL logic series**	(published 1984)

Note

Books available in the new series are shown with their date of publication.

* Supersedes the IC06N 1985 edition and the Supplement to IC06N issued Autumn 1985.

COMPONENTS AND MATERIALS (GREEN SERIES)

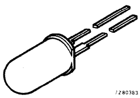
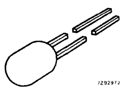
The green series of data handbooks comprises:

C1	**Programmable controller modules** PLC modules, PC20 modules
C2	**Television tuners, coaxial aerial input assemblies, surface acoustic wave filters**
C3	**Loudspeakers**
C4	**Ferroxcube potcores, square cores and cross cores**
C5	**Ferroxcube for power, audio/video and accelerators**
C6	**Synchronous motors and gearboxes**
C7	**Variable capacitors**
C8	**Variable mains transformers**
C9	**Piezoelectric quartz devices**
C10	**Connectors**
C11	**Varistors, thermistors and sensors**
C12	**Potentiometers, encoders and switches**
C13	**Fixed resistors**
C14	**Electrolytic and solid capacitors**
C15	**Ceramic capacitors**
C16	**Permanent magnet materials**
C17	**Stepping motors and associated electronics**
C18	**Direct current motors**
C19	**Piezoelectric ceramics**
C20	**Wire-wound components for TVs and monitors**
C21*	**Assemblies for industrial use** HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices
C22	**Film capacitors**

* To be issued shortly.

SELECTION GUIDE

LEDs (visible light) grouped according to light families
5 mm round lens top

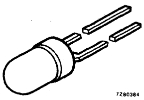
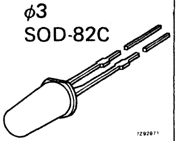
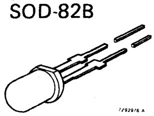
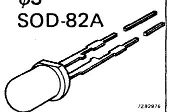
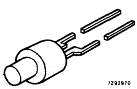
dimensions in mm/case	type	crystal	light colour	λ_{peak} nm	$\theta_{½}$	V_F at I_F = 10 mA V	I_F max. mA	package colour/ diffusor
ϕ5 SOD-63	CQX24 *	GaAlAs	hyper-red	650	20°	1,75	100	clear
	CQX54 *	GaAsP/GaP	super-red	630	20°	2,1	30	clear
	CQX64 *	GaP	super-green	565	20°	2,1	60	clear
	CQX74 *	GaPAs	yellow	590	20°	2,1	30	clear
	CQW24 *	GaAlAs	hyper-red	650	100°	1,75	100	red/diff.
	CQX54D	GaAsP/GaP	super-red	630	30°	2,1	30	red/diff.
	CQX64D	GaP	super-green	565	30°	2,1	60	green/diff.
	CQX74D	GaPAs	yellow	590	30°	2,1	30	yellow/diff.
	CQX51 *	GaAsP/GaP	super-red	630	70°	2,1	30	red/diff.
	CQY94B *	GaP	super-green	565	70°	2,1	60	green/diff.
	CQY96 *	GaPAs	yellow	590	70°	2,1	30	yellow/diff.
	CQY24B *	GaAsP	standard-red	650	70°	1,7	50	red/diff.
	CQT24 *	GaAlAs	hyper-red	650	70°	1,75	100	colourless/
		GaP	super-green	565	70°	2,1	60	diff.
	CQS51 *	GaP:ZnO	ultra-red	700	70°	2,0	30	red/diff.
ϕ5 SOD-85AL	CQS82AL	GaAlAs	hyper-red	650	70°	1,75	100	red/diff.
	CQS82L	GaAsP	standard-red	650	70°	1,7	50	red/diff.
	CQS84L	GaP	super-green	565	70°	2,1	60	green/diff.
	CQS86L	GaPAs	yellow	590	70°	2,1	30	yellow/diff.

* Also available in long leads (25 mm); add suffix L, e.g. CQX24L.

existing I_V classes in mcd at I_F = 10 mA										
1 0,7–1,6	2 1,0–2,2	3 1,6–3,5	4 3,0–7,0	5 5–12	6 10–22	7 16–35	8 30–70	9 50–120	10 > 100	page
–	–	–	–	–	–	X*	8	9	10*	347
–	–	–	–	–	X*	7	8	9*		359
–	–	–	–	–	X*	7	8	9*		369
–	–	–	–	–	X*	7	8	9*		379
–	–	–	X*/4	5	6*					283
			X*/4	5	6	7				365
			X*/4	5	6	7				375
			X*/4	5	6	7				385
–	–	X*	4	5	6					353
X*		3	4	5*						413
X*		3	4	5*						425
X*	2	3	4	(For these classes I_F = 20 mA)						389
–	–	–	X*							151
–	–		X*							
X*		3	4							55
–	–	X*	4	5	6*					73
X*	2	3*	4*	(For these classes I_F = 20 mA)						67
X*		3	4	5*						79
X*		3	4	5*						85

* I_V max. not specified.
X Type unclassified.

LEDs (visible light) grouped according to light families
3 mm round lens and 2 mm flat top

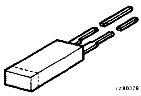
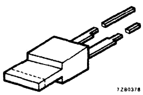
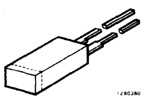
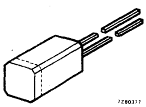
dimensions in mm/case	type	crystal	light colour	λ_{peak} nm	$\theta_{1/2}$	V_F at I_F = 10 mA V	I_F max. mA	package colour/ diffusor
ϕ3 SOD-53E 	CQW54	GaAlAs	super-red	650	100°	1,75	60	red/diff.
	CQW93▲	GaAlAs	hyper-red	650	60°	1,75	60	red/clear
	CQW95▲	GaP	super-green	565	60°	2,1	60	green/clear
	CQW97▲	GaPAs	yellow	590	60°	2,1	30	yellow/clear
	CQS54	GaP:ZnO	ultra-red	700	70°	2,0	30	red/diff.
	CQY54A	GaAsP	standard-red	650	70°	1,7	50	red/diff.
	CQY95B	GaP	super-green	565	70°	2,1	60	green/diff.
	CQY97A	GaPAs	yellow	590	70°	2,1	30	yellow/diff.
ϕ3 SOD-82C 	CQS93	GaP:ZnO	ultra-red	700	60°	2,2	25	red/diff.
	CQS95	GaP	super-green	565	60°	2,2	30	green/diff.
	CQS97	GaPAs	yellow	590	60°	2,2	30	yellow/diff.
ϕ3 SOD-82B 	CQS93E	GaP:ZnO	ultra-red	700	60°	2,2	25	red/diff.
	CQS95E	GaP	super-green	565	60°	2,2	30	green/diff.
	CQS97E	GaPAs	yellow	590	60°	2,2	30	yellow/diff.
ϕ3 SOD-82A 	CQS93L	GaP:ZnO	ultra-red	700	60°	2,2	25	red/diff.
	CQS95L	GaP	super-green	565	60°	2,2	30	green/diff.
	CQS97L	GaPAs	yellow	590	60°	2,2	30	yellow/diff.
ϕ2 SOD-79 	CQW20A	GaAlAs	hyper-red	650	110°	1,75	60	red/diff.
	CQW21	GaP	super-green	565	110°	2,1	60	green/diff.
	CQW22	GaPAs	yellow	590	110°	2,1	60	yellow/diff.

▲ This device has to be used behind a diffusing screen.

existing I_V classes in mcd at I_F = 10 mA									
1 0,7–1,6	2 1,0–2,2	3 1,6–3,5	4 3,0–7,0	5 5–12	6 10–22	7 16–35	8 30–70	9 50–120	page
–	–	–	X*	5	6	7*			289
				5	6	7	8*		331
–	–	–	X*	5	6	7*			335
–	–	–	X*	5	6	7*			341
X*		3	4	5*					61
X*	2	3*	(For these classes I_F = 20 mA)						395
X*		3	4	5*					419
X*		3	4	5*					431
X*	2	3*	(For these classes I_F = 20 mA)						91
X*	2	3*							109
X*	2	3*							127
X*	2	3*	(For these classes I_F = 20 mA)						97
–	–	X*	4	5*					115
–	–	X*	4	5*					133
X*	2	3*	(For these classes I_F = 20 mA)						103
–	–	X*	4	5*					121
–	–	X*	4	5*					139
X*									265
X*									271
X*									277

* I_V max. not specified.
X Type unclassified.

LEDs (visible light) grouped according to light families
single cast rectangular

dimensions in mm/case	type	crystal	light colour	λ_{peak} nm	$\theta_{1/2}$	V_F at I_F = 10 mA V	I_F max. mA	package colour/ diffusor
5 x 2,5 DC SOD-76	CQW10A*	GaAlAs	hyper-red	650	100°	1,75	100	red/diff.
	CQW10B*	GaAsP/GaP	super-red	630	100°	2,1	30	red/diff.
	CQW11B*	GaP	super-green	565	100°	2,1	60	green/diff.
	CQW12B*	GaPAs	yellow	590	100°	2,1	30	yellow/diff.
	CQW10U*	GaP:ZnO	ultra-red	700	100°	2,1	30	red/diff.
	CQT10B*	GaAlAs	hyper-red	650	110°	1,75	100	colourless/
		GaP	super-green	565	110°	2,1	60	diff.
5 x 1 DC SOD-75B	CQW60A*	GaAlAs	hyper-red	650	110°	1,75	100	red/diff.
	CQW60*	GaAsP/GaP	super-red	630	110°	2,1	30	red/diff.
	CQW61*	GaP	super-green	565	110°	2,1	60	green/diff.
	CQW62*	GaPAs	yellow	590	110°	2,1	30	yellow/diff.
	CQW60U*	GaP:ZnO	ultra-red	700	110°	2,0	30	red/diff.
	CQT60*	GaAlAs	hyper-red	650	110°	1,75	100	colourless/
		GaP	super-green	565	110°	2,2	60	diff.
5 x 3 DC SOD-77	CQV70A*	GaAlAs	hyper-red	650	100°	1,75	100	red/diff.
	CQV70*	GaAsP/GaP	super-red	630	100°	2,1	30	red/diff.
	CQV71A*	GaP	super-green	565	100°	2,1	60	green/diff.
	CQV72*	GaPAs	yellow	590	100°	2,1	30	yellow/diff.
	CQV70U*	GaP:ZnO	ultra-red	700	100°	2,0	30	red/diff.
	CQT70*	GaAlAs	hyper-red	650	110°	1,75	100	colourless/
		GaP	super-green	565	110°	2,2	60	diff.
5 x 5 DC SOD-74L	CQV80AL	GaAlAs	hyper-red	650	100°	1,75	100	red/diff.
	CQV80U*	GaP:ZnO	ultra-red	700	100°	2,0	30	red/diff.
	CQV80L	GaAsP/GaP	super-red	630	100°	2,1	30	red/diff.
	CQV81L	GaP	super-green	565	100°	2,1	60	green/diff.
	CQV82L	GaPAs	yellow	590	100°	2,1	30	yellow/diff.
	CQT80L	GaAlAs	hyper-red	650	110°	1,75	100	colourless/
		GaP	super-green	565	110°	2,1	60	diff.

* Also available in long leads (25 mm); add suffix L, e.g. CQX42L.

existing I_V classes in mcd at I_F = 10 mA									
1 0,7–1,6	2 1,0–2,2	3 1,6–3,5	4 3,0–7,0	5 5–12	6 10–22	7 16–35	8 30–70	9 50–120	page
X*		3	4						235
X*	2	3	–						241
X*	2	3	–						253
X*	2	3	–						259
X*	2	3							247
–	X*	–	–						145
–	X*	(For this class I_F = 20 mA)							
X*		3	4						301
X*	2	3	–						295
X*	2	3	–						313
X*	2	3	–						319
X*	2	3							307
–	X*	–	–						157
–	X*	(For this class I_F = 20 mA)							
–	X*	3	4						181
X*	2	3	–						175
X*	2	3	–						193
X*	2	3	–						199
X*	2	3							187
–	X*	–	–						163
–	X*	(For this class I_F = 20 mA)							
X*		3	4						211
X*	2	3							217
X*	2	3							205
X*	2	3							223
X*	2	3							229
–	X*								169
–	X*	(For this class I_F = 20 mA)							

* I_V max. not specified.
X Type unclassified.

Infrared LEDs and photo-sensitive devices

dimensions in mm/case	type	crystal	light colour	λ_{peak} nm	$\phi½$ o	V_F at I_F = 10 mA V	page
SOD-67	BPW50	Si (photo PIN diode)					49
ϕ 3 SOD-53F	CQY58A	GaAs	IR	930	10	1,25	401
	BPW22A	Si (phototransistor)			40		43
ϕ 5 SOD-63D2	CQW89A	GaAlAs	IR	830	40	1,45	325
	CQY89A	GaAs	IR	930	20	1,15	407

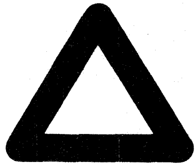
TYPE NUMBER SURVEY

In this alphanumeric list we present all light emitting diodes mentioned in this handbook.

GENERAL

Safety recommendations
Rating system
Letter symbols
Definitions
Dimensioning
Driving GaAlAs LEDs
Tape packaging of LEDs
Soldering and mounting recommendations

GENERAL SAFETY RECOMMENDATIONS
OPTOELECTRONIC DEVICES



1. GENERAL

When properly used and handled, optoelectronic devices do not constitute a risk to health or environment. Modern high technology materials have been used in the manufacture of these devices to ensure optimum performance. Some of these materials are toxic in certain circumstances. Mechanical or electrical damage is unlikely to give rise to any hazard, but toxic vapours may be generated if the devices are heated to destruction and it is important that the following recommendations are observed.

Care should be taken to ensure that all personnel who may handle, use or dispose of these products are aware of the necessary precautions.

Individual product data sheets will indicate whether any specific hazards are likely to be present.

2. DISPOSAL

These devices should be disposed of in accordance with the relevant legislation; in the United Kingdom disposal should therefore be carried out in accordance with the Deposit of Poisonous Waste Act 1972 and the Control of Pollution Act 1974, or with the latest legislation.

3. FIRE

Optoelectronic devices themselves, when used within the specified limits, do not present a fire hazard.

Devices can contain arsenic, beryllium, cadmium, lead, mercury, selenium, tellurium or similar hazardous materials or compounds, which, if exposed to high temperatures may emit toxic or noxious fumes.

Most packaging materials are flammable and care should be taken in the disposal of such materials, some of which will emit toxic fumes if burned.

4. HANDLING

Care must be exercised with those devices incorporating glass or plastic. If these devices are broken, precautions must be taken against the following hazards that may arise:

Broken glass or ceramic. Protective clothing such as gloves should be worn.

Contamination from toxic materials and vapours. In particular, skin contact and inhalation must be avoided.

Access to live contacts which may be at high potential. Devices must be isolated from the mains supply prior to their removal.

5. BERYLLIUM COMPOUNDS

Beryllium oxide dust is toxic if inhaled or if particles enter a cut or an abrasion. At all times avoid handling beryllium oxide ceramics; if they are touched, the hands must be washed thoroughly with soap and water. Do nothing to beryllium oxide ceramics that may produce dust or fumes.

Care should be taken upon eventual disposal that they are not thrown out with general industrial waste. Users seeking disposal of devices incorporating beryllium oxide ceramics should first take advice from the manufacturer's service department.

This potential hazard is present at all times from receipt to disposal of devices.

6. CADMIUM COMPOUNDS

Cadmium compounds are toxic. In the event of accidental breakage, cadmium dust may be released. Gloves should be worn and the dust should be mopped up with a damp cloth. Upon disposal, the cloth should be sealed in a plastic bag and the hands washed thoroughly with soap and water.

Controlled disposal of devices containing cadmium compounds should be conducted in the open air or in a well ventilated area.
Inhalation of cadmium dust must be avoided.

This potential hazard is present, if breakage occurs, at all times from receipt to disposal of devices.

7. OTHER COMPOUNDS

Other compounds, such as those containing arsenic, indium, lead, lithium, selenium, tantalum, tellurium etc., may be toxic by ingestion or inhalation.

The above information and recommendations are given in good faith and are in accordance with the best knowledge and opinion available at the date of the compilation of the data sheets.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

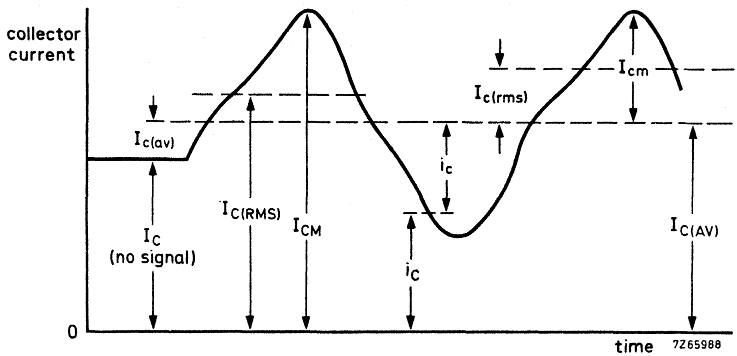
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f = forward; forward transfer
I, i (or 1) = input
L, l = load
O, o (or 2) = output
R, r = reverse; reverse transfer
S, s = source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

DEFINITIONS FOR OPTOELECTRONIC DEVICES ACCORDING TO IEC 306

DEFINITIONS AND UNITS OF RADIATION AND LIGHT QUANTITIES

Radiant flux, radiant power ϕ, P, (ϕ_e)

This is the power emitted, transferred or received as radiation, i.e. the radiant energy (dQ_e) emitted per second.

$$\phi_e = \frac{dQ_e}{dt} \qquad \text{unit: watt, W}$$

Radiant intensity I_e, I

For a source of given direction, the radiant intensity is the radiant power leaving the source, or an element of the source, in an element of solid angle (Ω) containing the given direction, divided by that element of solid angle.

$$I_e = \frac{d\phi_e}{d\Omega} \qquad \text{unit: watt per steradian, W/sr}$$

Irradiance E, (E_e)

At a point on a surface, the irradiance is the radiant power incident on an element of the surface containing the point divided by the area (A) of that element.

$$E = \frac{d\phi_e}{dA} \qquad \text{unit: watt per square metre, W/m}^2$$

Light

This is radiation capable of stimulating the eye. Exceptions to this definition are made where necessary in the data sheets, e.g. dark and light currents of a phototransistor and light rise time of a near-infrared light emitting diode.

Luminous flux ϕ, (ϕ_v)

The luminous flux $d\phi$ of a source of luminous intensity I_v in an element of solid angle of $d\Omega$, is given by:

$$d\phi = I_v.d\Omega \qquad \text{unit: lumen, lm}$$

Lumen

This is the luminous flux radiating from a point source of uniform luminous intensity of 1 candela, contained within a solid angle of 1 steradian.

$$1\ \text{lm} = 1\ \text{cd.sr}$$

Luminous intensity I_v, (I)

For a source of given direction, the luminous intensity is the luminous flux leaving the source, or an element of the source, in an element of solid angle (Ω) containing the given direction, divided by that element of solid angle.

$$I_v = \frac{d\phi_v}{d\Omega} \qquad \text{unit: candela, cd}$$

Candela

This is the luminous intensity, in the perpendicular direction, of a surface of 1/600 000 square metre of a black body at the temperature of freezing platinum under a pressure of 101 325 pascal.

Illuminance E_v, (E)

At a point on a surface, the illuminance is the luminous flux incident on an element of the surface containing the point, divided by the area (A) of that element.

$$E_v = \frac{d\phi_v}{dA} \qquad \text{unit: lux, lx}$$

Lux lx

This is the illumination produced when 1 lumen of flux falls on a surface of area 1 square metre. It will be seen that an illumination of 1 lx is produced on a area of 1 square metre at a distance of 1 metre from a point source of 1 candela.

Distribution temperature T_d

This is the temperature of a black body at which the spectral radiation distribution of the radiator under consideration, in a given wavelength range, is proportional or approximately proportional to the spectral radiation distribution of the black body. If the wavelength range given includes visible radiation, then the distribution temperature corresponds to the colour temperature.

Colour temperature T_c

The colour temperature of a radiator is the temperature of a black body which has the same, or approximately the same, spectral radiation distribution in the visible range as the radiator under consideration.

DEFINITIONS OF ELECTRICAL QUANTITIES

Photocurrent I_{ph}

This is the change in output current from the photocathode due to incident radiation.

Dark current I_d

This is the current flowing in a photoelectric device in the absence of illumination.

Dark current equivalent radiation E_d

This is the incident radiation required to give a d.c. signal output current equal to the dark current.

Quantum efficiency

This is the ratio of the number of emitted photoelectrons to the number of incident photons. Quantum efficiency (Q.E.) at a given wavelength of incident radiation may be calculated as follows:

$$\text{Q.E.} = \frac{\text{constant} \times S_k}{\lambda}$$

where S_k = spectral sensitivity (A/W) at wavelength λ
λ = wavelength of incident radiation (nm)

constant $= \dfrac{hc}{e} = 1{,}24 \times 10^3$ W.nm/A

h = Planck's constant ($6{,}6256 \times 10^{-34}$ js)
c = velocity of electromagnetic waves in vacuo = $2{,}997925 \times 10^8$ m/s
e = elementary charge = $1{,}60210 \times 10^{-19}$ coulomb or $4{,}80298 \times 10^{-19}$ e.s.u.

Saturation voltage V_{CEsat}

This is the lowest operating voltage which causes no change in photocurrent when this voltage is increased with constant radiation.

Saturation current I_{CEsat}

This is the output current of a photosensitive device which is not changed by an increase of either:

a. the irradiance under constant operating conditions, or,
b. the operating voltage under constant irradiance.

Thermal resistance

This is the ratio of temperature rise to power dissipation or

$$R_{th\ j\text{-}a} = \frac{T_j - T_{amb}}{P_{tot}}$$

The thermal resistance is also the reciprocal of the derating factor.

Pulsed operation

Under these conditions higher peak power dissipation is possible. In general, the shorter the pulse and lower the frequency, the lower is the temperature that the junction reaches.

By analogy with thermal resistance:

$$Z_{th\ j\text{-}a} = \frac{T_j - T_{amb}}{P_{tot}}$$

DEFINITIONS OF SENSITIVITY

These definitions apply more directly to photocathode sensitivity. For devices in which it is necessary to define the anode (overall) sensitivity, the signal output current should be considered instead of the photocurrent.

Actinity of radiation Z

This is the ratio of the sensitivity to a given radiation to the sensitivity to a reference radiation.

Radiant sensitivity S_R

This may be expressed as either:

a. the ratio of the photocurrent of the device to the incident radiant power, expressed in amperes per watt (A/W), or,
b. the ratio of the photocurrent of the device to the incident irradiance, expressed in amperes per watt per square metre ($A/W/m^2$).

Absolute spectral sensitivity $s\ (\lambda)$

This is the radiant sensitivity for monochromatic radiation of a stated wavelength.

Relative spectral sensitivity $s\ (\lambda)_{rel}$

This is the ratio of the radiant sensitivity at a particular wavelength to the radiant sensitivity at a reference wavelength, usually the wavelength of maximum reponse.

Note
For non-linear detectors, it is necessary to refer to constant photocurrent at all wavelengths.

Luminous sensitivity S_L

This may be expressed as either:

a. the ratio of the photocurrent of the device to the incident luminous flux, expressed in amperes per lumen (A/lm), or,
b. the ratio of the photocurrent of the device to the incident illuminance, expressed in amperes per lux (A/lx).

Dynamic sensitivity S_D

Under stated operating conditions, this is the ratio of the variation of the photocurrent of the device to the initiating small variation in the incident radiant or luminous power.

Note
Distinction is made between luminous dynamic sensitivity and radiant sensitivity.

Spectral sensitivity characteristics

This is the relationship, usually shown in graphical form, between the wavelength and the absolute or relative spectral sensitivity.

Absolute spectral sensitivity characteristics

This is the relationship, usually shown in graphical form, between the wavelength and the absolute spectral sensitivity.

Relative spectral sensitivity characteristics

This is the relationship between wavelength and the relative spectral sensitivity.

Quantum efficiency characteristic

This is the relationship, usually shown in graphical form, between the wavelength and the quantum efficiency.

DEFINITIONS OF TIME QUANTITIES

Rise time t_r

This is the time required for the photocurrent to rise from a stated low percentage to a stated higher percentage of the maximum value when a steady state of radiation is instantaneously applied. It is usual to consider the 10% and 90% levels (see Figs 1 and 2).

Fall time t_f

This is the time required for the photocurrent to fall from a stated high percentage to a stated lower percentage of the maximum value when the steady state of radiation is instantaneously removed.

It is usual to consider the 90% and 10% levels (see Figs 1 and 2).

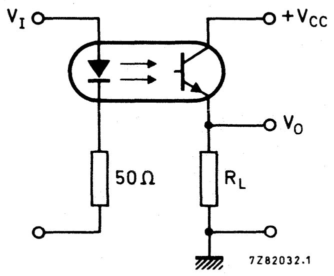


Fig. 1 Switching circuit.

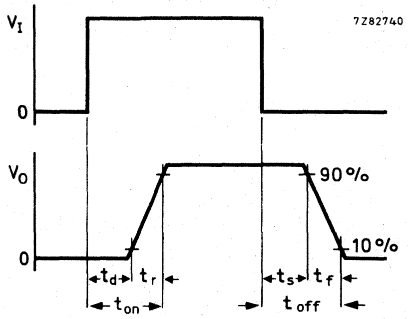


Fig. 2 Waveforms.

DEFINITIONS AND UNITS OF INFRARED SENSITIVE DEVICES

Emissivity

This is the ratio of the radiant exitance of a thermal radiator to that of a black body radiator at the same temperature.

Absolute refractive index n

This is the ratio of the velocity of light in vacuo to that in a particular medium. For most practical purposes the velocity of light in vacuo can be replaced by that in air.

Detectivity

This is the signal-to-noise ratio per unit radiant power. Thus it is the reciprocal of the N.E.P. Care must be exercised when considering detectivity as this term has also been used in the definitions of D*.

unit: 1/watts (1/W)

D*

This is an independent figure of merit which is defined as the r.m.s. signal-to-noise ratio in a 1 Hz bandwidth per unit r.m.s. incident radiant power per square root of detector area. Unless otherwise stated, it is assumed that the detector field of view is hemispherical (2 π steradian).

unit: cm$\sqrt{Hz}$/W

Wave number

This is the reciprocal of the wavelength in centimetres. ($\frac{1}{\lambda}$)

N.E.P. (Noise Equivalent Power)

This is the r.m.s. value of the incident, chopped, radiant power necessary to produce an r.m.s. signal to r.m.s. noise ratio of unity. The r.m.s. noise refers to the value calculated for unit square root bandwidth V/$\sqrt{Hz}$.

unit: W/$\sqrt{Hz}$

Responsivity

This is the ratio of the r.m.s. signal in volts to the r.m.s. value of the incident, chopped, radiant power.

unit: V/W

Noise equivalent irradiation

This is the value of incident radiation which, when modulated in a stated manner, produces a signal output power equal to the noise power, both of which are in a stated bandwidth.

Radiance L_e

This is the radiant intensity (I_e) at a point on a surface and in a given direction, of an element of that surface, divided by the area of the orthogonal projection of the element on a plane perpendicular to the given direction.

unit: watt per steradian square metre, W/sr.m^2

Radiant exitance (radiant emittance) M_e

At a point on a surface, this is the radiant power leaving an element of that surface, divided by the area of the element.

$$M_e = \frac{d\phi_e}{dA} \qquad \text{unit: watt per square metre, W/m}^2$$

Luminous exitance (luminous emittance) M_v

At a point on a surface, this is the luminous flux leaving an element of that surface, divided by the area of that element.

$$M_v = \frac{d\phi_v}{dA} \qquad \text{unit: lumen per square metre, lm/m}^2$$

Luminance L_v

This is the luminous intensity (I_v) at a point on a surface and in a given direction, of an element of that surface divided by the area of the orthogonal projection of the element on a plane perpendicular to the given direction.

unit: candela per square metre, cd/m^2

Steradian sr (see Fig. 3)

This is the solid angle subtended at the centre of a sphere by an element of the surface area equal to the square of the radius of the sphere. There are, therefore, 4π steradians in a complete sphere.

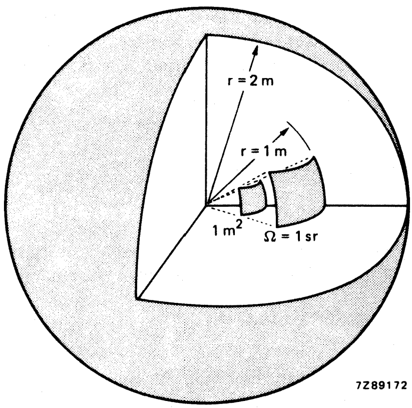


Fig. 3.

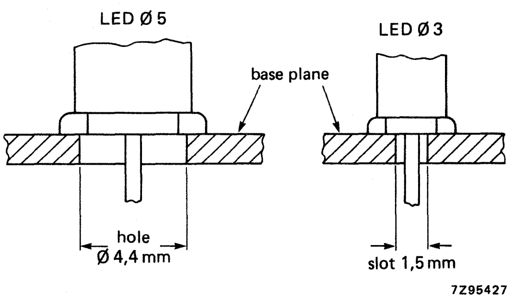
DIMENSIONING OF LED ENVELOPES

The dimensioning of the envelopes contained in this handbooks is in accordance with the I.E.C. publication 191: Mechanical Standardization of Semiconductor devices.

The following section defines the different characteristics of LED dimensions.

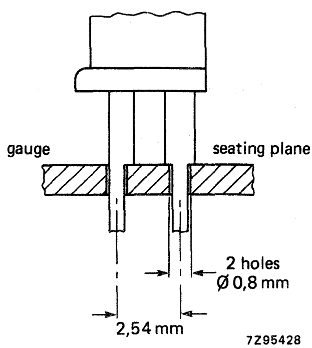
The Base Plane

As the base of the plastic body is irregular, due to the manufacturing process, the base plane is defined as:
  for Ø5 mm LEDs (or equivalent) a 4,4 mm hole,
  for Ø3 mm LEDs (or equivalent) a 1,5 mm slot.



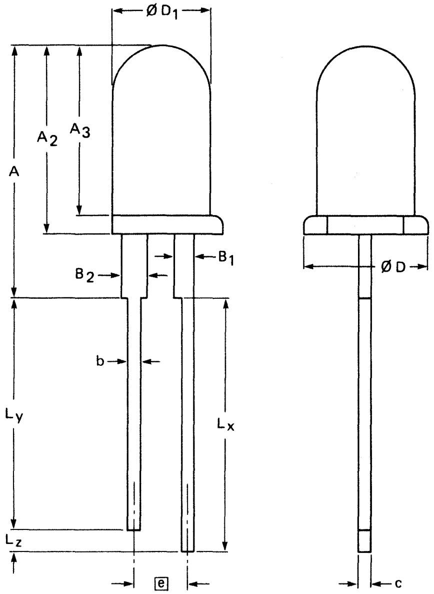
The Seating Plane

This is defined as when the flanges of the leads are seated on a gauge with 0,8 mm Ø holes which are 2,54 mm apart.



The Emission Area

The emission area is defined by top view dimensions such as ØD1, D1 and E1.



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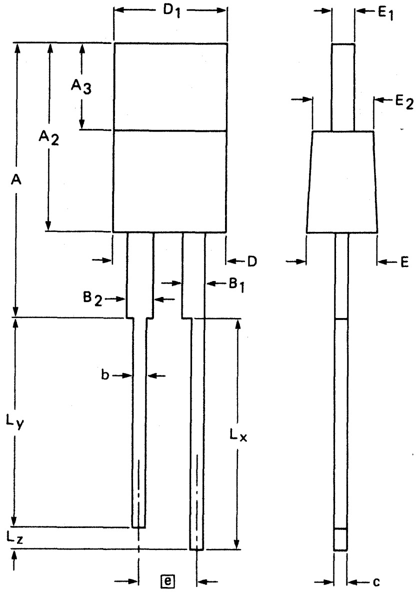

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Pinning

The cathode, anode, emitter and collector are indicated on the drawings. Only the flat on the body or the shortest lead are used for pinning reference. The wider part of the lead must not be taken as a reference as different configurations may exist according to version and variant.

Envelope numbering

In the absence of international standards the following numbering system is used:

SOD63A2

prefix — SOD

envelope designation — 63

variants and versions derived from basic envelope — A2

DRIVING GaAlAs LIGHT EMITTING DIODES

GaAlAs LEDs should be driven from a constant current supply to avoid small changes in forward voltage leading to large current changes. It is, however, possible to pulse the current to increase the efficiency of the LEDs by taking advantage of the non-linear relationship between luminous intensity and forward current (Fig. 1).

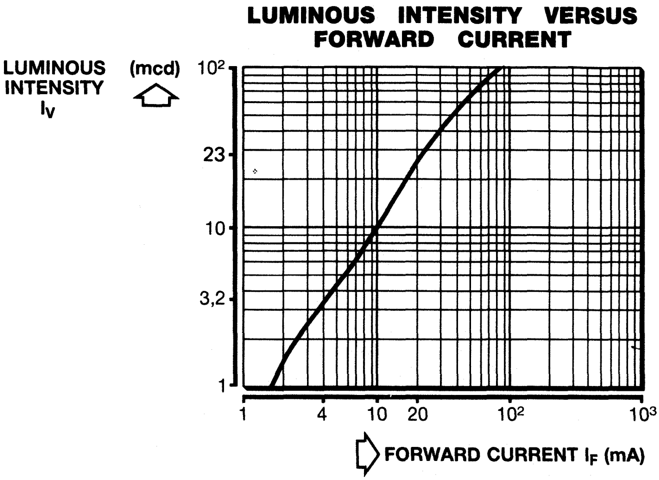


Fig. 1.

As the figure shows, a forward current of 4 mA results in a luminous intensity of 3,2 mcd, while a forward current of 20 mA results in a luminous intensity of 23 mcd. If the 20 mA current is pulsed with a dutyfactore d of 0,2, the average forward current is still 4 mA, and the average luminous intensity becomes 4,6 mcd. Thus the effective luminance intensity is 1,44 times as great with pulsed current as with d.c. of the same average value.

The effect is greatest at low average current; at higher currents the gain diminishes. This is because, at higher peak currents I_{FM}, the average power $P_{(AV)}$ increases as $V_{FM}I_{FM}d$, where V_{FM} is the peak voltage. The increase in $P_{(AV)}$ causes the diode junction temperature T_j to increase by $\Delta T_j = P_{(AV)}R_H$, where R_H is the thermal resistance of the diode junction. Since the luminous intensity is related to the junction temperature by $dI_V/dT_j = -0{,}7\%$ per $^{\circ}C$, the advantage of pulsed operation is lost if the average current is too high.

Junction temperature is also affected by the pulse duration t_p, since average current increases with increasing duration.

Figure 2 shows the effect of the peak current (I_{FM}) and pulse duration (t_p) on the average luminous intensity, and Fig. 3 shows how the duty factor and pulse duration affect the absolute maximum ratings of I_F.

LUMINOUS INTENSITY VERSUS FORWARD CURRENT AND PULSE DURATION

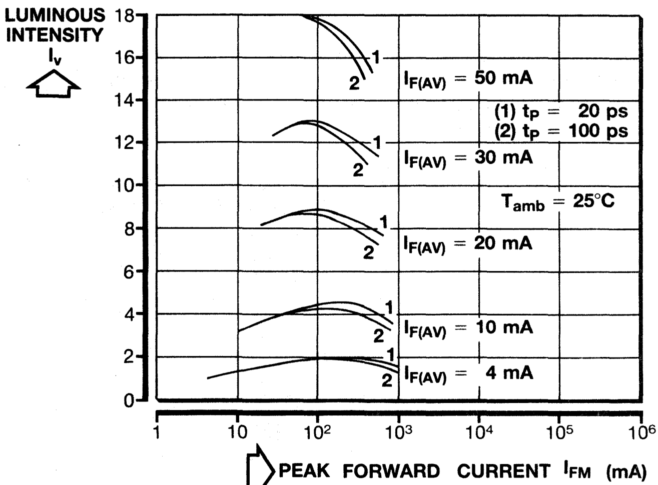


Fig. 2 T_{amb} = 25 °C;
(1) t_p = 20 ps
(2) t_p = 100 ps

FORWARD CURRENT VERSUS DUTY CYCLE AND PULSE DURATION

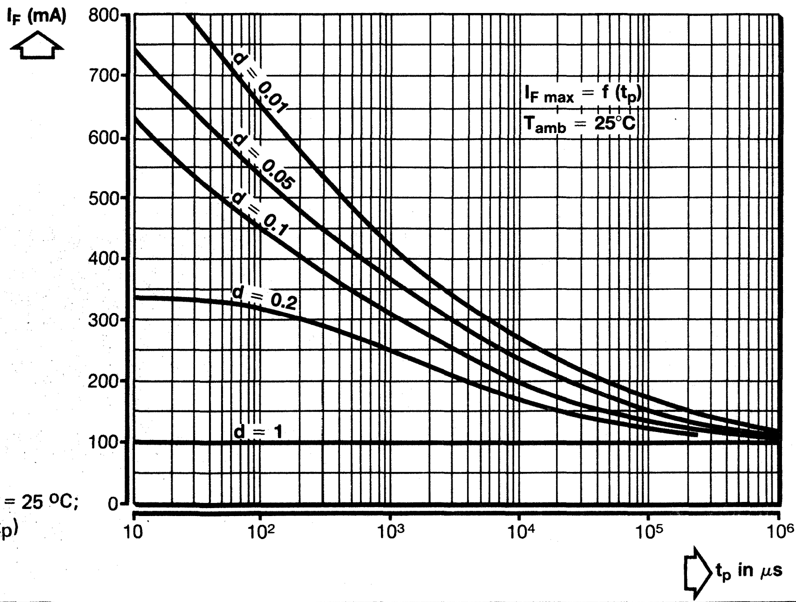


Fig. 3 T_{amb} = 25 °C;
$I_{F\,max}$ = f (t_p)

The peak wavelength of the colour emitted by the LED also changes with junction temperature, according to the relation d λ_p/dT_j = +0,15 to 0,20 nm/K. Detection of a colour difference between two LEDs depends on the dominant wavelength. Figure 4 shows how the response of the eye varies with wavelength, and Fig. 5, the change in wavelength just detectable by eye as a function of wavelength.

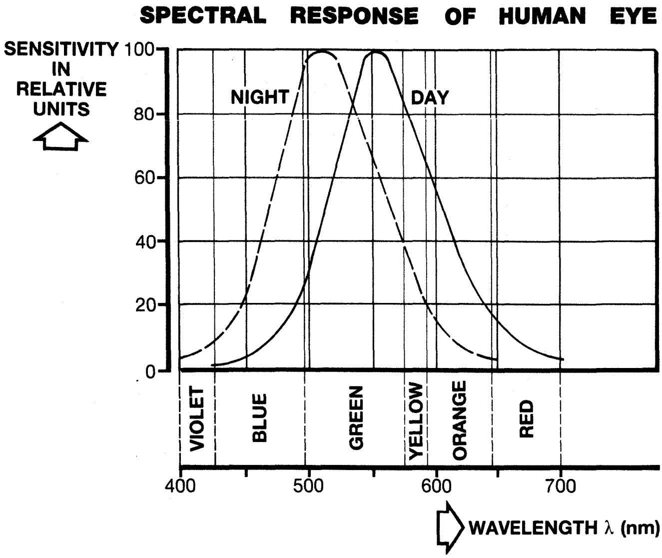


Fig. 4.

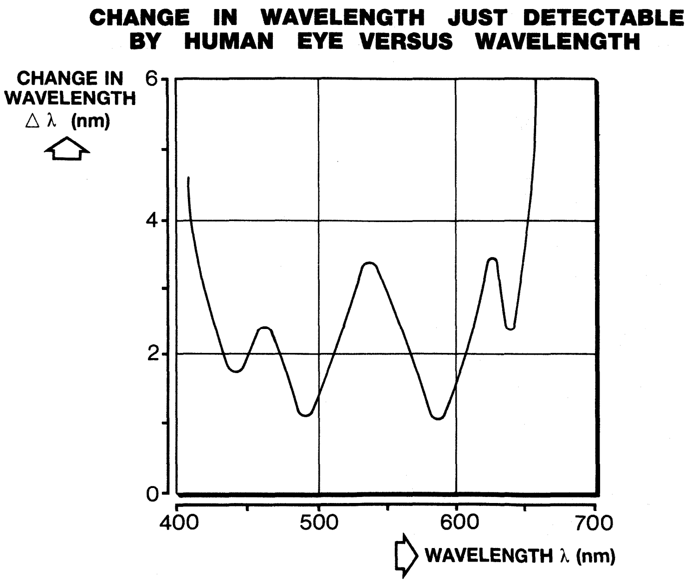


Fig. 5.

TAPE PACKAGING OF LEDs

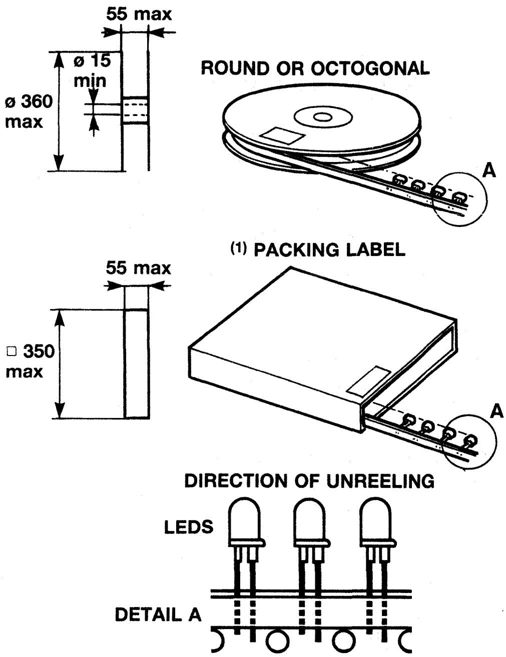
LEDs can be supplied on tape, with unindirectional leads for automatic insertion into PCBs. The tape packaging can be delivered on bandolier/rolls or meander/concertina packing as shown in Fig. 1.

The packaging consists of a carrier tape and a fixing tape as specified by IEC Publication 286. The relevant dimensions are given in Fig. 2 and the table.

MECHANICAL DATA

Dimensions in mm

Item	Symbol	Specification		Remarks
		value	tolerance	
Body width	A_1			Dimensions derived from relevant comp. spec.
Body height	A			
Body thickness	T			
Lead wire dimensions	b			
	c			See Philips envelope spec.
Pitch of component	P	12,7	±1	
Feed hole pitch	P_o	12,7	±0,2	Cumulative error 1mm/20 pitch
Feed hole centre to component centre	P_2	6,35	±0,4	To be measured at 10 mm from feed hole centre
Feed hole centre to lead	P_1			
Distance between outer leads	F	2,54	±0,2	
Lead to lead distance	$F_1 F_2$			
Component alignment	Δh	±1		At top of body
Component alignment	Δh_1	±1		At top of body
Lead alignment after cutting	Δ_2			
Parallelism	Δ_3			
Tape width	W	18	±0,5	
Hold down tape width	W_o	6	±0,3	
Hole position	W_1	9	±0,5	
Hold down tape position	W_2	0,5	±0,2	
Feed hole diameter	D_0	4	±0,2	
Total tape thickness	t	0,9	max.	
Height of component from tape centre	H			
Lead wire clinch height	H_o			
Component height	H_1	H+A	+0–0,2	
Length of snipped leads	L_1	11	max.	
Lead wire taped portion	L			
Pull out force	(P)	6N	min.	
Pull out force from tape end/reel		2,5N	max.	



DIMENSIONS (IN MM) OF REEL AND BOX
Fig. 1.

MECHANICAL DATA

Dimensions in mm

UNREELING

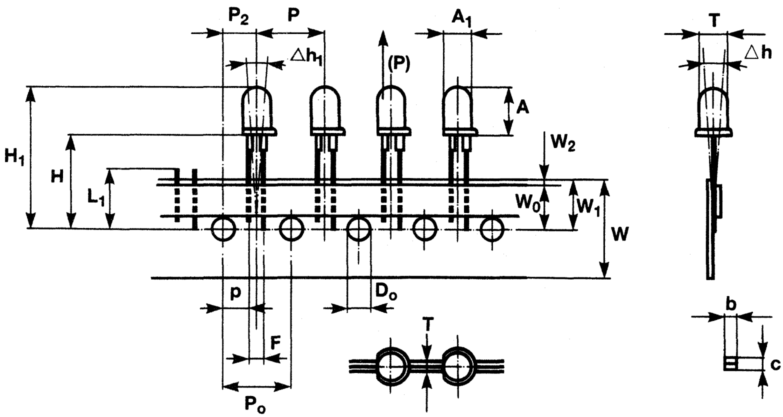


Fig. 2 See table.

SOLDERING AND MOUNTING RECOMMENDATIONS

Because LEDs are encapsulated in cast resin and not in transfer-moulded housings, they tend to soften when heated, as for instance during soldering. If there happens to be any mechanical stresses on the leads at this time, they tend to be displaced in a direction that minimizes the stress, with the result that the internal connections of the LED are fractured. This is one of the major reasons for LED failure.

To overcome the problem, it is essential:

a) to form and crop the leads before soldering;
b) to ensure that the holes in the printed circuit board (PCB) are of sufficient size (0,8 mm) to allow the LED to be inserted without stressing the leads while still allowing a good soldered joint to be made;
c) to ensure that the holes in the PCB are adequately spaced (2,54 mm) so as not to stress the leads;
d) that any spacers used do not impose stresses on the leads;
e) that any sockets are able to secure the LED without stress.

If it is necessary to crop the leads after soldering, the LED must first be allowed to cool to room temperature. This may take from 30 seconds to 3 minutes depending upon the circumstances.

Long sockets are particularly hazardous for the LED as they rarely have the same expansion characteristics as the PCB. The resulting distortion can easily be fatal for the LEDs unless great care is taken to ensure that the holes in the sockets and the PCB are not only in perfect alignment, but also that they are of adequate size and spacing. The longer the socket, the greater the care needed.

Soldering should be done with a solder-bath or temperature-controlled iron. In either case, the temperature should be accurately controlled (preferably at 245 ^{o}C) and, in the case of the solder-bath, it is useful to record the temperature. The maximum temperature must not exceed 260 ^{o}C and the maximum time is 7 seconds. Solder must not be less than 1,5 mm from the seating plane. When using a solder-bath, take care to avoid the pressure of the solder-wave bending the PCB.

The way in which the LED is cast means that the lower surface of the device is not suitable as a reference surface. The top of the device or the top of any flange should therefore be used. A slighty less accurate reference is the seating plane.

Figure 1 shows the effect on the lower surface of the LED of (a) under filling, and (b), over filling the mould. Other dimensions are within 0,1 mm and can be used as reference.

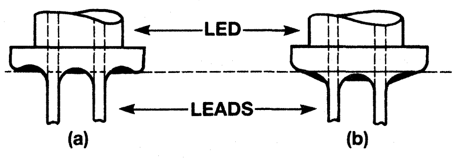


Fig. 1.

When mounting arrays of LEDs, it is preferable to use the top as the reference surface and if possible to use a screen in front of them. The screen not only makes any small differences of position less noticeable but also removes the need for the LEDs to withstand the mechanical tests required by some countries (see Fig. 2).

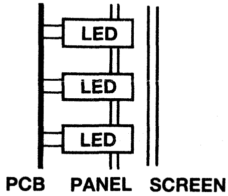


Fig. 2.

Finally, Fig. 3 shows a recommended mounting arrangement using sockets. The LED is held on the PCB by a double-sided adhesive tape and the socket presses the device against it. With the correct hole size and spacing, no stress is imposed on the leads and soldering can be done in complete safety.

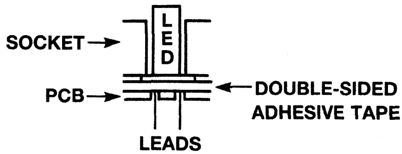


Fig. 3.

DEVICE DATA

SILICON PHOTOTRANSISTOR

N-P-N silicon phototransistor in epoxy resin encapsulation intended for optical coupling and encoding. The base is inaccessible. Combination with LED CQY58A is recommended.

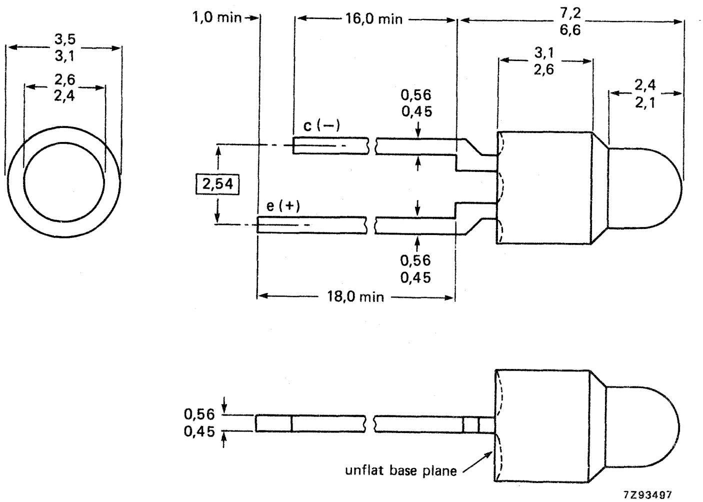
QUICK REFERENCE DATA

Collector-emitter voltage		V_{CEO}	max.	50	V
Collector current (d.c.)		I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	100	mW
Collector dark current V_{CE} = 30 V; E = 0		$I_{CEO(D)}$	<	100	nA
Collector light current V_{CE} = 5 V; E_e = 1 mW/cm^2; λ_{pk} = 930 nm	BPW22A-1	$I_{CEO(L)}$	>	1,5 to 8	mA
	BPW22A-2	$I_{CEO(L)}$	>	5 to 25	mA
Wavelength at peak response		λ_p	typ.	800	nm

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53F.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage	V_{CEO}	max.	50	V
Emitter-collector voltage	V_{ECO}	max.	7	V
Collector current				
d.c.	I_C	max.	25	mA
peak value	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	100	mW
Storage temperature	T_{stg}	−55 to +	100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature				
→ $>$1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient, → device mounted on printed-circuit board	$R_{th\ j\text{-}a}$	=	750	K/W

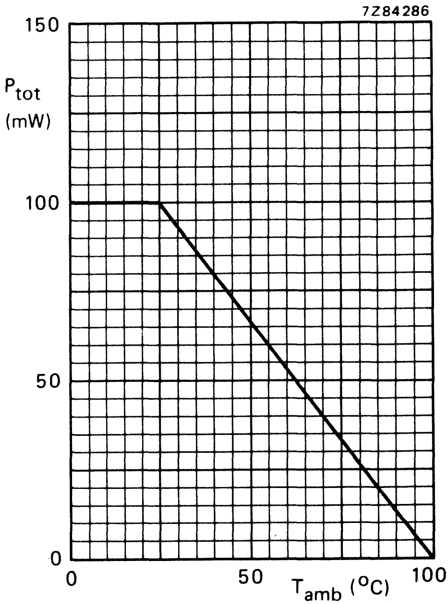


Fig. 2 Power derating curve versus ambient temperature.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector dark current V_{CE} = 30 V; E = 0		$I_{CEO(D)}$	<	100 nA	
Collector light current V_{CE} = 5 V; E_e = 1 mW/cm²; λ_p = 930 nm	**BPW22A-1**	$I_{CEO(L)}$		1,5 to 8 mA	←
	BPW22A-2	$I_{CEO(L)}$		5 to 25 mA	
Collector-emitter saturation voltage I_C = 1 mA; E_e = 1 mW/cm²; λ_p = 930 nm		V_{CEsat}	<	0,4 V	
Wavelength at peak response		λ_p	typ.	800 nm	
Bandwidth at half height		$\Delta\lambda$	typ.	400 nm	
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	20°	←
Switching times (see Figs 3, 4, 9 and 10) I_{Con} = 2 mA; V_{CC} = 5 V; R_E = 100 Ω; T_{amb} = 25 °C					
turn-on time		t_{on}	typ.	3 μs	
turn-off time		t_{off}	typ.	3 μs	
I_{Con} = 2 mA; V_{CC} = 5 V; R_E = 1 kΩ; T_{amb} = 25 °C turn-on time		t_{on}	typ.	12,0 μs	
turn-off time		t_{off}	typ.	12,0 μs	←

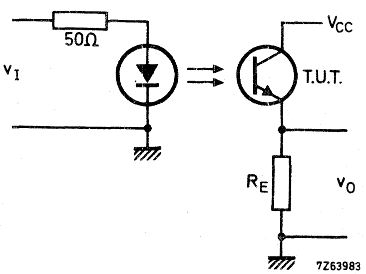


Fig. 3 Switching circuit with light emitting diode CQY58A. T.U.T. = BPW22A.

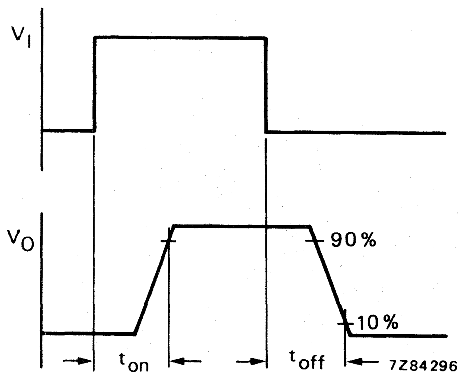


Fig. 4 Input and output switching waveforms.

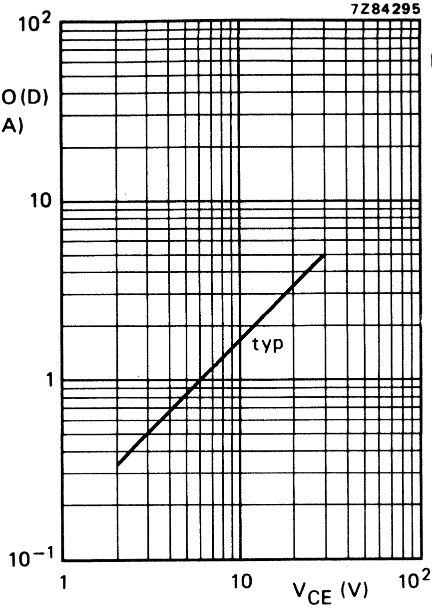


Fig. 5 $E = 0$; $T_j = 25\ ^oC$.

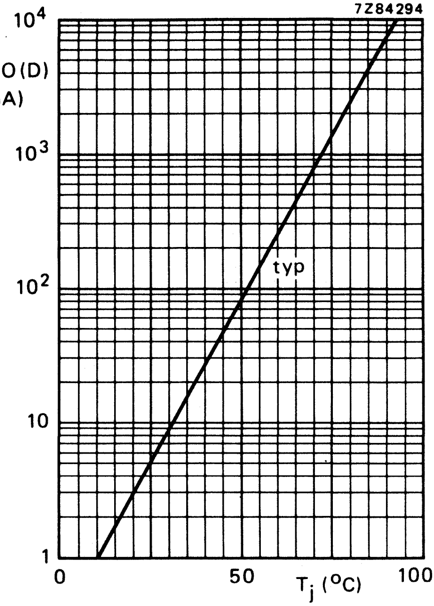


Fig. 6 $E = 0$; $V_{CE} = 30$ V.

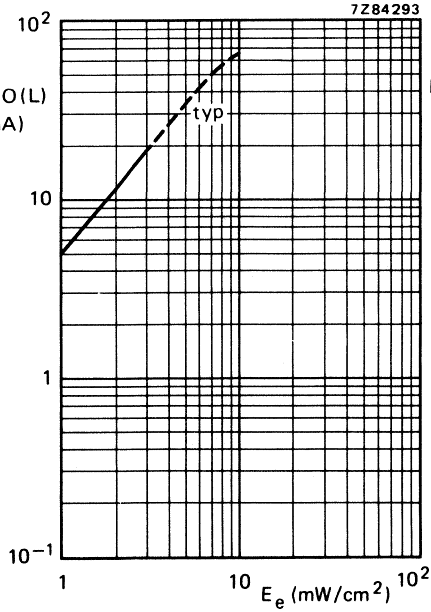


Fig. 7 GaAs source: $\lambda_{pk} = 930$ nm; $V_{CE} = 5$ V; $T_j = 25\ ^oC$.

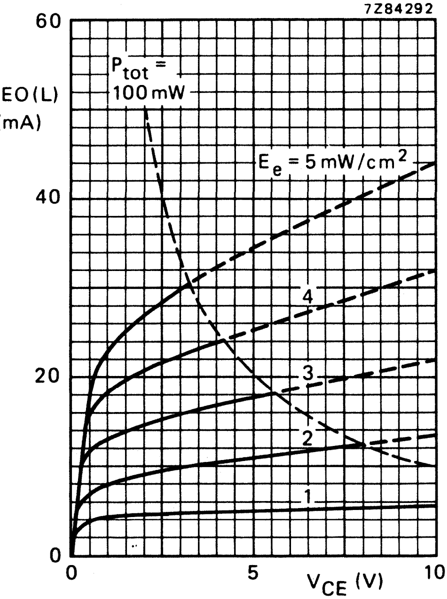


Fig. 8 $\lambda_{pk} = 930$ nm; $T_j = 25\ ^oC$; typical values.

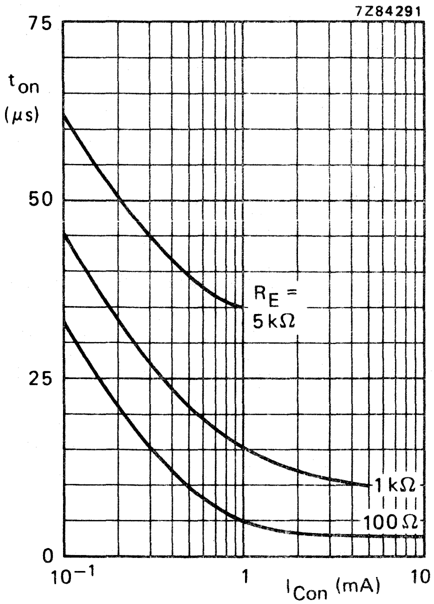


Fig. 9 V_{CC} = 5 V; T_{amb} = 25 °C; typical values; see also Figs 3 and 4.

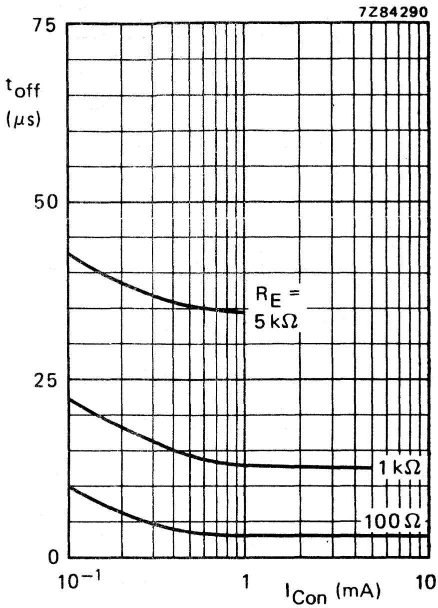


Fig. 10 V_{CC} = 5 V; T_{amb} = 25 °C; typical values; see also Figs 3 and 4.

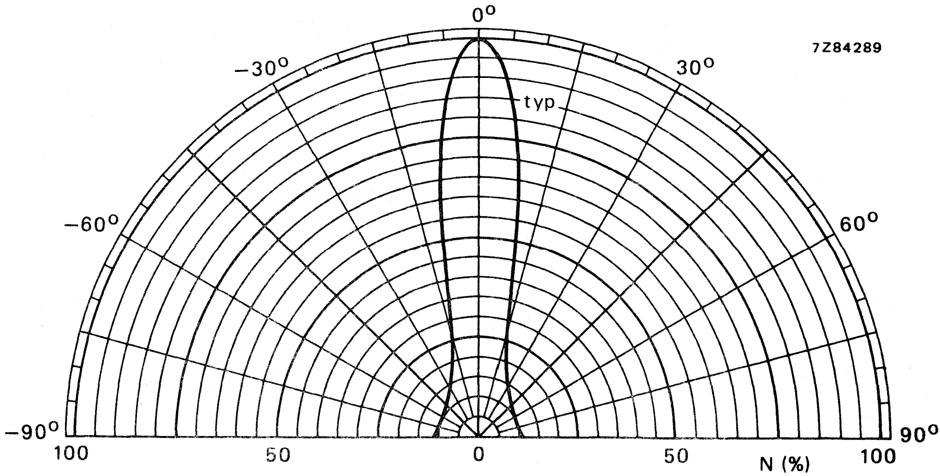


Fig. 11.

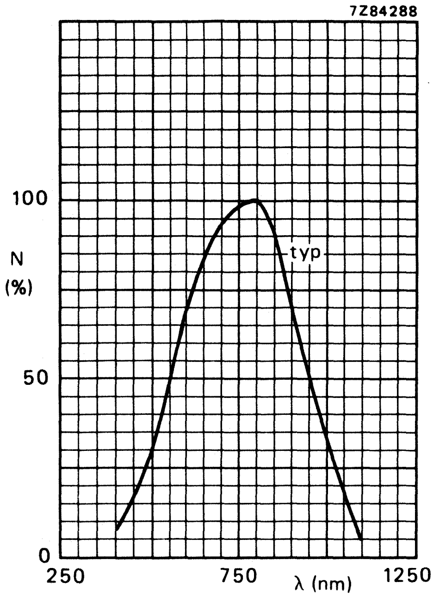


Fig. 12 Spectral response.

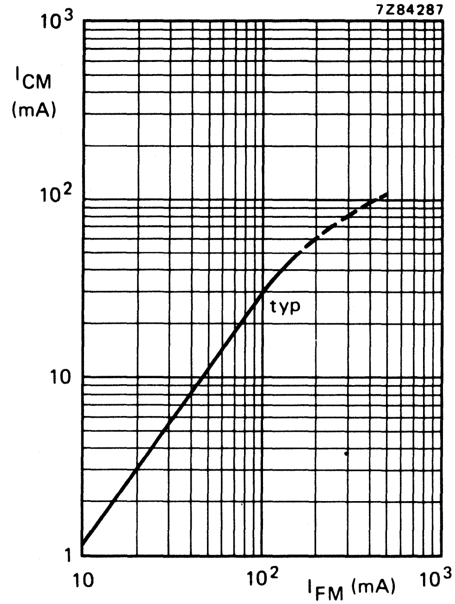


Fig. 13 V_{CE} = 5 V; t_p (I_{FM}) = 10 μs; T = 1 ms; d* = 10 mm; T_{amb} = 25 °C.

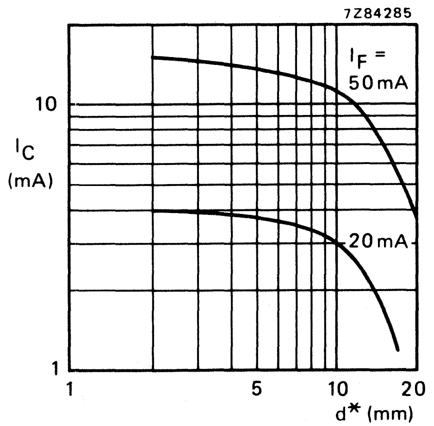


Fig. 14 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

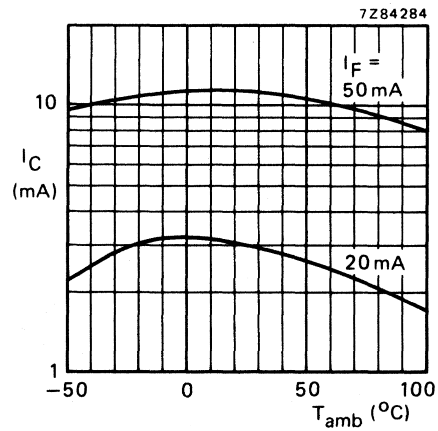


Fig. 15 V_{CE} = 5 V; d* = 10 mm; typical values.

* d = shortest free distance of mechanical on-axis when BPW22A is coupled with CQY58A.

SILICON PHOTO P-I-N DIODE

Silicon photo p-i-n diode in a plastic envelope with an infrared filter.

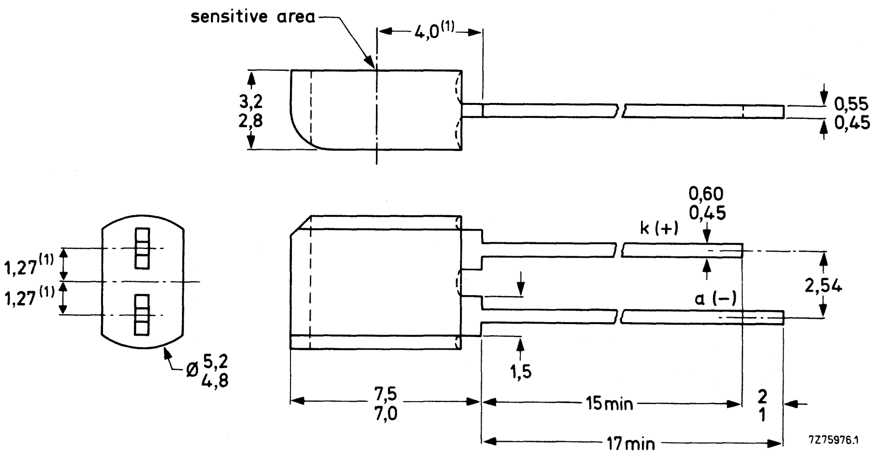
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	32	V
Total power dissipation up to T_{amb} = 47,5 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	100	°C
Dark reverse current V_R = 10 V; E_e = 0	$I_{R(D)}$	<	30	nA
Light reverse current V_R = 5 V; E_e = 1 mW/cm²; λ = 930 nm	$I_{R(L)}$	>	30	μA
Wavelength at peak response V_R = 5 V	λ_p	typ.	930	nm
Sensitive area	A	typ.	5	mm²

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-67.



(1) Reference for the positional tolerance of the sensitive area.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	32 V
Total power dissipation up to T_{amb} = 47,5 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}	−30 to + 100 °C	
Junction temperature	T_j	max.	100 °C
Lead soldering temperature up to the seating plane; $t_{sld} < 10$ s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	350 K/W

CHARACTERISTICS

T_j = 25 °C

Dark reverse current V_R = 10 V; E_e = 0	$I_{R(D)}$	typ. <	2 nA 30 nA
Light reverse current V_R = 5 V; E_e = 1 mW/cm²; λ = 930 nm	$I_{R(L)}$	> typ.	30 μA 45 μA
Reverse voltage I_R = 0,1 mA; E_e = 0	V_R	>	32 V
Wavelength at peak response V_R = 5 V	λ_p	typ.	930 nm
Diode capacitance V_R = 3 V	C_d	typ. <	17 pF 30 pF
V_R = 0	C_d	typ.	50 pF
Light switching times (see Figs 2 and 3) Rise time and fall time V_{KK} = 10 V; R_A = 1 kΩ	t_r, t_f	typ.	50 ns

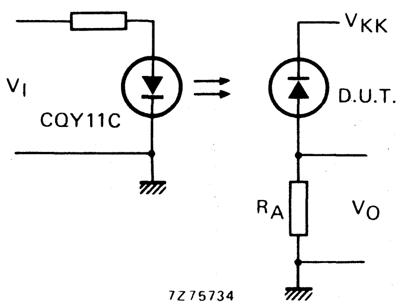


Fig. 2 Switching circuit.

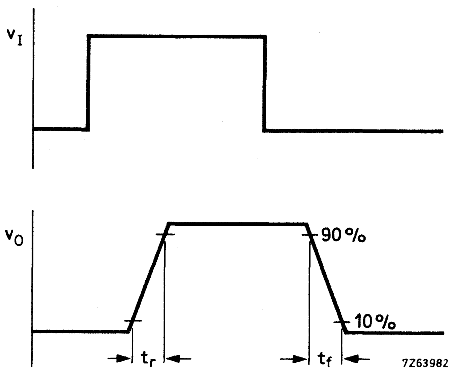


Fig. 3 Input and output switching waveforms.

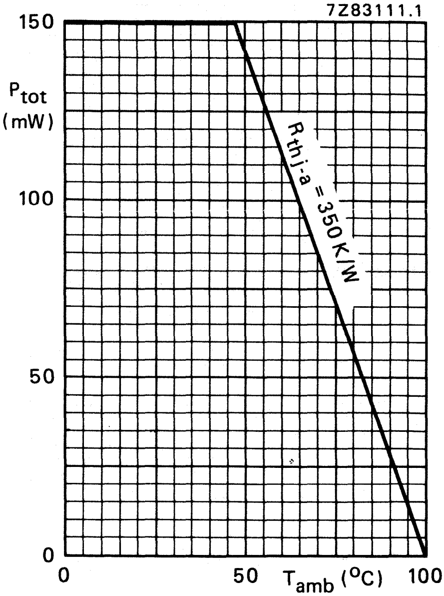


Fig. 4 Maximum permissible power dissipation as a function of temperature.

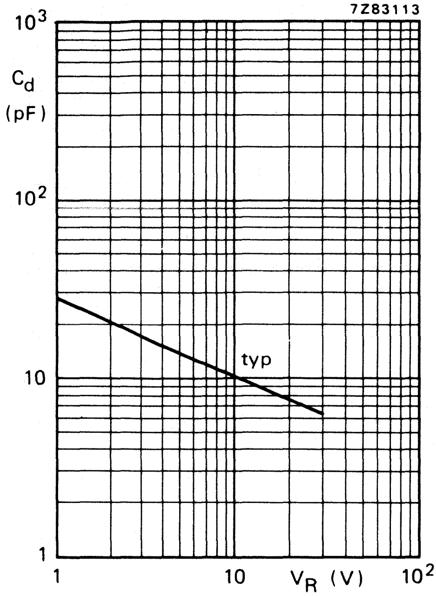


Fig. 5 T_{amb} = 25 °C.

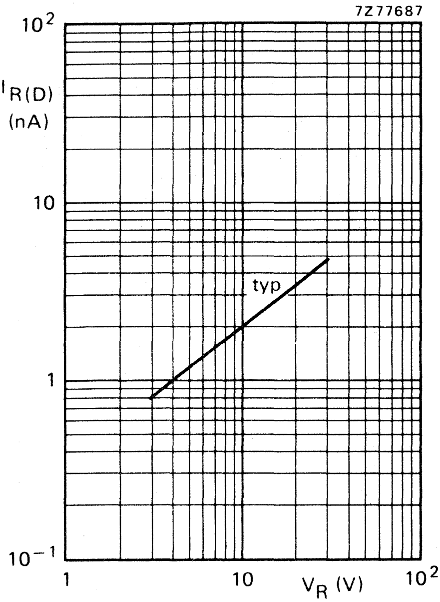


Fig. 6 E = 0; T_{amb} = 25 °C.

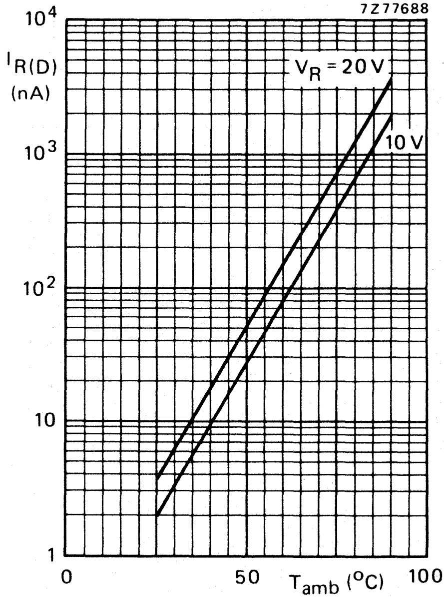


Fig. 7 E = 0; typical values.

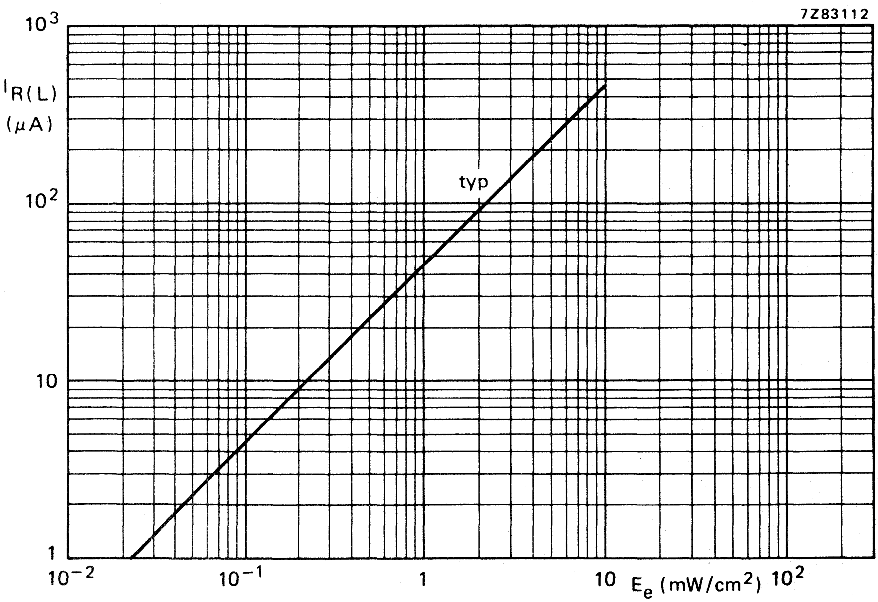


Fig. 8 V_R = 5 V; λ = 930 nm; T_{amb} = 25 °C.

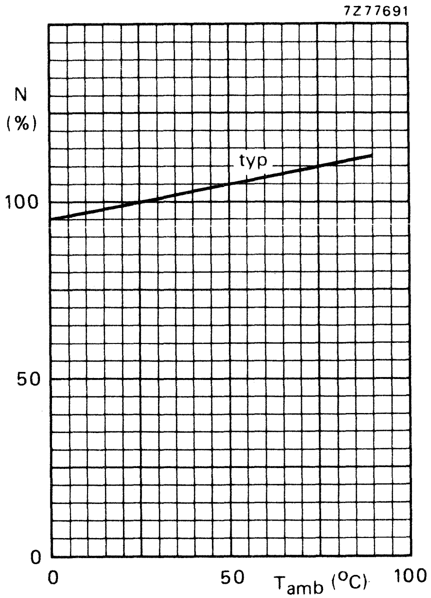


Fig. 9 E_e = 1 mW/cm²; λ = 930 nm.

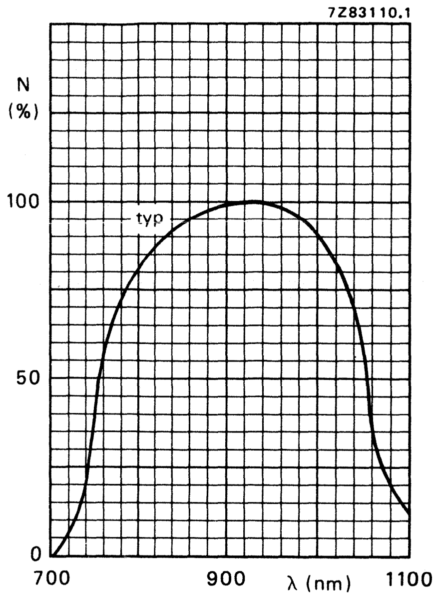


Fig. 10 V_R = 5 V; T_{amb} = 25 °C.

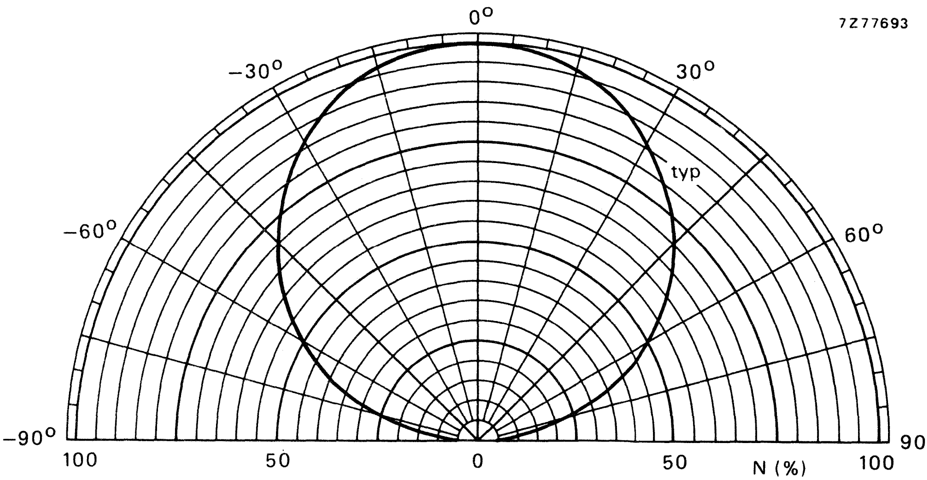


Fig. 11.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit red light (GaP:ZnO; ultra-red) at a typical peak wavelength of 700 nm when forward biased.

The CQS51 and CQS51L have a SOD-63 outline and are encapsulated in a red coloured diffusing resin.

The CQS51L is the long lead version of the CQS51 and has no seating plane but is in all other respects equal to the CQS51.

These LEDs are specially designed for low current applications.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 ^oC
Luminous intensity I_F = 10 mA	CQS51(L)	I_v	min.	0,7 mcd
Wavelength at peak emission		λ_p	typ.	700 nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	70 ^{o}

MECHANICAL DATA Dimensions in mm

Fig. 1 SOD-63A1.

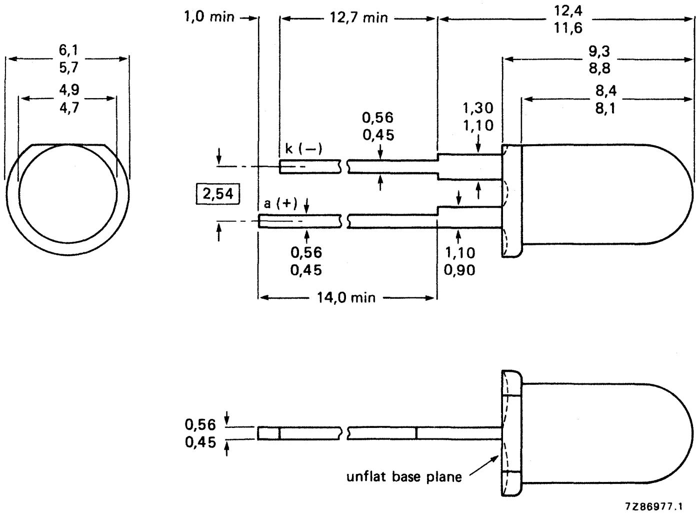
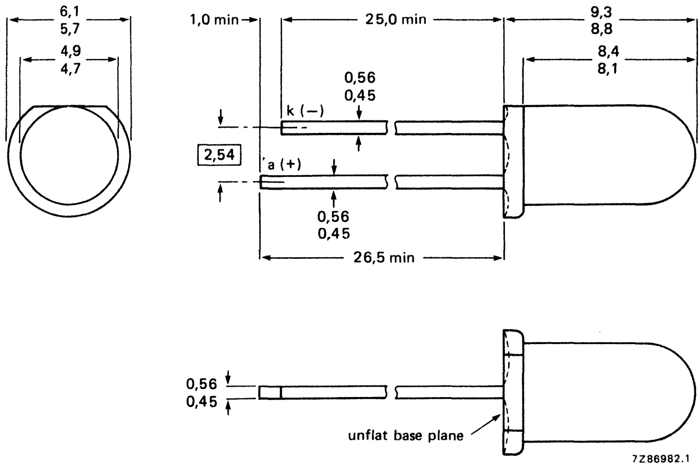


Fig. 1b SOD-63L.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; t_{sld} < 7 s; > 1,5 mm from the seating plane for CQS51; > 5 mm from the plastic body for CQS51L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,0	V
			max.	2,6	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth at half-intensity directions					
I_F = 10 mA		$\theta_{1/2}$	typ.	70	°
Bandwidth at half height		$\Delta\lambda$	typ.	90	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	700	nm
Luminous intensity					
I_F = 10 mA	CQS51(L)	I_v	min.	0,7	mcd
	CQS51(L)-3	I_v		1,6 to 3,5	mcd
	CQS51(L)-4	I_v	min.	3,0	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	45	pF

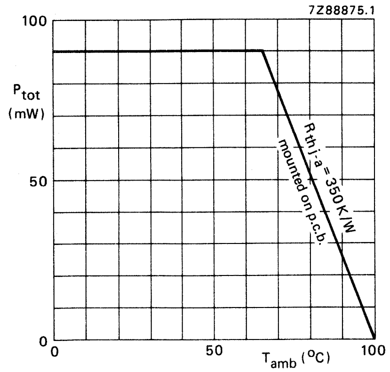


Fig. 2 Typical values.

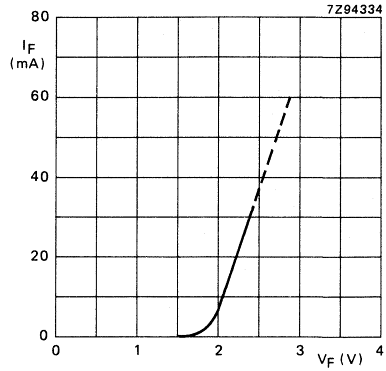


Fig. 3 $I_F = f\,(V_F)$.

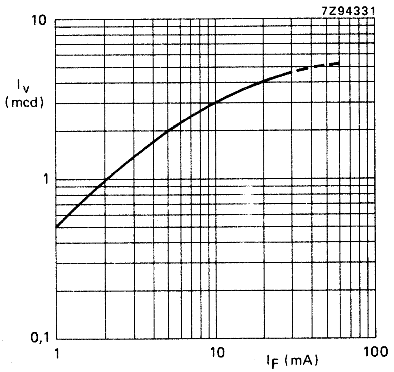


Fig. 4 $I_v = f\,(I_F)$.

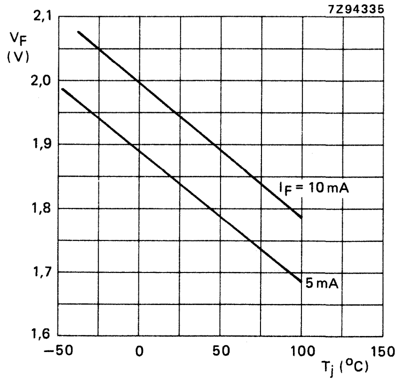


Fig. 5 Typical values.

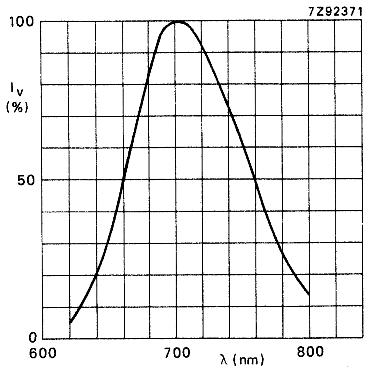


Fig. 6 Typical values.

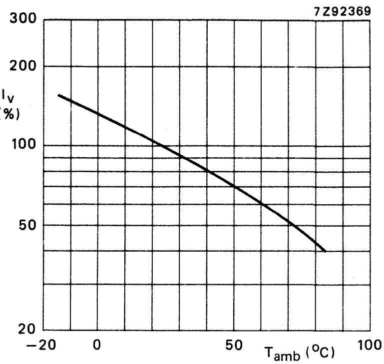


Fig. 7 Typical values.

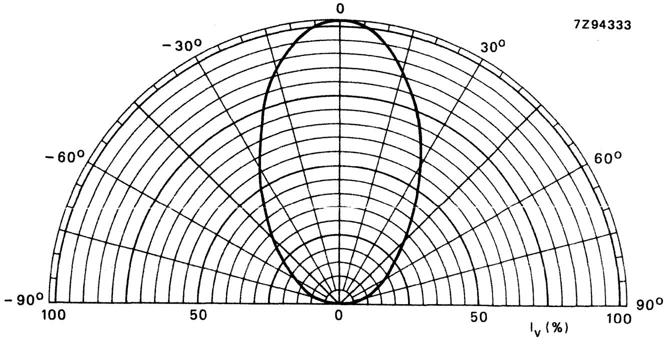


Fig. 8 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light (GaP:ZnO; ultra-red) at a typical peak wavelength of 700 nm when forward biased.

The CQS54 has a SOD-53 outline and is encapsulated in a red coloured diffusing resin.

This LED is specially designed for low current applications.

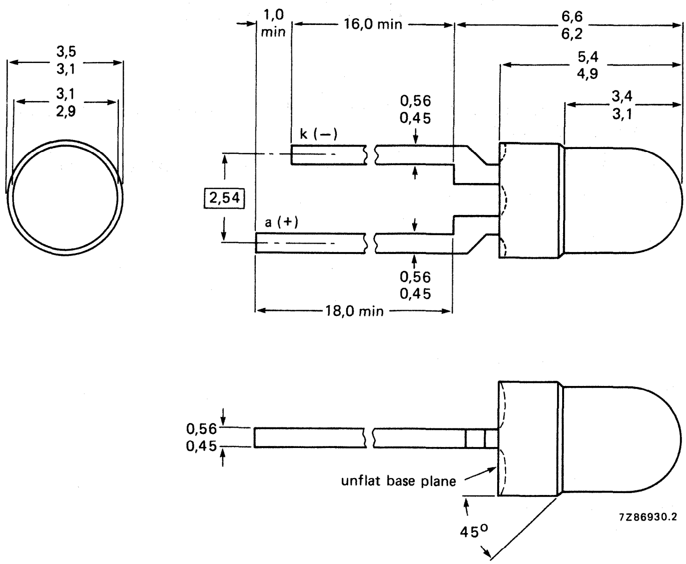
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	30 mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity I_F = 10 mA	I_v	min.	0,7 mcd
Wavelength at peak emission	λ_p	typ.	700 nm
Beamwidth at half-intensity directions	$\theta_{½}$	typ.	70 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; t_{sld} < 7 s; > 1,5 mm from the seating plane	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,0	V
			max.	2,6	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth at half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	70	°
Bandwidth at half height		$\Delta\lambda$	typ.	90	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	700	nm
Luminous intensity					
I_F = 2 mA		I_v	typ.		mcd
Luminous intensity					
I_F = 10 mA	CQS54	I_v	min.	0,7	mcd
	CQS54-2	I_v		1,0 to2,2	mcd
	CQS54-3	I_v	min.	1,6	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	45	pF

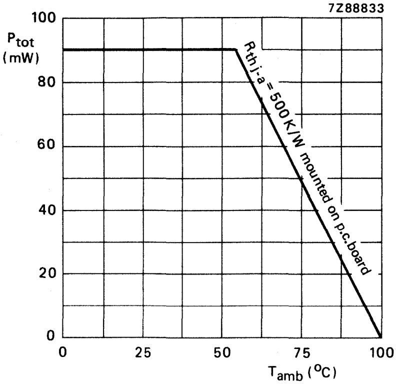


Fig. 2 Typical values.

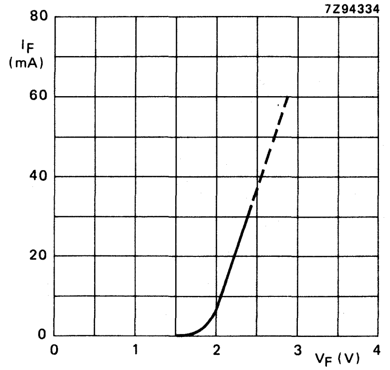


Fig. 3 $I_F = f(V_F)$.

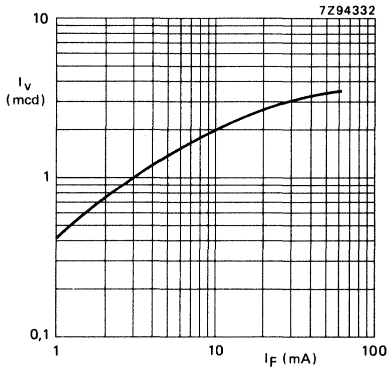


Fig. 4 $I_v = f(I_F)$.

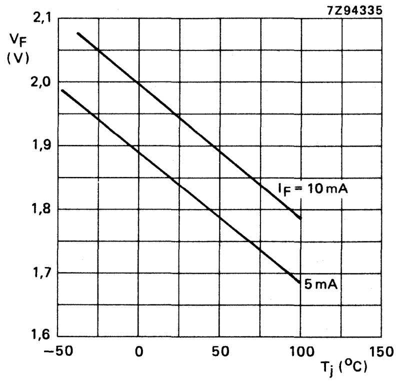


Fig. 5 Typical values.

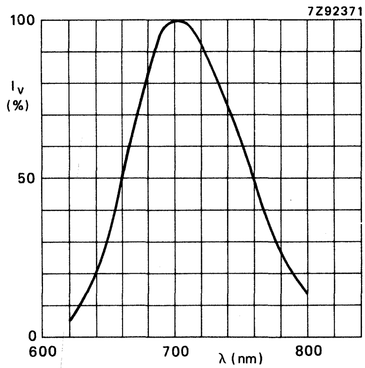


Fig. 6 Typical values.

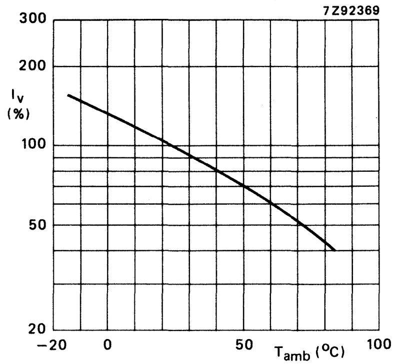


Fig. 7 Typical values.

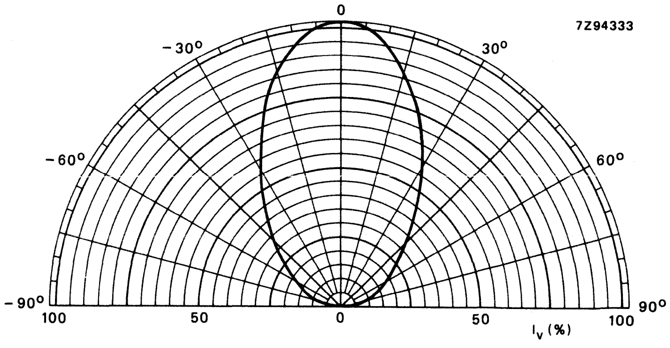


Fig. 8 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode which emits red light at a typical peak wavelength of 650 nm (GaAsP; standard red) when forward biased.

The CQS82L has a flangeless SOD-85 outline and is encapsulated in a red coloured diffusing resin.

Together with the CQS84L and CQS86L, the CQS82L forms one family and is available only in the long lead (L) version.

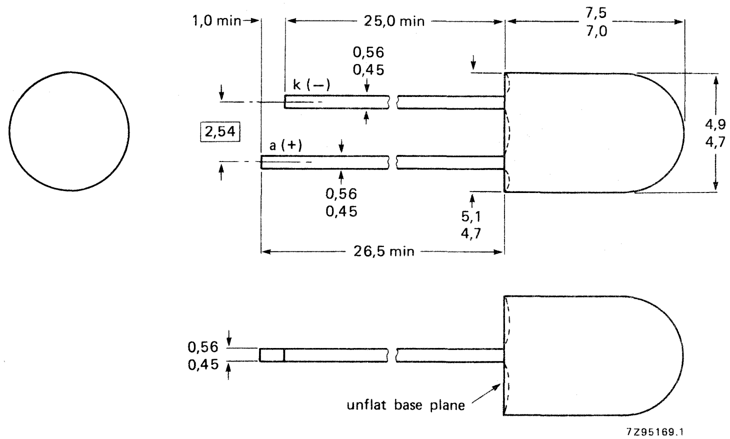
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	50	mA
Total power dissipation up to T_{amb} = 60 °C		P_{tot}	max.	100	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 20 mA	CQS82L	I_V	min.	0,7	mcd
	CQS82L-2	I_V		1,0 to 2,2	mcd
	CQS82L-3	I_V		1,6 to 3,5	mcd
	CQS82L-4	I_V	min.	3,0	mcd
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	650	nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-85AL.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	50	mA
peak value; t_p = 1 μs; f = 300 Hz		max.	1	A
peak value; t_p = 10 μs; δ = 0,01	I_{FRM}	max.	100	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	100	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s; $>$ 5 mm from the plastic body	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	1,7	V
			max.	2,0	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth at half-intensity directions					
I_F = 20 mA		$\theta_{1/2}$	typ.	70	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	650	nm
Luminous intensity					
I_F = 20 mA	CQS82L	I_v	min.	0,7	mcd
	CQS82L-2	I_v		1,0 to 2,2	mcd
	CQS82L-3	I_v		1,6 to 3,5	mcd
	CQS82L-4	I_v	min.	3,0	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	10	pF

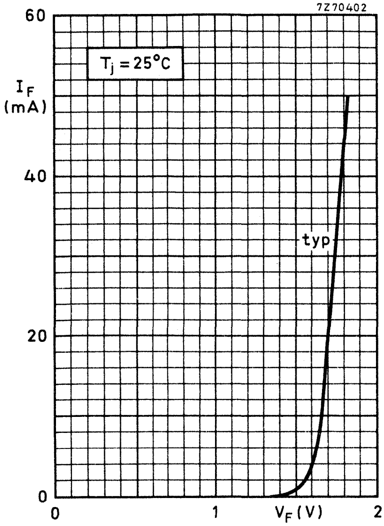


Fig. 2.

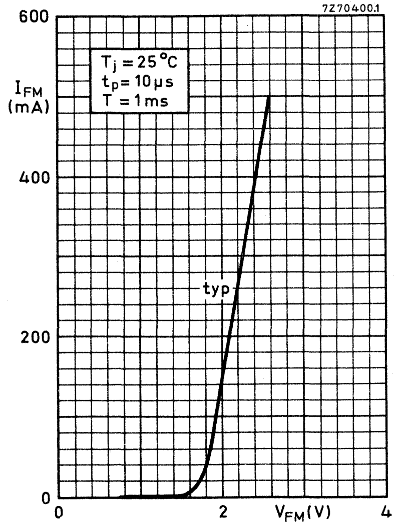


Fig. 3.

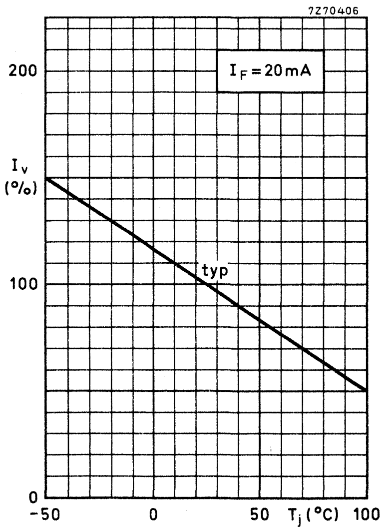


Fig. 4.

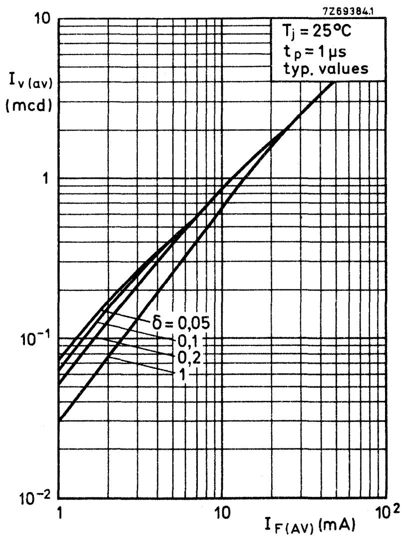


Fig. 5.

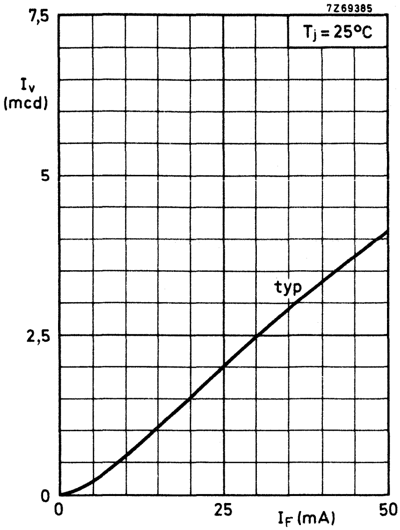


Fig. 6.

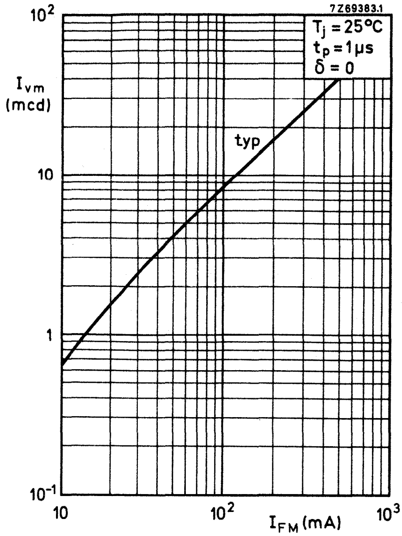


Fig. 7.

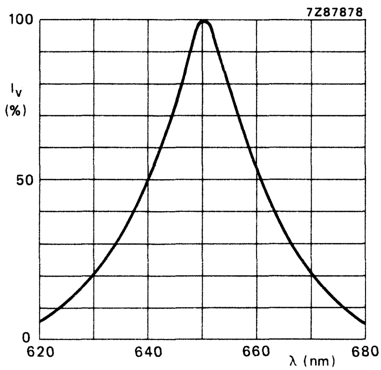


Fig. 8 Typical values.

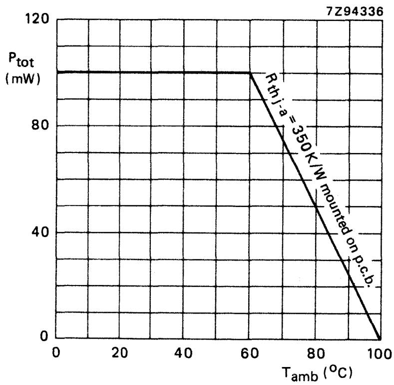


Fig. 9 Typical values.

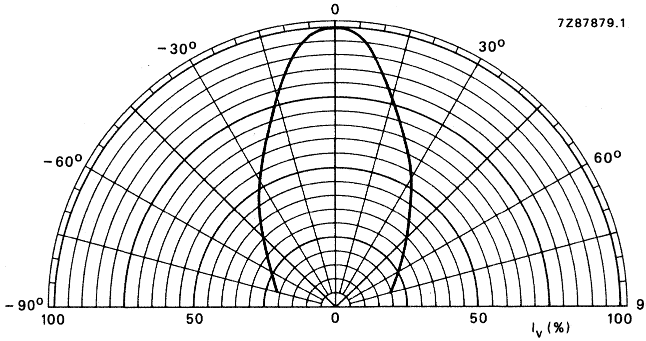


Fig. 10 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQS82AL has a flangeless SOD-85 outline and is encapsulated in a red diffusing resin.

Together with the CQS84L and the CQS86L, the CQS82AL forms one family and is available only in the long lead (L) version.

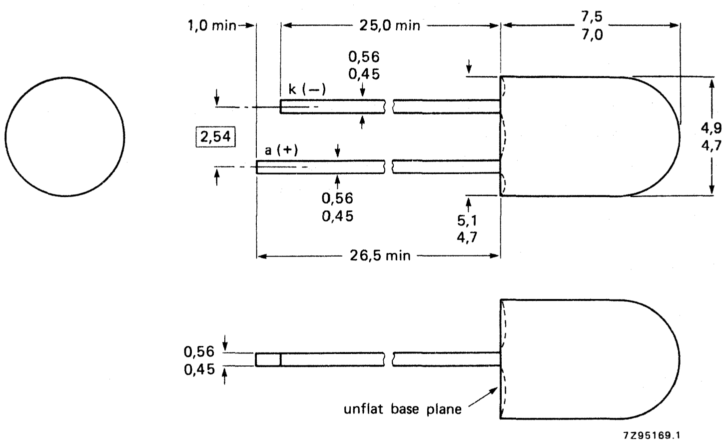
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS82AL	I_v	min.	1,6	mcd
	CQS82AL-4	I_v		3,0 to 7,0	mcd
	CQS82AL-5	I_v		5,0 to 12	mcd
	CQS82AL-6	I_v	min.	10	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-85AL.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	100	mA
peak value; t = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; t_{sld} < 7 s; >5 mm from the plastic body	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	1,75	V
			max.	2,2	V
I_F = 100 mA		V_F	typ.	2,0	V
			max.	2,5	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth at half-intensity directions					
I_F = 10 mA; in the plane of the leads		$\theta_{1/2}$	typ.	70	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Luminous intensity					
I_F = 10 mA	CQS82AL	I_v	min.	1,6	mcd
	CQS82AL-4	I_v		3,0 to 7,0	mcd
	CQS82AL-5	I_v		5,0 to 12	mcd
	CQS82AL-6	I_v	min.	10	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	80	pF

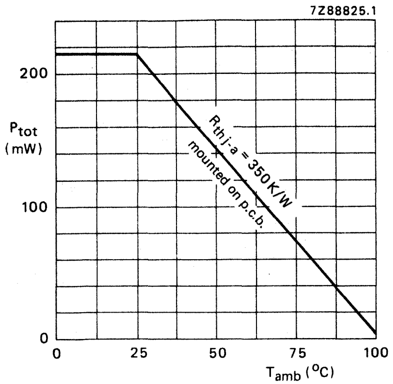


Fig. 2.

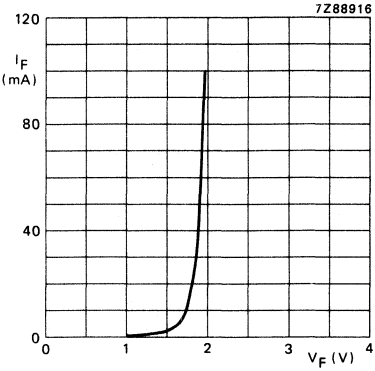


Fig. 3 T_{amb} = 25 °C; typ. values.

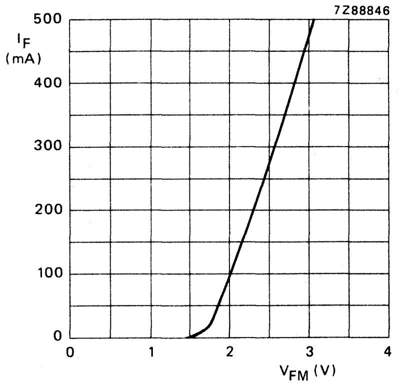


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

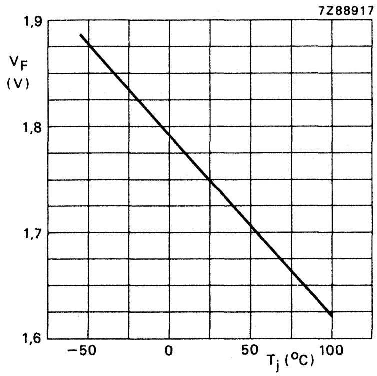


Fig. 5 I_F = 10 mA; typ. values.

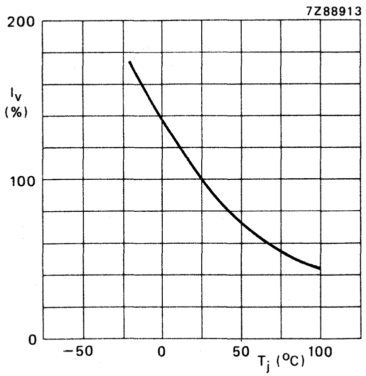


Fig. 6 Typical values.

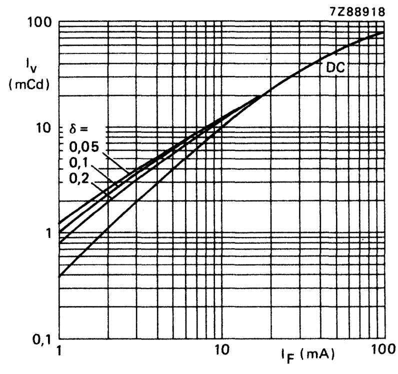


Fig. 7 t_p = 50 μs; typ. values.

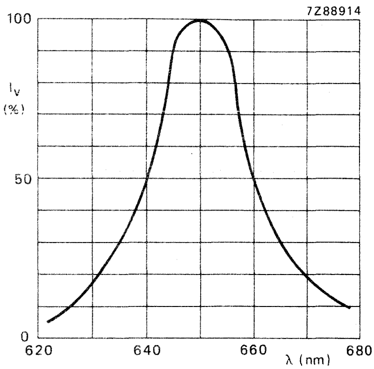


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

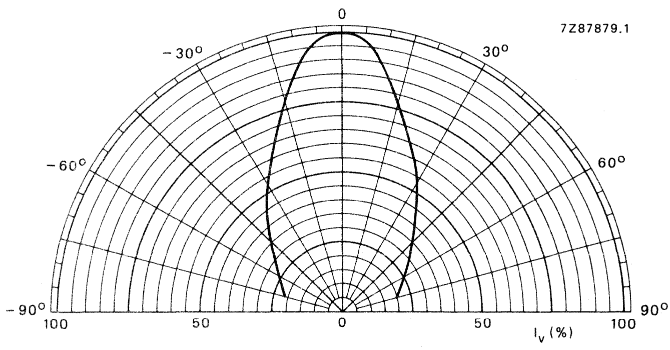


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQS84L has a flangeless SOD-85 outline and is encapsulated in a green diffusing resin.

Together with the CQS82AL and the CQS86L, the CQS84L forms one family and is available only in the long lead (L) version.

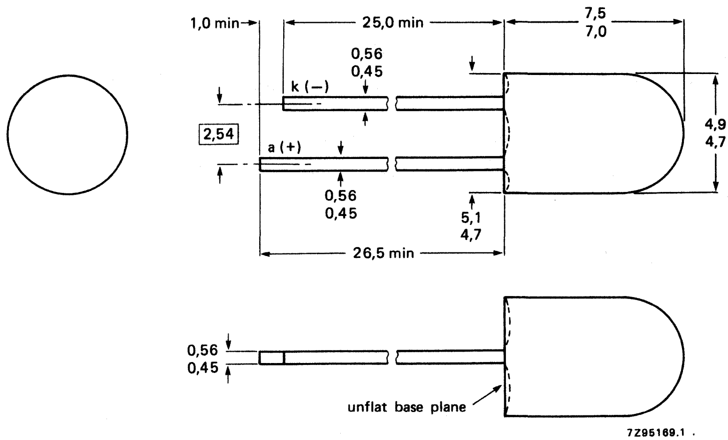
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 ^oC		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 10 mA	CQS84L	I_v	min.	0,7	mcd
	CQS84L-3	I_v		1,6 to 3,5	mcd
	CQS84L-4	I_v		3,0 to 7,0	mcd
	CQS84L-5	I_v	min.	5,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-85AL.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t = 1 μs; f = 300 Hz		max.	1	A
peak value; $t_p < 1$ ms; δ = 0,33	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 35 ^oC	P_{tot}	max.	180	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature; $t_{sld} < 7$ s; $>$ 5 mm from the plastic body	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 ^oC unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,1	V
			max.	2,6	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth at half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	70	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQS84L	I_v	min.	1,0	mcd
	CQS84L-3	I_v		1,6 to 3,5	mcd
	CQS84L-4	I_v		3,0 to 7,0	mcd
	CQS84L-5	I_v	min.	5,0	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	20	pF

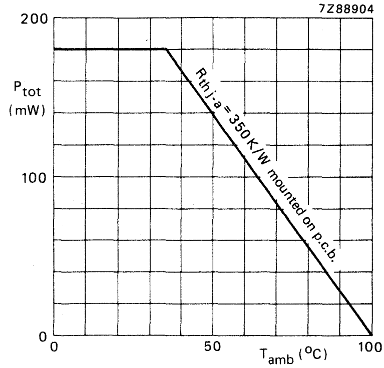


Fig. 2.

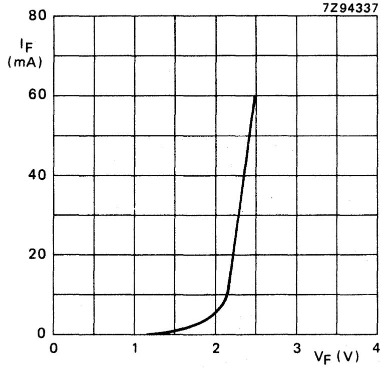


Fig. 3 T_{amb} = 25 °C; typ. values.

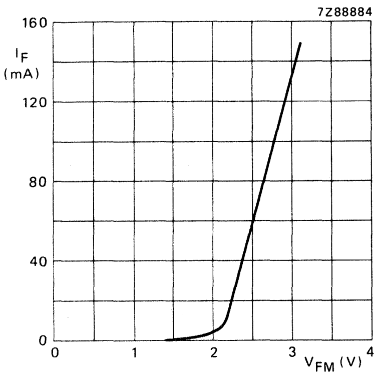


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

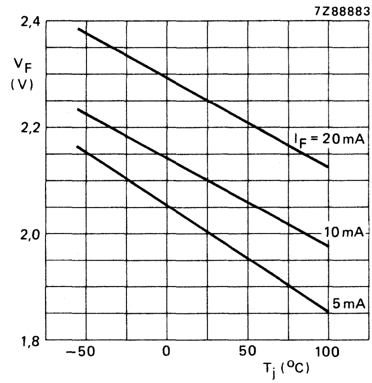


Fig. 5 Typical values.

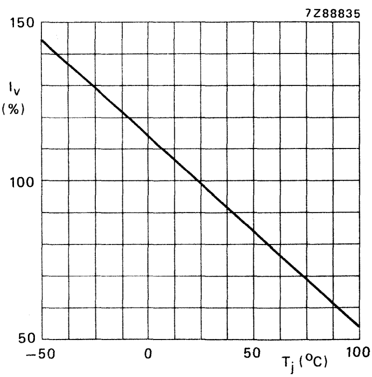


Fig. 6 Typical values.

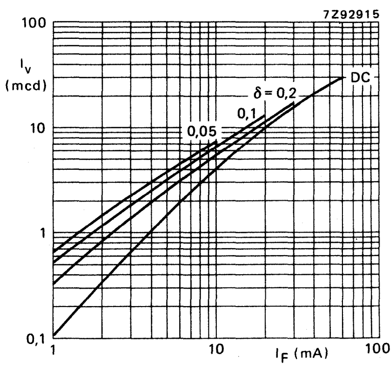


Fig. 7 t_p = 50 μs; typ. values.

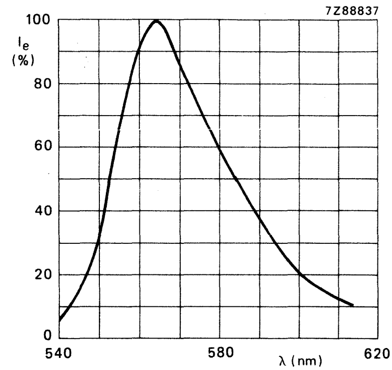


Fig. 8 I_F = 10 mA; typ. values.

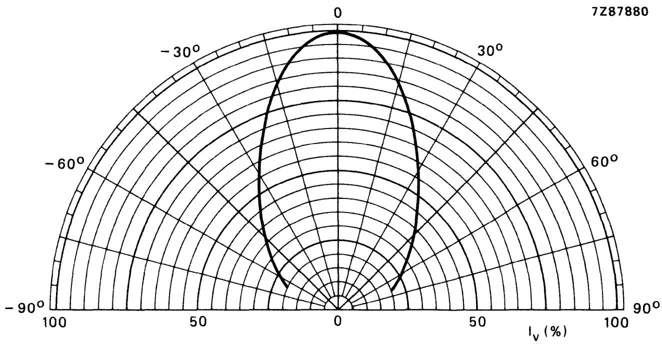


Fig. 9 I_F = 10 mA; typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQS86L has a flangeless SOD-85 outline and is encapsulated in a yellow diffusing resin.

Together with the CQS82AL and the CQS84L, the CQS86L forms one family and is available only in the long lead (L) version.

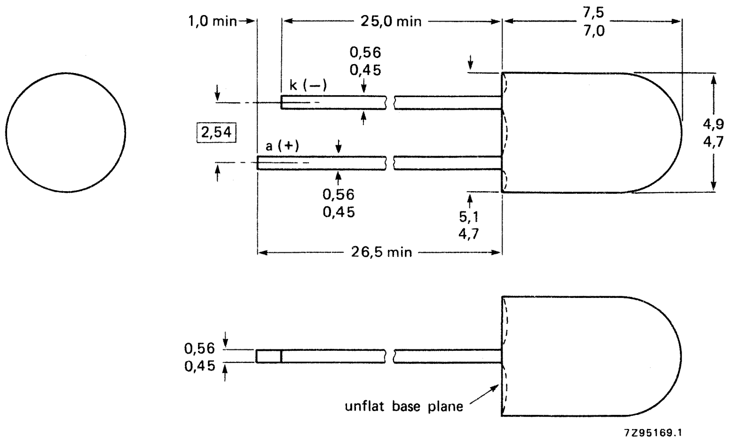
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS86L	I_V	min.	0,7	mcd
	CQS86L-3	I_V		1,6 to 3,5	mcd
	CQS86L-4	I_V		3,0 to 7,0	mcd
	CQS86L-5	I_V	min.	5,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-85AL



Note : Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_p < 1 ms; δ = 0,33			max.	60 mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90 mW
Storage temperature		T_{stg}		−55 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature; t_{sld} < 7 s; > 5 mm from the plastic body		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 10 mA		V_F	typ.	2,1 V
			max.	2,6 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth at half-intensity directions				
I_F = 10 mA		$\theta_{½}$	typ.	70 °
Bandwidth at half height		$\Delta\lambda$	typ.	40 nm
Wavelength at peak emission				
I_F = 10 mA		λ_p	typ.	590 nm
Luminous intensity				
I_F = 10 mA	CQS86L	I_V	min.	0,7 mcd
	CQS86L-3	I_V		1,6 to 3,5 mcd
	CQS86L-4	I_V		3,0 to 7,0 mcd
	CQS86L-5	I_V	min.	5,0 mcd
Diode capacitance				
V_R = 0; f = 1 MHz		C_d	typ.	15 pF

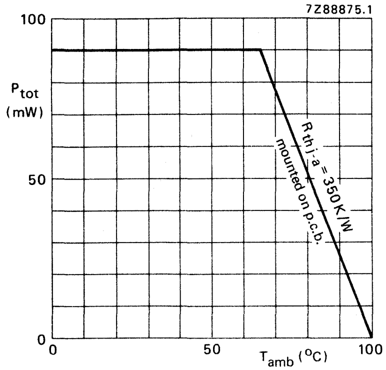


Fig. 2.

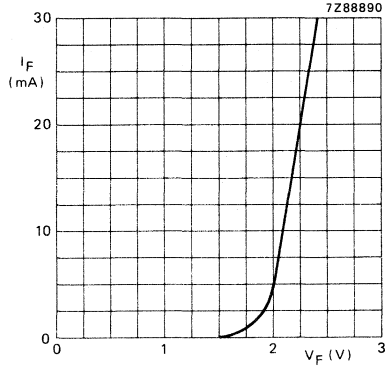


Fig. 3 T_{amb} = 25 °C; typ. values.

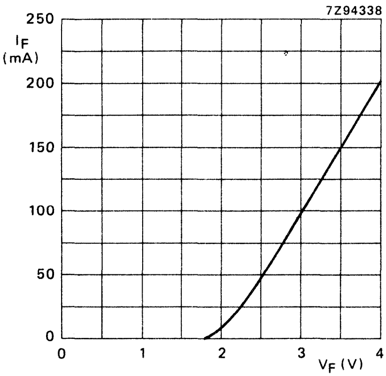


Fig. 4 t_{on} = 50 μs; δ = 0,33;
T_{amb} = 25 °C; typ. values.

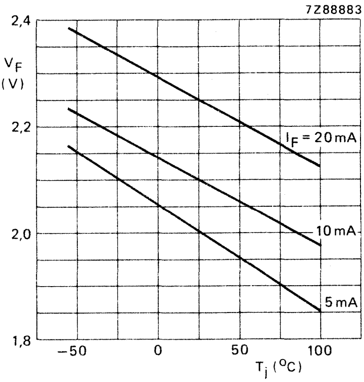


Fig. 5 Typical values.

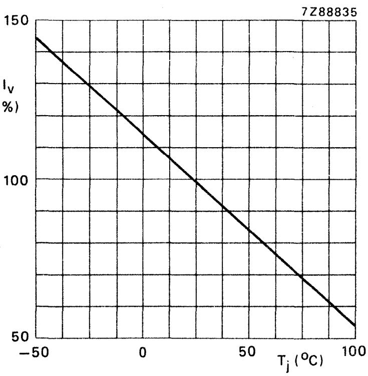


Fig. 6 Typical values.

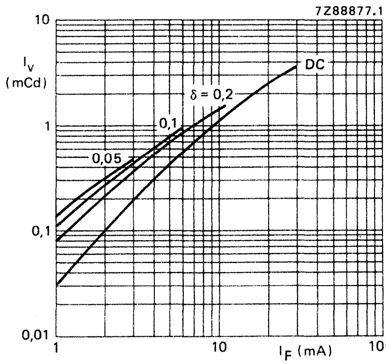


Fig. 7 t_p = 50 μs; typ. values.

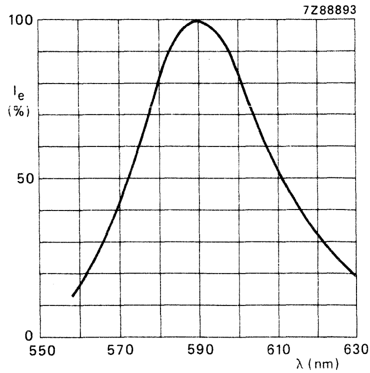


Fig. 8 Typical values.

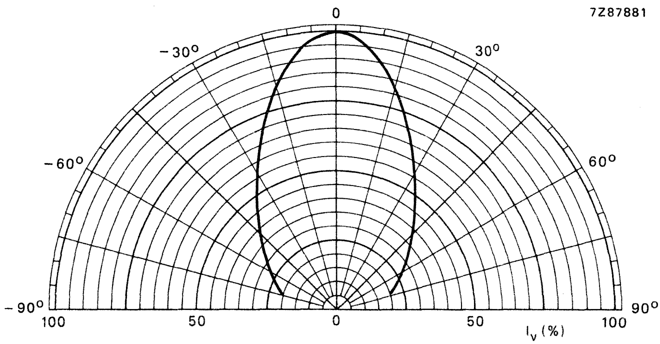


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQS93 has a SOD-82 outline and is encapsulated in a red coloured diffusing resin.

Together with the CQS95 and CQS97, the CQS93 forms one family.

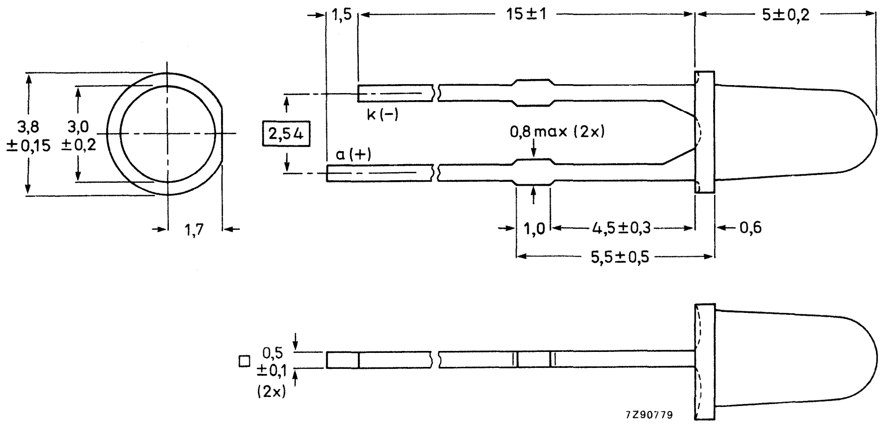
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	25	mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	70	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 20 mA	CQS93	I_v	min.	0,7	mcd
	CQS93-2	I_v		1,0 to 2,2	mcd
	CQS93-3	I_v	min.	1,6	mcd
Wavelength at peak emission		λ_p	typ.	700	nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	60	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82C.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	25	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_p = 1 ms; δ = 0,33	I_{FRM}	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	70	mW
Storage temperature	T_{stg}		−30 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; t_{sld} < 7s; > 3 mm from the plastic body	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current V_R = 5 V		I_R	max.	5	μA
Beamwidth at half-intensity directions I_F = 20 mA		$\theta_{1/2}$	typ.	60	°
Bandwidth at half height		$\Delta\lambda$	typ.	100	nm
Wavelength at peak emission I_F = 20 mA		λ_p	typ.	700	nm
Luminous intensity I_F = 20 mA	CQS93	I_v	min.	0,7	mcd
	CQS93-2	I_v		1,0 to 2,2	mcd
	CQS93-3	I_v	min.	1,6	mcd

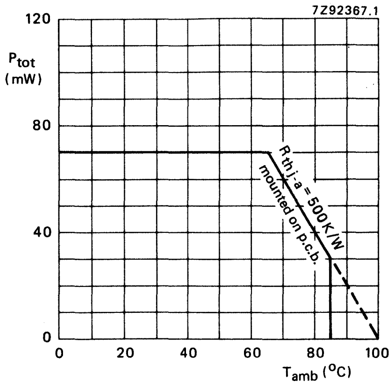


Fig. 2.

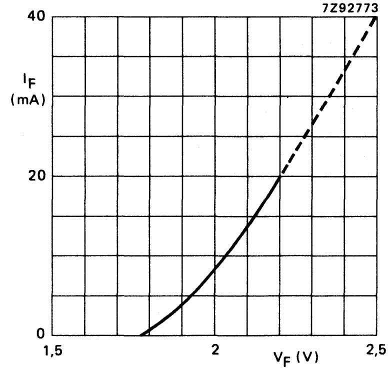


Fig. 3 T_{amb} = 25 °C; typ. values.

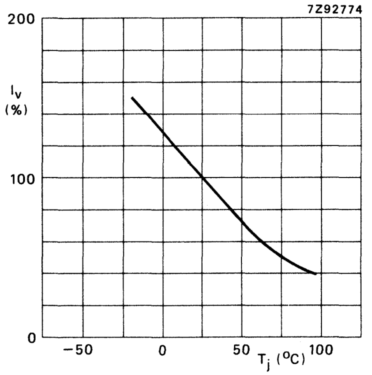


Fig. 4 Typical values.

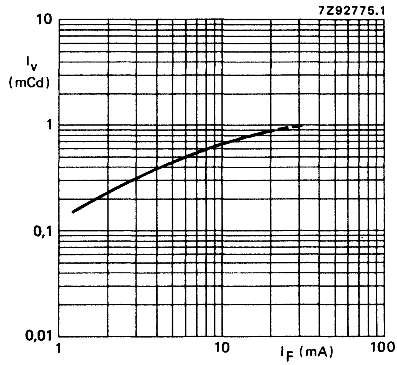


Fig. 5 T_{amb} = 25 °C; typ. values.

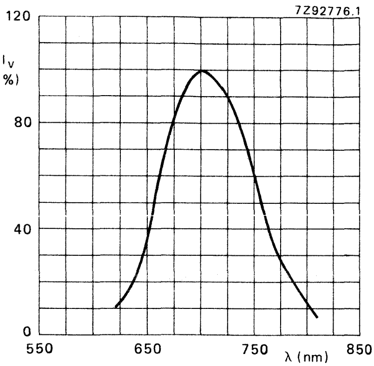


Fig. 6 I_F = 20 mA; T_{amb} = 25 °C; typ. values.

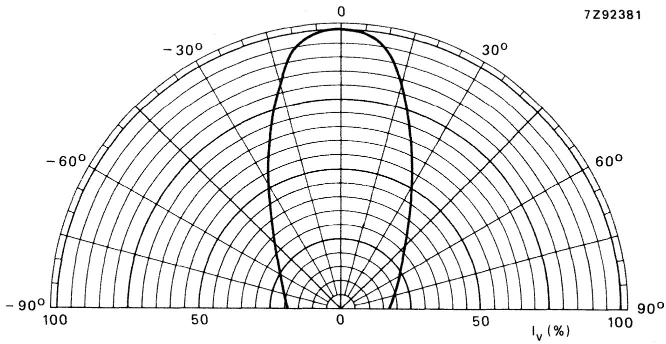


Fig. 7 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQS93E has a SOD-82 outline and is encapsulated in a red coloured diffusing resin.

The additional letter E signifies extremely long leads (34 mm).

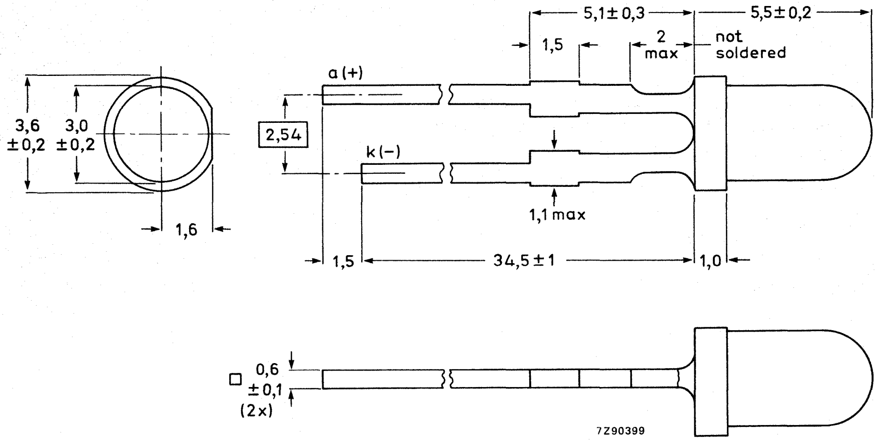
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	25	mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	70	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 20 mA	CQS93E	I_v	min.	0,7	mcd
	CQS93E-2	I_v		1,0 to 2,2	mcd
	CQS93E-3	I_v	min.	1,6	mcd
Wavelength at peak emission		λ_p	typ.	700	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	50	o

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82B.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	25	mA
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz		max.	1	A
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	70	mW
Storage temperature	T_{stg}		−30 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature; $t_{sld} < 7$ s; $>$ 1,5 mm from the seating plane	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_{amb} = 25 ^oC unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current					
V_R = 5 V		I_R	max.	5	μA
Beamwidth between half-intensity directions					
I_F = 20 mA		$\theta_{½}$	typ.	50	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	100	nm
Wavelength at peak emission; I_F = 20 mA		λ_p	typ.	700	nm
Luminous intensity					
I_F = 20 mA	CQS93E	I_v	min.	0,7	mcd
	CQS93E-2	I_v		1,0 to 2,2	mcd
	CQS93E-3	I_v	min.	1,6	mcd

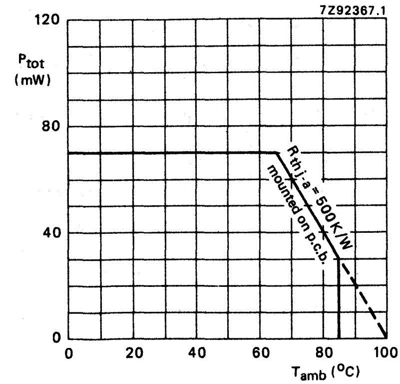


Fig. 2.

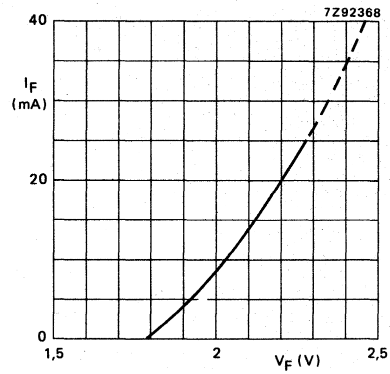


Fig. 3 T_{amb} = 25 °C; typ. values.

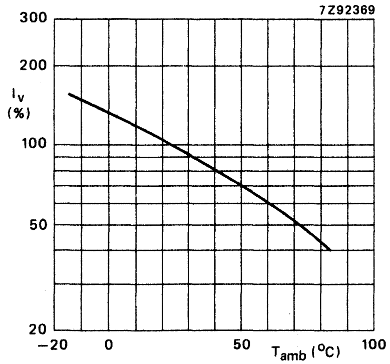


Fig. 4 Typ. values.

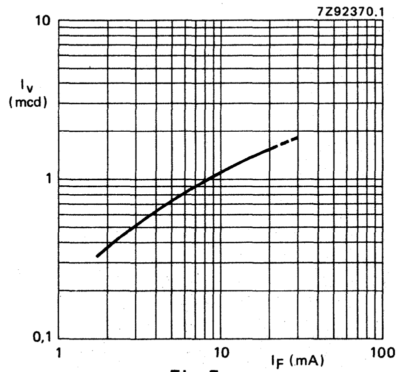


Fig. 5.

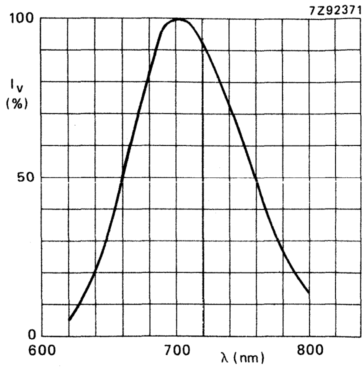


Fig. 6 Typ. values.

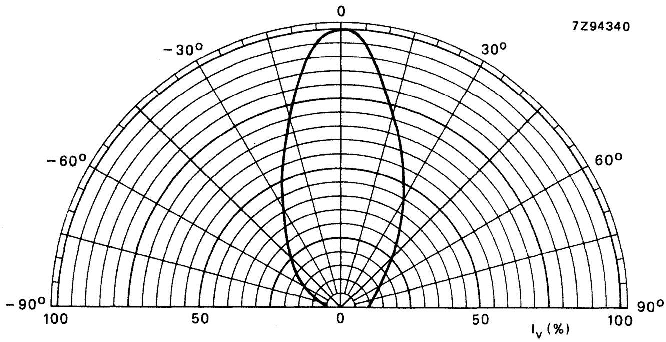


Fig. 7 Typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQS93L has a SOD-82 outline and is encapsulated in a red coloured diffusing resin.

The additional letter L signifies long leads (26 mm).

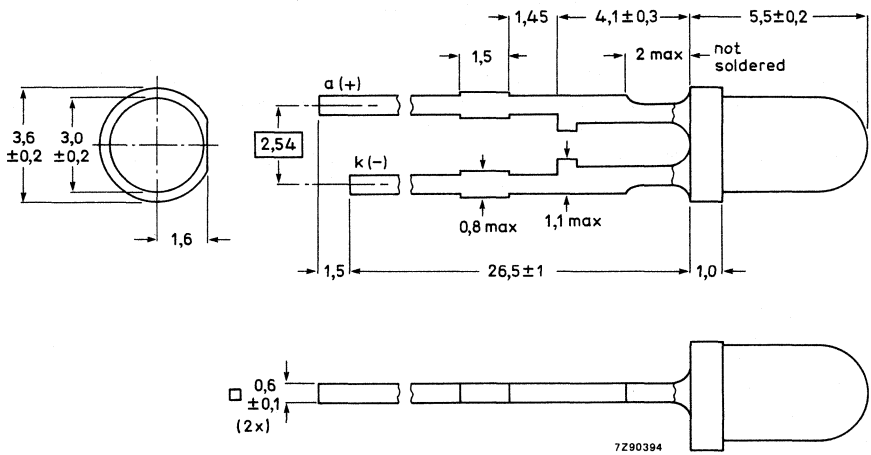
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	25	mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	70	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 20 mA	CQS93L	I_v	min.	0,7	mcd
	CQS93L-2	I_v		1,0 to 2,2	mcd
	CQS93L-3	I_v	min.	1,6	mcd
Wavelength at peak emission		λ_p	typ.	700	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	50	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82A.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	25	mA
peak value; t_{on} = 1 ms; δ = 0,33		max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	70	mW
Storage temperature	T_{stg}		−30 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s; $> 1,5$ mm from the seating plane	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current					
V_R = 5 V		I_R	max.	5	μA
Beamwidth between half-intensity directions					
I_F = 20 mA		$\theta_{½}$	typ.	50	°
Beamwidth at half height		$\Delta\lambda$	typ.	100	nm
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	700	nm
Luminous intensity					
I_F = 20 mA	CQS93L	I_v	min.	0,7	mcd
	CQS93L-2	I_v		1,0 to 2,2	mcd
	CQS93L-3	I_v	min.	1,6	mcd

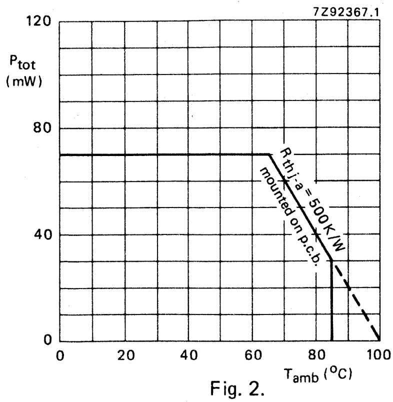


Fig. 2.

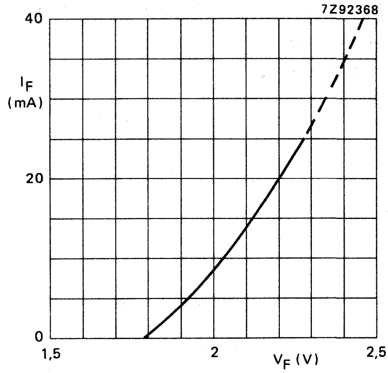


Fig. 3 T_{amb} = 25 °C; typ. values.

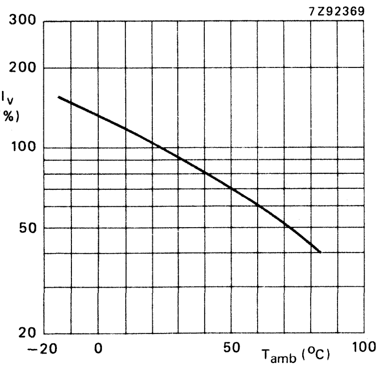


Fig. 4 Typ. values.

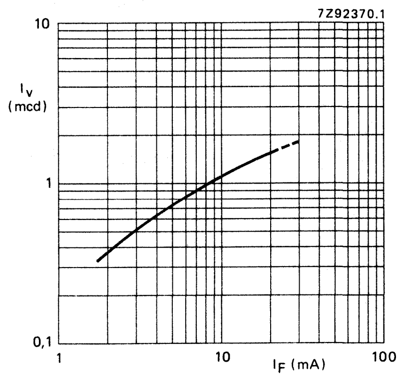


Fig. 5 Typ. values.

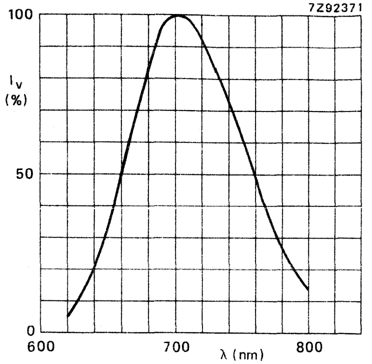


Fig. 6 Typ. values.

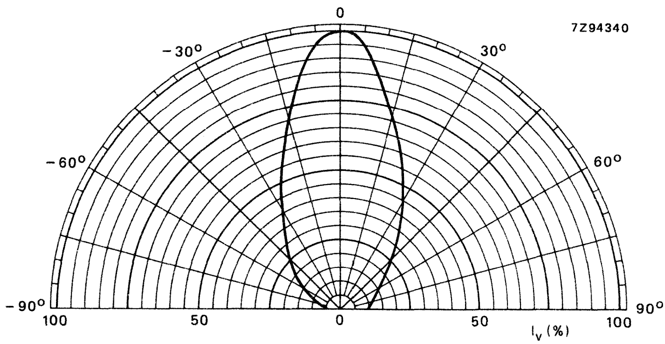


Fig. 7 Typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with diameter of 3 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQS95 has a SOD-82 outline and is encapsulated in a green coloured diffusing resin.

Together with the CQS93 and the CQS97, the CQS95 forms one family.

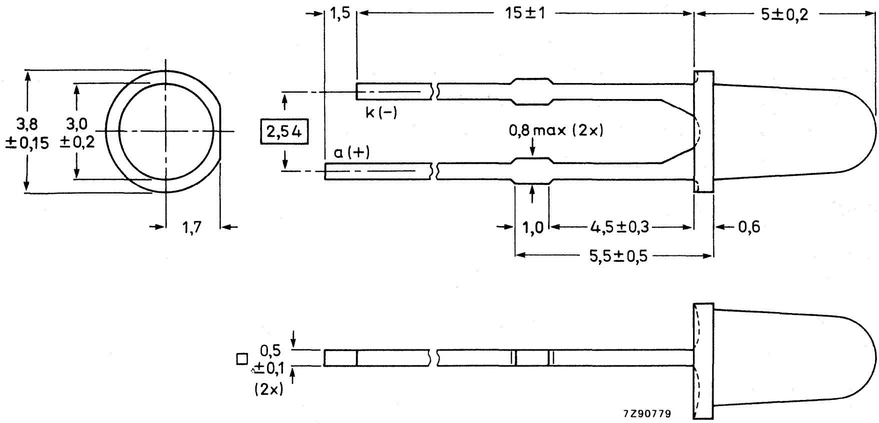
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS95	I_v	min.	0,7	mcd
	CQS95-2	I_v		1,0 to 2,2	mcd
	CQS95-3	I_v	min.	1,6	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	60	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82C.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	40	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−30 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; t_{sld} < 7 s; > 3 mm from the plastic body	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current					
V_R = 5 V		I_R	max.	10	μA
Beamwidth at half-intensity directions					
I_F = 20 mA		$\theta_{½}$	typ.	60	°
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQS95	I_v	min.	0,7	mcd
	CQS95-2	I_v		1,0 to 2,2	mcd
	CQS95-3	I_v	min.	1,6	mcd

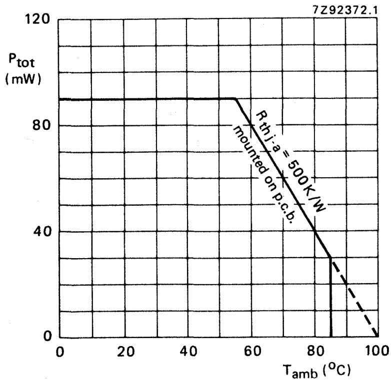


Fig. 2 Typical values.

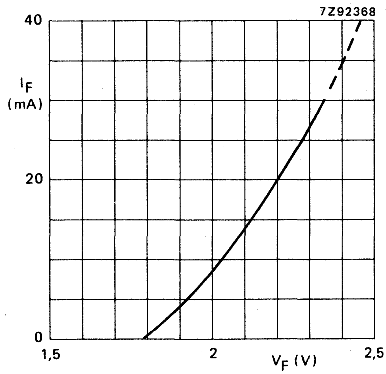


Fig. 3 T_{amb} = 25 °C; typ. values.

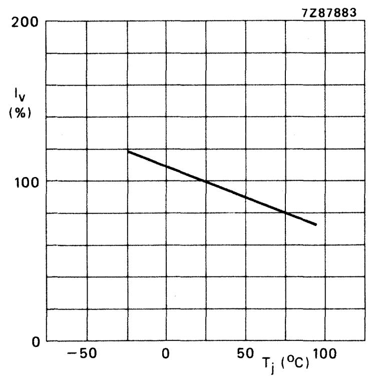


Fig. 4 Typical values.

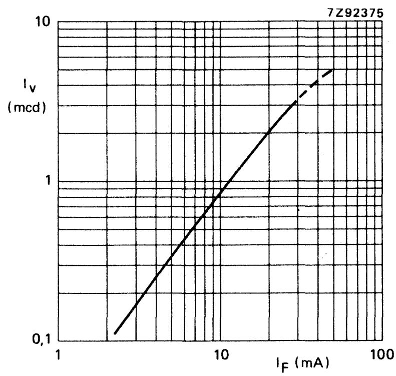


Fig. 5 T_{amb} = 25 °C; typ. values.

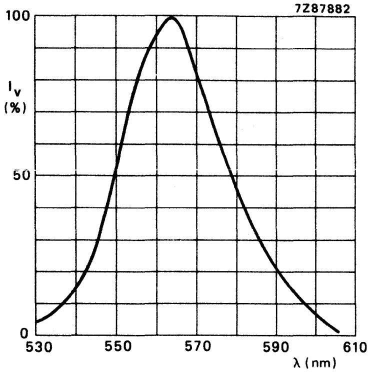


Fig. 6 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

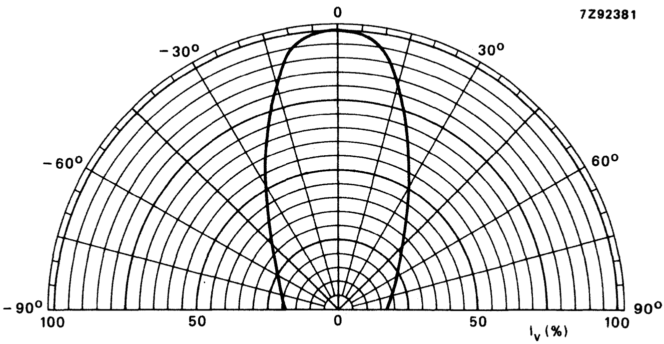


Fig. 7 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with diameter of 3 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQS95E has a SOD-82 outline and is encapsulated in a green coloured diffusing resin.

The additional letter E signifies extremely long leads (34 mm).

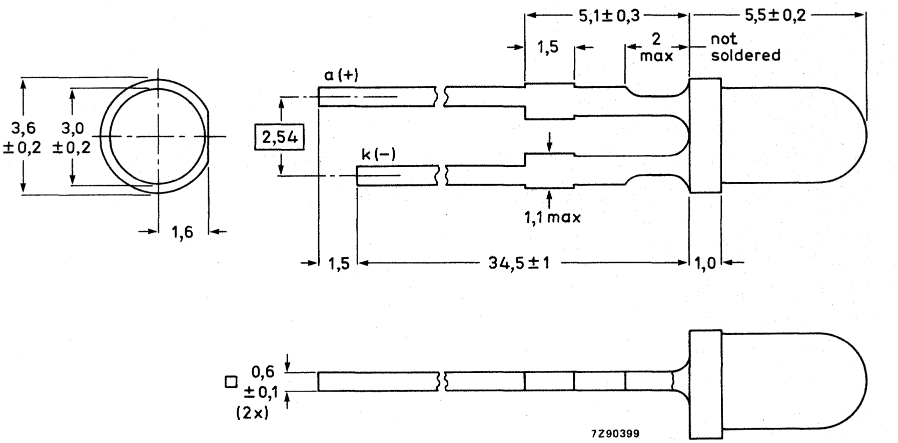
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS95E	I_V	min.	1,6	mcd
	CQS95E-4	I_V		3,0 to 7,0	mcd
	CQS95E-5	I_V	min.	5,0	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	50	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82B.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_{on} = 1 ms; δ = 0,01		max.	40	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−30 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s; $>$ 1,5 mm from the seating plane	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current					
V_R = 5 V		I_R	max.	10	μA
Beamwidth between half-intensity directions					
I_F = 20 mA		$\theta_{½}$	typ.	50	°
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQS95E	I_v	min.	1,6	mcd
	CQS95E-4	I_v		3,0 to 7,0	mcd
	CQS95E-5	I_v	min.	5,0	mcd

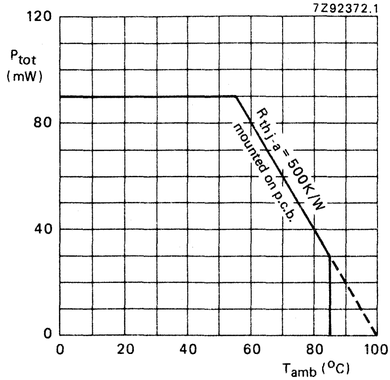


Fig. 2.

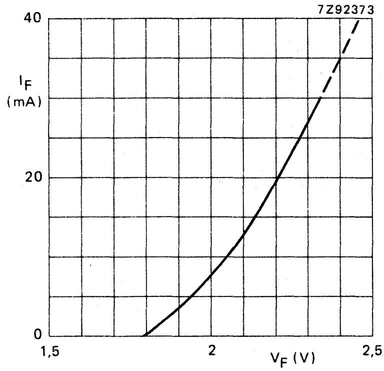


Fig. 3 T_{amb} = 25 °C; typ. values.

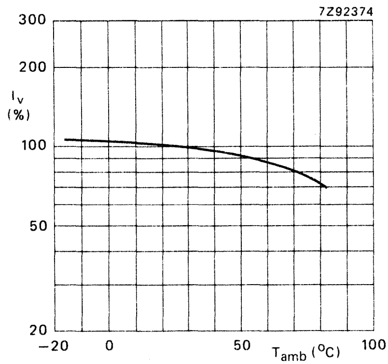


Fig. 4 Typ. values.

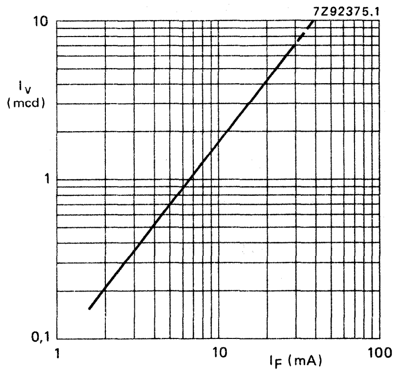


Fig. 5 Typ. values.

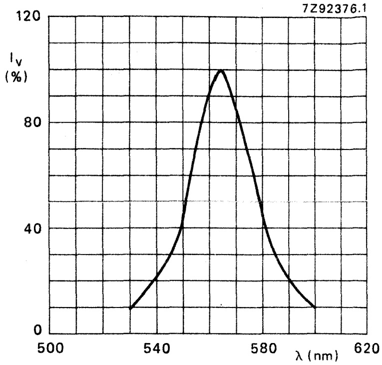


Fig. 6 Typ. values.

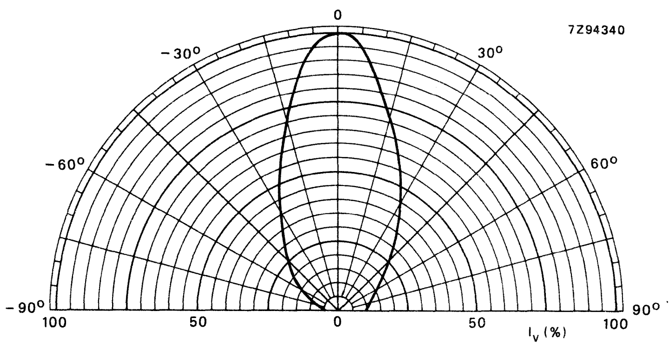


Fig. 7 Typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQS95L has a SOD-82 outline and is encapsulated in a green coloured diffusing resin.

The additional letter L signifies long leads (26 mm).

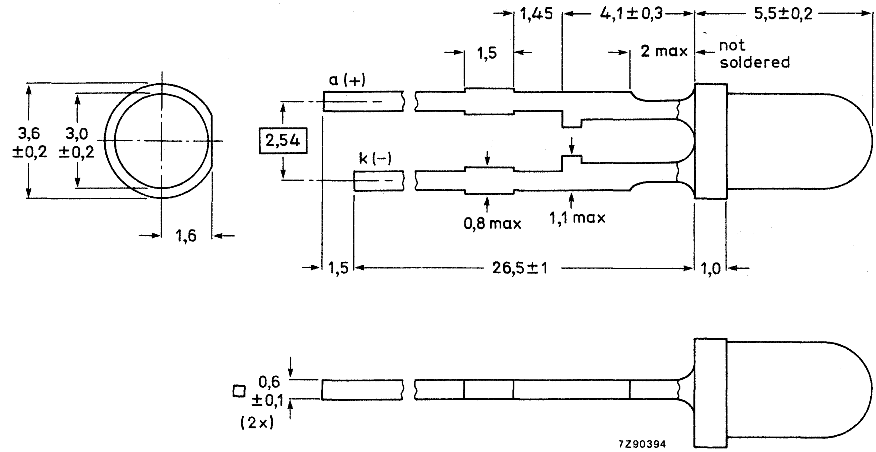
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS95L	I_v	min.	1,6	mcd
	CQS95L-4	I_v		3,0 to 7,0	mcd
	CQS95L-5	I_v	min.	5,0	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	50	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82A.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	30 mA
peak value; t_{on} = 1 ms; δ = 0,01	I_{FRM}	max.	40 mA
peak value; t_p = 1 μs; f = 300 Hz		max.	1 A
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		−30 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature; $t_{sld} < 7$ s; $> 1,5$ mm from the seating plane	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage				
I_F = 20 mA		V_F	typ.	2,2 V
			max.	2,8 V
Reverse current				
V_R = 5 V		I_R	max.	10 μA
Beamwidth between half-intensity directions				
I_F = 20 mA		$\theta_{½}$	typ.	50 °
Bandwidth at half height		$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission				
I_F = 20 mA		λ_p	typ.	565 nm
Luminous intensity				
I_F = 10 mA	CQS95L	I_v	min.	1,6 mcd
	CQS95L-4	I_v		3,0 to 7,0 mcd
	CQS95L-5	I_v	min.	5,0 mcd

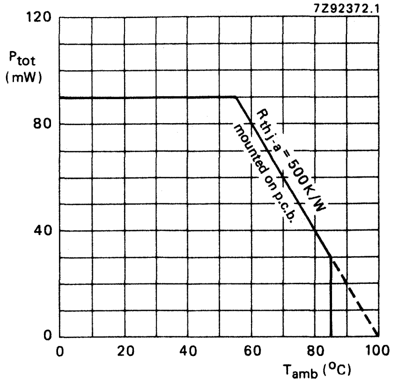


Fig. 2.

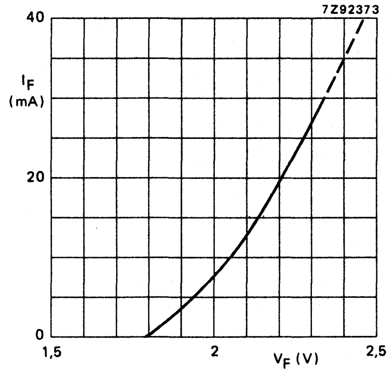


Fig. 3 T_{amb} = 25 °C; typ. values.

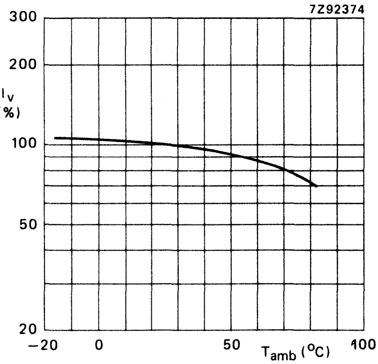


Fig. 4 Typ. values.

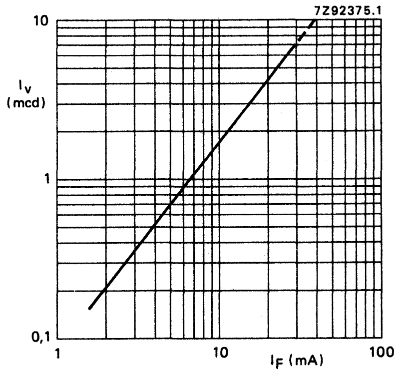


Fig. 5 Typ. values.

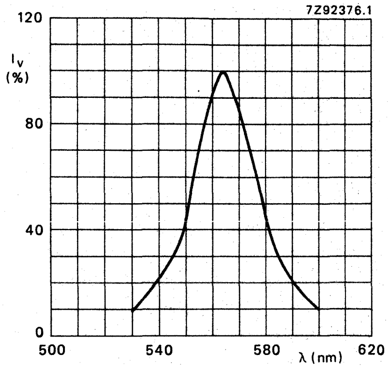


Fig. 6 Typ. values.

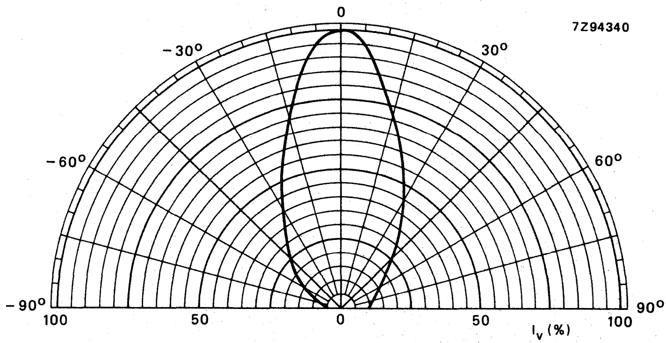


Fig. 7 Typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQS97 has a SOD-82 outline and is encapsulated in a yellow coloured diffusing resin.

Together with the CQS93 and CQS95, the CQS97 forms one family.

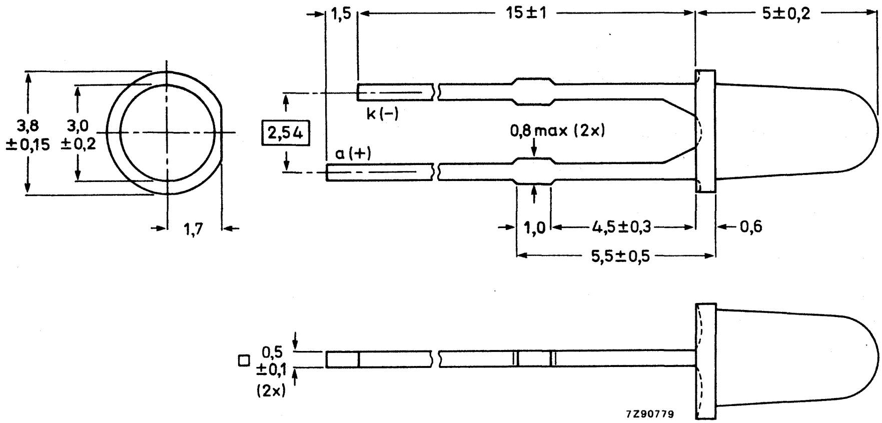
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS97	I_v	min.	0,7	mcd
	CQS97-2	I_v		1,0 to 2,2	mcd
	CQS97-3	I_v	min.	1,6	mcd
Wavelength at peak emission		λ_p	typ.	590	nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	60	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82C.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_p = 1 ms; δ = 0,33	I_{FRM}	max.	40	mA
Total power dissipation up to T_{amb} = 55 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−30 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature; $t_{sld} < 7$ s > 3 mm from the plastic body	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage					
I_F = 20 mA		V_F	typ.	2,2	V
			max.	2,8	V
Reverse current					
V_R = 5 V		I_R	max.	10	μA
Beamwidth at half-intensity directions					
I_F = 20 mA		$\theta_{1/2}$	typ.	60	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	590	nm
Luminous intensity					
I_F = 10 mA	CQS97	I_v	min.	0,7	mcd
	CQS97-2	I_v		1,0 to 2,2	mcd
	CQS97-3	I_v	min.	1,6	mcd

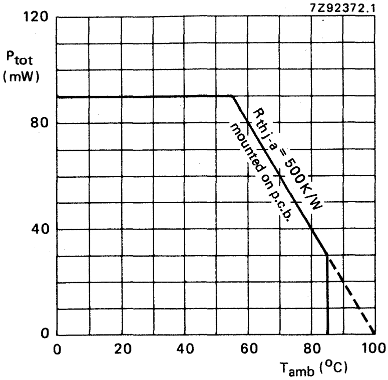


Fig. 2 Typical values.

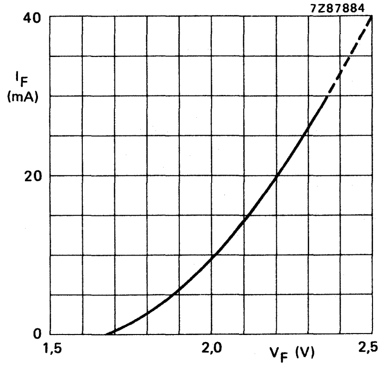


Fig. 3 T_{amb} = 25 °C; typ. values.

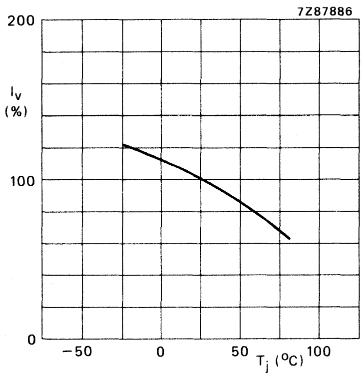


Fig. 4 Typical values.

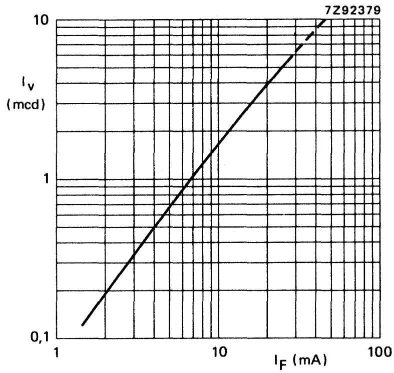


Fig. 5 T_{amb} = 25 °C; typ. values.

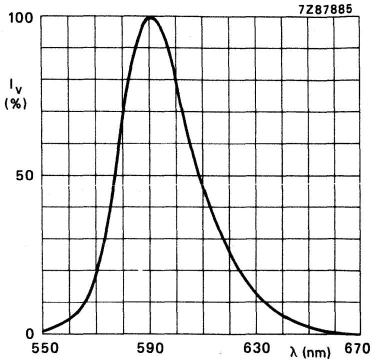


Fig. 6 I_F = 20 mA; T_{amb} = 25 °C; typ. values.

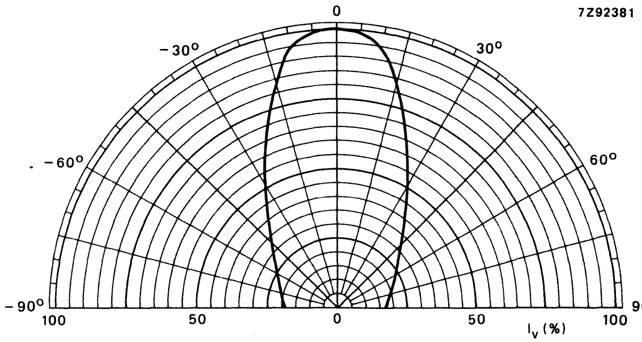


Fig. 7 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQS97E has a SOD-82 outline and is encapsulated in a yellow coloured diffusing resin.

The additional letter E signifies long leads (34 mm)

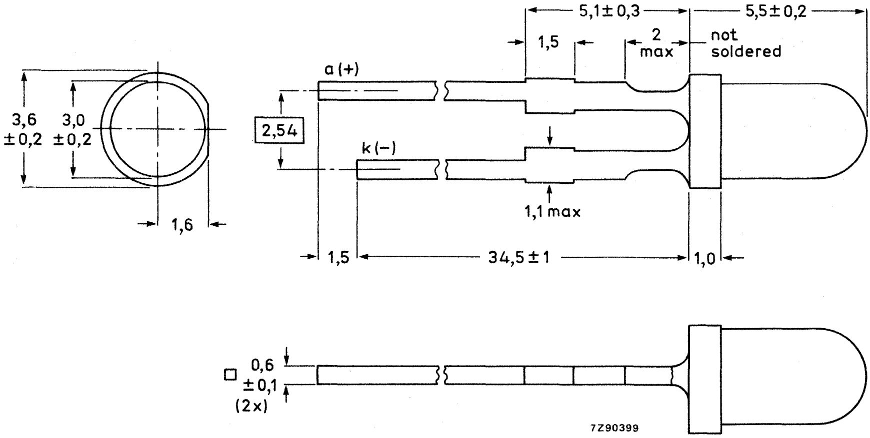
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQS97E	I_V	min.	1,6	mcd
	CQS97E-4	I_V		3,0 to 7,0	mcd
	CQS97E-5	I_V	min.	5,0	mcd
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	590	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	50	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-82B.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value		I_{FRM}	max.	40 mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90 mW
Storage temperature		T_{stg}		−30 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature; $t_{sld} < 7$ s; > 1,5 mm from the seating plane		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage				
I_F = 20 mA		V_F	typ.	2,2 V
			max.	2,8 V
Reverse current				
V_R = 5 V		I_R	max.	10 µA
Beamwidth between half-intensity directions				
I_F = 20 mA		$\theta_{½}$	typ.	50 °
Bandwidth at half height		$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission				
I_F = 20 mA		λ_p	typ.	590 nm
Luminous intensity				
I_F = 10 mA	CQS97E	I_v	min.	1,6 mcd
	CQS97E-4	I_v		3,0 to 7,0 mcd
	CQS97E-5	I_v	min.	5,0 mcd

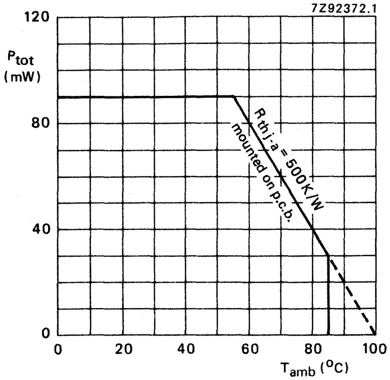


Fig. 2.

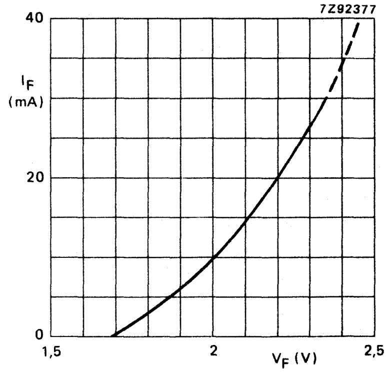


Fig. 3 T_{amb} = 25 °; typ. values.

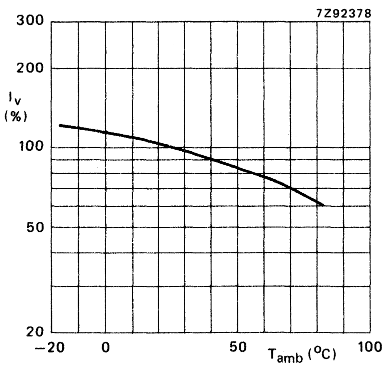


Fig. 4 Typ. values.

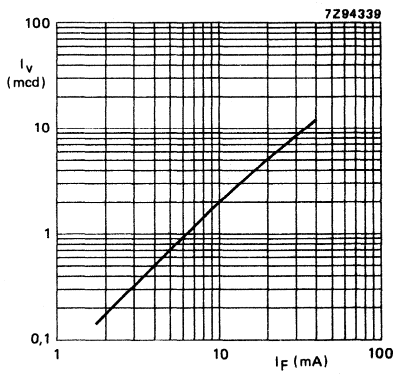


Fig. 5 Typ. values.

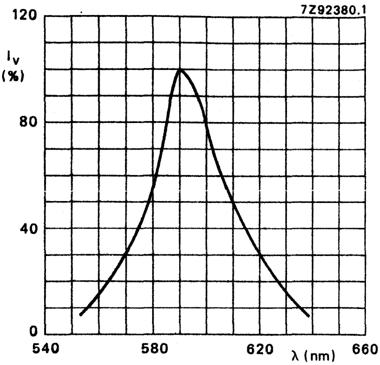


Fig. 6 I_F = 20 mA; T_{amb} = 25 °C.

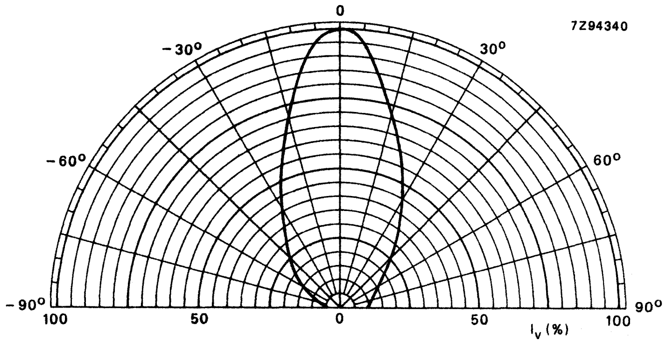


Fig. 7 Typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQS97L has a SOD-82 outline and is encapsulated in a yellow coloured diffusing resin.

The additional letter L signifies long leads (26 mm).

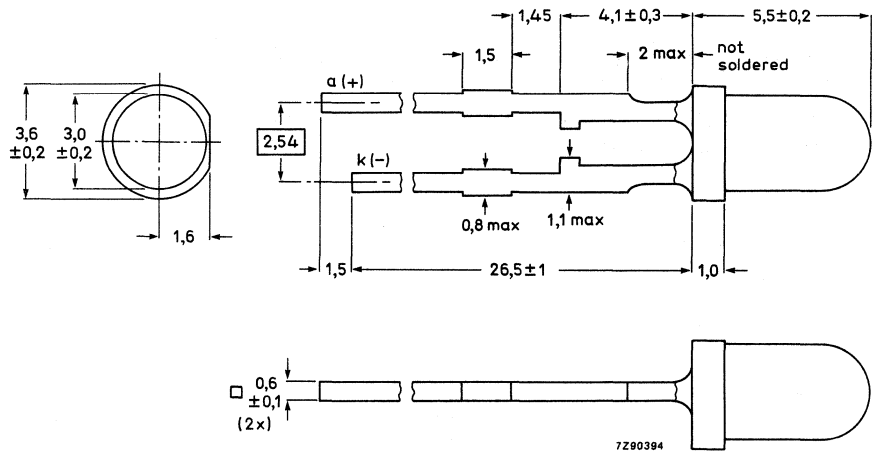
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to T_{amb} = 55 ^oC		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 ^oC
Luminous intensity				
I_F = 10 mA	CQS97L	I_v	min.	1,6 mcd
	CQS97L-4	I_v		3,0 to 7,0 mcd
	CQS97L-5	I_v	min.	5,0 mcd
Wavelength at peak emission		λ_p	typ.	590 nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	50 ^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD 82A.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	30 mA
peak value; t_{on} = 1 ms; δ = 0,01	I_{FRM}	max.	40 mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		−30 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature; t_{sld} < 7 s; > 1,5 mm from the seating plane	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage				
I_F = 20 mA		V_F	typ.	2,2 V
		V_F	max.	2,8 V
Reverse current				
V_R = 5 V		I_R	max.	10 μA
Beamwidth between half-intensity directions				
I_F = 20 mA		$\theta_{1/2}$	typ.	50 °
Bandwidth at half height		$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission				
I_F = 20 mA		λ_p	typ.	590 nm
Luminous intensity				
I_F = 10 mA	CQS97L	I_v	min.	1,6 mcd
	CQS97L-4	I_v		3,0 to 7,0 mcd
	CQS97L-5	I_v	min.	5,0 mcd

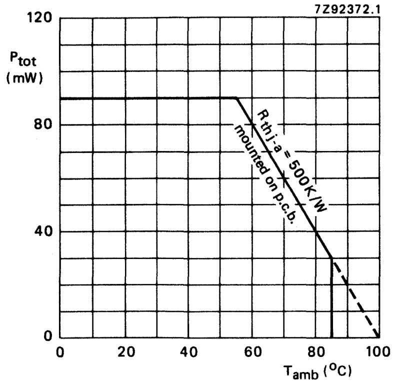


Fig. 2.

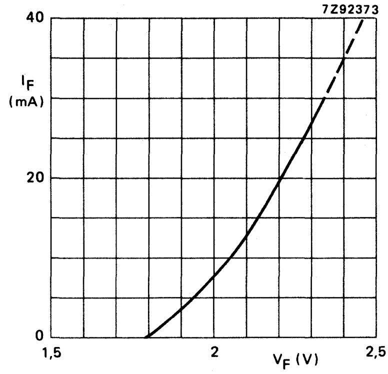


Fig. 3 T_{amb} = 25 °C; typ. values.

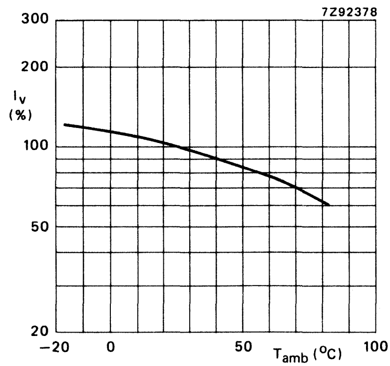


Fig. 4 Typ. values.

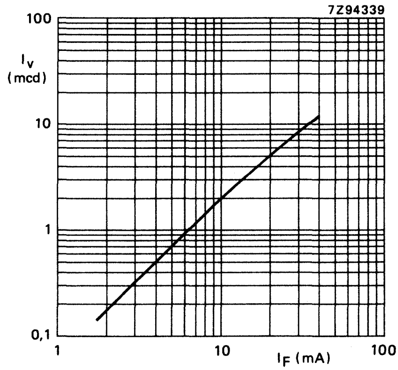


Fig. 5 T_{amb} = 25 °C; typical values.

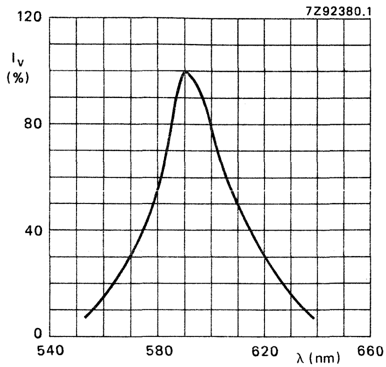


Fig. 6 Typical values.

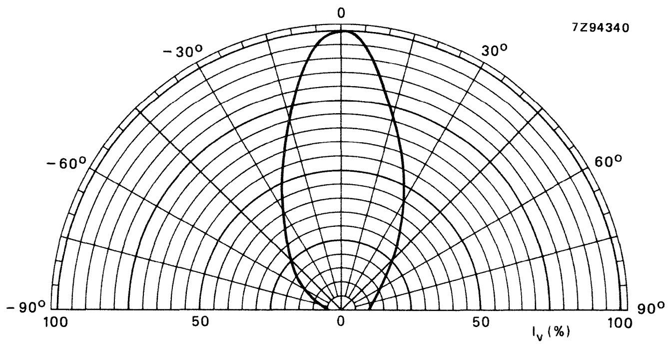


Fig. 7 Typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 2,5 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) or green light at a typical peak wavelength of 565 nm (GaP; super-green) depending on the polarity of the current.

The CQT10B has a SOD-76 outline and is encapsulated in a colourless diffusing resin. The SOD-76 envelope enables the CQT10B to be used in configurations together with the CQW10B family.

The bicolour function gives this light emitting block special possibilities e.g.

- as level sensor overdrive indicator or
- as zero point indicator or
- as tuning indicator

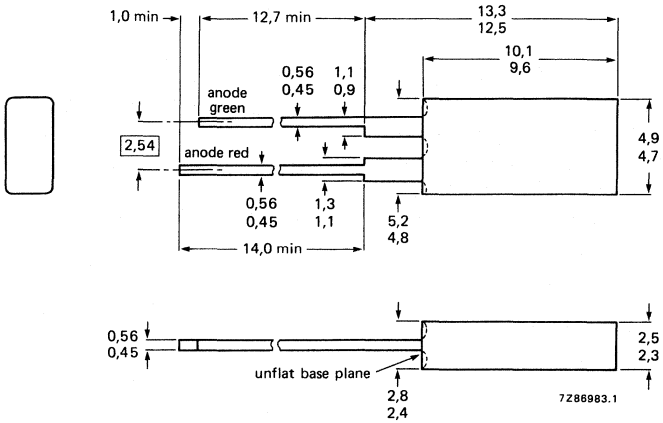
QUICK REFERENCE DATA

Forward current (d.c.)	red green	I_F	max.	100 mA 60 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity red at I_F = 10 mA green at I_F = 20 mA		I_V	min. typ.	1,0 mcd 1,5 mcd
Wave length at peak emission	red green	λ_p	typ.	650 nm 565 nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{½}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A2



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current					
d.c.	red	I_F	max.	100	mA
	green			60	mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1	A
peak value, t_{on} = 1 ms; δ = 0,33			max.	150	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Storage temperature		T_{stg}		−55 to +100	°C
Lead soldering temperature					
> 1,5 mm from the seating plane; t_{sld} < 7 s		T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
red at I_F = 10 mA		V_F	typ.	1,75	V
			max.	2,2	V
green at I_F = 20 mA		V_F	typ.	2,1	V
			max.	3,0	V
Beamwidth between half-intensity directions at I_F = 10 mA		$\theta_{1/2}$	typ.	100	°
Wavelength at peak emissions at I_F = 10 mA	red	λ_p	typ.	650	nm
	green		typ.	565	nm
Capacitance at V_R = 0; f = 1 MHz		C_d	typ.	100	pF
Luminous intensity					
red at I_F = 10 mA		I_v	min.	1,0	mcd
green at I_F = 20 mA			typ.	1,5	mcd

DEVELOPMENT DATA

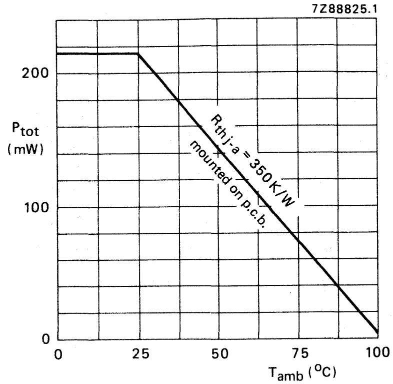


Fig. 2.

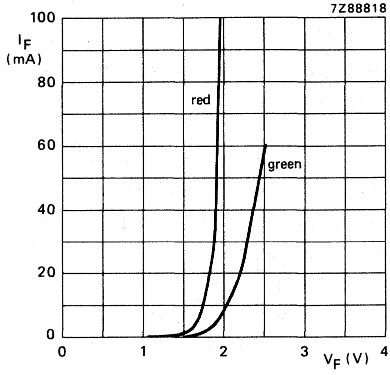


Fig. 3 T_{amb} = 25 °C; typ values.

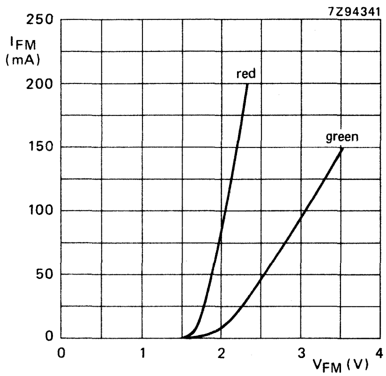


Fig. 4 t_{on} = 20 μs; δ = 0,01; T_{amb} = 25 °C; typical values.

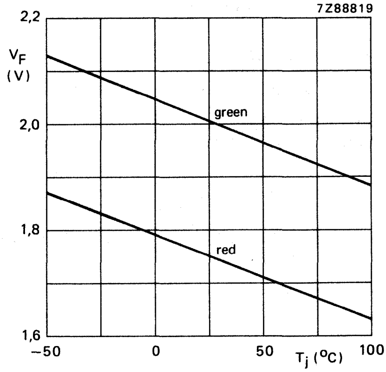


Fig. 5 I_F = 10 mA; typical values.

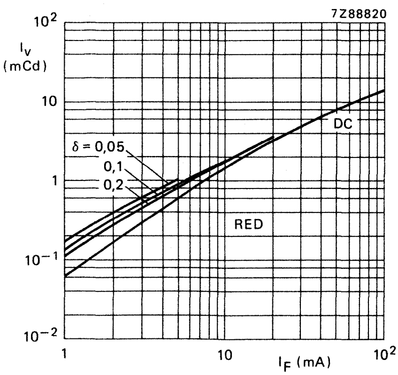


Fig. 6 t_p = 50 μs; typ. values.

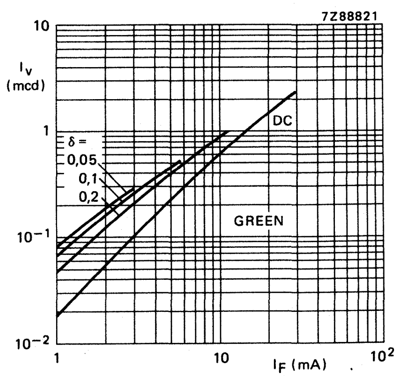


Fig. 7 t_p = 50 μs; typ. values.

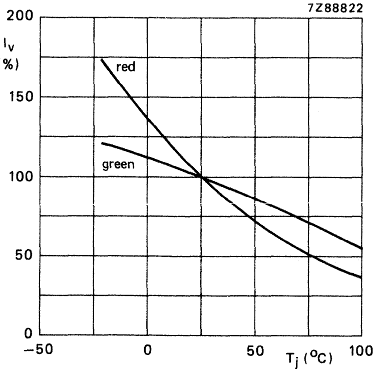


Fig. 8 Typical values.

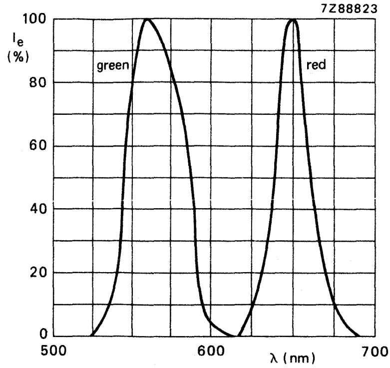


Fig. 9 I_F = 10 mA; typical values.

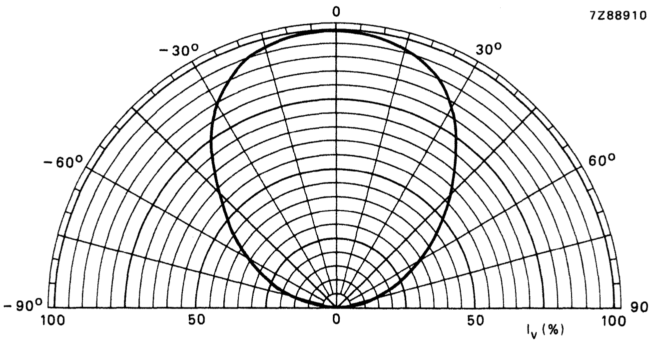


Fig. 10 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 5 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) or green light at a typical peak wavelength of 565 nm (GaP; super-green) depending on the polarity of the current.

The CQT24 has a SOD-63 outline and is encapsulated in a clear diffusing resin. Because of its resistance to high forward currents, the CQT24 is suitable for high I_V applications, for example, moving information display panels.

Other applications are:

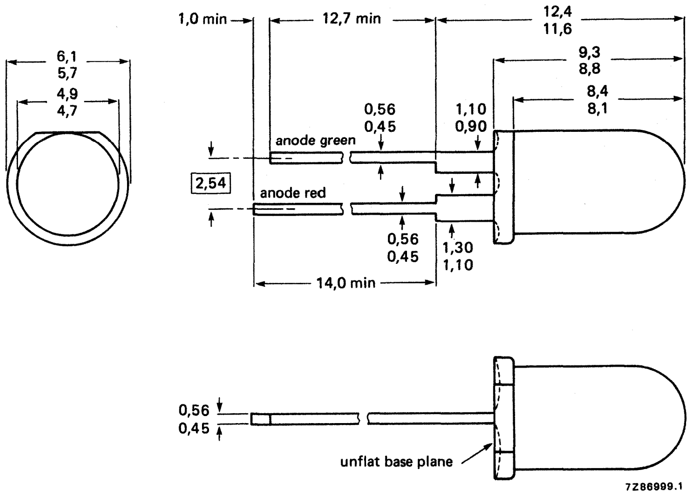
- mains indicator
- temperature indicator
- motor control indicator

QUICK REFERENCE DATA

Continuous reverse current	V_R	max.	5	V
Forward current (d.c.)				
red	I_F	max.	100	mA
green			60	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity				
red at I_F = 10 mA	I_V	min.	3	mcd
		typ.	10	mcd
green at I_F = 20 mA	I_V	min.	3	mcd
		typ.	10	mcd
Wavelength at peak emission				
red	λ_p	typ.	650	nm
green			565	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	70	°

MECHANICAL DATA Dimensions in mm

Fig. 1 SOD-63A2.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current (d.c.)			
red	I_F	max.	100 mA
green			60 mA
Forward current			
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		max.	150 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Storage temperature	T_{stg}		−55 to +100 °C
Lead soldering temperature			
> 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage			
red at I_F = 10 mA	V_F	typ.	1,75 V
		max.	2,2 V
green at I_F = 20 mA	V_F	typ.	2,1 V
		max.	3,0 V
Beamwidth between half-intensity directions at I_F = 10 mA (in the plane of the leads)	$\theta_{½}$	typ.	70 °
Wavelength at peak emissions at I_F = 10 mA			
red	λ_p	typ.	650 nm
green			565 nm
Diode capacitance at V_R = 0; f = 1 MHz	C_d	typ.	160 pF
Luminous intensity			
red at I_F = 10 mA	I_v	min.	3 mcd
		typ.	10 mcd
green at I_F = 20 mA	I_v	min.	3 mcd
		typ.	10 mcd

DEVELOPMENT DATA

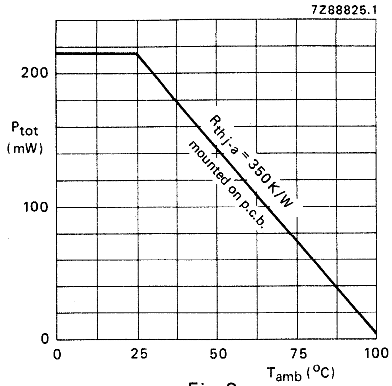


Fig. 2.

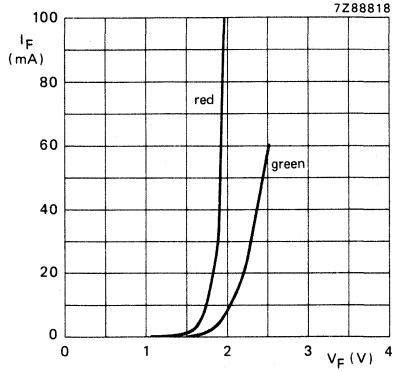


Fig. 3 T_{amb} = 25 °C; typ. values.

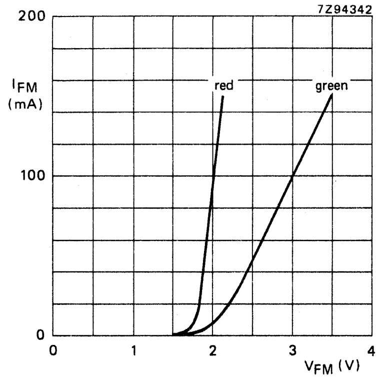


Fig. 4 t_{on} = 20 μs; δ = 0,01; T_{amb} = 25 °C; typical values.

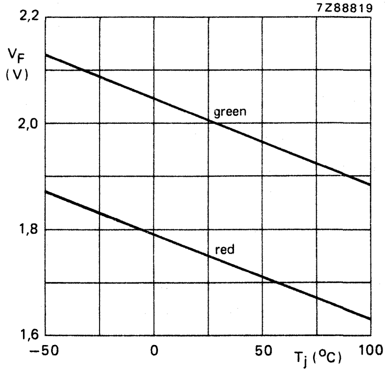


Fig. 5 I_F = 10 mA; typical values.

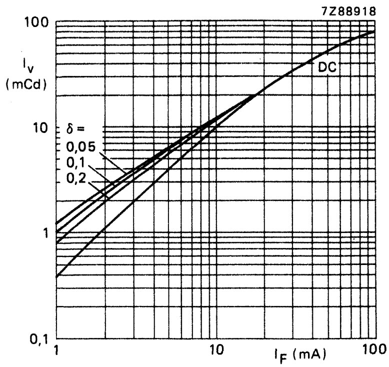


Fig. 6 t_p = 50 μs; typ. values.

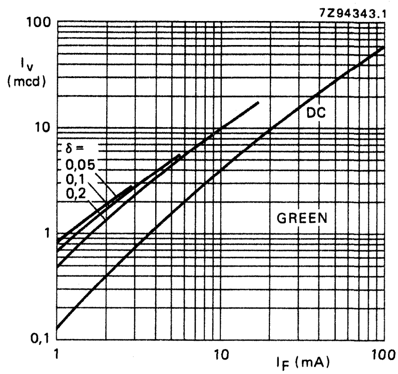


Fig. 7 t = 50 μs; typical values.

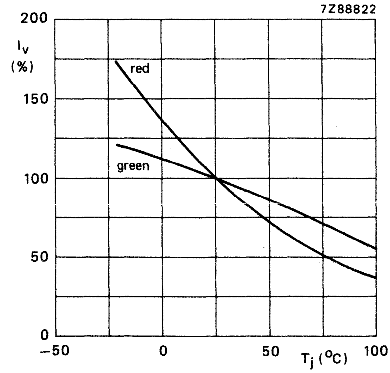


Fig. 8 Typical values.

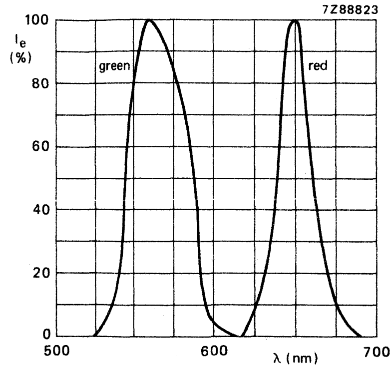


Fig. 9 I_F = 10 mA; typical values.

DEVELOPMENT DATA

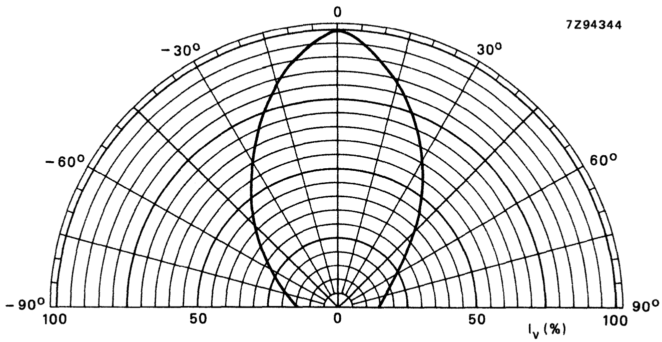


Fig 10 I_F = 10 mA; typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 1 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) or green light at a typical peak wavelength of 565 nm (GaP; super-green) depending on the polarity of the current.

The CQT60 has a SOD-75 outline and is encapsulated in a colourless diffusing resin. Because of its SOD-75 envelope, the CQT60 can be used in configurations together with the CQW60 family.

The bicolour function gives this light emitting device special application possibilities, e.g.

- as level sensor overdrive indicator
- as zero point indicator
- as tuning indicator

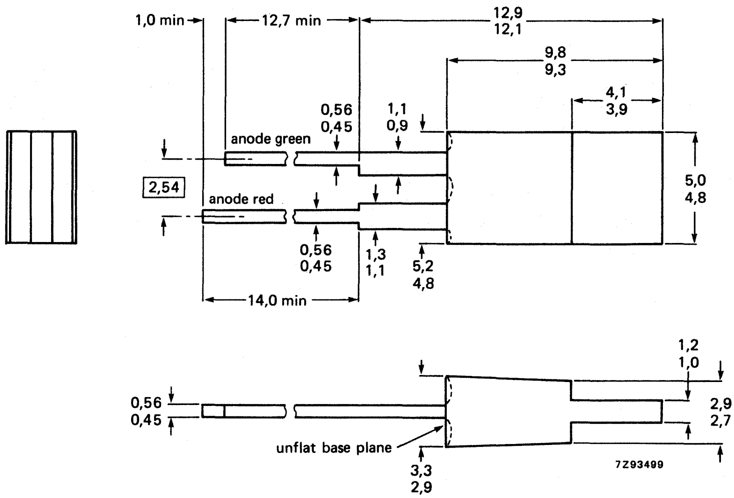
QUICK REFERENCE DATA

Forward current (d.c.)			
red	I_F	max.	100 mA
green			60 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity			
red at I_F = 10 mA	I_v	min.	1,0 mcd
green at I_F = 20 mA		typ.	1,5 mcd
Wavelength at peak emission			
red	λ_p	typ.	650 nm
green			565 nm
Beamwidth between half-intensity directions in the plane of the leads	$\theta_{½}$	typ.	110 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-75B2



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current			
red	I_F	max.	100 mA
green			60 mA
Forward current			
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value, t_{on} = 1 ms; δ = 0,33			150 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Storage temperature	T_{stg}		−55 to +100 °C
Lead soldering temperature $>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage			
red at I_F = 10 mA	V_F	typ.	1,75 V
		max.	2,2 V
green at I_F = 20 mA	V_F	typ.	2,1 V
		max.	3,0 V
Beamwidth between half-intensity directions at I_F = 10 mA	$\theta_{½}$	typ.	110 °
Wavelength at peak emission at I_F = 10 mA			
red	λ_p	typ.	650 nm
green			565 nm
Luminous intensity			
red at I_F = 10 mA	I_v	min.	1,0 mcd
green at I_v = 20 mA		typ.	1,5 mcd
Diode capacitance at V_R = 0; f = 1 MHz	C_d	typ.	100 pF

DEVELOPMENT DATA

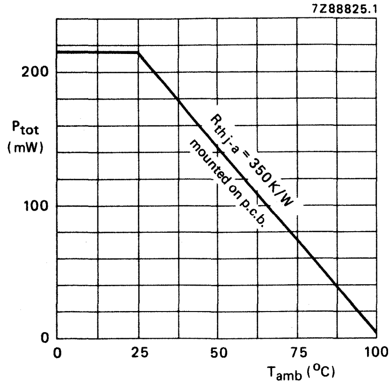


Fig. 2.

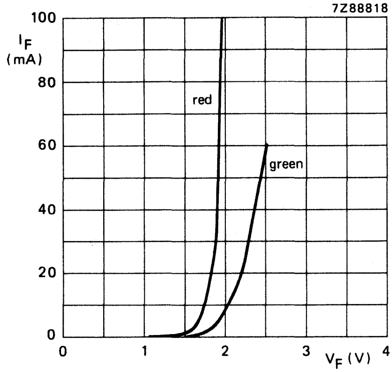


Fig. 3 T_{amb} = 25 °C; typ. values.

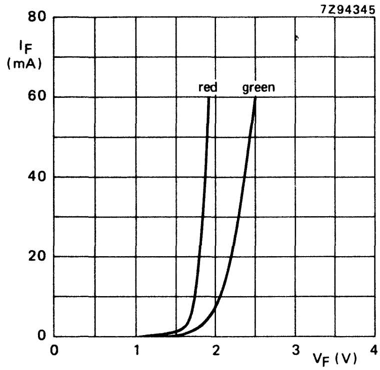


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C; typical values.

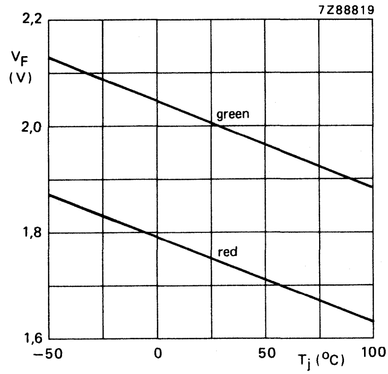


Fig. 5 I_F = 10 mA; typical values.

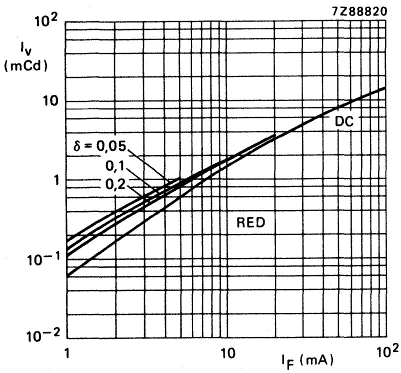


Fig. 6 t_p = 50 μs; typ. values.

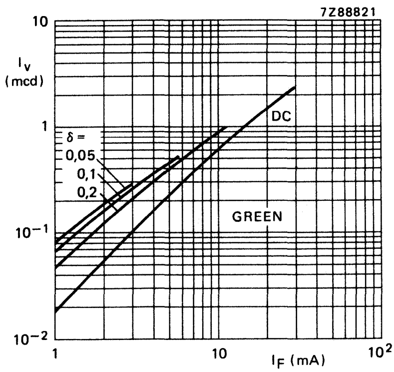


Fig. 7 t_p = 50 μs; typ. values.

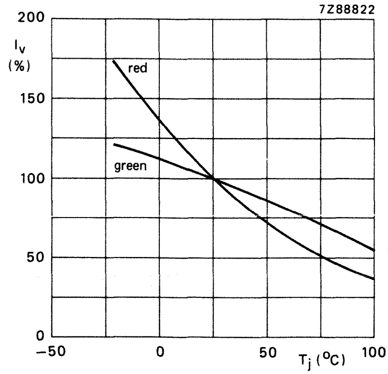


Fig. 8 Typical values.

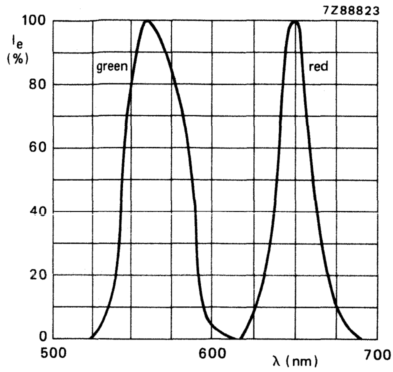


Fig. 9 I_F = 10 mA; typical values.

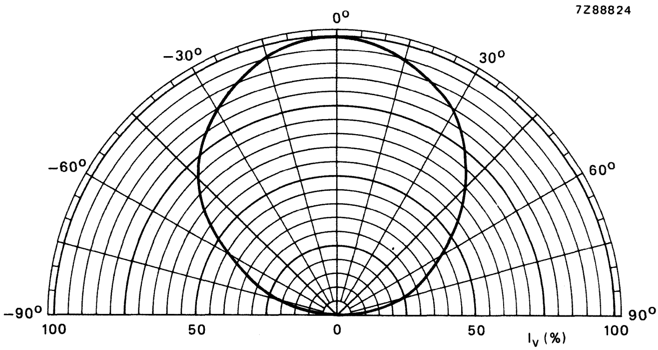


Fig. 10 I_F = 10 mA; typical values.

DEVELOPMENT DATA

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 3 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) or green light at a typical peak wavelength of 565 nm (GaP; super-green) depending on the polarity of the current.

The CQT70 has a SOD-77 outline and is encapsulated in a colourless diffusing resin. Because of its SOD-77 envelope, the CQT70 can be used in configurations together with the CQV70 family.

The bicolour function gives this light emitting device special application possibilities, e.g.

- as level sensor overdrive indicator
- as zero point indicator
- as tuning indicator
- as temperature indicator
- for motor control
- in bicolour information panels

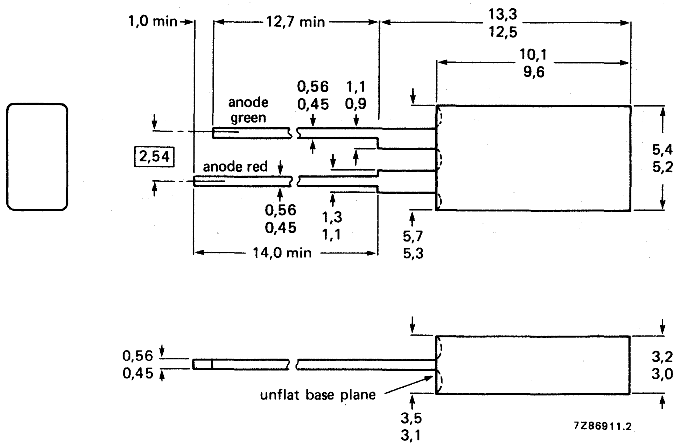
QUICK REFERENCE DATA

Forward current (d.c.)			
red	I_F	max.	100 mA
green			60 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity			
red at I_F = 20 mA	I_v	min.	1,0 mcd
green at I_F = 20 mA		typ.	1,5 mcd
Wavelength at peak emission			
red	λ_p	typ.	650 nm
green			565 nm
Beamwidth between half-intensity directions in the plane of the leads	$\theta_{1/2}$	typ.	110 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-77A2.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current (d.c.)			
red	I_F	max.	100 mA
green			60 mA
Forward current			
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33			150 mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Storage temperature	T_{stg}		−55 to +100 °C
Lead soldering temperature > 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage			
red at I_F = 10 mA	V_F	typ.	1,75 V
		max.	2,2 V
green at I_F = 20 mA	V_F	typ.	2,1 V
		max.	3,0 V
Beamwidth between half-intensity directions at I_F = 10 mA	$\theta_{½}$	typ.	110 °
Wavelength at peak emission at I_F = 10 mA			
red	λ_p	typ.	650 nm
green			565 nm
Luminous intensity			
red at I_F = 10 mA	I_v	min.	1,0 mcd
green at I_v = 20 mA	I_v	typ.	1,5 mcd
Diode capacitance at V_R = 0; f = 1 MHz	C_d		100 pF

DEVELOPMENT DATA

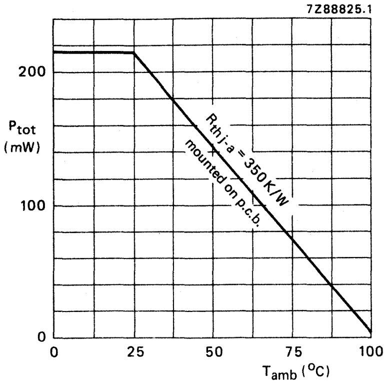


Fig. 2.

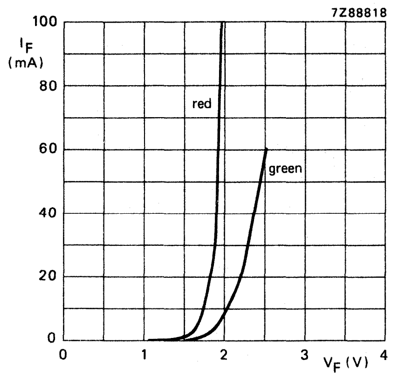


Fig. 3 T_{amb} = 25 °C; typ. values.

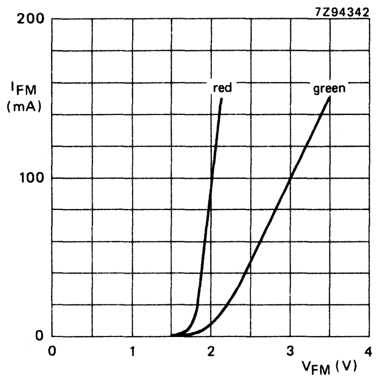


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C, typical values.

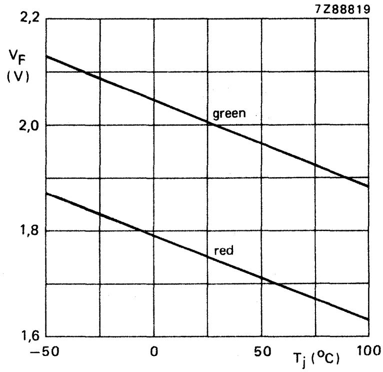


Fig. 5 I_F = 10 mA; typical values.

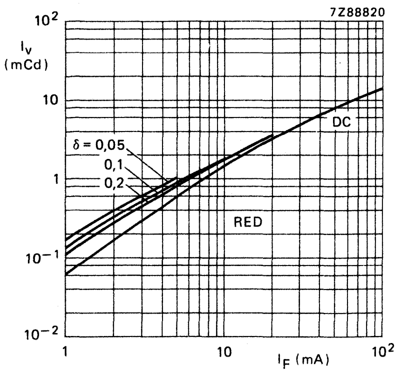


Fig. 6 t_p = 50 μs; typ. values.

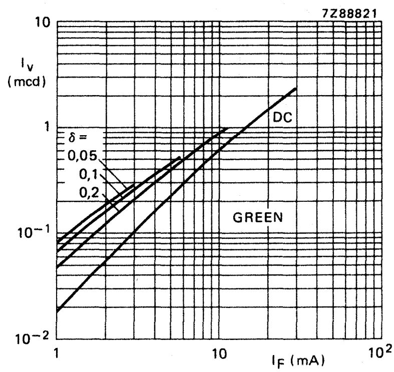


Fig. 7 t_p = 50 μs; typ. values.

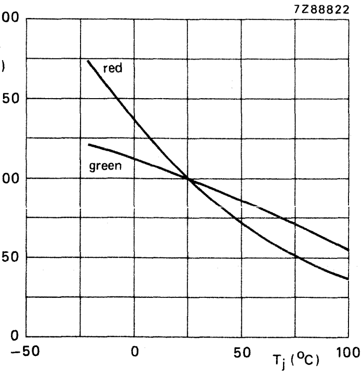


Fig. 8 Typical values.

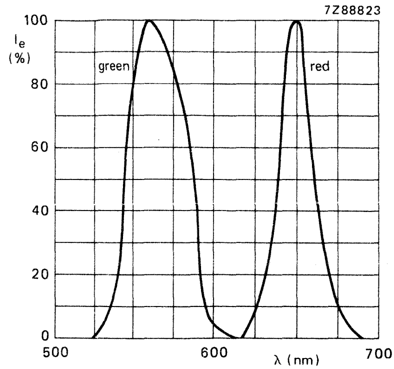


Fig. 9 I_F = 10 mA; typical values.

DEVELOPMENT DATA

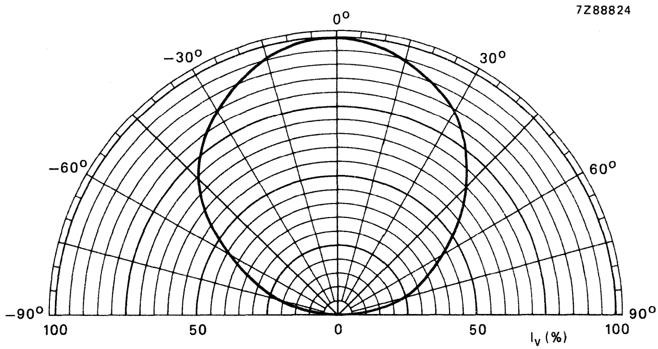


Fig. 10 I_F = 10 mA; typical values.

Note. Formerly known as the CQT10.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 5 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) or green light at a typical peak wavelength of 565 nm (GaP; super green) depending on the polarity of the current. The CQT80L has a SOD-74L envelope and is encapsulated in a clear diffusing resin.

Because of its high I_V the CQT80L is suitable for applications where only low currents are available.

The CQT80L is suitable for surface illumination such as announcing boards, score boards, moving advertisements and electronic games applications. A third colour (orange) is available when an alternating current is applied.

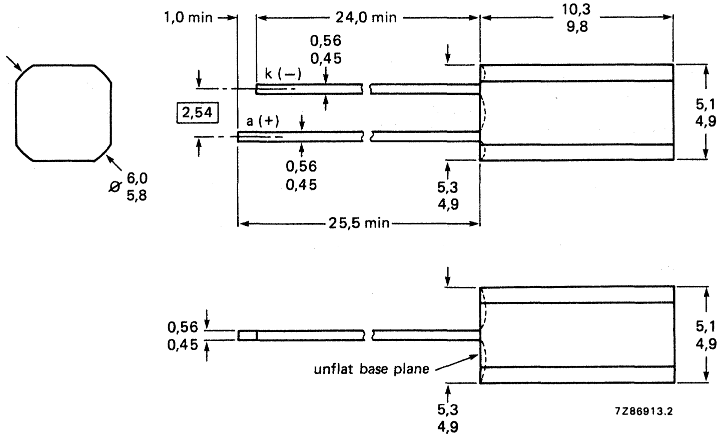
QUICK REFERENCE DATA

Forward current (d.c.)			
red	I_F	max.	100 mA
green	I_F	max.	60 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity			
red at I_F = 10 mA	I_V	min.	1,0 mcd
green at I_F = 20 mA	I_V	typ.	2,0 mcd
Wavelength at peak emission			
red	λ_p	typ.	650 nm
green	λ_p	typ.	565 nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-74L.



Note. Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Forward current (d.c.)			
red	I_F	max.	100 mA
green			60 mA
Forward current			
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		max.	150 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		−55 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature $>$ 5,0 mm from the plastic body; $t_{sld} < 7$ s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage			
red at I_F = 10 mA	V_F	typ.	1,75 V
		max.	2,2 V
green at I_F = 20 mA	V_F	typ.	2,1 V
		max.	3,0 V
Beamwidth between half-intensity directions I_F = 10 mA	$\theta_{1/2}$	typ.	100 °
Wavelength at peak emission at I_F = 10 mA			
red	λ_p	typ.	650 nm
green			565 nm
Luminous intensity			
red at I_F = 10 mA	I_v	min.	1,0 mcd
green at I_F = 20 mA		typ.	2,0 mcd
Diode capacitance V_R = 0; f = 1 MHz	C_d	typ.	100 pF

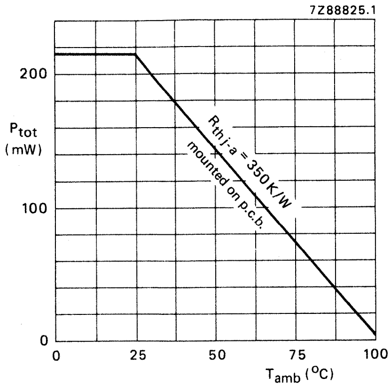


Fig. 2.

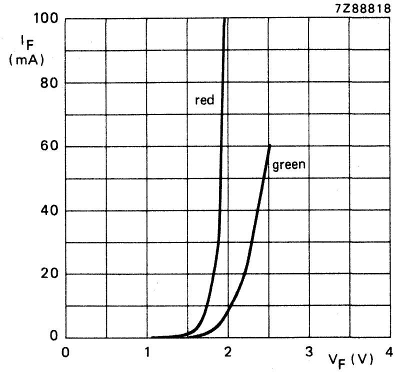


Fig. 3 T_{amb} = 25 °C; typ. values.

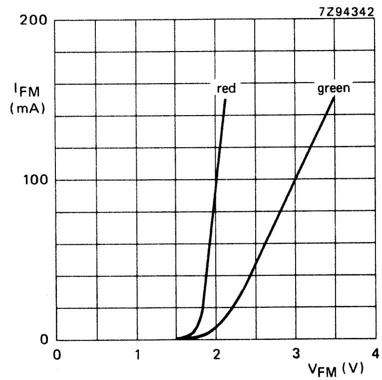


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C; typical values.

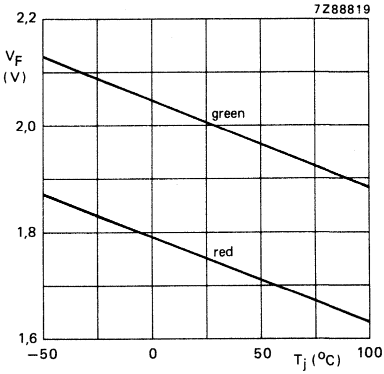


Fig. 5 I_F = 10 mA; typical values.

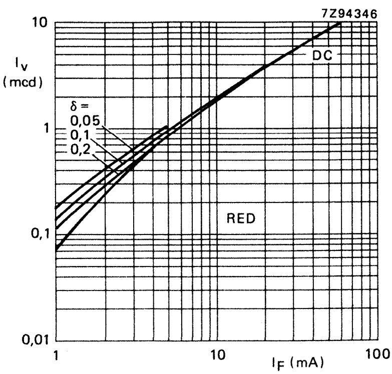


Fig. 6 t_p = 50 μs; typ. values.

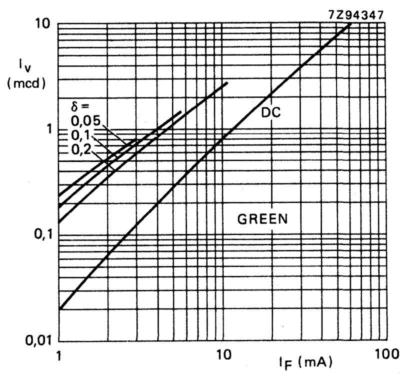


Fig. 7 t_p = 50 μs; typ. values.

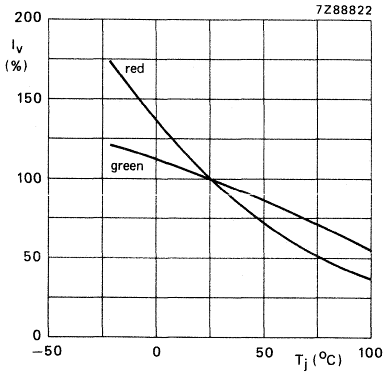


Fig. 8 Typical values.

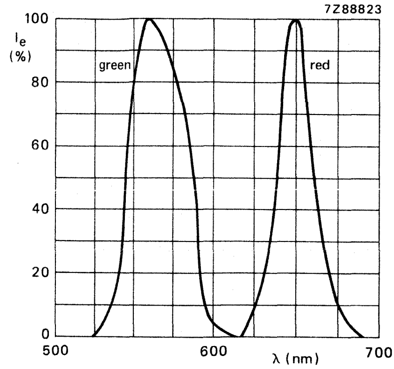


Fig. 9 I_F = 10 mA; typ. values.

DEVELOPMENT DATA

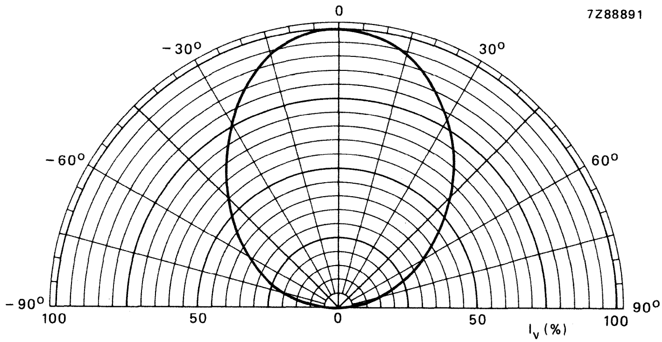


Fig. 10 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes with a diameter of 5 mm x 3 mm which emit red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased. The CQV70 and CQV70L have a SOD-77 envelope and are encapsulated in a red diffusing resin.

When stacked in an array these SOD-77 LEDs can be used as level indicators. The CQV70L is similar to the CQV70 but has long leads and has no seating plane.

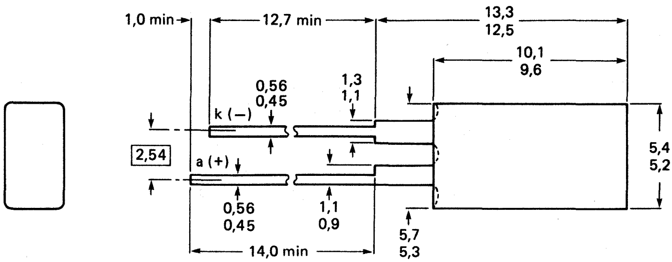
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV70(L)	I_v	min.	0,7	mcd
	CQV70(L)-2	I_v		1,0 to 2,2	mcd
	CQV70(L)-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	630	nm
Beamwidth between half-intensity directions					
in the plane of the leads, I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-77A1.
CQV70 .



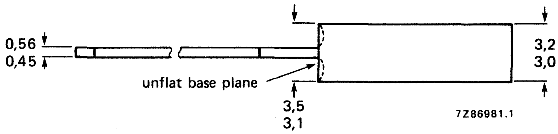
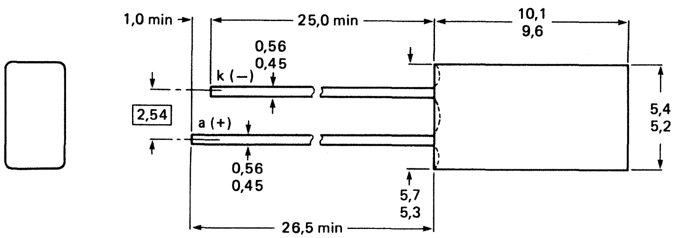
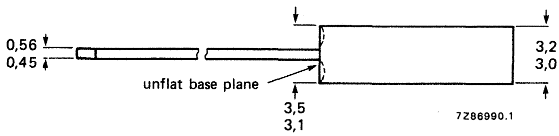


Fig. 1b SOD-77L.
CQV70L.





Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz		max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at $t_{sld} < 7$ s; > 1,5 mm from the seating plane for CQV70; > 5 mm from the plastic body for CQV70L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage; I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current; V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{½}$	typ.	100	°
Bandwidth at half height		Δλ	typ.	45	nm
Wavelength at peak emission; I_F = 10 mA		λ_p	typ.	630	nm
Luminous intensity; I_F = 10 mA	CQV70(L)	I_v	min.	0,7	mcd
	CQV70(L)-2	I_v		1,0 to 2,2	mcd
	CQV70(L)-3	I_v		1,6 to 3,5	mcd
Diode capacitance; V_R = 0; f = 1 MHz		C_d	typ.	10	pF

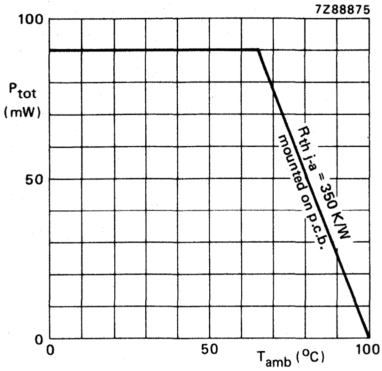


Fig. 2.

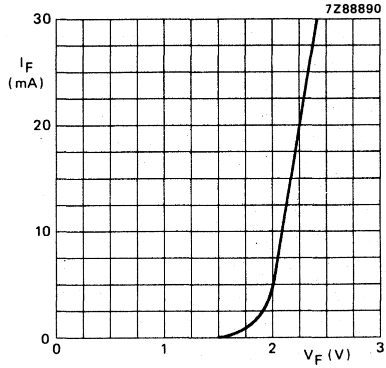


Fig. 3 T_{amb} = 25 °C; typical values.

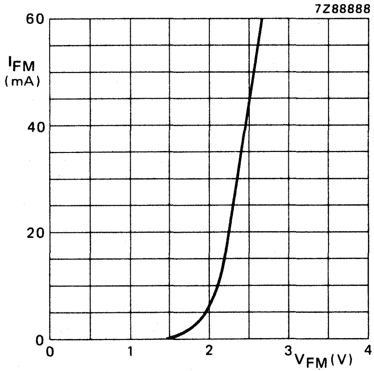


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typical values.

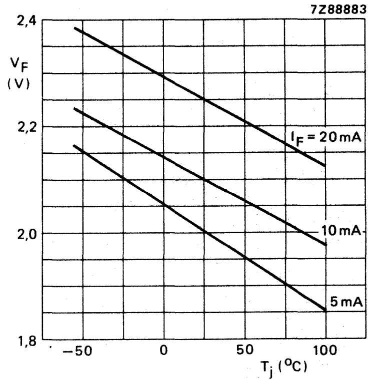


Fig. 5 Typical values.

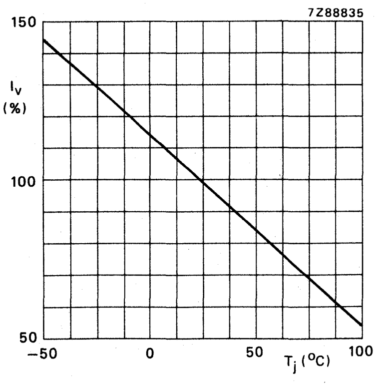


Fig. 6 I_F = 10 mA; typical values.

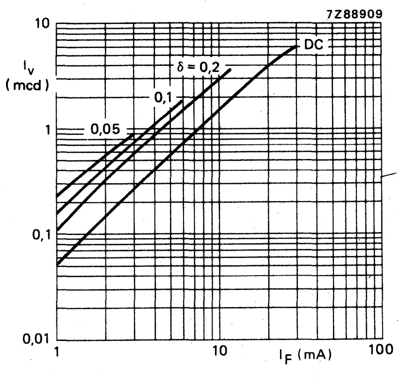


Fig. 7 t_p = 50 μs; typical values.

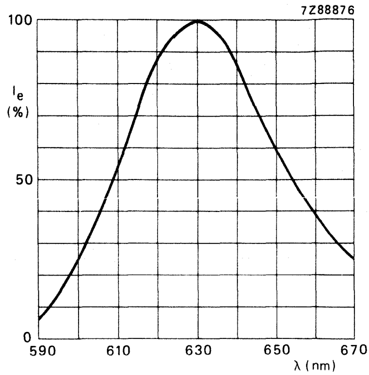


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typical values.

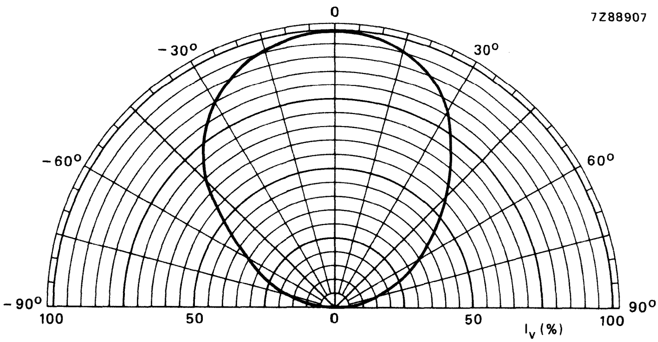


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 3 mm which emit red light at a typical peak wavelength of 650 nm (GaAlAs, hyper-red) when forward biased. The CQV70A and CQV70AL have SOD-77 envelopes and are encapsulated in a red diffusing resin. Its high luminousity enables the CQV70A to be used in applications where only low currents are available and because of its high I_{Fmax} it can be used in high I_V applications.

These SOD-77 LEDs, when stacked in an array, can be used as level indicators. The CQV70AL is similar to the CQV70A but has long leads and has no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV70A(L)	I_V	min.	0,7	mcd
	CQV70A(L)-3	I_V		1,6 to 3,5	mcd
	CQV70A(L)-4	I_V		3,0 to 7,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Beamwidth between half-intensity directions					
in the plane of the leads; I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-77A2.
CQV70A.

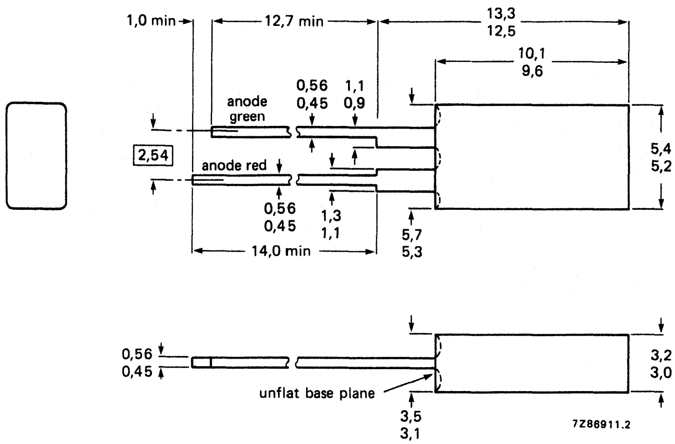
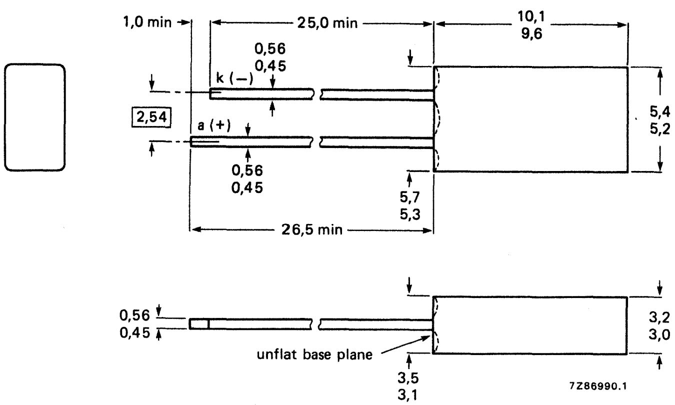


Fig. 1b SOD-77L.
CQV70AL.



→ **Note.** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	100	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at t_{sld} < 7 s > 1,5 mm from the seating plane for CQV70A > 5 mm from the plastic body for CQV70AL	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_f	typ.	1,75	V
			max.	2,2	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{½}$	typ.	100	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	650	nm
Luminous intensity I_F = 10 mA	CQV70A(L)	I_v	min.	0,7	mcd ←
	CQV70A(L)-3	I_v		1,6 to 3,5	mcd
	CQV70A(L)-4	I_v		3,0 to 7,0	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	80	pF

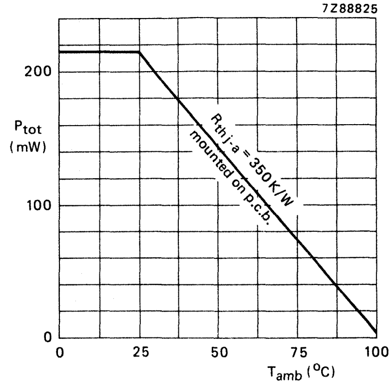


Fig. 2.

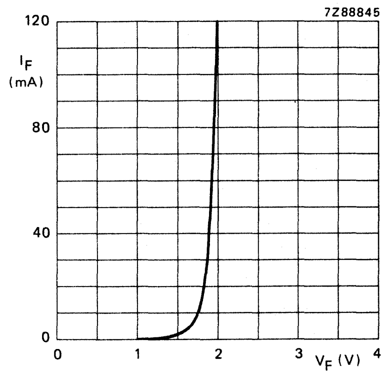


Fig. 3 T_{amb} = 25 °C; typ. values.

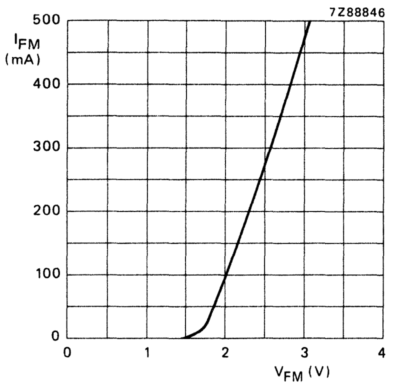


Fig. 4 t_{on} = 20 μs; δ = 0,01; typ. values.

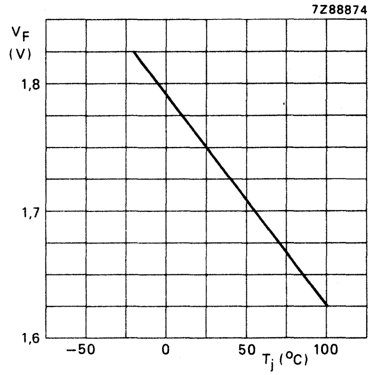


Fig. 5 I_F = 10 mA; typ. values.

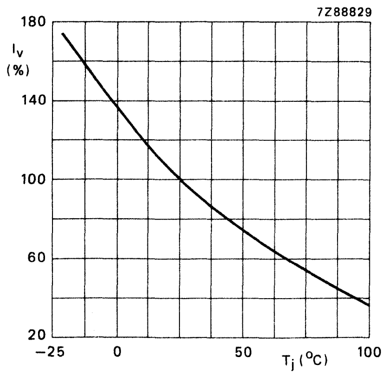


Fig. 6 Typical values.

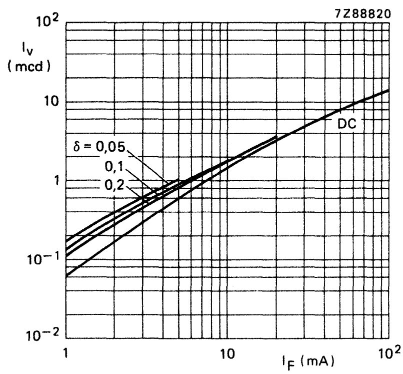


Fig. 7 t_p = 50 μs; typ. values.

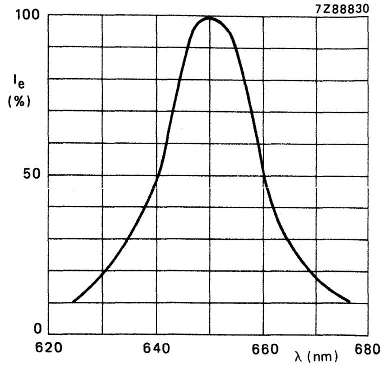


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

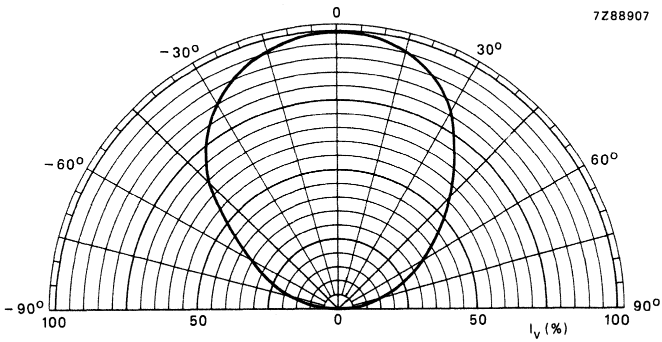


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 3 mm which emit red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQV70U and CQV70UL have a SOD-77 outline and are encapsulated in a red diffusing resin.

The CQV70UL is similar to the CQV70U but has longer leads and no seating plane.

QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity at I_F = 10 mA	I_V	min.	0,7	mcd
Wavelength at peak emission	λ_p	typ.	700	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-77A1.
CQV70U

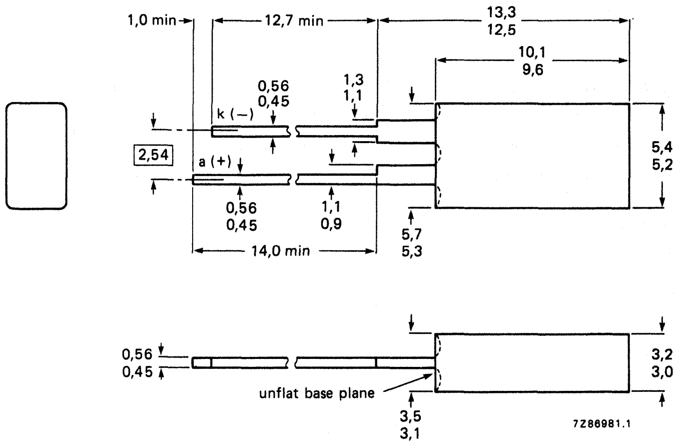
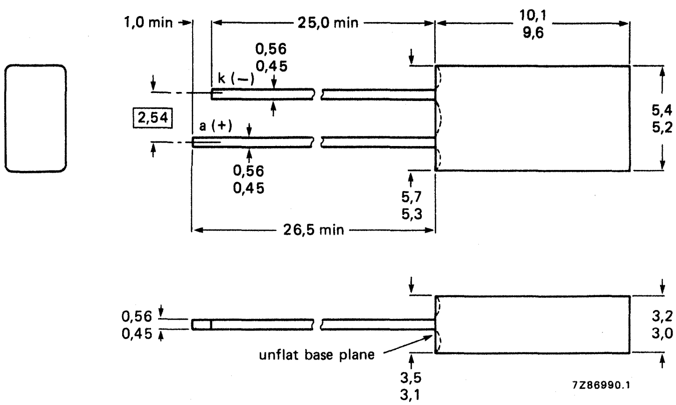


Fig. 1b SOD-77.
CQV70UL



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5	V
Forward current					
d.c.		I_F	max.	30	mA
peak value; $t_p = 1\ \mu s$; f = 300 Hz		I_{FRM}	max.	1	A
peak value; $t_{on} = 1$ ms; $\delta = 0{,}33$		I_{FRM}	max.	60	mA
Total power dissipation up to $T_{amb} = 25\ ^oC$		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	^oC
Storage temperature		T_{stg}		−55 to +100	^oC
Lead soldering temperature					
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	CQV70U	T_{sld}	max.	260	^oC
$>$ 5 mm from the seating plane; $t_{sld} < 7$ s	CQV70UL				

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

$T_{amb} = 25\ ^oC$ unless otherwise specified

Forward voltage at $I_F = 10$ mA		V_F	typ.	2,0	V
			max.	2,6	V
Reverse current at $V_R = 5$ V		I_R	max.	100	μA
Beamwidth between half-intensity directions at $I_F = 10$ mA		$\theta_{1/2}$	typ.	100	^{o}
Wavelength at peak emission at $I_F = 10$ mA		λ_p	typ.	700	nm
Capacitance at $V_R = 0$; f = 1 MHz		C_d	typ.	45	pF
Bandwidth at half height		$\Delta\lambda$	typ.	90	nm
Luminous intensity at $I_F = 10$ mA	CQV70U(L)	I_v	min.	0,7	mcd
	CQV70U(L)-2	I_v		1,0 to 2,2	mcd
	CQV70U(L)-3	I_v		1,6 to 3,5	mcd

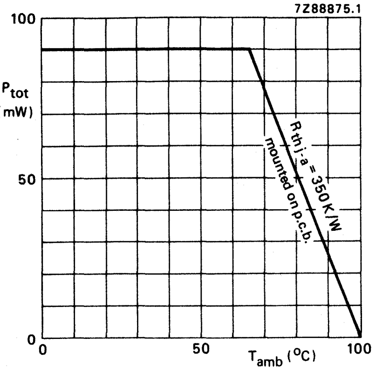


Fig. 2 Typical values.

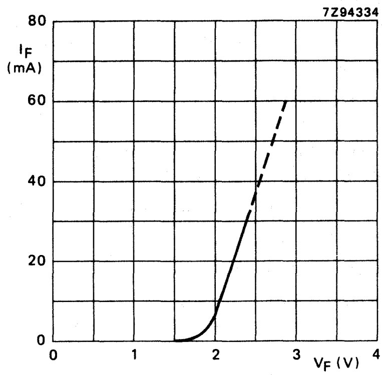


Fig. 3 Typical values.

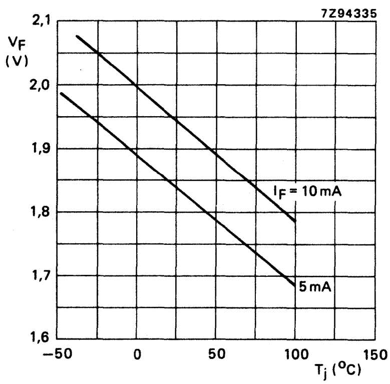


Fig. 4 Typical values.

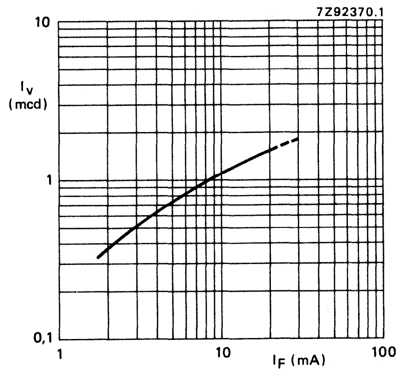


Fig. 5 Typical values.

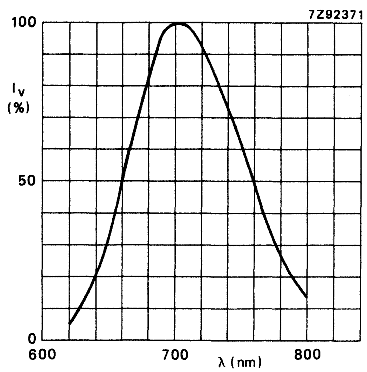


Fig. 6 Typical values.

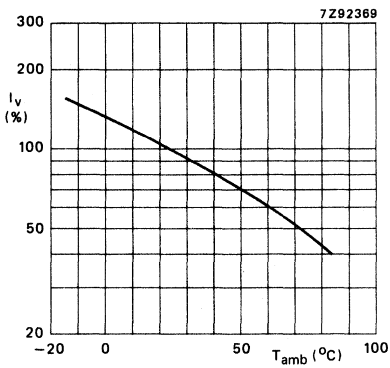


Fig. 7 Typical values.

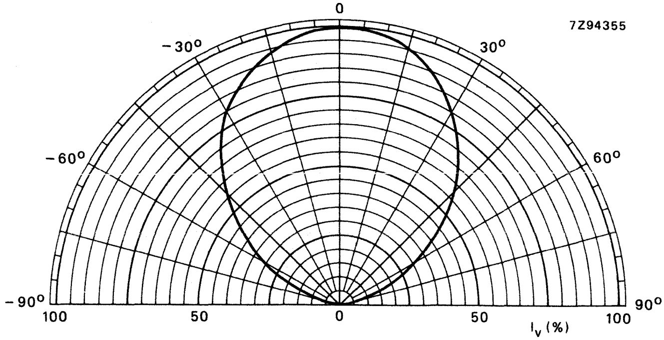


Fig. 8 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 3 mm which emit green light at a typical peak wavelength of 565 nm (GaP, super-green) when forward biased. The CQV71A and CQV71AL have SOD-77 envelopes and are encapsulated in a green diffusing resin.

When stacked in an array these SOD-77 LEDs can be used as level indicators.

The CQV71AL is similar to the CQV71A but has long leads and has no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV71A(L)	I_V	min.	0,7	mcd
	CQV71A(L)-2	I_V		1,0 to 2,2	mcd
	CQV71A(L)-3	I_V		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-77A1.
CQV71A.

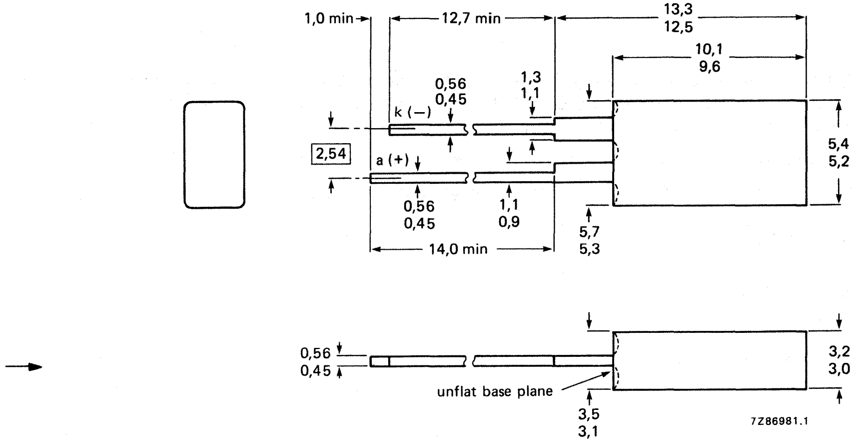
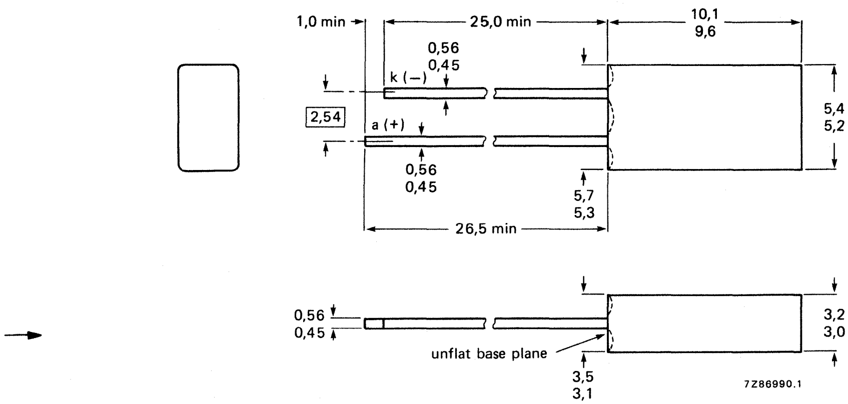


Fig. 1b SOD-77L.
CQV71AL.



→ **Note:** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,01	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	180	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at t_{sld} < 7 s > 1,5 mm from the seating plane for CQV71A > 5 mm from the plastic body for CQV71AL	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{1/2}$	typ.	100	°
Bandwith at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	565	nm
Luminous intensity I_F = 10 mA	CQV71A(L)	I_v	min.	0,7	mcd ←
	CQV71A(L)-2	I_v		1,0 to 2,2	mcd
	CQV71A(L)-3	I_v		1,6 to 3,5	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	20	pF

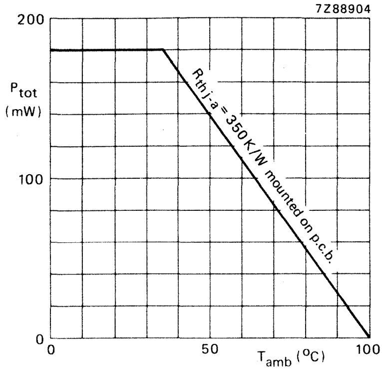


Fig. 2.

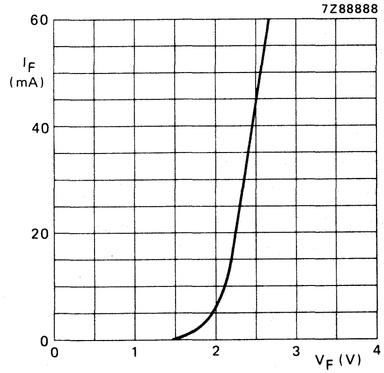


Fig. 3 T_{amb} = 25 °C; typical values.

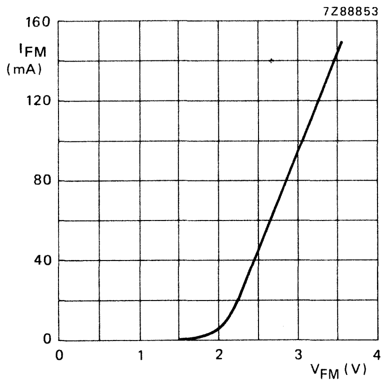


Fig. 4 t_{on} = 1 ms; δ = 0,01;
T_j = 25 °C; typical values.

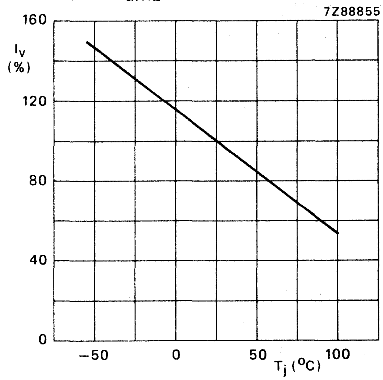


Fig. 5 Typical values.

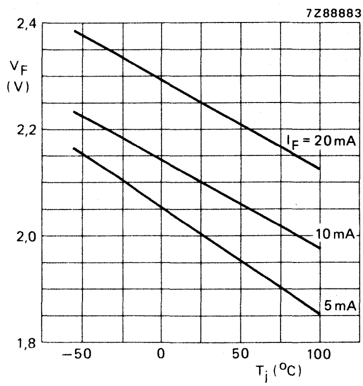


Fig. 6 I_F = 10 mA; typ. values.

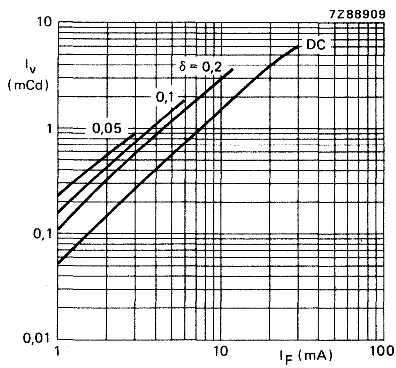


Fig. 7 t_p = 50 μs; typical values.

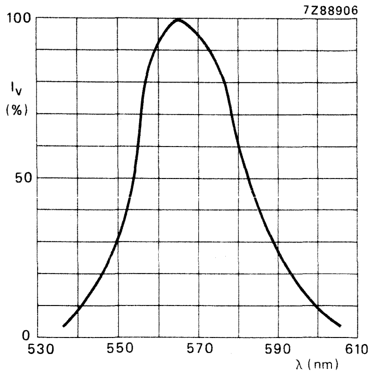


Fig. 8 Typical values.

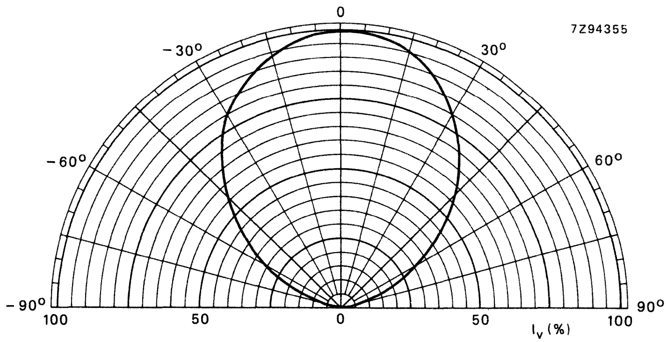


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 3 mm which emit yellow light at a typical wavelength of 590 nm (GaPAs) when forward biased. The CQV72 and CQV72L have a SOD-77 envelope and are encapsulated in a yellow diffusing resin.

The CQV72L is the long lead version (26 mm) and has no seating plane but is in all other respects equal to the CQV72.

When stacked in an array these LEDs can be used as level indicators etc.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV72(L)	I_v	min.	0,7	mcd
	CQV72(L)-2	I_v		1,0 to 2,2	mcd
	CQV72(L)-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth between half-intensity directions					
in the plane of the leads; I_F = 10 mA		$\theta_{1/2}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig 1a SOD-77A1.
CQV72.

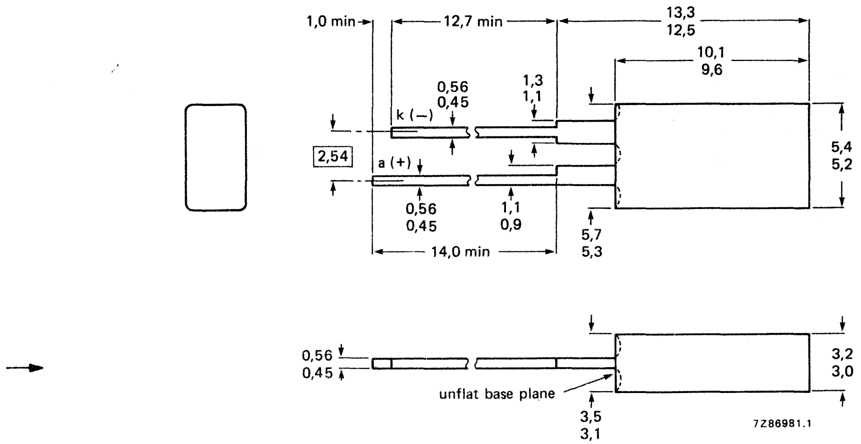
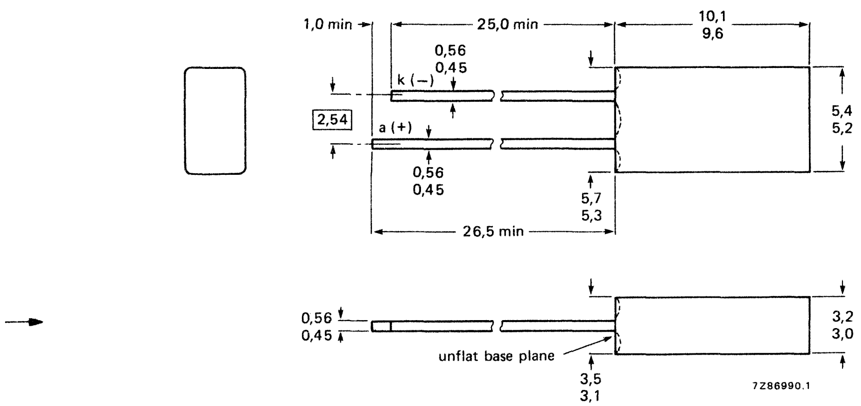


Fig. 1b SOD-77L.
CQV72L.



→ **Note.** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		−55 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature at t_{sld} < 7 s > 1,5 mm from the seating plane for CQV72 > 5 mm from the plastic body for CQV72L	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	2,1 V 3,0 V
Reverse current V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{1/2}$	typ.	100 °
Bandwidth at half height		$\Delta\lambda$	typ.	40 nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	590 nm
Luminous intensity I_F = 10 mA	CQV72(L)	I_v	min.	0,7 mcd ←
	CQV72(L)-2	I_v		1,0 to 2,2 mcd
	CQV72(L)-3	I_v		1,6 to 3,5 mcd
Diode capacitance V_R = 0, f = 1 MHz		C_d	typ.	15 pF

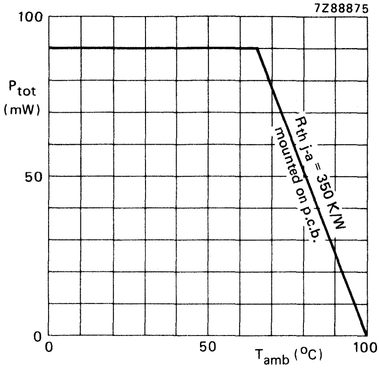


Fig. 2.

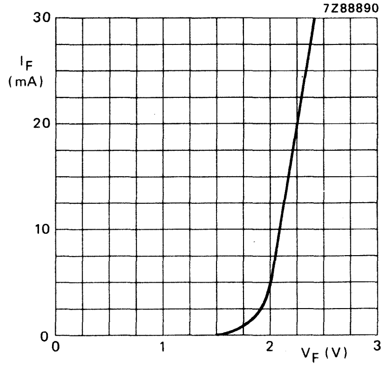


Fig. 3 T_{amb} = 25 °C; typ. values.

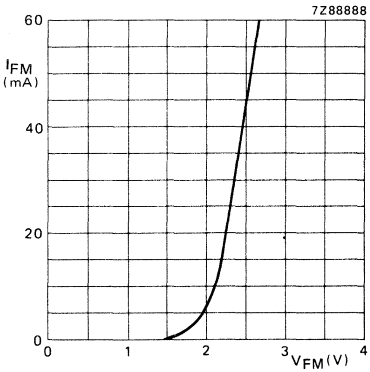


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

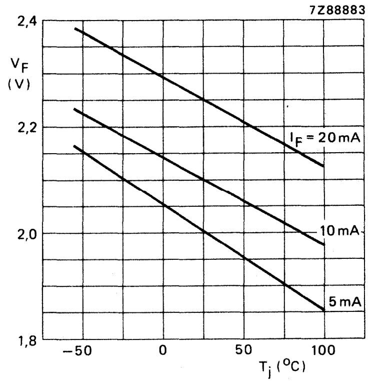


Fig. 5 Typical values.

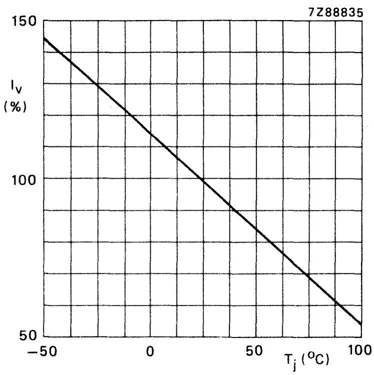


Fig. 6 I_F = 10 mA; typ. values.

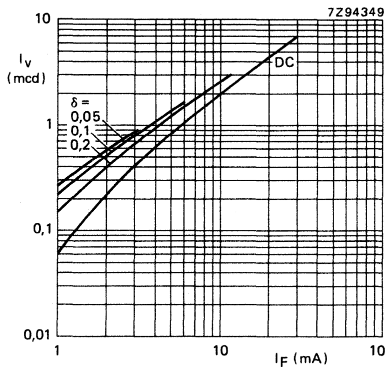


Fig. 7 t_p = 50 μs; typical values.

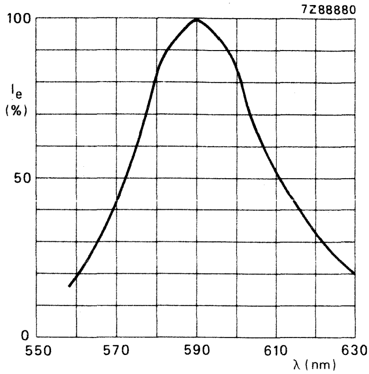


Fig. 8 Typical values.

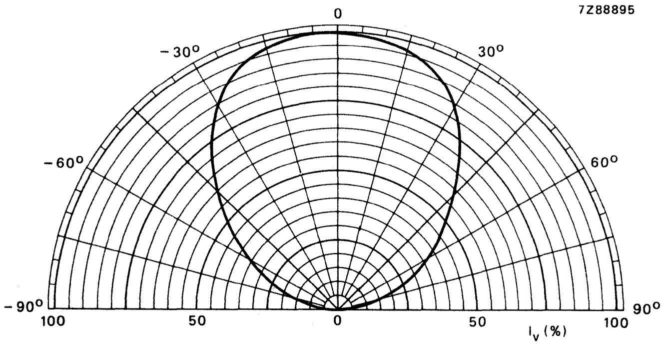


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 5 mm which emits red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased. The CQV80 has a SOD-74L envelope and is encapsulated in a red diffusing resin.

These SOD-74 LEDs are suitable for surface illumination, for example in information boards, score boards, moving advertisement and electronic game applications.
The CQV80L has long leads and has no seating plane.

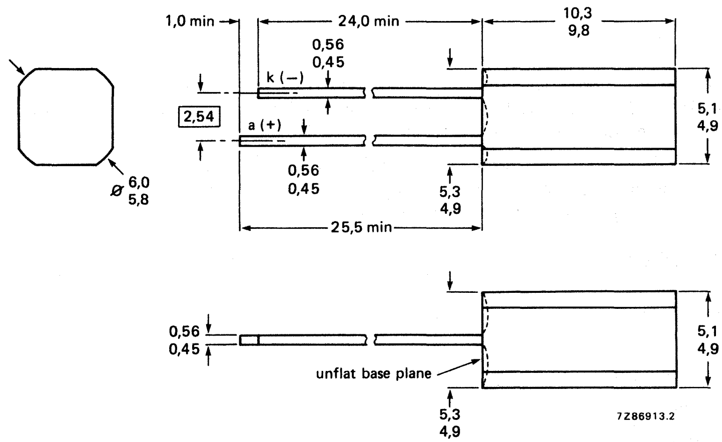
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 10 mA	CQV80L	I_V	min.	0,7	mcd
	CQV80L-2	I_V		1,0 to 2,2	mcd
	CQV80L-3	I_V		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	630	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-74L.



Note. Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs, f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90 mW
Storage temperature		T_{stg}		−55 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature				
$>$ 5,0 mm from the plastic body; t_{sld} $<$ 7 s		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 10 mA		V_F	typ.	2,1 V
			max.	3,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions				
I_F = 10 mA		$\theta_{½}$	typ.	100 ° ←
Bandwidth at half height		$\Delta\lambda$	typ.	45 nm
Wavelength at peak emission				
I_F = 10 mA		λ_p	typ.	630 nm
Luminous intensity				
I_F = 10 mA	CQV80L	I_v	min.	0,7 mcd
	CQV80L-2	I_v		1,0 to 2,2 mcd ←
	CQV80L-3	I_v		1,6 to 3,5 mcd
Diode capacitance				
V_R = 0, f = 1 MHz		C_d	typ.	10 pF

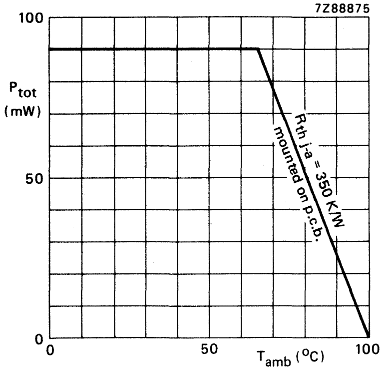


Fig. 2.

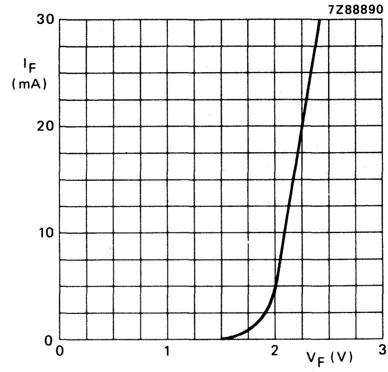


Fig. 3 T_{amb} = 25 °C; typ. values.

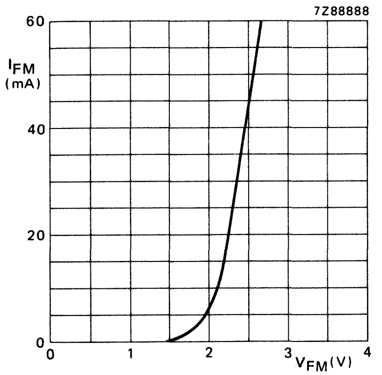


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

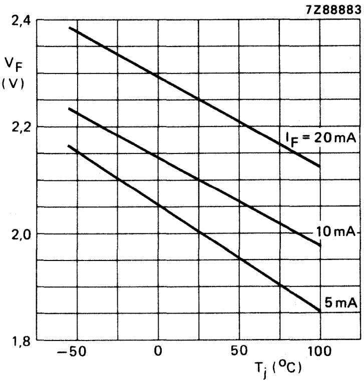


Fig. 5 Typical values.

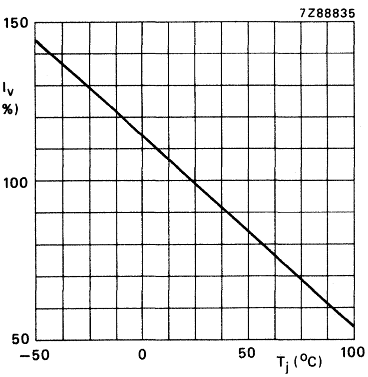


Fig. 6 I_F = 10 mA; typ. values.

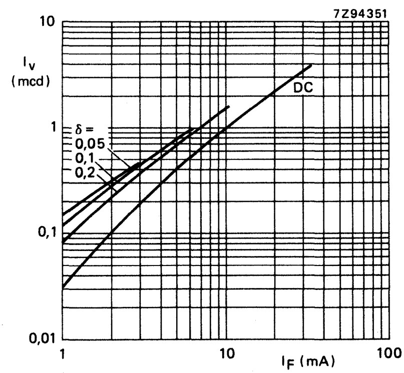


Fig. 7 t_p = 50 μs; typical values.

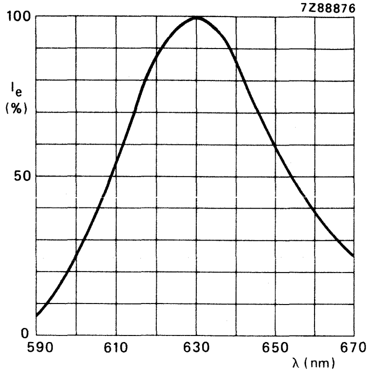


Fig. 8 Typical values.

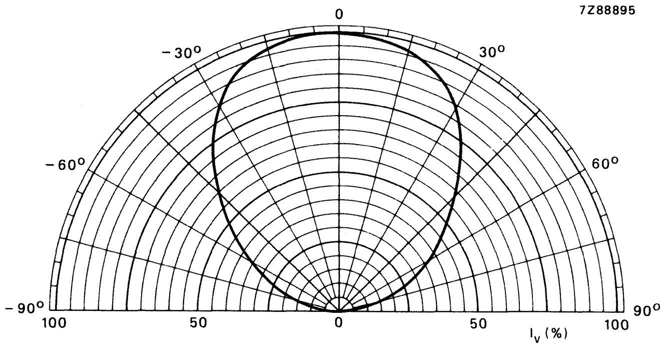


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 5 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased. The CQV80AL has SOD-74L envelope and is encapsulated in a red diffusing resin. The CQV80AL has long leads but no seating plane.

This LED is suitable for surface illumination, for example in information boards, score boards, moving advertisements and electronic games applications. Because of its high light intensity the CQV80AL is also suitable in applications where only very low currents are available and because of its high I_{Fmax} it can be used in high I_v applications.

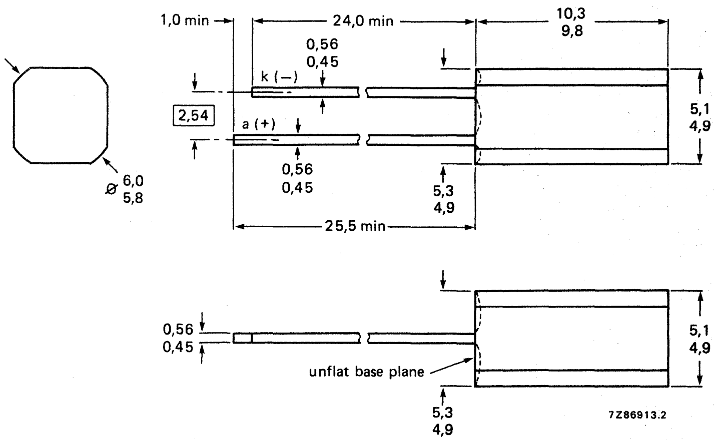
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV80AL	I_v	min.	0,7	mcd
	CQV80AL-3	I_v		1,6 to 3,5	mcd
	CQV80AL-4	I_v		3,0 to 7,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-74L.



→ **Note.** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	100	mA
peak value, $t_p = 1\ \mu s$; f = 300 Hz	I_{FRM}	max.	1	A
peak value; $t_{on} = 20\ \mu s$; $\delta = 0{,}01$	I_{FRM}	max.	500	mA
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature				
$>$ 5,0 mm from the plastic body; $t_{sld} < 7$ s	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage					
$I_F = 10$ mA		V_F	typ.	1,75	V
			max.	2,2	V
Reverse current					
$V_R = 5$ V		I_R	max.	100	μA
Beamwidth between half-intensity directions					
$I_F = 10$ mA		$\theta_{1/2}$	typ.	100	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
$I_F = 10$ mA		λ_p	typ.	650	nm
Luminous intensity					
$I_F = 10$ mA	CQV80AL	I_v	min.	1,0	mcd
	CQV80AL-3	I_v		1,6 to 3,5	mcd
	CQV80AL-4	I_v		3,0 to 7,0	mcd
Diode capacitance					
$V_R = 0$; f = 1 MHz		C_d	typ.	80	pF

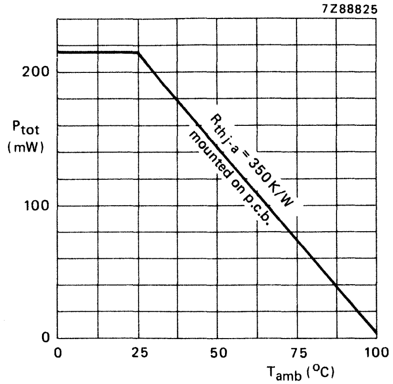


Fig. 2.

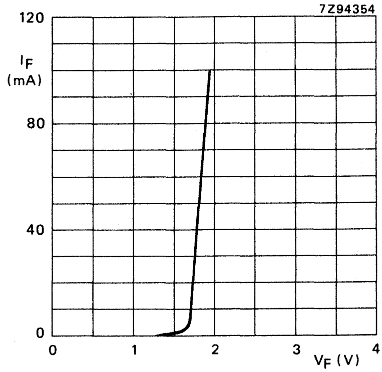


Fig. 3 T_{amb} = 25 °C; typ. values.

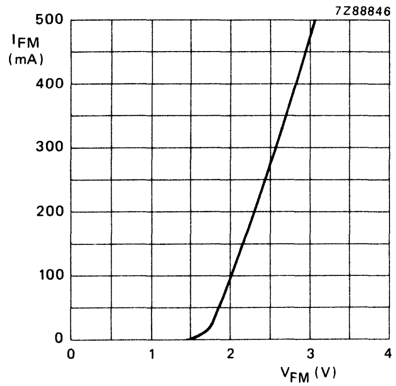


Fig. 4 t_{on} = 20 μs; δ = 0,01; T_{amb} = 25 °C; typ. values.

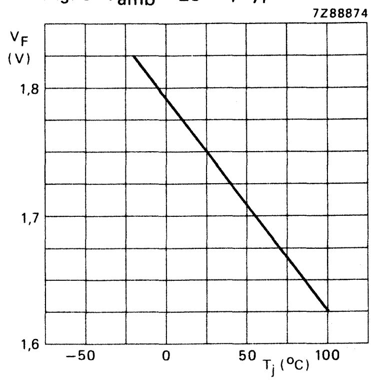


Fig. 5 I_F = 10 mA; typ. values.

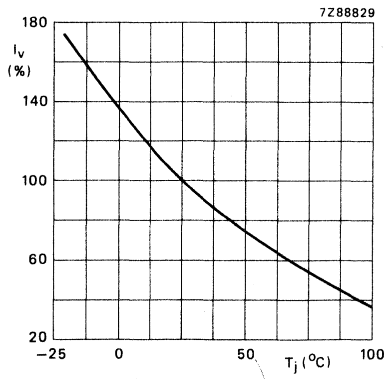


Fig. 6 Typical values.

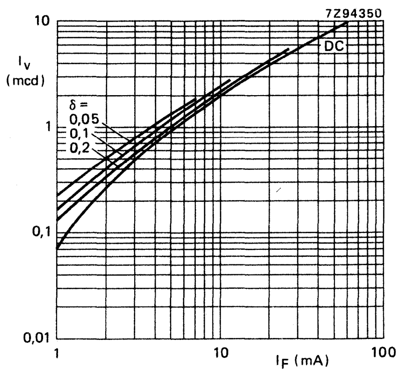


Fig. 7 t_p = 50 μs; typical values.

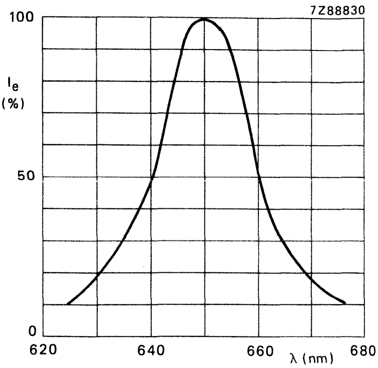


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

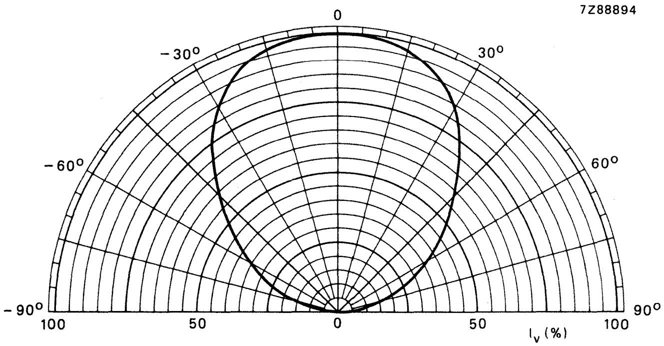


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diode of 5 mm x 5 mm which emits red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQV80UL has a SOD-74L outline and is encapsulated in a red diffusing resin.

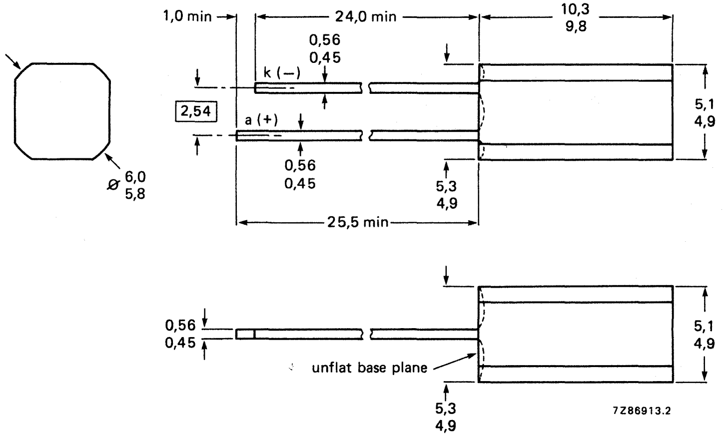
The CQV80UL has long leads but no seating plane.

QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity at I_F = 10 mA	I_V	min.	0,7	mcd
Wavelength at peak emission	λ_p	typ.	700	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	100	°

MECHANICAL DATA Dimensions in mm

Fig. 1 SOD-74L.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Storage temperature		T_{stg}		−55 to +100 °C
Lead soldering temperature				
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	CQV80U	T_{sld}	max.	260 °C
$>$ 5 mm from the seating plane; $t_{sld} < 7$ s	CQV80UL	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage at I_F = 10 mA		V_F	typ.	2,0 V
			max.	2,6 V
Reverse current at V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions at I_F = 10 mA		$\theta_{½}$	typ.	100 °
Wavelength at peak emission at I_F = 10 mA		λ_p	typ.	700 nm
Capacitance at V_R = 0; f = 1 MHz		C_d	typ.	45 pF
Bandwidth at half height		$\Delta\lambda$	typ.	90 nm
Luminous intensity at I_F = 2 mA		I_v	typ.	0,4 mcd
Luminous intensity at I_F = 10 mA	CQV80UL	I_v	min.	0,7 mcd
	CQV80UL-2	I_v		1,0 to 2,2 mcd
	CQV80UL-3	I_v		1,6 to 3,5 mcd

DEVELOPMENT DATA

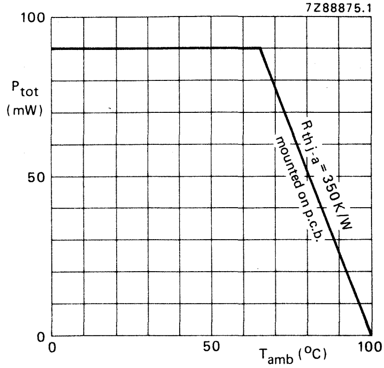


Fig. 2.

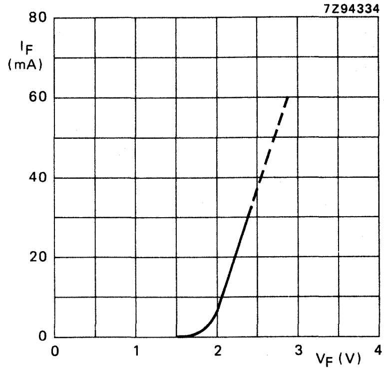


Fig. 3 Typical values.

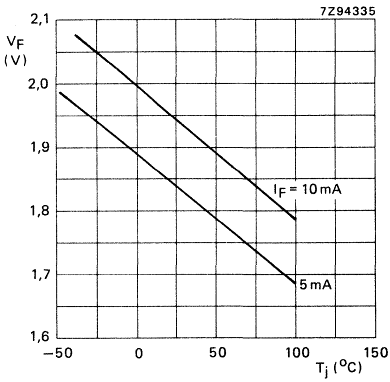


Fig. 4 Typical values.

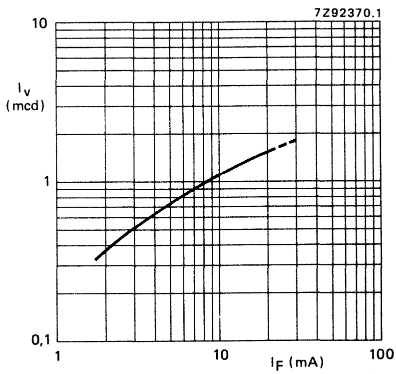


Fig. 5 Typical values.

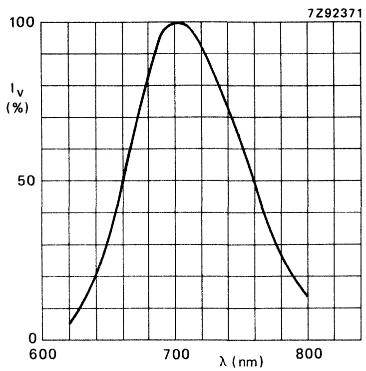


Fig. 6 Typical values.

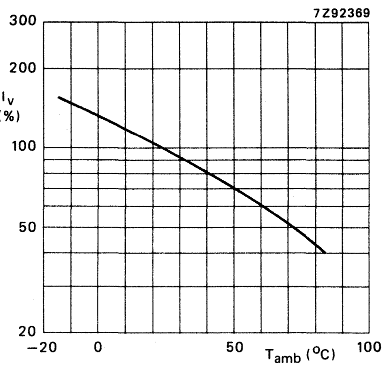


Fig. 7 Typical values.

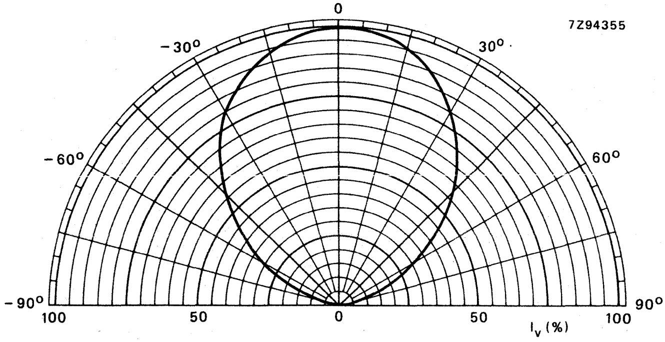


Fig. 8 Typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 5 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased. The CQV81L has SOD-74L envelope and is encapsulated in a green diffusing resin.

These SOD-74 LEDs are suitable for surface illumination, for example in information boards, score boards, moving advertisement and electronic game applications.

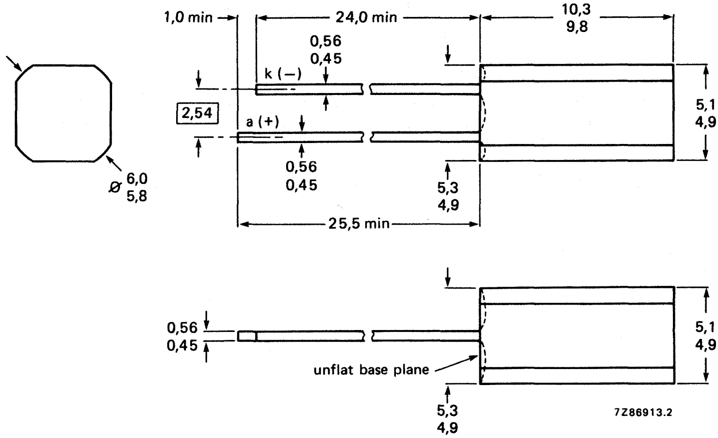
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV81L	I_v	min.	0,7	mcd
	CQV81L-2	I_v		1,0 to 2,2	mcd
	CQV81L-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-74L.



→ **Note.** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5	V
Forward current					
d.c.		I_F	max.	60	mA
peak value, t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	150	mA ←
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Storage temperature		T_{stg}		−55 to +100	°C
Junction temperature		T_j	max.	100	°C
Lead soldering temperature					
> 5,0 mm from the plastic body; t_{sld} < 7 s		T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{1/2}$	typ.	100	° ←
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQV81L	I_v	min.	0,7	mcd ←
	CQV81L-2	I_v		1,0 to 2,2	mcd
	CQV81L-3	I_v		1,6 to 3,5	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	20	pF

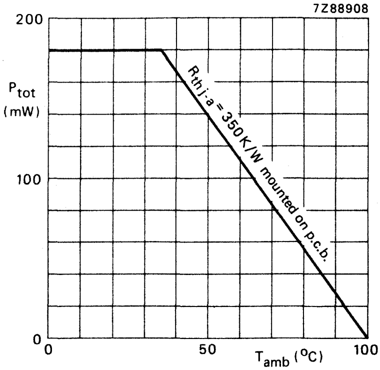


Fig. 2.

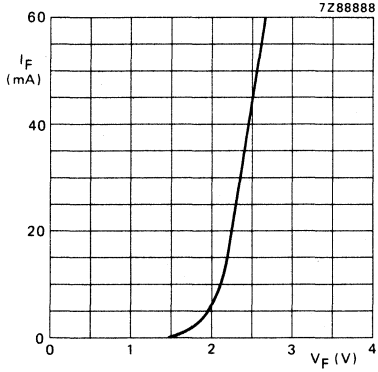


Fig. 3 T_{amb} = 25 °C; typical values.

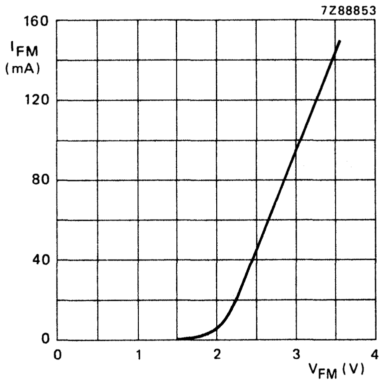


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typical values.

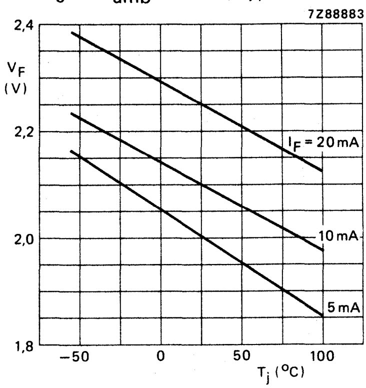


Fig. 5 Typical values.

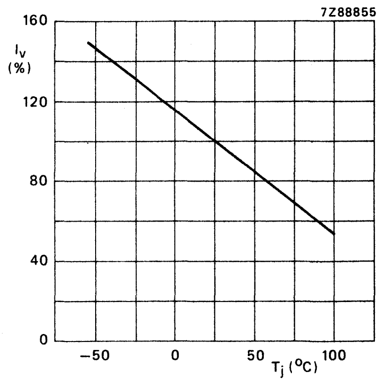


Fig. 6 I_F = 10 mA; typical values.

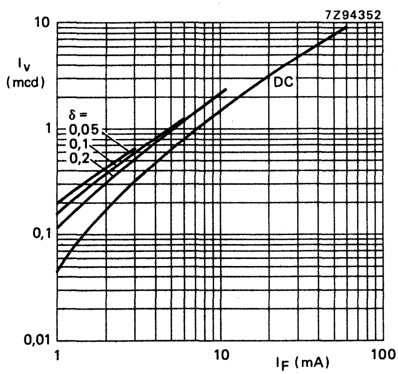


Fig. 7 t_p = 50 μs; typical values.

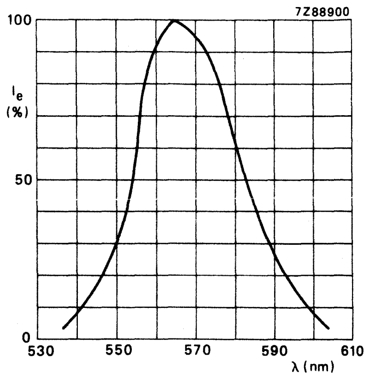


Fig. 8 Typical values.

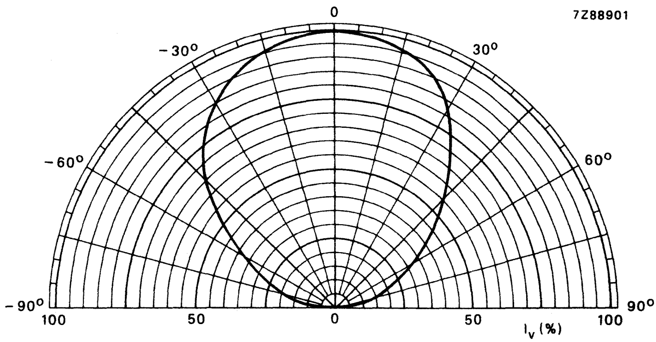


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Rectangular light emitting diode of 5 mm x 5 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased. The CQV82L has a SOD-74L envelope and is encapsulated in a yellow diffusing resin.

The CQV82L is suitable for surface illumination, for example, information boards, score boards, moving advertisements and electronic game applications.

The CQV82L has long leads and has no seating plane.

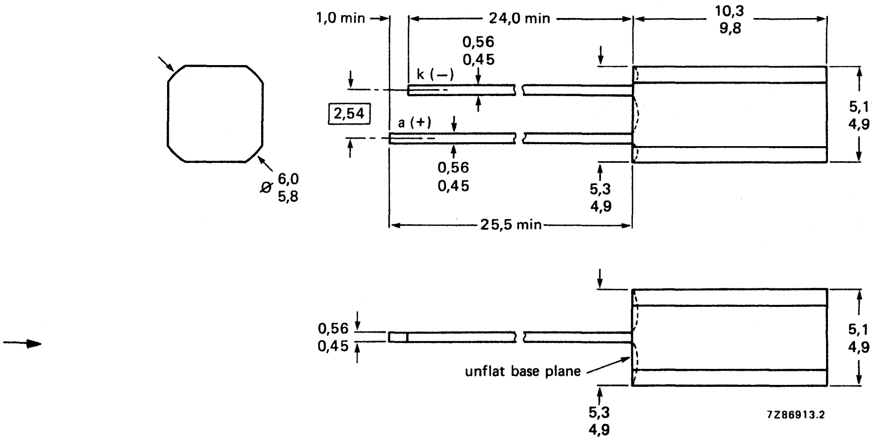
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQV82L	I_v	min.	0,7	mcd
	CQV82L-2	I_v		1,0 to 2,2	mcd
	CQV82L-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-74L.



→ **Note.** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A ←
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90 mW
Storage temperature		T_{stg}		−55 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature				
> 5,0 mm from the plastic body; t_{sld} < 7 s		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage		V_F	typ.	2,1 V
			max.	3,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions				
I_F = 10 mA		$\theta_{1/2}$	typ.	100 ° ←
Bandwidth at half height		$\Delta\lambda$	typ.	40 nm
Wavelength at peak emission				
I_F = 10 mA		λ_p	typ.	590 nm
Luminous intensity				
I_F = 10 mA	CQV82L	I_v	min.	0,7 mcd ←
	CQV82L-2	I_v		1,0 to 2,2 mcd
	CQV82L-3	I_v		1,6 to 3,5 mcd
Diode capacitance				
V_R = 0; f = 1 MHz		C_d	typ.	15 pF

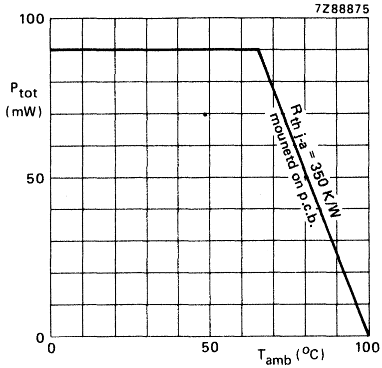


Fig. 2.

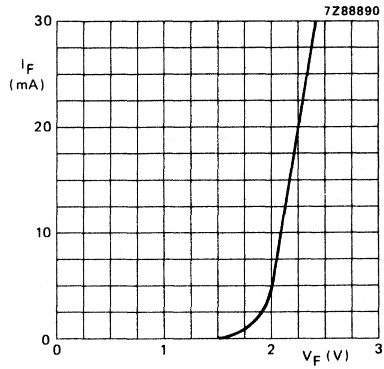


Fig. 3 Typical values.

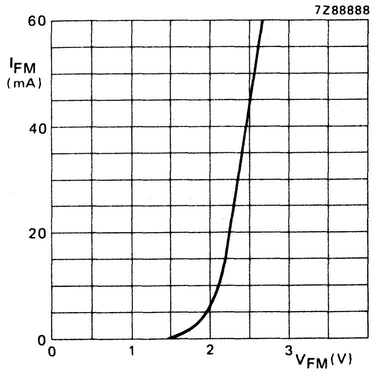


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

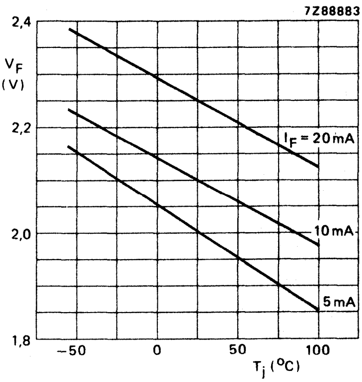


Fig. 5 Typical values.

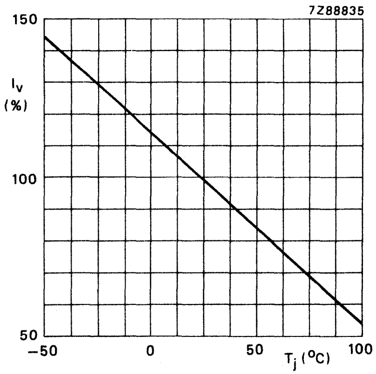


Fig. 6 I_F = 10 mA; typ. values.

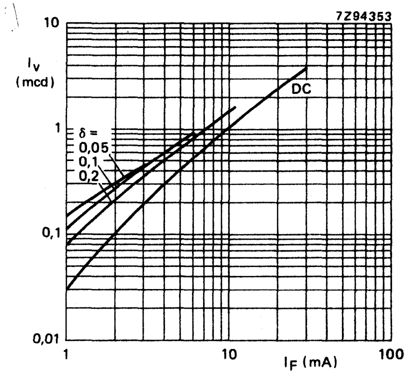


Fig. 7 t_p = 50 μs; typical values.

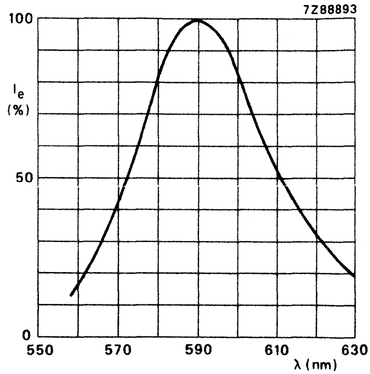


Fig. 8 Typical values.

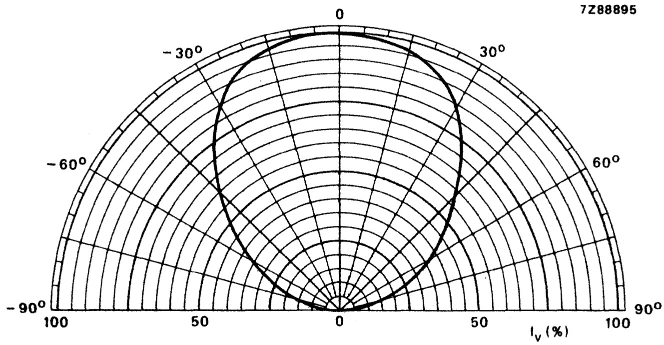


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diode of 5 mm x 2,5 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQW10A has a SOD-76 envelope and is encapsulated in a red diffusing resin.

The CQW10AL is the long lead version of the CQW10A without a seating plane but is in all other respects similar to the CQW10A.

When stacked in an array these SOD-76 LEDs can be used, for example, as level indicators. Because of its high light intensity the CQW10A(L) is suitable in applications where only low currents are available and because of its high I_{Fmax} it can be used for high I_V applications.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW10A(L)	I_V	min.	0,7	mcd
	CQW10A(L)-3	I_V		1,6 to 3,5	mcd
	CQW10A(L)-4	I_V		3,0 to 7,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A2.
CQW10A

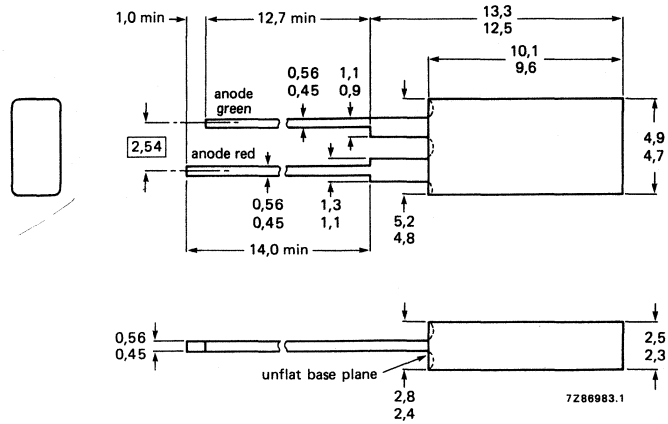
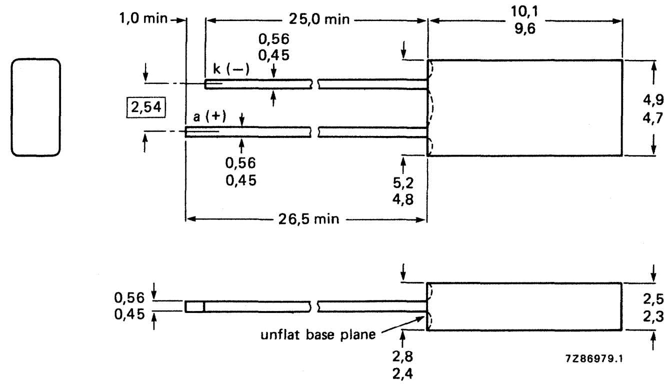


Fig. 1b SOD-76L.
CQW10AL



→ **Note:** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
d.c.	I_F	max.	100	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s > 1,5 mm from the seating plane for CQW10A > 5 mm from the plastic body for CQW10AL	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	1,75 2,2	V V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{1/2}$	typ.	100	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	650	nm
Luminous intensity I_F = 10 mA	CQW10A(L)	I_v	min.	0,7	mcd
	CQW10A(L)-3	I_v		1,6 to 3,5	mcd
	CQW10A(L)-4	I_v		3,0 to 7,0	mcd
Diode capacitance V_R = 0, f = 1 MHz		C_d	typ.	80	pF

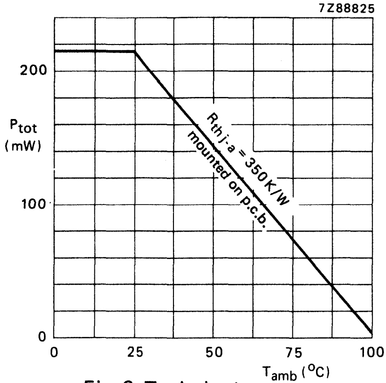


Fig. 2 Typical values.

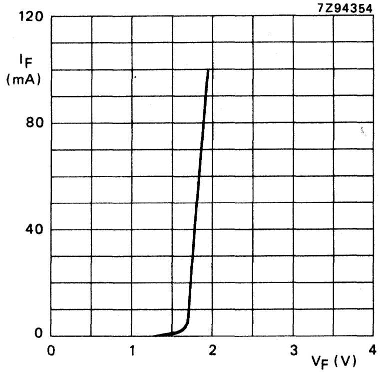


Fig. 3 T_{amb} = 25 °C; typ. values.

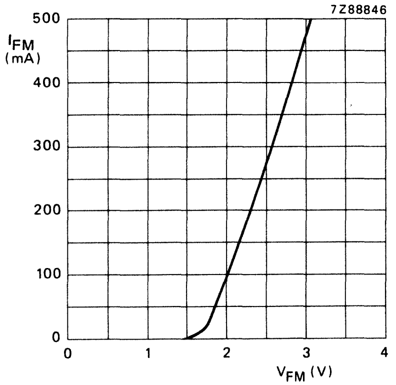


Fig. 4 t_{on} = 20 μs; δ = 0,01; typ. values.

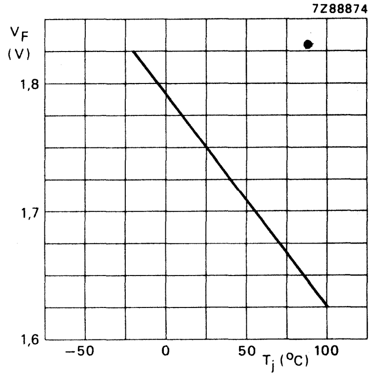


Fig. 5 I_F = 10 mA; typ. values.

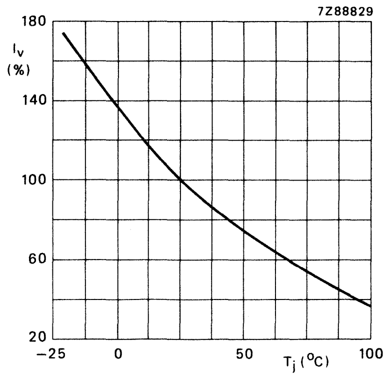


Fig. 6 Typical values.

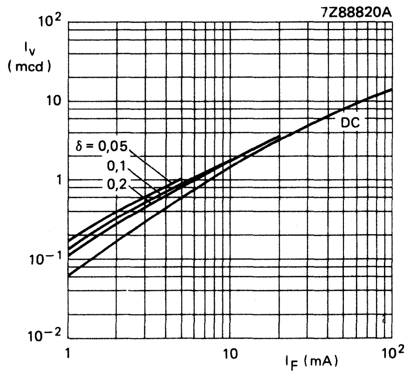


Fig. 7 t_p = 50 μs; typ. values.

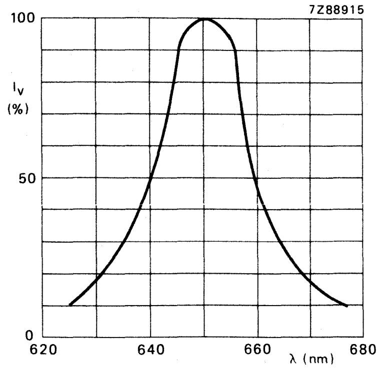


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

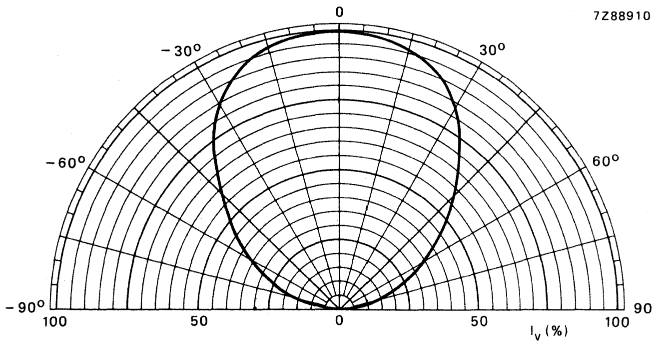


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diode of 5 mm x 2,5 mm which emits red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased.

The CQW10B has a SOD-76 envelope and is encapsulated in a red diffusing resin.

The CQW10BL is similar to the CQW10 but has long leads (26 mm) and no seating plane.

When stacked as an array these SOD-76 LEDs can be used, for example, as level indicators.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW10B(L)	I_v	min.	0,7	mcd
	CQW10B(L)-2	I_v		1,0 to 2,2	mcd
	CQW10B(L)-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	630	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A1.
CQW10B

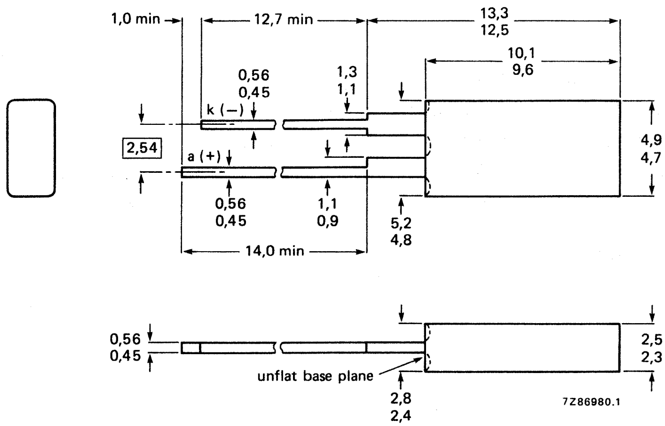
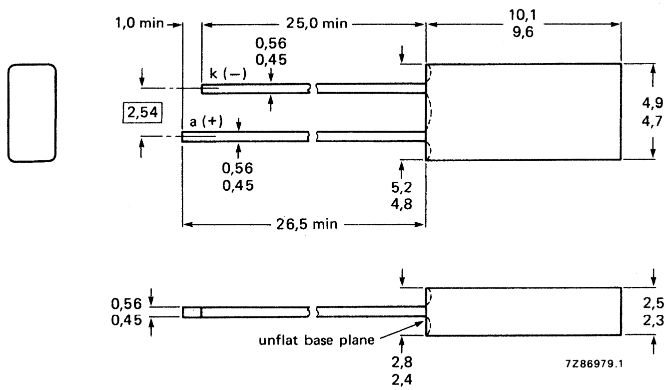


Fig. 1b SOD-76L
CQW10B4



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		−55 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature; t_{sld} < 7 s > 1,5 mm from the seating plane for CQW10B > 5 mm from the plastic body for CQW10BL	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	2,1 V 3,0 V
Reverse current V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{1/2}$	typ.	100 °
Bandwidth at half height		$\Delta\lambda$	typ.	45 nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	630 nm
Luminous intensity I_F = 10 mA	CQW10B(L)	I_v	min.	0,7 mcd
	CQW10B(L)-2	I_v		1,0 to 2,2 mcd
	CQW10B(L)-3	I_v		1,6 to 3,5 mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	10 pF

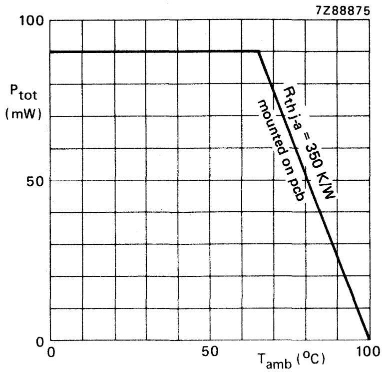


Fig. 2.

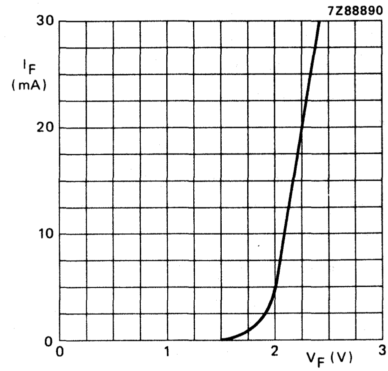


Fig. 3 T_j = 25 °C; typ. values.

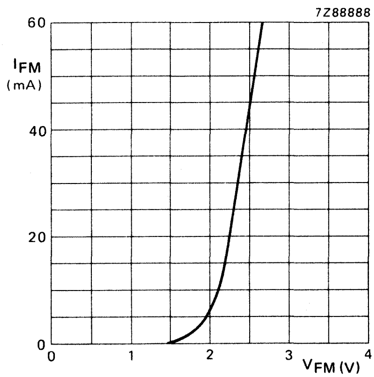


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_j = 25 °C; typ. values.

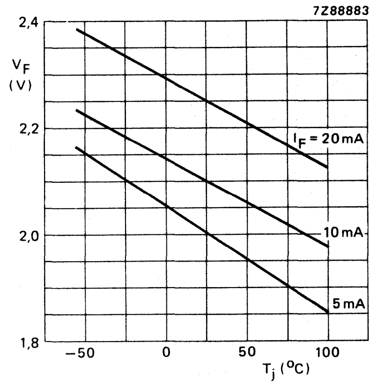


Fig. 5 Typical values.

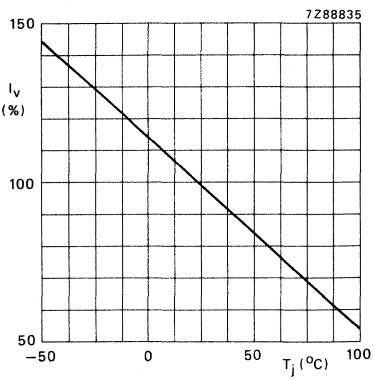


Fig. 6 I_F = 10 mA; typ. values.

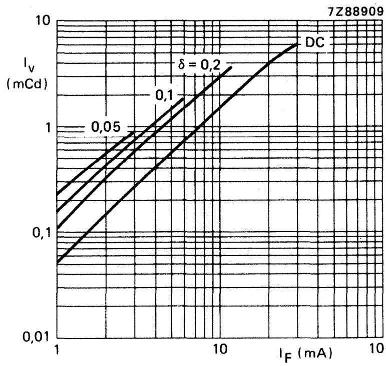


Fig. 7 t_p = 50 μs; typ. values.

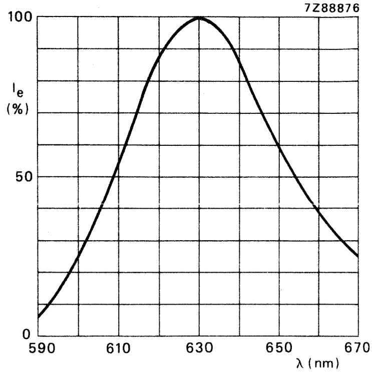


Fig. 8 I_F = 10 mA; typ. values.

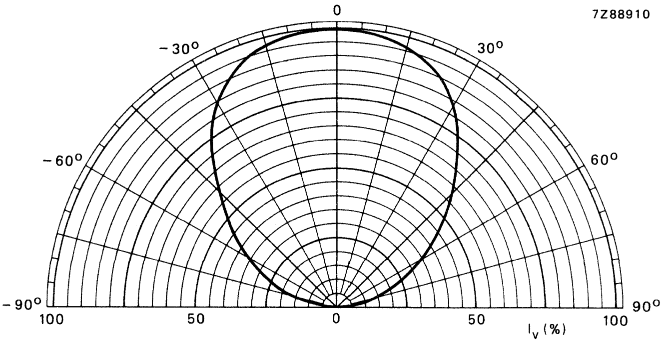


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 2,5 mm x 5 mm which emit red light at a typical peak wavelength of 700 nm (GaP:ZnO; ultra-red) when forward biased.

The CQW10U and CQW10UL have a SOD-76 outline and are encapsulated in a red diffusing resin.

The CQW10U and CQW10UL are specially designed for low current applications.

QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation upt to T_{amb} = 65 ^oC	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	^oC
Luminous intensity at I_F = 10 mA	I_v	min.	0,7	mcd
Wavelength at peak emission	λ_p	typ.	700	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	100	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A1.
CQW10U.

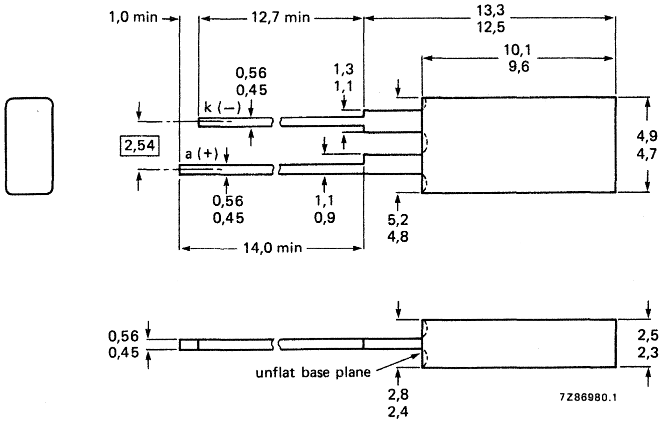
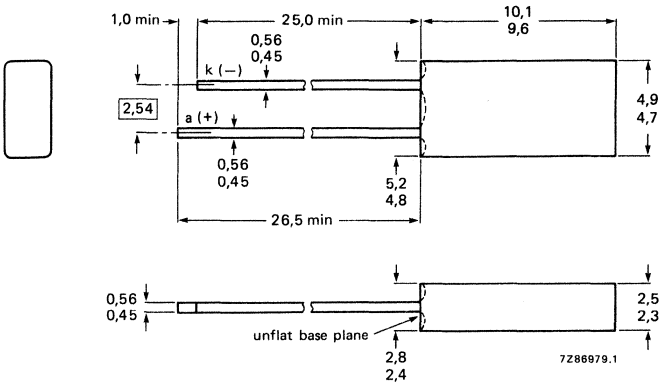


Fig. 1b SOD-76L.
CQW10UL



Note: Solderability not guaranteed in tie-bar zone.

DEVELOPMENT DATA

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5	V
Forward current					
d.c.		I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Storage temperature		T_{stg}		−55 to +100	°C
Lead soldering temperature					
> 1,5 mm from the seating plane; t_{sld} < 7 s	CQW10U	T_{sld}	max.	260	°C
> 5 mm from the seating plane; t_{sld} < 7 s	CQW10UL				

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage at I_F = 10 mA		V_F	typ.	2,0	V
			max.	2,6	V
Reverse current at V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions at I_F = 10 mA		$\theta_{1/2}$	typ.	100	°
Wavelength at peak emission at I_F = 10 mA		λ_p	typ.	700	nm
Capacitance at V_R = 0; f = 1 MHz		C_d	typ.	45	pF
Bandwidth at half height		$\Delta\lambda$	typ.	90	nm
Luminous intensity at I_F = 10 mA	CQW10U(L)	I_v	min.	0,7	mcd
	CQW10U(L)-2	I_v		1,0 to 2,2	mcd
	CQW10U(L)-3	I_v		1,6 to 3,5	mcd

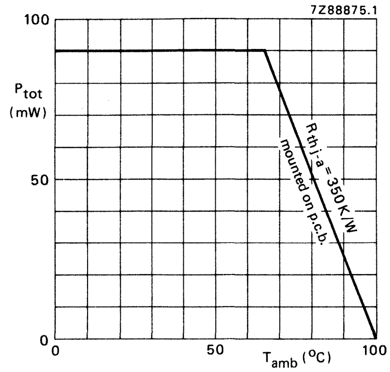


Fig. 2.

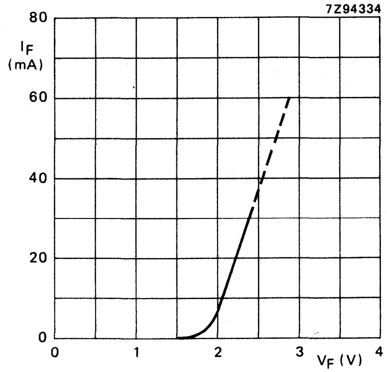


Fig. 3 Typical values.

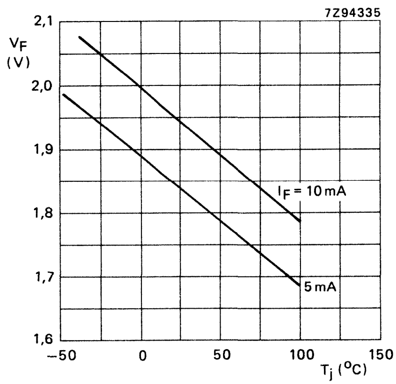


Fig. 4 Typical values.

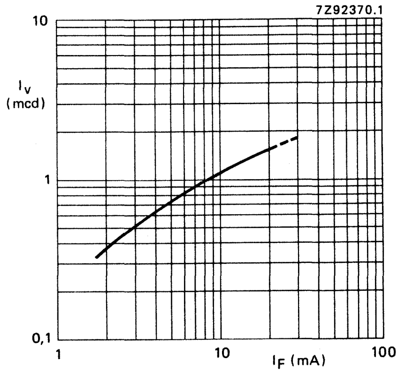


Fig. 5 Typical values.

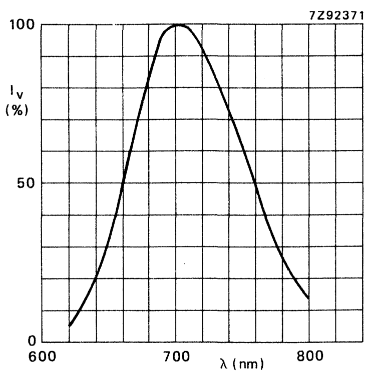


Fig. 6 Typical values.

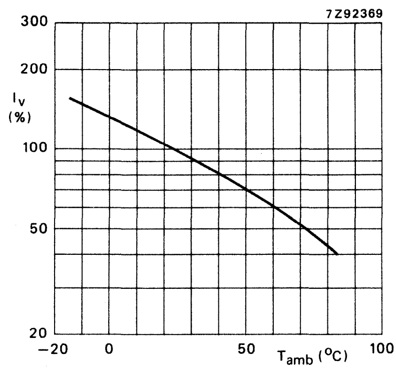


Fig. 7 Typ. values.

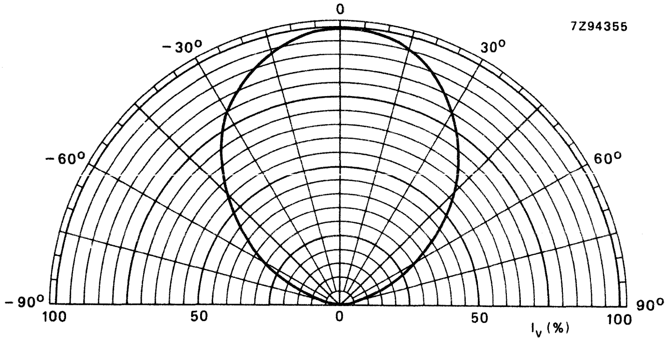


Fig. 8 Typical values.

DEVELOPMENT DATA

LIGHT EMITTING DIODES

Rectangular light emitting diode of 5 mm x 2,5 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQW11B has a SOD-76 envelope and is encapsulated in a green diffusing resin.

The CQW11BL is the long lead version of the CQW11B without a seating plane, but in all respects similar to the CQW11B.

When stacked in an array these SOD-76 LEDs can be used, for example, as level indicators. Because of its high light intensity the CQW11B is very suitable in applications where only low currents are available and because of its high I_{Fmax} it can be used for high I_v applications.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW11B(L)	I_v	min.	0,7	mcd
	CQW11B(L)-2	I_v		1,0 to 2,2	mcd
	CQW11B(L)-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{1/2}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-76A1.
CQW11B

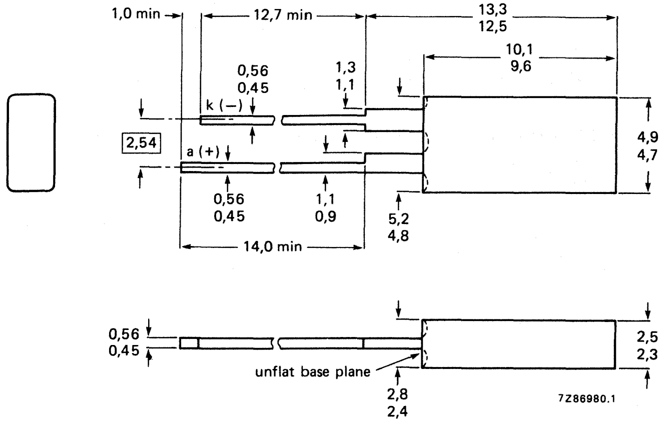
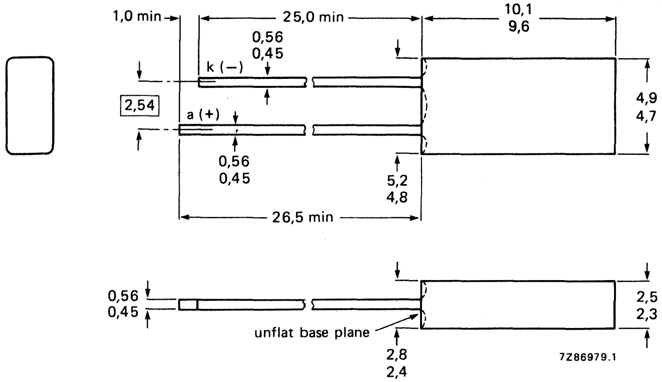


Fig. 1b SOD-76L.
CQW11BL



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	60 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	150 mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180 mW
Storage temperature		T_{stg}		−55 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature; t_{sld} < 7 s				
> 1,5 mm from the seating plane CQW11B		T_{sld}	max.	260 °C
> 5 mm from the plastic body CQW11BL		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 10 mA		V_F	typ.	2,1 V
			max.	3,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions				
I_F = 10 mA		$\theta_{1/2}$	typ.	100 °
Bandwidth at half height		$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission				
I_F = 10 mA		λ_p	typ.	565 nm
Luminous intensity				
I_F = 10 mA	CQW11B(L)	I_v	min.	0,7 mcd
	CQW11B(L)-2	I_v		1,0 to 2,2 mcd
	CQW11B(L)-3	I_v		1,6 to 3,5 mcd
Diode capacitance				
V_R = 0; f = 1 MHz		C_d	typ.	20 pF

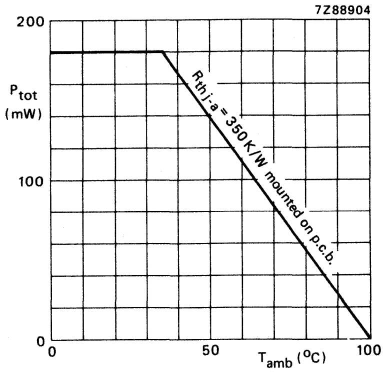


Fig. 2.

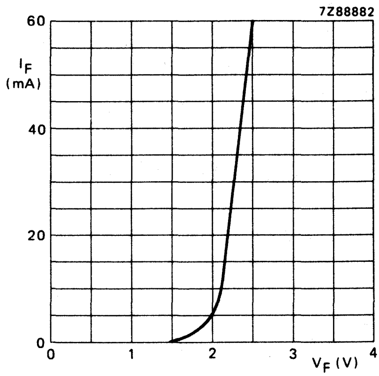


Fig. 3 T_j = 25 °C; typ. values.

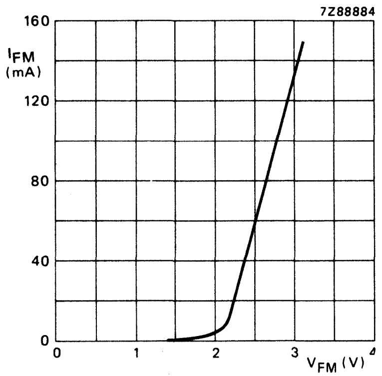


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

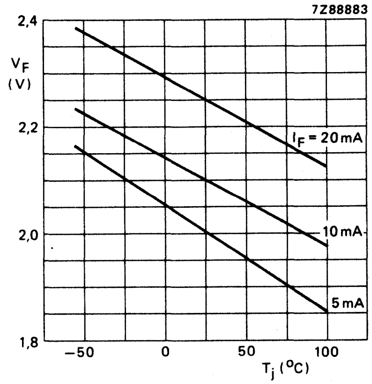


Fig. 5 Typical values.

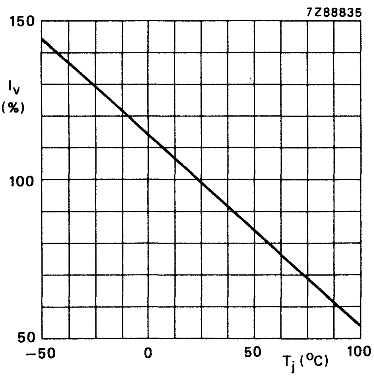


Fig. 6 I_F = 10 mA; typ. values.

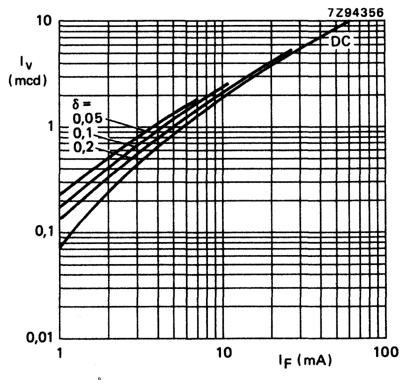


Fig. 7 t_p = 50 μs; typical values.

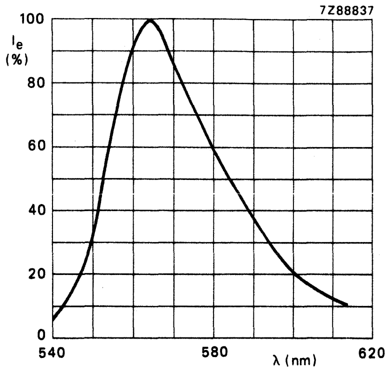


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

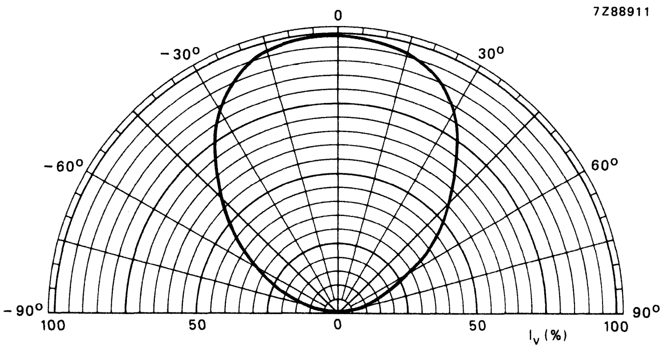


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diode of 5 mm x 2,5 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQW12B has a SOD-76 envelope and is encapsulated in a yellow diffusing resin.

The CQW12BL is similar to the CQW12B but has long leads and no seating plane.

When stacked as an array these SOD-76 LEDs can be used, for example, as level indicators.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW12B(L)	I_v	min.	0,7	mcd
	CQW12B(L)-2	I_v		1,0 to 2,2	mcd
	CQW12B(L)-3	I_v		1,6 to 3,5	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth between half-intensity directions					
I_F = 10 mA; in the plane of the leads		$\theta_{½}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-76A.1.
CQW12B.

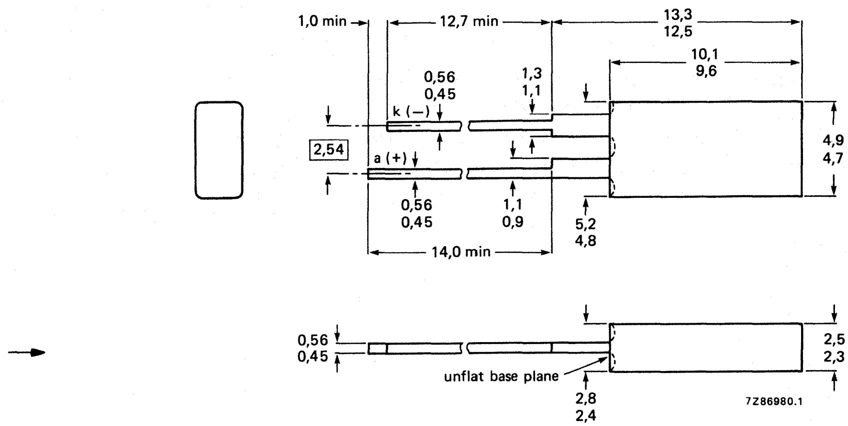
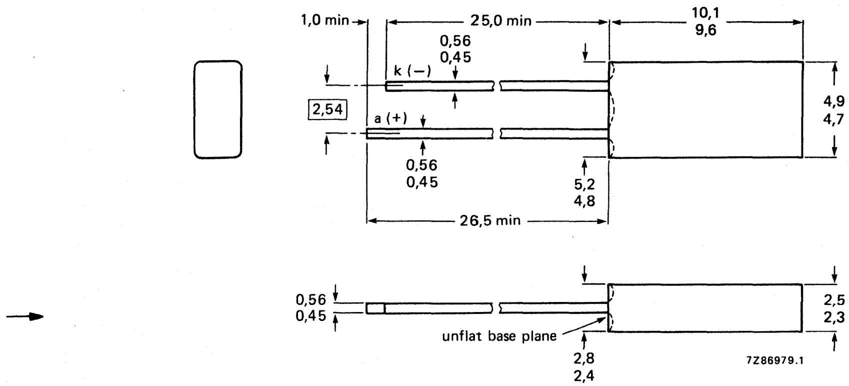


Fig. 1b SOD-76L.
CQW12BL



→ **Note:** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value, t_{on} = 1 ms; δ = 0,33		max.	60	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s > 1,5 mm from the seating plane for CQW12B > 5 mm from the plastic body for CQW12BL	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{½}$	typ.	100	°
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	590	nm
Luminous intensity I_F = 10 mA	CQW12B(L)	I_v	min.	0,7	mcd
	CQW12B(L)-2	I_v		1,0 to 2,2	mcd
	CQW12B(L)-3	I_v		1,6 to 3,5	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	15	pF

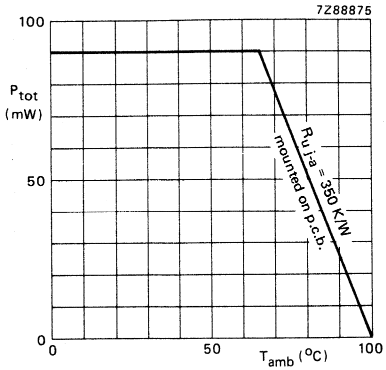


Fig. 2.

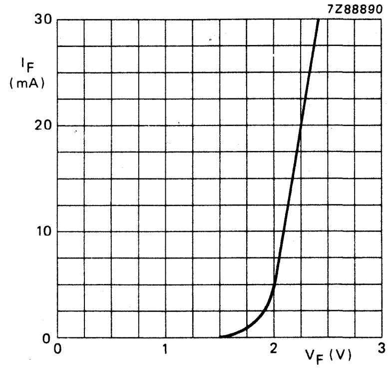


Fig. 3 T_j = 25 °C; typ. values.

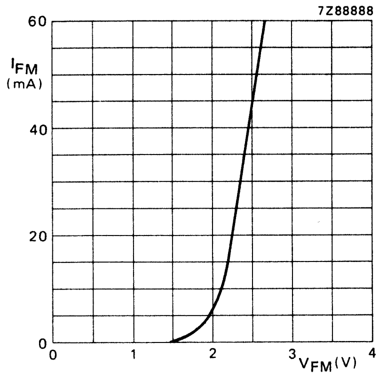


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_j = 25 °C; typ. values.

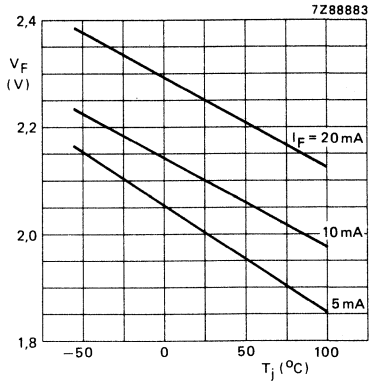


Fig. 5 Typical values.

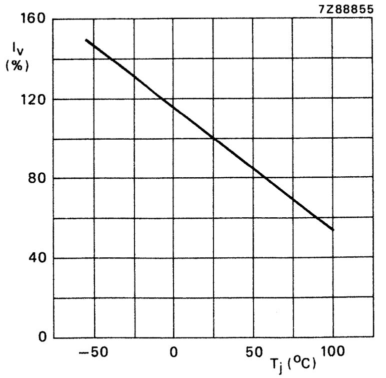


Fig. 6 I_F = 10 mA; typ. values.

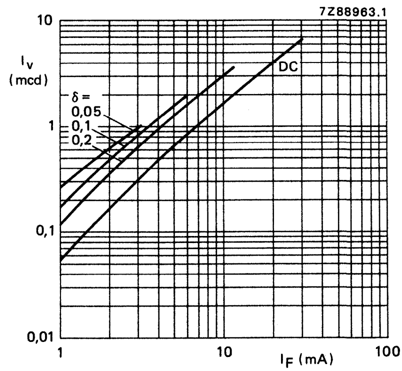


Fig. 7 t_p = 50 μs; typical values.

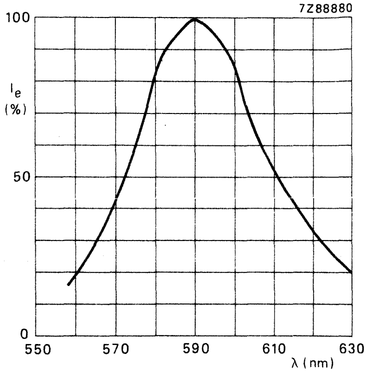


Fig. 8 Typical values.

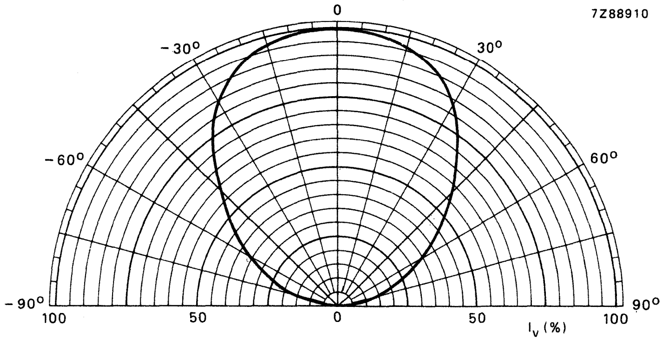


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diode with a diameter of 2 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQW20A has a SOD-79 outline and is encapsulated in a red diffusing resin.

This LED is suitable for small indicator functions and in applications where only low currents are available.

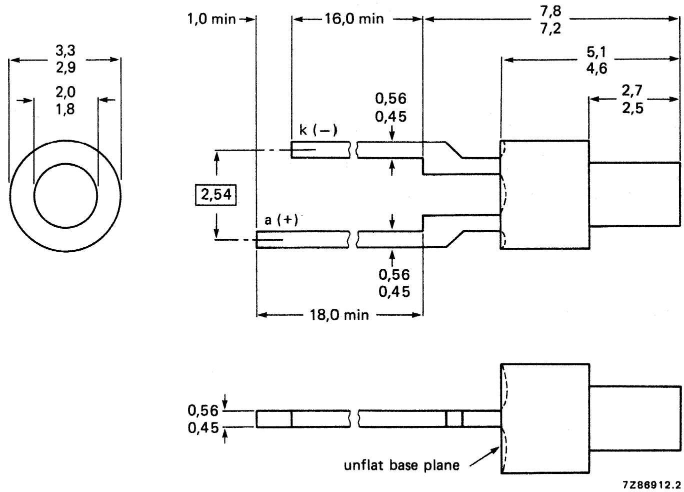
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	60	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity I_F = 10 mA	I_V	min.	0,7	mcd
		typ.	2,5	mcd
Wavelength at peak emission	λ_p	typ.	650	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-79.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value, t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature				
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient				
when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 4 mA	V_F	typ.	1,65	V
I_F = 10 mA	V_F	typ.	1,75	V
		max.	2,20	V
Reverse current				
V_R = 5 V	I_R	max.	100	μA
Beamwidth between half-intensity directions				
I_F = 10 mA	$\theta_{½}$	typ.	110	°
Bandwidth at half height	$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission	λ_p	typ.	650	nm
Luminous intensity				
I_F = 10 mA	I_v	min.	0,7	mcd
		typ.	2,5	mcd
Diode capacitance				
V_R = 0; f = 1 MHz	C_d	typ.	80	pF

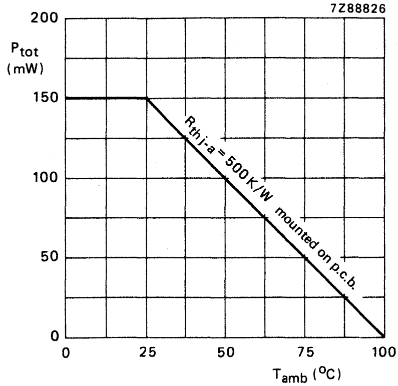


Fig. 2.

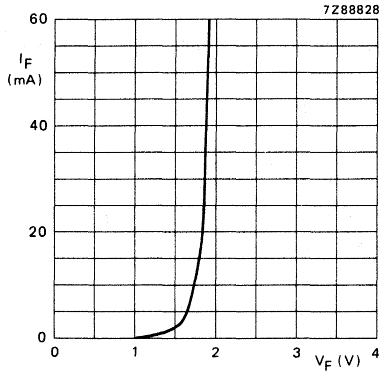


Fig. 3 T_{amb} = 25 °C; typ. values.

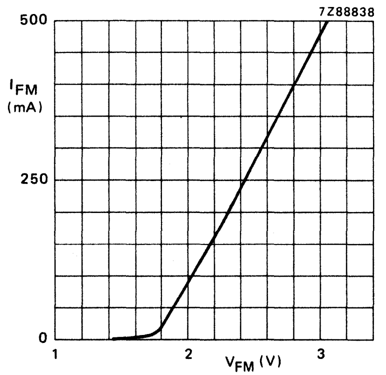


Fig. 4 t_{on} = 20 μs; δ = 0,01; T_{amb} = 25 °C; typ. values.

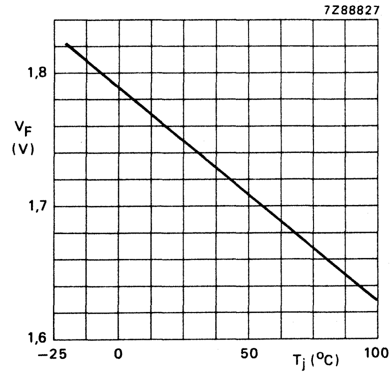


Fig. 5 I_F = 10 mA; typ. values.

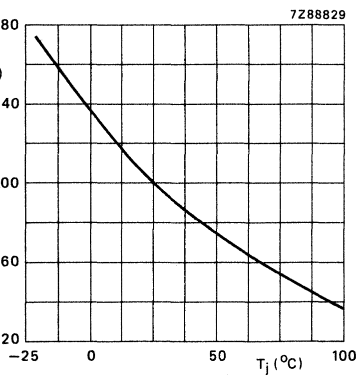


Fig. 6 Typical values.

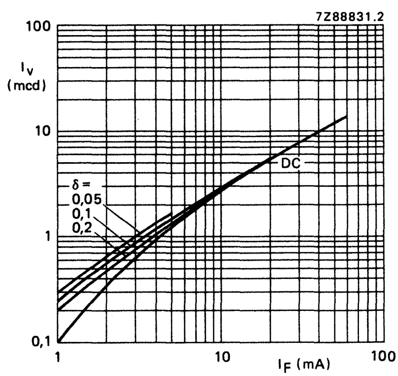


Fig. 7 t_p = 50 μs; typ. values.

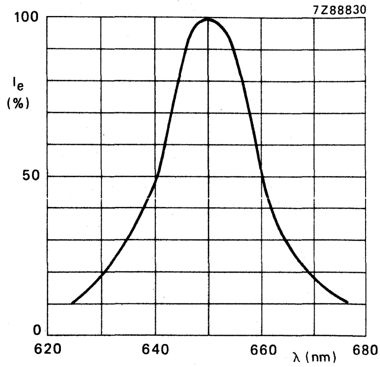


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

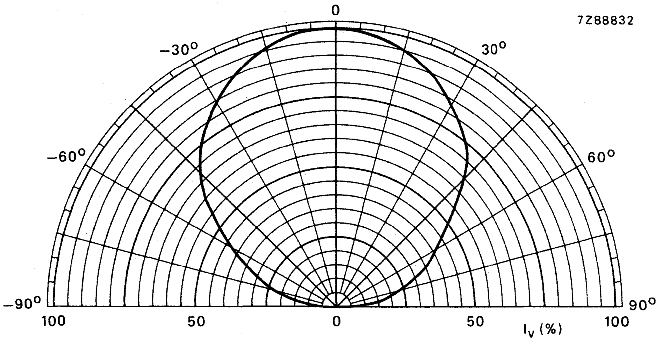


Fig. 9 I_F = 10 mA; typ. values.

LIGHT EMITTING DIODES

Circular light emitting diode with a diameter of 2 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQW21 has a SOD-79 outline and is encapsulated in a green diffusing resin.

The CQW21 is suitable for small indicator functions and can resist higher forward currents when a higher luminousity is required.

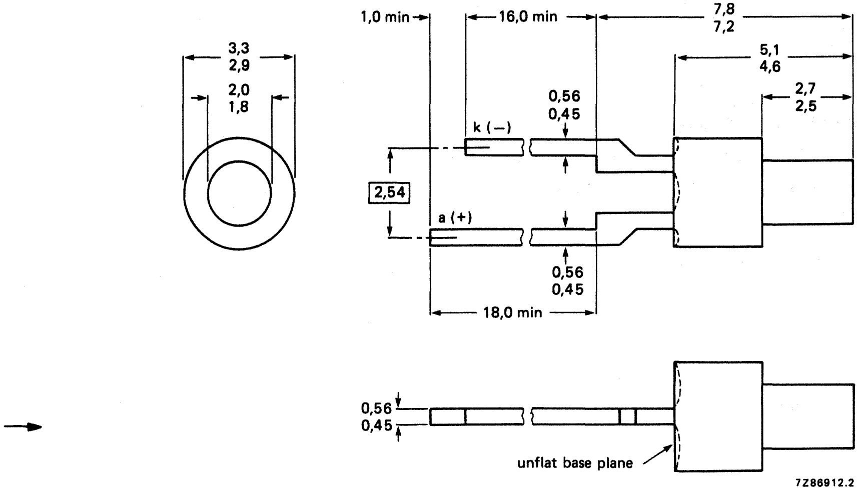
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	60	mA
Total power dissipation up to T_{amb} = 25 ^oC	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	100	^oC
Luminous intensity I_F = 10 mA	I_v	min.	0,7	mcd
		typ.	1,5	mcd
Wavelength at peak emission	λ_p	typ.	565	nm
Beamwidth between half-intensity directions	$\theta_{½}$	typ.	110	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-79.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	60 mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		max.	150 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−55 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature			
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage			
I_F = 10 mA	V_F	typ.	2,1 V
		max.	3,0 V
Reverse current			
V_R = 5 V	I_R	max.	100 μA
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	110 °
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission	λ_p	typ.	565 nm
Luminous intensity			
I_F = 10 mA	I_v	min.	0,7 mcd
		typ.	1,5 mcd
Diode capacitance			
V_R = 0; f = 1 MHz	C_d	typ.	20 pF

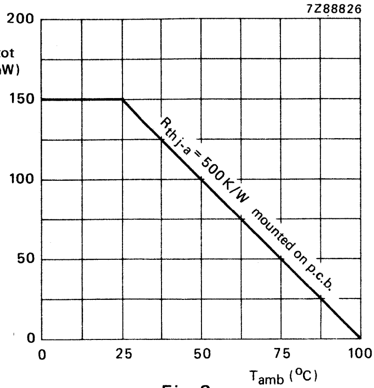


Fig. 2.

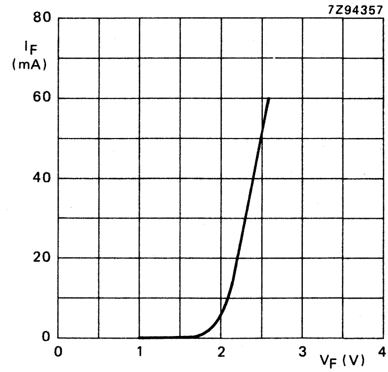


Fig. 3 T_{amb} = 25 °C; typ. values.

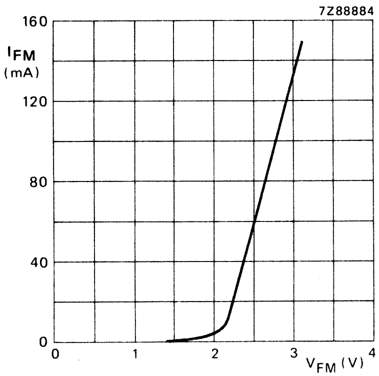


Fig. 4 t_{on} = 1 ms; δ = 0,33; T_{amb} = 25 °C; typ. values.

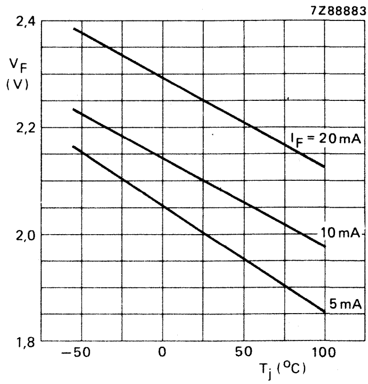


Fig. 5 Typical values.

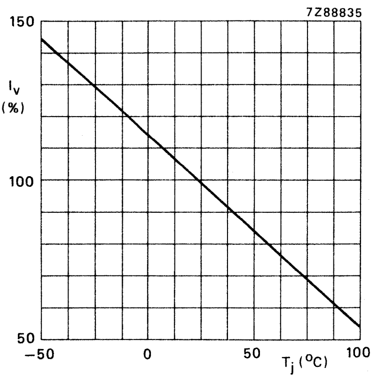


Fig. 6 Typical values.

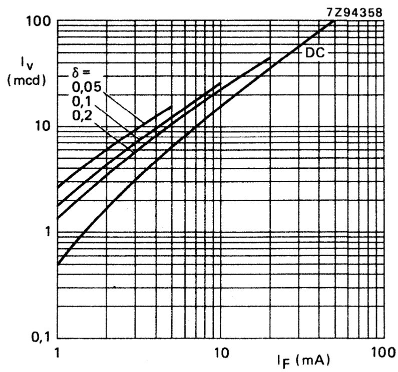


Fig. 7 t_p = 50 μs; typical values.

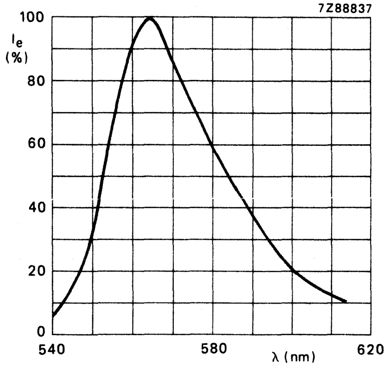


Fig. 8 I_F = 10 mA; typ. values.

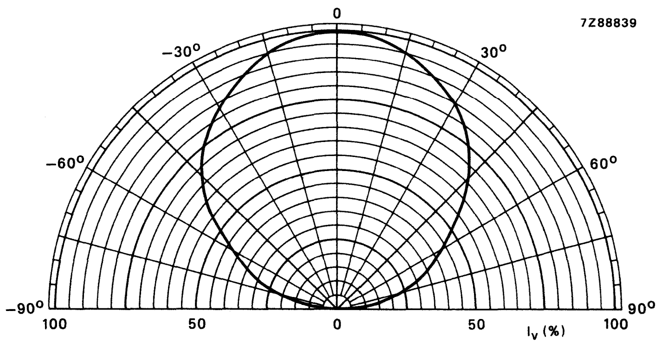


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 2 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQW22 has a SOD-79 outline and is encapsulated in a yellow diffusing resin.

The CQW21 is suitable for small indicator functions.

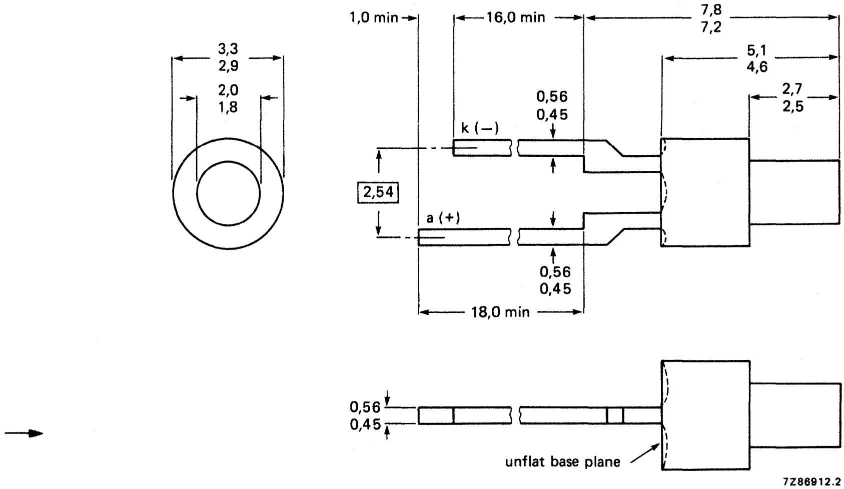
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity I_F = 20 mA	I_v	min. typ.	0,7 1,5	mcd mcd
Wavelength at peak emission	λ_p	typ.	590	nm
Beamwidth between half-intensity directions	$\theta_{½}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-79.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 55 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature $>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 20 mA	V_F	typ.	2,1	V
		max.	3,0	V
Reverse current V_R = 5 V	I_R	max.	100	μA
Diode capacitance	C_d	typ.	15	pF
Beamwidth between half-intensity directions	$\theta_{½}$	typ.	110	^{o}
Bandwidth at half height	$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission	λ_p	typ.	590	nm
Luminous intensity I_F = 20 mA	I_v	min.	0,7	mcd
		typ.	1,5	mcd

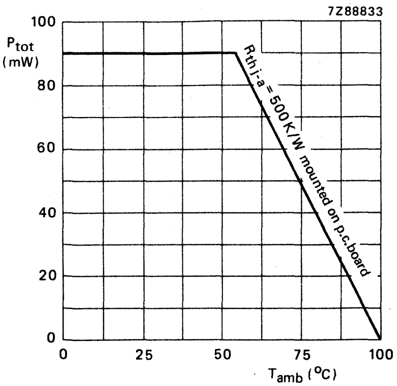


Fig. 2.

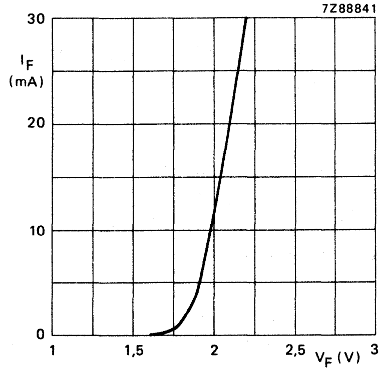


Fig. 3 T_{amb} = 25 °C; typ. values.

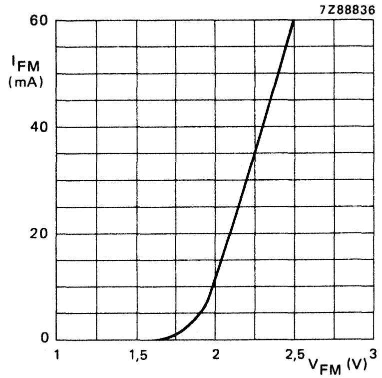


Fig. 4 t_{on} = 1 ms; δ = 0,33; T_{amb} = 25 °C, typical values.

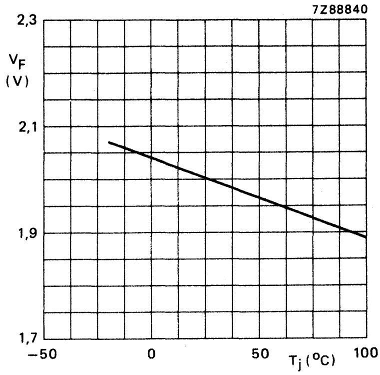


Fig. 5 I_F = 10 mA; typical values.

→

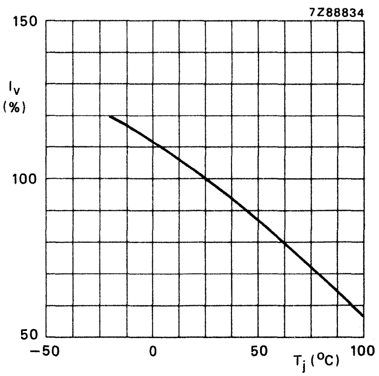


Fig. 6 Typical values.

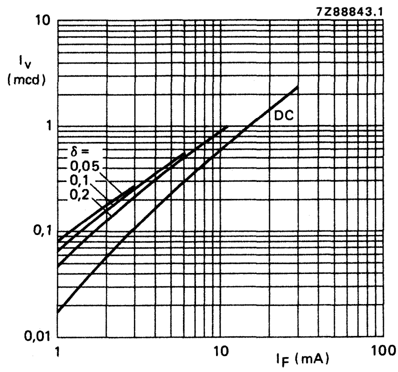


Fig. 7 t_p = 50 μs; typical values.

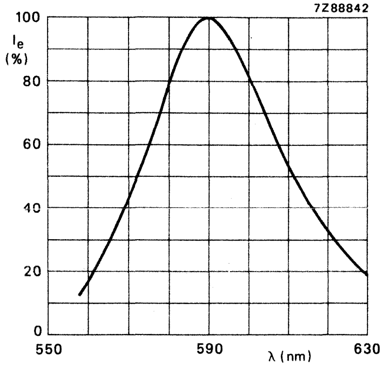


Fig. 8 Typical values.

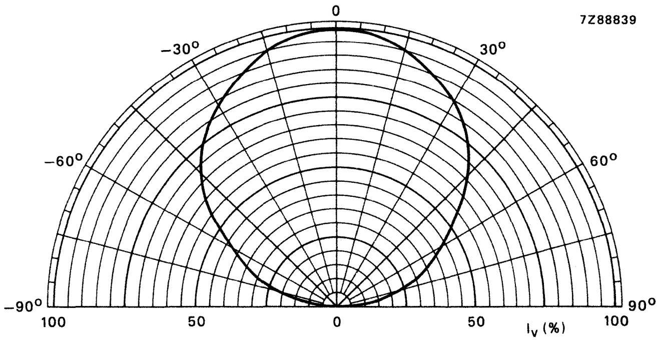


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQW24 and CQW24L have a SOD-63 outline and are encapsulated in a red diffusing resin.

The CQW24L is the long-lead version of the CQW24 and has no seating plane but is in all other respects similar to the CQW24.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW24(L)	I_V	min.	3	mcd
	CQW24(L)-4	I_V		3 to 7	mcd
	CQW24(L)-5	I_V		5 to 12	mcd
	CQW24(L)-6	I_V	min.	10	mcd
Wavelength at peak emission		λ_p	typ.	650	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	100	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-63A2.
CQW24

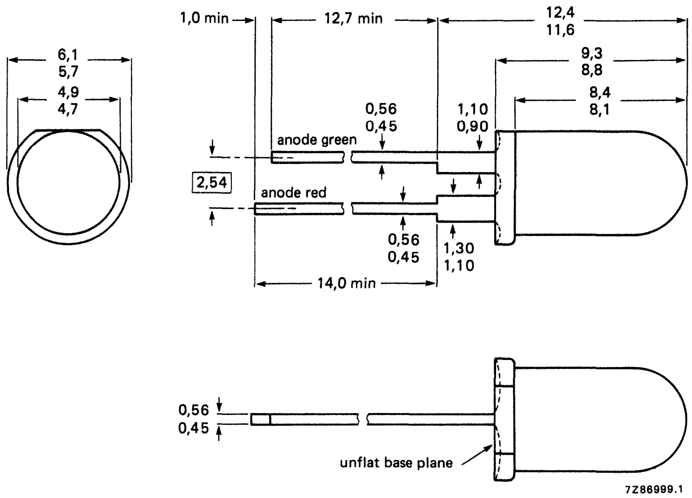
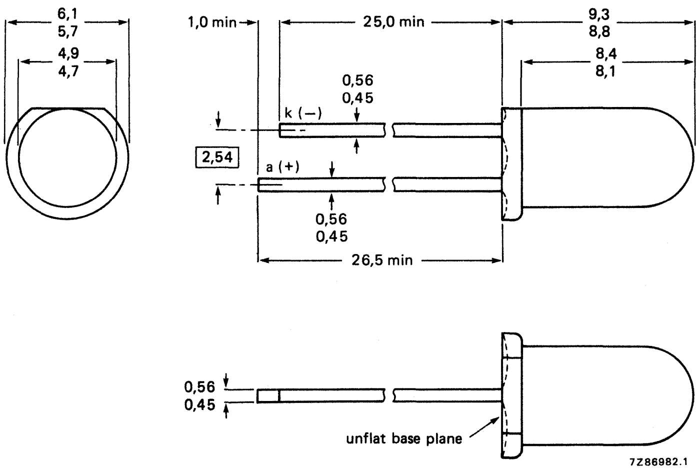


Fig. 1b SOD-63L



→ **Note.**: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	100	mA
Forward current peak value, t_p = 1 μs; f = 300 Hz peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max. max.	1 500	A mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s > 1,5 mm from the seating plane for CQW24 > 5 mm from the plastic body for CQW24L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 4 mA		V_F	typ.	1,65	V
I_F = 10 mA		V_F	typ. max.	1,75 2,2	V V
I_F = 50 mA		V_F	typ.	1,9	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Bandwidth between half-intensity directions					
I_F = 10 mA		$\theta_{1/2}$	typ.	100	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
I_F = 10 mA, T_{amb} = 25 °C		λ_p	typ.	650	nm
Luminous intensity					
I_F = 4 mA	CQW24(L)-4	I_v	typ.	1,5	mcd
	CQW24(L)-5	I_v	typ.	3	mcd
	CQW24(L)-6	I_v	typ.	4	mcd
I_F = 10 mA	CQW24(L)	I_v	min.	4	mcd
	CQW24(L)-4	I_v	 typ.	3 to 7 5	mcd mcd
	CQW24(L)-5	I_v	 typ.	5 to 12 8	mcd mcd
	CQW24(L)-6	I_v	min. typ.	10 15	mcd mcd
I_F = 50 mA	CQW24(L)-4	I_v	typ.	30	mcd
	CQW24(L)-5	I_v	typ.	40	mcd
	CQW24(L)-6	I_v	typ.	50	mcd

→ Diode capacitance
$V_R = 0$; f = 1 MHz | C_d | typ. | 80 pF

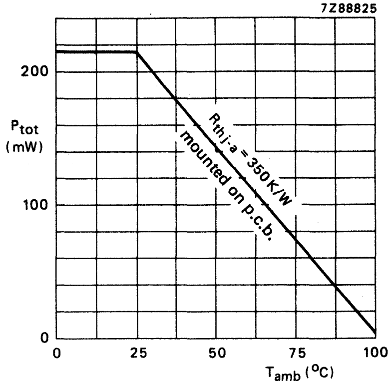


Fig. 2.

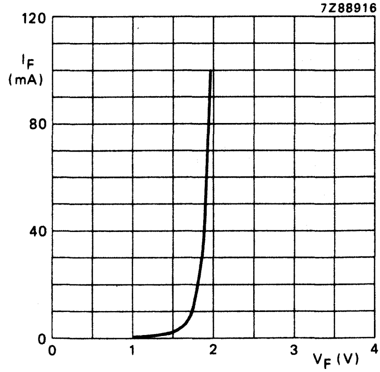


Fig. 3 T_{amb} = 25 °C; typ. values.

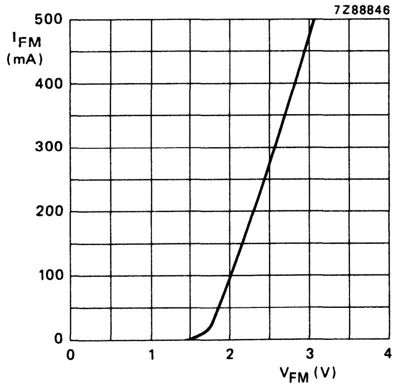


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

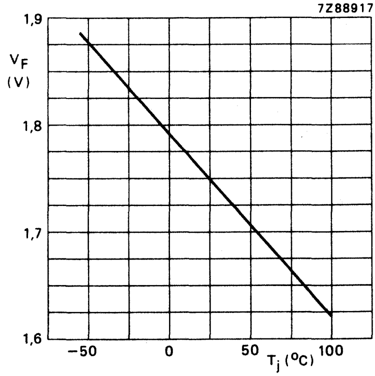


Fig. 5 I_F = 10 mA; typ. values.

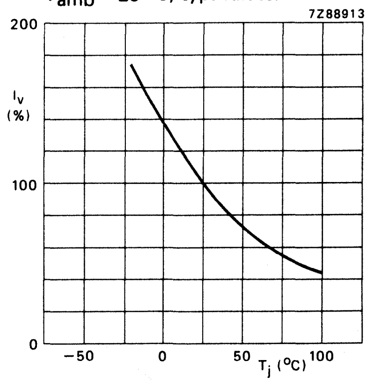


Fig. 6 Typical values.

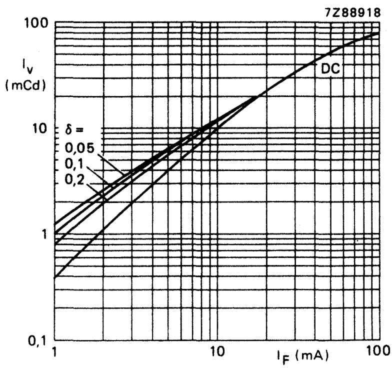


Fig. 7 t_p = 50 μs; typ. values.

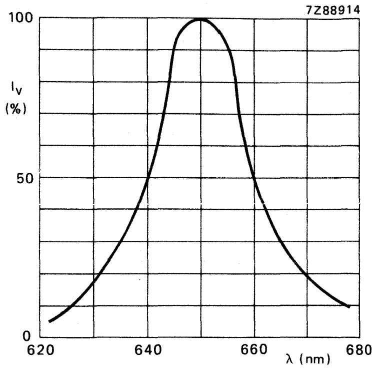


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

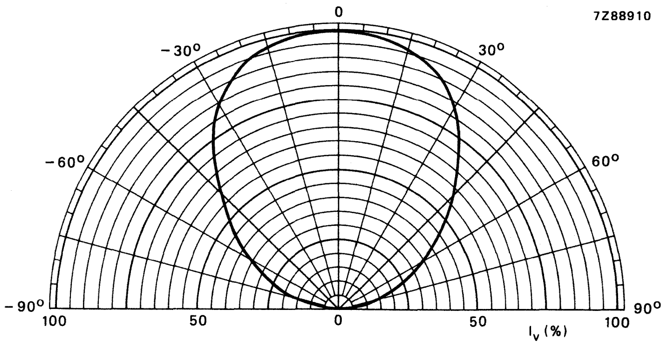


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQW54 has a SOD-53 outline and is encapsulated in a red coloured diffusing resin.

The high light intensity of the CQW54 makes it suitable for applications where only low currents are available.

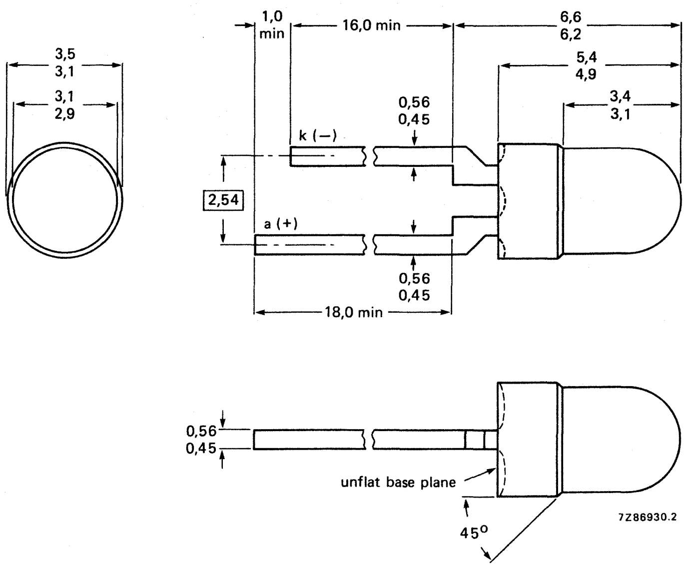
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	150 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
I_F = 10 mA	CQW54	I_V	min.	3 mcd
	CQW54-5	I_V		5 to 12 mcd
	CQW54-6	I_V		10 to 22 mcd
	CQW54-7	I_V	min.	16 mcd
Wavelength at peak emission				
I_F = 10 mA		λ_p	typ.	650 nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 ^oC	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature > 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage					
I_F = 4 mA		V_F	typ.	1,65	V
I_F = 10 mA		V_F	typ.	1,75	V
			max.	2,2	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	100	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Luminous intensity					
I_F = 4 mA	CQW54-5	I_v	typ.	3	mcd
	CQW54-6	I_v	typ.	6	mcd
	CQW54-7	I_v	typ.	7	mcd
I_F = 10 mA	CQW54	I_v	min.	3	mcd
		I_v	typ.	5	mcd
	CQW54-5	I_v		5 to 12	mcd
		I_v	typ.	8	mcd
	CQW54-6	I_v		10 to 22	mcd
		I_v	typ.	15	mcd
	CQW54-7	I_v	min.	16	mcd
		I_v	typ.	18	mcd
I_F = 50 mA	CQW54-5	I_v	typ.	40	mcd
	CQW54-6	I_v	typ.	75	mcd
	CQW54-7	I_v	typ.	90	mcd

→ Diode capacitance

$V_R = 0$; f = 1 MHz | C_d | typ. | 80 pF

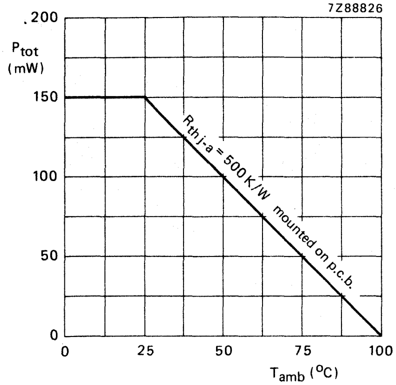


Fig. 2.

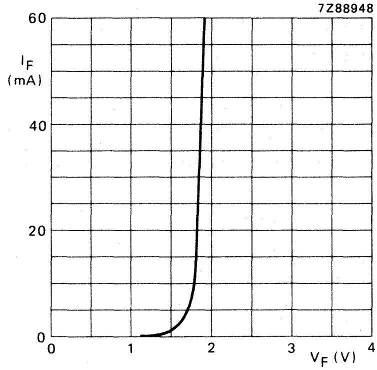


Fig. 3 T_{amb} = 25 °C; typ. values.

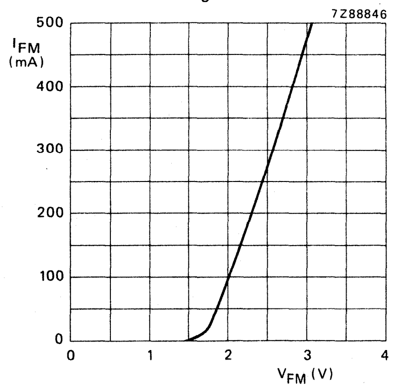


Fig. 4 t_{on} = 20 μs; δ = 0,01; T_{amb} = 25 °C; typ. values.

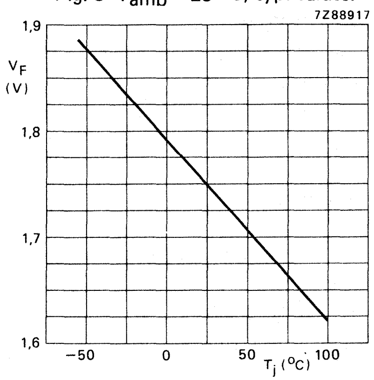


Fig. 5 I_F = 10 mA; typ. values.

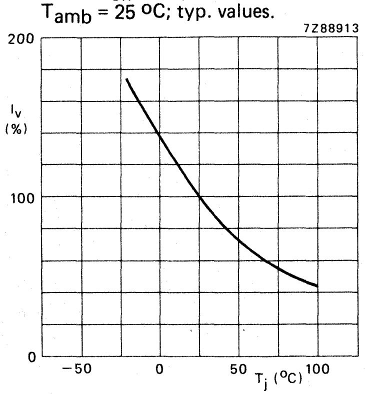


Fig. 6 Typical values.

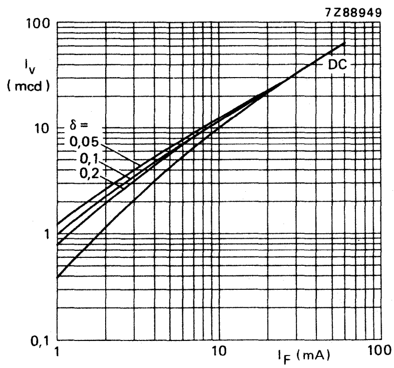


Fig. 7 t_p = 50 μs; typ. values.

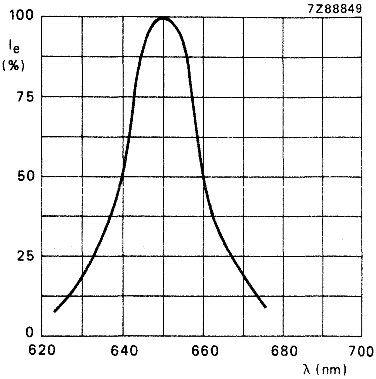


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

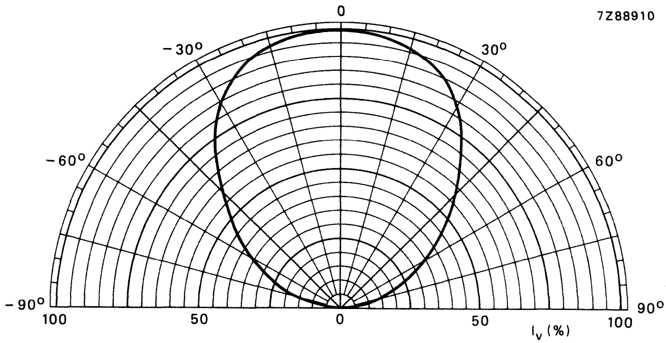


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 1 mm which emit red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased.

The CQW60 and CQW60L have a SOD-75 outline and are encapsulated in a red diffusing resin. These LEDs when stacked in an array (in combination with other SOD-75 LEDs) can be used, for example, as level indicators.

The CQW60L is equal to the CQW60 but has long leads and no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW60(L)	I_v	min.	0,7	mcd
	CQW60(L)-2	I_v		1,0 to 2,2	mcd
	CQW60(L)-3	I_v	min.	1,6	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	630	nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B1.
CQW60

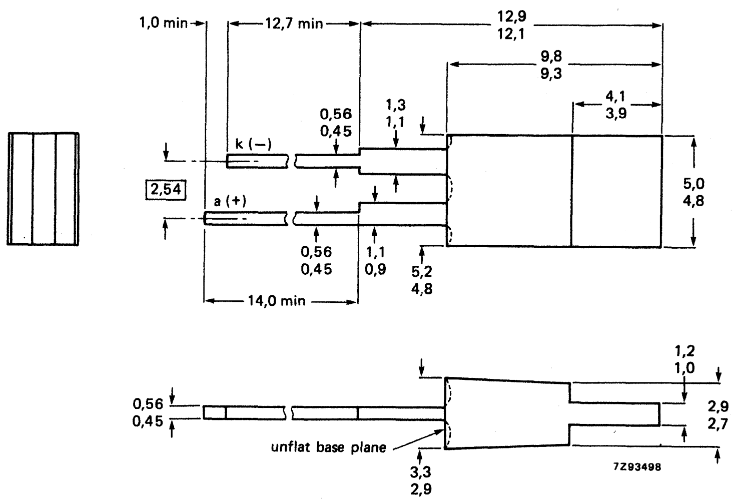
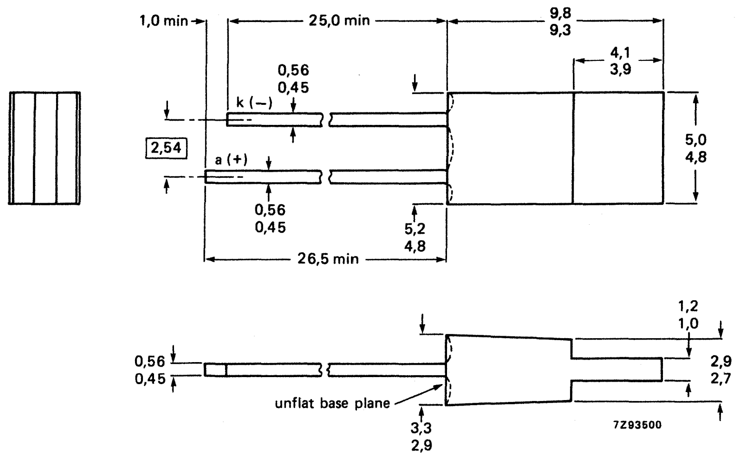


Fig. 1b SOD-75BL.
CQW60L.



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at $t_{sld} < 7$ s > 1,5 mm from the seating plane for CQW60 > 5 mm from the plastic body for CQW60L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	2,1 3,0	V V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{½}$	typ.	110	°
Bandwidth at half height		$\Delta\lambda$	typ.	45	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	630	nm
Luminous intensity I_F = 10 mA	CQW60(L)	I_v	min.	0,7	mcd
	CQW60(L)-2	I_v		1,0 to 2,2	mcd
	CQW60(L)-3	I_v	min.	1,6	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	10	pF

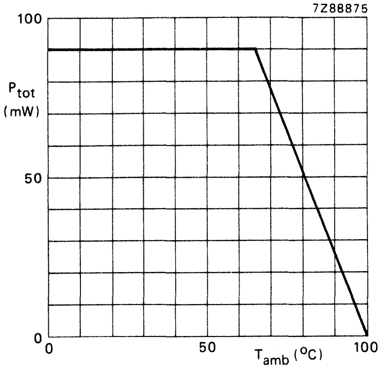


Fig. 2.

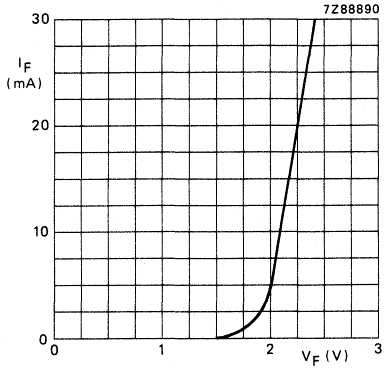


Fig. 3 T_{amb} = 25 °C; typ. values.

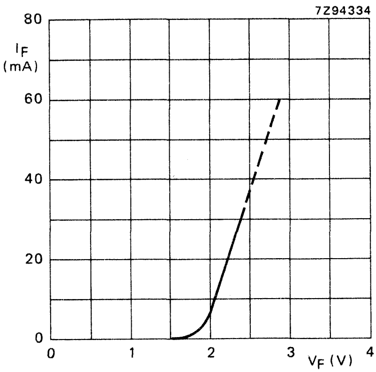


Fig. 4 t_{on} = 50 μs; δ = 0,01

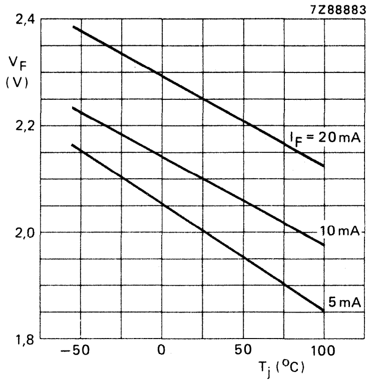


Fig. 5 Typical values.

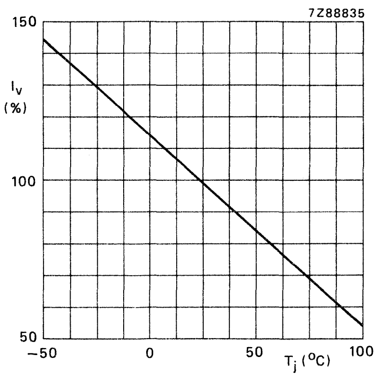


Fig. 6 I_F = 10 mA; typ. values.

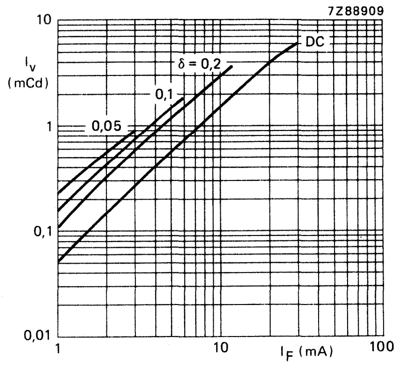


Fig. 7 t_p = 50 μs; typical values.

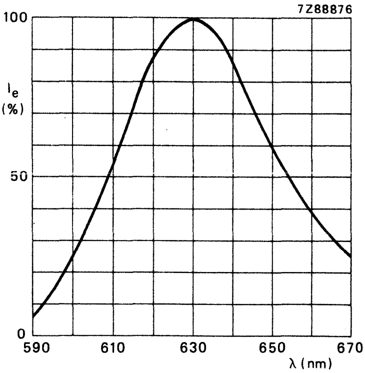


Fig. 8 Typical values.

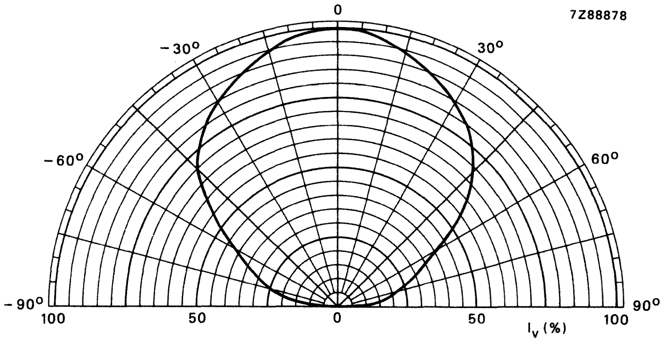


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 1 mm which emit red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQW60A and CQW60AL have a SOD-75 outline and are encapsulated in a red diffusing resin. These LEDs when stacked in an array (in combination with other SOD-75 LEDs) can be used, for example, as level indicators.

The CQW60AL is equal to the CQW60A but has long leads and no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW60A(L)	I_V	min.	0,7	mcd
	CQW60A(L)-3	I_V		1,6 to 3,5	mcd
	CQW60A(L)-4	I_V	min.	3,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Beamwidth between half-intensity directions					
in the plane of the leads		$\theta_{½}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B2.
CQW60A

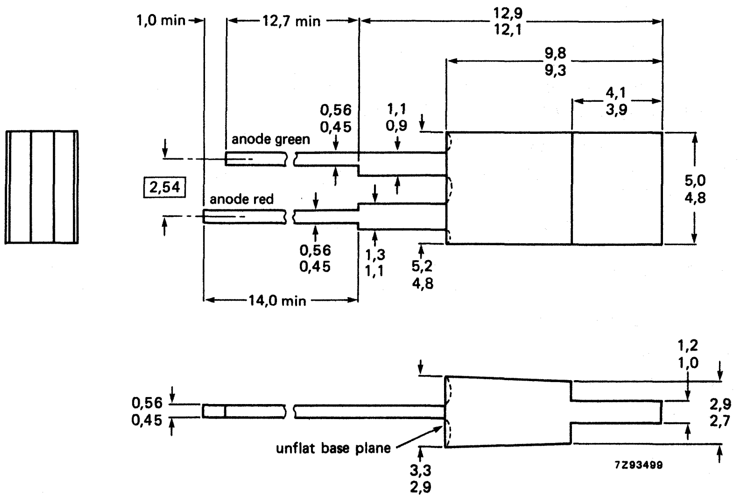
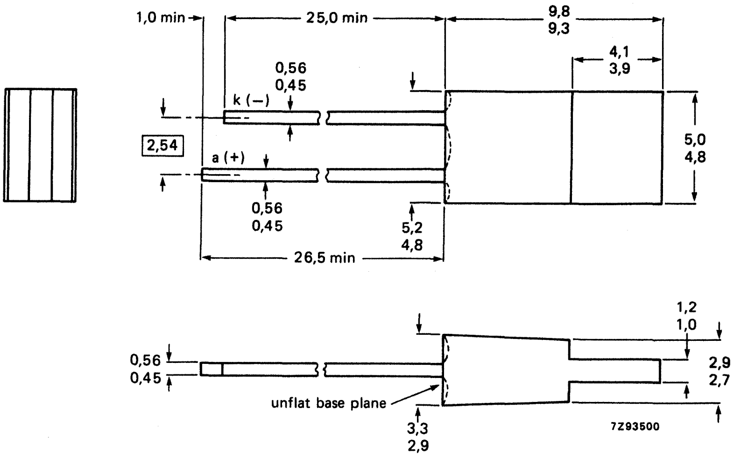


Fig. 1b SOD-75BL.
CQW60AL



Note. Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	100	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	215	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at t_{sld} < 7 s				
> 1,5 mm from the seating plane for CQW60A	T_{sld}	max.	260	°C
> 5 mm from the plastic body for CQW60AL	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	1,75	V
		V_F	max.	2,20	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	650	nm
Luminous intensity					
I_F = 10 mA	CQW60A(L)	I_v	min.	0,7	mcd
	CQW60A(L)-3	I_v		1,6 to 3,5	mcd
	CQW60A(L)-4	I_v	min.	3,0	mcd
Diode capacitance					
V_R = 0, f = 1 MHz		C_d	typ.	80	pF

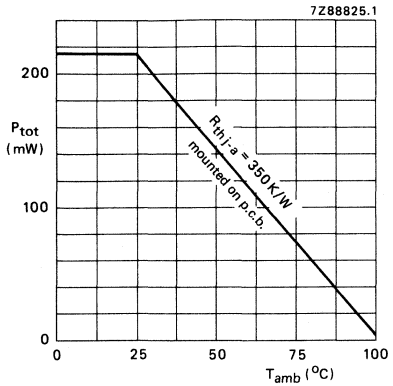


Fig. 2.

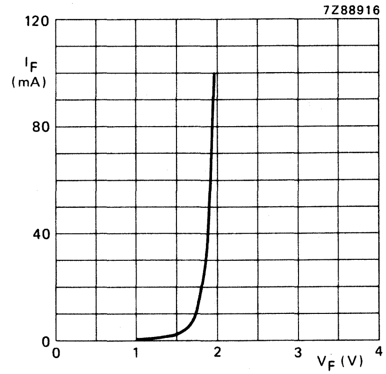


Fig. 3 T_{amb} = 25 ^oC; typ. values.

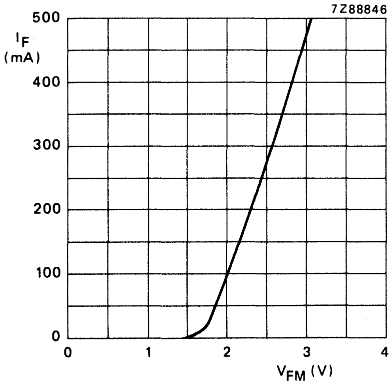


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 ^oC; typ. values.

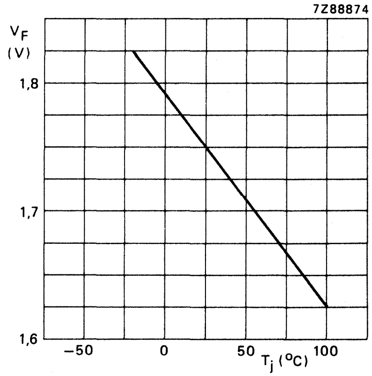


Fig. 5 I_F = 10 mA; typical values.

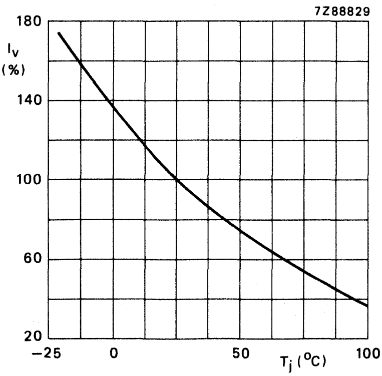


Fig. 6 Typical values.

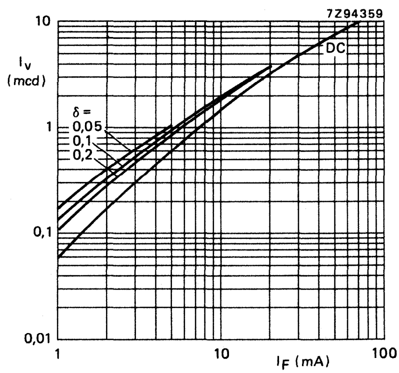


Fig. 7 t_p = 50 μs; typical values.

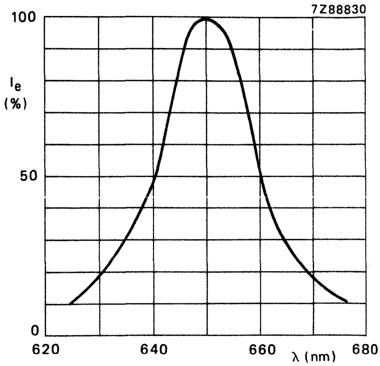


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

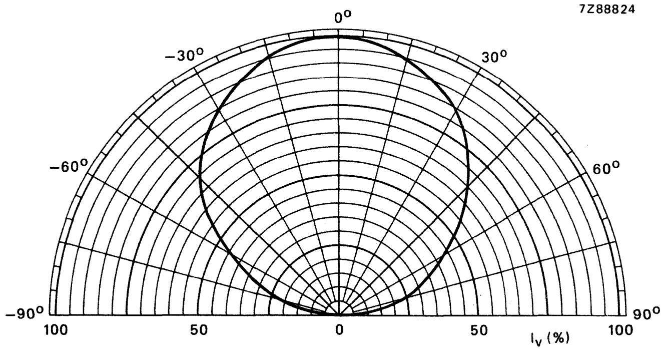


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 1 mm which emit red light at a typical peak wavelength of 700 nm (GaAsP; standard red) when forward biased.

The CQW60U and CQW60UL have a SOD-75 outline and are encapsulated in a red diffusing resin.

The CQW60U and CQW60UL are specially designed for low current applications.

QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity at I_F = 10 mA	I_v	min.	0,7	mcd
Wavelength at peak emission	λ_p	typ.	700	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-75B1.
CQW60U

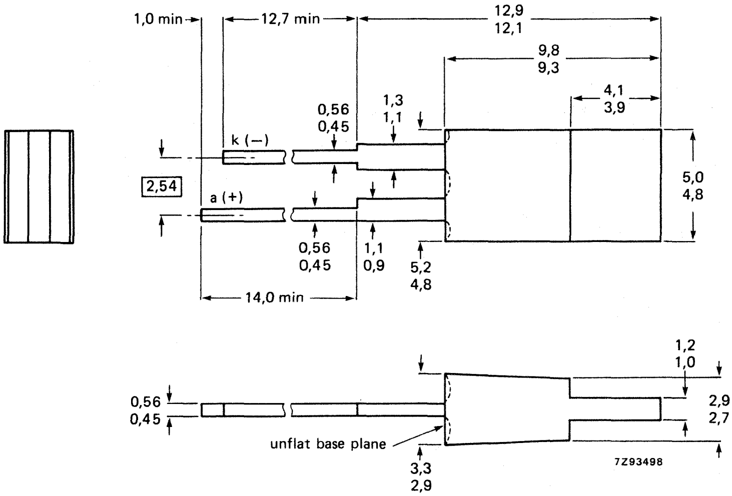
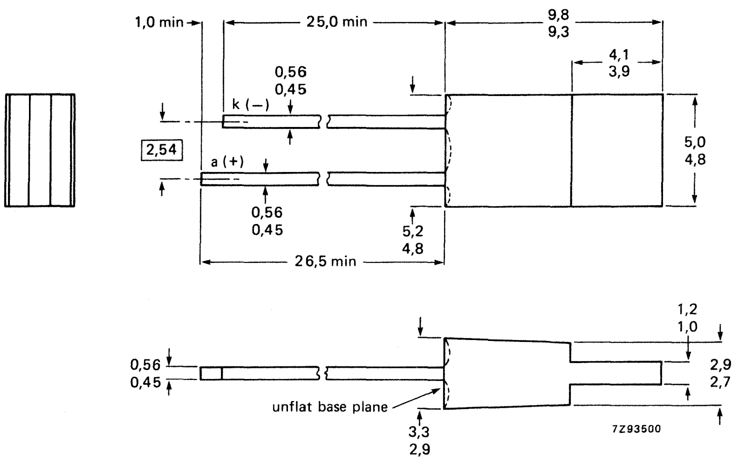


Fig. 1b SOD-75BL.
CQW60UL



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Storage temperature		T_{stg}		−55 to +100 °C
Lead soldering temperature				
> 1,5 mm from the seating plane; t_{sld} < 7 s	CQW60U	T_{sld}	max.	260 °C
> 5 mm from the seating plane; t_{sld} < 7 s	CQW60UL			

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage at I_F = 10 mA		V_F	typ.	2,0 V
			max.	2,6 V
Reverse current at V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions at I_F = 10 mA		$\theta_{1/2}$	typ.	110 °
Wavelength at peak emission at I_F = 10 mA		λ_p	typ.	700 nm
Capacitance at V_R = 0; f = 1 MHz		C_d	typ.	45 pF
Bandwidth at half height		$\Delta\lambda$	typ.	90 nm
Luminous intensity at I_F = 10 mA		I_v	min.	0,7 mcd
	CQW60U(L)-2	I_v	min.	1,0 mcd
			max.	2,2 mcd
	CQW60U(L)-3	I_v	min.	1,6 mcd

DEVELOPMENT DATA

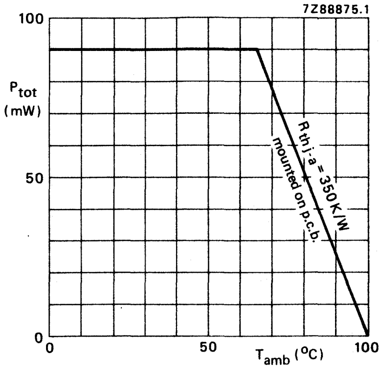


Fig. 2.

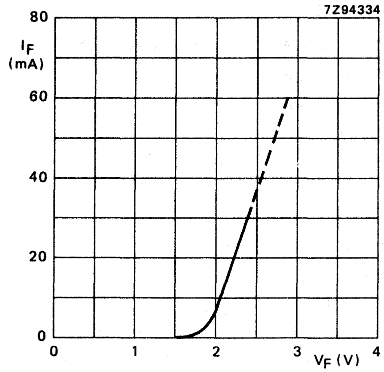


Fig. 3 Typical values.

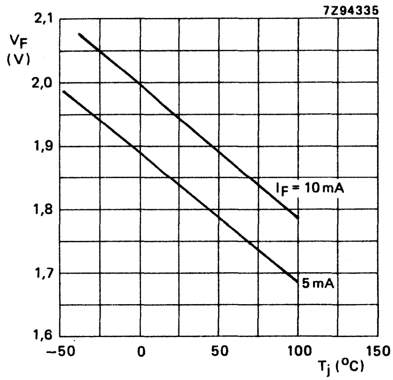


Fig. 4 Typical values.

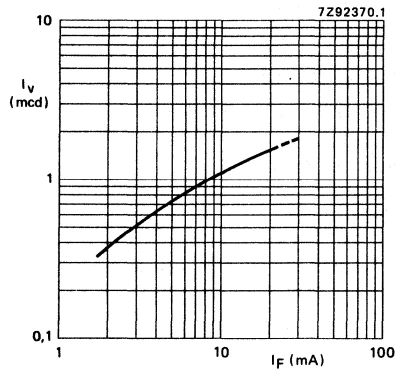


Fig. 5 Typical values.

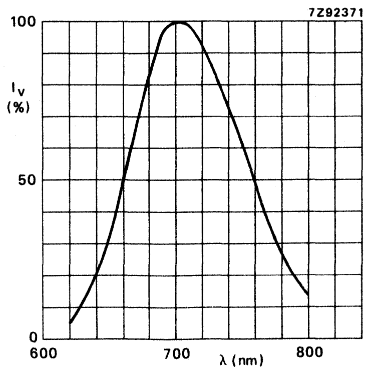


Fig. 6 Typical values.

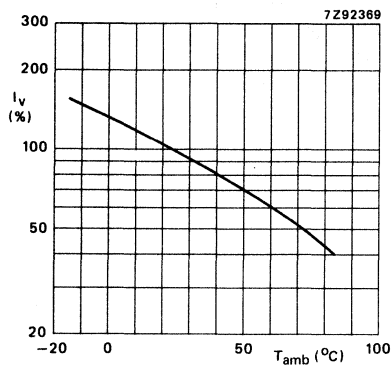


Fig. 7 Typ. values.

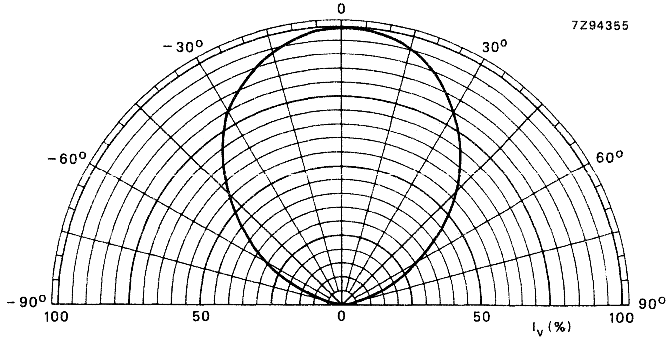


Fig. 8 Typical values.

DEVELOPMENT DATA

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 1 mm which emit green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQW61 and CQW61L have a SOD-75 outline and are encapsulated in a green diffusing resin. These LEDs when stacked in an array (in combination with other SOD-75 LEDs) can be used, for example, as level indicators.

The CQW61L is equal to the CQW61 but has long leads and no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW61(L)	I_V	min.	0,7	mcd
	CQW61(L)-2	I_V		1,0 to 2,2	mcd
	CQW61(L)-3	I_V	min.	1,6	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B1.
CQW61

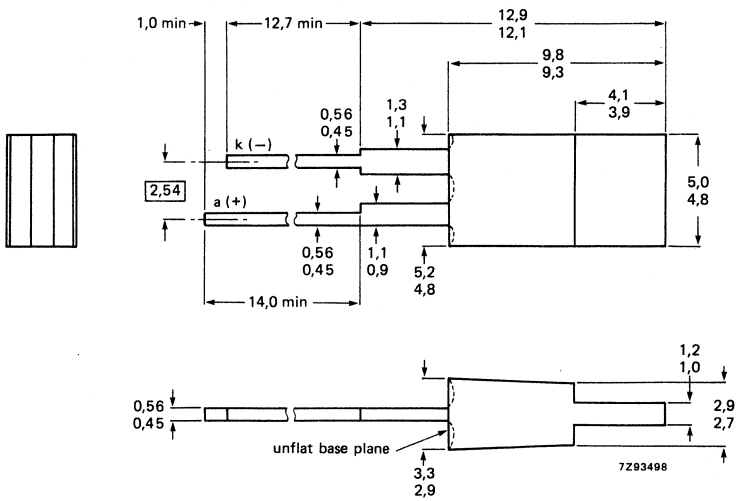
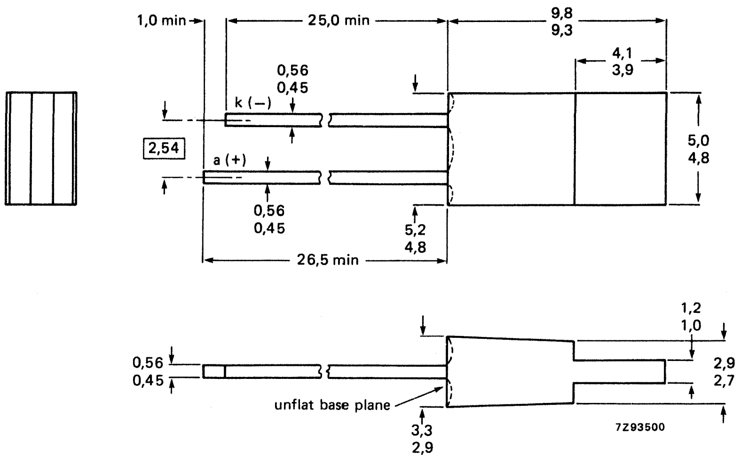


Fig. 1b SOD-75BL.
CQW61L



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	180	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at t_{sld} < 7 s > 1,5 mm from the seating plane for CQW61 > 5 mm from the plastic body for CQW61L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{½}$	typ.	110	°
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQW61(L)	I_v	min.	0,7	mcd
	CQW61(L)-2	I_v		1,0 to 2,2	mcd
	CQW61(L)-3	I_v	min.	1,6	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	20	pF

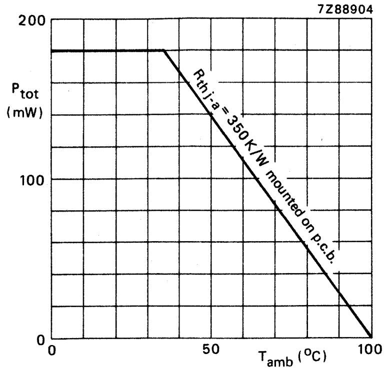


Fig. 2.

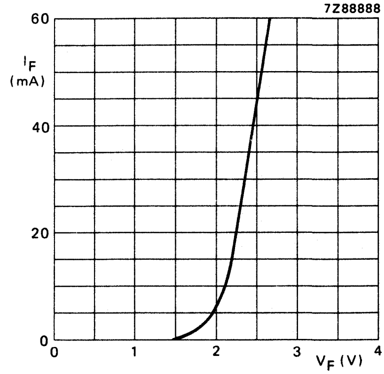


Fig. 3 T_{amb} = 25 °C; typ. values.

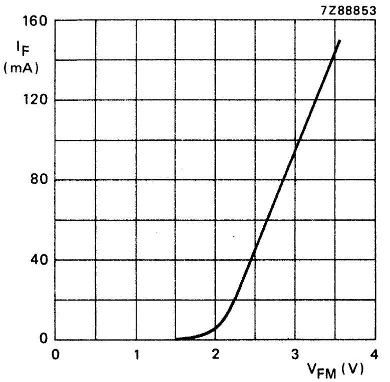


Fig. 4 t_{on} = 50 μs; δ = 0,01; T_{amb} = 25 °C; typ. values.

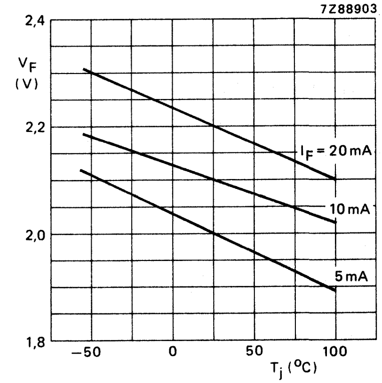


Fig. 5 Typical values.

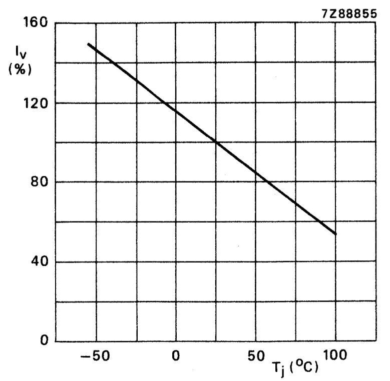


Fig. 6 Typical values.

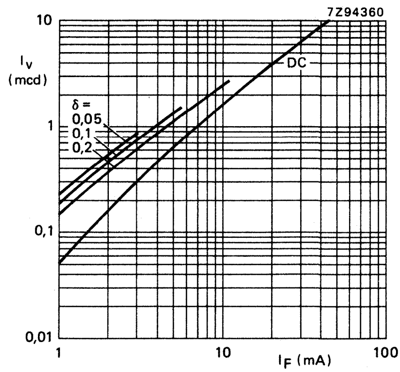


Fig. 7 t_p = 50 μs; typical values.

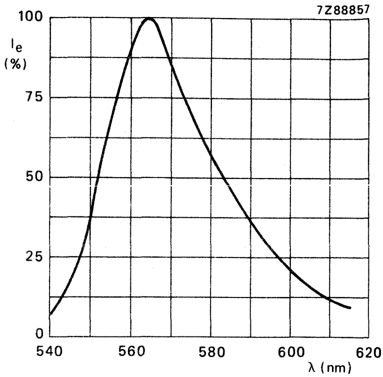


Fig. 8 I_F = 10 mA; typical values.

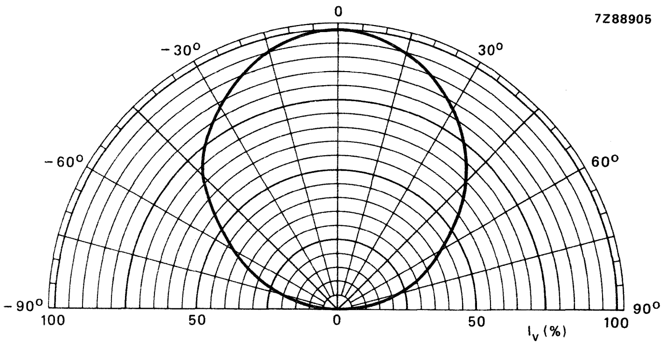


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Rectangular light emitting diodes of 5 mm x 1 mm which emit yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQW62 and CQW62L have a SOD-75 outline and are encapsulated in a yellow diffusing resin. These LEDs when stacked in an array (in combination with other SOD-75 LEDs) can be used, for example, as level indicators.

The CQW62L is equal to the CQW62 but has long leads and no seating plane.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 ^oC		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	^oC
Luminous intensity					
I_F = 10 mA	CQW62(L)	I_v	min.	0,7	mcd
	CQW62(L)-2	I_v		1,0 to 2,2	mcd
	CQW62(L)-3	I_v	min.	1,6	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth between half-intensity directions					
in the plane of the leads		$\theta_{½}$	typ.	110	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B1.
CQW62

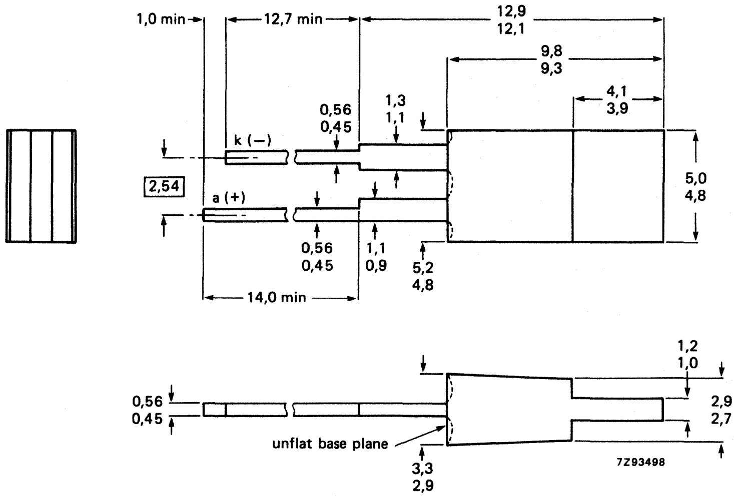
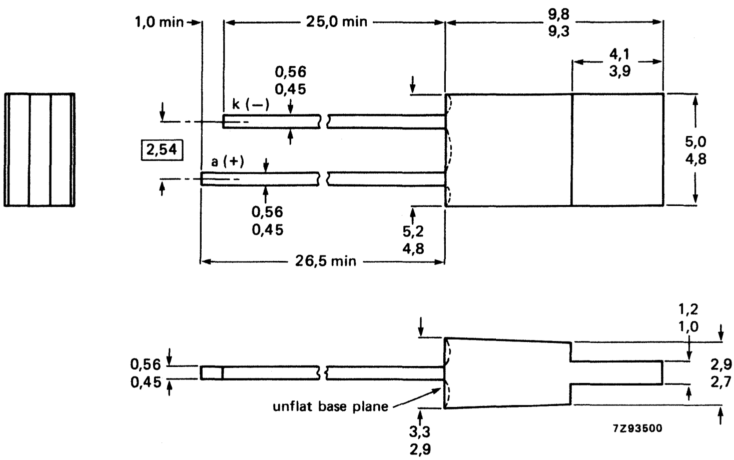


Fig. 1b SOD-75BL.
CQW62L



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature at $t_{sld} < 7$ s $>$ 1,5 mm from the seating plane for CQW62 $>$ 5 mm from the plastic body for CQW62L	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions in the plane of the leads; I_F = 10 mA		$\theta_{½}$	typ.	110	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	590	nm
Luminous intensity I_F = 10 mA	CQW62(L)	I_v	min.	0,7	mcd
	CQW62(L)-2	I_v		1,0 to 2,2	mcd
	CQW62(L)-3	I_v	min.	1,6	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	15	pF

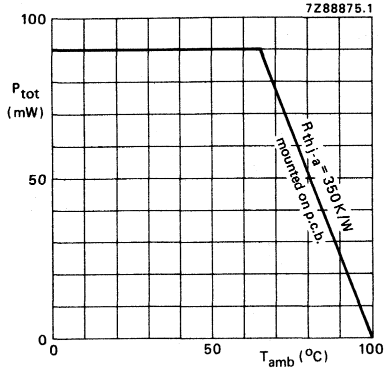


Fig. 2.

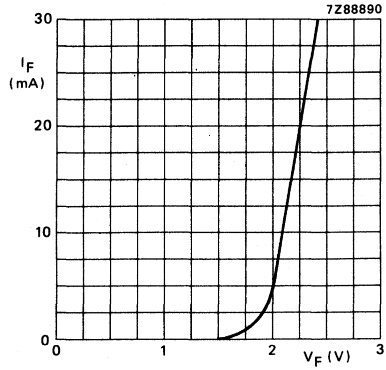


Fig. 3 T_{amb} = 25 °C; typ. values.

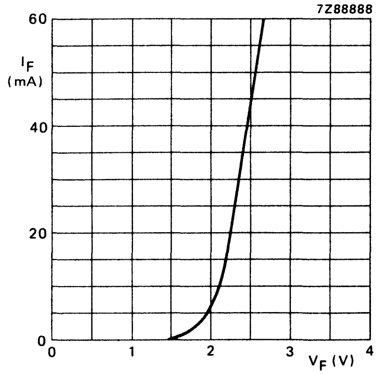


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

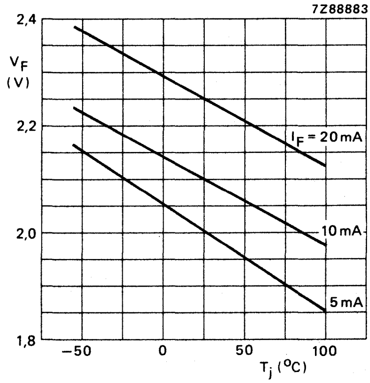


Fig. 5 Typical values.

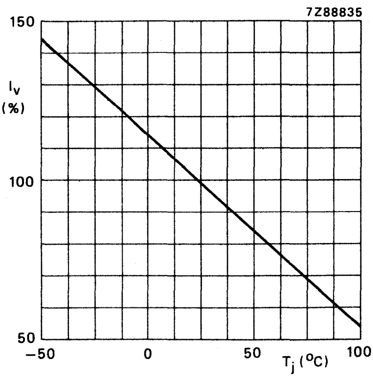


Fig. 6 I_F = 10 mA; typ. values.

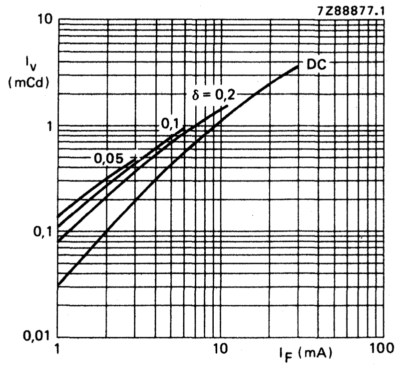


Fig. 7 t_p = 50 μs; typical values.

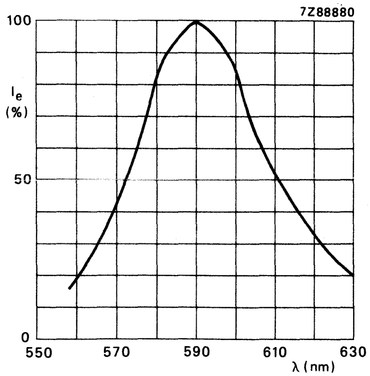


Fig. 8 Typical values.

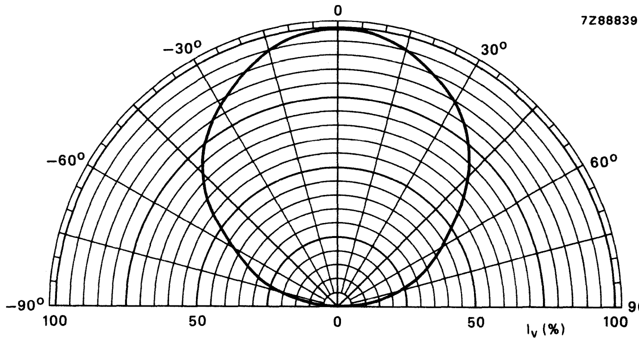


Fig. 9 Typical values.

HIGH-SPEED INFRARED EMITTING DIODE

Circular infrared emitting diode with diameter of 5 mm which emits infrared light at a typical peak wavelength of 830 nm (GaAlAs; infrared) when forward biased.

The CQW89A has a SOD-63 outline and is moulded in a light blue encapsulation with long leads. It is intended for remote control applications using carrier frequencies up to 1 MHz.

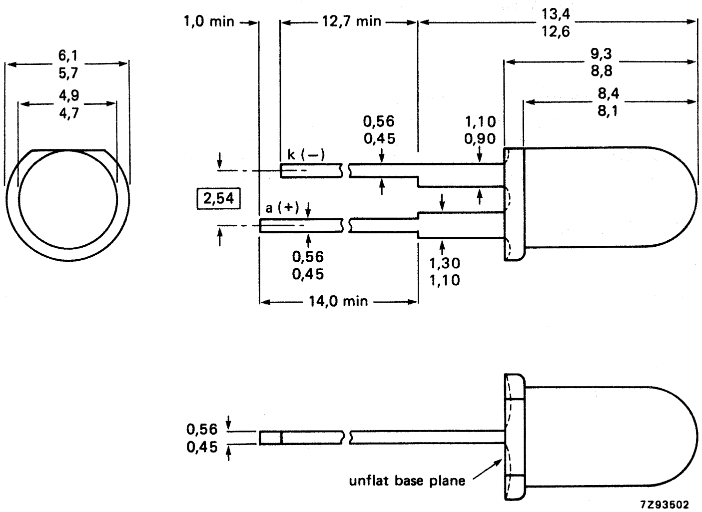
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	130	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	300	mW
Junction temperature		T_j	max.	100	°C
Radiant intensity (on axis)					
I_F = 100 mA	CQW89A	I_e	min.	9	mW/sr
	CQW89A-1	I_e	min.	12	mW/sr
	CQW89A-2	I_e	min.	15	mW/sr
Switching times (see Figs 2 and 3)					
I_F = 100 mA		t_r	typ.	30	ns
		t_f	typ.	30	ns
Wavelength at peak emission		λ_p	typ.	830	nm
Beamwidth at half-intensity directions		$\theta_{½}$	typ.	40	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63D2.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	130 mA
peak value; t_p = 10 μs; δ = 0,01	I_{FM}	max.	2500 mA
peak value; t_p = 50 μs; δ = 0,01	I_{FM}	max.	1500 mA
Total power dissipation up to T_{amb} = 25 ^oC with heatsink	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−55 to +100 ^oC
Junction temperature	T_j	max.	100 ^oC
Lead soldering temperature t_{sld} < 10 s	T_{sld}	max.	260 ^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a printed circuit board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 1,5 A; t_{on} = 50 μs; δ = 0,01		V_F	typ.	3,7 V
Forward voltage I_F = 100 mA		V_F	typ.	1,7 V
			max.	2,2 V
Reverse current V_R = 5 V		I_R	max.	100 μA
Diode capacitance at f = 1 MHz V_R = 0		C_d	typ.	200 pF
Total radiant power I_F = 100 mA		ϕe	typ.	8 mW
Radiant intensity (on axis) I_F = 100 mA	CQW89A	I_e	min.	9 mW/sr
	CQW89A-1	I_e	min.	12 mW/sr
	CQW89A-2	I_e	min.	15 mW/sr
Radiant power temperature coefficient		$k\phi e$	typ.	−0,6 %/K
Wavelength at peak emission I_F = 100 mA		λ_p	typ.	830 nm
Spectral line half width I_F = 100 mA		$\Delta\lambda$	typ.	35 nm
Beamwidth at half-intensity direction I_F = 100 mA		$\theta_{½}$	min.	28 ^{o}
			typ.	40 ^{o}
Switching times (see Figs 2 and 3) I_F = 100 mA		t_r	typ.	30 ns
		t_f	typ.	30 ns

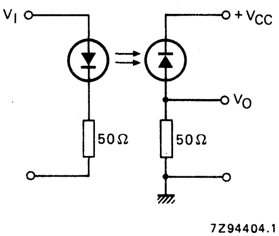


Fig. 2 Measuring circuit.

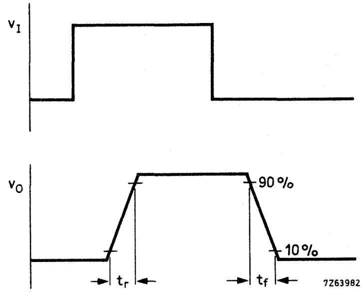


Fig. 3 Waveforms.

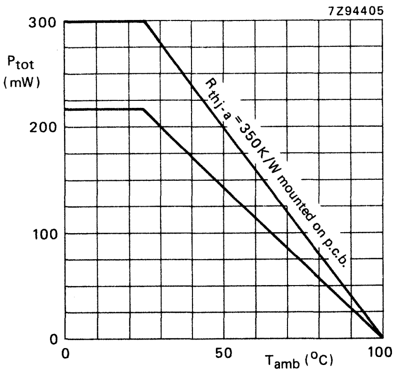


Fig. 4 Typical values.

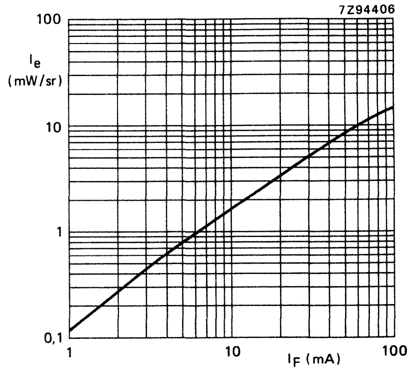


Fig. 5 t_{on} = 10 μs; δ = 0,01; T_{amb} = 25 °C; typical values.

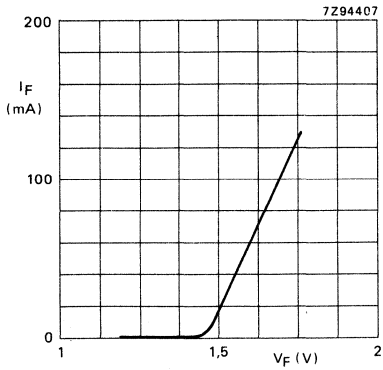


Fig. 6 T_{amb} = 25 °C; typical values.

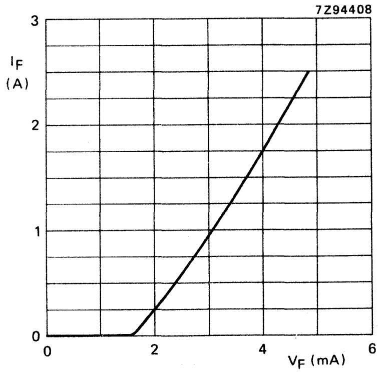


Fig. 7 t_{on} = 10 μs; T_{amb} = 25 °C; typical values.

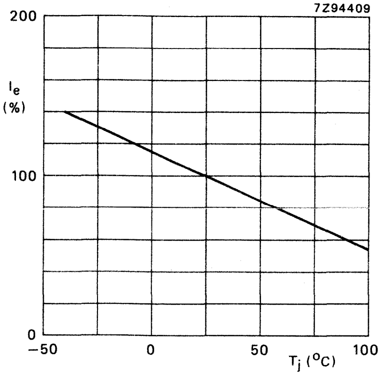


Fig. 8 I_F = 100 mA; typical values.

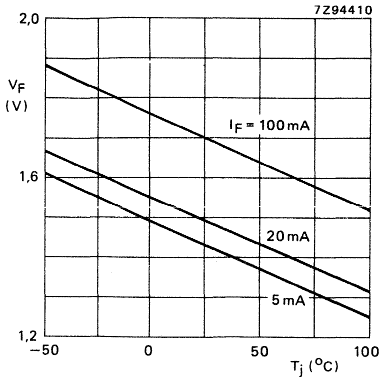


Fig. 9 Typical values.

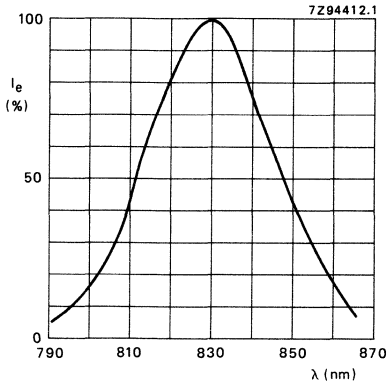


Fig. 10 Spectral response; typical values.

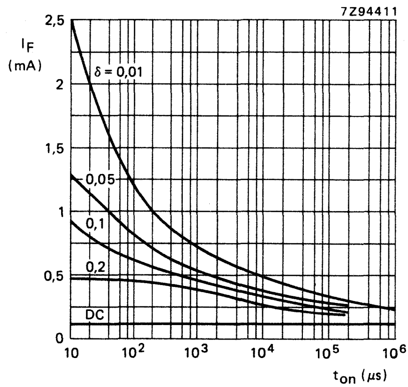


Fig. 11 Typical values.

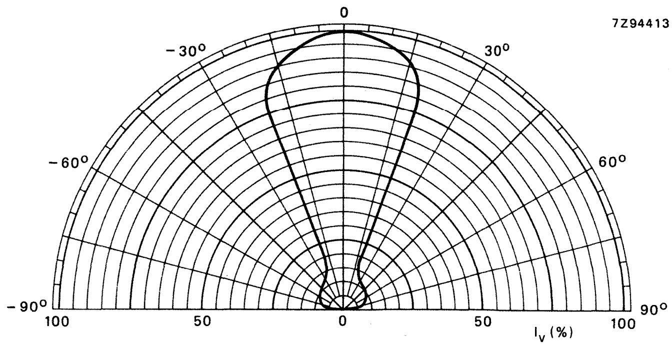


Fig. 12 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 650 nm (GaAlAS; hyper-red) when forward biased. The CQW93 has a SOD-53 outline and is encapsulated in a red non-diffusing resin.

Note: This device has to be used behind a diffusing screen.

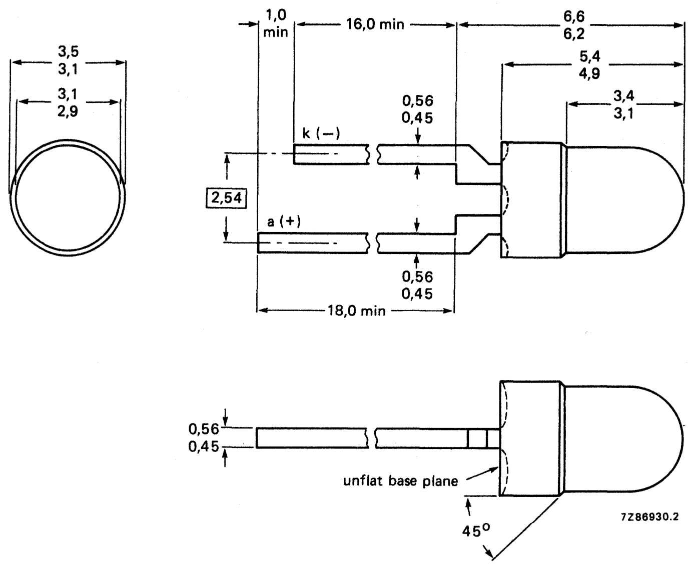
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	150 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity I_F = 10 mA	CQW93	I_v	min.	5 mcd
Wavelength at peak emission		λ_p	typ.	650 nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	60 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 20 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature > 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	1,75	V
			max.	2,2	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	60	°
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission		λ_p	typ.	650	nm
Luminous intensity I_F = 10 mA	CQW93	I_v	min.	5	mcd
	CQW93-5	I_v	min.	5	mcd
			max.	12	mcd
	CQW93-6	I_v	min.	10	mcd
			max.	22	mcd
	CQW93-7	I_v	min.	16	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	80	pF

DEVELOPMENT DATA

LIGHT EMITTING DIODE WITH HIGH LUMINOSITY

Circular light emitting diode with a diameter of 3 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQW95 has a SOD-53 outline and is encapsulated in a green non-diffusing resin.

The CQW95 can resist higher forward currents when high luminosity is required. An appropriate device, for example, for the backlighting of push buttons.

Note: This device has to be used behind a diffusing screen.

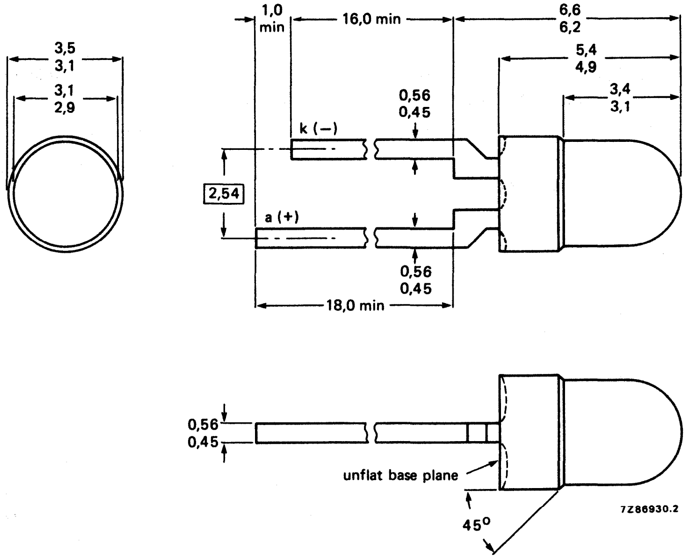
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	150	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW95	I_v	min.	3	mcd
	CQW95-5	I_v		5 to 12	mcd
	CQW95-6	I_v		10 to 22	mcd
	CQW95-7	I_v	min.	16	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	60	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5 V
Forward current			
d.c.	I_F	max.	60 mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	150 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−55 to +100 °C
Junction temperature	T_j	max.	100 °C
Lead soldering temperature $>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 10 mA		V_F	typ.	2,1 V
			max.	3,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	60 °
Bandwidth at half height		$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission		λ_p	typ.	565 nm
Luminous intensity				
I_F = 10 mA	CQW95	I_V	min.	3 mcd
	CQW95-5	I_V		5 to 12 mcd
	CQW95-6	I_V		10 to 22 mcd
	CQW95-7	I_V	min.	16 mcd
Diode capacitance				
V_R = 0; f = 1 MHz		C_d	typ.	20 pF

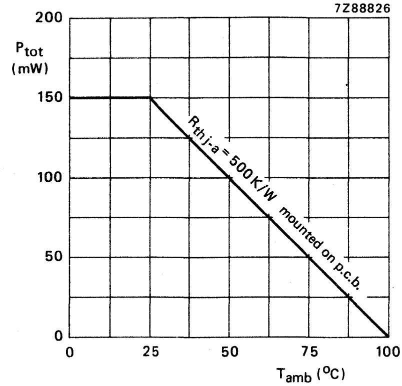


Fig. 2.

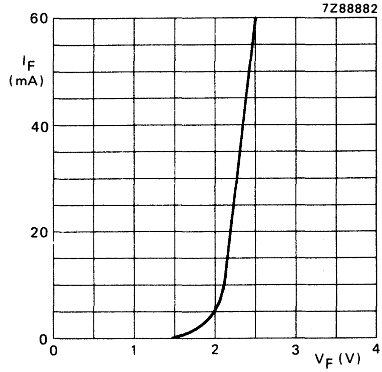


Fig. 3 T_{amb} = 25 °C; typ. values.

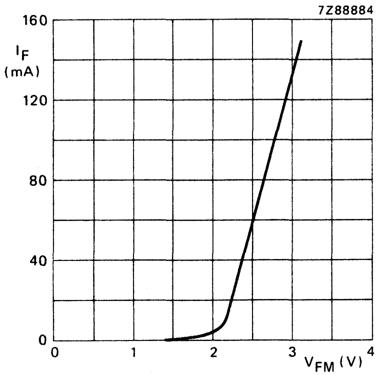


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

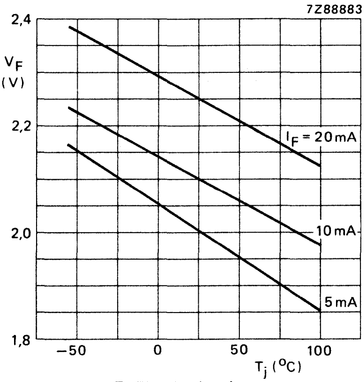


Fig. 5 Typical values.

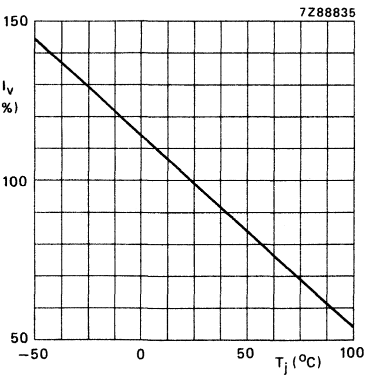


Fig. 6 Typical values.

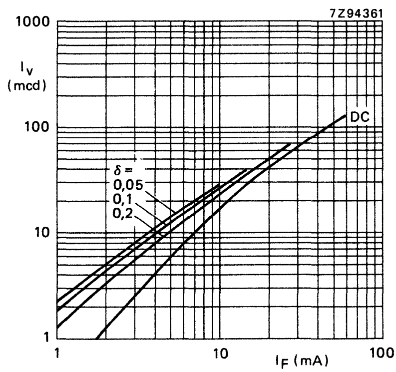


Fig. 7 t_p = 50 μs; typ. values.

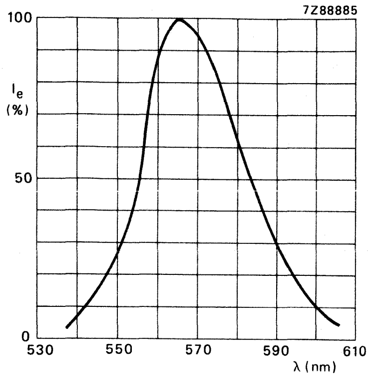


Fig. 8 I_F = 10 mA; typ. values.

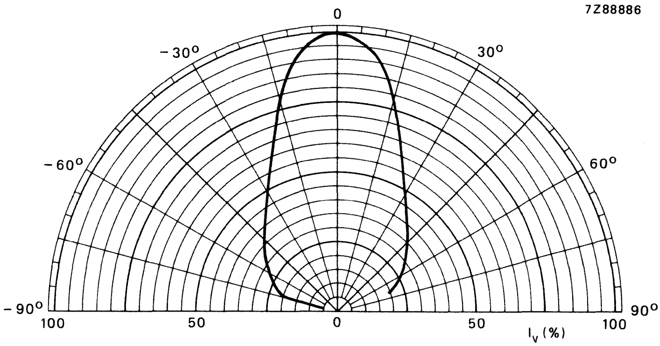


Fig. 9 Typical values.

LIGHT EMITTING DIODE WITH HIGH LUMINOSITY

Circular light emitting diode with a diameter of 3 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQW97 has a SOD-53 outline and is mounted in a yellow non-diffusing resin. An appropriate device, for example, backlighting push button indicators.

Note: This device has to be used behind a diffusing screen.

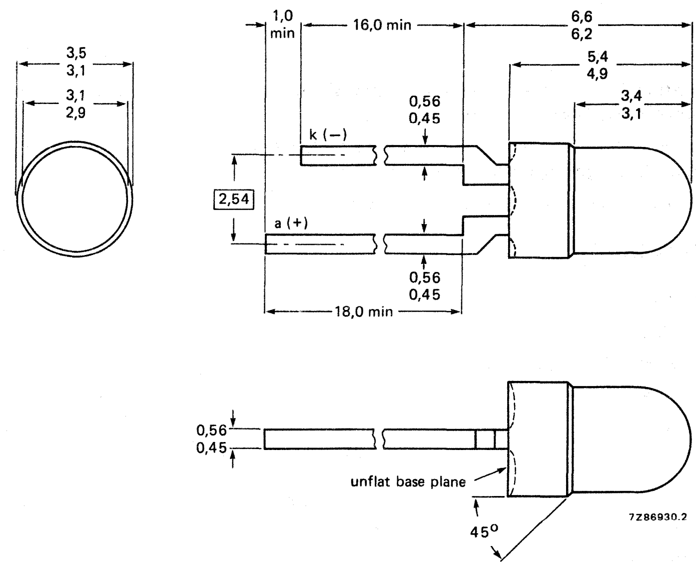
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQW97A	I_V	min.	3	mcd
	CQW97A-5	I_V		5 to 12	mcd
	CQW97A-6	I_V		10 to 22	mcd
	CQW97A-7	I_V	min.	16	mcd
Wavelength at peak emission		λ_p	typ.	590	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	60	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 55 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature $>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{½}$	typ.	60	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	590	nm
Luminous intensity I_F = 10 mA	CQW97A	I_V	min.	3	mcd
	CQW97A-5	I_V		5 to 12	mcd
	CQW97A-6	I_V		10 to 22	mcd
	CQW97A-7	I_V	min.	16	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	15	pF

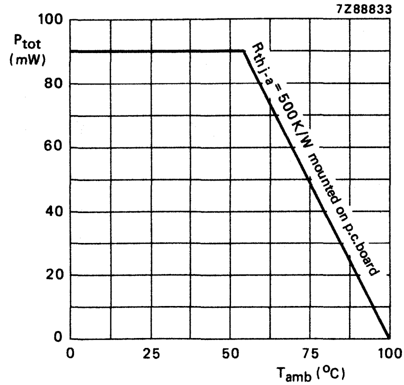


Fig. 2.

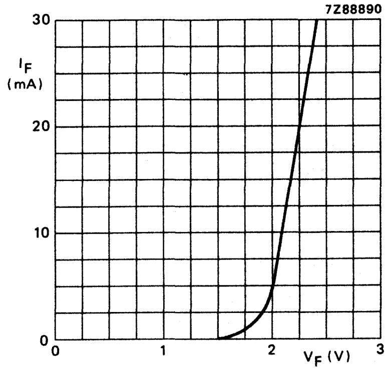


Fig. 3 T_j = 25 °C; typ. values.

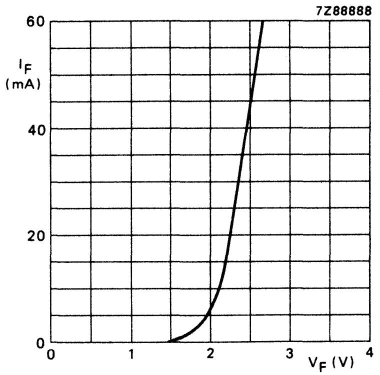


Fig. 4 t_p = 50 μs; δ = 0,01; T_{amb} = 25 °C; typ. values.

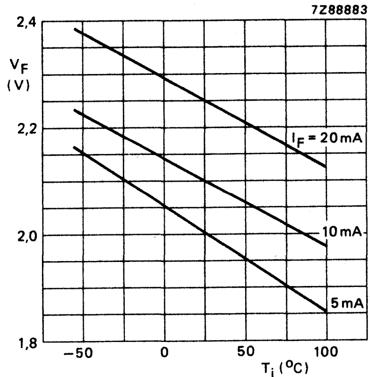


Fig. 5 Typical values.

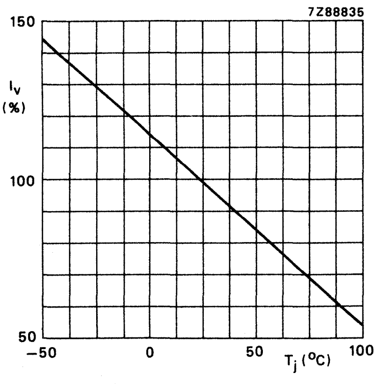


Fig. 6 Typical values.

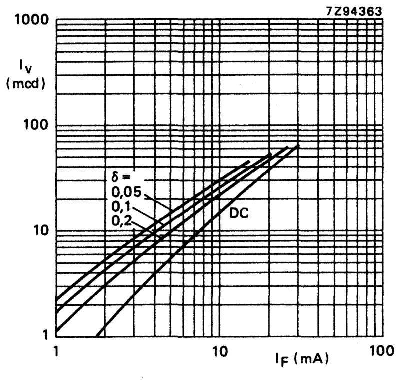


Fig. 7 T_j = 25 °C; typ. values.

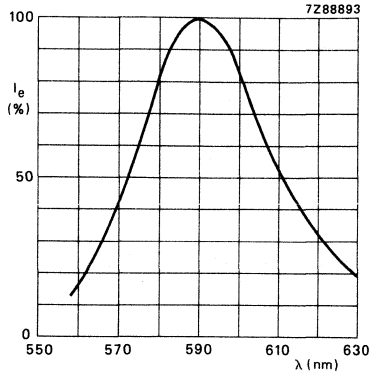


Fig. 8 Typical values.

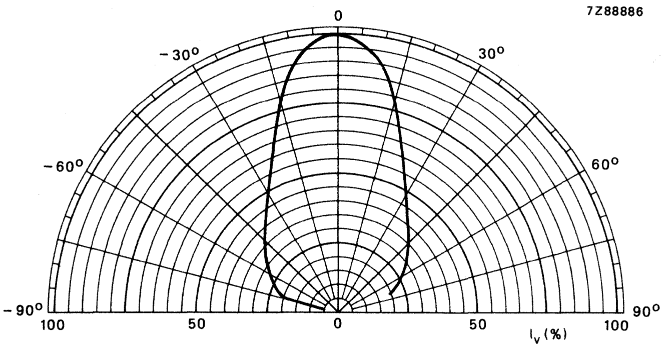


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 3 mm which emit a narrow beam of red light at a typical peak wavelength of 650 nm (GaAlAs; hyper-red) when forward biased.

The CQX24 and CQX24L have a SOD-63 outline and are encapsulated in a clear colourless resin.

The very high light intensity of the CQX24 and CQX24L make them suitable for applications where only low currents are available. They are also suited for very high luminous intensity applications because of their ability to withstand high forward currents.

The CQX24L is the long-lead version of the CQX24 and has no seating plane but is in all other respects equal to the CQX24.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQX24(L)	I_V	min.	16	mcd
	CQX24(L)-8	I_V		30 to 70	mcd
	CQX24(L)-9	I_V		50 to 120	mcd
	CQX24(L)-10	I_V	min.	100	mcd
Wavelength at peak emission		λ_p	typ.	650	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	20	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-63D2.
CQX24

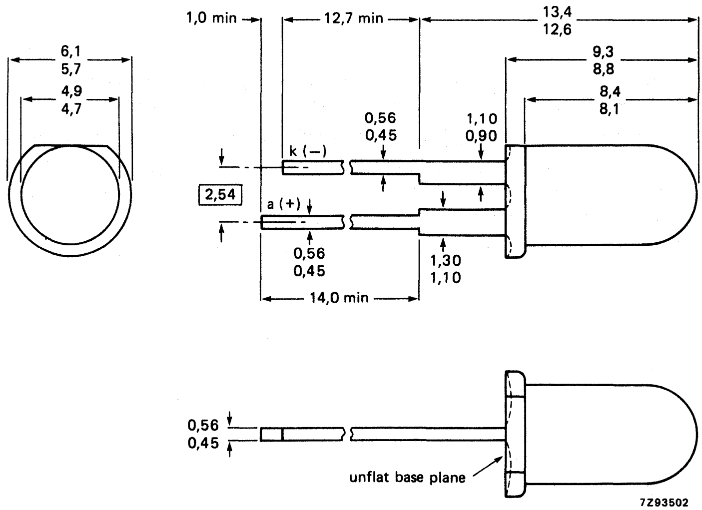
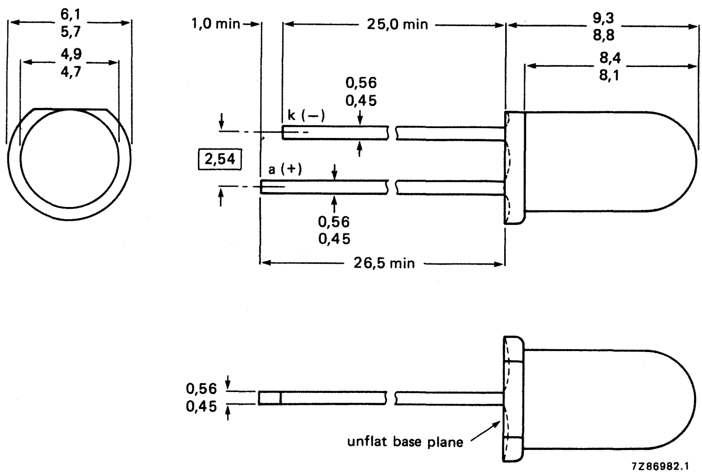


Fig. 1b SOD-63L.
CQX24L



Note. Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5	V
Forward current d.c.		I_F	max.	100	mA
Forward current peak value, $t_p = 1\ \mu s$; f = 300 Hz		I_{FRM}	max.	1	A
peak value, $t_{on} = 20\ \mu s$; $\delta = 0{,}01$		I_{FRM}	max.	500	mA
Total power dissipation up to $T_{amb} = 25\ ^oC$		P_{tot}	max.	215	mW
Storage temperature		T_{stg}		−55 to +100	^oC
Junction temperature		T_j	max.	100	^oC
Lead soldering temperature; $t_{sld} < 7$ s; > 1,5 mm from the seating plane for CQX24; > 5 mm from the plastic body for CQX24L		T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board		$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage $I_F = 10$ mA		V_F	max.	2,2	V
			typ.	1,75	V
$I_F = 50$ mA		V_F	typ.	1,9	V
Reverse current $V_R = 5$ V		I_R	max.	100	μA
Beamwidth between half-intensity directions $I_F = 10$ mA		$\theta_{1/2}$	typ.	20	^{o}
Bandwidt at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission $I_F = 10$ mA; $T_{amb} = 25\ ^oC$		λ_p	typ.	650	nm
Luminous intensity $I_F = 4$ mA	CQX24(L)-8	I_v	typ.	16	mcd
	CQX24(L)-9	I_v	typ.	35	mcd
	CQX24(L)-10	I_v	typ.	50	mcd
$I_F = 10$ mA	CQX24(L)	I_v	min.	16	mcd
	CQX24(L)-8	I_v		30 to 70	mcd
			typ.	50	mcd
	CQX24(L)-9	I_v		50 to 120	mcd
			typ.	80	mcd
	CQX24(L)-10	I_v	min.	100	mcd
			typ.	120	mcd
$I_F = 50$ mA	CQX24(L)-8	I_v	typ.	200	mcd
	CQX24(L)-9	I_v	typ.	400	mcd
	CQX24(L)-10	I_v	typ.	600	mcd

→ Diode capacitance
$V_R = 0$; f = 1 MHz | C_d | typ. | 80 pF

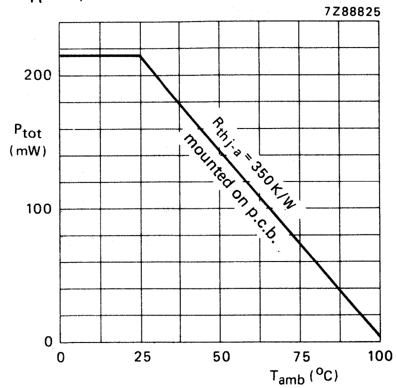


Fig. 2.

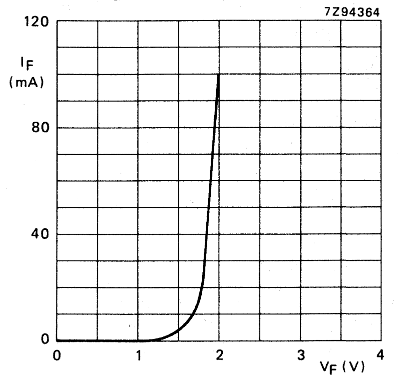


Fig. 3 Typical values; T_{amb} = 25 °C.

→

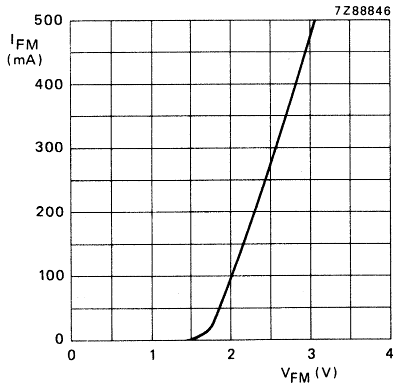


Fig. 4 t_{on} = 20 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

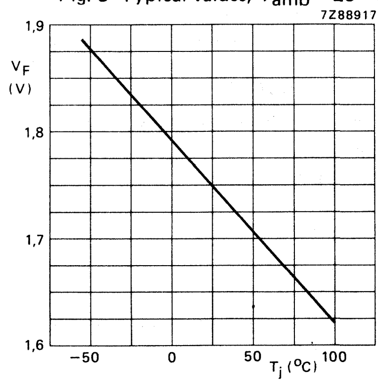


Fig. 5 I_F = 10 mA; typ. values.

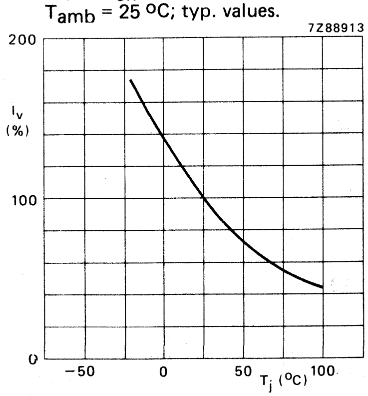


Fig. 6 Typical values.

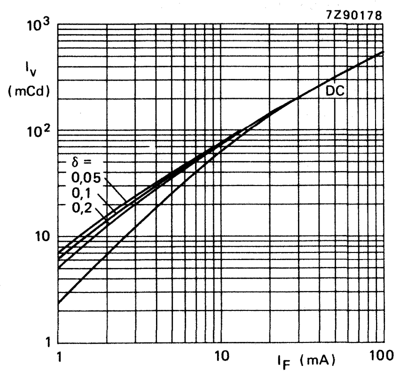


Fig. 7 t_p = 50 μs; typ. values.

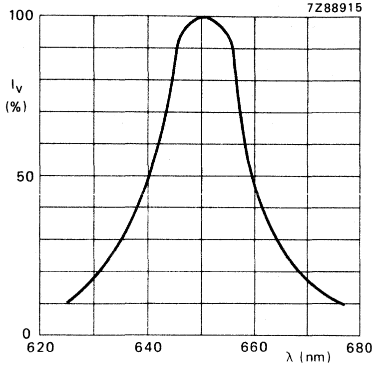


Fig. 8 I_F = 10 mA; T_{amb} = 25 °C; typ. values.

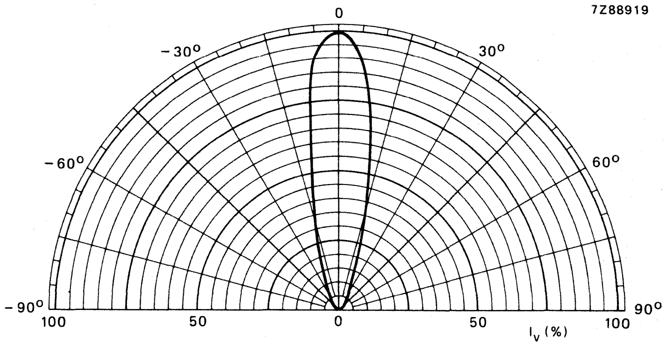


Fig. 9.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 5 mm which emits red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased.

The CQX51 and CQX51L have a SOD-63 outline and are encapsulated in a red diffusing resin.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Luminous intensity at I_F = 10 mA	CQX51	I_v	min.	1,6	mcd
	CQX51-4	I_v		3 to 7	mcd
	CQX51-5	I_v		5 to 12	mcd
	CQX51-6	I_v	min.	10	mcd
Wavelength at peak emission		λ_p	typ.	630	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63A1.
CQX51

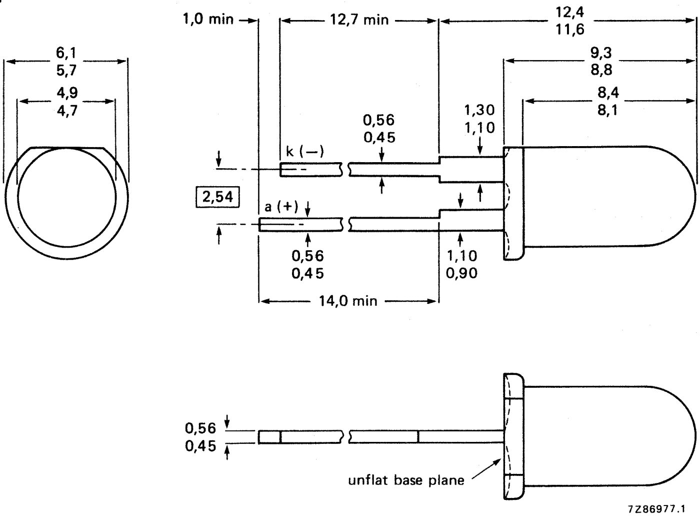
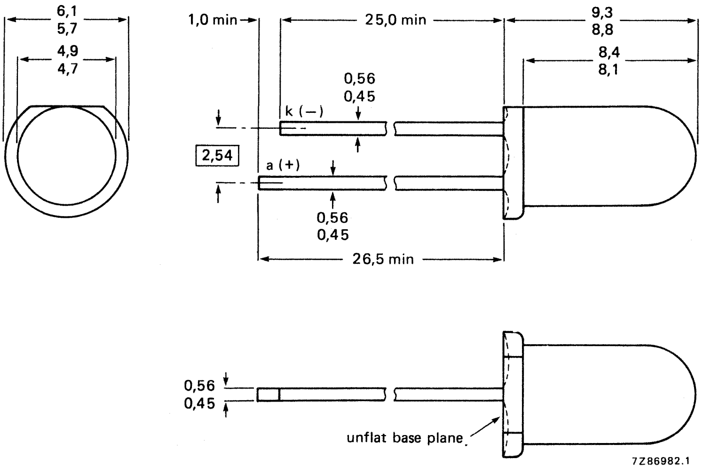


Fig. 1b SOD-63L.
CQX51L



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Forward current peak value; t_{on} = 1 ms; δ = 0,33 peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	 max. max.	 60 1	 mA A
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature > 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	230	^oC

THERMAL RESISTANCE

From junction to ambient mounted on a printed-circuit board	$R_{th\ j\text{-}a}$	min.	350	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1 5	V V
Reverse current V_R = 5 V		I_R	max.	100	μA
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	10	pF
Luminous intensity (on-axis) I_F = 10 mA	CQX51	I_v	min.	1,6	mcd
	CQX51-4	I_v		3 to 7	mcd
	CQX51-5	I_v		5 to 12	mcd
	CQX51-6	I_v	min.	10	mcd
Wavelength at peak emission		λ_p	typ.	630	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	70	^{o}

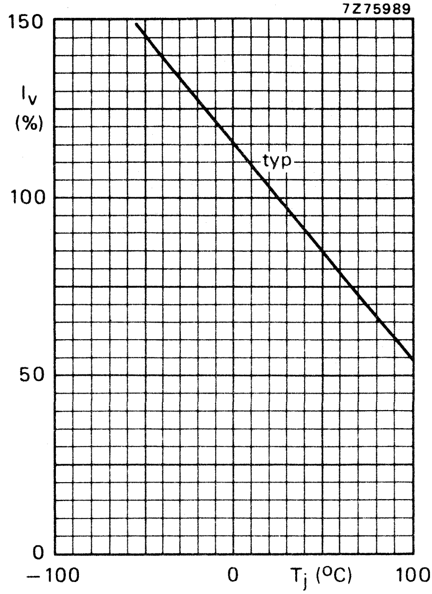


Fig. 2 I_F = 10 mA.

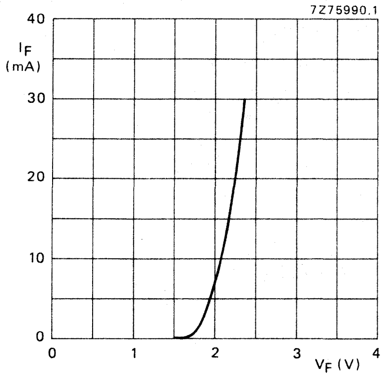


Fig. 3 T_j = 25 °C.

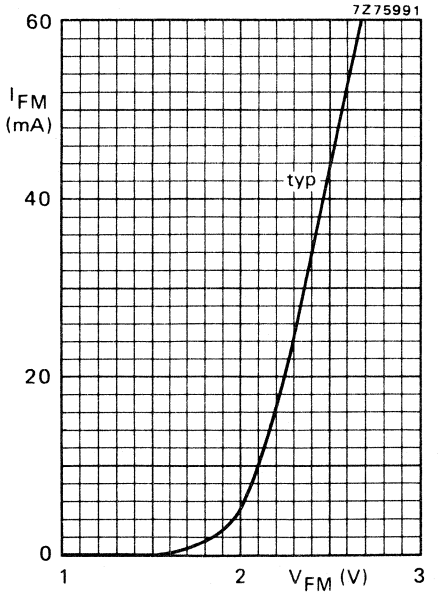


Fig. 4 t_p = 50 μs; T = 5 ms; T_j = 25 °C.

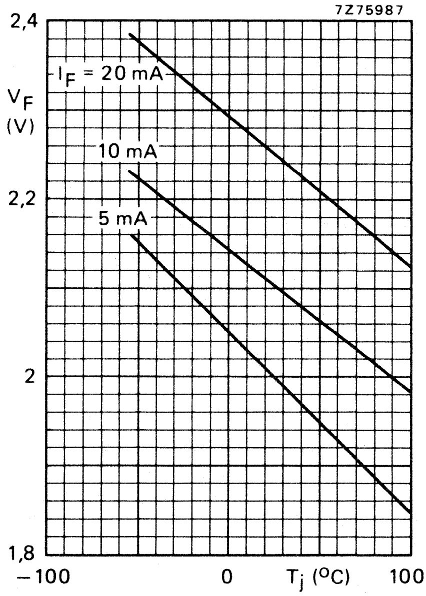


Fig. 5 Typical values.

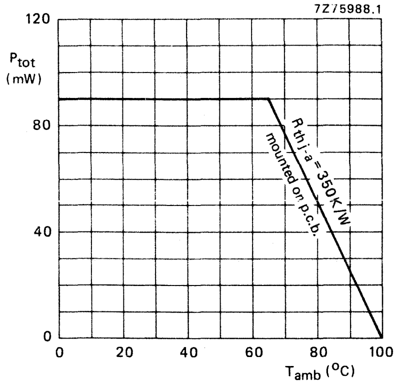


Fig. 6.

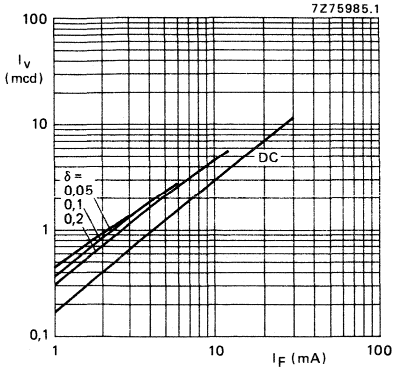


Fig. 7 T_{amb} = 25 °C.

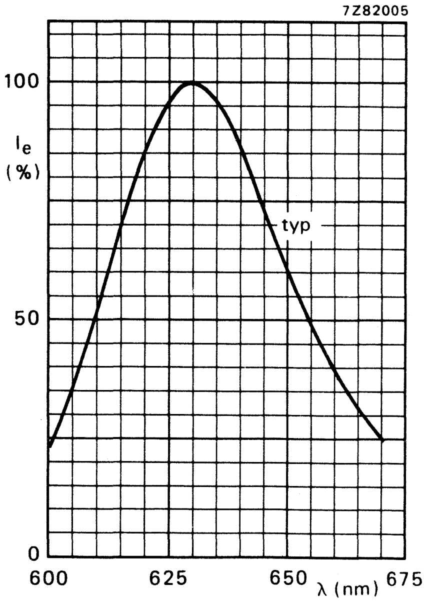


Fig. 8 Typical values.

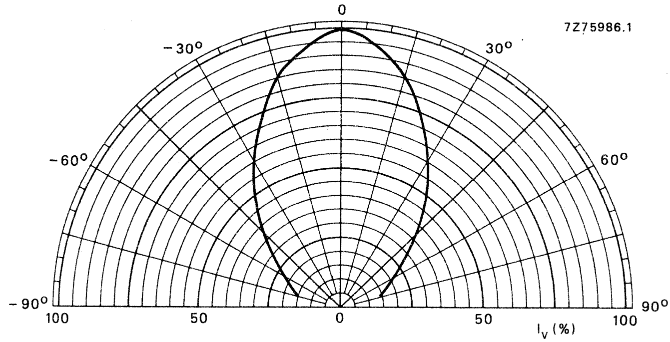


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit a narrow beam of red light at a typical peak wavelength of 630 nm (GaAsP/GaP; super-red) when forward biased.

The CQX54 and CQX54L have a SOD-63 outline and are encapsulated in a clear diffusing resin.

The CQX54L is the long-lead version of the CQX54 and has no seating plane but is in all other respects equal to the CQX54.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQX54(L)	I_V	min.	10	mcd
	CQX54(L)-7	I_V		16 to 35	mcd
	CQX54(L)-8	I_V		30 to 70	mcd
	CQX54(L)-9	I_V	min.	50	mcd
Wavelength at peak emission		λ_p	typ.	630	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	20	°

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-63D1.
CQX54

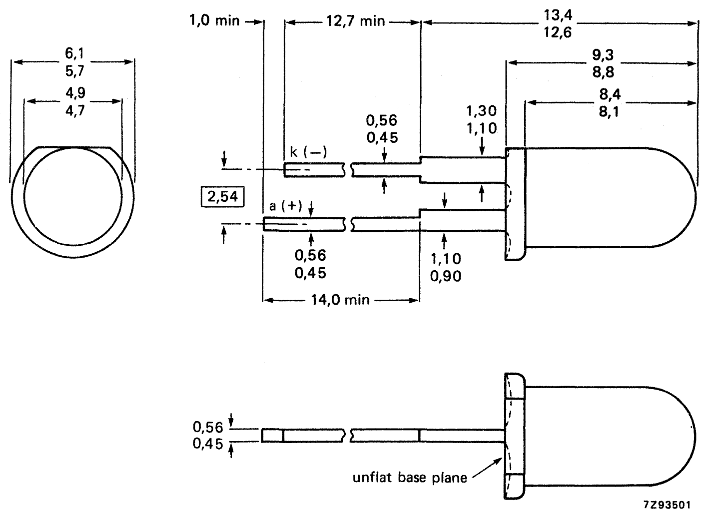
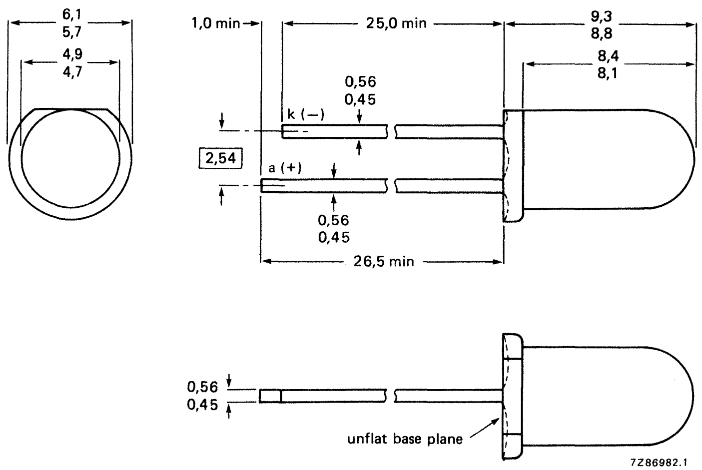


Fig. 1b SOD-63L.
CQX54L



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current d.c.		I_F	max.	30 mA
Forward current peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 ^{o}C		P_{tot}	max.	90 mW
Storage temperature		T_{stg}		−55 to +100 ^{o}C
Junction temperature		T_j	max.	100 ^{o}C
Lead soldering temperature; $t_{sld} < 7$ s $>$ 1,5 mm from the seating plane for CQX54 $>$ 5 mm from the plastic body for CQX54L		T_{sld}	max.	260 ^{o}C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_j = 25 ^{o}C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1 V	
			max.	3,0 V	
Reverse current V_R = 5 V		I_R	max.	100 μA	
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	20 ^{o}	
Bandwidth at half height		$\Delta\lambda$	typ.	45 nm	←
Wavelength at peak emission		λ_p	typ.	630 nm	
Luminous intensity I_F = 10 mA	CQX54(L)	I_V	min.	10 mcd	←
	CQX54(L)-7	I_V		16 to 35 mcd	
	CQX54(L)-8	I_V		30 to 70 mcd	
	CQX54(L)-9	I_V	min.	50 mcd	
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	10 pF	←

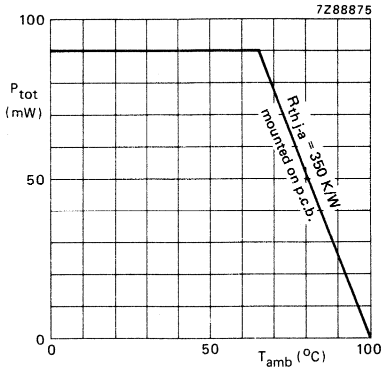


Fig. 2.

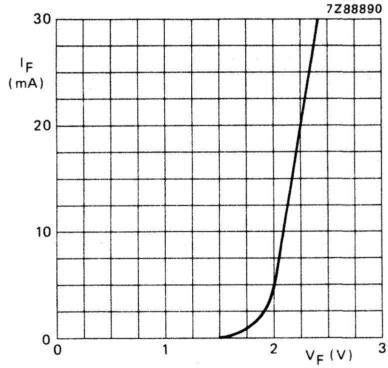


Fig. 3 T_{amb} = 25 °C; typ. values.

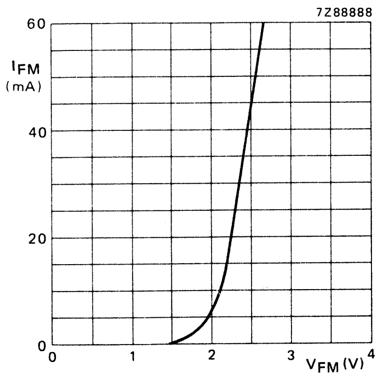


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

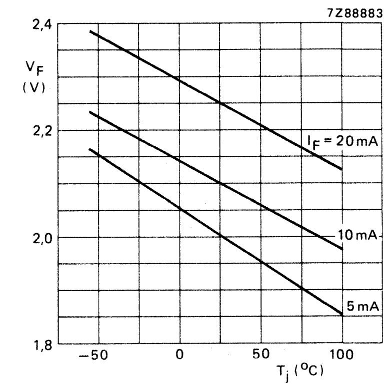


Fig. 5 Typical values.

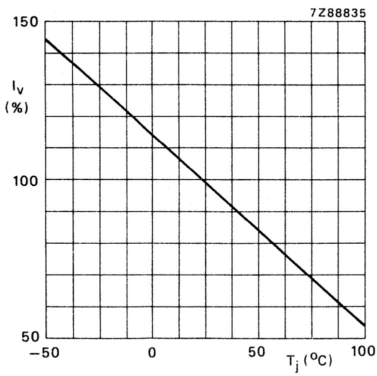


Fig. 6 Typical values.

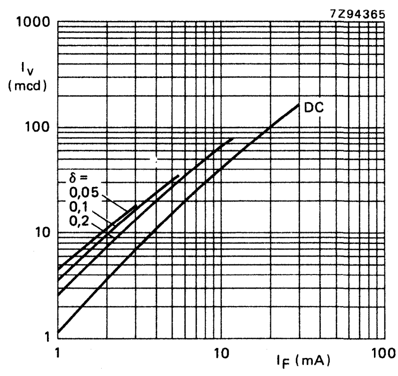


Fig. 7 t_p = 50 μs; typ. values.

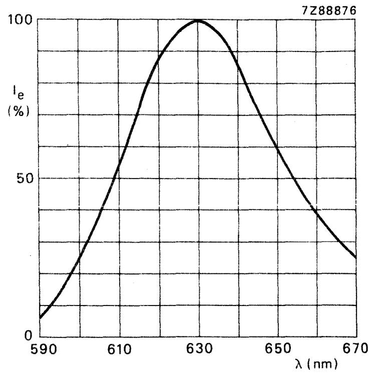


Fig. 8 Typical values.

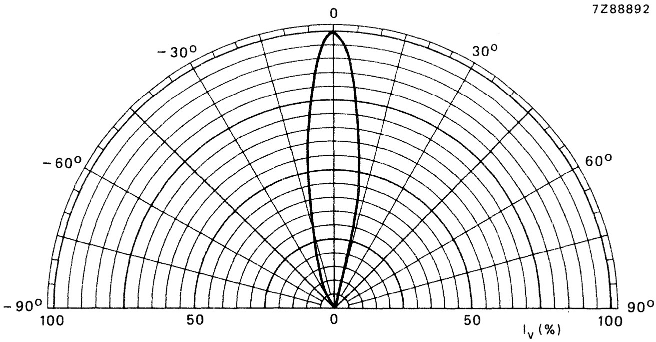


Fig. 9 I_F = 10 mA; typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 5 mm which emits red light at a typical peak wavelength of 630 nm (GaPAs; super-red) when forward biased.

The CQX54D has a SOD-63 outline and is encapsulated in a clear diffusing resin.

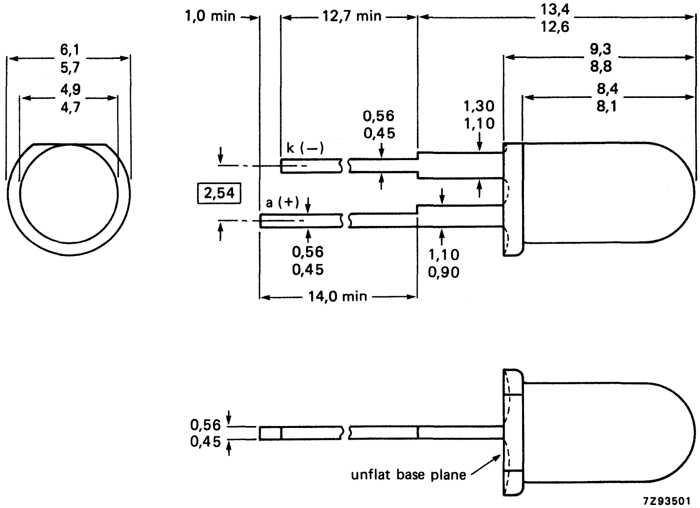
QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	^oC
Luminous intensity at I_F = 10 mA	I_v	min.	3	mcd
Wavelength at peak emission	λ_p	typ.	630	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	30	^{o}

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63D1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	30 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
peak value; t_{on} = 1 ms; δ = 0,33		I_{FRM}	max.	60 mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Storage temperature		T_{stg}		−55 to +100 °C
Lead soldering temperature				
> 1,5 mm from the seating plane; t_{sld} < 7 s		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage				
at I_F = 10 mA		V_F	typ.	2,1 V
			max.	3,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions				
at I_F = 10 mA		$\theta_{½}$	typ.	30 ° ←
Bandwidth at half height		$\Delta\lambda$	typ.	45 nm
Wavelength at peak emission				
at I_F = 10 mA		λ_p	typ.	630 nm
Capacitance				
at V_R = 0; f = 1 MHz		C_d	typ.	35 pF
Luminous intensity				
at I_F = 10 mA	CQX54D	I_v	min.	3 mcd
	CQX54D-5	I_v	min.	5 mcd
			max.	12 mcd
	CQX54D-6	I_v	min.	10 mcd
			min.	22 mcd
	CQX54D-7	I_v	min.	16 mcd

DEVELOPMENT DATA

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit a narrow beam of green light at a typical peak wavelength of 565 nm (GaP, super-green) when forward biased.

The CQX64 and CQX64L have a SOD-63 outline and are encapsulated in a clear resin. Because of their resistance to high forward currents, the CQX64 and CQX64L are suitable for applications where high luminous intensity is required and applications where only low currents are available.

The CQX64L is the long-lead version of the CQX64 and has no seating plane but is in all other respects equal to the CQX64.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQX64(L)	I_V	min.	10	mcd
	CQX64(L)-7	I_V		16 to 35	mcd
	CQX64(L)-8	I_V		30 to 70	mcd
	CQX64(L)-9	I_V	min.	50	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	20	°

MECHANICAL DATA

Dimensions in mm

→ Fig. 1 SOD-63DI.

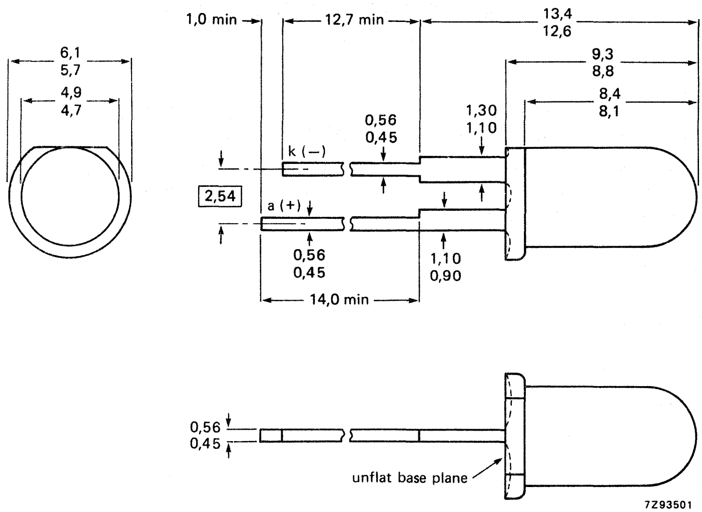
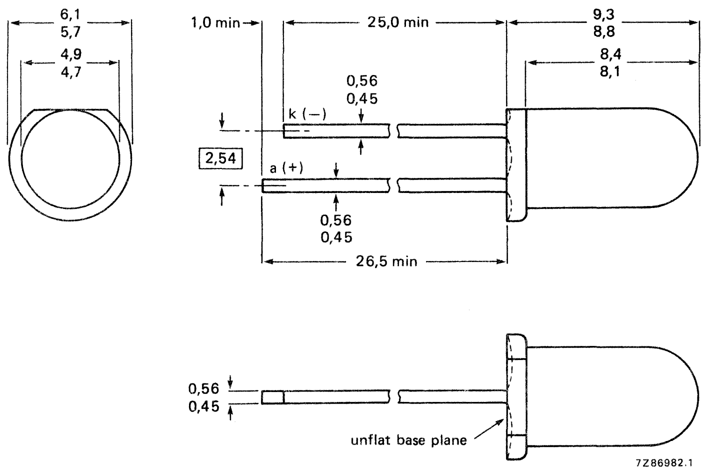


Fig. 1b SOD-63L.
CQX64L



→ **Note:** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	60	mA
Forward current peak value, t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	180	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature; $t_{sld} < 7$ s; > 1,5 mm from the seating plane for CQX64; > 5 mm from the plastic body for CQX64L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
		V_F	max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	20	°
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission		λ_p	typ.	565	nm
Luminous intensity I_F = 10 mA	CQX64(L)	I_v	min.	10	mcd ←
	CQX64(L)-7	I_v		16 to 35	mcd
	CQX64(L)-8	I_v		30 to 70	mcd
	CQX64(L)-9	I_v	min.	50	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	20	pF ←

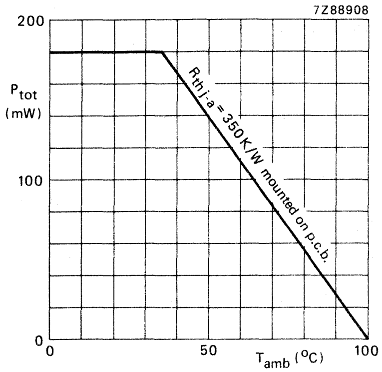


Fig. 2.

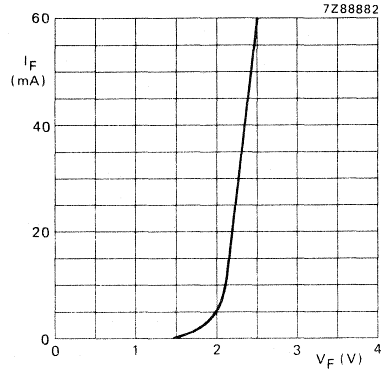


Fig. 3 T_{amb} = 25 °C; typ. values.

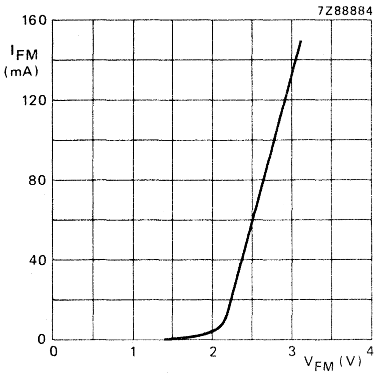


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

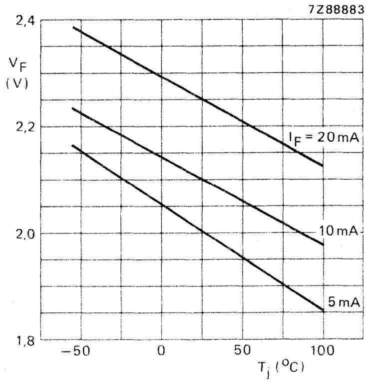


Fig. 5 Typical values.

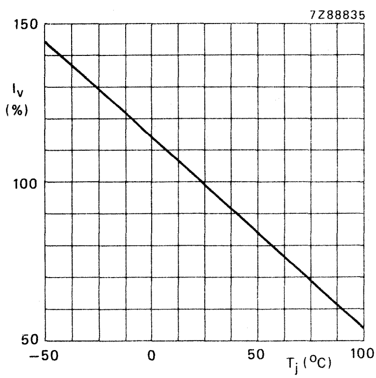


Fig. 6 Typical values.

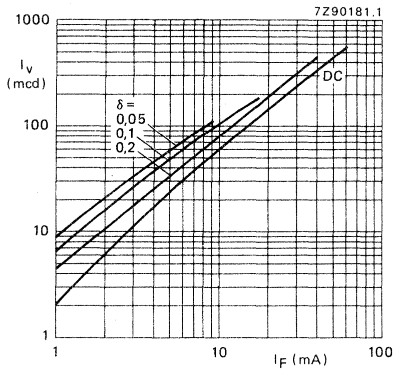


Fig. 7 t_p = 50 μs; typ. values.

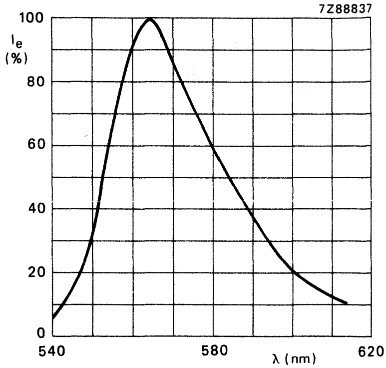


Fig. 8 I_F = 10 mA; typ. values.

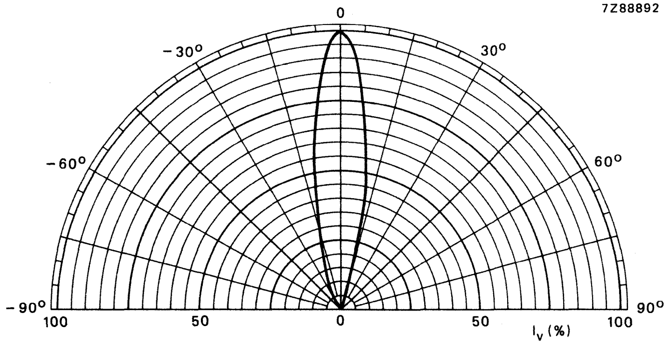


Fig. 9 I_F = 10 mA; typ. values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 5 mm which emits green light at a typical peak wavelength of 565 nm (GaP) when forward biased.

The CQX64D has a SOD-63 outline and is encapsulated in a green diffusing resin.

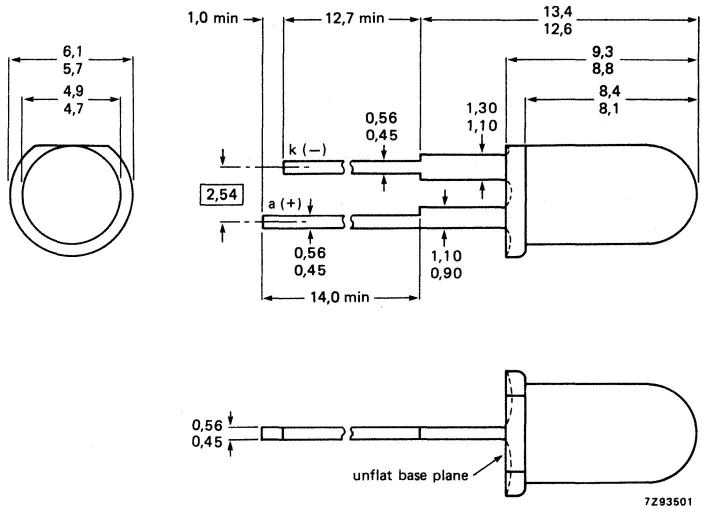
QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity at I_F = 10 mA	I_V	min.	3	mcd
Wavelength at peak emission	λ_p	typ.	565	nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	30	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63D1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value, t_p = 1 μs; f = 300 Hz		max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 35 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	100	°C
Storage temperature	T_{stg}		−55 to +100	°C
Lead soldering temperature				
> 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage					
at I_F = 10 mA		V_F	typ.	2,1	V
			max.	3	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions					
at I_F = 10 mA		$\theta_{1/2}$	typ.	30	°
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission					
at I_F = 10 mA		λ_p	typ.	565	nm
Capacitance					
at V_R = 0; f = 1 MHz		C_d	typ.	35	pF
Luminous intensity					
at I_F = 10 mA	CQX54D	I_v	min.	3	mcd
	CQX54D-5	I_v	min.	5	mcd
			max.	12	mcd
	CQX54D-6	I_v	min.	10	mcd
			min.	22	mcd
	CQX54D-7	I_v	min.	16	mcd

DEVELOPMENT DATA

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit a narrow beam of yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQX74 and CQX74L have a SOD-63 outline and are encapsulated in a clear resin.

The CQX74L is the long-lead version of the CQX74 and has no seating plane but is in all other respects equal to the CQX74.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
I_F = 10 mA	CQX74(L)	I_V	min.	10 mcd
	CQX74(L)-7	I_V		16 to 35 mcd
	CQX74(L)-8	I_V		30 to 70 mcd
	CQX74(L)-9	I_V	min.	50 mcd
Wavelength at peak emission		λ_p	typ.	590 nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	20 °

MECHANICAL DATA Dimensions in mm

Fig. 1a SOD-63DI.
CQX74

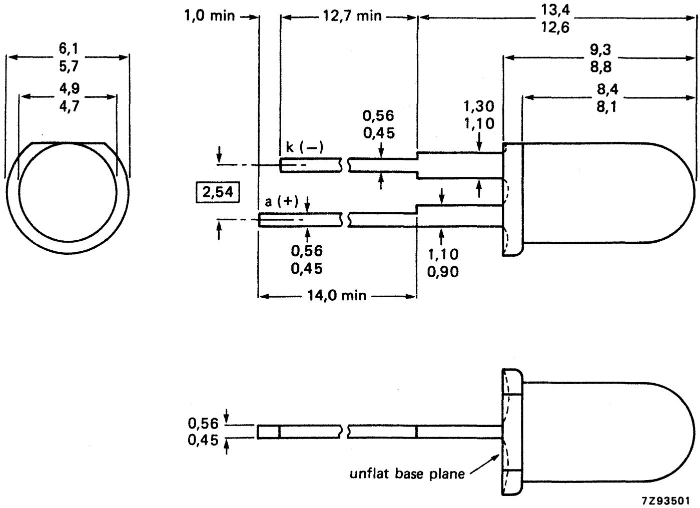
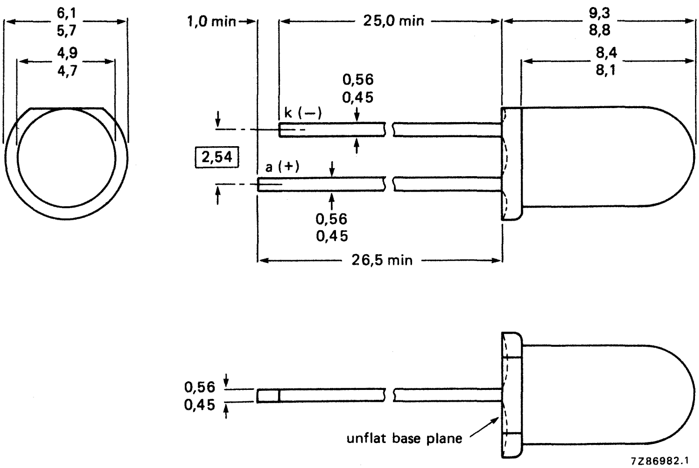


Fig. 1b SOD-63L.
CQX74L



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	30	mA
Forward current peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature; t_{sld} < 7 s; > 1,5 mm from the seating plane for CQX74; > 5 mm from the plastic body for CQX74L	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	2,1	V
		V_F	max.	3,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{½}$	typ.	20	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	590	nm
Luminous intensity I_F = 10 mA	CQX74(L)	I_v	min.	10	mcd ←
	CQX74(L)-7	I_v		16 to 35	mcd
	CQX74(L)-8	I_v		30 to 70	mcd
	CQX74(L)-9	I_v	min.	50	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	15	pF ←

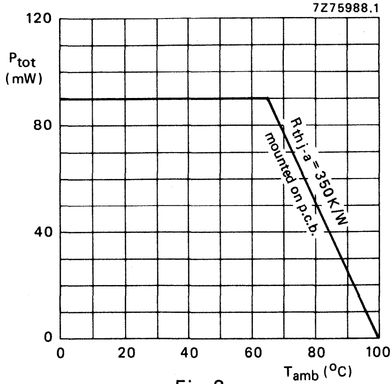


Fig. 2.

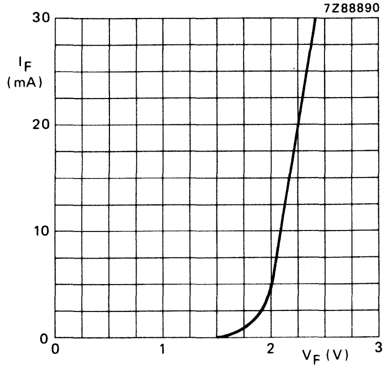


Fig. 3 T_j = 25 °C; typ. values.

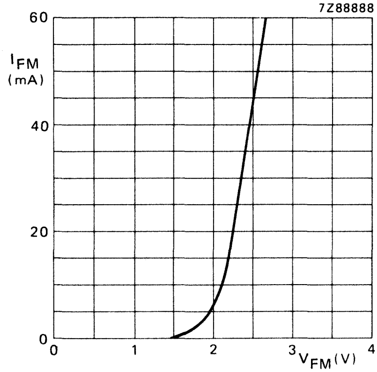


Fig. 4 t_{on} = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

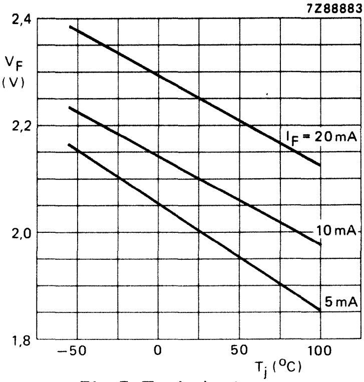


Fig. 5 Typical values.

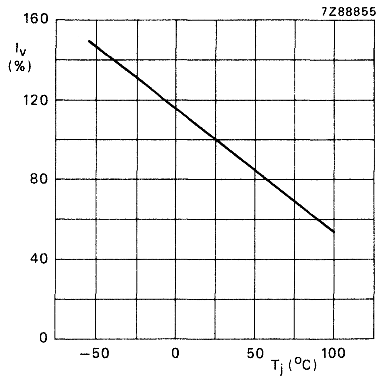


Fig. 6 I_F = 10 mA; typ. values.

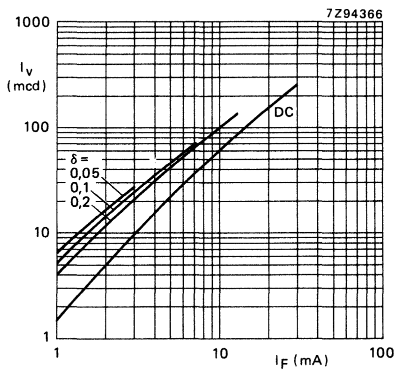


Fig. 7 t_p = 50 μs; typ. values.

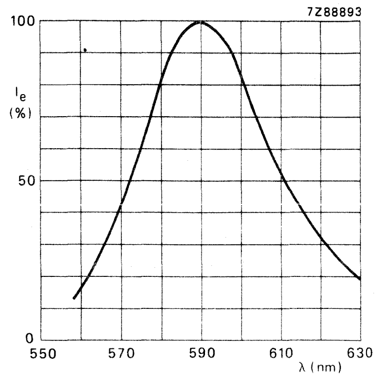


Fig. 8 Typical values.

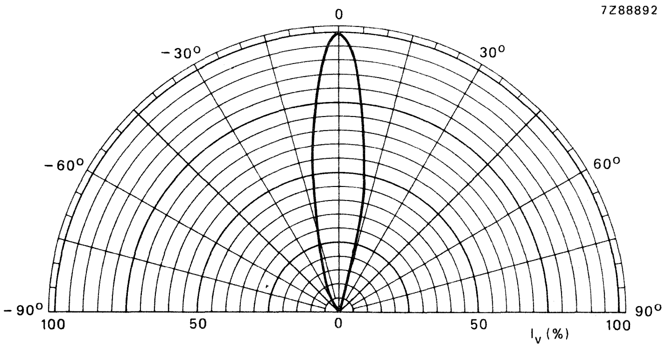


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 5 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQX74D has a SOD-63 outline and is encapsulated in a yellow diffusing resin.

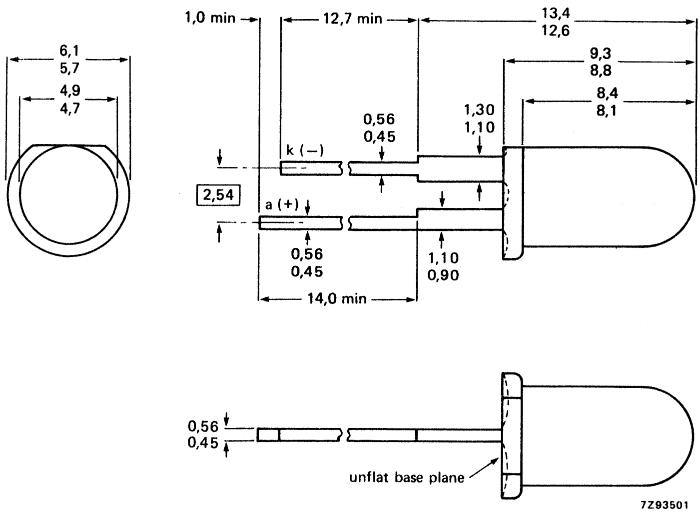
QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Luminous intensity at I_F = 10 mA	I_V	min.	3	mcd
Wavelength at peak emission	λ_p	typ.	590	nm
Beamwidth between half-intensity directions	$\theta_{½}$	typ.	30	°

MECHANICAL DATA

Dimensions in mm

→ Fig. 1 SOD-63D1.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value, t_p = 1 μs; f = 300 Hz	I_{frm}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{frm}	max.	60	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Junction temperature	T_j	max.	100	°C
Storage temperature	T_{stg}		−55 to +100	°C
Lead soldering temperature				
> 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Forward voltage at I_F = 10 mA		V_F	typ.	2,1	V
			max.	3	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions at I_F = 10 mA		$\theta_{½}$	typ.	30	°
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission at I_F = 10 mA		λ_p	typ.	590	nm
Capacitance at V_R = 0; f = 1 MHz		C_d	typ.	35	pF
Luminous intensity at I_F = 10 mA	CQX54D	I_v	min.	3	mcd
	CQX54D-5	I_v	min.	5	mcd
			max.	12	mcd
	CQX54D-6	I_v	min.	10	mcd
			min.	22	mcd
	CQX54D-7	I_v	min.	16	mcd

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit red light at a typical peak wavelength of 650 nm (GaAsP; standard-red) when forward biased.

The CQY24B and CQY24BL have a SOD-63 outline and are encapsulated in a red diffusing resin. Together with types CQY94B(L) and CQY96(L) they form one family.

The CQY24BL is the long-lead version of the CQY24B and has no seating plane but is in all other respects equal to the CQY24B.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	50	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	100	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 20 mA	CQY24B(L)	I_V	min.	0,7	mcd
	CQY24B(L)-2	I_V		1,0 to 2,2	mcd
	CQY24B(L)-3	I_V		1,6 to 3,5	mcd
	CQY24B(L)-4	I_V	min.	3,0	mcd
Wavelength at peak emission		λ_p	typ.	650	nm
Beamwidth between half-intensity directions		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

→ Fig. 1a SOD-63AI.
CQY24B

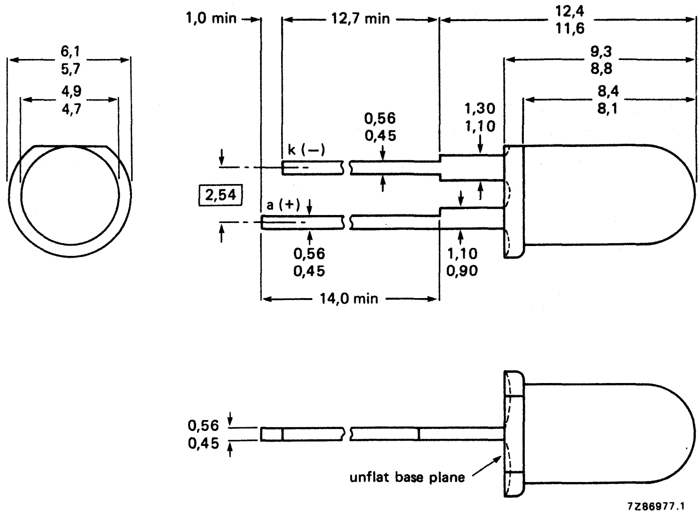
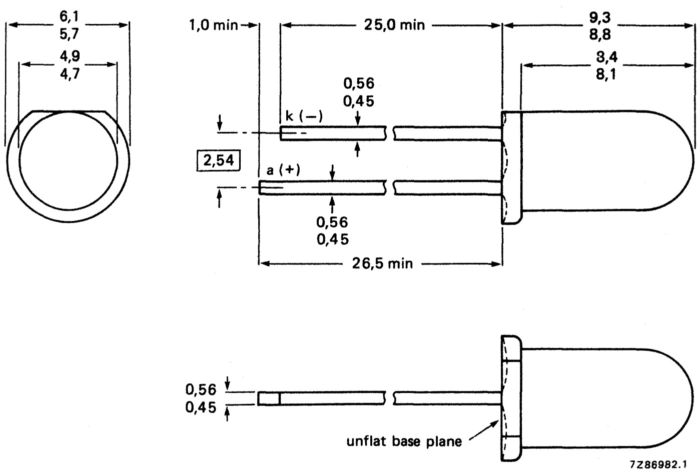


Fig. 1b SOD-63L.
CQY24BL



→ **Note:** Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	50	mA
Forward current peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_p = 10 μs; δ = 0,01	I_{FRM}	max.	500	mA
Total power dissipation up to T_{amb} = 65 ^oC	P_{tot}	max.	100	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature; t_{sld} < 7 s; > 1,5 mm from the seating plane for CQY24B; > 5 mm from the plastic body for CQY24BL	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ.	1,7	V
		V_F	max.	2,0	V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{1/2}$	typ.	70	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	20	nm
Wavelength at peak emission I_F = 20 mA		λ_p	typ.	650	nm
Luminous intensity (on axis) I_F = 20 mA	CQY24B(L)	I_v	min.	0,7	mcd
	CQY24B(L)-2	I_v		1,0 to 2,2	mcd
	CQY24B(L)-3	I_v		1,6 to 3,5	mcd
	CQY24B(L)-4	I_v	min.	3,0	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	45	pF

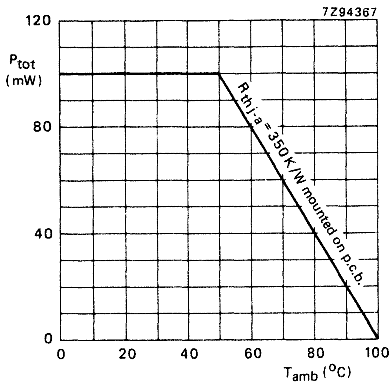


Fig. 2.

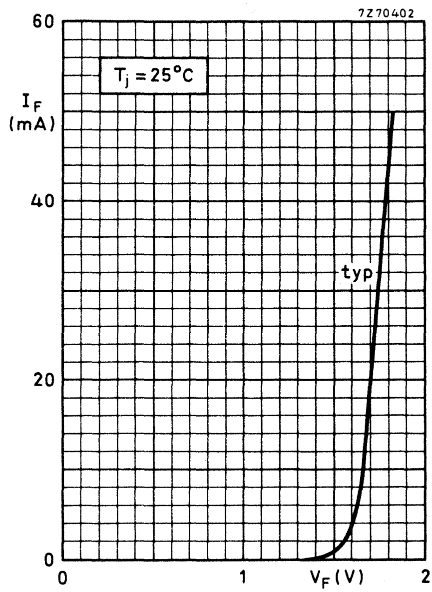


Fig. 3.

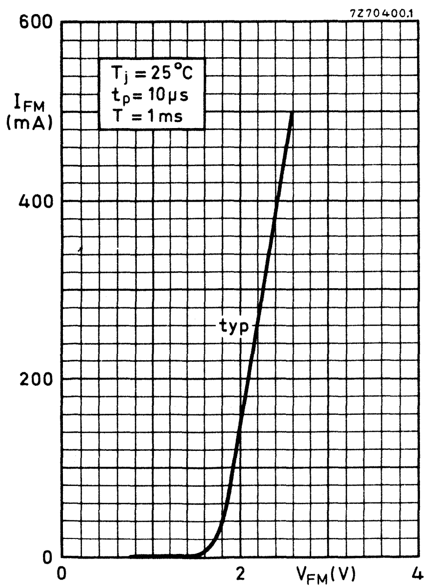


Fig. 4.

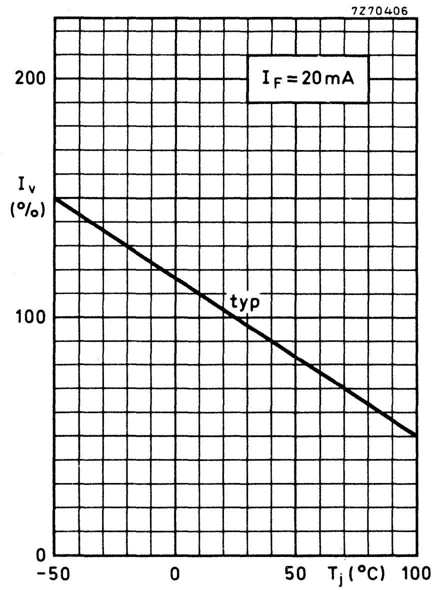


Fig. 5.

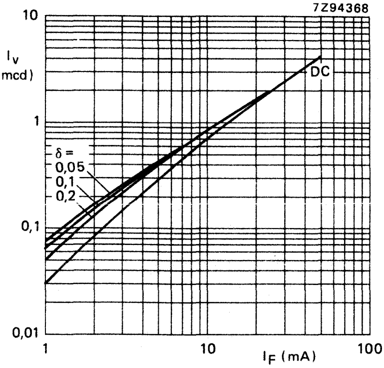


Fig. 6 Typical values.

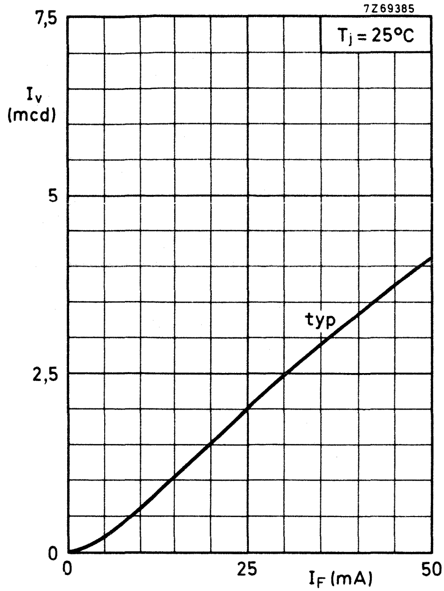


Fig. 7.

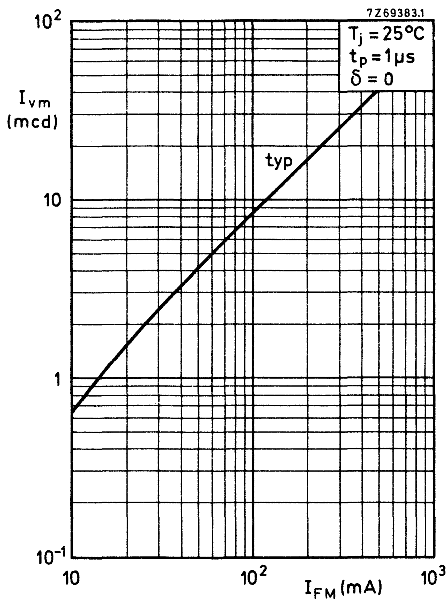


Fig. 8.

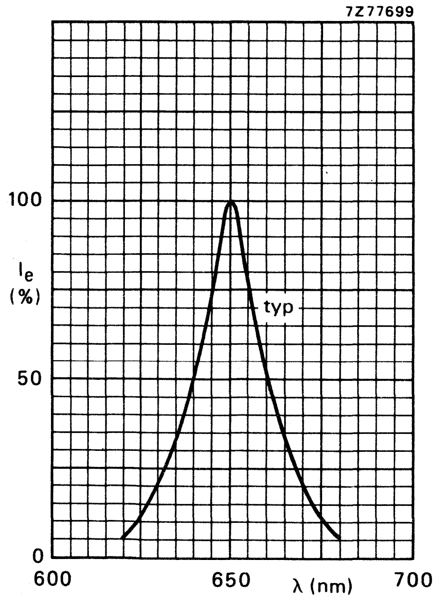


Fig. 9.

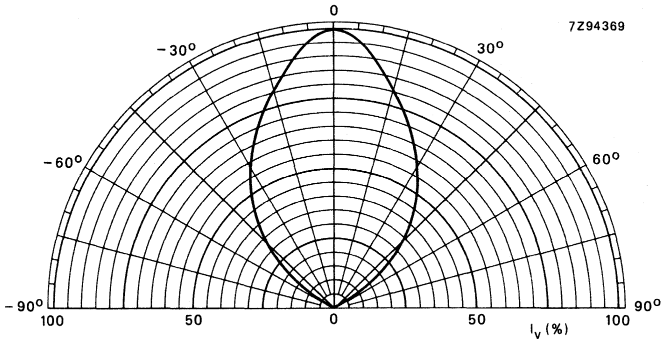


Fig. 10 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits red light at a typical peak wavelength of 650 nm (GaAsP; standard-red) when forward biased.

The CQY54A has a SOD-53 outline and is encapsulated in a red diffusing resin.

Together with the CQY95B and the CQY97A the CQY54A forms one LED family.

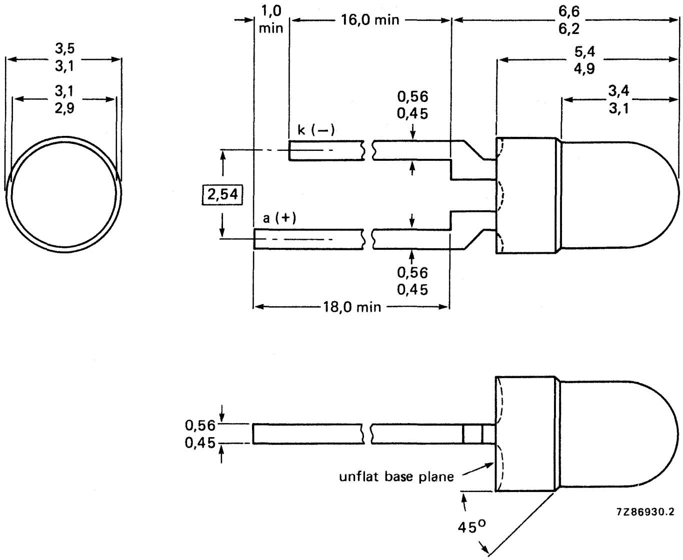
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	50	mA
Total power dissipation up to T_{amb} = 40 °C		P_{tot}	max.	120	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 20 mA	CQY54A	I_v	min.	0,7	mcd
	CQY54A-2	I_v		1,0 to 2,2	mcd
	CQY54A-3	I_v	min.	1,6	mcd
Wavelength at peak emission					
I_F = 20 mA		λ_p	typ.	650	nm
Beamwidth at half-intensity directions					
I_F = 20 mA		$\theta_{½}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage		V_R	max.	5 V
Forward current				
d.c.		I_F	max.	50 mA
peak value; t_p = 1 μs; f = 300 Hz		I_{FRM}	max.	1 A
Total power dissipation up to T_{amb} = 40 °C		P_{tot}	max.	120 mW ←
Storage temperature		T_{stg}		−55 to +100 °C
Junction temperature		T_j	max.	100 °C
Lead soldering temperature				
> 1,5 mm from the seating plane; t_{sld} < 7 s		T_{sld}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient			
when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage				
I_F = 20 mA		V_F	typ.	1,7 V
			max.	2,0 V
Reverse current				
V_R = 5 V		I_R	max.	100 μA
Beamwidth between half-intensity directions				
I_F = 20 mA		$\theta_{½}$	typ.	70 ° ←
Bandwidth at half height		$\Delta\lambda$	typ.	20 nm
Wavelength at peak emission				
I_F = 20 mA		λ_p	typ.	650 nm
Luminous intensity				
I_F = 20 mA	CQY54A	I_v	min.	0,7 mcd ←
	CQY54A-2	I_v		1,0 to 2,2 mcd
	CQY54A-3	I_v	min.	1,6 mcd
Diode capacitance				
V_R = 0; f = 1 MHz		C_d	typ.	45 pF ←

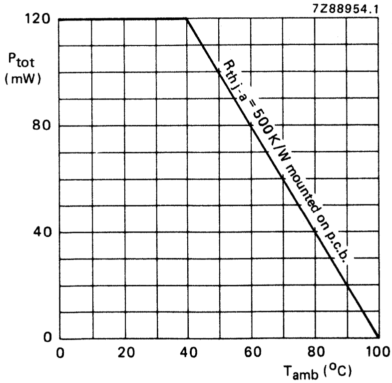


Fig. 2.

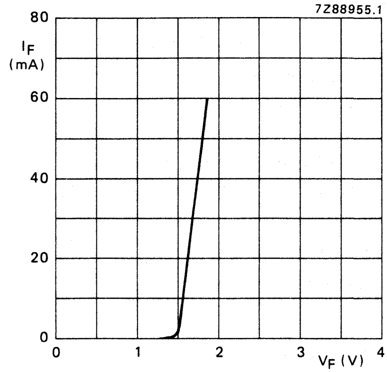


Fig. 3 T_{amb} = 25 °C.

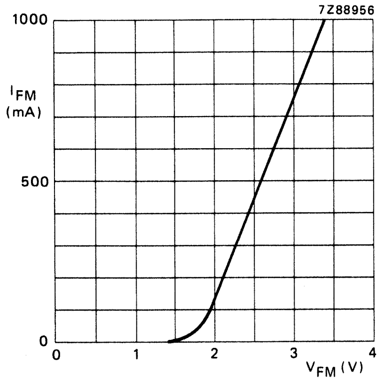


Fig. 4 Typical values.

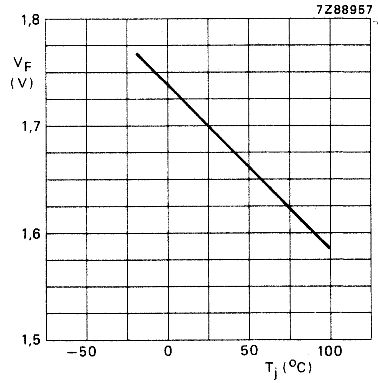


Fig. 5 I_F = 20 mA; typ. values.

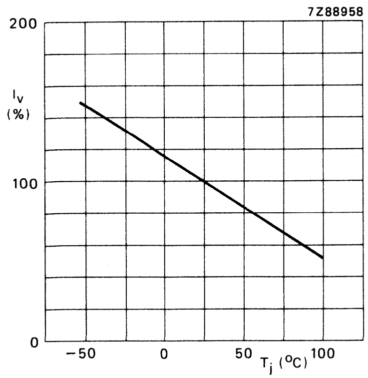


Fig. 6 I_F = 20 mA; typ. values.

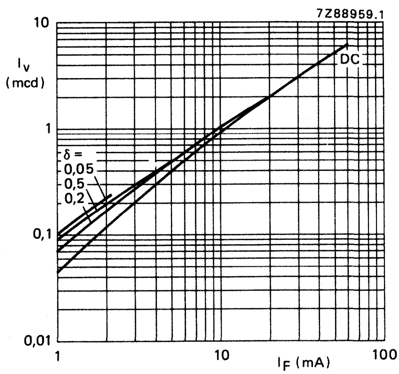


Fig. 7 t_p = 50 μs; T_j = 25 °C.

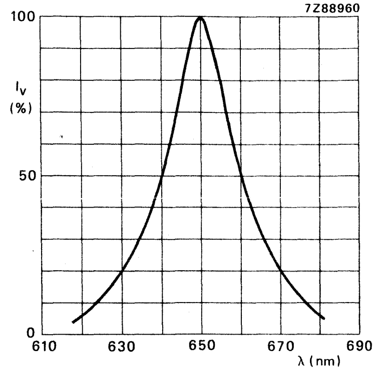


Fig. 8 Typical values.

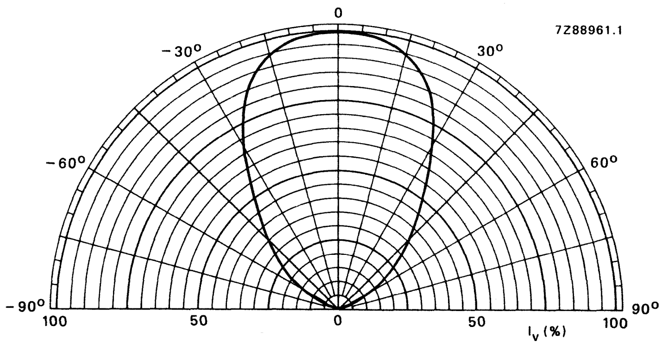


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Diffused planar light emitting diode intended for optical coupling and encoding. It emits radiation in the near infrared when forward biased. Infrared translucent epoxy encapsulation (dark blue). Combination with phototransistor BPW22A is recommended.

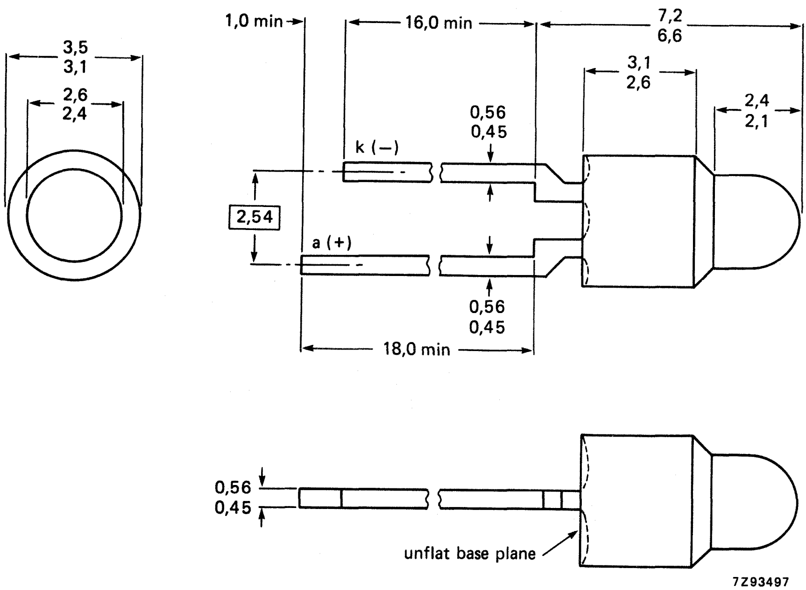
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	100	mW
Radiant intensity (on-axis) at I_F = 20 mA	I_e	typ.	2	mW/sr
Wavelength at peak emission	λ	typ.	930	nm

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53F.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	50	mA
(peak value); t_p = 10 μs; δ = 0,01	I_{FRM}	max.	200	mA
Total power dissipation up to T_{amb} = 25 °C (see Fig. 2)	P_{tot}	max.	100	mW
Storage temperature	T_{stg}	−55 to +	100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature				
→ > 1,5 mm from the seating plane; t_{sld} < 7 s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient,				
→ device mounted on a printed-circuit board	$R_{th\ j\text{-}a}$	=	750	K/W

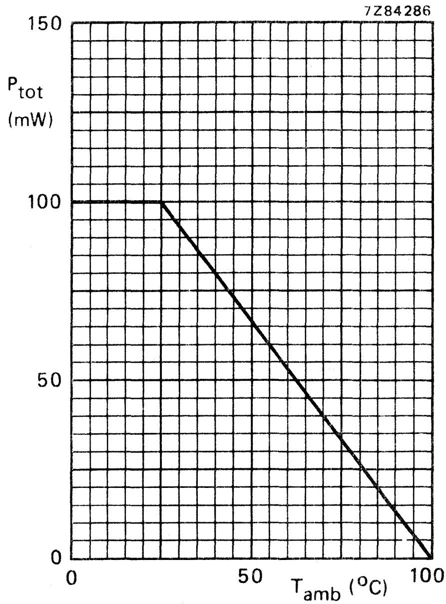


Fig. 2 Power derating curve versus ambient temperature.

CHARACTERISTICS

$T_j = 25\ ^oC$

Forward voltage $I_F = 20$ mA		V_F	typ. max.	1,2 V 1,5 V
Reverse current $V_R = 5$ V		I_R	max.	100 μA
Diode capacitance $V_R = 0$; f = 1 MHz		C_d	typ.	40 pF
Total radiant power $I_F = 20$ mA		ϕ_e	typ.	1 mW
Radiant intensity (on-axis)	**CQY58A**	I_e	min.	2 mW/sr ←
$I_F = 20$ mA	**CQY58A-1**	I_e	min. max.	1 mW/sr 5 mW/sr
	CQY58A-2	I_e	min.	3 mW/sr
Wavelength at peak emission		λ	typ.	930 nm
Bandwidth at half height		$\Delta\lambda$	typ.	50 nm
Beamwidth between half-intensity directions $I_F = 20$ mA		$\theta_{1/2}$	typ.	20 ^{o} ←
Switching times $I_{Fon} = 20$ mA Light rise time		t_r	typ.	3 μs
Light fall time		t_f	typ.	3 μs

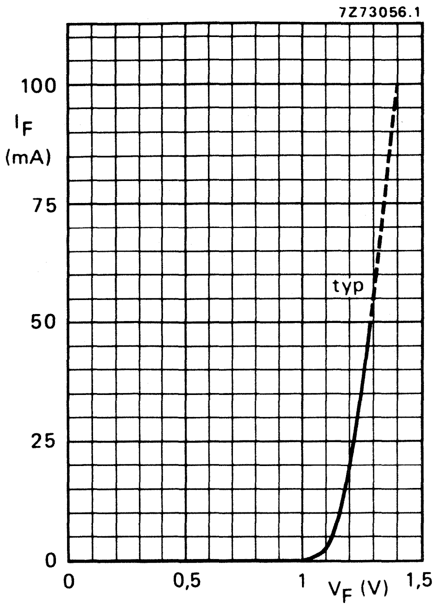


Fig. 3 T_{amb} = 25 °C.

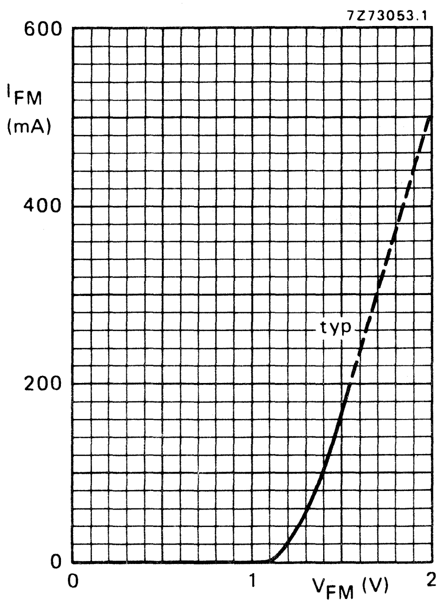


Fig. 4 t_p = 10 μs; T = 1 ms; T_{amb} = 25 °C.

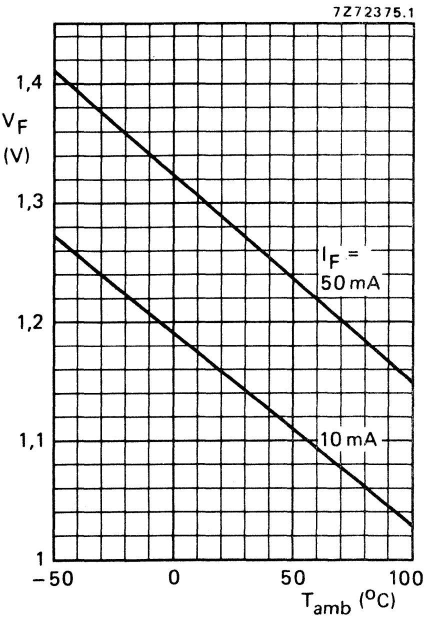


Fig. 5 Typical values.

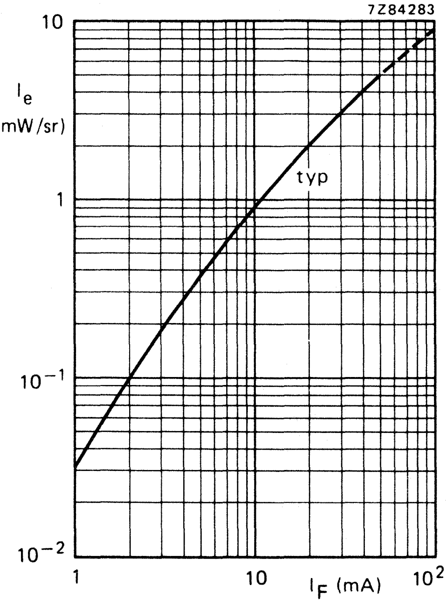


Fig. 6 T_{amb} = 25 °C.

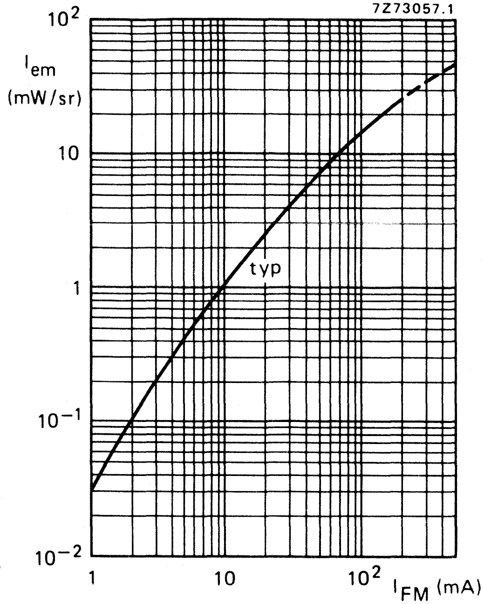


Fig. 7 t_p = 10 μs; T = 1 ms; T_{amb} = 25 °C.

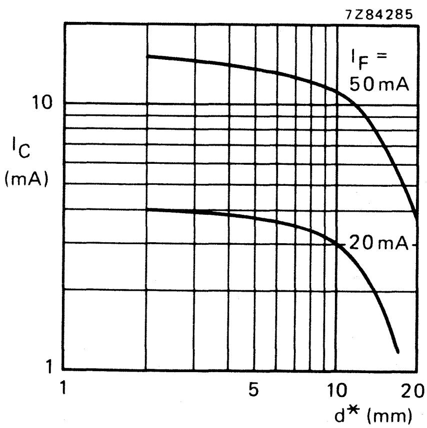


Fig. 8 V_{CE} = 5 V; T_{amb} = 25 °C; typical values.

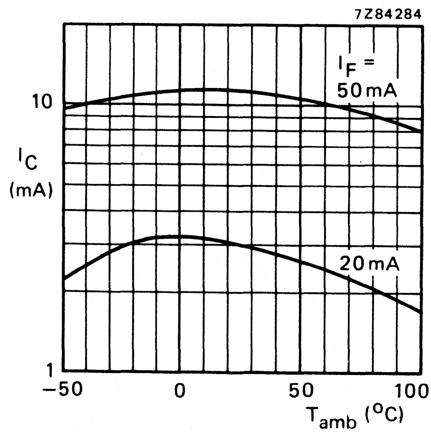


Fig. 9 V_{CE} = 5 V; d* = 10 mm; typical values.

* d = shortest free distance of mechanical on-axis when BPW22A is coupled with CQY58A.

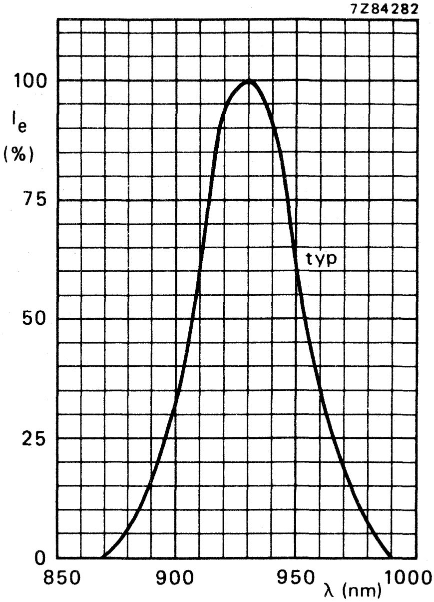


Fig. 10 Spectral response.

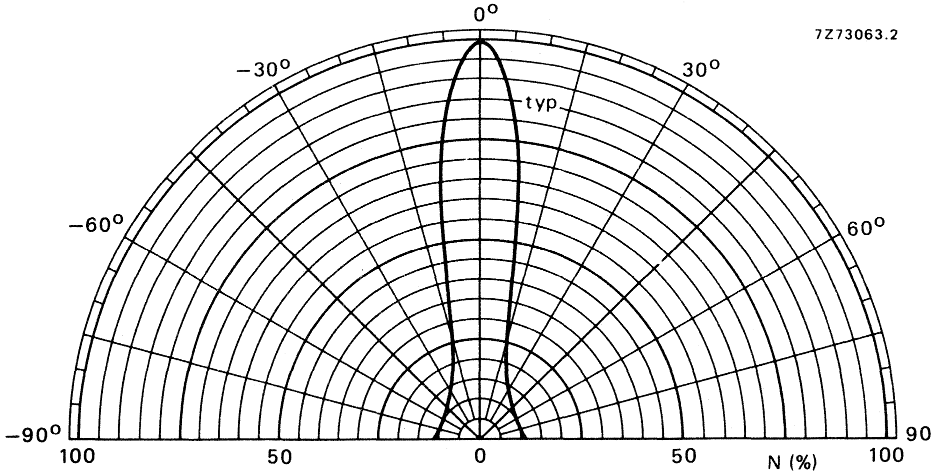


Fig. 11 Typical values.

GaAs LIGHT EMITTING DIODE

Epitaxial gallium arsenide light emitting diode intended for remote-control applications. It emits radiation in the near infrared when forward biased. Infrared translucent epoxy encapsulation (dark blue).

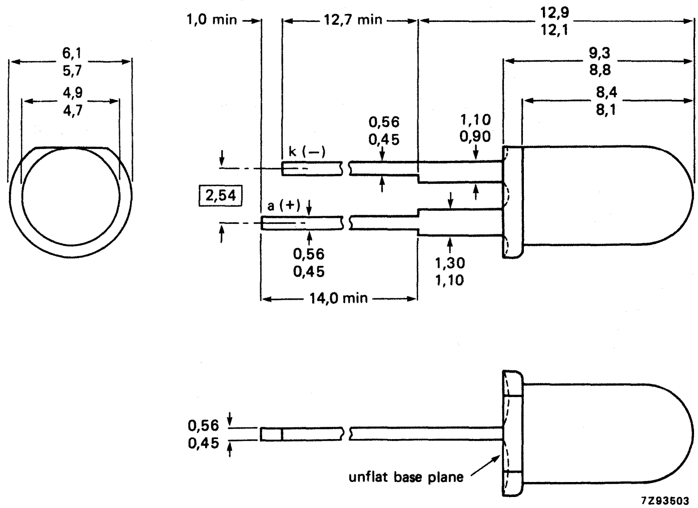
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	130	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	215	mW
Junction temperature		T_j	max.	100	°C
Radiant intensity (on-axis) at I_F = 100 mA	CQY89A	I_e	min.	9	mW/sr
	CQY89A-1	I_e	min.	12	mW/sr
	CQY89A-2	I_e	min.	15	mW/sr
Wavelength at peak emission		λ_p	typ.	930	nm

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63B2.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current (d.c.)	I_F	max.	130	mA
Forward current (peak value) $t_p \leq 50\ \mu s$; $\delta = 0{,}05$	I_{FM}	max.	1000	mA
Non-repetitive peak forward current ($t_p \leq 10\ \mu s$)	I_{FSM}	max.	2500	mA
Total power dissipation up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	215	mW
Storage temperature	T_{stg}	−55 to + 100		^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature up to the seating plane; $t_{sld} < 10$ s	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient mounted on a printed-circuit board	$R_{th\ j\text{-}a}$	=	350	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Forward voltage $I_F = 100$ mA		V_F	typ.	1,4	V
			<	1,6	V
$I_{FM} = 1500$ mA; $t_p = 20\ \mu s$; $\delta = 0{,}033$		V_{FM}	typ.	2,4	V
Reverse current $V_R = 5$ V		I_R	<	100	μA
Diode capacitance $V_R = 0$; f = 1 MHz		C_d	typ.	40	pF
Total radiant power $I_F = 100$ mA		ϕ_e	>	7	mW
			typ.	12	mW
Decrease of radiant power with temperature $I_F = 100$ mA		$\frac{\Delta\phi_e}{\Delta T_j}$	typ.	1	%/K
Radiant intensity (on-axis) $I_F = 100$ mA	CQY89A	I_e	min.	9	mW/sr ←
	CQY89A-1	I_e	min.	12	mW/sr
	CQY89A-2	I_e	min.	15	mW/sr
Wavelength at peak emission $I_F = 100$ mA		λ_p	typ.	930	nm
Spectral line half width $I_F = 100$ mA		$\Delta\lambda$	typ.	50	nm
Beamwidth between half-intensity directions $I_F = 100$ mA		$\theta_{1/2}$	typ.	40	^{o}

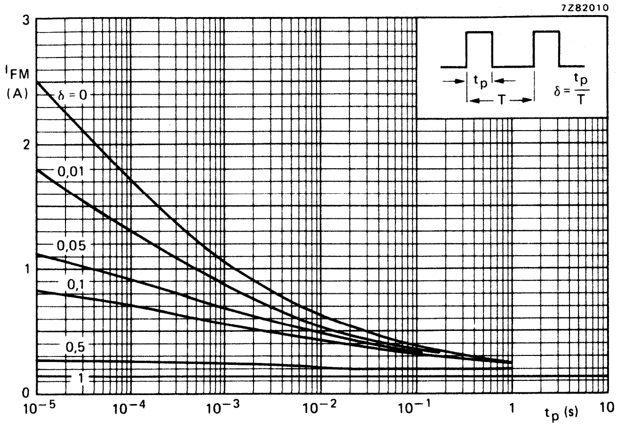


Fig. 2 T_{amb} = 25 °C; $T_{j\ peak}$ = 100 °C.

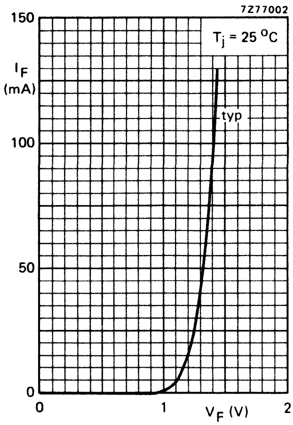


Fig. 3.

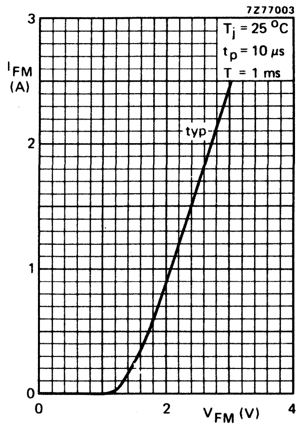


Fig. 4.

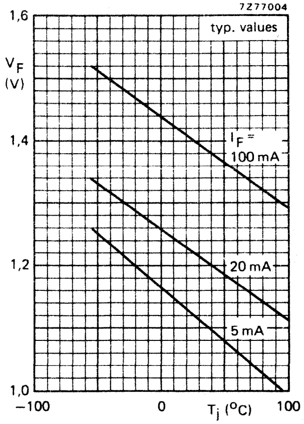


Fig. 5.

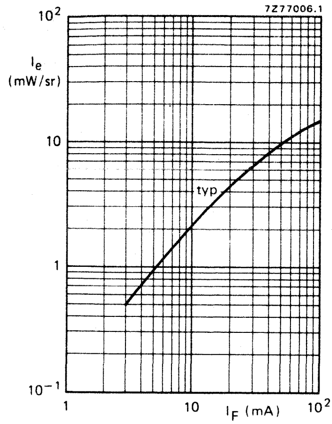


Fig. 6 T_j = 25 °C.

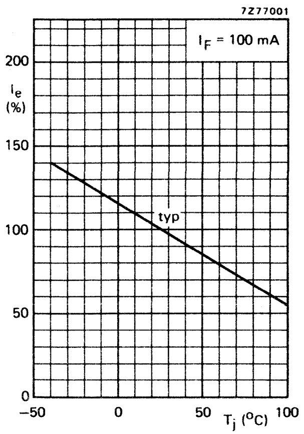


Fig. 7.

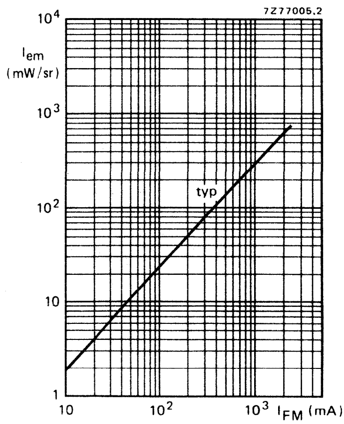


Fig. 8 T_{amb} = 25 °C; t_p = 10 μs; T = 1 ms.

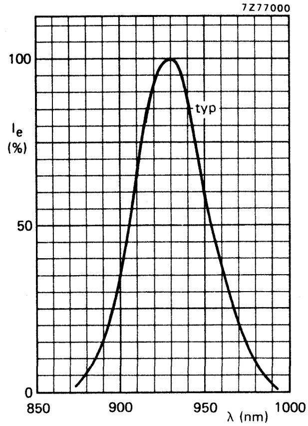

7Z77000
100
I_e
(%)
50
0
850
900
950
1000
λ (nm)
typ

Fig. 9.

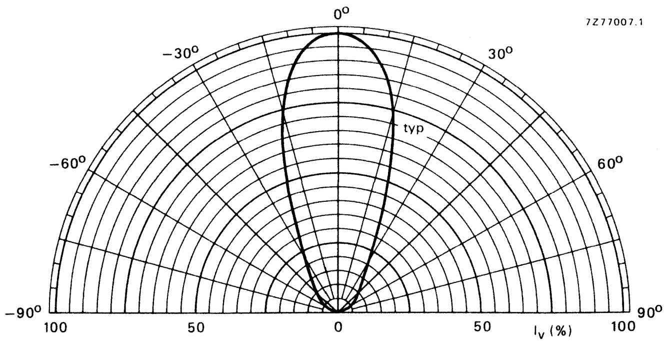

7Z77007.1
0°
−30°
30°
−60°
60°
−90°
90°
typ
100
50
0
50
100
I_v (%)

Fig. 10.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQY94B and CQY94BL have a SOD-63 outline and are encapsulated in a green diffusing resin. Because of their resistance to high forward currents, the CQY94B and CQY94BL are suitable for those applications where high lumousity is required.

The CQY94BL is the long-lead version of the CQY94B and has no seating plane but is in all other respects equal to the CQY94B.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 35 °C		P_{tot}	max.	180	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQY94B(L)	I_v	min.	0,7	mcd
	CQY94B(L)-3	I_v		1,6 to 3,5	mcd
	CQY94B(L)-4	I_v		3,0 to 7,0	mcd
	CQY94B(L)-5	I_v	min.	5,0	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig 1a SOD-63AI.
CQY94B

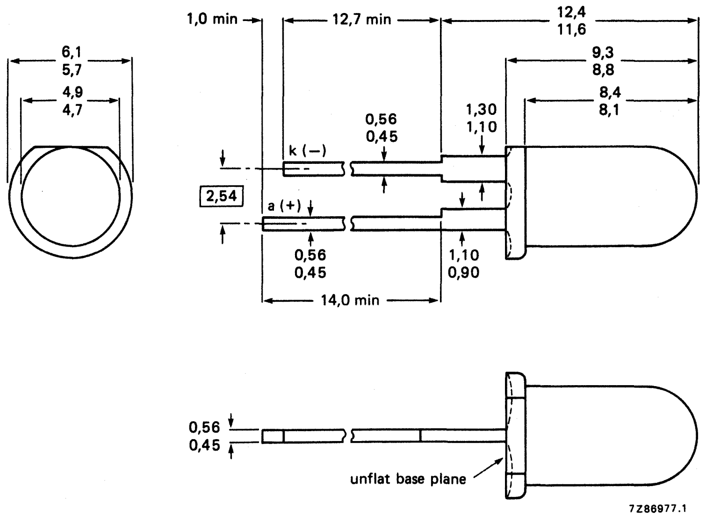
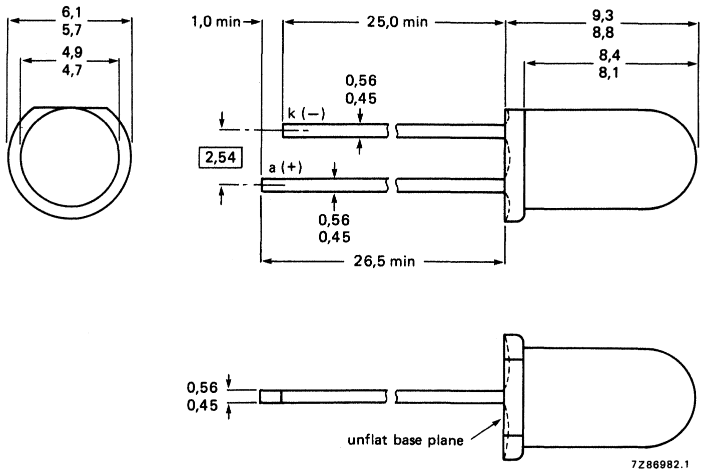


Fig. 1b SOD-63L.
CQY94BL



Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	60	mA
Forward current peak value; t_p = 1 μs; f = 300 Hz peak value; t_p = 1 ms; δ = 0,33	I_{FRM}	max. max.	1 150	A mA
Total power dissipation up to T_{amb} = 35 ^oC	P_{tot}	max.	180	mW
Storage temperature	T_{stg}		−55 to +100	^oC
Junction temperature	T_j	max.	100	^oC
Lead soldering temperature at $t_{sld} < 7$ s $>$ 1,5 mm from the seating plane for CQY94B $>$ 5 mm from the plastic body for CQY94BL	T_{sld}	max.	260	^oC

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	350	K/W

CHARACTERISTICS

T_j = 25 ^oC unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	2,1 3,0	V V
Reverse current V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions I_F = 10 mA		$\theta_{½}$	typ.	70	^{o}
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission I_F = 10 mA		λ_p	typ.	565	nm
Luminous intensity I_F = 10 mA	CQY94B(L)	I_v	min.	0,7	mcd
	CQY94B(L)-3	I_v		1,6 to 3,5	mcd
	CQY94B(L)-4	I_v		3,0 to 7,0	mcd
	CQY94B(L)-5	I_v	min.	5,0	mcd
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	20	pF

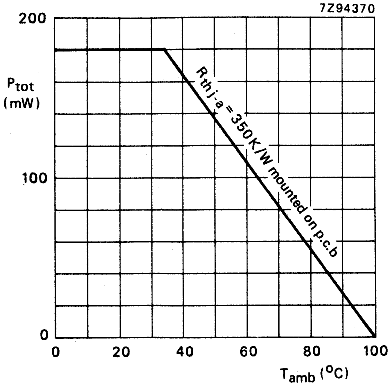


Fig. 2 Typical values.

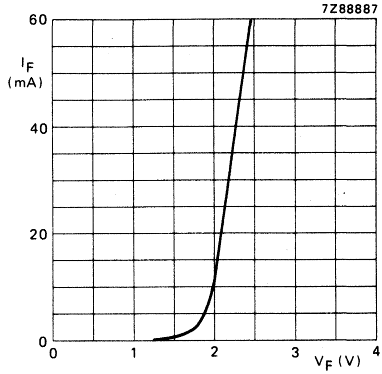


Fig. 3 T_{amb} = 25 °C; typ. values.

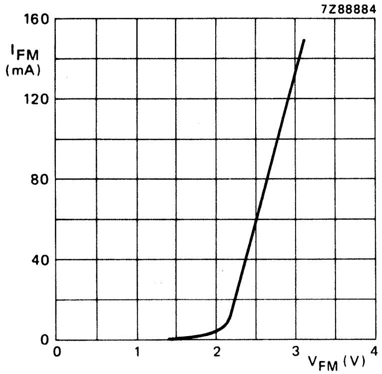


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

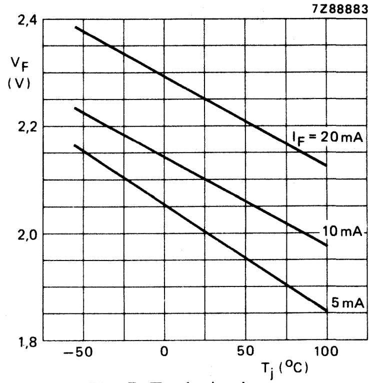


Fig. 5 Typical values.

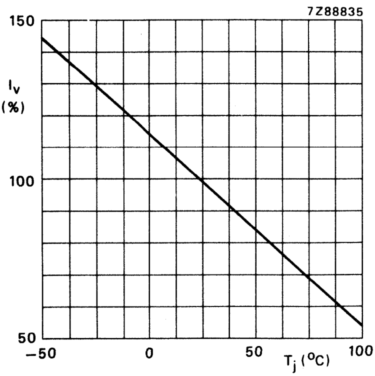


Fig. 6 Typical values.

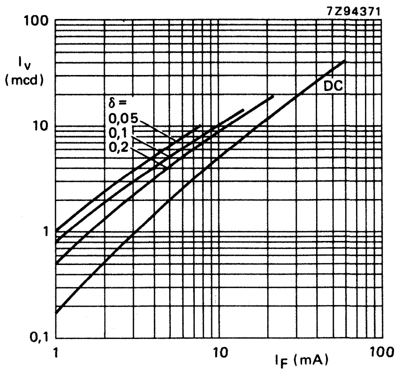


Fig. 7 t_p = 50 μs.

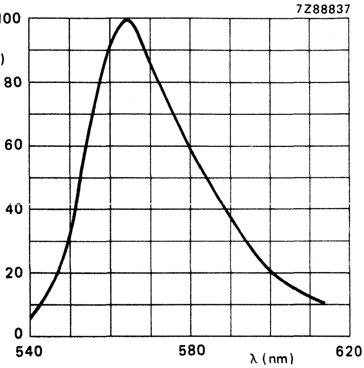


Fig. 8 I_F = 10 mA; typ. values.

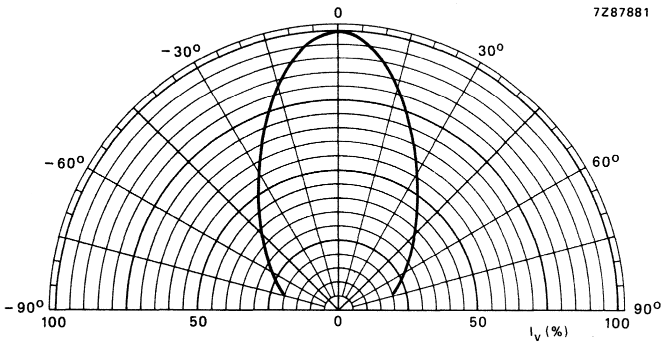


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits green light at a typical peak wavelength of 565 nm (GaP; super-green) when forward biased.

The CQY95B has a SOD-53 outline and is encapsulated in a green diffusing resin.

This LED can resist higher forward currents when a higher lumiousity is required. Because the CQY95B is available in high I_V classes, it is suitable for those applications where only low currents are available.

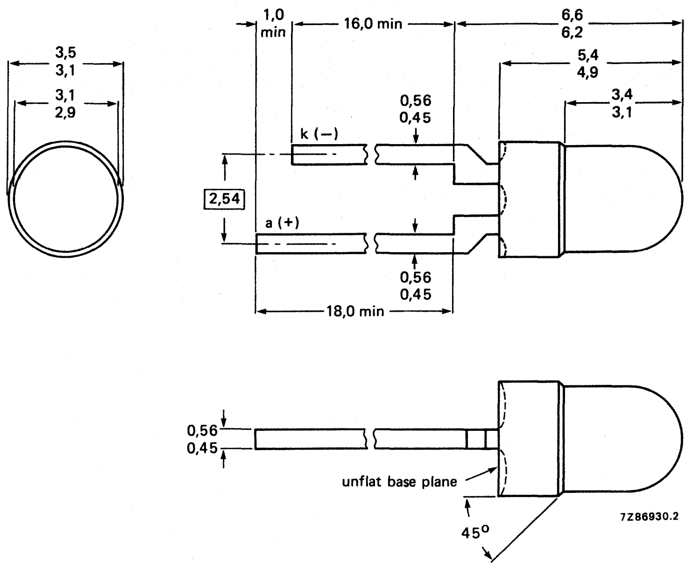
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	60	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	150	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQY95B	I_V	min.	0,7	mcd
	CQY95B-3	I_V		1,6 to 3,5	mcd
	CQY95B-4	I_V		3,0 to 7,0	mcd
	CQY95B-5	I_V	min.	5,0	mcd
Wavelength at peak emission		λ_p	typ.	565	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	60	mA
peak value; t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	150	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature				
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	70	° ←
Bandwidth at half height		$\Delta\lambda$	typ.	30	nm
Wavelength at peak emission		λ_p	typ.	565	nm
Luminous intensity					
I_F = 10 mA	CQY95B	I_v	min.	0,7	mcd
	CQY95B-3	I_v		1,6 to 3,5	mcd
	CQY95B-4	I_v		3,0 to 7,0	mcd
	CQY95B-5	I_v	min.	5,0	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	20	pF ←

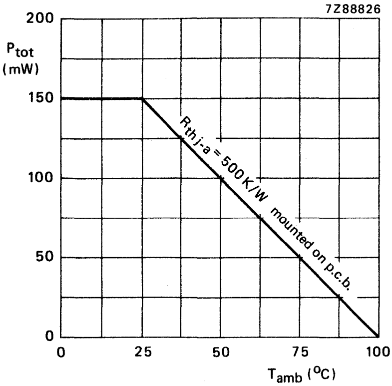


Fig. 2.

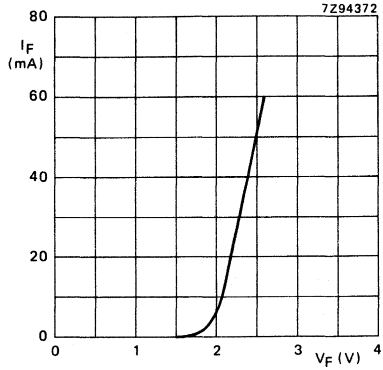


Fig. 3 T_{amb} = 25 °C; typ. values.

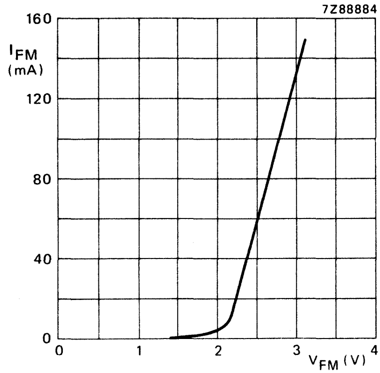


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

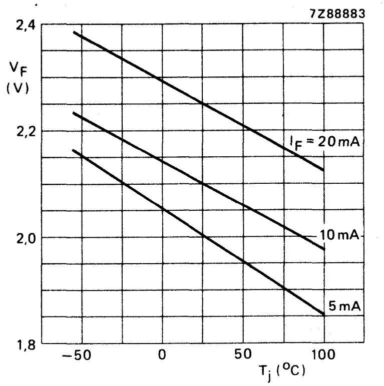


Fig. 5 Typical values.

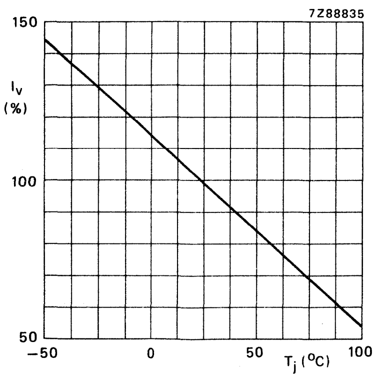


Fig. 6 Typical values.

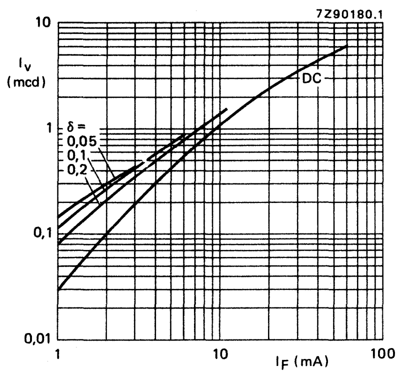


Fig. 7 t_p = 50 μs; typ. values.

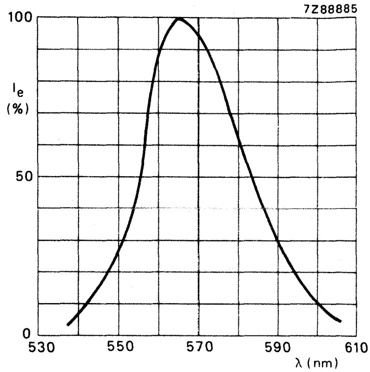


Fig. 8 I_F = 10 mA; typ. values.

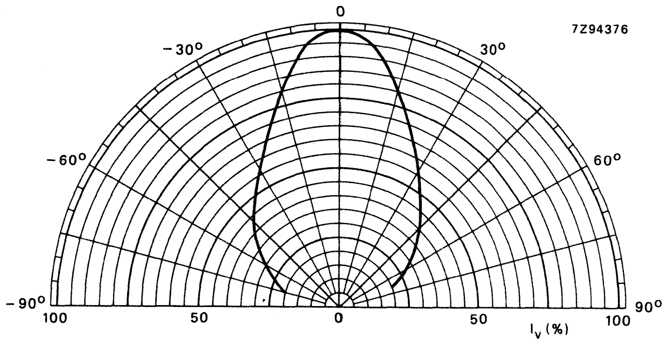


Fig. 9 Typical values.

LIGHT EMITTING DIODES

Circular light emitting diodes with a diameter of 5 mm which emit yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQY96 and CQY96L have a SOD-63 outline and are encapsulated in a yellow diffusing resin.

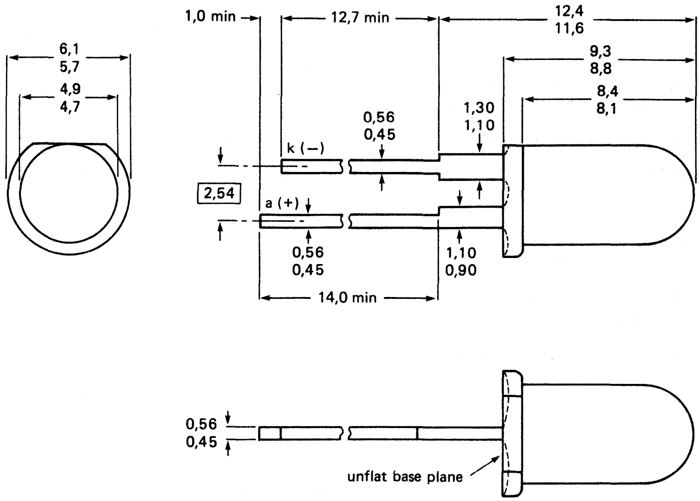
The CQY96L is the long-lead version of the CQY96 and has no seating plane but is in all other respects equal to the CQY96.

QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 65 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity (on-axis)					
I_F = 10 mA	CQY96(L)	I_V	min.	0,7	mcd
	CQY96(L)-3	I_V		1,6 to 3,5	mcd
	CQY96(L)-4	I_V		3,0 to 7,0	mcd
	CQY96(L)-5	I_V		**5,0 to 12**	**mcd**
Wavelength at peak emission		λ_p	typ.	590	nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	70	°

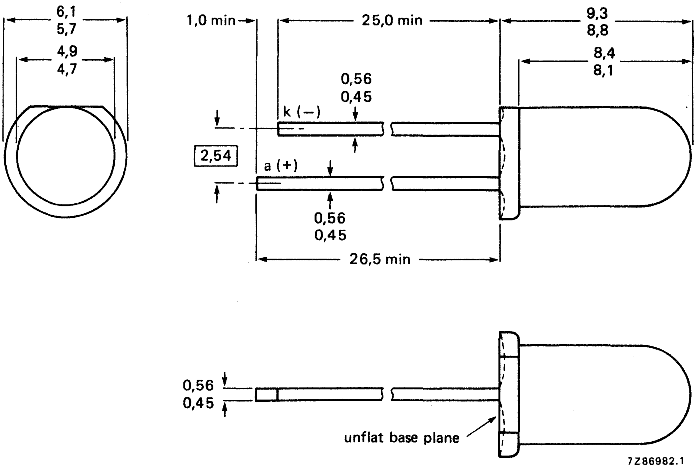
MECHANICAL DATA Dimensions in mm

Fig. 1a SOD-63A1.
CQY96



7Z86977.1

Fig. 1b SOD-63L.
CQY96L



7Z86982.1

Note: Solderability not guaranteed in tie-bar zone.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Continuous reverse voltage	V_R	max.	5	V
Forward current d.c.	I_F	max.	30	mA
Forward current peak value; t_p = 1 μs; f = 300 Hz peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max. max.	1 60	A mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature at $t_{sld} < 7$ s $>$ 1,5 mm from the seating plane for CQY96 $>$ 5 mm from the plastic body for CQY96L	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient mounted on a printed board	$R_{th\ j\text{-}a}$	=	350	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage I_F = 10 mA		V_F	typ. max.	2,1 3	V V
Reverse current V_R = 5 V		I_R	max.	100	μA
Diode capacitance V_R = 0; f = 1 MHz		C_d	typ.	15	pF ←
Luminous intensity (on-axis) I_F = 10 mA	CQY96(L)	I_V	min.	0,7	mcd
	CQY96(L)-3	I_V		1,6 to 3,5	mcd
	CQY96(L)-4	I_V		3,0 to 7,0	mcd
	CQY96(L)-5	I_V		5,0 to 12	mcd ←
Wavelength at peak emission		λ_p	typ.	590	nm
Bandwidth at half height		$\theta_{1/2}$	typ.	40	nm
Beamwidth between half-intensity directions		$\Delta\lambda$	typ.	70	° ←

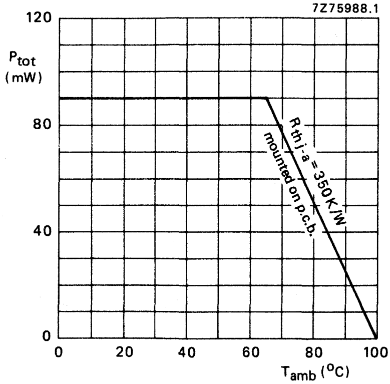


Fig. 2.

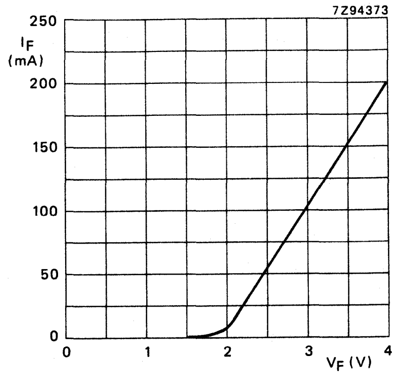


Fig. 3 T_{amb} = 25 °C; typ. values.

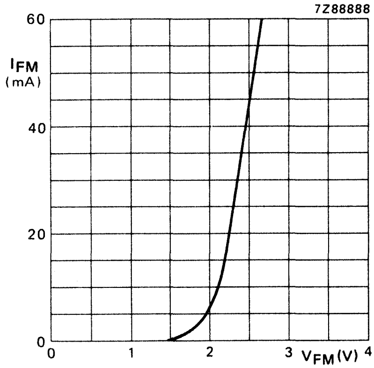


Fig. 4 t_{on} = 1 ms; δ = 0,33;
T_{amb} = 25 °C; typ. values.

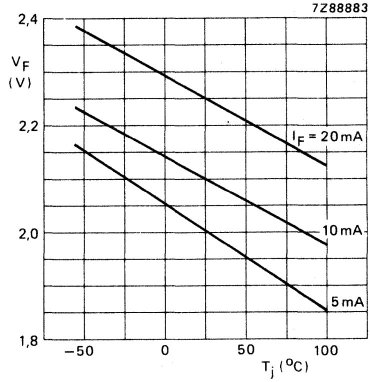


Fig. 5 Typical values.

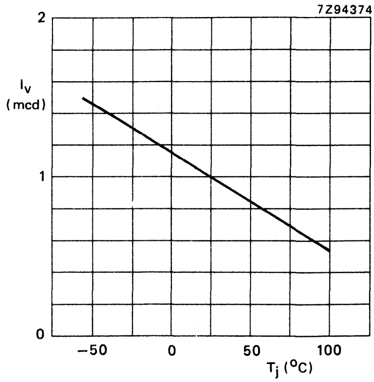


Fig. 6 Typical values.

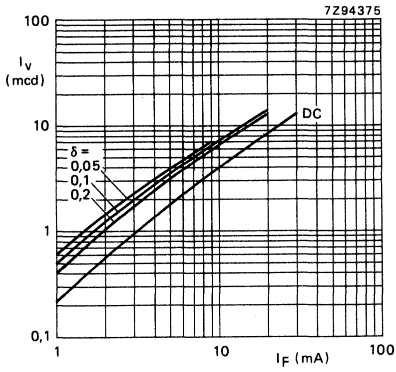


Fig. 7 t_p = 50 μs.

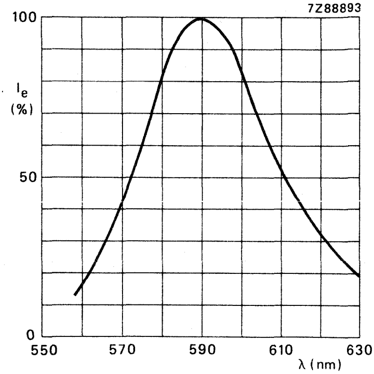


Fig. 8 Typical values.

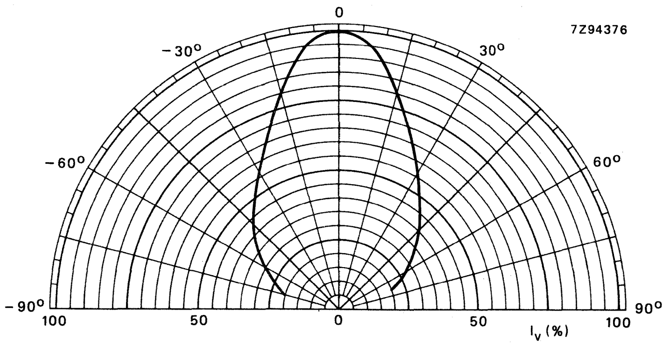


Fig. 9 Typical values.

LIGHT EMITTING DIODE

Circular light emitting diode with a diameter of 3 mm which emits yellow light at a typical peak wavelength of 590 nm (GaPAs) when forward biased.

The CQY97A has a SOD-53 envelope and is encapsulated in a yellow coloured resin.

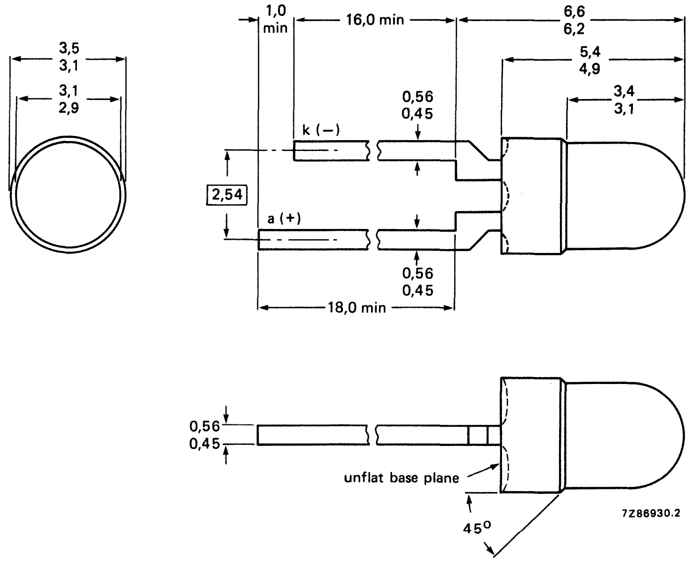
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5	V
Forward current (d.c.)		I_F	max.	30	mA
Total power dissipation up to T_{amb} = 55 °C		P_{tot}	max.	90	mW
Junction temperature		T_j	max.	100	°C
Luminous intensity					
I_F = 10 mA	CQY97A	I_v	min.	0,7	mcd
	CQY97A-3	I_v		1,6 to 3,5	mcd
	CQY97A-4	I_v		3,0 to 7,0	mcd
	CQY97A-5	I_v	min.	5,0	mcd
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70	°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53E.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Reverse voltage	V_R	max.	5	V
Forward current				
d.c.	I_F	max.	30	mA
peak value, t_p = 1 μs; f = 300 Hz	I_{FRM}	max.	1	A
peak value; t_{on} = 1 ms; δ = 0,33	I_{FRM}	max.	60	mA
Total power dissipation up to T_{amb} = 55 °C	P_{tot}	max.	90	mW
Storage temperature	T_{stg}		−55 to +100	°C
Junction temperature	T_j	max.	100	°C
Lead soldering temperature				
$>$ 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	260	°C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j\text{-}a}$	max.	500	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Forward voltage					
I_F = 10 mA		V_F	typ.	2,1	V
			max.	3,0	V
Reverse current					
V_R = 5 V		I_R	max.	100	μA
Beamwidth between half-intensity directions					
I_F = 10 mA		$\theta_{½}$	typ.	70	°
Bandwidth at half height		$\Delta\lambda$	typ.	40	nm
Wavelength at peak emission					
I_F = 10 mA		λ_p	typ.	590	nm
Luminous intensity (class division)					
I_F = 10 mA	CQY97A	I_v	min.	0,7	mcd
	CQY97A-3	I_v		1,6 to 3,5	mcd
	CQY97A-4	I_v		3,0 to 7,0	mcd
	CQY97A-5	I_v	min.	5,0	mcd
Diode capacitance					
V_R = 0; f = 1 MHz		C_d	typ.	15	pF

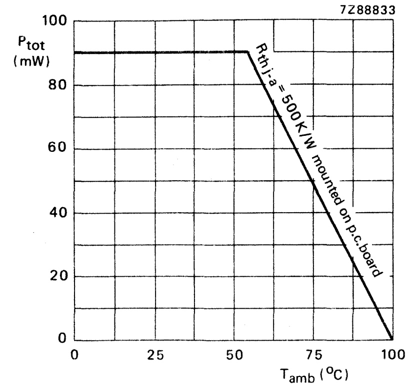


Fig. 2.

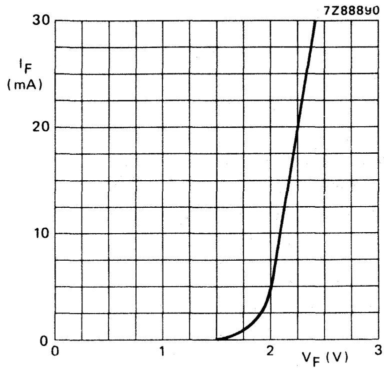


Fig. 3 T_j = 25 °C; typ. values.

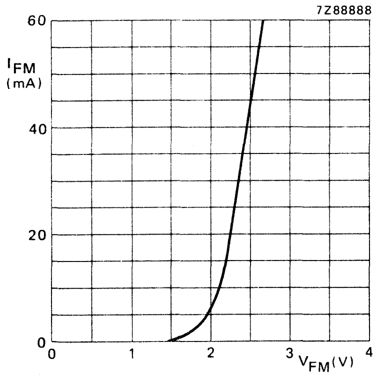


Fig. 4 t_p = 50 μs; δ = 0,01;
T_{amb} = 25 °C; typ. values.

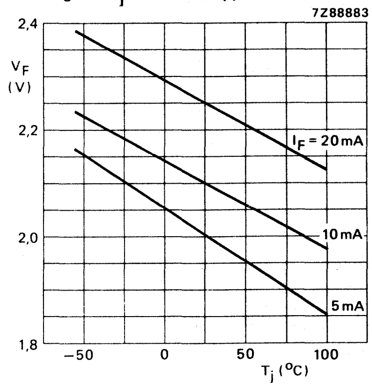


Fig. 5 Typical values.

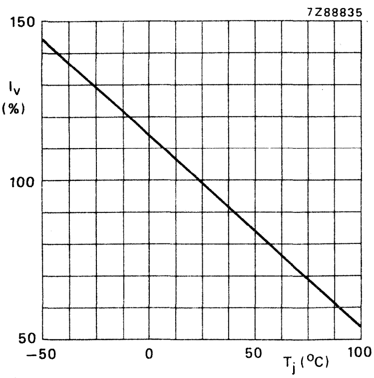


Fig. 6 Typical values.

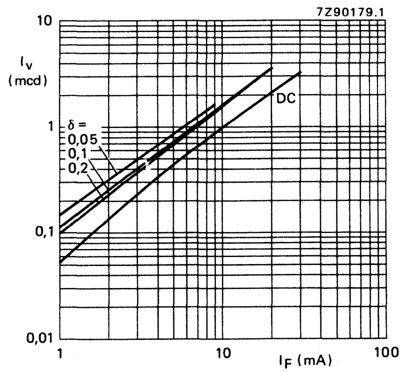


Fig. 7 T_j = 25 °C, typ. values.

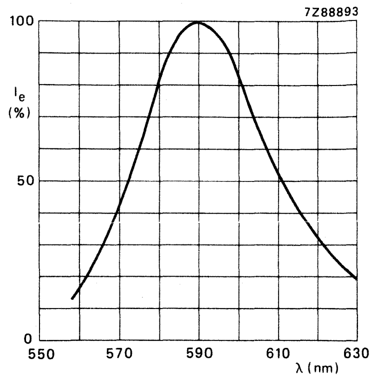


Fig. 8 Typical values.

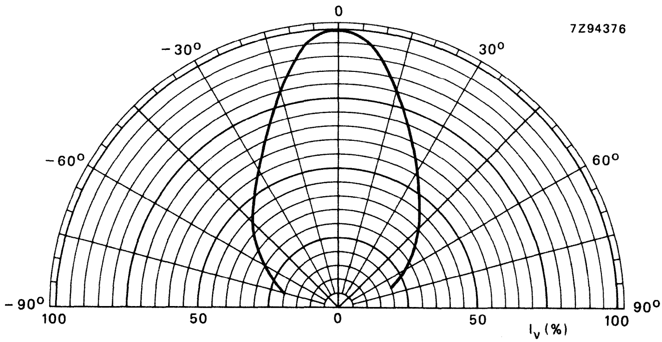


Fig. 9 Typical values.

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sm = Small-signal transistors
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

P = Low-frequency power transistors

P = Low-frequency power transistors

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband transistors

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
WBM= Wideband hybrid IC modules
WBT= Wideband transistors

* = series
RFP = R.F. power transistors and modules
ThM = Thyristor modules
WBM = Wideband hybrid IC modules

FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
PDT = Photodiodes or transistors
RFP = R.F. power transistors and modules
Sm = Small-signal transistors
Th = Thyristors

type no.	book	section	type no.	book	section	type no.	book	section
BST120	S5/S7	FET/Mm	BTW40*	S2b	Th	BUV82	S4b	SP
BST122	S5/S7	FET/Mm	BTW42*	S2b	Th	BUV83	S4b	SP
BSV15	S3	Sm	BTW43*	S2b	Tri	BUV89	S4b	SP
BSV16	S3	Sm	BTW45*	S2b	Th	BUV90;A	S4b	SP
BSV17	S3	Sm	BTW58*	S2b	Th	BUW11;A	S4b	SP
BSV52;R	S7	Mm	BTW59*	S2b	Th	BUW12;A	S4b	SP
BSV64	S3	Sm	BTW63*	S2b	Th	BUW13;A	S4b	SP
BSV78	S5	FET	BTW92*	S2b	Th	BUW84	S4b	SP
BSV79	S5	FET	BTX18*	S2b	Th	BUW85	S4b	SP
BSV80	S5	FET	BTX94*	S2b	Tri	BUX46;A	S4b	SP
BSV81	S5	FET	BTY79*	S2b	Th	BUX47;A	S4b	SP
BSW66A	S3	Sm	BTY91*	S2b	Th	BUX48;A	S4b	SP
BSW67A	S3	Sm	BU426	S4b	SP	BUX80	S4b	SP
BSW68A	S3	Sm	BU426A	S4b	SP	BUX81	S4b	SP
BSX19	S3	Sm	BU433	S4b	SP	BUX82	S4b	SP
BSX20	S3	Sm	BU505	S4b	SP	BUX83	S4b	SP
BSX45	S3	Sm	BU506	S4b	SP	BUX84	S4b	SP
BSX46	S3	Sm	BU506D	S4b	SP	BUX84F	S4b	SP
BSX47	S3	Sm	BU508A	S4b	SP	BUX85	S4b	SP
BSX59	S3	Sm	BU508D	S4b	SP	BUX85F	S4b	SP
BSX60	S3	Sm	BU705	S4b	SP	BUX86	S4b	SP
BSX61	S3	Sm	BU706	S4b	SP	BUX87	S4b	SP
BSY95A	S3	Sm	BU706D	S4b	SP	BUX88	S4b	SP
BT136*	S2b	Tri	BU806	S4b	SP	BUX90	S4b	SP
BT137*	S2b	Tri	BU807	S4b	SP	BUX98	S4b	SP
BT138*	S2b	Tri	BU804	S4b	SP	BUX98A	S4b	SP
BT139*	S2b	Tri	BU824	S4b	SP	BUX99	S4b	SP
BT149*	S2b	Th	BU826	S4b	SP	BUY89	S4b	SP
BT151*	S2b	Th	BUP22*	S4b	SP	BUZ10	S9	PM
BT152*	S2b	Th	BUP23*	S4b	SP	BUZ10A	S9	PM
BT153	S2b	Th	BUS11;A	S4b	SP	BUZ11	S9	PM
BT155*	S2b	Th	BUS12;A	S4b	SP	BUZ11A	S9	PM
BT157*	S2b	Th	BUS13;A	S4b	SP	BUZ14	S9	PM
BTV24*	S2b	Th	BUS14;A	S4b	SP	BUZ15	S9	PM
BTV34*	S2b	Tri	BUS21*	S4b	SP	BUZ20	S9	PM
BTV58*	S2b	Th	BUS22*	S4b	SP	BUZ21	S9	PM
BTV59*	S2b	Th	BUS23*	S4b	SP	BUZ23	S9	PM
BTV60*	S2b	Th	BUT11;A	S4b	SP	BUZ24	S9	PM
BTW23*	S2b	Th	BUT11A	S4b	SP	BUZ25	S9	PM
BTW38*	S2b	Th	BUT11AF	S4b	SP	BUZ30	S9	PM

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
PM = Power MOS transistors
Sm = Small-signal transistors
SP = Low-frequency switching power transistors
Th = Thyristors
Tri = Triacs

* = series
PM = Power MOS transistors
R = Rectified diodes

* = series
LED = Light-emitting diodes
M = Microwave transistors
Mm = Microminiature semiconductors for hybrid circuits
Ph = Photoconductive devices
PhC = Photocouplers
R = Rectifier diodes
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes

* = series
LED = Light-emitting diodes
M = Microwave transistors
SEN = Sensors
WBM = Wideband hybrid IC modules
I = Infrared devices
PhC = Photocouplers

* = series
FET = Field-effect transistors
I = Infrared devices
M = Microwave transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
PhC = Photocouplers
R = Rectifier diodes
SEN = Sensors
Sm = Small-signal transistors
SP = Low-frequency switching power transistors
St = Rectifier stacks
WBM = Wideband hybrid IC modules

* = series
FET = Field-effect transistors
P = Low-frequency power transistors
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

A = Accessories
FET = Field-effect transistors
Ph = Photoconductive devices
PhC = Photocouplers
RFP = R.F. power transistors and modules
Sm = Small-signal transistors

NOTES

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