

Semiconductors

Book S8a

1986

Light emitting diodes

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LIGHT EMITTING DIODES

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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 ($< 1,5 \text{ W}$), 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:

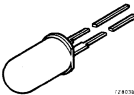
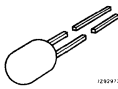
- C1 Programmable controller modules**
PLC modules, PC20 modules
- C2 Television tuners, coaxial aerial input assemblies, surface acoustic wave filters**
- C3 Loudspeakers**
- C4 Ferroxcube potcores, square cores and cross cores**
- C5 Ferroxcube for power, audio/video and accelerators**
- C6 Synchronous 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

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	$\theta_{1/2}$	V_F at $I_F = 10 \text{ mA}$ V	I_F max. mA	package colour/ diffusor
 $\phi 5$ SOD-63 <small>728731</small>	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 GaP	hyper-red super-green	650 565	70° 70°	1,75 2,1	100 60	colourless/ diff.
	CQS51 *	GaP:ZnO	ultra-red	700	70°	2,0	30	red/diff.
 $\phi 5$ SOD-85AL <small>128947</small>	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.

SELECTION GUIDE

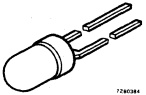
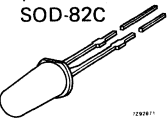
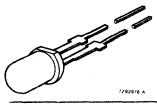
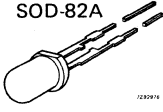
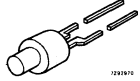
existing I_V classes in mcd at $I_F = 10$ mA											
1 0,7-1,6	2 1,0-2,2	3 1,6-3,5	4 3,0-7,0	5 5-12	6 10-22	7 16-35	8 30-70	9 50-120	10 > 100	page	
-	-	-	-	-	-	X*	8	9	10*	347	
-	-	-	-	-	X*	7	8	9*		359	
-	-	-	-	-	X*	7	8	9*		369	
-	-	-	-	-	X*	7	8	9*		379	
-	-	-	X*/4	5	6*					283	
-	-	-	X*/4	5	6	7				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.

SELECTION GUIDE

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 $I_F = 10 \text{ mA}$ V	I_F max. mA	package colour/ diffusor
$\phi 3$ SOD-53E 	CQW54	GaAlAs	super-red	650	100°	1,75	60	red/diff.
	CQW93▲	GaAlAs	hyper-red	650	60°	1,75	60	red/clear
	COW95▲	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.
$\phi 3$ 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.
$\phi 3$ 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.
$\phi 3$ 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.
$\phi 2$ 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.

SELECTION GUIDE

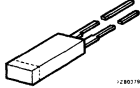
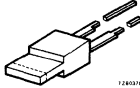
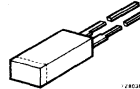
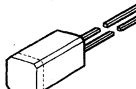
existing I_V classes in mcd at $I_F = 10$ mA									page
1 0,7-1,6	2 1,0-2,2	3 1,6-3,5	4 3,0-7,0	5 5-12	6 10-22	7 16-35	8 30-70	9 50-120	
-	-	-	X*	5	6	7*	8*		289
-	-	-	X*	5	6	7*		331	
-	-	-	X*	5	6	7*		335	
X*		3	4	5*					341
X*	2	3*	(For these classes $I_F = 20$ mA)						61
X*		3	4	5*					395
X*		3	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.

SELECTION GUIDE

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 $I_F = 10 \text{ mA}$ V	I_F max. mA	package colour/ diffuser	
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 GaP	hyper-red super-green	650 565	110° 110°	1,75 2,1	100 60	colourless/ diff.	
	CQW60A*	GaAlAs	hyper-red	650	110°	1,75	100	red/diff.	
5 x 1 DC SOD-75B 	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 GaP	hyper-red super-green	650 565	110° 110°	1,75 2,2	100 60	colourless/ 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 GaP	hyper-red super-green	650 565	110° 110°	1,75 2,2	100 60	colourless/ 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 GaP	hyper-red super-green	650 565	110° 110°	1,75 2,1	100 60	colourless/ diff.	

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

SELECTION GUIDE

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.

SELECTION GUIDE

Infrared LEDs and photo-sensitive devices

dimensions in mm/case	type	crystal	light colour	λ_{peak} nm	$\phi \frac{1}{2}$ o	V_F at $I_F = 10 \text{ mA}$ V	page
SOD-67	BPW50	Si (photo PIN diode)					49
$\phi 3$ SOD-53F	CQY58A BPW22A	GaAs Si (phototransistor)	IR	930	10 40	1,25	401 43
$\phi 5$ SOD-63D2	CQW89A CQY89A	GaAlAs GaAs	IR	830 930	40 20	1,45 1,15	325 407

TYPE NUMBER SURVEY

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

		page
BPW22A	Photosensitive transistor, SOD-53F	43
BPW50	Photosensitive PIN diode for remote control, SOD-67	49
CQS51(L)	LED, ultra-red, ϕ 5 mm, SOD-63A1	55
CQS54	LED, ultra-red, ϕ 3 mm, SOD-53E	61
CQS82L	LED, standard-red, ϕ 5 mm, SOD-85AL	67
CQS82AL	LED, hyper-red, ϕ 5 mm, SOD-85AL	73
CQS84L	LED, super-green, ϕ 5 mm, SOD-85AL	79
CQS86L	LED, yellow, ϕ 5 mm, SOD-85AL	85
CQS93	LED, ultra-red, ϕ 3 mm, SOD-82C	91
CQS93E	LED, ultra-red, ϕ 3 mm, SOD-82B	97
CQS93L	LED, ultra-red, ϕ 3 mm, SOD-82A	103
CQS95	LED, super-green, ϕ 3 mm, SOD-82C	109
CQS95E	LED, super-green, ϕ 3 mm, SOD-82B	115
CQS95L	LED, super-green, ϕ 3 mm, SOD-82A	121
CQS97	LED, yellow, ϕ 3 mm, SOD-82C	127
CQS97E	LED, yellow, ϕ 3 mm, SOD-82B	133
CQS97L	LED, yellow, ϕ 3 mm, SOD-82A	139
CQT10B	LED, bi-colour, hyper-red or super-green, SOD-76A2	145
CQT24	LED, bi-colour, hyper-red or super-green, SOD-63A2	151
CQT60	LED, bi-colour, hyper-red or super-green, SOD-75B2	157
CQT70	LED, bi-colour, hyper-red or super-green, SOD-77A2	163
CQT80L	LED, hyper-red, super-green or orange, SOD-74L	169
COV70(L)	LED, hyper-red, 5 x 3 mm, SOD-77A1 and SOD-77L	175
COV70A(L)	LED, hyper-red, 5 x 3 mm, SOD-77A2 and SOD-77L	181
COV70U(L)	LED, ultra-red, 5 x 3 mm, SOD-77A1 and SOD-77L	187
COV71A(L)	LED, super-green, 5 x 3 mm, SOD-77A1 and SOD-77L	193
COV72(L)	LED, yellow, 5 x 3 mm, SOD-77A1 and SOD-77L	199
COV80L	LED, super-red, 5 x 3 mm, SOD-74L	205
COV80AL	LED, hyper-red, 5 x 3 mm, SOD-74L	211
COV80UL	LED, ultra-red, 5 x 5 mm, SOD-74L	217
COV81L	LED, super-green, 5 x 5 mm, SOD-74L	223
COV82L	LED, yellow, 5 x 5 mm, SOD-74L	229
CQW10A(L)	LED, hyper-red, 5 x 5 mm, SOD-76A2 and SOD-76L	235
CQW10B(L)	LED, super-red, 5 x 2,5 mm, SOD-76A1 and SOD-76L	241
CQW10U(L)	LED, ultra-red, 5 x 2,5 mm, SOD-76A1 and SOD-76L	247
CQW11B(L)	LED, super-green, 5 x 2,5 mm, SOD-76A1 and SOD-76L	253
CQW12B(L)	LED, yellow, 5 x 2,5 mm, SOD-76A1 and SOD-76L	259
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CQW21	LED, super-green, ϕ 2 mm, SOD-79	271
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CQW24(L)	LED, hyper-red, ϕ 2,5 mm, SOD-63A2 and SOD-63L	283
CQW54	LED, hyper-red, ϕ 3 mm, SOD-53E	289
CQW60(L)	LED, super-red, 5 x 1 mm, SOD-75B1 and SOD-75BL	295
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GENERAL

Safety recommendations

Rating system

Letter symbols

Definitions

Dimensioning

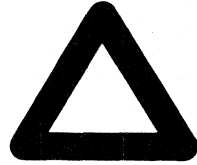
Driving GaAlAs LEDs

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_{bcm}

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

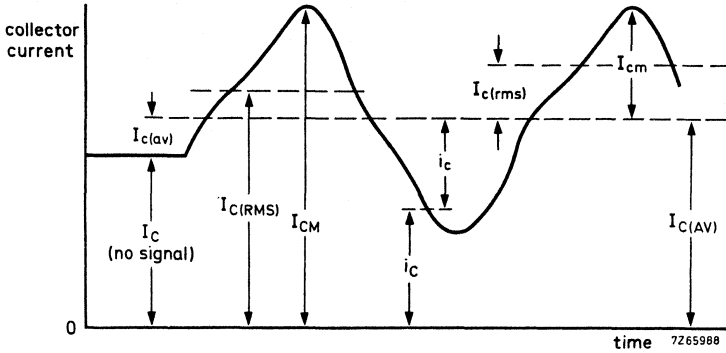
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

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: $\text{Re}(h_{ib})$ etc. for the real part of h_{ib}
 $\text{Im}(h_{ib})$ 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.

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

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.

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

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.

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

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 $d\Omega$, is given by:

$$d\phi = I_v \cdot d\Omega \quad \text{unit: lumen, lm}$$

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.

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

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.

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

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.

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

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:

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

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

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

$$h = \text{Planck's constant} (6,6256 \times 10^{-34} \text{ js})$$

$$c = \text{velocity of electromagnetic waves in vacuo} = 2,997925 \times 10^8 \text{ m/s}$$

$$e = \text{elementary charge} = 1,60210 \times 10^{-19} \text{ coulomb or } 4,80298 \times 10^{-19} \text{ e.s.u.}$$

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

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

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:

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

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.

Activity 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/m²).

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 response.

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).

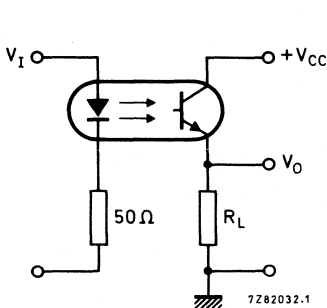


Fig. 1 Switching circuit.

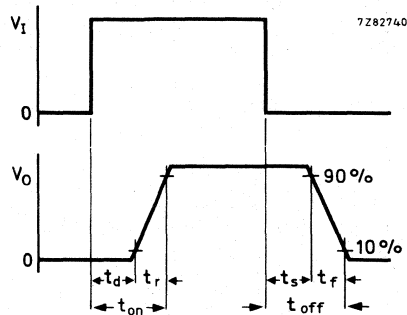


Fig. 2 Waveforms.

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 band-width 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√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/√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.m²

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.

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

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.

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

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/m²

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.

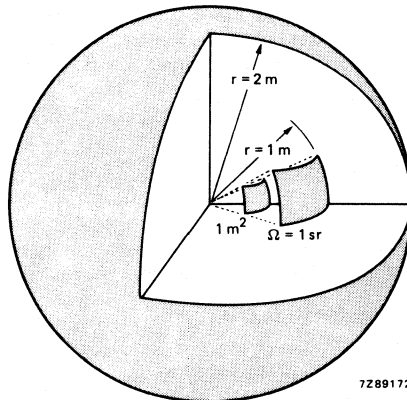


Fig. 3.

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DIMENSIONING OF LED ENVELOPES

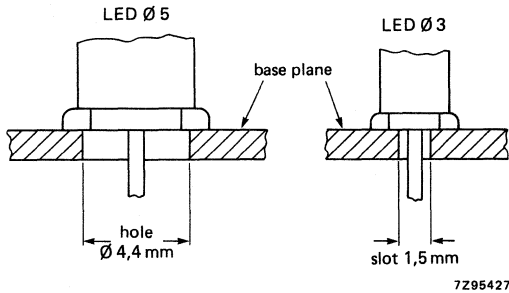
The dimensioning of the envelopes contained in this handbook is in accordance with the I.E.C. publication 191: Mechanical Standardization of Semiconductor devices.

The following section defines the different characteristics of LED dimensions.

The Base Plane

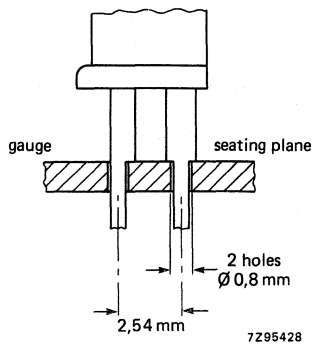
As the base of the plastic body is irregular, due to the manufacturing process, the base plane is defined as:

- for $\varnothing 5$ mm LEDs (or equivalent) a 4,4 mm hole,
- for $\varnothing 3$ mm LEDs (or equivalent) a 1,5 mm slot.



The Seating Plane

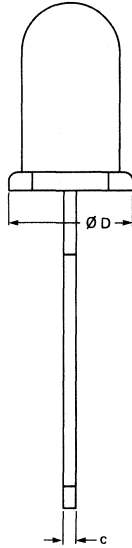
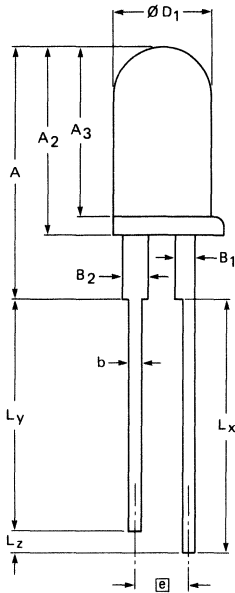
This is defined as when the flanges of the leads are seated on a gauge with 0,8 mm \varnothing holes which are 2,54 mm apart.



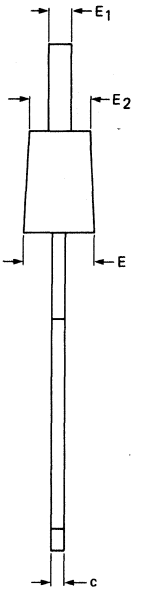
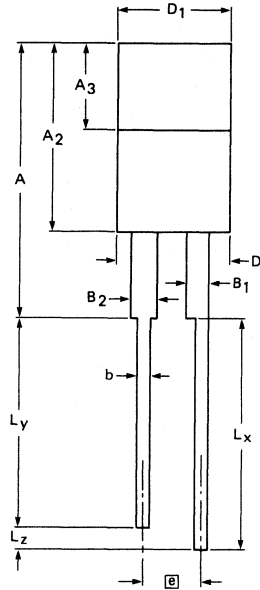
GENERAL

The Emission Area

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



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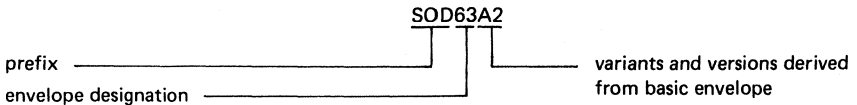
7295426

Pinning

The cathode, anode, emitter and collector are indicated on the drawings. Only the flat on the body or the shortest lead is 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:



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).

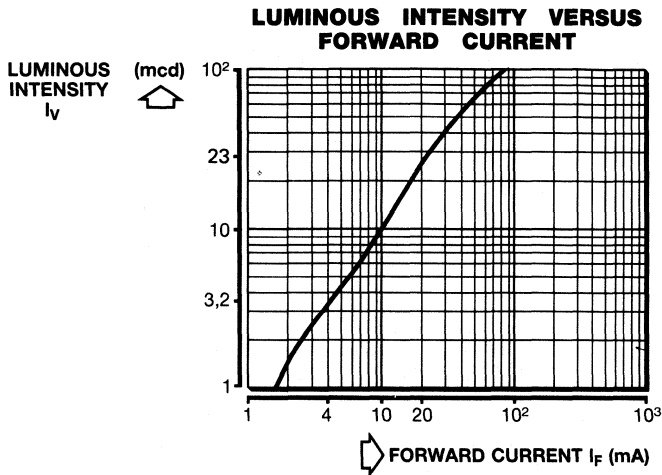


Fig. 1.

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 dutyfactor 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 $^{\circ}\text{C}$, 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

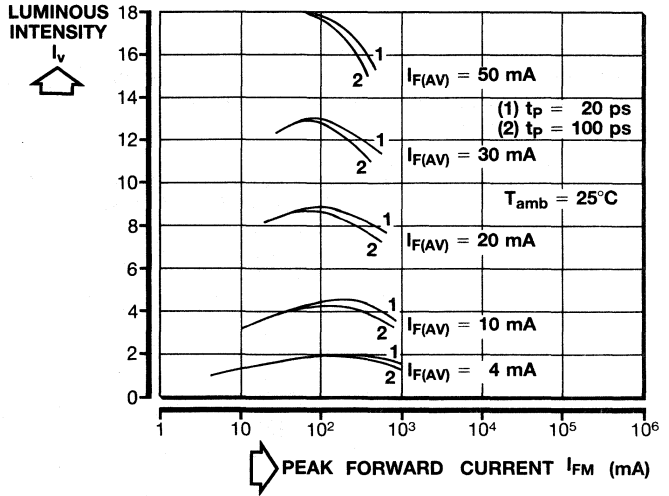


Fig. 2 $T_{amb} = 25^\circ\text{C}$;

(1) $t_p = 20$ ps

(2) $t_p = 100$ ps

FORWARD CURRENT VERSUS DUTY CYCLE AND PULSE DURATION

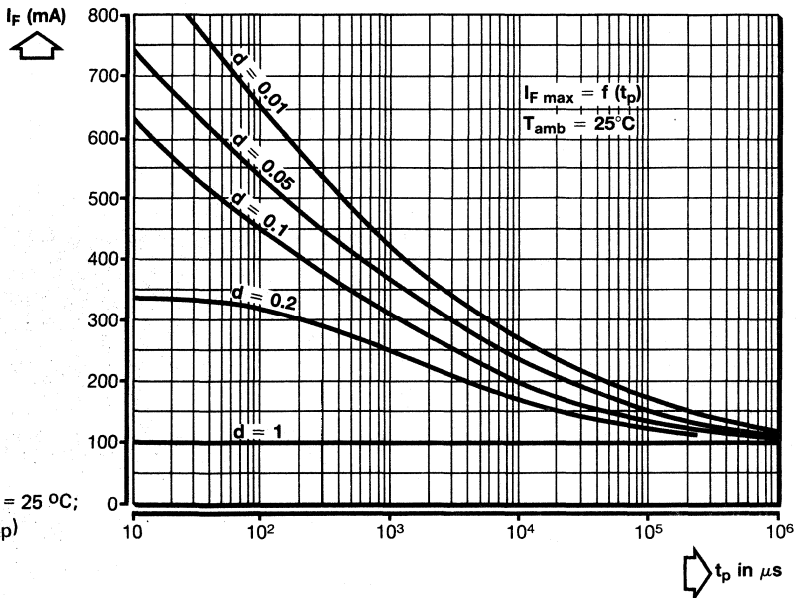


Fig. 3 $T_{amb} = 25^\circ\text{C}$;

$I_{F \text{ max}} = f(t_p)$

The peak wavelength of the colour emitted by the LED also changes with junction temperature, according to the relation $d\lambda_p/dT_j = +0,15$ 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.

SPECTRAL RESPONSE OF HUMAN EYE

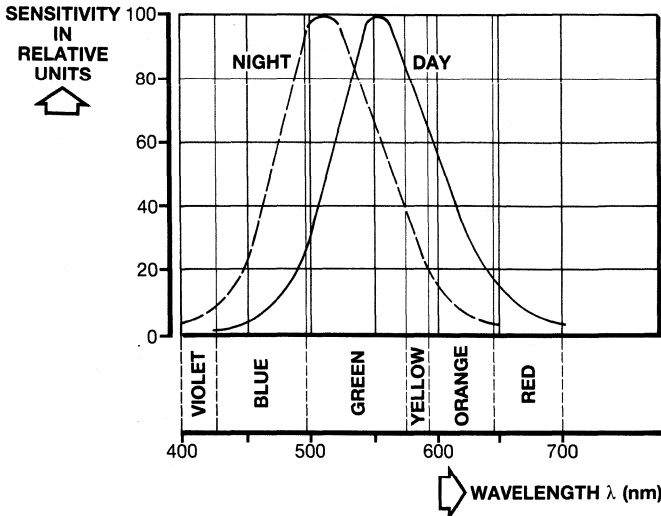


Fig. 4.

CHANGE IN WAVELENGTH JUST DETECTABLE BY HUMAN EYE VERSUS WAVELENGTH

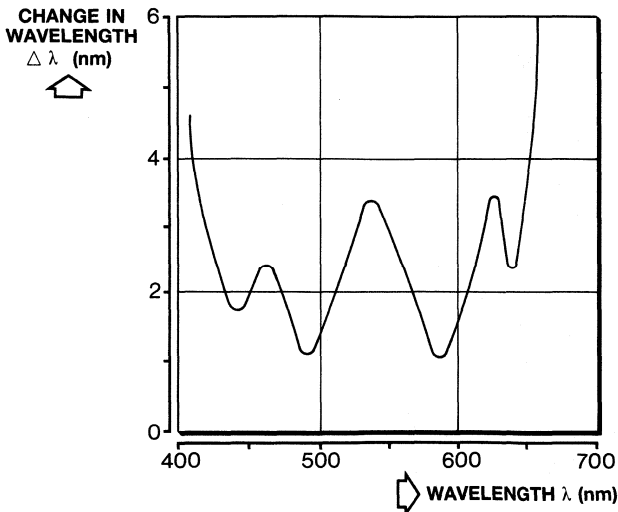


Fig. 5.

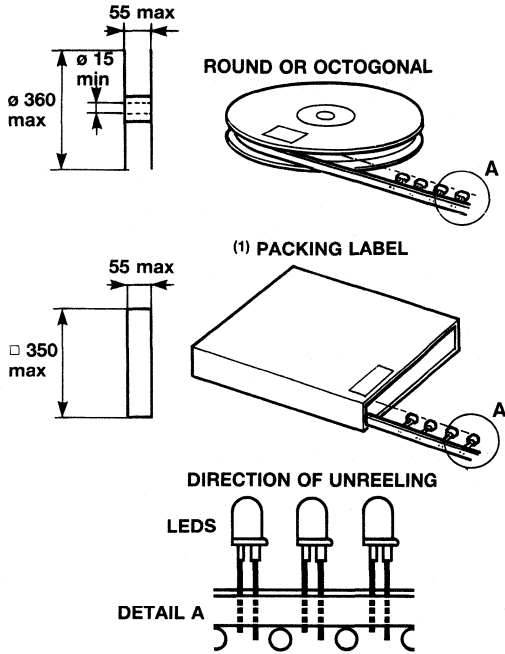
TAPE PACKAGING OF LEDs

LEDs can be supplied on tape, with unidirectional 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			See Philips envelope spec.
	c			
Pitch of component	P	12,7	±1	
Feed hole pitch	P ₀	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 ₀	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 ₀			
Component height	H ₁	H+A	+0-0,2	
Length of snapped 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

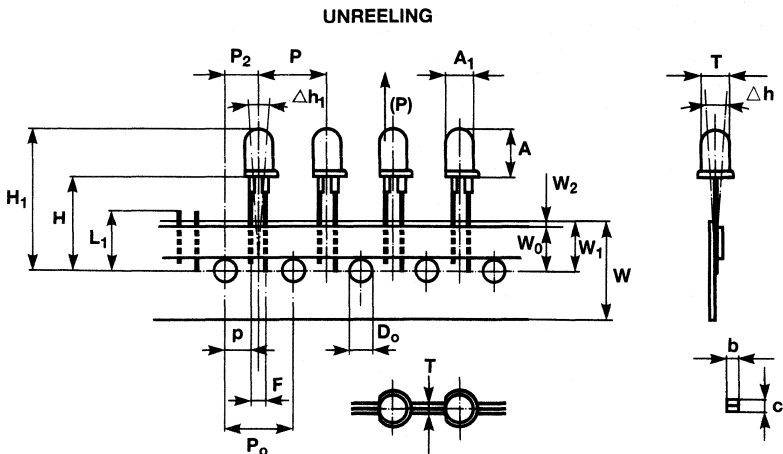


Fig. 2 See table.

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 °C) and, in the case of the solder-bath, it is useful to record the temperature. The maximum temperature must not exceed 260 °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 slightly 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.

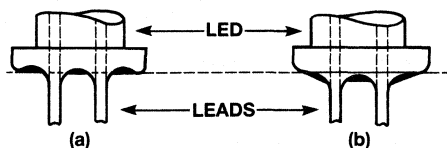


Fig. 1.

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).

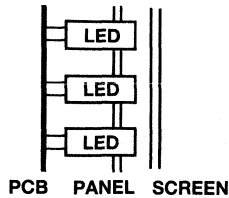


Fig. 2.

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.

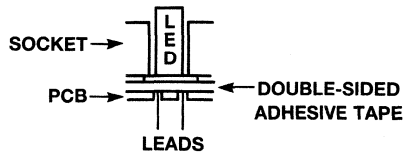


Fig. 3.



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 COY58A is recommended.

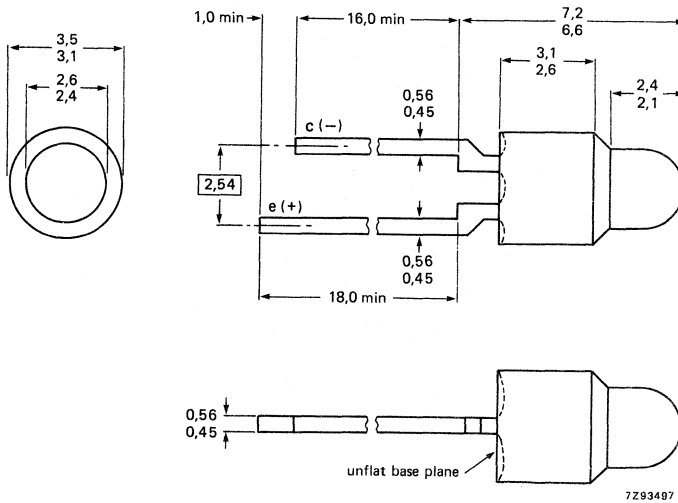
QUICK REFERENCE DATA

Collector-emitter voltage	V_{CE0}	max.	50 V	
Collector current (d.c.)	I_C	max.	25 mA	
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	100 mW	
Collector dark current $V_{CE} = 30\text{ V}; E = 0$	$I_{CEO(D)}$	<	100 nA	
Collector light current $V_{CE} = 5\text{ V}; E_e = 1\text{ mW/cm}^2; \lambda_{pk} = 930\text{ nm}$	BPW22A-1 BPW22A-2	$I_{CEO(L)}$ $I_{CEO(L)}$	> 1,5 to 8 mA > 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 $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	100 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
→ > 1,5 mm from the seating plane; $t_{sld} < 7\text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

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

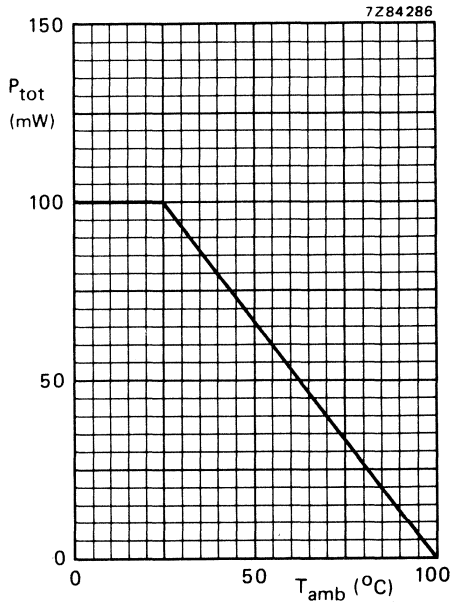


Fig. 2 Power derating curve versus ambient temperature.

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector dark current

$V_{CE} = 30\text{ V}; E = 0$

$I_{CEO(D)} < 100\text{ nA}$

Collector light current

$V_{CE} = 5\text{ V}; E_e = 1\text{ mW/cm}^2; \lambda_p = 930\text{ nm}$

BPW22A-1
BPW22A-2

$I_{CEO(L)} \quad 1,5\text{ to }8\text{ mA}$ ←
 $I_{CEO(L)} \quad 5\text{ to }25\text{ mA}$

Collector-emitter saturation voltage

$I_C = 1\text{ mA}; E_e = 1\text{ mW/cm}^2; \lambda_p = 930\text{ nm}$

$V_{CEsat} < 0,4\text{ V}$

Wavelength at peak response

$\lambda_p \quad \text{typ. } 800\text{ nm}$

Bandwidth at half height

$\Delta\lambda \quad \text{typ. } 400\text{ nm}$

Beamwidth between half-intensity directions

$\theta_{1/2} \quad \text{typ. } 20^\circ$ ←

Switching times (see Figs 3, 4, 9 and 10)

$I_{Con} = 2\text{ mA}; V_{CC} = 5\text{ V}; R_E = 100\text{ }\Omega; T_{amb} = 25\text{ }^\circ\text{C}$
turn-on time

$t_{on} \quad \text{typ. } 3\text{ }\mu\text{s}$

turn-off time

$t_{off} \quad \text{typ. } 3\text{ }\mu\text{s}$

$I_{Con} = 2\text{ mA}; V_{CC} = 5\text{ V}; R_E = 1\text{ k}\Omega; T_{amb} = 25\text{ }^\circ\text{C}$

turn-on time

$t_{on} \quad \text{typ. } 12,0\text{ }\mu\text{s}$

turn-off time

$t_{off} \quad \text{typ. } 12,0\text{ }\mu\text{s}$ ←

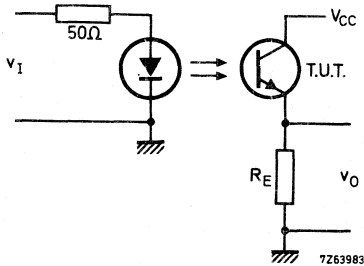


Fig. 3 Switching circuit with light emitting diode CQY58A. T.U.T. = BPW22A.

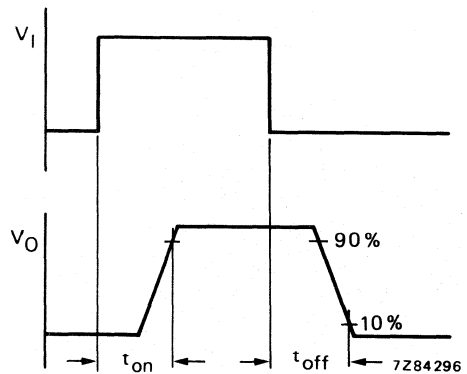


Fig. 4 Input and output switching waveforms.

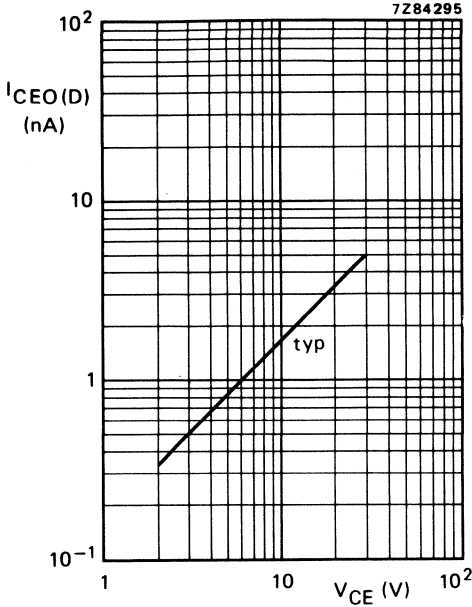


Fig. 5 $E = 0$; $T_j = 25^\circ\text{C}$.

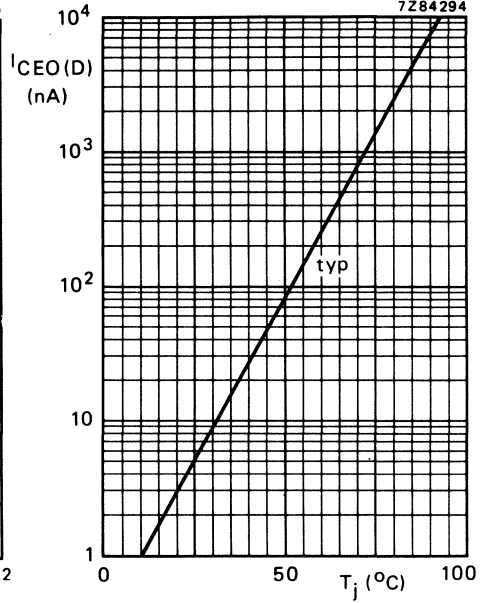


Fig. 6 $E = 0$; $V_{CE} = 30\text{ V}$.

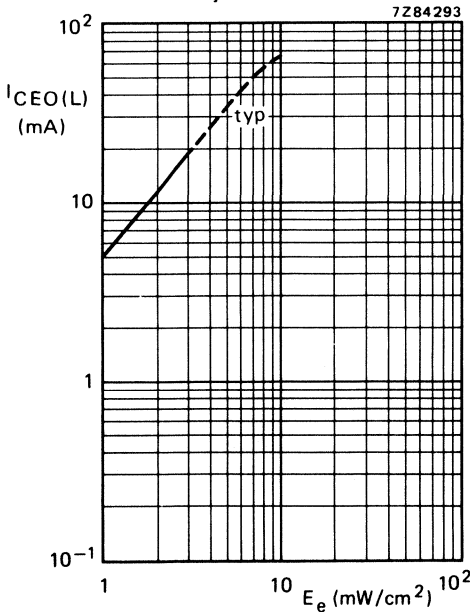


Fig. 7 GaAs source: $\lambda_{pk} = 930\text{ nm}$;
 $V_{CE} = 5\text{ V}$; $T_j = 25^\circ\text{C}$.

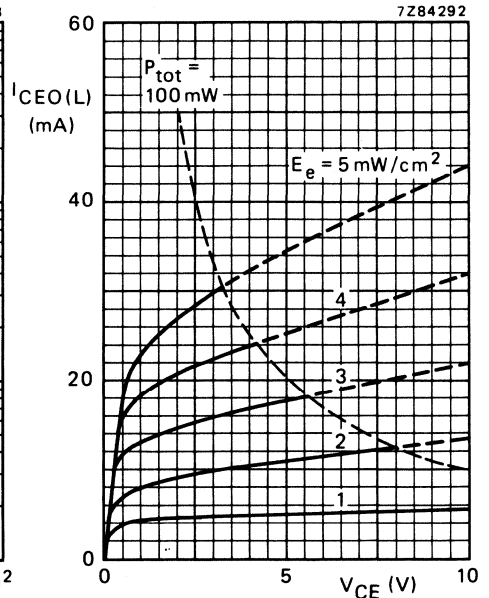


Fig. 8 $\lambda_{pk} = 930\text{ nm}$; $T_j = 25^\circ\text{C}$;
typical values.

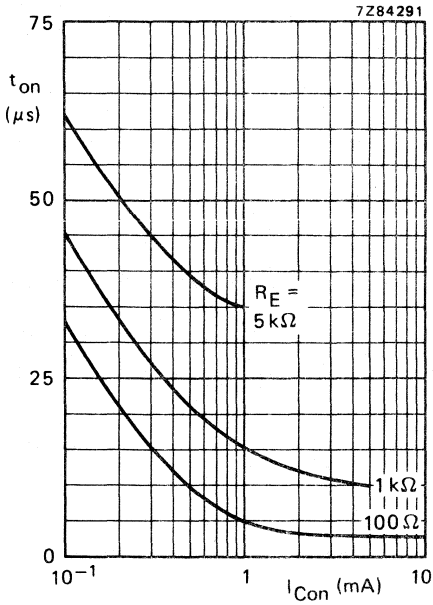


Fig. 9 $V_{CC} = 5 V$; $T_{amb} = 25^\circ C$; typical values; see also Figs 3 and 4.

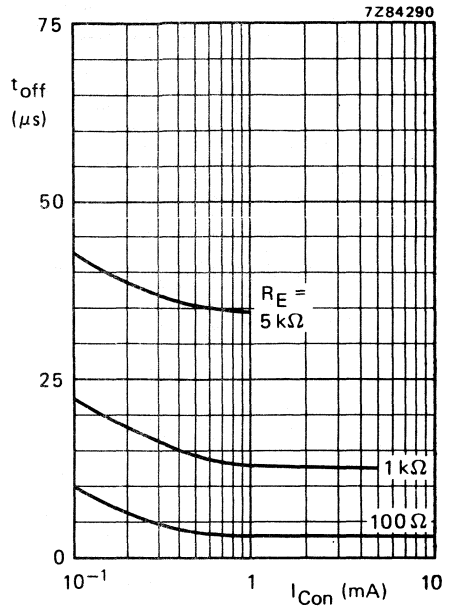


Fig. 10 $V_{CC} = 5 V$; $T_{amb} = 25^\circ C$; typical values; see also Figs 3 and 4.

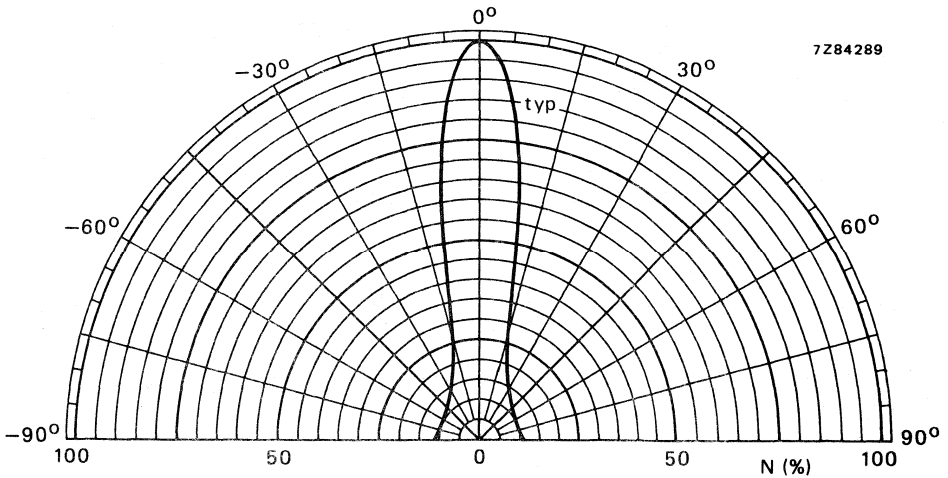


Fig. 11.

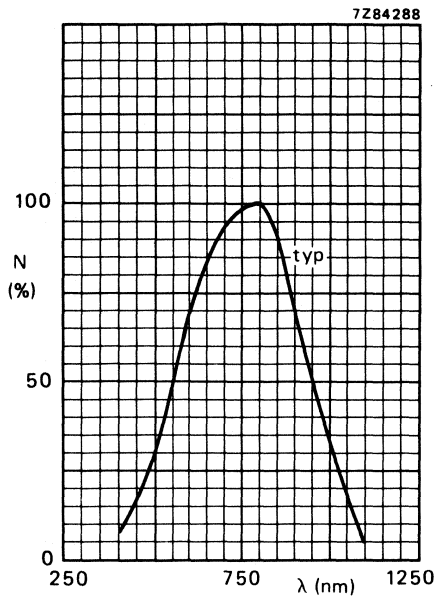


Fig. 12 Spectral response.

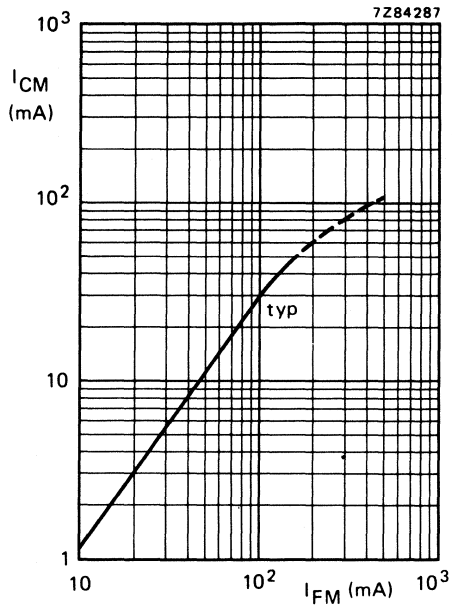


Fig. 13 $V_{CE} = 5$ V; $t_p(I_{FM}) = 10$ μ s; $T = 1$ ms; $d^* = 10$ mm; $T_{amb} = 25$ $^{\circ}$ C.

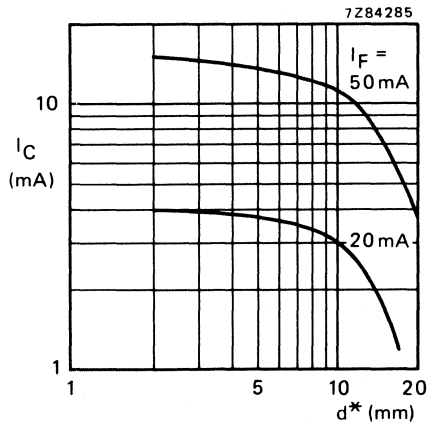


Fig. 14 $V_{CE} = 5$ V; $T_{amb} = 25$ $^{\circ}$ C; typical values.

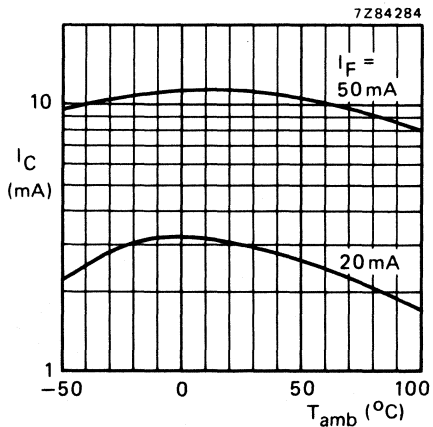


Fig. 15 $V_{CE} = 5$ V; $d^* = 10$ mm; typical values.

* 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.

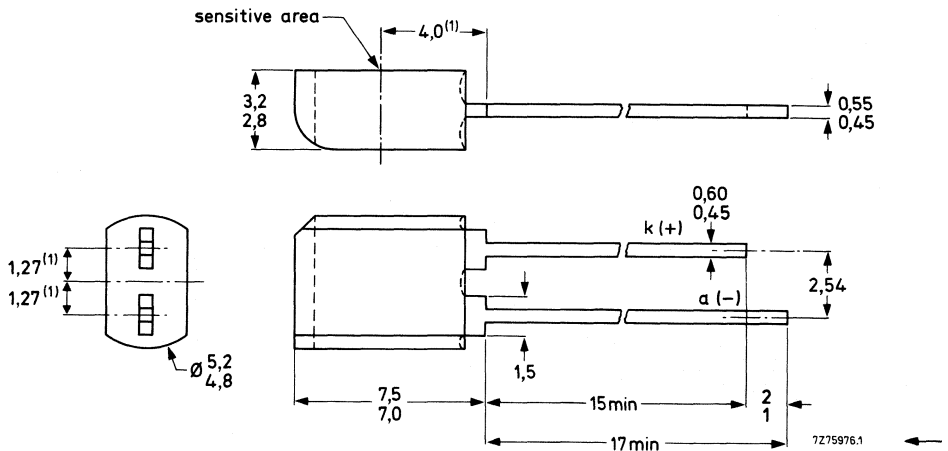
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	32 V
Total power dissipation up to $T_{amb} = 47,5\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Dark reverse current $V_R = 10\text{ V}; E_e = 0$	$I_{R(D)}$	<	30 nA
Light reverse current $V_R = 5\text{ V}; E_e = 1\text{ mW/cm}^2; \lambda = 930\text{ nm}$	$I_{R(L)}$	>	30 μA
Wavelength at peak response $V_R = 5\text{ V}$	λ_p	typ.	930 nm
Sensitive area	A	typ.	5 mm ²

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 $T_{amb} = 47,5\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}	-30 to + 100	$^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature up to the seating plane; $t_{sld} < 10\text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

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

$T_j = 25\text{ }^\circ\text{C}$

Dark reverse current
 $V_R = 10\text{ V}; E_e = 0$

$I_R(D)$	typ.	2 nA
	<	30 nA

Light reverse current
 $V_R = 5\text{ V}; E_e = 1\text{ mW/cm}^2; \lambda = 930\text{ nm}$

$I_R(L)$	>	30 μA
	typ.	45 μA

Reverse voltage
 $I_R = 0,1\text{ mA}; E_e = 0$

V_R	>	32 V
-------	---	------

→ Wavelength at peak response
 $V_R = 5\text{ V}$

λ_p	typ.	930 nm
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Diode capacitance
 $V_R = 3\text{ V}$

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
 $V_{KK} = 10\text{ V}; R_A = 1\text{ k}\Omega$

t_r, t_f	typ.	50 ns
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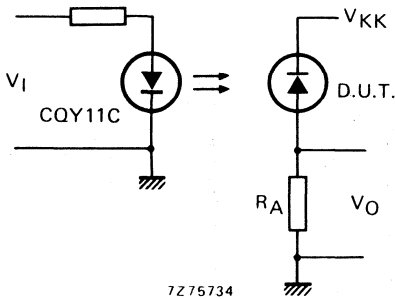


Fig. 2 Switching circuit.

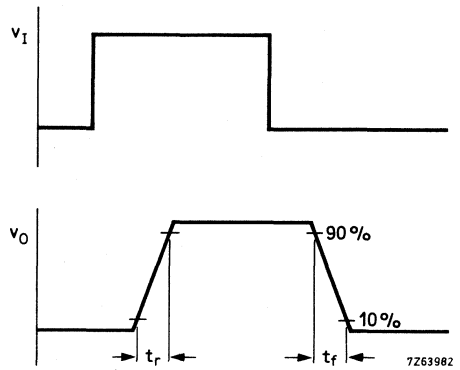


Fig. 3 Input and output switching waveforms.

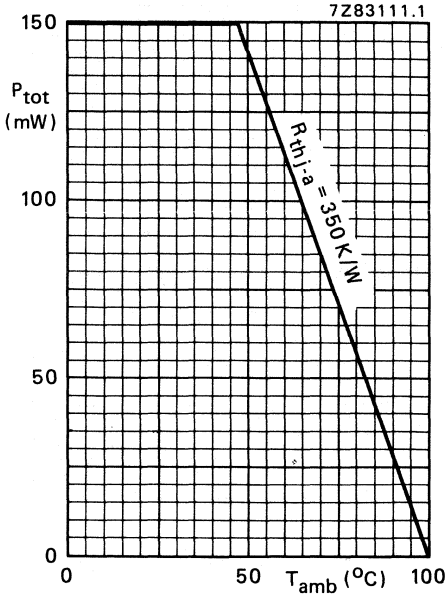


Fig. 4 Maximum permissible power dissipation as a function of temperature.

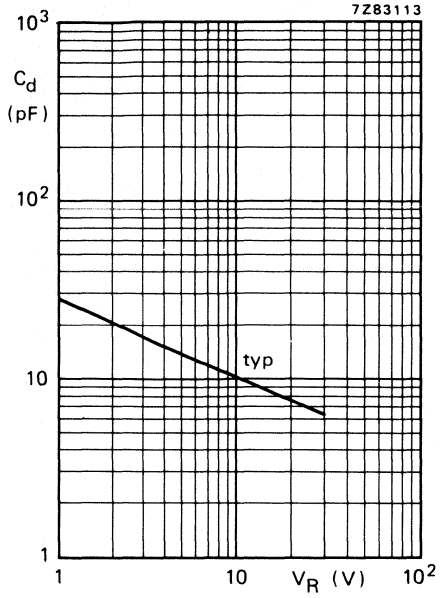


Fig. 5 $T_{amb} = 25^{\circ}C$.

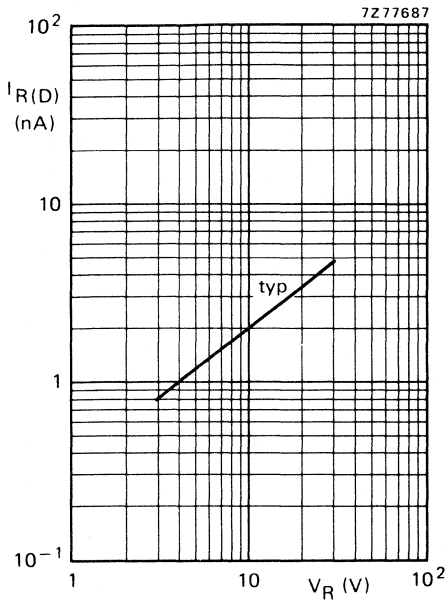


Fig. 6 $E = 0$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

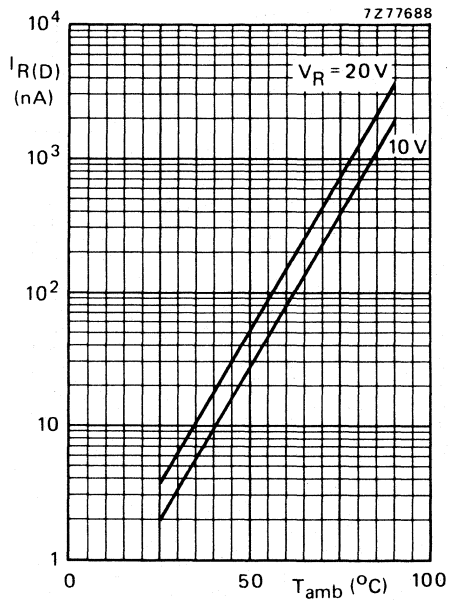


Fig. 7 $E = 0$; typical values.

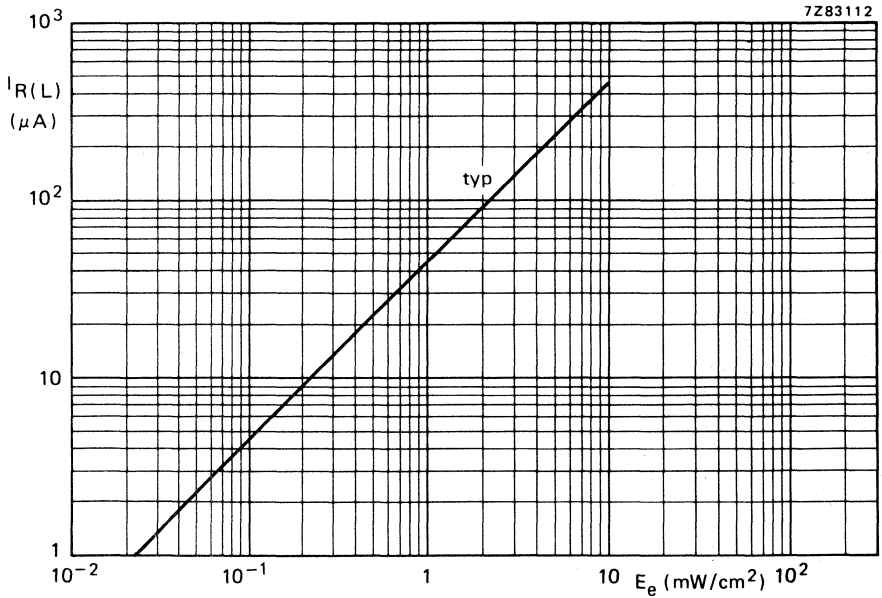


Fig. 8 $V_R = 5\text{ V}$; $\lambda = 930\text{ nm}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

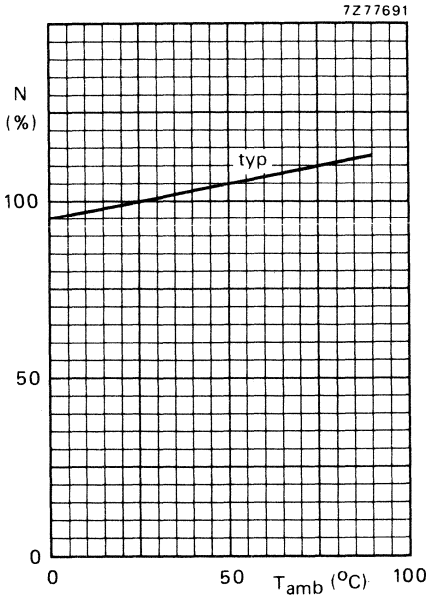


Fig. 9 $E_e = 1 \text{ mW/cm}^2$; $\lambda = 930 \text{ nm}$.

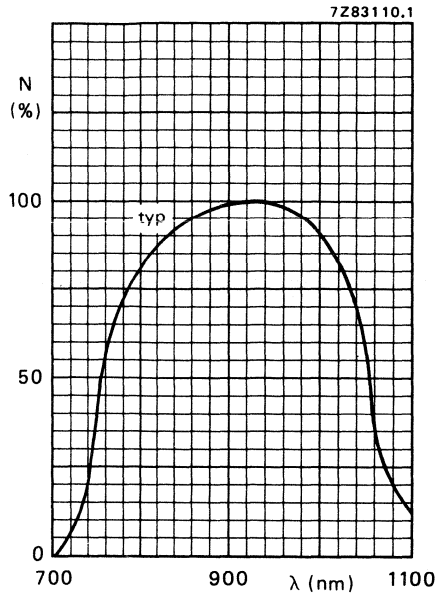


Fig. 10 $V_R = 5 \text{ V}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

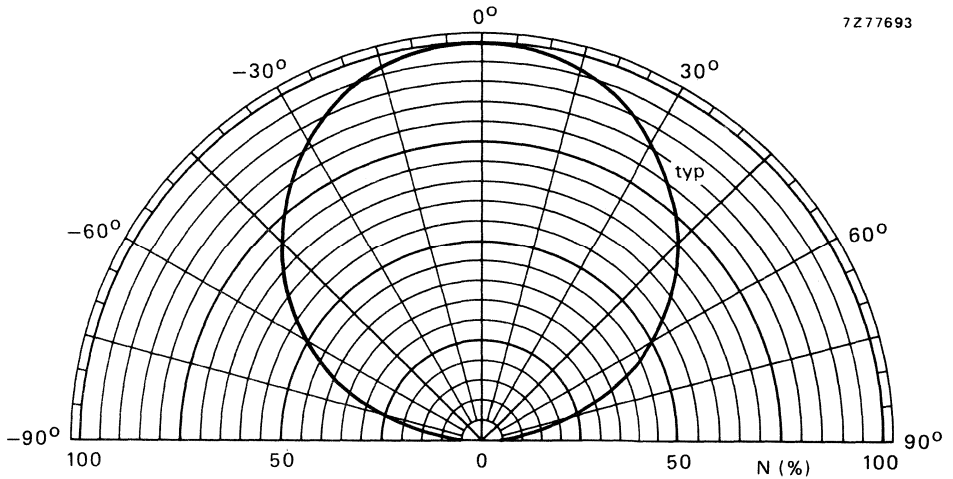


Fig. 11.



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 $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	CQS51(L)	I_v	min.	0,7 mcd
Wavelength at peak emission		λ_p	typ.	700 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63A1.

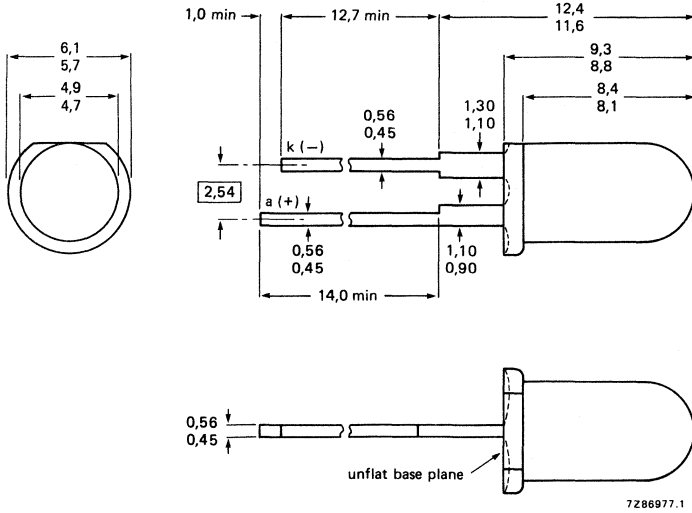
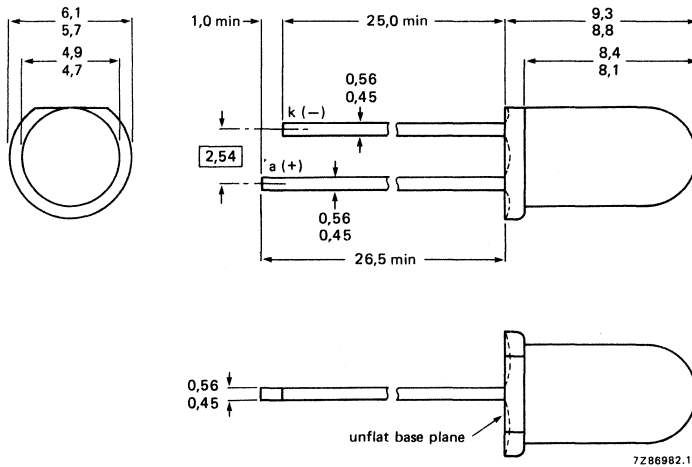


Fig. 1b SOD-63L.



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 1,5 mm from the seating plane for CQS51 > 5 mm from the plastic body for CQS51L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when

the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

 $I_F = 10 \text{ mA}$

V_F	typ.	2,0 V
	max.	2,6 V

Reverse current

 $V_R = 5 \text{ V}$

I_R	max.	100 μA
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Beamwidth at half-intensity directions

 $I_F = 10 \text{ mA}$

$\theta_{1/2}$	typ.	70 $^\circ$
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Bandwidth at half height

$\Delta\lambda$	typ.	90 nm
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Wavelength at peak emission

 $I_F = 10 \text{ mA}$

λ_p	typ.	700 nm
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Luminous intensity

 $I_F = 10 \text{ mA}$

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

 $V_R = 0$; $f = 1 \text{ MHz}$

C_d	typ.	45 pF
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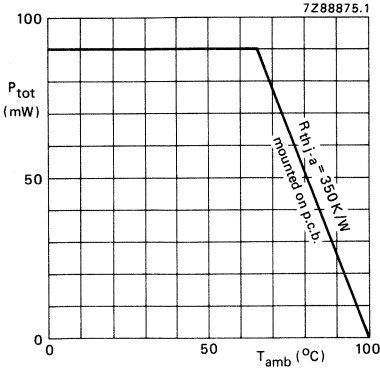


Fig. 2 Typical values.

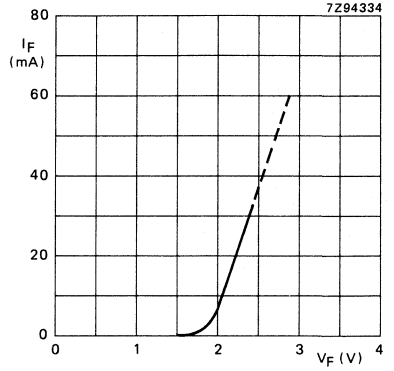


Fig. 3 $I_F = f(V_F)$.

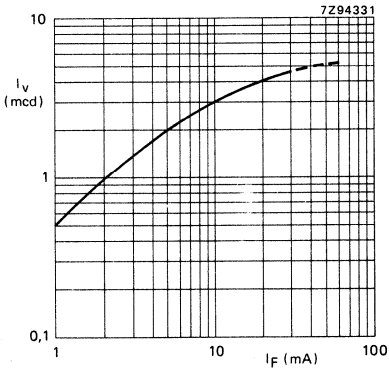


Fig. 4 $I_V = f(I_F)$.

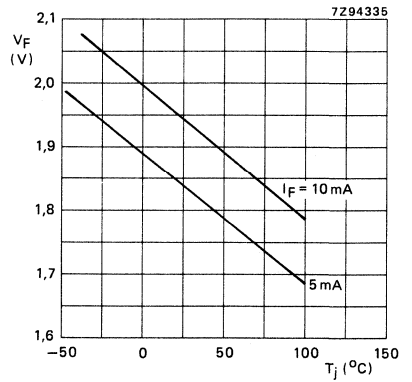


Fig. 5 Typical values.

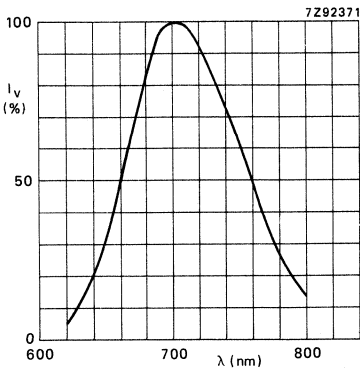


Fig. 6 Typical values.

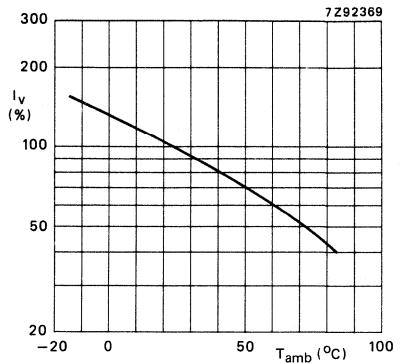


Fig. 7 Typical values.

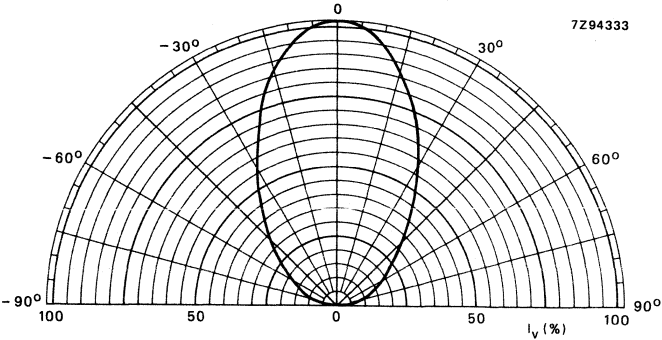


Fig. 8 Typical values.

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.

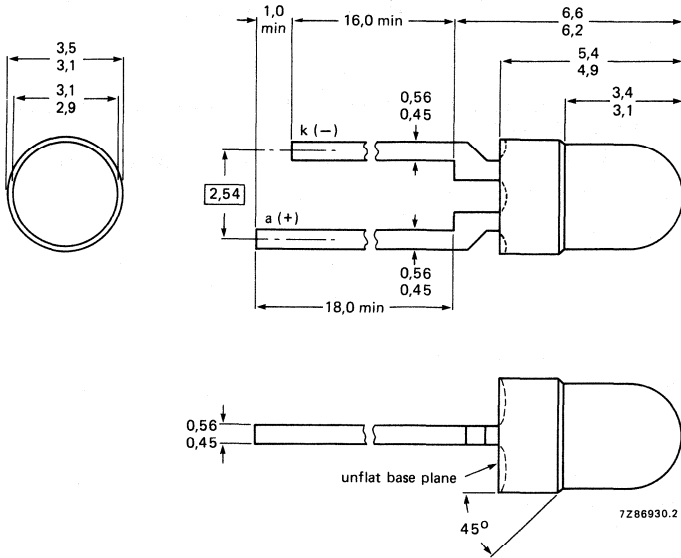
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity $I_F = 10\text{ mA}$	I_v	min.	0,7 mcd
Wavelength at peak emission	λ_p	typ.	700 nm
Beamwidth at half-intensity directions	$\theta_{1/2}$	typ.	70 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 1,5 mm from the seating plane	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when
the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

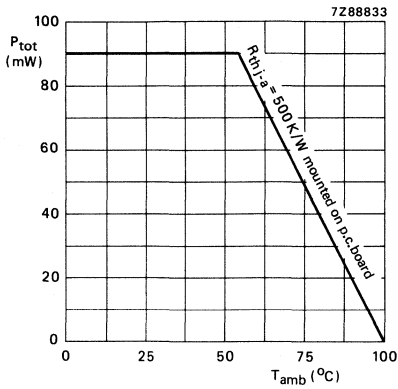


Fig. 2 Typical values.

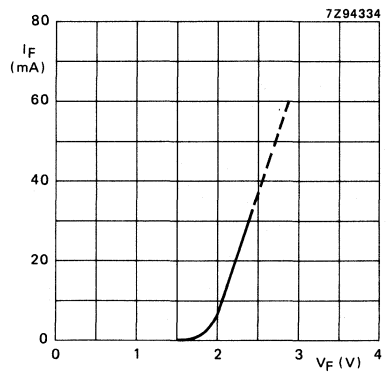


Fig. 3 $I_F = f(V_F)$.

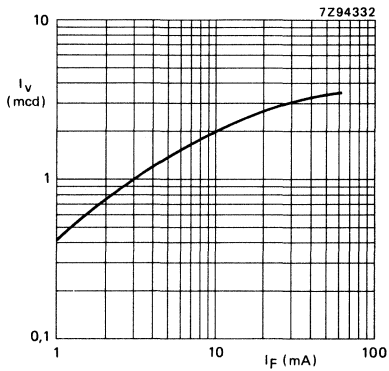


Fig. 4 $I_V = f(I_F)$.

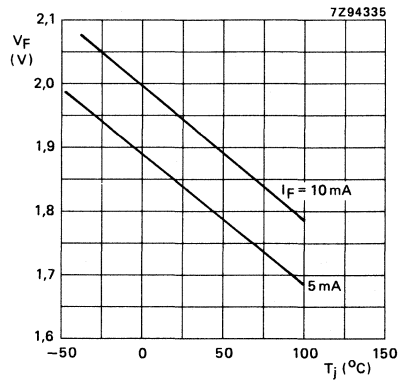


Fig. 5 Typical values.

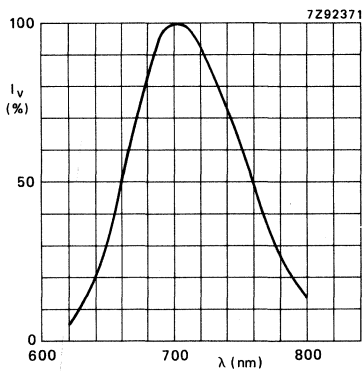


Fig. 6 Typical values.

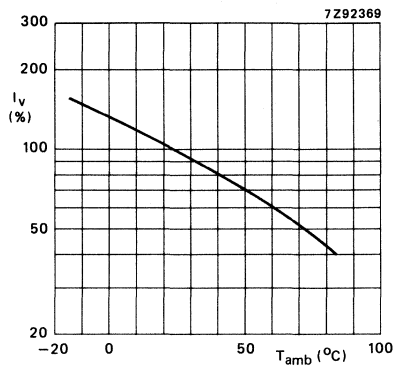


Fig. 7 Typical values.

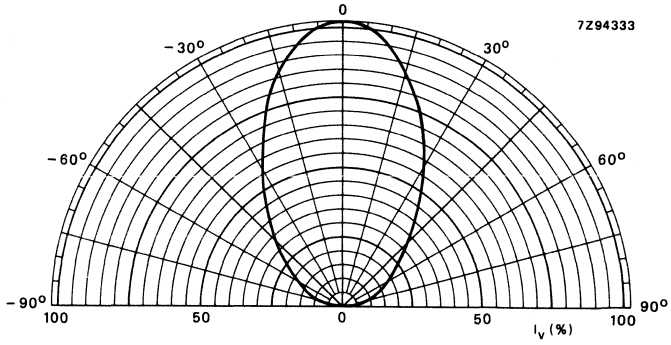


Fig. 8 Typical values.

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.

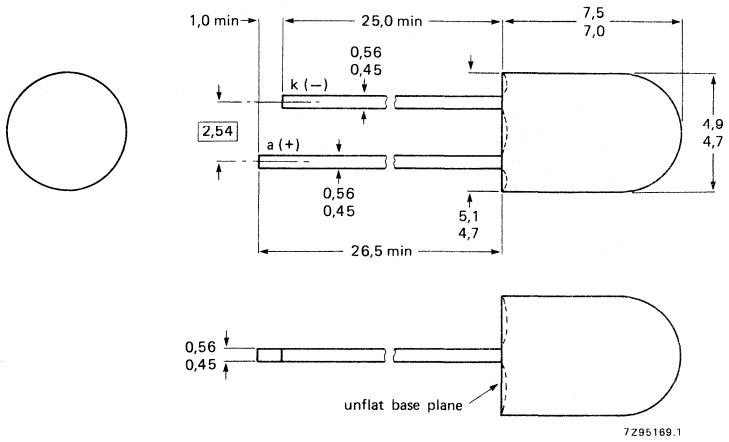
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	50 mA
Total power dissipation up to $T_{amb} = 60\text{ }^\circ\text{C}$	P_{tot}	max.	100 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 20\text{ mA}$	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			
$I_F = 20\text{ mA}$	λ_p	typ.	650 nm
Beamwidth at half-intensity directions	$\theta_{1/2}$	typ.	70 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_p = 10 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	100 mA
Total power dissipation up to $T_{amb} = 60 \text{ }^\circ\text{C}$	P_{tot}	max.	100 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 5 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when
the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 20 \text{ mA}$	V_F	typ.	1,7 V	
		max.	2,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth at half-intensity directions				
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm	
Wavelength at peak emission				
$I_F = 20 \text{ mA}$	λ_p	typ.	650 nm	
Luminous intensity				
$I_F = 20 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	10 pF	

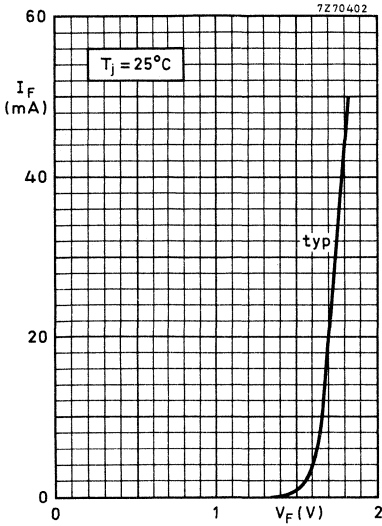


Fig. 2.

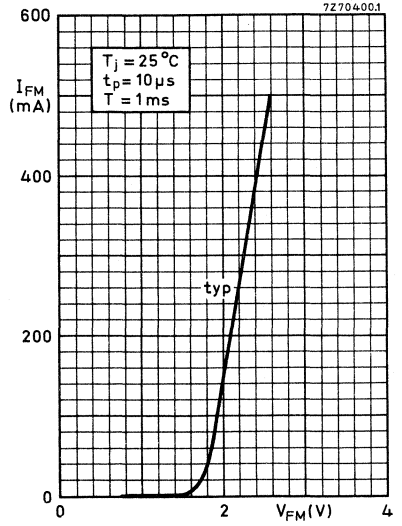


Fig. 3.

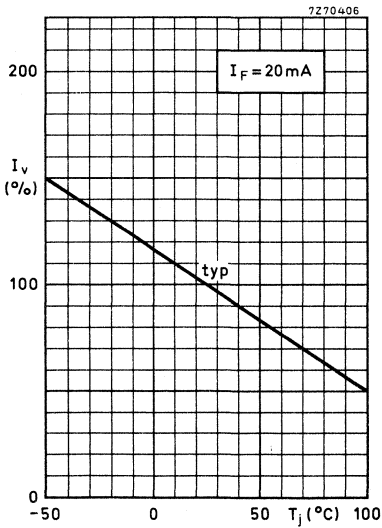


Fig. 4.

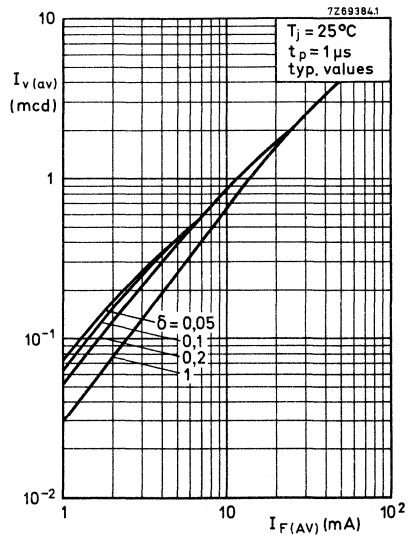


Fig. 5.

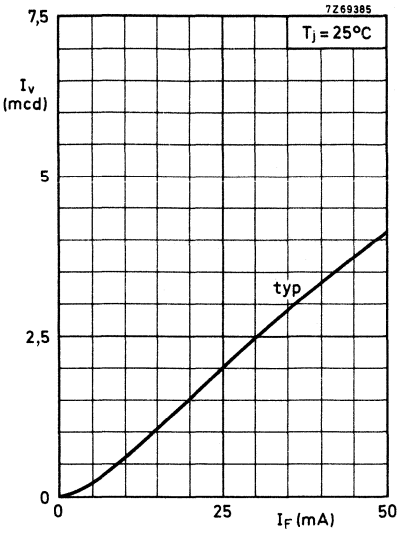


Fig. 6.

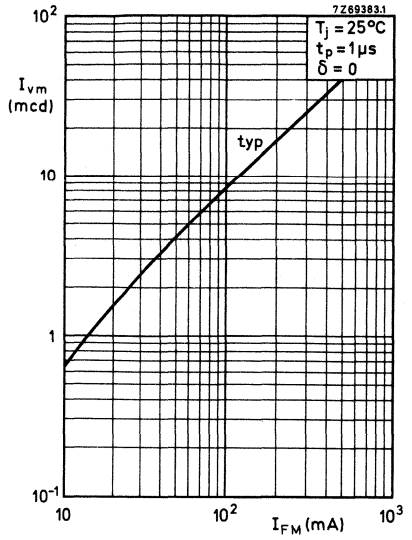


Fig. 7.

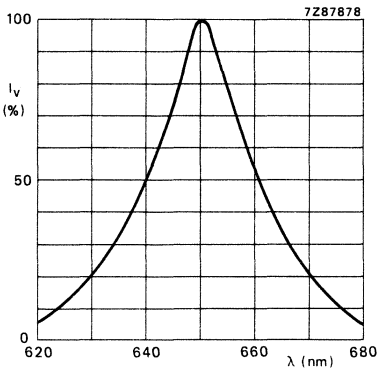


Fig. 8 Typical values.

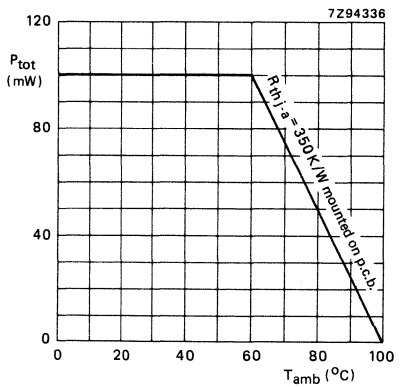


Fig. 9 Typical values.

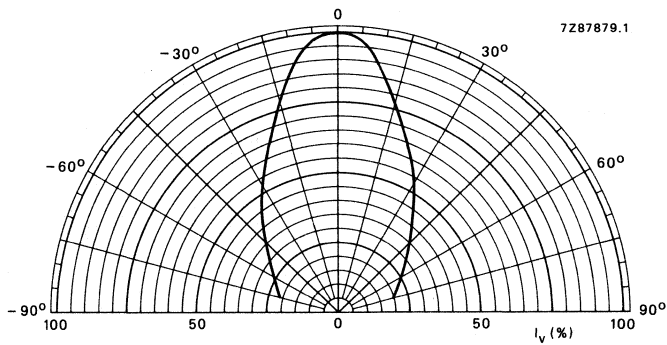


Fig. 10 Typical values.

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 $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$		λ_p	typ. 650 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ. 70 $^\circ$

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; $t = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 5 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when

the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

$I_F = 10 \text{ mA}$	V_F	typ.	1,75 V
		max.	2,2 V

$I_F = 100 \text{ mA}$	V_F	typ.	2,0 V
		max.	2,5 V

Reverse current

$V_R = 5 \text{ V}$	I_R	max.	100 μA
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Beamwidth at half-intensity directions

$I_F = 10 \text{ mA}$; in the plane of the leads	$\theta_{1/2}$	typ.	70 $^\circ$
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Bandwidth at half height

$\Delta\lambda$	typ.	20 nm
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Wavelength at peak emission

$I_F = 10 \text{ mA}$	λ_p	typ.	650 nm
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Luminous intensity

$I_F = 10 \text{ mA}$	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

$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	80 pF
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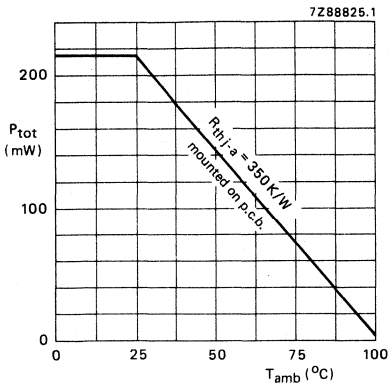


Fig. 2.

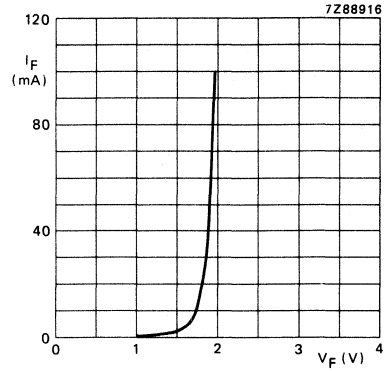


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

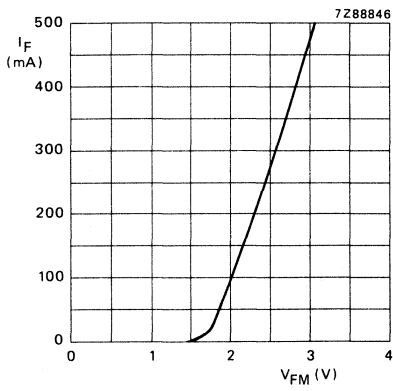


Fig. 4 $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

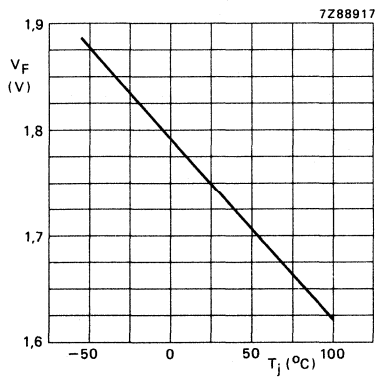


Fig. 5 $I_F = 10 \text{ mA}$; typ. values.

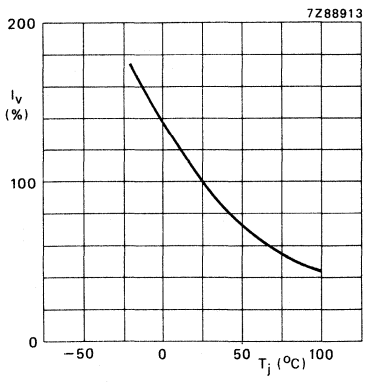


Fig. 6 Typical values.

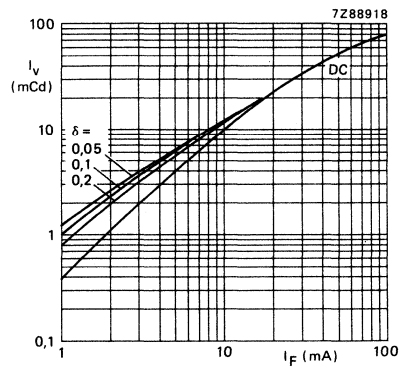


Fig. 7 $t_D = 50 \mu\text{s}$; typ. values.

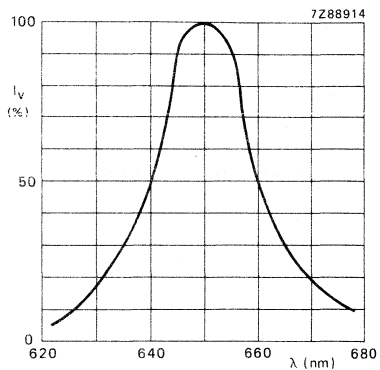


Fig. 8 $I_F = 10$ mA; $T_{amb} = 25$ °C; typ. values.

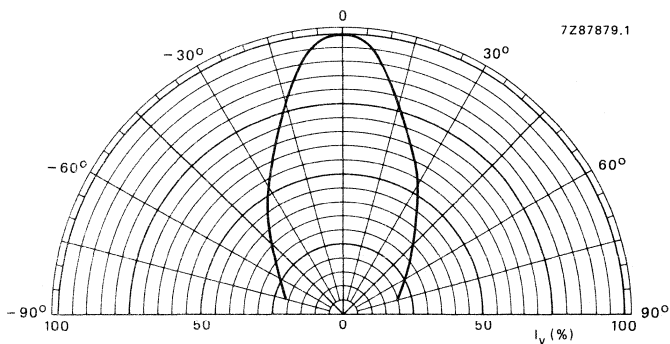


Fig. 9 Typical values.

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.

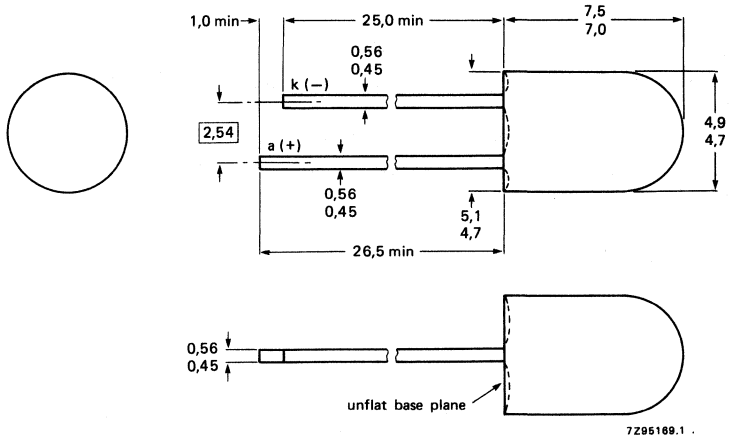
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 35\text{ }^\circ\text{C}$		P_{tot}	max.	180 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	565 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70 $^\circ$

MECHANICAL DATA

Fig. 1 SOD-85AL.

Dimensions in mm



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; $t = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_p < 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 5 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when
the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V
		max.	2,6 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	100 μA
Beamwidth at half-intensity directions			
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission			
$I_F = 10 \text{ mA}$	λ_p	typ.	565 nm
Luminous intensity			
$I_F = 10 \text{ mA}$			
	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			
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF

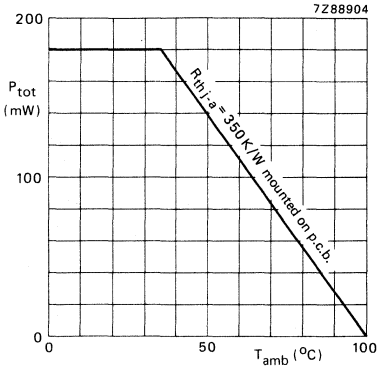


Fig. 2.

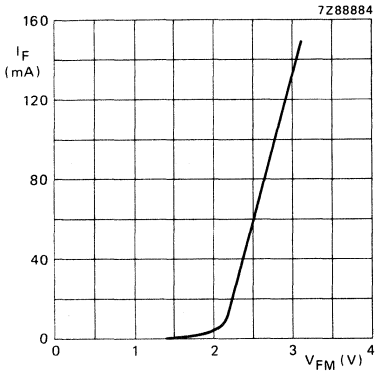


Fig. 4 $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

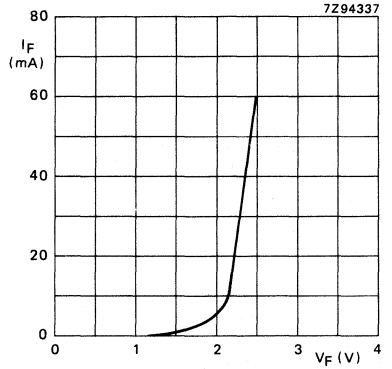


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

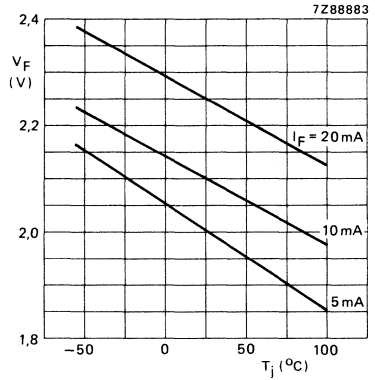


Fig. 5 Typical values.

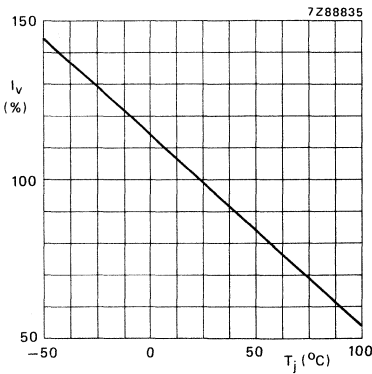


Fig. 6 Typical values.

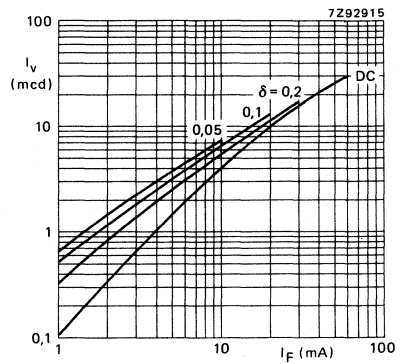


Fig. 7 $t_p = 50 \text{ } \mu\text{s}$; typ. values.

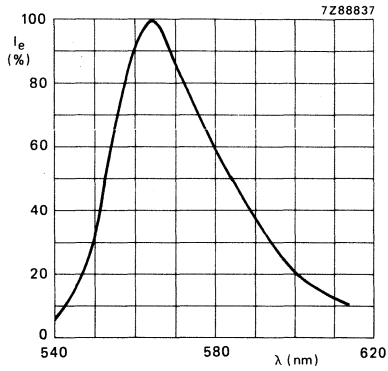


Fig. 8 I_F = 10 mA; typ. values.

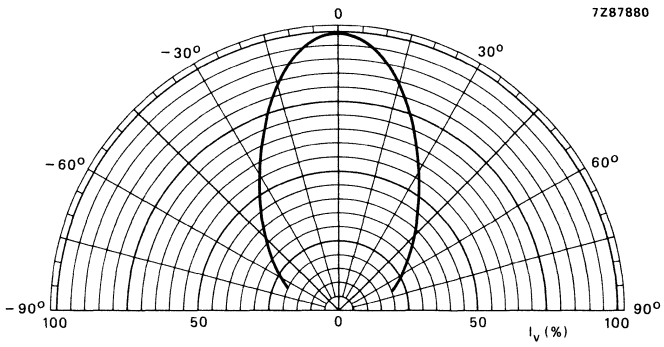
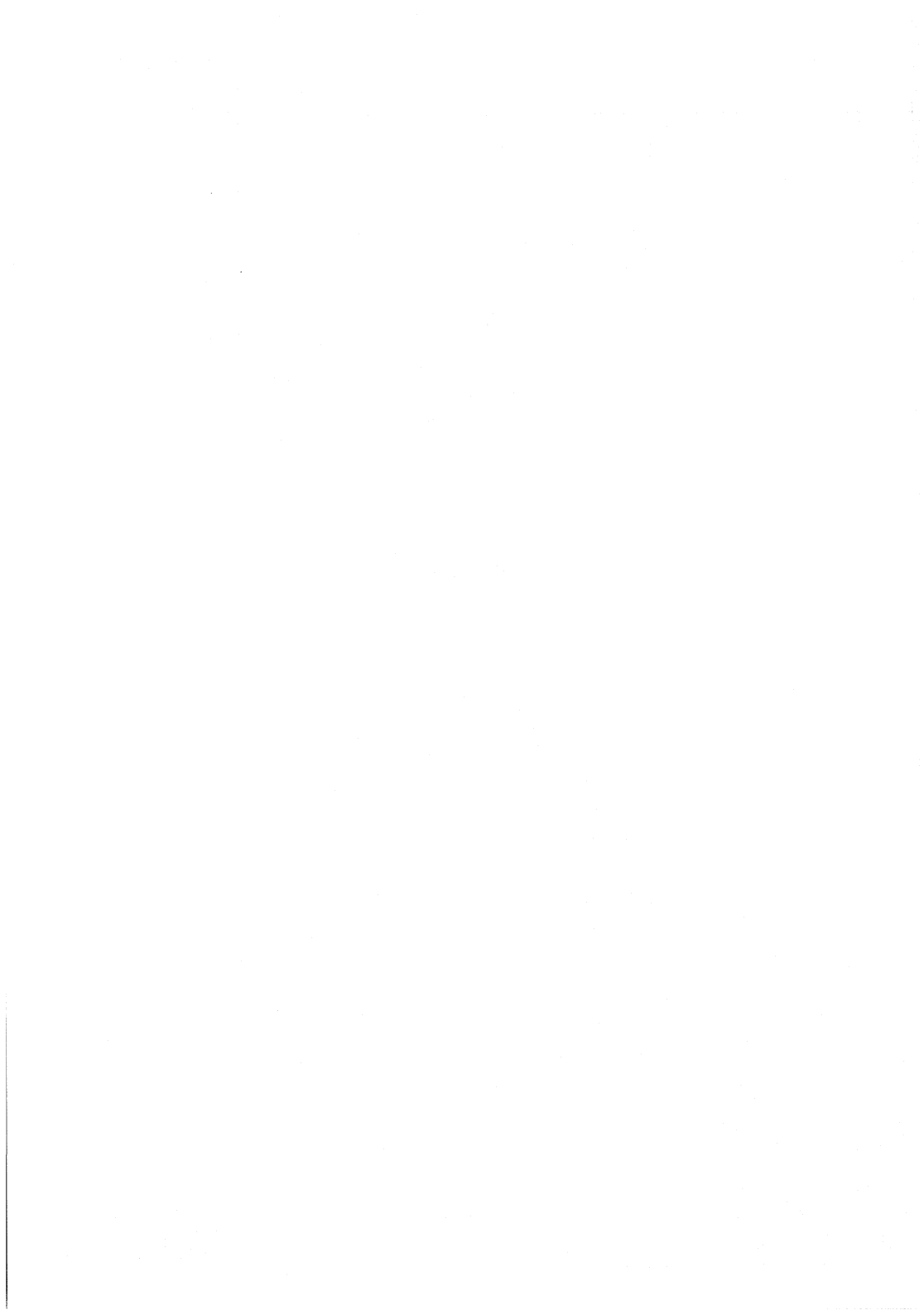


Fig. 9 I_F = 10 mA; typ. values.



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.

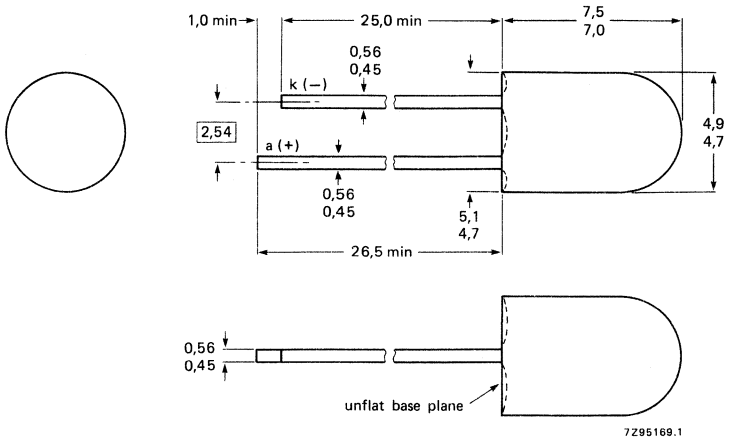
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_p < 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 5 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when
the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	2,6 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth at half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	590 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF	

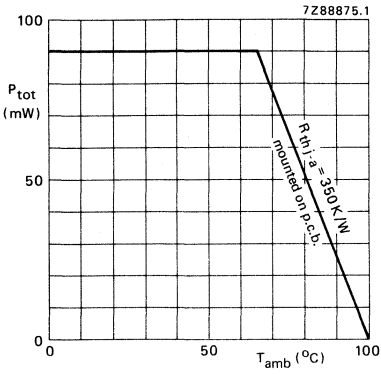


Fig. 2.

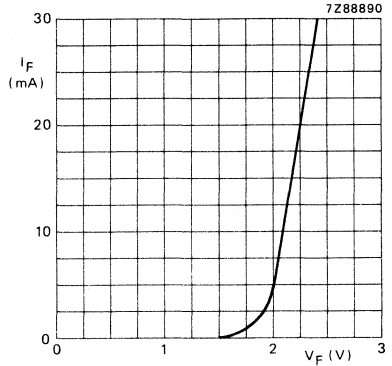


Fig. 3 $T_{amb} = 25\text{ }^\circ\text{C}$; typ. values.

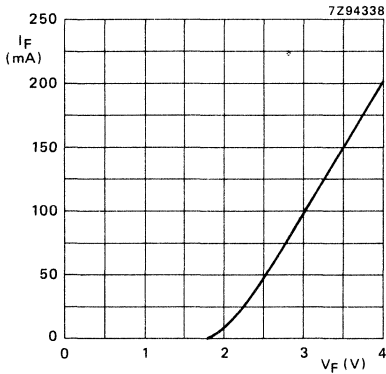


Fig. 4 $t_{on} = 50\text{ }\mu\text{s}$; $\delta = 0,33$;
 $T_{amb} = 25\text{ }^\circ\text{C}$; typ. values.

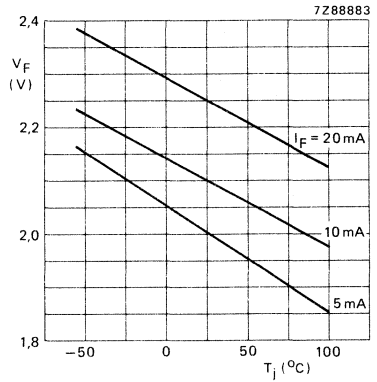


Fig. 5 Typical values.

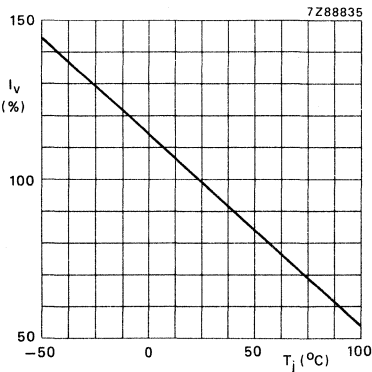


Fig. 6 Typical values.

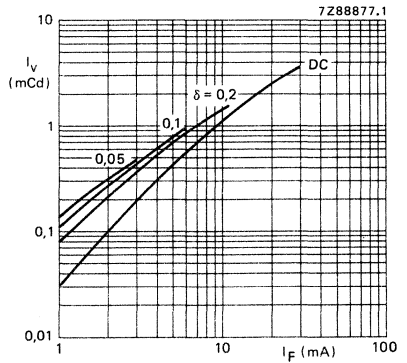


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typ. values.

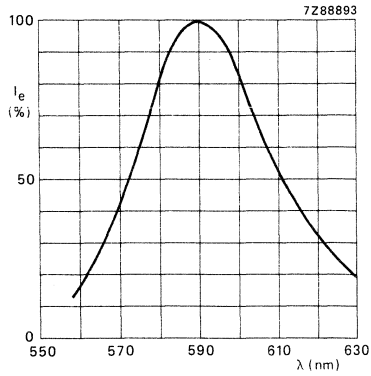


Fig. 8 Typical values.

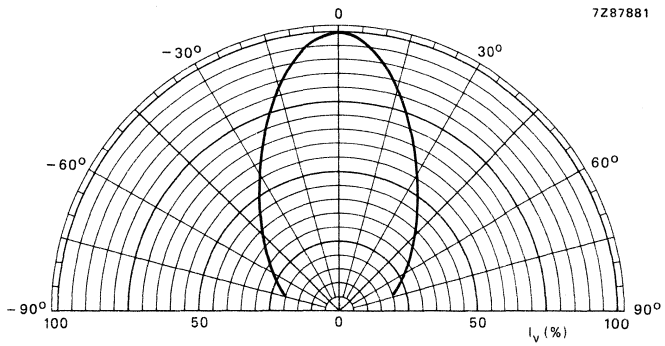


Fig. 9 Typical values.

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.

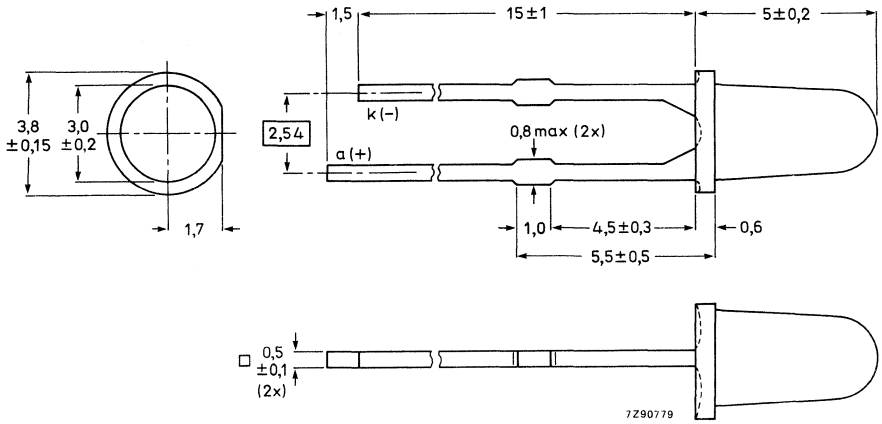
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	25 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	70 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 20\text{ mA}$	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 $^\circ$

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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_p = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	30 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	70 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7s$; > 3 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 20 \text{ mA}$	V_F	typ.	2,2 V
		max.	2,8 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	5 μA
Beamwidth at half-intensity directions			
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	60 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	100 nm
Wavelength at peak emission			
$I_F = 20 \text{ mA}$	λ_p	typ.	700 nm
Luminous intensity			
$I_F = 20 \text{ mA}$			
	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

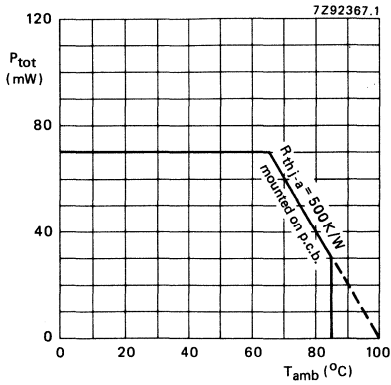


Fig. 2.

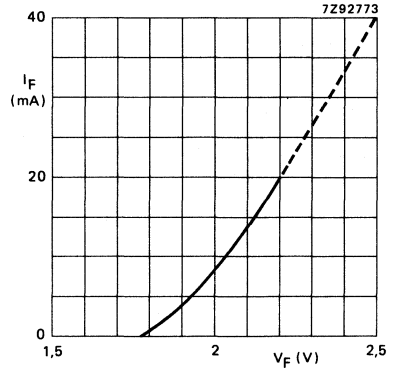


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

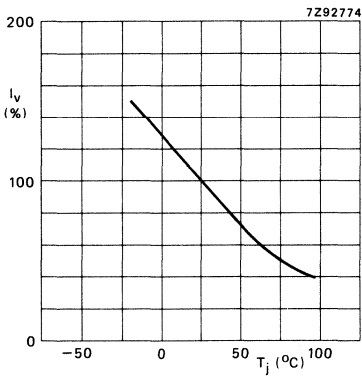


Fig. 4 Typical values.

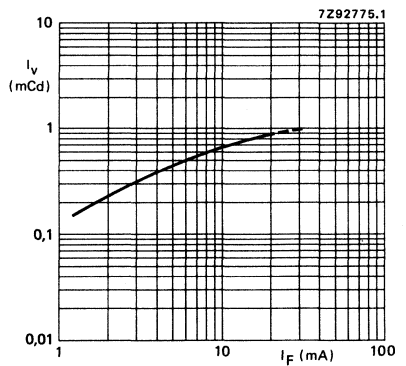


Fig. 5 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

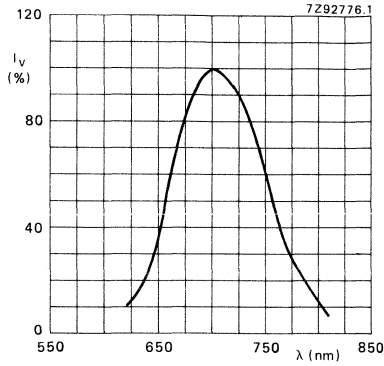


Fig. 6 $I_F = 20$ mA; $T_{amb} = 25$ °C; typ. values.

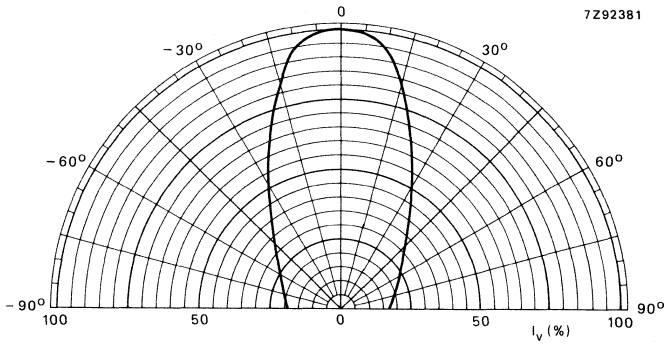
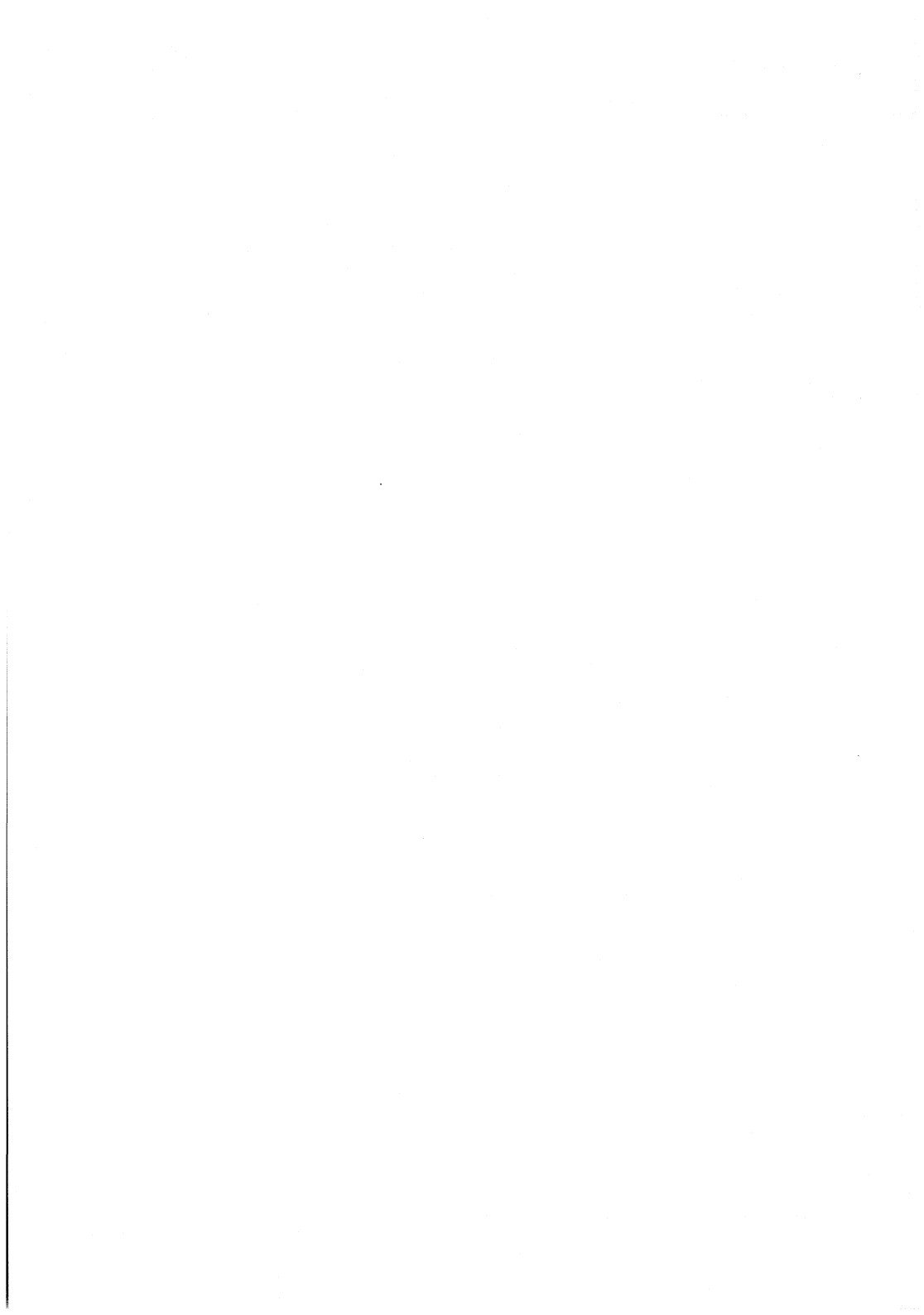


Fig. 7 Typical values.



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).

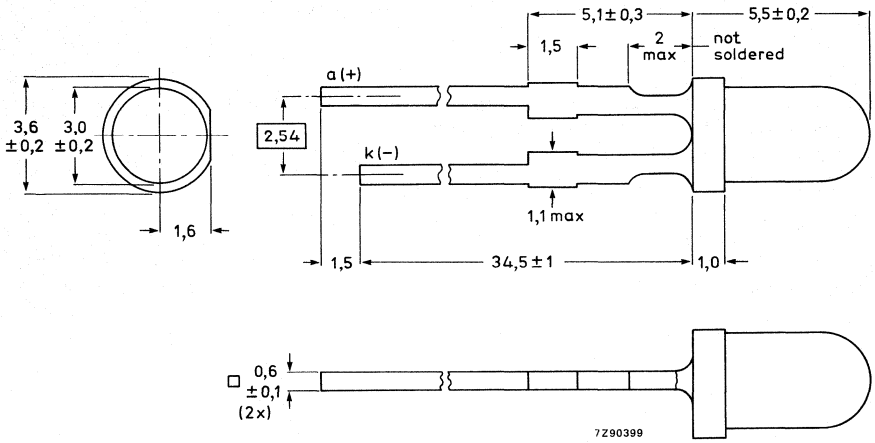
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	25 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	70 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 20\text{ mA}$	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		$\theta_{1/2}$	typ.	50 $^\circ$

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; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$		max.	30 mA
peak value; $t_p = 1 \text{ } \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	70 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 1,5 mm from the seating plane	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 20 \text{ mA}$	V_F	typ.	2,2 V
		max.	2,8 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	5 μA
Beamwidth between half-intensity directions			
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	50 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	100 nm
Wavelength at peak emission; $I_F = 20 \text{ mA}$	λ_p	typ.	700 nm
Luminous intensity			
$I_F = 20 \text{ mA}$			
	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

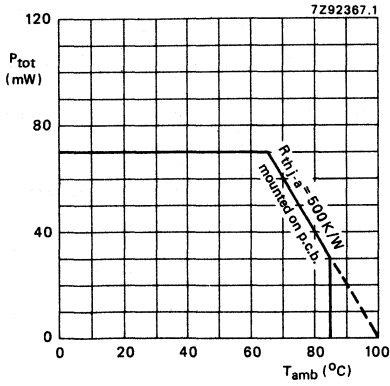


Fig. 2.

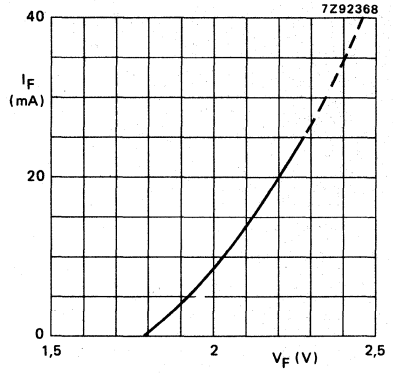


Fig. 3 $T_{amb} = 25$ °C; typ. values.

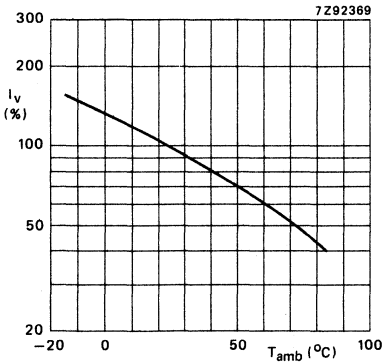


Fig. 4 Typ. values.

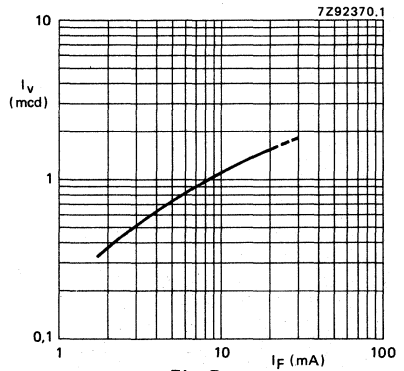


Fig. 5.

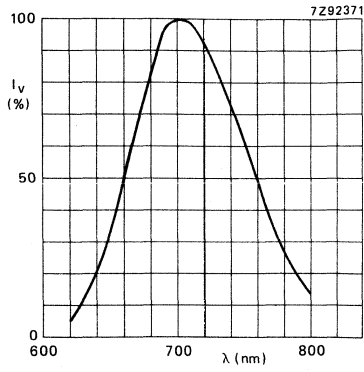


Fig. 6 Typ. values.

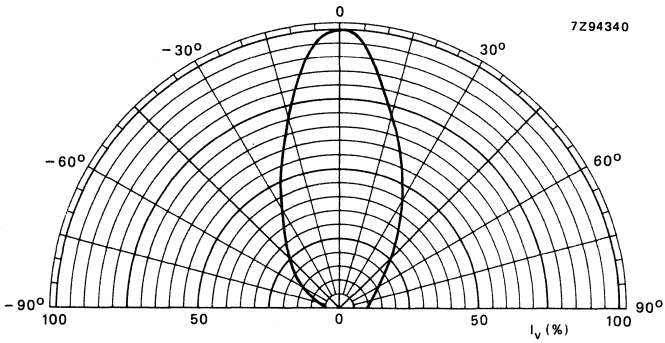


Fig. 7 Typ. values.



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).

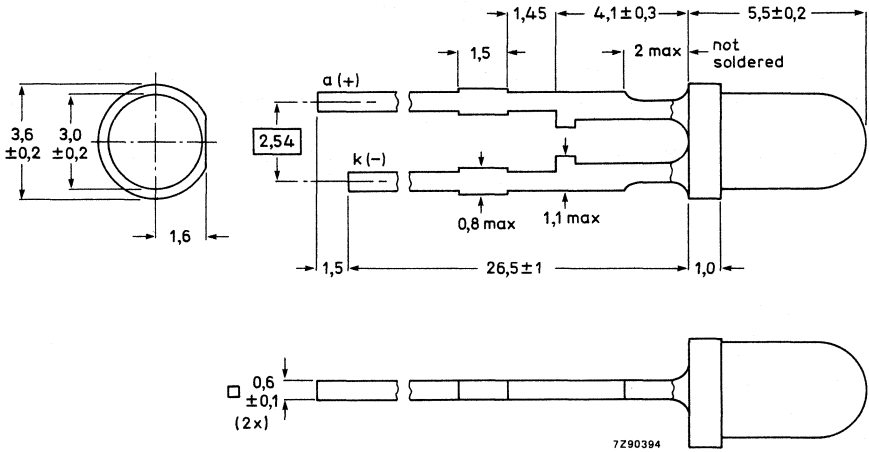
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	25 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	70 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 20\text{ mA}$	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 $^\circ$

MECHANICAL DATA

Fig. 1 SOD-82A.

Dimensions in mm



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; $\delta = 0,33$		max.	30 mA
peak value; $t_P = 1$ μ s; $f = 300$ 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

$R_{th\ j-a}$	max.	500 K/W
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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 μ A
Beamwidth between half-intensity directions			
$I_F = 20$ mA	$\theta_{1/2}$	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

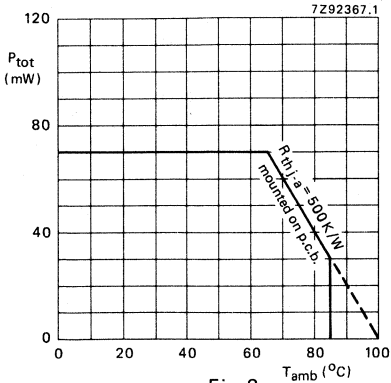


Fig. 2.

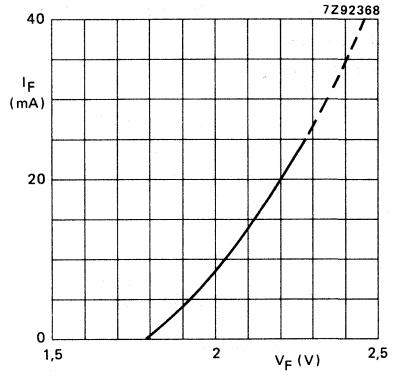


Fig. 3 $T_{amb} = 25 \text{ }^{\circ}\text{C}$; typ. values.

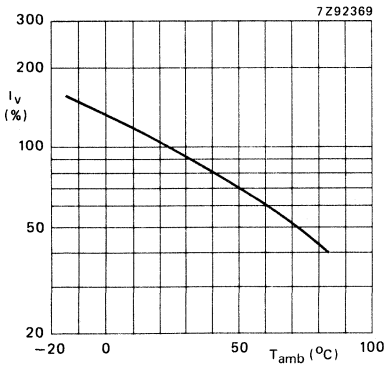


Fig. 4 Typ. values.

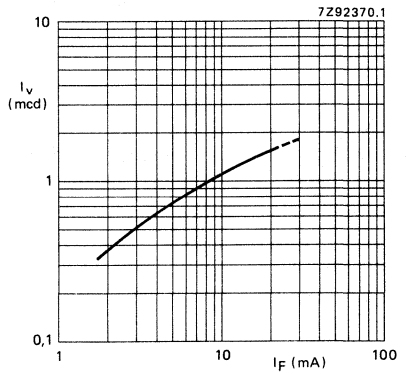


Fig. 5 Typ. values.

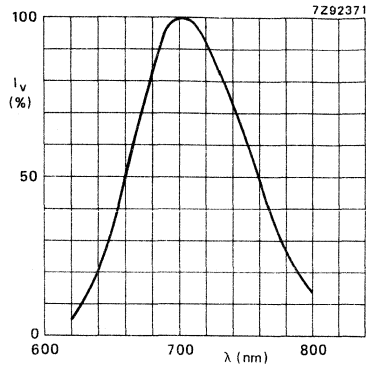


Fig. 6 Typ. values.

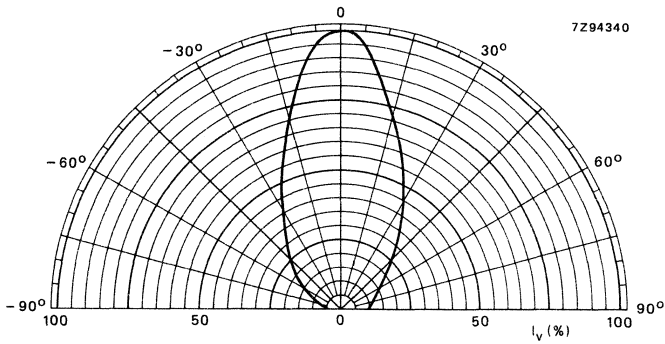


Fig. 7 Typ. values.

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.

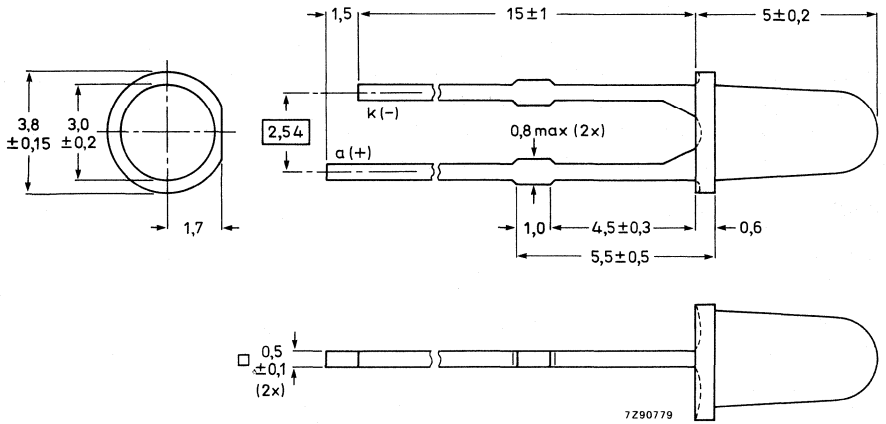
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	40 mA
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 3 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when
the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 20 \text{ mA}$	V_F	typ.	2,2 V	
		max.	2,8 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	10 μA	
Beamwidth at half-intensity directions				
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	60 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm	
Wavelength at peak emission				
$I_F = 20 \text{ mA}$	λ_p	typ.	565 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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

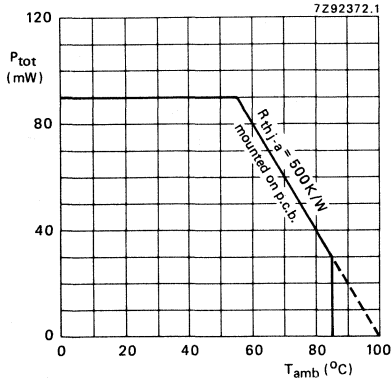


Fig. 2 Typical values.

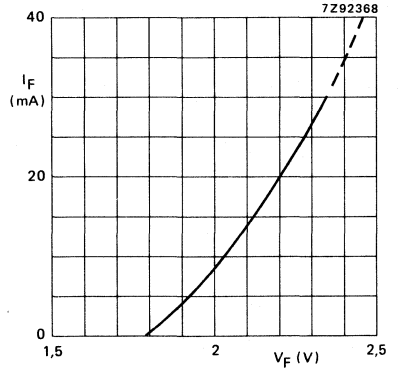


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

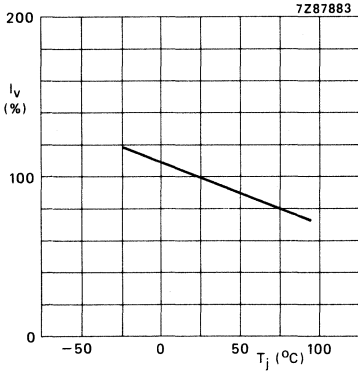


Fig. 4 Typical values.

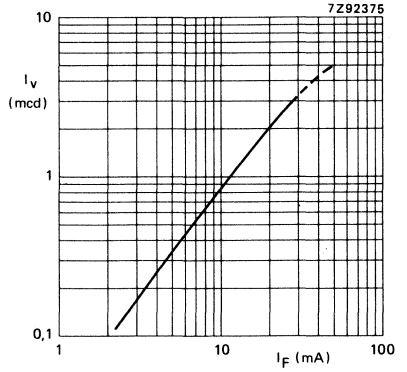


Fig. 5 $T_{amb} = 25^{\circ}C$; typ. values.

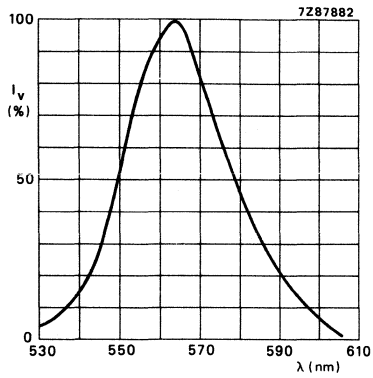


Fig. 6 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

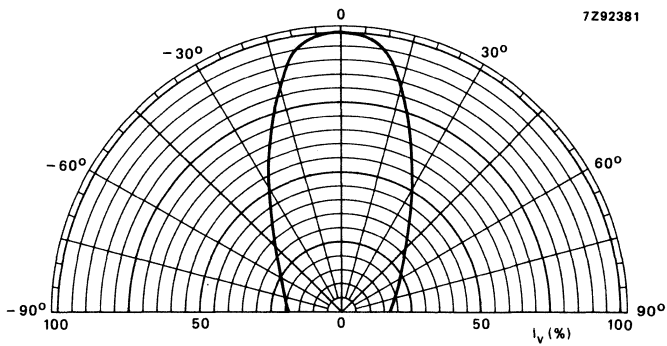


Fig. 7 Typical values.

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).

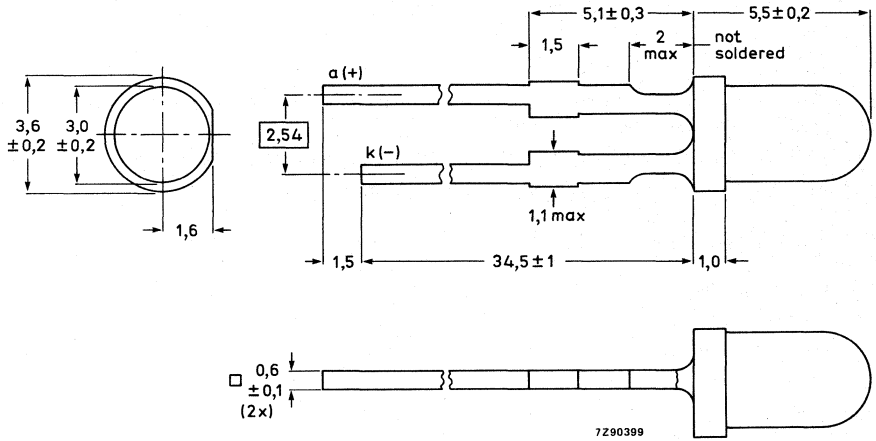
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity $I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	50 $^\circ$

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; $\delta = 0,01$		max.	40 mA
peak value; $t_p = 1$ μ s; $f = 300$ 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

$R_{th\ j-a}$	max.	500 K/W
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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 μ A
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	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

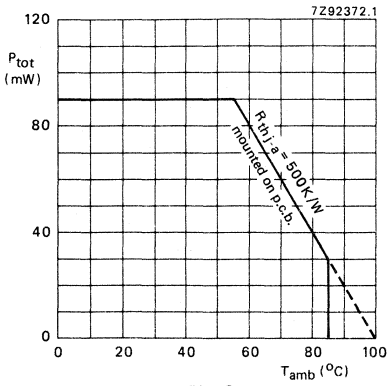


Fig. 2.

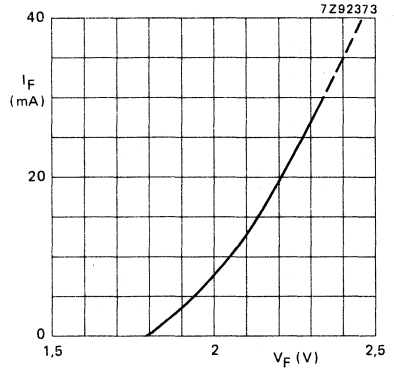


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

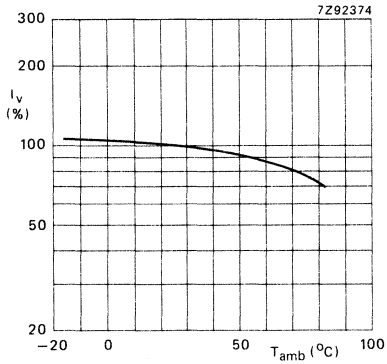


Fig. 4 Typ. values.

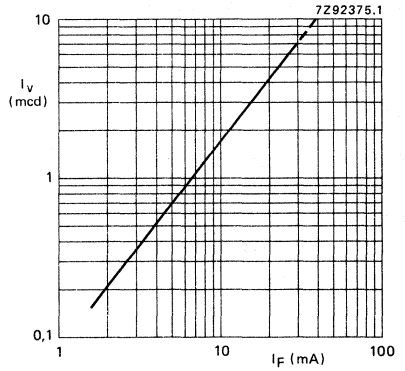


Fig. 5 Typ. values.

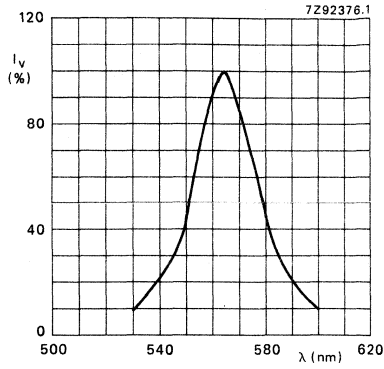


Fig. 6 Typ. values.

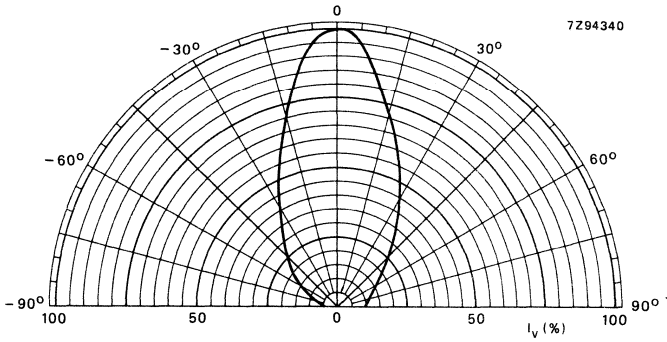


Fig. 7 Typ. values.

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).

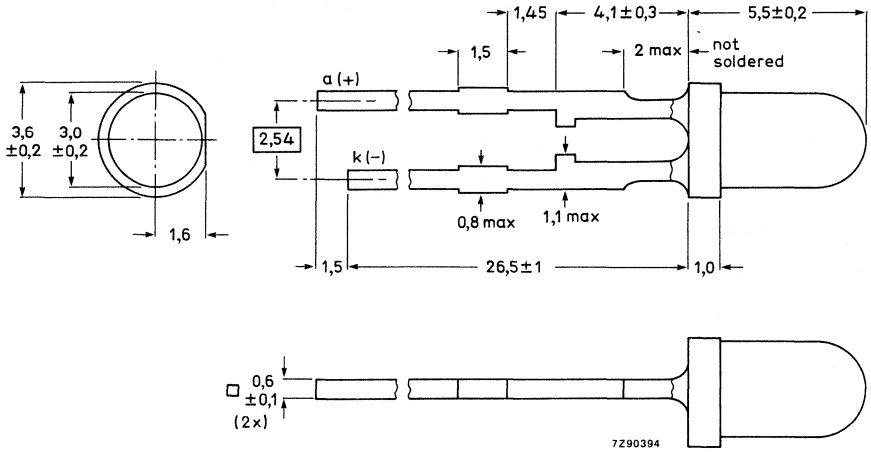
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	50 $^\circ$

MECHANICAL DATA

Fig. 1 SOD-82A.

Dimensions in mm



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; $t_{ON} = 1 \text{ ms}$; $\delta = 0,01$		max.	40 mA
peak value; $t_P = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$; > 1,5 mm from the seating plane	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 20 \text{ mA}$	V_F	typ.	2,2 V
		max.	2,8 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	10 μA
Beamwidth between half-intensity directions			
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	50 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission			
$I_F = 20 \text{ mA}$	λ_p	typ.	565 nm
Luminous intensity			
$I_F = 10 \text{ mA}$			
	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

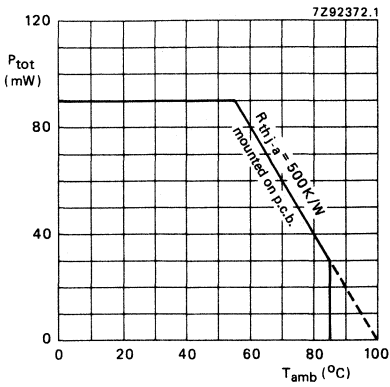


Fig. 2.

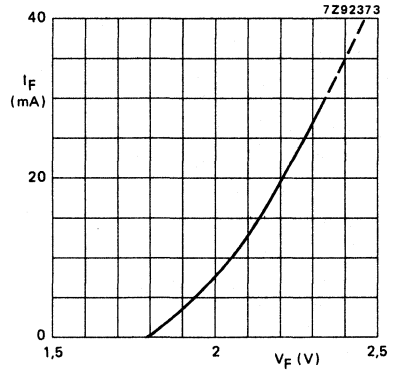


Fig. 3 $T_{amb} = 25^{\circ}\text{C}$; typ. values.

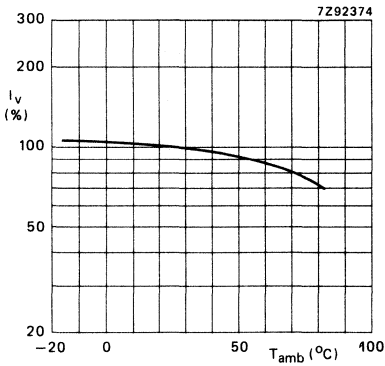


Fig. 4 Typ. values.

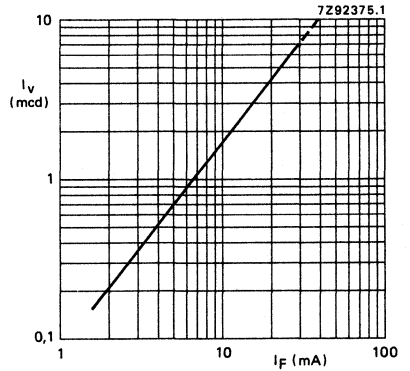


Fig. 5 Typ. values.

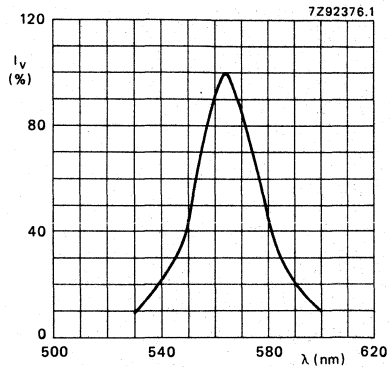


Fig. 6 Typ. values.

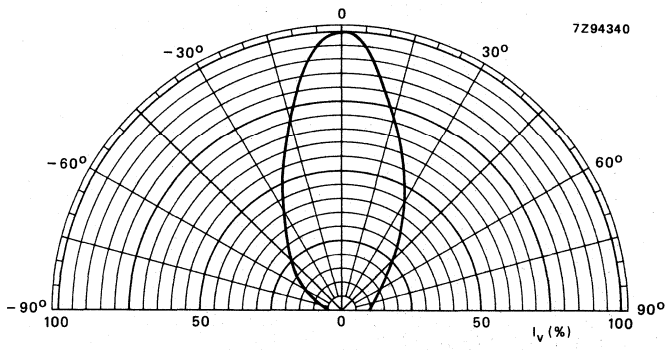


Fig. 7 Typ. values.

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.

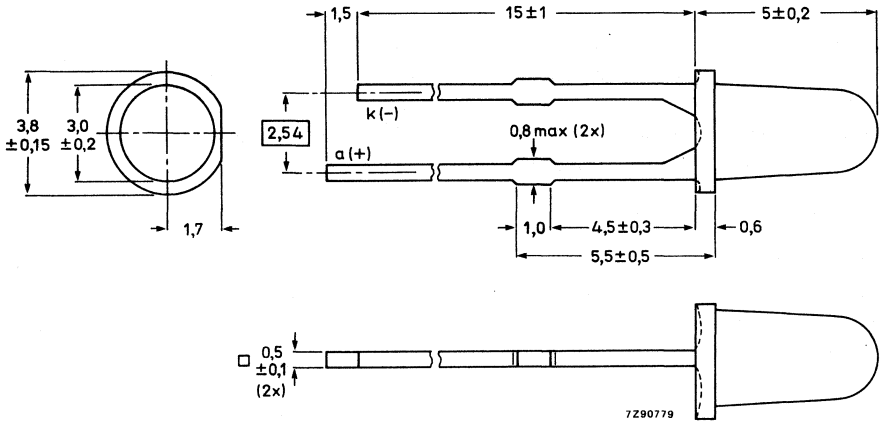
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	60 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_p = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	40 mA
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$ > 3 mm from the plastic body	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

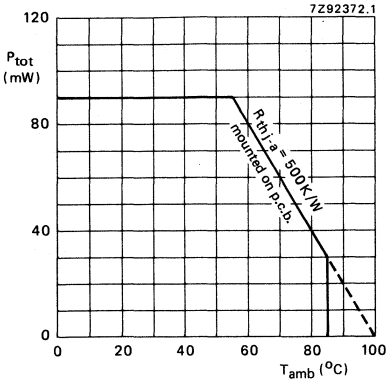


Fig. 2 Typical values.

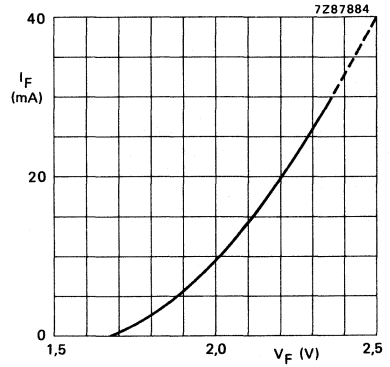


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

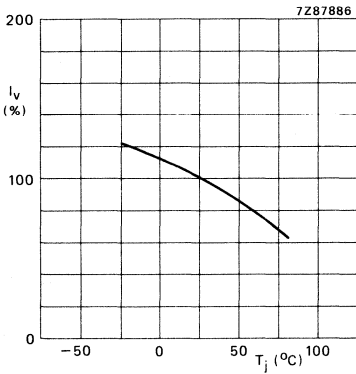


Fig. 4 Typical values.

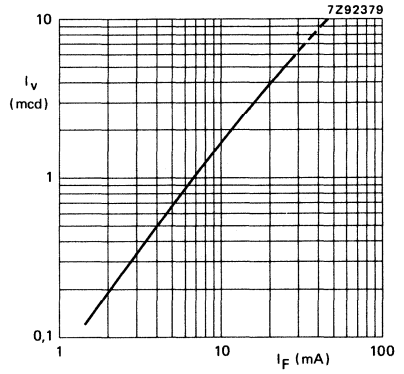


Fig. 5 $T_{amb} = 25^{\circ}C$; typ. values.

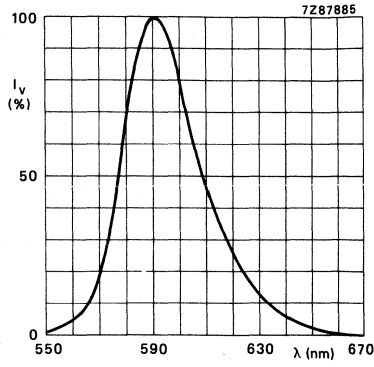


Fig. 6 $I_F = 20 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

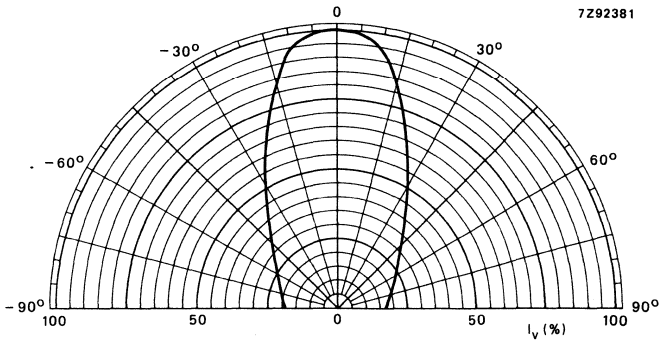


Fig. 7 Typical values.



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)

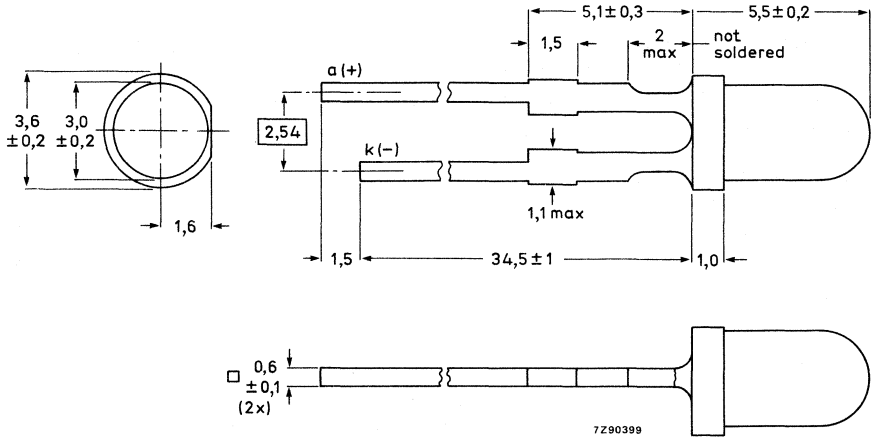
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 20\text{ mA}$		λ_p	typ.	590 nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	50 $^\circ$

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 $T_{amb} = 55\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-30 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7\text{ s}$; > 1,5 mm from the seating plane	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th\ j-a}$	max.	500 K/W
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CHARACTERISTICS $T_{amb} = 25\text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 20\text{ mA}$	V_F	typ.	2,2 V
		max.	2,8 V
Reverse current			
$V_R = 5\text{ V}$	I_R	max.	10 μA
Beamwidth between half-intensity directions			
$I_F = 20\text{ mA}$	$\theta_{1/2}$	typ.	50 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission			
$I_F = 20\text{ mA}$	λ_p	typ.	590 nm
Luminous intensity			
$I_F = 10\text{ mA}$			
	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

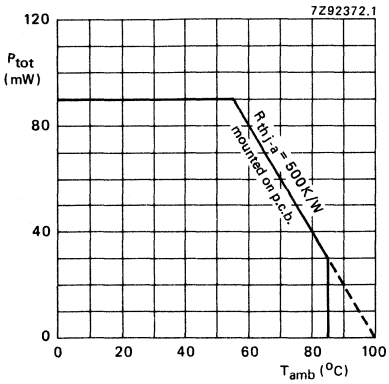


Fig. 2.

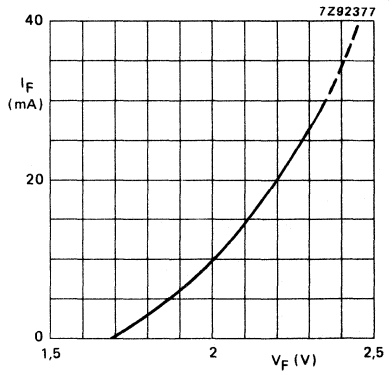


Fig. 3 $T_{amb} = 25^{\circ}$; typ. values.

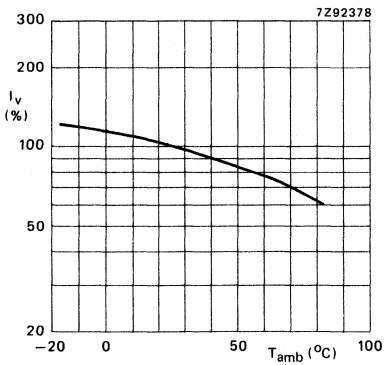


Fig. 4 Typ. values.

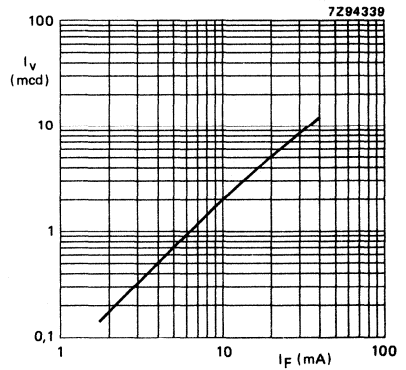


Fig. 5 Typ. values.

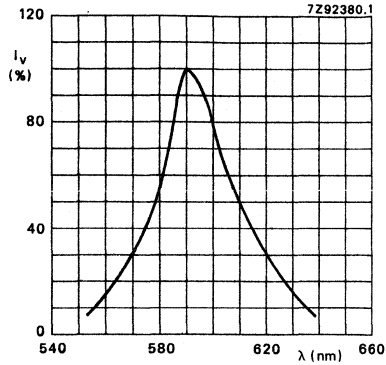


Fig. 6 $I_F = 20 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$.

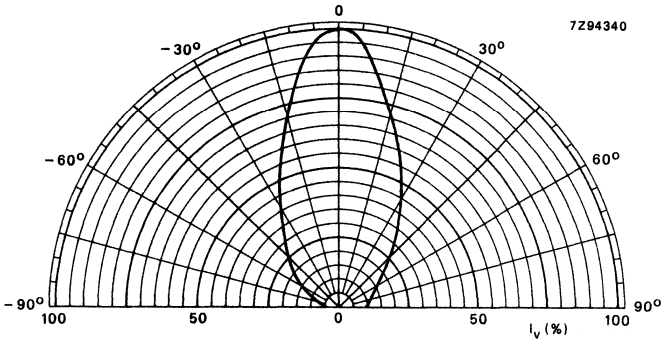


Fig. 7 Typ. values.



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).

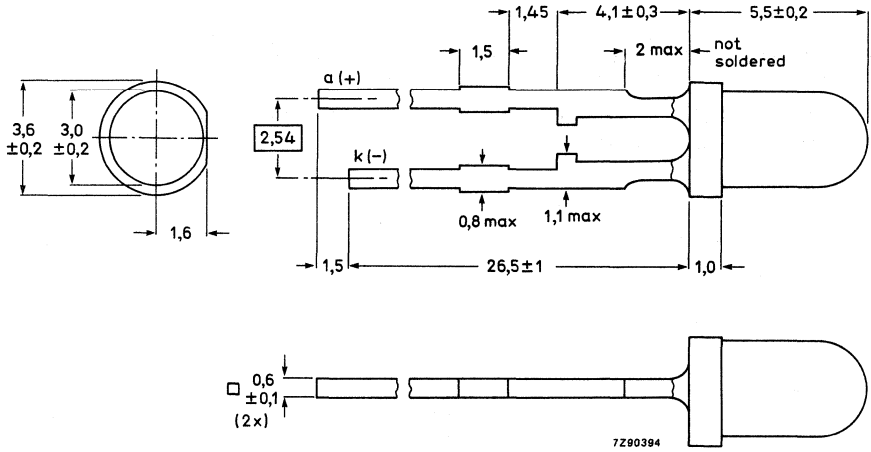
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	50 $^\circ$

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; $\delta = 0,01$		max.	40 mA
peak value; $t_p = 1$ μ s; $f = 300$ 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 RESISTANCEFrom junction to ambient when the device is mounted
on a p.c. board

$R_{th\ j-a}$	max.	500 K/W
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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 μ A
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

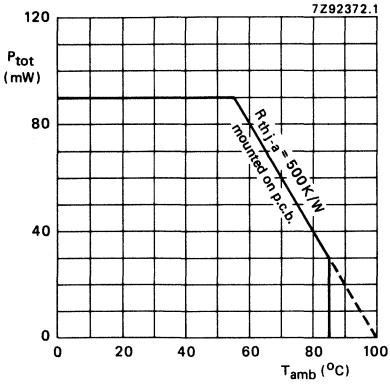


Fig. 2.

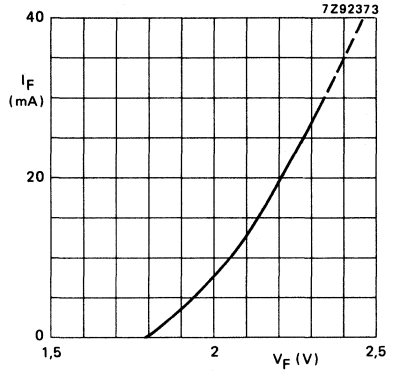


Fig. 3 $T_{amb} = 25 \text{ }^{\circ}\text{C}$; typ. values.

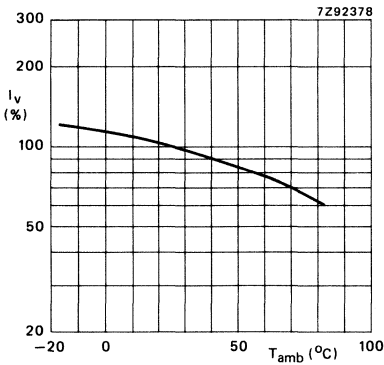


Fig. 4 Typ. values.

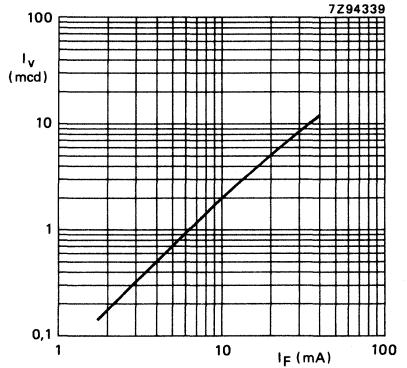


Fig. 5 $T_{amb} = 25 \text{ }^{\circ}\text{C}$; typical values.

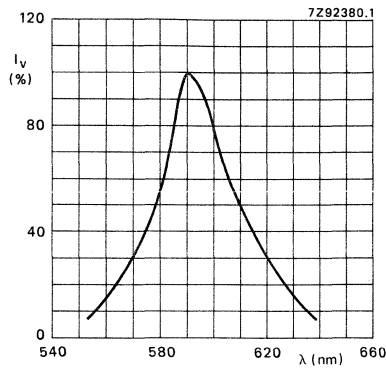


Fig. 6 Typical values.

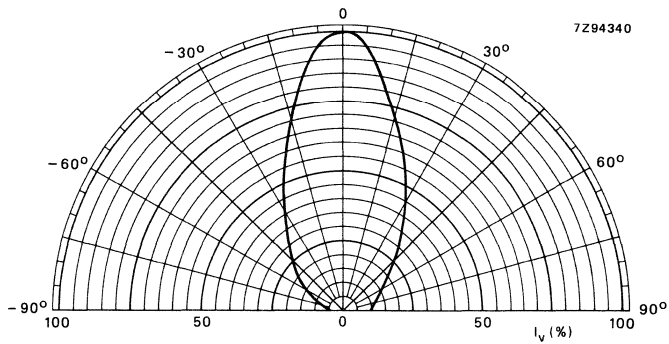
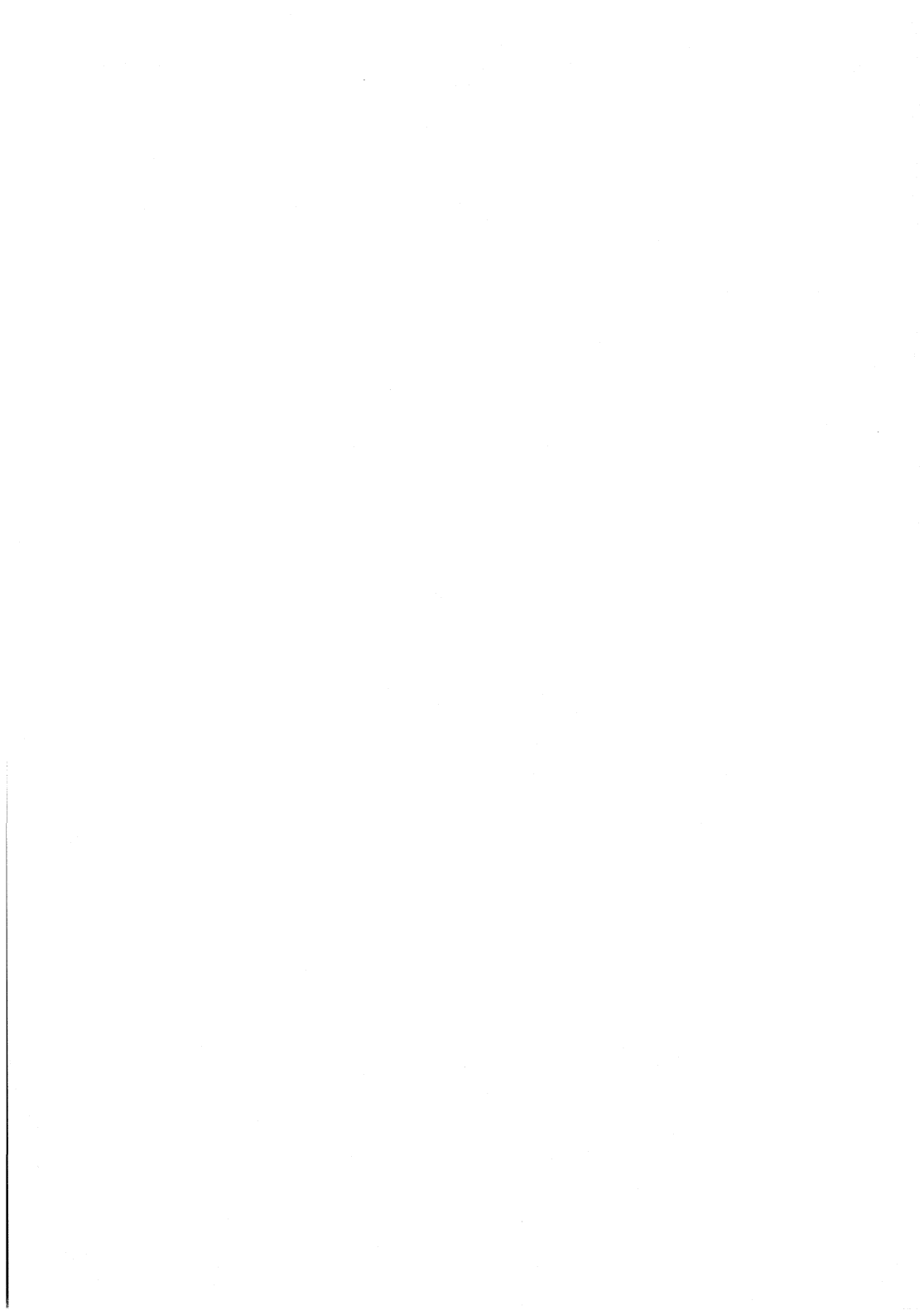


Fig. 7 Typical values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQT10B

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

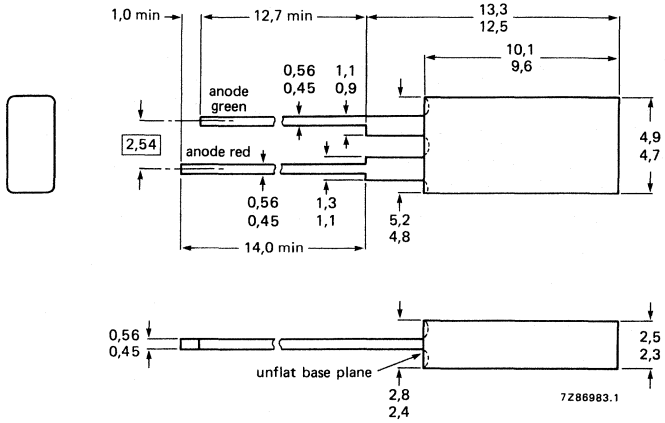
QUICK REFERENCE DATA

Forward current (d.c.)	red green	I_F	max.	100 mA 60 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$		P_{tot}	max.	215 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
red at $I_F = 10\text{ mA}$		I_v	min.	1,0 mcd
green at $I_F = 20\text{ mA}$			typ.	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		$\theta_{1/2}$	typ.	100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A2



RATINGS

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

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

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

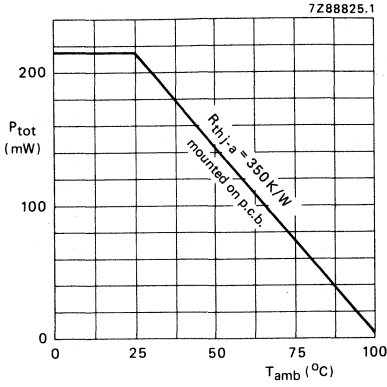


Fig. 2.

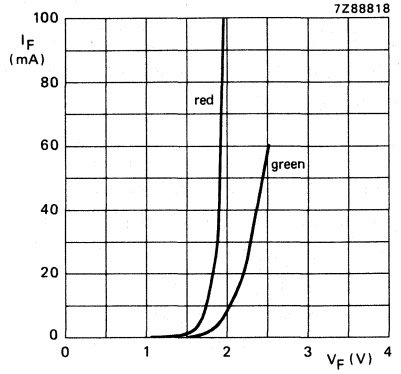


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

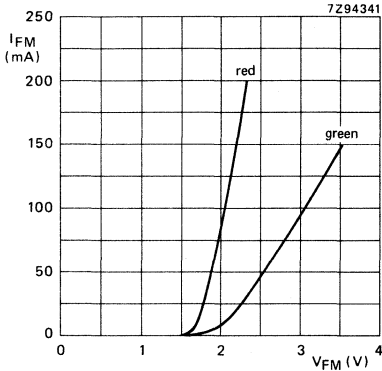


Fig. 4 $t_{on} = 20\text{ }\mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

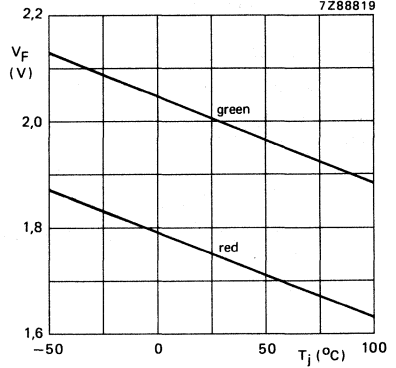


Fig. 5 $I_F = 10\text{ mA}$; typical values.

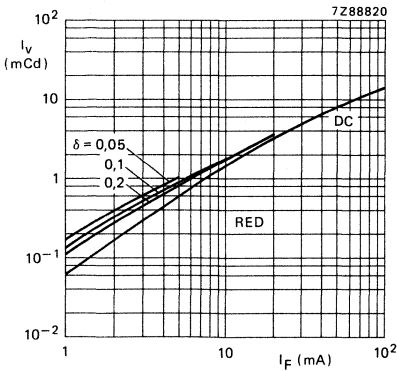


Fig. 6 $t_p = 50\text{ }\mu\text{s}$; typ. values.

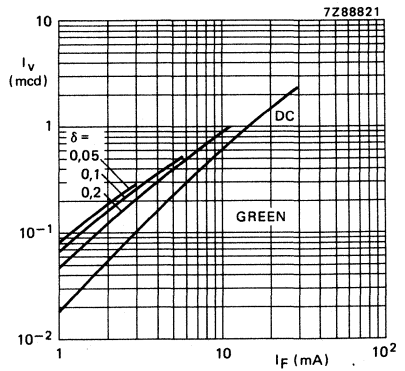


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typ. values.

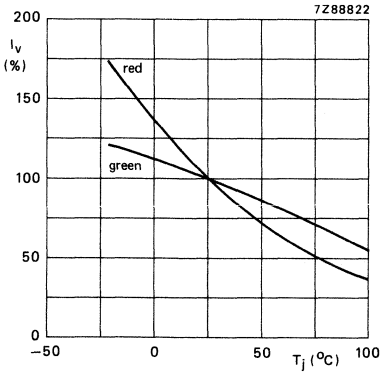


Fig. 8 Typical values .

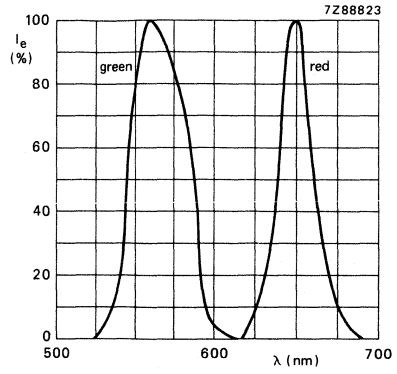


Fig. 9 $I_F = 10$ mA; typical values.

DEVELOPMENT DATA

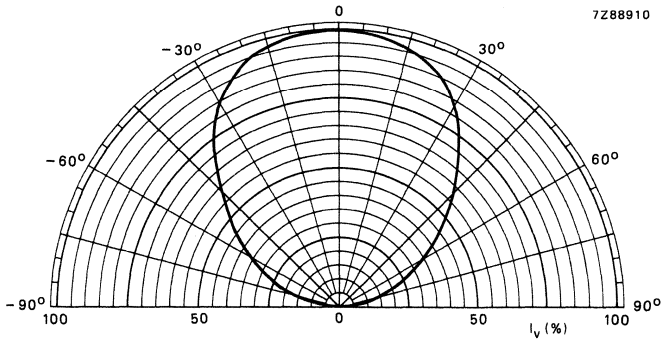
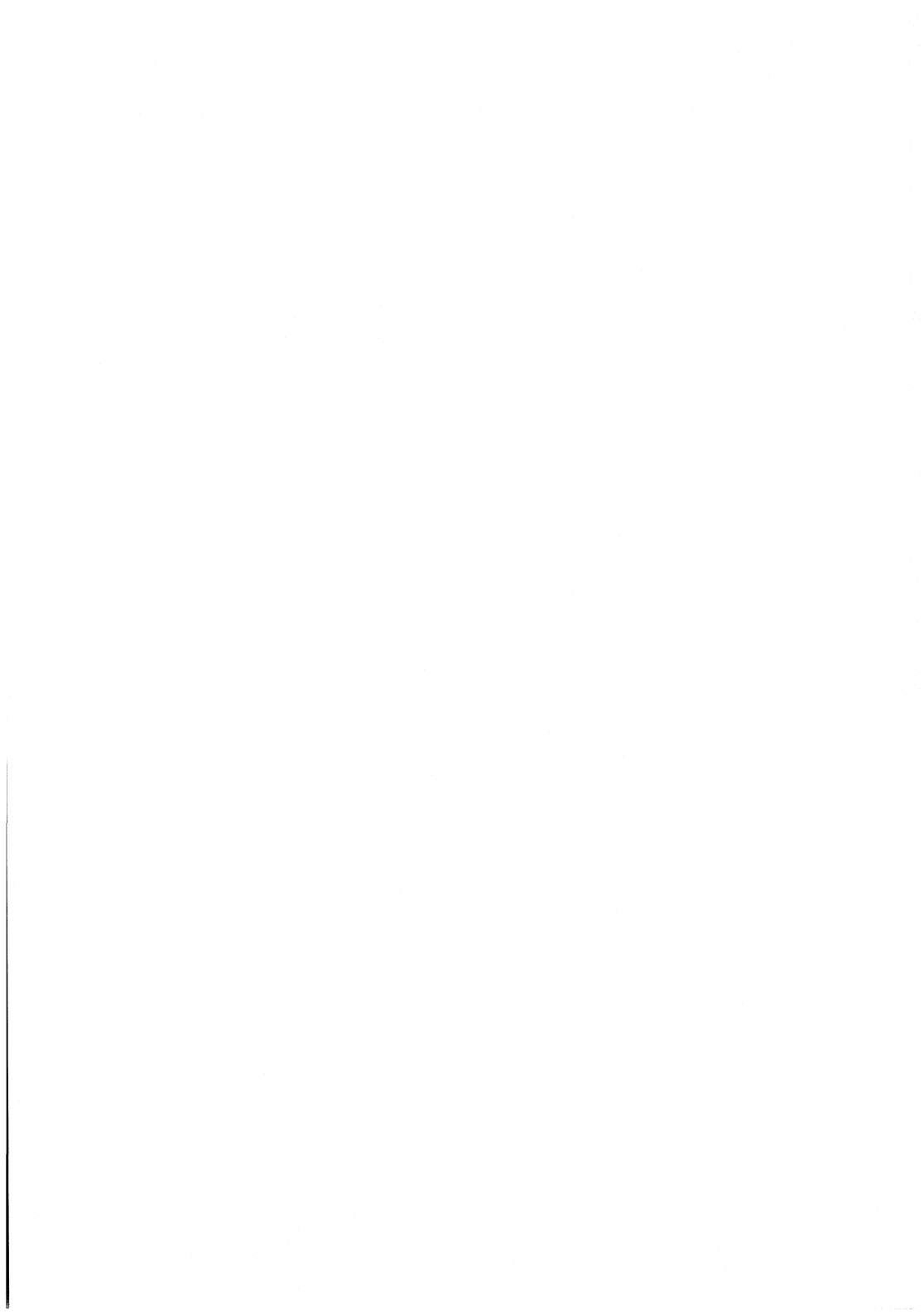


Fig. 10 Typical values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQT24

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

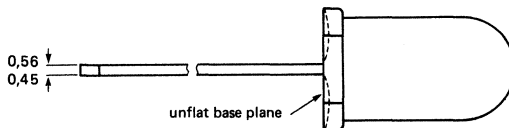
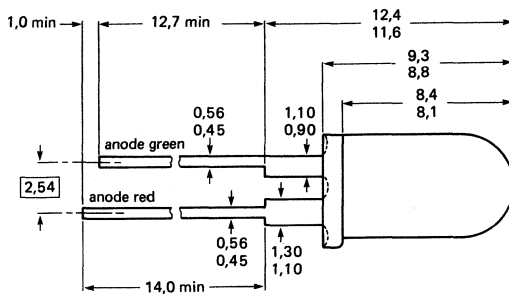
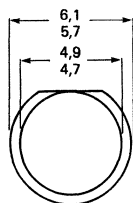
QUICK REFERENCE DATA

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

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63A2.



7Z86999.1

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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$		max.	150 mA

Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$

P_{tot}	max.	215 mW
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Junction temperature

T_j	max.	100 $^\circ\text{C}$
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Storage temperature

T_{stg}		-55 to +100 $^\circ\text{C}$
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Lead soldering temperature

> 1,5 mm from the seating plane; $t_{slid} < 7 \text{ s}$	T_{slid}	max.	260 $^\circ\text{C}$
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THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

red at $I_F = 10 \text{ mA}$	V_F	typ.	1,75 V
		max.	2,2 V
green at $I_F = 20 \text{ mA}$	V_F	typ.	2,1 V
		max.	3,0 V

Beamwidth between half-intensity directions at $I_F = 10 \text{ mA}$ (in the plane of the leads)

$\theta_{1/2}$	typ.	70 $^\circ$
----------------	------	-------------

Wavelength at peak emissions

at $I_F = 10 \text{ mA}$			
red	λ_p	typ.	650 nm
green			565 nm

Diode capacitance

at $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	160 pF
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Luminous intensity

red at $I_F = 10 \text{ mA}$	I_v	min.	3 mcd
		typ.	10 mcd
green at $I_F = 20 \text{ mA}$	I_v	min.	3 mcd
		typ.	10 mcd

DEVELOPMENT DATA

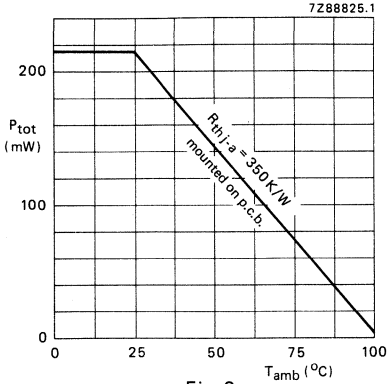


Fig. 2.

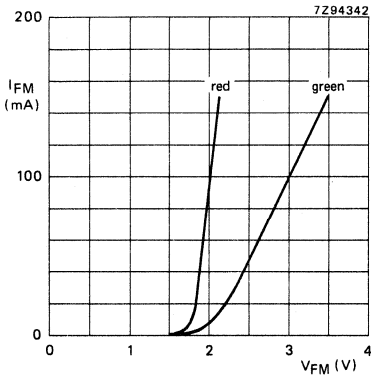


Fig. 4 $t_{on} = 20 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^{\circ}C$; typical values.

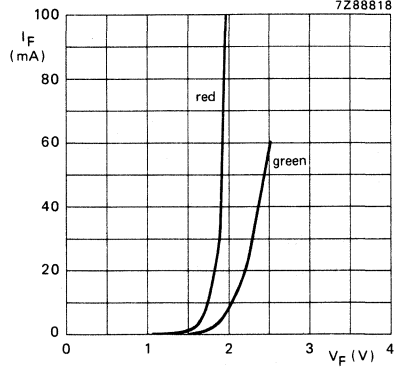


Fig. 3 $T_{amb} = 25 \text{ }^{\circ}C$; typ. values.

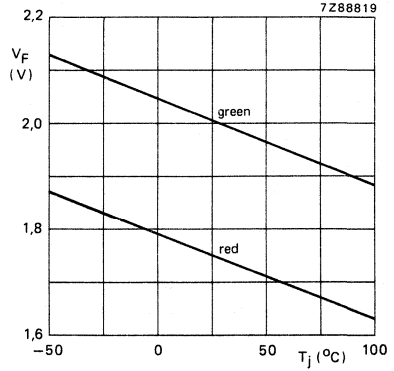


Fig. 5 $I_F = 10 \text{ mA}$; typical values.

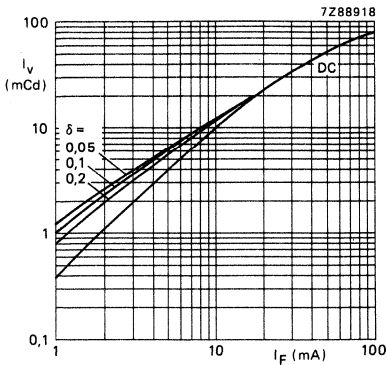


Fig. 6 $t_p = 50 \mu s$; typ. values.

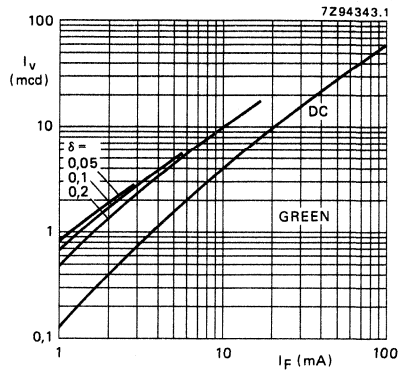


Fig. 7 $t = 50 \mu s$; typical values.

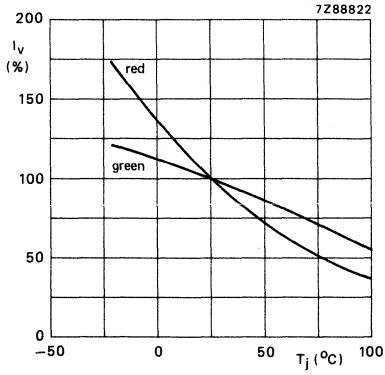


Fig. 8 Typical values.

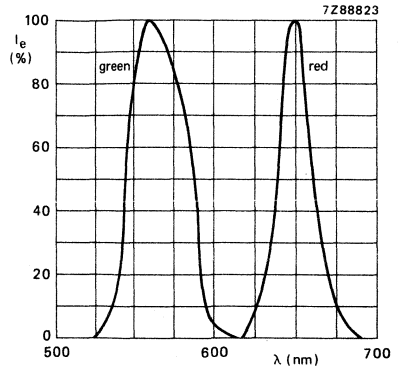


Fig. 9 $I_F = 10$ mA; typical values.

DEVELOPMENT DATA

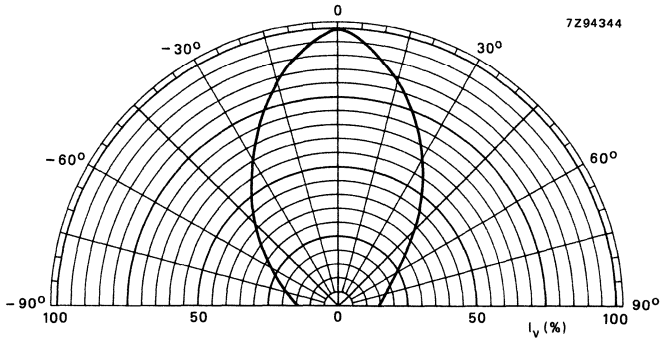


Fig 10 $I_F = 10$ mA; typical values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQT60

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

green

I_F max. 100 mA

60 mA

Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$

P_{tot} max. 215 mW

Junction temperature

T_j max. 100 $^\circ\text{C}$

Luminous intensity

red at $I_F = 10\text{ mA}$

green at $I_F = 20\text{ mA}$

I_v min. 1,0 mcd

typ. 1,5 mcd

Wavelength at peak emission

red

green

λ_p typ. 650 nm

565 nm

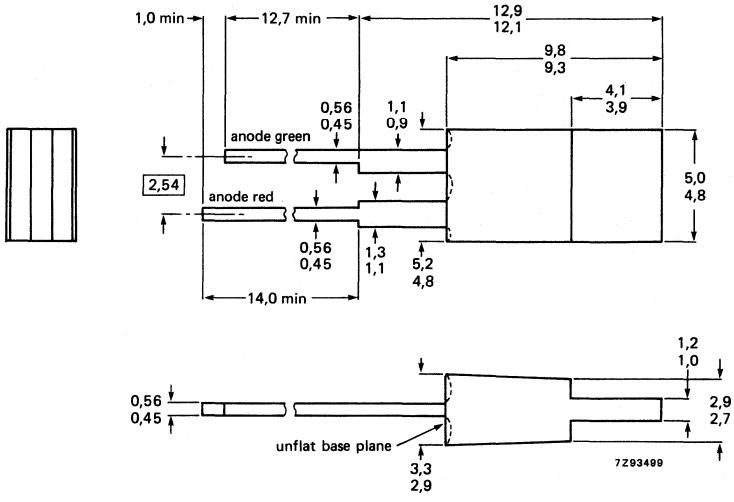
Beamwidth between half-intensity directions
in the plane of the leads

$\theta_{1/2}$ typ. 110 $^\circ$

MECHANICAL DATA

Fig. 1 SOD-75B2

Dimensions in mm



RATINGS

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

Forward current

red				100 mA
green	I_F	max.		60 mA

Forward current

peak value; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$				1 A
peak value, $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.		150 mA

Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$

P_{tot}	max.	215 mW
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Junction temperature

T_j	max.	100 $^\circ\text{C}$
-------	------	----------------------

Storage temperature

T_{stg}		-55 to +100 $^\circ\text{C}$
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Lead soldering temperature

> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$

T_{sld}	max.	260 $^\circ\text{C}$
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THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified**Forward voltage**

red at $I_F = 10 \text{ mA}$	V_F	typ.	1,75 V
------------------------------	-------	------	--------

max. 2,2 V

green at $I_F = 20 \text{ mA}$	V_F	typ.	2,1 V
--------------------------------	-------	------	-------

max. 3,0 V

Beamwidth between half-intensity directions

at $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	110 $^\circ$
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Wavelength at peak emission

at $I_F = 10 \text{ mA}$			
--------------------------	--	--	--

red	λ_p	typ.	650 nm
-----	-------------	------	--------

green			565 nm
-------	--	--	--------

Luminous intensity

red at $I_F = 10 \text{ mA}$	I_v	min.	1,0 mcd
------------------------------	-------	------	---------

green at $I_F = 20 \text{ mA}$		typ.	1,5 mcd
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Diode capacitance

at $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	100 pF
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DEVELOPMENT DATA

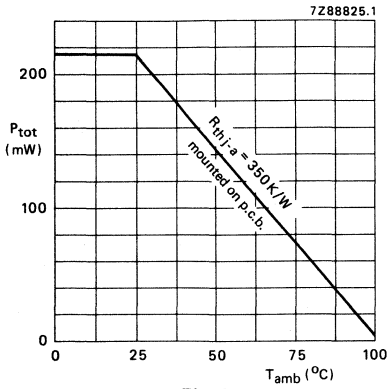


Fig. 2.

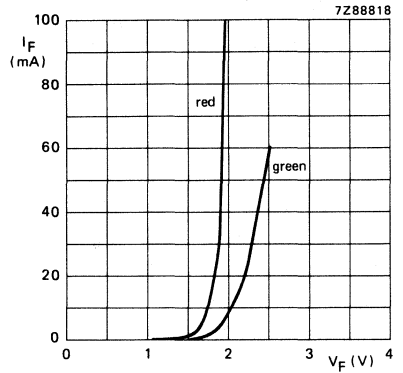


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

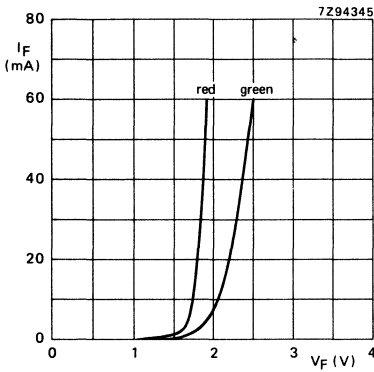


Fig. 4 $t_{on} = 20\text{ }\mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typical values.

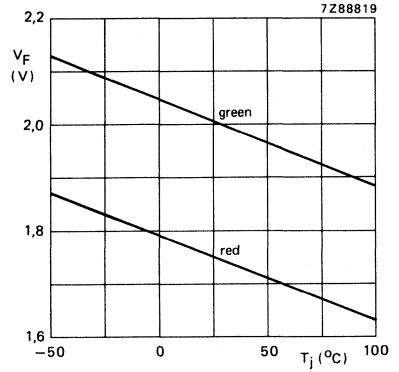


Fig. 5 $I_F = 10\text{ mA}$; typical values.

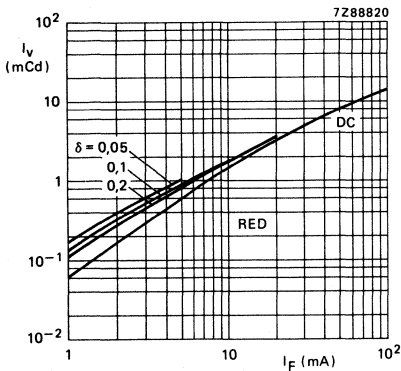


Fig. 6 $t_p = 50\text{ }\mu\text{s}$; typ. values.

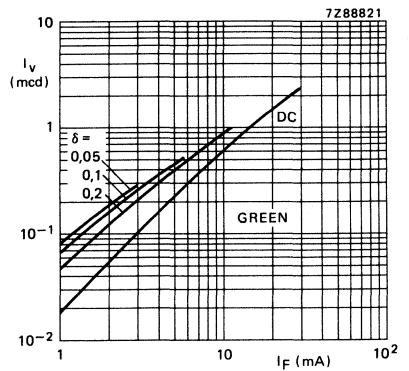


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typ. values.

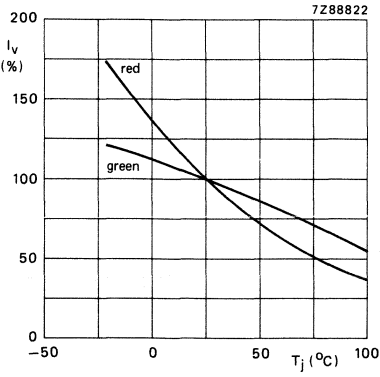


Fig. 8 Typical values.

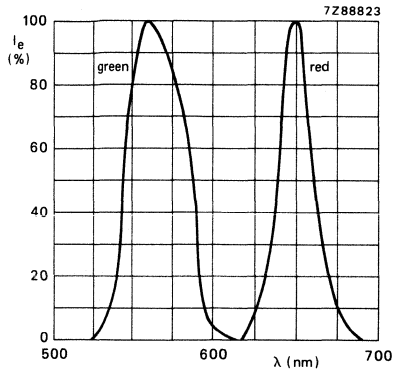


Fig. 9 $I_F = 10$ mA; typical values.

DEVELOPMENT DATA

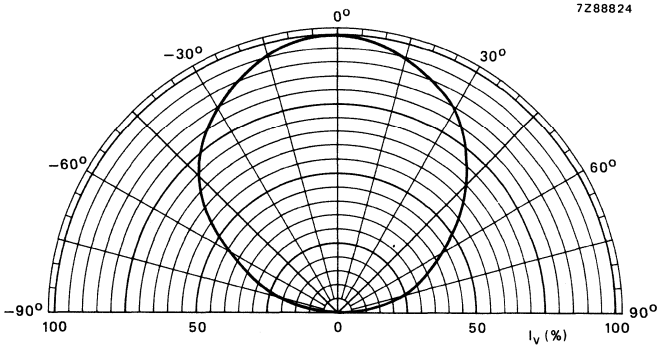


Fig. 10 $I_F = 10$ mA; typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQT70

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

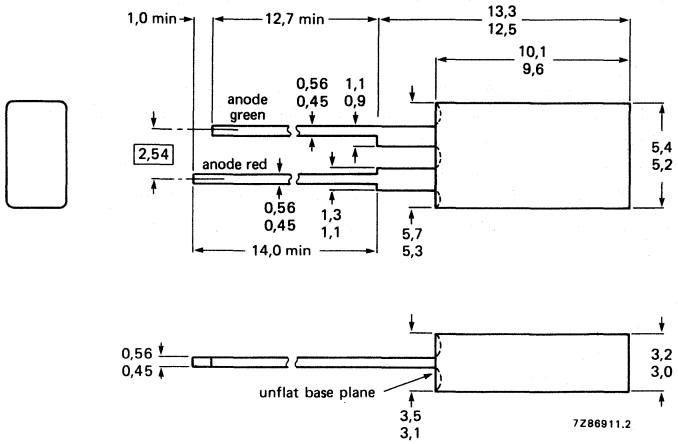
QUICK REFERENCE DATA

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

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			100 mA
green	I_F	max.	60 mA

Forward current

peak value; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$			1 A
peak value; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA

Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$

P_{tot}	max.	215 mW
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Junction temperature

T_j	max.	100 $^\circ\text{C}$
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Storage temperature

T_{stg}		-55 to +100 $^\circ\text{C}$
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Lead soldering temperature

> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$
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THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

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

Forward voltage

red at $I_F = 10 \text{ mA}$	V_F	typ.	1,75 V
		max.	2,2 V
green at $I_F = 20 \text{ mA}$	V_F	typ.	2,1 V
		max.	3,0 V

Beamwidth between half-intensity directions

at $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	110 $^\circ$
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Wavelength at peak emission

at $I_F = 10 \text{ mA}$			
red			650 nm
green	λ_p	typ.	565 nm

Luminous intensity

red at $I_F = 10 \text{ mA}$	I_v	min.	1,0 mcd
green at $I_v = 20 \text{ mA}$	I_v	typ.	1,5 mcd

Diode capacitance

at $V_R = 0$; $f = 1 \text{ MHz}$	C_d		100 pF
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DEVELOPMENT DATA

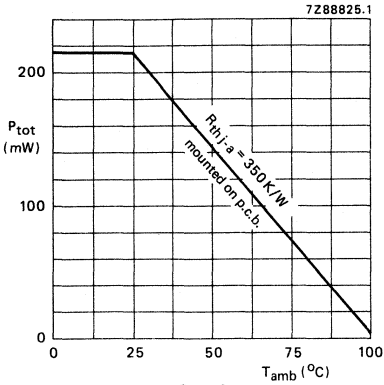


Fig. 2.

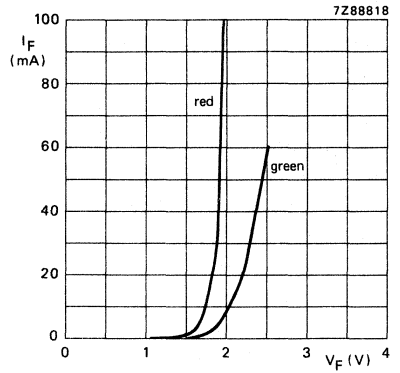


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

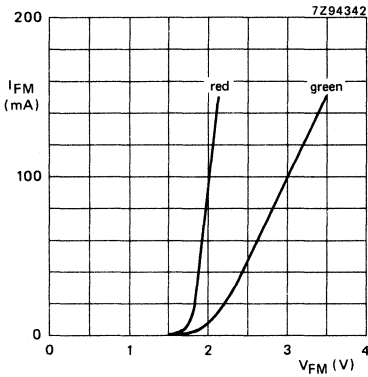


Fig. 4 $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$, typical values.

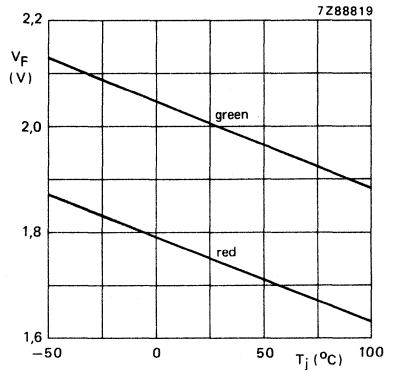


Fig. 5 $I_F = 10 \text{ mA}$; typical values.

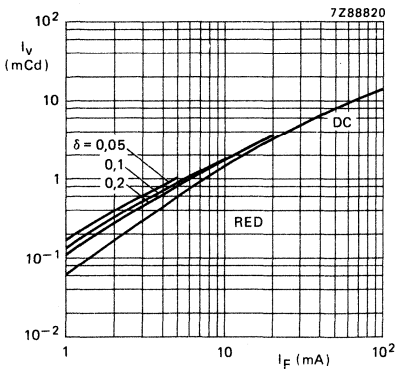


Fig. 6 $t_p = 50 \mu\text{s}$; typ. values.

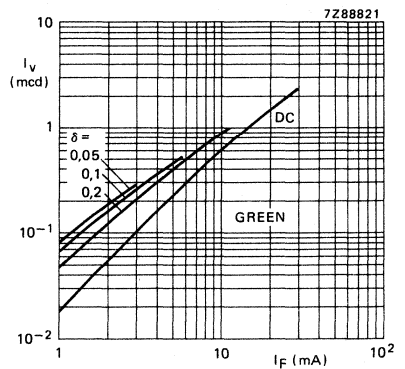


Fig. 7 $t_p = 50 \mu\text{s}$; typ. values.

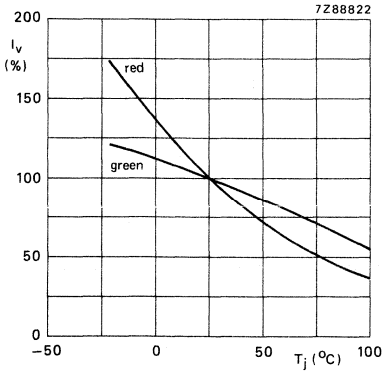


Fig. 8 Typical values.

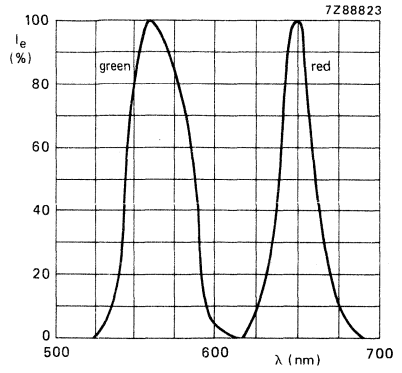


Fig. 9 $I_F = 10$ mA; typical values.

DEVELOPMENT DATA

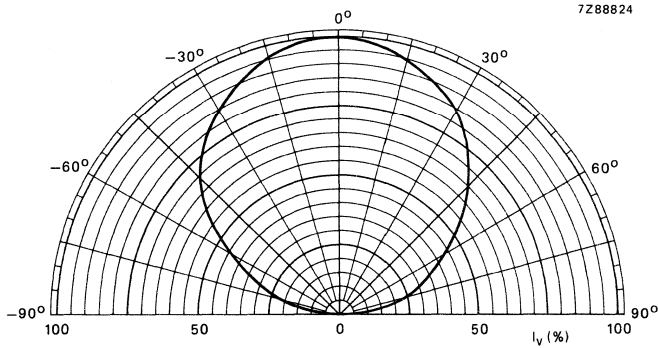


Fig. 10 $I_F = 10$ mA; typical values.

Note. Formerly known as the CQT10.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQT80L

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.

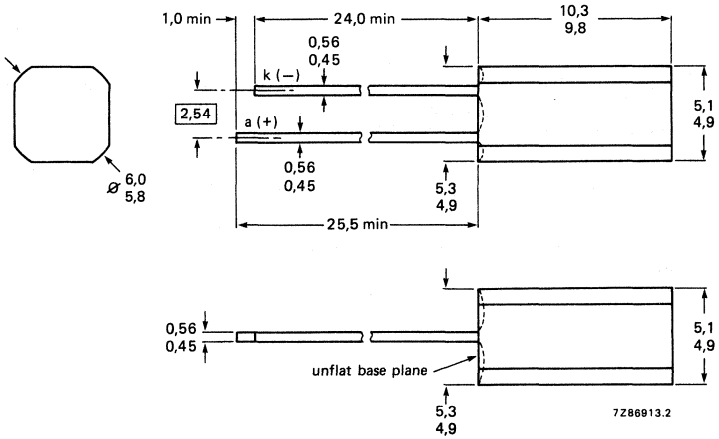
QUICK REFERENCE DATA

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

MECHANICAL DATA

Fig. 1 SOD-74L.

Dimensions in mm



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			100 mA
green	I_F	max.	60 mA

Forward current

peak value; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA

Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$

P_{tot}	max.	215 mW
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Storage temperature

T_{stg}	- 55 to +100	$^\circ\text{C}$
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Junction temperature

T_j	max.	100 $^\circ\text{C}$
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Lead soldering temperature

> 5,0 mm from the plastic body; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$
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THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

red at $I_F = 10 \text{ mA}$	V_F	typ.	1,75 V
		max.	2,2 V
green at $I_F = 20 \text{ mA}$	V_F	typ.	2,1 V
		max.	3,0 V

Beamwidth between half-intensity directions

$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$
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Wavelength at peak emission at $I_F = 10 \text{ mA}$

red			650 nm
green	λ_p	typ.	565 nm

Luminous intensity

red at $I_F = 10 \text{ mA}$		min.	1,0 mcd
green at $I_F = 20 \text{ mA}$	I_v	typ.	2,0 mcd

Diode capacitance

$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	100 pF
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DEVELOPMENT DATA

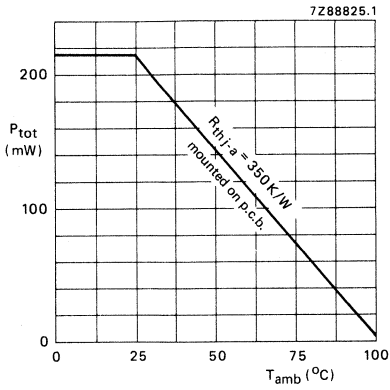


Fig. 2.

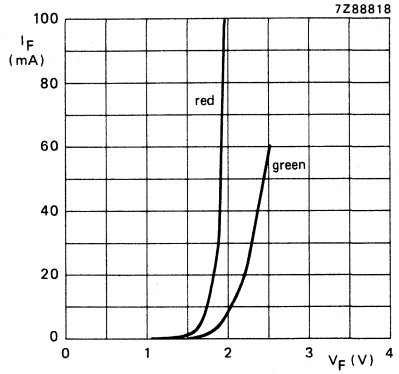


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

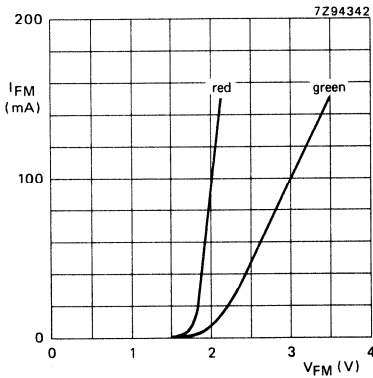


Fig. 4 $t_{on} = 20 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25^{\circ}C$; typical values.

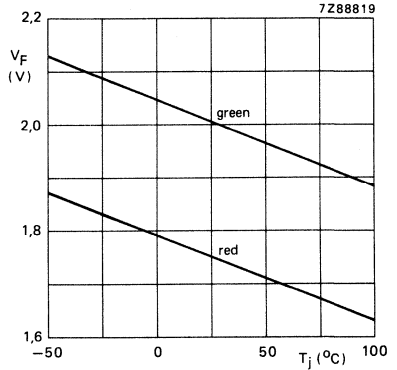


Fig. 5 $I_F = 10 \text{ mA}$; typical values.

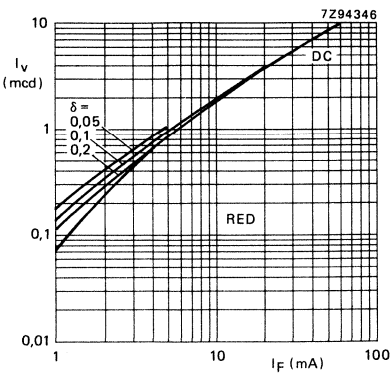


Fig. 6 $t_p = 50 \mu s$; typ. values.

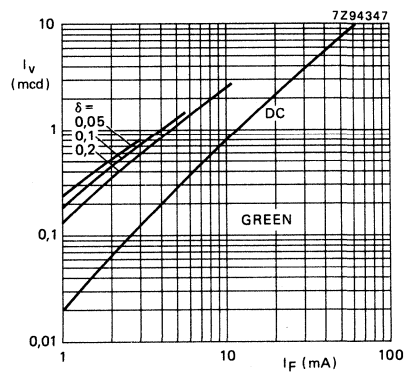


Fig. 7 $t_p = 50 \mu s$; typ. values.

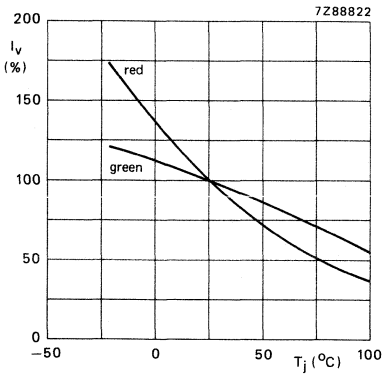


Fig. 8 Typical values.

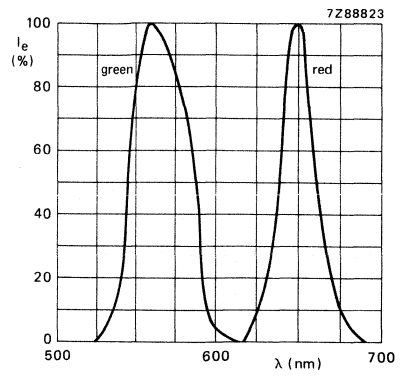


Fig. 9 $I_F = 10$ mA; typ. values.

DEVELOPMENT DATA

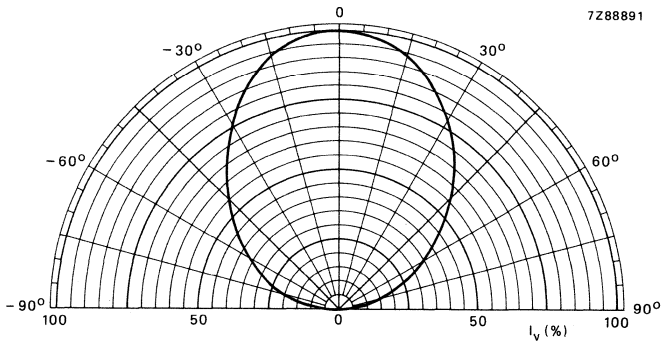


Fig. 10 Typical values.

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 $T_{amb} = 65\text{ °C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity $I_F = 10\text{ mA}$	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 $I_F = 10\text{ mA}$	λ_p	typ.	630 nm
Beamwidth between half-intensity directions in the plane of the leads, $I_F = 10\text{ mA}$	$\theta_{1/2}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-77A1.
CQV70.

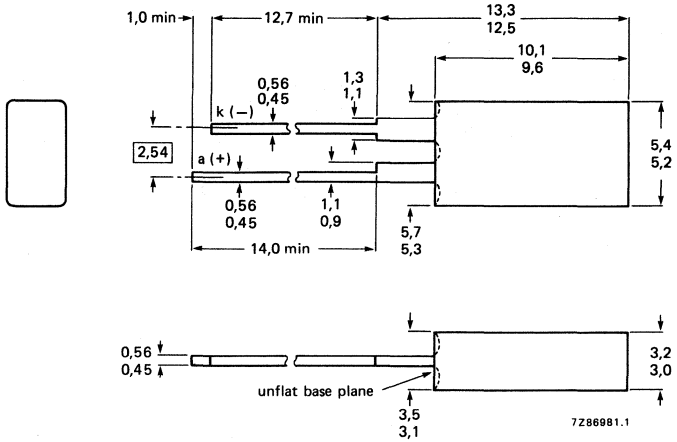
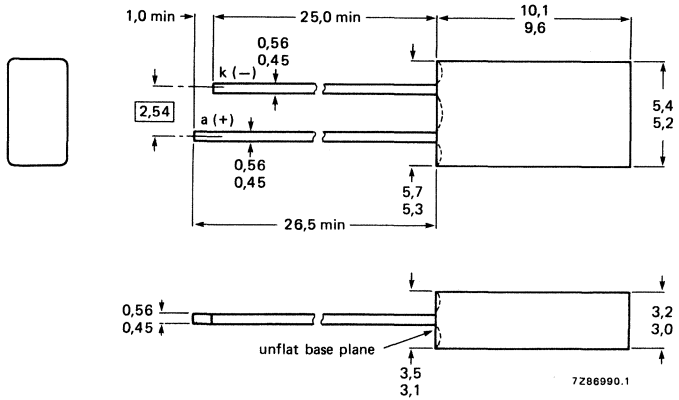


Fig. 1b SOD-77L.
CQV70L.



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$		max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{slid} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQV70	T_{slid}	max.	260 $^\circ\text{C}$
> 5 mm from the plastic body for CQV70L			

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	45 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	630 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	10 pF	←

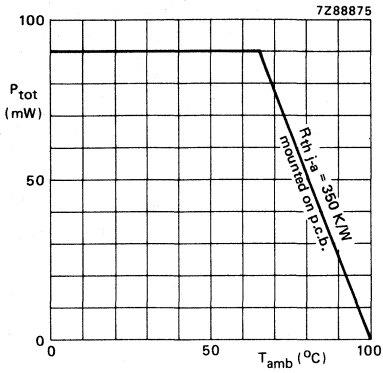


Fig. 2.

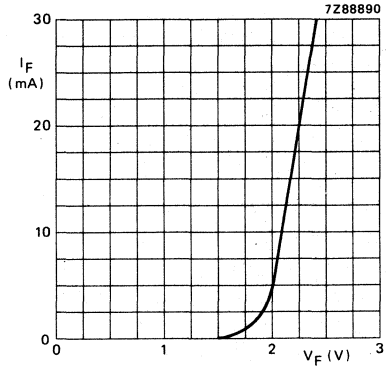


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typical values.

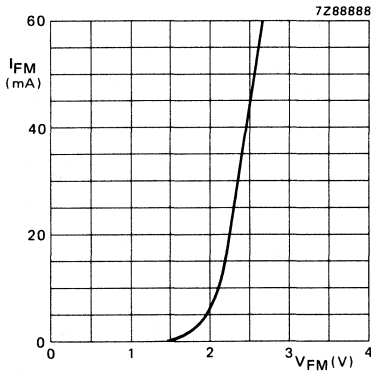


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25^\circ\text{C}$; typical values.

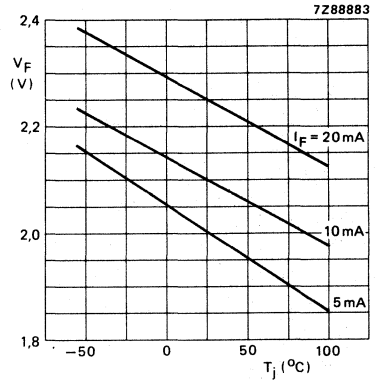


Fig. 5 Typical values.

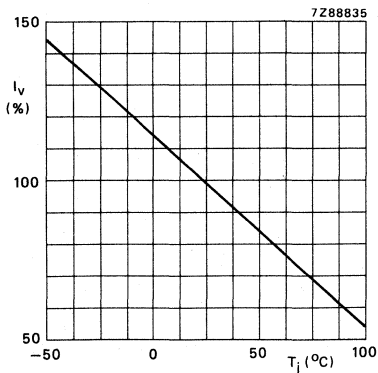


Fig. 6 $I_F = 10 \text{ mA}$; typical values.

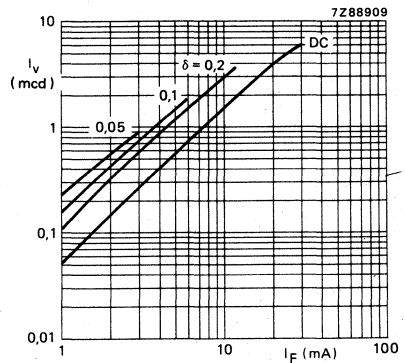


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

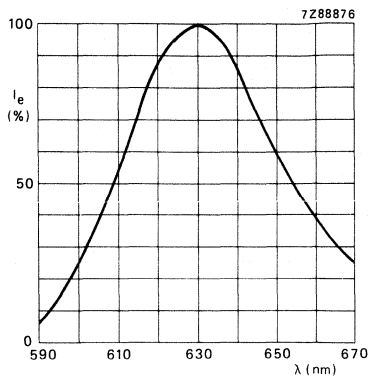


Fig. 8 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

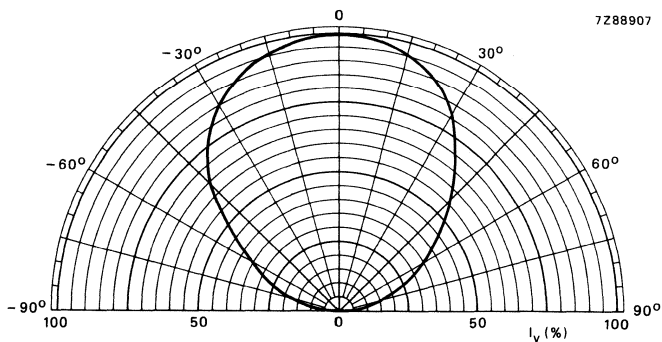


Fig. 9 Typical values.

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 luminosity 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 $T_{amb} = 25\text{ °C}$	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 °C
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$	λ_p	typ.	650 nm
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10\text{ mA}$	$\theta_{1/2}$	typ.	100 °

CQV70A CQV70AL

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-77A2.
CQV70A.

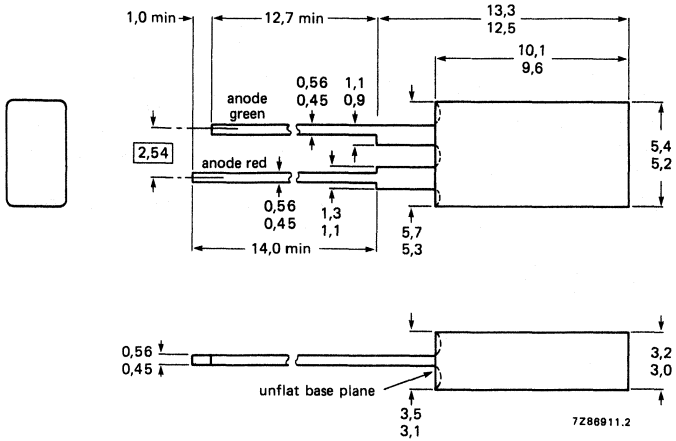
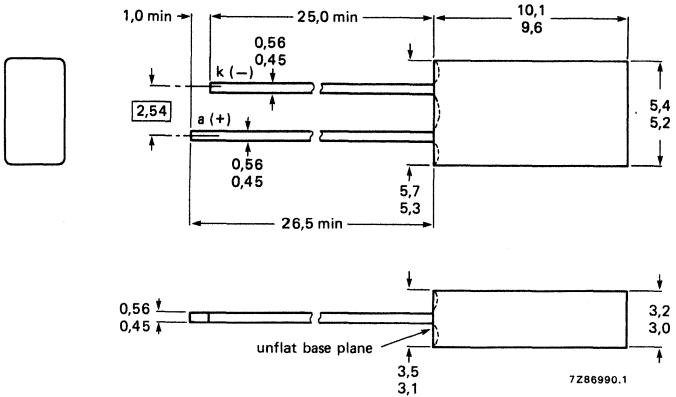


Fig. 1b SOD-77L.
CQV70AL.



➔ **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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQV70A			
> 5 mm from the plastic body for CQV70AL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th\ j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_f	typ.	1,75 V	
		max.	2,2 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	650 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	80 pF	

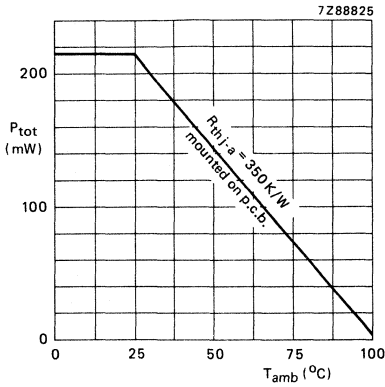


Fig. 2.

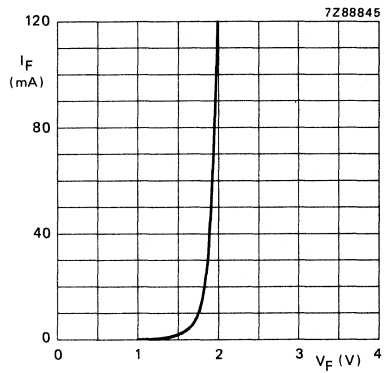


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

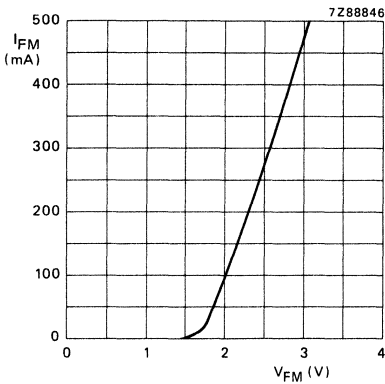


Fig. 4 $t_{on} = 20 \mu s$; $\delta = 0,01$; typ. values.

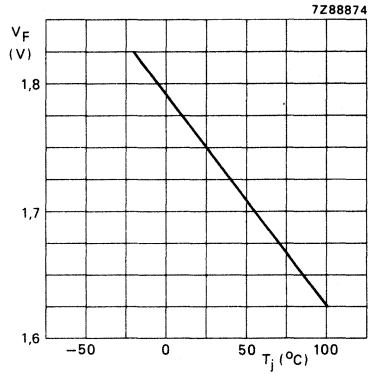


Fig. 5 $I_F = 10 mA$; typ. values.

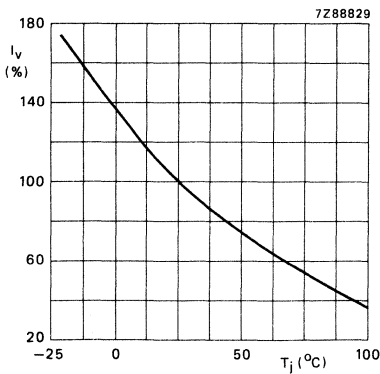


Fig. 6 Typical values.

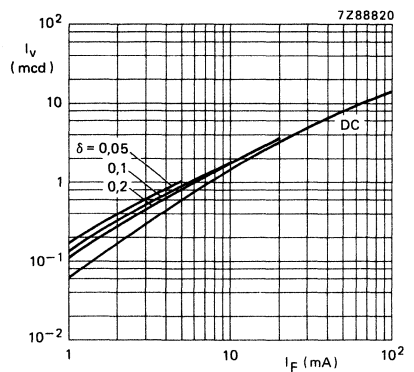


Fig. 7 $t_p = 50 \mu s$; typ. values.

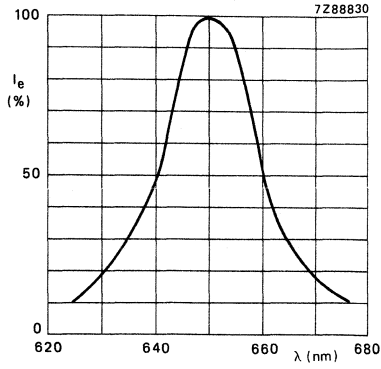


Fig. 8 $I_F = 10$ mA; $T_{amb} = 25$ °C; typ. values.

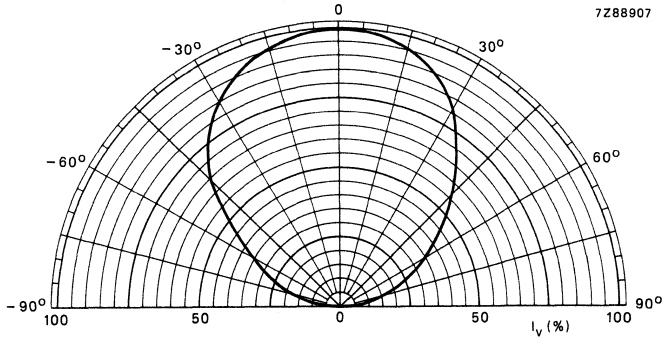
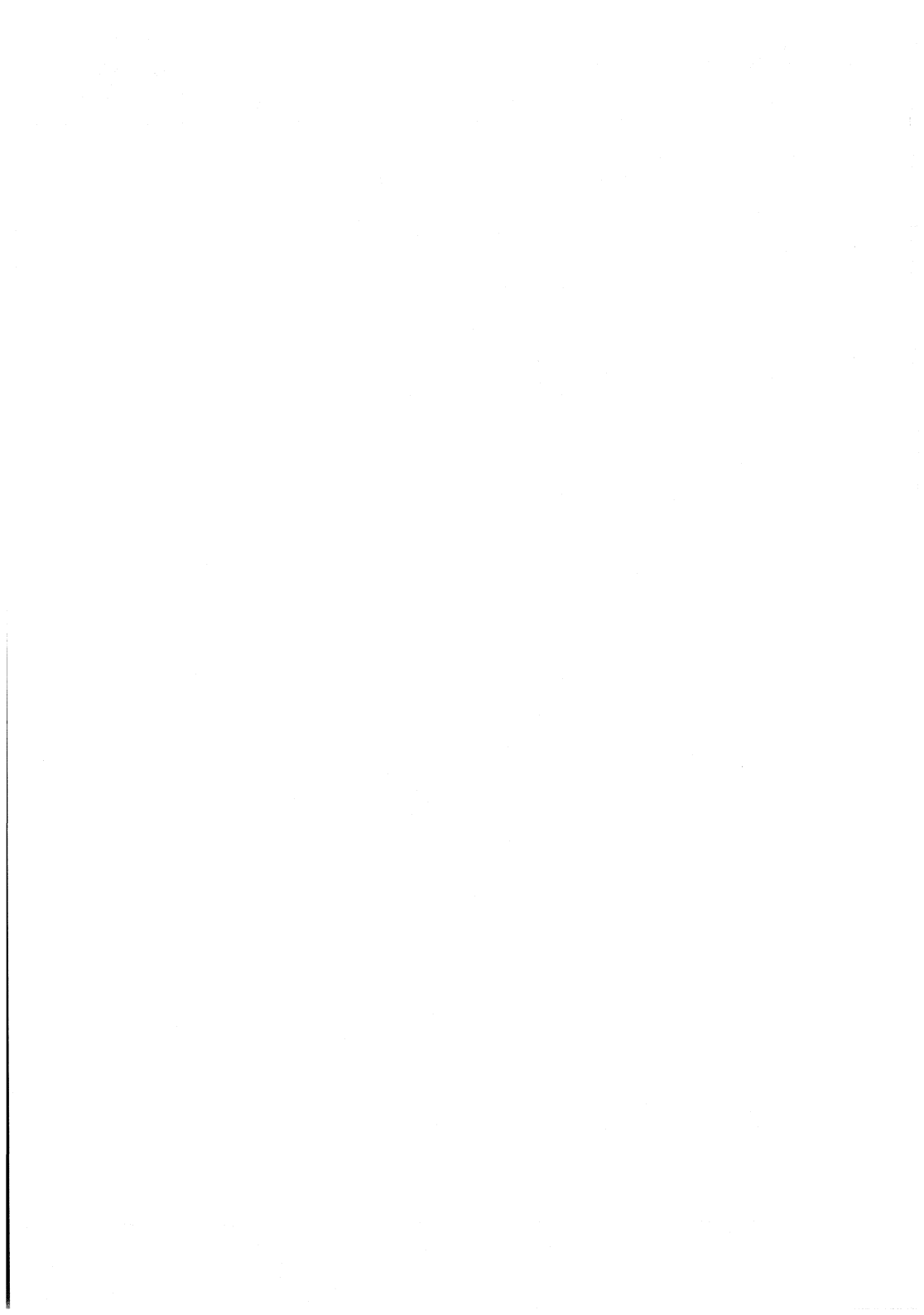


Fig. 9 Typical values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQV70U
CQV70UL

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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity at $I_F = 10\text{ mA}$	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 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-77A1.
CQV70U

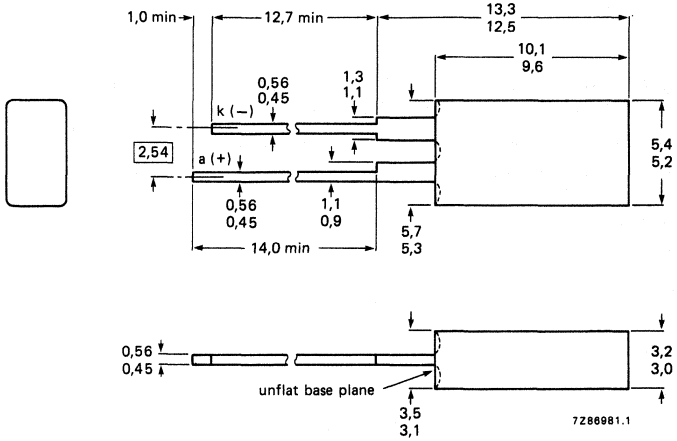
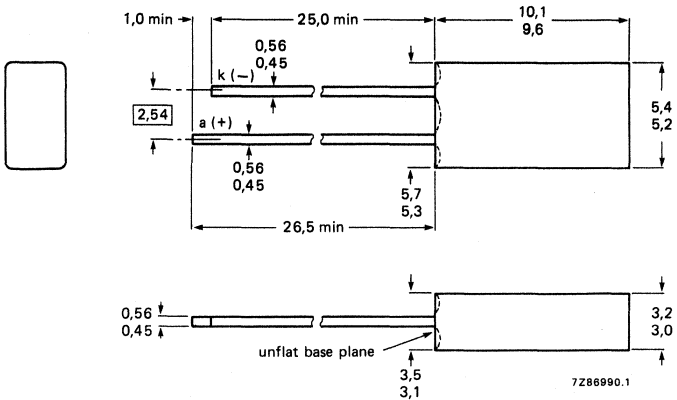


Fig. 1b SOD-77.
CQV70UL



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A	
peak value; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA	
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Lead soldering temperature				
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQV70U			
> 5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQV70UL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

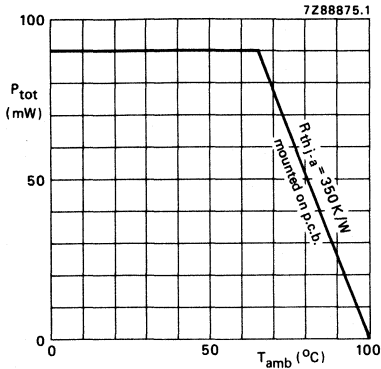


Fig. 2 Typical values.

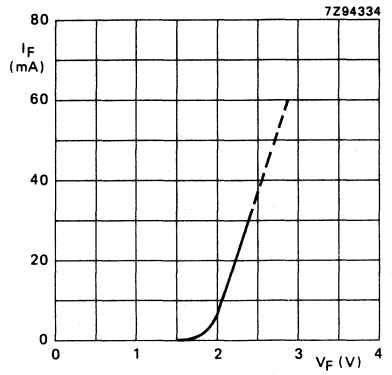


Fig. 3 Typical values.

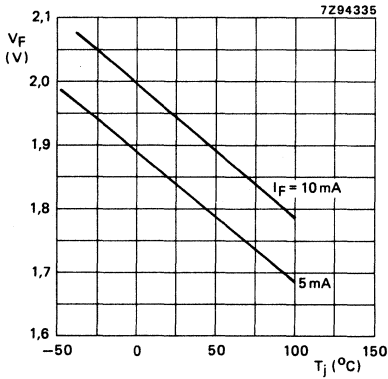


Fig. 4 Typical values.

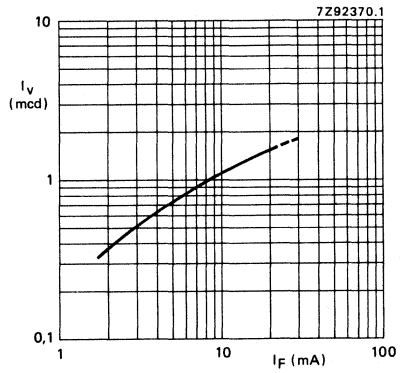


Fig. 5 Typical values.

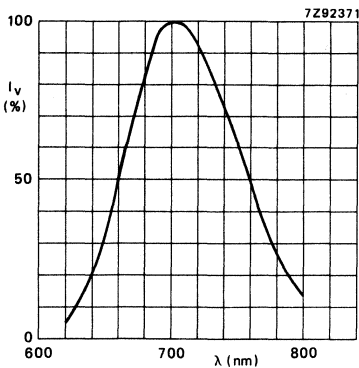


Fig. 6 Typical values.

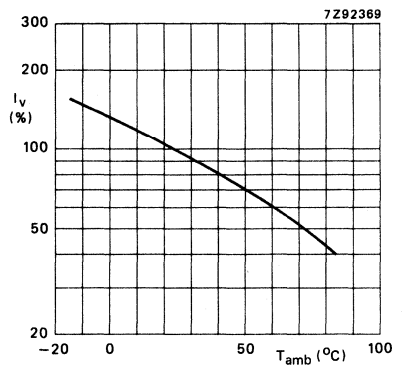


Fig. 7 Typical values.

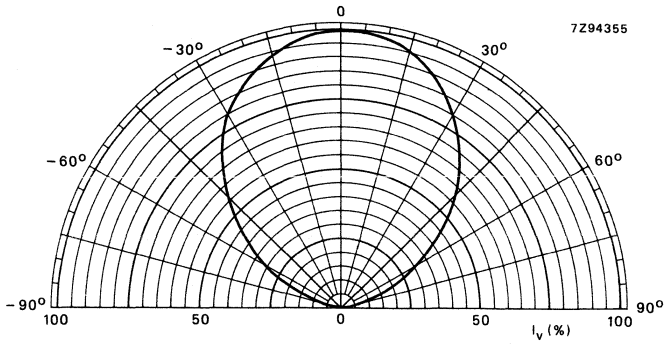
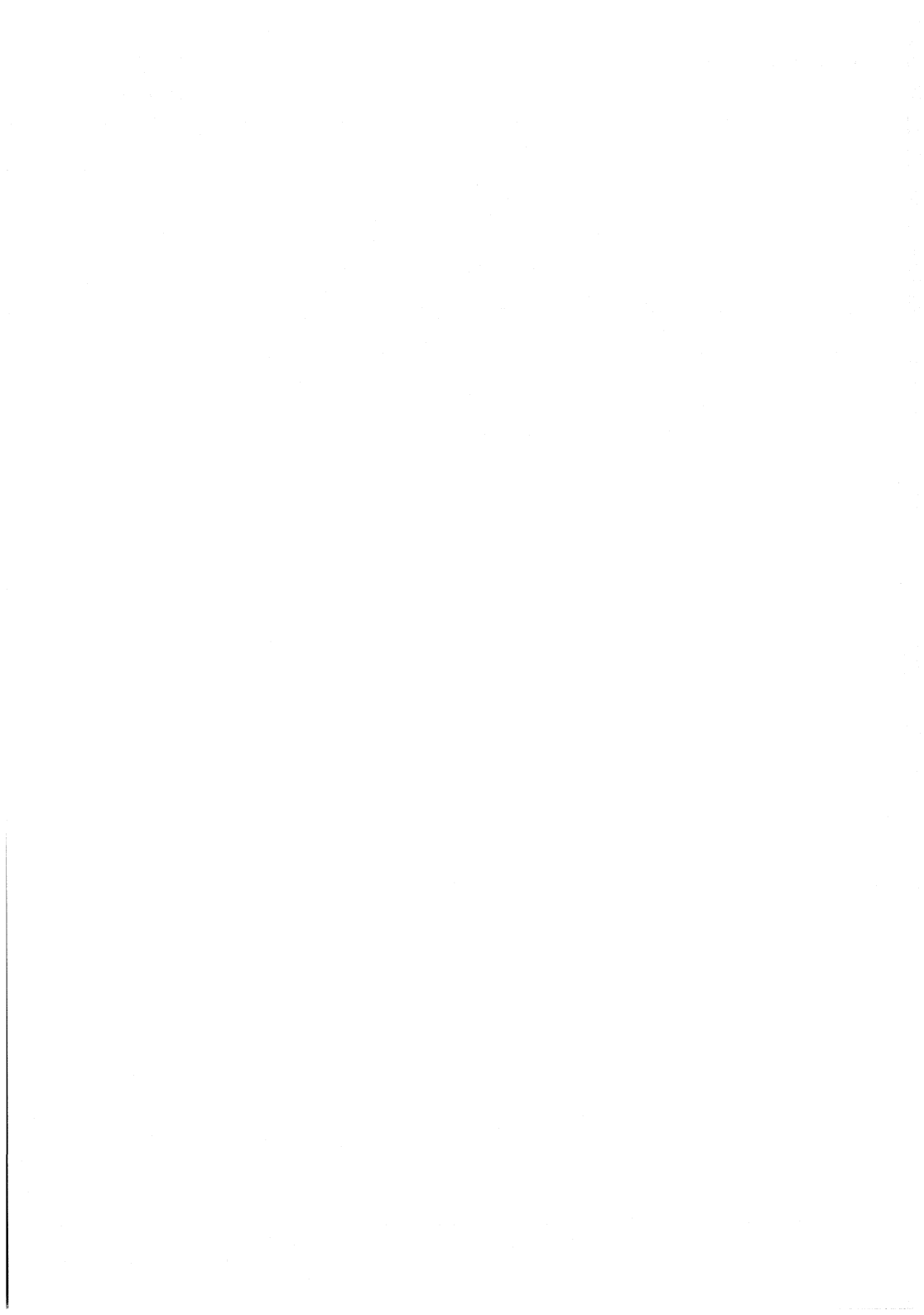


Fig. 8 Typical values.

DEVELOPMENT DATA



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 $T_{amb} = 35\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$		λ_p	typ. 565 nm
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10\text{ mA}$		$\theta_{1/2}$	typ. 100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-77A1.
CQV71A.

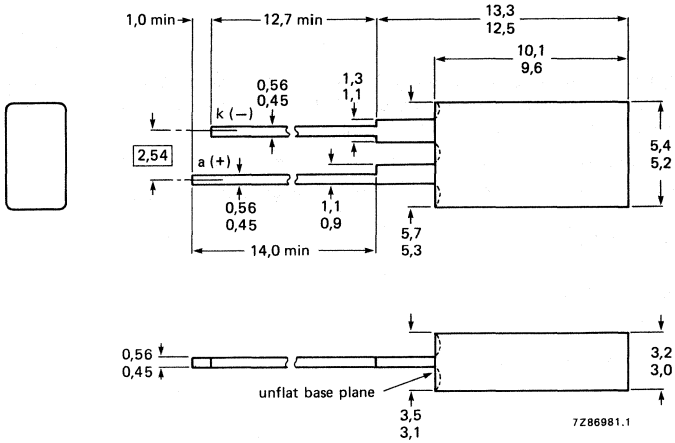
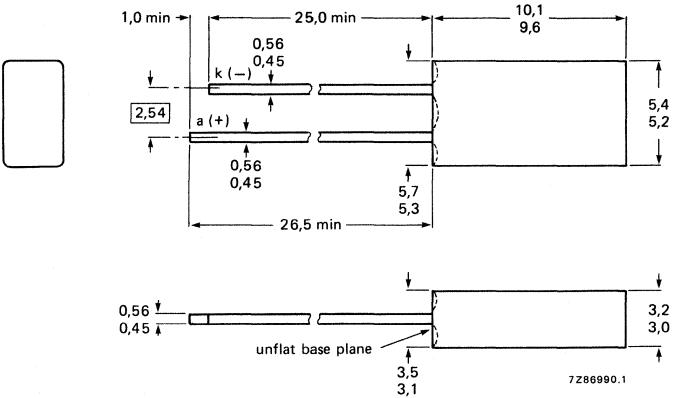


Fig. 1b SOD-77L
CQV71AL.



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,01$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQV71A			
> 5 mm from the plastic body for CQV71AL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient when the device
is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	565 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF	

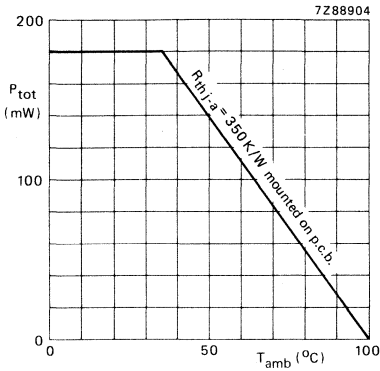


Fig. 2.

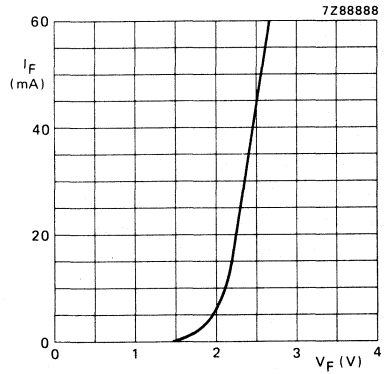


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typical values.

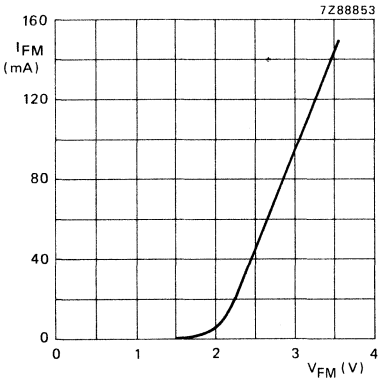


Fig. 4 $t_{ON} = 1\text{ ms}$; $\delta = 0,01$;
 $T_j = 25^\circ\text{C}$; typical values.

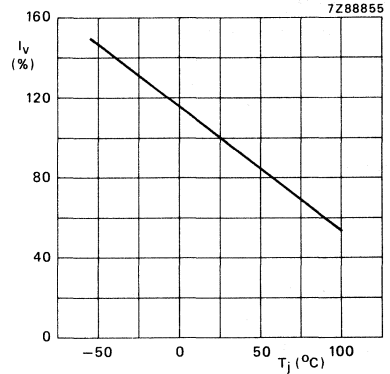


Fig. 5 Typical values.

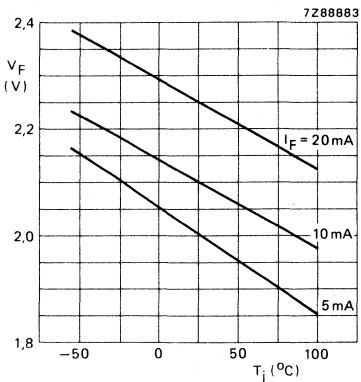


Fig. 6 $I_F = 10\text{ mA}$; typ. values.

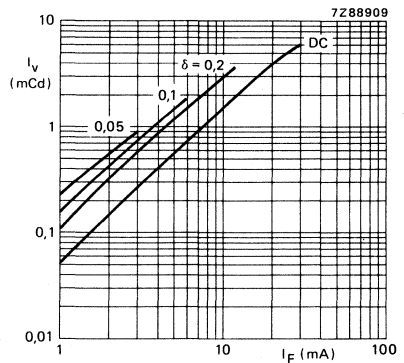


Fig. 7 $t_p = 50\ \mu\text{s}$; typical values.

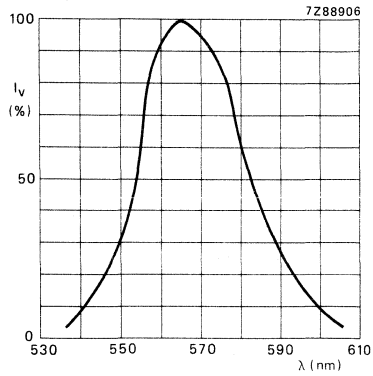


Fig. 8 Typical values.

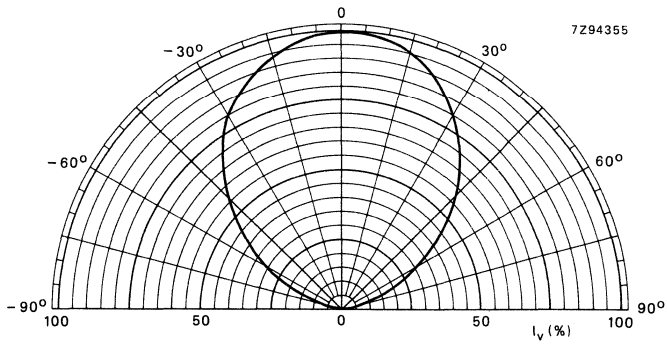


Fig. 9 Typical values.

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 $T_{amb} = 65\text{ °C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10\text{ mA}$		$\theta_{1/2}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

Fig 1a SOD-77A1.
CQV72.

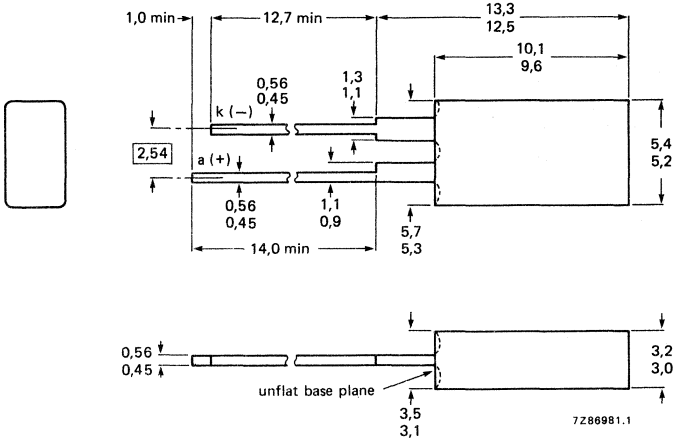
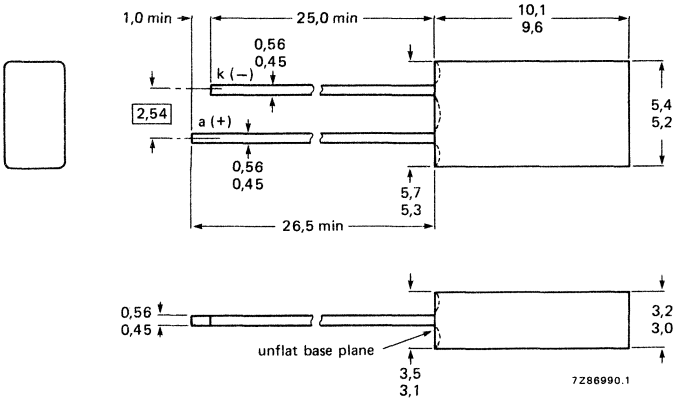


Fig. 1b SOD-77L.
CQV72L.



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{slid} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQV72			
> 5 mm from the plastic body for CQV72L	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	590 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$, $f = 1 \text{ MHz}$	C_d	typ.	15 pF	

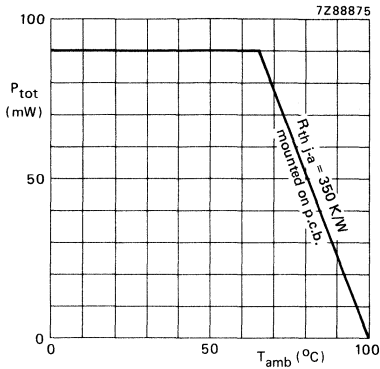


Fig. 2.

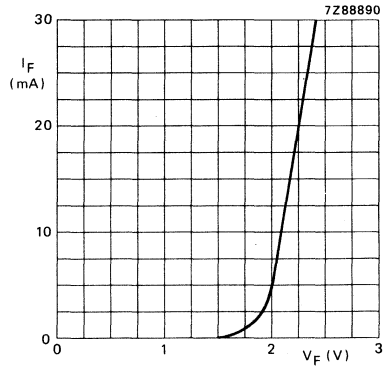


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

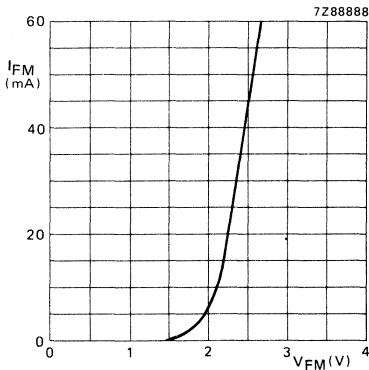


Fig. 4 $t_{on} = 50\text{ }\mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

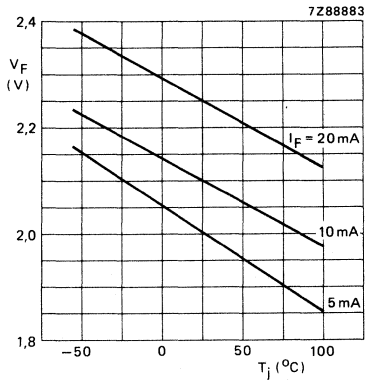


Fig. 5 Typical values.

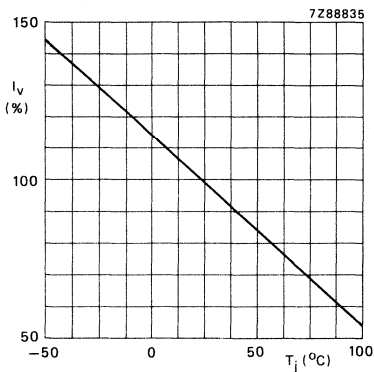


Fig. 6 $I_F = 10\text{ mA}$; typ. values.

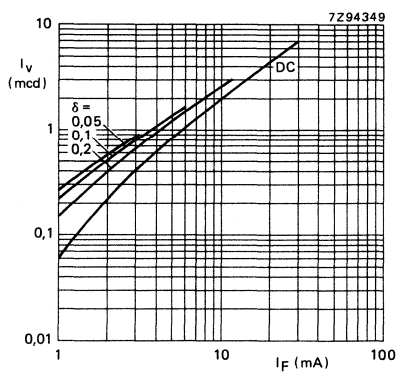


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typical values.

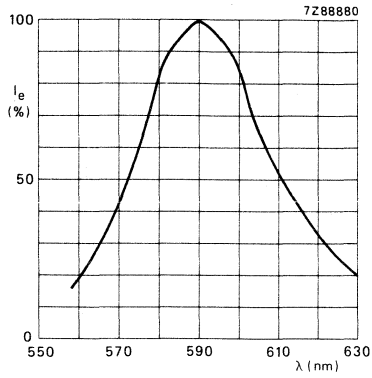


Fig. 8 Typical values.

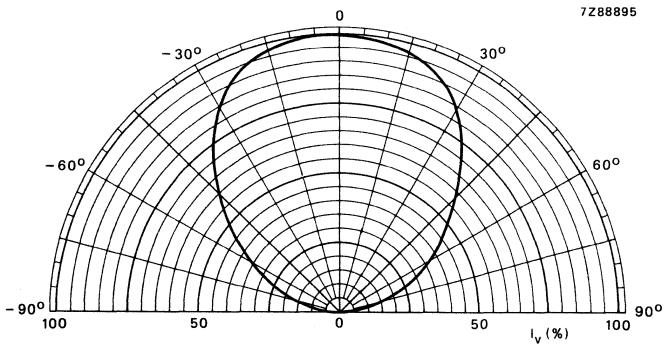


Fig. 9 Typical values.



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.

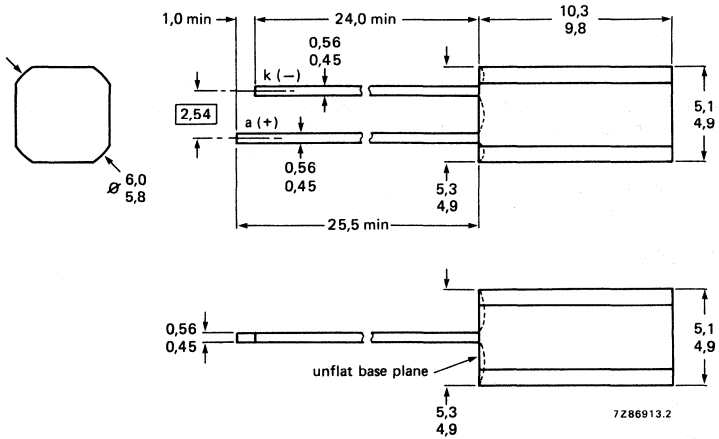
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V	
Forward current (d.c.)		I_F	max.	30 mA	
Total power dissipation up to $T_{amb} = 65\text{ °C}$		P_{tot}	max.	90 mW	
Junction temperature		T_j	max.	100 °C	
Luminous intensity					
$I_F = 10\text{ mA}$	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					
$I_F = 10\text{ mA}$		λ_p	typ.	630 nm	
Beamwidth between half-intensity directions					
$I_F = 10\text{ mA}$		$\theta_{1/2}$	typ.	100 °	

MECHANICAL DATA

Fig. 1 SOD-74L.

Dimensions in mm



→ 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		max.	1 A
peak value; $t_{on} = 1$ ms; $\delta = 0,33$	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; $t_{slid} < 7$ s	T_{slid}	max.	260 °C

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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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 μ A	
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				
	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	←

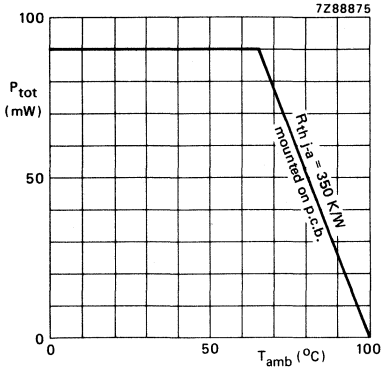


Fig. 2.

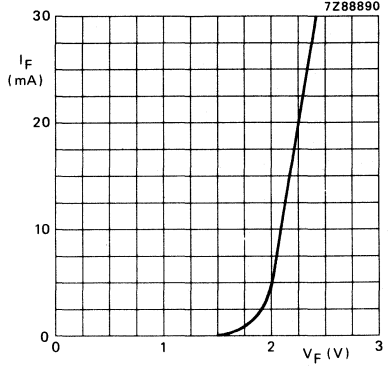


Fig. 3 $T_{amb} = 25$ °C; typ. values.

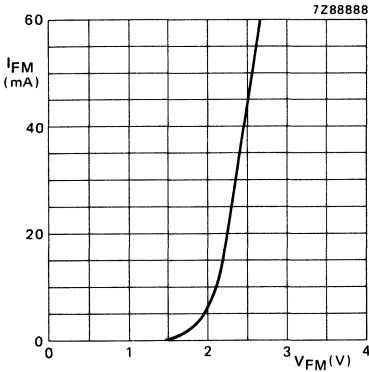


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25$ °C; typ. values.

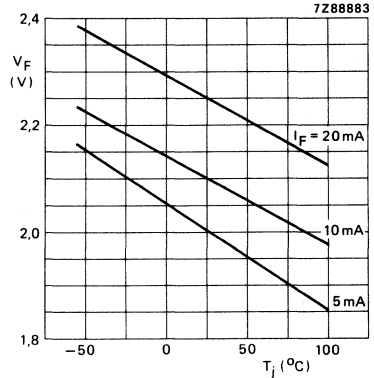


Fig. 5 Typical values.

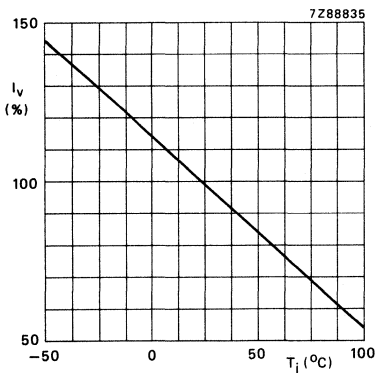


Fig. 6 $I_F = 10$ mA; typ. values.

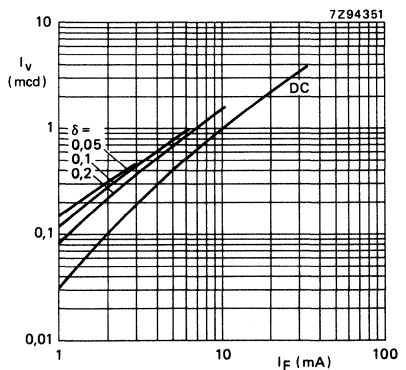


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

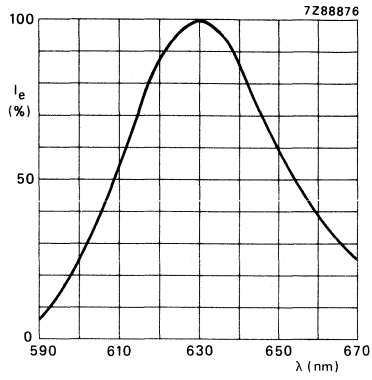


Fig. 8 Typical values.

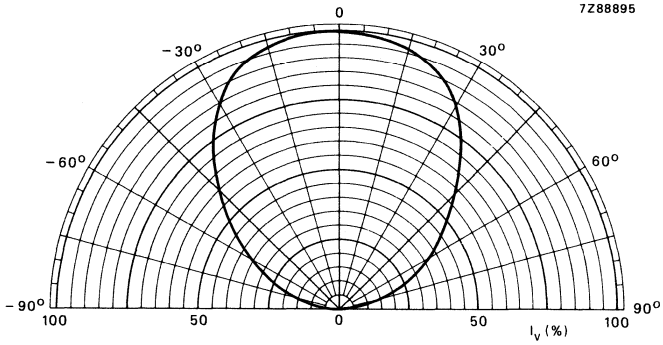


Fig. 9 Typical values.

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.

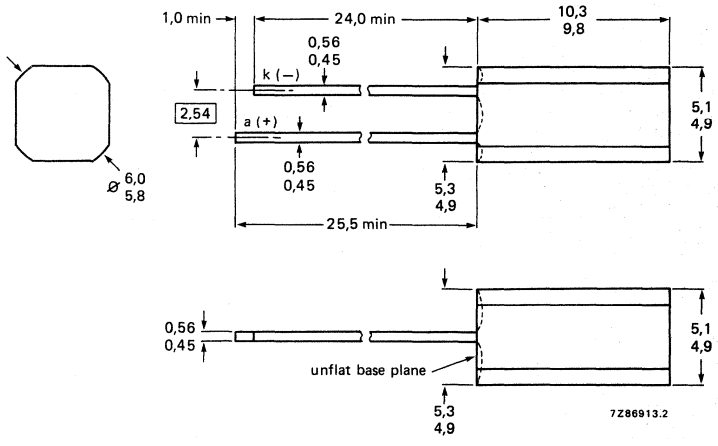
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	100 mA
Total power dissipation up to $T_{amb} = 25\text{ °C}$		P_{tot}	max.	215 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	650 nm
Beamwidth between half-intensity directions				
$I_F = 10\text{ mA}$		$\theta_{1/2}$	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.	100 mA
peak value; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA ←
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 5,0 mm from the plastic body; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th\ j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	1,75 V	
		max.	2,2 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$ ←	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	650 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	80 pF	

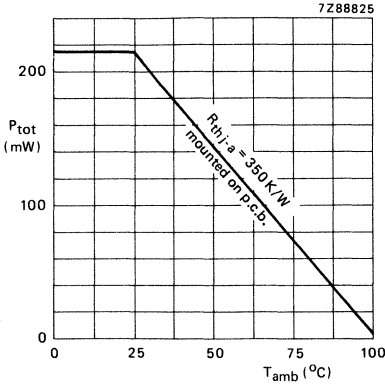


Fig. 2.

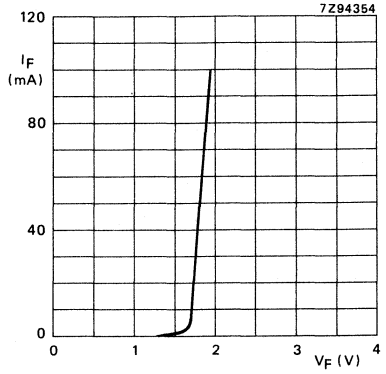


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typ. values.

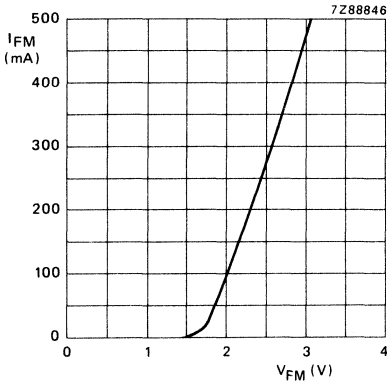


Fig. 4 $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25^\circ\text{C}$; typ. values.

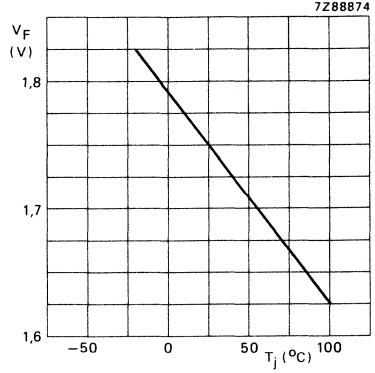


Fig. 5 $I_F = 10 \text{ mA}$; typ. values.

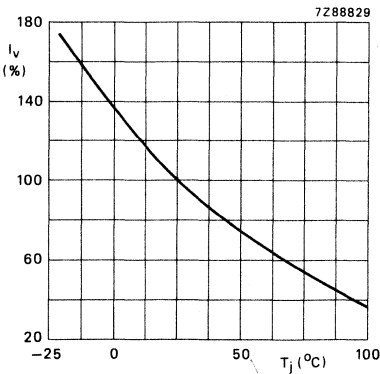


Fig. 6 Typical values.

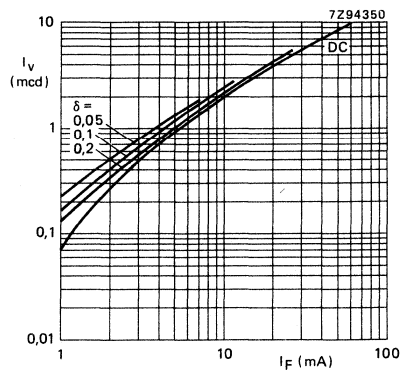


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

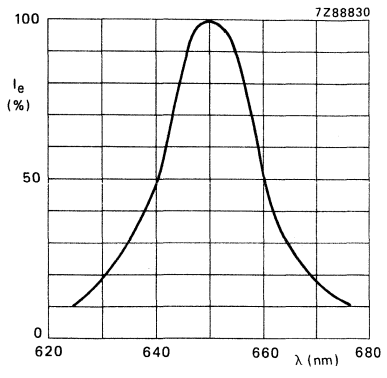


Fig. 8 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

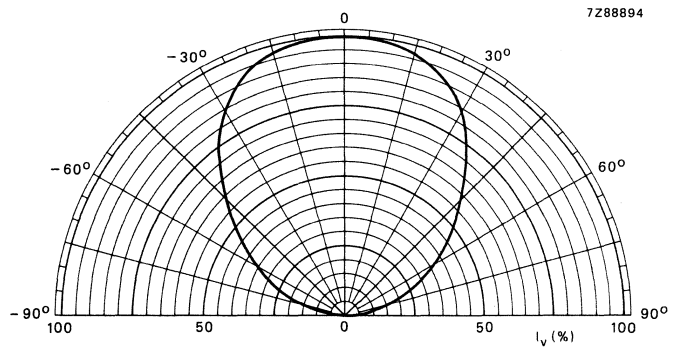


Fig. 9 Typical values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQV80U
CQV80UL

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.

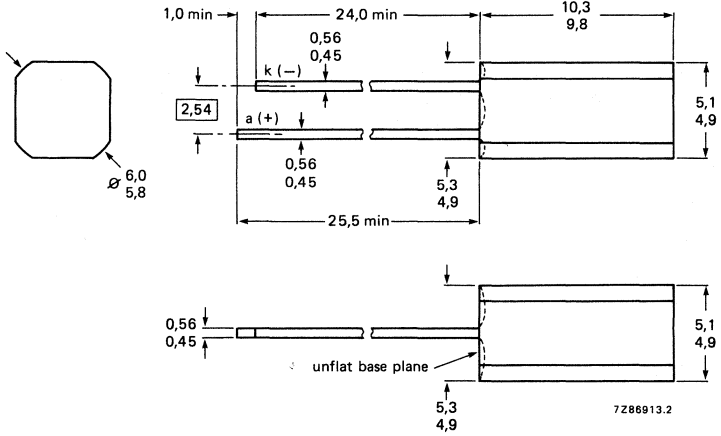
QUICK REFERENCE DATA

Reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity at $I_F = 10\text{ mA}$	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 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQV80U	T_{sld}	max. 260 $^\circ\text{C}$
> 5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQV80UL		

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

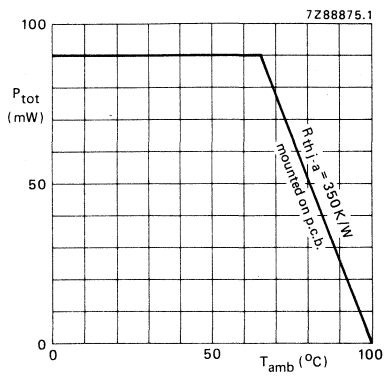


Fig. 2.

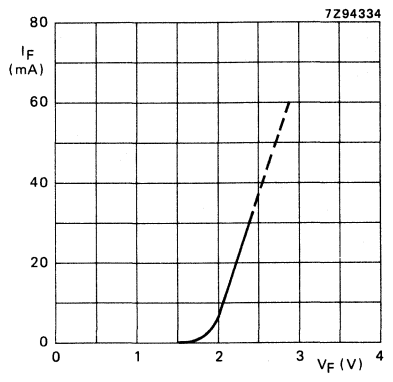


Fig. 3 Typical values.

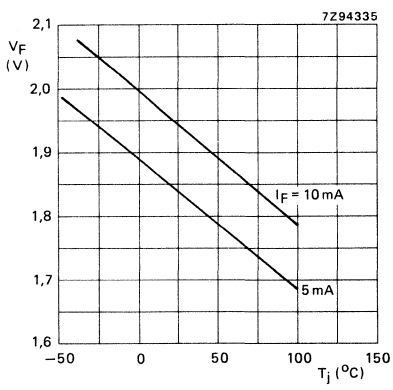


Fig. 4 Typical values.

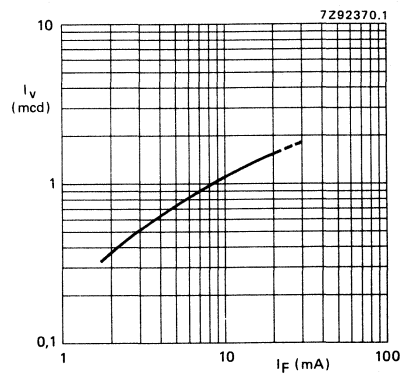


Fig. 5 Typical values.

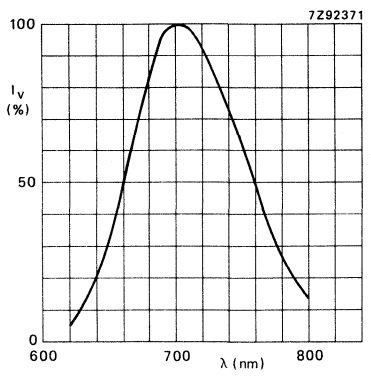


Fig. 6 Typical values.

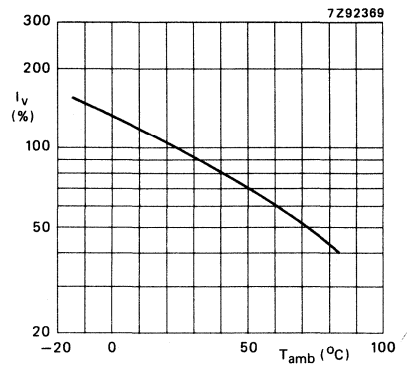


Fig. 7 Typical values.

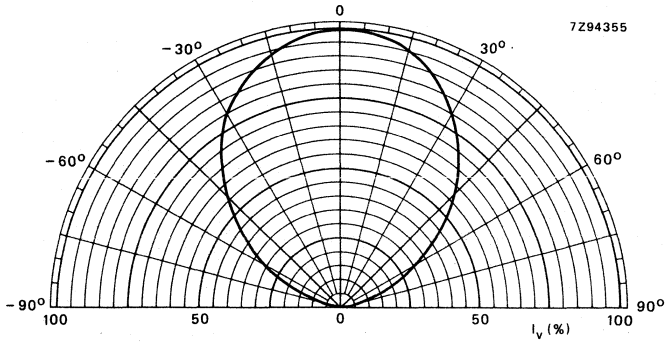


Fig. 8 Typical values.

DEVELOPMENT DATA

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.

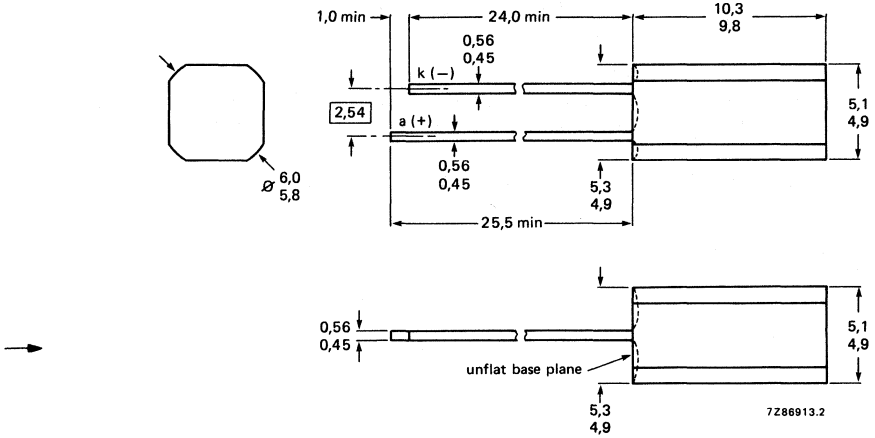
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 35\text{ }^\circ\text{C}$		P_{tot}	max.	180 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	565 nm
Beamwidth between half-intensity directions				
$I_F = 10\text{ mA}$		$\theta_{1/2}$	typ.	100 $^\circ$

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, $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A	
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA	←
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Lead soldering temperature				
> 5,0 mm from the plastic body; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$	

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th\ j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

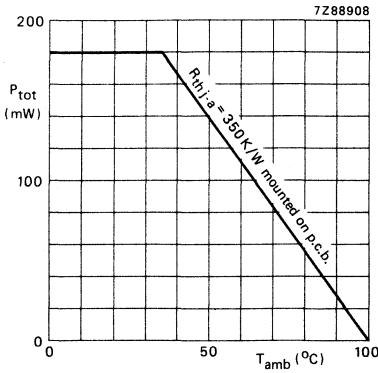


Fig. 2.

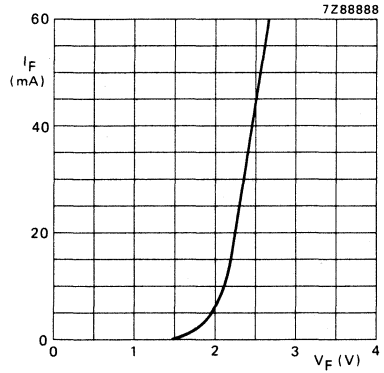


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

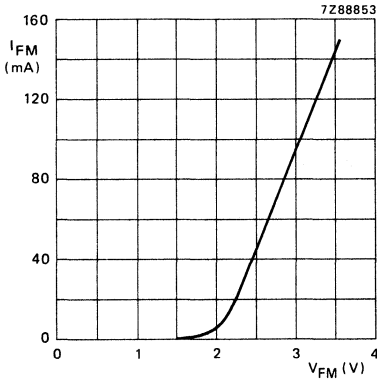


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

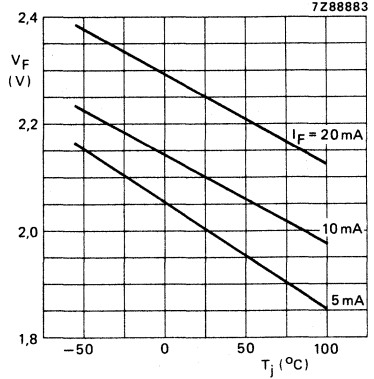


Fig. 5 Typical values.

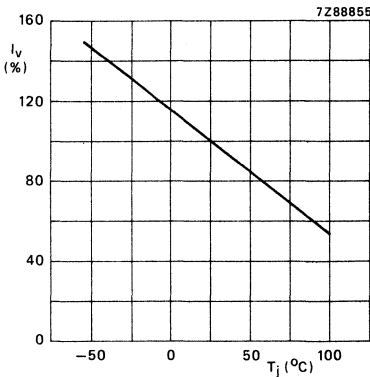


Fig. 6 $I_F = 10 \text{ mA}$; typical values.

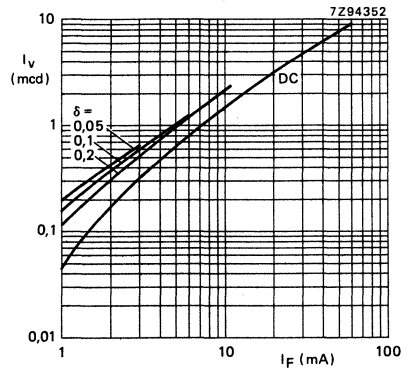


Fig. 7 $t_D = 50 \mu\text{s}$; typical values.

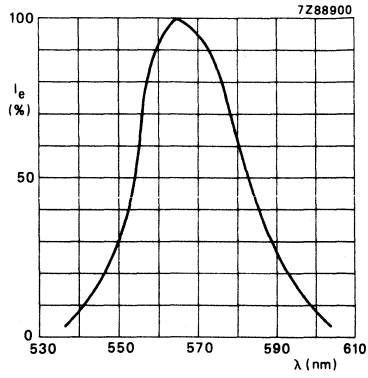


Fig. 8 Typical values.

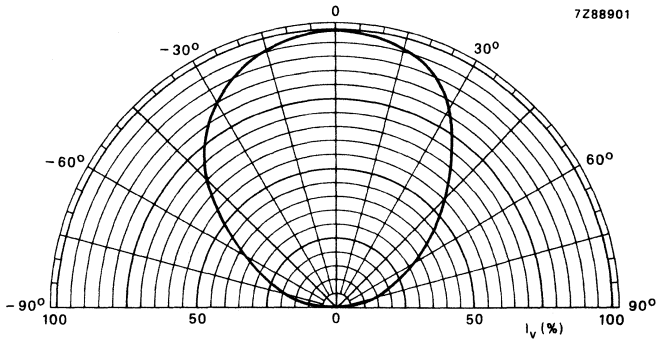


Fig. 9 Typical values.

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.

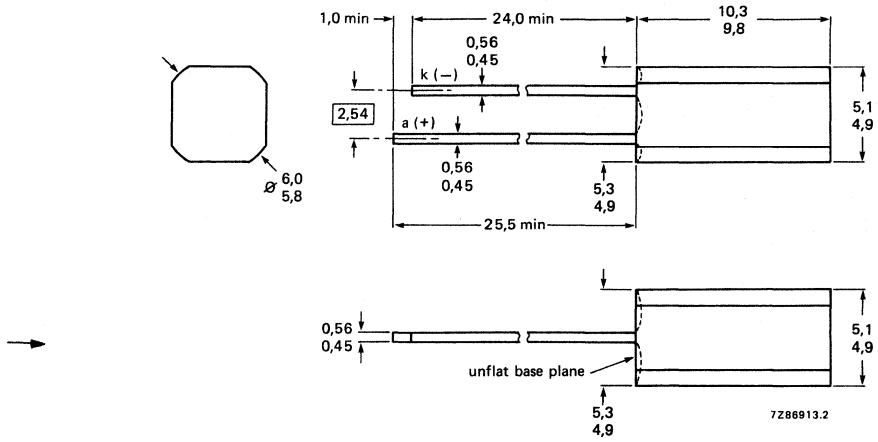
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth between half-intensity directions				
$I_F = 10\text{ mA}$		$\theta_{1/2}$	typ.	100 $^\circ$

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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$		max.	1 A	←
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA	
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Lead soldering temperature				
> 5,0 mm from the plastic body; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$	

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

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

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

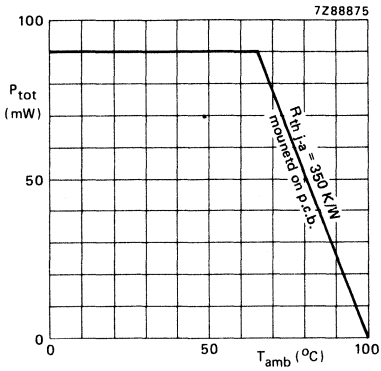


Fig. 2.

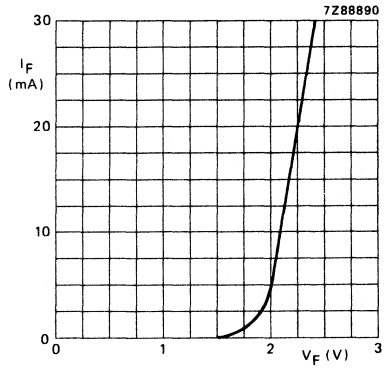


Fig. 3 Typical values.

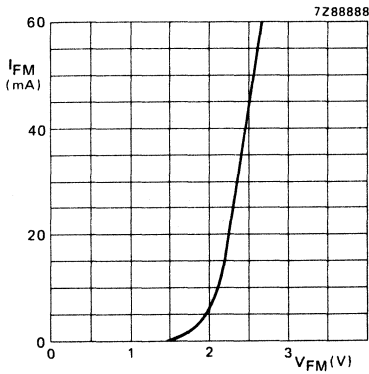


Fig. 4 $t_{on} = 50 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

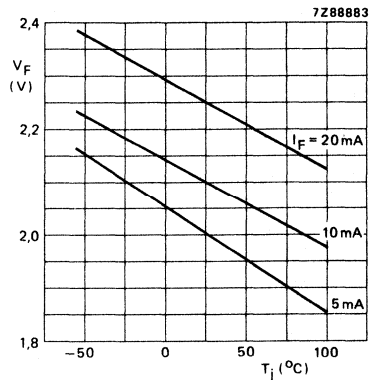


Fig. 5 Typical values.

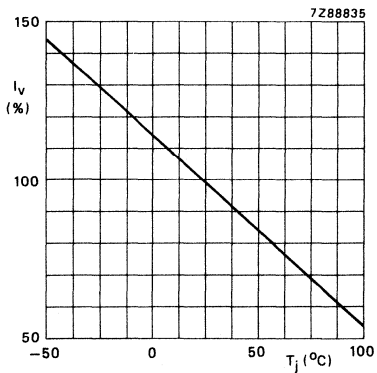


Fig. 6 $I_F = 10 \text{ mA}$; typ. values.

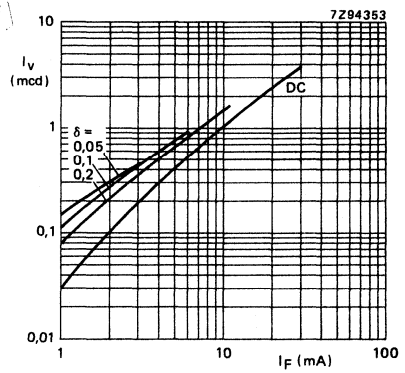


Fig. 7 $t_p = 50 \mu s$; typical values.

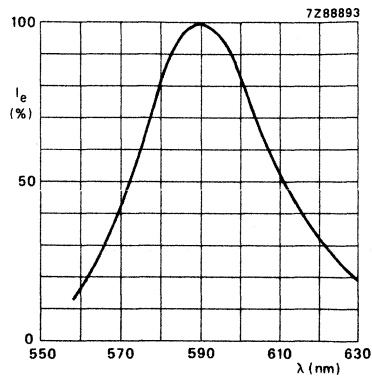


Fig. 8 Typical values.

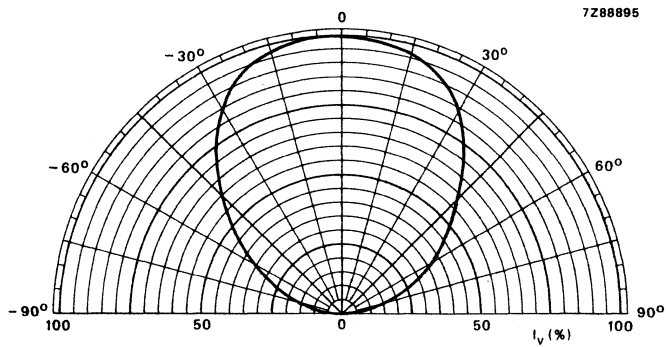


Fig. 9 Typical values.

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 $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$	λ_p	typ.	650 nm
Beamwidth between half-intensity directions			
$I_F = 10\text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A2.
CQW10A

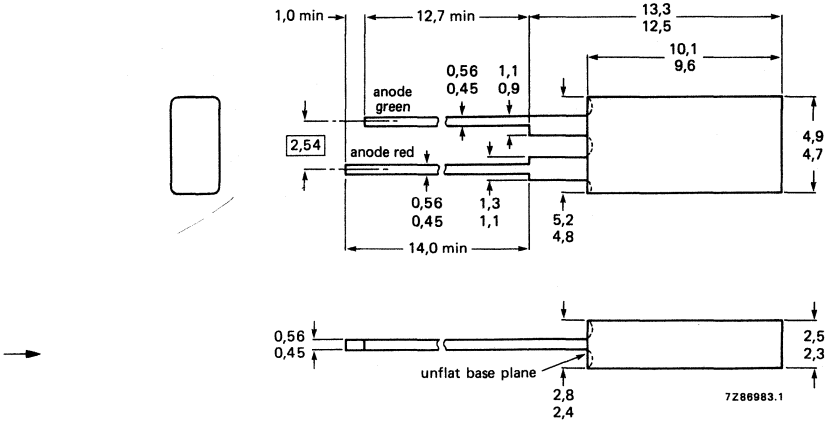
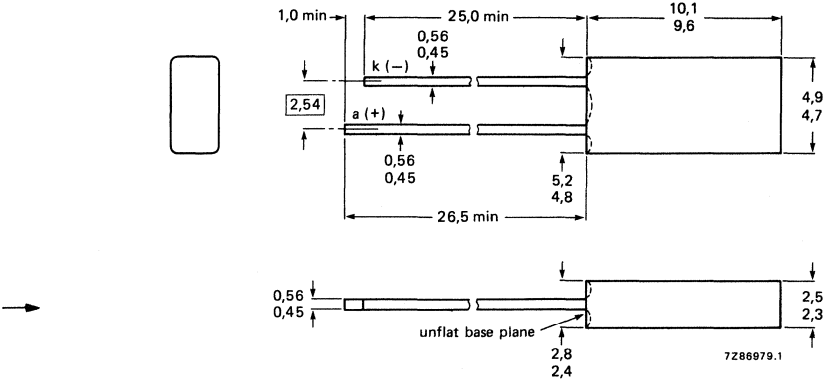


Fig. 1b SOD-76L.
CQW10AL



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A	
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA	←
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Lead soldering temperature; $t_{sld} < 7 \text{ s}$				
> 1,5 mm from the seating plane for CQW10A				
> 5 mm from the plastic body for CQW10AL	T_{sld}	max.	260 $^\circ\text{C}$	

THERMAL RESISTANCEFrom junction to ambient when the device
is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

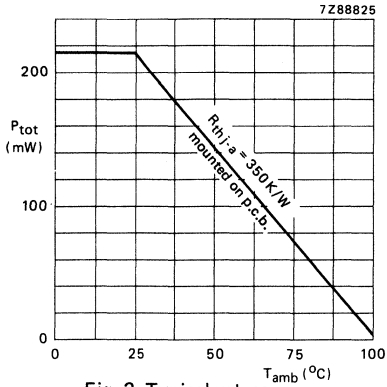


Fig. 2 Typical values.

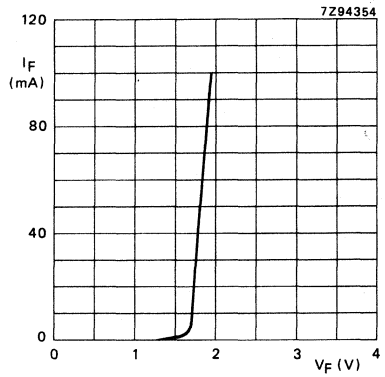


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typ. values.

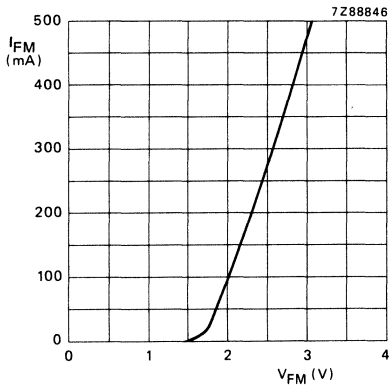


Fig. 4 $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$; typ. values.

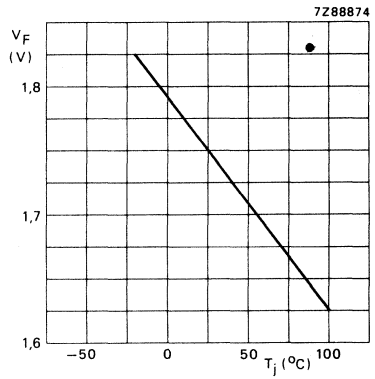


Fig. 5 $I_F = 10 \text{ mA}$; typ. values.

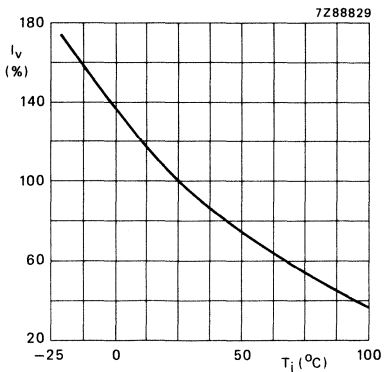


Fig. 6 Typical values.

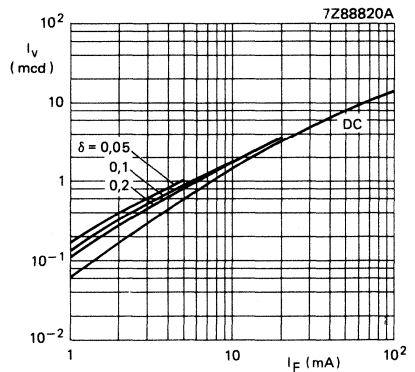


Fig. 7 $t_p = 50 \mu\text{s}$; typ. values.

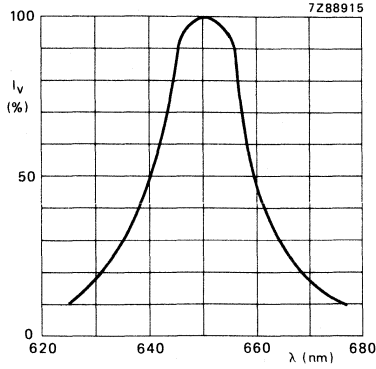


Fig. 8 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

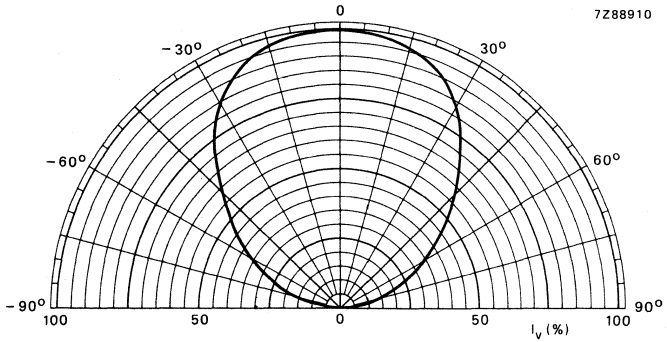


Fig. 9 Typical values.



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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$	λ_p	typ.	630 nm
Beamwidth between half-intensity directions			
$I_F = 10\text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A1.
CQW10B

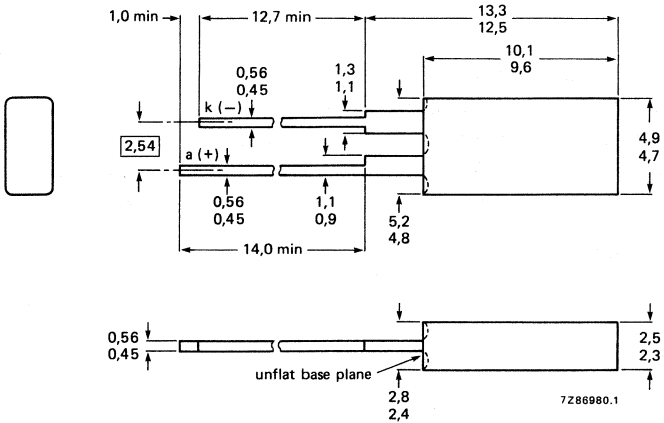
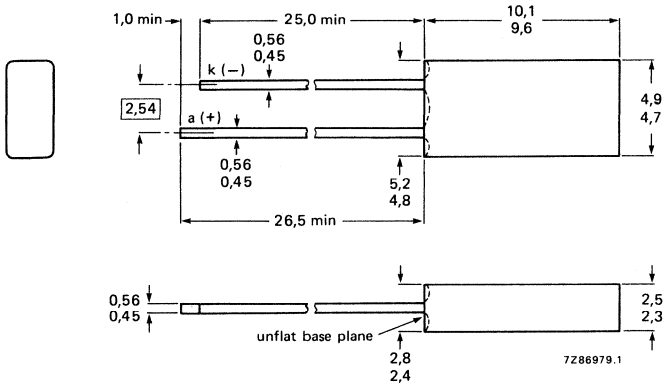


Fig. 1b SOD-76L
CQW10B4



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW10B			
> 5 mm from the plastic body for CQW10BL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	45 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	630 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	10 pF	

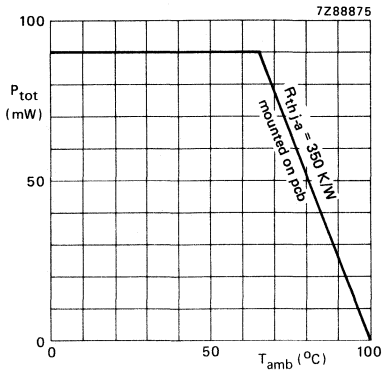


Fig. 2.

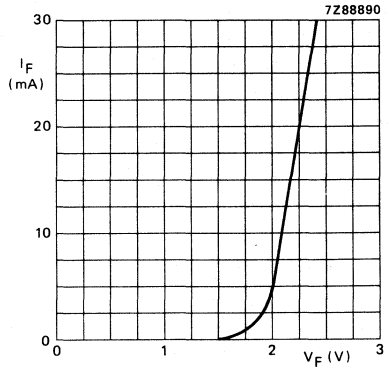


Fig. 3 $T_j = 25^\circ\text{C}$; typ. values.

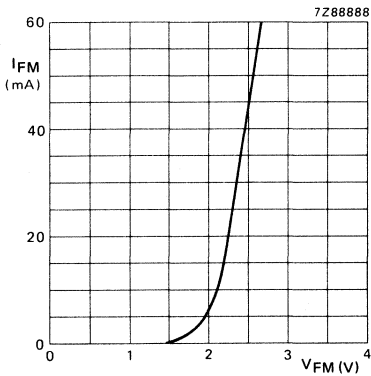


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_j = 25^\circ\text{C}$; typ. values.

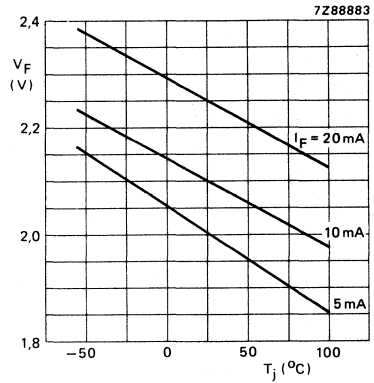


Fig. 5 Typical values.

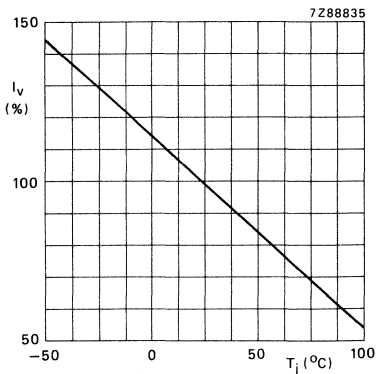


Fig. 6 $I_F = 10 \text{ mA}$; typ. values.

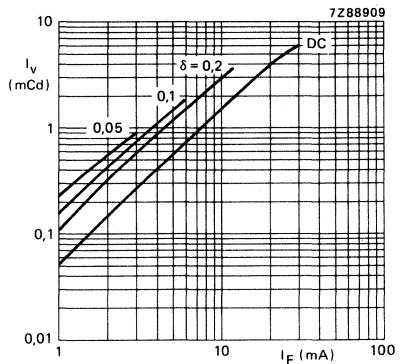


Fig. 7 $t_p = 50 \mu\text{s}$; typ. values.

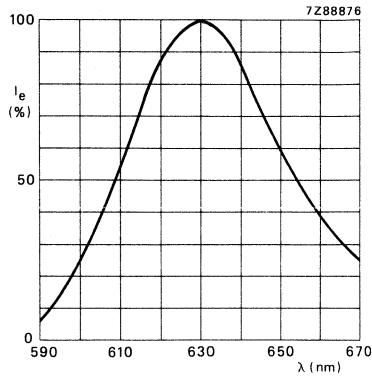


Fig. 8 $I_F = 10$ mA; typ. values.

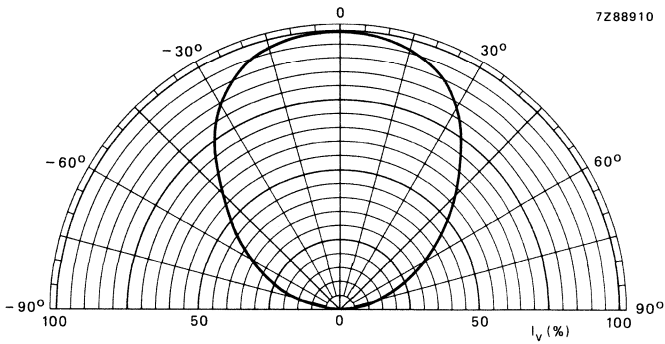


Fig. 9 Typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQW10U
CQW10UL

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 up to $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity at $I_F = 10\text{ mA}$	I_v	min.	0,7 mcd
Wavelength at peak emission	λ_p	typ.	700 nm
Beamwidth between half-intensity directions	$\theta_{\frac{1}{2}}$	typ.	100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-76A1.
CQW10U.

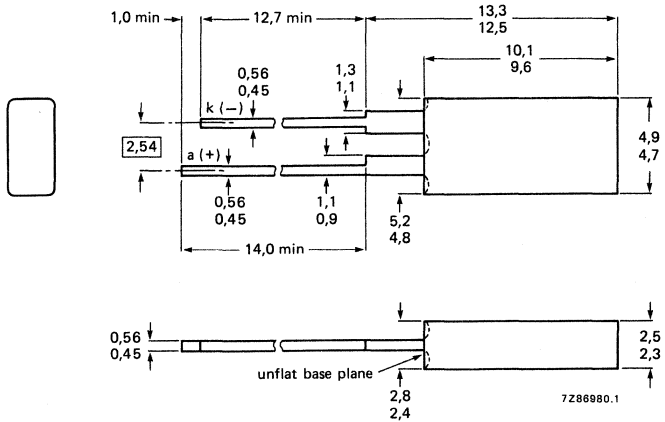
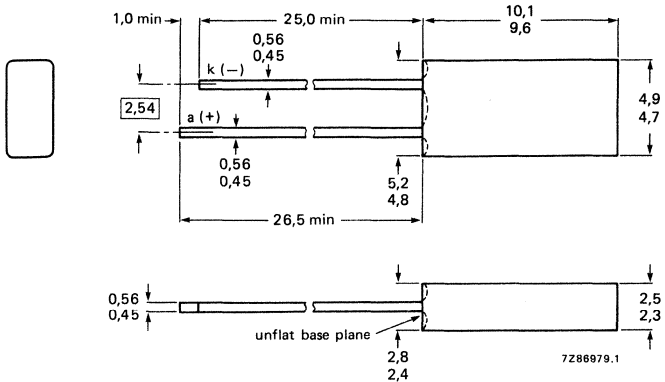


Fig. 1b SOD-76L.
CQW10UL



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A	
peak value; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA	
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Lead soldering temperature				
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQW10U			
> 5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQW10UL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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DEVELOPMENT DATA

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

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

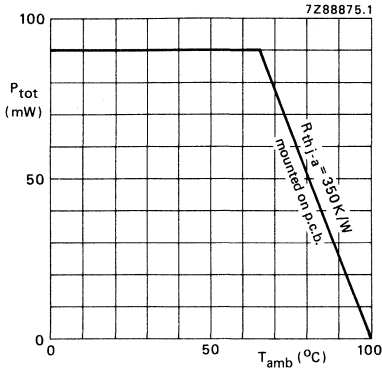


Fig. 2.

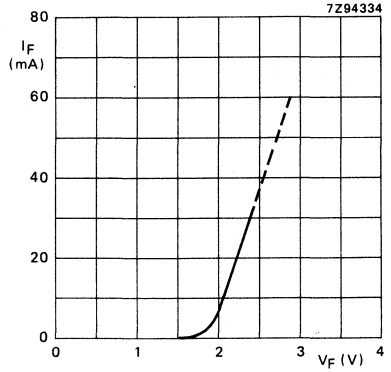


Fig. 3 Typical values.

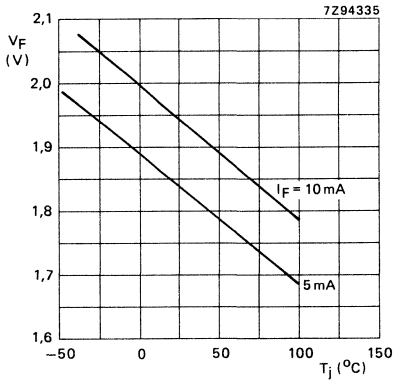


Fig. 4 Typical values.

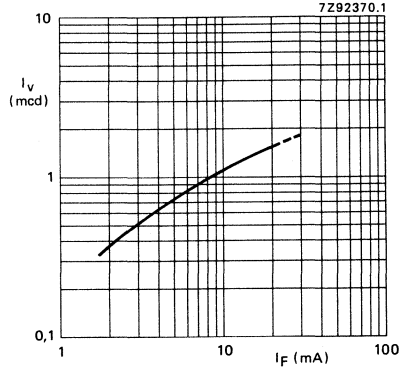


Fig. 5 Typical values.

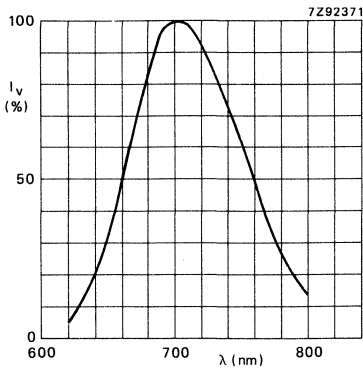


Fig. 6 Typical values.

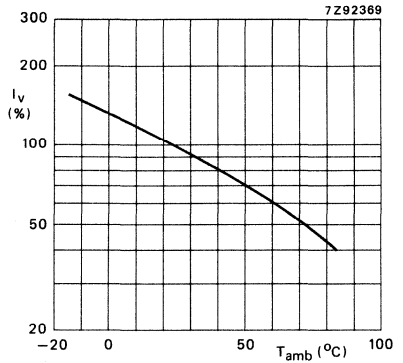


Fig. 7 Typ. values.

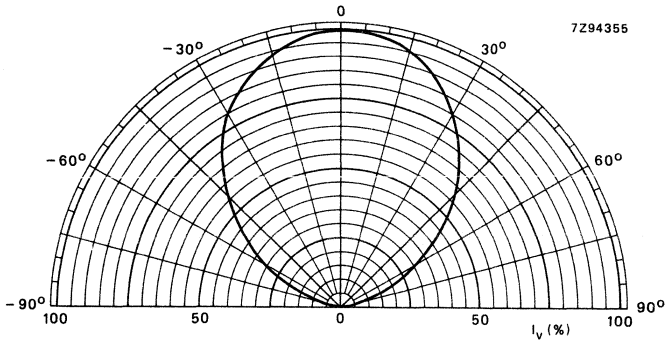


Fig. 8 Typical values.

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 $T_{amb} = 35\text{ }^\circ\text{C}$		P_{tot}	max.	180 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	565 nm
Beamwidth between half-intensity directions				
$I_F = 10\text{ mA}$		$\theta_{1/2}$	typ.	100 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-76A1.
CQW11B

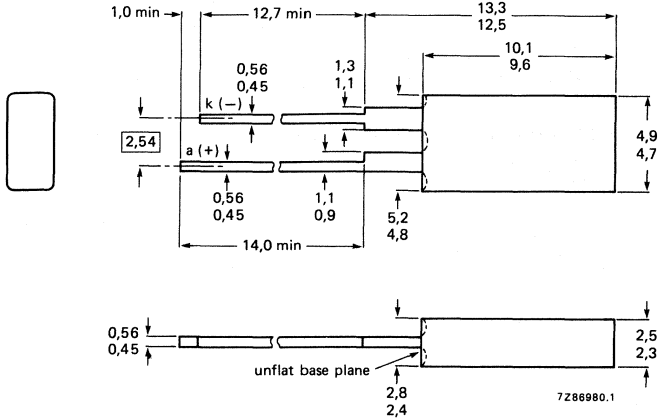
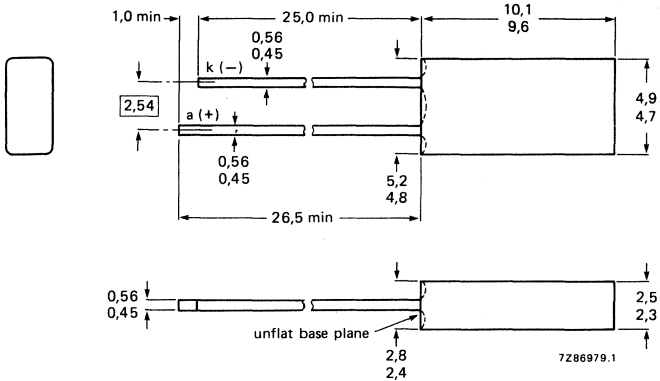


Fig. 1b SOD-76L.
CQW11BL



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A	
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA	←
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Lead soldering temperature; $t_{sld} < 7 \text{ s}$				
> 1,5 mm from the seating plane CQW11B				
> 5 mm from the plastic body CQW11BL	T_{sld}	max.	260 $^\circ\text{C}$	

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

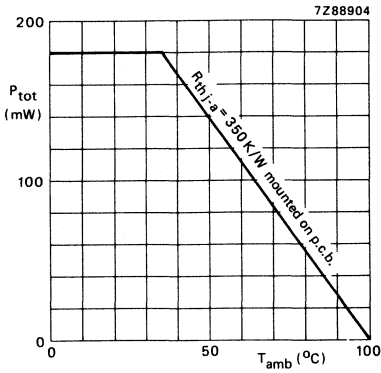


Fig. 2.

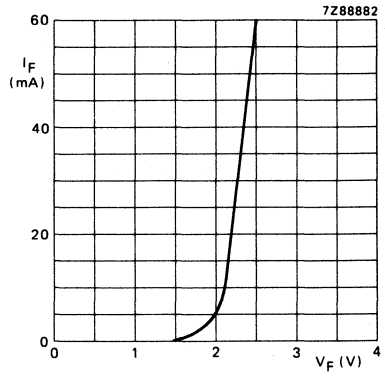


Fig. 3 $T_j = 25^\circ C$; typ. values.

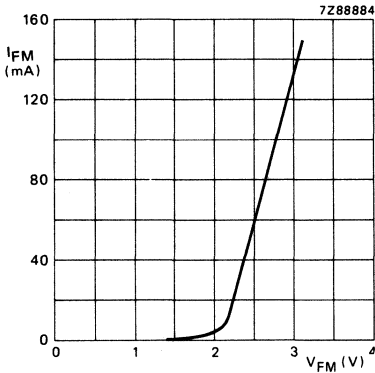


Fig. 4 $t_{on} = 1$ ms; $\delta = 0,33$;
 $T_{amb} = 25^\circ C$; typ. values.

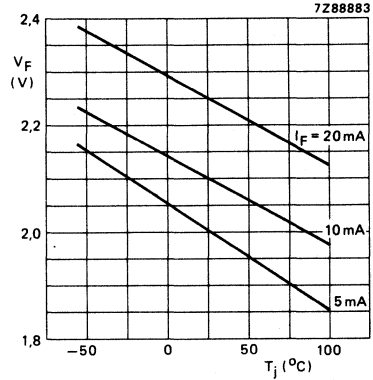


Fig. 5 Typical values.

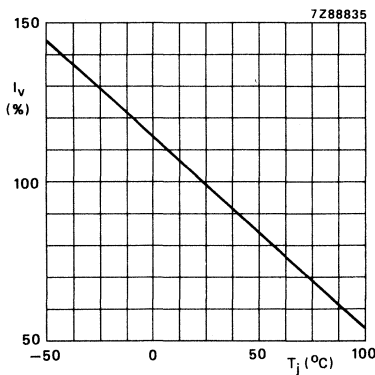


Fig. 6 $I_F = 10$ mA; typ. values.

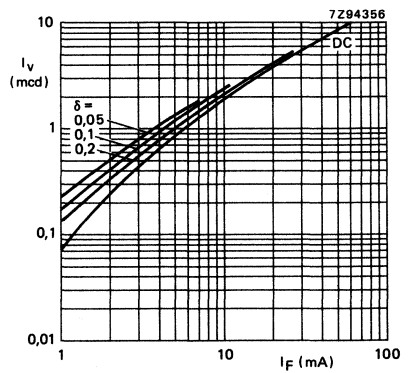


Fig. 7 $t_p = 50 \mu s$; typical values.

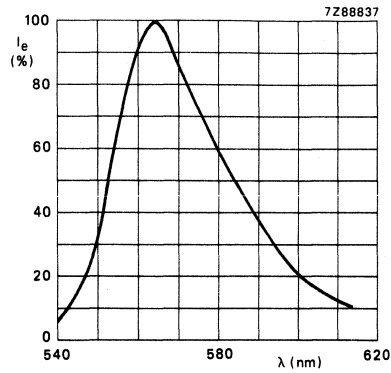


Fig. 8 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

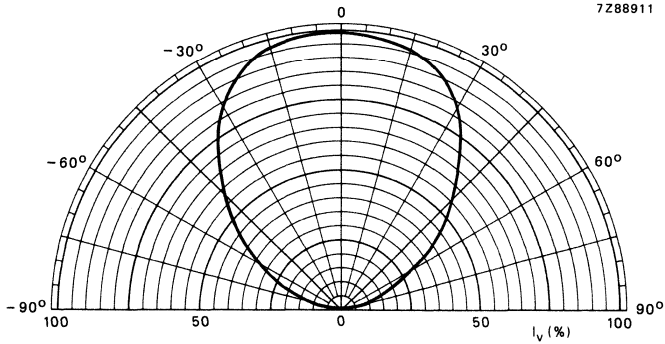


Fig. 9 Typical values.



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 $T_{amb} = 65\text{ °C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth between half-intensity directions				
$I_F = 10\text{ mA}$; in the plane of the leads		$\theta_{1/2}$	typ.	100 °

MECHANICAL DATA

Dimensions in mm

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

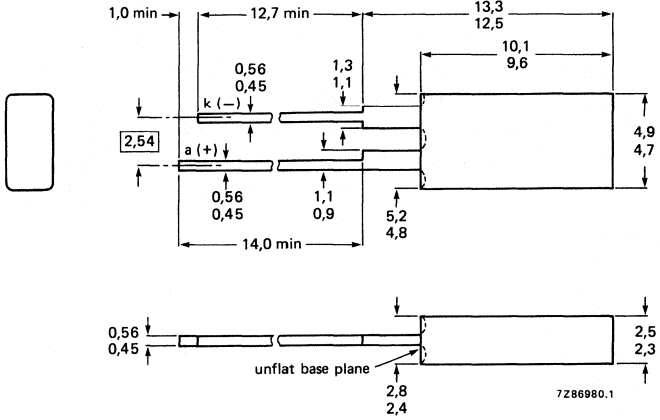
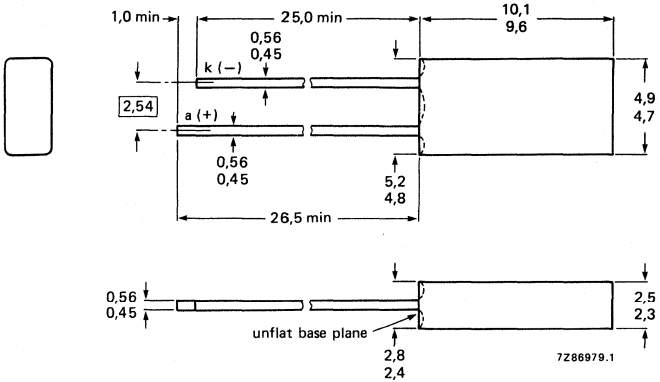


Fig. 1b SOD-76L.
CQW12BL



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value, $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{slid} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW12B			
> 5 mm from the plastic body for CQW12BL	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V
		max.	3,0 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	100 μA
Beamwidth between half-intensity directions			
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	100 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm
Wavelength at peak emission			
$I_F = 10 \text{ mA}$	λ_p	typ.	590 nm
Luminous intensity			
$I_F = 10 \text{ mA}$	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			
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF

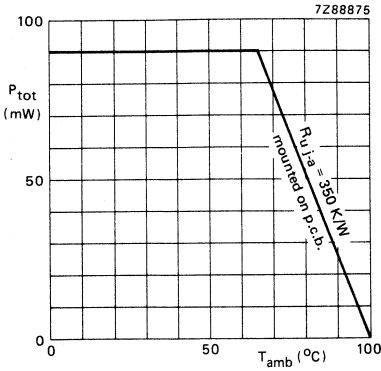


Fig. 2.

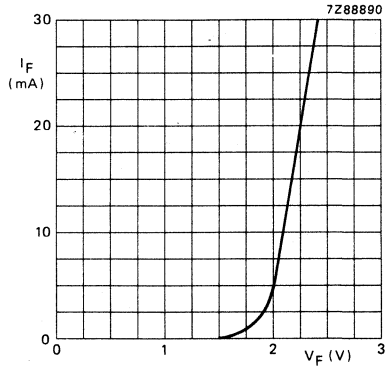


Fig. 3 $T_j = 25^\circ\text{C}$; typ. values.

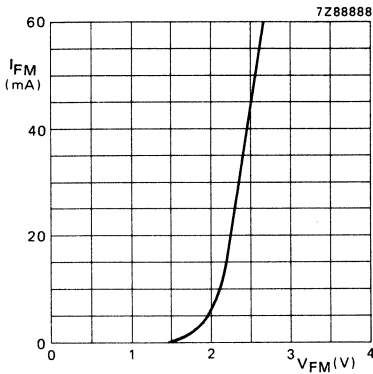


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_j = 25^\circ\text{C}$; typ. values.

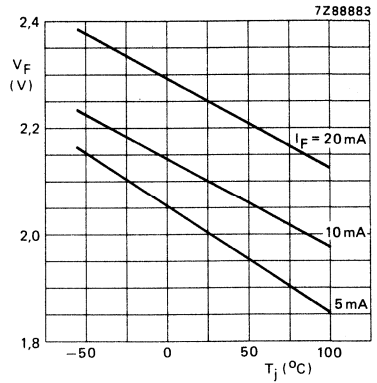


Fig. 5 Typical values.

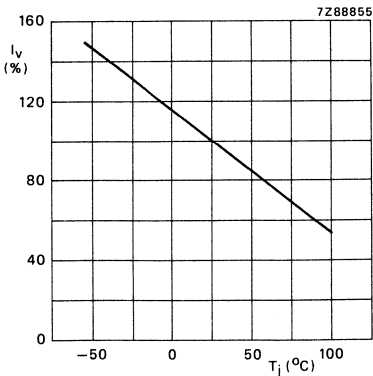


Fig. 6 $I_F = 10 \text{ mA}$; typ. values.

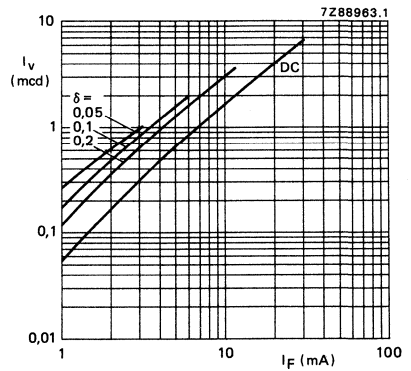


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

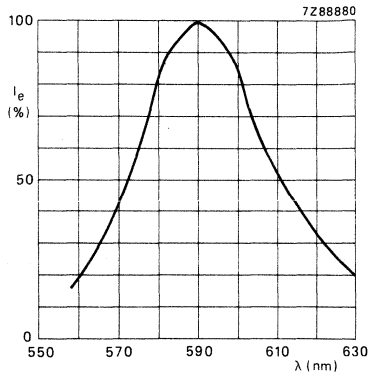


Fig. 8 Typical values.

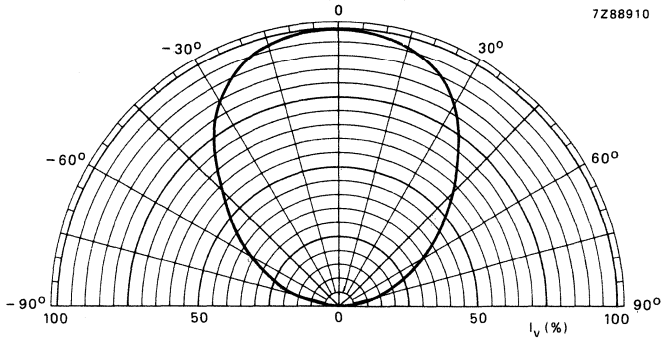


Fig. 9 Typical values.



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.

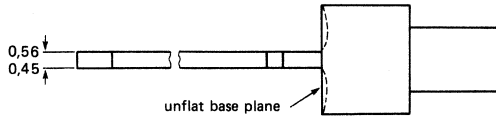
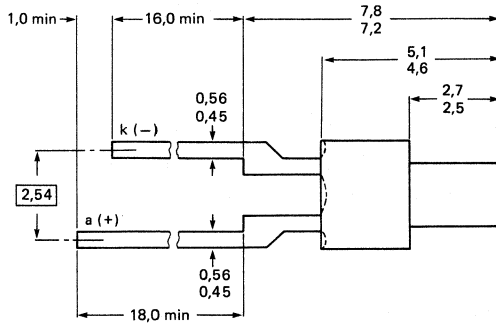
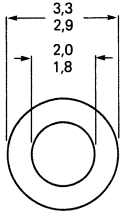
QUICK REFERENCE DATA

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

MECHANICAL DATA

Fig. 1 SOD-79.

Dimensions in mm



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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$		max.	1 A
peak value, $t_{on} = 20 \mu s$; $\delta = 0,01$	I_{FRM}	max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

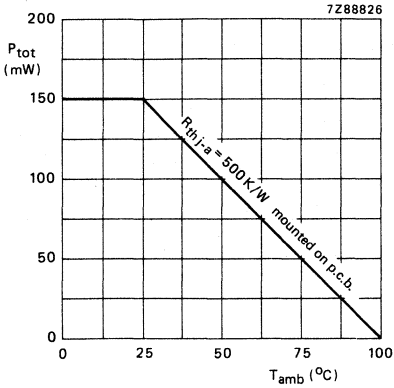


Fig. 2.

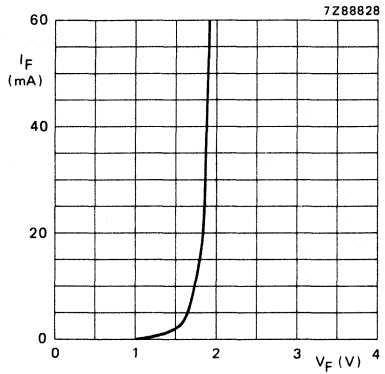


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

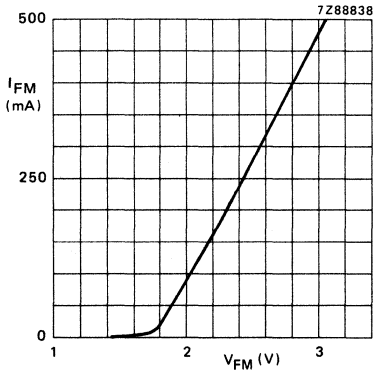


Fig. 4 $t_{on} = 20 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25^{\circ}C$; typ. values.

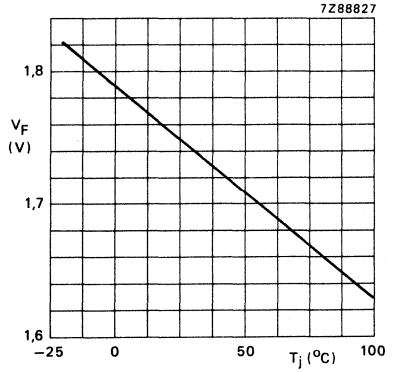


Fig. 5 $I_F = 10 mA$; typ. values.

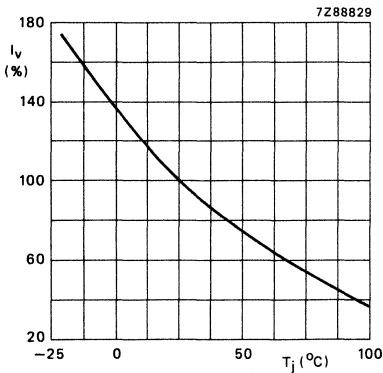


Fig. 6 Typical values.

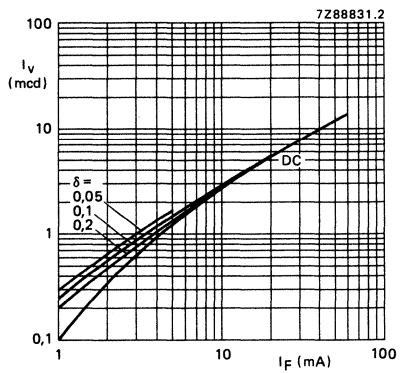


Fig. 7 $t_p = 50 \mu s$; typ. values.

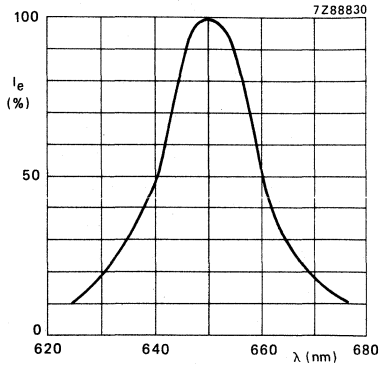


Fig. 8 $I_F = 10$ mA; $T_{amb} = 25$ °C; typ. values.

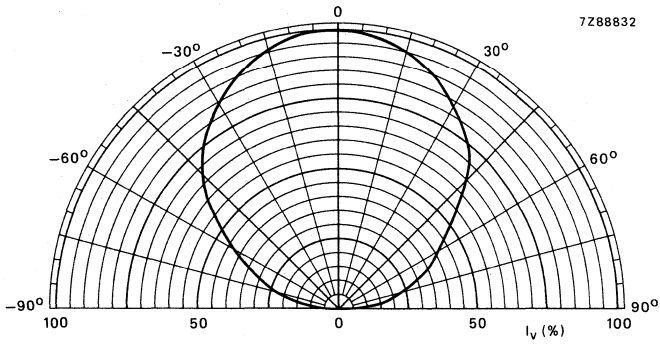


Fig. 9 $I_F = 10$ mA; typ. values.

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 luminosity is required.

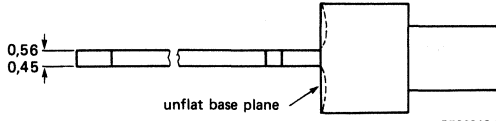
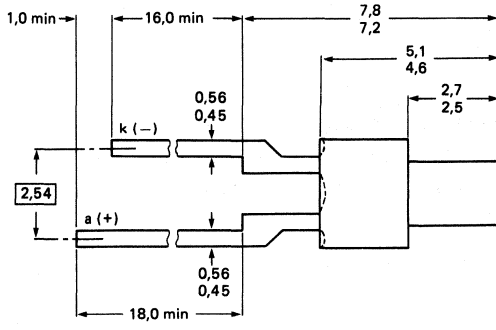
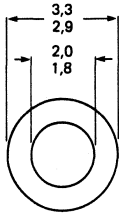
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity $I_F = 10\text{ mA}$	I_v	min. typ.	0,7 mcd 1,5 mcd
Wavelength at peak emission	λ_p	typ.	565 nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	110 $^\circ$

MECHANICAL DATA

Fig. 1 SOD-79.

Dimensions in mm



7286912.2

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{slid} < 7 \text{ s}$	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

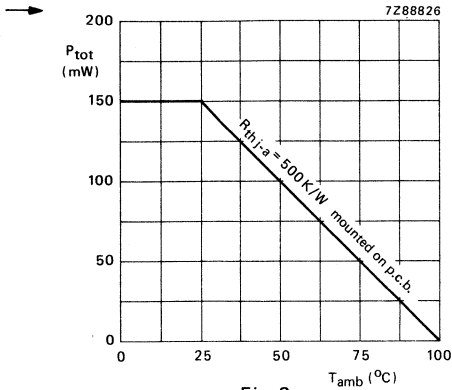


Fig. 2.

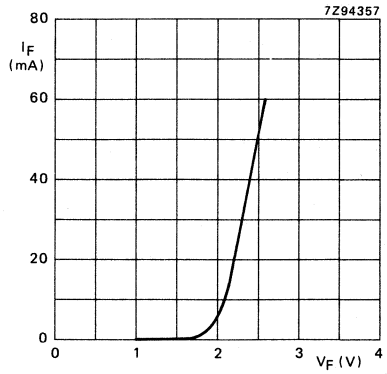


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

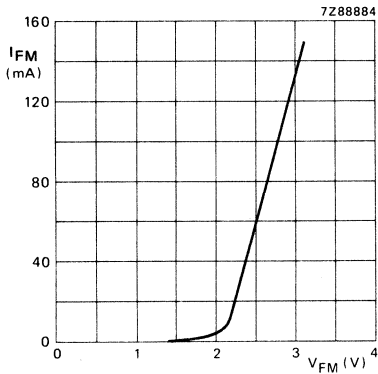


Fig. 4 $t_{on} = 1 \text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

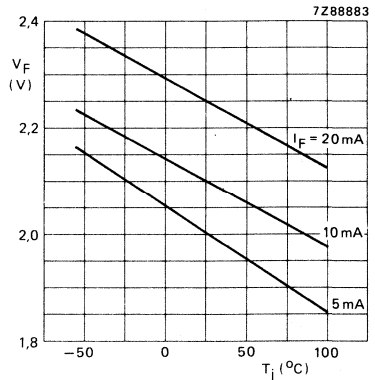


Fig. 5 Typical values.

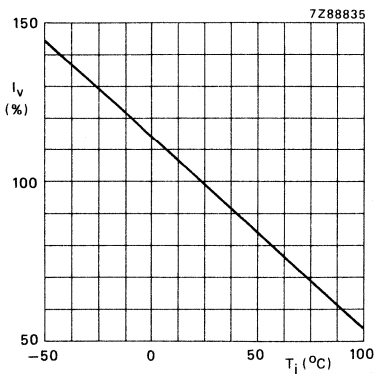


Fig. 6 Typical values.

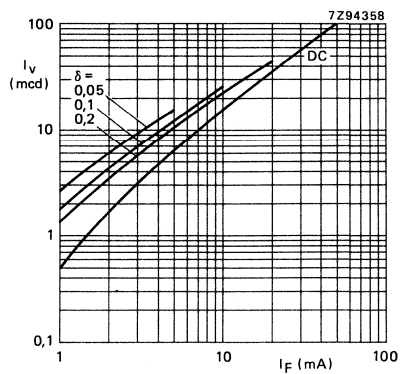


Fig. 7 $t_p = 50 \text{ } \mu\text{s}$; typical values.

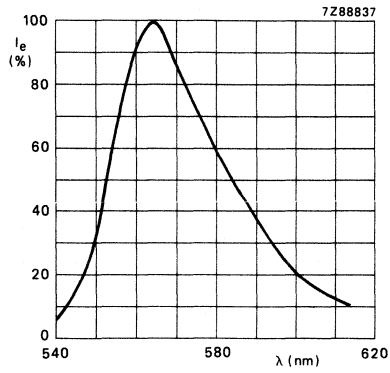


Fig. 8 $I_F = 10$ mA; typ. values.

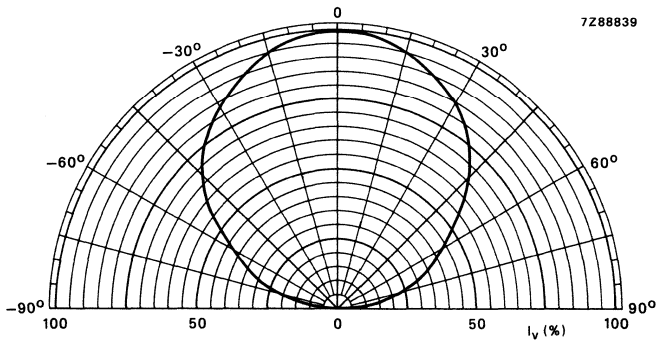


Fig. 9 Typical values.

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.

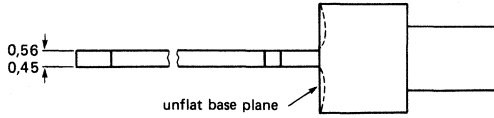
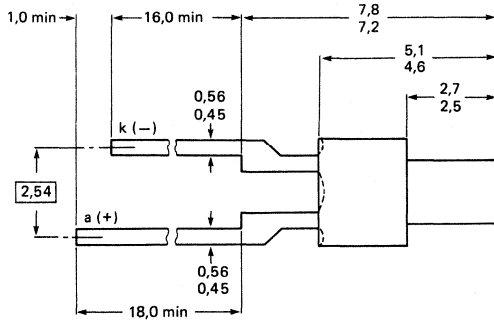
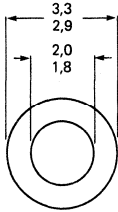
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V	
Forward current (d.c.)	I_F	max.	30 mA	
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Luminous intensity $I_F = 20\text{ mA}$	I_v	min.	0,7 mcd	←
		typ.	1,5 mcd	
Wavelength at peak emission	λ_p	typ.	590 nm	
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	110 $^\circ$	

MECHANICAL DATA

Fig. 1 SOD-79.

Dimensions in mm



7Z88912.2

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

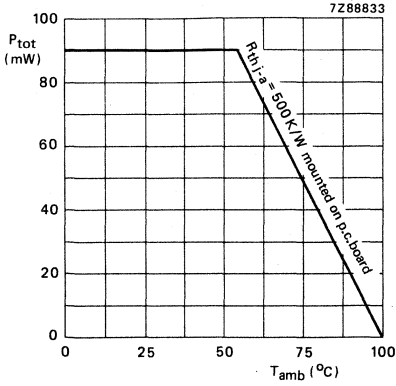


Fig. 2.

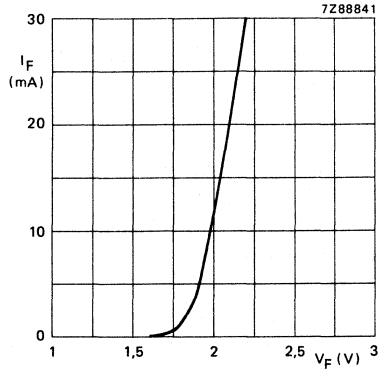


Fig. 3 $T_{amb} = 25 \text{ } ^\circ\text{C}$; typ. values.

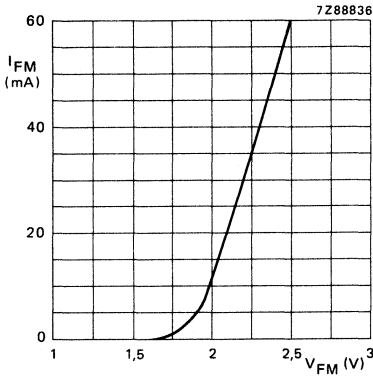


Fig. 4 $t_{on} = 1 \text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25 \text{ } ^\circ\text{C}$; typical values.

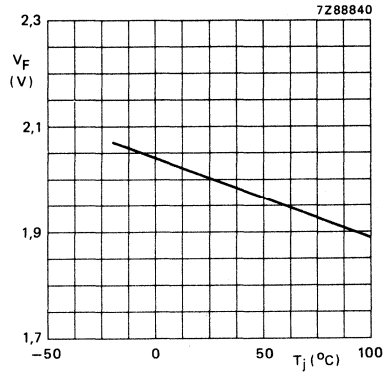


Fig. 5 $I_F = 10 \text{ mA}$; typical values.

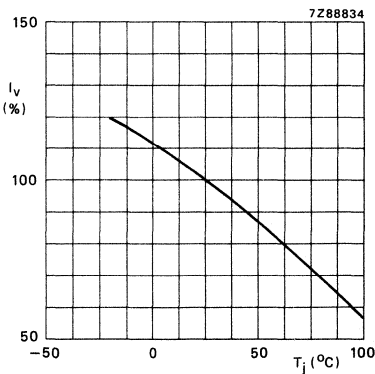


Fig. 6 Typical values.

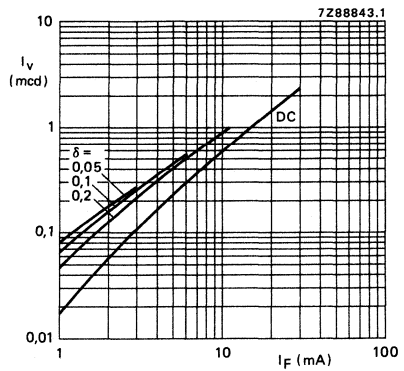


Fig. 7 $t_p = 50 \text{ } \mu\text{s}$; typical values.

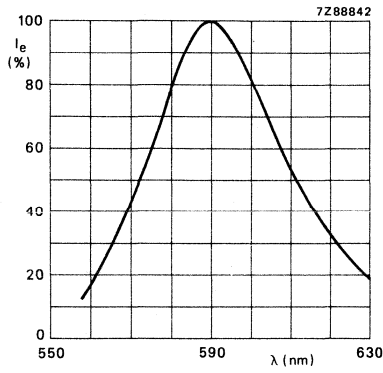


Fig. 8 Typical values.

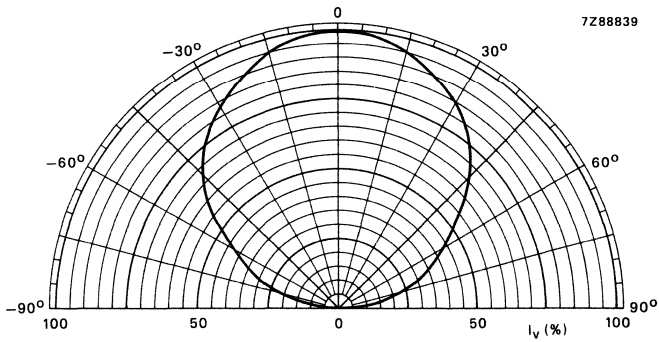


Fig. 9 Typical values.

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 $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity $I_F = 10\text{ mA}$	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 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-63A2.
CQW24

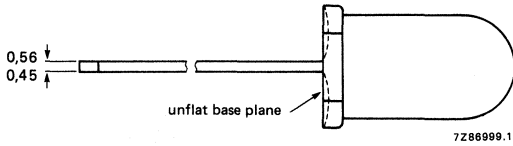
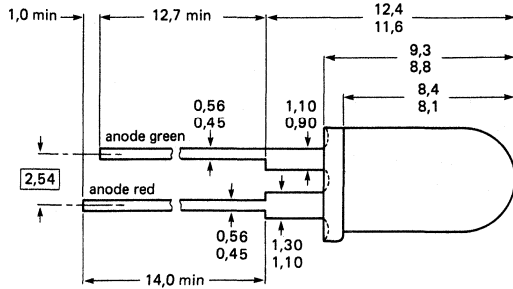
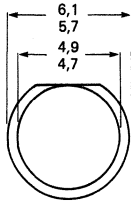
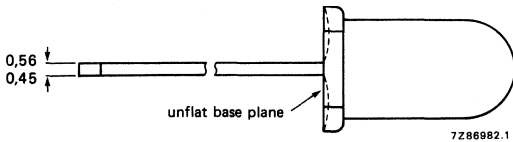
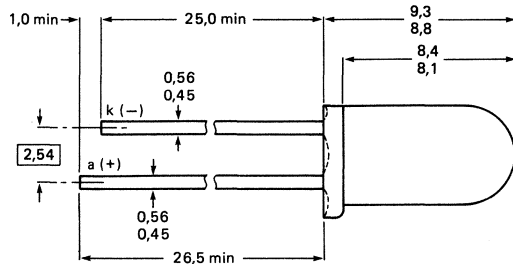
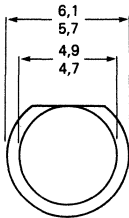


Fig. 1b SOD-63L



→ 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, $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$ peak value; $t_{\text{ON}} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max. max.	1 A 500 mA
Total power dissipation up to $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{\text{sld}} < 7 \text{ s}$ > 1,5 mm from the seating plane for CQW24 > 5 mm from the plastic body for CQW24L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device
is mounted on a p.c. board

$R_{\text{th j-a}}$	max.	350 K/W
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CHARACTERISTICS

 $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

CQW24
CQW24L

→ Diode capacitance
 $V_R = 0; f = 1 \text{ MHz}$

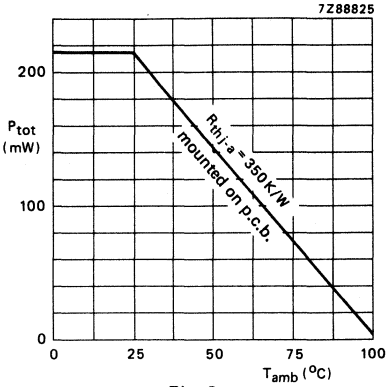


Fig. 2.

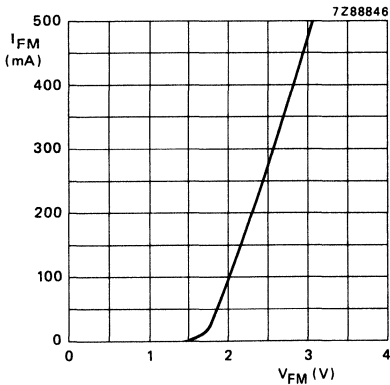


Fig. 4 $t_{on} = 20 \mu s; \delta = 0,01;$
 $T_{amb} = 25 \text{ }^\circ\text{C};$ typ. values.

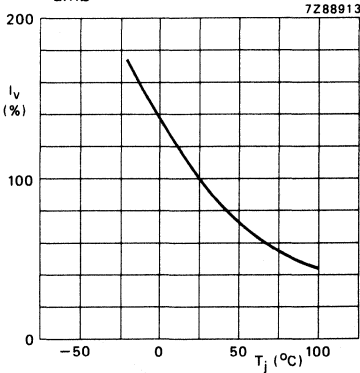


Fig. 6 Typical values.

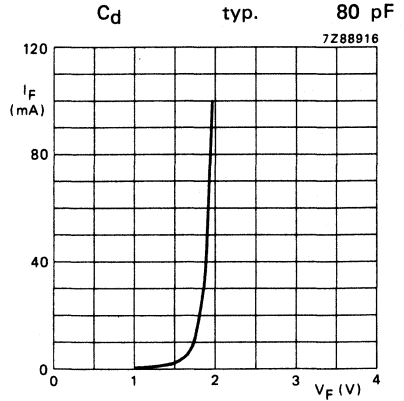


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C};$ typ. values.

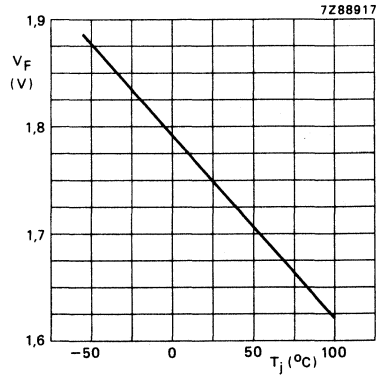


Fig. 5 $I_F = 10 \text{ mA};$ typ. values.

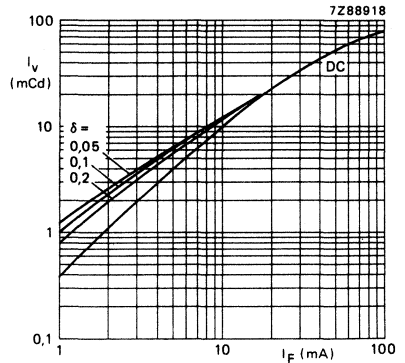


Fig. 7 $t_p = 50 \mu s;$ typ. values.

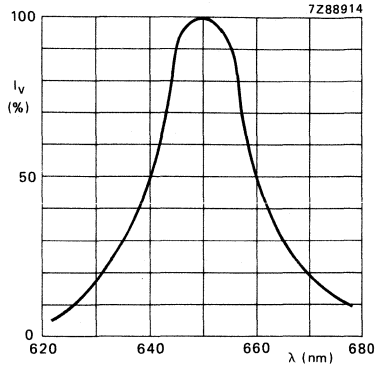


Fig. 8 $I_F = 10$ mA; $T_{amb} = 25$ °C; typ. values.

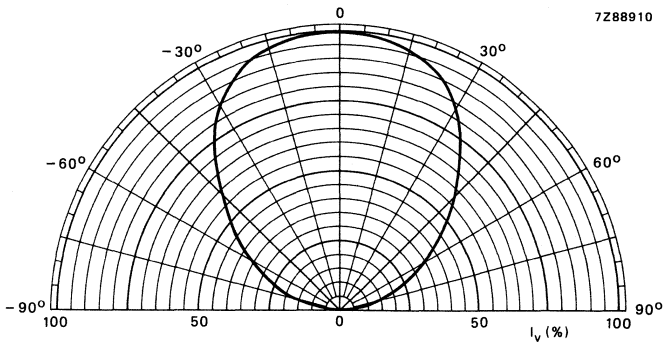


Fig. 9 Typical values.

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.

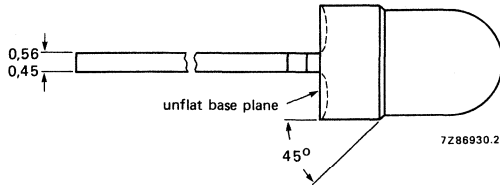
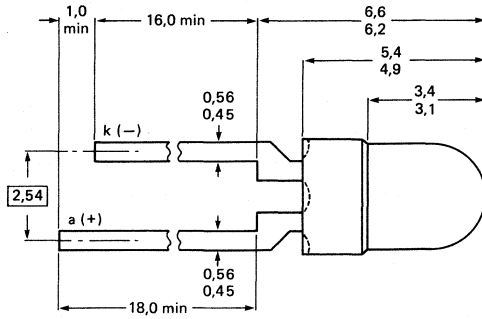
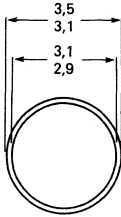
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V
Forward current (d.c.)	I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$		λ_p	typ. 650 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ. 100 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$		max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

CQW54

→ Diode capacitance
 $V_R = 0; f = 1 \text{ MHz}$

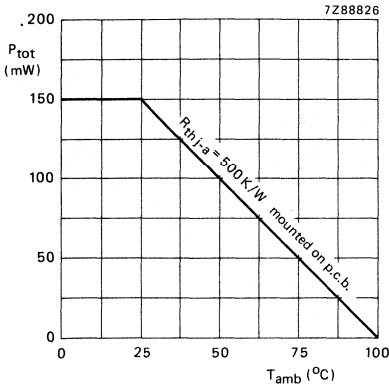


Fig. 2.

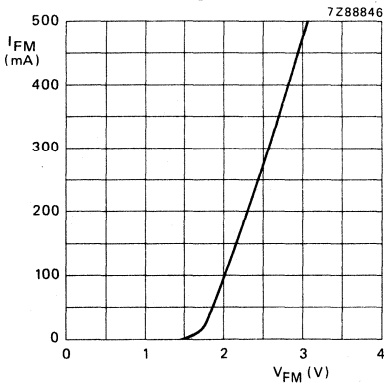


Fig. 4 $t_{\text{on}} = 20 \mu\text{s}; \delta = 0,01;$
 $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C};$ typ. values.

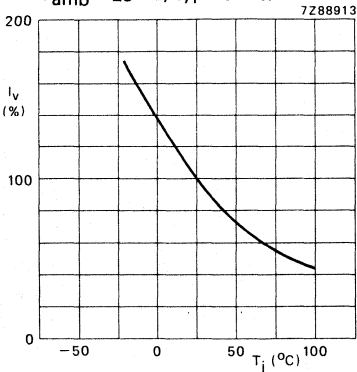


Fig. 6 Typical values.

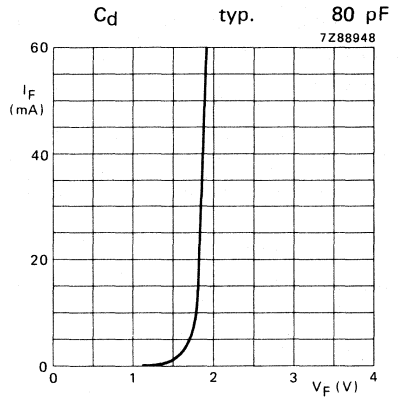


Fig. 3 $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C};$ typ. values.

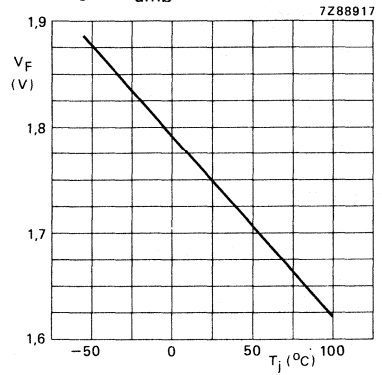


Fig. 5 $I_F = 10 \text{ mA};$ typ. values.

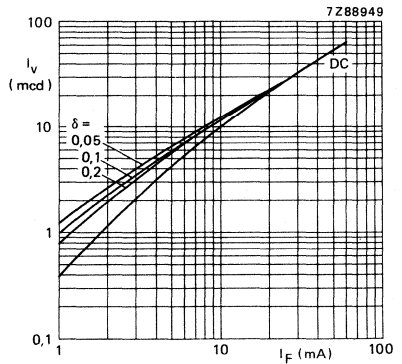


Fig. 7 $t_p = 50 \mu\text{s};$ typ. values.

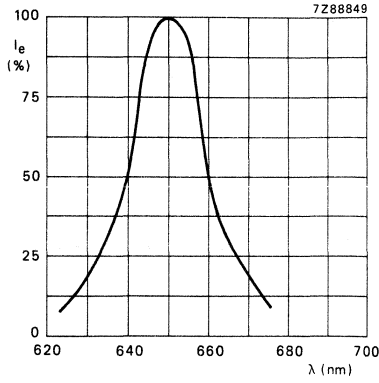


Fig. 8 $I_F = 10 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$; typ. values.

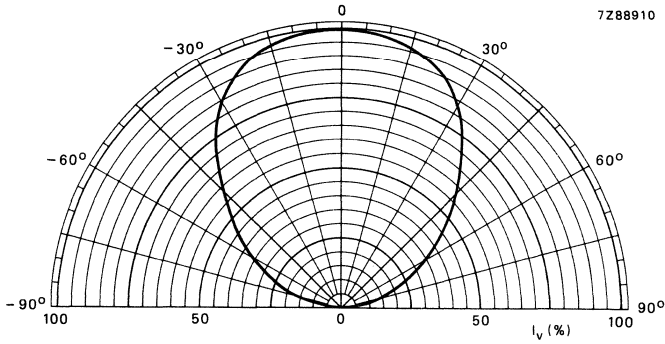


Fig. 9 Typical values.



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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 10\text{ mA}$	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			
$I_F = 10\text{ mA}$		λ_p	typ. 630 nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{\frac{1}{2}}$	typ. 110 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B1.
CQW60

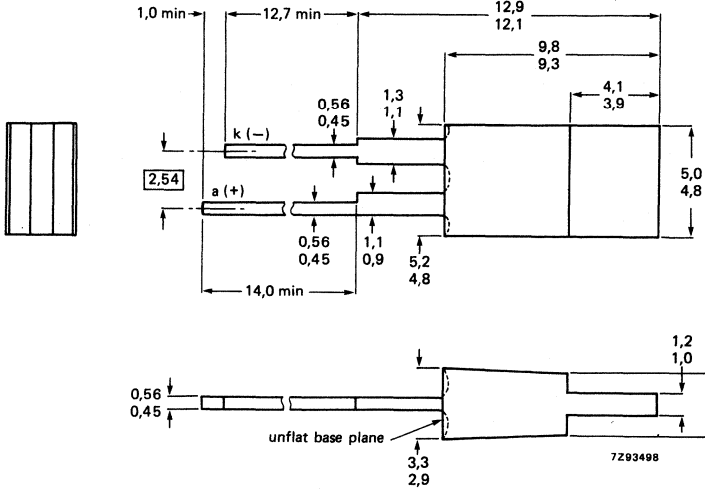
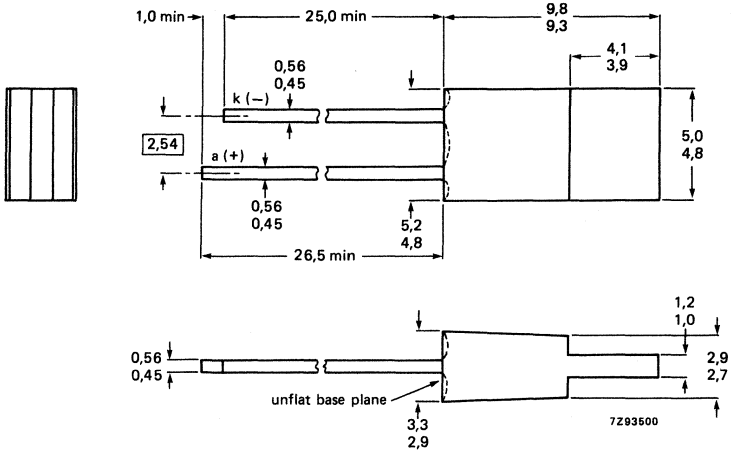


Fig. 1b SOD-75BL.
CQW60L



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW60			
> 5 mm from the plastic body for CQW60L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions in the plane of the leads	$\theta_{1/2}$	typ.	110 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	45 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	630 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	10 pF	

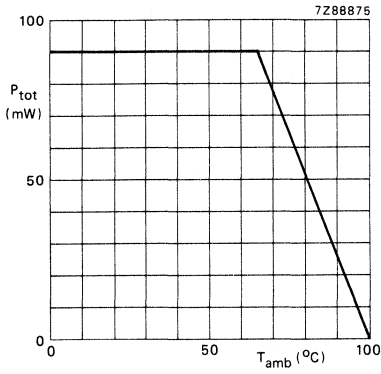


Fig. 2.

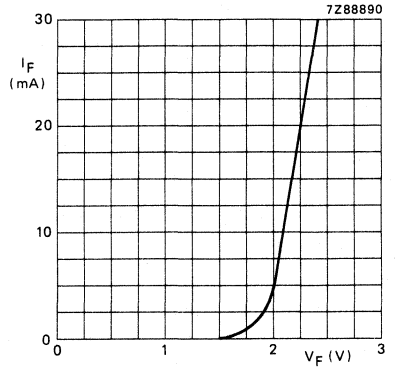


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

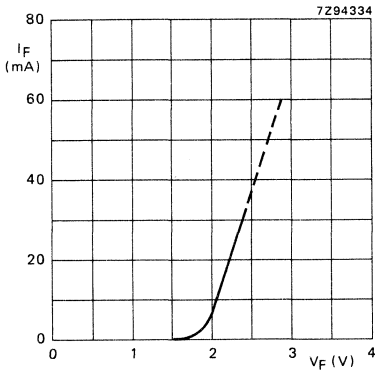


Fig. 4 $t_{on} = 50 \mu s$; $\delta = 0,01$

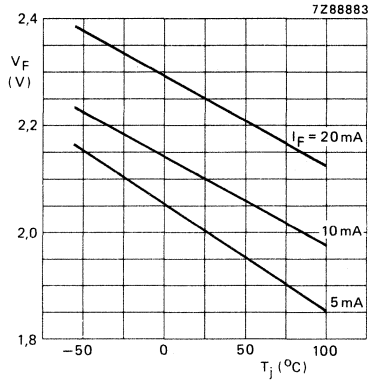


Fig. 5 Typical values.

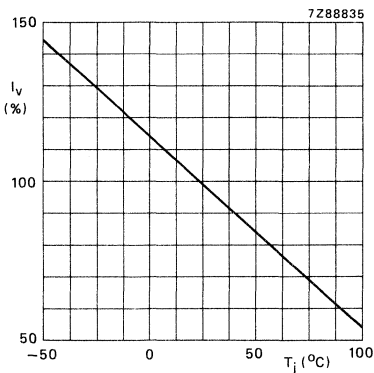


Fig. 6 $I_F = 10$ mA; typ. values.

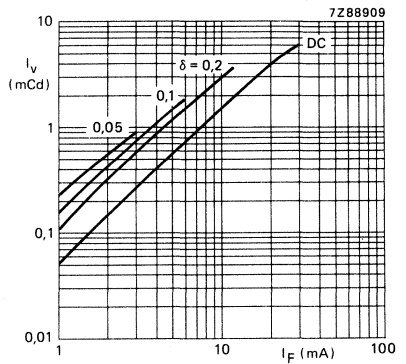


Fig. 7 $t_p = 50 \mu s$; typical values.

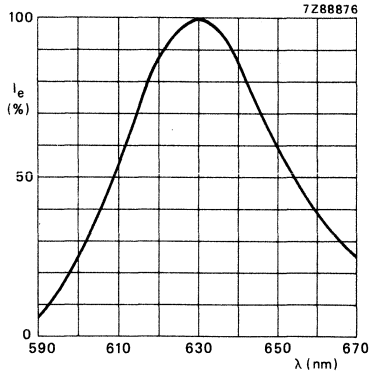


Fig. 8 Typical values.

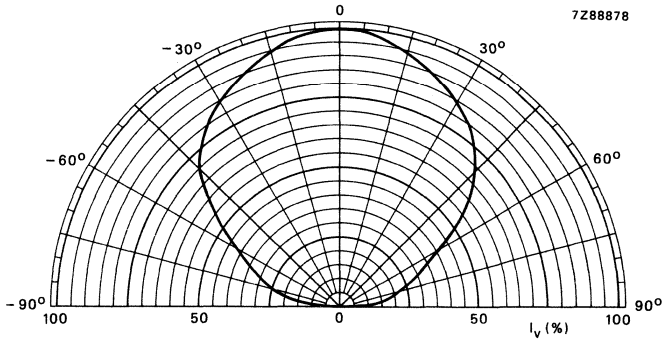


Fig. 9 Typical values.

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 $T_{amb} = 25\text{ }^\circ\text{C}$		P_{tot}	max.	215 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	650 nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110 $^\circ$

CQW60A
CQW60AL

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B2.
CQW60A

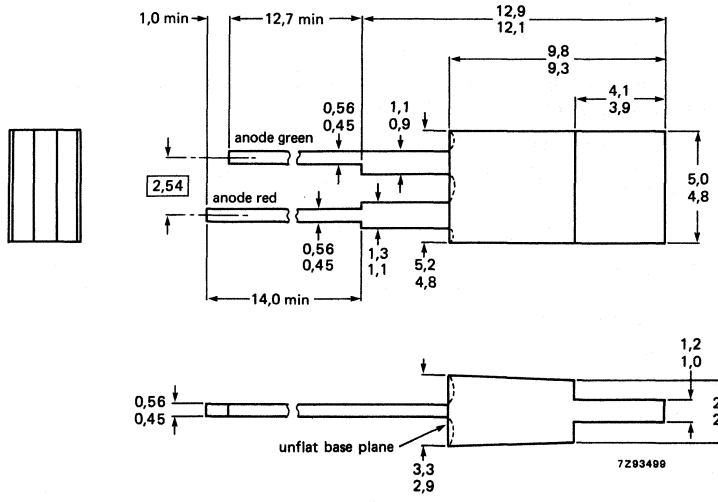
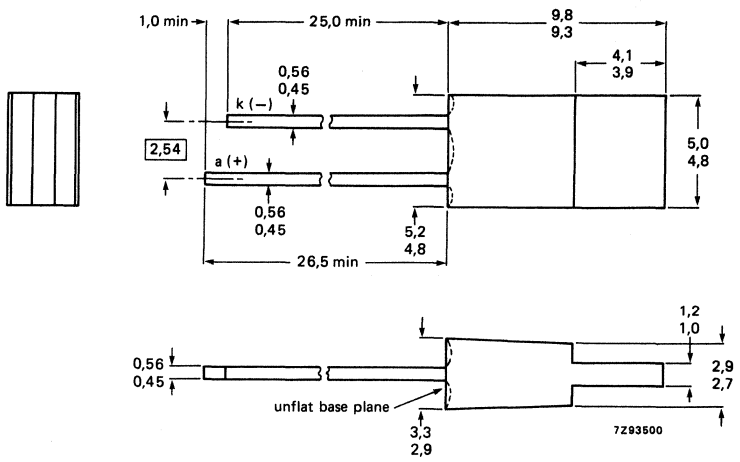


Fig. 1b SOD-75BL.
CQW60AL



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW60A			
> 5 mm from the plastic body for CQW60AL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	1,75 V	
		max.	2,20 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions in the plane of the leads	$\theta_{1/2}$	typ.	110 $^\circ$	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	650 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$, $f = 1 \text{ MHz}$	C_d	typ.	80 pF	

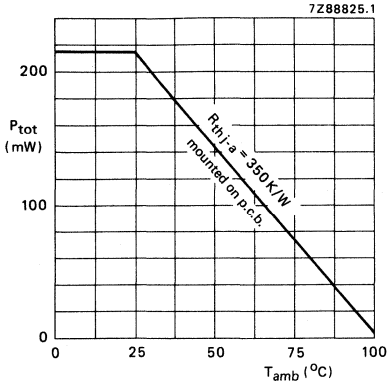


Fig. 2.

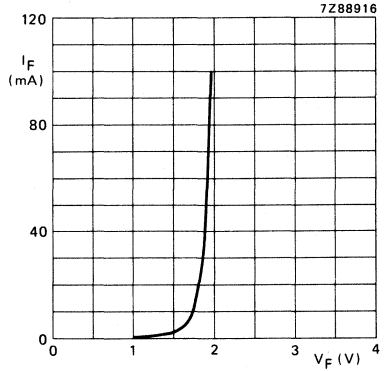


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

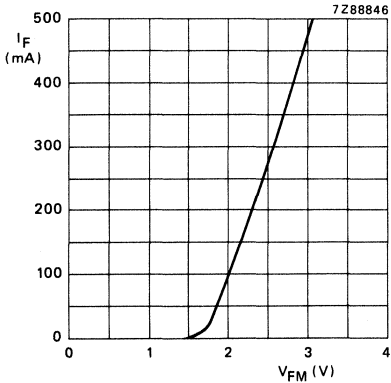


Fig. 4 $t_{on} = 20\text{ }\mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

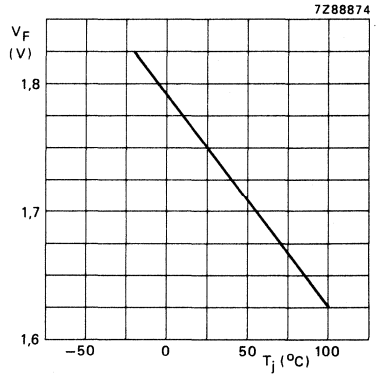


Fig. 5 $I_F = 10\text{ mA}$; typical values.

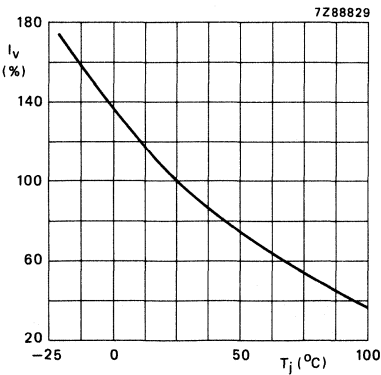


Fig. 6 Typical values.

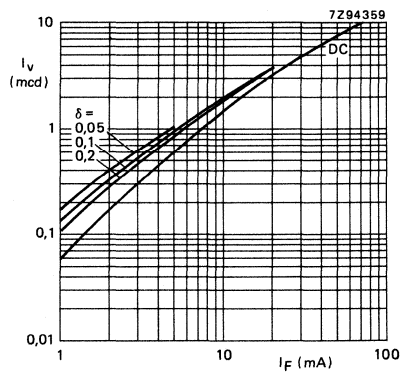


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typical values.

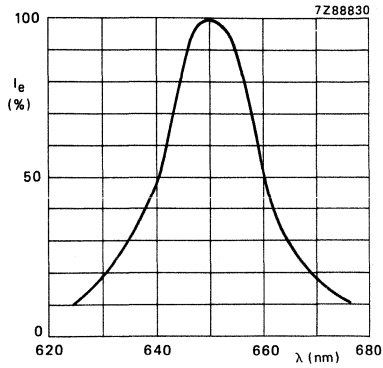


Fig. 8 $I_F = 10$ mA; $T_{amb} = 25$ °C; typ. values.

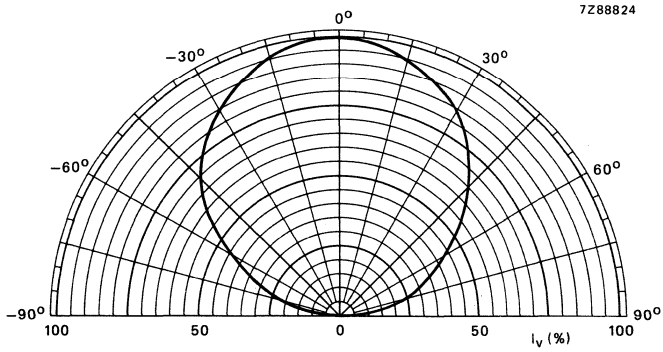


Fig. 9 Typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQW60U
CQW60UL

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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity at $I_F = 10\text{ mA}$	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 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-75B1.
CQW60U

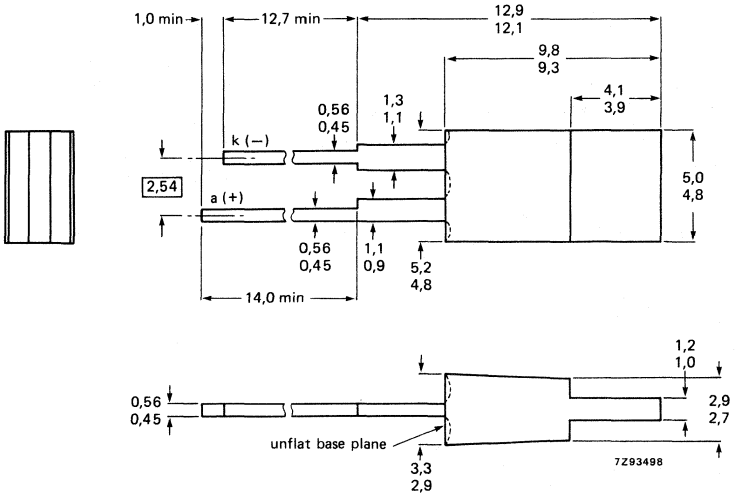
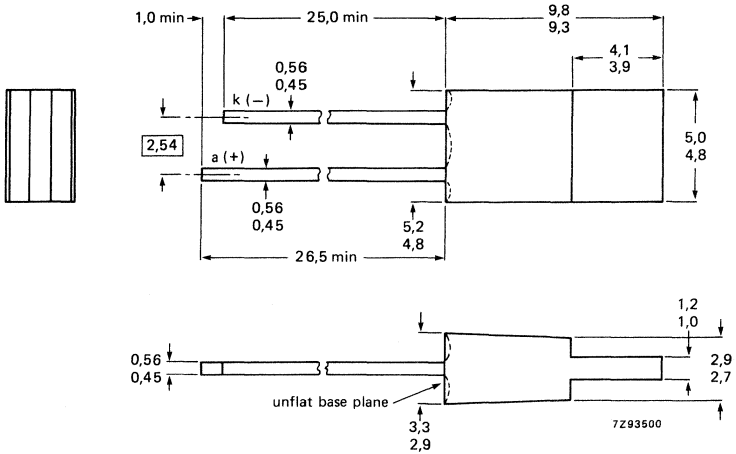


Fig. 1b SOD-75BL.
CQW60UL



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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A	
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA	
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Lead soldering temperature				
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQW60U	T_{sld}	max.	260 $^\circ\text{C}$
> 5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	CQW60UL			

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

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

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

DEVELOPMENT DATA



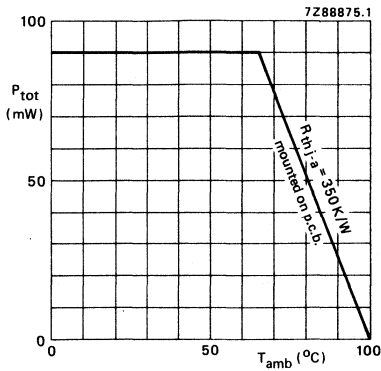


Fig. 2.

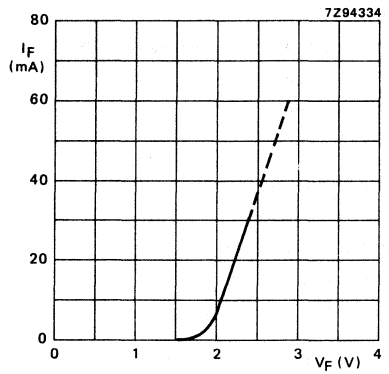


Fig. 3 Typical values.

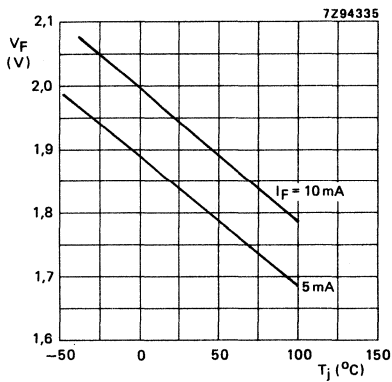


Fig. 4 Typical values.

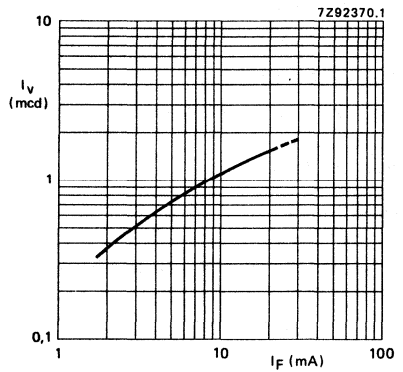


Fig. 5 Typical values.

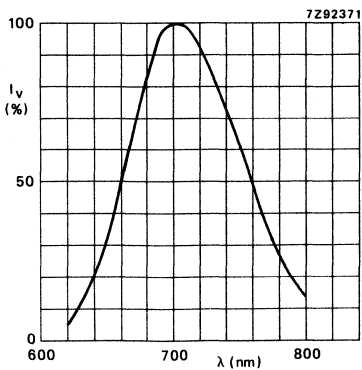


Fig. 6 Typical values.

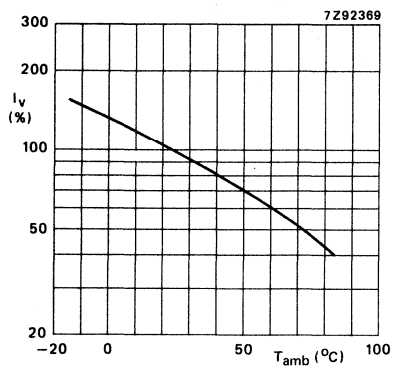


Fig. 7 Typ. values.

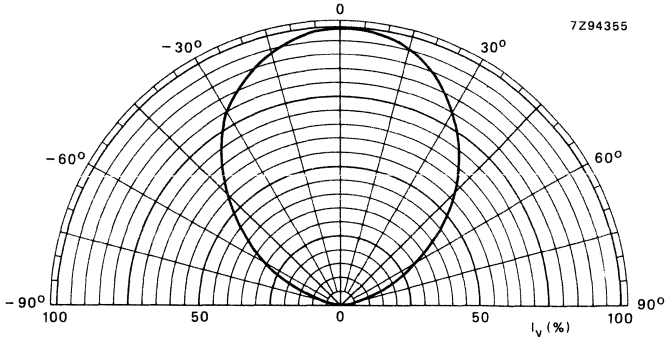


Fig. 8 Typical values.

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 $T_{amb} = 35\text{ }^\circ\text{C}$		P_{tot}	max.	180 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	565 nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110 $^\circ$

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW61			
> 5 mm from the plastic body for CQW61L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage			
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V
		max.	3,0 V
Reverse current			
$V_R = 5 \text{ V}$	I_R	max.	100 μA
Beamwidth between half-intensity directions in the plane of the leads; $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	110 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission			
$I_F = 10 \text{ mA}$	λ_p	typ.	565 nm
Luminous intensity			
$I_F = 10 \text{ mA}$			
	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			
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF

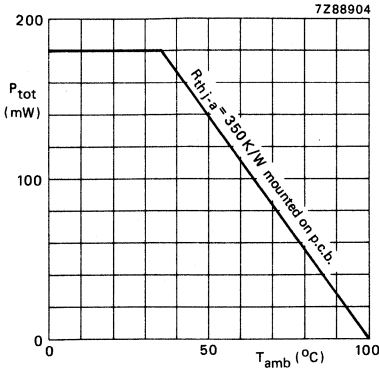


Fig. 2.

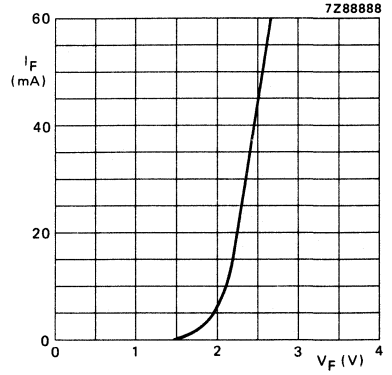


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typ. values.

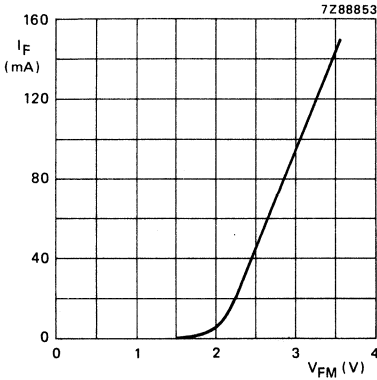


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25^\circ\text{C}$; typ. values.

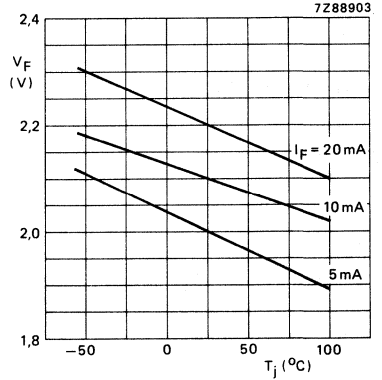


Fig. 5 Typical values.

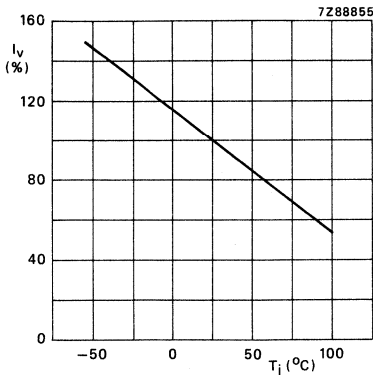


Fig. 6 Typical values.

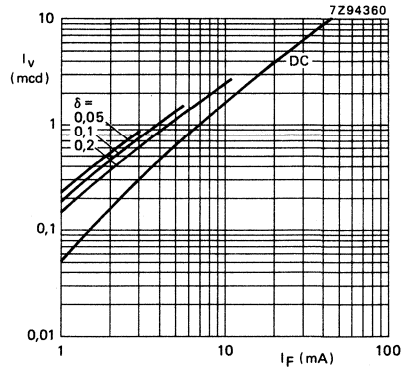


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

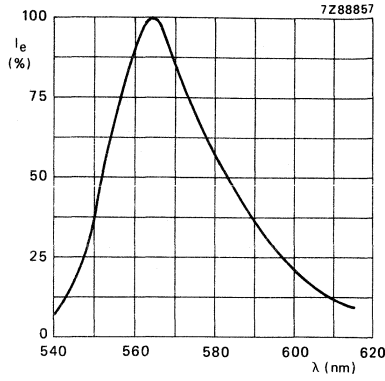


Fig. 8 $I_F = 10$ mA; typical values.

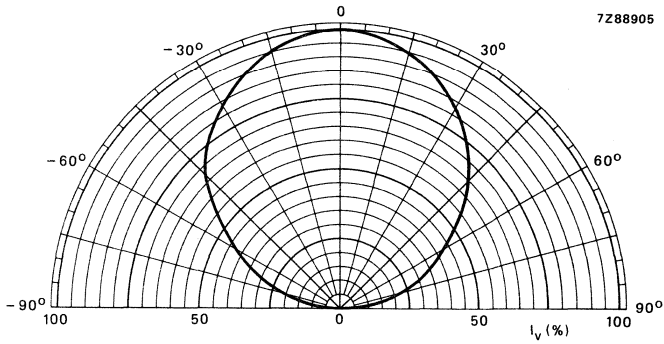


Fig. 9 Typical values.

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 $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth between half-intensity directions in the plane of the leads		$\theta_{1/2}$	typ.	110 $^\circ$

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOD-75B1.
CQW62

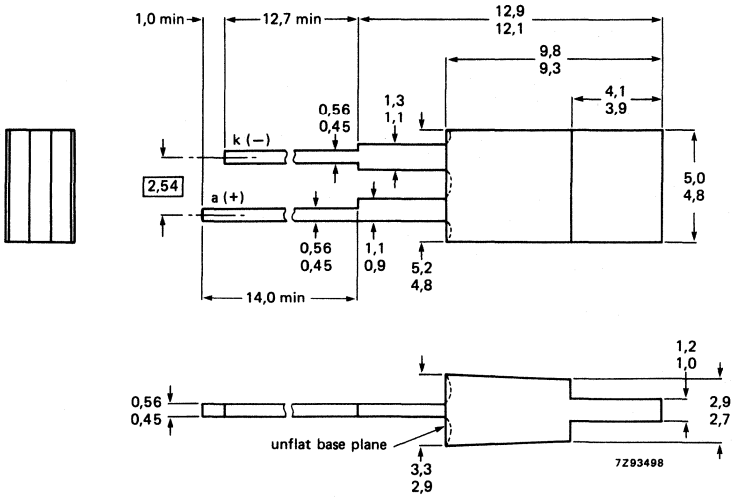
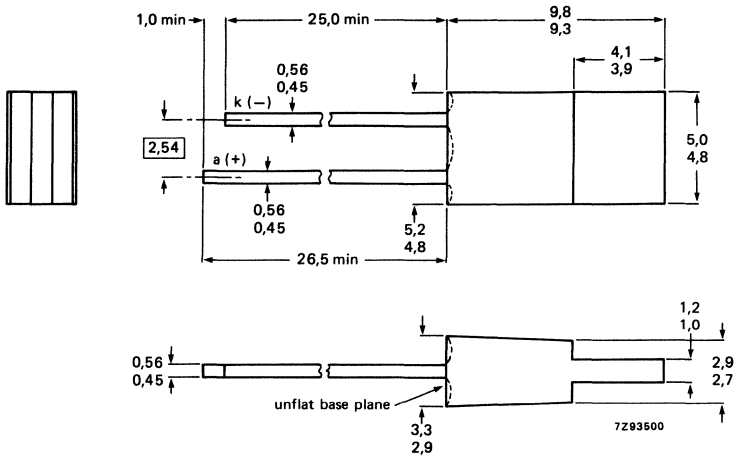


Fig. 1b SOD-75BL.
CQW62L



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{slid} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQW62	T_{slid}	max.	260 $^\circ\text{C}$
> 5 mm from the plastic body for CQW62L			

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

 $I_F = 10 \text{ mA}$

V_F	typ.	2,1 V
	max.	3,0 V

Reverse current

 $V_R = 5 \text{ V}$

I_R	max.	100 μA
-------	------	-------------------

Beamwidth between half-intensity directions

in the plane of the leads; $I_F = 10 \text{ mA}$

$\theta_{1/2}$	typ.	110 $^\circ$
----------------	------	--------------

Bandwidth at half height

$\Delta\lambda$	typ.	40 nm
-----------------	------	-------

Wavelength at peak emission

 $I_F = 10 \text{ mA}$

λ_p	typ.	590 nm
-------------	------	--------

Luminous intensity

 $I_F = 10 \text{ mA}$

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

 $V_R = 0$; $f = 1 \text{ MHz}$

C_d	typ.	15 pF
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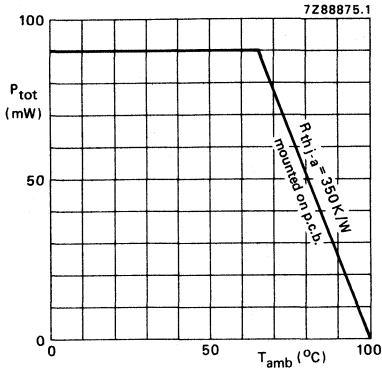


Fig. 2.

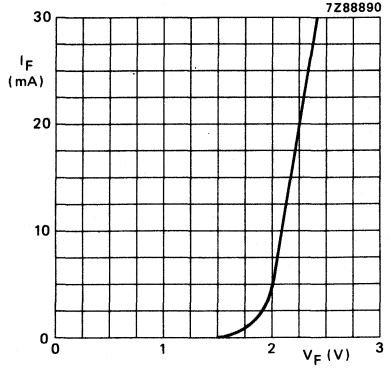


Fig. 3 $T_{amb} = 25 \text{ °C}$; typ. values.

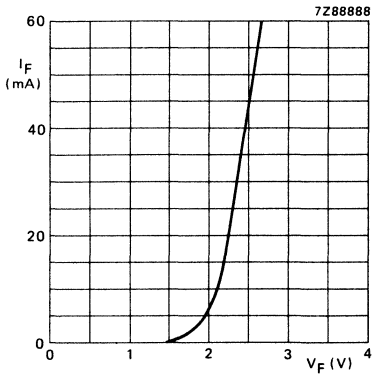


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ °C}$; typ. values.

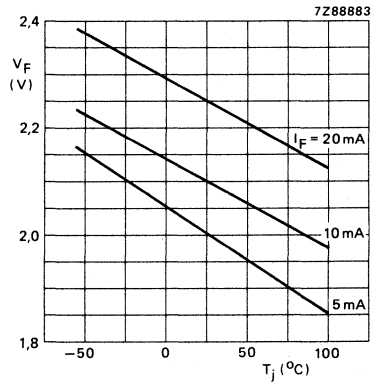


Fig. 5 Typical values.

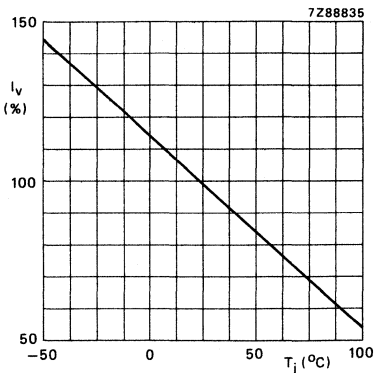


Fig. 6 $I_F = 10 \text{ mA}$; typ. values.

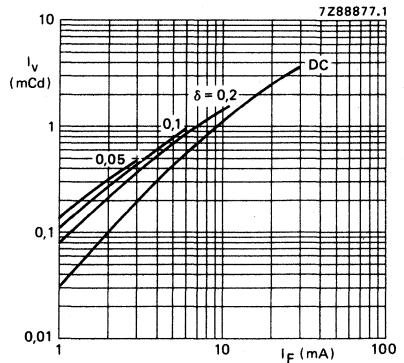


Fig. 7 $t_p = 50 \mu\text{s}$; typical values.

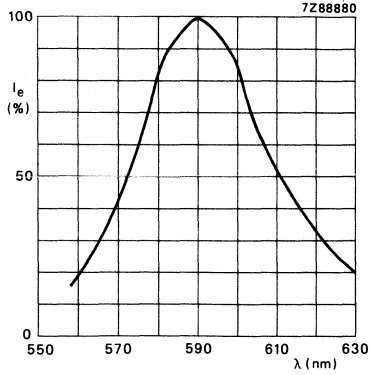


Fig. 8 Typical values.

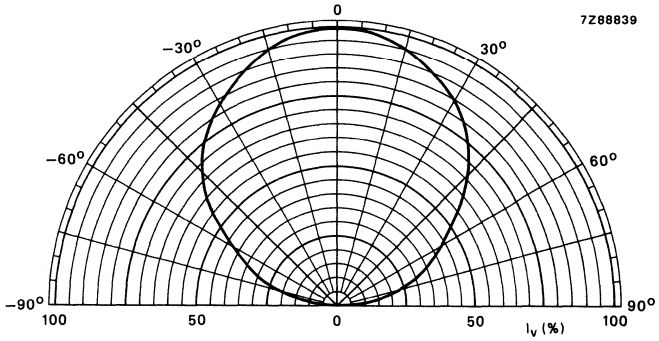


Fig. 9 Typical values.

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. ←

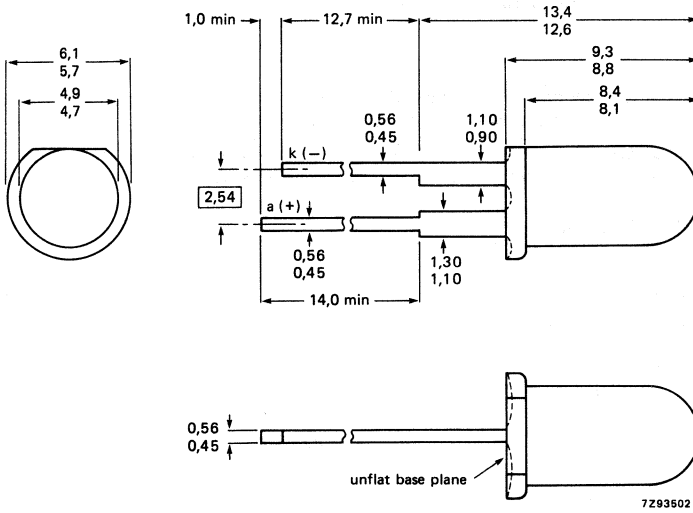
QUICK REFERENCE DATA

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

MECHANICAL DATA

Fig. 1 SOD-63D2.

Dimensions in mm



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; $t_p = 10 \mu\text{s}$; $\delta = 0,01$	I_{FM}	max.	2500 mA
peak value; $t_p = 50 \mu\text{s}$; $\delta = 0,01$	I_{FM}	max.	1500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$ with heatsink	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		-55 to $+100 \text{ }^\circ\text{C}$
Junction temperature	T_j	max.	$100 \text{ }^\circ\text{C}$
Lead soldering temperature $t_{sld} < 10 \text{ s}$	T_{sld}	max.	$260 \text{ }^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient

when the device is mounted on a printed circuit board

$R_{th j-a}$	max.	350 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage

 $I_F = 1,5 \text{ A}$; $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$

V_F	typ.	3,7 V	←
-------	------	-------	---

Forward voltage

 $I_F = 100 \text{ mA}$

V_F	typ.	1,7 V
	max.	2,2 V

Reverse current

 $V_R = 5 \text{ V}$

I_R	max.	100 μA
-------	------	-------------------

Diode capacitance at $f = 1 \text{ MHz}$ $V_R = 0$

C_d	typ.	200 pF
-------	------	--------

Total radiant power

 $I_F = 100 \text{ mA}$

ϕ_e	typ.	8 mW
----------	------	------

Radiant intensity (on axis)

 $I_F = 100 \text{ mA}$

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.	$-0,6 \text{ } \%/ \text{K}$
-----------	------	------------------------------

Wavelength at peak emission

 $I_F = 100 \text{ mA}$

λ_p	typ.	830 nm
-------------	------	--------

Spectral line half width

 $I_F = 100 \text{ mA}$

$\Delta\lambda$	typ.	35 nm	←
-----------------	------	-------	---

Beamwidth at half-intensity direction

 $I_F = 100 \text{ mA}$

$\theta_{1/2}$	min.	28°
	typ.	40°

Switching times (see Figs 2 and 3)

 $I_F = 100 \text{ mA}$

t_r	typ.	30 ns
-------	------	-------

t_f	typ.	30 ns
-------	------	-------

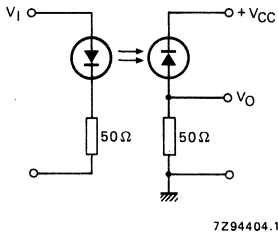


Fig. 2 Measuring circuit.

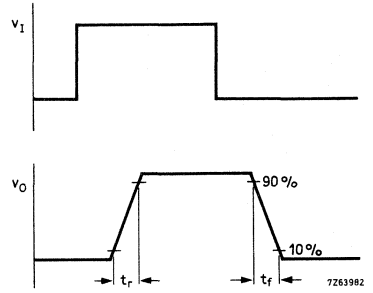


Fig. 3 Waveforms.

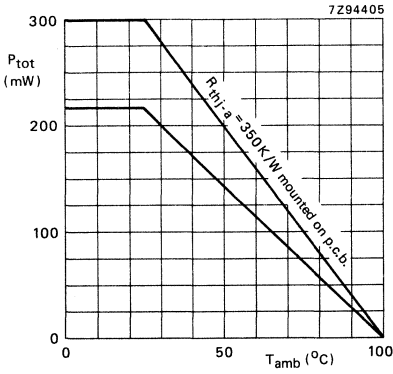


Fig. 4 Typical values.

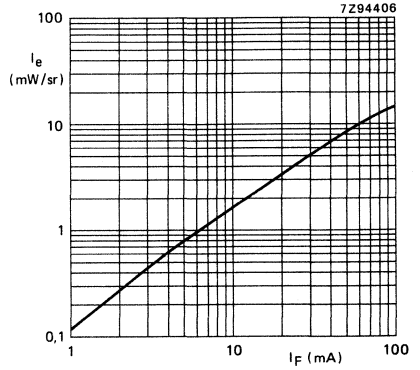


Fig. 5 $t_{ON} = 10 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

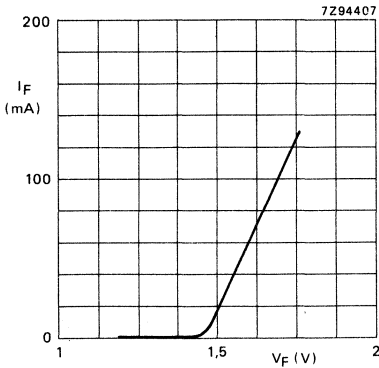


Fig. 6 $T_{amb} = 25 \text{ }^\circ\text{C}$; typical values.

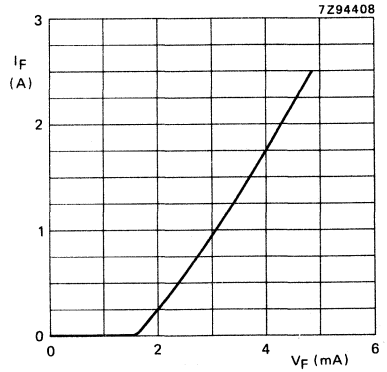


Fig. 7 $t_{ON} = 10 \mu s$; $T_{amb} = 25 \text{ }^\circ\text{C}$;
typical values.

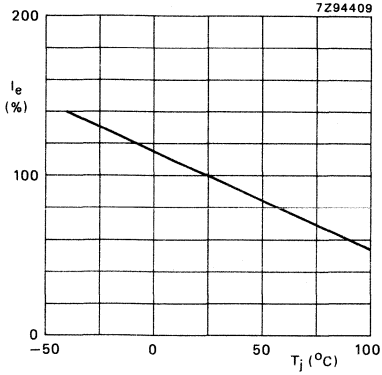


Fig. 8 $I_F = 100$ mA; typical values.

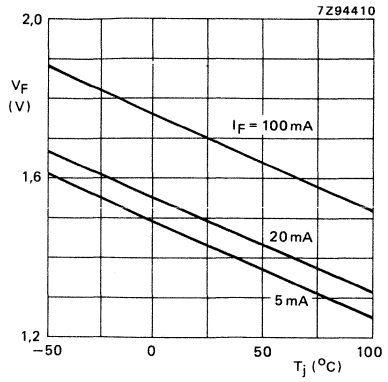


Fig. 9 Typical values.

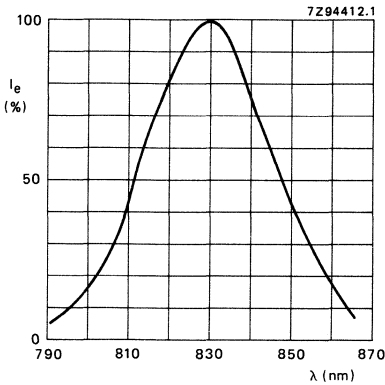


Fig. 10 Spectral response; typical values.

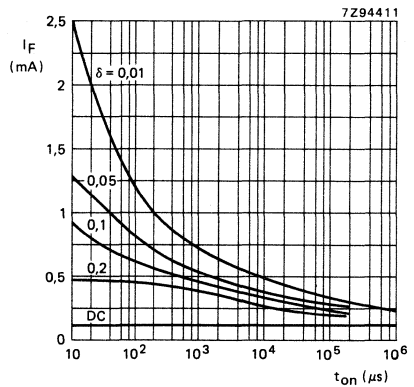


Fig. 11 Typical values.

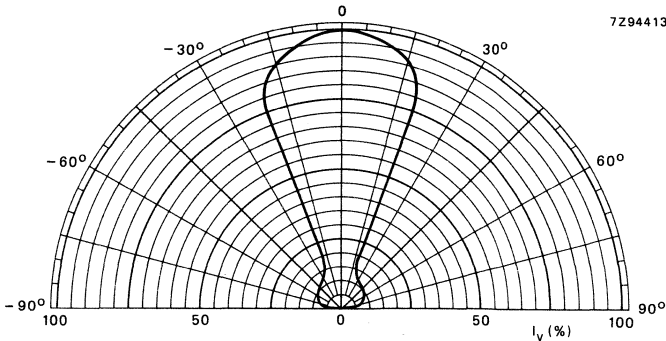


Fig. 12 Typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQW93

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.

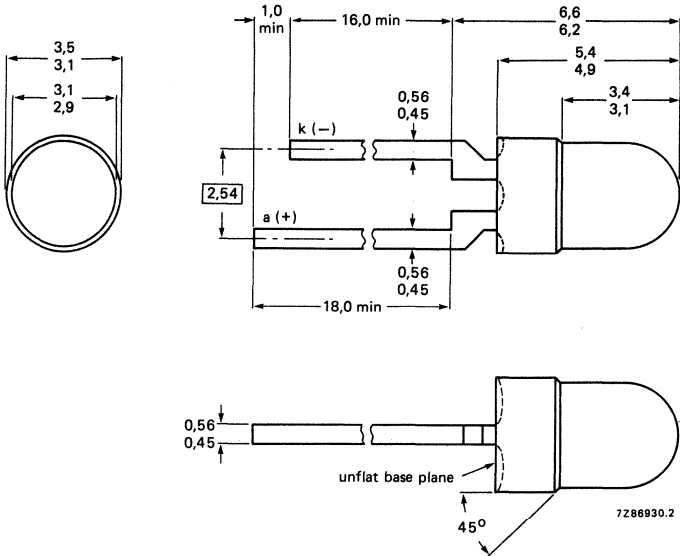
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 25^\circ\text{C}$		P_{tot}	max.	150 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity		I_v	min.	5 mcd
$I_F = 10\text{ mA}$	CQW93			
Wavelength at peak emission		λ_p	typ.	650 nm
Beamwidth between half-intensity directions		$\theta_{1/2}$	typ.	60 $^\circ$ ←

MECHANICAL DATA

Fig. 1 SOD-53E.

Dimensions in mm



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{ON} = 20 \mu\text{s}$; $\delta = 0,01$	I_{FRM}	max.	500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	1,75 V	
		max.	2,2 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	60 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm	
Wavelength at peak emission	λ_p	typ.	650 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	80 pF	

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.

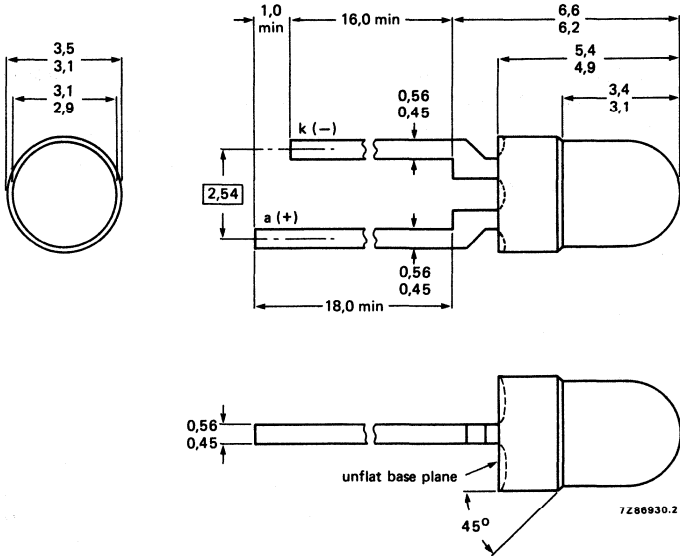
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$		P_{tot}	max.	150 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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 $^\circ$ ←

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th\ j-a}$	max.	500 K/W
---------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	60 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm	
Wavelength at peak emission	λ_p	typ.	565 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF	

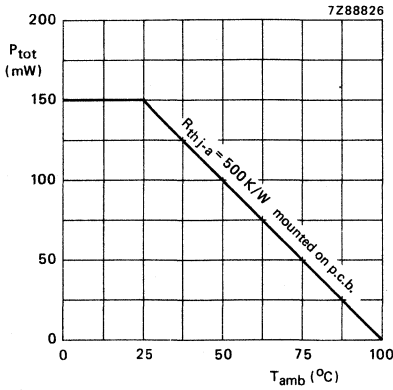


Fig. 2.

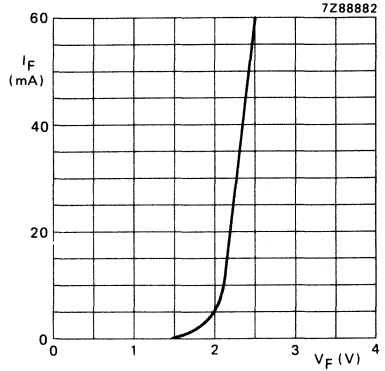


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typ. values.

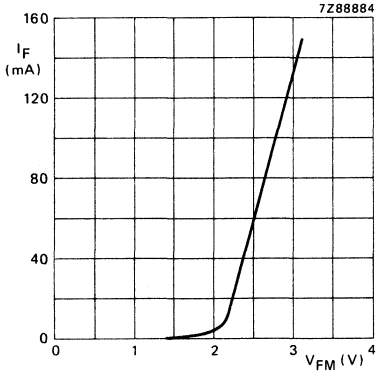


Fig. 4 $t_{ON} = 1 \text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25^\circ\text{C}$; typ. values.

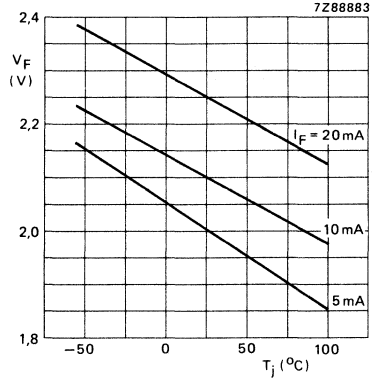


Fig. 5 Typical values.

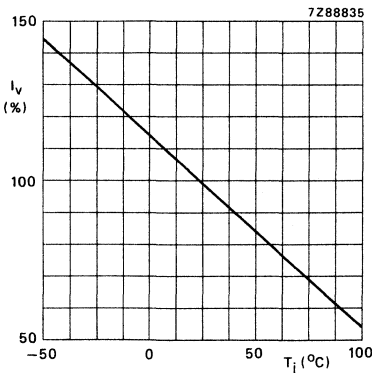


Fig. 6 Typical values.

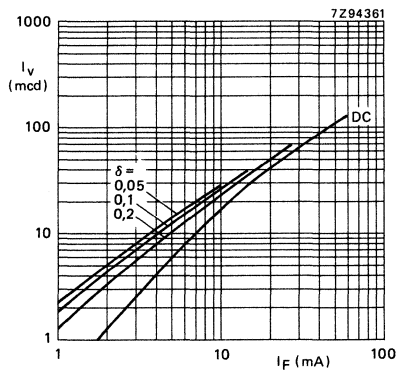


Fig. 7 $t_p = 50 \mu\text{s}$; typ. values.

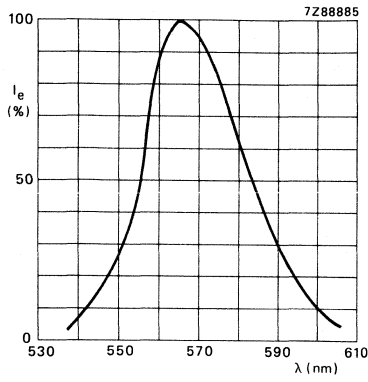


Fig. 8 $I_F = 10$ mA; typ. values.

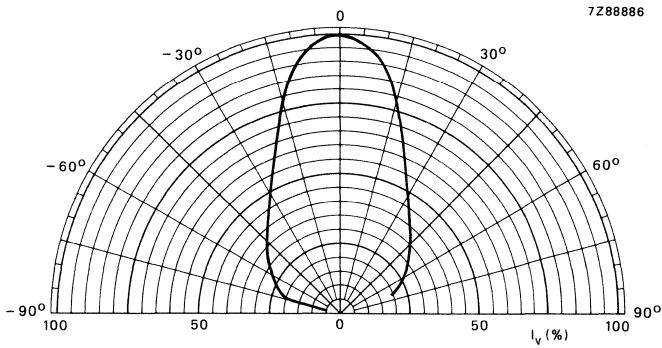


Fig. 9 Typical values.

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.

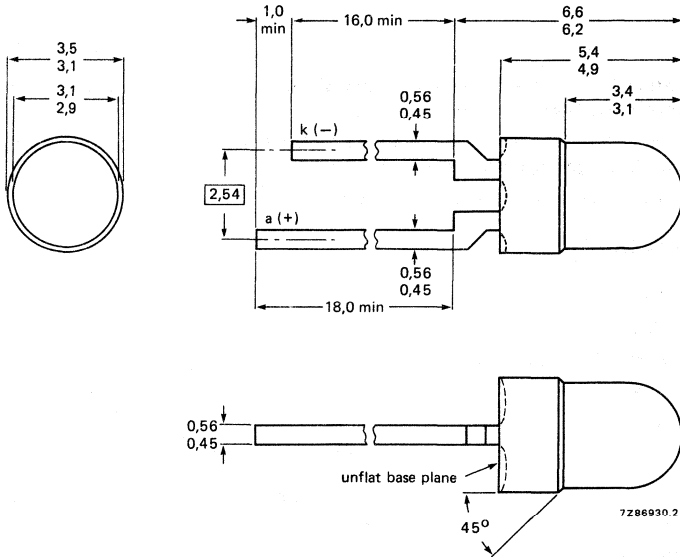
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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		$\theta_{\frac{1}{2}}$	typ.	60 $^\circ$ ←

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{\text{on}} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{\text{amb}} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{\text{slid}} < 7 \text{ s}$	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{\text{th j-a}}$	max.	500 K/W
---------------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	60 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	590 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF	

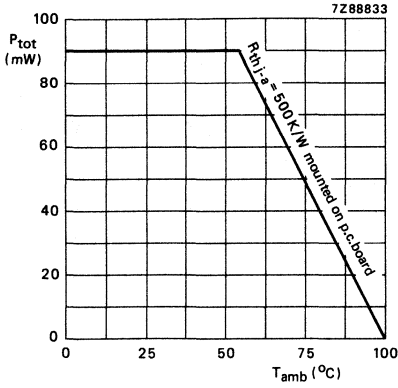


Fig. 2.

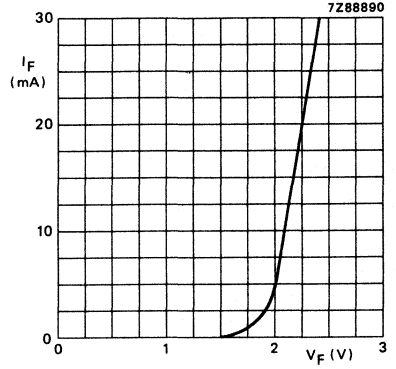


Fig. 3 $T_j = 25^{\circ}C$; typ. values.

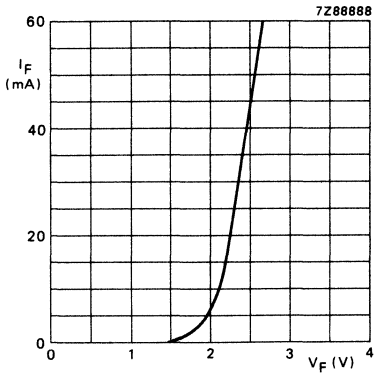


Fig. 4 $t_p = 50 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25^{\circ}C$; typ. values.

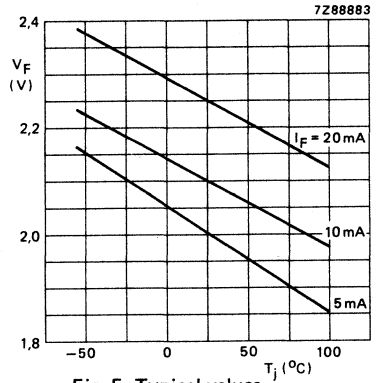


Fig. 5 Typical values.

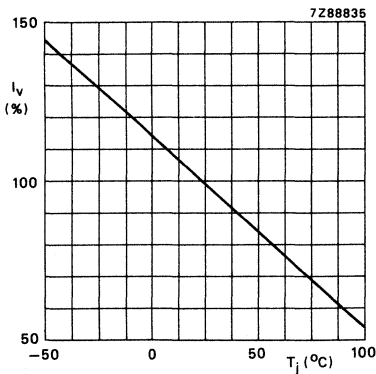


Fig. 6 Typical values.

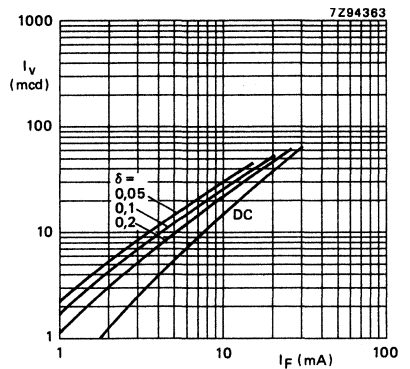


Fig. 7 $T_j = 25^{\circ}C$; typ. values.

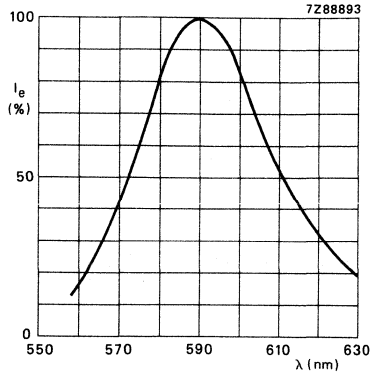


Fig. 8 Typical values.

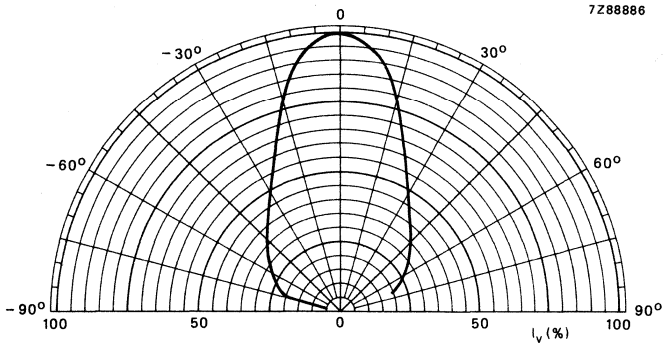


Fig. 9 Typical values.

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.

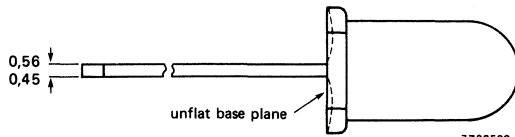
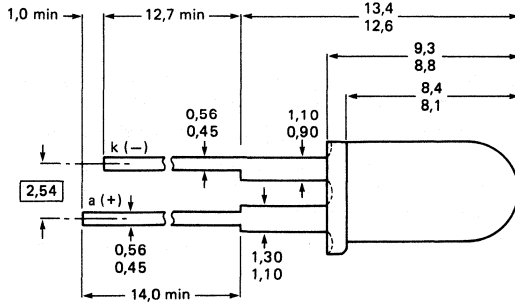
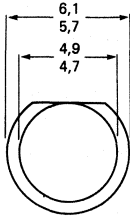
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V	
Forward current (d.c.)		I_F	max.	100 mA	
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$		P_{tot}	max.	215 mW	
Junction temperature		T_j	max.	100 $^\circ\text{C}$	
Luminous intensity					
$I_F = 10\text{ mA}$	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 $^\circ$	←

MECHANICAL DATA

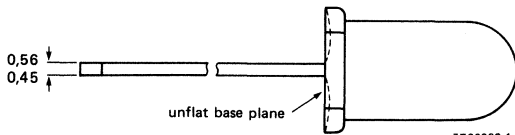
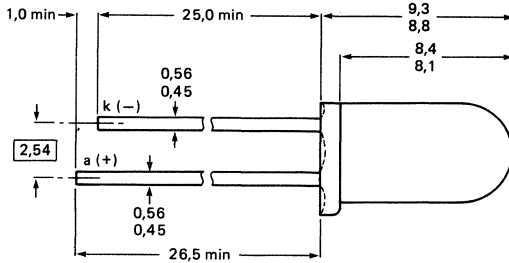
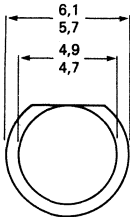
Dimensions in mm

→ Fig. 1a SOD-63D2.
CQX24



7293502

Fig. 1b SOD-63L.
CQX24L



7286982.1

→ 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 peak value, $t_{ON} = 20 \mu s$; $\delta = 0,01$	I_{FRM}	max. max.	1 A 500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
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 $^\circ\text{C}$

THERMAL RESISTANCE

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

$T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 10$ mA	V_F	max. typ.	2,2 V 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 $^\circ$	←	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm		
Wavelength at peak emission $I_F = 10$ mA; $T_{amb} = 25 \text{ }^\circ\text{C}$	λ_p	typ.	650 nm		
Luminous intensity $I_F = 4$ mA	CQX24(L)-8 CQX24(L)-9 CQX24(L)-10	I_v I_v I_v	typ. typ. typ.	16 mcd 35 mcd 50 mcd	
$I_F = 10$ mA	CQX24(L) CQX24(L)-8 CQX24(L)-9 CQX24(L)-10	I_v I_v I_v I_v	min. typ. typ. typ.	16 mcd 30 to 70 mcd 50 mcd 80 mcd 100 mcd 120 mcd	←
$I_F = 50$ mA	CQX24(L)-8 CQX24(L)-9 CQX24(L)-10	I_v I_v I_v	typ. typ. typ.	200 mcd 400 mcd 600 mcd	

→ Diode capacitance
 $V_R = 0$; $f = 1$ MHz

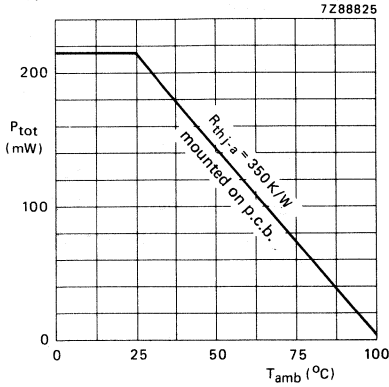


Fig. 2.

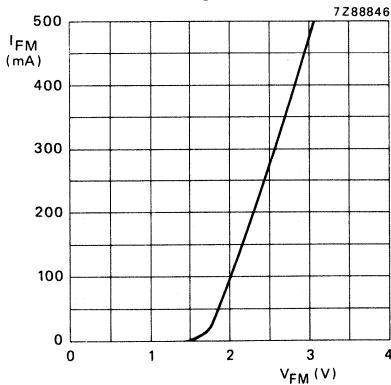


Fig. 4 $t_{on} = 20$ μs ; $\delta = 0,01$;
 $T_{amb} = 25$ $^{\circ}C$; typ. values.

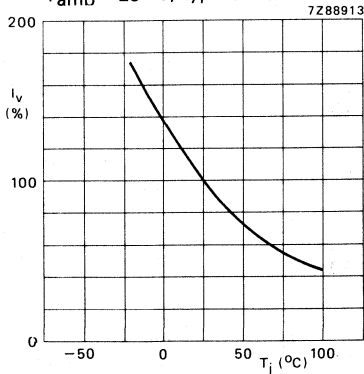


Fig. 6 Typical values.

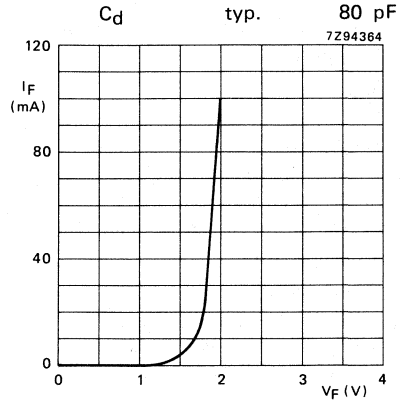


Fig. 3 Typical values; $T_{amb} = 25$ $^{\circ}C$.

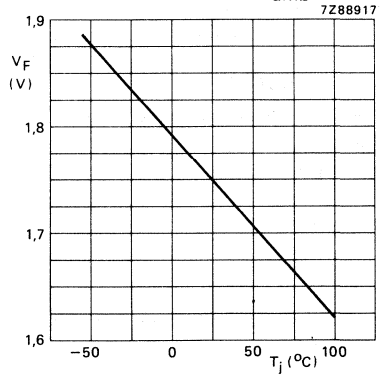


Fig. 5 $I_F = 10$ mA; typ. values.

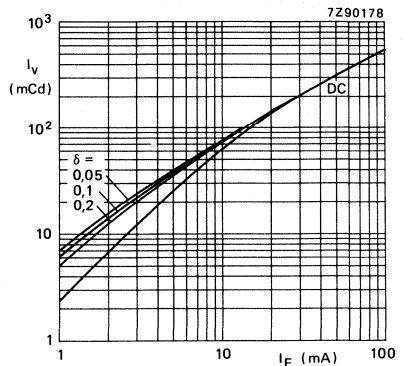


Fig. 7 $t_p = 50$ μs ; typ. values.

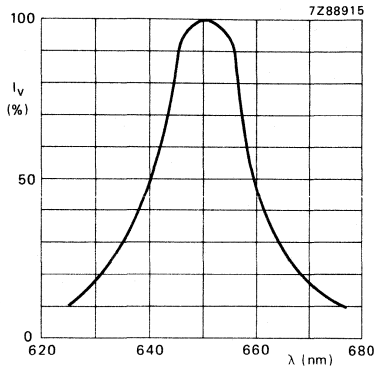


Fig. 8 $I_F = 10 \text{ mA}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

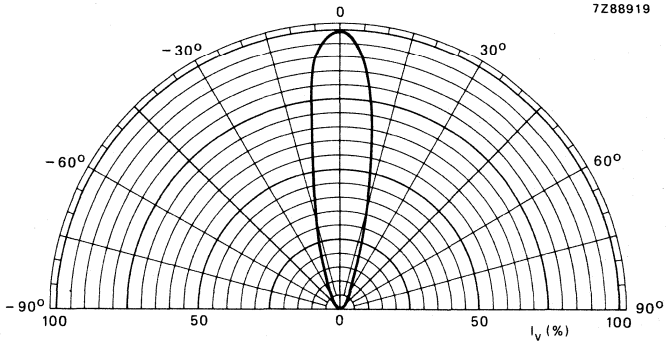


Fig. 9.

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 $T_{amb} = 65^\circ\text{C}$		P_{tot}	max.	90 mW
Luminous intensity				
at $I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	70°

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-63A1.
CQX51

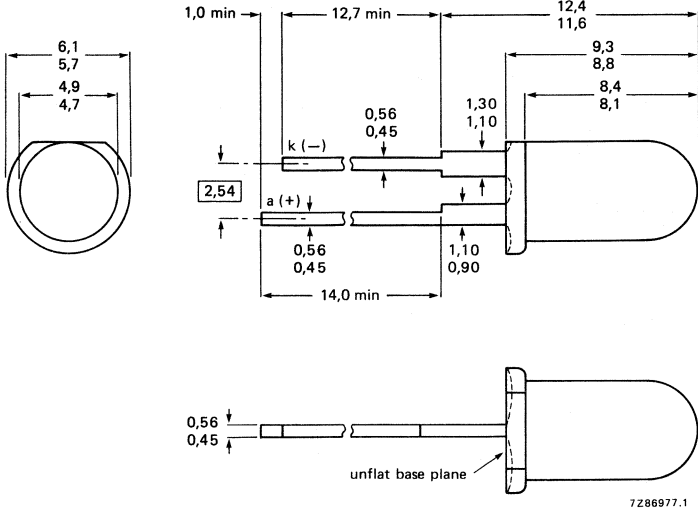
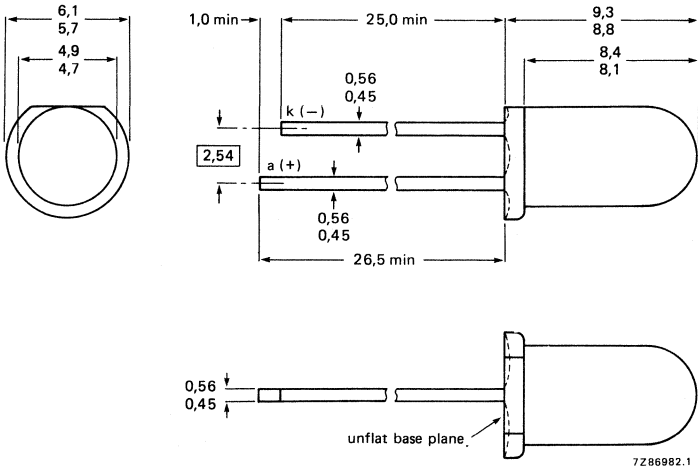


Fig. 1b SOD-63L.
CQX51L



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; $\delta = 0,33$	I_{FRM}	max.	60 mA
peak value; $t_p = 1$ μ s; $f = 300$ Hz		max.	1 A
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 > 1,5 mm from the seating plane; $t_{sld} < 7$ s	T_{sld}	max.	230 °C

THERMAL RESISTANCE

From junction to ambient mounted on a printed-circuit board	$R_{th\ j-a}$	min.	350 K/W
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CHARACTERISTICS $T_j = 25$ °C unless otherwise specified

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

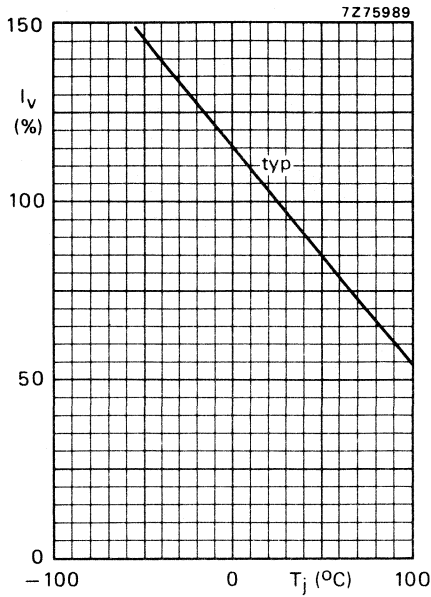


Fig. 2 $I_F = 10$ mA.

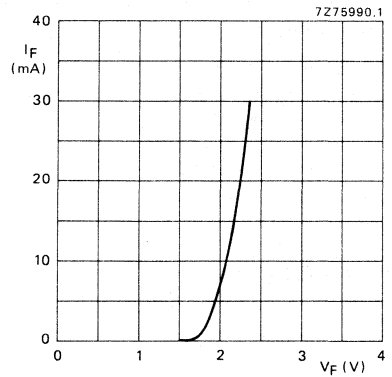


Fig. 3 $T_j = 25$ °C.

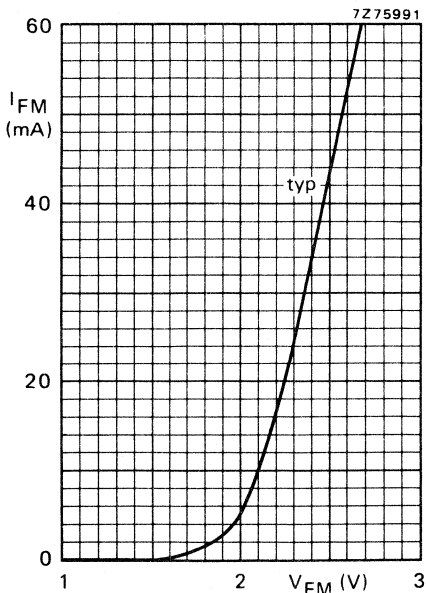


Fig. 4 $t_p = 50$ μ s; $T = 5$ ns; $T_j = 25$ °C.

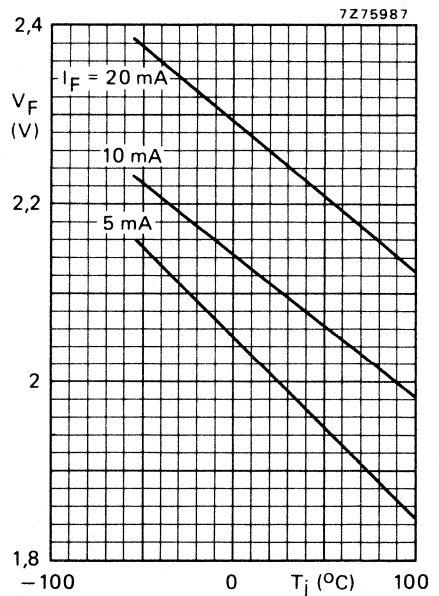


Fig. 5 Typical values.

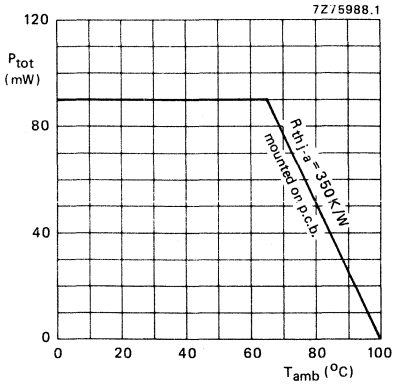


Fig. 6.

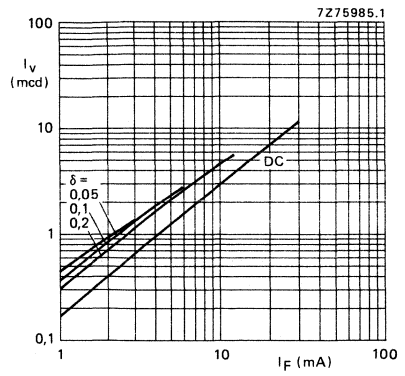


Fig. 7 $T_{amb} = 25^{\circ}C$.

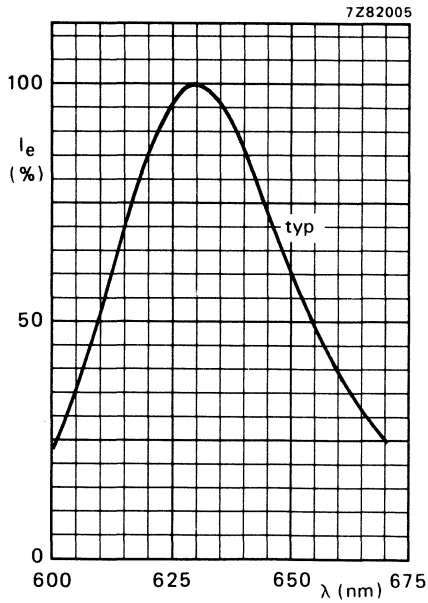


Fig. 8 Typical values.

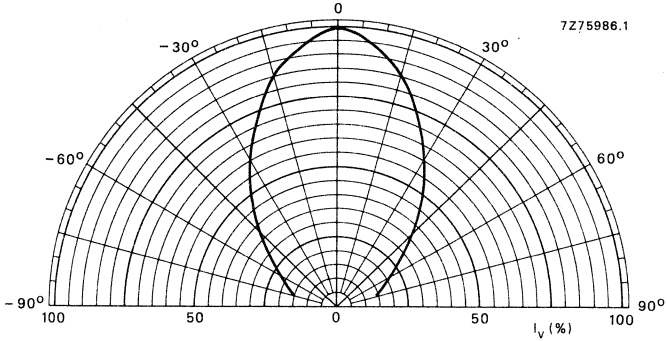


Fig. 9 Typical values.

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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Luminous intensity $I_F = 10\text{ mA}$	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	$\theta_{1/2}$	typ.	20 $^\circ$	

CQX54
CQX54L

MECHANICAL DATA

Dimensions in mm

→ Fig. 1a SOD-63D1.
CQX54

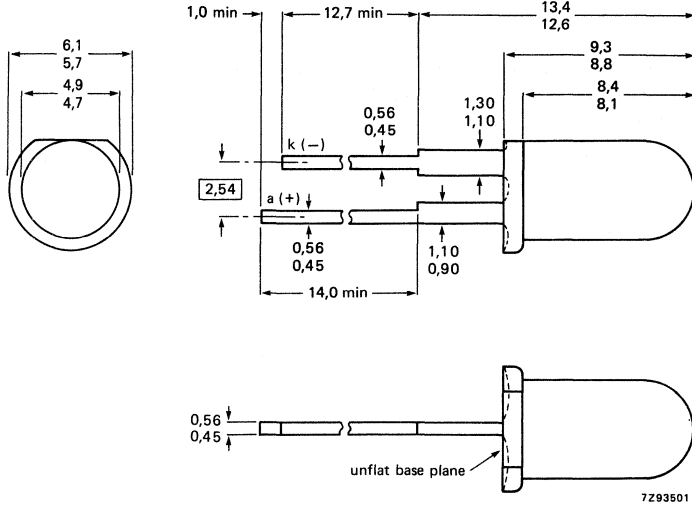
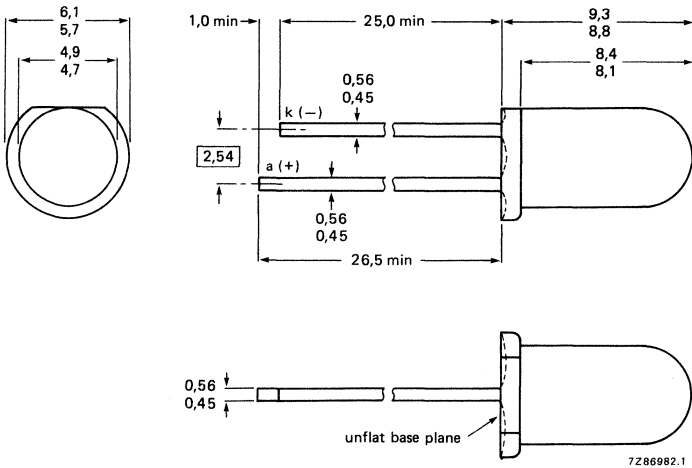


Fig. 1b SOD-63L.
CQX54L



→ 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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$ peak value; $t_{\text{ON}} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max. max.	1 A 60 mA
Total power dissipation up to $T_{\text{amb}} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		$-55 \text{ to } +100 \text{ }^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{\text{slid}} < 7 \text{ s}$ > 1,5 mm from the seating plane for CQX54 > 5 mm from the plastic body for CQX54L	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient
when the device is mounted on a p.c. board

$R_{\text{th j-a}}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

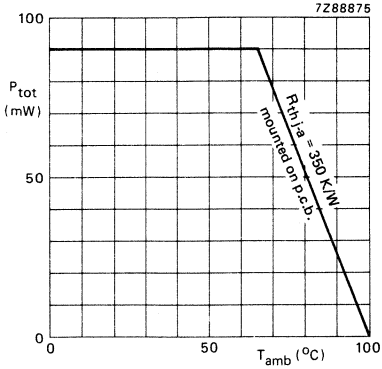


Fig. 2.

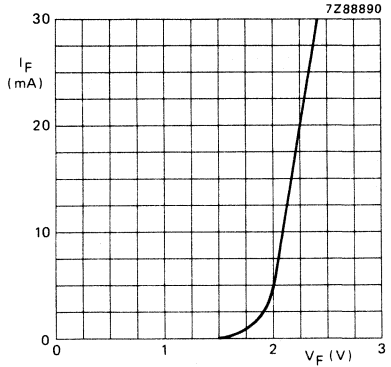


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

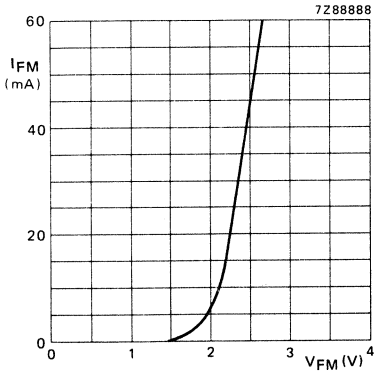


Fig. 4 $t_{on} = 50\text{ }\mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25\text{ }^{\circ}\text{C}$; typ. values.

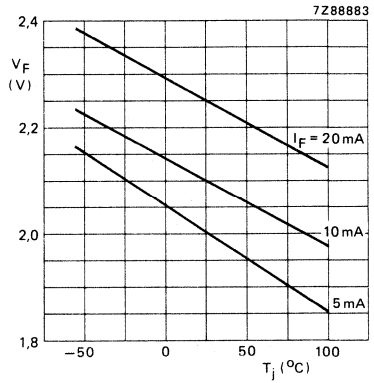


Fig. 5 Typical values.

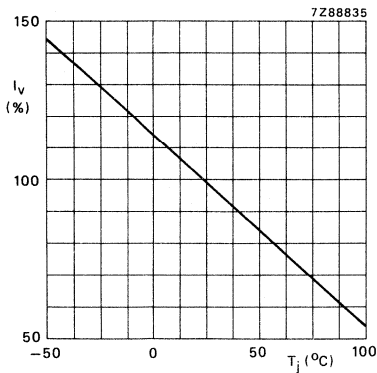


Fig. 6 Typical values.

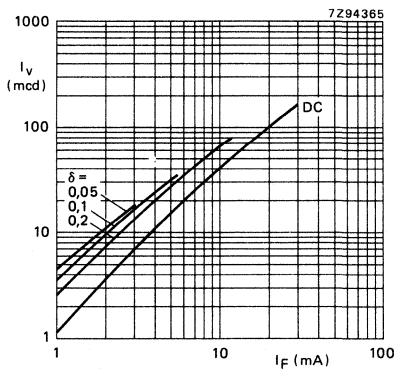


Fig. 7 $t_p = 50\text{ }\mu\text{s}$; typ. values.

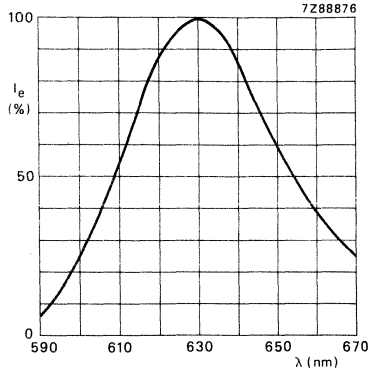


Fig. 8 Typical values.

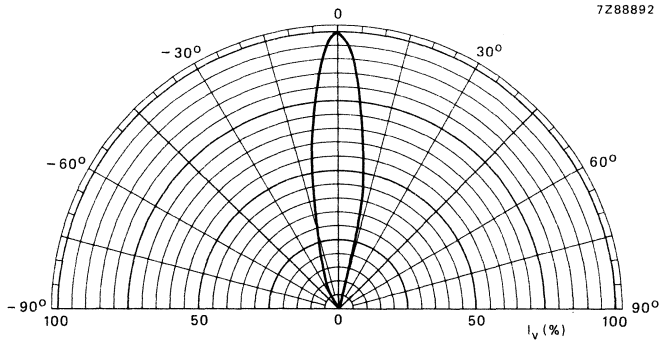


Fig. 9 $I_F = 10$ mA; typ. values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQX54D

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. ←

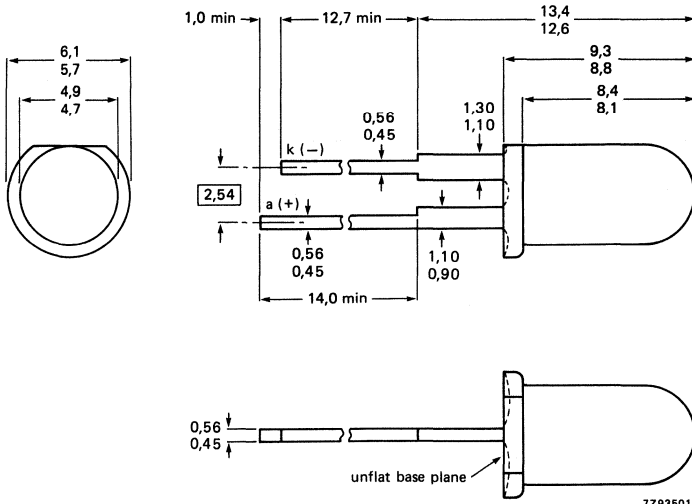
QUICK REFERENCE DATA

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

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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th\ j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
at $I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
at $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	30 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	45 nm	
Wavelength at peak emission				
at $I_F = 10 \text{ mA}$	λ_p	typ.	630 nm	
Capacitance				
at $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	35 pF	
Luminous intensity				
at $I_F = 10 \text{ mA}$				
	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 $T_{amb} = 35\text{ }^\circ\text{C}$		P_{tot}	max.	180 mW	
Junction temperature		T_j	max.	100 $^\circ\text{C}$	
Luminous intensity					
$I_F = 10\text{ mA}$	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		$\theta_{1/2}$	typ.	20 $^\circ$	

MECHANICAL DATA

Dimensions in mm

→ Fig. 1 SOD-63DI.

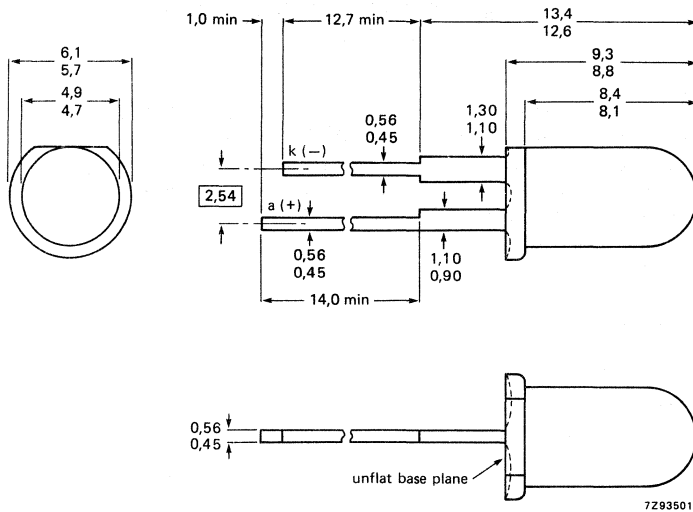
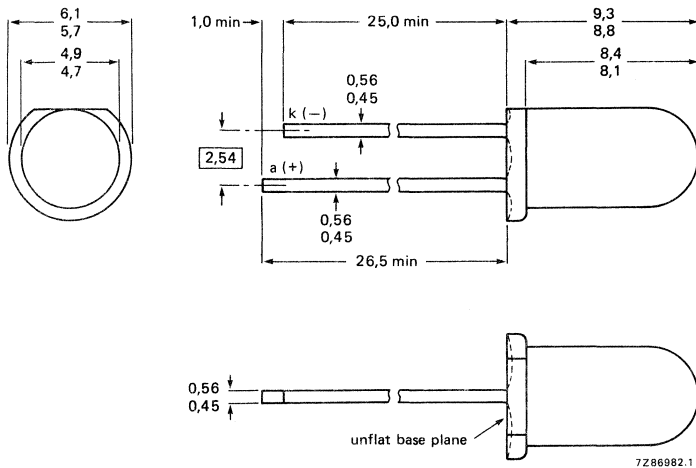


Fig. 1b SOD-63L.
CQX64L



→ 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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$		max.	150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{slid} < 7 \text{ s}$			
> 1,5 mm from the seating plane for CQX64	T_{slid}	max.	260 $^\circ\text{C}$
> 5 mm from the plastic body for CQX64L			

THERMAL RESISTANCE

From junction to ambient

when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

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

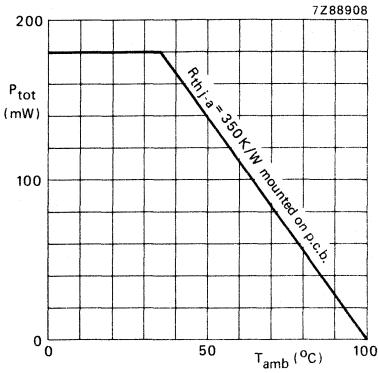


Fig. 2.

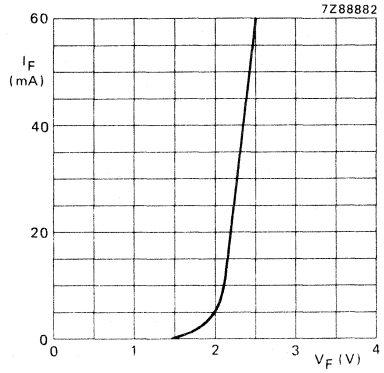


Fig. 3 $T_{amb} = 25^\circ\text{C}$; typ. values.

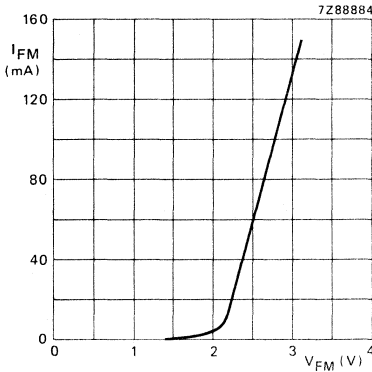


Fig. 4 $t_{on} = 1\text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25^\circ\text{C}$; typ. values.

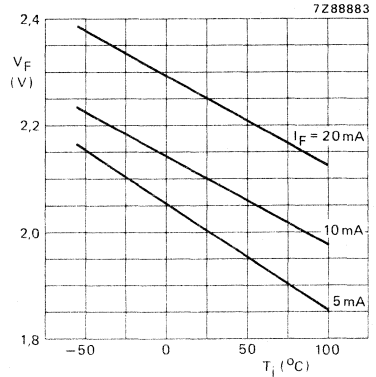


Fig. 5 Typical values.

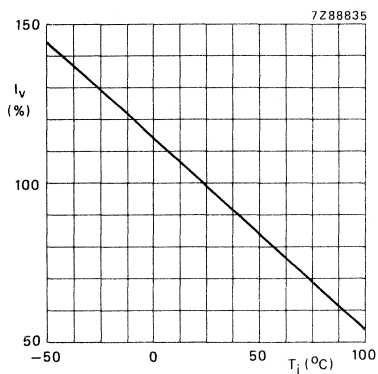


Fig. 6 Typical values.

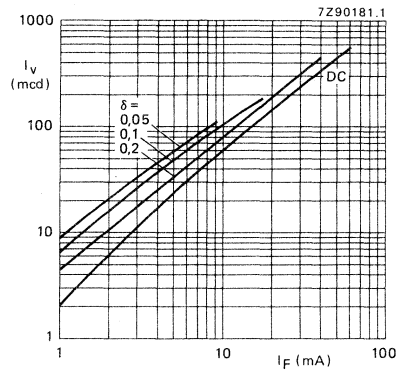


Fig. 7 $t_p = 50\ \mu\text{s}$; typ. values.

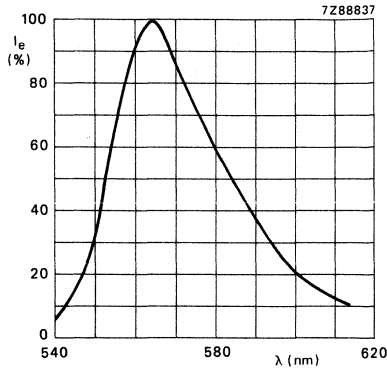


Fig. 8 $I_F = 10$ mA; typ. values.

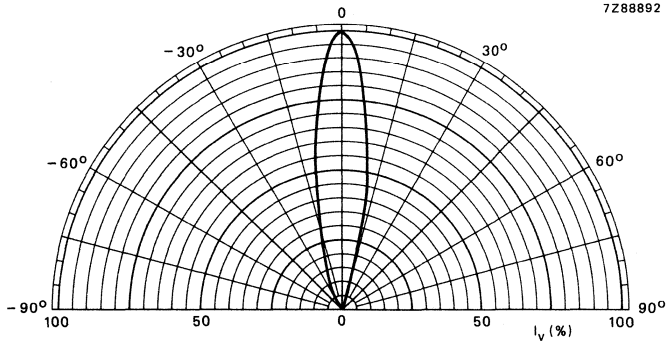


Fig. 9 $I_F = 10$ mA; typ. values.



DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQX64D

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 $T_{amb} = 35\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Luminous intensity at $I_F = 10\text{ mA}$	I_v	min.	3 mcd	
Wavelength at peak emission	λ_p	typ.	565 nm	
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	30 $^\circ$	←

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, $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
at $I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
at $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	30 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm	
Wavelength at peak emission				
at $I_F = 10 \text{ mA}$	λ_p	typ.	565 nm	
Capacitance				
at $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	35 pF	
Luminous intensity				
at $I_F = 10 \text{ mA}$				
	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 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 $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW	
Junction temperature		T_j	max.	100 $^\circ\text{C}$	
Luminous intensity					
$I_F = 10\text{ mA}$	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 $^\circ$	

CQX74
CQX74L

MECHANICAL DATA

Dimensions in mm

→ Fig. 1a SOD-63DI.
CQX74

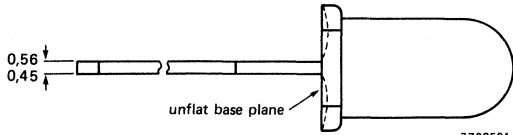
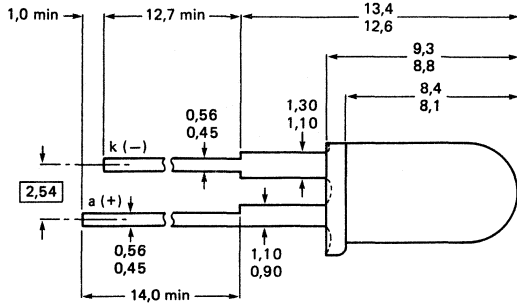
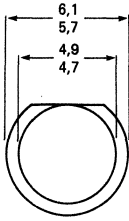
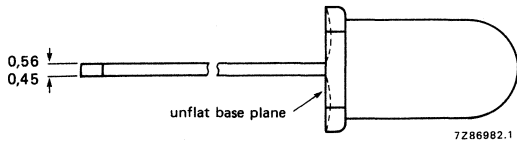
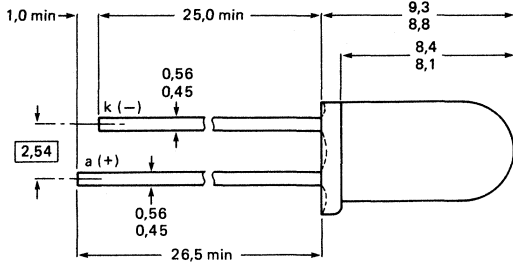
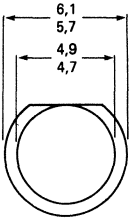


Fig. 1b SOD-63L.
CQX74L



→ **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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$ peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max. max.	1 A 60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature; $t_{sld} < 7 \text{ s}$ > 1,5 mm from the seating plane for CQX74 > 5 mm from the plastic body for CQX74L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient	$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 10 \text{ mA}$	V_F	typ. max.	2,1 V 3,0 V
Reverse current $V_R = 5 \text{ V}$	I_R	max.	100 μA
Beamwidth between half-intensity directions $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	20 $^\circ$
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm
Wavelength at peak emission $I_F = 10 \text{ mA}$	λ_p	typ.	590 nm
Luminous intensity $I_F = 10 \text{ mA}$			
	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 $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF ←

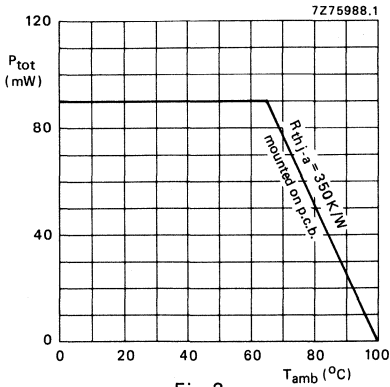


Fig. 2.

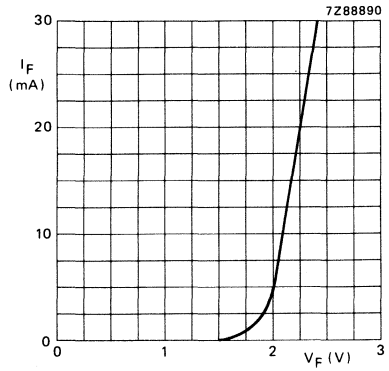


Fig. 3 $T_j = 25^\circ\text{C}$; typ. values.

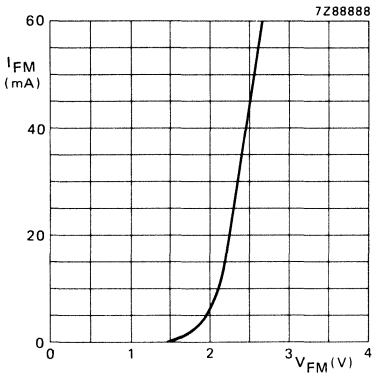


Fig. 4 $t_{on} = 50 \mu\text{s}$; $\delta = 0,01$;
 $T_{amb} = 25^\circ\text{C}$; typ. values.

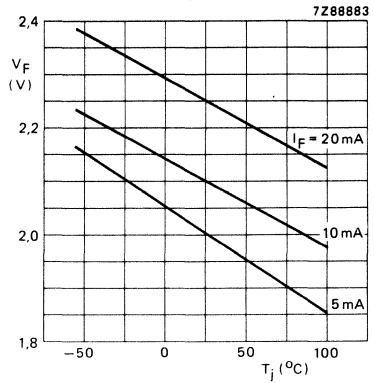


Fig. 5 Typical values.

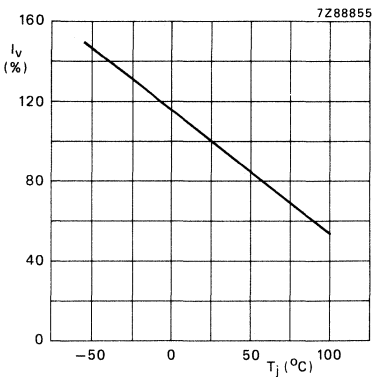


Fig. 6 $I_F = 10 \text{ mA}$; typ. values.

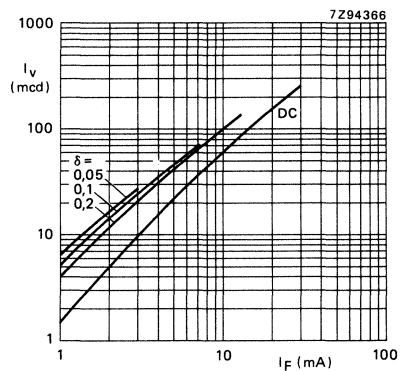


Fig. 7 $t_p = 50 \mu\text{s}$; typ. values.

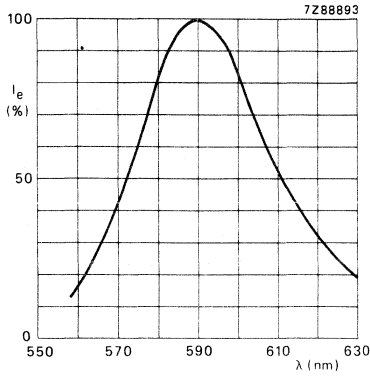


Fig. 8 Typical values.

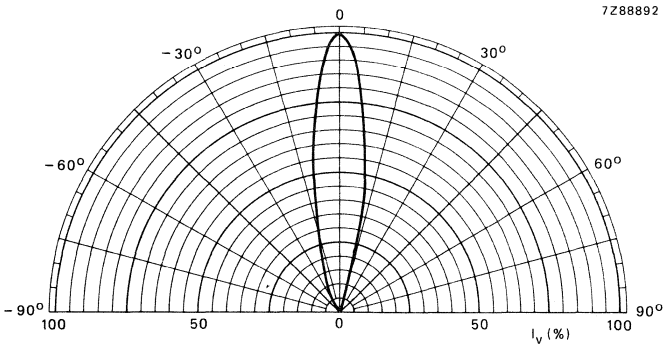


Fig. 9 Typical values.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

CQX74D

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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity at $I_F = 10\text{ mA}$	I_v	min.	3 mcd
Wavelength at peak emission	λ_p	typ.	590 nm
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	30 $^\circ$ ←

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, $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{frm}	max.	60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_{amb} = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
at $I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
at $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	30 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm	
Wavelength at peak emission				
at $I_F = 10 \text{ mA}$	λ_p	typ.	590 nm	
Capacitance				
at $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	35 pF	
Luminous intensity				
at $I_F = 10 \text{ mA}$				
	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 $T_{amb} = 65\text{ }^\circ\text{C}$	P_{tot}	max.	100 mW
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Luminous intensity			
$I_F = 20\text{ mA}$	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	$\theta_{1/2}$	typ.	70 $^\circ$ ←

CQY24B
CQY24BL

MECHANICAL DATA

Dimensions in mm

→ Fig. 1a SOD-63Al.
CQY24B

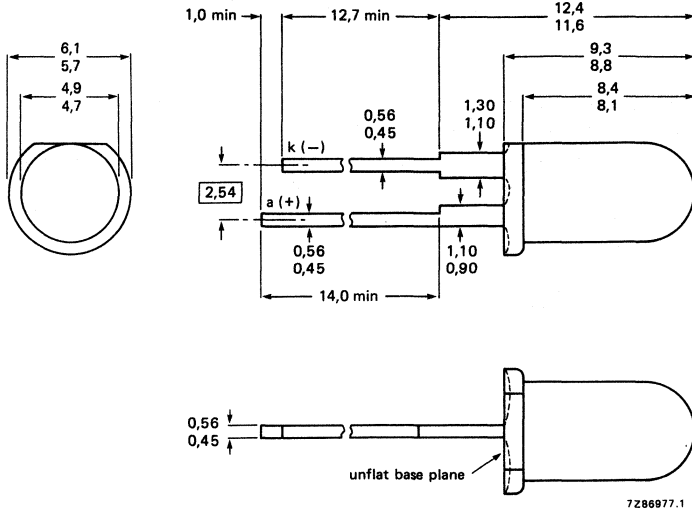
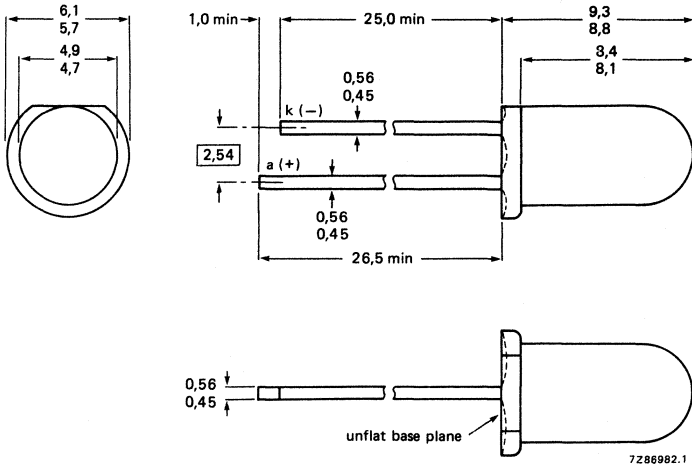


Fig. 1b SOD-63L.
CQY24BL



→ 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; $t_p = 1 \mu s$; $f = 300$ Hz	I_{FRM}	max.	1 A	←
peak value; $t_p = 10 \mu s$; $\delta = 0,01$		max.	500 mA	
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	100 mW	
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
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 $^\circ\text{C}$	

THERMAL RESISTANCE

From junction to ambient mounted on a p.c. board	$R_{th j-a}$	max.	350 K/W	
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 10$ 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 $I_F = 10$ mA	$\theta_{1/2}$	typ.	70 $^\circ$	←
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	←

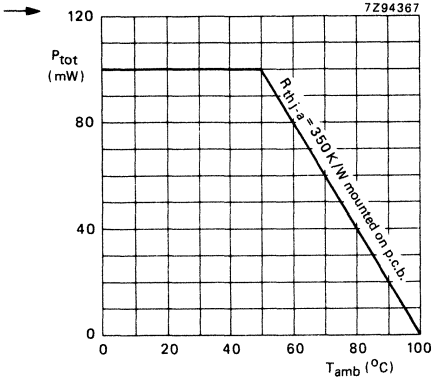


Fig. 2.

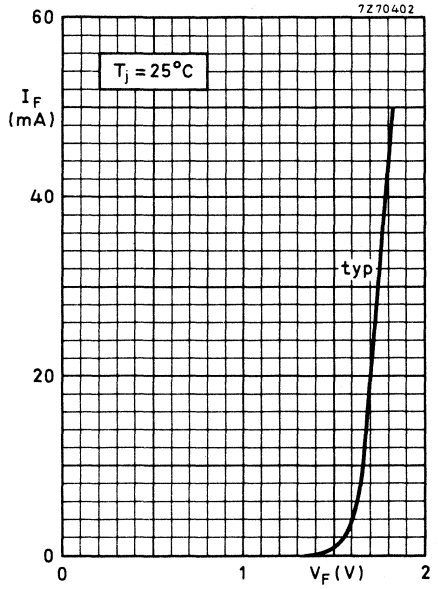


Fig. 3.

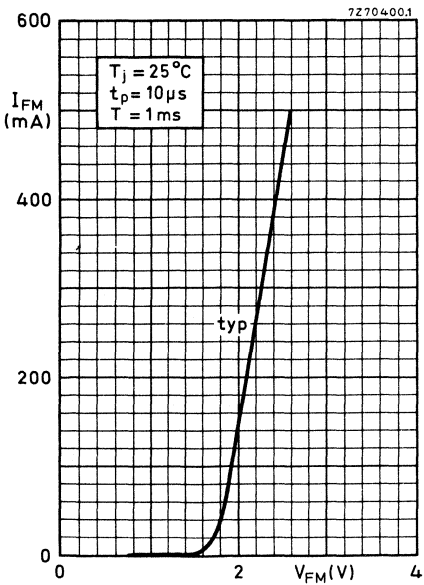


Fig. 4.

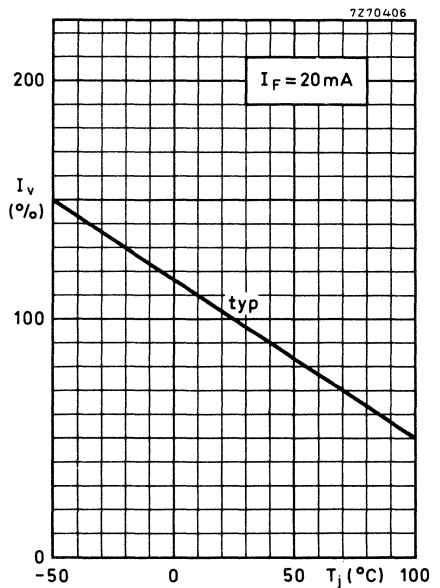


Fig. 5.

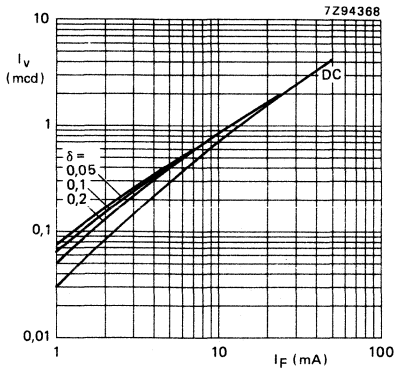


Fig. 6 Typical values.

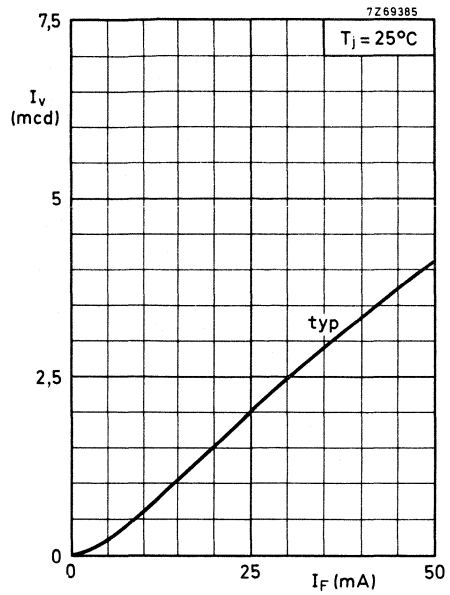


Fig. 7.

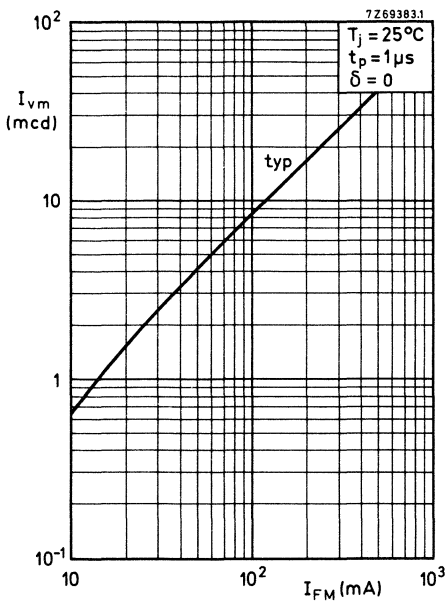


Fig. 8.

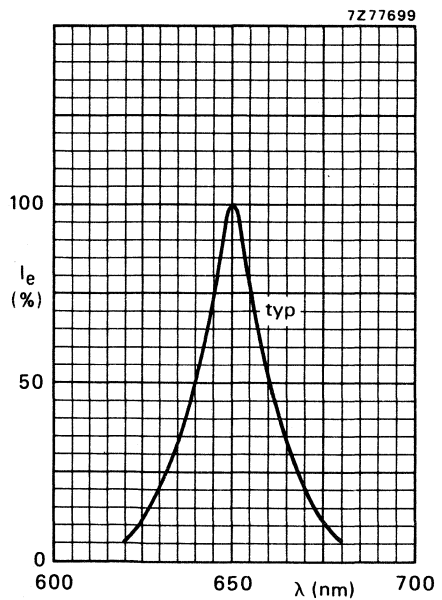


Fig. 9.

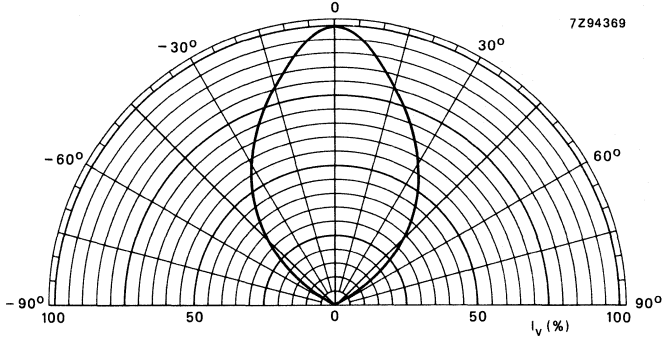


Fig. 10 Typical values.

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.

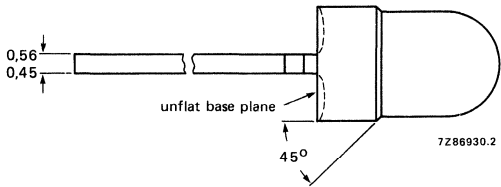
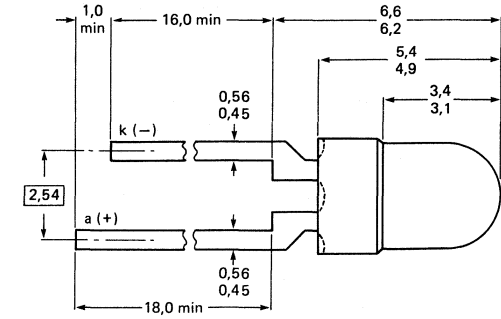
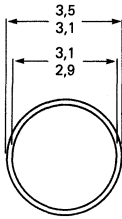
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V	
Forward current (d.c.)		I_F	max.	50 mA	
Total power dissipation up to $T_{amb} = 40\text{ °C}$		P_{tot}	max.	120 mW	←
Junction temperature		T_j	max.	100 °C	
Luminous intensity					
$I_F = 20\text{ mA}$	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					
$I_F = 20\text{ mA}$		λ_p	typ.	650 nm	
Beamwidth at half-intensity directions					
$I_F = 20\text{ mA}$		$\theta_{1/2}$	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.	50 mA	
peak value; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$	I_{FRM}	max.	1 A	
Total power dissipation up to $T_{amb} = 40 \text{ }^\circ\text{C}$	P_{tot}	max.	120 mW	←
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Lead soldering temperature				
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$	

THERMAL RESISTANCE

From junction to ambient

when the device is mounted on a p.c. board

$R_{th j-a}$	max.	500 K/W
--------------	------	---------

CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage					
$I_F = 20 \text{ mA}$	V_F	typ.	1,7 V		
		max.	2,0 V		
Reverse current					
$V_R = 5 \text{ V}$	I_R	max.	100 μA		
Beamwidth between half-intensity directions					
$I_F = 20 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$	←	
Bandwidth at half height	$\Delta\lambda$	typ.	20 nm		
Wavelength at peak emission					
$I_F = 20 \text{ mA}$	λ_p	typ.	650 nm		
Luminous intensity					
$I_F = 20 \text{ mA}$					
	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					
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	45 pF	←	

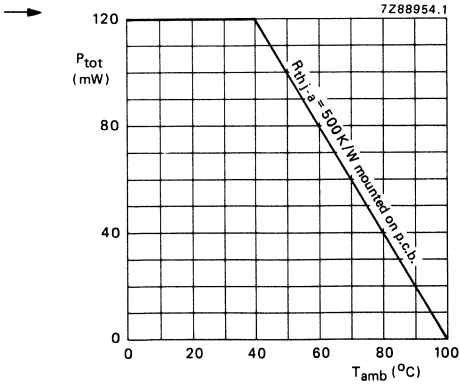


Fig. 2.

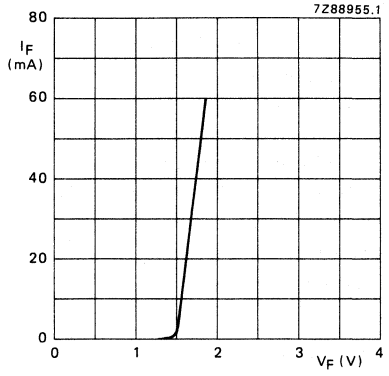


Fig. 3 $T_{amb} = 25^{\circ}C$.

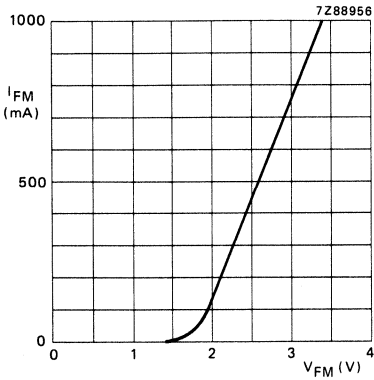


Fig. 4 Typical values.

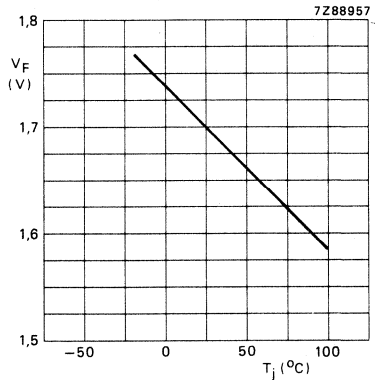


Fig. 5 $I_F = 20\text{ mA}$; typ. values.

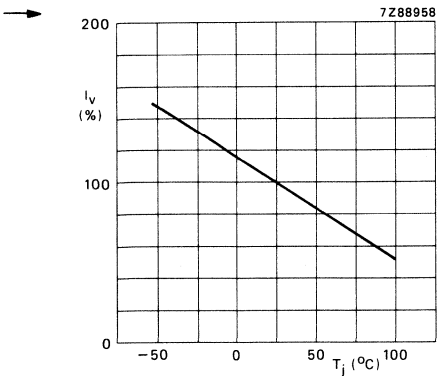


Fig. 6 $I_F = 20\text{ mA}$; typ. values.

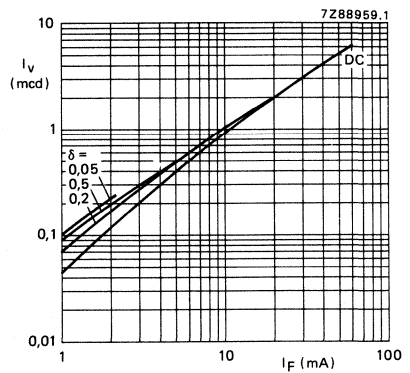


Fig. 7 $t_p = 50\ \mu s$; $T_j = 25^{\circ}C$.

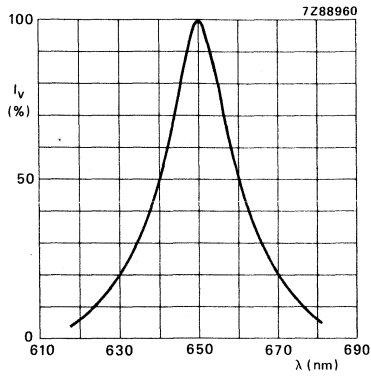


Fig. 8 Typical values.

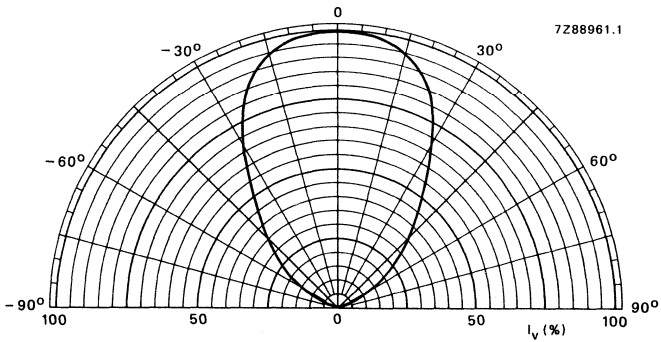


Fig. 9 Typical values.



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.

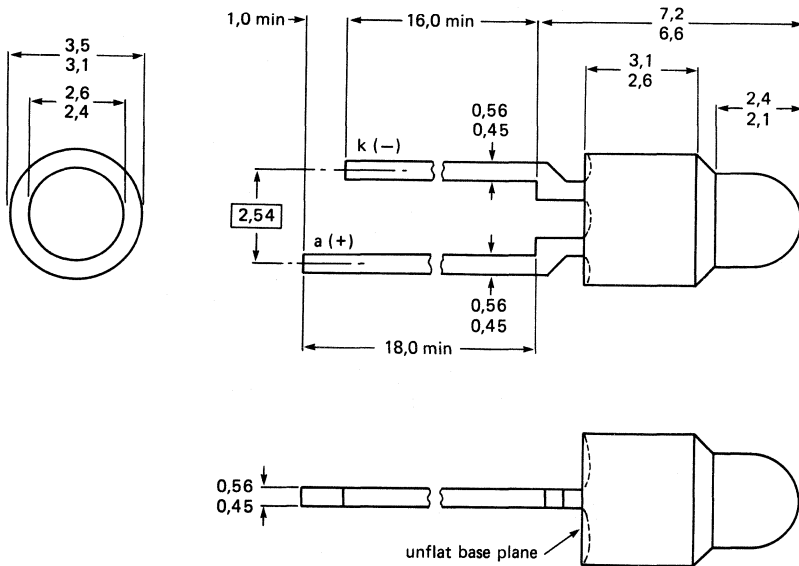
QUICK REFERENCE DATA

Continuous reverse voltage	V_R	max.	5 V	
Forward current (d.c.)	I_F	max.	50 mA	
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.	100 mW	
Radiant intensity (on-axis) at $I_F = 20\text{ mA}$	I_e	typ.	2 mW/sr	←
Wavelength at peak emission	λ	typ.	930 nm	

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOD-53F.



7Z93497

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); $t_p = 10 \mu s$; $\delta = 0,01$	I_{FRM}	max.	200 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$ (see Fig. 2)	P_{tot}	max.	100 mW
Storage temperature	T_{stg}		-55 to + 100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
→ > 1,5 mm from the seating plane; $t_{slid} < 7 \text{ s}$	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

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

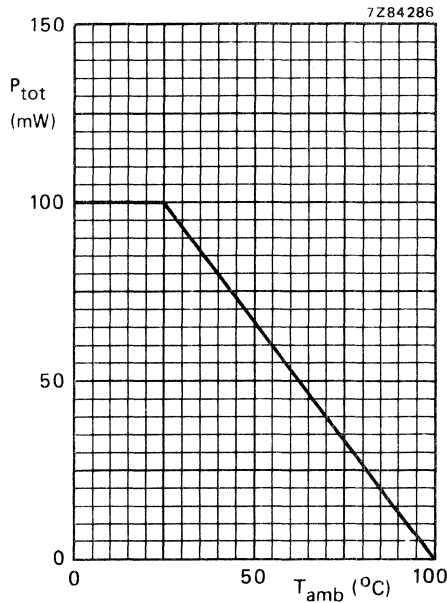


Fig. 2 Power derating curve versus ambient temperature.

CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$

Forward voltage

 $I_F = 20\text{ mA}$

V_F	typ.	1,2 V	
	max.	1,5 V	

Reverse current

 $V_R = 5\text{ V}$

I_R	max.	100 μA	
-------	------	-------------------	--

Diode capacitance

 $V_R = 0; f = 1\text{ MHz}$

C_d	typ.	40 pF	
-------	------	-------	--

Total radiant power

 $I_F = 20\text{ mA}$

ϕ_e	typ.	1 mW	
----------	------	------	--

Radiant intensity (on-axis)

 $I_F = 20\text{ mA}$

CQY58A

I_e	min.	2 mW/sr	←
-------	------	---------	---

CQY58A-1

I_e	min.	1 mW/sr	
-------	------	---------	--

CQY58A-2

I_e	max.	5 mW/sr	
-------	------	---------	--

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

 $I_F = 20\text{ mA}$

$\theta_{1/2}$	typ.	20 $^\circ$	←
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Switching times

 $I_{Fon} = 20\text{ mA}$

Light rise time

t_r	typ.	3 μs	
-------	------	-----------------	--

Light fall time

t_f	typ.	3 μs	
-------	------	-----------------	--

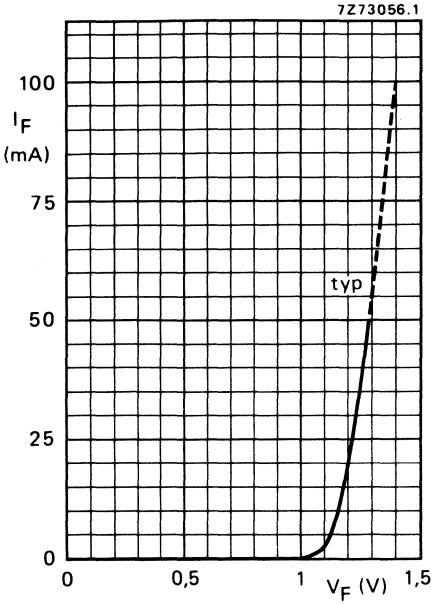


Fig. 3 $T_{amb} = 25\text{ }^{\circ}\text{C}$.

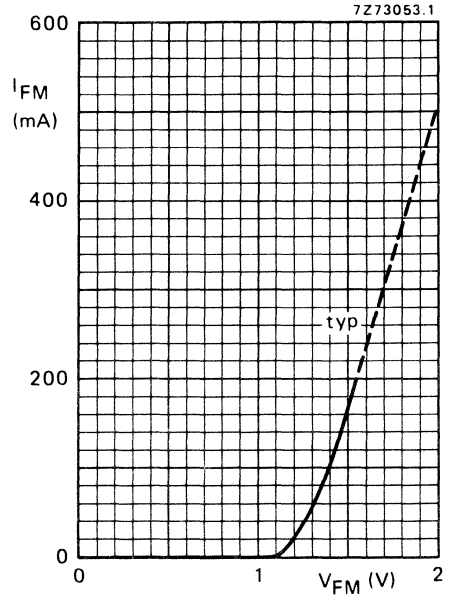


Fig. 4 $t_p = 10\text{ }\mu\text{s}$; $T = 1\text{ ms}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

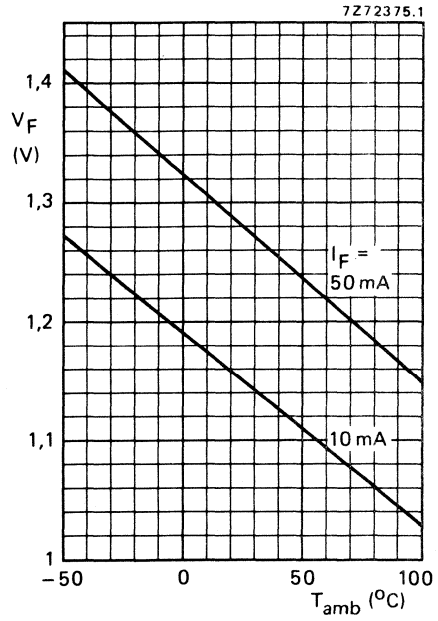


Fig. 5 Typical values.

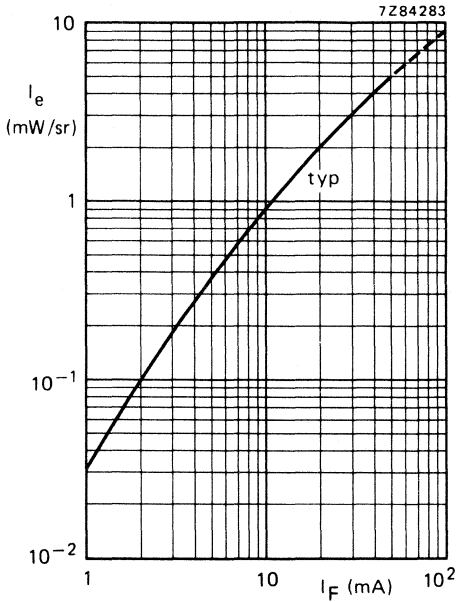


Fig. 6 $T_{amb} = 25^\circ C$.

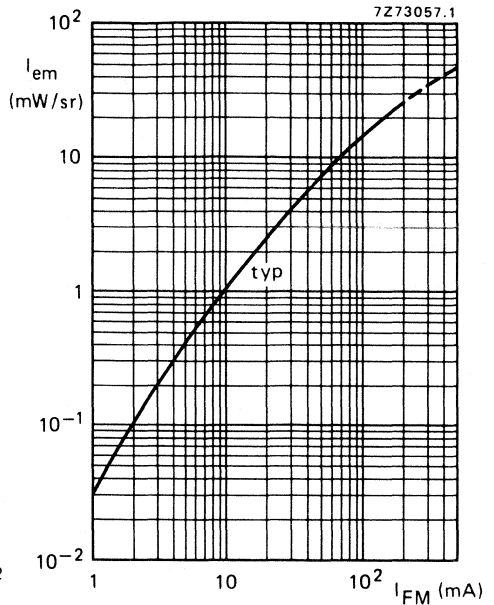


Fig. 7 $t_p = 10 \mu s$; $T = 1 ms$; $T_{amb} = 25^\circ C$.

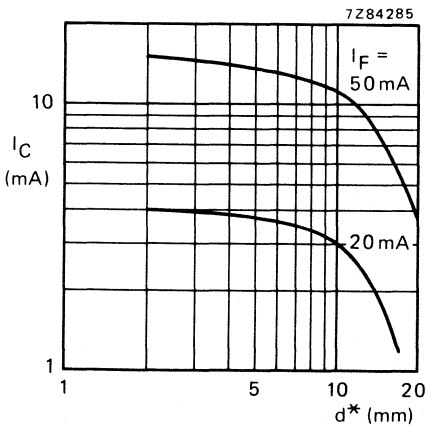


Fig. 8 $V_{CE} = 5 V$; $T_{amb} = 25^\circ C$; typical values.

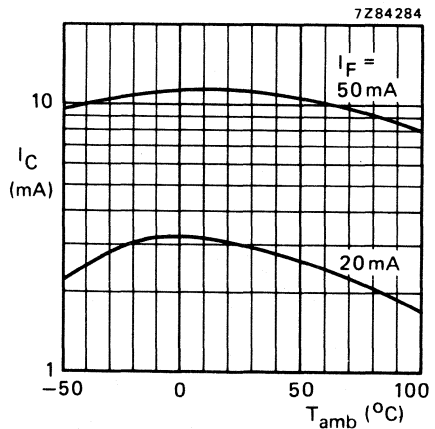


Fig. 9 $V_{CE} = 5 V$; $d^* = 10 mm$; typical values.

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

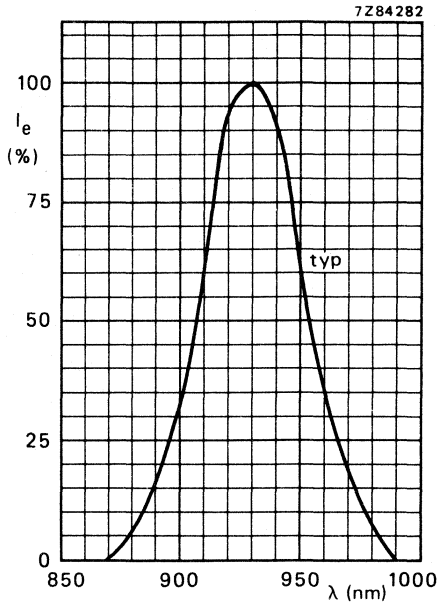


Fig. 10 Spectral response.

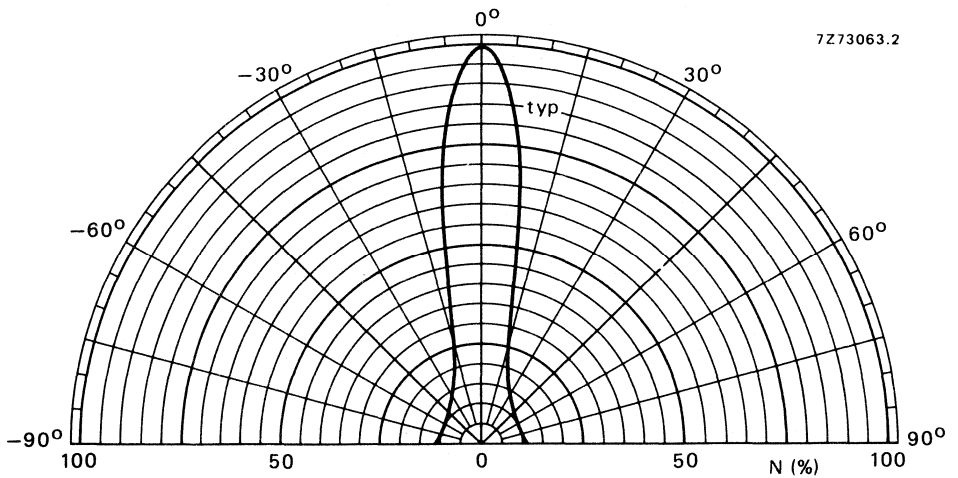


Fig. 11 Typical values.

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).

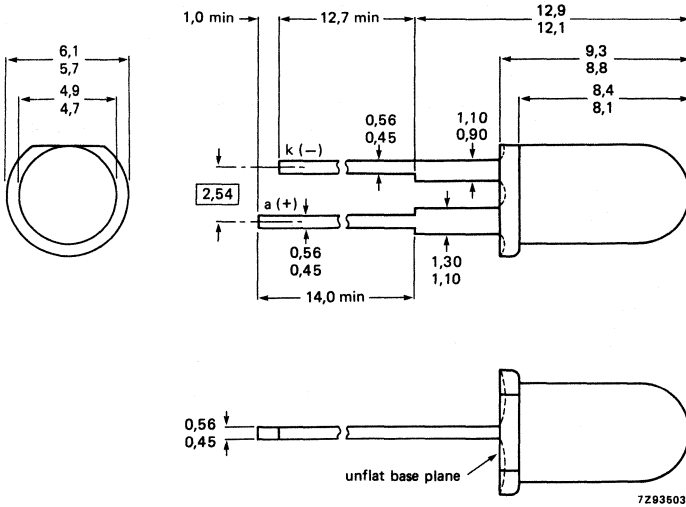
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	130 mA
Total power dissipation up to $T_{amb} = 25\text{ }^\circ\text{C}$		P_{tot}	max.	215 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Radiant intensity (on-axis) at $I_F = 100\text{ mA}$	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) $t_p \leq 50 \mu\text{s}; \delta = 0,05$	I_{FM}	max.	1000 mA
Non-repetitive peak forward current ($t_p \leq 10 \mu\text{s}$)	I_{FSM}	max.	2500 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	215 mW
Storage temperature	T_{stg}		-55 to + 100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature up to the seating plane; $t_{sld} < 10 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient mounted on a printed-circuit board	$R_{th j-a}$	=	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 100 \text{ mA}$	V_F	typ. <	1,4 V 1,6 V	
$I_{FM} = 1500 \text{ mA}; t_p = 20 \mu\text{s}; \delta = 0,033$	V_{FM}	typ.	2,4 V	
Reverse current $V_R = 5 \text{ V}$	I_R	<	100 μA	
Diode capacitance $V_R = 0; f = 1 \text{ MHz}$	C_d	typ.	40 pF	
Total radiant power $I_F = 100 \text{ mA}$	ϕ_e	> typ.	7 mW 12 mW	
Decrease of radiant power with temperature $I_F = 100 \text{ mA}$	$\frac{\Delta\phi_e}{\Delta T_j}$	typ.	1 %/K	
Radiant intensity (on-axis) $I_F = 100 \text{ mA}$	CQY89A CQY89A-1 CQY89A-2	I_e I_e I_e	min. min. min.	9 mW/sr 12 mW/sr 15 mW/sr
Wavelength at peak emission $I_F = 100 \text{ mA}$	λ_p	typ.	930 nm	
Spectral line half width $I_F = 100 \text{ mA}$	$\Delta\lambda$	typ.	50 nm	
Beamwidth between half-intensity directions $I_F = 100 \text{ mA}$	$\theta_{1/2}$	typ.	40 $^\circ$	

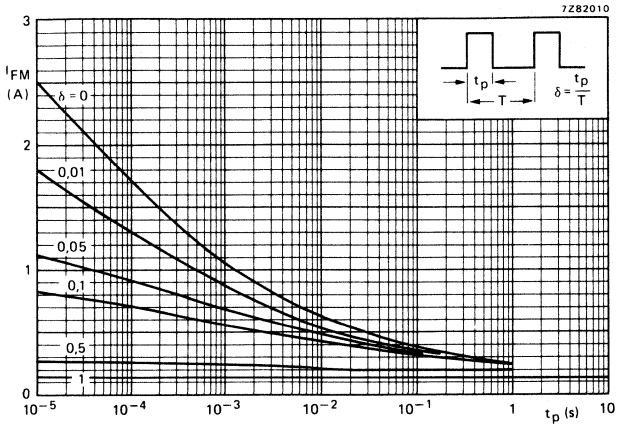


Fig. 2 $T_{amb} = 25\text{ }^\circ\text{C}$; $T_j \text{ peak} = 100\text{ }^\circ\text{C}$.

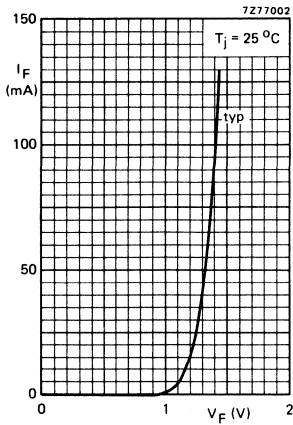


Fig. 3.

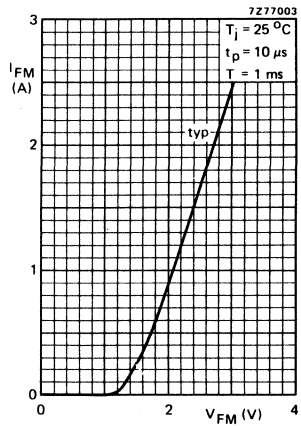


Fig. 4.

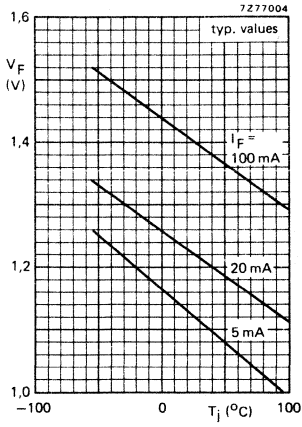


Fig. 5.

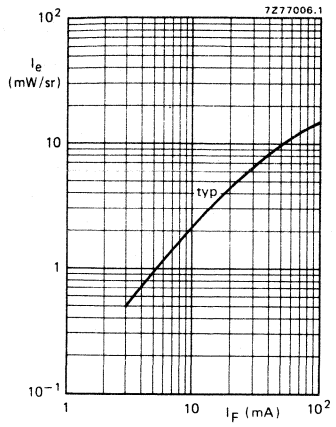


Fig. 6 $T_j = 25^{\circ}\text{C}$.

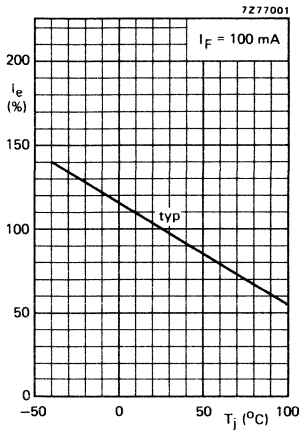


Fig. 7.

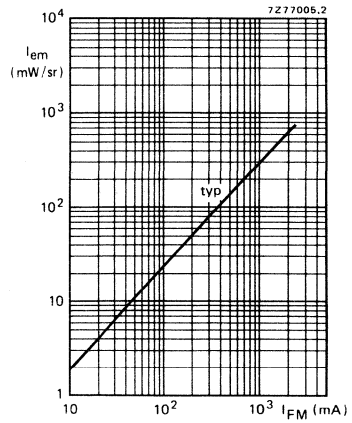


Fig. 8 $T_{amb} = 25^{\circ}\text{C}$; $t_p = 10 \mu\text{s}$; $T = 1 \text{ ms}$.

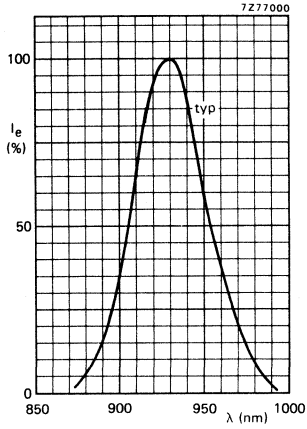


Fig. 9.

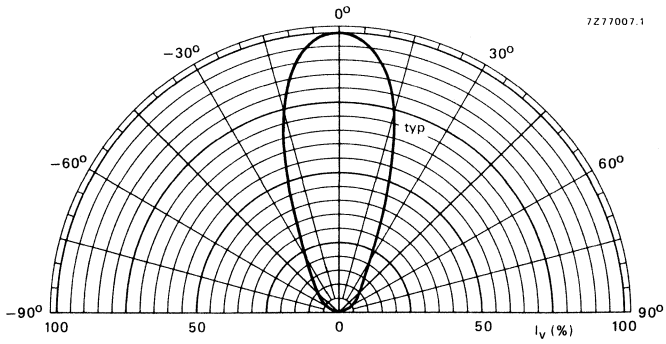


Fig. 10.

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 $T_{amb} = 35\text{ }^\circ\text{C}$	P_{tot}	max.	180 mW	
Junction temperature	T_j	max.	100 $^\circ\text{C}$	
Luminous intensity				
$I_F = 10\text{ mA}$				
	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 $^\circ$ ←	

CQY94B
CQY94BL

MECHANICAL DATA

Dimensions in mm

→ Fig 1a SOD-63Al.
CQY94B

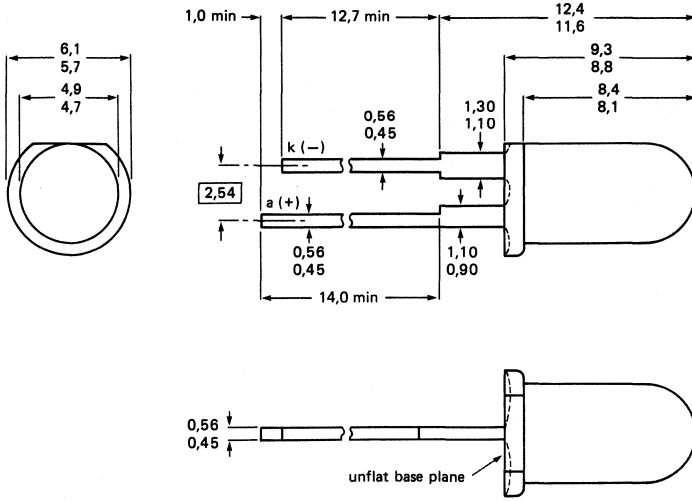
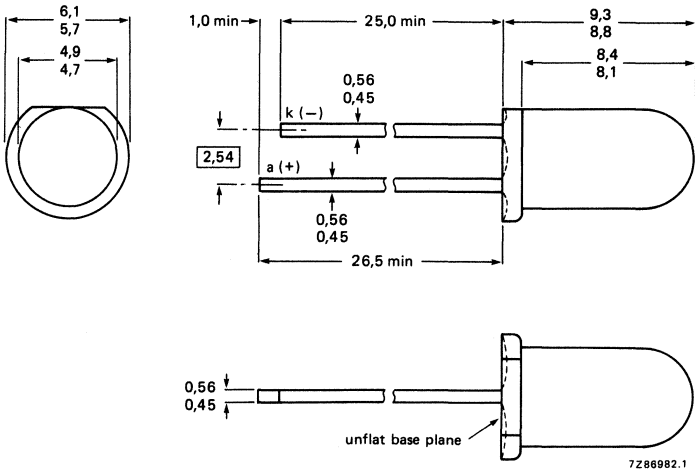


Fig. 1b SOD-63L.
CQY94BL



→ **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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$ peak value; $t_p = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max. max.	1 A 150 mA
Total power dissipation up to $T_{amb} = 35 \text{ }^\circ\text{C}$	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		-55 to $+100 \text{ }^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$ > 1,5 mm from the seating plane for CQY94B > 5 mm from the plastic body for CQY94BL	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCEFrom junction to ambient
when the device is mounted on a p.c. board

$R_{th j-a}$	max.	350 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 10 \text{ mA}$	V_F	typ. max.	2,1 V 3,0 V
Reverse current $V_R = 5 \text{ V}$	I_R	max.	100 μA
Beamwidth between half-intensity directions $I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$ ←
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm
Wavelength at peak emission $I_F = 10 \text{ mA}$	λ_p	typ.	565 nm
Luminous intensity $I_F = 10 \text{ mA}$	CQY94B(L) I_v CQY94B(L)-3 I_v CQY94B(L)-4 I_v CQY94B(L)-5 I_v	min. min. min. min.	0,7 mcd 1,6 to 3,5 mcd 3,0 to 7,0 mcd 5,0 mcd ←
Diode capacitance $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF ←

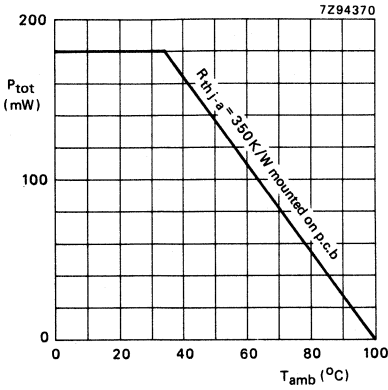


Fig. 2 Typical values.

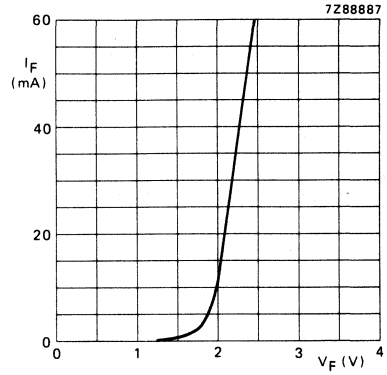


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

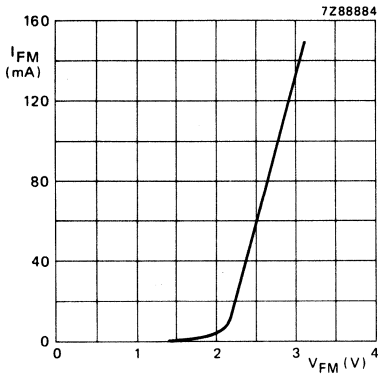


Fig. 4 $t_{on} = 1 ms$; $\delta = 0,33$;
 $T_{amb} = 25^{\circ}C$; typ. values.

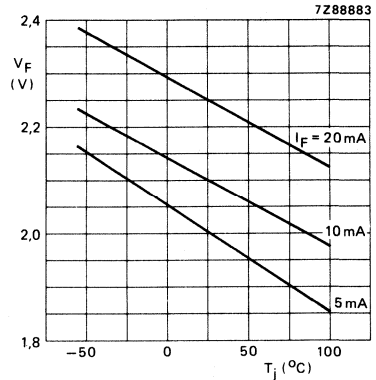


Fig. 5 Typical values.

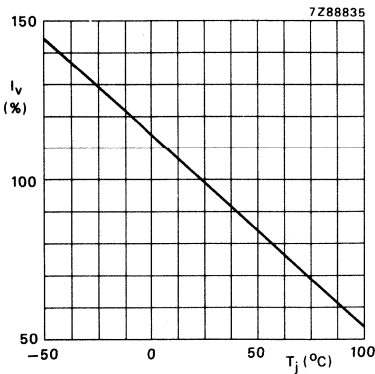


Fig. 6 Typical values.

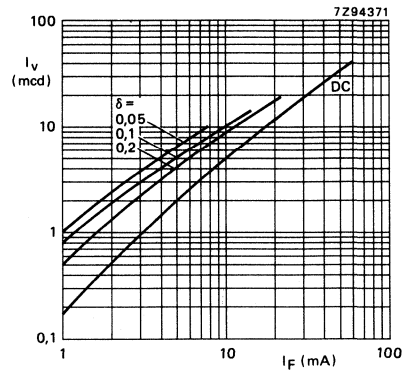


Fig. 7 $t_p = 50 \mu s$.

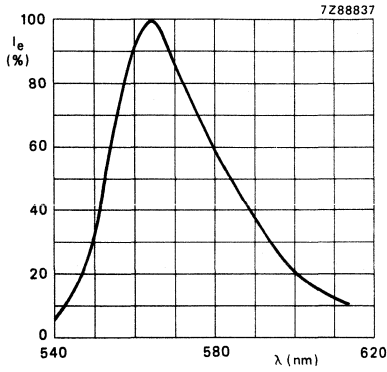


Fig. 8 $I_F = 10$ mA; typ. values.

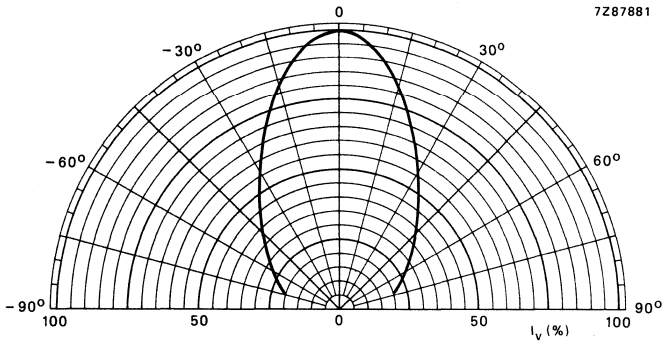


Fig. 9 Typical values.

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 lumiosity is required. Because the CQY95B is available in high I_V classes, it is suitable for those applications where only low currents are available.

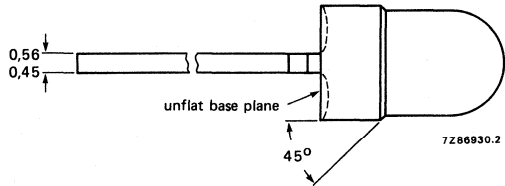
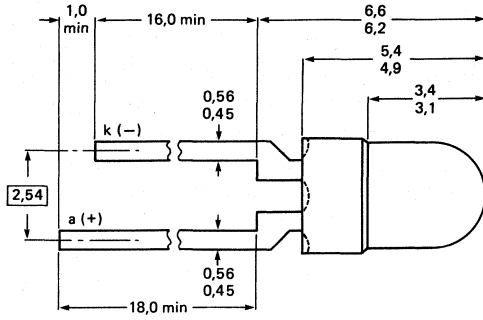
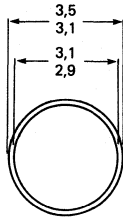
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	60 mA
Total power dissipation up to $T_{amb} = 25\text{ °C}$		P_{tot}	max.	150 mW
Junction temperature		T_j	max.	100 °C
Luminous intensity				
$I_F = 10\text{ mA}$	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

Fig. 1 SOD-53E.

Dimensions in mm



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; $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	150 mA
Total power dissipation up to $T_{amb} = 25 \text{ }^\circ\text{C}$	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{slid} < 7 \text{ s}$	T_{slid}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board

$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions	$\theta_{1/2}$	typ.	70 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	30 nm	
Wavelength at peak emission	λ_p	typ.	565 nm	
Luminous intensity				
$I_F = 10 \text{ mA}$	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	20 pF	←

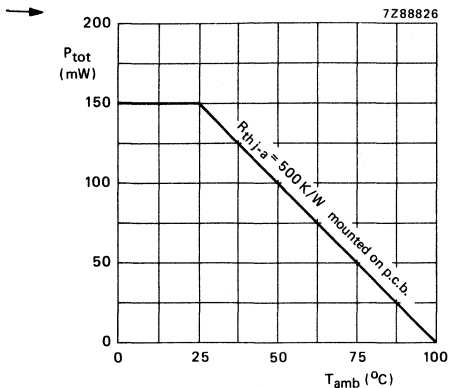


Fig. 2.

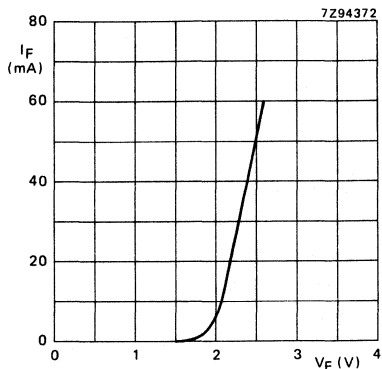


Fig. 3 $T_{amb} = 25^{\circ}C$; typ. values.

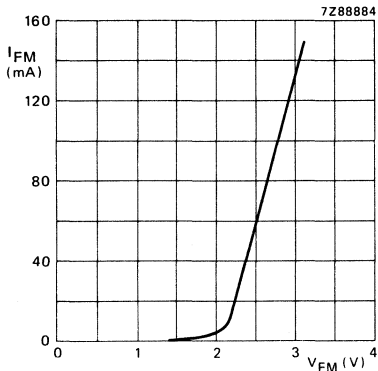


Fig. 4 $t_{on} = 1$ ms; $\delta = 0,33$;
 $T_{amb} = 25^{\circ}C$; typ. values.

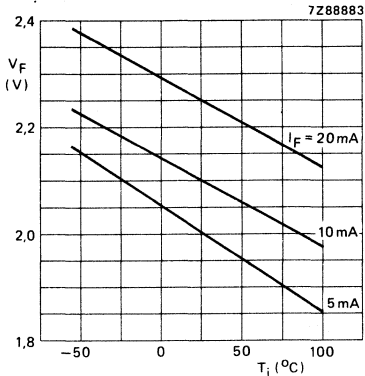


Fig. 5 Typical values.

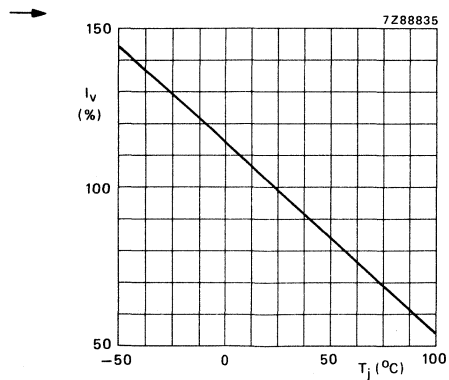


Fig. 6 Typical values.

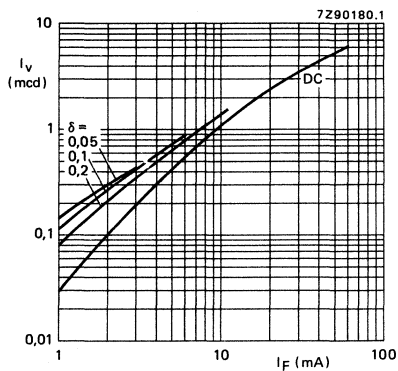


Fig. 7 $t_p = 50 \mu s$; typ. values.

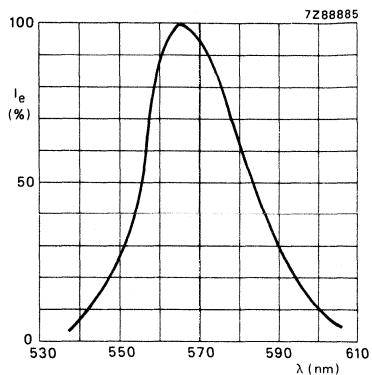


Fig. 8 $I_F = 10$ mA; typ. values.

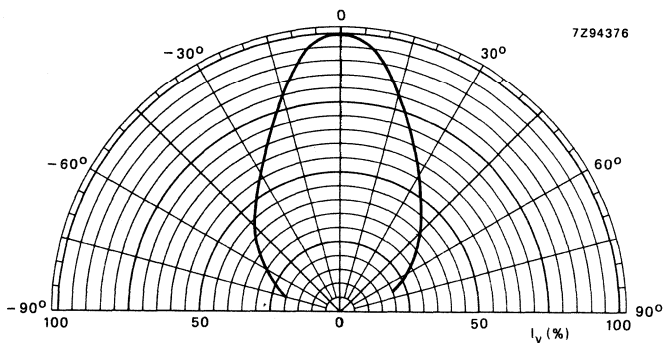


Fig. 9 Typical values.

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 $T_{amb} = 65\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW	
Junction temperature		T_j	max.	100 $^\circ\text{C}$	
Luminous intensity (on-axis)					
$I_F = 10\text{ mA}$	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		$\theta_{\frac{1}{2}}$	typ.	70 $^\circ$	←

MECHANICAL DATA

Dimensions in mm

→ Fig. 1a SOD-63A1.
CQY96

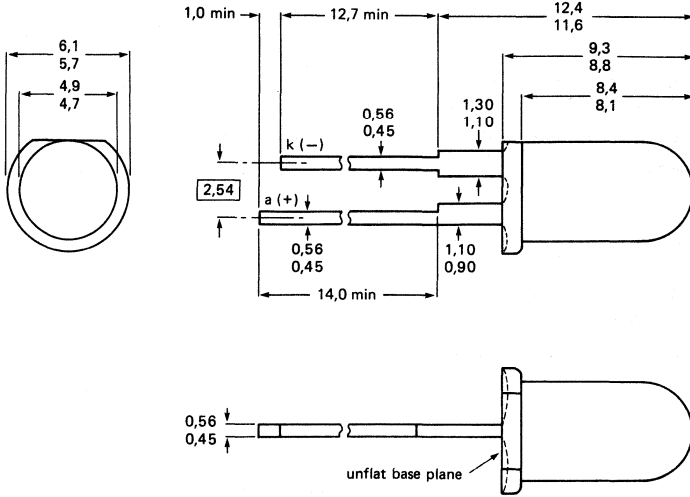
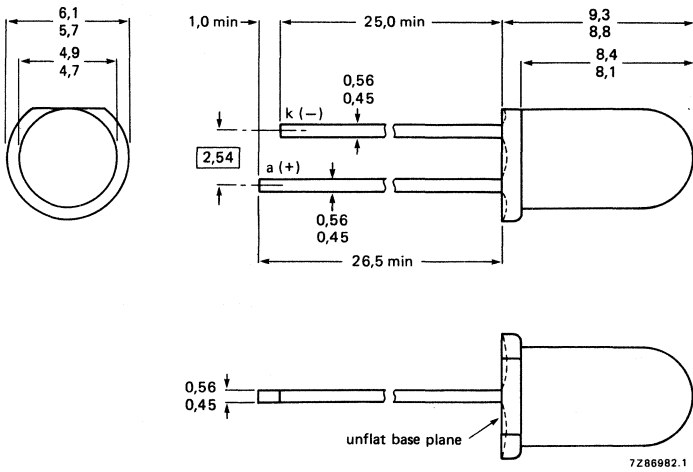


Fig. 1b SOD-63L.
CQY96L



→ 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; $t_p = 1 \mu s$; $f = 300 \text{ Hz}$ peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max. max.	1 A 60 mA
Total power dissipation up to $T_{amb} = 65 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature at $t_{sld} < 7 \text{ s}$ > 1,5 mm from the seating plane for CQY96 > 5 mm from the plastic body for CQY96L	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

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

$T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage $I_F = 10 \text{ mA}$	V_F	typ. max.	2,1 V 3 V
Reverse current $V_R = 5 \text{ V}$	I_R	max.	100 μA
Diode capacitance $V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF ←
Luminous intensity (on-axis) $I_F = 10 \text{ mA}$	CQY96(L) I_v CQY96(L)-3 I_v CQY96(L)-4 I_v CQY96(L)-5 I_v	min.	0,7 mcd 1,6 to 3,5 mcd 3,0 to 7,0 mcd 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 $^\circ$ ←

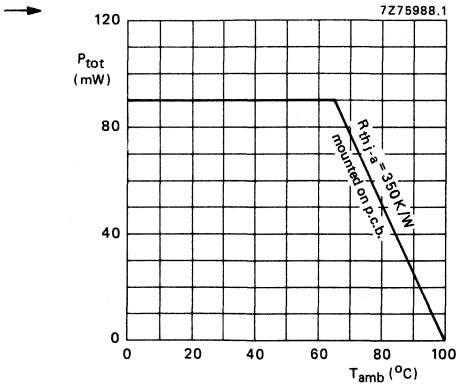


Fig. 2.

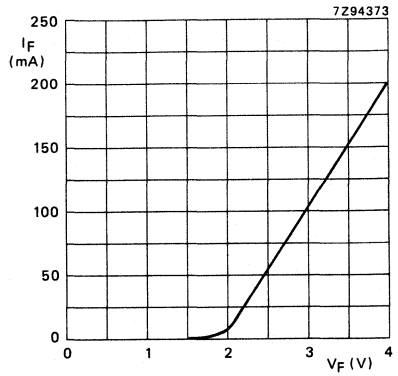


Fig. 3 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

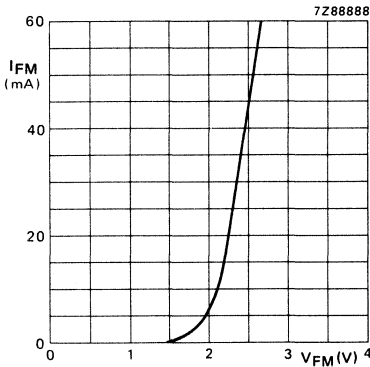


Fig. 4 $t_{on} = 1 \text{ ms}$; $\delta = 0,33$;
 $T_{amb} = 25 \text{ }^\circ\text{C}$; typ. values.

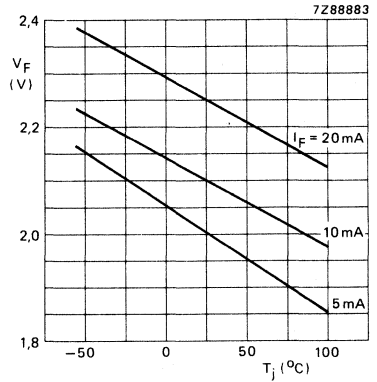


Fig. 5 Typical values.

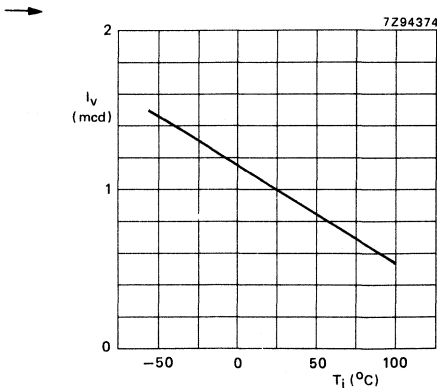


Fig. 6 Typical values.

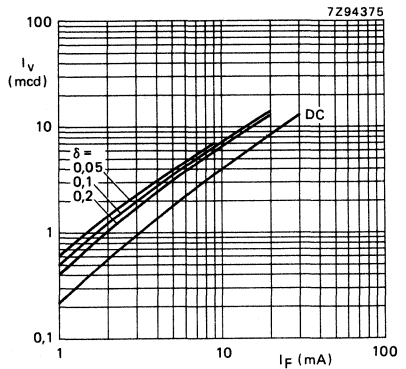


Fig. 7 $t_p = 50 \text{ } \mu\text{s}$.

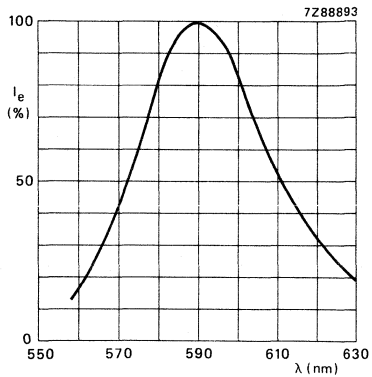


Fig. 8 Typical values.

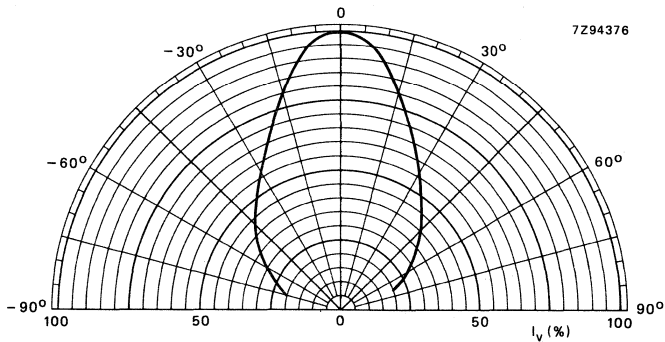


Fig. 9 Typical values.



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.

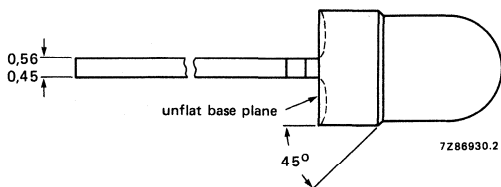
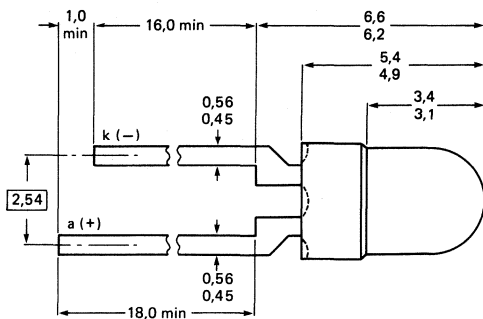
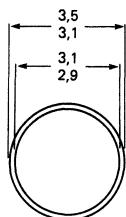
QUICK REFERENCE DATA

Continuous reverse voltage		V_R	max.	5 V
Forward current (d.c.)		I_F	max.	30 mA
Total power dissipation up to $T_{amb} = 55\text{ }^\circ\text{C}$		P_{tot}	max.	90 mW
Junction temperature		T_j	max.	100 $^\circ\text{C}$
Luminous intensity				
$I_F = 10\text{ mA}$	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				
$I_F = 10\text{ mA}$		λ_p	typ.	590 nm
Beamwidth at half-intensity directions		$\theta_{1/2}$	typ.	70 $^\circ$ ←

MECHANICAL DATA

Fig. 1 SOD-53E.

Dimensions in mm



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, $t_p = 1 \mu\text{s}$; $f = 300 \text{ Hz}$		max.	1 A
peak value; $t_{on} = 1 \text{ ms}$; $\delta = 0,33$	I_{FRM}	max.	60 mA
Total power dissipation up to $T_{amb} = 55 \text{ }^\circ\text{C}$	P_{tot}	max.	90 mW
Storage temperature	T_{stg}		-55 to +100 $^\circ\text{C}$
Junction temperature	T_j	max.	100 $^\circ\text{C}$
Lead soldering temperature			
> 1,5 mm from the seating plane; $t_{sld} < 7 \text{ s}$	T_{sld}	max.	260 $^\circ\text{C}$

THERMAL RESISTANCE

From junction to ambient when the device is mounted on a p.c. board	$R_{th \text{ j-a}}$	max.	500 K/W
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CHARACTERISTICS $T_j = 25 \text{ }^\circ\text{C}$ unless otherwise specified

Forward voltage				
$I_F = 10 \text{ mA}$	V_F	typ.	2,1 V	
		max.	3,0 V	
Reverse current				
$V_R = 5 \text{ V}$	I_R	max.	100 μA	
Beamwidth between half-intensity directions				
$I_F = 10 \text{ mA}$	$\theta_{1/2}$	typ.	70 $^\circ$	←
Bandwidth at half height	$\Delta\lambda$	typ.	40 nm	
Wavelength at peak emission				
$I_F = 10 \text{ mA}$	λ_p	typ.	590 nm	
Luminous intensity (class division)				
$I_F = 10 \text{ mA}$				
	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				
$V_R = 0$; $f = 1 \text{ MHz}$	C_d	typ.	15 pF	←

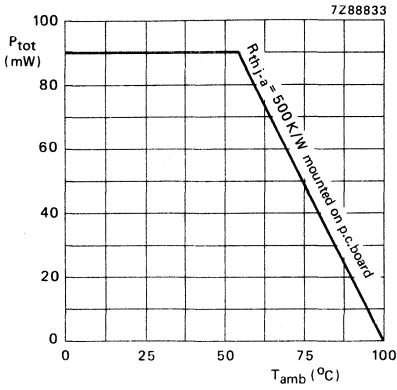


Fig. 2.

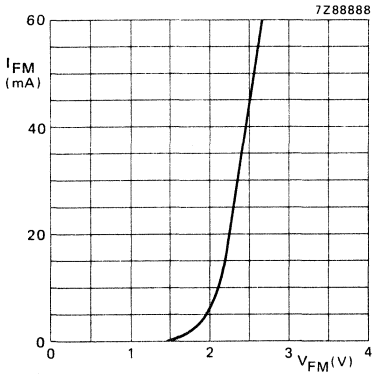


Fig. 4 $t_p = 50 \mu s$; $\delta = 0,01$;
 $T_{amb} = 25^{\circ}C$; typ. values.

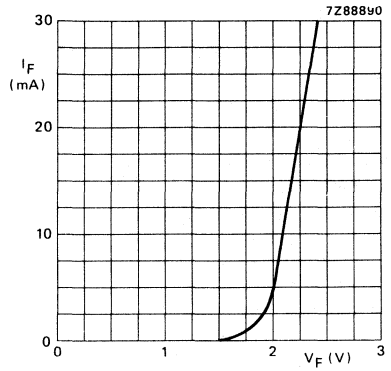


Fig. 3 $T_j = 25^{\circ}C$; typ. values.

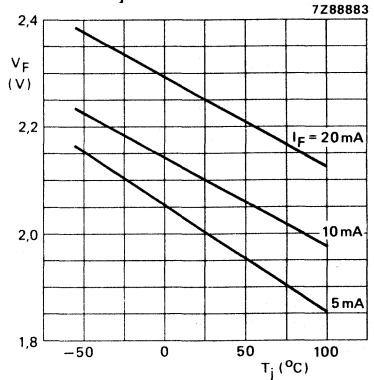


Fig. 5 Typical values.

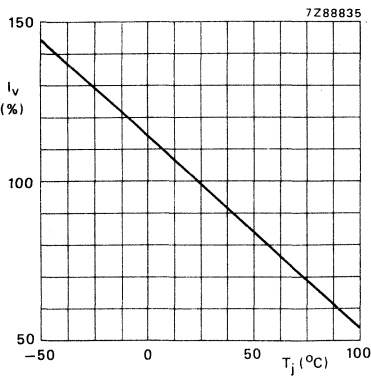


Fig. 6 Typical values.

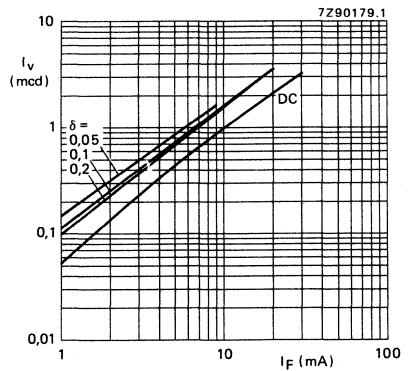


Fig. 7 $T_j = 25^{\circ}C$, typ. values.

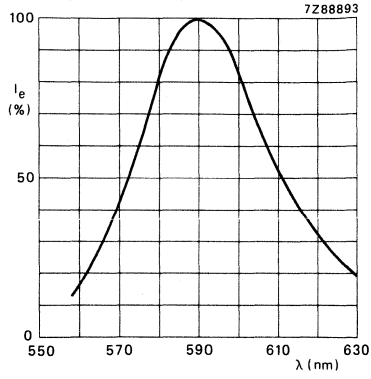


Fig. 8 Typical values.

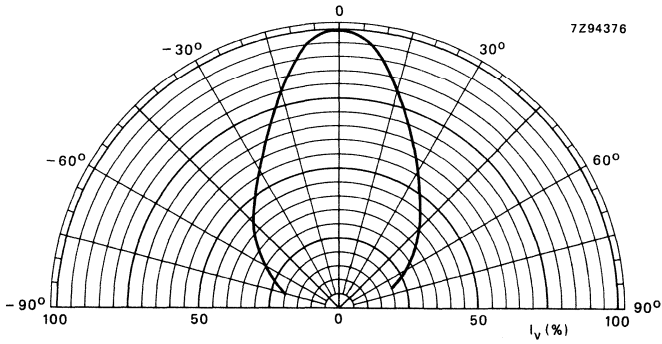


Fig. 9 Typical values.

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV103	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAW56	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAW62	S1	SD
BA315	S1	Vrg	BAS56	S1/S7	SD/Mm	BAX12	S1	SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAX14	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX18	S1	SD
BA318	S1	SD	BAT54	S1/S7	SD/Mm	BAX80	S1	SD
BA423	S1	T	BAT74	S1/S7	SD/Mm	BB112	S1	T
BA480	S1	T	BAT81	S1	T	BB119	S1	T
BA481	S1	T	BAT82	S1	T	BB130	S1	T
BA482	S1	T	BAT83	S1	T	BB204B	S1	T
BA483	S1	T	BAT85	S1	T	BB204G	S1	T
BA484	S1	T	BAT86	S1	T	BB212	S1	T
BA682	S1/S7	T/Mm	BAV10	S1	SD	BB215	S7	Mm
BA683	S1/S7	T/Mm	BAV18	S1	SD	BB219	S7	Mm
BAS11	S1	SD	BAV19	S1	SD	BB405B	S1	T
BAS15	S1	SD	BAV20	S1	SD	BB417	S1	T
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB809	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BB909A	S1	T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BB909B	S1	T
BAS20	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BBY31	S7/S1	Mm/T
BAS21	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD	BBY40	S7/S1	Mm/T
BAS28	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD	BC107	S3	Sm

Mm = Microminiature semiconductors
for hybrid circuits

SD = Small-signal diodes

Sm = Small-signal transistors

Sp = Special diodes

T = Tuner diodes

Vrg = Voltage regulator diodes

INDEX

type no.	book	section	type no.	book	section	type no.	book	section
BC108	S3	Sm	BC808	S7	Mm	BCX17;R	S7	Mm
BC109	S3	Sm	BC817	S7	Mm	BCX18;R	S7	Mm
BC140	S3	Sm	BC818	S7	Mm	BCX19;R	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX20;R	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX51	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX52	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX53	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX54	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX55	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX56	S7	Mm
BC200	S3	Sm	BC858	S7	Mm	BCX68	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX69	S7	nm
BC264B	S5	FET	BC860	S7	Mm	BCX70*	S7	Mm
BC264C	S5	FET	BC868	S7	Mm	BCX71*	S7	Mm
BC264D	S5	FET	BC869	S7	Mm	BCY56	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY57	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY58	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY59	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY70	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY71	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY72	S3	Sm
BC375	S3	Sm	BCV26	S7	Mm	BCY78	S3	Sm
BC376	S3	Sm	BCV27	S7	Mm	BCY79	S3	Sm
BC546	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC547	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC548	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC549	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC550	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC556	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC557	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC558	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC559	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC560	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC635	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC636	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC637	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC638	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P
BC639	S3	Sm	BCW72;R	S7	Mm	BD204	S4a	P
BC640	S3	Sm	BCW81;R	S7	Mm	BD226	S4a	P
BC807	S7	Mm	BCW89;R	S7	Mm	BD227	S4a	P

* = series

FET = Field-effect transistors

Mm = Microminiature semiconductors
for hybrid circuits

P = Low-frequency power transistors

Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BD228	S4a	P	BD335	S4a	P	BD839	S4a	P
BD229	S4a	P	BD336	S4a	P	BD840	S4a	P
BD230	S4a	P	BD337	S4a	P	BD841	S4a	P
BD231	S4a	P	BD338	S4a	P	BD842	S4a	P
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BDT20	S4a	P
BD332	S4a	P	BD828	S4a	P	BDT21	S4a	P
BD333	S4a	P	BD829	S4a	P	BDT29	S4a	P
BD334	S4a	P	BD830	S4a	P	BDT29A	S4a	P

P = Low-frequency power transistors

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type no.	book	section	type no.	book	section	type no.	book	section
BDT29B	S4a	P	BDT62B	S4a	P	BDV67A	S4a	P
BDT29C	S4a	P	BDT62C	S4a	P	BDV67B	S4a	P
BDT30	S4a	P	BDT63	S4a	P	BDV67C	S4a	P
BDT30A	S4a	P	BDT63A	S4a	P	BDV67D	S4a	P
BDT30B	S4a	P	BDT63B	S4a	P	BDV91	S4a	P
BDT30C	S4a	P	BDT63C	S4a	P	BDV92	S4a	P
BDT31	S4a	P	BDT64	S4a	P	BDV93	S4a	P
BDT31A	S4a	P	BDT64A	S4a	P	BDV94	S4a	P
BDT31B	S4a	P	BDT64B	S4a	P	BDV95	S4a	P
BDT31C	S4a	P	BDT64C	S4a	P	BDV96	S4a	P
BDT32	S4a	P	BDT65	S4a	P	BDW55	S4a	P
BDT32A	S4a	P	BDT65A	S4a	P	BDW56	S4a	P
BDT32B	S4a	P	BDT65B	S4a	P	BDW57	S4a	P
BDT32C	S4a	P	BDT65C	S4a	P	BDW58	S4a	P
BDT41	S4a	P	BDT81	S4a	P	BDW59	S4a	P
BDT41A	S4a	P	BDT82	S4a	P	BDW60	S4a	P
BDT41B	S4a	P	BDT83	S4a	P	BDX35	S4a	P
BDT41C	S4a	P	BDT84	S4a	P	BDX36	S4a	P
BDT42	S4a	P	BDT85	S4a	P	BDX37	S4a	P
BDT42A	S4a	P	BDT86	S4a	P	BDX42	S4a	P
BDT42B	S4a	P	BDT87	S4a	P	BDX43	S4a	P
BDT42C	S4a	P	BDT88	S4a	P	BDX44	S4a	P
BDT51	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT52	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT53	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT54	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT55	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT56	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT57	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT58	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT60	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT60A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT60B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT60C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT61	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT61A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT61B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P
BDT61C	S4a	P	BDV66B	S4a	P	BDX65	S4a	P
BDT62	S4a	P	BDV66C	S4a	P	BDX65A	S4a	P
BDT62A	S4a	P	BDV66D	S4a	P	BDX65B	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX65C	S4a	P	BF256B	S5	FET	BF593	S4b	HVP
BDX66	S4a	P	BF256C	S5	FET	BF620	S7	Mm
BDX66A	S4a	P	BF324	S3	Sm	BF621	S7	Mm
BDX66B	S4a	P	BF370	S3	Sm	BF622	S7	Mm
BDX66C	S4a	P	BF410A	S5	FET	BF623	S7	Mm
BDX67	S4a	P	BF410B	S5	FET	BF660;R	S7	Mm
BDX67A	S4a	P	BF410C	S5	FET	BF689K	S10	WBT
BDX67B	S4a	P	BF410D	S5	FET	BF763	S10	WBT
BDX67C	S4a	P	BF419	S4b	HVP	BF767	S7	Mm
BDX68	S4a	P	BF420	S3	Sm	BF819	S4b	HVP
BDX68A	S4a	P	BF421	S3	Sm	BF820	S7	Mm
BDX68B	S4a	P	BF422	S3	Sm	BF821	S7	Mm
BDX68C	S4a	P	BF423	S3	Sm	BF822	S7	Mm
BDX69	S4a	P	BF450	S3	Sm	BF823	S7	Mm
BDX69A	S4a	P	BF451	S3	Sm	BF824	S7	Mm
BDX69B	S4a	P	BF457	S4b	HVP	BF840	S7	Mm
BDX69C	S4a	P	BF458	S4b	HVP	BF841	S7	Mm
BDX77	S4a	P	BF459	S4b	HVP	BF857	S4b	HVP
BDX78	S4a	P	BF469	S4b	HVP	BF858	S4b	HVP
BDX91	S4a	P	BF470	S4b	HVP	BF859	S4b	HVP
BDX92	S4a	P	BF471	S4b	HVP	BF869	S4b	HVP
BDX93	S4a	P	BF472	S4b	HVP	BF870	S4b	HVP
BDX94	S4a	P	BF483	S3	Sm	BF871	S4b	HVP
BDX95	S4a	P	BF485	S3	Sm	BF872	S4b	HVP
BDX96	S4a	P	BF487	S3	Sm	BF926	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF936	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF939	S3	Sm
BDY91	S4a	P	BF496	S3	Sm	BF960	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF964	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF966	S5	FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF967	S3	Sm
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF970	S3	Sm
BF241	S3	Sm	BF536	S7	Mm	BF979	S3	Sm
BF245A	S5	FET	BF550;R	S7	Mm	BF980	S5	FET
BF245B	S5	FET	BF569	S7	Mm	BF981	S5	FET
BF245C	S5	FET	BF579	S7	Mm	BF982	S5	FET
BF247A	S5	FET	BF583	S4b	HVP	BF989	S7/S5	Mm/FET
BF247B	S5	FET	BF585	S4b	HVP	BF990	S7/S5	Mm/FET
BF247C	S5	FET	BF587	S4b	HVP	BF991	S7/S5	Mm/FET
BF256A	S5	FET	BF591	S4b	HVP	BF992	S7/S5	Mm/FET

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

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type no.	book	section	type no.	book	section	type no.	book	section
BF994	S7/S5	Mm/FET	BFQ63	S10	WBT	BFT46	S7/S5	Mm/FET
BF996	S7/S5	Mm/FET	BFQ65	S10	WBT	BFT92;R	S7	Mm
BFG23	S10	WBT	BFQ66	S10	WBT	BFT93;R	S7	Mm
BFG32	S10	WBT	BFQ67	S7	Mm	BFW10	S5	FET
BFG34	S10	WBT	BFQ68	S10	WBT	BFW11	S5	FET
BFG51	S10	WBT	BFQ136	S10	WBT	BFW12	S5	FET
BFG65	S10	WBT	BFR29	S5	FET	BFW13	S5	FET
BFG67	S7	Mm	BFR30	S7/S5	Mm/FET	BFW16A	S10	WBT
BFG90A	S10	WBT	BFR31	S7/S5	Mm/FET	BFW17A	S10	WBT
BFG91A	S10	WBT	BFR49	S10	WBT	BFW30	S10	WBT
BFG96	S10	WBT	BFR53;R	S7	Mm	BFW61	S5	FET
BFP90A	S10	WBT	BFR54	S3	Sm	BFW92	S10	WBT
BFP91A	S10	WBT	BFR64	S10	WBT	BFW92A	S10	WBT
BFP96	S10	WBT	BFR65	S10	WBT	BFW93	S10	WBT
BFQ10	S5	FET	BFR84	S5	FET	BFX29	S3	Sm
BFQ11	S5	FET	BFR90	S10	WBT	BFX30	S3	Sm
BFQ12	S5	FET	BFR90A	S10	WBT	BFX34	S3	Sm
BFQ13	S5	FET	BFR91	S10	WBT	BFX84	S3	Sm
BFQ14	S5	FET	BFR91A	S10	WBT	BFX85	S3	Sm
BFQ15	S5	FET	BFR92;R	S7	Mm	BFX86	S3	Sm
BFQ16	S5	FET	BFR92A;R	S7	Mm	BFX87	S3	Sm
BFQ17	S7	Mm	BFR93;R	S7	Mm	BFX88	S3	Sm
BFQ18A	S7	Mm	BFR93A;R	S7	Mm	BFX89	S10	WBT
BFQ19	S7	Mm	BFR94	S10	WBT	BFY50	S3	Sm
BFQ22S	S10	WBT	BFR95	S10	WBT	BFY51	S3	Sm
BFQ23	S10	WBT	BFR96	S10	WBT	BFY52	S3	Sm
BFQ23C	S10	WBT	BFR96S	S10	WBT	BFY55	S3	Sm
BFQ24	S10	WBT	BFR101A;B	S7/S5	Mm/FET	BFY90	S10	WBT
BFQ32	S10	WBT	BFS17;R	S7	Mm	BG2000	S1	RT
BFQ32C	S10	WBT	BFS18;R	S7	Mm	BG2097	S1	RT
BFQ32S	S10	WBT	BFS19;R	S7	Mm	BGD102	S10	WBM
BFQ33	S10	WBT	BFS20;R	S7	Mm	BGD102E	S10	WBM
BFQ34	S10	WBT	BFS21	S5	FET	BGD104	S10	WBM
BFQ34T	S10	WBT	BFS21A	S5	FET	BGD104E	S10	WBM
BFQ42	S6	RFP	BFS22A	S6	RFP	BGX11*	S2b	ThM
BFQ43	S6	RFP	BFS23A	S6	RFP	BGX12*	S2b	ThM
BFQ51	S10	WBT	BFT24	S10	WBT	BGX13*	S2b	ThM
BFQ51C	S10	WBT	BFT25;R	S7	Mm	JGX14*	S2b	ThM
BFQ52	S10	WBT	BFT44	S3	Sm	BGX15*	S2b	ThM
BFQ53	S10	WBT	BFT45	S3	Sm	BGX17*	S2b	ThM

* = 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

type no.	book	section	type no.	book	section	type no.	book	section
BGX25	S2a	ThM	BGY84A	S10	WBM	BLV95	S6	RFP
BGY22	S6	RFP	BGY85	S10	WBM	BLV96	S6	RFP
BGY22A	S6	RFP	BGY85A	S10	WBM	BLV97	S6	RFP
BGY23	S6	RFP	BGY93A	S6	RFP	BLV98	S6	RFP
BGY23A	S6	RFP	BGY93B	S6	RFP	BLV99	S6	RFP
BGY32	S6	RFP	BGY93C	S6	RFP	BLW29	S6	RFP
BGY33	S6	RFP	BLU20/12	S6	RFP	BLW31	S6	RFP
BGY35	S6	RFP	BLU30/12	S6	RFP	BLW32	S6	RFP
BGY36	S6	RFP	BLU45/12	S6	RFP	BLW33	S6	RFP
BGY4CA	S6	RFP	BLU50	S6	RFP	BLW34	S6	RFP
BGY40B	S6	RFP	BLU51	S6	RFP	BLW50F	S6	RFP
BGY41A	S6	RFP	BLU52	S6	RFP	BLW60	S6	RFP
BGY41B	S6	RFP	BLU53	S6	RFP	BLW60C	S6	RFP
BGY43	S6	RFP	BLU60/12	S6	RFP	BLW76	S6	RFP
BGY45A	S6	RFP	BLU97	S6	RFP	BLW77	S6	RFP
BGY45B	S6	RFP	BLU98	S6	RFP	BLW78	S6	RFP
BGY46A	S6	RFP	BLU99	S6	RFP	BLW79	S6	RFP
BGY46B	S6	RFP	BLV10	S6	RFP	BLW80	S6	RFP
BGY47	S6	RFP	BLV11	S6	RFP	BLW81	S6	RFP
BGY50	S10	WBM	BLV20	S6	RFP	BLW82	S6	RFP
BGY51	S10	WBM	BLV21	S6	RFP	BLW83	S6	RFP
BGY52	S10	WBM	BLV25	S6	RFP	BLW84	S6	RFP
BGY53	S10	WBM	BLV30	S6	RFP	BLW85	S6	RFP
BGY54	S10	WBM	BLV30/12	S6	RFP	BLW86	S6	RFP
BGY55	S10	WBM	BLV31	S6	RFP	BLW87	S6	RFP
BGY56	S10	WBM	BLV32F	S6	RFP	BLW89	S6	RFP
BGY57	S10	WBM	BLV33	S6	RFP	BLW90	S6	RFP
BGY58	S10	WBM	BLV33F	S6	RFP	BLW91	S6	RFP
BGY58A	S10	WBM	BLV36	S6	RFP	BLW95	S6	RFP
BGY59	S10	WBM	BLV37	S6	RFP	BLW96	S6	RFP
BGY60	S10	WBM	BLV45/12	S6	RFP	BLW97	S6	RFP
BGY61	S10	WBM	BLV57	S6	RFP	BLW98	S6	RFP
BGY65	S10	WBM	BLV59	S6	RFP	BLW99	S6	RFP
BGY67	S10	WBM	BLV75/12	S6	RFP	BLX13	S6	RFP
BGY67A	S10	WBM	BLW80/28	S6	RFP	BLX13C	S6	RFP
BGY70	S10	WBM	BLV90	S6	RFP	BLX14	S6	RFP
BGY71	S10	WBM	BLV91	S6	RFP	BLX15	S6	RFP
BGY74	S10	WBM	BLV92	S6	RFP	BLX39	S6	RFP
BGY75	S10	WBM	BLV93	S6	RFP	BLX65	S6	RFP
BGY84	S10	WBM	BLV94	S6	RFP	BLX65E	S6	RFP

* = series

RFP = R.F. power transistors and modules

ThM = Thyristor modules

WBM = Wideband hybrid IC modules

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type no.	book	section	type no.	book	section	type no.	book	section
BLX67	S6	RFP	BPX71	S8b	PDT	BSR56	S7/S5	Mm/FET
BLX68	S6	RFP	BPX72	S8b	PDT	BSR57	S7/S5	Mm/FET
BLX69A	S6	RFP	BR100/03	S2b	Th	BSR58	S7/S5	Mm/FET
BLX91A	S6	RFP	BR101	S3	Sm	BSR60	S3	Sm
BLX91CB	S6	RFP	BRY39	S3	Sm	BSR61	S3	Sm
BLX92A	S6	RFP	BRY56	S3	Sm	BSR62	S3	Sm
BLX93A	S6	RFP	BRY61	S7	Mm	BSS38	S3	Sm
BLX94A	S6	RFP	BRY62	S7	Mm	BSS50	S3	Sm
BLX94C	S6	RFP	BS107	S5	FET	BSS51	S3	Sm
BLX95	S6	RFP	BS170	S5	FET	BSS52	S3	Sm
BLX96	S6	RFP	BSD10	S5	FET	BSS60	S3	Sm
BLX97	S6	RFP	BSD12	S5	FET	BSS61	S3	Sm
BLX98	S6	RFP	BSD20	S5/7	FET	BSS62	S3	Sm
BLY85	S6	RFP	BSD22	S5/7	FET	BSS63;R	S7	Mm
BLY87A	S6	RFP	BSD212	S5	FET	BSS64;R	S7	Mm
BLY87C	S6	RFP	BSD213	S5	FET	BSS68	S3	Sm
BLY88A	S6	RFP	BSD214	S5	FET	BSS83	S5/7	FET/Mm
BLY88C	S6	RFP	BSD215	S5	FET	BST15	S7	Mm
BLY89A	S6	RFP	BSR12;R	S7	Mm	BST16	S7	Mm
BLY89C	S6	RFP	BSR13;R	S7	Mm	BST39	S7	Mm
BLY90	S6	RFP	BSR14;R	S7	Mm	BST40	S7	Mm
BLY91A	S6	RFP	BSR15;R	S7	Mm	BST50	S7	Mm
BLY91C	S6	RFP	BSR16;R	S7	Mm	BST51	S7	Mm
BLY92A	S6	RFP	BSR17;R	S7	Mm	BST52	S7	Mm
BLY92C	S6	RFP	BSR17A;R	S7	Mm	BST60	S7	Mm
BLY93A	S6	RFP	BSR18;R	S7	Mm	BST61	S7	Mm
BLY93C	S6	RFP	BSR18A;R	S7	Mm	BST62	S7	Mm
BLY94	S6	RFP	BSR19; A	S7	Mm	BST70A	S5	FET
BLY97	S6	RFP	BSR20; A	S7	Mm	BST72A	S5	FET
BPF24	S8b	PDT	BSR30	S7	Mm	BST74A	S5	FET
BPW22A	S8a/b	PDT	BSR31	S7	Mm	BST76A	S5	FET
BPW50	S8a/b	PDT	BSR32	S7	Mm	BST78	S5	FET
BPW71	S8b	PDT	BSR33	S7	Mm	BST80	S5/S7	FET/Mm
BPX25	S8b	PDT	BSR40	S7	Mm	BST82	S5/S7	FET/Mm
BPX29	S8b	PDT	BSR41	S7	Mm	BST84	S5/S7	FET/Mm
BPX40	S8b	PDT	BSR42	S7	Mm	BST86	S5/S7	FET/Mm
BPX41	S8b	PDT	BSR43	S7	Mm	BST90	S5	FET
BPX42	S8b	PDT	BSR50	S3	Sm	BST97	S5	FET
BPX61	S8b	PDT	BSR51	S3	Sm	BST100	S5	FET
BPX61P	S8b	PDT	BSR52	S3	Sm	BST110	S5	FET

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

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type no.	book	section	type no.	book	section	type no.	book	section
BUZ31	S9	PM	BUZ84A	S9	PM	BYV22*	S2a	R
BUZ32	S9	PM	BY228	S1	R	BYV23*	S2a	R
BUZ33	S9	PM	BY229*	S2a	R	BYV24*	S2a	R
BUZ34	S9	PM	BY249*	S2a	R	BYV26*	S1	R
BUZ35	S9	PM	BY260*	S2a	R	BYV27*	S1/S2a	R
BUZ36	S9	PM	BY261*	S2a	R	BYV28*	S1/S2a	R
BUZ40	S9	PM	BY329*	S2a	R	BYV29*	S2a	R
BUZ41A	S9	PM	BY359*	S2a	R	BYV30*	S2a	R
BUZ42	S9	PM	BY438	S1	R	BYV32*	S2a	R
BUZ43	S9	PM	BY448	S1	R	BYV33*	S2a	R
BUZ44A	S9	PM	BY458	S1	R	BYV34*	S2a	R
BUZ45	S9	PM	BY505	S1	R	BYV36*	S1	R
BUZ45A	S9	PM	BY509	S1	R	BYV39*	S2a	R
BUZ45B	S9	PM	BY527	S1	R	BYV42*	S2a	R
BUZ45C	S9	PM	BY584	S1	R	BYV43*	S2a	R
BUZ46	S9	PM	BY588	S1	R	BYV72*	S2a	R
BUZ50A	S9	PM	BY609	S1	R	BYV73*	S2a	R
BUZ50B	S9	PM	BY610	S1	R	BYV79*	S2a	R
BUZ53A	S9	PM	BY614	S1	R	BYV92*	S2a	R
BUZ54	S9	PM	BY619	S1	R	BYV95A	S1	R
BUZ54A	S9	PM	BY620	S1	R	BYV95B	S1	R
BUZ60	S9	PM	BY707	S1	R	BYV95C	S1	R
BUZ60B	S9	PM	BY708	S1	R	BYV96D	S1	R
BUZ63	S9	PM	BY709	S1	R	BYV96E	S1	R
BUZ63B	S9	PM	BY710	S1	R	BYW25*	S2a	R
BUZ64	S9	PM	BY711	S1	R	BYW29*	S2a	R
BUZ71	S9	PM	BY712	S1	R	BYW30*	S2a	R
BUZ71A	S9	PM	BY713	S1	R	BYW31*	S2a	R
BUZ72	S9	PM	BY714	S1	R	BYW54	S1	R
BUZ72A	S9	PM	BYD13*	S1	R	BYW55	S1	R
BUZ73A	S9	PM	BYD33*	S1	R	BYW56	S1	R
BUZ74	S9	PM	BYD73*	S1	R	BYW92*	S2a	R
BUZ74A	S9	PM	BYM56*	S1	R	BYW93*	S2a	R
BUZ76	S9	PM	BYQ28*	S2a	R	BYW94*	S2a	R
BUZ76A	S9	PM	BYR29*	S2a	R	BYW95A	S1	R
BUZ80	S9	PM	BYT79*	S2a	R	BYW95B	S1	R
BUZ80A	S9	PM	BYV10	S1	R	BYW95C	S1	R
BUZ83	S9	PM	BYV19*	S2a	R	BYW96D	S1	R
BUZ83A	S9	PM	BYV20*	S2a	R	BYW96E	S1	R
BUZ84	S9	PM	BYV21*	S2a	R	BYX25*	S2a	R

* = series

PM = Power MOS transistors

R = Rectified diodes

type no.	book	section	type no.	book	section	type no.	book	section
BYX30*	S2a	R	BZX93	S1	Vrf	CNY57A	S8b	PhC
BYX32*	S2a	R	BZX94	S1	Vrf	CNY57U	S8b	PhC
BYX38*	S2a	R	BZY91*	S2a	Vrg	CNY57AU	S8b	PhC
BYX39*	S2a	R	BZY93*	S2a	Vrg	CNY62	S8b	PhC
BYX42*	S2a	R	BZY95*	S2a	Vrg	CNY63	S8b	PhC
BYX46*	S2a	R	BZY96*	S2a	Vrg	CQF24	S8b	Ph
BYX50*	S2a	R	CFX13	S11	M	CQL10A	S8b	Ph
BYX52*	S2a	R	CFX21	S11	M	CQL13A	S8b	Ph
BYX56*	S2a	R	CFX30	S11	M	CQL16	S8b	Ph
BYX90G	S1	R	CFX31	S11	M	CQS51L	S8a	LED
BYX94	S1	R	CFX32	S11	M	CQS54	S8a	LED
BYX96*	S2a	R	CFX33	S11	M	CQS82L	S8a	LED
BYX97*	S2a	R	CNG35	S8b	PhC	CQS82AL	S8a	LED
BYX98*	S2a	R	CNG36	S8b	PhC	CQS84L	S8a	LED
BYX99*	S2a	R	CNG39	S8b	PhC	CQS86L	S8a	LED
BZD23	S1	Vrg	CNR36	S8b	PhC	CQS93	S8a	LED
BZT03	S1	Vrg	CNR70	S8b	PhC	CQS93E	S8a	LED
BZV10	S1	Vrf	CNR71	S8b	PhC	CQS93L	S8a	LED
BZV11	S1	Vrf	CNX21	S8b	PhC	CQS95	S8a	LED
BZV12	S1	Vrf	CNX35	S8b	PhC	CQS95E	S8a	LED
BZV13	S1	Vrf	CNX35U	S8b	PhC	CQS95L	S8a	LED
BZV14	S1	Vrf	CNX36	S8b	PhC	CQS97	S8a	LED
BZV37	S1	Vrf	CNX36U	S8b	PhC	CQS97E	S8a	LED
BZV46	S1	Vrg	CNX37	S8b	PhC	CQS97L	S8a	LED
BZV49*	S1/S7	Vrg/Mm	CNX38	S8b	PhC	CQT10B	S8a	LED
BZV55*	S7	Mm	CNX38U	S8b	PhC	CQT24	S8a	LED
BZV85*	S1	Vrg	CNX39	S8b	PhC	CQT60	S8a	LED
BZW03*	S1	Vrg	CNX39U	S8b	PhC	CQT70	S8a	LED
BZW14	S1	Vrg	CNX44	S8b	PhC	CQT80L	S8a	LED
BZW70*	S2a	TS	CNX44A	S8b	PhC	CQV70(L)	S8a	LED
BZW86*	S2a	TS	CNX46	S8b	PhC	CQV70A(L)	S8a	LED
BZW91*	S2a	TS	CNX48	S8b	PhC	CQV70U(L)	S8a	LED
BZX55*	S1	Vrg	CNX48U	S8b	PhC	CQV71A(L)	S8a	LED
BZX70*	S2a	Vrg	CNX62	S8b	PhC	CQV72(L)	S8a	LED
BZX75*	S1	Vrg	CNX72	S8b	PhC	CQV80L	S8a	LED
BZX79*	S1	Vrg	CNX82	S8b	PhC	CQV80AL	S8a	LED
BZX84*	S7/S1	Mm/Vrg	CNX91	S8b	PhC	CQV80UL	S8a	LED
BZX90	S1	Vrf	CNX92	S8b	PhC	CQV81L	S8a	LED
BZX91	S1	Vrf	CNY50	S8b	PhC	CQV82L	S8a	LED
BZX92	S1	Vrf	CNY57	S8b	PhC	CQW10A(L)	S8a	LED

* = 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

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type no.	book	section	type no.	book	section	type no.	book	section
CQW10B(L)	S8a	LED	CQY96(L)	S8a	LED	LKE27010R	S11	M
CQW10U(L)	S8a	LED	CQY97A	S8a	LED	LKE27025R	S11	M
CQW11B(L)	S8a	LED	H11A1	S8b	PhC	LKE32002T	S11	M
CQW12B(L)	S8a	LED	H11A2	S8b	PhC	LKE32004T	S11	M
CQW20A	S8a	LED	H11A3	S8b	PhC	LTE42005S	S11	M
CQW21	S8a	LED	H11A4	S8b	PhC	LTE42008R	S11	M
CQW22	S8a	LED	KM210A	S13	SEN	LTE42012R	S11	M
CQW24(L)	S8a	LED	KM210B	S13	SEN	LV1721E50R	S11	M
CQW54	S8a	LED	KM210C	S13	SEN	LV2024E45R	S11	M
CQW60(L)	S8a	LED	KP100A	S13	SEN	LV2327E40R	S11	M
CQW60A(L)	S8a	LED	KP101A	S13	SEN	LV3742E16R	S11	M
CQW60U(L)	S8a	LED	KP220G	S13	SEN	LV3742E24R	S11	M
CQW61(L)	S8a	LED	KP221G	S13	SEN	LWE2015R	S11	M
CQW62(L)	S8a	LED	KTY81*	S13	SEN	LWE2025R	S11	M
CQW89A	S8a/b	I	KTY83*	S13	SEN	LZ1418E100RS11		M
CQW93	S8a	LED	KTY84*	S13	SEN	MCT2	S8b	PhC
CQW95	S8a	LED	LAE2001R	S11	M	MCT26	S8b	PhC
CQW97	S8a	LED	LAE4001Q	S11	M	MKB12040WS	S11	M
CQX24(L)	S8a	LED	LAE4001R	S11	M	MKB12100WS	S11	M
CQX51(L)	S8a	LED	LAE4002S	S11	M	MKB12140W	S11	M
CQX54(L)	S8a	LED	LAE6000Q	S11	M	MO6075B200ZS11		M
CQX54D	S8a	LED	LBE1004R	S11	M	MO6075B400ZS11		M
CQX64(L)	S8a	LED	LBE1010R	S11	M	MRB12175YR	S11	M
CQX64D	S8a	LED	LBE2003S	S11	M	MRB12350YR	S11	M
CQX74(L)	S8a	LED	LBE2005Q	S11	M	MS1011B700YS11		M
CQX74D	S8a	LED	LBE2008T	S11	M	MS6075B800ZS11		M
CQY11B	S8b	LED	LBE2009S	S11	M	MSB12900Y	S11	M
CQY11C	S8b	LED	LCE1010R	S11	M	MZ0912B75Y	S11	M
CQY24B(L)	S8a	LED	LCE2003S	S11	M	MZ0912B150YS11		M
CQY49B	S8b	LED	LCE2005Q	S11	M	OM286; M	S13	SEN
CQY49C	S8b	LED	LCE2008T	S11	M	OM287; M	S13	SEN
CQY50	S8b	LED	LCE2009S	S11	M	OM320	S10	WBM
CQY52	S8b	LED	LJE42002T	S11	M	OM321	S10	WBM
CQY52A	S8b	LED	LKE1004R	S11	M	OM322	S10	WBM
CQY52S	S8b	LED	LKE2002T	S11	M	OM323	S10	WBM
CQY54A	S8a	LED	LKE2004T	S11	M	OM323A	S10	WBM
CQY58A	S8a/b	I	LKE2015T	S11	M	OM335	S10	WBM
CQY89A	S8a/b	I	LKE21004R	S11	M	OM336	S10	WBM
CQY94B(L)	S8a	LED	LKE21015T	S11	M	OM337	S10	WBM
CQY95B	S8a	LED	LKE21050T	S11	M	OM337A	S10	WBM

* = series

LED = Light-emitting diodes

M = Microwave transistors

SEN = Sensors

WBM = Wideband hybrid IC modules

I = Infrared devices

PhC = Photocouplers

type no.	book	section	type no.	book	section	type no.	book	section
OM339	S10	WBM	PDE1003U	S11	M	PTB23005X	S11	M
OM345	S10	WBM	PDE1005U	S11	M	PTB32001X	S11	M
OM350	S10	WBM	PDE1010U	S11	M	PTB32003X	S11	M
OM360	S10	WBM	PEE1001U	S11	M	PTB32005X	S11	M
OM361	S10	WBM	PEE1003U	S11	M	PTB42001X	S11	M
OM370	S10	WBM	PEE1005U	S11	M	PTB42002X	S11	M
OM386B	S13	SEN	PEE1010U	S11	M	PTB42003X	S11	M
OM386M	S13	SEN	PH2222;R	S3	Sm	PV3742B4X	S11	M
OM387B	S13	SEN	PH2222A;R	S3	Sm	PVB42004X	S11	M
OM387M	S13	SEN	PH2369	S3	Sm	PZ1418B15U	S11	M
OM388B	S13	SEN	PH2907;R	S3	Sm	PZ1418B30U	S11	M
OM389B	S13	SEN	PH2907A;R	S3	Sm	PZ1721B12U	S11	M
OM931	S4a	P	PH2955T	S4a	P	PZ1721B25U	S11	M
OM961	S4a	P	PH3055T	S4a	P	PZ2024B10U	S11	M
OSB9110	S2a	St	PH5415	S3	Sm	PZ2024B20U	S11	M
OSB9115	S2a	St	PH5416	S3	Sm	PZB16035U	S11	M
OSB9210	S2a	St	PH13002	S4b	SP	PZB27020U	S11	M
OSB9215	S2a	St	PH13003	S4b	SP	RPY100	S8b	I
OSB9410	S2a	St	PHSD51	S2a	R	RPY101	S8b	I
OSB9415	S2a	St	PKB3001U	S11	M	RPY102	S8b	I
OSM9110	S2a	St	PKB3003U	S11	M	RPY103	S8b	I
OSM9115	S2a	St	PKB3005U	S11	M	RPY109	S8b	I
OSM9210	S2a	St	PKB12005U	S11	M	RV3135B5X	S11	M
OSM9215	S2a	St	PKB20010U	S11	M	RX1214B300YS11	M	M
OSM9410	S2a	St	PKB23001U	S11	M	RXB12350Y	S11	M
OSM9415	S2a	St	PKB23003U	S11	M	RZ1214B35Y	S11	M
OSM9510	S2a	St	PKB23005U	S11	M	RZ1214B60W	S11	M
OSM9511	S2a	St	PKB25006T	S11	M	RZ1214B65Y	S11	M
OSM9512	S2a	St	PKB32001U	S11	M	RZ1214B125WS11	M	M
OSS9110	S2a	St	PKB32003U	S11	M	RZ1214B125YS11	M	M
OSS9115	S2a	St	PKB32005U	S11	M	RZ1214B150YS11	M	M
OSS9210	S2a	St	PMBF4391	S7	Mm	RZ2833B45W	S11	M
OSS9215	S2a	St	PMBF4392	S7	Mm	RZ3135B15U	S11	M
OSS9410	S2a	St	PMBF4392	S7	Mm	RZ3135B15W	S11	M
OSS9415	S2a	St	PO44	S8b	PhC	RZ3135B25U	S11	M
P2105	S8b	I	PO44A	S8b	PhC	RZ3135B30W	S11	M
PBMF4391	S5	FET	PPC5001T	S11	M	RZB12100Y	S11	M
PBMF4392	S5	FET	PQC5001T	S11	M	RZB12350Y	S11	M
PBMF4393	S5	FET	PTB23001X	S11	M	RZZ1214B300YS11	M	M
PDE1001U	S11	M	PTB23003X	S11	M	TIP29*	S4a	P

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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

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type no.	book	section	type no.	book	section	type no.	book	section
TIP30*	S4a	P	1N829;A	S1	Vrf	1N6097	S2a	R
TIP31*	S4a	P	1N914	S1	SD	1N6098	S2a	R
TIP32*	S4a	P	1N916	S1	SD	2N918	S10	WBT
TIP33*	S4a	P	1N3879	S2a	R	2N929	S3	Sm
TIP34*	S4a	P	1N3880	S2a	R	2N930	S3	Sm
TIP41*	S4a	P	1N3881	S2a	R	2N1613	S3	Sm
TIP42*	S4a	P	1N3882	S2a	R	2N1711	S3	Sm
TIP47	S4a	P	1N3883	S2a	R	2N1893	S3	Sm
TIP48	S4a	P	1N3889	S2a	R	2N2219	S3	Sm
TIP49	S4a	P	1N3890	S2a	R	2N2219A	S3	Sm
TIP50	S4a	P	1N3891	S2a	R	2N2222	S3	Sm
TIP110	S4a	P	1N3892	S2a	R	2N2222A	S3	Sm
TIP111	S4a	P	1N3893	S2a	R	2N2297	S3	Sm
TIP112	S4a	P	1N3909	S2a	R	2N2368	S3	Sm
TIP115	S4a	P	1N3910	S2a	R	2N2369	S3	Sm
TIP116	S4a	P	1N3911	S2a	R	2N2369A	S3	Sm
TIP117	S4a	P	1N3912	S2a	R	2N2483	S3	Sm
TIP120	S4a	P	1N3913	S2a	R	2N2484	S3	Sm
TIP121	S4a	P	1N4001G	S1	R	2N2904	S3	Sm
TIP122	S4a	P	1N4002G	S1	R	2N2904A	S3	Sm
TIP125	S4a	P	1N4003G	S1	R	2N2905	S3	Sm
TIP126	S4a	P	1N4004G	S1	R	2N2905A	S3	Sm
TIP127	S4a	P	1N4005G	S1	R	2N2906	S3	Sm
TIP130	S4a	P	1N4006G	S1	R	2N2906A	S3	Sm
TIP131	S4a	P	1N4007G	S1	R	2N2907	S3	Sm
TIP132	S4a	P	1N4148	S1	SD	2N2907A	S3	Sm
TIP135	S4a	P	1N4150	S1	SD	2N3019	S3	Sm
TIP136	S4a	P	1N4151	S1	SD	2N3020	S3	Sm
TIP137	S4a	P	1N4153	S1	SD	2N3053	S3	Sm
TIP140	S4a	P	1N4446	S1	SD	2N3375	S6	RFP
TIP141	S4a	P	1N4448	S1	SD	2N3553	S6	RFP
TIP145	S4a	P	1N4531	S1	SD	2N3632	S6	RFP
TIP146	S4a	P	1N4532	S1	SD	2N3822	S5	FET
TIP147	S4a	P	1N5059	S1	R	2N3823	S5	FET
TIP2955	S4a	P	1N5060	S1	R	2N3866	S6	RFP
TIP3055	S4a	P	1N5061	S1	R	2N3903	S3	Sm
1N821;A	S1	Vrf	1N5062	S1	R	2N3904	S3	Sm
1N823;A	S1	Vrf	1N5832	S2a	R	2N3905	S3	Sm
1N825;A	S1	Vrf	1N5833	S2a	R	2N3906	S3	Sm
1N827;A	S1	Vrf	1N5834	S2a	R	2N3924	S6	RFP

* = 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

type no.	book	section	type no.	book	section	type no.	book	section
2N3926	S6	RFP	2N5401	S3	Sm	56339	S4b	A
2N3927	S6	RFP	2N5415	S3	Sm	56352	S4b	A
2N3966	S5	FET	2N5416	S3	Sm	56353	S4b	A
2N4030	S3	Sm	2N5550	S3	Sm	56354	S4b	A
2N4031	S3	Sm	2N5551	S3	Sm	56359b	S2,4b	A
2N4032	S3	Sm	2N6659	S5	FET	56359c	S2,4b	A
2N4033	S3	Sm	2N6660	S5	FET	56359d	S2,4b	A
2N4091	S5	FET	2N6661	S5	FET	56360a	S2,4b	A
2N4092	S5	FET	4N25	S8b	PhC	56363	S2,4b	A
2N4093	S5	FET	4N26	S8b	PhC	56364	S2,4b	A
2N4123	S3	Sm	4N27	S8b	PhC	56367	S2a/b	A
2N4124	S3	Sm	4N28	S8b	PhC	56368a	S2,4b	A
2N4125	S3	Sm	375CQY-B	S8b	Ph	56368b	S2,4b	A
2N4126	S3	Sm	502CQF	S8b	Ph	56369	S2,4b	A
2N4391	S5	FET	503CQF	S8b	Ph	56378	S2,4b	A
2N4392	S5	FET	504CQL	S8b	Ph	56379	S2,4b	A
2N4393	S5	FET	516CQF-B	S8b	Ph	56387a,b	S4b	A
2N4427	S6	RFP	56201d	S4b	A			
2N4856	S5	FET	56201j	S4b	A			
2N4857	S5	FET	56245	S3,10	A			
2N4858	S5	FET	56246	S3,10	A			
2N4859	S5	FET	56261a	S4b	A			
2N4860	S5	FET	56264a,b	S2a/b	A			
2N4861	S5	FET	56295	S2a/b	A			
2N5400	S3	Sm	56326	S4b	A			

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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