

# Transistors

## silicon p-n-p power transistors

book 1 parts 1  
and 2

Outline: TO-3

Type No.	Drawing reference	Maximum Ratings						$h_{FE}$		$f_T$		$V_{CE(sat)}$		$I_B$	Special Features
		$V_{CBO}$	$V_{CEO}$	$I_{CM}$	$I_{C(AV)}$	$T_j$	$P_{tot}$	min.	max.	min.	max.	at $I_C$	at $I_C$		
		(V)	(V)	(A)	(A)	(°C)	(W)			(MHz)	(V)	(A)	(A)		
BDX92 BDX94 BDX96	AR3	-60 -80 -100	-60 -80	12	8	200	90	20	-	3	4	-1.0	5	1	BDX91 BDX93 BDX95 } n-p-n complements

# Datasheet.L

## silicon r.f. amplifier low power transistors

Type No.	Outline	Drawing reference	$V_{CBO}$	$V_{CEO}$	$I_{CM}$	$I_{C(AV)}$	$T_j$	$P_{tot}$	$h_{FE}$		$f_T$	$V_{CE(sat)}$		Special Features
			(V)	(V)	(mA)	(mA)	(°C)	(mW)	min.	max.	min.	max.	(MHz)	
<b>N-P-N TYPES</b>														
BF115	TO-72	BA1	50	30	30	30	175	145	40	-	20	230*		
BF180	TO-72	BA2	30	20	20	20	175	150	-	-	-	675*	N < 9.5dB at 800MHz	
BF181	TO-72	BA2	30	20	20	20	175	150	-	-	-	600*	N = 6.8 dB typ. at 900MHz	
BF200	TO-72	BA2	30	20	20	20	175	150	15	-	3.0	270	Typ. $G_{UM}$ at 200 MHz = 22dB	
BF194 BF195	SOT-25	Y2	30	20	30	30	125	220	115* 67*	-	1.0	260* 200*	N = 4dB typ. at 100MHz	
BF196	SOT-25	Y2	40	30	25	25	125	250	27	-	4.0	400*	Typ. gain control range = 60dB	
BF197	SOT-25	Y2	40	25	25	25	125	250	38	-	7.0	550*	Typ. $G_{UM}$ at 45MHz = 41dB	
BF362 BF363	SOT-37	Z1	30	20	20	20	125	120	20	-	3.0	800* 600	N = 5dB typ. at 800MHz	
BF480	SOT-37	Z1	20	15	30	20	125	140	10	-	10	1600*	N = 3.3dB typ at 800 MHz	
BFT24	SOT-37	Z2	8	5	5	2.5	150	30	20	40*	1.0	1200	N = 3.8dB at 500MHz	
<b>P-N-P TYPES</b>														
BF324	TO-92	BB1	-30	-30	-	25	150	250	25	-	4.0	450*	N = 3dB typ at f = 100MHz	
BF450 BF451	TO-92	BB2	-40	-40	-	25	150	250	60 30	-	1.0	325*		

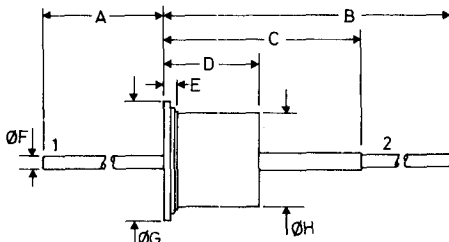
\*Typical

# OUTLINES and DIMENSIONS (millimetres)

**A**

B.S.3934 SO-16

DO-1  
DO-2  
DO-3

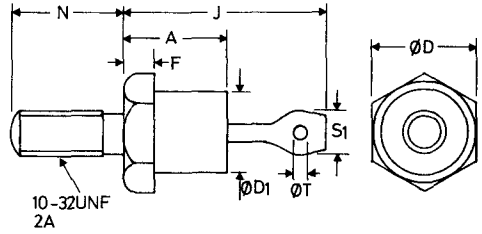


	1	2	A	B	C	D	E	ØF	ØG	ØH
	min.	min.	min.	min.	min.	max.	max.	max.	max.	max.
A1	a	k	35	51	17	7.7	1.6	1.1	9.6	7.1
A2	k	a	35	49	17	8.5	1.9	1.1	9.7	7.1
A3	k	a	35	51	17	7.7	1.6	1.1	9.6	7.1

**B**

B.S.3934 SO-10

DO-4



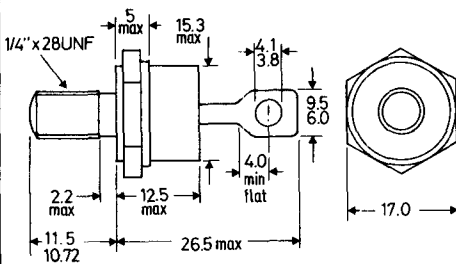
A	10.3 max.	J	20.3 max.
ØD	11.1 max.	N	11.5 max.
ØD1	9.3 max.	S1	4.8 max.
F	3.2	ØT	1.6 min.

	Stud	Eyelet
B1	k	a
B2	a	k

**C**

B.S.3934 SO-13

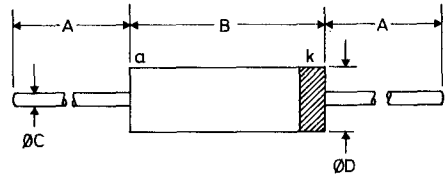
DO-5



	Stud	Eyelet
C1	k	a
C2	a	k

**D**

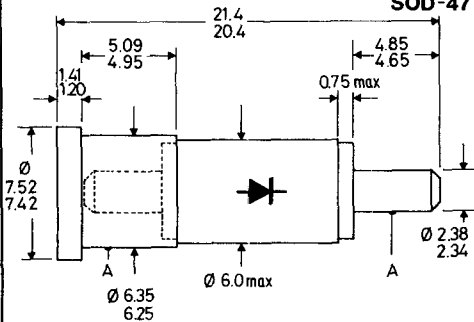
DO-7  
DO-14  
DO-15



		A	B	ØC	ØD
		min.	max.	nom.	max.
D1	DO-7	25.4	7.6	0.52	2.5
D2	DO-14	25.4	7.6	0.5	3.3
D3	DO-15	25.4	6.4	0.8	3.2

**E**

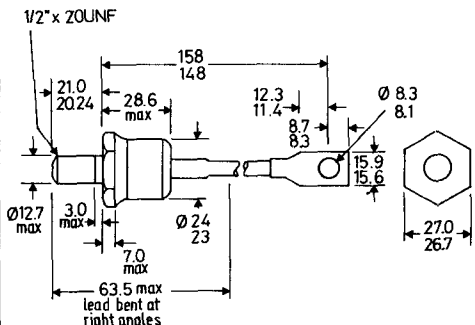
DO-22  
SOD-47



A = concentricity tolerance = ± 0.20

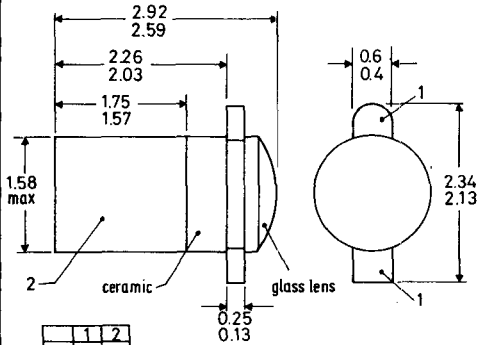
**F**

DO-30



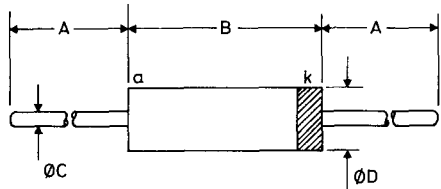
BZW86 Blue sleeve - anode to eyelet  
BZW86R Red sleeve - anode to stud

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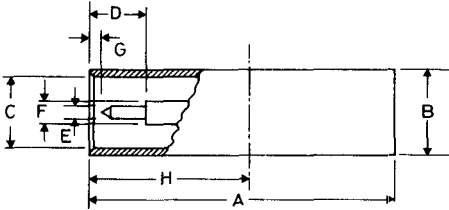
**G****DO-31**

	1	2
G1	k	a
G2	e	c

For LED's the overall length = 3.60/2.97

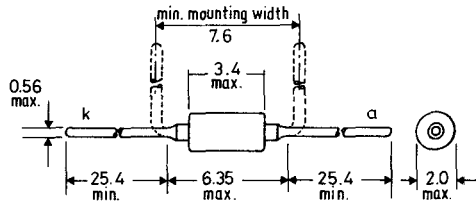
**H****DO-35**

A	B	ØC	ØD
min.	max.	max.	max.
25.4	4.25	0.56	1.85

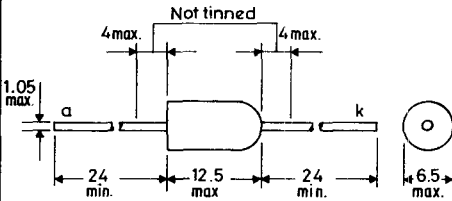
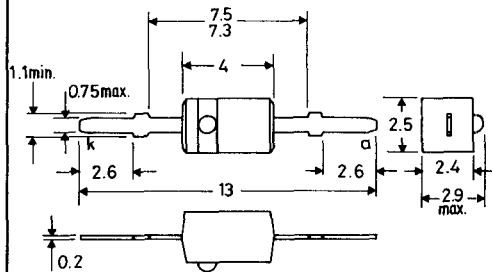
**J****DO-37  
SOD-49**

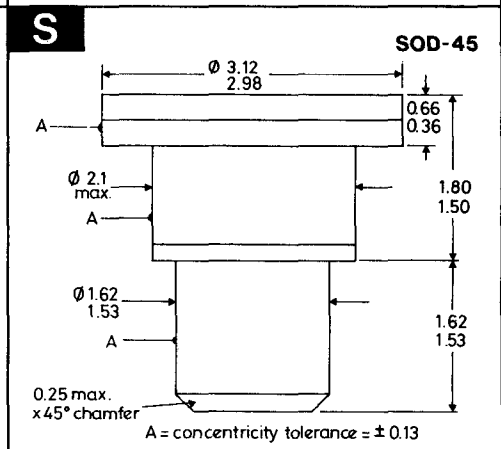
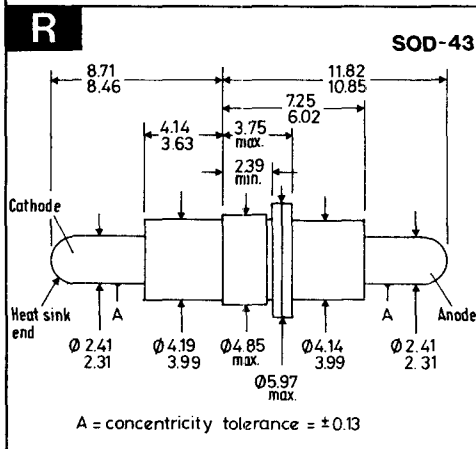
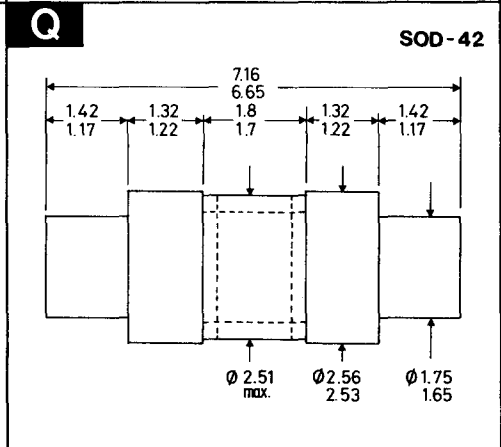
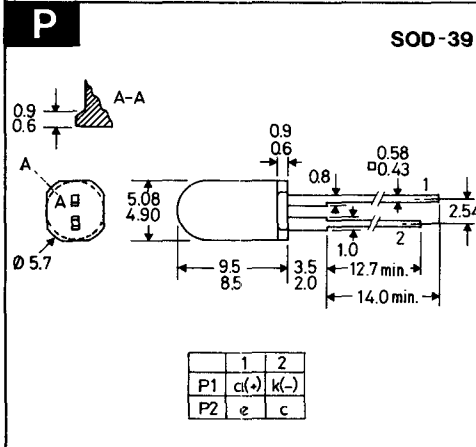
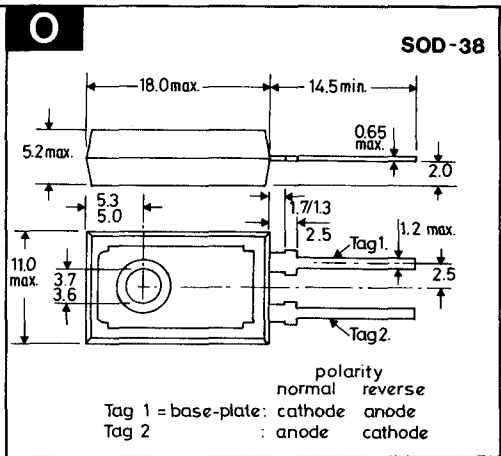
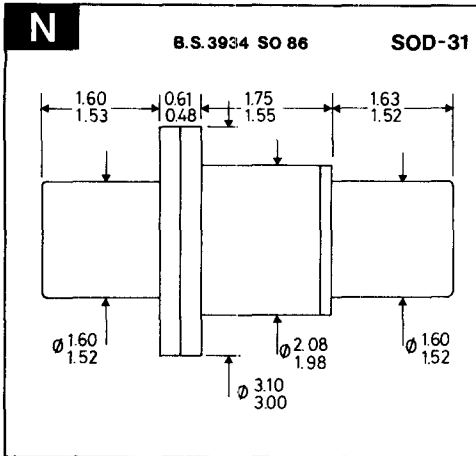
A	19.43/18.67	ØE	0.84/0.79
ØB*	5.59/5.49	ØF	1.57/1.52
ØC	4.80/4.72	G	0.71/0.15
D	3.73 min.	H	10.32 nom.

\*These tolerances apply only over H

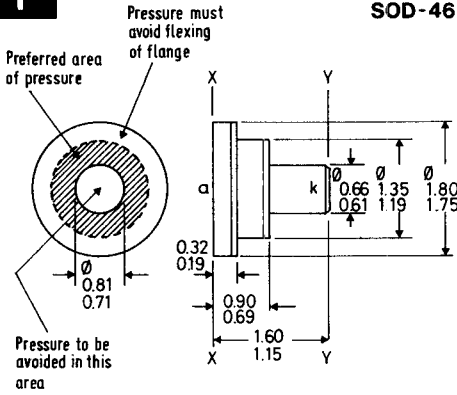
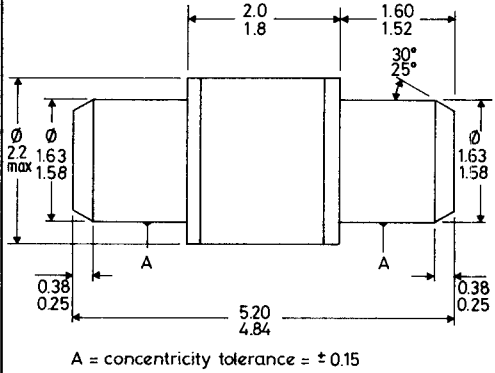
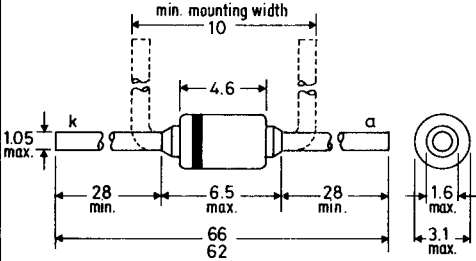
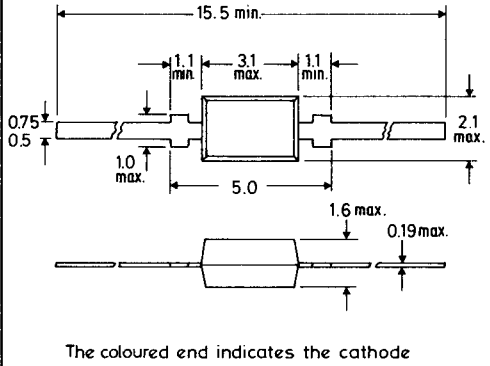
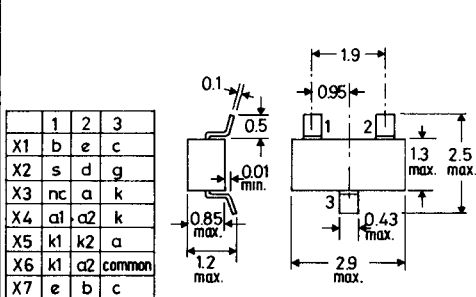
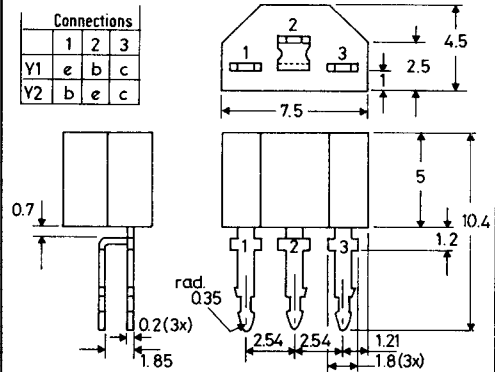
**K****SOD-17**

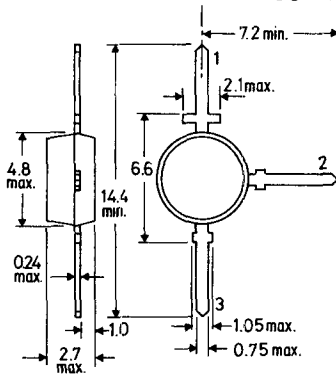
Cathode indicated by the broad band of colour code

**L****SOD-18****M****SOD-23**

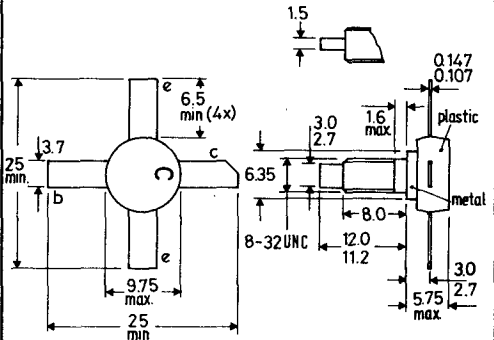
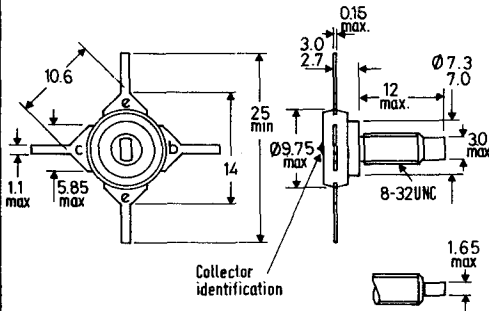
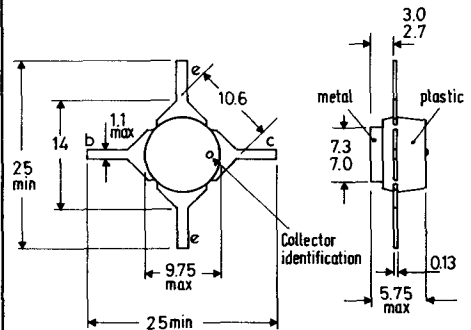
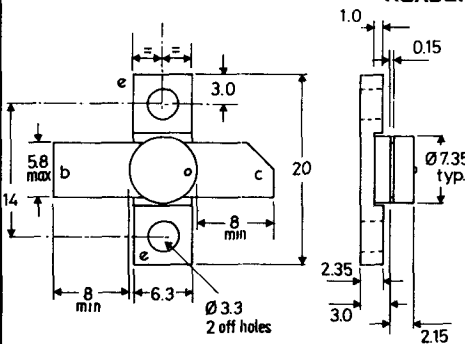
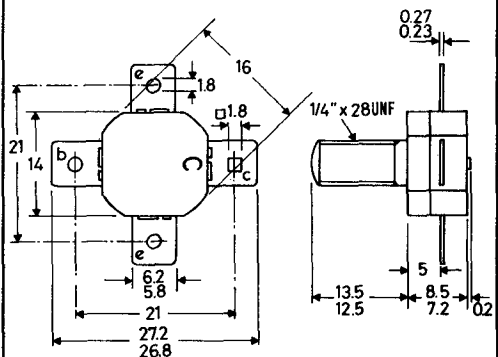


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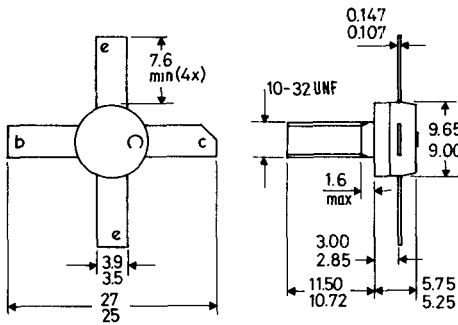
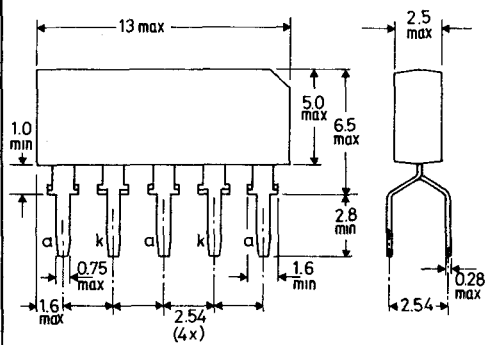
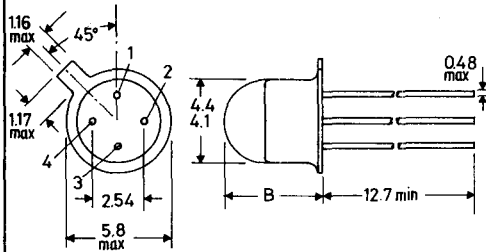
**T****SOD-46****U****SOD-50****V****SOD-51****W****SOD-52****X****SOT-23****Y****SOT-25**

**Z****SOT-37**

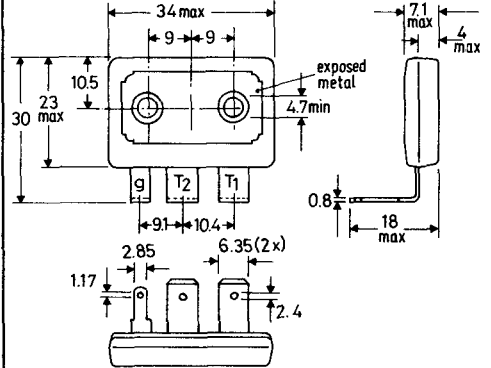
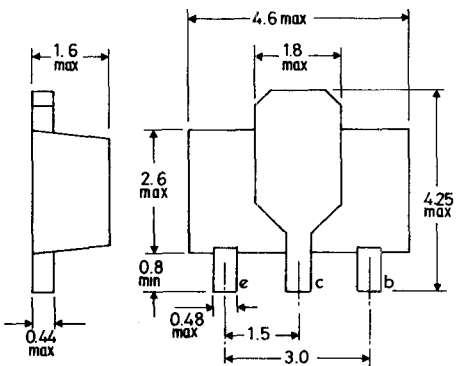
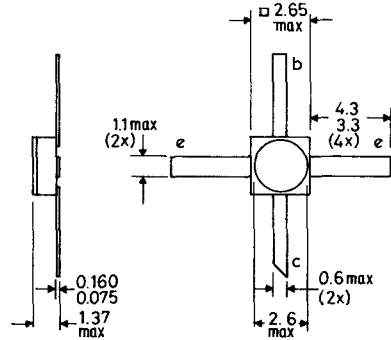
	1	2	3
Z1	c	b	e
Z2	c	e	b

**AC****SOT-48/2****AD****SOT-48/3****AE****SOT-48/4****AF****SOT-48  
HEADER****AG****SOT-55**

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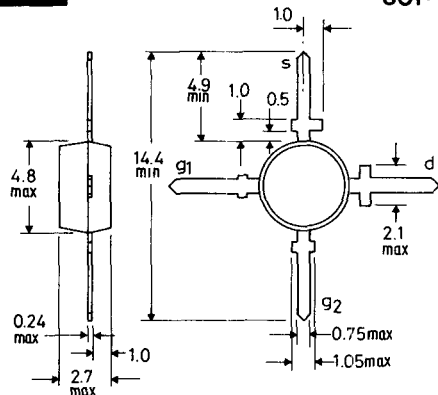
**AH****SOT-56****AJ****SOT-60****AK****SOT-70**

	1	2	3	4	B max
AK1	a	—	k	—	5.08
AK2	e	b	c	—	4.5
AK3	Vp	IP	GND	OP	5.08

**AL****SOT-80****AM****SOT-89****AN****SOT-100**

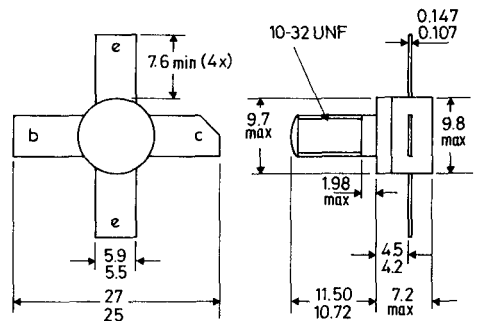
# AO

SOT-103



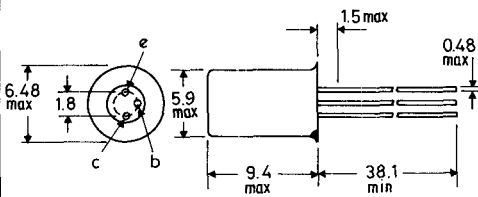
# AP

SOT-105



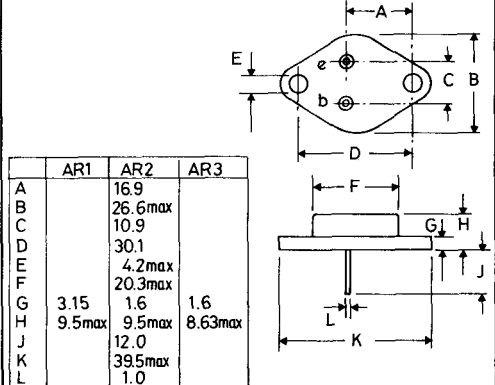
# AQ

B.S.3934 SO-21/SB3-10 TO-1



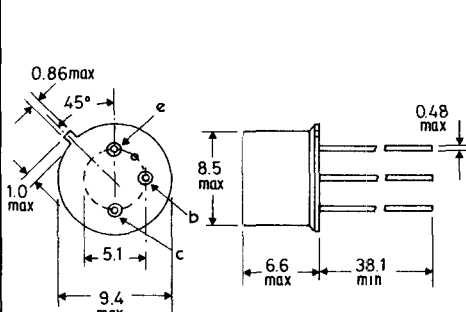
# AR

B.S.3934 SO-5B/SB2-2 TO-3



# AS

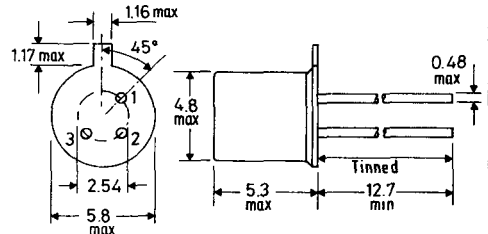
B.S.3934 SO-3/SB3-3B TO-5



AS1: collector connected to case  
AS2: base connected to case

# AT

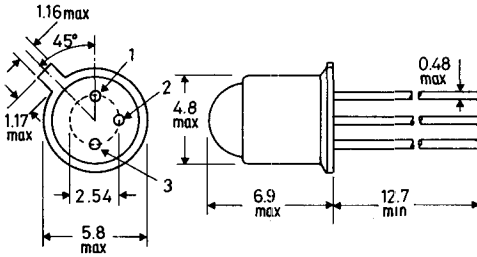
B.S.3934 SO-12A/SB3-6A TO-18



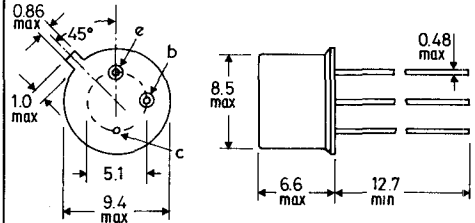
	1	2	3
AT1	e	b	c + env.
AT2	s	d	g + env.
AT3	d	g	s + env.
AT4	k	-	a
AT5	a	-	k
AT6	k	-	a

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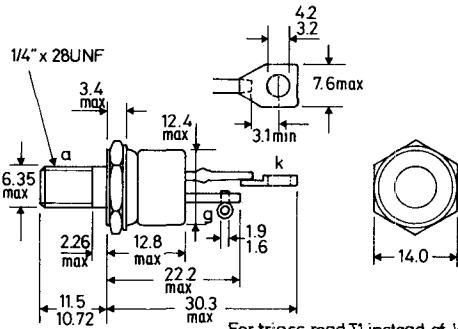
**AU****TO-18**  
(with lens)

	1	2	3
AU1	a	a	k
AU2	e	b	c+case
AU3	k	-	a

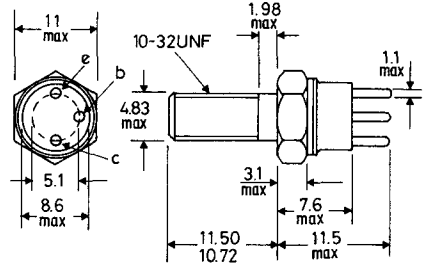
**AV****B.S.3934 SO-3/SB3-3A TO-39**

AV1: b+case  
 AV2: case isolated  
 AV3: c+case  
 AV4: e.cathode  
       b.gate  
       c.anode+case

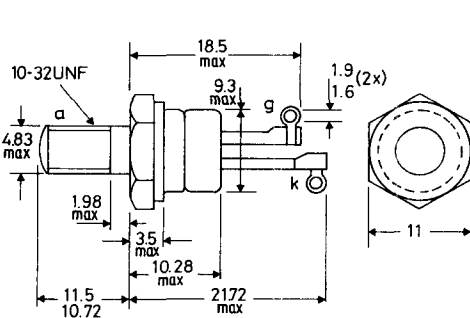
AV5: e.b. cell connections  
 c. metal case  
 AV6: red spot indicates  
       +ve connection

**AW****B.S.3932 SO-36 TO-48**

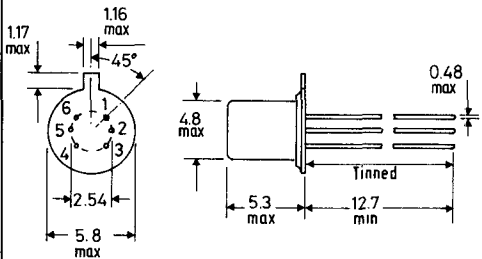
For triacs read T1 instead of k  
 T2 instead of a

**AX****TO-60**

Emitter connected to envelope

**AY****B.S.3934 SO-35A TO-64**

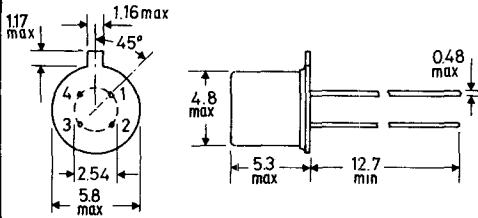
For triacs read T1 instead of k  
 T2 instead of a

**AZ****TO-71**

Pin	1	2	3	4	5	6
AZ1	e1	e2	c2	b2	b1	c1
AZ2	s1	d1	g1	s2	d2	g2

**BA**

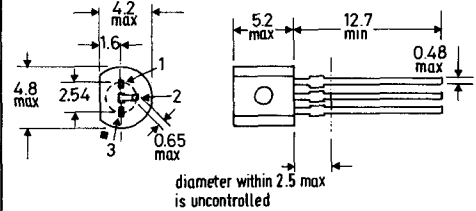
B.S.3934 SO-12A/SB4-3 TO-72



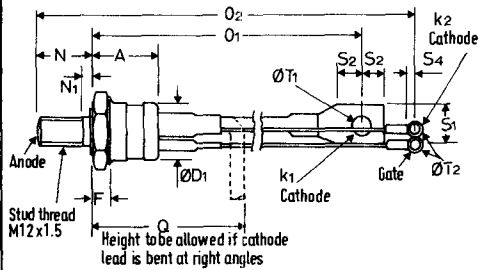
	1	2	3	4
BA1	b	e	c	s+envelope
BA2	e	b	c	s+envelope
BA3	s	d	g	screen+envelope
BA4	d	g	g	s+b+envelope
BA5	d	s	g	b+envelope
BA6	k	gk	ga	a

**BB**TO-92  
variant

Pin	1	2	3
BB1	e	b	c
BB2	b	e	c
BB3	d	s	g
BB4	g	a	k
BB5	b	c	e

**BC**

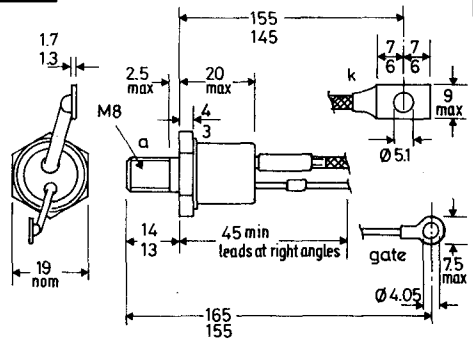
B.S.3934 SO-30C TO-94



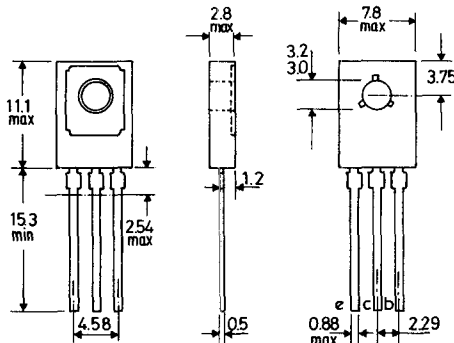
A	28.5max	O1	158 max	S4	3.8 min
ØD1	24.1max	O2	190max	ØT1	8.3max
F	8.9max	Q	63.5max	ØT2	4.2max
N	21.0max	S1	16.5max		
N1	3.0max	S2	9.6min		

**BD**

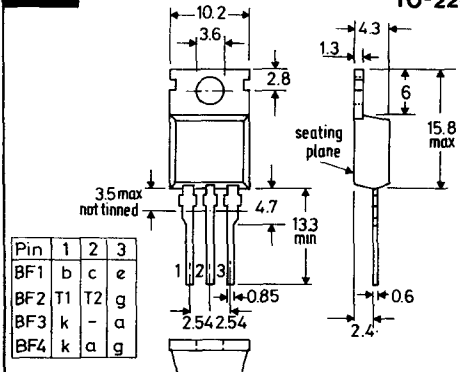
TO-103

For triacs read T1 instead of k  
T2 instead of a**BE**

TO-126

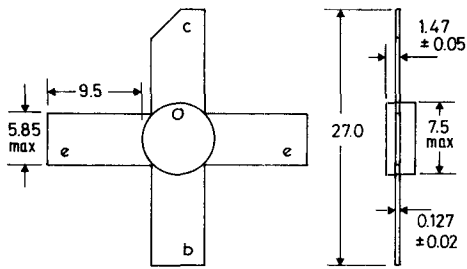
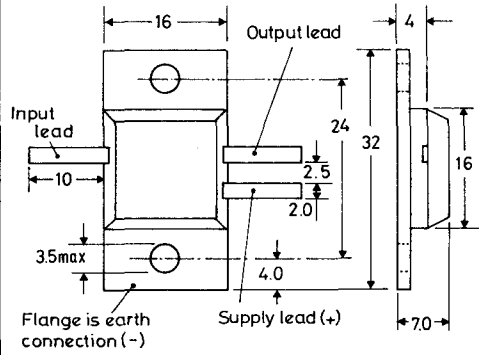
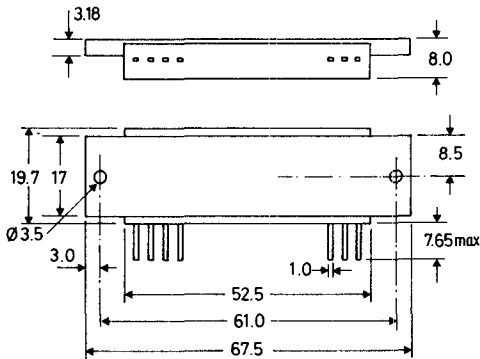
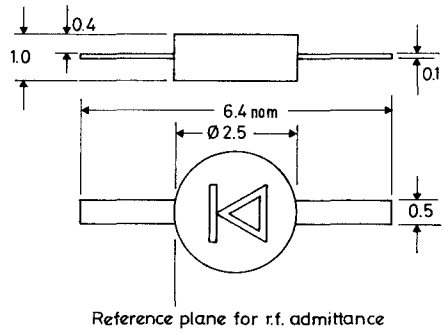
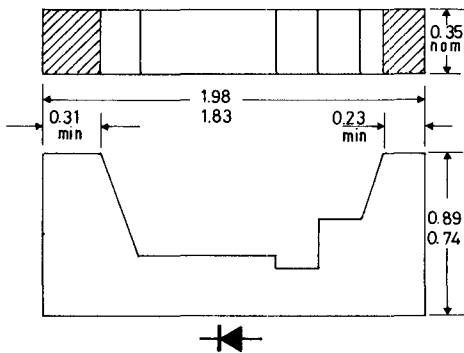
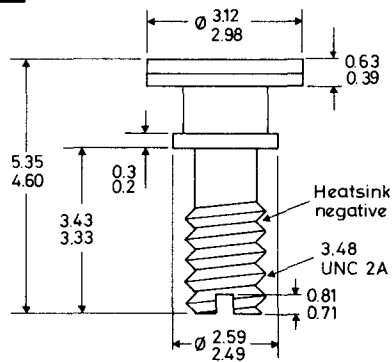
**BF**

TO-220



Pin	1	2	3
BF1	b	c	e
BF2	T1	T2	g
BF3	k	-	a
BF4	k	a	g

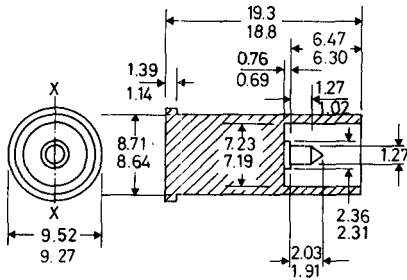
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**BG****BH****BJ****BK****BL****BM**

# BN

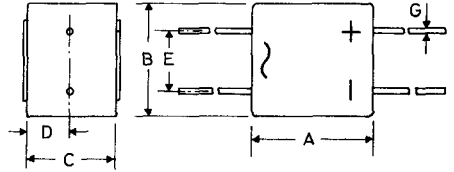
B.S.3934

SO-26

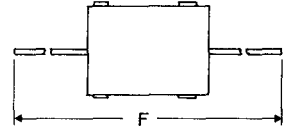


(All dimensions max.)

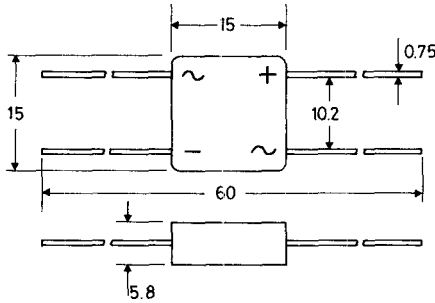
# BO



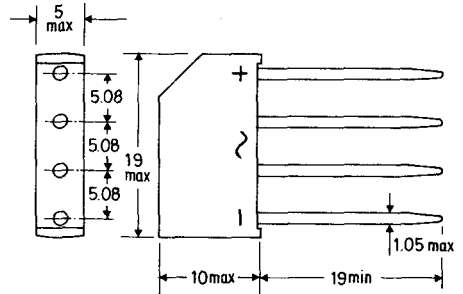
	BO1	BO2	BO3
A	12	20	12
B	10	19	10
C	8	15	8
D	4	7.5	4
E	5	10	5
F	58	60	48
G	0.75	1.0	1.1



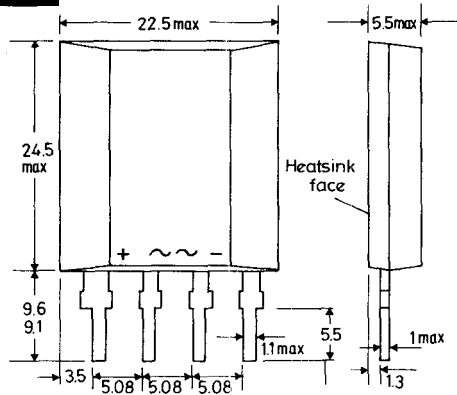
# BP



# BQ

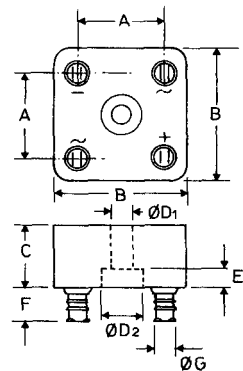


# BR



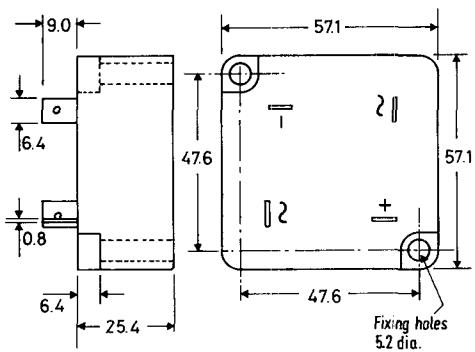
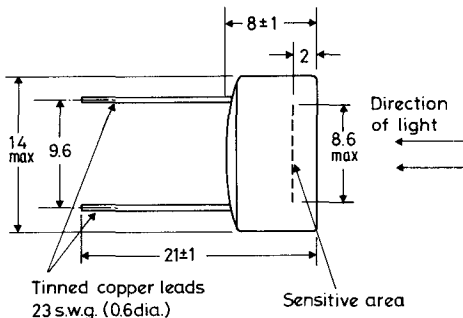
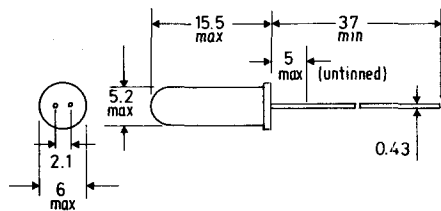
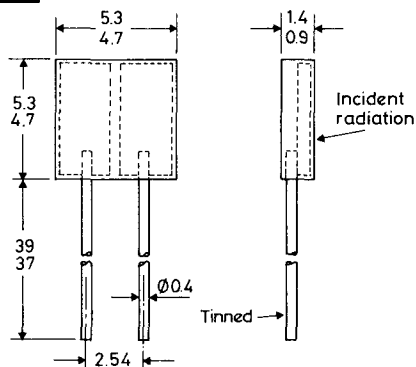
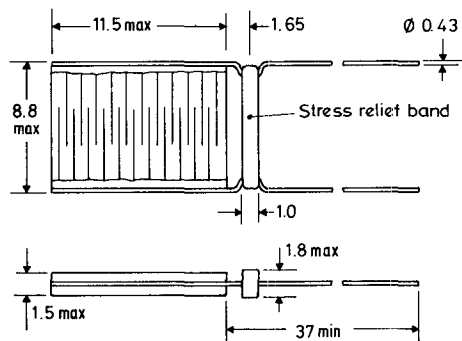
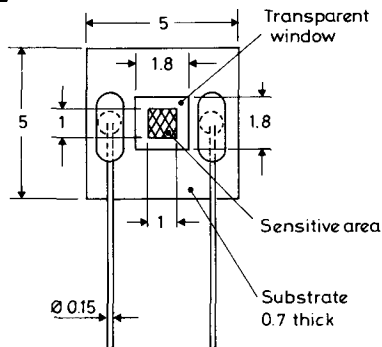
# BS

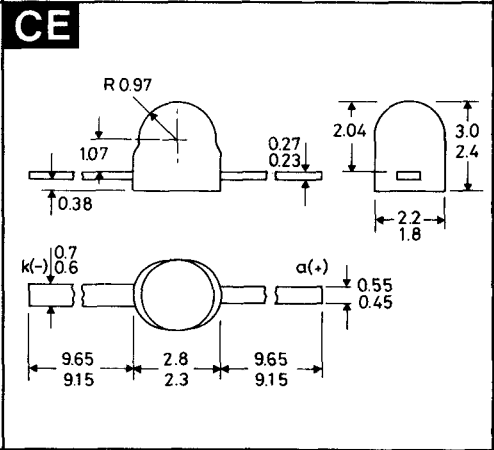
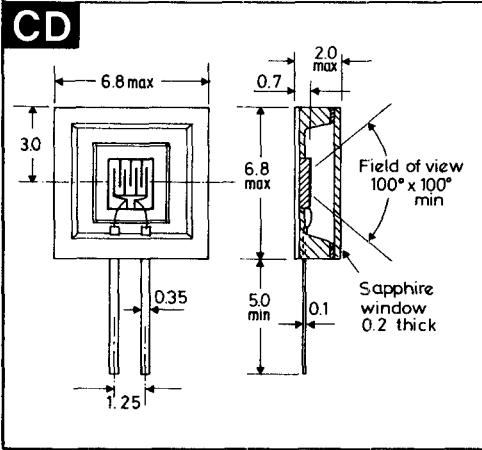
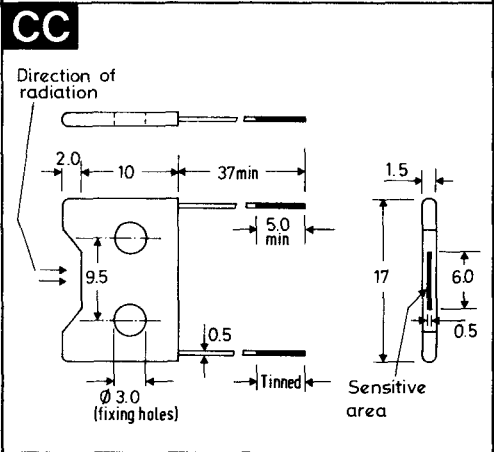
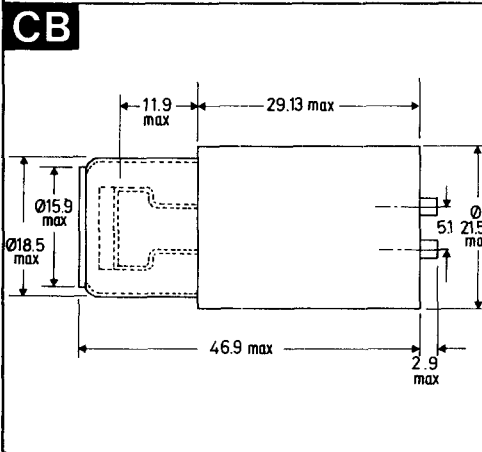
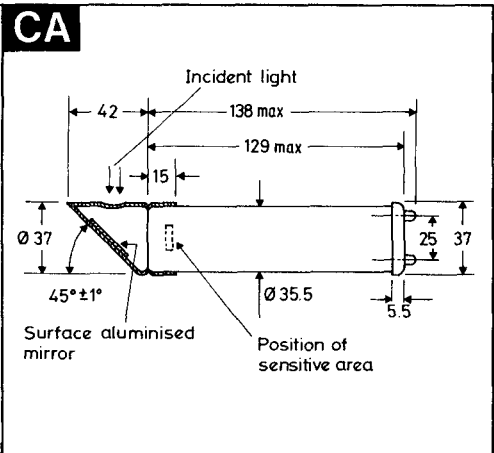
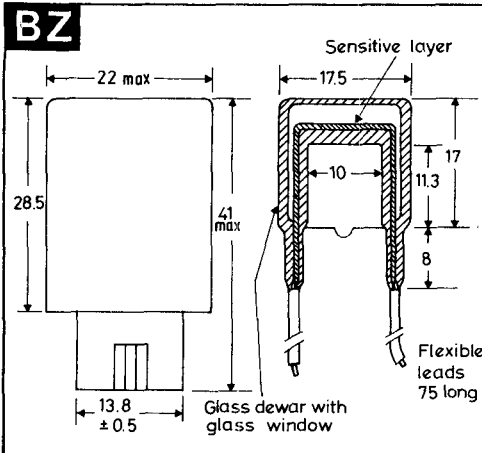
B.S.3934 SO-67



	BS1	BS2
	typ.	max.
A	23	21
B	35	34.6
C	17	15.2
ØD1	5	5.05
ØD2	11	11
E	5	3.7
F	9	9
ØG	4.8	4.8

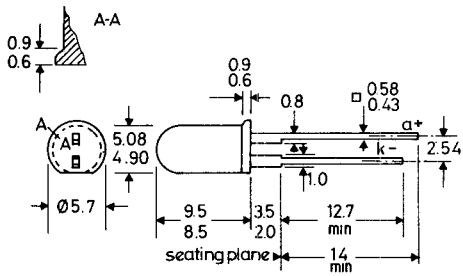
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**BT****BU****BV****BW****BX****BY**

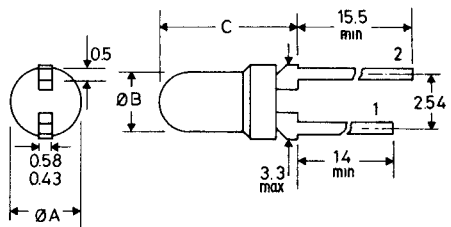


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# CF

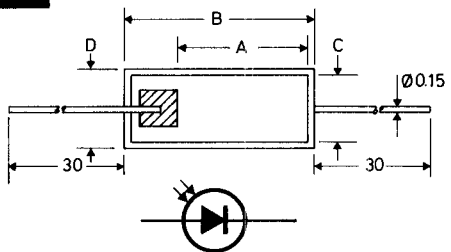


# CG



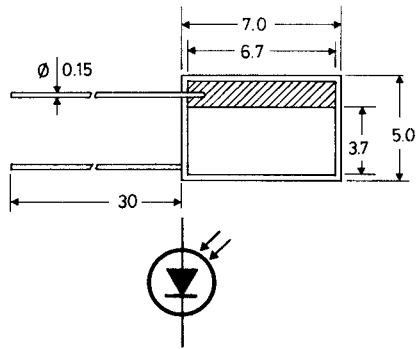
	1	2	$\varnothing A$	$\varnothing B$	C
CG1	$k^-$	$a^+$	3.0-3.17	2.4-2.6	5.8-6.3
CG2	$a^+$	$k^-$	3.0-3.17	2.4-2.6	5.8-6.3
CG3	$k^-$	$a^+$	3.3 max	2.65-3.17	4.8-6.3

# CH

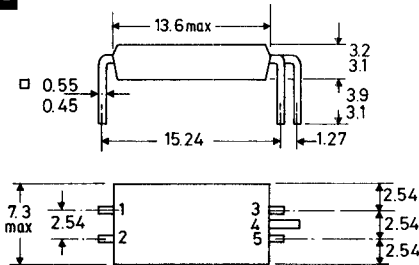


	CH1	CH2
A	2.2	3.5
B	3.35	4.55
C	0.95	1.85
D	1.25	2.15

# CJ

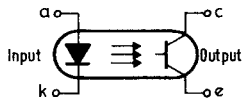
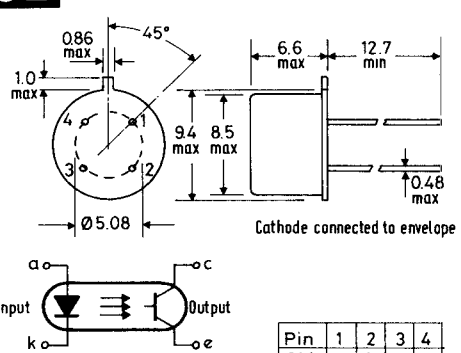


# CK



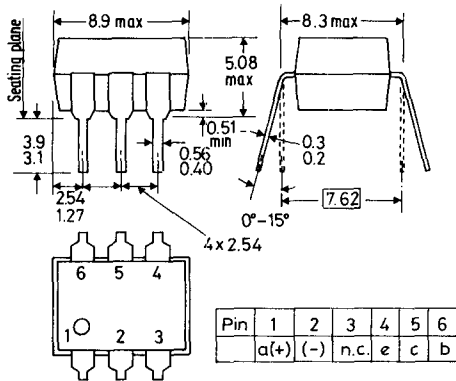
Pin	1	2	3	4	5
CK1	a	k	b	c	e
CK2	k	a	e	omitted	c

# CL

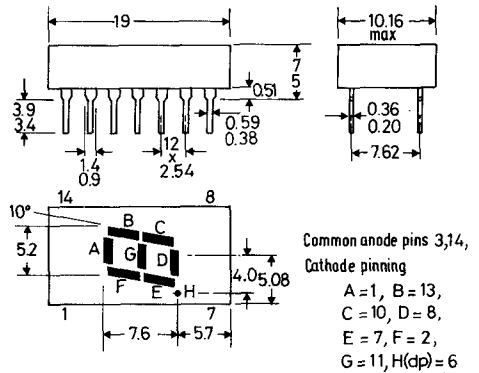


Pin	1	2	3	4
CL1	a	k	e	c
CL2	e	c	a	k

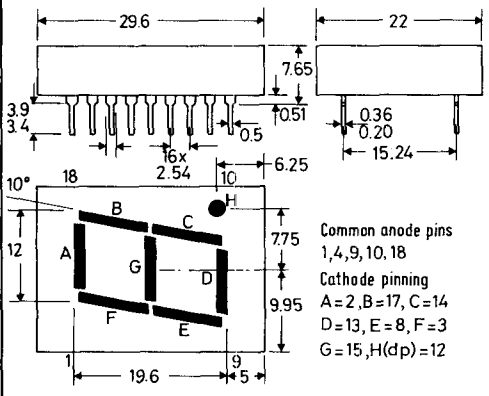
# CM



# CN



# CO



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