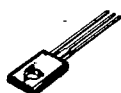


2SD439

2009A

NPN/PNP Epitaxial Planar
Silicon Transistors

T-33-05

2SB559

Low Frequency Power Amp, Medium Speed Switching Applications

©372E

Features

- Large allowable collector dissipation and wide ASO.
- Low saturation voltage and good linearity of h_{FE} .
- Suited for use in output stage of low-voltage high-output ($P_o=2W/V_{CC}=4.5V$) AF amp.

(): 2SB559

Absolute Maximum Ratings at $T_a=25^\circ C$

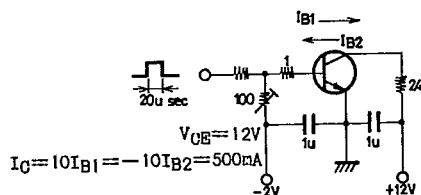
			unit
Collector to Base Voltage	V_{CB0}	(-)20	V
Collector to Emitter Voltage	V_{CE0}	(-)18	V
Emitter to Base Voltage	V_{EB0}	(-)5	V
Collector Current	I_C	(-)1.2	A
Peak Collector Current	i_{cp}	(-)2.0	A
Collector Dissipation	P_C	1	W
		8	W
	$T_c=25^\circ C$		
Junction Temperature	T_j	150	$^\circ C$
Storage Temperature	T_{stg}	-55 to +150	$^\circ C$

Electrical Characteristics at $T_a=25^\circ C$

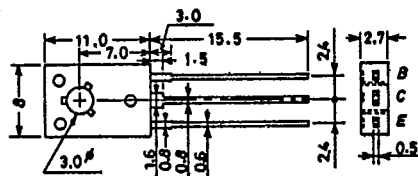
			min	typ	max	unit
C-B Breakdown Voltage	$V_{(BR)CBO}$	$I_C=(-)10\mu A, I_E=0$	(-)20			V
C-E Breakdown Voltage	$V_{(BR)CEO}$	$I_C=(-)1mA, R_{BE}=\infty$	(-)18			V
E-B Breakdown Voltage	$V_{(BR)EBO}$	$I_E=(-)10\mu A, I_C=0$	(-)5			V
Collector Cutoff Current	I_{CBO}	$V_{CB}=(-)15V, I_E=0$			(-)1	μA
Emitter Cutoff Current	I_{EBO}	$V_{EB}=(-)4V, I_C=0$			(-)1	μA
DC Current Gain	$h_{FE}(1)$	$V_{CE}=(-)2V, I_C=(-)500mA$	60*		320*	
	$h_{FE}(2)$	$V_{CE}=(-)2V, I_C=(-)1.5A_{(pulse)}$	(40)50			
Gain Bandwidth Product	f_T	$V_{CE}=(-)10V, I_C=(-)50mA$		150		MHz
Collector Capacitance	c_{ob}	$V_{CB}=(-)10V, f=1MHz$		(30)20		pF
C-E Saturation Voltage	$V_{CE(sat)}$	$I_C=(-)1A, I_B=(-)50mA$	(-)0.35	(-)0.7		V
			0.25	0.5		V
B-E Saturation Voltage	$V_{BE(sat)}$	$I_C=(-)500mA, I_B=(-)50mA$	(-)0.85	(-)1.2		V
Turn-ON Time	t_{on}	See specified Test Circuit.		50		ns
Storage Time	t_{stg}	"		(60)70		ns
Fall Time	t_f	"		200		ns

* The 2SB559/2SD439 are classified by h_{FE} at 500mA.

60 D 120 100 E 200 160 F 320

Case Outline 2009A
(unit:mm)**Switching Time Test Circuit**

(For PNP, the polarity is reversed.)

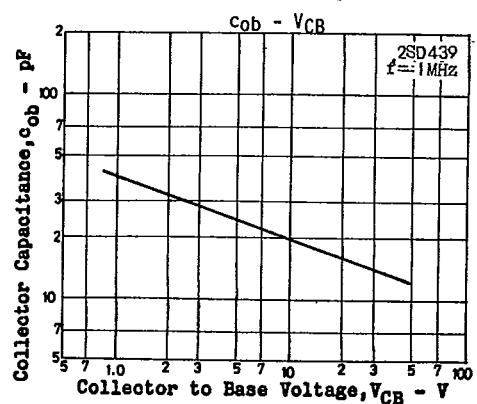
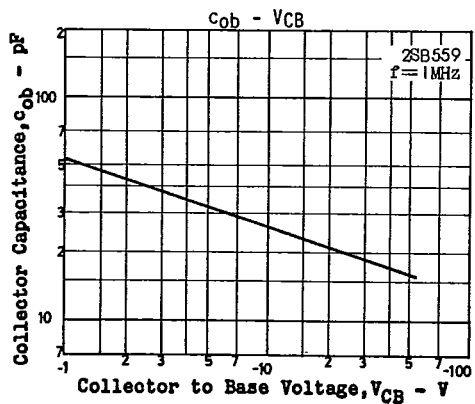
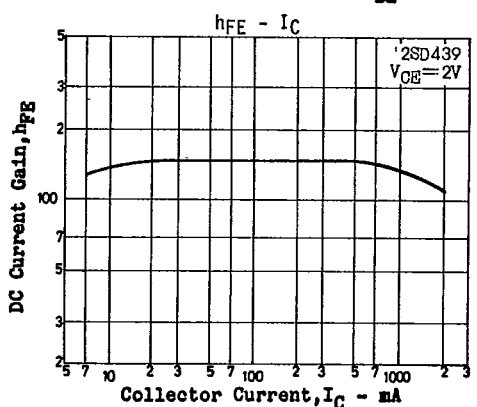
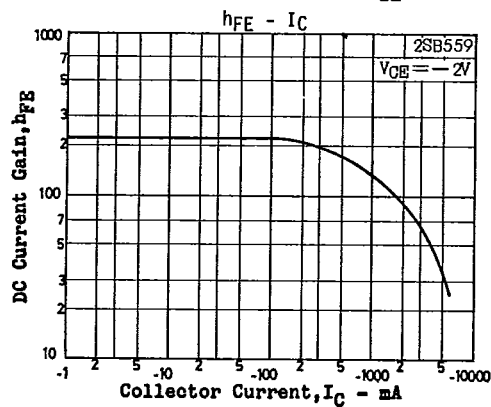
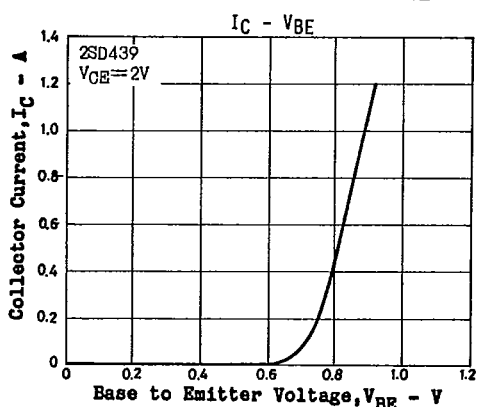
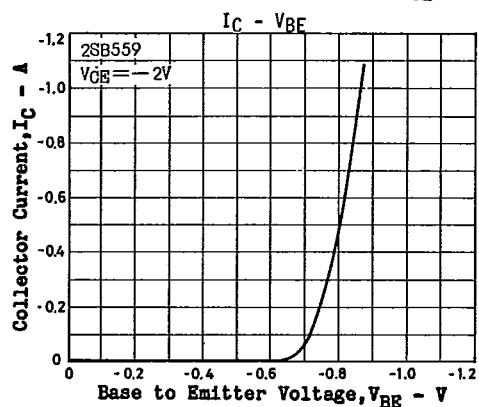
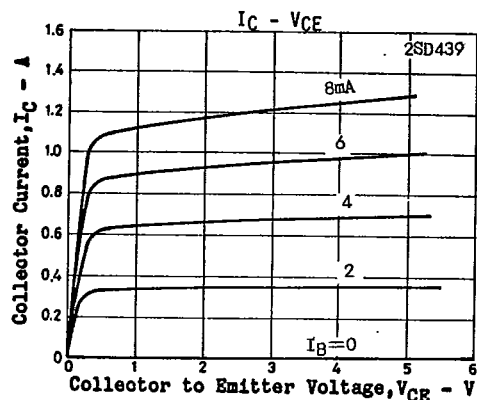
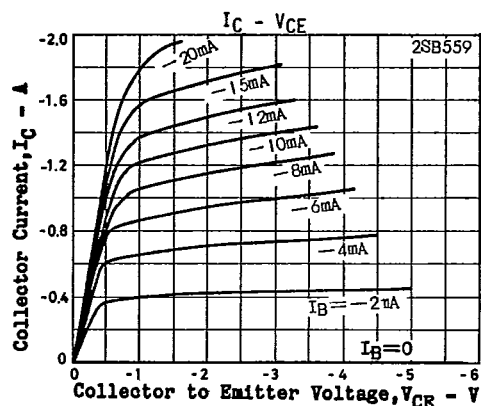


JEDEC: TO-126

B: Base
C: Collector
E: Emitter

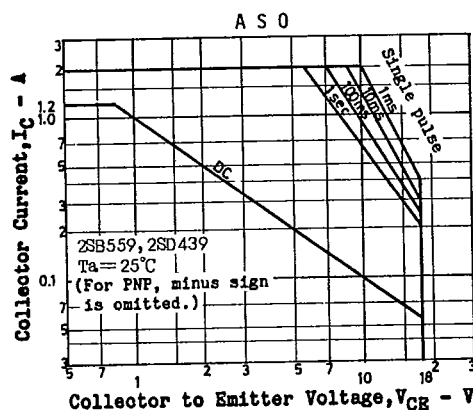
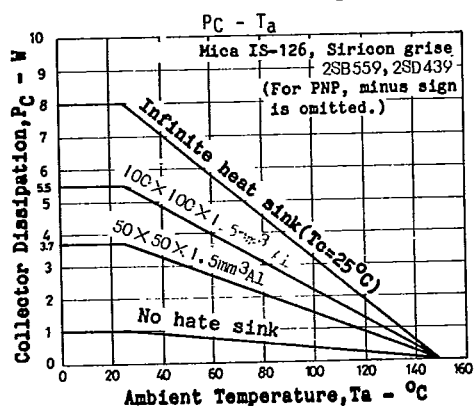
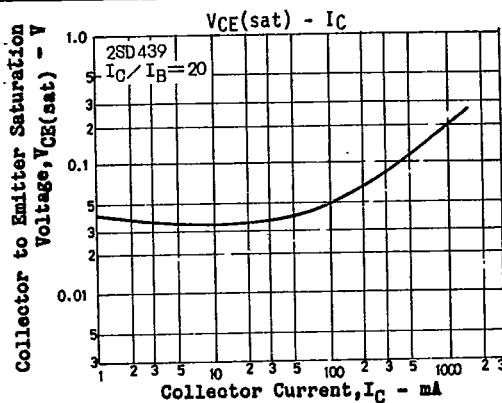
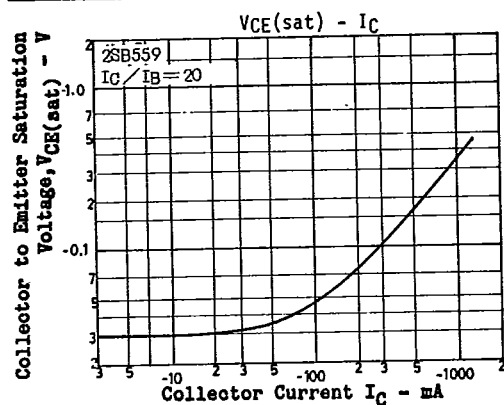
2SD439/2SB559

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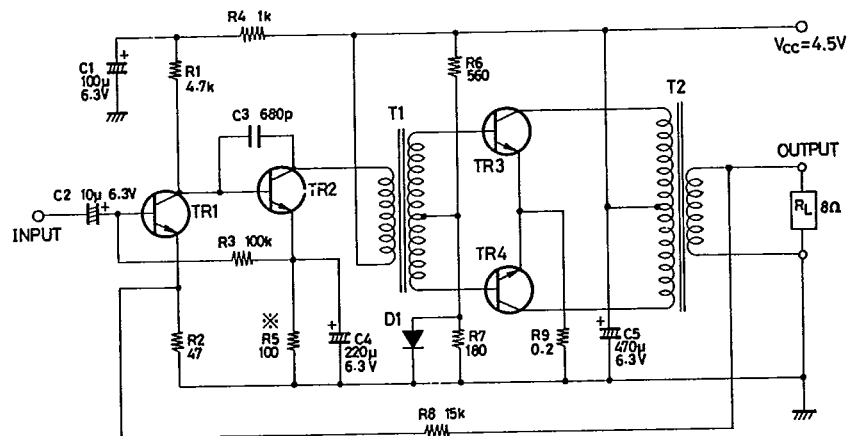


2SD439/2SB559

T-33-05



Sample Application Circuit: 2SD439-used 2.2W input/output transformer coupling amp



TR1: 2SC536 E,F TR2: 2SC536 E,F D1: DS442 TR3: 2SD439 E1, E2, F1, F2
TR4: 2SD439 E1, E2, F1, F2

Note: TR3, TR4 must be on the same rank. * R5 --- TR1 of rank E: 100ohm
TR1 of rank F: 82ohm

Data on transformer

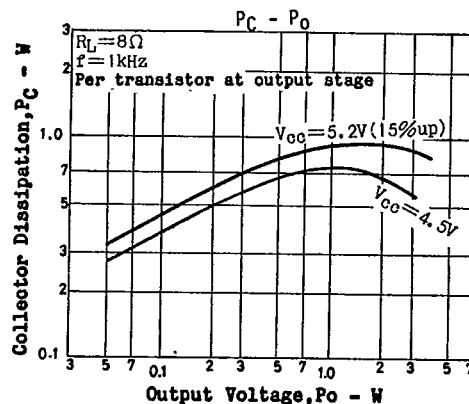
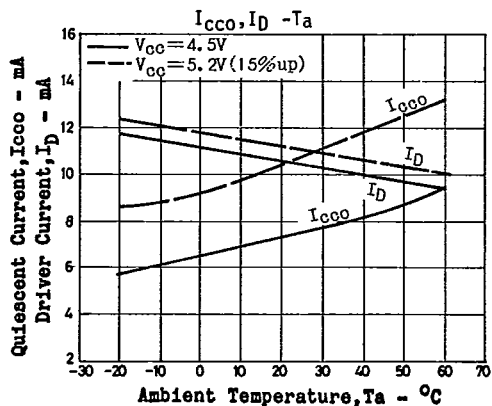
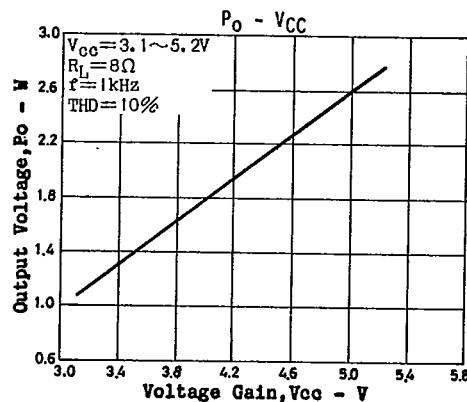
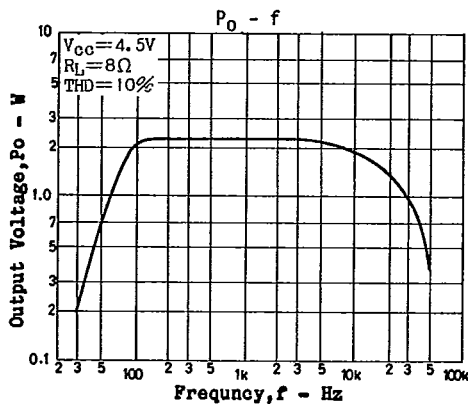
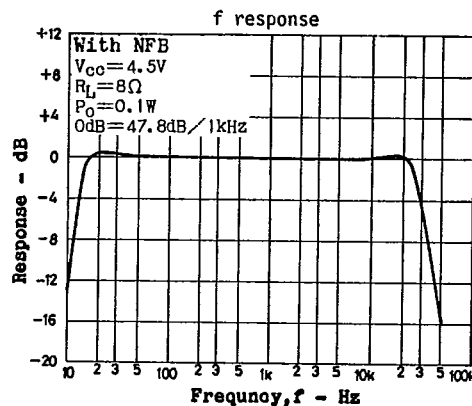
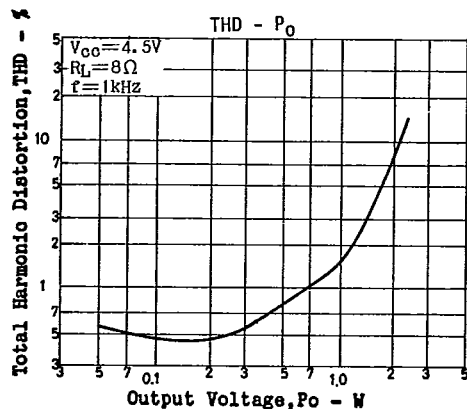
Transformer name		Impedance		DC resistor	
		Primary	Secondary	Primary	Secondary
Driver transformer	T1 ST-52	600ohm	2Kohm	37ohm	165ohm
Output transformer	T2 GS-1684	14ohm	8ohm	0.24ohm	0.17ohm

2SD439/2SB559

T-33-05

[Specification] At $V_{CC}=4.5V$, $R_L=8\Omega$, $R_g=600\Omega$, $f=1kHz$

Quiescent Current	I_{CCO}	Output stage	typ	
	I_D	Driver stage	7.6	mA
Voltage Gain	VG	Without NFB	10.5	dB
	VG	With NFB	64.0	dB
Output Voltage	P_o	THD=10%	2.2	W
	P_o	Output stage: Rank D2	1.7	W
Total Harmonic Distortion	THD	$P_o=0.5W$	0.8	%
Input Resistance	r_i	$P_o=0.5W$	55	kohm



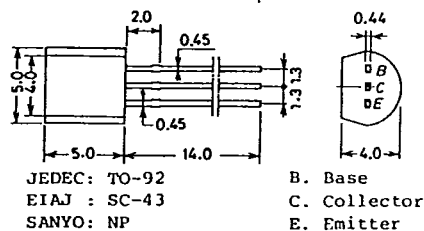
T-91-20

CASE OUTLINES AND ATTACHMENTS

- All of Sanyo Transistor case outlines are illustrated below.
- All dimensions are in mm, and dimensions which are not followed by min. or max. are represented by typical values.
- No marking is indicated.

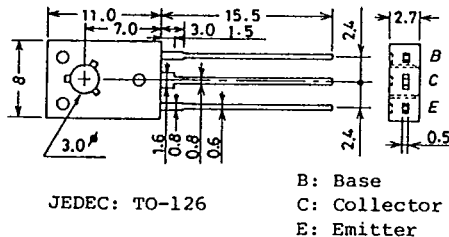
Case Outline—[2003A]

unit:mm



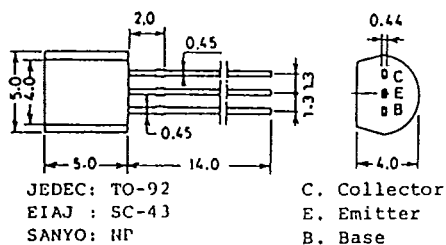
Case Outline—[2009A]

unit:mm



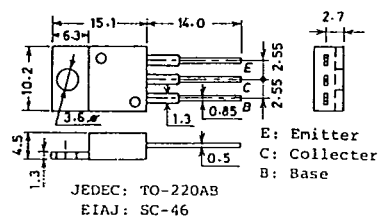
Case Outline—[2004A]

unit:mm



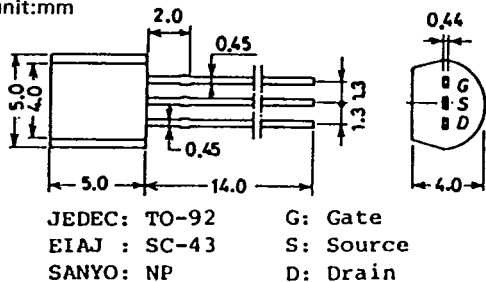
Case Outline—[2010A]

unit:mm



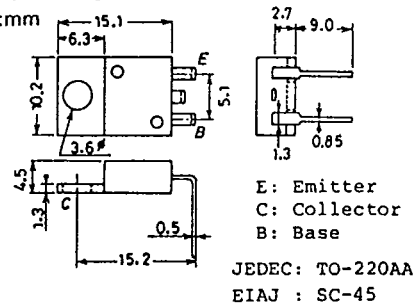
Case Outline—[2005A]

unit:mm



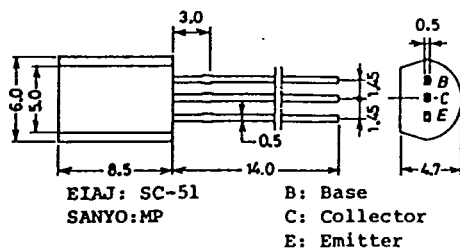
Case Outline—[2012]

unit:mm



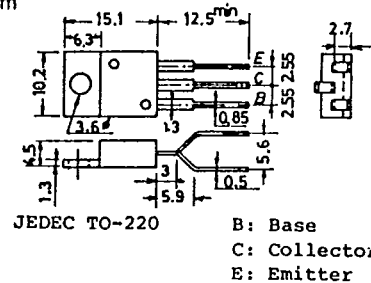
Case Outline—[2006A]

unit:mm



Case Outline—[2013]

unit:mm



EIAJ TC-3, TB-3
JEDEC. TO-3

C:Collector
E:Emitter
B:Base

G: Gate
S: Source
D: Drain

G: Gate
D: Drain
S: Source

B: Base
C: Collector
E: Emitter
SANYO: CP

D: Drain
G: Gate
S: Source

SANYO: DP6A

JEDEC: TO-92
EIAJ : SC-43
SANYO: NP

D: Drain
G: Gate
S: Source

D: Drain
G: Gate
S: Source

SANYO: D26B

SANYO: TO3PB

E: Emitter
C: Collector
B: Base

E: Emitter
C: Collector
B: Base
SANYO:DP6A

S: Source
G: Gate
D: Drain
SANYO: CP

E: Emitter
C: Collector
B: Base

SANYO: DP6B

E: Emitter
C: Collector
B: Base

G1: Cat1
\$: Source
D-r Drain
G2: Gate2
SANYO: OP4A

E: Emitter
C: Collector
B: Base

SANYO:TO3PML

B: Base
C: Collector
E: Emitter
SANYO: SPA

G: Gate
S: Source
D: Drain
SANYO: SPA

D: Drain
G: Gate
S: Source
SANYO: SPA

SANYO: TO220ML

D: Drain
G: Gate
S: Source
SANYO: SP'

SANYO: TO126ML

T-91-20

G : Gate
S : Source
D : Drain

SANYO : CP

SANYO: TO126LP

SANYO : CP

[illegible]

C : Collector
E : Emitter
B : Base
SANYO: SPA

unit:mm

JEDEC: TO-220AB
EIAJ: SC-46

1:Source
2:Drain
3:Gate

JEDEC: TO-220AB
EIAJ: SC-46

unit:mm

1:Drain
2:Source
3:Gate 1
4:Gate 2

```
1: Drain
2: Source
3: Gate 1
4: Gate 2
```

~~0.16~~

unit:mm

The drawing shows three views of the SANYO CP transistor package:

- Top View:** A rectangular package with overall dimensions of 2.9 mm (width) by 2.5 mm (height). The emitter (E) is a small rectangle at the top center, 0.3 mm wide. The collector (C) and base (B) are at the bottom, with C on the left and B on the right. C is 1.9 mm wide, and B is 0.8 mm wide. The total width of the bottom contacts is 2.9 mm.
- Side View:** Shows the package height as 0.16 mm. The base (B) is 0.8 mm wide, and the collector (C) is 1.1 mm wide. The distance from the base to the collector is 0.1 mm.
- Bottom View:** Shows the mounting pads. The distance between the center of the collector pad and the center of the base pad is 0.4 mm.

E: Emitter
C: Collector
B: Base

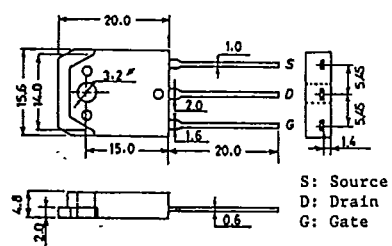
SANYO: CP

E: Emitter
C: Collector
B: Base

SANYO: CP

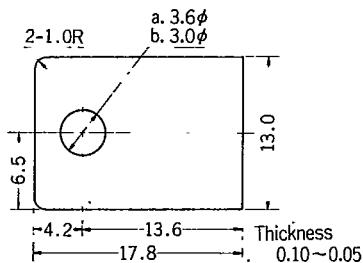
SANYO: CP

Case Outline—[2056] unit:mm



SANYO: TO3PB

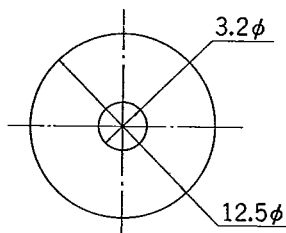
Case Outline—[0008] unit:mm

a. IS-313B
b. IS-313D

SANYO

Case Outline—[0004] unit:mm

unit:mm

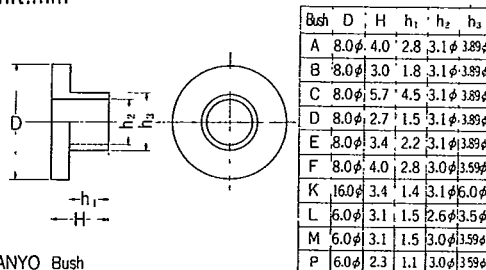


SANYO IS-126

Thickness : 0.075

Case Outline—[0009] unit:mm

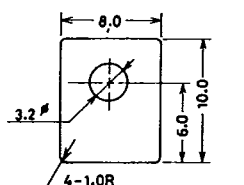
unit:mm



SANYO Bush

Case Outline—[0005] unit:mm

unit:mm

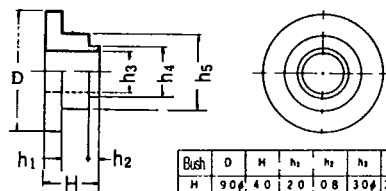


Thickness : 0.075

SANYO IS-126A Mica

Case Outline—[0010] unit:mm

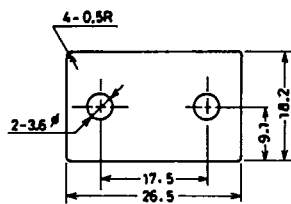
unit:mm



SANYO Bush

Case Outline—[0006] unit:mm

unit:mm

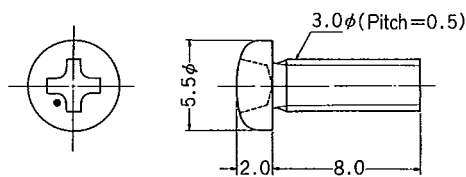


Thickness : 0.05~0.1

SANYO IS-20MA Mica

Case Outline—[0011] unit:mm

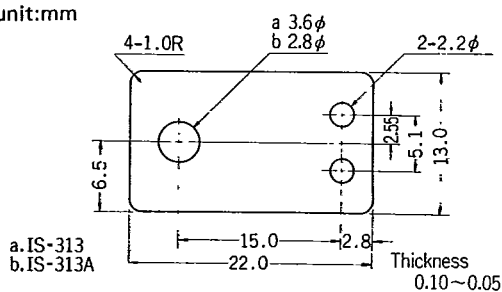
unit:mm



JIS No. B1111 M3×0.5

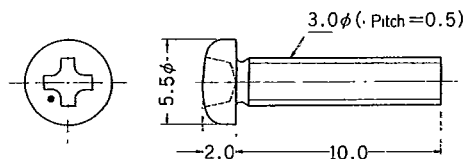
Case Outline—[0007] unit:mm

unit:mm



Case Outline—[0012] unit:mm

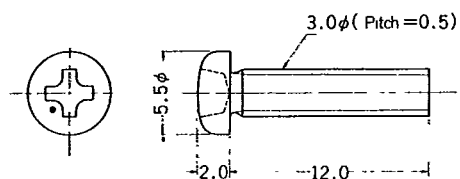
unit:mm



JIS No. B1111 M3×0.5

Case Outline—[0013]

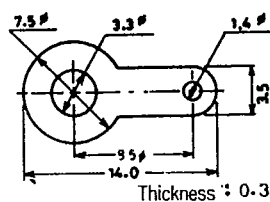
unit:mm



JIS No. B1111 M3×0.5

Case Outline—[0018]

unit:mm

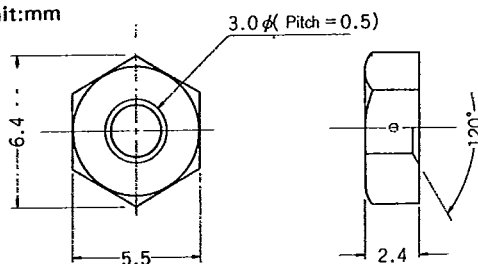


SANYO Lug 1.4

T=91-20

Case Outline—[0014]

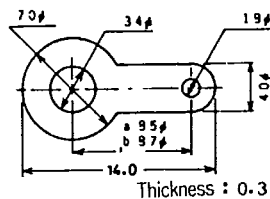
unit:mm



JIS No. B1181 M3×0.5

Case Outline—[0019]

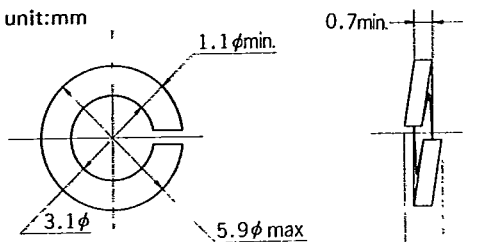
unit:mm



SANYO Lug 1.8φ

Case Outline—[0015]

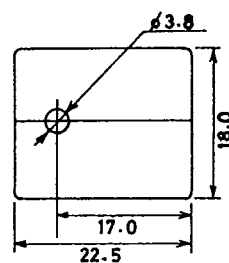
unit:mm



JIS No. B 1251 Spring washer (M3)

Case Outline—[0020]

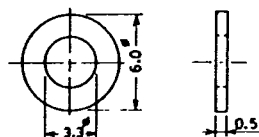
unit:mm



SANYO IS-3MP Mica

Case Outline—[0016]

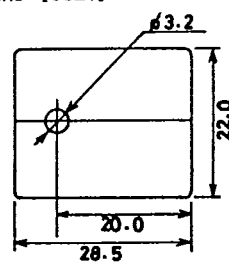
unit:mm



JIS No. B1252 Flat washer

Case Outline—[0021]

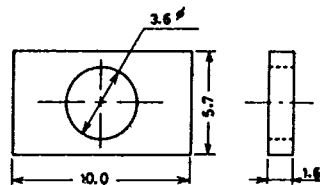
unit:mm



SANYO IS-MPC Mica

Case Outline—[0017]

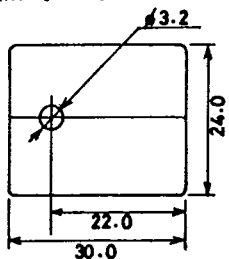
unit:mm



JIS No. G3141 Rectangular washer

Case Outline—[0022]

unit:mm



SANYO IS-3PBL Mica