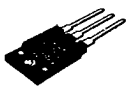
T-33-11

# 2SD1656





2039

NPN Triple Diffused Planar Silicon Transistor

## Color TV Horizontal Deflection Output Applications



**Applications**

. High-voltage, power switching

**Features**

. Fast speed ($t_f$ max=0.4us).
. High reliability (Adoption of HVP process).
. High breakdown voltage ($V_{CBO}$=1500V).
. Micaless package facilitating mounting operation.

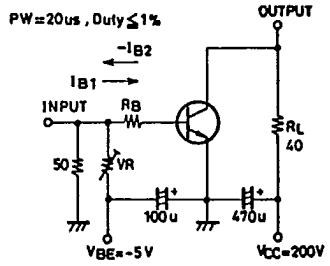
**Absolute Maximum Ratings** at Ta=25°C

| | | | | unit |
|---|---|---|---|---|
| Collector to Base Voltage | $V_{CBO}$ | | 1500 | V |
| Collector to Emitter Voltage | $V_{CEO}$ | | 800 | V |
| Emitter to Base Voltage | $V_{EBO}$ | | 6 | V |
| Collector Current | $I_C$ | | 6 | A |
| Peak Collector Current | $i_{cp}$ | | 16 | A |
| Collector Dissipation | $P_C$ | $T_C$=25°C | 60 | W |
| Junction Temperature | Tj | | 150 | °C |
| Storage Temperature | Tstg | | -55 to +150 | °C |

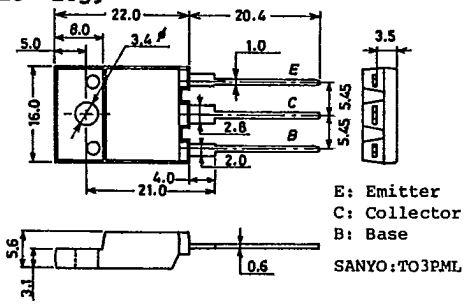
**Electrical Characteristics** at Ta=25°C

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Collector Cutoff Current | $I_{CBO}$ | $V_{CB}$=800V,$I_E$=0 | | | 10 | uA |
| Emitter Cutoff Current | $I_{EBO}$ | $V_{EB}$=5V,$I_C$=0 | | | 1 | mA |
| DC Current Gain | $h_{FE}$ | $V_{CE}$=5V,$I_C$=1A | 8 | | | |
| Gain Bandwidth Product | $f_T$ | $V_{CE}$=10V,$I_C$=1A | | 3 | | MHz |
| Collector to Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C$=5A,$I_B$=1A | | | 5 | V |
| Base to Emitter Saturation Voltage | $V_{BE(sat)}$ | $I_C$=5A,$I_B$=1A | | | 1.5 | V |
| Collector to Base Breakdown Voltage | $V_{(BR)CBO}$ | $I_C$=5mA,$I_E$=0 | 1500 | | | V |
| Collector to Emitter Breakdown Voltage | $V_{(BR)CEO}$ | $I_C$=100mA,$R_{BE}$=∞ | 800 | | | V |
| Emitter to Base Breakdown Voltage | $V_{(BR)EBO}$ | $I_E$=200mA,$I_C$=0 | 7 | | | V |
| Fall Time | $t_f$ | $I_C$=5A,$I_{B1}$=1A, $I_{B2}$=-2A | | | 0.4 | us |

**Switching Time Test Circuit**




**Case Outline** 2039
(unit:mm)




E: Emitter
C: Collector
B: Base
SANYO:TO3PML

2SD1656

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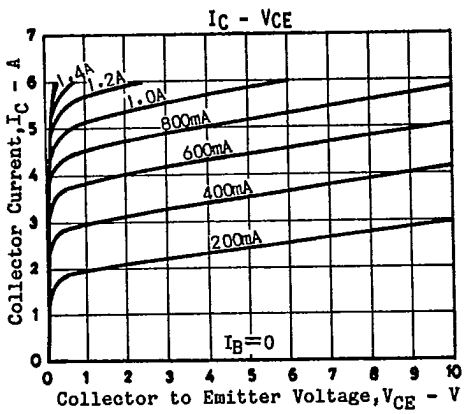
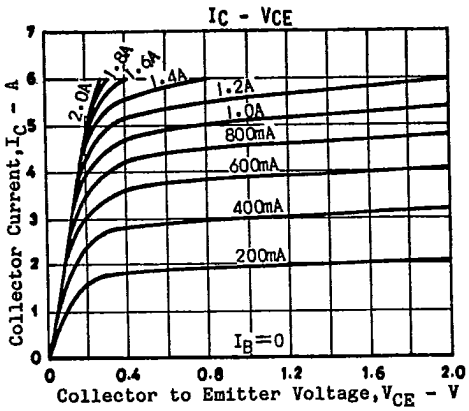
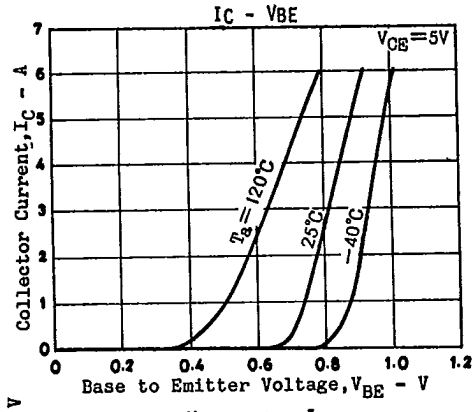
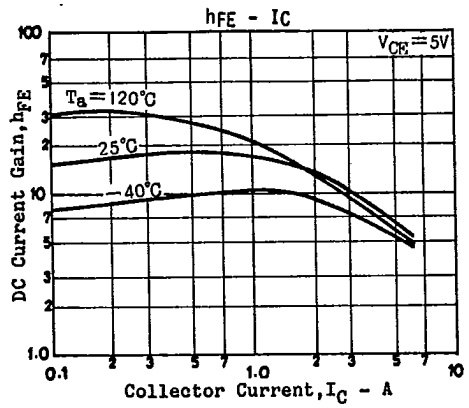
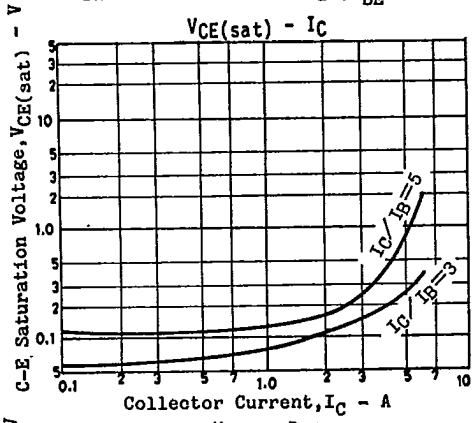
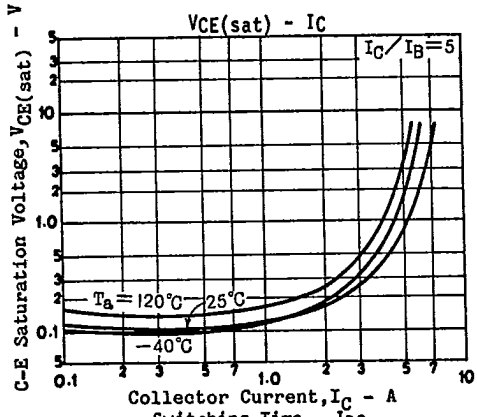


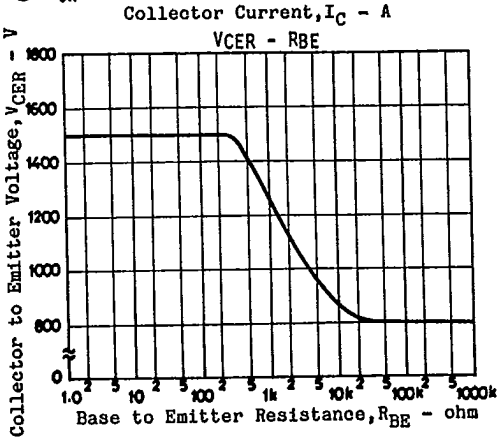



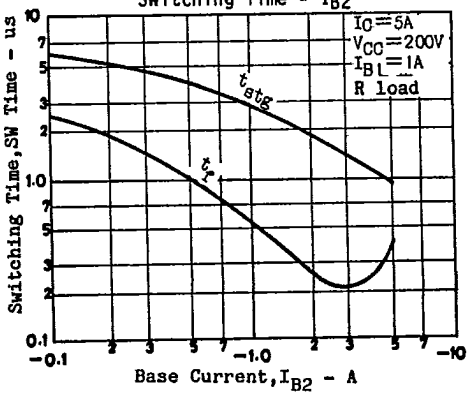



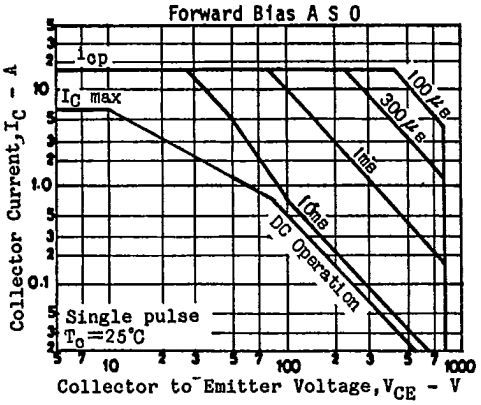



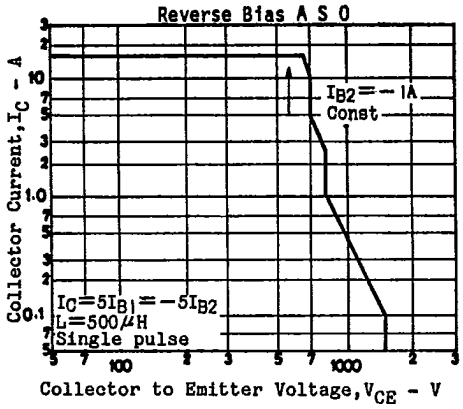



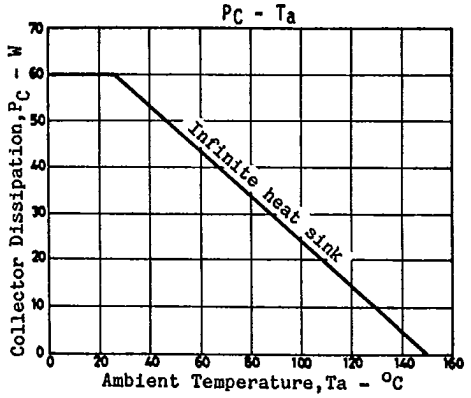
Forward Bias A S O




Reverse Bias A S O




$P_C$ - Ta

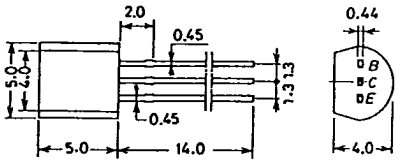


# CASE OUTLINES AND ATTACHMENTS



- 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.

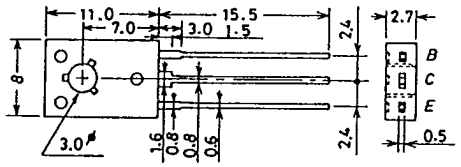
Case Outline—[2003A]
unit:mm




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

B. Base
C. Collector
E. Emitter

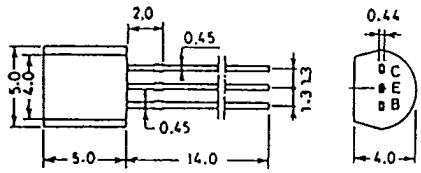
Case Outline—[2009A]
unit:mm




JEDEC: TO-126

B: Base
C: Collector
E: Emitter

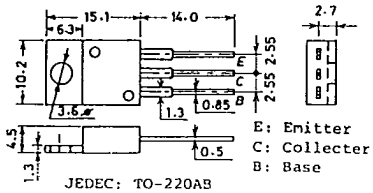
Case Outline—[2004A]
unit:mm




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

C. Collector
E. Emitter
B. Base

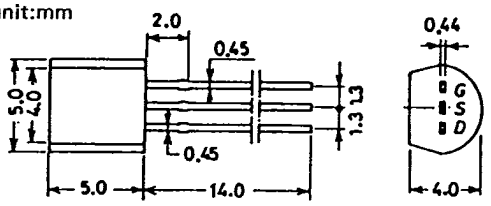
Case Outline—[2010A]
unit:mm




JEDEC: TO-220AB
EIAJ: SC-46

E: Emitter
C: Collecter
B: Base

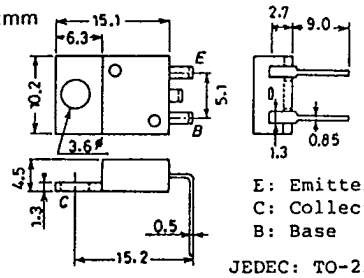
Case Outline—[2005A]
unit:mm




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

G: Gate
S: Source
D: Drain

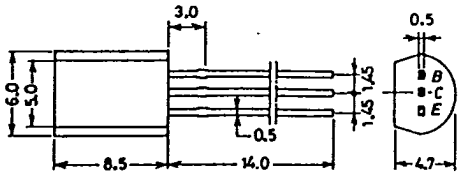
Case Outline—[2012]
unit:mm




E: Emitter
C: Collector
B: Base

JEDEC: TO-220AA
EIAJ : SC-45

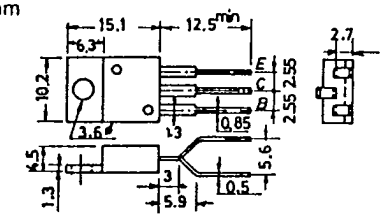
Case Outline—[2006A]
unit:mm




EIAJ: SC-51
SANYO:MP

B: Base
C: Collector
E: Emitter

Case Outline—[2013]
unit:mm




JEDEC TO-220

B: Base
C: Collector
E: Emitter

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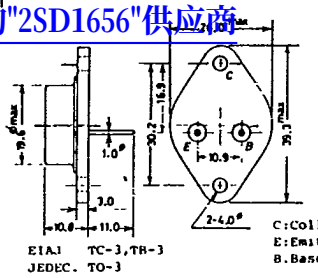
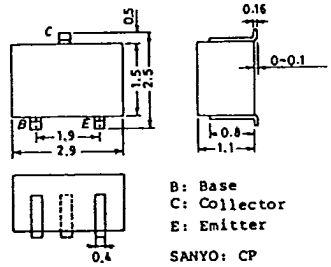
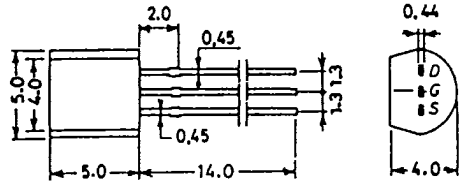
Case Outline—[2017]
unit:mm



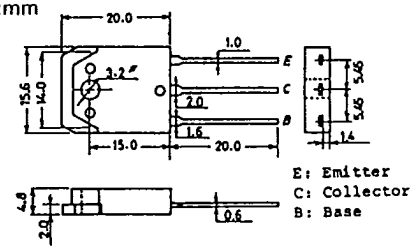

Case Outline—[2018A]
unit:mm



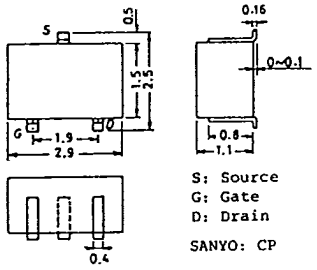

Case Outline—[2019A]
unit:mm



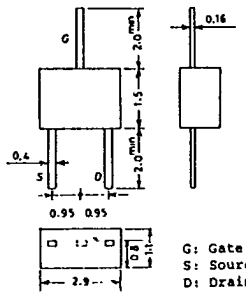

Case Outline—[2022]
unit:mm



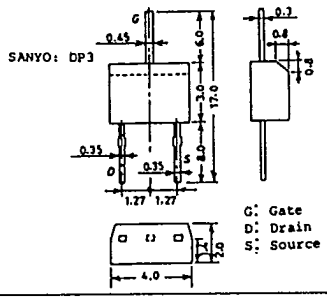

Case Outline—[2024A]
unit:mm



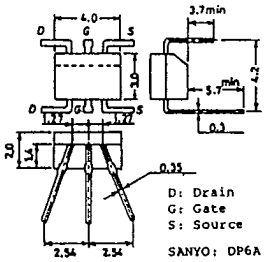

Case Outline—[2025]
unit:mm



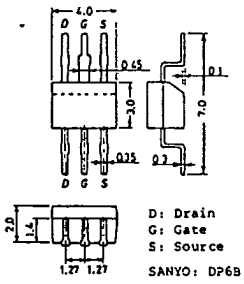

Case Outline—[2026]
unit:mm



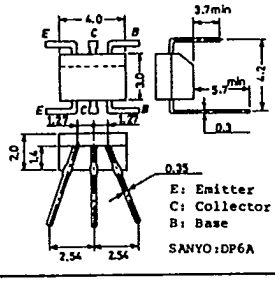

Case Outline—[2027A]
unit:mm




Case Outline—[2028A]
unit:mm




Case Outline—[2029A]
unit:mm



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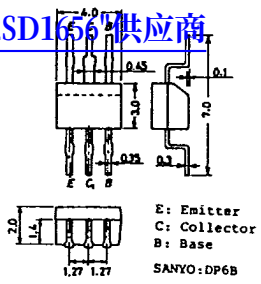
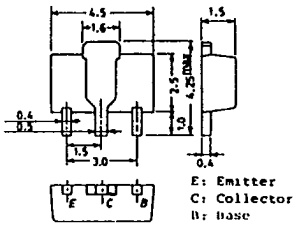
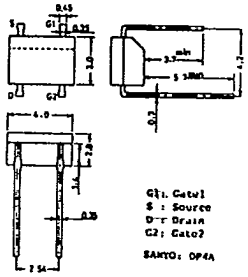
Case Outline—[2030A]
unit:mm



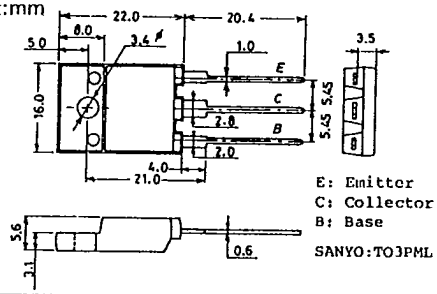

Case Outline—[2038]
unit:mm



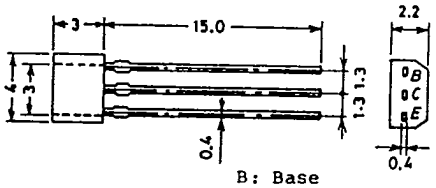

Case Outline—[2031A]
unit:mm



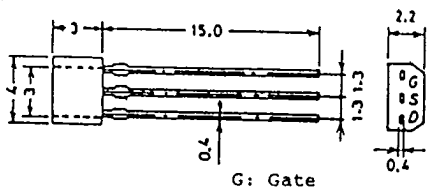

Case Outline—[2039]
unit:mm



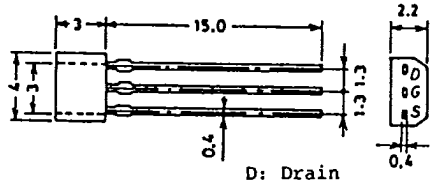

Case Outline—[2033]
unit:mm



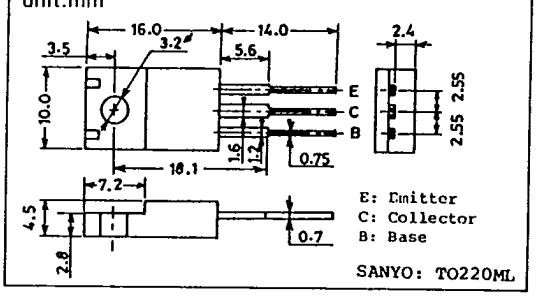

Case Outline—[2040]
unit:mm



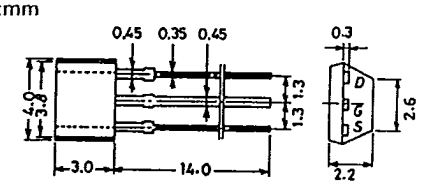

Case Outline—[2034]
unit:mm



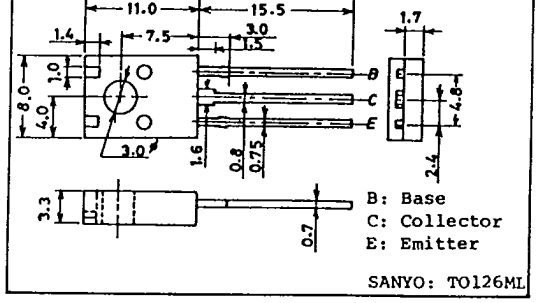

Case Outline—[2041]
unit:mm




Case Outline—[2037]
unit:mm




Case Outline—[2042A] unit:mm



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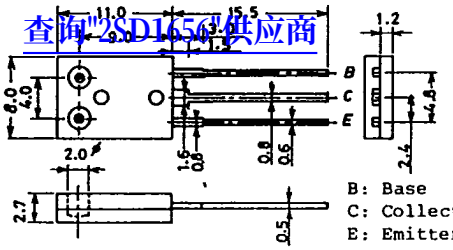
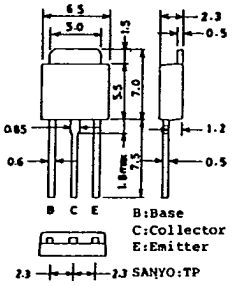
Case Outline—[2043A] unit:mm



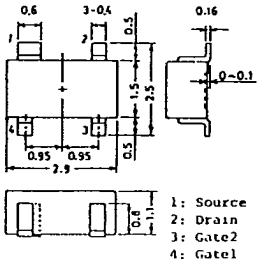

SANYO: TO126LP

Case Outline—[2045] unit:mm

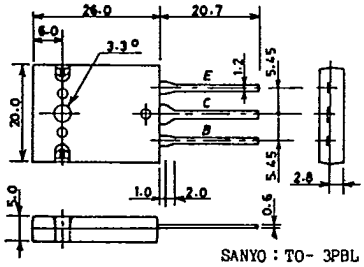



SANYO:TP

Case Outline—[2046] unit:mm

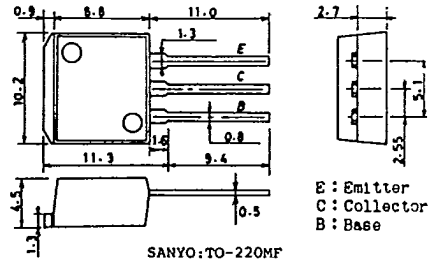



Case Outline—[2048] unit:mm



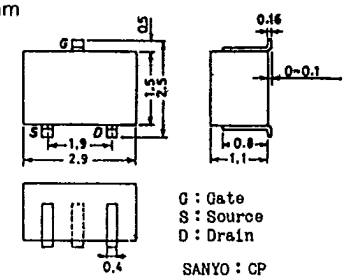

SANYO : TO- 3PBL

Case Outline—[2049] unit:mm



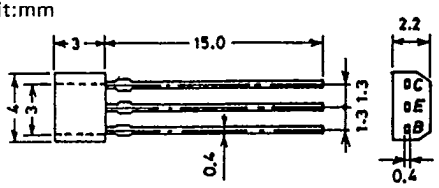

SANYO:TO-220MF

Case Outline—[2050] unit:mm



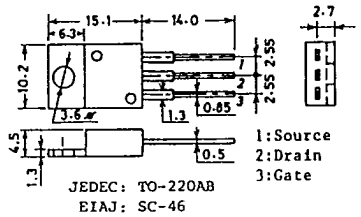

SANYO : CP

Case Outline—[2051] unit:mm



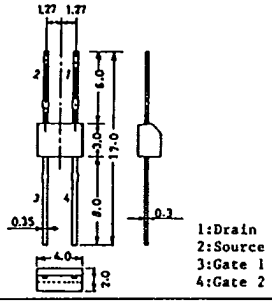

SANYO: SPA

Case Outline—[2052A] unit:mm

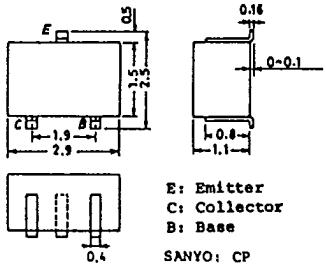



JEDEC: TO-220AB
EIAJ: SC-46

Case Outline—[2053] unit:mm




Case Outline—[2054] unit:mm

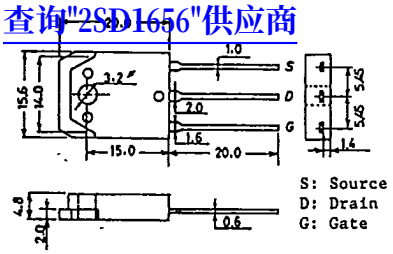



SANYO: CP

T-91-20

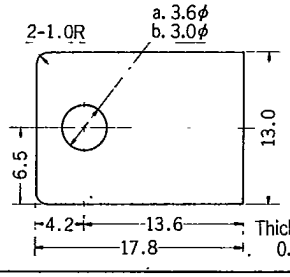


Case Outline—[2056] unit:mm




SANYO: TO3PB

Case Outline—[0008]
unit:mm

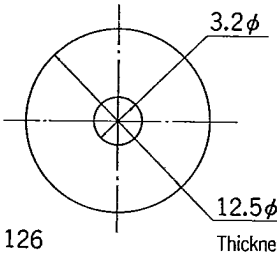



a. IS-313B
b. IS-313D

SANYO

Thickness 0.10~0.05

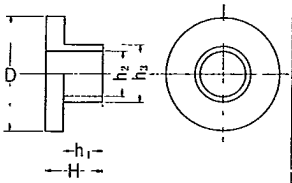
Case Outline—[0004]
unit:mm




SANYO IS-126

Thickness : 0.075

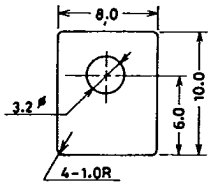
Case Outline—[0009]
unit:mm




| Bush | D | H | h1 | h2 | h3 |
|---|---|---|---|---|---|
| A | 8.0φ | 4.0 | 2.8 | 3.1φ | 3.89φ |
| B | 8.0φ | 3.0 | 1.8 | 3.1φ | 3.89φ |
| C | 8.0φ | 5.7 | 4.5 | 3.1φ | 3.89φ |
| D | 8.0φ | 2.7 | 1.5 | 3.1φ | 3.89φ |
| E | 8.0φ | 3.4 | 2.2 | 3.1φ | 3.89φ |
| F | 8.0φ | 4.0 | 2.8 | 3.0φ | 3.59φ |
| K | 16.0φ | 3.4 | 1.4 | 3.1φ | 6.0φ |
| L | 6.0φ | 3.1 | 1.5 | 2.6φ | 3.5φ |
| M | 6.0φ | 3.1 | 1.5 | 3.0φ | 3.59φ |
| P | 6.0φ | 2.3 | 1.1 | 3.0φ | 3.59φ |

SANYO Bush

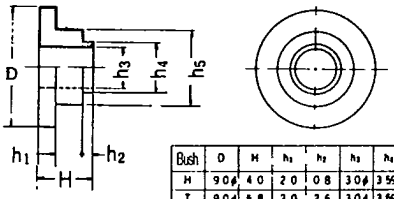
Case Outline—[0005]
unit:mm




Thickness : 0.075

SANYO IS-126A Mica

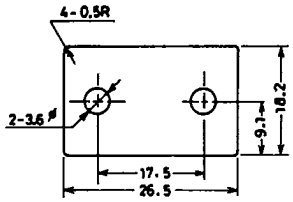
Case Outline—[0010]
unit:mm




| Bush | D | H | h1 | h2 | h3 | h4 | h5 |
|---|---|---|---|---|---|---|---|
| H | 9.0φ | 4.0 | 2.0 | 0.8 | 3.0φ | 3.59φ | 5.6φ |
| T | 9.0φ | 5.8 | 2.0 | 2.6 | 3.0φ | 3.59φ | 5.6φ |
| UB | 16.0φ | 6.8 | 1.5 | 3.3 | 3.0φ | 3.89φ | 8.0φ |

SANYO Bush

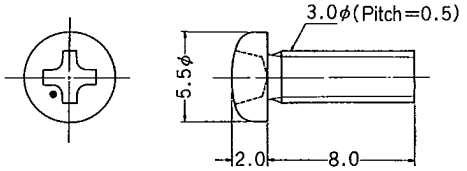
Case Outline—[0006]
unit:mm




Thickness : 0.05~0.1

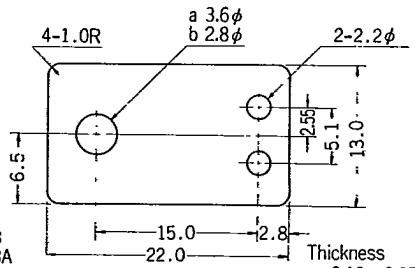
SANYO IS-20MA Mica

Case Outline—[0011]
unit:mm




JIS No.B1111 M3×0.5

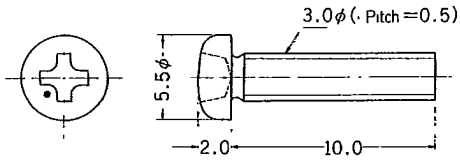
Case Outline—[0007]
unit:mm




a. IS-313
b. IS-313A

Thickness 0.10~0.05

Case Outline—[0012]
unit:mm

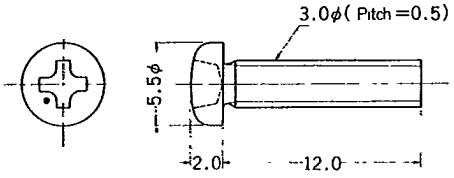



JIS No.B1111 M3×0.5

T-91-20

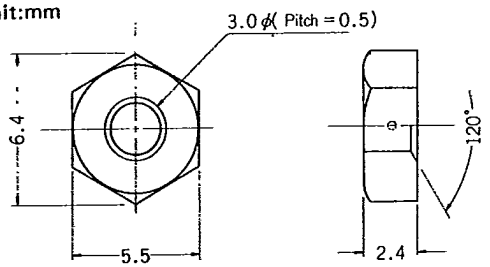


Case Outline—[0013]
unit:mm



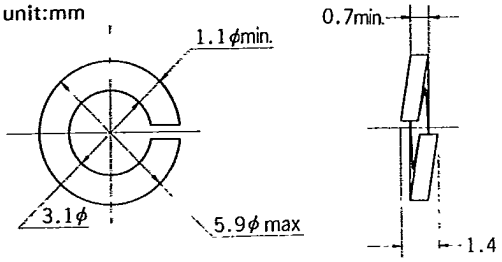

JIS No.B1111 M3×0.5

Case Outline—[0014]
unit:mm



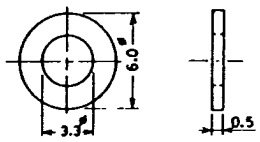

JIS No. B1181 M3×0.5

Case Outline—[0015]
unit:mm



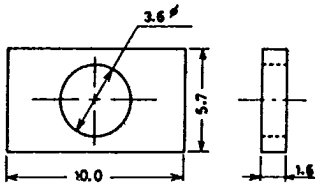

JIS No. B 1251 Spring washer (M3)

Case Outline—[0016]
unit:mm



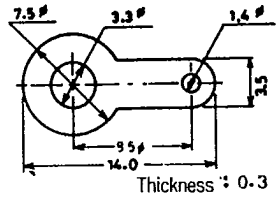

JIS No.B1252 Flat washer

Case Outline—[0017]
unit:mm




JIS No.G3141 Rectangular washer

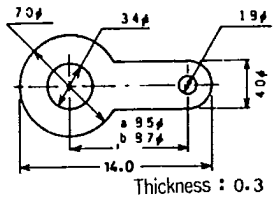
Case Outline—[0018]
unit:mm




Thickness : 0.3

SANYO Lug 1.4

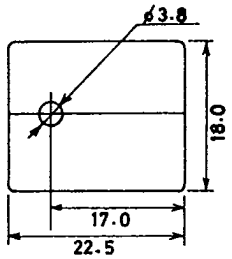
Case Outline—[0019]
unit:mm




Thickness : 0.3

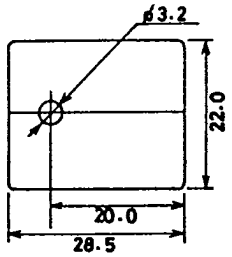
SANYO Lug 1.8φ

Case Outline—[0020]
unit:mm



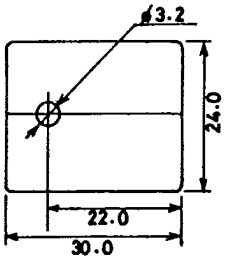

SANYO IS-3MP Mica

Case Outline—[0021]
unit:mm




SANYO IS-MPC Mica

Case Outline—[0022]
unit:mm




SANYO IS-3PBL Mica