

# 2SC4024

**Application :** DC-DC Converter, Emergency Lighting Inverter and General Purpose

( $T_a=25^{\circ}\text{C}$ )

| Symbol               | Conditions                                  | 2SC4024   | Unit |
|----------------------|---------------------------------------------|-----------|------|
| ICBO                 | V <sub>CB</sub> =100V                       | 10max     | μA   |
| IEBO                 | V <sub>EB</sub> =15V                        | 10max     | μA   |
| V(BR)CEO             | I <sub>C</sub> =25mA                        | 50min     | V    |
| h <sub>FE</sub>      | V <sub>CE</sub> =4V, I <sub>C</sub> =1A     | 300to1600 |      |
| V <sub>CE(sat)</sub> | I <sub>C</sub> =5A, I <sub>B</sub> =0.1A    | 0.5max    | V    |
| f <sub>T</sub>       | V <sub>CE</sub> =12V, I <sub>E</sub> =-0.5A | 24typ     | MHz  |
| COB                  | V <sub>CB</sub> =10V, f=1MHz                | 150typ    | pF   |

| V <sub>CC</sub><br>(V) | R <sub>L</sub><br>(Ω) | I <sub>C</sub><br>(A) | I <sub>B1</sub><br>(A) | I <sub>B2</sub><br>(A) | t <sub>ON</sub><br>(μs) | t <sub>STG</sub><br>(μs) | t <sub>F</sub><br>(μs) |
|------------------------|-----------------------|-----------------------|------------------------|------------------------|-------------------------|--------------------------|------------------------|
| 20                     | 4                     | 5                     | 0.1                    | -0.1                   | 0.5t <sub>VP</sub>      | 2.0t <sub>VP</sub>       | 0.5t <sub>VP</sub>     |

Technical drawing of a 1/2" x 1/2" x 1/2" 303 stainless steel ball bearing. The drawing shows three views: a front view, a side view, and a cross-sectional view. The front view shows a diameter of 10.1 ± 0.2, a width of 4.0 ± 0.2, and a total height of 16.9 ± 0.3. The side view shows a diameter of 4.2 ± 0.2 and a width of 2.4 ± 0.2. The cross-sectional view shows a diameter of 13.0 min, a width of 2.54, and a height of 1.35 ± 0.15. The drawing also includes a detail of the ball bearing's internal structure, showing a diameter of 0.85 ± 0.17 and a width of 0.45 ± 0.17. The drawing is labeled with 'a' and 'b' for the ball bearing and 'c' for the cross-sectional view.

Weight : Approx 2.0g  
a. Type No.  
b. Lot No.

The graph shows the relationship between Collector Current  $I_C$  (A) and Collector-Emitter Voltage  $V_{CE}$  (V) for various base currents  $I_B$ . The curves are labeled with  $I_B$  values: 35mA, 30mA, 25mA, 20mA, 15mA, 10mA, and 5mA. The curves show that  $I_C$  approaches  $I_B$  as  $V_{CE}$  increases.

The graph shows the relationship between the collector-emitter saturation voltage ( $V_{CE(sat)}$ ) and the base current ( $I_B$ ) for a 2N2222A NPN transistor. The y-axis represents  $V_{CE(sat)}$  in Volts, ranging from 0 to 1.5. The x-axis represents  $I_B$  in Amperes on a logarithmic scale, ranging from 0.002 to 1.0. Four curves are plotted for different collector currents ( $I_C$ ): 1A, 3A, 5A, and 10A. The curves indicate that  $V_{CE(sat)}$  increases significantly as  $I_B$  decreases, especially for higher  $I_C$  values.

The graph plots Collector Current  $I_C$  (A) on the y-axis (0 to 10) against Base-Emitter Voltage  $V_{BE}$  (V) on the x-axis (0 to 1.2). Three curves are shown for different temperatures at  $V_{CE} = 4V$ :

- $125^\circ C$  (Case Temp): The highest curve, starting around  $V_{BE} = 0.55V$  and  $I_C = 0$ , reaching  $I_C = 10A$  at  $V_{BE} \approx 1.15V$ .
- $25^\circ C$  (Case Temp): The middle curve, starting around  $V_{BE} = 0.65V$  and  $I_C = 0$ , reaching  $I_C = 10A$  at  $V_{BE} \approx 1.1V$ .
- $-30^\circ C$  (Case Temp): The lowest curve, starting around  $V_{BE} = 0.75V$  and  $I_C = 0$ , reaching  $I_C = 10A$  at  $V_{BE} \approx 1.05V$ .

Approximate data points extracted from the graph:

| $V_{BE}$ (V) | $I_C$ (A) at $125^\circ C$ | $I_C$ (A) at $25^\circ C$ | $I_C$ (A) at $-30^\circ C$ |
|--------------|----------------------------|---------------------------|----------------------------|
| 0.55         | 0                          | -                         | -                          |
| 0.65         | 0.5                        | 0                         | -                          |
| 0.75         | 1.5                        | 0.2                       | 0                          |
| 0.85         | 4.0                        | 1.0                       | 0.1                        |
| 0.95         | 8.0                        | 4.0                       | 0.5                        |
| 1.05         | 10.0                       | 8.0                       | 1.0                        |
| 1.10         | -                          | 10.0                      | 2.0                        |
| 1.15         | -                          | -                         | 4.0                        |
| 1.20         | -                          | -                         | 10.0                       |

Graph of DC Current Gain  $h_{FE}$  vs Collector Current  $I_C$  (A) for 2N3866 at  $V_{CE}=4V$ . The graph shows three curves: a top curve peaking at  $h_{FE} \approx 900$ , a middle curve labeled 'Typ' peaking at  $h_{FE} \approx 500$ , and a bottom curve peaking at  $h_{FE} \approx 300$ . All curves peak around  $I_C = 1A$ .

Graph of DC Current Gain  $h_{FE}$  vs Collector Current  $I_C$  (A) for 2N2222A at  $V_{CE}=4V$ . The graph shows three curves for temperatures 125°C, 25°C, and -30°C. The DC current gain  $h_{FE}$  increases with collector current  $I_C$  up to a peak and then decreases. The peak  $h_{FE}$  is highest at 125°C and lowest at -30°C.

| Time $t$ (ms) | Transient Thermal Resistance $\theta_{ja}$ ( $^{\circ}\text{C}/\text{W}$ ) |
|---------------|----------------------------------------------------------------------------|
| 1             | 0.4                                                                        |
| 10            | 1.0                                                                        |
| 100           | 1.8                                                                        |
| 1000          | 3.5                                                                        |

The graph shows the relationship between the emitter current  $I_E$  and the cut-off frequency  $f_T$  for the 2N4350 JFET. The x-axis represents the emitter current  $I_E$  in Amperes (A), ranging from -0.05 to -10. The y-axis represents the cut-off frequency  $f_T$  in Megahertz (MHz), ranging from 0 to 30. The curve is a downward-opening parabola with a peak labeled 'Typ' at  $I_E = -0.5$  A and  $f_T \approx 24$  MHz. The condition  $V_{CE} = 12V$  is noted in the top right corner.

| Emitter Current $I_E$ (A) | Cut-off Frequency $f_T$ (MHz) |
|---------------------------|-------------------------------|
| -0.05                     | 12                            |
| -0.1                      | 16                            |
| -0.2                      | 20                            |
| -0.3                      | 23                            |
| -0.4                      | 24                            |
| -0.5                      | 24                            |
| -0.6                      | 23                            |
| -0.8                      | 20                            |
| -1.0                      | 18                            |
| -2.0                      | 12                            |
| -5.0                      | 6                             |
| -10.0                     | 4                             |

Graph of Collector Current  $I_C$  (A) vs. Collector-Emitter Voltage  $V_{CE}$  (V) for a 2N2222A transistor. The graph shows DC, 10ms, and 1ms curves. The DC curve is the lowest, followed by 10ms, and then 1ms. The curves show that the transistor can handle higher collector current for shorter pulse widths. The graph is labeled "Without Heatsink Natural Cooling".

The graph shows the relationship between Maximum Power Dissipation  $P_c$  (W) and Ambient Temperature  $T_a$  (°C) for different heat sink configurations. The y-axis is logarithmic, ranging from 2 to 40 W. The x-axis is linear, ranging from 0 to 150 °C. The configurations are:

- Natural Cooling
- Silicone Grease
- Heatsink Aluminum in mm
- With Infinite heatsink
- 150x150x2
- 100x100x2
- 50x50x2
- Without Heatsink

All configurations show a linear decrease in  $P_c$  as  $T_a$  increases, converging at 150 °C. The 'Without Heatsink' configuration has the lowest  $P_c$  values, while 'Natural Cooling' and 'Silicone Grease' have the highest.