



# HE9015

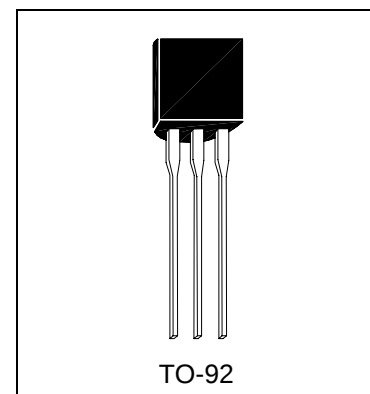
PNP EPITAXIAL PLANAR TRANSISTOR

## Description

The HE9015 is designed for use in pre-amplifier of low level and low noise.

## Features

- High Total Power Dissipation ( $P_D$ : 450mW)
- Complementary to HE9014
- High  $h_{FE}$  and Good Linearity



TO-92

## Absolute Maximum Ratings

- Maximum Temperatures  
Storage Temperature ..... -55 ~ +150 °C  
Junction Temperature ..... +150 °C Maximum
- Maximum Power Dissipation  
Total Power Dissipation ( $T_A=25^\circ\text{C}$ ) ..... 450 mW
- Maximum Voltages and Currents ( $T_A=25^\circ\text{C}$ )  
 $V_{CBO}$  Collector to Base Voltage ..... -50 V  
 $V_{CEO}$  Collector to Emitter Voltage ..... -45 V  
 $V_{EBO}$  Emitter to Base Voltage ..... -5 V  
 $I_C$  Collector Current ..... -100 mA

## Electrical Characteristics ( $T_A=25^\circ\text{C}$ )

| Symbol         | Min. | Typ.  | Max.  | Unit | Test Conditions                                  |
|----------------|------|-------|-------|------|--------------------------------------------------|
| $BV_{CBO}$     | -50  | -     | -     | V    | $I_C=-100\mu\text{A}$ , $I_E=0$                  |
| $BV_{CEO}$     | -45  | -     | -     | V    | $I_C=-1\text{mA}$ , $I_B=0$                      |
| $BV_{EBO}$     | -5   | -     | -     | V    | $I_E=-100\mu\text{A}$ , $I_C=0$                  |
| $I_{CBO}$      | -    | -     | -50   | nA   | $V_{CB}=-50\text{V}$ , $I_E=0$                   |
| $I_{EBO}$      | -    | -     | -50   | nA   | $V_{EB}=-5\text{V}$ , $I_C=0$                    |
| $*V_{CE(sat)}$ | -    | -0.20 | -0.7  | V    | $I_C=-100\text{mA}$ , $I_B=-5\text{mA}$          |
| $*V_{BE(sat)}$ | -    | -0.82 | -1    | V    | $I_C=-100\text{mA}$ , $I_B=-5\text{mA}$          |
| $V_{BE(on)}$   | -0.6 | -0.65 | -0.75 | V    | $V_{CE}=-5\text{V}$ , $I_C=-2\text{mA}$          |
| $*h_{FE}$      | 100  | 200   | 600   |      | $V_{CE}=-5\text{V}$ , $I_C=-1\text{mA}$          |
| Cob            | -    | 4.5   | 7     | pF   | $V_{CB}=-10\text{V}$ , $f=1\text{MHz}$ , $I_E=0$ |
| $f_T$          | 100  | 190   | -     | MHz  | $V_{CE}=-5\text{V}$ , $I_C=-10\text{mA}$         |

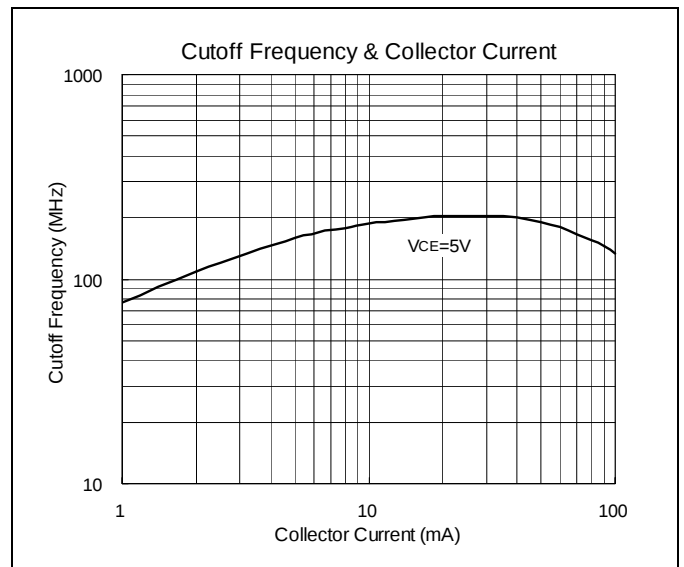
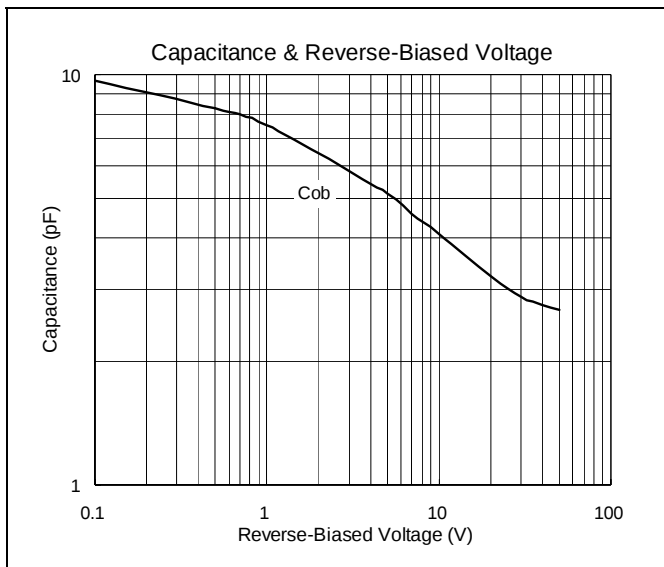
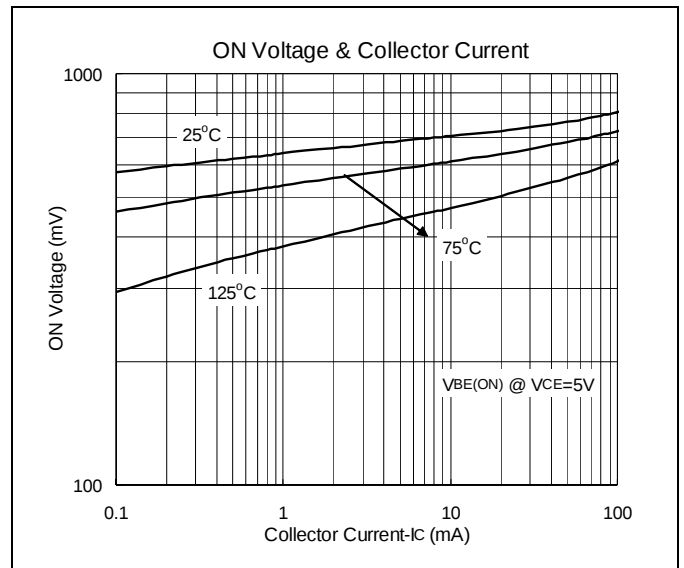
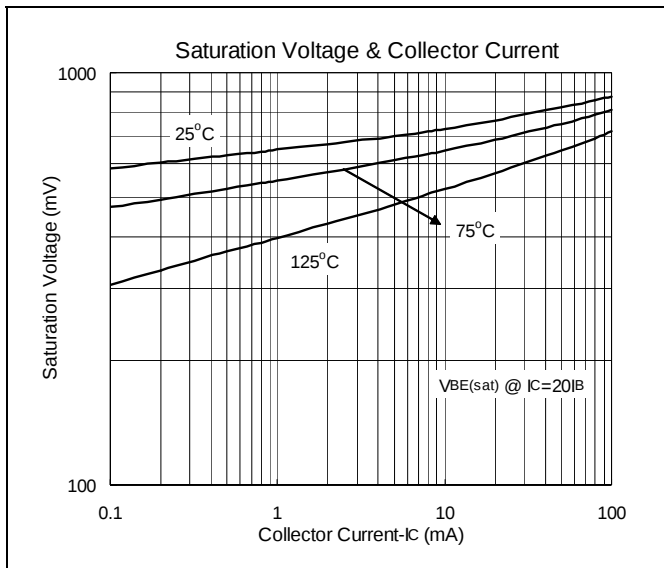
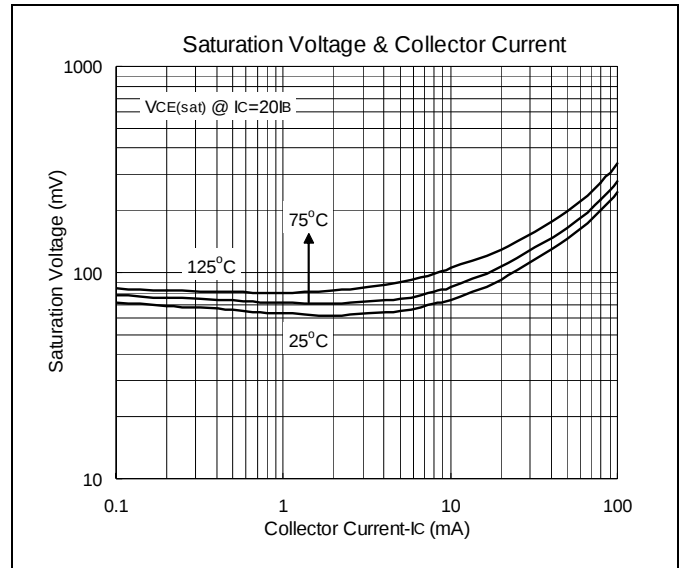
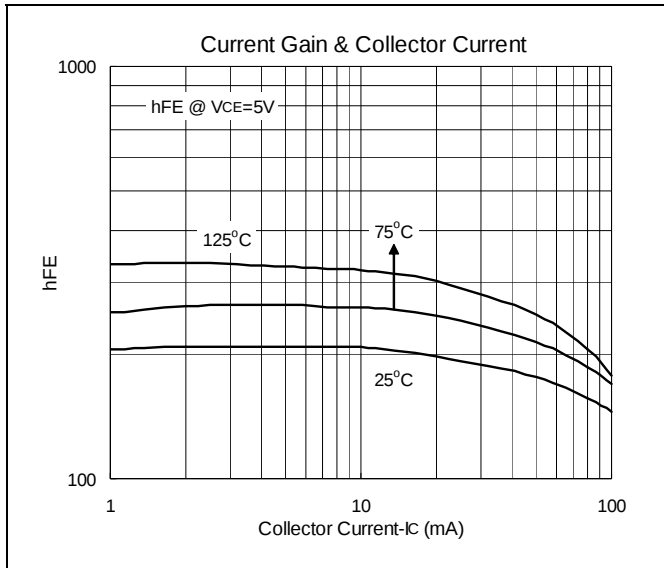
\*Pulse Test: Pulse Width  $\leq 380\mu\text{s}$ , Duty Cycle  $\leq 2\%$

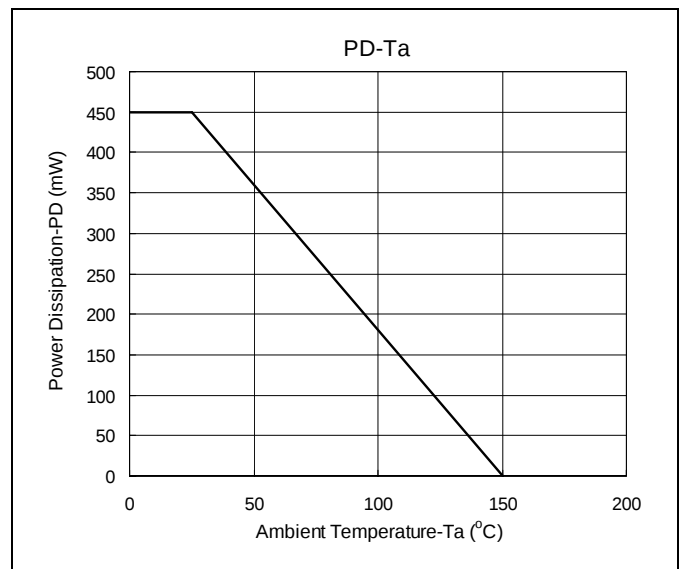
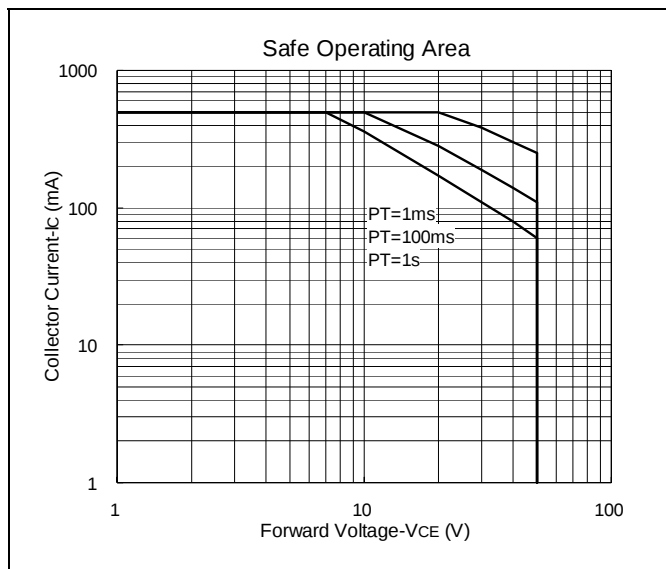
## Classification on $h_{FE1}$

| Rank  | B       | C       |
|-------|---------|---------|
| Range | 100-300 | 200-600 |



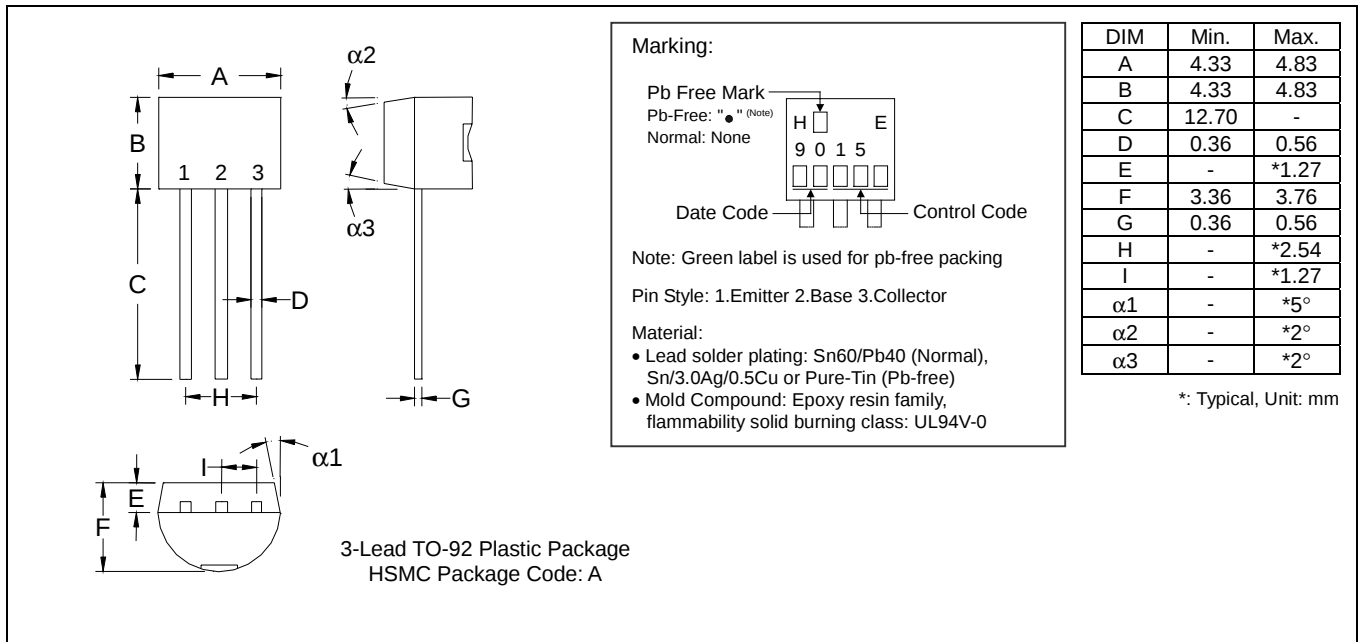
### Characteristics Curve



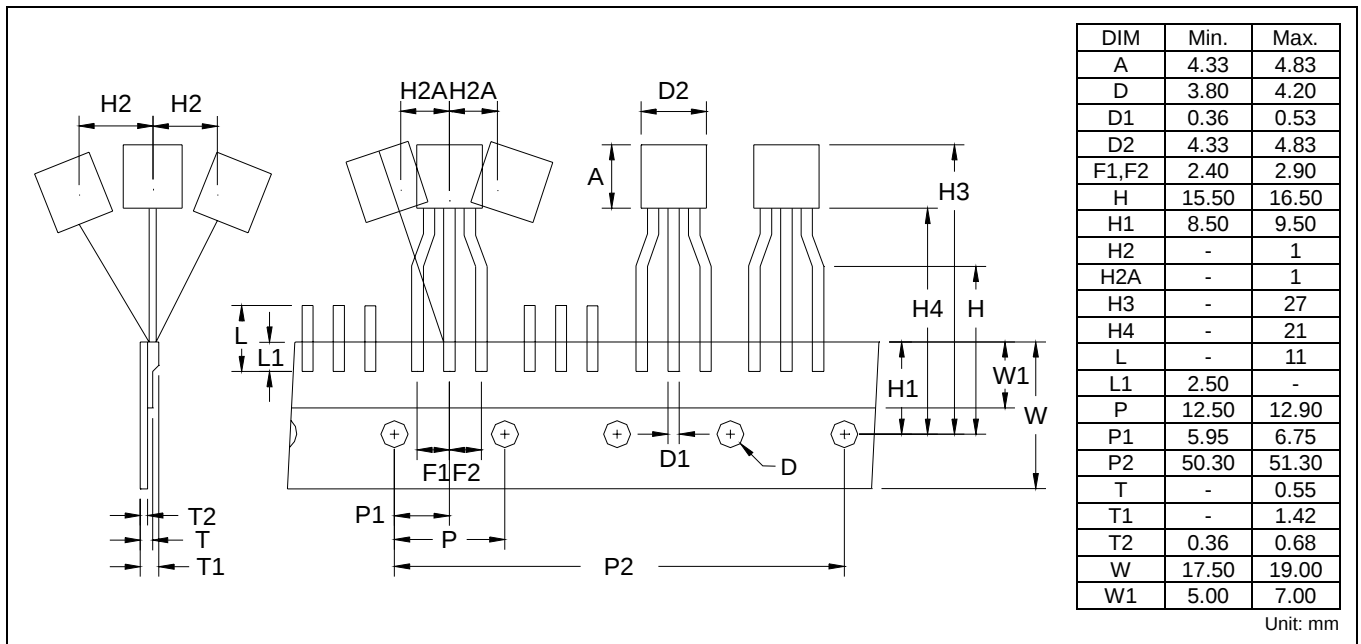




### TO-92 Dimension



### TO-92 Taping Dimension



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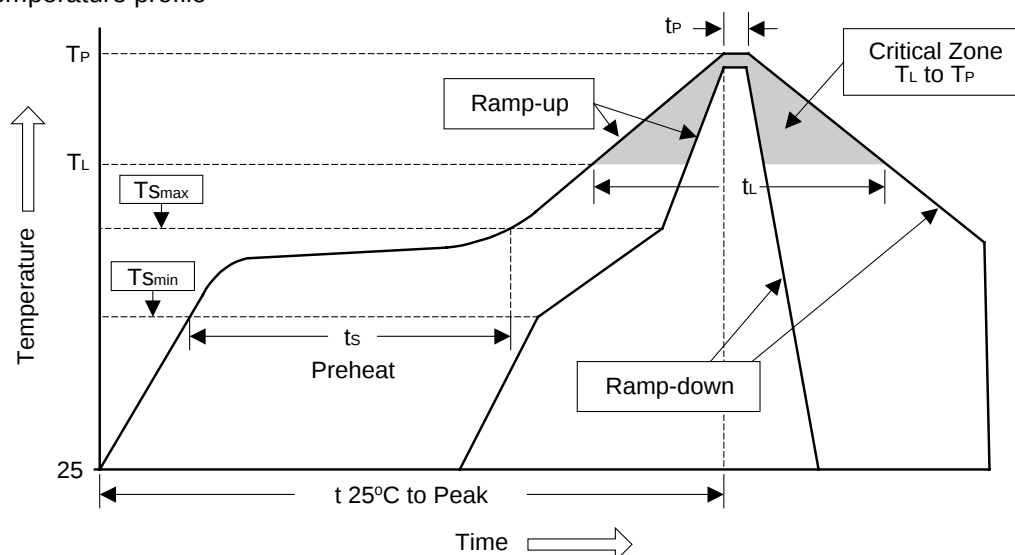
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## Soldering Methods for HSMC's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



| Profile Feature                                      | Sn-Pb Eutectic Assembly | Pb-Free Assembly |
|------------------------------------------------------|-------------------------|------------------|
| Average ramp-up rate ( $T_L$ to $T_P$ )              | <3°C/sec                | <3°C/sec         |
| Preheat                                              |                         |                  |
| - Temperature Min ( $T_{smin}$ )                     | 100°C                   | 150°C            |
| - Temperature Max ( $T_{smax}$ )                     | 150°C                   | 200°C            |
| - Time (min to max) ( $t_s$ )                        | 60~120 sec              | 60~180 sec       |
| $T_{smax}$ to $T_L$                                  |                         |                  |
| - Ramp-up Rate                                       | <3°C/sec                | <3°C/sec         |
| Time maintained above:                               |                         |                  |
| - Temperature ( $T_L$ )                              | 183°C                   | 217°C            |
| - Time ( $t_L$ )                                     | 60~150 sec              | 60~150 sec       |
| Peak Temperature ( $T_P$ )                           | 240°C +0/-5°C           | 260°C +0/-5°C    |
| Time within 5°C of actual Peak Temperature ( $t_P$ ) | 10~30 sec               | 20~40 sec        |
| Ramp-down Rate                                       | <6°C/sec                | <6°C/sec         |
| Time 25°C to Peak Temperature                        | <6 minutes              | <8 minutes       |

3. Flow (wave) soldering (solder dipping)

| Products         | Peak temperature | Dipping time |
|------------------|------------------|--------------|
| Pb devices.      | 245°C ±5°C       | 5sec ±1sec   |
| Pb-Free devices. | 260°C +0/-5°C    | 5sec ±1sec   |