



HE9013

NPN EPITAXIAL PLANAR TRANSISTOR

Description

The HE9013 is designed for use in 1W output amplifier of portable radios in class B push-pull operation.

Features

- High Total Power Dissipation (P_T : 625mW)
- High Collector Current (I_C : 500mA)
- Complementary to HE9012
- Excellent linearity

Absolute Maximum Ratings

- Maximum Temperatures
Storage Temperature -55 ~ +150 °C
Junction Temperature +150 °C Maximum
- Maximum Power Dissipation
Total Power Dissipation ($T_A=25^\circ\text{C}$) 625 mW
- Maximum Voltages and Currents ($T_A=25^\circ\text{C}$)
 V_{CBO} Collector to Base Voltage 40V
 V_{CEO} Collector to Emitter Voltage 20V
 V_{EBO} Emitter to Base Voltage 5V
 I_C Collector Current 500 mA
 I_{cp} Base Current 100 mA

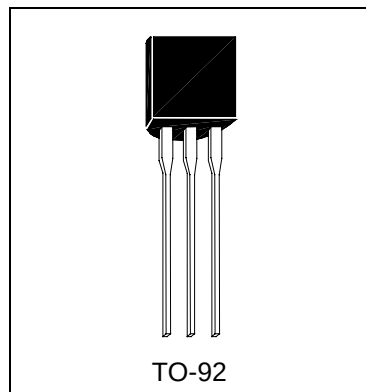
Electrical Characteristics ($T_A=25^\circ\text{C}$)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
BV_{CBO}	40	-	-	V	$I_C=100\mu\text{A}$, $I_E=0$
BV_{CEO}	20	-	-	V	$I_C=1\text{mA}$, $I_B=0$
$BVEBO$	5	-	-	V	$I_E=100\mu\text{A}$, $I_C=0$
I_{CBO}	-	-	100	nA	$V_{CE}=25\text{V}$, $I_E=0$
$IEBO$	-	-	100	nA	$V_{EB}=3\text{V}$, $I_C=0$
$*V_{CE(sat)}$	-	-	0.6	V	$I_C=500\text{mA}$, $I_B=50\text{mA}$
$*V_{BE(sat)}$	-	-	1.2	V	$I_C=500\text{mA}$, $I_B=50\text{mA}$
$V_{BE(on)}$	-	-	0.9	V	$V_{CE}=1\text{V}$, $I_C=10\text{mA}$
$*h_{FE1}$	95	180	300		$V_{CE}=1\text{V}$, $I_C=50\text{mA}$
$*h_{FE2}$	40	-	-		$V_{CE}=1\text{V}$, $I_C=500\text{mA}$
C_{ob}	-	-	8	pF	$V_{CB}=10\text{V}$, $f=1\text{MHz}$
f_T	100	-	-	MHz	$V_{CE}=1\text{V}$, $I_C=10\text{mA}$, $f=100\text{MHz}$

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

Classification on h_{FE1}

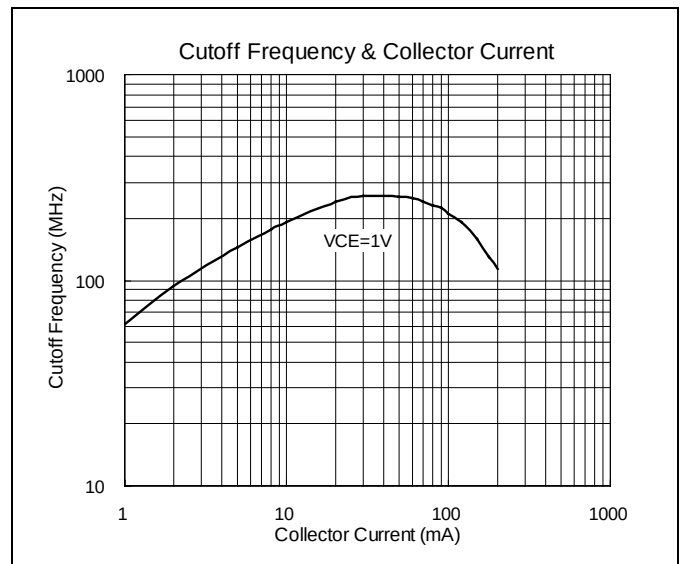
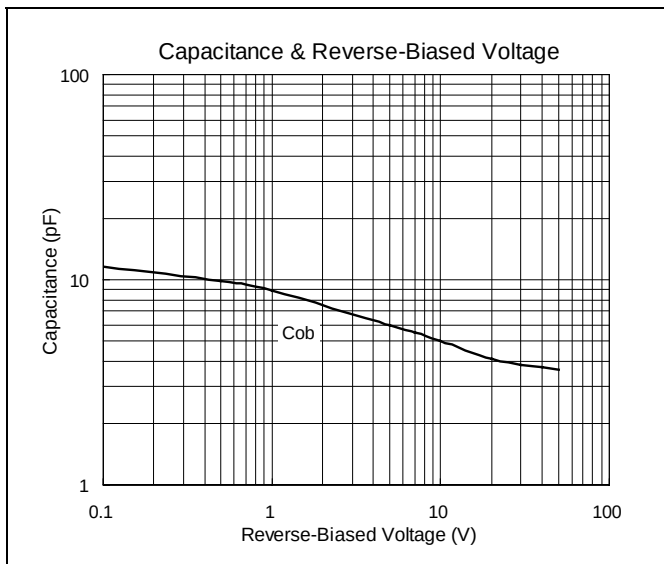
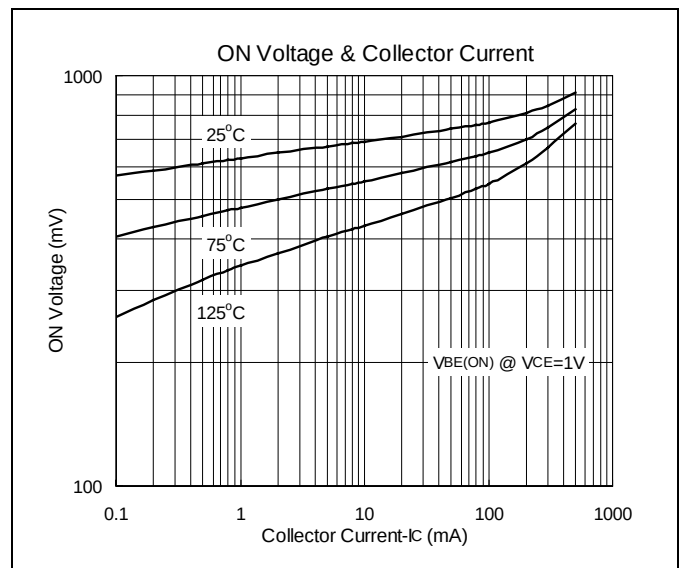
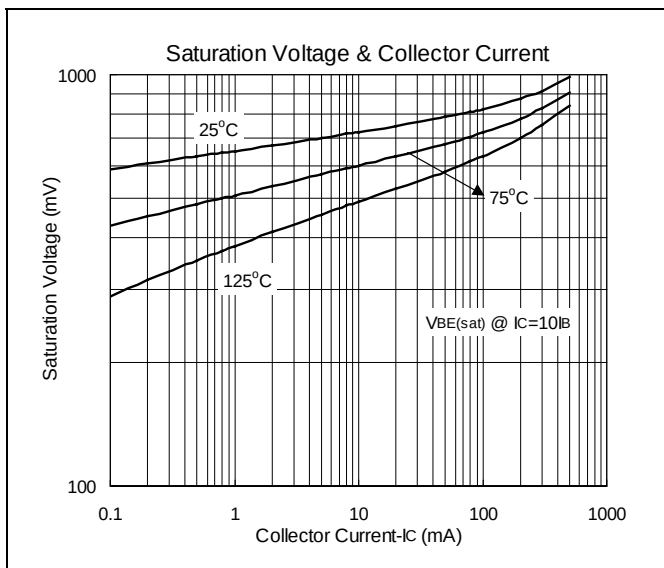
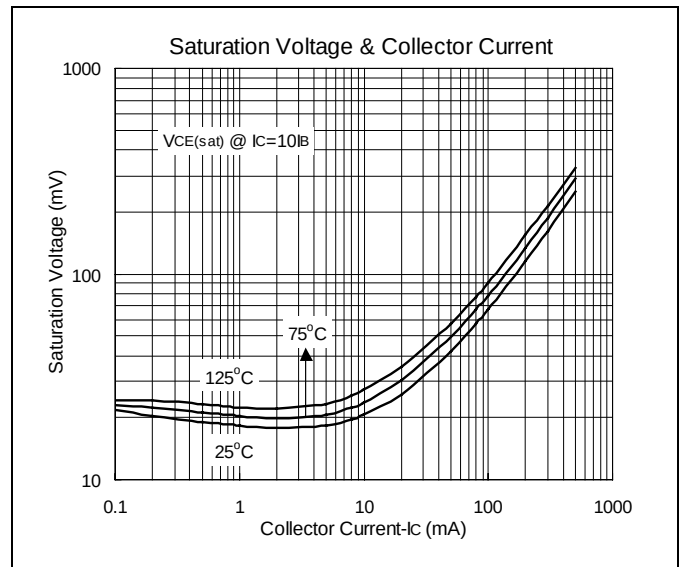
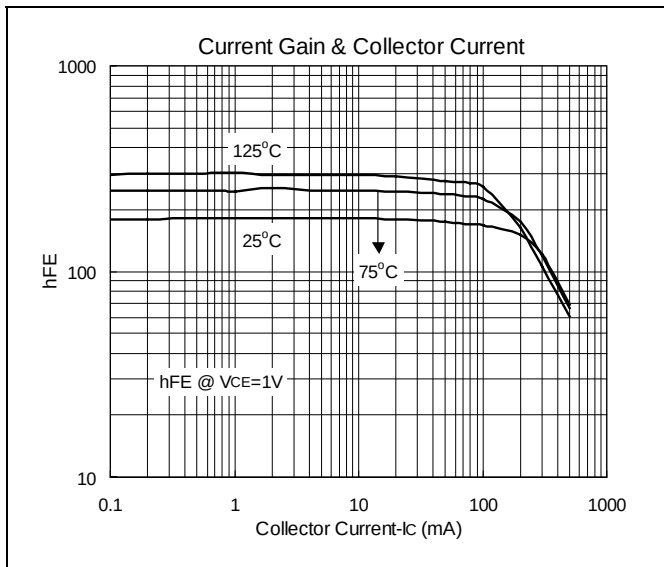
Rank	F	G	H	I1	I2
Range	95-135	112-166	144-202	176-246	214-300

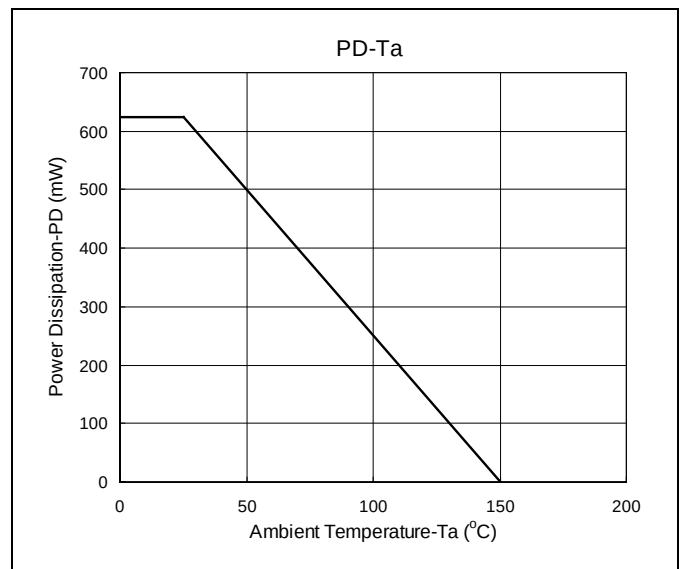
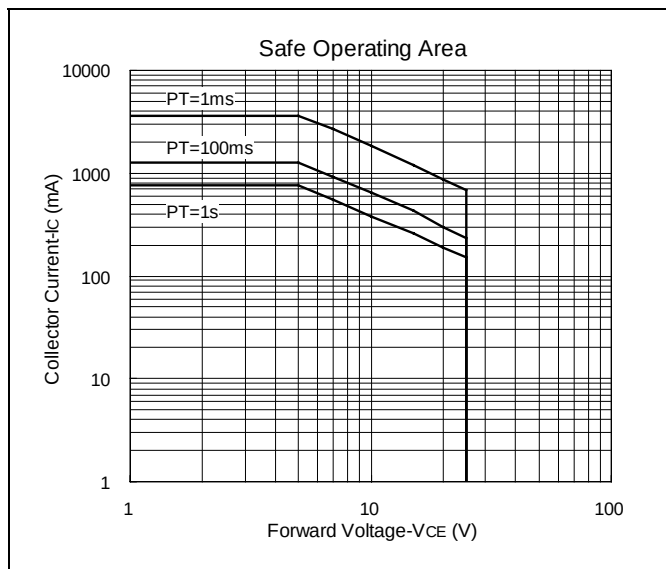


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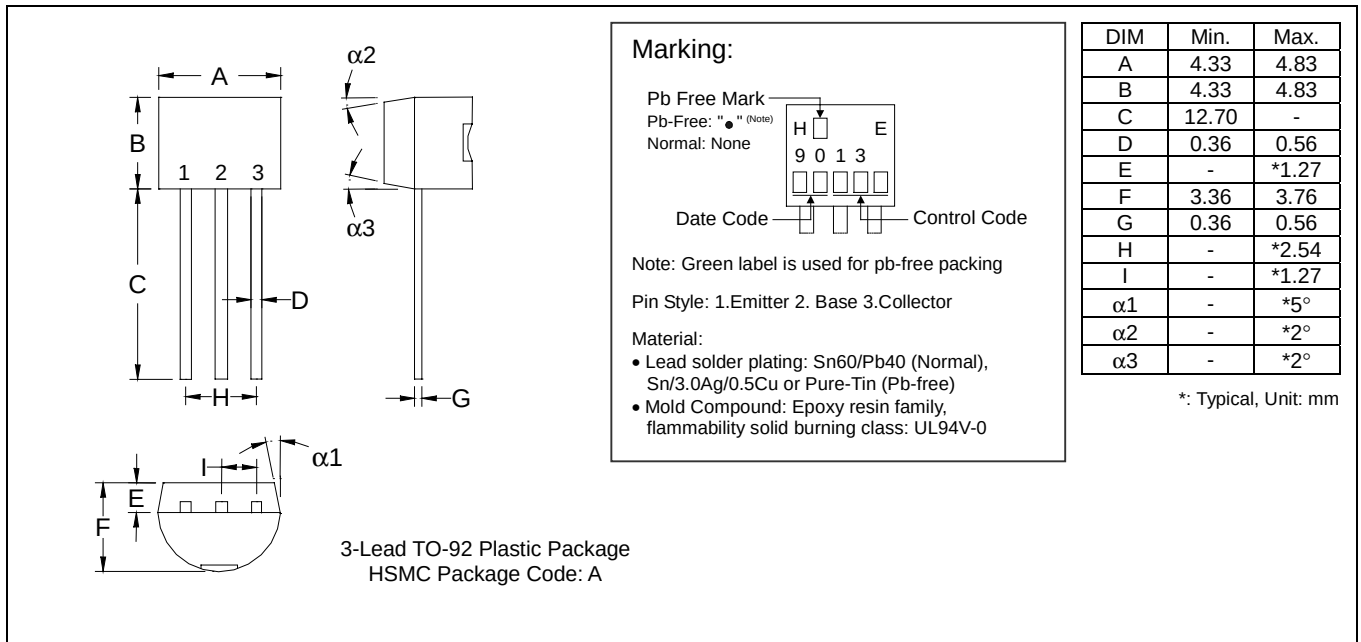
Characteristics Curve



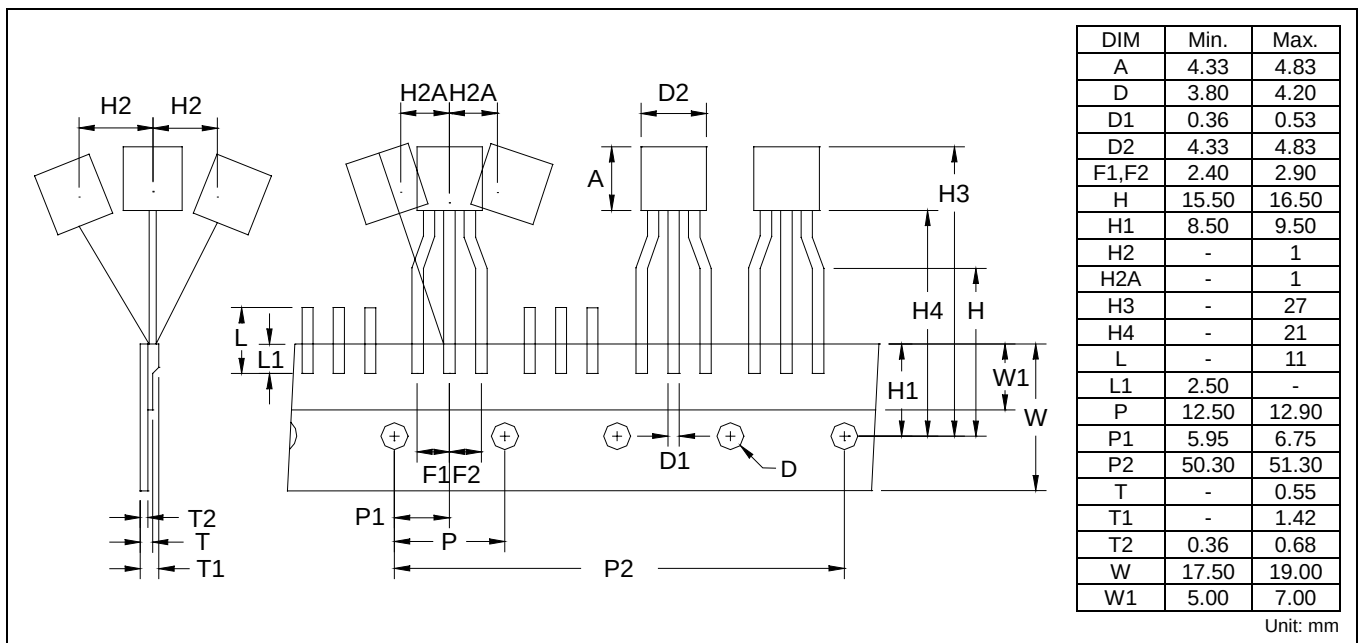




TO-92 Dimension



TO-92 Taping Dimension



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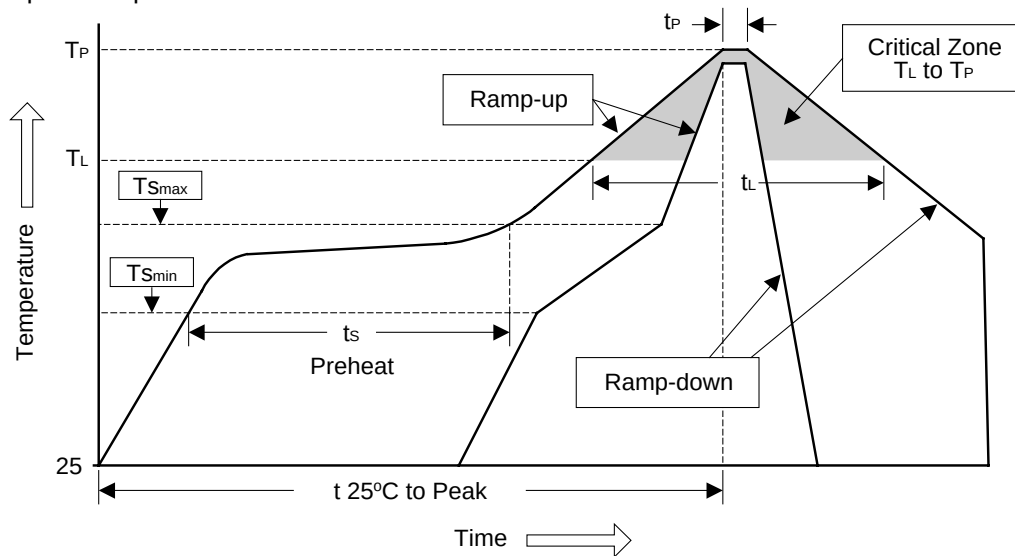
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Soldering Methods for HSMC's Products

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