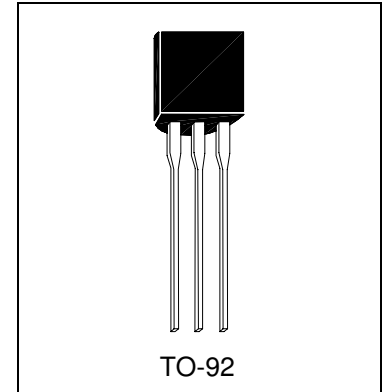




# H2N3904

NPN EPITAXIAL PLANAR TRANSISTOR



## Description

The H2N3904 is designed for general purpose switching and amplifier applications.

## 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 ..... 60 V  
 $V_{CEO}$  Collector to Emitter Voltage ..... 40 V  
 $V_{EBO}$  Emitter to Base Voltage ..... 6 V  
 $I_C$  Collector Current ..... 200 mA

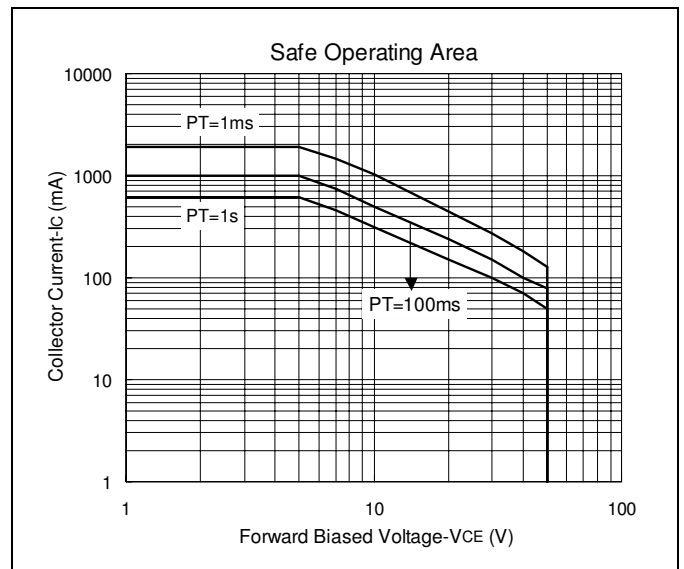
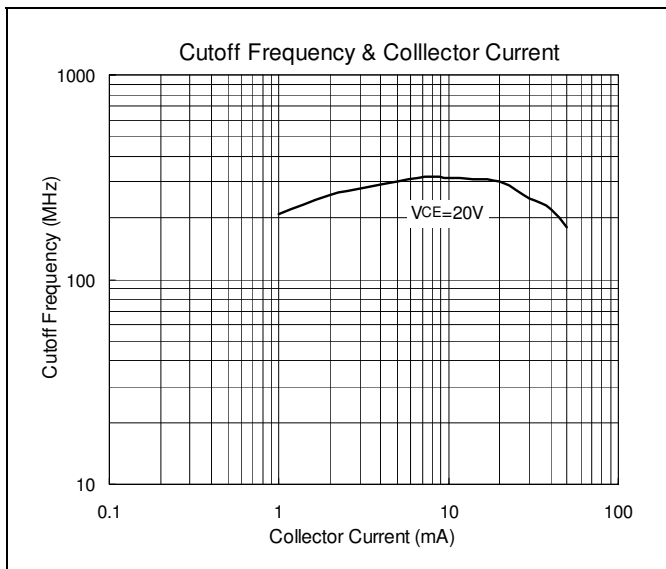
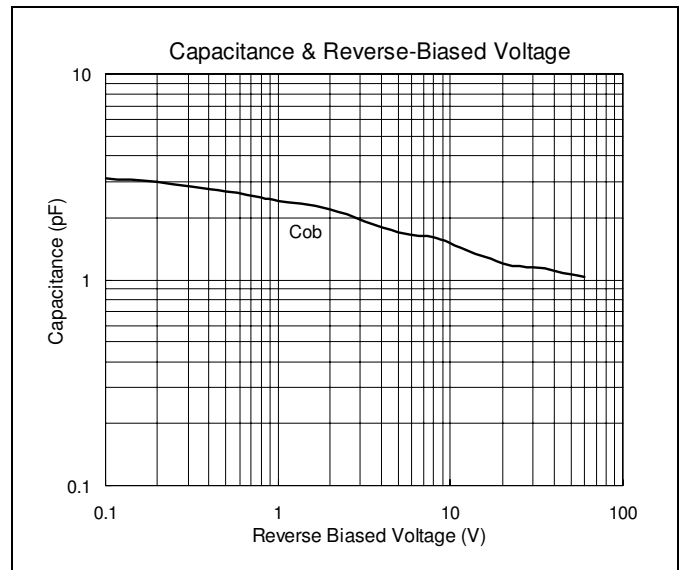
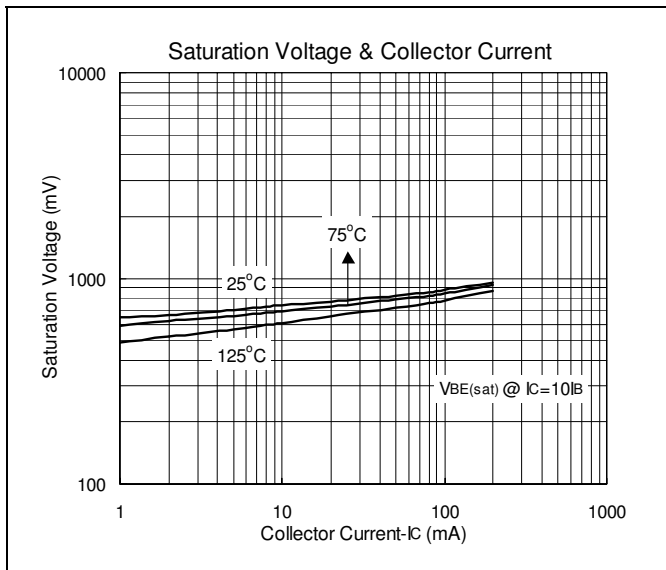
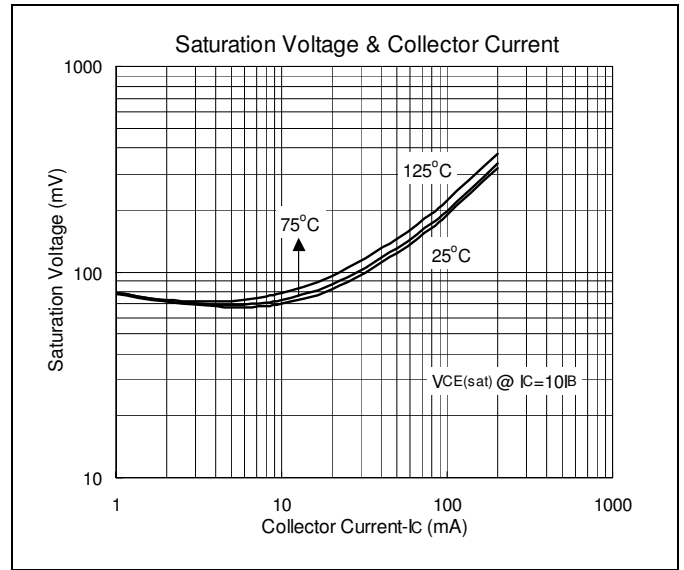
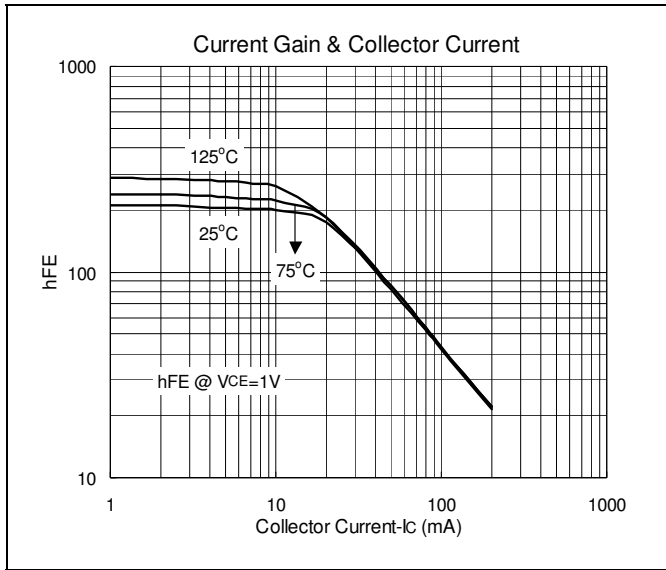
## Electrical Characteristics ( $T_A=25^\circ\text{C}$ )

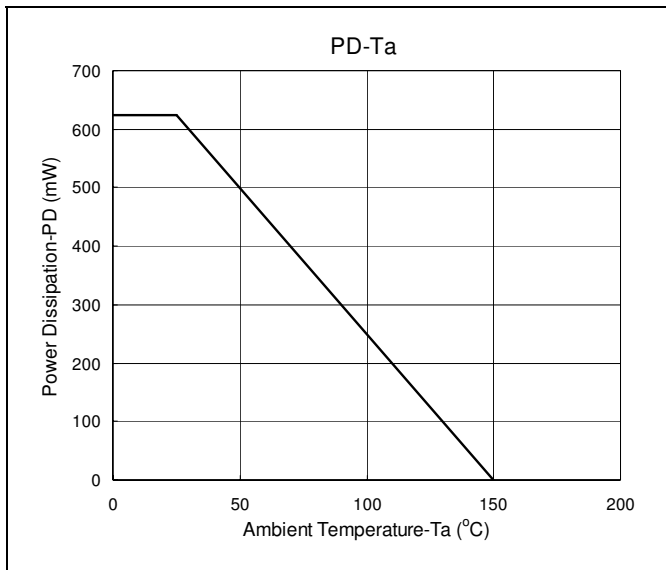
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
$BV_{CBO}$	60	-	-	V	$I_C=10\mu\text{A}, I_E=0$
$BV_{CEO}$	40	-	-	V	$I_C=1\text{mA}, I_B=0$
$BV_{EBO}$	6	-	-	V	$I_E=10\mu\text{A}, I_C=0$
$I_{CEX}$	-	-	50	nA	$V_{CE}=30\text{V}, V_{BE}=3\text{V}$
$*V_{CE(sat)1}$	-	-	200	mV	$I_B=1\text{mA}, I_C=10\text{mA}$
$*V_{CE(sat)2}$	-	-	300	mV	$I_B=5\text{mA}, I_C=50\text{mA}$
$*V_{BE(sat)1}$	650	-	850	mV	$I_B=1\text{mA}, I_C=10\text{mA}$
$*V_{BE(sat)2}$	-	-	950	mV	$I_B=5\text{mA}, I_C=50\text{mA}$
$*h_{FE1}$	40	-	-		$V_{CE}=1\text{V}, I_C=100\mu\text{A}$
$*h_{FE2}$	70	-	-		$V_{CE}=1\text{V}, I_C=1\text{mA}$
$*h_{FE3}$	100	-	300		$V_{CE}=1\text{V}, I_C=10\text{mA}$
$*h_{FE4}$	60	-	-		$V_{CE}=1\text{V}, I_C=50\text{mA}$
$*h_{FE5}$	30	-	-		$V_{CE}=1\text{V}, I_C=100\text{mA}$
$f_T$	300	-	-	MHz	$I_C=10\text{mA}, V_{CE}=20\text{V}, f=100\text{MHz}$
Cob	-	-	4	pF	$V_{CB}=5\text{V}, f=1\text{MHz}, I_E=0$

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



### Characteristics Curve







### TO-92 Dimension

**Marking:**

Pb Free Mark  
 Pb-Free: "●" (Note)  
 Normal: None

H	2	N
3	9	0
4		

Date Code      Control Code

Note: Green label is used for pb-free packing

Pin Style: 1.Emitter 2.Base 3.Collector

Material:

- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	4.33	4.83
B	4.33	4.83
C	12.70	-
D	0.36	0.56
E	-	*1.27
F	3.36	3.76
G	0.36	0.56
H	-	*2.54
I	-	*1.27
α1	-	*5°
α2	-	*2°
α3	-	*2°

\*: Typical, Unit: mm

3-Lead TO-92 Plastic Package  
 HSMC Package Code: A

### TO-92 Taping Dimension

DIM	Min.	Max.
A	4.33	4.83
D	3.80	4.20
D1	0.36	0.53
D2	4.33	4.83
F1,F2	2.40	2.90
H	15.50	16.50
H1	8.50	9.50
H2	-	1
H2A	-	1
H3	-	27
H4	-	21
L	-	11
L1	2.50	-
P	12.50	12.90
P1	5.95	6.75
P2	50.30	51.30
T	-	0.55
T1	-	1.42
T2	0.36	0.68
W	17.50	19.00
W1	5.00	7.00

Unit: mm

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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



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T <sub>smin</sub> )	100°C	150°C
- Temperature Max (T <sub>smax</sub> )	150°C	200°C
- Time (min to max) (ts)	60~120 sec	60~180 sec
T <sub>smax</sub> to T <sub>L</sub>		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60~150 sec	60~150 sec
Peak Temperature (T <sub>p</sub> )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t <sub>p</sub> )	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