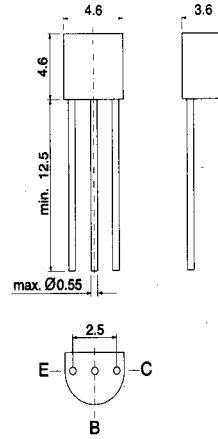


NPN Silicon Expitaxial Planar Transistor  
for switching and amplifier applications.

As complementary types the PNP transistors  
HN / 2N 3905 and HN / 2N 3906 are recommended.

On special request, these transistors can be manufactured  
in different pin configurations. Please refer to the "TO-92  
TRANSISTOR PACKAGE OUTLINE" on page 80 for the  
available pin options.



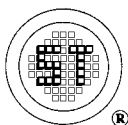
TO-92 Plastic Package  
Weight approx. 0.18 g  
Dimensions in mm

### Absolute Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

	Symbol	Value	Unit
Collector Base Voltage	$V_{CBO}$	60	V
Collector Emitter Voltage	$V_{CEO}$	40	V
Emitter Base Voltage	$V_{EBO}$	6	V
Collector Current	$I_C$	100	mA
Peak Collector Current	$I_{CM}$	200	mA
Power Dissipation at $T_{amb} = 25^\circ\text{C}$	$P_{tot}$	500 <sup>1)</sup>	mW
Junction Temperature	$T_J$	150	$^\circ\text{C}$
Storage Temperature Range	$T_S$	-55 to +150	$^\circ\text{C}$

<sup>1)</sup> Valid provided that leads are kept at ambient temperature at a distance of 2 mm from case

G S P FORM A AVAILABLE



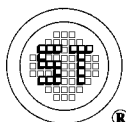
**SEMTECH ELECTRONICS LTD.**  
( wholly owned subsidiary of HONEY TECHNOLOGY LTD. )



## Characteristics at $T_{amb} = 25\text{ }^{\circ}\text{C}$

		Symbol	Min.	Typ.	Max.	Unit
DC Current Gain at $V_{CE} = 1\text{V}$ , $I_C = 0.1\text{ mA}$	<b>HN / 2N 3903</b>	$h_{FE}$	20	-	-	-
	<b>HN / 2N 3904</b>	$h_{FE}$	40	-	-	-
at $V_{CE} = 1\text{V}$ , $I_C = 1\text{ mA}$	<b>HN / 2N 3903</b>	$h_{FE}$	35	-	-	-
	<b>HN / 2N 3904</b>	$h_{FE}$	70	-	-	-
at $V_{CE} = 1\text{V}$ , $I_C = 10\text{ mA}$	<b>HN / 2N 3903</b>	$h_{FE}$	50	-	150	-
	<b>HN / 2N 3904</b>	$h_{FE}$	100	-	300	-
at $V_{CE} = 1\text{V}$ , $I_C = 50\text{ mA}$	<b>HN / 2N 3903</b>	$h_{FE}$	30	-	-	-
	<b>HN / 2N 3904</b>	$h_{FE}$	60	-	-	-
at $V_{CE} = 1\text{V}$ , $I_C = 100\text{ mA}$	<b>HN / 2N 3903</b>	$h_{FE}$	15	-	-	-
	<b>HN / 2N 3904</b>	$h_{FE}$	30	-	-	-
Thermal Resistance Junction to Ambient		$R_{thA}$	-	-	250 <sup>1)</sup>	K/W
Collector Saturation Voltage at $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ at $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$		$V_{CE\text{ sat}}$	-	-	0.2	V
		$V_{CE\text{ sat}}$	-	-	0.3	V
Base Saturation Voltage at $I_C = 10\text{ mA}$ , $I_B = 1\text{ mA}$ at $I_C = 50\text{ mA}$ , $I_B = 5\text{ mA}$		$V_{BE\text{ sat}}$	-	-	0.85	V
		$V_{BE\text{ sat}}$	-	-	0.95	V
Collector Cutoff Current $V_{EB} = 3\text{ V}$ , $V_{CE} = 30\text{ V}$		$I_{CEV}$	-	-	50	nA
Emitter Cutoff Current $V_{EB} = 3\text{ V}$ , $V_{CE} = 30\text{ V}$		$I_{EBV}$	-	-	50	nA
Collector Base Breakdown Voltage at $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$		$V_{(BR)CBO}$	60	-	-	V
Collector Emitter Breakdown Voltage at $I_C = 1\text{ mA}$ , $I_B = 0$		$V_{(BR)CEO}$	40	-	-	V
Emitter Base Breakdown Voltage at $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$		$V_{(BR)EBO}$	6	-	-	V
Gain Bandwidth Product at $V_{CE} = 20\text{ V}$ , $I_C = 10\text{ mA}$ , $f = 100\text{ MHz}$	<b>HN / 2N 3903</b>	$f_T$	250	-	-	MHz
	<b>HN / 2N 3904</b>	$f_T$	300	-	-	MHz
Collector Base Capacitance at $V_{CB} = 5\text{ V}$ , $f = 100\text{ kHz}$		$C_{CBO}$	-	-	4	pF
Emitter Base Capacitance at $V_{EB} = 0.5\text{ V}$ , $f = 100\text{ kHz}$		$C_{EBO}$	-	-	8	pF

<sup>1)</sup> Valid provided that leads are kept at ambient temperature at a distance of 2 mm from case.

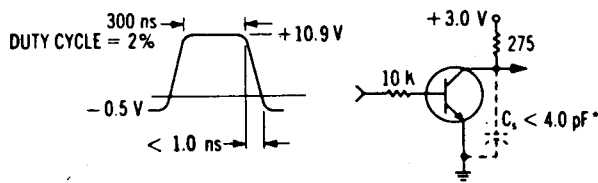


**HONEY TECHNOLOGY LTD.**  
(Subsidiary of a company listed on the Hong Kong Stock Exchange)



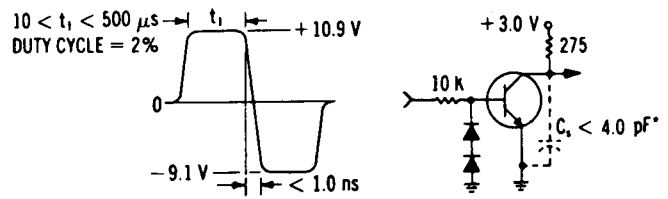
## Characteristics (continued)

	Symbol	Min.	Typ.	Max.	Unit
Rise Time (see Fig. 1) at $I_{B1} = 1 \text{ mA}$ , $I_C = 10 \text{ mA}$	$t_r$	-	-	70	ns
Fall Time (see Fig. 2) at $-I_{B1} = I_{B2} = 1 \text{ mA}$ , $I_C = 10 \text{ mA}$	$t_f$	-	-	200	ns



**Fig. 1:** Test circuit for delay and rise time

\* total shunt capacitance of test jig and connectors



**Fig. 2:** Test circuit for storage and fall time

\* total shunt capacitance of test jig and connectors

