

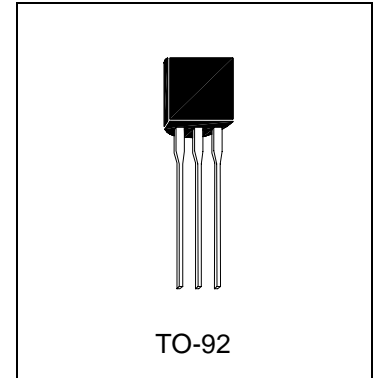


# HSB1386A

LOW FREQUENCY TRANSISTOR (-20V, -4A)

## Features

- Low  $V_{CE(sat)}$   
 $V_{CE(sat)} = -0.55V$  (Typ.) ( $I_C/I_B = -4A/-0.1A$ )
- Excellent DC current gain characteristics.



## Structure

Epitaxial planar type PNP silicon transistor

## Absolute Maximum Ratings ( $T_A = 25^\circ C$ )

Symbol	Parameter	Limits	Unit
$V_{CBO}$	Collector-Base Voltage	-30	V
$V_{CEO}$	Collector-Emitter Voltage	-20	V
$V_{EBO}$	Emitter-Base Voltage	-6	V
$I_C$	Collector Current	-4	A
		-10	A(Pulse)*
$P_D$	Collector Power Dissipation ( $T_a = 25^\circ C$ )	750	mW
$T_j$	Junction Temperature	150	$^\circ C$
$T_{stg}$	Storage Temperature	-55~+150	$^\circ C$

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

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions
$BV_{CBO}$	Collector-Base Breakdown Voltage	-30	-	-	V	$I_C = -50\mu A$
$BV_{CEO}$	Collector-Emitter Breakdown Voltage	-20	-	-	V	$I_C = -1mA$
$BV_{EBO}$	Emitter-Base Breakdown Voltage	-6				$I_C = -50\mu A$
$I_{CBO}$	Collector Cutoff Current	-	-	-0.5	$\mu A$	$V_{CB} = -20V$
$I_{EBO}$	Emitter Cutoff Current	-	-	-0.5	$\mu A$	$V_{EB} = -5V$
* $V_{CE(sat)}$	Collector-Emitter Saturation Voltage	-	-	-1	V	$I_C/I_B = -4A/-0.1A$
*hFE	DC Current Transfer Ratio	82	-	580		$V_{CE} = -2V, I_C = -0.5A$
fT	Transition Frequency	-	110	-	MHz	$V_{CE} = -6V, I_E = 50mA, f = 30MHz$
Cob	Output Capacitance	-	30	-	pF	$V_{CB} = -20V, I_E = 0A, f = 1MHz$

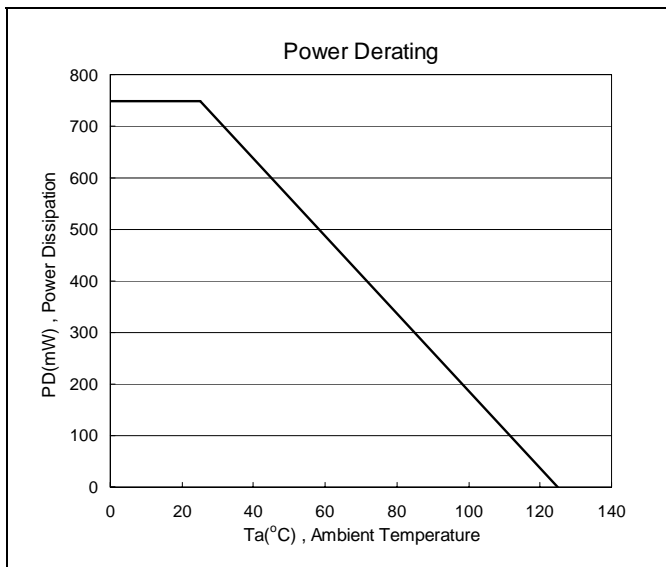
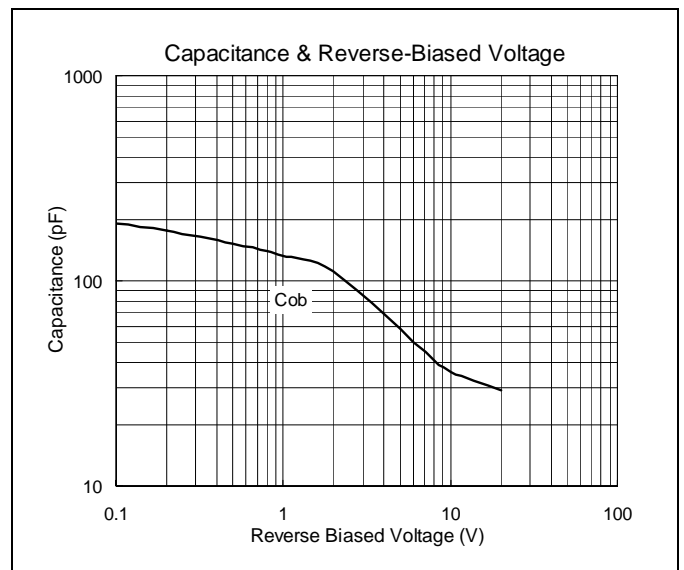
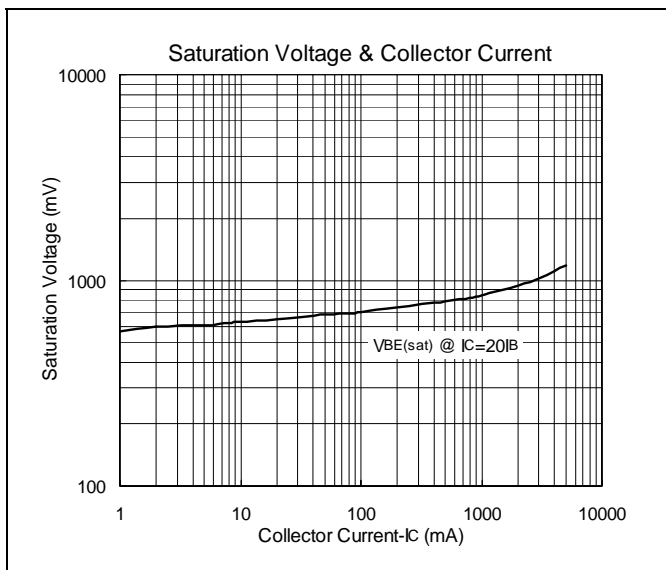
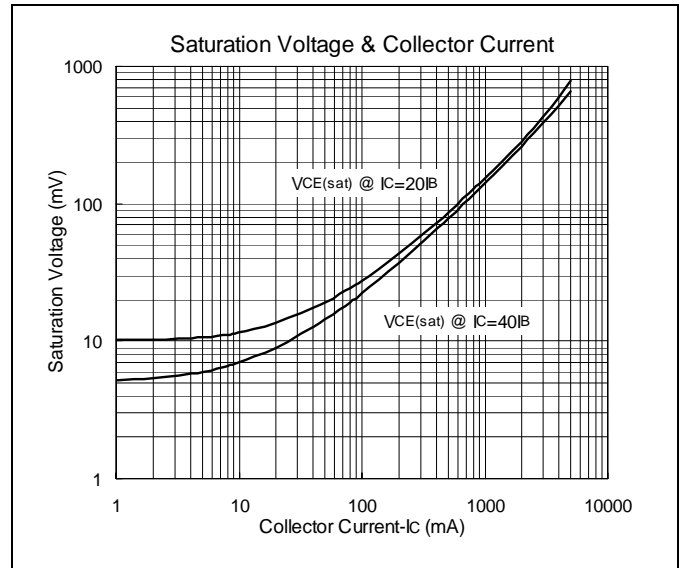
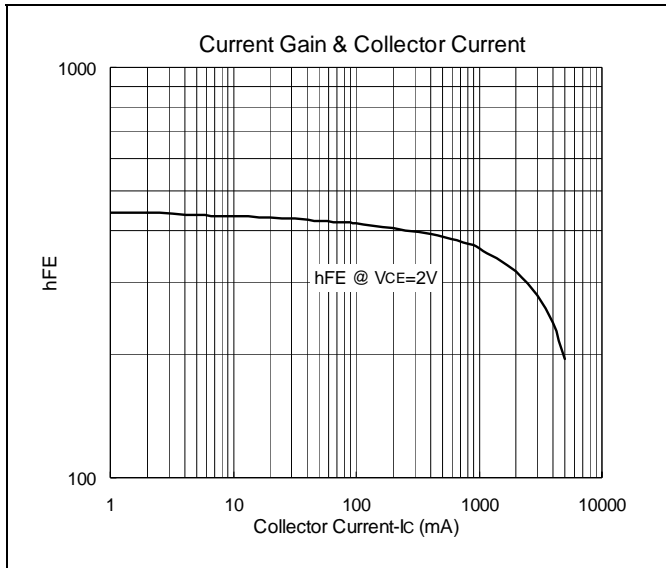
\*Pulse Test: Pulse Width  $\leq 380\mu s$ , Duty Cycle  $\leq 2\%$

## Classification Of hFE

Rank	P	Q	R	E
Range	82-180	120-270	180-390	370-580



### Characteristics Curve





### TO-92 Dimension

**Marking:**

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

H	S	B
1	3	8
6	A	

Date Code      Control Code

Note: Green label is used for pb-free packing  
 Pin Style: 1. Emitter 2. Collector 3. Base

**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
$\alpha 1$	-	*5°
$\alpha 2$	-	*2°
$\alpha 3$	-	*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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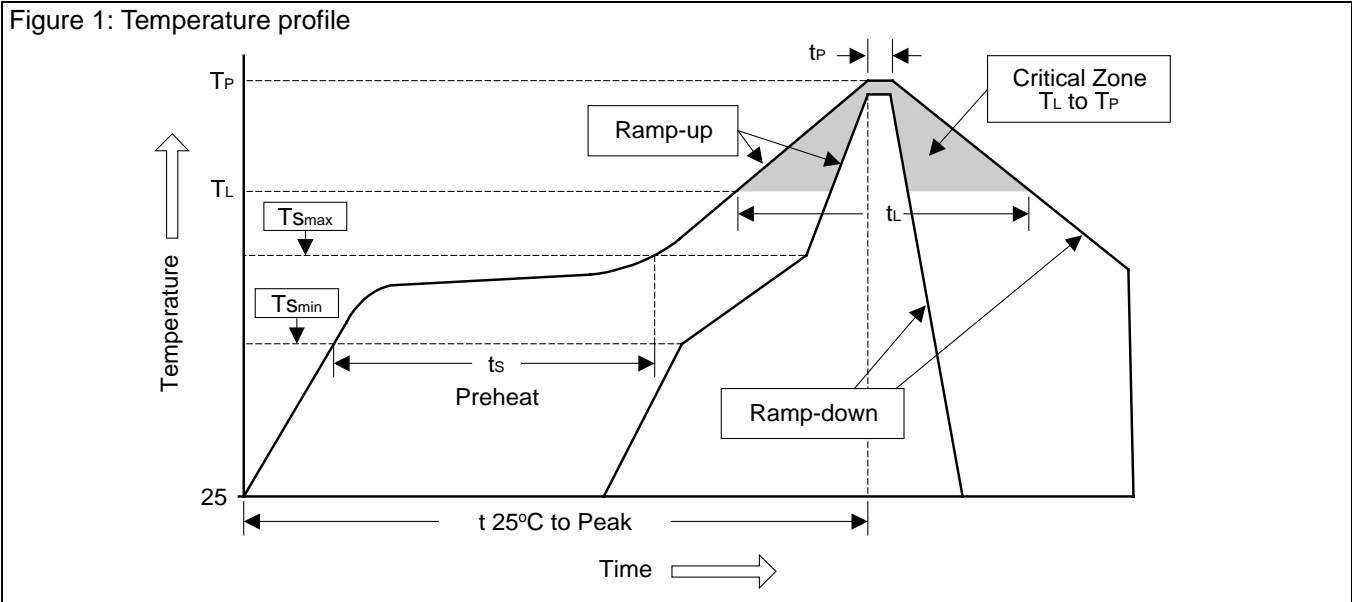
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### Soldering Methods for HSMC's Products

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 ( $T_L$ to $T_P$ )	$<3^{\circ}\text{C}/\text{sec}$	$<3^{\circ}\text{C}/\text{sec}$
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	$<3^{\circ}\text{C}/\text{sec}$	$<3^{\circ}\text{C}/\text{sec}$
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	$<6^{\circ}\text{C}/\text{sec}$	$<6^{\circ}\text{C}/\text{sec}$
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