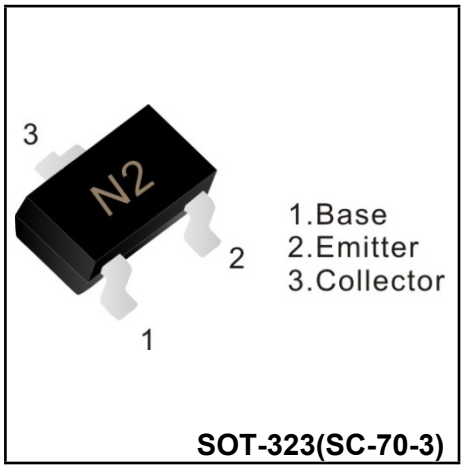
NPN Transistor

FEATURES

- Collector Current Capability IC=70mA
- Collector Emitter Voltage VCEO=15V
- High power gain
- Low noise figure
- High transition frequency

MECHANICAL DATA

- Case: SOT-323(SC-70-3)



SOT-323(SC-70-3)

Marking Code	
BFS520	N2

■ Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	Rating	Unit
Collector - Base Voltage	V_{CBO}	20	V
Collector - Emitter Voltage	V_{CEO}	15	
Emitter - Base Voltage	V_{EBO}	2.5	
Collector Current - Continuous	I_C	70	mA
Collector Power Dissipation	P_C	300	mW
Thermal Resistance From Junction To Soldering Point	$R_{\theta JS}$	190	W/℃
Junction Temperature	T_J	175	℃
Storage Temperature Range	T_{stg}	-65 to 150	

■ Electrical Characteristics Ta = 25℃

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Collector- base breakdown voltage	V_{CBO}	I_C= 100 μA， I_E= 0	20			V
Collector- emitter breakdown voltage	V_{CEO}	I_C= 1 mA， I_B= 0	15			
Emitter - base breakdown voltage	V_{EBO}	I_E= 100 μ A， I_C= 0	2.5			
Collector-base cut-off current	I_{CBO}	V_{CB}= 20 V , I_E= 0			50	nA
Emitter cut-off current	I_{EBO}	V_{EB}= 2.5V , I_C=0			100	
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C= 70 mA, I_B=7mA			0.5	V
Base - emitter saturation voltage	$V_{BE(sat)}$	I_C= 70 mA, I_B=7mA			1.2	
DC current gain	h_{FE}	V_{CE}= 6V, I_C= 20mA	60		250	
Maximum unilateral power gain	GUM	I_C=20mA; V_{CE}=6V; T_{amb} =25°C; f=0.9GHz		15		dB
		I_C=20mA; V_{CE}=6V; T_{amb} =25°C; f=2GHz		9		
Insertion power gain	$\|S_{21}\|^2$	I_C=20mA; V_{CE}=6V; T_{amb} =25°C; f=0.9GHz	13			
Noise figure	NF	Gs = Gopt; I_C= 5mA; V_{CE} = 6V; Tamb = 25 °C;f = 0.9GHz			1.6	
		Gs = Gopt; I_C= 20mA; V_{CE} = 6V; Tamb = 25 °C;f = 0.9GHz			2.1	
		Gs = Gopt; I_C= 5mA; V_{CE} = 6V; Tamb = 25 °C;f = 2GHz		1.9		
Output power at 1 dB gain compression	P_{L1}	Ic = 20 mA; V_{CE} = 6 V; R_L = 50 Ω; f = 900 MHz; Tamb = 25 °C		17		dBm
Third order intercept point	ITO	(Note.1)		26		
Collector capacitance	C_c	V_{CB}= 6V, I_E=i_e=0,f=1MHz		0.5		pF
Emitter capacitance	C_e	V_{EB}= 0.5V, I_C=i_c=0,f=1MHz		1		
Feedback capacitance	C_{re}	V_{CB}= 6V, I_C=0,f=1MHz		0.4		
Transition frequency	f_T	V_{CE}= 6V, I_C= 20mA,f=1GHz,Tamb =25°C		9		GHz

Note. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and

$$G_{UM} = 10 \log \frac{|S_{21}|^2}{\left(1-|S_{11}|^2\right)\left(1-|S_{22}|^2\right)} \text{ dB.}$$

Note.1 I_C = 20 mA; V_{CE} = 6 V; R_L = 50 Ω; f = 900 MHz; Tamb = 25 °C;
fp = 900 MHz; fq = 902 MHz; measured at f(2p-q) = 898 MHz and at f(2q-p) = 904 MHz.

■ Typical Characterisitics

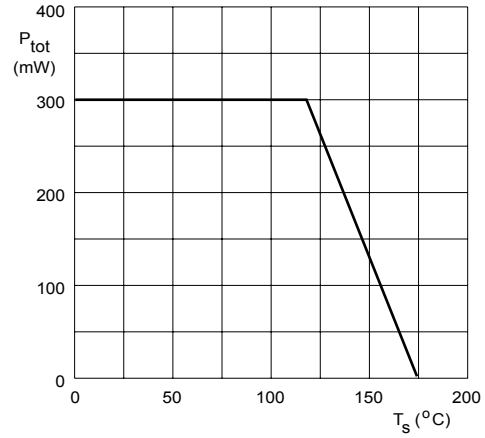
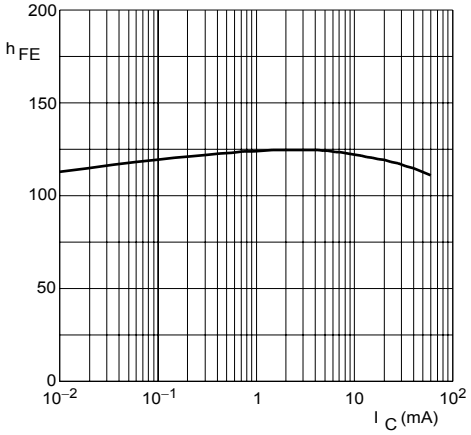
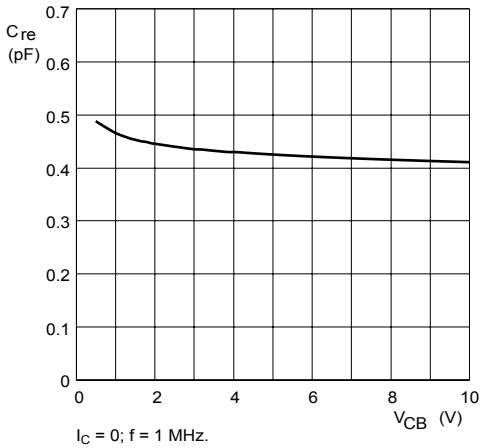


Fig.1 Power derating curve.



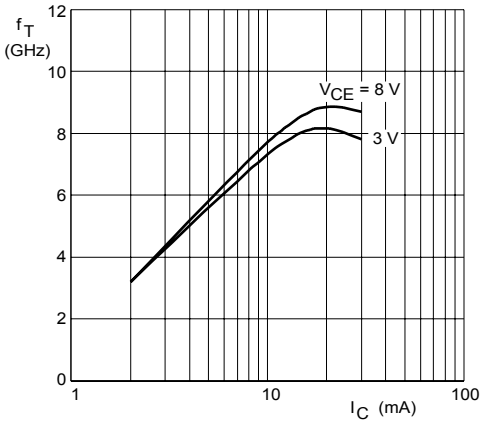
V_{CE} = 6 V; T_j = 25 °C.

Fig.2 DC current gain as a function of collector current.



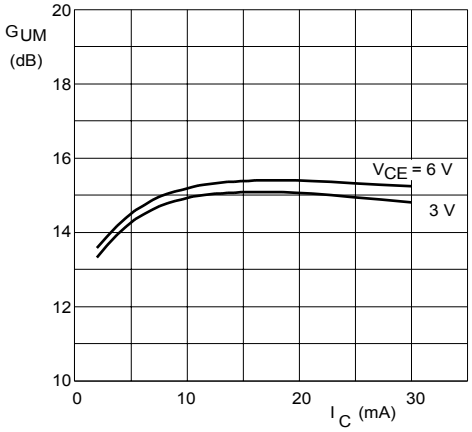
I_C = 0; f = 1 MHz.

Fig.3 Feedback capacitance as a function of collector-base voltage.



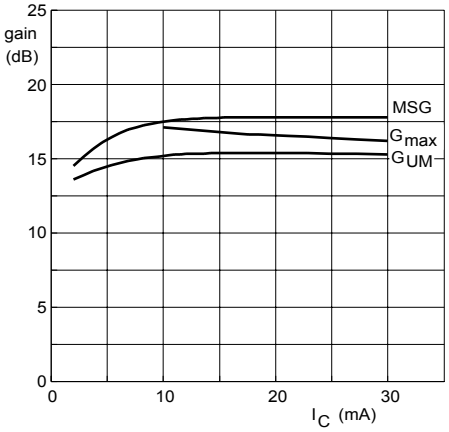
f = 1 GHz; T_{amb} = 25 °C.

Fig.4 Transition frequency as a function of collector current.



V_{CE} = 6 V; f = 900 MHz; T_{amb} = 25 °C.

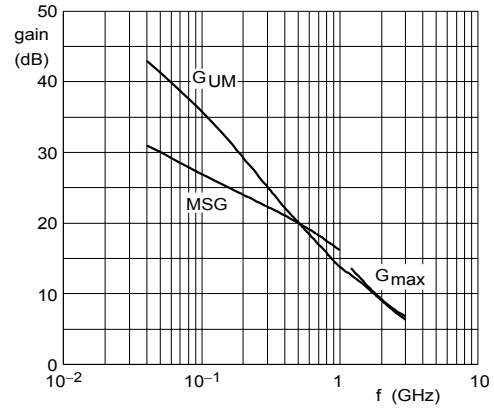
Fig.5 Maximum unilateral power gain as a function of collector current.



V_{CE} = 6 V; f = 2 GHz; T_{amb} = 25 °C.

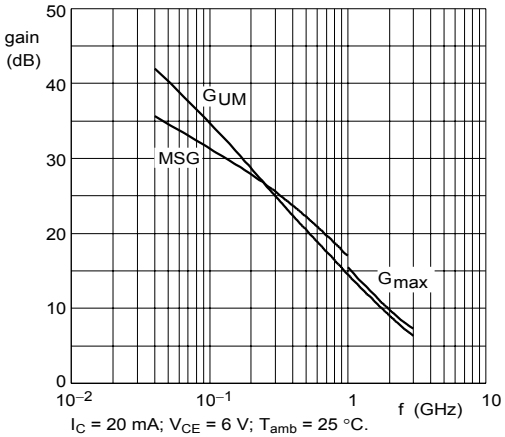
Fig.6 Gain as a function of collector current.

■ Typical Characterisitics



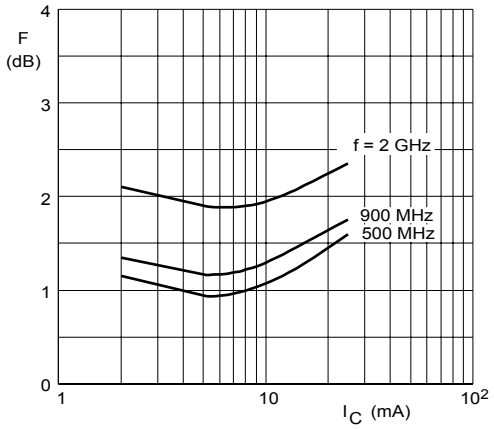
I_C = 5 mA; V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.7 Gain as a function of frequency.



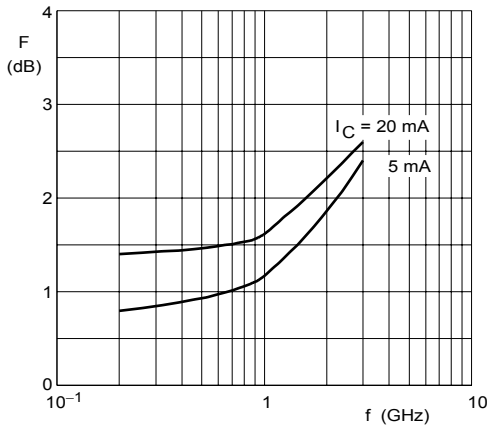
I_C = 20 mA; V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.8 Gain as a function of frequency.



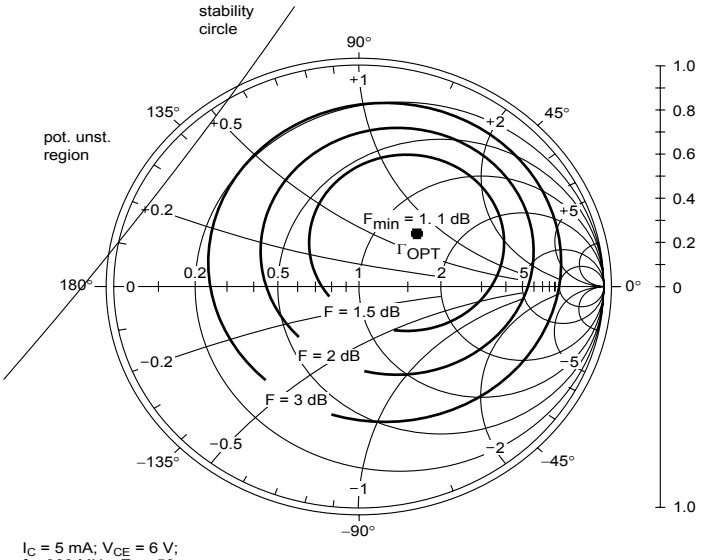
V_{CE} = 6 V; T_{amb} = 25 °C.

Fig.9 Minimum noise figure as a function of collector current.



V_{CE} = 6 V; T_{amb} = 25 °C.

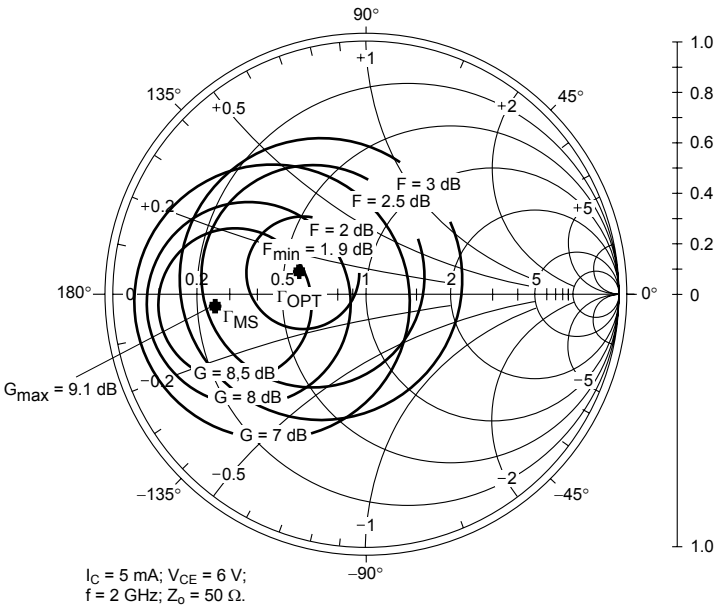
Fig.10 Minimum noise figure as a function of frequency.



I_C = 5 mA; V_{CE} = 6 V;
f = 900 MHz; Z_o = 50 Ω.

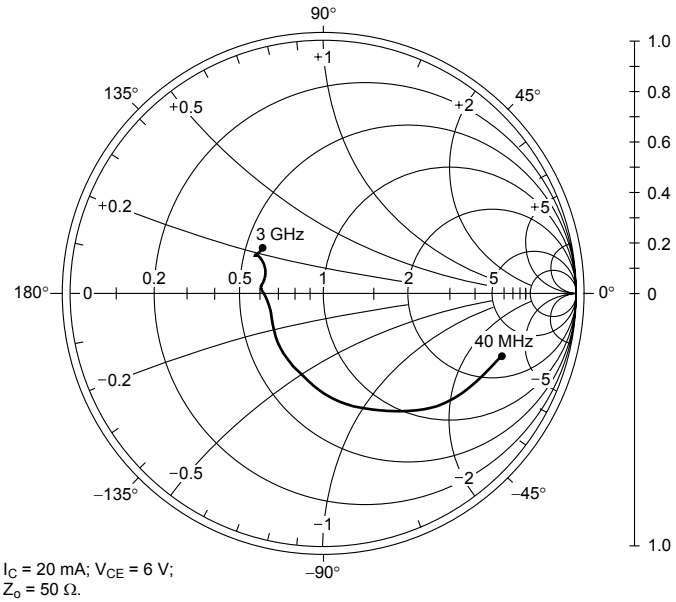
Fig.11 Noise circle.

■ Typical Characterisitics



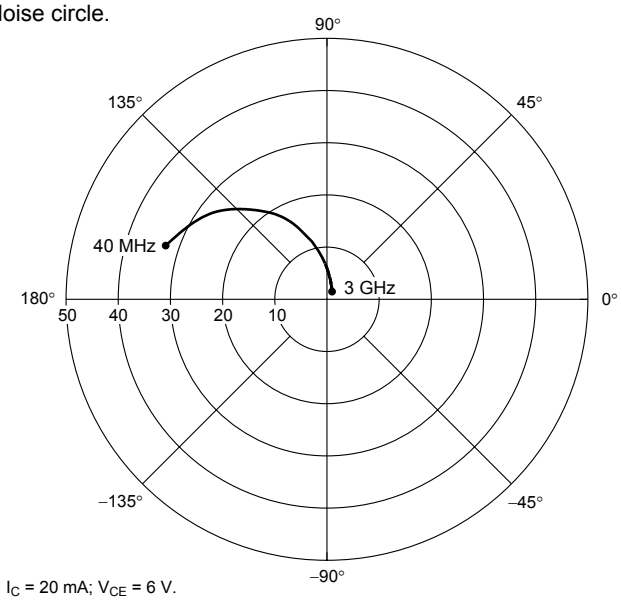
I_C = 5 mA; V_{CE} = 6 V;
f = 2 GHz; Z_o = 50 Ω.

Fig.12 Noise circle.



I_C = 20 mA; V_{CE} = 6 V;
Z_o = 50 Ω.

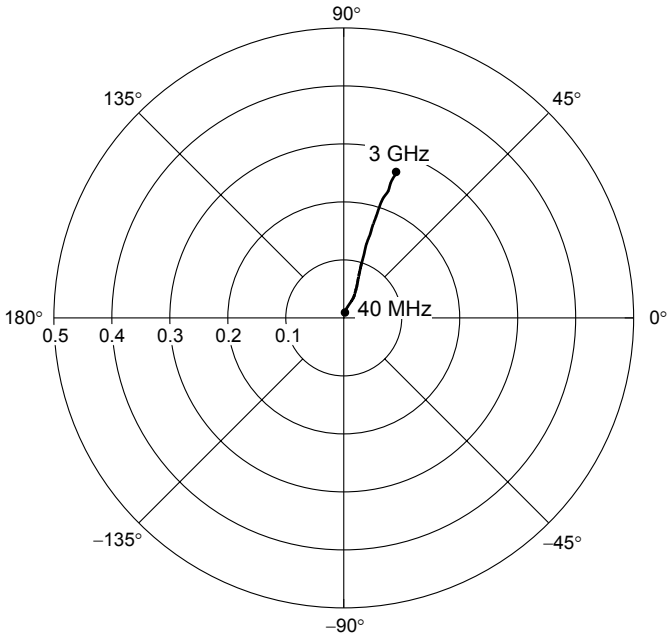
Fig.13 Common emitter input reflection coefficient (S_{11}).



I_C = 20 mA; V_{CE} = 6 V.

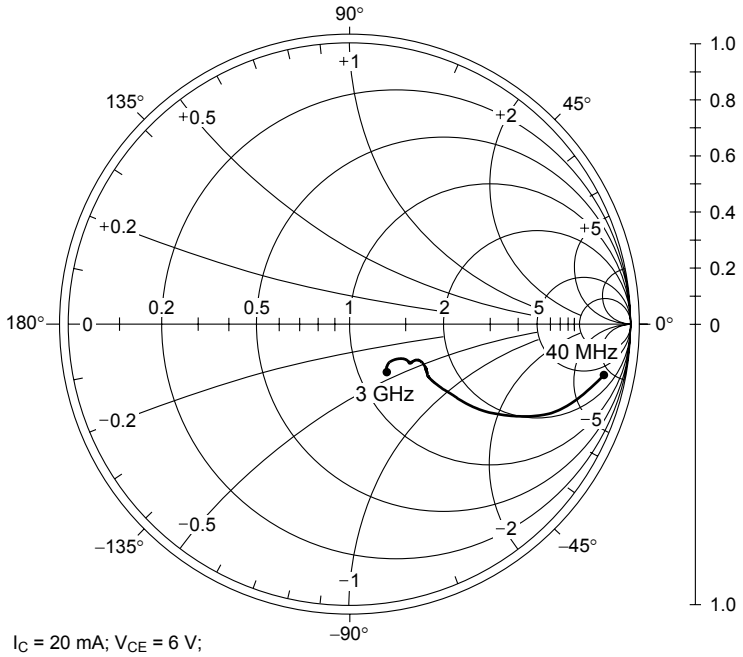
Fig.14 Common emitter forward transmission coefficient (S_{21}).

■ Typical Characterisitics



I_C = 20 mA; V_{CE} = 6 V.

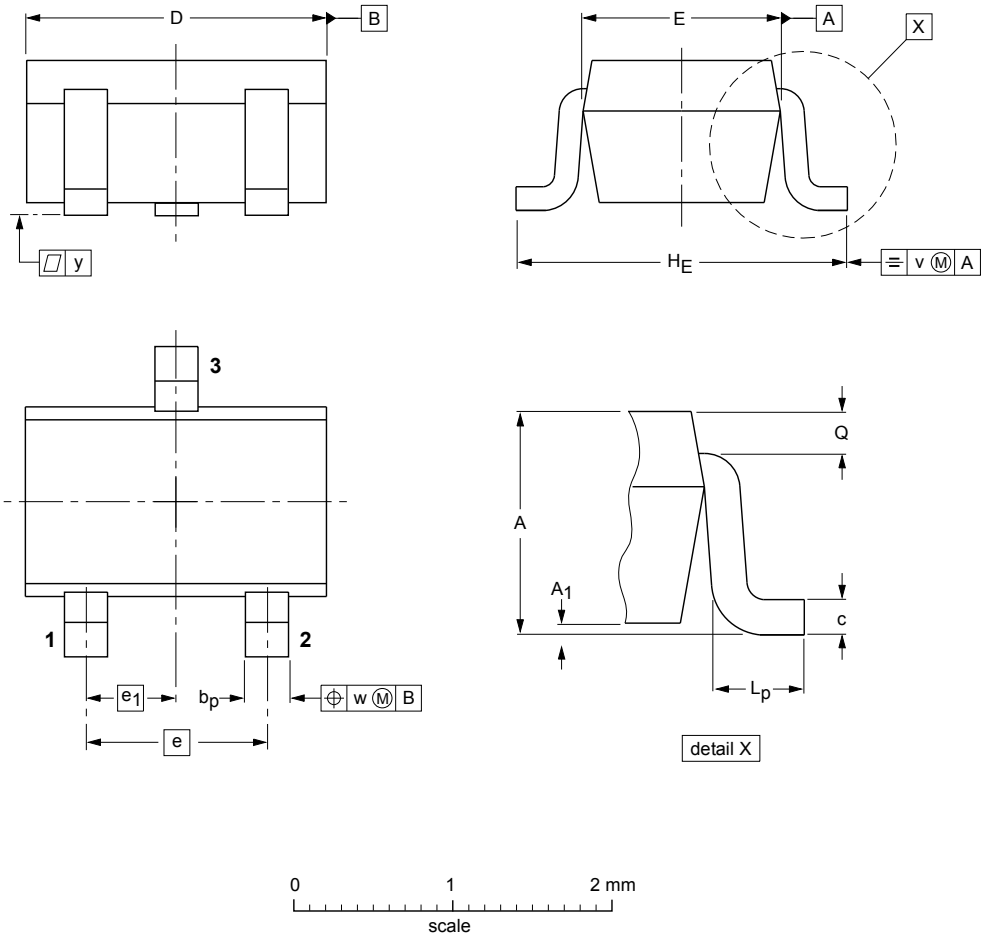
Fig.15 Common emitter reverse transmission coefficient (S_{12}).



I_C = 20 mA; V_{CE} = 6 V;
Z_o = 50 Ω.

Fig.16 Common emitter output reflection coefficient (S_{22}).

■ SOT-323



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2