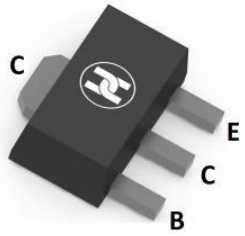
NPN Silicon RF Transistor

FEATURES

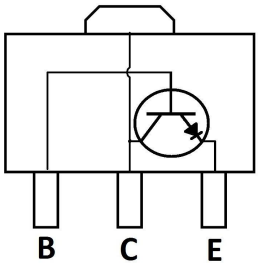
- Low Noise and High Gain
  NF = 1.1 dB TYP., G_a = 8.0 dB TYP.
  @V_{CE} = 10 V, I_C = 7 mA, f = 1.0 GHz
  NF = 1.8 dB TYP., G_a = 9.0 dB TYP.
  @V_{CE} = 10 V, I_C = 40 mA, f = 1.0 GHz



SOT-89

APPLICATIONS

- Designed for low noise amplifier at VHF, UHF and CATV band.



MECHANICAL DATA

- Case: SOT-89
- Case Material: Molded Plastic. UL flammability
- Classification Rating: 94V-0
- Weight: 0.055 grams (approximate)

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Parameter	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	20	V
Collector-emitter voltage	V_{CEO}	12	V
Emitter-base voltage	V_{EBO}	3.0	V
Collector current	I_C	100	mA
Total power dissipation	P_T*	1.2	W
Junction temperature	T_j	150	℃
Storage temperature	T_{stg}	-65 to +150	℃
Thermal Resistance	$R_{th(j-a)}$*	62.5	℃/W

* mounted on 16 cm^2 X 0.7 mm(t) Ceramic Substrate

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test conditions	Min	Typ	Max	Unit
Collector cutoff current	I_{CBO}	V_{CB} = 10V,I_E=0			1.0	μ A
Emitter cutoff current	I_{EBO}	V_{EB} = 1.0V,I_C=0			1.0	μ A
DC current gain	h_{FE} *1	V_{CE} =10V,Ic=20mA	50	120	250	
Insertion Power Gain	$\|S_{21e}\|^2$	V_{CE} = 10 V, I_C = 20 mA, f = 1.0 GHz		9		dB
Noise Figure	NF	V_{CE} = 10 V, I_C = 7 mA, f = 1.0 GHz		1.1		dB
		V_{CE} = 10 V, I_C = 40 mA, f = 1.0 GHz		1.8	3.0	dB
Output Capacitance	C_{ob}	V_{CB} = 10 V, I_E = 0, f = 1.0 MHz		0.65	1.0	pF
Transition frequency	f_T	V_{CE} = 10V ,Ic=20mA		6.5		GHz

*1 Pulse Measurement PW ≤ 350 ms, Duty Cycle ≤ 2 %

*2 The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

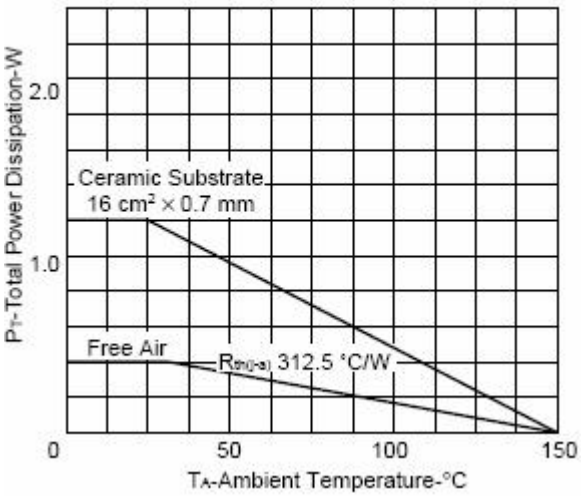
CLASSIFICATION OF h_{FE}

Marking	RH	RF	RE
Rank	RH	RF	RE
hFE	20~100	80~160	125~250

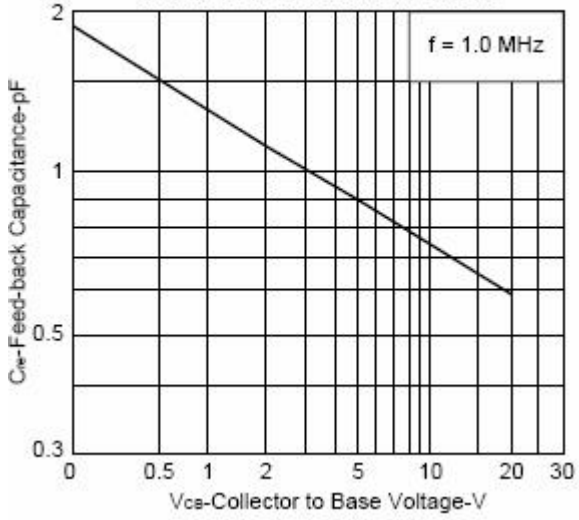
NPN Silicon RF Transistor

Typical Characteristics

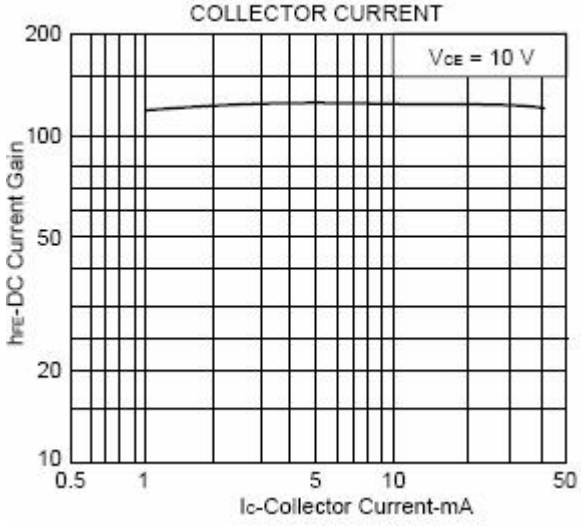
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



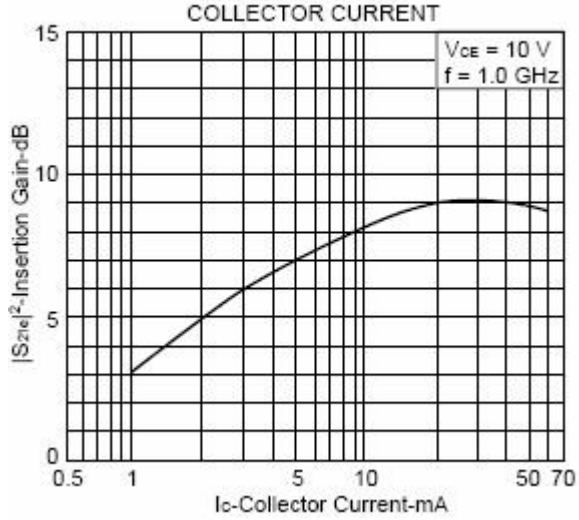
FEED-BACK CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



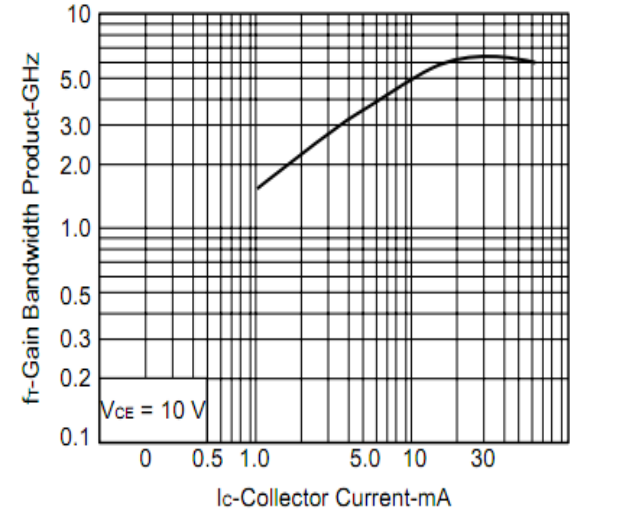
DC CURRENT GAIN vs. COLLECTOR CURRENT



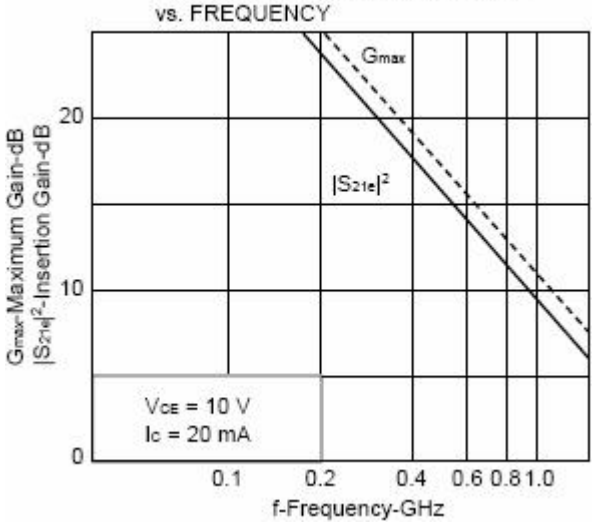
INSERTION GAIN vs. COLLECTOR CURRENT



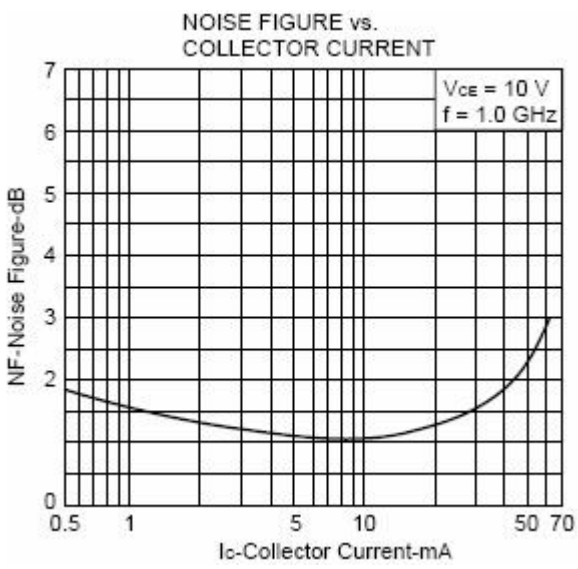
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT

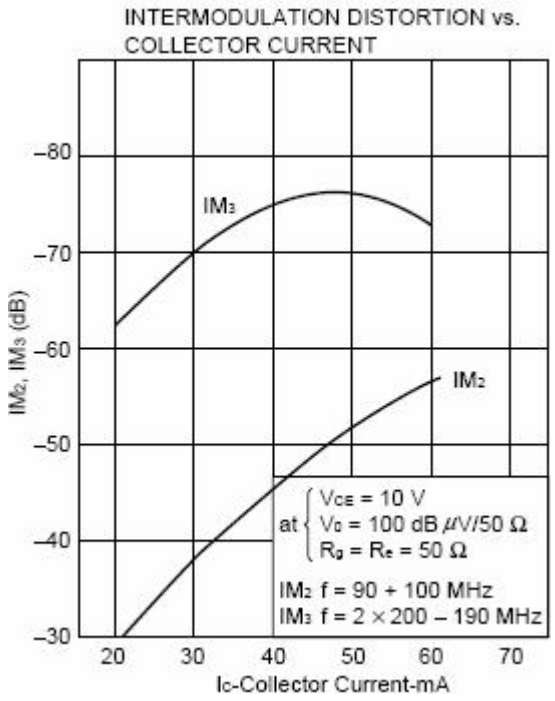


INSERTION GAIN, MAXIMUM GAIN vs. FREQUENCY



NPN Silicon RF Transistor





S-PARAMETER

V_{CE} = 10 V, I_C = 40 mA, Z_O = 50 Ω

f (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
200	0.196	-94.4	13.023	102.4	0.043	74.5	0.444	-21.1
400	0.103	-118.3	6.852	89.2	0.081	77.4	0.398	-25.3
600	0.056	-131.1	4.632	78.3	0.118	77.5	0.399	-26.9
800	0.024	-43.7	3.527	75.9	0.152	78.0	0.414	-28.9
1000	0.008	-2.0	2.854	68.7	0.188	78.4	0.440	-33.5
1200	0.039	13.1	2.421	65.7	0.218	75.7	0.461	-33.3
1400	0.072	11.8	2.118	59.0	0.255	71.7	0.479	-36.3
1600	0.102	9.6	1.887	57.1	0.278	73.1	0.499	-35.5
1800	0.129	8.6	1.681	52.5	0.308	71.3	0.515	-38.8
2000	0.151	9.8	1.579	51.4	0.339	71.8	0.537	-35.9

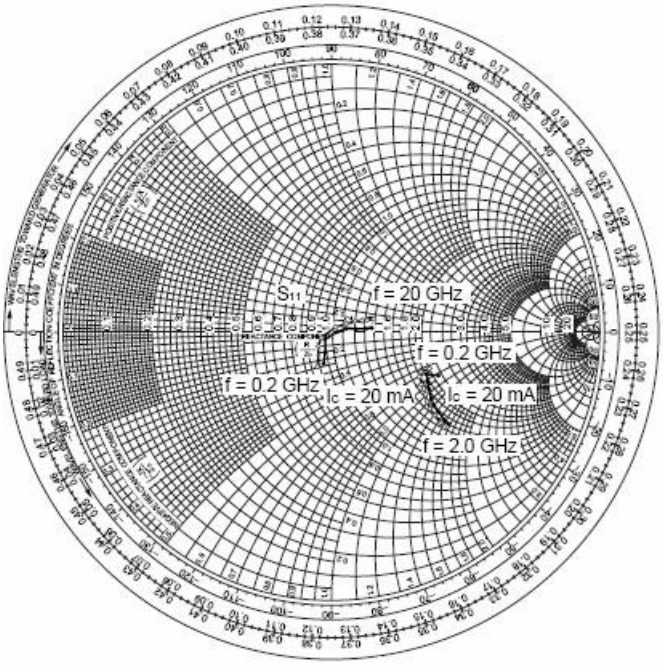
NPN Silicon RF Transistor

V_{CE} = 10 V, I_C = 20 mA, Z_O = 50 Ω

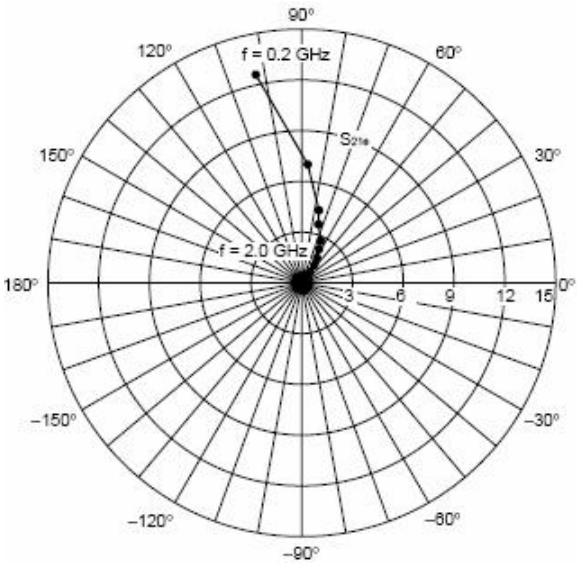
f (MHz)	$\lvert S_{11} \rvert$	$\angle S_{11}$	$\lvert S_{21} \rvert$	$\angle S_{21}$	$\lvert S_{12} \rvert$	$\angle S_{12}$	$\lvert S_{22} \rvert$	$\angle S_{22}$
200	0.130	-109.2	13.430	98.1	0.042	79.0	0.403	-22.1
400	0.073	-134.1	6.930	87.2	0.081	80.6	0.382	-24.7
600	0.037	-146.6	4.690	79.4	0.119	79.4	0.392	-25.6
800	0.010	177.1	3.560	75.2	0.154	79.7	0.412	-27.1
1000	0.024	23.7	2.878	68.2	0.191	76.5	0.440	-31.9
1200	0.056	17.2	2.439	65.4	0.220	76.8	0.463	-32.3
1400	0.093	13.8	2.133	59.0	0.257	72.9	0.483	-35.7
1600	0.124	12.0	1.898	57.3	0.280	74.0	0.504	-35.3
1800	0.151	11.0	1.693	52.9	0.311	72.4	0.519	-38.4
2000	0.174	13.4	1.591	52.0	0.341	72.8	0.542	-36.3

S-P ARAMETER

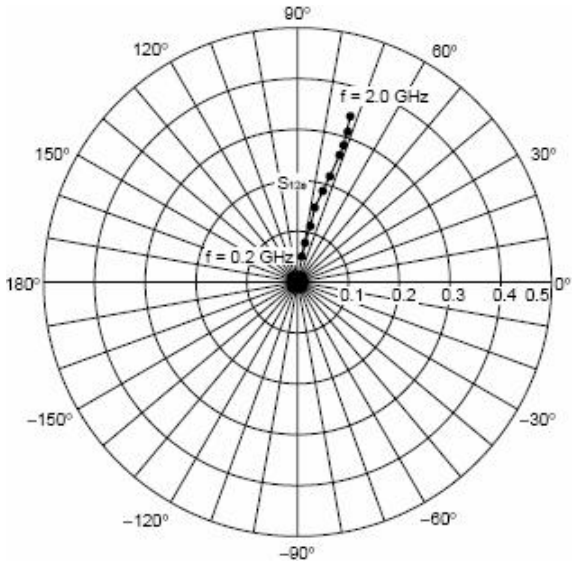
S_{11e}, S_{22e}-FREQUENCY CONDITION V_{CE} = 10 V



S_{21e}-FREQUENCY CONDITION V_{CE} = 10 V
I_C = 20 mA

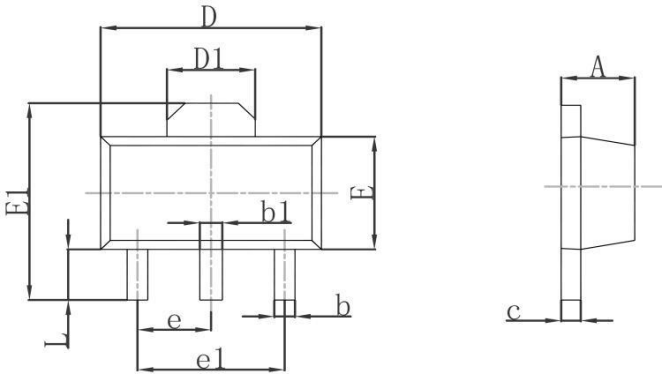


S_{12e}-FREQUENCY CONDITION V_{CE} = 10 V
I_C = 20 mA



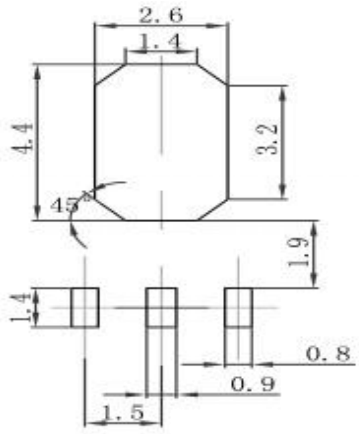
NPN Silicon RF Transistor

SOT-89 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550REF		0.061REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP		0.060TYP	
e1	3.000TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

SOT-89 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters
2. General tolerance: ±0.05mm
3. The pad layout is for reference purposes only

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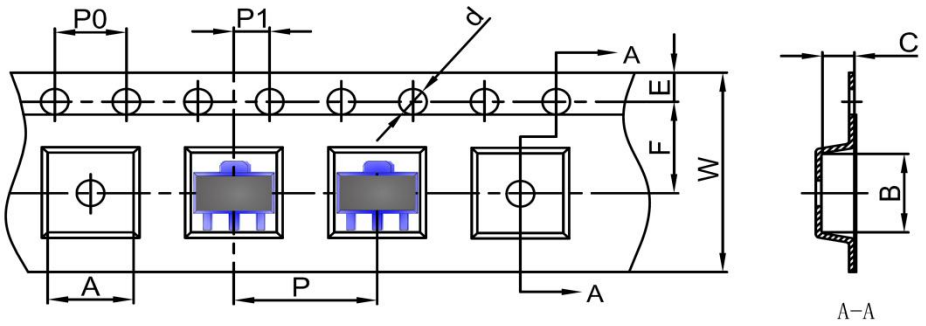
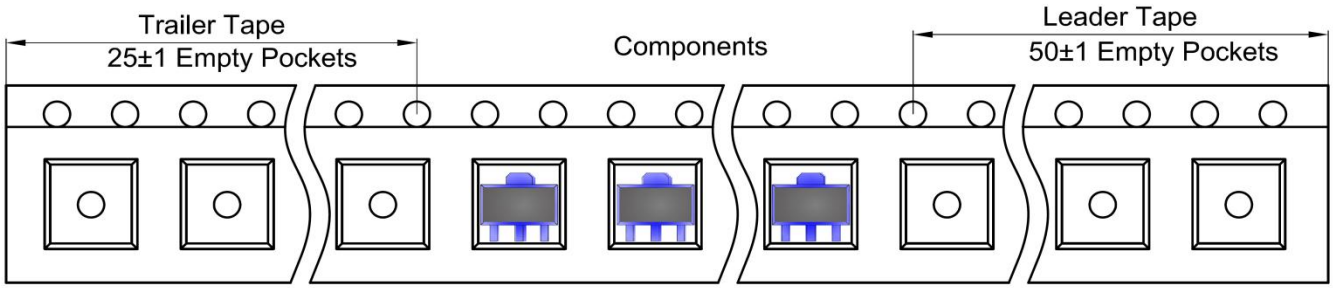
SOT-89 Tape and Reel

SOT-89 Embossed Carrier Tape

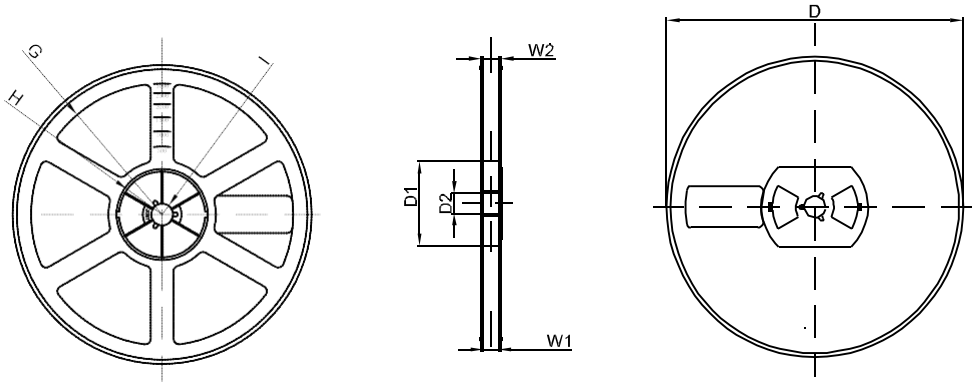


	DIMENSIONS ARE IN MILLIMETER									
TYPE	A	B	C	d	E	F	P0	P	P1	W
SOT-89	4.85	4.45	1.85	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00
TOLERANCE	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1	±0.1

SOT-89 Tape Leader and Trailer



SOT-89 Reel



	DIMENSIONS ARE IN MILLIMETER							
REEL OPTION	D	D1	D2	G	H	I	W1	W2
7" DIA	Ø178	54.40	13.00	R78	R25.60	R6.50	13.20	16.50
TOLERANCE	±2	±1	±1	±1	±1	±1	±1	±1