High Frequency Chip Inductor

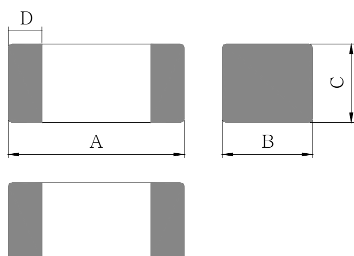
HCI2012F-SERIES

1.Features

Certificate of Green Partner

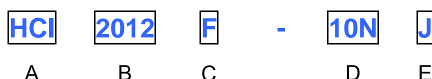
1. Monolithic inorganic material construction.
2. Closed magnetic circuit avoids crosstalk.
3. S.M.T. type.
4. Suitable for flow and reflow soldering.
5. Shapes and dimensions follow E.I.A. spec.
6. Available in various sizes.
7. Excellent solderability and heat resistance.
8. High SRF up to 6GHz and above.
9.This component is compliant with RoHS legislation and also support lead-free soldering.
10. Operating Temperature：-55~+105℃(Including self-temperature rise)

2. Dimensions

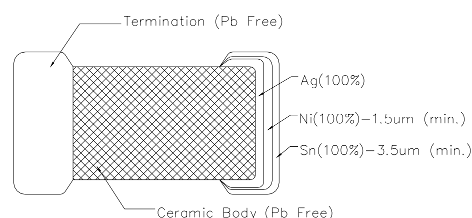


Chip size				
Size	**A(mm)**	**B(mm)**	**C(mm)**	**D(mm)**
2012	2.0±0.2	1.25±0.2	0.85±0.2	0.5±0.3
			1.25±0.2	

3. Part Numbering



A: Series
B: Dimension L x W
C: Material Lead Free Material
D: Inductance 10N=10 nH
E: Inductance Tolerance S=±0.3nH , J=±5% , K=±10%



4.Specification

Tai-Tech Part Number	Thickness (mm)	Inductance (nH)	Test Frequency (MHz)	Q@100MHz Normal Value	Q@100MHz min.	Rated Current (mA) max.	DCR (Ω) max.	SRF (MHz) min.
HCI2012F-1N5S	0.85±0.20	1.5	100	21	10	300	0.10	4000
HCI2012F-2N2S	0.85±0.20	2.2	100	18	10	300	0.10	4000
HCI2012F-2N7S	0.85±0.20	2.7	100	19	12	300	0.10	4000
HCI2012F-3N3□	0.85±0.20	3.3	100	16	12	300	0.13	4000
HCI2012F-3N9□	0.85±0.20	3.9	100	18	12	300	0.15	4000
HCI2012F-4N7□	0.85±0.20	4.7	100	18	12	300	0.20	3500
HCI2012F-5N6□	0.85±0.20	5.6	100	20	15	300	0.23	3200
HCI2012F-6N8□	0.85±0.20	6.8	100	20	15	300	0.25	2800
HCI2012F-8N2□	0.85±0.20	8.2	100	21	15	300	0.28	2400

□：S=±0.3nH , J=±5% , K=±10%

Tai-Tech	Thickness	Inductance		Q@100MHz		Rated Current	DCR	SRF
Part Number	(mm)	(nH)	Test Frequency (MHz)	Normal Value	min.	(mA) max.	(Ω) max.	(MHz) min.
HCI2012F-10N□	0.85±0.20	10	100	20	15	300	0.30	2100
HCI2012F-12N□	0.85±0.20	12	100	21	15	300	0.35	1900
HCI2012F-15N□	0.85±0.20	15	100	22	15	300	0.40	1600
HCI2012F-18N□	0.85±0.20	18	100	24	15	300	0.45	1500
HCI2012F-22N□	0.85±0.20	22	100	23	18	300	0.50	1400
HCI2012F-27N□	0.85±0.20	27	100	23	18	300	0.55	1300
HCI2012F-33N□	0.85±0.20	33	100	24	18	300	0.60	1200
HCI2012F-39N□	0.85±0.20	39	100	23	18	300	0.65	1000
HCI2012F-47N□	0.85±0.20	47	100	23	18	300	0.70	900
HCI2012F-56N□	0.85±0.20	56	100	23	18	300	0.75	800
HCI2012F-68N□	0.85±0.20	68	100	25	18	300	0.80	700
HCI2012F-82N□	0.85±0.20	82	100	24	18	300	0.90	600
HCI2012F-R10□	0.85±0.20	100	100	23	18	300	0.90	600
HCI2012F-R12□	0.85±0.20	120	50	22	13	300	0.95	500
HCI2012F-R15□	0.85±0.20	150	50	22	13	300	1.00	500
HCI2012F-R18□	0.85±0.20	180	50	23	13	300	1.10	400
HCI2012F-R22□	0.85±0.20	220	50	20	12	300	1.20	350
HCI2012F-R27□	0.85±0.20	270	50	20	12	300	1.30	300
HCI2012F-R33□	0.85±0.20	330	50	22	12	300	1.40	250
HCI2012F-R39□	1.25±0.20	390	50	17	10	300	1.30	250
HCI2012F-R47□	1.25±0.20	470	50	17	10	300	1.50	200

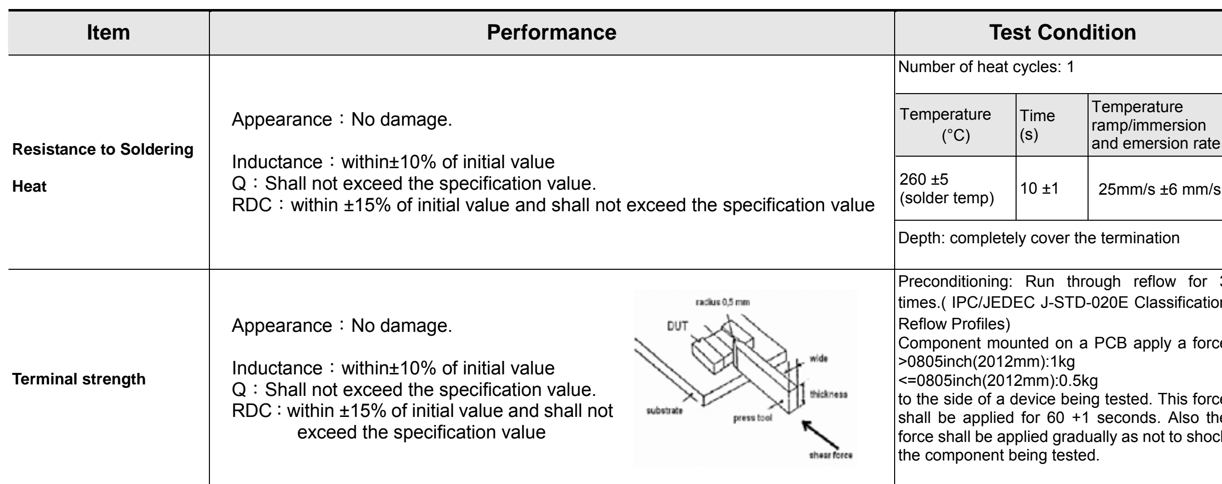
□：S=±0.3nH , J=±5% , K=±10%

5. Reliability and Test Condition

Item	Performance	Test Condition
Series No.	FCI | FHI | FCH | HCI	--
Operating Temperature	-55~+105℃ (Including self-temperature rise)	--
Transportation Storage Temperature	-55~+105℃ (on board)	For long storage conditions, please see the Application Notice
Inductance (Ls)	Refer to standard electrical characteristics list	Agilent4291 Agilent E4991 Agilent4287 Agilent16192
Q Factor		
DC Resistance		Agilent 4338
Rated Current		DC Power Supply Over Rated Current requirements, there will be some risk
Temperature Rise Test	Rated Current < 1A ΔT 20℃Max Rated Current ≧ 1A ΔT 40℃Max	1. Applied the allowed DC current. 2. Temperature measured by digital surface thermometer.
Life test	Appearance: no damage. Inductance: within±10%of initial value. Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Temperature: 105±2℃ Applied current: rated current. Duration: 1000±12hrs. Measured at room temperature after placing for 24±2 hrs.
Load Humidity		Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Humidity: 85±2%R.H. Temperature: 85±2℃. Duration:1000hrsMin.Bead:with100%ratedcurrent，Inductance: with 10% rated current Measured at room temperature after placing for 24±2 hrs.
Thermal shock	Appearance: no damage. Inductance: within±10%of initial value. Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Condition for 1 cycle Step1: -55±2℃ 30±5 min. Step2: 105±2℃ ≦0.5min Step3: 105±2℃ 30±5min. Number of cycles: 500 Measured at room temperature after placing for 24±2 hrs.
Vibration	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Oscillation Frequency: 10Hz～2KHz～10Hz for 20 minutes Equipment： Vibration checker Total Amplitude:10g Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations)。
Bending	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Shall be mounted on a FR4 substrate of the following dimensions: >=0805inch(2012mm):40x100x1.2mm <0805inch(2012mm):40x100x0.8mm Bending depth: >=0805inch(2012mm):1.2mm <0805inch(2012mm):0.8mm Duration of 10 sec for a min.
Shock	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Test condition: (see table below)
Insulation Resistance	IR>1GΩ	Chip Inductor Only Test Voltage:100±10%V for 30Sec.
Solderability	More than 95% of the terminal electrode should be covered with solder.	a.Method B, 4 hrs @155°C dry heat @235°C±5°C Test time:5 +0/-0.5 seconds. b. Method D category 3. (steam aging 8hours ± 15 min)@ 260°C±5°C Test time: 30 +0/-0.5 seconds.

Shock – Test condition:

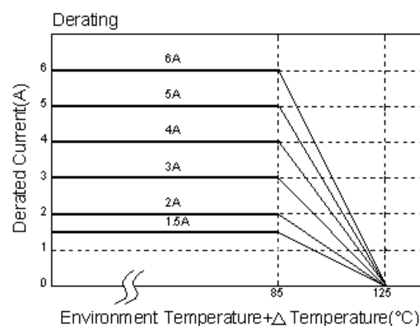
Type	Peak Value (g's)	Normal duration (D) (ms)	Wave form	Velocity change (Vi)ft/sec
SMD	50	11	Half-sine	11.3
Lead	50	11	Half-sine	11.3



Item	Performance	Test Condition
Resistance to Soldering Heat	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Number of heat cycles: 1 Temperature (°C): 260 ±5 (solder temp) Time (s): 10 ±1 Temperature ramp/immersion and emersion rate: 25mm/s ±6 mm/s Depth: completely cover the termination
Terminal strength	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Component mounted on a PCB apply a force >0805inch(2012mm):1kg <=0805inch(2012mm):0.5kg to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to shock the component being tested.

**Derating Curve

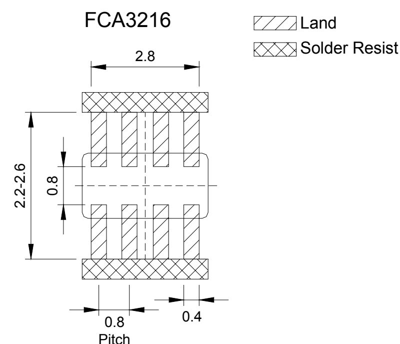
For the ferrite chip bead which withstanding current over 1.5A, as the operating temperature over 85℃, the derating current information is necessary to consider with. For the detail derating of current, please refer to the Derated Current vs. Operating Temperature curve.

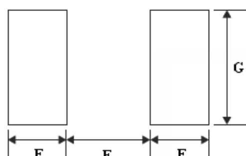


6.Soldering and Mounting

6-1. Recommended PC Board Pattern

Chip Size						Land Patterns For Reflow Soldering		
Series	Type	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)	F(mm)	G(mm)
FCB	1005	1.0±0.10	0.50±0.10	0.50±0.10	0.25±0.10	0.50	0.40	0.60
FCM	1608	1.6±0.15	0.80±0.15	0.80±0.15	0.30±0.20	0.80	0.85	0.95
HCB	2012	2.0±0.20	1.25±0.20	0.85±0.20	0.50±0.30	1.05	1.00	1.45
GHB		2.0±0.20	1.25±0.20	1.25±0.20	0.50±0.30			
FCI	3216	3.2±0.20	1.60±0.20	1.10±0.20	0.50±0.30	1.05	2.20	1.80
FHI	3225	3.2±0.20	2.50±0.20	1.30±0.20	0.50±0.30	1.05	2.20	2.70
FCH	4516	4.5±0.20	1.60±0.20	1.60±0.20	0.50±0.30	1.05	3.30	1.80
HCI	4532	4.5±0.20	3.20±0.20	1.50±0.20	0.50±0.30	1.05	3.30	3.40





PC board should be designed so that products can prevent damage from mechanical stress when warping the board.

6-2. Soldering

Mildly activated rosin fluxes are preferred. TAI-TECH terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

6-2.1 Soldering Reflow:

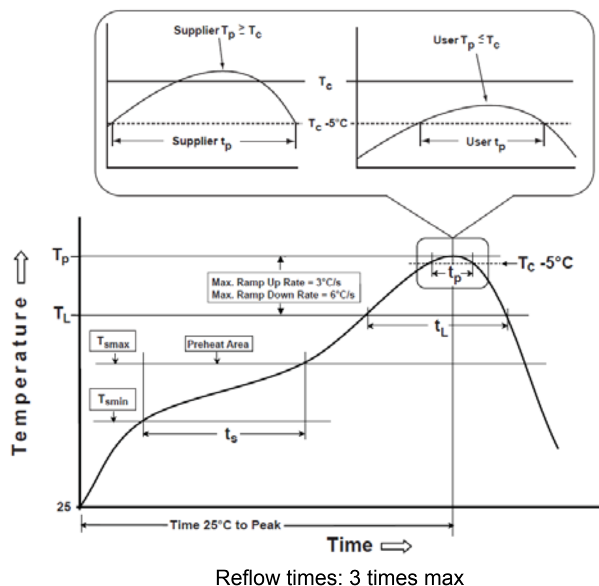
Recommended temperature profiles for lead free re-flow soldering in Figure 1. Table 1.1&1.2 (J-STD-020E)

6-2.2 Soldering Iron:

Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended. (Figure 2.)

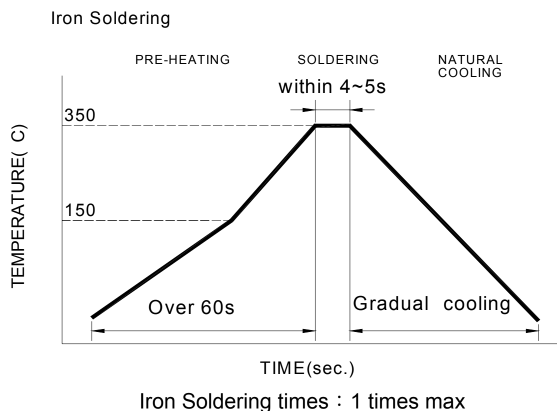
- Preheat circuit and products to 150℃
- Never contact the ceramic with the iron tip
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- 350℃ tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.

Fig.1 Soldering Reflow



Reflow times: 3 times max

Fig.2 Iron soldering temperature profiles



Iron Soldering times：1 times max

Table (1.1): Reflow Profiles

Profile Type:	Pb-Free Assembly
Preheat -Temperature Min(T_{smin}) -Temperature Max(T_{smax}) -Time(t_s)from(T_{smin} to T_{smax})	 150℃ 200℃ 60-120seconds
Ramp-up rate($T_L$to T_p)	3℃/second max.
Liquidus temperature(T_L) Time(t_L)maintained above T_L	217℃ 60-150 seconds
Classification temperature(T_c)	See Table (1.2)
Time(t_p) at Tc- 5℃ (Tp should be equal to or less than Tc.)	＜30 seconds
Ramp-down rate(T_p to T_L)	6℃ /second max.
Time 25℃ to peak temperature	8 minutes max.

Tp: maximum peak package body temperature, **Tc**: the classification temperature.

For user (customer) **Tp** should be equal to or less than **Tc.**

Table (1.2) Package Thickness/Volume and Classification Temperature (T_c)

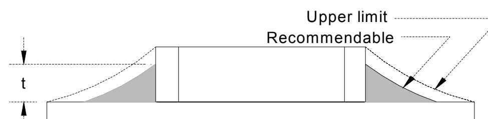
	Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
PB-Free Assembly	<1.6mm	260℃	260℃	260℃
	1.6-2.5mm	260℃	250℃	245℃
	≥2.5mm	250℃	245℃	245℃

Reflow is referred to standard IPC/JEDEC J-STD-020E。

6-2.3 Solder Volume:

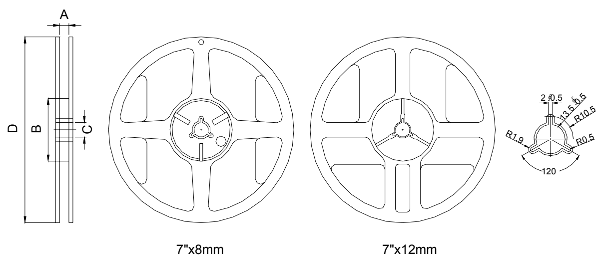
Accordingly increasing the solder volume, the mechanical stress to product is also increased. Exceeding solder volume may cause the failure of mechanical or electrical performance. Solder shall be used not to be exceed as shown in right side:

Minimum fillet height = soldering thickness + 25% product height



7.Packaging Information

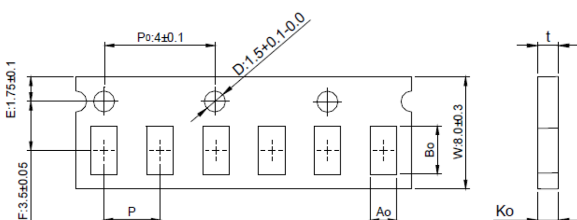
7-1. Reel Dimension



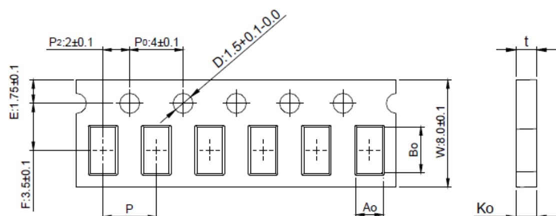
Type	A(mm)	B(mm)	C(mm)	D(mm)
7"x8mm	9.0±0.5	60±2	13.5±0.5	178±2
7"x12mm	13.5±0.5	60±2	13.5±0.5	178±2

7-2.1 Tape Dimension / 8mm

■Material of taping is paper

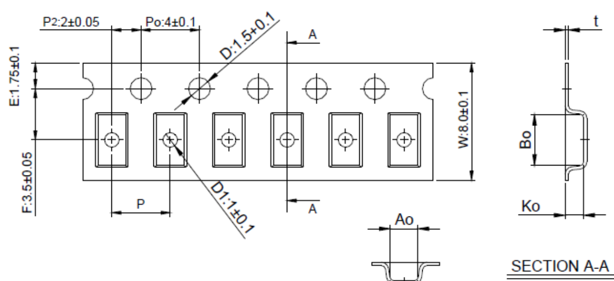


Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	t(mm)
100505	1.12±0.03	0.62±0.03	0.60±0.03	2.0±0.05	0.60±0.03



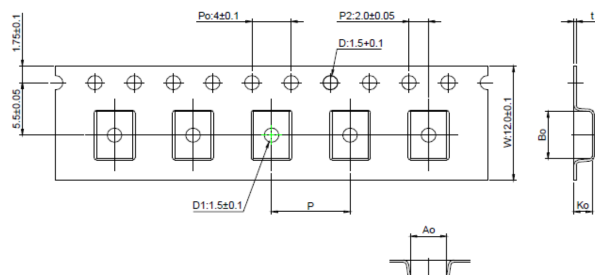
Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	t(mm)
160808	1.80±0.05	0.96+0.05/-0.03	0.95±0.05	4.0±0.10	0.95±0.05
201209	2.10±0.05	1.30±0.05	0.95±0.05	4.0±0.10	0.95±0.05

■Material of taping is plastic



Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	t(mm)	D1(mm)
201212	2.10±0.10	1.28±0.10	1.28±0.10	4.0±0.10	0.22±0.05	1.0±0.10
321611	3.35±0.10	1.75±0.10	1.25±0.10	4.0±0.10	0.23±0.05	1.0±0.10
322513	3.42±0.10	2.77±0.10	1.55±0.10	4.0±0.10	0.22±0.05	1.0±0.10
321609	3.40±0.10	1.77±0.10	1.04±0.10	4.0±0.10	0.22±0.05	1.0±0.10

7-2.2 Tape Dimension / 12mm

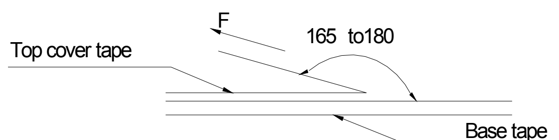


Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	t(mm)	D1(mm)
451616	4.70±0.10	1.75±0.10	1.75±0.10	4.0±0.10	0.24±0.05	1.5±0.10
453215	4.70±0.10	3.45±0.10	1.60±0.10	8.0±0.10	0.24±0.05	1.5±0.10

7-3. Packaging Quantity

Chip Size	453215	451616	322513	321611	321609	201212	201209	160808	100505
Chip / Reel	1000	2000	2500	3000	3000	2000	4000	4000	10000
Inner box	4000	8000	12500	15000	15000	10000	20000	20000	50000
Middle box	20000	40000	62500	75000	75000	50000	100000	100000	250000
Carton	40000	80000	125000	150000	150000	100000	200000	200000	500000

7-4. Tearing Off Force



The force for tearing off cover tape is 15 to 60 grams in the arrow direction under the following conditions.

Room Temp. (℃)	Room Humidity (%)	Room atm (hPa)	Tearing Speed mm/min
5~35	45~85	860~1060	300

Application Notice

・Storage Conditions(component level)
To maintain the solder ability of terminal electrodes:
1. TAI-TECH products meet IPC/JEDEC J-STD-020E standard-MSL, level 1.
2. Temperature and humidity conditions: Less than 40℃ and 60% RH.
3. Recommended products should be used within 12 months from the time of delivery.
4. The packaging material should be kept where no chlorine or sulfur exists in the air.

・Transportation
1.Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
3. Bulk handling should ensure that abrasion and mechanical shock are minimized.

Impedance, Inductance, Q v.s. Frequency Characteristics(Typical)