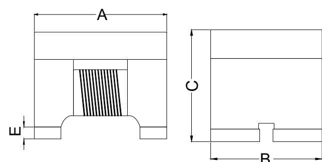
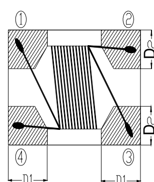
Wire Wound Type Common Mode Filter HSF1210F2SF-SERIES

1. Features

1. High common mode impedance at high frequency cause excellent noise suppression performance.
2. HSF1210F2SF series realizes small size and low profile. 1.2x1.0x0.9 mm.
3. 100% Lead(Pb) & Halogen-Free and RoHS compliant.
4. Excellent for USB3.0
5. Operating temperature -40~+125℃ (Including self - temperature rise)

2. Dimension





Series	A(mm)	B(mm)	C(mm)	D1(mm)	D2(mm)	E(mm)
1210F2SF	1.2±0.2	1.0±0.2	0.9 max.	0.35±0.1	0.35±0.1	0.03 min.

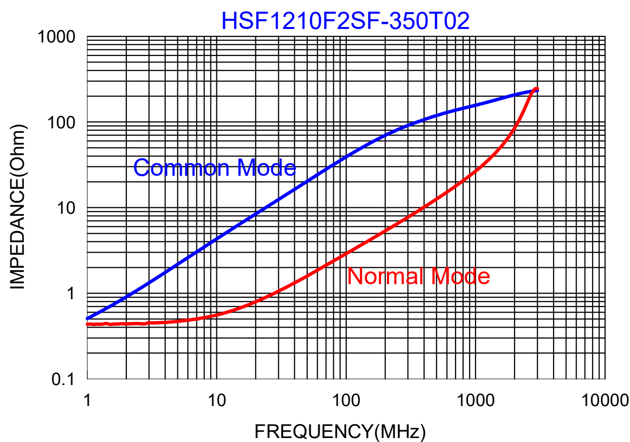
3. Part Numbering

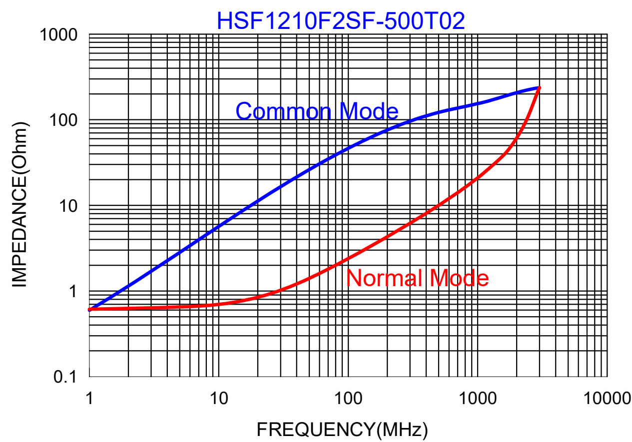
HSF	1210	F	2	S	F	-	900	T	02
A	B	C	D	E	F		G	H	I

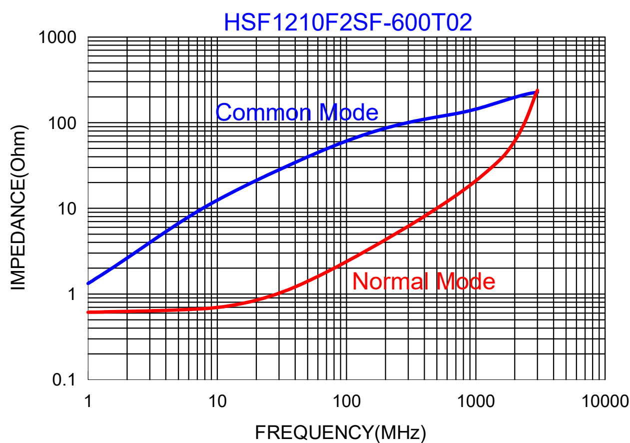
A: Series
B: Dimension
C: Material Ferrite
D: Number of Lines 2=2 lines
E: Type S=Shielded, N=Unshielded
F: Lead free
G: Impedance 900=90Ω
H: Packaging T=Taping and Reel, B=Bulk
I: Rated Current 02=200mA

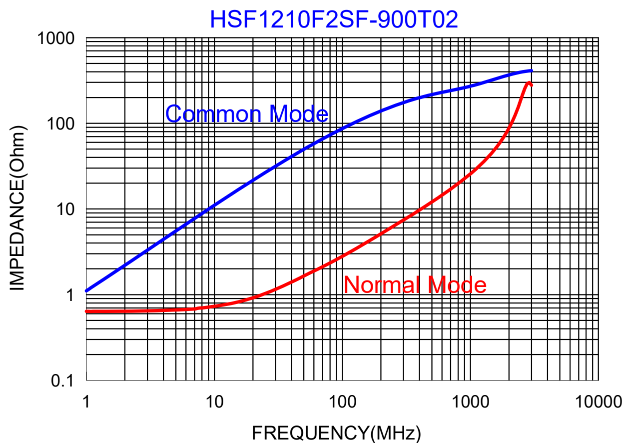
4. Specification

TAI-TECH Part Number	Common mode Impedance (Ω)	Test Frequency (MHz)	DC Resistance (Ω) max.	Rated Current (mA) max.	Rated Volt. (Vdc) max.	Withstand Volt. (Vdc) max.	IR (Ω) min.
HSF1210F2SF-350T02	35±25%	100	0.30	200	50	125	10M
HSF1210F2SF-500T02	50±25%	100	0.30	250	50	125	10M
HSF1210F2SF-600T02	60±25%	100	0.30	250	50	125	10M
HSF1210F2SF-900T02	90±25%	100	0.40	200	50	125	10M

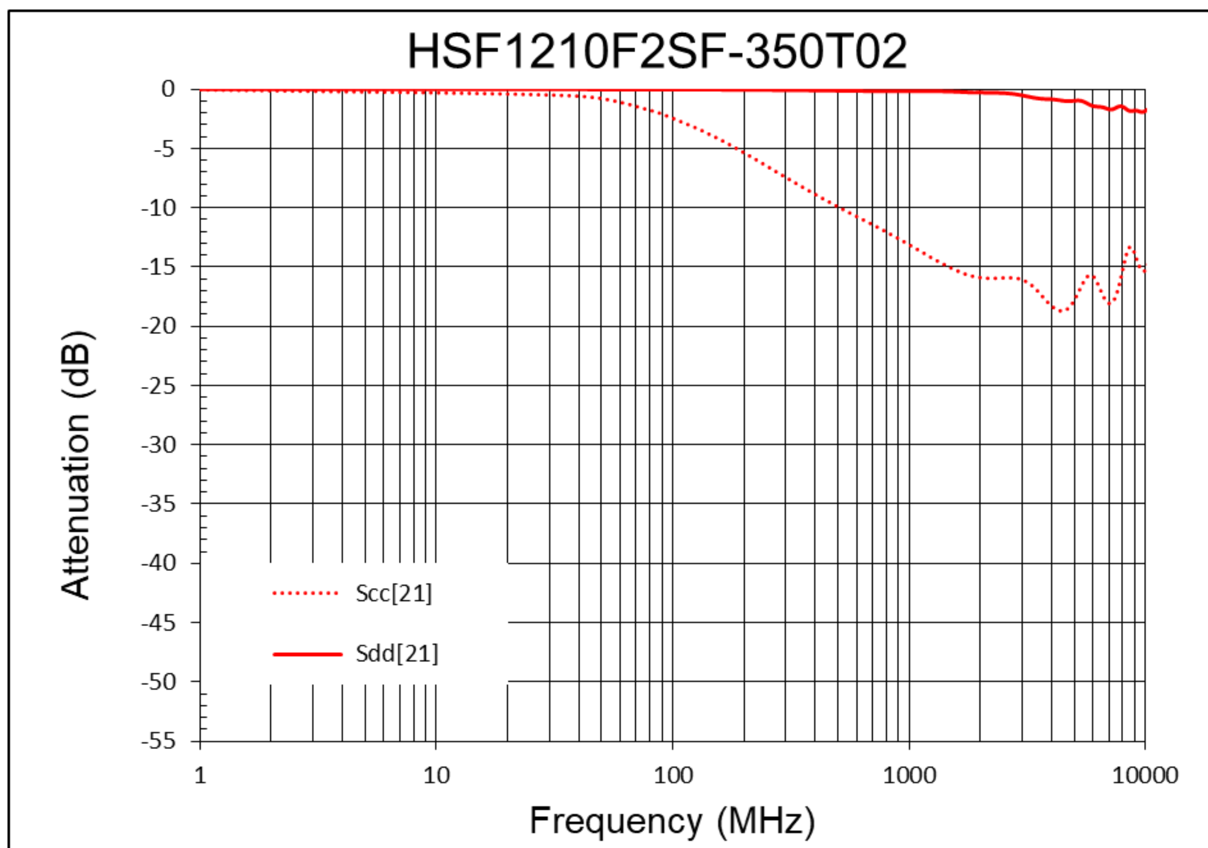


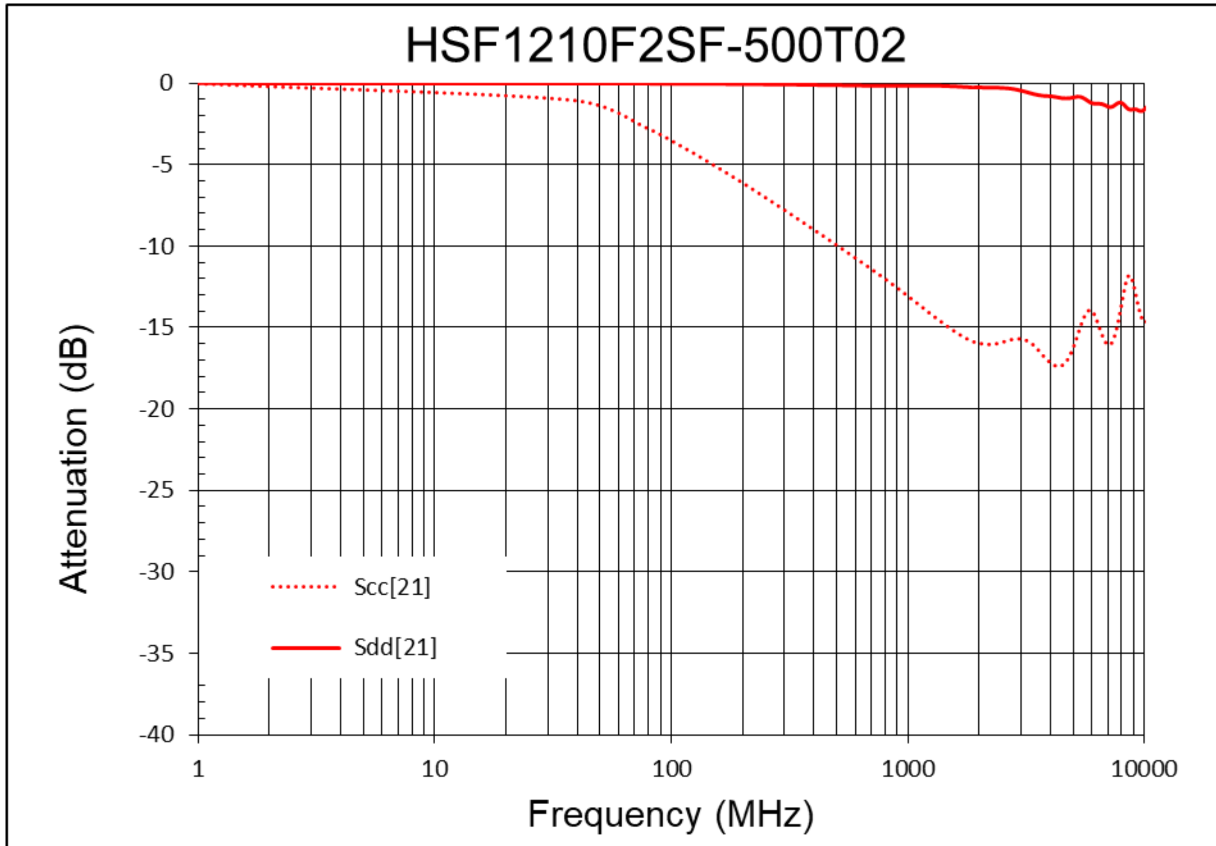


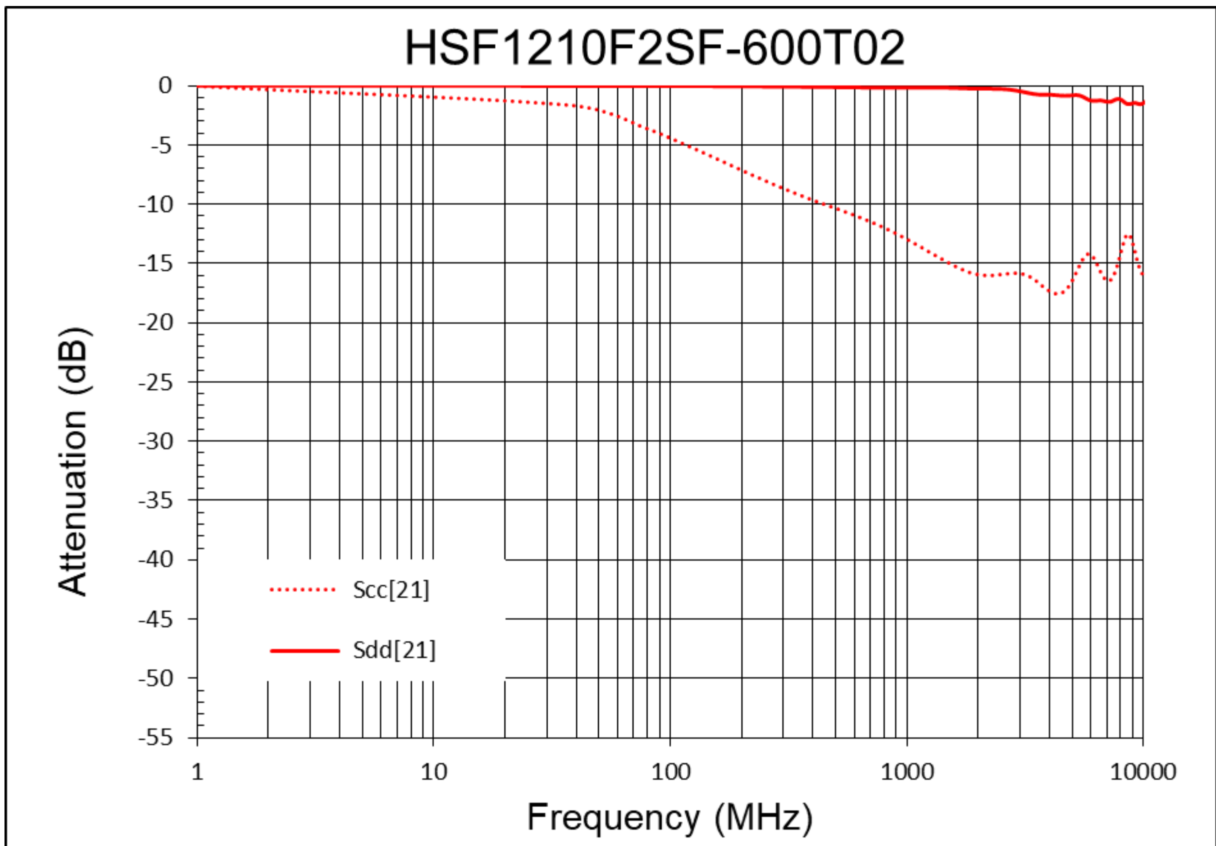




Sdd21&Scc21




HSF1210F2SF-500T02
Attenuation (dB)
0
-5
-10
-15
-20
-25
-30
-35
-40
1
10
100
1000
10000
Frequency (MHz)
Scc[21]
Sdd[21]


HSF1210F2SF-600T02
Attenuation (dB)
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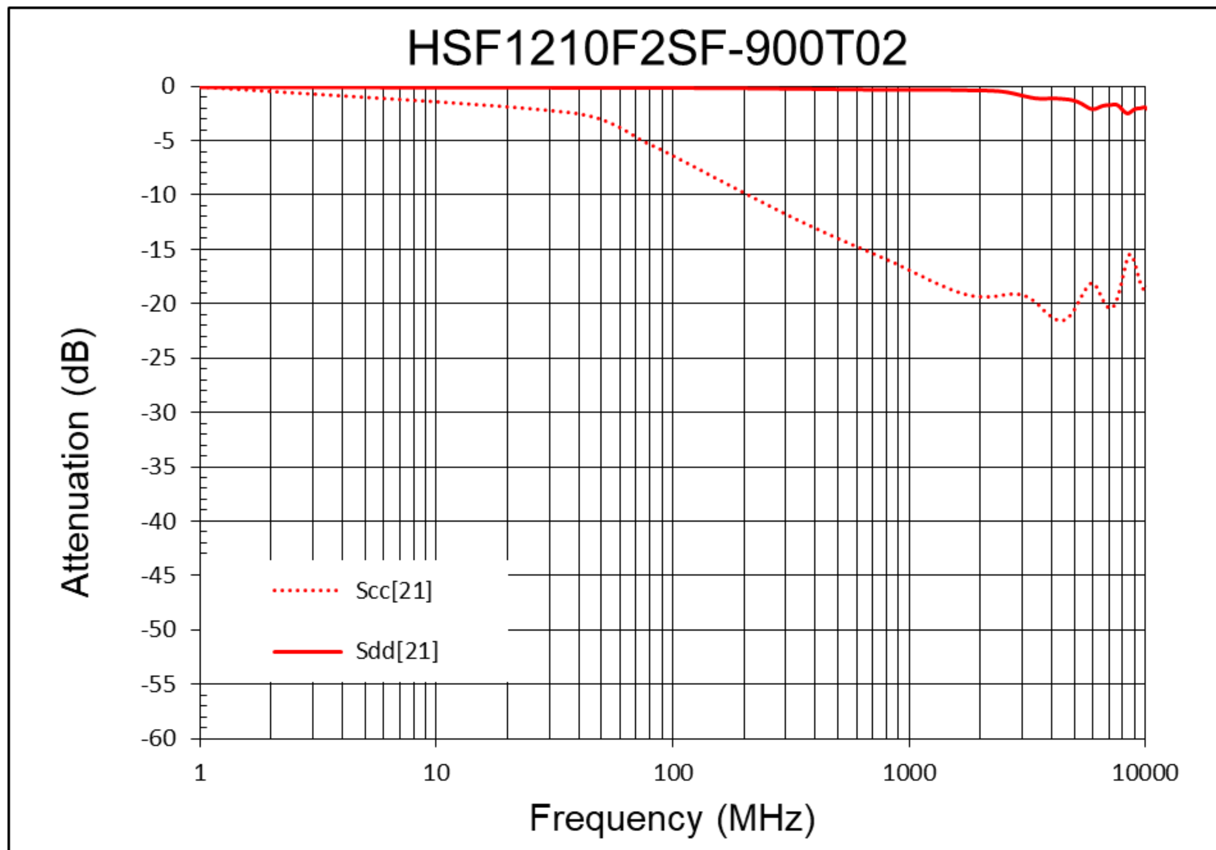
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
1
10
100
1000
10000
Frequency (MHz)
Scc[21]
Sdd[21]

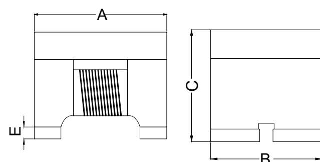

HSF1210F2SF-900T02
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
Attenuation (dB)
Scc[21]
Sdd[21]
1
10
100
1000
10000
Frequency (MHz)

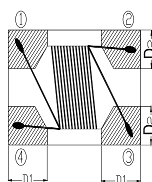
Wire Wound Type Common Mode Filter HSF1210F2SF-SERIES-U4

1. Features

1. High common mode impedance at high frequency cause excellent noise suppression performance.
2. HSF1210F2SF series realizes small size and low profile. 1.2x1.0x0.9 mm.
3. 100% Lead(Pb) & Halogen-Free and RoHS compliant.
4. For USB3.1G1/2、HDMI2.0/2.1、USB4.0、Thunderbolt.
5. Operating temperature -40~+125℃ (Including self - temperature rise)

2. Dimension





Series	A(mm)	B(mm)	C(mm)	D1(mm)	D2(mm)	E(mm)
1210F2SF	1.2±0.2	1.0±0.2	0.9 max.	0.35±0.1	0.35±0.1	0.03 min.

3. Part Numbering

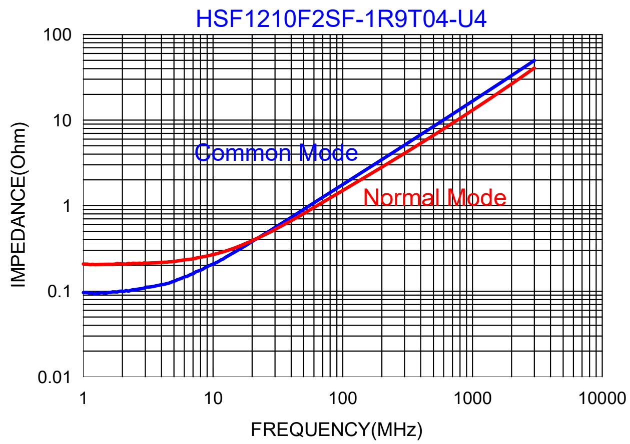
HSF 1210 F 2 S F - 900 T 03 - U4

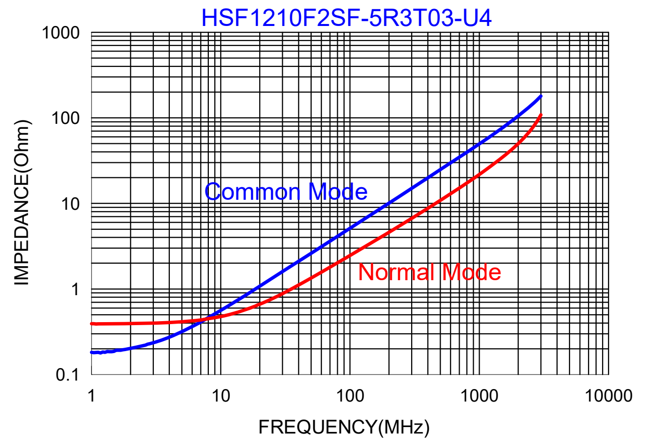
A B C D E F G H I J

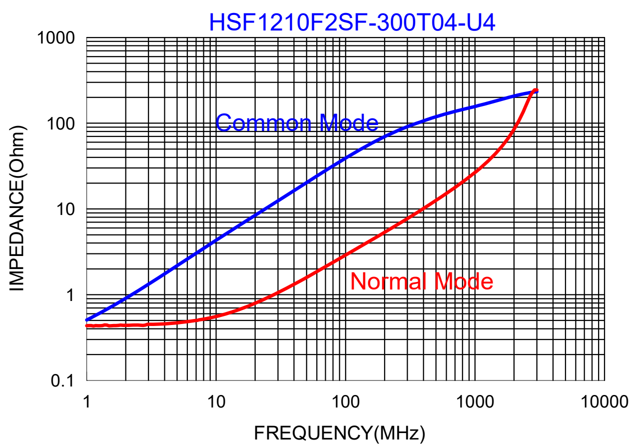
A: Series	
B: Dimension	
C: Material	Ferrite
D: Number of Lines	2=2 lines
E: Type	S=Shielded, N=Unshielded
F: Lead free	
G: Impedance	900=90Ω
H: Packaging	T=Taping and Reel, B=Bulk
I: Rated Current	03=300mA
J: Control S/N	

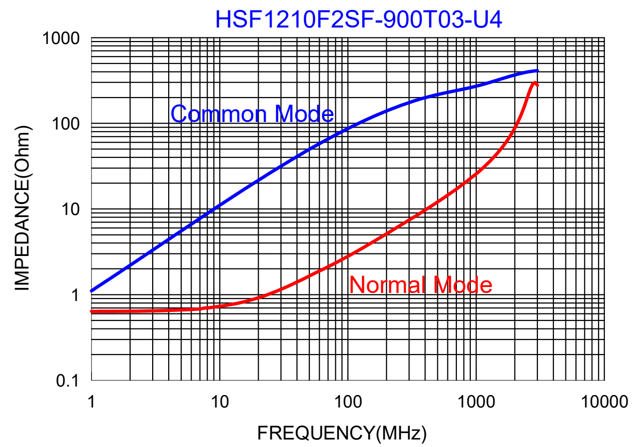
4. Specification

TAI-TECH Part Number	Common mode Impedance (Ω) Typ.	Test Frequency (MHz)	Cut-off Frequency (GHz)Typ.	DC Resistance (Ω) max.	Rated Current (mA)max.	Rated Volt. (Vdc)max.	Withstand Volt. (Vdc) max.	IR (Ω) min.
HSF1210F2SF-1R9T04-U4	1.9	100	18	0.20	400	50	125	10M
HSF1210F2SF-5R3T03-U4	5.3	100	18	0.30	300	50	125	10M
HSF1210F2SF-300T04-U4	30.0	100	18	0.20	400	50	125	10M
HSF1210F2SF-900T03-U4	90.0	100	18	0.30	300	50	125	10M

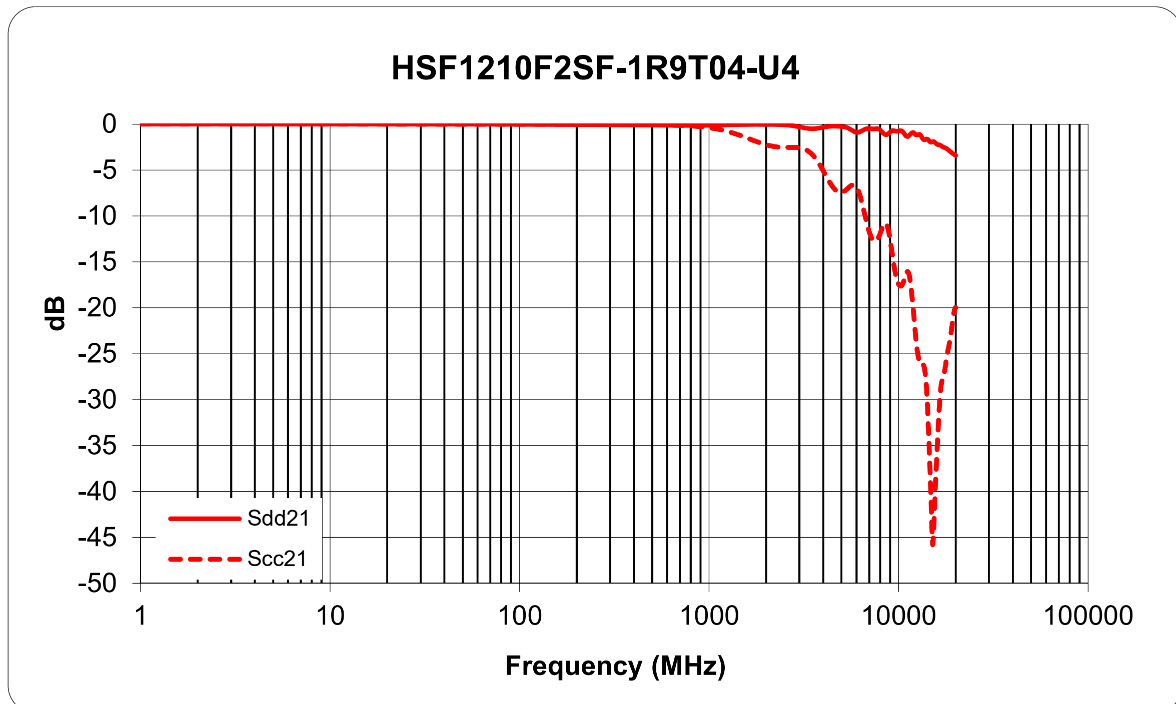


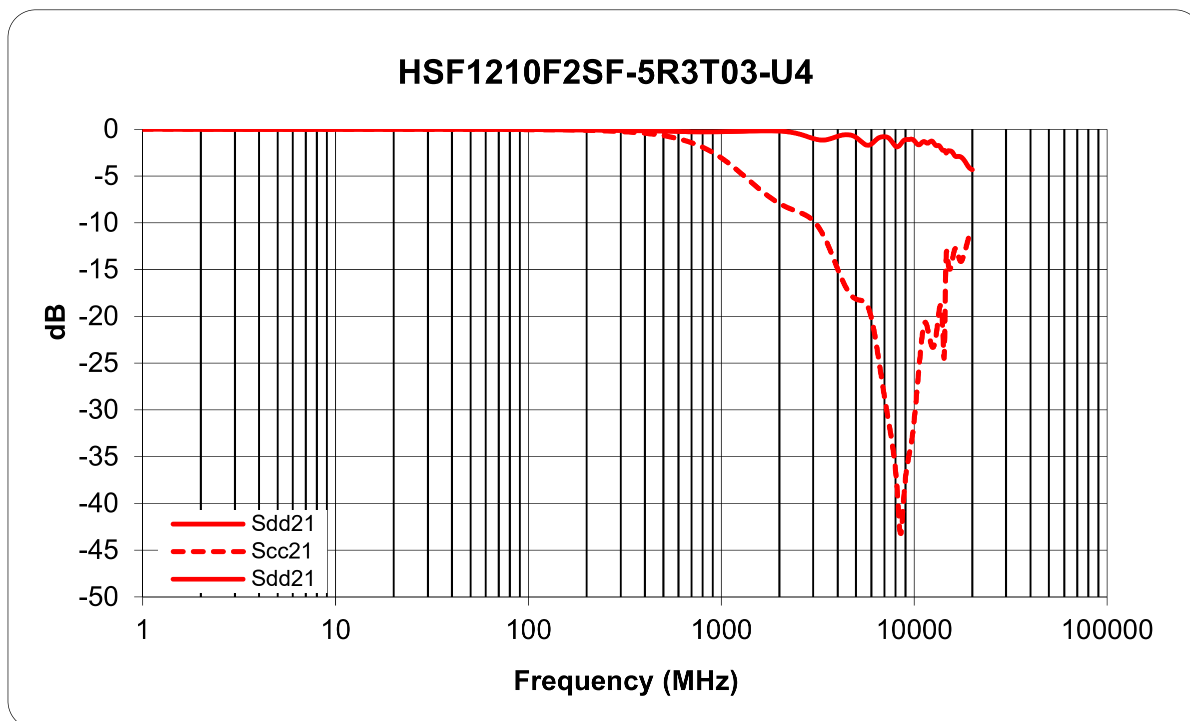


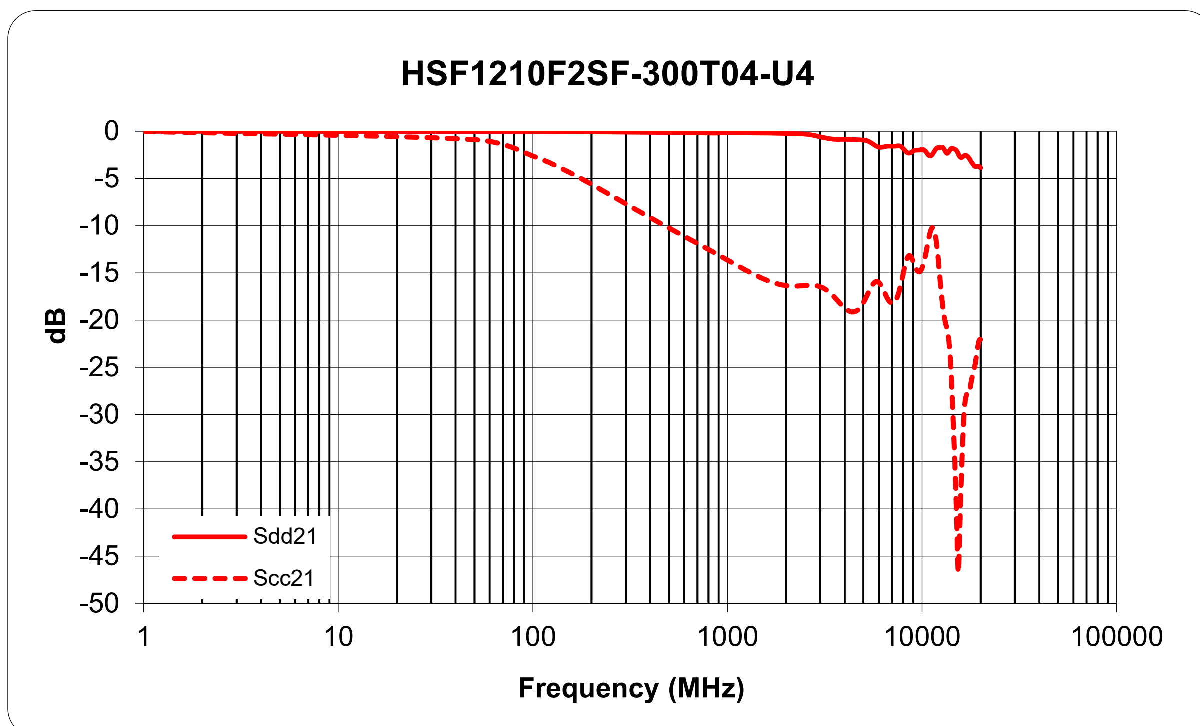


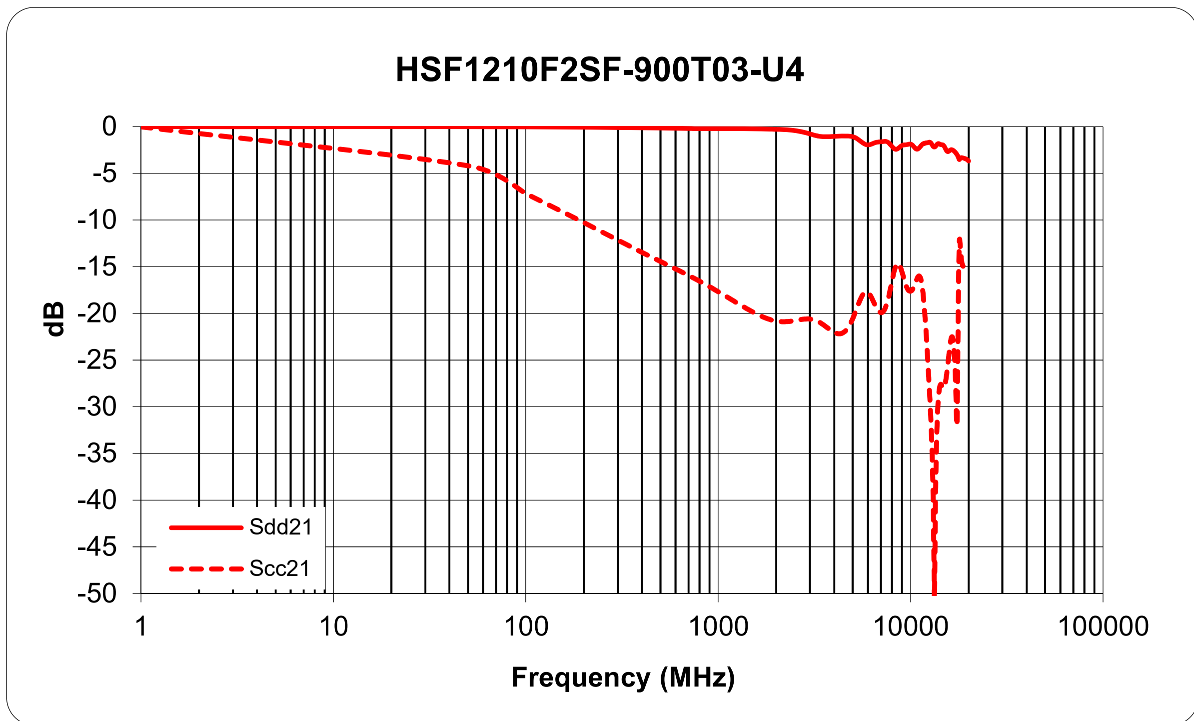


Sdd21&Scc21




HSF1210F2SF-5R3T03-U4
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
dB
1
10
100
1000
10000
100000
Frequency (MHz)
Sdd21
Scc21
Sdd21


HSF1210F2SF-300T04-U4
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
dB
1
10
100
1000
10000
100000
Frequency (MHz)
Sdd21
Scc21


HSF1210F2SF-900T03-U4
dB
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1
10
100
1000
10000
100000
Frequency (MHz)
Sdd21
Scc21

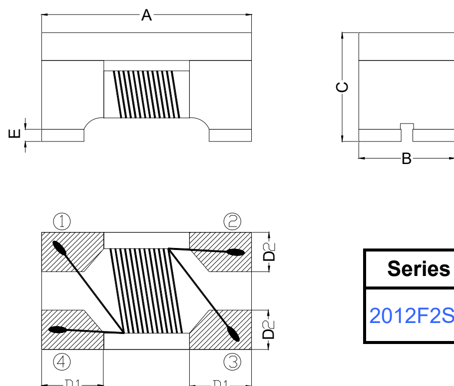
Wire Wound Type Common Mode Filter

HSF2012F2SF-SERIES-H

1. Features

1. High common mode impedance at high frequency cause excellent noise suppression performance.
2. HSF2012F2SF series realizes small size and low profile. 2.0x1.2x1.2 mm.
3. 100% Lead(Pb) & Halogen-Free and RoHS compliant.
4. For USB3.1G2 & HDMI2.0
5. Operating temperature -40~+125℃ (Including self - temperature rise)

2. Dimension



Series	A(mm)	B(mm)	C(mm)	D1(mm)	D2(mm)	E(mm)
2012F2SF	2.0±0.2	1.2±0.2	1.2±0.2	0.50±0.1	0.51±0.1	0.15±0.1

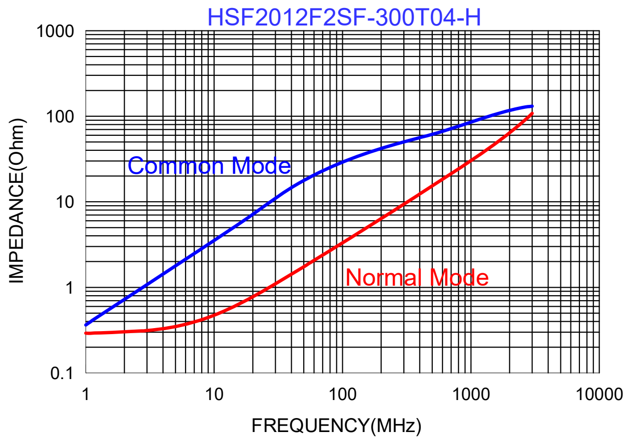
3. Part Numbering

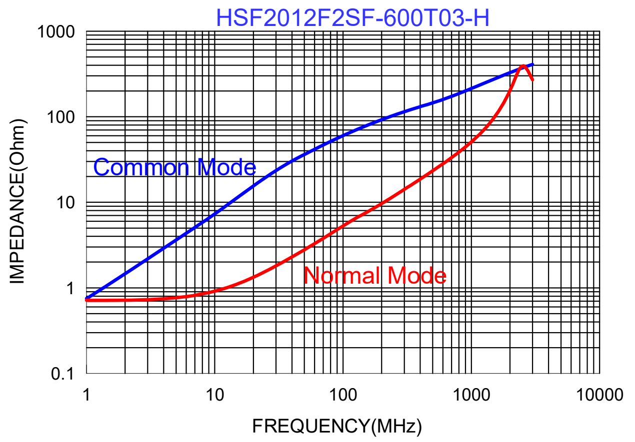
HSF	2012	F	2	S	F	-	600	T	03	-	H
A	B	C	D	E	F		G	H	I		J

A: Series
B: Dimension
C: Material Ferrite Core
D: Number of Lines 2=2 lines
E: Type S=Shieded , N=Unshielded
F: Lead free
G: Impedance 600=60Ω
H: Packaging T=Taping and Reel
I: Rated Current 03=300mA
J: Control S/N

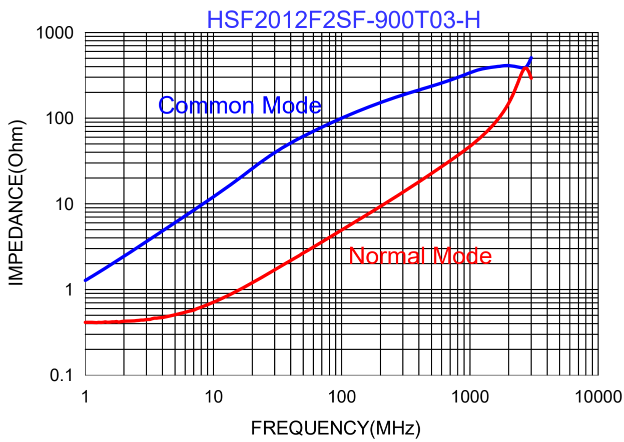
4. Specification

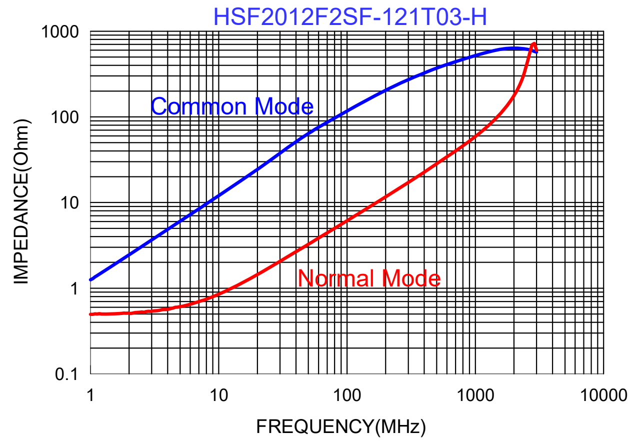
TAI-TECH Part Number	Common mode Impedance (Ω)	Test Frequency (MHz)	DC Resistance (Ω) max.	Rated Current (mA) max.	Rated Volt. (Vdc) max.	Withstand Volt. (Vdc) max.	IR (Ω) min.
HSF2012F2SF-300T04-H	30±25%	100	0.20	400	50	125	10M
HSF2012F2SF-600T03-H	60±25%	100	0.30	300	50	125	10M
HSF2012F2SF-900T03-H	90±25%	100	0.30	300	50	125	10M
HSF2012F2SF-121T03-H	120±25%	100	0.35	330	50	125	10M





-H

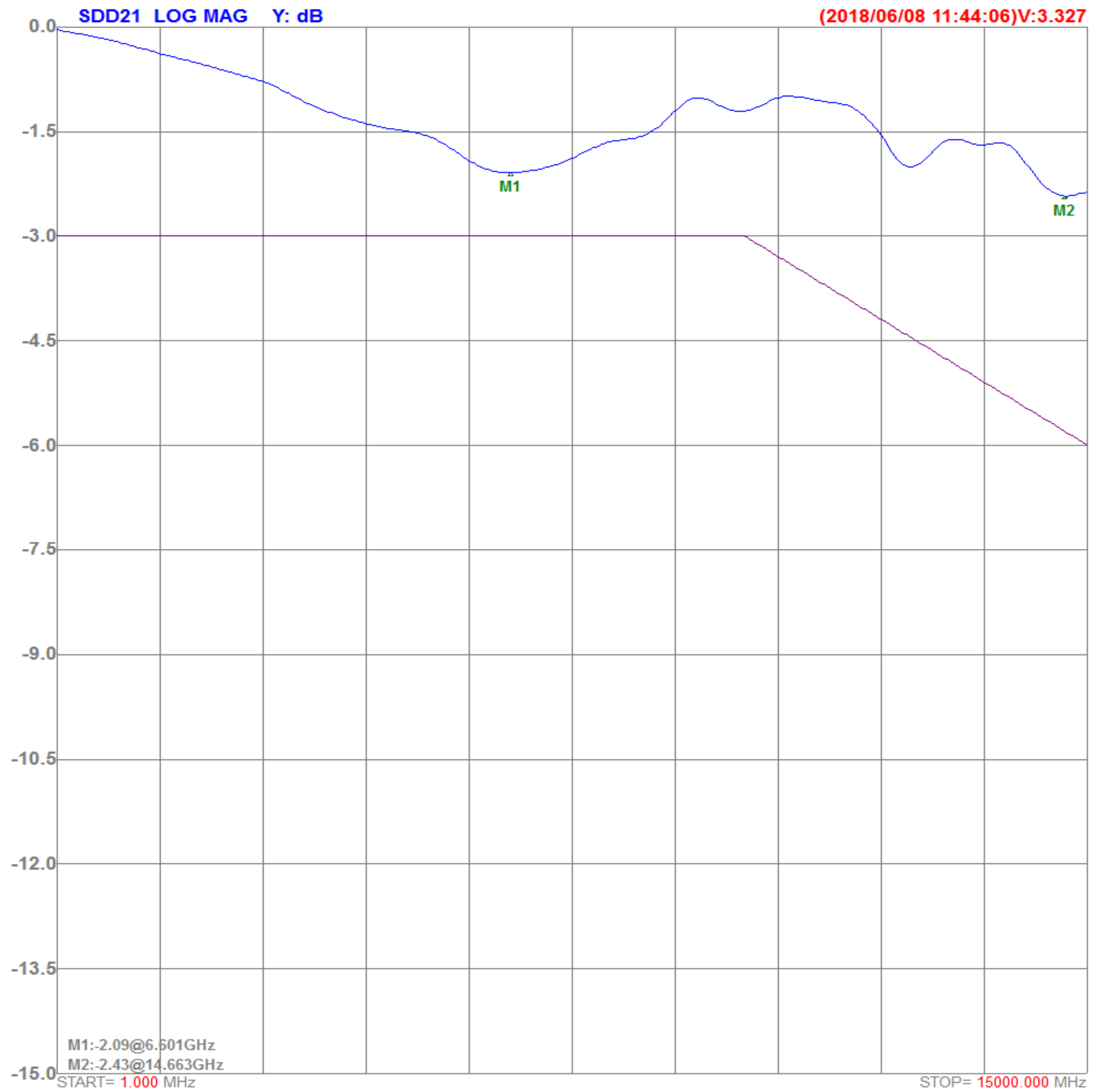




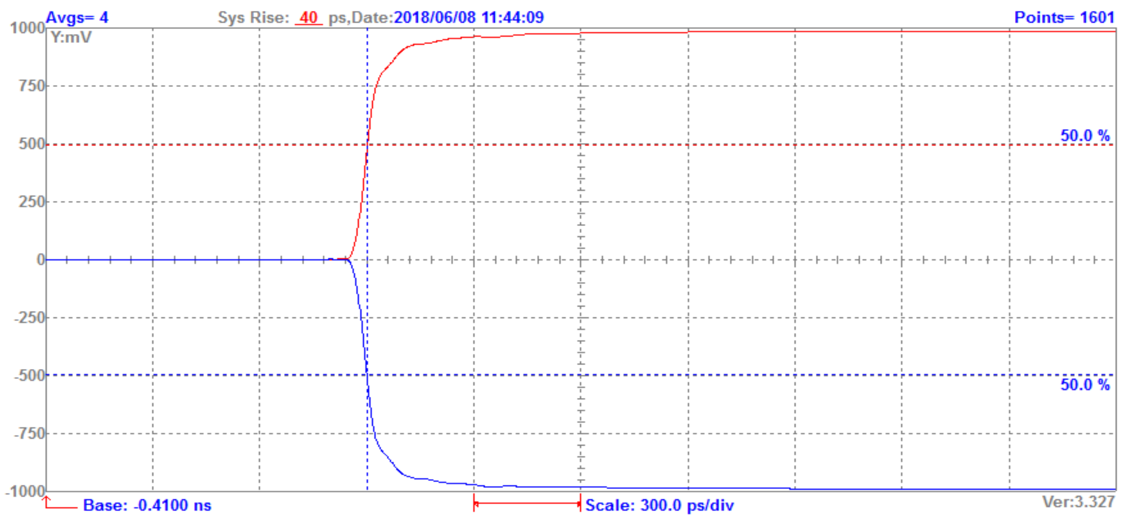
HSF2012F2SF-300T04-H

USB3.1 Choke Insertion Loss Graphic result

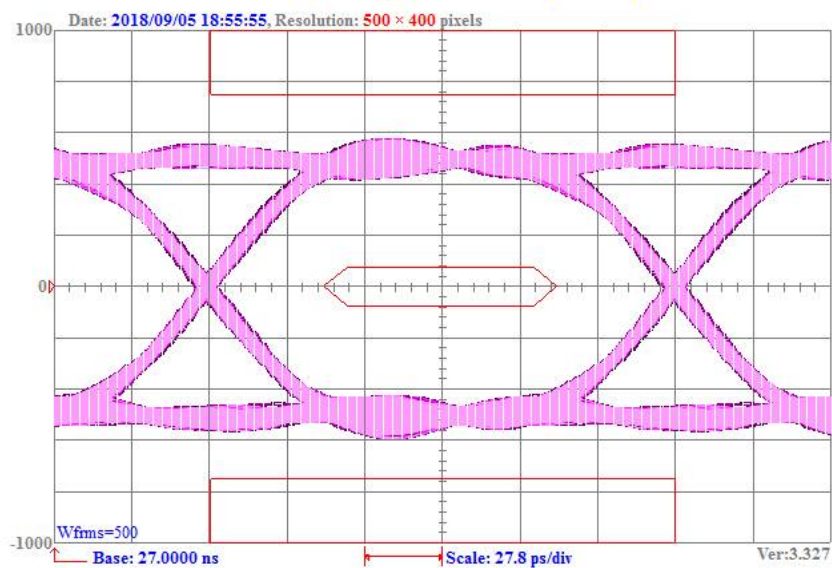
C1 -(PASS)



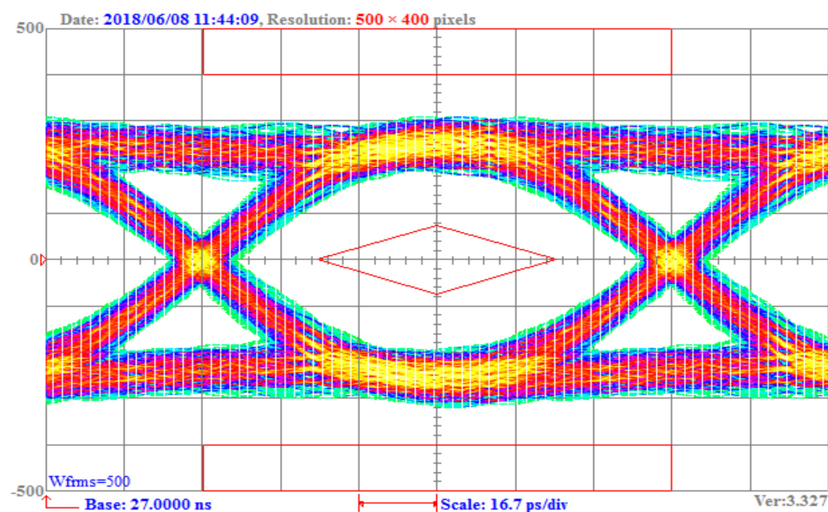
USB3.1 Choke Intra Skew Graphic result



HDMI2.0 Choke Eye Diagram with-25ps Graphic result



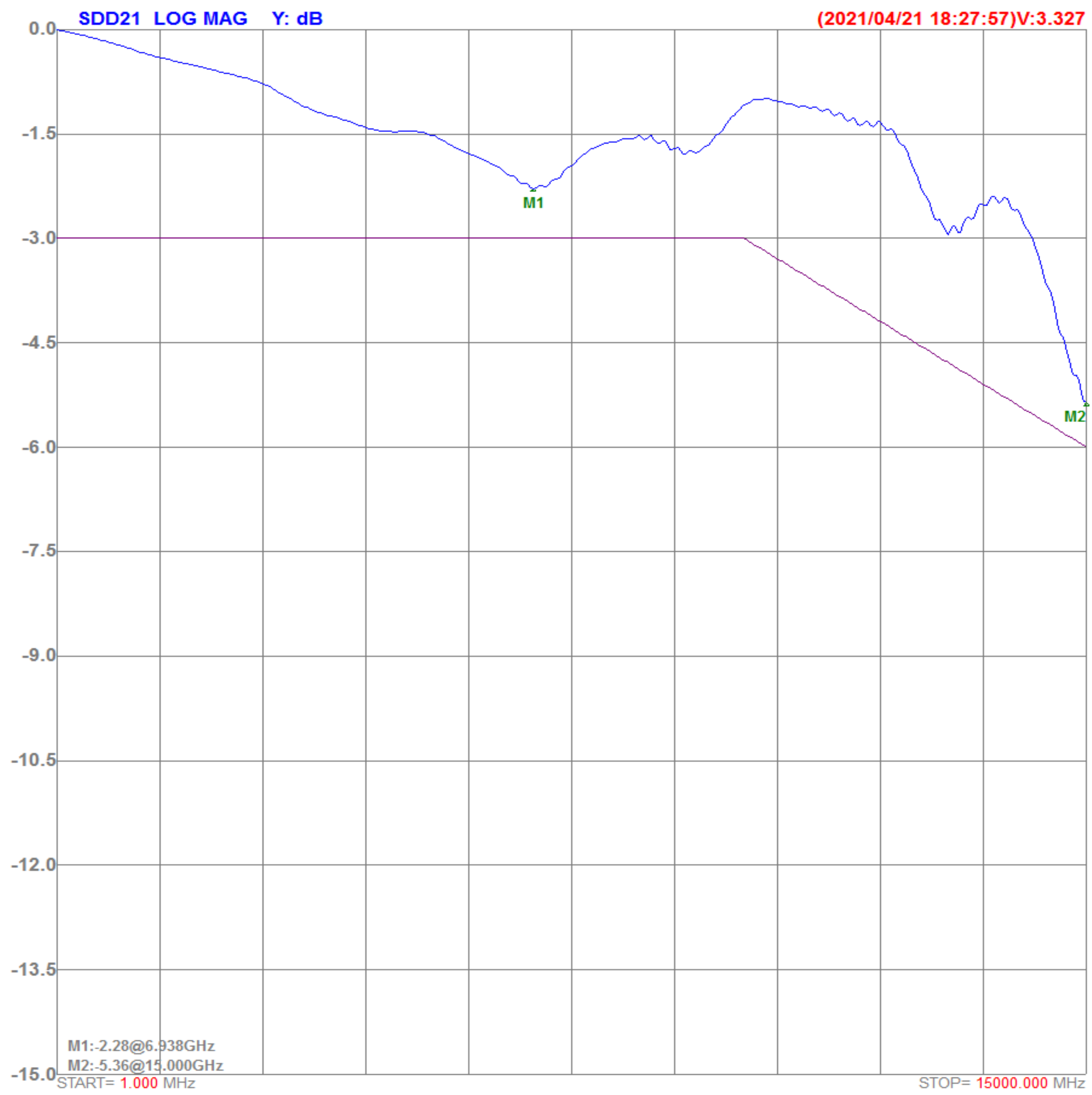
USB3.1 Choke Eye Diagram Graphic result



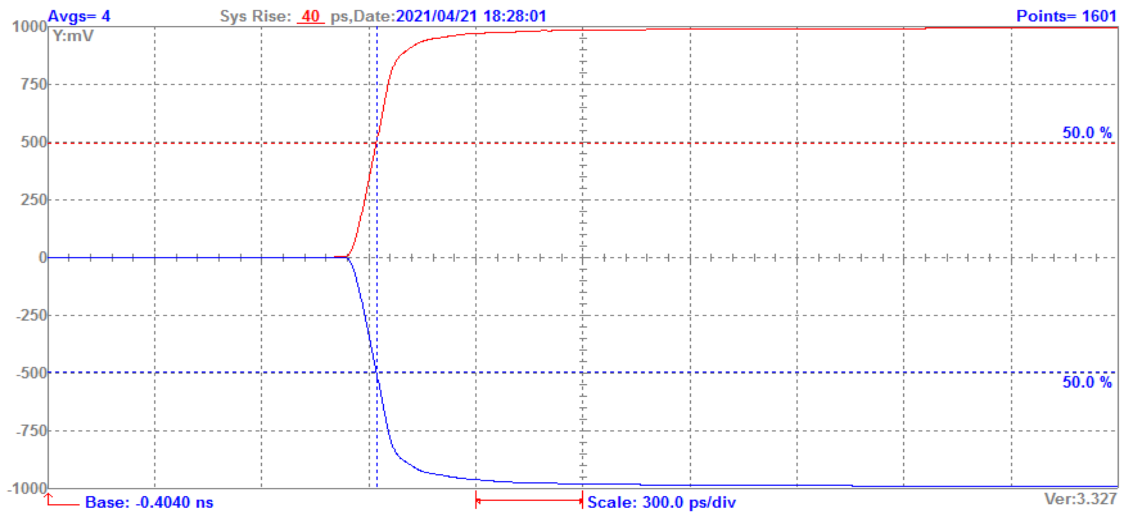
HSF2012F2SF-600T03-H

USB3.1 Choke Insertion Loss Graphic result

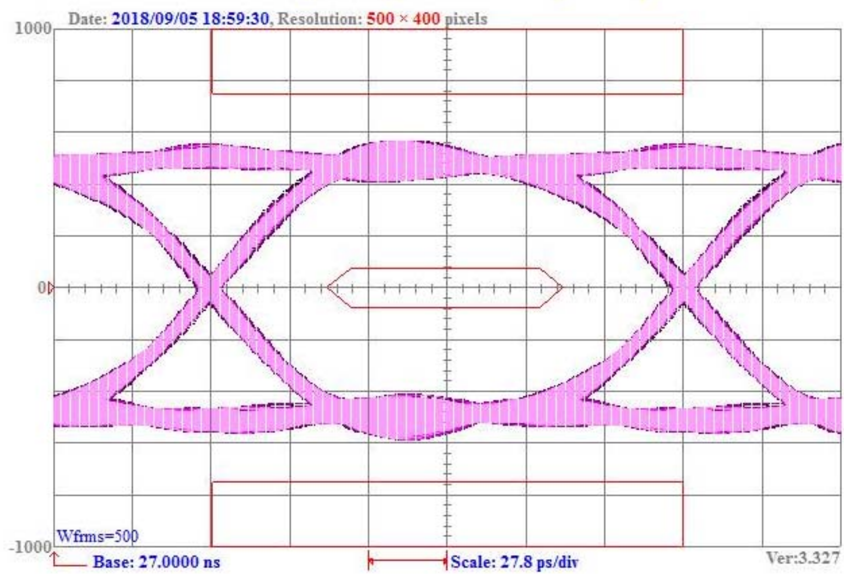
C1 -(PASS)



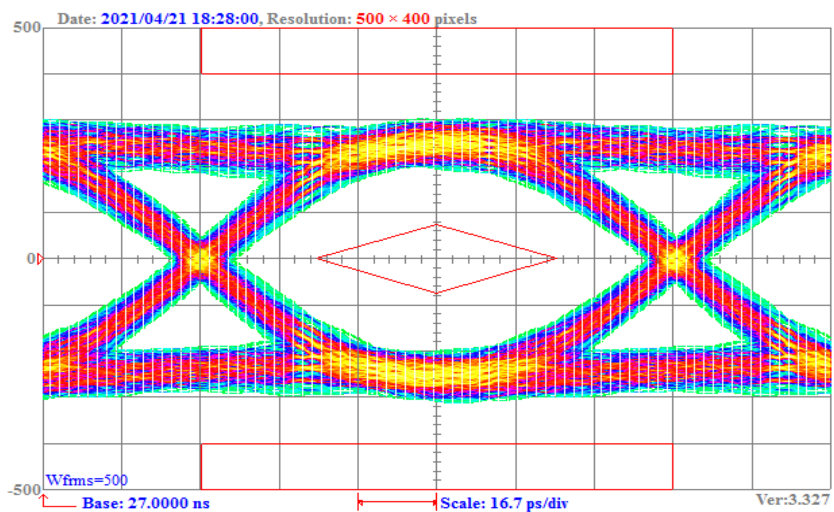
USB3.1 Choke Intra Skew Graphic result



HDMI2.0 Choke Eye Diagram with-25ps Graphic result



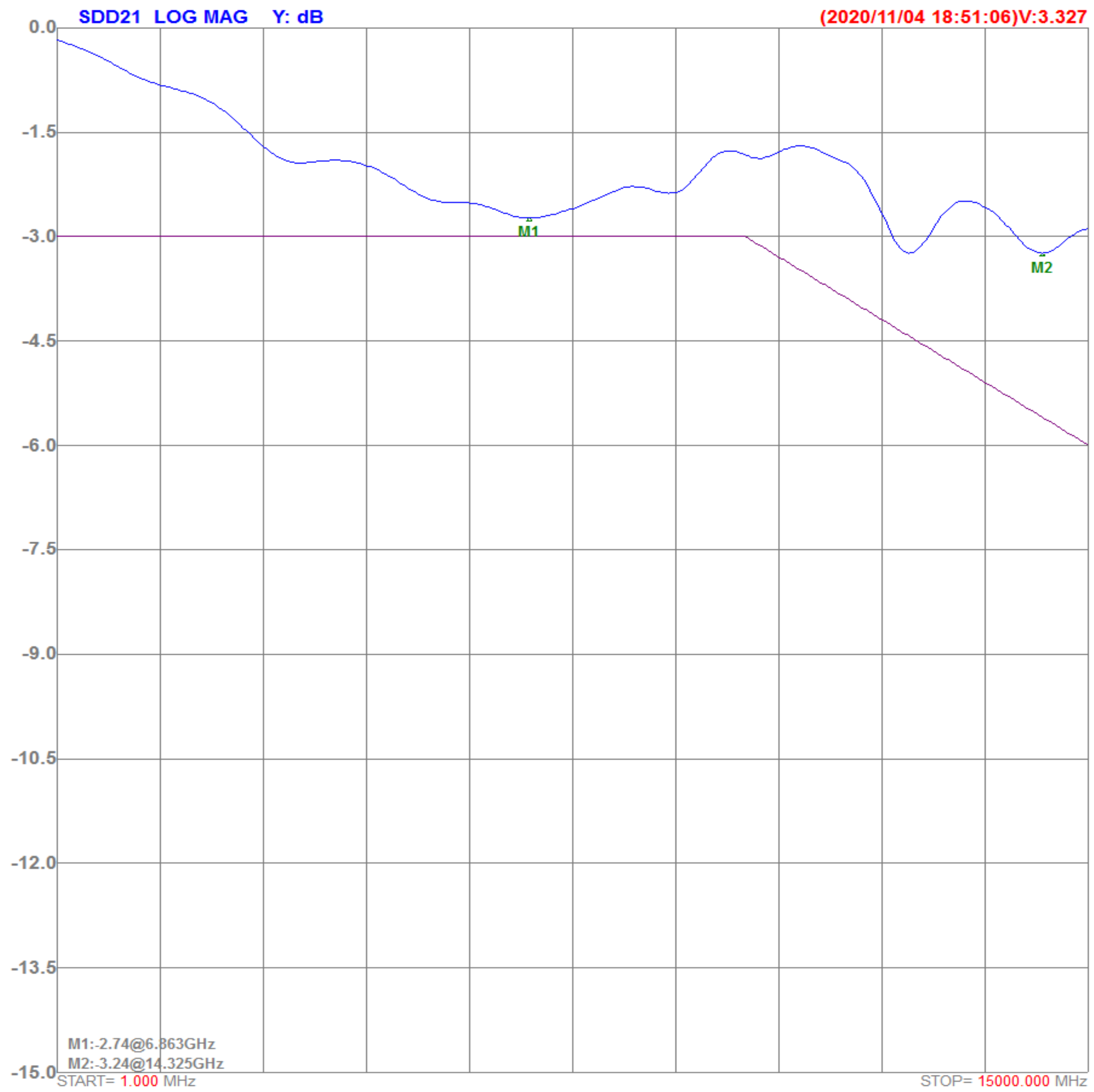
USB3.1 Choke Eye Diagram Graphic result



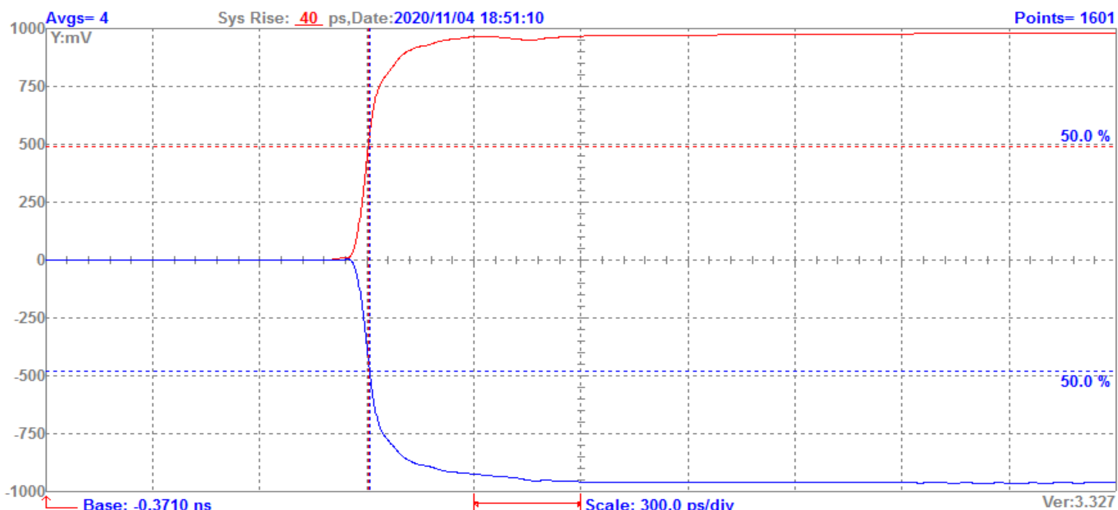
HSF2012F2SF-900T03-H

USB3.1 Choke Insertion Loss Graphic result

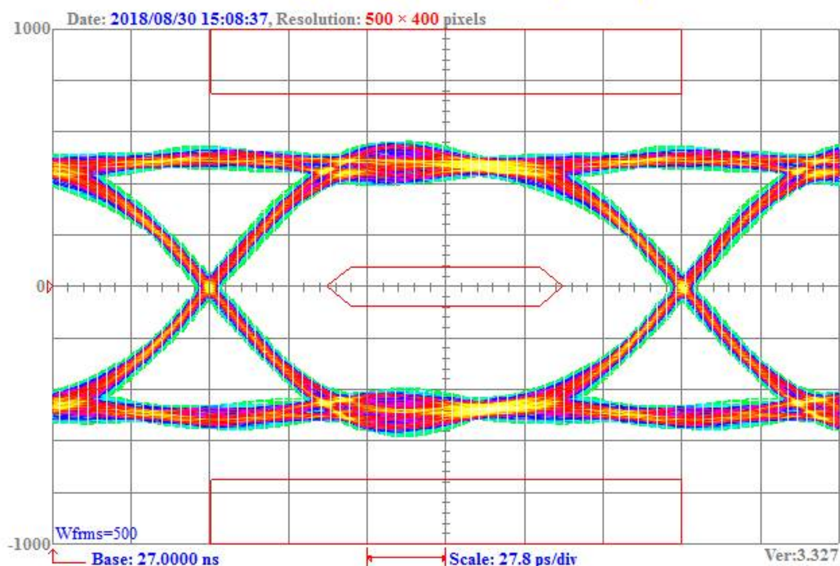
C1 -(PASS)



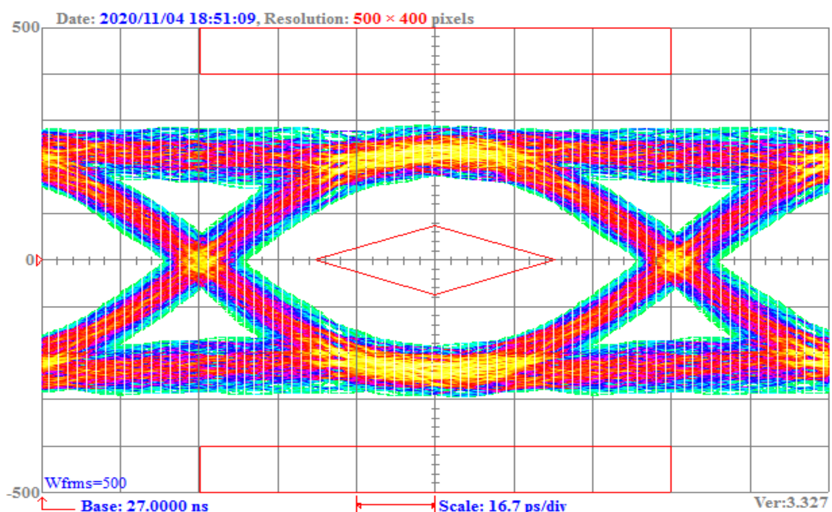
USB3.1 Choke Intra Skew Graphic result



HDMI2.0 Choke Eye Diagram with-25ps Graphic result

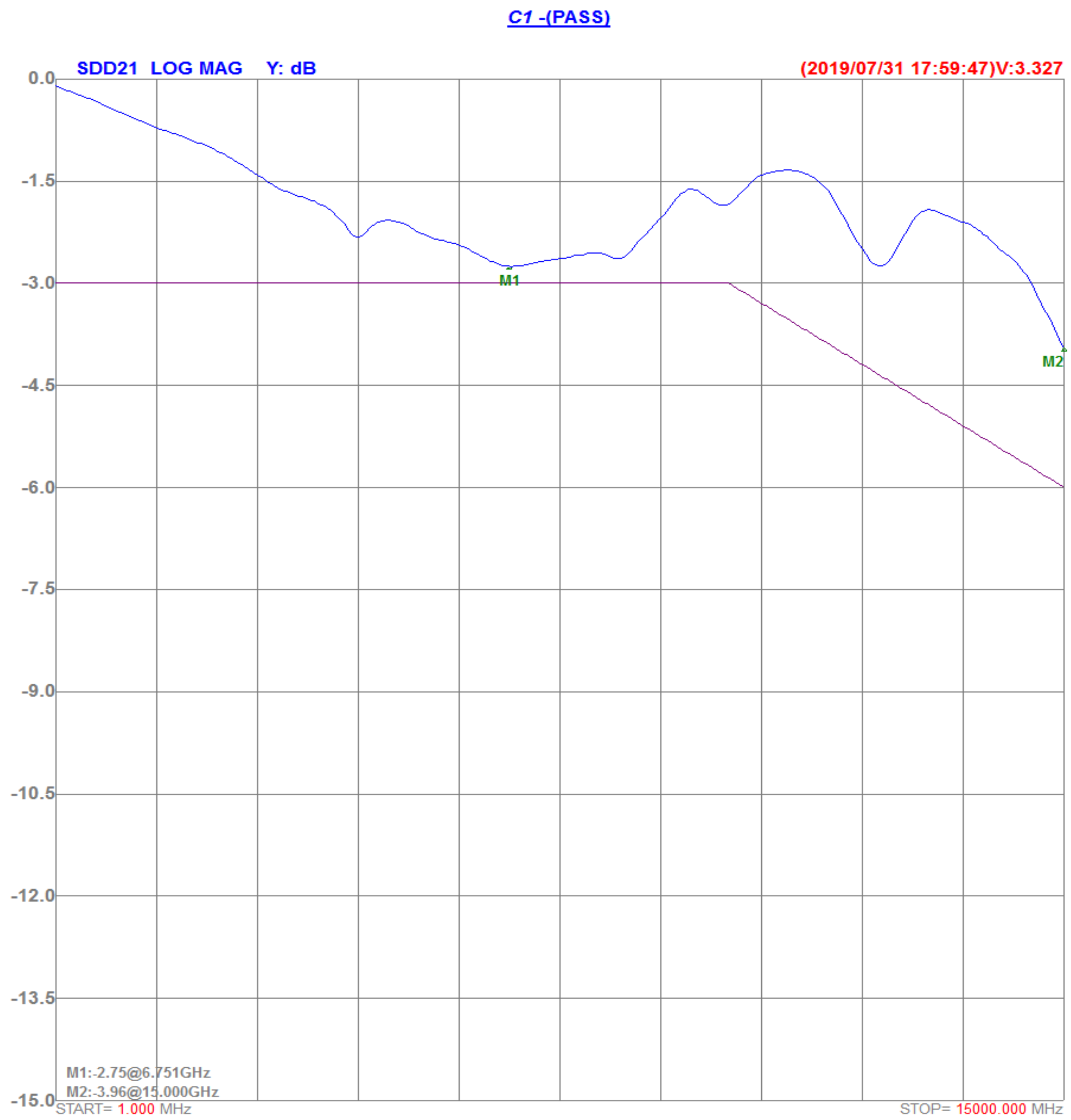


USB3.1 Choke Eye Diagram Graphic result

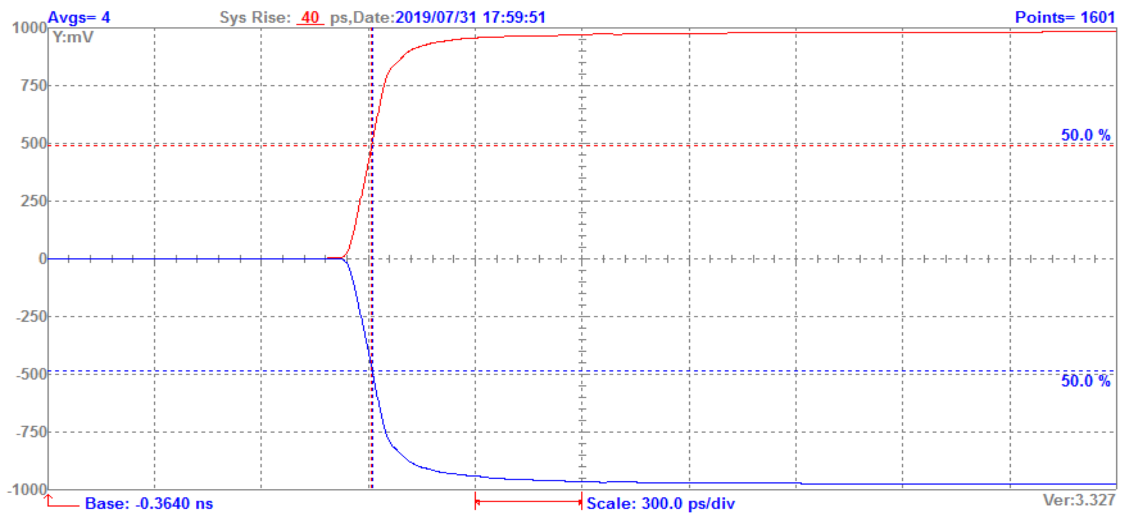


HSF2012F2SF-121T03-H

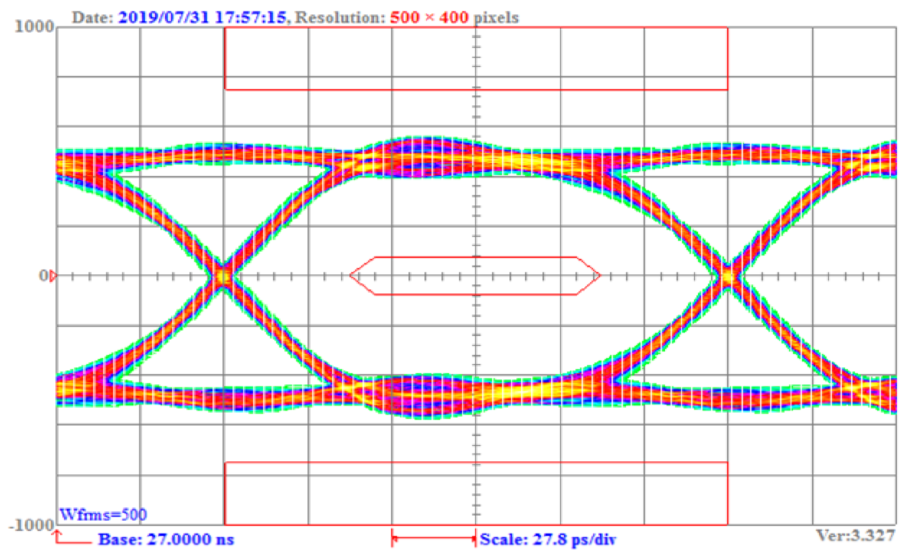
USB3.1 Choke Insertion Loss Graphic result



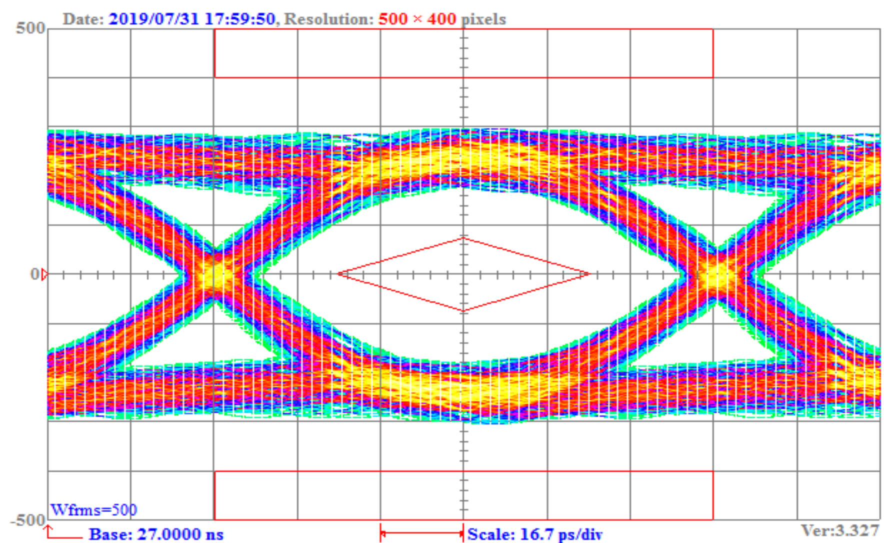
USB3.1 Choke Intra Skew Graphic result



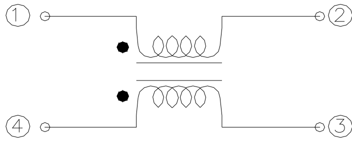
HDMI2.0 Choke Eye Diagram with 25ps Graphic result



USB3.1 Choke Eye Diagram Graphic result

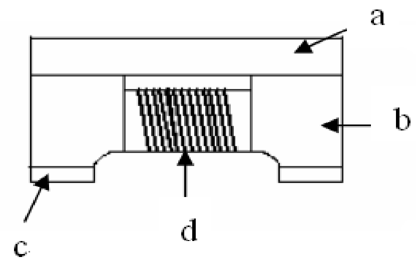


5. Schematic Diagram



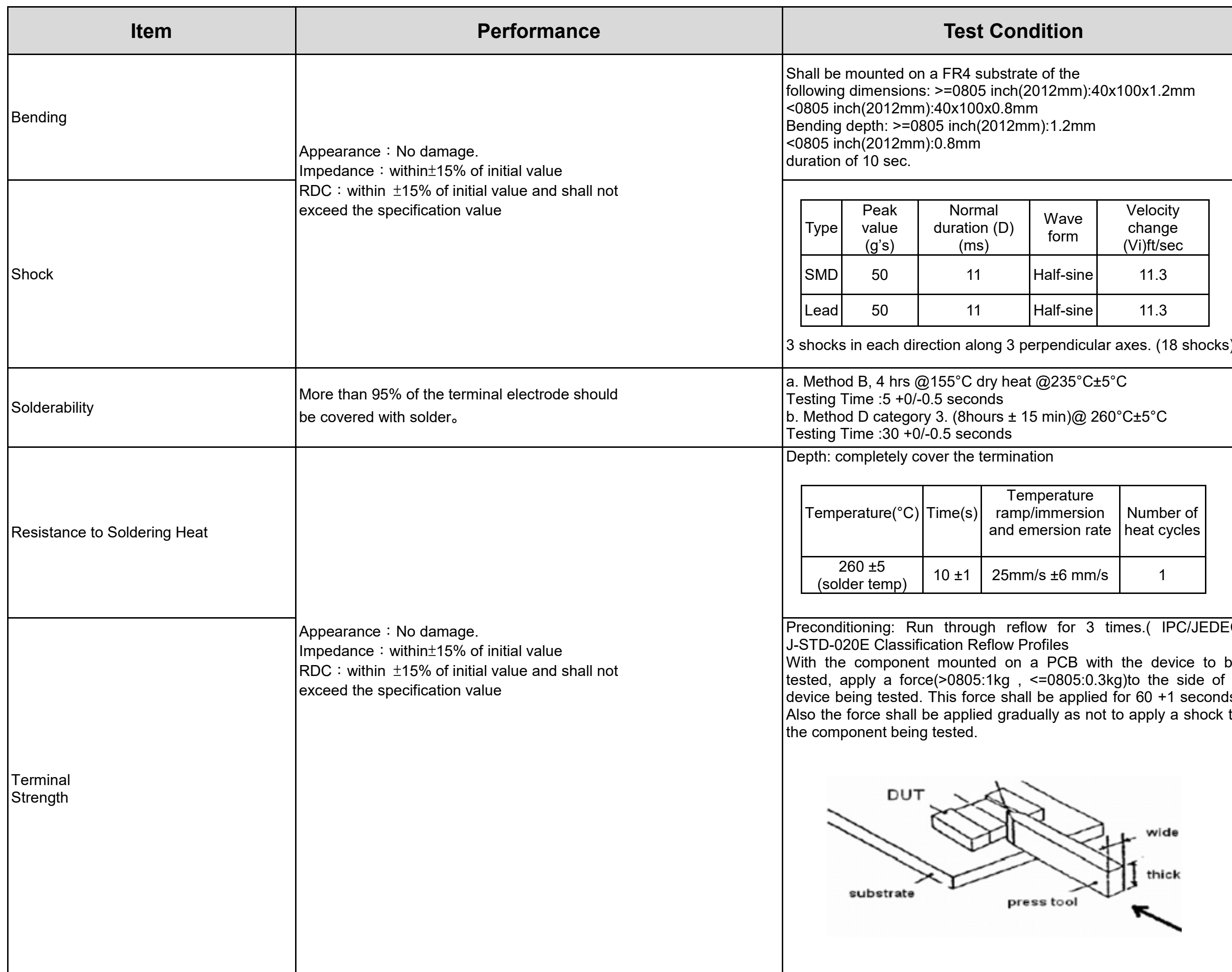
6. Materials

No.	Description	Specification
a.	Upper Plate	Ferrite
b.	Core	Ferrite Core
c	Termination	Ag/Ni/Sn
d	Wire	Enameled Copper Wire



7. Reliability and Test Condition (HSF1210, HSF2012)

Item	Performance	Test Condition
Operating temperature	-40~+125℃ (Including self - temperature rise)	
Storage temperature	-40~+125℃ (on board)	
Electrical Performance Test		
Z(common mode)	Refer to standard electrical characteristics list.	Keysight E4991B + Keysight 16197A
DCR		Agilent-34420A Agilent-4338B
I.R.		Chroma 19073
Temperature Rise Test	Rated Current ΔT 40℃Max	1.Applied the allowed DC current. 2.Temperature measured by digital surface thermometer
Reliability Test		
Life Test		Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles) Temperature：125±2℃ Applied current：rated current Duration：1000±12hrs Measured at room temperature after placing for 24 hrs.
Load Humidity		Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles Humidity：85±3% R.H, Temperature：85℃±2℃ Duration：1000hrs Min. Bead：with 100% rated current，Inductance: with 10% rated current Measured at room temperature after placing for 24 hrs.
Moisture Resistance	Appearance：No damage. Impedance：within±15% of initial 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 1. Baked at50℃ for 25hrs, measured at room temperature after placing for 4 hrs. 2. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in 2.5hrs. 3. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in 2.5hrs,keep at 25℃ for 2 hrs then keep at -10℃ for 3 hrs 4. Keep at 25℃ 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at room temperature after placing for 1~2 hrs.
Thermal shock		Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles Condition for 1 cycle Step1：-40±2℃ 30±5min Step2：125±2℃ ≦0.5min Step3：125±2℃ 30±5min Number of cycles： 500 Measured at room temperature after placing for 24 hrs.
Vibration		Oscillation Frequency: 10Hz～2KHz～10Hz for 20 minute Equipment： Vibration checker Total Amplitude:10g Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations)。

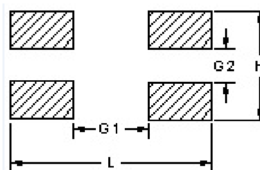


<table>
<tr><th>Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>Bending</td><td rowspan="2">Appearance：No damage.
Impedance：within±15% of initial value
RDC：within ±15% of initial value and shall not exceed the specification value</td><td>Shall be mounted on a FR4 substrate of the following dimensions: >=0805 inch(2012mm):40x100x1.2mm
<0805 inch(2012mm):40x100x0.8mm
Bending depth: >=0805 inch(2012mm):1.2mm
<0805 inch(2012mm):0.8mm
duration of 10 sec.</td></tr>
<tr><td>Shock</td><td><table><tr><th>Type</th><th>Peak value (g's)</th><th>Normal duration (D) (ms)</th><th>Wave form</th><th>Velocity change (Vi)ft/sec</th></tr><tr><td>SMD</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr><tr><td>Lead</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr></table>3 shocks in each direction along 3 perpendicular axes. (18 shocks).</td></tr>
<tr><td>Solderability</td><td>More than 95% of the terminal electrode should be covered with solder。</td><td>a. Method B, 4 hrs @155°C dry heat @235°C±5°C
Testing Time :5 +0/-0.5 seconds
b. Method D category 3. (8hours ± 15 min)@ 260°C±5°C
Testing Time :30 +0/-0.5 seconds</td></tr>
<tr><td>Resistance to Soldering Heat</td><td rowspan="2">Appearance：No damage.
Impedance：within±15% of initial value
RDC：within ±15% of initial value and shall not exceed the specification value</td><td>Depth: completely cover the termination<table><tr><th>Temperature(°C)</th><th>Time(s)</th><th>Temperature ramp/immersion and emersion rate</th><th>Number of heat cycles</th></tr><tr><td>260 ±5 (solder temp)</td><td>10 ±1</td><td>25mm/s ±6 mm/s</td><td>1</td></tr></table></td></tr>
<tr><td>Terminal Strength</td><td>Preconditioning: Run through reflow for 3 times.(IPC/JEDEC J-STD-020E Classification Reflow Profiles
With the component mounted on a PCB with the device to be tested, apply a force(>0805:1kg , <=0805:0.3kg)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 apply a shock to the component being tested.</td></tr>
</table>

8. Soldering and Mounting

8-1. Recommended PC Board Pattern

	HSF1210F2S	HSF2012F2S
L(mm)	1.55	2.60
H(mm)	1.10	1.40
G1(mm	0.65	1.25
G2(mm	0.30	0.45



8-2. 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.

8-2.1 Soldering Reflow:

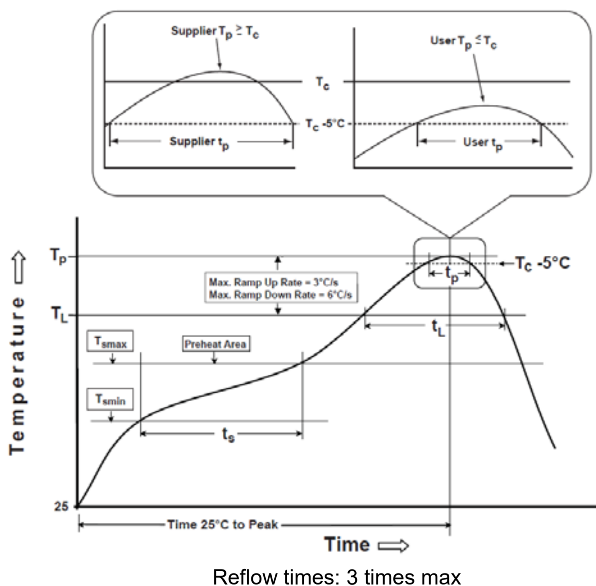
Recommended temperature profiles for lead free re-flow soldering in Figure 1. Table 1.1&1.2 (J-STD-020E)

8-2.2 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.)

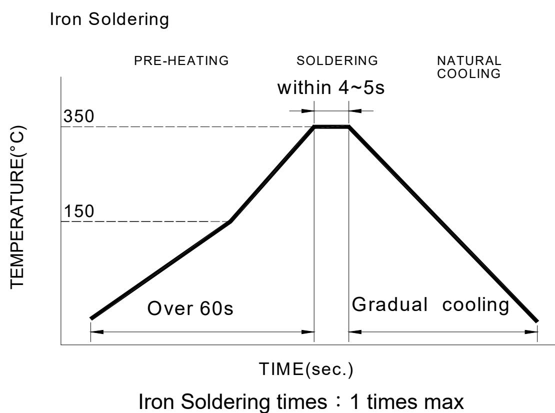
- Preheat circuit and products to 150℃
- 350℃ tip temperature (max)
- Never contact the ceramic with the iron tip
- 1.0mm tip diameter (max)
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- Limit soldering time to 4~5sec.

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.

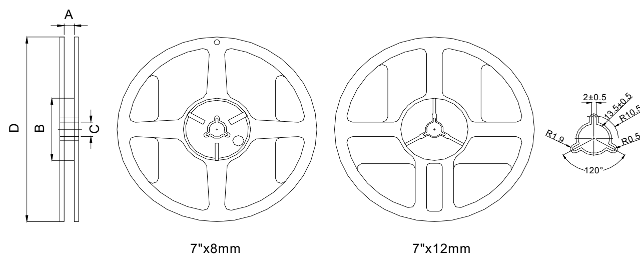
Table (1.2) Package Thickness/Volume and Classification Temperature (T_c)

	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。

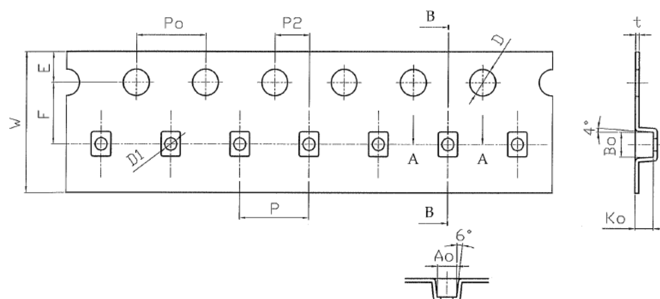
9. Packaging Information

9-1. Reel Dimension



Type	A(mm)	B(mm)	C(mm)	D(mm)
7"x8mm	9.0±0.5	60.0±2.0	13.5±0.5	178.0±2.0

9-2. Tape Dimension / 8mm

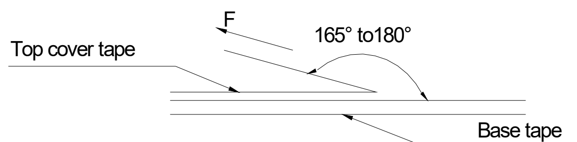


Series	W(mm)	P(mm)	E(mm)	F(mm)	P2(mm)	D(mm)	D1(mm)	P0(mm)	A0(mm)	B0(mm)	K0(mm)	t(mm)
HSF1210F2S	8.00±0.10	4.00±0.10	1.75±0.10	3.50±0.05	2.00±0.05	1.50+0.10/-0.00	0.70±0.10	4.00±0.10	1.12±0.10	1.40±0.10	1.05±0.10	0.22±0.05

9-3. Packaging Quantity

Chip size	Chip/Reel	Inner Box	Middle Box	Carton
HSF1210F2S	3000	15000	75000	150000

9-4. Tearing Off Force



The force for tearing off cover tape is 15 to 80 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

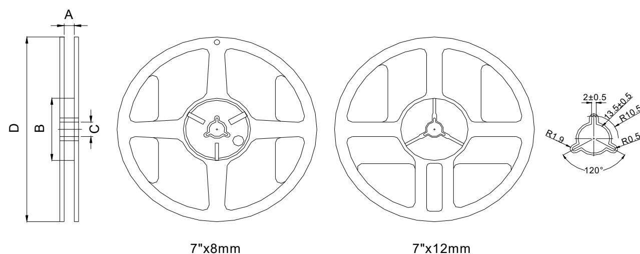
Application Notice

・Storage Conditions(component level)
To maintain the solderability 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 form 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.

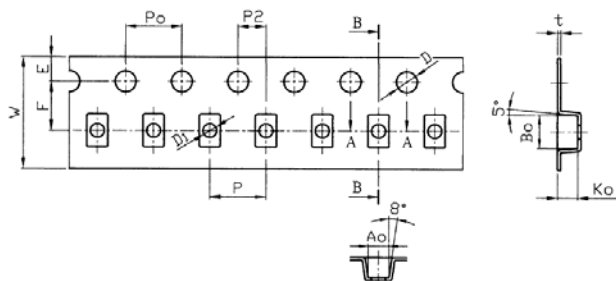
9. Packaging Information

9-1. Reel Dimension



Type	A(mm)	B(mm)	C(mm)	D(mm)
7"x8mm	9.0±0.5	60.0±2.0	13.5±0.5	178.0±2.0

9-2. Tape Dimension / 8mm

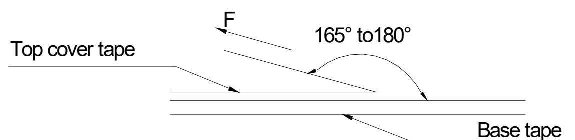


Series	W(mm)	P(mm)	E(mm)	F(mm)	P2(mm)	D(mm)	D1(mm)	P0(mm)	A0(mm)	B0(mm)	K0(mm)	t(mm)
HSF2012F2S	8.00±0.10	4.00±0.10	1.75±0.10	3.50±0.05	2.00±0.05	1.50+0.10/-0.00	1.00±0.10	4.00±0.10	1.50±0.10	2.35±0.10	1.45±0.10	0.28±0.05

9-3. Packaging Quantity

Chip size	Chip/Reel	Inner Box	Middle Box	Carton
HSF2012F2S	2000	10000	50000	100000

9-4. Tearing Off Force



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