

MULTILAYER CERAMIC DEVICES (FILTERS / DIPLEXERS / BALUNS)



REFLOW

FEATURES

- Compact and Low-profile
- Low loss and high attenuation
- Stable temperature characteristics

APPLICATIONS

- Bluetooth® module, Wireless LAN, Digital TV

ORDERING CODE

F	I	△	2	1	2	B	2	4	5	0	2	5	-	T
1	2	3	4	5	6	7								
1 Device code		2 Electrode code		3 Dimensions code		4 Special Code		5 Frequency [MHz]		6 Spec Code		7 Packaging		
FI	Filters for High Frequency	△ With Plating	△ Blank space	325 3.2×2.5	212 2.0×1.25	B Band Pass Filter	L Low Pass Filter	example 2450 2400~2500	0620 470~770	01~ Individual Spec	-T Tape & Reel			
				168 1.6×0.8	105 1.0×0.5	C Balance Filter	P Diplexer							
						T Balun	D Dual Filter							

EXTERNAL DIMENSIONS/STANDARD QUANTITY

FI 325P Type 	FI 212B Type 	FI 212B245025/FI 212B190223 	FI 212L Type
FI 212C245033/FI 212C245034 	FI 168B/L Type 	FI 212C Type 	FI 212C249566/FI 212C355068
FI 212C245075 	FI 212P Type 	FI 212P 3960A4 	FI 168T Type
FI 168D Type 	FI 168P Type 	FI 105B/L Type 	

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	FI 325P Type	FI 212C2450XX	FI 212C245051	FI 212C249566 FI 212C355068	FI 212P245003	FI 212P245003/ FI 212P089208/ FI 212P085912	FI 212P089213/ FI 212P085909	FI 212P3960A4	FI 168T Type	FI 168D087018	FI 168P Type	Type	Standard Quantity [pcs]
(1)	GND	Balanced	Balanced	Balanced	GND	GND	GND	Low Band	Unbalance	High Band IN	GND	325P	2000
(2)	Common	GND	GND	GND	Common	Common Port	Common Port	GND	GND	GND	High Band	212B	3000
(3)	GND	Balanced	Balanced	Balanced	GND	GND	GND	High Band	Balanced	Low Band IN	Common	212L	
(4)	High Band	GND	GND	GND	HIGH Band	High Band	Low Band	GND	Balanced	Low Band OUT	Low Band	212C	
(5)	GND	Unbalance	Unbalance	Unbalance	GND	GND	GND	GND	GND	GND	—	212P	4000
(6)	Low Band	DC	NC	NC or DC	Low Band	Low Band	High Band	Common	NC	High Band OUT	—	168B	
(7)	—	NC	NC	NC	—	—	—	GND	—	—	—	168L	
(8)	—	GND	GND	GND	—	—	—	GND	—	—	—	168T	
												168D	10000
												168P	
												105B	
												105L	

PART NUMBERS

Multi-layer band pass filters

Applications	External dimensions	Ordering code	Notes
2.4GHz W-LAN Bluetooth	2.0×1.25×1.0 max.	FI 212B245025/FI 212B245026/FI 212B245027	
	1.6×0.8×0.5 max.	FI 168B245001	
	1.0×0.5×0.4 max.	FI 105B245024	
WiMAX	1.6×0.8×0.5 max.	FI 168B250065/FI 168B24956D	
UWB	2.0×1.25×1.0 max.	FI 212B396001	WiMedia Band group 1
	2.0×1.25×1.0 max.	FI 212B448802	WiMedia Band group 1 TFC 7
PHS	2.0×1.25×1.0 max.	FI 212B190223	

Multi-layer low pass filters

Applications	External dimensions	Ordering code	Notes
Digital TV	2.0×1.25×0.5 max.	FI 212L062003	for ISDB-T
	1.6×0.8×0.45 max.	FI 168L062005	Thickness 0.45 mm max.
WiMAX	1.6×0.8×0.45 max.	FI 168L259764	Thickness 0.45 mm max.
2.4GHz W-LAN Bluetooth	1.0×0.5×0.4 max.	FI 105L250014	Thickness 0.4 mm max.
Other	1.6×0.8×0.45 max.	FI 168D087018	Dual band LPF

Multi-layer balance filters

Applications	External dimensions	Ordering code	Notes
Bluetooth	2.0×1.25×1.0 max.	FI 212C245032	Conjugated match to CSR BC4
	2.0×1.25×1.0 max.	FI 212C245033	Conjugated match to CSR BC3
	2.0×1.25×1.0 max.	FI 212C245034	Conjugated match to CSR BC4-BGA
	2.0×1.25×1.0 max.	FI 212C245036	Conjugated match to CSR BC5
	2.0×1.25×1.0 max.	FI 212C245051	Conjugated match to STLC2500C-D
	2.0×1.25×0.7 max.	FI 212C245075	Conjugated match to CSR BC5FM, BC6ROM
WiMAX	2.0×1.25×0.5 max.	FI 212C249566	Thickness 0.5 mm max.
	2.0×1.25×0.5 max.	FI 212C355068	Thickness 0.5 mm max.

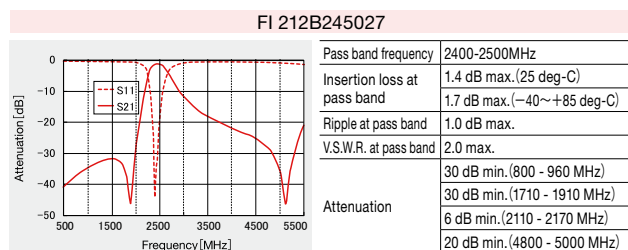
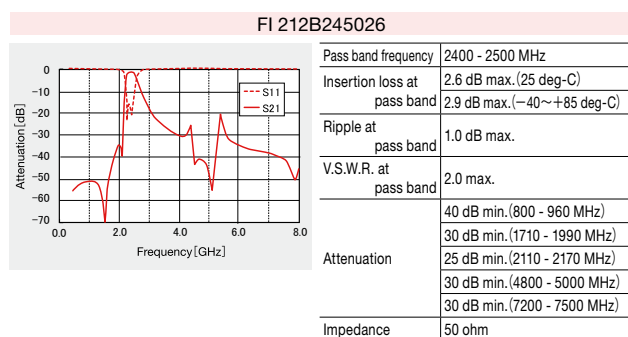
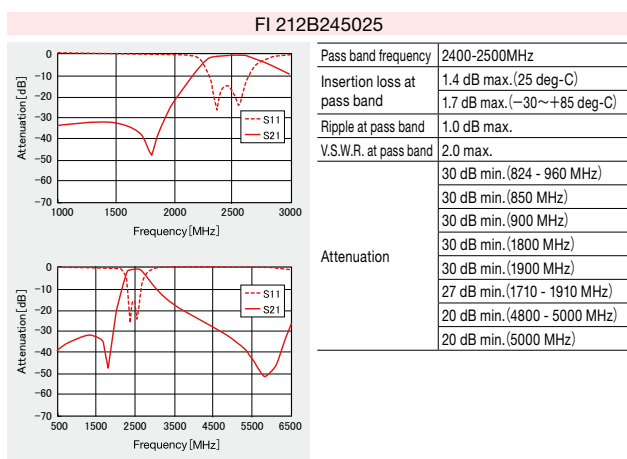
Multi-layer diplexer

Applications	External dimensions	Ordering code	Notes
W-LAN	2.0×1.25×1.0 max.	FI 212P245003	
	1.6×0.8×0.65 max.	FI 168P245010	
		FI 168P245023	
Cellular	2.0×1.25×1.0 max.	FI 212P089208	
		FI 212P089213	
		FI 212P085909	
		FI 212P085912	
GPS/ 2.4GHz W-LAN	1.6×0.8×0.65 max.	FI 168P157519	
UWB	2.0×1.25×1.0 max.	FI 212P3960A4	
BS	3.2×2.5×1.0 max.	FI 325P120057	

Multi-layer Balun

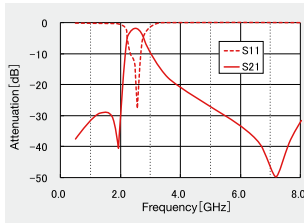
Applications	External dimensions	Ordering code	Notes
5GHz	1.6×0.8×0.5 max.	FI 168T578717	Thickness 0.5 mm max.
BS	1.6×0.8×0.5 max.	FI 168T155021	Thickness 0.5 mm max.

ELECTRICAL CHARACTERISTICS·TYPICAL CHARACTERISTICS



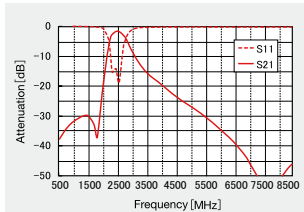
* This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>) or CD catalogs.

FI 168B245001



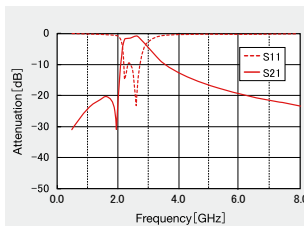
Pass band frequency	2400 ~ 2500MHz
Insertion loss at pass band	2.2 dB (25deg-C)
Ripple at pass band	2.5 dB (−30~+85deg-C)
V.S.W.R. at pass band	1.0 dB max.
Attenuation	25 dB min. (880 ~ 960MHz)
	25 dB min. (1710 ~ 1910MHz)
	20 dB min. (4800 ~ 5000MHz)
	20 dB min. (7200 ~ 7500MHz)
Impedance	50 ohm

FI 105B245024



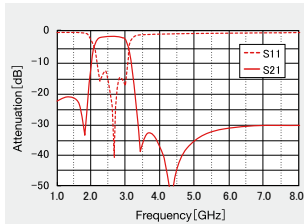
Pass band frequency	2400-2500MHz
Insertion loss at pass band	3.0 dB max. (25 deg-C)
Ripple at pass band	3.3 dB max. (−40~+85 deg-C)
V.S.W.R. at pass band	1.0 dB max.
Attenuation	25 dB min. (880 ~ 960 MHz)
	22 dB min. (1710 ~ 1910 MHz)
	20 dB min. (4800 ~ 5000 MHz)
	20 dB min. (7200 ~ 7500 MHz)

FI 168B250065



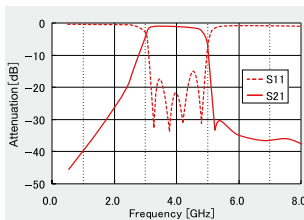
Pass band frequency	2300 - 2700 MHz
Insertion loss at 2300 - 2500 MHz	2.4 dB max. (25 deg-C)
Insertion loss at 2500 - 2700 MHz	2.6 dB max. (−30~+85 deg-C)
Ripple at 2300 - 2500 MHz	2.3 dB max. (25 deg-C)
Ripple at 2500 - 2700 MHz	2.5 dB max. (−30~+85 deg-C)
V.S.W.R. at 2300 - 2500 MHz	1.4 dB max.
V.S.W.R. at 2500 - 2700 MHz	1.3 dB max.
Attenuation	15 dB min. (1500 - 2000 MHz)
	10 dB min. (4600 - 8000 MHz)
Impedance	50 ohm

FI 168B24956D



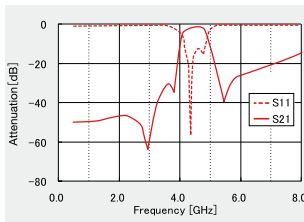
Pass band frequency	2300 - 2690MHz
Insertion loss at pass band	2.3 dB (25deg-C)
Ripple at pass band	2.6 dB (−30~+85deg-C)
V.S.W.R. at pass band	0.8 dB max.
Attenuation	15 dB min. (DC-1620MHz)
	23 dB min. (3490-4000MHz)
	25 dB min. (4490-8000MHz)
Impedance	50 ohm

FI 212B396001



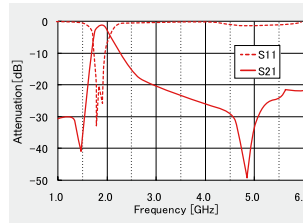
Pass band frequency	3168 ~ 4752 MHz
Insertion loss at pass band	2.7 dB max. (25 deg-C)
Ripple at pass band	3.0 dB max. (−30~+85 deg-C)
V.S.W.R. at pass band	2.0 dB max.
Attenuation	33 dB min. (900MHz)
	25 dB min. (1500MHz)
	22 dB min. (1900MHz)
	13 dB min. (2500MHz)
	10dB min. (5150MHz)
Impedance	50 ohm

FI 212B448802



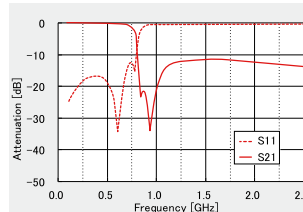
Pass band frequency	4224 ~ 4752 MHz
Insertion loss at 4224 ~ 4488 MHz	2.4 dB max. (25 deg-C)
Insertion loss at 4488 ~ 4752 MHz	2.7 dB max. (−30~+85 deg-C)
Ripple at pass band	2.5 dB max. (25 deg-C)
V.S.W.R. at pass band	2.8 dB max. (−30~+85 deg-C)
Attenuation	1.5 dB max.
	2.2 max.
	40 dB min. (2400-2500MHz)
	25 dB min. (3300-3600MHz)
	10 dB min. (5158-5850MHz)
Impedance	50 ohm

FI 212B190223



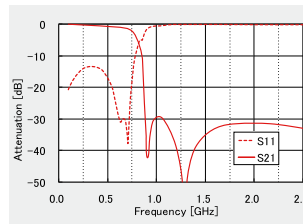
Pass band frequency	1884-1930MHz
Insertion Loss at 1884-1920MHz	1.7 dB max. (25deg-C)
Insertion Loss at 1920-1930MHz	2.0 dB max. (−30~+85deg-C)
Ripple at Pass band	1.7 dB max. (25deg-C)
V.S.W.R. at Pass band	2.0 dB max.
Attenuation	30 dB min. (1420MHz)
	18 dB min. (3768-3860MHz)
Impedance	50 ohm

FI 212L062003



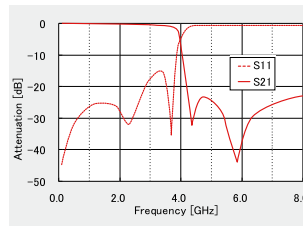
Pass band frequency	470 ~ 770 MHz
Insertion loss at 470 ~ 600MHz	0.7 dB max. (25 deg-C)
Insertion loss at 600 ~ 710MHz	0.9 dB max. (−30~+85 deg-C)
Insertion loss at 710 ~ 770MHz	1.5 dB max. (25 deg-C)
Ripple at 470 ~ 710 MHz	1.7 dB max. (−30~+85 deg-C)
V.S.W.R. at 470 ~ 710 MHz	3.3 dB max. (25 deg-C)
	3.7 dB max. (−30~+85 deg-C)
	1.2 dB max.
	2.5 max.
Attenuation	15 dB min. (830 ~ 840 MHz)
	(25 deg-C)
	11 dB min. (830 ~ 840 MHz)
	(−30~+85 deg-C)
	15 dB min. (888 ~ 925 MHz)
	(25 deg-C)
	15 dB min. (940 ~ 960 MHz)
	(−30~+85 deg-C)
	7 dB min. (1429 ~ 1453 MHz)
	(25 deg-C)
	8 dB min. (1920 ~ 1980 MHz)
	(−30~+85 deg-C)
	8 dB min. (2400 ~ 2500 MHz)
Impedance	50 ohm

FI 168L062005



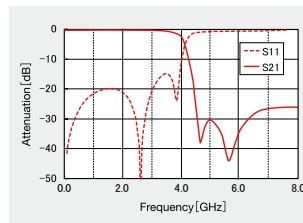
Pass band frequency	470 ~ 770 MHz
Insertion loss at 470-600MHz	1.2 dB max. (25 deg-C)
Insertion loss at 600-710MHz	1.3 dB max. (−30~+85 deg-C)
Insertion loss at 710-770MHz	2.2 dB max. (25 deg-C)
Ripple at 470 ~ 710 MHz	2.4 dB max. (−30~+85 deg-C)
V.S.W.R.	4.0 dB max. (25 deg-C)
	4.4 dB max. (−30~+85 deg-C)
	1.4 dB max.
	2.0 max. (470 ~ 710 MHz)
	2.5 max. (710 ~ 770 MHz)
Attenuation	25 dB min. (888 ~ 925 MHz)
	(25 deg-C)
	21 dB min. (888 ~ 925 MHz)
	(−30~+85 deg-C)
	25 dB min. (940 ~ 960 MHz)
	(25 deg-C)
	27 dB min. (1429 ~ 1453 MHz)
	(−30~+85 deg-C)
	26 dB min. (1920 ~ 1980 MHz)
	(25 deg-C)
	26 dB min. (2400 ~ 2500 MHz)
Impedance	50 ohm

FI 168L259764



Pass band frequency	470 ~ 770 MHz
Insertion loss at 470-770MHz	2300 ~ 2700 MHz
Insertion loss at 2300-2700MHz	0.5 dB max. (25 deg-C)
Ripple at 470 ~ 770 MHz	0.6 dB max. (−30~+85 deg-C)
Ripple at 2300 ~ 2700 MHz	0.5 dB max. (25 deg-C)
V.S.W.R. at 470 ~ 770 MHz	0.6 dB max. (−30~+85 deg-C)
V.S.W.R. at 2300 ~ 2700 MHz	0.3 dB max.
	0.3 dB max.
	2.0 max.
	2.0 max.
Attenuation	20 dB min. (4600 ~ 5400 MHz)
	20 dB min. (6900 ~ 8100 MHz)
Impedance	50 ohm

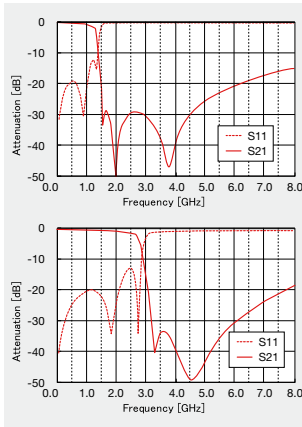
FI 105L250014



Pass band frequency	2400-2500MHz
Insertion loss at 2400 - 2500 MHz	0.45 dB max. (25 deg-C)
V.S.W.R. at 2400 - 2500 MHz	0.55 dB max. (−40~+85 deg-C)
Attenuation	1.7 max.
	21 dB min. (4800 ~ 5000 MHz)
	21 dB min. (7200 ~ 7500 MHz)
Impedance	50 ohm

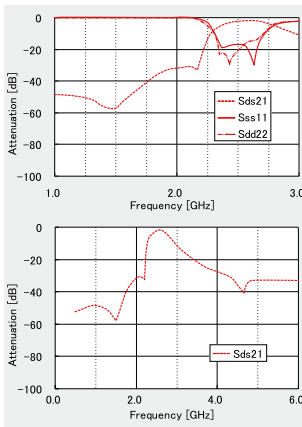
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FI 168D087018



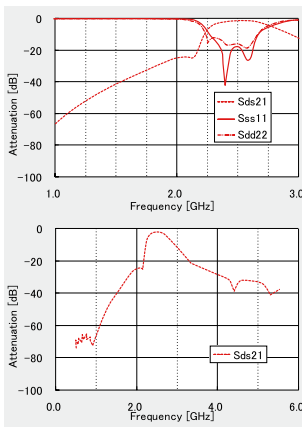
Low band	
Pass band frequency	824 ~ 915 MHz
Insertion loss at 824 ~ 915 MHz	0.6 dB max. (−20 to +85 Deg.C)
V.S.W.R. at 824 ~ 915 MHz	1.5 max.
Attenuation	25 dB min. (1648-1830MHz) 25 dB min. (2472-2745MHz)
Impedance	50 ohm
High band	
Pass band frequency	1710 ~ 1910 MHz
Insertion loss at 1710 ~ 1910 MHz	0.6 dB max. (−20 to +85 Deg.C)
V.S.W.R. at 824 ~ 915 MHz	1.5 max.
Attenuation	25 dB min. (3420-3820MHz) 25 dB min. (5130-5730MHz)
Impedance	50 ohm
Isolation	
In to In/Out to Out	27 dB min. (824-915MHz) 30 dB min. (1710-1910MHz)
In to Out	30 dB min. (824-915MHz) 30 dB min. (1710-1910MHz)

FI 212C245032



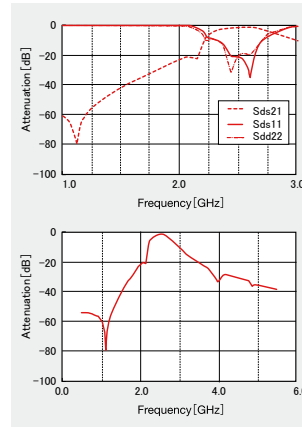
Pass band frequency	2400-2500MHz
Insertion loss at pass band	3.7 dB (25deg-C) 4.0 dB (−30~+85deg-C)
Ripple at pass band	1.0 dB max.
Unbalanced port V.S.W.R. at pass band	2.0 max.
Balanced port V.S.W.R. at pass band	2.0 max.
Amplitude Imbalance at pass band	2.0 dB max.
Phase Imbalance at pass band	180 +/- 10 deg
Attenuation	35 dB min. (880-960MHz) 20 dB min. (1710-1990MHz) 20 dB min. (1990-2170MHz) 20 dB min. (4800-5000MHz)
Unbalanced Port Impedance	50 ohm
Balanced Port Impedance	Conjugated match to CSR BC4

FI 212C245033



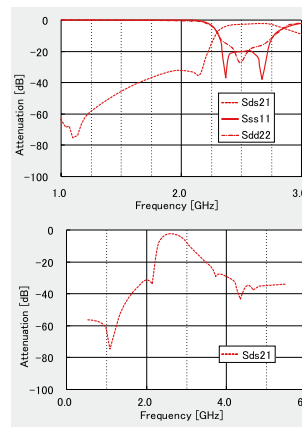
Pass band frequency	2400-2500MHz
Insertion loss at pass band	2.7 dB (25deg-C) 3.0 dB (−30~+85deg-C)
Ripple at pass band	1.0 dB max.
Unbalanced port V.S.W.R. at pass band	2.0 max.
Balanced port V.S.W.R. at pass band	2.0 max.
Amplitude Imbalance at pass band	2.0 dB max.
Phase Imbalance at pass band	180 +/- 10 deg
Attenuation	25 dB min. (880-960MHz) 15 dB min. (1710-1990MHz) 15 dB min. (1990-2170MHz) 15 dB min. (4800-5000MHz)
Unbalanced Port Impedance	50 ohm
Balanced Port Impedance	Conjugated match to CSR BC3

FI 212C245034



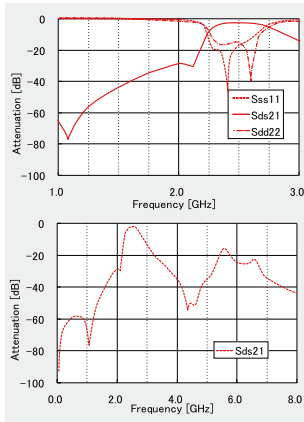
Pass band frequency	2400-2500MHz
Insertion loss at pass band	2.7 dB max. (25 deg-C) 3.0 dB max. (−30~+85 deg-C)
Ripple at pass band	1.0 dB max.
Amp. balance at Passband	2.0 dB Max.
Phase Balance at Passband	180 +/- 10 deg
Unbalanced Port V.S.W.R. at Passband	2.0 max.
Balanced Port V.S.W.R. at Passband	2.0 max.
Attenuation	25 dB min. (880 - 960 MHz) 15 dB min. (1710 - 1990 MHz) 12 dB min. (1990 - 2170 MHz) 15 dB min. (4800 - 5000 MHz)
Unbalanced Port Impedance	50 ohm
Balanced Port Impedance	Conjugated to CSR BC4-BGA, BC5-BGA

FI 212C245036



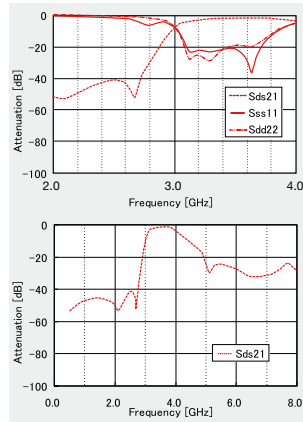
Pass band frequency	2400-2500MHz
Insertion loss at pass band	3.7 dB (25deg-C) 4.0 dB (−30~+85deg-C)
Ripple at pass band	1.0 dB max.
Unbalanced port V.S.W.R. at pass band	2.0 max.
Balanced port V.S.W.R. at pass band	2.0 max.
Amplitude Imbalance at pass band	2.0 dB max.
Phase Imbalance at pass band	180 +/- 10 deg
Attenuation	35 dB min. (880-960MHz) 20 dB min. (1710-1990MHz) 15 dB min. (1990-2170MHz) 20 dB min. (4800-5000MHz)
Unbalanced Port Impedance	50 ohm
Balanced Port Impedance	Conjugated match to CSR BC5

FI 212C245051



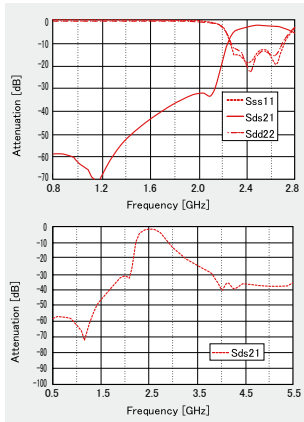
Pass band frequency	2400-2500MHz
Insertion loss at pass band	3.7 dB (25deg-C)
Ripple at pass band	4.0 dB (-30~+85deg-C)
Unbalanced port V.S.W.R. at pass band	2.0 max.
Balanced port V.S.W.R. at pass band	2.0 max.
Amplitude Imbalance at pass band	2.0 dB max.
Phase Imbalance at pass band	180 +/- 10 deg
Attenuation	40 dB min. (824-960MHz)
	12 dB min. (1570-1580MHz)
	27 dB min. (1710-1785MHz)
	25 dB min. (1805-1880MHz)
	23 dB min. (1880-1910MHz)
Unbalanced Port Impedance	50 ohm
	Balanced Port Impedance
	Conjugated match to STLC2500C-D

FI 212C355068



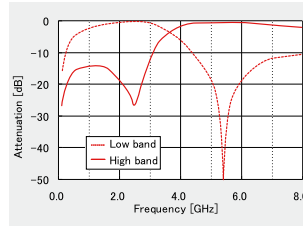
Pass band frequency	3300-3800MHz
Insertion loss at pass band	2.5 dB (25 deg-C)
Ripple at pass band	2.8 dB (-30~+85 deg-C)
Unbalanced port V.S.W.R. at pass band	2.3 max.
Balanced port V.S.W.R. at pass band	2.3 max.
Amplitude imbalance at pass band	2.0 dB max.
Phase imbalance at pass band	180 +/- 12 deg
Attenuation	40 dB min. (1710-1990MHz)
	40 dB min. (2110-2170MHz)
	35 dB min. (2400-2500MHz)
	15 dB min. (4900-5850MHz)
Impedance	50:100

FI 212C245075



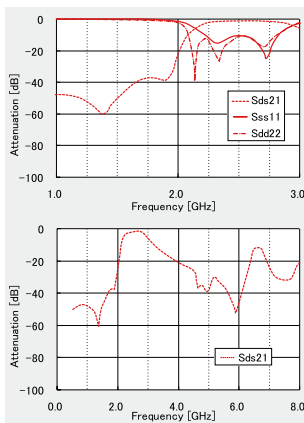
Pass band frequency	2400-2500MHz
Insertion loss at pass band	3.7 dB (25deg-C)
Ripple at pass band	4.0 dB (-30~+85deg-C)
Unbalanced port V.S.W.R. at pass band	2.2 max.
Balanced port V.S.W.R. at pass band	2.2 max.
Amplitude Imbalance at pass band	2.0 dB max.
Phase Imbalance at pass band	180 +/- 10 deg
Attenuation	40 dB min. (880-960MHz)
	16 dB min. (1710-1990MHz)
	12 dB min. (1990-2170MHz)
	30 dB min. (4800-5000MHz)
Unbalanced Port Impedance	50 ohm
Balanced Port Impedance	Conjugated match to CSR BC5FM.BC6ROM

FI 212P245003



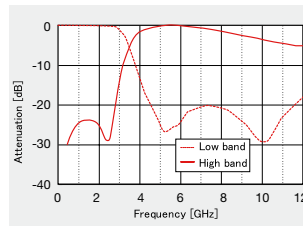
Low band	
Pass band frequency	2400-2500MHz
Insertion loss at 2400-2500MHz	0.5 dB max. (25 deg-C)
V.S.W.R.	2.0 max.
Attenuation	14 dB min. (4900-5150MHz)
	20 dB min. (5150-5350MHz)
High band	
Pass band frequency 1	4900-5150MHz
Pass band frequency 2	5150-5350MHz
Pass band frequency 3	5470-5825MHz
Insertion loss at pass band 1	0.7 dB max. (25 deg-C)
Insertion loss at pass band 2	0.6 dB max. (25 deg-C)
Insertion loss at pass band 3	0.9 dB max. (25 deg-C)
V.S.W.R.	2.0 max. (band-1-2)
Attenuation	2.5 max. (band-2)
	20 dB min. (2400-2500MHz)

FI 212C249566



Pass band frequency	2300-2690MHz
Insertion loss at 2300-2495MHz	2.9 dB max. (25 deg-C)
Ripple at 2300-2495MHz	3.2 dB max. (-30~+85 deg-C)
Unbalanced port V.S.W.R. at 2300-2495MHz	2.3 max.
Balanced port V.S.W.R. at 2300-2495MHz	2.3 max.
Amplitude Imbalance at 2300-2495MHz	2.0 dB max.
Phase Imbalance at 2300-2495MHz	180 +/- 12 deg
Insertion loss at 2495-2690MHz	2.3 dB max. (25 deg-C)
Ripple at 2495-2690MHz	2.6 dB max. (-30~+85 deg-C)
Unbalanced port V.S.W.R. at 2495-2690MHz	2.3 max.
Balanced port V.S.W.R. at 2495-2690MHz	2.3 max.
Amplitude Imbalance at 2495-2690MHz	2.0 dB max.
Phase Imbalance at 2495-2690MHz	180 +/- 12 deg
Attenuation	40 dB Min. (824-960MHz)
	15 dB Min. (1710-1990MHz)
	20 dB Min. (4900-5850MHz)
Impedance	50 : 100

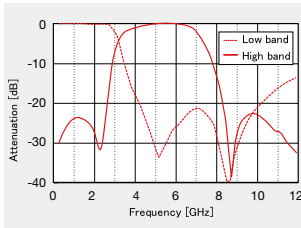
FI 168P245010



Low band	
Pass band frequency	2400-2500MHz
Insertion loss at 2400-2500MHz	0.40 dB max. (25 deg-C)
V.S.W.R. at 2400-2500 MHz	2.0 max.
Attenuation	20 dB min. (4900-5580MHz)
	15 dB min. (5850-8500MHz)
Impedance	50 ohm
High band	
Pass band frequency	4900-5850 MHz
Insertion loss at 4900-5850 MHz	0.60 dB max. (25 deg-C)
V.S.W.R. at 4900-5850 MHz	2.0 max.
Attenuation	20 min. (2400-2500MHz)
Impedance	50 ohm

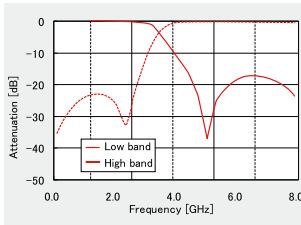
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FI 168P245023



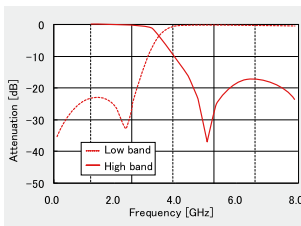
Low band	
Pass band frequency	2400-2500MHz
Insertion loss at 2400-2500MHz	0.60 dB max. (25 deg-C) 0.70 dB max. (-30~+85 deg-C)
V.S.W.R. at 2400 ~ 2500 MHz	2.0max.
Attenuation	20 dB min. (4800-6000MHz) 20 dB min. (7200-7500MHz)
Impedance	50 ohm
High band	
Pass band frequency	4900 ~ 5950 MHz
Insertion loss at 4900 ~ 5850 MHz	0.80 dB max. (25 deg-C) 0.95 dB max. (-40~+85 deg-C)
V.S.W.R. at 4900 ~ 5850 MHz	2.0max.
Attenuation	20 dB min. (1800-2500MHz) 20 dB min. (9800-11900MHz) *Reference
Impedance	50 ohm

FI 212P089208



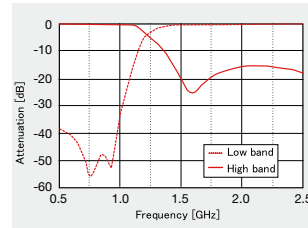
Low band	
Pass band frequency	698 ~ 960 MHz
Insertion loss at 698 ~ 960 MHz	0.27 dB max. (+25 Deg.C) 0.32 dB max. (-40 to +85 Deg.C)
V.S.W.R. at 698 ~ 960 MHz	2.0 max.
Attenuation	13dB min. (1710-2170MHz)
Impedance	50 ohm
High band	
Pass band frequency	1710 ~ 2170 MHz
Insertion loss at 1710 ~ 2170 MHz	0.45 dB max. (+25 Deg.C) 0.55 dB max. (-40 to +85 Deg.C)
V.S.W.R. at 698 ~ 960 MHz	2.0 max.
Attenuation	19dB min. (698-960MHz)
Impedance	50 ohm

FI 212P089213



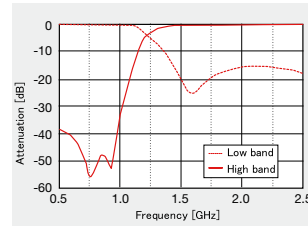
Low band	
Pass band frequency	698 ~ 960 MHz
Insertion loss at 698 ~ 960 MHz	0.27 dB max. (+25 Deg.C) 0.32 dB max. (-40 to +85 Deg.C)
V.S.W.R. at 698 ~ 960 MHz	2.0 max.
Attenuation	13dB min. (1710-2170MHz)
Impedance	50 ohm
High band	
Pass band frequency	1710 ~ 2170 MHz
Insertion loss at 1710 ~ 2170 MHz	0.45 dB max. (+25 Deg.C) 0.55 dB max. (-40 to +85 Deg.C)
V.S.W.R. at 698 ~ 960 MHz	2.0 max.
Attenuation	19dB min. (698-960MHz)
Impedance	50 ohm

FI 212P085909



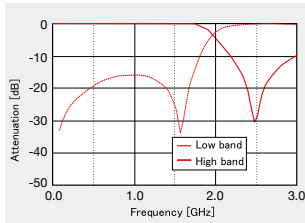
Low band	
Pass band frequency	698-960 MHz
Insertion loss at 698 ~ 960 MHz	0.70 dB max. (+25 deg-C) 0.75 dB max. (-30~+85 deg-C)
V.S.W.R. at 698 ~ 960 MHz	1.6 max.
Attenuation	19dB min. (1558-1570MHz) 20dB min. (1570-1580MHz) 19dB min. (1580-1610MHz)
Impedance	50 ohm
High band	
Pass band frequency 1	1558-1570MHz
Pass band frequency 2	1570-1580MHz
Pass band frequency 3	1580-1610MHz
Insertion loss at 1558 ~ 1570 MHz	0.75 dB max. (+25 deg-C) 0.85 dB max. (-30~+85 deg-C)
Insertion loss at 1570 ~ 1580 MHz	0.70 dB max. (+25 deg-C) 0.80 dB max. (-30~+85 deg-C)
Insertion loss at 1580 ~ 1610 MHz	0.70 dB max. (+25 deg-C) 0.80 dB max. (-30~+85 deg-C)
V.S.W.R. at 1558 ~ 1570 MHz	1.6 max.
V.S.W.R. at 1570 ~ 1580 MHz	1.6 max.
V.S.W.R. at 1580 ~ 1610 MHz	1.6 max.
Attenuation	35dB min. (698-824MHz) 42dB min. (824-894MHz) 25dB min. (894-960MHz)
Impedance	50 ohm

FI 212P085912



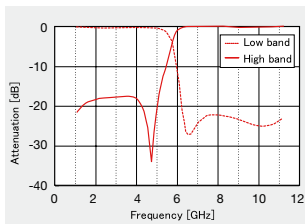
Low band	
Pass band frequency	698-960 MHz
Insertion loss at 698 ~ 960 MHz	0.70 dB max. (+25 deg-C) 0.75 dB max. (-30~+85 deg-C)
V.S.W.R. at 698 ~ 960 MHz	1.6 max.
Attenuation	19dB min. (1558-1570MHz) 20dB min. (1570-1580MHz) 19dB min. (1580-1610MHz)
Impedance	50 ohm
High band	
Pass band frequency 1	1558-1570MHz
Pass band frequency 2	1570-1580MHz
Pass band frequency 3	1580-1610MHz
Insertion loss at 1558 ~ 1570 MHz	0.75 dB max. (+25 deg-C) 0.85 dB max. (-30~+85 deg-C)
Insertion loss at 1570 ~ 1580 MHz	0.70 dB max. (+25 deg-C) 0.80 dB max. (-30~+85 deg-C)
Insertion loss at 1580 ~ 1610 MHz	0.70 dB max. (+25 deg-C) 0.80 dB max. (-30~+85 deg-C)
V.S.W.R. at 1558 ~ 1570 MHz	1.6 max.
V.S.W.R. at 1570 ~ 1580 MHz	1.6 max.
V.S.W.R. at 1580 ~ 1610 MHz	1.6 max.
Attenuation	35dB min. (698-824MHz) 42dB min. (824-894MHz) 25dB min. (894-960MHz)
Impedance	50 ohm

FI 168P157519



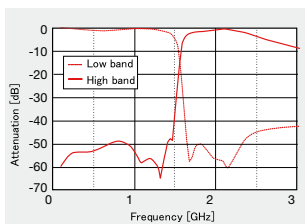
Low band	
Pass band frequency 0	824~960MHz
Pass band frequency 1	1558~1585MHz
Pass band frequency 2	1585~1610MHz
Insertion loss at 824 ~ 960 MHz	0.50 dB max. (+25 deg.-C)
Insertion loss at 1558 ~ 1585 MHz	0.60 dB max. (-40~+85 deg.-C)
Insertion loss at 1585 ~ 1610 MHz	0.40 dB max. (+25 deg.-C)
Insertion loss at 1558 ~ 1610 MHz	0.50 dB max. (-40~+85 deg.-C)
Insertion loss at 1585 ~ 1610 MHz	0.45 dB max. (+25 deg.-C)
Insertion loss at 1558 ~ 1610 MHz	0.55 dB max. (-40~+85 deg.-C)
V.S.W.R. at 824 ~ 960 MHz	2.0 max.
V.S.W.R. at 1558 ~ 1585 MHz	2.0 max.
V.S.W.R. at 1585 ~ 1610 MHz	2.0 max.
Attenuation	13dB min. (2400~2500MHz)
Impedance	50 ohm
High Band	
Pass band frequency	2400 ~ 2500 MHz
Insertion loss at 2400 ~ 2500 MHz	0.60 dB max. (+25 deg.-C)
Insertion loss at 2400 ~ 2500 MHz	0.70 dB max. (-40~+85 deg.-C)
V.S.W.R. at 2400 ~ 2500 MHz	2.0 max.
Attenuation	12dB min. (824~960MHz)
Attenuation	23dB min. (1558~1585MHz)
Attenuation	20dB min. (1585~1610MHz)
Impedance	50 ohm

FI 212P3960A4



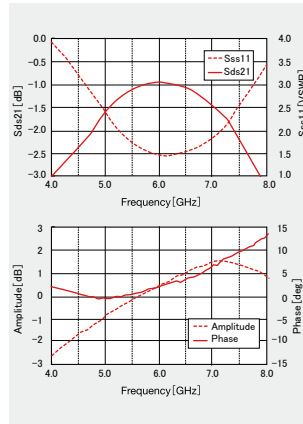
Low band	
Pass band frequency	3168-4782MHz
Insertion loss at 3168 ~ 4782 MHz	1.2 dB max. (+25 deg.-C)
Insertion loss at 3168 ~ 4782 MHz	1.5 dB max. (-40~+85 deg.-C)
V.S.W.R. at 3168 ~ 4782 MHz	2.2 max.
Attenuation	18dB min. (6336-9504MHz)
Impedance	50 ohm
High band	
Pass band frequency	6336-9504MHz
Insertion loss at 6336 ~ 9504 MHz	1.2 dB max. (+25 deg.-C)
Insertion loss at 6336 ~ 9504 MHz	1.5 dB max. (-40~+85 deg.-C)
V.S.W.R. at 6336 ~ 9504 MHz	2.2 max.
Attenuation	13dB min. (3168-4782MHz)
Impedance	50 ohm

FI 325P120057



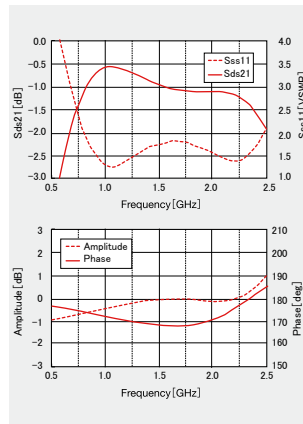
Low band	
Pass band frequency	900 ~ 1450 MHz
Insertion loss at 900 ~ 1450 MHz	4.00 dB max. (+25 deg.-C)
Insertion loss at 900 ~ 1450 MHz	4.40 dB max. (-40~+85 deg.-C)
Ripple at 900 ~ 1450 MHz	3.0 dB max. (+25 deg.-C)
Ripple at 900 ~ 1450 MHz	3.4 dB max. (-40~+85 deg.-C)
V.S.W.R. at 900 ~ 1450 MHz	2.2 max.
Attenuation	44dB min. (1650~2200MHz) (+25 deg.-C)
Attenuation	40dB min. (1650~2200MHz) (-40~+85 deg.-C)
Attenuation	45dB min. (1650MHz) (+25 deg.-C)
Attenuation	41dB min. (1650MHz) (-40~+85 deg.-C)
Impedance	50 ohm
High Band	
Pass band frequency	1650 ~ 2200 MHz
Insertion loss at 1650 ~ 2200 MHz	4.00 dB max. (+25 deg.-C)
Insertion loss at 1650 ~ 2200 MHz	4.40 dB max. (-40~+85 deg.-C)
Ripple at 1650 ~ 2200 MHz	3.0 dB max. (+25 deg.-C)
Ripple at 1650 ~ 2200 MHz	3.2 dB max. (-40 to +85 Deg.C)
V.S.W.R. at 1650 ~ 2200 MHz	2.25 max.
Attenuation	44dB min. (900~1450MHz) (+25 deg.-C)
Attenuation	40dB min. (900~1450MHz) (-40~+85 deg.-C)
Attenuation	45dB min. (1450MHz) (+25 deg.-C)
Attenuation	41dB min. (1450MHz) (-40~+85 deg.-C)
Impedance	50 ohm

FI 168T578717



Pass band frequency	5725-5850MHz
Insertion loss at pass band	1.0 dB max. (25 deg.-C)
Insertion loss at pass band	1.2 dB max. (-30~+85 deg.-C)
V.S.W.R. at pass band	2.0 max.
Phase balance at pass band	180 +/- 10 deg
Amplitude Imbalance at pass band	1.0 dB max.
Impedance	50 : 100

FI 168T155021



Pass band frequency	900-2200MHz
Insertion loss at pass band	2.0 dB max. (25 deg.-C)
Insertion loss at pass band	2.3 dB max. (-30~+85 deg.-C)
V.S.W.R. at pass band	2.3 max.
Phase balance at pass band	180 +/- 20 deg
Amplitude Imbalance at pass band	+/- 2 dB max.
Impedance	50 : 75

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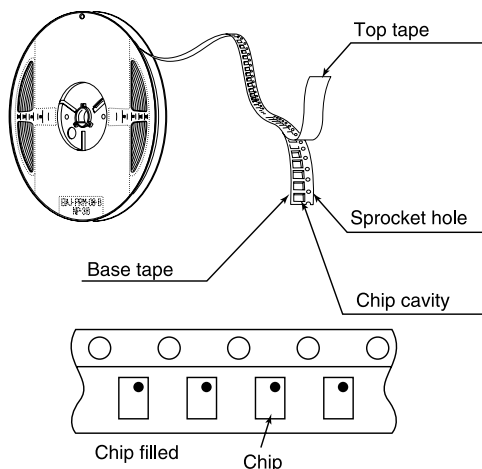
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For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>) or CD catalogs.

① Minimum Quantity

Type	Embossed Tape [pcs]
325P	2000
212B	3000
212L	
212C	
212P	
168B	4000
168L	
168T	
168D	
168P	
105B	10000
105L	

② Tape Material

Embossed Tape
Card Board Carrier Tape

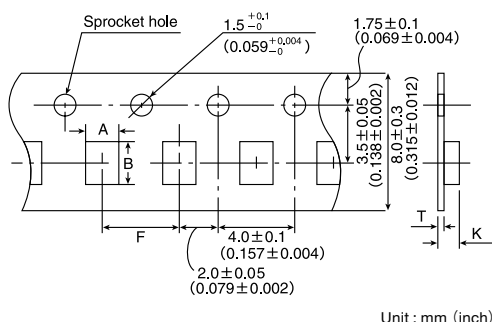


● Taped package

Type (EIA)	Thickness mm (inch)	Standard Quantity [pcs]
325P	0.90 typ.(0.035)	2000
212B	0.90 typ.(0.035)	3000
212L	0.45 typ.(0.018)	
212C	0.90 typ.(0.035)	
212P	0.90 typ.(0.035)	
212C-0.5	0.45 typ.(0.018)	4000
212C-0.7	0.60 typ.(0.024)	
168B	0.45 typ.(0.018)	
168L	0.45 typ.(0.018)	
168T	0.45 typ.(0.018)	10000
168D	0.45 typ.(0.018)	
168P	0.60 typ.(0.024)	
105B	0.30 typ.(0.0118)	
105L	0.30 typ.(0.0118)	

③ Taping Dimensions

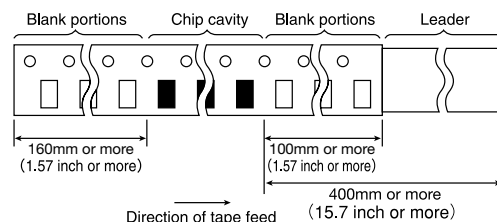
- Embossed tape 0.315 inches wide (325P Type, 212B Type, 212C Type, 212C-0.7 Type)
- Paper tape 0.315 inches wide (212L Type, 212C-0.5 Type, 168B Type, 168L Type, 168T Type, 168D Type, 105B Type, 105L Type)



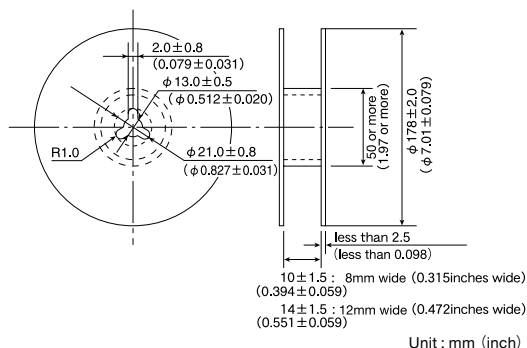
Type (EIA)	Chip cavity		Insertion Pitch	Tape Thickness max.	
	A	B	F	K	T
325P	2.75±0.2 (0.108±0.008)	3.55±0.2 (0.14±0.008)	4.0±0.1 (0.157±0.004)	1.35 (0.053)	0.3 (0.012)
212B	1.5±0.25 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.6 (0.063)	0.3 (0.012)
212L	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	0.65 (0.026)	0.65 (0.026)
212C	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.6 (0.063)	0.3 (0.012)
212C-0.5					
212C-0.7	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.3 (0.051)	0.3 (0.012)
212P	1.55±0.2 (0.061±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.1 (0.157±0.004)	1.6 (0.063)	0.3 (0.012)
168B	1.00±0.05 (0.039±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.55 (0.022)	0.55 (0.022)
168L	1.00±0.05 (0.039±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.55 (0.022)	0.55 (0.022)
168T	1.00±0.05 (0.039±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.55 (0.022)	0.55 (0.022)
168D	1.00±0.05 (0.039±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.55 (0.022)	0.55 (0.022)
168P	0.95±0.05 (0.037±0.002)	1.80±0.05 (0.071±0.002)	4.0±0.1 (0.157±0.004)	0.80 (0.031)	0.80 (0.031)
105B	0.62±0.03 (0.024±0.001)	1.12±0.03 (0.044±0.001)	2.0±0.05 (0.079±0.002)	0.45 (0.018)	0.45 (0.018)
105L	0.62±0.03 (0.024±0.001)	1.12±0.03 (0.044±0.001)	2.0±0.05 (0.079±0.002)	0.45 (0.018)	0.45 (0.018)

Unit : mm (inch)

④ Leader and Blank Portion

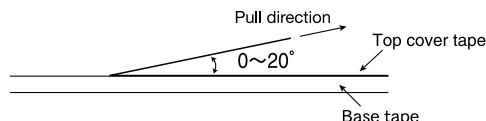


⑤ Reel size



⑥ Top Tape Strength

The top tape requires a peel-off force of 0.1~0.7N in the direction of the arrow as illustrated below.



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RELIABILITY DATA

1. Operating Temperature Range

Specified Value : $-30 \sim +85^{\circ}\text{C}$

2. Storage Temperature Range

Specified Value : $-30 \sim +85^{\circ}\text{C}$

[Test Methods and Remarks]

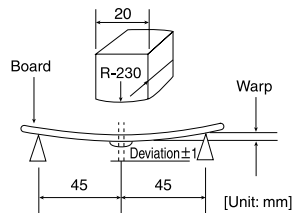
※Note : -20 to $+40^{\circ}\text{C}$ in taped packaging

3. Resistance to Flexure of Substrate

Specified Value : No mechanical damage.

[Test Methods and Remarks]

Warp : 2mm
Testing board : Glass epoxy-resin substrate
Thickness : 0.8mm

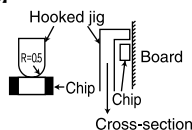


4. Adhesion of Electrode

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

Applied force : 5N
Duration : 10 sec.



5. Solderability

Specified Value : 75% or more of immersed surface of terminal electrode shall be covered with fresh solder.

[Test Methods and Remarks]

Solder temperature : $230 \pm 5^{\circ}\text{C}$ Preconditioning : Immersion into flux.
Duration : 4 ± 1 sec. Immersion and Removal speed : 25mm/sec.

6. Resistance to Solder Heat

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

Preheating : 150°C for 2 min. Preconditioning : Immersion into flux.
Solder temperature : $260 \pm 5^{\circ}\text{C}$ Immersion and Removal speed : 25mm/sec.
Duration : 5 ± 0.5 sec. Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.

7. Thermal Shock

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

According to JIS C 0025.

Conditions for 1 cycle

Step	Temperature ($^{\circ}\text{C}$)	Duration (min)
1	$-40 \pm 3^{\circ}\text{C}$	30 ± 3
2	Room Temperature	Within 3
3	$85 \pm 2^{\circ}\text{C}$	30 ± 3
4	Room Temperature	Within 3

Number of cycles : 100

Mounting method : Soldering onto PC board.

Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.

8. Humidity (steady state)

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

Temperature : $+40 \pm 2^{\circ}\text{C}$ Duration : 96 hrs
Humidity : 90~95%RH Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.

9. High temperature life test

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

Temperature : $+85 \pm 2^{\circ}\text{C}$ Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.
Duration : 96 hrs

10. Low temperature life test

Specified Value : Characteristics : shall satisfy the electrical characteristics.
Appearance : No significant abnormality.

[Test Methods and Remarks]

Temperature : $-40 \pm 2^{\circ}\text{C}$ Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.
Duration : 96 hrs

Note on standard condition:

"standard condition" referred to herein is defined as follows :
5 to 35°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

When there are questions concerning measurement result :

In order to provide correlation data, the test shall be conducted under condition of $20 \pm 2^{\circ}\text{C}$ of temperature, 60 to 70% relative humidity and 86 to 106kPa of air pressure.
Unless otherwise specified, all the tests are conducted under the "standard condition".

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For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>) or CD catalogs.

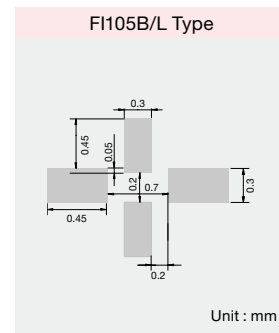
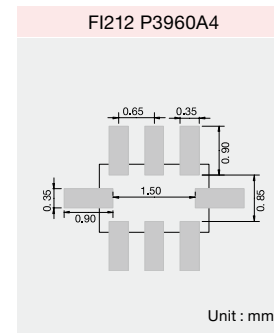
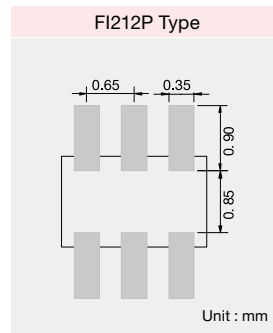
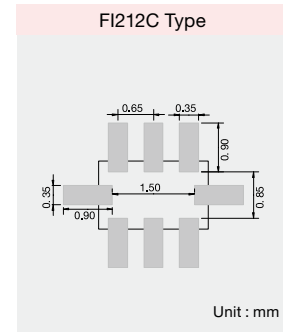
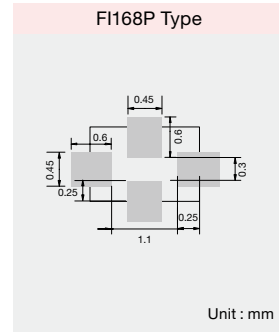
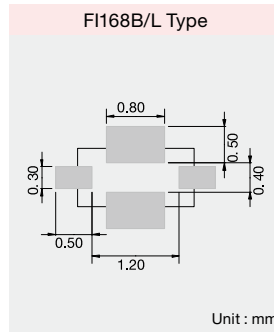
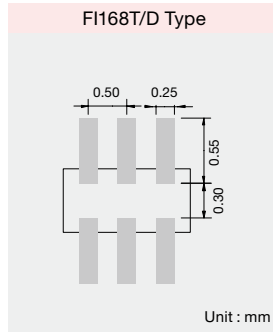
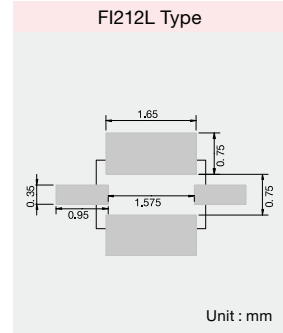
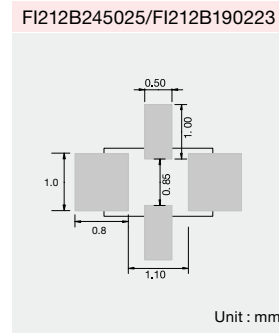
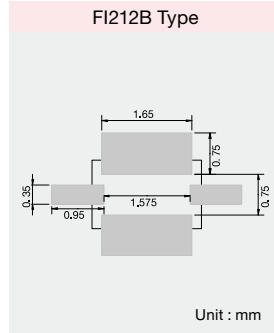
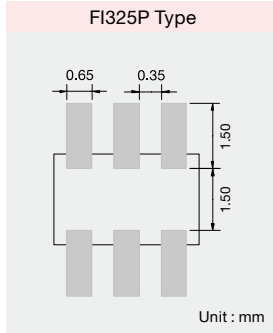
PRECAUTIONS

1. PCB Design

◆Land pattern design

Land pattern dimension examples

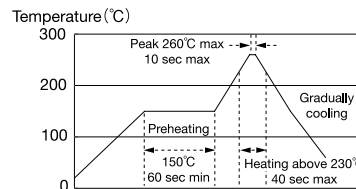
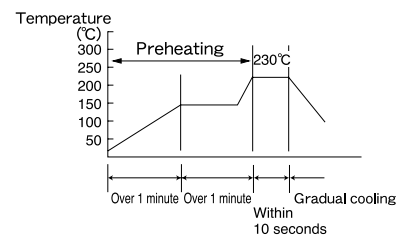
Technical considerations



2. Soldering

◆Conditions for Reflow soldering (for reference)

[Reflow Profile]



※ Components should be preheated to within 100 to 130°C from soldering temperature.
※ Assured to be reflow soldering for 2 times.

Note : The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended.

Technical considerations

3. Storage conditions

◆Storage

1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible.

• Recommended conditions

Ambient temperature : -20~+40°C

Humidity : Below 70%RH

The ambient temperature must be kept below 30°C.

Even under ideal storage conditions, the solderability of electrodes decreases gradually, so filters should be mounted within 6 months from the time of delivery.

• The packaging material should be kept where no chlorine or sulfur exists in the air.

Precautions

◆Storage

1. If the parts are stocked in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/ packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check the solderability before using the filter.

Technical considerations

■ Please contact of our offices for further details of specifications.

All of the standard values listed here are subject to change without notice.

Therefore, please check the specifications carefully before use.

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