FUJITSU SEMICONDUCTOR
DATA SHEET

DS04-20100-3E

*ASSP*

# TIMING EXTRACTION BANDPASS FILTER (1.5 to 100MHz)

# F1/F2/F3 SERIES

## ■ DESCRIPTION

The F1, F2 and F3 Series were developed as timing extraction filters for primary, secondary, and tertiary digital communication devices.

This new all-solid-state bandpass filter (BPF) uses a piezoelectric with a large electromechanical coefficient (lithium tantalate: $LiTaO_3$). The filter has a wide bandwidth, and is very stable.

## ■ FEATURES

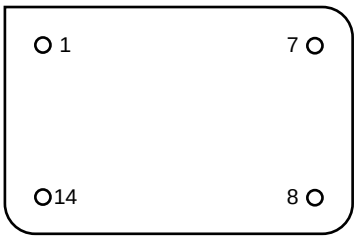
- Wide frequency range 1.5 to 100MHz
- Wide fractional bandwidth (%): 0.1 to 2.5
- Low insertion loss: 6dB or less
- Excellent temperature characteristics: 1.5 to 35MHz: ±400ppm or less (0 to 60°C)
  36 to 100MHz: –30ppm/°C (0 to 60°C)
- Small frequency deviation $\Delta f_O$ < ±500ppm eliminating the need for adjustment
- Highly reliable hermetically sealed package
- Compatible with small 14-pin DIP IC

## ■ PACKAGE

14-PIN DIP SIZE METAL CASE

## ■ PIN ASSIGNMENT

(BOTTOM VIEW)




| Pin No. | Pin name | Description |
|---|---|---|
| 1 | IN | Input pin |
| 7 | GND | Ground pin |
| 8 | NC | No connection |
| 14 | OUT | Output pin |

## ■ MAXIMUM RATINGS

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Operating temperature | $T_a$ | –20 to 80 | °C |
| Storage temperature | $T_{stg}$ | –40 to 80 | °C |
| Insulation resistance | IR | 100 (100V DC) | MΩ |
| Frequency range | — | 1.5 to 100 | MHz |

## ■ RECOMMENDED OPERATING CONDITIONS

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Operating temperature | $T_a$ | 0 to 70 | °C |

## ■ STANDARD FREQUENCY

| Series | Standard frequency | Application | Remarks |
|---|---|---|---|
| F1 | 1.544MHz | For the U.S. and Japan (primary group) | |
| | 2.048MHz | For Europe (primary group) | |
| | 3.088MHz | For the U.S. and Japan (primary group) | 1.544 × 2 |
| | 3.152MHz | For the U.S. and Japan (primary group) | |
| | 4.096MHz | For Europe (primary group) | 2.048 × 2 |
| | 6.312MHz | For the U.S. and Japan (secondary group) | |
| | 8.192MHz | For the U.S. and Japan (secondary group) | |
| | 8.448MHz | For Europe (secondary group) | |
| | 12.624MHz | For the U.S. and Japan (secondary group) | 6.312 × 2 |
| | 16.384MHz | For the U.S. and Japan (secondary group) | 8.192 × 2 |
| F2 | 16.896MHz | For Europe (secondary group) | 8.448 × 2 |
| | 32.064MHz | For Japan (tertiary group) | |
| | 34.368MHz | For Europe (tertiary group) | |
| F3 | 44.736MHz | For the U.S. (tertiary group) | |

## ■ ELECTRICAL CHARACTERISTICS

F1 Series

| Item | Symbol | Condition | Rating | | | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typical | Max. | | |
| Frequency deviation | $\Delta f_O$ | — | –500 | — | +500 | ppm | $f_O$ standard |
| Load Q | Q | — | 1000 | — | 40 | — | |
| Insertion loss | IL | — | — | — | 6 | dB | |
| Stop band attenuation | $A_{OUT}$ | $f_O$ ± 10MHz | 20 | — | — | dB | |
| Frequency stability with temperature | $\Delta f$ (Ta) | — | –400 | — | +400 | ppm | 25°C standard, Ta = 0 to 70°C |

F2 Series

| Item | Symbol | Condition | Rating | | | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typical | Max. | | |
| Frequency deviation | $\Delta f_O$ | — | –500 | — | +500 | ppm | $f_O$ standard |
| Load Q | Q | — | 1000 | — | 40 | — | |
| Insertion loss | IL | — | — | — | 6 | dB | |
| Stop band attenuation | $A_{OUT}$ | $f_O$ ± 10MHz | 20 | — | — | dB | |
| Frequency stability with temperature | $\Delta f$ (Ta) | — | –400 | — | +400 | ppm | 25°C standard, Ta = 0 to 70°C |

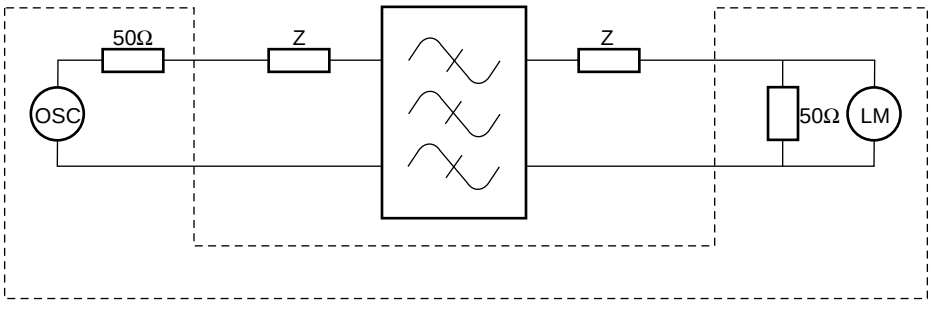
F3 Series

| Item | Symbol | Condition | Rating | | | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typical | Max. | | |
| Frequency deviation | $\Delta f_O$ | — | –500 | — | +500 | ppm | $f_O$ standard |
| Load Q | Q | — | 200 | — | 50 | — | |
| Insertion loss | IL | — | — | — | 6 | dB | |
| Stop band attenuation | $A_{OUT}$ | $f_O$ ± 10MHz | 20 | — | — | dB | |
| Frequency stability with temperature | $\Delta f$ (Ta) | — | –1350 | — | 750 | ppm | 25°C standard, Ta = 0 to 70°C |

## ■ ELECTRICAL CHARACTERISTICS

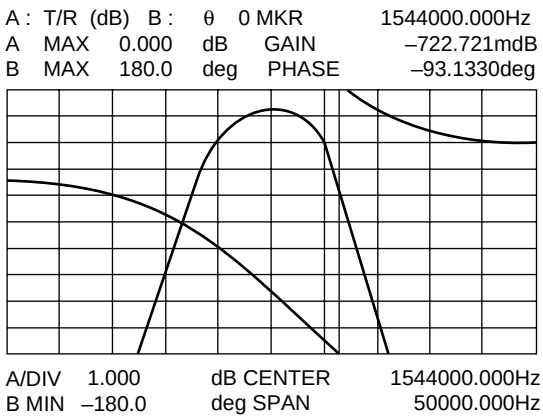
| No. | Standard frequency (MHz) | Part number | Specification | | | |
|---|---|---|---|---|---|---|
| | | | Load Q | Insertion loss, IL (dB) | Phase rotation θ (degree) | Terminating impedance Z (Ω) |
| 1 | 1.544 | FAR-F1DA-1M5440-G201 | 110 ±20 | 3 or less | –90±20 | 790 |
| 2 | 1.544 | FAR-F1DA-1M5440-G202 | 110 ±20 | 3 or less | –90±20 | 1000 |
| 3 | 1.544 | FAR-F1DA-1M5440-G203 | 60 ±10 | 3 or less | –95±10 | 2035/20pF |
| 4 | 1.544 | FAR-F1DA-1M5440-G205 | 110 ±20 | 3 or less | –90±20 | 2000 |
| 5 | 2.048 | FAR-F1DA-2M0480-G201 | 40 ±10 | 3 or less | –90±10 | 2035 |
| 6 | 2.048 | FAR-F1DA-2M0480-G202 | 100 ±20 | 3 or less | –90±20 | 1000 |
| 7 | 3.088 | FAR-F1DA-3M0880-G201 | 150 ±20 | 3 or less | –90±20 | 640 |
| 8 | 3.152 | FAR-F1DA-3M1520-G201 | 85 ±15 | 3 or less | –90±15 | 1285 |
| 9 | 4.096 | FAR-F1DA-4M0960-G201 | 110 ±20 | 3 or less | –90±20 | 750 |
| 10 | 6.312 | FAR-F1DA-6M3120-G201 | 110 ±20 | 3 or less | –90±20 | 985 |
| 11 | 6.312 | FAR-F1DA-6M3120-G202 | 110 ±20 | 3 or less | –90±20 | 1000 |
| 12 | 8.192 | FAR-F1DA-8M1920-G201 | 100 ±20 | 3 or less | –90±20 | 980 |
| 13 | 8.448 | FAR-F1DA-8M4480-G201 | 110 ±20 | 3 or less | –90±20 | 980 |
| 14 | 12.624 | FAR-F1DA-12M624-G201 | 100 ±20 | 3 or less | –90±20 | 590 |
| 15 | 16.384 | FAR-F1DA-16M384-G201 | 100 ±20 | 3 or less | –90±20 | 410 |
| 16 | 16.896 | FAR-F1DA-16M896-G201 | 100 ±20 | 3 or less | –90±20 | 390 |
| 17 | 32.064 | FAR-F2DA-32M064-G201 | 100 ±10 | 3 or less | –90±15 | 100 |
| 18 | 34.368 | FAR-F2DA-34M368-G201 | 100 ±10 | 3 or less | –90±15 | 100 |
| 19 | 44.736 | FAR-F3DA-44M736-G201 | 65 ±15 | 6 or less | 38±10 | 105 |

## ■ TEST CIRCUIT

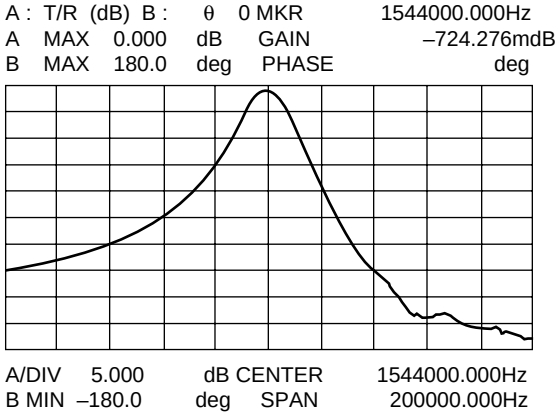


## ■ CHARACTERISTICS SAMPLE

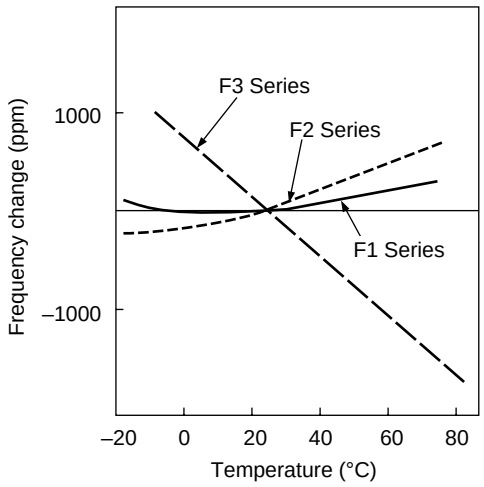
Pass band characteristic




Stop band characteristic




Temperature characteristic




## ■ PART NUMBERING SYSTEM

[Example]

FAR–F1DA–□□□□□□–G□□□

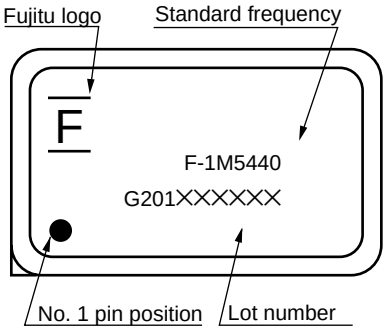
① ② ③

① Series designation

② Frequency designation: The standard frequency is designated in six alphanumeric characters. M is used to designate the decimal point in MHz. Refer to “ELECTRIC CHARACTERISTICS” in detail
Example: 1.544MHz: 1M5440

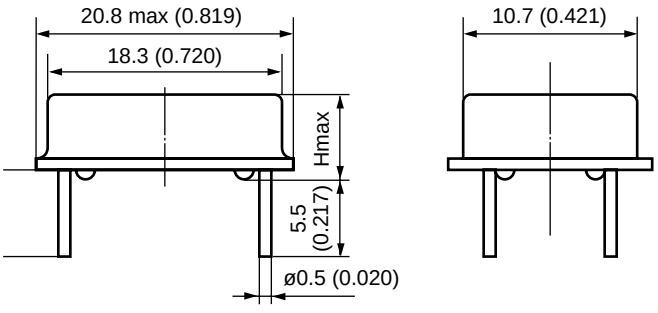
③ Serial number: The serial number is assigned from 201 to 999 (201 is normal).

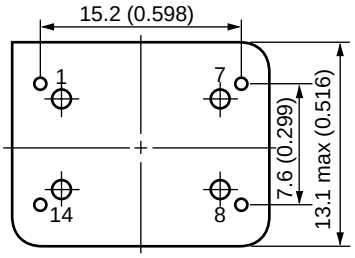
## ■ MARKING




## ■ DIMENSIONS

Unit: mm (in.)




| Series | H |
|---|---|
| F1 < 3 MHz | 8.5 (0.335) |
| F1 ≥ 3 MHz | 5.8 (0.228) |
| F2 | 5.8 (0.228) |
| F3 | 5.8 (0.228) |

# FUJITSU LIMITED



The contents of this document are subject to change without notice. Customers are advised to consult with FUJITSU sales representatives before ordering.

The information and circuit diagrams in this document are presented as examples of semiconductor device applications, and are not intended to be incorporated in devices for actual use. Also, FUJITSU is unable to assume responsibility for infringement of any patent rights or other rights of third parties arising from the use of this information or circuit diagrams.

The products described in this document are designed, developed and manufactured as contemplated for general use, including without limitation, ordinary industrial use, general office use, personal use, and household use, but are not designed, developed and manufactured as contemplated (1) for use accompanying fatal risks or dangers that, unless extremely high safety is secured, could have a serious effect to the public, and could lead directly to death, personal injury, severe physical damage or other loss (i.e., nuclear reaction control in nuclear facility, aircraft flight control, air traffic control, mass transport control, medical life support system, missile launch control in weapon system), or (2) for use requiring extremely high reliability (i.e., submersible repeater and artificial satellite).
Please note that Fujitsu will not be liable against you and/or any third party for any claims or damages arising in connection with above-mentioned uses of the products.

Any semiconductor devices have an inherent chance of failure. You must protect against injury, damage or loss from such failures by incorporating safety design measures into your facility and equipment such as redundancy, fire protection, and prevention of over-current levels and other abnormal operating conditions.

If any products described in this document represent goods or technologies subject to certain restrictions on export under the Foreign Exchange and Foreign Trade Law of Japan, the prior authorization by Japanese government will be required for export of those products from Japan.

F9703