# FAM Series Intensity Modulator

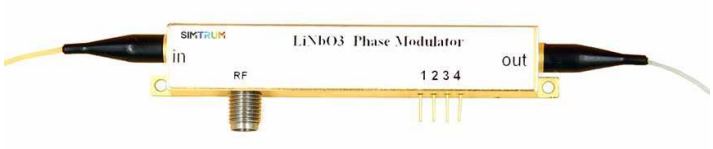
## Description

The $LiNbO_3$ intensity modulator is widely used in high-speed optical communication system, laser sensing and ROF systems because of well electro-optic effect. The FAM series based on MZ push-pull structure and APE Technology(X-cut), has stable physical and chemical characteristics, which can be applied both in laboratory experiments and industrial systems.

● **Bandwidth:** 10GHz,20GHz, 40GHz, 50GHz ● **Wavelength:** 780nm,850nm,1060nm,1310nm,1550nm

## Features

- Low insertion loss
- High Bandwidth
- Low half-wave voltage
- Customization option




## Applications

- ROF systems
- Quantum key distribution
- Laser sensing systems
- Side-band modulation

| FAM Series | FAM-07 | FAM-08 | FAM-10 | FAM-13 | FAM-15 | | | |
|---|---|---|---|---|---|---|---|---|
| Operating wavelength | 780nm | 850nm | 1064nm | 1310nm | 1550nm | | | |
| Bandwidth | 10GHz | 10GHz | 10/20GHz | 2.5GHz | 50GHz | 10GHz | 20GHz | 40GHz |
| Insertion Loss | ＜5dB | ＜5dB | < 5dB | < 5dB | < 4dB | | | |
| Extinction ratio @DC | > 20dB | > 20dB | > 20dB | > 20dB | > 20dB | | | |
| $V_\pi$ @RF (1KHz) | < 3V | < 3V | < 4V | <3.5V | < 6V | <5V | | |
| $V_\pi$ @Bias | < 3.5V | < 3.5V | < 5V | <5V | <8V | <7V | | |

## Ordering information

| AM | XX | XXG | XX | XX | XX |
|---|---|---|---|---|---|
| Type:<br>AM---Intensity Modulator | Wavelength:<br>07---780nm<br>08---850nm<br>10---1060nm<br>13---1310nm<br>15---1550nm | Bandwidth:<br>10G---10GHz<br>20G---20GHz<br>40G---40GHz<br>50G---50GHz | Monitor PD:<br>PD---With PD<br>00 --- No PD | In-Out Fiber type:<br>PP---PM/PM | Optical connector:<br>FA---FC/APC<br>FP---FC/PC<br>SP---Customization |

# FAM-07-10G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 760 | 780 | 800 | nm |
| Insertion loss | | IL | | 4.5 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | | dB |
| Optical fiber | Input port | | PM780 fiber(125/250μm) | | | |
| | output port | | PM780 fiber(125/250μm) | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or Customization | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 10 | 12 | | GHz |
| Half-wave voltage Vpi | RF | @1KHz | | 2.5 | 3 | V |
| | Bias | @1KHz | | 3 | 4 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power@780nm | $P_{in,Max}$ | dBm | | | 10 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-08-10G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 830 | 850 | 870 | nm |
| Insertion loss | | IL | | 4.5 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | PM780 fiber(125/250μm) | | | |
| | output port | | PM780 fiber(125/250μm) | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or Customization | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 10 | 12 | | GHz |
| Half-wave voltage Vpi | RF | @1KHz | | 2.5 | 3 | V |
| | Bias | @1KHz | | 3 | 4 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power@850nm | $P_{in,Max}$ | dBm | | | 10 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-10-10G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1030 | 1060 | 1100 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | | dB |
| Optical fiber | Input port | | 980nm PM fiber (125/250μm) | | | |
| | output port | | 980nm PM fiber (125/250μm) | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or Customization | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 10 | 12 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 3.5 | 4 | V |
| | Bias | @Bias | | 4 | 5 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-13-10G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1290 | 1310 | 1330 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 2.5 | 3 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 3.3 | 3.5 | V |
| | Bias | @Bias | | 4 | 5 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-15-2.5G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1530 | 1550 | 1565 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | 45 | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 2.5 | 3 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 4.5 | 5 | V |
| | Bias | @Bias | | 6 | 7 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-15-10G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1530 | 1550 | 1565 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | 45 | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 10 | 12 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 4.5 | 5 | V |
| | Bias | @Bias | | 6 | 7 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | SMA(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-15-20G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1530 | 1550 | 1565 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | 45 | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 18 | 20 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 4.5 | 5 | V |
| | Bias | @Bias | | 6 | 7 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | K(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

# FAM-15-40G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1530 | 1550 | 1565 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | 45 | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 28 | 30 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 4.5 | 5 | V |
| | Bias | @Bias | | 6 | 7 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | V(f) | | | |

**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

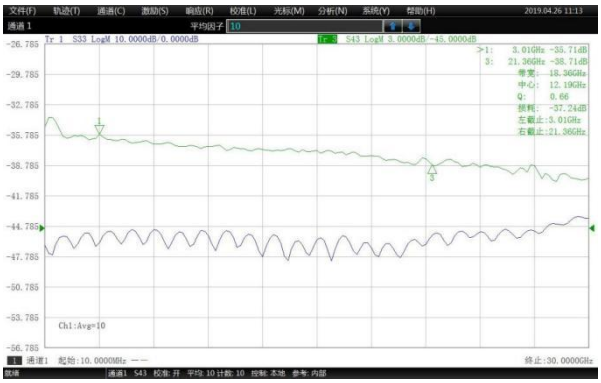
# FAM-15-50G

| Parameter | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Optical parameters** | | | | | | |
| Operating wavelength | | λ | 1530 | 1550 | 1565 | nm |
| Insertion loss | | IL | | 4 | 5 | dB |
| Optical return loss | | ORL | | | -45 | dB |
| Switch extinction ratio @DC | | ER@DC | 20 | 23 | 45 | dB |
| Dynamic extinction ratio | | DER | | 13 | | dB |
| Optical fiber | Input port | | Panda PM Fujikura SM | | | |
| | output port | | Panda PM Fujikura SM | | | |
| Optical fiber interface | | | FC/PC、FC/APC Or user to specify | | | |
| **Electrical parameters** | | | | | | |
| Operating bandwidth （-3dB） | | $S_{21}$ | 35 | 40 | | GHz |
| Half-wave voltage Vpi | RF | @50KHz | | 5 | 6 | V |
| | Bias | @Bias | | 7 | 8 | V |
| Electrical return loss | | $S_{11}$ | | -12 | -10 | dB |
| Input impedance | RF | $Z_{RF}$ | 50 | | | Ω |
| | Bias | $Z_{BIAS}$ | 1M | | | Ω |
| Electrical interface | | | V(f) | | | |

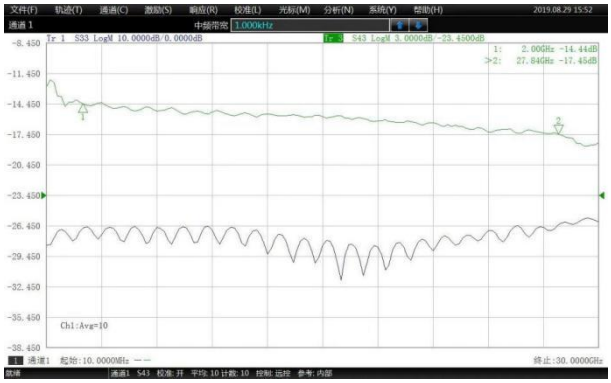
**Limit Conditions**

| Parameter | Symbol | Unit | Min | Typ | Max |
|---|---|---|---|---|---|
| Input optical power | $P_{in,Max}$ | dBm | | | 20 |
| Input RF power | | dBm | | | 28 |
| bias voltage | Vbias | V | -15 | | 15 |
| Operating temperature | Top | ℃ | -10 | | 60 |
| Storage temperature | Tst | ℃ | -40 | | 85 |
| Humidity | RH | % | 5 | | 90 |

## S21&S11 Curve

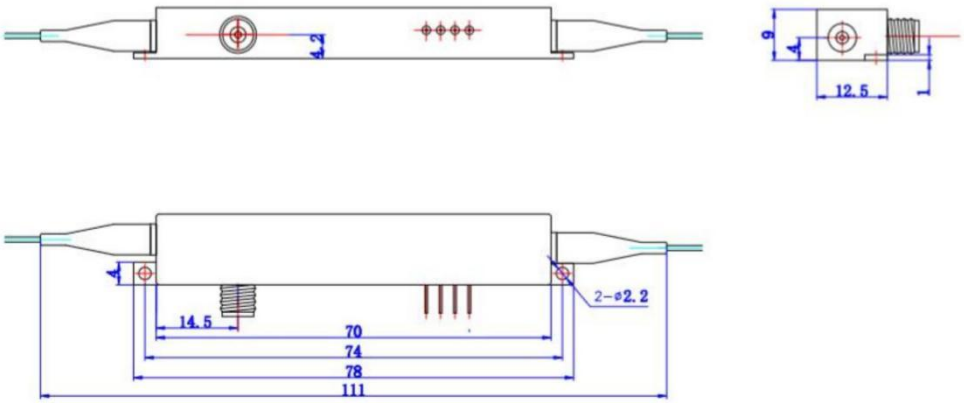


S21&s11 curves of FAM-15-20G

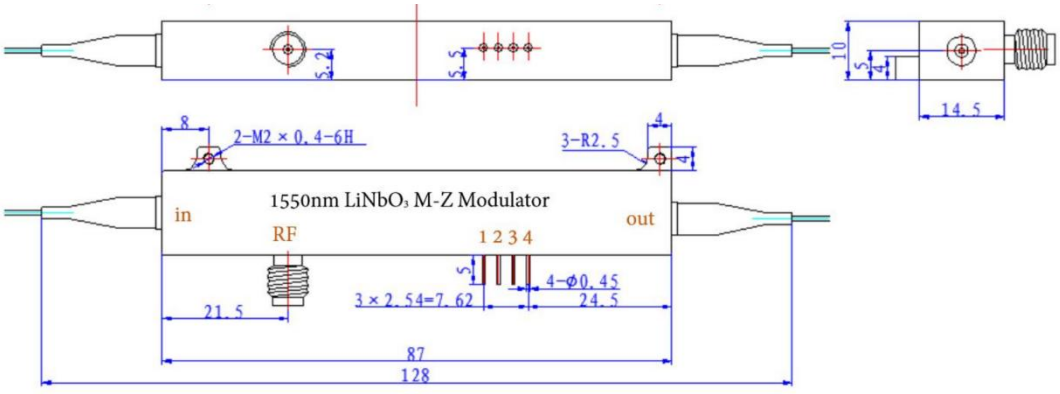


S21&s11 curves of FAM-15-40G

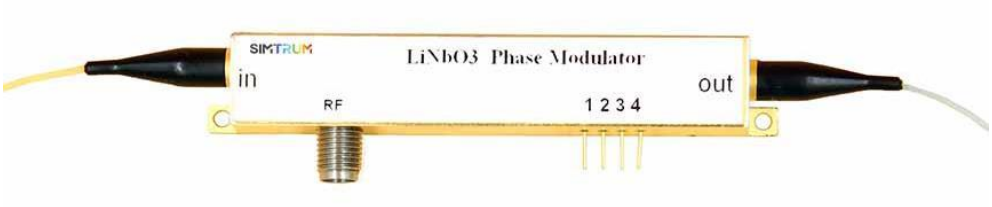
## Mechanical Diagram (mm)




For 2.5G/10G/20G




For 40G/50G




| PORT | Symbol | Note |
|---|---|---|
| In | Optical input port | PM Fiber (125μm/250μm) |
| Out | Optical output port | PM Fiber (125μm/250μm) |
| RF | RF input port | SMA(f)/ K(f) / V(f) |
| Bias | Bias control port | 1,2 Bias, 3-PD cathode, 4-PD anode |