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  - Characteristics ......................................................................................... 3

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XMFS Series are designed for low noise applications up to C-band (to 6GHz). These devices are supplied in the plastic packages (SOT-143).

**FEATURES**
1. Low Noise Figure.
2. High Associated Gain.

**APPLICATIONS**
- Low Noise Amplifier. (for Wireless LAN, DBS tuner/ converter, GPS receiver)
- Oscillator. (for Wireless LAN, DBS tuner/ converter, GPS receiver)

**DIMENSIONS**

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<tr>
<th>Pin Marking</th>
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<tr>
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<td>(3): Source</td>
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<td>(4): Drain</td>
<td>(4): Drain</td>
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<tr>
<td>B : Lot No.</td>
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### ABSOLUTE MAXIMUM RATINGS
(Ta=25°C)

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<thead>
<tr>
<th></th>
<th>V_{DS}</th>
<th>V_{GS}</th>
<th>I_{D}</th>
<th>P_{tot}</th>
<th>T_{ch}</th>
<th>T_{stg}</th>
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<tbody>
<tr>
<td>XMFS2-M1</td>
<td>6V</td>
<td>−3V</td>
<td>100mA</td>
<td>300mW</td>
<td>150°C</td>
<td>−55 to 150°C</td>
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<td>XMFS3-M1</td>
<td>5V</td>
<td>−3V</td>
<td>60mA</td>
<td>200mW</td>
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* : Power Dissipation (Tc=25°C)

### ELECTRICAL SPECIFICATIONS
(Ta=25°C)

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<th></th>
<th>V_{GSS}</th>
<th>I_{GS}</th>
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<th>Gas</th>
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### S PARAMETERS
(V_{DS}=3.0V, I_{D}=10mA)

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XMFP Series are designed for power applications up to C-band (to 6GHz). These devices are supplied in the plastic packages. (SOT-89') (*: XMFP4-M4 in the MURATA original plastic package.)

■ FEATURES
1. High Output Power.
2. High Linear Power Gain.

■ APPLICATIONS
• Power Amplifier.
  (for Base Stations of all wireless telecommunications.)

■ DIMENSIONS

XMFP1-M3

XMFP2-M3

XMFP3-M3

XMFP4-M4

Pin:
(1) Gate
(2) Source
(3) Drain

Marking:
A: Part No.
B: Lot No.
Plastic with Heat Sink

Dimensions in mm:
## ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

<table>
<thead>
<tr>
<th></th>
<th>Vgs0</th>
<th>Vds0</th>
<th>Io</th>
<th>Ptot (*1)</th>
<th>Tch</th>
<th>Tstg</th>
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<tbody>
<tr>
<td>XMFP1-M3</td>
<td>−6V</td>
<td>−8V</td>
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<td>−6V</td>
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<td>2.2A</td>
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*1: Power Dissipation (To=25°C)

## ELECTRICAL SPECIFICATIONS

(Ta=25°C)

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<th>Io (µA)</th>
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<th>Rth (*3)</th>
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</tbody>
</table>

*1: Pulsed Measurement; duty cycle 1:100; Isom=100µs

*2: Vg=5V, Vo=5V, Io=50mA, f=1.9GHz

*3: Channel to case
### S PARAMETERS

#### XMFP1-M3 (Vds=4.0V, Is=75mA)

<table>
<thead>
<tr>
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<th>S11</th>
<th>S21</th>
<th>S12</th>
<th>S22</th>
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<tbody>
<tr>
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#### XMFP4-M4 (Vds=5.0V, Is=1400mA)

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<thead>
<tr>
<th>freq. (MHz)</th>
<th>S11</th>
<th>S21</th>
<th>S12</th>
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<tr>
<td>500</td>
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<td>2000</td>
<td>MAG</td>
<td>ANG</td>
<td>MAG</td>
<td>ANG</td>
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</tbody>
</table>
CHARACTERISTICS
XMFP1-M3

Drain - Source Voltage $V_{DS}$ (V)

Drain Current $I_D$ (mA)

$V_{GS} = 0V$

$V_{GS} = -0.5V/STEP$

Power Added Efficiency $\eta_{add}$

Output Power $P_0$ (dBm)

Input Power $P_{in}$ (dBm)

$V_{DS} = 3.0V$

$V_{DS} = 4.0V$

$I_D = 0.5 I_{DSS}$

$f = 1.9$ GHz

XMFP2-M3

Drain - Source Voltage $V_{DS}$ (V)

Drain Current $I_D$ (mA)

$V_{GS} = 0V$

$V_{GS} = -0.5V/STEP$

Power Added Efficiency $\eta_{add}$

Output Power $P_0$ (dBm)

Input Power $P_{in}$ (dBm)

$V_{DS} = 3.0V$

$V_{DS} = 4.0V$

$I_D = 0.5 I_{DSS}$

$f = 1.9$ GHz
**CHARACTERISTICS**

**XMFP3-M3**

- **Io vs. VDS**
  - Drain Current (mA) vs. Drain-Source Voltage (V)
  - Gate-Source Voltage (V) = 0V

- **Po, \( \eta_{add} \) vs. Pin**
  - Output Power (dBm) vs. Input Power (dBm)
  - Power Added Efficiency (\%)

**XMFP4-M4**

- **Io vs. VDS**
  - Drain Current (mA) vs. Drain-Source Voltage (V)
  - Gate-Source Voltage (V) = 0V

- **Po, \( \eta_{add} \) vs. Pin**
  - Output Power (dBm) vs. Input Power (dBm)
  - Power Added Efficiency (\%)

**Notes:**
- \( \eta_{add} \) = Power Added Efficiency
- Input Power \( P_{in} \) in (dBm)
- Output Power \( P_o \) in (dBm)
- \( V_{DS} = 4.0V \) with \( I_o = 0.8A \), \( f = 1.9 \text{ GHz} \)
- \( V_{DS} = 4.8V \) with \( I_o = 1.6A \), \( f = 1.8 \text{ GHz} \)
- \( V_{GS} \) = 0.5 V/STEP
**LAND PATTERNS**
The recommended solder land patterns are shown below.

<table>
<thead>
<tr>
<th>XMFS2-M1</th>
<th>XMFP1-M3</th>
<th>XMFP4-M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>XMFS3-M1</td>
<td>XMFP2-M3</td>
<td>XMFP3-M3</td>
</tr>
</tbody>
</table>

**SOLDERING CONDITION**
The recommended soldering condition is shown below.
### TAPE DIMENSIONS

![Tape Dimensions Diagram]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>XMFS2-M1</th>
<th>XMFP1-M3</th>
<th>XMFP2-M3</th>
<th>XMFP3-M3</th>
<th>XMFP4-M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>4.0±0.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>1.75±0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>3.5±0.05</td>
<td>5.5±0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>8.0±0.2</td>
<td>12.0±0.2</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>d</td>
<td>φ1.5±0.1/0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>P1</td>
<td>4.0±0.1</td>
<td>8.0±0.1</td>
<td></td>
<td></td>
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<tr>
<td>P2</td>
<td>2.0±0.05</td>
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<td></td>
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</tr>
<tr>
<td>L1</td>
<td>3.3±0.1</td>
<td>4.45±0.1</td>
<td>6.25±0.1</td>
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<td></td>
</tr>
<tr>
<td>W1</td>
<td>3.4±0.1</td>
<td>4.8±0.1</td>
<td>6.3±0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>1.5±0.1</td>
<td>1.8±0.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### REEL DIMENSIONS

![Reel Dimensions Diagram]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>XMFS2-M1</th>
<th>XMFP1-M3</th>
<th>XMFP2-M3</th>
<th>XMFP3-M3</th>
<th>XMFP4-M4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>φ178±2</td>
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<tr>
<td>B</td>
<td>φ62±0.5</td>
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<tr>
<td>C</td>
<td>φ13±0.5</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>10.0±1.5</td>
<td>13.5±1.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**NOTICE**

1. **Storage**
   - Please store in manufacturer's packing under the following conditions.
     - Temperature: $-10^\circ C$ to $+40^\circ C$, Humidity: 30 to 85% RH
   - As more than 6 months storage might degrade solderability, please confirm solderability before usage in that case.
   - Please do not store in the following environments, which could damage electrical characteristics or solderability.
     1. Dusty place
     2. Ambient air containing corrosive gases (Cl₂, H₂S, NH₃, SO₂, NOₓ, etc.)
     3. Ambient air containing volatile or combustible gases
     4. Depressurized or pressurized air
     5. Where water may splash or where humidity is so high that condensation could easily occur
     6. Environment subject to strong static charges or electromagnetic field
     7. Exposed to direct sunlight
     8. In liquid
     9. Influenced by low frequency vibration
     10. Other environments with risks similar to 1. through 9.

   Please contact the manufacturer before storing the products in any of the above environments.

2. **Handling Precautions**
   - As electrostatic field or discharge may degrade this product, please take methods such as wearing wrist strap, grounding working desk or equipments to avoid this damage.
   - Please do not touch the electrodes with bare hands, which may degrade solderability.
   - Please do not drop or throw this product directly to the floor.
   - When you transport the products, please pack them so as to keep them without excessive mechanical vibration or shock through its transportation.
   - Please contact the manufacturer before cleaning the product. Please do not use flon, trichloroethane and so on to protect the global environment.
   - Please do not attach water droplets or dust to the product. Please contact the manufacturer if you have any questions concerning the handling of this product.
   - Heat management is necessary in order to use this product.
**NOISE FIGURE TEST SYSTEM**

- Noise Source
- Bias Tee
- Tuner
- D.U.T.
- Tuner
- Bias Tee
- Low Noise Amplifier
- Synthesizer
- Mixer
- Noise Figure Meter
- VGS
- Gate Bias
- VDS
- ID
- RF Amplifier
- Power Meter
- Power Meter
- Rg (= 100Ω)

**POWER TEST SYSTEM**

- Synthesizer
- RF Amplifier
- Power Meter
- Power Meter
- Bias Tee
- Tuner
- D.U.T.
- Tuner
- Bias Tee
- ATT.
- Power Meter
- Rg (= 100Ω)

**IM3 TEST SYSTEM**

- Synthesizer 1
- Amplifier 1
- 3dB HYB
- VAR ATT.
- Power Meter
- Spectrum Analyzer
- VGS
- Gate Bias
- VDS
- ID
- Bias Tee
- Tuner
- D.U.T.
- Tuner
- Bias Tee
- ATT.
- Power Meter
### Cellular Phone

- Antenna
- Band Pass Filter
- Low Noise Amplifier
- Band Pass Filter
- Mixer
- Switch or Duplexer
- Low Pass Filter
- Power Amplifier
- Driver Amplifier
- Band Pass Filter

### BS/CS Receiver

- Antenna
- Low Noise Amplifier
- Low Noise Amplifier 1
- Low Noise Amplifier 2
- Band Pass Filter
- Mixer
- Oscillator
- XMFS2
- XMFS3
- XMFP1
- XMFP2

### PHS

- Antenna
- Band Pass Filter
- Low Noise Amplifier
- Band Pass Filter
- Mixer
- Switch
- Low Pass Filter
- Power Amplifier
- Driver Amplifier
- Band Pass Filter
- Pin Driver /BIAS

### GPS Receiver

- Antenna
- Band Pass Filter
- Low Noise Amplifier

### Wireless LAN

- Antenna
- Band Pass Filter
- Low Noise Amplifier
- Mixer
- Switch or Duplexer
- Low Pass Filter
- Power Amplifier
- Band Pass Filter
- Mixer

---

Block Diagram of Application

---

13
GaAs FIELD EFFECT TRANSISTOR
XMFP1-M3 1.8GHz Test Board

LAYOUT

SCHEMATIC

TYPICAL CHARACTERISTICS

HANDLING OF TEST BOARD

1. Precaution
Before handling test boards, avoid any cause of electrostatic discharge and surge.
The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. Bias Procedure
- Set slowly the gate to source voltage, to $V_{GG}$ recommended for each test board.
- Adjust gradually the drain to source voltage, to $V_{DD}$.
- Check the Io is about 0.5Ios. If it is not, adjust Vos so that Io approaches 0.5Ios.
- Input RF power to RF port of test board from lower level, and measure electrical characteristics.
- When biasing off, the reverse procedure is recommended.
- Note that the bias condition during test should not exceed its absolute maximum ratings.
1. **Precaution**

Before handling test boards, avoid any cause of electrostatic discharge and surge. The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. **Bias Procedure**

- Set slowly the gate to source voltage, to \( V_{GG} \) recommended for each test board.
- Adjust gradually the drain to source voltage, to \( V_{DD} \).
- Check the \( I_D \) is about 0.5\( I_{DSS} \). If it is not, adjust \( V_{GG} \) so that \( I_D \) approaches 0.5\( I_{DSS} \).
- Input RF power to RF port of test board from lower level, and measure electrical characteristics.
- When biasing off, the reverse procedure is recommended.
- Note that the bias condition during test should not exceed its absolute maximum ratings.
GaAs FIELD EFFECT TRANSISTOR
XMFP3-M3 0.9GHz Test Board

LAYOUT

SUBSTRATE (Glass-epoxy): t=0.8mm, εr=4.4
Heat sink (Duralumin): 50×35×10mm
Chip C: GRM93series (MURATA)
Chip R: MCR03series (ROHM)
Supply Voltage: VGG = 3.5V, VDD = 4.8V

SCHEMATIC

Gamma for max output power matching
ΓS = 0.73, θ = 148°
ΓL = 0.77, θ = 162°

HANDLING OF TEST BOARD

1. Precaution
Before handling test boards, avoid any cause of electrostatic discharge and surge.
The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. Bias Procedure
- Set slowly the gate to source voltage, to VGG recommended for each test board.
- Adjust gradually the drain to source voltage, to VDD.
- Check the Io is about 0.5I0SS. If it is not, adjust VGG so that Io approaches 0.5I0SS.
- Input RF power to RF port of test board from lower level, and measure electrical characteristics.
- When biasing off, the reverse procedure is recommended.
- Note that the bias condition during test should not exceed its absolute maximum ratings.

TYPICAL CHARACTERISTICS

Po, ηadd vs. Pin

VGG = 4.8V
VDD = 4.8V
f = 0.9GHz

Po, ηadd vs. Pin

Power Added Efficiency ηadd (%)

Output Power Po (dBm)

Input Power Pin (dBm)
GaAs FIELD EFFECT TRANSISTOR
XMFP3-M3 1.8GHz Test Board

HANDLING OF TEST BOARD

1. Precaution

   Before handling test boards, avoid any cause of electrostatic discharge and surge.

   The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. Bias Procedure

   - Set slowly the gate to source voltage, to $V_{GG}$ recommended for each test board.
   - Adjust gradually the drain to source voltage, to $V_{DD}$.
   - Check the $I_D$ is about $0.5I_{DSS}$. If it is not, adjust $V_{GG}$ so that $I_D$ approaches $0.5I_{DSS}$.
   - Input RF power to RF port of test board from lower level, and measure electrical characteristics.
   - When biasing off, the reverse procedure is recommended.
   - Note that the bias condition during test should not exceed its absolute maximum ratings.

TYPICAL CHARACTERISTICS

- $P_o$, $\eta_{add}$ vs. $P_{in}$

   - $V_{DD} = 4.8V$
   - $V_{GG} = -3.5V$
   - $f = 1.8GHz$

   - $P_o$, $\eta_{add}$

LAYOUT

- Substrate: Glass-epoxy: t=0.8mm, $\varepsilon_r=4.4$
- Heat sink: Duralumin: 50×35×10mm
- Chip C: GRM39series (MURATA)
- Chip R: MCR03series (ROHM)
- Supply Voltage: $V_{GG} = 3.5V, V_{DD} = 4.8V$

SCHEMATIC

- $\Gamma_{max}$ for max output power matching

   - $\Gamma_{S} = 0.82, \angle = 177$
   - $\Gamma_{L} = 0.73, \angle = 166$

Parts List

- FET XMFP3-M3
- C1 1000pF
- C2 2pF
- C3 4700pF
- C4 2pF
- C5 1pF
- C6 4700pF
- C7 1000pF
- R1 1kΩ
- M1 1kΩ
**GaAs FIELD EFFECT TRANSISTOR**

**XMFP4-M4 0.9GHz Test Board**

**Handling of Test Board**

1. **Precaution**
   Before handling test boards, avoid any cause of electrostatic discharge and surge.
   The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. **Bias Procedure**
   - Set slowly the gate to source voltage, to $V_{GG}$ recommended for each test board.
   - Adjust gradually the drain to source voltage, to $V_{DD}$.
   - Check the $I_D$ is about 0.5$I_{DSS}$. If it is not, adjust $V_{GG}$ so that $I_D$ approaches 0.5$I_{DSS}$.
   - Input RF power to RF port of test board from lower level, and measure electrical characteristics.
   - When biasing off, the reverse procedure is recommended.
   - Note that the bias condition during test should not exceed its absolute maximum ratings.

**Typical Characteristics**

![Schematic Diagram](image)

- **Parts List**
  - **FET** XMFP4-M4
  - **C1** 1000pF
  - **C2** 5pF
  - **C3** 4700pF
  - **C4** 10pF
  - **C5** 1pF
  - **C6** 1000pF
  - **C7** 50pF
  - **R1** 2.2kΩ
  - **R2** 2.2kΩ

![Typical Characteristics Graph](image)

- **$P_o, \eta_{add}$ vs. $P_{in}$**
  - $V_{DD} = 4.8V$
  - $V_{GG} = -6.0V$
  - $f = 0.9GHz$

- **Layout**
  - Substrate (Glass-epoxy): $t=0.8mm, \varepsilon_r=4.4$
  - Heat sink (Duralumin): $50\times35\times10mm$
  - Chip C: GRM39series (MURATA)
  - Chip R: MCR03series (ROHM)
  - Supply Voltage: $V_{GG} = 6.0V, V_{DD} = 4.8V$
**GaAs FIELD EFFECT TRANSISTOR**
XMFP4-M4 1.8GHz Test Board

### HANDLING OF TEST BOARD

1. **Precaution**
   - Before handling test boards, avoid any cause of electrostatic discharge and surge.
   - The measurement instruments must be grounded, and the operator is recommended to wear a wrist strap.

2. **Bias Procedure**
   - Set slowly the gate to source voltage, to \( V_{GG} \) recommended for each test board.
   - Adjust gradually the drain to source voltage, to \( V_{DD} \).
   - Check the \( I_{D} \) is about 0.5\( I_{DSS} \). If it is not, adjust \( V_{GG} \) so that \( I_{D} \) approaches 0.5\( I_{DSS} \).
   - Input RF power to RF port of test board from lower level, and measure electrical characteristics.
   - When biasing off, the reverse procedure is recommended.
   - Note that the bias condition during test should not exceed its absolute maximum ratings.

### TYPICAL CHARACTERISTICS

- **Po, \( \eta_{add} \) vs. Pin**
  - \( V_{DD} = 4.8\)V
  - \( V_{GG} = -6.0\)V
  - \( f = 1.8\)GHz

### LAYOUT

- **Substrate (Glass-epoxy)**: \( t = 0.8\)mm, \( \epsilon_r = 4.4 \)
- **Heat sink (Duralumin)**: \( 50 \times 35 \times 10\)mm
- **Chip C**: GRM39series (MURATA)
- **Chip R**: MCR03series (ROHM)
- **Supply Voltage**: \( V_{GG} = 6.0\)V, \( V_{DD} = 4.8\)V

### SCHEMATIC

- **\( \Gamma \) for max output power matching**
  - \( \Gamma_{III} = 0.80, \angle = -170 \)°
  - \( \Gamma_{L} = 0.80, \angle = 158 \)°

### Parts List

<table>
<thead>
<tr>
<th>Part</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FET</td>
<td>XMFP4-M4</td>
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<tr>
<td>C1</td>
<td>1000pF</td>
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<tr>
<td>C2</td>
<td>6pF</td>
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<tr>
<td>C3</td>
<td>4700pF</td>
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<tr>
<td>C4</td>
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</tr>
<tr>
<td>C6</td>
<td>4700pF</td>
</tr>
<tr>
<td>C7</td>
<td>1000pF</td>
</tr>
<tr>
<td>R1</td>
<td>2.2kΩ</td>
</tr>
<tr>
<td>R2</td>
<td>2.2kΩ</td>
</tr>
</tbody>
</table>
1. Export Control

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For products which are controlled items subject to “the Foreign Exchange and Foreign Trade Control Law” of Japan, the export license specified by the law is required for export.

2. Please contact our sales representatives or engineers before using our products listed in this catalog for the applications requiring especially high reliability what detects might directly cause damage to other party’s life, body or property (listed below) or for other applications not specified in this catalog.

- Aircraft equipment
- Aerospace equipment
- Undersea equipment
- Medical equipment
- Transportation equipment (automobiles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data-processing equipment
- Applications of similar complexity or with reliability requirements comparable to the applications listed in the above

3. Product specifications in this catalog are as of May 1997, and are subject to change or stop the supply without notice. Please confirm the specifications before ordering any product. If there are any questions, please contact our sales representatives or engineers.

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5. None of ozone depleting substances (ODS) under the Montreal Protocol is used in manufacturing process of us.

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