**Warranty**  
Elisra warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If within one year after delivery to the original owner and after prepaid return by the original owner, any product is found to be defective, Elisra shall, at its option, repair or replace said defective unit. This warranty does not apply to products which have been disassembled, modified or subjected to conditions exceeding the applicable specifications or ratings. In addition, this warranty does not apply to tubes, transistors, diodes, and fuses. Elisra reserves the right to make design changes without notice on any of its products without any obligation to make the same or similar changes to units previously purchased. In no event does Elisra assume liability for installation, labor or for consequential damages. This warranty is the extent of the obligation or liability assumed by Elisra with respect to its products, and no other warranty or guarantee is either expressed or implied.

Elisra, the Elisra logo are trademarks of Elisra Electronic Systems Ltd. Other company and brand, product and service names are trademarks or registered trademarks of their respective holders. Specifications are subject to change without notice.
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**PREFACE**

Meet Elisra

**CONTROL DEVICES**

**Microwave PIN Diode Switches**

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**ORDERING ADDRESS**

48 Mivtza Kadesh Street
Bene-Beraq 51203, Israel
Tel: 972-3-617 5655  Fax: 972-3-617 5299
www.mw-elisra.com   Email: trml@elisra.com
Elisra Electronic Systems is a recognized leader in sophisticated electronic systems and components for defense and civilian markets.

Elisra Microwave Division has over 30 years of proven experience in supplying best-of-class components and subassemblies for a wide variety of RF and Microwave applications covering the frequency range of 1 MHz to 50 GHz. Modern production facilities operating under a stringent framework of quality assurance standards have established Elisra as a worldclass and preferred supplied of products with unsurpassed reliability.
Our company’s highly skilled teams of engineers and technicians, renowned for their technological expertise, have been the cornerstone of our leadership status in both military and commercial markets.

**Elisra Defense and Commercial Applications All Across the Globe**

Defense applications are known for their demanding and stringent requirements and Elisra systems have been proven with thousands of hours in the field. Based on our wealth-of military expertise, combat know-how and adaptability, we also provide creative and competitive solutions for commercial applications. With more than a $46 million turnover, our advanced technologies have been brought to all corners of the world. Our growing client list includes such notable companies as Motorola, Lockheed Martin, BAE Systems, Daimler-Benz Aerospace, IBM, British Telecom, Deutsche Telekom, and many others.

**Modern Facilities and Experienced Staff**

Our modern plant occupies more than 22,000 square meters of floor space and is located in suburb of Tel-Aviv, within close proximity to Ben Gurion International Airport. Over the years, we have built up a team of experienced and committed staff employing a highly skilled group of more than 270 microwave engineers, technicians, production workers and marketing specialists. They support all projects from their inception through to completion with ongoing after-sales support. Our production site also comprises state-of-the-art equipment and facilities including “cleanrooms”, laser processing machines, and automatic “pick-and-place” equipment. The majority of the company’s engineers and technicians are reserve officers and solders in the Israeli Defense Forces, adding unmatched knowledge of the battlefield experience. It is this
very blend of technological expertise and in-depth understanding from real-life scenarios that is the foundation of our position of distinction in the Industry.

**Comprehensive Quality Assurance and Reliability Program**

Elisra is synonymous and reliability and quality by virtue of the fact that our products are deployed in some of the most innovative and sophisticated military and commercial systems. This is achieved by careful in-house planning and design, accurate workmanship standards, controlled procedures and rigorous inspections. All phases of our activities from design through to production are carefully monitored by the independently managed quality assurance department personnel. Elisra’s facilities and products are ISO-9001 certified, reflecting internationally recognized standards. Elisra’s quality assurance program is based on the following military specifications and standards: MIL-E-4158, MIL-E-5400, MIL-E-16400, MIL-M-38510, MIL-STD-202, MIL-STD-454.

In-house capabilities at all levels of project design, development, production, testing and system integration assure outstanding accuracy and quick time-to-market.

All systems and components are inspected to conform to precise requirements and specifications. Comprehensive testing includes simulation of some of the most extreme conditions possible via the use of special vibration, temperature and humidity chambers.

**On-Going Customer Support and Satisfaction**

The proven reliability of our products is a reflection of the continuous communication we have with our customers.

To ensure that our customers’ requirements are met, constant dialogue and feedback are attained at every stage of the development process. Once systems are installed, we provide on-going documentation, training and support to ensure that our clients become expert and successful users of the technology.

**Wide Product Portfolio**

In this catalog you will find a brief overview of microwave amplifiers lines offered by Elisra Microwave Division.

For more details about our other microwave products, please visit our web site:

[www.mw-elisra.com](http://www.mw-elisra.com)
Control Devices
GENERAL INFORMATION

Insertion Loss
The difference in power, measured in dB, between input level and output level when the unit is at low loss condition and all other throws are off.

Isolation
The in power, measured in dB, between input level and output level when the unit is at high loss condition. Isolation of the off throws in multithrow switches is measured with another throw at low loss condition and is properly terminated.

VSWR
The ratio between the reflected signal and the incident signal.

Power Handling Capability
The maximum CW power to which the unit can be subjected without possible permanent damage. This rating is based on the assumption that a 50 ohm source and load are used and that the control voltages and temperature range are within the specified limits.

Switching Time
The time required for the device to attain 90% of the final RF signal referenced to the 50% level of the command logic (see Figure 1).

Recommended Driver Waveforms
The time required for PIN diodes to change state is a function of drive current, driving impedance and parameters of the diodes. To achieve specified switching speed (in units without a driver), current spikes are necessary (see Figure 2).

Switching Transients
One of the consequences of fast switching are the switching transients which appear at the RF ports.

Microwave Switches

SPST To SP16T Switches
High Frequency Switches
Low-Frequency Switches
Drop-in Switches
Transfer Switches
High Power Switches

VSWR
The ratio between the reflected signal and the incident signal.

Power Handling Capability
The maximum CW power to which the unit can be subjected without possible permanent damage. This rating is based on the assumption that a 50 ohm source and load are used and that the control voltages and temperature range are within the specified limits.

Switching Time
The time required for the device to attain 90% of the final RF signal referenced to the 50% level of the command logic (see Figure 1).

Recommended Driver Waveforms
The time required for PIN diodes to change state is a function of drive current, driving impedance and parameters of the diodes. To achieve specified switching speed (in units without a driver), current spikes are necessary (see Figure 2).

Switching Transients
One of the consequences of fast switching are the switching transients which appear at the RF ports.
The transients are due to the DC shifts which occur internally in the switch during switching. Transients can cause problems because their spectral content can cause false signals to occur during switching. The problem is particularly serious when the spectral content is inside the RF band of the switch. The frequency of the transient spectral content is a function of the speed of the switch. Faster switching produces transient energy at higher frequencies. The amplitude of the transients is higher for faster switching speeds and for switches designed for lower frequencies. To decrease this effect, Elisra uses built-in, small size, low loss, high pass filters. Another way to decrease this effect is by using slower switching speed switches.

**Video Leakage Measurements**

Transients are specified in several ways. One approach is to specify the maximum allowable amplitude of the transient found at each of the RF ports. Alternately, when the majority of the spectral content is outside the switch RF band, transient amplitude can be specified in-band only. This can be measured by filtering off the out-of-band transient energy. An additional method specifies the spectral content, in dBm, in the RF band of interest.

**Input Drive Requirements**

<table>
<thead>
<tr>
<th>Speed</th>
<th>&quot;0&quot; Logic</th>
<th>&quot;1&quot; Logic</th>
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<tbody>
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<td>2.5V min. 0.04 mA</td>
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<tr>
<td>High speed</td>
<td>0.8V max. 5.0 mA</td>
<td>2.5V min. 4.0 mA</td>
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</table>

* Provided for high speed modules.

The measuring technique is described in the following set-up schematic (see Figure 3).

**Test Conditions**

**Switching Rate:** Maximum switching rate specified

**Pulse Width:** 50% of time period

**RF Input:** None

**Power Supplies:** ON

**RF Ports:** All RF ports are 50 ohms terminated

**Definition:** The video leakage measured by the set-up is defined by the maximum spike that occurs (mV peak to peak)

**NOTE:** 50 ohm terminations should be connected to all RF ports.
SPST PIN Diode Switches

HIGH FREQUENCY
Series MW 121T

- Solid State
- Frequency Band 0.5 to 18 GHz
- Low Insertion Loss
- High Isolation
- Integral TTL Driver
- Hermetically Sealed

GENERAL INFORMATION
This series of SPST switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

GENERAL SPECIFICATIONS
- Power Handling Capability: 100 mW
- Operating Temperature Range: -55°C to +105°C
- Storage Temperature Range: -65°C to +125°C
- Reflective Switching Speed: 15 ns typical
- Non-Reflective Switching Speed: 25 ns typical

OPTIONS
- Low Video Leakage
- Switches Without Drivers
- Another Frequency Band
- Lower Insertion Loss Can Be Provided

HOW TO ORDER
See the variety of switches on the next page, and follow the example below:

MW 121 T28H0AC3

LEGEND
1. Basic model number for an SPST switch
2. Isolation (Reflective or Non-Reflective)
   H - High, 60 dB       L - Low, 40 dB
3. Switching Speed
   Reflective         Non-Reflective
   H - High 15 ns 25 ns
   L - Low 100 ns 150 ns
4. TTL Control Logic
   0 - Logic “0” Low Loss
      Logic “1” Isolation
   1 - Logic “0” Isolation
      Logic “1” Low Loss
5. Power Supply
   a. Voltage
      A - +5V -12V
      B - +5V -15V
      C - +12V -12V
      D - +15V -15V
   b. Current
      High Speed +40 mA (+V)
                  - 25 mA (-V)
      Low Speed  +100 mA (+V)
                  - 50 mA (-V)
6. Case type
## SPECIFICATIONS

**MW 121T High Isolation/High Speed/Low Speed Switches**

### High Frequency Reflective Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
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<th>2 to 4</th>
<th>4 to 8</th>
<th>8 to 12</th>
<th>12 to 18</th>
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<td>Isolation min (dB)</td>
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</table>

Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

**CASE C3**

SMA/F

CASE C4

2 MOUNTING THREADS

CASE C5

SMA/F

HIGH ISOLATION/LOW SPEED SWITCHES

**CASE C5**

SMA/F

**CASE C1**

SMA/F

Index
SP2T PIN Diode Switches

HIGH FREQUENCY
Series MW 122T

- Solid State
- Frequency Band 0.5 to 18 GHz
- Low Insertion Loss
- High Isolation
- Integral TTL Driver
- Hermetically Sealed

GENERAL INFORMATION
This series of SP2T switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

GENERAL SPECIFICATIONS
Power Handling Capability 100 mW
Operating Temperature Range -55°C to +105°C
Storage Temperature Range -65°C to +125°C
Reflective Switching Speed 25 ns typical
Non-Reflective Switching Speed 25 ns typical

OPTIONS
- Low Video Leakage
- Switches Without Drivers
- Another Frequency Band
- Lower Insertion Loss Can Be Provided

HOW TO ORDER
See the variety of switches on the next page, and follow the example below:


MW 122T28HH0AG3

LEGEND
1. Basic model number for an SP2T switch
2. Isolation (Reflective or Non-Reflective)
   H - High, 60 dB   L - Low, 40 dB
3. Switching Speed
   Reflective Non-Reflective
   H - High 25 ns 25 ns
   L - Low 100 ns 150 ns
4. TTL Control Logic
   0 - Logic “0” Low Loss
     Logic “1” Isolation
   1 - Logic “0” Isolation
     Logic “1” Low Loss
5. Power Supply
   a. Voltage
      A - +5V -12V
      B - +5V -15V
      C - +12V -12V
      D - +15V -15V
   b. Current
      High Speed +80 mA (+V)
                  - 25 mA (-V)
      Low Speed  +125 mA (+V)
                  - 50 mA (-V)
6. Case type

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### High Frequency Reflective Switches

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<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
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### High Frequency Non-Reflective Switches

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Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

CASE V3

CASE G5

HIGH ISOLATION/LOW SPEED SWITCHES

CASE G3

CASE G5

Index
SP3T PIN Diode Switches

HIGH FREQUENCY
Series MW 123T

Solid State
Frequency Band 0.5 to 18 GHz
Low Insertion Loss
High Isolation
Integral TTL Driver
Hermetically Sealed

GENERAL INFORMATION
This series of SPST switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

GENERAL SPECIFICATIONS
Power Handling Capability 100 mW
Operating Temperature Range -55°C to +105°C
Storage Temperature Range -65°C to +125°C
Reflective Switching Speed 25 ns typical
Non-Reflective Switching Speed 25 ns typical

OPTIONS
Low video Leakage
Switches Without Drivers
Another Frequency Band
Lower Insertion Loss Can Be Provided

HOW TO ORDER
See the variety of switches on the next page, and follow the example below:
MW 123 T28 H H 0 A R4

= MW 123T28HH0AR4

LEGEND
1. Basic model number for an SP3T switch
2. Isolation (Reflective or Non-Reflective)
   H - High, 60 dB   L - Low, 40 dB
3. Switching Speed
   Reflective Non-Reflective
   H - High 20 ns   25 ns
   L - Low 100 ns  150 ns
4. TTL Control Logic
   0 - Logic “0” Low Loss
      Logic “1” Isolation
   1 - Logic “0” Isolation
      Logic “1” Low Loss
5. Power Supply
   a. Voltage
      A - +5V -12V
      B - +5V -15V
      C - +12V -12V
      D - +15V -15V
   b. Current
      High Speed +100 mA (+V)
        40 mA (-V)
      Low Speed +130 mA (+V)
        90 mA (-V)
6. Case type
**SPECIFICATIONS**

**MW 123T High Isolation/High Speed/Low Speed Switches**

### High Frequency Reflective Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
<th>IL max (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWR max</th>
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### High Frequency Non-Reflective Switches

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Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

CASE Q1

CASE R4

CASE R1

CASE R5

HIGH ISOLATION/LOW SPEED SWITCHES

CASE R3
SP4T PIN Diode Switches

HIGH FREQUENCY
Series MW 124T

➢ Solid State
➢ Frequency Band 0.5 to 18 GHz
➢ Low Insertion Loss
➢ High Isolation
➢ Integral TTL Driver
➢ Hermetically Sealed

GENERAL INFORMATION
This series of SP4T switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

GENERAL SPECIFICATIONS
Power Handling Capability 100 mW
Operating Temperature Range -55°C to +105°C
Storage Temperature Range -65°C to +125°C
Reflective Switching Speed 25 ns typical
Non-Reflective Switching Speed 25 ns typical

OPTIONS
➢ Low Video Leakage
➢ Switches Without Drivers
➢ Another Frequency Band
➢ Lower Insertion Loss Can Be Provided

HOW TO ORDER
See the variety of switches on the next page, and follow the example below:

MW 124 T28 H H 0 A Q2

= MW 124T28HH0AQ2

LEGEND
1. Basic model number for an SP4T switch
2. Isolation (Reflective or Non-Reflective)
   H - High, 60 dB  L - Low, 40 dB
3. Switching Speed
   Reflective Non-Reflective
   H - High 20 ns 25 ns
   L - Low 100 ns 150 ns
4. TTL Control Logic
   0 - Logic “0” Low Loss
   Logic “1” Isolation
   1 - Logic “0” Isolation
   Logic “1” Low Loss
5. Power Supply
   a. Voltage
      A - +5V -12V
      B - +5V -15V
      C - +12V -12V
      D - +15V -15V
   b. Current
      High Speed +140 mA (+V)
      - 40 mA (-V)
      Low Speed +160 mA (+V)
      - 60 mA (-V)
6. Case type
## SPECIFICATIONS

### MW 124T High Isolation/High Speed/Low Speed Switches

#### High Frequency Reflective Switches

<table>
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<th>Model Number</th>
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<th>IL max (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWR max</th>
<th>IL max (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWR max</th>
<th>IL max (dB)</th>
<th>Isolation min (dB)</th>
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<th>Isolation min (dB)</th>
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#### High Frequency Non-Reflective Switches

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<th>Isolation min (dB)</th>
<th>VSWR max</th>
<th>IL max (dB)</th>
<th>Isolation min (dB)</th>
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<th>Isolation min (dB)</th>
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</table>

Note: Outline drawings of cases are depicted on pages following these tables. Termination at the Input Port.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

CASE Q6

[Diagram of CASE Q6]

CASE Q7

[Diagram of CASE Q7]

HIGH ISOLATION/LOW SPEED SWITCHES

CASE Q31

[Diagram of CASE Q31]

CASE Q5

[Diagram of CASE Q5]

Index
SP5T PIN Diode Switches

**HIGH FREQUENCY**

Series MW 125T

- Solid State
- Frequency Band 0.5 to 18 GHz
- Low Insertion Loss
- High Isolation
- Integral TTL Driver
- Hermetically Sealed

**GENERAL INFORMATION**

This series of SP5T switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

**GENERAL SPECIFICATIONS**

- Power Handling Capability: 100 mW
- Operating Temperature Range: -55°C to +105°C
- Storage Temperature Range: -65°C to +125°C
- Reflective Switching Speed: 30ns typical
- Non-Reflective Switching Speed: 30 ns typical

**OPTIONS**

- Low Video Leakage
- Switches Without Drivers
- Another Frequency Band
- Lower Insertion Loss Can Be Provided

**HOW TO ORDER**

See the variety of switches on the next page, and follow the example below:

MW 125 T28 1 H 2 H 3 0 4 5 A 6

**LEGEND**

1. Basic model number for an SP5T switch
2. Isolation (Reflective or Non-Reflective)
   - H - High, 60 dB
   - L - Low, 40 dB
3. Switching Speed
   - Reflective
     - H - High 15 ns 25 ns
     - L - Low 100 ns 150 ns
   - Non-Reflective
4. TTL Control Logic
   - 0 - Logic “0” Low Loss
     - Logic “1” Isolation
   - 1 - Logic “0” Isolation
     - Logic “1” Low Loss
5. Power Supply
   - Voltage
     - A - +5V -12V
     - B - +5V -15V
     - C - +12V -12V
     - D - +15V -15V
   - Current
     - High Speed +170 mA (+V)
       - 40 mA (-V)
     - Low Speed +170 mA (+V)
       - 140 mA (-V)
6. Case type
## SPECIFICATIONS

### MW 125T High Isolation/High Speed/Low Speed Switches

#### High Frequency Reflective Switches

| Model Number | Frequency (GHz) | | | | | |
|--------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|
|              | Model Number   | 0.5 to 1 | 1 to 2 | 2 to 4 | 4 to 8 | 8 to 12 | 12 to 18 |
|              | IL max (dB)    | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max |
| MW 125T51    | 1.4            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T12    | 1.5            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T24    | 1.8            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T48    | 2.2            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T82    | 2.8            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T18    | 3.5            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125T52    | 1.4            | 60       | 2.0     | 1.5    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125T08    | 1.8            | 60       | 2.0     | 2.2    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125T88    | 2.8            | 60       | 2.0     | 3.5    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125T28    | 1.8            | 60       | 2.0     | 2.2    | 60     | 2.0     | 2.8    | 60     | 2.0     | 3.5    | 60     | 2.0     |

#### High Frequency Non-Reflective Switches

| Model Number | Frequency (GHz) | | | | | |
|--------------|----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|              | Model Number   | 0.5 to 1 | 1 to 2 | 2 to 4 | 4 to 8 | 8 to 12 | 12 to 18 |
|              | IL max (dB)    | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max | IL max (dB) | Isolation min (dB) | VSWR max |
| MW 125TN51   | 1.7            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN12   | 1.8            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN24   | 2.2            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN48   | 2.6            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN82   | 3.0            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN18   | 3.5            | 60       | 2.0     |        |        |        |        |        |        |        |        |        |
| MW 125TN52   | 1.7            | 60       | 2.0     | 1.8    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125TN08   | 2.2            | 60       | 2.0     | 2.6    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125TN88   | 3.0            | 60       | 2.0     | 3.5    | 60     | 2.0     |        |        |        |        |        |        |
| MW 125TN28   | 2.2            | 60       | 2.0     | 2.6    | 60     | 2.0     | 3.0    | 60     | 2.0     | 3.5    | 60     | 2.0     |

Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

CASE T

CASE T1

HIGH ISOLATION/LOW SPEED SWITCHES

CASE T1
SP6T PIN Diode Switches

HIGH FREQUENCY
Series MW 126T

- Solid State
- Frequency Band 0.5 to 18 GHz
- Low Insertion Loss
- High Isolation
- Integral TTL Driver
- Hermetically Sealed

GENERAL INFORMATION
This series of SP6T switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

GENERAL SPECIFICATIONS
Power Handling Capability 100 mW
Operating Temperature Range -55°C to +105°C
Storage Temperature Range -65°C to +125°C
Reflective Switching Speed 30ns typical
Non-Reflective Switching Speed 30 ns typical

OPTIONS
- Low Video Leakage
- Switches Without Drivers
- Another Frequency Band
- Lower Insertion Loss Can Be Provided

HOW TO ORDER
See the variety of switches on the next page, and follow the example below:

MW 126T28 H H 0 A X
1 2 3 4 5 6

LEGEND
1. Basic model number for an SP6T switch
2. Isolation (Reflective or Non-Reflective)
   H - High, 60 dB L - Low, 40 dB
3. Switching Speed
   Reflective Non-Reflective
   H - High 20 ns 30 ns
   L - Low 100 ns 150 ns
4. TTL Control Logic
   0 - Logic “0” Low Loss
   Logic “1” Isolation
   1 - Logic “0” Isolation
   Logic “1” Low Loss
5. Power Supply
   a. Voltage
      A - +5V-12V
      B - +5V-15V
      C - +12V -12V
      D - +15V -15V
   b. Current
      High Speed +200 mA (+V)
      - 50 mA (-V)
      Low Speed +160 mA (+V)
      - 80 mA (-V)
6. Case type
**SPECIFICATIONS**

**MW 126T High Isolation/High Speed/Low Speed Switches**

### High Frequency Reflective Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
<th>0.5 to 1</th>
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<th>2 to 4</th>
<th>4 to 8</th>
<th>8 to 12</th>
<th>12 to 18</th>
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<td>Isolation min (dB)</td>
<td>VSWR max</td>
<td>IL max (dB)</td>
<td>Isolation min (dB)</td>
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<td>IL max (dB)</td>
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### High Frequency Non-Reflective Switches

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<th>Model Number</th>
<th>Frequency (GHz)</th>
<th>0.5 to 1</th>
<th>1 to 2</th>
<th>2 to 4</th>
<th>4 to 8</th>
<th>8 to 12</th>
<th>12 to 18</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IL max (dB)</td>
<td>Isolation min (dB)</td>
<td>VSWR max</td>
<td>IL max (dB)</td>
<td>Isolation min (dB)</td>
<td>VSWR max</td>
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<td>1.8</td>
<td>60</td>
<td>2.0</td>
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<td>3.2</td>
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</table>

Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

HIGH ISOLATION/HIGH SPEED SWITCHES

CASE X1

CASE X2

HIGH ISOLATION/LOW SPEED SWITCHES

CASE X

CASE X1

Index
SP8T PIN Diode Switches

**HIGH FREQUENCY**

Series MW 128T

- Solid State
- Frequency Band 0.5 to 18 GHz
- Low Insertion Loss
- High Isolation
- Integral TTL Driver
- Hermetically Sealed

**GENERAL INFORMATION**

This series of SP8T switches is designed to give excellent performance for a wide range of military system applications in the 0.5 GHz to 18 GHz frequency range.

**GENERAL SPECIFICATIONS**

- Power Handling Capability: 100 mW
- Operating Temperature Range: -55°C to +105°C
- Storage Temperature Range: -65°C to +125°C
- Reflective Switching Speed: 30ns typical
- Non-Reflective Switching Speed: 30 ns typical

**OPTIONS**

- Low Video Leakage
- Switches Without Drivers
- Another Frequency Band
- Lower Insertion Loss Can Be Provided

**HOW TO ORDER**

See the variety of switches on the next page, and follow the example below:

<table>
<thead>
<tr>
<th>MW 128 T28</th>
<th>H</th>
<th>H</th>
<th>0</th>
<th>A</th>
<th>U1</th>
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<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

**LEGEND**

1. Basic model number for an SP8T switch
2. Isolation (Reflective or Non-Reflective)
   - H - High, 60 dB
   - L - Low, 40 dB
3. Switching Speed
   - Reflective
     - H - High: 25 ns
     - L - Low: 100 ns
   - Non-Reflective
     - H - High: 30 ns
     - L - Low: 150 ns
4. TTL Control Logic
   - 0 - Logic “0” Low Loss
     - Logic “1” Isolation
   - 1 - Logic “0” Isolation
     - Logic “1” Low Loss
5. Power Supply
   a. Voltage
      - A - +5V - 12V
      - B - +5V - 15V
      - C - +12V - 12V
      - D - +15V - 15V
   b. Current
      - High Speed: +280 mA (+V)
        - 60 mA (-V)
      - Low Speed: +320 mA (+V)
        - 220 mA (-V)
6. Case type
## SPECIFICATIONS

### MW 128T High Isolation/High Speed/Low Speed Switches

### High Frequency Reflective Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWRmax</th>
<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWRmax</th>
<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
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<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWRmax</th>
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</tbody>
</table>

### High Frequency Non-Reflective Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency (GHz)</th>
<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
<th>VSWRmax</th>
<th>ILmax (dB)</th>
<th>Isolation min (dB)</th>
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</tbody>
</table>

Note: Outline drawings of cases are depicted on pages following these tables.
Outline Drawings

HIGH & LOW SPEED SWITCHES

CASE U1

CASE U3
Elisra’s transfer switches offer optimized insertion loss, excellent VSWR and isolation. Other optional models are available upon request.

The 12TR switches are supplied complete with integral driver and TTL control.

**GENERAL SPECIFICATIONS**

- **Power Handling Capability**: 200 mW
- **Temperature Range**: -55°C to +125°C
- **Storage Temperature Range**: -65°C to +125°C
- **RF Connectors**: SMA (female)
- **DC and Logic Connector**: Solder pin

**OPTIONS**

- Other Frequency Bands are Available
- Higher Isolation is Available

**HOW TO ORDER**

To order an MW 12TR switch please follow the example.

**EXAMPLE:**

\[
\text{MW 12TR 01} \quad \text{D1} \quad \text{PS1} \quad 1 \quad 2 \quad 3
\]

**LEGEND**

1. Select switch (basic model number)
2. TTL Control Input (for units with drivers)
3. Power Supply (for units with driver)
   - PS1: +5V and -5V
   - PS2: +5V and -12V
   - PS3: +12V and -12V
   - PS4: +15V and -15V
   - PS5: +5V for drop-in only

**SPECIFICATIONS**

### MW 12RT Transfer Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>Insertion Loss max (dB)</th>
<th>VSWR max</th>
<th>Isolation (dB)</th>
<th>DC Requirements (mA)</th>
<th>Switching Time max (ns)</th>
<th>Case</th>
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</thead>
<tbody>
<tr>
<td>MW 12TR 02</td>
<td>0.01 – 0.5</td>
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<td>1.8</td>
<td>1.8</td>
<td>50</td>
<td>70</td>
<td>40</td>
<td>35</td>
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<tr>
<td>MW 12TR 18</td>
<td>2 – 18</td>
<td>2.9</td>
<td>2.0</td>
<td>50</td>
<td>70</td>
<td>40</td>
<td>35</td>
</tr>
</tbody>
</table>
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

TRANSFER SWITCHES

CASE TR1

CASE TR2 (Drop-in)
High Power PIN Diode Switches

SPST Through SP8T

- Over 100 Watt CW and 1000 Watt Peak Power Handling Capacity
- .5 – 18 GHz Frequency Range Coverage
- Patented Transition Technology
- Low Loss, High Isolation
- Wideband, Narrowband
- SPST Through SP8T Configurations
- Compact and Lightweight
- High Reliable MIC Technology
- Integral TTL Driver
- Special Heat Dissipation Methodology
- TNC or SMA Standard Port Connections

**GENERAL INFORMATION**

The MW 412XY High Power PIN Diode Switches series offers a variety of performance options covering frequency bands from 0.5 to 18 GHz. Featuring cold switching power handling of 100 Watts CW in addition to extended peak power handling of over 1000 Watts, this series meets a spectrum of stringent requirements.

SPST through SP8T configurations are available, as the bandwidth can be extended over one octave for a reflective SPDT and over 30% relative for a reflective SP6T.

This series utilizes a precise and unique design, featuring a special heat sinking technology to obtain high reliability devices with high performances.

The whole series is hermetically sealed and SMA or TNC ported.

Base plate operating temperature is -55°C to +85°C. Switching speed can be lowered to a minimum value of 500ns typical, depending on the nominal power handling.

The switches are available with an internally integrated TTL driver, or RS422 driver.

The whole series is available, utilizing MIL-STD-883 methods in the Quality Control system.

Custom designed switches are available upon request in addition to other standard units.
SPST Through SP8T

**HIGH POWER**

**Series MW 41212XY**

- Over 100 Watt CW and 1000 Watt Peak Power Handling
- Low Loss
- High Isolation
- Wideband, Narrowband
- SPST Through SP8T Configurations
- Small Size and Weight
- High Reliable MIC Technology

**GENERAL INFORMATION**

**DC Selection and Driver Requirements**

Two options of high power drivers are available depending mainly on the nominal power handling, the number of output ports and the required switching speed.

**OPTIONS**

**Option I (High Power Drivers)**

For switches with power handling up to 60W, the following driver is used:

- +5V at 100 mA per arm
- -15V at 20 mA

**Option II (Super High Power Drivers)**

For switches with power handling up to 100W, the following driver is used:

- +5V at 20 mA
- -5V at 100 mA per arm
- +28V at 20 mA

Note; All currents are typical

**HOW TO ORDER**

Please specify the model number following the example below:

Example:

MW 4121 1 4 1 8 20 45 T C

This example presents the model number for an SPST switch operating between 4 to 8 GHz with 20W CW power handling, 45dB minimum isolation, cold switching capability and TTL controlled.

**LEGEND:**

1 - Number of outputs
   (1 for an SPST; 8 for an SP8T)
2 - Lowest frequency in GHz
3 - Highest frequency in GHz
4 - CW power handling in Watts
5 - Minimum isolation in dB
   (standard 20 dB and 40 dB, custom is possible)
6 - Control (T = TTL, E = ECL, 0 = RS442)
7 - Switching type
   (C = cold switching, H = hot switching)
SPECIFICATIONS

High Power Switches Up to 50W CW

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Power Handling (Watt CW)</th>
<th>Frequency Range (GHz)</th>
<th>Insertion Loss (dB) typ./max.</th>
<th>Isolation (dB) typ./min.</th>
<th>Switching Speed (n-sec) typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW-41212-1-2</td>
<td>50</td>
<td>1-2</td>
<td>0.6/1.0</td>
<td>35/30</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212-2-4</td>
<td>50</td>
<td>2-4</td>
<td>0.8/1.2</td>
<td>30/25</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212-4-8</td>
<td>50</td>
<td>4-8</td>
<td>0.9/1.3</td>
<td>26/20</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212-6-18</td>
<td>50</td>
<td>6-18</td>
<td>1.0/1.4</td>
<td>24/18</td>
<td>600</td>
</tr>
</tbody>
</table>

High Power Switches 50 to 100W CW

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Power Handling (Watt CW)</th>
<th>Frequency Range (GHz)</th>
<th>Insertion Loss (dB) typ./max.</th>
<th>Isolation (dB) typ./min.</th>
<th>Switching Speed (n-sec) typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW-41212P-1-2</td>
<td>100</td>
<td>1-2</td>
<td>0.7/1.1</td>
<td>35/30</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212P-2-4</td>
<td>100</td>
<td>2-4</td>
<td>0.9/1.3</td>
<td>30/25</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212P-4-8</td>
<td>100</td>
<td>4-8</td>
<td>1.0/1.4</td>
<td>26/20</td>
<td>600</td>
</tr>
<tr>
<td>MW-41212P-6-18</td>
<td>100</td>
<td>6-18</td>
<td>1.1/1.5</td>
<td>24/18</td>
<td>600</td>
</tr>
</tbody>
</table>

GENERAL SPECIFICATIONS

VSWR:
- 2:1 max.

Switching Type:
- Cold (No RF during the switching command).
- Hot switching up to 50 Watts is an option

CASES

Series MW 412 XY utilizes plated aluminum cases with a near perfect surface and heat sinks to obtain low thermal resistances ensuring high reliability and a long service life.

Standard cases produced at Elisra are depicted in the mechanical outline drawing. Special cases are available upon request. (See page 3-38)
Cellular PCS and ISM Applications

HIGH POWER
PIN Diode Switches

- 200W Average and 2000W Peak Power
- SPST Through SP8T Configuration
- Low Loss, High Isolation
- Compact and Lightweight
- Highly Reliable MIC Technology
- Integral TTL Driver
- Special Heat Dissipation Methodology
- N-type, TNC or SMA Standard Port Connections

GENERAL INFORMATION
Elisra Cellular PCS and ISM High Power PIN Diode Switches offers 200 Watt average power handling capability covering frequency bands of cellular and PCS and ISM systems.

GENERAL SPECIFICATIONS
Configuration: Reflective
Switching Type: Cold Switching
Switching Speed: 10 msec. Typ.
Voltage Supplies: +5V; -15V

OPTIONS
- 2.4 – 2.5 GHz Frequency Band
- Non-Reflective Configuration
- Transfer Switch Configuration
- Faster Switch Speeds
## SPECIFICATIONS

### High Power Switches

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Configuration</th>
<th>Frequency Range</th>
<th>Power Handling Av/Peak (Watt)</th>
<th>Insertion (Loss) (MHz)</th>
<th>Isolation typ./min. (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MWP- 41211-CEL</td>
<td>SPST</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.4/0.6</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41212-CEL</td>
<td>SPDT</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.5/0.7</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41213-CEL</td>
<td>SP3T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.5/0.7</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41214-CEL</td>
<td>SP4T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.6/0.8</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41215-CEL</td>
<td>SP5T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.6/0.8</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41216-CEL</td>
<td>SP6T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.7/0.9</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41217-CEL</td>
<td>SP7T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.7/0.9</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41218-CEL</td>
<td>SP8T</td>
<td>824-960</td>
<td>200/2000</td>
<td>0.8/1.0</td>
<td>35/30</td>
</tr>
<tr>
<td>MWP- 41211-PCS</td>
<td>SP5T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.6/0.8</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41212-PCS</td>
<td>SPDT</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.7/0.9</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41213-PCS</td>
<td>SP3T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.7/0.9</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41214-PCS</td>
<td>SP4T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.8/1.0</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41215-PCS</td>
<td>SP5T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.8/1.0</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41216-PCS</td>
<td>SP6T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.9/1.1</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41217-PCS</td>
<td>SP7T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>0.9/1.1</td>
<td>30/25</td>
</tr>
<tr>
<td>MWP- 41218-PCS</td>
<td>SP8T</td>
<td>1850-2150</td>
<td>200/2000</td>
<td>1.0/1.2</td>
<td>30/25</td>
</tr>
</tbody>
</table>
Outline Drawings
All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE A (SPST)

CASE B (SPDT)
CASE B1 (SPDT)

CASE C (SP3T-SP6T)

Index
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE D (SPDT) 6-18GHz 100Watt

CASE E (SPDT) 1-8GHz 50Watt
**Modulators and Translators**

- BI-Phase Modulators
- Frequency Translators

**Series MW BP BI-Phase**

**MODULATOR WITH DRIVER**

- High Performance
- MIC Quadrature Hybrid Design
- TTL Compatibility
- Low Insertion Loss
- Small Packaging

**GENERAL INFORMATION**

This miniature 0° - 180° phase shifter combines broad frequency coverage and fast switching characteristics in a compact lightweight package configuration. The unit consists of silicon pin diode chips and broadband quadrature hybrid coupler circuits. Reversing the TTL control polarity will switch the RF output phase by 180°.

**GENERAL SPECIFICATIONS**

- Power Handling Capability: 0.1W (CW)
- Operating Temperature Range: 55°C to +95°C
- Power Supply Requirements: ±12V, 40 mA
- RF Connectors: SMA female
**SPECIFICATIONS**

**MW BP Modulator with Driver**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>IL max (dB)</th>
<th>VSWR max</th>
<th>Phase Delta (deg)</th>
<th>Switching Time (ns)</th>
<th>Amplitude Balance Between 2 States (dB)</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW BP 74171</td>
<td>7.4 – 17.1</td>
<td>3.5</td>
<td>2.0</td>
<td>180±4°</td>
<td>100</td>
<td>1</td>
<td>AB</td>
</tr>
</tbody>
</table>

**OPTIONS**

- **Other Frequency Ranges**

**HOW TO ORDER**

To order the above mentioned frequency translator please state the model number. For other frequency ranges please contact manufacturer.

---

**Outline Drawings**

All dimensions are in inches and (mm). Drawings are in first angle projection.

**CASE AB**

![Outline Drawings](image)
**MW FT FREQUENCY TRANSLATOR**

- High Performance
- MIC Quadrature Hybrid Design
- 6 Bit TTL Digital Drive
- Low Insertion Loss

**GENERAL INFORMATION**

Frequency translator comprises fast switching digital phase shifters. The input binary word advances or retards the phase in discreet increments. The device is switched periodically through 360° increments that are equal to the least significant bit. The frequency translator converts the frequency of an RF carrier to a lower or higher frequency.

**GENERAL SPECIFICATIONS**

- Power Handling Capability: 0.1W (CW)
- Operating Temperature: -55°C to +105°C
- Range Temperature Coefficient: 0.025 dB/°C
- Switching Time: 30 ns max
- Power Supply Requirements: 5V at 200 mA at 50 mA
- Frequency Translation: 0 to 100 kHz
- RF Connectors: SMA female

**OPTIONS**

- Other Frequency Ranges

**HOW TO ORDER**

To order the above mentioned frequency translator please state the model number. For other frequency ranges please contact manufacturer.

**SPECIFICATIONS**

**MW FT Frequency Translator**

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>Translation Loss max (dB)</th>
<th>Carrier &amp; Sideband Suppression (dBc)</th>
<th>Flatness max (±dB)</th>
<th>VSWR</th>
<th>Number of Bits</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW FT20406</td>
<td>2.25 – 3.75</td>
<td></td>
<td></td>
<td>1.5</td>
<td>2.5</td>
<td>6</td>
<td>AT</td>
</tr>
</tbody>
</table>
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE AT

[Diagram with dimensions and annotations]
Mixers

- Low Frequency Mixers
- High Frequency Mixers

**GENERAL INFORMATION**

Elisra produces a complete line of high performance in numerous frequency ranges from a low of 0.5 – 2000 MHz to a high of 2 – 18 GHz. They are available in either connectorized or drop-in packages. These mixers offer high reliability as a major feature. They are 100% tested and built to most Army, Navy and Air Force military specifications (MIL-E-5400, Class II and MIL-E-16400).

**DEFINITION**

Single Sideband Conversion Loss (LC)

Normally referred to as a conversion loss, the single sideband conversion loss of a mixer is the ratio expressed in dB between the RF single input power to a mixer and the output power contained in the desired IF sideband.

Single Sideband Noise Figure (SSBNF)

The single sideband noise figure of a mixer is usually associated with its characteristics system loss (conversion loss) and may usually be treated much the same as an attenuation pad of value $L_c$ in the signal path.

1 dB Compression Point (1 dB Comp PT)

The 1 dB compression point of a mixer refers to an RF input overload level sufficiently large to cause a 1 dB increase in conversion loss compared to the small signal (linear) conversion loss case.

RF Port to IF Port Signal Isolation (L-I Iso)

The L-I port isolation is the ratio in dB between the L frequency power level incident at the L port of the mixer and the L frequency power emanating from the IF (I) port. (L-I feed through).

RF Port to IF Port Signal Isolation (R-I Iso)

The R-I port isolation is the power ratio in dB between the R frequency power level incident at the R port of the mixer and the R frequency power emanating from the IF (I) port. (R-I feed through).

L Port to R Port Signal Isolation (L-R Iso)

The L to R port isolation is the ratio in dB between the L frequency power level incident at the L port of the mixer and the L frequency power emanating from the R port. (L-R feed through).
Intermodulation Suppression

Typical harmonic intermodulation for mixer generated harmonics of the input signals are shown in Tables 1 and 2. Suppression numbers are for an FRF signal level at –10 dBm and FLO signal level of +7 dBm.

HOW TO ORDER

When placing your order, please follow the example below.

Example:

MW 14186 M 8
1 2 3

LEGEND

1 – Basic Model Number
2 – Drive Level Suffix
3 – Case Number

INTERMODULATION SUPPRESSION

TABLE 1. High Frequency Mixers*

<table>
<thead>
<tr>
<th>FLO Harmonics</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRF Harmonics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>25</td>
<td>18</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>40</td>
<td>50</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>65</td>
<td>&gt;70</td>
<td>65</td>
<td>&gt;70</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
</tr>
</tbody>
</table>

TABLE 2. Low Frequency Mixers*

<table>
<thead>
<tr>
<th>FLO Harmonics</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRF Harmonics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-</td>
<td>25</td>
<td>10</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>63</td>
<td>70</td>
<td>69</td>
<td>&gt;70</td>
<td>64</td>
</tr>
<tr>
<td>4</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
</tr>
<tr>
<td>5</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
<td>&gt;70</td>
</tr>
</tbody>
</table>

* Relative to desired IF output.

Figure 1. Intercept Diagram

Return Loss – Voltage Standing Wave Ratio (VSWR)

The return loss of a mixer port in dB is a measure of the difference between the incident (applied) power in dBm and the power reflected back toward the power source.

Input Intercept Point (IP)

The point on the input power coordinate at which the fundamental response and the third order spurious response curve intercept. It is often used to predict the 2-tone, 3rd -order suppression of a mixer. The higher the intercept point, the better the 3rd-order suppression. Relative to the input, the intercept point is typically 9 to 11 dB higher than the compression point.

Drive Level (DL)

Drive level is the power level of the local oscillator signal applied to the LO port of a mixer. Operating a mixer with the maximum recommended LO drive level will result in the best 2-tone performance, lowest conversion loss and flattest conversion loss versus frequency characteristics. A reduced LO drive level may help reduce mixer-generated intermodulation products and minimize 1/F noise in the output signal. A higher than recommended LO power level will result in an increased noise figure and higher LO feedthrough at both the RF and IF ports of the mixer (refer to Table 3).
TABLE 3. Mixer Drive Level Characteristics

<table>
<thead>
<tr>
<th>Local Drive Level</th>
<th>Drive Level Suffix</th>
<th>Local Drive Level Range (dBm)</th>
<th>Typical 1 dB Compression Point (dBm)</th>
<th>Typical Input Intercept Point per min LO Drive (dBm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Drive</td>
<td>L</td>
<td>+10 to +13</td>
<td>+4</td>
<td>+14</td>
</tr>
<tr>
<td>Medium Drive</td>
<td>M</td>
<td>+13 to +15</td>
<td>+8</td>
<td>+17</td>
</tr>
<tr>
<td>High Drive</td>
<td>H</td>
<td>+17 to +19</td>
<td>+11</td>
<td>+20</td>
</tr>
<tr>
<td>Super High Drive</td>
<td>S</td>
<td>+20 to +23</td>
<td>+16</td>
<td>+25</td>
</tr>
</tbody>
</table>

SPECIFICATIONS

Standard Mixers

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Drive Level Suffix</th>
<th>Operating Frequency</th>
<th>Conversion Loss</th>
<th>Isolation</th>
<th>VSWR (typ)</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMW 14158</td>
<td>M</td>
<td>0.05÷2 DC÷500</td>
<td>8</td>
<td>10.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 14064</td>
<td>M</td>
<td>2÷6</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 141611</td>
<td>M</td>
<td>2÷16</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 14181</td>
<td>M</td>
<td>4÷18</td>
<td>6.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW141846</td>
<td>M</td>
<td>4÷18</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 14185</td>
<td>M</td>
<td>5÷18</td>
<td>5÷6000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW1418204</td>
<td>M</td>
<td>2÷18</td>
<td>5÷4000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 1418216</td>
<td>M</td>
<td>2÷18</td>
<td>2000 TO 6000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 1418218</td>
<td>M</td>
<td>2÷18</td>
<td>2000 TO 8000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW 14208</td>
<td>M</td>
<td>2÷20</td>
<td>2000 TO 8000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Outline Drawings
All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE 7

CASE 8
Digitally Controlled Attenuators

Series MW DC

**DIGITALLY CONTROLLED ATTENUATORS**

- High Performance
- MIC Quadrature Hybrid Design
- 60 dB Dynamic Range
- Temperature Compensated
- Non-Reflective
- VVA Upon Request

**GENERAL INFORMATION**

- Power Handling Capacity: 0.1 Watt (CW)
- Mean Attenuation Range 1: 60 dB
- Temperature Coefficient: 0.025 dB/°C
- Accuracy of Attenuation 2: ±1 dB
- Switching Speed: 1 µs
- RF Connectors: SMA female

**OPTIONS**

- Other Models of Digitally Controlled Attenuators are Available Upon Request.

**NOTES:**

1. Mean attenuation is defined as the average of the maximum and minimum values of attenuation over the specified frequency range at a given control word.
2. Accuracy of attenuation is defined as the change from the required mean attenuation.

**HOW TO ORDER**

To order the above mentioned attenuator please state the model number. For other frequency ranges please contact manufacturer.
## SPECIFICATIONS

### MW DC Digitally Controlled Attenuators

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>Step Size (dB)</th>
<th>Number of Bits</th>
<th>Insertion Loss max (dB)</th>
<th>VSWR max</th>
<th>Flatness (±dB) Up to 30 dB</th>
<th>Flatness (±dB) Up to 60 dB</th>
<th>DC Power Supply (V)</th>
<th>DC Power Supply (mA)</th>
<th>Operating Temperature Range (°C)</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW DC20606</td>
<td>2 – 6</td>
<td>1</td>
<td>6</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>3.00</td>
<td>+5</td>
<td>+15</td>
<td>-15</td>
<td>AD</td>
</tr>
<tr>
<td>MW DC60186</td>
<td>6 – 18</td>
<td>1</td>
<td>6</td>
<td>6.0</td>
<td>2.2</td>
<td>2.5</td>
<td>3.00</td>
<td>+5</td>
<td>+12</td>
<td>-12</td>
<td>BD</td>
</tr>
<tr>
<td>MW DC20406</td>
<td>2 – 4</td>
<td>1</td>
<td>6</td>
<td>2.0</td>
<td>2.0</td>
<td>1.25</td>
<td>1.75</td>
<td>+5</td>
<td>+15</td>
<td>-15</td>
<td>CD</td>
</tr>
<tr>
<td>MW DC40806</td>
<td>4 – 8</td>
<td>1</td>
<td>6</td>
<td>3.0</td>
<td>2.0</td>
<td>1.25</td>
<td>2.00</td>
<td>+15</td>
<td>150</td>
<td>50</td>
<td>CD</td>
</tr>
<tr>
<td>MW DC50107</td>
<td>5 – 10</td>
<td>0.5</td>
<td>7</td>
<td>2.6</td>
<td>2.0</td>
<td>1.25</td>
<td>1.75</td>
<td>+12</td>
<td>120</td>
<td>35</td>
<td>DD</td>
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</tbody>
</table>

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**Model Number**: MW DC20606

**Frequency Range**: 2 – 6 GHz

**Step Size**: 1 dB

**Number of Bits**: 6

**Insertion Loss max**: 2.5 dB

**VSWR max**: 2.5

**Flatness (±dB) Up to 30 dB**: 2.5

**Flatness (±dB) Up to 60 dB**: 3.00

**DC Power Supply (V)**: +5

**DC Power Supply (mA)**: +15

**Operating Temperature Range (°C)**: -15

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**Model Number**: MW DC60186

**Frequency Range**: 6 – 18 GHz

**Step Size**: 1 dB

**Number of Bits**: 6

**Insertion Loss max**: 6.0 dB

**VSWR max**: 2.2

**Flatness (±dB) Up to 30 dB**: 2.5

**Flatness (±dB) Up to 60 dB**: 3.00

**DC Power Supply (V)**: +5

**DC Power Supply (mA)**: +12

**Operating Temperature Range (°C)**: +105

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**Model Number**: MW DC20406

**Frequency Range**: 2 – 4 GHz

**Step Size**: 1 dB

**Number of Bits**: 6

**Insertion Loss max**: 2.0 dB

**VSWR max**: 2.0

**Flatness (±dB) Up to 30 dB**: 1.25

**Flatness (±dB) Up to 60 dB**: 1.75

**DC Power Supply (V)**: +5

**DC Power Supply (mA)**: +15

**Operating Temperature Range (°C)**: 0 to +70

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**Model Number**: MW DC40806

**Frequency Range**: 4 – 8 GHz

**Step Size**: 1 dB

**Number of Bits**: 6

**Insertion Loss max**: 3.0 dB

**VSWR max**: 2.0

**Flatness (±dB) Up to 30 dB**: 1.25

**Flatness (±dB) Up to 60 dB**: 2.00

**DC Power Supply (V)**: +15

**DC Power Supply (mA)**: 150

**Operating Temperature Range (°C)**: 50

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**Model Number**: MW DC50107

**Frequency Range**: 5 – 10 GHz

**Step Size**: 0.5 dB

**Number of Bits**: 7

**Insertion Loss max**: 2.6 dB

**VSWR max**: 2.0

**Flatness (±dB) Up to 30 dB**: 1.25

**Flatness (±dB) Up to 60 dB**: 1.75

**DC Power Supply (V)**: +12

**DC Power Supply (mA)**: 120

**Operating Temperature Range (°C)**: 0 to +70
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE AD

CASE BD

CASE CD

CASE DD
Step Attenuators

SERIES MW SA

- High Performance
- High Speed
- Temperature Compensated
- Flat Frequency

GENERAL INFORMATION

This series of step attenuators utilizes beam lead pin diodes as the switching element and T pad resistors as the attenuation element. These T pads are switched in any combination of discrete values by pairs of high speed diode switches.

Any value of attenuation between 0 to 63 dB in 1 dB steps can be provided by changing the input word.

GENERAL SPECIFICATIONS

- Attenuation Range: up to 63 dB
- Switching Speed: 50 ns
- Accuracy of Attenuation: ±1 dB
- Operating Temperature Range: -55°C to +95°C

HOW TO ORDER

To order the above mentioned attenuator please state the model number. For other frequency ranges please contact manufacturer.

SPECIFICATIONS

MW SA Step Attenuators

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range (GHz)</th>
<th>Step Size (dB)</th>
<th>Number of Bits</th>
<th>Insertion Loss max (dB)</th>
<th>VSWR max</th>
<th>Flatness (±dB)</th>
<th>DC Power Supply Up to 30 dB</th>
<th>Power Handling Capability (W)</th>
<th>Case</th>
</tr>
</thead>
<tbody>
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<td>MW SA20606</td>
<td>2 – 6</td>
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<td>1.5</td>
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<td>MW SA20602</td>
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<td></td>
<td>50</td>
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</tr>
</tbody>
</table>

* Operating temperature range is -55°C to +70°C.
Outline Drawings

All dimensions are in inches and (mm). Drawings are in first angle projection.

CASE AST

CASE BST

CASE CST