

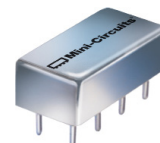
Plug-In

# I&Q Modulator

50Ω

95 to 105 MHz

MIQA-100M+



CASE STYLE: A06

## Maximum Ratings

|                                                                 |                |
|-----------------------------------------------------------------|----------------|
| Operating Temperature                                           | -55°C to 100°C |
| Storage Temperature                                             | -55°C to 100°C |
| LO Power                                                        | 50mW           |
| I&Q Current                                                     | 40mA           |
| Permanent damage may occur if any of these limits are exceeded. |                |

## Pin Connections

|                   |       |
|-------------------|-------|
| LO (carrier)      | 1     |
| RF (signal)       | 8     |
| I (0°)(ref.)      | 7     |
| Q (90°)*          | 4     |
| 50Ω TERM EXTERNAL | 2     |
| GROUND            | 3,5,6 |
| CASE GROUND       | 3,5,6 |

\*Q= I +90° for lower sideband suppression

## Features

- hermetically sealed metal case
- excellent 3rd and 5th order harmonic
- good carrier and sideband rejections

## Applications

- radar
- communication system
- military, hi-rel application

## Modulator Electrical Specifications

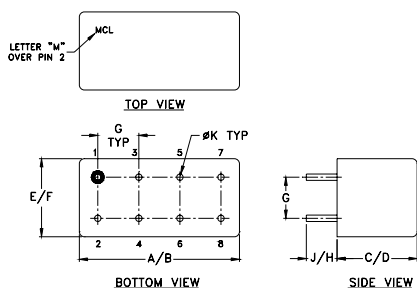
| FREQUENCY (MHz)           |     |      |      | CONVERSION LOSS (dB) |          |      | CARRIER REJECTION (-dBc) |      | SIDE BAND REJECTION (-dBc) |      |      | HARMONIC SUPPRESSION (-dBc) |      |      |      |
|---------------------------|-----|------|------|----------------------|----------|------|--------------------------|------|----------------------------|------|------|-----------------------------|------|------|------|
| RF (SIGNAL/ LO (CARRIER)) |     | I&Q  |      | $\bar{x}$            | $\sigma$ | Max. | Typ.                     | Min. | Typ.                       | Min. | Typ. | Min.                        | Typ. | Min. | Typ. |
| fL                        | fU  | Min. | Max. |                      |          |      |                          |      |                            |      |      |                             |      |      |      |
| 95                        | 105 | DC   | 5    | 5.5                  | 0.10     | 6.5  | 38                       | 30   | 38                         | 30   | 48   | 45                          | 58   | 55   |      |

Operating LO power: 10±1dBm  
1dB Compression: 0dBm typical  
Conversion Loss: (I + Q) power, dBm - RF power, dBm  
Carrier and sideband rejections measured at -5dBm I/Q power.

## Typical Performance Data

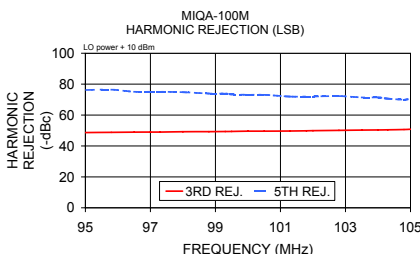
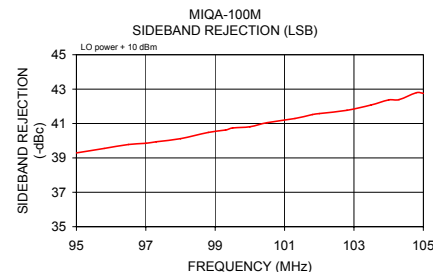
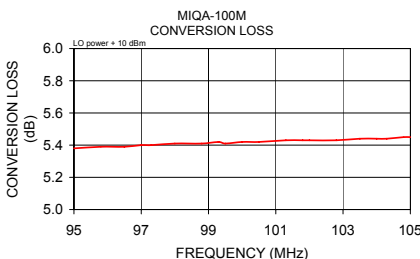
| Carrier Freq. (MHz) | Conversion Loss |               | Sideband Rejection ( $\bar{x}$ ) |            | Carrier Rejection ( $\bar{x}$ ) |            | 3rd Harmonic Suppression ( $\bar{x}$ ) |            | 5th Harmonic Suppression ( $\bar{x}$ ) |            | DC Offset ( $\bar{x}$ ) (mV) |
|---------------------|-----------------|---------------|----------------------------------|------------|---------------------------------|------------|----------------------------------------|------------|----------------------------------------|------------|------------------------------|
|                     | $\bar{x}$ (dB)  | $\sigma$ (dB) | LSB (-dBc)                       | USB (-dBc) | LSB (-dBc)                      | USB (-dBc) | LSB (-dBc)                             | USB (-dBc) | LSB (-dBc)                             | USB (-dBc) |                              |
| 95.00               | 5.38            | 0.02          | 39.29                            | 44.75      | 52.53                           | 52.54      | 48.67                                  | 54.98      | 76.21                                  | 73.88      | 0.21                         |
| 95.80               | 5.39            | 0.03          | 39.55                            | 44.33      | 52.71                           | 52.13      | 48.79                                  | 55.31      | 76.43                                  | 73.83      | 0.20                         |
| 96.50               | 5.39            | 0.03          | 39.78                            | 44.03      | 52.17                           | 52.17      | 48.93                                  | 55.49      | 75.07                                  | 72.99      | 0.20                         |
| 97.00               | 5.40            | 0.03          | 39.85                            | 43.85      | 52.19                           | 51.95      | 49.01                                  | 55.77      | 75.07                                  | 72.63      | 0.19                         |
| 97.30               | 5.40            | 0.03          | 39.94                            | 43.81      | 51.97                           | 51.60      | 48.99                                  | 55.76      | 75.07                                  | 73.12      | 0.21                         |
| 98.00               | 5.41            | 0.03          | 40.12                            | 43.30      | 51.77                           | 51.53      | 49.23                                  | 56.37      | 74.79                                  | 72.51      | 0.21                         |
| 98.80               | 5.41            | 0.03          | 40.48                            | 42.87      | 51.40                           | 51.45      | 49.28                                  | 56.69      | 73.94                                  | 71.49      | 0.21                         |
| 99.30               | 5.42            | 0.02          | 40.62                            | 42.62      | 51.50                           | 51.43      | 49.38                                  | 56.91      | 73.90                                  | 71.57      | 0.21                         |
| 99.50               | 5.41            | 0.03          | 40.74                            | 42.63      | 51.44                           | 51.27      | 49.42                                  | 57.03      | 73.36                                  | 71.15      | 0.23                         |
| 100.00              | 5.42            | 0.03          | 40.81                            | 42.25      | 51.12                           | 51.35      | 49.58                                  | 57.31      | 73.12                                  | 70.29      | 0.22                         |
| 100.50              | 5.42            | 0.03          | 41.05                            | 41.97      | 51.12                           | 51.29      | 49.60                                  | 57.59      | 73.10                                  | 70.95      | 0.21                         |
| 101.30              | 5.43            | 0.02          | 41.29                            | 41.72      | 51.06                           | 50.78      | 49.68                                  | 58.16      | 71.94                                  | 70.18      | 0.22                         |
| 101.80              | 5.43            | 0.02          | 41.52                            | 41.56      | 50.81                           | 50.88      | 49.83                                  | 58.36      | 72.01                                  | 70.24      | 0.21                         |
| 102.00              | 5.43            | 0.02          | 41.58                            | 41.38      | 50.89                           | 50.72      | 49.91                                  | 58.72      | 71.99                                  | 70.24      | 0.21                         |
| 102.80              | 5.43            | 0.02          | 41.77                            | 41.03      | 50.55                           | 50.44      | 50.07                                  | 59.22      | 72.27                                  | 69.68      | 0.21                         |
| 103.50              | 5.44            | 0.02          | 42.08                            | 40.55      | 50.35                           | 50.45      | 50.27                                  | 60.13      | 71.39                                  | 69.29      | 0.23                         |
| 104.00              | 5.44            | 0.02          | 42.37                            | 40.32      | 50.07                           | 50.23      | 50.35                                  | 60.23      | 71.41                                  | 69.13      | 0.23                         |
| 104.30              | 5.44            | 0.02          | 42.39                            | 40.23      | 50.37                           | 50.07      | 50.47                                  | 60.33      | 70.63                                  | 69.29      | 0.23                         |
| 104.80              | 5.45            | 0.02          | 42.79                            | 40.02      | 50.00                           | 49.85      | 50.64                                  | 61.17      | 69.98                                  | 69.15      | 0.23                         |
| 105.00              | 5.45            | 0.02          | 42.75                            | 39.83      | 49.95                           | 49.99      | 50.81                                  | 61.15      | 70.53                                  | 68.43      | 0.23                         |

## Outline Drawing

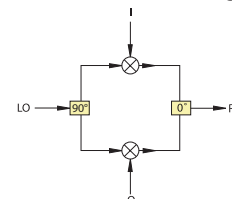


## Outline Dimensions (inch/mm)

| A     | B     | C    | D    | E        | F     |
|-------|-------|------|------|----------|-------|
| .770  | .800  | .285 | .310 | .370     | .400  |
| 19.56 | 20.32 | 7.24 | 7.87 | 9.40     | 10.16 |
| G     | H     | J    | K    | wt grams |       |
| .200  | .20   | .14  | .031 | 5.2      |       |
| 5.08  | 5.08  | 3.56 | 0.79 |          |       |



## I&Q modulation block diagram



## Notes

- Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at [www.minicircuits.com/MCLStore/terms.jsp](http://www.minicircuits.com/MCLStore/terms.jsp)



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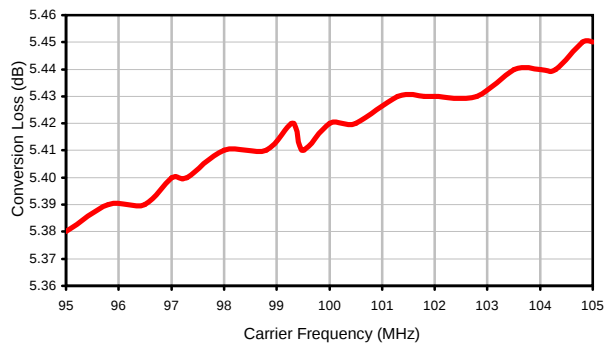
REV. D  
M166133  
MIQA-100M+  
DJ/VV/CP/AM  
180418

## Typical Performance Data

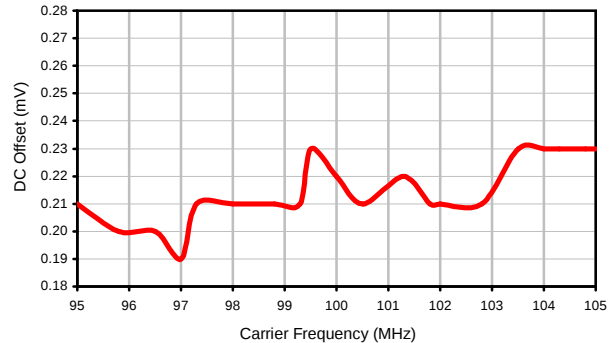
| CARRIER<br>FREQ. | CONVERSION<br>LOSS | SIDE BAND<br>REJECTION |        | CARRIER<br>REJECTION |        | 3rd HARMONIC<br>SUPPRESSION |        | 5th HARMONIC<br>SUPPRESSION |        | DC<br>OFFSET |
|------------------|--------------------|------------------------|--------|----------------------|--------|-----------------------------|--------|-----------------------------|--------|--------------|
|                  |                    | LSB                    | USB    | LSB                  | USB    | LSB                         | USB    | LSB                         | USB    |              |
| (MHz)            | (dB)               | (-dBc)                 | (-dBc) | (-dBc)               | (-dBc) | (-dBc)                      | (-dBc) | (-dBc)                      | (-dBc) | (mV)         |
| 95.0             | 5.38               | 39.29                  | 44.75  | 52.53                | 52.54  | 48.67                       | 54.98  | 76.21                       | 73.88  | 0.21         |
| 95.8             | 5.39               | 39.55                  | 44.33  | 52.71                | 52.13  | 48.79                       | 55.31  | 76.43                       | 73.83  | 0.20         |
| 96.5             | 5.39               | 39.78                  | 44.03  | 52.17                | 52.17  | 48.93                       | 55.49  | 75.07                       | 72.99  | 0.20         |
| 97.0             | 5.40               | 39.85                  | 43.85  | 52.19                | 51.95  | 49.01                       | 55.77  | 75.07                       | 72.63  | 0.19         |
| 97.3             | 5.40               | 39.94                  | 43.81  | 51.97                | 51.60  | 48.99                       | 55.76  | 75.07                       | 73.12  | 0.21         |
| 98.0             | 5.41               | 40.12                  | 43.30  | 51.77                | 51.53  | 49.23                       | 56.37  | 74.79                       | 72.51  | 0.21         |
| 98.8             | 5.41               | 40.48                  | 42.87  | 51.40                | 51.45  | 49.28                       | 56.69  | 73.94                       | 71.49  | 0.21         |
| 99.3             | 5.42               | 40.62                  | 42.62  | 51.50                | 51.43  | 49.38                       | 56.91  | 73.90                       | 71.57  | 0.21         |
| 99.5             | 5.41               | 40.74                  | 42.63  | 51.44                | 51.27  | 49.42                       | 57.03  | 73.36                       | 71.15  | 0.23         |
| 100.0            | 5.42               | 40.81                  | 42.25  | 51.12                | 51.35  | 49.58                       | 57.31  | 73.12                       | 70.29  | 0.22         |
| 100.5            | 5.42               | 41.05                  | 41.97  | 51.12                | 51.29  | 49.60                       | 57.59  | 73.10                       | 70.95  | 0.21         |
| 101.3            | 5.43               | 41.29                  | 41.72  | 51.06                | 50.78  | 49.68                       | 58.16  | 71.94                       | 70.18  | 0.22         |
| 101.8            | 5.43               | 41.52                  | 41.56  | 50.81                | 50.88  | 49.83                       | 58.36  | 72.01                       | 70.24  | 0.21         |
| 102.0            | 5.43               | 41.58                  | 41.38  | 50.89                | 50.72  | 49.91                       | 58.72  | 71.99                       | 70.24  | 0.21         |
| 102.8            | 5.43               | 41.77                  | 41.03  | 50.55                | 50.44  | 50.07                       | 59.22  | 72.27                       | 69.68  | 0.21         |
| 103.5            | 5.44               | 42.08                  | 40.55  | 50.35                | 50.45  | 50.27                       | 60.13  | 71.39                       | 69.29  | 0.23         |
| 104.0            | 5.44               | 42.37                  | 40.32  | 50.07                | 50.23  | 50.35                       | 60.23  | 71.41                       | 69.13  | 0.23         |
| 104.3            | 5.44               | 42.39                  | 40.23  | 50.37                | 50.07  | 50.47                       | 60.33  | 70.63                       | 69.29  | 0.23         |
| 104.8            | 5.45               | 42.79                  | 40.02  | 50.00                | 49.85  | 50.64                       | 61.17  | 69.98                       | 69.15  | 0.23         |
| 105.0            | 5.45               | 42.75                  | 39.83  | 49.95                | 49.99  | 50.81                       | 61.15  | 70.53                       | 68.43  | 0.23         |

## Typical Performance Curves

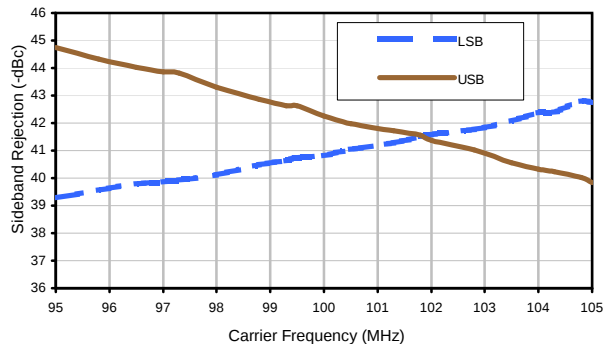
Conversion Loss



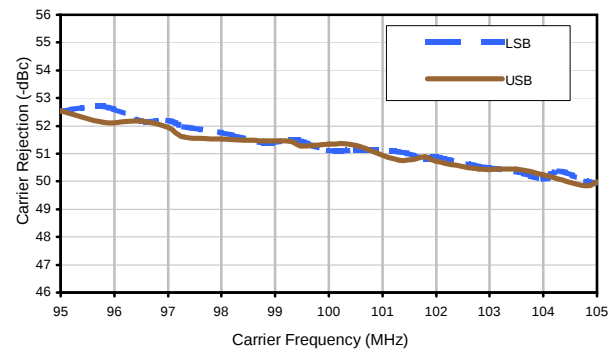
DC Offset



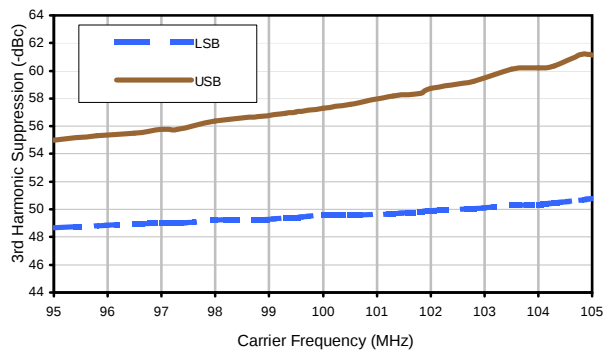
Sideband Rejection



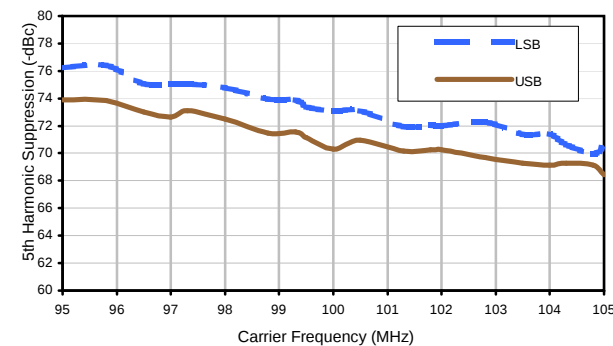
Carrier Rejection



3rd Harmonic Suppression



5th Harmonic Suppression



A01  
A04  
A05  
A06

## Outline Dimensions



| CASE# | A               | B               | C              | D               | E              | F               | G              | H             | J             | K             | WT,<br>GRAM |
|-------|-----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|---------------|---------------|---------------|-------------|
| A01   | .770<br>(19.56) | .800<br>(20.32) | .385<br>(9.78) | .400<br>(10.16) | .370<br>(9.40) | .400<br>(10.16) | .200<br>(5.08) | .20<br>(5.08) | .14<br>(3.56) | .031<br>(.79) | 5.2         |
| A04   |                 |                 | .200<br>(5.08) | .210<br>(5.33)  |                |                 |                |               |               |               | 3.7         |
| A05   |                 |                 | .240<br>(6.10) | .250<br>(6.35)  |                |                 |                |               |               |               | 3.7         |
| A06   |                 |                 | .285<br>(7.24) | .310<br>(7.87)  |                |                 |                |               |               |               | 5.2         |

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

- Header material: C.R.S.  
Pin material: #52 alloy.  
Cover material: Cupro-Nickel.
- Pin finish: Electro Tin-Silver.
- Insulated spacer available. Request P/N B14-045-01.
- Tolerance on pin diameter  $\pm .005$  inch.
- Glass meniscus 0.015 inch max.
- Blue bead indicates Pin 1. Pin numbers do not appear on unit, for reference only.



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All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

| Specification                  | Test/Inspection Condition                                                                                                                                       | Reference/Spec                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Operating Temperature          | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Storage Temperature            | -55° to 100° C<br>Ambient Environment                                                                                                                           | Individual Model Data Sheet                                                                          |
| Thermal Shock                  | -55° to 100°C, 100 cycles                                                                                                                                       | MIL-STD-202, Method 107, Condition A-3, except +100°C                                                |
| Vibration (High Frequency)     | 20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)                                                                             | MIL-STD-202, Method 204, Condition D                                                                 |
| Mechanical Shock               | 50g, 11 ms, 1/2-sine, 18 shocks: 3 each direction, each of 3 axes                                                                                               | MIL-STD-202, Method 213, Condition A                                                                 |
| Moisture Resistance            | 10 cycles, 24 hours per cycle                                                                                                                                   | MIL-STD-202, Method 106, Condition A, except 50°C and end point electrical test done within 12 hours |
| Solderability                  | 10X Magnification                                                                                                                                               | J-STD-002, 95% Coverage                                                                              |
| Resistance to Solder Heat      | 260°C for 10 seconds                                                                                                                                            | MIL-STD-202, Method 210, Condition B                                                                 |
| Marking Resistance to Solvents | Isopropyl alcohol + mineral spirits at 25°C; terpene defluxer at 25°C;<br>distilled water + proylene glycol monomethyl ether + monoethanolamine at 63°C to 70°C | MIL-STD-202, Method 215                                                                              |
| Terminal Strength              | 4 1/2 Pound Pull                                                                                                                                                | MIL-STD-202, Method 211, Condition A                                                                 |



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| Specification       | Test/Inspection Condition | Reference/Spec                       |
|---------------------|---------------------------|--------------------------------------|
| Gross Leak          | 125°C Bubble Test         | MIL-STD-202, Method 112, Condition D |
| Barometric Pressure | 100,000 Feet              | MIL-STD-202, Method 105, Condition D |