

# X2 Frequency Multiplier

50Ω Output 20 to 1000 MHz

## ZX90-2-13-S+



Generic photo used for illustration purposes only

CASE STYLE: JA1242

| Connectors | Model        |
|------------|--------------|
| SMA        | ZX90-2-13-S+ |

**+RoHS Compliant**

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

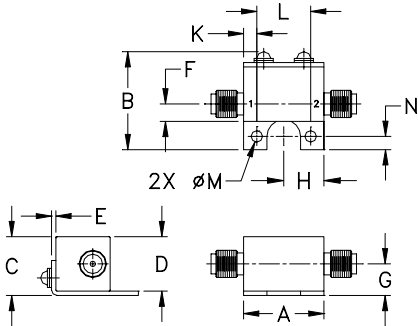
### Maximum Ratings

|   |                |
|---|----------------|
| Operating Temperature   | -40°C to 85°C  |
| Storage Temperature   | -55°C to 100°C |
| RF Input Power, 25°C  | 23 dBm         |
| Permanent damage may occur if any of these limits are exceeded. |                |

### Coaxial Connections

|        |   |
|--------|---|
| INPUT  | 1 |
| OUTPUT | 2 |

### Outline Drawing



### Outline Dimensions (Inch/mm)

| A     | B     | C     | D     | E    | F    | G     |
|-------|-------|-------|-------|------|------|-------|
| .74   | .90   | .54   | .50   | .04  | .16  | .29   |
| 18.80 | 22.86 | 13.72 | 12.70 | 1.02 | 4.06 | 7.37  |
| H     | J     | K     | L     | M    | N    | wt    |
| .37   | --    | .122  | .496  | .106 | .122 | grams |
| 9.40  | --    | 3.10  | 12.60 | 2.69 | 3.10 | 19.0  |

### Features

- broadband
- low conversion loss, 11 dB typ.
- rugged construction
- protected by US Patent 6,790,049

### Applications

- synthesizers
- local oscillators

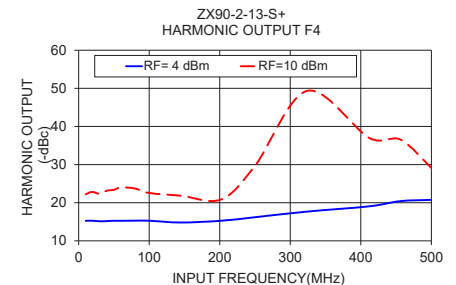
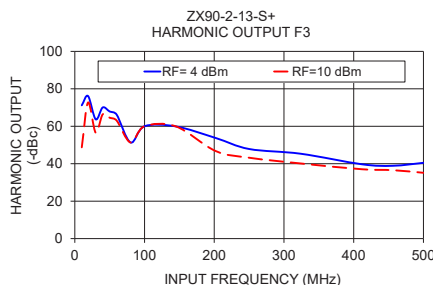
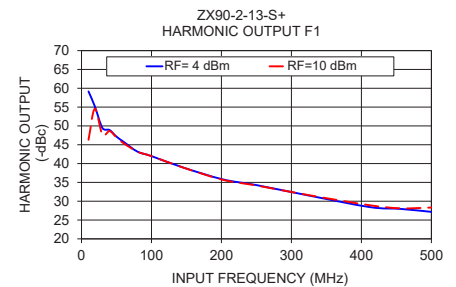
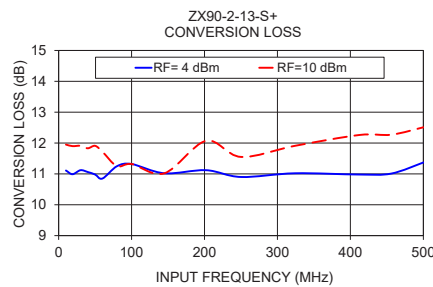
### Electrical Specifications

| MULTIPLICATION FACTOR | FREQUENCY (MHz) |         | INPUT POWER (dBm) |      | CONVERSION LOSS (dB) |      | *HARMONIC OUTPUT (dBc) |           |           |
|-----------------------|-----------------|---------|-------------------|------|----------------------|------|------------------------|-----------|-----------|
|                       | F1              | F2      | Min.              | Max. | Typ.                 | Max. | F1                     | F3        | F4        |
|                       | Input           | Output  |                   |      |                      |      | Typ. Min.              | Typ. Min. | Typ. Min. |
| 2                     | 10-500          | 20-1000 | 4                 | 10   | 11.0                 | 14.5 | 45                     | 21        | 21        |

\* Harmonics of input frequency below the power level of F2

### Typical Performance Data

| Input Frequency (MHz) | INPUT RF=4dBm        |                                 |       | INPUT RF=10 dBm      |                                 |       |       |       |
|-----------------------|----------------------|---------------------------------|-------|----------------------|---------------------------------|-------|-------|-------|
|                       | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       | Conversion Loss (dB) | Harmonic Output Below F2 (-dBc) |       |       |       |
|                       |                      | F1                              | F3    | F4                   | F1                              | F3    | F4    |       |
| 10.00                 | 11.11                | 59.15                           | 71.19 | 15.25                | 11.95                           | 46.31 | 48.75 | 22.22 |
| 19.00                 | 10.99                | 55.21                           | 76.15 | 15.28                | 11.90                           | 54.53 | 72.71 | 22.84 |
| 30.00                 | 11.12                | 49.42                           | 63.71 | 15.14                | 11.91                           | 47.59 | 56.55 | 22.33 |
| 40.00                 | 11.06                | 48.92                           | 70.05 | 15.18                | 11.83                           | 48.64 | 66.36 | 23.15 |
| 50.00                 | 10.98                | 47.15                           | 67.89 | 15.27                | 11.91                           | 46.95 | 64.56 | 23.38 |
| 60.00                 | 10.85                | 45.80                           | 66.24 | 15.26                | 11.72                           | 45.41 | 63.06 | 24.02 |
| 80.00                 | 11.25                | 43.16                           | 51.34 | 15.29                | 11.25                           | 43.16 | 51.34 | 23.72 |
| 100.00                | 11.32                | 41.98                           | 60.02 | 15.28                | 11.32                           | 41.98 | 60.02 | 22.55 |
| 145.00                | 11.02                | 38.96                           | 59.93 | 14.81                | 11.02                           | 38.96 | 59.93 | 21.84 |
| 202.00                | 11.12                | 35.80                           | 53.75 | 15.27                | 12.07                           | 35.68 | 46.78 | 20.87 |
| 250.00                | 10.90                | 34.28                           | 47.86 | 16.20                | 11.55                           | 34.18 | 43.20 | 29.69 |
| 324.00                | 11.02                | 31.54                           | 45.33 | 17.68                | 11.91                           | 31.64 | 40.13 | 49.34 |
| 412.00                | 10.98                | 28.44                           | 39.69 | 19.06                | 12.26                           | 28.93 | 37.04 | 36.98 |
| 456.00                | 11.01                | 27.96                           | 38.89 | 20.42                | 12.27                           | 28.12 | 36.56 | 36.58 |
| 500.00                | 11.37                | 27.17                           | 40.48 | 20.75                | 12.51                           | 28.32 | 35.15 | 29.11 |



### 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.
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# Frequency Multiplier (Doublers)

# ZX90-2-13-S+

## Typical Performance Data

| Frequency (MHz) |           |           |           | RF IN = 4dBm         |                         |           |           |
|-----------------|-----------|-----------|-----------|----------------------|-------------------------|-----------|-----------|
|                 |           |           |           | Conversion Loss (dB) | Harmonic Output* (-dBc) |           |           |
| X1 Output       | X2 Output | X3 Output | X4 Output | X2 Output            | X1 Output               | X3 Output | X4 Output |
| 10              | 20        | 30        | 40        | 11.11                | 59.15                   | 71.19     | 15.25     |
| 12              | 24        | 36        | 48        | 11.11                | 59.13                   | 80.11     | 15.26     |
| 14              | 28        | 42        | 56        | 11.05                | 57.87                   | 78.65     | 15.27     |
| 15              | 30        | 45        | 60        | 11.08                | 56.79                   | 75.26     | 15.30     |
| 17              | 34        | 51        | 68        | 11.04                | 56.14                   | 76.86     | 15.28     |
| 19              | 38        | 57        | 76        | 10.99                | 55.21                   | 76.15     | 15.28     |
| 21              | 42        | 63        | 84        | 11.02                | 54.38                   | 75.25     | 15.27     |
| 30              | 60        | 90        | 120       | 11.12                | 49.42                   | 63.71     | 15.14     |
| 35              | 70        | 105       | 140       | 11.04                | 50.01                   | 71.18     | 15.20     |
| 40              | 80        | 120       | 160       | 11.06                | 48.92                   | 70.05     | 15.18     |
| 45              | 90        | 135       | 180       | 11.05                | 47.95                   | 68.75     | 15.22     |
| 50              | 100       | 150       | 200       | 10.98                | 47.15                   | 67.89     | 15.27     |
| 55              | 110       | 165       | 220       | 10.95                | 46.47                   | 66.97     | 15.28     |
| 60              | 120       | 180       | 240       | 10.85                | 45.80                   | 66.24     | 15.26     |
| 64              | 128       | 192       | 256       | 10.88                | 45.23                   | 65.54     | 15.26     |
| 68              | 136       | 204       | 272       | 10.89                | 44.74                   | 64.77     | 15.25     |
| 80              | 160       | 240       | 320       | 11.25                | 43.16                   | 51.34     | 15.29     |
| 90              | 180       | 270       | 360       | 11.25                | 43.12                   | 61.64     | 15.31     |
| 100             | 200       | 300       | 400       | 11.32                | 41.98                   | 60.02     | 15.28     |
| 110             | 220       | 330       | 440       | 11.29                | 41.16                   | 59.26     | 15.23     |
| 120             | 240       | 360       | 480       | 11.06                | 40.53                   | 59.35     | 15.09     |
| 130             | 260       | 390       | 520       | 11.26                | 39.78                   | 59.29     | 15.05     |
| 140             | 280       | 420       | 560       | 11.05                | 39.23                   | 59.78     | 14.92     |
| 143             | 285       | 428       | 570       | 11.03                | 39.08                   | 59.92     | 14.91     |
| 145             | 290       | 435       | 580       | 11.02                | 38.96                   | 59.93     | 14.81     |
| 170             | 340       | 510       | 680       | 11.06                | 37.29                   | 56.33     | 15.01     |
| 186             | 372       | 558       | 744       | 11.07                | 36.50                   | 55.57     | 15.17     |
| 202             | 404       | 606       | 808       | 11.12                | 35.80                   | 53.75     | 15.27     |
| 218             | 436       | 654       | 872       | 10.95                | 35.29                   | 50.73     | 15.65     |
| 234             | 468       | 702       | 936       | 11.06                | 34.83                   | 49.46     | 15.93     |
| 250             | 500       | 750       | 1000      | 10.90                | 34.28                   | 47.86     | 16.20     |
| 260             | 520       | 780       | 1040      | 10.90                | 33.89                   | 46.95     | 16.50     |
| 270             | 540       | 810       | 1080      | 10.90                | 33.53                   | 46.33     | 16.52     |
| 280             | 560       | 840       | 1120      | 11.06                | 30.69                   | 40.28     | 16.46     |
| 324             | 648       | 972       | 1296      | 11.02                | 31.54                   | 45.33     | 17.68     |
| 368             | 736       | 1104      | 1472      | 10.99                | 29.85                   | 41.65     | 18.38     |
| 412             | 824       | 1236      | 1648      | 10.98                | 28.44                   | 39.69     | 19.06     |
| 456             | 912       | 1368      | 1824      | 11.01                | 27.96                   | 38.89     | 20.42     |
| 500             | 1000      | 1500      | 2000      | 11.37                | 27.17                   | 40.48     | 20.75     |

\*Harmonic Output below power level of X2 Output .



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REV. OR

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1/3/2019

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# Frequency Multiplier (Doublers)

# ZX90-2-13-S+

## Typical Performance Data

| Frequency (MHz) |           |           |           | RF IN = 10dBm        |                         |           |           |
|-----------------|-----------|-----------|-----------|----------------------|-------------------------|-----------|-----------|
|                 |           |           |           | Conversion Loss (dB) | Harmonic Output* (-dBc) |           |           |
| X1 Output       | X2 Output | X3 Output | X4 Output | X2 Output            | X1 Output               | X3 Output | X4 Output |
| 10              | 20        | 30        | 40        | 11.95                | 46.31                   | 48.75     | 22.22     |
| 12              | 24        | 36        | 48        | 11.97                | 58.24                   | 77.56     | 22.07     |
| 14              | 28        | 42        | 56        | 11.87                | 57.08                   | 76.03     | 22.67     |
| 15              | 30        | 45        | 60        | 11.99                | 55.73                   | 70.81     | 22.00     |
| 17              | 34        | 51        | 68        | 11.97                | 55.37                   | 73.44     | 22.41     |
| 19              | 38        | 57        | 76        | 11.90                | 54.53                   | 72.71     | 22.84     |
| 21              | 42        | 63        | 84        | 11.93                | 53.82                   | 71.85     | 22.76     |
| 30              | 60        | 90        | 120       | 11.91                | 47.59                   | 56.55     | 22.33     |
| 35              | 70        | 105       | 140       | 11.79                | 49.72                   | 67.27     | 22.85     |
| 40              | 80        | 120       | 160       | 11.83                | 48.64                   | 66.36     | 23.15     |
| 45              | 90        | 135       | 180       | 11.84                | 47.67                   | 65.30     | 23.40     |
| 50              | 100       | 150       | 200       | 11.91                | 46.95                   | 64.56     | 23.38     |
| 55              | 110       | 165       | 220       | 11.86                | 46.13                   | 63.68     | 23.67     |
| 60              | 120       | 180       | 240       | 11.72                | 45.41                   | 63.06     | 24.02     |
| 64              | 128       | 192       | 256       | 11.75                | 44.81                   | 62.56     | 24.06     |
| 68              | 136       | 204       | 272       | 11.77                | 44.24                   | 62.01     | 24.07     |
| 80              | 160       | 240       | 320       | 11.25                | 43.16                   | 51.34     | 15.29     |
| 90              | 180       | 270       | 360       | 11.25                | 43.12                   | 61.64     | 15.31     |
| 100             | 200       | 300       | 400       | 11.32                | 41.98                   | 60.02     | 15.28     |
| 110             | 220       | 330       | 440       | 11.29                | 41.16                   | 59.26     | 15.23     |
| 120             | 240       | 360       | 480       | 11.06                | 40.53                   | 59.35     | 15.09     |
| 130             | 260       | 390       | 520       | 11.26                | 39.78                   | 59.29     | 15.05     |
| 140             | 280       | 420       | 560       | 11.05                | 39.23                   | 59.78     | 14.92     |
| 143             | 285       | 428       | 570       | 11.03                | 39.08                   | 59.92     | 14.91     |
| 145             | 290       | 435       | 580       | 11.02                | 38.96                   | 59.93     | 14.81     |
| 170             | 340       | 510       | 680       | 12.18                | 37.07                   | 53.41     | 19.35     |
| 186             | 372       | 558       | 744       | 12.18                | 36.27                   | 49.55     | 19.34     |
| 202             | 404       | 606       | 808       | 12.07                | 35.68                   | 46.78     | 20.87     |
| 218             | 436       | 654       | 872       | 11.68                | 35.20                   | 44.84     | 23.42     |
| 234             | 468       | 702       | 936       | 11.84                | 34.81                   | 44.13     | 25.71     |
| 250             | 500       | 750       | 1000      | 11.55                | 34.18                   | 43.20     | 29.69     |
| 260             | 520       | 780       | 1040      | 11.60                | 33.80                   | 42.59     | 32.25     |
| 270             | 540       | 810       | 1080      | 11.66                | 33.41                   | 42.26     | 34.00     |
| 280             | 560       | 840       | 1120      | 11.78                | 29.14                   | 33.99     | 31.13     |
| 324             | 648       | 972       | 1296      | 11.91                | 31.64                   | 40.13     | 49.34     |
| 368             | 736       | 1104      | 1472      | 12.20                | 29.85                   | 38.92     | 35.96     |
| 412             | 824       | 1236      | 1648      | 12.26                | 28.93                   | 37.04     | 36.98     |
| 456             | 912       | 1368      | 1824      | 12.27                | 28.12                   | 36.56     | 36.58     |
| 500             | 1000      | 1500      | 2000      | 12.51                | 28.32                   | 35.15     | 29.11     |

\*Harmonic Output below power level of X2 Output .



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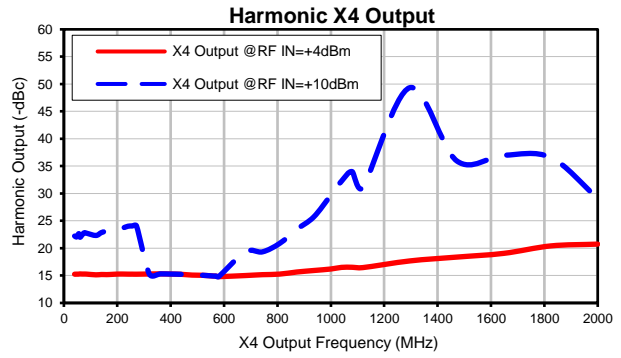
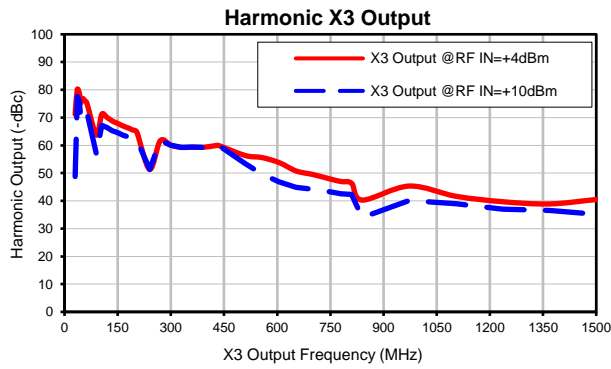
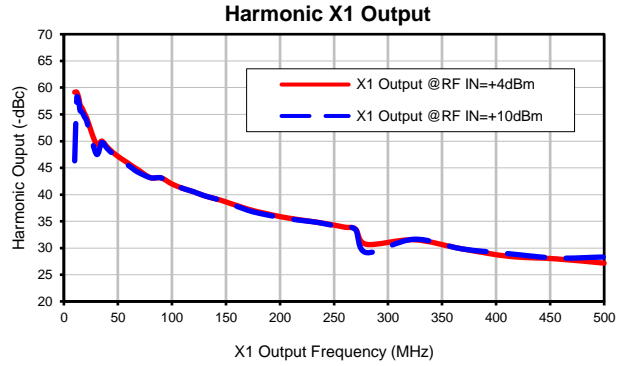
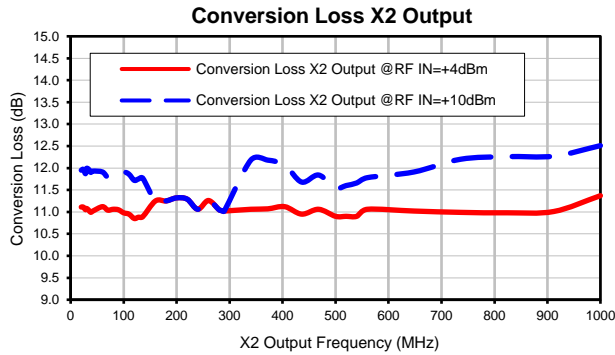


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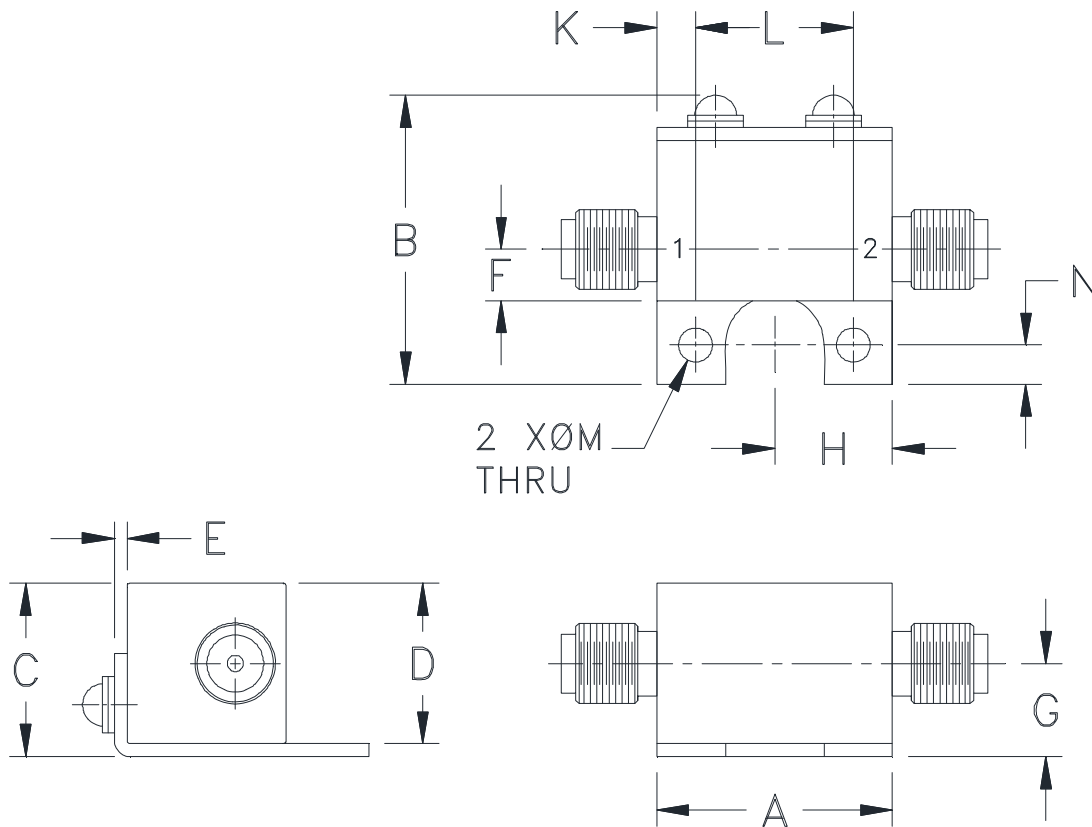
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## Typical Performance Curves



### Outline Dimensions



| CASE #. | A              | B              | C              | D              | E             | F             | G             | H             | J      | K              | L               | M              | N              | WT, GRAM |
|---------|----------------|----------------|----------------|----------------|---------------|---------------|---------------|---------------|--------|----------------|-----------------|----------------|----------------|----------|
| JA1242  | .74<br>(18.80) | .90<br>(22.86) | .54<br>(13.72) | .50<br>(12.70) | .04<br>(1.02) | .16<br>(4.06) | .29<br>(7.37) | .37<br>(9.40) | -<br>- | .122<br>(3.10) | .496<br>(12.60) | .106<br>(2.69) | .122<br>(3.10) | 19.0     |

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

**Tolerance on hole size and interaxes dimensions to be  $\pm .005$ .**

#### Notes:

1. Case material: Brass.
2. Case finish: Nickel plate.



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| Specification              | Test/Inspection Condition  | Reference/Spec                       |
|----------------------------|--|--------------------------------------|
| Operating Temperature      | -40° to 85°C   | Individual Model Data Sheet          |
| Storage Temperature        | -55° to 100° C<br>Ambient Environment  | Individual Model Data Sheet          |
| Barometric Pressure        | 100,000 Feet   | MIL-STD-202, Method 105, Condition D |
| Humidity                   | 90% RH, 65°C<br>Units may require bake-out after humidity to restore full performance. | MIL-STD-202, Method 103              |
| Thermal Shock              | -65° to 125°C, 5 cycles  | MIL-STD-202, Method 107, Condition B |
| 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           | 100g, 6ms sawtooth, 3 shocks each direction 3 axes (total 18)                          | MIL-STD-202, Method 213, Condition I |