

# NEW PRODUCT GUIDE



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# ADAPTERS



## H I G H L I G H T S

- Now up to 50 GHz
- 2.4mm to 2.4mm
- 2.92mm to 2.92mm
- 2.92mm to 2.4mm
- 3.5mm to 3.5mm
- SMA to SMP

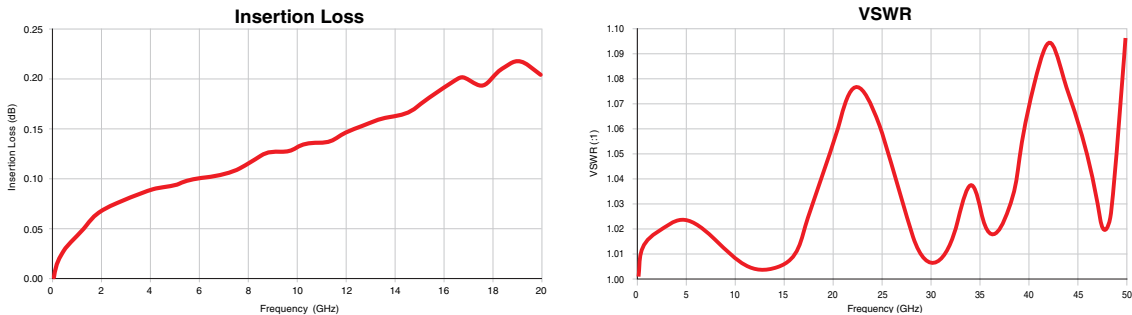


2.4mm to 2.4mm  
50Ω DC to 50 GHz



| Model Number | Conn. 1 | Conn. 2 | F Low (GHz) | F High (GHz) | VSWR (:1) Typ. | Impedance (Ω) |
|--------------|---------|---------|-------------|--------------|----------------|---------------|
| 24F-24F+     | 2.4mm-F | 2.4mm-F | DC          | 50           | 1.03           | 50            |
| 24F-24M+     | 2.4mm-F | 2.4mm-M | DC          | 50           | 1.06           | 50            |
| 24M-24M+     | 2.4mm-M | 2.4mm-M | DC          | 50           | 1.04           | 50            |

Typical Performance

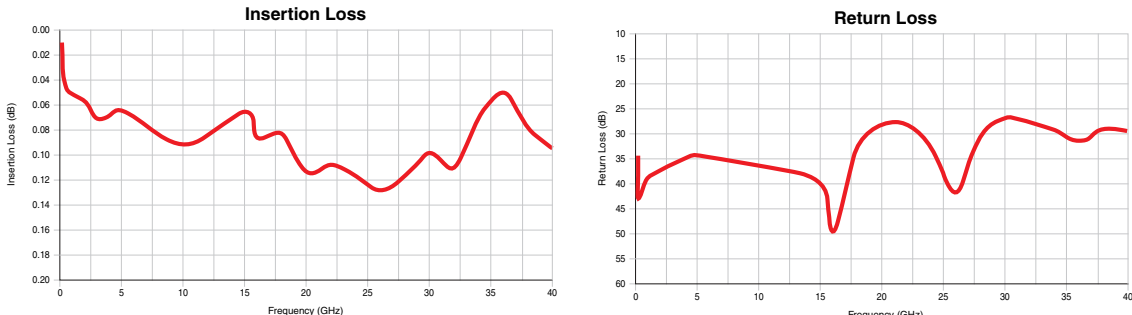


2.92mm to 2.92mm  
2.92mm to 2.4mm  
50Ω DC to 40 GHz



| Model Number | Conn. 1  | Conn. 2  | F Low (GHz) | F High (GHz) | VSWR (:1) Typ. | Impedance (Ω) |
|--------------|----------|----------|-------------|--------------|----------------|---------------|
| KF-24F+      | 2.92mm-F | 2.4mm-F  | DC          | 40           | 1.1            | 50            |
| KF-24M+      | 2.92mm-F | 2.4mm-M  | DC          | 40           | 1.1            | 50            |
| KF-KF50+     | 2.92mm-F | 2.92mm-F | DC          | 40           | 1.03           | 50            |
| KF-KM50+     | 2.92mm-F | 2.92mm-M | DC          | 40           | 1.04           | 50            |
| KFFL-KF50+   | 2.92mm-F | 2.92mm-F | DC          | 40           | 1.05           | 50            |
| KFPM-KF50+   | 2.92mm-F | 2.92mm-F | DC          | 40           | 1.08           | 50            |
| KM-24F+      | 2.92mm-M | 2.4mm-F  | DC          | 40           | 1.1            | 50            |
| KM-24M+      | 2.92mm-M | 2.4mm-M  | DC          | 40           | 1.1            | 50            |
| KM-KM50+     | 2.92mm-M | 2.4mm    | DC          | 40           | 1.02           | 50            |

Typical Performance

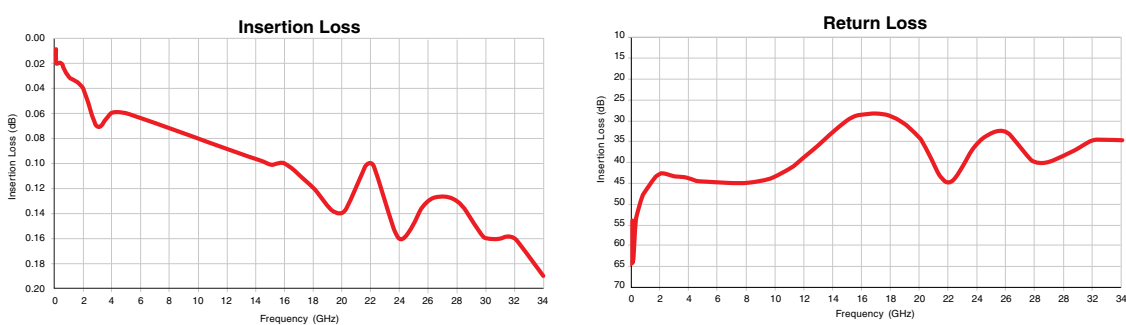


3.5mm to 3.5mm  
50Ω DC to 34 GHz



| Model Number | Conn. 1 | Conn. 2 | F Low (GHz) | F High (GHz) | VSWR (:1) Typ. | Impedance (Ω) |
|--------------|---------|---------|-------------|--------------|----------------|---------------|
| 35F-35F50+   | 3.5mm-F | 3.5mm-F | DC          | 34           | 1.07           | 50            |
| 35F-35M50+   | 3.5mm-F | 3.5mm-M | DC          | 34           | 1.07           | 50            |
| 35M-35M50+   | 3.5mm-M | 3.5mm-M | DC          | 34           | 1.02           | 50            |
| 35FFL-35F50+ | 3.5mm-F | 3.5mm-F | DC          | 33           | 1.07           | 50            |

Typical Performance

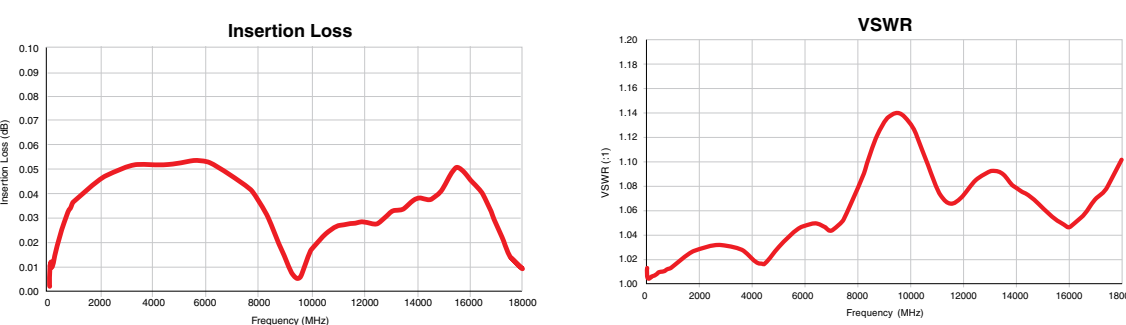


SMA to SMP  
50Ω DC to 18 GHz



| Model Number | Conn. 1 | Conn. 2 | F Low (GHz) | F High (GHz) | VSWR (:1) Typ. | Impedance (Ω) |
|--------------|---------|---------|-------------|--------------|----------------|---------------|
| SMPF-SF50+   | SMP-F   | SMA-F   | DC          | 18           | 1.07           | 50            |
| SMPF-SM50+   | SMP-F   | SMA-M   | DC          | 18           | 1.07           | 50            |

Typical Performance



# AMPLIFIERS



## H I G H L I G H T S

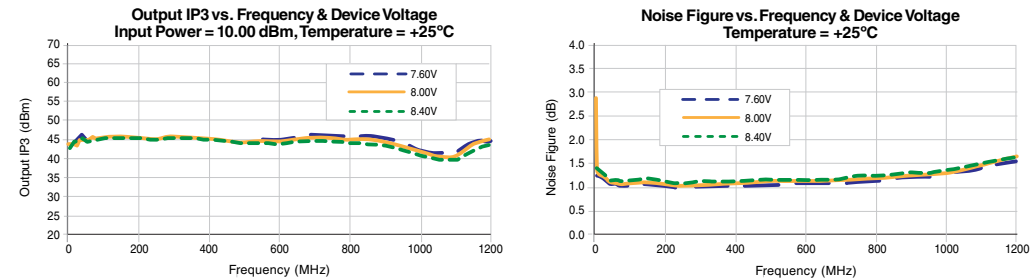
- MMIC Amplifiers Achieve +45 dBm IP3, 0.8 dB NF from 1 to 2 GHz
- MMIC Gain Block with Flat Gain from DC to 20 GHz
- Wideband MMIC LNAs with Bypass/Shutdown Feature
- Ultra-Wideband MMIC LNAs Covering 0.5 to 15 GHz
- Ultra-Wideband Connectorized Amplifiers up to 40 GHz
- Connectorized LNAs Achieve 1.4 dB Noise Figure from 0.5 to 8 GHz
- High Power Rack Mount Amplifiers and Modules Spanning 700 to 6000 MHz

Ultra-High Dynamic Range  
MMIC Amplifiers  
50Ω 1 MHz to 2 GHz



| Model Number | Frequency Range (MHz) | Noise Figure (dB) | IP3 (dBm) | P1dB (dBm) | Operating Voltage (V) | Package   |
|--------------|-----------------------|-------------------|-----------|------------|-----------------------|-----------|
| PHA-13LN+    | 1 to 1000             | 0.8               | +39       | +24        | 3-5                   | SOT-89    |
| LHA-13LN+    | 1 to 1000             | 1.1               | +38.3     | +23.3      | 3-5                   | 3x3mm QFN |
| PHA-13HLN+   | 1 to 1000             | 0.9               | +43       | +28.7      | 8                     | SOT-89    |
| LHA-13HLN+   | 1 to 1000             | 1.2               | +43.3     | +28        | 8                     | 3x3mm QFN |
| PHA-23LN+    | 30 to 2000            | 1.2               | +37.4     | +24        | 3-5                   | SOT-89    |
| LHA-23LN+    | 30 to 2000            | 1.2               | +36.9     | +23.8      | 3-5                   | 3x3mm QFN |
| PHA-23HLN+   | 30 to 2000            | 1.4               | +44.4     | +28.4      | 8                     | SOT-89    |
| LHA-23HLN+   | 30 to 2000            | 1.3               | +44.7     | +28.3      | 8                     | 3x3mm QFN |

PHA-13HLN+ Characteristic Performance

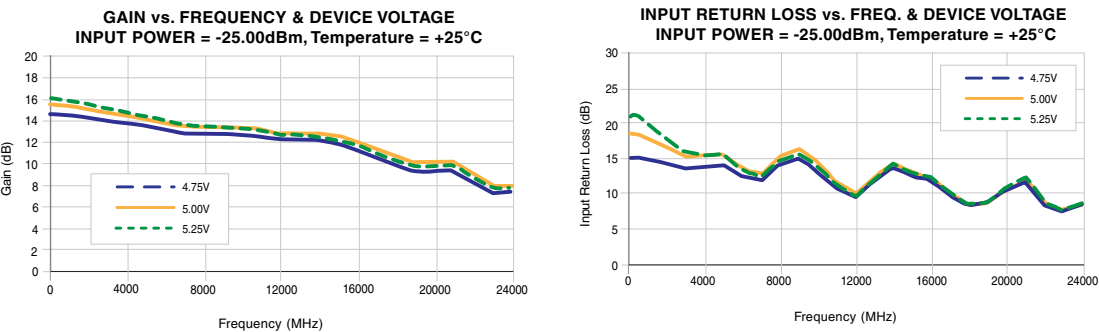


Ultra-Wideband  
MMIC Gain Block  
50Ω DC to 20 GHz



| Model Number | Frequency Range (MHz) | Gain (dB) | NF (dB) | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) | DC Current (mA) |
|--------------|-----------------------|-----------|---------|------------|----------------|-----------------|------------------|-------------|-----------------|
| EHC-24L+     | DC-20000              | 15.1      | 5.2     | 7          | 19.2           | 1.28            | 1.43             | 5           | 19.1            |

EHC-24L+ Characteristic Performance

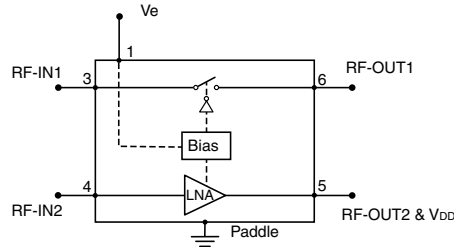


MMIC Amplifiers with  
Bypass/Shutdown Feature  
50Ω now up to 18 GHz

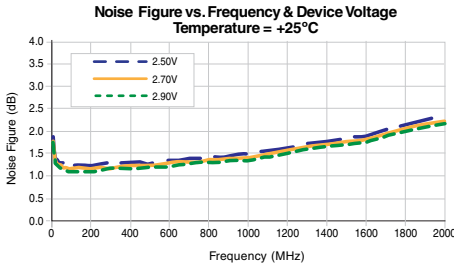


| Model Number | Frequency Range (MHz) | Gain (dB) | Noise Figure (dB) | IP3 (dBm) | P1dB (dBm) | Voltage (V) | Current (mA) |
|--------------|-----------------------|-----------|-------------------|-----------|------------|-------------|--------------|
| TSS-183A+    | 5000 to 18000         | 14.2      | 4.4               | +28.9     | +17.9      | 5           | 145          |
| TSY-13LNB+   | 30 to 1000            | 14.7      | 1.2               | +26.4     | +17.1      | 2.7         | 7.7          |
| TSY-172LNB+  | 30 to 1700            | 13.1      | 1.4               | +24.7     | +17.5      | 2.7         | 7.7          |

Simplified Schematic & Pad Description



TSY-172LNB+ Characteristic Performance

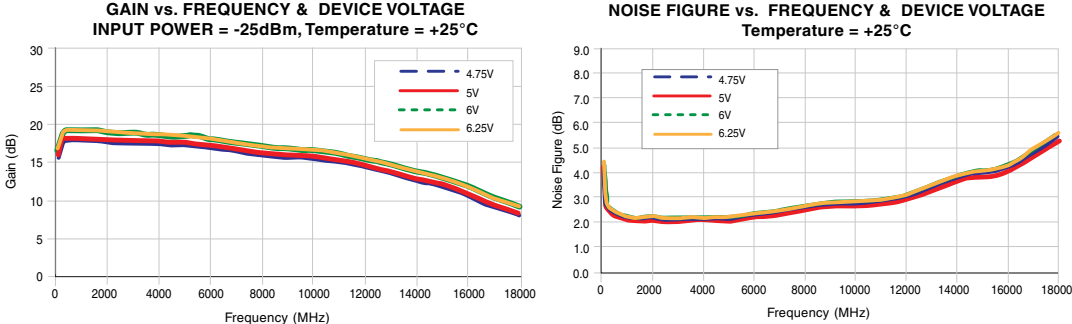


Ultra-Wideband  
MMIC LNAs  
50Ω 0.5 to 15 GHz



| Model Number | Frequency Range (MHz) | Gain (dB) | Noise Figure (dB) | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) | DC Current (mA) |
|--------------|-----------------------|-----------|-------------------|------------|----------------|-----------------|------------------|-------------|-----------------|
| PMA2-123LN+  | 500-12000             | 16.8      | 2.6               | 14.9       | 27             | 1.96            | 1.17             | 5.0/6.0     | 51/68           |
| PMA2-133LN+  | 10000-13000           | 15.3      | 1.3               | 13.5       | 28.6           | 1.24            | 1.08             | 3.0/5.0     | 13/29           |
| PMA2-153LN+  | 500-15000             | 16.8      | 2.6               | 14.8       | 26.8           | 1.97            | 1.15             | 5.0/6.0     | 50/66           |

PMA2-153LN+ Characteristic Performance





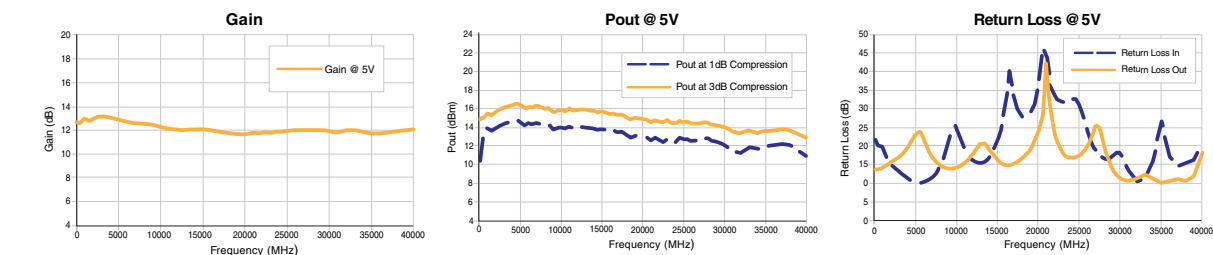
Ultra-Wideband  
Connectorized Amplifiers

50Ω 0.005 to 40 GHz



| Model Number | Frequency Range (MHz) | Gain (dB) | NF (dB) | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) | DC Current (mA) |
|--------------|-----------------------|-----------|---------|------------|----------------|-----------------|------------------|-------------|-----------------|
| ZVA-403GX+   | 0.05-40000            | 11        | 4.5     | 11         | 21             | 1.45            | 1.6              | 5           | 100             |
| ZVA-213UWX+  | 100-20000             | 14        | 3       | 16         | 29             | 1.3             | 1.4              | +12, -5     | 84              |
| ZVA-183WX-S+ | 100-18000             | 28        | 3       | 26         | 34.5           | 1.3             | 1.6              | 15          | 625             |
| ZVA-203GX+   | 1500-21000            | 29        | 3       | 15.5       | 27.5           | 1.5             | 1.6              | 5           | 450             |

ZVA-403GX+ Characteristic Performance



High Power Rack Mount Amplifiers

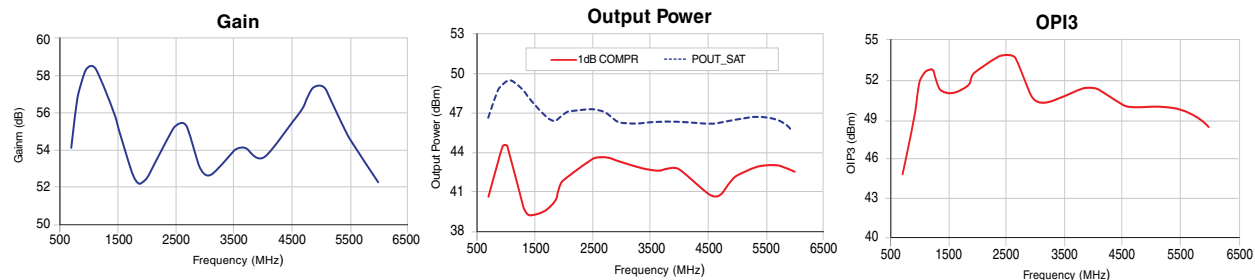
50Ω 20 to 6000 MHz

- Rugged 3U Rack Mount Chassis with Internal Fans
- Operates from AC line Power
- Built-In Over Temperature Protection
- Immunity to Open/Short Loads



| Model Number             | Frequency Range (MHz) | Gain (dB) | NF (dB) Typ. | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) |
|--------------------------|-----------------------|-----------|--------------|------------|----------------|-----------------|------------------|-------------|
| <b>NEW!</b> HPA-25W-272+ | 20-2700               | 50        | 10           | 38         | 50             | 1.3             | 2.5              | 110/220 AC  |
| <b>NEW!</b> HPA-50W-63+  | 70-6000               | 56        | 12           | 43         | 50             | 2.5             | 3                | 110/220 AC  |
| HPA-100W-63+             | 2500-6000             | 58        | 15           | 43         | 50             | 2.5             | 2.5              | 110/220 AC  |
| HPA-272+                 | 700-2700              | 48        | 8.2          | 49         | 55             | 1.3             | 1.3              | 110/220 AC  |

HPA-50W-63+ Characteristic Performance



Coaxial Wideband LNAs

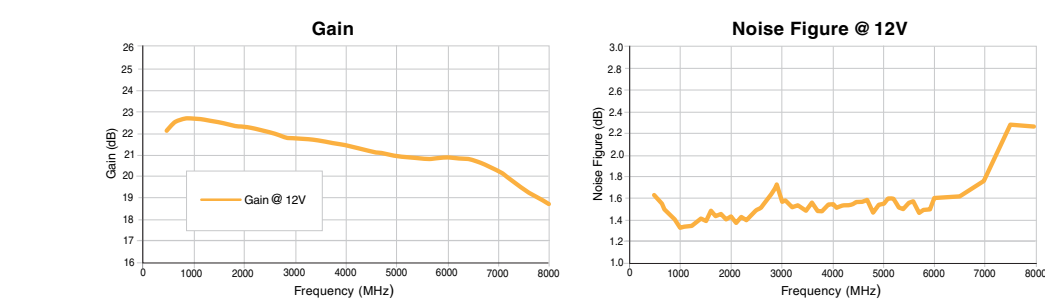
50Ω 0.5 to 8 GHz

- 12V Model Features Internal Voltage Regulator Allowing Operation at Various Voltages



| Model Number | F Low (MHz) | Gain (dB) | NF (dB) | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) | DC Current |
|--------------|-------------|-----------|---------|------------|----------------|-----------------|------------------|-------------|------------|
| ZX60-83LN+   | 500-8000    | 22.1      | 1.4     | 20.7       | 35.2           | 1.38            | 1.58             | 5.0/6.0     | 60/70      |
| ZX60-83LN12+ | 500-8000    | 22.1      | 1.4     | 20.7       | 35.2           | 1.38            | 1.58             | 12          | 77         |

ZX60-83LN12+ Characteristic Performance



High-Power Amplifier Modules

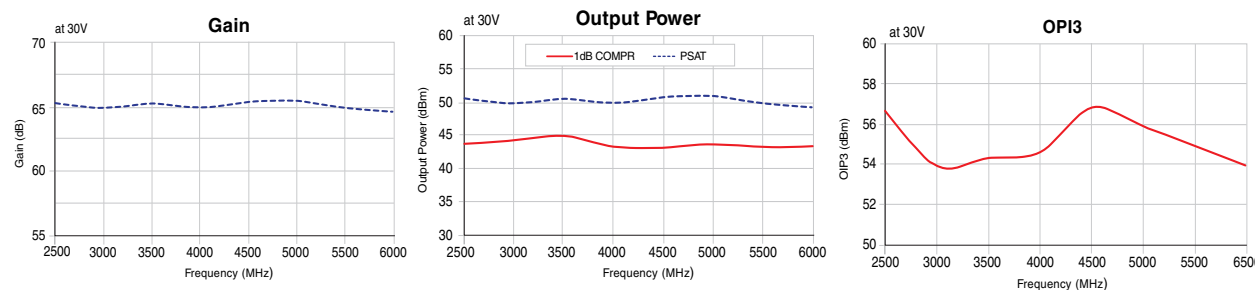
50Ω 1 MHz to 2 GHz

- Self-Protected against Overheating and Reverse Polarity
- Immunity to Open/Short Loads



| Model Number  | Frequency Range (MHz) | Gain (dB) | NF (dB) | P1dB (dBm) | Out. IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | Voltage (V) | DC Current (mA) |
|---------------|-----------------------|-----------|---------|------------|----------------|-----------------|------------------|-------------|-----------------|
| ZHL-50W-63+   | 700-6000              | 59        | 11      | 42         | 53             | 1.5             | 1.5              | 40          | 6000            |
| ZHL-50W-63X+  | 700-6000              | 59        | 11      | 42         | 53             | 1.5             | 1.5              | 40          | 6000            |
| ZHL-100W-63+  | 2500-6000             | 58        | 12      | 43         | 54             | 2               | 1.2              | 30          | 8000            |
| ZHL-100W-63X+ | 2500-6000             | 58        | 12      | 43         | 54             | 2               | 1.2              | 30          | 8000            |

ZHL-100W-63+ Characteristic Performance



# ATTENUATORS



## HIGHLIGHTS

- Coaxial Precision Fixed Attenuators from DC to 65 GHz
- MMIC Fixed Attenuators from DC to 43.5 GHz in QFN

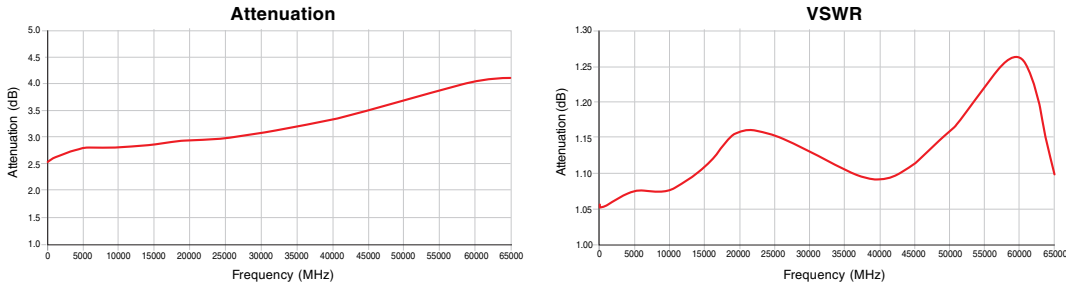
### Coaxial Precision Fixed Attenuators

50Ω **NOW!** DC to 65 GHz



| Model Number  | F Low (GHz) | F High (GHz) | Nom. Attenuation (dB) | Attenuation Accuracy (dB) | VSWR (:1) DC - 26.5 GHz Max. | VSWR (:1) 26.5 - 50 GHz Max. | VSWR (:1) 50 - 65 GHz Max. | Power (W) |
|---------------|-------------|--------------|-----------------------|---------------------------|------------------------------|------------------------------|----------------------------|-----------|
| BW-E3-1W653+  | DC          | 65           | 3                     | ±1.5                      | 1.35                         | 1.55                         | 1.65                       | 1         |
| BW-E6-1W653+  | DC          | 65           | 6                     | ±1.5                      | 1.35                         | 1.55                         | 1.65                       | 1         |
| BW-E10-1W653+ | DC          | 65           | 10                    | ±1.5                      | 1.35                         | 1.55                         | 1.65                       | 1         |
| BW-E20-1W653+ | DC          | 65           | 20                    | ±1.5                      | 1.35                         | 1.55                         | 1.65                       | 1         |

BW-E3-1W653+ Characteristic Performance



### MMIC Fixed Attenuators

50Ω DC to 43.5 GHz

- Performance to 43.5 GHz in a 2x2mm QFN Package
- Also available in bare die form



| Model Number | Freq. Range (GHz) | Nom. Atten. (dB) | Atten. (dB) Typ. DC-10 GHz | Atten. (dB) Typ. 10-20 GHz | Atten. (dB) Typ. 20-30 GHz | Atten. (dB) Typ. 30-40 GHz | VSWR (:1) Typ. DC-10 GHz | VSWR (:1) Typ. 10-20 GHz | VSWR (:1) Typ. 20-30 GHz | VSWR (:1) Typ. 30-40 GHz | Max Input Power (W) |
|--------------|-------------------|------------------|----------------------------|----------------------------|----------------------------|----------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------|
| KAT-0+       | DC - 40           | 0                | 0.03                       | 0.17                       | 0.39                       | 0.35                       | 1.08                     | 1.3                      | 1.54                     | 1.34                     | 2                   |
| KAT-1+       | DC - 40           | 1                | 0.9                        | 1                          | 1.1                        | 1.1                        | 1.11                     | 1.18                     | 1.29                     | 1.4                      | 2                   |
| KAT-2+       | DC - 40           | 2                | 2                          | 2                          | 2.2                        | 2.1                        | 1.1                      | 1.19                     | 1.38                     | 1.38                     | 2                   |
| KAT-3+       | DC - 40           | 3                | 2.9                        | 3                          | 3.2                        | 3.1                        | 1.15                     | 1.2                      | 1.35                     | 1.4                      | 2                   |
| KAT-4+       | DC - 40           | 4                | 3.9                        | 3.9                        | 4                          | 4                          | 1.12                     | 1.21                     | 1.35                     | 1.52                     | 1.7                 |
| KAT-5+       | DC - 40           | 5                | 4.9                        | 4.9                        | 5                          | 5.1                        | 1.11                     | 1.13                     | 1.29                     | 1.47                     | 1.4                 |
| KAT-6+       | DC - 40           | 6                | 6                          | 6                          | 6.1                        | 6.1                        | 1.08                     | 1.11                     | 1.26                     | 1.44                     | 1.6                 |
| KAT-7+       | DC - 40           | 7                | 7                          | 7                          | 7.1                        | 7.4                        | 1.07                     | 1.14                     | 1.31                     | 1.52                     | 1.3                 |
| KAT-8+       | DC - 40           | 8                | 8                          | 8                          | 8.2                        | 8.4                        | 1.09                     | 1.12                     | 1.3                      | 1.53                     | 1.2                 |
| KAT-9+       | DC - 40           | 9                | 8.9                        | 8.9                        | 9.1                        | 9.3                        | 1.09                     | 1.11                     | 1.26                     | 1.58                     | 1.1                 |
| KAT-10+      | DC - 40           | 10               | 9.9                        | 9.9                        | 10                         | 10.1                       | 1.09                     | 1.11                     | 1.3                      | 1.5                      | 1.7                 |
| KAT-12+      | DC - 40           | 12               | 12                         | 12.1                       | 12.2                       | 12.4                       | 1.06                     | 1.16                     | 1.31                     | 1.48                     | 1.1                 |
| KAT-15+      | DC - 40           | 15               | 15                         | 15                         | 15.1                       | 15                         | 1.11                     | 1.13                     | 1.33                     | 1.51                     | 1.4                 |
| KAT-20+      | DC - 40           | 20               | 20                         | 20                         | 19.9                       | 19.9                       | 1.09                     | 1.1                      | 1.3                      | 1.55                     | 0.8                 |
| KAT-30+      | DC - 40           | 30               | 30                         | 30.2                       | 30.1                       | 31.3                       | 1.15                     | 1.13                     | 1.36                     | 1.68                     | 1                   |



# CABLES



## HIGHLIGHTS

- HandFlex™ Interconnect Cables to 40 GHz
- Ultra-Thin (0.047" dia.) Interconnect Cables to 18 GHz
- Flexible Interconnect Cables to 18 GHz
- Phase Stable Test Cables to 40 and 50 GHz
- Temperature Stable Test Cables to 40 GHz
- Precision VNA Cables to 40 and 50 GHz

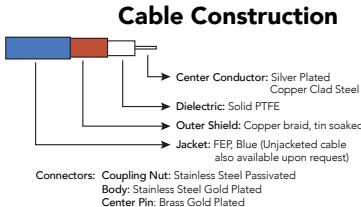
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CABLES

## 40 GHz Interconnect Cables

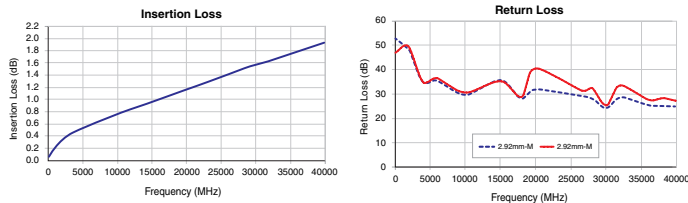
50Ω **NOW!** DC to 40 GHz

- Hand-formable
- Tight bend radius, 6mm
- 2.92mm connector



| Model Number | Length (in) | Length (cm) | Insertion Loss (dB) DC - 6 GHz | Insertion Loss (dB) 6 - 18 GHz | Insertion Loss (dB) 18 - 26.5 GHz | Insertion Loss (dB) 26.5 - 40 GHz | Return Loss (dB) DC - 6 GHz Typ. | Return Loss (dB) 6 - 18 GHz Typ. | Return Loss (dB) 18 - 26.5 GHz Typ. | Return Loss (dB) 26.5 - 40 GHz Typ. |
|--------------|-------------|-------------|--------------------------------|--------------------------------|-----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-------------------------------------|-------------------------------------|
| 086-3KM+     | 3           | 7.6         | 0.13                           | 0.23                           | 0.35                              | 0.49                              | 35                               | 35                               | 33                                  | 26                                  |
| 086-6KM+     | 6           | 15.2        | 0.22                           | 0.44                           | 0.65                              | 0.89                              | 33                               | 33                               | 31                                  | 30                                  |
| 086-9KM+     | 9           | 22.9        | 0.3                            | 0.7                            | 1.0                               | 1.4                               | 37                               | 27                               | 25                                  | 27                                  |
| 086-12KM+    | 12          | 30.5        | 0.4                            | 0.85                           | 1.3                               | 1.7                               | 34                               | 34                               | 30                                  | 24                                  |
| 086-15KM+    | 15          | 38.1        | 0.5                            | 1.1                            | 1.6                               | 2.2                               | 38                               | 27                               | 25                                  | 27                                  |
| 086-18KM+    | 18          | 45.7        | 0.5                            | 1.0                            | 1.8                               | 2.4                               | 35                               | 33                               | 27                                  | 27                                  |
| 086-24KM+    | 24          | 61.0        | 0.7                            | 1.4                            | 2.5                               | 3.2                               | 35                               | 30                               | 26                                  | 26                                  |

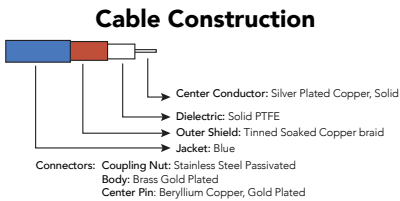
### 086-12KM+ Characteristic Performance



## Ultra-Thin Interconnect Cables

50Ω DC to 18 GHz

- Hand-formable
- Ultra-thin construction, 0.047" dia.
- Tight bend radius, 3.2mm
- Available in various SMP and SMA connector configurations

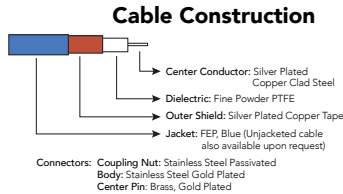


| Model Number | Length (in) | Length (cm) | Insertion Loss (dB) DC - 2 GHz | Insertion Loss (dB) 2 - 6 GHz | Insertion Loss (dB) 6 - 10 GHz | Insertion Loss (dB) 10 - 18 GHz | Return Loss (dB) DC - 2 GHz Typ. | Return Loss (dB) 2 - 6 GHz Typ. | Return Loss (dB) 6 - 10 GHz Typ. | Return Loss (dB) 10 - 18 GHz Typ. |
|--------------|-------------|-------------|--------------------------------|-------------------------------|--------------------------------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|-----------------------------------|
| 047-3SMP+    | 3           | 7.6         | 0.11                           | 0.17                          | 0.27                           | 0.34                            | 31                               | 29                              | 29                               | 28                                |
| 047-6SMP+    | 6           | 15.2        | 0.21                           | 0.37                          | 0.57                           | 0.72                            | 30                               | 28                              | 32                               | 27                                |
| 047-12SMP+   | 12          | 30.5        | 0.42                           | 0.74                          | 1.14                           | 1.51                            | 30                               | 28                              | 27                               | 27                                |
| 047-3SMPR+   | 3           | 7.6         | 0.11                           | 0.19                          | 0.31                           | 0.39                            | 31                               | 28                              | 31                               | 24                                |
| 047-6SMPR+   | 6           | 15.2        | 0.21                           | 0.37                          | 0.55                           | 0.75                            | 30.5                             | 33.3                            | 31                               | 24.7                              |
| 047-12SMPR+  | 12          | 30.5        | 0.41                           | 0.73                          | 1.14                           | 1.53                            | 31                               | 31                              | 32                               | 28                                |
| 047-3SMPC+   | 3           | 7.6         | 0.11                           | 0.19                          | 0.3                            | 0.39                            | 31                               | 28                              | 33                               | 27                                |
| 047-6SMPC+   | 6           | 15.2        | 0.21                           | 0.37                          | 0.57                           | 0.78                            | 31                               | 31                              | 30                               | 24                                |
| 047-12SMPC+  | 12          | 30.5        | 0.42                           | 0.75                          | 1.18                           | 1.55                            | 31                               | 32                              | 32                               | 25                                |
| 047-3SMPSM+  | 3           | 7.6         | 0.11                           | 0.18                          | 0.27                           | 0.35                            | 31                               | 28                              | 30                               | 27                                |
| 047-6SMPSM+  | 6           | 15.2        | 0.21                           | 0.38                          | 0.57                           | 0.75                            | 30                               | 27                              | 29                               | 26                                |
| 047-12SMPSM+ | 12          | 30.5        | 0.39                           | 0.7                           | 1.11                           | 1.51                            | 33                               | 28                              | 27                               | 26                                |

Flexible Interconnect Cables

50Ω DC to 18 GHz

- Flexible construction
- 10mm minimum bend radius
- Various lengths, diameters and connector configurations



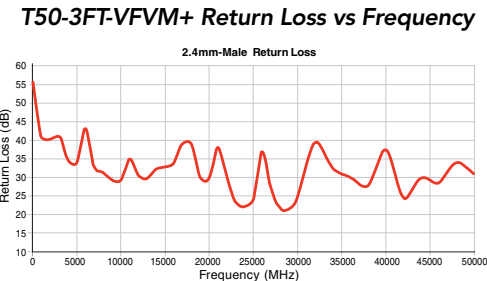
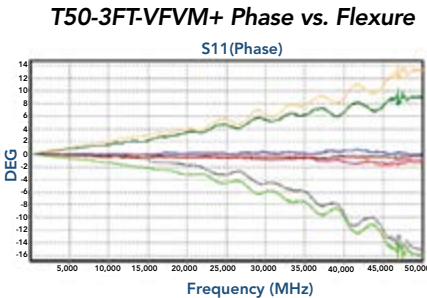
| Model Number  | Conn. 1  | Conn. 2  | Length (in) | Insertion Loss (dB) DC - 2 GHz | Insertion Loss (dB) 2 - 6 GHz | Insertion Loss (dB) 6 - 10 GHz | Insertion Loss (dB) 10 - 18 GHz | Return Loss (dB) DC - 2 GHz | Return Loss (dB) 2 - 6 GHz | Return Loss (dB) 6 - 10 GHz | Return Loss (dB) 10 - 18 GHz Typ. |
|---------------|----------|----------|-------------|--------------------------------|-------------------------------|--------------------------------|---------------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------------|
| FL086-6SM+    | SMA Male | SMA Male | 6           | 0.1                            | 0.2                           | 0.3                            | 0.4                             | 40                          | 37                         | 34                          | 33                                |
| FL086-12SM+   | SMA Male | SMA Male | 12          | 0.2                            | 0.4                           | 0.6                            | 0.9                             | 39                          | 33                         | 33                          | 29                                |
| FL086-24SM+   | SMA Male | SMA Male | 24          | 0.4                            | 0.7                           | 1.1                            | 1.5                             | 42                          | 38                         | 32                          | 29                                |
| FL086-6NM+    | N Male   | N Male   | 6           | 0.1                            | 0.2                           | 0.2                            | 0.3                             | 43                          | 40                         | 31                          | 28                                |
| FL086-12NM+   | N Male   | N Male   | 12          | 0.2                            | 0.3                           | 0.5                            | 0.6                             | 46                          | 43                         | 30                          | 30                                |
| FL086-24NM+   | N Male   | N Male   | 24          | 0.4                            | 0.7                           | 1.1                            | 1.4                             | 44                          | 39                         | 33                          | 32                                |
| FL086-6SMNM+  | SMA Male | N Male   | 6           | 0.1                            | 0.2                           | 0.4                            | 0.3                             | 40                          | 38                         | 31                          | 24                                |
| FL086-12SMNM+ | SMA Male | N Male   | 12          | 0.2                            | 0.4                           | 0.6                            | 0.7                             | 43                          | 40                         | 28                          | 25                                |
| FL086-24SMNM+ | SMA Male | N Male   | 24          | 0.4                            | 0.7                           | 1.1                            | 1.4                             | 45                          | 38                         | 31                          | 26                                |
| FL141-6SM+    | SMA Male | SMA Male | 6           | 0.1                            | 0.1                           | 0.2                            | 0.3                             | 32                          | 32                         | 29                          | 28                                |
| FL141-12SM+   | SMA Male | SMA Male | 12          | 0.1                            | 0.2                           | 0.4                            | 0.5                             | 32                          | 31                         | 28                          | 28                                |
| FL141-24SM+   | SMA Male | SMA Male | 24          | 0.2                            | 0.4                           | 0.7                            | 1                               | 34                          | 32                         | 30                          | 30                                |
| FL141-6NM+    | N Male   | N Male   | 6           | 0.1                            | 0.1                           | 0.1                            | 0.2                             | 35                          | 39                         | 33                          | 26                                |
| FL141-12NM+   | N Male   | N Male   | 12          | 0.1                            | 0.2                           | 0.3                            | 0.4                             | 34                          | 43                         | 29                          | 27                                |
| FL141-24NM+   | N Male   | N Male   | 24          | 0.2                            | 0.4                           | 0.7                            | 0.9                             | 34                          | 36                         | 33                          | 29                                |
| FL141-6SMNM+  | SMA Male | N Male   | 6           | 0.1                            | 0.1                           | 0.1                            | 0.2                             | 34                          | 32                         | 31                          | 24                                |
| FL141-12SMNM+ | SMA Male | N Male   | 12          | 0.1                            | 0.2                           | 0.4                            | 0.4                             | 32                          | 33                         | 25                          | 23                                |
| FL141-24SMNM+ | SMA Male | N Male   | 24          | 0.2                            | 0.4                           | 0.6                            | 0.9                             | 35                          | 40                         | 31                          | 24                                |



Phase Stable Test Cables

50Ω DC to 40/50 GHz

| Model Number  | Conn. 1     | Conn. 2   | Length (ft) | IL (dB) DC - 18 GHz | IL (dB) 18 - 26.5 GHz | IL (dB) 26.5 - 40 GHz | IL (dB) 40 - 50 GHz | RL (dB) DC - 18 GHz | RL (dB) 18 - 26.5 GHz | RL (dB) 26.5 - 40 GHz | RL (dB) 40 - 50 GHz |
|---------------|-------------|-----------|-------------|---------------------|-----------------------|-----------------------|---------------------|---------------------|-----------------------|-----------------------|---------------------|
| T40-2FT-KFKM+ | 2.92 Female | 2.92 Male | 2           | 1.4                 | 1.8                   | 2.2                   | -                   | 24                  | 23                    | 19                    | -                   |
| T40-2FT-KMKM+ | 2.92 Male   | 2.92 Male | 2           | 1.4                 | 1.8                   | 2.2                   | -                   | 24                  | 23                    | 19                    | -                   |
| T40-2FT-VFVM+ | 2.4 Female  | 2.4 Male  | 2           | 1.4                 | 1.8                   | 2.2                   | -                   | 27                  | 19                    | 20                    | -                   |
| T40-3FT-KFKM+ | 2.92 Female | 2.92 Male | 3           | 2                   | 2.4                   | 3.3                   | -                   | 25                  | 24                    | 20                    | -                   |
| T40-3FT-KMKM+ | 2.92 Male   | 2.92 Male | 3           | 2                   | 2.4                   | 3.3                   | -                   | 25                  | 24                    | 20                    | -                   |
| T40-3FT-VFVM+ | 2.4 Female  | 2.4 Male  | 3           | 2                   | 2.4                   | 3.3                   | -                   | 24                  | 20                    | 18                    | -                   |
| T50-2FT-VFVM+ | 2.4 Female  | 2.4 Male  | 2           | 0.9                 | 1.4                   | 1.8                   | 2.2                 | 26                  | 24                    | 23                    | 19                  |
| T50-3FT-VFVM+ | 2.4 Female  | 2.4 Male  | 3           | 2                   | 2.4                   | 3.3                   | 3.7                 | 25                  | 20                    | 20                    | 19                  |



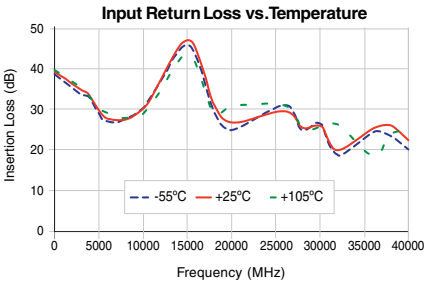
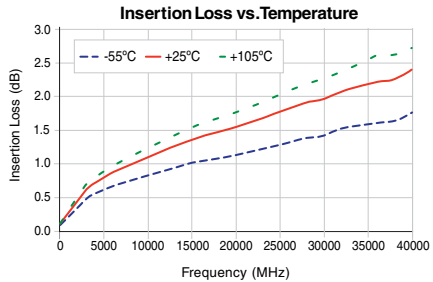
Temperature Stable Test Cables

50Ω DC to 40 GHz



| Model Number    | Conn. 1   | Conn. 2   | Length (ft) | Insertion Loss (dB) DC - 6 GHz | Insertion Loss (dB) 6 - 18 GHz | Insertion Loss (dB) 18 - 26.5 GHz | Insertion Loss (dB) 26.5 - 40 GHz | Return Loss (dB) DC - 6 GHz | Return Loss (dB) 6 - 18 GHz | Return Loss (dB) 18 - 26.5 GHz | Return Loss (dB) 26.5 - 40 GHz |
|-----------------|-----------|-----------|-------------|--------------------------------|--------------------------------|-----------------------------------|-----------------------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|
| TMP40-1M-KMKM+  | 2.92 Male | 2.92 Male | 3.28        | 1                              | 1.7                            | 2.1                               | 2.6                               | 26                          | 23                          | 20                             | 17                             |
| TMP40-3FT-KMKM+ | 2.92 Male | 2.92 Male | 3           | 1                              | 1.6                            | 2.1                               | 2.4                               | 24                          | 22                          | 17                             | 17                             |
| TMP40-6FT-KMKM+ | 2.92 Male | 2.92 Male | 6           | 1.7                            | 3                              | 3.7                               | 4.6                               | 23                          | 22                          | 18                             | 17                             |

TMP-40-3FT-KMKM+ Characteristic Performance

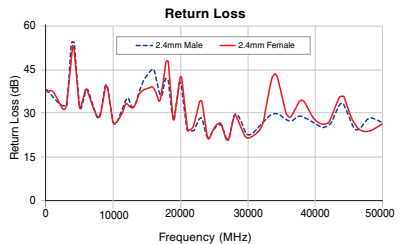
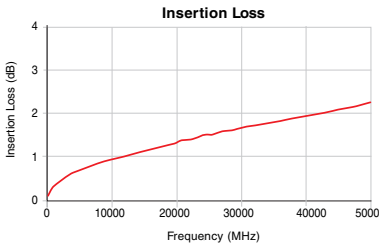
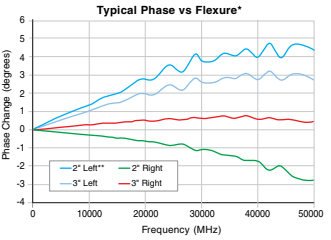


Precision VNA Cables

50Ω DC to 40 GHz

| Model Number    | Conn. 1     | Conn. 2              | Length (ft) | Insertion Loss (dB) DC - 18 GHz | Insertion Loss (dB) 18 - 26.5 GHz | Insertion Loss (dB) 26.5 - 40 GHz | Insertion Loss (dB) 40 - 50 GHz | Return Loss (dB) DC - 18 GHz | Return Loss (dB) 18 - 26.5 GHz | Return Loss (dB) 26.5 - 40 GHz | Return Loss (dB) 40 - 50 GHz |
|-----------------|-------------|----------------------|-------------|---------------------------------|-----------------------------------|-----------------------------------|---------------------------------|------------------------------|--------------------------------|--------------------------------|------------------------------|
| VNAX-2FT-VMVRF+ | 2.4mm Male  | 2.4mm Rugged Female  | 2           | 1.3                             | 1.6                               | 2                                 | 2.4                             | 21                           | 20                             | 19                             | 17                           |
| VNAC-2R1-K+     | 2.92mm Male | 2.92mm Rugged Female | 2.08        | 1.4                             | 1.8                               | 2.3                               | -                               | 23                           | 21                             | 18                             | -                            |
| VNAX-2FT-KMVRF+ | 2.92mm Male | 2.4mm Rugged Female  | 2           | 1.3                             | 1.6                               | 2                                 | -                               | 21                           | 20                             | 19                             | -                            |

VNAX-2FT-VMVR+ Characteristic Performance





# COUPLERS



- HIGHLIGHTS
- Ultra-Wideband MMIC Couplers up to 43.5 GHz
  - Coaxial Directional Couplers covering 18 to 40 GHz
  - Surface Mount Stripline Couplers up to 300W

## Ultra-Wideband MMIC Couplers

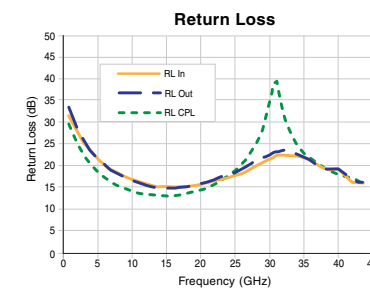
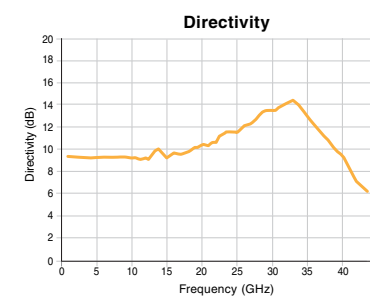
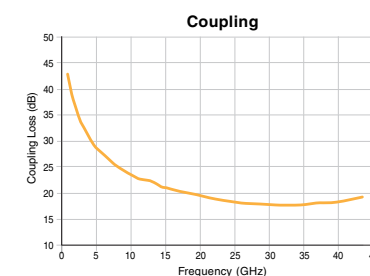
50Ω 4 to 43.5 GHz

- Excellent coupling flatness
- No external termination required
- DC passing up to 1.3A

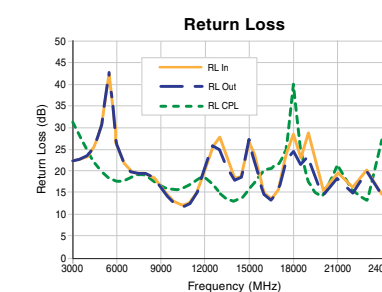
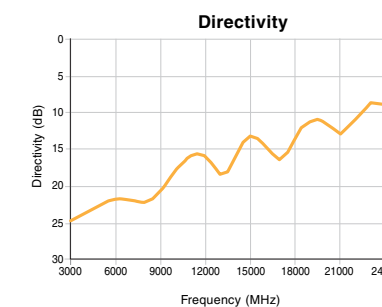
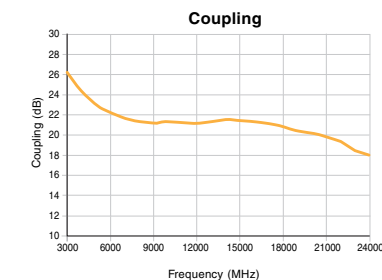


| Model Number | Freq. Range (GHz) | Type           | Coupling (dB) Nom. | Mainline Loss (dB) Typ. | Directivity (dB) Typ. | VSWR (:1) Typ. | Power Input Max. (W) | Interface |
|--------------|-------------------|----------------|--------------------|-------------------------|-----------------------|----------------|----------------------|-----------|
| EDC21-24+    | 4-20              | Directional    | 21                 | 0.7                     | 19                    | 1.37           | 1.77                 | 4x4mm QFN |
| EDC21-24-D+  | 4-20              | Directional    | 21                 | 0.7                     | 19                    | 1.37           | 1.77                 | Die       |
| EDC19-KA-D+  | 5-43.5            | Directional    | 18.3               | 0.5                     | 9.3                   | 1.4            | 1.47                 | Die       |
| EBDC19-KA-D+ | 5-43.5            | Bi-Directional | 18.7               | 0.6                     | 10                    | 1.45           | 1.45                 | Die       |

EDC19-KA-D+  
Characteristic Performance



EDC21-24-D+  
Characteristic Performance





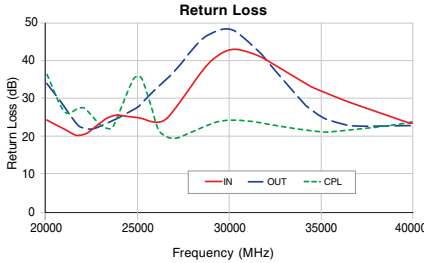
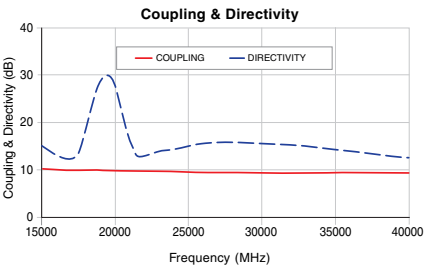
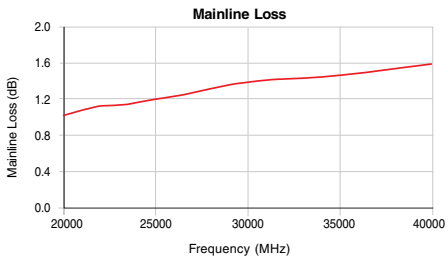
Ultra-Wideband Coaxial Couplers  
50Ω 18 to 40 GHz

- Excellent coupling flatness
- DC passing up to 3A

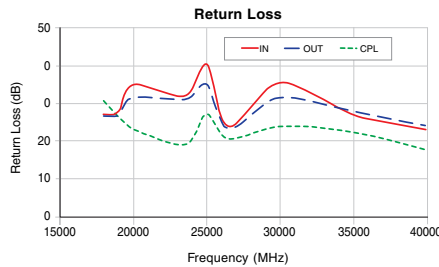
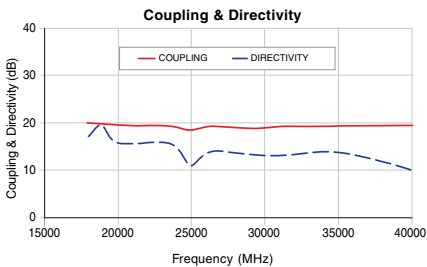
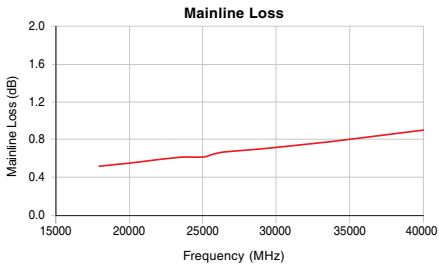


| Model Number   | F Low (MHz) | F High (MHz) | Coupling (dB) Nom. | Mainline Loss (dB) Typ. | Directivity (dB) Typ. | VSWR (:1) Typ. | Power Input Max. (W) | Type        |
|----------------|-------------|--------------|--------------------|-------------------------|-----------------------|----------------|----------------------|-------------|
| ZDC10-20403-K+ | 20000       | 40000        | 10                 | 1.2                     | 13                    | 1.22           | 20                   | Directional |
| ZDC20-20403-K+ | 18000       | 40000        | 20                 | 0.9                     | 12                    | 1.25           | 20                   | Directional |

ZDC10-20403-K+ Characteristic Performance



ZDC20-20403-K+ Characteristic Performance



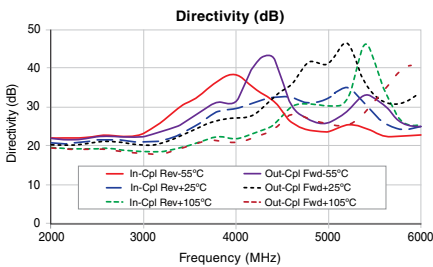
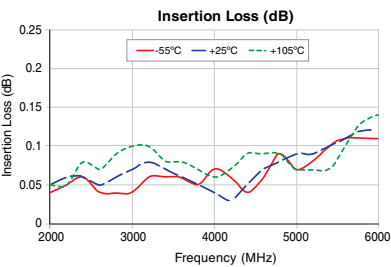
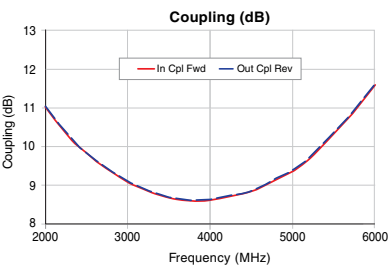
High-Power Stripline Couplers  
50 and 75Ω 20 to 6000 MHz

- Input power up to 300W
- Small, surface mount form factors
- Bandwidths as wide as 10:1
- Very low insertion loss

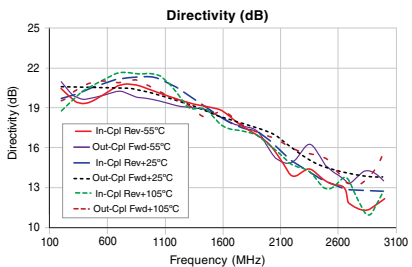
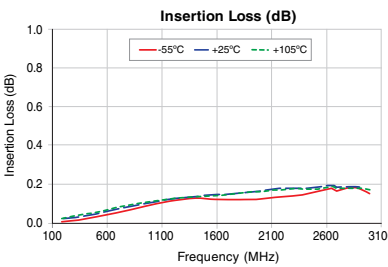
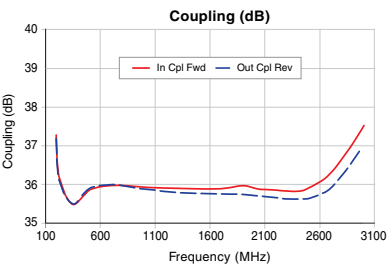


| Model Number   | Freq Range. (MHz) | Type             | Coupling (dB) Nom. | Mainline Loss (dB) Typ. | Directivity (dB) Typ. | VSWR (:1) Typ. | Power Input Max. (W) |
|----------------|-------------------|------------------|--------------------|-------------------------|-----------------------|----------------|----------------------|
| BDCH-10-63     | 2000-6000         | Bi-Directional   | 10                 | 0.1                     | 22                    | 1.12           | 100                  |
| BDCH-15-272    | 700-2700          | Bi-Directional   | 15                 | 0.25                    | 19                    | 1.13           | 150                  |
| BDCH-20-272    | 700-2700          | Bi-Directional   | 21                 | 0.25                    | 21                    | 1.12           | 150                  |
| BDCH-25-272    | 700-2700          | Bi-Directional   | 26                 | 0.2                     | 18                    | 1.2            | 150                  |
| BDCH-35-272    | 700-2700          | Bi-Directional   | 35                 | 0.2                     | 16                    | 1.3            | 150                  |
| BDCH46-122-75+ | 40-1250 (75Ω)     | Bi-Directional   | 14-46              | 0.15                    | 19                    | 1.12           | 2                    |
| DDCH-35-252+   | 225-2500          | Dual-Directional | 36                 | 0.15                    | 19                    | 1.1            | 100                  |
| DDCH-50-13+    | 20-1000           | Dual-Directional | 50                 | 0.15                    | 24.5                  | 1.06           | 300                  |
| DDCH-50-521+   | 20-520            | Dual-Directional | 50                 | 0.07                    | 21                    | 1.05           | 300                  |
| MBDA-30-451HP  | 225-450           | Bi-Directional   | 30.5               | 0.15                    | 28                    | 1.07           | 200                  |
| MBDC-13-63HP   | 2000-6000         | Bi-Directional   | 12.8               | 0.1                     | 23                    | 1.15           | 100                  |
| MBDC-20-63HP   | 2000-6000         | Bi-Directional   | 20.25              | 0.15                    | 23                    | 1.17           | 100                  |

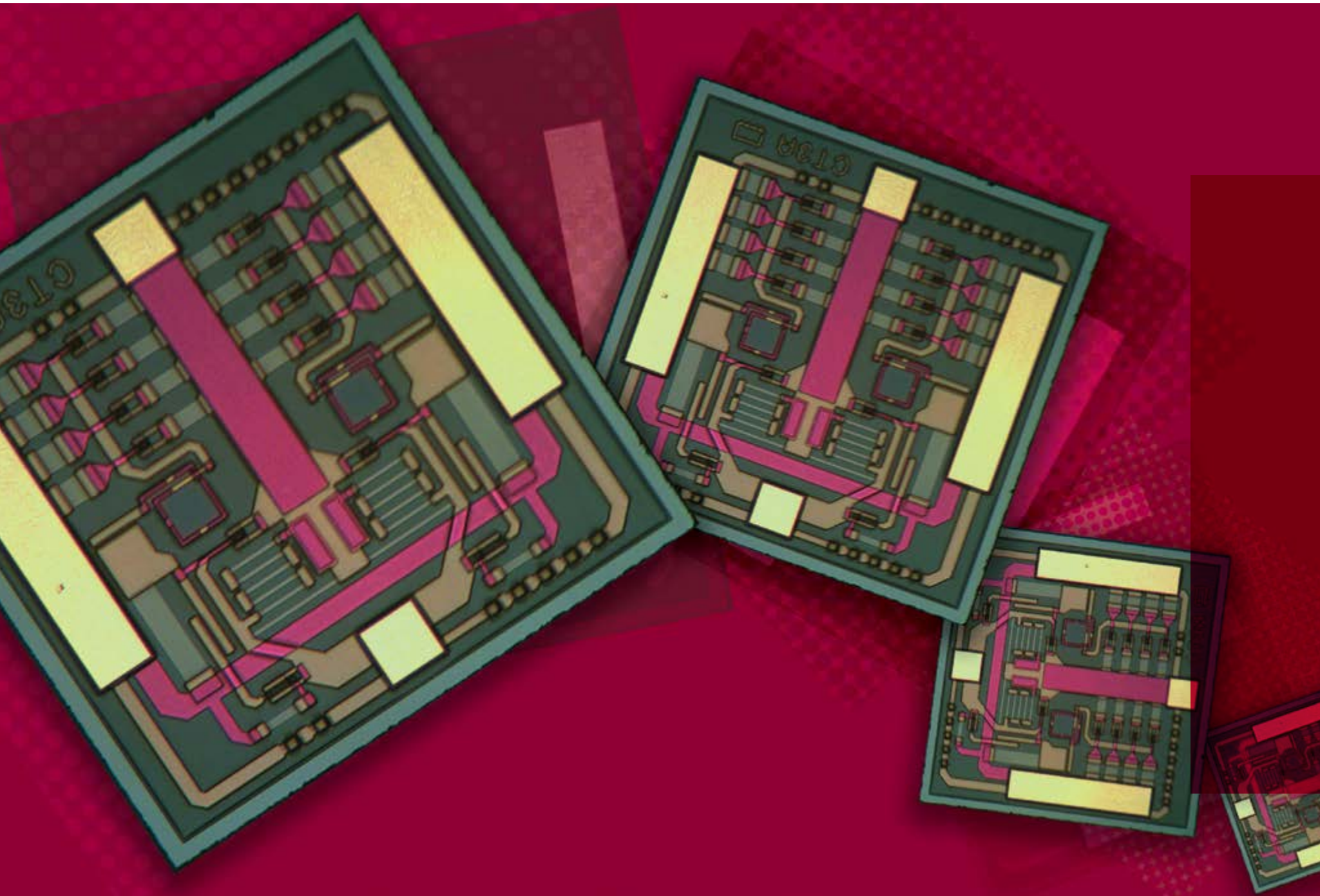
BDCH-10-63 Characteristic Performance



DDCH-35-252+ Characteristic Performance



# DIE PARTS



## HIGHLIGHTS

- One of the Industry's Widest Selections of MMIC Die Products
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  - Mixers
  - Multipliers
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Amplifiers

| Model Number  | Frequency Range (MHz) | Gain (dB) | P1dB (dBm) | NF (dB) | IP3 (dBm) | Input VSWR (:1) | Output VSWR (:1) | DC Voltage (V) | DC Current (mA)     | Features              |
|---------------|-----------------------|-----------|------------|---------|-----------|-----------------|------------------|----------------|---------------------|-----------------------|
| AVA-24A-D+    | 5000-22000            | 13        | 19.2       | 5.8     | 25        | 1.3             | 1.9              | 5              | 126                 | Wideband              |
| AVA-183A-D+   | 5000-20000            | 14.5      | 18.2       | 4.3     | 25        | 1.6             | 1.7              | 5              | 131                 | Wideband              |
| EHA-24L-D+    | DC-20000              | 13.4      | 6.8        | 5.1     | 16.6      | 1.433           | 1.377            | 5              | 19.1                | Low Current, Wideband |
| GALI-39-D+    | DC-7000               | 19.7      | 10.5       | 2.4     | 22.9      | 1.79            | 2.3              | 3.5            | 35                  | Wideband              |
| MAR-8A-D+     | DC-1000               | 31.5      | 12.5       | 3.1     | 25        | 1.4             | 1.79             | 3.7            | 36                  | High Gain             |
| PHA-1-D+      | 50-6000               | 13.6      | 22.5       | 2.1     | 39        | 1.6             | 1.3              | 5              | 155                 | High IP3              |
| PHA-1H-D+     | 50-6000               | 13.8      | 22.6       | 2.2     | 41        | 1.39            | 1.23             | 5              | 132                 | High Dynamic Range    |
| PHA-13HLN-D+  | 1-1000                | 23        | 19/24/18   | 1.1     | 33/40/43  | 1.34            | 1.3              | 3/5/8          | 71/138/234          | High Dynamic Range    |
| PHA-23HLN-D+  | 30-2000               | 21        | 19/24/28   | 1.2     | 31/37/44  | 1.94            | 1.48             | 3/5/8          | 72/141/235          | High Dynamic Range    |
| PMA2-133LN-D+ | 10000-13000           | 15.3      | 13.5       | 1.3     | 28.6      | 1.24            | 1.08             | 3/5            | 13/29               | Low Noise             |
| PMA2-153LN-D+ | 500-15000             | 16.8      | 14.8       | 2.6     | 26.8      | 1.97            | 1.15             | 5.0/6.0        | 50/66               | Wideband, Low Noise   |
| 500-15000     | 16.8                  | 14.8      | 2.6        | 26.8    | 1.97      | 1.15            | 5.0/6.0          | 50/66          | Wideband, Low Noise | Wideband, Low Noise   |
| TSS-53LNB-D+  | 500-6000              | 21.4      | 20.7       | 1.3     | 35        | 1.2             | 1.4              | 5              | 82                  | Bypass                |
| TSY-172LNB-D+ | 30-1700               | 13.1      | 17.5       | 1.4     | 24.7      | 1.9             | 1.5              | 2.7            | 7.7                 | Bypass                |

Couplers

| Model Number | Frequency Range (MHz) | Coupling (dB) Nom. | Mainline Loss (dB) | Directivity (dB) | VSWR (:1) | Power Input Max. (W) | Construction | Feature | Type           |
|--------------|-----------------------|--------------------|--------------------|------------------|-----------|----------------------|--------------|---------|----------------|
| EBDC19-KA-D+ | 5000-43500            | 18.7               | 0.6                | 10               | 1.45      | 1.45                 | MMIC         | 1W      | Bi-Directional |
| EDC19-KA-D+  | 5000-43500            | 18.3               | 0.5                | 9.6              | 1.4       | 1.47                 | MMIC         | 1W      | Directional    |
| EDC21-24-D+  | 4000-20000            | 21                 | 0.7                | 19               | 1.37      | 1.77                 | MMIC         | 0.89W   | Directional    |

Fixed Equalizers

| Model Number | Freq. Low (MHz) | Insertion Loss (dB) @ Freq. Low | Insertion Loss (dB) @ Freq. High | VSWR(:1) Typ. Input | VSWR(:1) Typ. Output | Max Input Power (dBm) |
|--------------|-----------------|---------------------------------|----------------------------------|---------------------|----------------------|-----------------------|
| EQY-1-63-D+  | DC-6000         | 1.6                             | 0.4                              | 1.24                | 1.24                 | 31                    |
| EQY-2-63-D+  | DC-6000         | 2.5                             | 0.4                              | 1.29                | 1.29                 | 31                    |
| EQY-3-63-D+  | DC-6000         | 3.8                             | 0.6                              | 1.29                | 1.29                 | 31                    |
| EQY-4-63-D+  | DC-6000         | 4.8                             | 0.6                              | 1.25                | 1.25                 | 31                    |
| EQY-5-63-D+  | DC-6000         | 6                               | 1                                | 1.24                | 1.24                 | 31                    |
| EQY-6-63-D+  | DC-6000         | 7                               | 0.5                              | 1.2                 | 1.2                  | 32                    |
| EQY-8-63-D+  | DC-6000         | 8.7                             | 0.5                              | 1.21                | 1.21                 | 31                    |
| EQY-10-63-D+ | DC-6000         | 11.2                            | 1                                | 1.12                | 1.12                 | 31                    |

Reflectionless Filters

| Model Number | Passband F1 (MHz) | Passband F2 (MHz) | Stopband F3 (MHz) | Rejection @ F3 (dB) | Stopband F4 (MHz) | Rejection @ F4 (dB) | Filter Type |
|--------------|-------------------|-------------------|-------------------|---------------------|-------------------|---------------------|-------------|
| XBF-163-D+   | 15500             | 16500             | DC - 8000         | 77                  | 24000 - 30000     | 53                  | Band Pass   |
| XBF-183-D+   | 17500             | 18500             | DC - 9000         | 77                  | 27000 - 32000     | 50                  | Band Pass   |
| XBF-24-D+    | 19500             | 20500             | DC - 10000        | 76                  | 30000 - 32000     | 49                  | Band Pass   |
| XHF-63M-D+   | 5900 - 26000      | 5000              | 3000 - 4100       | 34                  | DC - 3000         | 38                  | High Pass   |
| XHF-14M-D+   | 9900 - 26000      | 8800              | 5000 - 7000       | 32                  | DC - 5000         | 41                  | High Pass   |
| XHF-143M-D+  | 13900 - 26000     | 11200             | 7000 - 9000       | 30                  | DC - 7000         | 41                  | High Pass   |

Ultra-Wideband Splitter/Combiners

| Model Number | Frequency Range (MHz) | Isolation (dB) | Insertion Loss (dB) above 3 dB | Phase Unbalance (deg) | Amplitude Unbalance (dB) | Features   |
|--------------|-----------------------|----------------|--------------------------------|-----------------------|--------------------------|------------|
| EP2C-D+      | 1800-12500            | 19.7           | 0.9                            | 3.2                   | 0.09                     | DC Passing |
| EP2K-D+      | 2000-26500            | 18.9           | 1.6                            | 6                     | 0.2                      | DC Passing |
| EP2W-D+      | 500-9500              | 19.4           | 1.8                            | 1.7                   | 0.1                      | DC Passing |
| EP2KA-D+     | 10000-43500           | 22             | 0.9                            | 6.1                   | 0.22                     | DC Passing |

90° Hybrids

| Model Number | Frequency Range (MHz) | Isolation (dB) | Insertion Loss (dB) above 3 dB | Phase Unbalance (deg) | Amplitude Unbalance (dB) |
|--------------|-----------------------|----------------|--------------------------------|-----------------------|--------------------------|
| EPQ-113-D+   | 5000-11000            | 19             | 0.6                            | 1.4                   | 1.5                      |
| EPQ-133-D+   | 6000-14000            | 20             | 0.6                            | 8.8                   | 1.6                      |

Mixers

| Model Number | LO Level (dBm) | RF in @ 1 dB Comp. (dBm) | LO/RF Frequency Range (MHz) | IF Frequency Range (MHz) | Conversion Loss (dB) | LO-RF Isolation (dB) | LO-IF Isolation (dB) | IP3 (dBm) at Center Band |
|--------------|----------------|--------------------------|-----------------------------|--------------------------|----------------------|----------------------|----------------------|--------------------------|
| MDB-24H-D+   | 15             | 10                       | 5000-21500                  | DC-5000                  | 7.9                  | 35                   | 44                   | 23                       |
| MDB-44H-D+   | 15             | 10                       | 10000-40000                 | DC-15000                 | 8.4                  | 37                   | 37                   | 20                       |
| MDB-73H-DG+  | 15             | 10                       | 2200-7000                   | DC-1600                  | 8.5                  | 40                   | 51.6                 | 18.2                     |

Frequency Doublers

| Model Number | Input Frequency Range (MHz) | Output Frequency Range (MHz) | RF Input Power Range (dBm) | Conv. Loss (dB) Typ. | F1 Harmonic Output Below F2 (dBc) Typ. | F3 Harmonic Output Below F2 (dBc) Typ. | F4 Harmonic Output Below F2 (dBc) Typ. |
|--------------|-----------------------------|------------------------------|----------------------------|----------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| CY2-44-D+    | 7000-20000                  | 14000-40000                  | 12-18                      | 13                   | 30                                     | 30                                     | 10                                     |
| CY2-143-D+   | 2000-7000                   | 4000-14000                   | 12-18                      | 12                   | 30                                     | 32                                     | 17                                     |
| CY2-283-D+   | 3500-14000                  | 7000-28000                   | 12                         | 13                   | 35                                     | 34                                     | 23                                     |

# FILTERS/DIPLEXERS

FD

FILTERS/DIPLEXERS

## High-Q Suspended Substrate Filters and Diplexers

50Ω DC to 26 GHz

- Wide passband width
- Stopband width up to  $6 \times F_c$
- Very high rejection, 90 dB typ.
- Outstanding selectivity
- Power handling up to 3W



### Filter Models

| Model Number | Passband (MHz) | Stopband F3 (MHz) | Rejection @ F3 (dB) | Stopband F4 (MHz) | Rejection @ F4 (dB) |
|--------------|----------------|-------------------|---------------------|-------------------|---------------------|
| ZBSS-7975+   | 7825-8125      | DC-6900           | 35                  | 9350-15000        | 35                  |
| ZHSS-8G+     | 160-2500       | 5300-5800         | 20                  | DC-5300           | 40                  |
| ZLSS-11G+    | 11000-11400    | 12500-14500       | 20                  | 14500-26500       | 40                  |
| ZLSS-14G+    | 14000-15100    | 16500-18000       | 20                  | 18000-26500       | 40                  |
| ZLSS-2R8G+   | 2800-3300      | 4000-4700         | 20                  | 4700-26500        | 40                  |
| ZLSS-4G+     | 4000-4500      | 5500-6300         | 20                  | 6300-26500        | 40                  |
| ZLSS-6G+     | 6000-6600      | 8200-9600         | 20                  | 9600-26500        | 40                  |
| ZLSS-8G+     | 8000-8600      | 10800-12500       | 20                  | 12500-26500       | 40                  |

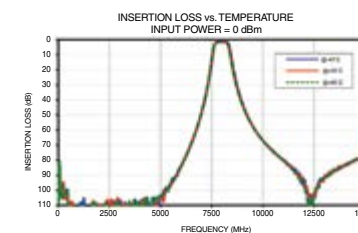
### Diplexer Models

| Model Number | Passband (MHz)        | Passband IL (dB) | Rejection (dB)                          | Return Loss (dB) |
|--------------|-----------------------|------------------|-----------------------------------------|------------------|
| ZDSS-3G4G+   | DC-3000<br>4000-20000 | 1.5              | 30 @ 4000-20000 MHz<br>15 @ DC-3000 MHz | 10               |

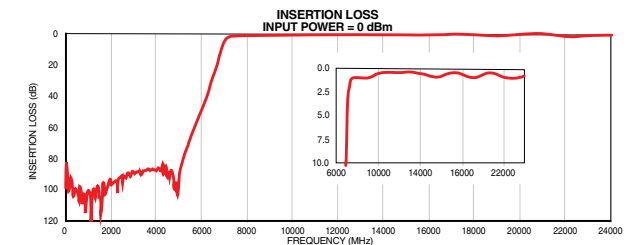
### HIGHLIGHTS

- Suspended Substrate Filters and Diplexers
- Tiny LTCC Bandpass Filters with  $F_c$  down to 415 MHz
- Coaxial 75Ω Diplexers for CATV/ Broadband Systems
- Ceramic Resonator Bandpass Filters
- High-Rejection MMIC Reflectionless Filters

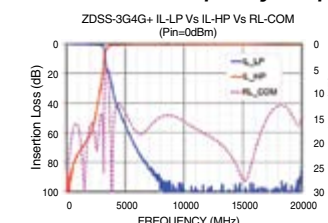
### ZBSS-7975+ Frequency Response



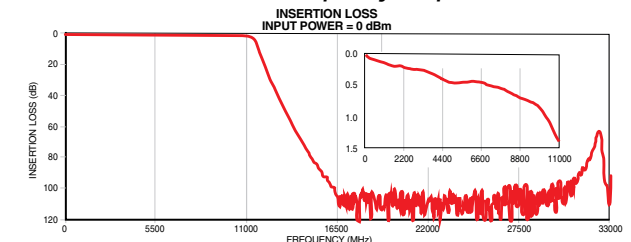
### ZHSS-8G+ Frequency Response



### ZDSS-3G4G+ Frequency Response



### ZLSS-11G+ Frequency Response





LTCC Bandpass Filters

50Ω F<sub>c</sub> from 415 to 618 MHz

- New Low frequency passbands
- Very small size, 0.15 x 0.15 x 0.059
- Rugged LTCC construction
- Power handling up to 4W



| Model Number | Passband (MHz) | F <sub>c</sub> (MHz) | Lower Stopband (MHz) | Lower Stopband Rejection (dB) | Upper Stopband (MHz) | Upper Stopband Rejection (dB) |
|--------------|----------------|----------------------|----------------------|-------------------------------|----------------------|-------------------------------|
| BFTC-415+    | 330-500        | 415                  | 1-240                | 20                            | 650-1800             | 20                            |
| BFTC-500+    | 400-600        | 500                  | 1-290                | 20                            | 800-2000             | 20                            |
| BFTC-615+    | 450-780        | 615                  | 1-320                | 20                            | 970-2400             | 20                            |
| BFTC-618+    | 460-776        | 618                  | 1-330                | 20                            | 980-2400             | 20                            |

BFTC-415+ Frequency Response



Coaxial Broadband Diplexers

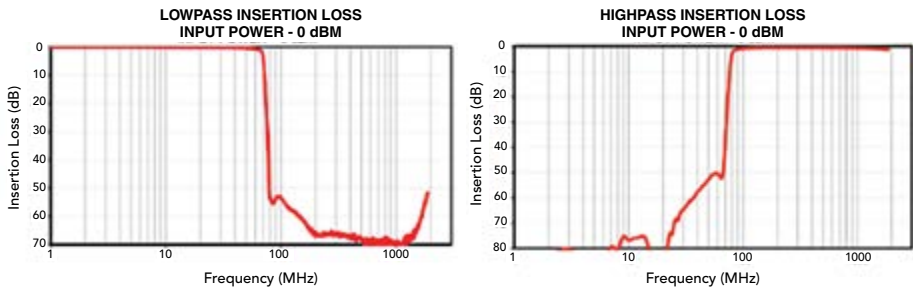
75Ω Various Splits from 5 to 1700 MHz

- Ideal for DOCSIS 3.1 systems with extended range



| Model Number    | Passband (MHz) | Passband IL (dB) | Rejection (dB) | Return Loss (dB) | Crossover Isolation (dB) |
|-----------------|----------------|------------------|----------------|------------------|--------------------------|
| ZDPL-4254-75-F+ | 54-1700        | 1                | 50 @ 5-42      | 22               | 40                       |
|                 | 5-42           |                  | 50 @ 54-1700   | 24               |                          |
| ZDPL-6588-75-F+ | 88-1700        | 1.2              | 50 @ 5-65      | 20               | 35                       |
|                 | 5-65           |                  | 50 @ 88-1700   |                  |                          |
| ZDPL-8510-75-F+ | 102-1400       | 1.6              | 45 @ 5-85      | 20               | 30                       |
|                 | 5-85           |                  | 50 @ 102-1400  | 22               |                          |

ZDPL-6588-75-F+ Frequency Response



Ceramic Resonator Bandpass Filters

50Ω Various Passbands

- Power handling up to 8W
- Fractional bandwidth from 3 to 25%
- High stopband rejection, up to 35 dB
- Excellent selectivity
- Small size



New Releases (See Full Model List on our Website)

| Model Number | Passband (MHz) | F <sub>c</sub> (MHz) | Lower Stopband (MHz) | Lower Stopband Rejection (dB) | Upper Stopband (MHz) | Upper Stopband Rejection (dB) |
|--------------|----------------|----------------------|----------------------|-------------------------------|----------------------|-------------------------------|
| CBP-2250A+   | 2000-2500      | 2250                 | DC-1630              | 20                            | 2900-6000            | 35                            |
| CBP-1060Q+   | 1030-1090      | 1060                 | 500-930              | 20                            | 1190-1400            | 20                            |
| CBP-1320Q+   | 1280-1360      | 1320                 | 900-1170             | 20                            | 1490-20000           | 20                            |
| CBP-5800AG+  | 5725-5825      | 5800                 | DC-5100              | 20                            | 6250-7300            | 20                            |

Reflectionless Filters with High Rejection

50Ω Various Passbands

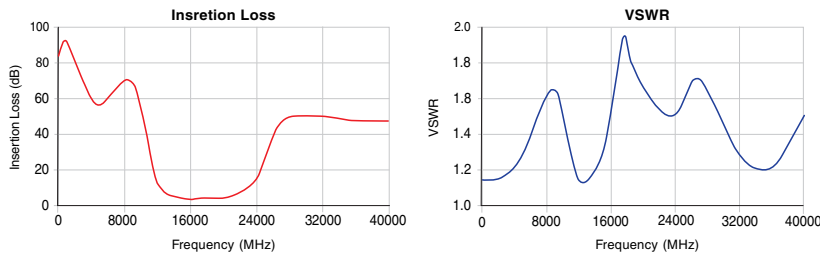
- Patented design terminates stopband signals
- New multi-section designs achieve stopband rejection up to 76 dB
- Available in QFN and bare die



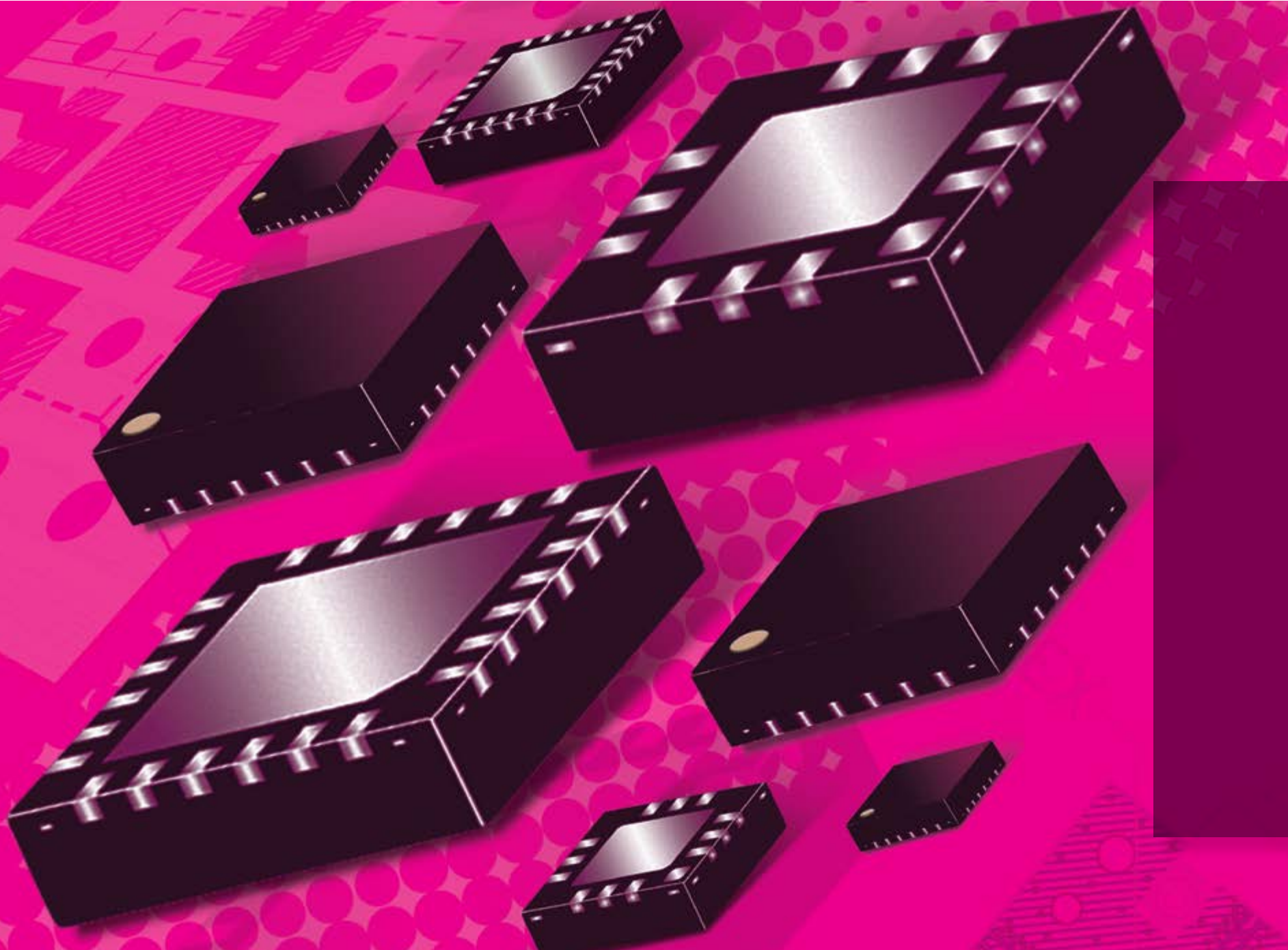
New Releases (See Full Model List on our Website)

| Model Number | Passband (MHz) | Stopband F3 (MHz) | Rejection @ F3 (dB) | Stopband F4 (MHz) | Rejection @ F4 (dB) |
|--------------|----------------|-------------------|---------------------|-------------------|---------------------|
| XBF-163-DG+  | 15500-16500    | DC-8000           | 55                  | 24000-40000       | 55                  |
| XBF-183-DG+  | 17500-18500    | DC-9000           | 55                  | 27000-40000       | 55                  |
| XBF-24-DG+   | 19500-20500    | DC-10000          | 76                  | 30000-40000       | 49                  |
| XHF-63M-DG+  | 5900-26000     | 3000-4100         | 30                  | DC-3000           | 40                  |
| XHF-14M-DG+  | 9900-26000     | 5000-7000         | 30                  | DC-5000           | 40                  |
| XHF-143M-DG+ | 13900-26000    | 7000-8000         | 30                  | DC-7000           | 40                  |
| XHF-14M+     | 9900-20000     | 5000-7000         | 30                  | DC-5000           | 40                  |
| XHF-63M+     | 5900-19000     | 3000-4100         | 30                  | DC-3000           | 40                  |
| XHF-143M+    | 13900-19000    | 7000-8000         | 30                  | DC-7000           | 40                  |

XBF-183-D+ Typical Performance



# MIXERS



## H I G H L I G H T S

- Ultra-Wideband MMIC Mixers up to 40 GHz
- MMIC Active Mixer
- High IP3 Mixer for VHF/UHF



Wideband Double Balanced Mixers

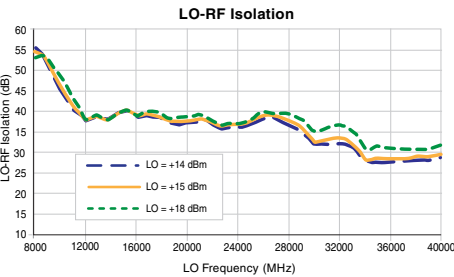
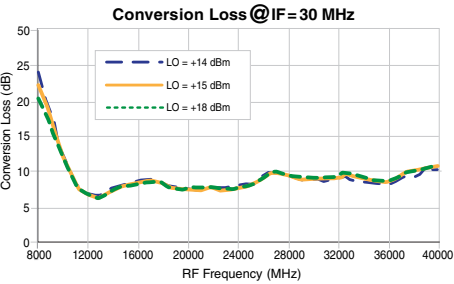
50Ω 5 to 40 GHz Level 15

- Ideal for frequency conversion in 5G applications
- Useable as up & down Converter
- Available in 3x3mm QFN and bare die

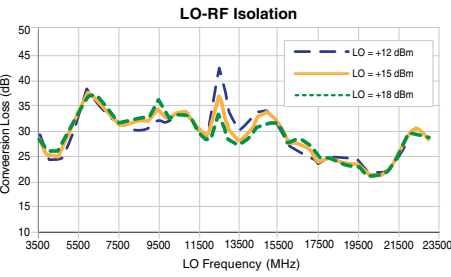
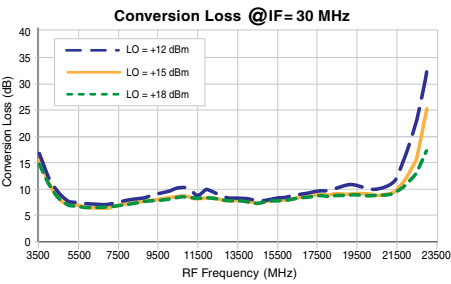


| Model Number | RF in @ 1 dB Comp. (dBm) Typ. | RF/LO Freq. Range (MHz) | IF Freq. Range (MHz) | Conv. Loss (dB) Typ. | Conv. Loss (dB) (σ) | Conv. Loss (dB) Max. | LO-RF Isolation (dB) Typ. | LO-IF Isolation (dB) Typ. | IP3 (dBm) Typ. |
|--------------|-------------------------------|-------------------------|----------------------|----------------------|---------------------|----------------------|---------------------------|---------------------------|----------------|
| MDB-44H+     | 10                            | 10000-40000             | DC-15000             | 8.4                  | 0.05                | 13.2                 | 37                        | 37                        | 20             |
| MDB-24H+     | 10                            | 5000-21500              | DC-5000              | 7.9                  | 0.18                | 11.7                 | 35                        | 44                        | 23             |

MDB-44H+ Characteristic Performance



MDB-24H+ Characteristic Performance



MMIC Active Mixer

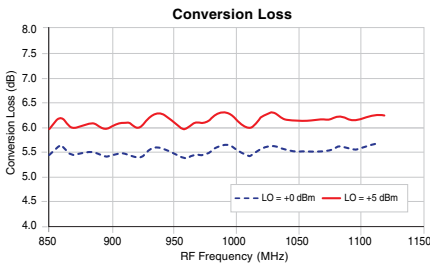
50Ω 850 to 1200 MHz Level 0

- Low conversion loss, 5.5 dB typ.
- Can be used at alternate frequency bands up to 2 GHz by adjusting off-chip L-C values

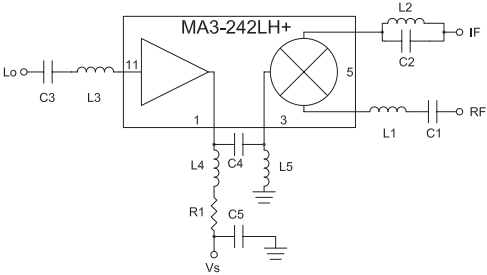


| Model Number | RF in @ 1 dB Comp. (dBm) Typ. | RF/LO Freq. Range (MHz) | IF Freq. Range (MHz) | Conv. Loss (dB) Typ. | LO-RF Isolation (dB) Typ. | LO-IF Isolation (dB) Typ. | IP3 (dBm) Typ. |
|--------------|-------------------------------|-------------------------|----------------------|----------------------|---------------------------|---------------------------|----------------|
| MA3-242LH+   | 14                            | 850-1200                | 50-80                | 5.5                  | 25                        | 20                        | 18             |

MA3-242LH+ Characteristic Performance



Simplified Schematic



High IP3 Frequency Mixer

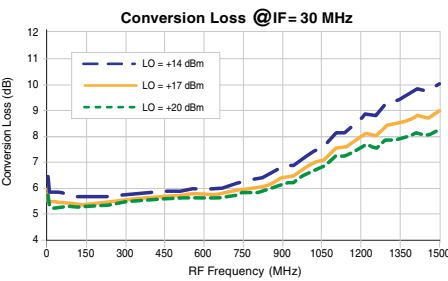
50Ω 5 to 1000 MHz Level 17

- Ideal for VHF/UHF, broadcast, TV and more
- High IP3 minimizes distortion in crowded signal environments

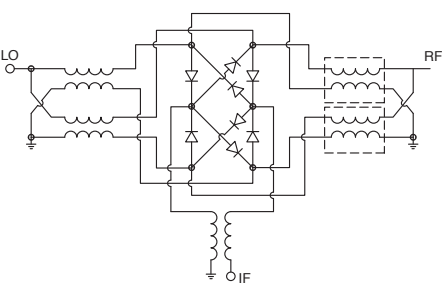


| Model Number | RF in @ 1 dB Comp. (dBm) Typ. | RF Freq. Range (MHz) | LO Freq. Range (MHz) | IF Freq. Range (MHz) | Conv. Loss (dB) Typ. | LO-RF Isolation (dB) Typ. | LO-IF Isolation (dB) Typ. | IP3 (dBm) Typ. |
|--------------|-------------------------------|----------------------|----------------------|----------------------|----------------------|---------------------------|---------------------------|----------------|
| SYM-102H+    | 14                            | 35-1030              | 5-1000               | 5-1000               | 5.8                  | 60                        | 48                        | 26             |

SYM-102H+ Characteristic Performance



Simplified Schematic



# MULTIPLIERS

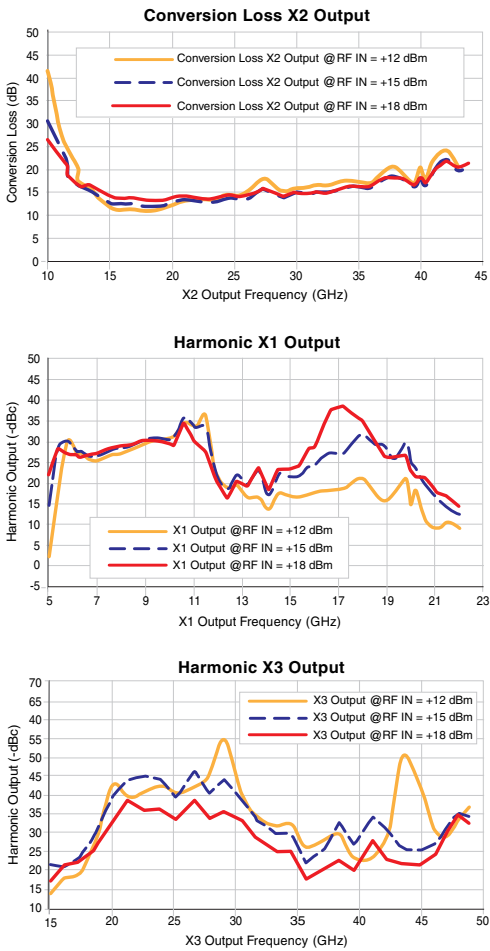
## MMIC Frequency Doublers 50Ω 7 to 40 GHz

- Ideal for frequency conversion in 5G systems
- Wide input power range, +12 to +18 dBm
- 3x3mm QFN package

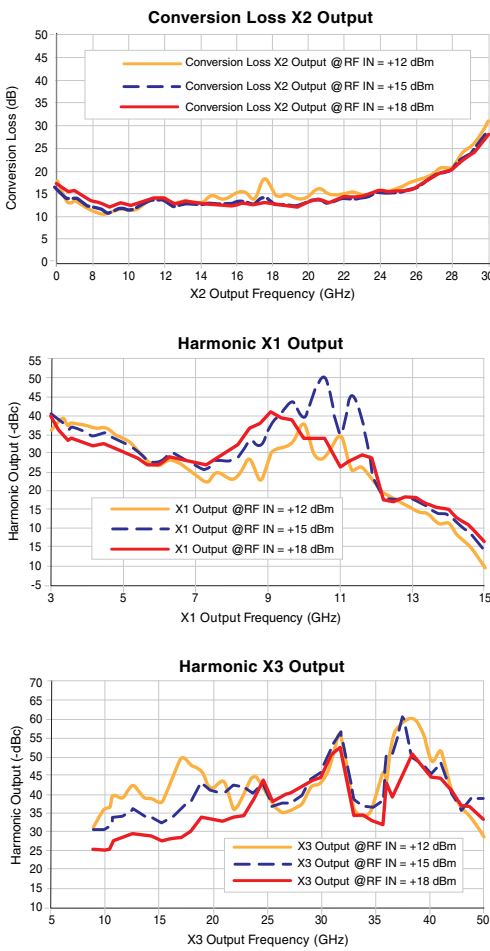


| Model Number | Input Freq. Range (MHz) | Output Freq. Range (MHz) | RF Input Power (dBm) Range | Conversion Loss (dB) Typ. | F1 Harmonic Output Below F2 (dBc) Typ. | F3 Harmonic Output Below F2 (dBc) Typ. | F4 Harmonic Output Below F2 (dBc) Typ. |
|--------------|-------------------------|--------------------------|----------------------------|---------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| CY2-44+      | 6200-20000              | 12400-40000              | 12-18                      | 14                        | 26                                     | 34                                     | 18                                     |
| CY2-283+     | 3500-14000              | 7000-28000               | 12-18                      | 13                        | 34                                     | 40                                     | 23                                     |

CY2-44+ Characteristic Performance



CY2-283+ Characteristic Performance

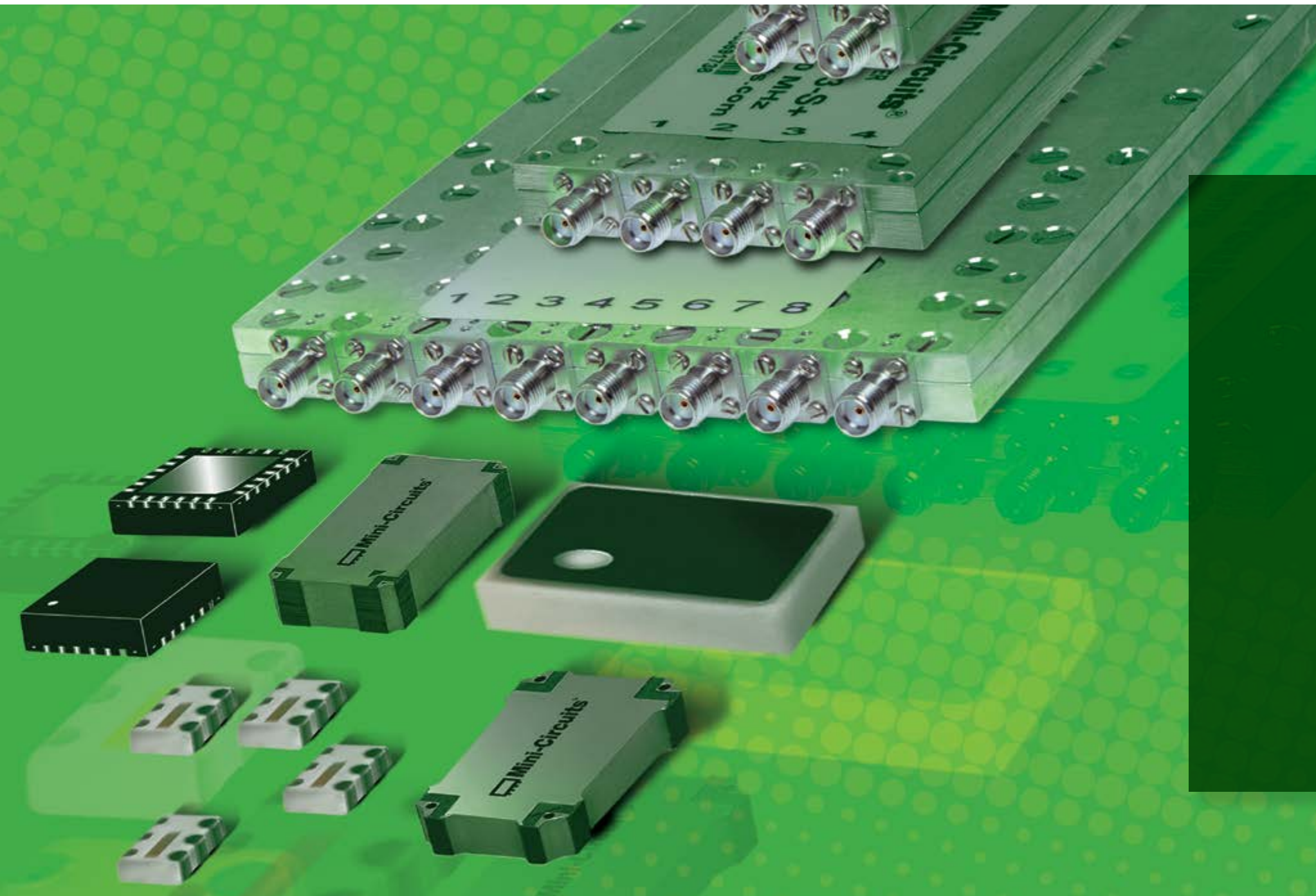


### HIGHLIGHTS

- Ultra-Wideband MMIC Frequency Doublers up to 40 GHz



# SPLITTERS/COMBINERS & HYBRIDS



## H I G H L I G H T S

- Ultra-Wideband MMIC Splitter/Combiners Covering 0.5 to 43.5 GHz in Package
- MMIC 90° Hybrids from 5 to 14 GHz
- High Power Stripline 90° Hybrids up to 200W

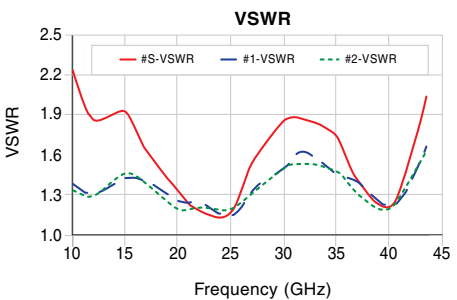
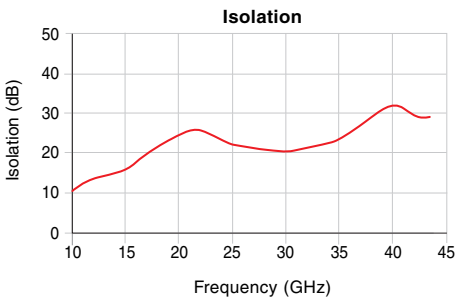
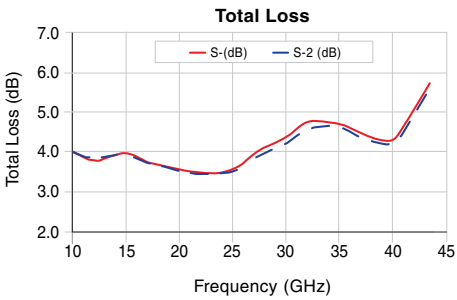
Ultra-Wideband MMIC 2-Way Splitter/Combiners  
50Ω 0.5 to 43.5 GHz

- Now up to 43.5 GHz in Surface Mount Package
- DC Passing
- Bare die available

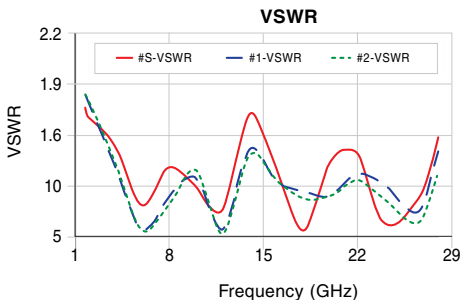
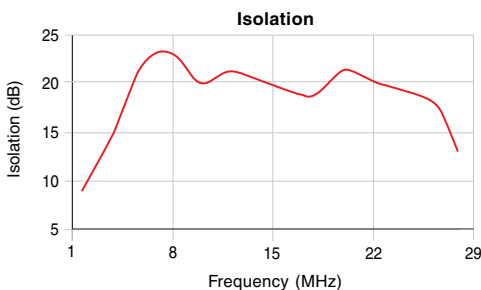
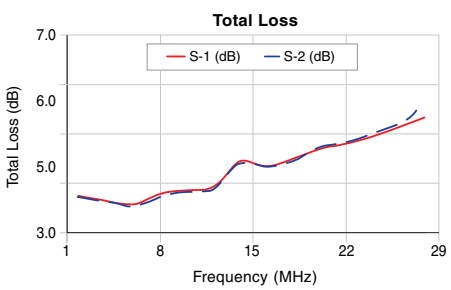


| Model Number | Freq. Range (MHz) | Isolation (dB), Typ. | Insertion Loss (dB) above 3 dB, Typ. | Phase Unbalance (deg), Typ. | Amplitude Unbalance (dB), Typ. | Power Input (W) as Splitter, Max. |
|--------------|-------------------|----------------------|--------------------------------------|-----------------------------|--------------------------------|-----------------------------------|
| EP2W+        | 700-6000          | 19.8                 | 1.3                                  | 0.9                         | 0.1                            | 2.5                               |
| EP2W1+       | 500-9500          | 19.4                 | 1.8                                  | 1.7                         | 0.1                            | 2.5                               |
| EP2C+        | 1800-12500        | 16                   | 1.1                                  | 6                           | 0.2                            | 1.85                              |
| EP2K+        | 5000-20000        | 20                   | 2.1                                  | 4.2                         | 0.1                            | 2.5                               |
| EP2K1+       | 2000-26500        | 20                   | 2.4                                  | 5.4                         | 0.3                            | 2.5                               |
| NEW! EP2KA+  | 10000-43500       | 22                   | 1.5                                  | 6                           | 0.22                           | 1.25                              |

EP2KA+ Characteristic Performance



EP2K1+ Characteristic Performance



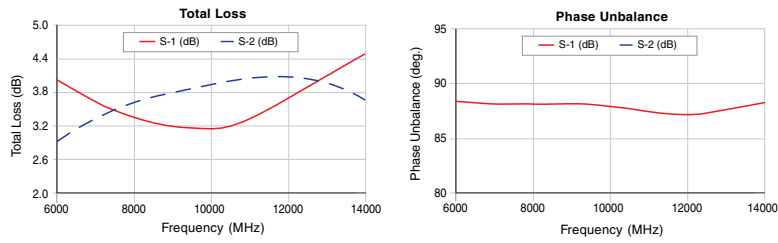
MMIC 2-Way 90° Hybrids  
50Ω 5 to 14 GHz

- Power handling up to 1.59W
- No external termination required



| Model Number | Freq. Range (MHz) | Isolation (dB) | Insertion Loss (dB) above 3 dB | Phase Unbalance (deg) | Amplitude Unbalance (dB) | Form Factor |
|--------------|-------------------|----------------|--------------------------------|-----------------------|--------------------------|-------------|
| EPQ-113+     | 5000-11000        | 19             | 0.6                            | 3.7                   | 0.8                      | 4x4mm QFN   |
| EPQ-133+     | 6000-14000        | 20             | 0.6                            | 4.1                   | 0.4                      | 4x4mm QFN   |
| EPQ-113-D+   | 5000-11000        | 19             | 0.6                            | 1.4                   | 1.5                      | Die         |
| EPQ-133-D+   | 6000-14000        | 20             | 0.6                            | 8.8                   | 1.6                      | Die         |

EPQ-133+ Characteristic Performance



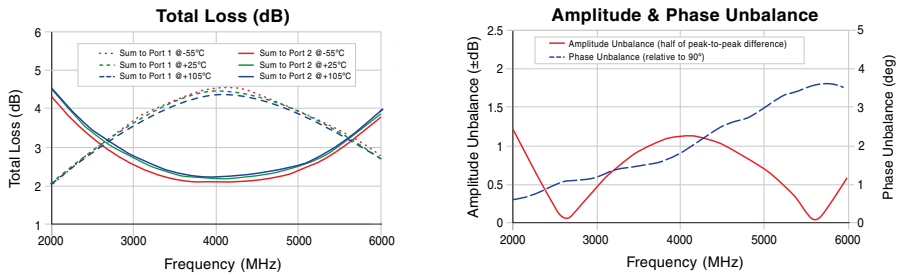
Stripline 2-Way 90° Hybrids  
50Ω 600 to 6000 MHz

- High power handling, up to 200W
- Surface mount packages as small as 0.25 x 0.20 x 0.069"



| Model Number  | Freq. Low (MHz) | Isolation (dB), Typ. | Insertion Loss (dB) above 3 dB | Phase Unbalance (deg) | Amplitude Unbalance (dB) | Input Power (W) |
|---------------|-----------------|----------------------|--------------------------------|-----------------------|--------------------------|-----------------|
| NEW! QCH-63   | 2000-6000       | 26                   | 0.2                            | 1.5                   | 1.0                      | 200             |
| QCH-83        | 4000-8000       | 23                   | 0.15                           | 5                     | 0.45                     | 75              |
| QCH-123+      | 8000-12000      | 23                   | 0.25                           | 6                     | 0.35                     | 50              |
| QCH-272+      | 700-2700        | 22                   | 0.3                            | 0.9                   | 0.1                      | 200             |
| NEW! QCH-382+ | 800-3800        | 28                   | 0.25                           | 1.6                   | 0.35                     | 150             |
| QCH-392+      | 600-3900        | 14                   | 0.6                            | 5                     | 0.8                      | 90              |

QCH-63 Characteristic Performance





# SWITCHES



## HIGHLIGHTS

- Extra-Long Life Mechanical Switches up to 26.5 GHz
- USB/SPI/I2C Solid State Switches, DC to 8 GHz



## SWITCHES

### Xtra Long Life Electromechanical Switches

50Ω DC to 26.5 GHz

- Extra-long switching life – 10 million cycles guaranteed, capable of >100 million cycles with factory cleaning
- 12 and 24V operating voltage options
- Absorptive and reflective models



| Model Number  | Freq. Low (GHz) | Freq. Hi (GHz) | Insertion Loss (dB) Typ. | Isolation (dB), Typ. | VSWR (:1), Typ. | RF Power (W) Max. |
|---------------|-----------------|----------------|--------------------------|----------------------|-----------------|-------------------|
| MSP2T-26-12+  | DC              | 26.5           | 0.25                     | 85                   | 1.20            | 10                |
| MSP2T-26XL+   | DC              | 26.5           | 0.25                     | 85                   | 1.20            | 10                |
| MSP2TA-26-12+ | DC              | 26.5           | 0.25                     | 80                   | 1.20            | 10                |
| MSP2TA-26XL+  | DC              | 26.5           | 0.25                     | 85                   | 1.20            | 10                |

### Solid State Switches

50Ω DC to 8 GHz

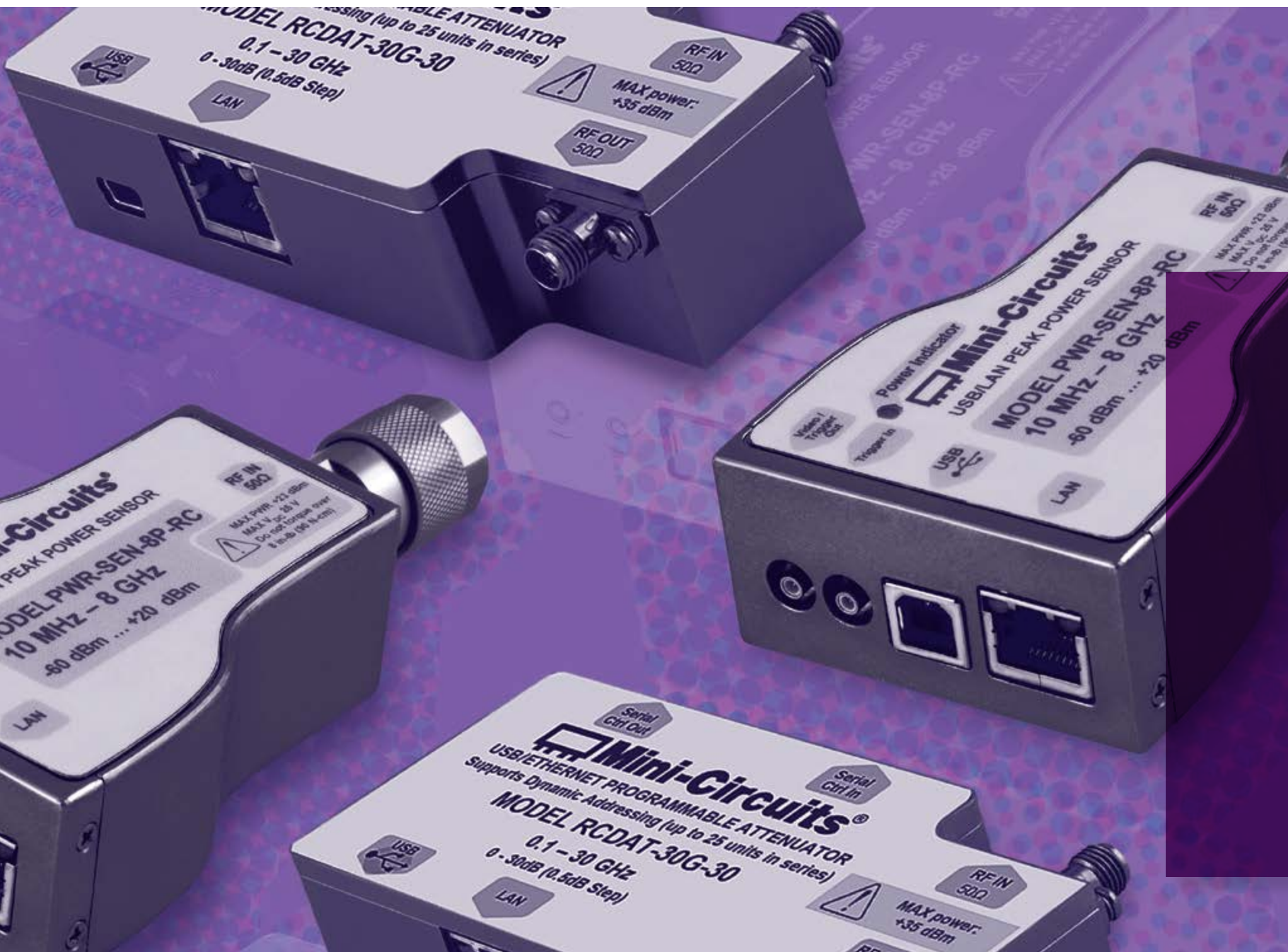
- USB, I<sup>2</sup>C, SPI and TTL control options
- High Isolation, up to 110 dB
- Switching speed, as fast as 25 ns



| Model Number   | Number of Switches | Switch Type | Control Interface            | Freq. Range (MHz) | Insertion Loss (dB) | Isolation (dB) | VSWR (:1) | Switching Time (usec) | Supply Voltage (V) | Max Input Power (W) |
|----------------|--------------------|-------------|------------------------------|-------------------|---------------------|----------------|-----------|-----------------------|--------------------|---------------------|
| SPI-SP8T-6G    | 1                  | SP8T        | SPI                          | 1-6000            | 4                   | 90             | 1.25      | 6                     | 5-24               | 0.5                 |
| SPI-SP10T-63   | 1                  | SP10T       | SPI                          | 1-6000            | 4                   | 90             | 1.25      | 6                     | 12-24              | 0.5                 |
| U2C-1SP2T-63VH | 1                  | SPDT        | USB / I <sup>2</sup> C / SPI | 10-6000           | 4                   | 110            | 1.3       | 0.7                   | USB (5V) or 12-24  | 2                   |
| U2C-1SP4T-63H  | 1                  | SP4T        | USB / I <sup>2</sup> C       | 2-6000            | 3.7                 | 80             | 1.25      | 0.25                  | 5                  | 1                   |
| USB-1SP16T-83H | 1                  | SP16T       | USB / TTL                    | 1-8000            | 7.5                 | 100            | 1.3       | 5.5                   | USB (5V)           | 1                   |
| USB-1SP8T-63H  | 1                  | SP8T        | USB                          | 10-6000           | 4                   | 80             | 1.25      | 0.25                  | USB (5V)           | 1                   |
| USB-2SP2T-DCH  | 2                  | SPDT        | USB                          | DC-8000           | 1.4                 | 50             | 1.2       | 14                    | USB (5V)           | 3.15                |
| USB-4SP2T-63H  | 4                  | SPDT        | USB                          | 10-6000           | 2                   | 80             | 1.25      | 0.25                  | USB (5V)           | 1                   |
| USB-SP4T-63    | 1                  | SP4T        | USB                          | 1-6000            | 1                   | 50             | 1.2       | 3                     | USB (5V)           | 0.5                 |



# TEST SOLUTIONS



## HIGHLIGHTS

- USB/Ethernet Programmable Attenuator covers 0.1 to 30 GHz
- USB/Ethernet Peak/Average Power Sensor, 0.01 to 8 GHz



# USB/Ethernet Programmable Attenuator

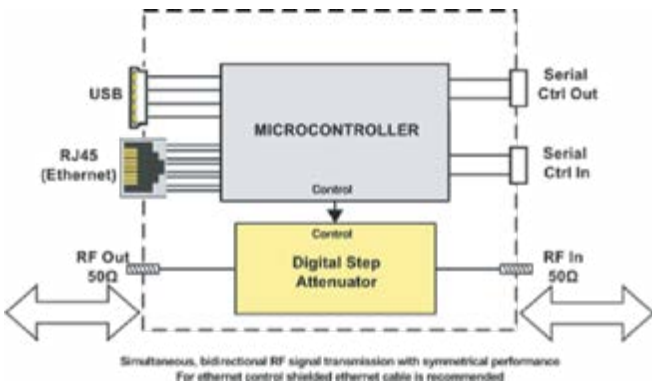
50Ω 0.1 to 30 GHz 0 to 30 dB

- Precision attenuation up to 30 GHz
- Fine resolution, 0.5 dB steps
- Fast transitions, 100ns
- Control up to 25 attenuators via 'Daisy Chain'
- User-friendly GUI and comprehensive API included

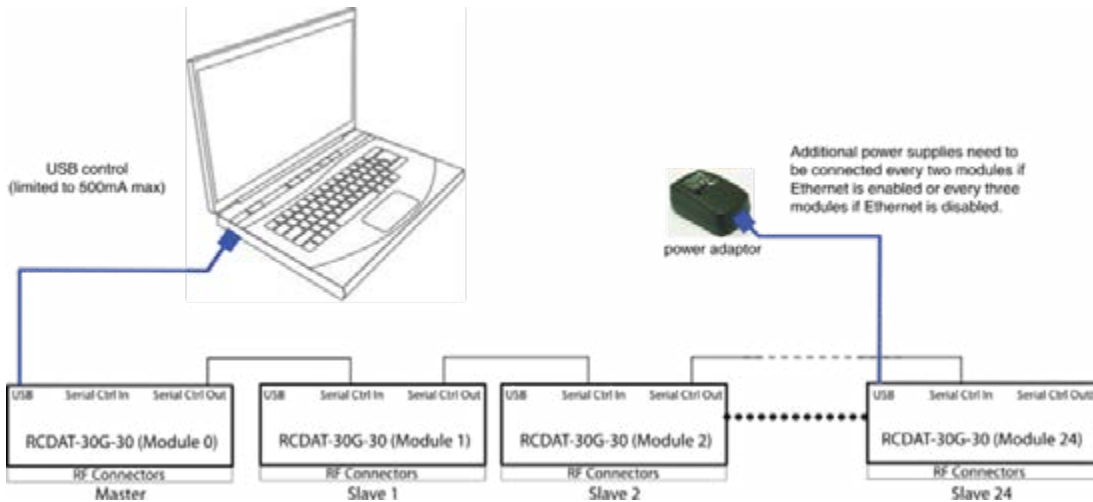


| Model Number | Number of Channels | F Low (MHz) | F High (MHz) | Attenuation Range (dB), Typ | Attenuation Step (dB), Typ | Insertion Loss (0 dB Setting) (dB), Max | Attenuation Accuracy (dB), Typ | Max Input Power (dBm) | IP3 (dB), Typ |
|--------------|--------------------|-------------|--------------|-----------------------------|----------------------------|-----------------------------------------|--------------------------------|-----------------------|---------------|
| RCDAT-30G-30 | 1                  | 100         | 30000        | 30                          | 0.5                        | 16.0                                    | ± 0.8                          | 24                    | 38            |

Block Diagram



Connecting Multiple Units (Daisy Chain)



# Peak & Average Smart Power Sensor

50Ω 0.01 to 8 GHz

- Peak & average power of CW & pulse waveforms with pulse profiling
- Measures power levels down to -60 dBm
- Sample rate 500,000 samples per sec.
- USB and Ethernet Controlled



| Model Number | Sensor Type | Impedance (Ω) | F. Low (MHz) | F. High (MHz) | Input Power (dBm), Min | Input Power (dBm), Max | Dynamic Range (dB), Typ | Measurement Speed (ms) |
|--------------|-------------|---------------|--------------|---------------|------------------------|------------------------|-------------------------|------------------------|
| PWR-8P-RC    | Peak & Avg. | 50            | 10           | 8000          | -60                    | +20                    | 80                      | 0.002                  |

Graphical User Interface – Pulse Profiling Features

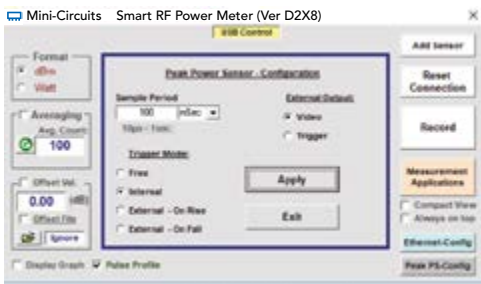


Fig 1: Main screen in Pulse Profiling configuration mode

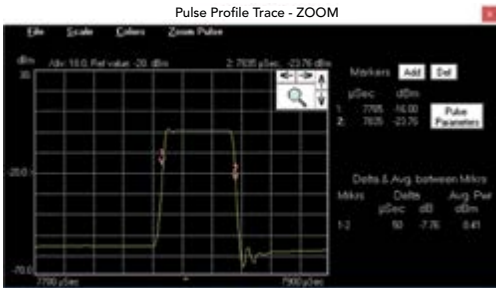


Fig 3: Graphical Pulse Profile - "Zoom on Pulse"

| Parameter           | Value  |
|---------------------|--------|
| Pulse Width (mSec)  | 0.044  |
| Pulse Period (mSec) | 8.020  |
| Duty Cycle (%)      | 0.55   |
| Rise Time (µs)      | 3.54   |
| Fall Time (µs)      | 3.54   |
| Pulse Pwr ( dBm)    | 0.75   |
| Cycle Avg. ( dBm)   | -19.70 |
| Crest Factor (dB)   | 20.45  |
| Over Shoot (dB)     | 0.98   |

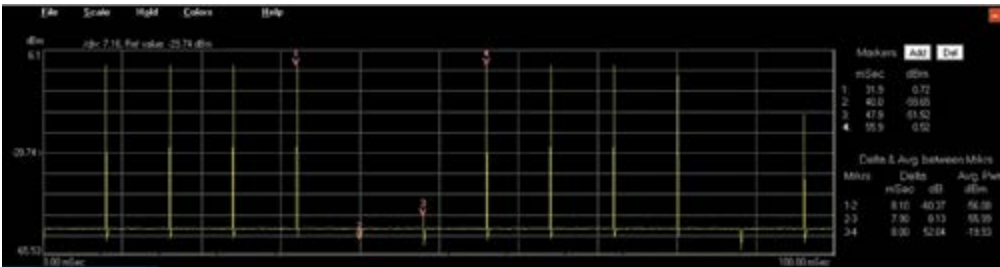


Fig 2: Graphical Pulse Profile - Full sample period



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