



无线探针的频率响应

从测试仪电子设备向待测电路板提供清晰、准确的信号对于高速测试至关重要。夹具布线可能是信号传输路径中失真和噪声的主要因素。为了更好地理解无线夹具的可能性，QA Technology检查了无线针套、端子和探针的高频性能。

QA使用网络分析仪测量各种探针配置的频率响应特性。无线针套的初始测试使用覆盖300KHz至3GHz频率范围的RF网络分析仪。随后使用微波网络分析仪进行的测试覆盖了50MHz至20GHz的频率范围。为了保持一致性，最近的测试图表推断了低于50MHz的数据，而忽略了高于10GHz的数据。QA使用TDR示波器查看通过测试夹具的信号路径的阻抗，并使用微波网络分析仪的时域变换选项获得时域阻抗信息。

试验程序

测试夹具用于100、75、50和39mil无线针套产品。这些夹具装置包括一个0.250[6.35]G10针套安装板、一个0.062[1.57]G10针套隔板和两个电气接口板，这些电气接口板通过非导电支座连接到针套安装板上。X75、X50、X39和X31无线端子的测试夹具由多个G10板组成，总计1.562[39.67]，夹在两个电气接口板之间。在所有夹具中，电气接口板为测试设备提供SMA连接器，并提供铜迹线，以接触各种探针/针套配置。配置包括接地探针和信号探针的不同中心间距、多个接地探针以及测量串扰的布置，其中一对探针被“驱动”，相邻一对探针的“接收”被测量。

结果

下图研究了X75探针的性能。以下是所有其他无线组件的可比数据。

图1显示了1.00[25.4]中心上两个X75探针的频率响应。这可能代表IC封装的信号探针到接地探针的分离。请注意，带宽衰减低于100 MHz。这种响应主要由信号和接地探针之间的分离所控制。在1.00[25.4]个中心测试的其他无线探针系列的图具有非常相似的性能。在图2中，探针位于其标称0.075[1.91]中心。在这些较近的中心上，可实现超过400 MHz的-1dB频率响应。这种改进是由于间距更近的探针提供了与50欧姆测试环境阻抗的更好匹配。

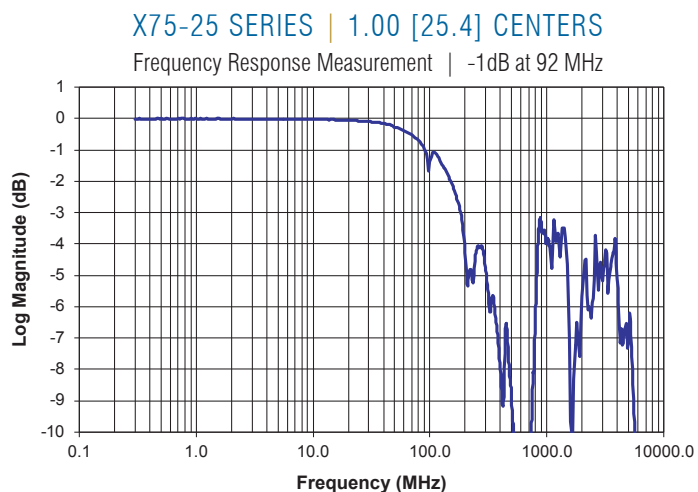


Figure 1: Frequency response of two 0.075 [1.91] wireless X Probes (signal and ground) on 1.00 [25.4] centers.

微波网络分析仪的TDR选项允许测量传输线长度上任何点的阻抗。图3显示了0.075[1.91]中心上两个无线0.075[1.91]QA X Probes®的阻抗。在该TDR图中，传输信号的有效上升时间为50皮秒，相当于7 GHz测试频率。测量的高带宽夸大了阻抗极限；在较低的频率下，阻抗差异将不太明显。这些高频测量显示了三个不同的物理区域：端子、从端子到X Probe的过渡以及X Probe本身。这些阻抗变化是由端子和探针的不同直径以及围绕它们的钻孔间隙引起的。分离探针的介电材料的性质在确定传输线的特性阻抗方面也起着关键作用。

图4显示了信号探针位于两个接地之间时，三探针串联配置在0.075[1.91]中心的性能。尽管这种配置可能并不总是实用的，但其-1dB的性能在1400 MHz以上时表现出色。图5显示了相同三探针配置的相应TDR图。

布线问题是无线探测解决方案存在的原因。用转换器板替换夹具接线为在待测单元（UUT）和测试电子设备之间路由测试信号提供了更可重复和可控的环境。

测试信号和探针位置由UUT的需求驱动。出于参考目的，图6显示了0.075[1.91]中心上两对0.075[1.91]无线X Probe之间的串扰图。

X75-25 SERIES | 0.075 [1.91] CENTERS
Frequency Response Measurement | -1dB at 435 MHz

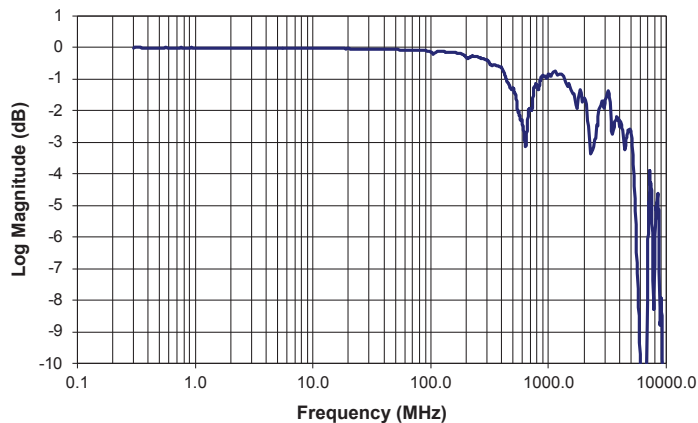


Figure 2: Frequency response of two 0.075 [1.91] wireless X Probes (signal and ground) on 0.075 [1.91] centers.

X75-25 SERIES | 0.075 [1.91] CENTERS
TDR Measurement

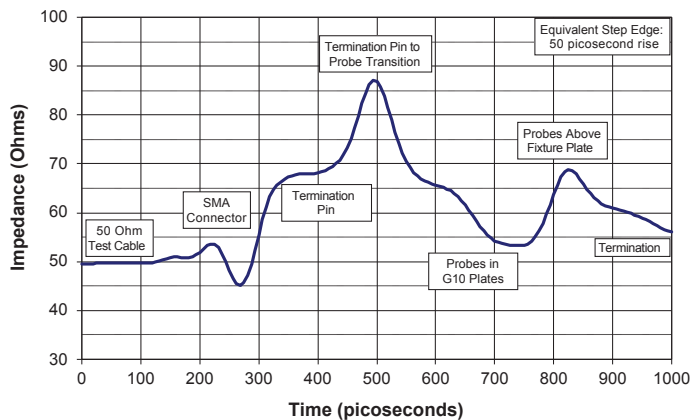


Figure 3: Impedance of the transmission line created by two 0.075 [1.91] wireless X Probes (signal and ground) on 0.075 [1.91] centers. Note: the 50 picosecond equivalent rise time equates to an effective test frequency of 7 GHz.

X75-25 SERIES | 0.075 [1.91] X 3
Frequency Response Measurement | -1dB at 1450 MHz

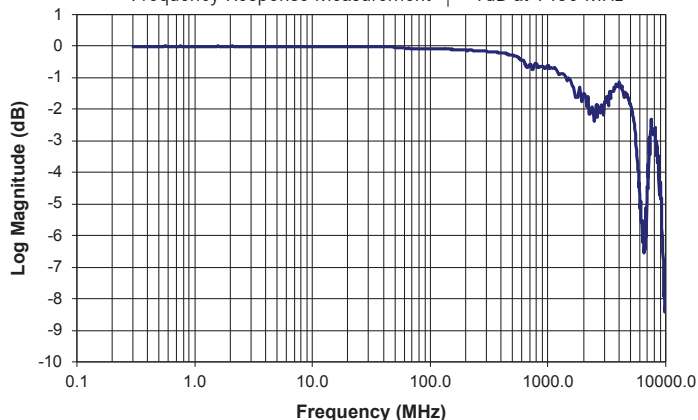


Figure 4: For a three-probe configuration (signal between two grounds) excellent performance to more than 1400MHz was achieved.

结论

无线探测解决方案可以提供优异的高频性能。信号对接地探针间距和分离探针的介电材料在确定传输路径的阻抗和带宽方面都起着主要作用。一般来说，更恒定的探针直径和分离探针的一致介电材料使得信号路径中的阻抗变化更少，总体高频性能更好。

用转换器板替换夹具接线，使测试工程师能够更好地控制到待测单元的信号路径的长度和阻抗特性。这产生了更清晰、无失真的测试信号和更高的性能测试。

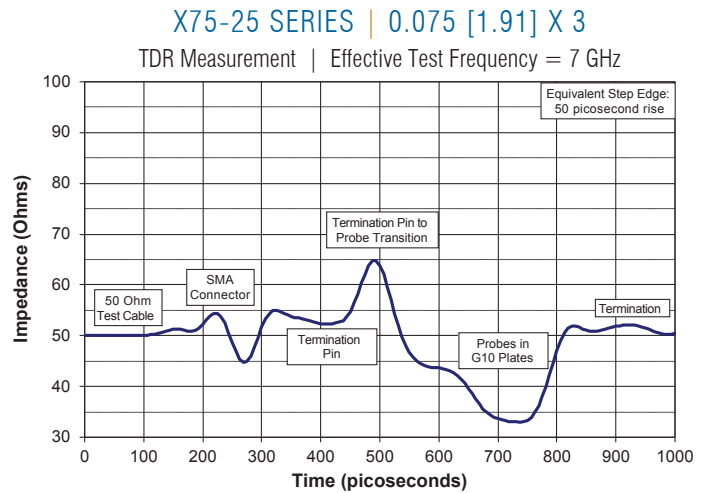


Figure 5: The TDR plot for the three-probe configuration shows a better match to the 50 Ohm test environment. This results in a higher bandwidth frequency response.

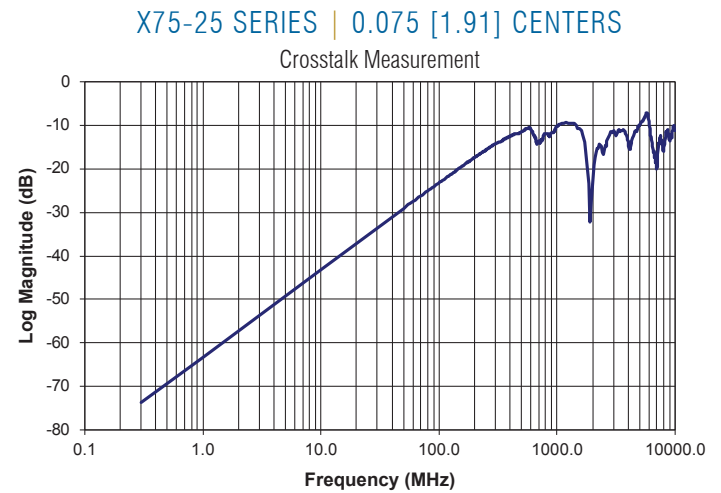
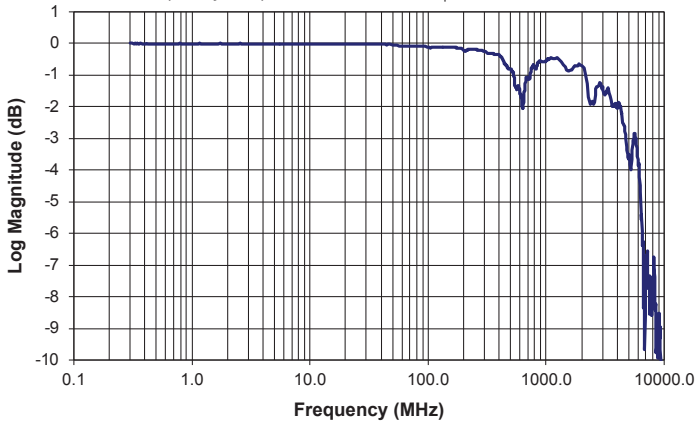


Figure 6: Crosstalk between two pairs of X75 probes on a 0.075 [1.91] grid.

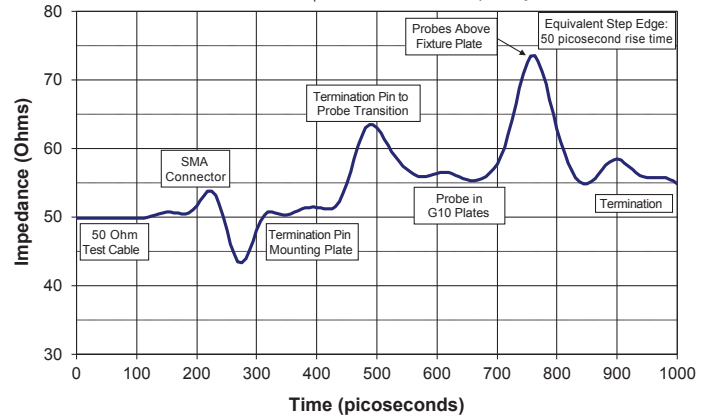
X50-25 无线系列

X50-25 SERIES | 0.050 [1.27] CENTERS
Frequency Response Measurement | -1dB at 530 MHz

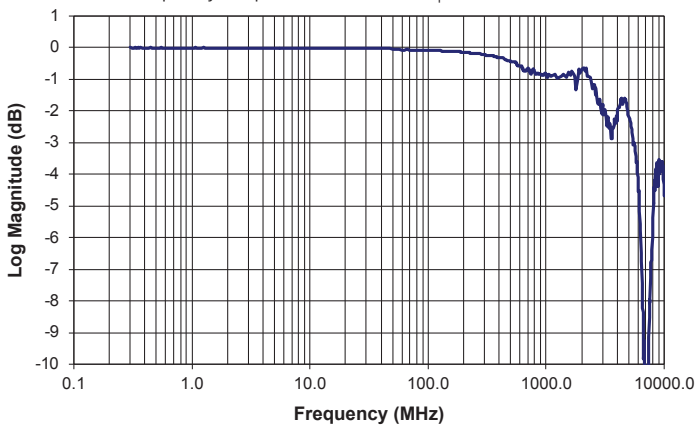


Two X50 wireless probes (signal and ground) on 0.050 [1.27] centers.

X50-25 SERIES | 050 [1.27] CENTERS
TDR Measurement | Effective Test Frequency = 7GHz

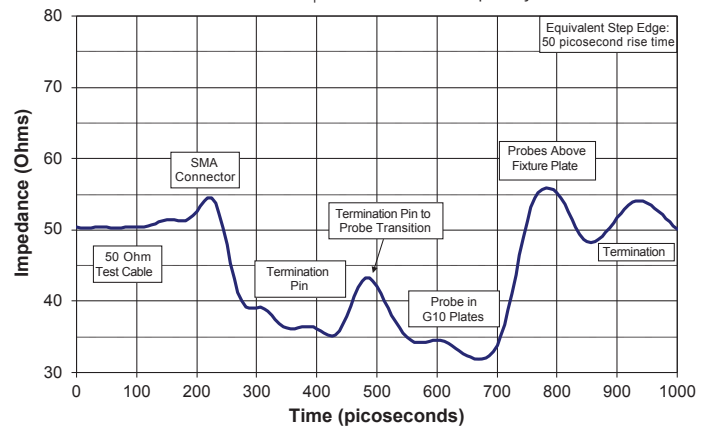


X50-25 SERIES | 0.050 [1.27] X3
Frequency Response Measurement | -1dB at 1800 MHz

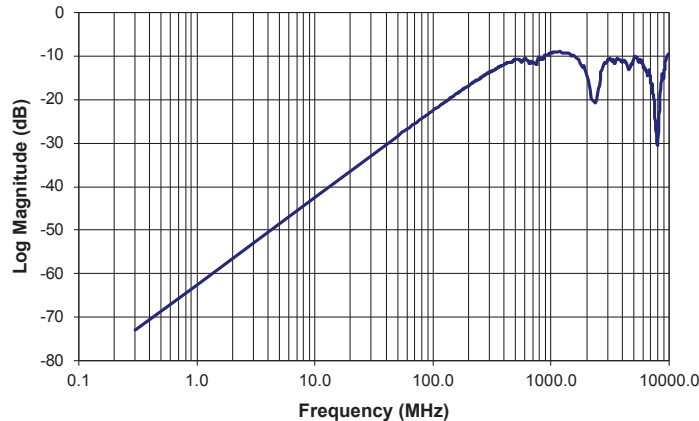


Three X50 wireless probes (ground-signal-ground) on 0.050 [1.27] centers.

X50-25 SERIES | 0.050 [1.27] X3
TDR Measurement | Effective Test Frequency = 7GHz



X50-25 SERIES | 0.050 [1.27] CENTERS
Crosstalk Measurement

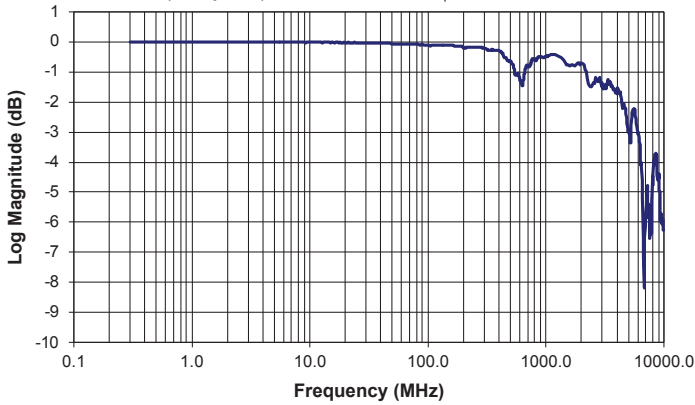


Cross talk for two pairs of X50 wireless probes on a 0.050 [1.27] grid.

X39-25 无线系列

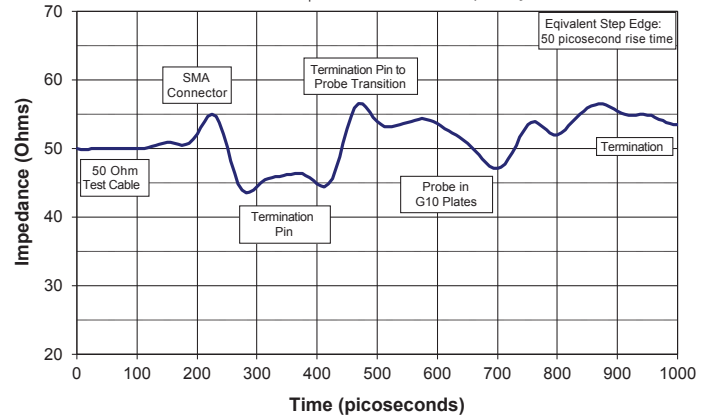
X39-25 SERIES | 0.039 [1.00] CENTERS

Frequency Response Measurement | -1dB at 540 MHz



X39-25 SERIES | 0.039 [1.00] CENTERS

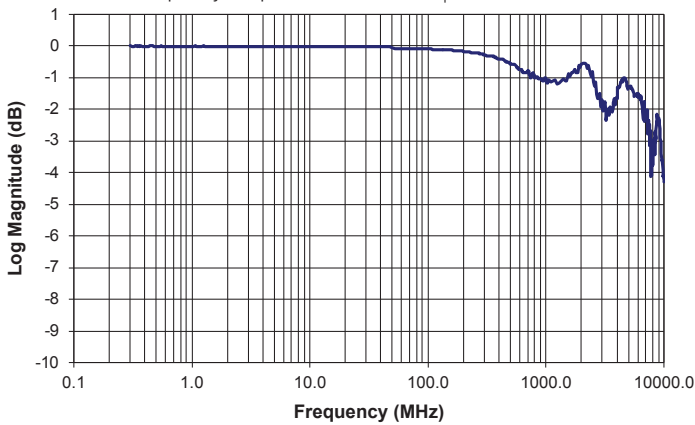
TDR Measurement | Effective Test Frequency = 7GHz



Two X39 wireless probes (signal and ground) on 0.039 [1.00] centers.

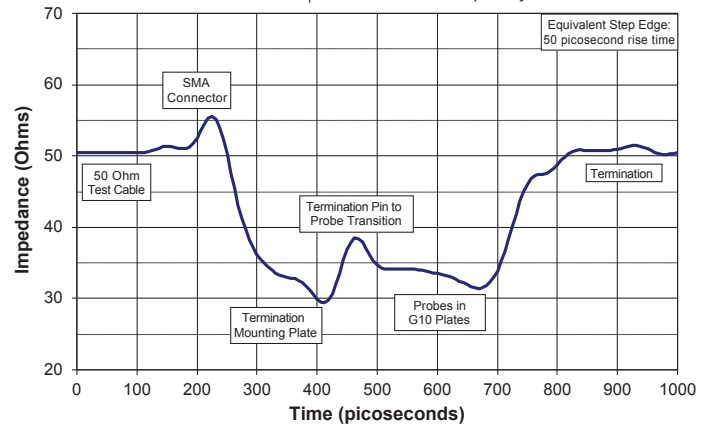
X39-25 SERIES | 0.039 [1.00] X3

Frequency Response Measurement | -1dB at 740 MHz



X39-25 SERIES | 0.039 [1.00] X3

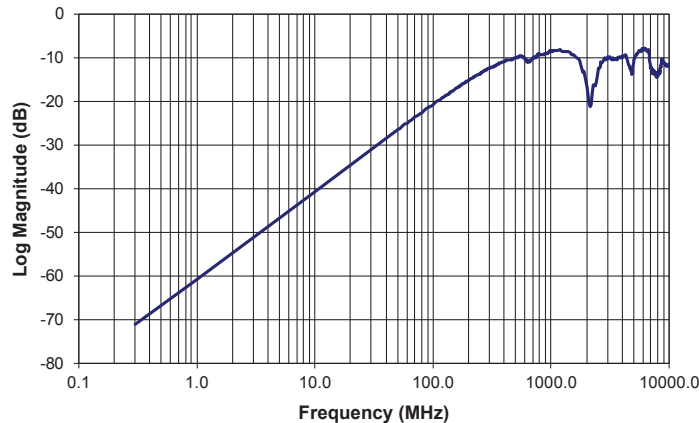
TDR Measurement | Effective Test Frequency = 7GHz



Three X39 wireless probes (ground-signal-ground) on 0.039 [1.00] centers.

X39-25 SERIES | 0.039 [1.00] CENTERS

Crosstalk Measurement

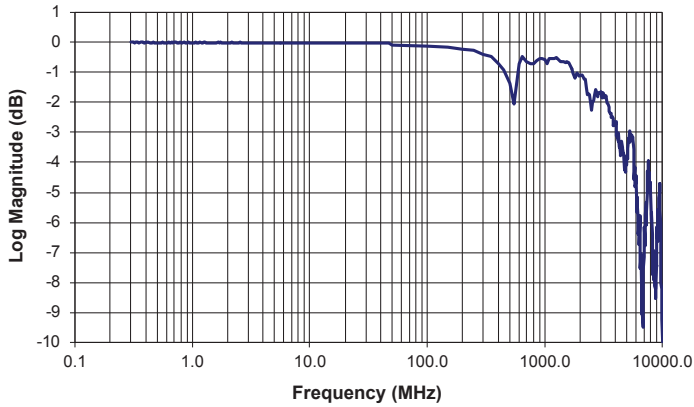


Crosstalk for two pairs of X39 wireless probes on a 0.039 [1.00] grid.

X31-25 无线系列

X31-25 SERIES | 0.031 [0.80] CENTERS

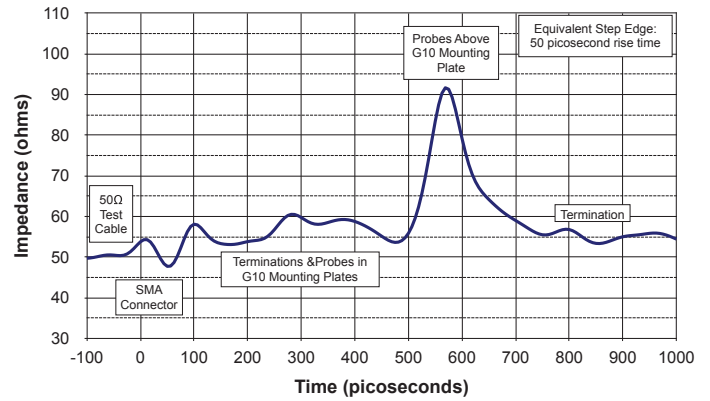
Frequency Response Measurement | -1dB at 500 MHz



Two X31 wireless probes (signal and ground) on 0.031 [0.80] centers.

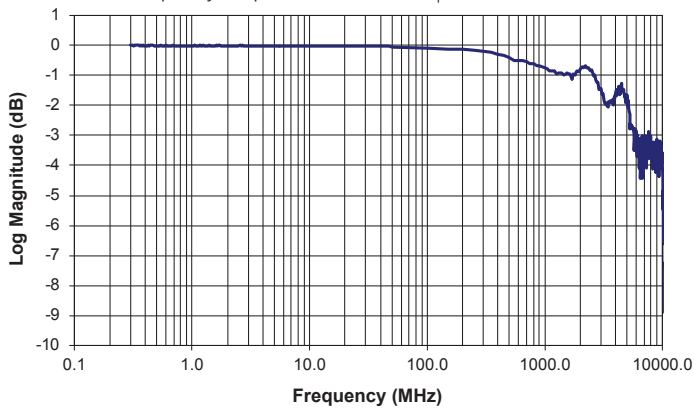
X31-25 SERIES | 0.031 [0.80] CENTERS

TDR Measurement | Effective Test Frequency = 7GHz



X31-25 SERIES | 0.031 [0.80] X3

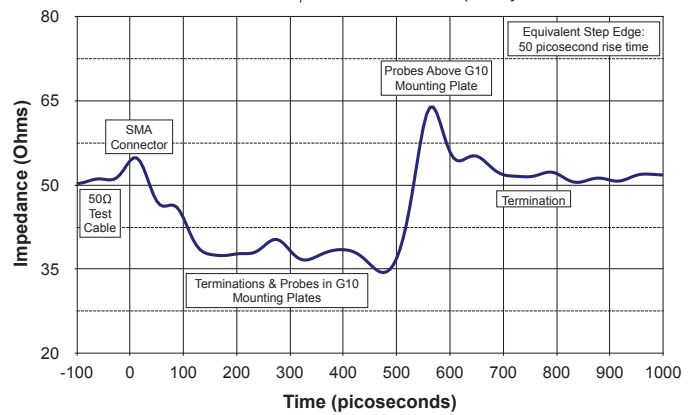
Frequency Response Measurement | -1dB at 1700 MHz



Three X31 wireless probes (ground-signal-ground) on 0.031 [0.80] centers.

X31-25 SERIES | 0.031 [0.80] X3

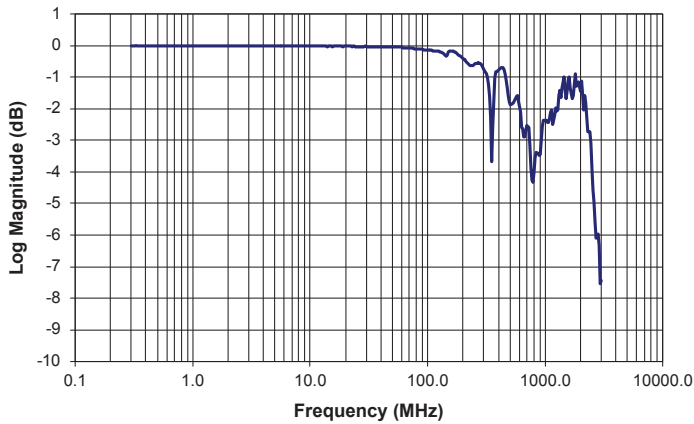
TDR Measurement | Effective Test Frequency = 7GHz



100-25 无线系列

100-25 SERIES | 0.100 [2.54]

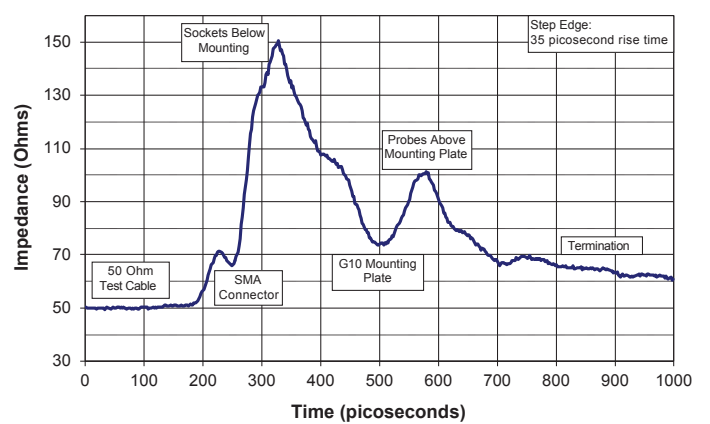
Frequency Response Measurement | -1dB at 320 MHz



Two 100-25 Series wireless socket assemblies (signal and ground) on 0.100 [2.54] centers.

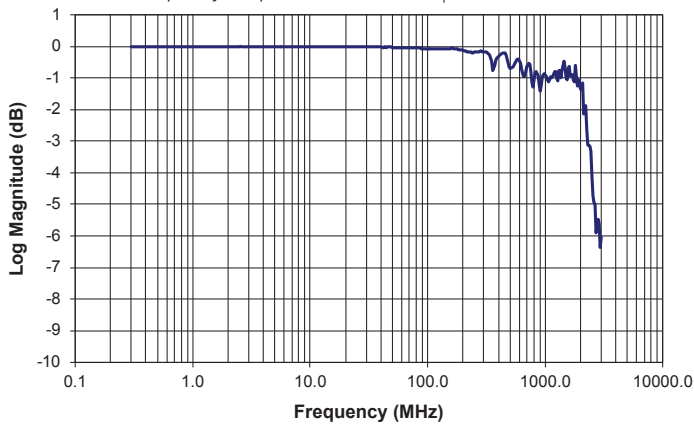
100-25 SERIES | 0.100 [2.54]

TDR Measurement | Effective Test Frequency = 10GHz



100-25 SERIES | 0.100 [2.54] X3

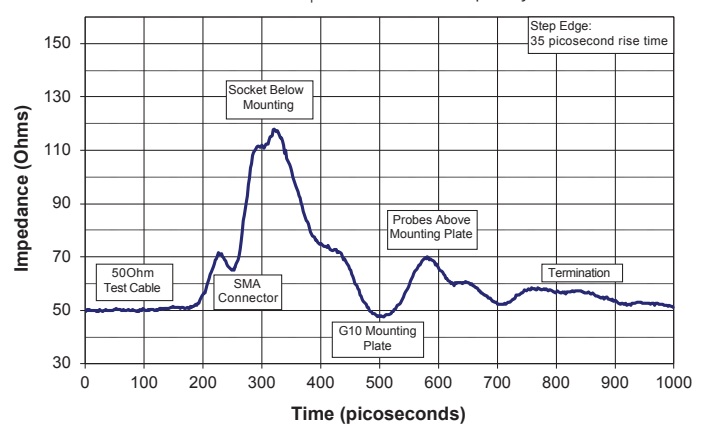
Frequency Response Measurement | -1dB at 770 MHz



Three 100-25 Series wireless socket assemblies (ground-signal-ground) on 0.100 [2.54] centers.

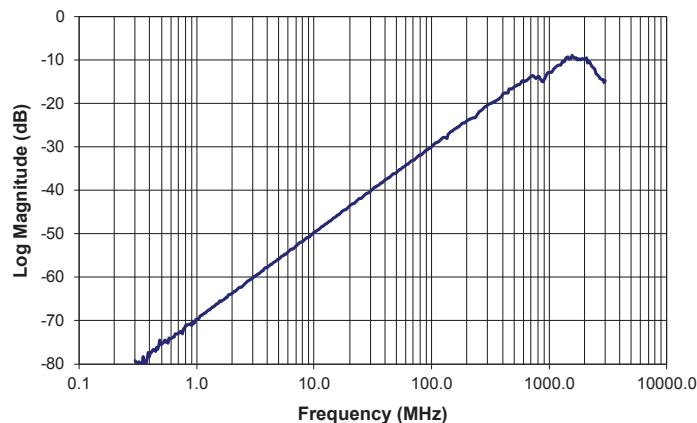
100-25 SERIES | 0.100 [2.54] X3

TDR Measurement | Effective Test Frequency = 7GHz



100-25 SERIES | 0.100 [2.54] CENTERS

Crosstalk Measurement

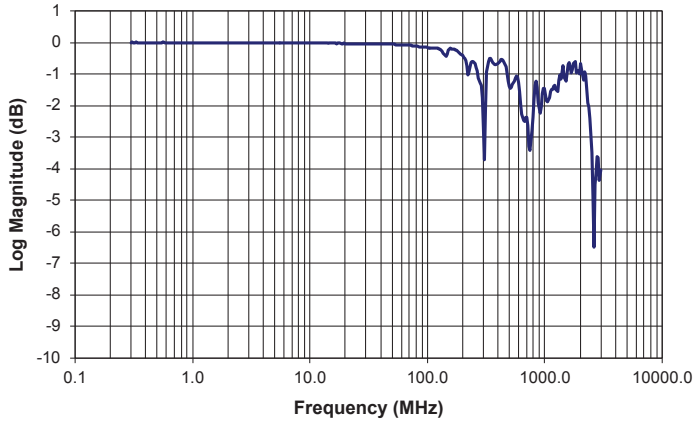


Crosstalk for two pairs of 100-25 Series wireless socket assemblies on a 0.100 [2.54] grid.

075-25 无线系列

075-25 SERIES | 0.075 [1.91] CENTERS

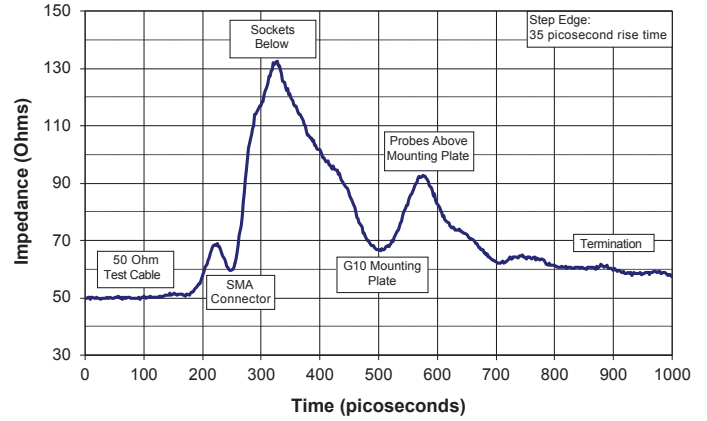
Frequency Response Measurement | -1dB at 220 MHz



Two 075-25 Series wireless socket assemblies (signal and ground) on 0.075 [1.91] centers.

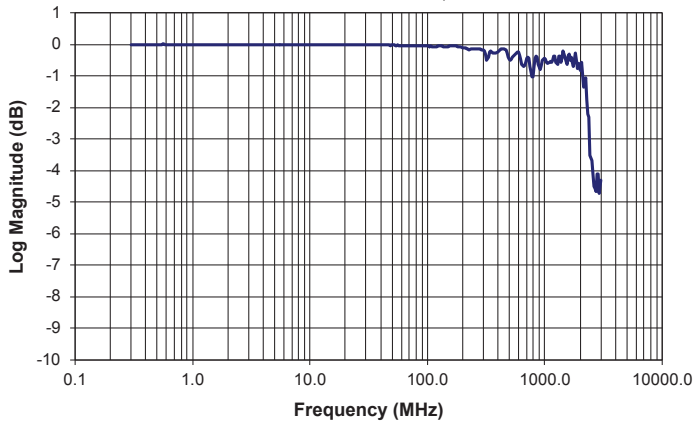
075-25 SERIES | 0.075 [1.91] CENTERS

TDR Measurement | Effective Test Frequency = 10GHz



075-25 SERIES | 0.075 [1.91] X3

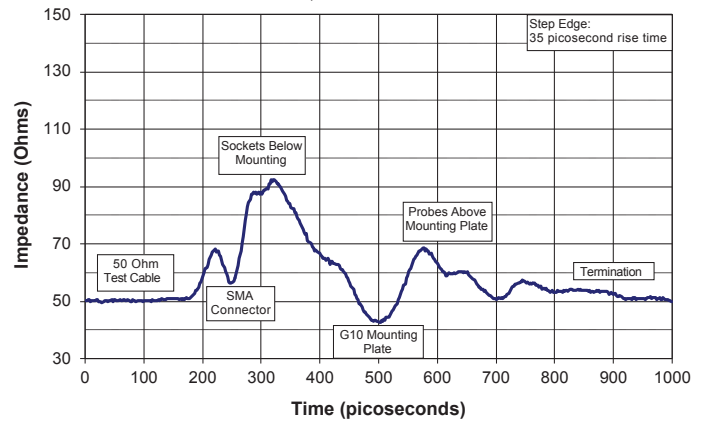
Frequency Response Measurement | -1dB at 770 MHz



Three 075-25 Series wireless socket assemblies (ground-signal-ground) on 0.075 [1.91] centers.

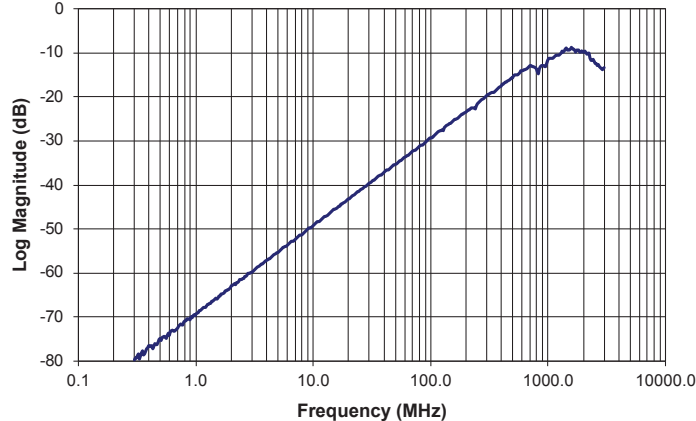
075-25 SERIES | 0.075 [1.91] X3

TDR Measurement | Effective Test Frequency = 7GHz



075-25 SERIES | 0.075 [1.91] CENTERS

Crosstalk Measurement

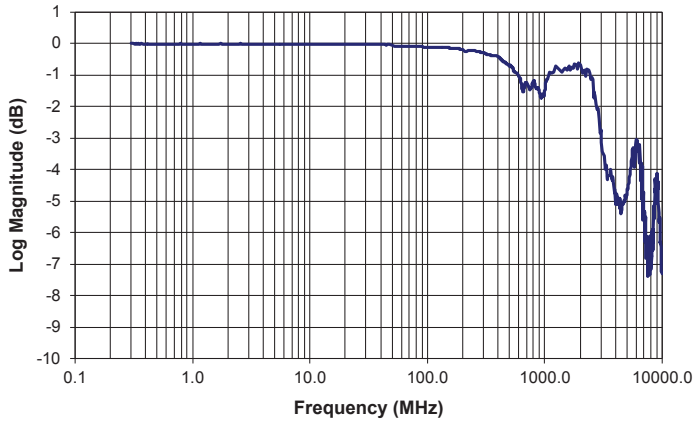


Crosstalk for two pairs of 075-25 Series wireless socket assemblies on a 0.075 [1.91] grid.

050-25 无线系列

050-25 SERIES | 0.050 [1.27] CENTERS

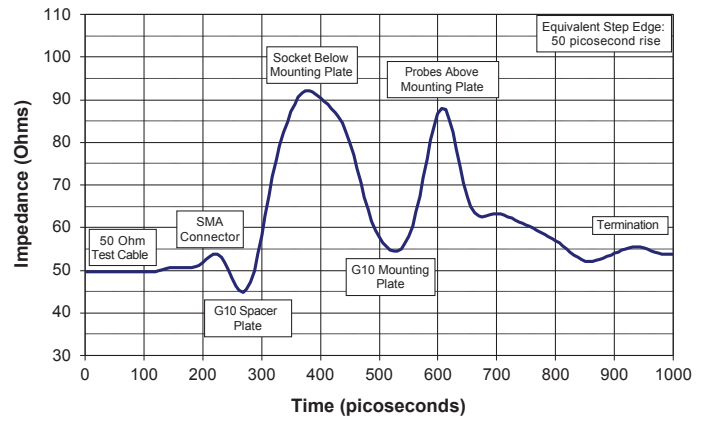
Frequency Response Measurement | -1dB at 585 MHz



Two 050-25 Series wireless socket assemblies (signal and ground) on 0.050 [1.27] centers.

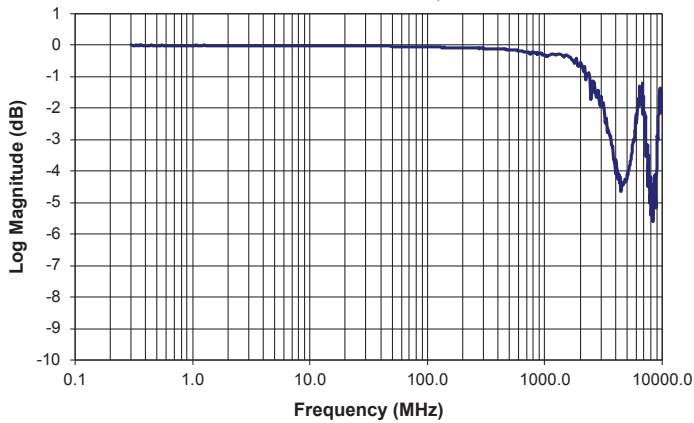
050-25 SERIES | 0.050 [1.27] CENTERS

TDR Measurement | Effective Test Frequency = 7GHz



050-25 SERIES | 0.050 [1.27] X3

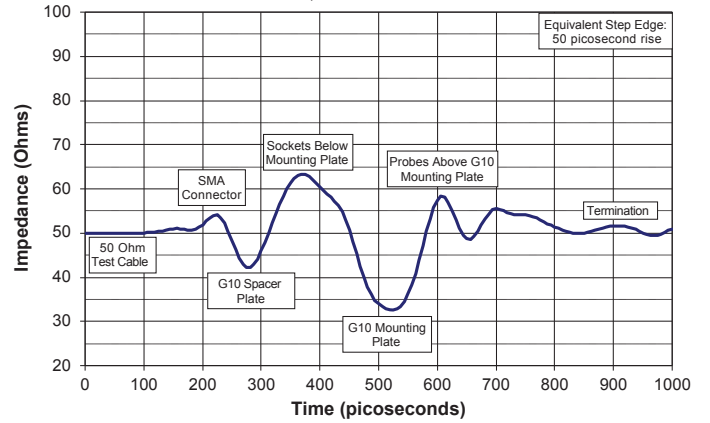
Frequency Response Measurement | -1dB at 2250 MHz



Three 050-25 wireless socket assemblies (ground-signal-ground) on 0.050 [1.27] centers.

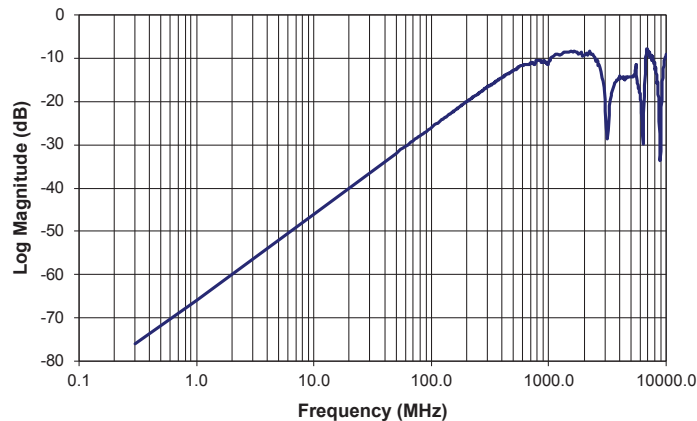
050-25 SERIES | 0.050 [1.27] X3

TDR Measurement | Effective Test Frequency = 7GHz



050-25 SERIES | 0.050 [1.27] CENTERS

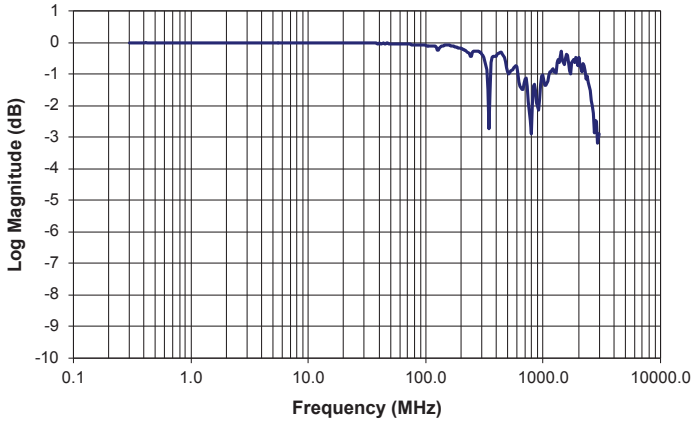
Crosstalk Measurement



Crosstalk for two pairs of 050-25 wireless socket assemblies on a 0.050 [1.27] grid.

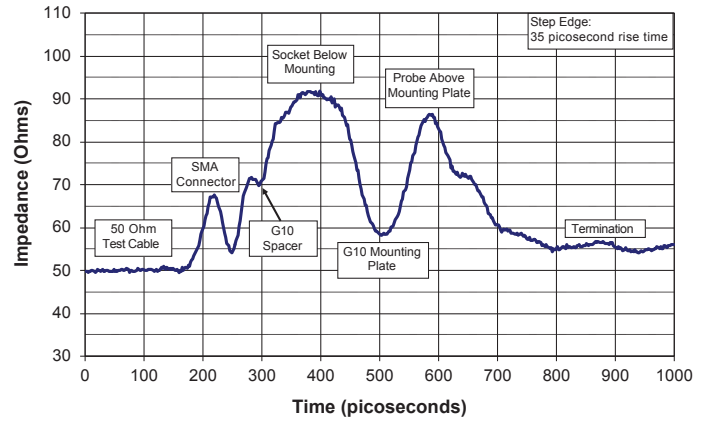
050-16 无线系列

050-16 SERIES | 0.050 [1.27] CENTERS
Frequency Response Measurement | -1dB at 336 MHz

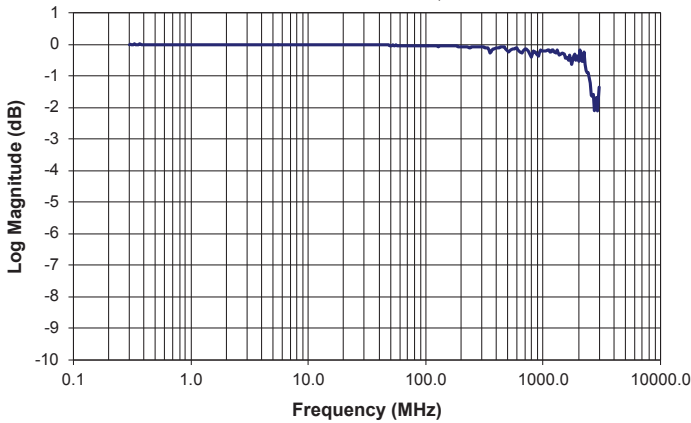


Two 050-16 wireless socket assemblies (signal and ground) on 0.050 [1.27] centers.

050-16 SERIES | 0.050 [1.27] CENTERS
TDR Measurement | Effective Test Frequency = 10GHz

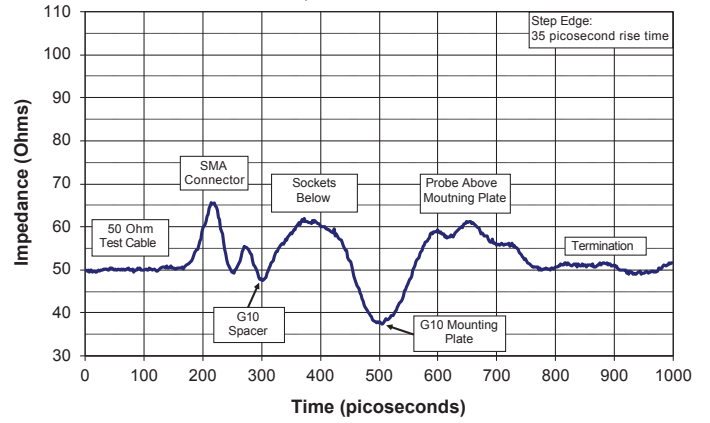


050-16 SERIES | 0.050 [1.27] X3
Frequency Response Measurement | -1dB at 2495 MHz

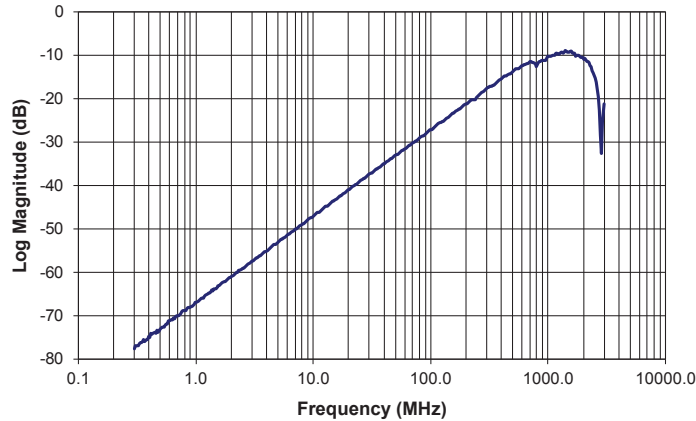


Three 050-16 wireless socket assemblies (ground-signal-ground) on 0.050 [1.27] centers.

050-16 SERIES | 0.050 [1.27] X3
TDR Measurement | Effective Test Frequency = 10GHz



050-16 SERIES | 0.050 [1.27] CENTERS
Crosstalk Measurement

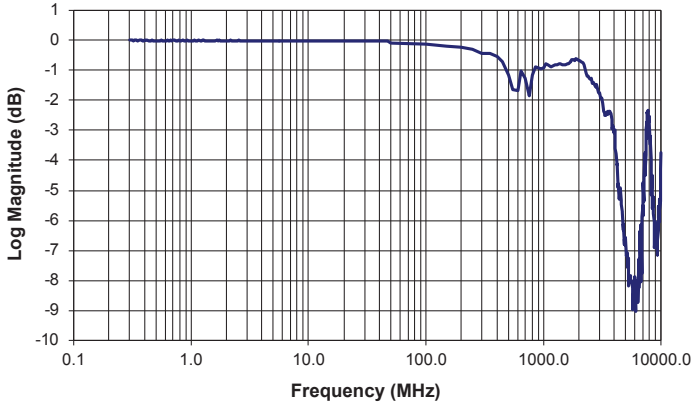


Crosstalk for two pairs of 050-16 wireless socket assemblies on a 0.050 [1.27] grid.

039-25 无线系列

039-25 SERIES | 0.039 [1.00] CENTERS

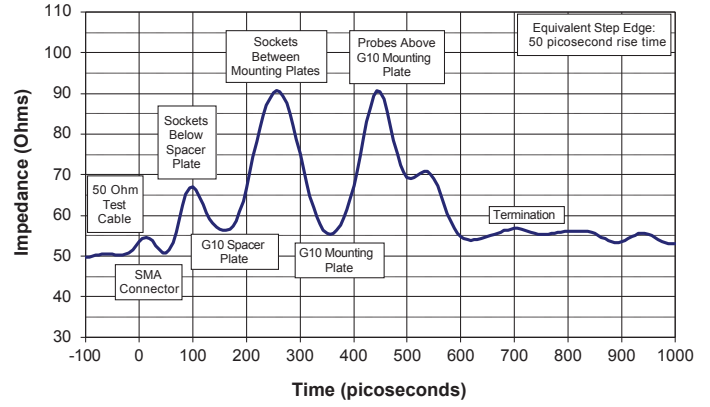
Frequency Response Measurement | -1dB at 500 MHz



Two 039-25 wireless socket assemblies (signal and ground) on 0.039 [1.00] centers.

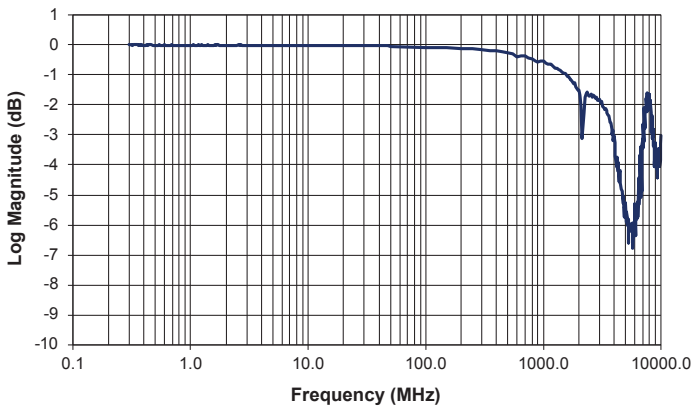
039-25 SERIES | 0.039 [1.00] CENTERS

TDR Measurement | Effective Test Frequency = 7GHz



039-25 SERIES | 0.039 [1.00] X3

Frequency Response Measurement | -1dB at 1600 MHz



Three 039-25 wireless socket assemblies (ground-signal-ground) on 0.039 [1.00] centers.

039-25 SERIES | 0.039 [1.00] X3

TDR Measurement | Effective Test Frequency = 7GHz

