Keysight Technologies CX1100 Accessories for CX3300 Analyzer

CX1101A Current Sensor, Single Channel
CX1102A Current Sensor, Dual Channel
CX1103A Current Sensor
CX1151A Passive Probe Interface Adapter
CX1152A Digital Channel

KEYSIGHT TECHNOLOGIES

User's Guide

Notices

Copyright Notice

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1 General Information

KEYSIGHT TECHNOLOGIES

Introduction

Keysight CX1100 series provides accessories for Keysight CX3300 Device Current Waveform Analyzer. The following accessories are available for connecting a device under test (DUT).

- "CX1101A Current Sensor, Single Channel"
- "CX1102A Current Sensor, Dual Channel"
- "CX1103A Current Sensor"
- "CX1151A Passive Probe Interface Adapter"
- "CX1152A Digital Channel"

For the specifications and more information on the accessories, refer to Keysight CX3300 *Data Sheet*. Go to www.keysight.com/find/cx3300a to get the latest documents.

CX1101A Current Sensor, Single Channel

For general current measurement of wide I-V range.

Current range: 40 nA to 1 A, maximum 10 A by using CX1206A sensor head

Maximum input voltage: ±40 V

Maximum bandwidth: 100 MHz

Input connector: SMA jack or BNC jack using adapter (furnished)

Furnished accessories:

- CX1203A sensor head
- Ground lead

- Adapter (SMA plug to BNC jack, 50 Ω)

Optional sensor head: CX1201A, CX1202A, CX1203A, CX1204A, CX1205A, CX1206A

Refer to "Sensor Heads for CX1101A/CX1102A Current Sensor" on page 27 for the sensor head.

CX1102A Current Sensor, Dual Channel

For fast transition current measurement using two analog channels.

Current range of primary channel: 1 μA to 1 A

Current range of secondary channel: 40 nA to 20 mA

Maximum input voltage: ±12 V

Maximum bandwidth: 100 MHz

Input connector: SMA jack or BNC jack using adapter (furnished)

Furnished accessories:

- CX1203A sensor head
- Ground lead
- Adapter (SMA plug to BNC jack, 50 Ω)

Optional sensor head: CX1201A, CX1202A, CX1203A, CX1204A, CX1205A

Refer to "Sensor Heads for CX1101A/CX1102A Current Sensor" on page 27 for the sensor head.

CX1103A Current Sensor

For wide bandwidth low current measurement in low voltage range.

Current range: 100 pA to 20 mA

Maximum input voltage: ±0.5 V (50 Ω input OFF), ±1 V (50 Ω input ON)

Maximum bandwidth: 200 MHz

Input connector: SMA jack or BNC jack using adapter (furnished)

Furnished accessories:

- Ground lead
- Adapter (SMA plug to BNC jack, 50 Ω)

CX1151A Passive Probe Interface Adapter

For 14/16-bit voltage measurement using passive voltage probe such as Keysight N2843A 500 MHz 10:1 Passive Probe.

Maximum input voltage: ±100 V peak (DC+AC)

Maximum bandwidth: 300 MHz

Input connector: BNC jack

CX1152A Digital Channel

Digital channel interface cable for digital signal monitoring.

Maximum input dynamic range: ±25 V

Input impedance: 10 MΩ

Number of channels: 8

Furnished accessories:

- Grabber, 10 ea.
- Probe ground lead, 5 ea.
- Adapter (BNC jack to probe tip), 1 ea.

Effective Measurement Bandwidth

The effective measurement bandwidth is determined by both the accessory's bandwidth and the CX3300's bandwidth. Table 1-1 shows the maximum effective bandwidth estimated by the following formula.

Effective bandwidth = $1/(1/A^2+1/B^2)^{1/2}$

Table 1-1 **Maximum Effective Bandwidth**

Accessories		CX3300 bandwidth option (B)		
Model No.	**Standalone bandwidth (A)**	**50 MHz**	**100 MHz**	**200 MHz**
CX1101A	100 MHz	45 MHz	70 MHz	90 MHz
CX1102A	100 MHz	45 MHz	70 MHz	90 MHz
CX1103A	200 MHz	50 MHz	90 MHz	140 MHz
CX1151A	300 MHz	50 MHz	95 MHz	165 MHz

- For the CX1101A/CX1102A, the values are effective for using the CX1201A, CX1202A, or CX1203A sensor head. If the CX1204A/CX1205A is used, it may be much worse than the above value. If the CX1206A is used, it will be approximately 3 MHz.
- For the CX1151A, the values are the voltage measurement bandwidth.
- Measurement bandwidth could be worse than the above value with the actual wiring to DUT from the sensor/adapter input.

NOTE

The bandwidth shown in the Channel summary on the CX3300 main screen is the approximate value automatically calculated by considering the measurement range, the sampling rate, and filters.

Inspection

- Inspect the shipping container for damage.

  Keep the shipping container and cushioning material until you have inspected the contents of the shipment for completeness and have checked the CX1100 mechanically and electrically.

  If the shipping container is damaged or the cushioning materials show signs of stress, notify the carrier as well as your Keysight Technologies Sales Office. Keep the shipping materials for the carrier's inspection. The Keysight Technologies office will arrange for repair or replacement at Keysight Technologies' option without waiting for claim settlement.

- Check the accessories.

  If the contents are incomplete or damaged, notify your Keysight Technologies Sales Office.

- Inspect the CX1100.

  If there is mechanical damage or defect, or if the CX1100 does not operate properly or pass diagnosis, notify your Keysight Technologies Sales Office.

  To perform diagnosis of the current sensor, see "Current Sensor Diagnosis" on page 12.

Maintenance

Maintenance should be performed periodically to keep the CX1100 in good condition. If problems arise, contact your Keysight Technologies Sales Office.

- "Cleaning"
- "Current Sensor Diagnosis"
- "Consumable Supplies"
- "Troubleshooting"
- "Servicing"

NOTE

For the precautions on connecting or disconnecting the CX1100, see "Using the CX1100" on page 19.

Cleaning

Disconnect the CX1100 from the CX3300 before cleaning.

Use a dry soft cloth or a soft cloth slightly dampened with a mild soap and water solution to clean the external case parts. Do not use detergents or chemical solvents. Do not attempt to clean internally.

Make sure that the CX1100 is completely dry before reconnecting to the CX3300.

Current Sensor Diagnosis

Perform the following procedure to start the diagnosis on the CX3300.

1. Connect the current sensor to the CX3300.
2. Press the Menu key several times to open the Configuration dialog box.
3. Click Diagnosis to display the Configuration > Diagnosis screen.
4. Click Sensor Floating PS and follow the instruction.

Consumable Supplies

For the consumable supplies of the CX1100/CX1200, see Table 1-2.

The sensor head is also the consumable supply.

Troubleshooting

Perform the following procedure to isolate the trouble between the CX3300 and the CX1100.

1. If you find the CX1100 which is not detected by the CX3300, disconnect it and connect it to another normal channel.

   If it is not detected by the CX3300, contact your nearest Keysight Technologies sales office. The CX1100 will be defective.

2. Perform the Self-Test.

   If the CX3300 fails the Self-Test, contact your nearest Keysight Technologies sales office. The CX3300 will be defective.

   For the Self-Test, refer to *Keysight CX3300 User's Guide*.

3. Perform the Sensor Floating PS test.

   If you find the CX100 which fails the test, disconnect it and connect it to another normal channel. If it fails the test, contact your nearest Keysight Technologies sales office. The CX1100 will be defective.

   For the Sensor Floating PS test, refer to "Current Sensor Diagnosis" on page 12.

Servicing

If the CX3300 is confirmed as defective, send it to an authorized service center for repair.

If the CX1100 is found to be defective, you can order the replacement part or you can send it to an authorized service center for repair.

If you are shipping the product to Keysight Technologies for service, perform the following steps before shipping.

1. Contact your nearest Keysight Technologies sales office for information on obtaining an RMA number and return address.
2. Write the following information on a tag and attach it to the malfunctioning equipment.
   - Name and address of owner
   - Product model number (for example, CX1101A)
   - Product serial number (for example, MYXXXXXXXX)
   - Description of failure or service required
3. Pack the product in the original carrying case or fungible.
4. Pack it in the original shipping container and cushioning material, or fungible.

   Seal the container closely and mark it as “FRAGILE”.

NOTE

If any correspondence is required, refer to the product by serial number and model number.

NOTE

Include the CX1203A sensor head for servicing the CX1101A or the CX1102A.

NOTE

You do not need to include the sensors and the sensor heads for servicing the CX3300 mainframe.

Table 1-2 CX1100/CX1200 Consumable Supplies

Description	Part number
Cable, coaxial, 50 Ω, BNC plug to BNC plug, 24 inch, 1 ea.	8121-2850
Ground lead, 1 ea.	C1101-61711
Adapter, coaxial, straight, 50 Ω, SMA plug to BNC jack, 1 ea.	1250-3975
Cable, coaxial, 50 Ω, SMA plug to open, 100 mm, 1 ea.	8121-2773
Cable, coaxial, 50 Ω, SMA plug to open, 300 mm, 1 ea.	8121-2854
Cable, coaxial, 50 Ω, SMA plug to MHF plug, 100 mm, 1 ea.	8121-2774
Cable, coaxial, 50 Ω, SMA plug to MHF plug, 300 mm, 1 ea.	8121-2853
Cable, coaxial, 50 Ω, MHF plug, shorted, 21 mm, 1 ea.	8121-2780
Connector, RF, 50 Ω, MHF jack straight SMT, 6 GHz, ∅ 2 mm, 1 ea.	1250-3656
MHF pulling tool, 1 ea.	8710-2791
Cable, shielded, twisted pair, 100 mm, 1 ea., for CX1204A	C1101-61712
Cable, shielded, twisted pair, 300 mm, 1 ea., for CX1204A	C1101-61713
Test lead, 2 inch, 5 ea., for CX1205A	5959-9334
Cable, Mini USB Plug to Mini USB Plug, 28AWG, 5 V, 1 A, 500 mm, 1 ea., for CX1206A	8121-2779
Cable, flat, 1 ea., for CX1152A	C1152-61701
Probe lead, 10 MΩ, 1 ea., for CX1152A	C1152-61702
Grabber, 1 ea., for CX1152A	5090-4832
Probe ground lead, 2 inch, 5 ea., for CX1152A	5959-9334
Pod ground lead, 5 ea., for CX1152A	5959-9335
Adapter, BNC to probe tip, 1 ea., for CX1152A	1250-3817
Label, probe, 1 sheet, for CX1152A	C1152-87101

Safety Information

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. This manual contains information and warnings that must be followed by users to ensure safe operation and to maintain the product in a safe condition.

- “Safety Summary”
- “Safety Symbols”
- “Product Stewardship”

Safety Summary

To avoid personal injury and to prevent fire or damage to this product or products connected to it, review and comply with the following safety precautions. Failure to comply with these precautions or with specific warnings elsewhere in this manual may impair the protections provided by the product. In addition, it violates safety standards of design, manufacture, and intended use of the product. Keysight Technologies assumes no liability for the customer’s failure to comply with these requirements.

NOTE

Do not use this product which is cracked, damaged or has defective leads.

Do not use this product in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Safety of any system incorporating the equipment is the responsibility of the assembler of the system.

- *DANGEROUS PROCEDURE WARNINGS*

  Warnings, indicated by red WARNING mark, shall be complied. Procedures throughout in this manual prevent you from potentially hazard. Their instructions contained in the warnings must be followed.

- *USE ONLY GROUNDED INSTRUMENTS*

Do not connect the CX1100 ground lead to a potential other than earth ground. Always make sure the CX1100 and the CX3300 are grounded properly.

- *KEEP AWAY FROM LIVE CIRCUITS*

  Avoid open circuitry. Do not touch connections or components when power is present.

- *INDOOR USE ONLY*

  Do not operate in wet/damp environments. Keep product surfaces dry and clean.

  Do not operate in the presence of flammable gases, corrosive gases, or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

- *DO NOT REMOVE COVERS*

  No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.

- *IN CASE OF DAMAGE OR SUSPECTED FAILURES*

  Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel. Return the instrument to a Keysight Technologies sales or service office for services and repair to ensure that safety features are maintained.

- *USE ONLY THE SPECIFIC ACCESSORIES*

  Specific accessories satisfy the requirements for specific characteristics for using the instrument. Use the specific accessories, cables, adapters, and so on for safety reasons.

Safety Symbols

The general definitions of safety symbols used on the CX1100 or in this manual are listed below.

Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.

Caution, refer to accompanying documentation. The equipment will be marked with this symbol when it is necessary for the user to refer to the instruction manual.

Read operator's manual. To indicate that the operator's manual or card should be read before continuing the operation.

The CE mark shows that the product complies with all applicable European Directives.

China RoHS - Product with Toxic Substance 40 yr EPUP

WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

Product Stewardship

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/ electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a “Monitoring and Control instrumentation” product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Keysight office or visit the following website for more information.

http://about.keysight.com/en/companyinfo/environment/

2 Using the CX1100

NOTE

Do not use the CX1100 which is cracked, damaged or has defective leads.

CAUTION

The current sensor cable is a sensitive part of the sensor and, therefore, you should be careful not to damage it through excessive bending or pulling. Avoid any mechanical shocks to this product in order to guarantee accurate performance and protection.

CAUTION

To prevent damage on the current sensor, do not apply any electrical potential and/or current to the current sensor input when the CX3300 has been turned off or the current sensor has been disconnected from the CX3300.

To Connect/Disconnect DUT

Connect or disconnect DUT properly to prevent damage on DUT and on the CX1100.

Connecting Current Sensor to the CX3300

Connect a current sensor to the CX3300 before connecting DUT.

1. If you use the CX1101A or CX1102A current sensor, attach a sensor head to the current sensor.
2. Attach the connector of a current sensor to the desired analog input channel on the CX3300.
3. Fasten the screws on the connector to assure the contact.

If the CX3300 does not detect the current sensor or the sensor head:

- Disable and enable the analog input channel connected to the current sensor by pressing the 1 (yellow), 2 (green), 3 (blue), or 4 (red) key associated with the channel. When the channel is disabled, the key does not light.
- Or, disconnect the current sensor or the sensor head and connect it again.

NOTE

Connecting the CX1102A Current Sensor to the CX3324A

Connect the Primary and Secondary connectors to the contiguous channels 1 and 2, 2 and 3, or 3 and 4. Both connectors must be connected properly.

Connecting Current Sensor to DUT

Turn the CX3300 on and connect a current sensor to the CX3300 before connecting the current sensor to DUT.

1. If voltage is applied to DUT, shut off the power to DUT.
2. Connect the sensor ground lead to earth ground near DUT.
3. Connect the sensor input to DUT by using the SMA cable, the furnished accessories, or your desired cable and accessories.

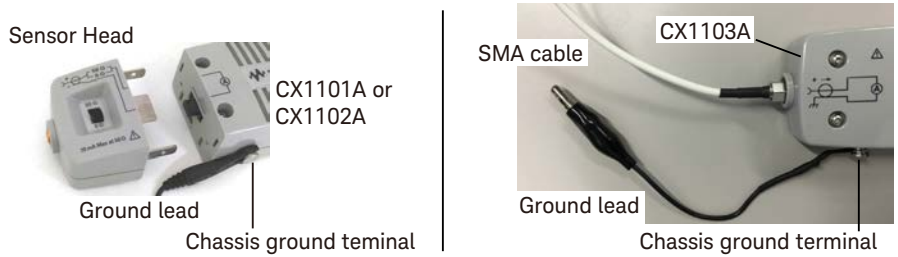
   For using the CX1101A/CX1102A current sensor, also see "Sensor Heads for CX1101A/CX1102A Current Sensor" on page 27.

   For using the CX1103A current sensor, also see "CX1103A Current Sensor" on page 36.

When the current sensor has been connected to DUT:

- Do not apply any electrical potential and/or current to the current sensor input which exceeds the maximum rating of the current sensor. For the maximum rating, refer to Keysight CX3300 *Data Sheet*.
- Do not turn the CX3300 off.
- Do not disconnect the current sensor from the CX3300.
- Do not remove the sensor head from the current sensor.

Figure 2-1 **Connecting Current Sensor Input**



WARNING

IF YOU CONNECT FUSES TO THE CURRENT SENSOR INPUT

Use fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.). Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

Disconnecting Current Sensor from DUT

Before disconnecting DUT:

- Do not turn the CX3300 off.
- Do not disconnect the current sensor from the CX3300.
- Do not remove the sensor head from the current sensor.

If you want to disconnect DUT along with the sensor head:

- Shut off the power to DUT, then remove the sensor head from the current sensor, to prevent damage on DUT.

After the measurement is completed, disconnect the current sensor from DUT as shown below.

1. If voltage is applied to DUT, shut off the power to DUT.
2. Disconnect the sensor input from DUT.
3. Disconnect the sensor ground lead.

After disconnecting DUT:

- Isolate the sensor input conductor and do not contact it with DUT to prevent damage on DUT.

Using the CX1151A Passive Probe Interface Adapter

To monitor voltage, connect the CX1151A to the CX3300 as shown below.

1. Attach the CX1151A to the desired analog input channel on the CX3300.
2. Fasten the screws on the CX1151A to assure the contact.

If the CX3300 does not detect the CX1151A:

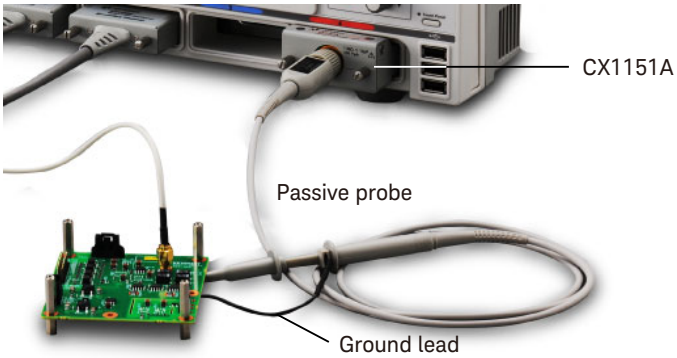
- Disable and enable the analog input channel connected to the CX1151A by pressing the 1 (yellow), 2 (green), 3 (blue), or 4 (red) key associated with the channel. When the channel is disabled, the key does not light.
- Or, disconnect the CX1151A and connect it again.

To connect DUT

Use a passive probe or a BNC cable and accessories, and connect DUT as shown below. For the supported probes, see Table 2-1 on page 24.

1. Connect a probe or a cable to the CX1151A.
2. If voltage is applied to DUT, shut off the power to DUT.
3. Connect the ground lead to earth ground near DUT if the probe is used.
4. Connect the probe or the cable to DUT.

Figure 2-2 **CX1151A Connection Example**



When the probe/cable has been connected to DUT:

- Do not apply any electrical potential and/or current to the probe input which exceeds the maximum rating of the probe. For the maximum rating, refer to the probe's manual, data sheet, or selection guide.

Table 2-1 **Supported Passive Probes**

Attenuation ratio	Keysight model number
1:1	10070D, N2870A
10:1	10073D, 10074D, N2862B, N2863B, N2871A, N2872A, N2873A, N2890A, N2894A, N2853A, N2843A, N2842A, N2841A, N2840A
20:1	N2875A
100:1	10076C

Some of Keysight passive probes can be used, but the skew adjustment with the CX3300 is made by the N2843A 500 MHz 10:1 Passive Probe. Other probes can be used as well if you don't care much about the skew optimization.

If you use the probe other than the N2843A and you want to adjust the skew, enter the Skew value on the Channel mini dialog box or the Setting dialog box (Setting > Channels > Skew).

You may use a probe which is not listed in Table 2-1. Or you may insert an attenuator between the CX1151A and DUT. Then, the CX3300 cannot detect it automatically. So you need to specify its attenuation ratio as follows.

1. Press the Menu key to open the Setting dialog box.
2. Set the following conditions on the Setting dialog box (Setting > Sensor / Probe > Channel *N*). Where, *N* is 1, 2, 3, or 4 associated with the channel connected to the CX1151A.
   - Channel *N*: ON
   - Attenuation:

     Set 1.000 for a 1:1 probe, 10.00 for a 10:1 probe, 100.0 for a 100:1 probe, or the attenuation value of the used probe or the inserted attenuator.

To disconnect DUT

After the measurement is completed, disconnect the probe/cable from DUT as shown below.

1. If voltage is applied to DUT, shut off the power to DUT.
2. Disconnect the probe or the cable from DUT.
3. Disconnect the ground lead if the probe is used.
4. Disconnect the probe or the cable from the CX1151A.

Using the CX1152A Digital Channel

The CX1152A is the accessory for the CX3324A. To monitor digital signal, connect the CX1152A to the CX3324A and set the CX3324A as shown below.

CAUTION

Be sure to orient the flat cable and the Digital D7-D0 connector. Inserting the cable incorrectly could bend pins and/or cause errors.

1. Connect the flat cable of the CX1152A to the Digital D7-D0 connector on the CX3324A rear panel.
2. Press the Menu key to open the Setting dialog box.
3. Set the following conditions on the Setting dialog box (Setting > Digital Channels).
   - Digital Channels: ON
   - Channels:

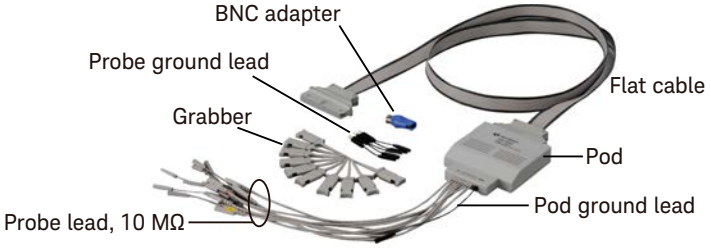
     Check the D7, D6, D5, D4, D3, D2, D1, and/or D0 check box associated with the digital channel used for the measurement.
   - Graph scale:

     Small, medium, or large
   - Display order from top to bottom on the graph:

     D0-D7 (D0 to D7) or D7-D0 (D7 to D0)
   - Threshold Voltage:

     Set the voltage for judging the logic level high or low.

Figure 2-3 CX1152A Digital Channel

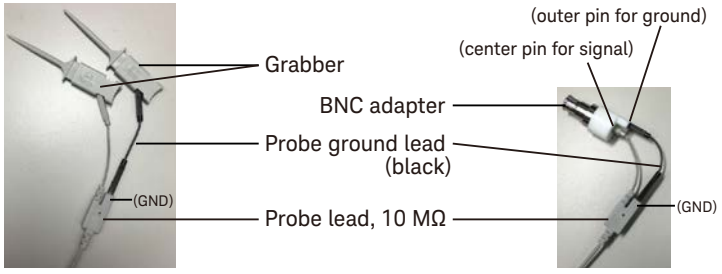


Furnished accessories (see Table 1-2 on page 15 for the part number):

- Grabber, 10 ea.
- Probe ground lead, 5 ea.
- BNC adapter (BNC jack to probe tip), 1 ea.

To connect DUT, use these accessories as shown in Figure 2-4.

Figure 2-4 **Connecting the grabber/BNC adapter**



CAUTION

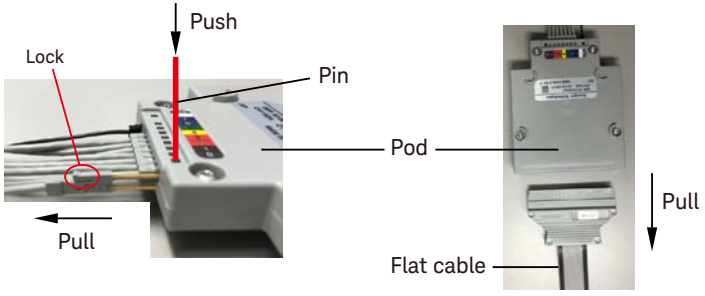
Do not apply voltage to the digital channel input which exceeds ±40 V.

Replacing probe lead, pod ground lead, and flat cable

To replace the lead or the cable, disconnect it as shown below and replace it with new one. See Figure 2-5.

- To disconnect the lead from the pod, prepare a pin used to release the lock of the lead. While pushing the lock using the pin, pull the connector of the lead.
- To disconnect the flat cable from the pod, pull the connector of the flat cable.

Figure 2-5 **Disconnecting the probe lead and the flat cable**



Sensor Heads for CX1101A/CX1102A Current Sensor

The following sensor heads are available for Keysight CX1101A/CX1102A current sensor.

- "CX1201A Sensor Head, Coaxial Through"
- "CX1202A Sensor Head, Coaxial Through with V Monitor"
- "CX1203A Sensor Head, Coaxial Termination"
- "CX1204A Sensor Head, Twisted Pair Adapter"
- "CX1205A Sensor Head, Test Lead Adapter"
- "CX1206A Sensor Head, High Current Adapter with Expander"

This section provides the description, the simplified circuit diagram, and the connection image of each sensor head.

CX1201A Sensor Head, Coaxial Through

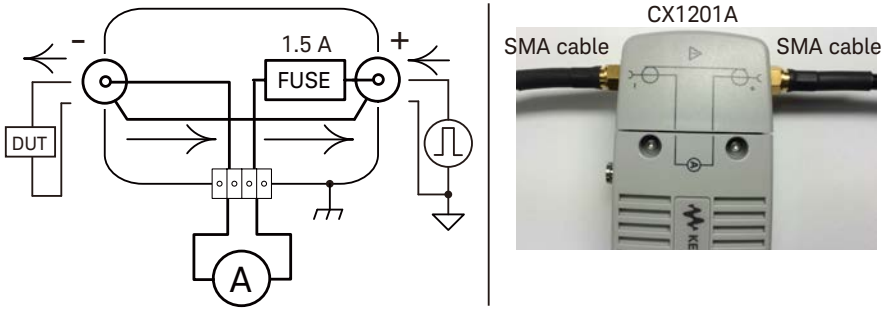
Has two SMA connectors for ammeter + and – terminals of a CX3300 analog input channel through a current sensor.

Maximum current: 1 A

Input connector: SMA jack

To connect DUT, use SMA cables as shown in Figure 2-6. Also see Figure 2-8.

Figure 2-6 CX1201A Simplified Circuit Diagram and Connection Image



CX1202A Sensor Head, Coaxial Through with V Monitor

Has two SMA connectors for ammeter + and – terminals of a CX3300 analog input channel through a current sensor. Also has a SMA connector for voltage monitor by a voltmeter.

Maximum current: 1 A

Input connector: SMA jack

To connect DUT, use SMA cables as shown in Figure 2-7. This example also uses a passive probe, a probe tip-BNC plug adapter, and a BNC jack-SMA plug adapter for voltage monitor. The passive probe may be connected to the CX1151A Passive Probe Interface Adapter attached on a CX3300 analog input channel. Also see Figure 2-8.

Figure 2-7 **CX1202A Simplified Circuit Diagram and Connection Image**

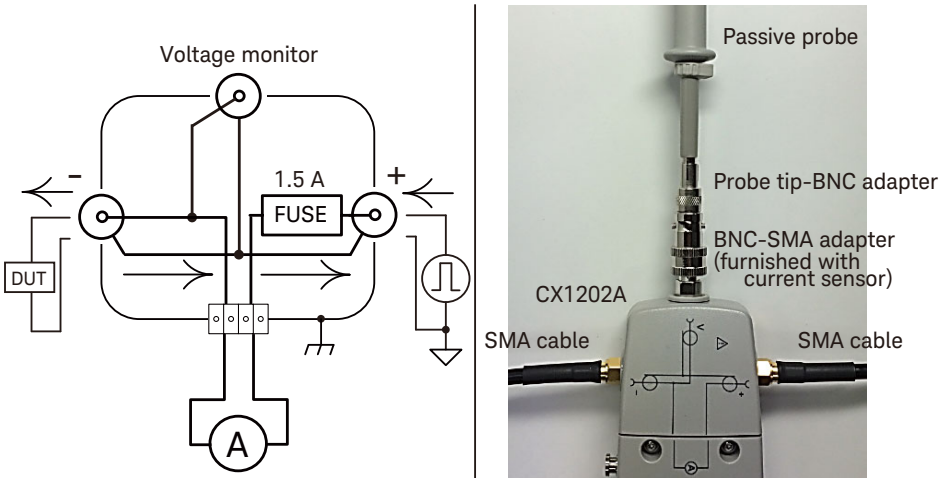
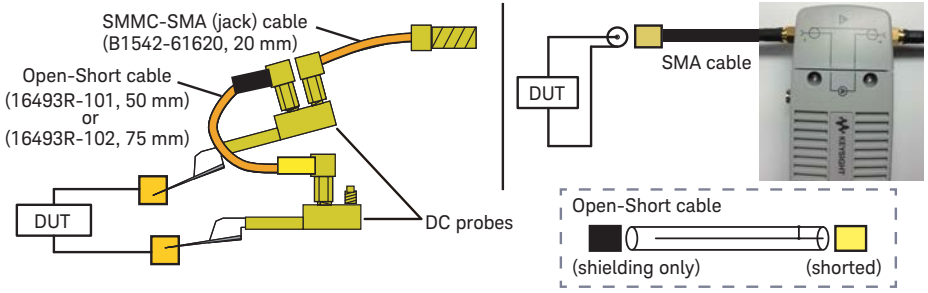


Figure 2-8 **On Wafer Device Connection Example using DC Probes**



CX1203A Sensor Head, Coaxial Termination

Has a SMA connector for ammeter + and – terminals of a CX3300 analog input channel through a current sensor. Also has a built-in series resistor 50 Ω.

Maximum current: 1 A with 0 Ω, 70 mA with 50 Ω series resistor

Input connector: SMA jack (center: +, outer: –)

To connect DUT, use a SMA cable as shown in Figure 2-9, a BNC cable as shown in Figure 2-10, or the furnished accessories as shown in Figure 2-11 or 2-12.

Furnished accessories (see Table 1-2 on page 15 for the part number):

- SMA plug to open cable, 50 Ω, 100 mm, 1 ea.

  Use this cable to solder DUT directly. See Figure 2-11.

  Do not connect this cable to the sensor input when you solder DUT.

- MHF connection kit

  Used for mounting MHF connector on DUT and connecting it to the sensor input. See Figures 2-12 and 2-13.

  - MHF jack straight connector for surface mount, 50 Ω, ∅ 2 mm, 5 ea.

    This is Samtec Inc. RSP-122811-01 or equivalent. Create the pads for this connector on DUT and solder this connector on there.

  - SMA plug to MHF plug cable, 50 Ω, 100 mm, 1 ea.

    Use this cable to connect the sensor input to DUT.

  - MHF plug short cable, 50 Ω, 21 mm, 5 ea.

    Use this cable to short the pads.

  - MHF pulling tool, 1 ea.

    Use this tool to remove the MHF cable from the MHF connector on DUT.

Other available accessories (see Table 1-2 on page 15 for the part number):

- SMA plug to open cable, 50 Ω, 300 mm

  Use this cable to solder DUT directly.

- SMA plug to MHF plug cable, 50 Ω, 300 mm

  Use this cable to connect the sensor input to the MHF connector on DUT.

Figure 2-9 **CX1203A Simplified Circuit Diagram and Connection Image**

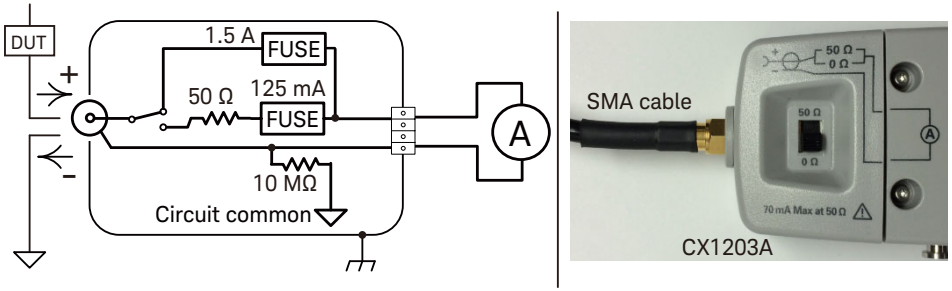
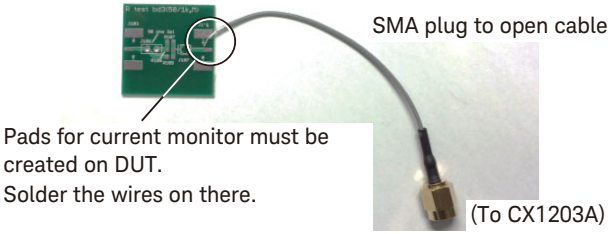


Figure 2-10 **Using a BNC cable**

Figure 2-11 **Using the SMA plug to open cable**



CAUTION

Do not connect the SMA plug to open cable to the sensor input when you solder DUT.

Figure 2-12 **Using the MHF connection kit**

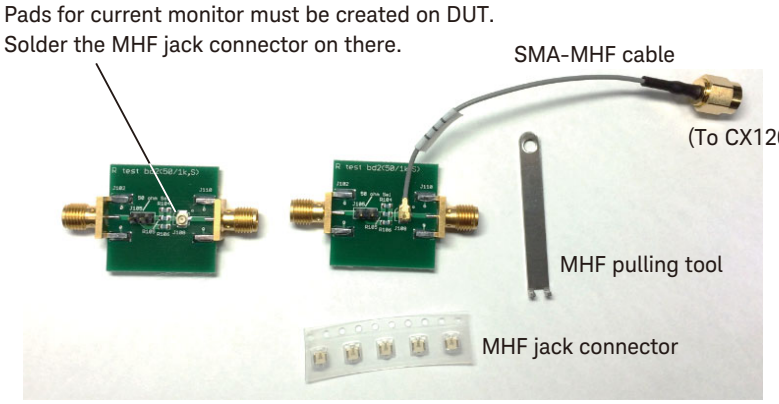
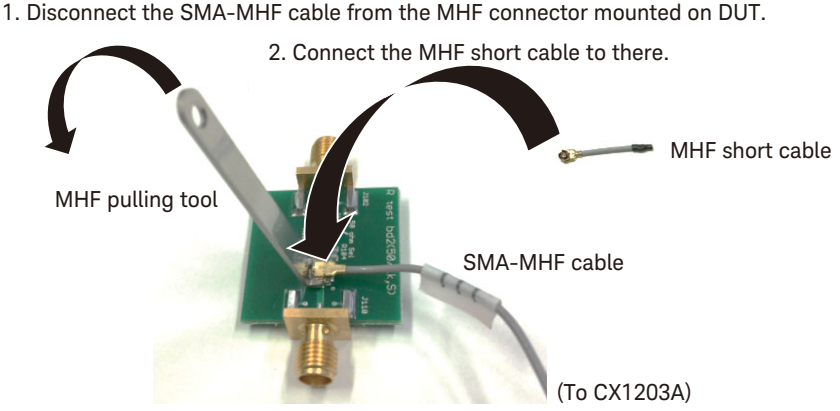


Figure 2-13 **Disconnecting the SMA-MHF cable and connecting the MHF short cable**



CX1204A Sensor Head, Twisted Pair Adapter

Sensor head with extension cables for soldering DUT

Maximum current: 1 A

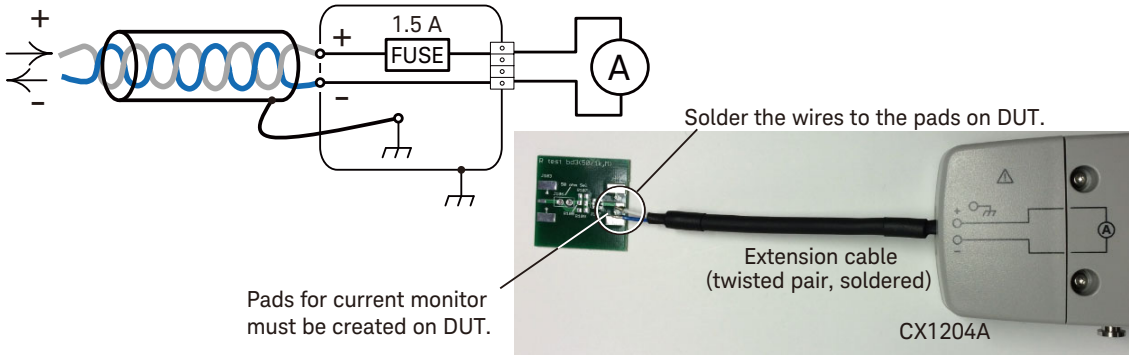
Furnished accessories (see Table 1-2 on page 15 for the part number):

- Extension cable (twisted pair) 100 mm, 1 ea., soldered on the sensor head
- Extension cable (twisted pair) 300 mm, 1 ea.

Initially, a 100 mm cable has been soldered on the sensor head. If you want to replace the extension cable, see "Replacing the extension cable" on page 33.

To connect DUT, solder the wires of the extension cable, which are soldered on the sensor head, as shown in Figure 2-14.

Figure 2-14 CX1204A Simplified Circuit Diagram and Connection Image



CAUTION

Do not attach the sensor head to the current sensor when you solder DUT or replace the extension cable.

Replacing the extension cable

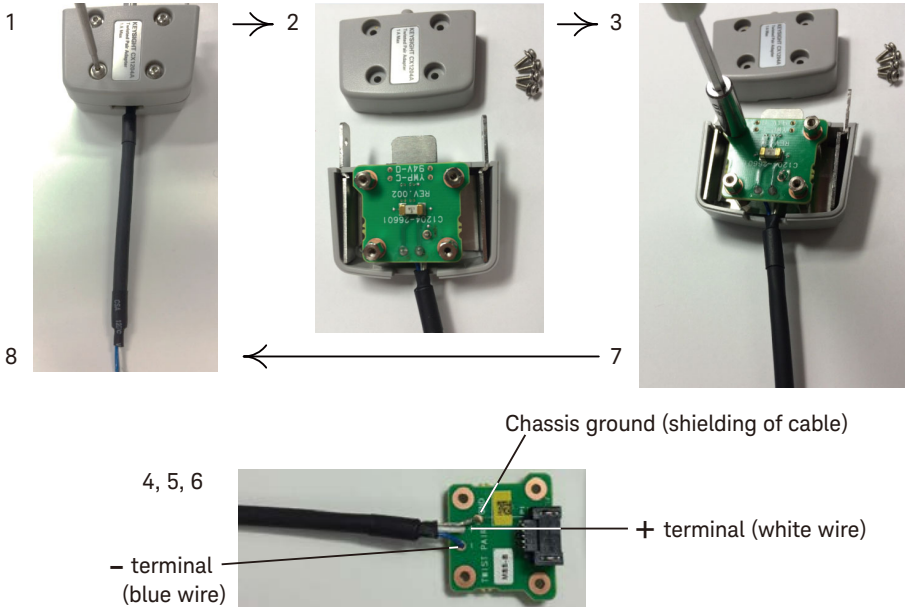
To replace the extension cable, remove the sensor head cover and the internal PC board by using the following tools.

- T6 Torx screwdriver
- 4 mm box driver

Procedure:

1. Unscrew and remove four screws from the bottom cover.
2. Remove the bottom cover.
3. Unscrew and remove four standoff screws from the PC board.
4. Remove the PC board.
5. Unsolder the wires from the PC board, and remove the extension cable.
6. Prepare a new extension cable and solder the wires.
7. Replace the PC board on the top cover using the standoff screws.
8. Replace the bottom cover by using the screws.

Figure 2-15 **Removing bottom cover and PC board**



CX1205A Sensor Head, Test Lead Adapter

Has two mini jack terminals for ammeter + and – terminals of a CX3300 analog input channel through a current sensor.

Maximum current: 1 A

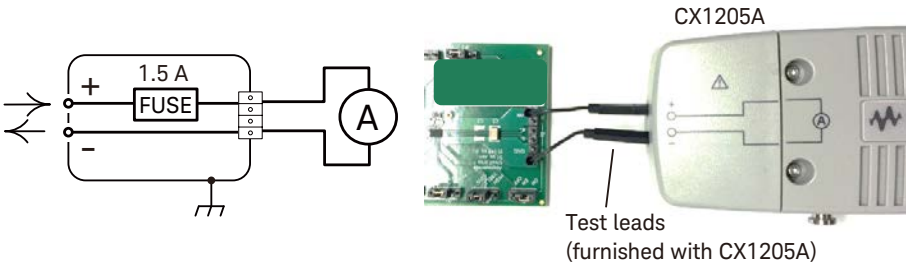
Input terminals: Mini jack

Furnished accessories (see Table 1-2 on page 15 for the part number):

- Test lead, mini plug to mini jack, 2 inch, 10 ea.

To connect DUT, use the test leads as shown in Figure 2-16. The test leads can be used for connecting the mini plug (pin) on DUT directly.

Figure 2-16 CX1205A Simplified Circuit Diagram and Connection Image



CX1206A Sensor Head, High Current Adapter with Expander

Accessory for the CX1101A current sensor. Expands the maximum measurement current up to 10 A. Has two banana jack terminals for ammeter + and – terminals of a CX3300 analog input channel through a current sensor.

Maximum voltage: ±40 V

Maximum current: 10 A

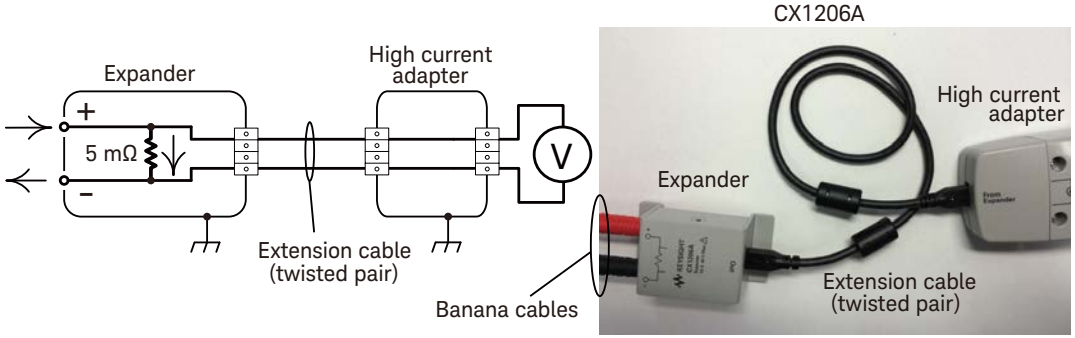
Input terminals: Banana jack

Contents:

- High current adapter, 1 ea.
- Expander, 1 ea.
- Extension cable, 1 ea.

To connect DUT, use banana cables as shown in Figure 2-17.

Figure 2-17 CX1206A Simplified Circuit Diagram and Connection Image



CX1103A Current Sensor

The CX1103A has a SMA connector for ammeter + and – terminals of a CX3300 analog input channel.

Maximum current: 20 mA

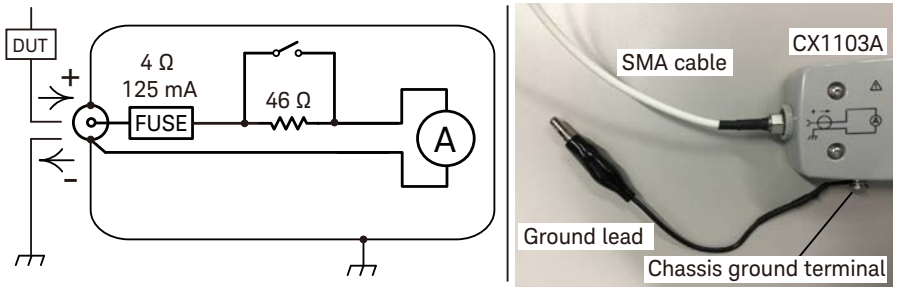
Input connector: SMA jack (center: +, outer: –)

To connect DUT, use a SMA cable as shown in Figure 2-18 or a BNC cable and the BNC to SMA adapter furnished with the CX1103A.

Furnished accessories (see Table 1-2 on page 15 for the part number):

- Ground lead, 1 ea.
- BNC jack to SMA plug adapter, 1 ea.

Figure 2-18 **CX1103A Simplified Circuit Diagram and Connection Image**



Precautions for Measurements

- Let the CX1100 connected to the CX3300 warm up for 30 minutes.
- Do not connect the ground lead to a potential other than earth ground.
- Keep away DUT from the CX3300.
- Avoid, if possible, the proximity of something which may create noise.
- During the measurement, do not touch connectors and components in the measurement path.
- The CX3300 provides the user calibration capability for making more accurate measurements. To perform the user calibration, refer to *Keysight CX3300 User's Guide*.

CAUTION

OBSERVE THE CX1100 RATINGS

Do not apply any electrical potential and/or current to the CX1100 input which exceeds the maximum rating of the CX1100. For the maximum rating, refer to Keysight CX3300 *Data Sheet*.

NOTE

About Measurement Accuracy

Measurement accuracy can be affected by RF electro-magnetic field having the strengths greater than 3 V/m in the frequency range of 80 MHz to 2 GHz or 1 V/m in the frequency range of 2 GHz to 2.7 GHz. The extent of this effect depends upon how the instrument is positioned and shielded.

3 Performance Data Plots

This chapter provides the following performance plots for the CX1100.

CX1101A and CX1102A:

- Frequency response
- Step response
- RMS noise
- Input impedance
- Input equivalent circuit

CX1103A:

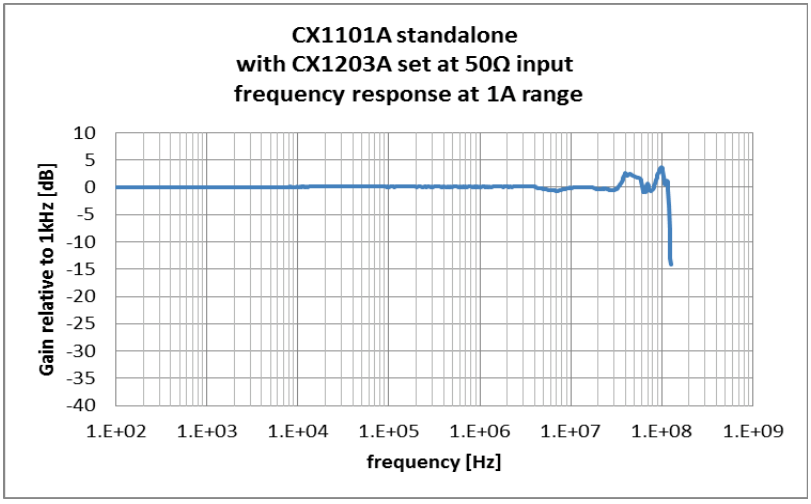
- Frequency response
- Step response
- RMS noise
- Input impedance

CX1151A:

- Frequency response
- Step response

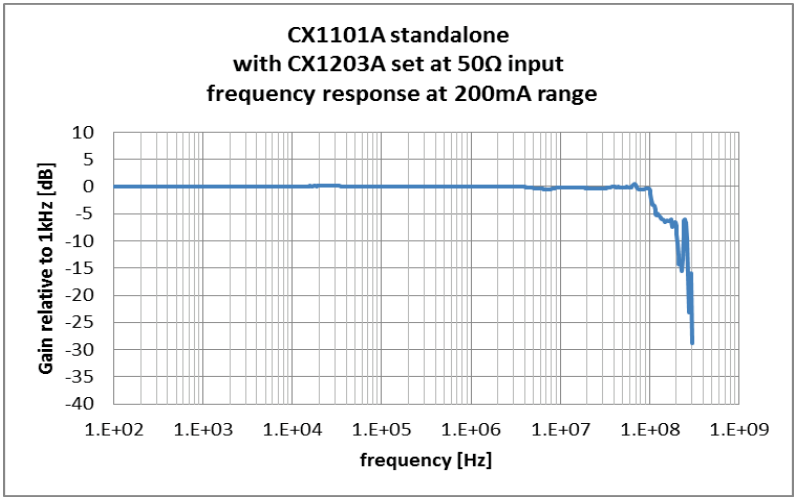
CX1101A

Figure 3-1 **Frequency Response, 1 A Range**



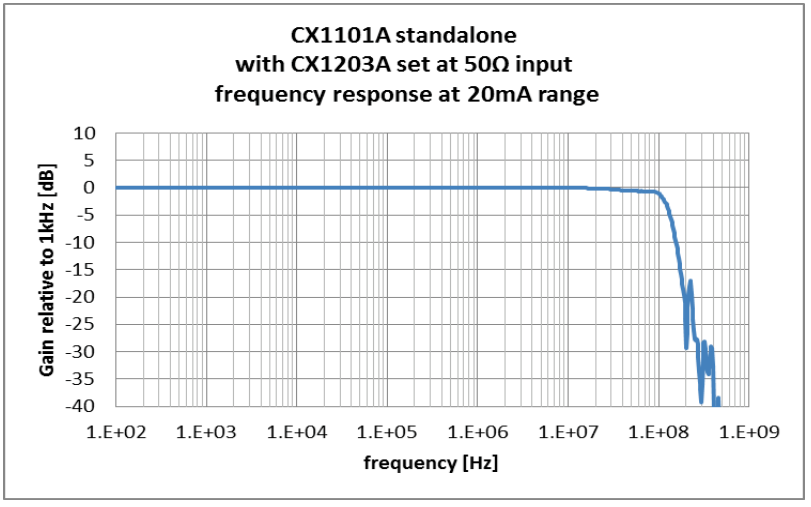
- -3 dB bandwidth: 120 MHz

Figure 3-2 **Frequency Response, 200 mA Range**



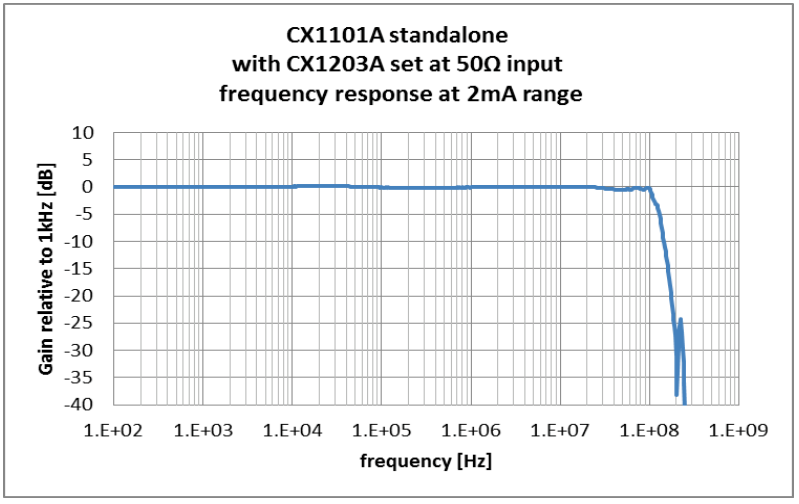
- -3 dB bandwidth: 105 MHz

Figure 3-3 **Frequency Response, 20 mA Range**



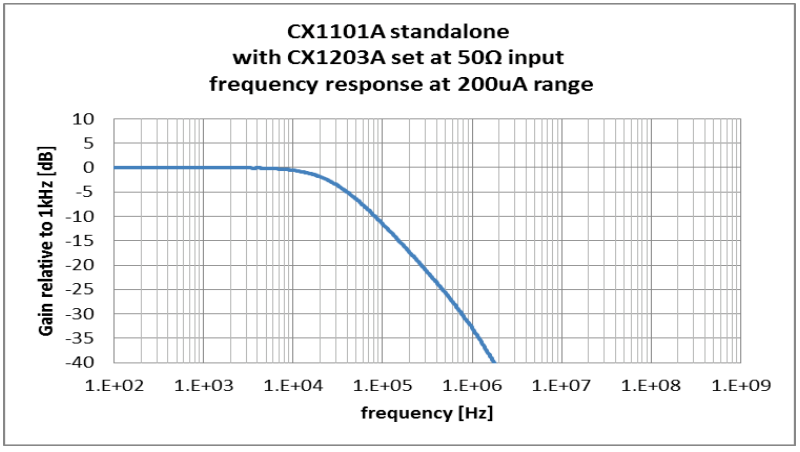
- -3 dB bandwidth: 120 MHz

Figure 3-4 **Frequency Response, 2 mA Range**



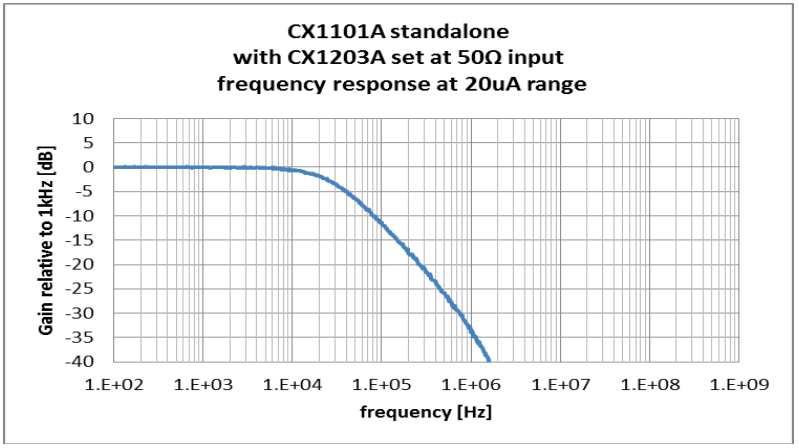
- -3 dB bandwidth: 115 MHz

Figure 3-5 **Frequency Response, 200 μA Range**



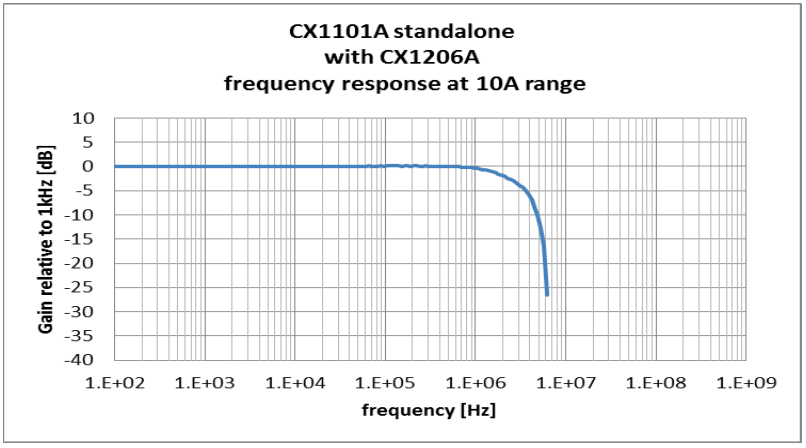
- -3 dB bandwidth: 27 kHz

Figure 3-6 **Frequency Response, 20 μA Range**



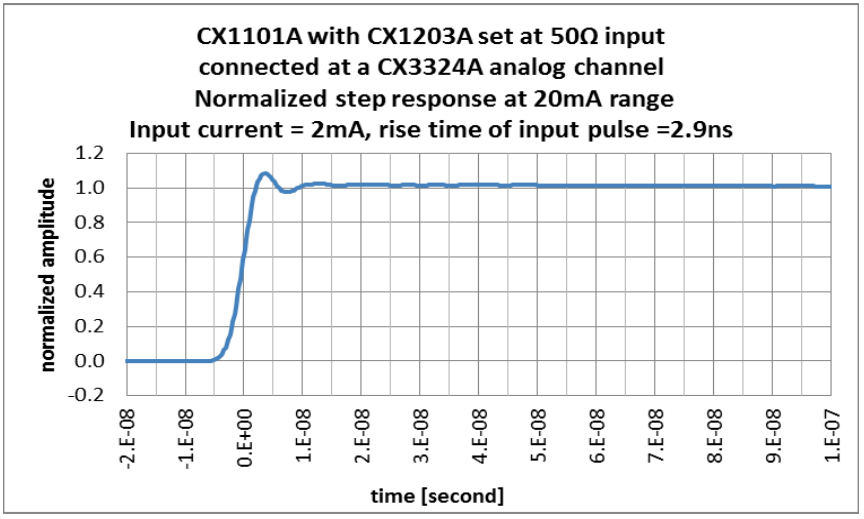
- -3 dB bandwidth: 27 kHz

Figure 3-7 **Frequency Response, 10 A Range**



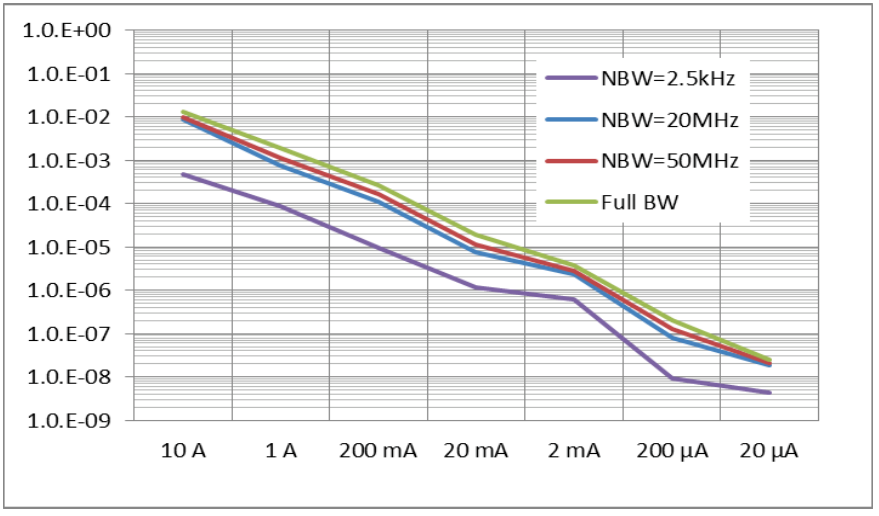
- -4 dB bandwidth: 3.3 MHz

Figure 3-8 **Step Response, 20 mA Range**



- 10-90% rise time: 4 ns
- 10-90% rise time of CX1101A: 2.7 ns = sqrt (4^2-2.9^2)

Figure 3-9 **RMS Noise [A] vs Current Range, with CX3300 and Sensor Input Open**



NBW: Bandwidth limit

Full BW: Bandwidth limit off

Figure 3-10 **Input Common Mode Impedance**

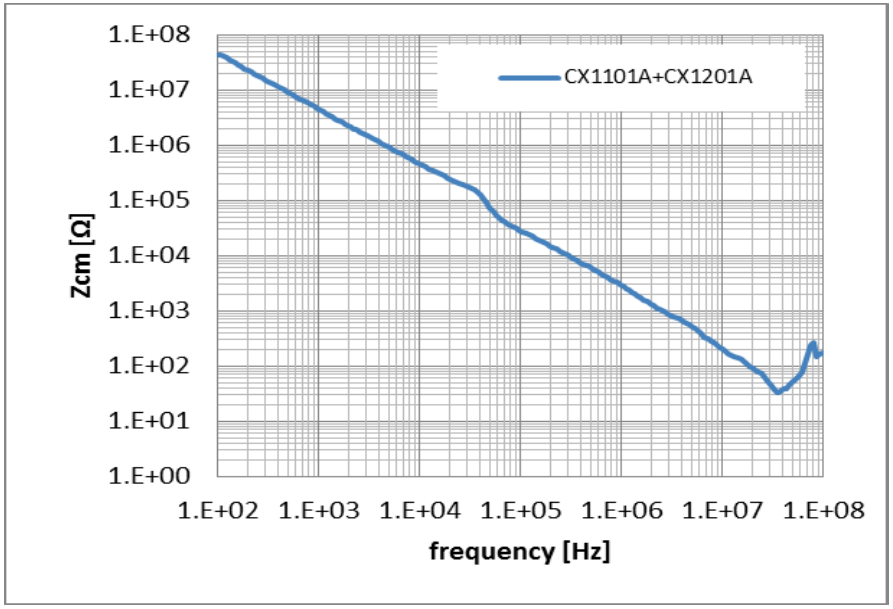


Figure 3-11 **Input Insertion Impedance**

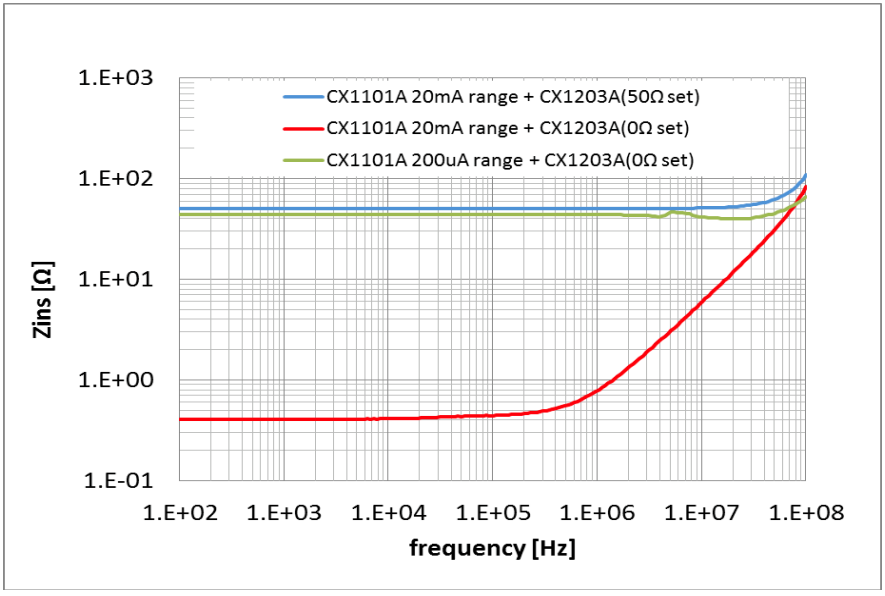
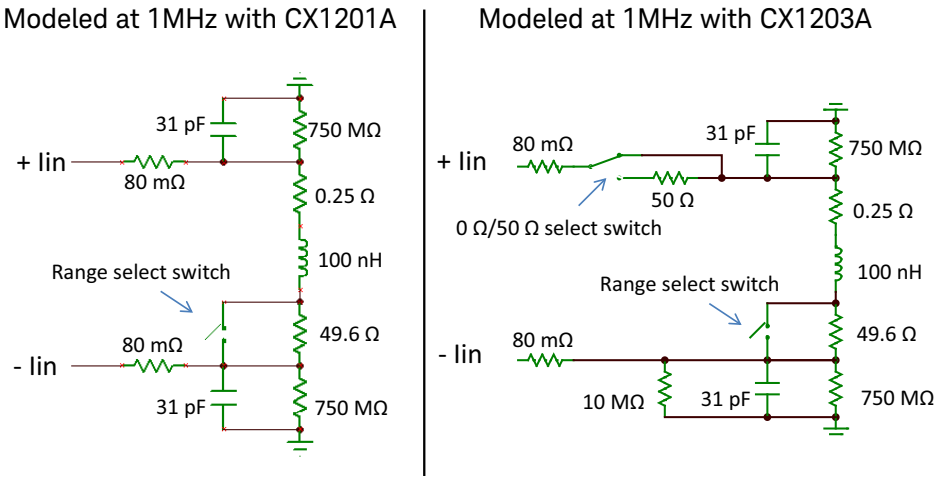


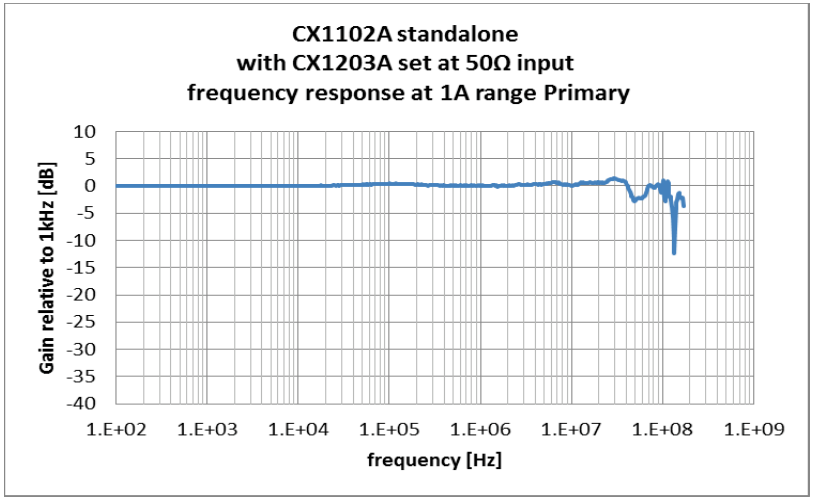
Figure 3-12 **Input Equivalent Circuit**



The range select switch opens for the 20 µA and 200 µA ranges and closes for the other ranges.

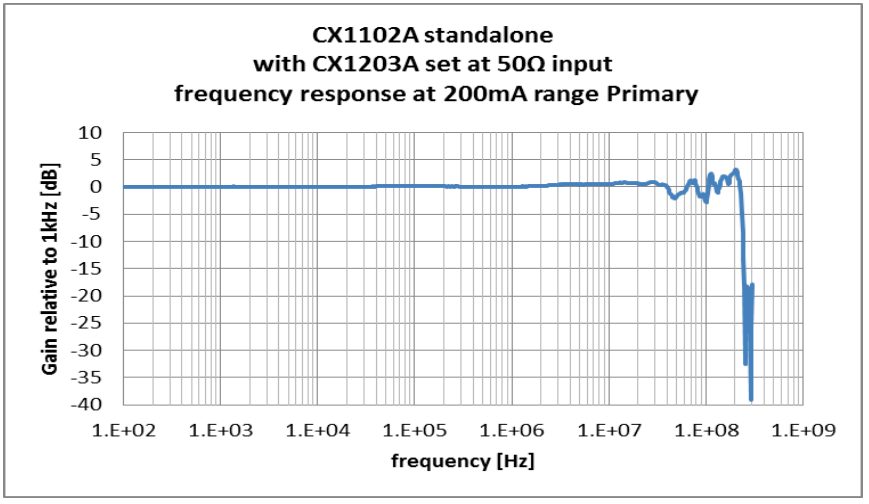
CX1102A

Figure 3-13 **Frequency Response, Primary 1 A Range**



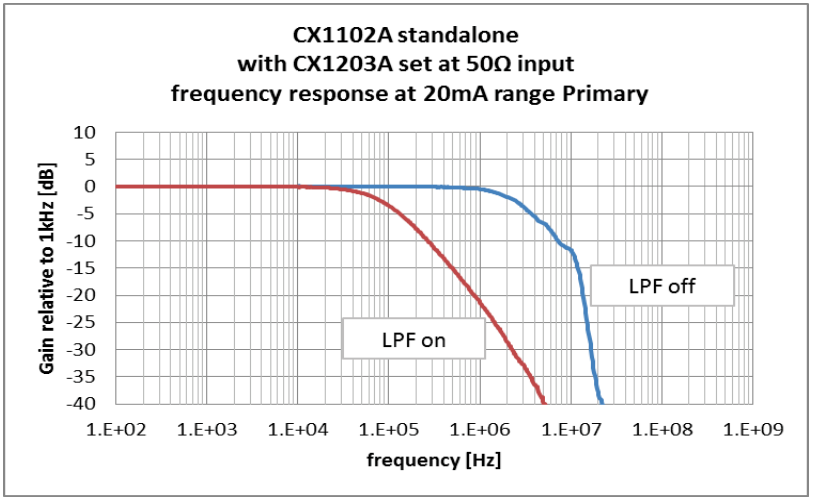
- -3 dB bandwidth: 127 MHz

Figure 3-14 **Frequency Response, Primary 200 mA Range**



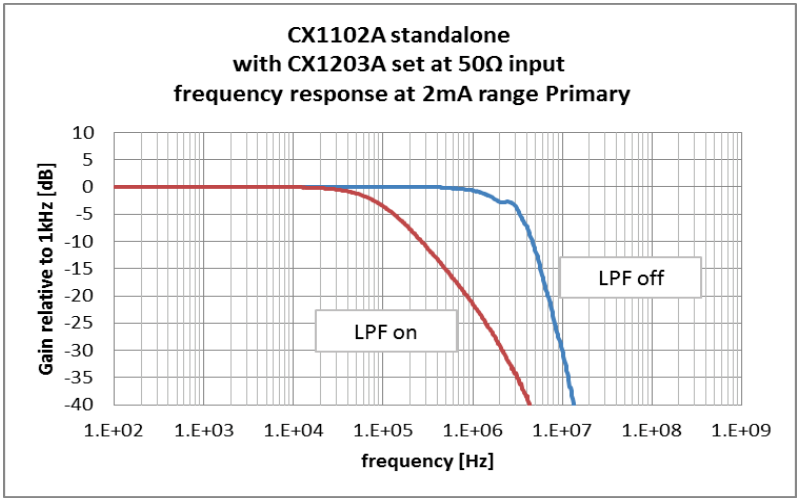
- -3 dB bandwidth: 231 MHz

Figure 3-15 **Frequency Response, Primary 20 mA Range**



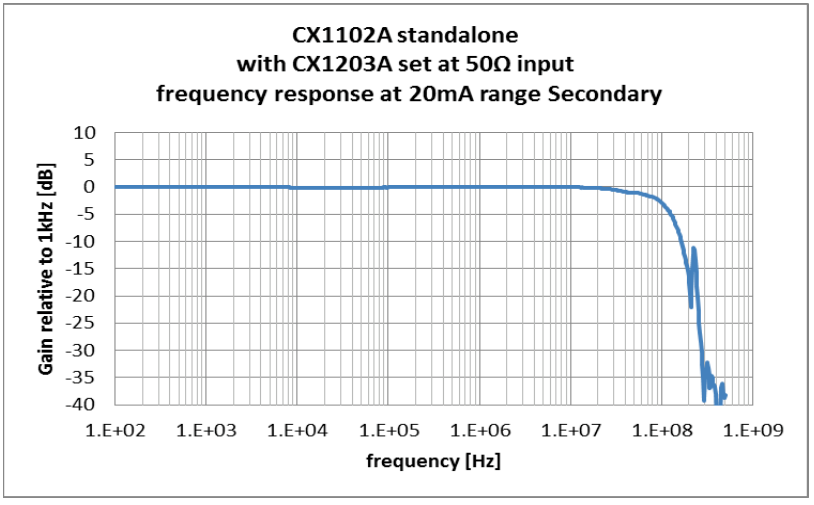
- -3 dB bandwidth (Low Pass Filter (LPF) off): 2.6 MHz
- -3 dB bandwidth (Low Pass Filter (LPF) on): 90 kHz

Figure 3-16 **Frequency Response, Primary 2 mA Range**



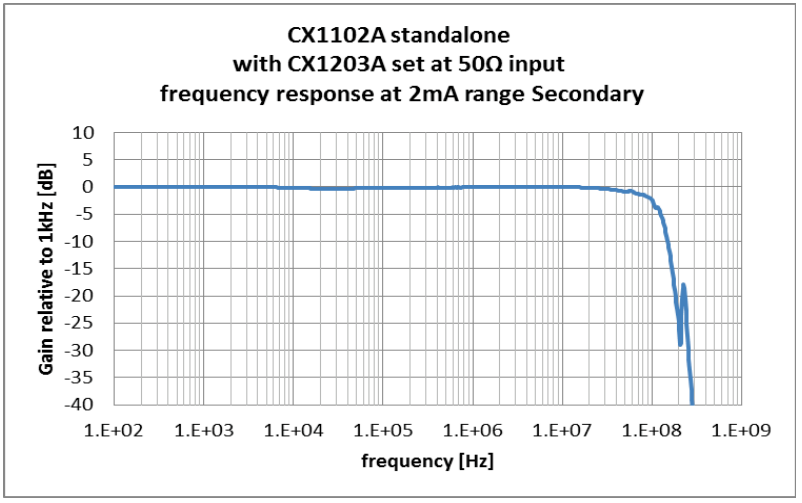
- -3 dB bandwidth (Low Pass Filter (LPF) off): 2.7 MHz
- -3 dB bandwidth (Low Pass Filter (LPF) on): 90 kHz

Figure 3-17 **Frequency Response, Secondary 20 mA Range**



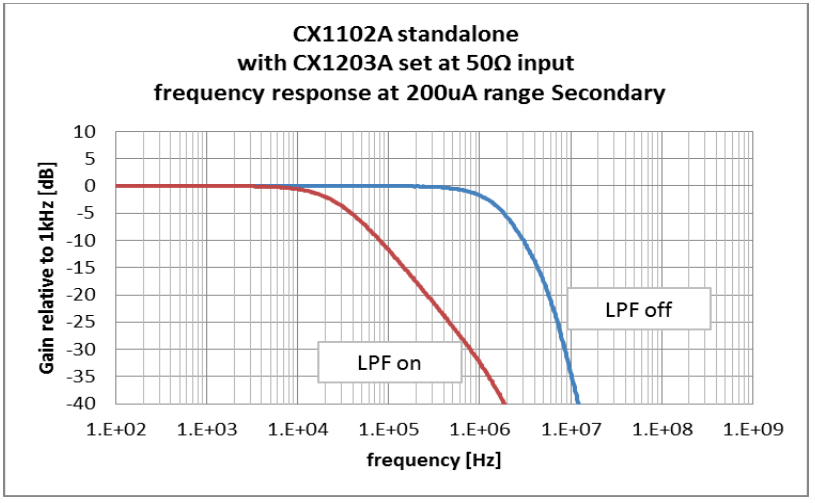
- -3 dB bandwidth: 101 MHz

Figure 3-18 **Frequency Response, Secondary 2 mA Range**



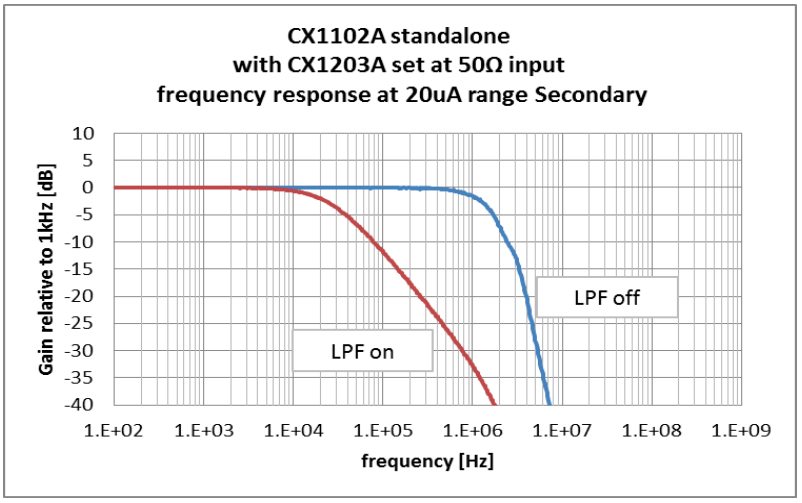
- -3 dB bandwidth: 103 MHz

Figure 3-19 **Frequency Response, Secondary 200 μA Range**



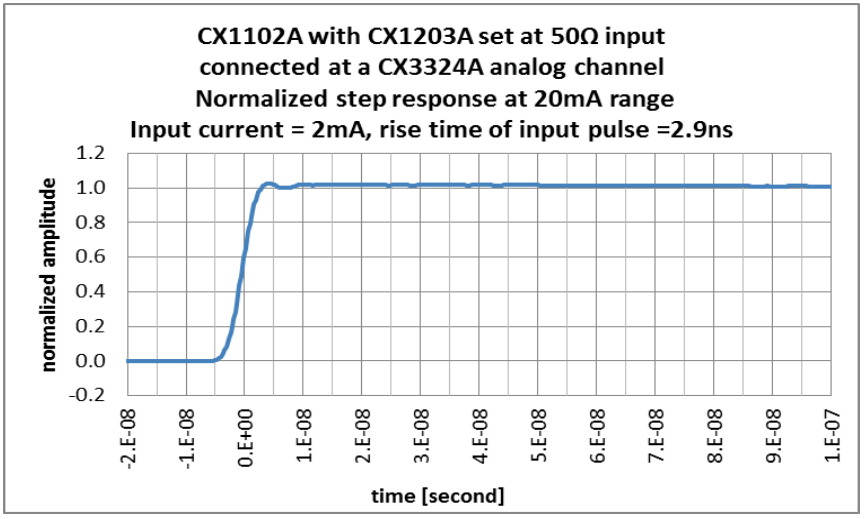
- -3 dB bandwidth (Low Pass Filter (LPF) off): 1.3 MHz
- -3 dB bandwidth (Low Pass Filter (LPF) on): 26 kHz

Figure 3-20 **Frequency Response, Secondary 20 μA Range**



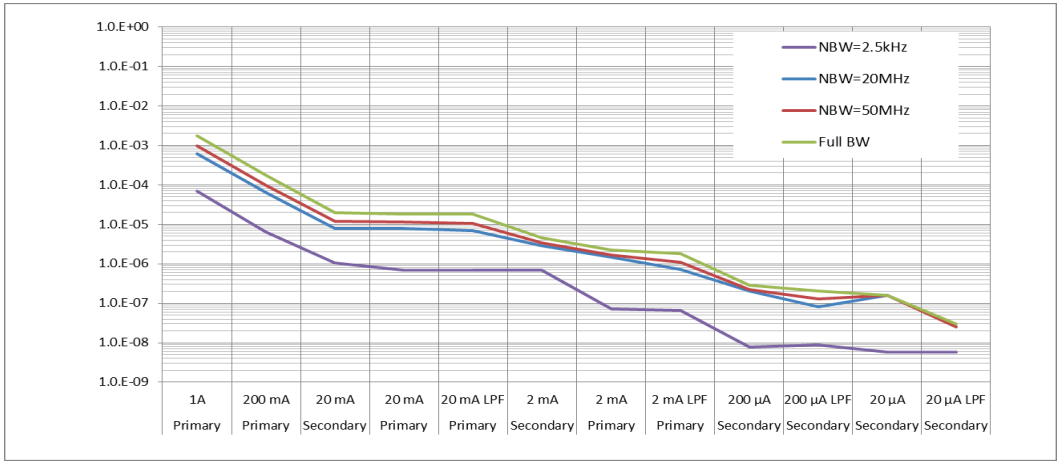
- -3 dB bandwidth (Low Pass Filter (LPF) off): 1.3 MHz
- -3 dB bandwidth (Low Pass Filter (LPF) on): 26 kHz

Figure 3-21 **Step Response, 20 mA Range**



- 10-90% rise time: 4.26 ns
- 10-90% rise time of CX1102A: 3.1 ns = sqrt (4.26^2-2.9^2)

Figure 3-22 **RMS Noise [A] vs Current Range, with CX3300 and Sensor Input Open**



NBW: Bandwidth limit

Full BW: Bandwidth limit off

Figure 3-23 **Input Common Mode Impedance**

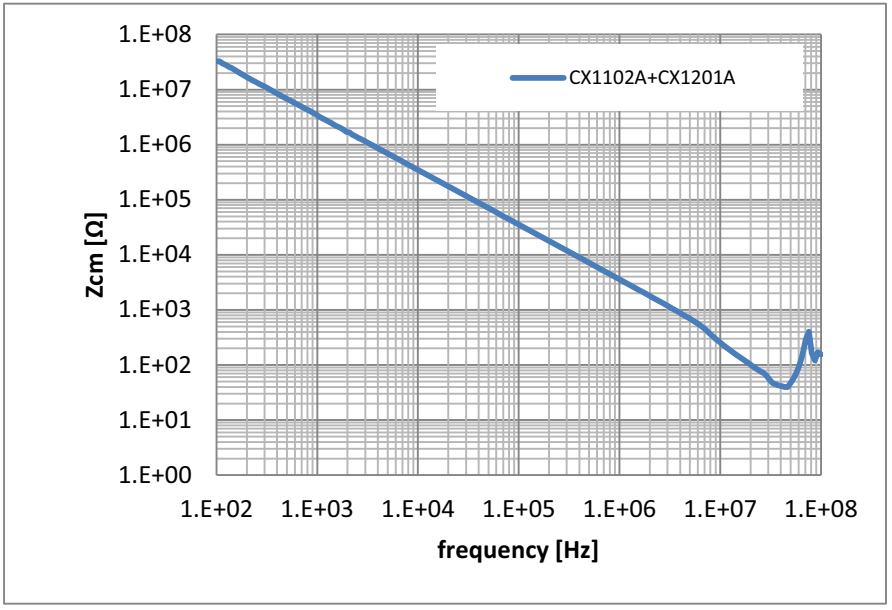


Figure 3-24 **Input Insertion Impedance**

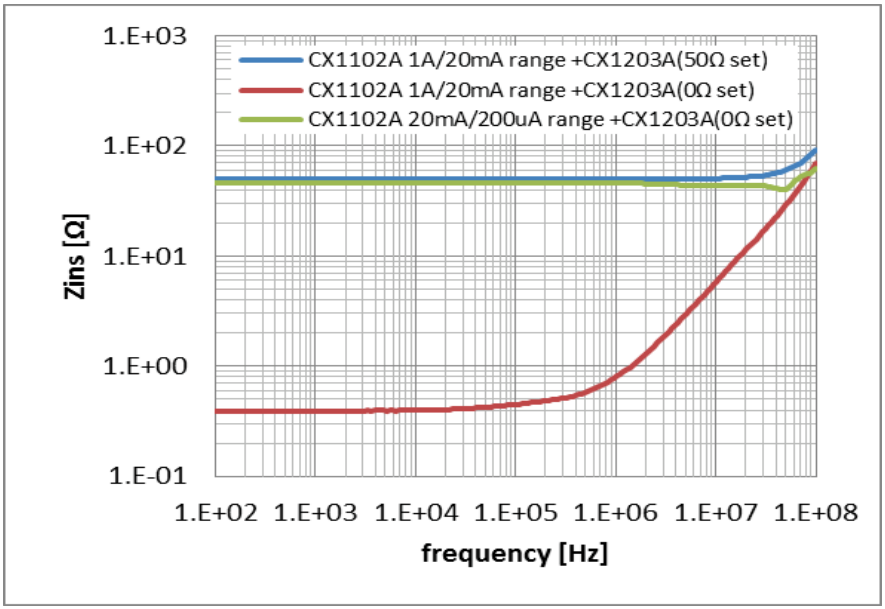
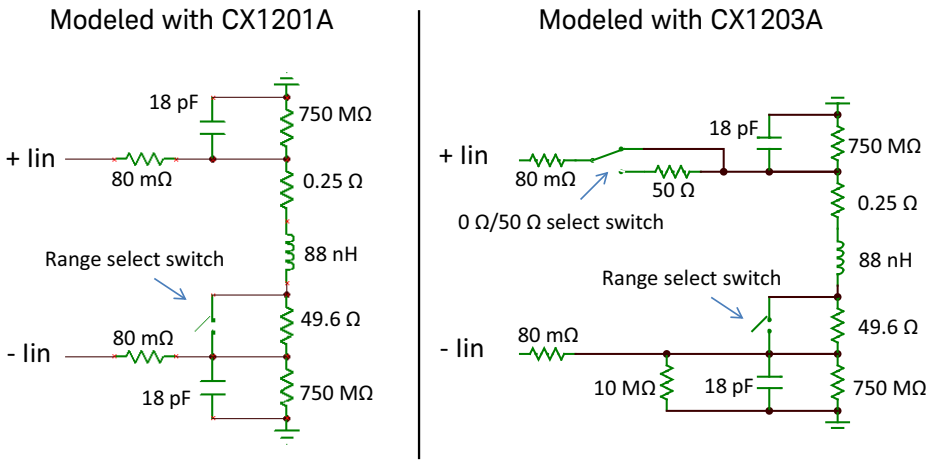


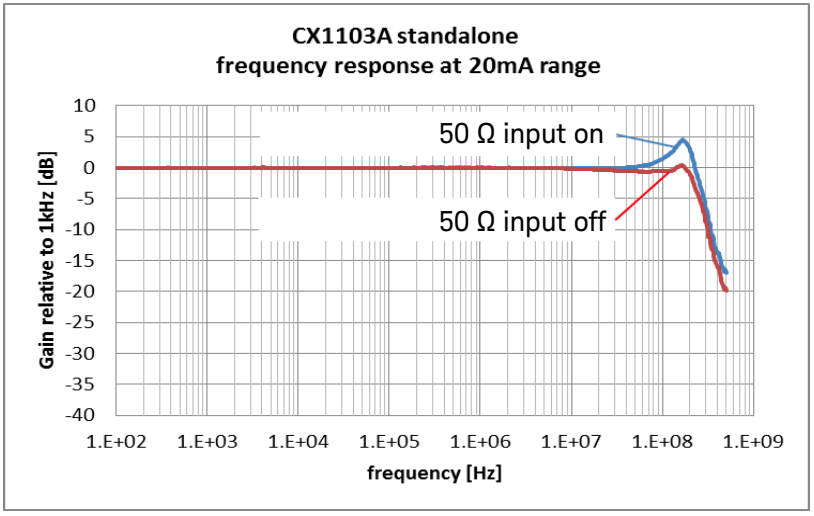
Figure 3-25 **Input Equivalent Circuit**



The range select switch opens in the following conditions. It closes in the other condition.
- If the primary channel uses the 2 mA range and the secondary channel uses the 20 µA range.
- If the primary channel uses the 20 mA range and the secondary channel uses the 200 µA range.

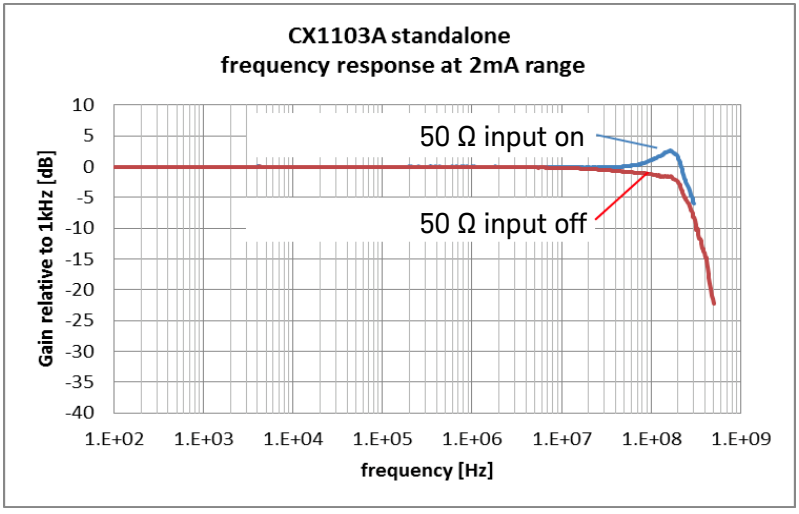
CX1103A

Figure 3-26 **Frequency Response, 20 mA Range**



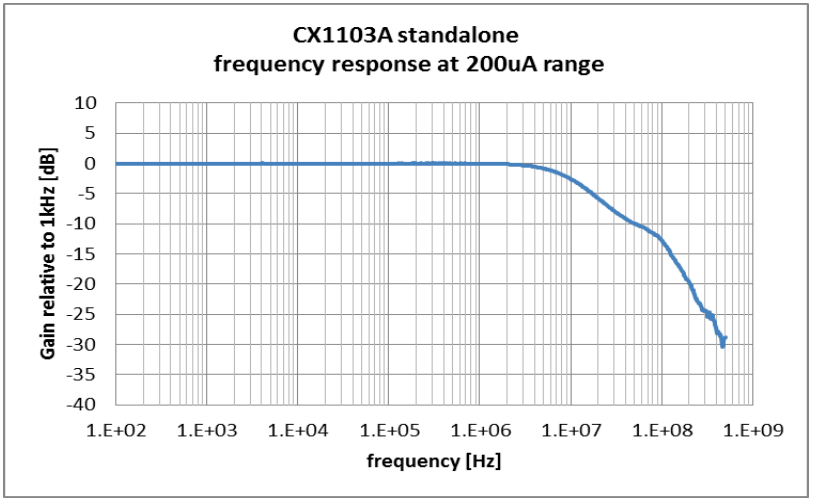
- -3 dB bandwidth (50 Ω input on): 260 MHz
- -3 dB bandwidth (50 Ω input off): 227 MHz

Figure 3-27 **Frequency Response, 2 mA Range**



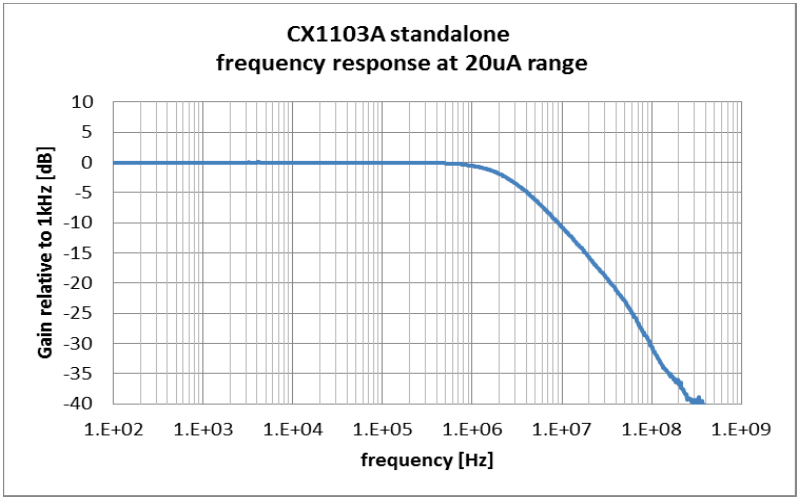
- -3 dB bandwidth (50 Ω input on): 250 MHz
- -3 dB bandwidth (50 Ω input off): 210 MHz

Figure 3-28 **Frequency Response, 200 μA Range**



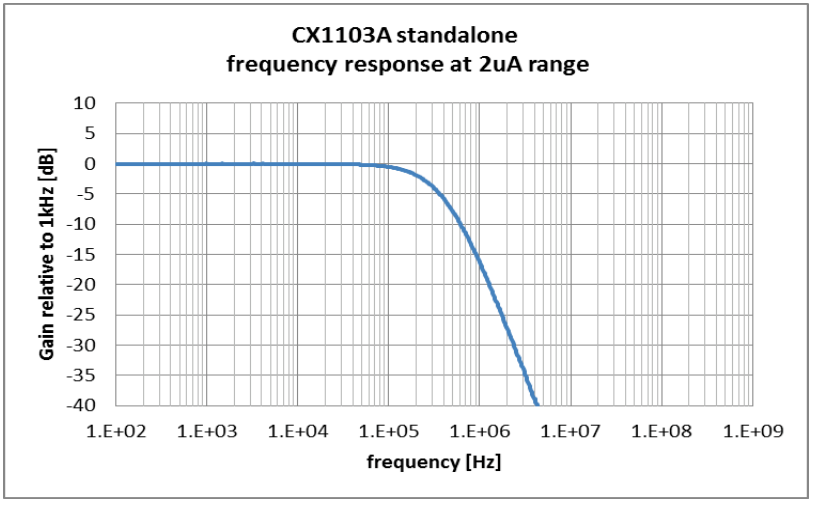
- -3 dB bandwidth: 11 MHz

Figure 3-29 **Frequency Response, 20 μA Range**



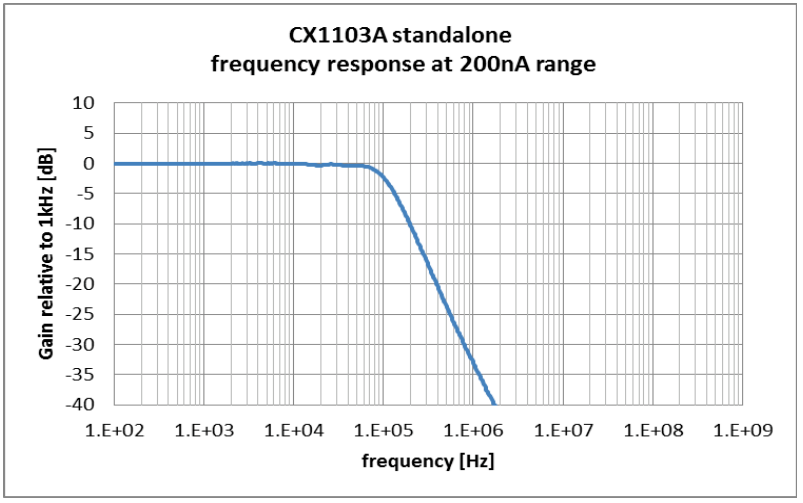
- -3 dB bandwidth: 2.7 MHz

Figure 3-30 **Frequency Response, 2 μA Range**



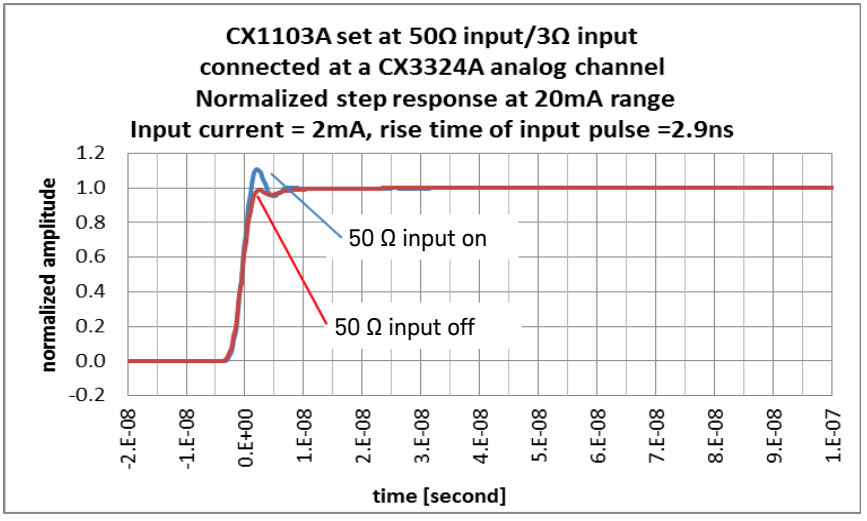
- -3 dB bandwidth: 260 kHz

Figure 3-31 **Frequency Response, 200 nA Range**



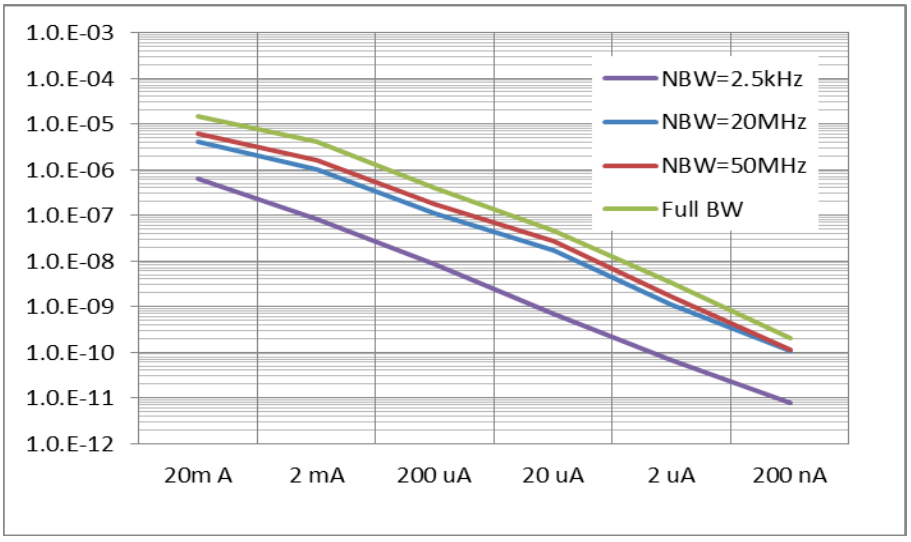
- -3 dB bandwidth: 110 kHz

Figure 3-32 **Step Response, 20 mA Range**



- 10-90% rise time: 3.5 ns
- 10-90% rise time of CX1103A: 1.96 ns = sqrt (3.5^2-2.9^2)

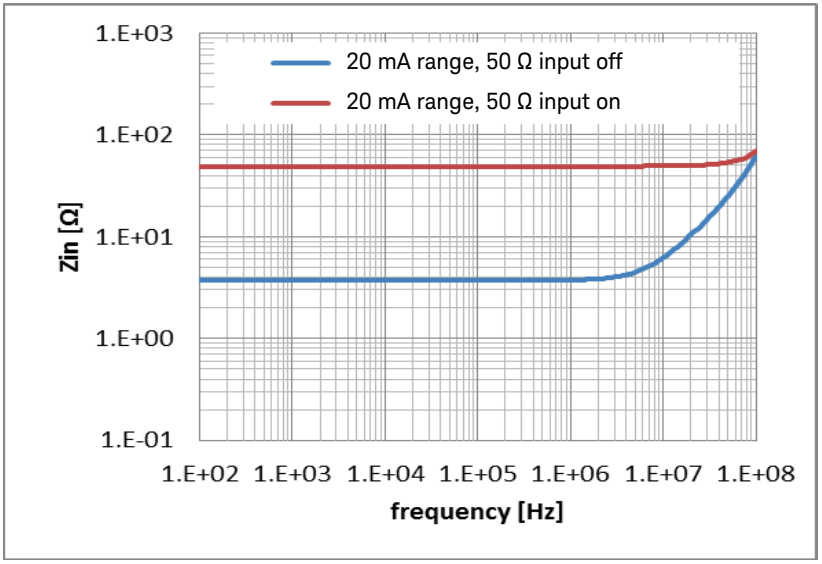
Figure 3-33 **RMS Noise [A] vs Current Range, with CX3300 and Sensor Input Open**



NBW: Bandwidth limit

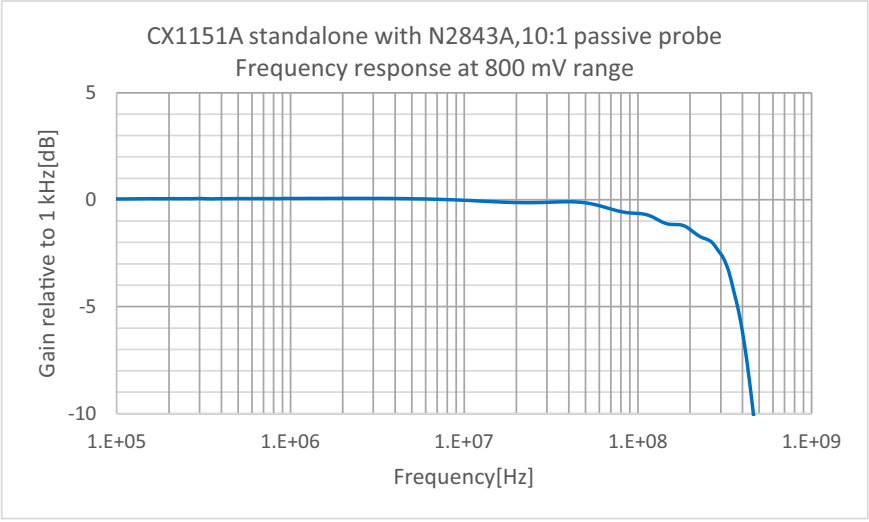
Full BW: Bandwidth limit off

Figure 3-34 **Input Impedance**



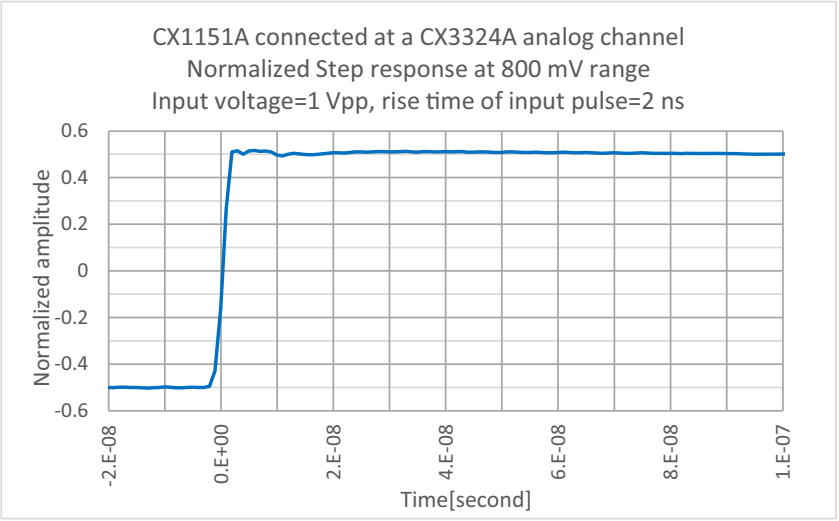
CX1151A

Figure 3-35 **Frequency Response**



- -3 dB bandwidth: 310 MHz

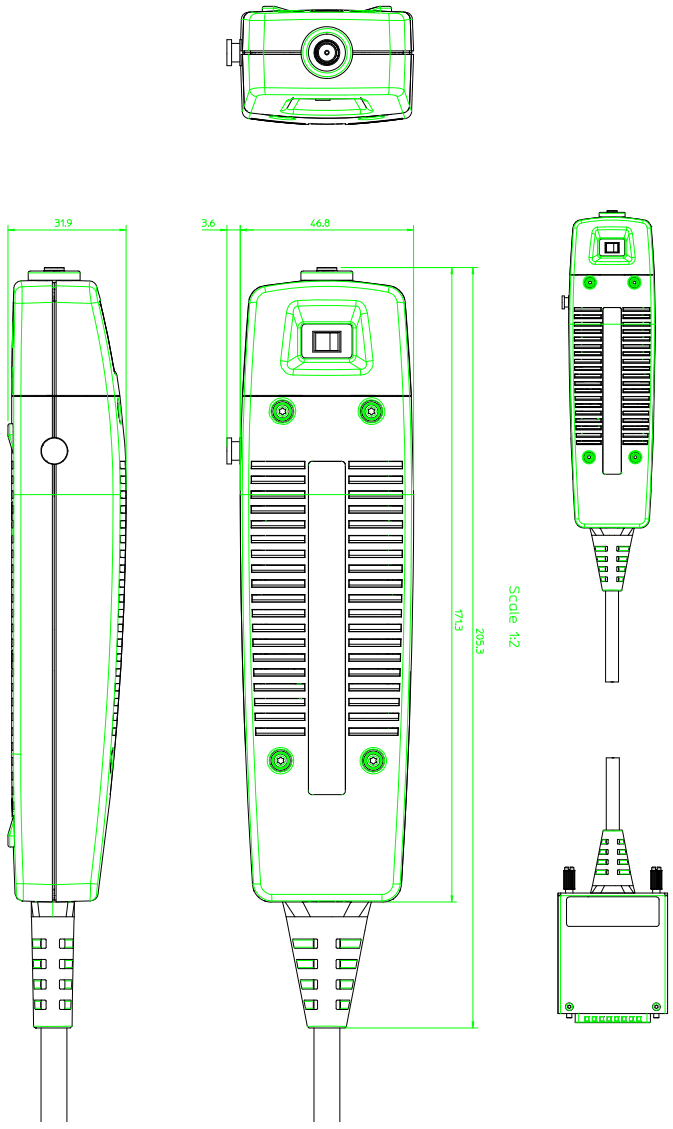
Figure 3-36 **Step Response**



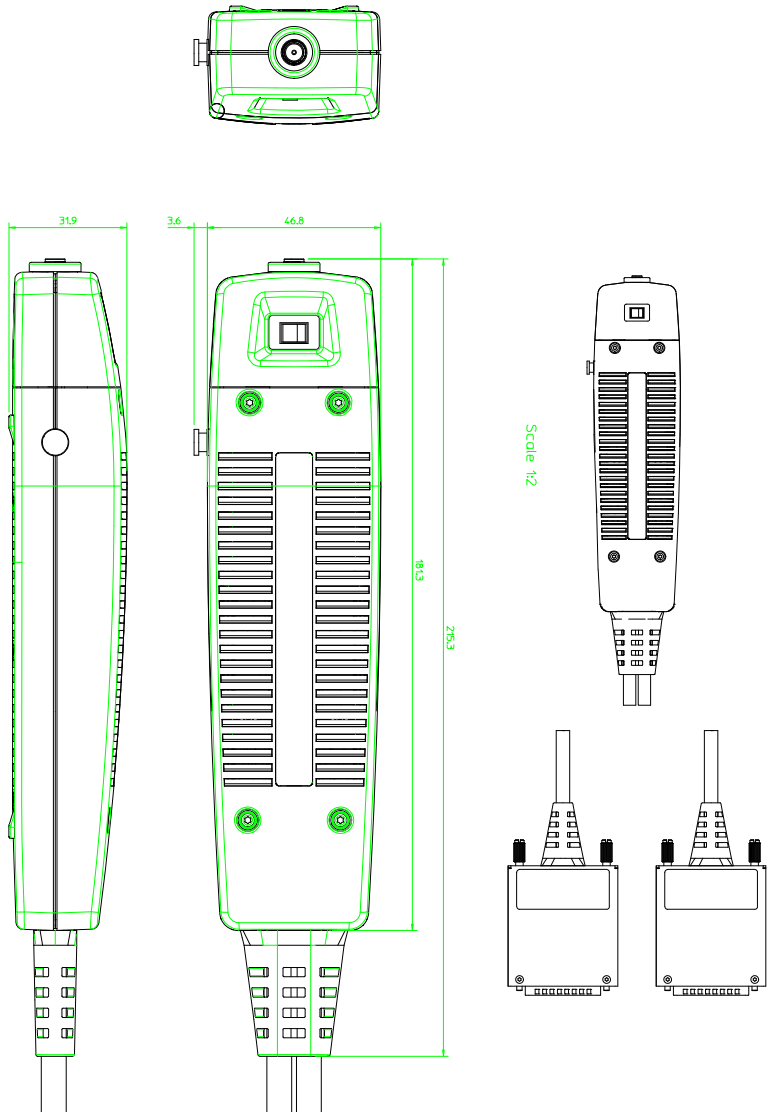
- 10-90% rise time: 2.5 ns
- 10-90% rise time of CX1151A: 1.5 ns = sqrt (2.5^2-2.0^2)

4 Dimensions

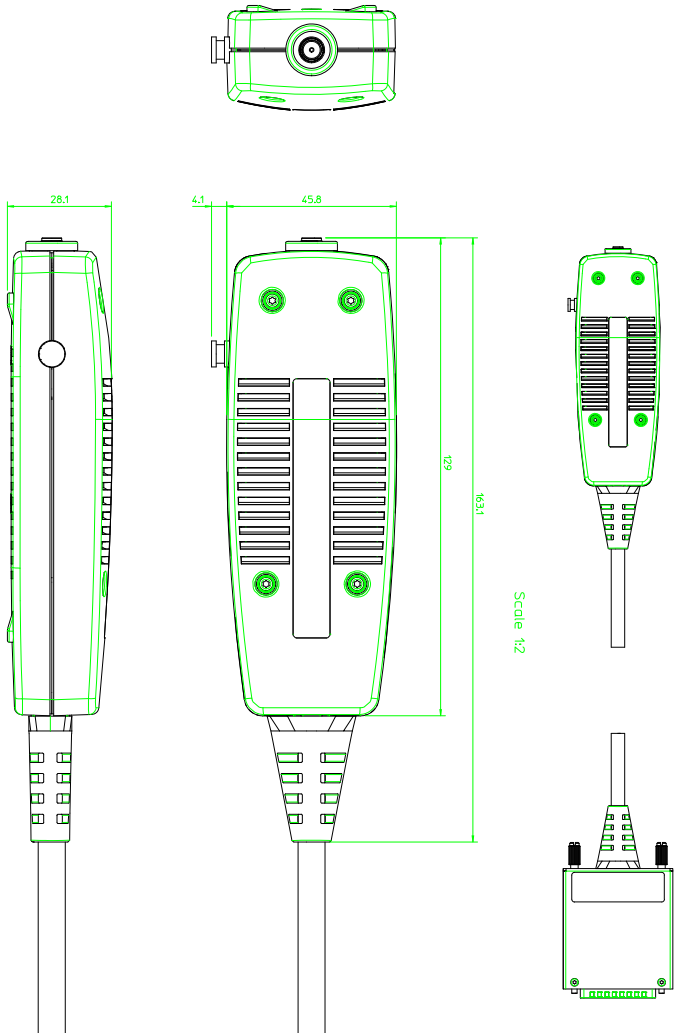
CX1101A



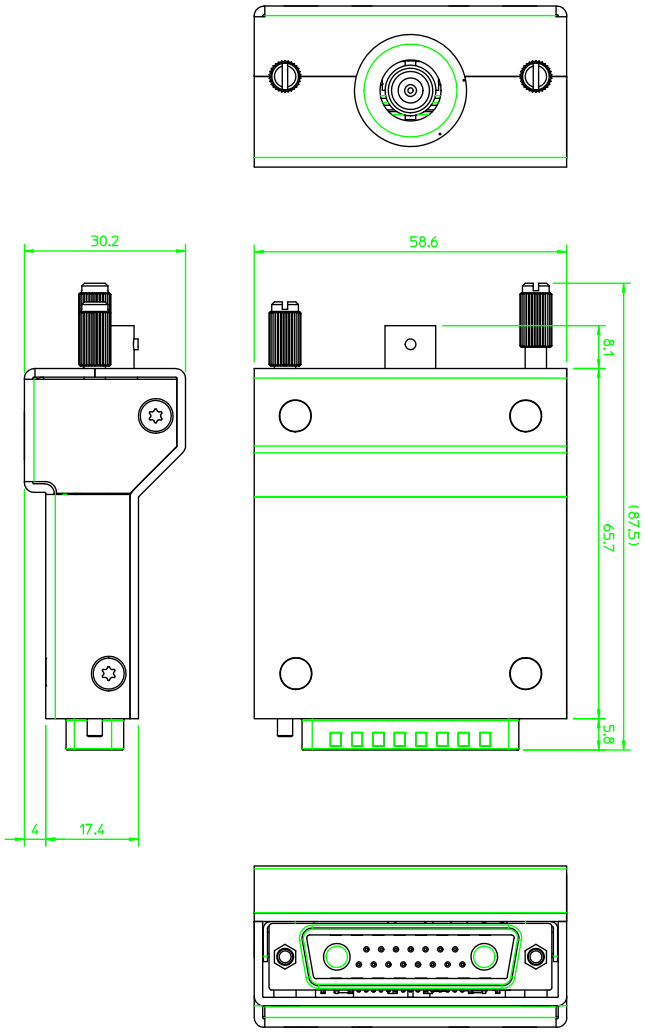
CX1102A



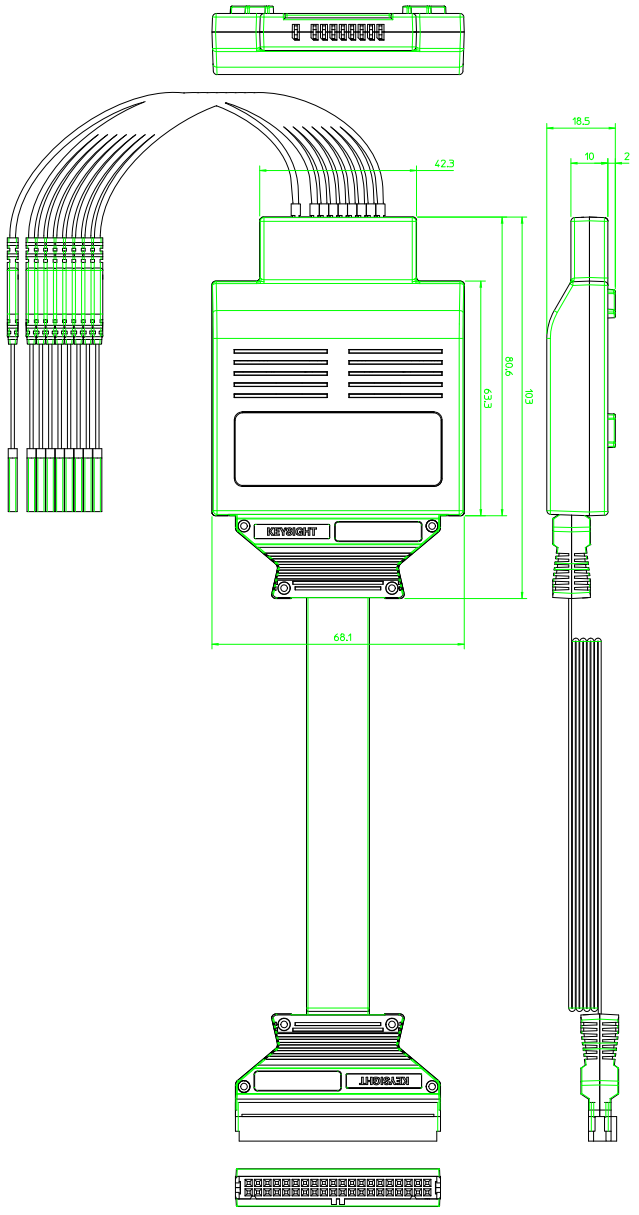
CX1103A



CX1151A



CX1152A



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