AC Current Probes
CT1 • CT2 • CT6 Data Sheet

Features & Benefits

- High Bandwidth
- Ultra-low Inductance
- Very Small Form Factor
- Characterize Current Waveforms up to <200 ps Rise Times
- Very Low Loading of Circuit Under Test
- Fits Into Dense, Closely-spaced Circuit Designs

Applications

- Data Storage Read Channel Design
- Silicon Characterization
- High-frequency Analog Design
- ESD Testing
- Signal Injection
- Differential Current Measurements
- Single-shot Low Rep-rate Pulse Measurements
- Propagation Delay Measurement
CT1/CT2. Current Probes with P6041 BNC Probe Cable.

CT6 Current Probe
The CT6 is the newest addition to the Tektronix portfolio of high-frequency current probes. It is designed to meet the needs of high-speed circuit design and test applications which require ultra-high bandwidth, low inductance, and extremely small form factor. The CT6 provides up to 2 GHz bandwidth when used with high-bandwidth oscilloscopes such as the Tektronix TDS694C, TDS794D, and TDS7000 Series oscilloscopes or with other compatible 50 Ω input measuring instruments. Low inductance (<3 nH) assures that the loading effect of the CT6 on the circuit-under-test will be negligible, which is especially important for today's low-amplitude, high-speed circuit designs such as disk drive read/write preamplifiers. The probe is a closed-circuit design which will accept uninsulated wire sized up to 20 gauge. This product is exempt from CE mark by virtue of its 30 V voltage limit.

CT1/CT2 Current Probes
The CT1 and CT2 Current Probes are designed for permanent or semi-permanent in-circuit installation. Each probe consists of a current transformer and an interconnecting cable. The current transformers have a small hole through which a current carrying conductor is passed during circuit assembly.

The P6041 Probe Cable provides the connection between the CT1 and CT2 Current Transformers and a BNC oscilloscope input. A 50 Ω termination is required to terminate the cable when connected to a high-impedance (1 MΩ) oscilloscope input. One probe cable can be used to monitor several current transformers that have been wired into a circuit.

Miniature Construction
The CT1 and CT2 detachable cable design enables one or more probes to be located on circuit boards or in other limited space areas. The CT6 offers the smallest form factor available, for measurement on ever-shrinking circuit boards and components. It is designed for temporary installation and does not incorporate removable cables, as the CT1 and CT2 do.

Extendible Probe Length
Specified rise time and bandwidth are obtained when using the probe cables provided: The P6041 cable used with the CT1 and CT2 is 42 inches nominal. If additional length is required, the cables can be extended by using high-quality 50 Ω cable and suitable interface connectors. (Also see Special Probe Cables, Optional Accessories.) Long cables may degrade high-frequency response.

High Sensitivity
The CT1 and CT6 provide an output of 5 mV for each milliamp of input current when terminated in 50 Ω. The CT2 provides 1 mV per milliamp when terminated in 50 Ω.

Typical Systems
The CT1, CT2, and CT6 high-frequency current transformers are dynamic (i.e., non-DC) current measuring devices. They are typically used in conjunction with compatible high-bandwidth oscilloscopes and other instruments to observe and/or record high-frequency current waveforms. The CT1, CT2, and CT6 normally operate directly into 50 Ω scopes and other measuring device inputs.

The CT1 or CT2 can be used with 1 MΩ input systems; use the P6041 probe cable and terminate the output with a 50 Ω feed-through termination (see Optional Accessories).

In all cases, the CT1, CT2, and CT6 must work into 50 Ωs to obtain specified performance and sensitivity.
Typical Measurement Applications

Differential Current Measurements
Most true-differential voltage amplifiers have a maximum bandwidth of about 100 MHz. The CT1 or CT6 can make differential current measurements to 1 GHz and 2 GHz, respectively, by passing two wires carrying opposing currents through the same core. The displayed result is the difference current. The CT2 can perform the same function to 200 MHz. In all cases, Derating with Frequency and Amp-second Product (Current-time Product) guidelines should not be exceeded. (See Characteristics.)

Single-shot and Low Rep-rate Pulse Measurements
These common measurements are easy to make with the CT1, CT2, or CT6 provided that your signal fits within the Max Pulse Current and Amp-second Product (Current-time Product) guidelines for the specific current probe characteristics.

For example, the CT2 is rated at 36 A peak, with an Amp-second Product of \(50 \times 10^{-6}\) seconds (50 Amp-microseconds), therefore the CT2 can safely handle a 36 A peak pulse with a maximum width of 1.39 microseconds or lower amplitude pulses for longer pulse widths. The CT1, CT2, and CT6 all have low-frequency roll-off characteristics. Low-frequency "droop" will exhibit itself when the pulse width approaches the L/R time constant of the specific transformer.

Propagation Delay Measurements
Two CT1 or CT2 Current Transformers with matching probe cables can be used to measure propagation delay (transit time) between the input and output currents of high-frequency devices. The probe outputs are connected to the inputs of dual-channel real-time or sampling scopes.

Verification of any Probe/Cable/Scope System mismatch can be obtained by passing the same signal current through both probes and observing total system delay difference, if any.

Characteristics

CT1, CT2, and CT6 Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>CT1</th>
<th>CT2</th>
<th>CT6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bandwidth (typical)</td>
<td>25 kHz to 1 GHz</td>
<td>1.2 kHz to 200 MHz</td>
<td>250 kHz to 2 GHz</td>
</tr>
<tr>
<td>Rise Time</td>
<td>350 ps</td>
<td>500 ps</td>
<td>200 ps</td>
</tr>
<tr>
<td>Sensitivity (into 50 Ω)</td>
<td>5 mV/mA</td>
<td>1 mV/mA</td>
<td>5 mV/mA</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±3%</td>
<td>±3%</td>
<td>±3%</td>
</tr>
<tr>
<td>Magnetizing Inductance</td>
<td>6 μH</td>
<td>7 μH</td>
<td>1 μH</td>
</tr>
<tr>
<td>Leakage Inductance</td>
<td>2.4 nH</td>
<td>1 nH</td>
<td>1.5 nH</td>
</tr>
<tr>
<td>Insertion Impedance:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Bare Wire Size</td>
<td>#14 wire</td>
<td>#16 wire</td>
<td>#20 wire</td>
</tr>
<tr>
<td>Max. Bare Wire Voltage:</td>
<td>1.78 mm (0.070 in.)</td>
<td>1.32 mm (0.052 in.)</td>
<td>0.8 mm (0.032 in.)</td>
</tr>
<tr>
<td>Max. Peak Pulse Current</td>
<td>12 A</td>
<td>36 A</td>
<td>6 A</td>
</tr>
<tr>
<td>Max. Continuous Current (RMS)</td>
<td>450 mA</td>
<td>2.5 A</td>
<td>120 mA</td>
</tr>
<tr>
<td>Amp-second Product</td>
<td>1 \times 10^4 A*Sec</td>
<td>50 \times 10^4 A*Sec</td>
<td>0.25 \times 10^4 A*Sec</td>
</tr>
<tr>
<td>L/R Time Constant (droop)</td>
<td>&gt;6.35 μs</td>
<td>&gt;160 μs</td>
<td>0.4 μs</td>
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<tr>
<td>Propagation Delay</td>
<td>3.25 ns</td>
<td>6.1 ns</td>
<td>5.2 ns</td>
</tr>
<tr>
<td>Safety</td>
<td>UL3111-2-032, CSA1010.2-032, EN61010-2-032, IEC61010-2-032</td>
<td>UL3111-2-032, CSA1010.2-032, EN61010-2-032, IEC61010-2-032</td>
<td>NA</td>
</tr>
</tbody>
</table>

* (<3.25% Duty Factor).
CT6 Typical Frequency Response.
Ordering Information

**CT1**
High-frequency Current Probe.
*Includes*: Manual and P6041 Interconnect Cable.

**CT2**
High-frequency Current Probe.
*Includes*: Manual and P6041 Interconnect Cable.

**CT6**
High-frequency Current Probe.

**CT1 or CT2 Recommended Accessories**
Feed-through 50 Ω Termination – Order 011-0049-02.

**Service**
- Opt. C3 – Calibration Service 3 Years
- Opt. C5 – Calibration Service 5 Years
- Opt. D1 – Calibration Data Report (CT6 only)
- Opt. D5 – Calibration Data Report 5 Years (with Opt. C5)
- Opt. R3 – Repair Service 3 Years
- Opt. R5 – Repair Service 5 Years

**CT6 Standard Accessories**
- SMA to BNC Adapter – Order 015-0572-xx.
- Color Cable Marker Bands –
- Probe Holder – Order 015-0682-xx.
- Certificate of Traceable Calibration –
- Warranty – One Year.

Tektronix is registered to ISO 9001 and ISO 14001 by SRI Quality System Registrar.
Contact Tektronix:

ASEAN / Australasia (05) 6356 3900
Austria 0800 2255 4835*
Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777
Belgium 0800 2255 4835*
Brazil +55 (11) 3759 7627
Canada 1 800 833 9200
Central Europe and the Baltics +41 52 675 3777
Central Europe & Greece +41 52 675 3777
Denmark +45 80 88 1401
Finland +41 52 675 3777
France 0800 2255 4835*
Germany 0800 2255 4835*
Hong Kong 400 620 5635
India 000 800 650 1835
Italy 0800 2255 4835*
Japan 81 (3) 6714 3010
Luxembourg +41 52 675 3777
Mexico, Central/South America & Caribbean 52 (55) 56 04 50 90
Middle East, Asia, and North Africa +41 52 675 3777
The Netherlands 08000 2255 4835*
Norway 800 16098
People’s Republic of China 400 620 5635
Poland +41 52 675 3777
Portugal 80 08 12370
Republic of Korea 001 800 8255 2835
Russia & CIS +7 (495) 7484900
South Africa +41 52 675 3777
Spain 0800 2255 4835*
Sweden 0800 2255 4835*
Switzerland 08000 2255 4835*
Taiwan 886 (2) 2722 9622
United Kingdom & Ireland 08000 2255 4835*
USA 1 800 833 9200

* European toll-free number. If not accessible, call: +41 52 675 3777

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