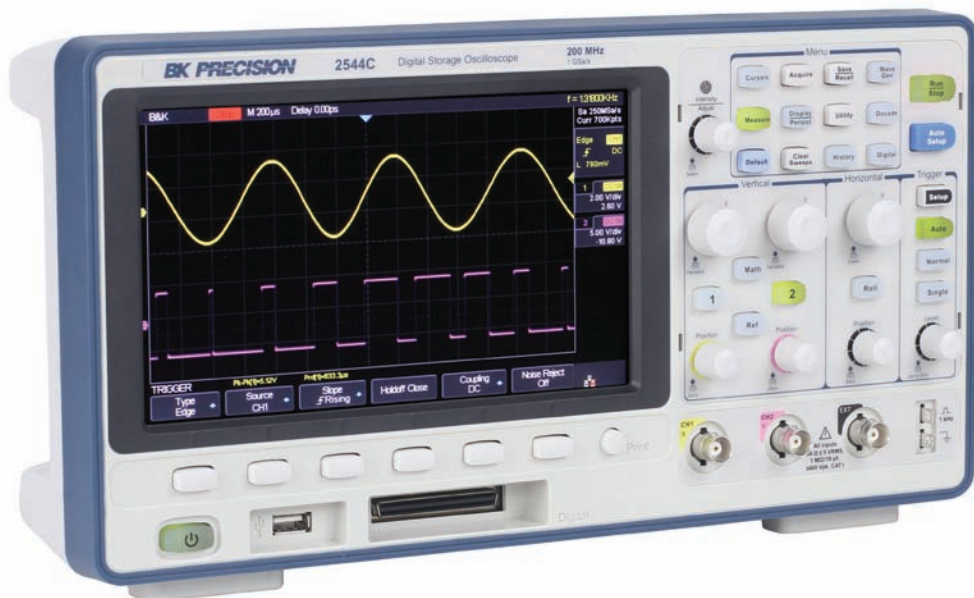


## Mixed Signal Oscilloscopes 2540C Series



The 2540C Digital Storage and Mixed Signal Oscilloscope (MSO) Series delivers advanced features and debug capabilities for a wide range of applications at an entry-level price point. With up to 200 MHz bandwidth in a 2-channel configuration, each model offers a maximum sample rate of 1 GSa/s, and a maximum memory depth of 14 Mpts. In addition, these oscilloscopes provide an 8" color display with 256 levels of color grading combined with a high waveform update rate up to 60,000 wfms/sec, which allows the instruments to capture infrequent glitches with excellent signal fidelity. The logic analyzer and decode software provides 16 additional digital channels and serial bus decoding for I<sup>2</sup>C, SPI, UART/RS232, CAN, and LIN protocols.

Maximize productivity using extensive features such as digital filtering, waveform recording, pass/fail limit testing, and automatic measurements. The built-in 25 MHz function/arbitrary waveform generator (AWG) comes standard with all models and provides stimulus output of 4 arbitrary waveforms, sine, square, ramp, pulse, DC, noise, cardiac, Gaussian pulse, and exponential rise/fall waveforms to the device under test.

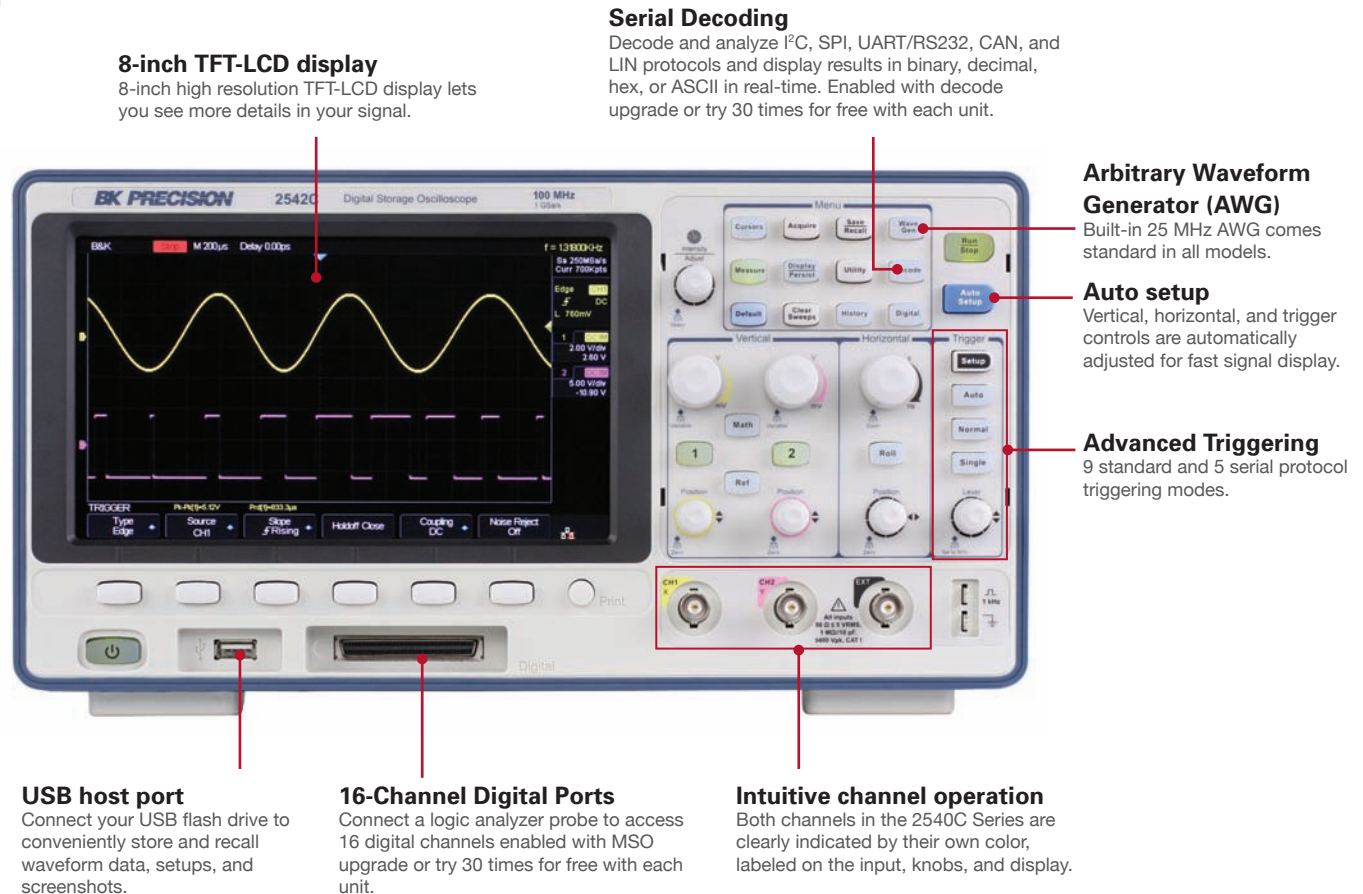
The 2540C Series oscilloscopes are ideal for applications in design, education, service, and repair. This instrument offers a comprehensive set of tools to capture signal anomalies, decode serial bus protocols, and help speed up debug and analysis. The MSO and decoding functionalities are available for upgrade in the field with the purchase of a license key.

### Features & Benefits

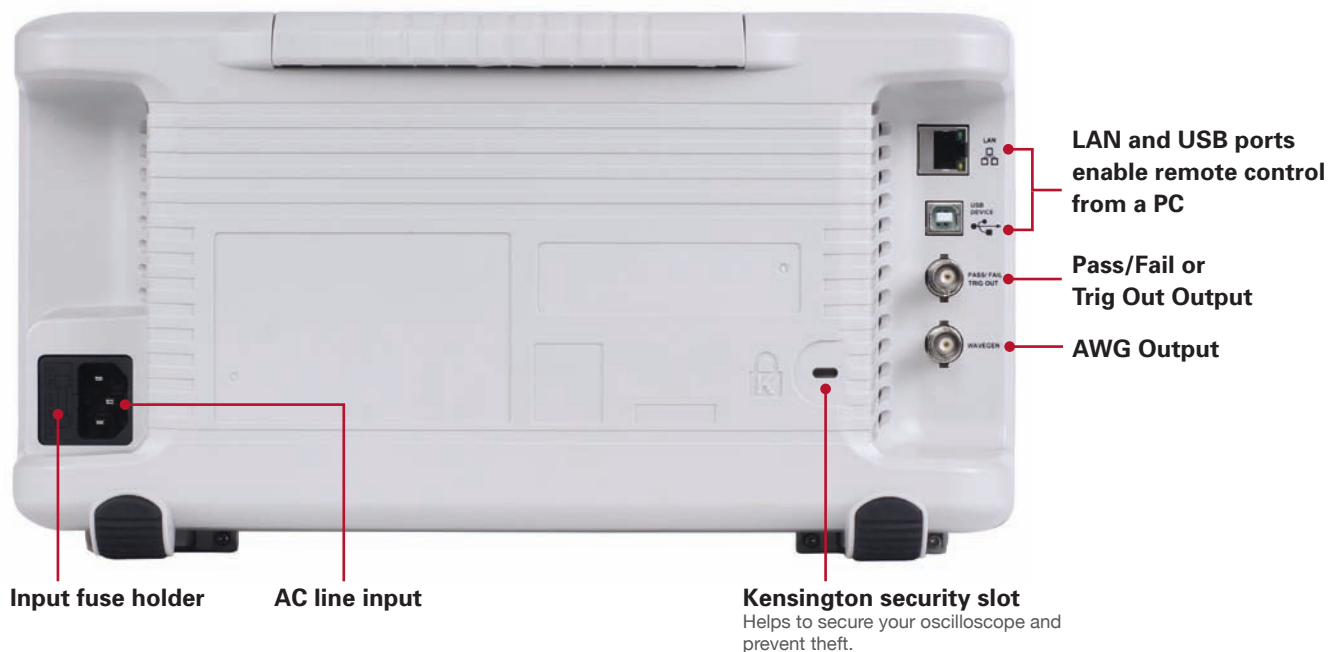
- Bandwidth up to 200 MHz
- 1 GSa/s maximum sample rate
- 14 Mpts maximum record length
- 16 digital channels with logic analyzer (MSO upgrade)
- Serial bus decoding supporting I<sup>2</sup>C, SPI, UART/RS232, CAN, and LIN protocols (Decode upgrade)
- Built-in Function and Arbitrary Waveform Generator comes standard on all models
- Large 8" widescreen display with 256-level color gradient
- 60,000 wfms/s maximum waveform capture rate
- Compact footprint and lightweight
- High speed hardware-based pass/fail testing function and masking
- Segmented acquisition history waveform record function (record length up to 80,000 frames)
- Trigger types: Edge, Slope, Pulse, Video, Window, Runt, Interval, Dropout, Pattern, Serial
- FFT including seven other math functions: Addition, Subtraction, Multiplication, Division, Integration, Differential, and Square Root
- 36 automatic measurements supporting statistics, gating, math, history and reference measurements
- Multi-language user interface and built-in context sensitive help
- Software provided for remote PC control
- Front panel USB port for saving and recalling waveforms, setups, and screenshots
- Standard LAN and USBTMC-compliant USB device port
- Selectable 50  $\Omega$  and 1 M $\Omega$  input coupling

| Model            | 2540C       | 2540C-MSO | 2542C       | 2542C-MSO | 2544C       | 2544C-MSO |
|------------------|-------------|-----------|-------------|-----------|-------------|-----------|
| Bandwidth        | 70 MHz      |           | 100 MHz     |           | 200 MHz     |           |
| Channels         | 2           |           | 2           |           | 2           |           |
| Digital Channels | Upgradeable | 16        | Upgradeable | 16        | Upgradeable | 16        |

## Front panel



## Rear panel

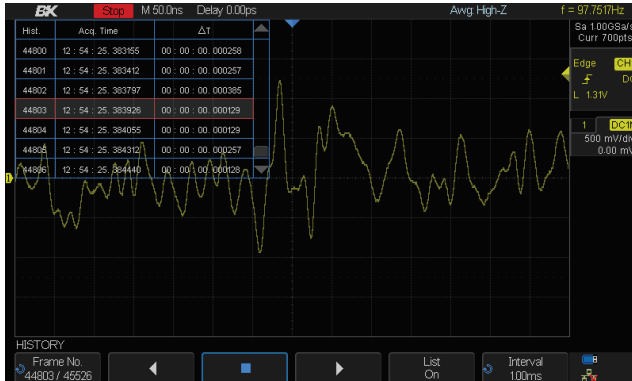


## Mixed Signal Oscilloscopes 2540C Series

### The tools you need

All traditional digital oscilloscope features come standard in the 2540C Series: Cursors, 50  $\Omega$  input coupling, reference signals, persist, rolling, noise rejection and deskew.

#### Waveform History and Recording



Quickly scroll through millions of points with History Mode's playback functionality to find difficult to capture events. Eliminate unnecessary idle signals and dead-time by selectively capturing up to 80,000 segments.

#### Automatic Waveform Math and Measurement



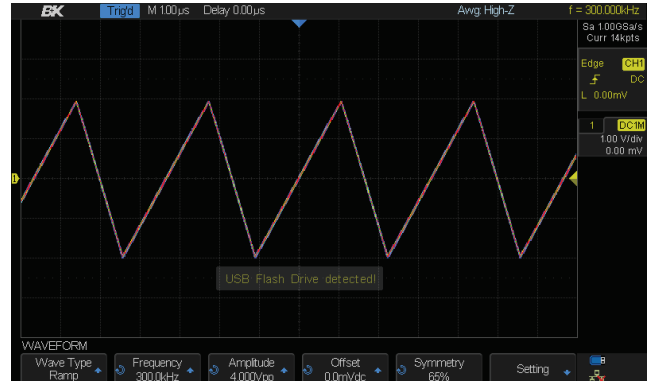
Display 36 automated measurements that include voltage, time, and statistics. Arithmetic and FFT functions can be performed on analog channels and two reference signals.

#### Hardware Pass/Fail and Masking



Perform up to 40,000 pass/fail decisions a second. Easy to generate masking templates help capture anomalies even with complicated waveforms.

#### Function and Arbitrary Waveform Generator



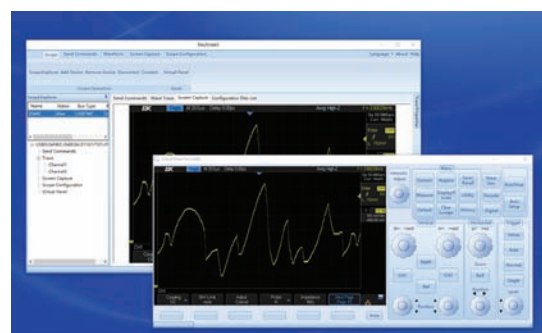
A powerful 25 MHz function/arbitrary waveform generator comes standard in the 2540C Series. Use complimentary software to generate waveforms and load up to 4 arbitrary waveforms into the instrument. Built-in functions are sine, square, ramp, pulse, DC, noise, cardiac, Gaussian pulse, and exponential rise/fall.

#### Color Grading



With 256 levels of color grading, the most common occurrences are represented in red and the least common are represented in purple. Easily spot outliers as they will persist for a user specified time.

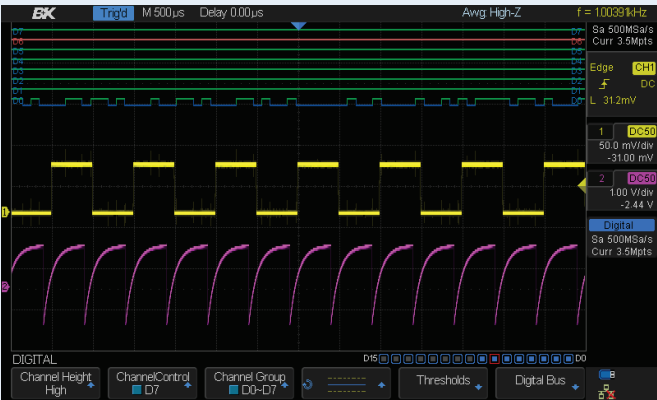
#### PC Connectivity



The tools you need

Included in all MSO models

MSO license - LA2540C



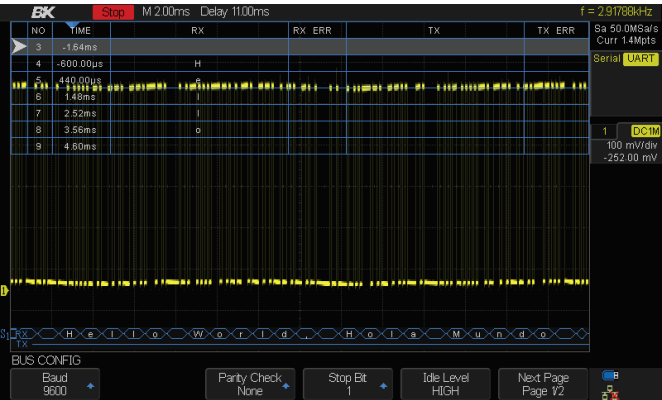
The 16 integrated digital channels are displayed along-side analog channels allowing users to view up to 18 time-correlated channels with shared triggering and acquisition on one screen. The LA2540C license enables the 16 digital channels of the 2540C Series and is included with MSO models.

16 channel logic probe - LP2540C



The 16-channel color-coded logic probe consists of two eight-channel pods. To make contact with the DUT, the probe connects directly to square pins or clips to test points using the included grabbers. With an input capacitance of only 8 pF and 100 kΩ input impedance, the probe protects the integrity of your signal. The probe is included with MSO models.

Decode license - DC2540C



Select up to 2 serial bus protocols I<sup>2</sup>C, SPI, UART/RS232, CAN, and LIN and decode concurrently from analog and MSO channels. Decode information in real-time and display in binary, decimal, hex, or ASCII.

Buy now, upgrade later

Install the MSO and decode licenses at any time or try before you buy with the 30 trial license on each model. Any DSO model in the 2540C Series can be upgraded to an MSO. Installation is quick and easily done within the oscilloscope menu. To purchase a license key, please fill out the [license request form](#) or visit the 2540C Series accessories page.

| Available Upgrades               |            |            |
|----------------------------------|------------|------------|
|                                  | DSO Models | MSO Models |
| I6-channel logic probe (LP2540C) | Optional   | Standard   |
| MSO license (LA2540C)            | Optional   | Standard   |
| Decode license (DC2540C)         | Optional   | Optional   |

## Specifications

| Model                              | 2540C / 2542C / 2544C                                               |
|------------------------------------|---------------------------------------------------------------------|
| <b>Performance Characteristics</b> |                                                                     |
| Bandwidth                          | 70 MHz / 100 MHz / 200 MHz                                          |
| Rise Time                          | <5 ns / <3.5 ns / <1.8 ns                                           |
| Sample Rate                        | 1 GSa/s (single channel),<br>500 MSa/s (dual channel)               |
| Input Channels                     | Analog: 2<br>Digital: 16 (-MSO models or with LA2540C upgrade)      |
| Memory Depth                       | 14 Mpts (single channel),<br>7 Mpts (dual channel)                  |
| Waveform Update Rate               | 60,000 wfms/s                                                       |
| Hardware Bandwidth Limits          | 20 MHz                                                              |
| Input Coupling                     | DC, AC, GND                                                         |
| Input Impedance                    | 1 M $\Omega$ $\pm$ 2%    (22 pF $\pm$ 3 pF)<br>50 $\Omega$ $\pm$ 2% |
| Ch to Ch Isolation                 | >40dB                                                               |
| <b>Acquisition System</b>          |                                                                     |
| Peak Detect                        | 1 ns                                                                |
| Average                            | 4, 16, 32, 64, 128, 256, 512, 1024                                  |
| Enhanced Resolution                | 0.5, 1, 1.5, 2., 2.5, 3 bits selectable                             |
| Interpolation                      | Sin(x)/x, Linear                                                    |
| <b>Vertical System</b>             |                                                                     |
| Vertical Resolution                | 8 bits                                                              |
| Vertical Sensitivity               | 500 $\mu$ V/div to 10 V/div (1-2-5 )                                |
| Maximum Input Voltage              | 1 M $\Omega$ < 400 Vpk; 50 $\Omega$ <5 Vrms                         |
| DC Gain Accuracy                   | $\pm$ 3%: 5 mV/div to 10 V/div; $\pm$ 4%: < 2 mV/div                |
| <b>Horizontal System</b>           |                                                                     |
| Time Base Range                    | 2.0 ns/div to 50 s/div                                              |
| Time Base Accuracy                 | $\pm$ 25 ppm                                                        |
| Ch to Ch Deskew Range              | $\pm$ 100 ns                                                        |
| <b>Trigger System</b>              |                                                                     |
| Modes                              | Auto, Normal, Single                                                |
| Coupling                           | DC, AC, LF Reject, HF Reject, Noise Reject Ch1-Ch2                  |
| Trigger Level                      | Internal: $\pm$ 4.5 div from center                                 |
|                                    | External: EXT: $\pm$ 0.6 V<br>EXT/5: $\pm$ 3 V                      |
| Hold-Off Range                     | 100 ns to 1.5 s                                                     |
| Types                              | Edge, Slope, Pulse, Video, Window, Interval, Dropout, Runt, Pattern |
| Serial Trigger                     | I2C, SPI, UART/RS232, CAN, LIN                                      |
| <b>Cursors</b>                     |                                                                     |
| Mode                               | Manual, Track                                                       |
| Measurements                       | $\Delta$ T, I/ $\Delta$ T, X2, X1, $\Delta$ V, Y2, Y1               |

Note: All specifications apply to the unit after a temperature stabilization time of 30 minutes over an ambient temperature range of 23 °C  $\pm$  5 °C.

|                                 |                                                                                                                  |
|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Waveform Math</b>            |                                                                                                                  |
| Math Operation                  | Add, Subtract, Multiply, Divide, FFT, Derivative, Integral, Square Root                                          |
| FFT                             | Windows: Rectangle, Blackman, Hanning, Hamming, Flattop                                                          |
| <b>Waveform Measurements</b>    |                                                                                                                  |
| Voltage                         | Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Mean, Cmean, Stdev, Cstd, Vrms, Crms, FOV, FPPE, ROV, RPRE, Level@Trigger    |
| Time                            | +SR, -SR, Period, Freq, +Width, -Width, Rise, Fall, BWidth, +Duty, -Duty, Time@Mid                               |
| Delay                           | Phase, FRR, FRF, FFR, FFF, LRR, LRF, LFF, Skew                                                                   |
| Statistics                      | Current, Mean, Min, Max, Stdev, Count                                                                            |
| Gating                          | Time domain                                                                                                      |
| <b>I/O Interface</b>            |                                                                                                                  |
| Standard                        | USB Host, USB Device, LAN, Pass/Fail, Trigger Out                                                                |
| Pass/Fail                       | 3.3 V TTL Output                                                                                                 |
| <b>Display System</b>           |                                                                                                                  |
| Display                         | 8" Color TFT-LCD, 800 x 480 Resolution                                                                           |
| Wave Display Mode               | Vectors, Dots                                                                                                    |
| Persistence                     | Off, Infinite, 1 sec, 5 sec, 10 sec, 30 sec                                                                      |
| Intensity Grading               | 256 Levels                                                                                                       |
| Language                        | Simplified Chinese, Traditional Chinese, English, French, Japanese, Korean, German, Russian, Italian, Portuguese |
| <b>Environmental and Safety</b> |                                                                                                                  |
| Temperature                     | Operating: 10 °C to +40 °C<br>Storage: -20 °C to +60 °C                                                          |
| Humidity                        | Operating: 85% RH, 40 °C, 24 hours<br>Storage: 85% RH, 65 °C, 24 hours                                           |
| Altitude                        | Operating: 3,000 m<br>Storage: 15,266 m                                                                          |
| <b>General</b>                  |                                                                                                                  |
| Power Requirements              | 100 to 240 VAC, CAT II, 50 VA Max, 45 Hz to 440 Hz                                                               |
| Dimensions (W x H x D)          | 4.8" x 7.2" x 13.4" (123 x 184 x 340 mm)                                                                         |
| Weight                          | 7.3 lbs (3.3 kg)                                                                                                 |
| <b>Three-Year Warranty</b>      |                                                                                                                  |
| Included Accessories            | Passive probes (one per channel), power cord, certificate of calibration, USB (Type A to B) communication cable  |
| Optional Accessories            | 16-channel digital logic probe (LP2540C)                                                                         |

## Specifications

| Function/Arbitrary Waveform Generator |                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------|
| Waveforms                             | Sine, Square, Ramp, Pulse, DC, Noise , Cardiac, Gaus Pulse, Exp Rise        |
| Arbitrary                             | 4 Slots for Arbitrary Waveforms                                             |
| Maximum Output Frequency              | 25 MHz                                                                      |
| Sample Rate                           | 125 MSa/s                                                                   |
| Frequency Resolution                  | 1 $\mu$ Hz                                                                  |
| Frequency Accuracy                    | $\pm 50$ ppm                                                                |
| Vertical Resolution                   | 14 bits                                                                     |
| Amplitude Range                       | -1.5 to +1.5 V @ 50 $\Omega$ ; -3 to +3 V @ 1 M $\Omega$                    |
| Output Impedance                      | 50 $\Omega \pm 2\%$                                                         |
| Protection                            | Short-Circuit Protection                                                    |
| Sine Characteristics                  |                                                                             |
| Frequency                             | 1 $\mu$ Hz to 25 MHz                                                        |
| Offset Accuracy (100 kHz)             | $\pm(0.3 \text{ dB} * \text{Offset Setting Value} + 1 \text{ mVpp})$        |
| Amplitude flatness                    | $\pm 0.3 \text{ dB}$<br>(100 kHz, 5 Vpp)                                    |
| Spurious (non harmonics)              | DC to 1 MHz: -60 dBc<br>1 MHz to 5 MHz: -55 dBc<br>5 MHz to 25 MHz: -50 dBc |
| Harmonic distortion                   | DC to 5 MHz: -50 dBc<br>5 MHz to 25 MHz: -45 dBc                            |
| Square/Pulse Characteristics          |                                                                             |
| Frequency                             | 1 $\mu$ Hz to 10 MHz                                                        |
| Duty Cycle                            | 20% to 80%                                                                  |
| Rise/Fall Time                        | < 24 ns (10% to 90%)                                                        |
| Overshoot (1 kHz, 1 Vpp Typical)      | < 3%                                                                        |
| Pulse Width                           | > 50 ns                                                                     |
| Jitter                                | < 500 ps + 10 ppm                                                           |
| Ramp Characteristics                  |                                                                             |
| Frequency                             | 1 $\mu$ Hz to 300 kHz                                                       |
| Linearity (Typical)                   | < 0.1% of Pk-Pk (Typical, 1 kHz, 1 Vpp, 100% Symmetry)                      |
| Symmetry                              | 0% to 100% (Adjustable)                                                     |
| DC Characteristics                    |                                                                             |
| Offset Range                          | $\pm 1.5 \text{ V}$ (50 $\Omega$ )<br>$\pm 3 \text{ V}$ (High-Z)            |
| Accuracy                              | $\pm(\text{offset} * 1\% + 3 \text{ mV})$                                   |
| Noise Characteristics                 |                                                                             |
| Bandwidth                             | > 25 MHz (-3 dB)                                                            |
| Arbitrary Wave Characteristics        |                                                                             |
| Frequency                             | 1 $\mu$ Hz to 5 MHz                                                         |
| Wave Length                           | 16 Kpts                                                                     |
| Sample Rate                           | 125 MSa/s                                                                   |

| Serial Decoder (DC2540C)               |                                                           |
|----------------------------------------|-----------------------------------------------------------|
| Threshold                              | -4.5 to 4.5 div                                           |
| Recorded List                          | 1 to 7 Lines                                              |
| I2C Decoder                            |                                                           |
| Signal                                 | SCL, SDA                                                  |
| Address                                | 7 bit, 10 bit                                             |
| SPI Decoder                            |                                                           |
| Signal                                 | CLK, MISO, MOSI, CS                                       |
| Edge Select                            | Rising Falling                                            |
| Idle Level                             | Low, High                                                 |
| Bit Order                              | MSB, LSB                                                  |
| UART / RS232 Decoder                   |                                                           |
| Signal                                 | RX, TX                                                    |
| Data Width                             | 5, 6, 7, 8 bit                                            |
| Parity Check                           | None, Odd, Even                                           |
| Stop Bit                               | 1, 1.5, 2 bit                                             |
| Idle Level                             | Low, High                                                 |
| CAN Decoder                            |                                                           |
| Signal                                 | CAN_H, CAN_L                                              |
| Source                                 | CAN_H, CAN_L, CAN_H-CAN_L                                 |
| LIN Decoder                            |                                                           |
| Supported Specification                | Ver1.3, Ver2.0                                            |
| MSO Digital Channels (LA2540C/LP2540C) |                                                           |
| Digital Channels                       | 16                                                        |
| Sample Rate                            | 500 MSa/s                                                 |
| Memory Depth                           | 14 Mpts/Ch                                                |
| Maximum Input Voltage                  | $\pm 20 \text{ Vpeak}$                                    |
| Threshold Accuracy                     | $\pm (3\% \text{ of threshold setting} + 150 \text{ mV})$ |
| Input Dynamic Range                    | $\pm 10 \text{ V}$                                        |
| Minimum Input Voltage Swing            | 800 mVpp                                                  |
| Input Impedance                        | 100 k $\Omega$    8 pF                                    |
| Maximum Input Frequency                | 60 MHz                                                    |
| Minimum Detectable Pulse Width         | 8.3 ns                                                    |
| Ch to Ch Skew                          | $\pm (1 \text{ digital sample interval})$                 |
| User Defined Threshold Range           | $\pm 3 \text{ V}$ in 10 mV steps                          |
| Threshold Selections                   | TTL, CMOS, LVCMOS3.3, LVCMOS2.5, Custom (-3 to +3 V)      |