

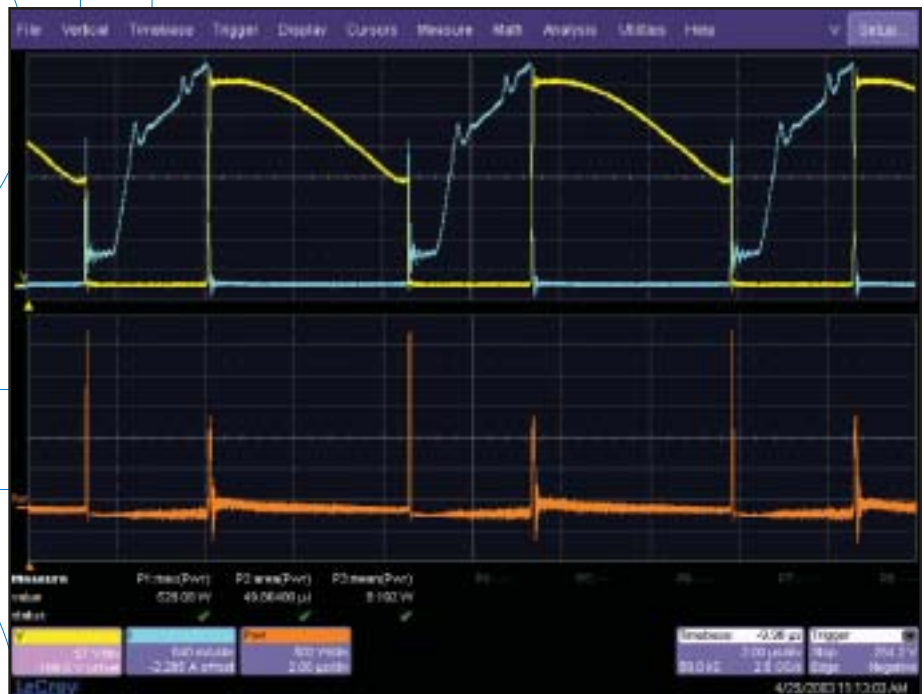
PMA2

PowerMeasure Analysis Software

PMA2 PowerMeasure Analysis Software

LEADING FEATURES

- **Automatic setup and display of relevant waveforms and parameters**
- **Waveforms scaled and displayed in Volts, Amps, Watts, Ohms, etc.**
- **Power device performance analyzed in-circuit**
- **Measure and view the time domain response of the entire control loop**
- **Line harmonics testing to EN 61000-3-2**
- **Complete solutions available, including probes and differential amplifiers.**
- **Usable with a wide range of probes, amplifiers, shunts, and current shunt resistors.**
- **Gated measurement capability**



PMA2 PowerMeasure Analysis Software can be used with any LeCroy X-Stream DSO. Combine PMA2 with other accessories for a complete PowerMeasure System.

LeCroy's PMA2 PowerMeasure Analysis Software provides exceptional ability to measure and analyze the operating characteristics of power conversion devices and circuits. PMA2 is used with LeCroy X-Stream DSOs to make critical power switching device measurements, perform control loop modulation analysis, and measure line power harmonics. Specially designed LeCroy accessories, such as differential amplifiers, differential probes, current probes, and deskew fixtures, provide unparalleled measurement quality.

PMA2 provides quick and easy setup of your voltage and current input. In many cases, no

manual deskew is required, ensuring the highest accuracy of your measurements. Once set up, access to important analysis and measurements is only a button push away.

All aspects of Device Analysis, such as various power losses, saturation voltage, high side gate drive, dynamic-on resistance, safe operating area, and others are easily performed. Modulation analysis allows you to intuitively understand control loop response, such as soft start performance or step response to line and load changes. Line Power Analysis allows simple and quick pre-compliance testing to EN 61000-3-2.

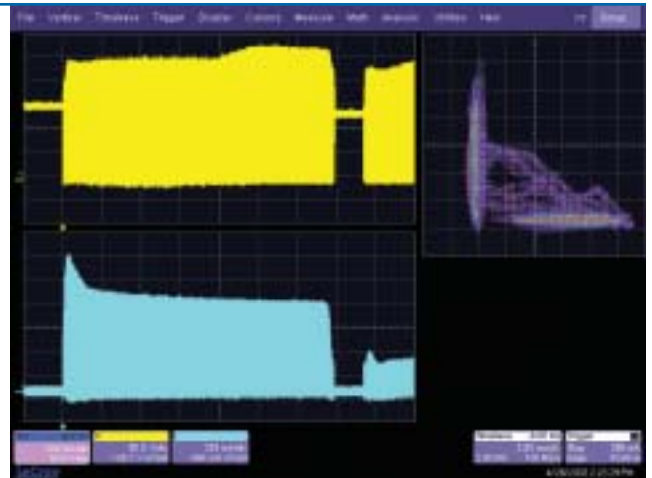
Power Device Analysis

Analyze power device performance while the device is operating in circuit, without requiring specially designed test fixtures or clipping circuits. Only LeCroy can provide the full range of measurement

capability, including capture windows in the 100s of milliseconds at high sample rates for finding unusual violations during safe operating area measurements.

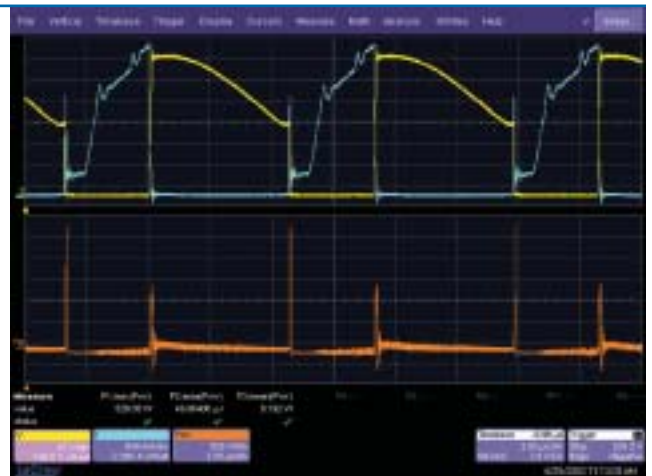
Safe Operating Area

PMA2 gives you completely new knowledge about your circuit. Finding SOA violations that occur for only a few cycles after an event, such as short circuit or startup, can be problematic. These violations often go undetected, and degrade the device over time. Using the long record length and fast processing of PMA2 on X-Stream DSOs, SOA display on very long records with high resolution is possible and improper device characteristics can be identified.



Power Losses

Instantaneous Power Loss and Total Losses per Switching Cycle of the power switching device are all easily measured over a single cycle or multiple cycles. Display the power waveform and zoom on it for detail. Use gated measurements to look at losses during a small portion of the waveform—measurements such as Turn-Off Loss, or Measure Conduction Loss and Dynamic-On Resistance during the conduction portion of the switching cycle.

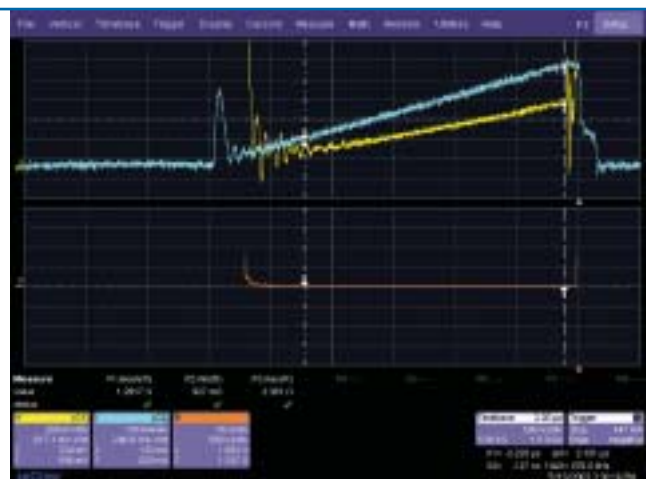


Voltage

Accurately measure and view

- Small voltage signals riding on top of large positive to negative bus voltage transitions during High-Side Gate Drive measurements
- Saturation voltages of a small fraction of a volt when there are large dynamic range transitions of an in-circuit device
- Instantaneous voltage change (dv/dt).

(Note: LeCroy's DA1855A Differential Amplifier and DXC100A Voltage Probes provide the high CMRR and fast overdrive recovery necessary for some of these measurements)



Modulation Analysis

The width of every pulse in a PWM power supply's control circuit is measured

The time value of each pulse width is displayed on the vertical axis



Modulation Analysis functions produce a time domain display, which represents the modulated parameter in a time-vs-parameter value graphical plot. They are convenient tools for intuitively viewing the time domain response of the entire control loop, including any time constants added by the pulse width modulator. Modulation Analysis can be performed for duty cycle, period, frequency, and pulse width.

Soft-Start



- 1 In this example, PMA2 on a WavePro DSO acquires a 20 ms record of every gate drive pulse from the time a power supply is turned on until it reaches steady state.
- 2 Modulation Analysis displays the pulse width value of every cycle on the vertical axis as it occurs. The soft start circuit's performance is readily observed.
- 3 The 5 volt supply is monitored as it increases from 0 volts to a regulated +5 volt level.
- 4 The zoom feature allows each gate drive to be individually examined.

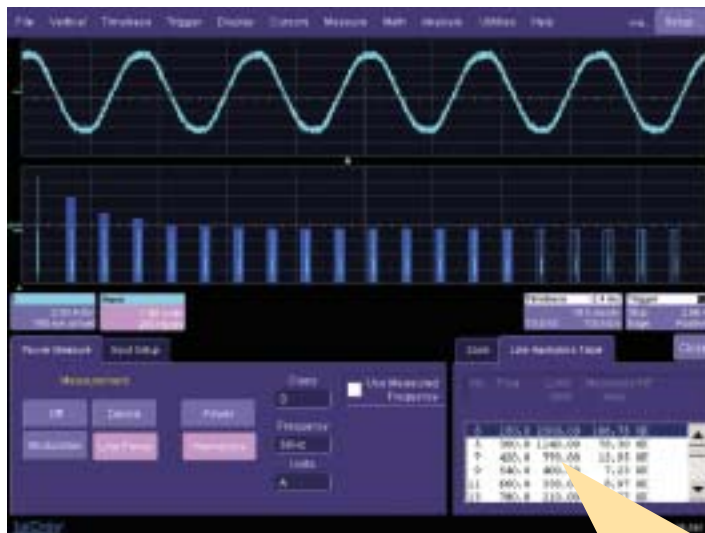
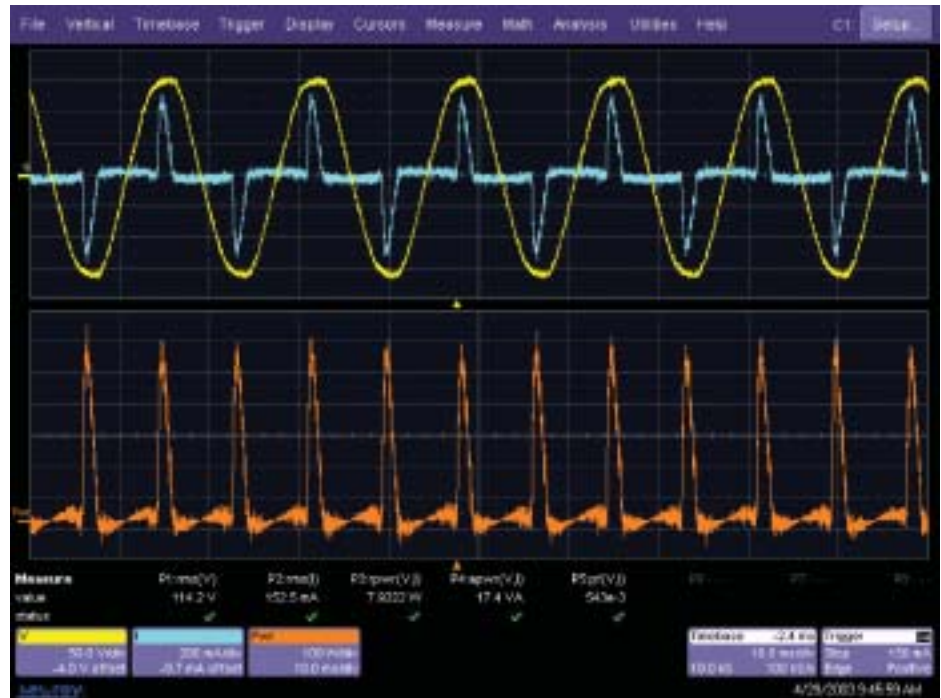
Step Response



- 1 PMA2 on a WavePro DSO examines the change in gate drive pulse widths as a power supply's load steps from full to minimum.
- 2 Modulation Analysis displays the pulse width value of every cycle on the vertical axis as it occurs. The circuit's response to a step change can be observed.
- 3 Zoom traces can be used to view individual gate drive pulses and observe their behavior before and after a large load change.
- 4 WavePro SMART Trigger allows the gate drive signal acquisition to start on the first gate drive pulse that occurs after the load changes from maximum to minimum.

Line Harmonic Analysis

Line Power Analysis easily measures a power conversion device's incoming RMS line voltage, RMS current consumption (in watts and VA), Power Factor, Apparent Power, and Real Power. Line current harmonic measurements are made and compared to standard templates for EN 61000-3-2 Class A, B, C, or D equipment. Results can be displayed in either graphical frequency domain or tabular formats.



Line current harmonics are viewed in graphical and tabular format simultaneously. The proper template for the selected class and line frequency is calculated and displayed. As each current waveform is acquired, each harmonic's value is displayed on the graph. You can use a cursor to select individual harmonics for measurement purposes. Out-of-limit harmonics are shown extending beyond the template. Tabular harmonic data for each frequency is displayed along with its frequency and magnitude limit. Harmonics exceeding their limits are also indicated in the table.

NO	Freq	Limit [mA]	Measured P/F [mA]
3	180.0	2300.00	106.75 OK
5	300.0	1140.00	78.30 OK
7	420.0	770.00	12.95 OK
9	540.0	400.00	7.23 OK
11	660.0	330.00	8.97 OK
13	780.0	210.00	5.57 OK

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Systems and Accessories

PMA2 will run on LeCroy X-Stream based DSOs, such as WavePro 7000 Series and WaveMaster Series.

LeCroy also offers the most complete PowerMeasure solutions, including probes and accessories. To complete your measurement system, consider choosing from



DA1855A Differential Amplifier

A stand-alone 100 MHz differential amplifier that acts as a fully integrated signal-conditioning preamplifier. It provides unequalled common mode rejection ratio (CMRR) of 100,000:1 (typical) and overdrive recovery of < 100 ns to 100 mV from 400 V overdrive. System scale factors can be set to between 200 μ V/div and 100 V/div. Use with any DXC Series differential voltage probe.

When combined with the DXC series differential probes, the DA1855A acquires virtually any signal in a power conversion circuit without the signal degradation normally associated with such measurements. The common mode voltage range (CMVR) is limited only by the voltage rating of the probes.

DXC Series Differential Probes

The DXC100A is a high-performance, passive, matched differential probe pair designed for use with the DA1855A. The DXC100A handles up to \pm 500 V (1000 V differential) voltage rating, and provides a 100,000:1 (typical) CMRR when used with a DA1855A. Other higher and lower voltage DXC Series differential probes are also available.

the high quality accessories below. Or use PMA2's unique setup capability to integrate your existing probes, amplifiers, current shunts, or current sensing resistors into your LeCroy oscilloscope.

Current Probes

LeCroy offers a range of current probes from 2–50 MHz and 15–500A. The most popular, the AP015 is a 30 A rms, 50 MHz probe based on a combination of Hall effect and transformer technology that allows measurements to be made on DC, AC, and impulse currents. Its rugged design uses a split-core transformer that allows the probe head to be clamped around a conductor that remains in circuit.



Deskew Calibration Source

The DCS-015 provides time-coincident voltage and current signals that are used as references for deskewing current and voltage measuring systems.



Ordering Information

SOFTWARE:

PowerMeasure Analysis – use with any LeCroy X-Stream DSO	PMA2
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DIFFERENTIAL AMPLIFIERS:

1 ch. 100 MHz Differential Amplifier with Fast Overdrive Recovery and 100 kHz, 1 MHz, and 20 MHz BW filters	DA1855A
2 ch. 100 MHz Differential Amplifier with Fast Overdrive Recovery and 100 kHz, 1 MHz, and 20 MHz BW filters	DA1855A-PR2

DIFFERENTIAL PASSIVE PROBES: *

±100 or ±10 Selectable, +/- 500V Passive Differential Probe Pair		DXC100A
±100 2.5 kV Passive High Voltage Probe Pair	Requires DA101 for full performance	DXC5100
±10 1 MΩ Passive Attenuator	Recommended with DXC5100	DA101

CURRENT PROBES:

30 Amp, 50 MHz Current Probe	AC/DC, 30 Amp rms, 50 Amp Peak Pulse	AP015
15 Amp, 50 MHz Current Probe	AC/DC, 15 Amp rms, 50 Amp Peak Pulse	CP015
150 Amp, 10 MHz Current Probe	AC/DC, 150 Amp rms, 500 Amp Peak Pulse	CP150
500 Amp, 2 MHz Current Probe	AC/DC, 500 Amp rms, 700 Amp Peak Pulse	CP500

ACCESSORIES:

Deskew Calibration Source	DCS015
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Other Power Accessories

HIGH-VOLTAGE DIFFERENTIAL PROBES:

1,400 V 100 MHz Differential Probe	±100 / ±1000, ProBus Powered, with Scale Factor Readout	ADP305
1,400 V 20 MHz Differential Probe	±100 / ±1000, ProBus Powered, with Scale Factor Readout	ADP300
15 MHz Differential Probe	700 V, ±10 / ±100, Battery Powered, w/o Scale Factor Readout	AP031

HIGH-VOLTAGE PASSIVE PROBES:

±10/±100, 200/300 MHz, 5 MΩ/50 MΩ High Voltage Probe	600 V/1.2 kV Max. Voltage DC + Peak AC	PPE1.2KV
±100, 400 MHz, 50 MΩ High Voltage Probe	5 kV Max. Voltage DC + Peak AC	PPE5KV
±1000, 100 MHz, 50 MΩ High Voltage Probe	20 kV (40 kV Peak) Max. Voltage DC + Peak AC	PPE20KV

* To ensure highest performance, probes should be ordered with differential amplifiers.

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