

LeCroy PowerMeasure™ System

Get the Complete Picture



LeCroy

Power Measurements Made Easy!

COMPLETE PACKAGE!

— **POWER DEVICE ANALYSIS:**

measures power device saturation voltage, instantaneous power loss, safe operating area (SOA), and dynamic on-resistance while the device is operating in circuit.

— **MODULATION ANALYSIS:**

displays and analyzes modulation information contained in power conversion control circuits.

— **LINE POWER ANALYSIS:**

analyzes voltage current, real power, apparent power, power factor, and line current harmonics for precompliance to EN61000-3-2 for CE qualification.

LeCroy's PowerMeasure System

New!

not only makes your routine power measurements simple, it makes easy work of even your most complex, difficult measurements.

No more crossing your fingers and hoping your power supply or motor drive won't fail. No more trial and error — or expensive, over-designed systems. Now you can focus on what's important in power design — confident that the testing is accurate and exhaustive. You won't have to worry about product failures or recalls.

The PowerMeasure System is the most complete high-performance design system available for the power conversion engineer. It includes an easy-to-use, high-performance, full-featured digital storage oscilloscope (DSO); high-performance current and differential voltage measurement capabilities; and powerful software for your key measurements.

You will quickly find this system indispensable. Its accuracy, precision, and reliability will improve your production and let you feel "hard-wired" to the power conversion product you are creating.

The New LeCroy PowerMeasure System.

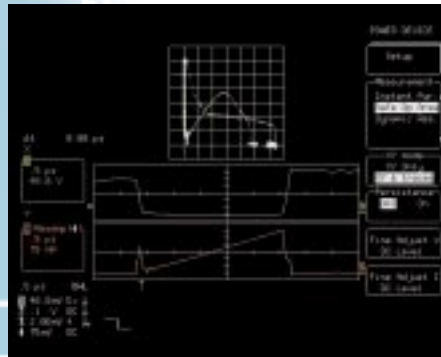
**Complete.
Very Complete.
Affordable Too!**

It will do virtually everything you want to do...
with just the push of a few buttons!

The LeCroy PowerMeasure System is all you need
to start and complete your power conversion
design safely and with confidence.

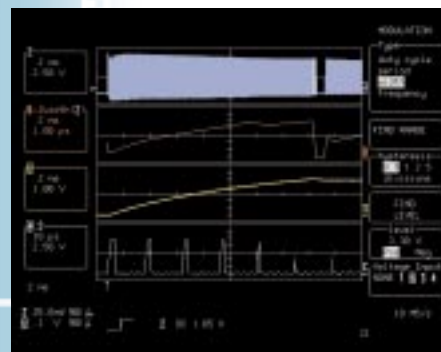
The LeCroy PowerMeasure System sets a new standard of affordability while providing an unequalled level of performance and completeness. It no longer makes economic sense to use unsafe and questionable measurement practices when the highest level of measurement integrity is available for such an affordable price.

Power Device
Analysis



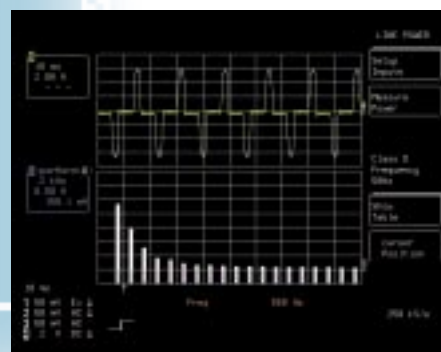
*Measure power device
characteristics – in circuit.*

Modulation
Analysis



*Use modulation analysis to
determine step response and
softstart performance.*

Line Power
Analysis



*Analyze power factor and
line current harmonics.*

The PowerMeasure™ System

These components make up the PowerMeasure System—the most complete solution available for making power measurements.

The Waverunner DSO captures complete records of each detail in every cycle of important circuit transitions such as load change, turn-on, and turn-off. SMART Trigger® makes it easy to capture waveforms during complex power transitions. The system performs mathematical analysis of live or stored waveforms and performs waveform math and math-on-math for detailed live analysis of the circuit and its components.

The PowerMeasure Analysis (PMA1) software's dedicated menus and shortcuts let you quickly and easily set up the scope to acquire, view, and analyze power signals. A "Setup Helper" is built in to support users step-by-step, ensuring correct and accurate measurements. A dedicated manual comes with PMA1 that details the best way to optimize the scope and probe setups for voltage, current, power, and energy measurements.

The DA1855A is a stand-alone, high-performance 100 MHz differential amplifier that acts as a fully integrated signal conditioning preamplifier. It provides unequalled common mode rejection ratio (CMRR) and overdrive recovery performance. Amplifier gain can be set to 1 or 10. A built-in input attenuator can be separately set to attenuate signals by a factor of 10, extending the gain between 200 $\mu\text{V}/\text{div}$ and 100 V/div , and common mode dynamic range limited only by the voltage rating of the probes.

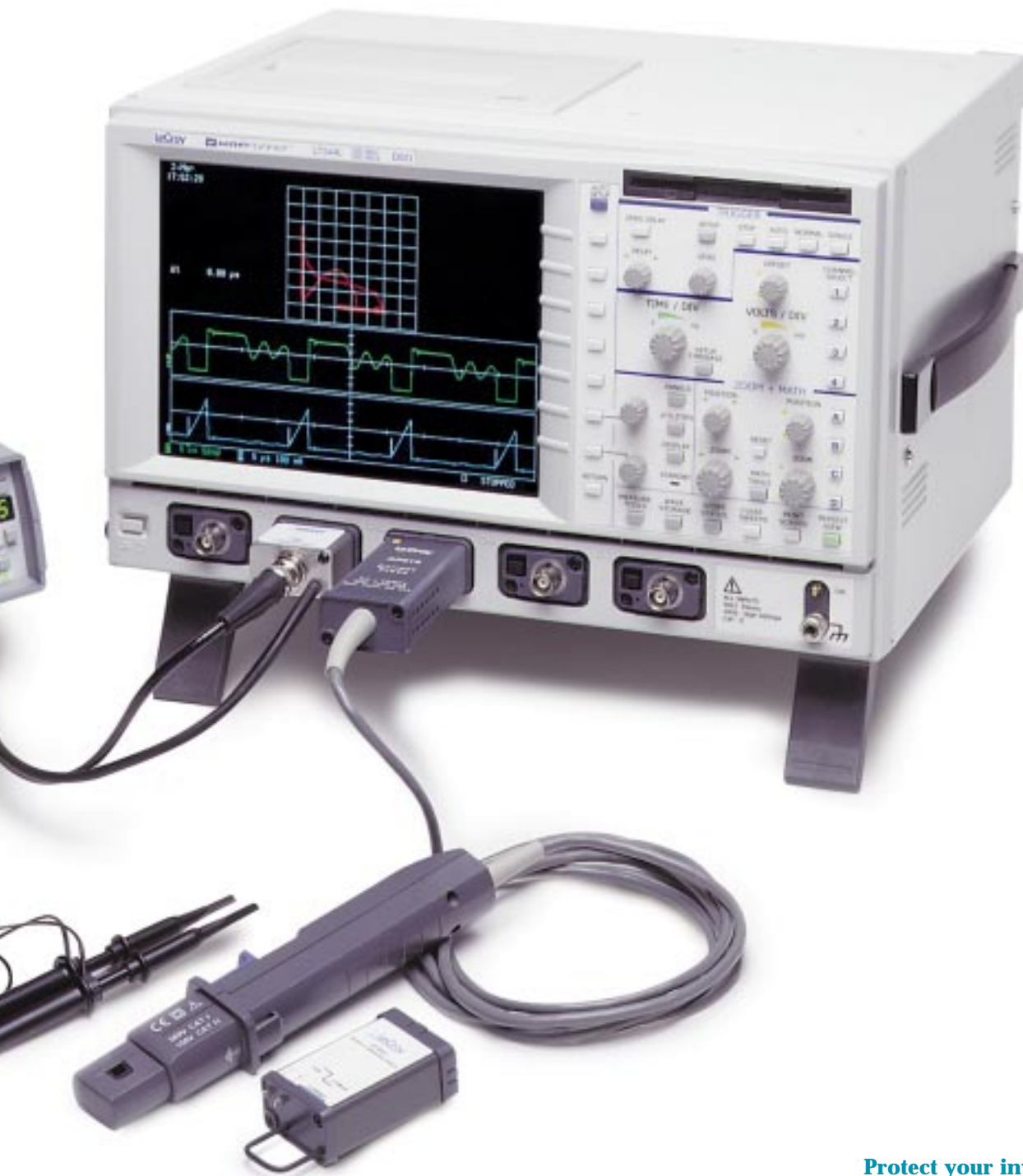
Equipped with the ProBus™ interface, the DA1855A becomes an integral part of the oscilloscope. The amplifier can be fully controlled from the oscilloscope's front panel, the amplifier's front panel, or by using remote commands (GPIB or RS-232-C).



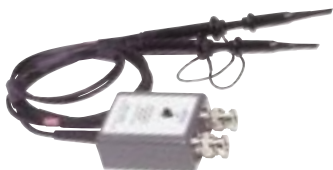
The AP015 current probe measures the current flowing through a conductor. The probe is based on a combination of Hall effect and transformer technology that allows measurements to be made on DC, AC, and impulse currents. Its rugged design uses a split-core transformer that allows the probe head to be clamped around a conductor that remains in circuit.

The AP015 is a wideband DC-coupled current probe. It is the ideal tool for making accurate measurements in high-efficiency switch mode power supplies and other applications requiring high bandwidth.





The DXC100A is a high-performance, passive, matched differential probe pair designed for use with the DA1855A. It increases the maximum input signal and common mode ranges in proportion to their attenuation ratio, up to a ± 500 V (1000 V differential) voltage rating.



The DCS015 provides time-coincident voltage and current signals that are used as references for deskewing current and voltage measuring systems.



Protect your investment!

Maybe you already own a LeCroy DSO, or you've already invested thousands of dollars in another vendor's probes. No problem! The PowerMeasure System software works on any LeCroy oscilloscope, and other manufacturers' current and voltage probe settings are integrated into the setup menus. Waveforms are displayed showing the proper units (watts, joules, VA, etc.), even with other manufacturers' non-ProBus accessories. Not only do you protect your investment, you get superior performance and analysis capabilities.

Power Device Analysis

LeCroy's PowerMeasure System includes the capability to analyze power devices' performance while they are operating in circuit. Tests formerly reserved for the test fixture and requiring specially designed clipping circuits can now be routinely made on these devices while they operate in their designed environment. This requires a unique combination of capabilities not previously available in a single system.

The PowerMeasure System combines the required current and differential voltage measuring capability with unequalled DSO triggering, long record capture, and waveform math to make these difficult measurements as simple as the push of a few buttons.

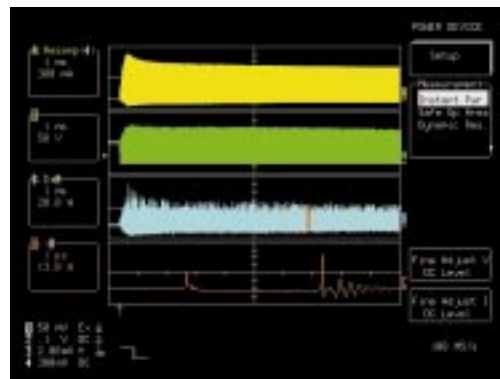
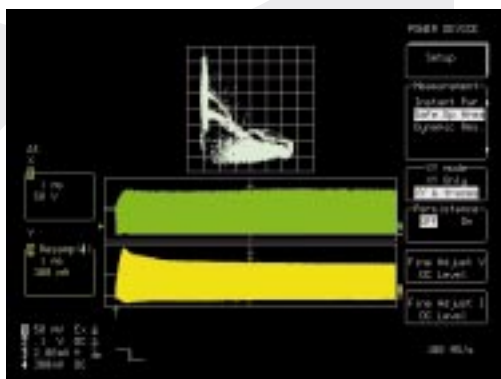
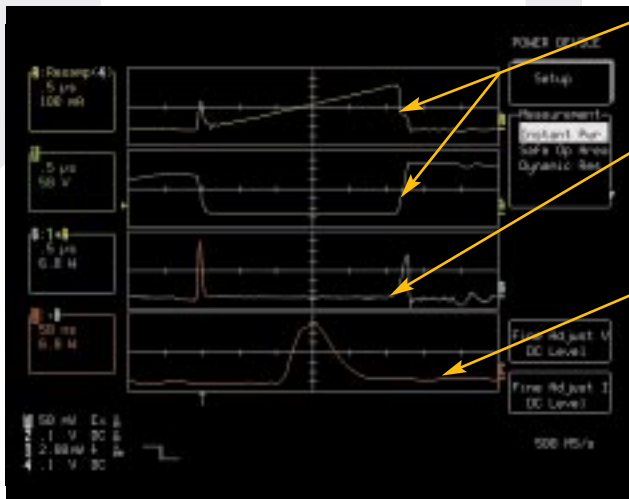
INSTANTANEOUS POWER

Power Device Analysis captures the device's current waveform and displays it properly time-deskewed in relationship to the voltage waveform.

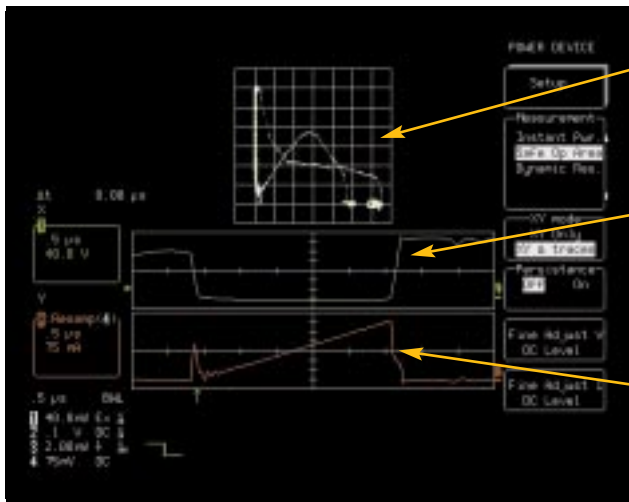
Each acquired point on the current waveform is multiplied by its corresponding point on the voltage waveform. The resulting Instantaneous Power waveform is displayed using the proper units (watts).

A zoom trace is provided that allows the user to expand the power waveform for detailed analysis. Other waveforms or math functions can be substituted for the zoom trace. For instance, the DSO's MATH TOOLS can be used to display an energy waveform (joules).

The *Waverunner* oscilloscope's full range of standard measure tools, such as waveform parameters and math tools, are also available.



The Waverunner LT344L DSO's 1 Mpoint/channel allows the required high sampling rate to be sustained over enough time to enable the user to acquire a switching transistor's voltage and current waveform from turn-on to steady state. This allows the Safe Operating Area and Instantaneous Power waveforms for each and every one of these cycles to be captured and observed at your leisure. There's no need to destroy multiple devices trying to capture that elusive glitch.



SAFE OPERATING AREA

LeCroy's PowerMeasure System displays the device's Safe Operating Area in the proper XY format; Voltage on the X-axis and Current on the Y-axis.

The DA1855A/DXC100A differential amplifier and probes have unique capabilities to allow a power FET's drain-source voltage to be safely acquired while the device operates in a power supply's line-referenced primary circuit.

A precision AC/DC current probe, such as the AP015, acquires the power device's drain current waveform, and Power Device Analysis displays it properly time-deskewed in relationship to the voltage waveform.

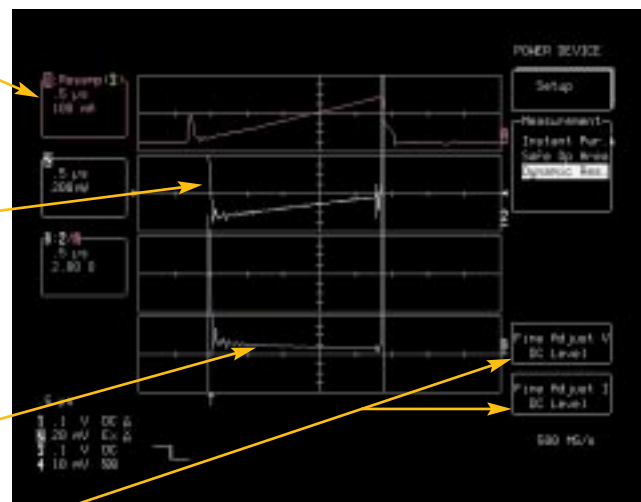
DYNAMIC ON-RESISTANCE

The power device's current waveform is acquired using an AP015 AC/DC current probe, time-deskewed and displayed in proper time relationship to the voltage waveform.

The DA1855A differential amplifier's fast recovery from overdrive and the DXC100A differential probe's 250 ppm flatness capability combine to accurately acquire the power device's saturation voltage waveform — while the device is operating in circuit.

The voltage waveform is divided by the current waveform and the device's dynamic on-resistance is displayed.

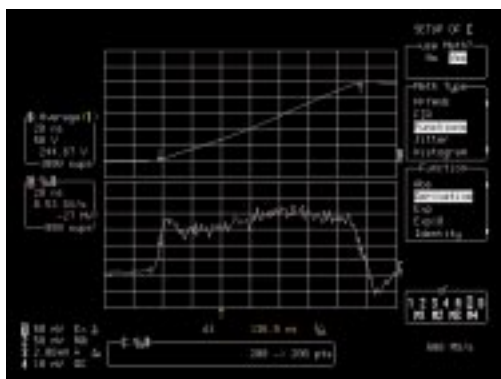
Adjustment is provided to allow the user to remove any residual DC offset in both the current and voltage waveform without removing the probes from the circuit.



DRAIN-SOURCE VOLTAGE dv/dt

The PowerMeasure System's Math functions measure and display the dv/dt of a power transistor's drain-source turn-off voltage waveform.

Cursors allow the dv/dt value to be read at any point on the waveform.



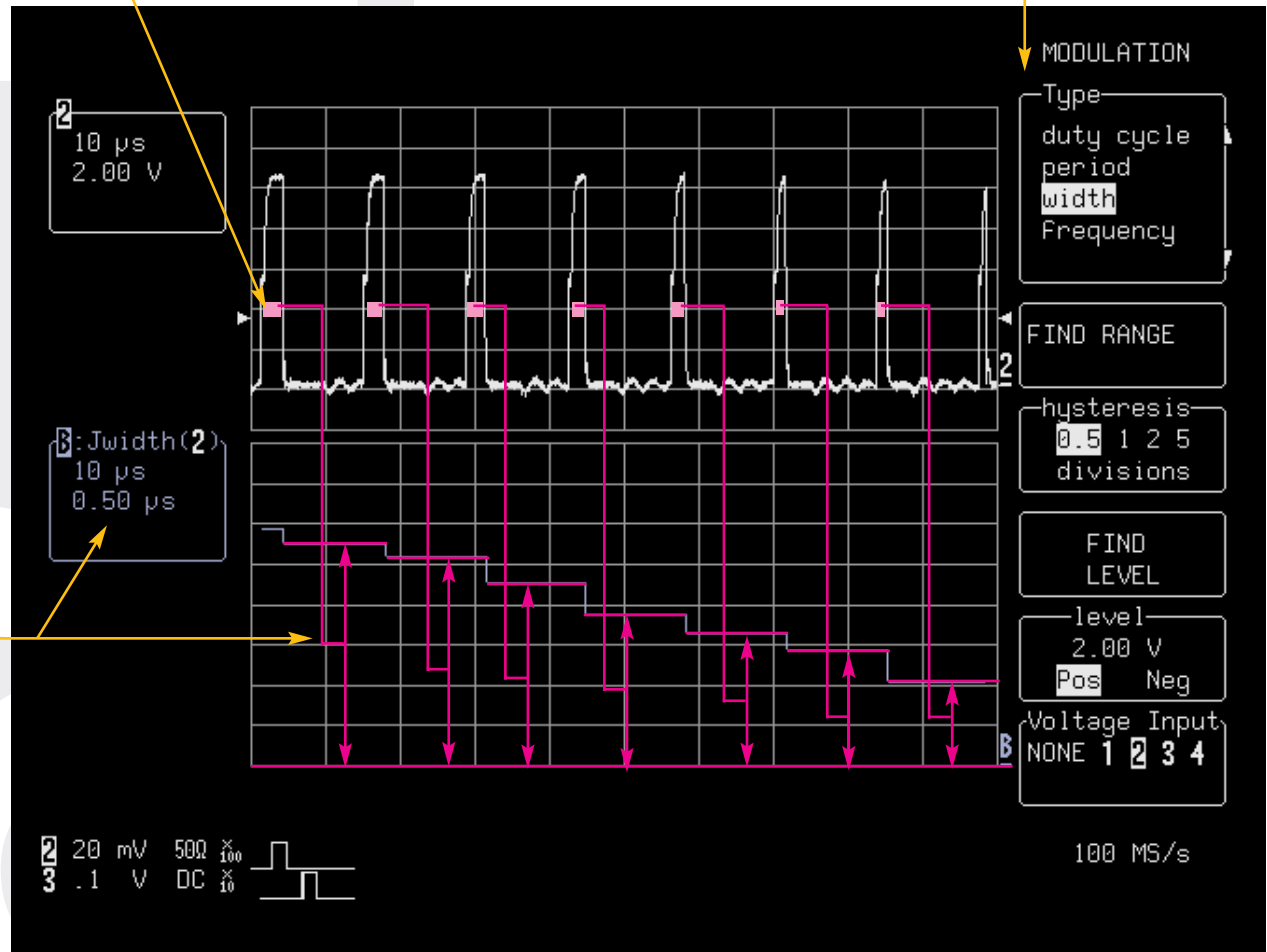
Modulation Analysis

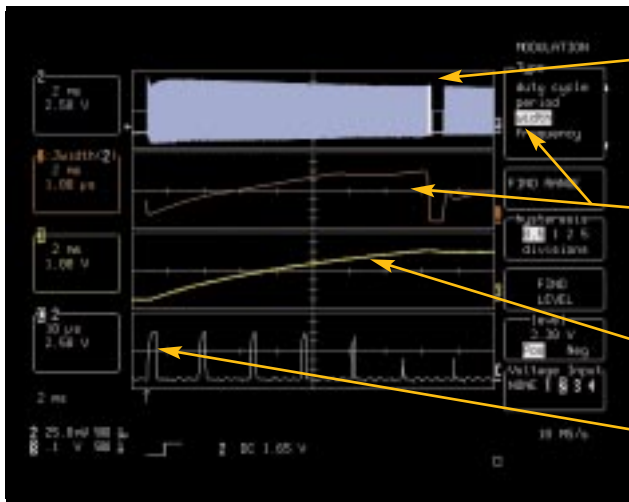
A switchmode power conversion circuit's output is controlled by transferring the proper amount of energy from an unregulated source to the output on a cycle-by-cycle basis. Power conversion design engineers can learn a great deal about the circuits they design by analyzing the information contained in the modulation of this energy transfer. Modulation Analysis provides the engineer with tools to view this information in a very clear and concise way.

The width of every pulse in a rapidly changing Pulse Width Modulated (PWM) power supply's control circuit is measured.

Modulation Analysis is provided for duty cycle, period, width, and frequency modulation.

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





STARTUP

In this example, the *Waverunner* LT344L 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.

Modulation Analysis displays the width value of every pulse on the vertical axis as it occurs. The softstart circuit's performance is readily observed.

The 5 volt supply is monitored as it increases from 0 volts to a regulated +5 volt level.

The zoom feature allows each gate drive pulse to be individually examined.

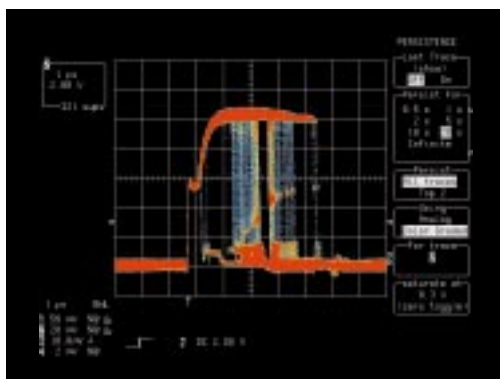
STEP RESPONSE

The *Waverunner* LT344L DSO examines the change in gate drive pulse widths as a power supply's load steps from full to minimum.

Modulation Analysis displays the width value of every pulse on the vertical axis as it occurs. The circuit's response to a step change can be observed.

The two zoom traces allow individual gate drive pulses to be observed before and after a large load change.

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.



Analog Persistence™ reveals many details about the change in a power supply's gate drive signal during a large load change. Color variation indicates the relative distribution of the various pulse widths and the change in waveform shape.

Line Power Analysis

LeCroy PowerMeasure System provides design engineers with an easy-to-use method of measuring the line power harmonics of their circuits. EN61000-3-2 precompliance testing avoids expensive and time-consuming trips to a third-party qualification laboratory.

Line Power Analysis easily measures a power supply's power factor and power consumption (watts and VA), as well as its line voltage and current rms values. Line harmonics measurements for class A, B, C, and D equipment are read out in both graphical and tabular format.

The LeCroy PowerMeasure System measures line voltage up to ± 500 volts and current up to 30 amps. Higher voltage and currents are accommodated through the use of optional probes. Proper units and scale factors are easily set by the PowerMeasure Software.

Live power line voltage and current waveforms are displayed.

Live power and energy waveforms are displayed.

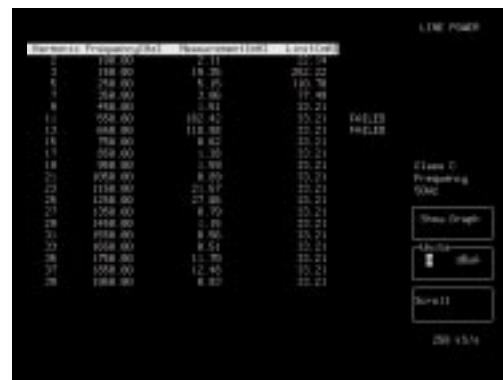
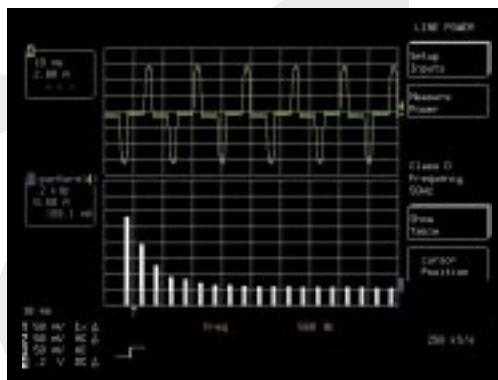
RMS Line Voltage
RMS Line Current
Real Power
Apparent Power
Power Factor

All on "live" waveforms



Select EN61000-3-2 Class A, B, C, or D.

Select 50 or 60 Hz line frequency.



Line current harmonics can be viewed in either graphical or tabular format. 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. A cursor is provided to select individual harmonics. Out-of-limit harmonics are shown extending beyond the template. In tabular format, the value of each harmonic is displayed along with its frequency and magnitude limit. Harmonics exceeding their limits are shown as "FAILED" on the table.

PMA1 Technical Specifications

POWERMEASURE ANALYSIS SOFTWARE

The PowerMeasure Analysis software provides unique tools for power conversion engineers using switching techniques. This software adds dedicated menus and short-cuts allowing the user to set up the oscilloscope quickly and easily to view and analyze signals from power supply, electronic motor drives, or high-efficiency lighting designs. A "Setup Helper" is built in to support users step-by-step, ensuring correct and accurate measurements.

A detailed manual gives expert advice on how to optimize the oscilloscope and probe setup for voltage, current, power, and energy measurement. Full remote control is possible over GPIB or RS-232-C interfaces.

PowerMeasure Analysis software is also available as an upgrade for 9300, LC, and *Waverunner* series LeCroy oscilloscopes.

GENERAL SPECIFICATIONS

- Analysis on up to 1 million points with the PS344L, up to 250 kpoints with the PS344, and up to 100 kpoints with the PS322 and PS224.
- Deskew range is $\pm 2 \mu\text{s}$ with a resolution of 10 ps.
- Scale factor from x100 to 1:10,000 provided for non-ProBus voltage and current probes.
- Fine voltage and current DC offset adjustment.
- Proper units displayed for non-ProBus voltage and current probes.

PowerMeasure Analysis software consists of three measurement areas:

POWER DEVICE ANALYSIS

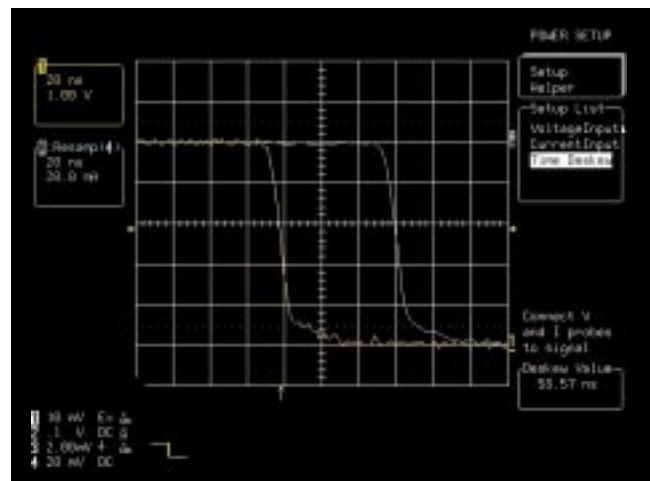
- Instantaneous Power
- Safe Operating Area (SOA)
- Saturation Voltage and Dynamic Turn-on Resistance
- dv/dt measurements

MODULATION ANALYSIS

- Signal width, duty cycle, period, or frequency modulation
- Full control of hysteresis (0.5, 1, 2, 5 div) and level (Pos and Neg)
- Analysis for an unlimited number of events or cycles

LINE HARMONICS

- 50 Hz and 60 Hz
- Standard templates for Class A, B, C, and D
- Up to 40th harmonics
- Real power, power factor, rms voltage, and rms current parameters
- Graph or tabular display
- Automatic Pass/Fail test for precompliance harmonics testing (EN-61000-3-2)



$\pm 2 \mu\text{s}$ channel-to-channel
time deskew (10 ps resolution)

Power Measure System Packages

LeCROY POWERMEASURE SYSTEMS

	PS344L	PS344	PS322	PS224
Channels	4	4	2	4
Points per channel	1 Mpt	250 kpts	100 kpts	100 kpts
Bandwidth	500 MHz	500 MHz	500 MHz	200 MHz
Maximum Voltage [†]	500 V	500 V	500 V	500 V

POWER DEVICE ANALYSIS

Power Device Saturation	Yes	Yes	Yes	Yes
Upper Gate Drive	Yes	Yes	Yes	Yes
Dynamic On-Resistance	Yes	Yes	Yes	Yes
Instantaneous Power				
up to 1 ms window acquisition*	Yes	Yes	Yes	Yes
up to 10 ms window acquisition*	Yes	No	No	No
Safe Operating Area				
up to 1 ms window acquisition*	Yes	Yes	Yes	Yes
up to 10 ms window acquisition*	Yes	No	No	No

MODULATION ANALYSIS

Load Change, Turn-On, Turn-Off, Softstart				
up to 2 ms window acquisition**	Yes	Yes	Yes	Yes
up to 20 ms window acquisition**	Yes	No	No	No

SINGLE PHASE POWER LINE ANALYSIS

Harmonics Analysis (EN61000-3-2)	Yes	Yes	Yes	Yes
Real Power, Apparent Power, Power Factor	Yes	Yes	Yes	Yes

[†] ± 500 V to ground, 1000 V differential. Up to 2.5 kV with the optional DXC-5100, a passive differential matched pair of 1:100 probes.

* at 100 MS/s

** at 50 MS/s

Waverunner Oscilloscopes

The PowerMeasure System uses the *Waverunner* series of oscilloscopes as its foundation. Its built-in wizard menus walk you through the measurements and calibration of your PowerMeasure System. *Waverunner* is easy to learn and easy to operate. Its large 8.4" color display lets you see not only the current or voltage signals, but also the resulting power, energy, safe operating area, and many other measurements. For many applications, the PS344L offers the best solution with its four input channels and one million points of memory

on each channel. *Waverunner* scopes provide the best view of your signal with up to four zooms of your circuit signal. Each scope channel uses the LeCroy ProBus interface for intelligent probe connection. Just plug in the AP015 current probe or DA1855A amplifier, and the scope knows how to calibrate and control all functions! Units are displayed on the screen, so you can read out the amps or watts of your measurement. The PowerMeasure System is integrated to give you easily obtained and accurate results on your power measurement applications.

WAVERUNNER COLOR DIGITAL OSCILLOSCOPES

POWERMEASURE SYSTEM	WAVERUNNER SCOPE	BANDWIDTH	CHANNELS	SAMPLE RATE	ACQUISITION MEMORY
PS344L	LT344L	500 MHz	4	500 MS/s	1 Mpts/ch
PS344	LT344	500 MHz	4	500 MS/s	250 kpts/ch
PS322	LT322	500 MHz	2	200 MS/s	100 kpts/ch
PS224	LT224	200 MHz	4	200 MS/s	100 kpts/ch



Differential Voltage Measurements

DA1855A TECHNICAL SPECIFICATIONS

The DA1855A differential amplifier, when combined with the DXC series differential probes, provides the user with the capability of accurately acquiring virtually any signal in a power conversion circuit without concern for the signal degradation normally associated with these measurements. The Common Mode Voltage Range is limited only by the voltage rating of the probes. The amplifier's signal clipping capability and high Common Mode Rejection Ratio (CMRR) allow you to make such difficult measurements as device saturation voltage and high-side gate drive—while the device is operating in its line primary voltage environment.

PROBUS COMPATIBLE

STATE-OF-THE-ART OVERDRIVE RECOVERY

VERY LOW NOISE

AMPLIFIER GAIN: x1 or x10

GAIN ACCURACY: $\pm 1\%$



BANDWIDTH: DC to 100 MHz

OUTPUT IMPEDANCE: 50 Ω

INPUT ATTENUATION: $\div 1$ or $\div 10$

MAX DIFFERENTIAL LINEAR INPUT:

0.5 Volts \times Combined Internal and
Gain Setting Probe's Attenuation Factor

COMMON MODE REJECTION RATIO: 100,000 to 1

MAX INPUT COMMON MODE INPUT:

($\div 1$ ATTENUATOR): ± 15.5 V

($\div 10$ ATTENUATOR): ± 155 V

($\div 10$ ATTENUATOR and $\times 10$ probe):
up to ± 1.55 kV (limited by probe rating)

± 500 V w/DXC100A

± 2500 V w/DXC-5100

INPUT RESISTANCE: 1 M Ω or 100 M Ω

INPUT CAPACITANCE: 20 pF

BANDWIDTH LIMIT FILTERS: 20 MHz, 1 MHz, and
100 kHz (three-pole bessel)

OFFSET MODE: Differential and Comparison

Offset Range

DIFFERENTIAL MODE: Up to $\pm 50,000$ scope
divisions

COMPARISON MODE: Up to $\pm 75,000$ scope
divisions

VOLTAGE RANGES

AMPLIFIER/PROBE COMBINATION		DA1855A DXC200	DA1855A DXC100A	DA1855A $\div 100/2500$ V Probes
COMMON MODE				
Each probe tip to earth ground		± 155 V	± 500 V	± 2500 V
DIFFERENTIAL MODE	Linear	10 V	800 V	800 V
	Probe tip to probe tip Clipped	310 V	1000 V	2500 V

Differential Voltage Measurements *continued...*

DXC100A

BANDWIDTH: DC to 100 MHz with DA185XA

MAX INPUT VOLTAGE: 500 V (1000 V differential)

ATTENUATION: Selectable $\div 10$ or $\div 100$

CABLE LENGTH: 1.2 m



DXC350A

BANDWIDTH: DC to 100 MHz with DA185XA

MAX INPUT VOLTAGE: 400 V (800 V differential)

HIGH INPUT IMPEDANCE: 92 M Ω /2.7 pF

CABLE LENGTH: 1.2 m

ATTENUATION: $\div 100$

Current Measurements

AP015

BANDWIDTH: DC to 50 MHz

MAX DC CURRENT: ± 30 A

MAX PEAK PULSE CURRENT: ± 50 A with pulse width < 10 s

OFFSET RANGE: ± 100 A maximum (depends on oscilloscope used)

OUTPUT SENSITIVITY: 10 mA/div to 20 A/div

COUPLING: AC, DC, GND

DC ACCURACY (AT 25° C): $\pm 1\%$ of reading to 15 A, $\pm 2\%$ of reading to 30 A

RISE TIME: < 7 ns

di/dt TRACKING: > 1.6 A/ns

EXTERNAL FIELD REJECTION: 75 dB at DC

INSERTION IMPEDANCE: $< 0.06 \Omega$ at 5 MHz

CABLE LENGTH: 2 m

OPENING DIMENSION: 5 mm



Channel Delay Matching

DCS015

TIME CORRELATION: ± 1 ns

VOLTAGE OUTPUT: ~ 0 to 5 V

CURRENT OUTPUT: ~ -100 to 0 mA

REPETITION RATE: ~ 8 kHz

RISE TIME: ~ 8 ns



The DCS015's time coincident voltage and current waveform edges and the PMA1 Software deskew function can be used to match delay differences up to ± 2 ns with 10 ps resolution. This is sufficient for large current and voltage probes with greatly differing lengths.

Recommended System Components

	VOLTAGE			CURRENT		TIME	DSO WITH PMA1 OPTIONAL SOFTWARE			
APPLICATIONS (up to 500 V)	DA1855A w/ DXC100A	AP031	AP032	AP015	AP011	DCS015	IT344L 4 Ch	IT344 4 Ch	IT224 4 Ch	IT322 2 Ch
POWER DEVICE ANALYSIS										
Power Device Saturation	R ¹	No	No	N/R	N/R	N/R	Yes	Yes	Yes	Yes
Upper Gate Drive	R ¹	No	No	N/R	N/R	N/R	Yes	Yes	Yes	Yes
Dynamic On-Resistance	R ²	No	No	N/R	N/R	N/R	Yes	Yes	Yes	Yes
Instantaneous Power										
up to 1 ms window acquisition*	R ¹	No	No	Yes	No	R	Yes	Yes	Yes	Yes
up to 10 ms window acquisition*	R ¹	No	No	Yes	No	R	Yes	Yes	No	No
Safe Operating Area										
up to 1 ms window acquisition*	R ¹	No	No	Yes	No	R	Yes	Yes	Yes	Yes
up to 10 ms window acquisition*	R ¹	No	No	Yes	No	R	Yes	No	No	No
MODULATION ANALYSIS										
Load Change, Turn-On, Turn-Off, Softstart										
up to 2 ms window acquisition**	R	No	No	Yes	No	N/R	Yes	Yes	Yes	Yes
up to 20 ms window acquisition**	R	No	No	Yes	No	N/R	Yes	Yes	No	No
SINGLE PHASE POWER LINE ANALYSIS										
Harmonics Analysis (EN61000-3-2)	Yes	Yes	Yes	Yes	Yes	N/R	Yes	Yes	Yes	Yes
Real Power, Apparent Power, Power Factor	Yes	Yes	Yes	Yes	Yes	N/R	Yes	Yes	Yes	Yes

R means required

N/R means not required

Yes means appropriate

No means not applicable

** at 100 MS/s*

*** at 50 MS/s*

¹ DA1855A and DXC100A required for this measurement.

² up to 2.5 kV with the optional DXC-5100, a passive differential matched pair of 1:100 probes.

Additional Accessories for Power Measurements

ACTIVE DIFFERENTIAL VOLTAGE PROBES

AP031	15 MHz; 20:1, 200:1 attenuation; 1.4 kV
AP032	15 MHz; 10:1, 100:1 attenuation; 700 V
AP033	500 MHz x 10, 1:1, 10:1, 100:1 (with adapter); 200 V

ACTIVE CURRENT PROBES

AP011	120 kHz; 150 amps DC
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PASSIVE HIGH VOLTAGE PROBES

PPE1.2kV	50 MΩ with 600 V/1.2 kV max voltage
PPE2kV	50 MΩ with 2 kV max voltage DC + peak AC
PPE4kV	50 MΩ with 4 kV max voltage DC + peak AC
PPE5kV	50 MΩ with 5 kV max voltage DC + peak AC
PPE6kV	50 MΩ with 6 kV max voltage DC + peak AC
PPE20kV	50 MΩ with 20 kV (40 kV peak) max voltage DC + peak AC

Ordering Information

POWERMEASURE SYSTEMS:		PRODUCT CODE
LT344L Four-Channel 500 MHz DSO with 1 Mpt mem/ch DA1855A, DXC100A, DCS015, AP015, and PMA1 software		PS344L
LT344 Four-Channel 500 MHz DSO with 250 kpts mem/ch DA1855A, DXC100A, DCS015, AP015, and PMA1 software		PS344
LT322 Two-Channel 500 MHz DSO with 100 kpts mem/ch DA1855A, DXC100A, DCS015, AP015, and PMA1 software		PS322
LT224 Four-Channel 200 MHz DSO with 100 kpts mem/ch DA1855A, DXC100A, DCS015, AP015, and PMA1 software		PS224
SOFTWARE:		
PowerMeasure Analysis		PMA1
DIFFERENTIAL AMPLIFIERS - PROBUS COMPATIBLE:		
100 MHz Differential Amplifier		DA1850A
100 MHz Differential Amplifier with Precision Offset and 100 kHz, 1 MHz, and 20 MHz BW filters		DA1855A
DIFFERENTIAL PASSIVE PROBES:		
250 MHz $\div 10/\div 100$ Differential Probe Pair		DXC100A
250 MHz $\div 100$ High-Impedance Differential Probe Pair		DXC350A
50 MHz $\div 1$ Differential Probe		DXC200
DIFFERENTIAL ACTIVE PROBES:		
15 MHz $\div 10/\div 100$ 700 V Differential Active Probe		AP031
15 MHz $\div 20/\div 200$ 1.4 kV Differential Active Probe		AP032
CURRENT ACTIVE PROBES:		
50 MHz 30 Amp AC/DC Current Probe		AP015
120 kHz 150 Amp AC/DC Current Probe		AP011
ACCESSORIES:		
Deskew Calibration Source		DCS015

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