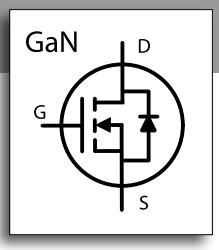
TELEDYNE LECROY
Everywhereyoulook™

60 V Common Mode Differential Probes

DL02-HCM (250 MHz)
DL05-HCM (500 MHz)
DL10-HCM (1 GHz)





Key Applications

- **48 V motors and drives**
- **High-power DC-DC converters**
- **GaN-based PDNs**
- **AC-DC switch-mode power supplies**
- **Wireless charging systems**
- **Gate-drive measurements**

Key Features

Ideal probe for 48 V Power Conversion

- 250 MHz, 500 MHz and 1 GHz bandwidth
- 80 V dynamic range
- 60 V common mode

Highest accuracy

- 0.5% gain accuracy
- Precision gain calibration
- Best LF flatness (0.1 dB)

Lowest noise and highest rejection

Wide variety of tips

- High performance solder-in
- Browser
- Single pins and header
- Mini and micro grabbers
- Socketed connections
- High temp solder-in
- Y-banana adaptor

ProBus active probe interface

The 60 V Common Mode Differential Probes are the ideal probes for low voltage GaN power conversion measurement with the highest accuracy, best CMRR, and lowest noise.

Ideal Probes for 48 V GaN Power Conversion

60 V of common mode and 80 V differential input range with 1 GHz of bandwidth, make these probes ideal for low voltage GaN power conversion measurements. The 60 V of common mode is well suited for handling any float of the battery and bulk/absorption voltage during charging, while the 80 V differential input range provide margin for any overshoot.

Highest Accuracy

The DL-HCM probes are calibrated for high-precision measurements to within 0.5% at DC and 0.1 dB flatness from DC to 100 MHz. This provides for high accuracy of top and base voltage levels of pulse-width modulated signals. The Precision Gain Calibration capability permits further measurement precision by improving the gain accuracy and removing small offset drifts from the measurement configuration.

Lowest Noise and Highest Rejection

The Common Mode Rejection Ratio (CMRR) is exceptional to very high frequencies. This provides for the best measurement performance when measuring very fast slew rate (high dV/dt) PWM signals typical of GaN devices and systems. Exceptional CMRR combined with low probe noise and high offset capability makes the probes capable of measuring very small control signals floating on high common mode voltages.

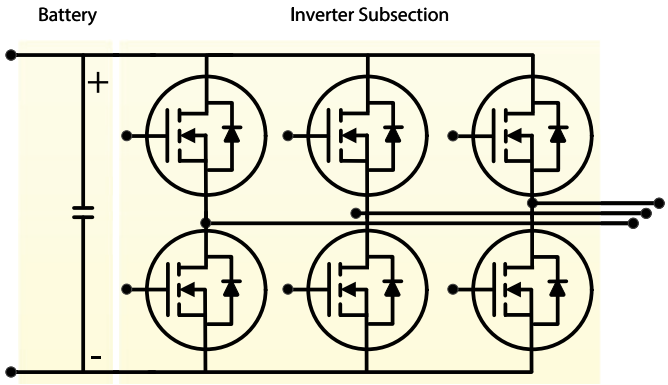
Wide Variety of Tips

The DL-HCM probes provide the perfect combination of high performance and flexibility for connecting to any device under test. An optional accessory kit and high temperature solder-in tip are available for further connectivity options.

BEST PROBE FOR 48 V POWER CONVERSION TESTING

48 V Battery-powered Motor and Drive Systems

Higher battery voltages require differential probes with suitable common mode ratings and peak voltage differential swings that can only be supplied with DL-HCM probes. 1 GHz permits accurate measurements on GaN power conversion systems.



- **All-purpose probe for DC (battery), Device, Gate-drive and Inverter Output measurements**
- **60 V common-mode exceeds requirements during battery-charging**
- **60 V offset range for DC ripple measurements**
- **80 V (DC + peak AC) differential swing for overshoot events**
- **Low attenuation with multiple ranges for best noise performance**

DC Bus or Battery Voltage	DC Battery Charging Voltage	Drive/Inverter Pulse-Width Modulated (PWM) Output			
V_{dc}	V_{dc}	V_{pk} Line-Line or Line-Ref (Rated)		V_{pk} Line-Line or Line-Ref (with Overshoot)*	
		Operating	Charging	Operating	Charging
12	13.8	12	13.8	14.4	16.6
18	20.7	18	20.7	21.6	24.8
36	41.4	36	41.4	43.2	49.7
48	55.2	48	55.2	57.6	66.2
56	64.4	56	64.4	67.2	77.3

**assumes 20% signal overshoot*

High-power DC-DC Converters

Higher-power DC-DC converters used in server and vehicle applications operate through a wide dynamic range. DL-HCM probes provide the common mode and peak voltage needed for up to 60 V inputs, and the dynamic range to measure much smaller output voltages.

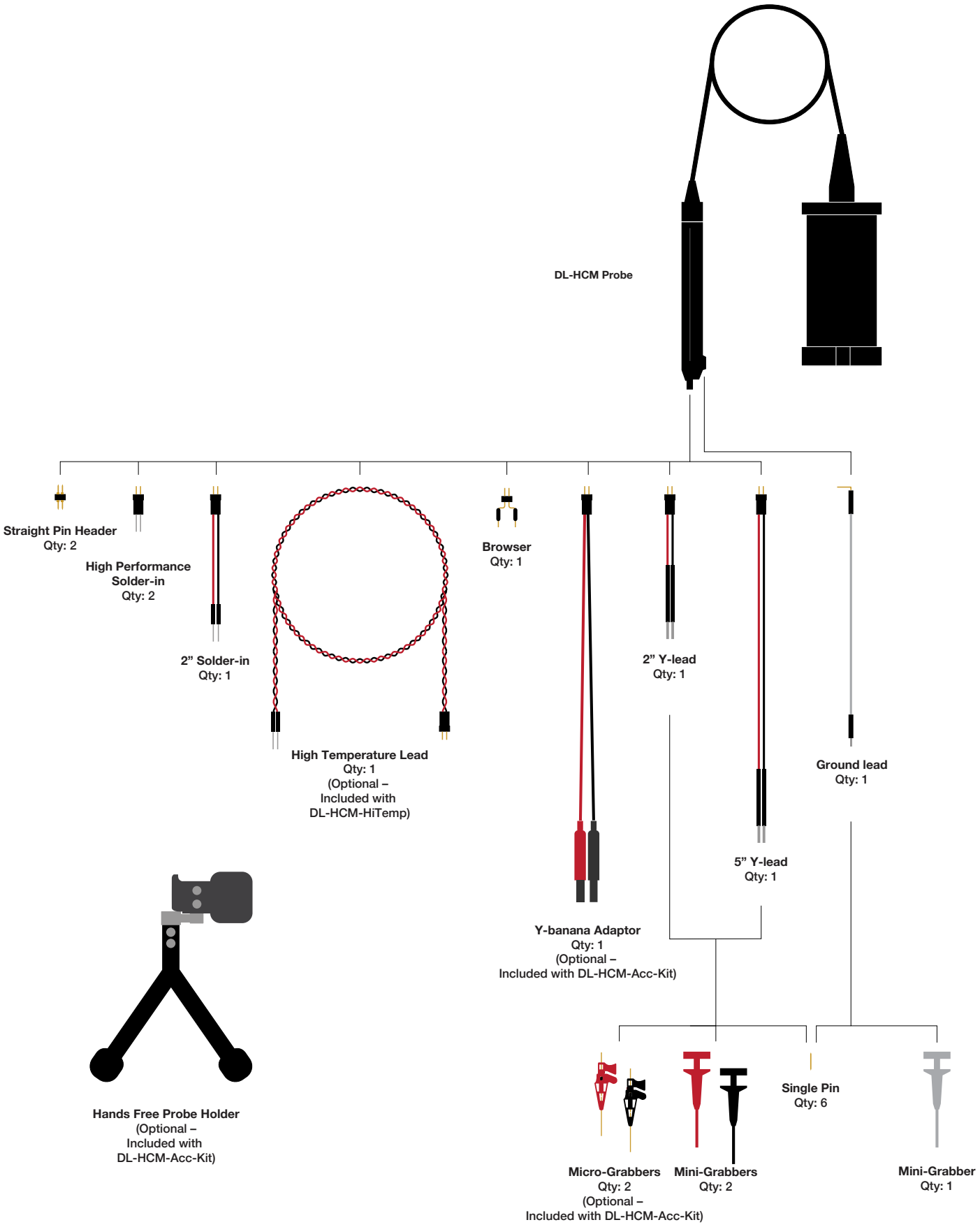
- **All-purpose probe for DC (battery), Device, Gate-drive and Inverter Output measurements**
- **High-sensitivity (200 mV/div)**
- **0.5% DC gain accuracy**
- **60 V common mode and offset ranges**

GaN Buck, Boost and Half-Bridge Systems

Faster switching speeds made possible by GaN devices are making a variety of low-power power conversion systems lighter, smaller, and more efficient. DL-HCM probes provide the bandwidth and performance necessary for testing various low-power GaN systems.

- **Power distribution networks (PDNs)**
- **AC-DC switch-mode power supplies (SMPS)**
- **DC-DC converters**
- **Wireless charging systems**

WIDE VARIETY OF TIPS



SPECIFICATIONS AND ORDERING INFORMATION

	DL02-HCM	DL05-HCM	DL10-HCM
Bandwidth*	250 MHz (gauranteed, without leads) 250 MHz (Browser) 250 MHz (2"" Y-lead) 250 MHz (5"" Y-lead) 30 MHz (Hi-Temp lead)	500 MHz (guaranteed, without leads) 500 MHz (High performance solder-in and browser) 500 MHz (2" Y-lead/solder-in) 500 MHz (5" Y-lead) 30 MHz (Hi-Temp lead)	1 GHz (guaranteed, without leads) 1 GHz (High performance solder-in and browser) 800 MHz (2" Y-lead) 700 MHz (solder-in) 500 MHz (5" Y-lead) 30 MHz (Hi-Temp lead)
Rise Time (10-90%)*	1400 ps	700 ps	350 ps
Differential Voltage Range	80 V (DC + peak AC) from 200 mV/div to 20 V/div		
Common Mode Voltage Range	±60 V (DC + peak AC)		
Maximum Input Voltage to Earth	80 V (DC + peak AC), max 60 V DC (either input to ground)		
Maximum Safe Input Voltage	For Hand-held use: 28.28 Vrms or 60 V DC (referenced to ground) per IEC/EN 61010-031:2015		
Sensitivity	200 mV/div to 1 V/div (7.8x) 1.02 V/div to 2.5 V/div (17.5x) 2.55 V/div to 20 V/div (70x)		
DC Gain Accuracy	±0.5% (guaranteed)		
DC Gain Drift	≤ 0.075%/°C, can be calibrated out with precision gain cal		
Frequency Response Flatness	DC to 50 MHz: 0.1dB	DC to 100MHz: 0.1 dB	
Offset Range	±60V		
Attenuation	7.8x / 17.5x / 70x		
Input Impedance	200 kΩ || 0.6 pF (between inputs), 100 kΩ || 1 pF (either input to ground)		
Input/Output Coupling	DC		
Output Termination	50 Ω		
Interface	ProBus		
Cable Length	1.42 m from probe sockets to oscilloscope connection		
Noise and Rejection			
CMRR	DC - 10 kHz: 80 dB 100 kHz: 70 dB 1 MHz: 55 dB 10 MHz: 50 dB 250 MHz: 40 dB	DC - 10 kHz: 80 dB 100 kHz: 70 dB 1 MHz: 55 dB 100 MHz: 50 dB 500 MHz: 35 dB	DC - 10 kHz: 80 dB 100 kHz: 70 dB 1 MHz: 55 dB 100 MHz: 50 dB 1 GHz: 30 dB
Noise (Probe)	200 mV/div to 1 V/div: 2.7 mVrms 1.02 V/div to 2.5 V/div: 3.5 mVrms 2.55 V/div to 20 V/div: 10.25 mVrms	200 mV/div to 1 V/div: 3.25mV$_{rms}$ 1.02 V/div to 2.5 V/div: 4.5mV$_{rms}$ 2.55 V/div to 20 V/div: 14.5mV$_{rms}$	200 mV/div to 1 V/div: 4.3mV$_{rms}$ 1.02 V/div to 2.5 V/div: 6mV$_{rms}$ 2.55 V/div to 20 V/div: 20mV$_{rms}$
Environmental			
Temperature	0°C to 50°C (Operating), -40°C to 70°C (Non-Operating)		
Humidity (Operating)	5% to 90% RH (Non-Condensing) up to 30°C, decreasing linearly to 45% RH at 50°C		
Humidity (Non-Operating)	5% to 95% RH (Non-Condensing), 75% RH above 40°C, 45% RH above 50°C		
Altitude (Operating)	Up to 3000 m (9842 ft)		
Certifications			
CE Declaration of Conformity	Conforms to EN61010-031:2015, EN61326-1:2013, and EN50581:2012		

** All Bandwidth and Rise Time measurements are made without leads and an oscilloscope bandwidth greater than the probe bandwidth.*

Ordering Information

Product Description	Product Code
250 MHz 60V Common Mode Differential Probe. Includes standard set of leads and tips.	DL02-HCM
500 MHz 60V Common Mode Differential Probe. Includes standard set of leads and tips.	DL05-HCM
1 GHz 60V Common Mode Differential Probe. Includes standard set of leads and tips.	DL10-HCM
DL-HCM series high-temperature solder-in tip, 30 MHz bandwidth, 1 meter length.	DL-HCM-HiTemp
DL-HCM series accessories kit with probe holder, micro IC grabbers (Qty 2.), and Y-banana adaptor.	DL-HCM-Acc-Kit

DL02-HCM
Standard leads and tips

Browser
Y-lead socket (5")
Ground lead
Single pin (Qty. 6)
Straight pin header (Qty. 2)

DL05-HCM and DL10-HCM
Standard leads and tips

High performance solder-in tips (Qty. 2)
2" solder-in tip
Browser
Y-lead socket (2" and 5")
Mini grabbers (Qty. 3)
Ground lead
Single pin (Qty. 6)
Straight pin header (Qty. 2)

Customer Service

Teledyne LeCroy oscilloscopes and probes are designed, built, and tested to ensure high reliability. In the unlikely event you experience difficulties, our digital oscilloscopes are fully warranted for three years and our probes are warranted for one year. This warranty includes:

- No charge for return shipping
- Long-term 7-year support
- Upgrade to latest software at no charge

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Local sales offices are located throughout the world.
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