

# DLT100AGEVB

---

## ON Semiconductor Dynamic Load Tool Evaluation Board User's Quick Step Guide



ON Semiconductor®

<http://onsemi.com>

---

### EVAL BOARD USER'S MANUAL



#### What you will need to use the DLT

- Multichannel Oscilloscope
- 12 V/600 mA Power Supply with Cables to Connect to DLT
- Adjustable Voltage and Switching Frequency Square Wave (Function) Generator
- Two Differential Scope Probes or One Differential Probe and 50  $\Omega$  Terminated Passive Probe
- Coax Cable to Attach Function Generator to Scope's External Trigger
- Small Screwdriver to Adjust Trimmer Pots

#### Attaching the DLT to your circuit

- Make the Connection to Your Board As Close As Possible to Where-your Actual Load Will Be Placed
- Make the Connections to Your Board As Short As Possible. Any Added Wire Between the DLT and the Circuit Under Test Will Increase Inductance and Reduce the di/dt Capability of the DLT
- Observe the Polarity of the DLT's Connection Tabs

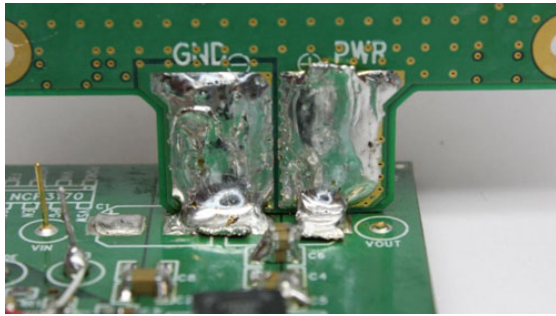


Figure 1. DLT Attached with Solder Wick

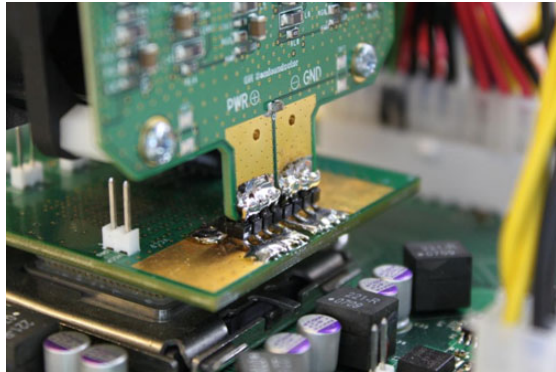


Figure 2. DLT Attached to Interposer with Header Pins

## Choosing the Load Range

The dynamic load tool is equipped with two load range settings (High & Low). The high load range offers the ability to load more power (Typically ~55 W total) and has a current monitor resolution of 5 mV/A. The low load range has a lower loading power ability (Typically ~12 W total), but has a higher current monitor resolution of 25 mV/A. The low load range setting allows for better accuracy when monitoring low load conditions. It is important to enable only one of the loading options at a time. If both options are enabled then both drive circuits will operate. This will not cause any damage to the DLT, however both banks will be producing loads and both load current sense lines would need to be monitored and their respective current representation would need to be summed in some manner. The two load ranges have separate load sense monitoring points. These are located just below the DLT's operation selector switches.

**ATTENTION:** Disabling the High or Low Load section does not fully disconnect them. There will still be a low leakage current from the disabled drive stage.

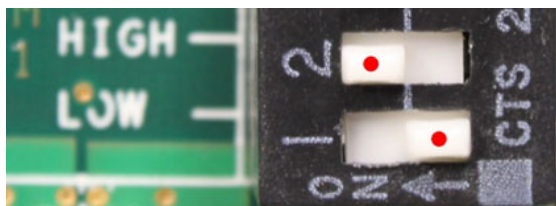


Figure 3. High Current Selected (5 mV/A)

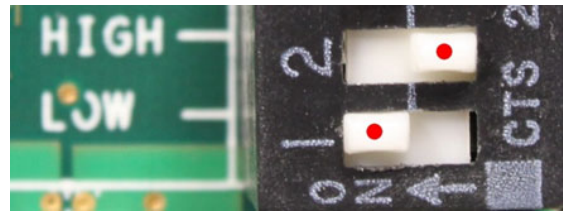


Figure 4. Low Current Selected (25 mV/A)



Figure 5. Current Monitor Sense Points

## Supplying Operational Power to the DLT

The DLT is powered by an external power supply. It will operate with an input supply of 10 V–18 Vdc. The typical input needed would be a 12 V supply capable of supplying > 600 mA. The input power is attached to the DLT in the upper left hand corner via TPWR3 & TPWR4 or via the optional Molex Connector (Molex part #39-29-3046).

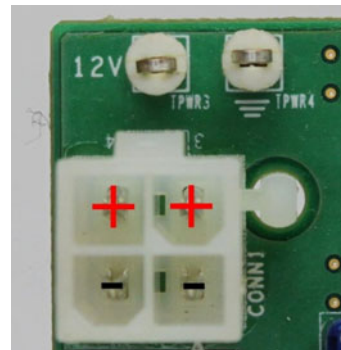


Figure 6. Input Power Connection

## Connecting the Function Generator

A 50  $\Omega$  coax cable with EZ Clips can be used to attach the function generator to the two pin connector on the DLT with two ways to drive it:

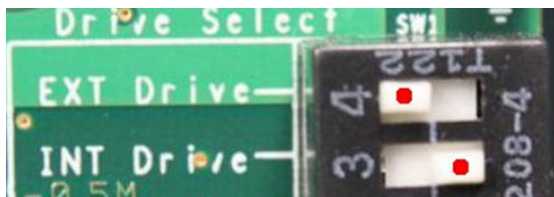
1. By using an arbitrary waveform generator. Use the Direct Drive two pin connector and select EXT drive.

When using this drive option, the signal generator can be set to provide a drive signal that is a replica

of the desired load pattern. For example, if the high power range is used (5 mV/A) and a load step between 5 A and 60 A is desired, then the generator needs to provide a voltage signal between 25 mV and 300 mV and also have the desired frequency and rise time.



**Figure 7. Direct Drive**  
(Drives DLT Load Amps Directly)



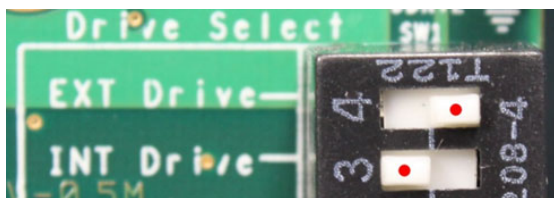
**Figure 8. Direct Drive Switch Selection**

- By using a standard bipolar signal generator. Use the FUNC GEN IN two pin connector and select INT drive.

When using this drive option, the bipolar signal produced by the generator is internally processed by the DLT in order to obtain the desired load pattern. The levels of the load step are set by the two potentiometers on the DLT board, while the slew rate is set by adjusting the amplitude from the signal generator.



**Figure 9. Internal Drive (Square Wave Input)**



**Figure 10. Internal Drive Switch Selection**

The oscilloscope can be triggered from the load current signal, but it is recommended that the external trigger on the function generator be used.

As mentioned the load amplifiers can be driven directly. The load will proportionally follow the voltage of the input drive signal. This allows more control over the dynamic load and custom profiles can be created. It will also require a more advanced input signal generator to provide an adjustable slew rate.

|                   | Internal Drive                 | Direct Drive                 |
|-------------------|--------------------------------|------------------------------|
| Connector         | JDRV1                          | JDRV2                        |
| Input Signal      | 2 V pk-pk Square Wave or Pulse | 0 to +1 V Pulse              |
| Lower Load Set By | DC Pot                         | Low Voltage of Drive Signal  |
| High Load Set By  | Step Pot                       | High Voltage of Drive Signal |
| Slew Rate         | Drive Signal's Amplitude       | Drive Signal's Slew Rate     |

#### Operating the DLT

To operate the DLT attach it to the circuit you will be testing and connect the scope, function generator and 12 V supply as outlined above. It is recommended the following process be done the first time the DLT is used on each circuit. This will help prevent a possible load condition which may be undesirable with an improperly tuned feedback loop.

- Turn cooling fan speed to full (Clockwise) and both DC Load and Step Load pots to lowest settings (Counter clockwise).
- Set the drive and load range switches to desired settings.
- Apply power and enable the circuit that you will be testing.
- Apply the 12 Vdc to power the DLT. You should see the green power LED light up.
- Don't enable, but adjust the function generator's settings for a +/-400 mV pk-pk, 1 kHz square wave.
- Using a DVM to monitor the voltage on the Isense pins slowly adjust the DC load pot to the desired lower load level (High  $I_{CC} = 5 \text{ mV/A}$  or Low  $I_{CC} = 25 \text{ mV/A}$ ). Doing this applies load without any other enable on the DLT. After the square wave is enabled the DLT load step will increase the load using the DC load as a starting point.
- Remove the DVM from the Isense pins and attach a differential probe.
- Verify that the voltage the scope is reading via the diff probe is the same as that seen on the DVM. If not, calibrate the scope and differential probe before proceeding further.
- Enable the function generator's output.

10. Slowly increase the load by turning the “STEP” pot clockwise until you reach the desired load step.
11. Once the desired load step is obtained you can adjust the load’s trailing and leading edge slew rate by adjusting the function generator’s square wave output voltage level. Increase the voltage to increase the slew rate. DO NOT exceed 2 V pk-pk or the DLT’s amplifier may be damaged!
12. Adjust the square wave’s frequency to test at different load repetitive rates.
13. The function generator’s output can be changed to ‘Pulse’ to test at different duty cycles. At higher load switching frequencies with slower slew rates it may be necessary to increase the generators duty cycle to allow for full load step swing.

### External Static Load

While the DLT is capable of providing a static load it is advisable to use a separate load in parallel if higher loads are needed. If there isn’t enough room to connect a second

external load directly to the board being tested (which is the best practice) it may be connected directly to the DLT at pins PWR2 & PWR3. However, any additional current pulled through these points will decrease the load current that the DLT is capable of drawing due to additional heat generated through the board.

### Thermal Considerations

The DLT is equipped with a fan which when running at full speed, is capable of providing enough cooling to dissipate roughly 55 W total power. It is recommended that the cooling fan be run at full speed. The DLT is also equipped with thermal protection circuits on both the high and low load banks. If the operational board temperature reaches the predetermined point the DLT will stop drawing any load until the temperature drops. Once it drops to a safe temperature the DLT will again start drawing load. During the time that the DLT is in thermal protection the corresponding “High” or “Low” drive “HOT” LED will light.

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

The evaluation board/kit (research and development board/kit) (hereinafter the "board") is not a finished product and is as such not available for sale to consumers. The board is only intended for research, development, demonstration and evaluation purposes and should as such only be used in laboratory/development areas by persons with an engineering/technical training and familiar with the risks associated with handling electrical/mechanical components, systems and subsystems. This person assumes full responsibility/liability for proper and safe handling. Any other use, resale or redistribution for any other purpose is strictly prohibited.

The board is delivered "AS IS" and without warranty of any kind including, but not limited to, that the board is production-worthy, that the functions contained in the board will meet your requirements, or that the operation of the board will be uninterrupted or error free. ON Semiconductor expressly disclaims all warranties, express, implied or otherwise, including without limitation, warranties of fitness for a particular purpose and non-infringement of intellectual property rights.

ON Semiconductor reserves the right to make changes without further notice to any board.

You are responsible for determining whether the board will be suitable for your intended use or application or will achieve your intended results. Prior to using or distributing any systems that have been evaluated, designed or tested using the board, you agree to test and validate your design to confirm the functionality for your application. Any technical, applications or design information or advice, quality characterization, reliability data or other services provided by ON Semiconductor shall not constitute any representation or warranty by ON Semiconductor, and no additional obligations or liabilities shall arise from ON Semiconductor having provided such information or services.

The boards are not designed, intended, or authorized for use in life support systems, or any FDA Class 3 medical devices or medical devices with a similar or equivalent classification in a foreign jurisdiction, or any devices intended for implantation in the human body. Should you purchase or use the board for any such unintended or unauthorized application, you shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the board.

This evaluation board/kit does not fall within the scope of the European Union directives regarding electromagnetic compatibility, restricted substances (RoHS), recycling (WEEE), FCC, CE or UL, and may not meet the technical requirements of these or other related directives.

**FCC WARNING** – This evaluation board/kit is intended for use for engineering development, demonstration, or evaluation purposes only and is not considered by ON Semiconductor to be a finished end product fit for general consumer use. It may generate, use, or radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC rules, which are designed to provide reasonable protection against radio frequency interference. Operation of this equipment may cause interference with radio communications, in which case the user shall be responsible, at its expense, to take whatever measures may be required to correct this interference.

ON Semiconductor does not convey any license under its patent rights nor the rights of others.

**LIMITATIONS OF LIABILITY:** ON Semiconductor shall not be liable for any special, consequential, incidental, indirect or punitive damages, including, but not limited to the costs of requalification, delay, loss of profits or goodwill, arising out of or in connection with the board, even if ON Semiconductor is advised of the possibility of such damages. In no event shall ON Semiconductor's aggregate liability from any obligation arising out of or in connection with the board, under any theory of liability, exceed the purchase price paid for the board, if any.

For more information and documentation, please visit [www.onsemi.com](http://www.onsemi.com).

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

North American Technical Support:

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative