DLT100AGEVB

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

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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 Ω 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

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Figure 1. DLT Attached with Solder Wick

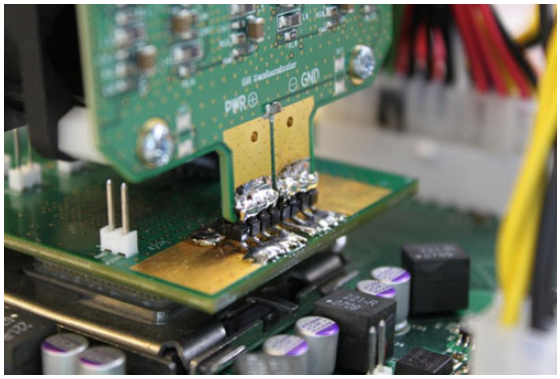

Figure 2. DLT Attached to Interposer with Header Pins

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.

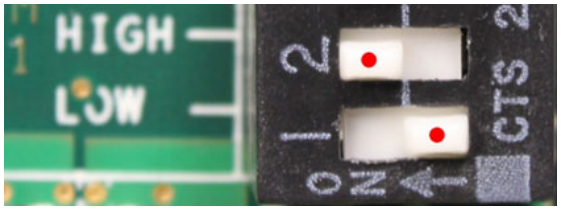

Figure 3. High Current Selected (5 mV/A)

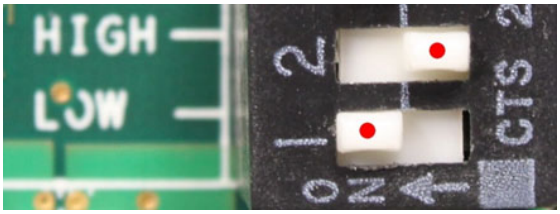

Figure 4. Low Current Selected (25 mV/A)

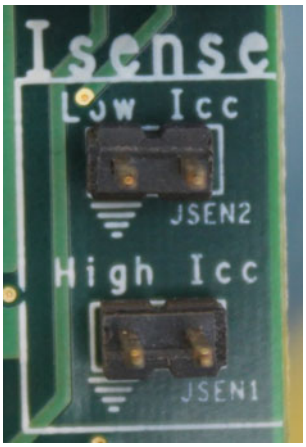

Figure 5. Current Monitor Sense Points

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).

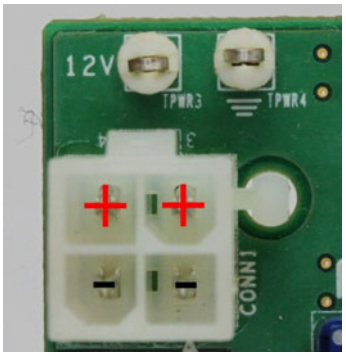

Figure 6. Input Power Connection

Connecting the Function Generator

A 50 Ω 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)

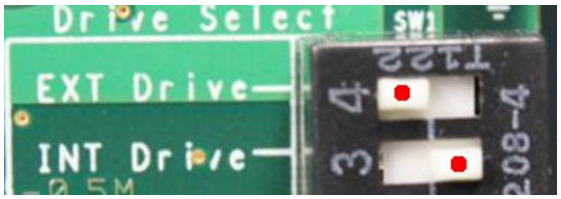

Figure 8. Direct Drive Switch Selection

2. 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.

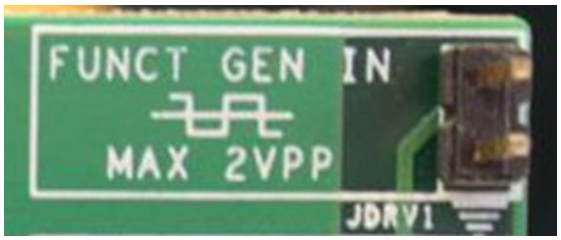

Figure 9. Internal Drive (Square Wave Input)

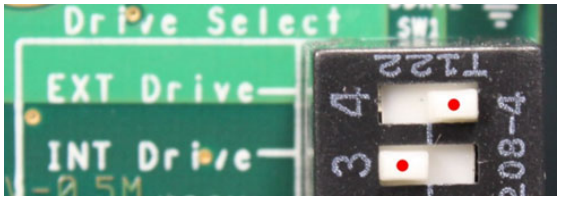

Figure 10. Internal Drive Switch Selection

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.

1. Turn cooling fan speed to full (Clockwise) and both DC Load and Step Load pots to lowest settings (Counter clockwise).
2. Set the drive and load range switches to desired settings.
3. Apply power and enable the circuit that you will be testing.
4. Apply the 12 Vdc to power the DLT. You should see the green power LED light up.
5. Don't enable, but adjust the function generator's settings for a +/-400 mV pk-pk, 1 kHz square wave.
6. 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 mV/A or Low I_{CC} = 25 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.
7. Remove the DVM from the Isense pins and attach a differential probe.
8. 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.
9. 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.

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