POWER CYCLING TEST BENCH (PCTB)

PCT Bench can measure the thermal impedance/resistance of power cycling modules. It is desgned to perform power cycling tests on IGBT / diode /MOSFET power electronic modules according to **IEC 60749-34:2010** and the **automotive standard AQG 324:2018.**

Overview

Power cycle tests are accelerated lifetime tests used to evaluate the assembly and contact mechanisms of power electronic components. The lifespan of the module is governed by the module's progressive fatigue produced by repeated thermo-mechanical stress. The thermomechanical stress is generated by repeatedly heating the module with the load current flowing through the tested semiconductors and then cooling it down after the load current is shut off. This component has a significant impact on the module's lifetime, as measured in terms of power cycles till failure.

PCTB KEY FEATURES

- Simultaneous testing of up to 12 units
- Load currents up to 800A
- Thermal impedance and thermal resistance measurements
- Individually adjustable coolant flow for each item being tested
- Cooling flow interruption during heating for PC minimum tests

APPLICATION

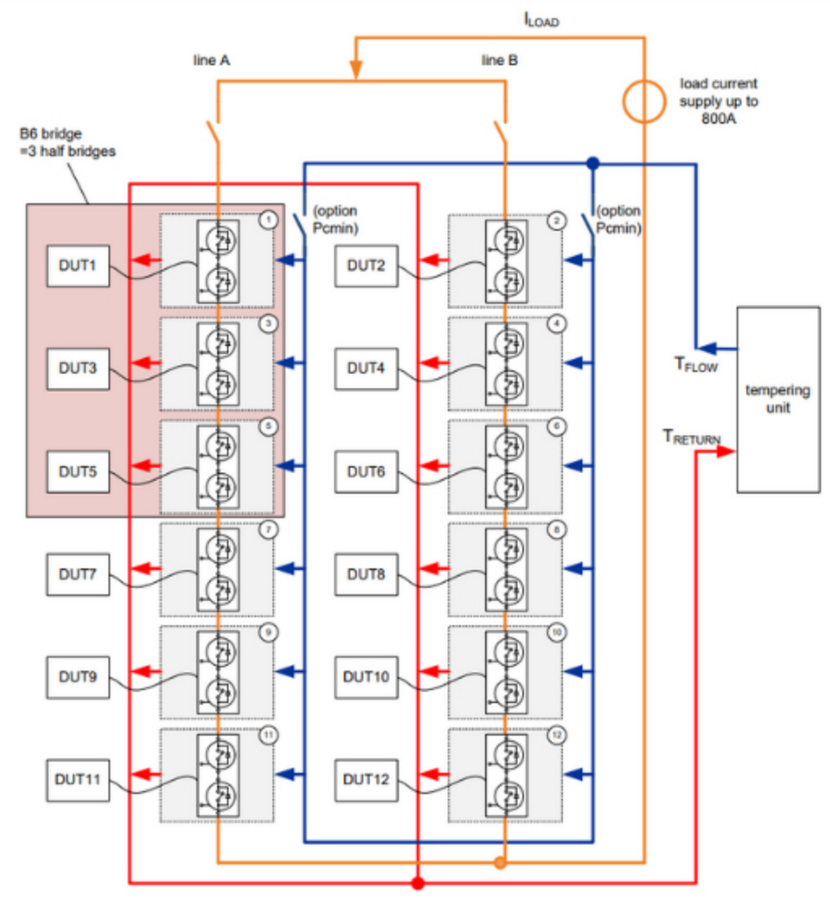
V	**Precise individual Tjmax thru Gate voltage tuning and manual adjustment of flow rate per test position**
V	**Accurate in-situ simulation of the actual application of Pin Fin power module**
V	**Different Conduction mode capabilities- MOSFET, IGBT, and body Diode**

HOW DOES PCTB WORK?

The PCTB power cycling test bench connects the modules in series on two test lines that alternately strain with up to 800A load current, maximizing the installed load current supply.
Each DUT has its own specific measuring and control unit that links to a central control unit. This allows for fine-grained control of module evaluation. The DUTs are mounted on up to 12 cooling plates and connected to the cooling circuit via fast couplings.

An algorithm for controlling load current, heating, and cooling is created. The constant cycle time control strategy is the most application-oriented and stresses the modules the most, resulting in shorter test durations. Each semiconductor is first given a calibration curve describing the junction temperature dependency of the conduction voltage at an adjustable sensing current. The junction temperature for each tested semiconductor may be estimated by measuring the conduction voltage at the given sense current. 100us after the load current is shut off, the highest junction temperature is calculated.

Each DUT's end of cycle conditions are checked. The user can set a percentage limit for the increase of conduction voltage, thermal resistance, and/or junction temperature fluctuation as failure criterion. Typical cycle metrics including conduction voltage, thermal resistance, maximum and lowest junction temperatures are recorded for each power cycle. After bridging the failing module, the test continues with the remaining DUTs. Two records per DUT are stored. With a 20Hz resolution, the second data record preserves the measurement signals of a complete cycle for chosen cycles across lifespan. In this case, a third data record is created with the high resolution thermal impedance curve (up to 20kHz) for specified lifespan cycles.



Power Cycling Test Bench Principle -Alpitronic

ATC LAB
ANALYTICAL TESTING AND CALIBRATION