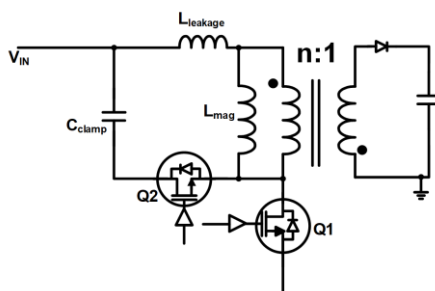


Example of Testing Active Clamp Flyback (ACF) Circuit

What's the ACF circuit ?

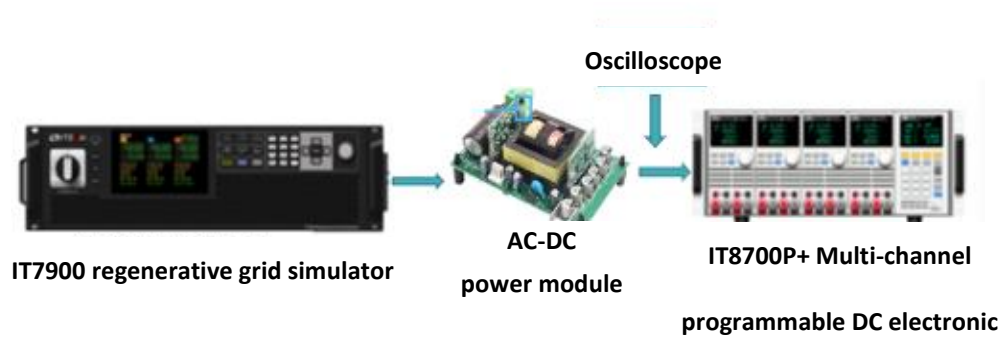
The active clamp flyback (ACF) circuit is a topological circuit that can realize soft switching. Capable of achieving zero voltage switching (ZVS) or zero current switching (ZCS), soft switching can reduce the switching loss of the switching tube in the ACF circuit and resolve the efficiency difficulty.



With faster switching speed, higher efficiency and smaller component, ACF can meet the requirements to improve performance and lower power consumption, and can decrease power size and weight to the maximum extent. Therefore, the ACF circuit is widely applied in power supply, new energy, photovoltaic, automotive electronics, aviation, and other fields.

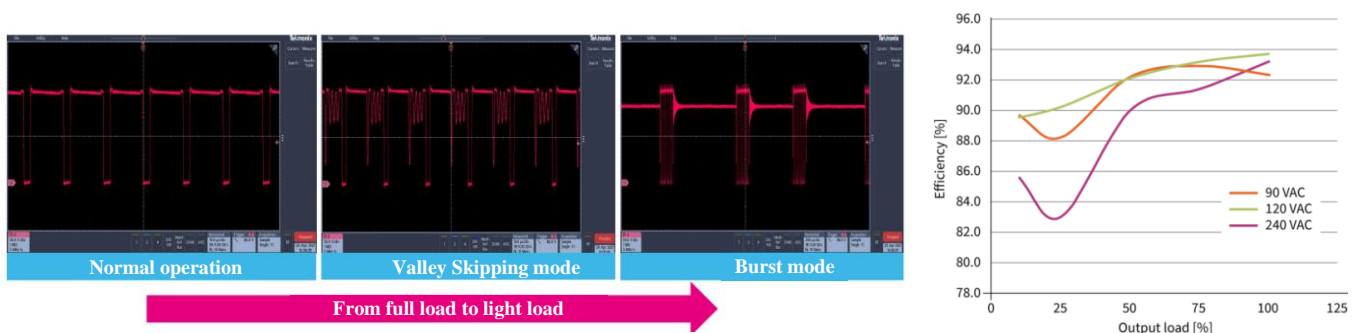
Case study

A customer uses the ITECH IT7900 +IT8700P to conduct an energy efficiency analysis for an AC-DC power module designed based on active clamp flyback (ACF).



1. Verify the effect of different inputting voltages or frequencies on the power module energy efficiency.

IT7900 is set in multi-channel modes that output 90, 120, 240VAC, and 50Hz, respectively. The three channels of outputs are connected to three same AC-DC modules that correspond to the IT8700P and three modules. In CV mode, it can synchronize from full load to light load for pulling load. Use the host computer software to save data for energy efficiency analysis and use the oscilloscope to observe switching speed for comparison.

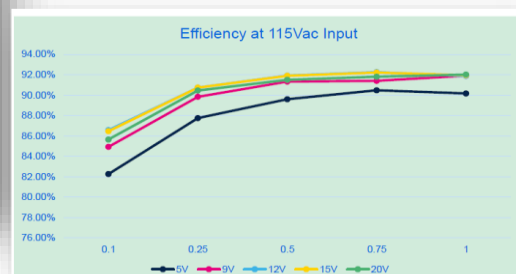


Energy efficiency curve of power module under different input voltages

2. Verify the conversion efficiency and switching speed change from light load to full load of the active-clamp-flyback (ACF) circuit under different voltage outputs

After outputting single-phase 115VAC, 60Hz AC with IT7900 and setting different voltages from full load to light load by using IT 8700P and CV mode for pulling load, obtain the following data and curve.

	% Loading	5V	9V	12V	15V	20V
EU CoC Rev.05-Tier2 Limit for 10% Loading		72.48%	77.30%	78.30%	78.85%	78.85%
115Vac 60Hz Input	10%	82.25%	84.92%	86.56%	86.45%	85.64%
	25%	87.74%	89.83%	90.73%	90.73%	90.45%
	50%	89.59%	91.32%	91.91%	91.89%	91.50%
	75%	90.47%	91.39%	92.25%	92.21%	91.80%
	100%	90.16%	91.90%	91.88%	91.95%	92.01%



115VAC input ACF power module energy efficiency curve

Highlighted advantages of ITECH test solution

The IT8700P used with multi-channel input DC programmable load has a faster dynamic response so as to achieve the minimum current rise time of less than 10 μ s. The switching speed that responds to the active clamp flyback (ACF) circuit and lower conduction resistance are more applicable to low-voltage load tests. The faster loop speed can accurately control current without overshoot and improve testing efficiency. The voltage and current measurement speeds are updated to 250kHz. When combined with the free host computer for data recording, this device can simplify other measurement instruments and improve experiment efficiency.

The IT7900 Regenerative Grid Simulator features multiple flexibility output modes. AC/DC/AC+DC/DC+AC output is possible in the single-phase mode, and voltage can be expanded to 700V in the reverse phase mode. When in the multi-channel mode, the device can serve as a three-channel AC/DC power supply, allowing users to test 3 independent DUTs at the same time, in which, parameters of each channel can be set separately. In addition, as a four-quadrant grid simulator, IT7900 features an island simulation function, which is often

used as a back-end for testing DC-AC, AC-AC, and other circuits. It can replace several instruments for usage that save lab space and cut test costs.

IT7900 Regenerative grid simulator

- ♦ High power density/minimum rack space, 3U up to 15kVA, 16Hz~150Hz
- ♦ Regenerative grid simulator & full 4-Quadrant AC&DC power sources
- ♦ Power Amplifier function for PHIL applications
- ♦ Professional anti-islanding test mode, can set and simulate the RLC (resistive-inductive-capacitive), active and reactive power circuit for anti-islanding detection
- ♦ CC/CV/CP modes
- ♦ AC, DC, AC+DC or DC+AC output capability
- ♦ Comprehensive working modes selectable: single-phase, three-phase, reversed phase and multi-channel
- ♦ Programmable Output Impedance, allows simulation of Real-World Utility Grid Impedance
- ♦ Compliance tests incl LVRT /Phase Jump/Frequency variation/Harmonic Injection

IT8700P+ High Speed Multi-channel DC Electronic Load

- ♦ Three-stage current range, higher accuracy and lower ripple
- ♦ Supports master-slave parallel connection of 16-channel modules, flexibly extends power
- ♦ Faster dynamic response, minimum current rise time < 10 μ s
- ♦ Ultra-low internal resistance, suitable for testing low-voltage capacitors, fuel cells, etc.
- ♦ Faster loop speed, precise control of current without overshoot
- ♦ The voltage and current measurement speed is upgraded to 250kHz, good for system integration
- ♦ Comprehensive protection functions: OVP/OCP/OPP/OTP, Sense protection
- ♦ Compatible with IT8700P mainframe, old and new modules can be matched
- ♦ Short-circuit peak current measurement function
- ♦ Available front/rear terminals*1
- ♦ 8 operating modes: CC/ CV/ CR/ CW/ CV+CC/ CR+CC/ CW+CC/ CV+CR (CR-LED)
- ♦ Automatic test function to tell whether the test results exceed the set specifications
- ♦ Built-in LAN, USB, RS232 interfaces
- ♦ CV loop speed is adjustable to match different DUTs
- ♦ Multi channel synchronous control

*1 Current is no more than 15A if connecting with front terminals



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