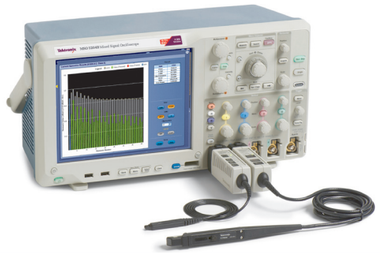
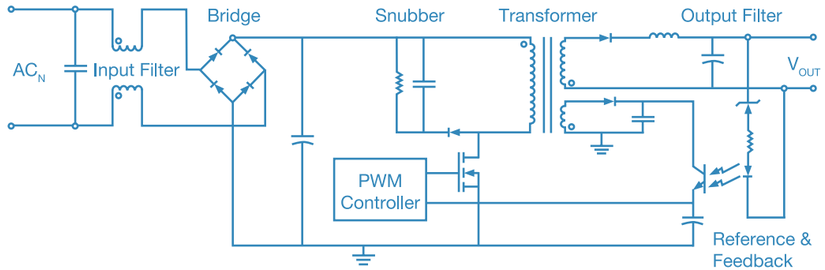
Testing a New Switch-Mode Power Supply Design

Essential Measurements

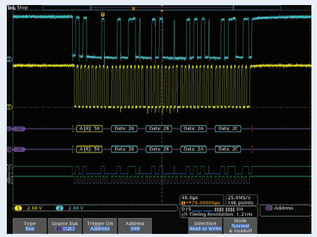




Verifying Initial Startup

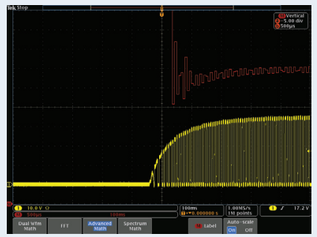
Startup and Command Timing

Check the digital control circuits for proper operation. Oscilloscopes equipped with protocol decoding may be used to see serial bus activity (such as I²C) during startup.



Controller Operation – Gate Drive Modulation

Use an oscilloscope to observe gate drive signals during startup.



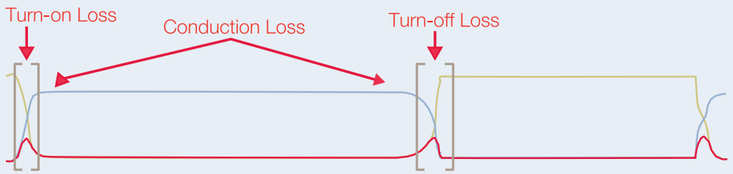
Oscilloscope Probing Considerations

- Eliminate timing skew between current and voltage probes. Since power is the product of voltage and current, accurate measurements are made with time-aligned voltage and current waveforms.
- Mind your attenuation and use the full dynamic range of your scope.
- Automatically remove signal voltage offset by using DC Reject in the differential probe.
- Degauss/AutoZero current probes.

Optimizing Circuit Performance

Switching Loss

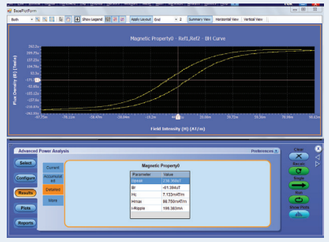
Check switching loss in MOSFETs and IGBTs in the circuit, since external parasitics will affect device performance.



Losses in Magnetic Elements

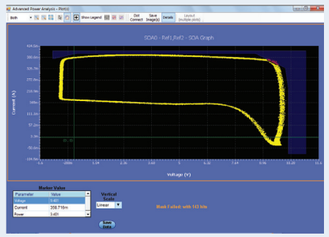
Quantify losses in inductors and transformers used for filtering, energy storage, and isolation.

- Core Loss comprised of hysteresis loss and eddy current loss.
- Copper Loss due to winding resistance.



Safe Operating Area

Power software confirms that MOSFETs or IGBTs are operating within maximum V and I specifications.



Validating Overall Performance

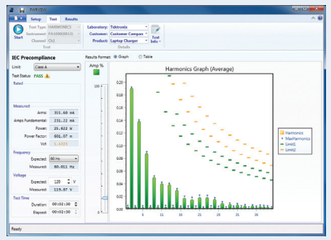
Output Noise and Stability

Evaluate ripple and noise, in the time domain and the frequency domain.

Pre-compliance and Specification Testing

Use a power analyzer to test:

- IEC62301 standby power
- IEC61000-3-2 current harmonics
- Energy consumption



Tektronix Power Measurement Solutions

- Oscilloscopes
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- AC/DC Current Probes
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