



APEC Conference and Expo 2012

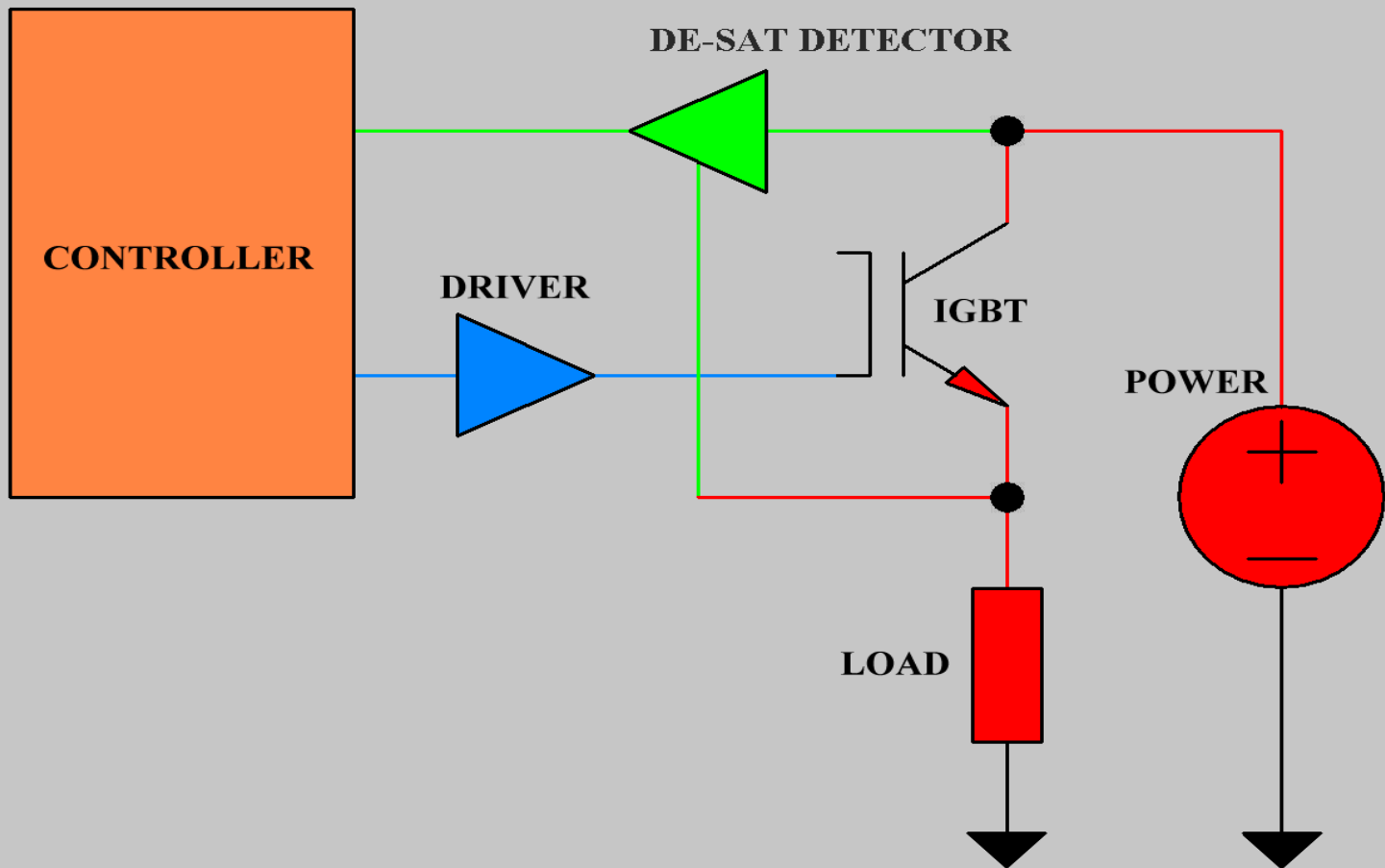
Full-Duplex Digital Isolator for Fast
Bi-Directional Communication Across a
High-Withstand Barrier

Presenter: Bill Morong, PE



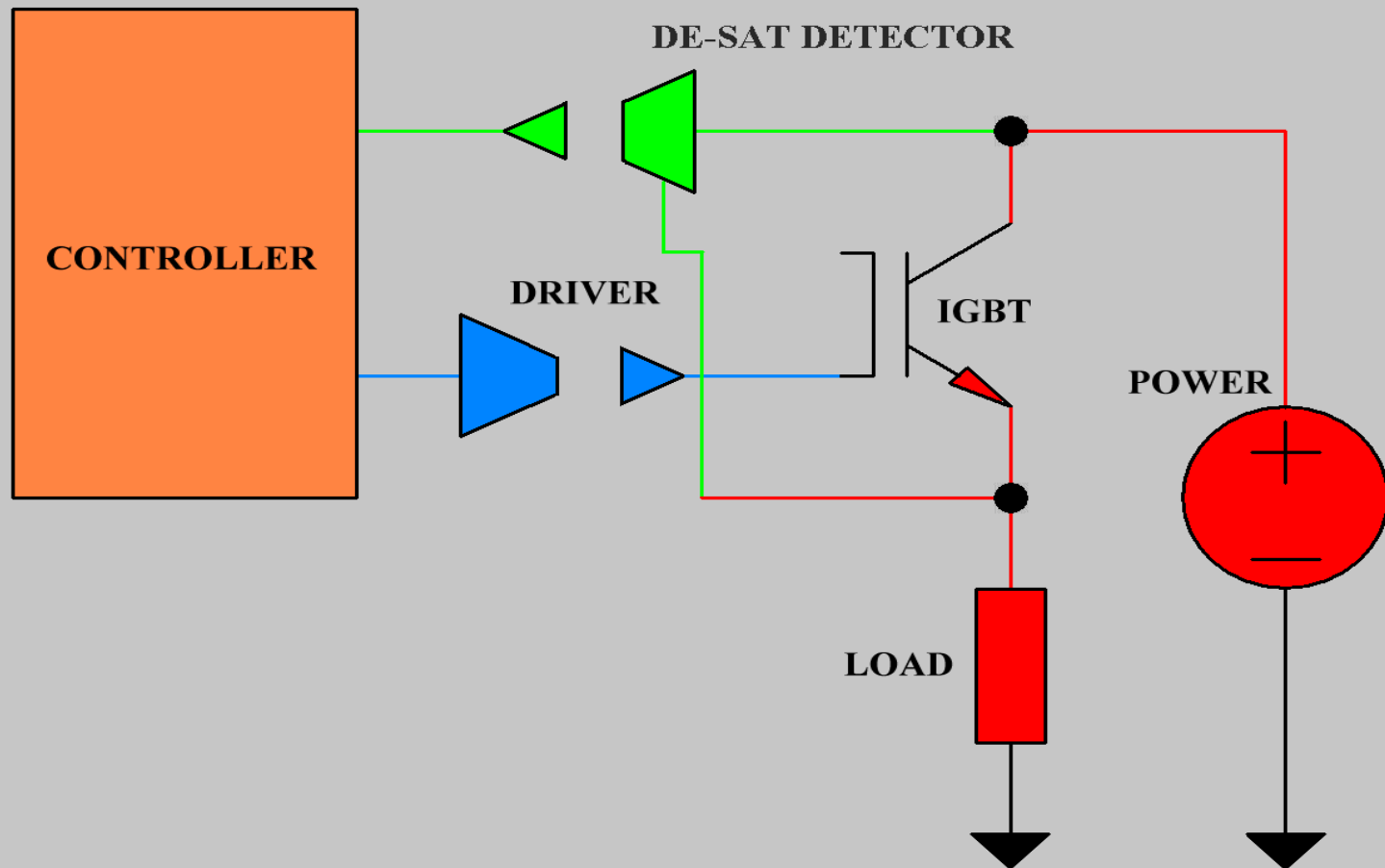
Requirements for IGBT Drivers

IGBT REQUIRES BI-DIRECTIONAL DATA



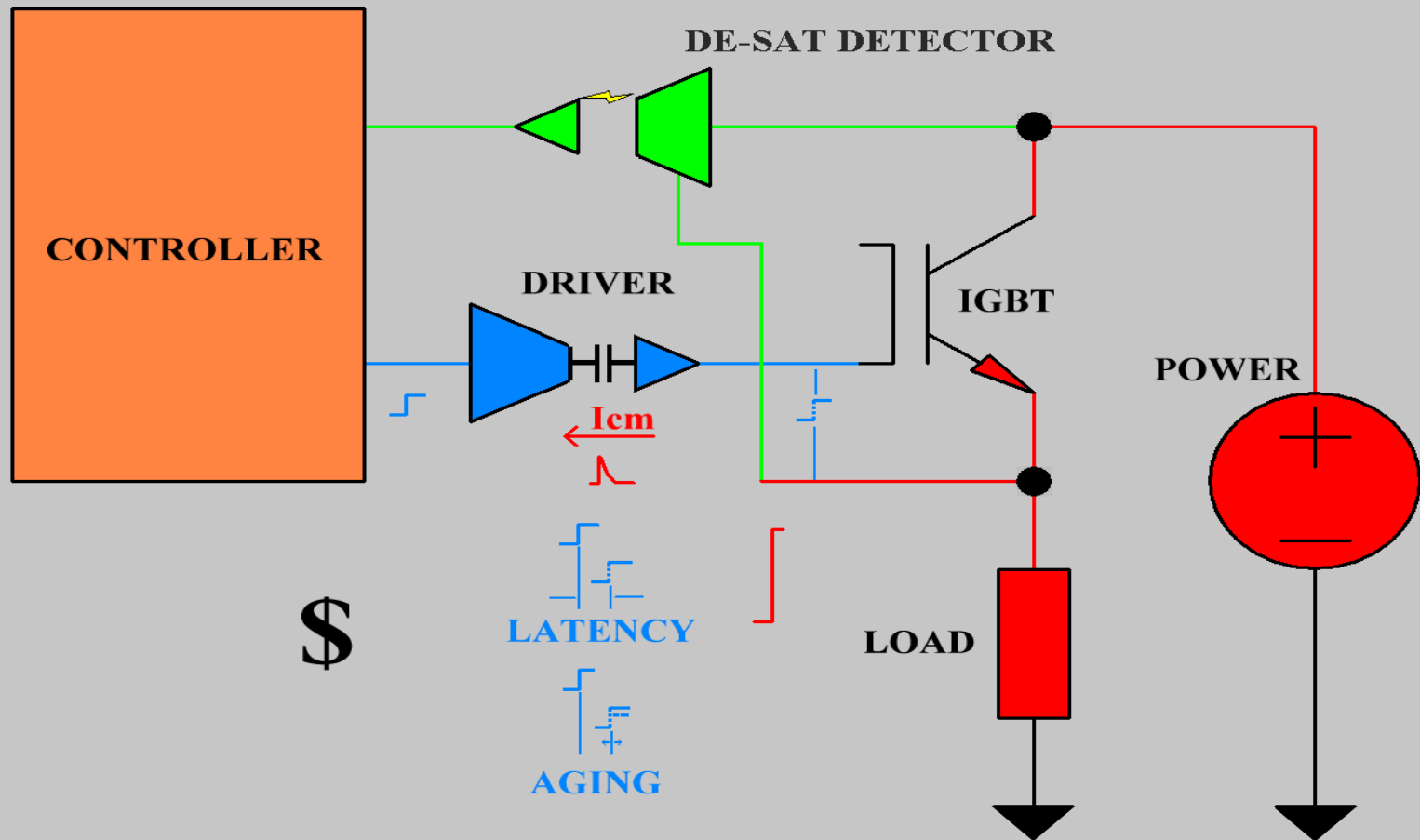
Fast, Reliable, High-Voltage Isolation

IGBT MAY REQUIRE ISOLATION



Low-Latency, Long Life, Low Cost

ISOLATION REQUIREMENTS

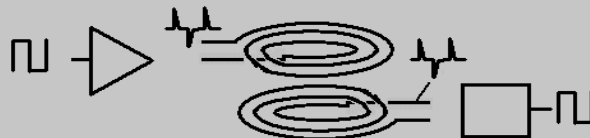


Choices Limited by dV/dT Requirements

ISOLATION METHODS



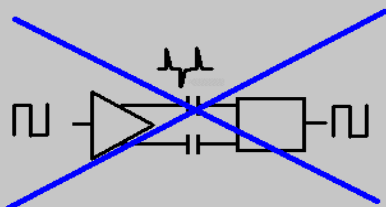
TIGHTLY COUPLED TRANSFORMER



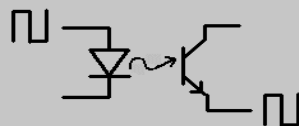
LOOSELY COUPLED TRANSFORMER



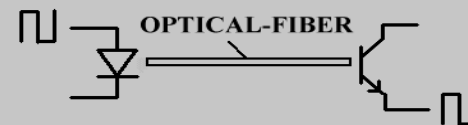
GMR ISOLATOR



CAPACITIVE ISOLATOR



OPTO-COUPLER



FIBER-OPTIC LINK

TIGHTLY-COUPLED XFMR MAY BE CAPACITIVE AND COSTLY UNLESS PULSED

LOOSELY-COUPLED XFMR MAY EMIT NOISE

GMR ISOLATION NOT YET COMMON FOR IGBT DRIVERS

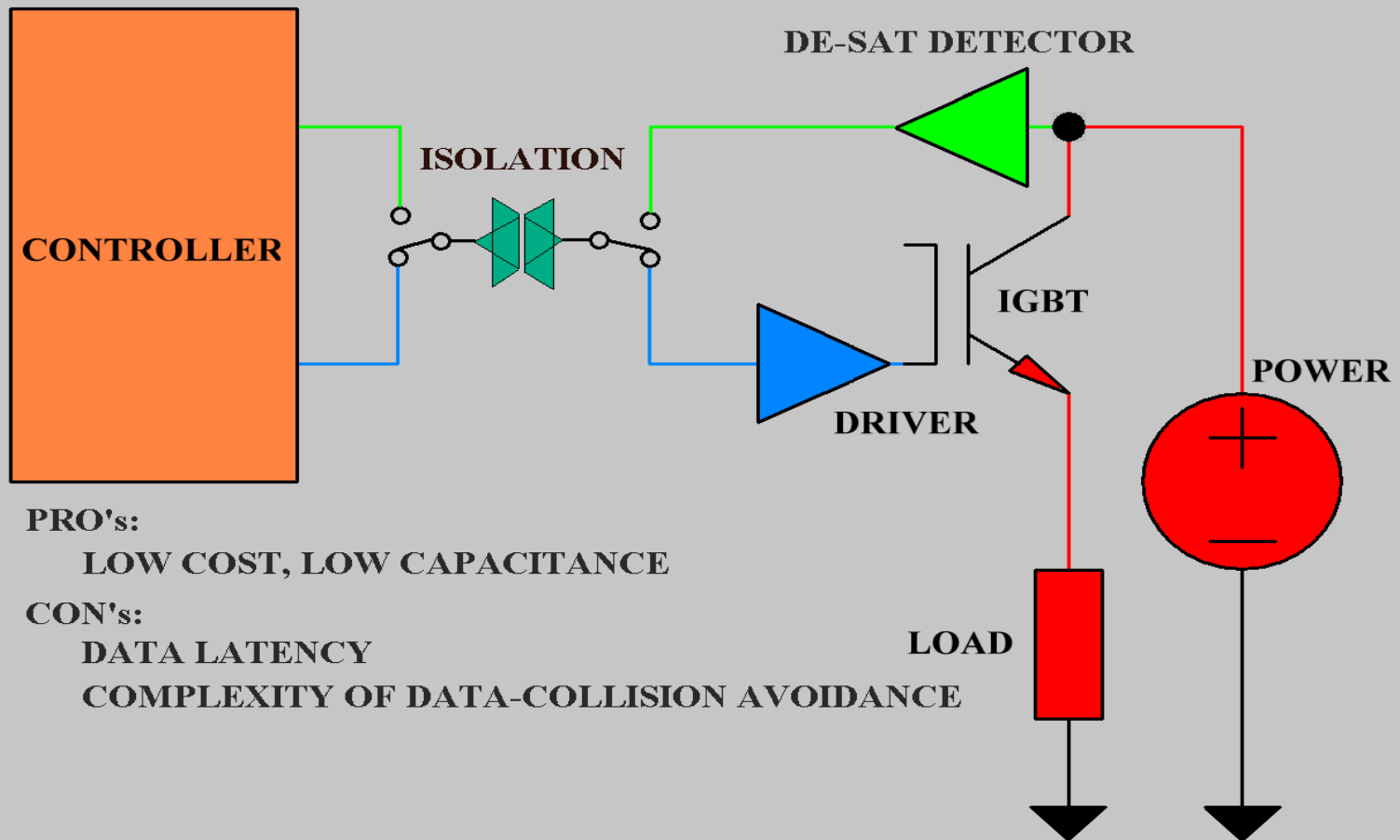
CAPACITIVE TOO DIFFICULT AT HIGH CM dV/dT

OPTO-COUPLED KNOWN FOR AGING

FIBER OPTICS COSTLY

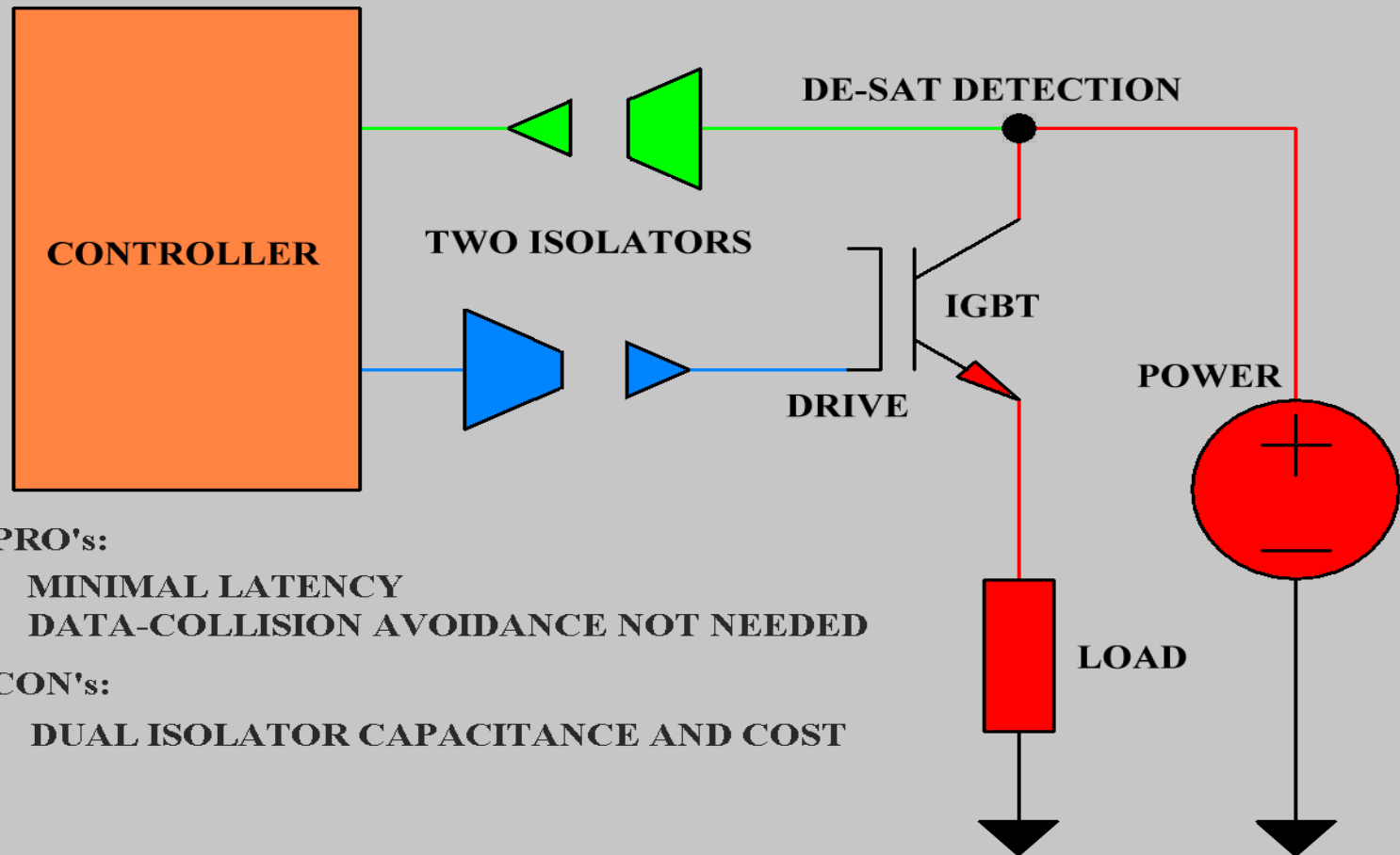
One Possible Solution

HALF-DUPLEX ISOLATION



Best Current Practice

FULL-DUPLEX ISOLATION



PRO's:

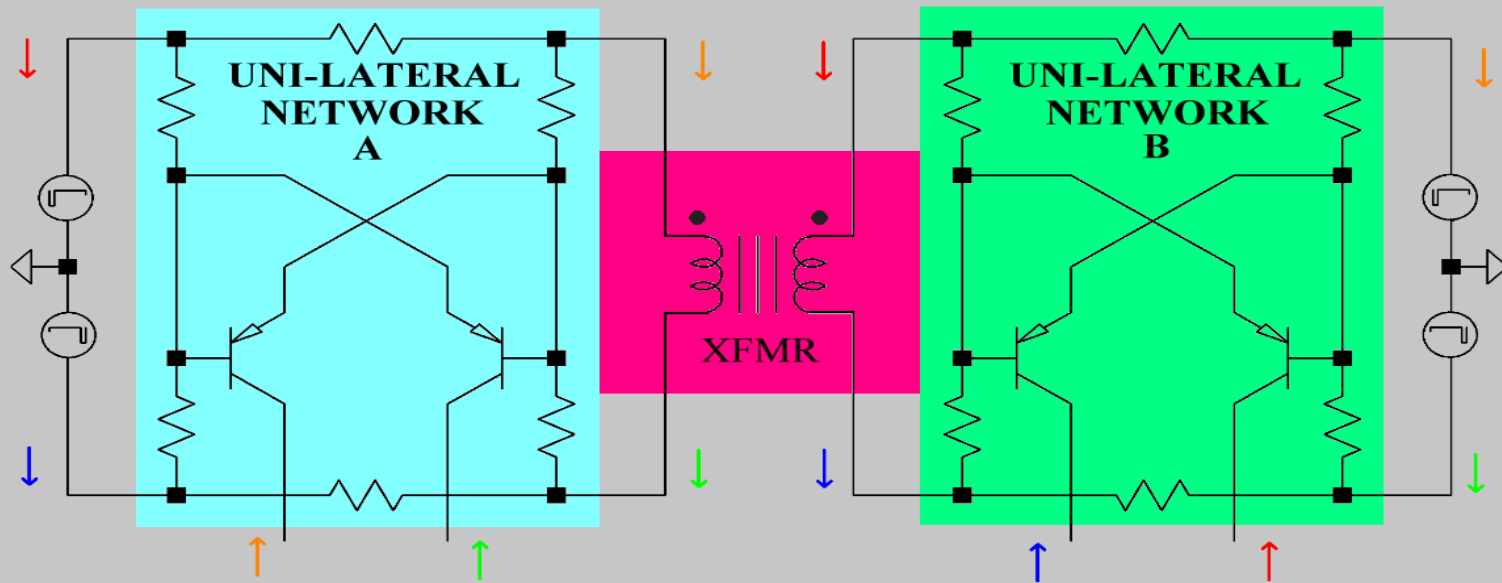
- MINIMAL LATENCY
- DATA-COLLISION AVOIDANCE NOT NEEDED

CON's:

- DUAL ISOLATOR CAPACITANCE AND COST

Patent-Pending Digital Isolator

COGNIPOWER FULL-DUPLEX SINGLE-TRANSFORMER ISOLATION



PRO's:

SINGLE TRANSFORMER CAPACITANCE

SINGLE TRANSFORMER COST

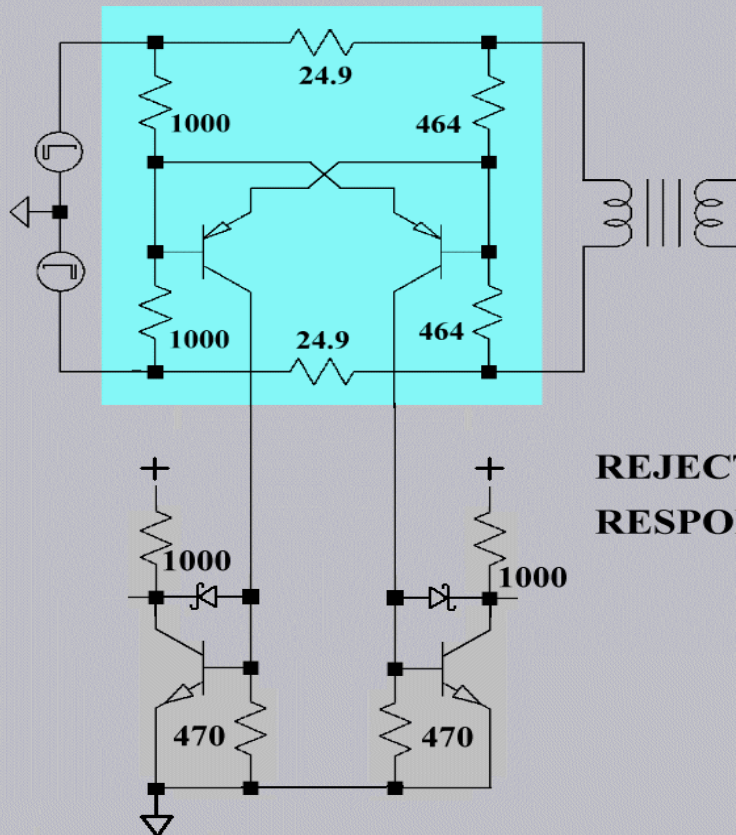
DATA COLLISION CIRCUITRY NOT NEEDED

FULL-DUPLEX DATA PROPAGATION MINIMIZES DATA LATENCY

CogniPOWER
power smarter

The Key to the Technique

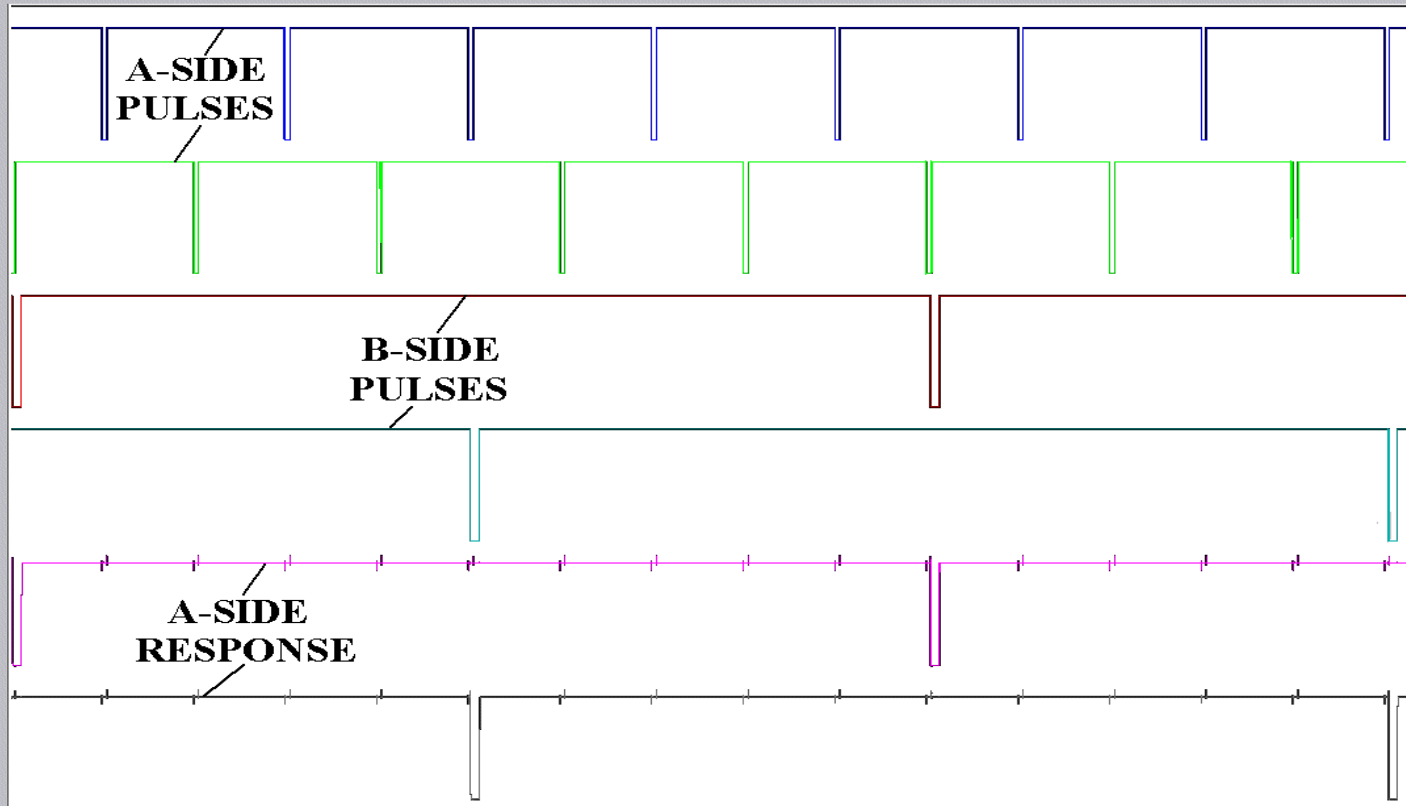
UNI-LATERAL NETWORK



**REJECTS DATA FROM GENERATORS
RESPONDS TO DATA FROM TRANSFORMER**

Pulse Waveforms in SPICE

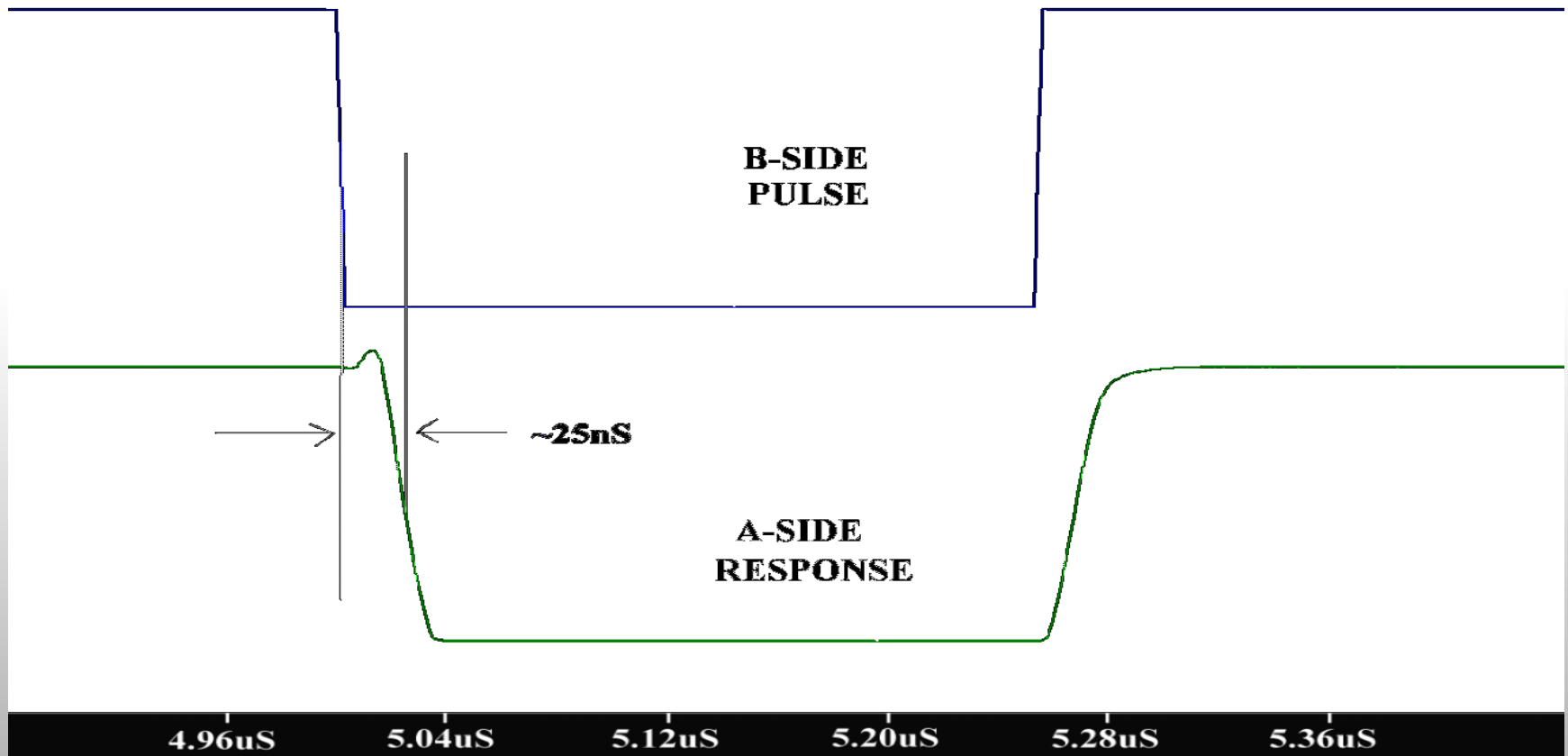
UNI-LATERAL NETWORK REJECTION



DATA PULSES TRANSMITTED TO REDUCE TRANSFORMER SIZE/CAPACITANCE

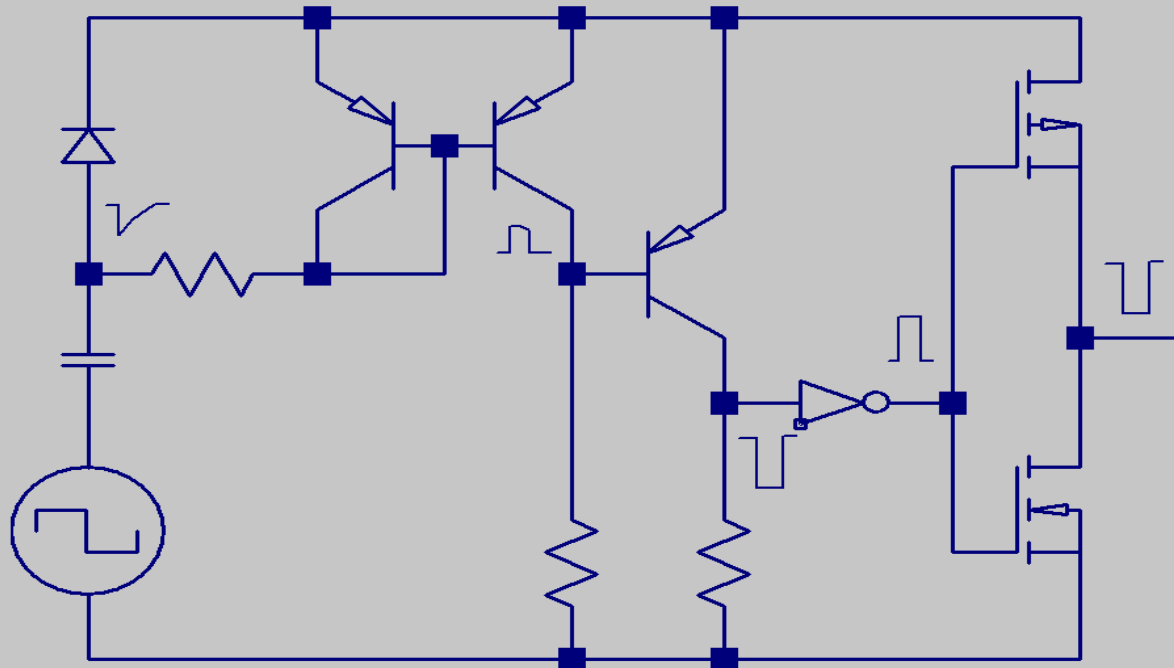
Latency of 25 nS

ISOLATION PROPAGATION DELAY



Simple Data Reconstruction

DATA PULSE GENERATION DATA RECONSTRUCTION



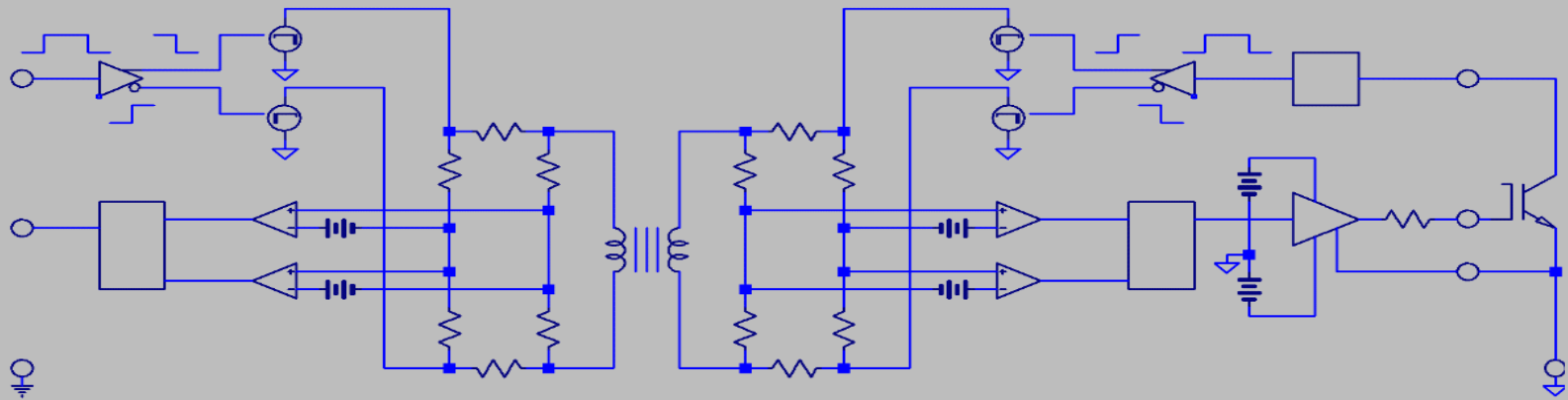
GENERATION

RECONSTRUCTION

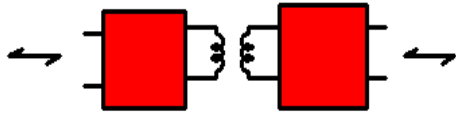
IGBT Driver Application

COGNIPOWER

IGBT DRIVER WITH SINGLE-TRANSFORMER FULL-DUPLEX DATA TRANSMISSION

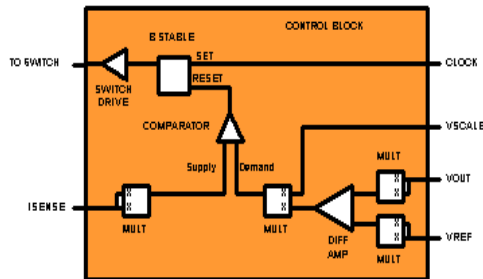


Building Blocks



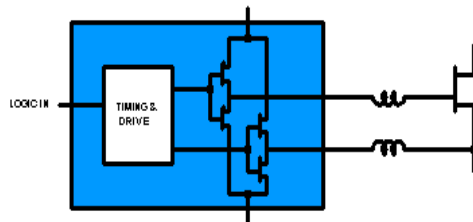
Digital Isolator
APEC 2012

Arbitrarily high
voltage withstand



Predictive Energy
Balancing Controls
APEC 2011

Harmonically pure
Agile response for
any SMPC topology



Common Mode
Switch Drive
APEC 2010

Precise, low-latency
high-side drive for
FETs and IGBTs



Single-Stage PFC
And Regulation
APEC 2013?

Ask about our AC-
DC converter design

Questions?

Come see us at Booth # 1007

Thank you

CogniPOWER
power smarter