



Si823Hx Gate Driver Board

October 2022

Connecting Everyone and Everything, All the Time.



Si823Hx Gate Driver Board



APPLICATIONS

- Motor drives
- Solar inverters
- Industrial inverters & UPS

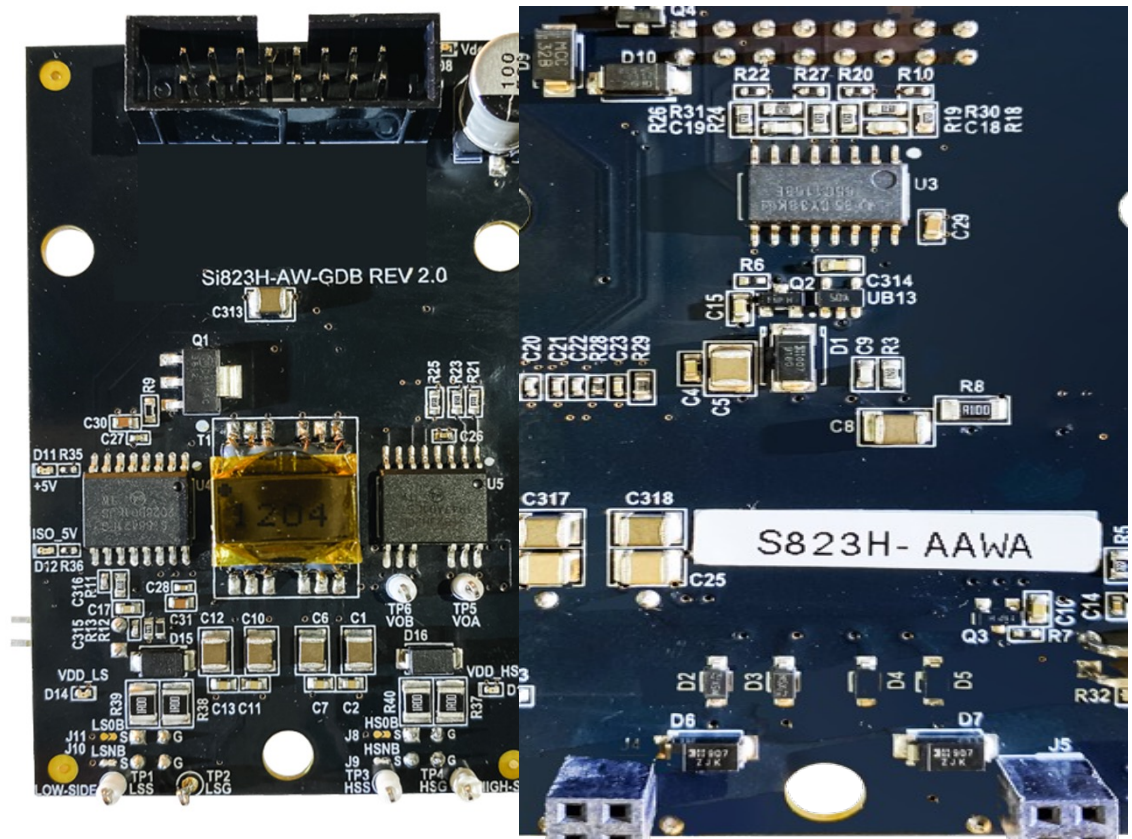
FEATURES

- Two input, high-side/low-side driver
- Integrated dead-time control and overlap protection
- Differential inputs for increased noise immunity
- Reverse polarity protection for 12 V input supply
- 4 A symmetric peak output current
- 1 Ω or 4 Ω sourcing/sinking gate resistors
- Built-in +15 V and -3.5 V isolated gate bias supplies
- 5 kV_{RMS} safety rated isolation
- 125 kV/ μ s common mode transient immunity (CMTI)
- DC bus voltage up to 800 V
- Switch temperature (NTC) feedback
- Reference design available



Si823Hx Gate Driver Board Details

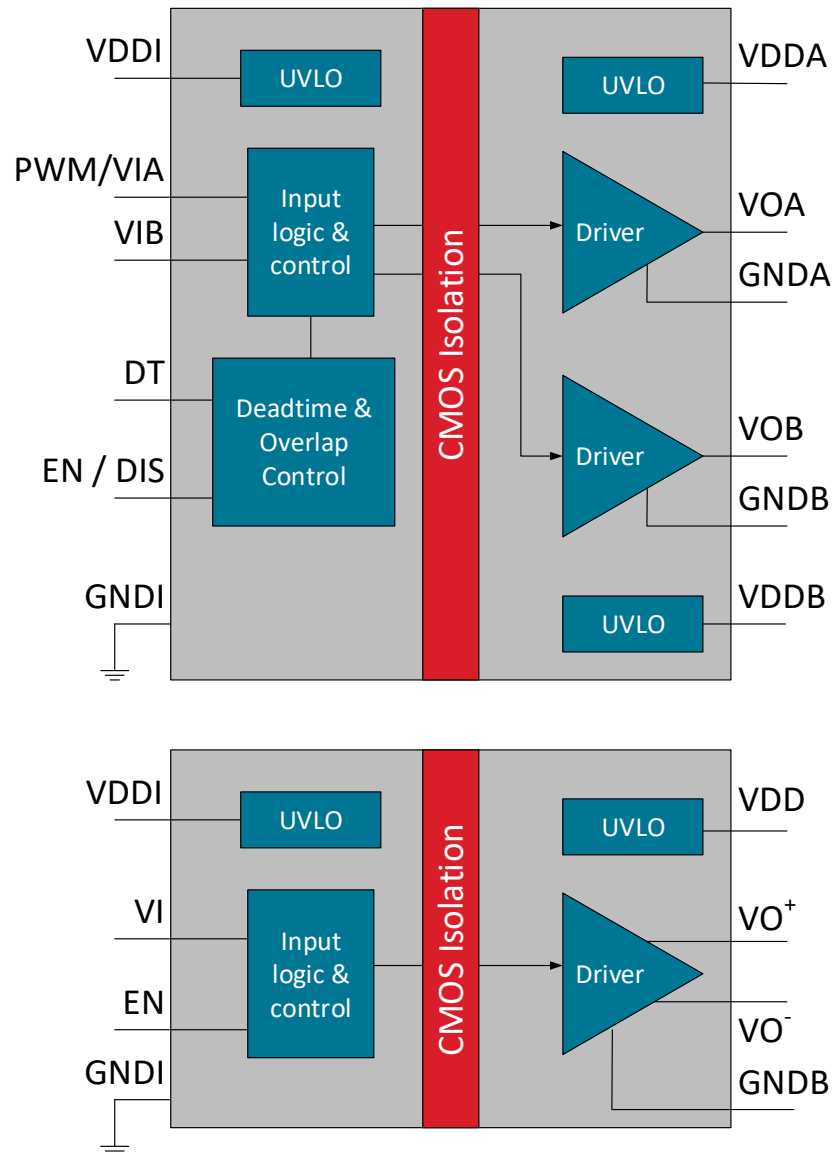
- Compact and thermally optimized board design (2" x 3")
 - Optimized for power dissipation and noise immunity
- Tightly integrated, Si823H2x for high-performance
 - Two channel package with shoot-through protection
 - 4 A of symmetric output current for fast slew rates
- Efficient use of Si8842x for isolated power and signaling
 - Single DC-DC converter provides power for entire board
 - Digital isolation provides module temperature feedback
- Versatile transformer configuration delivers all voltage domains
 - 12 V input yields 5 V non-isolated output & 2 fully-isolated gate supplies
 - Adjustable gate supply voltage
 - User-configurable unipolar or bipolar gate bias



Top

Bottom

Si823Hx: High Input VDDI Gate Drivers



APPLICATIONS

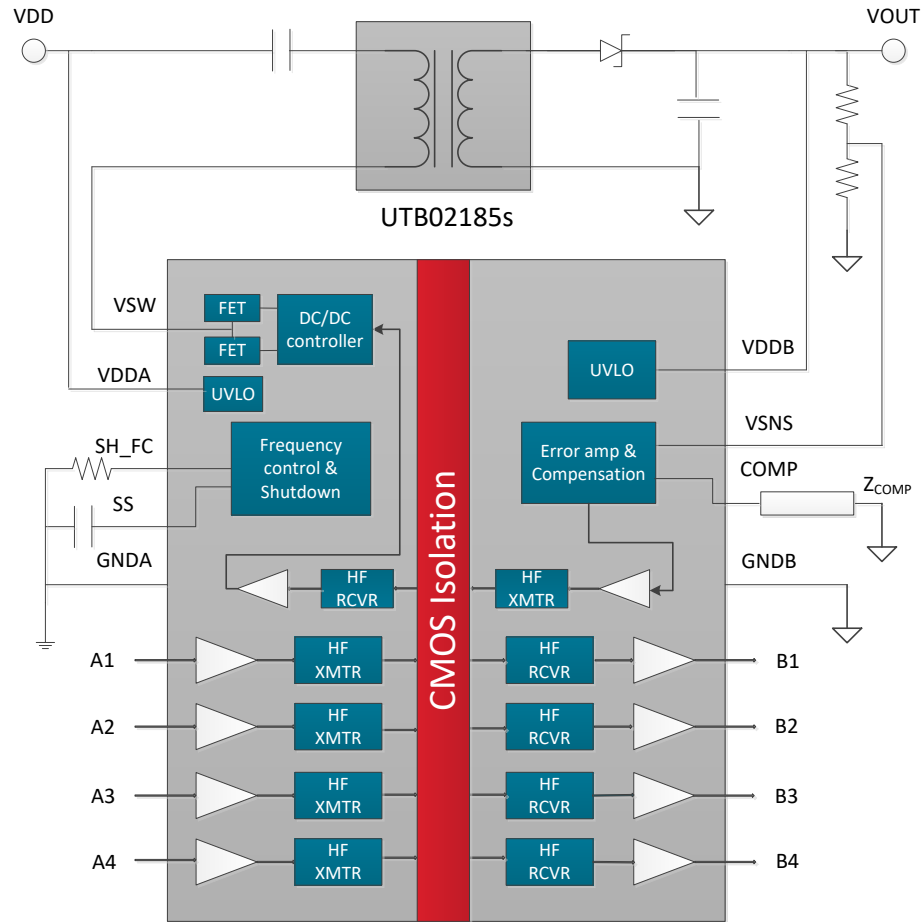
- Power supplies
- Industrial inverters & UPS
- Motor control & Drives
- Solar inverters

FEATURES

- VDDI: 4.5 V–20 V or 3.0 V–5.5 V options; VDDA/B: 5.5 V – 30 V (36 V_{max})
- Drive strength: Symmetric 4 A sink/source
- Isolation: 5 kV_{rms}, 10 kV surge with VDE 0884-10 reinforced
- CMTI: Min 125 kV/μs; T_{PLH}/T_{PHL}: 30 ns max
- Over-temp protection for safety
- Input de-glitch for noise filtering (Si823H3x options)
- Package specs (16 WB, NB, QFN-14)
 - 8 mm creepage (WB), missing pins 12 & 13, MSL 2



Si88xx: Digital Isolator With DC-DC Converter



Si88240: 100Mbps quad digital isolator with 2W DCDC converter

APPLICATIONS

- Factory automation
- Process & motor control
- Battery management systems (BMS)
- PLCs & control systems

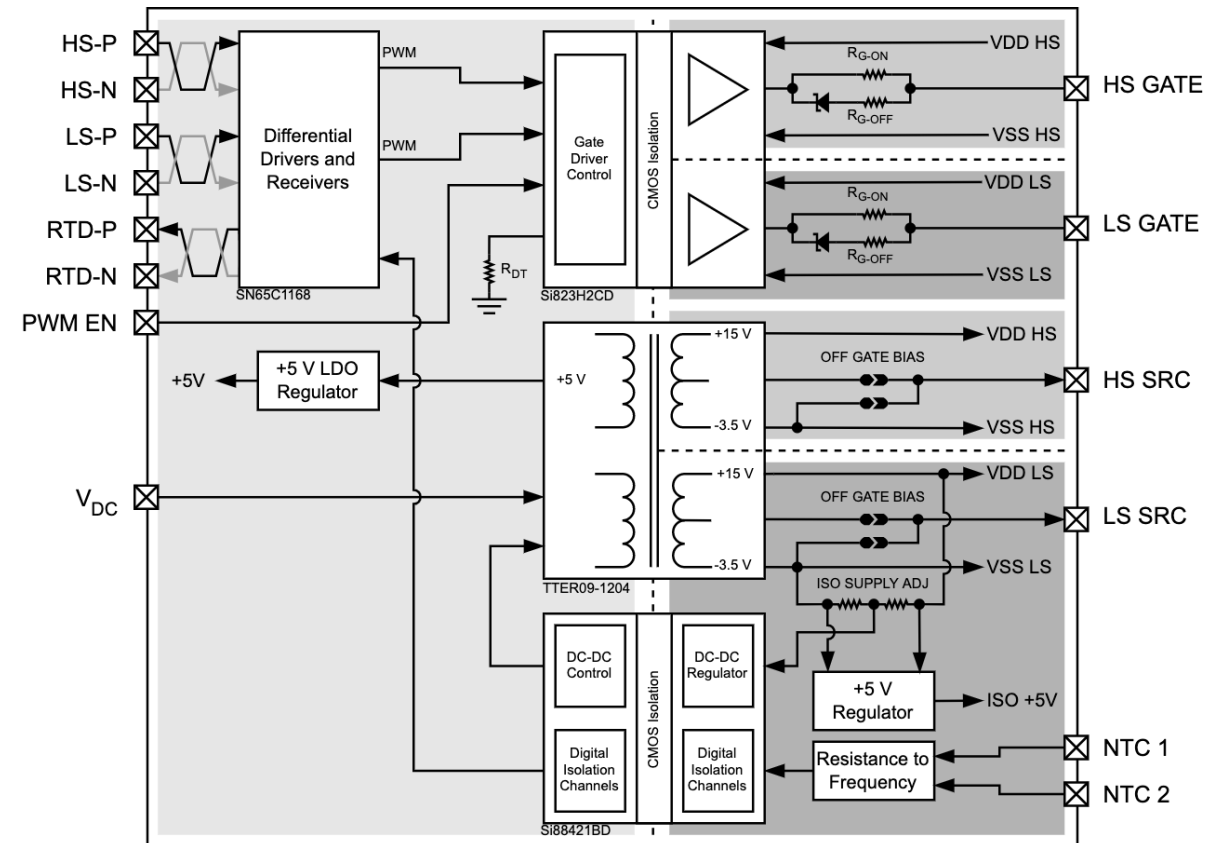
FEATURES

- Integrated dc-dc converter with secondary sensing & feedback
 - Internal switch: 2 W of power & 78 % efficiency
 - External switch: 5 W, 83% efficiency
 - Full featured with soft start, frequency control, shutdown options
- Robust Isolation
 - 5 kVrms reinforced
 - Unmatched noise immunity of 100 kV/ms
 - Up-to four high speed (100 Mbps) digital channels, multiple configurations
 - Low prop delay of 18 ns

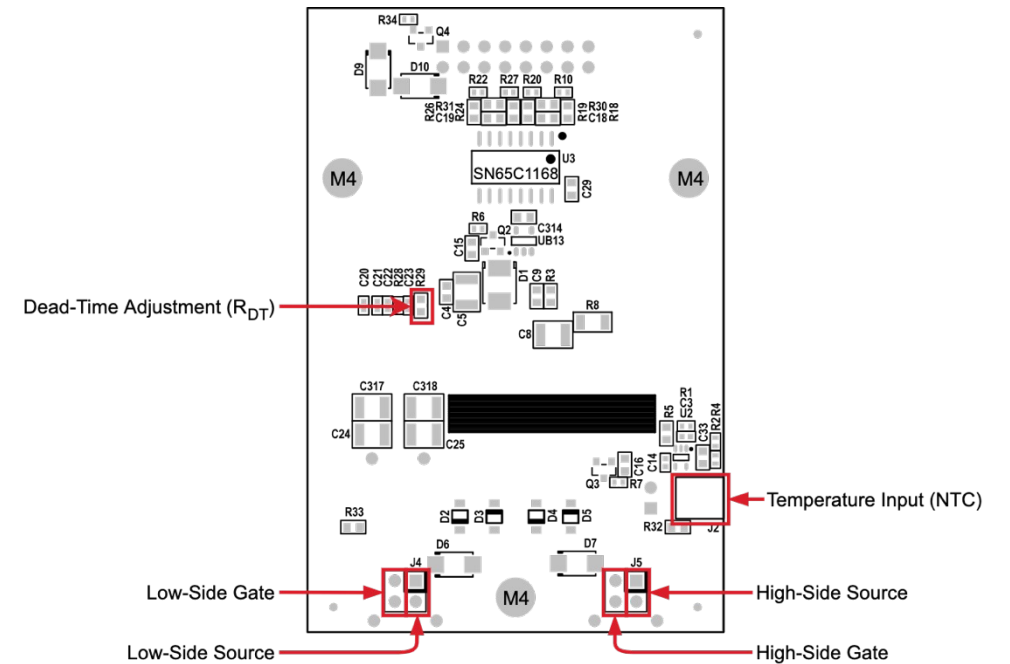
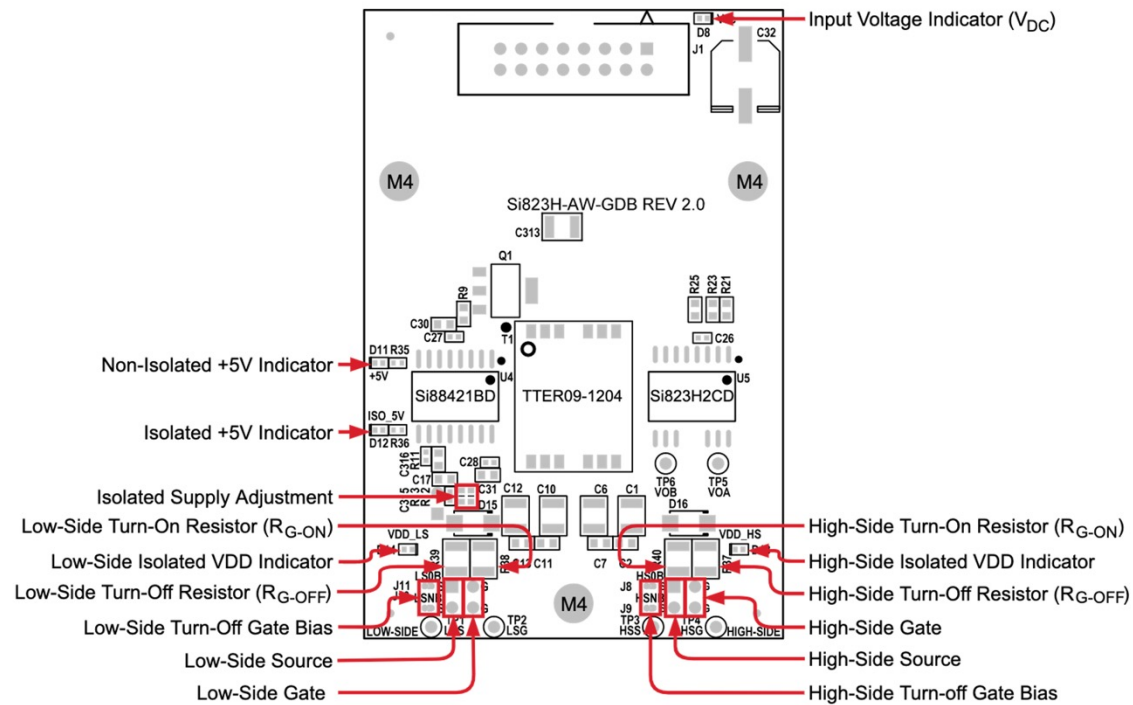


Si823Hx Gate Driver Board Block Diagram

- 16-pin interface
 - Differential HS and LS PWM signals
 - Differential temperature signal (Digital Freq.)
 - Single ended driver enable signal
 - 12 V_{DC} single supply input
- Si88xx Digital Isolator and DC-DC Controller
 - External switching transistor product option
 - Cross-regulation for all secondary windings
 - 5 V LDO regulates non-isolated secondary for greater efficiency
 - 5 V NPN based regulator powers isolated components
- User-configurable features
 - Dead-time adjusted through resistor value
 - Turn-on/turn-off slew rate through resistor adjustment
 - Secondary voltage adjusted through voltage divider
 - Selectable unipolar or bipolar gate bias through solder bump



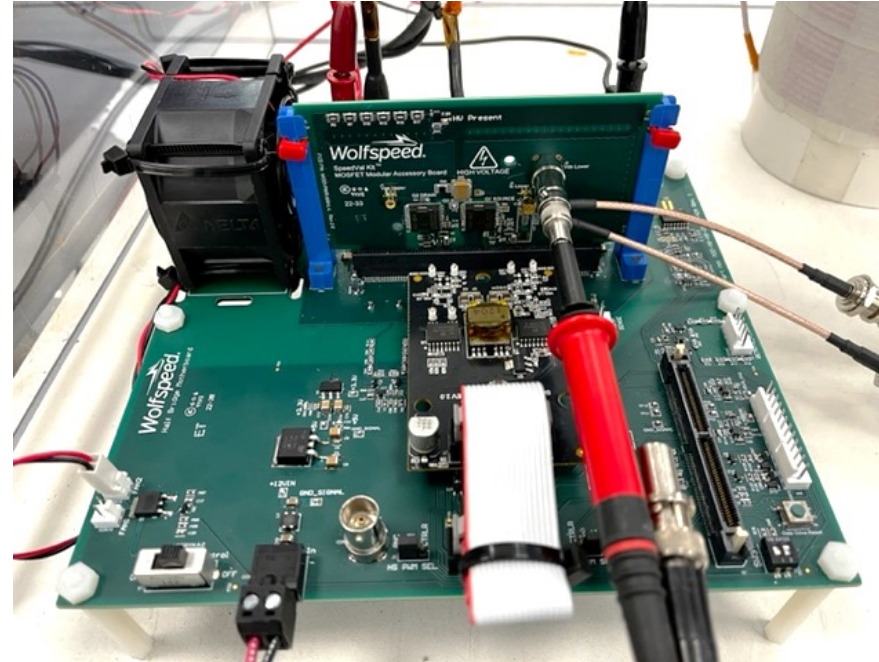
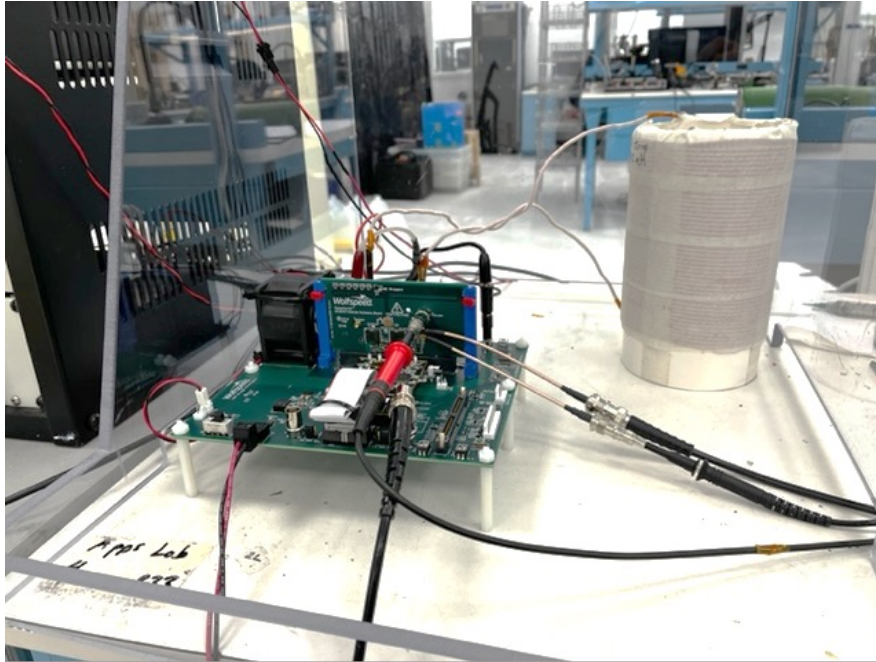
Si823Hx Gate Driver Board Layout



- Optimized for power dissipation and noise immunity
- Isolation maintained while using single transformer and two channel gate driver
- Test points and power supply indicators included for evaluation
- User-configurable components easily accessible

SpeedVal and Si823Hx Gate Driver Board Validation

Tested with C3M0045065L (45Ω device in TOLL package)



Conditions:

$T_{vj} = 25^{\circ}\text{C}$

$V_{DD} = 400\text{V}$

$R_{G(\text{ext})} = 5\Omega$

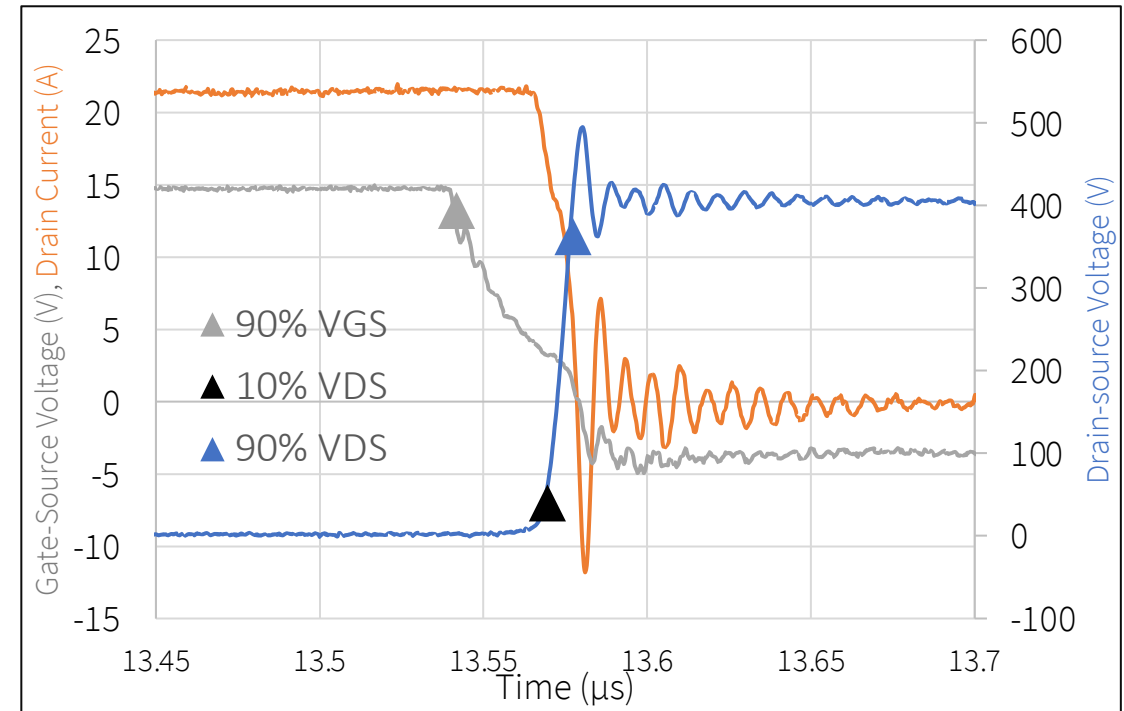
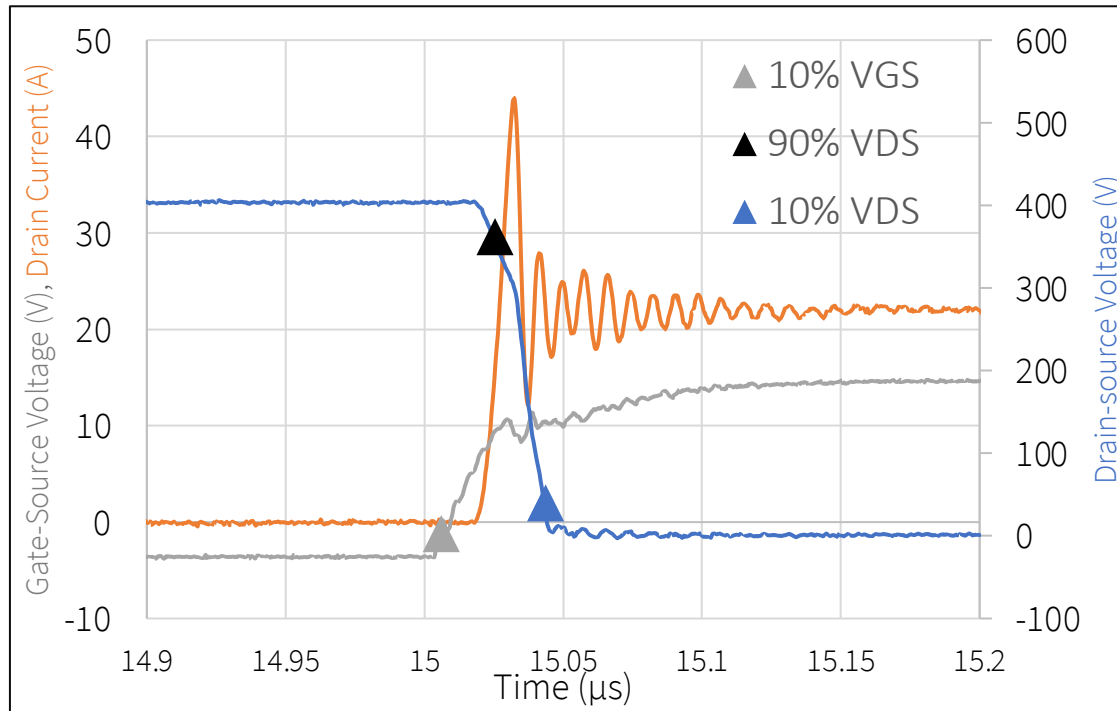
$V_{GS} = -3\text{V}/+15\text{V}$

FWD = body diode

$L = 142\mu\text{H}$

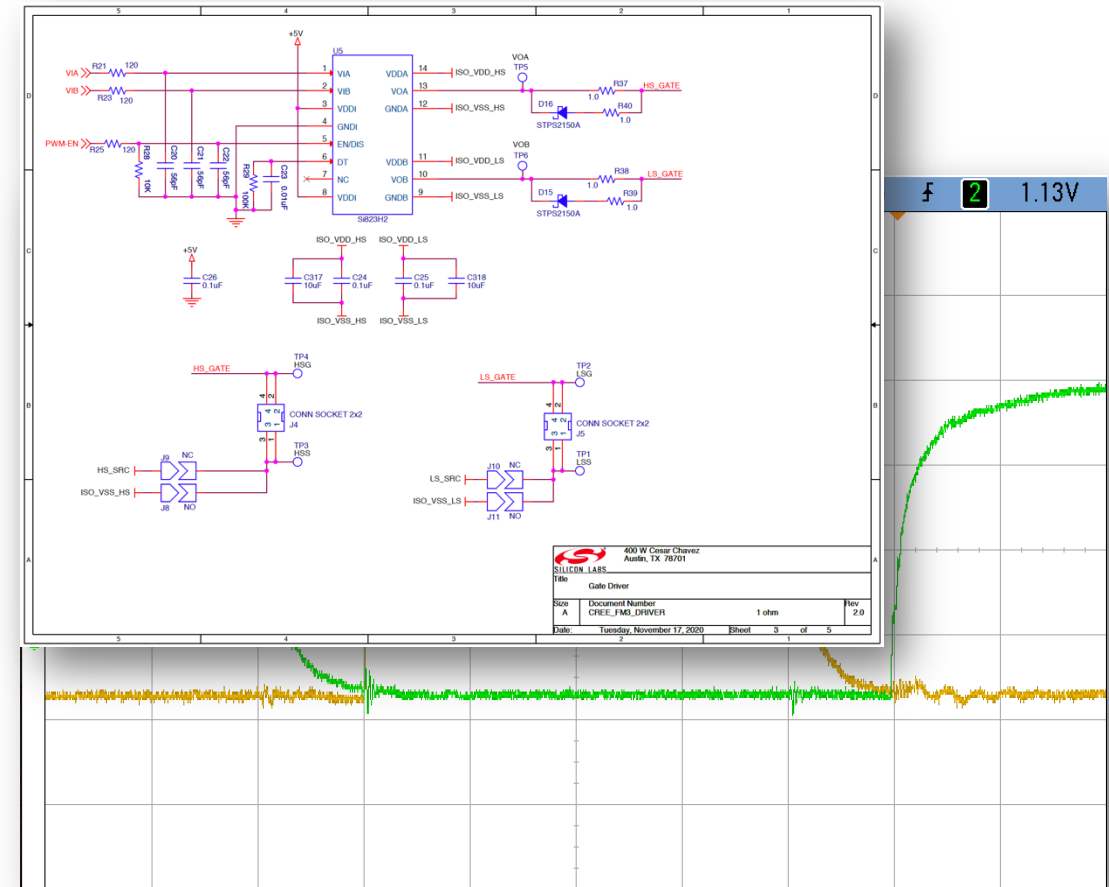
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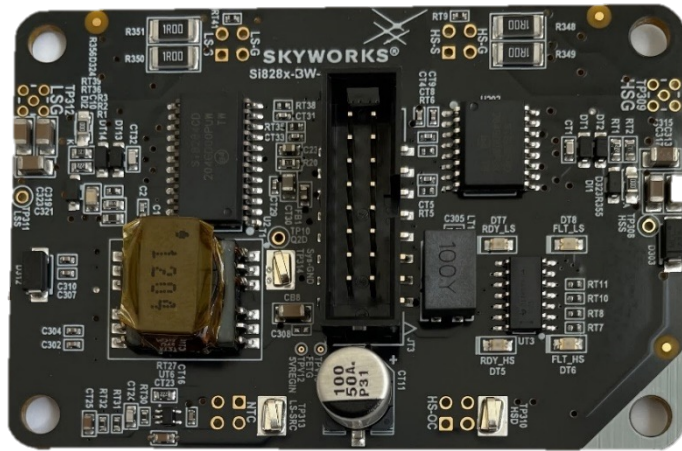


Evaluation and Development Collateral Available

- Gate driver board reference design
 - Schematic
 - Detailed BOM
 - Digital layout files
- Comprehensive test report
 - Wolfspeed WolfPACK™ - Tested with demanding 11 mΩ module
- Extensive development resources
 - [Si823Hx Gate Driver Board User's Guide](#)
 - [Si823Hx Data Sheet](#)
 - [Si88x2x Data Sheet](#)
 - [AN892: Design Guide for Isolated DC-DC Using the Si882xx/883xx](#)
 - [AN901: Design Guide for Isolated DC-DC Using the Si884xx/886xx](#)
 - [AN1131: Design Guide for Reducing Radiated and Conducted Emissions in Isolated Systems Using Silicon Labs' Isolators](#)
 - [AN1167: Safety Considerations for Silicon Labs Series Capacitor Isolators](#)



Si828x Gate Driver Board



APPLICATIONS

- Motor drives
- Solar inverters
- Industrial inverters & UPS

FEATURES

- Complimentary digital inputs for integrated safety interlock
- SiC optimized DESAT protection
- Differential inputs for increased noise immunity
- Reverse polarity protection for 12 V input supply
- 4 A peak output current
- 1 Ω or 4 Ω sourcing/sinking gate resistors
- Built-in +15 V and -3.5 V isolated gate bias supplies
- 5 kV_{RMS} safety rated isolation
- 125 kV/ μ s common mode transient immunity (CMTI)
- DC bus voltage up to 800 V
- Switch temperature (NTC) feedback
- Reference design available



A Decade of Proven Isolation Technology



- Leader in automotive, solar & server power
- Patented capacitive isolation technology
- Field proven, >1B channels shipped



Digital Isolators



Isolated Gate Drivers



Industrial I/O



Isolated Analog
and ADCs



Isolated FET
Drivers

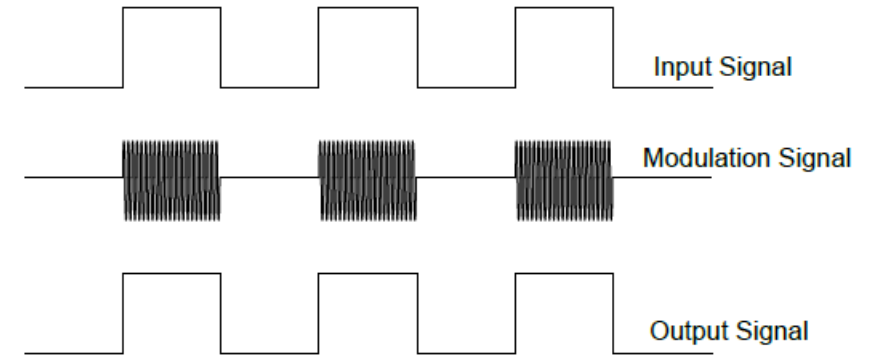
History of Innovation

First to address emissions with Capacitive Isolation

- Digital isolation mechanisms have inherent emissions challenges
- Our capacitive isolation architecture reduced emissions >15-20db over competition

First to use On-Off Keying (OOK)

- Proprietary OOK provides error-free transmission & robust noise tolerance
- Pulsed architecture can latch on noise glitches, propagating errors



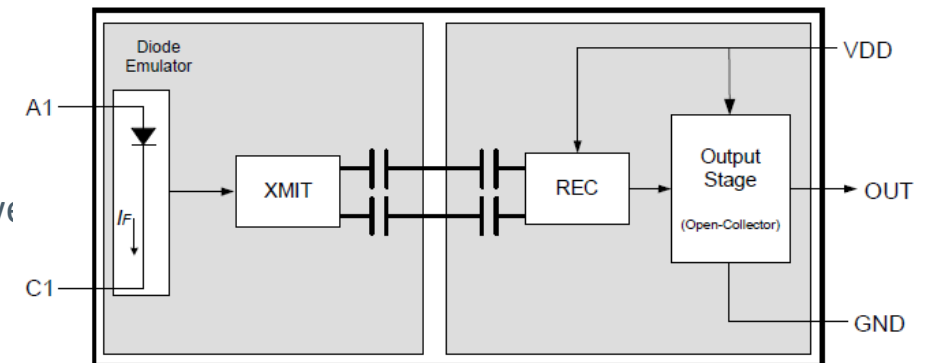
OOK Modulation

First with LED emulator input

- Provides a direct replacement for inferior optocouplers and opto-drivers
- Developed into highly integrated PLC input product

First with SSR replacement driver

- Innovative power transfer across Isolation barrier eliminates field side power supply
- Cost efficient, simple way to build solid-state relays



LED Emulator Input

First with fast-switching dual gate driver

- 200 kV/ μ s CMTI allows for switching fastest FETs, including GaN
- Required for achieving highest level of power density in SMPS design

Skyworks Isolation Portfolio



Digital Isolator

Si86xx/T

- 1-6 ch, 5 kV_{RMS}
- Pin 2 pin - ADI, TI
- T=10kV Surge

Si87xx

- Replaces Optos
- Faster, robust
- Same price

Si88xx

- Si86xx + dc/dc
- 5 W power, 80% eff
- Low noise

Si86Sx

Sampling Now

- Robust Isolation
- Noise immunity
- High functionality



Isolated Analog

Si8920

- Analog isolator
- Differential I/O
- Shunt R sensing

Si8921x/2x

- Current sensor
- SE or DIFF output
- High performance

Si893x

- Voltage sensor
- SE, DIFF, or DSM output

Si894x

- Current sensor
- DSM Output
- High performance



Isolated Drivers

Si823x/39x

- Ideal for Si FETs
- 2.5V VDDI
- UVLO flag + shutoff

Si826x

- Replaces Opto-drivers
- Low drift over time
- Drives SiC FETs

Si827x

- Fastest MOSFETs
- SiC & GaN FETs
- 200 kV/ μ s CMTI

Si828x

- Drives IGBT & SiC
- DCDC option
- 125 kV/ μ s CMTI

Si823Hx

- 20 V VDDI
- 30 ns max latency
- 125 kV/ μ s CMTI



Industrial I/O

Si838x

- Ideal for PLC input
- 8 ch. sinking/sourcing
- Use any digital levels

Si834x

- Ideal for PLC output
- 4 ch. sinking/sourcing
- Ideal for relays

Si875x

- Isolated FET driver
- Choose your FET
- Build-your-own SSR

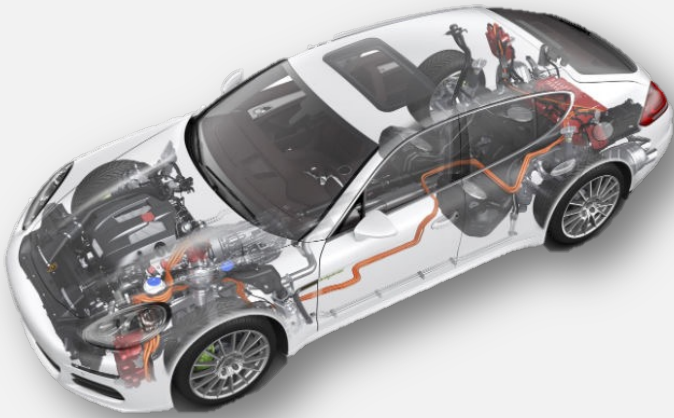
Si876x

Sampling Now

- Compact SSR
- Built-in FETs

Isolation Markets

AUTOMOTIVE



Battery Mgmt Systems (BMS)
On Board Chargers (OBC)
DC - DC Converters
Traction Inverters

INDUSTRIAL / MOTOR CONTROL

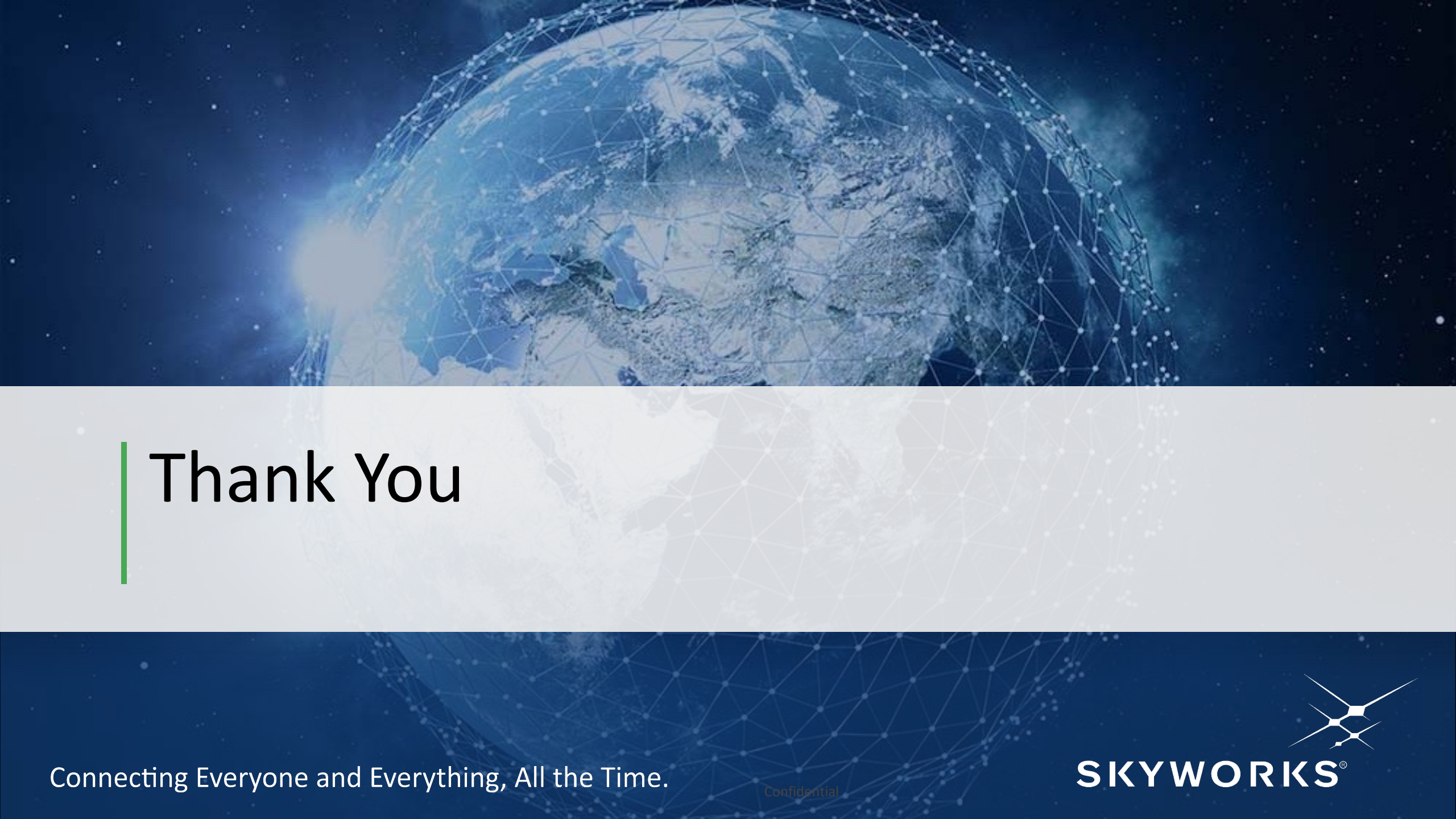


Programmable Logic Controllers
Remote I/O
Motor Control
Isolated Fieldbus (RS-485)

POWER SUPPLY / SOLAR



Server / Cloud Power Supplies
Telecom Power Supplies
Uninterruptible Power Supplies
Solar Inverters



Thank You

Connecting Everyone and Everything, All the Time.

Confidential



Si823Hx Gate Driver Board Compatibility

- Compatible with “PACK” module configurations
 - Half-bridge, full-bridge, six-pack (three-phase)
 - 1B (1.33” wide) and 2B (2.25” wide) modules
- Available from multiple vendors
 - [Wolfspeed WolfPACK™](#)
 - [Infineon EasyPACK](#)
 - [ST Micro AcePACK](#)
- **NOTE:** Interposer required such as Wolfspeed CIL board

