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NCD 57252

High Current Dual Channel Galvanic Isolated IGBT Driver

PCIM 2021

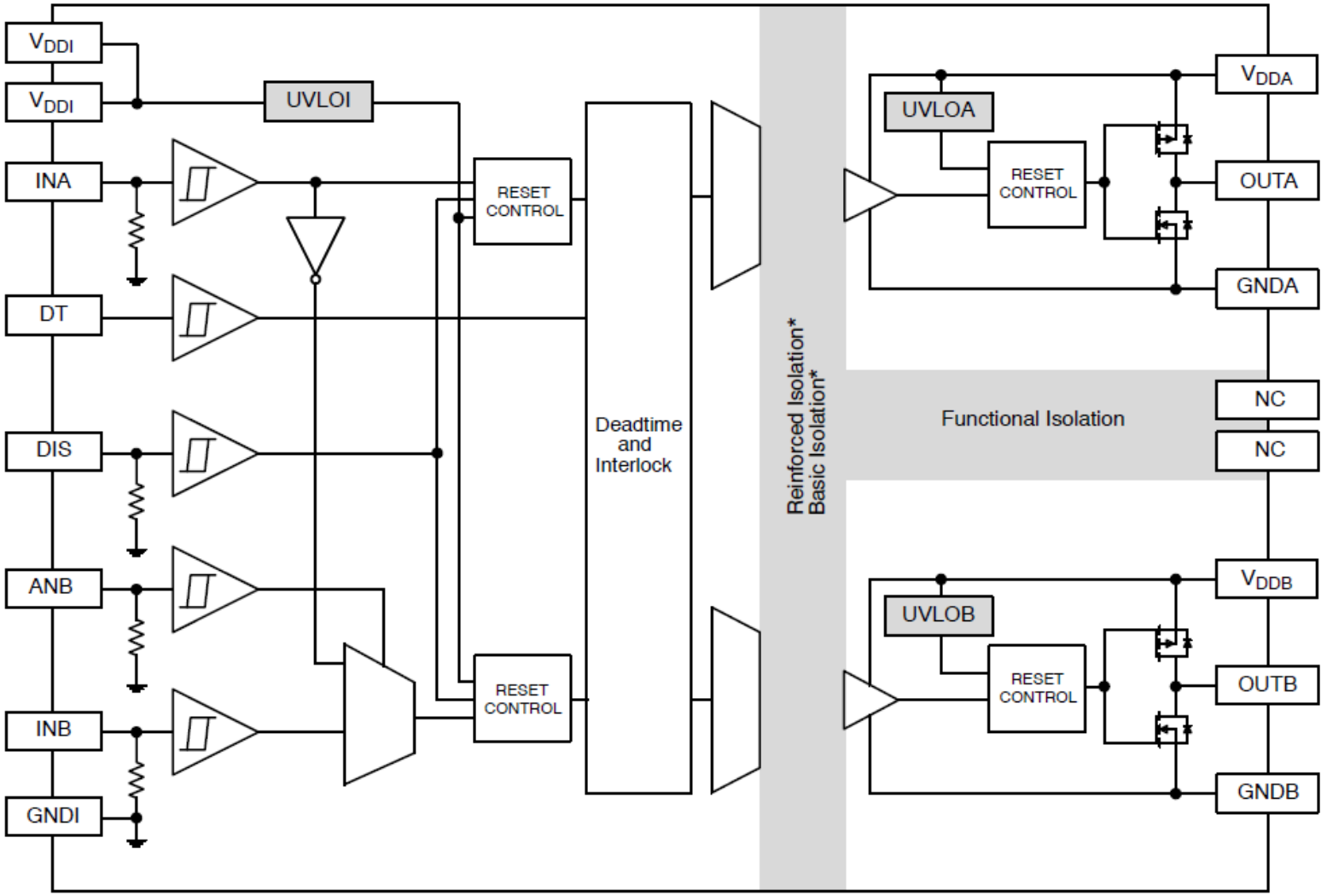
Martin STŘELEC

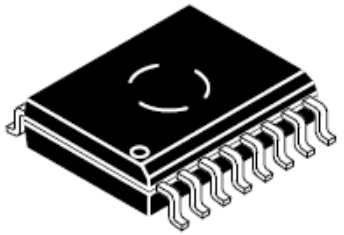
NCD 57252

ONSEMI WEB LINK

- High Peak Output Current **±6.5 A**
- **TWO** Galvanically isolated output channels
- **5000 V_{RMS}** Input to Output Galvanic Isolation
- **1500 V_{RMS}** Differential Voltage between Output Channels
- **1200 V_{PK}** Working Voltage (per VDE0884−11 Requirements
- Configurable to one of three mode of operation
  - Two independent channels
  - Two output channels with **DEADTIME**
    - **GUARANTED** minimum Deadtime or
    - **ADDED DEADTIME** set by external resistor
  - Two output channels generated from single input signal (**ANB function**)
- **DISABLE** function to Turn Off Outputs for Power Sequencing
- **3.3 V**, **5 V**, and **15 V** Logic Input Capability
- **32V** Output Voltage Capability
- NCV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable
- This Device is Pb−Free, Halogen Free/BFR Free and is RoHS Compliant

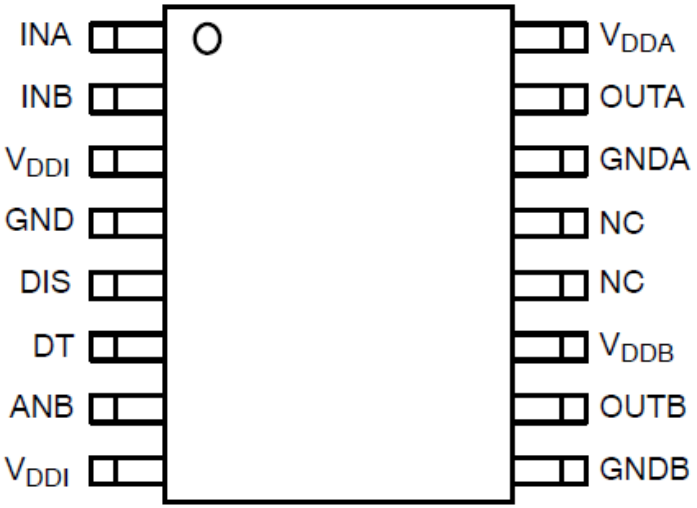
NCD 57252





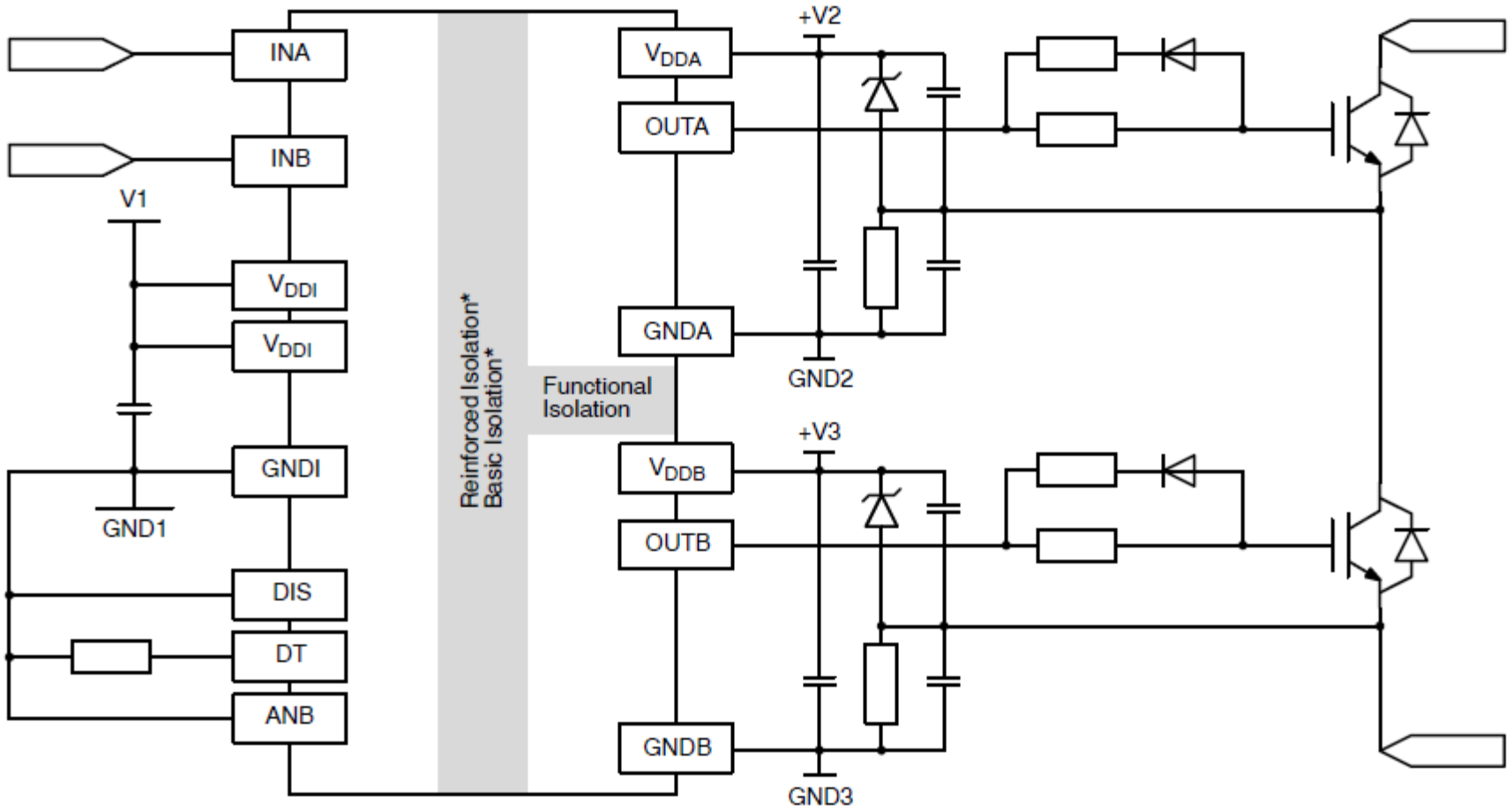
1

SOIC–16 WB



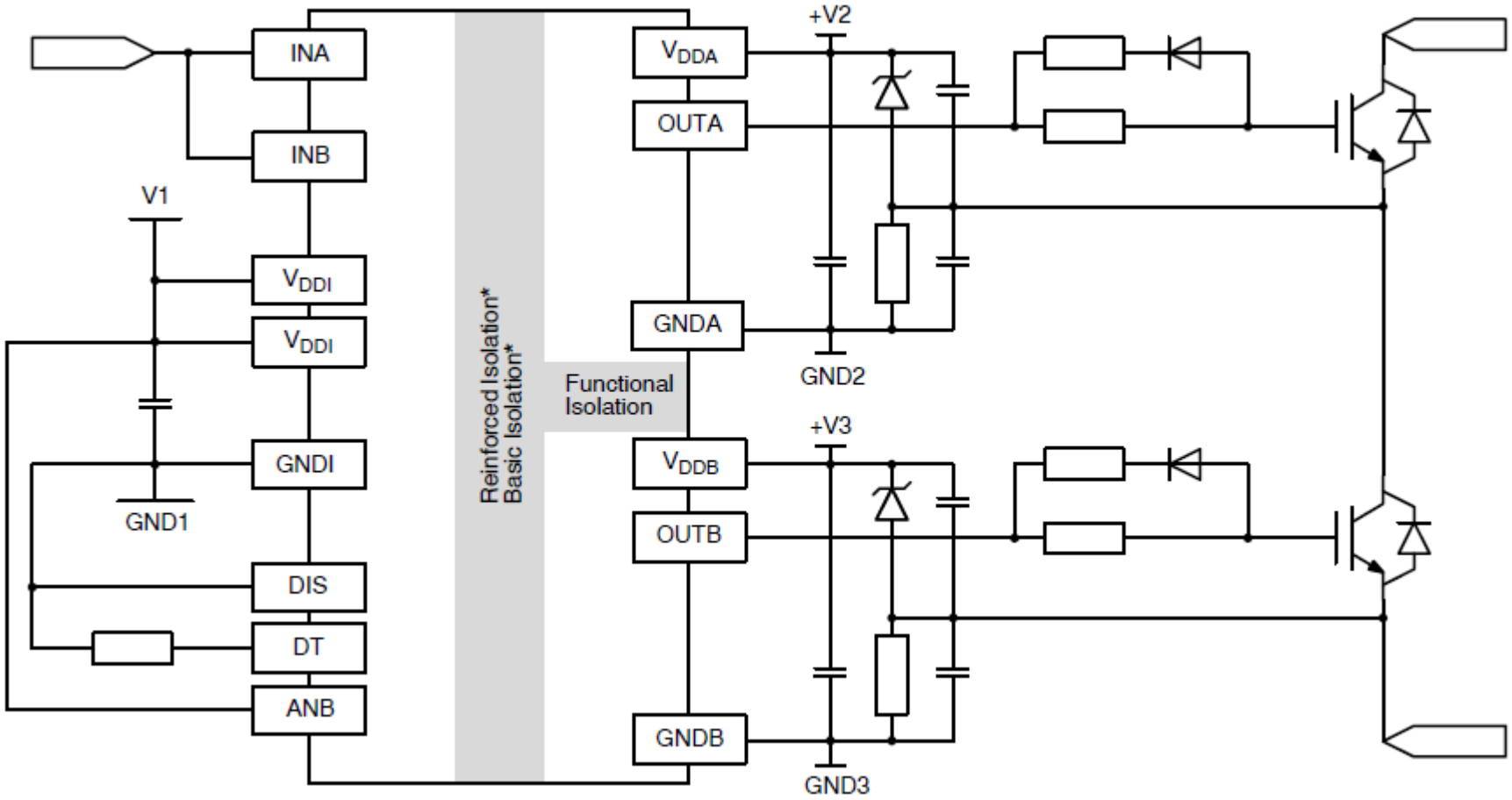
NCD 57252

Half - Bridge setup with **ADDED DEADTIME**



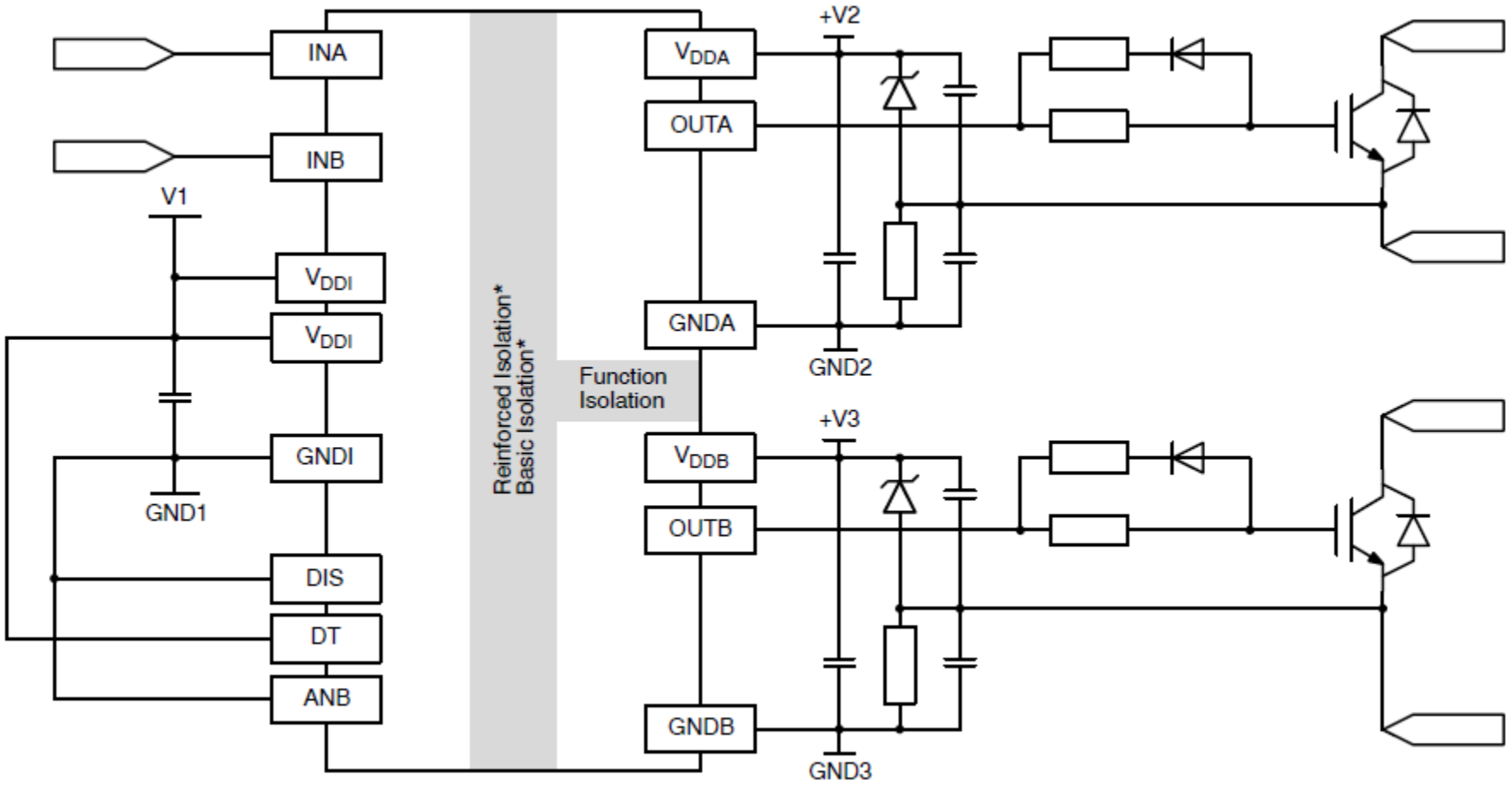
NCD 57252

Half - Bridge setup with **ADDED DEADTIME** and use single input signal (ANB function)



NCD 57252

TWO independent channels setup



NCD 57252 Evaluation board

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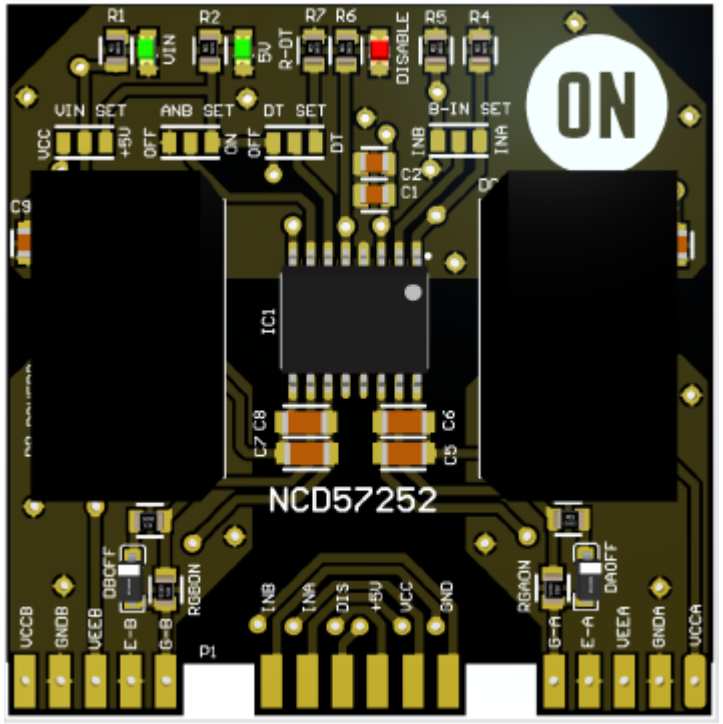
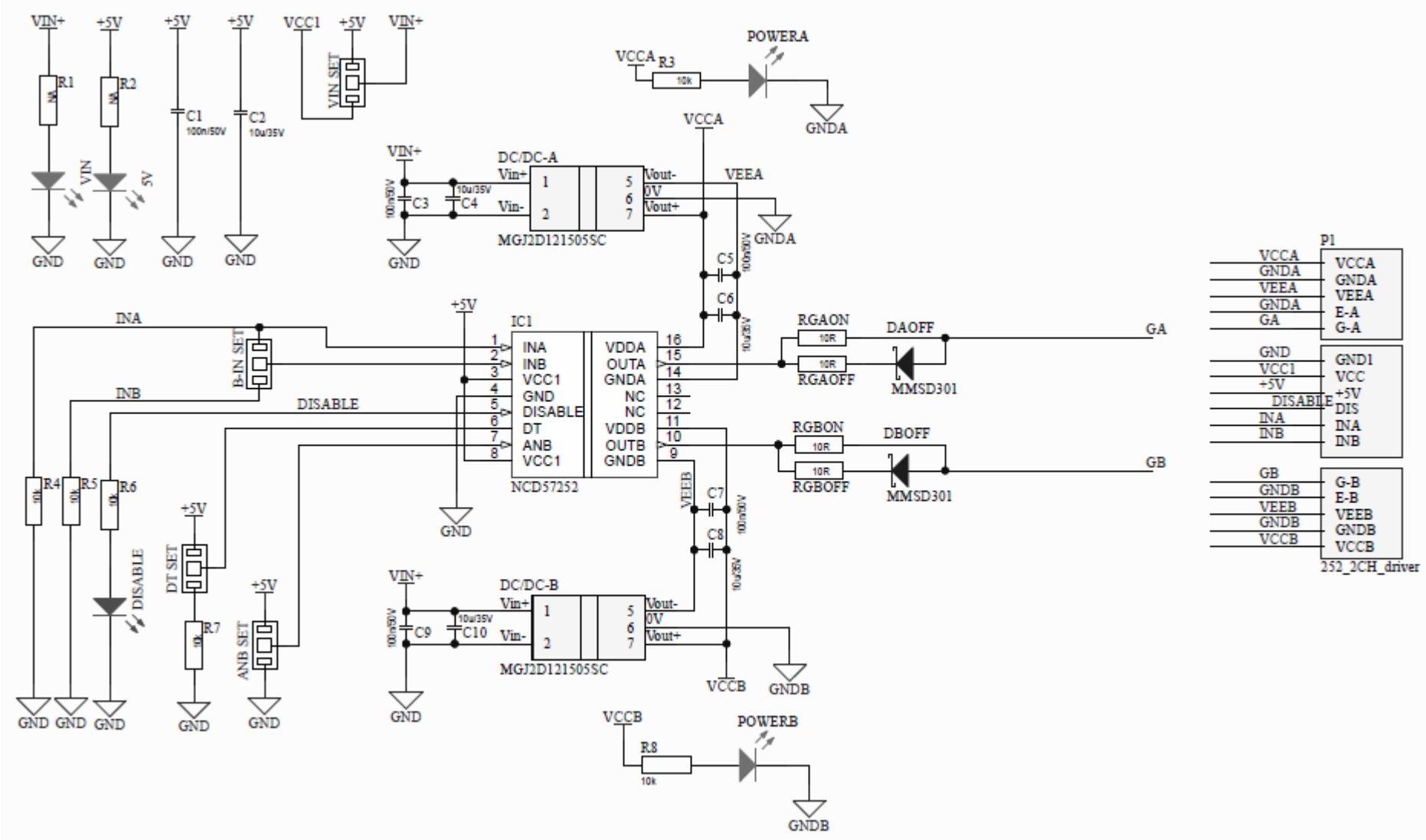
- All components for direct connection to power device
- DUT card symmetrical design reducing PCB area
- Simple configuration of input parameters
- Allows to Test Basic Datasheet Parameters
- All Parts TOP placed for easy access
- Reference PCB design
- On Board DC/DC sources (optional)



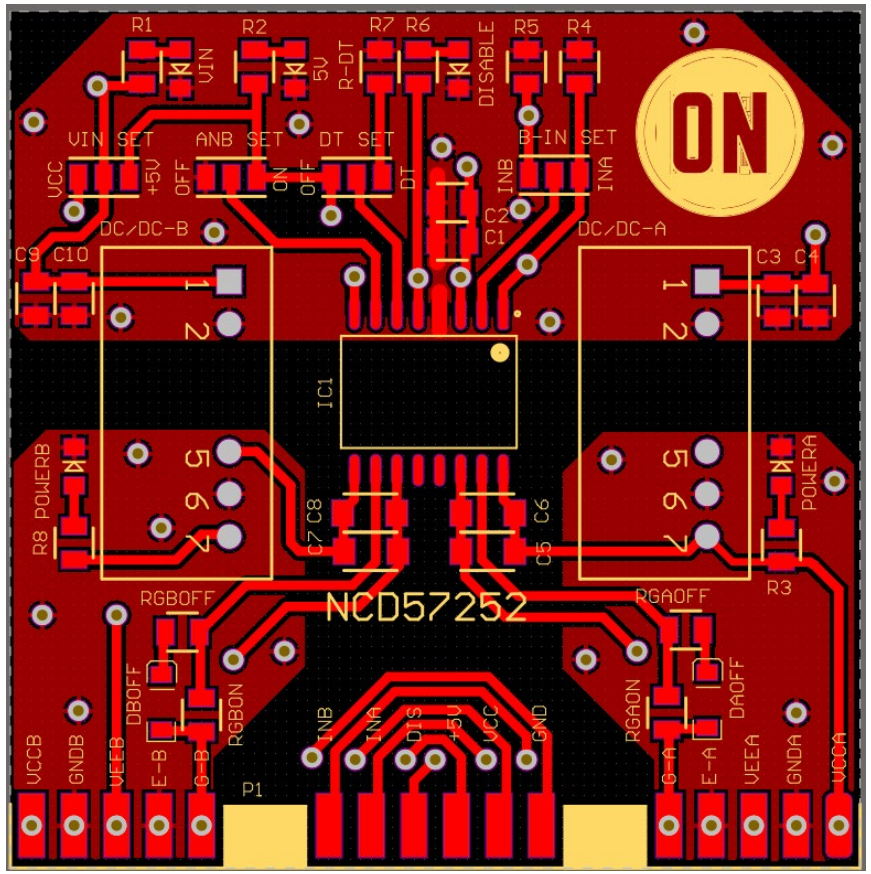
NCD 57252 Evaluation board

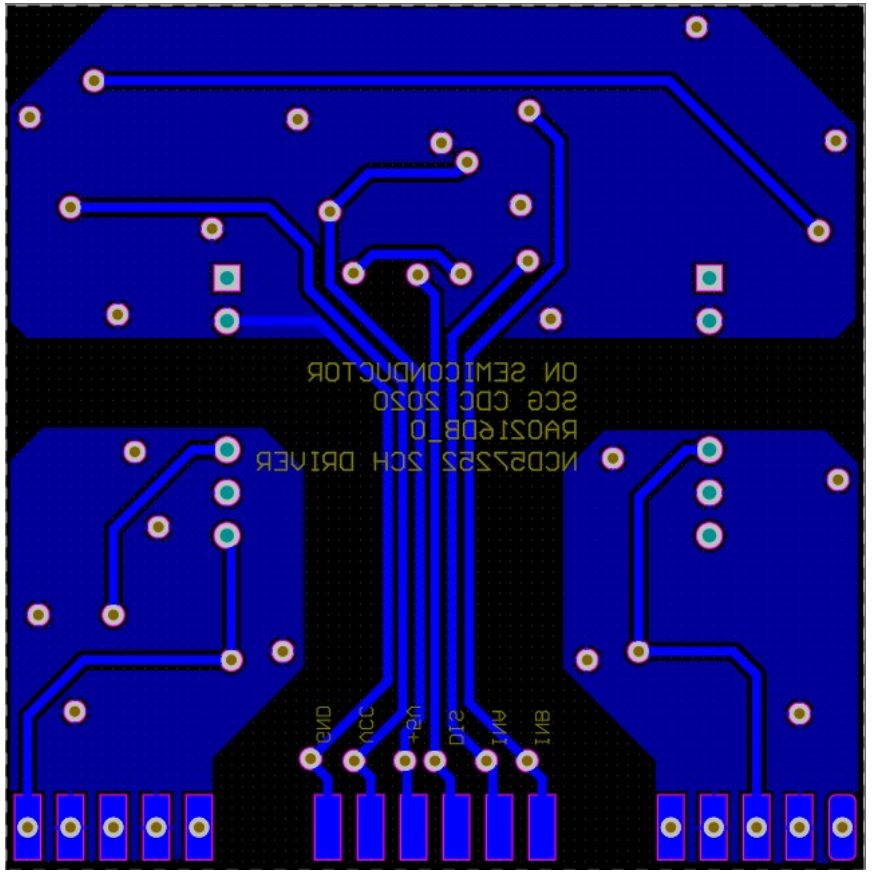
Evaluation Board Schematic



NCD 57252 Evaluation board

Evaluation board PCB Layout



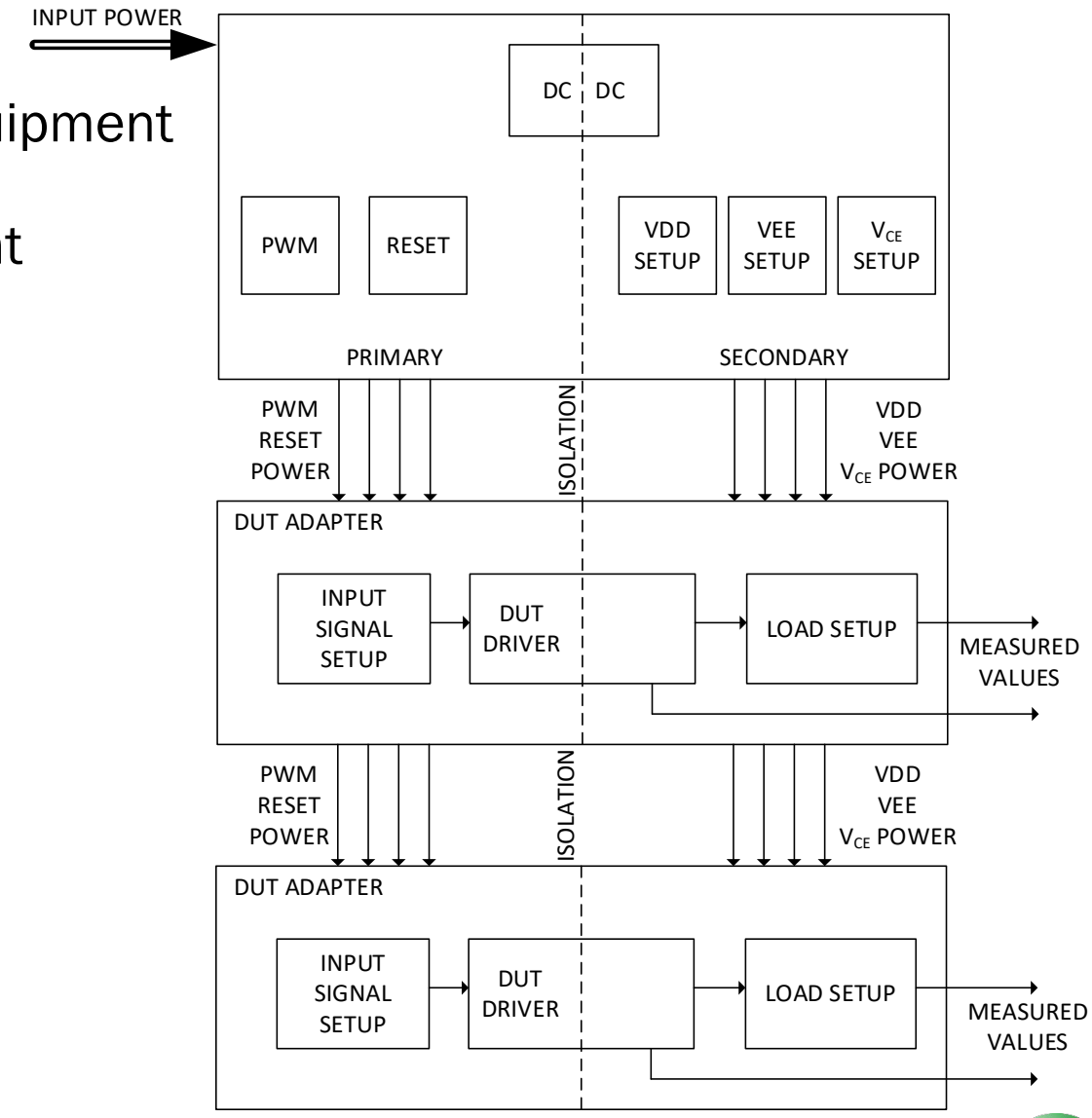


NCD 57252 Comparison board

- Designed to allows
  - Simple measurement without special equipment
  - Parameter comparison
  - Multi channel comparison / measurement
  - Functionality test
  - Features promotion

- Main Board provides
  - Adjustable power for IN/OUT side
  - Adjustable PWM input signal
  - Input / Control signals (PWM, RST, V_{CE})

- DUT board provides
  - Interface for tested device
  - Power & Load setup
  - Measurement setup

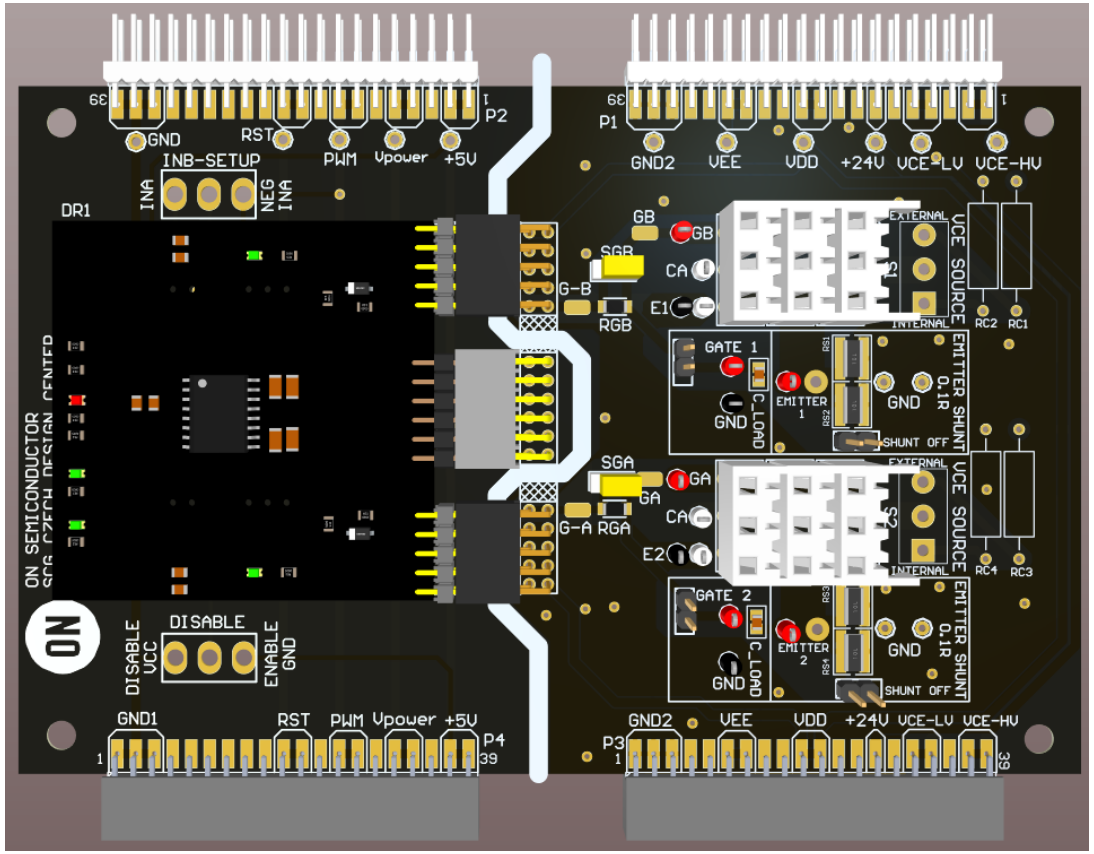


NCD 57252 Comparison board – Main Bord

- Powered by universal AC/DC adapter (9~18V)
- On-board primary side power source 5V
- On-board PWM generator 0.8~45kHz (50% Duty Cycle)
- On-board Reset signal source (Button switch with TTL 5V signal output)
- On-board DC/DC source ±24V for powering the secondary side
- Adjustable secondary side positive power source VDD (10 ~ 24V)
- Adjustable secondary side negative power source VEE (0V or -5 ~ -24V)
- Adjustable VCE power source (VDD or 24V)
- External VCE power source possibility (External input up to 200VDC)

NCD 57252 Comparison board – DUT adapter

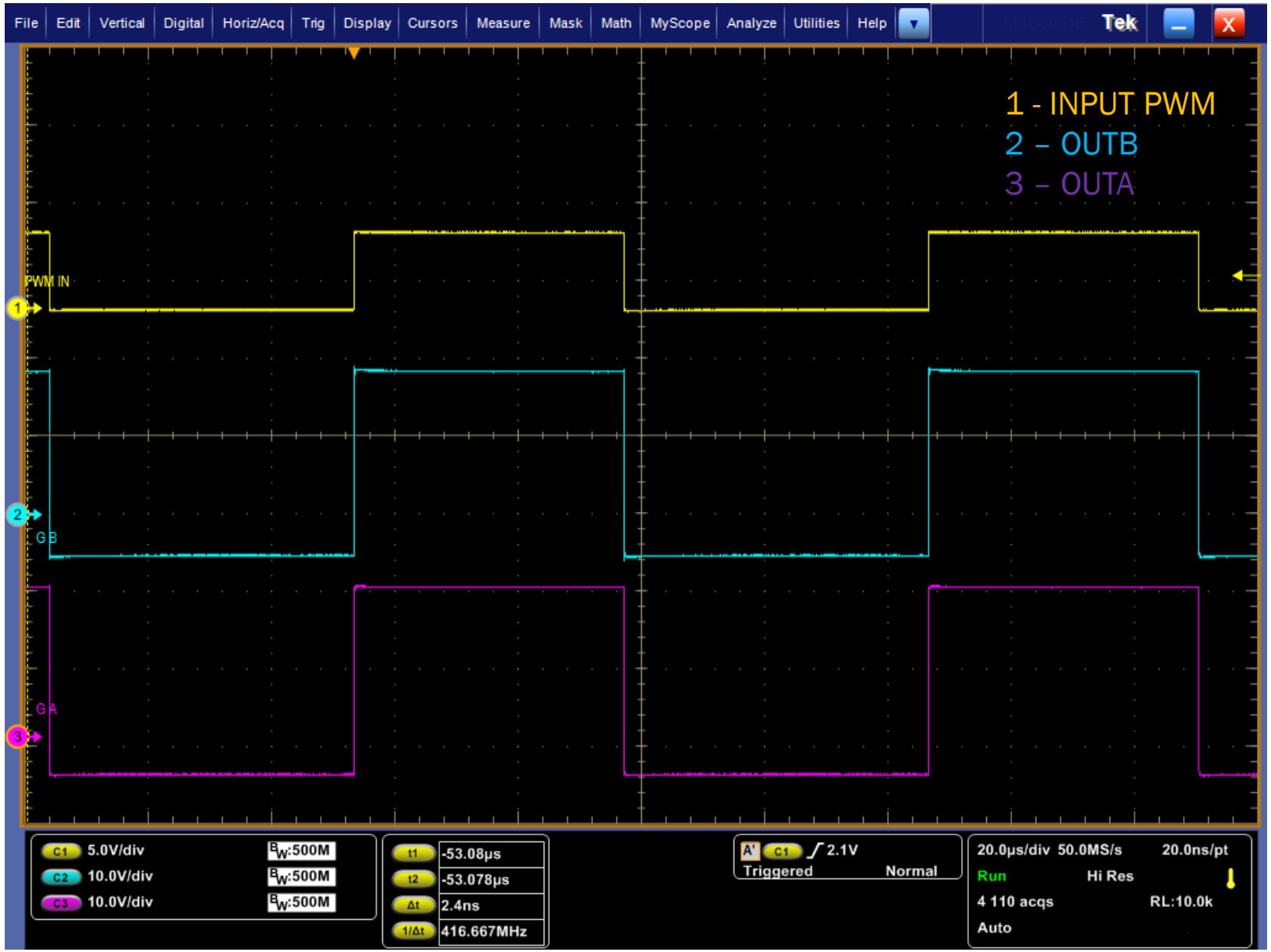
- NCD57252 2CH board interface
- 2 symmetrical channels
- DISABLE setup
- Complementary input signal generator
- LOAD setup
  - 100nF capacitor
  - up to 3 TO247-3L IGBT in socket
- SHUNT for gate current measurement
- Gate resistor setup (0R / 10R)
- V_{CE} power setup for IGBT (internal / external) up to 200V



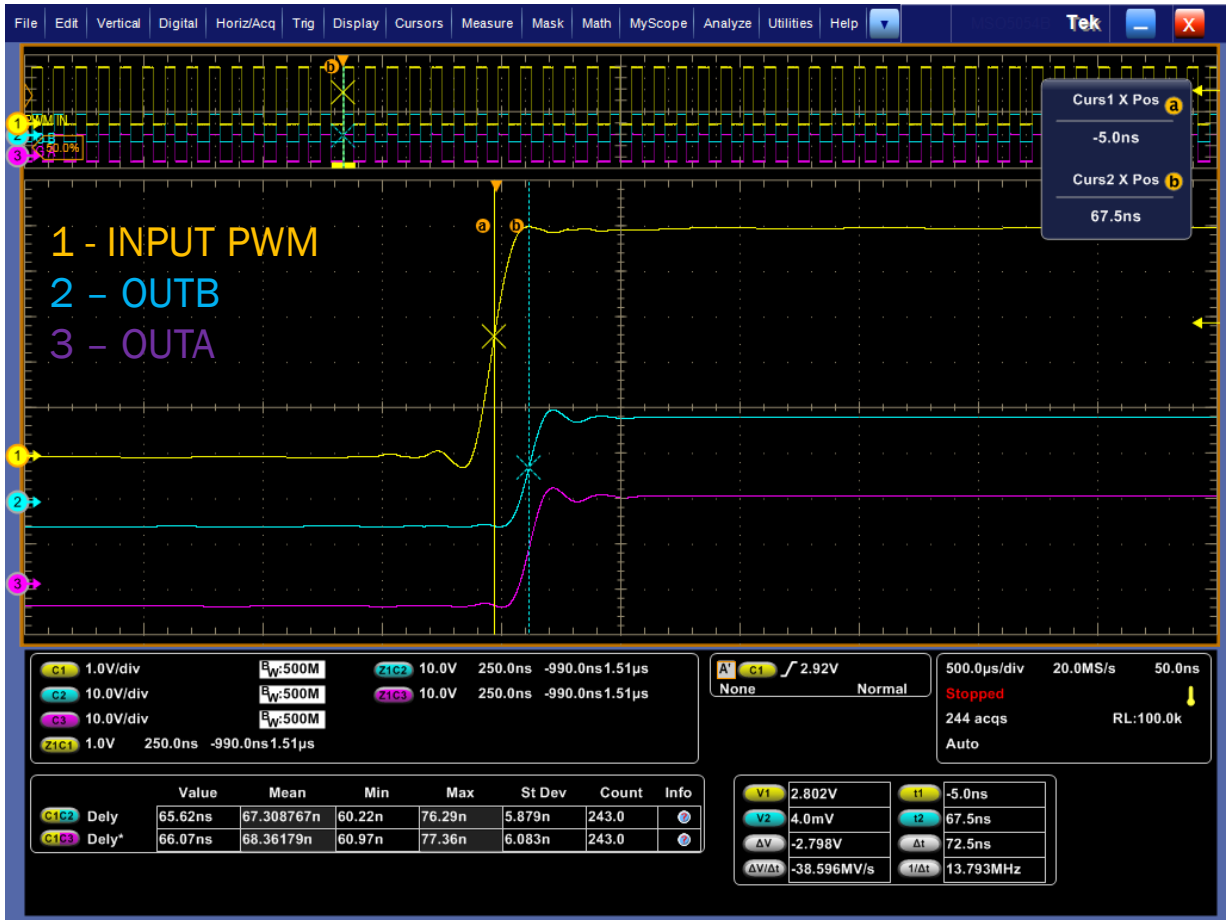
NCD 57252 Comparison board

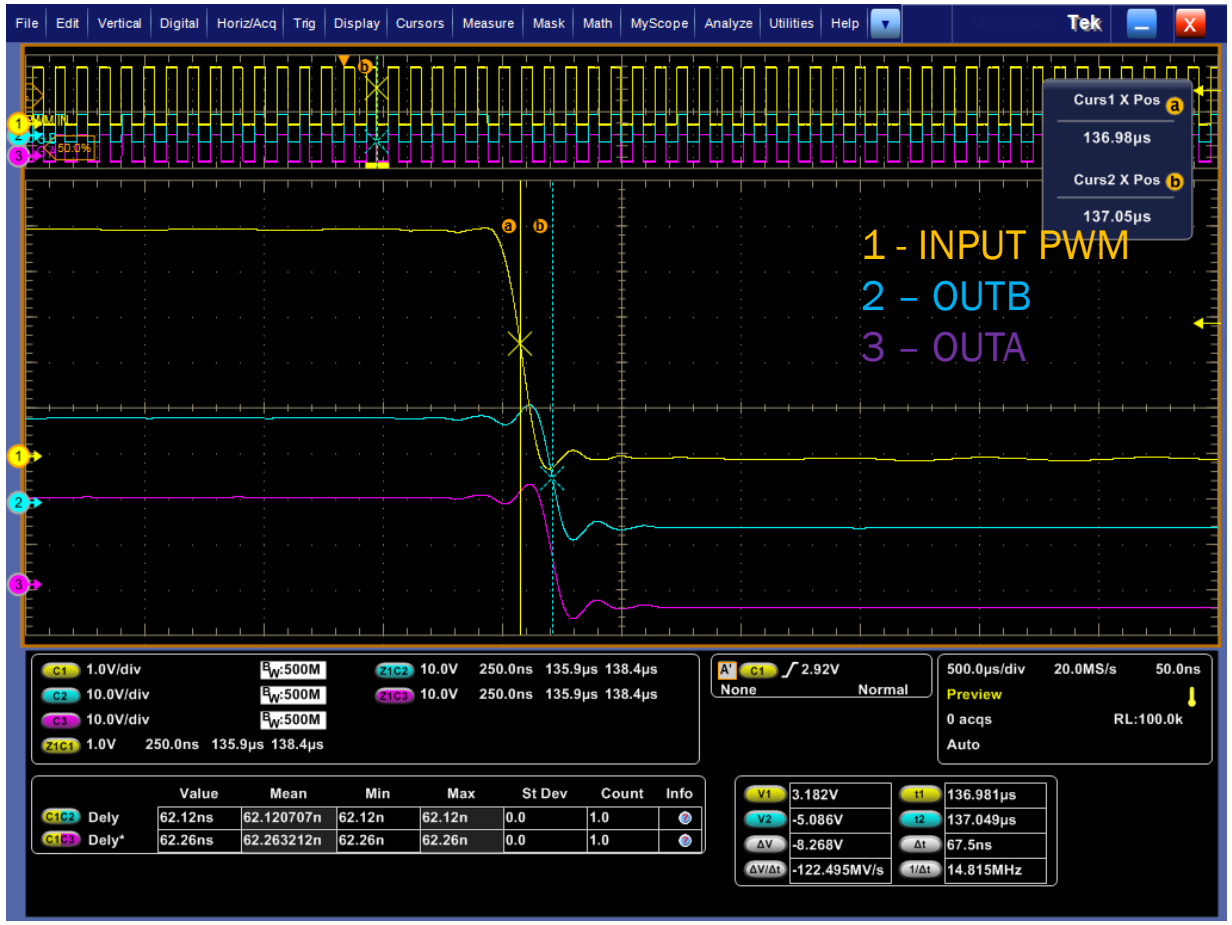
Real measurement data – Scope screens with main parameters

NCD 57252 Comparison board – Propagation delay



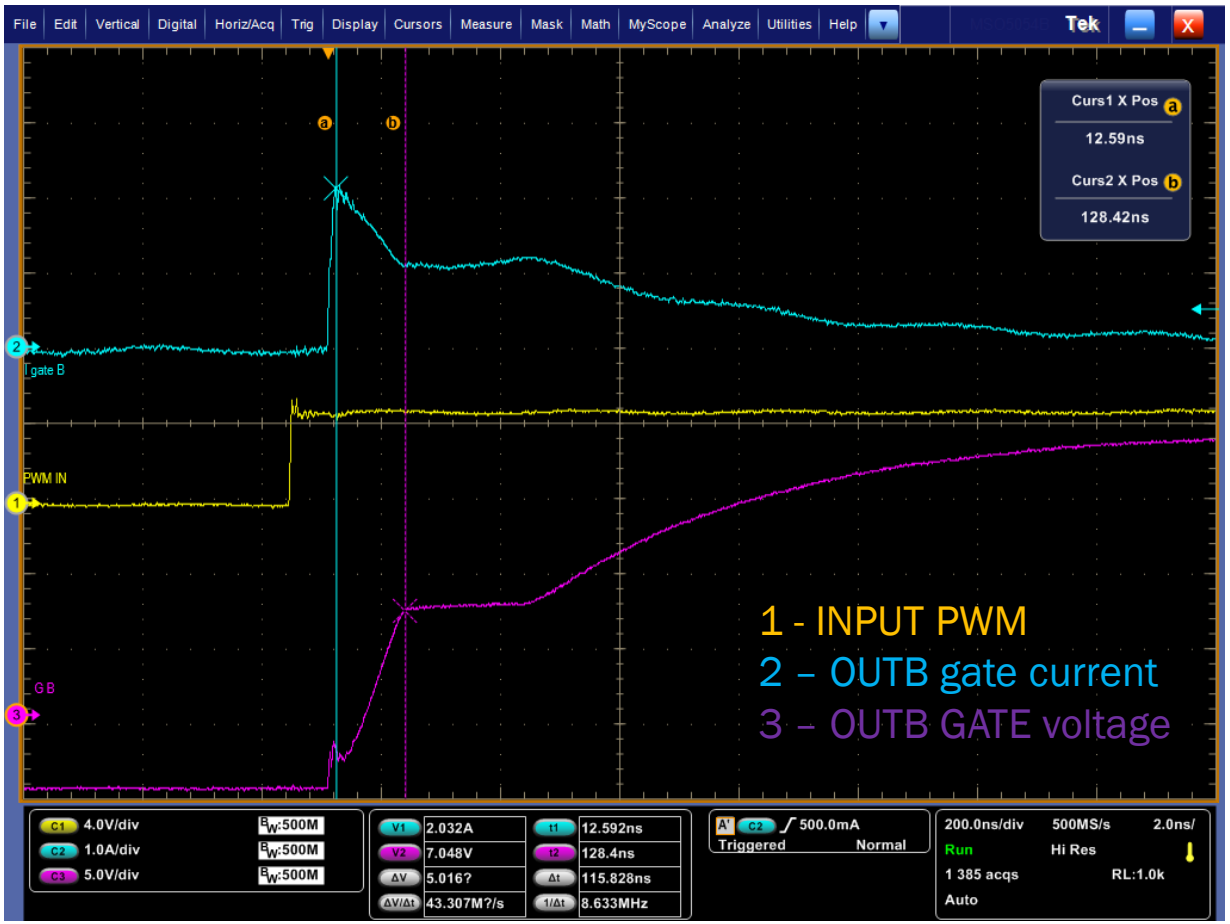
NCD 57252 Comparison board – Propagation delay

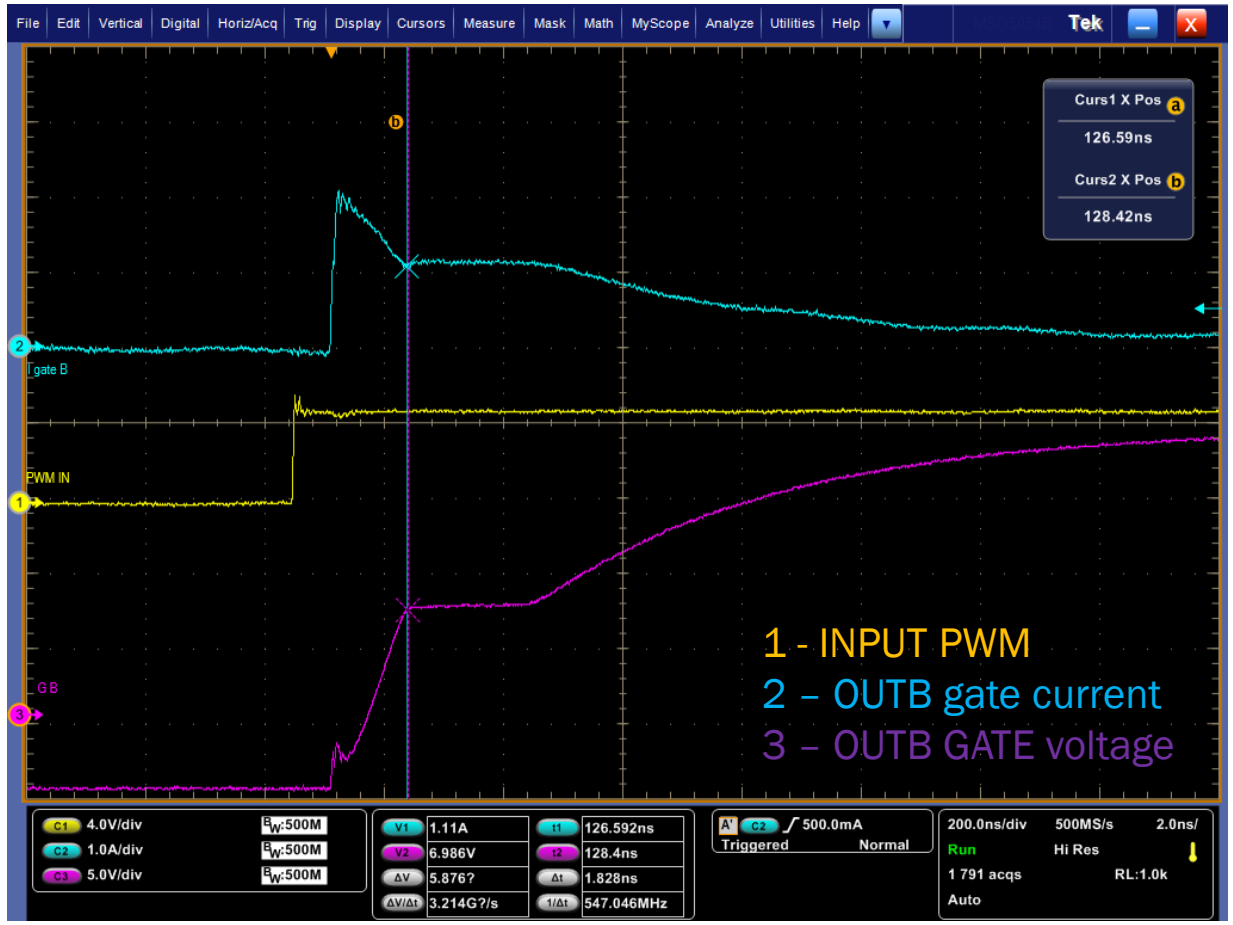




Same propagation delay for Turn-ON / Turn-OFF ~60ns

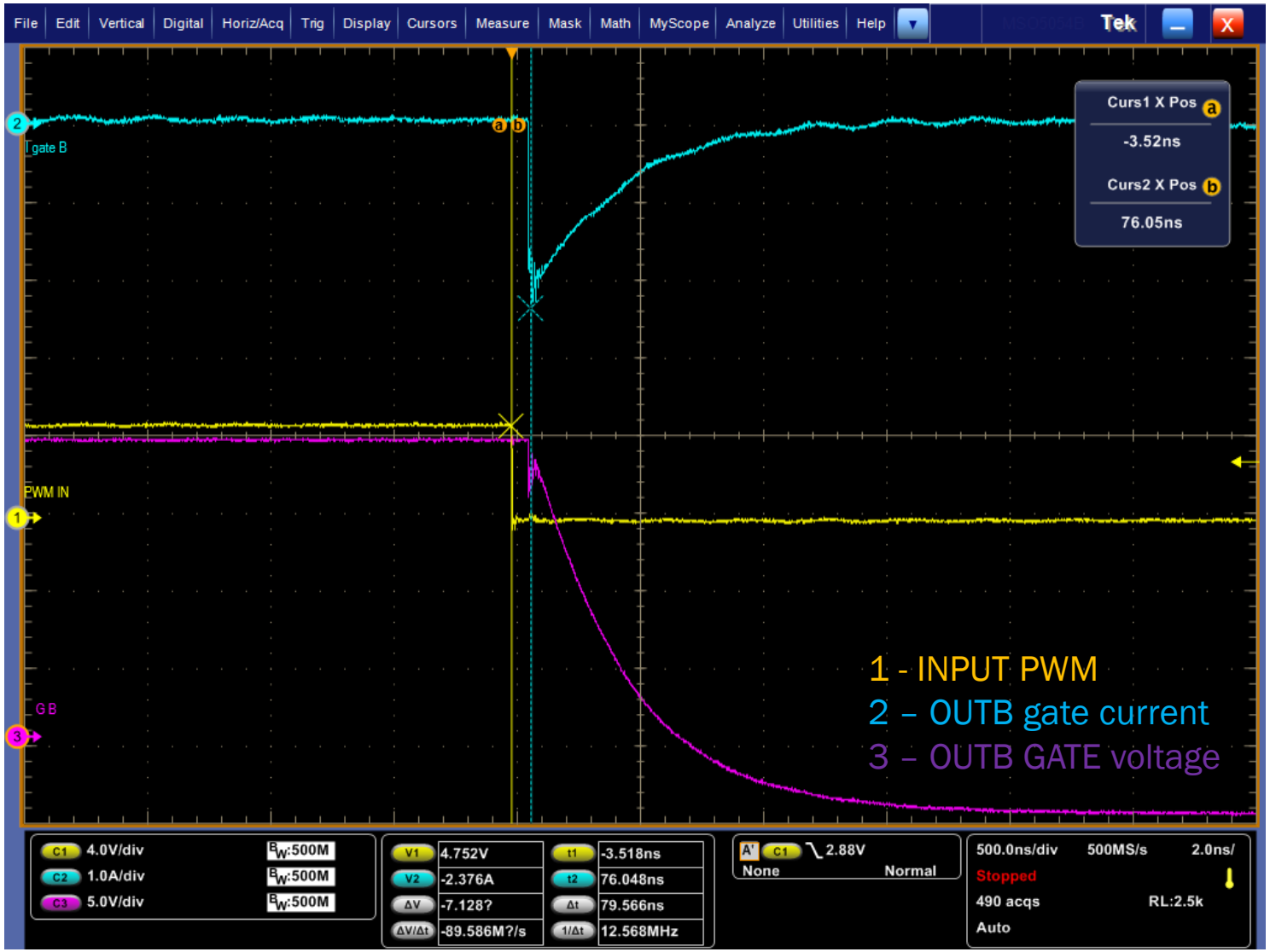
NCD 57252 Comparison board - Real IGBT Switching



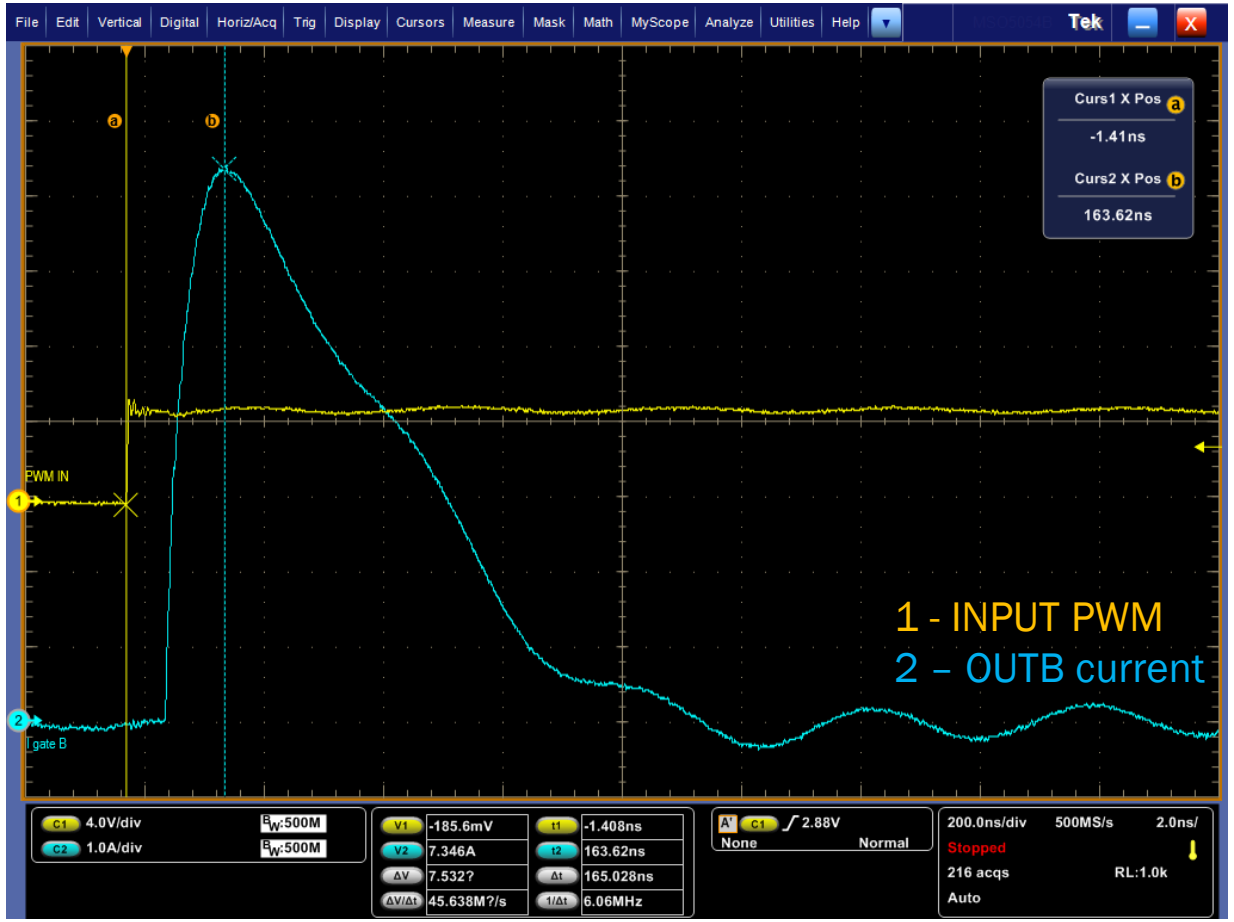


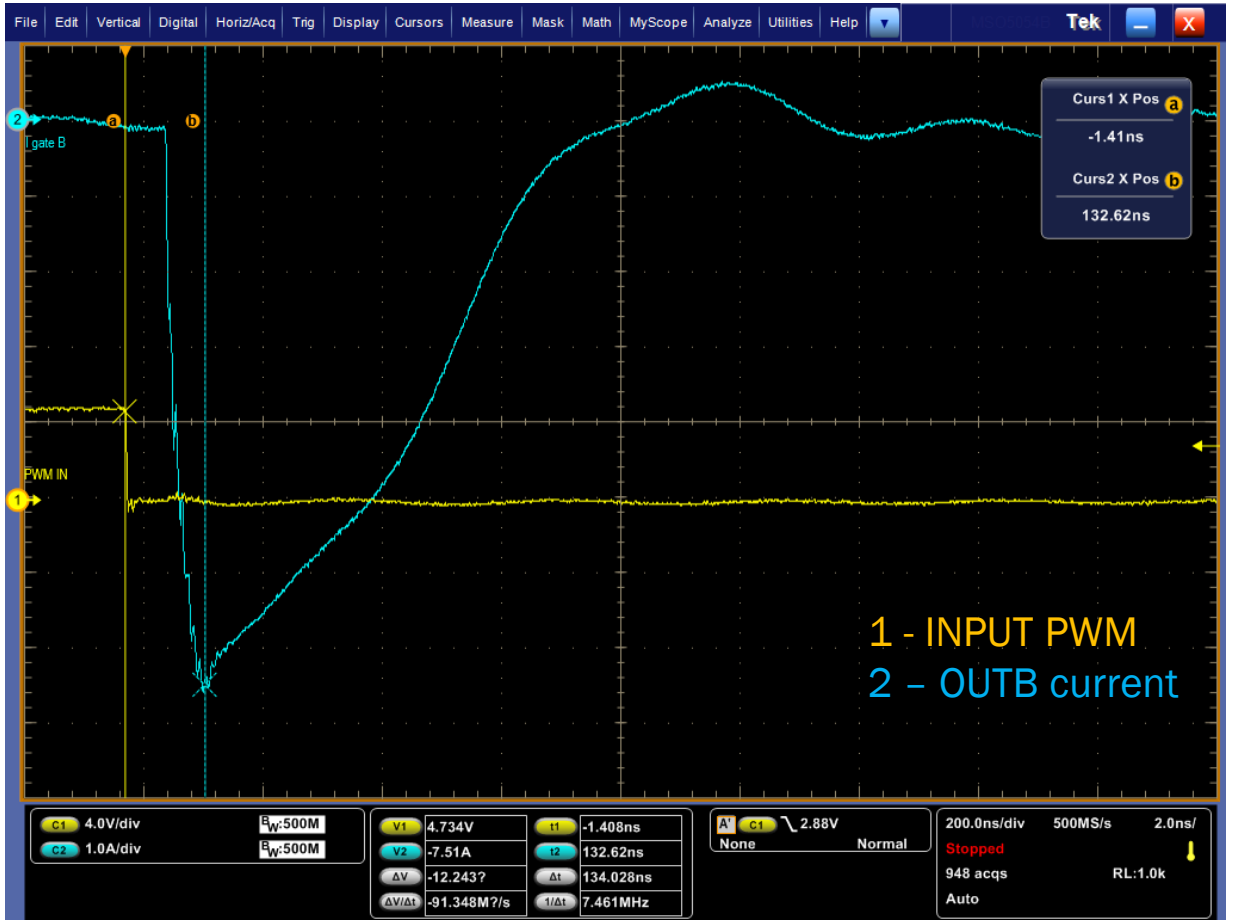
External load 3 pcs NGTB50N120FL2 in parallel with R_G = 10Ω
(Equivalent input capacitance 3 x 7.5nF)

NCD 57252 Comparison board
Real IGBT Switching – Turn OFF



NCD 57252 Comparison board – Output Peak Current

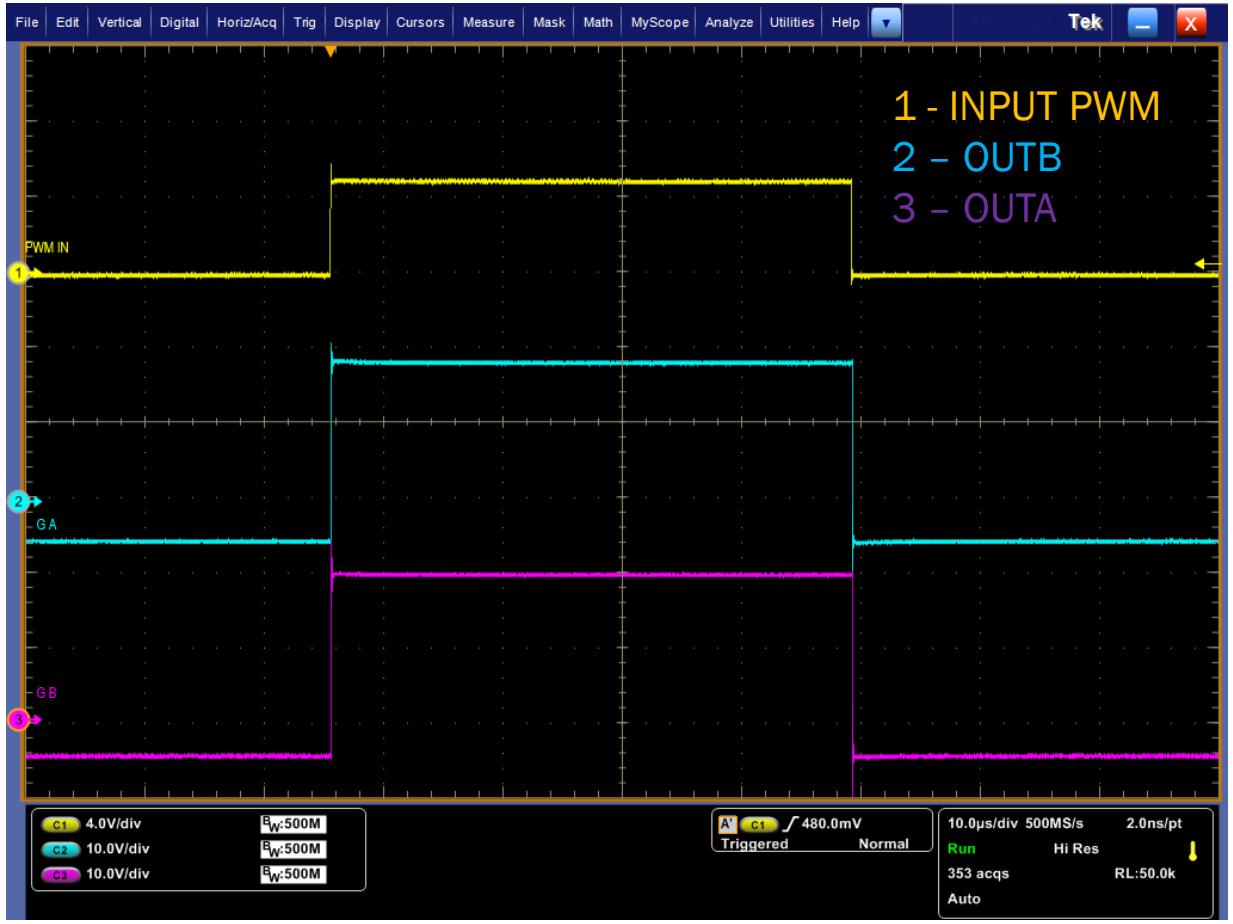


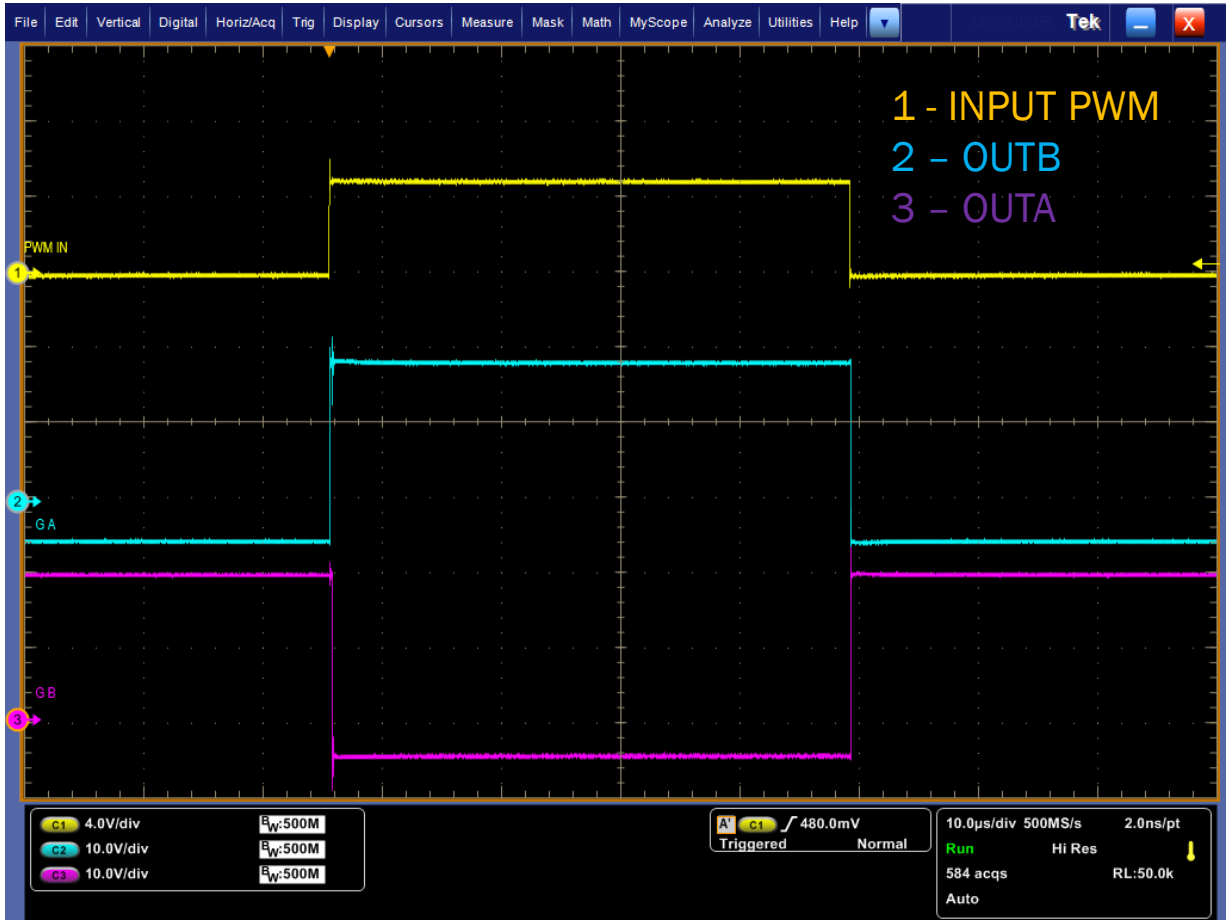


Hight Peak Current capability up to ±6.5A

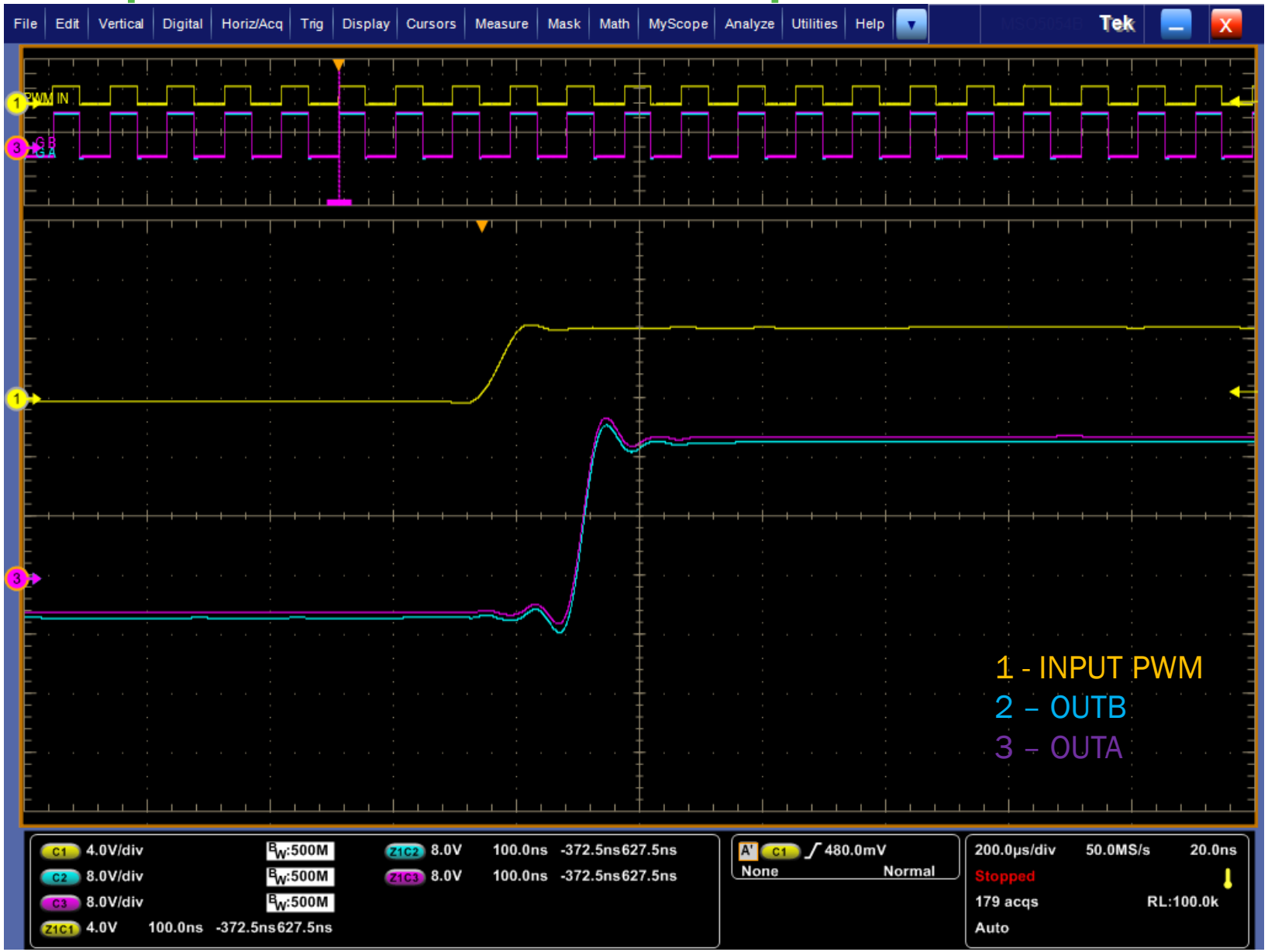
(Measured on 100nF Capacitive load, higher peak is caused by emitter shunt inductance)

NCD 57252 Comparison board – Two independent channels setup

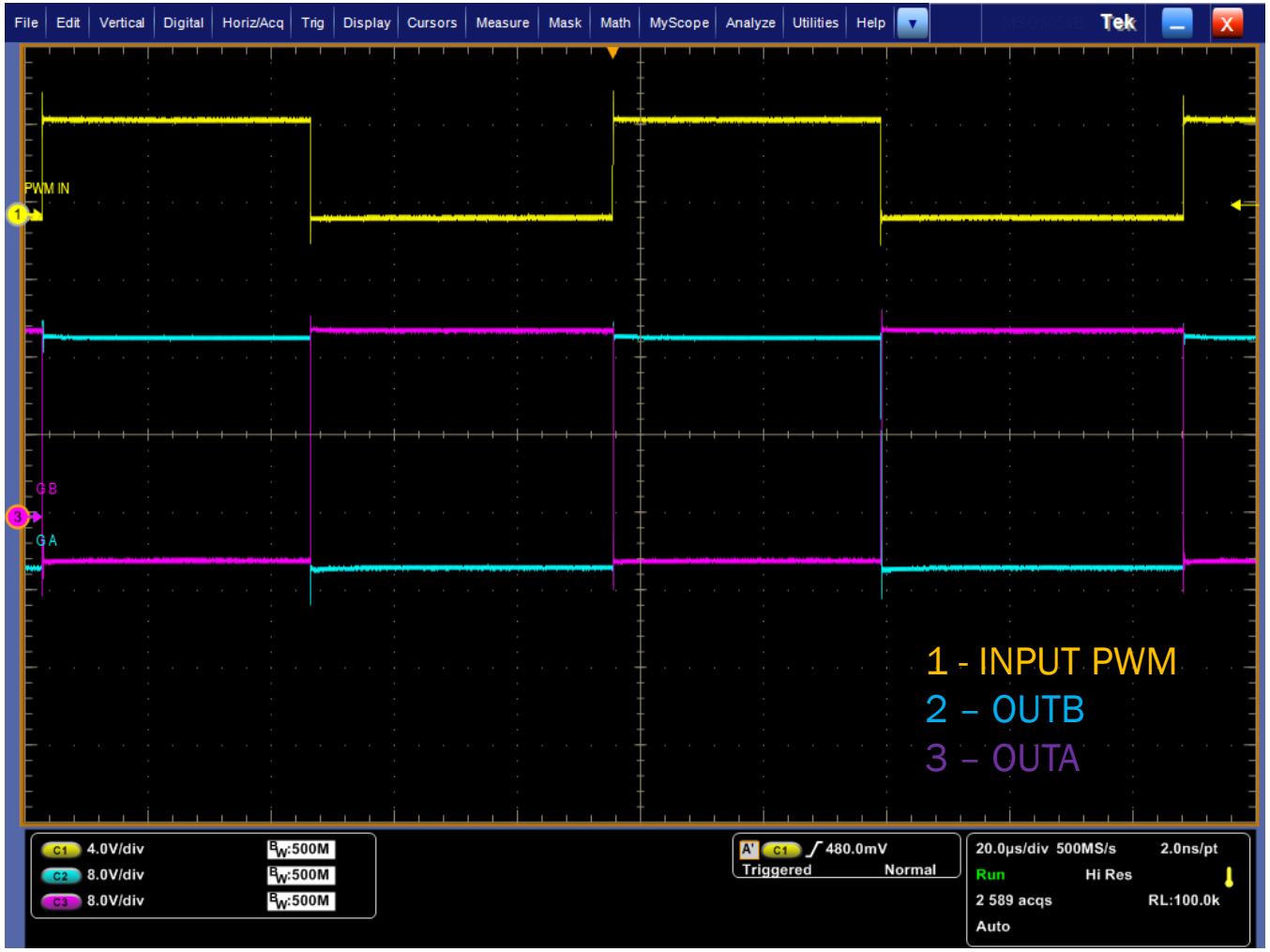




NCD 57252 Comparison board – Two independent channels setup

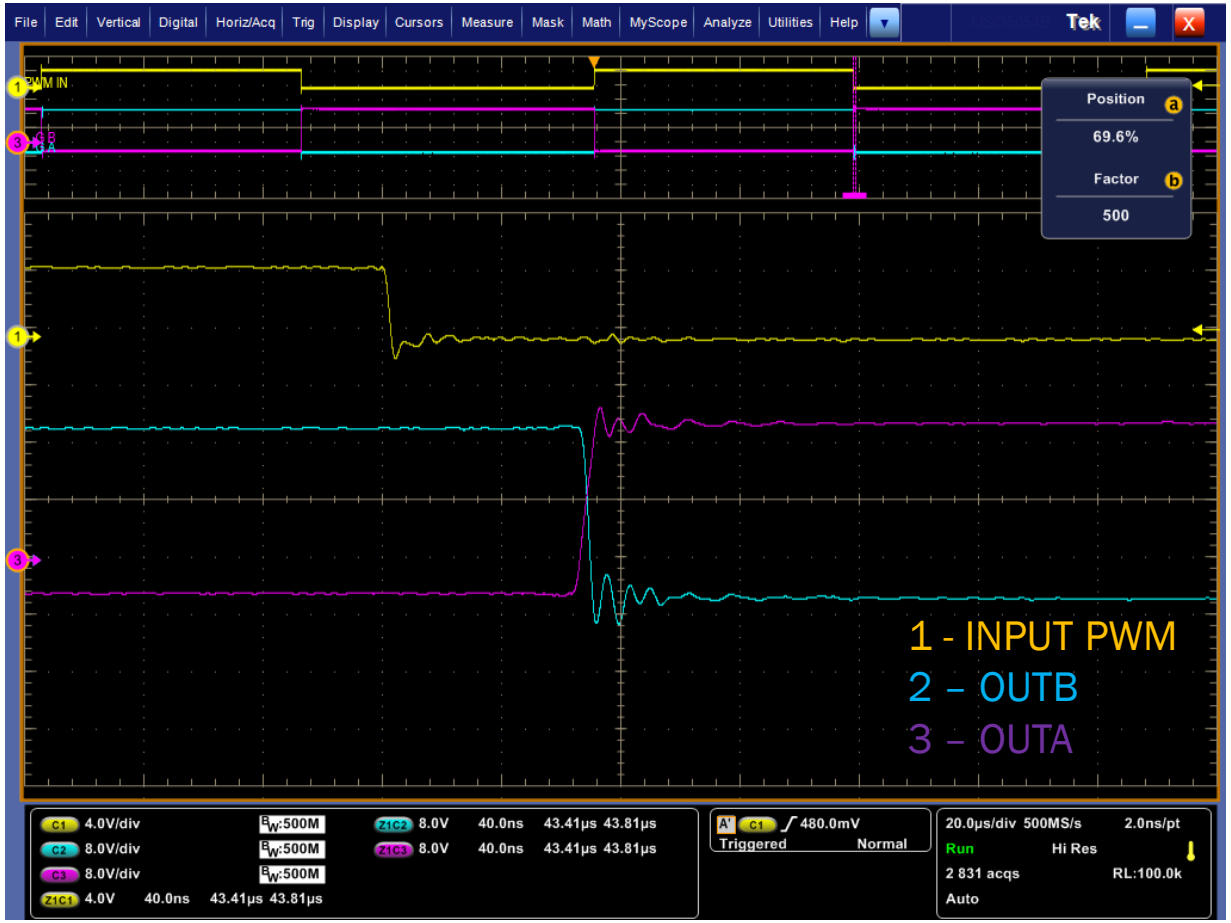


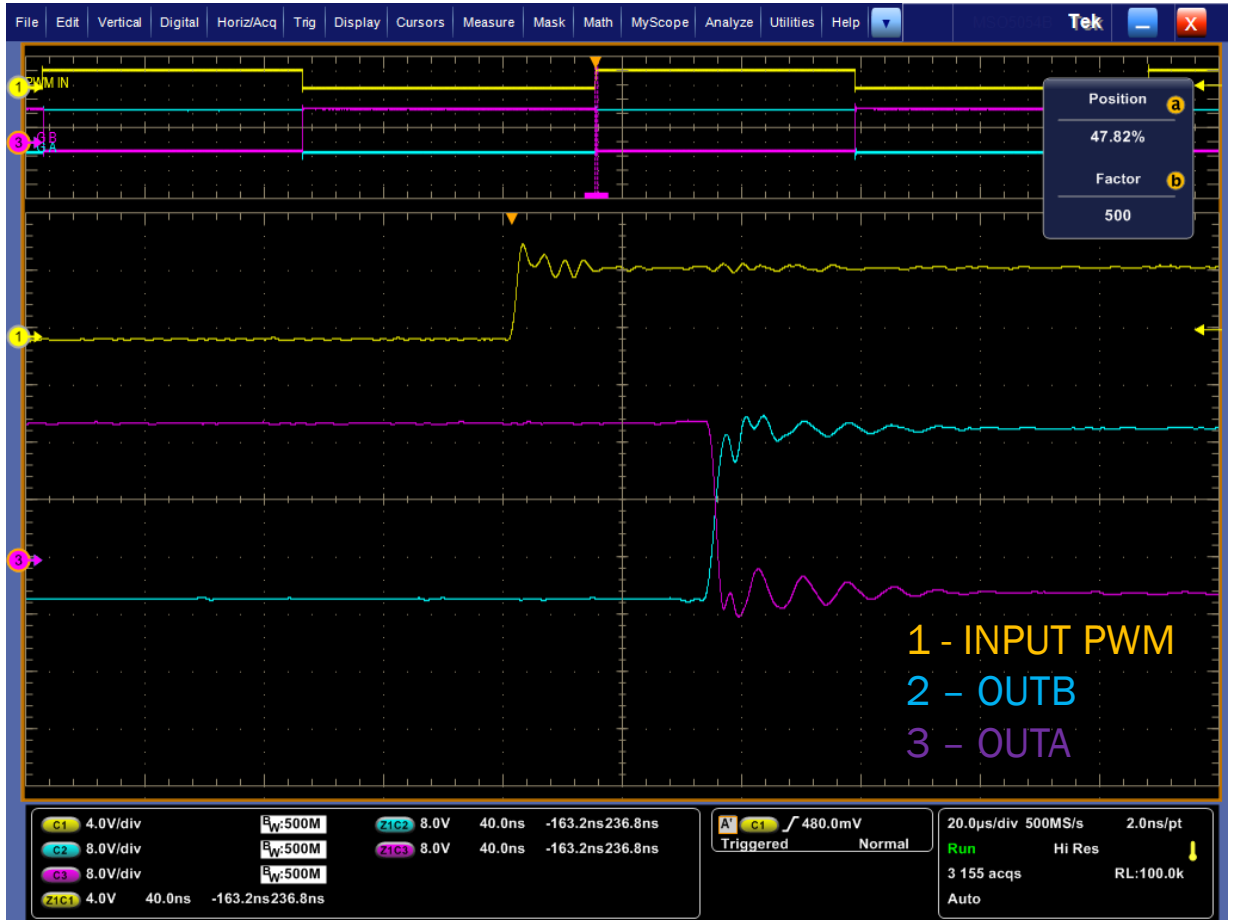
NCD 57252 Comparison board
Complementary outputs generated from single input – ANB function



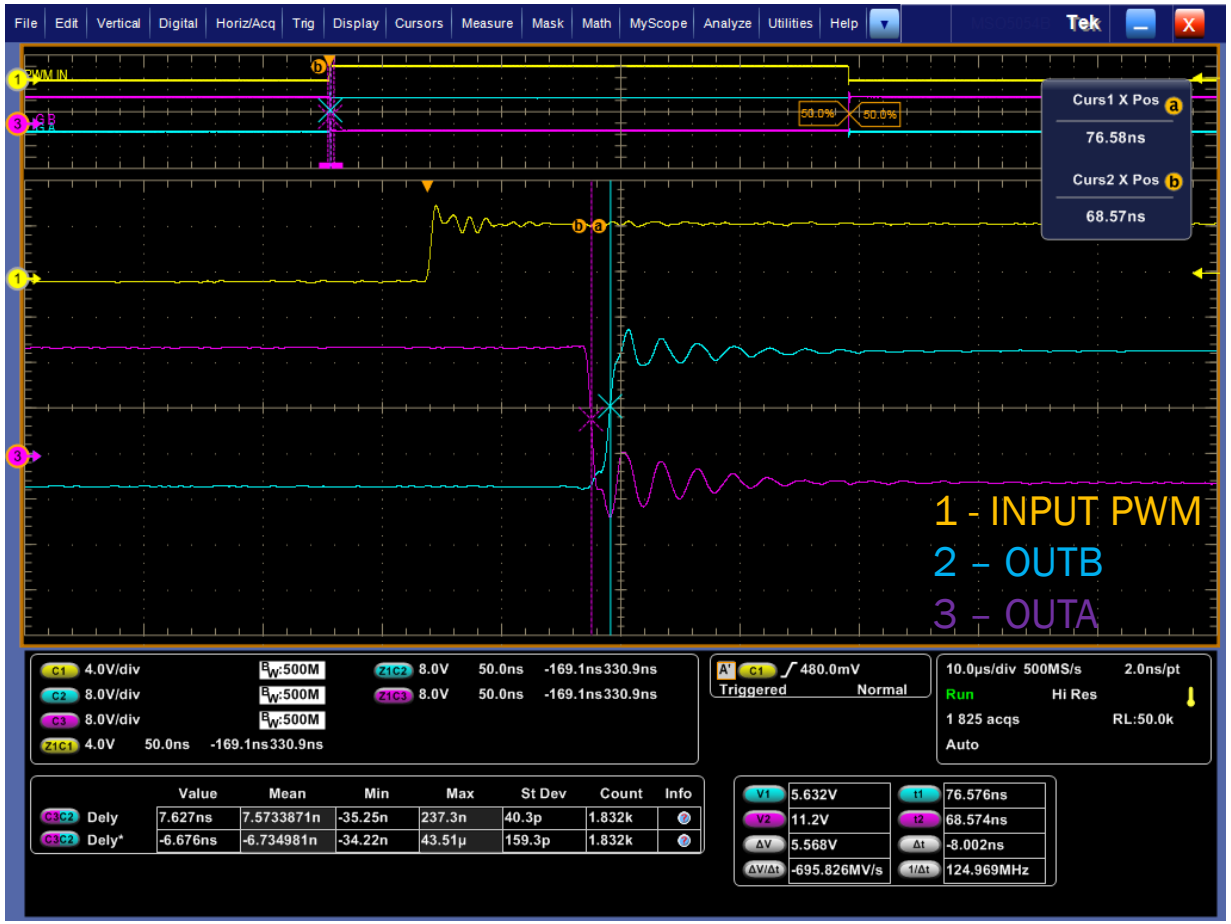
Two output signals are generated from simgle input signal

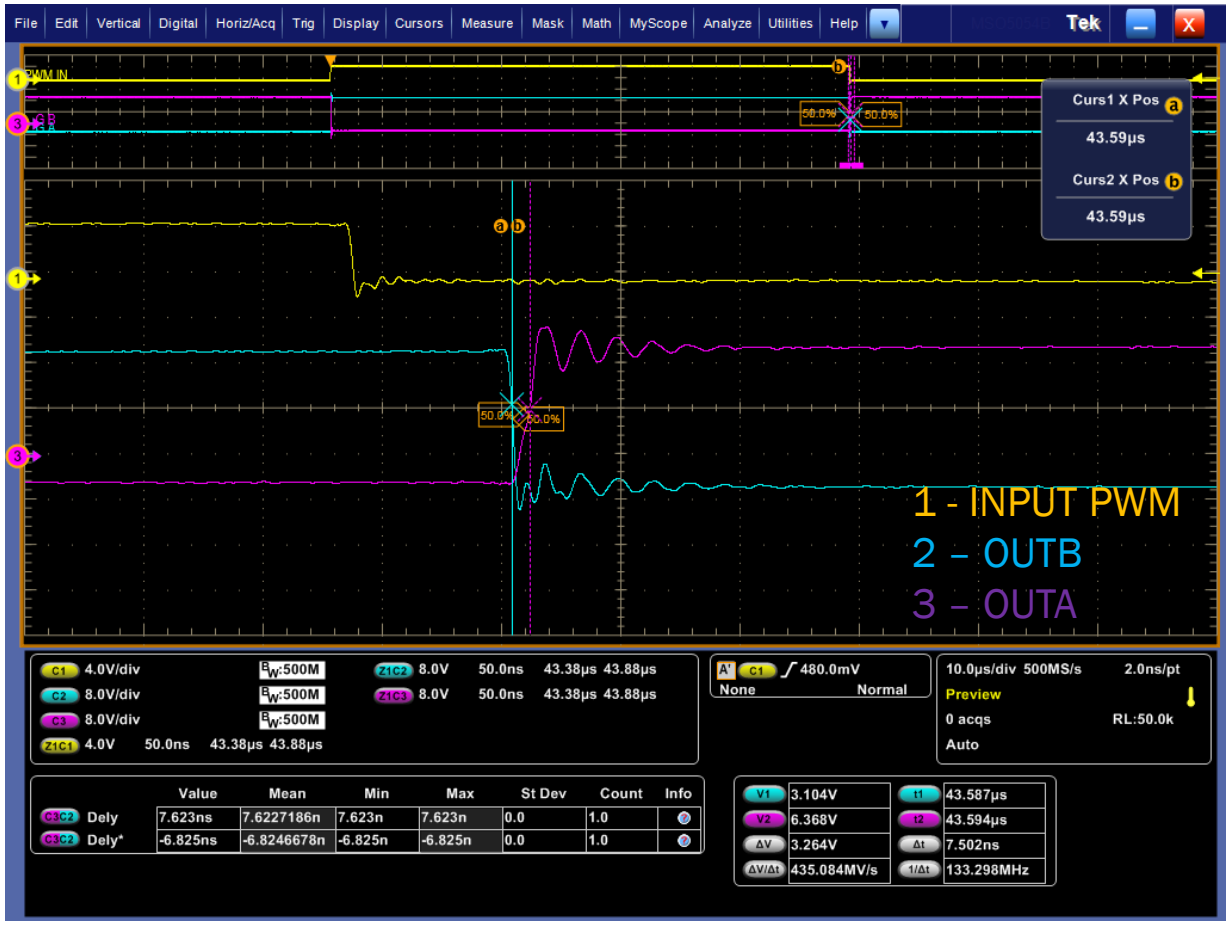
NCD 57252 Comparison board
Complementary outputs generated from single input – ANB function





NCD 57252 Comparison board
Added Guaranted mimium Deadtime

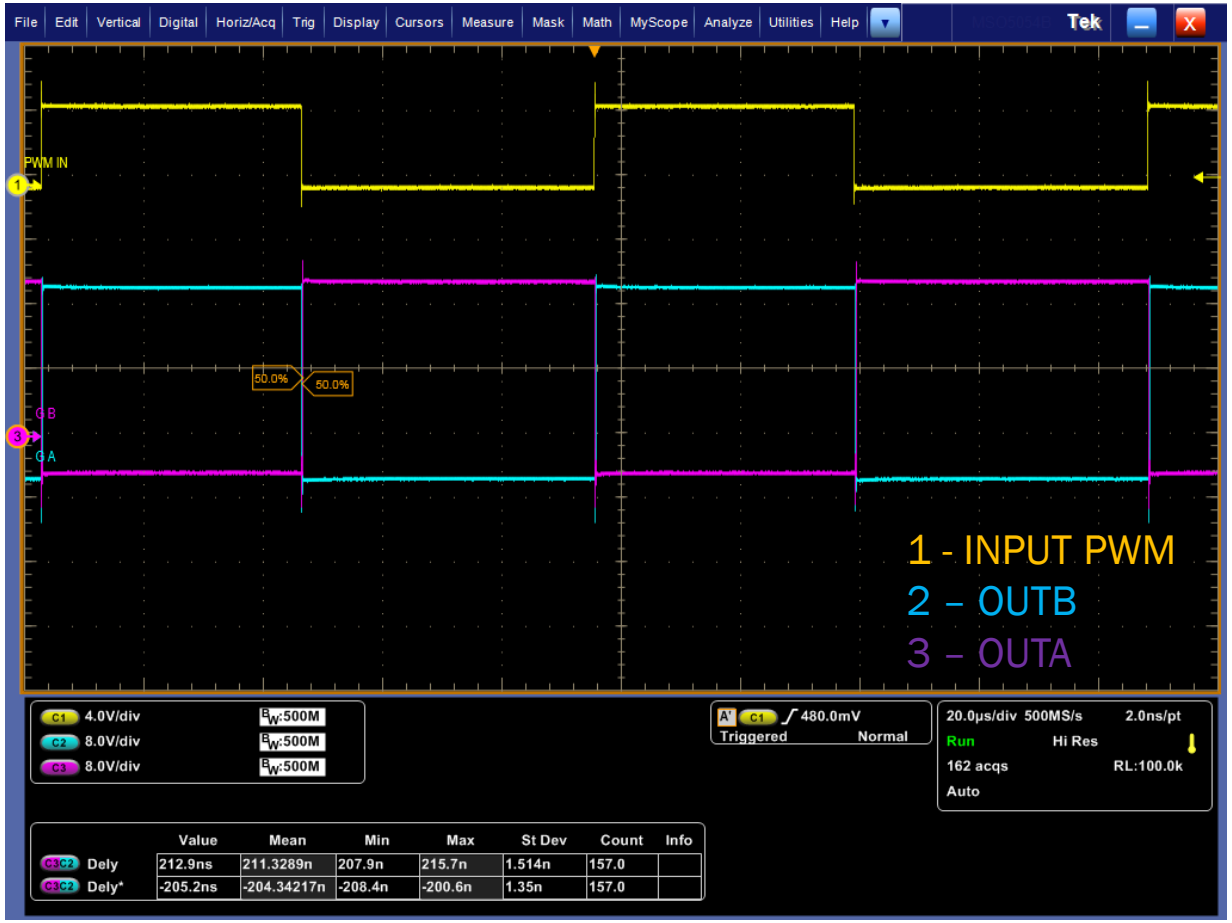


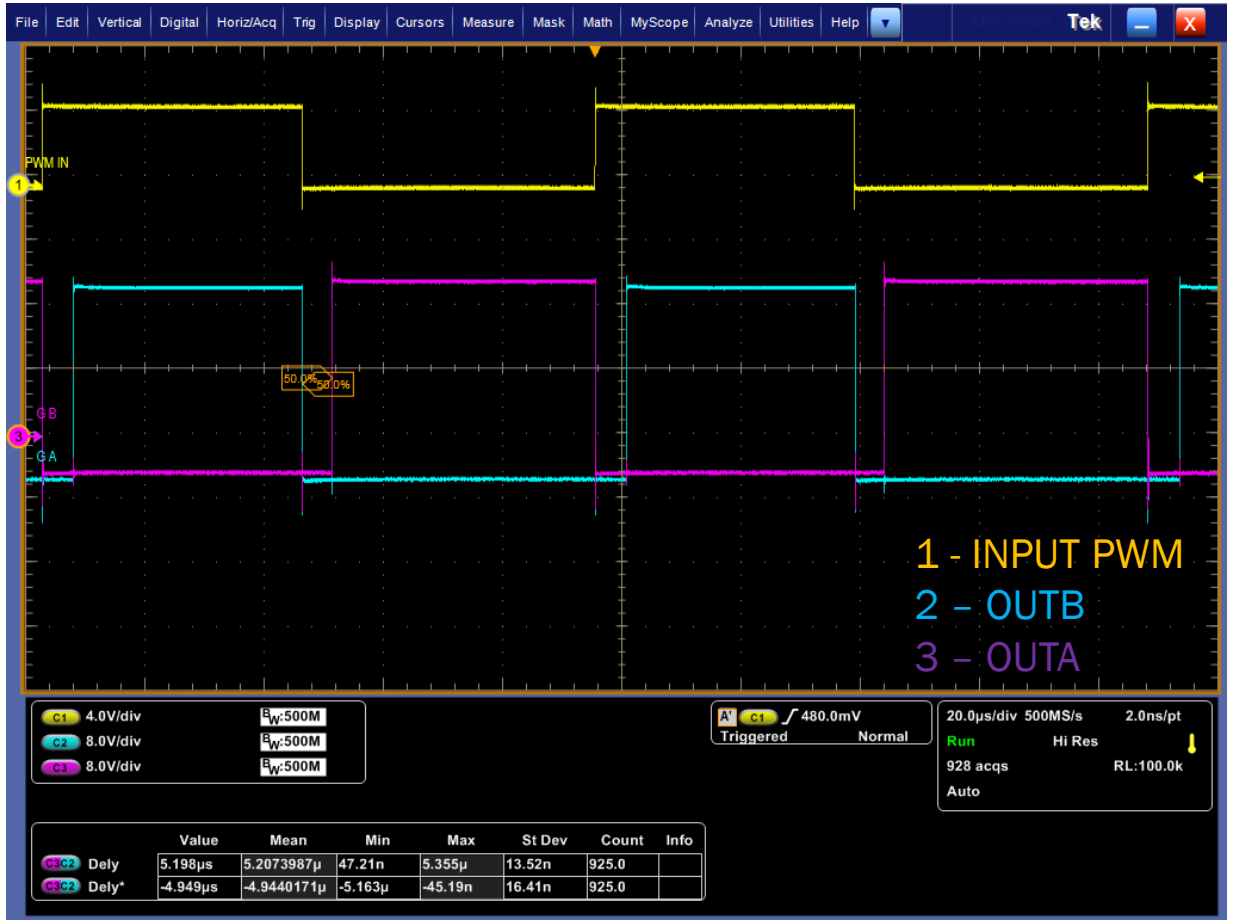


The driver can provide minimal guaranted deadtime ~10ns

Can be used as cross condution protection agains against deadtime of the input signal or in case of interference

NCD 57252 Comparison board
Added Guaranted adjustable Deadtime





External deadtime resistor

20kΩ = 200ns

500kΩ = 5us

THANK YOU

Annexes

Evaluation board and Comparison board test setup for previous results

NCD 57252 Comparison board - Propagation delay measurement

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = NEG INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = disconnected

DUT card

ANB SET = OFF

DT SET = OFF

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal)

PROBE 2 = DUT adapter GA test point / E2 (Output signal)

NCD 57252 Comparison board – Output Peak Current measurement

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = NEG INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = connected

DUT card

ANB SET = OFF

DT SET = OFF

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal)

PROBE 2 = DUT adapter SHUNT 2 probe socket (Gate Current)

NCD 57252 Comparison board – Two independent channels setup

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = INA or NEG INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = disconnected

DUT card

ANB SET = OFF

DT SET = OFF

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal – both channels)

PROBE 2 = DUT adapter GA / E2 (Output Channel A)

PROBE 3 = DUT adapter GB / E1 (Output Channel B)

NCD 57252 Comparison board
Two complementary output signals from sigle input signal (ANB setup)

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = disconnected

DUT card

ANB SET = ON

DT SET = OFF or DT

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal – both channels)

PROBE 2 = DUT adapter GA / E2 (Output Channel A)

PROBE 3 = DUT adapter GB / E1 (Output Channel B)

NCD 57252 Comparison board – Guaranted minimum DEADTIME setup

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = disconnected

DUT card

ANB SET = ON

DT SET = FLOAT

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal – both channels)

PROBE 2 = DUT adapter GA / E2 (Output Channel A)

PROBE 3 = DUT adapter GB / E1 (Output Channel B)

NCD 57252 Comparison board – Guaranted adjustable DEADTIME setup

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = OFF

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = NEG INA

SGA / SGB = ON (RG = 0Ω)

IGBT not assembled

C_LOAD = disconnected

DUT card

ANB SET = OFF

DT SET = DT

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal – both channels)

PROBE 2 = DUT adapter GA / E2 (Output Channel A)

PROBE 3 = DUT adapter GB / E1 (Output Channel B)

NCD 57252 Comparison board - Real IGBT switching

Main board

Primary (Input) setup

PWM = 15kHz

PWM setup = Internal generator

Secondary (Output) setup

VCE-LV SETUP = 24V

VDD SETUP = REG VDD = 15V

VEE SETUP = REG VEE = -5V

DUT adapter

DISABLE setup = Enable

INB setup = INA

SGA / SGB = OFF (RG = 10Ω)

IGBT assembled 3 pcs

C_LOAD = disconnected

DUT card

ANB SET = ON

DT SET = DT

(RGA/RGB assembled by 0 Ω)

VIN SET = +5V

B-IN SET = INB

Measurement setup

PROBE 1 = DUT adapter PWM test point / GND (Input signal – both channels)

PROBE 2 = DUT adapter GA / E2 (Output Channel A)

PROBE 3 = DUT adapter GB / E1 (Output Channel B)