N5100 UNIVERSAL SWITCHING BUFFER

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INTRODUCTION

The N5100 is a universal switching buffer with strong functions, specifically designed to drive the power MOSFET for the various switching topology applications, it allows to receive dual input signals from a push-pull controller, and transfer to provide total 4 driving outputs for directly driving dual N-channel and dual P-channel MOSFETs.

The N5100 is suitable for DC/DC converter or DC/AC inverter applications. It is operating in high efficiency ZVS control while used in the DC/AC application.

The N5100 provides 4 high current totem pole outputs that allow to be used on the multiple switching control application with single universal switching buffer.

BLOCK DIAGRAM

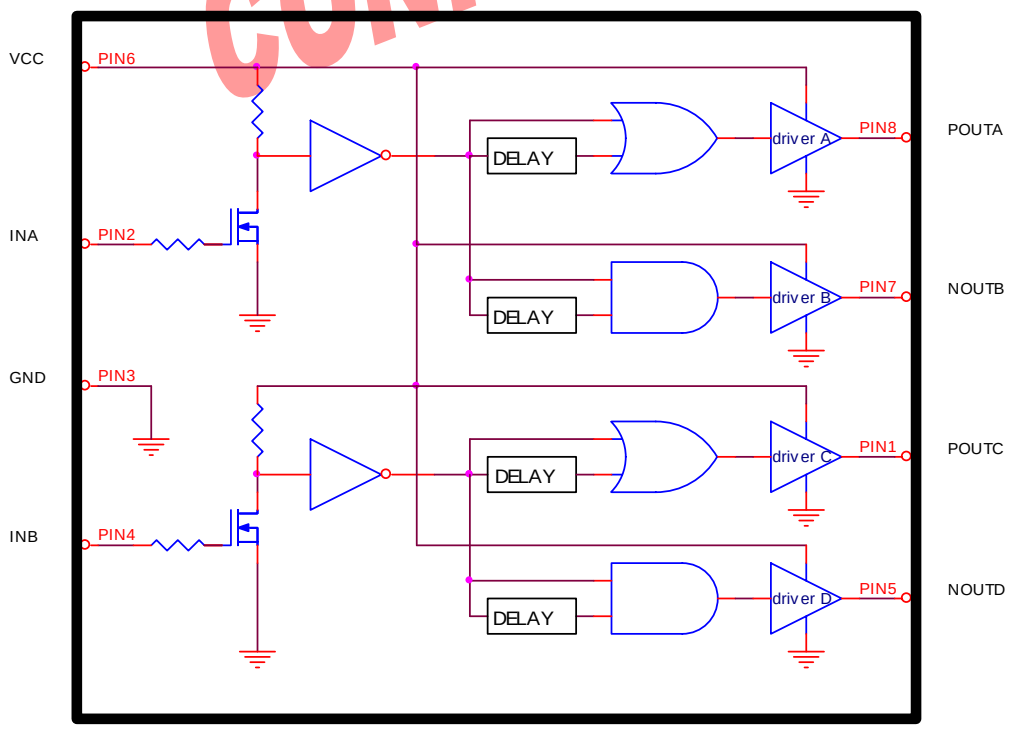


Fig 1 N5100 Function Block Diagram

PIN FUNCTIONS

POUTC (Pin 1) : The output of driver C that is driving the external P-channel MOSFET.

INA (Pin 2) : The control input A; TTL/CMOS compatible input.

GND(Pin 3) : The GND pin.

INB(Pin 4) : The control input B; TTL/CMOS compatible input.

NOUTD (Pin 5) : The output of driver D that is driving the external N-channel MOSFET.

VCC (Pin 6) : Supply voltage input.

NOUTB (Pin 7) : The output of driver B that is driving the external N-channel MOSFET.

POUTA (Pin 8) : The output of driver A that is driving the external P-channel MOSFET.

TYPICAL APPLICATION

1. PUSH-PULL APPLICATION

Fig 2 presents the N5100 for push-pull application, The N5100 provides large driving capability more than the push-pull PWM contrtoller outputs. It also provides the level shift function that let power MOSFETs work in higher driving level to reduce $R_{DS(ON)}$ for increasing the efficeincy of device.

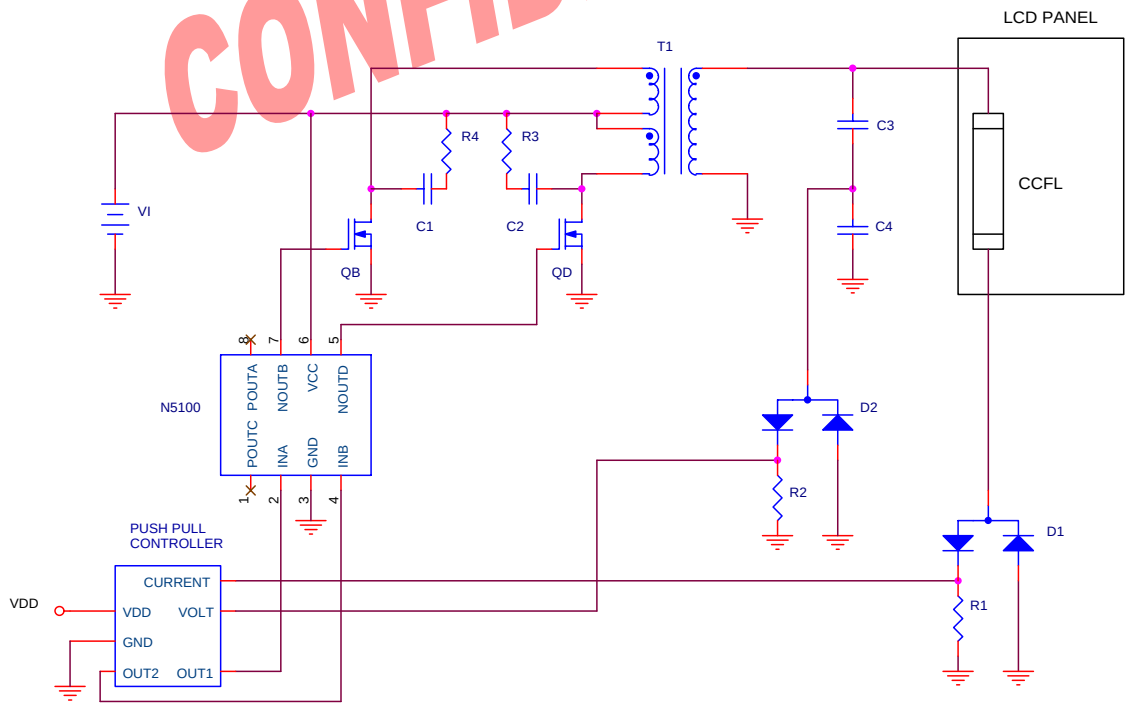


Fig 2 N5100 for push-pull application

2. HALF-BRIDGE APPLICATION

Fig 3 presents the N5100 for half-bridge application, one of the output of the push-pull PWM controller is coupled to a MOSFET(2N7002) to provide an opposite polarity voltage signal for driving P- channel power MOSFET (QB) .

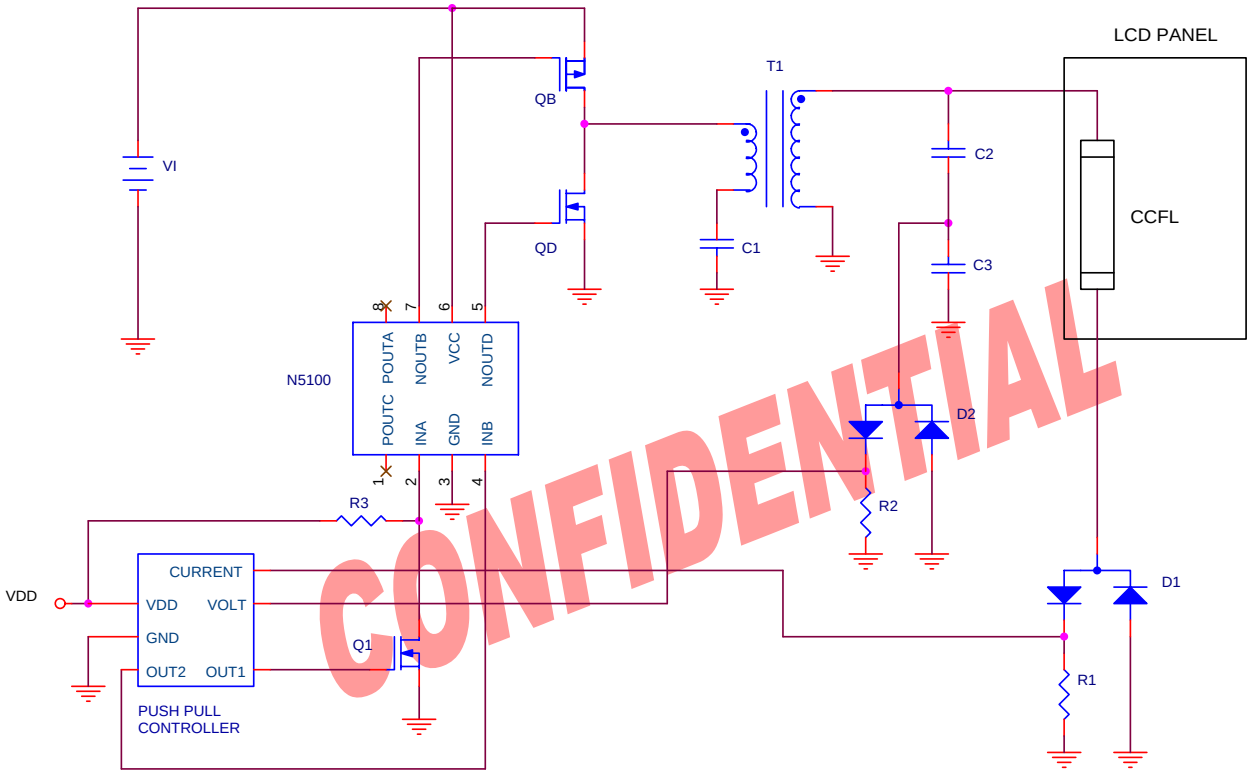


Fig 3 N5100 for half-bridge application

3. FULL-BRIDGE APPLICATION

Fig 4 presents the N5100 direct-driving method for full-bridge application , it is used to provide a low cost solution for full-bridge DC/AC inverter , the application is used push-pull PWM controller instead of full-bridge PWM controller to reduce PWM controller's cost , and the N5100 is provided large driving capability can easily drive mutiple switching apparatus by single chip only , if the input voltage (VI) of power supply is not over the maximum rating of the supply voltage (VCC) ,then outputs of N5100 can be used to drive all of the power MOSFET derectly as Fig 4 .

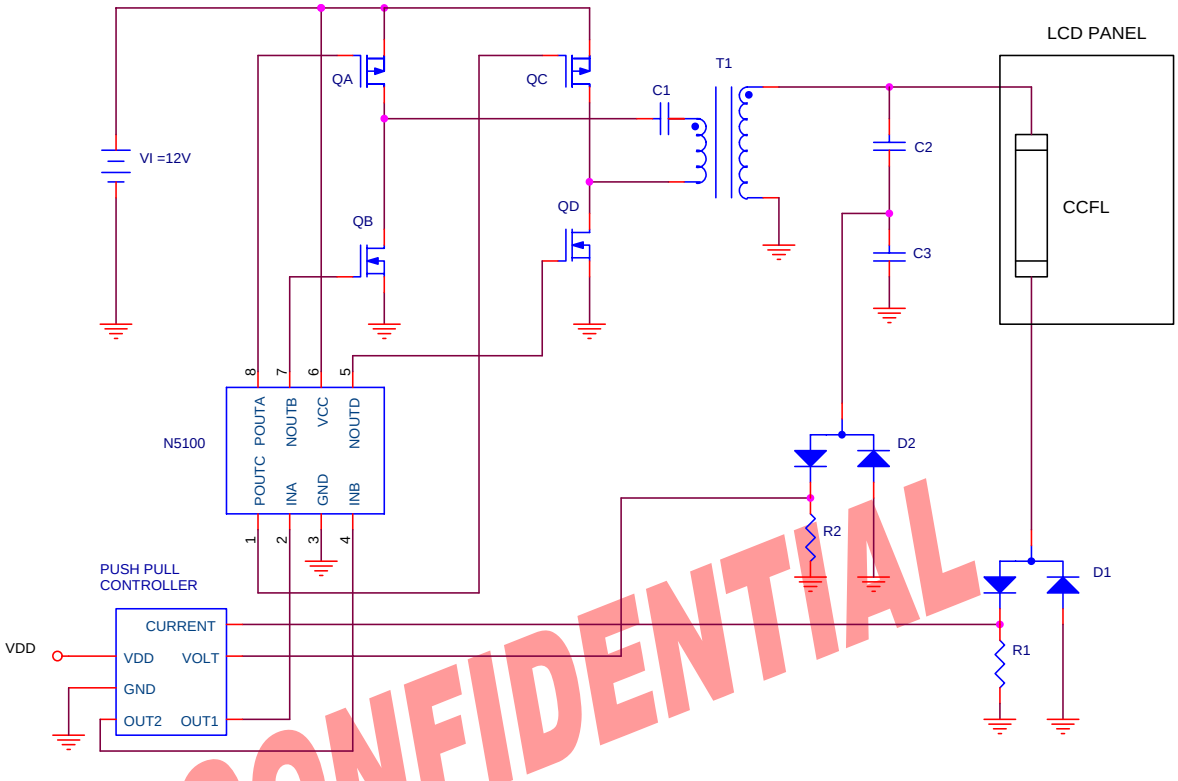


Fig 4 N5100 is directly driving full-bridge application

Fig 5 presents the level-shift driving method for full-bridge application, if the input voltage (VI) of power supply is over the maximum rating of the supply voltage (VCC) of N5100 , then outputs of N5100 should be used the RCD level-shift circuit (R3, R4, C4, C5, ZD1, ZD2) for driving P-channel of the power MOSFET as Fig 5 .

Fig 6 presents N5100 to be used as a traditional MOSFET driver for full-bridge application, It is used a full-bridge PWM controller to provide 4 different outputs , then the outputs of full-bridge PWM controller are couple to the input pin INA and INB of N5100. For using a full-bridge PWM controller in full-bridge application as Fig 6, it is needed 2 pcs of the N5100 at least.

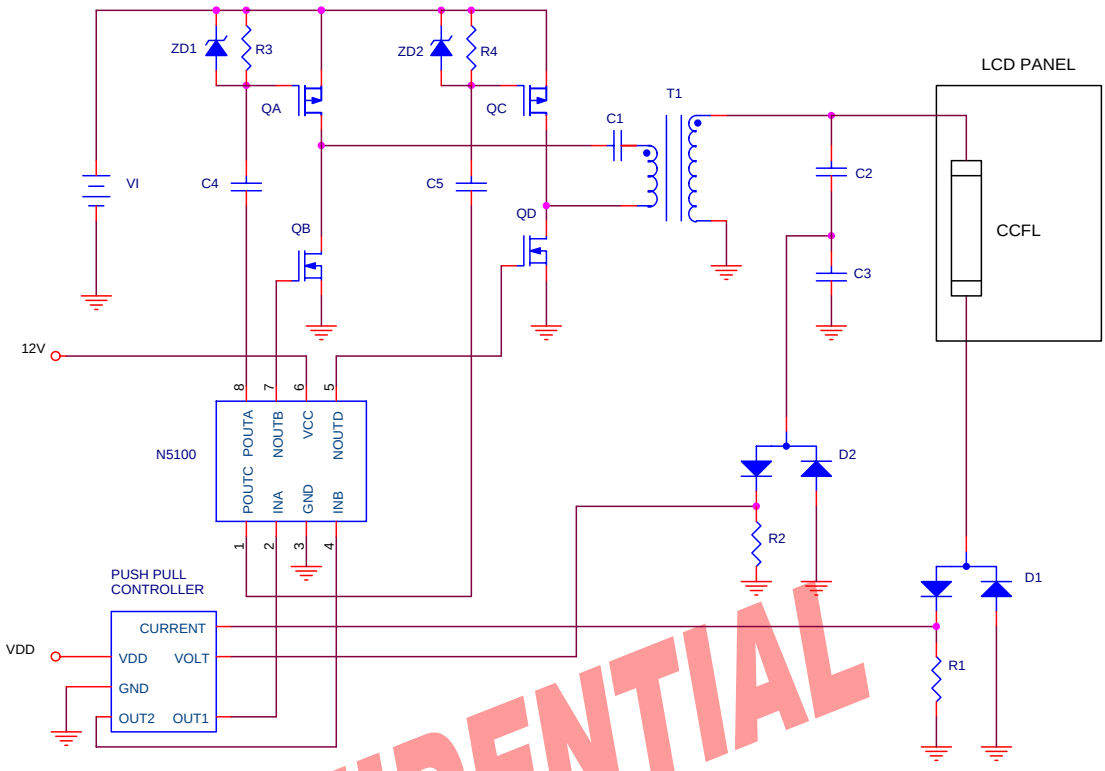


Fig 5 N5100 is driving full-bridge application with level shift circuit (VI>14V)

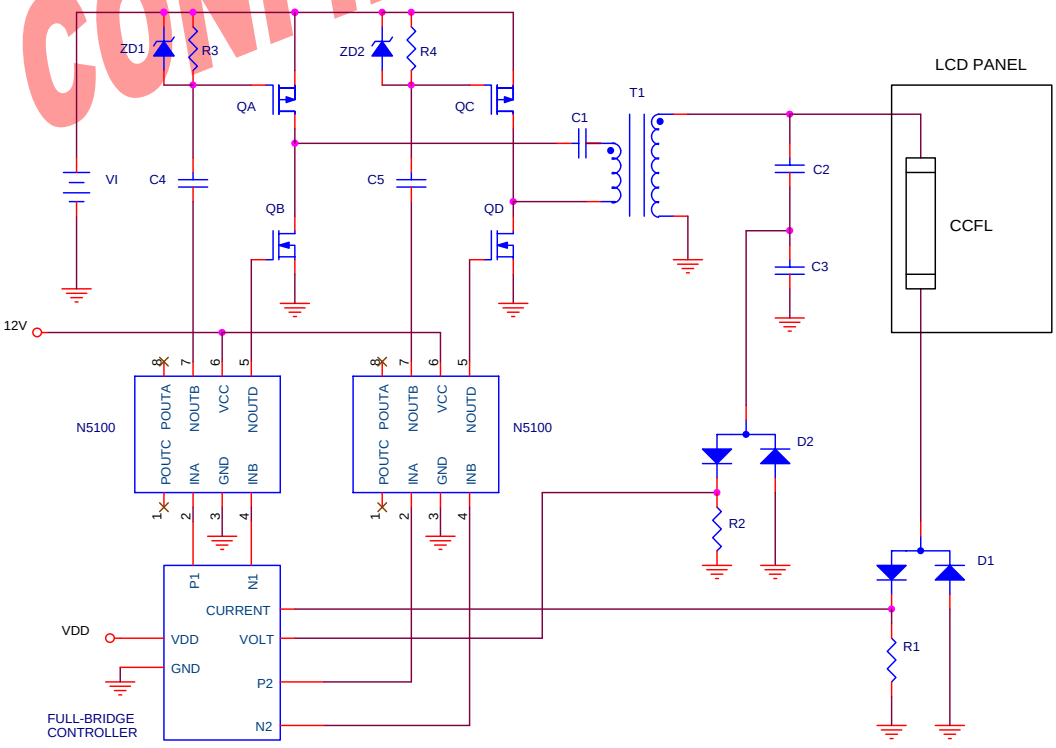


Fig 6 N5100 is driving full-bridge application with full-bridge PWM controller

OPERATING WAVEFORM

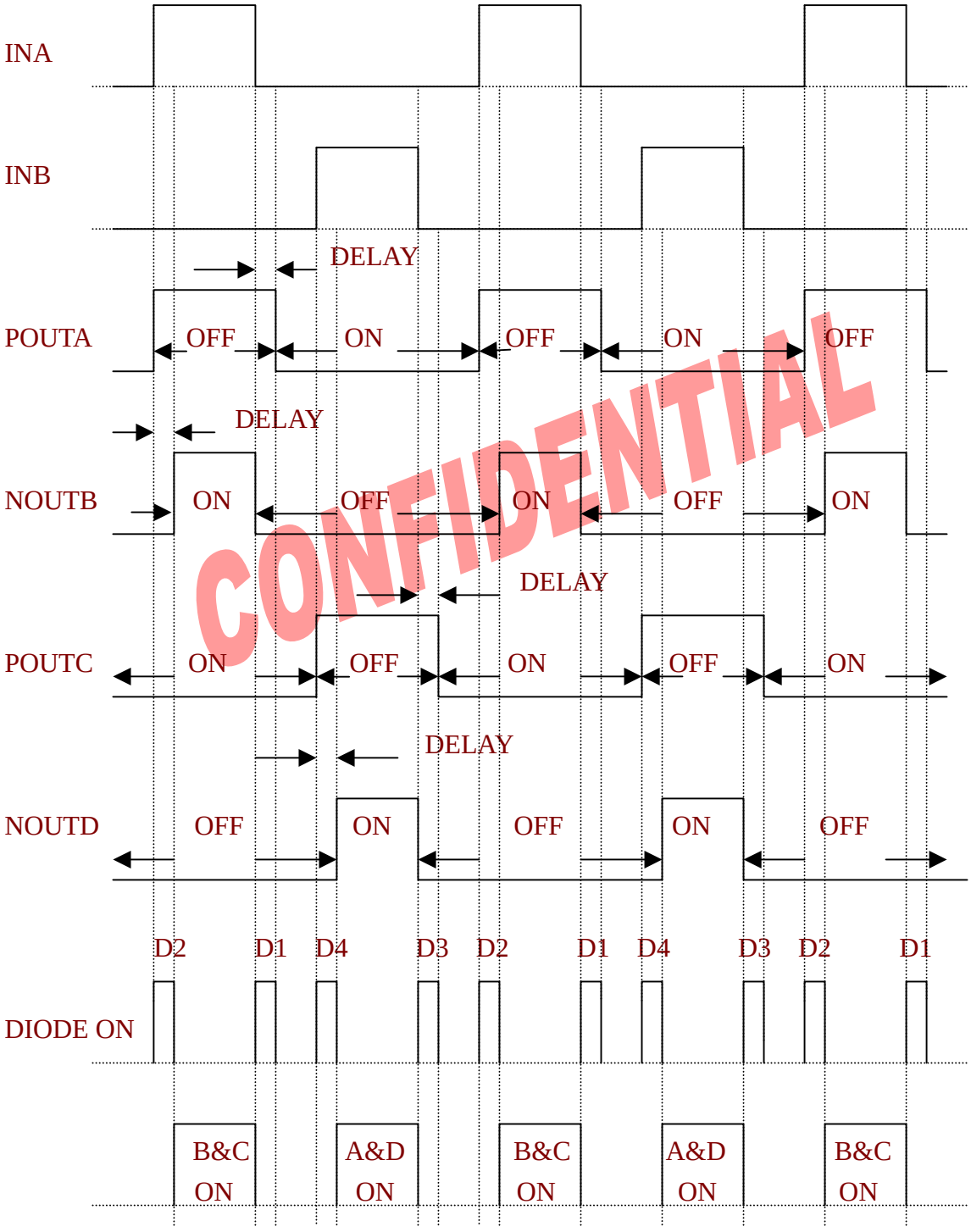
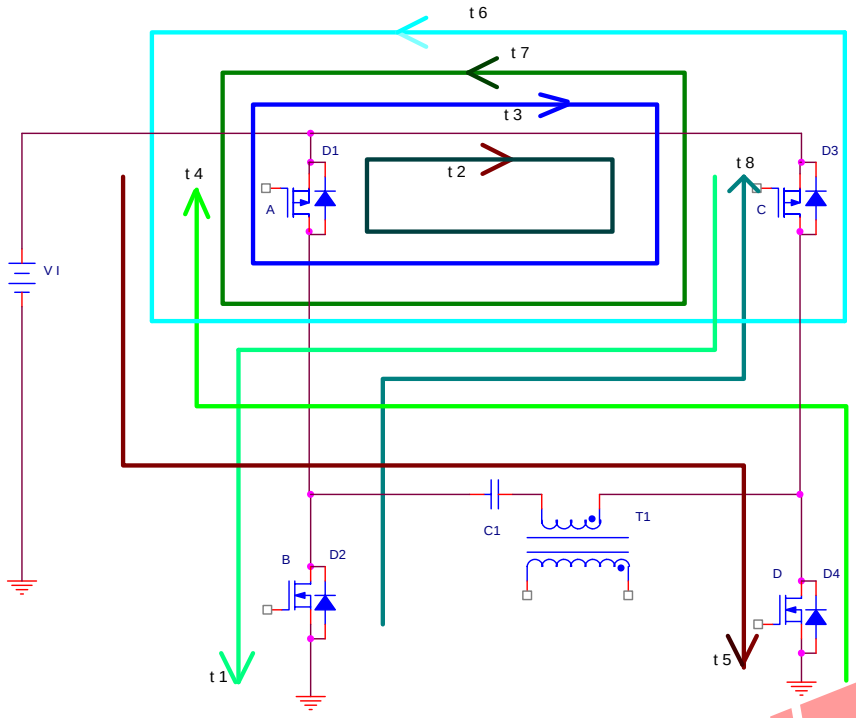


Fig 7 N5100 OPERATING WAVEFORM

OPERATING SEQUENCE

See the Fig 8 , the operating sequence is from t1~t8, there are total 8 different periods in every cycle , all of current paths are clearly presented as bellow description. The switch A,B,C,D are operating in the zero voltage switching(ZVS) to turn be on status.



t 1: D2 -- OFF , SW B -- ON , SW C -- ON(SW B : ZVS -- ON
t 2 : SW B -- OFF , SW C -- ON , D1 -- ON
t 3 : D1 -- OFF , SW A -- ON , SW C -- ON(SW A : ZVS -- OI
t 4 : SW C -- OFF , SW A -- ON , D4 -- ON
t 5 :D4 -- OFF , SW D -- ON , SW A -- ON(SW D : ZVS -- OI
t 6 : SW D -- OFF , SW A -- ON , D3 -- ON
t 7 : D3 -- OFF , SW C -- ON , SW A -- ON(SW C : ZVS -- OI
t 8 : SW A -- OFF , SW C -- ON , D2 -- ON

Fig 8 THE OPERATING SEQUENCE FOR CONTROLLING DC/AC FULL- BRIDGE APPLICATION WITH N5100