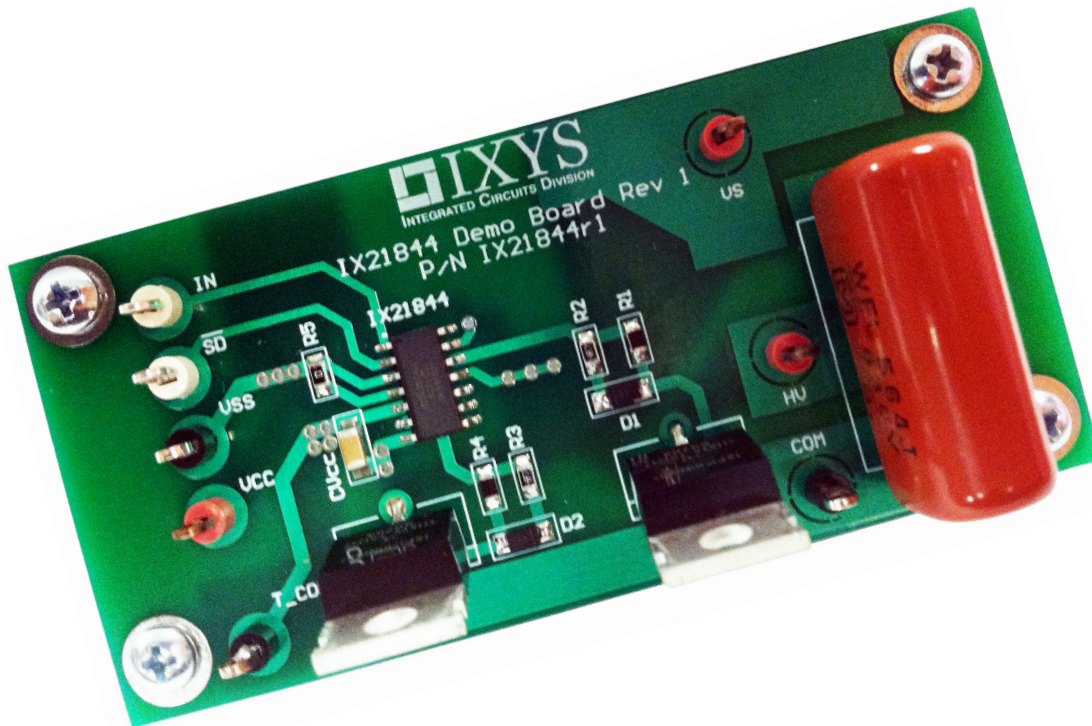


1. Introduction



IXYS Integrated Circuits Division's IX21844 evaluation board contains all the necessary circuitry to demonstrate the features of a high voltage gate driver configured as a half-bridge driver. IX21844 has dependent high-side and low-side referenced output channels, which are capable of sourcing 1.4A and sinking 1.8A peak current. The floating high-side channel can drive MOSFETs or IGBTs up to 600V from the common reference.

The IX21844 features a user-programmable deadtime circuit that can be set with an external resistor. In addition, when a fault or an over-current condition is detected, the device's shutdown (\overline{SD}) pin can be used to terminate gate drive to the high-side and low-side switches.

1.1 Features:

- Floating Channel for Bootstrap Operation up to 600V
- Programmable Deadtime
- Outputs Capable of Sourcing 1.4A Peak Current and Sinking 1.8A Peak Current
- Gate Drive Supply Range: 10V to 20V
- 3.3V Logic Compatibility Enables Seamless Interface with Micro-Controllers
- Independent Under-Voltage Lockout (UVLO) Function for Both High-Side and Low-Side Outputs
- Schmitt-Trigger Inputs at IN and \overline{SD} Provide Better Noise Immunity
- High dV/dt Capability: 50V/ns
- Negative Voltage Transient Protection: -5V

Figure 1. Evaluation Board Layout, Top View

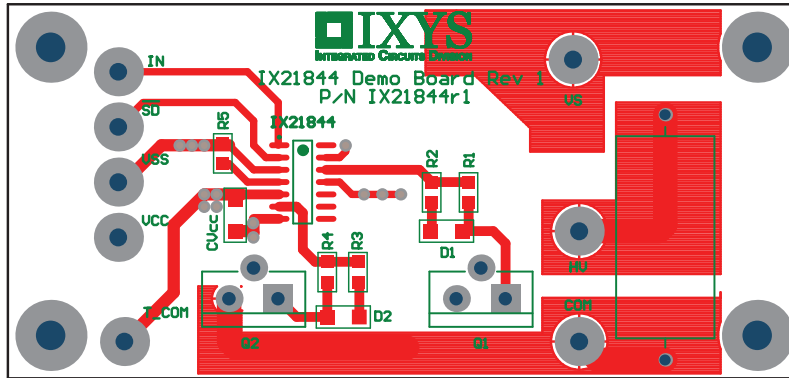
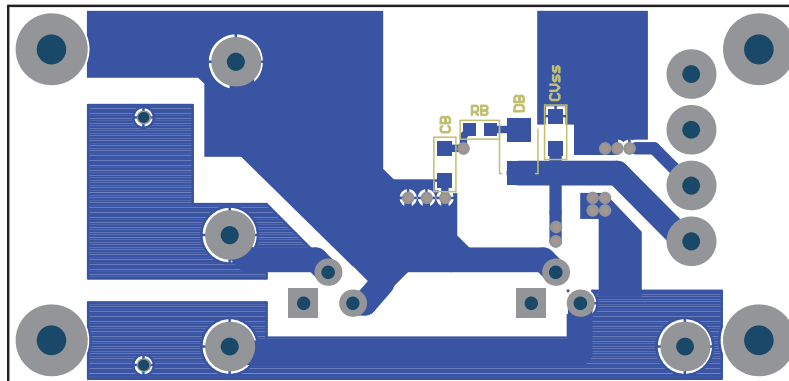


Figure 2. Evaluation Board Layout, Bottom View



1.2 Evaluation Board Pin Descriptions

Pin Name	Description
HV	High Voltage Bus
V _S	High-Side Floating Supply Return
V _{SS}	Logic Ground
V _{CC}	Low-Side and Logic Fixed Supply Voltage
SD	Logic Input for Shutdown, Active Low
IN	Logic Input for High-Side and Low-Side Outputs
COM	Low-Side Return
T_COM	Test Point, Low-Side Return

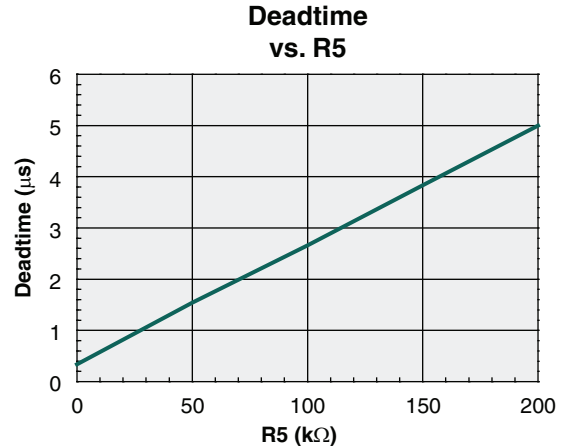
1.3 Evaluation Board Bill of Materials

Ref. Des.	Qty.	Description	Manufacturer	Mfr. P/N
U1	1	High-Side and Low-Side Gate Driver	IXYS IC Division	IX21844N
Q1, Q2	2	Polar HV MOSFET 800V 10A TO-220	IXYS	IXFP10N80P
R1, R4	2	RES 47 Ohm 1/8W 5% 0805 SMD	YAGEO	RC0805JR-0747RL
R2, R3, R _B	3	RES 4.7 Ohm 1/8W 5% 0805 SMD	YAGEO	RC0805JR-0747R7L
D1, D2	2	DIODE Fast Recovery 30V 1A Mini2	PANASONIC	DB2230400L
D _B	1	DIODE Super Fast 600V 1A	Diodes Inc.	MURS160-13-F
CV _{CC} , CV _{SS} , C _B	3	CAP CER 0.33μF X7R 1206	TDK	C3216X7R1H334K160AA
CVBUS	1	CAP FILM 0.56μF 630VDC Radial	Panasonic	P12270

2. Functional Description

This demo board features a very inexpensive bootstrap circuit that provides power to the high-side drive channel. It consists of resistor, R_B , super fast recovery diode, D_B , and capacitor, C_B . The bootstrap charging sequence is as follows: When V_S (high-side floating supply return) is pulled below V_{CC} or is pulled down to COM by the load, the C_B bootstrap capacitor begins to charge through resistor, R_B , and diode, D_B , from the V_{CC} supply. This charge continues until V_S is pulled up to a higher voltage than V_{CC} by the external high-side power MOSFET. V_{BS} (the difference voltage between V_B and V_S) starts to float, and the bootstrap diode begins to reverse bias and block the high HV voltage.

The IX21844 features a programmable deadtime circuit, which can be set by changing the value of resistor, $R5$. The graph below shows the value of resistor $R5$ needed to set the required deadtime. On this evaluation board, $R5$ is selected as 0Ω , which typically provides a 350nS deadtime.

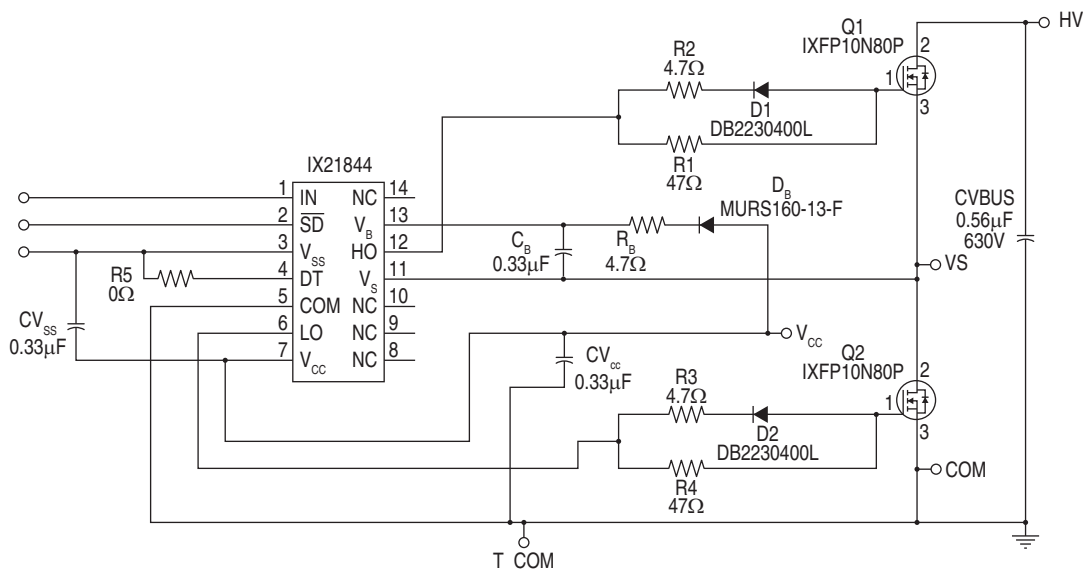


Provide the necessary voltages to V_{CC} and HV, and refer to the IX21844 datasheet for proper operating conditions. Provide the PWM logic input signal for IN.

The IX21844 demo board includes diode-resistor networks, $D1/R1/R2$ and $D2/R3/R4$, to provide faster gate turn-off times for both the high-side and low-side power MOSFETs.

Note: The evaluation board does not have reverse polarity protection. Applying a negative voltage to HV or to V_{CC} may permanently damage the components on the board. In addition, when probing the high-side output, the scope probe GND has to be isolated to prevent shorting the high-side output to GND.

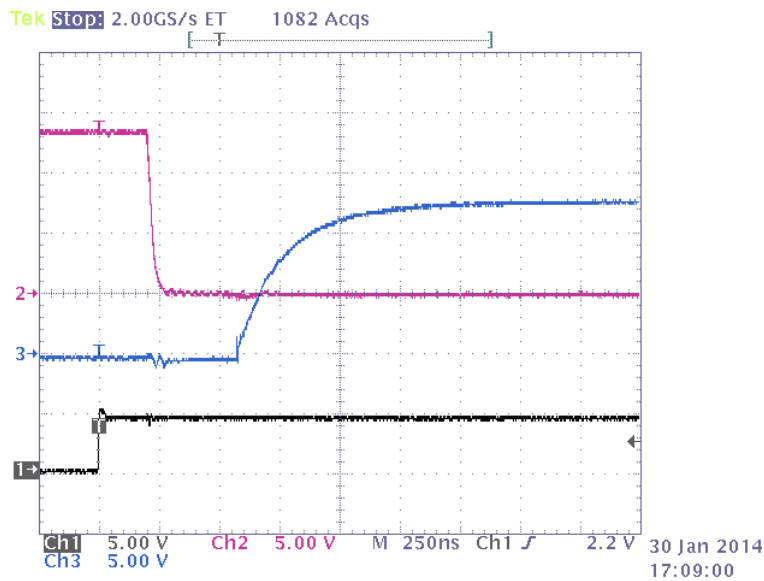
Figure 3. Evaluation Board Schematic



3. Operating Waveforms

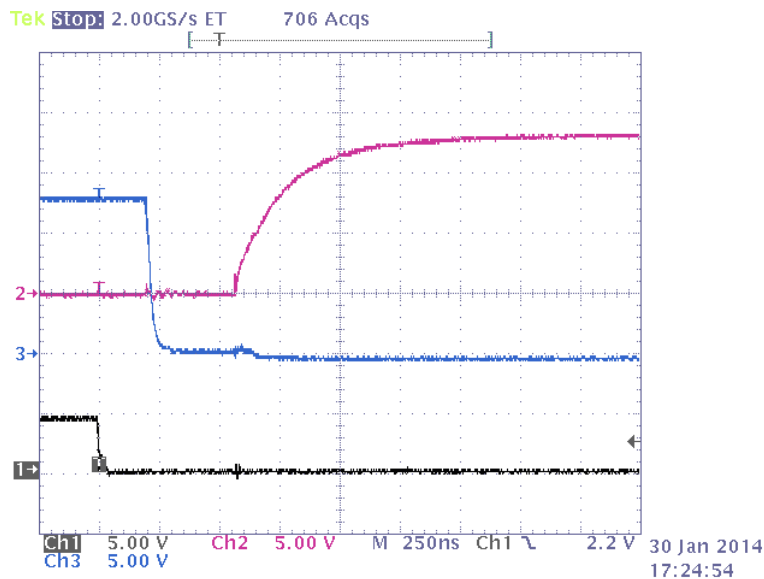
3.1 Waveforms 1

- CH1: IN, CH2: Q1 Gate Signal, CH3: Q2 Gate Signal
- Waveforms show falling edge of High-Side MOSFET Q1 and rising edge of Low-Side MOSFET Q2. Deadtime: 350ns.



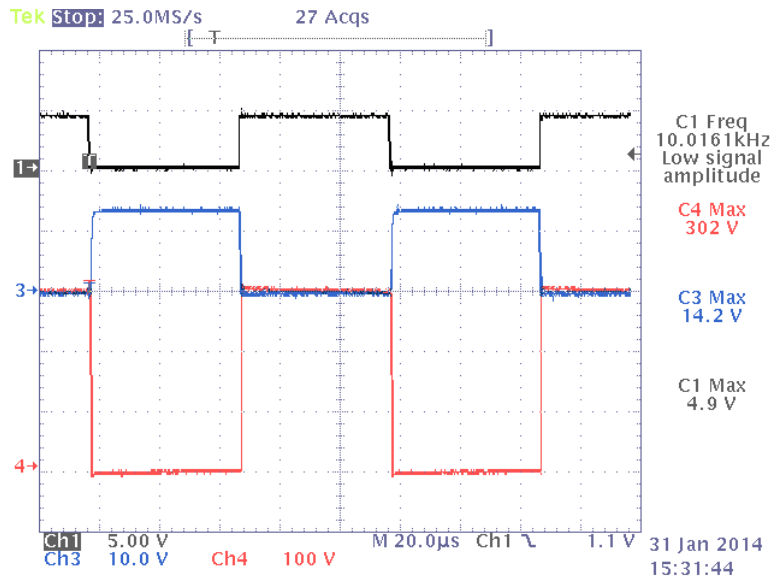
3.2 Waveforms 2

- CH1: IN, CH2: Q1 Gate Signal, CH3: Q2 Gate Signal
- Waveforms show rising edge of High-Side MOSFET Q1 and falling edge of Low-Side MOSFET Q2. Deadtime 350nS.



3.3 Waveforms 3

- CH1: IN, CH3: Q2 Gate Signal, CH4: VS
- Waveforms show input signal at 10 kHz frequency, Low-Side Q2 switching at 14.2V and VS High-Side Floating Supply Return Switching at 300V.



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