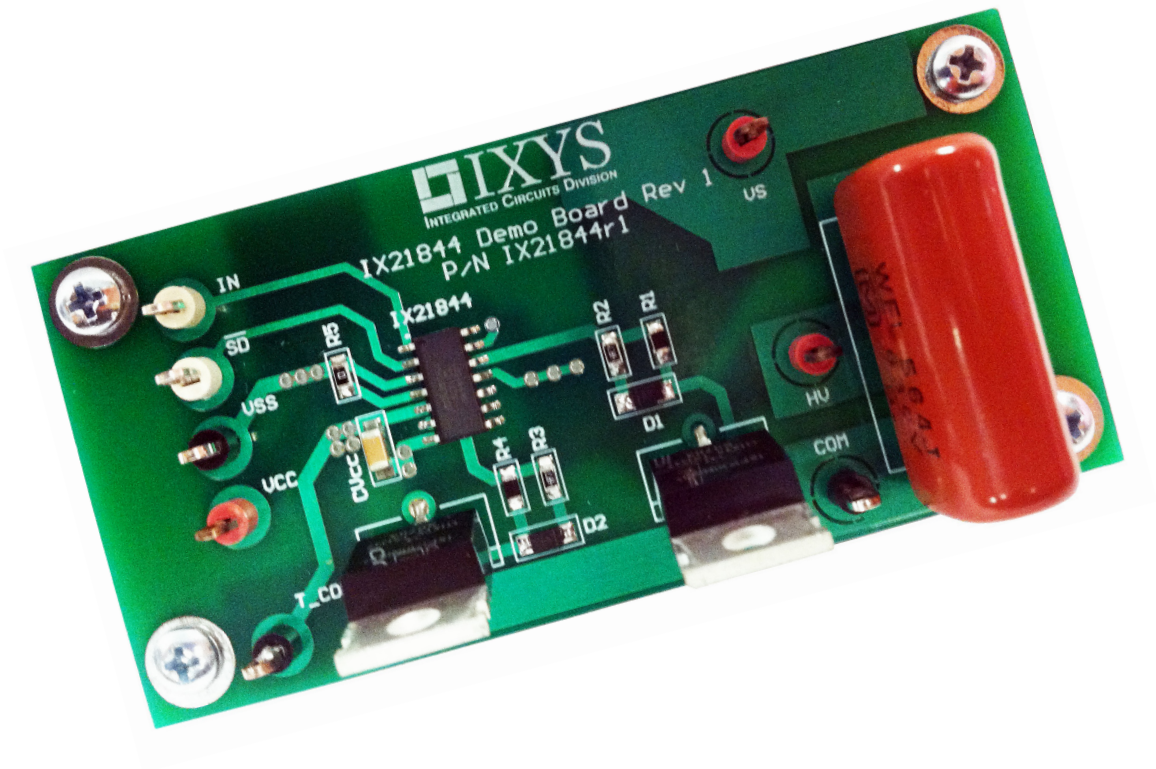
IX21844 Evaluation Board User's Guide

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

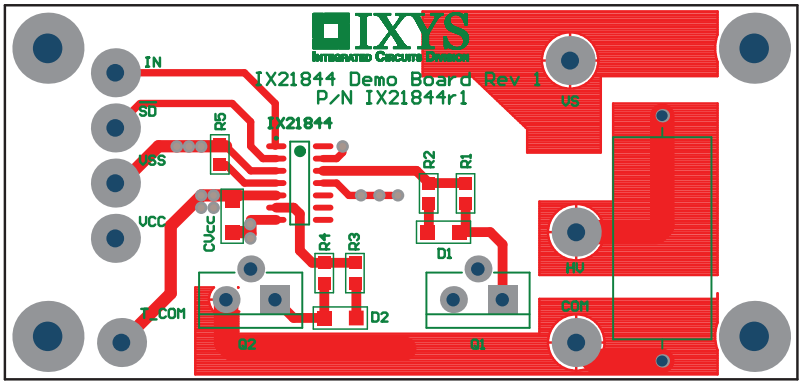
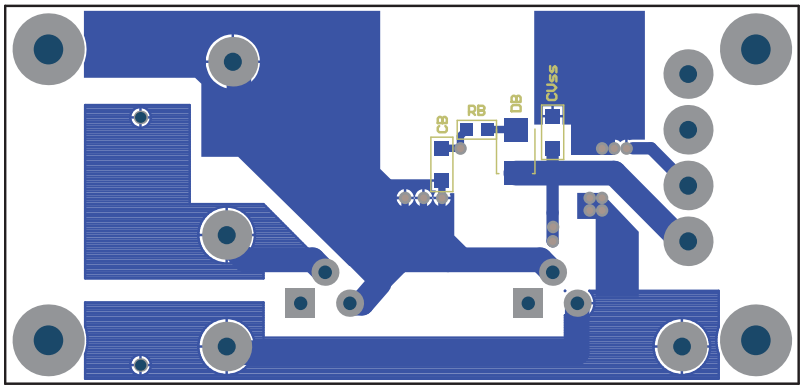


Figure 2. Evaluation Board Layout, Bottom View



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
$\overline{SD}$	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

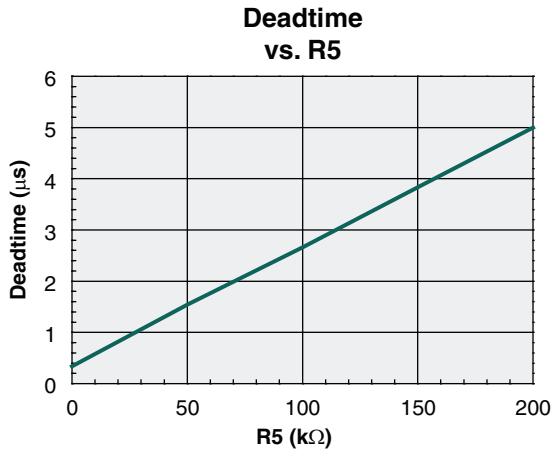
1.3 Evaluation Board Bill of Materials

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-074R7L
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.

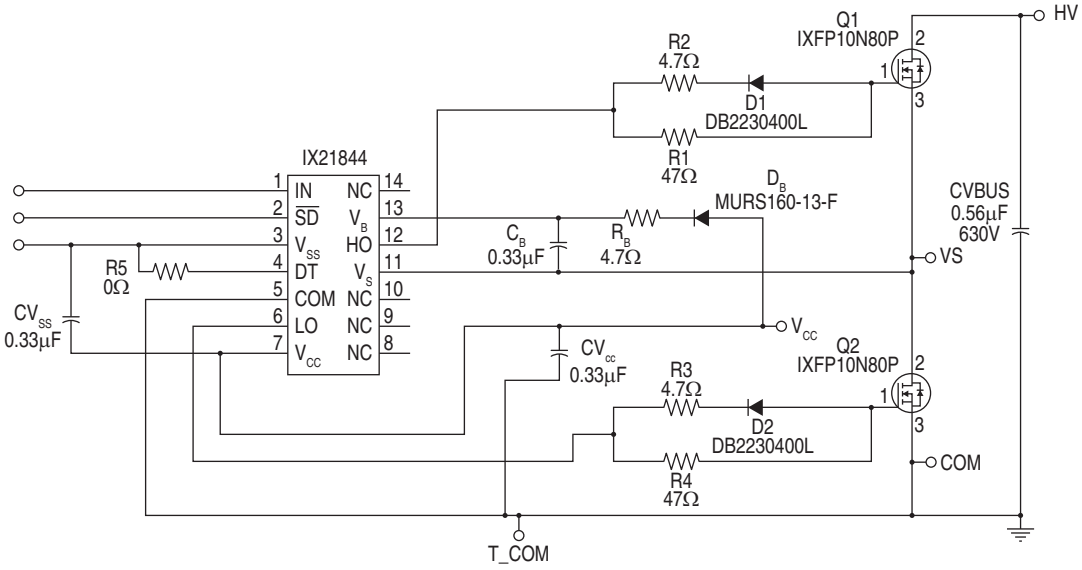


Provide the necessary voltages to V_{CC} and HV, and refer to the IX21844 datasheet for proper operating conditions. Provide the PWM logic input signal for IN.

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.*

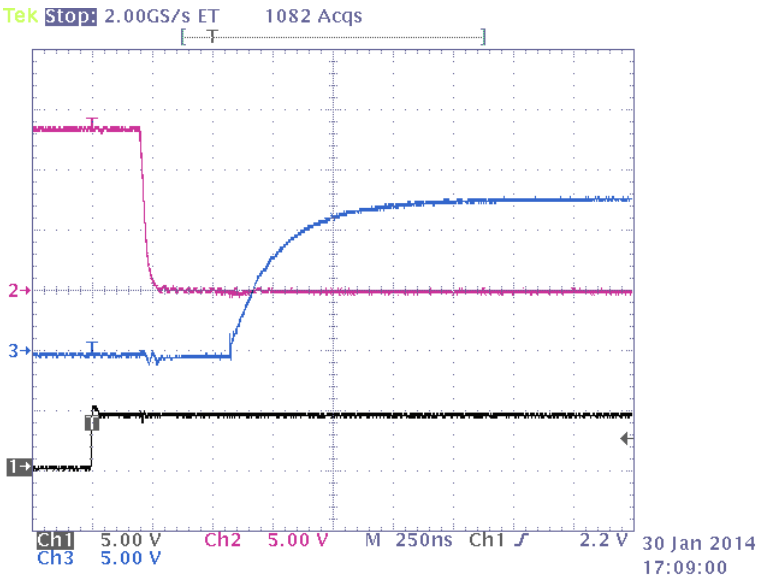
Figure 3. Evaluation Board Schematic



3. Operating Waveforms

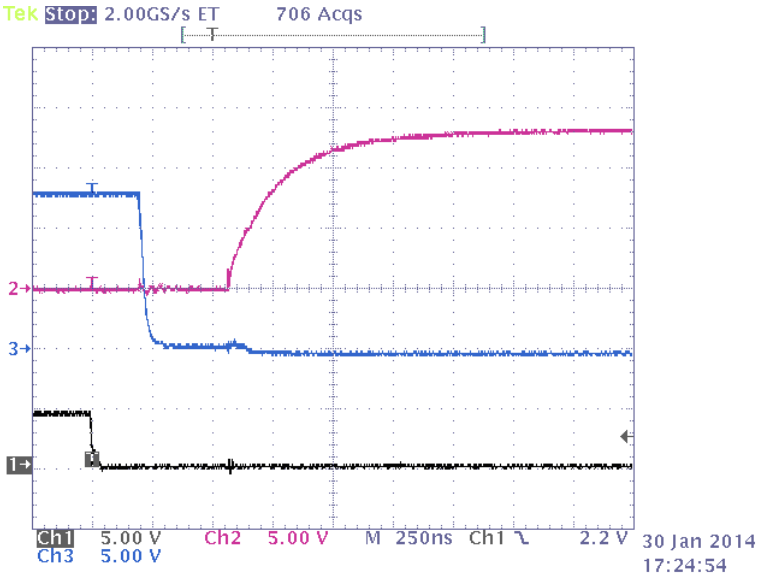
3.1 Waveforms 1

- 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.



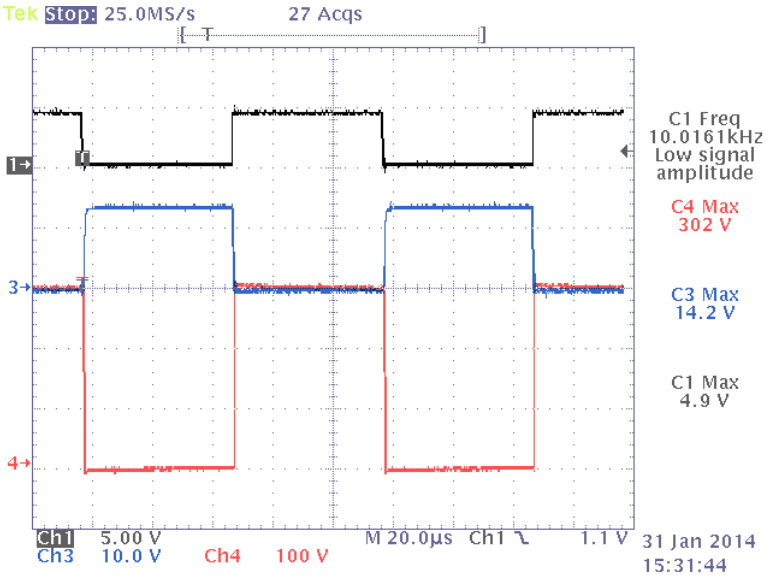
3.2 Waveforms 2

- 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.



For additional information please visit www.ixysic.com

Specification: IX21844-UG_R01

3/19/2014