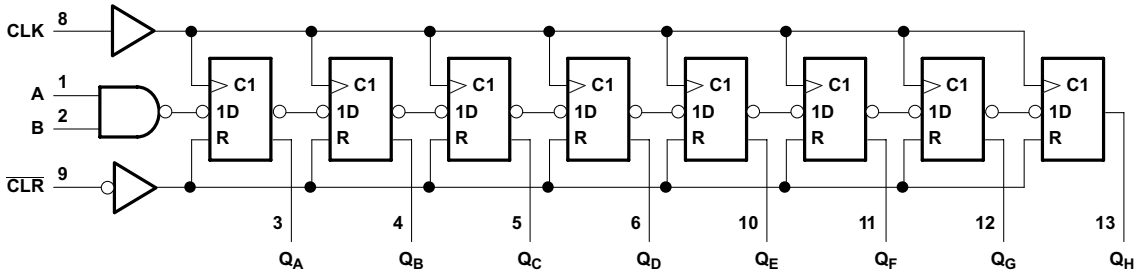
9 Detailed Description

9.1 Overview

The SN74HC164 is an 8-bit shift register with 2 serial inputs (A and B) connected through an AND gate, as well as an asynchronous clear (CLR). The device requires a high signal on both A and B in order to set the input data line high; a low signal on either input will set the input data line low. Data at A and B can be changed while CLK is high or low, provided that the minimum set-up time requirements are met.

The CLK pin of the SN74HC164 is triggered on a positive or rising-edge signal, from LOW to HIGH. Upon a positive-edge trigger, the device will store the result of the (A ● B) input data line in the first register and propagate each register's data to the next register. The data of the last register, QH, will be discarded at each clock trigger. If a low signal is applied to the CLR pin of the SN74HC164, the device will set all registers to a value of 0 immediately.

9.2 Functional Block Diagram



Pin numbers shown are for the D, J, N, NS, PW, and W packages.

9.3 Feature Description

The HC164 has a wide operating voltage range of 2 V to 6 V, outputs that can drive up to 10 LSTTL loads and Low Power Consumption, 80-μA maximum I. It is typically t_{pd} = 20 ns and has ±4-mA output drive at 5 V with low input current of 1-μA maximum. It also has AND-gated (enable/disable) serial inputs a fully buffered clock and serial inputs as well as a direct clear.

9.4 Device Functional Modes

Table 1 lists the functional modes of the SNx4HC164.

Table 1. Function Table(1)(2)

INPUTS				OUTPUTS			
$\overline{CLR}$	CLK	A	B	Q_A	Q_B	. . .	Q_H
L	X	X	X	L	L		L
H	L	X	X	Q_{A0}	Q_{B0}		Q_{H0}
H	↑	H	H	H	Q_{An}		Q_{Gn}
H	↑	L	X	L	Q_{An}		Q_{Gn}
H	↑	X	L	L	Q_{An}		Q_{Gn}

(1) Q_{A0}, Q_{B0}, Q_{H0} = the level of Q_A, Q_B, or Q_H, respectively, before the indicated steady-state input conditions were established.
(2) Q_{An}, Q_{Gn} = the level of Q_A or Q_G before the most recent ↑ transition of CLK: indicates a 1-bit shift.

Copyright © 1982–2015, Texas Instruments Incorporated

10 Application and Implementation

10.1 Application Information

The SNx4HC164 is an 8-bit shift register that can be used as a deserializer in order to reduce the number of GPIO's needed when driving multiple LED's. In order to correctly display the proper output in the LED's a sink MOSFET was added to prevent the LED's from lighting up until the correct data or the proper clock signal has been achieved.

10.2 Typical Application

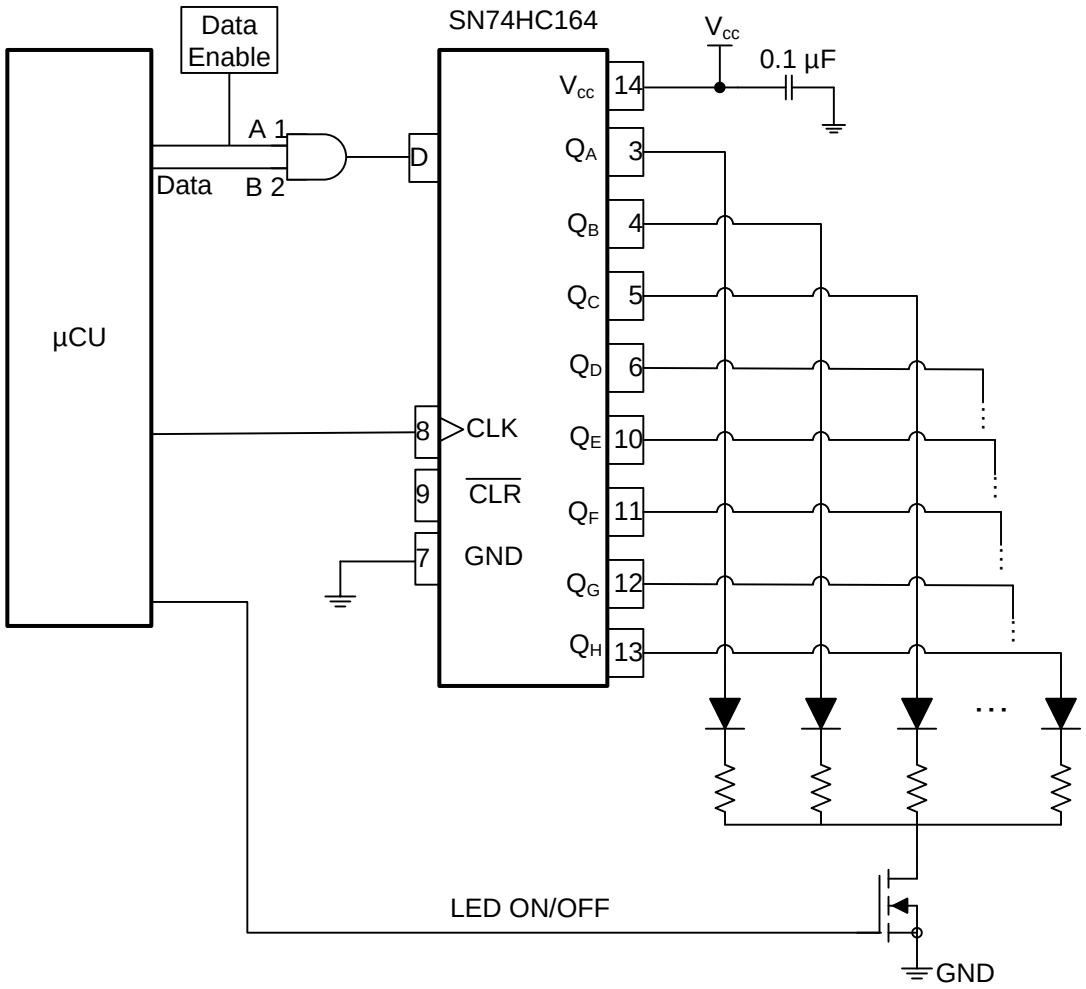


Figure 4. Typical Application Diagram

10.2.1 Design Requirements

Ensure that the incoming clock rising edge meets the criteria in *Recommended Operating Conditions*.

10.2.2 Detailed Design Procedure

Ensure that input and output voltages do not exceed ratings in *Absolute Maximum Ratings*.

Input voltage threshold information can be found in *Recommended Operating Conditions*.

Detailed timing requirements can be found in *Timing Requirements, T_A = 25°C*.

Copyright © 1982–2015, Texas Instruments Incorporated