National Semiconductor

DS8664 14-Digit Decoder/Driver With Low Battery Indicator

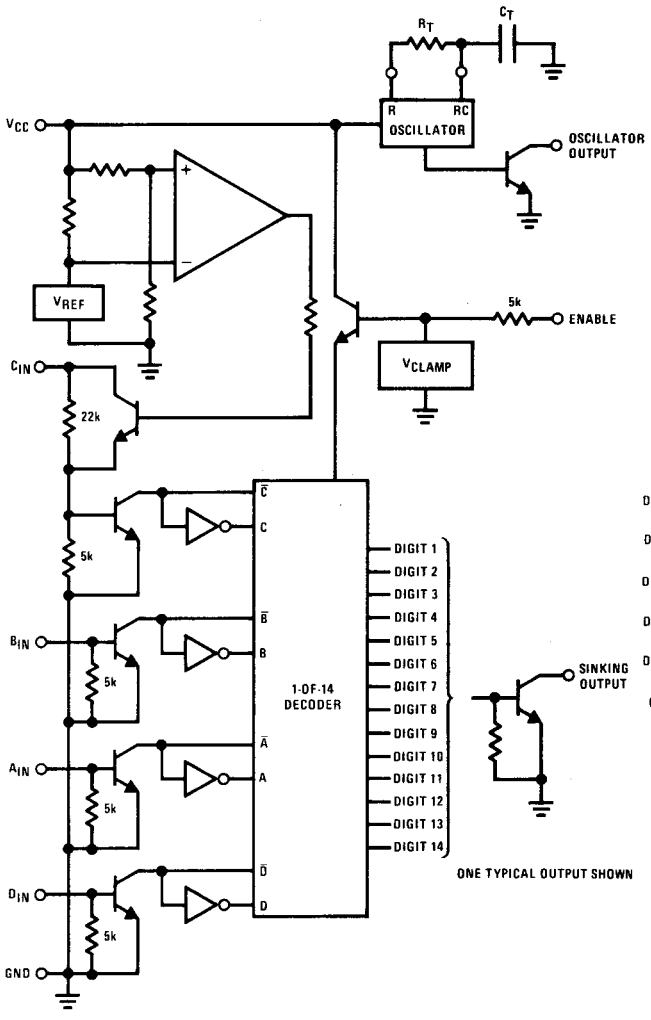
General Description

The DS8664 circuit is a 14-digit decoder/driver with an 80 mA sink capability. The circuit has current threshold inputs, and is designed to be driven by P-channel MOS. The enable input permits interdigit blanking of the decoded outputs. An open-collector output oscillator is provided for system timing (two passive external components are required). A low-battery indicator is provided at the "C" input with a nominal trip point of 3.25V at 25°C.

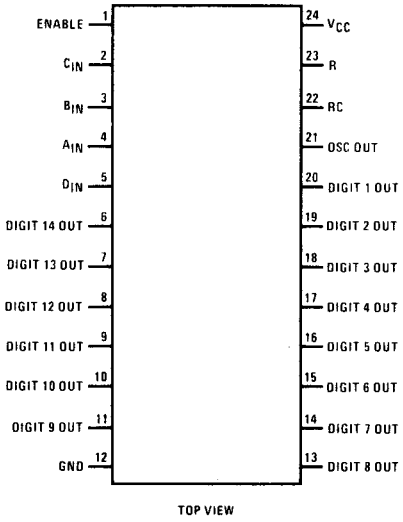
Features

- Oscillator frequency accuracy allows maximum system speed
- Inter-digit blanking with the enable input provides ghost-free display operation
- Low-battery indicator accuracy provides consistent low-battery indication

Logic and Connection Diagrams



Dual-In-Line Package



TOP VIEW

Order Number DS8664N
See NS Package N24A

Absolute Maximum Ratings (Note 1)

Supply Voltage	10V
Input Voltage	±10V
Input Current	±1.5 mA
Output Voltage	10V
Storage Temperature Range	−65°C to +150°C
Maximum Power Dissipation* at 25°C	
Molded Package	2005 mW
Lead Temperature (Soldering, 10 seconds)	300°C

*Derate molded package 16.04 mW/°C above 25°C.

Operating Conditions

	MIN	MAX	UNITS
Supply Voltage (V_{CC})	2.9	9.5	V
Temperature (T_A)	0	+70	°C

Electrical Characteristics (Notes 2 and 3)

	PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
V_{IH}	Logical "1" Input Voltage Decoder Inputs	V_{CC} = Max, V_{ENABLE} = 4.9V	I_{IN} = 260μA	0.50			V
			I_{IN} = 1400μA			1.50	V
V_{IH}	Enable Input	V_{CC} = Max, I_{ENABLE} = 260μA, T_A = 25°C		3.0	4.2	5.1	V
I_{IH}	Logical "1" Input Current Decoder Inputs	V_{CC} = Max, V_{ENABLE} = 4.9V			260		μA
I_{IH}	Enable Input	V_{CC} = Max			260		μA
V_{IL}	Logical "0" Input Voltage	V_{CC} = Max, V_{ENABLE} = 4.9V, I_{IL} = 25μA	A_{IN},B_{IN},D_{IN}			0.30	V
			C_{IN}			0.50	V
I_{IL}	Logical "0" Input Current	V_{CC} = Max, V_{ENABLE} = 4.9V, V_{IL} = Max				25	μA
V_{OH}	C Input (Low-Battery Output)	V_{CC} = 3.1V, T_A = 25°C	I_{IN} = 300μA	4.9	7.3		V
			I_{IN} = 400μA	6.5	10.0		V
V_{OL}	C Input (Low-Battery Output)	V_{CC} = 3.4V, I_{IN} = 1300μA, T_A = 25°C			1.0	3.0	V
I_{OH}	Logical "1" Output Current Except Pin R	V_{CC} = Max, V_{OH} = 10.0V, V_{ENABLE} = 4.9V V_{RC} = 0.6V				50	μA
I_{OS}	Output Short Circuit Current Pin R Only	V_{CC} = Max, V_{RC} = 0.6V		−0.15	−0.28	−0.45	mA
V_{OL}	Logical "0" Output Voltage Digit Outputs	V_{CC} = Min, I_{OL} = 80 mA, V_{ENABLE} = 4.9V			0.35	0.55	V
$V_{OL(OSC)}$	Oscillator Output	V_{CC} = Min, I_{OL} = 6 mA, V_{RC} = 1.5V			0.20	0.55	V
V_{OL}	Pin R	V_{CC} = Min, I_{OL} = 60μA, V_{RC} = 1.5V			0.10	0.25	V
I_{CC}	Supply Current—Enabled	V_{CC} = Max, V_{ENABLE} = 4.9V			15.0	22.0	mA
I_{CC}	Supply Current—Disabled	V_{CC} = Max, V_{ENABLE} = 1.0V			6.0	12.0	mA
f_{OSC}	Oscillator Frequency	R_T = 35k ±2%, C_T = 100 pF ±5%,	V_{CC} = Min to 4.5V	300	350	400	kHz
		R_T = 33k ±2%, C_T = 100 pF ±5%,	V_{CC} = 7.9V to Max	320	360	400	kHz
D.C.	Duty Cycle (t_{PWH}/τ)	R_T = 35k ±2%, C_T = 100 pF ±5%,	V_{CC} = Min to 4.5V	0.46	0.56	0.66	
		R_T = 33k ±2%, C_T = 100 pF ±5%,	V_{CC} = 7.9V to Max	0.46	0.56	0.66	

Switching Characteristics V_{CC} = 4.0V, T_A = 25°C unless otherwise specified.

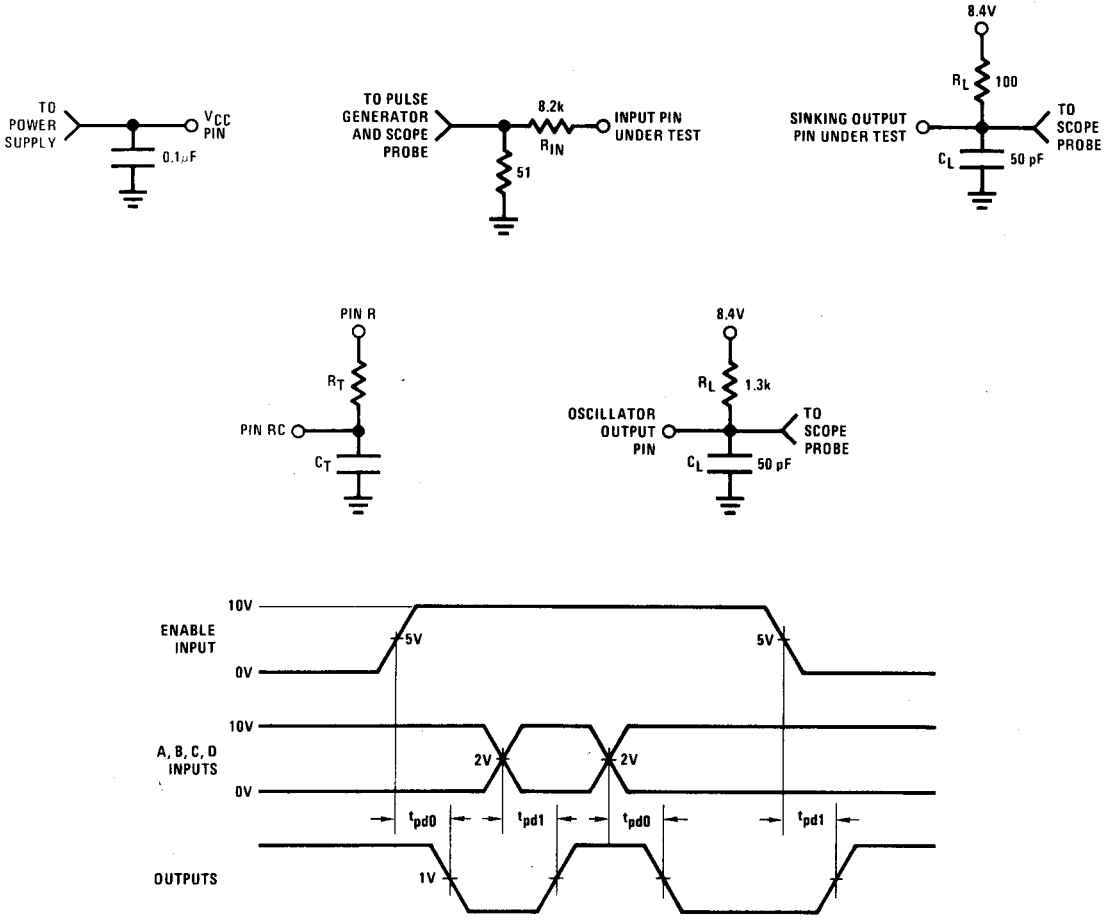
	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
t_{pd1} or t_{pd0}	Propagation Delay From A, B, C, D Inputs to Digit Outputs	R_{IN} = 8.2k, V_{ENABLE} = 10V, R_L = 100Ω, C_L = 50 pF			500	ns
t_{pd0}	Propagation Delay to a Logical "0" From Enable Input to Digit Outputs	R_{IN} = 8.2k, R_L = 100Ω, C_L = 50 pF	30	80	200	ns
t_{pd1}	Propagation Delay to a Logical "1" From Enable Input to Digit Outputs	R_{IN} = 8.2k, R_L = 100Ω, C_L = 50 pF	100	250	500	ns

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Unless otherwise specified, min/max limits apply across the 0°C to +70°C range; all typical values are given for V_{CC} = 4.0V and T_A = 25°C.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

AC Test Circuits and Switching Time Waveforms



Note: Input voltage rise and fall times are 120 ns from 10% to 90% points.

Truth Table

A_{IN}	B_{IN}	C_{IN}	D_{IN}	DIG. OUT ON
0	0	0	0	NONE
1	0	0	0	1
0	1	0	0	2
1	1	0	0	3
0	0	1	0	4
1	0	1	0	5
0	1	1	0	6
1	1	1	0	7
0	0	0	1	8
1	0	0	1	9
0	1	0	1	10
1	1	0	1	11
0	0	1	1	12
1	0	1	1	13
0	1	1	1	14
1	1	1	1	NONE