LSI/CSI

LS7314-7315

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AC POWER CONTROLLERS

A

FEATURES:

- 10 I/Os to Select/Indicate up to ten Power Levels
- Inputs activated by Touch or Pushbutton Switch
- Output switches pure and precise AC Power to Load
- Operates with 50Hz/60Hz line frequency
- Rugged, latchup-free process technology
- +10V to +14V operation (Vss-V_{DD})
- LS7314, LS7315 (DIP; LS7314-S, LS7315-S (SOIC) - See Figure 1

APPLICATIONS:

- Universal and shaded-pole motor speed control for modern appliance designs. Eliminates awkward mechanical switch assemblies and multi-tapped motor windings. (See Fig. 4C)
- Multi-level light switches. (See Fig. 4D)

DESCRIPTION:

The LS7314 - LS7315 are MOS integrated circuits specifically designed for appliance motor speed control, lighting control, etc. I/Os ($\overline{PL}$s) are provided for selecting/indicating from one to ten power levels. The LS7315 is designed for pushbutton control. The LS7314 is designed for touch control. (See Figures 4A and 4B)

INPUT/OUTPUT DESCRIPTION:

$\overline{PL1}$-$\overline{PL10}$ (Pins 1-8, 15, 16)

Ten inputs/outputs for selecting ten output phase angles (power levels). When no power level is selected (such as after system power-up) $\overline{PL1}$-$\overline{PL10}$ all act as inputs. When a power level is selected by applying a logic zero at one of these inputs for T_H time (See Dynamic Characteristics), the output ($\overline{TRIG}$) is turned on at the phase angle selected and the PL input switches status to become an output in order to drive a display, such as an LED. It switches back to the input state when another $\overline{PL}$ input is activated or when $\overline{OFF}$ is selected. (See Note 1)

$\overline{OFF}$ (Pin 10)

If $\overline{TRIG}$ is on, a logic 0 applied to the $\overline{OFF}$ input for T_H time turns $\overline{TRIG}$ output off and switches the selected $\overline{PL}$ back to the input state. If $\overline{TRIG}$ is off, activating $\overline{OFF}$ leaves the circuit unaffected. Following an $\overline{OFF}$ activation, $\overline{TRIG}$ can be turned on by applying any $\overline{PL}$ input. (See Note 1)

SYNC (Pin 12)

Input for PLL reference frequency (50Hz/60Hz). All internal clock frequencies are synchronized with the SYNC input.

CAP (Pin 11)

Input for component connection for the PLL filter capacitor.

CONNECTION DIAGRAM - TOP VIEW

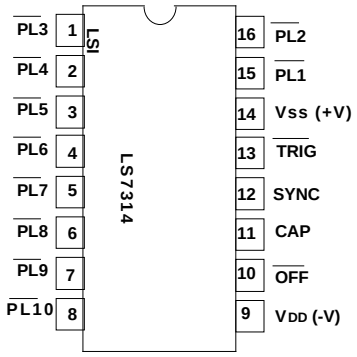


FIGURE 1

$\overline{TRIG}$ (Pin 13)

This output is designed to drive a triac in series with the load and control its firing angle with respect to the AC line. A 1ms output pulse width is provided to enable the triac to fire even with inductive loads which cause significant phase delays between voltage and current.

Vss (Pin 14)

Supply voltage positive terminal.

V_{DD} (Pin 9)

Supply voltage negative terminal (ground).

NOTE 1: LS7315 has an internal pullup resistor on this input and LS7314 does not. (See DC Electrical Characteristics.)

FIGURE 2. $\overline{TRIG}$ PHASE ANGLE Ø

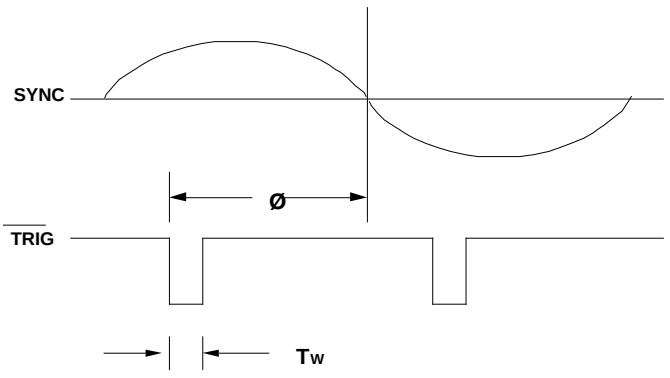


FIGURE 3. LS7314-LS7315 BLOCK DIAGRAM

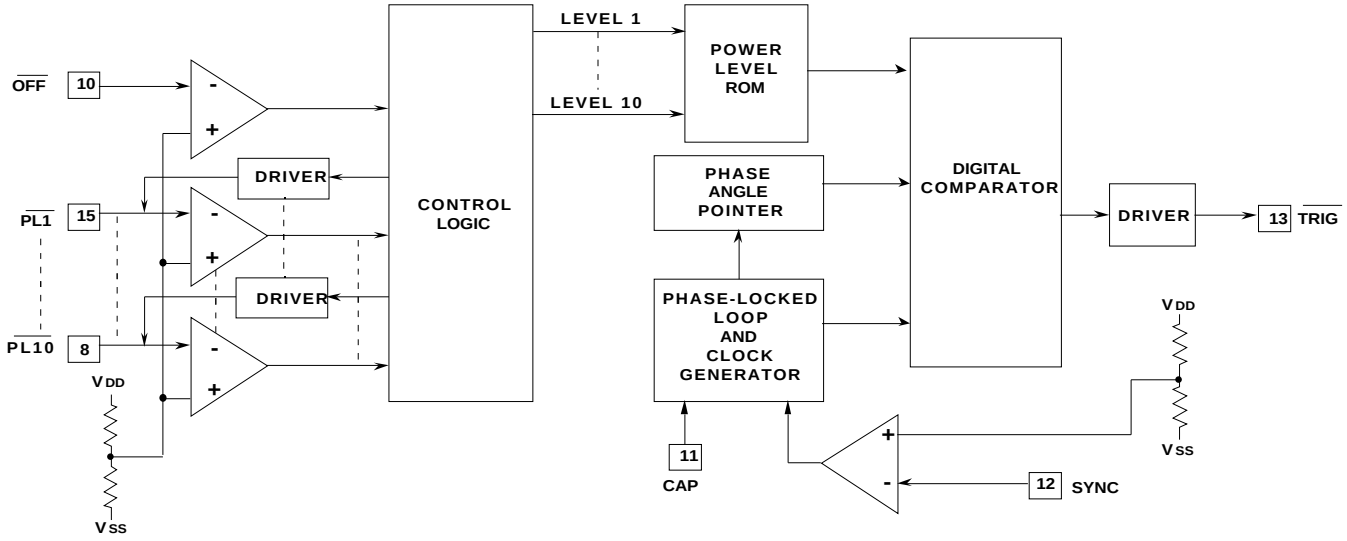


TABLE 1. $\overline{\text{TRIG}}$ PHASE ANGLES, Ø (1)

PL	Ø *	% PWR (2)	Ø **	%PWR (2)
1	43°	8	81°	40
2	55°	16	105°	67
3	68°	26	116°	77
4	81°	40	120°	80
5	95°	55	123°	83
6	108°	69	129°	87
7	122°	82	134°	90
8	134°	90	160°	99
9	147°	96	167°	99
10	160°	99	175°	99

***LS7314 & LS7315** ****LS7315-51**

(1) The $\overline{\text{TRIG}}$ Phase Angles shown in TABLE 1 are referenced to the SYNC input. Ø values are mask programmable.
(2) The percentage of Full Power delivered to a resistive load by the Triac Switch.

FIGURE 4C and 4D NOTES

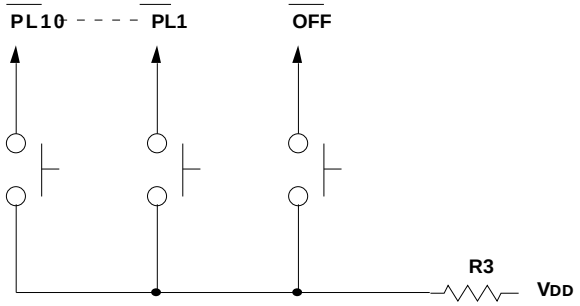
NOTE 1: Value for 5mA LEDs.
NOTE 2: Use zener which produces 6.2V ±5% at 500µA or less, i. e. P/N MZ4627.
NOTE 3: R6-C6 Snubber Network may be required for large inductive loads.
NOTE 4: Tie all unused touch inputs together and return to Vss through 100k Ohm, 1/4W resistor.
NOTE 5: The AC Mains Polarity shown is required for Touch Control applications.

FIGURE 4C VALUE TABLE

CONDITION	C2(µF)
(1), (3)	0.47
(1), (4)	0.33
(2), (3)	0.68
(2), (4)	0.47

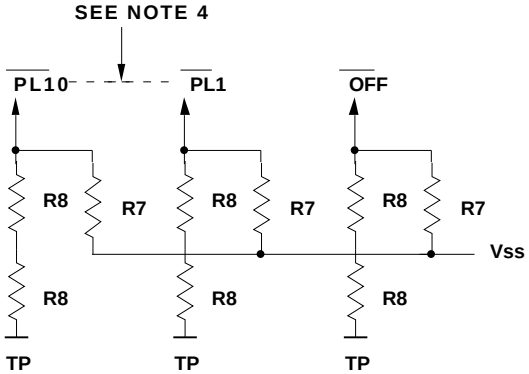
(**1**) No LEDs (**2**) 5mA LEDs
(**3**) 115VAC, C2 = 200V (**4**) 220VAC, C2 = 400V

FIGURE 4A. PUSHBUTTON INTERFACE FOR LS7315



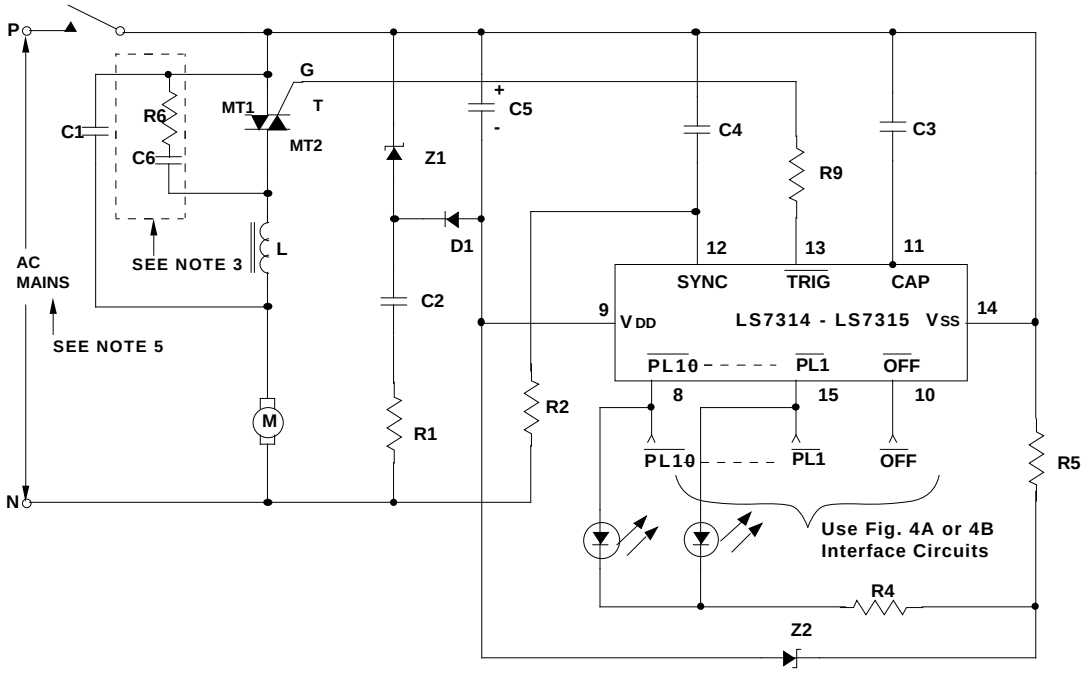
R3 = 10KΩ, 1/4W

FIGURE 4B. TOUCH INTERFACE FOR LS7314



R7 = 1MΩ to 5MΩ, 1/4W (Select for Sensitivity)
R8 = 2.7MΩ, 1/4W for 115VAC Mains
R8 = 4.7MΩ, 1/4W for 220VAC Mains

FIGURE 4C. MOTOR SPEED CONTROL APPLICATION

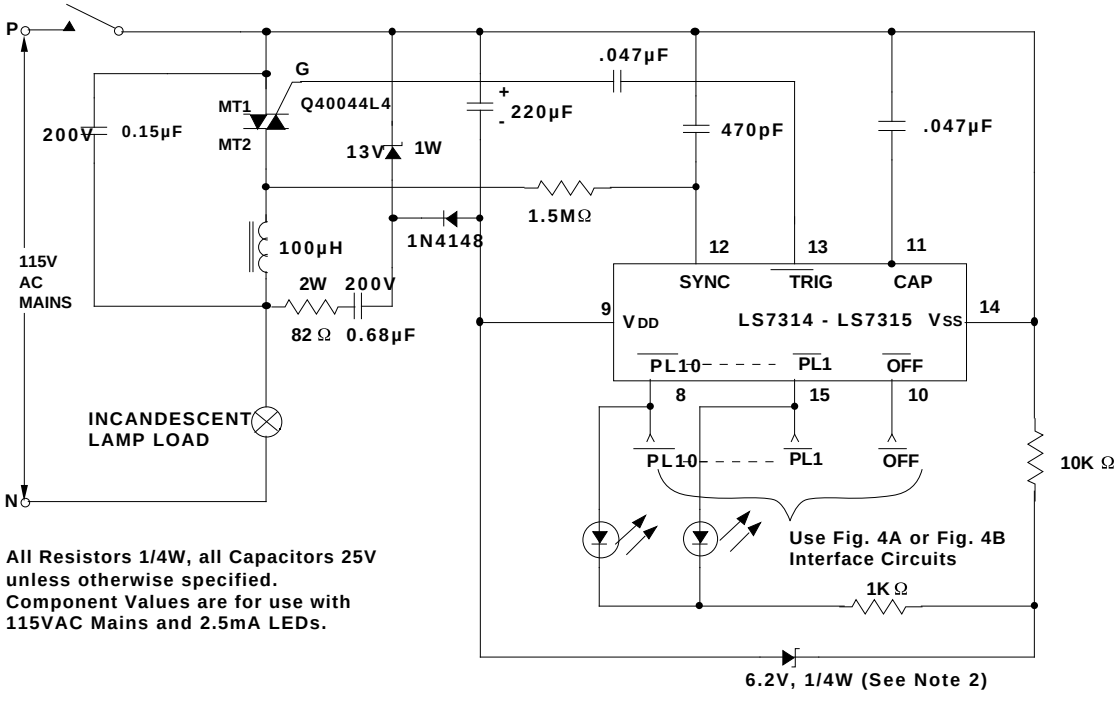


C1 = 0.15µF, 200V (400V)*
C2 = See Figure 4 Value Table
C3 = 0.047µF
C4 = 470pF
C5 = 220uF
C6 = 0.47µF, 200V (400V)*
L = 100µH (200µH)*
D1 = 1N4148
T = Q4004L4 (Q5004L4)* Typical

R1 = 82Ω
R2 = 1.5MΩ
R4 = 560Ω (See Note 1)
R5 = 10kΩ
R6 = 1.8kΩ, 1W (2W)*
R9 = 100Ω
Z1 = 13V ± 5%, 1W
Z2 = 6.2V, 1/4W (See Note 2)

All resistors 1/4W, all capacitors 25V unless otherwise specified.
* Indicates component change for 220VAC Mains.

FIGURE 4D. MULTI-LEVEL WALL SWITCH DIMMER APPLICATION



All Resistors 1/4W, all Capacitors 25V unless otherwise specified. Component Values are for use with 115VAC Mains and 2.5mA LEDs.

MAXIMUM RATINGS:

PARAMETER	SYMBOL	VALUE	UNIT
Storage Temperature	T_{STG}	-65 to +150	°C
Operating Temperature	T_A	0 to +80	°C
DC Supply Voltage	Vss - V_{DD}	+20	V
Any Input Voltage	V_{IN}	Vss - 20 to Vss + 0.5	V

DC ELECTRICAL CHARACTERISTICS:
(T_A = 25˚C, all voltages referenced to V_{DD})

	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Supply Voltage	V_{SS}	+10	+12	+14	V	-
Supply Current	I_{DD}	-	1.2	2	mA	Vss = 12V, outputs off
Input Voltage:						
SYNC, LO	V_{ISL}	0	-	1/3Vss	V	-
SYNC, HI	V_{ISH}	2/3Vss	-	Vss	V	-
All other inputs, LO	V_{IL}	0	-	1/4Vss	V	-
All other inputs, HI	V_{IH}	1/2Vss	-	Vss	V	-
Input Current:						
SYNC Input	I_H	-	-	110	µA	With Series 1.5MΩ Resistor to 115VAC
Input Pull-up Resistance:						
For LS7315						
PL, OFF	R_{IN}	50	100	200	kΩ	-
Output Voltage:						
TRIG, HI	V_{OH}	Vss	-	-	V	-
TRIG, LO	V_{OL}	-	Vss - 8	-	V	-
Output Current:						
TRIG, Sink	I_{OS}	25	-	-	mA	Vss = +12V V_{OL} = Vss - 4V
PL Source	I_{OPL}	5	-	-	mA	$V_{OP\,L}$= Vss - 1V

DYNAMIC CHARACTERISTICS:

	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
SYNC frequency	f_S	40	-	70	Hz	-
PL, OFF hold time	T_H	50	-	infinite	ms	60Hz SYNC
	T_H	60	-	infinite	ms	50Hz SYNC
TRIG Pulse Width	T_W	-	1.0	-	ms	60Hz SYNC
	T_W	-	1.2	-	ms	50Hz SYNC