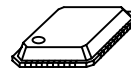


1/3, 1/4 Duty LCD Driver

■ GENERAL DESCRIPTION

NJU6533 is a 1/3 or 1/4 duty segment type LCD driver. It incorporates 4 common driver circuits and 32 segment driver circuits. **NJU6533** can drive maximum 96 segments in 1/3 duty ratio and maximum 128 segments in 1/4 duty ratio. Controlled by MPU, **NJU6533** can be used in many LCD applications

■ PACKAGE OUTLINE

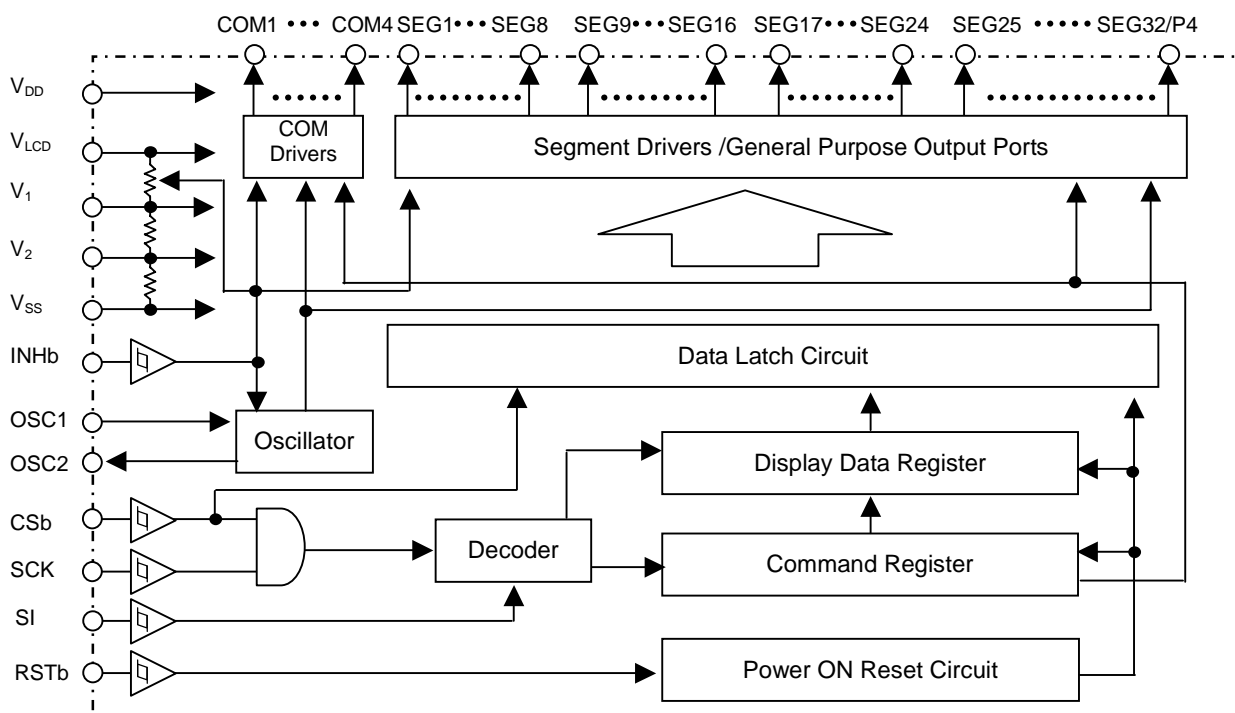


NJU6533KQ1

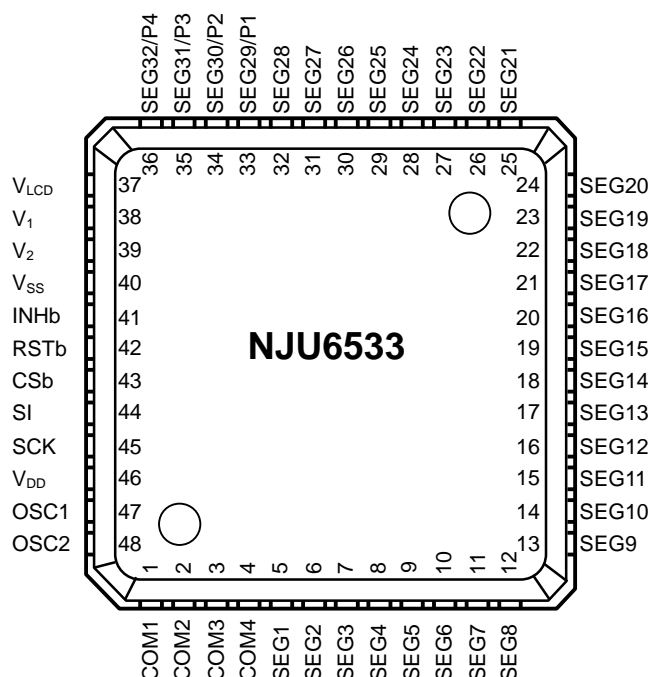
■ FEATURES

- LCD driving circuit :Max. 32outputs (4 outputs as for general purpose ports)
- Programmable Duty Ratio
 - 1/3 duty ratio :Driving max. 96 segments
 - 1/4 duty ratio :Driving max. 128 segments
- Programmable Bias Ratio :1/2, 1/3 bias ratio
- Serial Data Transfer :Shift clock max. 2MHz
- Built-in Oscillator :CR oscillation with external resistor, or external oscillation signal input.
- Display OFF :INHb pin
- Operating Voltage :3V / 5.0V
- C-MOS Technology :P-Sub
- Package Outline :QFN48

■ BLOCK DIAGRAM



PIN CONFIGURATION



TERMINAL DISCRIPTION

| No. | Pad Name | Function |
|-----------|------------------------------------|---|
| 46 | V _{DD} | Power supply: 3V /5V |
| 37 | V _{LCD} | LCD driving voltage $V_{LCD} \geq V_1 \geq V_2 \geq V_{SS}$, $V_{LCD} \geq V_{DD}$ |
| 38, 39 | V ₁ , V ₂ | Bias At 1/3 bias ratio, keep V ₁ - V ₂ open At 1/2 bias ratio, short V ₁ - V ₂ |
| 40 | V _{SS} | GND V _{SS} =0V |
| 41 | INHb | Display OFF When INHb is "H", display is ON, and when INHb is "L", display is off. When INHb is "L", all segment and common drivers output V _{SS} , and the oscillator stop operation. But, if at the same time RSTb="L", the oscillator functions and all segment and common drivers output V _{SS} |
| 42 | RSTb | Reset When RSTb is "L", command register and latch circuit is reset |
| 43 | CSb | Chip select When CSb is "L", data can be read in. |
| 44 | SI | Serial data input (8 bit=1 word) |
| 45 | SCK | Serial clock |
| 47, 48 | OSC1, OSC2 | External resistor connection pin for CR oscillation, or external clock input pin. When external clock is used, input the signal to OSC1 and keep OSC2 open. |
| 1~4 | COM1 ~ COM4 | Common driver outputs |
| 5~32 | SEG1 ~ SEG28 | Segment driver outputs |
| 33~36 | SEG29/P1 ~ SEG32 /P4 | Segment driver outputs/general purpose output ports These 4 pins can be used as segment driver outputs or general purpose output ports by setting Command Register. When selected as general purpose ports, data can be outputted via these ports during COM1 timing. According to transferred data, "H"=V _{DD} or "L"=V _{SS} will be outputted. |

■ FUNCTION DESCRIPTION

(1) Block Function

- Oscillator

The oscillator includes a built-in capacitor and an external resistor. It generates clock signal for LCD driving. When use external clock, input the clock signal to OSC1 and keep OSC2 open.

- Decoder

Input serial data is decoded and sent to the appropriate block.

- Command Register

Command data is written to this 8 bits command register to control **NJU6533** operation.

- Display Data Register

Data is written to this 8 bits register as display data.

- Latch Circuit

Data stored in display data register is assigned to the corresponding SEG/port.

- Segment Driver/General Purpose Ports

Basing on display data, segment drivers output LCD SEG driving signal.

And, SEG29/P1 ~ SEG32/P4 pins can be selected as segment driver output or general-purpose ports by instruction.

- Common Driver

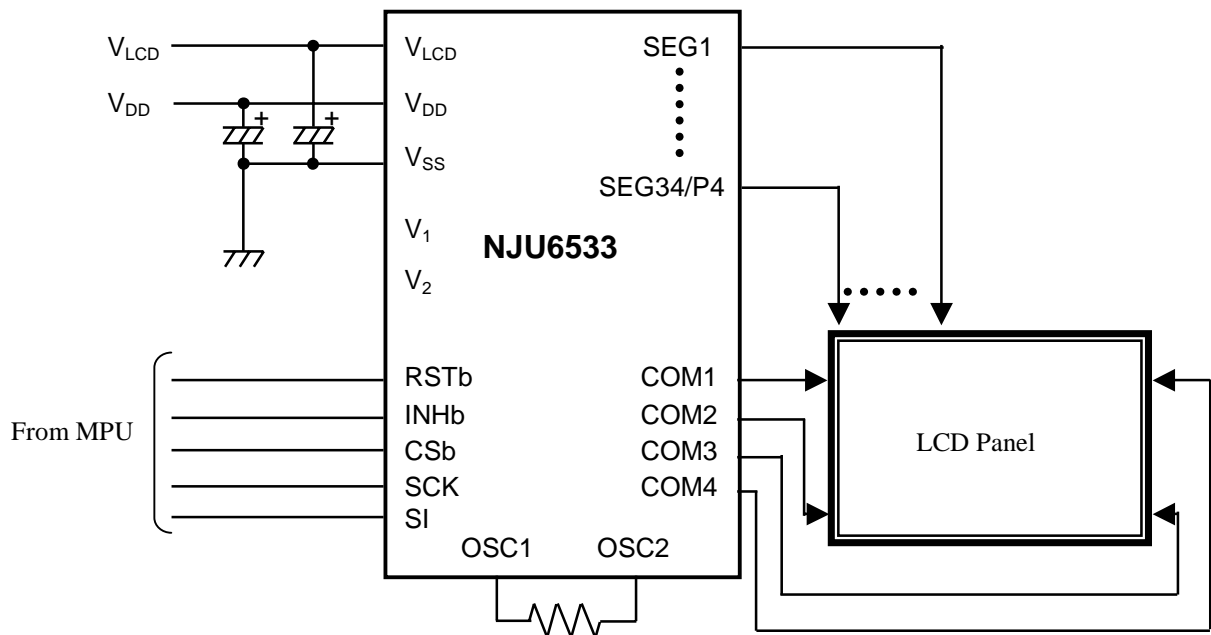
Common drivers output LCD COM driving signal.

- Power On Reset

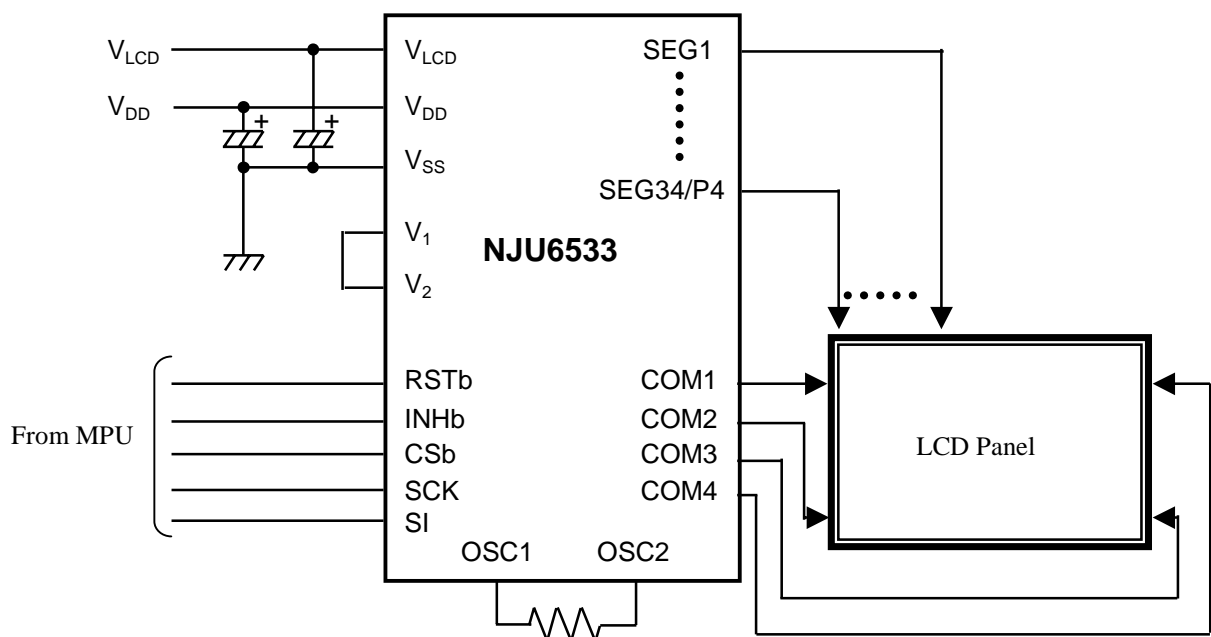
When power is on, **NJU6533** is automatically initialized. And if RSTb="L", **NJU6533** is reset too.

APPLICATION CIRCUIT

- 1/4 duty, 1/3 bias



- 1/4 duty, 1/2 bias



Note) Because display data is not yet stable just after V_{DD} on, if LCD panel is turned on, unexpected pattern will be displayed, therefore, keep $INHb$ terminal to "L" level until data transfer from MPU is over.

[CAUTION]

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