**JRC**

# NJU6533

## 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
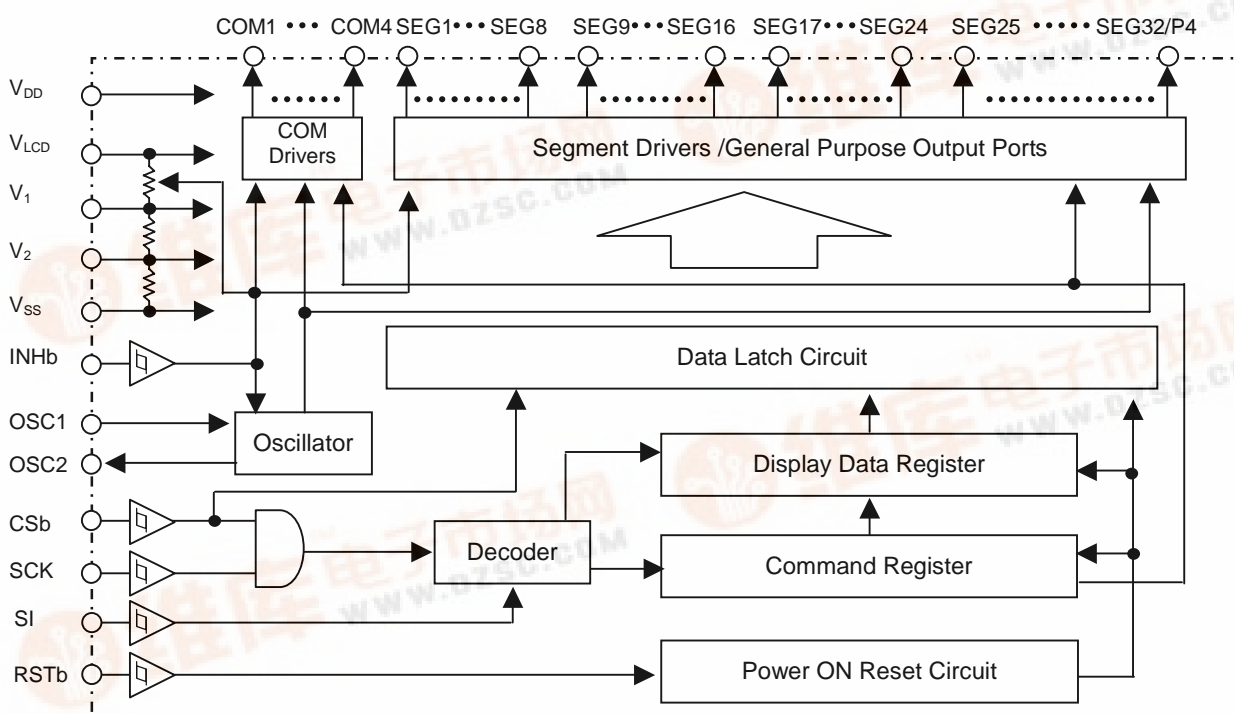
### ■ PACKAGE OUTLINE

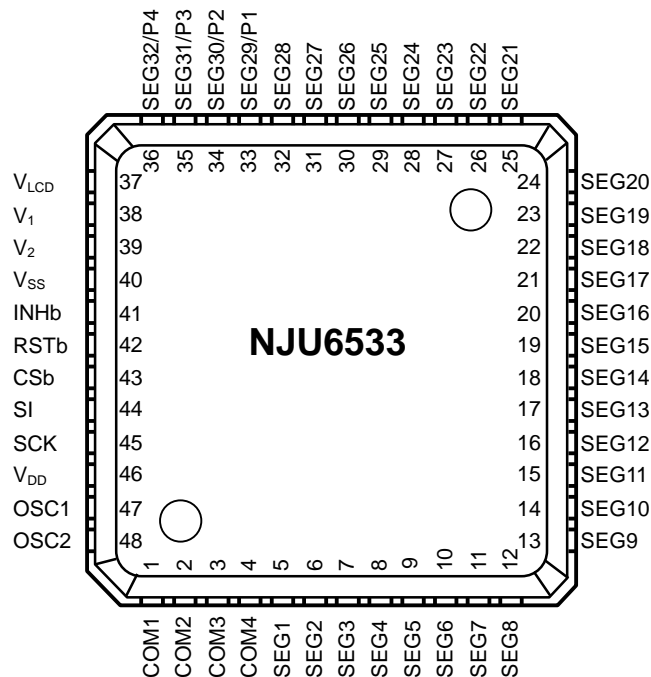**NJU6533KQ1**

### ■ 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



New Japan Radio Co.,Ltd.

# NJU6533

## ■ PIN CONFIGURATION



## ■ TERMINAL DISCRIPTION

| No. | Pad Name | Function |
|---|---|---|
| 46 | $V_{DD}$ | Power supply: 3V /5V |
| 37 | $V_{LCD}$ | LCD driving voltage<br>$V_{LCD} \geq V_1 \geq V_2 \geq V_{SS}$, $V_{LCD} \geq V_{DD}$ |
| 38, 39 | $V_1$, $V_2$ | Bias<br>At 1/3 bias ratio, keep $V_1$- $V_2$ open<br>At 1/2 bias ratio, short $V_1$- $V_2$ |
| 40 | $V_{SS}$ | GND<br>$V_{SS} = 0V$ |
| 41 | INHb | Display OFF<br>When INHb is "H", display is ON, and when INHb is "L", display is off.<br>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<br>When RSTb is "L", command register and latch circuit is reset |
| 43 | CSb | Chip select<br>When CSb is "L", data can be read in. |
| 44 | SI | Serial data input (8 bit=1word) |
| 45 | SCK | Serial clock |
| 47, 48 | OSC1, OSC2 | External resistor connection pin for CR oscillation, or external clock input pin.<br>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<br>These 4 pins can be used as segment driver outputs or general purpose output ports by setting Command Register.<br>When selected as general purpose ports, data can be outputted via these ports during COM1 timing.<br>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
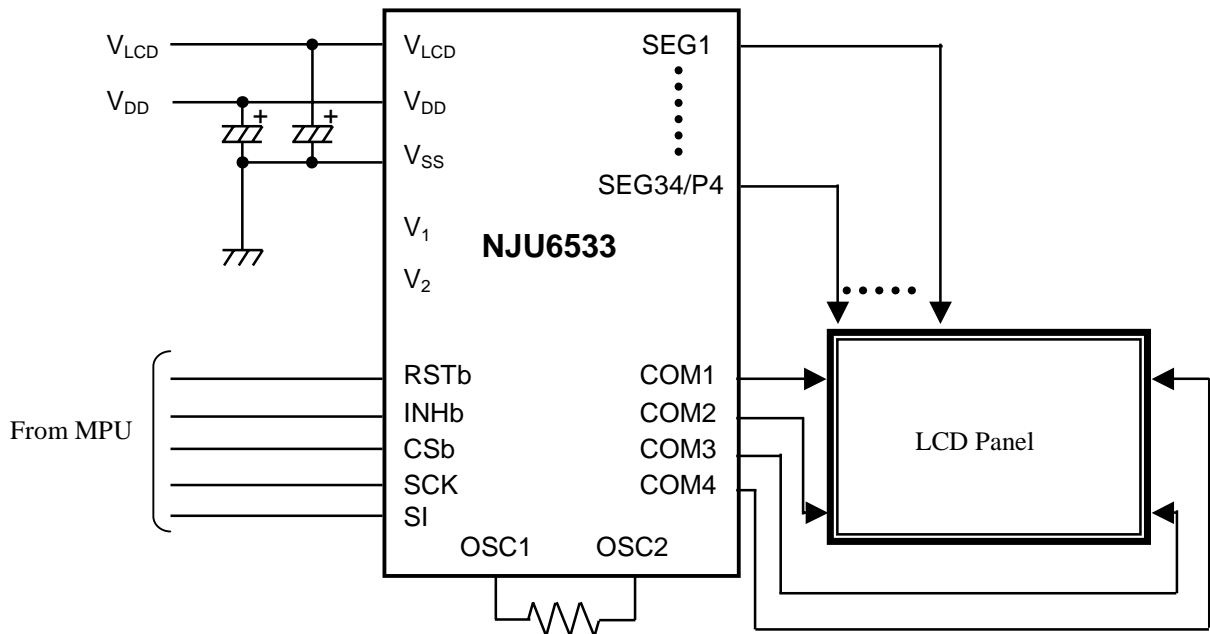Common drivers output LCD COM driving signal.

• Power On Reset
When power is on, **NJU6533** is automatically initialized. And if RSTb="L", **NJU6533** is reset too.
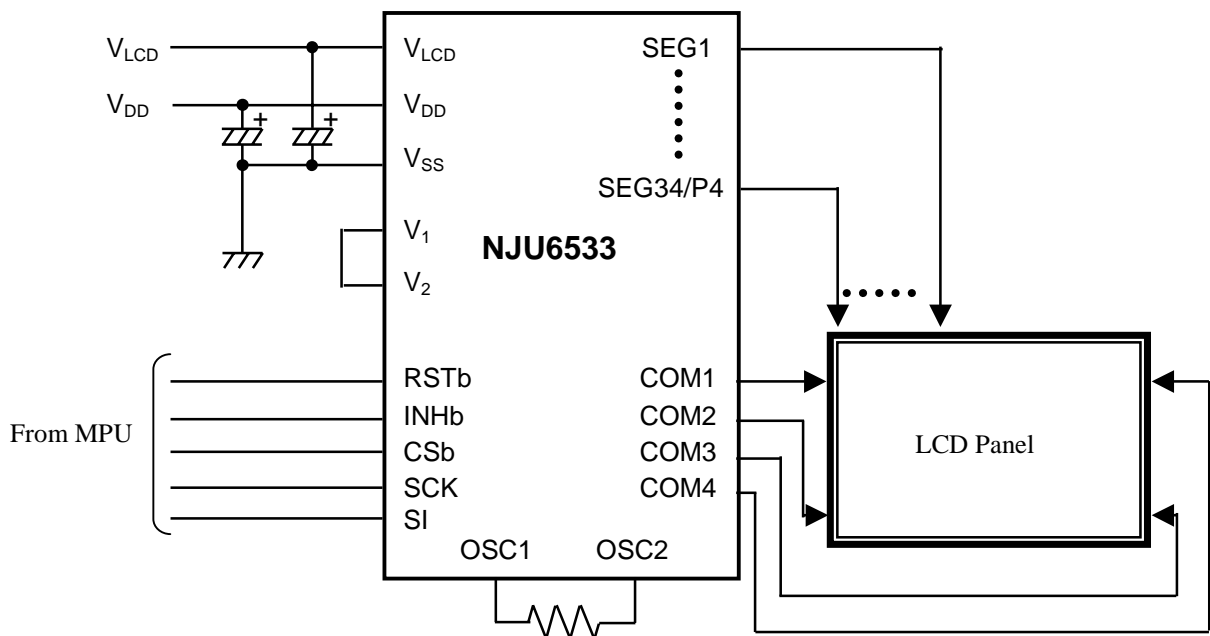
# NJU6533

## ■ 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.