

# SED1190

## CMOS LCD 64-COMMON DRIVERS

### ■ DESCRIPTION

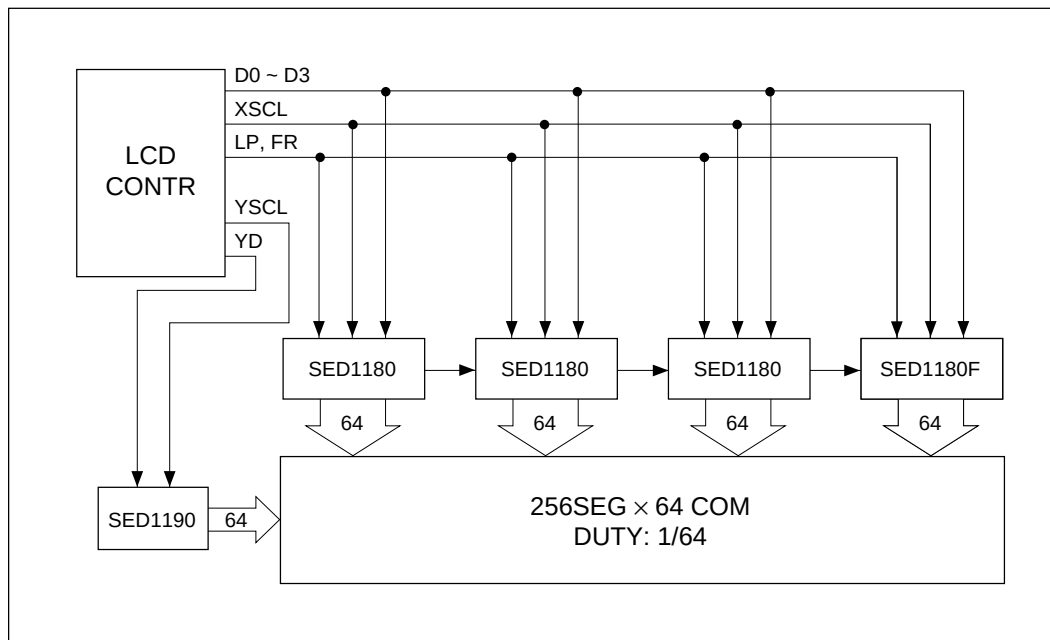
The SED1190 is a dot matrix LCD common (row) driver for driving high-capacity LCD panel at duty cycles higher than 1/64. The LSI uses two serially connected, 32-bit shift registers to hold the display data, and level shifter converts the TTL level 64-bit parallel data from the shift registers to levels suitable for use by the LCD drive circuitry. The SED1190 generates common drive signals using the voltages supplied to LCD drive voltage pins.

The SED1190 is used in conjunction with the SED1180 (64-bit row driver) to drive a large capacity dot matrix LCD panel.

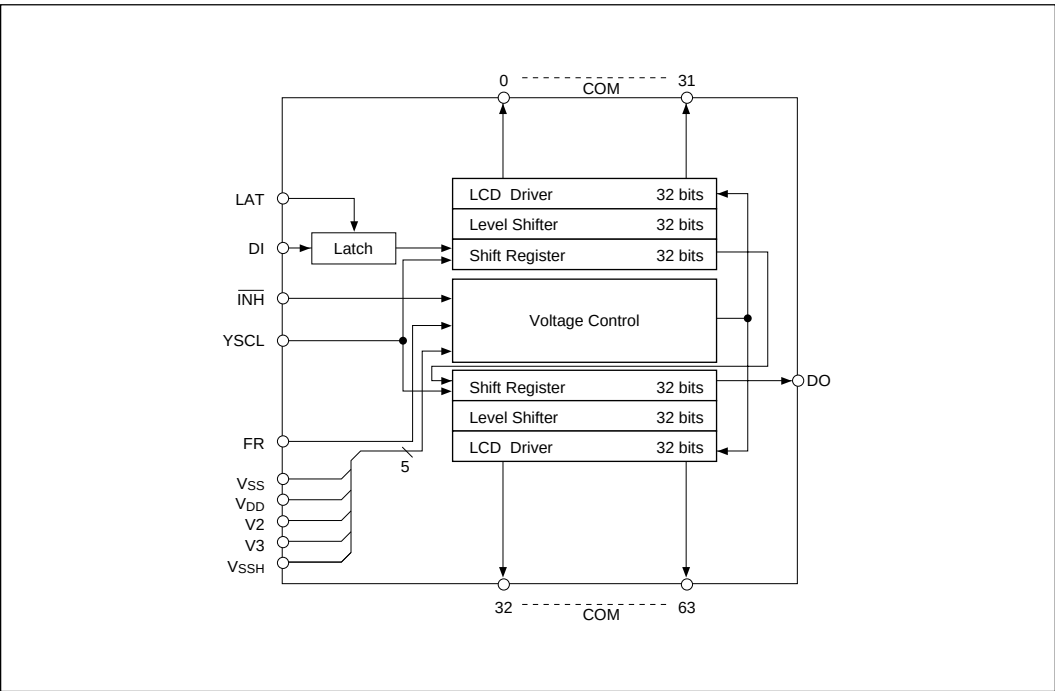
### ■ FEATURES

- Low-power CMOS technology
- 64-bit common (row) driver
- Display blanking
- Duty cycle: 1/64 to 1/128
- Daisy chain enable support
- Wide range of LCD voltage: -14V to -25V
- Supply voltage: 5.0V  $\pm 10\%$
- Package: ..... QFP1-80 pin (F0A)  
QFP5-80 pin (F5A)  
DIE: Al pad chip (D0A)

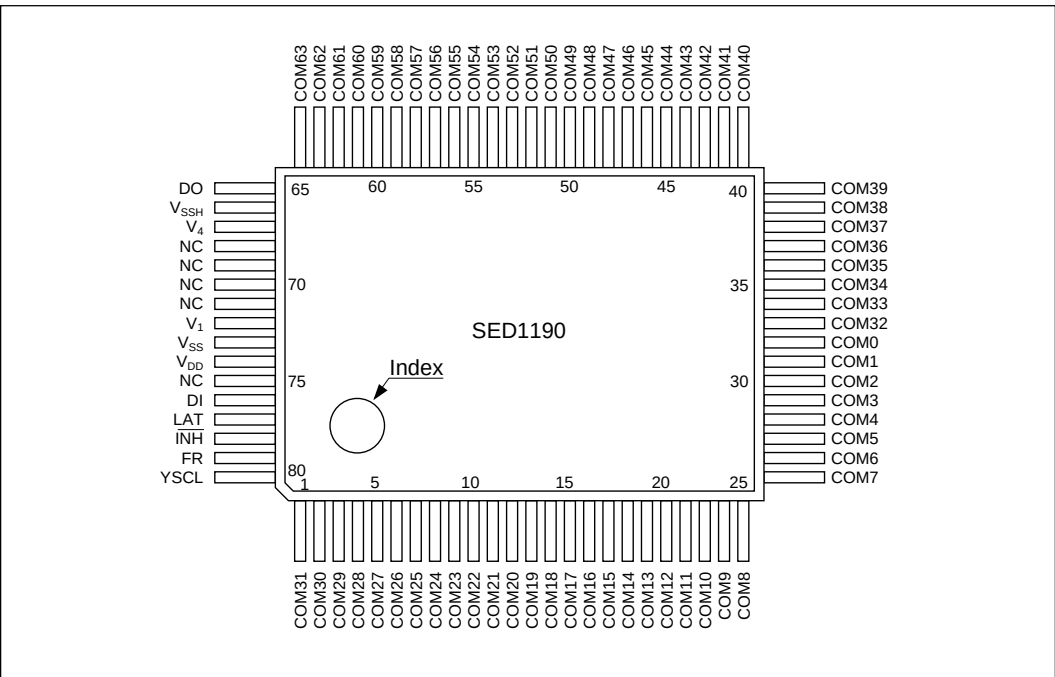
### ■ SYSTEM BLOCK DIAGRAM



■ BLOCK DIAGRAM



■ PIN CONFIGURATION



| Number | Name  | Number | Name  | Number | Name  | Number | Name  |
|--------|-------|--------|-------|--------|-------|--------|-------|
| 1      | COM31 | 21     | COM11 | 41     | COM40 | 61     | COM60 |
| 2      | COM30 | 22     | COM10 | 42     | COM41 | 62     | COM61 |
| 3      | COM29 | 23     | COM 9 | 43     | COM42 | 63     | COM62 |
| 4      | COM28 | 24     | COM 8 | 44     | COM43 | 64     | COM63 |
| 5      | COM27 | 25     | COM 7 | 45     | COM44 | 65     | DO    |
| 6      | COM26 | 26     | COM 6 | 46     | COM45 | 66     | VSSH  |
| 7      | COM25 | 27     | COM 5 | 47     | COM46 | 67     | V4    |
| 8      | COM24 | 28     | COM 4 | 48     | COM47 | 68     | NC    |
| 9      | COM23 | 29     | COM 3 | 49     | COM48 | 69     | NC    |
| 10     | COM22 | 30     | COM 2 | 50     | COM49 | 70     | NC    |
| 11     | COM21 | 31     | COM 1 | 51     | COM50 | 71     | NC    |
| 12     | COM20 | 32     | COM 0 | 52     | COM51 | 72     | V1    |
| 13     | COM19 | 33     | COM32 | 53     | COM52 | 73     | Vss   |
| 14     | COM18 | 34     | COM33 | 54     | COM53 | 74     | VDD   |
| 15     | COM17 | 35     | COM34 | 55     | COM54 | 75     | NC    |
| 16     | COM16 | 36     | COM35 | 56     | COM55 | 76     | DI    |
| 17     | COM15 | 37     | COM36 | 57     | COM56 | 77     | LAT   |
| 18     | COM14 | 38     | COM37 | 58     | COM57 | 78     | INH   |
| 19     | COM13 | 39     | COM38 | 59     | COM58 | 79     | FR    |
| 20     | COM12 | 40     | COM39 | 60     | COM59 | 80     | YSCL  |

NC = Not connected

## ■ PIN DESCRIPTION

| Pin Name      | Function                                                                                          |    |                 |
|---------------|---------------------------------------------------------------------------------------------------|----|-----------------|
| COM0 to COM63 | LCD common drive outputs                                                                          |    |                 |
| DI            | Serial data input                                                                                 |    |                 |
| LAT           | Transparent latch control input:                                                                  |    |                 |
|               | LAT                                                                                               | DI | DI latch output |
|               | H                                                                                                 | H  | H               |
|               |                                                                                                   | L  | L               |
|               | L                                                                                                 | X  | DI latch        |
| DO            | Serial data output                                                                                |    |                 |
| YSCL          | Serial data shift clock. Data is shifted through the controller on the falling edge of this clock |    |                 |
| FR            | LCD AC-drive signal input                                                                         |    |                 |
| INH           | Active-low blanking input                                                                         |    |                 |
| VDD, VSS      | Logic power supply inputs                                                                         |    |                 |
| V1, V4, VSSH  | LCD drive power inputs<br>VDD ≥ V1 ≥ V4 ≥ VSSH                                                    |    |                 |

## ■ ELECTRICAL CHARACTERISTICS

### ● Absolute Maximum Ratings

| Parameter                      | Symbol           | Ratings                      | Unit  |
|--------------------------------|------------------|------------------------------|-------|
| Supply voltage (1)             | V <sub>SS</sub>  | −7.0 to +0.3                 | V     |
| Supply voltage (2)             | V <sub>SSH</sub> | −28.0 to +0.3                | V     |
|                                | V1, V4           |                              |       |
| Input voltage                  | V <sub>I</sub>   | V <sub>SS</sub> −0.3 to +0.3 | V     |
| Operating temperature          | T <sub>opr</sub> | −20 to +75                   | °C    |
| Storage temperature            | T <sub>stg</sub> | −55 to +125                  | °C    |
| Soldering temperature and time | T <sub>sol</sub> | 260, 10                      | °C, s |

#### Notes:

1. All voltages referenced to a V<sub>DD</sub> of 0 V.
2. V1 and V4 must satisfy the relationship  $V_{DD} \geq V1$ ,  $V4 \geq V_{SSH}$
3. Exceeding the absolute maximum ratings can cause permanent damage to the device. Functional operation under these conditions is not implied.
4. Moisture resistance of flat packages can be reduced by the soldering process. Care should be taken to avoid thermally stressing the package during board assembly.

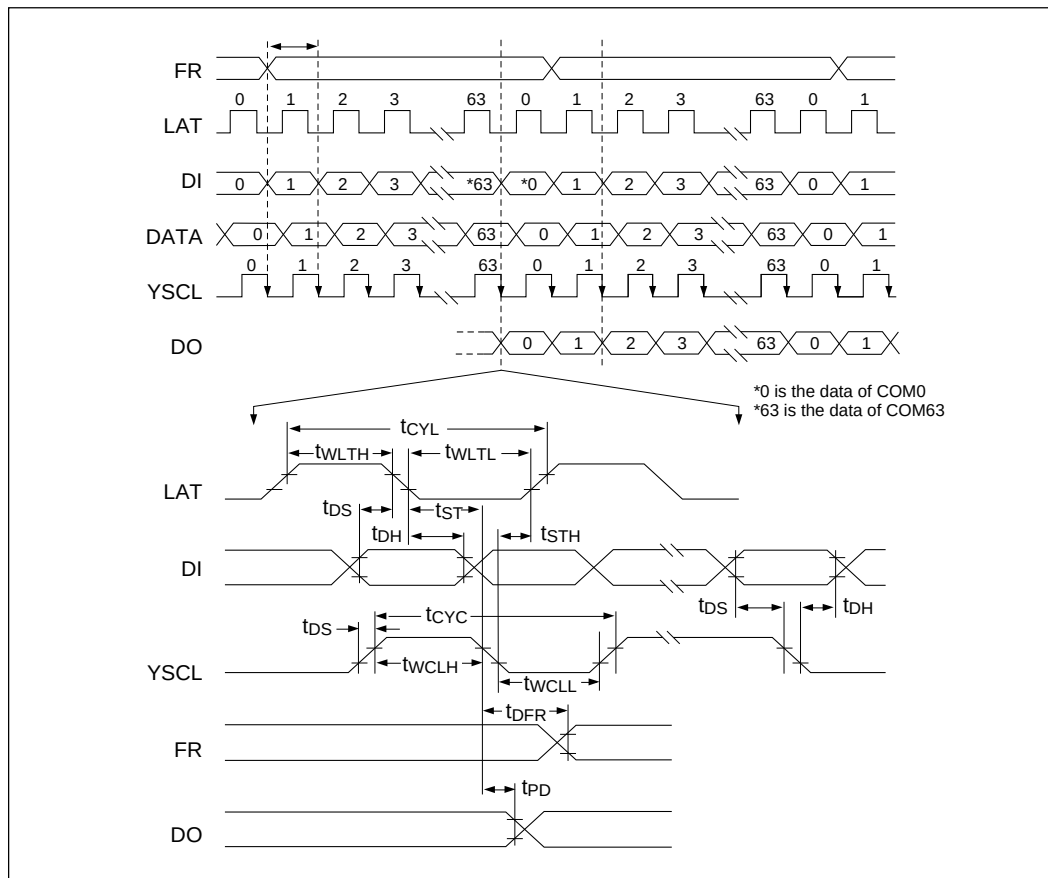
## ● DC Characteristics

(V<sub>DD</sub> = 0V, V<sub>SS</sub> = -5.0 V ±10%, T<sub>a</sub> = -20 to 75°C)

| Parameter                       | Symbol           | Conditions                                                                                       |                                                                                                                                                                                                           | Rating               |      |                      | Unit |
|---------------------------------|------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------|----------------------|------|
|                                 |                  |                                                                                                  |                                                                                                                                                                                                           | Min                  | Typ  | Max                  |      |
| Supply voltage (1)              | V <sub>SS</sub>  |                                                                                                  |                                                                                                                                                                                                           | -5.5                 | -5.0 | -4.5                 | V    |
| Supply voltage (2)              | V <sub>I1</sub>  |                                                                                                  |                                                                                                                                                                                                           | V <sub>SSH</sub>     | —    | V <sub>DD</sub>      | V    |
|                                 | V <sub>I4</sub>  |                                                                                                  |                                                                                                                                                                                                           | V <sub>SSH</sub>     | —    | V <sub>DD</sub>      | V    |
|                                 | V <sub>SSH</sub> | Recommended V <sub>SSH</sub>                                                                     |                                                                                                                                                                                                           | -25.0                | —    | -14.0                | V    |
|                                 |                  | Operable V <sub>SSH</sub> (see note)                                                             |                                                                                                                                                                                                           | -25.0                | —    | -5.0                 | V    |
| High level input voltage        | V <sub>IH</sub>  |                                                                                                  |                                                                                                                                                                                                           | 0.2V <sub>SS</sub>   | —    | V <sub>DD</sub> +0.3 | V    |
| Low level input voltage         | V <sub>IL</sub>  |                                                                                                  |                                                                                                                                                                                                           | V <sub>SS</sub> -0.3 | —    | 0.8V <sub>SS</sub>   | V    |
| High level output voltage       | V <sub>OH</sub>  | I <sub>OH</sub> = -0.6 mA                                                                        |                                                                                                                                                                                                           | -0.4                 | —    | —                    | V    |
| Low level output voltage        | V <sub>OL</sub>  | I <sub>OL</sub> = 0.6 mA                                                                         |                                                                                                                                                                                                           | —                    | —    | V <sub>SS</sub> +0.4 | V    |
| Input leakage current           | I <sub>LI</sub>  | 0 V ≥ V <sub>I</sub> ≥ V <sub>SS</sub>                                                           |                                                                                                                                                                                                           | —                    | 0.05 | 2.0                  | μA   |
| Output leakage current          | I <sub>LO</sub>  | 0 V ≥ V <sub>O</sub> ≥ V <sub>SS</sub>                                                           |                                                                                                                                                                                                           | —                    | 0.05 | 5.0                  | μA   |
| Shift clock                     | YSCL             |                                                                                                  |                                                                                                                                                                                                           | —                    | —    | 2.5                  | MHz  |
| Frame signal                    | FR               |                                                                                                  |                                                                                                                                                                                                           | —                    | 1/60 | —                    | s    |
| Input capacitance               | C <sub>I</sub>   | T <sub>a</sub> = 25°C                                                                            |                                                                                                                                                                                                           | —                    | 5.0  | 8.0                  | pF   |
| Common output on resistance     | R <sub>COM</sub> | V <sub>OH</sub> = V <sub>DD</sub> -0.5 V<br>V <sub>OL</sub> = V <sub>SSH</sub> +0.5 V<br>COM bit | V <sub>SSH</sub> = -20.0 V                                                                                                                                                                                | —                    | 0.8  | 1.0                  | kΩ   |
|                                 |                  |                                                                                                  | V <sub>SSH</sub> = -14.0 V                                                                                                                                                                                | —                    | 0.9  | 1.3                  |      |
|                                 |                  |                                                                                                  | V <sub>SSH</sub> = -9.0 V                                                                                                                                                                                 | —                    | 1.3  | 2.0                  |      |
|                                 |                  |                                                                                                  | V <sub>SSH</sub> = -5.0 V                                                                                                                                                                                 | —                    | 3.0  | 30.0                 |      |
| Quiescent current               | I <sub>Q</sub>   | SED 1190                                                                                         | V <sub>SSH</sub> = -25 V, V <sub>SSH</sub> = -5.5 V, V <sub>I</sub> = V <sub>DD</sub>                                                                                                                     | —                    | 0.05 | 30                   | μA   |
| Operating current for the logic | I <sub>SS</sub>  | FR cycle = 16.7 ms                                                                               | V <sub>SS</sub> = -5.0 V, V <sub>IH</sub> = V <sub>DD</sub> , V <sub>IL</sub> = V <sub>SS</sub> , YSCL cycle = 130 μs (duty 50%), All "H" output terminals are opened at every data input all 1/128 duty. | —                    | 3.0  | 8.0                  | μA   |
| Operating current for LCD       | I <sub>SSH</sub> | FR cycle = 16.7 ms                                                                               | V <sub>SS</sub> = -4.5 V, V <sub>I1</sub> = -2.0 V, V <sub>I4</sub> = -18.0 V, YSCL cycle = 130 μs (duty 50%), All "H" output terminals are opened at every data input of 1/128 duty.                     | —                    | 3.0  | 8.0                  | μA   |
| Pull up MOS current             | -I <sub>p</sub>  | V <sub>SS</sub> = -5.0 V, V <sub>IL</sub> = -5.0 V<br>Applicable to LAT input terminals          |                                                                                                                                                                                                           | 10.0                 | 25.0 | 50.0                 | μA   |

**Note:** Error free operation is guaranteed in this range but the output resistance of the LCD drivers is higher than in the recommended operating range. It is suggested that the driver is tested with the target LCD panel to determine if performance is acceptable.

- AC Electrical Characteristics
  - I/O Signal Timing

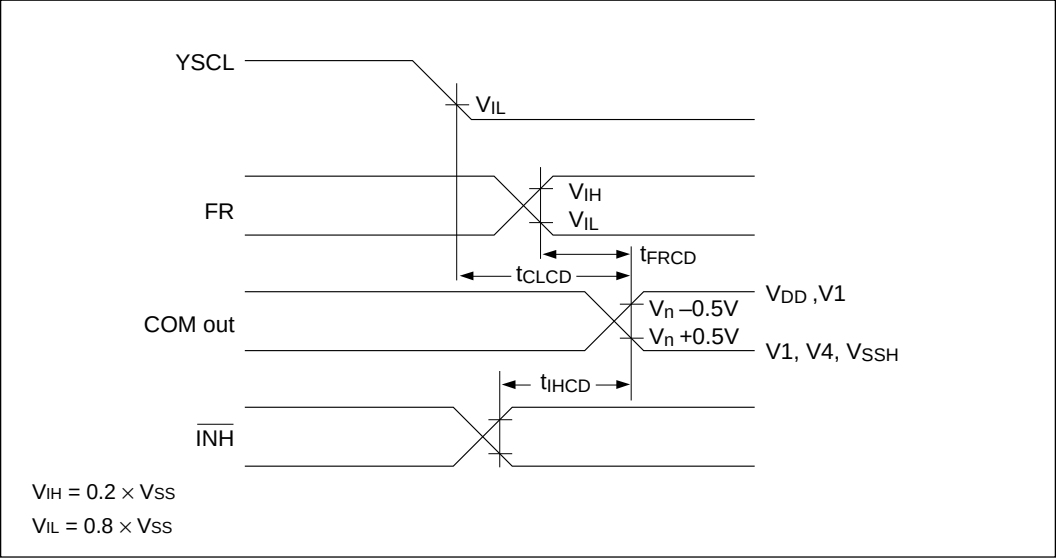


$V_{DD} = 0V$ ,  $V_{SS} = -5.0V \pm 10\%$ ,  $T_a = -20$  to  $75^\circ C$

| Parameter                      | Symbol | Conditions | Min       | Typ | Max | Unit |
|--------------------------------|--------|------------|-----------|-----|-----|------|
| Latch pulse cycle time         | tCYL   | —          | 400       | —   | —   | ns   |
| Latch pulse "H" width          | twLTH  | —          | 180       | —   | —   | ns   |
| Latch pulse "L" width          | twLL   | —          | 180       | —   | —   | ns   |
| Shift clock cycle time         | tCYC   | —          | 400       | —   | —   | ns   |
| Shift clock "H" time           | twCLH  | —          | 110       | —   | —   | ns   |
| Shift clock "L" time           | twCLL  | —          | 110 (240) | —   | —   | ns   |
| Data setup time                | tDS    | —          | 100 (70)  | —   | —   | ns   |
| Data hold time                 | tDH    | —          | 30        | —   | —   | ns   |
| Data shift timing              | tST    | —          | 0         | —   | —   | ns   |
| Data shift hold time           | tSTH   | —          | 125       | —   | —   | ns   |
| Permissible frame signal delay | tDFR   | —          | -500      | 0   | 500 | ns   |
| Input signal rise time         | tr     | —          | —         | —   | *   | ns   |
| Input signal fall time         | tf     | —          | —         | —   | *   | ns   |
| Data output delay time         | tPD    | CL = 15pF  | 30        | —   | 170 | ns   |

\* tr, tf = (tCYL - twLH - twLTL) / 2 where tf ≥ 50ns.

● Common Drive

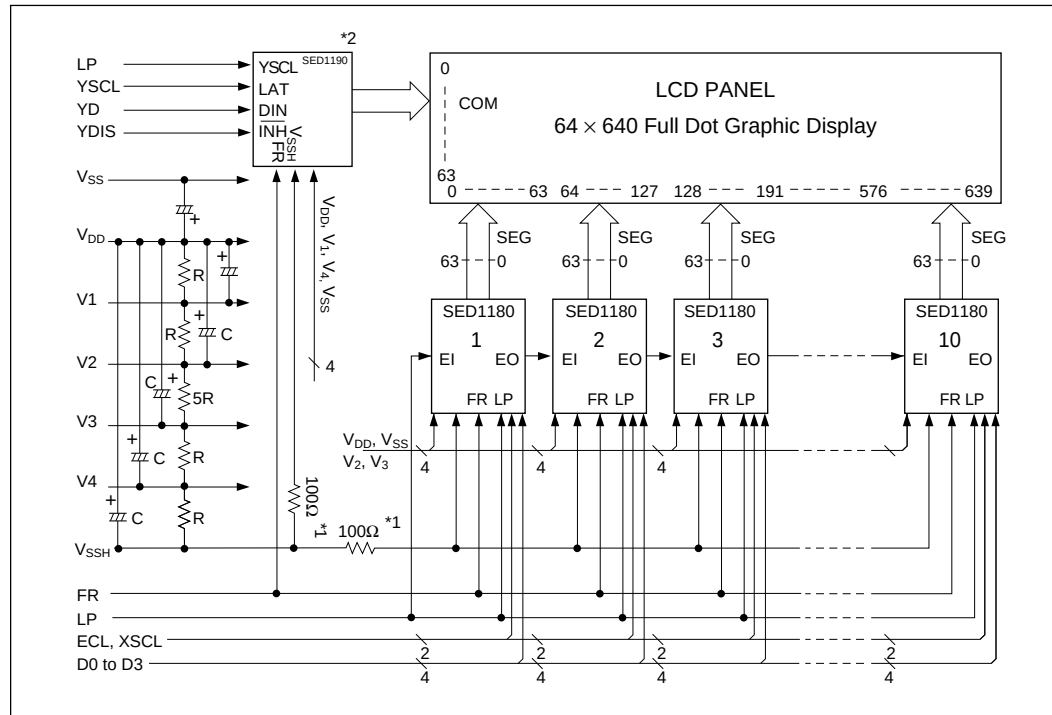


$V_{DD} = 0V, V_{SS} = -5.0V \pm 10\%, T_a = -20 \text{ to } 75^\circ\text{C}$

| Parameter                    | Symbol     | Conditions                                            | Min | Typ | Max | Unit    |
|------------------------------|------------|-------------------------------------------------------|-----|-----|-----|---------|
| YSCl – COM output delay time | $t_{CLCD}$ | $V_{SSH} = -14.0 \text{ to } -25.0V$<br>$C_L = 100pF$ | —   | —   | 3.0 | $\mu s$ |
| RF – COM output delay time   | $t_{FRCD}$ |                                                       | —   | —   | 3.0 | $\mu s$ |
| INH – COM output delay time  | $t_{IHCD}$ |                                                       | —   | —   | 3.0 | $\mu s$ |

## ■ EXAMPLE OF APPLICATION

(64 × 640 pixels, 1/64 duty ratio)



### Notes:

1. Current limiting resistors
2. Bypass Vss and VSSH with capacitors of at least 0.01  $\mu$ F