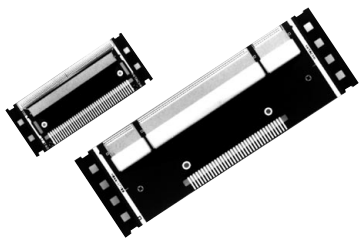
LCD Drivers for Handheld PCs HD66130/134S/136 HD66137

Main Uses: LCD displays for PDAs and subnote PCs
Implementation of LCD display systems featuring low power consumption and shadow-free display.

- 50% lower power consumption achieved through use of new LCD drive method
- High-quality shadow-free screen
- On-chip LCD power supply inversion/step-up circuit enables use of conventional drive system power supply
- Number of mounted devices reduced by high-output-count design
- Slim TCP package for narrower frame

In the field of portable information devices the demand is for features that will make these products more user-friendly—larger color screens that are easier on the eyes, higher speeds, and longer continuous operation. The greatest need is for longer continuous operation, but this necessitates lower power consumption, a requirement that conflicts with the demand for larger screens and higher speeds. Because of their features of lightness, thinness, and low power consumption, LCDs are widely used as the display systems in devices such as PDAs, but current mainstream PDA mid-size, monochrome LCDs of around 320 × 240 dots use a drive method that requires a high voltage (20 V or so) for both segment and common drivers. With this type, the power for charging and discharging the liquid crystal load accounts for a significant proportion of the display power consumption, so that even if the LCD driver power consumption is reduced, there are still limits in terms of the overall display system.

In light of this, Hitachi has developed the HD/66130/134S/136/137 LCD driver chip sets, achieving lower power consumption through the use of a new LCD drive method, for use with mid-size color LCD displays of 320 × 240 dots to 640 × 240 dots, ideal for color PDAs.



Features

The new LCD drive method requires a higher common driver voltage (20 V to 43 V) than before, but enables the voltage for the large number of segment drivers to be cut to 2.6 V to 5.5 V. This decreases the liquid crystal load charge/discharge current that accounts for most of the power consumption, and greatly reduces the power consumption of the overall display system. As the LCD drive output amplitude is decreased, waveform distortion is also

Table 1 Product Specifications

Item	Segment Drivers			Common Driver
	HD66130	HD66134S	HD66136	HD66137
LCD output pins	240/320	240	384/400	160/200/240
Logic operating voltage	2.5 V to 5.5 V	2.7 V to 5.5 V	2.7 V to 5.5 V	2.5 V to 5.5 V
LCD drive voltage	2.6 V to 5.5 V (V_0-GND)	3.5 V to 5.5 V (V_0-GND)	2.7 V to 5.5 V (V_0-GND)	15 V to 43 V (V_{LCD}-V_{EE})
Data bits	4/8	8	8/12	1
LCD drive power supply inversion/ step-up circuit	—	—	—	On-chip switch circuit generating negative power supply through use of external capacitors
Shadowing correction circuit	No	Yes (External circuit required)	Yes (External circuit required)	—
Alternation signal generator	No	No	No	2-line to 31-line alternation signal generation

reduced, preventing a drop in contrast and helping to improve display quality. With a simple driver type, conventional LCD modules can be directly replaced with these new products, enabling overall display system power consumption to be cut by approximately 50 percent by this measure alone.

The HD66130/134S/136 segment driver lineup offers a choice of models to suit the LCD screen dot-count and screen size. For example, the HD66136 segment driver allows switching between 400 and 384 LCD drive outputs, and can handle a wide variety of LCD panels. Used in combination with the HD66137 common driver, a 640 × 240-dot color display can be driven with a five-plus-one chip configuration, greatly reducing the number of mounted chips.

The HD66134S/136 segment drivers incorporate some shadowing correction circuitry, enabling a shadow-free screen to be achieved with simple external circuitry. The HD66137 common driver has an on-chip LCD power supply inversion/step-up circuit, and even with the new LCD drive method, a negative power supply (V_{EE}) is generated automatically by connecting two external capacitors, making it possible to use existing power supply circuits. In addition, any number of lines can be set for the signals providing LCD drive output alternation, allowing a setting to made in accordance with the frequency characteristics of the LCD used.

From Our Engineer

A slim TCP (tape carrier package) is used, enabling the creation of a lightweight, compact LCD display with a small frame area. Future development will focus on a further reduction in power consumption.

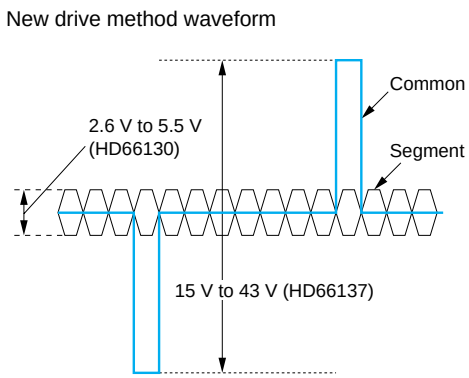


Fig. 1 Drive Method

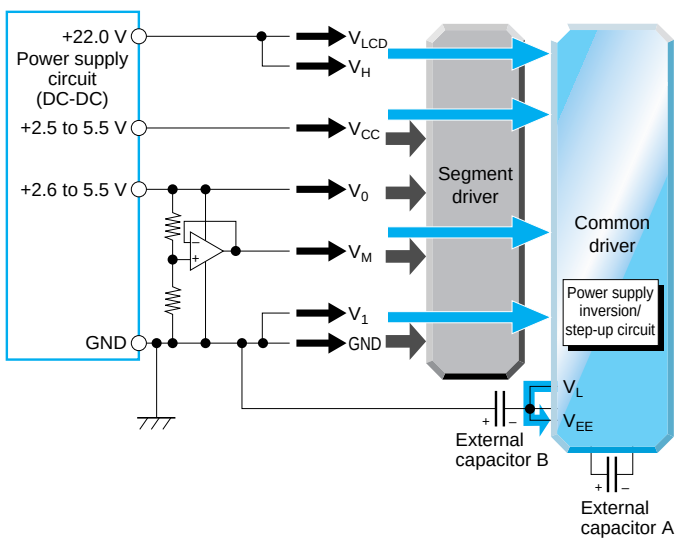


Fig. 2 Sample Power Supply Circuit