

NXP LCD segment drivers PCF8551 & PCF8553

# Low-power, low-cost LCD segment drivers for compact, efficient applications

These highly integrated drivers, optimized for low voltage and low power at a low cost, have a minimum  $V_{DD}$  and  $V_{LCD}$  of only 1.8 V, and typically consume just 4.6  $\mu$ A at mux 1:4, a frame frequency of 64 Hz, and all segments driven ON. Housed in small TSSOP packages, they are ideally suited for use in metering, consumer healthcare, small appliances, battery-operated systems, wearable devices, and more.

# **KEY FEATURES**

- ▶ PCF8551: 4 x 36 LCD segment driver in TSSOP48 package
- ▶ PCF8553: 4 x 40 LCD segment driver in TSSOP56 package
- $V_{DD}$  and  $V_{LCD}$  with independent supplies (range: 1.8 to 5.5 V)
- Multiplex drive mode selectable for static, 1:2, 1:3 and 1:4
- Display bias configuration selectable for static, 1/2 and 1/3
- Display inversion mode selectable for line (driving scheme A) and frame inversion (driving scheme B)
- Selectable internal or external clock via input pin CLK
- ▶ Programmable frame frequency from 32 to 128 Hz
- Selectable power-on-reset (POR) functionality via input pin PORE
- Blinking functionality and selectable blinking frequencies
- Programmable power drive boost mode to increase driving capability of LCD outputs and support large displays with higher effective capacitance
- ▶ Ultra-low power (I<sub>DD</sub> + I<sub>LCD</sub>):
  - 50 nA (typ) in power-down mode
  - 1.6  $\mu A$  (typ) in static mode and all segments ON 4.6  $\mu A$  (typ) in mux 1:4 and all segments ON
- ▶ Operating temperature range -40 to +85 °C

# **KEY BENEFITS**

- Low voltage
- Low power
- Low cost
- High reliability
- Design versatility
- Suitable for a wide selection of LCDs

# **APPLICATIONS**

- Utility meters
- Consumer healthcare devices, such as meters for blood glucose or blood pressure
- Small appliances, including coffee makers, weight scales, thermostats, etc.
- Wearable devices

The NXP PCF8551 and PCF8553 are single-chip LCD controllers and drivers that integrate an oscillator, bias generation, and instruction decoding. The PCF8551 is a  $4 \times 36$  driver in a TSSOP48 package, while the PCF8553 is a  $4 \times 40$  driver in a TSSOP56 package.



When designers replace a microcontroller that integrates an LCD driver with a two-chip combination that uses a lower-cost microcontroller and an external LCD driver like the PCF8551 or PCF8553, the result is greater design flexibility, better performance, and higher reliability – all at a comparable cost. For example, to create a very cost-effective solution without compromising quality or performance, designers can use the PCF8551 or PCF8553 with one of NXP's low-cost microcontrollers, such as the LPC812 in a TSSOP20 package.

The PCF8551 is available with a 2-line I<sup>2</sup>C interface that operates at up to 400 kHz, or a 3-line SPI interface that operates at up to 3 MHz. The PCF8553 has a selectable I<sup>2</sup>C or SPI interface.

Both devices offer very low current consumption. To reduce consumption even further, the designer can select a low-capacitance display and program it for a low multiplex rate (depending on the display resolution), and a low frame frequency. Selecting a low  $V_{LCD}$  voltage can help, too.

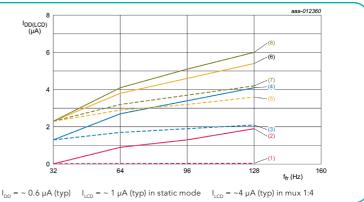
# PCF8551 and PCF8553 pin configurations

								_
SEG31 1		48 SEG30	SEG31 1		48 SEG30	SEG34 1		56 SEG33
SEG32 2		47 SEG29	SEG32 2		47 SEG29	SEG35 2		55 SEG32
SEG33 3		46 SEG28	SEG33 3		46 SEG28	SEG36 3		54 SEG31
SEG34 4		45 SEG27	SEG34 4		45 SEG27	SEG37 4		53 SEG30
SEG35 5		44 SEG26	SEG35 5		44 SEG26	SEG38 5		52 SEG29
COM0 6		43 SEG25	COM0 6		43 SEG25	SEG39 6		51 SEG28
COM1 7		42 SEG24	COM1 7		42 SEG24	COM0 7		50 SEG27
COM2 8		41 SEG23	COM2 8		41 SEG23	COM1 8		49 SEG26
COM3 9		40 SEG22	COM3 9		40 SEG22	COM2 9		48 SEG25
VLCD 10		39 SEG21	VLCD 10		39 SEG21	COM3 10		47 SEG24
VDD 11		38 SEG20	VDD 11		38 SEG20	VLCD 11		46 SEG23
VSS 12		37 SEG19	VSS 12		37 SEG19	VDD 12	PCF8553DTT	45 SEG22
T1 13	CF8551ATT	36 SEG18	SDIO 13	PCF8551BTT	36 SEG18	IFS 13 VSS 14		44 SEG21
CLK 14		35 SEG17	CLK 14		35 SEG17	-		43 SEG20
SCL 15		34 SEG16	SCL 15		34 SEG16	RST 15 SDIO 16		42 SEG19 41 SEG18
SDA 16		33 SEG15	CE 16		33 SEG15	A0 17		40 SEG17
PORE 17		32 SEG14	PORE 17		32 SEG14	CLK 18		39 SEG16
SEG0 18		31 SEG13	SEG0 18		31 SEG13	SCL 19		38 SEG15
SEG1 19		30 SEG12	SEG1 19		30 SEG12	SDA/CE 20		37 SEG14
SEGI 19		29 SEG12	SEG2 20		30 SEG12 29 SEG11	PORE 21		36 SEG13
SEG2 20 SEG3 21		29 SEG10	SEG3 21		29 SEG10	A122		35 SEG12
SEG4 22			SEG4 22		28 SEG10 27 SEG9	SEG0 23		34 SEG11
	27 SEG9 28 SEG8		SEG5 23		27 SEG9 26 SEG8	SEG124		33 SEG10
SEG5 23			_			SEG2 25		32 SEG9
SEG6 24		25 SEG7	SEG6 24		25 SEG7	SEG3 26		31 SEG8
						SEG4 27		30 SEG7
		aaa-012401			aaa-012402	SEG5 28		29 SEG6
								898-011473

### Integrated versus standalone LCD driver

Features	Microcontroller	Microcontroller	
Design flexibility	Limited	High	
Resolution	Limited	High	
Optical performance	Limited	High	
Reliability	Limited	High	
Cost	Low	Comparable	

## Ultra-low (Please see the datasheet for additional information)



### **Ordering information**

Туре	Package and size	Marking	Interface	Delivery
PCF8551ATT/A	TSSOP48: 6.1 x 12.5 x 0.95 mm; pitch = 0.5 mm	PCF8551A	I <sup>2</sup> C (400 kHz)	Tape and Reel
PCF8551BTT/A	TSSOP48: 6.1 x 12.5 x 0.95 mm; pitch = 0.5 mm	PCF8551B	SPI (3 MHz)	Tape and Reel
PCF8553DTT/A	TSSOP56: 6.1 x 14.0 x 0.95 mm; pitch = 0.5 mm	PCF8553D	Selectable I <sup>2</sup> C or SPI	Tape and Reel

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