永嘉微电
Vinka Microelectronics

VK0384 Datasheet

48×8 LCD DRIVER

Rev.1.3

1 General Description

VK0384 is a dot-matrix storage-mapped LCD driver that supports LCD screens with a maximum of 384 dots (48SEG×8COM). The single-chip microcomputer can be configured to display parameters and send display data through a 3-wire serial interface, and can also enter power-saving mode through instructions.

2 Key Features

- Operating voltage:2.4-5.2V
- Integrated RC oscillator (default)
- Selectable LCD bias: 1/4
- Selectable LCD duty:1/8 duty (8 COM)
- Built-in 48×8 bit display RAM
- Configurable buzzer output: 2 kHz or 4 kHz
- Power-down mode via software command(LCD OFF, SYS DIS)
- 3 wire serial communication interface
- Software-configurable of LCD parameters
- Dual command formats for configuration and access
- Auto-increment addressing for sequential write
- VLCD adjustable via external pin (≤ VDD)
- Available Packages:
  LQFP64(7.0mm × 7.0mm PP=0.4mm)

3 Application field

- Electricity meter/gas meter
- Massage device/beauty device
- Medical instruments
- Vehicle-mounted equipment
- Air conditioner/heater

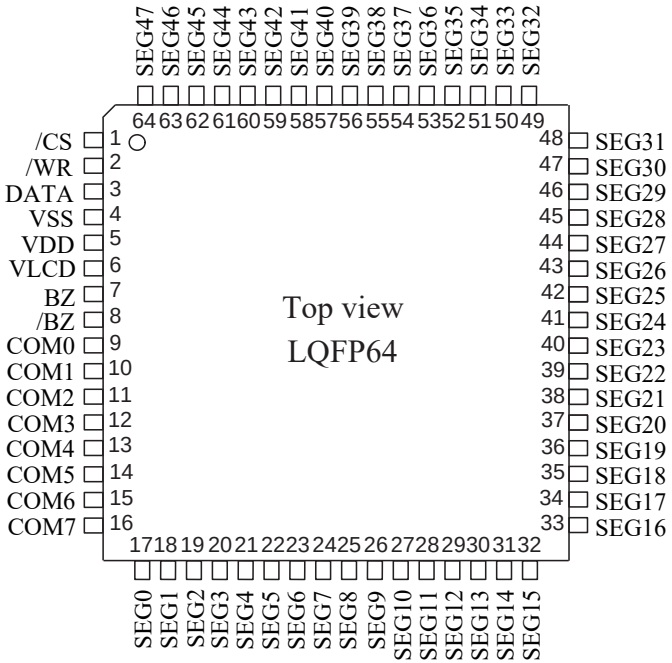
4 Product Selection

Part No.	VK0192	VK0256	VK0256B	VK0256C	VK0384
COM	8	8	8	8	8
SEG	24	32	32	32	48
On-chip oscillator	√	√	√	√	√
External clock	√	√	√	√	-

5 Ordering Information

Part No	Packaging	Tube Qty	Tray Qty	Box Qty	Total Qty	Notes
VK0192	LQFP44	-	160/tray	1600/box	9600 PCS	
VK0256	QFP64	-	66/tray	660/box	3960 PCS	
VK0256B	LQFP64	-	250/tray	2500/box	15000 PCS	
VK0256C	LQFP52	-	90/tray	900/box	5400 PCS	
VK0384	LQFP64	-	250/tray	2500/box	15000 PCS	

6 Package Pinout Information(LQFP64)



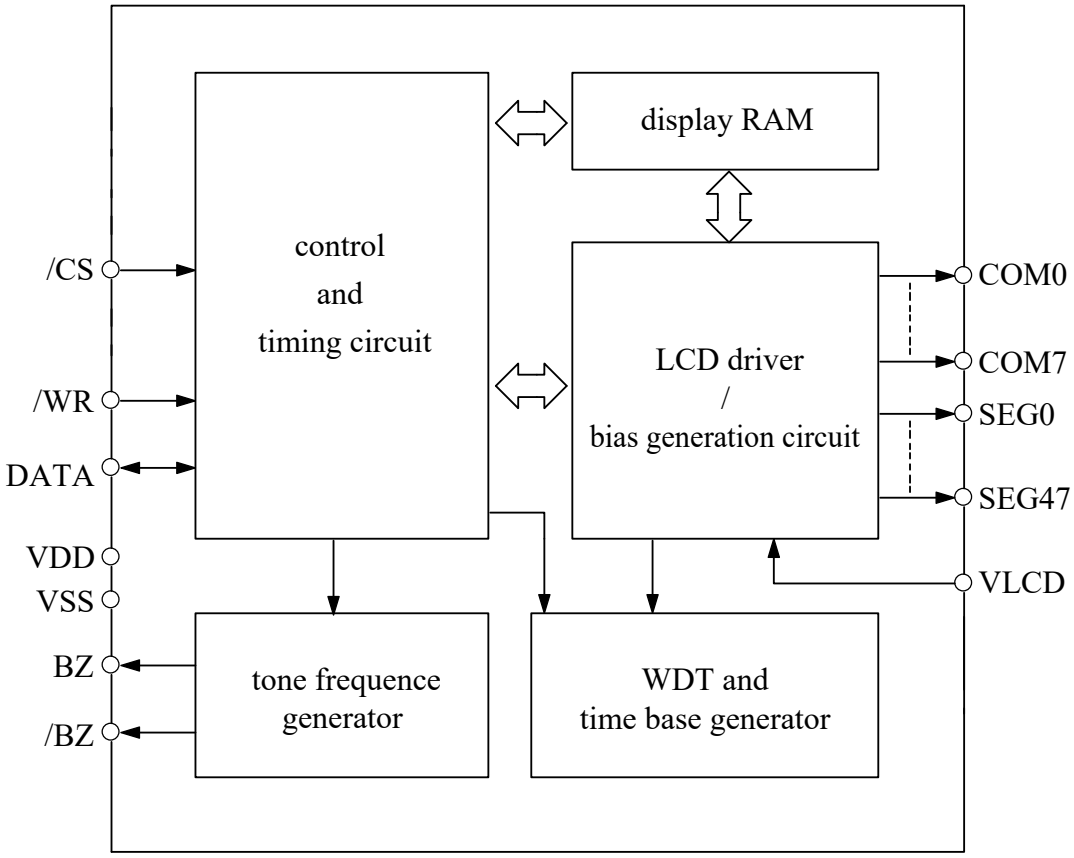
For more information: Page 15

6.1 VK0384/LQFP64 Pin Description

No.	Name	I/O	Function
1	/CS	I	Chip select signal with pull-up resistor ,active low.
2	/WR	I	Serial write signal with pull-up resistor, data latched on the rising edge of the /WR signal.
3	DATA	I/O	Serial data signal with pull-up resistor, input/output depending on access mode.
4	VSS	VSS	Negative power supply
5	VDD	VDD	Positive power supply
6	VLCD	I	LCD driving voltage input,must be ≤VDD
7	BZ	O	2kHz or 4kHz tone frequency output pair， when TONE OFF the BZ and /BZ pins output low level.
8	/BZ	O	
9-16	COM0-COM7	O	LCD COM drive outputs
17-64	SEG0-SEG47	O	LCD SEG drive outputs

7 Functional Description

7.1 Block Diagram



7.2 Display RAM

The VK0384 integrates 48 × 8-bit RAM for LCD display. directly mapped to SEGx/ COMx segments. Data is latched and updated on the LCD according to scan timing set by the system configuration. The display RAM can be accessed using three commands: WRITE, and MODIFY-WRITE. Each RAM address corresponds to a specific combination of SEG and COM lines.

The following is a mapping from the RAM to the LCD pattern:

	COM7	COM6	COM5	COM4		COM3	COM2	COM1	COM0		
SEG0					1					0	address 7 bit (A6---A0)
SEG1					3					2	
SEG2					5					4	
SEG3					7					6	
⋮					⋮					⋮	
SEG47					95					94	
	D3	D2	D1	D0	Data\Addr	D3	D2	D1	D0	Data\Addr	

7.3 Tone Output

The VK0384 integrates a basic tone generator capable of producing 2 kHz or 4 kHz output signals. The output consists of a differential pair: BZ and /BZ, designed to drive a passive piezoelectric buzzer. Use the TONE 2K or TONE 4K commands to select the desired tone frequency. Tone output can be enabled or disabled via the TONE ON or TONE OFF commands. When the tone function is disabled or the system is powered down, both BZ and /BZ will remain at low level.

7.4 LCD Driver

The VK0384 is a 384-segment LCD driver (48SEG×8COM). It supports software-configurable bias settings of 1/4, and COM configurations of 8.

7.5 Communication Interfacing

The VK0384 communicates with the host via a 3-wire serial interface.
When used solely for display output, only 3 lines are required (/CS, /WR, and DATA)

- /CS: Chip select input. It enables the serial interface when low and terminates communication when high.
- /WR: Write clock input. On the rising edge, data and commands from DATA are latched into the device.
- DATA: Bidirectional serial data line used to transfer both command and display data.

7.6 Command Format

The VK0384 is configured via software commands that support two primary modes: command mode and data mode.

- Command mode is used to configure system-level parameters. It is identified by a command mode ID of 100.
- Data mode supports two types of memory operations: WRITE, and MODIFY-WRITE.

These commands allow the host controller to configure LCD behavior and access display RAM contents.

The following are the data mode IDs and the command mode ID:

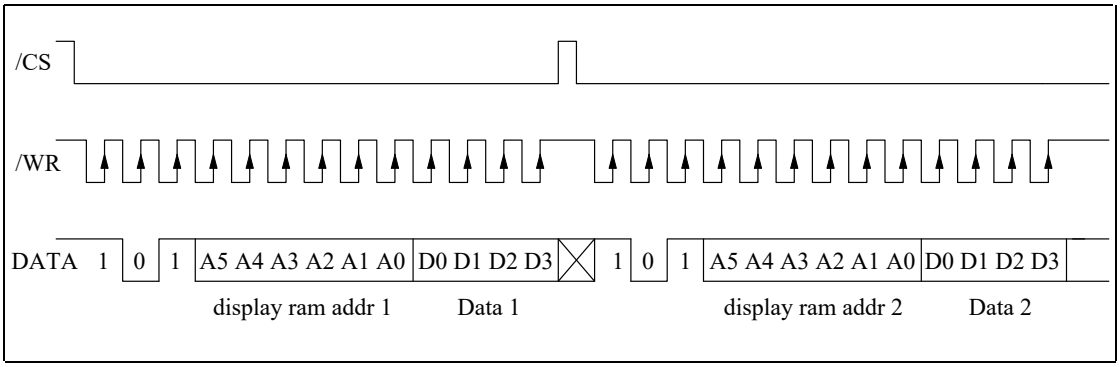
Operation	MODE	ID
WRITE	DATA	101
COMMAND	COMMAND	100

8 CMD/Data Timing Diagrams

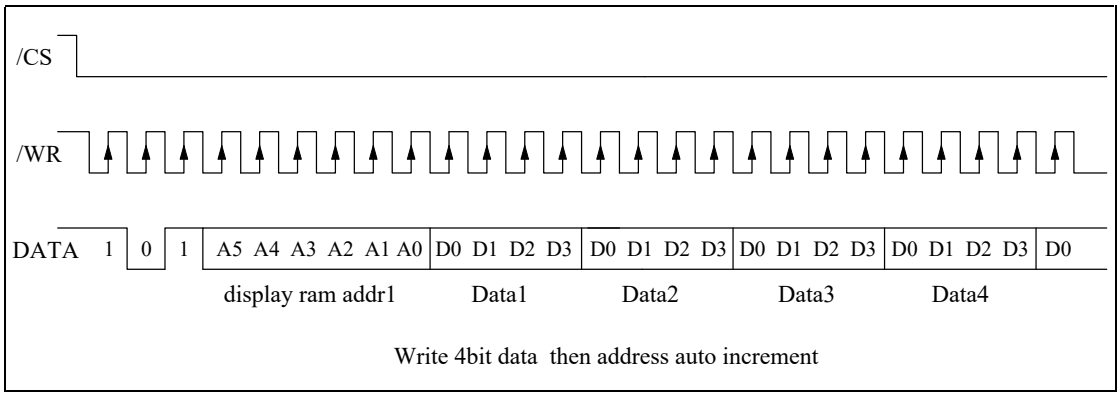
The command sequence corresponds to two ID codes.

8.1 WRITE Mode

Command code: 101

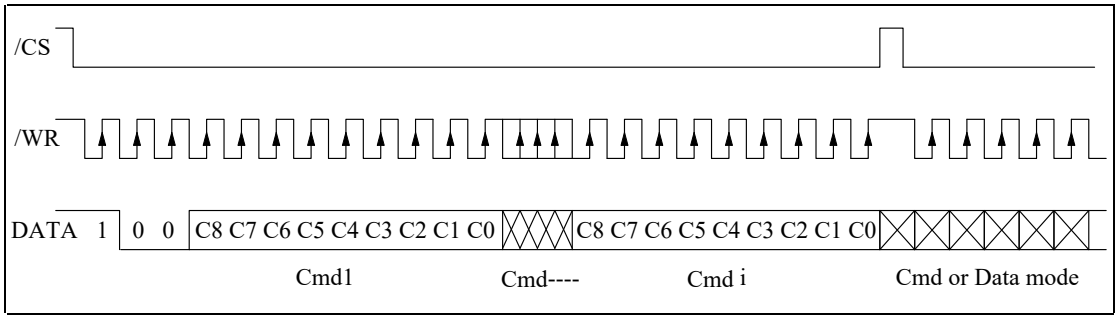


Successive Address Writing



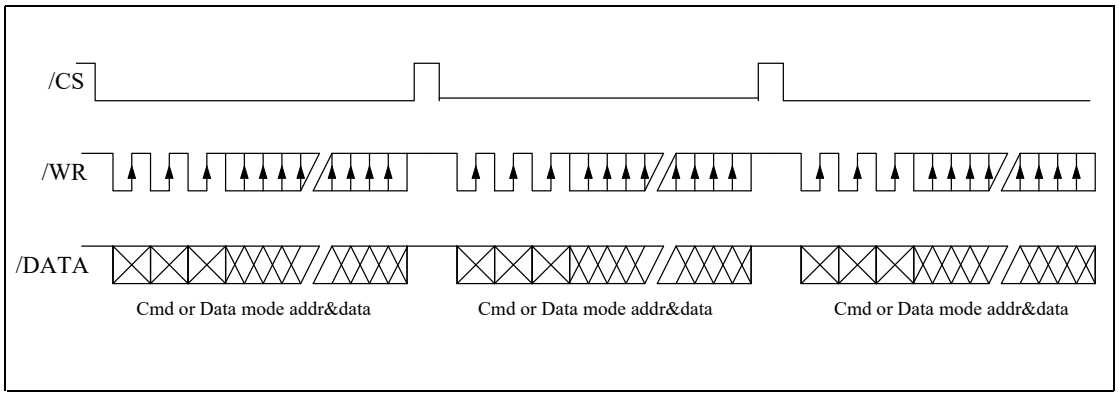
8.2 Command Mode

Command Code : 100



8.3 Data and Command Mode

Data and Command Mode



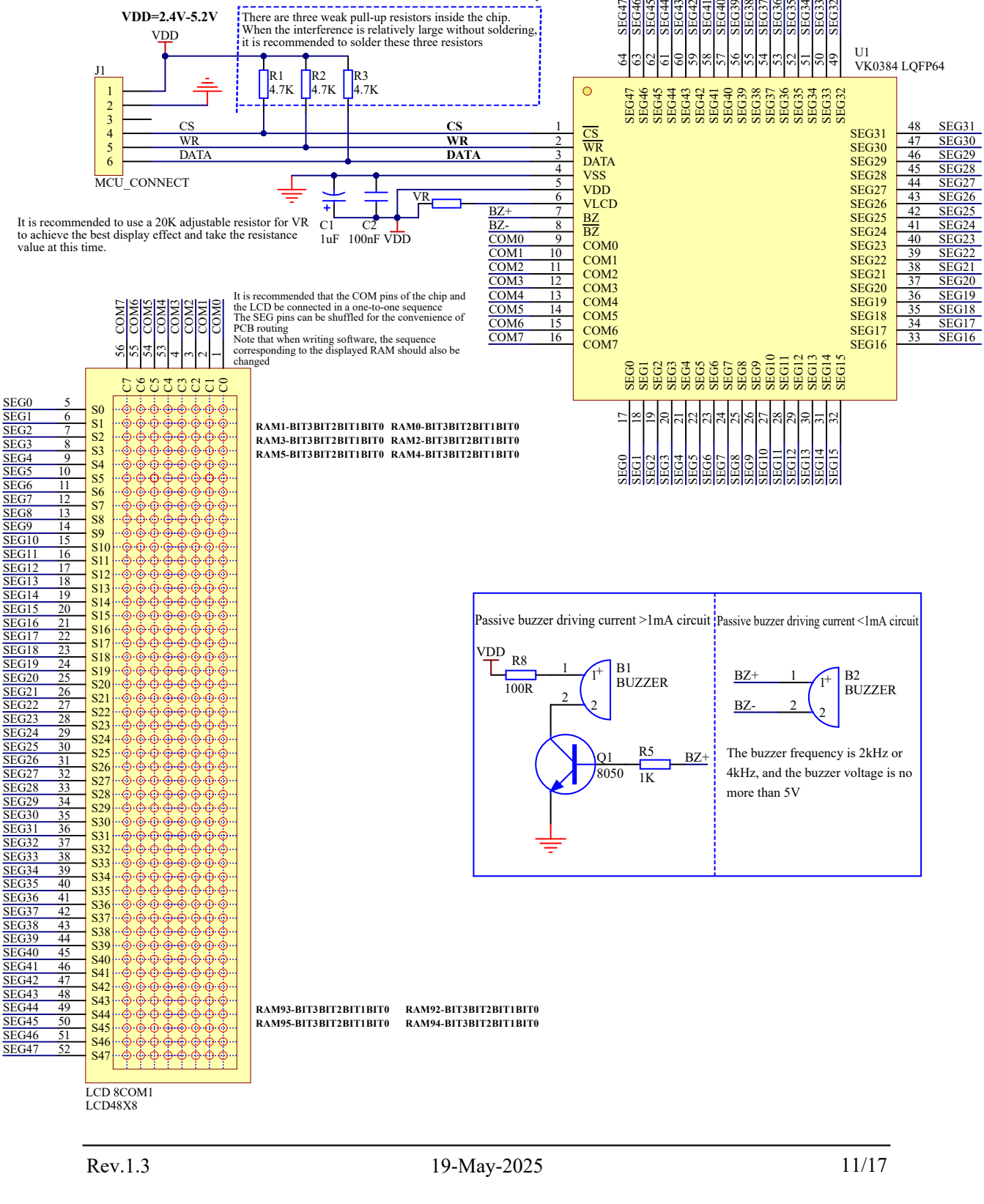
9 Command Summary

Name	ID	Command Code	D/C	Function	Def.
WRITE	101	A6A5A4A3A2A1A0D0D1D2D3	D	Write data to the RAM	
SYS DIS	100	0000- 0000-X	C	Turn off system oscillator	YES
SYS EN	100	0000- 0001-X	C	Turn on the system clock	
LCD OFF	100	0000- 0010-X	C	Turn off LCD bias generator	YES
LCD ON	100	0000- 0011-X	C	Turn on LCD bias generator	
TONE OFF	100	0000- 1000-X	C	Turn off tone outputs	YES
RC 32k	100	0001-10XX-X	C	on-chip RC oscillator	YES
TONE 4k	100	010X-XXXX-X	C	Tone frequency, 4kHz	
TONE 2k	100	011X-XXXX-X	C	Tone frequency, 2kHz	
TEST	100	1110-0000 X	C	Test mode	
NORMAL	100	1110-0011- X	C	Normal mode	YES

Note : X: 0 or 1
A6-A0: Display RAM addresses
D3-D0:4bit Display RAM data
D/C:Data/Command mode
Def.:Power on reset default
101and 100 is Command ID

10 Application Circuits

When the surrounding interference is relatively large, a 10R to 1k resistor and a PF-level small capacitor to ground can be connected in series on the communication pin
When the power supply of the single-chip microcomputer (3.3V) and the driver chip(5V)is inconsistent, it is recommended to add a level conversion circuit to the communication pin



11 Electrical characteristics

11.1 Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Supply voltage	VDD	-0.3～5.5	V
Input Voltage	VIN	V_{SS}-0.3～V_{DD}+0.3	V
Storage Temperature	T_{STG}	-50～+125	℃
Operating Temperature	T_{OTG}	-40～+85	℃

11.2 DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	
						VDD	Conditions
Operating voltage	VDD	2.4	—	5.2	V	—	—
Operating current	I_{DD1}	—	155	310	μA	3V	No load/LCD ON On-chip RC oscillator
		—	260	420		5V	
Operating current	I_{DD2}	—	8	30	μA	3V	No load/LCD OFF On-chip RC oscillator
		—	20	60		5V	
Standby Current	I_{STB}	—	1	10	μA	3V	No load, Power down mode
		—	2	20		5V	
Low-level Input	V_{IL}	0	—	0.6	V	3V	DATA, /WR, /CS
		0	—	1.0		5V	
High-level Input	V_{IH}	2.4	—	3.0	V	3V	DATA, /WR, /CS
		4.0	—	5.0		5V	
BZ, /BZ	I_{OL1}	0.9	1.8	—	mA	3V	V_{OL}=0.3V
		1.7	3.0	—		5V	V_{OL}=0.5V
BZ, /BZ	I_{OH1}	-0.9	-1.8	—	mA	3V	V_{OH}=2.7V
		-1.7	-3.0	—		5V	V_{OH}=4.5V
DATA	I_{OL1}	0.9	1.8	—	mA	3V	V_{OL}=0.3V
		1.7	3.0	—		5V	V_{OL}=0.5V
DATA	I_{OH1}	-0.9	-1.8	—	mA	3V	V_{OH}=2.7V
		-1.7	-3.0	—		5V	V_{OH}=4.5V
LCD COM Sink Current	I_{OL2}	80	160	—	μA	3V	V_{OL}=0.3V
		180	360	—		5V	V_{OL}=0.5V
LCD COM Source Current	I_{OH2}	-40	-80	—	μA	3V	V_{OH}=2.7V
		-90	-180	—		5V	V_{OH}=4.5V
LCD SEG Sink Current	I_{OL3}	50	100	—	μA	3V	V_{OL}=0.3V
		120	240	—		5V	V_{OL}=0.5V
LCD SEG Source Current	I_{OH3}	-30	-60	—	μA	3V	V_{OH}=2.7V
		-70	-140	—		5V	V_{OH}=4.5V
Pull-UP Resistor	R_{UP}	100	200	300	kΩ	3V	DATA, /WR, /CS
		50	100	150		5V	

11.3 AC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions	
						VDD	Conditions
System Clock	f_{SYS1}	22	32	40	kHz	3V	On-chip RC oscillator
		24	32	40		5V	
LCD Clock	f_{LCD1}	44	64	80	Hz	3V	On-chip RC oscillator
		48	64	80	Hz	5V	
LCD Common Period	t_{COM}	—	N/f_{LCD}	—	sec	—	N:Number of COM
Serial Data Clock(/WR)	F_{CLK1}	—	—	150	kHz	3V	Duty cycle 50%
		—	—	300	kHz	5V	Duty cycle 50%
Serial Interface Reset PW	t_{CS}	—	250	—	ns	—	/CS
/WR, Input Pulse Width	t_{CLK}	3.34	—	—	μs	3V	Write mode
		1.67	—	—	μs	5V	Write mode
Rise/Fall Time Serial Data Clock Width	t_r, t_f	—	120	—	ns	3V	—
						5V	
Setup Time for DATA to /WR Clock Width	t_{su}	—	120	—	ns	3V	—
						5V	
Hold Time for DATA to /WR, Clock Width	t_h	—	120	—	ns	3V	—
						5V	
Setup Time for /CS to /WR, Clock Width	t_{su1}	—	100	—	ns	3V	—
						5V	
Hold Time for /CS to /WR, Clock Width	t_{h1}	—	100	—	ns	3V	—
						5V	

Figure 1

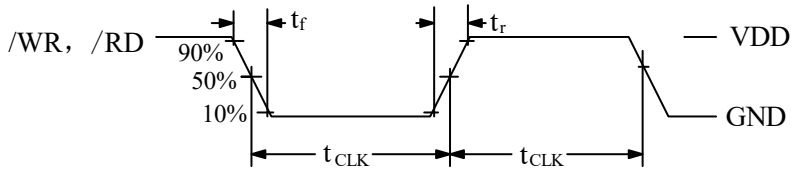


Figure 2

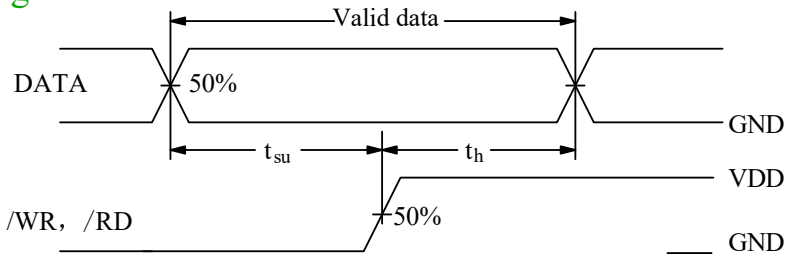


Figure 3

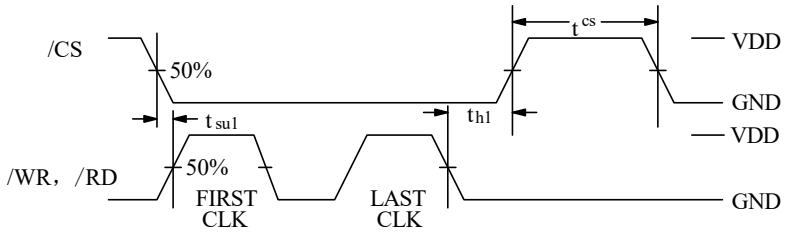
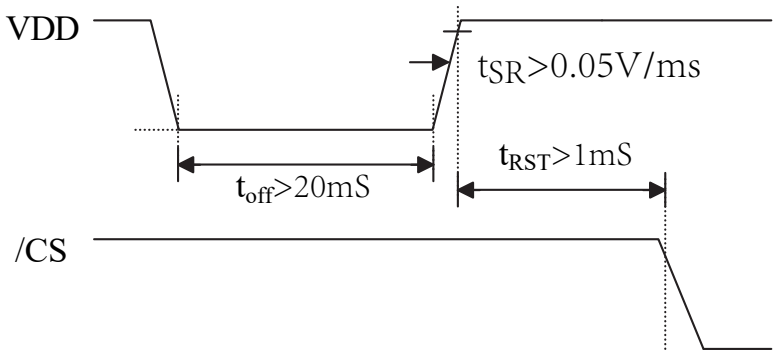
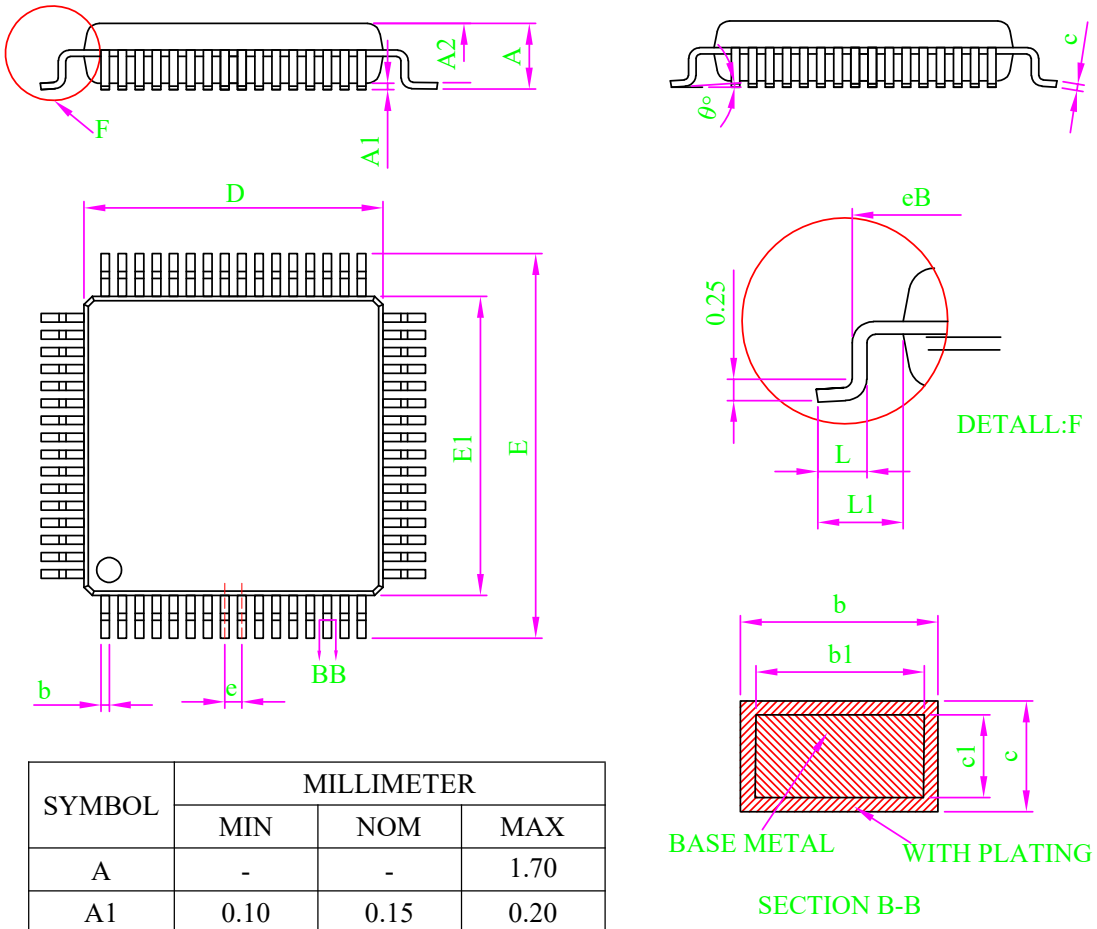


Figure 4



12 Package Information

12.1 LQFP64(7.0mm x 7.0mm PP=0.4mm)



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	-	-	1.70
A1	0.10	0.15	0.20
A2	1.30	1.40	1.50
b	0.16	-	0.24
b1	0.15	0.18	0.21
c	0.13	-	0.17
c1	0.12	0.13	0.14
D	6.90	7.00	7.10
E	8.80	9.00	9.20
E1	6.90	7.00	7.10
eB	8.10	-	8.28
e	0.40 BSC		
L	0.42	0.57	0.72
L1	0.95	1.00	1.15
θ	0	-	10°

Note:

1. All dimension are in mm.
2. Dim D&El does not include plastic flash; Flash: Plastic residual around body edge after de junk/singulation.
3. Dim b does not include dambar protrusion/intrusion.
4. Plating thickness 0.007mm-0.015mm

13 Disclaimer

Warranty and liability —— The information provided in this document is believed to be accurate and reliable. However, Shenzhen Vinka Microelectronics Co., Ltd. (hereinafter "the Company") makes no warranties, express or implied, as to the completeness or suitability of this information for any specific purpose.

In no event shall the Company be liable for any indirect, incidental, or consequential damages, including but not limited to loss of profits, equipment damage, or system failure, arising out of the use of this product or documentation, regardless of the legal theory under which such liability is asserted.

Right to change —— The Company reserves the right to modify any information contained herein without prior notice. The latest version of this document is available at: https://www.szvinka.com/

Applicability —— This product is not designed or intended for use in life-critical, medical, or safety systems where failure could result in injury or death. The customer shall assume full responsibility for any such use.

Application —— All product application descriptions provided herein are intended for illustrative purposes only.
The Company makes no representations or warranties, express or implied, regarding the suitability of any specific application without further testing or modification.

The customer is solely responsible for determining whether the Company's products are appropriate for their intended applications or end customers.

The customer shall ensure proper design practices, implementation safeguards, and operational validation to minimize risks associated with product use.

The Company shall not be held liable for any defects, losses, costs, or damages arising from weaknesses or failures in the customer's own products or applications, or from the integration or use of third-party products.

Furthermore, the customer shall conduct all necessary testing and validation for any third-party deployment of the Company's products to avoid potential misuse or associated damages. The Company assumes no liability in this regard.

Commercial terms of sale —— Unless otherwise agreed in writing, sales of this product are subject to the Company's standard terms and conditions of sale. The Company expressly rejects the applicability of the customer's general terms and conditions.

Export control—— This product may be subject to applicable export control regulations. The customer is solely responsible for compliance with such regulations, including obtaining any necessary export licenses.

14 Revision History

No.	Version	Date	Modify the content	Check
1	1.0	2018-08-10	initial release	YES
2	1.1	2018-10-11	Add reference circuit	YES
3	1.2	2019-03-21	Alignment correction	YES
4	1.3	2025-05-19	Change Description	YES

[1] Please refer to the latest version of this document before starting or finalizing any design.

[2] Since the release of this document, the status or availability of this product may have changed. For the most up-to-date information, please visit: https://www.szvinka.com/