GT23L16U2W

Standard Chinese Font Chip

DATASHEET

- Font Size: 11X12 dots, 15X16 dots
- Character Set: Unicode V3.0
- Input Method Code List：

  GT PINYIN

  GT 3D IDEOGRAPH

  PINYIN
- Multi-Language:

  Languages of 150 countries including Latin, Cyrillic, Arabian
- Data Arrangement: Horizontal byte, horizontal string
- Bus Interface：SPI

  PLII (Reduced Address Bus Interface)
- Package：SO20W & QFN40

VER 3.2

2010-Q1

INDEX

Section 1: Hardware

1 General 4
1.1 Chip Feature 4
1.2 Chip Content 5
2 Pin Description and Interface Connection 8
2.1 Pin Configuration (SO20W) 8
2.2 Pin Configuration（QFN40） 9
2.3 SPI Interface Description 10
2.4 SPI Connection Block Diagram 10
2.5 PLII Bus Description 11
2.6 PLII Bus Connection Block Diagram 12
2.7 PLII Bus Address Access Operation 12
3 Operating Instruction 13
3.1 SPI Bus Operating Instruction 13
3.2 PLII Operating Instruction 14
4 Electric Characteristic 18
4.1 Absolute Maximum Rating 18
4.2 DC Characteristic 18
4.3 AC Characteristic 18
5 Package Size 22

Section 2: Software

6 Font Read Method 24
6.1 Character Dot Matrix Arrangement (Data Arrangement Format) 24
6.2 Dot Matrix Font Address Table 30
6.3 Calculation of Character Address 31
7 Appendix 38
7.1 UNICODE3.0（GB13000）Character Section 38
7.2 Unicode Character Section (Non- Chinese characters) 43
7.3 8×16 Dots Special Character（64 characters） 53

7.4 UNICODE3.0 Character Section Match Table 53

7.5 Language Checklist (150 countries).....60

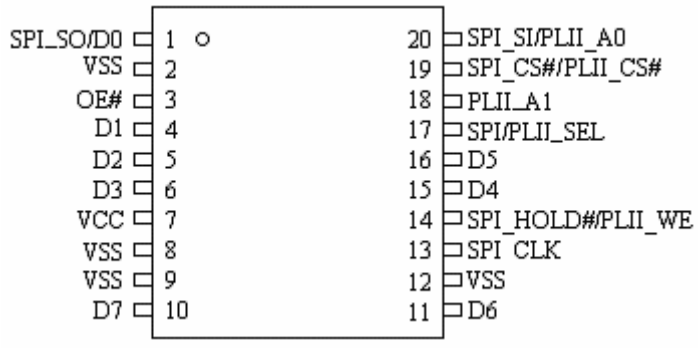
1 General

GT23L16U2W font chip contain two font sizes (11X12 dots & 15X16 dots), it supports Unicode V3.0 – Chinese font (GB13000 licensed by NITS), ASCII character and 150 countries' character. The data arrangement format is horizontal byte, horizontal string. The user may obtain the address of certain character dot matrix with the calculation method given by this datasheet, which enables the user to access to more character data by continually reading from the address already obtained.

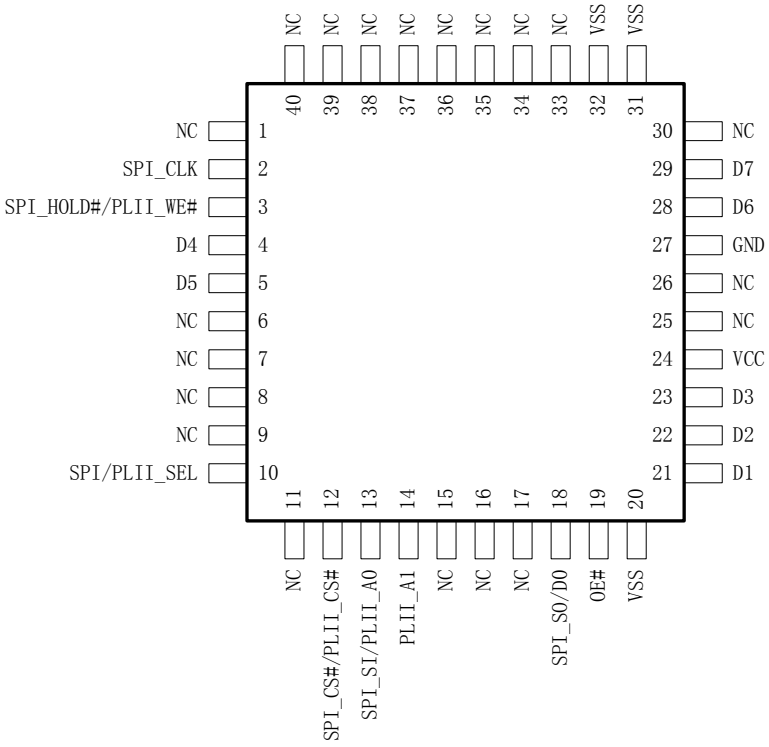
GT21L16S2W contain GT PINYIN, GT 3D IDEOGRAPH and PINYIN input method code list, cooperating with corresponding input method, it enables convenient Chinese inputting by numerical keyboard for various IT products.

1.1 Chip Feature

- Bus Interface: SPI
  PLII (Reduced Address Bus Interface)
- Data Arrangement: Horizontal byte, horizontal string
- SPI Frequency: 20MHz(max.) @3.3V
- PLII Access Rate: 130ns(max.) @3.3V
- Operating Voltage: 2.7V~3.6V
- Current:
  Operating: 12mA
  Standby: 10uA
- Package: SO20W（12.80mmX10.30mm）、QFN40 (6mmX6mm)
- Operating Temperature: -20℃~85℃(SPI Mode)；-10℃~85℃(PLII Mode)



SO20W



QFN40

1.2 Chip Content

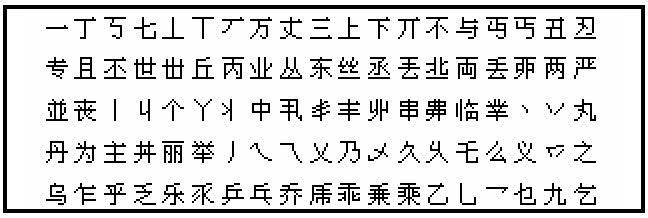
Category	Content	Character Set	Characters
Chinese Font	11X12 dots Unicode font	Unicode V3.0 Supports GB13000	27484+1088
	15X16 dots Unicode font	Unicode V3.0 Supports GB13000	27484+1088
	8X16 dots special character	Customized	64
ASCII Font	5X7 dots ASCII font	ASCII	96
	7X8 dots ASCII font	ASCII	96
	6X12 dots ASCII font	ASCII	96
	8X16 dots ASCII font	ASCII	96
	12 dot matrix Arial font	ASCII	96
	12 dot matrix Times New Roman font	ASCII	96
	16 dot matrix Arial font	ASCII	96
	16 dot matrix Times New Roman font	ASCII	96
Unicode Font	8X16 dots Latin font	Unicode	376
	8X16 dots Greek font	Unicode	96
	8X16 dots Cyrillic font	Unicode	250
	12 dot matrix Unicode font (Latin, Greek, Cyril)	Unicode	555
	12 dot matrix Arabia font	Unicode	250
	12 dot matrix Arabia extendable font	Customized	498
	16 dot matrix Unicode font (Latin, Greek, Cyril)	Unicode	555
	16 dot matrix Arabia font	Unicode	250
	16 dot matrix Arabia extendable font	Customized	498
Input Method Code List	GT PINYIN		6763
	GT3D IDEOGRAPH	Unicode V3.0	27484
	PINYIN		6763

Language Check List

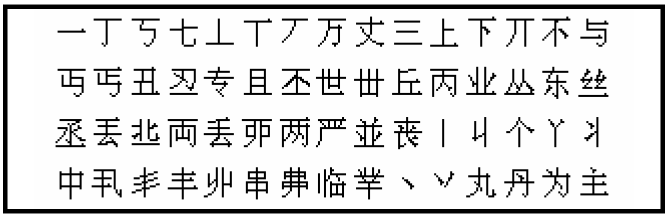
Language Family	Language	Country	Latin Countries	Total
Latin	English	UK,USA etc.	39	112
	French	France, Niger etc.	22	
	Spanish	Mexico, Spain etc.	22	
	Portuguese	Portugal, Brazil etc.	7	
	German	Germany, Austria etc.	5	
	Italian	Italy, San Marino etc.	3	
	Malay	Malaysia, Brunei etc.	2	
	Swahili	Tanzania, Kenya etc.	2	
	Other	Netherlands, Sweden etc.	10	
Arabian	Arabian	Egypt, Jordan etc.		21
Cyrillic	12 languages	Russia, Kazakhstan etc.		15
Greek	Greek	Greece, Cyprus etc.		2
				Sum 150

Font Sample

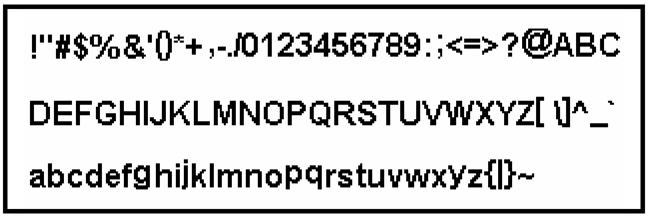
11X12 dots Unicode Chinese



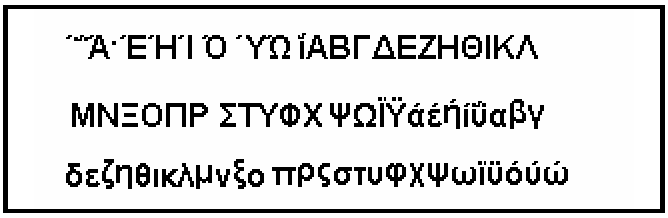
15X16 dots Unicode Chinese



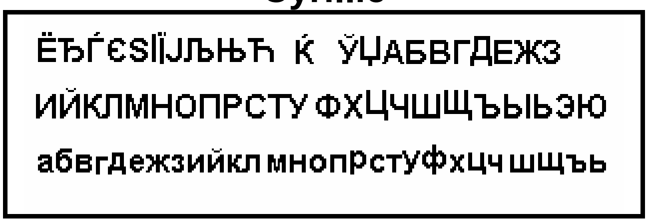
Latin（Contain ASCII character）



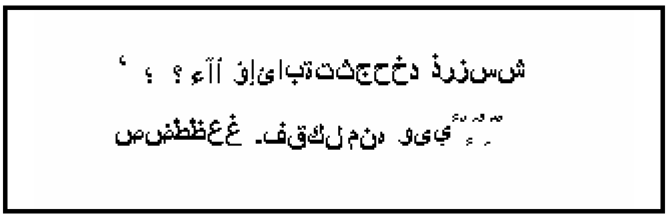
Greek



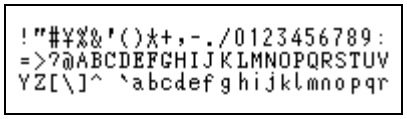
Cyrillic



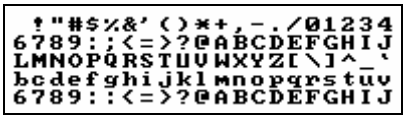
Arabian



5x7 dots ASCII font

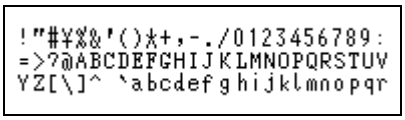


7x8 dots ASCII font

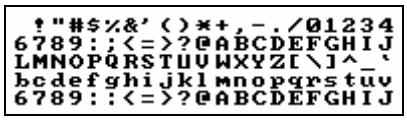


6x12 dots ASCII font

8x16 dots ASCII font



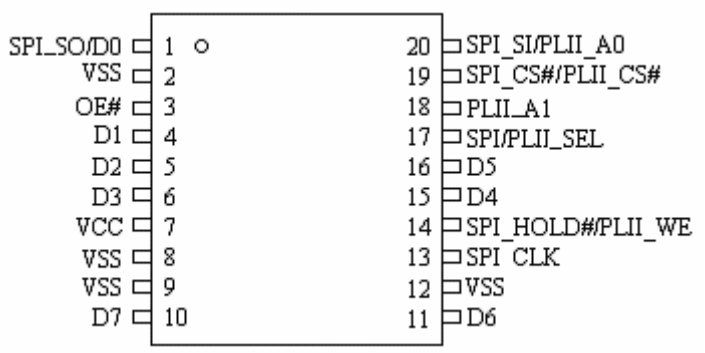
12 dot matrix Arial font



16 dot matrix Arial font

2 Pin Description and Interface Connection

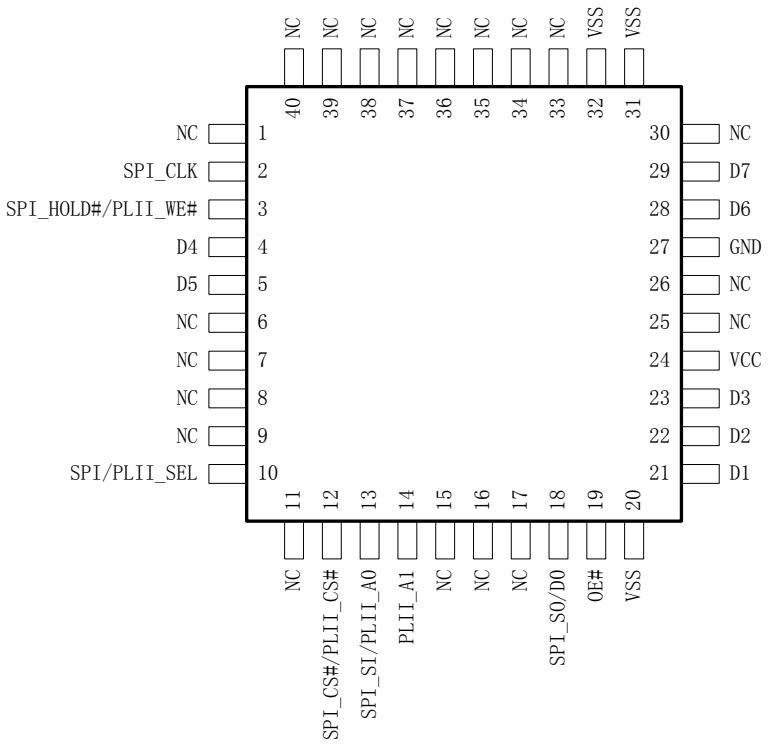
2.1 Pin Configuration (SO20W)



SO20W

SO20W	Name	Description	
		GT23(SPI)	GT23(PLII)
1	SPI_SO/D0	Serial data output	Data Outputs
2	VSS	Ground	
3	OE#	No Connection	Output Enable Input
4	D1	No Connection	Data Outputs
5	D2	No Connection	Data Outputs
6	D3	No Connection	Data Outputs
7	VCC	Power Supply(3.3V)	
8	VSS	Ground	
9	VSS	Ground	
10	D7	No Connection	Data Outputs
11	D6	No Connection	Data Outputs
12	VSS	Ground	
13	SPI_CLK	Serial clock input	No Connection
14	SPI_HOLD#/PLII_WE	Hold(to pause the device)	Write Enable Input
15	D4	No Connection	Data Outputs
16	D5	No Connection	Data Outputs
17	SPI/PLII_SEL	SPI/PLII SELECT	
		NC: SPI	GND: PLII
18	PLII_A1	No Connection	Address Inputs
19	SPI_CS#/PLII_CS#	Chip enable input	Chip Enable Input
20	SPI_SI/PLII_A0	Serial data input	Address Inputs

2.2 Pin Configuration（QFN40）



QFN40

QFN40	**Name**	**GT23(SPI)**	**GT23(PLII)**
2	SPI_CLK	Serial clock input	No Connection
3	SPI_HOLD#/PLII_WE	Hold(to pause the device)	Write Enable Input
4	D4	No Connection	Data Outputs
5	D5	No Connection	Data Outputs
10	SPI/PLII_SEL	SPI/PLII SELECT	
		NC: SPI	GND: PLII
12	SPI_CS#/PLII_CS#	Chip enable input	Chip Enable Input
13	SPI_SI/PLII_A0	Serial data input	Address Inputs
14	PLII_A1	No Connection	Address Inputs
18	SPI_SO/D0	Serial data output	Data Outputs
19	OE#	No Connection	Output Enable Input
20,27,31,32	VSS	Ground	
21	D1	No Connection	Data Outputs
22	D2	No Connection	Data Outputs
23	D3	No Connection	Data Outputs
24	VCC	Power Supply(3.3V)	
28	D6	No Connection	Data Outputs
29	D7	No Connection	Data Outputs
6,7,8,9,11,15,16,17, 25,26,30,33,34,35,3 6,37,38,39,40	NC	No Connection	No Connection

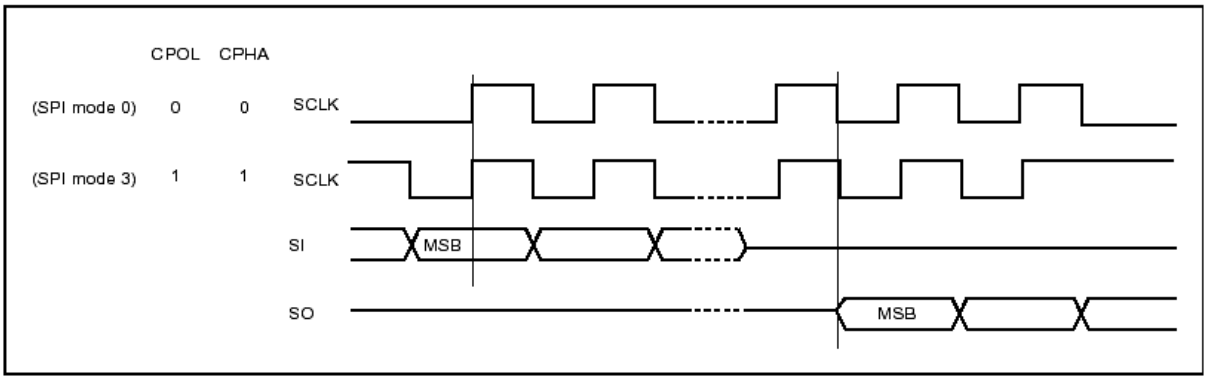
2.3 SPI Interface Description

Serial Data Output(SO): Data shift-out on the falling edge of the serial clock.

Serial Data Input(SI) : Data shift-in on the rising edge of the serial clock.

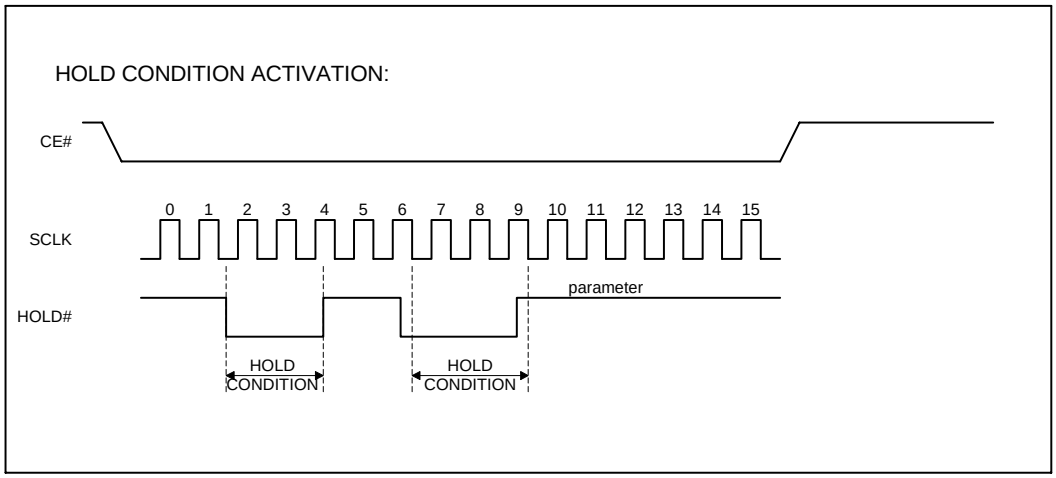
Serial Clock Input(SCLK): Data shift-out on the falling edge of the serial clock, shift-in on the rising edge of the serial clock.

Chip Enable Input(CS#): The device is enabled by a high to low transition on CE#. CE# must remain low for the duration of any command sequence.



HOLD#: To temporarily stop serial communication with SPI flash memory without resetting the device.

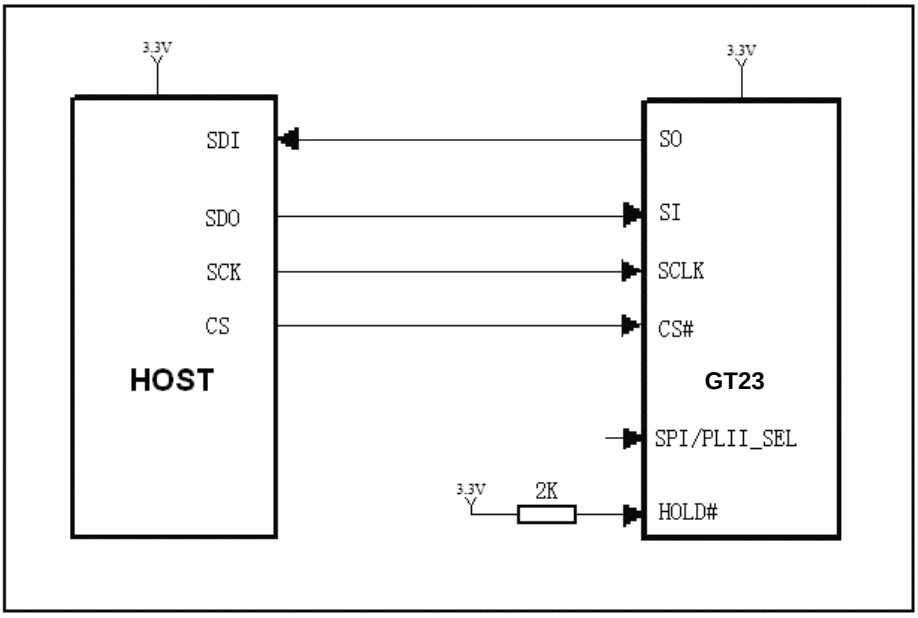
The HOLD# mode begins when the SCK active low state coincides with the falling edge of the HOLD# signal. The HOLD mode ends when the HOLD# signal's rising edge coincides with the SCK active low state.



2.4 SPI Connection Block Diagram

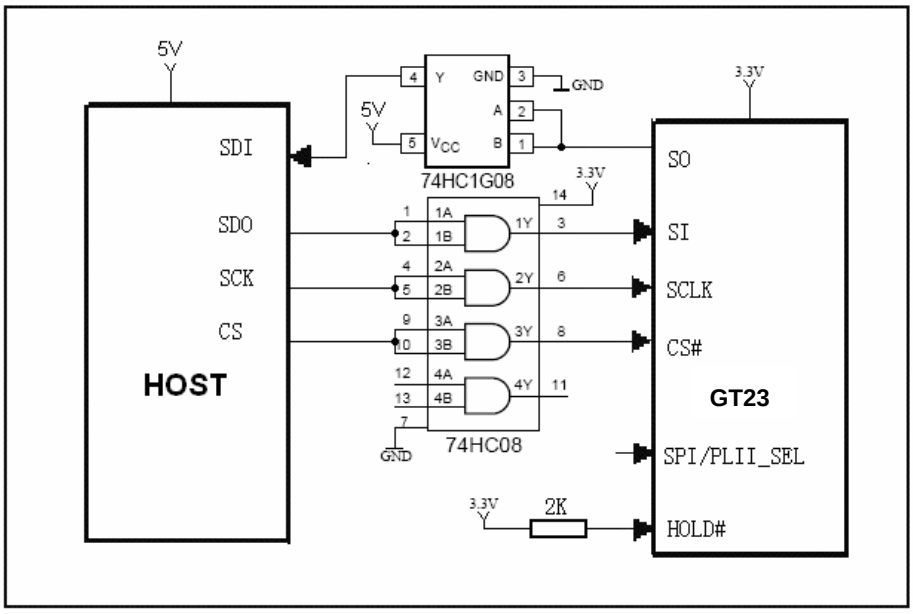
When SPI/PLII_SEL is not connected, the chip is at SPI bus mode.

HOLD# PIN should pulled to 3.3V through 2K resister



SPI Connection Block Diagram

If system is supplied by 5V,the block diagram is bellowed(HOLD# PIN should pulled to 3.3V through 2K resister)

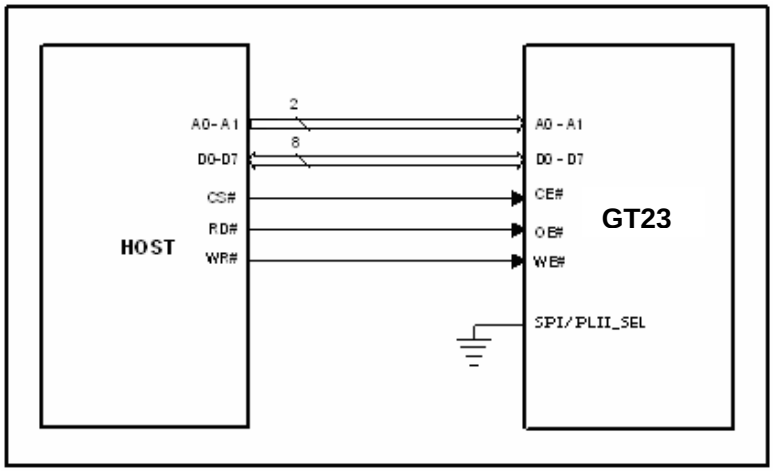


2.5 PLII Bus Description

Pin name	I/O	Description
A[1..0]	I	Address register
D[7..0]	I/O	Address input / data output
CE#	I	Chip enable input
OE#	I	Output enable input
WE#	I	Write enable input

2.6 PLII Bus Connection Block Diagram

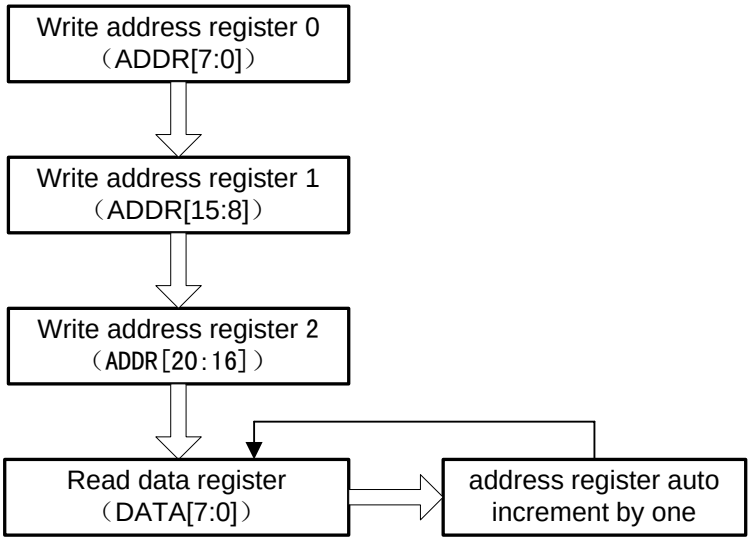
When SPI/PLII_SEL is connected to ground, the chip is at PLII bus mode.



2.7 PLII Bus Address Access Operation

In PLII BUS mode, there are 3 address register in ROM chip, the host CPU will write the address of the read data into these 3 address register, then read the data from data register. Each time the host CPU reads data register, the address in address register will automatically add one to itself. When the host CPU obtains the first address, it will read the other data consecutively in data string. Once the chip is powered on, address register will reset.

A1 A0（address）	Operation	Register
0 0	write	Address register 0 [ADDR7:0]
0 1	write	Address register 1 [ADDR15:8]
1 0	write	Address register 2 [ADDR20:16]
0 0	read	Data register [DATA7:0]



3 Operating Instruction

3.1 SPI Bus Operating Instruction

3.1.1 Instruction Parameter

Instruction	Description	Instruction Code(One-Byte)		Address Bytes	Dummy Bytes	Data Bytes
READ	Read Data Bytes	0000 0011	03 h	3	—	1 to ∞
FAST_READ	Read Data Bytes at Higher Speed	0000 1011	0B h	3	1	1 to ∞

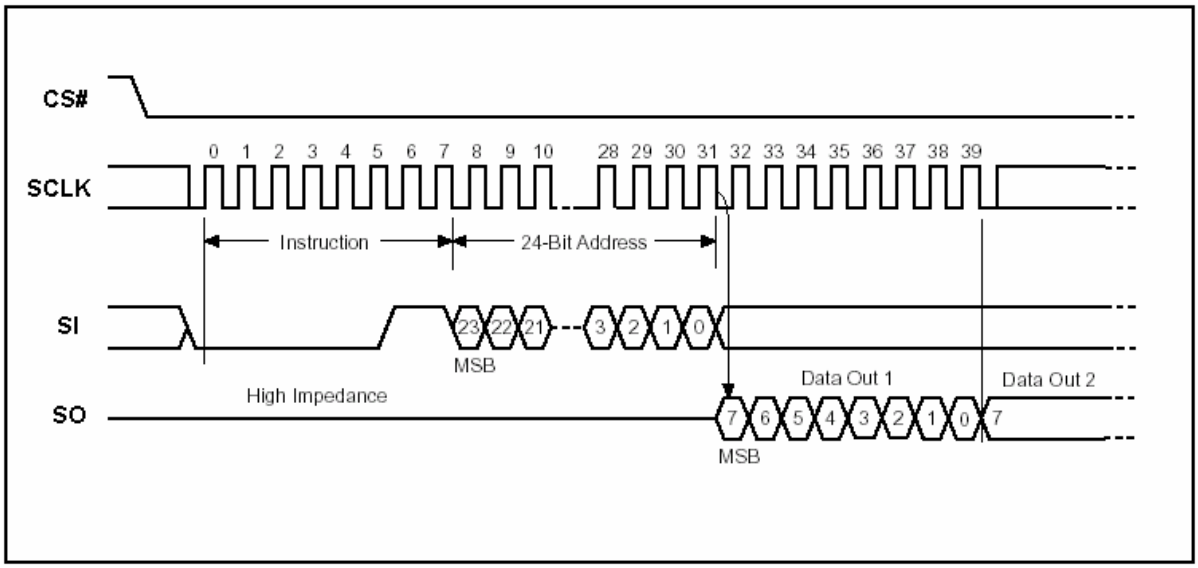
.

3.1.2 Read Data Bytes

The Read instruction supports up to 20 MHz, It outputs the data starting from the specified address location. The data output stream is continuous through all addresses until terminated by a low to high transition on CE#. The internal address pointer will automatically increment.

The Read instruction is initiated by executing an 8-bit command,03H, followed by address bits [A23-A0]. CE# must remain active low for the duration of the Read cycle.

Figure：Read Data Bytes (READ) Instruction Sequence and Data-outsequence:



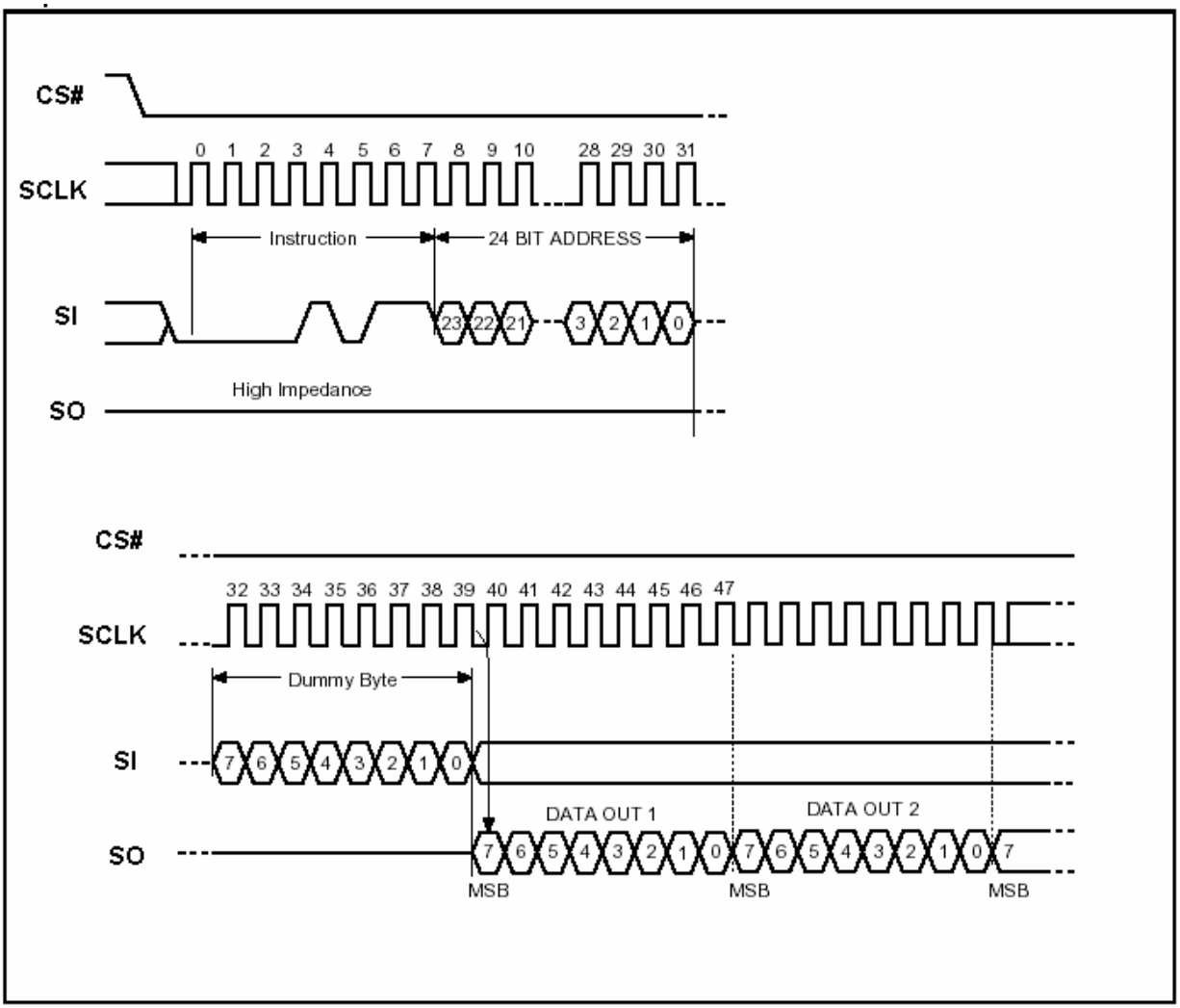
3.1.3 Read Data Bytes at Higher Speed

The High-Speed-Read instruction supporting up to 30 MHz is initiated by executing an 8-bit command, 0BH, followed by address bits [A23-A0] and a dummy byte. CE# must remain active low for the duration of the High-Speed-Read cycle.

Following a dummy byte (8 clocks input dummy cycle), the High-Speed-Read instruction outputs the data starting from the specified address location. The data output stream is continuous

through all addresses until terminated by a low to high transition on CE#. The internal address pointer will automatically increment.

Read Data Bytes at Higher Speed (READ_FAST) Instruction Sequence and Data-out sequence:



3.2 PLII Operating Instruction

PLII Bus doesn't need a great amount of I/O pin for address bus when it uses the address decoder and the latch built in ROM chip. This allows transfer speed to reach parallel bus speed with only 2 I/O pin for address (A0-A1).

In PLII BUS mode, there are 3 address register in ROM chip, the host CPU will write the address of the read data into these 3 address register, then read the data from data register. Each time the host CPU reads data register, the address in address register will automatically add one to itself. When the host CPU obtains the first address, it will read the other data consecutively in data string. Once the chip is powered on, address register will reset.

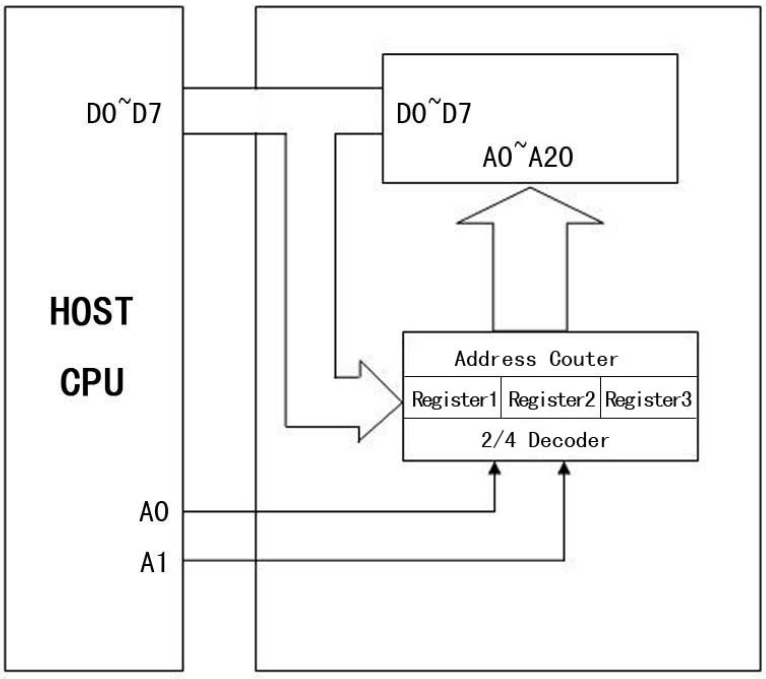
3.2.1 Pin Description

Pin name	I/O	Description
A[1..0]	I	address register
D[7..0]	I/O	Address input / data output
CE#	I	Chip enable input,
OE#	I	Output enable input
WE#	I	Write enable input

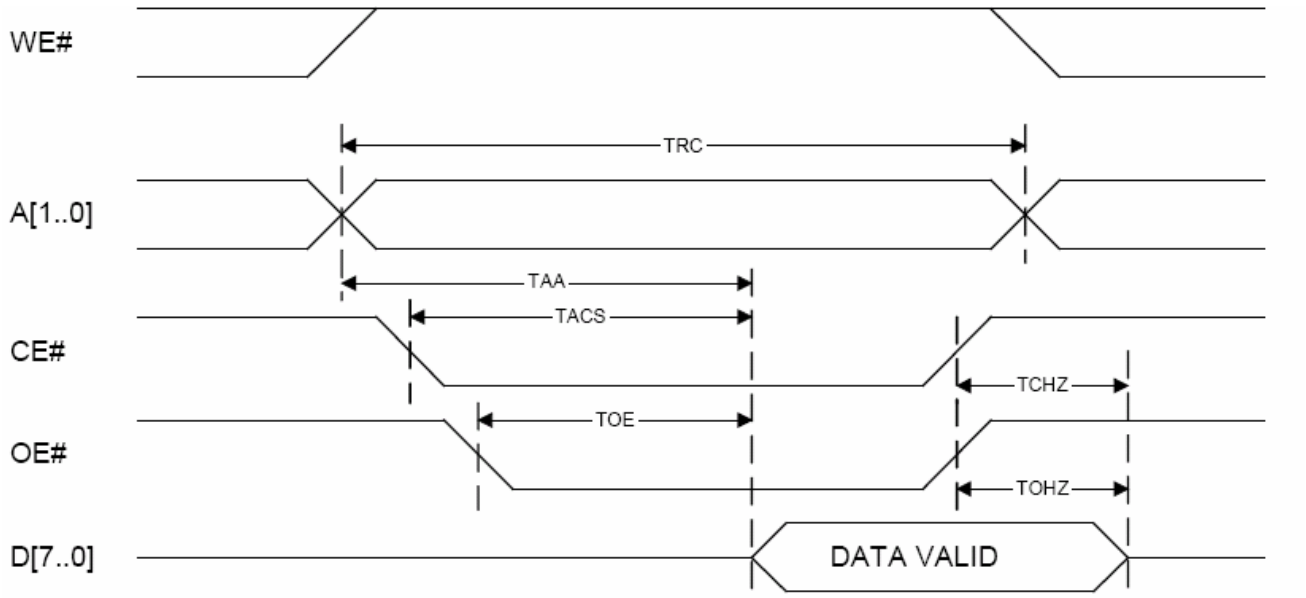
Truth Table

Mode	CE#	OE#	WE#	D[7..0]
Other	H	X	X	High-Z
Read	L	L	H	Data Out
write	L	H	L	Addr In

3.2.2 Read Operation

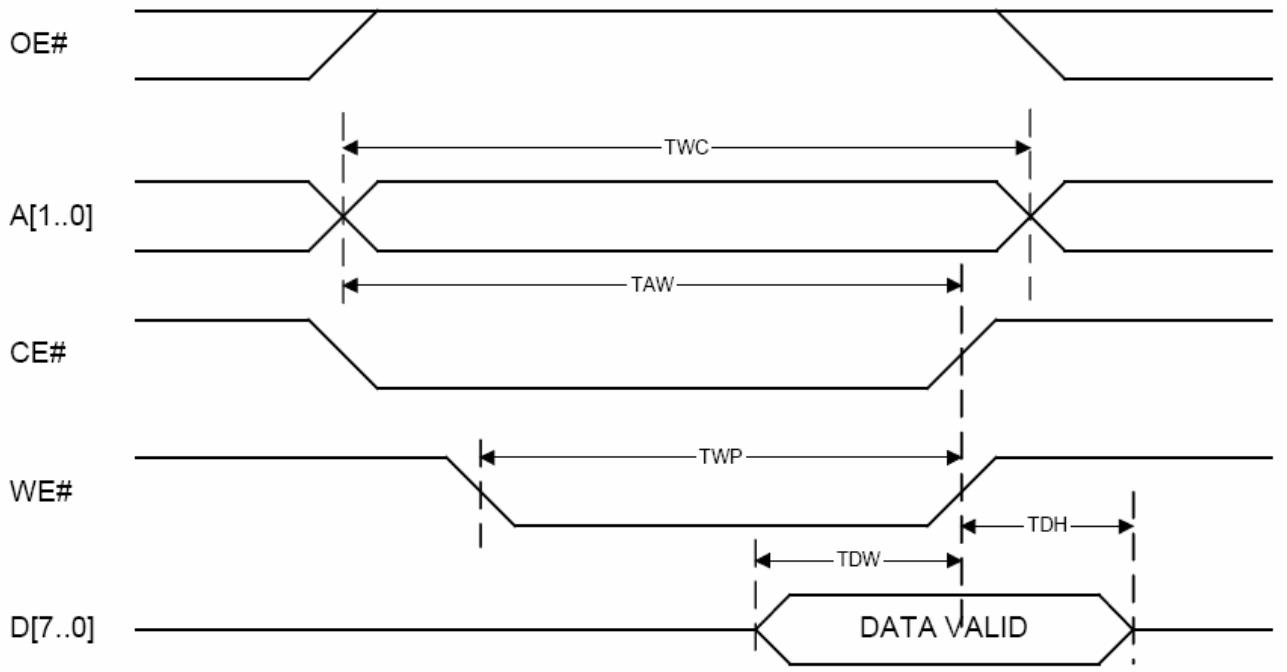


When reading font data, the host CPU will first activate each address register via A0~A1, then write A0~A20 into the 3 address register (in font chip) via 8-bit data bus (D[7..0]) separately. Meanwhile the font chip will return the initial address data to the host CPU. When OE# & CE# are both at low level, and WE# is at high level, the host CPU is enabled to read every byte data via data bus (D[7..0]). The address register will add 1 to itself and keep the value when encountered a low to high transition on either OE# or CE#.

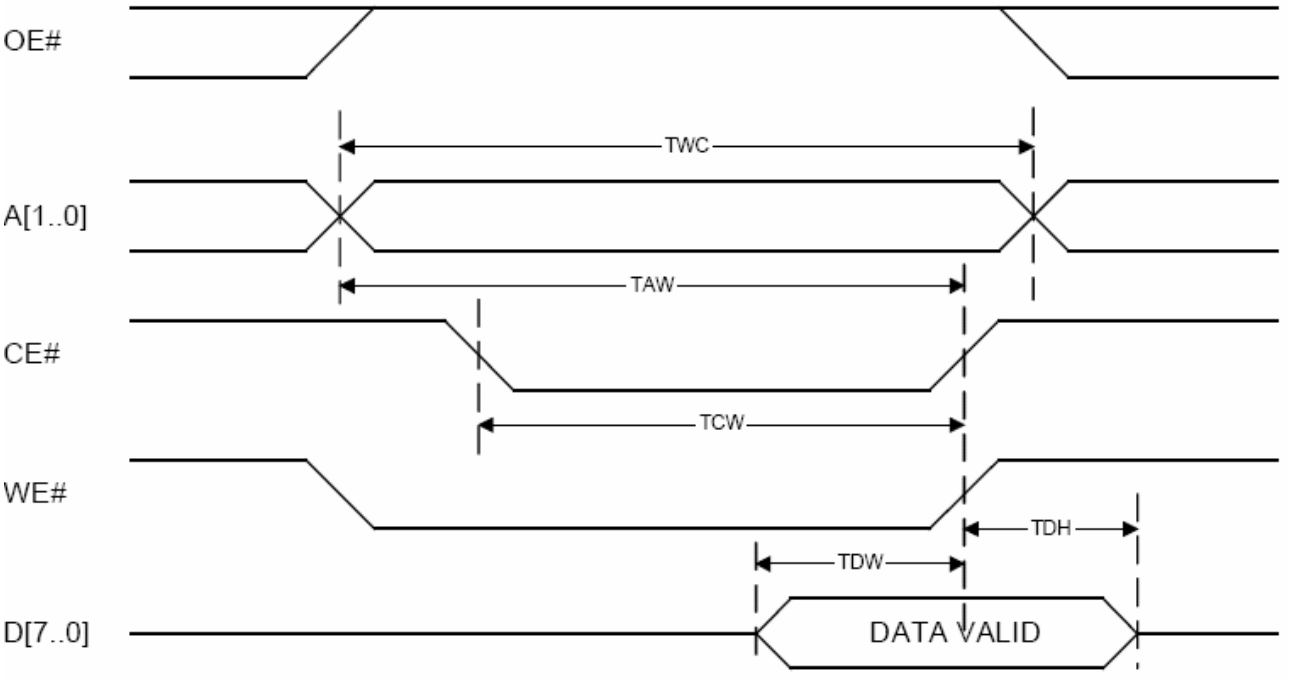


Read Cycle Timing Waveform

3.2.3 Write Operation



Write Cycle Timing Waveform(WE# controlled)



Write Cycle Timing Waveform(CE# controlled)

4 Electric Characteristic

4.1 Absolute Maximum Rating

Symbol	Parameter	Min.	Max.	Unit	Condition
T_{OP}	Operating Temperature	-20	85	℃	SPI mode
T_{OP}	Operating Temperature	-10	85	℃	PLII mode
T_{STG}	Storage Temperature	-65	125	℃	
VCC	Supply Voltage	-0.3	3.6	V	
V_{IN}	Input Voltage	-0.5	VCC+0.5	V	
GND	Power Ground	0	0	V	

4.2 DC Characteristic

Condition：T_{OP} = -20℃ to 85℃，GND=0V in SPI mode； T_{OP} =-10℃ to 85℃，GND=0V in PLII mode

Symbol	Parameter	Min.	Max.	Unit	Condition
I_{DD}	VCC Supply Current(active)		12	mA	
I_{SB}	VCC Standby Current		10	uA	
V_{IL}	Input LOW Voltage	-0.3	0.6	V	VCC=2.7-3.6V
V_{IH}	Input HIGH Voltage	0.7VCC	VCC+0.3	V	
V_{OL}	Output LOW Voltage		0.4 (I_{OL}=1.6mA)	V	
V_{OH}	Output HIGH Voltage	0.8VCC (I_{OH}=-0.4mA)		V	
I_{LI}	Input Leakage Current	0	+10	uA	
I_{LO}	Output Leakage Current	0	+10	uA	

Note：I_{IL}：Input LOW Current，I_{IH}：Input HIGH Current，
I_{OL}：Output LOW Current，I_{OH}：Output HIGH Current，

4.3 AC Characteristic

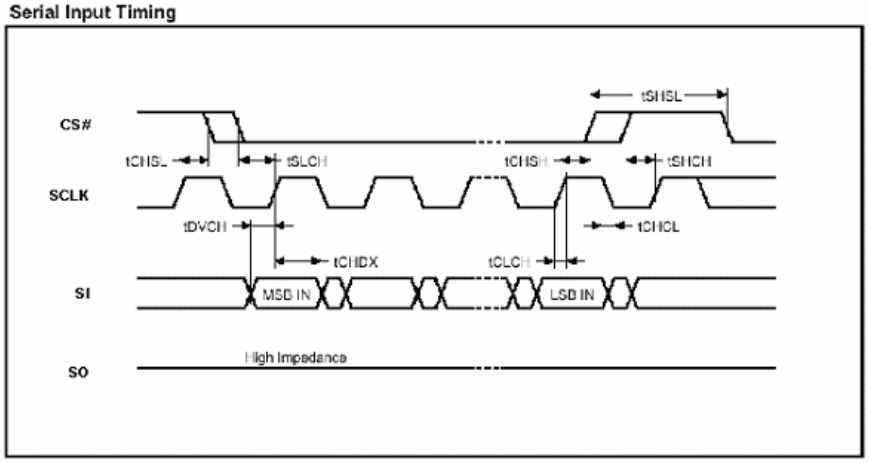
4.3.1 SPI Bus AC Characteristic

Condition：T_{OP} = -20℃ to 85℃，VCC= 2.7V to 3.6V

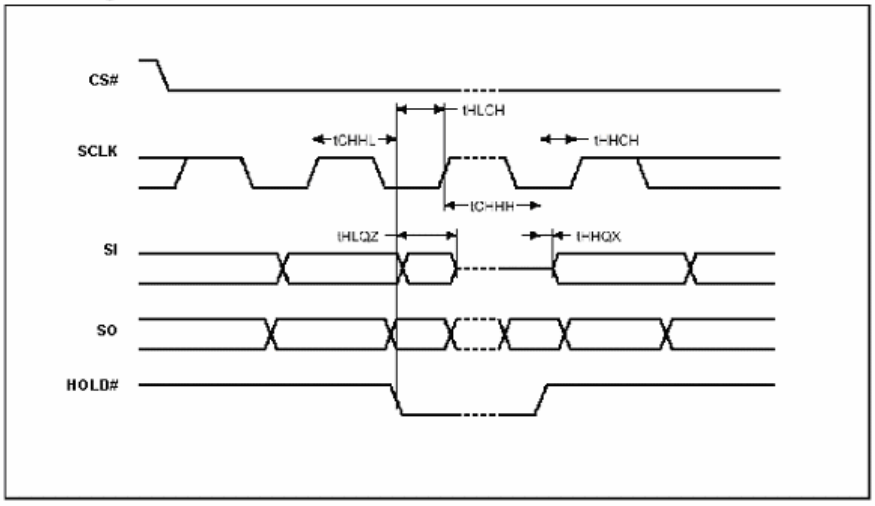
Symbol	Alt.	Parameter	Min.	Max.	Unit
Fc	Fc	Clock Frequency	D.C.	20	MHz
t_{CH}	t_{CLH}	Clock High Time	20		ns
t_{CL}	t_{CLL}	Clock Low Time	20		ns
t_{CLCH}		Clock Rise Time(peak to peak)	0.1		V/ns
t_{CHCL}		Clock Fall Time (peak to peak)	0.1		V/ns
t_{SLCH}	t_{CSS}	CS# Active Setup Time (relative to SCLK)	5		ns
t_{CHSL}		CS# Not Active Hold Time (relative to SCLK)	5		ns
t_{DVCH}	t_{DSU}	Data In Setup Time	2		ns
t_{CHDX}	t_{DH}	Data In Hold Time	5		ns
t_{CHSH}		CS# Active Hold Time (relative to SCLK)	5		ns
t_{SHCH}		CS# Not Active Setup Time (relative to SCLK)	5		ns
t_{SHSL}	t_{CSH}	CS# Deselect Time	100		ns
t_{SHQZ}	t_{DIS}	Output Disable Time		9	ns
t_{CLQV}	t_V	Clock Low to Output Valid		9	ns

t CLQX	tHO	Output Hold Time	0		ns
t HLCH		HOLD# Setup Time (relative to SCLK)	5		ns
t CHHH		HOLD# Hold Time (relative to SCLK)	5		ns
t HHCH		HOLD Setup Time (relative to SCLK)	5		ns
t CHHL		HOLD Hold Time (relative to SCLK)	5		ns
t HHQX	tLZ	HOLD to Output Low-Z		9	ns
t HLQZ	tHZ	HOLD# to Output High-Z		9	ns

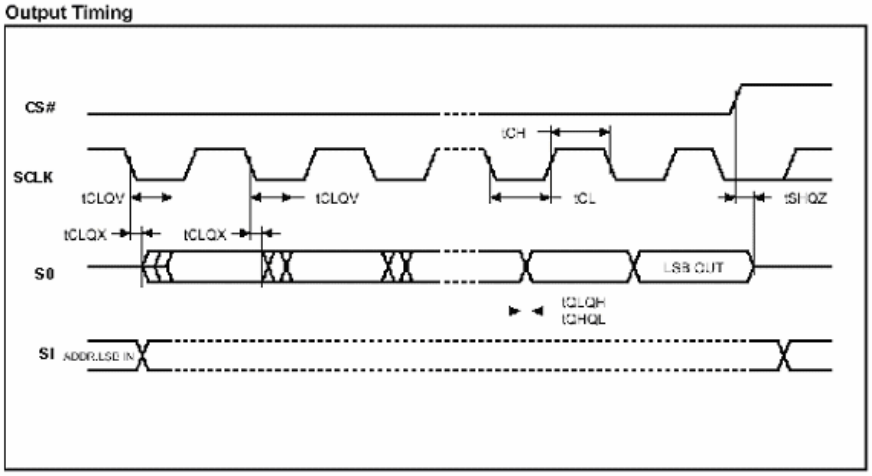
Serial Input Timing



Hold Timing



Output Timing

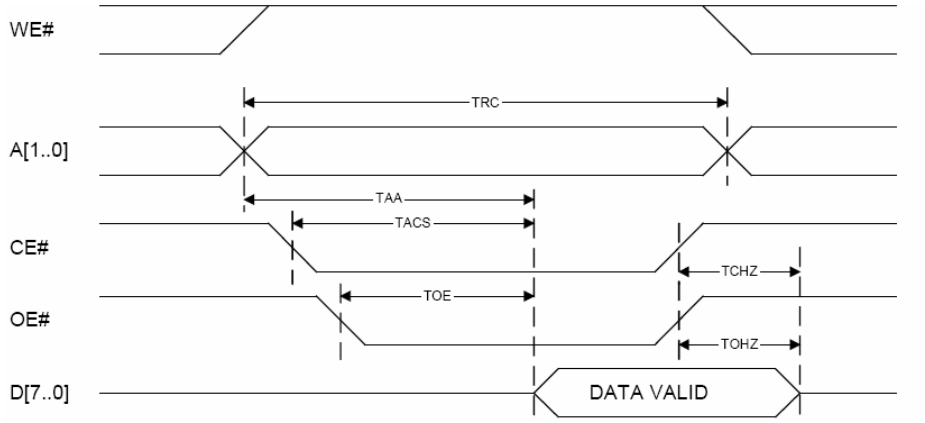


4.3.2 PLII Bus AC Characteristic

4.3.2.1 Read Cycle Timing Characteristic

Condition：T_{OP} = -10℃ to 85℃，VCC= 2.7V to 3.6V

Symbol	Parameter	Min.	Max.	Unit
TRC	Read Cycle Time	130	-	ns
TAA	Address Access Time	-	110	ns
TACS	Chip Select Access Time	-	110	ns
TOE	Output Enable to Output Valid	-	100	ns
TCHZ	Chip Deselect to Output in High-Z	-	10	ns
TOHZ	Output Disable to Output in High-Z	-	10	ns

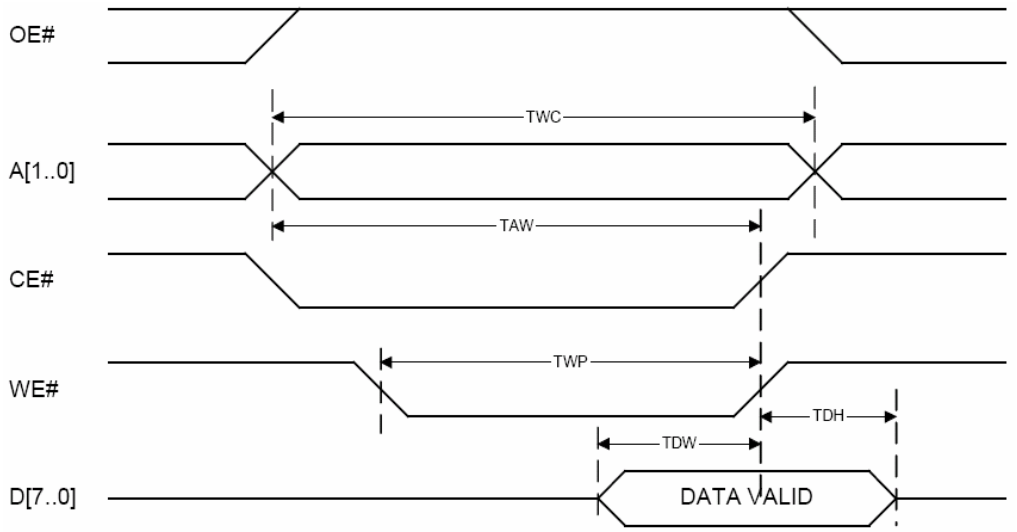


Read cycle timing waveform

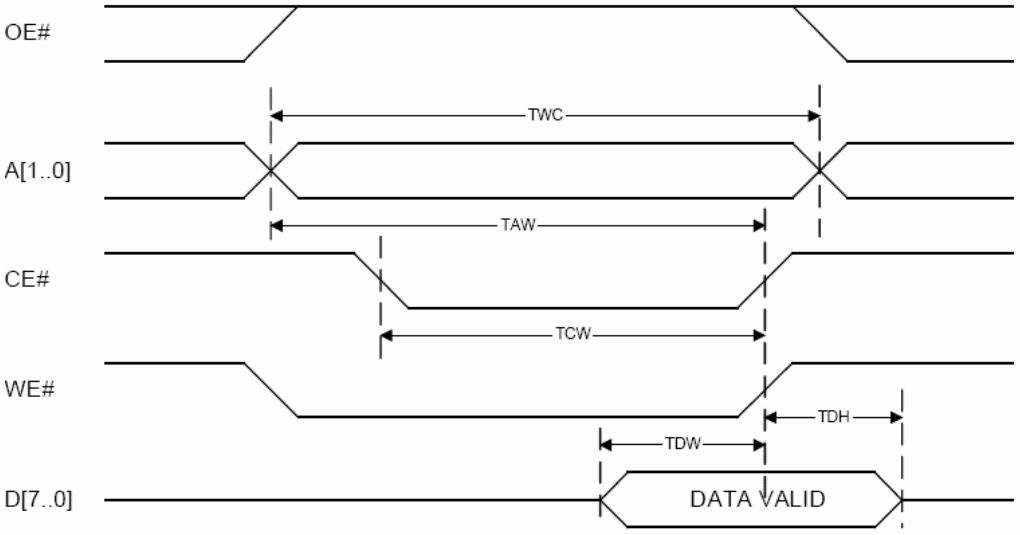
4.3.2.2 Write Cycle Timing Characteristic

Condition：T_{OP} = -10℃ to 85℃，VCC= 2.7V to 3.6V

Symbol	Parameter	Min.	Max.	Unit
TWC	Write Cycle Time	130		ns
TAW	Address Valid to End-of-Write	120		ns
TCW	Chip Select to End-of-Write	100		ns
TWP	Write Pulse Width	100		ns
TDW	Dada to Write Time Overlap	30		ns
TDH	Data Hold from Write Time	5		ns



write cycle timing waveform（WE# controlled）

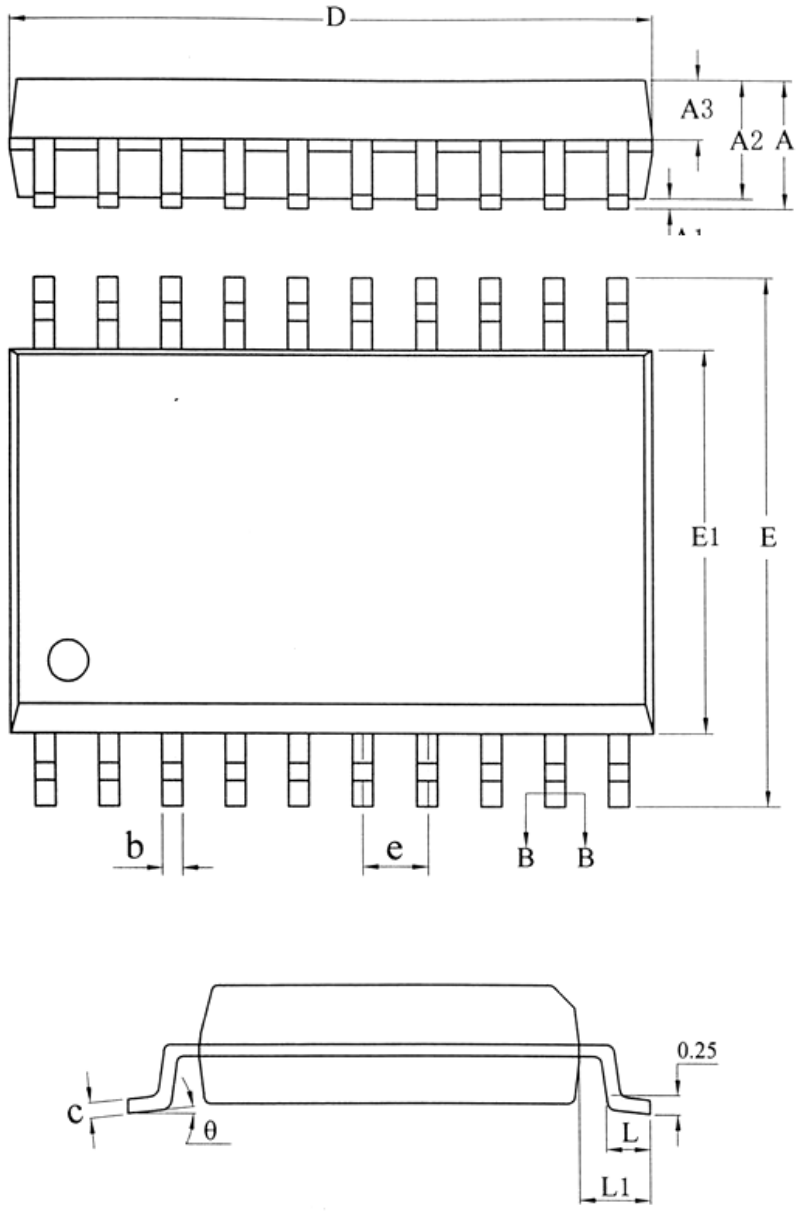


write cycle timing waveform（CE# controlled）

5 Package Size

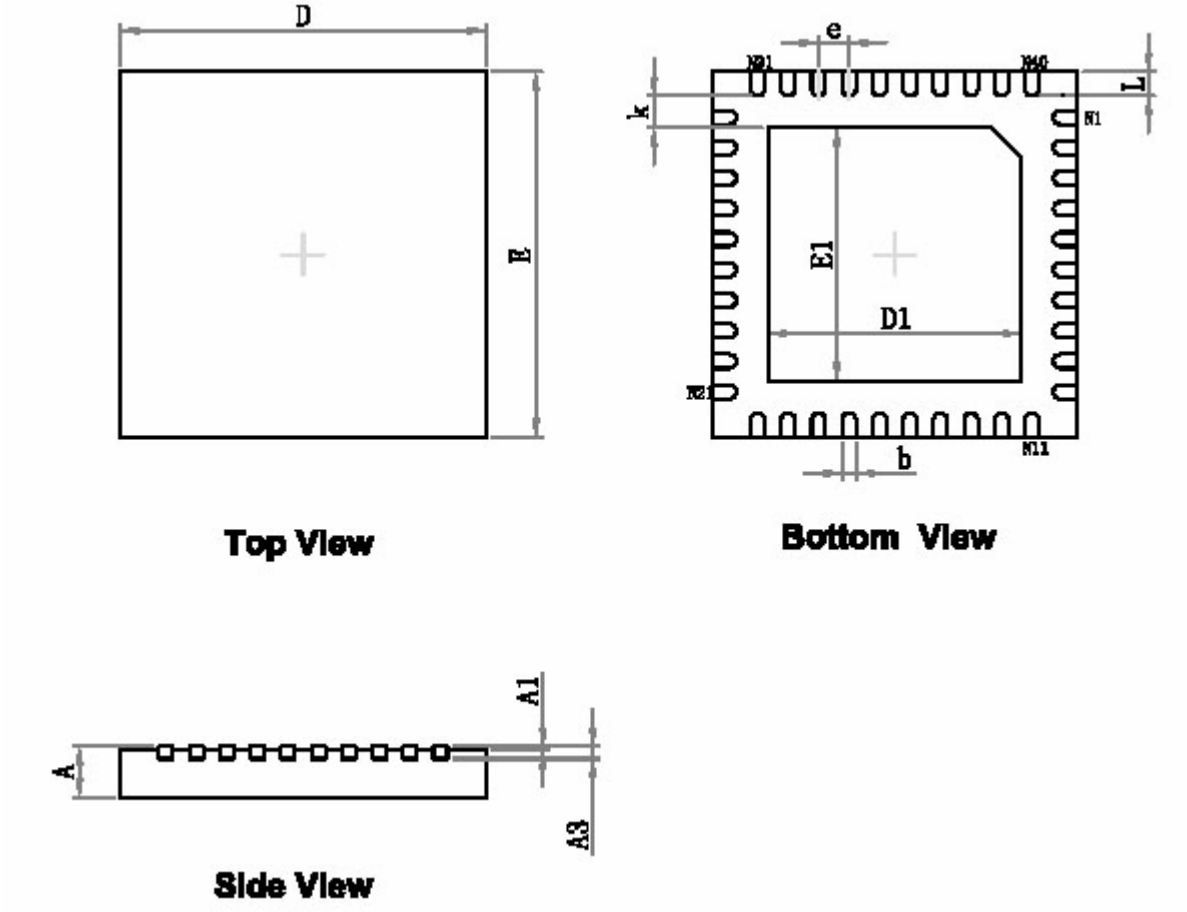
(1) SO20W

单位: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	2.70
A1	0.10	0.20	0.30
A2	2.10	2.30	2.50
A3	0.92	1.02	1.12
b	0.35	—	0.44
b1	0.34	0.37	0.39
c	0.26	—	0.31
c1	0.24	0.25	0.26
D	12.60	12.80	13.00
E	10.10	10.30	10.50
E1	7.30	7.50	7.70
e	1.27BSC		
L	0.70	0.85	1.00
L1	1.40BSC		
θ	0	—	8°

(2) QFN40



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	5.900	6.100	0.232	0.240
E	5.900	6.100	0.232	0.240
D1	4.100	4.300	0.161	0.169
E1	4.100	4.300	0.161	0.169
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.300	0.500	0.012	0.020

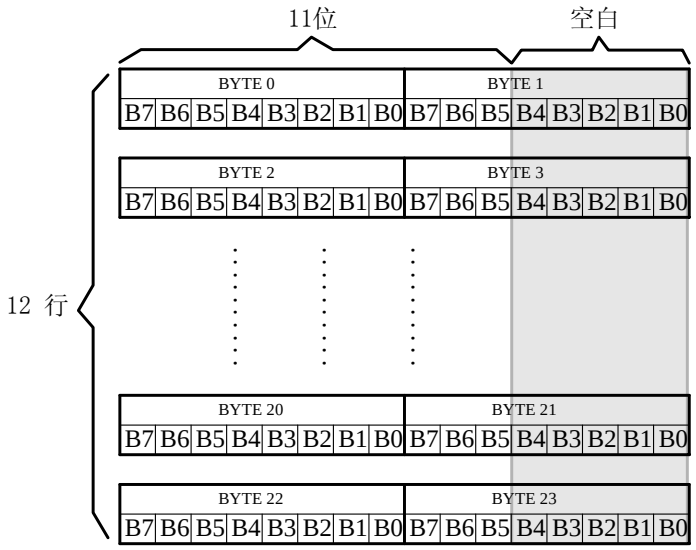
6 Font Read Method

6.1 Character Dot Matrix Arrangement (Data Arrangement Format)

Each character is stored in the Chinese dot matrix format, each dot is expressed by a binary bit. 1 represents for lightened dot, 0 represents for unlightened dot. The data arrangement format is byte horizontal, string horizontal. The biggest bit of BYTE represents the most left point, the smallest bit of BYTE represents the most right point. Advances when horizontal row is booked. Chinese will display when using the above method.

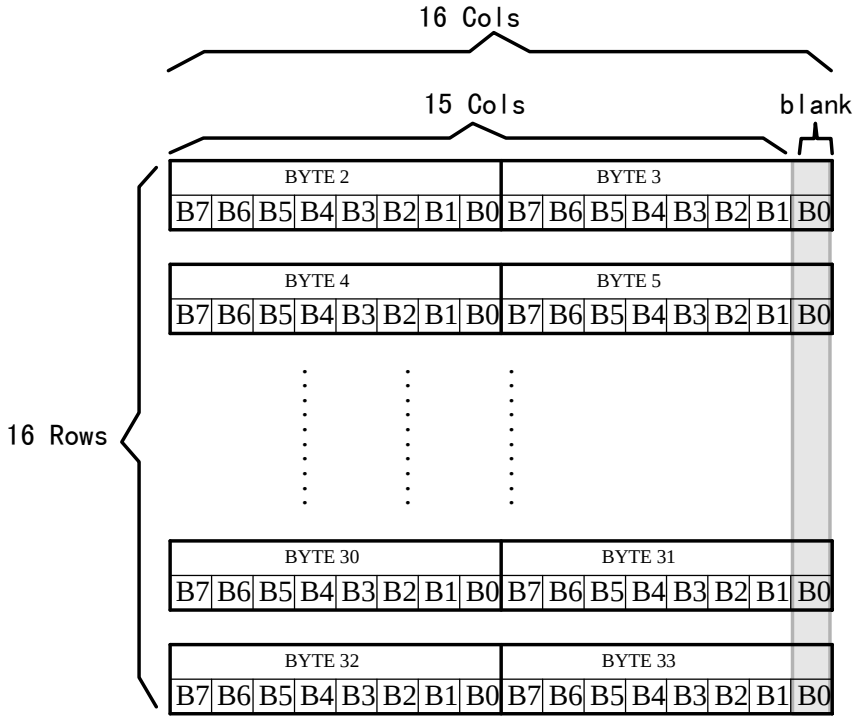
6.1.1 11X12 dots font

11X12 dots font requires 24 bytes (BYTE 0 – BYTE 23) to display. Data arrangement format of this 11X12 dots font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



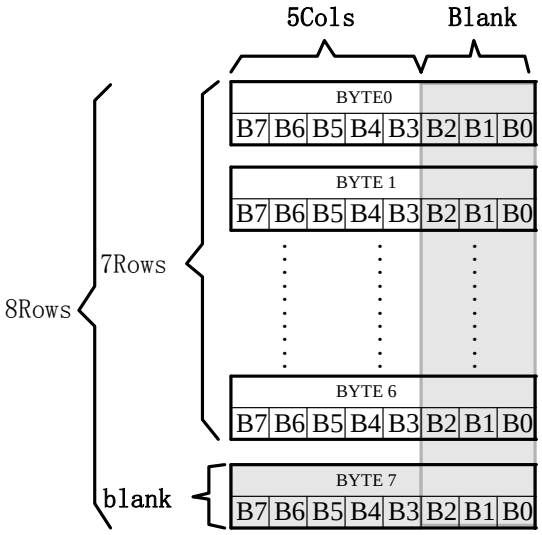
6.1.2 15X16 dots font

15X16 dots font requires 32 bytes (BYTE 0 – BYTE 31) to display. Data arrangement format of this 15X16 dots font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



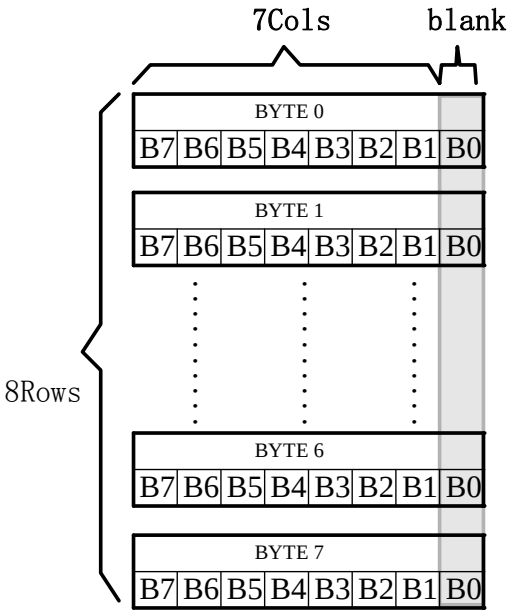
6.1.3 5X7 dots ASCII font

5X7 dots ASCII font requires 8 bytes (BYTE 0 – BYTE7) to display. Data arrangement format of this ASCII font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



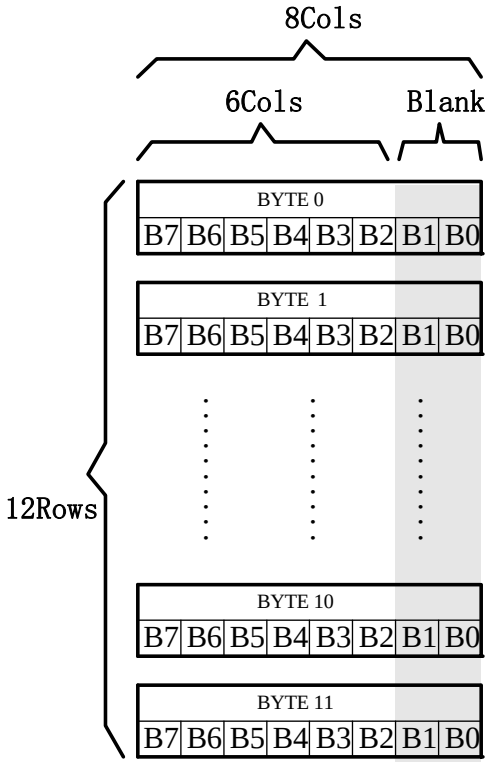
6.1.4 7X8 dots ASCII font

7X8 dots ASCII font requires 8 bytes (BYTE 0 – BYTE7) to display. Data arrangement format of this ASCII font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



6.1.5 6X12 dots ASCII font

6X12 dots ASCII font requires 12 bytes (BYTE 0 – BYTE11) to display. Data arrangement format of this ASCII font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



6.1.6 8X16 dots font

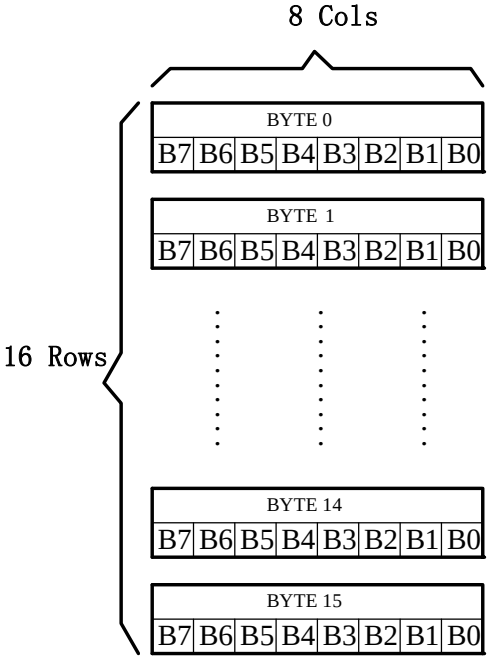
The following fonts can be applied to this data arrangement format:

8X16 dots ASCII font

8X16 dots special character

8X16 dots Unicode font

8X16 dots font requires 16 bytes（BYTE 0 – BYTE15）to display. Data arrangement format of this font is byte horizontal, string horizontal, the detailed arrangement structure is showed below:



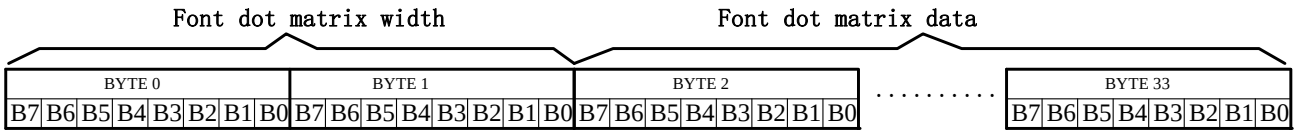
6.1.7 12 dot matrix proportional adjusted font

The following fonts can be applied to this data arrangement format:
12 dot matrix Arial font
12 dot matrix Times New Roman font
12 dot matrix Unicode font

- Storage Format

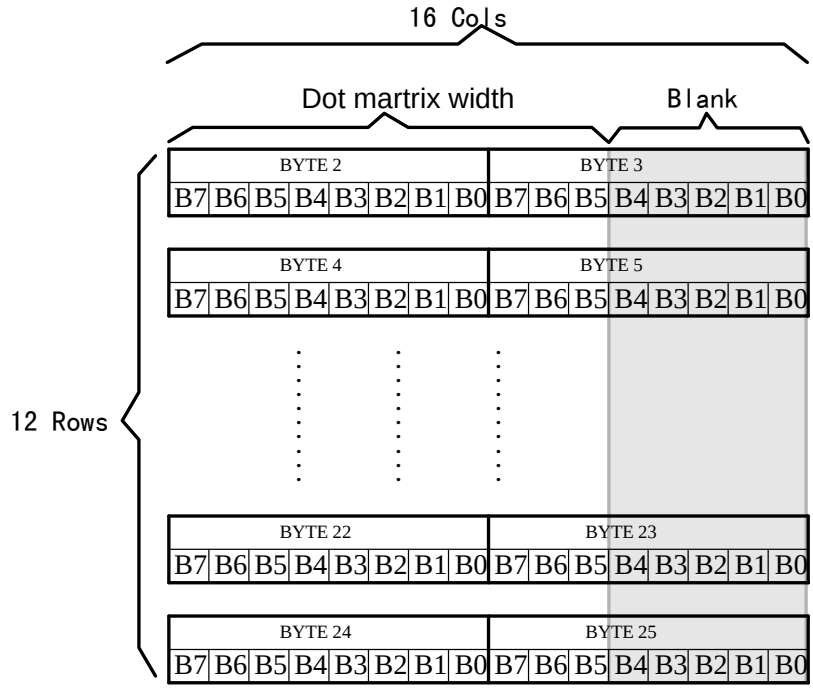
12 dots proportionally adjusted font requires 26 bytes（BYTE 0 – BYTE25）to display.

For the font is proportionally adjusted, BYTE0~ BYTE1 are stored font width data, BYTE2-25 are stored dots matrix data.



- Storage Structure

The dots matrix storage width of proportionally adjusted font uses BYTE as its unit. Different font width will reveal corresponding blanks. With the font's actual width data stored in BYTE0~BYTE 1, it can be used as reference for the position of the next word.



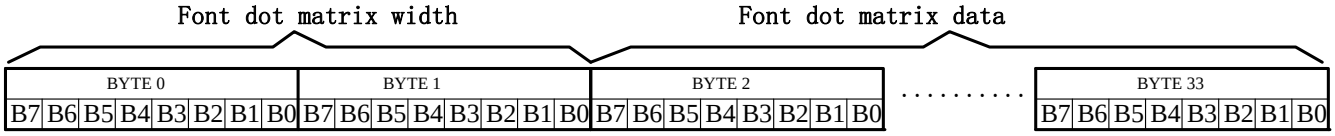
6.1.8 16 dot matrix proportional adjusted font

The following fonts can be applied to this data arrangement format:
16 dot matrix Arial font
16 dot matrix Times New Roman font
16 dot matrix Unicode font

- Storage Format

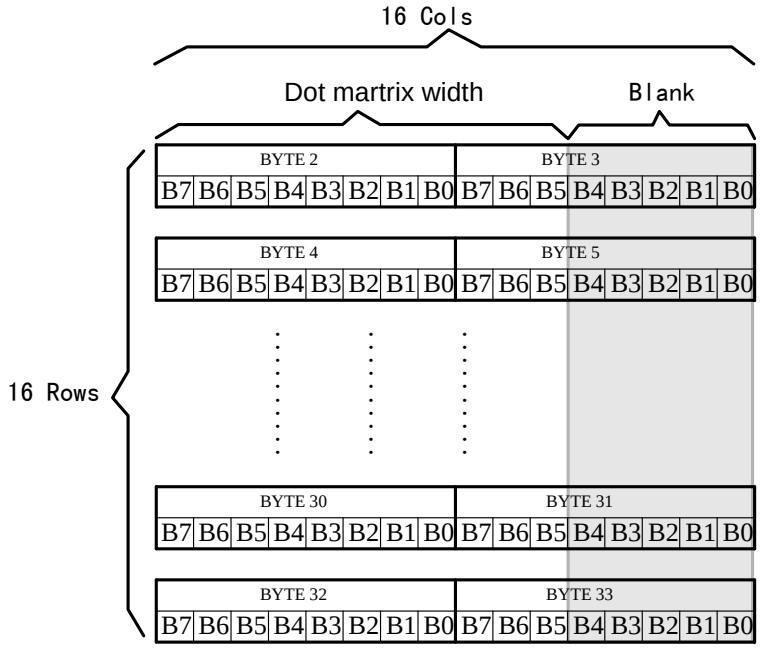
16 dots proportionally adjusted font requires 34 bytes（BYTE 0 – BYTE33）to display.

For the font is proportionally adjusted, BYTE0~ BYTE1 are stored font width data, BYTE2-33 are stored dots matrix data.



- Storage Structure

The dots matrix storage width of proportionally adjusted font uses BYTE as its unit. Different font width will reveal corresponding blanks. With the font's actual width data stored in BYTE0~BYTE 1, it can be used as reference for the position of the next word.



For Example: ASCII Arial Font “B”

0-33 BYTE: 00 0C 00 00 00 00 00 00 7F 80 7F C0 60 C0 60 C0 60 C0 7F 80 7F C0 60 E0 60 60 60 60 7F C0 7F 80 00 00

In BYTE0~BYTE1: “00 0C” is width data, 12 bit width, 4 blank bits is reserved. The typeset of the next word may shift forward considering the blank bits.

In BYTE2~BYTE33: “00 00 00 00 00 00 7F 80 7F C0 60 C0 60 C0 60 C0 7F 80 7F C0 60 E0 60 60 60 60 7F C0 7F 80 00 00” is dot matrix data.

6.2 Dot Matrix Font Address Table

1	Content	Character Set	Code Scope	Characters	Address	Reference Method
2	11X12 dots Unicode font	Unicode		27484+985	00000	6.3.1.1
3	15X16 dots Unicode font	Unicode		27484+985	A76B8	6.3.1.2
4	6X12 dots ASCII font	ASCII	20~7F	96	186A58	6.3.2.3
5	12 dot matrix Arial font	ASCII	20~7F	96	187058	6.3.2.5
6	12 dot matrix Times New Roman font	ASCII	20~7F	96	187A18	6.3.2.6
7	8X16 dots ASCII font	ASCII	20~7F	96	1883D8	6.3.2.4
8	5X7 dots ASCII font	ASCII	20~7F	96	188BD8	6.3.2.1
9	7X8 dots ASCII font	ASCII	20~7F	96	188ED8	6.3.2.2
10	16 dot matrix Arial font	ASCII	20~7F	96	1891D8	6.3.2.7
11	16 dot matrix Times New Roman font	ASCII	20~7F	96	189E98	6.3.2.8
12	8X16 dots Latin font	Unicode	00A0-0217	376	18AB58	6.3.3.1
13	8X16 dots Greek font	Unicode	0370-03CF	96	18C2D8	6.3.3.2
14	8X16 dots Cyrillic font	Unicode	0400-04F9	250	18C8D8	6.3.3.3
15	8X16 dots special character	GB2312	ACA1-ACDF	64	18D878	6.3.1.3
16	Reserved				18DC78	
17	PINYIN input method code list				18E6F8	
18	12 dot matrix Unicode font (Latin, Greek, Cyril)	Unicode	0020-04E9	555	19AD22	6.3.3.4-6.3.3.6
19	16 dot matrix Unicode font (Latin, Greek, Cyril)	Unicode	0020-04E9	555	19E580	6.3.3.9-6.3.3.11
20	16 dot matrix Arabian font	Unicode	0600~06F9	840	1A2F36	6.3.3.12
21	16 dot matrix Arabian extendable font	Customized	B000-B1F1	498	1A506A	6.3.3.13
22	12 dot matrix Arabian font	Unicode	0600~06F9	840	1AA0E6	6.3.3.7
23	12 dot matrix Arabian extendable font	Customized	B000-B1F1	498	1ABA4A	6.3.3.8
24	GT PINYIN & GT 3D IDEOGRAPH input method code list				1AF7D6	
25	Reserved				1F644E	

6.3 Calculation of Character Address

With certain calculation method, the user may obtain certain character dots address using character code.

6.3.1 Chinese Font

6.3.1.1 11X12 dots Unicode font

Ucode: Character code

MSB: High byte of FontCode.

LSB: Low byte fo FontCode.

Address: Address of character data.

ZFindex: Get a lookup table in Appendix 7.4 (see: function WORD ZFindex (WORD Ucode)), returns the font serial number in the table;

```
BaseAdd=0x0000 ;
if(Ucode >=0x3400 && Ucode <= 0x4DB5)          //UNICODE3.0 Chinese font expand section 6582 Chinese characters
    Address =(unicode-0x3400)*24+ BaseAdd;
else if(Ucode >=0x4E00 && Ucode <= 0x9FA5)   //UNICODE3.0 Chinese font section 20902 Chinese characters
    Address =(unicode-0x4E00+6582)*24+ BaseAdd;
else if(Ucode >=0xFF00 && Ucode <= 0xFF5E || Ucode >=0x20 && Ucode <= 0x7E )
{   if(Ucode ==0xFF00 || Ucode == 0x20)                //Blank
        Address =（27484+538）*24+ BaseAdd;
    else if(Ucode >0xFF00 && Ucode <= 0xFF5E)
        Address = (Ucode -0xFF00+27484+987)*24+ BaseAdd;
    else if(Ucode >0x20 && Ucode <= 0x7E )
        Address = (Ucode -0x20+27484+987)*24+ BaseAdd;
}
else if (Ucode>=00A1&& Ucode <=33D5 || Ucode>= E76C && Ucode <= FFE5)   //Code Scope
Address = ZFindex(Ucode)*24+27484*24+ BaseAdd;
```

6.3.1.2 15X16 dots Unicode font

Ucode: Character code

MSB: High byte of FontCode.

LSB: Low byte fo FontCode.

Address: Address of character data.

ZFindex Get a lookup table in Appendix 7.4 (see: function WORD ZFindex (WORD Ucode)), returns the font serial number in the table;

```
BaseAdd=0x0A76B8 ;
if(Ucode >=0x3400 && Ucode <= 0x4DB5)          // UNICODE3.0 Chinese font expand section 6582 Chinese characters
    Address =(unicode-0x3400)*32+ BaseAdd;
else if(Ucode >=0x4E00 && Ucode <= 0x9FA5)   // UNICODE3.0 Chinese font section 20902
```

```
Chinese characters
        Address =(unicode-0x4E00+6582)*32+ BaseAdd;
    else if(Ucode >=0xFF00 && Ucode <= 0xFF5E || Ucode >=0x20 && Ucode <= 0x7E )
    {   if(Ucode ==0xFF00 || Ucode == 0x20)              //Blank
            Address =（27484+538）*32+ BaseAdd;
        else if(Ucode >0xFF00 && Ucode <= 0xFF5E)
            Address = (Ucode -0xFF00+27484+987)*32+ BaseAdd;
        else if(Ucode >0x20 && Ucode <= 0x7E )
            Address = (Ucode -0x20+27484+987)*32+ BaseAdd;
    }
    else if (Ucode>=00A1&& Ucode <=33D5 || Ucode>= E76C && Ucode <= FFE5)   //Code Scope
    Address = ZFindex(Ucode)*32+27484*32+ BaseAdd;
```

6.3.1.3 **8X16 dots special character**

Parameter：

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x18D878

if (FontCode >= 0xACA1) and (FontCode <=0xACDF) then

ByteAddress = (FontCode–0xACA0) * 16+BaseAdd

6.3.2 ASCII Font

6.3.2.1 5X7 dots ASCII font

Parameters:

ASCIICode: ASCII code(8 bits)

BaseAdd: The base address of font

Address: Address of character data

Calculation of character address:

BaseAdd=0x188BD8

if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then

Address = (ASCIICode –0x20) * 8+BaseAdd

6.3.2.2 7X8 dots ASCII font

Parameters:

ASCIICode: ASCII code(8 bits)

BaseAdd: The base address of font

Address: Address of character data

Calculation of character address:

BaseAdd=0x188ED8

if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then

Address = (ASCIICode –0x20) * 8+BaseAdd

6.3.2.3 6X12 dots ASCII font

Parameters:

ASCIICode: ASCII code(8 bits)
BaseAdd: The base address of font
Address: Address of character data
Calculation of character address:
BaseAdd=0x186A58
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then
Address = (ASCIICode –0x20) * 12+BaseAdd

6.3.2.4 8X16 dots ASCII font

Parameters:
ASCIICode: ASCII code(8 bits)
BaseAdd: The base address of font
Address: Address of character data
Calculation of character address:
BaseAdd=0x1883D8
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then
Address = (ASCIICode –0x20) * 16+BaseAdd

6.3.2.5 12 dot matrix Arial font

Parameters:
ASCIICode: ASCII code(8 bits)
BaseAdd: The base address of font
Address: Address of character data
Calculation of character address:
BaseAdd=0x187058
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then
Address = (ASCIICode –0x20) * 26 + BaseAdd

6.3.2.6 12 dot matrix Times New Roman font

Parameters:
ASCIICode: ASCII code(8 bits)
BaseAdd: The base address of font
Address: Address of character data
Calculation of character address:
BaseAdd=0x187A18
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then
Address = (ASCIICode –0x20) *26 + BaseAdd

6.3.2.7 16 dot matrix Arial font

Parameters:
ASCIICode: ASCII code(8 bits)
BaseAdd: The base address of font
Address: Address of character data
Calculation of character address:
BaseAdd=0x1891D8
if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then

Address = (ASCIICode –0x20) * 34 + BaseAdd

6.3.2.8 16 dot matrix Times New Roman font

Parameters:

ASCIICode: ASCII code(8 bits)

BaseAdd: The base address of font

Address: Address of character data

Calculation of character address:

BaseAdd=0x189E98

if (ASCIICode >= 0x20) and (ASCIICode <= 0x7E) then

Address = (ASCIICode –0x20) * 34 + BaseAdd

6.3.3 Unicode Font

6.3.3.1 8X16 dots Latin font

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd = 0x18AB58

if (FontCode >= 0x00A0) and (FontCode <=0x0217) then

Address = (FontCode–0x00A0) * 16+BaseAdd

6.3.3.2 8X16 dots Greek font

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd = 0x18C2D8

if (FontCode >= 0x0370) and (FontCode <=0x03CF) then

Address = (FontCode–0x00A0) * 16+BaseAdd

6.3.3.3 8X16 dots Cyrillic font

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x18C8D8

if (FontCode >= 0x0400) and (FontCode <=0x04F9) then

Address = (FontCode–0x0400) * 16+BaseAdd

6.3.3.4 **12 dot matrix Latin font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x19AD22

if (FontCode >= 0x0020) and (FontCode <=0x007F) then

Address = (FontCode–0x 0020) * 26+BaseAdd

Else if (FontCode >= 0x00A0) and (FontCode <=0x017F) then

Address = (FontCode–0x0040) * 26+BaseAdd

6.3.3.5 **12 dot matrix Greek font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x19AD22+350*26

if (FontCode >= 0x0384) and (FontCode <=0x03CE) then

Address = (FontCode–0x0384) * 26+BaseAdd

6.3.3.6 **12 dot matrix Cyrillic font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x19AD22+425*26

if (FontCode >= 0x0400) and (FontCode <=0x045F) then

Address = (FontCode–0x0400) * 26+BaseAdd

Else if (FontCode >= 0x0490) and (FontCode <=0x04a3) then

Address = (FontCode–0x 0490+96) * 26+BaseAdd

Else if (FontCode >= 0x04AE) and (FontCode <=0x04B3) then

Address = (FontCode–0x04AE+117) * 26+BaseAdd

Else if (FontCode >= 0x04B8) and (FontCode <=0x04BB) then

Address = (FontCode–0x04B8+122) * 26+BaseAdd

Else if (FontCode >= 0x04D8) and (FontCode <=0x04D9) then

Address = (FontCode–0x04D8+126) * 26+BaseAdd

Else if (FontCode >= 0x04E8) and (FontCode <=0x04E9) then

Address = (FontCode–0x04E8+128) * 26+BaseAdd

6.3.3.7 **12 dot matrix Arabian font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x1AA0E6

if (FontCode >= 0x0600) and (FontCode <=0x06F9) then

Address = (FontCode–0x0600) * 26+BaseAdd

6.3.3.8 **12 dot matrix Arabian extendable font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x1ABA4A

if (FontCode >= 0xB000) and (FontCode <=0XB1F1) then

Address = (FontCode–0xB000) * 26+BaseAdd

6.3.3.9 **16 dot matrix Latin font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x19E580

if (FontCode >= 0x0020) and (FontCode <=0x007F) then

Address = (FontCode–0x0020) * 34+BaseAdd

Else if (FontCode >= 0x00A0) and (FontCode <=0x017F) then

Address = (FontCode–0x0040) * 34+BaseAdd

6.3.3.10 **16 dot matrix Greek font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)

Address: Address of character data

Calculation of character address:

BaseAdd=0x19E580+350*34

if (FontCode >= 0x0384) and (FontCode <=0x03CE) then

Address = (FontCode–0x0384) * 34+BaseAdd

6.3.3.11 **16 dot matrix Cyrillic font**

Parameters:

BaseAdd: The base address of font

FontCode: Unicode code (16bits)
Address: Address of character data
Calculation of character address:
BaseAdd=0x19E580+425*34
if (FontCode >= 0x0400) and (FontCode <=0x045F) then
    Address = (FontCode–0x0400) * 34+BaseAdd
Else if (FontCode >= 0x0490) and (FontCode <=0x04a3) then
    Address = (FontCode–0x0490+96) * 34+BaseAdd
Else if (FontCode >= 0x04AE) and (FontCode <=0x04B3) then
    Address = (FontCode–0x04AE+117) * 34+BaseAdd
Else if (FontCode >= 0x04B8) and (FontCode <=0x04BB) then
    Address = (FontCode–0x04B8+122) * 34+BaseAdd
Else if (FontCode >= 0x04D8) and (FontCode <=0x04D9) then
    Address = (FontCode–0x04D8+126) * 34+BaseAdd
Else if (FontCode >= 0x04E8) and (FontCode <=0x04E9) then
    Address = (FontCode–0x04E8+128) * 34+BaseAdd

6.3.3.12 **16 dot matrix Arabian font**

Parameters:
BaseAdd: The base address of font
FontCode: Unicode code (16bits)
Address: Address of character data
Calculation of character address:
BaseAdd=0x1A2F36
if (FontCode >= 0x0600) and (FontCode <=0x06F9) then
    Address = (FontCode–0x0600) * 34+BaseAdd

6.3.3.13 **16 dot matrix Arabian extendable font**

Parameters:
BaseAdd: The base address of font
FontCode: Unicode code (16bits)
Address: Address of character data
Calculation of character address:
BaseAdd=0x1A506A
if (FontCode >= 0xB000) and (FontCode <=0XB1F1) then
    Address = (FontCode–0xB000) * 34+BaseAdd

7 Appendix

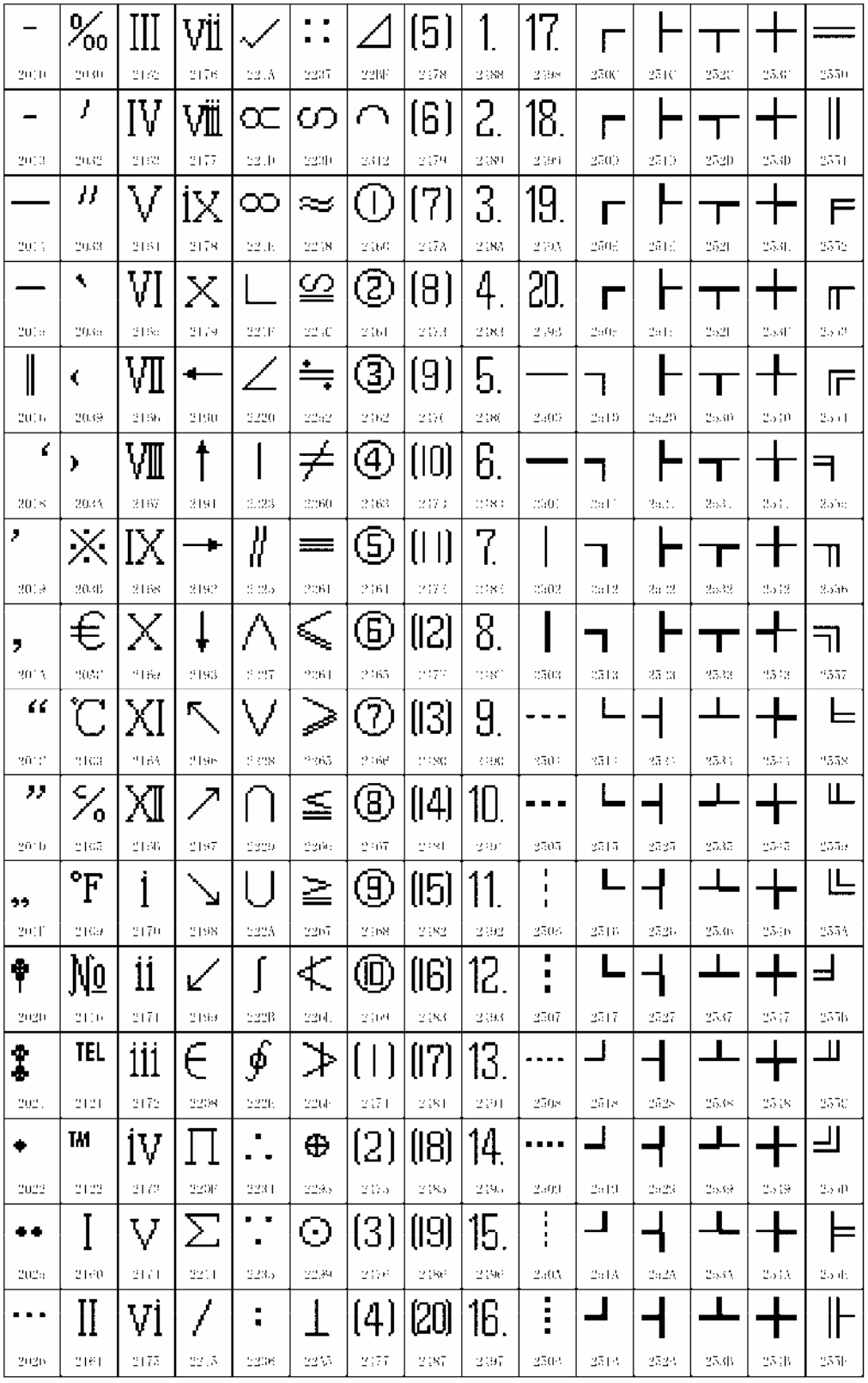
7.1 UNICODE3.0（GB13000）Character Section

Corresponding code: 00A1~33D5、E76C~FFE5

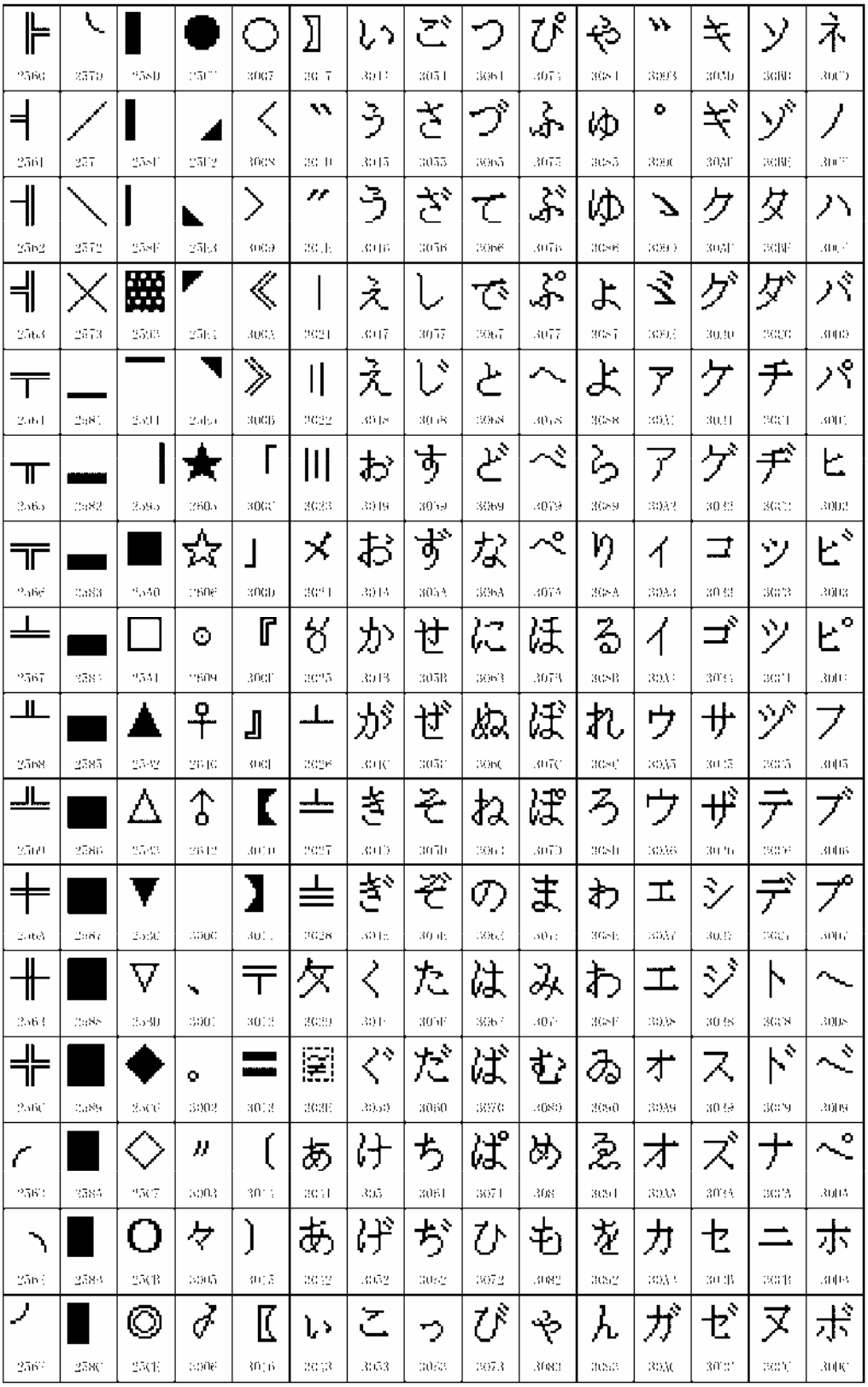
Total: 1088 characters；

UNICODE3.0 Character Section

UNICODE3.0 Character Section

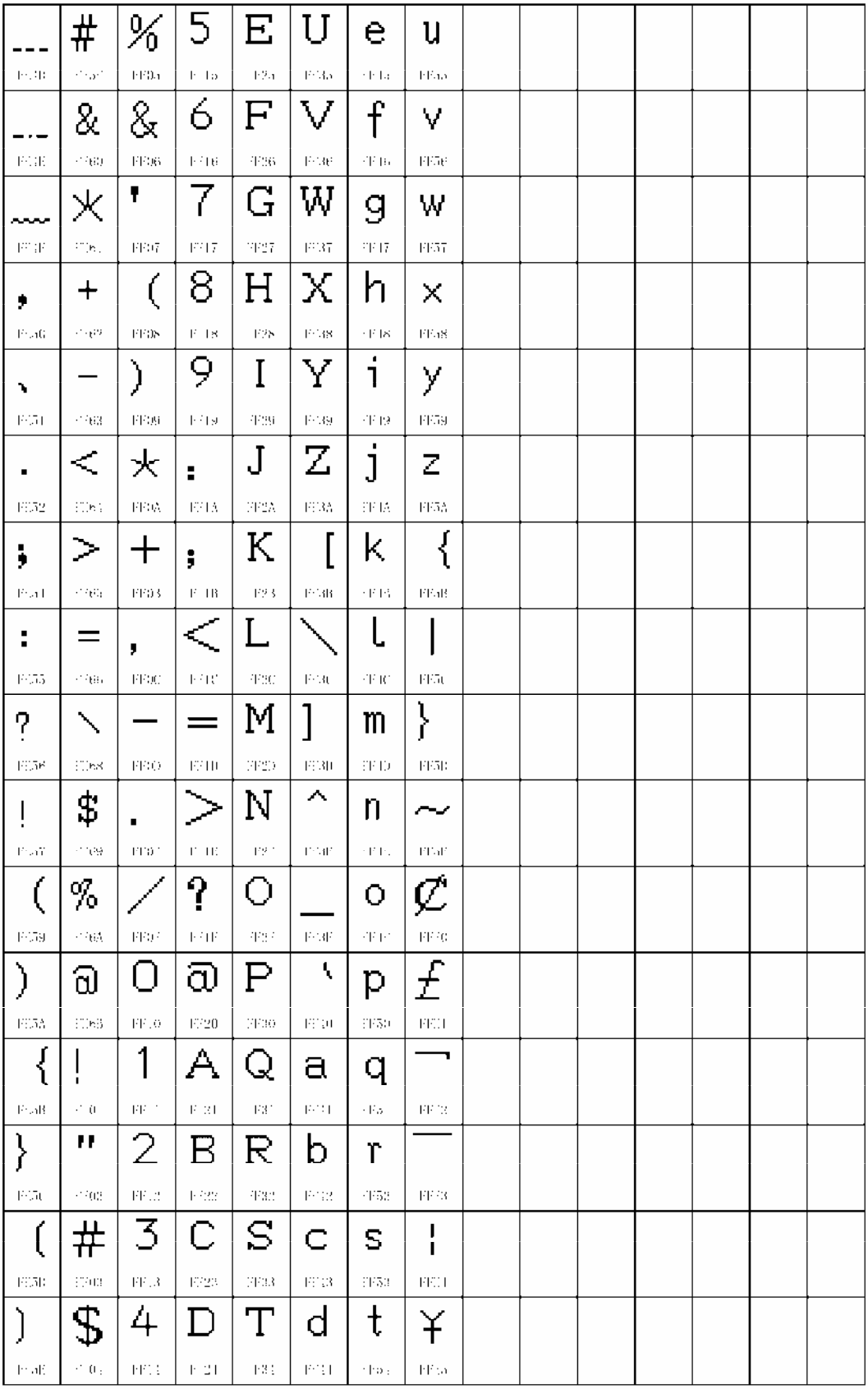


UNICODE3.0 Character Section



UNICODE3.0 Character Section

UNICODE3.0 Character Section



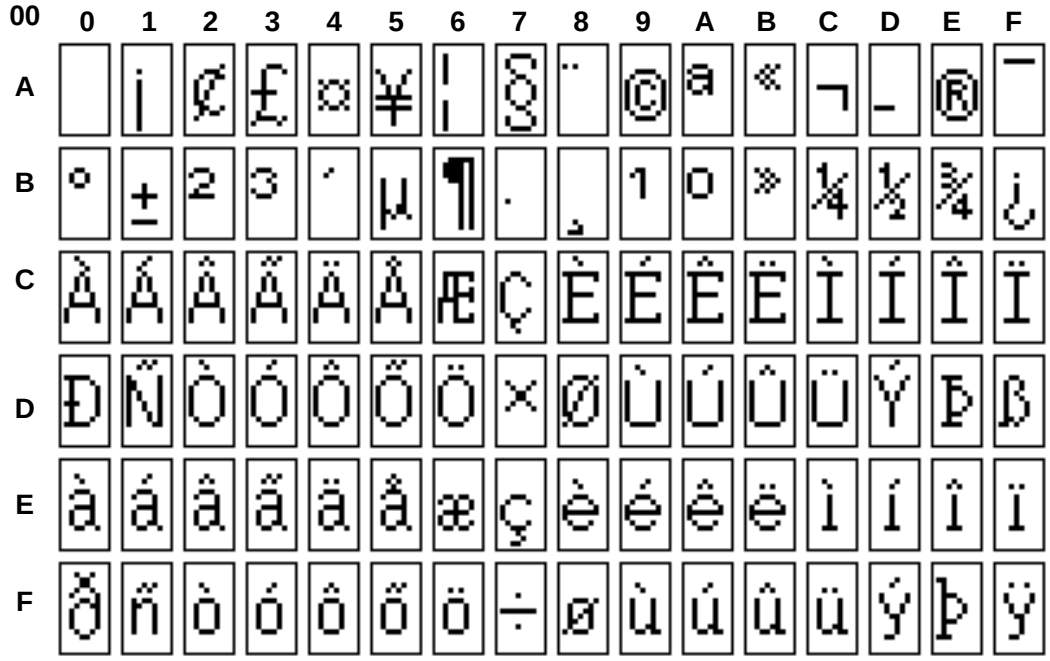
7.2 Unicode Character Section (Non- Chinese characters)

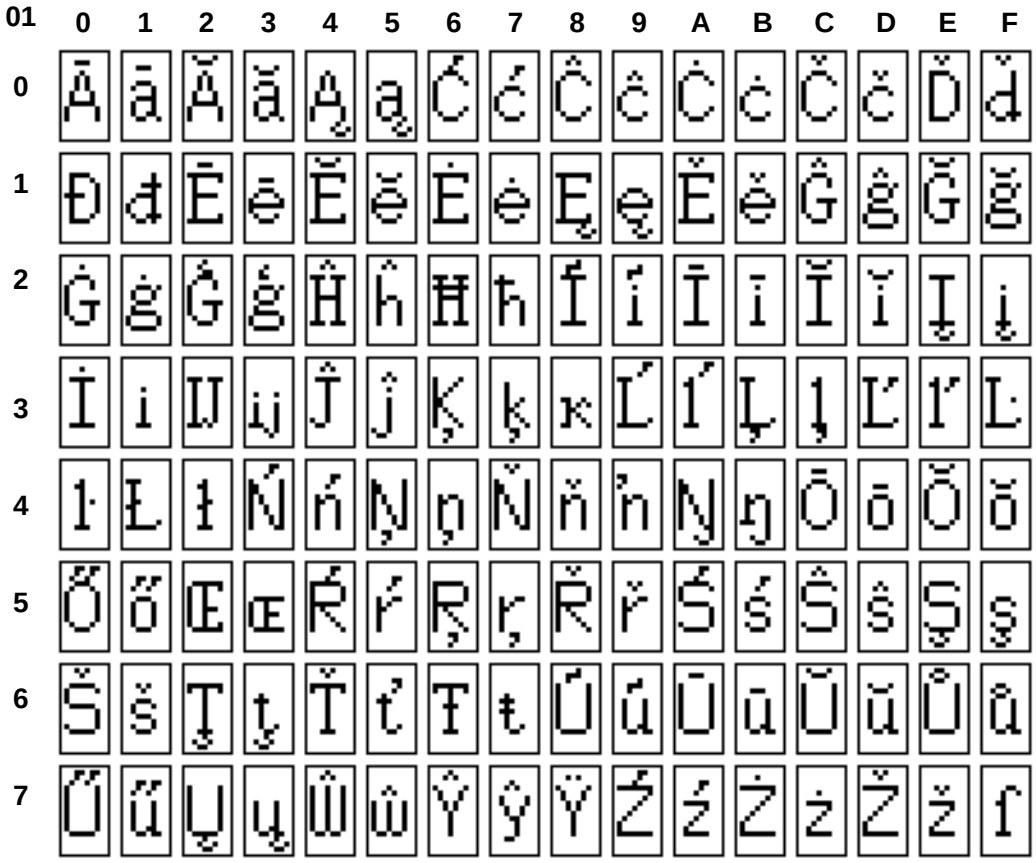
Contains Latin, Greek, Cyril (456 characters), and Arabian (250 characters).

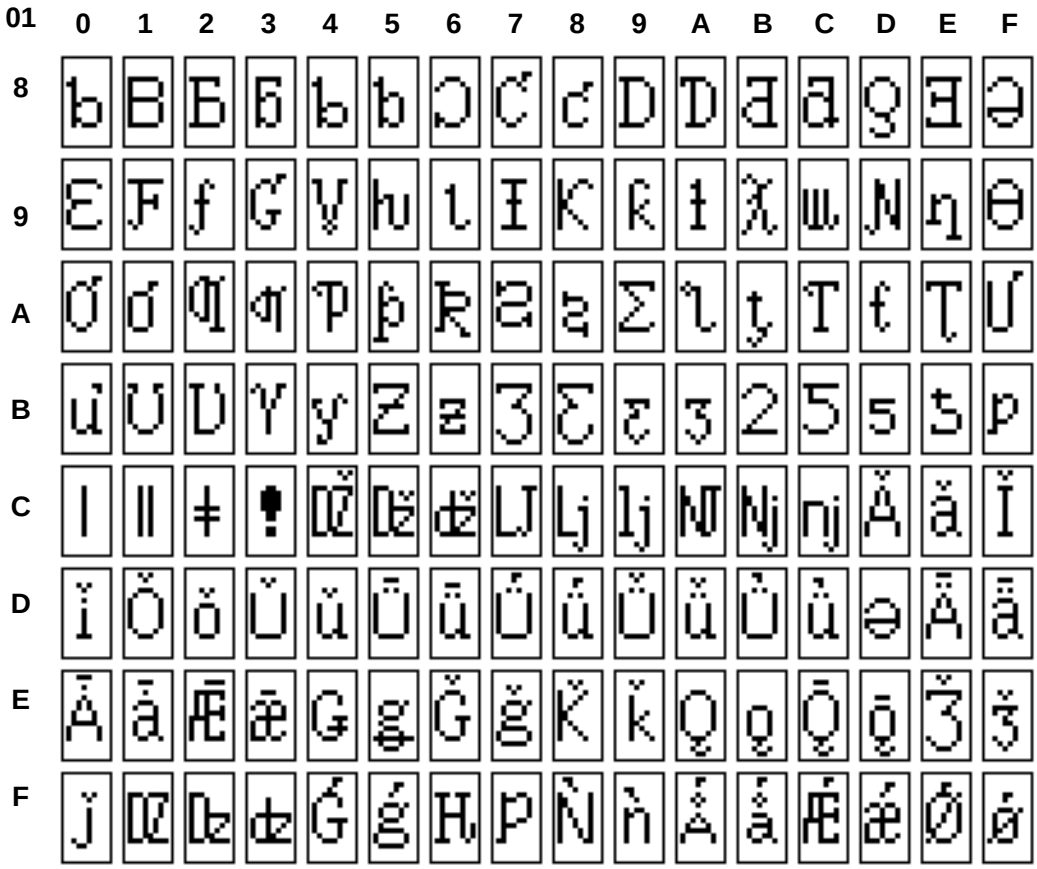
7.2.1 8×16 dots Latin fonts (376 characters)

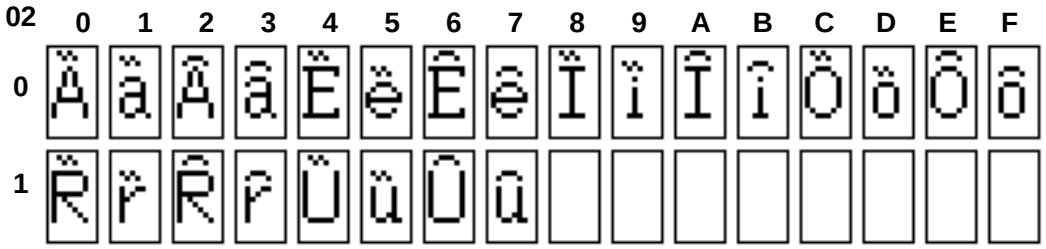
Corresponding codes: 00A0~0217(contains ASCII)

Unicode character section-Latin




01
0 1 2 3 4 5 6 7 8 9 A B C D E F
0
1
2
3
4
5
6
7

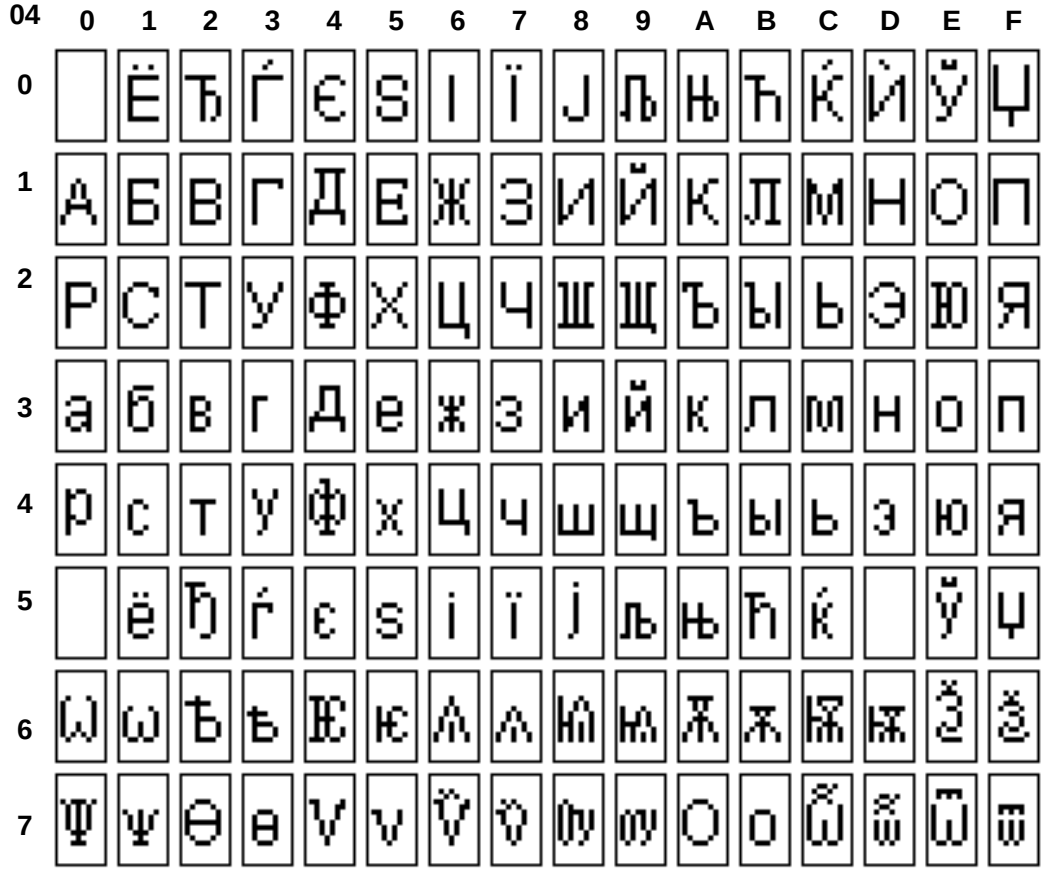

01
0 1 2 3 4 5 6 7 8 9 A B C D E F
8
9
A
B
C
D
E
F

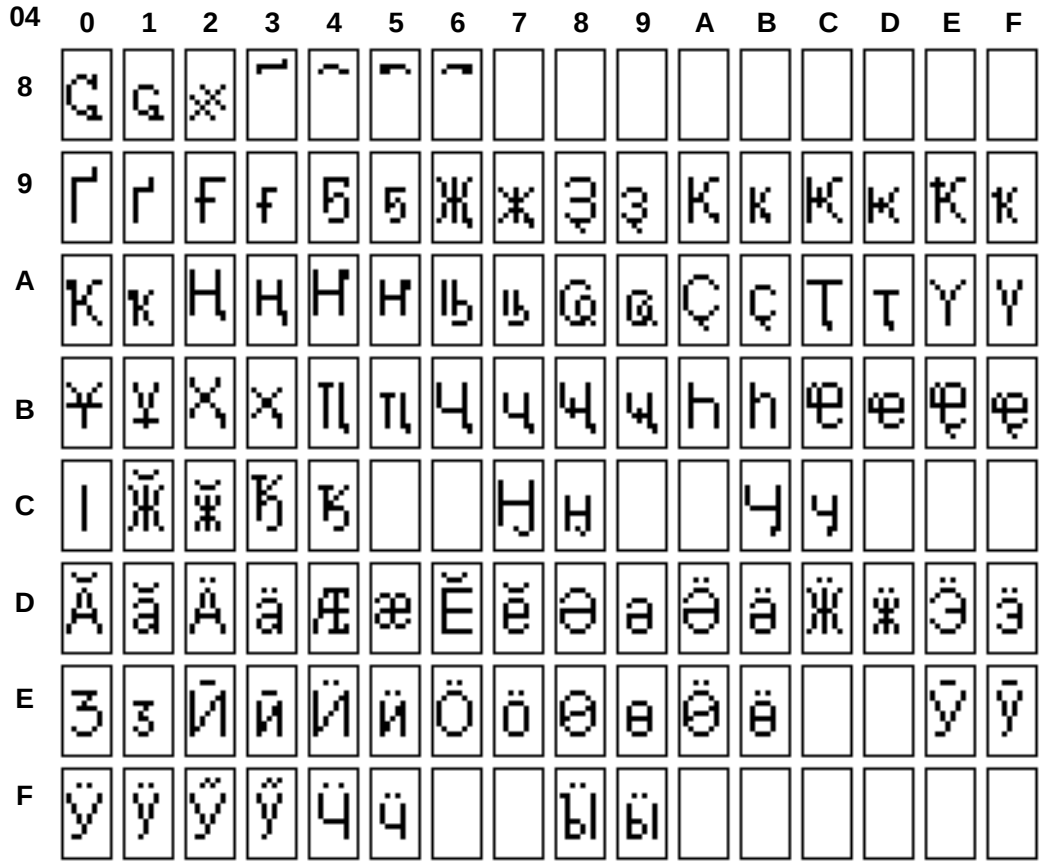

02
0 1 2 3 4 5 6 7 8 9 A B C D E F
0
1

7.2.2 8×16 dots Cyrillic fonts(250 characters)

Corresponding codes: 0400~04F9

Unicode character section-Cyrillic




04
0 1 2 3 4 5 6 7 8 9 A B C D E F
8
9
A
B
C
D
E
F

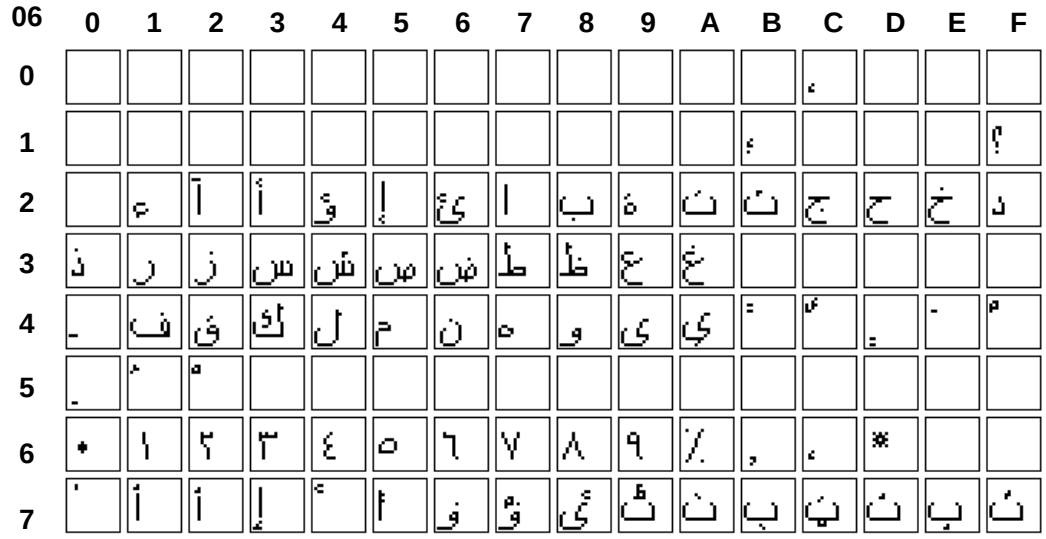
7.2.3 8×16 dots Greek fonts (96 characters)

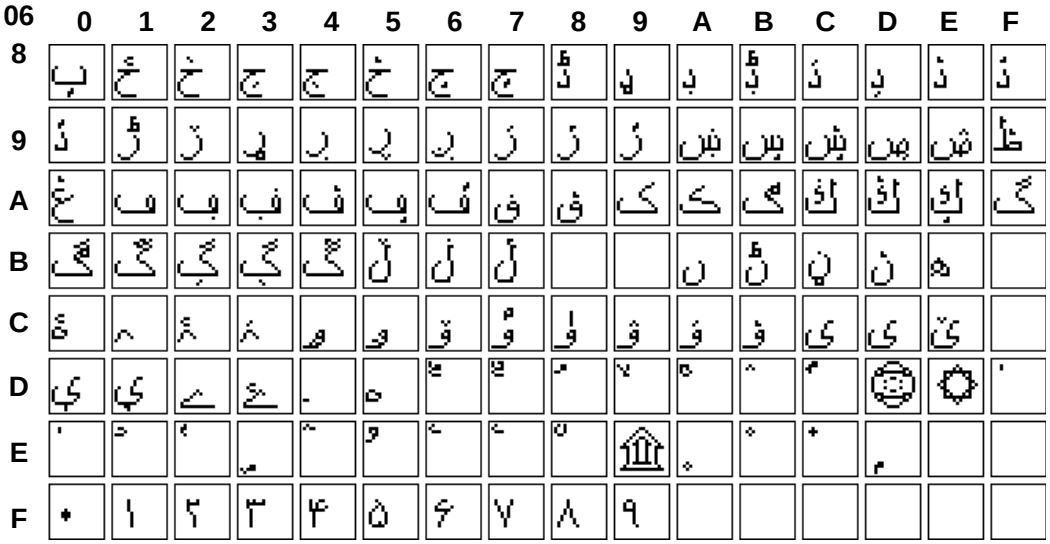
Corresponding codes: 0370~03CF

Unicode character section-Greek

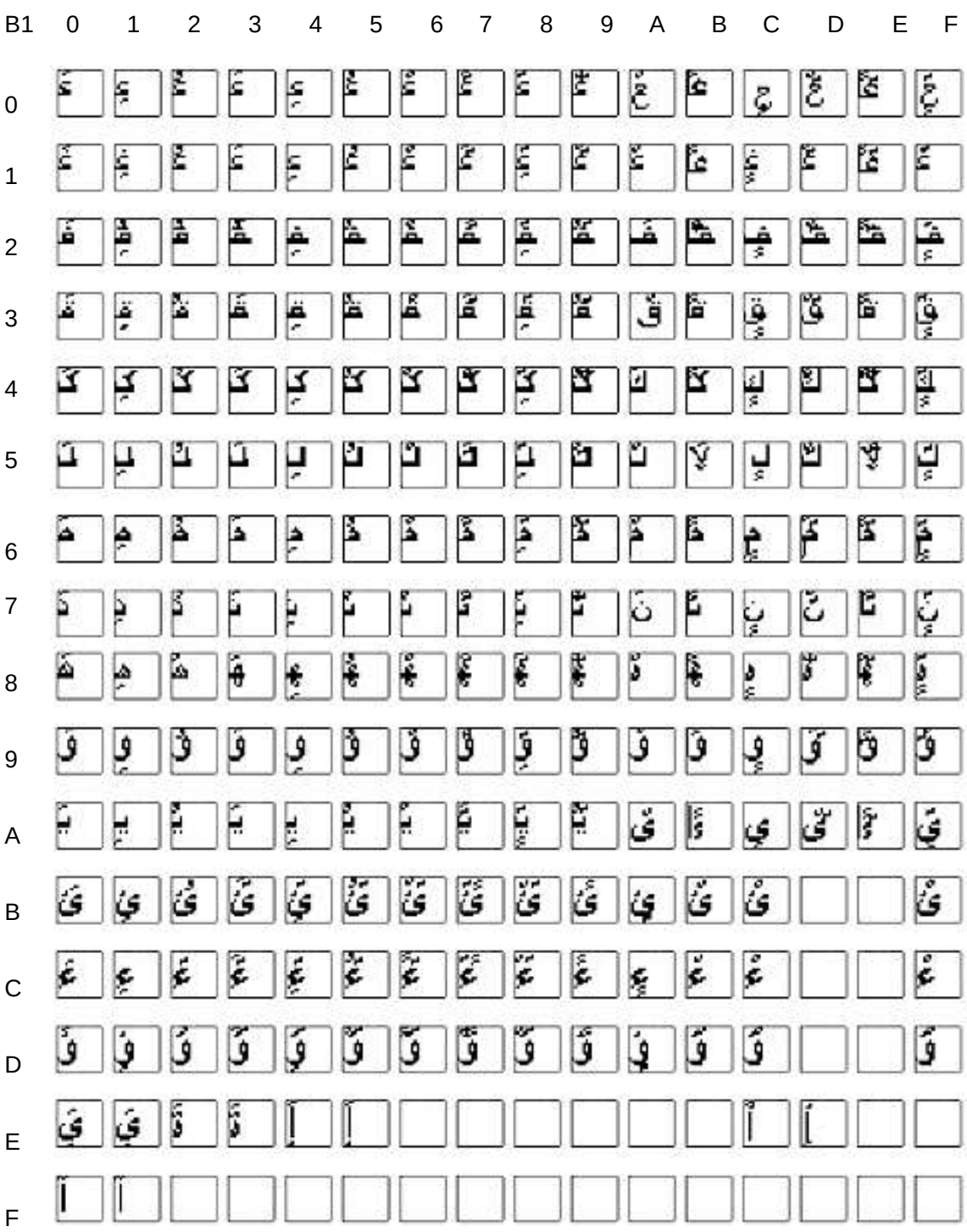
7.2.4 16 dot matrix Arabian fonts(250 characters)

Corresponding codes: 0600~06F9



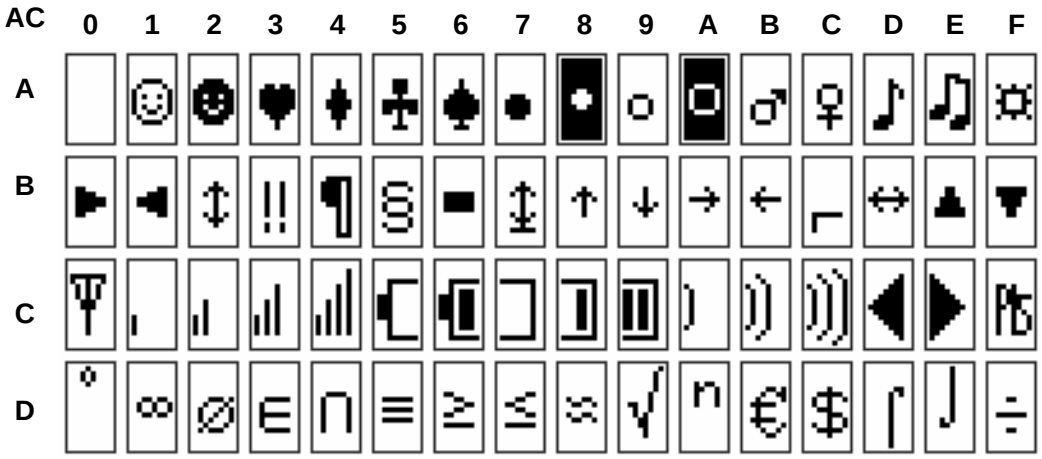

06
0 1 2 3 4 5 6 7 8 9 A B C D E F
8
9
A
B
C
D
E
F

7.2.5 **16 dots Arabian extendable fonts(498 characters)**


B1 0 1 2 3 4 5 6 7 8 9 A B C D E F
0
1
2
3
4
5
6
7
8
9
A
B
C
D
E
F

7.3 8×16 Dots Special Character（64 characters）

Corresponding code: AAA1~ABC0



7.4 UNICODE3.0 Character Section Match Table

This table described the code position of the scattered characters. The user may obtain serial number of the code position by checking the list, and eventually calculate to get the corresponding address.

Character match table arranged by WORD format:

unsigned int ZFTABLE[1088]={

0xa1,0xa2,0xa3,0xa4,0xa5,0xa6,0xa7,0xa8,
0xa9,0xaa,0xab,0xac,0xad,0xae,0xaf,0xb0,
0xb1,0xb2,0xb3,0xb4,0xb5,0xb6,0xb7,0xb8,
0xb9,0xba,0xbb,0xbc,0xbd,0xbe,0xbf,0xc0,
0xc1,0xc2,0xc3,0xc4,0xc5,0xc6,0xc7,0xc8,
0xc9,0xca,0xcb,0xcc,0xcd,0xce,0xcf,0xd0,
0xd1,0xd2,0xd3,0xd4,0xd5,0xd6,0xd7,0xd8,
0xd9,0xda,0xdb,0xdc,0xdd,0xde,0xdf,0xe0,
0xe1,0xe2,0xe3,0xe4,0xe5,0xe6,0xe7,0xe8,
0xe9,0xea,0xeb,0xec,0xed,0xee,0xef,0xf0,
0xf1,0xf2,0xf3,0xf4,0xf5,0xf6,0xf7,0xf8,
0xf9,0xfa,0xfb,0xfc,0xfd,0xfe,0xff,0x101,
0x113,0x11b,0x12b,0x144,0x148,0x14d,0x152,0x153,
0x160,0x161,0x16b,0x178,0x192,0x1ce,0x1d0,0x1d2,
0x1d4,0x1d6,0x1d8,0x1da,0x1dc,0x251,0x261,0x2c6,
0x2c7,0x2c9,0x2ca,0x2cb,0x2d9,0x2dc,0x391,0x392,
0x393,0x394,0x395,0x396,0x397,0x398,0x399,0x39a,
0x39b,0x39c,0x39d,0x39e,0x39f,0x3a0,0x3a1,0x3a3,
0x3a4,0x3a5,0x3a6,0x3a7,0x3a8,0x3a9,0x3b1,0x3b2,
0x3b3,0x3b4,0x3b5,0x3b6,0x3b7,0x3b8,0x3b9,0x3ba,

0x3bb,0x3bc,0x3bd,0x3be,0x3bf,0x3c0,0x3c1,0x3c3,
0x3c4,0x3c5,0x3c6,0x3c7,0x3c8,0x3c9,0x401,0x410,
0x411,0x412,0x413,0x414,0x415,0x416,0x417,0x418,
0x419,0x41a,0x41b,0x41c,0x41d,0x41e,0x41f,0x420,
0x421,0x422,0x423,0x424,0x425,0x426,0x427,0x428,
0x429,0x42a,0x42b,0x42c,0x42d,0x42e,0x42f,0x430,
0x431,0x432,0x433,0x434,0x435,0x436,0x437,0x438,
0x439,0x43a,0x43b,0x43c,0x43d,0x43e,0x43f,0x440,
0x441,0x442,0x443,0x444,0x445,0x446,0x447,0x448,
0x449,0x44a,0x44b,0x44c,0x44d,0x44e,0x44f,0x451,
0x2010,0x2013,0x2014,0x2015,0x2016,0x2018,0x2019,0x201a,
0x201c,0x201d,0x201e,0x2020,0x2021,0x2022,0x2025,0x2026,
0x2030,0x2032,0x2033,0x2035,0x2039,0x203a,0x203b,0x20ac,
0x2103,0x2105,0x2109,0x2116,0x2121,0x2122,0x2160,0x2161,
0x2162,0x2163,0x2164,0x2165,0x2166,0x2167,0x2168,0x2169,
0x216a,0x216b,0x2170,0x2171,0x2172,0x2173,0x2174,0x2175,
0x2176,0x2177,0x2178,0x2179,0x2190,0x2191,0x2192,0x2193,
0x2196,0x2197,0x2198,0x2199,0x2208,0x220f,0x2211,0x2215,
0x221a,0x221d,0x221e,0x221f,0x2220,0x2223,0x2225,0x2227,
0x2228,0x2229,0x222a,0x222b,0x222e,0x2234,0x2235,0x2236,

0x2237,0x223d,0x2248,0x224c,0x2252,0x2260,0x2261,0x2264,
0x2265,0x2266,0x2267,0x226e,0x226f,0x2295,0x2299,0x22a5,
0x22bf,0x2312,0x2460,0x2461,0x2462,0x2463,0x2464,0x2465,
0x2466,0x2467,0x2468,0x2469,0x2474,0x2475,0x2476,0x2477,
0x2478,0x2479,0x247a,0x247b,0x247c,0x247d,0x247e,0x247f,
0x2480,0x2481,0x2482,0x2483,0x2484,0x2485,0x2486,0x2487,
0x2488,0x2489,0x248a,0x248b,0x248c,0x248d,0x248e,0x248f,
0x2490,0x2491,0x2492,0x2493,0x2494,0x2495,0x2496,0x2497,
0x2498,0x2499,0x249a,0x249b,0x2500,0x2501,0x2502,0x2503,
0x2504,0x2505,0x2506,0x2507,0x2508,0x2509,0x250a,0x250b,
0x250c,0x250d,0x250e,0x250f,0x2510,0x2511,0x2512,0x2513,
0x2514,0x2515,0x2516,0x2517,0x2518,0x2519,0x251a,0x251b,
0x251c,0x251d,0x251e,0x251f,0x2520,0x2521,0x2522,0x2523,
0x2524,0x2525,0x2526,0x2527,0x2528,0x2529,0x252a,0x252b,
0x252c,0x252d,0x252e,0x252f,0x2530,0x2531,0x2532,0x2533,
0x2534,0x2535,0x2536,0x2537,0x2538,0x2539,0x253a,0x253b,
0x253c,0x253d,0x253e,0x253f,0x2540,0x2541,0x2542,0x2543,
0x2544,0x2545,0x2546,0x2547,0x2548,0x2549,0x254a,0x254b,
0x2550,0x2551,0x2552,0x2553,0x2554,0x2555,0x2556,0x2557,
0x2558,0x2559,0x255a,0x255b,0x255c,0x255d,0x255e,0x255f,
0x2560,0x2561,0x2562,0x2563,0x2564,0x2565,0x2566,0x2567,
0x2568,0x2569,0x256a,0x256b,0x256c,0x256d,0x256e,0x256f,
0x2570,0x2571,0x2572,0x2573,0x2581,0x2582,0x2583,0x2584,
0x2585,0x2586,0x2587,0x2588,0x2589,0x258a,0x258b,0x258c,

0x258d,0x258e,0x258f,0x2593,0x2594,0x2595,0x25a0,0x25a1,
0x25b2,0x25b3,0x25bc,0x25bd,0x25c6,0x25c7,0x25cb,0x25ce,
0x25cf,0x25e2,0x25e3,0x25e4,0x25e5,0x2605,0x2606,0x2609,
0x2640,0x2642,0x3000,0x3001,0x3002,0x3003,0x3005,0x3006,
0x3007,0x3008,0x3009,0x300a,0x300b,0x300c,0x300d,0x300e,
0x300f,0x3010,0x3011,0x3012,0x3013,0x3014,0x3015,0x3016,
0x3017,0x301d,0x301e,0x3021,0x3022,0x3023,0x3024,0x3025,
0x3026,0x3027,0x3028,0x3029,0x303e,0x3041,0x3042,0x3043,
0x3044,0x3045,0x3046,0x3047,0x3048,0x3049,0x304a,0x304b,
0x304c,0x304d,0x304e,0x304f,0x3050,0x3051,0x3052,0x3053,
0x3054,0x3055,0x3056,0x3057,0x3058,0x3059,0x305a,0x305b,
0x305c,0x305d,0x305e,0x305f,0x3060,0x3061,0x3062,0x3063,
0x3064,0x3065,0x3066,0x3067,0x3068,0x3069,0x306a,0x306b,
0x306c,0x306d,0x306e,0x306f,0x3070,0x3071,0x3072,0x3073,
0x3074,0x3075,0x3076,0x3077,0x3078,0x3079,0x307a,0x307b,
0x307c,0x307d,0x307e,0x307f,0x3080,0x3081,0x3082,0x3083,
0x3084,0x3085,0x3086,0x3087,0x3088,0x3089,0x308a,0x308b,
0x308c,0x308d,0x308e,0x308f,0x3090,0x3091,0x3092,0x3093,
0x309b,0x309c,0x309d,0x309e,0x30a1,0x30a2,0x30a3,0x30a4,
0x30a5,0x30a6,0x30a7,0x30a8,0x30a9,0x30aa,0x30ab,0x30ac,

0x30ad,0x30ae,0x30af,0x30b0,0x30b1,0x30b2,0x30b3,0x30b4,
0x30b5,0x30b6,0x30b7,0x30b8,0x30b9,0x30ba,0x30bb,0x30bc,
0x30bd,0x30be,0x30bf,0x30c0,0x30c1,0x30c2,0x30c3,0x30c4,
0x30c5,0x30c6,0x30c7,0x30c8,0x30c9,0x30ca,0x30cb,0x30cc,
0x30cd,0x30ce,0x30cf,0x30d0,0x30d1,0x30d2,0x30d3,0x30d4,
0x30d5,0x30d6,0x30d7,0x30d8,0x30d9,0x30da,0x30db,0x30dc,
0x30dd,0x30de,0x30df,0x30e0,0x30e1,0x30e2,0x30e3,0x30e4,
0x30e5,0x30e6,0x30e7,0x30e8,0x30e9,0x30ea,0x30eb,0x30ec,
0x30ed,0x30ee,0x30ef,0x30f0,0x30f1,0x30f2,0x30f3,0x30f4,
0x30f5,0x30f6,0x30fc,0x30fd,0x30fe,0x3105,0x3106,0x3107,
0x3108,0x3109,0x310a,0x310b,0x310c,0x310d,0x310e,0x310f,
0x3110,0x3111,0x3112,0x3113,0x3114,0x3115,0x3116,0x3117,
0x3118,0x3119,0x311a,0x311b,0x311c,0x311d,0x311e,0x311f,
0x3120,0x3121,0x3122,0x3123,0x3124,0x3125,0x3126,0x3127,
0x3128,0x3129,0x3220,0x3221,0x3222,0x3223,0x3224,0x3225,
0x3226,0x3227,0x3228,0x3229,0x3231,0x32a3,0x338e,0x338f,
0x339c,0x339d,0x339e,0x33a1,0x33c4,0x33ce,0x33d1,0x33d2,
0x33d5,0xe76c,0xe78d,0xe78e,0xe78f,0xe790,0xe791,0xe792,
0xe793,0xe794,0xe795,0xe796,0xe7c7,0xe7c8,0xe7e7,0xe7e8,
0xe7e9,0xe7ea,0xe7eb,0xe7ec,0xe7ed,0xe7ee,0xe7ef,0xe7f0,
0xe7f1,0xe7f2,0xe7f3,0xe815,0xe816,0xe817,0xe818,0xe819,
0xe81a,0xe81b,0xe81c,0xe81d,0xe81e,0xe81f,0xe820,0xe821,
0xe822,0xe823,0xe824,0xe825,0xe826,0xe827,0xe828,0xe829,
0xe82a,0xe82b,0xe82c,0xe82d,0xe82e,0xe82f,0xe830,0xe831,

0xe832,0xe833,0xe834,0xe835,0xe836,0xe837,0xe838,0xe839,
0xe83a,0xe83b,0xe83c,0xe83d,0xe83e,0xe83f,0xe840,0xe841,
0xe842,0xe843,0xe844,0xe845,0xe846,0xe847,0xe848,0xe849,
0xe84a,0xe84b,0xe84c,0xe84d,0xe84e,0xe84f,0xe850,0xe851,
0xe852,0xe853,0xe854,0xe855,0xe856,0xe857,0xe858,0xe859,
0xe85a,0xe85b,0xe85c,0xe85d,0xe85e,0xe85f,0xe860,0xe861,
0xe862,0xe863,0xe864,0xf92c,0xf979,0xf995,0xf9e7,0xf9f1,
0xfa0c,0xfa0d,0xfa0e,0xfa0f,0xfa11,0xfa13,0xfa14,0xfa18,
0xfa1f,0xfa20,0xfa21,0xfa23,0xfa24,0xfa27,0xfa28,0xfa29,
0xfe30,0xfe31,0xfe33,0xfe34,0xfe35,0xfe36,0xfe37,0xfe38,
0xfe39,0xfe3a,0xfe3b,0xfe3c,0xfe3d,0xfe3e,0xfe3f,0xfe40,
0xfe41,0xfe42,0xfe43,0xfe44,0xfe49,0xfe4a,0xfe4b,0xfe4c,
0xfe4d,0xfe4e,0xfe4f,0xfe50,0xfe51,0xfe52,0xfe54,0xfe55,
0xfe56,0xfe57,0xfe59,0xfe5a,0xfe5b,0xfe5c,0xfe5d,0xfe5e,
0xfe5f,0xfe60,0xfe61,0xfe62,0xfe63,0xfe64,0xfe65,0xfe66,
0xfe68,0xfe69,0xfe6a,0xfe6b,0xff01,0xff02,0xff03,0xff04,
0xff05,0xff06,0xff07,0xff08,0xff09,0xff0a,0xff0b,0xff0c,
0xff0d,0xff0e,0xff0f,0xff10,0xff11,0xff12,0xff13,0xff14,
0xff15,0xff16,0xff17,0xff18,0xff19,0xff1a,0xff1b,0xff1c,
0xff1d,0xff1e,0xff1f,0xff20,0xff21,0xff22,0xff23,0xff24,

0xff25,0xff26,0xff27,0xff28,0xff29,0xff2a,0xff2b,0xff2c,
0xff2d,0xff2e,0xff2f,0xff30,0xff31,0xff32,0xff33,0xff34,
0xff35,0xff36,0xff37,0xff38,0xff39,0xff3a,0xff3b,0xff3c,
0xff3d,0xff3e,0xff3f,0xff40,0xff41,0xff42,0xff43,0xff44,
0xff45,0xff46,0xff47,0xff48,0xff49,0xff4a,0xff4b,0xff4c,
0xff4d,0xff4e,0xff4f,0xff50,0xff51,0xff52,0xff53,0xff54,
0xff55,0xff56,0xff57,0xff58,0xff59,0xff5a,0xff5b,0xff5c,
0xff5d,0xff5e,0xffe0,0xffe1,0xffe2,0xffe3,0xffe4,0xffe5

};

Character match table arranged by BYTE format:

unsigned char ZFTABLE[2176]={

0x00,0xa1,0x00,0xa2,0x00,0xa3,0x00,0xa4,0x00,0xa5,0x00,0xa6,0x00,0xa7,0x00,0xa8,
0x00,0xa9,0x00,0xaa,0x00,0xab,0x00,0xac,0x00,0xad,0x00,0xae,0x00,0xaf,0x00,0xb0,
0x00,0xb1,0x00,0xb2,0x00,0xb3,0x00,0xb4,0x00,0xb5,0x00,0xb6,0x00,0xb7,0x00,0xb8,
0x00,0xb9,0x00,0xba,0x00,0xbb,0x00,0xbc,0x00,0xbd,0x00,0xbe,0x00,0xbf,0x00,0xc0,
0x00,0xc1,0x00,0xc2,0x00,0xc3,0x00,0xc4,0x00,0xc5,0x00,0xc6,0x00,0xc7,0x00,0xc8,
0x00,0xc9,0x00,0xca,0x00,0xcb,0x00,0xcc,0x00,0xcd,0x00,0xce,0x00,0xcf,0x00,0xd0,
0x00,0xd1,0x00,0xd2,0x00,0xd3,0x00,0xd4,0x00,0xd5,0x00,0xd6,0x00,0xd7,0x00,0xd8,
0x00,0xd9,0x00,0xda,0x00,0xdb,0x00,0xdc,0x00,0xdd,0x00,0xde,0x00,0xdf,0x00,0xe0,
0x00,0xe1,0x00,0xe2,0x00,0xe3,0x00,0xe4,0x00,0xe5,0x00,0xe6,0x00,0xe7,0x00,0xe8,
0x00,0xe9,0x00,0xea,0x00,0xeb,0x00,0xec,0x00,0xed,0x00,0xee,0x00,0xef,0x00,0xf0,
0x00,0xf1,0x00,0xf2,0x00,0xf3,0x00,0xf4,0x00,0xf5,0x00,0xf6,0x00,0xf7,0x00,0xf8,

0x00,0xf9,0x00,0xfa,0x00,0xfb,0x00,0xfc,0x00,0xfd,0x00,0xfe,0x00,0xff,0x01,0x01,
0x01,0x13,0x01,0x1b,0x01,0x2b,0x01,0x44,0x01,0x48,0x01,0x4d,0x01,0x52,0x01,0x53,
0x01,0x60,0x01,0x61,0x01,0x6b,0x01,0x78,0x01,0x92,0x01,0xce,0x01,0xd0,0x01,0xd2,
0x01,0xd4,0x01,0xd6,0x01,0xd8,0x01,0xda,0x01,0xdc,0x02,0x51,0x02,0x61,0x02,0xc6,
0x02,0xc7,0x02,0xc9,0x02,0xca,0x02,0xcb,0x02,0xd9,0x02,0xdc,0x03,0x91,0x03,0x92,
0x03,0x93,0x03,0x94,0x03,0x95,0x03,0x96,0x03,0x97,0x03,0x98,0x03,0x99,0x03,0x9a,
0x03,0x9b,0x03,0x9c,0x03,0x9d,0x03,0x9e,0x03,0x9f,0x03,0xa0,0x03,0xa1,0x03,0xa3,
0x03,0xa4,0x03,0xa5,0x03,0xa6,0x03,0xa7,0x03,0xa8,0x03,0xa9,0x03,0xb1,0x03,0xb2,
0x03,0xb3,0x03,0xb4,0x03,0xb5,0x03,0xb6,0x03,0xb7,0x03,0xb8,0x03,0xb9,0x03,0xba,
0x03,0xbb,0x03,0xbc,0x03,0xbd,0x03,0xbe,0x03,0xbf,0x03,0xc0,0x03,0xc1,0x03,0xc3,
0x03,0xc4,0x03,0xc5,0x03,0xc6,0x03,0xc7,0x03,0xc8,0x03,0xc9,0x04,0x01,0x04,0x10,
0x04,0x11,0x04,0x12,0x04,0x13,0x04,0x14,0x04,0x15,0x04,0x16,0x04,0x17,0x04,0x18,
0x04,0x19,0x04,0x1a,0x04,0x1b,0x04,0x1c,0x04,0x1d,0x04,0x1e,0x04,0x1f,0x04,0x20,
0x04,0x21,0x04,0x22,0x04,0x23,0x04,0x24,0x04,0x25,0x04,0x26,0x04,0x27,0x04,0x28,
0x04,0x29,0x04,0x2a,0x04,0x2b,0x04,0x2c,0x04,0x2d,0x04,0x2e,0x04,0x2f,0x04,0x30,
0x04,0x31,0x04,0x32,0x04,0x33,0x04,0x34,0x04,0x35,0x04,0x36,0x04,0x37,0x04,0x38,
0x04,0x39,0x04,0x3a,0x04,0x3b,0x04,0x3c,0x04,0x3d,0x04,0x3e,0x04,0x3f,0x04,0x40,
0x04,0x41,0x04,0x42,0x04,0x43,0x04,0x44,0x04,0x45,0x04,0x46,0x04,0x47,0x04,0x48,
0x04,0x49,0x04,0x4a,0x04,0x4b,0x04,0x4c,0x04,0x4d,0x04,0x4e,0x04,0x4f,0x04,0x51,
0x20,0x10,0x20,0x13,0x20,0x14,0x20,0x15,0x20,0x16,0x20,0x18,0x20,0x19,0x20,0x1a,
0x20,0x1c,0x20,0x1d,0x20,0x1e,0x20,0x20,0x20,0x21,0x20,0x22,0x20,0x25,0x20,0x26,
0x20,0x30,0x20,0x32,0x20,0x33,0x20,0x35,0x20,0x39,0x20,0x3a,0x20,0x3b,0x20,0xac,
0x21,0x03,0x21,0x05,0x21,0x09,0x21,0x16,0x21,0x21,0x21,0x22,0x21,0x60,0x21,0x61,
0x21,0x62,0x21,0x63,0x21,0x64,0x21,0x65,0x21,0x66,0x21,0x67,0x21,0x68,0x21,0x69,
0x21,0x6a,0x21,0x6b,0x21,0x70,0x21,0x71,0x21,0x72,0x21,0x73,0x21,0x74,0x21,0x75,
0x21,0x76,0x21,0x77,0x21,0x78,0x21,0x79,0x21,0x90,0x21,0x91,0x21,0x92,0x21,0x93,
0x21,0x96,0x21,0x97,0x21,0x98,0x21,0x99,0x22,0x08,0x22,0x0f,0x22,0x11,0x22,0x15,
0x22,0x1a,0x22,0x1d,0x22,0x1e,0x22,0x1f,0x22,0x20,0x22,0x23,0x22,0x25,0x22,0x27,
0x22,0x28,0x22,0x29,0x22,0x2a,0x22,0x2b,0x22,0x2e,0x22,0x34,0x22,0x35,0x22,0x36,
0x22,0x37,0x22,0x3d,0x22,0x48,0x22,0x4c,0x22,0x52,0x22,0x60,0x22,0x61,0x22,0x64,
0x22,0x65,0x22,0x66,0x22,0x67,0x22,0x6e,0x22,0x6f,0x22,0x95,0x22,0x99,0x22,0xa5,
0x22,0xbf,0x23,0x12,0x24,0x60,0x24,0x61,0x24,0x62,0x24,0x63,0x24,0x64,0x24,0x65,
0x24,0x66,0x24,0x67,0x24,0x68,0x24,0x69,0x24,0x74,0x24,0x75,0x24,0x76,0x24,0x77,
0x24,0x78,0x24,0x79,0x24,0x7a,0x24,0x7b,0x24,0x7c,0x24,0x7d,0x24,0x7e,0x24,0x7f,
0x24,0x80,0x24,0x81,0x24,0x82,0x24,0x83,0x24,0x84,0x24,0x85,0x24,0x86,0x24,0x87,
0x24,0x88,0x24,0x89,0x24,0x8a,0x24,0x8b,0x24,0x8c,0x24,0x8d,0x24,0x8e,0x24,0x8f,
0x24,0x90,0x24,0x91,0x24,0x92,0x24,0x93,0x24,0x94,0x24,0x95,0x24,0x96,0x24,0x97,
0x24,0x98,0x24,0x99,0x24,0x9a,0x24,0x9b,0x25,0x00,0x25,0x01,0x25,0x02,0x25,0x03,
0x25,0x04,0x25,0x05,0x25,0x06,0x25,0x07,0x25,0x08,0x25,0x09,0x25,0x0a,0x25,0x0b,
0x25,0x0c,0x25,0x0d,0x25,0x0e,0x25,0x0f,0x25,0x10,0x25,0x11,0x25,0x12,0x25,0x13,
0x25,0x14,0x25,0x15,0x25,0x16,0x25,0x17,0x25,0x18,0x25,0x19,0x25,0x1a,0x25,0x1b,
0x25,0x1c,0x25,0x1d,0x25,0x1e,0x25,0x1f,0x25,0x20,0x25,0x21,0x25,0x22,0x25,0x23,
0x25,0x24,0x25,0x25,0x25,0x26,0x25,0x27,0x25,0x28,0x25,0x29,0x25,0x2a,0x25,0x2b,
0x25,0x2c,0x25,0x2d,0x25,0x2e,0x25,0x2f,0x25,0x30,0x25,0x31,0x25,0x32,0x25,0x33,
0x25,0x34,0x25,0x35,0x25,0x36,0x25,0x37,0x25,0x38,0x25,0x39,0x25,0x3a,0x25,0x3b,
0x25,0x3c,0x25,0x3d,0x25,0x3e,0x25,0x3f,0x25,0x40,0x25,0x41,0x25,0x42,0x25,0x43,

0x25,0x44,0x25,0x45,0x25,0x46,0x25,0x47,0x25,0x48,0x25,0x49,0x25,0x4a,0x25,0x4b,
0x25,0x50,0x25,0x51,0x25,0x52,0x25,0x53,0x25,0x54,0x25,0x55,0x25,0x56,0x25,0x57,
0x25,0x58,0x25,0x59,0x25,0x5a,0x25,0x5b,0x25,0x5c,0x25,0x5d,0x25,0x5e,0x25,0x5f,
0x25,0x60,0x25,0x61,0x25,0x62,0x25,0x63,0x25,0x64,0x25,0x65,0x25,0x66,0x25,0x67,
0x25,0x68,0x25,0x69,0x25,0x6a,0x25,0x6b,0x25,0x6c,0x25,0x6d,0x25,0x6e,0x25,0x6f,
0x25,0x70,0x25,0x71,0x25,0x72,0x25,0x73,0x25,0x81,0x25,0x82,0x25,0x83,0x25,0x84,
0x25,0x85,0x25,0x86,0x25,0x87,0x25,0x88,0x25,0x89,0x25,0x8a,0x25,0x8b,0x25,0x8c,
0x25,0x8d,0x25,0x8e,0x25,0x8f,0x25,0x93,0x25,0x94,0x25,0x95,0x25,0xa0,0x25,0xa1,
0x25,0xb2,0x25,0xb3,0x25,0xbc,0x25,0xbd,0x25,0xc6,0x25,0xc7,0x25,0xcb,0x25,0xce,
0x25,0xcf,0x25,0xe2,0x25,0xe3,0x25,0xe4,0x25,0xe5,0x26,0x05,0x26,0x06,0x26,0x09,
0x26,0x40,0x26,0x42,0x30,0x00,0x30,0x01,0x30,0x02,0x30,0x03,0x30,0x05,0x30,0x06,
0x30,0x07,0x30,0x08,0x30,0x09,0x30,0x0a,0x30,0x0b,0x30,0x0c,0x30,0x0d,0x30,0x0e,
0x30,0x0f,0x30,0x10,0x30,0x11,0x30,0x12,0x30,0x13,0x30,0x14,0x30,0x15,0x30,0x16,
0x30,0x17,0x30,0x1d,0x30,0x1e,0x30,0x21,0x30,0x22,0x30,0x23,0x30,0x24,0x30,0x25,
0x30,0x26,0x30,0x27,0x30,0x28,0x30,0x29,0x30,0x3e,0x30,0x41,0x30,0x42,0x30,0x43,
0x30,0x44,0x30,0x45,0x30,0x46,0x30,0x47,0x30,0x48,0x30,0x49,0x30,0x4a,0x30,0x4b,
0x30,0x4c,0x30,0x4d,0x30,0x4e,0x30,0x4f,0x30,0x50,0x30,0x51,0x30,0x52,0x30,0x53,
0x30,0x54,0x30,0x55,0x30,0x56,0x30,0x57,0x30,0x58,0x30,0x59,0x30,0x5a,0x30,0x5b,
0x30,0x5c,0x30,0x5d,0x30,0x5e,0x30,0x5f,0x30,0x60,0x30,0x61,0x30,0x62,0x30,0x63,
0x30,0x64,0x30,0x65,0x30,0x66,0x30,0x67,0x30,0x68,0x30,0x69,0x30,0x6a,0x30,0x6b,
0x30,0x6c,0x30,0x6d,0x30,0x6e,0x30,0x6f,0x30,0x70,0x30,0x71,0x30,0x72,0x30,0x73,
0x30,0x74,0x30,0x75,0x30,0x76,0x30,0x77,0x30,0x78,0x30,0x79,0x30,0x7a,0x30,0x7b,
0x30,0x7c,0x30,0x7d,0x30,0x7e,0x30,0x7f,0x30,0x80,0x30,0x81,0x30,0x82,0x30,0x83,
0x30,0x84,0x30,0x85,0x30,0x86,0x30,0x87,0x30,0x88,0x30,0x89,0x30,0x8a,0x30,0x8b,
0x30,0x8c,0x30,0x8d,0x30,0x8e,0x30,0x8f,0x30,0x90,0x30,0x91,0x30,0x92,0x30,0x93,
0x30,0x9b,0x30,0x9c,0x30,0x9d,0x30,0x9e,0x30,0xa1,0x30,0xa2,0x30,0xa3,0x30,0xa4,
0x30,0xa5,0x30,0xa6,0x30,0xa7,0x30,0xa8,0x30,0xa9,0x30,0xaa,0x30,0xab,0x30,0xac,
0x30,0xad,0x30,0xae,0x30,0xaf,0x30,0xb0,0x30,0xb1,0x30,0xb2,0x30,0xb3,0x30,0xb4,
0x30,0xb5,0x30,0xb6,0x30,0xb7,0x30,0xb8,0x30,0xb9,0x30,0xba,0x30,0xbb,0x30,0xbc,
0x30,0xbd,0x30,0xbe,0x30,0xbf,0x30,0xc0,0x30,0xc1,0x30,0xc2,0x30,0xc3,0x30,0xc4,
0x30,0xc5,0x30,0xc6,0x30,0xc7,0x30,0xc8,0x30,0xc9,0x30,0xca,0x30,0xcb,0x30,0xcc,
0x30,0xcd,0x30,0xce,0x30,0xcf,0x30,0xd0,0x30,0xd1,0x30,0xd2,0x30,0xd3,0x30,0xd4,
0x30,0xd5,0x30,0xd6,0x30,0xd7,0x30,0xd8,0x30,0xd9,0x30,0xda,0x30,0xdb,0x30,0xdc,
0x30,0xdd,0x30,0xde,0x30,0xdf,0x30,0xe0,0x30,0xe1,0x30,0xe2,0x30,0xe3,0x30,0xe4,
0x30,0xe5,0x30,0xe6,0x30,0xe7,0x30,0xe8,0x30,0xe9,0x30,0xea,0x30,0xeb,0x30,0xec,
0x30,0xed,0x30,0xee,0x30,0xef,0x30,0xf0,0x30,0xf1,0x30,0xf2,0x30,0xf3,0x30,0xf4,
0x30,0xf5,0x30,0xf6,0x30,0xfc,0x30,0xfd,0x30,0xfe,0x31,0x05,0x31,0x06,0x31,0x07,
0x31,0x08,0x31,0x09,0x31,0x0a,0x31,0x0b,0x31,0x0c,0x31,0x0d,0x31,0x0e,0x31,0x0f,
0x31,0x10,0x31,0x11,0x31,0x12,0x31,0x13,0x31,0x14,0x31,0x15,0x31,0x16,0x31,0x17,
0x31,0x18,0x31,0x19,0x31,0x1a,0x31,0x1b,0x31,0x1c,0x31,0x1d,0x31,0x1e,0x31,0x1f,
0x31,0x20,0x31,0x21,0x31,0x22,0x31,0x23,0x31,0x24,0x31,0x25,0x31,0x26,0x31,0x27,
0x31,0x28,0x31,0x29,0x32,0x20,0x32,0x21,0x32,0x22,0x32,0x23,0x32,0x24,0x32,0x25,
0x32,0x26,0x32,0x27,0x32,0x28,0x32,0x29,0x32,0x31,0x32,0xa3,0x33,0x8e,0x33,0x8f,
0x33,0x9c,0x33,0x9d,0x33,0x9e,0x33,0xa1,0x33,0xc4,0x33,0xce,0x33,0xd1,0x33,0xd2,
0x33,0xd5,0xe7,0x6c,0xe7,0x8d,0xe7,0x8e,0xe7,0x8f,0xe7,0x90,0xe7,0x91,0xe7,0x92,
0xe7,0x93,0xe7,0x94,0xe7,0x95,0xe7,0x96,0xe7,0xc7,0xe7,0xc8,0xe7,0xe7,0xe7,0xe8,

0xe7,0xe9,0xe7,0xea,0xe7,0xeb,0xe7,0xec,0xe7,0xed,0xe7,0xee,0xe7,0xef,0xe7,0xf0,
0xe7,0xf1,0xe7,0xf2,0xe7,0xf3,0xe8,0x15,0xe8,0x16,0xe8,0x17,0xe8,0x18,0xe8,0x19,
0xe8,0x1a,0xe8,0x1b,0xe8,0x1c,0xe8,0x1d,0xe8,0x1e,0xe8,0x1f,0xe8,0x20,0xe8,0x21,
0xe8,0x22,0xe8,0x23,0xe8,0x24,0xe8,0x25,0xe8,0x26,0xe8,0x27,0xe8,0x28,0xe8,0x29,
0xe8,0x2a,0xe8,0x2b,0xe8,0x2c,0xe8,0x2d,0xe8,0x2e,0xe8,0x2f,0xe8,0x30,0xe8,0x31,
0xe8,0x32,0xe8,0x33,0xe8,0x34,0xe8,0x35,0xe8,0x36,0xe8,0x37,0xe8,0x38,0xe8,0x39,
0xe8,0x3a,0xe8,0x3b,0xe8,0x3c,0xe8,0x3d,0xe8,0x3e,0xe8,0x3f,0xe8,0x40,0xe8,0x41,
0xe8,0x42,0xe8,0x43,0xe8,0x44,0xe8,0x45,0xe8,0x46,0xe8,0x47,0xe8,0x48,0xe8,0x49,
0xe8,0x4a,0xe8,0x4b,0xe8,0x4c,0xe8,0x4d,0xe8,0x4e,0xe8,0x4f,0xe8,0x50,0xe8,0x51,
0xe8,0x52,0xe8,0x53,0xe8,0x54,0xe8,0x55,0xe8,0x56,0xe8,0x57,0xe8,0x58,0xe8,0x59,
0xe8,0x5a,0xe8,0x5b,0xe8,0x5c,0xe8,0x5d,0xe8,0x5e,0xe8,0x5f,0xe8,0x60,0xe8,0x61,
0xe8,0x62,0xe8,0x63,0xe8,0x64,0xf9,0x2c,0xf9,0x79,0xf9,0x95,0xf9,0xe7,0xf9,0xf1,
0xfa,0x0c,0xfa,0x0d,0xfa,0x0e,0xfa,0x0f,0xfa,0x11,0xfa,0x13,0xfa,0x14,0xfa,0x18,
0xfa,0x1f,0xfa,0x20,0xfa,0x21,0xfa,0x23,0xfa,0x24,0xfa,0x27,0xfa,0x28,0xfa,0x29,
0xfe,0x30,0xfe,0x31,0xfe,0x33,0xfe,0x34,0xfe,0x35,0xfe,0x36,0xfe,0x37,0xfe,0x38,
0xfe,0x39,0xfe,0x3a,0xfe,0x3b,0xfe,0x3c,0xfe,0x3d,0xfe,0x3e,0xfe,0x3f,0xfe,0x40,
0xfe,0x41,0xfe,0x42,0xfe,0x43,0xfe,0x44,0xfe,0x49,0xfe,0x4a,0xfe,0x4b,0xfe,0x4c,
0xfe,0x4d,0xfe,0x4e,0xfe,0x4f,0xfe,0x50,0xfe,0x51,0xfe,0x52,0xfe,0x54,0xfe,0x55,
0xfe,0x56,0xfe,0x57,0xfe,0x59,0xfe,0x5a,0xfe,0x5b,0xfe,0x5c,0xfe,0x5d,0xfe,0x5e,
0xfe,0x5f,0xfe,0x60,0xfe,0x61,0xfe,0x62,0xfe,0x63,0xfe,0x64,0xfe,0x65,0xfe,0x66,
0xfe,0x68,0xfe,0x69,0xfe,0x6a,0xfe,0x6b,0xff,0x01,0xff,0x02,0xff,0x03,0xff,0x04,
0xff,0x05,0xff,0x06,0xff,0x07,0xff,0x08,0xff,0x09,0xff,0x0a,0xff,0x0b,0xff,0x0c,
0xff,0x0d,0xff,0x0e,0xff,0x0f,0xff,0x10,0xff,0x11,0xff,0x12,0xff,0x13,0xff,0x14,
0xff,0x15,0xff,0x16,0xff,0x17,0xff,0x18,0xff,0x19,0xff,0x1a,0xff,0x1b,0xff,0x1c,
0xff,0x1d,0xff,0x1e,0xff,0x1f,0xff,0x20,0xff,0x21,0xff,0x22,0xff,0x23,0xff,0x24,
0xff,0x25,0xff,0x26,0xff,0x27,0xff,0x28,0xff,0x29,0xff,0x2a,0xff,0x2b,0xff,0x2c,
0xff,0x2d,0xff,0x2e,0xff,0x2f,0xff,0x30,0xff,0x31,0xff,0x32,0xff,0x33,0xff,0x34,
0xff,0x35,0xff,0x36,0xff,0x37,0xff,0x38,0xff,0x39,0xff,0x3a,0xff,0x3b,0xff,0x3c,
0xff,0x3d,0xff,0x3e,0xff,0x3f,0xff,0x40,0xff,0x41,0xff,0x42,0xff,0x43,0xff,0x44,
0xff,0x45,0xff,0x46,0xff,0x47,0xff,0x48,0xff,0x49,0xff,0x4a,0xff,0x4b,0xff,0x4c,
0xff,0x4d,0xff,0x4e,0xff,0x4f,0xff,0x50,0xff,0x51,0xff,0x52,0xff,0x53,0xff,0x54,
0xff,0x55,0xff,0x56,0xff,0x57,0xff,0x58,0xff,0x59,0xff,0x5a,0xff,0x5b,0xff,0x5c,
0xff,0x5d,0xff,0x5e,0xff,0xe0,0xff,0xe1,0xff,0xe2,0xff,0xe3,0xff,0xe4,0xff,0xe5 };

7.5 Language Checklist (150 countries)

No.	country	Area	language	Language serial
1	Malaysia	Asia	Malay	Latin
2	Brunei	Asia	Malay, English	Latin
3	Indonesia	Asia	Indonesian	Latin
4	Philippines	Asia	English	Latin
5	Sikkim	Asia	English	Latin
6	UK	Europe	English	Latin
7	Ireland	Europe	English	Latin
8	USA	North America	English	Latin
9	Canada	North America	English, French	Latin
10	Australia	Oceania	English	Latin
11	New Zealand	Oceania	English	Latin
12	Germany	Europe	German	Latin
13	Switzerland	Europe	German, French	Latin
14	Austria	Europe	German	Latin
15	Luxemburg	Europe	German, French	Latin
16	Liechtenstein	Europe	German	Latin
17	Italy	Europe	Italian	Latin
18	Vatican	Europe	Italian	Latin
19	San Marino	Europe	Italian	Latin
20	Denmark	Europe	Denish	Latin
21	Iceland	Europe	Icelandic	Latin
22	Norway	Europe	Norwegian	Latin
23	Sweden	Europe	Swedish	Latin
24	Finland	Europe	Finnish, Swedish	Latin
25	Netherlands	Europe	Dutch	Latin
26	Suriname	South America	Dutch	Latin
27	The Faroe Islands	Europe	Faeroese	Latin
28	Portugal	Europe	Portuguese	Latin
29	Brazil	South America	Portuguese	Latin
30	Cape Vrde	Africa	Portuguese	Latin
31	Guinea Bissau	Africa	Portuguese	Latin
32	Sao Tome&Principe	Africa	Portuguese	Latin
33	Angora	Africa	Portuguese	Latin
34	Mozambique	Africa	Portuguese	Latin
35	France	Europe	French	Latin
36	Belgium	Europe	French, Dutch	Latin
37	Monaco	Europe	French, Italian	Latin
38	Haiti	North America	French	Latin
39	Senegal	Africa	French	Latin
40	Mali	Africa	French	Latin
41	Burkina Faso	Africa	French	Latin
42	Guinea	Africa	French	Latin
43	Cote d´Ivoir	Africa	French	Latin

No.	country	Area	language	Language serial
44	Togo	Africa	French	Latin
45	Benin	Africa	French	Latin
46	Niger	Africa	French	Latin
47	Cameroon	Africa	French	Latin
48	Chad	Africa	French	Latin
49	Central Africa Rep.	Africa	French	Latin
50	Djibouti	Africa	French	Latin
51	Burundi	Africa	French	Latin
52	Congo,DR	Africa	French	Latin
53	Congo	Africa	French	Latin
54	Gabon	Africa	French	Latin
55	Comoros	Africa	French	Latin
56	Madagascar	Africa	French	Latin
57	Spain	Europe	Spanish, Catalan	Latin
58	Mexico	North America	Spanish	Latin
59	Guatemala	North America	Spanish	Latin
60	Costa Rica	North America	Spanish	Latin
61	Panama	North America	Spanish	Latin
62	Dominican Rep.	North America	Spanish	Latin
63	El Salvador	North America	Spanish	Latin
64	Honduras	North America	Spanish	Latin
65	Nicaragua	North America	Spanish	Latin
66	Puerto Rica	North America	Spanish	Latin
67	Cuba	North America	Spanish	Latin
68	Venezuela	South America	Spanish	Latin
69	Colombia	South America	Spanish	Latin
70	Peru	South America	Spanish	Latin
71	Argentina	South America	Spanish	Latin
72	Ecuador	South America	Spanish	Latin
73	Chile	South America	Spanish	Latin
74	Uruguay	South America	Spanish	Latin
75	Paraguay	South America	Spanish	Latin
76	Bolivia	South America	Spanish	Latin
77	Eq.Guinea	Africa	Spanish	Latin
78	Ceuta&Melilla	Africa	Spanish	Latin
79	Jamaica	North America	English	Latin
80	Belize	North America	English	Latin
81	Trinidad&Tobago	North America	English	Latin
82	Bahamas	North America	English	Latin
83	Antigua&Barbuda	North America	English	Latin
84	Dominica	North America	English	Latin
85	Saint Vincent&Grenadines	North America	English	Latin
86	Grenada	North America	English	Latin
87	Cayman Is.	North America	English	Latin

No.	country	Area	language	Language serial
88	St. Kitts-Nevis	North America	English	Latin
89	Tonga	Oceania	English	Latin
90	Fiji	Oceania	English	Latin
91	Solomon Is.	Oceania	English	Latin
92	Vanuatu	Oceania	English	Latin
93	Kiribati	Oceania	English	Latin
94	Nauru	Oceania	English	Latin
95	Marshall Is Rep	Oceania	English	Latin
96	Zimbabwe	Africa	English	Latin
97	Gambia	Africa	English	Latin
98	Sierra Leone	Africa	English	Latin
99	Liberia	Africa	English	Latin
100	Ghana	Africa	English	Latin
101	Nigeria	Africa	English	Latin
102	Uganda	Africa	English	Latin
103	Zambia	Africa	English	Latin
104	Malawi	Africa	English	Latin
105	Seychelles	Africa	English	Latin
106	Mauritius	Africa	English	Latin
107	Botswana	Africa	English	Latin
108	Namibia	Africa	English	Latin
109	Lesotho	Africa	English	Latin
110	South Africa	Africa	Dutch, English	Latin
111	Kenya	Africa	Swahili	Latin
112	Tanzania	Africa	Swahili	Latin
113	Egypt	Africa	Arabian	Arabian
114	Tunisia	Africa	Arabian	Arabian
115	Libyan Arab Jm	Africa	Arabian	Arabian
116	Morocco	Africa	Arabian	Arabian
117	Algeria	Africa	Arabian	Arabian
118	Sudan	Africa	Arabian	Arabian
119	Somalia	Africa	Arabian	Arabian
120	Djibouti	Africa	Arabian	Arabian
121	Mauritania	Africa	Arabian	Arabian
122	Syrian	Asia	Arabian	Arabian
123	United Arab Emirates	Asia	Arabian	Arabian
124	Lebanon	Asia	Arabian	Arabian
125	Yemen Rep.	Asia	Arabian	Arabian
126	Kuwait	Asia	Arabian	Arabian
127	Qatar	Asia	Arabian	Arabian
128	Palestine	Asia	Arabian	Arabian
129	Bahrian	Asia	Arabian	Arabian
130	Oman	Asia	Arabian	Arabian
131	Jordan	Asia	Arabian	Arabian

No.	country	Area	language	Language serial
132	Iraq	Asia	Arabian	Cyrillic
133	Saudi Arabia	Asia	Arabian	Cyrillic
134	Russia	Europe	Russian	Cyrillic
135	Byelorussia	Europe	Russian	Cyrillic
136	Ukraine	Europe	Ukrainian	Cyrillic
137	Bulgari	Europe	Bulgarian	Cyrillic
138	Macedonia Rep.	Europe	Macedonian	Cyrillic
139	Yugoslavia FR	Europe	Serbian	Cyrillic
140	Crotia Rep	Europe	Serbian	Cyrillic
141	Bosnia&Herzegovina	Europe	Serbian	Cyrillic
142	Azerbaijan	Asia	Azeri	Cyrillic
143	Kyrgyz Rep.	Asia	Kirghiz	Cyrillic
144	Tadzhikistan	Asia	Tadzhikistani	Cyrillic
145	Turkmenistan	Asia	Turkoman	Cyrillic
146	Uzbekstan	Asia	Uzbekstani	Cyrillic
147	Kazakhstan	Asia	Kazak	Cyrillic
148	Mongolia	Asia	Mongol	Cyrillic
149	Greek	Europe	Greek	Greek
150	Cyprus	Asia	Greek	Greek

In the 150 countries,112 countries are in Latin language family, 21 countries are in Arabian language family, 15 countries are in Cyrillic language family, 2 countries are in Greek language family. In countries that use Latin, 39 countries use English, 22 countries use French, 22 countries use Spanish, 7 countries use Portuguese, 5 countries use German, 3 countries use Italian, 2 countries use Malay, 2 countries use Swahili, 10 countries use other Latin language,