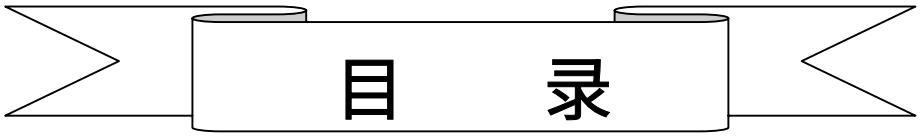
液晶显示模块

EDM12864-T

大连东福彩色液晶显示器有限公司



目　　录

1. 使用范围

该检验标准适用于大连东福公司设计提供的标准液晶显示模块。如果在使用中出现了异常问题或没有列明的项目，建议同最近的供应商或本公司联系。

2. 质量保证

如在此手册列明的正常条件下使用、储存该产品，公司将提供 12 个月的质量保证。

3. 性能特点

3-1．性能：

显示方式: 半透、正显，STN LCD,
显示颜色 : 显示点: 深蓝色；背景: 黄绿色
显示形式 : 128(w)×64(h) 全点阵
输入数据 : 来自 MPU 的 8 位并行数据接口
驱动路数 : 1/64 Duty
视 角 : 6 点
背 光 : LED，黄绿色
RAM 显示容量: 65×132 bits
具有内部温度补偿

3-2．机械性能：

项 目	规 格	单位
外形尺寸	100.0(W)×58.5(H) ×13.0 Max.(T)	mm
显示点阵数	128(W) ×64(H) Dots	—
字符结构	—	—
视 域	54.0(W)×31.0(H)	mm
显示图形域	47.33(W)×26.21(H)	mm
点间距	0.37(W)×0.41(H)	mm
点尺寸	0.34(W)×0.38(H)	mm
重量	Approx. 80	g

3-3． 极限参数：

项 目		符 号	最小值	最大值	单位	注 释
电源电压	逻辑	Vdd	-0.3	4.0	V	
	LCD 驱动	Vee	-12.0	0	V	内部
输入电压		Vi	Vss-0.3	Vdd+0.3	V	
操作温度		Top	-10	50	℃	
储存温度		Tstg	-20	60	℃	
湿度		—	10	95	%RH	

3-4． 电气特性：

3-4-1. 电气参数

项 目		符 号	条 件	最小值	典型值	最大值	单 位
电源电压	逻辑	Vdd		2.4	3.0	3.5	V
	LCD 驱动	V0		—	9.6	—	
输入电压	高电平	Vih		0.8Vdd	—	Vdd	
	低电平	Vil		0	—	0.2Vdd	

频　　率		Fflm	Vdd=3.0V	—	65	—	Hz
功　耗	逻辑	Idd	Vdd=3.0V，LED is On VLED=2.0V	—	40	—	mA
			Vdd=3.0V，LED is Off	—	0.3	0.6	
			Vdd=3.0V，LED is Off 无逻辑存取	—	150	250	uA
			VDD=3.0V,STANDBY	—	3.5	10	
			VDD=3.0V,POWER SAVE	—	0.2	5	
LCD 驱动电压 (推荐电压)		V0	Ta= -20℃ ϕ=0°，θ=0°	—	—	—	V
			Ta= 25℃ ϕ=0°，θ=0°	—	9.6	—	
			Ta= 60℃ ϕ=0°，θ=0°	—	—	—	

Note:　<1> 驱动路数=1/64　　<2> 所有点在静态条件下

3-4-2. LED 背光规格

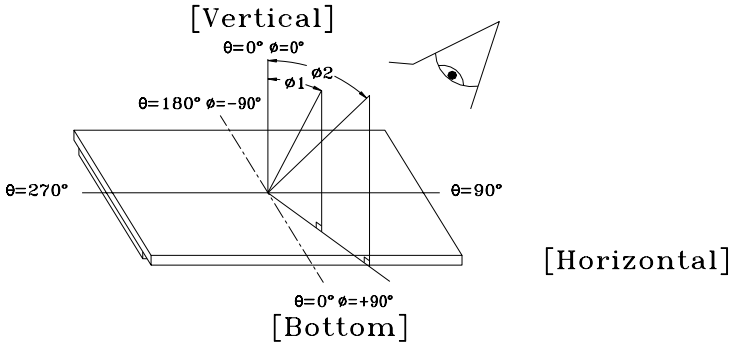
项目	单位	标　准　值			条　　件
		最小值	典型值	最大值	
电源电压	V	—	2.0	—	—
频　　率	Hz	—	—	—	—
亮　　度	cd/m^2(nit)	45	—	—	—
电　　流	mA	—	—	—	—
寿　　命	Hrs	—			Note <1>
发光颜色	—	Yellow-green			—
操作温度	℃	-30 ~ 70			—
储存温度	℃	-40 ~ 80			—

Note<1>: Half value of initial brightness at 20℃ 60%RH

3-5.　电光特性

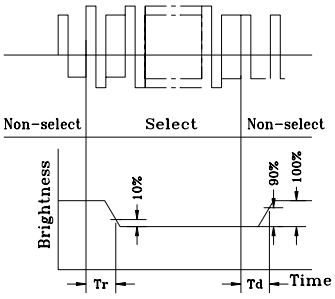
项　目		符号	温度	条件	最小值	典型值	最大值	单位	注释
LCD 驱动电压 (推荐电压)		Vop	-10℃	ϕ=0°，θ=0°	—	—	—	V	1,2,5
			25℃		—	9.6	—		
			50℃		—	—	—		
响应时间	上升时间	tr	-10℃	ϕ=0°，θ=0°	—	1500	2000	mS	1,3,5
			25℃		—	150	200		
	衰退时间	td	-10℃		—	3000	3500		
			25℃		—	200	250		
视　角		Δϕ	25℃	垂直	-35	—	35	deg.	1,4,5
				水平	-30	—	30		
对比度		K	25℃	ϕ=0°，θ=0°	2.0	5.0	—	—	1,5,6

注：<1> ϕ和θ的定义　　<2> 在此电压范围内能获得对比度大于 2(k≥2)

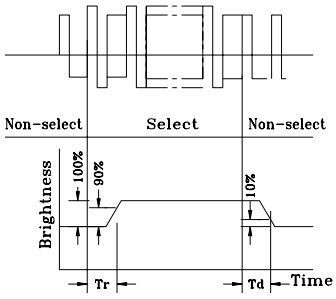


注：<3> 响应时间波形定义

正显

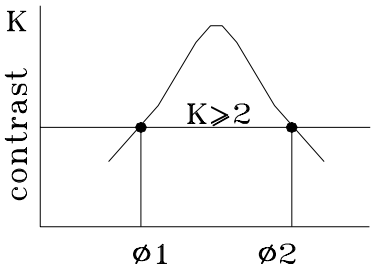


负显



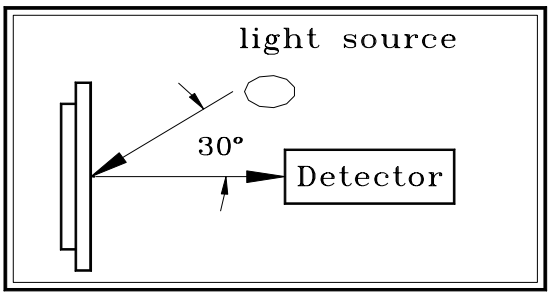
注：<4>视角定义

(ΔΦ) ΔΦ=|Φ1-Φ2|



Viewing angle

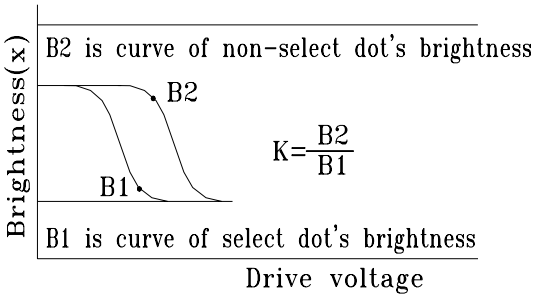
注：<5> 光学测量系统温度控制室



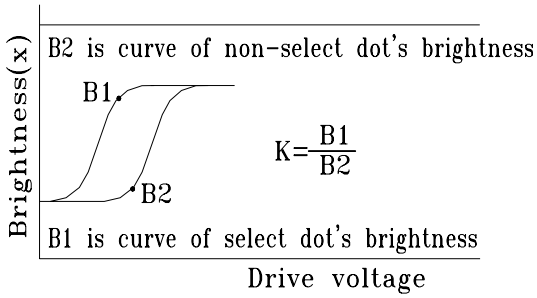
Measuring equipment: DMS
(Made in AUTRONIC)

注意：<6> 对比度定义(K)

正显



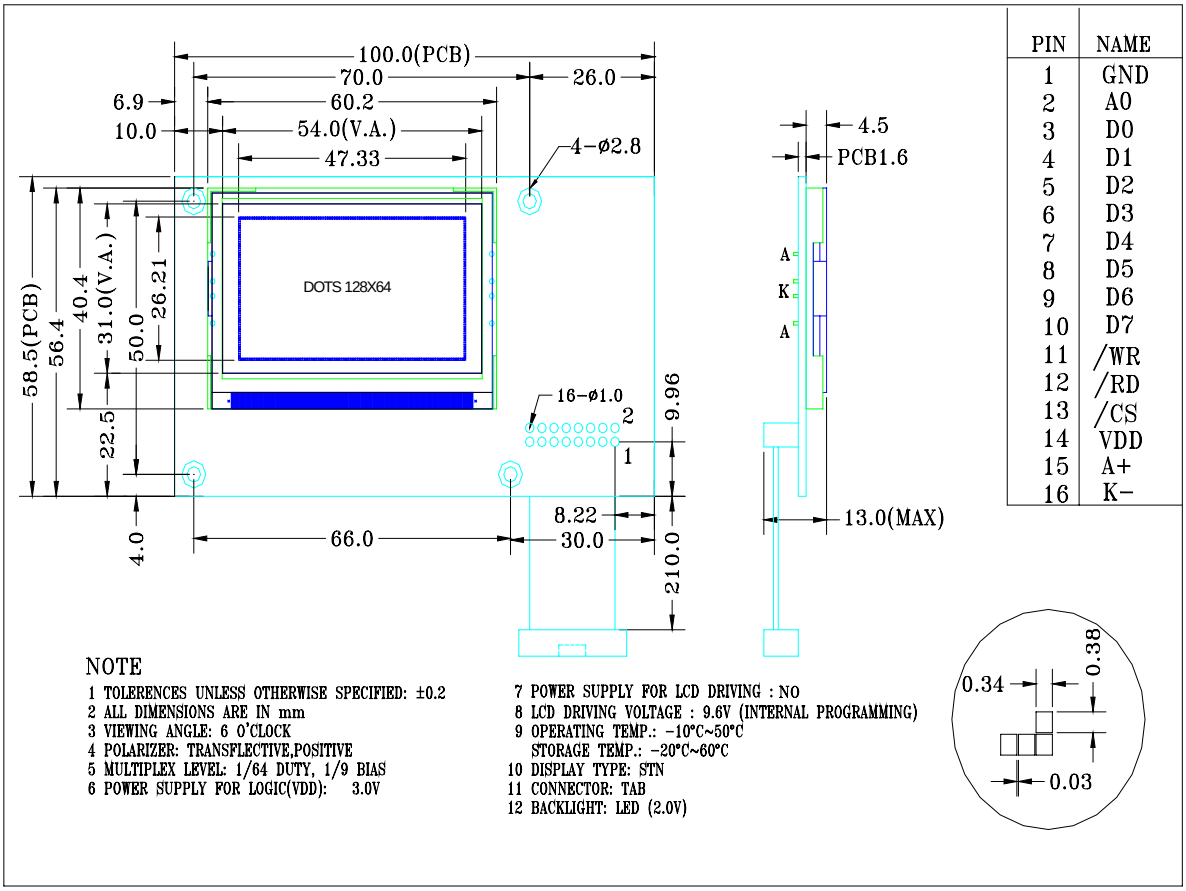
负显



正显对比度(K)= $\frac{\text{非选择点的亮度(B2)}}{\text{选择点的亮度(B1)}}$

负显对比度(K)= $\frac{\text{非选择点的亮度(B1)}}{\text{选择点的亮度(B2)}}$

4. 外形图

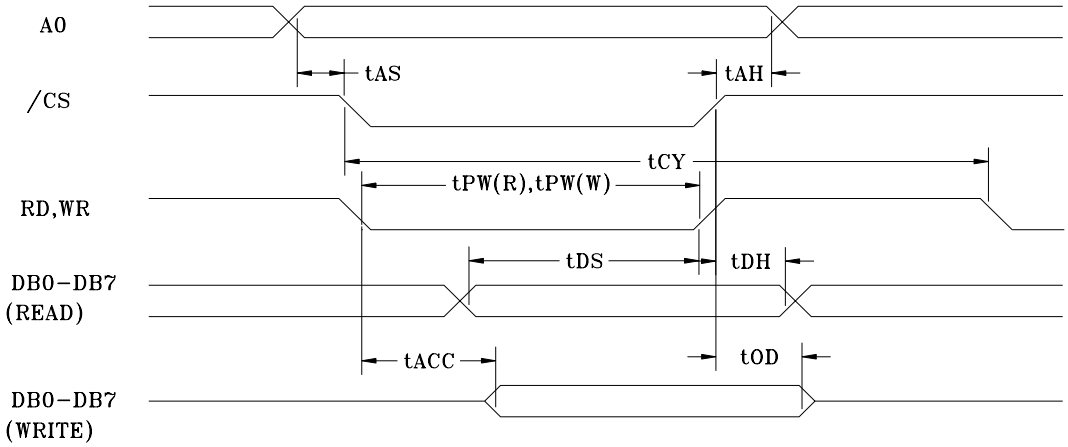


5. I/O 接口特性

5-1. I/O 接口：

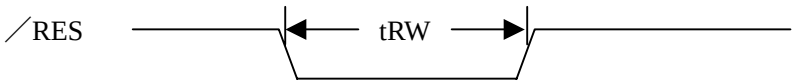
- A0：选择数据或指令。A0=“ H ”，D0－D7 的数据是显示数据
  A0=“ L ”，D0－D7 的数据是控制指令
- /RD：“ L ”时读，接 MPU 的/RD
- /WR：“ L ”时写，接 MPU 的/WR
- /CS：片选，低有效
- GND：电源地
- VDD：电源正
- D0－D7：数据线
- A：LED 电源正极 2V
- K：LED 电源负极

5-2．时序及时序图：



AC 特性：

Item	MIN	TYP	MAX	UNIT
TAS	0	-	-	ns
TAH	0	-	-	ns
TCY	300	-	-	ns
TPW(W)	60	-	-	ns
TPW(R)	120	-	-	ns
TDS	40	-	-	ns
TDH	15	-	-	ns
TACC	-	-	140	ns
TOD	-	-	70	ns

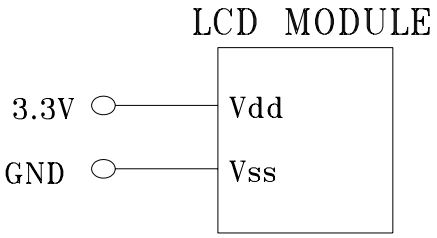


Item	MIN	TYP	MAX	UNIT
TRW	1000	-	-	ns

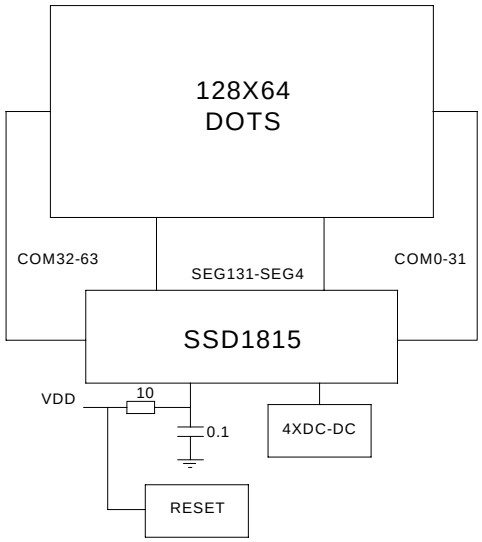
DC 特性：VSS=0V,VDD=2.4-5.5V

ITEM	SYM	MIN	TYP	MAX	UNIT
Input Voltage High	VIH	0.8VDD	-	VDD	V
Input Voltage Low	VIL	VSS	-	0.2VDD	V
Output Voltage High	VOH	0.9VDD	-	VDD	V
Output Voltage Low	VOL	VSS	-	0.1VDD	V

5-3. 电源连接图



5-4. 电路图解



5-5．软硬件注解

1．LCD 偏压设置

LCD 偏压应设为 1／9。由“ LCD BIAS SET ”指令设置：

D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	0	0	0	1	0 1

D0=0，1/9 偏压；D0=1，1/7 偏压

2．ADC 选择

D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	0	0	0	0	0 1

通常 ADC 位设为“ 1 ”，即 DDRAM 与显示列反向对应。

3．COM 扫描方向选择

D7	D6	D5	D4	D3	D2	D1	D0
1	1	0	0	0 1	*	*	*

设 D3=“ 1 ”，反向;　　设 D3=“ 0 ”，正向。通常为正向。

4．页地址 X 排列
对应显示屏从上至下，页地址 X 依次为：
X=0，1，2，3，4，5，6，7
用“ PAGE ADDRESS SET ”指令修改。

5．列地址 Y 排列
ADC=1 时，对应显示屏第 1 列到第 128 列，Y 地址依次为：
从 04H 到 83H
用“ COLUMN ADDRESS SET ”指令修改。

6．LCD 电压设定
按下面顺序指定 LCD 驱动电压：

- POWER CONTROL 指令中设 VC=1（使用内部电压转换器），VR=1（使用内部电压调节器），VF=1（使用内部电压跟随器）；
- REGULATOR RESISTOR SELECT 指令中 R2、R1、R0 分别设为“ 0，1，0 ”（粗调 LCD 电压）；
- SET REFERENCE VOLTAGE MODE 指令；
- SET REFERENCE VOLTAGE REGISTER 指令设为“ 05H ”，将 LCD 电压设为大约 9.6V（本指令取值 00H~3FH，可以微调 LCD 电压）

指令表

Instruction	A0	RW	D7	D6	D5	D4	D3	D2	D1	D0	Function
Read Display Data	1	1	Read data								Read data from DDRAM
Write Display Data	1	0	Write data								Write data from DDRAM
Read Status	0	1	BUSY	ADC	ON/OFF	RESETB	0	0	1	0	Read the internal status
Display ON/OFF	0	0	1	0	1	0	1	1	1	DON	Turn ON/OFF LCD panel When DON=0,display is OFF（POR） When DON=1,display is ON
Initial Display line	0	0	0	1	ST5	ST4	ST3	ST2	ST1	ST0	Specify DDRAM line for COM1 It is 01000000 after POR
Set Reference Voltage Mode	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode
Set Reference Voltage Register	0	0	X	X	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set Page Address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set Column Address MSB	0	0	0	0	0	1	Y7	Y6	Y5	Y4	Set column address MSB Y7Y6Y5Y4=0000 after POR
Set Column Address LSB	0	0	0	0	0	0	Y3	Y2	Y1	Y0	Set column address LSB Y3Y2Y1Y0=0000 after POR
ADC Select	0	0	1	0	1	0	0	0	0	ADC	Select SEG output direction ADC=0 normal (SEG1-SEG132)(POR) ADC=1 reverse (SEG132-SEG1)
Reverse Display ON/OFF	0	0	1	0	1	0	0	1	1	REV	Select normal/reverse display When REV=0 normal (POR) When REV=1 reverse
Entire Display ON/OFF	0	0	1	0	1	0	0	1	0	EON	Select normal display/entire display on When EON=0,normal display (POR) When EON=1,entire display ON
LCD Bias Select	0	0	1	0	1	0	0	0	1	BIAS	Select LCD bias BIAS=0,1/9BIAS(POR) BIAS=1,1/7BIAS
Set Modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode Read-Modify-Write mode is turn off after POR

Reset Modify-read	0	0	1	1	1	0	1	1	1	0	Release modify-read mode
Reset	0	0	1	1	1	0	0	0	1	0	Initialize internal functions
SHL Select	0	0	1	1	0	0	SHL	X	X	X	Select Com output direction When SHL=0 normal (COM1-COM64) When SHL=1 reverse (COM64-COM1)
Power Control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation After reset,VC=0,VR=0,VF=0
Regulator Resistor Select	0	0	0	0	1	0	0	R2	R1	R0	Select resistance ratio of the regulator resistor After POR,R2R1R0=100b
Set Static Indicator Mode	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode
Set Static Indicator Register			X	X	X	X	X	X	S1	S0	Set static register
Power Save	-	-	-	-	-	-	-	-	-	-	Compound instruction of display OFF and entire display ON
Test Instruction	0	0	1	1	1	1	X	X	X	X	Don't use this instrution
Test Mode Reset	0	0	1	1	1	1	0	0	0	0	Don't use this instrution
NOP	0	0	1	1	1	0	0	0	1	1	Command result in No operation

扩展指令表

Instruction	Bit Pattern	Function
Set Multiplex Ratio	10101000 00$X_5X_4X_3X_2X_1X_0$	Set Multiplex Ratio N from 2 to 65 (POR) N= $X_5X_4X_3X_2X_1X_{0+2}$
Set Bias Ratio(X_1X_0) Set TC Value($X_4X_3X_2$) Modify Osc Freq($X_7X_6X_5$)	10101000 $X_7X_6X_5X_4X_3X_2X_1X_0$	X1X0=00 01 10 11 1/8 or 1/6 1/6 or 1/5 1/9 or 1/7(POR) Prohibited X4X3X2=000:-0.01%(POR), X4X3X2=010:-0.10%, X4X3X2=100:-0.18%, X4X3X2=111:-0.25% Increase X7X6X5 will increase oscilliator frequency and vice versa.This command is not recommended to br used. X7X6X5=011(POR)
Set 1/4 Bias	1010101X_0	X0=0,normal (POR) X0=1,fixed at 1/4 Bias
Set Total Frame Phase	11010100 00 $X_5X_4$0000	X5X4=00,3 phases X5X4=01,5 phases X5X4=10,7 phases (POR) X5X4=11,16 phases Static Icon signal phases for each frame
Set Display Offset	11010011 00$X_5X_4X_3X_2X_1X_0$	After POR,$X_5X_4X_3X_2X_1X_0$=0 After setting mux ratio less than default value,data will be display at Center of matrix. To move display towards ROW0 by L, $X_5X_4X_3X_2X_1X_0$=L To move display away from ROW0 by L, $X_5X_4X_3X_2X_1X_0$=64-L

- Read Display Data

通过此指令读取由列地址（Column address）和页地址（Page address）指定的显示数据 RAM 中的 8 位数据，之后列地址自动加一。设置列地址后需要虚读一次。

- Write Display Data

通过此指令将 8 位数据写到由列地址（Column address）和页地址（Page address）指定的显示数据 RAM 中的，之后列地址自动加一。

- Read Status

读取内部状态。

标志	含义
BUSY	表示正在进行内部操作或复位，BUSY 为高时不接受任何指令。0：有效 1：正忙
ADC	指示 RAM 中的列地址与驱动列的对应方向，0：反向 1：正向
ON/OFF	指示显示开关状态，0：显示开 1：显示关
RESETB	指示正在进行初始化，0：有效 1：正在初始化

- Display ON/OFF

DON=1：打开显示
DON=0：关闭显示

- Intial Display Line

设置显示起始行对应的显示 RAM 行地址，位 ST5-ST0 的可取值 0~63。

- 参考电压选择

由两个字节组成，第一个字节“ Set Reference Voltage Select mode”,设置参考电压方式；第二个字节“ Set Reference Voltage register”，更新参考电压值，位 SV5-SV0 可取值 0~63，取值越大 LCD 电压越高。在第二个字节指令后，设置参考电压方式被释放。

- Set Page Address

设置显示 RAM 的页地址，它与列地址一起构成了访问显示 RAM 的地址。位 P3-P0 可取值 0~8。

- Set Column Address

设置显示 RAM 的列地址，它与页地址一起构成了访问显示 RAM 的地址。由高低两个字节组成（高字节 MSB 和低字节 LSB），位 Y7-Y0 组成列地址可取值 0~131。

- ADC Select

设置 RAM 中的列地址与驱动列的对应方向，0：正向 1：反向

- Reverse Display

REV=1, 使 LCD 反显而 RAM 内容不变，即显示 RAM 数据位为 1 对应的点不亮，为 0 对应的点点亮。

- Entire Display ON/OFF

EON=1,使 LCD 上所有的点点亮，而 RAM 内容不变。此指令优先于 Reverse Display 指令。

- LCD Bias Select

设置 LCD 驱动需要的偏压比。BIAS=0，1/7 偏压；BIAS=1，1/9 偏压。

- Set Modify-read

此指令使读显示数据后列地址不自动加一。

- Reset Modify-read

取消 Set Modify-read 指令的作用。

- Reset

初始化显示起始行，列地址，页地址等到初始状态，但不影响显示 RAM 的内容。

- SHL Select

COM（行）输出扫描方向的选择。SHL=0，正向（COM1-COM64）；SHL=1，反向（COM64-COM1）。

- Power Comtrol

LCD 电源电路选择

VC：电压转换器开/关
VR：电压调节器开/关
VF：电压跟踪器开/关

- Regulator Resistor Select

选择调节电阻比率，R2-R0 取值 0~7。

- Set Static Indicator state

双字节指令，第一个字节“ Set Static Indicator Mode ”使第二个字节“ Set Static Indicator Register ”生效，第二个字节更新静态指示符寄存器的内容而不用插入任何其它指令，在设置了静态指示符寄存器后设置静态指示符状态被释放：

- Set Static Indicator Mode
  SM=0，静态指示符 OFF
  SM=1，静态指示符 ON
- Set Static Indicator Register

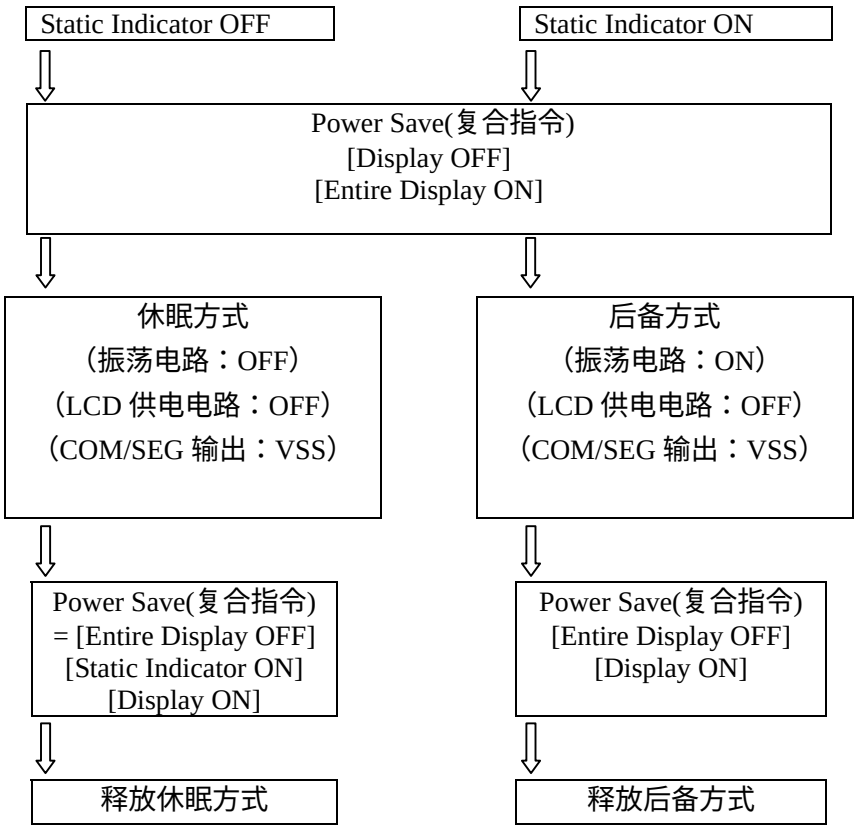
设置静态指示符寄存器

S1	S0	静态指示符状态
0	0	OFF
0	1	ON（1 秒闪烁）
1	0	ON（0.5 秒闪烁）
1	1	ON

*本品没有静态指示符

- Power Save 节电（复合指令）

如果在关显示状态下执行“ Entire Display ON ”指令可使驱动 IC 进入节电状态而减少功耗



显示与 DDRAM 对应图

Page Address				DATA	Column Address														Line Address
0	0	0	0	D0					0	0	1	0	0						00
				D1					0	1	0	1	0						01
				D2					1	0	0	0	1						02
				D3					1	0	0	0	1				PAGE 0		03
				D4					1	1	1	1	1						04
				D5					1	0	0	0	1						05
				D6					1	0	0	0	1						06
				D7					0	0	0	0	0						07
0	0	0	1	D0															08
				D1															09
				D2															0A
				D3													PAGE 1		0B
				D4															0C
				D5															0D
				D6															0E
				D7															0F
0	0	1	0	D0 ↓ D7													PAGE 2		10 ↓ 17
0	0	1	1	D0 ↓ D7													PAGE 3		18 ↓ 1F
0	1	0	0	D0 ↓ D7													PAGE 4		20 ↓ 27
0	1	0	1	D0 ↓ D7													PAGE 5		28 ↓ 2F
0	1	1	0	D0 ↓ D7													PAGE 6		30 ↓ 37
0	1	1	1	D0 ↓ D7													PAGE 7		38 ↓ 3F
1	0	0	0	D0													PAGE 8		
Column Address				HEX	00	01	02	03	04	05	06	07	08	09	0A	0B	→	83	ADC=1
				HEX	83	82	81	80	7F	7E	7D	7C	7B	7A	79	78	→	00	ADC=0

复位状态

- 置/RES 为低电平，初始化如下：

  -Display ON/OFF: OFF
  -Entire Display ON/OFF: OFF(Normal)
  -ADC select: OFF(normal)
  -Reverse Display ON/OFF: OFF(Normal)
  -Power Control register(VC,VR,VF)=(0,0,0)
  -LCD bias ratio: 1/9
  -Read-modify-write: OFF
  -SHL select: 0
  -Static indicator mode: OFF
  -Static indicator register: (S1,S0)=(0,0)
  -Display start line: 0(First)
  -Column address: 0
  -Page address: 0

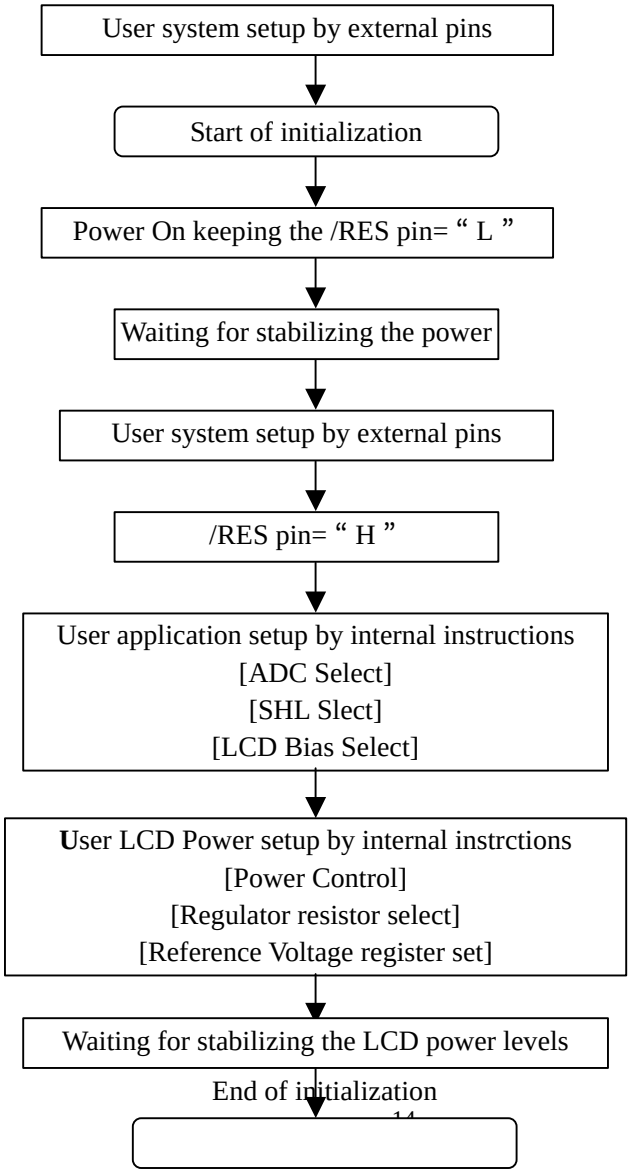
-Regulator resistor select register: (R2,R1,R0)=(0,0,0)
-Reference voltage set: OFF
-Reference voltage comtrol register:
(SV5,SV4,SV3,SV2,SV1,SV0)=(1,0,0,0,0,0)

- 用 RESET 指令，初始化如下：

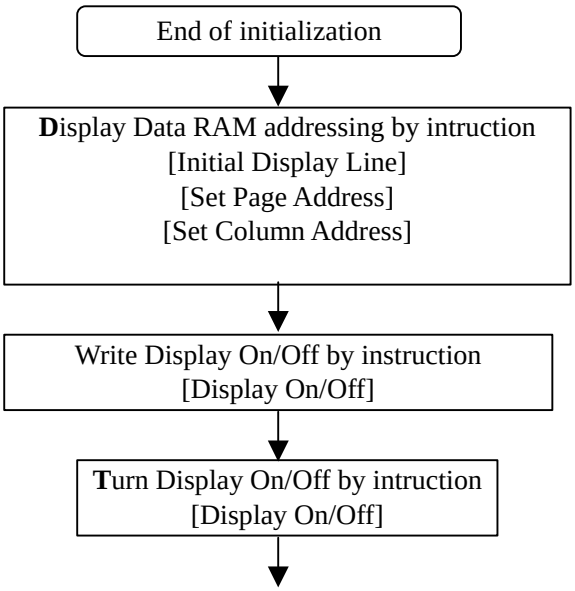
-Read-modify-write: OFF
-Static indicator mode: OFF
-Static indicator register: (S1,S0)=(0,0)
-SHL select: 0
-Display start line: 0(First)
-Column address: 0
-Page address: 0
-Regulator resistor select register: (R2,R1,R0)=(0,0,0)
-Reference voltage set: OFF
-Reference voltage comtrol register:
(SV5,SV4,SV3,SV2,SV1,SV0)=(1,0,0,0,0,0)

参考流程

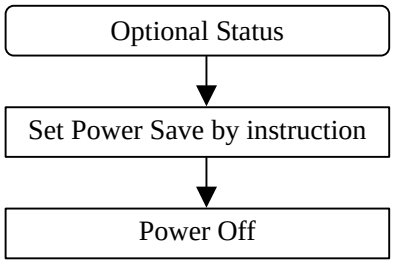
参考初始化流程



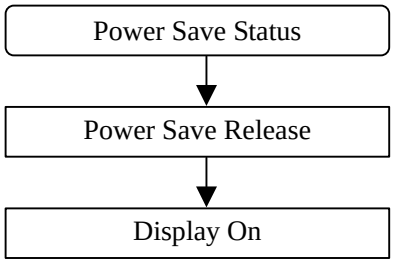
参考数据显示流程



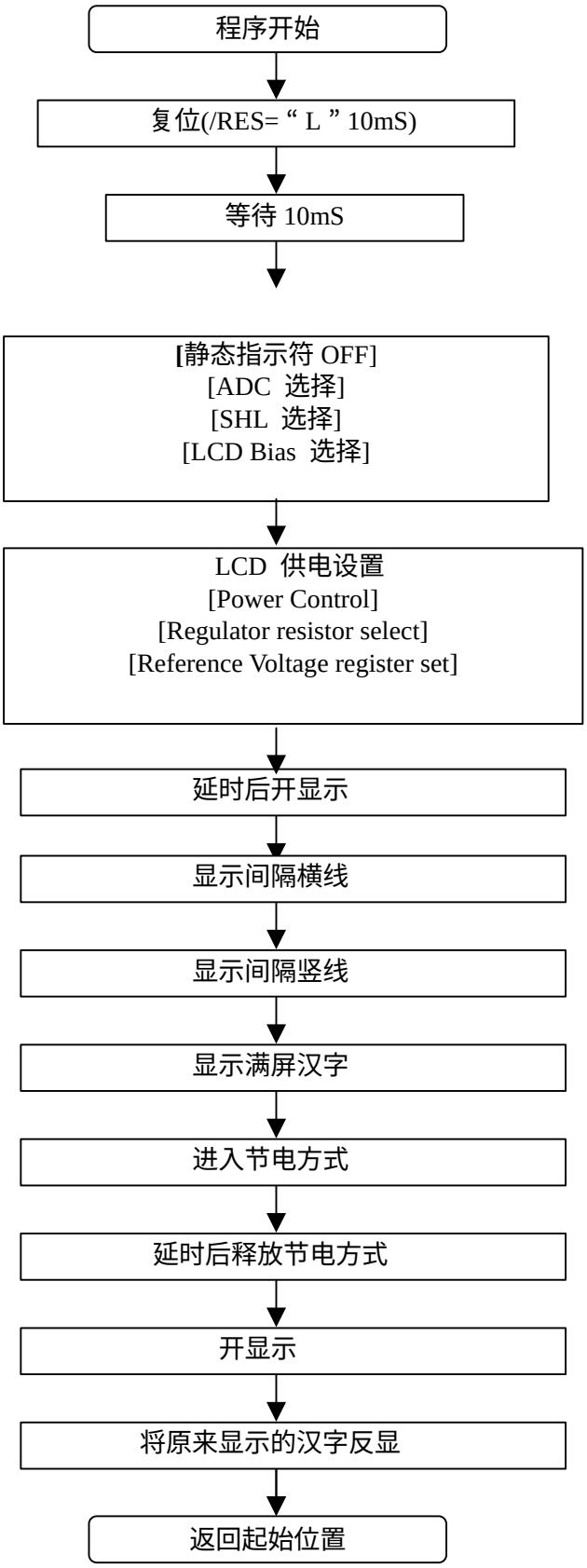
参考关电流程



参考关电恢复流程



程序举例


程序开始
复位(/RES=“ L ”10mS)
等待 10mS
[静态指示符 OFF]
[ADC 选择]
[SHL 选择]
[LCD Bias 选择]
LCD 供电设置
[Power Control]
[Regulator resistor select]
[Reference Voltage register set]
延时后开显示
显示间隔横线
显示间隔竖线
显示满屏汉字
进入节电方式
延时后释放节电方式
开显示
将原来显示的汉字反显
返回起始位置

下面是 8031 编程的举例，显示横条、竖条和汉字。

；晶振 12MHz
；/CS 接 GND
；/RES 接 P1.5
；A0 接 P1.3
；/RD，/WR 接 8031/RD，/WR

```
;TCP12864
Rrst  bit   P1.5
d_i       bit   P1.3
      ORG 0000H
  START:nop
          clr rrst
      NOP
      LCALL DELAY1
          SETB rrst
      LCALL DELAY1

      LCALL BF
      CLR d_i
      MOV A,#0ACH     ;STATIC INDICATOR OFF
      MOVX @R0,A
      MOV A,#000H     ;OFF
      MOVX @R0,A

      LCALL BF
          CLR d_i
      MOV A,#0A1H     ;ADC
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#0C0H     ;SHL
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#0A2H     ;BIAS 1/9
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#02FH     ;POWER
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#023H     ;POWER-RRS
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#081H     ;POWER
      MOVX @R0,A
      LCALL BF
          CLR d_i
      MOV A,#05H      ;POWER-SRVR
      MOVX @R0,A
      LCALL DELAY1

      LCALL BF
          CLR d_i
      MOV A,#0AFH     ;DISP ON
      MOVX @R0,A

      MOV R7,#80H
      MOV R1,#55H
      LCALL BF
          CLR d_i
      MOV A,#0B0H  ;X=0
      MOVX @R0,A
      LCALL Y0
      LCALL WR0
      LCALL BF
          CLR d_i
      MOV A,#0B1H  ;X=1
      MOVX @R0,A
      LCALL Y0
      LCALL WR0
      LCALL BF
          CLR d_i
      MOV A,#0B2H  ;X=2
      MOVX @R0,A
      LCALL Y0
      LCALL WR0
      LCALL BF
          CLR d_i
      MOV A,#0B3H  ;X=3
```

```
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B4H  ;X=4
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B5H  ;X=5
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B6H  ;X=6
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B7H  ;X=7
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL DELAY3

MOV R7,#80H
MOV R1,#0AAH
LCALL BF
    CLR d_i
MOV A,#0B0H  ;X=0
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B1H  ;X=1
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B2H  ;X=2
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B3H  ;X=3
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B4H  ;X=4
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B5H  ;X=5
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B6H  ;X=6
MOVX @R0,A
LCALL Y0
LCALL WR0
LCALL BF
    CLR d_i
MOV A,#0B7H  ;X=7
MOVX @R0,A
LCALL Y0
LCALL WR0
lcall delay3

MOV R7,#80H
MOV R1,#0FFH
LCALL BF
    CLR d_i
MOV A,#0B0H  ;X=0
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
```

```
    CLR d_i
MOV A,#0B1H   ;X=1
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B2H   ;X=2
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B3H   ;X=3
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B4H   ;X=4
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B5H   ;X=5
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B6H   ;X=6
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B7H   ;X=7
MOVX @R0,A
LCALL Y0
LCALL WR1
lcall delay3
MOV R7,#80H
MOV R1,#000H
LCALL BF
    CLR d_i
MOV A,#0B0H   ;X=0
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B1H   ;X=1
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B2H   ;X=2
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B3H   ;X=3
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B4H   ;X=4
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B5H   ;X=5
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B6H   ;X=6
MOVX @R0,A
LCALL Y0
LCALL WR1
LCALL BF
    CLR d_i
MOV A,#0B7H   ;X=7
MOVX @R0,A
```

```
LCALL Y0
LCALL WR1
lcall delay3

MOV DPTR,#0900H
mov r3,#0b0h
mov r4,#010h
lcall zk
mov r3,#0b0h
mov r4,#11h
lcall zk
mov r3,#0b0h
mov r4,#12h
lcall zk
mov r3,#0b0h
mov r4,#13h
lcall zk
mov r3,#0b0h
mov r4,#014h
lcall zk
mov r3,#0b0h
mov r4,#15h
lcall zk
mov r3,#0b0h
mov r4,#16h
lcall zk
mov r3,#0b0h
mov r4,#17h
lcall zk
mov r3,#0b2h
mov r4,#010h
lcall zk
mov r3,#0b2h
mov r4,#11h
lcall zk
mov r3,#0b2h
mov r4,#12h
lcall zk
mov r3,#0b2h
mov r4,#13h
lcall zk
mov r3,#0b2h
mov r4,#014h
lcall zk
mov r3,#0b2h
mov r4,#15h
lcall zk
mov r3,#0b2h
mov r4,#16h
lcall zk
mov r3,#0b2h
mov r4,#17h
lcall zk
mov r3,#0b4h
mov r4,#010h
lcall zk
mov r3,#0b4h
mov r4,#11h
lcall zk
mov r3,#0b4h
mov r4,#12h
lcall zk
mov r3,#0b4h
mov r4,#13h
lcall zk
mov r3,#0b4h
mov r4,#014h
lcall zk
mov r3,#0b4h
mov r4,#15h
lcall zk
mov r3,#0b4h
mov r4,#16h
lcall zk
mov r3,#0b4h
mov r4,#17h
lcall zk
mov r3,#0b6h
mov r4,#010h
lcall zk
mov r3,#0b6h
mov r4,#11h
lcall zk
mov r3,#0b6h
mov r4,#12h
lcall zk
mov r3,#0b6h
mov r4,#13h
lcall zk
mov r3,#0b6h
```

```
mov r4,#014h
lcall zk
mov r3,#0b6h
mov r4,#15h
lcall zk
mov r3,#0b6h
mov r4,#16h
lcall zk
mov r3,#0b6h
mov r4,#17h
lcall zk
lcall delay3
MOV DPTR,#1300H
mov r3,#0b0h
mov r4,#010h
lcall zk
mov r3,#0b0h
mov r4,#11h
lcall zk
mov r3,#0b0h
mov r4,#12h
lcall zk
mov r3,#0b0h
mov r4,#13h
lcall zk
mov r3,#0b0h
mov r4,#014h
lcall zk
mov r3,#0b0h
mov r4,#15h
lcall zk
mov r3,#0b0h
mov r4,#16h
lcall zk
mov r3,#0b0h
mov r4,#17h
lcall zk
mov r3,#0b2h
mov r4,#010h
lcall zk
mov r3,#0b2h
mov r4,#11h
lcall zk
mov r3,#0b2h
mov r4,#12h
lcall zk
mov r3,#0b2h
mov r4,#13h
lcall zk
mov r3,#0b2h
mov r4,#014h
lcall zk
mov r3,#0b2h
mov r4,#15h
lcall zk
mov r3,#0b2h
mov r4,#16h
lcall zk
mov r3,#0b2h
mov r4,#17h
lcall zk
mov r3,#0b4h
mov r4,#010h
lcall zk
mov r3,#0b4h
mov r4,#11h
lcall zk
mov r3,#0b4h
mov r4,#12h
lcall zk
mov r3,#0b4h
mov r4,#13h
lcall zk
mov r3,#0b4h
mov r4,#014h
lcall zk
mov r3,#0b4h
mov r4,#15h
lcall zk
mov r3,#0b4h
mov r4,#16h
lcall zk
mov r3,#0b4h
mov r4,#17h
lcall zk
mov r3,#0b6h
mov r4,#010h
lcall zk
mov r3,#0b6h
mov r4,#11h
```

```
lcall zk
mov r3,#0b6h
mov r4,#12h
lcall zk
mov r3,#0b6h
mov r4,#13h
lcall zk
mov r3,#0b6h
mov r4,#014h
lcall zk
mov r3,#0b6h
mov r4,#15h
lcall zk
mov r3,#0b6h
mov r4,#16h
lcall zk
mov r3,#0b6h
mov r4,#17h
lcall zk
lcall delay3

;POWER SAVE
LCALL BF
CLR d_i
MOV A,#0AeH     ;DISPLAY OFF
MOVX @R0,A
LCALL BF
CLR d_i
MOV A,#0A5H     ;ENTIRE DISPLAY ON
MOVX @R0,A

lcall delay3

;POWER SAVE RELEASE
LCALL BF
CLR d_i
MOV A,#0A4H     ;ENTIRE DISPLAY OFF
MOVX @R0,A
LCALL BF
CLR d_i
MOV A,#0AdH     ;STATIC INDICATOR ON
MOVX @R0,A
LCALL BF
CLR d_i
MOV A,#0AfH     ;DISP ON
MOVX @R0,A

LCALL BF
CLR d_i
MOV A,#0AFH     ;DISP ON
MOVX @R0,A

LCALL BF
CLR d_i
MOV A,#0A7H     ;REVERSE DISPLAY ON
MOVX @R0,A
LCALL DELAY3
lcall delay3

LJMP START

WR0:    LCALL BF
        SETB d_i
        MOV A,R1
        MOVX @R0,A
        MOV R1,A
        DJNZ R7,WR0
        MOV R7,#80H
        RET
WR1:    LCALL BF
        SETB d_i
        MOV A,R1
        MOVX @R0,A
        CPL A
        MOV R1,A
        DJNZ R7,WR1
        MOV R7,#80H
        RET
Y0:  LCALL BF
        CLR d_i
        MOV A,#10H
        MOVX @R0,A      ;Y=0
        LCALL BF
        CLR d_i
        MOV A,#04H
        MOVX @R0,A      ;Y=0
        RET
BF:  NOP
        CLR d_i
        MOVX A,@R0
```

```
        JB ACC.7,BF
        JB ACC.4,BF
        RET
DELAY1: NOP
        MOV R4,#00AH
        MOV R3,#0FFH
LOOP2:    DJNZ R3,LOOP2
        DJNZ R4,LOOP2
        RET
DELAY3: MOV R5,#08H
        MOV R4,#0FFH
        MOV R3,#0FFH
LOOP1:   DJNZ R3,LOOP1
        DJNZ R4,LOOP1
        DJNZ R5,LOOP1
        RET
zk:       LCALL BF
            CLR d_i
        MOV A,r3            ;X=r3
        MOVX @R0,A
        LCALL BF
            CLR d_i
        MOV A,r4
        MOVX @R0,A          ;Y=r4
        LCALL BF
            CLR d_i
        MOV A,#04
        MOVX @R0,A
        mov r2,#10h
tt:      lcall bf
        mov a,#00h
        movc a,@a+dptr
            SETB d_i
        MOVX @R0,A
        inc dptr
        djnz r2,tt
        LCALL BF
            CLR d_i
        inc r3
        MOV A,r3            ;X=1
        MOVX @R0,A
        LCALL BF
            CLR d_i
        MOV A,r4
        MOVX @R0,A
        LCALL BF
            CLR d_i
        MOV A,#04H
        MOVX @R0,A
        mov r2,#010h
        tt1:lcall bf
        mov a,#00h
        movc a,@a+dptr
            SETB d_i
        MOVX @R0,A
        inc dptr
        djnz r2,tt1
        ret
    ORG 0900H     ;

    DB
    000H,040H,060H,0F0H,0F0H,000H,000H,000H
    ;1
    DB
    000H,040H,060H,0F0H,0F0H,000H,000H,000H
    ;1
    DB 000H,010H,010H,01FH,01FH,010H,010H,000H
    DB 000H,010H,010H,01FH,01FH,010H,010H,000H

    DB 040H,042H,0CCH,000H,004H,044H,064H,05CH
    DB 047H,0F4H,044H,044H,046H,004H,000H,000H
    DB 040H,020H,01FH,020H,044H,044H,044H,044H
    DB 044H,07FH,044H,044H,046H,044H,040H,000H

    DB 008H,008H,008H,088H,068H,018H,00FH,0E8H
    DB 008H,008H,008H,088H,008H,00CH,008H,000H
    DB 000H,040H,021H,011H,00DH,041H,081H,07FH
    DB 001H,005H,009H,031H,061H,000H,000H,000H

    DB 010H,010H,010H,010H,010H,0F1H,092H,096H
    DB 090H,090H,090H,0D0H,090H,018H,010H,000H
    DB 000H,080H,040H,020H,018H,007H,000H,000H
    DB 040H,080H,040H,03FH,000H,000H,000H,000H

    DB 000H,000H,000H,0FEH,092H,092H,092H,092H
    DB 092H,092H,092H,0FFH,002H,000H,000H,000H
    DB 040H,042H,044H,04DH,040H,07FH,040H,040H
    DB 040H,07FH,040H,049H,044H,066H,040H,000H
```

```
DB 040H,040H,042H,042H,042H,042H,042H,0C2H
DB 042H,042H,042H,043H,042H,060H,040H,000H
DB 010H,008H,004H,006H,000H,040H,080H,07FH
DB 000H,000H,002H,004H,008H,018H,000H,000H

DB 080H,080H,09FH,091H,091H,091H,09FH,0E0H
DB 09FH,091H,0B1H,0D1H,09FH,080H,080H,000H
DB 008H,008H,0FCH,08CH,08AH,08AH,0F9H,000H
DB 0F9H,08AH,08AH,08CH,0FCH,008H,008H,000H

DB 010H,010H,010H,0D0H,0FFH,090H,010H,000H
DB 010H,090H,010H,0FFH,010H,010H,010H,000H
DB 008H,004H,003H,000H,0FFH,000H,011H,008H
DB 006H,041H,080H,07FH,000H,000H,000H,000H


DB
020H,030H,010H,010H,090H,0F0H,060H,000H
;2
DB
020H,030H,010H,010H,090H,0F0H,060H,000H
;2
DB 018H,01CH,016H,013H,011H,018H,018H,000H
DB 018H,01CH,016H,013H,011H,018H,018H,000H

DB 000H,0FEH,002H,022H,0DAH,006H,000H,0FEH
DB 092H,092H,092H,092H,0FFH,002H,000H,000H
DB 000H,0FFH,008H,010H,008H,007H,000H,0FFH
DB 042H,024H,008H,014H,022H,061H,020H,000H

DB 000H,000H,080H,040H,030H,00CH,000H,0C0H
DB 007H,01AH,020H,040H,080H,080H,080H,000H
DB 001H,001H,020H,070H,028H,024H,023H,020H
DB 020H,028H,030H,060H,000H,001H,000H,000H

DB 010H,010H,092H,092H,092H,092H,092H,092H
DB 0D2H,09AH,012H,002H,0FFH,002H,000H,000H
DB 000H,000H,03FH,010H,010H,010H,010H,010H
DB 03FH,000H,040H,080H,07FH,000H,000H,000H

DB 010H,022H,064H,00CH,080H,004H,074H,084H
DB 004H,004H,004H,0C4H,03EH,004H,000H,000H
DB 000H,008H,0F8H,006H,081H,040H,020H,011H
DB 00AH,004H,00BH,010H,060H,0C0H,040H,000H

DB 000H,010H,00CH,024H,024H,024H,025H,026H
DB 0A4H,074H,024H,004H,014H,00CH,000H,000H
DB 002H,002H,002H,002H,002H,042H,082H,07FH
DB 002H,002H,002H,002H,002H,003H,002H,000H

DB 000H,0FEH,002H,022H,012H,01EH,0AAH,04AH
DB 0AAH,01AH,00AH,002H,002H,0FFH,002H,000H
DB 000H,0FFH,042H,042H,041H,049H,048H,052H
DB 054H,041H,041H,042H,042H,0FFH,000H,000H

DB 080H,082H,082H,0FEH,082H,082H,082H,0FEH
DB 082H,0A2H,010H,008H,086H,060H,000H,000H
DB 000H,040H,030H,00FH,000H,000H,000H,0FFH
DB 000H,084H,042H,021H,010H,008H,006H,000H

DB
020H,030H,010H,010H,010H,0F0H,0E0H,000H
;3
DB
020H,030H,010H,010H,010H,0F0H,0E0H,000H
;3
DB 008H,018H,011H,011H,011H,01FH,00EH,000H
DB 008H,018H,011H,011H,011H,01FH,00EH,000H

DB 004H,004H,004H,0F4H,094H,094H,095H,096H
DB 094H,094H,094H,0F4H,004H,006H,004H,000H
DB 000H,0FEH,002H,002H,07AH,04AH,04AH,04AH
DB 04AH,04AH,07AH,002H,082H,0FEH,000H,000H

DB 024H,024H,024H,0A4H,0FEH,0A3H,022H,000H
DB 024H,048H,000H,0FFH,000H,000H,000H,000H
DB 010H,008H,006H,001H,0FFH,000H,001H,002H
DB 002H,002H,002H,0FFH,001H,001H,001H,000H

DB 010H,010H,010H,0FFH,010H,010H,088H,088H
DB 088H,0FFH,088H,088H,08CH,008H,000H,000H
DB 004H,044H,082H,07FH,001H,080H,081H,046H
DB 028H,010H,028H,026H,041H,0C0H,040H,000H

DB 000H,0F8H,00CH,00BH,008H,008H,0F8H,040H
DB 030H,08FH,008H,008H,008H,0FCH,008H,000H
DB 000H,07FH,021H,021H,021H,021H,07FH,000H
DB 000H,000H,043H,080H,040H,03FH,000H,000H

DB 000H,030H,028H,0A4H,063H,010H,008H,048H
```

```
DB 048H,048H,07FH,048H,048H,04CH,008H,000H
DB 000H,022H,063H,022H,012H,012H,000H,0FEH
DB 042H,042H,042H,042H,042H,0FEH,000H,000H

DB 000H,000H,000H,000H,07FH,049H,049H,049H
DB 049H,049H,07FH,000H,000H,080H,000H,000H
DB 000H,0FFH,049H,049H,049H,049H,0FFH,000H
DB 0FFH,049H,049H,049H,049H,0FFH,001H,000H

DB 000H,040H,0C0H,080H,080H,0C0H,040H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H
DB 001H,005H,007H,003H,003H,007H,005H,001H
DB 000H,000H,000H,000H,000H,000H,000H,000H


DB
000H,080H,0C0H,060H,0F0H,0F0H,000H,000H
;4
DB
000H,080H,0C0H,060H,0F0H,0F0H,000H,000H
;4
DB 003H,003H,002H,012H,01FH,01FH,012H,000H
DB 003H,003H,002H,012H,01FH,01FH,012H,000H

DB 040H,044H,054H,065H,0C6H,064H,054H,044H
DB 000H,0FCH,044H,044H,0C2H,042H,040H,000H
DB 020H,011H,049H,081H,07FH,001H,005H,049H
DB 030H,00FH,000H,000H,0FFH,000H,000H,000H

DB 000H,0FCH,084H,084H,084H,0FEH,014H,010H
DB 090H,010H,010H,010H,0FFH,010H,010H,000H
DB 000H,03FH,010H,010H,010H,03FH,000H,000H
DB 000H,023H,040H,080H,07FH,000H,000H,000H

DB 080H,040H,020H,0F8H,047H,040H,040H,040H
DB 07FH,0A0H,022H,02CH,020H,030H,020H,000H
DB 000H,000H,000H,0FFH,000H,000H,000H,000H
DB 000H,003H,00CH,030H,040H,080H,0F0H,000H

DB 000H,0F8H,00CH,00BH,008H,008H,0F8H,040H
DB 030H,08FH,008H,008H,008H,0FCH,008H,000H
DB 000H,07FH,021H,021H,021H,021H,07FH,000H
DB 000H,000H,043H,080H,040H,03FH,000H,000H

DB 000H,008H,0C8H,088H,098H,0E8H,089H,08EH
DB 088H,0C8H,0A8H,098H,08CH,088H,000H,000H
DB 080H,060H,01FH,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H

DB 000H,010H,060H,080H,000H,0FFH,000H,000H
DB 000H,0FFH,000H,000H,0C0H,030H,000H,000H
DB 040H,040H,040H,047H,040H,07FH,040H,040H
DB 040H,07FH,044H,043H,040H,060H,040H,000H

DB 000H,040H,0C0H,080H,080H,0C0H,040H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H
DB 001H,005H,007H,003H,003H,007H,005H,001H
DB 000H,000H,000H,000H,000H,000H,000H,000H
org 1300h
DB 004H,034H,0C4H,004H,0C4H,03CH,020H,010H
DB 00FH,0E8H,008H,008H,028H,018H,000H,000H
DB 010H,008H,006H,001H,082H,08CH,040H,030H
DB 00CH,003H,00CH,010H,060H,0C0H,040H,000H
DB 040H,042H,044H,0C8H,000H,0FCH,004H,002H
DB 082H,0FCH,004H,004H,004H,0FEH,004H,000H
DB 000H,040H,020H,01FH,020H,047H,042H,041H
DB 040H,07FH,040H,042H,044H,043H,040H,000H
DB 040H,020H,0F8H,007H,004H,0E4H,024H,024H
DB 024H,0FFH,024H,024H,024H,0E6H,004H,000H
DB 000H,000H,0FFH,000H,080H,043H,046H,02AH
DB 01AH,017H,022H,022H,042H,0C7H,040H,000H
DB 000H,000H,0FEH,022H,022H,022H,022H,0FEH
DB 022H,022H,022H,022H,0FFH,002H,000H,000H
DB 080H,060H,01FH,002H,002H,002H,002H,07FH
DB 002H,002H,042H,082H,07FH,000H,000H,000H
DB 008H,008H,008H,088H,068H,018H,00FH,0E8H
DB 008H,008H,008H,088H,008H,00CH,008H,000H
DB 000H,040H,021H,011H,00DH,041H,081H,07FH
DB 001H,005H,009H,031H,061H,000H,000H,000H
DB 000H,000H,000H,0FEH,092H,092H,092H,092H
DB 092H,092H,092H,0FFH,002H,000H,000H,000H
DB 040H,042H,044H,04DH,040H,07FH,040H,040H
DB 040H,07FH,040H,049H,044H,066H,040H,000H
DB 000H,008H,0C8H,088H,098H,0E8H,089H,08EH
DB 088H,0C8H,0A8H,098H,08CH,088H,000H,000H
DB 080H,060H,01FH,000H,000H,000H,000H,000H
DB 000H,000H,000H,000H,000H,000H,000H,000H
DB 000H,000H,000H,07EH,022H,022H,022H,022H
DB 022H,022H,022H,07FH,002H,000H,000H,000H
DB 000H,0FFH,041H,041H,041H,0FFH,000H,000H
```

DB 000H,0FFH,041H,041H,041H,0FFH,000H,000H
DB 004H,084H,084H,0FCH,084H,084H,000H,0FEH
DB 002H,0FAH,002H,002H,0FFH,002H,000H,000H
DB 010H,030H,010H,01FH,088H,088H,040H,023H
DB 018H,007H,07CH,080H,083H,080H,0E0H,000H
DB 008H,008H,008H,008H,0C8H,038H,00FH,008H
DB 008H,0E8H,008H,008H,088H,00CH,008H,000H
DB 008H,004H,002H,0FFH,000H,040H,041H,041H
DB 041H,07FH,041H,041H,041H,061H,040H,000H
DB 010H,022H,064H,00CH,080H,0FCH,004H,0F4H
DB 004H,0FCH,000H,0F8H,000H,0FFH,000H,000H
DB 000H,004H,0FCH,003H,040H,027H,010H,00FH
DB 010H,067H,000H,047H,080H,07FH,000H,000H
DB 040H,042H,0CCH,000H,010H,090H,090H,090H
DB 090H,090H,0FFH,010H,012H,014H,010H,000H
DB 000H,000H,07FH,020H,010H,020H,060H,03FH
DB 010H,010H,007H,018H,060H,080H,070H,000H
DB 000H,002H,0F2H,042H,042H,042H,042H,042H
DB 042H,042H,042H,0FFH,002H,000H,000H,000H
DB 000H,000H,03FH,040H,040H,040H,040H,040H
DB 040H,040H,040H,040H,040H,078H,000H,000H
DB 020H,030H,02CH,0A3H,060H,030H,082H,082H
DB 042H,022H,012H,01AH,027H,042H,0C0H,000H
DB 024H,066H,025H,014H,014H,054H,040H,042H
DB 042H,042H,07EH,042H,043H,062H,040H,000H
DB 010H,00CH,004H,024H,024H,024H,025H,026H
DB 024H,034H,024H,004H,094H,00EH,004H,000H
DB 000H,081H,081H,041H,031H,00FH,001H,001H
DB 07FH,081H,081H,081H,081H,0F1H,000H,000H
DB 000H,000H,0F8H,088H,088H,088H,088H,008H
DB 07FH,088H,00AH,00CH,008H,0C8H,000H,000H
DB 040H,020H,01FH,000H,008H,010H,00FH,040H
DB 020H,013H,01CH,024H,043H,080H,0F0H,000H
DB 010H,010H,0F0H,01FH,010H,010H,0F0H,000H
DB 0F0H,010H,010H,010H,010H,0F8H,010H,000H
DB 000H,082H,045H,028H,010H,02CH,043H,000H
DB 07FH,020H,020H,020H,020H,07FH,000H,000H
DB 000H,000H,000H,0FEH,092H,092H,092H,0FEH
DB 092H,092H,092H,0FFH,002H,000H,000H,000H
DB 044H,044H,024H,025H,014H,00CH,004H,0FFH
DB 004H,00CH,014H,015H,024H,066H,024H,000H
DB 040H,042H,044H,0CCH,000H,000H,000H,000H
DB 0C0H,03FH,0C0H,000H,000H,000H,000H,000H
DB 000H,000H,000H,03FH,090H,048H,030H,00EH
DB 001H,000H,001H,00EH,030H,0C0H,040H,000H
DB 020H,020H,020H,022H,024H,02CH,020H,0E0H
DB 03FH,020H,020H,020H,020H,0F0H,020H,000H
DB 000H,040H,020H,010H,008H,004H,003H,000H
DB 002H,004H,04CH,080H,040H,03FH,000H,000H
DB 002H,002H,002H,0F2H,012H,012H,012H,012H
DB 0F2H,002H,002H,0FEH,002H,003H,002H,000H
DB 000H,000H,000H,00FH,004H,004H,004H,004H
DB 00FH,040H,080H,07FH,000H,000H,000H,000H
DB 000H,0FCH,000H,000H,000H,002H,00CH,018H
DB 000H,000H,000H,000H,0FEH,000H,000H,000H
DB 000H,03FH,020H,010H,008H,084H,082H,041H
DB 040H,020H,018H,017H,020H,0C0H,000H,000H
DB 040H,042H,044H,0CCH,000H,000H,0F1H,091H
DB 095H,0F9H,095H,093H,0F1H,000H,000H,000H
DB 000H,040H,020H,01FH,020H,040H,0BFH,084H
DB 084H,0BFH,094H,0A4H,09FH,080H,080H,000H
DB 040H,042H,044H,0C8H,000H,008H,008H,048H
DB 088H,008H,008H,0FFH,008H,008H,000H,000H
DB 000H,040H,020H,01FH,020H,040H,040H,040H
DB 041H,048H,050H,04FH,040H,040H,040H,000H
DB 020H,022H,0ECH,000H,040H,044H,054H,054H
DB 054H,07FH,054H,054H,056H,044H,040H,000H
DB 000H,000H,07FH,020H,010H,000H,0FFH,015H
DB 015H,015H,055H,095H,07FH,000H,000H,000H
DB 040H,020H,010H,0FCH,023H,010H,08CH,067H
DB 004H,0F4H,004H,044H,094H,08CH,000H,000H
DB 040H,030H,000H,077H,080H,081H,088H,092H
DB 0B4H,083H,080H,0E0H,000H,011H,060H,000H
DB 020H,030H,0ACH,063H,030H,000H,0FEH,088H
DB 090H,0A0H,0FFH,0A0H,090H,098H,000H,000H
DB 022H,067H,022H,012H,012H,000H,07FH,048H
DB 044H,042H,07FH,042H,044H,06CH,040H,000H
DB 020H,030H,0ACH,063H,030H,000H,024H,064H
DB 0A4H,03FH,0E4H,024H,0A4H,060H,000H,000H
DB 022H,063H,022H,012H,012H,014H,085H,046H
DB 024H,01CH,017H,024H,044H,0C6H,004H,000H
DB 000H,0F8H,008H,008H,00CH,0CAH,049H,048H
DB 048H,0E8H,048H,008H,008H,0FCH,008H,000H
DB 000H,0FFH,000H,000H,000H,01FH,008H,008H
DB 008H,01FH,000H,040H,080H,07FH,000H,000H
DB 002H,002H,002H,002H,002H,002H,0FEH,002H
DB 022H,042H,082H,082H,002H,003H,002H,000H
DB 000H,000H,000H,000H,000H,000H,0FFH,000H
DB 000H,000H,000H,001H,000H,000H,000H,000H
DB 040H,042H,0CCH,000H,008H,008H,0FFH,008H

```
DB 008H,008H,0FFH,008H,008H,088H,000H,000H
DB 040H,020H,01FH,020H,041H,051H,04FH,041H
DB 041H,041H,07FH,041H,041H,041H,041H,000H
DB 000H,010H,088H,0C4H,023H,040H,042H,042H
DB 042H,042H,042H,0C2H,043H,062H,040H,000H
DB 002H,001H,000H,0FFH,000H,000H,000H,000H
DB 000H,040H,080H,07FH,000H,000H,000H,000H

end
```

6. 质量等级

6-1. 检验条件

6-1-1．检验的环境条件如下：

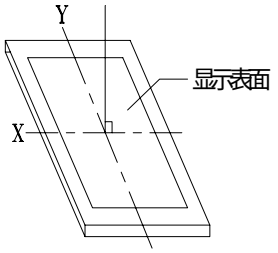
室内温度: 20±3℃

湿度: 65±20% RH

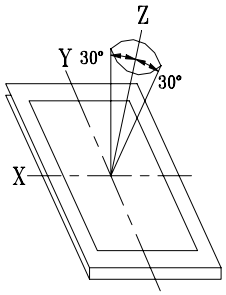
6-1-2．外部视觉检验

检验将使用一个 20W 的萤光灯作为照明并且检验者的眼睛距离 LCD 模块应该大于 30cm。

6-1-3． (1)照亮方法 (2) 检验距离及角度



萤光灯垂直于显示表面



从Z轴距X，Y轴ø＝30°，距离30±5cm范围内检验。

6-2. 可接受的取样程序列表

缺点类型	取样程序	AQL
主要缺陷	MIL-STD-105D 检验等级 I 常规检验 个别样品检验	Q/ED-01-98(II)
次要缺陷	MIL-STD-105D 检验等级 I 常规检验 个别样品检验	Q/ED-01-98(II)

6-3. 缺点等级

6-3-1．主要缺陷：

主要缺陷指此缺陷需要降级使用。

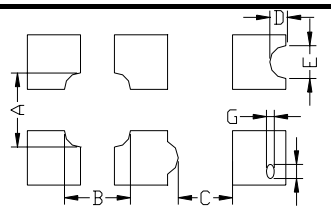
6-3-2． 次要缺陷：

次要缺点指这种缺陷：虽然背离目前产品的标准，但是与产品的性能无关，可忽略。

6-4. 检验标准

项目	检验标准		缺陷类型
1) 显示检查	(1) 不显示 (2) 垂直列缺少 (3) 平行缺少 (4) 交叉行缺少		主要
2) 黑／白污点	尺寸 Φ(mm)	可接受的数量	次要
	Φ≤0.3	忽略(note)	
	0.3<Φ≤0.45	3	
	0.45<Φ≤0.6	1	
	0.3<Φ	0	

	(Note)不允许集中 4 个或更多的污点	
3) 黑／白行	长度(mm) | 宽度(mm) | 可接受的数量 L≤10 | W≤0.03 | 忽略 5.0≤L≤10 | 0.03<W≤0.04 | 3 5.0≤L≤10 | 0.04<W≤0.05 | 2 1.0≤L≤10 | 0.05<W≤0.06 | 2 1.0≤L≤10 | 0.06<W≤0.08 | 1 L≤10 | 0.08<W | 下一项第 2)条缺点 缺陷间距要大于 20mm	次要

4) 显示图案	 [单位: mm] $\frac{A+B}{2}\leq 0.45$ | 0<C | $\frac{D+E}{2}\leq 0.35$ | $\frac{F+G}{2}\leq 0.35$ Note: 1) 最多可接受 3 个缺点 2) 每四分之三英寸内不允许有两个或更多的针孔	次要
5) 对比度不规则的点	尺寸 Φ(mm) | 可接受的数量 Φ≤0.7 | 忽略(note) 0.7<Φ≤1.0 | 3 1.0<Φ≤1.5 | 1 1.5<Φ | 0 Note: 1) 与样品一致 2) 缺点间距要大于 30mm	次要
6) 偏光片针眼	尺寸 Φ(mm) | 可接受的数量 Φ≤0.4 | 忽略(note) 0.4<Φ≤0.65 | 2 0.65<Φ≤1.2 | 1 1.2<Φ | 0	次要
7) 偏光片凹痕和擦痕	偏光片上的凹痕和擦痕要求应该同“ 2)黑/白污点 3) 黑/白行”一致。	次要
8) LCD 表面污点	即使用软布或类似的清洁物轻轻擦拭也擦不掉。	次要
9) 彩　虹	在对比度最合适的情况下，不允许在视域内有彩虹。	次要
10) 视窗缺陷	由于偏光片小或密封圈大，使其暴露在视窗内。	次要
11）铁框外观	在铁框的可见范围内不允许有铁锈和深度的划伤。	次要
12) 基板缺点	不能有明显的裂痕。	次要
13) 部件装配	(1) 装配部件失败 (2) 装配了不符合规范的部件 (3) 比如：极性颠倒，HSC 或 TCP 脱落	主要
14) 部件定位	(1) LSI, IC 管脚宽度大于焊盘宽度 50% (2) LSI, IC 管脚定位偏离焊盘超过 50%	次要
15) 焊接缺陷	(1) 0.45<Φ，N≥1 (2) 0.3<Φ≤0.45, N≥1 Φ: 焊球的平均直径(unit: mm) (3)0.5<L， N≥1 L: 焊接片的平均长度(unit: mm)	主要 次要 次要

16) PCB 板损伤	(1) PCB 铜铂走线严重损伤，几乎断开。 (2) 铜铂走线轻度损伤。	主要 次要
17) PCB 修理	(1) 由于 PCB 板铜铂线断开，每片 PCB 上有 2 处或更多处使用明线连接修补。 (2) 短路部分被划开。	次要
18) 框架爪	框架爪缺少或弯曲	次要
19) 喷码标识	(1) 标志或标签错误或不清晰。 (2) 缺少 1／3 以上的标识。	次要

7. 可靠性

7-1. 寿命

50,000 小时(25℃ 室内没有太阳照射)

7-2. 可靠性项目

项目	条件	标　　准
1) 高温操作	60℃ 96hrs	外观无变化，对比度与初始值不会相差±10%。 总电流消耗不会超过初始值的 2 倍。.
2) 低温操作	-20℃ 96hrs	
3) 湿度	40℃, 90%RH, 96hrs	外观无变化，对比度与初始值不会相差±20%。 总电流消耗不会超过初始值的 2 倍。.
4) 高温	70℃ 96hrs	
5) 低温	-30℃ 96hrs	
6) 热冲击	25℃→30℃→25℃→70℃ 5(min) 30(min) 5(min) 30(min) 5 cycle, 55~60%RH	
7) 振动	10~55~10hz amplitude: 1.5mm 2hrs for each direction	外观和性能无变化。 总电流消耗不会超过初始值的 2 倍。

8. 生产注意事项

8-1. 装配方法

大连东福公司设计开发的 LCD 模块，其 LCD 面板是由二块贴有偏光片的薄玻璃组成，非常容易被损坏。

由于模块是这种结构，安装是要用线路板上的定位孔。拿 LCD 模块时需格外小心。

8-2. 谨慎处理和清洁 LCD

当清洁 LCD 表面时，使用沾有[下列推荐]溶剂的软布轻轻的擦拭。

- 异丙醇

不能使用干的或硬的布料擦拭 LCD 表面，那将会伤害偏光片的表面。

不能使用下列的溶剂:

- 水
- 酒精
- 乙烯酮
- 芬芳溶剂

8-3. 防静电措施

LCD 模块使用 C-MOS LSI 驱动, 因此我们建议你：

将不用的输入端连接到 Vdd 或 Vss 上, 开电前不要输入任何信号，工作区、工具及操作者身体都需接地，以防静电。

8-4. 包装

- 对于模块应同对待 LCD 一样，避免从高处落下，受到强烈的震动。
- 防止模块老化，模块不能在有阳光直接照射或高温／高湿度条件下操作或储存。

8-5. 谨慎操作

- 在指定的限制电压下驱动 LCD 模块，因为电压超出限制范围会缩短 LCD 模块的使用寿命。由于使用直流电驱动 LCD 模块会产生化学反应使模块出现不应该的退化, 因此避免用直流电驱动 LCD 模块。
- 当温度低于操作温度范围时，响应时间将被延迟，另一方面工作温度过高，模块显示发黑。但是这些现象并不意味模块本身有故障，在指定的操作温度下模块又会恢复正常。

8-6. 储存

如打算长期储存, 推荐以下方法。

- 放在一个不漏气的密封聚乙烯袋中，不用放干燥剂。
- 放置在一个没有阳光直接照射，且满足储存温度范围的黑地方。
- 储存时不允许有东西碰到偏光片表面。

8-7. 安全

- 将已损坏的或不要的 LCD 敲成碎片，并用异丙醇洗刷掉液晶，然后把它烧掉。
- 当手接触破损的玻璃渗漏出的液晶时，请尽快用水将其洗掉。

9. 使用注意事项

9-1. 当双方认为有必要时，双方各提供一个样品。

样品经双方证实后，判断才有效。

9-2. 在以下场合中，双方共同讨论来解决问题：

- 这种规范中出现问题时。
- 在这规范中没有指明的问题出现时。
- 当用户的检查条件和工作条件改变，产生了新问题时。
- 从客户的角度评估，认为产生了新的问题时。

9-3.包装

- 采用防静电包装
- 发泡塑料防护
- 硬纸盒