

AN-B-1003H

Futaba

双葉電子工業株式会社

显示屏目录

Display catalog

VFD Module

CIG VFD

VFD



光与技术的交流

A COMMUNICATION OF LIGHT AND TECHNOLOGY



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双叶电子向您提供具有高附加价值的显示屏产品

Futaba offers a application with high value-added displays

显示屏在我们的现实生活中，发挥着极其重要的作用，在汽车上能够通过显示屏，及时明确地反馈速度、警告等重要信息；而带有显示屏的DVD、音响以及家电类产品则更为简便好用。显示屏不仅仅是一个简单的人机界面，作为一个与使用者的眼睛接触最频繁的部位，显示屏的设计以及表现力在很大程度上决定着产品的价值。双叶电子的VFD产品占有世界上最大的市场份额，是因为我们在技术实力，设计经验达到了世界最高水平。如果您追求确实可靠的显示性能，或者希望用更具魅力的屏幕显示来引领市场竞争，那么请选择双叶电子作为您的合作伙伴吧！我们会以得到世界各国制造商所信赖的显示屏技术，协助提升您的新产品价值。

In general, display devices can provide significant functions to an end user. In a car for example, it informs the driver of current speed or warnings. With DVD's, audio systems and home appliances, it simplifies the use of such appliances. Furthermore, not only does a display act as an interface, but the display device also affects the user's impression of the end product. This is due to the fact that the display device is always exposed to end users' eyes, which in turn is one of the essential elements to determine product value. Futaba has the largest market share of VFD products in the world, allowing Futaba to lead the technology, know-how and experience in this field. If you want "a display which does not fail in its performance", or "an attractive display to beat your competition", you are recommended to choose Futaba as your partner. Futaba's display technology will be sure to help you enhance the quality of your new products with Futaba's highly esteemed performance in the world as well as the domestic market.

用途例

●热水供应系统 HOT WATER SUPPLY SYSTEM



●按摩椅 HEALTH



●音响 AUDIO



●烤箱 OVEN



●汽车 AUTOMOTIVE



●DVD 机顶盒 DVD, STB



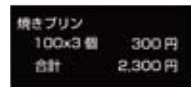
●兑换机 VENDING MACHINE



●数码广告牌 ADVERTISEMENT



●POS



●计测器 MEASUREMENT



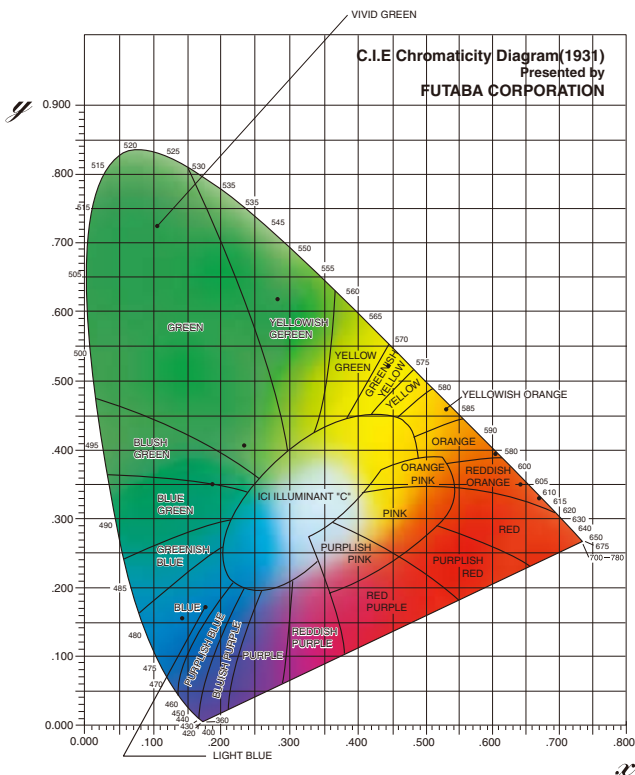
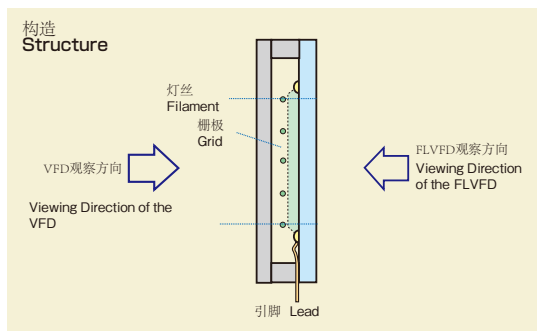
真空荧光显示屏 VFD (Vacuum Fluorescent Display)

VFD简介

Features of VFD

视认性优越的自发光型显示屏

General VFD; Excellent Readability



VFD用荧光体包含基本的绿色, 共用10种以上颜色可选用。
Including standard green phosphor, over 10 additional colors have been developed.

概要

VFD是基于真空管原理改良发展而来的显示屏。在真空容器内,利用电子冲击印刷在阳极上的荧光体来发光。

特点

1. 自发光、高亮度、视认性佳
2. 环境适应能力强、寿命长
3. 有广视野角的前面发光型VFD(FLVFD)

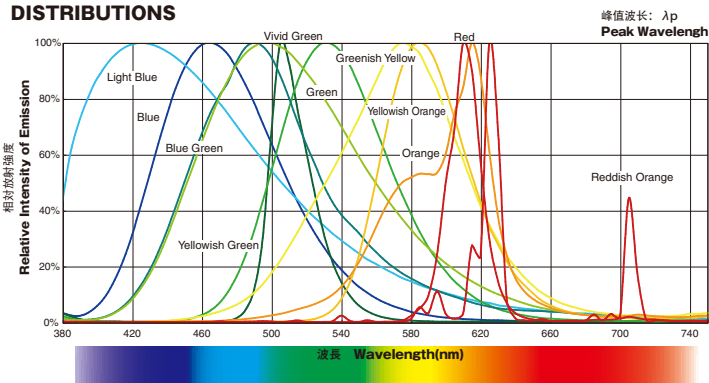
SUMMARY

VFD is a display device developed with vacuum triode tube technology. The phosphor is patterned on the anode in vacuum package. Electrons come into collision with the phosphor to emit light.

FEATURE

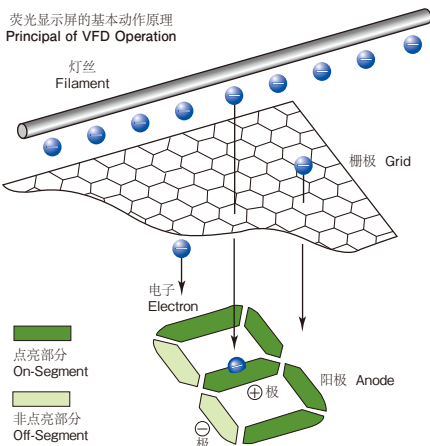
1. Superior readability, with high self-luminance.
2. High reliability long life.
3. The FLVFD (Front Luminance VFD) is available, offering a wide viewing angle.

光谱分布 SPECTRAL DISTRIBUTIONS



动作原理

Principal of VFD Operation



灯丝是在极细钨丝线上包覆钡(Ba)、锶(Sr)、钙(Ca)的氧化物所做成。提供规定的电压给灯丝后,会使阴极温度达到约600摄氏度,并释放出热电子。栅极是由一种不妨碍显示的金属网格做成,对其施加正电压后,可加速及扩散灯丝所放射出来的电子,并将其导向阳极;反之,如果对其施加负电压,则有阻断(截止)电子流向阳极的功用。阳极是由与显示图案形状相似的石墨等导体和印刷在其上方的荧光体图案两部分所组成;对其施加正电压后,阳极会受到被栅极加速和扩散后的电子冲击,从而使荧光体受激发而发光。目前使用得最为广泛的荧光体是可以用低电压驱动的ZnO:Zn的绿色荧光体(峰值波长505nm)。此外,我们可以通过使用不同的荧光体,实现从橙红色到蓝色等各种颜色的发光效果。

The filament consists of a very thin tungsten wire coated with barium, strontium and calcium oxides. Application of a specified voltage raises the temperature of the filament cathode to approximately 600°C, which causes thermionic emission.

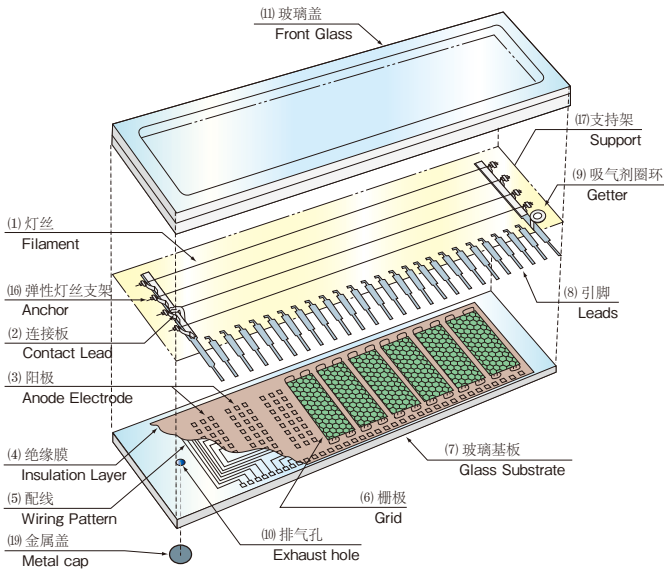
The grid is a thin stainless steel mesh. When a positive voltage is applied to the grid, electrons emitted by the filaments are accelerated and diffused towards the anode. When a negative voltage is applied to the grid, electron flow to the anode is cut off.

The anode consists of a conductor such as graphite, which is coated with phosphor formed into the desired graphic pattern. When a positive voltage is applied to the anode, electrons accelerated and diffused by the grid collide with the anode, exciting the phosphor and causing it to emit light. The most widely used phosphor is ZnO:Zn, which operates at low voltage and has a green peak wavelength of 505 nanometer. Various colors, ranging from reddish orange to blue, can also be obtained by using different types of phosphor.

构造

Structure

荧光显示屏的分解斜视图
Stranbismal Figure of VFD



(1) 灯丝

在很细的钨丝线上包覆钡(Ba)、锶(Sr)、钙(Ca)的氧化物所做成,在两端施电压后,会发出热电子。

(2) 连接板

对玻璃盖内面的透明导电膜,做电气上的连接。

(3) 阳极

让灯丝放射出的电子能到达阳极,使其电极上的荧光体发光。

(4) 绝缘膜

对阳极/栅极与配线,做电气上的绝缘。

(5) 配线

对引脚和阳极/栅极做电气上的连接。

(6) 栅极

对灯丝放射出的电子做控制的电极。

(7) 玻璃基板

同一般玻璃窗户等用途上使用的钠钙玻璃,在这玻璃上成形有电极和图案等。

(8) 引脚

使用与玻璃膨胀率相同的426合金(镍42%、铬6%、其余铁)做成,为了电压和信号等供给而引出的电极。

(9) 吸气剂圈环

可在玻璃盖内面形成钡的蒸着膜,这层被膜能吸取显示屏内部残留的气体。

(10) 排气孔

从这里抽出内部的空气。

(11) 玻璃盖

为了形成真空容器的玻璃覆盖。

(12) 封止玻璃

玻璃和引脚固着用玻璃膏剂,可维持真空。

(13) 荧光体

按显示图案形状印刷的荧光体,受电子冲击后会发光。

(14) 导通孔

在绝缘膜上的孔,使阳极/栅极电极和配线做电气上的接续。

(15) 透明导电膜

在玻璃盖内面形成,可防止因外部静电影响而造成的显示品位低下。

(16) 弹性灯丝支架

固定灯丝及吸收灯丝通电时因热膨胀的伸展,使灯丝不致成弯曲状的弹性材料。

(17) 支持架

在弹性灯丝支架的另一端,用来和弹性灯丝支架共同固定灯丝用。

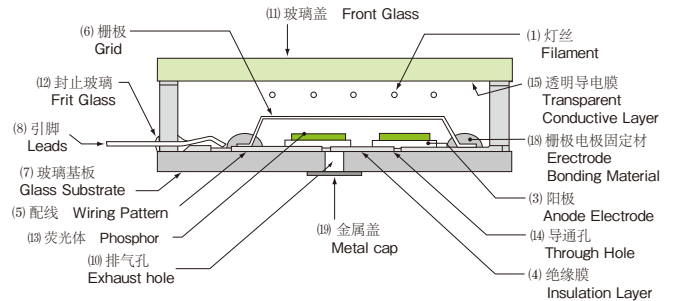
(18) 栅极电极固定材

使栅极固着在玻璃基板上,及透过导通孔与配线形成电气连接的固定材。

(19) 金属盖

涂有固着用玻璃膏剂的金属盖,作为真空密封用。

荧光显示屏断面图
Cross sectional view of VFD



※ 大尺寸VFD、背透式VFDの場合,会使用下图所示的玻璃排气管。
As shown below large size VFD or clear background VFD may need an exhaust tip instead of a metal cap.



(1) Filament

The filament consists of a very thin tungsten wire coated with barium, strontium and calcium oxides. Application of a specified voltage raises the temperature of the filament cathode, and causes thermionic emission.

(2) Contact Lead

The contact lead electrically connects filament voltage to the transparent conductive layer formed on the inside of the front glass.

(3) Anode Electrode

The anode electrode consists of a conductor such as graphite.

(4) Insulation Layer

The insulation layer electrically insulates the anode and grid electrode from wiring pattern.

(5) Wiring Pattern

The wiring pattern connects the anode electrodes and grid to the metal leads.

(6) Grid

Applying positive or negative voltage to the grid controls the flow of the electrons.

(7) Glass Substrate

Conventional soda-lime glass plate is used for the glass substrate. The wiring pattern and other patterns are formed on the substrate.

(8) Leads

The leads are made of 426 alloy (Ni 42%, Cr 6%, Fe balance), which has a similar thermal expansion coefficient as glass.

(9) Getter

The getter is important in maintaining a high vacuum level by absorbing residual gasses left inside the display after the exhausting process.

(10) Exhaust hole

The air is exhausted through this hole.

(11) Front Glass

The front glass forms the vacuum package.

(12) Frit Glass

Frit glass is a low temperature melting glass used for bonding glass parts and leads. It acts as a seal to maintain the vacuum inside the display.

(13) Phosphors

The phosphor is formed into the desired graphic pattern. When the electrons emitted by the filament collide with the anode, the phosphor is excited and emits light.

(14) Through Hole

The through hole is formed on the insulation layer. It connects the anode electrode and wiring pattern.

(15) Transparent Conductive Layer

The transparent conductive layer is formed on the inside of the front glass. It protects the display from external electrostatic charges.

(16) Anchor

It is the spring material by which absorb expansion by generation of heat when passing current on a filament, and it is made for a filament not to be bent.

(17) Support

The end of the filament by the side of an anchor and opposite is fixed.

(18) Grid Electrode Bonding Material

It is the adherence material for attaching a grid on a glass substrate and tying electrically with wiring through a through hole.

(19) Metal cap

The metal cap seals the exhaust hole.

VFD 产品介绍

VFD Products

荧光显示屏 VFD:Vacuum Fluorescent Display

视认性优越的自发光显示屏。

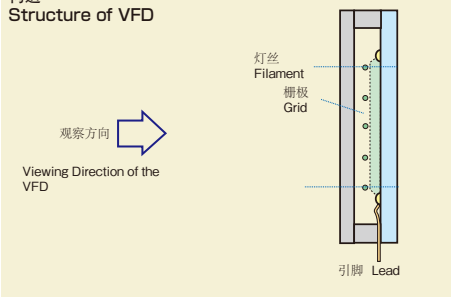
General VFD; Excellent Readability

●客户定制图案 Custom design



• VFD

构造
Structure of VFD



前面发光型显示屏(FLVFD) Front Luminous VFD

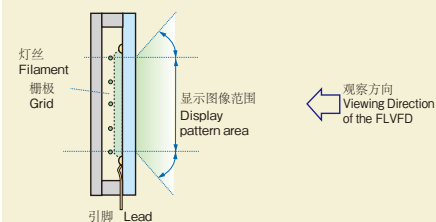
因显示图像在前面发光，而具广视野角。

Front Luminous VFD; Light emitting pattern on the front panel, wider viewing angle



• FLVFD

构造
Structure of FLVFD



●点阵字型 Dot character type

可显示数字、英文字母、日文片假名、记号标记。
It can display alpha numeric character information.



●全点阵型 Full dot matrix type

可显示图表、图形、汉字等。
It can display graphic information including pictures and charts.



多彩荧光显示屏 Multi-Color VFD

具10种以上鲜艳颜色的美丽显示。

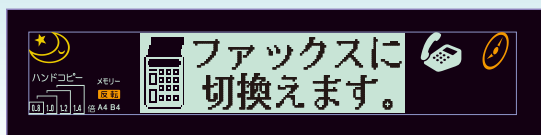
Beautiful display patterns for more than 10 vivid colors.



混合型荧光显示屏 Hybrid VFD

能清楚传达文字和图标二种内容。

Clear information capability with characters and icons.



双层显示荧光显示屏 Bi-Planar VFD

双层显示能显示更多情报，也可显示立体感效果。

Bi-Planar VFD; Double layer of information and 3-D image.



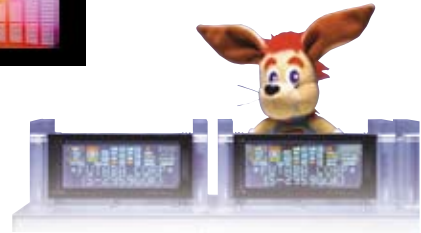
背透式荧光显示屏 Clear background VFD

显示区域背面可以透视，可以和背光组合显示。

Since the rear glass is transmissive, an attractive display expression is realized combined with the back lighting.



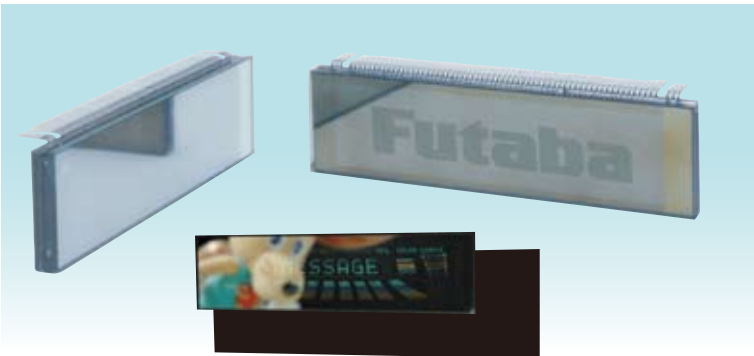
与背光式组合显示例
Clear Background VFD with back lighting



金属质感荧光显示屏 Metallic Face VFD

具有金属质感光泽的新型VFD。

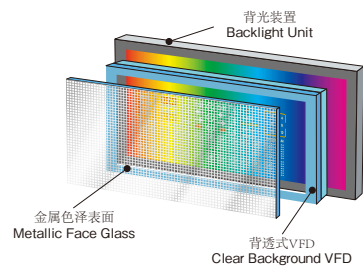
VFD which has metallic luster appearance is newly developed.



**结合金属面与背透式的VFD
Metallic Face & Clear Background VFD**

背透式VFD的表面具有金属光泽。

A semi-transparent metallic coating is located on the back surface of the VFD.



FIVFD Fully Integrated VFD

高精度、高精细、多彩VFD。

High luminance, high resolution and multi-color



AMVFD AMVFD

超高亮度全点阵VFD。

Ultra-high luminance, full dot matrix display



配有固定架的荧光显示屏 VFD With Holder

提高插件作业效率。

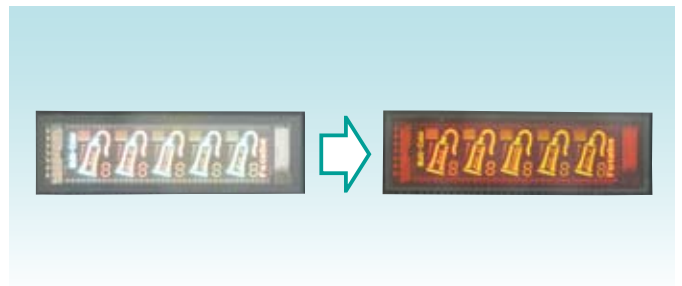
It works as a guide to insert VFD lead to PCB hole.



带印刷式滤光片荧光显示屏 VFD With Filter

VFD表面有印刷滤色片。

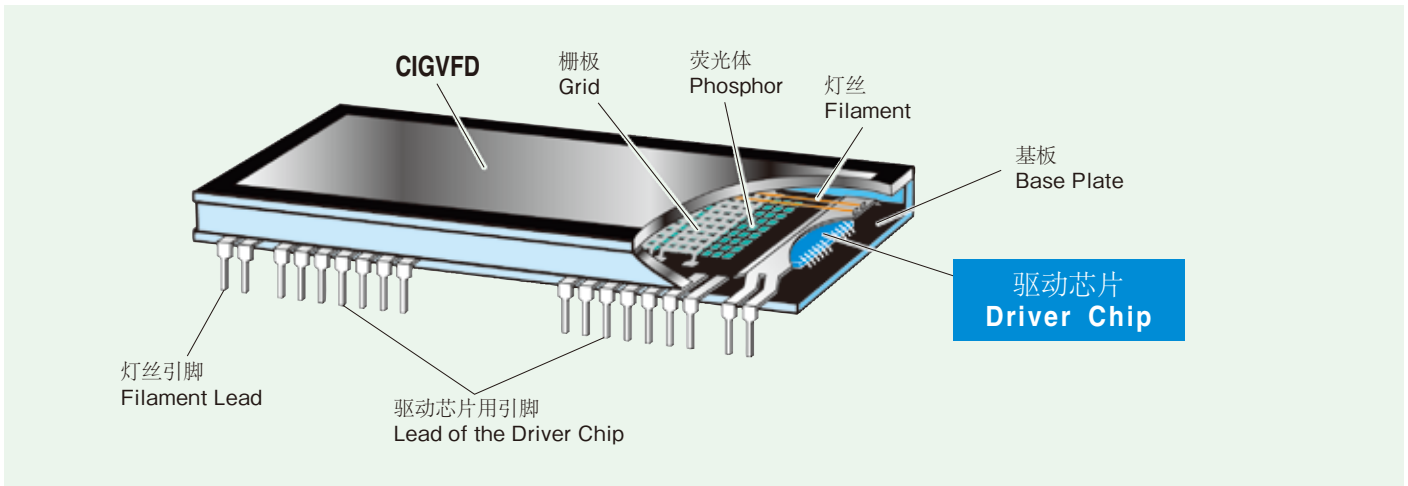
Printing filter on the glass.



CIGVFD的特点

Features of CIG VFD

■ CIGVFD的构造 Structure of Chip In Glass VFD



■概要:

CIGVFD简单来说就是内置驱动IC的VFD。在显示内容点数多时，所需引脚数也就多，要做成小型外形尺寸会有困难。当VFD驱动IC内置后，驱动VFD所需电极，除了电源和信号线以外都无需外引，可以大量减少外部引脚数。

■特点:

1. 以前很难实现的小尺寸、高密度、大容量显示的VFD成为可能。
2. 由于基板配线大量减少，基板设计也变得简单，从而缩短开发时间。
3. 基板成本可缩减。
4. 引脚大量减少，使产品装配更为容易。
5. 驱动IC内置，用户无需再另行准备驱动IC。
6. 即使是客户定制开发品，周边电路仍可以标准化。

■用途:

图像显示（全点阵）、混合表示（段码+点阵）、字符显示（5×7点阵）

■SUMMARY

CIGVFD is the VFD with a driver IC mounted on it. In many cases, a conventional full dot matrix type or 5×7 dots type had difficulty to be designed because of too many lead terminals. By mounting the driver IC chip on VFD base plate, the leads needed to drive the VFD are only for power supply and signal.

It is a drastic reduction of external leads.

■FEATURE

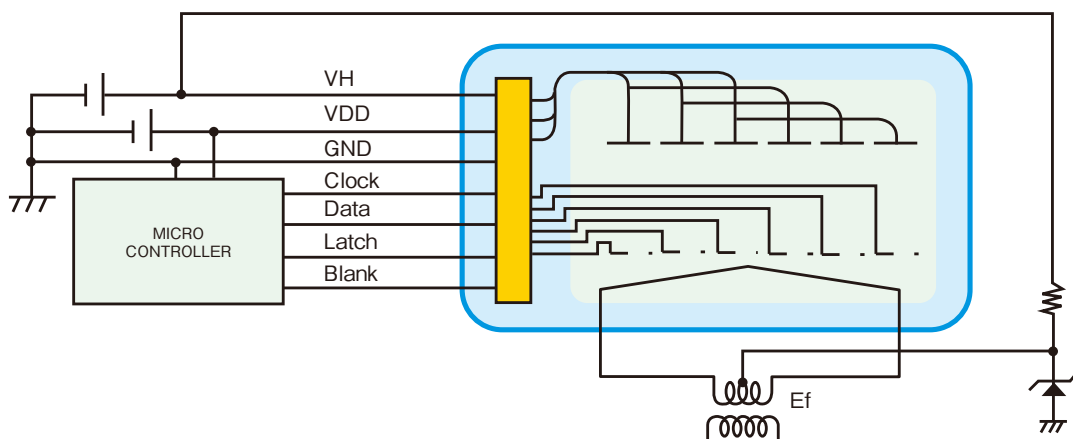
1. The small package which couldn't be realized so far, the VFD of the big capacity indication and high density can be realized.
2. Because wiring on the circuit board decrease, circuit board design becomes easy, and a development period can be shortened.
3. This VFD can reduce the cost of PWB.
4. The number of the lead terminal were drastically reduced to several connections to the PWB, which reduces the manufacturing complexity.
5. Since the VFD is constructed with driver IC, no external driver is necessary.
6. The VFD is a custom design product. When employing the VFD design, the peripheral devices can now be standardized.

■APPLICATION

Graphic, Hybrid, 5×7 dots matrix type

驱动电路图例

Example of Electrical Circuit for CIG VFD



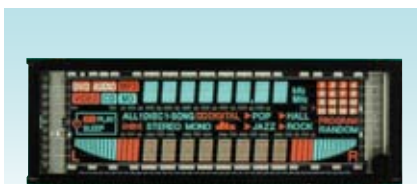
CIGVFD产品介绍

CIG VFD products

5×7控制器 5×7 dot matrix controller

内置字库，驱动变得简单。

Since character fonts are built-in, the interface is simplified.



■概要:

本品是内置字库、可以自动显示的VFD。内置有显示RAM，在显示数据被变动前，可以维持原有显示内容；另外还可做字符颜色的渐进式变换。

■特点:

- ◆栅极自动扫描
- ◆内置字库
- ◆内置用户可以自定义的字符RAM
- ◆可以通过灰阶调节方式，达到字符颜色的渐进式变换的效果。

■SUMMARY

Automatic message display is easily implemented with CIG VFD which has built-in character fonts. The built-in display RAM keeps displaying messages until there is a change in data. Color shifting of characters is also available.

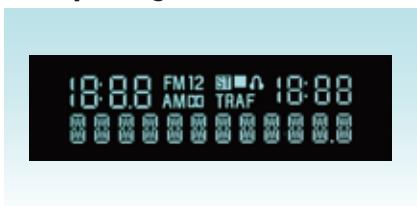
■FEATURE

- ◆Grid auto scanning
- ◆Characters ROM(Custom order available)
- ◆User definition character RAM
- ◆Section gray scale control

车用电源对应显示控制器 Display controller for automotive battery level

低电压下可实现多字画控制驱动。

Multiple segments are controllable even at low voltages such as automotive battery level.



■概要:

本品对应车用电池电压，有动态驱动型，也可做5×7点阵字等多字画显示。

■特点:

- ◆有1/3 DUTY显示控制型
- ◆有内置按键扫描功能型
- ◆工作温度: -40~85度C, 保存温度: -55~100度C

■SUMMARY

CIG VFD is usable at automotive battery voltage. A dynamic drive type is also available. Multiple segment displays, such as 5x7 dot character, can also be used.

■FEATURE

- ◆A triplex display controller type is available.
- ◆Some types have a built-in key scanning function.
- ◆Operating temperature: -40 to 85°C
- ◆Storage temperature: -55 to 100°C

显示控制器 display controller

内置显示控制器，操作简单。

With a built-in controller, operation is simplified.



■概要:

可以通过简单命令写入要显示的数据到RAM，使其自动显示。由于有自动显示功能，写入的数据在被更改之前，可以维持自动显示原有的内容。

■特点:

- ◆无需对栅极做扫描控制
- ◆数据只需一次写入就可维持显示状态
- ◆软件驱动的负荷减少
- ◆可以做16级灰阶调节

■SUMMARY

Message can be displayed by writing data into the display RAM using a simple command. The data written into the display RAM maintains the displayed message on the screen until there is a data change made by the automatic display function.

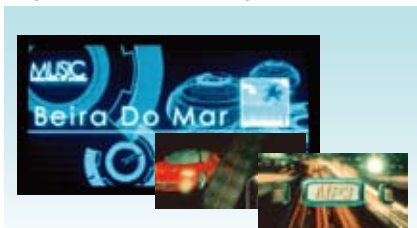
■FEATURE

- ◆No grid scanning is needed.
- ◆Displayed message or image is maintained only by writing display data.
- ◆Load required for the microcontroller is reduced.
- ◆Gray scale is available up to 16 levels.

FIVFD Fully Integrated VFD

高亮度、高精度、多色彩对应

High luminance, high resolution and multi-color



■概要:

本品系内置16级灰阶调节功能的CIGVFD。可显示带灰阶的动画图像效果，提高画面表现力。

■特点:

- ◆动画显示
- ◆具高亮度、高精度的立体感表现
- ◆动画和文字交叉混合显示
- ◆多重颜色图像显示
- ◆亮度为一般产品的2倍以上
- ◆像素点距在0.4mm以下

■SUMMARY

CIG VFD with a built-in function to display data in 16 gray scale levels. Based on this gray scale capability, a variety of images can create an attractive display.

■FEATURE

- ◆Picture expression.
- ◆3-D effect is represented with high luminance and high resolution.
- ◆Capability of superimposing text information on motion picture.
- ◆Multicolor re-configurable display
- ◆High Luminance: Twice of that of conventional one.
- ◆Pixel Pitch: Less than 0.4mm

AMVFD AMVFD

超高亮度全点阵显示屏

Ultra-high luminance, full dot matrix display



表示例

■概要:

在IC的上面配置荧光体，实现点阵之静态点亮，最适于需超高亮度的抬头显示器(HUD)使用。

■特点:

- ◆内置驱动器、控制器、记忆体功能
- ◆全点阵显示
- ◆采用高辨识性的绿色显示

■SUMMARY

By applying phosphor directly onto the IC, static drive of the pixels is obtained. Most suitable type VFD for a HUD (Head Up Display) which requires high luminance.

■FEATURE

- ◆Driver, controller and memory functions are built-in.
- ◆Full dot matrix display
- ◆Green display with excellent readability.

产品介绍

Product Information

VFD标准品一览表

List of Standard VFD

段码型 (计算器、收银机、电子秤用)

Segment Type (Calculator, Electronic Cash Register and Balance)

C.H.:文字高 Character Height
 C.W.:文字宽 Character Width
 C.P.:文字中央部到下一个文字中央部的距离 Distance between the centers of character
 P.L.:外形长度 Horizontal Length of the Package
 P.H.:外形高度 Vertical Length of the Package
 P.T.:外形厚度 Thickness of the Package
 L.P.:引脚长度 Lead Pitch
 L.L.:引脚间距 Lead Length

品名 Type Number	位数 No. of Digits	显示内容 Character Pattern	文字尺寸 Character Dimension			外形尺寸 Outer Dimensions				
			C.H.	C.W.	C.P.	P.H.	P.L.	P.T.	L.P.	L.L.
7-LT-73GK	7	0000000	13.0	6.0	10.6	33.5	100.0	8.0	2.54	7.5
9-LT-03GNAK1	9	000000000	12.4	6.3	12.0	33.5	135.2	8.0	2.0	6.0
10-MT-153GNK	10	0000000000	10.0	4.5	8.4	25.0	106.0	6.1	2.54	7.5
13-MT-102N	13	0000000000000	11.0	3.1	6.6	20.5	110.2	6.5	2.54	33.0
13-LT-68GN	13	0000000000000	15.0	4.2	7.0	25.0	114.6	6.1	2.54	40.0
15-MT-42G	15	000000000000000	8.0	3.5	6.4	20.5	118.2	6.1	2.54	22.0

段码型 (时钟、定时器用)

Segment Type (Clock and Timer)

: 车用
 : Automotive

品名 Type Number	位数 No. of Digits	显示内容 Character Pattern	文字尺寸 Character Dimension			外形尺寸 Outer Dimensions				
			C.H.	C.W.	C.P.	P.H.	P.L.	P.T.	L.P.	L.L.
2-BT-428GN	3.5	10:00	7.6	4.0	6.9	18.5	48.2	6.1	2.0	8.2
4-BT-68NY	3.5	10:00	7.6	4.0	7.0	20.5	48.2	6.1	2.54	5.0
4-BT-224GNM	3.5	10:00	8.0	4.4	7.0	20.5	48.2	6.1	2.54	8.2
4-BT-52NM	4	00:00	7.6	4.0	7.7	25.0	55.6	6.1	2.54	8.2
4-BT-245INK	3.5	10:00	7.6	4.0	6.5	16.2	54.2	5.5	2.0	5.5
4-LT-123GK	4	00:00	14.0	7.8	18.0	29.0	95.0	6.1	2.54	6.1
5-MT-253N/NA	4	00:00	10.0	4.8	7.0	20.5	60.0	6.5	2.0	19.5/17.5
10-BT282GINK	-	00:00:00 000000	6.0	3.7	4.7	25.0	75.0	6.6	2.54	14.5

英文字母式段码型 (计算器、收银机、电子秤用)

Alpha Numeric Type (Calculator, Electronic Cash Register and Balance)

品名 Type Number	位数 No. of Digits	显示内容 Character Pattern	文字尺寸 Character Dimension			外形尺寸 Outer Dimensions				
			C.H.	C.W.	C.P.	P.H.	P.L.	P.T.	L.P.	L.L.
16-LY-03G	16	0000000000000000	12.5	7.0	11.0	29.0	205.2	8.0	2.0	10.0
20-LY-05GK	20	00000000000000000000	12.5	7.0	10.5	29.0	250.2	8.0	2.0	6.5

5X7点阵字型

Dot Character Type

字形控制驱动IC内置型 驱动IC内置型
 It includes VFD driver of character controller. It includes VFD driver.

品名 Type Number	位数 No. of Digits	显示内容 Character format	文字尺寸 Character Dimension			外形尺寸 Outer Dimensions				
			C.H.	C.W.	C.P.	P.H.	P.L.	P.T.	L.P.	L.L.
8-MD-06INKM	8	5×7	8.0	4.1	7.6	16.2	81.2	6.0	2.0	4.1
12-BD-02INK	12	5×7	6.7	4.7	6.9	18.5	118.2	6.5	2.0	10.0
12-BD-03INK	12	5×7	6.3	3.2	5.2	16.2	90.0	6.0	2.0	7.0
16-BD-11INK	16	5×7	7.4	3.5	5.5	16.2	118.2	5.9	2.0	10.0
16-SD-03GK	16	5×7	5.0	3.5	4.8	20.5	100.0	6.1	1.5	6.5
16-SD-13GINK	16	5×7+cursor	5.0	3.3	4.6	16.2	100.0	6.1	2.0	9.5
16-MD-12NK	16	5×7	8.6	3.8	5.9	16.2	118.2	6.5	1.78	4.0
16-MD-05GK	16	5×7+Dp,com	8.8	5.2	8.4	25.0	160.2	8.0	2.0	6.5
202-SD-16GNM	20×2	5×7	5.34	2.35	3.6	25.0	96.9	6.1	1.25	5.5
162-MD-05GN	16×2	5×7	8.5	3.7	5.0	33.5	106.2	8.0	1.5	4.0
162-MD-02G	16×2	5×7+Dp,com,descriptor	8.5	5.0	8.0	40.0	160.2	8.5	1.78	8.5
20-SD-06GK	20	5×7	4.3	2.4	3.7	16.2	100.0	5.5	1.5	6.0

●可在我司主页上下载最新的标准品规格书：http://www.futaba.co.jp/en/display/d_dl/index.html
The product specification can be downloaded from http://www.futaba.co.jp/en/display/d_dl/index.html

5X7点阵字型 Dot Character Type

CIG 驱动IC内置型

CIG It includes VFD driver.

品名 Type Number	位数 No. of Digits	显示内容 Character format	文字尺寸 Character Dimension			外形尺寸 Outer Dimensions				
			C.H.	C.W.	C.P.	P.H.	P.L.	P.T.	L.P.	L.L.
202-SD-08GK	20×2	5×7+cursor	5.0	3.5	5.2	33.5	135.2	8.0	1.5	3.0
202-BD-01GINK CIG	20×2	5×7+Dp,com,cursor	6.8	3.8	5.4	33.5	135.2	6.6	2.0	6.0
202-MD-15GINAK CIG	20×2	5×7	8.9	3.9	4.9	33.5	130.0	6.0	2.0	7.9
202-MD-20GINK CIG	20×2	5×7+Dp,com,descriptor	9.0	5.3	7.9	40.0	188.0	9.0	2.0	6.0
202-LD-04GK	20×2	5×7+Dp,com,descriptor	11.3	6.5	9.9	48.3	230.0	10.0	2.0	6.0
204-SD-02GN	20×4	5×7	4.8	2.4	3.8	48.3	100.0	10.0	1.0	3.6
204-LD-01GN	20×4	5×7	11.3	7.3	10.3	75.0	240.0	11.6	2.0	6.0
242-SD-04GN	24×2	5×7	5.3	2.2	3.6	25.0	110.2	6.1	1.5	3.5

段码型 (DVD、STB(机顶盒)用) Segment Type (DVD and STB)

C²CIG 内置文字字库控制型驱动IC

CIG 单纯型驱动IC

C²CIG It includes VFD driver of character controller.

CIG It includes VFD driver.

品名 Type Number	显示内容 Character Pattern	显示区尺寸 Pattern Area		外形尺寸 Outer Dimensions				
		C.H.	C.W.	P.H.	P.L.	P.T.	L.P.	L.L.
FV927ND		9.9	38.2	18.5	64.7	6.5	2.0	4.0
2-MT-237INK CIG		9.8	53.8	18.5	85.8	6.5	2.0	8.0
9-BT-199NK		8.8	74.0	16.2	100.0	5.9	2.0	10.5
11-BT-234NK		9.7	74.0	18.5	100.0	6.6	2.0	12.0
11-MT-141NK		8.0	84.2	16.2	110.2	5.9	1.78	11.5
16-BT-131INK C²CIG		12.0	86.7	20.5	118.2	5.9	2.0	10.0
16-BT-160INAK C²CIG		12.0	86.7	20.5	118.2	5.9	2.0	7.0
16-BT-169INK CIG		12.0	86.7	20.5	118.2	6.5	2.0	8.0

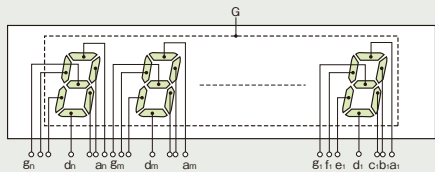
全点阵型 Full Dot Matrix Type

品名 Type Number	点数 Character Size(LxH)	显示内容尺寸 Character Dimension			外形尺寸 Outer Dimensions				
		Pattern Area(CHxCW)	Dot Size(HxW)	Dot Pitch(H/L)	P.H.	P.L.	P.T.	L.P.	L.L.
GP1204AI	128×64	27.42×54.96	0.33×0.33	0.43×0.43	42.0	85.0	7.6	2.0	4.5
GP1180AI	128×64	28.65×57.45	0.3×0.3	0.45×0.45	42.0	85.0	7.6	2.0	4.5
GP1212AI	256×64	28.7×115.1	0.35×0.35	0.45×0.45	44.0	145.0	7.6	2.0	5.5
GP1219AI	256×64	40.17×163.69	0.48×0.49	0.63×0.64	60.0	205.2	10.0	2.0	5.5
GP1229AI	128×32	14.3×57.5	0.35×0.35	0.45×0.45	27.0	84.0	6.6	2.0	3.5

阳极/栅极的驱动方式 Driving method for Anode and Grid

静态驱动

Static Drive



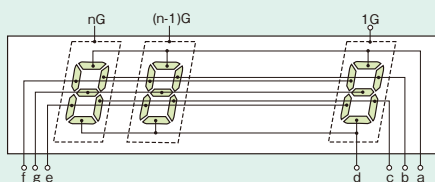
静态驱动型荧光显示屏的阳极电极连接图
Anode connection for static driven VFD

所谓静态驱动，就是段码的每一划都单独由阳极端子引出分别驱动。正电压常时加载于栅极，并对必要的阳极端子加载正电压，达到显示效果。虽然需要针对段码的数量配置相应的驱动端口，但是可以实现低电压化、高亮度化，而且不需要配置动态驱动电路。

For static drive, generally there is one grid that is individually pinned out. All anode segments must also individually be pinned out. The grid is always supplied a positive DC voltage, and each anode is supplied a positive or negative voltage depending on it's "selected" or "non-selected" status. Each anode requires an individual driver port for this driving method, low voltage drive and high luminance can be achieved with this driving method. The timing circuit which is required for dynamic drive is not needed.

动态驱动

Dynamic Drive



动态驱动式荧光显示屏的阳极电极连接图
Anode connection for dynamic driven VFD

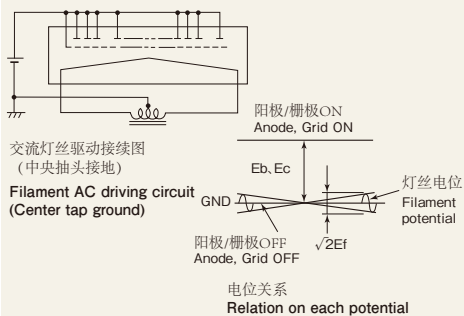
动态驱动是将每个位数，各做一栅极及引出引脚，而各栅极内的同段段码字符，则共同以一个引脚引出的驱动方式。按一定顺序对栅极引脚加载正电压，配合扫描周期对阳极引脚也加载正电压，要显示的段码，进行显示。与静态驱动相比，因为动态驱动下发光周期变小，所以需要加载的正电压相对较高，但是可以大幅减少驱动端口的数量。扫描周期设计为1/2的动态驱动时称为二重驱动(Duplex)，它是动态驱动的一种特殊形式。

For dynamic drive, there is one individually pinned out grid for each digit. Corresponding anode segments are internally connected and pinned out. With dynamic drive a large number of digits does not significantly increase the number of leads. In order to be luminate a desired segment, it's on time is synchronized with its grid scanning. Relatively higher voltage is required for dynamic drive than static drive. When the duty cycle is 1/2, it is called duplex drive.

灯丝的驱动方式 Driving method for filament

交流灯丝驱动

Filament AC Drive



交流灯丝驱动接线图
(中央抽头接地)

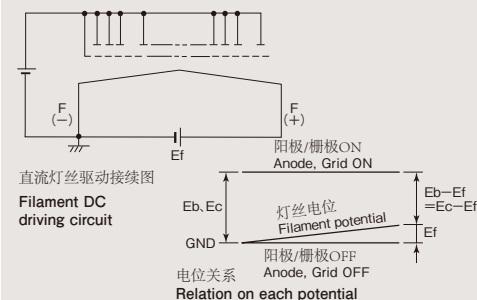
Filament AC driving circuit
(Center tap ground)

交流驱动是相对常用的驱动方法。交流驱动的情况下，灯丝电位（阴极电位）会上下波动。为保证在灯丝电位下降状态时的电位，仍比阳极、栅极的电压还要高，需加上一截止偏压（一般用稳压二极管来实现）通常截止偏压与灯丝电压用变压器的中央抽头相连，如果是侧边接头时，灯丝电位的振幅会变大，从而要求更高的截止偏压。另外，阳极、栅极电压不比灯丝电压高到一定程度，会造成接头的对面一侧比接头面的亮度高的现象。

AC filament drive is the most popular driving method for the VFD. Since the filament potential (cathode potential) has some amplitude, the proper cut off bias voltage has to be applied to make the minimum filament potential higher than the anode and grid off voltage. Generally, a zener diode is used to set the cut off bias voltage. It is recommended to ground center tap of the filament. If one end of the filament is connected to the ground, the amplitude of the filament voltage will become larger, requiring a higher cut off bias voltage. When anode and grid voltage is not sufficiently higher than the filament voltage, the luminance on the grounded side is lower than the other side.

直流灯丝驱动

Filament DC Drive



直流灯丝驱动接线图

Filament DC driving circuit

此驱动方式多用于车用电池电源驱动场合。由于在灯丝电压正极侧的阳极、栅极分到的 E_f 实效电压较低，交流驱动的VFD以直流驱动的话，会产生亮度倾斜的现象。左图为灯丝以直流电压驱动时的连接原理图及电位关系图。直流对应的VFD，为了解决亮度倾斜问题，在内部电极结构上作了修正。在与动态驱动并用的情况下，阳极、栅极驱动的输出波形可能会缺陷或产生突波，需要加载数伏特（V）左右的截止偏压来防止漏光。

DC filament drive is commonly used for battery driven VFD's. A basic connection diagram and relation of electrode potentials are shown in figures to the left. The directly heated filament has a voltage gradient from the negative side to the positive side. If a typical AC filament designed VFD is connected, luminance gradient along with the voltage drop will be observed. So, filament height of DC filament designed VFD is offset to correct the luminance gradient. When a DC driven filament is used together with dynamic driven anodes and grids, unwanted noise or spikes can occur on the anode or grid driver output. A few volts of cut off bias voltage are required to prevent cross talk.

驱动电压 Drive Voltage

■阳极、栅极电压

指相对于灯丝电位的电压。实际供给阳极、栅极的电压是带有截止偏压后的电压。由MCU直接驱动时（使用带高耐压端口的VFD驱动内藏型MCU时），输出段的电压会是负电源。

■Anode, Grid Voltage

Anode and grid voltages must be higher than the filament voltage in order to illuminate the display image. The voltage applied to the driver is sum of anode or grid voltage and cut off voltage. When the VFD is directly driven by micro-controller (micro-controller with built-in VFD driver), the output becomes negative voltage power supply.

■灯丝电压

灯丝会放出让荧光体发光的必要之热电子。灯丝电压太高的话，灯丝表面氧化物的涂层会蒸发，导致亮度劣化加速、缩短使用寿命。灯丝电压过低的话，无法释放出稳定的热电子，导致显示效果变差。因此灯丝电压必须设定在额定值(Typ)。

■Filament Voltage

Application of a specified voltage raises the temperature of the filament cathode, which causes thermionic emission. Excessive voltage causes evaporation of the coating and leads to degradation of display quality and reduces the lifetime of the display. Insufficient voltage causes unstable thermionic emission and leads to degradation of display quality. The rated filament voltage should be carefully maintained.

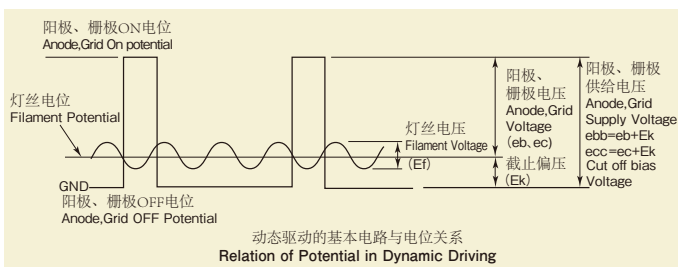
■截止偏压

当阳极、栅极输出为OFF时，其电位还是比灯丝电位高的话，热电子还是会到达阳极产生发光现象（漏光）。为了防止该情况出现，必须提高灯丝的电位；使此灯丝电位提高的电压叫作截止偏压。一般我们用稳压二极管来做截止偏压电路。规格书里所记载的截止偏压(Ek)，是指当灯丝电压(Ef)为正弦波，采用中央抽头连接的情况下的电压。

■Cut Off Bias Voltage

If the filament potential is lower than the anode and grid cut off voltage, thermionic electrons can reach the anode and cause illumination of the phosphor. The filament bias voltage should be increased to prevent this problem. Generally, a zener diode is used to obtain the bias voltage. The cut off bias voltage specified in the specification is calculated from the sine wave filament voltage and filament center tap condition.

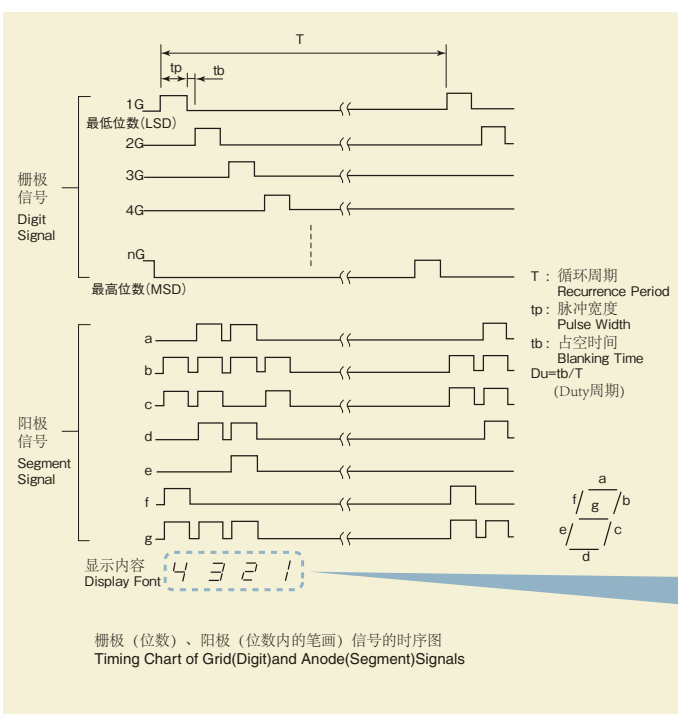
驱动波形 Relationship of Electrode Potential of Dynamic Drive VFD



左图为动态驱动时的驱动波形图。阳极、栅极的供给电压为阳极、栅极原本的电压加上截止偏压后的电压。要防止漏光现象发生，只需将灯丝电位提高到截止偏压的准位即可。

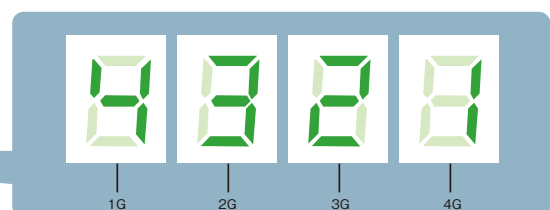
The figure shows relationship of electrode potential of dynamic driven VFD. Anode and grid supply voltage is the sum of anode or grid voltage and cut off bias voltage. Filament bias voltage(EK) is required to prevent improper illumination.

栅极和阳极信号时序图 Timing Chart of Grid (Digit) and Anode (Segment) Signals



图为信号时序图，让栅极进行自动扫描，阳极的信号要与栅极波形同步送出，从而显示想要的显示内容。下图所示的是分别在第1、2、3、4栅极内，显示4、3、2、1的图形时的情况。

This figure show the timing chart of the grid (digit) and anode (segment) signals. The individually pinned out grids are repeatedly and sequentially driven per the wave forms in figure. Anodes that are to be illuminated are driven synchronously with their corresponding grid. The figure gives an example of which segments to drive for the characters "4,3,2,1" to be illuminated under grids 1,2,3 and 4 (1G, 2G, 3G and 4G).



1G栅极为ON的同时，阳极的b、c、f、g笔画也设为ON，会在1G显示为4；以同样方式在2G、3G、4G位分别显示3、2、1。

The timing the grid 1G is on, and the anode b, c, f and g is on. It shows 4 on 1G, 2G, 3G, and 4G also shows 3, 2, and 1 same as 1G is driven.

全点阵的驱动方法 Driving method for full dot matrix

	构造 Structure	驱动原理 Principal of VFD operation	扫描时序图 Timing chart
4重阳极矩阵 Quadruple anode matrix	<p>栅极分割图 Grid assignment</p> <p>配线例 Example of wiring</p>	<p>灯丝 Filament 栅极 Grid 阳极 Anode</p> <p>S-1 S-2 S-3 S-4</p>	
双线式栅极 Dual wire grid	<p>正视图 Front view</p> <p>侧视图 Cross view</p>	<p>灯丝 Filament 栅极 Grid 阳极 Anode</p> <p>发光区域 Lighting area</p>	

通用型栅极驱动方法 Driving method for universal driving

栅极时序图
Grid timing chart

栅极分割图 Grid assignment

要点亮跨越两个栅极的图形 (▷), 须将该两个栅极同时设定为ON。
The pattern with more than one grid. (▷) is luminous to be powered on them at a same time.

阳极连接图 Anode connection table

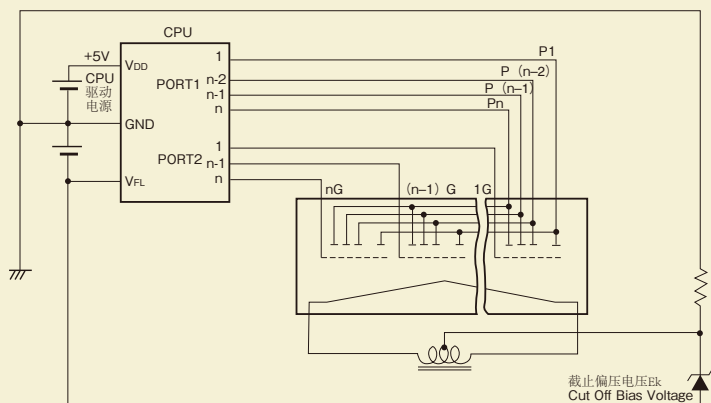
	1G	2G	3G
P1	1a	2a	3a
P2	1b	2b	3b
P3	1f	2f	3f
P4	1g	2g	3g
P5	1c	2c	3c
P6	1e	2e	3e
P7	1d	2d	3d
P8	○	◁◁	▷▷
P9	□□		▷

阳极时序图 Anode timing chart

	1G	2G	3G
P1	T1	T2	T3
P2	T1	T2	T3
P3	T1	T2	T3
P4	T1	T2	T3
P5	T1	T2	T3
P6	T1	T2	T3
P7	T1	T2	T3
P8	T1	T2	T3
P9	T1	T4	

驱动电路例 (MCU直接驱动)

Example of Electrical Circuit for Driving VFD (Micro Controller Direct Drive)



使用自带高耐压端口的MCU直接驱动VFD时的连接示意图。

An example of VFD direct driving using a microcontroller with high voltage output ports is shown in this diagram.

VFD用驱动IC (市售驱动IC)

Driver for VFD

详情请向各IC厂家确认。

① 单纯型驱动器 (串联输入/并联输出)

内置移位寄存器及门锁器的驱动器。使用在静态驱动的VFD或高电压、多端口数的VFD上。

① Driver (Serial In-Parallel Out)

Driver of this type has built-in shift register and latch. It is commonly used for static drive VFD, high voltage drive VFD or VFD with large number of ports of display.

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
NEC	μPD6700	18V	Positive	47
	μPD16306	80V	Positive	64
	μPD16310	80V	Positive	40
001(セキヨウ)	ML9271	18V	Positive	48
	ML9272	65V	Positive	40
PTC	PT6305	70V	Positive	48
	PT6306	70V	Positive	64

③ 控制型驱动器2(内置文字字库)

主要使用在5×7点阵显示, 已含有文字字库在内。

③ Controller Driver 2 (with character fonts)

This type of driver is commonly used for 5x7dots display pattern. Character font is preregistered.

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
HOLTEK	H16514	50V	Positive	5x7dot-24digits 2rows
JRC	NJU3430	45V	Negative	5x7dot-16digits
RENESAS	M66004	40V	Negative	5x7dot-16digits
001(セキヨウ)	ML9203	60V	Positive	5x7dot-16digits 2rows
	ML9208	42V	Negative	5x7dot-16digits
	ML9209	42V	Negative	Alpha Numeric-16digits
	ML9286	80V	Positive	5x7dot-20digits
	ML9289	42V	Positive	Alpha Numeric-16digits
PTC	PT6302	45V	Negative	5x7dot-16digits
	PT6314	70V	Positive	5x7dot-24digits 2rows
SANYO	LC75710	50V	Negative	5x7dot-16digits
	LC75711	50V	Negative	5x7dot-16digits
	LC75712	50V	Negative	5x7dot-16digits

单片机型(内置VFD驱动器)

Micro Controller (built in VFD driver)

Maker	Type	Parts Number	Package (Pin)	VFD Driver (Ports)	Output Voltage	Power Supply	Notes
FUJITSU	16bit	MB90M405 Series	100	60	43	Negative	
HOLTEK	8bit	HT49RV3/HT49CV3	52	22	30	Negative	
		HT49RV5/HT49CV5	56	22	30	Negative	
		HT49RV7/HT49CV7	100	22	30	Negative	
		HT49RV9/HT49CV9	100	28	30	Negative	
NEC	8bit	μPD789871 Sub Series	52	25	45	Negative	
		μPD780208 Sub Series	100	53	45	Negative	
		μPD780232 Sub Series	80	53	45	Negative	
		μPD784976A Sub Series	100	48	45	Negative	
PANASONIC	8bit	MN101C87 Series	64	26	40	Negative	
		MN101C88 Series	100	53	40	Negative	
		MN101CA3 Series	100	53	40	Negative	
		MN101CA5 Series	112	57	40	Negative	
		MN103SD3 Series	100	—	—	—	CIGVFD display controller
RENESAS	16bit	M16C/39P Group	100	34	45	Negative	
SANYO	8bit	LC876 Series	100	52/48	40	Negative	

② 控制型驱动器1

带内存的驱动器, 可自动输出控制栅极的时序, 只需将要显示的资料写入一次, 就可自动显示其内容。

② Controller Driver 1

Driver of this type has display memory. It can generate grid timing by itself. Once data is send, display image can be maintained.

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
HOLTEK	HT16511	35V	Negative	8Gx20S~16Gx12S
	HT16512	35V	Negative	4Gx16S~11Gx11S
	HT16515	35V	Negative	4Gx24S~12Gx16S
JRC	NJU3426	45V	Negative	14Gx16S
	NJU3427	45V	Negative	4Gx28S~16Gx20S
NEC	μPD16311	35V	Negative	8Gx20S~16Gx12S
	μPD16312	35V	Negative	4Gx16S~11Gx11S
	μPD16313	35V	Negative	4Gx16S~11Gx11S
	μPD16315	35V	Negative	4Gx24S~12Gx16S

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
PTC	PT6311	35V	Negative	8Gx20S~16Gx12S
	PT6312	35V	Negative	6Gx16S~11Gx11S
	PT6313-S	35V	Negative	4Gx12S~8Gx8S
	PT6315	35V	Negative	4Gx24S~12Gx16S
	PT6315-S	35V	Negative	4Gx12S~8Gx8S
	PT6351	35V	Negative	12Gx16S~16Gx12S
PTC	PT6355	35V	Negative	7Gx18S~10Gx16S
	PT6324	35V	Negative	16Gx24S
SANYO	LC75725	45V	Negative	(4~11G)x43S

④ 汽车电源用复式驱动器

以使用车用电源电压为主, 工作周期(DUTY)为1/2的驱动器, 也有带亮度调整及按键扫描功能。另亦有工作周期为1/3之系列产品。(Triplex驱动)

④ Duplex Drive for Automotive Battery

This type of driver is specialized for duty=1/2 driving conditions using automotive battery voltages. Some driver also have dimming and key scan function.

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
001(セキヨウ)	ML9212	18V	Positive	3Gx32S
	ML9213	18V	Positive	3Gx56S
	ML9226	18.5V	Positive	3Gx32S
	ML9227	18.5V	Positive	3Gx27S
	ML9228	18.5V	Positive	3Gx82S
	SANYO	LC7573	18V	Positive
LC7574		18V	Positive	2Gx37S
LC75741		18V	Positive	2Gx53S
LC75742		18V	Positive	2Gx41S
LC75750		18V	Positive	3Gx88S
LC75754		18V	Positive	3Gx24S
LC75756		18V	Positive	3Gx52S
LC75757		18V	Positive	3Gx41S

⑤ 其他

时钟等专用驱动器。

⑤ Others

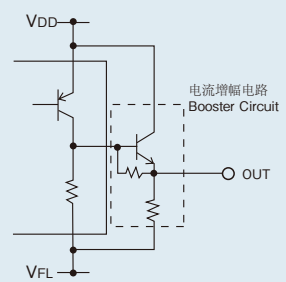
Custom drivers for clock are also available.

Maker	Part Number	Output Voltage	Power Supply	Number of Ports
HOLTEK	HT16561	18V	Positive	12H static
	HT16562	18V	Positive	12H 1/2Duty
	HT16565	18V	Positive	24H static
001(セキヨウ)	HT16566	18V	Positive	24H 1/2Duty
	ML9298	18V	Positive	12H 1/2Duty

电流增幅电路 Booster Circuit

若有一部分驱动器输出电流能力不足时, 可如下图方式外接三极管使用。

If some driver ports do not have enough output capability, external transistor can be connected as shown below.



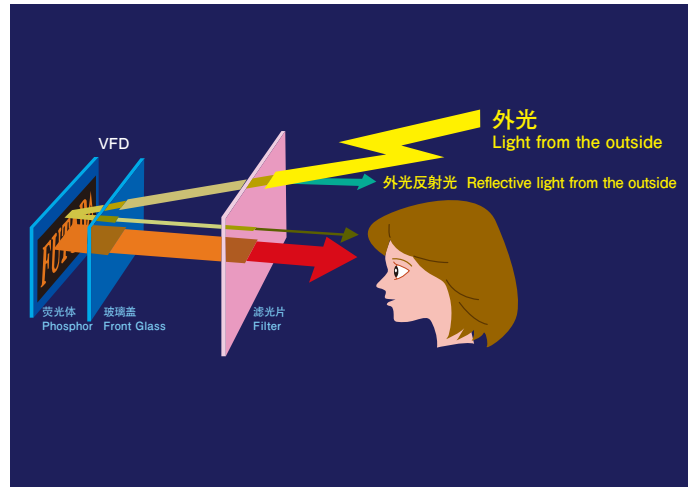
滤光片

Filter

(1) 提高对比度 Improve Contrast

VFD显示部的荧光体，未点亮时的颜色接近于白色；受到外光照射时，点亮部分和未点亮部分的对比度较低。为了防止上述情况，使用滤光片来抑制外光反射，提高对比度和视认性。另外，也可以使人眼不易看到VFD的内部构造。一般上，透过率在民用规格为20~40%，车载规格为5~20%。

The phosphor that is display segment in VFD is almost white. If the light from the outside shines the phosphor, the contrast between on and off segment gets worse. The optical filter avoids the reflective light on the phosphor to improve contrast and readability. And also, it has an effect that the structure inside of VFD is difficult to be seen. The transmissivity of the optical filter is generally used 20~40% in commercial application, 5~20% in car application.



(2) 变换颜色 Color Modulation

通过滤光片可以改变发光色。

A) 变更颜色

因为绿色具有亮度高、光谱宽广的特性，跟各种滤光片组合后，能显示出蓝到红等各色的发光效果。另外，跟粉红色系（葡萄酒红色系）的滤光片组合后，可以显示出白色。当采用以绿色为主，再加上其它红或蓝色系等多色荧光体时，因红色滤光片不易使蓝色光透过，因此在滤光片的选用上也需特别注意。

B) 提高颜色的纯度

使用与发光色同色的滤光片，可以得到更鲜艳的颜色。

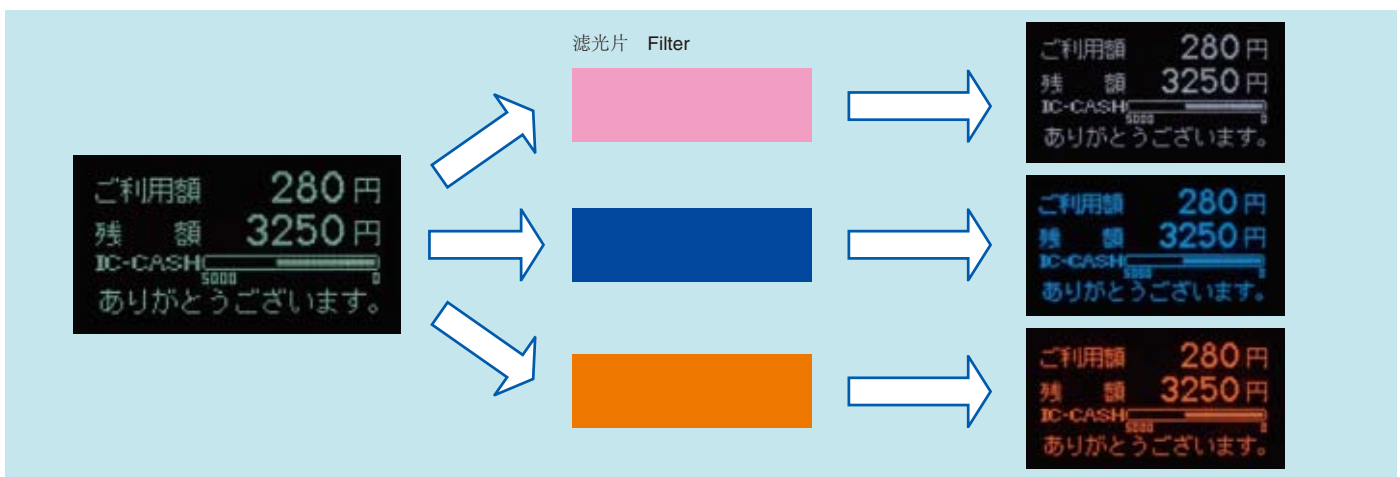
The color of light can be changed through the optical filter. Some examples are shown below.

A) Changing the Color

The color green is high luminous and has a wide spectrum. It gets appropriate color from blue to red combined with various optical filter. Pink filter (color is almost wine red) can turn the color to white. The various colors of phosphor have been developed. Used red or blue with main color green, the optical filter of color close to red is difficult to transmit the blue light. The blue light is hard to be seen because of the characteristic of the filter.

B) Improvement of Color purity

By using same color filter as luminous light make the color more vivid.



(3) 保护VFD Guard the VFD

因为VFD是玻璃制品，对强压和冲击耐力较弱，所以需要外壳保护。在音频和视频等设备上，为了提高整体外观和对比度的效果，也可以考虑使用带颜色的透明丙烯酸树脂等的着色塑胶材料。在使用滤光片时，请与滤光片制作厂商作讨论，并以实物做充分的效果确认。

为了防止VFD外围出现外光的反射现象，可以在VFD的外围部分增加遮挡外光(需从外面看不到)的结构件。

VFD is weak to a high pressure and a shock, since VFD is made of glass. It needs a guard cover. The optical filter is used both as improvement of set appearance and as improvement of contrast. So that the filter of commercial equipment like audio and video set is made of semitransparent plastics like acrylic resin. In case of using filter in practice, please consult with filter manufacturer and confirm the real one carefully.

To avoid diffused reflection on the glass edges, glass edges should be masked.

固定架

Holder

■ 固定架的目的

- 固定荧光显示屏位置
- 使荧光显示屏的引脚易于插入基板
- 提高抗震动强度

■ 荧光显示屏固定架的设计注意事项

1. 基准面(Datumline)为玻璃基板, 请不要以玻璃盖板面基准进行设计。
2. 斩切引脚处会有金属残留 (1.5mm MAX), 请注意。
3. 固定架上设计高度0.5mm的弹性体, 可防止PCB洗净工程的洗净液残留。
4. 弹性体机构可吸收VFD外形公差, 推荐使用弹性体设计。
5. 为避免使金属盖受到压力, 固定架需设计间隙孔。
6. 玻璃密封膏会有溢出情形 (在外形尺寸规格内), 请注意。
7. 固定架的引脚导孔采用交错式布局, 可用于引脚间距较小的荧光显示屏。使用交错式布局时, 固定架的引脚导孔与PCB插入孔间若存在空隙, 可能会导致引脚插入PCB困难, 因此尽量考虑无间隙设计。另外在使用交错布局时, 设计上需留有足够的导孔距离并极力减小导孔间的角度, 从而使荧光显示屏易于插入固定架。若使用交错布局, 组装时需先把固定架装入PCB, 然后再插入荧光显示屏, 可使引脚易于插入PCB, 提高组装效率。
8. 本公司可直接为客户提供装配好固定架的产品。

■ Purpose of VFD holder

- Position of VFD can be fixed.
- It works as a guide to insert VFD lead to PCB hole.

■ Please take the following points into the consideration for the VFD holder design.

1. Datum line is designed to the glass substrate. The front glass plate must not be used as datum plane.
2. The lead cut edge is remained at opposite side of the lead out. Normally this dimension is specified as 1.5mm Max.
3. 0.5mm stand off is recommendable to prevent the washing liquid from remaining.



4. The design that tab has a tension for VFD to absorb the tolerance is recommended.
5. Please make a hole not give stress to the metal cap for exhausting.
6. The excessive sealing paste (within the tolerance of outer dimension specification) should be considered.
7. Designing the holder to stagger lead out, PCB design can be easier for the smaller lead pitch (1.5, 1.25mm). Since every other lead tilts bisymmetry direction, the following points should be considered.
 - Lead tilt angle should be minimized to

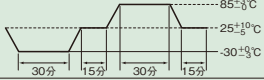
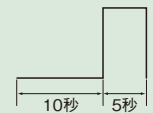
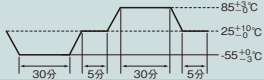
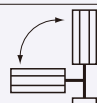
avoid difficulty for inserting the leads into the holder.

- The gap between lead out portion of holder and PCB should be minimized.
- It is recommended to attach the holder to PCB first, and then insert the VFD.

双叶电子的VFD(荧光显示屏),是以可满足下表可靠性试验要求的前提下,做设计及生产的。具有MTTF 10⁸小时以上的市场实绩。
对于亮度减低时间的预期寿命,设计时已充分考量,能满足客户应用上的需求;民用规格的预期寿命,其亮度半减期推测为3万小时以上。

Futaba VFDs are designed and manufactured to satisfy the reliability tests shown in the below table. 10⁸hour of MTTF was confirmed in accordance with field experience. Luminance life expectancy is designed to satisfy the requirements of the application fully. For consumer application, the life expectancy is estimated more than 30000 hours.

○:适用 ×:不适用
○:Applicable ×:Not Applicable

	试验项目 Test Item	试验条件 Test Conditions	用途 Application	
			一般用途 Application	车用 Automotive Use
功能耐久性试验 Function Durability	寿命 Life	于室温下,以额定电压点亮1000小时 Lighted for 1,000 hours at room temperature with applying the rated voltage.	○	○
	震动耐久 Vibration Fatigue	于点亮状态下,以加速度4.4G、频率2000cpm,做X轴方向4小时,Y、Z轴方向各2小时加震。 Lighted 4.4G acceleration, 2,000 cpm vibration applied for 4 hours in the X and each 2 hours in the Y and Z directions.	×	○
	高温动作 High Temperature Operation	于85±2℃的恒温槽中,以额定电压点亮96小时。 Lighted for the period of 96 hours at 85±2℃.	×	○
	低温动作 Low Temperature Operation	于-40±3℃的恒温槽中,以额定电压点亮96小时。 Lighted for the period of 96 hours at -40±3℃.	×	○
	温度循环 Temperature Cycling	 以额定电压点亮,做5个循环。 Lighted, subject to the specified test condition as shown for 5 cycles.	×	○
	灯丝循环 Heater Cycling	 灯丝加以120%之额定电压,重复做2万次循环。(阳极与栅极不加电压) Filament voltage at 120% of the rated voltage and 20,000 cycles without voltage applied to anode and grid.	○	○
环境试验 Environment Test	高温放置 High Temperature Storage	不点亮状态下,于85±2℃的恒温槽中,放置72小时。 Unlighted, subject at 85±2℃ for the period of 72 hours.	○	○
	低温放置 Low Temperature Storage	不点亮状态下,于-40±3℃的恒温槽中,放置72小时。 Unlighted, subject at -40±3℃ for the period of 72 hours.	○	○
	热冲击 Thermal Shock	 不点亮状态下,做5个循环。 Unlighted, subject to the specified test condition as shown for 5 cycles.	○	○
	湿度放置 Humidity(Steady State)	不点亮状态下,于40±2℃,相对湿度90~95%的恒温槽中,放置96小时。 Unlighted, subject to a relative humidity of 90 to 95% and a temperature of 40±2℃ for the period 96 hours.	○	○
物理特性试验 Physical Characteristic	震动(1) Vibration(1)	以振幅1.5mm、频率10~55Hz,扫描往返时间1分钟条件下,对X、Y、Z轴方向各做2小时加震。(不点亮状态) Unlighted, 1.5mm total excursion, 10~55Hz frequency, sweep time cycle 1 minute vibration applied for 2 hours in each X, Y, and Z directions.	○	○
	震动(2) Vibration(2)	以加速度4G、频率55~200Hz,扫描往返时间10分钟条件下,对X、Y、Z轴方向各做2小时加震。(不点亮状态) Unlighted, 4G acceleration, 55~200Hz frequency, sweep time cycle 10 minutes vibration applied for 2 hours in each X, Y, and Z directions.	×	○
	冲击 Shock	最大加速度100G、作用时间6ms、半波正弦波条件下,对X、X'、Y、Y'、Z、Z'轴各方向做3回,合计18回。(不点亮状态) Unlighted, 100G maximum acceleration, 6ms duration time, half sine wave 3 times in each X, X', Y, Y', and Z, Z' directions(18 times in total in unlightedstate).	○	○
	可焊性 Solderability	引脚于230±5℃的焊锡槽中,浸放5秒。 Immerse in a 230±5℃ solder pot for 5 seconds.	○	○
	焊接耐热性 Resistance to Soldering Heat	引脚于280±5℃的焊锡槽中,浸放30±2秒。 Immerse in a 280±5℃ solder pot for 30±2 seconds.	○	○
引脚强度 Terminal Strength	 在引脚的前端挂上一个250g的砝码,折弯至90度的角度,再返回原位置为1次,做3次往返。 A 250g weight, bend 90° and then return to original position, 3 cycles.	○	○	



以下内容是荧光显示屏在使用上的注意事项要点整理。
为了防止质量问题的发生，请在产品设计与组装工程上进行参考。

■ 发光闪烁

以动态方式驱动，在下列情况下，可能会发生闪烁(闪烁)现象；然而这个现象可以通过改变驱动频率的方式来解决，此现象与VFD可靠性无关。
设计时，请留意以下几点：

(1) 驱动频率过低

显示屏与观看者的位置处于静止的状态，在画面扫描频率较慢(约50Hz以下)时会发生闪烁现象。如显示屏与观看者处于移动的状态，即使画面扫描频率在上述频率以上，也可能感觉到闪烁。

(2) 灯丝电源频率与画面扫描频率

VFD为直热型阴极，会因为加到灯丝上的交流电，而产生电位上下变动；发光会依阳极与栅极的实效电压而变化。因此当灯丝电源频率与画面扫描频率有干涉时，会感受到显示有闪烁；画面扫描频率建议为220Hz以上。

(3) 灯丝固有震动数与画面扫描频率的干涉

灯丝和弦一样有固有震动数，当VFD受到外力冲击时，灯丝会以一定的周期震动；该震动之周期称之为固有震动数。当灯丝发生震动时，会造成灯丝和栅极间的距离变化、阳极电流变化。因此当驱动频率与固有震动数大约相等时或者是整数倍时，显示内容也会发生闪烁。

■ 漏光

(1) 截止电压过低的情况

当灯丝与交流电压驱动时，灯丝需以中央抽头方式与地相接。如灯丝的电位有比接地还低的情况发生时，会让电子流入到发光体，造成发光。在规格书内规范的截止电压规格(Ek)，是以正弦波及中央抽头做出的基准数值；如果电路是以侧边方式接地的话，会有漏光情况发生。

(2) 遮断时间(占空比)过短的情况

有关于栅极的驱动波形，在由ON变化到OFF的时候，电压会有下降较慢的情形。当栅极的驱动波形还没降到最低，下一个栅极的信号就被设定为ON了的话，就会发生漏光。有此情形时，

请加大遮断的时间(占空比)。

(3) 在栅极与阳极的驱动波形上，有突波杂讯时

如果在驱动波形上有突波杂讯存在时，会产生漏光现象。有此情形发生时，可以在输出端和负电源之间，加入电容器或电阻等，此法可以使突波杂讯变小。

■ 灯丝电压

(1) 阴极温度(由灯丝电压控制而来)是左右VFD寿命很重要的一个因素，为了得到亮度平均的良好发光效果，灯丝请一定要使用规格范围内的电压驱动，使阴极温度在规范范围内。另外绝对不能以调整灯丝电压作为亮度控制的方法。

(2) 灯丝电压方面，以直流作为规格的VFD请给直流电压，以交流作为规格的VFD请给交流电压。如果交流规格的VFD供给直流电压的话，会造成左右方向上的亮度倾斜发生。(反之也会一样)

(3) 灯丝电压波形，在非正弦波场合时，请设定使其电压之有效值与规格电压相同。

(4) 为了截止偏压电路能简便设计，可采在灯丝电路上取出一中点电压，或于灯丝的电源变压器上设一中央抽头，再由该处接上截止偏压(Ek)的方式来做。

■ 亮度调整(减光)

为了对应周围环境的亮度，有时需要对VFD的亮度做调整控制。例如在晚上时不需要很高的亮度，如显示的亮度未做调整的话，会过于刺眼。在那个时候，可以将栅极的扫描驱动周期不动(画面频率)，将阳极与栅极的输出脉波工作宽度调小(或占空比变大)，然后亮度就会降下来；另亮度与脉波工作宽度(或占空比)是成比例关系的。静态驱动屏的亮度，也可以用同样的方法来调控；此时的静态驱动屏与动态屏的驱动同样，会因其驱动的频率周期，发生发光闪烁的现象。有此状况时，请参考之前关于「发光闪烁」的说明内容。虽然以降低阳极、栅极的电压方式，也可以调控亮度；但是此方式可能会造成亮度不均的问题，因此不推荐。

■ 安装和处理

- (1) 直接徒手去取拿荧光显示屏的话，容易造成引脚的焊接性劣化、沾污玻璃显示面等情形发生，因此建议戴手套或手指套后取拿。
- (2) 如果有需要对引脚做弯折动作时，请注意不要让引脚根部的玻璃封着部分受力过大，以免产生裂纹和剥落。通常要对引脚做弯折动作时，弯折的部位至少要离引脚根部2mm以上。
- (3) 荧光显示屏的包装，虽然已使用缓冲材对VFD玻璃开裂和剥落做防止，仍请不要让其受到保证G力以上的冲击力或震动等。
- (4) 排气管是荧光显示屏机械结构上，最弱的一个地方；实装时或者实装后，请注意不要使其受到外力时，与其它的部品个体碰触。排气管的周边，请留下充分的空间。
- (5) 在工程作业间，可能会让排气管受到损伤、玻璃表面划伤。请考虑使用适当的包装内装箱或托盘等保护。
- (6) 超声波会使灯丝断线与荧光体剥落，绝对不可使用超声波做洗净。
- (7) 用来做玻璃密封的材料，容易因酸性和碱性等而劣化，如有不得不采用助焊剂时，请注意用清水充分清洗干净。
- (8) 在焊接工程时，请注意不要使荧光显示屏受到保证以上的热冲击。
- (9) 做安装时，推荐使用固定架。

■ 运输

为了避免敝公司产品，在运输中造成破损或玻璃表面刮伤情形发生，我们已在包装上做了充分的考量。如果有需要搬运时，请尽量使用我们送抵贵公司时的包装样式。

■ 保管

在高温、高湿甚至盐分或硫磺成分较高的环境下做长时间保管的话，引脚的可焊性或脚与脚间的绝缘性会有劣化，玻璃的表面也会变得较不透明，因此请存放于适当的场所。另当长期保存后再使用时，请再次做粘化处理。



This sheet shows some important points for handling and driving VFDs.

■ Flickering

When a VFD is driven dynamically, flickering may occur as a result of driving frequency. This phenomenon can be resolved by changing the driving frequency. When designing, please note the following.

(1) The driving frequency is too low

When the display and the observer are not moving, flickering can occur when the driving frequency is below 50 Hz. If the display and/or the observer is moving, flickering can occur even if the driving frequency is above 50 Hz.

(2) Interference between filament frequency and grid scanning frequency

The filament is used as a cathode. When the cathode potential is changed by the AC power supply voltage of the filaments, the effective voltage of the anodes and grids is changed. This can result in interference between the frequency of the AC power supply of the filaments and the grid scanning frequency, which could cause flickering in the display. It is recommended that the filament driving frequency stay above 220 Hz.

(3) Interference between resonant frequency of filaments and the frame frequency

Each filament wire has a natural resonant frequency. When a mechanical shock is applied to the display, the filaments will vibrate. When a filament vibrates, the distance between the filament and the grids change, causing the frequency as that of the filaments. Flickering occurs when the driving frequency of the grids is almost the same as the resonant frequency of the filaments or a harmonic of it.

■ Un-balanced Lighting

1) Cut off bias voltage is not sufficient

Segments luminesce when a positive voltage as referenced to the filament is applied simultaneously to the anode and grid. When either the grid or anode voltage are lower than the filament potential, segment luminescence ceases. To turn a luminescing segment off the anode or grid must usually have a negative potential to that of the filament. This negative potential is called cut off bias voltage. Partial lighting may occur if the cut off bias voltage is not sufficient for the AC filament drive. The cut off bias

voltage called out in the specification is calculated using sine wave filament voltage and filament center tap condition. The side tap bias condition may cause a greater amount of unwanted lighting if too low of a voltage is applied.

2) Blanking time is not sufficient

Blanking time is required between grid on times to prevent unwanted partial luminance of a segment that is off. The bottom of the grid waveform tends to be rounded, particularly when it transitions from on to off. A blanking time of 20 microseconds is typically used.

3) Grid or Anode drive pulse has spike noise

If the driving pulse has capacitive noise, partial lighting may occur. Adding a capacitor or resistor between the negative power supply and the output can solve this problem.

■ Filament Voltage

1) The life of VFD's depend considerably upon the cathode temperature. The filament voltage is properly applied within the rating to achieve uniform luminance. Brightness should never be adjusted by changing the filament voltage.

2) When a VFD designed for AC filament voltage has DC filament voltage applied, a brightness gradient will be caused horizontally between the digits. Thus, only VFD's specially designed for DC filament voltage should be used in such case.

3) The value of the filament voltage shall be set so that the effective r.m.s. value may coincide with the rating; even when the waveform is different from a sine wave.

4) The cut-off bias (Ek) should be applied to the center tap provided in the filament transformer; or a neutral point in the filament circuit.

■ Luminance Adjustment (Dimming)

When VFDs are used for clocks or in automotive applications, it is essential to be able to adjust luminance according to ambient brightness. To decrease the luminance, the grid scanning is maintained and the pulse width of the anode and grid outputs is decreased. Luminance is proportional to pulse width. Flickering may occur if the frequency is improper. Please see "Notes for Handling Futaba's VFD."

■ Handling And Assembly

- 1) Be sure to handle VFDs with gloves or finger cots to keep the lead soldering from deteriorating and to keep the surface of the glass clean.
- 2) During lead bending, the leads should be bent a minimum of 2mm from the substrate edge so as to not chip or crack the glass.
- 3) VFDs should be properly packaged in order to keep the glass free from cracking and chipping, and to prevent the displays from being subjected to excessive shock and vibration.
- 4) Since the exhaust tube is the most fragile part of a VFD, sufficient area should be allowed for mounting of the display in order to protect the exhaust tube from coming into contact with other parts or any part of the equipment case.
- 5) In the manufacturing process, care must be taken to protect the exhaust tube and glass package.
- 6) Exposure to strong ultrasonic waves for an extended period can cause filament breakage and phosphor peeling. Ultrasonic washing should be avoided.
- 7) Acids and alkalines easily affect the glass materials used for package sealing. Care should be taken when selecting a solvent such as flux. When such solvent must be used, sufficient washing is required.
- 8) VFDs should not be subjected to more thermal shock in a soldering process than is applied during reliability testing.
- 9) It is recommended that a holder be used to attach VFDs to a PCB.

■ Transportation

Futaba VFDs are carefully packaged to prevent mechanical defects or surface scratches during transportation. Futaba factory packaging should be used by customers for transportation.

■ Storage

Avoid long term storage in a place having a salty or sulphurous atmosphere, high temperature, or high humidity. These conditions could lead to deterioration of lead soldering, degradation of the insulation between leads, and lowering of glass surface clearness. In the case of long term storage, displays need to be re-aged.

VFD模块

VFD Module



VFD模块是由荧光显示屏、控制器、阳极和栅极驱动器、电源电路等所构成的人机界面单元。

其小型、轻量、易于安装的设计，适合于各种设备器材；具有友善简便的界面，可以很容易地和主机系统做连接。

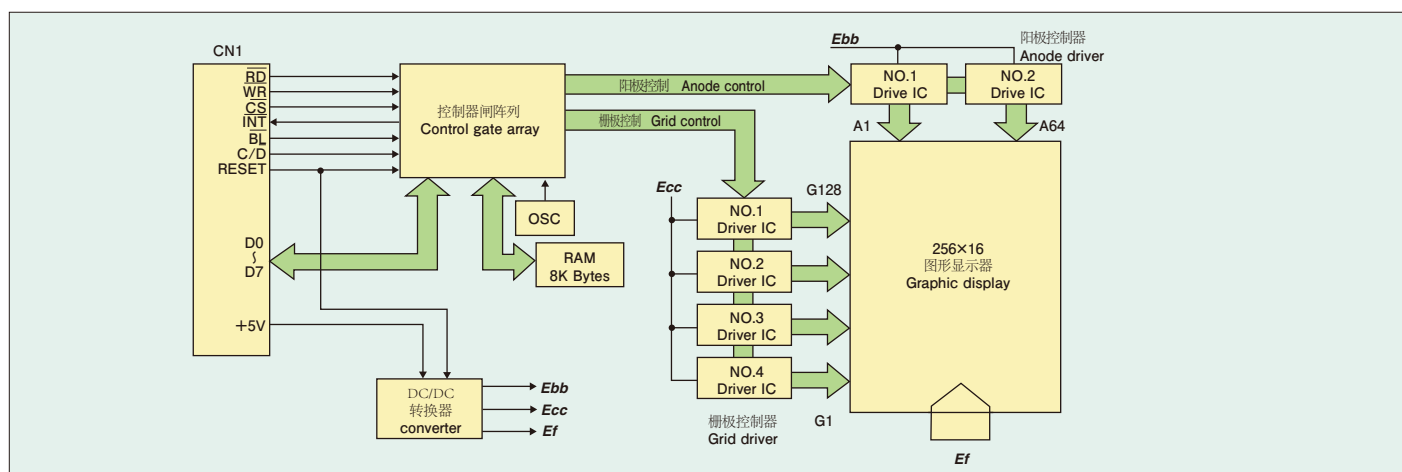
双叶电子的VFD模块具便利的界面接口驱动电路设计，在辨视性、亮度、寿命、可靠性、实装设计、维护等，可以大幅简化繁杂的人机界面设计。

为了使产品能实现更完善的人机界面，并快速及时上市，恭请使用我们双叶电子的VFD模块。

A VFD module is a highly sophisticated man-machine interface which consists of a vacuum fluorescent display, controller, anode/grid driver, power supply circuit, etc. Compact and lightweight design, suitable for most equipment, with simple connection to a host system. FUTABA VFD modules allow easy interface design (e.g. drive circuit design) and feature enhanced luminosity, visibility, life-time, reliability and ease of maintenance. FUTABA VFD modules allow timely product release to market and improve the man-machine interface.

方块图 Block diagram

以讯息显示模块为例 Example of message display module



定制模块

Custom design module

我们可依顾客的需求，进行定制品的模块开发。

定制品的模块，可配合各种机器及用途，进行显示屏的规格设计；开发显示控制及与主机间的通信软件；甚至于进一步整合系统的周边电路或零件，达到最优化的系统目的。

定制品的模块设计，可以帮助我们的顾客简化产品开发、削减系统成本。

■ 可对应的定制规格例

- 定制特定的显示图形。
- 设计最适合的显示规格。（大小、亮度、颜色等）
- 开发显示控制及通信软件。
- 内置英/数字、汉字与其它语言字库。
- 配置各种适用的接口。（并行、RS232C、USB等）
- 依电源需求内置专用电源电路（直流/直流转换器）。
- 搭载周边零件（按键开关、指示灯等）及周边电路。
- 设计加工外壳、隔离罩等框体结构件。

我们也可对应其它要求，欲了解更多信息，请与我们联系。

Futaba develops highly customized modules corresponding with customer's needs.

Custom design module realizes optimum design for individual system applications by applying graphics design, controller, software for function & communication with utilizing peripheral circuits for the system.

Our custom solution makes your system design easy & simple, and save you time & cost.

■ Customized design

- Applying original graphics design for VFD.
- Optimum VFD design with package size, luminance, color assignment, etc.
- Develop custom designed software for display function and communication.
- Utilizing Alphabets, numerals and other character fonts for various languages.
- Employing various interfacing circuit & protocol design. (parallel, RS232C, USB etc.)
- Built-in power supply unit for required power source in the system.
- On board design with key switch, indicator and other peripheral circuits & components.
- Design for housing case and shielding, etc.

We are ready for your various demands. Please contact us with your details.

标准的界面接口

Typical interfaces

并行 Parallel

■概要

采用多条信号线的通信方式，使用4~8条(4~8bit)数量的资料线，利用ASCII码或JIS码等，作为通信的格式。

■SUMMARY

A communication system using parallel signal lines which transmits ASCII or JIS codes using data lines (4 to 8 bits).

串行 Serial

■概要

资料以一个bit接着一个bit的顺序做传送通信的方式，资料通信有同步步与非同步式二种，通信的速度（波特率）可以调整设定。

■SUMMARY

A communication system to transmit data bit by bit. There are two types; a synchronous and an asynchronous type. Communication speed (baud rate) can be set.

CPU总线直结 CPU Bus

■概要

以CPU的地址总线、数据总线、读/写控制线进行数据传输的方式，可以做同记忆体存取方式一样的双向通信。

■SUMMARY

A system to transmit data using the CPU's address-bus, data-bus and R/W control line.

Like the case of memory access, parallel communication is available.

RS-232C RS-232C

■概要

通用标准的异步串行通信，可以传送JIS码等方式来做显示内容控制。抗杂讯力强、可设定通信的速度（波特率）。

■SUMMARY

The industry standard for an asynchronous serial communication for general use. Display is controlled by transmitting JIS code, etc. Good noise protection. Communication speed (baud rate) can be set.

RS-485 RS-485

■概要

总线型的多点接续对应的串行通信规格，可以实现多点对多点接续。

■SUMMARY

A system using serial communication for multiple point bus connection.

USB Universal Serial Bus

■概要

用于连接电脑周边设备的通用串行通信标准，可做高速通信。

■SUMMARY

The PC industry standard for high speed serial communication. USB typically connects peripheral devices of a computer.

IrDA (红外线) IrDA

■概要

红外线通讯(利用手机的红外线通信的输出)，请事先与我们确认可以对应的机种。

■SUMMARY

Infrared data communication (a communication system using the output of the infrared data communication of a cell phone).

It is necessary to confirm the availability of this feature on any particular cell phone.

CAN Controller Area Network

■概要

ISO国际标准组织认可之汽车专用标准串行协议；具备高实时处理能力、长距离运输等功能。

■SUMMARY

A communication system using ISO standard protocol for automotive serial communication.

High speed real-time processing, long distance transfer are available.

I²C Inter-Integrated Circuit

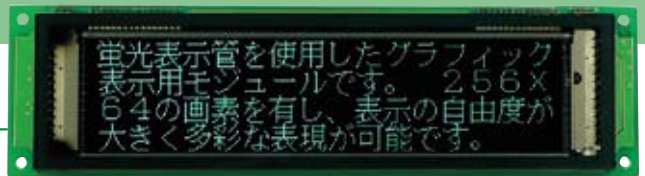
■概要

与异步串行通信（RS-232C接口等）相比可高速通信，用极少的信号线即可控制；可传输距离较短，只限于短距离通信。

■SUMMARY

High speed communication using low signal lines is available.

This is for short distance communication.



全点阵显示模块系列

Full dot matrix display module series

全点阵模块系列内置有敝司自行开发的专用控制器，可很简单地与主系统做连接。以小型、轻量、薄型的设计，充分体现出VFD的高视认性，实现最佳的人机界面。

■只需简单的把显示信息输入到模块里内置的 RAM，即可显示所需显示图形。

■可直接连接系统总线。

■具内置电源回路(DC/DC转换器)，可简单驱动。

The full dot matrix display module series uses a built-in custom designed controller, and achieves very simple connection to the host system.

The compact lightweight and slim design makes it easy to build the modules into various products, and achieving optimal man-machine interfacing quality with excellent visibility.

■Graphic display is achieved simply by saving display information to the module's RAM.

■Allows direct connection to system bus.

■Built-in power supply circuit (DC/DC converter) enables easy operation.

全点阵显示模块系列规格一览

Full dot matrix display module series specifications

NEW 新产品 New Products

※1 无字库模块也可供应。 Fontless type can be prepared.

品名 Part Number	点数 Number of Dots (W×H)	画面尺寸 Display Area (W×H) (mm)	点距 Dot Pitch (W×H) (mm)	外形尺寸 Outer Dimensions (W×H×T) (mm)	接口 Interface	电源 Power Supply	消费电力 Power Consumption Typ. (W)	汉字字库 Kanji Font
GP1209A01B	112×16	52.5×11.5	0.47×0.73	80.0×36.0×13.1	8bit Parallel/RS-232C	5V	1.3	Alphabet/Numeral /Katakana/European
GP1209A04A NEW	112×16	52.5×11.5	0.47×0.73	80.0×38.0×15.9	Synchronous Serial/ Asynchronous Serial	5V	1.0	Alphabet/Numeral /Katakana/European
GP1184A01A	140×16	69.9×11.5	0.5×0.73	116.0×37.0×13.7	8bit Parallel/RS-232C	5V	1.4	Alphabet/Numeral /Katakana/European
GP1184A01B	140×16	69.9×11.5	0.5×0.73	116.0×37.0×13.7	Synchronous Serial/ Asynchronous Serial	5V	1.4	Alphabet/Numeral /Katakana/European
GP1238A01A	192×16	124.6×10.2	0.65×0.65	180.0×40.0×24.1	8bit Parallel	5V	4.0	—
GP1198A01B	256×16	166.3×12.7	0.65×0.8	230.0×40.0×29.0	8bit Parallel	5V,24V	3.7	—
GP1112A03D	128×32	57.5×14.3	0.45×0.45	88.0×44.0×20.7	8bit Parallel	5V	2.0	Japanese ※1
GP1120A01D	128×32	83.1×20.7	0.65×0.65	130.0×38.5×22.2	8bit Parallel	5V	3.5	Japanese ※1
GP1127A01B	160×32	71.9×14.3	0.45×0.45	130.2×43.0×26.2	8bit Parallel	5V	2.5	Japanese ※1
GP1152A01A	240×36	149.8×28.6	0.61×0.8	205.2×62.0×30.0	8bit Parallel	5V	5.0	—
GP1135A01B	160×40	132.7×33.1	0.83×0.83	190.0×64.0×30.1	RS-232C	12V	4.5	Simplified Chinese
GP9002A03B NEW	127×64	57.0×28.7	0.45×0.45	108.0×57.5×20.8	8bit Parallel/Serial	5V	2.5	Japanese/Chinese /korean ※1
GP9003A01B	127×64	77.8×39.1	0.61×0.61	134.5×61.5×20.7	8bit Parallel/Serial	3.3V,5V	3.9	Japanese/Chinese /korean ※1
GP9002A01B	128×64	57.5×28.7	0.45×0.45	103.0×53.5×22.2	8bit Parallel/Serial	5V	2.5	Japanese/Chinese /korean ※1
GP1118A01B	128×64	83.1×41.5	0.65×0.65	140.0×68.0×29.0	8bit Parallel	5V	5.0	Japanese ※1
GP1128A01B	160×64	71.9×28.7	0.45×0.45	125.0×56.3×29.6	8bit Parallel	5V	3.8	Japanese ※1
GP1129A01B	192×64	86.3×28.7	0.45×0.45	145.0×56.3×29.6	8bit Parallel	5V	4.3	Japanese ※1
GP1205A01B	256×64	115.1×28.7	0.45×0.45	159.0×50.0×23.5	8bit Parallel	5V	5.0	Japanese ※1
GP1212A02A	256×64	115.1×28.7	0.45×0.45	159.0×50.0×21.2	RS-232C/USB2.0/I ² C	5V	4.8	Japanese
GP1157A01B	256×64	115.1×28.7	0.45×0.45	159.0×50.0×21.5	8bit Parallel/RS-232C	5V	4.5	Japanese
GP1160A02B	256×64	163.7×38.3	0.64×0.6	220.0×60.0×23.6	RS-232C	5V	7.5	Japanese
GP1150A01A	256×64	163.7×40.2	0.64×0.63	230.0×88.5×29.3	RS-232C	24V	7.2	Japanese
GP1193A02B	190×80	89.2×37.5	0.47×0.47	136.0×60.0×26.4	8bit Parallel	12V	6.6	Japanese/Chinese /korean ※1

点阵字型显示模块系列

Dot character display module series



点阵字型显示模块是使用5×7点阵型显示屏，及软件/硬件一体化后的模块，可以简单的被使用。

- 因模块上有单片机的关系，可简单地做显示操控，并能大幅减小主控系统的工作负荷。
- 备有标准并行/串行输入接口。
- 可显示超过200种以上的字符，如英文字母、数字、日文片假名、符号等。
- 具内置电源回路(DC/DC转换器)，可简单驱动。
- 小型、低功耗，有与LCD模块相同的外形和接口，方便和LCD模块互换的系列产品。

The dot character display module series uses 5×7-dot matrix display VFD and includes software and hardware.

- Easy display control is achieved using a one chip microcomputer on the module. This reduces the work of the host system.
- Parallel input/Serial input as standard.
- Display using over 200 fonts with a range of alphabetic characters, numbers, Katakana, symbols, etc.
- Built-in power supply circuit (DC/DC converter) enables operation with the single power supply.
- The LCD EMULATORS are compact, low power VFD modules with standard LCD interface.

点阵字型显示模块系列规格一览

Dot character display module series specifications

NEW 新产品 New Products

品名 Part Number	字数×行数 Digits×Rows	字体字形 Character format	文字尺寸 Size of digit (W×H)(mm)	外形尺寸 Outer Dimensions (W×H×T) (mm)	使用者可自 定义文字数 User's Definable font	接口 Interface	电源 Power Supply	消费电力 Power Consumption Typ.(W)	汉字字库 Kanji Font
M16SD08FA	16×1	5×8(5×7+cursor)	2.1×4.7	80.0×36.0×18.0	8	4/8bit Parallel/Serial	5V	0.4	Alphabet/Numeral/Katakana
M16SD08FJ	16×1	5×8(5×7+cursor)	2.1×4.7	80.0×36.0×18.0	8	4/8bit Parallel/Seria	5V	0.4	Alphabet/Numeral/European
M162SD07FA	16×2	5×8(5×7+cursor)	2.1×4.7	80.0×36.0×18.0	8	4/8bit Parallel/Serial	5V	0.7	Alphabet/Numeral/Katakana
M162SD07FJ	16×2	5×8(5×7+cursor)	2.1×4.7	80.0×36.0×18.0	8	4/8bit Parallel/Serial	5V	0.7	Alphabet/Numeral/European
M162SD12AA	16×2	5×7	3.5×5.5	137.0×27.5×12.2	8	Synchronous Serial	5V	1.0	Alphabet/Numeral/Katakana
M162SD13AA	16×2	5×7	3.5×5.5	137.0×27.5×12.2	8	Synchronous Serial	5V	1.0	Alphabet/Numeral/European
M162SD17BA NEW	16×2	5×7	3.5×5.5	137.0×27.5×15.2	8	Synchronous Serial	5V	0.8	Alphabet/Numeral/Cyrillic
M162MD05AA	16×2	5×8(5×7+cursor)	3.7×7.4	122.0×44.0×20.6	8	4/8bit Parallel/Serial	5V	1.7	Alphabet/Numeral/Katakana
M162MD05AJ	16×2	5×8(5×7+cursor)	3.7×7.4	122.0×44.0×20.6	8	4/8bit Parallel/Serial	5V	1.7	Alphabet/Numeral/European
M20SD03GR	20×1	5×7	3.5×5.0	150.0×31.0×18.6	—	8bit Parallel/Serial	5V	0.8	Alphabet/Numeral/Katakana /European
M202SD01LA	20×2	5×7	2.3×4.2	100.0×35.0×26.3	4	8bit Parallel/Serial	5V	1.6	Alphabet/Numeral/Katakana
M202SD16FA	20×2	5×8(5×7+cursor)	2.4×4.7	116.0×37.0×18.5	8	4/8bit Parallel/Serial	5V	0.7	Alphabet/Numeral/Katakana
M202SD16LJ NEW	20×2	5×8(5×7+cursor)	2.4×4.7	116.0×37.0×18.7	8	4/8bit Parallel/Serial	5V	0.7	Alphabet/Numeral/European
M202SD08GR	20×2	5×7+cursor	3.5×5.0	155.0×43.0×20.6	—	8bit Parallel/Serial	5V	1.8	Alphabet/Numeral/Katakana /European
M202MD15FA	20×2	5×8(5×7+cursor)	3.9×7.7	146.0×43.0×20.6	8	4/8bit Parallel/Serial	5V	1.7	Alphabet/Numeral/Katakana
M202MD15FJ	20×2	5×8(5×7+cursor)	3.9×7.7	146.0×43.0×20.6	8	4/8bit Parallel/Serial	5V	1.7	Alphabet/Numeral/European
M202MD15DA	20×2	5×8(5×7+cursor)	3.9×7.7	146.0×43.0×25.1	—	RS-232C	24V	2.5	Alphabet/Numeral/Katakana /European
M202MD15HA	20×2	5×8(5×7+cursor)	3.9×7.7	159.0×50.0×18.6	—	USB2.0	5V	1.8	Alphabet/Numeral/Katakana /European
M202MD20CY	20×2	5×7+Dp.com.descriptor	5.3×9.0	204.0×49.0×25.6	16	RS-232C/USB2.0	5V	4.0	Alphabet/Numeral/Katakana /European/Cyrillic
M202MD12BA	20×2	5×7+descriptor	5.5×10.5	190.0×64.0×27.0	—	RS-232C	5V	5.0	Alphabet/Numeral/Katakana
M202LD06BA	20×2	5×7+Dp.com.descriptor	7.2×11.3	273.0×76.2×31.5	—	8bit Parallel/Serial	5V	5.0	Alphabet/Numeral/European
M202LD06BB	20×2	5×7+Dp.com.descriptor	7.2×11.3	273.0×76.2×31.5	—	8bit Parallel/Serial	5V	5.0	Alphabet/Numeral/Katakana
M204SD02FA	20×4	5×8(5×7+cursor)	2.4×4.2	100.0×60.0×20.6	8	4/8bit Parallel/Serial	5V	1.5	Alphabet/Numeral/Katakana
M204SD02FJ	20×4	5×8(5×7+cursor)	2.4×4.2	100.0×60.0×20.6	8	4/8bit Parallel/Serial	5V	1.5	Alphabet/Numeral/European
M242SD04FA	24×2	5×8(5×7+cursor)	2.2×4.7	118.0×36.0×17.0	8	4/8bit Parallel/Serial	5V	0.9	Alphabet/Numeral/Katakana
M242SD04FJ	24×2	5×8(5×7+cursor)	2.2×4.7	118.0×36.0×17.0	8	4/8bit Parallel/Serial	5V	0.9	Alphabet/Numeral/European
M40SD04GR	40×1	5×7+cursor	3.5×5.0	240.0×35.0×20.1	—	8bit Parallel/Serial	5V	1.5	Alphabet/Numeral/Katakana /European
M402SD10FA	40×2	5×8(5×7+cursor)	2.2×4.7	182.0×33.5×18.4	8	4/8bit Parallel/Serial	5V	1.1	Alphabet/Numeral/Katakana
M402SD10FJ	40×2	5×8(5×7+cursor)	2.2×4.7	182.0×33.5×18.4	8	4/8bit Parallel/Serial	5V	1.1	Alphabet/Numeral/European
M402SD07GR	40×2	5×7+cursor	3.5×5.0	240.0×43.0×20.6	—	8bit Parallel/Serial	5V	3.8	Alphabet/Numeral/Katakana /European
M404SD01CA	40×4	5×7	3.0×5.0	230.0×60.0×32.0	3	8bit Parallel/Serial	5V	7.0	Alphabet/Numeral/Katakana
M404SD01CB	40×4	5×7	3.0×5.0	230.0×60.0×32.0	3	8bit Parallel/Serial	5V	7.0	Alphabet/Numeral/European

●可在我司主页上下载最新的标准品规格书：http://www.futaba.co.jp/en/display/d_dl/index.html
The product specification can be downloaded from http://www.futaba.co.jp/en/display/d_dl/index.html

集团网络

Network



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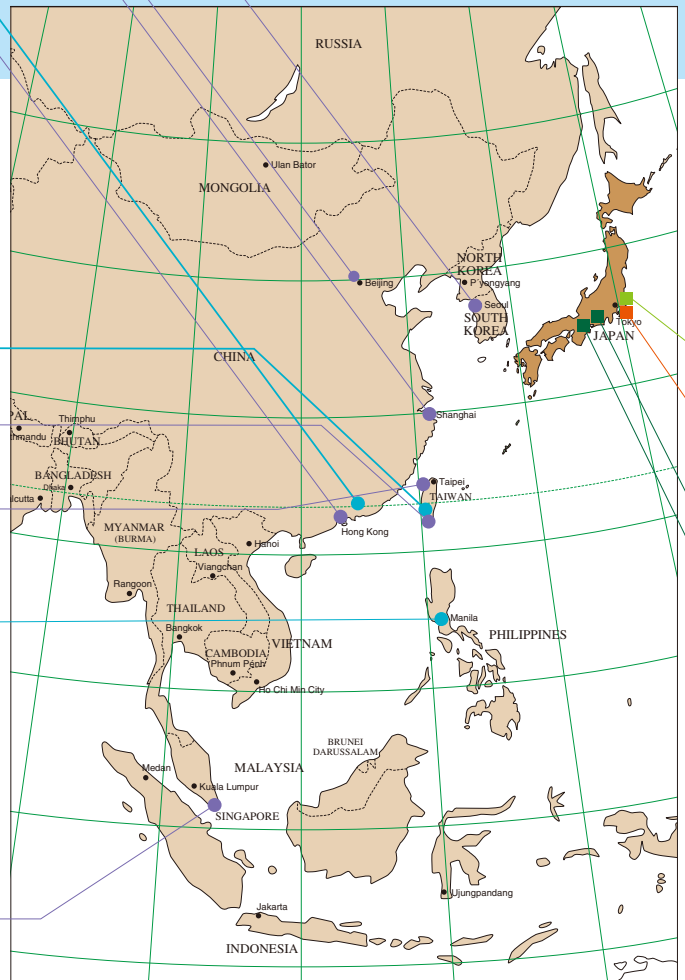
FUTABA DENSHI Corp.(S)Pte.Ltd.

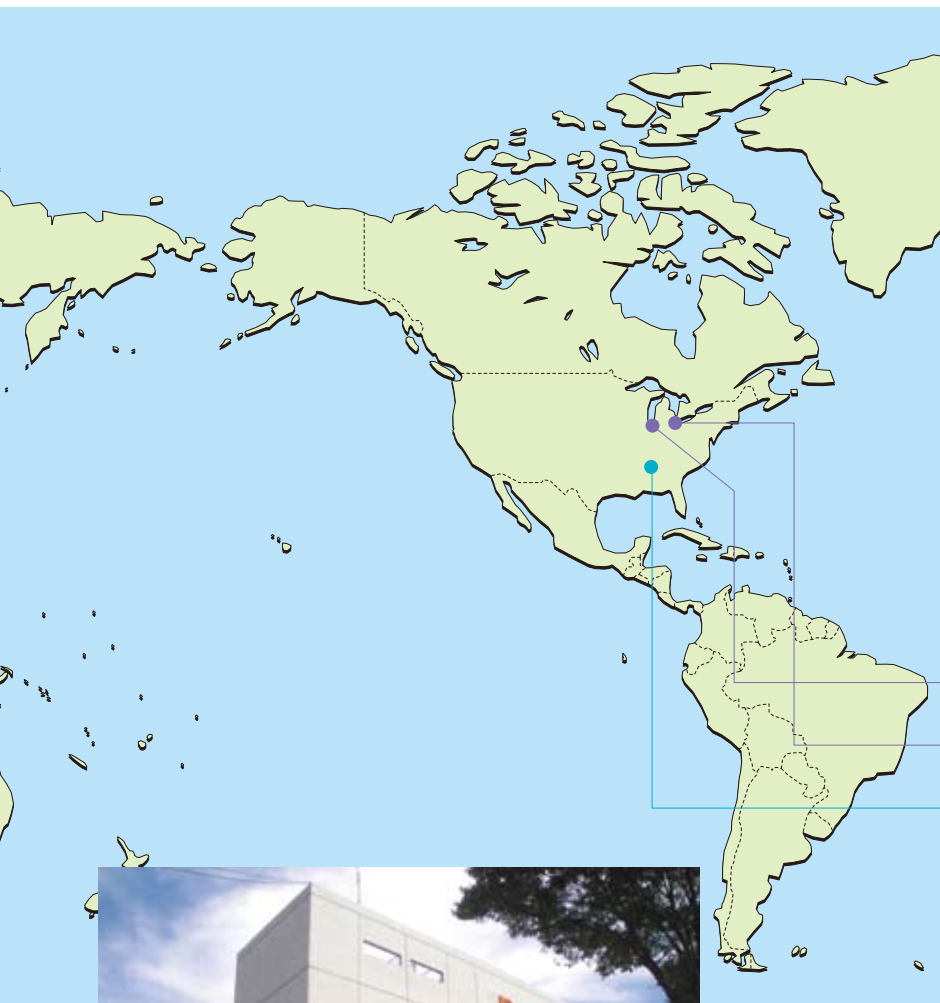
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Plants
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 工厂

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幕张营业中心



长生工厂鸟瞰图

公司概况

Outline

设立:	1948年2月3日	Established: February 3, 1948
资本金:	225亿5千8百万日元	Capital: ¥22,558 million
上市市场:	东京证券交易所市场第一部	Stock Exchange: the First Section of the Tokyo Stock Exchange
年销售额:	集团公司584亿1百万日元 日本双叶468亿2千2百万日元	Sales: 58,401 million yen on consolidated basis 46,822 million yen on unconsolidated basis
员工数:	集团公司5263人 日本双叶1439人	Employees: 5,263 on consolidated basis 1,439 on unconsolidated basis
经营产品内容:	荧光显示屏 荧光显示屏模块 荧光印刷光头(VFPH) 冲压金属模用部件 模压金属模用部件 精密板 省力设备 业余爱好用无线电控制设备 工业用无线店控制设备 机器人用机能部品的制造及销售	Main Products: Vacuum Fluorescent Displays(VFDs) VFD modules Vacuum Fluorescent Print Heads(VFPHs) Components for press die sets Components for mold bases Precision plates Equipment for automation Radio control equipment for hobby use Radio control equipment for industrial use Parts for robots
董事长:	桜田 弘	■ Directors President Hiroshi Sakurada

显示屏的历程

- 1948年 制造、销售收音机用的真空管而成立了双叶电子工业株式会社。(位于千叶县长生郡茂原町) 电子管工厂设立。(位于千叶县长生郡八积村) 设立东京支店主要销售真空管。(位于东京、神田花田町)
- 1970年 终止真空管的制造。 开始制造、销售圆形单管的荧光显示屏。
- 1972年 开发生产销售圆形单管多行的荧光显示屏。也致力开发用于时钟、音响、测定仪器的显示元件。
- 1976年 美国汽车厂商采用荧光显示屏用于汽车时钟,日本汽车厂商也开始使用。 开发多色及点阵式的显示。
- 1982年 开发前面发光型(FLVFD)的荧光显示屏。
- 1985年 开发大型显示银幕「JUMBOTRON」用的发光元件「TRINI RIGHT」
- 1987年 开始生产荧光显示屏模块,用于POS机、银行取款机、利息显示等。
- 1996年 多彩冷阴极管(FED)量产化成功。
- 1998年 开发出小型照片现象机器用的荧光印刷光头。
- 2001年 开始生产VFD内置驱动IC的CIGVFD。
- 2005年 开始生产高精细多彩全点阵的FIVFD。
- 2006年 开始量产多彩冷阴极管(FED)3英寸及11.5英寸。
- 2009年 取得TDK MICRO DEVICE CORPORATION股份,开始加入有机EL显示屏(OLED)新业务。

History of FUTABA Corporation for industrial applications Digital read-out

- 1948 ·Futaba Corporation established in Mobara-cho,Chosei-gun, to manufacture and sell radio receiver vacuum tubes. Electron tube plant located in Yatsumi-mura, Chosei-gun, Chiba Prefecture. ·Tokyo Branch established in Kanda-Hanada-cho, Tokyo, and vacuum tube sales begun.
- 1970 ·Manufacture of vacuum tubes completely shut down. ·Manufacture and sales of cylindrical multi-digit VFDs begun.
- 1972 ·Develop and manufacture cylindrical plural digit VFDs for clock, stereo, measurement, etc. begun.
- 1976 ·US automotive maker and Japanese automotive maker started to use VFDs for clock. Multicolor type and Dot-matrix type VFDs development begun.
- 1982 ·Develop Front luminous VFD (FLVFD)
- 1985 ·Develop Trinilight for Jumbotron
- 1987 ·Manufacture VFD Modules for POS, ATM and interest rate display board begun.
- 1996 ·Manufacture mono-color FED.
- 1998 ·Develop Vacuum Fluorescent Print Head for Mini-Labo system.
- 2001 ·Manufacture Chip-in Glass Display begun.
- 2005 ·Manufacture high-density color dot matrix FIVFD display begun.
- 2006 ·Manufacture 3" and 11.5" color FED display begun.
- 2009 ·Acquired share of TDK Micro Device Corp. to enter OLED business.

双叶电子工业株式会社其它产品简介

Product lines

■ 冲压金属模用部件 省力设备

为了实现冲压金属模制作的短交货期和低成本化，我们在多年技术积累的基础上，生产制造出多种产品和系统。

诸如将冲压金属模等各种部件规格化、标准化、气动供料器、自动卷线机等省力设备，以及提高行业效率的DIE-MATIC SYSTEM等。这些产品为提高模具行业的生产率做出了贡献。

■ 模压金属模用部件、精密平板

通过塑料模具用模座的规格化，批量生产质量稳定的产品，确立起向客户及时交货的体制，大幅度提高了产业的合理化和省力化。

精密平板被广泛用作模具用材料和各种机械装置的结构材料。

模具内压力温度计测系统（Mold Marshalling system）在模具内装置感应器，是一种简单的、低成本的计测系统。很容易测定出模具内部压力和温度，从而有助于射出成型的品质提高和成本降低。

■ 业余爱好用无线电控制设备

富于梦想的业余爱好无线电控制设备不仅深受无线电爱好者的钟爱，也受到广大一般顾客的喜爱，其实力是引以为豪的世界第一，本公司不断推出高技术含量、高品质的产品。

■ 工业用无线电控制设备

将在制作业余爱好用无线电控制设备中积累起来的技术，应用于吊车作业、搬运作业、喷洒农药作业等领域，开发出能在严酷艰巨条件下正确作业的各种工业用无线电控制设备。

Tools punching sets Labor-saving press machinery

Futaba has created a wide variety of components and systems that reduce delivery time and the costs involved in fabricating press tools. Moreover, we have standardized various components, starting with those used in press and die sets. The company has also contributed to improved productivity in the tooling industry by developing labor-saving machinery-including air feeders, automatic reels, and many others-along with the Die-matic system, offering dramatically enhanced production efficiency.



Mold-base components Precision plating

To assist in the streamlining of fabrication for plastic molding tools, Futaba has developed a standardized system of mold bases for use in plastic injection molding. These mass-producible mold bases ensure consistency of quality, pricing, and off-the-shelf delivery, helping to streamline production and save labor throughout the industry. Precision plating is widely used for mold-base materials and the structural material of various machinery and equipment.



Hobby-oriented radio control

Radio control is the hobby of dreams for millions of people throughout the world. Today Futaba boasts a position as the world's leader in production capability and sales, continuously expanding its line of products for the serious modeler.



Radio control equipment for industrial use

The control technique we have fostered has been applied to the development of industrial radio-control systems. Utilizing their technological advantages to the fullest extent, these are formidable tools designed for work in adverse conditions ranging from crane operation and transport tasks to agricultural chemical spraying and many others.





安全使用守则

- 使用之前，请务必认真阅读「使用说明书」和「规格书」。
- 不在规定规格内使用，可能会导致火灾等事故的发生。
- 荧光显示屏的玻璃切割面外露，操作不当会有受伤的可能。
- 请务必遵守标有「警告!」「注意!」的事项，否则可能导致火灾、漏电、破碎等事情，对人身造成伤害。
- 请务必遵守标有「警告!」「注意!」的事项，否则可能会对周边的设备仪器造成损害。



Safety information

- Please read User's Manual and the Specifications before using the product.
- Improper use may cause burning or accident.
- The glass section is exposed on the vacuum fluorescent display. Handling the glass section may cause injury.
- Serious injuries such as burns or electric shock and explosions may occur if the warnings and cautions are not followed.
- Other facilities and equipment may be damaged if the warnings and cautions are not followed.

有关产品规格，若有性能、信赖性的提升变更，恕不特别通知。

Specifications are subject to change without prior notice.

销售处 / Retailers

双葉電子工業株式会社