

DOT MATRIX LCD 40-OUT SEGMENT DRIVER

■ GENERAL DESCRIPTION

The NJU6407CR is a serial input, 40-out segment driver for dot matrix LCDs, especially useful as extension driver for LCD controller drivers like NJU6408B.

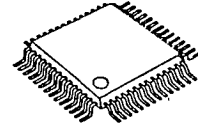
It consists of 40-bit (two of 20-bit) shift register, 40-bit latch, and 40 high voltage LCD drivers.

The shift direction of each 20-bit shift register can be set independently to each other, consequently the efficient extension driver allocation according to the number of characters and easy wiring with the LCD panel can be performed.

As the 40-driver have 4 level voltage inputs to drive the LCD, adjustable driving voltage according to the LCD panel can be supplied from the external power source.

The pin configuration of NJU6407CR is mirror inverted allocation against the NJU6407C.

■ PACKAGE OUTLINE



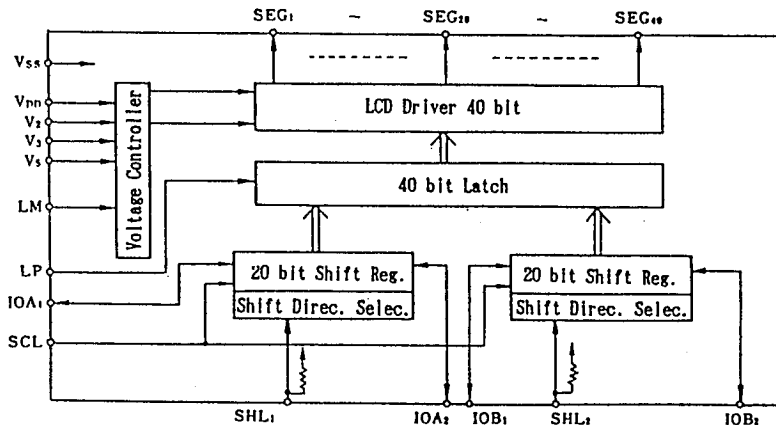
NJU6407CRF

■ FEATURES

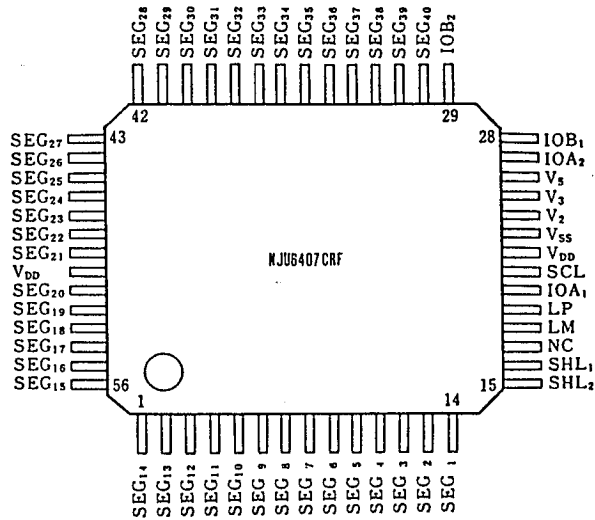
- 40 Segment Drivers
- 40-bit Shift Register  
( Two of 20-bit Shift Registers )
- Shift Direction of each 20-bit  
Shift Registers Selection
- Two of Shift Direction Select Terminal
- Duty Ratio 1/8 to 1/16
- Fast Data Transmission ( Shift Clock 3.3 MHz min. )
- External Power Supply for LCD Driving Voltage
- LCD Driving Voltage ---  $V_{DD} - 3V \sim V_{DD} - 13.5V$
- Operating Voltage ---  $5V \pm 10\%$
- Mirror Inverted Pin Configuration Against the NJU6407C
- Package Outline --- QFP 56
- C-MOS Technology

5

■ BLOCK DIAGRAM



■ PIN CONFIGURATION



■ TERMINAL DESCRIPTION

No.	SYMBOL	F U N C T I O N
14~1 56~51 49~30	SEG <sub>1</sub> ~ SEG <sub>14</sub> SEG <sub>15</sub> ~ SEG <sub>20</sub> SEG <sub>21</sub> ~ SEG <sub>40</sub>	LCD segment driving terminal. Each terminal corresponds to each bit of shift register.
22, 50 23	V <sub>DD</sub> V <sub>SS</sub>	Power supply terminal (connect to the controller's V <sub>DD</sub> terminal) Power supply terminal (connect to the controller's V <sub>SS</sub> terminal)
29 28	IOB <sub>2</sub> IOB <sub>1</sub>	Data input/output terminals for 21st to 40th bits shift register. Display data is input (output) synchronized with clock pulse. Input or output is selected by SHL <sub>2</sub> terminal.
27 20	IOA <sub>2</sub> IOA <sub>1</sub>	Data input/output terminals for 1st to 20th bits shift register. Display data is input (output) synchronized with clock pulse. Input or output is selected by SHL <sub>1</sub> terminal.
26, 25 24	V <sub>5</sub> , V <sub>3</sub> V <sub>2</sub>	LCD driving power source terminals. V <sub>DD</sub> ≧ V <sub>2</sub> ≧ V <sub>3</sub> ≧ V <sub>5</sub>
21	SCL	Shift register clock pulse input terminal. The data is shifted in the shift register by the falling edge of the clock pulse. A data setup time and hold time are required between data input and SCL. Clock pulse rising time (T <sub>RS</sub> ) and falling time (T <sub>FS</sub> ) should be set less than 50ns respectively.
19	LP	Latch pulse input terminal. The data in the shift register is latched to the Latch, "L" by this signal. "H" : Data writing, "L" : Data latch
18	LM	Alternate signal input for LCD driving.
16	SHL <sub>1</sub>	Shift direction and input/output control terminal (Pull-up R). "H" or Open : Shift direction is from 1st bit to 20th bit. "L" : Shift direction is from 20th bit to 1st bit.
15	SHL <sub>2</sub>	Shift direction and input/output control terminal (Pull-up R). "H" or Open : Shift direction is from 21st bit to 40th bit. "L" : Shift direction is from 40th bit to 21st bit.
17	NC	Non connection.

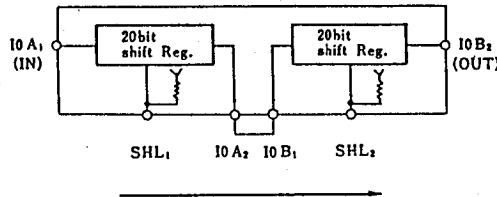
5

**FUNCTIONAL DESCRIPTION**
**(1) Shift register control**

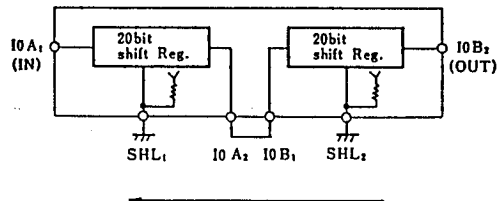
The 40-bit shift register is divided into two of 20-bit shift register.  
 The shift direction of each 20-bit shift register can be set independently to each other shown in below.

Control Terminal	Input	Shift Direction
SHL <sub>1</sub>	"H" or Open	IOA <sub>1</sub> → IOA <sub>2</sub>
	"L"	IOA <sub>1</sub> ← IOA <sub>2</sub>
SHL <sub>2</sub>	"H" or Open	IOB <sub>1</sub> → IOB <sub>2</sub>
	"L"	IOB <sub>1</sub> ← IOB <sub>2</sub>

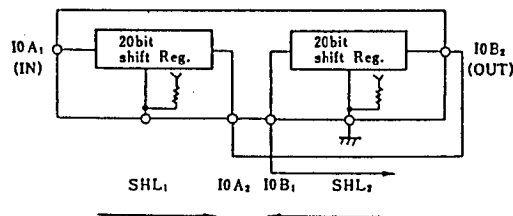
(1-1) When the terminals SHL<sub>1</sub> and SHL<sub>2</sub> are "H" or open, the data shift from SEG<sub>1</sub> to SEG<sub>40</sub>.



(1-2) When the terminals SHL<sub>1</sub> and SHL<sub>2</sub> are "L", the data shift from SEG<sub>40</sub> to SEG<sub>1</sub>.



(1-3) Reversed shift direction to each other is also available.  
 SEG<sub>1</sub> → SEG<sub>20</sub> → SEG<sub>40</sub> → SEG<sub>21</sub> example is shown in below:



## (2) LCD driver output truth table.

Input Data	Selection/Non-selection	LM	Driver Output (SEG <sub>1</sub> to SEG <sub>40</sub> )
"H"	Selection	H	V <sub>5</sub>
		L	V <sub>DD</sub>
"L"	Non-selection	H	V <sub>3</sub>
		L	V <sub>2</sub>

## ■ ABSOLUTE MAXIMUM RATINGS

( Ta=25°C )

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage ( 1 )	V <sub>DD</sub>	- 0.3 ~ + 7.0	V
Supply Voltage ( 2 ) Note 1)	V <sub>DD</sub> ~ V <sub>5</sub>	V <sub>DD</sub> -13.5 ~ V <sub>DD</sub> +0.3	V
Input Voltage	V <sub>IN</sub>	- 0.3 ~ V <sub>DD</sub> +0.3	V
Operating Temperature	T <sub>OP</sub>	- 30 ~ + 80	°C
Storage Temperature	T <sub>STG</sub>	- 55 ~ + 150	°C

 Note 1) The relation : V<sub>DD</sub> ≥ V<sub>2</sub> ≥ V<sub>3</sub> ≥ V<sub>5</sub> must be maintained.

## ■ ELECTRICAL CHARACTERISTICS

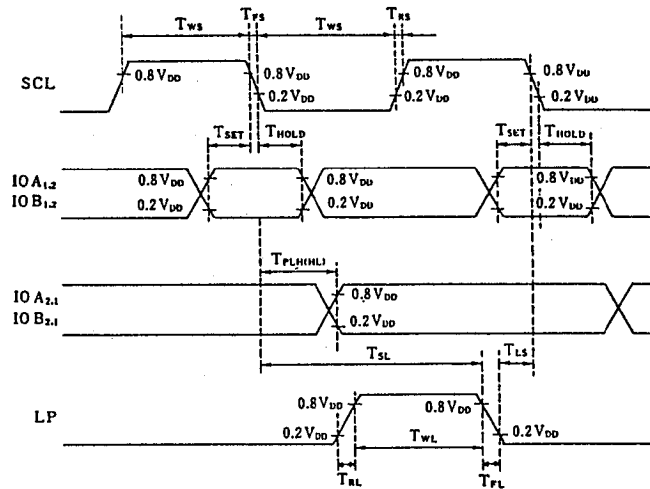
• DC Characteristics

 ( V<sub>DD</sub>=5V±10% , Ta=-20 ~ +75°C )

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	V <sub>IH</sub>	LM, LP, SHL <sub>1</sub> , SHL <sub>2</sub> Terminals		0.8V <sub>DD</sub>		V <sub>DD</sub>	V
	V <sub>IL</sub>					0.2V <sub>DD</sub>	
Input Current	I <sub>IH1</sub>	V <sub>IH</sub> =V <sub>DD</sub>	LM, LP Terminals			1	μA
	I <sub>IL1</sub>	V <sub>IL</sub> =0V				- 1	
	I <sub>IH2</sub>	V <sub>IH</sub> =V <sub>DD</sub>	SHL <sub>1</sub> , SHL <sub>2</sub> Terminals			1	
	I <sub>IL2</sub>	V <sub>IL</sub> =0V		- 10	- 15	- 25	
Output Voltage	V <sub>OH</sub>	I <sub>O</sub> =- 40μA	IOA <sub>1</sub> , IOA <sub>2</sub> , IOB <sub>1</sub> , IOB <sub>2</sub> Terminals	4.2			V
	V <sub>OL</sub>	I <sub>O</sub> = 400μA				0.4	
Driver On-resistance	R <sub>ON</sub>	I <sub>d</sub> =0.05mA	SEG <sub>1</sub> ~ SEG <sub>40</sub> Terminals			30	kΩ
Operating Current	I <sub>DD</sub>	SCL=1.5MHz, LM,LP=130us cycle No Load			0.6	1.0	mA
LCD Driving Voltage	V <sub>LCD</sub>	V <sub>DD</sub> - V <sub>5</sub>		V <sub>DD</sub> -3.0		V <sub>DD</sub> -13.5	V

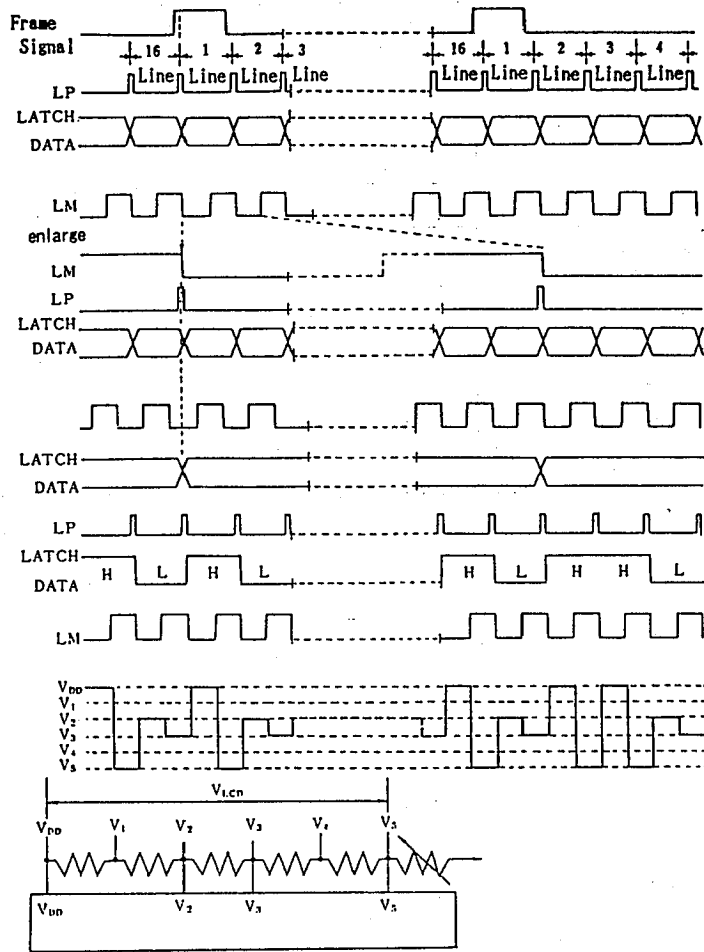
## • AC Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	$T_{PLH(HL)}$				250	ns
Maximum Operating Frequency	$f_{SCL}$	Duty = 50 %	3.3			MHz
SCL Pulse Width	$T_{WS}$		125			ns
LP Pulse Width	$T_{WL}$		125			ns
Set up Time	$T_{SET}$		50			ns
SCL → LP Time	$T_{SL}$		250			ns
LP → SCL Time	$T_{LS}$		0			ns
Data Hold Time	$T_{HOLD}$		50			ns
SCL Rise, Fall Time	$T_{RS}, T_{FS}$				50	ns
LP Rise, Fall Time	$T_{RL}, T_{FL}$				1	us



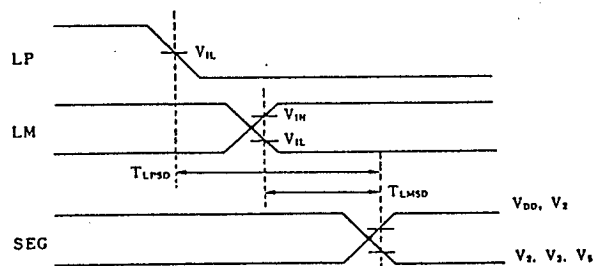
## ■ TIMING CHART

1/5 Bias, 1/16 Duty Ratio



5

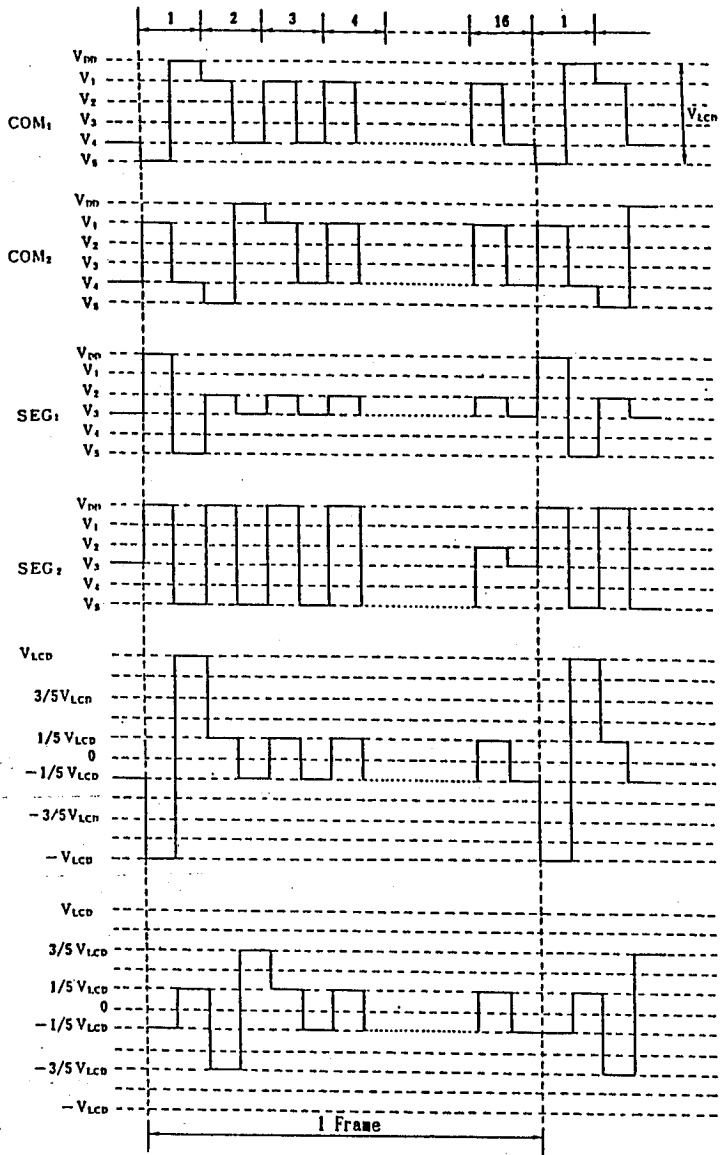
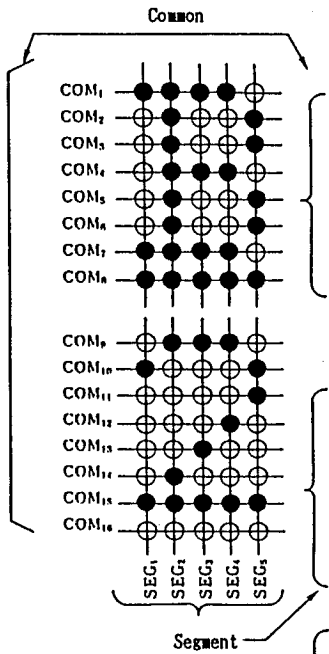
## ■ SEGMENT SIGNAL OUTPUT TIMING



PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
LP - SEG Output Delay Time	T <sub>LP<sub>SD</sub></sub>	C <sub>L</sub> = 100pF			4.5	us
LM - SEG Output Delay Time	T <sub>LM<sub>SD</sub></sub>	C <sub>L</sub> = 100pF			4.5	

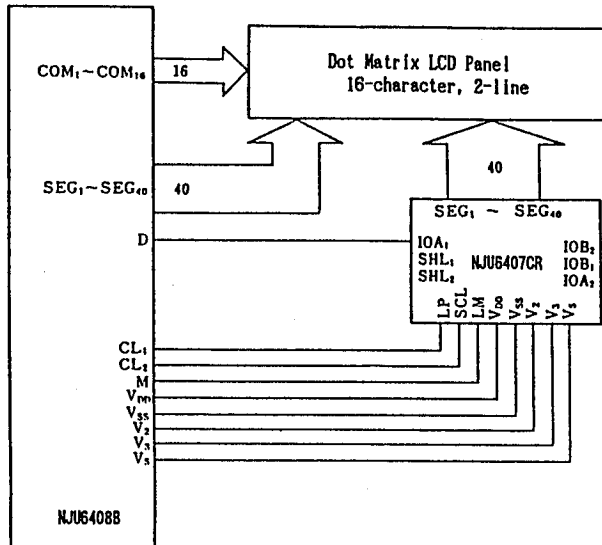
■ LCD DRIVING WAVEFORM EXAMPLE

1/5 Bias, 1/16 Duty Ratio

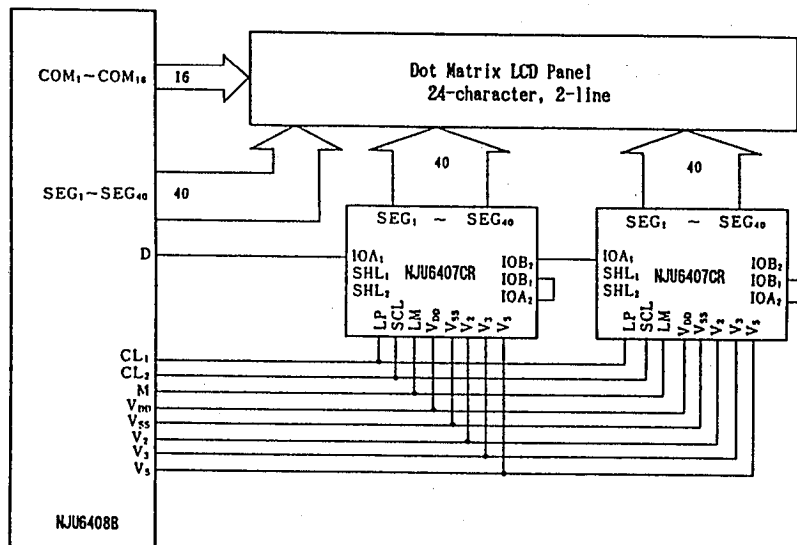


## ■ APPLICATION CIRCUITS

(1) 16-character 2-line Display Example ( Combine with NJU6408B )

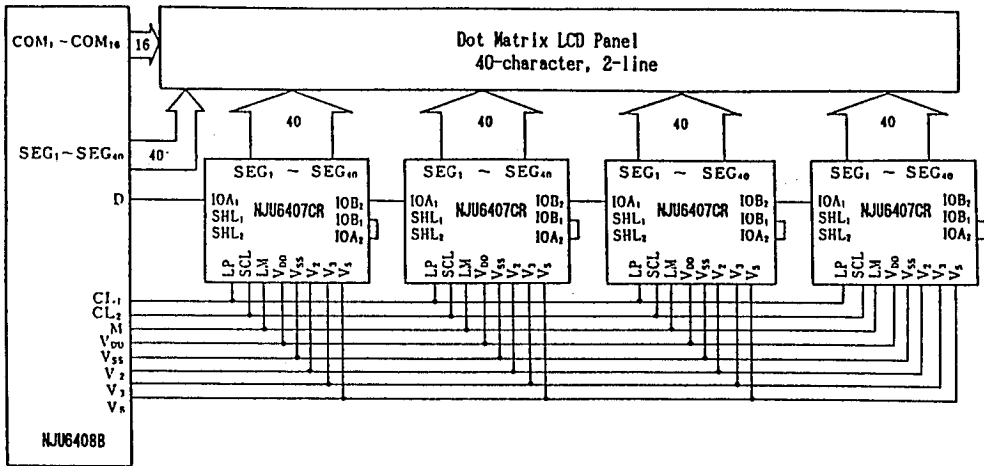


(2) 24-character 2-line Display Example ( NJU6408B + NJU6407CR x 2 )





(3) 40-character 2-line Display Example ( NJU6408B + NJU6407CR x 4 )



## MEMO

[CAUTION]

The specifications on this databook are only given for information, without any guarantee as regards either mistakes or omissions. The application circuits in this databook are described only to show representative usages of the product and not intended for the guarantee or permission of any right including the industrial rights.

SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:[szss20@163.com](mailto:szss20@163.com) QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL: 029-81022619 13072977981 FAX:029-88789382