

SINGLE CHIP DIGITAL DELAY IC

■ GENERAL DESCRIPTION

NJU9702 is a single chip digital delay LSI designed for Dolby Prologic or other types surround processor.

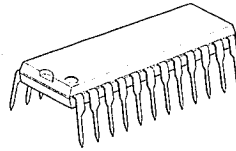
It consists of 16k SRAM, input/output filter, A/D D/A converters and control logic.

The A/D and D/A converter is using a ADM (Adaptive Delta Modulation) method. Consequently, it is realized low noise and low distortion.

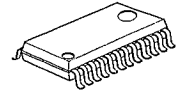
The delay time can select from 64 mode of 0.5ms to 32.8ms in 0.5ms step, according to the application.

Furthermore, the NJU9702 has a sleep mode, mute function, and power on initialization function which perform low current consumption in the sleep mode, muting on/off control and power on initialization.

■ PACKAGE OUTLINE



NJU9702D

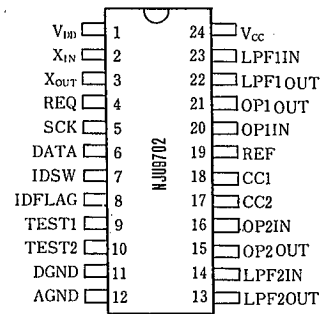


NJU9702G

■ FEATURES

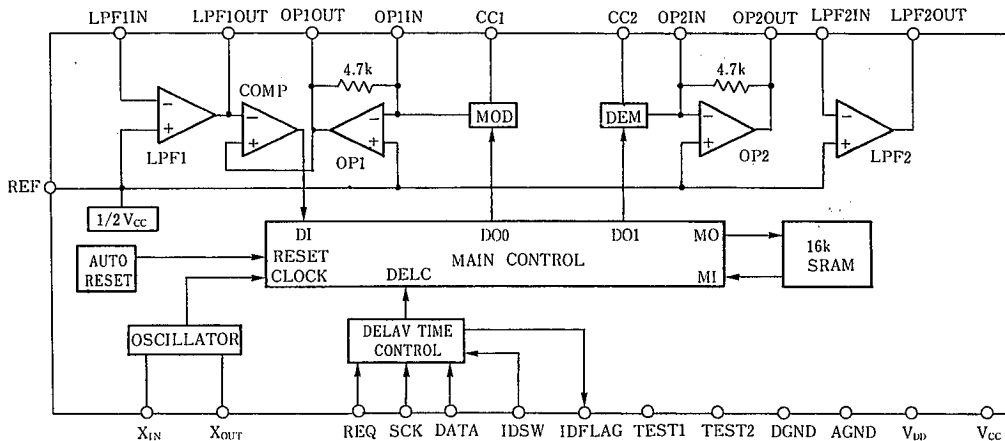
- ADM (Adaptive Delta Modulation) Method A/D and D/A Converter
- Low Noise and Low Distortion (No=95[dBV] TYP., THD=0.2[%] TYP.)
- 64 Delay Time Modes From 0.5ms To 32.8ms In 0.5ms step
- Low Current Consumption In Sleep Mode
- Input/Output Filter Built-in (Required External CR)
- A/D, D/A Converter Built-in (Required External CR)
- 16K SRAM (Internal)
- Power on initialization
- Oscillation Circuit
- Package Outline DIP24, SOP24
- C-MOS Technology

■ PIN CONFIGURATION



4

■ BLOCK DIAGRAM



■ TERMINAL DESCRIPTION

NO.	SYMBOL	FUNCTIONS		
1	V _{DD}	Voltage Supply for Digital Block V _{DD} =5[V]		
11	DGND	Digital GND DGND=0[V]		
24	V _{CC}	Voltage Supply for Analog Block V _{CC} =5[V]		
12	AGND	Analog GND AGND=0[V]		
19	REF	Analog Reference Voltage REF=1/2 · V _{CC}		
2	X _{IN}	Oscillator Input Terminal		
3	X _{OUT}	Oscillator Output Terminal	Connects to 2MHz ceramic Oscillator	
4	REQ	Data Request Input Terminal		
5	SCK	Serial Data Shift Clock Input Terminal		
6	DATA	Serial Data Input Terminal		
7	IDSW	ID Switch (ID Code When Connect to the Common Bus)		
8	IDFLAG	ID Flag (Data Input Confirmation and Serial Data Output)		
18	CC1	Current Control 1 Modulator	ADM Controller	
17	CC2	Current Control 2 Demodulator		
9, 10	TEST1, 2	Test Terminal (Normally Connects to the GND)		
23	LPF1IN	Lowpass Filter 1 Input	Input Side	Constitute a Lowpass Filter with external C and R.
22	LPF1OUT	Lowpass Filter 1 Output		
14	LPF2IN	Lowpass Filter 2 Input	Output Side	
13	LPF2OUT	Lowpass Filter 2 Output		
20	OP1IN	OP-AMP 1 Input	Input Side	Constitute a Integrator with external C.
21	OP1OUT	OP-AMP 1 Output		
16	OP2IN	OP-AMP 2 Input	Output Side	
15	OP2OUT	OP-AMP 2 Output		

■ FUNCTION DESCRIPTION

The sampling frequency (f_s) is 500KHz when master clock frequency is 2MHz.

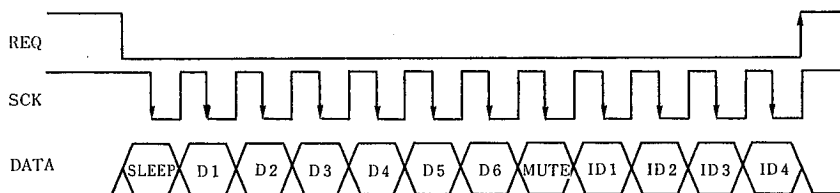
1)Data Format and Setting

The delay time is set by serial data.

The serial data is written into the NJU9702 synchronized by falling edge of shift clock (SCK) and the last 12 bit is effective before the data request (REQ) rising edge.

The time chart of serial data input is shown as follows.

In order to avoid the shock noise output at the delay time setting, mute function using is recommended.



(note1)

When the corresponding DATA of ID code (refer 5) input to the NJU9702 during the REQ signal is " High", the DATA changed because of the NJU9702 always loading the latest 12-bit data.

Therefore following three operation methods are required when serial data input.

- a)Fix the DATA terminal to " High" or "Low" except data setting period.
- b)Fix the REQ terminal to "Low" except data setting period.
- c)Fix the SCK terminal to " High" or "Low" after 12-bit data input.

(note2)

To use the mute after setting the delay time to avoided the shock noise.

2)Sleep Mode Setting

The sleep mode can be set by writing the code "1" (H level) to the Sleep bit of the serial data.

The sleep mode performs ① output muting, ② stop the internal clock, ③ stop the memory operation and put a low current consumption mode. Normally, this Sleep bit must be "0" (L level).

In order to avoid the shock noise output when the sleep mode released, mute function using is recommended.

4

SLEEP	MODE	FUNCTIONS
0	NORMAL	Normal operation
1	SLEEP	①Output Muting ② Stop the Internal Clock ③ Stop the Memory Operation

3) Delay Time Setting

64 kind of delay time from 0.5ms to 32.8ms in 0.5ms is set by D1 to D6 of the serial data.

D6	D5	D4	D3	D2	D1	Delay T.	
0	0	0	0	0	0	0.5	
					1	1.0	
				1	0	1.5	
					1	2.0	
			1	0	0	0	2.6
						1	3.1
					1	0	3.6
						1	4.1
		0		0	0	4.6	
					1	5.1	
				1	0	5.6	
					1	6.1	
		1	0	0	0	6.7	
					1	7.2	
				1	0	7.7	
					1	8.2	
	0		0	0	8.7		
				1	9.2		
			1	0	9.7		
				1	10.2		
	1	0	0	0	10.8		
				1	11.3		
			1	0	11.8		
				1	12.3		
		0	0	0	12.8		
				1	13.3		
			1	0	13.8		
				1	14.3		
	1	0	0	0	14.8		
				1	15.4		
			1	0	15.9		
				1	16.4		

D6	D5	D4	D3	D2	D1	Delay T.	
1	0	0	0	0	0	16.9	
					1	17.4	
				1	0	17.9	
					1	18.4	
			1	0	0	0	18.9
						1	19.5
					1	0	20.0
						1	20.5
		0		0	0	21.0	
					1	21.5	
				1	0	22.0	
					1	22.5	
		1	0	0	0	23.0	
					1	23.6	
				1	0	24.1	
					1	24.6	
	0		0	0	25.1		
				1	25.6		
			1	0	26.1		
				1	26.6		
	1	0	0	0	27.1		
				1	27.6		
			1	0	28.2		
				1	28.7		
		0	0	0	29.2		
				1	29.7		
			1	0	30.2		
				1	30.7		
	1	0	0	0	31.2		
				1	31.7		
			1	0	32.3		
				1	32.8		

4

4)Mute Setting

The mute mode can be set by writing the code "1" (H level) to the Mute bit of the serial data. Normally, this Mute bit must be "0" (L level).

MUTE	MODE	FUNCTIONS
0	NORMAL	Normal operation
1	SLEEP	Output Muting

5)ID Code Setting

The access from the controller (CPU) is recognized the ID code input. It is useful when the NJU9702 connect the common bus together with other LSI (s). The IDSW can select the prefixed ID code. If the other LSI using the ID code system and setting the same code already, please select other code by using this SW (IDSW).

CONDITIONS	CODE SELECTION TERM.	ID CODE			
	IDSW	ID1	ID2	ID3	ID4
1	0	0	0	1	0
2	1	0	0	1	1

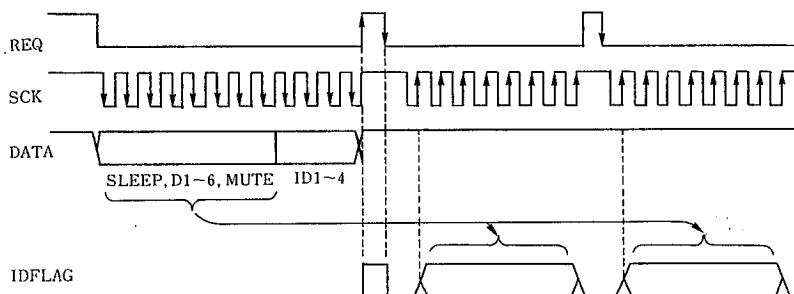
(note) ID code input except mentioned above, the NJU9702 can not receive any data. In this case, the NJU9702 still keeping the condition input before.

6)IDFLAG

IDFLAG is terminal to check the setting of delay time and the setting conditions.

When the serial data is received by the NJU9702, the IDFLAG terminal output "H" level for controller (CPU)'s confirmation.

After serial data writing, except the ID code (Sleep, D1 to D6, and Mute) can read out for checking. When the read out, ① set the "L" level of the request signal (REQ), ② input the clock signal are required. The data is output synchronized by the rising edge of the clock signal. The ID code can not read out even if over 8 clock input.

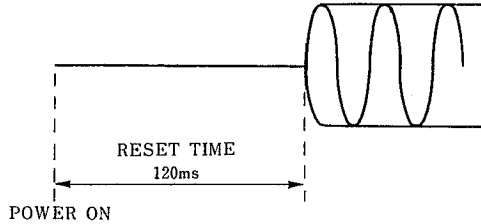


7)Reset Function

NJU9702 performs power-on-initialization when turn on the power. After 120ms passed the turn at the condition of $V_{CC}=5V$, Capacitor connecting to the REF terminal= $4.7\mu F$, it is released automatically. The 20.0ms delay time is set by the power-on-initialization.

The reset period of NJU9702 depends on an on-chip resistance "R" and a capacitor connected REF terminal. Next expression can compute the reset time.

$$\text{Reset Time} = 2.5 \times C (\mu F)$$



Condition : $V_{CC}=5V$, $C=4.7\mu F$ (REF terminal)

(REMARKS)

The NJU9702 needs to work a MUTE function for interruption that shock noise occurs when RESET is released.

The NJU9702 needs to supply a power to V_{DD} in advance or at the mean time with other power source V_{CC} . If a power supplying sequence is not performed correctly, then power-on-initialization dose not work correctly.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{DD}	6.5	V
	V _{CC}	6.5	V
Operating Current	I _{CC}	100	mA
Power Dissipation	P _D	500	mW
Operating Temperature Range	T _{opr}	-20 ~ +75	°C
Storage Temperature Range	T _{stg}	-40 ~ +125	°C

(note) V_{DD} should be rise up before V_{CC} or same time. Otherwise power-on-initialization may not be operate correctly.

■ RECOMMENDED OPERATING CONDITIONS

(V⁺=5V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Voltage	V _{DD}		4.5	5.0	5.5	V
	V _{CC}		4.5	5.0	5.5	V
Clock Frequency	f _{ck}			2.0		MHz
Input Voltage "H"	V _{IH}		0.7V _{DD}		V _{DD}	V
Input Voltage "L"	V _{IL}		0	-	0.3V _{DD}	V
Serial Clock	f _{sek}		-	-	4.0	MHz

4

■ ELECTRICAL CHARACTERISTICS

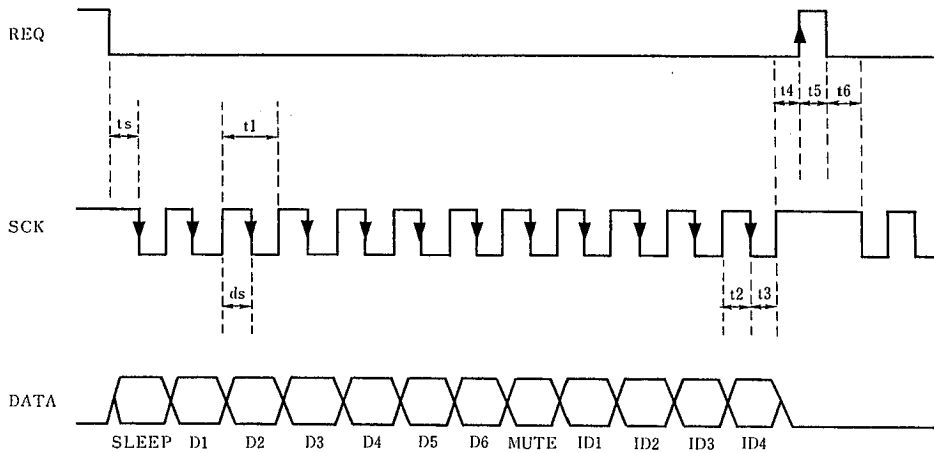
(V_{DD}=V_{CC}=5V, f=1kHz, V_O=200mVrms, Ta=25°C)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Operating Current	I _{CC}	No Signal	-	16	35	mA
Voltage Gain	G _V	R _i =47KΩ	-3.5	-0.5	2.5	dB
Max. Output Voltage	V _{Omax}	THD=10%	0.7	1	-	Vrms
Output Distortion	THD	30kHz LPF	-	0.2	1.0	%
Output Noise Voltage	N _O	DIN-AUDIO	-	-95	-75	dBV
Supply Voltage Rejc. Ratio	SVRR	V _{CC} =20dBV, f=100Hz	-	-40	-25	dB
Frequency Characteristics	f	-3dB, V _O =100mVrms	-	7	-	kHz

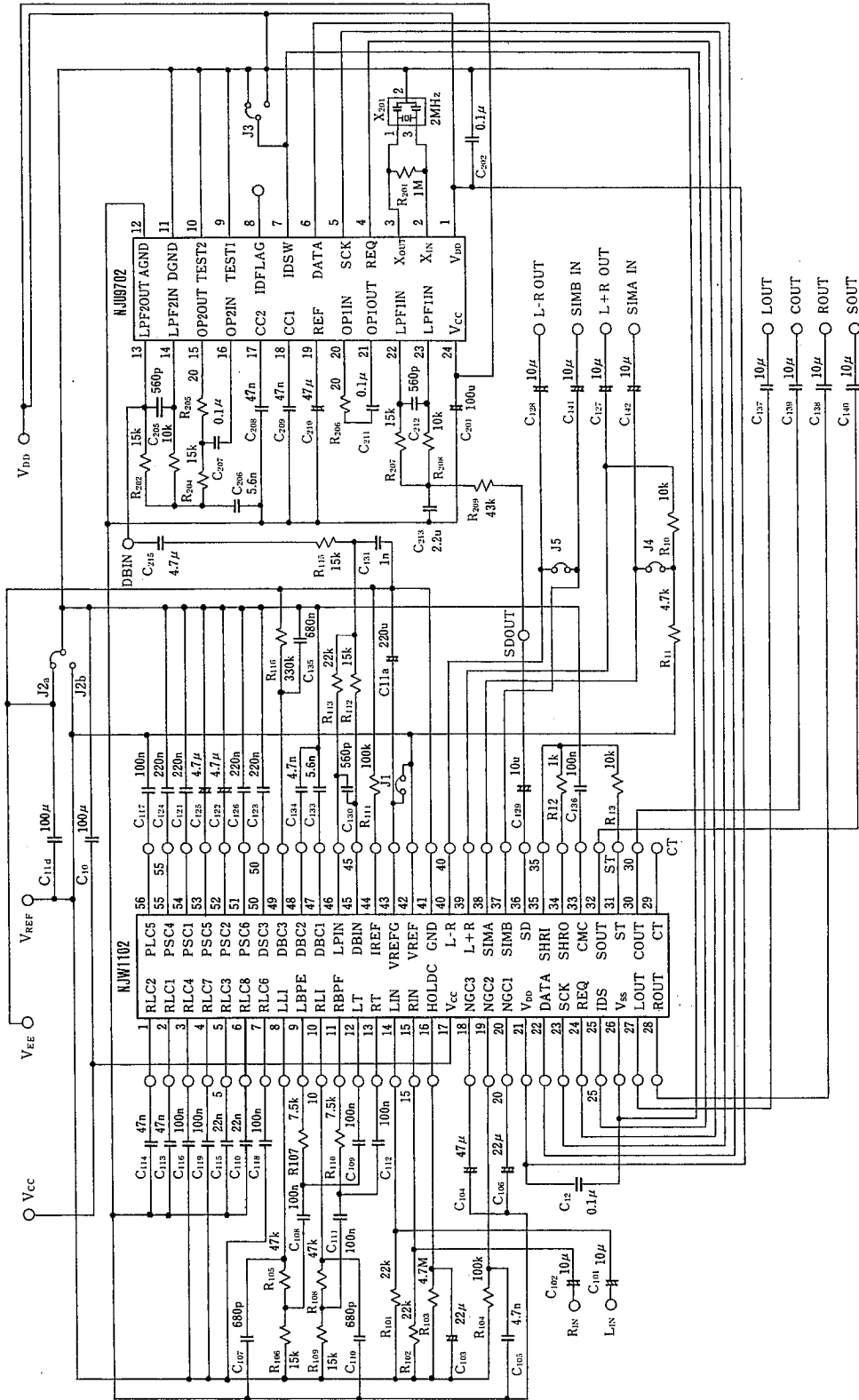
■ SERIAL DATA TIMING

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
SCK Clock Width	t_1	250	—	—	ns
SCK Duty	d_s	40	50	60	%
Data Set-up Time	t_2	100	$t_1/2$	—	ns
Data Hold Time	t_3	100	$t_1/2$	—	ns
REQ Hold Time	t_4	100	—	—	ns
REQ "H" Pulse Width	t_5	100	—	—	ns
SCK Set-up Time	t_6	100	—	—	ns

■ TIMING CHART



■ APPLICATION CIRCUIT(2) (Combined with NJW1102)



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；光电子元件和组件：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 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