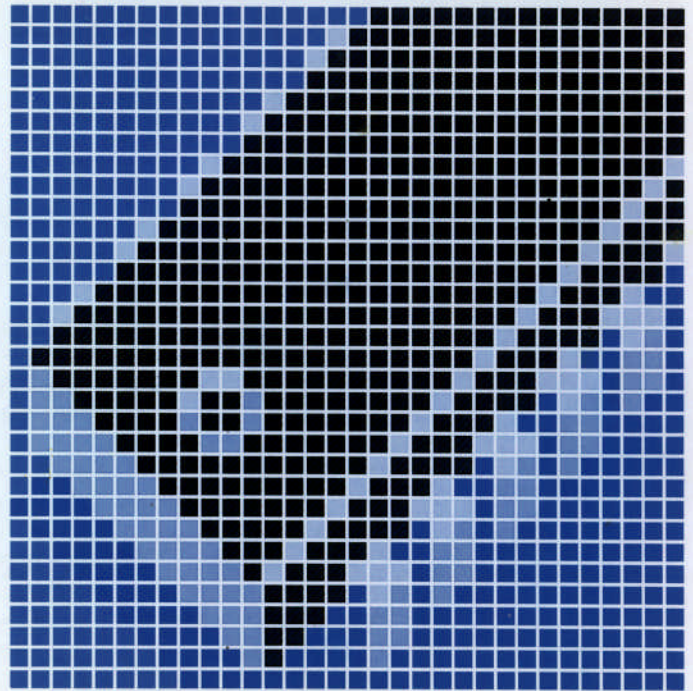
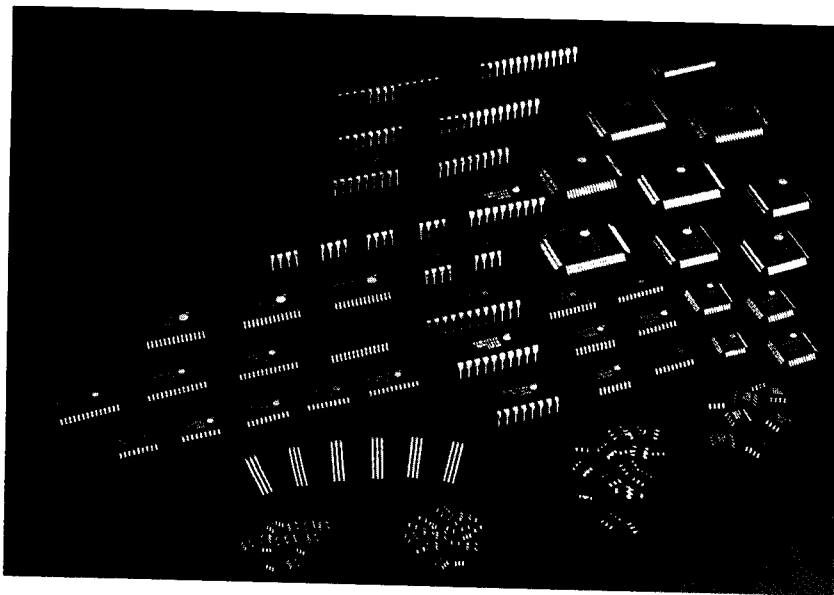


CMOS IC





The technology of the ICs used in every field from office automation equipment to video and audio equipment is becoming increasingly advanced. The required specifications and quality vary greatly depending on the applications, so high level technological capabilities are required for development. Seiko Instruments Inc. has supplied a variety of ASSPs (Application Specific Standard Products) based on its technological and developmental capabilities cultivated with watch ICs which require precision performance, high quality, accuracy and flexibility as well as high processing accuracy and low power consumption. Seiko Instruments Inc. continues to respond to the users' expectations converting the results of unique technological developments.

CONTENTS

MEMORY	NV RAM.....	2
	SERIAL E ² PROM	3
	PARALLEL E ² PROM	4
	SRAM.....	5
	FUSE ROM	5
MICROCOMPUTER	4-BIT SINGLE CHIP MICROCOMPUTER.....	6
	8-BIT SINGLE CHIP MICROCOMPUTER.....	6
POWER SUPPLY	VOLTAGE DETECTOR.....	7
	HIGH-PRECISION VOLTAGE DETECTOR WITH DELAY CIRCUIT	8
	HIGH-PRECISION VOLTAGE DETECTOR	9
	HIGH-PRECISION VOLTAGE REGULATOR.....	10
	VOLTAGE REGULATOR	10
	MINIATURE PACKAGE VOLTAGE REGULATOR.....	11
	HIGH-OUTPUT CURRENT & HIGH-PRECISION VOLTAGE REGULATOR	11
	VOLTAGE REGULATORS WITH RESET FUNCTION	12
	HIGH-OUTPUT VOLTAGE REGULATOR WITH RESET FUNCTION.....	12
	BATTERY BACKUP IC.....	13
	STEP UP & DOWN VOLTAGE REGULATOR	15
	STEP-UP SWITCHING REGULATOR.....	16
	INVERTING SWITCHING REGULATOR.....	17
	POWER MANAGEMENT IC FOR PORTABLE TELEPHONE.....	18
POWER MANAGEMENT IC	18	
TELECOMMUNICATIONS	PAGING DECODER IC (POCSAG).....	19
	LSIs FOR TELEPHONE SET	19
	4-BIT MICROCOMPUTER FOR TELEPHONE SET...	20
	TONE GENERATOR.....	20
	TONE SQUELCH	20
ICs FOR TIMERS	SERIAL-OUTPUT TIMER.....	21
	REALTIME CLOCK	21
	CR TIMER.....	21
SENSOR	TEMPERATURE SENSOR	21
DRIVER	LCD DRIVER.....	22
	THERMAL PRINT HEAD DRIVER	22

NV RAM

S-22 Series/S-24 Series

The NV RAM (non-volatile RAM) is a CMOS non-volatile memory combining a CMOS static RAM and a non-volatile electrically erasable and programmable ROM (E²PROM) as its back up on a bit-by-bit basis. Since the RAM is an asynchronously perfect CMOS static RAM, its current consumption is very low.

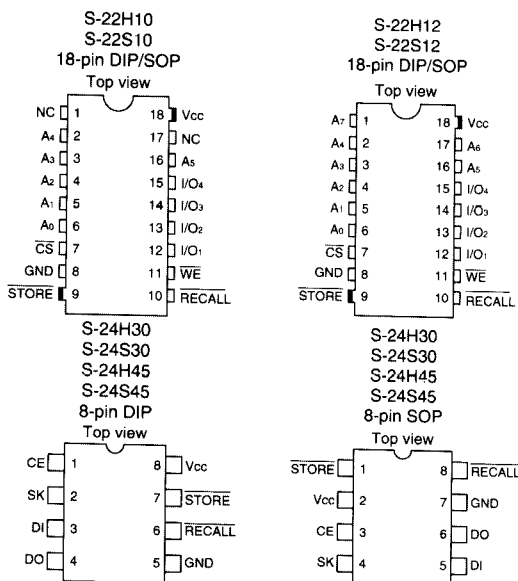
FEATURES

- 5-V single power supply. Electrically erasable and programmable ROM
- Three-state outputs
- Store and recall are controlled by a narrow signal width: >200ns (parallel type)
- 10,000 or 100,000 erase/write cycles for E²PROM
- Ten-year data retention
- Erroneous store protection: $\approx 3.5V$
- Wide operating temperature: $-40^{\circ}C$ to $+85^{\circ}C$

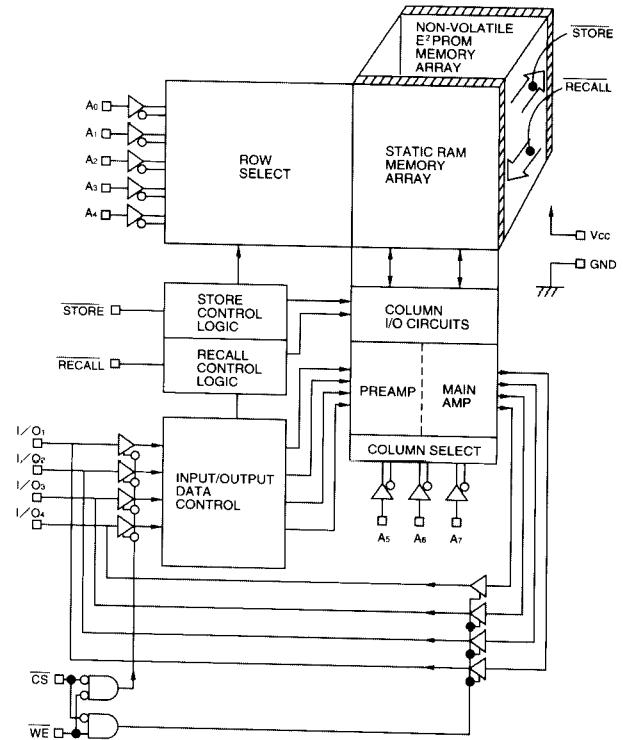
APPLICATIONS

- Constants setting
- Data memory
- Rewritable programs and firmware
- System configuration setting
- System parameters and part No. setting
- System status monitor

PIN CONFIGURATIONS



BLOCK DIAGRAM (S-22S12, S-22H12)



SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage	Current consumption		Static RAM operation			Store Operation	Array recall operation	Package
				Operating Max.	Standby Max.	Clock frequency Max.	Read cycle time Min.	Write cycle time Min.	Store time Max.	Recall cycle time Min.	
S-24H30	64-bit	8×8 Serial	5V±10%	10mA	1 μA	1MHz	—	—	10ms	2500ns	8 DIP/SOP
S-24S30	64-bit	8×8 Serial	5V±10%	10mA	1 μA	1MHz	—	—	10ms	2500ns	8 DIP/SOP
S-24H45	256-bit	16×16 Serial	5V±10%	10mA	1 μA	1MHz	—	—	10ms	2500ns	8 DIP/SOP
S-24S45	256-bit	16×16 Serial	5V±10%	10mA	1 μA	1MHz	—	—	10ms	2500ns	8 DIP/SOP
S-22H10	256-bit	64×4 Parallel	5V±10%	30mA	1 μA	—	—	—	10ms	2500ns	8 DIP/SOP
S-22S10	256-bit	64×4 Parallel	5V±10%	30mA	1 μA	—	200ns	200ns	10ms	1300ns	18 DIP/SOP
S-22H12	1K-bit	256×4 Parallel	5V±10%	30mA	1 μA	—	200ns	200ns	10ms	1300ns	18 DIP/SOP
S-22S12	1K-bit	256×4 Parallel	5V±10%	30mA	1 μA	—	200ns	200ns	10ms	1300ns	18 DIP/SOP

Note) H type : All inputs/outputs are compatible with TTL, and can be connected directly to TTL.
S type : Schmitt inputs are available to store and recall terminals.

SERIAL E²PROM

S-29 Series

The E²PROM (electrically erasable and programmable ROM) uses the CMOS silicon-gate process and the floating gate memory cell, and realizes high reliability. Various lineups afford suitable choice for usage.

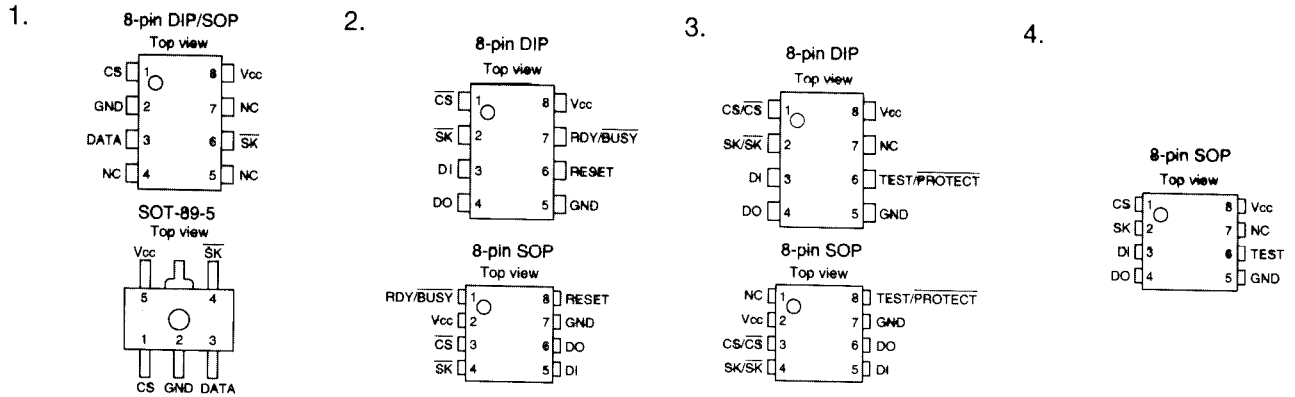
FEATURES

- Low current consumption
- Write operation with a built-in timer
- Wide operating voltage
- Erase data mode and write all mode
- Data retention: 10 years
- 10,000 or 100,000 erase/write cycles
- Wide operating temperature: -40°C to 85°C

APPLICATIONS

- Pager security (ID code)
- Camera
- Cordless telephone set
- VTR
- Printer

PIN CONFIGURATIONS



SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage		Current consumption		Clock frequency Max.	Package	Pin config No.	Note
			Read	Write	Operating Max.	Standby Max.				
S-2900A	512bits	64×8	1.5 to 5.5V	2.7 to 5.5V	1.4mA	1.0 μA	2.0MHz	8 DIP/SOP SOT-89-5 Chip	1	Easy interface with serial port
S-2913A	1K bits	64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93CS46, Sequential
S-2913C	1K bits	32×16+32×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93CS46, Sequential, Memory Protection
S-2914A	1K bits	64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93C46
S-2914AID	1K bits	64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8SOP	4	Instruction code conforming to NM93C46
S-2919A	1K bits	64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code)
S-2919C	1K bits	32×16+32×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection
S-2919G	1K bits	32×16+32×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection, CS active "L"
S-2922A	2K bits	128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93CS56, Sequential
S-2923C	2K bits	64×16+64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to CAT35C102, Sequential, Memory protection
S-2924A	2K bits	128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to CAT35C102
S-2929A	2K bits	128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code)
S-2929C	2K bits	64×16+64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection
S-2929G	2K bits	64×16+64×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection, CS active "L"
S-29255A	2K bits	128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8 DIP/SOP Chip	2	Instruction code conforming to M6M80021 Easy interface with serial port, Memory protection
S-2933C	4K bits	128×16+128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93CS66, Sequential, Memory protection
S-2934A	4K bits	256×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Instruction code conforming to NM93C66
S-2934AID	4K bits	256×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8SOP	4	Instruction code conforming to NM93C66
S-2939A	4K bits	256×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code)
S-2939C	4K bits	128×16+128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection
S-2939G	4K bits	128×16+128×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8DIP/SOP	3	Easy interface with serial port (SII original code) Memory protection, CS active "L"
S-29355A	4K bits	256×16	1.8 to 6.5V	2.7 to 6.5V	2.0mA	1.0 μA	2.0MHz	8 DIP/SOP Chip	2	Instruction code conforming to M6M80041 Easy interface with serial port, Memory protection
S-2940	1K bits	16×8	2.7 to 6.5V	3.8 to 6.5V	5.0mA	1.0 μA	0.15MHz	8DIP/SOP	—	Easy interface with serial port
S-2980	1K bits	768×1	2.4 to 5.5V	5V ± 10%	2.0mA	20 μA	0.25MHz	8DIP/SOP	—	Bit sequential Instruction code conforming to MB8541
S-2911	1K bits	64×16, 128×8	5V ± 10%	5V ± 10%	4.0mA	100 μA	0.25MHz	8DIP	—	Instruction code conforming to ER5911
S-2917	1K bits	64×16, 128×8	5V ± 10%	5V ± 10%	4.0mA	100 μA	0.5MHz	8DIP/SOP	—	Easy interface with serial port
S-2918	1K bits	32×8+96×8	5V ± 10%	5V ± 10%	4.0mA	100 μA	0.5MHz	8DIP/SOP	—	Easy interface with serial port Memory protection

PARALLEL E²PROM

S-28 Series

The S-2812A and the S-2817A are 2K×8-bit, and the S-2860A and the S-2864A are 8K×8-bit parallel E²PROMs that feature low current consumption. The S-2812A and the S-2860A operate within a wide voltage range and can operate at 3V. The S-2817A and the S-2864A operate at 5V±10%.

■FEATURES

- Low current consumption
- Data retention: 10 years
- 100,000 erase/write cycles
- 32-byte page write
- Data polling

■SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage		Current consumption		Address access time Max.	Package
			Read	Write	Operating Max.	Standby Max.		
S-2812A	16K bits	2K×8bits	1.8 to 5.5V	2.7 to 5.5V	30mA	1.0 μA	150ns	28 DIP/SOP/TSOP Chip
S-2817A	16K bits	2K×8bits	5V ± 10%	5V ± 10%				
S-2860A	64K bits	8K×8bits	1.8 to 5.5V	2.7 to 5.5V				
S-2864A	64K bits	8K×8bits	5V ± 10%	5V ± 10%				

The S-2840A(R) is a 2K×8-bit parallel E²PROM that is made utilizing CMOS floating gate process. It is provided with write protection function at V_{cc} power ON / OFF, and is suitable for writing in system equipment.

■FEATURES

- 5V single power supply
- Data polling function
- Data retention: 10 years
- 100,000 erase/write cycles

■SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage		Current consumption		Address access time Max.	Package
			Read	Write	Operating Max.	Standby Max.		
S-2840A(R)	16K bits	2K×8bits	5V ± 10%	5V ± 10%	25mA	100 μA	200ns	24 DIP

SRAM

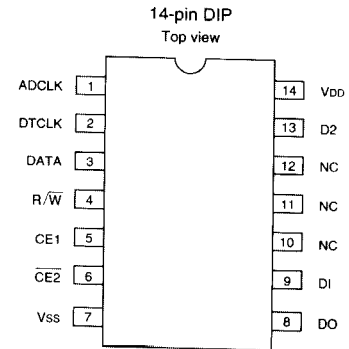
S-2510A

The S-2510A is a 2560-bit CMOS static RAM with a wide supply voltage range. Since addresses and data input format are serial, it is easy to interface with other devices. The S-2510A is suitable for extension memory of telephone.

FEATURES

- Low standby current
- Low data retention voltage
- Wide operating voltage range
- Because of serial inputs and outputs, It is easy to interface with at least 4 control lines.
- Data length can be set between 2-bit and 8-bit with D₀, D₁ and D₂ terminals.

PIN CONFIGURATIONS



SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage range	Data retention voltage Min.	Current consumption Max.			Access time Max.		Package
					Operating		Standby	Access time Max.		
					V _{CC} =1.5V f=10kHz	V _{CC} =3.0V f=200kHz		V _{CC} =1.5V	V _{CC} =1.2V	
S-2510A	2560 bits	Selectable	1.16 to 5.5V	1.0V	2.0 μA	50.0 μA	0.25 μA	3.0 μs	0.5 μs	14 DIP

FUSE ROM

S-2100R

The S-2100R is a 64-bit serial fuse ROM made using the CMOS process. It has low standby current (0.3 μA max., V_{DD} = 1.5V) and has a wide operating voltage range. Data can be read by the clock pulses from address 1 to address 64 serially. All the addresses are initialized with H, so writing into L can be done only once.

FEATURES

- Wide operating voltage range: 1.1V to 5.5V
- Well suited for chip on board applications due to thinness of chip

APPLICATIONS

- ID ROM
- Cordless telephone
- Security equipment

SPECIFICATIONS

Model No.	Memory size	Composition	Operating voltage range			Current consumption		Clock frequency Max.	Write time Min.	Package
			Read Min.	Write V _{DD} Min.	Write V _{PP} Typ.	Operating Max.	Standby Max.			
S-2100R	64 bits	Bit sequential	1.10V	4.5V	21V	20 μA	0.3 μA	140kHz	8ms	8DIP/SOP

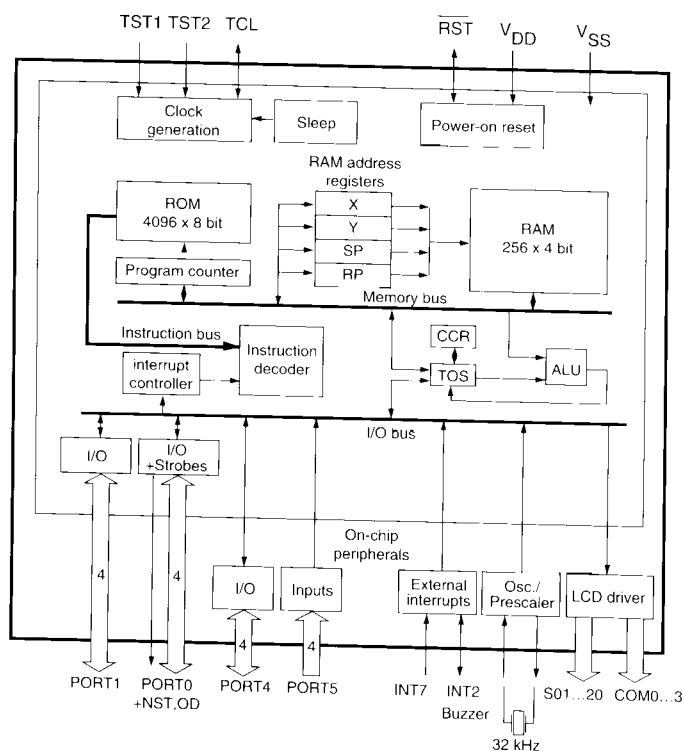
S-3605 Low voltage 4 bit microcontroller

The S-3605 is a member of the S-36XX family of low cost, single chip CMOS microcontrollers. This 4 bit μC contains an on-chip RC oscillator, CPU core, RAM, ROM, 16 I/O lines, 32 kHz crystal oscillator, 15 stage prescaler and liquid crystal display driver circuitry.

Software features

- High level language qFORTH with a highly optimizing compiler
- Efficient use of program space with compact, RISC-like instruction set
- ROM look-up table instructions
- Versatile interrupt handling with the unique AUTOSLEEP feature
- Self-check routines
- Programmable LCD driver circuitry with 20 segment drivers
80 pixels in 4:1 multiplex drive mode
60 pixels in 3:1 multiplex drive mode
- PC based development system
- Piggyback version for program evaluation

Functional block diagram

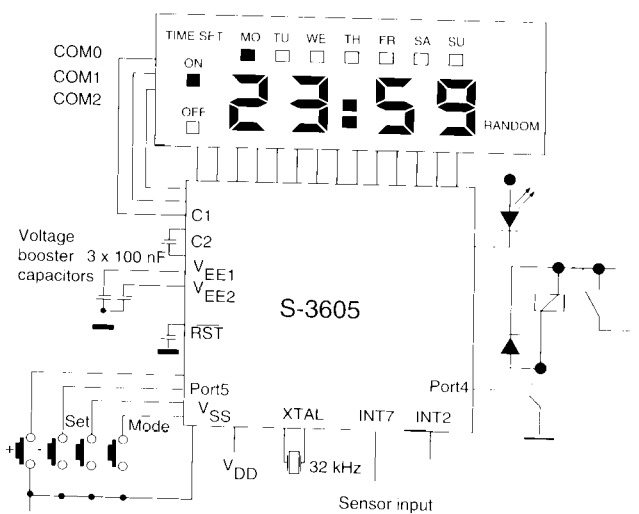


Hardware features

- 1.2 - 2.4 V operating voltage range
- 1.5 μm CMOS technology
- 4 bit stack oriented Harvard architecture
- Power saving and SLEEP mode for battery-operated applications ($< 1\mu\text{A}$)
- Independent power supplies (μC - crystal oscillator)
- 4 k x 8 bit of on-chip ROM
- 256 x 4 bit of on-chip RAM
- 12 bidirectional I/O lines
- 4 input lines with interrupt facility
- Fast on-chip RC oscillator
500 kHz internal operating frequency at 1.5 Volts (instruction cycle time of 4 μs)
- Min. 200 kHz at 1.2 Volts (i.e. atypical) instruction cycle time of 10 μs
- Separate watch crystal oscillator for time keeping
- 2 external and 2 prescaler (watch timer) interrupts
- Master reset and power-on reset
- Built-in LCD voltage generation with temperature compensation

S-3605 - Timer application

Application example



DC operating characteristics, $V_{\text{DD}} = 1.5 \text{ V}$, $T_{\text{AMB}} = +25^\circ\text{C}$

Supply voltage $V_{\text{DD}} = 1.5 \text{ V}$, $V_{\text{SS}} = 0 \text{ V}$, $T_{\text{AMB}} = +25^\circ\text{C}$ unless otherwise specified. All voltage levels are measured with reference to V_{SS} and current flowing into the device is positive. Typical parameters represent the statistical mean values

Parameter	Sym.	Min.	Typ.	Max.	Unit	Condition
Supply voltage	V_{DD}	1.2	1.5		V	
Active current	I_{DD}		215		μA	
Sleep current	I_{SLE}		0.9		μA	
Power save current	I_{PS}		0.4	0.1	μA	
Stop current	I_{STP}			0.1	μA	
RC oscillator frequency			280		kHz	$V_{\text{DD}} = 1.2 \text{ V}$

VOLTAGE DETECTOR

S-805 Series

The S-805 Series is a fixed type voltage detector made using the CMOS process. The detection voltage is fixed internally. It is made up of a low current consumption and high precision standard voltage source, a comparator, a hysteresis circuit and an output driver. TO-92 plastic package and plastic minimold package are available.

FEATURES

- Low current consumption
- Low voltage drive
- Built-in stable detection standard voltage supply
- Good hysteresis characteristics
- Excellent detection voltage temperature characteristics

APPLICATIONS

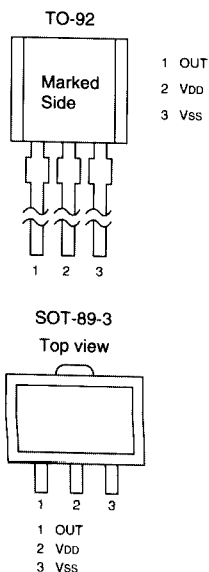
- Battery checker
- Level selector
- Window comparator
- Power failure detector
- Charger monitor
- Store-signal detector for non-volatile RAM

SPECIFICATIONS

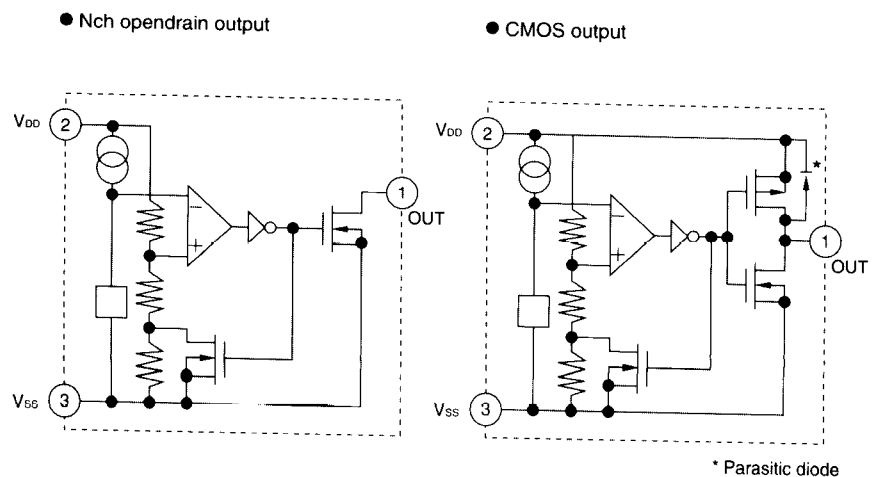
Detection voltage	TO-92	SOT-89-3*	Output state	Hysteresis width Typ.	Current consumption Typ.	Output current	Operating voltage
0.995 to 1.105V	S-8051ANB	S-8051ANB-NA-X	Nch opendrain	0.053V	1.4 μ A ($V_{DD}=1.5V$)	Nch, Typ.	0.9 to 5.0V
1.095 to 1.205V	S-8051ANR	S-8051ANR-NB-X		0.058V			
1.795 to 2.005V	—	S-8051HN-CD-X		0.095V			
1.995 to 2.205V	—	S-8052ANB-NE-X	CMOS	0.105V	1.8 μ A ($V_{DD}=3.0V$)	I_{OUT} V_{DD} (mA) (V) 0.25 0.95 0.50 1.20 3.70 2.40 7.00 3.60	1.5 to 10.0V
1.995 to 2.205V	S-8052ALB	S-8052ALB-LE-X		0.105V			
2.195 to 2.405V	S-8052ALR	S-8052ALR-LF-X		0.115V			
2.395 to 2.605V	S-8052ALO	S-8052ALO-LG-X		0.125V			
2.595 to 2.805V	S-8052ALY	S-8052ALY-LH-X		0.135V			
2.595 to 2.805V	—	S-8052ANY-NH-X	Nch opendrain	0.135V	2.6 μ A ($V_{DD}=6.0V$)	$V_{DS}=0.5V$	
2.295 to 2.505V	S-8052HNM	S-8052HNM-CR-X		2.000V			
2.795 to 3.105V	S-8053ALB	S-8053ALB-LI-X	CMOS	0.148V	2.2 μ A ($V_{DD}=4.5V$)	Pch, Min. I_{OUT} V_{DD} (mA) (V) 0.04 4.5 1.0 8.0	1.6 to 10.0V
2.895 to 3.105V	S-8053HLB	—		0.150V			
3.095 to 3.405V	S-8053ALR	S-8053ALR-LJ-X		0.163V			
3.395 to 3.705V	S-8053ANO	—	Nch opendrain	0.178V	2.6 μ A ($V_{DD}=6.0V$)	$V_{DS}=2.1V$	
2.895 to 3.105V	S-8053HNB	—		0.150V			
3.995 to 4.305V	S-8054ALB	S-8054ALB-LM-X	CMOS	0.208V	2.6 μ A ($V_{DD}=6.0V$)		
4.295 to 4.605V	S-8054ALR	S-8054ALR-LN-X		0.223V			
4.595 to 4.905V	S-8054ALO	S-8054ALO-LO-X		0.238V			
4.895 to 5.205V	S-8054ALY	S-8054ALY-LP-X		0.253V			
3.8 to 4.2V	S-8054HN	S-8054HN-CB-X		0.200V			
4.50 to 4.70V	S-8054HNM	S-8054HNM-CQ-X	Nch opendrain	0.050V			

* The last digit "X" changes as follows depending upon the packing form.
 X=S : Stick
 X=T1 or T2 : Tape

PIN CONFIGURATIONS



BLOCK DIAGRAM



VOLTAGE DETECTOR

S-806 Series

The S-806 Series is a fixed type voltage detector made using the CMOS process. The detection voltage is fixed internally. It is made up of a low current consumption and high precision standard voltage source, a comparator, a hysteresis circuit and an output driver. Output form is Nch opendrain and the package is TO-92.

FEATURES

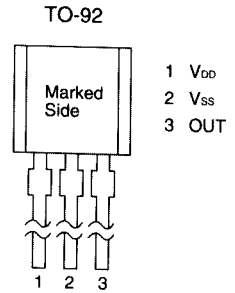
- Low voltage drive
- Built-in stable detection standard voltage supply
- Good hysteresis characteristics
- Excellent detection voltage temperature characteristics

SPECIFICATIONS

Detection voltage	Hysteresis width Typ.	Model No.			Current consumption Typ.	Output current Typ.	Operating voltage
		Loose	Taped (reel)*	Taped (zigzag)			
2.195 to 2.405V	0.115V	S-806L	S-806L-X	S-806L-Z	10 μ A ($V_{DD}=3.0V$)	I_{OUT} V_{DD} (mA) (V) 0.25 0.95 0.50 1.20 3.70 2.40 7.00 3.60 $V_{OS}=0.5V$	1.5 to 10.0V
2.395 to 2.605V	0.125V	S-806K	S-806K-X	S-806K-Z			
2.595 to 2.805V	0.135V	S-806J	S-806J-X	S-806J-Z			
2.795 to 3.005V	0.148V	S-806I	S-806I-X	S-806I-Z	10 μ A ($V_{DD}=4.5V$)	I_{OUT} V_{DD} (mA) (V) 0.25 0.95 0.50 1.20 3.70 2.40 7.00 3.60 $V_{OS}=0.5V$	1.6 to 10.0V
2.895 to 3.205V	0.150V	S-806H	S-806H-X	S-806H-Z			
3.095 to 3.405V	0.163V	S-806G	S-806G-X	S-806G-Z			
3.395 to 3.705V	0.178V	S-806F	S-806F-X	S-806F-Z	10 μ A ($V_{DD}=6.0V$)	I_{OUT} V_{DD} (mA) (V) 0.25 0.95 0.50 1.20 3.70 2.40 7.00 3.60 $V_{OS}=0.5V$	1.6 to 10.0V
3.695 to 4.005V	0.193V	S-806E	S-806E-X	S-806E-Z			
3.995 to 4.305V	0.208V	S-806D	S-806D-X	S-806D-Z			
4.40 to 4.70V	0.050V	S-806C	S-806C-X	S-806C-Z			

* The last digit "X" changes into "T" or "F" depending upon the direction of ICs on the tape.

PIN CONFIGURATIONS



HIGH-PRECISION VOLTAGE DETECTOR WITH DELAY CIRCUIT

▶ UNDER DEVELOPMENT

S-809 Series

The S-809 Series is a fixed type voltage detector with delay circuit. The detection voltage is fixed internally, with an accuracy of $\pm 2.0\%$. Three output forms are available, Nch opendrain and CMOS (active "H" and "L"). The package is very small TSOT-23-5 type.

FEATURES

- Low current consumption: 2.2 μ A typ. ($V_{DD}=1.5V$)
- High-precision detection voltage: $\pm 2.0\%$
- Minimum operating voltage: 0.7V

APPLICATIONS

- Battery checker
- Reset for microcomputer

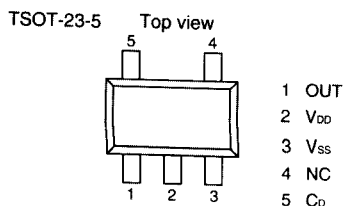
SELECTION GUIDE

Detection voltage*1	CMOS active "L"	CMOS active "H"	Nch opendrain
0.8V $\pm 2.0\%$	S-80908SL-D5Y-X	S-80908SH-D6Y-X	S-80908SN-D7Y-X
0.9V $\pm 2.0\%$	S-80909SL-D5Z-X	S-80909SH-D6Z-X	S-80909SN-D7Z-X
1.0V $\pm 2.0\%$	S-80910SL-D50-X	S-80910SH-D60-X	S-80910SN-D70-X

*1 Detection voltage can be selected by 0.1V step between 0.8V and 1.8V.

*2 The last digit of the model No. "X" changes into "P1" or "P2" depending upon the direction of ICs on the tape.

PIN CONFIGURATIONS



HIGH-PRECISION VOLTAGE DETECTOR

S-807 Series

The S-807 Series is an adjustment-free high-precision voltage detector made using the CMOS process. The detection voltage is fixed internally, with an accuracy of $\pm 2.4\%$. Two output types are available, Nch opendrain and CMOS output (active "H" and "L"), both of which have various product lineups. This series features much lower current consumption and higher detection voltage accuracy than the S-805 Series. We have added a new small package for the S-807 Series, the S-807XXSX Series. This small SOT-23-5 style package allows the designer to shrink the size of his finished product. Output forms of the S-807XXSX Series are Nch opendrain and CMOS active "L".

FEATURES

- Very-low current consumption
1.0 μA typ. ($V_{DD}=4.5$)
- High-precision detection voltage $\pm 2.4\%$
- Wide operating voltage range
1.0 to 15V
- Good hysteresis characteristics
5% typ.
- Wide operating temperature range
 -30°C to $+80^\circ\text{C}$
- 3 output forms: Nch opendrain, CMOS output active "H", active "L" (excluding the S-807XXSX)
- 2 output forms: Nch opendrain, CMOS active "L" (S-807XXSX)

APPLICATIONS

- Battery checker
- Battery backup for memories
- Power failure detector
- Reset for microcomputer
- Store signal detector for non-volatile RAM

SPECIFICATIONS

Detection voltage	Hysteresis width Typ.	CMOS Output (Low)			CMOS Output (High)		Nch opendrain			Current consumption Typ.	Pin configurations
		TO-92	SOT-89-3*	SOT-23-5*	TO-92	SOT-89-3*	TO-92	SOT-89-3*	SOT-23-5*		
1.5V $\pm 2.4\%$	0.075V		S-80715AL-AC-X					S-80715AN-DC-X		1.4 μA ($V_{DD}=3.0\text{V}$)	
1.6V $\pm 2.4\%$	0.08V		S-80716AL-AD-X					S-80716AN-DD-X			
1.7V $\pm 2.4\%$	0.085V	S-80717AL	S-80717AL-AE-X					S-80717AN-DE-X			
1.8V $\pm 2.4\%$	0.09V	S-80718AL	S-80718AL-AF-X					S-80718AN-DF-X			
1.9V $\pm 2.4\%$	0.095V	S-80719AL	S-80719AL-AG-X	S-80719SL-AG-X				S-80719AN-DG-X	S-80719SN-DG-X		
2.0V $\pm 2.4\%$	0.1V		S-80720AL-AH-X	S-80720SL-AH-X				S-80720AN-DH-X	S-80720SN-DH-X		
2.1V $\pm 2.4\%$	0.105V	S-80721AL	S-80721AL-AJ-X					S-80721AN-DJ-X			
2.2V $\pm 2.4\%$	0.11V	S-80722AL	S-80722AL-AK-X				S-80722AN	S-80722AN-DK-X			
2.3V $\pm 2.4\%$	0.115V	S-80723AL	S-80723AL-AL-X	S-80723SL-AL-X			S-80723AN	S-80723AN-DL-X	S-80723SN-DL-X		
2.4V $\pm 2.4\%$	0.12V	S-80724AL	S-80724AL-AM-X				S-80724AN	S-80724AN-DM-X			
2.5V $\pm 2.4\%$	0.125V	S-80725AL	S-80725AL-AN-X	S-80725SL-AN-X			S-80725AN	S-80725AN-DN-X	S-80725SN-DN-X		
2.6V $\pm 2.4\%$	0.13V		S-80726AL-AP-X					S-80726AN-DP-X			
2.7V $\pm 2.4\%$	0.135V	S-80727AL	S-80727AL-AQ-X	S-80727SL-AQ-X			S-80727AN	S-80727AN-DQ-X	S-80727SN-DQ-X		
2.8V $\pm 2.4\%$	0.14V		S-80728AL-AR-X	S-80728SL-AR-X			S-80728AN	S-80728AN-DR-X	S-80728SN-DR-X		
2.9V $\pm 2.4\%$	0.145V	S-80729AL	S-80729AL-AS-X					S-80729AN-DS-X			
3.0V $\pm 2.4\%$	0.15V	S-80730AL	S-80730AL-AT-X	S-80730SL-AT-X			S-80730AN	S-80730AN-DT-X	S-80730SN-DT-X		
3.1V $\pm 2.4\%$	0.155V	S-80731AL	S-80731AL-AV-X		S-80731AH		S-80731AN	S-80731AN-DV-X			
3.2V $\pm 2.4\%$	0.16V	S-80732AL	S-80732AL-AW-X				S-80732AN	S-80732AN-DW-X			
3.3V $\pm 2.4\%$	0.165V	S-80733AL	S-80733AL-AX-X		S-80733AH		S-80733AN	S-80733AN-DX-X			
3.4V $\pm 2.4\%$	0.17V	S-80734AL	S-80734AL-AY-X				S-80734AN	S-80734AN-DY-X			
3.5V $\pm 2.4\%$	0.175V	S-80735AL	S-80735AL-AZ-X	S-80735SL-AZ-X			S-80735AN	S-80735AN-DZ-X	S-80735SN-DZ-X		
3.6V $\pm 2.4\%$	0.18V		S-80736AL-A0-X					S-80736AN-D0-X			
3.7V $\pm 2.4\%$	0.185V	S-80737AL	S-80737AL-A1-X					S-80737AN-D1-X			
3.8V $\pm 2.4\%$	0.19V		S-80738AL-A2-X					S-80738AN-D2-X			
3.9V $\pm 2.4\%$	0.195V	S-80739AL	S-80739AL-A3-X					S-80739AN-D3-X			
4.0V $\pm 2.4\%$	0.2V	S-80740AL	S-80740AL-A4-X	S-80740SL-A4-X	S-80740AH	S-80740AH-B4-X	S-80740AN	S-80740AN-D4-X	S-80740SN-D4-X		
4.1V $\pm 2.4\%$	0.205V	S-80741AL	S-80741AL-A5-X				S-80741AN	S-80741AN-D5-X			
4.2V $\pm 2.4\%$	0.21V	S-80742AL	S-80742AL-A6-X	S-80742SL-A6-X				S-80742AN-D6-X	S-80742SN-D6-X		
4.3V $\pm 2.4\%$	0.215V	S-80743AL	S-80743AL-A7-X					S-80743AN-D7-X			
4.4V $\pm 2.4\%$	0.22V	S-80744AL	S-80744AL-A8-X					S-80744AN-D8-X			
4.295~ 4.605V	Release voltage 4.70V max.	S-80744HL	S-80744HL-U8-X								
4.5V $\pm 2.4\%$	0.225V	S-80745AL	S-80745AL-A9-X	S-80745SL-A9-X			S-80745AN	S-80745AN-D9-X	S-80745SN-D9-X		
4.6V $\pm 2.4\%$	0.23V	S-80746AL	S-80746AL-EA-X					S-80746AN-JA-X			
4.7V $\pm 2.4\%$	0.235V		S-80747AL-EB-X					S-80747AN-JB-X			
4.8V $\pm 2.4\%$	0.24V		S-80748AL-EC-X					S-80748AN-JC-X			
4.9V $\pm 2.4\%$	0.245V		S-80749AL-ED-X					S-80749AN-JD-X			
5.0V $\pm 2.4\%$	0.25V		S-80750AL-EE-X	S-80750SL-EE-X				S-80750AN-JE-X	S-80750SN-JE-X		
5.1V $\pm 2.4\%$	0.255V			S-80751SL-EF-X				S-80751AN-JF-X			

* The last digit "X" changes as follows depending upon the packing form when it is an SOT-89-3 or SOT-23-5 package product (tape only for SOT-23-5).

X=S : Stick

X=T1 or T2 : Tape

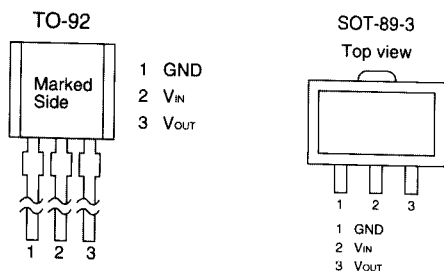
Please ask our sales person if you need another detection voltage product.

HIGH-PRECISION VOLTAGE REGULATOR

S-812XXPG Series

The S-812XXPG Series is a positive voltage regulator. As it is a CMOS device, it features a very precise output voltage and low current consumption. These features translate into longer battery life, especially in designs for portable, and hand held equipment.

PIN CONFIGURATIONS



FEATURES

- Very-low current consumption
- Small input/output voltage difference
- High-precision output voltage: $\pm 2.4\%$
- Excellent temperature coefficient of output voltage
- Wide operating voltage range
- Low load regulation
- TO-92 or SOT-89-3 package

APPLICATIONS

- Constant voltage power supply for battery-powered equipment, communication equipment and video equipment

SPECIFICATIONS

Output voltage	TO-92	SOT-89-3*	Input/Output voltage difference Typ.	Input stability 1	Input stability 2	Load stability Typ.	Current consumption	Input voltage Max.
1.1V \pm 2.4%	S-81211PG	S-81211PG-PA-X	0.05V	10mV to 50mV	10mV to 77mV	10mV	1.2 μ A typ. (3.2 μ A max.)	10V
1.5V \pm 2.4%	S-81215PG	S-81215PG-PK-X	0.03V	7mV to 39mV	7mV to 105mV	80mV		
2.0V \pm 2.4%	S-81220PG	S-81220PG-PS-X	0.63V	8mV to 48mV	8mV to 140mV	80mV		
2.4V \pm 2.4%	S-81224PG	S-81224PG-PX-X	0.49V	10mV to 55mV	10mV to 168mV	80mV		
2.5V \pm 2.4%	S-81225PG	S-81225PG-PH-X	0.59V	10mV to 57mV	10mV to 175mV	80mV		
3.0V \pm 2.4%	S-81230PG	S-81230PG-PB-X	0.44V	39mV to 78mV	39mV to 210mV	60mV		
3.3V \pm 2.4%	S-81233PG	S-81233PG-PF-X	0.37V	42mV to 84mV	42mV to 231mV	60mV		
3.5V \pm 2.4%	S-81235PG	S-81235PG-PI-X	0.34V	44mV to 88mV	44mV to 245mV	60mV		
3.7V \pm 2.4%	S-81237PG	S-81237PG-PE-X	0.31V	46mV to 92mV	46mV to 259mV	60mV		
4.0V \pm 2.4%	S-81240PG	S-81240PG-PJ-X	0.27V	48mV to 96mV	48mV to 280mV	50mV		
4.5V \pm 2.4%	S-81245PG	S-81245PG-P5-X	0.21V	52mV to 104mV	52mV to 315mV	50mV		
4.6V \pm 2.4%	S-81246PG	S-81246PG-PM-X	0.20V	53mV to 105mV	53mV to 322mV	50mV		
5.0V \pm 2.4%	S-81250PG	S-81250PG-PD-X	0.16V	55mV to 110mV	55mV to 350mV	40mV		
5.2V \pm 2.4%	S-81252PG	S-81252PG-PL-X	0.15V	57mV to 113mV	57mV to 364mV	40mV		

* The last digit "X" changes as follows depending upon the packing form.
X=S: Stick

X=T1 or T2: Tape

Please ask our sales person if you need another output voltage product.

VOLTAGE REGULATOR

S-802/812 Series

SPECIFICATIONS

Output voltage	TO-92	SOT-89-3*	Input stability Typ.	Load stability Typ.	Input/Output voltage difference Typ.	Current consumption Typ.	Input voltage Max.
-3V \pm 5%	S-80230AG	S-80230AG-GA-X	0.1%/V($V_{IN}=-10V$ to $-4V$)	60mV($I_{OUT}=1$ to 20mA)	60mV($I_{OUT}=1$ mA)	2.5 μ A	-10V
-5V \pm 5%	S-80250AG	S-80250AG-GB-X	0.1%/V($V_{IN}=-10V$ to $-6V$)	40mV($I_{OUT}=1$ to 40mA)	30mV($I_{OUT}=1$ mA)	3.0 μ A	-10V
1.5V \pm 5%	S-81215AG	S-81215AG-RK-X	0.1%/V($V_{IN}=2.5V$ to 10V)	80mV($I_{OUT}=1$ to 7mA)	300mV($I_{OUT}=0.5$ mA)	2.2 μ A	10V
2.5V \pm 5%	—	S-81225AG-RH-X	0.1%/V($V_{IN}=3.5V$ to 10V)	80mV($I_{OUT}=1$ to 10mA)	100mV($I_{OUT}=1$ mA)	2.5 μ A	10V
3.0V \pm 5%	S-81230AG	S-81230AG-RB-X	0.1%/V($V_{IN}=4V$ to 10V)	60mV($I_{OUT}=1$ to 20mA)	60mV($I_{OUT}=1$ mA)	2.5 μ A	10V
3.5V \pm 5%	—	S-81235AG-RI-X	0.1%/V($V_{IN}=4.5V$ to 10V)	60mV($I_{OUT}=1$ to 30mA)	60mV($I_{OUT}=1$ mA)	2.5 μ A	10V
3.7V \pm 5%	S-81237AG	S-81237AG-RE-X	0.1%/V($V_{IN}=4.3V$ to 10V)	60mV($I_{OUT}=1$ to 20mA)	60mV($I_{OUT}=1$ mA)	2.0 μ A	10V
4.0V \pm 5%	—	S-81240AG-RJ-X	0.1%/V($V_{IN}=5V$ to 10V)	50mV($I_{OUT}=1$ to 30mA)	50mV($I_{OUT}=1$ mA)	3.0 μ A	10V
5.0V \pm 5%	S-81250HG	S-81250HG-RD-X	0.1%/V($V_{IN}=6V$ to 10V)	40mV($I_{OUT}=1$ to 40mA)	30mV($I_{OUT}=1$ mA)	3.0 μ A	12V
5.2V \pm 5%	S-81252HG	S-81252HG-RL-X	0.1%/V($V_{IN}=6.2V$ to 15V)	40mV($I_{OUT}=1$ to 40mA)	30mV($I_{OUT}=1$ mA)	3.0 μ A	15V

* The last digit "X" changes as follows depending upon the packing form.

X=S: Stick

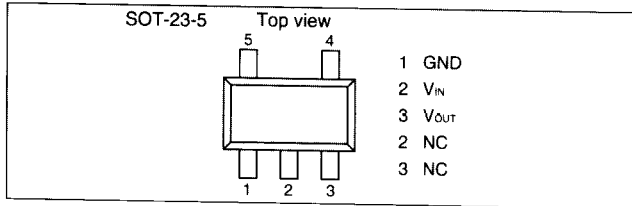
X=T1 or T2: Tape

MINIATURE PACKAGE VOLTAGE REGULATOR

S-812XXSG Series

The S-812XXSG Series is a positive voltage regulator made using the CMOS process. This series features a very precise output voltage ($V_{OUT} \geq 2.7V$: $V_{OUT} \pm 2.0\%$) and very low current consumption ($2.5 \mu A$ max.), and is in a very small 5-pin package (SOT-23-5). When used in portable, battery-powered equipment, this series helps extend battery life and allows the designer to improve the component density on the PCB.

PIN CONFIGURATIONS



FEATURES

- High-precision output voltage
 $\pm 2.4\%$ ($V_{OUT} \leq 2.6V$)
 $\pm 2.0\%$ ($V_{OUT} \geq 2.7V$)
- Low current consumption
 $1.2 \mu A$ typ., $2.5 \mu A$ max.
- Wide operating voltage range
 $16V$ max.
($V_{OUT} = 1.1V$ to $2.6V$: $10V$ max.)
- Wide operating temperature range
 $-40^\circ C$ to $+85^\circ C$
- SOT-23-5 package

APPLICATIONS

- High stability standard voltage
- Constant voltage power supply for battery-powered equipment, communication equipment, video equipment, and other equipment which require voltage temperature control

SPECIFICATIONS

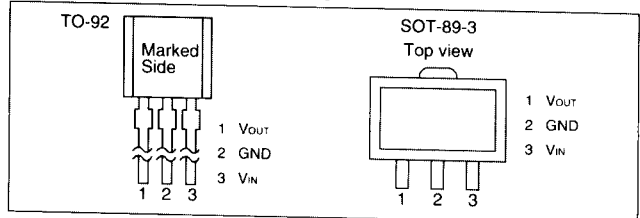
Output voltage	SOT-23-5*	I/O voltage difference Typ.	Input stability 1	Input stability 2	Load stability Typ.	Current consumption	Input voltage Max.
$1.1V \pm 2.4\%$	S-81211SG-QA-X	0.05V	10mV to 50mV	10mV to 77mV	10mV	$1.2 \mu A$ typ. ($2.5 \mu A$ max.)	10V
$1.5V \pm 2.4\%$	S-81215SG-QK-X	0.03V	7mV to 39mV	7mV to 105mV	80mV		
$2.0V \pm 2.4\%$	S-81220SG-QS-X	0.63V	8mV to 48mV	8mV to 140mV	80mV		
$2.4V \pm 2.4\%$	S-81224SG-QX-X	0.49V	10mV to 55mV	10mV to 168mV	80mV		
$2.5V \pm 2.4\%$	S-81225SG-QH-X	0.59V	10mV to 57mV	10mV to 175mV	80mV		
$3.0V \pm 2.0\%$	S-81230SG-QB-X	0.44V	39mV to 78mV	39mV to 210mV	60mV		
$3.3V \pm 2.0\%$	S-81233SG-QF-X	0.37V	42mV to 84mV	42mV to 231mV	60mV		
$3.5V \pm 2.0\%$	S-81235SG-QI-X	0.34V	44mV to 88mV	44mV to 245mV	60mV		
$3.7V \pm 2.0\%$	S-81237SG-QC-X	0.31V	46mV to 92mV	46mV to 259mV	60mV		
$4.0V \pm 2.0\%$	S-81240SG-QJ-X	0.27V	48mV to 96mV	48mV to 280mV	50mV		
$4.5V \pm 2.0\%$	S-81245SG-Q5-X	0.21V	52mV to 104mV	52mV to 315mV	50mV	16V	
$4.6V \pm 2.0\%$	S-81246SG-QM-X	0.20V	53mV to 105mV	53mV to 322mV	50mV		
$5.0V \pm 2.0\%$	S-81250SG-QD-X	0.16V	55mV to 110mV	55mV to 350mV	40mV		
$5.2V \pm 2.0\%$	S-81252SG-QL-X	0.15V	57mV to 113mV	57mV to 364mV	40mV		

* The last digit "X" changes into "T1" or "T2" depending upon the direction of ICs on the tape. Please ask our sales person if you need another output voltage product.

HIGH OUTPUT CURRENT & HIGH PRECISION VOLTAGE REGULATOR S-813 Series

The S-813 Series is a positive voltage regulator. Especially, despite its CMOS configuration, the S-813 Series can output high current with small input/output voltage difference. The S-813 Series features high precision output voltage. TO-92 plastic package and plastic minimold package are available.

PIN CONFIGURATIONS



SPECIFICATIONS

Output voltage	TO-92	SOT-89-3*	Input stability Typ.	Load stability Typ.	Input/Output voltage difference Typ.	Current consumption Typ.	Input voltage Max.
$3.0V \pm 2.4\%$	S-81330HG	S-81330HG-KB-X	$0.04\% / V(V_{IN} = 4V \text{ to } 15V)$	$60mV (I_{OUT} = 0.01 \text{ to } 30mA)$	$140mV (I_{OUT} = 30mA)$	$16 \mu A$	15V
$3.2V \pm 2.4\%$	S-81332HG	S-81332HG-KC-X	$0.04\% / V(V_{IN} = 4V \text{ to } 15V)$	$60mV (I_{OUT} = 0.01 \text{ to } 30mA)$	$140mV (I_{OUT} = 30mA)$		
$3.7V \pm 2.4\%$	—	S-81337HG-KE-X	$0.04\% / V(V_{IN} = 4.7V \text{ to } 15V)$	$60mV (I_{OUT} = 0.01 \text{ to } 30mA)$	$140mV (I_{OUT} = 30mA)$		
$4.0V \pm 2.4\%$	—	S-81340HG-K3-X	$0.04\% / V(V_{IN} = 5V \text{ to } 15V)$	$70mV (I_{OUT} = 0.05 \text{ to } 60mA)$	$120mV (I_{OUT} = 40mA)$		
$4.7V \pm 2.4\%$	—	S-81347HG-KQ-X	$0.04\% / V(V_{IN} = 5.6V \text{ to } 15V)$	$70mV (I_{OUT} = 0.05 \text{ to } 60mA)$	$120mV (I_{OUT} = 40mA)$		
$5.0V \pm 2.4\%$	S-81350HG	S-81350HG-KD-X	$0.04\% / V(V_{IN} = 6V \text{ to } 15V)$	$70mV (I_{OUT} = 0.05 \text{ to } 60mA)$	$120mV (I_{OUT} = 40mA)$		

* The last digit "X" changes as follows depending upon the packing form.
X=S: Stick
X=T1 or T2: Tape

Please ask our sales person if you need another output voltage product.

VOLTAGE REGULATORS WITH RESET FUNCTION

S-87050/8850 Series

The S-87050 and S-8850 Series are low-power 5-V voltage regulators with reset function. The output voltage and detection voltage are fixed internally.

The S-87050 Series is composed of a voltage regulator, a voltage detector and a delay circuit. The S-8850 Series is composed of a voltage regulator, a voltage detector, a delay circuit, a short-protection circuit and a shutdown circuit.

FEATURES

- Low current consumption: 3.5 μ A max.
- Small input/output voltage difference 0.15V typ. ($I_{OUT}=30$ mA)
- Wide operating voltage range: 1.0 to 15.0V
- Wide operating temperature range: -30° C to 80° C
- Excellent hysteresis characteristics
- High precision detection voltage: $\pm 3\%$
- SOT-89-5 or 8-pin SOP package

APPLICATIONS

- Constant voltage power supply and reset circuit of battery-powered equipment, VTR, camera, and communications equipment

SELECTION GUIDE

Detection voltage	Model No.	
	S-87050 Series (SOT-89-5)	S-8850 Series (8-pin SOP)
4.40 to 4.62V	--	S-8850AF, S-88501F
4.20 to 4.42V	--	S-8850BF, S-88502F
4.00 to 4.22V	S-87050CF-VP	S-8850CF, S-88503F
3.80 to 4.02V	S-87050DF-VQ	S-8850DF, S-88504F
3.60 to 3.82V	S-87050EF-VR	S-8850EF, S-88505F

* S-88501F to S-88505F can be completely immersed in molten solder.

SPECIFICATIONS

($T_a=25^{\circ}$ C)

Parameter	S-87050, S-8850 Series			Unit	
	Conditions	Min.	Typ.		Max.
Output voltage	$V_{IN}=7V, I_{OUT}=30$ mA	4.80	5.00	5.20	V
I/O voltage difference	$I_{OUT}=30$ mA	--	0.15	0.40	V
Input voltage		--	--	15	V
Current consumption	S-87050 $V_{IN}=7V, \text{No load}$	--	3.5	10.5	μ A
	S-8850 $V_{IN}=V_{SEN}=7V, V_{pr}="H", \text{No load}$	--	3.5	10.5	μ A
	S-8850 $V_{IN}=V_{SEN}=7V, V_{pr}="L", \text{No load}$	--	--	0.1	μ A
Hysteresis width		3	--	8	%
Delay time *	$C_d=4.7$ nF	15	27	41	ms
Output current	$V_{DS}=0.5V, V_{SEN}=2.4V$	2.00	3.70	--	mA
	$V_{SEN}=3.6V$	4.00	5.00	--	mA

* Excluding the charging current of C_d

Note) Release voltage of the S-8850AF : 4.75V max

HIGH-CURRENT VOLTAGE REGULATOR WITH RESET FUNCTION

► UNDER DEVELOPMENT

S-87X Series

The S-87X Series is a low-power high-output current voltage regulator with reset function. The output voltage and detection voltage are fixed internally, with accuracy of $\pm 2.4\%$. The S-87X Series is composed of a voltage regulator, a voltage detector, a short-protection circuit and an overheat protection circuit, and besides, either a delay circuit or a shutdown circuit is installed.

FEATURES

- Low current consumption: 10 μ A max.
- Small input/output voltage difference 0.12V typ. ($I_{OUT}=40$ mA)
- Wide operating voltage range: 1.0 to 24.0V
- Wide operating temperature range: -40° C to 85° C
- High precision output & detection voltage: $\pm 2.4\%$
- SOT-89-5 package

APPLICATIONS

- Constant voltage power supply and reset circuit of battery-powered equipment, VTR, camera, and communications equipment

SELECTION GUIDE

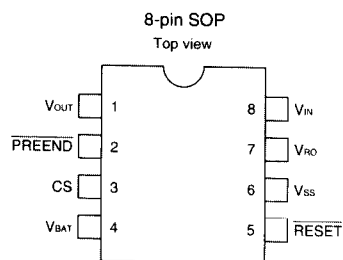
Model No.	Functions						
	Voltage regulator	Voltage detector	Short protection	Overheat protection	Delay circuit	Shutdown	
S-87XXXXA	YES	Detect V_{IN}	YES	YES	YES	V/R	V/D
S-87XXXXB	YES	Detect V_{OUT}	YES	YES	YES	NO	NO
S-87XXXXC	YES	Detect V_{IN}	YES	YES	NO	YES	NO
S-87XXXXD	YES	Detect V_{IN}	YES	YES	NO	YES	YES
S-87XXXXE	YES	Detect V_{OUT}	YES	YES	NO	YES	YES

BATTERY BACKUP IC

S-8420 Series

The S-8420 Series is a battery backup IC for use in the switching circuits of main and backup power supplies. It consists of a voltage regulator, a switchover circuit, and three voltage detectors (CS, RESET, PREEND). The current consumption is drastically minimized because of the CMOS configuration. The S-8420 Series has a built-in switch control circuit with special sequence, and also it detects the pre-end of the battery. The S-8420 Series affords a one-chip backup system.

PIN CONFIGURATIONS



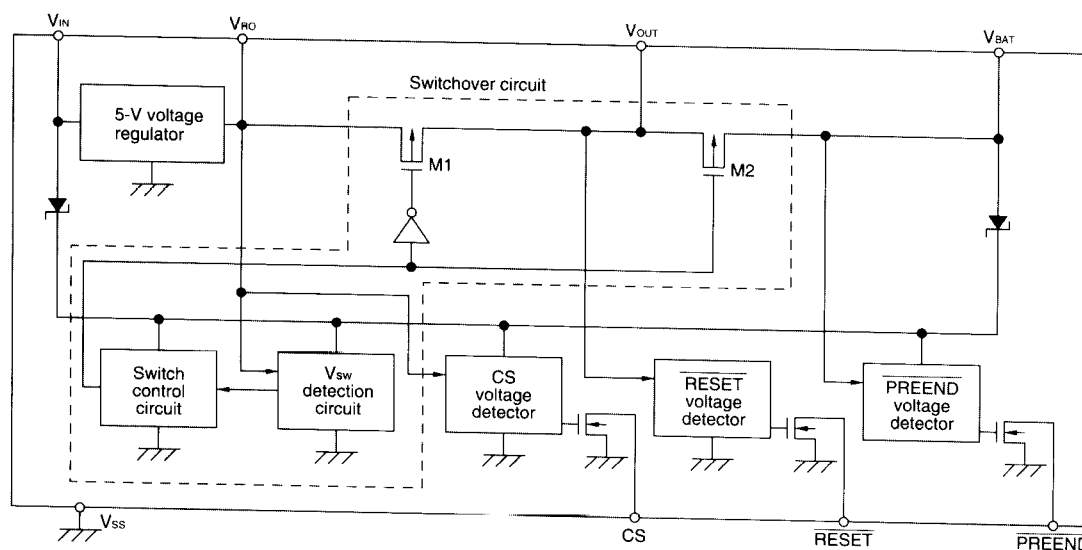
FEATURES

- Built-in switch control circuit
When the voltage of the main power connected to the V_{IN} terminal is less than V_{INI} , the backup voltage is not output to the V_{OUT} terminal even when the backup power is connected to the V_{BAT} terminal.
- Very low current consumption
Normal operation: $32\ \mu\text{A}$ max. ($V_{IN}=6\text{V}$)
Backup: $3.6\ \mu\text{A}$ max.
- Small input/output voltage difference
Voltage regulator: 0.35V max. ($I_{RO}=50\text{mA}$)
Switchover circuit: 0.3V max. ($I_{OUT}=50\text{mA}$)
- High precision output voltage: $\pm 3\%$
- High precision detection voltage: $\pm 3\%$
- 8-pin SOP package

APPLICATIONS

- Portable VTR camera
- Electronic still camera
- Memory card
- Memory backup devices

BLOCK DIAGRAM



Note) Output form of each detector is Nch opendrain.

SELECTION GUIDE

Model No.	Output voltage*(V)			CS detection voltage(V)			CS release voltage(V)			RESET detection voltage(V)		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
S-8420AF	4.86	5.0	5.14	4.36	4.49	4.62	4.44	4.59	4.74	2.42	2.5	2.58
S-8420BF	4.85	5.0	5.15	4.07	4.2	4.33	—	—	4.67	2.42	2.5	2.58
S-8420CF	5.06	5.25	5.44	4.07	4.2	4.33	—	—	4.67	2.23	2.3	2.37
S-8420DF	4.85	5.0	5.15	4.07	4.2	4.33	—	—	4.67	2.23	2.3	2.37

* S-8420AF/BF/DF : Regulated at the V_{RO} pin (output pin of the voltage regulator)
S-8420CF : Regulated at the V_{OUT} pin (output pin of the switch)

BATTERY BACKUP IC UNDER DEVELOPMENT

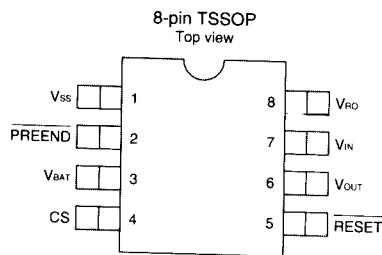
S-8423 Series

The S-8423 Series is a battery backup IC for use in the switching circuits of main and backup power supplies of 3-V operation microcomputer. It consists of two voltage regulators, a switchover circuit, and three voltage detectors (CS, RESET, PREEND). The current consumption is drastically minimized because of the CMOS configuration. The S-8423 Series has a built-in switch control circuit with special sequence, and also it detects the pre-end of the battery. The S-8423 Series affords a one-chip backup system.

FEATURES

- Built-in switch control circuit
When the voltage of the main power connected to the V_{IN} terminal is less than CS release voltage, the backup voltage is not output to the V_{OUT} terminal even when the backup power is connected to the V_{BAT} terminal.
- Very low current consumption
Normal operation: $43 \mu A$ max. ($V_{IN} = 6V$)
Backup: $2.1 \mu A$ max.
- Small input/output voltage difference
 $0.35V$ max. ($I_{OUT} = 50mA$)
- High precision output voltage: $\pm 2\%$
- High precision detection voltage: $\pm 2\%$
- 8-pin TSSOP package

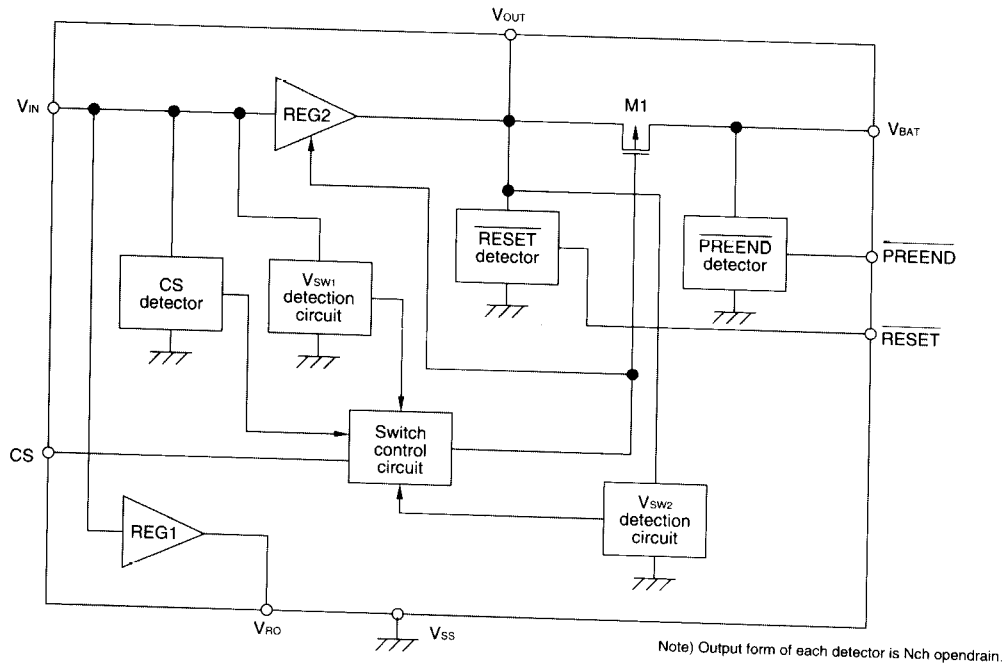
PIN CONFIGURATIONS



APPLICATIONS

- Portable VTR camera
- Electronic still camera
- Memory card
- Memory backup devices

BLOCK DIAGRAM



SELECTION GUIDE

Model No.	Output voltage*(V)			CS detection voltage(V)			CS release voltage(V)			RESET detection voltage(V)		
	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.
S-8423AFT	3.23	3.30	3.37	3.919	4.000	4.081	4.003	4.100	4.197	2.253	2.300	2.347
S-8423BFT	3.332	3.400	3.468	3.185	3.250	3.315	3.264	3.348	3.432	2.449	2.500	2.551
	3.135	3.200	3.265									

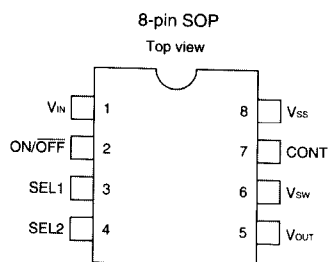
* S-8423AFT : $V_{RO} = V_{OUT}$
S-8423BFT : Upper = V_{RO} , lower = V_{OUT}

STEP-UP & DOWN VOLTAGE REGULATOR

S-8430AF

The S-8430AF is a high-precision DC-DC converter consisting of a CR oscillating circuit, a switching regulator, a voltage regulator and a Shottky-diode. The S-8430AF serves as a voltage regulator when the input voltage is higher than the output voltage. On the other hand, it serves as a step up switching regulator and as a voltage regulator when the input voltage is lower than the output voltage. Therefore, the output level is kept constant. The output voltage can be changed from 3V to 5V, and vice versa by an external signal. The S-8430AF is provided with a shutdown function that stops an internal CR oscillating circuit by other external signal.

PIN CONFIGURATIONS



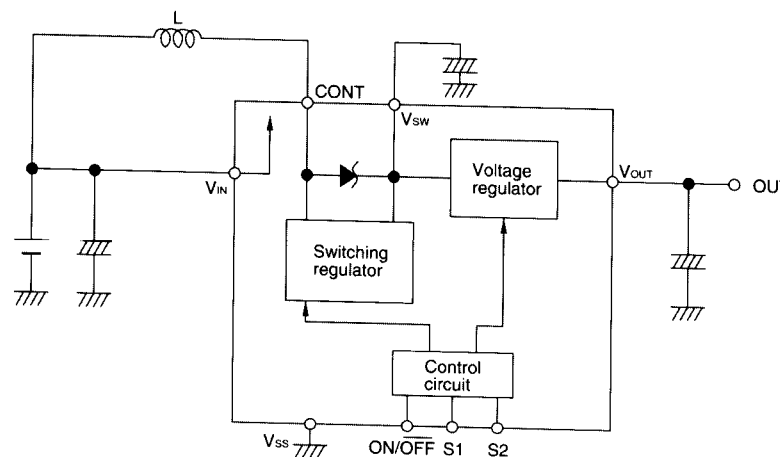
FEATURES

- Low current consumption
- High-precision output voltage
- Low voltage operation
- Selectable output voltage (switchable from 3V to 5V, and vice versa)
- Built-in CR oscillating circuit
- Shutdown function
- Selectable output voltage at shutdown (switchable from GND to voltage near the input voltage, and vice versa)
- Built-in Shottky-diode

APPLICATIONS

- Compact camera
- Handy copier
- Pager
- Handy terminal
- Battery-powered devices

BLOCK DIAGRAM



SPECIFICATIONS

Parameter	Conditions	(Ta=25°C)			Unit
		Min.	Typ.	Max.	
Input voltage		—	—	10.0	V
Output voltage	V _{IN} =2V, I _{OUT} =30mA SEL2=L, ON/OFF=H	2.85	3.00	3.15	V
	V _{IN} =3V, I _{OUT} =30mA SEL2=H, ON/OFF=H	4.80	5.00	5.20	V
Current consumption	V _{IN} =3V, No load, SEL2=H SEL1=H, ON/OFF=H	—	11	25	μA
	V _{IN} =7V, No load, SEL2=L SEL1=L, ON/OFF=L	—	—	0.2	μA
Operation start-up voltage	SEL2=L, V _{OUT} ≥ 2V, No load	0.9	—	—	V
Oscillation frequency	V _{IN} =3V	20	40	70	kHz

STEP-UP SWITCHING REGULATOR

S-8435/8436 Series

The S-8435 and S-8436 Series are CMOS step-up switching regulators that consist of a reference voltage source, a CR oscillation circuit, a power MOS FET, a diode, and a comparator. The output voltage is fixed internally, and a shutdown function is available. The current consumption is drastically minimized because of the CMOS configuration. They feature low voltage operation. The S-8435 Series easily forms a step-up switching regulator using only an external coil and capacitor. The S-8436 Series employs an external transistor to boost the available output current. These series are suitable for use as power sources for portable devices because of their small 5-pin package and few external parts.

FEATURES

- Low voltage operation: 0.9V min.
- Low current consumption Operating: $5.0\mu\text{A}$ typ.
 Shutdown: $0.2\mu\text{A}$ max.
- Shutdown function
- Built-in CR oscillation circuit
- Built-in diode
- High-precision output voltage
- SOT-89-5 package

APPLICATIONS

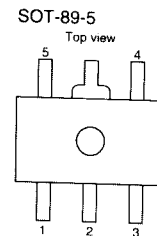
- Pager ● Compact camera ● Handy copier
- Electronic notebook ● Calculator
- Power source for portable device such as remote controller
- Video deck ● Power source for microcomputer
- Constant voltage power supply of communications equipment
- Other battery-powered equipment

ELECTRICAL CHARACTERISTICS

Parameter	Conditions	S-8435BF/S-8436BF			Unit
		Min.	Typ.	Max.	
Input power voltage		—	—	10	V
Operation start-up voltage	*1 $I_{\text{OUT}}=100\mu\text{A}$, *1 $V_{\text{OUT}}\geq 2.7\text{V}$	—	—	0.9	V
Current consumption	$V_{\text{IN}}=1.5\text{V}$, ON/OFF="H"	—	5	15	μA
Standby current	$V_{\text{IN}}=1.5\text{V}$, ON/OFF="L"	—	—	0.2	μA
Output voltage	$V_{\text{IN}}=1.5\text{V}$, $I_{\text{OUT}}=20\text{mA}/40\text{mA}$	2.91	3.00	3.09	V
Oscillation frequency	$V_{\text{IN}}=1.5\text{V}$	20	30	50	kHz

*1=S-8435BF *2=S-8435BF *3=S-8436BF

PIN CONFIGURATIONS



Pin No.	S-8435	S-8436
1	CONT	EXT
2	V_{SS}	
3	ON/OFF	
4	V_{IN}	
5	V_{OUT}	

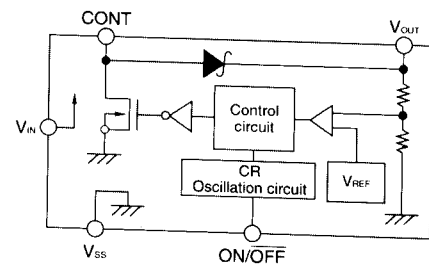
ELECTRICAL CHARACTERISTICS

Parameter	Conditions	S-8435CF/S-8436CF			Unit
		Min.	Typ.	Max.	
Input power voltage		—	—	10	V
Operation start-up voltage	*1 $I_{\text{OUT}}=100\mu\text{A}$, *1 $V_{\text{OUT}}\geq 4.5\text{V}$	—	—	0.9	V
Current consumption	$V_{\text{IN}}=3.0\text{V}$, ON/OFF="H"	—	5	15	μA
Standby current	$V_{\text{IN}}=3.0\text{V}$, ON/OFF="L"	—	—	0.2	μA
Output voltage	$V_{\text{IN}}=3.0\text{V}$, $I_{\text{OUT}}=20\text{mA}/40\text{mA}$	4.85	5.00	5.15	V
Oscillation frequency	$V_{\text{IN}}=3.0\text{V}$	20	30	50	kHz

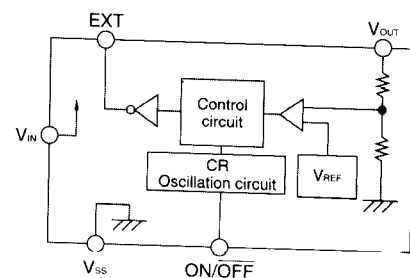
*1=S-8435CF *2=S-8435CF *3=S-8436CF

BLOCK DIAGRAM

S-8435 Series



S-8436 Series



SELECTION GUIDE

Output voltage	S-8435 Series	S-8436 Series
$1.5\text{V}\pm 3\%$	S-8435AF-SK-X	S-8436AF-XK-X
$3.0\text{V}\pm 3\%$	S-8435BF-SB-X	S-8436BF-XB-X
$3.6\text{V}\pm 3\%$	S-8435DF-S7-X	S-8436DF-X7-X
$3.7\text{V}\pm 3\%$	S-8435EF-SE-X	—
$4.4\text{V}\pm 3\%$	S-8435GF-WD-X	—
$5.0\text{V}\pm 3\%$	S-8435CF-SD-X	S-8436CF-XD-X
$12.0\text{V}\pm 3\%$	S-8435FF-WK-X	S-8436FF-YK-X

* The last digit "X" changes into "T1" or "T2" depending upon the direction of ICs on the tape.

INVERTING SWITCHING REGULATOR

S-8437/8438 Series

The S-8437AF and S-8438AF are CMOS inverting switching regulators that consist of a reference voltage source, a CR oscillation circuit, a power MOS FET and an error amplifier. For the S-8437AF, output voltage is fixed internally and it easily forms an inverting switching regulator with shutdown function; using an external coil, a diode and a capacitor. For the S-8438AF, any output voltage can be set under the conditions of $V_{IN} \leq 20 - |V_{OUT}|$ by adding two external resistors in addition to the above parts. Both the S-8437AF and the S-8438AF are suitable for use as power sources for portable devices because of their small 5-pin package (SOT-89-5), low current consumption and few external parts.

FEATURES

- Low current consumption (S-8437AF)
Operating: $13 \mu A$ typ.
Shutdown: $0.1 \mu A$ max.
- High-precision output voltage
 $-5V \pm 3.5%$ (S-8437AF)
- Any voltage can be set by mounting two external resistors (S-8438AF).
- Built-in CR oscillation circuit
Oscillation frequency: $50kHz$ typ.
- Built-in power MOS FET
- SOT-89-5 package

APPLICATIONS

- Power supply for portable equipment, such as pagers, electronic calculators, and remote controllers
- Constant voltage power for LCDs and analog circuits
- Power supply for communications equipment, such as cordless phone and portable telephone

ELECTRICAL CHARACTERISTICS (S-8437AF)

Parameter	Conditions	Min.	Typ.	Max.	Unit
Input voltage *		2	—	10	V
Output voltage	$V_{IN}=5V, I_{OUT}=10mA$	4.825	5.000	5.175	V
Line regulation	$V_{IN}=3$ to $10V, I_{OUT}=10mA$	—	35	160	mV
Load regulation	$V_{IN}=5V, I_{OUT}=10 \mu A$ to $15mA$	—	20	100	mV
Current consumption	$V_{IN}=5V, V_{OUT}=-7V$	—	13	28	μA
Standby current	$V_{IN}=5V, ON/OFF="L"$	—	—	0.1	μA
Oscillation frequency	$V_{IN}=5V$	30	50	70	kHz
Switching current	$V_{IN}=5V, CONT=4V$	—	150	—	mA
Output voltage during shutdown	$V_{IN}=5V, ON/OFF="L"$ $R_L=100 \Omega$	—	—	0.1	V

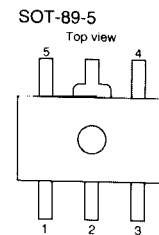
* The following equation shall met : $V_{IN} \leq 20 - |V_{OUT}|$

ELECTRICAL CHARACTERISTICS (S-8438AF)

Parameter	Conditions	Min.	Typ.	Max.	Unit
Input voltage *		2	—	10	V
Line regulation	$V_{IN}=3$ to $10V, V_{OUT}=-5V$ $I_{OUT}=10mA$	—	35	160	mV
Load regulation	$V_{IN}=5V, V_{OUT}=-5V$ $I_{OUT}=10 \mu A$ to $15mA$	—	20	100	mV
Reference voltage	$V_{IN}=5V$	1.176	1.200	1.224	V
Current consumption	$V_{IN}=5V, V_{FB}=-0.3V$	—	9	19	μA
Oscillation frequency	$V_{IN}=5V$	30	50	70	kHz
Switching current	$V_{IN}=5V, CONT=4V$	—	150	—	mA

* The following equation shall be met : $V_{IN} \leq 20 - |V_{OUT}|$

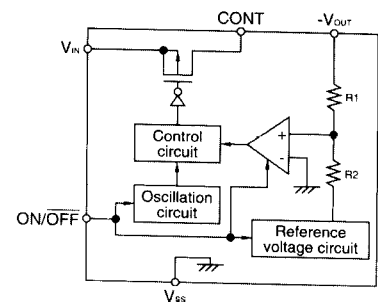
PIN CONFIGURATIONS



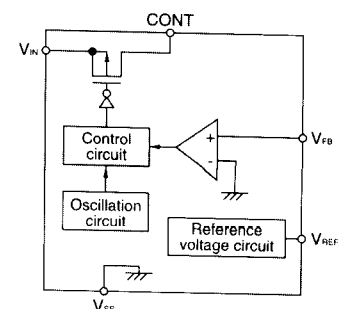
Pin No.	S-8437	S-8438
1	CONT	
2	V_{SS}	
3	ON/OFF	V_{FB}
4	$-V_{OUT}$	V_{REF}
5	V_{IN}	

BLOCK DIAGRAM

S-8437 Series



S-8438 Series



POWER MANAGEMENT IC FOR PORTABLE TELEPHONE

S-8440AF

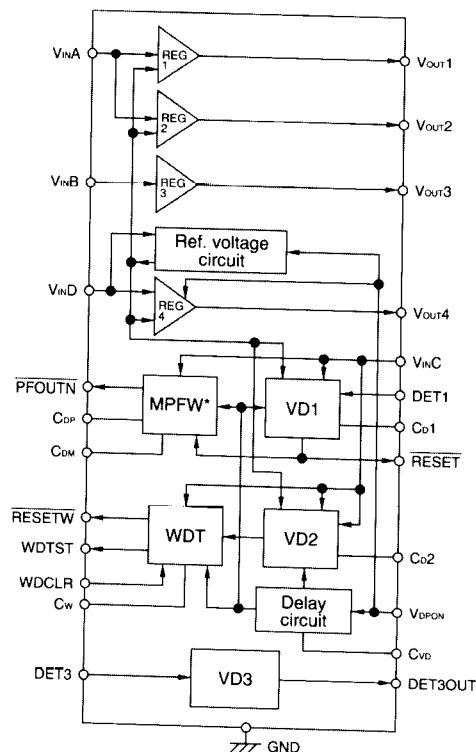
FEATURES

- Four built-in high-precision voltage regulators
 - REG1,2: $5V \pm 2.5\%$
 - REG3: $5.2V \pm 2.5\%$
 - REG4: $3.2V \pm 2.5\%$ (with shutdown function)
- Three built-in voltage detectors
 - VD1: Can set the detection voltage with two external resistors
 - VD2: $-V_{DET}$ (detection voltage) $= 2.50V \pm 2.5\%$
 - VD3: $-V_{DET} = 4.20V \pm 2.5\%$
 - VD1 and VD2 can set the delay time with an external capacitor.
- Low current consumption
 - Operating: $29\mu A$ typ.
 - Shutdown: $85nA$ max.
- Built-in high-precision reference voltage circuit: $1.2V \pm 2\%$
- Built-in momentary power-fail warning circuit that detects the momentary power-fail of the input voltage and generates a signal: Can set the undetected power-fail time with an external capacitor.
- Built-in watchdog timer circuit that detects MPU runaway and generates a RESET signal: Can set the time out period with an external capacitor (5s max.)
- 24-pin SSOP package

APPLICATIONS

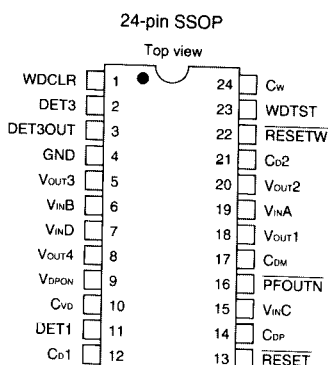
- Portable telephone
- Next generation cordlessphone
- Two-way radio equipment
- Other portable equipment

BLOCK DIAGRAM



*MPFW=Momentary power fail warning circuit

PIN CONFIGURATIONS



POWER MANAGEMENT IC

► UNDER DEVELOPMENT

S-8470AFS

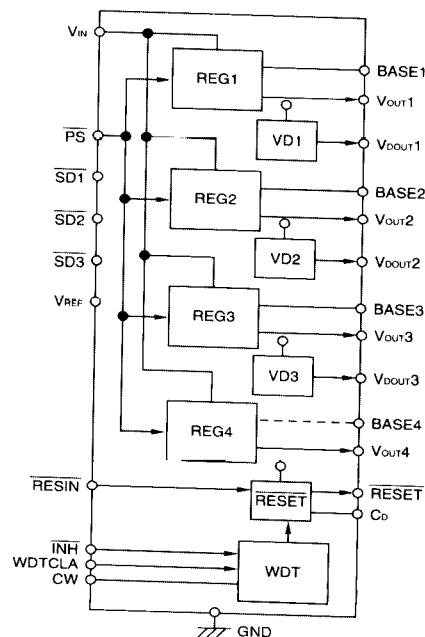
FEATURES

- Four built-in high-precision voltage regulators with external transistors (accuracy: $\pm 2.0\%$)
 - REG4 can have a power MOS FET built-in.
 - Each regulator's output voltage can be selected by 0.1 V step between 2V and 6V.
- Four built-in voltage detectors (accuracy: $\pm 2.0\%$)
 - Delay time can be set for \overline{RESET} with an external capacitor.
 - Each detector's detection voltage can be selected by 0.1V step between 2V and 6V.
 - Detection pins are selected from V_{IN} or V_{OUT} by option.
- Built-in watchdog timer circuit that detects MPU runaway and generates a RESET signal: Can set the timeout period with an external capacitor (5s max.)
- Low current consumption
- All voltage regulators except \overline{RESET} , voltage detectors and watchdog timer can have shutdown function.
- 24-pin SSOP package

APPLICATIONS

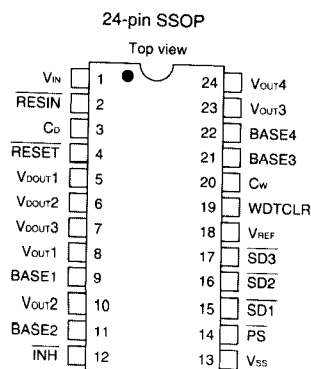
- Portable telephone
- Next generation cordlessphone
- Two-way radio equipment
- Other portable equipment

BLOCK DIAGRAM



* WDT: Watchdog timer
SD1 to SD3 = Shutdown pins

PIN CONFIGURATIONS



PAGING DECODER IC (POCSAG)

S-7037AF/7038AF

The S-7037AF and the S-7038AF are decoder ICs according to the CCIR* Radio Paging Code 1 (POCSAG** code). They internally process the POCSAG signals for the tone-only pager. Additionally, the decoded data is transferred to an external microcomputer, so they can also be used for a display pager. Five kinds (S-7037AF) and eight kinds (S-7038AF) of call-tone cadences let users know which call or message is received. They are provided with a battery saving function that drives the signal receiving circuit intermittently.

*CCIR: International Radio Consultative Committee

**POCSAG: Post Office Code Standardization Advisory Group

FUNCTIONS

- Power-on clearing
- BCH correction up to 2 bits
- Battery saving
- Battery low alert
- Extension
- Memory (for tone-only pager, 4 channels)(S-7038AF)

SPECIFICATIONS

Model No.	Operating voltage range	Current consumption Max.	Data rate	User address	Call-tone	External elements	ID-ROM	Note	Package
S-7037AF	1.7 to 5.5V (3.0V typ.)	110 μ A (at 3.0V)	1200bps	2	Address1: 1 cadence Address2: 4 cadences	Crystal(76kHz), C _G , R _F (C _D and R _D are built in.)	Direct interface to the S-2100R	Direct interface to CPU, CPU controlling output terminal	28-pin SOP
S-7038AF	1.7 to 5.5V (3.0V typ.)	50 μ A (at 3.0V, 512bps) 110 μ A (at 3.0V, 1200bps)	512bps or 1200bps	2	Address1: 4 cadences Address2: 4 cadences	Crystal(32 or 76kHz), C _G , R _F (C _D and R _D are built in.)	Direct interface to the S-2913	Direct interface to CPU, CPU controlling output terminal and CPU reference clock output terminal(32kHz at 512bps, 76kHz at 1200bps)	32-pin QFP

LSIs FOR TELEPHONE SET

S-72 Series

SPECIFICATIONS

Model No.	Applications	Main function and features	Package
S-7230A2/B2	PULSE/DTMF switchable dialer	<ul style="list-style-type: none"> • 32-digit redial function • Auto-pause and key-in-tone functions • PULSE/DTMF switchable, 3.58 MHz crystal used • DTMF/outpulse mixed dialing • Low standby current : 0.1 μA Max. (V_{DD}=3.5V) 	22 DIP 24 SOP
S-7235 Series	PULSE/DTMF switchable dialer	<ul style="list-style-type: none"> • 32-digit redial function • Auto-pause function • Key-in-tone function (S-7235 Series, S-7237A2) • PULSE/DTMF switchable, 3.58 MHz crystal used • DTMF/outpulse mixed dialing • Low standby current : 0.1 μA Max. (V_{DD}=3.0V) 	18 DIP 22 DIP 24 SOP
S-72361A	PULSE/DTMF switchable dialer	<ul style="list-style-type: none"> • 32-digit redial function • Auto-pause function • Key-in-tone function (S-7235 Series, S-7237A2) • PULSE/DTMF switchable, 3.58 MHz crystal used • DTMF/outpulse mixed dialing • Low standby current : 0.1 μA Max. (V_{DD}=3.0V) 	28 DIP 28 SOP
S-7237A2	PULSE/DTMF switchable dialer	<ul style="list-style-type: none"> • 32-digit redial function • Auto-pause function • Key-in-tone function (S-7235 Series, S-7237A2) • PULSE/DTMF switchable, 3.58 MHz crystal used • DTMF/outpulse mixed dialing • Low standby current : 0.1 μA Max. (V_{DD}=3.0V) 	22 DIP 24 SOP
S-7241 Series	20-station switchable repertory dialer	<ul style="list-style-type: none"> • 20-station one-touch dial function • Auto-pause and key-in-tone functions • PULSE/DTMF switchable, 3.58 MHz crystal used • DTMF/outpulse mixed dialing • Memory registration control terminal 	28 DIP 28 SOP
S-7247 Series	Switchable repertory dialer	<ul style="list-style-type: none"> • 3-key one-touch dial and 10-key abbreviated dial functions • Auto-pause and key-in-tone functions • 31-digit redial function 	28 DIP 28 SOP

CMOS 4-BIT MICROCOMPUTER FOR TELEPHONE SET

S-7292AF

The S-7292AF is a CMOS 4-bit microcomputer for telephone sets, which integrates on one chip a program memory (ROM), a data memory (RAM), an I/O port, a serial I/O, a timer and a dialer circuit. At power failure, it is powered solely by telephone line inputs. It is usable for cordless telephone set and multi-function telephone set.

FEATURES

- Low voltage operation
- Low current consumption
- Built-in watchdog timer
- Standby function
- DP or \overline{DP} can be selected by mask option
- 4 terminals for telephone function: \overline{HS} , \overline{BEEP} , \overline{KT} , TONE-OUT
- OTP version: S-72P92AF

APPLICATIONS

- Standard telephone set
- Cordless telephone set
- Answering machine
- Personal facsimile

SPECIFICATIONS

Model No.	ROM	RAM	Operating voltage range		Current consumption Max.			I/O line	Serial I/O	Timer(3)			Package
			*1 PULSE mode	DTMF mode	Operating		Standby			Timer 1	Timer 2	Timer 3	
					*2 PULSE mode	*3 DTMF mode							
S-7292AF	3K×16-bit	768×4-bit	1.7 to 5.5V	2.0 to 5.5V	0.7mA	1.1mA	10 μA	*4 33 (including telephone terminal)	1ch (8-bit clock synchronous type)	8-bit general timer	8-bit dial pulse timer	Selectable 150Hz or 300Hz	44 QFP

*1: Crystal used *2, *3: At 5.5V operation, output terminal not loaded
 *4: Input: 10, output: 12
 Input and output: 11 (including key I/O terminal)

TONE GENERATOR

S-7116A

The S-7116A is a tone generator made using the CMOS process. It is composed of 11-stage program counters, 8-Johnson counter, program decoders and a resistor ladder network.

FEATURES

- Tone output of 57 waves using a 3.579545MHz quartz crystal
- Low current consumption
 Operating mode: 1mA max. ($V_{DD}=5.0V$)
 Standby mode: 60 μA max. ($V_{DD}=5.0V$)
- Pseudo-sign wave tone output using a 5-bit D/A converter

SPECIFICATIONS

Model No.	Operating voltage $T_a = -25$ to $+70^\circ C$	Current consumption Max. $V_{DD}=5.0V$		Tone output level $V_{DD}=5.0V$	Deviation in power supply voltage at output level $V_{DD}=3.0$ to $10.0V$	Distortion rate Max. $V_{DD}=3.0V$	Deviation in temperature at output level $V_{DD}=5.0V$ $T_a = -10$ to $+60^\circ C$	Package
		Operating	Standby					
S-7116A	3.0 to 10.0V	1.0mA	0.06mA	240 to 440mVrms	-2.5 to 2.5 dB	10%	$\pm 0.1\%/^\circ C$	14 DIP

TONE SQUELCH

S-7119 Series

The S-7119 Series is a CMOS LSI developed for use in telecommunication control devices using the CTCSS method.

It serves as an encoder and a decoder of the setting tone. The tone output of 38 waves ranges from 67Hz to 250.3Hz. The tone can be set by transmitting the data in parallel to each program pin or by transmitting the data in serial to a built-in shift register. The S-7119 Series features low current consumption because of its CMOS configuration. A 28-pin small outline package enables customers to make portable communication systems.

FEATURES

- Encoding and decoding functions using the CTCSS method
- Tone output of 38 waves ranging from 67Hz to 250.3Hz
- 3.579545MHz or 4.194304MHz quartz crystal is usable
- Parallel or serial input is available when setting and controlling the tone (the serial input unit is made up of 2 latch circuits)
- Low current consumption
 Operating mode: 0.7mA typ. ($V_{DD}=3.0V$), 3mA typ. ($V_{DD}=5.0V$)
 Standby mode: 0.1mA max. ($V_{DD}=3.0V, 5.0V$)

APPLICATIONS

- Portable communication devices
- Professional communication systems
- Home automation devices
- Home security devices

SPECIFICATIONS

Model No.	Operating voltage	Current consumption		Tone detection response time Max.	TXOUT transmission tone frequency deviation		Package
		Operating Max.	Standby Max.		Min.	Max.	
S-7119BF	5V±10%	8mA	0.1mA	200ms	-0.16%	+0.16%	28 SOP
S-7119CF	2.7 to 5.5V	2mA	0.1mA	200ms	-0.16%	+0.16%	28 SOP

SERIAL-OUTPUT TIMER

S-3500A3

The S-3500A3 is a timer IC which outputs timer data serially. It can pick up timer data by inputting an external synchronous clock. It counts on the basis of year, month, day, hour and minute and automatically adjusts on the last day of an even month. The timer data is adjusted by two switches.

FUNCTIONS

- Auto-calendar/Power-on clear/Fast forwarding
- Indication of the column regulated
- Voltage detection

SPECIFICATIONS

Model No.	Operating voltage range	Current consumption Typ. V _{DD} =1.5V	Oscillating frequency deviation (Deviation between ICs)	Voltage deviation of oscillating frequency Max.		Voltage detector detection voltage	Package
				V _{DD} =1.1V to 1.5V	V _{DD} =1.5V to 1.7V		
S-3500A3	1.1 to 1.7V	0.7 μA	-15 to +15ppm	+6ppm	+5ppm	1.12 to 1.24V	14 SOP

REALTIME CLOCK

S-3520CF

The S-3520CF is a realtime clock that inputs/outputs serial clock and calendar data into/from CPU. A built-in voltage regulator provides good frequency stability and low power consumption. Even during backup operation, the S-3520CF is effective for saving the battery service life. Because it has a built-in 120-bit SRAM, it is also useful for CPU data backup.

FEATURES

- Low current consumption
- Wide data retention voltage range
- Clock and calendar data correction with the increment method
- Built-in auto-calendar until the year 2099
- Built-in 30×4-bit SRAM
- Easy serial interface to CPU with 5 lines

SPECIFICATIONS

Model No.	Operating voltage range	Current consumption Typ. V _{DD} =5.0V	Data retention voltage	Oscillating frequency deviation (Deviation between ICs)	Voltage detection of oscillating frequency V _{DD} =2.0 to 6.0V	Package
S-3520CF	3.0 to 6.0V	2.0 μA	2.0 to 6.0V	-15 to +15ppm	-5 to +5ppm	14 SOP

CR TIMER

S-8081B

The S-8081B is a CMOS CR timer developed for use in consumer electronics and industrial equipment. It consists of a CR oscillator, a 20-stage divider, a power on clear circuit, a trigger input chattering rejection circuit, an internal voltage regulator, a level shift circuit, and an output driver. It can be used as a high-precision, long service-life monostable timer.

APPLICATIONS

- Time switch
- Long time delay generator

FEATURES

- Excellent oscillation stability because of its built-in voltage regulator
- Power-on clear circuit is integrated

SPECIFICATIONS

Model No.	Operating voltage range	Operating current consumption Max.	Pull-down resistance	Power supply voltage fluctuation Typ.	Temperature fluctuation Typ.	High level output current Typ.	Low level output current Typ.	Low level output voltage Max.	Package
		C=0.0047 μF R=200k Ω Open output							
S-8081B	4.5 to 16.5V	200 μA	50 to 400k Ω	0.05%/V	0.10%/°C	15mA	30mA	0.4V	8 DIP/SOP

TEMPERATURE SENSOR

S-8100B

The S-8100B is a high-precision temperature sensor controller, on single chip with a linear output voltage of -8.1mV/K. Each chip is composed of a temperature sensor, a constant current circuit, and an operational amplifier. Its temperature range is from -40°C to +100°C. The S-8100B has much better linearity than the other temperature sensors such as thermistors, it can be used for a wide range of temperature control application.

FEATURES

- V_{SS} based output
- Built-in operational amplifier
- Current consumption: 10 μA typ.

APPLICATIONS

- Automobile telephones
- Security equipment
- Temperature compensation for measuring equipment

SPECIFICATIONS

Model No.	Operating voltage range	Output voltage			Linearity Max.	Repeatability Max.	Operating temperature range	Current consumption	Package
		T _a =-20°C	T _a =+30°C	T _a =+80°C					
S-8100B	3.0 to 5.5V	1.852 to 1.964V	1.452 to 1.564V	1.039 to 1.151V	±1.0%	±0.3%	-40 to 100°C	5 to 20 μA	SOT-89-3

LCD DRIVER ▶NEW

S-4520B/4525B Series

The S-4520B and S-4525B Series are driver ICs for use with a dot matrix LCD. They have 68 family/80 family MPU interfaces, 32×80-bit display RAMs, CR oscillation circuits, 61 segment driver outputs and 16 common driver outputs. Both graphic and character display are available. Since they feature wide operating voltage range and low power consumption, they are suitable for portable equipment.

■FEATURES

- Wide operating voltage
- Low current consumption
Standby: 1 μA max.
During display: 15 μA max.
- Oscillation circuit
 - Built-in CR oscillation circuit: 18kHz (S-4520BA, S-4525BA)
 - External clock: 2kHz (S-4520BB, S-4525BB)
- Master and slave operations
- Smooth-scroll and blinking operations
- Various commands

■SPECIFICATIONS

Model No.	Operating voltage		Power consumption Max.		Driver output	Display RAM	Duty	Bias	Form
	Logic	LCD driver	External clock 2kHz	CR-oscillation 18kHz					
S-4520B	2.4 to 7.0V	3.5 to 13.0V	25 μW	75 μW	16-common×61-segment	32×80-bit	1/16, 1/32	1/5, 1/6	100 QFP
*S-4525B	2.4 to 7.0V	2.4 to 13.0V	25 μW	75 μW	16-common×61-segment	32×80-bit	1/16, 1/32	1/2 to 1/4	Chip (Al pad) Chip (Au bump)

* Under development

THERMAL PRINT HEAD DRIVER

S-46 Series

The S-46 Series is thermal print head driver consisting of 64-bit shift registers (serial-in, serial/parallel-out), latches and Nch opendrain outputs. They can directly drive the thermal print head.

■FEATURES

- High-speed operation
- No thermorunaway as with MOS FET drivers
- Low current consumption through use of CMOS technology

■APPLICATIONS

- Thermal printer ● Graphic printer
- Video printer ● Lamp driver ● LED printer
- Data serial/parallel converter

■SPECIFICATIONS

Model No.	Bit size	Withstand Max.	Output voltage(SO pin)		Operating voltage		Current consumption Typ.	Driver output current Typ.	Features	Form
			V _{OH} Min.	V _{OL} Max.	Logic	Driver Max.				
S-4601A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	0.3mA (f _{CLK} =2MHz, SO: fixed)	15mA	• High-speed operation (Chip: 7MHz, Cascade connection: 5MHz)	Chip
S-4610A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	1.6mA (f _{CLK} =5MHz)	50mA	• 64-bit driver enable is divided into 32-bit×2 • High-speed operation (Chip: 14MHz)	Chip
S-4611A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	6.5mA (f _{CLK} =14MHz)	50mA	• 64-bit shift register is divided into 32-bit×2 • High-speed operation (Chip: 7MHz, Cascade connection: 5MHz)	Chip
S-4612A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	1.6mA (f _{CLK} =5MHz)	50mA	• High-speed operation (Chip: 7MHz, Cascade connection: 5MHz)	Chip
S-4620A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	1.6mA (f _{CLK} =5MHz)	30mA	• High-speed operation (Chip: 7MHz, Cascade connection: 5MHz)	Chip
S-4630A	64-bit	36V	V _{DD} - 0.05V	V _{SS} +0.05V	5±0.5V	26V	1.6mA (f _{CLK} =5MHz)	9mA	• High-speed operation (Chip: 7MHz, Cascade connection: 5MHz)	Chip

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