Reset IC with battery backup function
BA6129AF/BA6162/BA6162F

The BA6129AF, BA6162, and BA6162F are reset ICs with a battery backup function, designed for equipment using SRAMs and other similar components. These ICs are configured of a reset signal and CS signal output unit and a power supply switching unit. If the BA6129AF detects that the power supply has dropped to 3.5V or lower, it outputs the CS, CSB, and Reset signals to set the SRAM in backup mode. If the voltage drops to 3.3V or lower, the power supply switches to the battery. With the BA6162 and BA6162F, in the same way, a power supply of 4.2V is detected, and if the voltage drops to 3.3V or lower, the power supply switches to the battery. These ICs allow SRAMs to be write protected and allow the system to be reset, in addition to switching between the power supply and the battery.

●Applications

Equipment using SRAMs (cards, cassettes, facsimile machines, copiers, word processors, personal computers, etc.)

●Features

1) Equipped with battery backup function.
2) Equipped with both CS signals (CS and CSB) and Reset signals.
3) Low current consumption when powered from battery.
4) Low voltage loss when powered from battery.
5) Smooth switching between power supply and battery.

●Pin descriptions

Pin No.	Pin Name	Function
1	GND	Substrate GND
2	Reset	Reset output
3	CS	CS output
4	V_{BAT}	Battery power supply
5	CSB	CSB output
6	V_O	Power supply output
7	NC	
8	V_{CC}	Power supply voltage

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	7.0	V
Output current 1	I_{OUT1}	—80 (BA6129AF) —40 (BA6162/BA6162F)	mA
Output current 2	I_{OUT2}	—200	μA
Power dissipation	Pd	900 *1 (BA6162) 550 *2 (BA6129AF) (BA6162F)	mW
Operating temperature	Topr	—20~75	℃
Storage temperature	Tstg	—40~125	℃

I_{OUT1} indicates the output current on the V_{CC} side, and I_{OUT2} the output current on the V_{BAT} side.
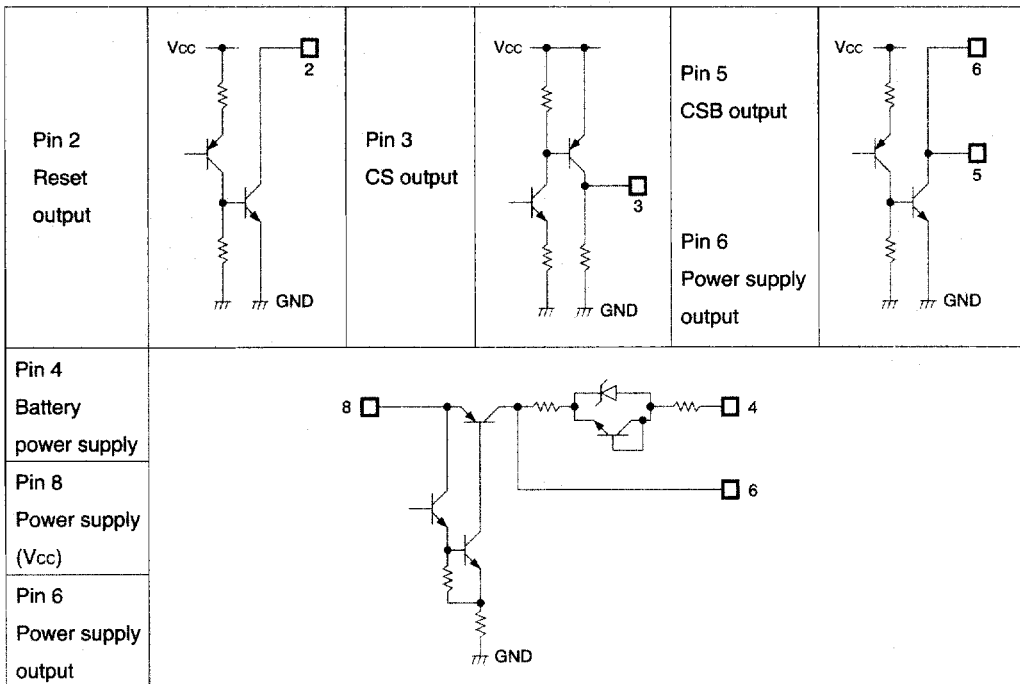
*1 When using at temperatures of 25°C or higher, reduce power by 9.0 mW for each 1.0°C above 25°C.

*2 When using at temperatures of 25°C or higher, reduce power by 5.5 mW for each 1.0°C above 25°C.

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●Block diagram

| 8 | 7 | 6 | 5 |
| Vcc | NC | Vo | CSB |

| 1 | 2 | 3 | 4 |
| GND | Reset | CS | VBAT |

●Input/output circuit

Pin 2
Reset
output

Pin 3
CS output

Pin 5
CSB output

Pin 6
Power supply
output

Pin 4
Battery
power supply

Pin 8
Power supply
(Vcc)
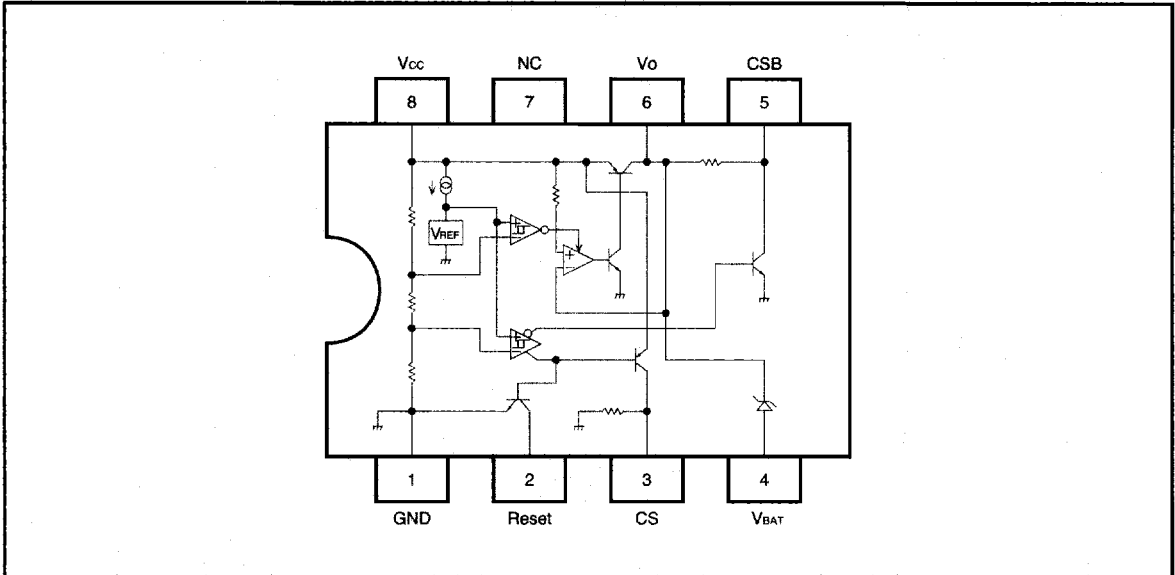
Pin 6
Power supply
output

● Electrical characteristics

BA6129AF (unless otherwise noted, Ta=25°C, VR$_{RES}$=V$_{CC}$=5V, R$_{RES}$=10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
No-load current consumption	I$_{CC}$	—	—	2.0	mA	V$_{CC}$=5V, V$_{BAT}$=3V
I/O voltage differential 1	V$_{SAT1}$	—	0.03	0.05	V	V$_{CC}$=5V, V$_{BAT}$=3V, Io=−1mA
Vo output voltage 1	V$_{O1}$	4.95	4.97	—	V	V$_{CC}$=5V, V$_{BAT}$=3V, Io=−1mA
Vo output voltage 2	V$_{O2}$	4.70	4.90	—	V	V$_{CC}$=5V, V$_{BAT}$=3V, Io=−15mA
Vo output voltage 3	V$_{O3}$	4.50	4.86	—	V	V$_{CC}$=5V, V$_{BAT}$=3V, Io=−30mA
Detection voltage	V$_S$	3.35	3.50	3.65	V	V$_{CC}$=H→L
Detection hysteresis voltage	V$_{SH}$	—	100	—	mV	V$_{CC}$=L→H
Reset output voltage L	V$_{RESL}$	—	—	0.4	V	V$_{CC}$=3V
Reset leakage current	I$_{RESH}$	—	—	0.1	μA	V$_{CC}$=5V, VR$_{RES}$=7V
Reset operating limit voltage	V$_{OPL}$	—	0.8	1.2	V	V$_{CC}$=H→L, V$_{RES}$≦0.4V
CS output voltage L	V$_{CSL}$	—	—	0.1	V	V$_{CC}$=3V, V$_{BAT}$=3V, Ics=+1μA
CS output voltage H	V$_{CSH}$	4.9	—	—	V	V$_{CC}$=5V, V$_{BAT}$=3V, Ics=−1μA
CSB output voltage L	V$_{CSBL}$	—	—	0.1	V	V$_{CC}$=5V, V$_{BAT}$=3V, Icsb=+1μA
CSB output voltage H	V$_{CSBH}$	Vo−0.1	—	—	V	V$_{CC}$=3V, V$_{BAT}$=3V, Icsb=−1μA
Detection voltage temperature characteristic	V$_S$	−0.05	—	+0.05	%/°C	
Switching voltage	V$_B$	3.15	3.30	3.45	V	V$_{CC}$=H→L, V$_{BAT}$=3V, Ro=200kΩ
Switching hysteresis voltage	V$_{BH}$	—	100	—	mV	V$_{CC}$=L→H, V$_{BAT}$=3V, Ro=200kΩ
Switching voltage temperature characteristic	V$_B$	−0.05	—	+0.05	%/°C	
Backup current consumption	I$_{CCB}$	—	—	0.5	μA	V$_{CC}$=GND, V$_{BAT}$=3V
I/O voltage differential 2	V$_{SAT2}$	—	0.20	0.30	V	V$_{CC}$=GND, V$_{BAT}$=3V, Io=−1μA
Vo output voltage 4	V$_{O4}$	2.70	2.80	—	V	V$_{CC}$=GND, V$_{BAT}$=3V, Io=−1μA
Vo output voltage 5	V$_{O5}$	2.60	2.67	—	V	V$_{CC}$=GND, V$_{BAT}$=3V, Io=−1μA
Vo output voltage 6	V$_{O6}$	Vcc−0.5	—	—	V	Io=−80mA
Reverse current	I$_{OR}$	—	—	0.1	μA	V$_{CC}$=5V, V$_{BAT}$=GND

(Note) Io, Ics, and Icsb are + when flowing toward the pin and − when flowing away from the pin.

◎ Not designed for radiation resistance.

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●Electrical characteristics

BA6162/F (unless otherwise noted, Ta=25℃, VR$_{RES}$=Vcc=5V, R$_{RES}$=10kΩ)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
No-load current consumption	I$_{CC}$	—	—	2.0	mA	Vcc=5V, V$_{BAT}$=3V
I/O voltage differential 1	V$_{SAT1}$	—	0.03	0.05	V	Vcc=5V, V$_{BAT}$=3V, Io=−1mA
Vo output voltage 1	V$_{O1}$	4.95	4.97	—	V	Vcc=5V, V$_{BAT}$=3V, Io=−1mA
Vo output voltage 2	V$_{O2}$	4.70	4.90	—	V	Vcc=5V, V$_{BAT}$=3V, Io=−15mA
Vo output voltage 3	V$_{O3}$	4.50	4.86	—	V	Vcc=5V, V$_{BAT}$=3V, Io=−30mA
Detection voltage	V$_S$	4.00	4.20	4.40	V	Vcc=H→L
Detection hysteresis voltage	V$_{SH}$	—	100	—	mV	Vcc=L→H
Reset output voltage L	V$_{RESL}$	—	—	0.4	V	Vcc=3.7V
Reset leakage current	I$_{RESH}$	—	—	0.1	μA	Vcc=5V, VR$_{RES}$=7V
Reset operating limit voltage	V$_{OPL}$	—	0.8	1.2	V	Vcc=H→L, V$_{RES}$≦0.4V
CS output voltage L	V$_{CSL}$	—	—	0.1	V	Vcc=3.7V, V$_{BAT}$=3V, Ics=+1μA
CS output voltage H	V$_{CSH}$	4.9	—	—	V	Vcc=5V, V$_{BAT}$=3V, Ics=−1μA
CSB output voltage L	V$_{CSBL}$	—	—	0.1	V	Vcc=5V, V$_{BAT}$=3V, Icsb=+1μA
CSB output voltage H	V$_{CSBH}$	Vo−0.1	—	—	V	Vcc=3.7V, V$_{BAT}$=3V, Icsb=−1μA
Detection voltage temperature characteristic	K$_{VS}$	−0.05	—	+0.05	%/℃	
Switching voltage	V$_B$	3.15	3.30	3.45	V	Vcc=H→L, V$_{BAT}$=3V, Ro=200kΩ
Switching hysteresis voltage	V$_{BH}$	—	100	—	mV	Vcc=L→H, V$_{BAT}$=3V, Ro=200kΩ
Switching voltage temperature characteristic	K$_{VB}$	−0.05	—	+0.05	%/℃	
Backup current consumption	I$_{CCB}$	—	—	0.5	μA	Vcc=GND, V$_{BAT}$=3V
I/O voltage differential 2	V$_{SAT2}$	—	0.20	0.03	V	Vcc=GND, V$_{BAT}$=3V, Io=−1μA
Vo output voltage 4	V$_{O4}$	2.70	2.80	—	V	Vcc=GND, V$_{BAT}$=3V, Io=−1μA
Vo output voltage 5	V$_{O5}$	2.60	2.67	—	V	Vcc=GND, V$_{BAT}$=3V, Io=−100μA
Vo output voltage 6	V$_{O6}$	Vcc−0.5	—	—	V	=−40mA
Reverse current	I$_{OR}$	—	—	0.1	μA	Vcc=5V, V$_{BAT}$=GND

(Note) Io, Ics, and Icsb are + when flowing toward the pin and - when flowing away from the pin.

* Not designed for radiation resistance.

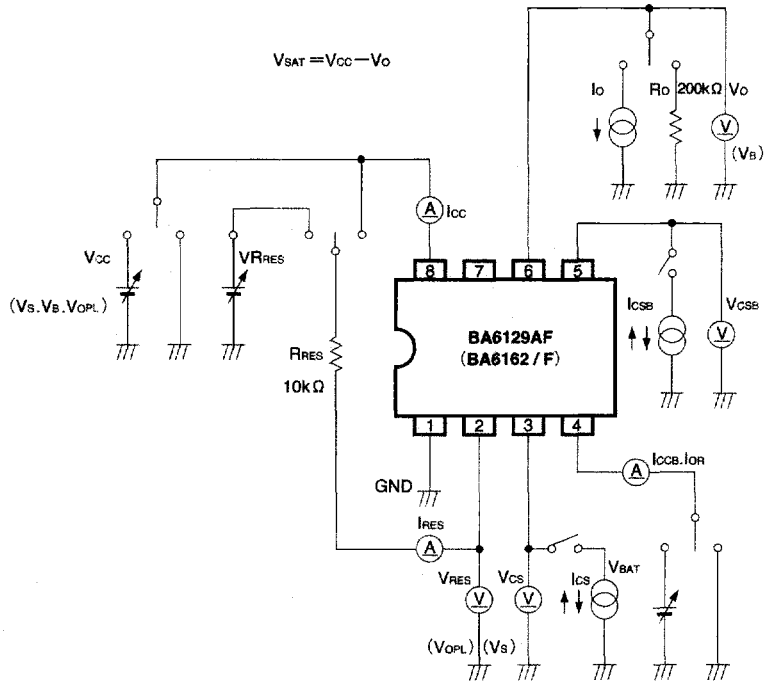●Measurement circuit

$V_{SAT} = V_{CC} - V_O$

Fig.1

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●Circuit operation
These ICs have two distinct functions, a logic output function and a power supply switching function.
The logic output circuit consists of the following :
①Reset output (NPN Tr open collector)
②CS output (PNP Tr open collector + pull-down resistor)
③CSB output (NPN Tr open collector + pull-up resistor)

The power supply switching circuit consists of a PNP power transistor and an SBD (Schottky barrier diode). The normal power supply V_{CC} and the battery backup power supply (V_{BAT}) are both connected to the switching circuit. When the PNP power transistor is turned on and off, the IC power is switched from the normal power supply to the battery backup power supply, and vice versa.
The power supply voltage detection circuit consists of a standard voltage source V_{REF} and a hysteresis comparator. The power supply V_{CC} is detected using a split resistance. When the power supply voltage drops below the detection voltage (BA6129AF : $V_S = 3.5V$ typ. when V_{CC} drops and $V_S + 0.1V$typ. when V_{CC} rises;

BA6162 / F : $V_S = 4.2V$ typ. when V_{CC} drops, and $V_S + 0.1V$typ. when V_{CC} rises), the Reset signal (Low) and the CS signal (CS - Low, CSB - High) are output by the logic output function, and the SRAM (or other memory device) is switched to backup mode.
If the power supply V_{CC} drops further and goes below the switching voltage (BA6129AF and BA6162 / F : $V_B = 3.3V$typ. when V_{CC} drops, $V_B + 0.1V$ typ. when V_{CC} rises), the SBD develops a forward bias because the PNP power transistor is off. The power supply output V_O switches from the power supply V_{CC} to the battery power supply (V_{BAT}).
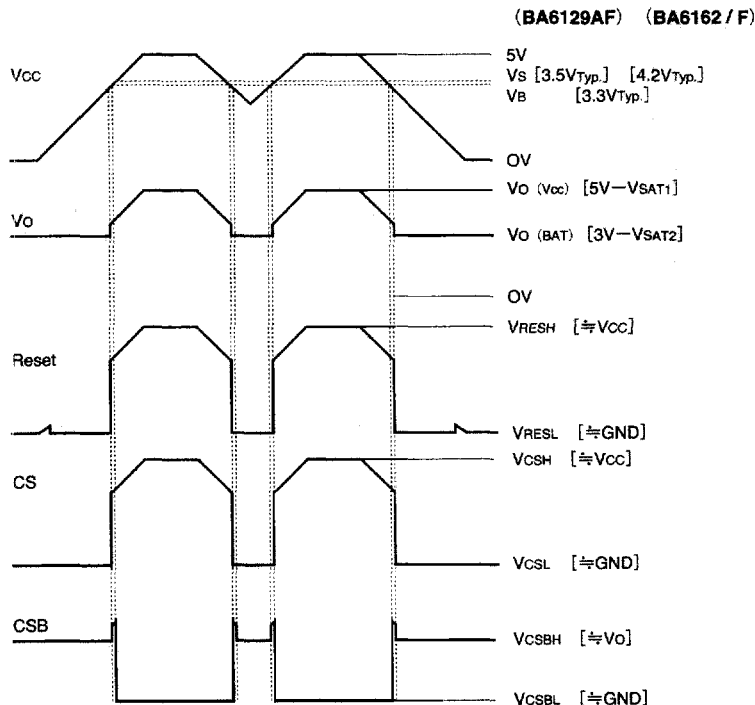When the normal power supply V_{CC} rises, the above process is reversed.

Fig. 2 Timing chart

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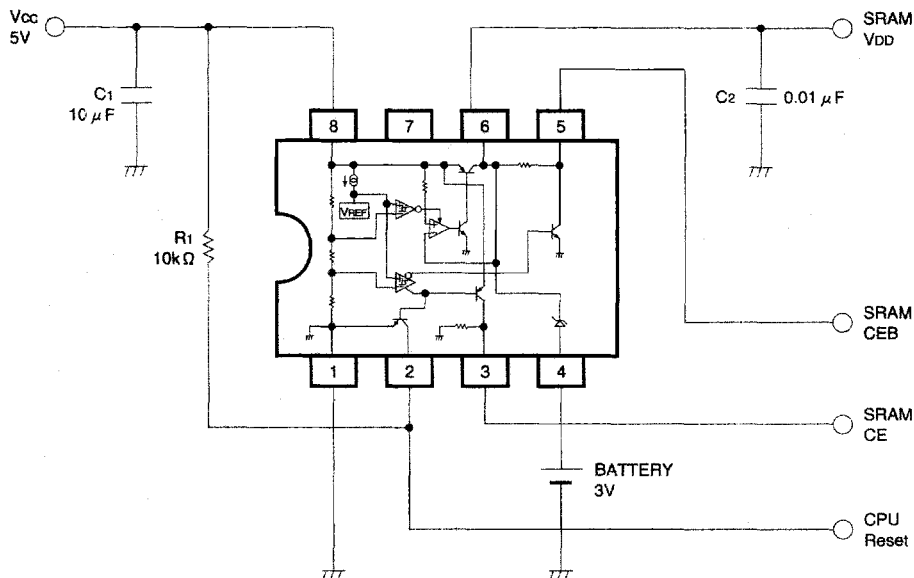
●Application example

Fig.3

●Precautions concerning use

1)   Power supply V_{CC}

These ICs are designed to operate with at $V_{CC}=5V$, but can also operate at V_{CC} values of other than 5V. However, the following conditions must be met :
(equation)

$$\begin{cases} V_S+V_{SH}<V_{CC}<V_{CCMax.} \\ V_{CC}-V_{BAT}<5V \end{cases}$$

2)   Battery voltage V_{BAT}

These ICs are designed to operate with at $V_{BAT}=3V$, but can also operate at V_{BAT} values of other than 3V. However, the following conditions must be met :
(equation)

$$\begin{cases} V_{BAT}<V_B \\ V_{CC}-V_{BAT}<5V \end{cases}$$

where) V_S : detection voltage
V_{SH} : detection hysteresis voltage
V_B : switching voltage

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●Electrical characteristic curves (BA6129AF)
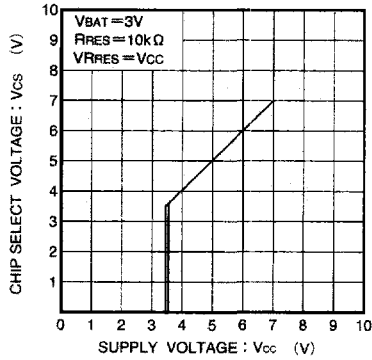
Fig. 4 CS output voltage - power
supply voltage characteristic
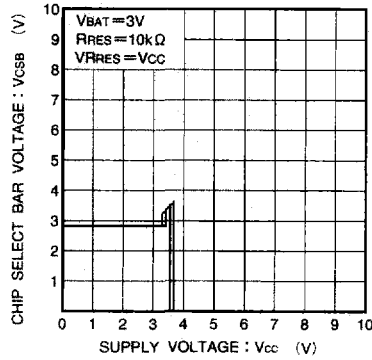
Fig. 5 CSB output voltage - power
supply voltage characteristic
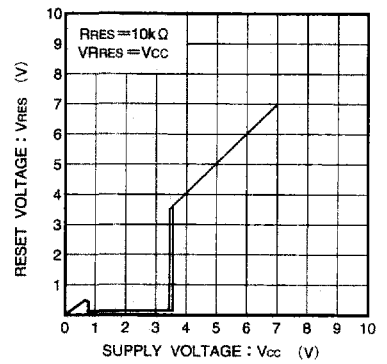
Fig. 6 Reset output voltage - power
supply voltage characteristic
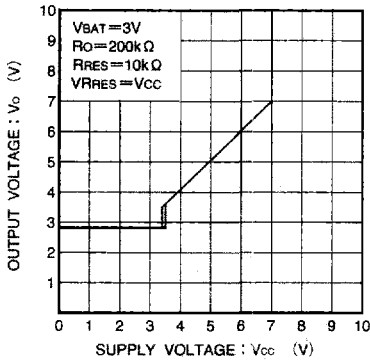
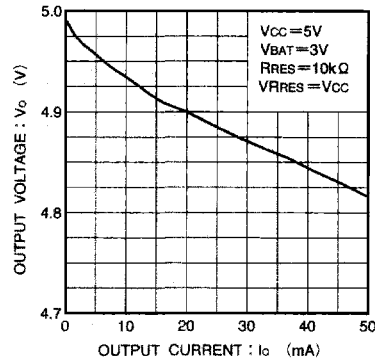Fig. 7 Output voltage - power supply
voltage characteristic

Fig. 8 Output voltage - output current
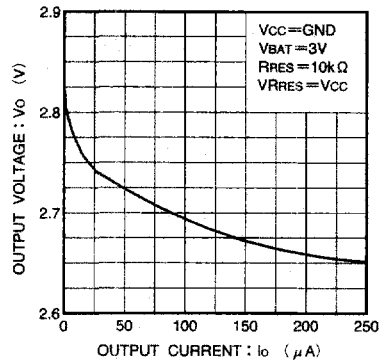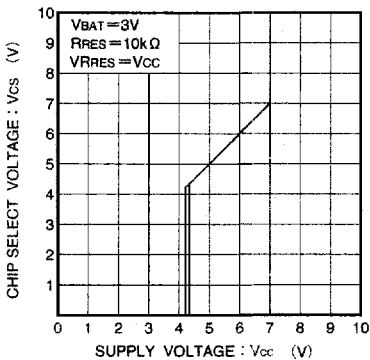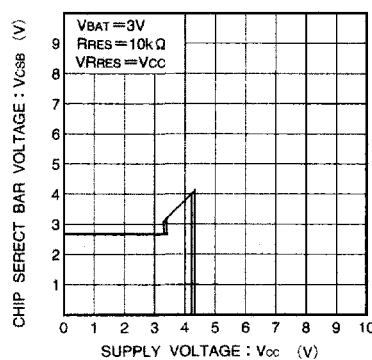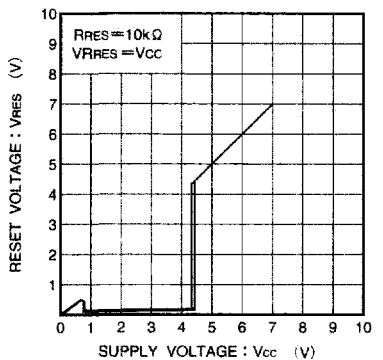characteristic (1) (when power
supply is detected)

Fig. 9 Output voltage - output current
characteristic (2) (when using
battery backup)

●Electrical characteristic curves (BA6162/F)

Fig. 10 CS output voltage - power supply
voltage characteristic

Fig. 11 CSB output voltage - power
supply voltage characteristic

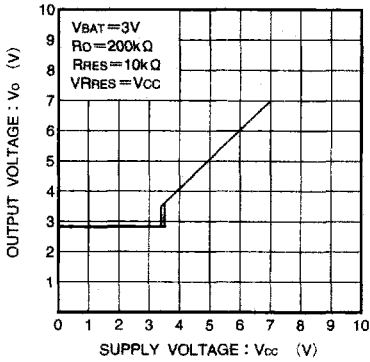Fig. 12 Reset output voltage - power
supply voltage characteristic

Memory backup ICs

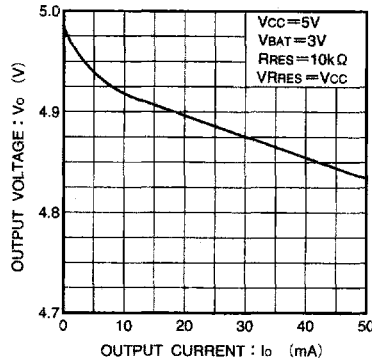Fig. 13 Output voltage - power supply voltage characteristic

Fig. 14 Output voltage - output current characteristic (1) (when power supply is detected)
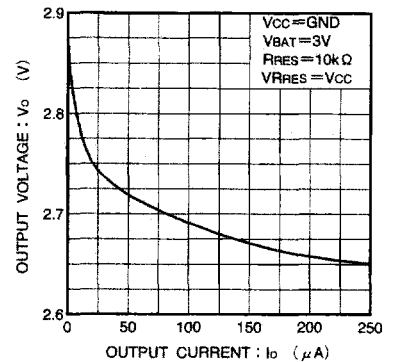
Fig. 15 Output voltage - output current characteristic (2) (when using battery backup)

●External dimensions (Units: mm)

SOP8

DIP8

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