

# Super-mini package regulator IC

## BA LBSG series

The BA LBSG (the " " indicates the output voltage value) is a low-saturation series regulator IC employing the super-mini mold package of the SMP5 (2916 package). Equipped with a power-saving function that reduces current consumption, it also offers outstanding ripple rejection and other characteristics, and is ideal for cellular telephones and other compact telephones.

### Applications

Residential / industrial device power supplies for cellular telephones such as the CDMA and GSM, and for other portable communication devices

### Features

- 1) Internal output transistor ( $I_o = 150\text{mA}$ )
- 2) Internal temperature protection circuit
- 3) Power-saving function enables designs with low current consumption
- 4) High level of ripple rejection (R.R. = 66dB)
- 5) SMP5 super-mini package enables space-saving designs
- 6) Low I / O voltage differential (90mV Typ. at  $I_o = 50\text{mA}$ )

### Super-mini regulator lineup

Series	Output voltage (V)									
	2.8	2.9	3.0	3.2	3.3	3.6	3.8	4.0	5.0	
BA○○○LBSG	○	○	○	○	○	☆	○	☆	☆	

\* "○○○" indicates the output voltage value. (Example: For 2.8V output, BA028LBSG)  
A star indicates a product under development.

### Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

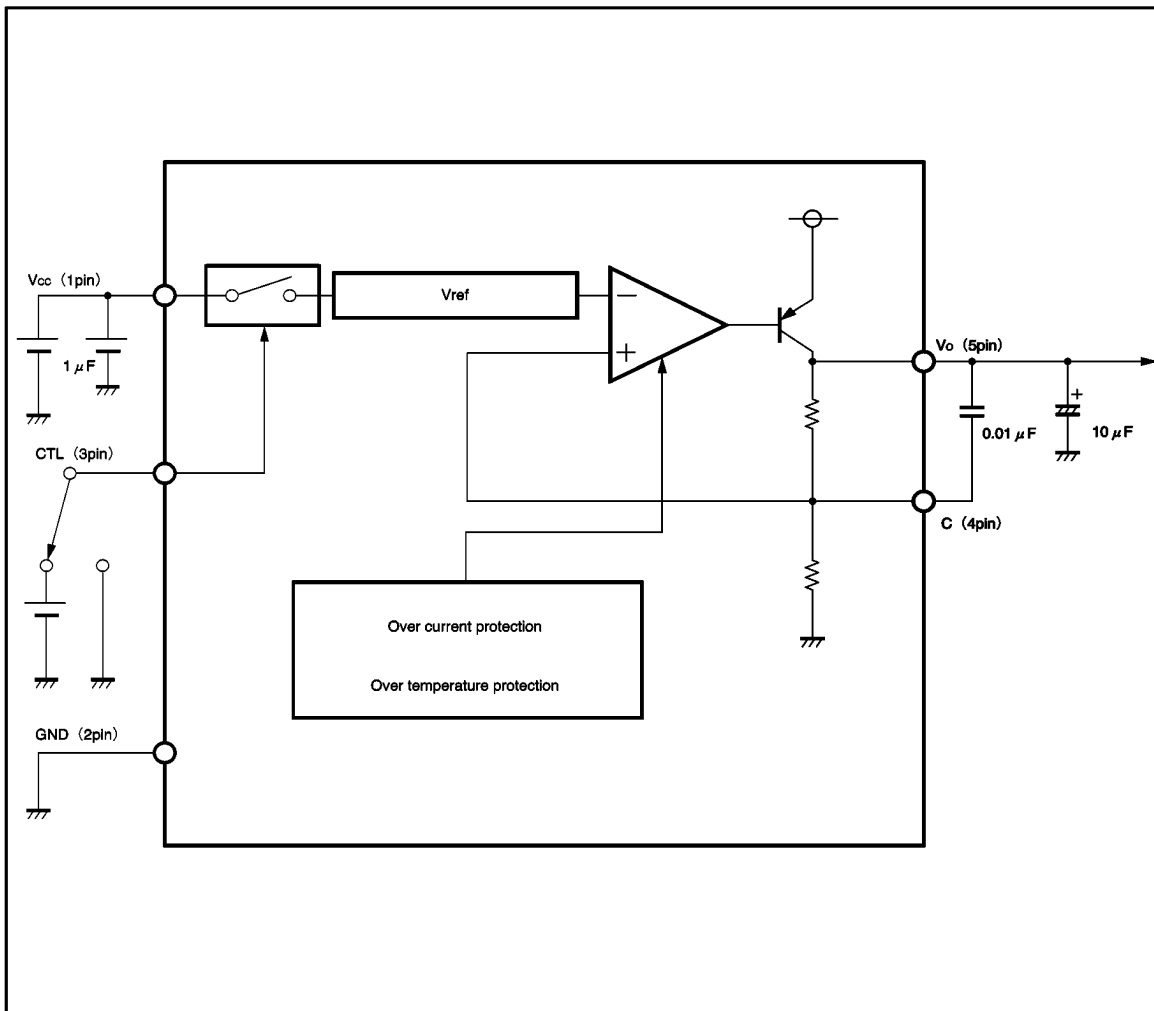
Parameter	Symbol	Limits	Unit
Applied voltage	Vcc	9	V
Power dissipation	Pd	170*	mW
Operating temperature	Topr	-40~+85	°C
Storage temperature	Tstg	-55~+125	°C

\* Reduced by 1.7mW for each increase in  $T_a$  of 1°C over 25°C

### Recommended operating conditions ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Limits	Unit
Operating power supply voltage	Vcc (input)	2.5~7.0	V

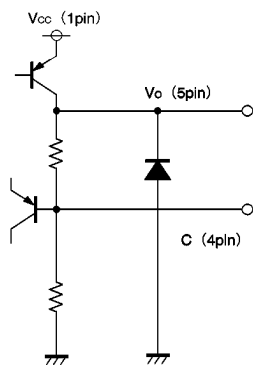
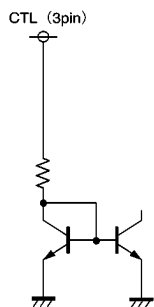
Block diagram



Pin descriptions

Pin No.	Pin name	Function
1	Vcc	Power supply
2	GND	Ground
3	CTL	Power - save function
4	C	Ripple improvement
5	OUT	Output

Input / output circuits



## Regulator ICs

## BA LBSG series

### Electrical characteristics

BA028LBSG (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 3.8\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Standby current	I <sub>CCS</sub>	—	0	10	μA	V <sub>ctl</sub> =0V
Circuit current	I <sub>CCA</sub>	—	65	150	μA	V <sub>ctl</sub> =3V, no output load
〈Output block〉						
Output voltage	V <sub>o</sub>	2.73	2.80	2.87	V	I <sub>o</sub> =50mA*1
Dropout voltage	ΔV <sub>d</sub>	—	90	150	mV	I <sub>o</sub> =50mA, V <sub>CC</sub> =0.95V <sub>o</sub>
Output current capability	I <sub>o</sub>	150	280	—	mA	—
Load regulation	Reg.L	—	40	80	mV	I <sub>o</sub> =1~50mA*1
Input regulation	Reg.I	—	3	30	mV	I <sub>o</sub> =10mA, V <sub>CC</sub> =3.8~7V*1
Output noise voltage	e <sub>n</sub>	—	56	—	nV	I <sub>o</sub> =10mA, C=0.01 μF*2
Ripple rejection 1	R.R1	45	58	—	dB	I <sub>o</sub> =10mA, f=400Hz
Ripple rejection 2	R.R2	—	66	—	dB	I <sub>o</sub> =10mA, f=400Hz, C=0.01 μF*2
〈Power-save block〉						
CTL OFF voltage	V <sub>off</sub>	—	—	0.6	V	—
CTL ON voltage	V <sub>on</sub>	2.4	—	—	V	—
CTL inflow current	I <sub>ctl</sub>	—	6.0	15	μA	V <sub>ctl</sub> =3V

\*1 In order to measure at  $T_a \approx T_j$  (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

\*2 Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01 μF) is used between pin 4 and pin 5, to improve ripple rejection.

©Not designed for radiation resistance.

## Regulator ICs

## BA LBSG series

BA030LBSG (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 4.0\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Coniditions
Standby current	I <sub>ccs</sub>	—	0	10	μA	V <sub>ctl</sub> =0V
Circuit current	I <sub>cca</sub>	—	65	150	μA	V <sub>ctl</sub> =3V, no output load
〈Output block〉						
Output voltage	V <sub>o</sub>	2.925	3.00	3.075	V	I <sub>o</sub> =50mA*1
Dropout voltage	ΔV <sub>d</sub>	—	90	150	mV	I <sub>o</sub> =50mA, V <sub>cc</sub> =0.95V <sub>o</sub>
Output current capability	I <sub>o</sub>	150	280	—	mA	—
Load regulation	Reg.L	—	40	80	mV	I <sub>o</sub> =1~50mA*1
Input regulation	Reg.I	—	3	30	mV	I <sub>o</sub> =10mA, V <sub>cc</sub> =4.0~7V*1
Output noise voltage	e <sub>n</sub>	—	56	—	nV	I <sub>o</sub> =10mA, C=0.01 μF*2
Ripple rejection 1	R.R1	45	58	—	dB	I <sub>o</sub> =10mA, f=400Hz
Ripple rejection 2	R.R2	—	66	—	dB	I <sub>o</sub> =10mA, f=400Hz, C=0.01 μF*2
〈Power-save block〉						
CTL OFF voltage	V <sub>off</sub>	—	—	0.6	V	—
CTL ON voltage	V <sub>on</sub>	2.4	—	—	V	—
CTL inflow current	I <sub>ctl</sub>	—	6.0	15	μA	V <sub>ctl</sub> =3V

\*1 In order to measure at  $T_a \approx T_j$  (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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## Regulator ICs

## BA LBSG series

BA032LBSG (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 4.2\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Coniditions
Standby current	I <sub>ccs</sub>	—	0	10	$\mu\text{A}$	V <sub>ctl</sub> =0V
Circuit current	I <sub>cca</sub>	—	65	150	$\mu\text{A}$	V <sub>ctl</sub> =3V, no output load
〈Output block〉						
Output voltage	V <sub>o</sub>	3.12	3.20	3.28	V	I <sub>o</sub> =50mA*1
Dropout voltage	$\Delta V_d$	—	90	150	mV	I <sub>o</sub> =50mA, V <sub>cc</sub> =0.95V <sub>o</sub>
Output current capability	I <sub>o</sub>	150	280	—	mA	—
Load regulation	Reg.L	—	40	80	mV	I <sub>o</sub> =1~50mA*1
Input regulation	Reg.I	—	3	30	mV	I <sub>o</sub> =10mA, V <sub>cc</sub> =4.2~7V*1
Output noise voltage	e <sub>n</sub>	—	56	—	nV	I <sub>o</sub> =10mA, C=0.01 $\mu\text{F}$ *2
Ripple rejection 1	R.R1	45	58	—	dB	I <sub>o</sub> =10mA, f=400Hz
Ripple rejection 2	R.R2	—	66	—	dB	I <sub>o</sub> =10mA, f=400Hz, C=0.01 $\mu\text{F}$ *2
〈Power-save block〉						
CTL OFF voltage	V <sub>off</sub>	—	—	0.6	V	—
CTL ON voltage	V <sub>on</sub>	2.4	—	—	V	—
CTL inflow current	I <sub>ctl</sub>	—	6.0	15	$\mu\text{A}$	V <sub>ctl</sub> =3V

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## Regulator ICs

## BA LBSG series

BA038LBSG (unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 4.8\text{V}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Coniditions
Standby current	I <sub>ccs</sub>	—	0	10	$\mu\text{A}$	V <sub>ctl</sub> =0V
Circuit current	I <sub>cca</sub>	—	65	150	$\mu\text{A}$	V <sub>ctl</sub> =3V, no output load
〈Output block〉						
Output voltage	V <sub>o</sub>	3.705	3.80	3.895	V	I <sub>o</sub> =50mA*1
Dropout voltage	$\Delta\text{Vd}$	—	90	150	mV	I <sub>o</sub> =50mA, V <sub>cc</sub> =0.95V <sub>o</sub>
Output current capability	I <sub>o</sub>	150	280	—	mA	—
Load regulation	Reg.L	—	40	80	mV	I <sub>o</sub> =1~50mA*1
Input regulation	Reg.I	—	3	30	mV	I <sub>o</sub> =10mA, V <sub>cc</sub> =4.8~7V*1
Output noise voltage	e <sub>n</sub>	—	56	—	nV	I <sub>o</sub> =10mA, C=0.01 $\mu\text{F}$ *2
Ripple rejection 1	R.R1	45	56	—	dB	I <sub>o</sub> =10mA, f=400Hz
Ripple rejection 2	R.R2	—	66	—	dB	I <sub>o</sub> =10mA, f=400Hz, C=0.01 $\mu\text{F}$ *2
〈Power-save block〉						
CTL OFF voltage	V <sub>off</sub>	—	—	0.6	V	—
CTL ON voltage	V <sub>on</sub>	2.4	—	—	V	—
CTL inflow current	I <sub>ctl</sub>	—	6.0	15	$\mu\text{A}$	V <sub>ctl</sub> =3V

\*1 In order to measure at  $T_a \approx T_j$  (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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Application example

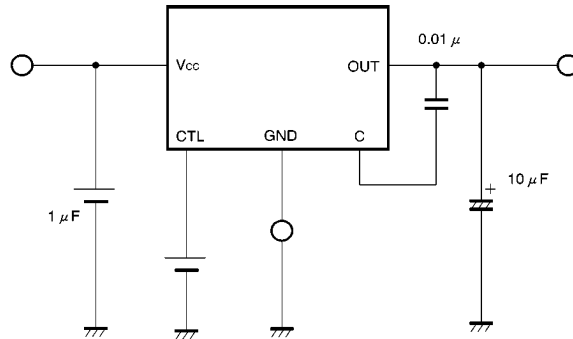


Fig.1

Electrical characteristic curves (BA030LBSG)

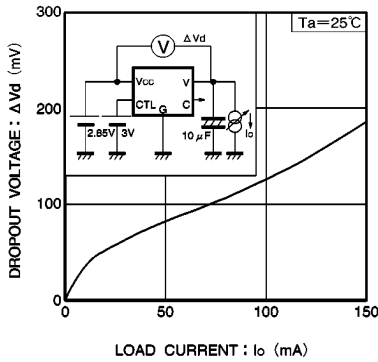


Fig.2 ΔVd vs. Io

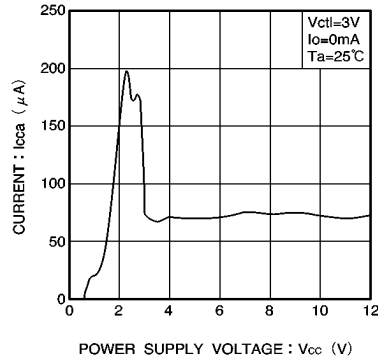


Fig.3 Icca vs. Vcc

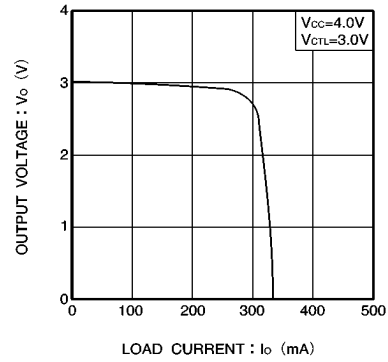


Fig.4 Io vs. Vo

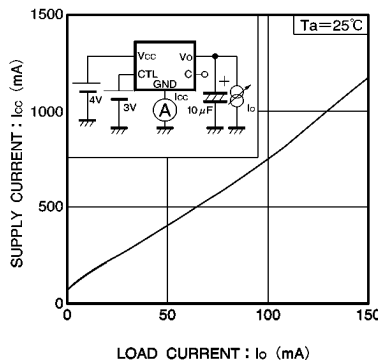


Fig.5 Icc vs. Io

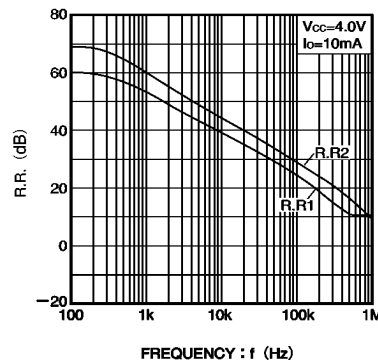


Fig.6 R.R. vs. f characteristics



External dimensions (Units: mm)

