

Super-mini package regulator IC

BA000LBSG series

The BA000LBSG (the "000" 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 characteristics, and is ideal for cellular telephones and other.

●Applications

Residential / industrial device power supplies for cellular telephone such as the CDMA and GSM, and for other portable.

●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 |
| BA000LBSG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

* "000" indicates the output voltage value. (Example : For 2.8V output, BA028LBSG)

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

| Parameter | Symbol | Limits | Unit |
|-----------------------|-----------|---------------|------------------|
| Applied voltage | V_{cc} | 9 | V |
| Power dissipation | P_d | 170* | mW |
| Operating temperature | T_{opr} | $-40\sim+85$ | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | $-55\sim+125$ | $^\circ\text{C}$ |

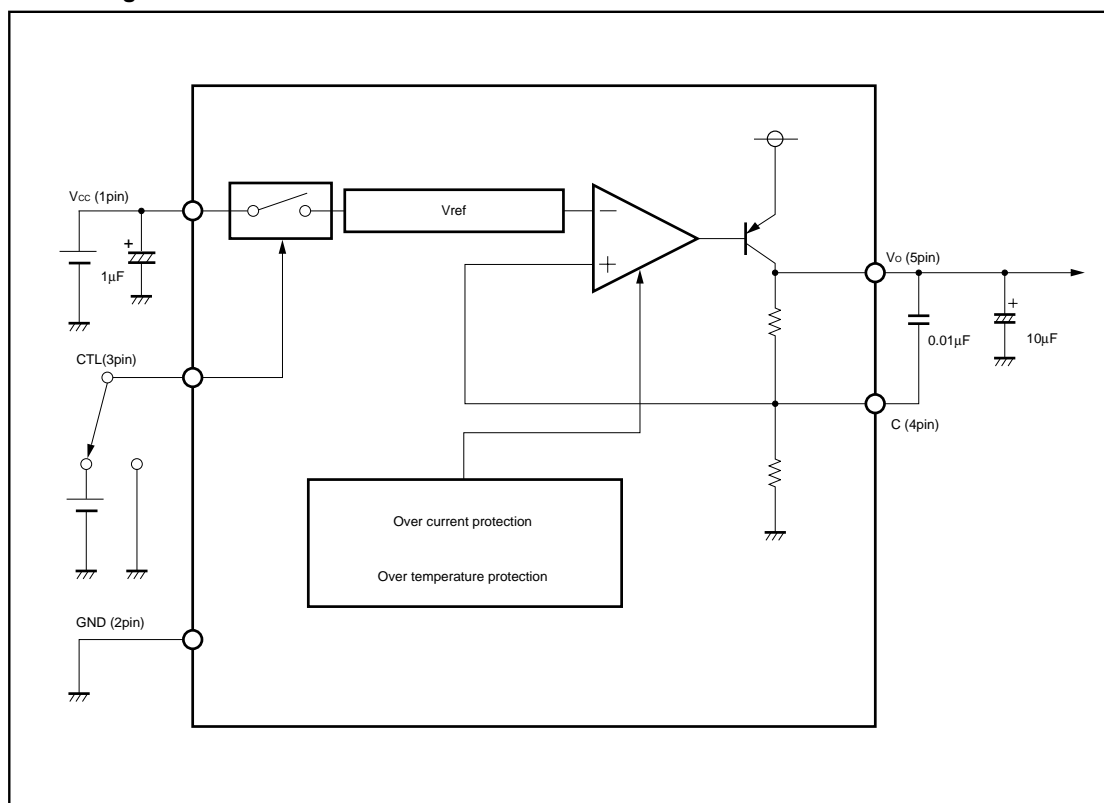
* Reduced by 1.7mW for each increase in T_a of 1°C over 25°C

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

| Parameter | Symbol | Limits | Unit |
|--------------------------------|------------------|---------|------|
| Operating power supply voltage | V_{cc} (input) | 2.5~7.0 | V |

Regulator IC

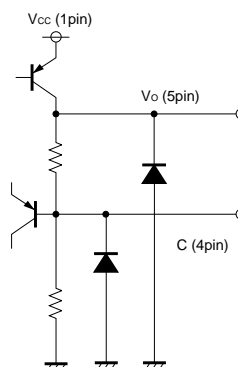
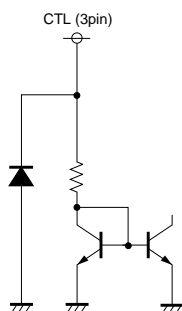
●Block diagram



●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 IC

●Electrical characteristics

BA028LBSG (unless otherwise noted, Ta=25°C, Vcc=3.8V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 2.73 | 2.80 | 2.87 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | I _o =10mA, V _{cc} =3.8~7V* ¹ |
| Output noise voltage | e _n | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 50 | 58 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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BA029LBSG (unless otherwise noted, Ta=25°C, Vcc=3.9V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 2.828 | 2.90 | 2.973 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | V _{cc} =3.9~7V |
| Output noise voltage | e _n | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 58 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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Regulator IC

BA030LBSG (unless otherwise noted, Ta=25°C, Vcc=4.0V)

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

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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BA032LBSG (unless otherwise noted, Ta=25°C, Vcc=4.2V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.12 | 3.20 | 3.28 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | I _o =10mA, V _{cc} =4.2~7V* ¹ |
| Output noise voltage | en | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 50 | 58 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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Regulator IC

BA033LBSG (unless otherwise noted, Ta=25°C, Vcc=4.3V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.218 | 3.30 | 3.382 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | V _{cc} =4.3~7V |
| Output noise voltage | en | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 58 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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BA036LBSG (unless otherwise noted, Ta=25°C, Vcc=4.6V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.51 | 3.60 | 3.69 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | V _{cc} =4.6~7V |
| Output noise voltage | en | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 56 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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Regulator IC

BA038LBSG (unless otherwise noted, Ta=25°C, Vcc=4.8V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.705 | 3.80 | 3.895 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | I _o =10mA, V _{cc} =4.8~7V* ¹ |
| Output noise voltage | en | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 50 | 56 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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BA040LBSG (unless otherwise noted, Ta=25°C, Vcc=5.0V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | – | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | – | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.90 | 4.00 | 4.10 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | – | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | – | mA | – |
| Load regulation | Reg.L | – | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | – | 3 | 30 | mV | V _{cc} =5.0~7V |
| Output noise voltage | en | – | 56 | – | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 56 | – | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | – | 66 | – | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | – | – | 0.6 | V | – |
| CTL ON voltage | V _{on} | 2.4 | – | – | V | – |
| CTL inflow current | I _{ctl} | – | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

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

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

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Regulator IC

BA050LBSG (unless otherwise noted, $T_a=25^{\circ}\text{C}$, $V_{CC}=6.0\text{V}$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|--------------|-------|------|-------|---------------|---|
| Standby current | I_{CCS} | - | 0 | 10 | μA | $V_{CTL}=0\text{V}$ |
| Circuit current | I_{CCA} | - | 65 | 150 | μA | $V_{CTL}=3\text{V}$, no output load |
| <Output block> | | | | | | |
| Output voltage | V_o | 4.875 | 5.00 | 5.125 | V | $I_o=50\text{mA}^{*1}$ |
| Dropout voltage | ΔV_d | - | 90 | 150 | mV | $I_o=50\text{mA}$, $V_{CC}=0.95V_o$ |
| Output current capability | I_o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | $I_o=1\sim 50\text{mA}^{*1}$ |
| Input regulation | Reg.I | - | 3 | 30 | mV | $V_{CC}=6.0\sim 7\text{V}$ |
| Output noise voltage | e_n | - | 56 | - | μV | $I_o=10\text{mA}$, $C=0.01\mu\text{F}^{*2}$ |
| Ripple rejection 1 | R.R1 | 45 | 54 | - | dB | $I_o=10\text{mA}$, $f=400\text{Hz}$ |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | $I_o=10\text{mA}$, $f=400\text{Hz}$, $C=0.01\mu\text{F}^{*2}$ |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V_{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V_{on} | 2.4 | - | - | V | - |
| CTL inflow current | I_{ctl} | - | 6.0 | 15 | μA | $V_{ctl}=3\text{V}$ |

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

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

A capacitor ($0.01\mu\text{F}$) is used between pin 4 and pin 5, to improve ripple rejection.

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●Application example

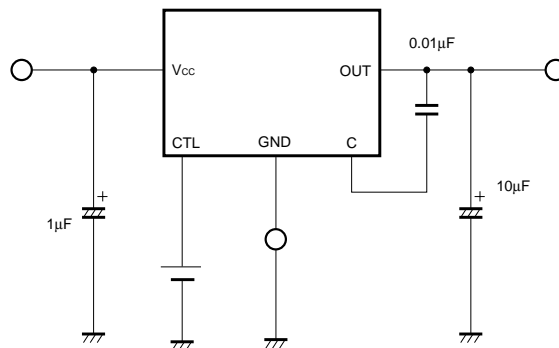


Fig.1

Regulator IC

●Electrical characteristic curves (BA030LBSG)

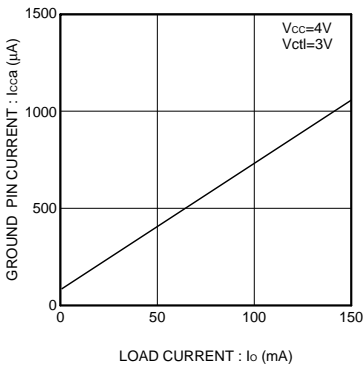


Fig.2 I_{cc} vs. I_o

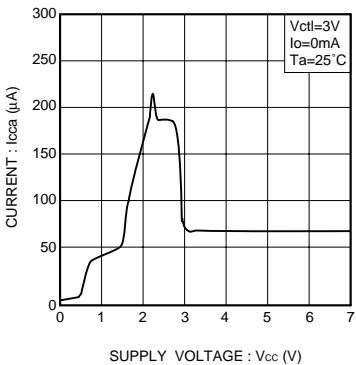


Fig.3 I_{cca} vs. V_{cc}

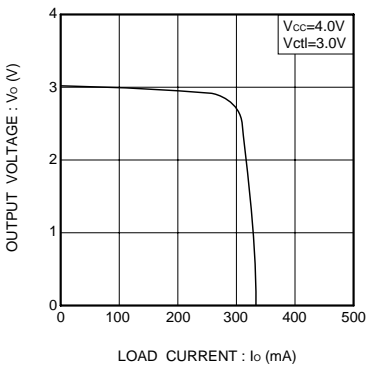


Fig.4 I_o vs. V_o

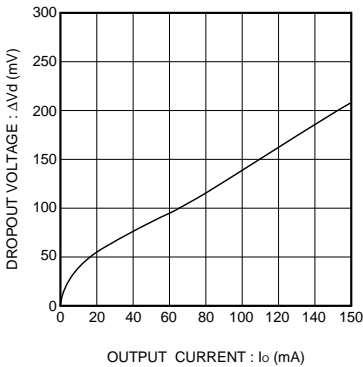


Fig.5 ΔV vs. I_o

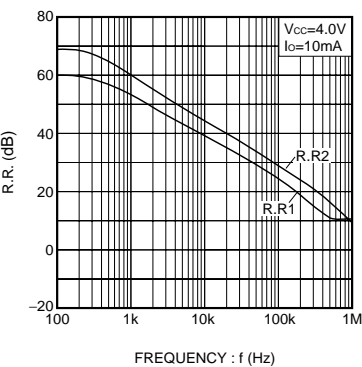
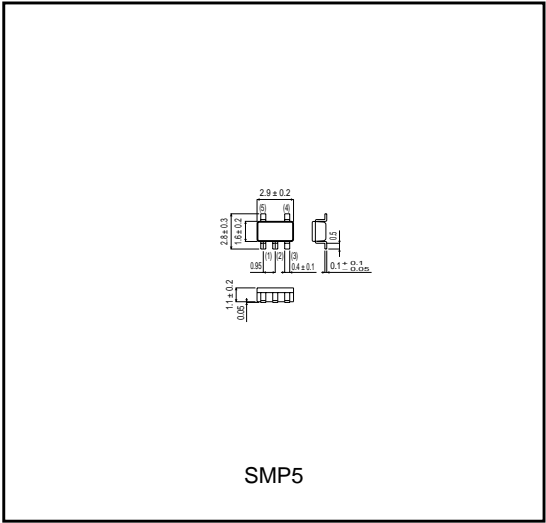


Fig.6 R.R. vs. f characteristics

●External dimensions (Units : mm)



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