

STRUCTURE                    Silicon Monolithic Integrated Circuit

TYPE                            Three-Terminal Regulator

PRODUCT SERIES            **BA78XXCP**

FEATURE                      Output current up to 1A

○ABSOLUTE MAXIMUM RATING (Ta=25°C)

| Parameter                            | Symbol | Limit            | Unit |
|--------------------------------------|--------|------------------|------|
| Input Voltage                        | Vin    | 35               | V    |
| Power Dissipation 1                  | Pd1    | 2 <sup>*1</sup>  | W    |
| Power Dissipation 2                  | Pd2    | 22 <sup>*2</sup> | W    |
| Output Current                       | Iout   | 1 <sup>*3</sup>  | A    |
| Operating Temperature Range          | Topr   | -40~+85          | °C   |
| Operating Junction Temperature Range | Tj     | -40~+150         | °C   |
| Storage Temperature Range            | Tstg   | -55~+150         | °C   |

\*1 Derating in done 16mW/°C for temperatures above Ta=25°C.

\*2 Derating in done 176mW/°C for temperatures above Ta=25°C, Mounted on infinity Aluminium heat sink.

\*3 Pd, ASO should not be exceeded.

○RECOMMENDED OPERATING CONDITIONS (Ta=-40~+85°C)

| Parameter      | Symbol         | Type     | Min  | Max             | Unit |
|----------------|----------------|----------|------|-----------------|------|
| Input Voltage  | Vin            | BA7805CP | 7.5  | 25              | V    |
|                |                | BA7806CP | 8.5  | 21              |      |
|                |                | BA7807CP | 9.5  | 22              |      |
|                |                | BA7808CP | 10.5 | 23              |      |
|                |                | BA7809CP | 11.5 | 26              |      |
|                |                | BA7810CP | 12.5 | 25              |      |
|                |                | BA7812CP | 15   | 27              |      |
|                |                | BA7815CP | 17.5 | 30              |      |
|                |                | BA7818CP | 21   | 33              |      |
|                |                | BA7820CP | 23   | 33              |      |
| BA7824CP       | 27             | 33       |      |                 |      |
| Output Current | I <sub>o</sub> | Common   | —    | 1 <sup>*3</sup> | A    |

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This product is not designed for protection against radioactive rays.

Status of this document

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○ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Ta=25°C, Vin=10V(05), 11V(06), 13V(07), 14V(08), 15V(09), 16V(10), 19V(12), 23V(15), 27V(18), 29V(20), 33V(24), Io=500mA)

| Parameter                                 | Symbol | Type              | Limit |      |       | Unit  | Condition                    |
|---|--------|-------------------|-------|------|-------|-------|------------------------------|
|   |        |                   | Min.  | Typ. | Max.  |       |                              |
| Output Voltage1                           | Vo1    | 05                | 4.8   | 5.0  | 5.2   | V     | Io=500mA                     |
|   |        | 06                | 5.75  | 6.0  | 6.25  |       |                              |
|   |        | 07                | 6.7   | 7.0  | 7.3   |       |                              |
|   |        | 08                | 7.7   | 8.0  | 8.3   |       |                              |
|   |        | 09                | 8.6   | 9.0  | 9.4   |       |                              |
|   |        | 10                | 9.6   | 10.0 | 10.4  |       |                              |
|   |        | 12                | 11.5  | 12.0 | 12.5  |       |                              |
|   |        | 15                | 14.4  | 15.0 | 15.6  |       |                              |
|   |        | 18                | 17.3  | 18.0 | 18.7  |       |                              |
| Output Voltage2                           | Vo2    | 05                | 4.75  | —    | 5.25  | V     | Vin=7.5~20V, Io=5mA~1A       |
|   |        | 06                | 5.7   | —    | 6.3   |       | Vin=8.5~21V, Io=5mA~1A       |
|   |        | 07                | 6.65  | —    | 7.35  |       | Vin=9.5~22V, Io=5mA~1A       |
|   |        | 08                | 7.6   | —    | 8.4   |       | Vin=10.5~23V, Io=5mA~1A      |
|   |        | 09                | 8.55  | —    | 9.45  |       | Vin=11.5~26V, Io=5mA~1A      |
|   |        | 10                | 9.5   | —    | 10.5  |       | Vin=12.5~25V, Io=5mA~1A      |
|   |        | 12                | 11.4  | —    | 12.6  |       | Vin=15~27V, Io=5mA~1A        |
|   |        | 15                | 14.25 | —    | 15.75 |       | Vin=17.5~30V, Io=5mA~1A      |
|   |        | 18                | 17.1  | —    | 18.9  |       | Vin=21~33V, Io=5mA~1A        |
| Line Regulation1                          | Reg.11 | 05                | —     | 3    | 100   | mV    | Vin=7~25V, Io=500mA          |
|   |        | 06                | —     | 4    | 120   |       | Vin=8~25V, Io=500mA          |
|   |        | 07                | —     | 5    | 140   |       | Vin=9~25V, Io=500mA          |
|   |        | 08                | —     | 5    | 160   |       | Vin=10.5~25V, Io=500mA       |
|   |        | 09                | —     | 6    | 180   |       | Vin=11.5~26V, Io=500mA       |
|   |        | 10                | —     | 7    | 200   |       | Vin=12.5~27V, Io=500mA       |
|   |        | 12                | —     | 8    | 240   |       | Vin=14.5~30V, Io=500mA       |
|   |        | 15                | —     | 9    | 300   |       | Vin=17.5~30V, Io=500mA       |
|   |        | 18                | —     | 10   | 360   |       | Vin=21~33V, Io=500mA         |
| Line Regulation2                          | Reg.12 | 05                | —     | 1    | 50    | mV    | Vin=8~12V, Io=500mA          |
|   |        | 06                | —     | 2    | 60    |       | Vin=9~13V, Io=500mA          |
|   |        | 07                | —     | 2    | 70    |       | Vin=10~15V, Io=500mA         |
|   |        | 08                | —     | 3    | 80    |       | Vin=11~17V, Io=500mA         |
|   |        | 09                | —     | 4    | 90    |       | Vin=13~19V, Io=500mA         |
|   |        | 10                | —     | 4    | 100   |       | Vin=14~20V, Io=500mA         |
|   |        | 12                | —     | 5    | 120   |       | Vin=16~22V, Io=500mA         |
|   |        | 15                | —     | 5    | 150   |       | Vin=20~26V, Io=500mA         |
|   |        | 18                | —     | 5    | 180   |       | Vin=24~30V, Io=500mA         |
| Ripple Rejection                          | R.R.   | 05                | 62    | 78   | —     | dB    | ein=1Vrms, f=120Hz, Io=100mA |
|   |        | 06                | 59    | 73   | —     |       |                              |
|   |        | 07                | 57    | 69   | —     |       |                              |
|   |        | 08                | 56    | 65   | —     |       |                              |
|   |        | 09                | 56    | 64   | —     |       |                              |
|   |        | 10                | 55    | 64   | —     |       |                              |
|   |        | 12                | 55    | 63   | —     |       |                              |
|   |        | 15                | 54    | 62   | —     |       |                              |
|   |        | 18                | 53    | 61   | —     |       |                              |
| Temperature Coefficient of Output Voltage | Tcvo   | 05                | —     | -1.0 | —     | mV/°C | Io=5mA, Tj=0~125°C           |
|   |        | 06/07/08/09/10/12 | —     | -0.5 | —     |       |                              |
|   |        | 15/18             | —     | -0.6 | —     |       |                              |
|   |        | 20/24             | —     | -0.7 | —     |       |                              |
| Peak Output Current                       | Io-p   | Common            | —     | 1.7  | —     | A     | Tj=25°C                      |
| Parameter                                 | Symbol | Type              | Limit |      |       | Unit  | Condition                    |

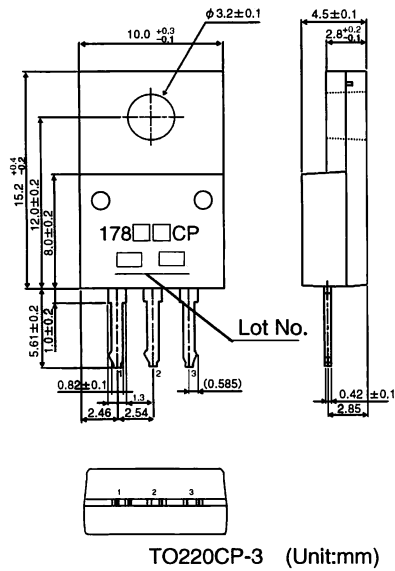
|                              |        |                      | Min. | Typ. | Max. |                      |                        |
|------------------------------|--------|----------------------|------|------|------|----------------------|------------------------|
| Load Regulation1             | Reg.L1 | 05                   | —    | 15   | 100  | mV                   | Io=5mA~1A              |
|                              |        | 06                   | —    | 16   | 120  |                      |                        |
|                              |        | 07                   | —    | 17   | 140  |                      |                        |
|                              |        | 08                   | —    | 19   | 160  |                      |                        |
|                              |        | 09                   | —    | 20   | 180  |                      |                        |
|                              |        | 10                   | —    | 21   | 200  |                      |                        |
|                              |        | 12                   | —    | 23   | 200  |                      |                        |
|                              |        | 15                   | —    | 27   | 300  |                      |                        |
|                              |        | 18                   | —    | 30   | 360  |                      |                        |
|                              |        | 20                   | —    | 32   | 400  |                      |                        |
|                              |        | 24                   | —    | 37   | 480  |                      |                        |
| Load Regulation2             | Reg.L2 | 05                   | —    | 5    | 50   | mV                   | Io=250mA~750mA         |
|                              |        | 06                   | —    | 6    | 60   |                      |                        |
|                              |        | 07                   | —    | 6    | 70   |                      |                        |
|                              |        | 08                   | —    | 7    | 80   |                      |                        |
|                              |        | 09                   | —    | 8    | 90   |                      |                        |
|                              |        | 10                   | —    | 8    | 90   |                      |                        |
|                              |        | 12                   | —    | 10   | 100  |                      |                        |
|                              |        | 15                   | —    | 10   | 150  |                      |                        |
|                              |        | 18                   | —    | 12   | 180  |                      |                        |
|                              |        | 20                   | —    | 14   | 200  |                      |                        |
|                              |        | 24                   | —    | 15   | 240  |                      |                        |
| Output Noise Voltage         | Vn     | 05                   | —    | 40   | —    | μV                   | f=10Hz~100kHz          |
|                              |        | 06                   | —    | 60   | —    |                      |                        |
|                              |        | 07                   | —    | 70   | —    |                      |                        |
|                              |        | 08                   | —    | 80   | —    |                      |                        |
|                              |        | 09                   | —    | 90   | —    |                      |                        |
|                              |        | 10                   | —    | 100  | —    |                      |                        |
|                              |        | 12                   | —    | 110  | —    |                      |                        |
|                              |        | 15                   | —    | 125  | —    |                      |                        |
|                              |        | 18                   | —    | 140  | —    |                      |                        |
|                              |        | 20                   | —    | 150  | —    |                      |                        |
|                              |        | 24                   | —    | 180  | —    |                      |                        |
| Dropout Voltage              | Vd     | Common               | —    | 2.0  | —    | V                    | Io=1A                  |
| Bias Current                 | Ib     | Common               | —    | 4.5  | 8.0  | mA                   | Io=0mA                 |
| Bias Current Change 1        | Ib1    | Common               | —    | —    | 0.5  | mA                   | Io=5mA~1A              |
| Bias Current Change 2        | Ib2    | 05                   | —    | —    | 0.8  | mA                   | Vin:8~25V, Io=500mA    |
|                              |        | 06                   | —    | —    | 0.8  |                      | Vin:8.5~25V, Io=500mA  |
|                              |        | 07                   | —    | —    | 0.8  |                      | Vin:9.5~25V, Io=500mA  |
|                              |        | 08                   | —    | —    | 0.8  |                      | Vin:10.5~25V, Io=500mA |
|                              |        | 09                   | —    | —    | 0.8  |                      | Vin:11.5~26V, Io=500mA |
|                              |        | 10                   | —    | —    | 0.8  |                      | Vin:12.5~27V, Io=500mA |
|                              |        | 12                   | —    | —    | 0.8  |                      | Vin:14.5~30V, Io=500mA |
|                              |        | 15                   | —    | —    | 0.8  |                      | Vin:17.5~30V, Io=500mA |
|                              |        | 18                   | —    | —    | 0.8  |                      | Vin:21~33V, Io=500mA   |
|                              |        | 20                   | —    | —    | 0.8  | Vin:23~33V, Io=500mA |                        |
|                              |        | 24                   | —    | —    | 0.8  | Vin:27~33V, Io=500mA |                        |
| Short-Circuit Output Current | Ios    | 05/06/07/08          | —    | 0.6  | —    | A                    | Vin=25V                |
|                              |        | 09/10/12/15/18/20/24 | —    | 0.3  | —    |                      | Vin=30V                |
| Output Resistance            | Ro     | 05                   | —    | 9    | —    | mΩ                   | f=1kHz                 |
|                              |        | 06/07/08/09          | —    | 10   | —    |                      |                        |
|                              |        | 10                   | —    | 11   | —    |                      |                        |
|                              |        | 12                   | —    | 12   | —    |                      |                        |
|                              |        | 15                   | —    | 14   | —    |                      |                        |
|                              |        | 18                   | —    | 17   | —    |                      |                        |
|                              |        | 20                   | —    | 19   | —    |                      |                        |
|                              |        | 24                   | —    | 27   | —    |                      |                        |

○Output Voltage and Marking

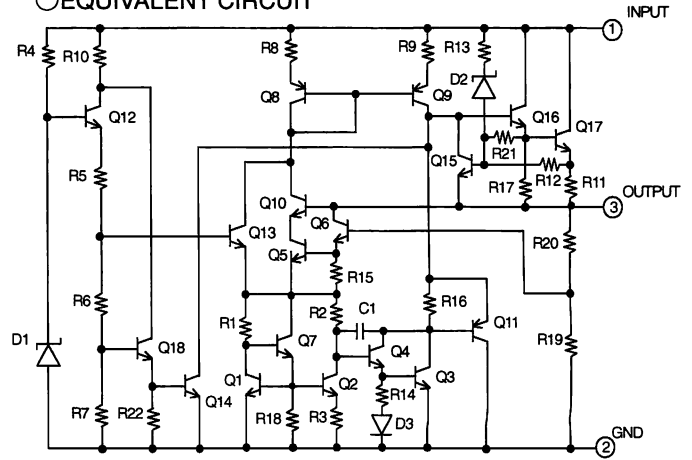
| Type     | Marking | Output Voltage(V) |
|----------|---------|-------------------|
| BA7805CP | 17805CP | 5                 |
| BA7806CP | 17806CP | 6                 |
| BA7807CP | 17807CP | 7                 |
| BA7808CP | 17808CP | 8                 |
| BA7809CP | 17809CP | 9                 |
| BA7810CP | 17810CP | 10                |

| Type     | Marking | Output Voltage(V) |
|----------|---------|-------------------|
| BA7812CP | 17812CP | 12                |
| BA7815CP | 17815CP | 15                |
| BA7818CP | 17818CP | 18                |
| BA7820CP | 17820CP | 20                |
| BA7824CP | 17824CP | 24                |

○ PHYSICAL DIMENTION



○ EQUIVALENT CIRCUIT



○ Pin number, Pin name

| Pin number | Pin name |
|------------|----------|
| 1          | INPUT    |
| 2          | GND      |
| 3          | OUTPUT   |

○ NOTES FOR USE

- (1) Absolute maximum range  
We are careful enough for quality control about this IC. So, there is no problem under normal operation, excluding that it exceeds the absolute maximum ratings. However, Absolute Maximum Ratings are those values beyond which the life of a device may be destroyed we cannot be defined the failure mode, such as short mode or open mode. Therefore physical security countermeasure, like fuse, is to be given when a specific mode to be beyond absolute maximum ratings is considered.
- (2) Ground voltage  
Make setting of the potential of the GND terminal so that it will be maintained at the minimum in any operating state. Furthermore, check to be sure no terminals are at a potential lower than the GND voltage including an actual electric transient.
- (3) Thermal design  
When you do the kind of use which exceeds Pd, it may be happened to deteriorating IC original quality such as decrease of electric current ability with chip temperature rise. Do not exceed the power dissipation (Pd) of the package specification rating under actual operation, and please design enough temperature margins.
- (4) Short circuit mode between terminals and wrong mounting  
Do not mount the IC in the wrong direction and be careful about the reverse-connection of the power connector. Moreover, this IC might be destroyed when the dust short the terminals between them or GND.
- (5) Operation in the strong electromagnetic field  
Malfunction may be happened when the device is used in the strong electromagnetic field.
- (6) ASO  
Do not exceed the maximum ASO and the absolute maximum ratings of the output transistor.
- (7) Thermal shutdown circuit  
The thermal shutdown circuit (TSD circuit) is built in this product. When IC chip temperature become higher, the thermal shutdown circuit operates and turns output off. The thermal shutdown circuit, which is aimed at isolating the LSI from thermal runaway as much as possible, is not aimed at the protection or guarantee of the LSI. Therefore, do not continuously use the LSI with this circuit operating or use the LSI assuming its operation.
- (8) GND wiring pattern  
Use separate ground lines for control signals and high current power driver outputs. Because these high current outputs that flows to the wire impedance changes the GND voltage for control signal. Therefore, each ground terminal of IC must be connected at the one point on the set circuit board. As for GND of external parts, it is similar to the above-mentioned.
- (9) Internal circuits could be damaged if there are modes in which the electric potential of the application's input and GND are the opposite of the electric potential of the various outputs. Use of a diode or other such bypass is recommended.
- (10) We recommend to put Diode for protection purpose in case of output pin connected with large load of impedance or reserve current occurred at initial and output off.
- (11) Anti-oscillating capacitor of output and bypass capacitor Anti-oscillating capacitor has to be put between Output and GND.(more than 0.1 μF)  
Tantalum capacitor is recommendable where capacitance value varied because of temperature change.  
Also it is recommendable to put 0.33 μF bypass capacitor between Input and GND as close as possible to pin.

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