

ASSP For Power Management Applications (Mobile Phones)

Power Management IC for Mobile Phone

MB3892

■ DESCRIPTION

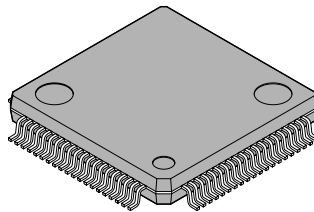
MB3892 is a low-saturation voltage type series regulator contains 3 channels for the baseband regulator, 1 channel for the backup regulator, 6 channels for the RF regulator, and 1 channel for the variable regulator. MB3892 is built in reset circuit, serial control circuit, operation Amp. for charge control of Lithium ion battery, LED drive circuit, receiver Amp., loudspeaker drive Amp., sounder circuit, vibrator drive circuit, and 4-ch D/A converter and the devices is miniaturized by systematization of built-in power supply for mobile phone.

■ FEATURES

- Power supply voltage range : VB = 2.85 V to 5.5 V
: EXTVCC = 3.0 V to 6.5 V
- Low power consumption current during standby : 100 μ A (Max.)
- Built-in low-saturation voltage type series regulator
- Built-in power-on reset function
- Built-in serial control function
- Built-in operation Amp. for charge control of Lithium ion battery
- Special power off function
(To prevent battery discharge, this function controls the power consumption current of main IC under 11 μ A (typ.) on the shipment.)

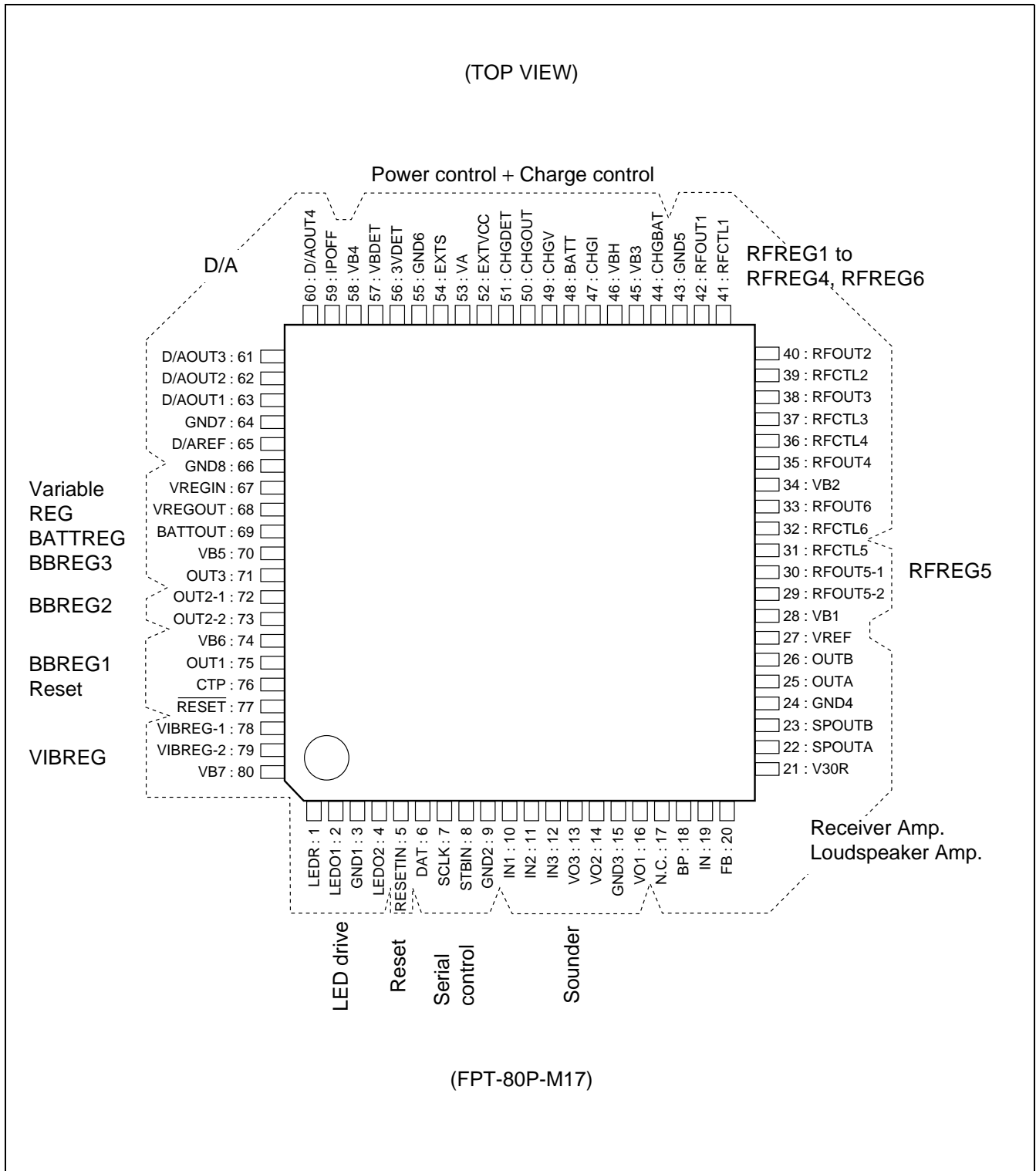
■ PACKAGE

80-pin plastic LQFP



(FPT-80P-M17)

PIN ASSIGNMENT



■ PIN DESCRIPTION

| Pin No. | Symbol | I/O | Descriptions |
|---------|----------|-----|---|
| 1 | LEDR | O | LEDR output pin. (an open collector output) |
| 2 | LEDO1 | O | LED1 output pin. (an open drain output) |
| 3 | GND1 | — | Ground pin. |
| 4 | LEDO2 | O | LED2 output pin. (an open drain output) |
| 5 | RESETIN | I | Reset detect comparator input pin. |
| 6 | DAT | I | Serial data input pin. |
| 7 | SCLK | I | Serial clock input pin. |
| 8 | STBIN | I | Strobe input pin. |
| 9 | GND2 | — | Ground pin. |
| 10 | IN1 | I | Sounder1 control input pin. |
| 11 | IN2 | I | Sounder2 control input pin. |
| 12 | IN3 | I | Sounder3 control input pin. |
| 13 | VO3 | O | Sounder3 control output pin. (an open drain output) |
| 14 | VO2 | O | Sounder2 control output pin. (an open drain output) |
| 15 | GND3 | — | Ground pin. |
| 16 | VO1 | O | Sounder1 control output pin. (an open drain output) |
| 17 | N.C. | — | No connection pin. |
| 18 | BP | — | Bypass pin. |
| 19 | IN | I | Non-inverted input pin. |
| 20 | FB | I | Inverted input pin. |
| 21 | V30R | — | Power supply pin for speaker Amp. |
| 22 | SPOUTA | O | Output A pin for loudspeaker Amp. |
| 23 | SPOUTB | O | Output B pin for loudspeaker Amp. |
| 24 | GND4 | — | Ground pin. |
| 25 | OUTA | O | Output A pin for receiver Amp. |
| 26 | OUTB | O | Output B pin for receiver Amp. |
| 27 | VREF | O | Reference output voltage pin. |
| 28 | VB1 | — | Power supply pin. |
| 29 | RFOUT5-2 | O | RF REG5 output pin2. (Short circuiting to pin 30) |
| 30 | RFOUT5-1 | O | RF REG5 output pin1. (Short circuiting to pin 29) |
| 31 | RFCTL5 | I | RF REG5 control pin. |
| 32 | RFCTL6 | I | RF REG6 control pin. |
| 33 | RFOUT6 | O | RF REG6 output pin. |
| 34 | VB2 | — | Power supply pin. |

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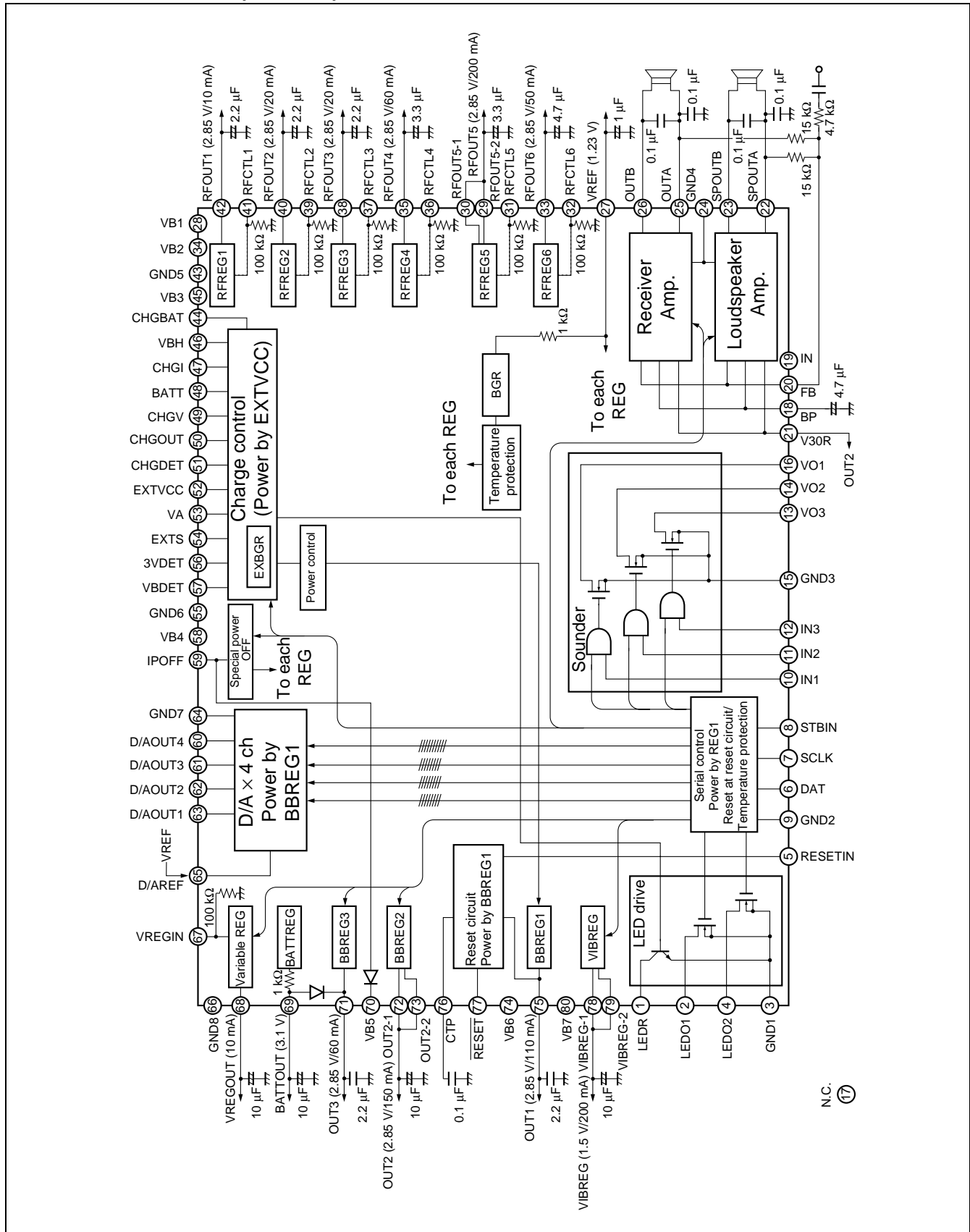
| Pin No. | Symbol | I/O | Descriptions |
|---------|---------|-----|---|
| 35 | RFOUT4 | O | RF REG4 output pin. |
| 36 | RFCTL4 | I | RF REG4 control pin. |
| 37 | RFCTL3 | I | RF REG3 control pin. |
| 38 | RFOUT3 | O | RF REG3 output pin. |
| 39 | RFCTL2 | I | RF REG2 control pin. |
| 40 | RFOUT2 | O | RF REG2 output pin. |
| 41 | RFCTL1 | I | RF REG1 control pin. |
| 42 | RFOUT1 | O | RF REG1 output pin. |
| 43 | GND5 | — | Ground pin. |
| 44 | CHGBAT | — | Main charge pin. |
| 45 | VB3 | — | Power supply pin. |
| 46 | VBH | I | Main charge pin. |
| 47 | CHGI | O | Main charge pin. |
| 48 | BATT | O | A/D input pin. |
| 49 | CHGV | I | Main charge pin. |
| 50 | CHGOUT | O | Main charge pin. |
| 51 | CHGDET | O | Main charge pin. |
| 52 | EXTVCC | — | Power supply pin for charge control. |
| 53 | VA | I | Preliminary charge pin. |
| 54 | EXTS | O | Preliminary charge pin. |
| 55 | GND6 | — | Ground pin. |
| 56 | 3VDET | O | Power supply detector pin. |
| 57 | VBDET | I | Power supply detector pin. |
| 58 | VB4 | — | Power supply pin. |
| 59 | IPOFF | I | Special power off input pin. |
| 60 | D/AOUT4 | O | 10 bit D/A output pin. |
| 61 | D/AOUT3 | O | 8 bit D/A3 output pin. |
| 62 | D/AOUT2 | O | 8 bit D/A2 output pin. |
| 63 | D/AOUT1 | O | 8 bit D/A1 output pin. |
| 64 | GND7 | — | Ground pin. |
| 65 | D/AREF | I | D/A reference voltage input pin. |
| 66 | GND8 | — | Ground pin. |
| 67 | VREGIN | I | Variable REG reference voltage input pin. |
| 68 | VREGOUT | O | Variable REG output pin. |

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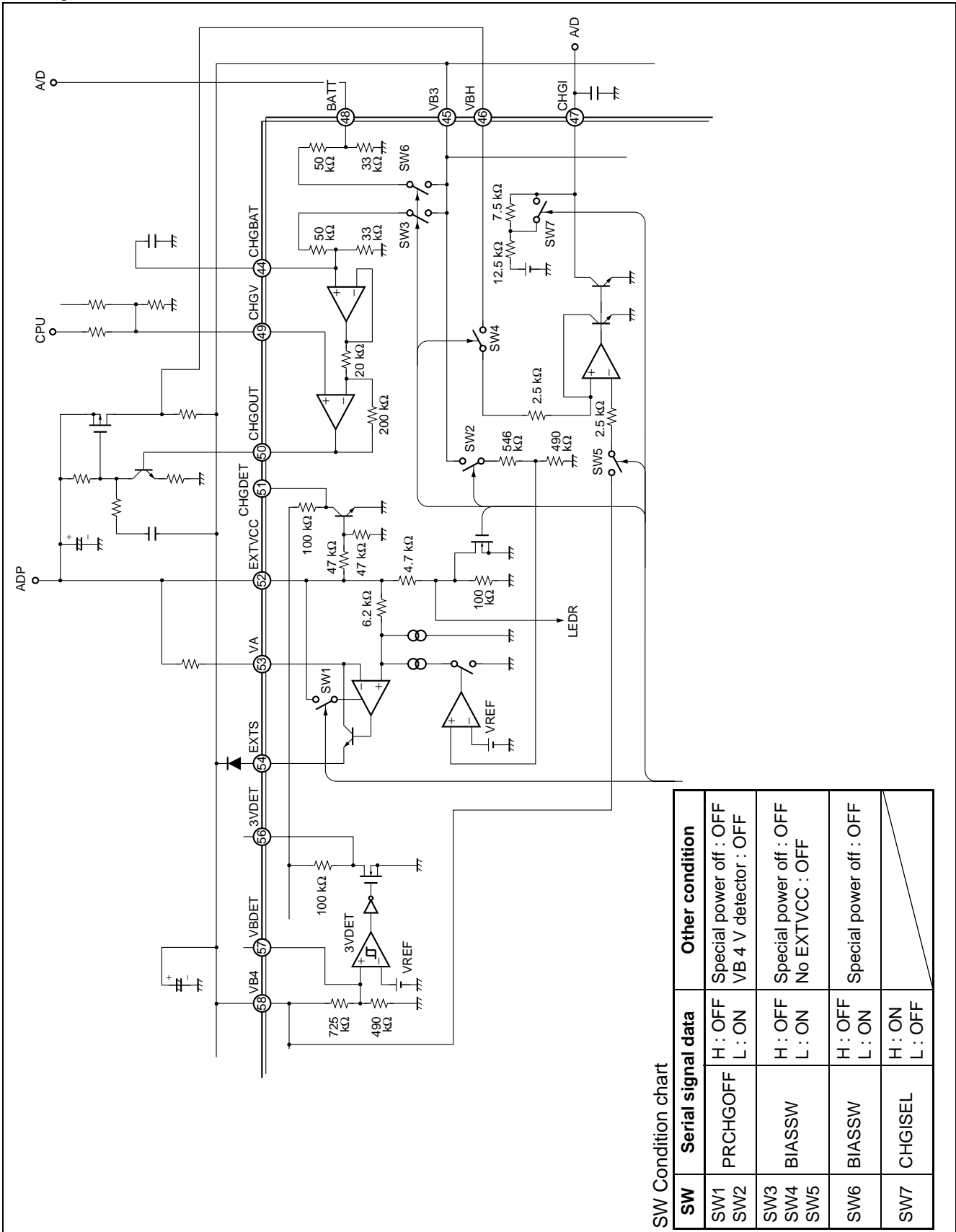
| Pin No. | Symbol | I/O | Descriptions |
|---------|---------------------------|-----|--|
| 69 | BATTOUT | O | Backup REG output pin. |
| 70 | VB5 | — | Power supply pin. |
| 71 | OUT3 | O | Baseband REG3 output pin. |
| 72 | OUT2-1 | O | Baseband REG2 output pin. (Short circuiting to pin 73) |
| 73 | OUT2-2 | O | Baseband REG2 output pin. (Short circuiting to pin 72) |
| 74 | VB6 | — | Power supply pin. |
| 75 | OUT1 | O | Baseband REG1 output pin. |
| 76 | CTP | I | Setting pin for power-on reset hold time. |
| 77 | $\overline{\text{RESET}}$ | O | Reset output pin. |
| 78 | VIBREG-1 | O | Vibrator REG output pin. (Short circuiting to pin 79) |
| 79 | VIBREG-2 | O | Vibrator REG output pin. (Short circuiting to pin 78) |
| 80 | VB7 | — | Power supply pin. |

■ BLOCK DIAGRAM (General)



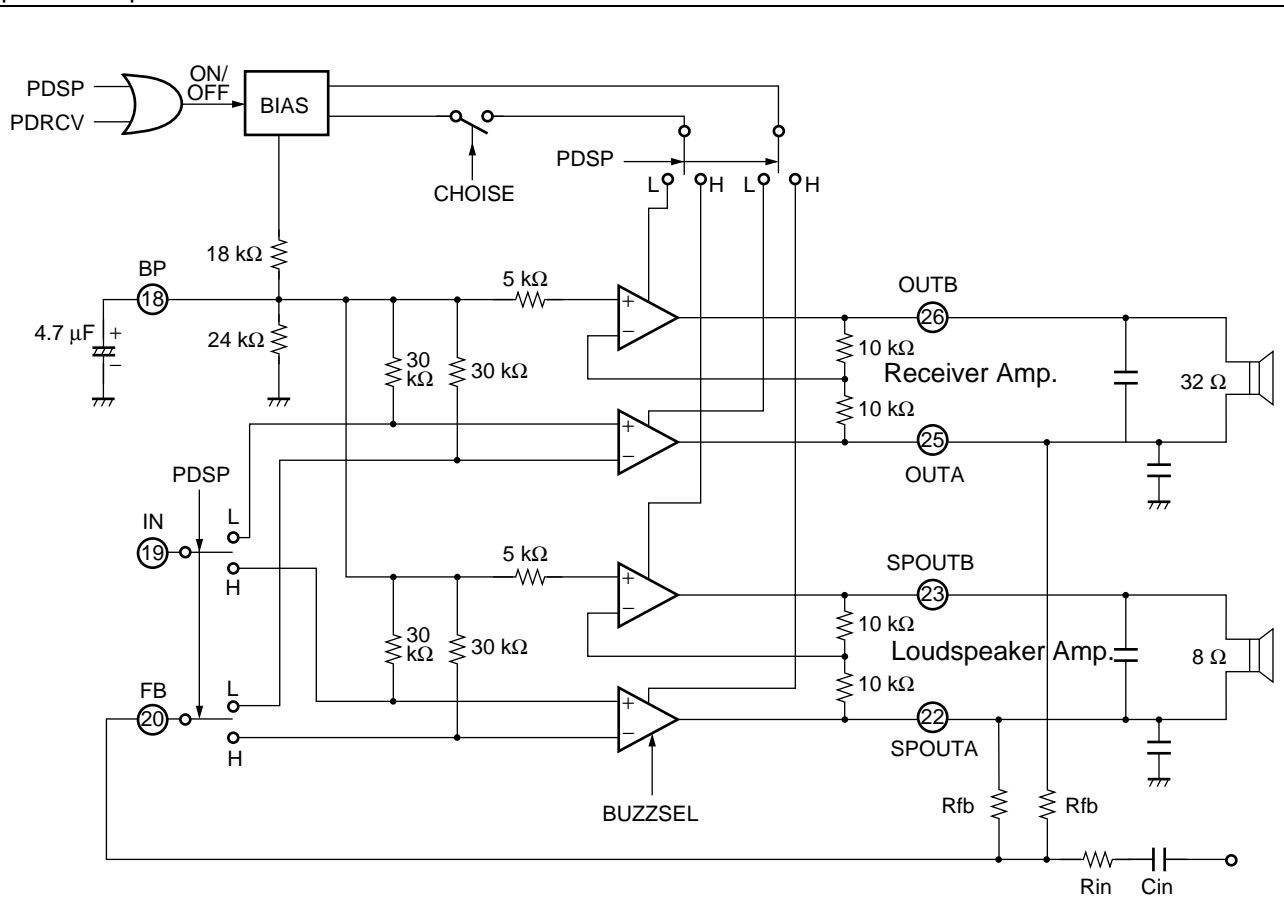
N.C. (17)

• Charge control



MB3892

• Speaker Amp.



| PDRCV | PDSP | CHOISE | BUZZSEL | Operating Amp. | Operation mode |
|-------|------|--------|---------|------------------|---|
| L | L | × | × | — | Standby |
| H | L | H | L | Receiver Amp. | Receiver (BTL drive) |
| H | L | L | L | Receiver Amp. | Earphone mode (single drive) |
| L | H | H | L | Loudspeaker Amp. | Loudspeaker Amp. (BTL drive) |
| L | H | L | H | Loudspeaker Amp. | Short wave form output (open collector) |
| H | H | × | L | Loudspeaker Amp. | When both of PDRCV/PDSP is "H" level, the operation of loudspeaker Amp. has priority. |

■ ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Conditions | Rating | | Unit |
|-----------------------------------|------------------|-------------------------|--------|--------|------|
| | | | Min. | Max. | |
| Power supply voltage | VB | — | — | 7 | V |
| | EXTVCC | — | — | 7 | V |
| Baseband regulator output current | Io | BBREG1 | — | -110 | mA |
| | Io | BBREG2 | — | -150 | mA |
| | Io | BBREG3 | — | -60 | mA |
| Receiver Amp. output current | Io | — | — | 150 | mA |
| Loudspeaker Amp. output current | Io | — | — | 400 | mA |
| Vibrator regulator output current | Io | — | — | -200 | mA |
| RF regulator output current | Io | RFREG1 | — | -10 | mA |
| | Io | RFREG2 | — | -20 | mA |
| | Io | RFREG3 | — | -20 | mA |
| | Io | RFREG4 | — | -60 | mA |
| | Io | RFREG5 | — | -200 | mA |
| | Io | RFREG6 | — | -50 | mA |
| Variable regulator output current | Io | — | — | -15 | mA |
| Power dissipation | P _D | T _a ≤ +25 °C | — | 1420 * | mW |
| Storage temperature | T _{stg} | — | -55 | +125 | °C |

*: The packages are mounted on the dual-sided epoxy board(10 cm × 10 cm)

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

■ RECOMMENDED OPERATING CONDITIONS

| Parameter | Symbol | Conditions | Value | | | Unit |
|-----------------------------------|------------------|---|-------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Power supply voltage | VB | — | 2.85 | — | 5.5 | V |
| | EXTVCC | Under 4.5 V preliminary charge circuit is not operated normally | 3.0 | — | 6.5 | V |
| REG capacitor ESR guarantee value | R _{ESR} | — | 0.4 | — | 7 | Ω |
| Operating ambient temperature | T _a | — | -30 | +25 | +80 | °C |

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure.

No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their FUJITSU representatives beforehand.

■ ELECTRICAL CHARACTERISTICS

• Power control

(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|-----------------------------|-------------------|-------------------|---------|--|-------|------|------|------|
| | | | | | Min. | Typ. | Max. | |
| Reference voltage | Reference voltage | V _{REF} | 27 | VREF = 0 mA | 1.19 | 1.23 | 1.27 | V |
| Baseband regulator [BBREG1] | Output voltage | V _{O1} | 75 | OUT1 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD1} | 75 | OUT1 = -110 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 75 | VB = 3.1 to 4.8 V, OUT1 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 75 | OUT1 = 0 to -110 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 75 | Vin = 0.2 Vrms, f = 1 kHz, OUT1 = -10 mA | — | -50* | — | dB |
| | Reverse current | I _{REV} | 75 | VB = 0 to 5 V or VB = Open | — | 30 | 43 | μA |
| | Rise time | T _R | 75 | OUT1 = 2.2 μF, OUT1 = 27 Ω | — | — | 60 | μs |
| Baseband regulator [BBREG2] | Output voltage | V _{O2} | 72, 73 | OUT2 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD2} | 72, 73 | OUT2 = -150 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 72, 73 | VB = 3.1 to 4.8 V, OUT2 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 72, 73 | OUT2 = 0 to -150 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 72, 73 | Vin = 0.2 Vrms, f = 1 kHz, OUT2 = -10 mA | — | -50* | — | dB |
| | Rise time | T _R | 72, 73 | OUT2 = 10 μF, OUT2 = 20 Ω | — | — | 190 | μs |
| Baseband regulator [BBREG3] | Output voltage | V _{O3} | 71 | OUT3 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD3} | 71 | OUT3 = -60 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 71 | VB = 3.1 to 4.8 V, OUT3 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 71 | OUT3 = 0 to -60 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 71 | Vin = 0.2 Vrms, f = 1 kHz, OUT3 = -10 mA | — | -50* | — | dB |
| | Reverse current | I _{REV} | 71 | VB = 0 to 5 V or VB = Open | — | 0 | 1 | μA |
| | Rise time | T _R | 71 | OUT3 = 2.2 μF, OUT3 = 47 Ω | — | — | 105 | μs |

* : Standard design value

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(Ta = +25 °C, VB = 3.6 V)

| Parameter | Symbol | Pin No. | Conditions | Value | | | Unit | |
|------------------------------------|------------------|-------------------|------------|--|------|------|------|----|
| | | | | Min. | Typ. | Max. | | |
| Backup regulator [BATTREG] | Output voltage | V _{BATT} | 69 | BATTOUT = 0 mA | 3.00 | 3.10 | 3.20 | V |
| | Output current | I _{BATT} | 69 | BATTOUT = 0 V | — | -3.1 | — | mA |
| | Reverse current | I _{REV} | 69 | VB = 0 to 5 V or VB = Open | — | 0 | 1 | μA |
| Vibrator drive circuit [VIBREG] | Output voltage | V _O | 78, 79 | VIBREG = 0 mA | 1.44 | 1.50 | 1.56 | V |
| | | V _{OLD} | 78, 79 | VIBREG = -200 mA | 1.38 | 1.50 | 1.56 | V |
| RF regulator [RFREG1] | Output voltage | V _{O1} | 42 | RFOUT1 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD1} | 42 | RFOUT1 = -10 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 42 | VB = 3.1 to 4.8 V, RFOUT1 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 42 | RFOUT1 = 0 to -10 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 42 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT1 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 42 | RFOUT1 = 2.2 μF, RFOUT1 = 300 Ω | — | — | 630 | μs |
| RF regulator [RFREG2] | Output voltage | V _{O2} | 40 | RFOUT2 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD2} | 40 | RFOUT2 = -20 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 40 | VB = 3.1 to 4.8 V, RFOUT2 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 40 | RFOUT2 = 0 to -20 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 40 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT2 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 40 | RFOUT2 = 2.2 μF, RFOUT2 = 150 Ω | — | — | 315 | μs |
| RF regulator [RFREG3] | Output voltage | V _{O3} | 38 | RFOUT3 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD3} | 38 | RFOUT3 = -20 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 38 | VB = 3.1 to 4.8 V, RFOUT3 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 38 | RFOUT3 = 0 to -20 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 38 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT3 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 38 | RFOUT3 = 2.2 μF, RFOUT3 = 150 Ω | — | — | 315 | μs |

* : Standard design value

(Continued)

(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|--------------------------|------------------|-------------------|---------|--|-------|------|------|------|
| | | | | | Min. | Typ. | Max. | |
| RF regulator [RFREG4] | Output voltage | V _{O4} | 35 | RFOUT4 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD4} | 35 | RFOUT4 = -60 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 35 | VB = 3.1 to 4.8 V, RFOUT4 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 35 | RFOUT4 = 0 to -60 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 35 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT4 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 35 | RFOUT4 = 3.1 μF, RFOUT4 = 51 Ω | — | — | 160 | μs |
| RF regulator [RFREG5] | Output voltage | V _{O5} | 29, 30 | RFOUT5 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD5} | 29, 30 | RFOUT5 = -200 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 29, 30 | VB = 3.1 to 4.8 V, RFOUT5 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 29, 30 | RFOUT5 = 0 to -200 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 29, 30 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT5 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 29, 30 | RFOUT5 = 3.3 μF, RFOUT5 = 15 Ω | — | — | 50 | μs |
| RF regulator [RFREG6] | Output voltage | V _{O6} | 33 | RFOUT6 = 0 mA | 2.79 | 2.85 | 2.91 | V |
| | | V _{OLD6} | 33 | RFOUT6 = -50 mA | 2.79 | 2.85 | 2.91 | V |
| | Line regulation | Line | 33 | VB = 3.1 to 4.8 V, RFOUT6 = -10 mA | — | — | 20 | mV |
| | Load regulation | Load | 33 | RFOUT6 = 0 to -50 mA | -30 | — | 0 | mV |
| | Ripple rejection | R.R | 33 | Vin = 0.2 Vrms, f = 1 kHz, RFOUT6 = -10 mA | — | -55* | — | dB |
| | Rise time | T _R | 33 | RFOUT6 = 4.7 μF, RFOUT6 = 62 Ω | — | — | 270 | μs |

* : Standard design value

(Continued)

MB3892

(Continued)

(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit | |
|----------------------------------|--|-------------------|------------------------|--------------------------------------|--|------|------------|------|-----|
| | | | | | Min. | Typ. | Max. | | |
| RF regulator control | Input voltage | V _{IL} | 41, 39, 37, 36, 31, 32 | — | 0 | — | OUT1 × 0.3 | V | |
| | | V _{IH} | 41, 39, 37, 36, 31, 32 | — | OUT1 × 0.7 | — | OUT1 | V | |
| | Input current | I _{IL} | 41, 39, 37, 36, 31, 32 | RFCTL1 to RFCTL6 = 0 V | -1 | — | 1 | μA | |
| | | I _{IH} | 41, 39, 37, 36, 31, 32 | RFCTL1 to RFCTL6 = 2.85 V | 22 | 28.5 | 41 | μA | |
| Variable bias regulator [VARREG] | Input voltage range | V _{IN} | 67 | — | 1.67 | — | 2.38 | V | |
| | Output voltage range | V _O | 68 | — | 2.00 | — | 2.85 | V | |
| | Output voltage precision | V _{OP} | 68 | — | -2.5 | — | 2.5 | % | |
| | Output current | I _O | 68 | — | -10 | — | — | mA | |
| | Input current | I _{IL} | 67 | VREGIN = 0 V | -1 | — | 1 | μA | |
| | | I _{IH} | 67 | VREGIN = 2.85 V | 22 | 28.5 | 41 | μA | |
| D/A converter | System resolution | — | 63, 62, 61 | D/A1 to D/A3 | — | — | 8 | bit | |
| | | — | 60 | D/A4 | — | — | 10 | bit | |
| | Differential non-linear type linearity error | L _E | 60 | 60 | D/A4 (Input code is 200) | -12 | — | +12 | LSB |
| | | | 60 | 60 | D/A4 (Input code is 100, and 300) | -9 | — | +9 | LSB |
| | | | 60 | 60 | D/A4 (Input code is 080, 180, 280, and 380) | -7 | — | +7 | LSB |
| | | | 63, 62, 61 | 63, 62, 61 | D/A1 to D/A3 (Input code is 040, 080, and 0C0) | -4 | — | +4 | LSB |
| | | | 63, 62, 61, 60 | 63, 62, 61, 60 | Other input code | -1.0 | — | +1.0 | LSB |
| | Output voltage range | V _{OC} | 63, 62, 61, 60 | D/AOUT1 to D/AOUT4 = -330 μA to 1 mA | 0.5 | — | 2.5 | V | |
| | Rise time | T _R | 63, 62, 61, 60 | D/AOUT1 to D/AOUT4 = 100 pF | — | — | 20 | μs | |
| | Output Noise | V _{NOVL} | 63, 62, 61, 60 | — | — | — | -77.8 | dBm | |

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(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|-------------------------|---------------------------|-------------------|----------------------------|--|------------|-------|-------|------|
| | | | | | Min. | Typ. | Max. | |
| Power-on reset | Detected voltage | V _{SL1} | 75 | — | 2.63 | 2.685 | 2.74 | V |
| | | V _{SH1} | 75 | — | 2.695 | 2.75 | 2.805 | V |
| | Output voltage | V _{OH} | 77 | $\overline{\text{RESET}} = -200 \mu\text{A}$ | OUT1 – 0.3 | OUT1 | — | V |
| | | V _{OH} | 77 | $\overline{\text{RESET}} = 200 \mu\text{A}$ | — | 0.01 | 0.4 | V |
| | POR hold time | T _{PR} | 77 | CTP ≤ 0.1 μF | 25 | 70 | 115 | ms |
| | Rise time | T _R | 77 | $\overline{\text{RESET}} = 50 \text{ pF}$ | — | — | 500 | ns |
| | Fall time | T _F | 77 | $\overline{\text{RESET}} = 50 \text{ pF}$ | — | — | 500 | ns |
| Supply voltage detector | Detected voltage | V _{3VDH} | 56 | — | 2.99 | 3.05 | 3.11 | V |
| | | V _{3VDL} | 56 | — | 2.79 | 2.85 | 2.907 | V |
| Power control (General) | Power consumption current | I _{B1} | 28, 34, 45, 58, 70, 74, 80 | Special power off | — | 11 | 20 | μA |
| | | I _{B2} | 28, 34, 45, 58, 70, 74, 80 | Standby | 50 | 70 | 100 | μA |
| | | I _{B3} | 28, 34, 45, 58, 70, 74, 80 | Power on (waiting) intermittent | 50 | 70 | 100 | μA |
| | | I _{B4} | 28, 34, 45, 58, 70, 74, 80 | Power on (waiting) receiving | 190 | 250 | 360 | μA |
| | | I _{B5} | 28, 34, 45, 58, 70, 74, 80 | Power on (conversation) transmission | 170 | 220 | 315 | μA |
| | | I _{B6} | 28, 34, 45, 58, 70, 74, 80 | Power on (conversation) receiving | 190 | 250 | 360 | μA |

* : Standard design value

Note: I_{B1} to I_{B6} of general power control means the total current at VB1 to VB7 terminals the load current is not included. As for the condition of each regulators at the measurement of power consumption current, please refer to “■ CONDITIONS of EACH REGURATORS at MEASUREMENT of CONSUMPTION CURRENT”.

MB3892

- Speaker Amp.

($T_a = +25\text{ }^\circ\text{C}$, $V_B = V_{30R} = 3.6\text{ V}$, $f = 1\text{ kHz}$)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|-------------------|----------------------------------|-----------|----------------------------------|--|-------|------|------|---------------|
| | | | | | Min. | Typ. | Max. | |
| Receiver Amp. | Voltage gain | A_{V1} | 25 | Single drive, INV input FB = 4.7 k Ω , FB to OUTA = 15 k Ω | 8.1 | 10.1 | 12.1 | dB |
| | | A_{V2} | 25, 26 | BTL drive, INV input FB = 4.7 k Ω , FB to OUTA = 15 k Ω | 14.1 | 16.1 | 18.1 | dB |
| | Open-ended voltage gain | A_{Vo} | 25, 26 | $f \leq 100\text{ Hz}$ | — | 80* | — | dB |
| | Output power | P_{O1} | 25, 26 | $V_{30R} = 3.6\text{ V}$, OUTA to OUTB = 32 Ω , THD = 10% | 60 | 90 | — | mW |
| | | P_{O2} | 25, 26 | $V_{30R} = 2.85\text{ V}$, OUTA to OUTB = 32 Ω , THD = 10% | 30 | 45 | — | mW |
| | Output voltage | V_o | 25, 26 | OUTA to OUTB = no load | 3.8 | 5.5 | — | V |
| | Offset voltage between output | V_{oo} | 25, 26 | — | -50 | — | 50 | mV |
| | Total harmonic distortion rate | THD | 25, 26 | $P_o = 25\text{ mW}$ | — | 0.5 | 1.0 | % |
| | Ripple rejection | R.R | 25, 26 | — | — | -45* | — | dB |
| Rise time | T_R | 25, 26 | BP = 1 V, BP = 4.7 μF | — | — | 0.1 | s | |
| Loud speaker Amp. | Voltage gain | A_v | 22, 23 | BTL drive, INV input FB = 4.7 k Ω , FB to SPOUTA = 15 k Ω | 14.1 | 16.1 | 18.1 | dB |
| | Open-ended voltage gain | A_{Vo} | 22, 23 | $f \leq 100\text{ Hz}$ | — | 80* | — | dB |
| | Output power | P_{O1} | 22, 23 | $V_{30R} = 3.6\text{ V}$, SPOUTA to SPOUTB = 8 Ω , THD = 10% | 160 | 260 | — | mW |
| | | P_{O2} | 22, 23 | $V_{30R} = 2.85\text{ V}$, SPOUTA to SPOUTB = 8 Ω , THD = 10% | 50 | 110 | — | mW |
| | Output voltage | V_o | 22, 23 | SPOUTA to SPOUTB = no load | 3.8 | 5.5 | — | V |
| | Offset voltage between output | V_{oo} | 22, 23 | — | -50 | — | 50 | mV |
| | Overall harmonic distortion rate | THD | 22, 23 | $P_o = 60\text{ mW}$ | — | 0.5 | 1.0 | % |
| | Ripple rejection | R.R | 22, 23 | — | — | -45* | — | dB |
| | Rise time | T_R | 22, 23 | BP = 1 V, BP = 4.7 μF | — | — | 0.1 | s |
| Speaker Amp. | Input impedance | R_{IN} | 19, 20 | — | 20 | 30 | 50 | k Ω |
| | Standby supply current | I_{CC1} | 21 | — | — | 0 | 10 | μA |

* : Standard design value

- Sounder

(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|-----------------|-------------------------|-------------------|-------------------|-----------------------|----------|------|----------|------|
| | | | | | Min. | Typ. | Max. | |
| Sounder | Output voltage | V _{O1} | 16 | VO1 = 200 mA | — | 0.3 | 0.5 | V |
| | | V _{O2} | 14 | VO2 = 100 mA | — | 0.3 | 0.5 | V |
| | | V _{O3} | 13 | VO3 = 50 mA | — | 0.3 | 0.5 | V |
| | Output leakage current | I _{LEAK} | 16, 14, 13 | VB = VO1 to VO3 = 6 V | — | — | 10 | μA |
| | Conditions for input ON | V _{ON} | 10, 11, 12 | — | VB × 0.7 | — | VB | V |
| | | V _{OFF} | 10, 11, 12 | — | 0.0 | — | VB × 0.3 | V |
| | Input current | I _{IH} | 10, 11, 12 | IN1 to IN3 = 3 V | -1 | — | 1 | μA |
| I _{IL} | | 10, 11, 12 | IN1 to IN3 = 0.4V | -1 | — | 1 | μA | |

- LED drive

(Ta = +25 °C, VB = 3.6 V)

| Parameter | | Symbol | Pin No. | Conditions | Value | | | Unit |
|-----------|------------------------|-------------------|---------|-----------------------|-------|------|------|------|
| | | | | | Min. | Typ. | Max. | |
| LED drive | Output voltage | V _{LE1} | 2 | LEDO1 = 25 mA | — | 0.2 | 0.4 | V |
| | | V _{LE2} | 4 | LEDO2 = 25 mA | — | 0.2 | 0.4 | V |
| | | V _{LER} | 1 | LEDR = 25 mA | — | 0.2 | 0.4 | V |
| | Output leakage current | I _{LEAK} | 2, 4, 1 | VB = VO1 to VO3 = 6 V | — | — | 10 | μA |

MB3892

- Charge control

(Ta = +25 °C, EXTVCC = 5.2 V)

| Parameter | Symbol | Pin No. | Conditions | Value | | | Unit | |
|-------------------------|--------------------------------|-------------------------|------------|--|--------------|------|------|---------------|
| | | | | Min. | Typ. | Max. | | |
| Charge control | Control input range | ΔV_{CHG} | 49 | — | 0.8 | — | 2.5 | V |
| | Control output minimum voltage | V_{COL} | 50 | EXTVCC = 6 V | — | — | 0.1 | V |
| | Control output maximum voltage | V_{COH} | 50 | EXTVCC = 6 V | EXTVCC - 0.5 | — | — | V |
| | Control input current | I_{CHGV} | 49 | CHGV = 4 V | — | — | 5 | μA |
| | Control output voltage | V_{GG1} | 50 | VB = 4 V, CHGV = 1.59 V | 0.85 | 1.44 | 2.15 | V |
| | | V_{GG2} | 50 | VB = 4 V, CHGV = 1.69 V | 1.85 | 2.44 | 3.15 | V |
| | Control gain | V_{GG} | 50 | $20 \log\{ (V_{\text{GG2}} - V_{\text{GG1}}) / 0.1\}$ | 18.8 | 20.8 | 22.8 | dB |
| | BATT detected voltage | V_{BATT} | 48 | VB = 3.6 V | 1.35 | 1.43 | 1.52 | V |
| V_{CHGBAT} | | 44 | VB = 3.6 V | 1.35 | 1.43 | 1.52 | V | |
| Charge current detector | VBH input voltage range | V_{BH} | 46 | EXTVCC = 6 V | 1.0 | — | 5.0 | V |
| | VBH input leakage current | I_{LBH} | 46 | VB = VBH = 4 V, EXTVCC = 0 V | — | — | 10 | μA |
| | Chage control output voltage | V_{CUR1} | 47 | Low precision VB = VBH = 3.6 V | 1.8 | 2.0 | 2.2 | V |
| | | V_{CUR2} | 47 | Low precision VB = 3.6 V, VBH = 3.75 V | 1.05 | 1.25 | 1.45 | V |
| | | V_{CUR3} | 47 | High precision VB = VBH = 3.6 V | 1.8 | 2.0 | 2.2 | V |
| | | V_{CUR4} | 47 | High precision VB = 3.6 V, VBH = 3.75 V | 0.48 | 0.8 | 1.12 | V |
| | Current detected sensitivity | V_{CURG1} | 47 | $20 \log\{ (V_{\text{CUR1}} - V_{\text{CUR2}}) / 0.15\}$ | 12 | 14 | 16 | dB |
| | | V_{CURG2} | 47 | $20 \log\{ (V_{\text{CUR3}} - V_{\text{CUR4}}) / 0.15\}$ | 16 | 18 | 20 | dB |

(Continued)

(Continued)

(Ta = +25 °C, EXTVCC = 5.2 V)

| Parameter | Symbol | Pin No. | Conditions | Value | | | Unit | |
|---------------------------------|-------------------------------------|------------------|----------------------------|------------------------------|------------|------|------|----|
| | | | | Min. | Typ. | Max. | | |
| Preliminary charge circuit | Switching voltage of charge current | V _{B1} | 28, 34, 45, 58, 70, 74, 80 | — | 2.5 | 2.6 | 2.7 | V |
| | | V _{B2} | 28, 34, 45, 58, 70, 74, 80 | — | 3.8 | 4.0 | 4.2 | V |
| | Charge current | I _{B1} | 54 | — | 40 | 50 | 60 | mA |
| | | I _{B2} | 54 | — | 80 | 100 | 120 | mA |
| Exterenal power supply detector | CHGDET output voltage | V _{CDL} | 51 | EXTVCC = 2 V, CHGDET = 0 A | — | — | 0.3 | V |
| | | V _{CDH} | 51 | EXTVCC = 0.6 V, CHGDET = 0 A | OUT1 – 0.2 | OUT1 | — | V |

- Serial control

(Ta = +25 °C, VB = 3.6 V)

| Parameter | Symbol | Pin No. | Conditions | Value | | | Unit | |
|----------------|---------------|-----------------|------------|-----------------------------|------------|------|------------|----|
| | | | | Min. | Typ. | Max. | | |
| Serial control | Input voltage | V _{IL} | 6, 7, 8 | — | 0 | — | OUT1 × 0.3 | V |
| | | V _{IH} | 6, 7, 8 | — | OUT1 × 0.7 | — | OUT1 | V |
| | Input current | I _{IL} | 6, 7, 8 | DAT = SCLK = STBIN = 0 V | –1 | — | 1 | μA |
| | | I _{IH} | 6, 7, 8 | DAT = SCLK = STBIN = 2.85 V | –1 | — | 1 | μA |

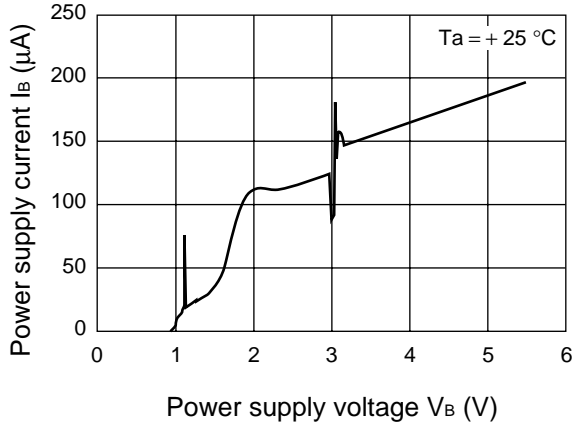
- Special power off

(Ta = +25 °C, VB = 3.6 V)

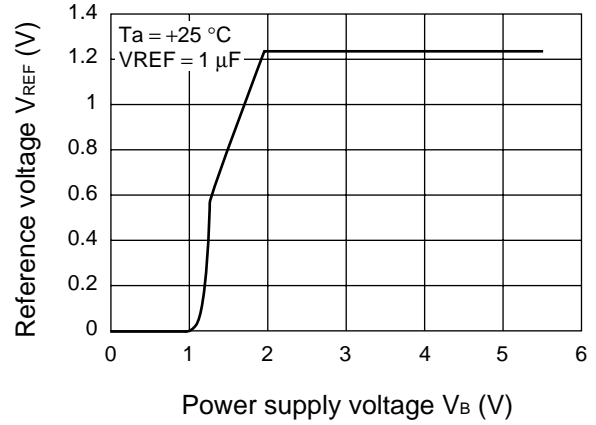
| Parameter | Symbol | Pin No. | Conditions | Value | | | Unit | |
|-------------------|---------------------------|----------------------|------------|-------------|----------|------|----------|---|
| | | | | Min. | Typ. | Max. | | |
| Special power off | Output voltage | V _{IPOFF} | 59 | IPOFF = 0 A | VB – 0.1 | VB | — | V |
| | IPOFFmode release voltage | V _{RELEASE} | 59 | — | — | — | VB × 0.3 | V |

TYPICAL CHARACTERISTICS

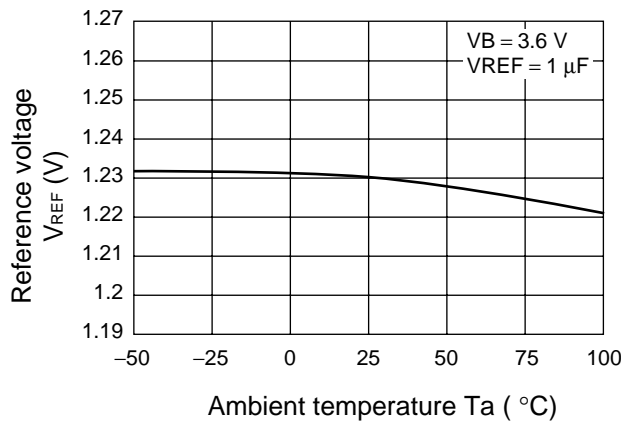
Power supply current vs. power supply voltage



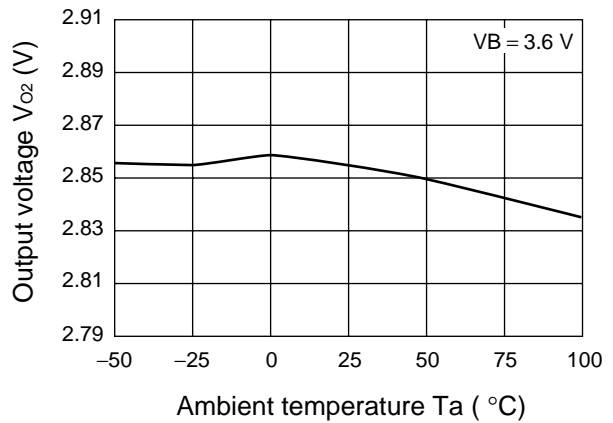
Reference voltage vs. power supply voltage



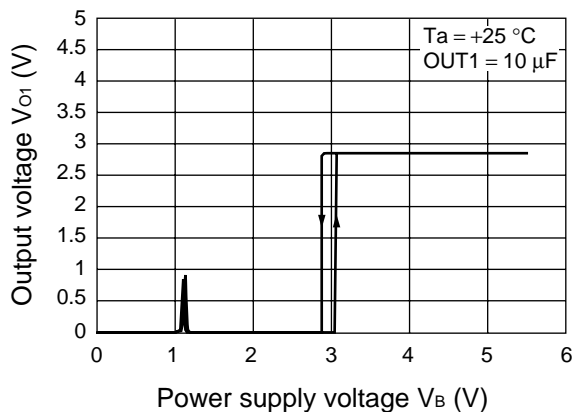
Reference voltage vs. ambient temperature



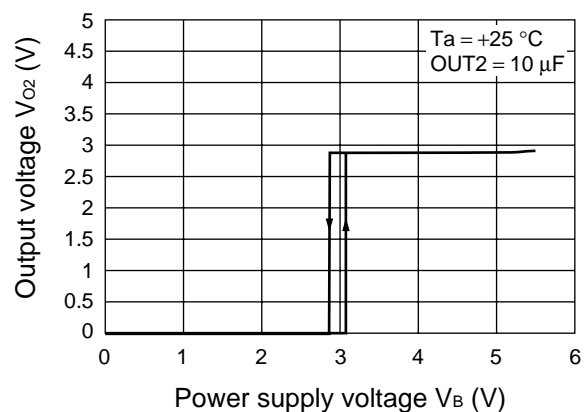
Output voltage vs. ambient temperature (BBREG2)



Output voltage vs. power supply voltage (BBREG1)

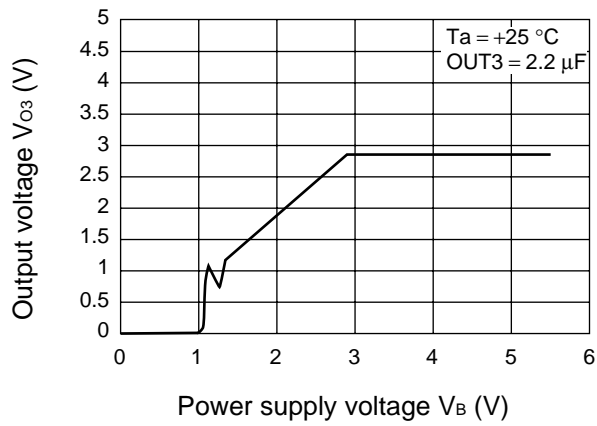


Output voltage vs. power supply voltage (BBREG2)

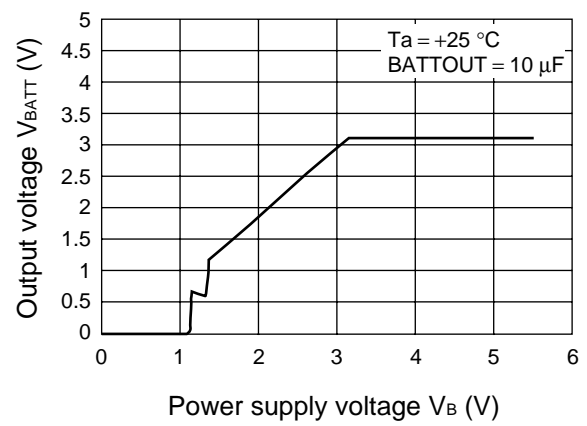


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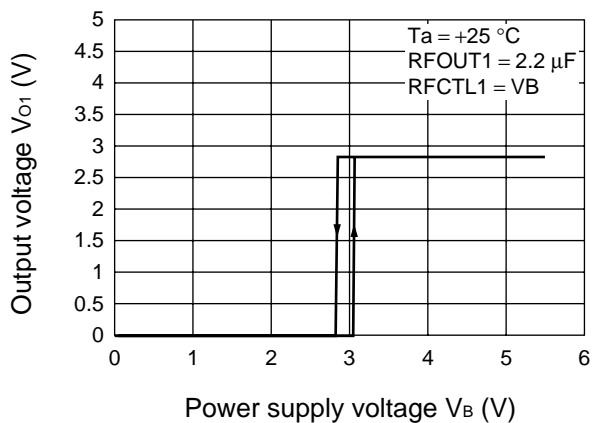
Output voltage vs. power supply voltage (BBREG3)



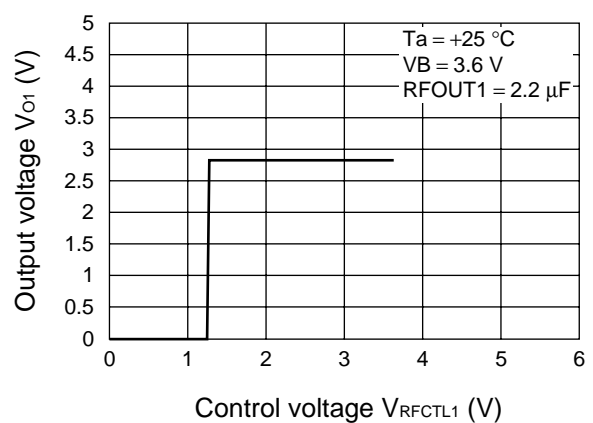
Output voltage vs. power supply voltage (BATTREG)



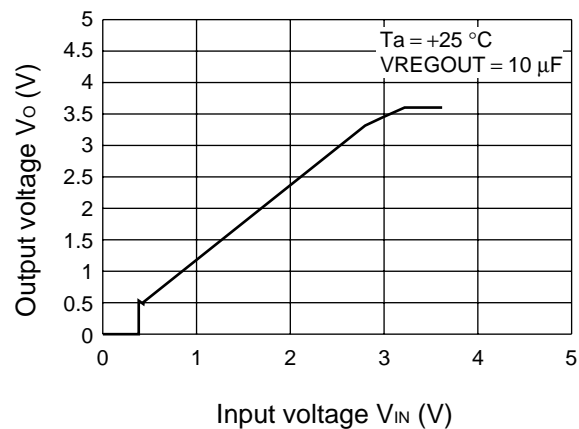
Output voltage vs. power supply voltage (RFREG1)



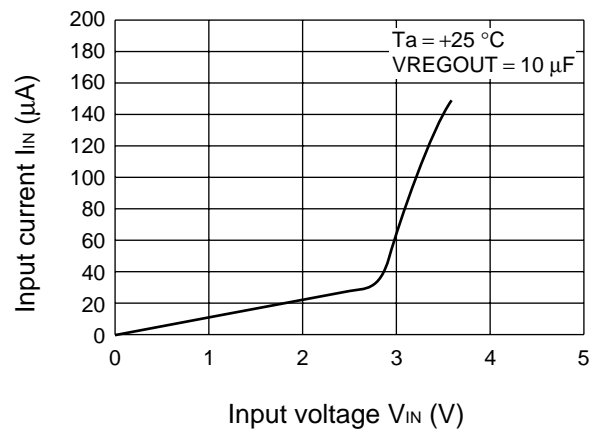
Output voltage vs. control voltage (RFREG1)



Output voltage vs. input voltage (Variable REG)

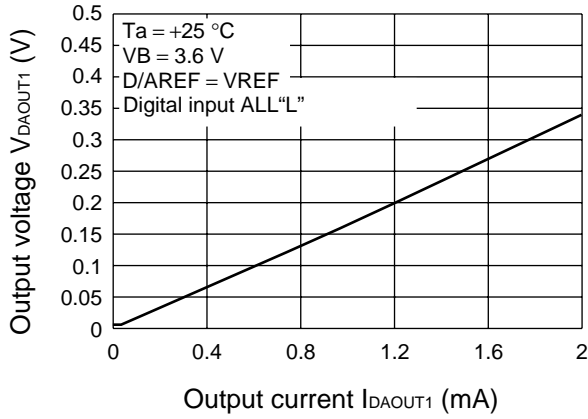


Input current vs. input voltage (Variable REG)

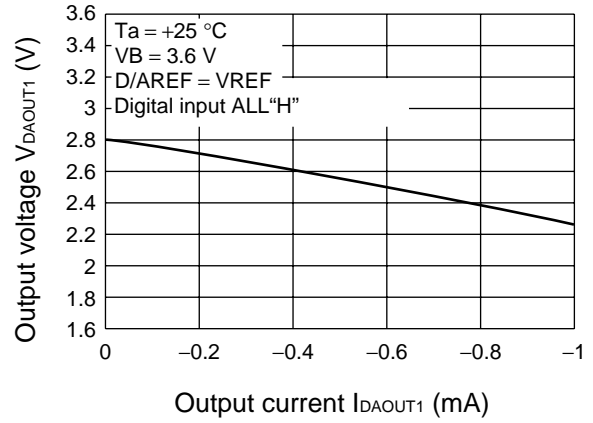


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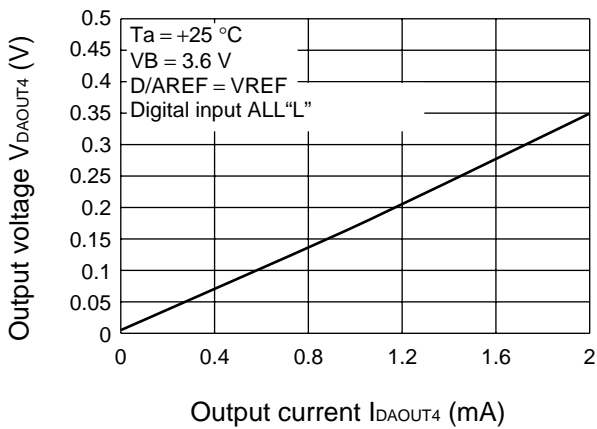
DA1 output voltage vs. output current



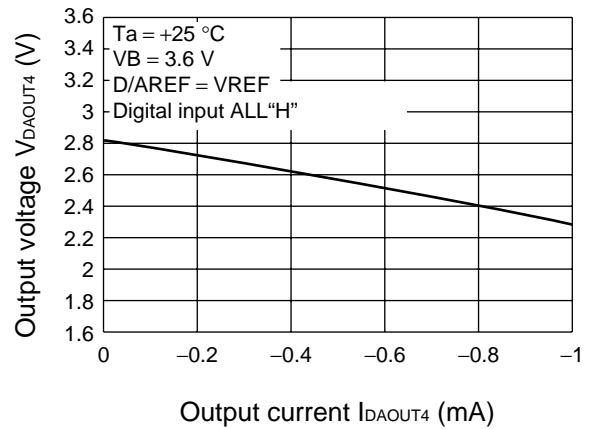
DA1 output voltage vs. output current



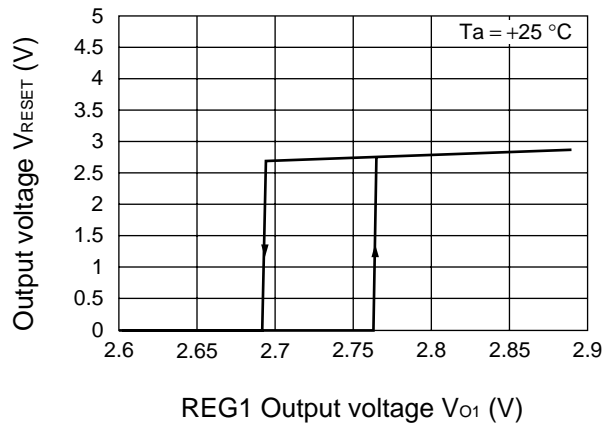
DA4 output voltage vs. output current



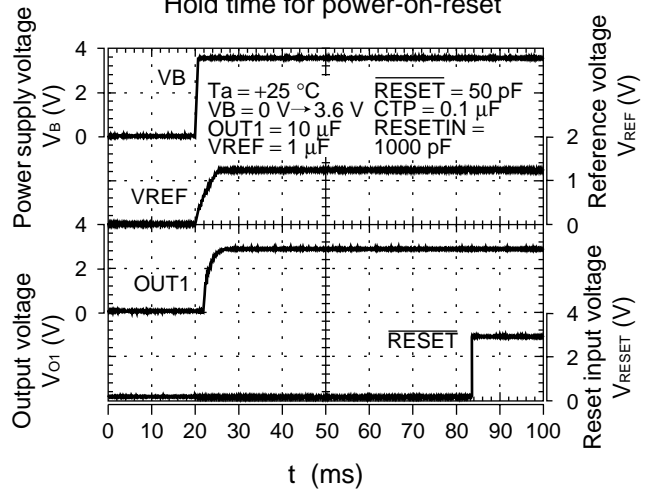
DA4 output voltage vs. output current



Reset output voltage vs. REG1 output voltage

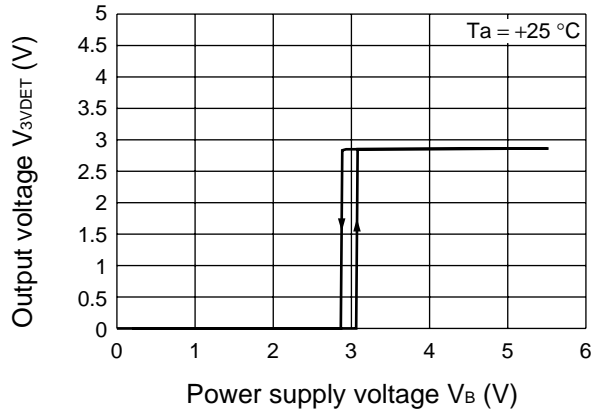


Hold time for power-on-reset

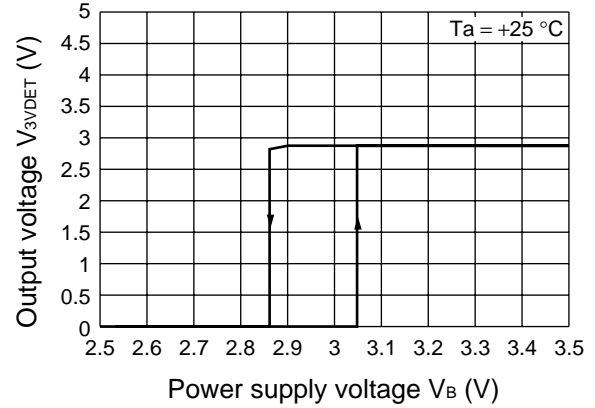


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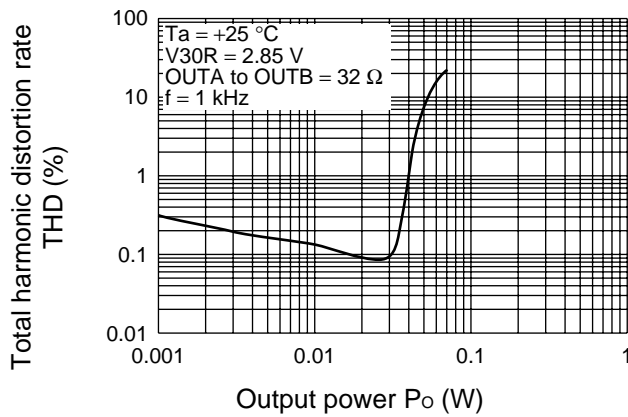
Power supply voltage detected output voltage vs. power supply voltage



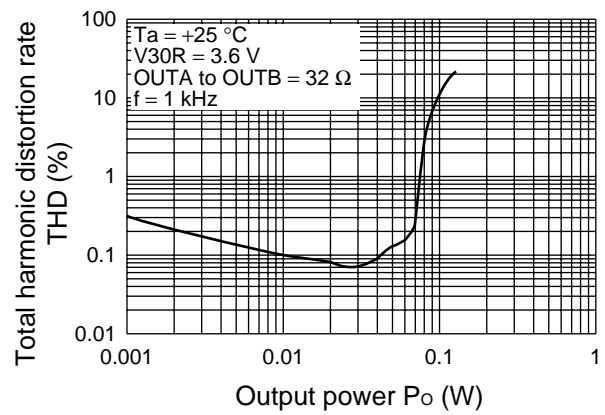
Power supply voltage detected output voltage vs. power supply voltage



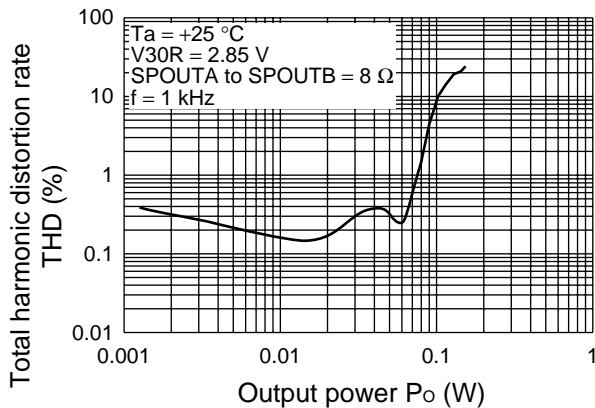
Total harmonic distortion rate vs. output power (receiver Amp.)



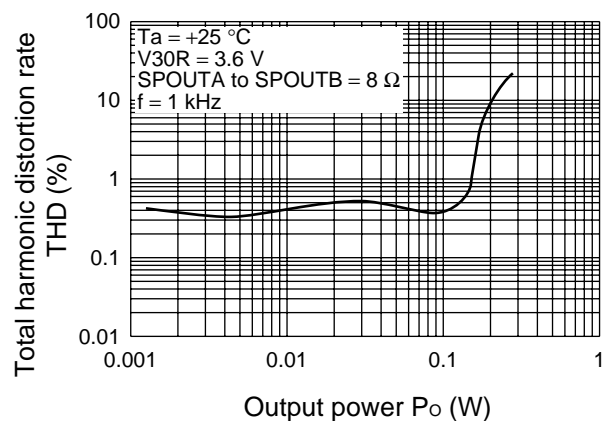
Total harmonic distortion rate vs. output power (receiver Amp.)



Total harmonic distortion rate vs. output power (Loudspeaker Amp.)

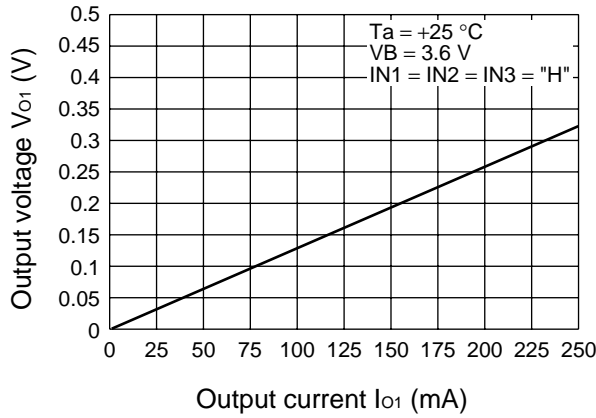


Total harmonic distortion rate vs. output power (Loudspeaker Amp.)

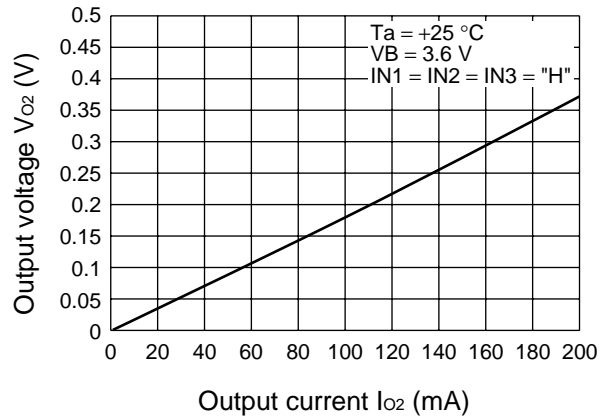


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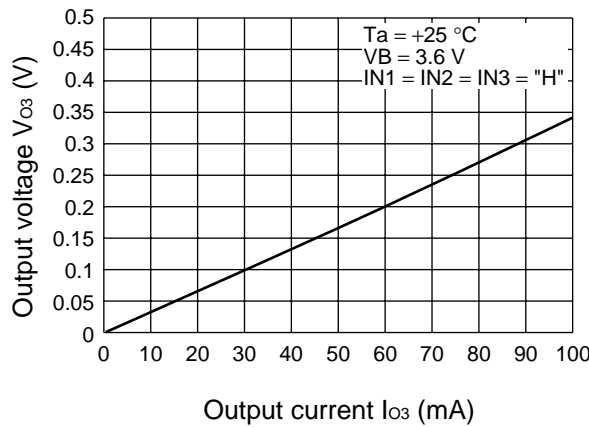
Sounder1 output voltage vs. output current



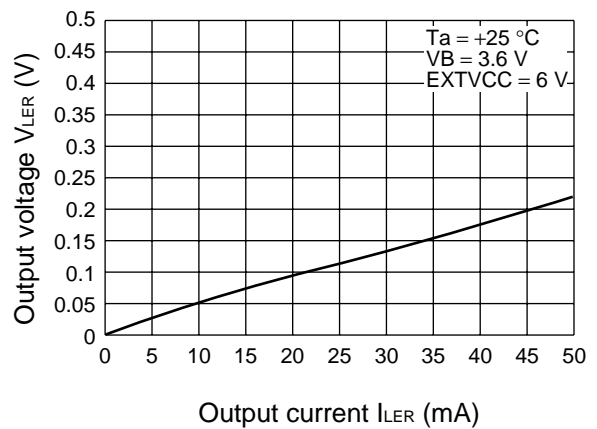
Sounder2 output voltage vs. output current



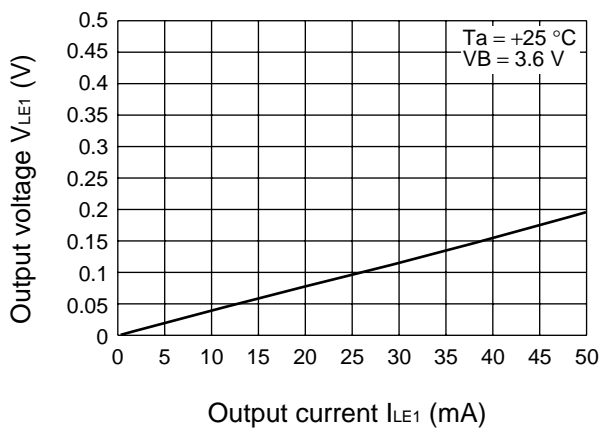
Sounder3 output voltage vs. output current



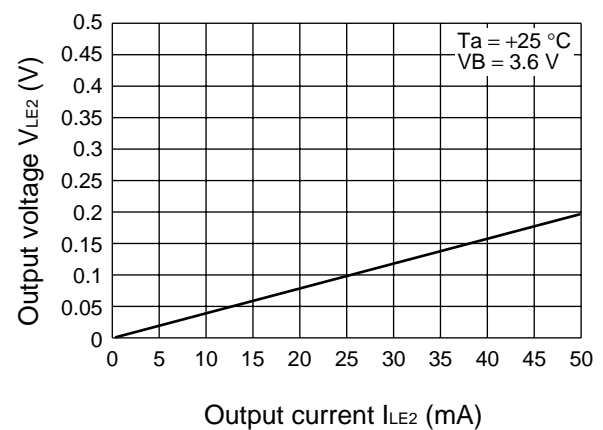
LEDR output voltage vs. output current



LED1 output voltage vs. output current

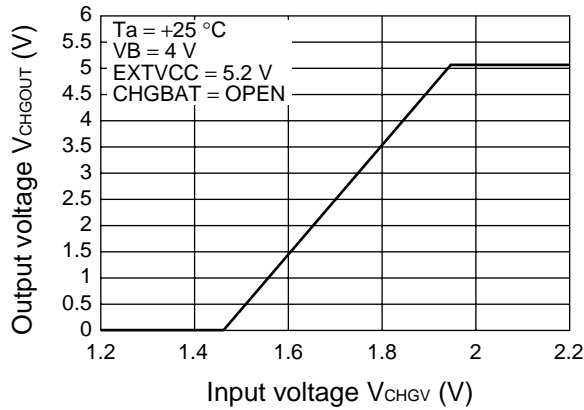


LED2 output voltage vs. output current

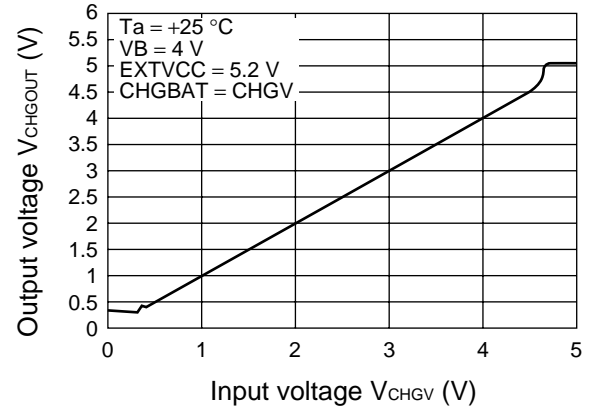


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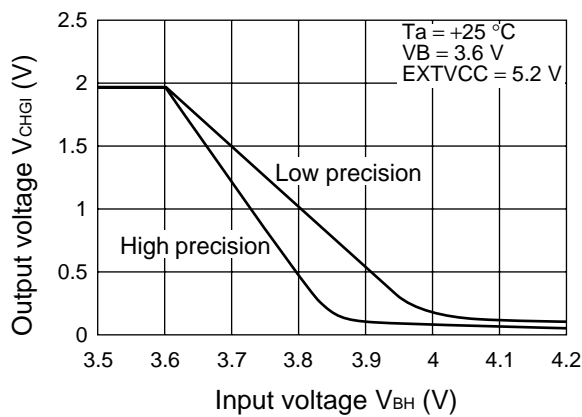
CHGOUT output voltage vs. CHGV input voltage



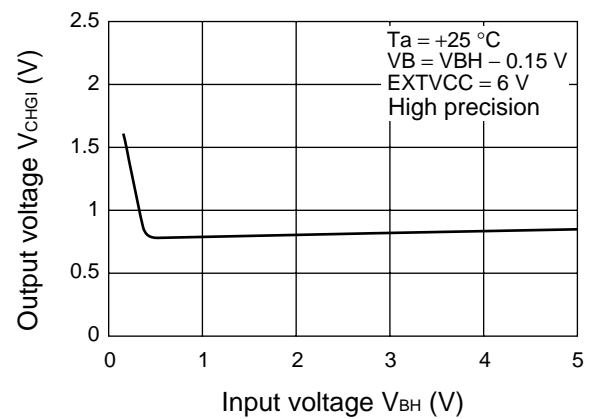
CHGOUT output voltage vs. CHGV input voltage



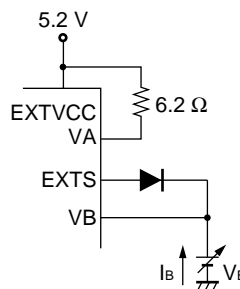
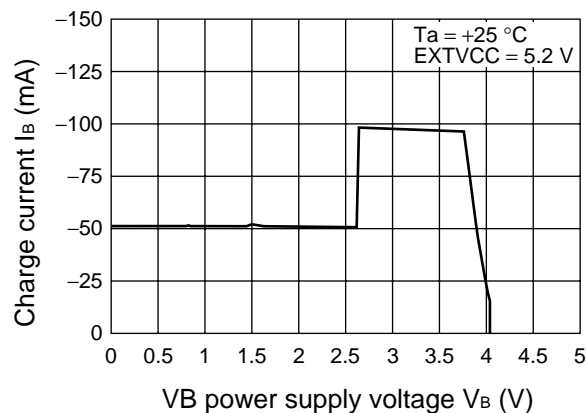
CHGI output voltage vs. VBH input voltage



CHGI output voltage vs. VBH input voltage

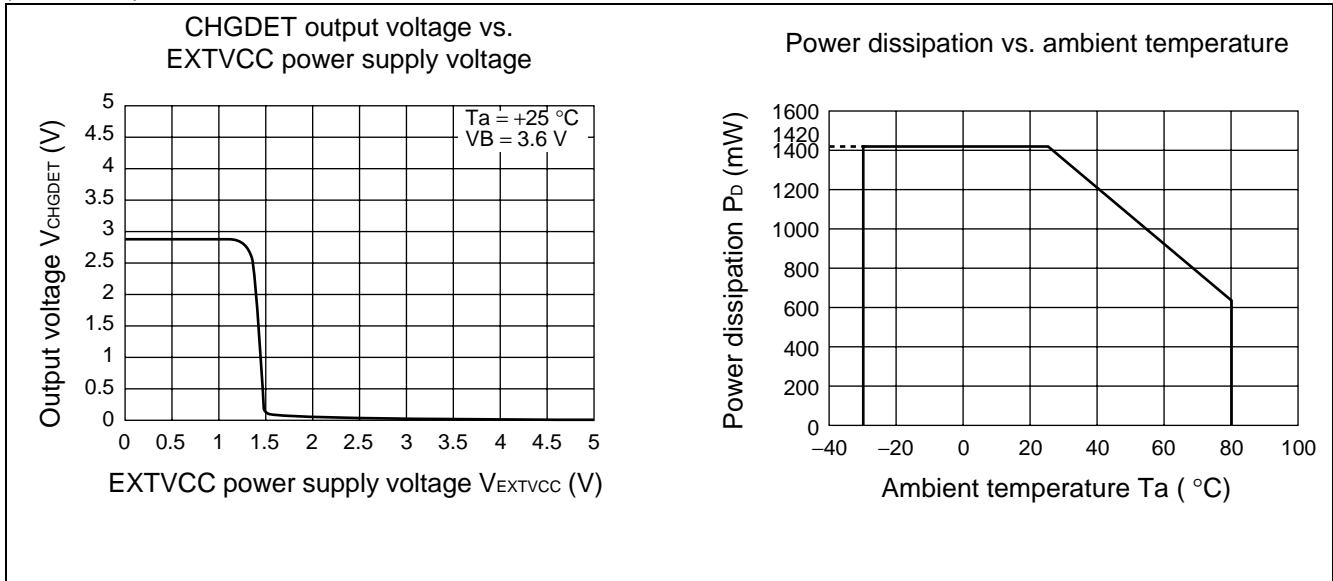


Preliminary charge current vs. VB power supply voltage



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■ FUNCTIONAL DESCRIPTION

1. Power Control

(1) Reference voltage

This circuit uses the voltage generated by VB1 terminal (pin 28) to produce a temperature compensated reference voltage (1.23 V typ.) for power control and uses this reference voltage on power control.

(2) Baseband regulator (BBREG1)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at OUT1 terminal (pin 75). Power can be drawn from OUT1 terminal for external use, up to a maximum load current of 110 mA.

(3) Baseband regulator (BBREG2)

This regulator uses the reference voltage to produce an output voltage (2.85 V typ.) at OUT2 terminal (OUT2-1 terminal (pin 72), OUT2-2 terminal (pin73)).

Power can be drawn from OUT2 terminal for external use, up to a maximum load current of 150 mA.

(4) Baseband regulator (BBREG3)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at OUT3 terminal (pin 71). Power can be drawn from OUT3 terminal for external use, up to a maximum load current of 60mA.

(5) Battery backup regulator (BATTREG)

This regulator uses the reference voltage to produce an output voltage (3.1V typ.) at BATTOUT terminal (pin 69).

(6) Vibrator drive circuit (VIBREG)

This circuit uses the reference voltage to produce an output voltage (1.5V typ.) at VIBREG terminal (VIBREG-1 terminal (pin 78), VIBREG-2 terminal (pin 79)).

Power can be drawn from VIBREG terminal for external use, up to a maximum load current of 200mA.

(7) RF regulator (RFREG1)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT1 terminal (pin 42) when an "H" level signal is input at the RFCTL1 terminal (pin 41).

Power can be drawn from RFOUT1 terminal for external use, up to a maximum load current of 10mA.

(8) RF regulator (RFREG2)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT2 terminal (pin 40) when an "H" level signal is input at the RFCTL2 terminal (pin 39).

Power can be drawn from RFOUT2 terminal for external use, up to a maximum load current of 20mA.

(9) RF regulator (RFREG3)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT3 terminal (pin 38) when an "H" level signal is input at the RFCTL3 terminal (pin 37).

Power can be drawn from RFOUT3 terminal for external use, up to a maximum load current of 20mA.

(10) RF regulator (RFREG4)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT4 terminal (pin 35) when an "H" level signal is input at the RFCTL4 terminal (pin 36).

Power can be drawn from RFOUT4 terminal for external use, up to a maximum load current of 60mA.

(11) RF regulator (RFREG5)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT5 terminal (RFOUT5-1 terminal (pin 30), RFOUT5-2 terminal (pin 29)) when an "H" level signal is input at the RFCTL5 terminal (pin 31).

Power can be drawn from RFOUT5 terminal for external use, up to a maximum load current of 200mA.

(12) RF regulator (RFREG6)

This regulator uses the reference voltage to produce an output voltage (2.85V typ.) at RFOUT6 terminal (pin 33) when an "H" level signal is input at the RFCTL6 terminal (pin 32).

Power can be drawn from RFOUT6 terminal for external use, up to a maximum load current of 50mA.

(13) Variable bias regulator

This regulator uses the voltage generated by VREGIN terminal (pin 67) to produce an amplified output voltage at VREGOUT terminal (pin 68).

Power can be drawn from VREGOUT terminal for external use, up to a maximum load current of 10mA.

(14) D/A converter

D/A1 to D/A3 converter process 8 bit input signal and D/A4 converter processes 10 bit input signal.

This converter generates an output voltage (0.5 to 2.5V) at D/AOUT1 terminal (pin 63) to D/AOUT4 terminal (pin 60) according to the signal from serial control.

(15) Power-on reset

When the OUT1 terminal (pin 75) voltage exceeds 2.75V(typ.) , after a delay interval set by a capacitor (0.1 μ F typ.) connected to the CTP terminal (pin 76) , the $\overline{\text{RESET}}$ terminal (pin 77) voltage becomes "H" level from "L" level and the reset signal is canceled.

When the OUT1 terminal voltage falls below 2.685V (typ.), the $\overline{\text{RESET}}$ terminal voltage becomes "L" level from "H" level and the reset signal is dispatched. (refer to "■POWER-ON RESET TIMING DIAGRAM", "■SETTING OF HOLD TIME FOR POWER-ON RESET".)

(16) Battery voltage detect

This function is to observe the battery voltage. When the VB4 terminal (pin 58) voltage exceeds 3.05V (typ.), the 3VDET terminal (pin 56) voltage goes to "H" level and when the VB4 terminal voltage falls below 2.85V (typ.), the 3VDET terminal goes to "L" level. (refer to ■BATTERY VOLTAGE DETECTOR)

2. Speaker Amp.

(1) Receiver Amp.

This is the BTL output type Amp. driving speaker directly. When the output power is 90mW typ. (at 32Ω), the serial control processes the on/off and the earphone switching control.

The optional gain can be set by the connection of feedback resistor from FB terminal (pin 20) to OUTA terminal (pin 25) and the connection of input resistor to FB terminal.

(2) Loudspeaker Amp.

This is the BTL output type Amp. driving speaker directly. When the output power is 260mW typ. (at 8Ω), the serial control processes the on/off control.

The optional gain can be set by the connection of feedback resistor from FB terminal (pin 20) to SPOUTA terminal (pin 22) and the connection of input resistor to FB terminal.

3. Sounder

Three low-saturation output transistors are built in for buzzer drive. When the signal from serial control is "H" level and IN1 terminal (pin 10) voltage is "H" level, the V01 terminal (pin 16) voltage is 0.3V (typ.). When IN2 terminal (pin 11) voltage and IN3 terminal (pin 12) voltage are "H" level, the V02 terminal (pin 14) voltage and V03 terminal (pin 13) voltage are also 0.3V (typ.).

4. LED drive

The LEDO1 terminal (pin 2) voltage and LEDO2 terminal (pin 4) voltage is 0.2V (typ.), when the signal from serial control is "H" level. When the signal from charge control is "H" level, the LEDR terminal (pin 1) voltage is 0.2V (typ.).

5. Charge control

(1) Charge control

The main charge is started by the signal from serial control indicates preliminary charge is finished.

According to the voltage level at CHGV terminal (pin 49) generated by microprocessor on the microprocessor operation, the charge current is controlled by adjusting gate voltage from outside FET.

(2) Charge current detector

The charge current detector sensitivity (gain) can be switched by the signal from serial control.

The VBH terminal (pin 46) voltage and VB4 terminal voltage (pin 58) are detected and CHGI terminal (pin 47) voltage is generated.

(3) Preliminary charge circuit

When the battery voltage is low, the charge is controlled until the microprocessor starts the operation.

Before the battery voltage reaches 2.6V (typ.), 50mA (typ.) is used for the charge and before 4V (typ.), 100mA (typ.) is used.

(4) External power supply detector

This function is to detect if the case is attached to the battery charger.

When the case is attached to the battery charger, EXTVCC terminal (pin 52) voltage is "H" level and generate "L" level voltage at CHGDET terminal (pin 51). When the case is not attached to the battery charger, EXTVCC terminal voltage is "L" level and generate "H" level voltage at CHGDET terminal.

6. Serial control

After the input signal from microprocessor at DAT terminal (pin 6) is captured at the rising edge of SCLK terminal (pin 7), the signal is input in the internal register at the rising edge of STBIN terminal (pin8) and mode is set.

7. Special power off

This function can control the power consumption current of main IC under 11 μ A (typ.) and the battery can be kept for the long period under the conditions that battery package is attached to the mobile phone on the shipment.

■ CONDITIONS of EACH REGULATORS at MEASUREMENT of CONSUMPTION CURRENT

Each regulators conditions at the measurement of consumption current are as the following table.
 [BIASSW] signal of serial control is "H" level (BIASSW OFF) .

| | | BBREG1 | BBREG2 | BBREG3 | BATTREG | VIBREG | VARREG | RFREG1 |
|---|-----|--------|--------|--------|---------|--------|--------|--------|
| Special power off | IB1 | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Standby | IB2 | ON | OFF | ON | ON | OFF | OFF | OFF |
| Power on (waiting/intermittent) | IB3 | ON | OFF | ON | ON | OFF | OFF | OFF |
| Power on (waiting/receiving) | IB4 | ON | ON | ON | ON | OFF | OFF | ON |
| Power on (conversation/ transmission) | IB5 | ON | ON | ON | ON | OFF | OFF | ON |
| Power on (conversation/receiving) | IB6 | ON | ON | ON | ON | OFF | OFF | ON |

| | | RFREG2 | RFREG3 | RFREG4 | RFREG5 | RFREG6 | Receiver Amp. | Loudspeaker Amp. |
|---|-----|--------|--------|--------|--------|--------|------------------|---------------------|
| Special power off | IB1 | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Standby | IB2 | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Power on (waiting/intermittent) | IB3 | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Power on (waiting/receiving) | IB4 | ON | ON | ON | OFF | ON | OFF | OFF |
| Power on (conversation/ transmission) | IB5 | ON | OFF | OFF | ON | ON | ON | OFF |
| Power on (conversation/ receiving) | IB6 | ON | ON | ON | OFF | ON | ON | OFF |

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LOGICS

(1) Serial Control Setting Table

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|-------------|-----------------|--------------|------------------|----------------|--------|---------|------------|-------------------|-----------------|
| Data | PDSP | PDRCV | CHOISE | LEDC1 (green) | LEDC2 (red) | BIASSW | REG2CTL | VIBCTL | LEDRCTL | VREGCTL |
| Operation at data "1" | Loud AMPON | Receiver AMPON | BTL drive | ON | ON | OFF | OFF | VIB REGON | Charge red LEDOFF | Variable REGON |
| Operation at data "0" | Loud AMPOFF | Receiver AMPOFF | Single drive | OFF | OFF | ON | ON | VIB REGOFF | Charge red LEDON | Variable REGOFF |
| Initial value after reset | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|---------|---------|--------------------------|--------------------------|---------------------|--------------|---|-----------------|-----------------|-----------------|
| Data | REG3CTL | | PWOFFCTL | | CHGISE L | PRCHG OFF | BUZZSEL | SOUND1 | SOUND2 | SOUND3 |
| Operation at data "1" | REG3ON | REG3OFF | Special poweroff setting | * | Low precision | PRCHG OFF | Loud-speaker Amp. short waveform output | Sounder1 ON | Sounder2 ON | Sounder3 ON |
| Operation at data "0" | REG3OFF | REG3ON | * | Special poweroff setting | High precision (×8) | PRCHG ON | Loud-speaker Amp. usual output | Sounder1 OFF | Sounder2 OFF | Sounder3 OFF |
| Initial value after reset | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

*: Unused

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Data | DAR4_9 | DAR4_8 | DAR4_7 | DAR4_6 | DAR4_5 | DAR4_4 | DAR4_3 | DAR4_2 | DAR4_1 | DAR4_0 |
| Operation at data "1" | DA4 setting data | | | | | | | | | |
| Operation at data "0" | | | | | | | | | | |
| Initial value after reset | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|--------|--------|------------------|--------|--------|--------|--------|--------|--------|--------|
| Data | PDNDA4 | PDNDA3 | DAR3_7 | DAR3_6 | DAR3_5 | DAR3_4 | DAR3_3 | DAR3_2 | DAR3_1 | DAR3_0 |
| Operation at data "1" | DA4ON | DA3ON | DA3 setting data | | | | | | | |
| Operation at data "0" | DA4OFF | DA3OFF | | | | | | | | |
| Initial value after reset | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|----|--------|------------------|--------|--------|--------|--------|--------|--------|--------|
| Data | * | PDNDA2 | DAR2_7 | DAR2_6 | DAR2_5 | DAR2_4 | DAR2_3 | DAR2_2 | DAR2_1 | DAR2_0 |
| Operation at data "1" | * | DA2ON | DA2 setting data | | | | | | | |
| Operation at data "0" | * | DA2OFF | | | | | | | | |
| Initial value after reset | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*:Unused

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| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|----|--------|-----------------|--------|--------|--------|--------|--------|--------|--------|
| Data | * | PDNDA1 | DAR1_7 | DAR1_6 | DAR1_5 | DAR1_4 | DAR1_3 | DAR1_2 | DAR1_1 | DAR1_0 |
| Operation at data "1" | * | DA1ON | DA1setting data | | | | | | | |
| Operation at data "0" | * | DA1OFF | | | | | | | | |
| Initial value after reset | * | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| A7 | A6 | A5 | A4 | A3 | A2 | A1 | A0 |
|----|----|----|----|----|----|----|----|
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |

| | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---------------------------|----|----|----|----|----|----|----|---------|---------------------------|---------------------------|
| Data | * | * | * | * | * | * | * | REG3CTL | PWOFFCTL | |
| Operation at data "1" | * | * | * | * | * | * | * | REG3ON | Special power off setting | * |
| Operation at data "0" | * | * | * | * | * | * | * | REG3OFF | * | Special power off setting |
| Initial value after reset | * | * | * | * | * | * | * | 1 | 0 | 1 |

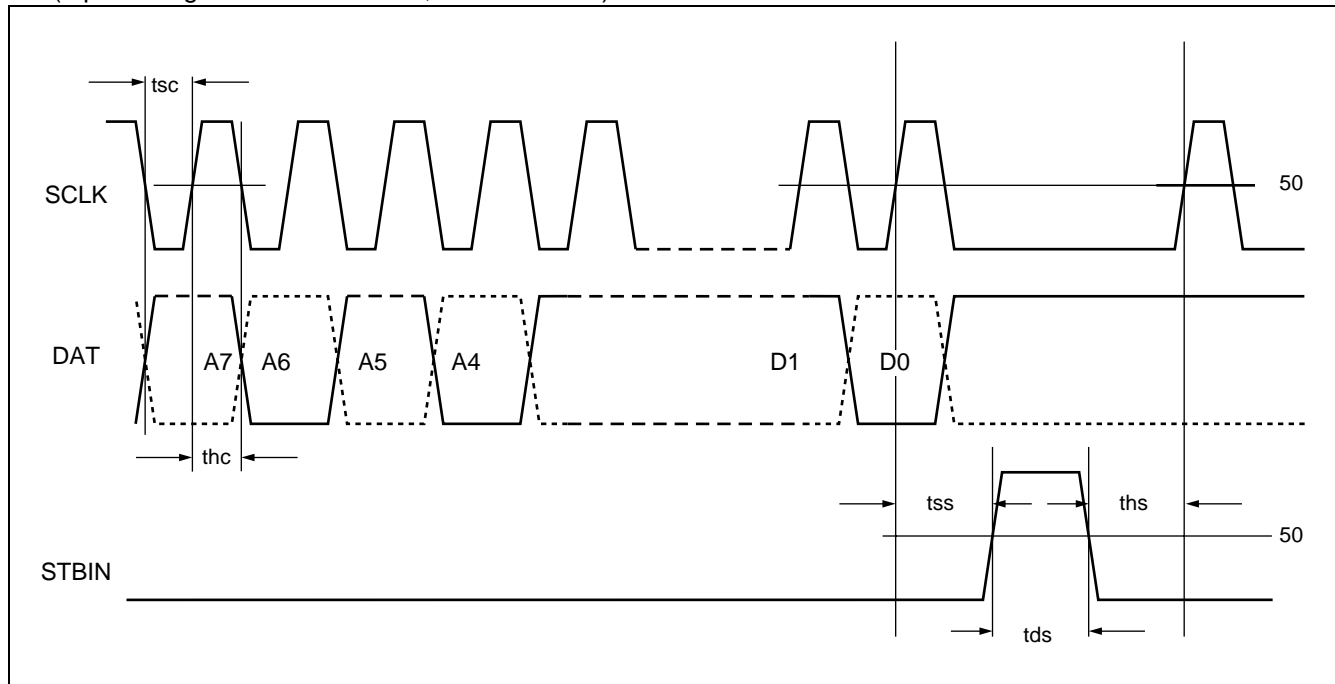
*:Unused

(2) Input Signal Timing

| Parameter | Symbol | Value | | | Unit | Remark |
|--------------------|--------|-------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Data setup time | tsc | 100 | — | — | ns | |
| Data hold time | thc | 100 | — | — | ns | |
| STB setup time | tss | 100 | — | — | ns | |
| STB pulse duration | tds | 100 | — | — | ns | |
| Removal time | ths | 100 | — | — | ns | |

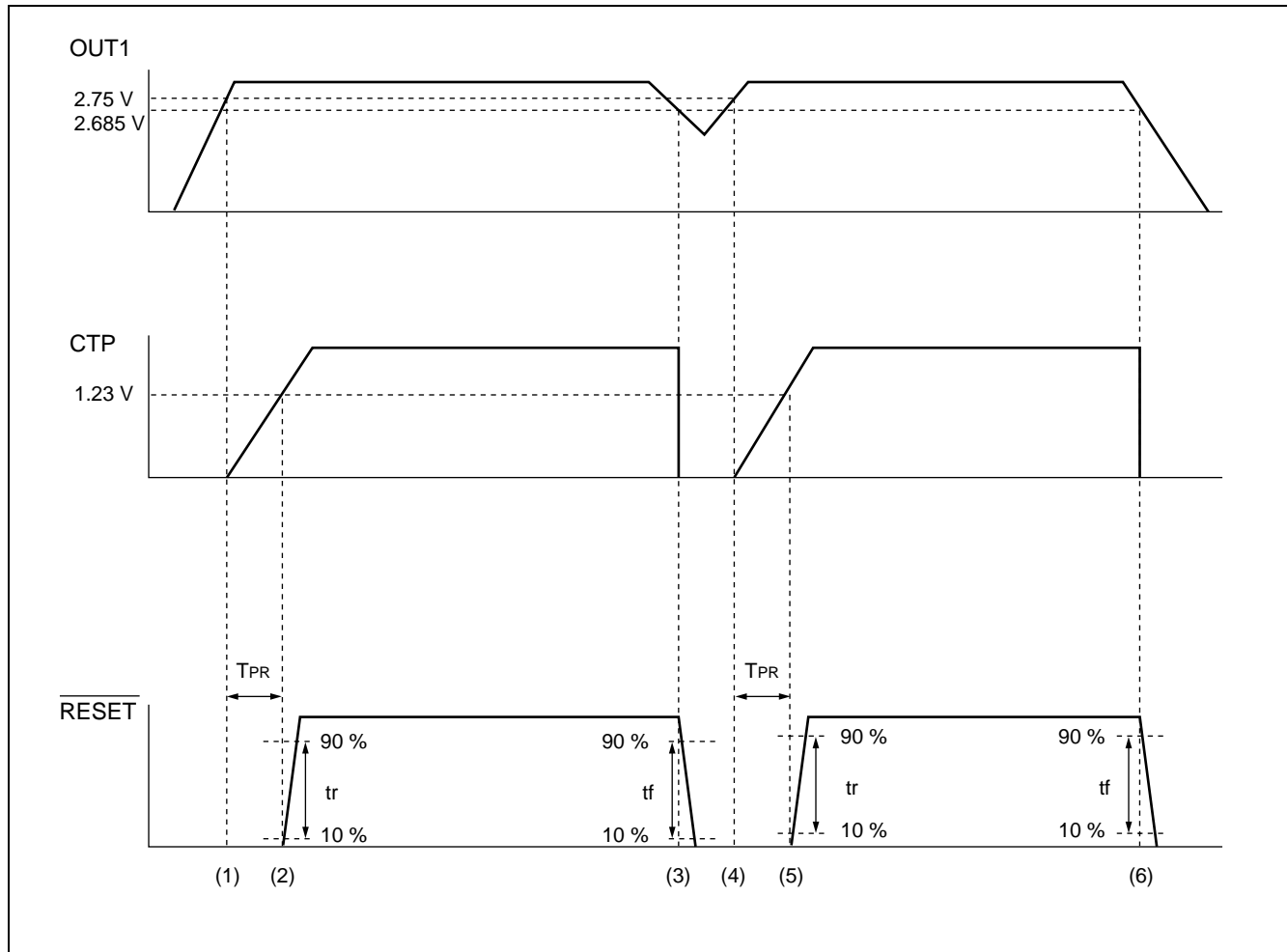
(3) Input Signal Timing Diagram

(Input voltage "H" level = 2.85 V, "L" level = 0 V)



Note : Data is defined at the rising edge of SCLK and IC mode is set through latching of DAT at rising edge STBIN.

POWER-ON RESET TIMING DIAGRAM



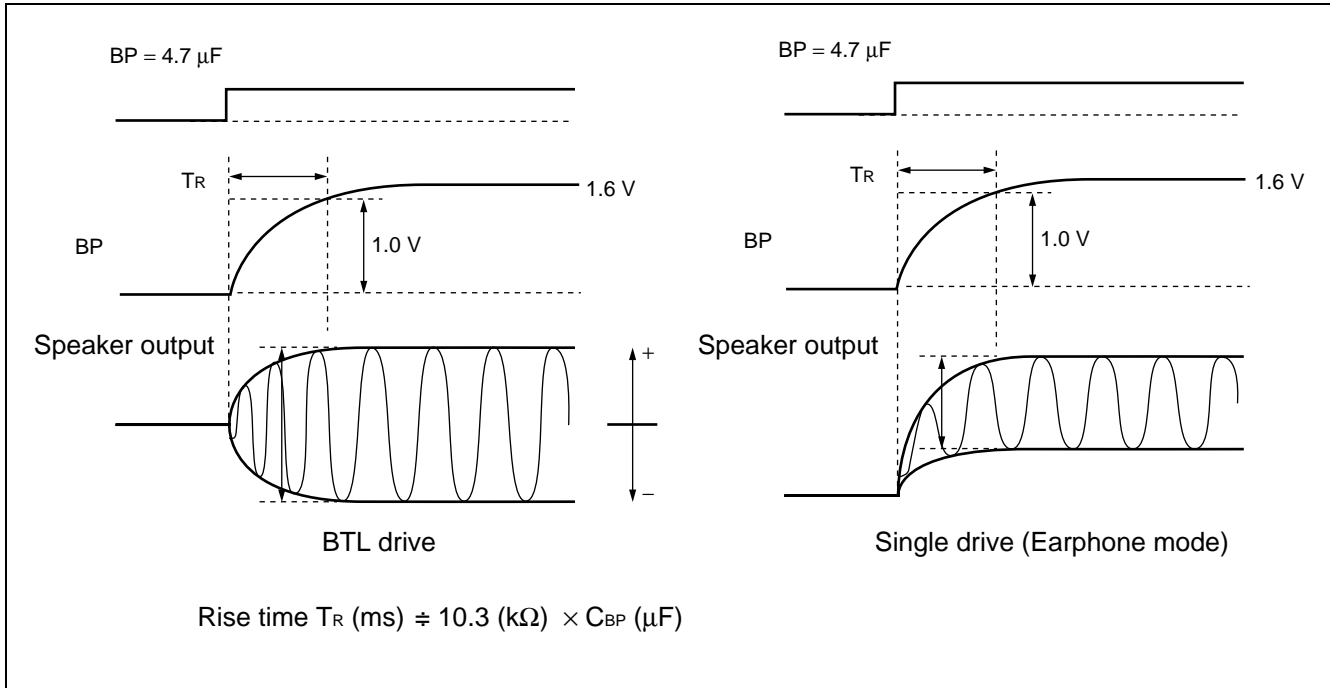
- (1) When the OUT1 terminal (pin 75) voltage exceeds detected rising voltage (2.75V typ.), the charge for timing capacitor (C_{TP}) for hold time for power-on reset starts .
- (2) When the CTP terminal (pin 76) voltage exceeds 1.23V (typ.), the reset is canceled. (The $\overline{\text{RESET}}$ terminal voltage becomes "H" level from "L" level.: rising time from 10% to 90% = t_r)
- (3) When OUT1 terminal voltage falls below detected rising voltage (2.685V typ.), the CTP terminal voltage is down and the reset signal is output. ($\overline{\text{RESET}}$ terminal voltage becomes "L" level from "H" level.)
- (4) When OUT1 terminal voltage exceeds rising voltage detect, charging of C_{TP} is started.
- (5) When CTP terminal voltage rises above threshold voltage, the reset is canceled.
- (6) When OUT1 terminal voltage falls below the voltage detect, the reset signal is output.

SETTING OF HOLD TIME FOR POWER-ON RESET

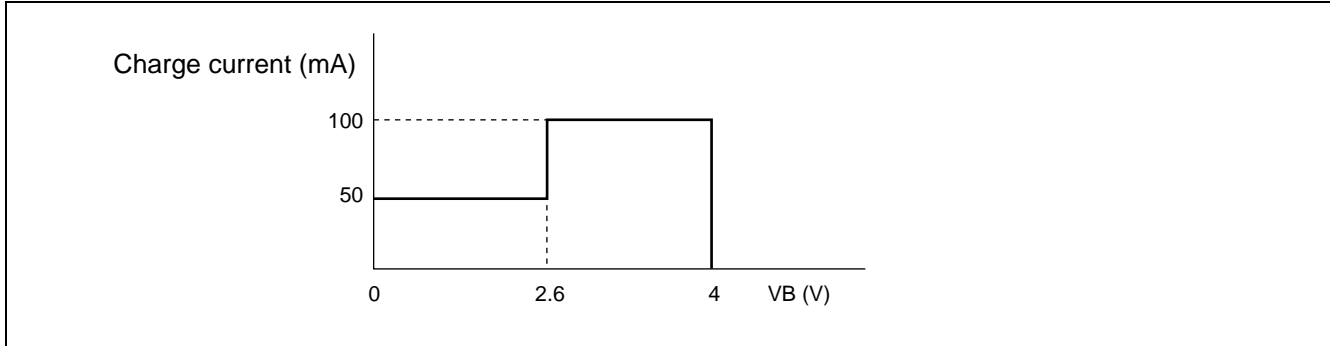
According to the time constant set by capacitor (C_{TP}) connected to CTP terminal (pin 76), rise time (hold time) of $\overline{\text{RESET}}$ terminal (pin 77) voltage can be set after OUT1 terminal (pin 75) voltage exceeds 2.75V (typ.).

$$\text{POR hold time : } T_{PR} \text{ (s)} \doteq \frac{1.23 \text{ (V)} \times C_{TP} \text{ (\mu F)}}{1.75 \text{ (\mu A)}} \quad (\text{tr of } \overline{\text{RESET}} \text{ is not included)}$$

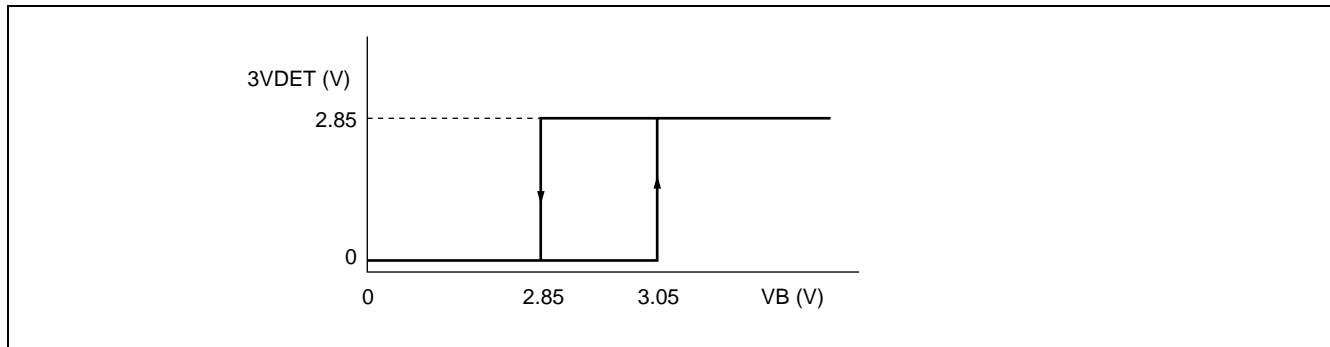
RISE TIME FOR SPEAKER Amp.



PRELIMINARY CHARGE CURRENT



BATTERY VOLTAGE DETECTOR



MB3892

■ USAGE PRECAUTIONS

- **Printed circuit board ground lines should be set up with consideration for common impedance.**
- **Take appropriate static electricity measures.**
 - Containers for semiconductor materials should have anti-static protection or be made of conductive material.
 - After mounting, printed circuit boards should be stored and shipped in conductive bags or Containers.
 - Work platforms, tools, and instruments should be properly grounded.
 - Working personal should be grounded with resistance of 250 kΩ to 1 MΩ between body and ground.

• **Do not apply negative voltages**

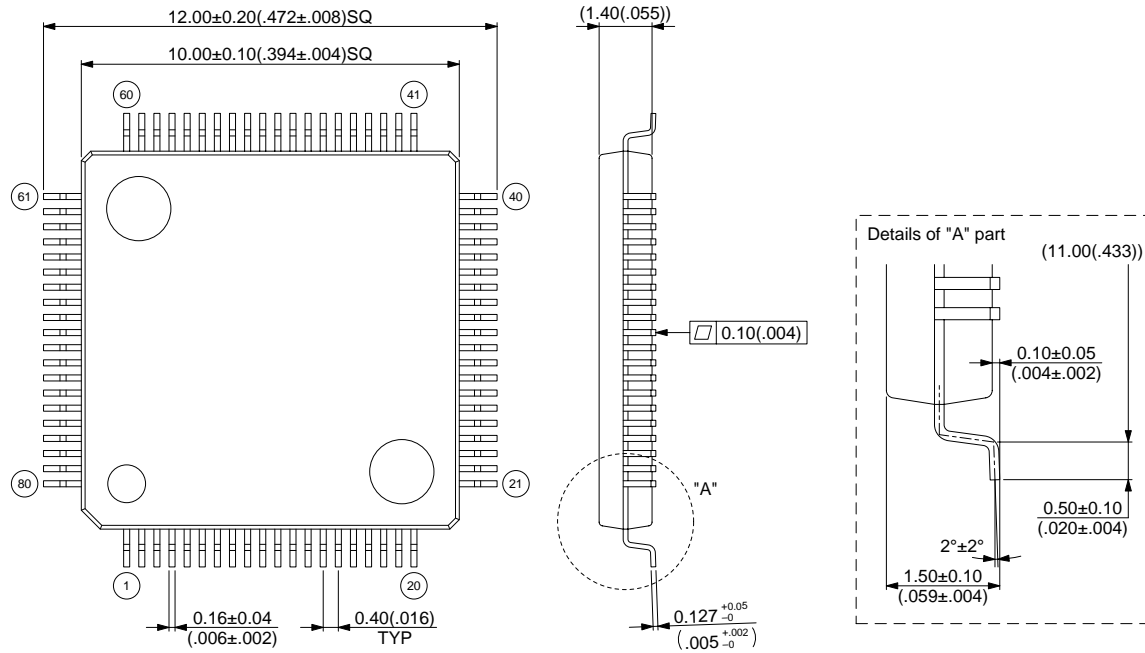
The use of negative voltages below -0.3V may create parasitic transistors on LSI lines, Which can cause abnormal operation.

■ ORDERING INFORMATION

| Part number | Package | Remarks |
|-------------|--------------------------------------|---------|
| MB3892PFF | 80-pin plastic LQFP (FPT-80P-M17) | |

■ PACKAGE DIMENTION

80-pin plastic LQFP
(FPT-80P-M17)



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Dimansions in mm (inches) .

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