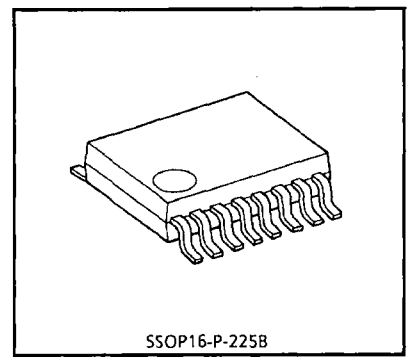
TENTATIVE DATA

# SYSTEM POWER SUPPLY IC FOR CELLULAR PHONE

3 independent regulators on a chip, very suitable for cellular, portable, mobile and digital telephones.



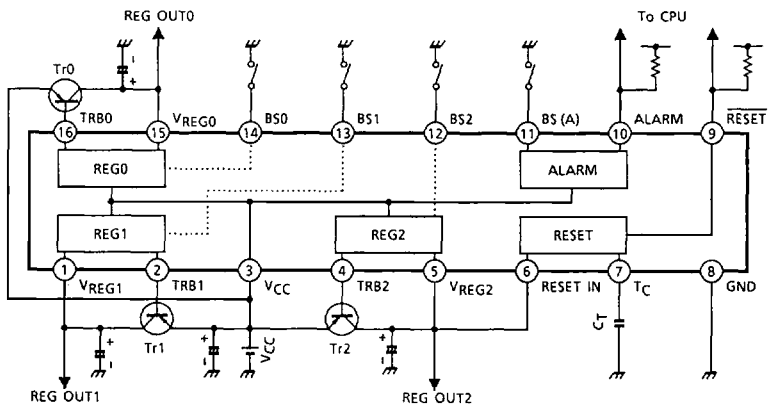

Weight : 0.07g (Typ.)



## FEATURES

- 3 regulators, independent one another
- Battery alarm function
- Power on reset
- Battery saving switches
- Small package (SSOP16 pin 0.65mm pitch)

## BLOCK DIAGRAM




TA31084FN-1

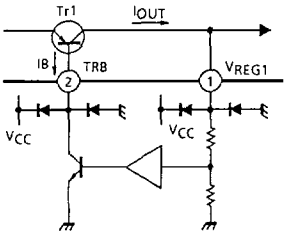
DESCRIPTION FOR EACH BLOCK

1. Regulator

   Reg0, Reg1 and Reg2 have all the same construction, and can be power saving state separately.
   Maximum output current $I_{O\,(MAX)}$ is decided by $h_{FE}$ of the external Tr.

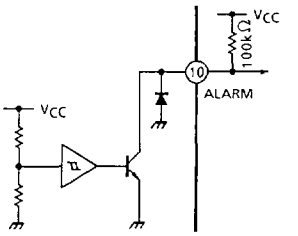
   $I_{O\,(MAX)} \fallingdotseq h_{FE} \times I_B$

   But load current is keeping over 2mA, because stabilization of operating.




2. Alarm

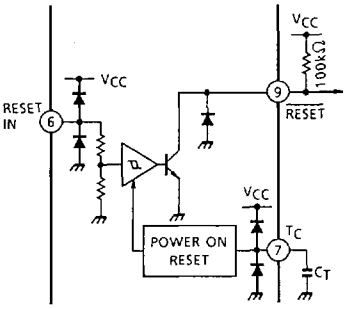
   ALARM terminal outputs high level voltage when the power supply voltage $V_{CC}$ decreases to $V_{TH\text{-}L\,(A)}$, output is the open-collector style, so pull up to $V_{CC}$ or $V_{REG}$ etc.
   The range of hysteresis is about 100mV.




3. Reset

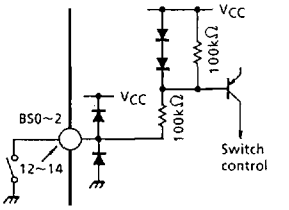
   $\overline{RESET}$ terminal outputs low level voltage when the voltage less than $V_{TH\text{-}L\,(R)}$ adds to RESET IN terminal.
   Output is the open-collector style, so pull up to $V_{CC}$ or $V_{REG}$ etc.
   RESET IN terminal is also the power supply to RESET block, so possible to be battery saving state if RESET IN terminal is open. (Because of the diodes for protection as the right figure, avoid adding higher voltage than $V_{CC}$.)
   Although the voltage of RESET IN terminal rises up to $V_{TH\text{-}H\,(R)}$ ; RESET signal is cancelled with a delay time decided by time constant of the external $C_T$.
   (Power On Reset)

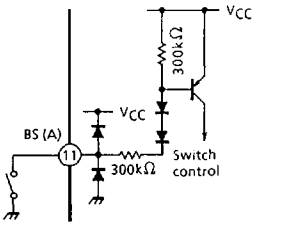
   $T_{PR} \fallingdotseq 2.6C_T / I_{CT}$ (s)



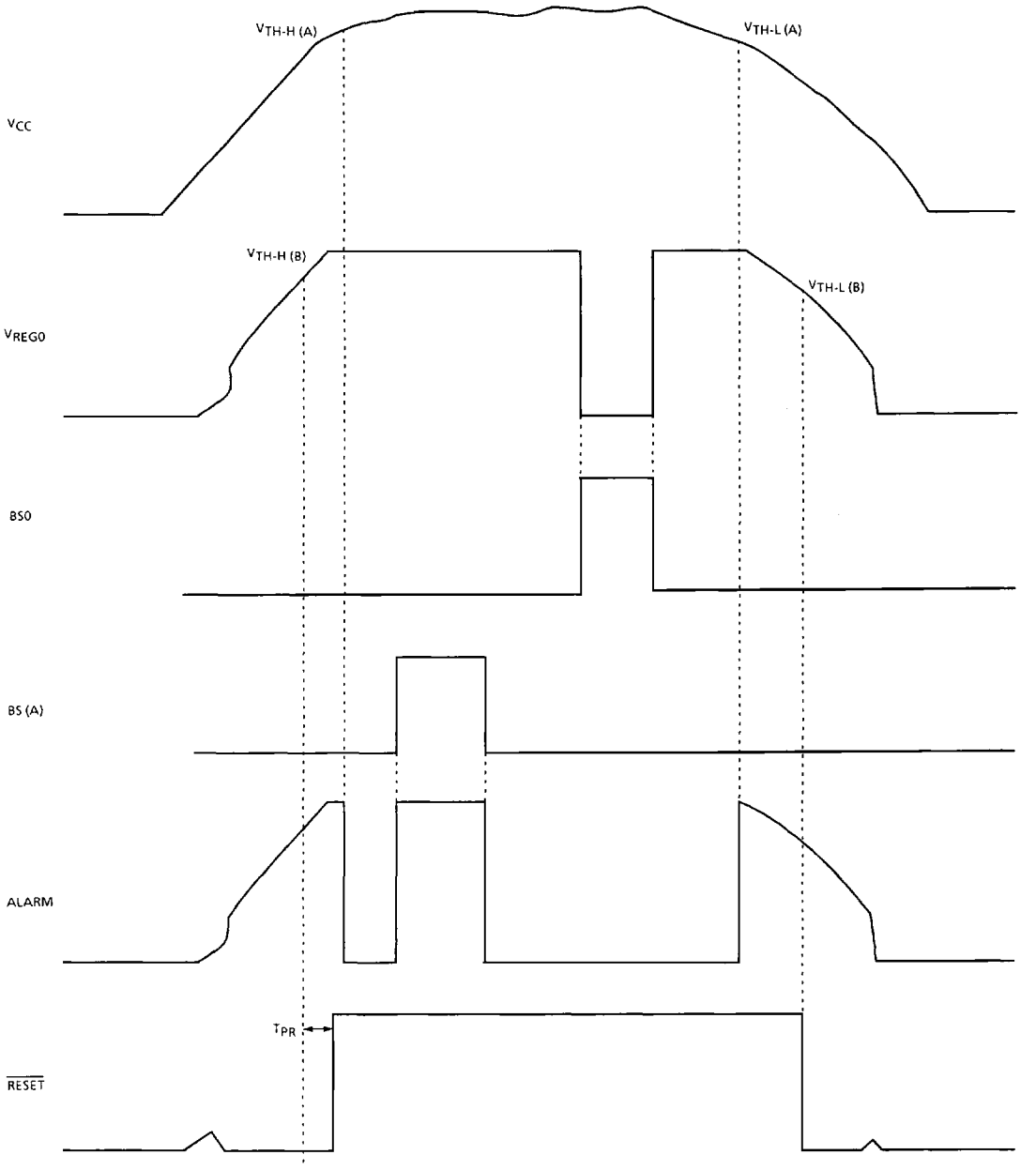

4. Switch

   BS0~2, BS (A) terminals are all low active.
   When open or $V_{CC}$, each block goes to power saving state.
   And avoid adding higher voltage than $V_{CC}$ because of the diodes for protection as the right figures.
   (The values in the figures are Typ.)



**TIMING CHART** (In case of APPLICATION CIRCUIT)




TA31084FN-3

# REGULATOR AND PERIPHERAL

**MAXIMUM RATINGS** (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 12 | V |
| Power Dissipation | $P_D$ | 560 | mW |
| Operating Temperature | $T_{opr}$ | −30~85 | °C |
| Storage Temperature | $T_{stg}$ | −50~150 | °C |

**ELECTRICAL CHARACTERISTICS** (Unless otherwise specified, $V_{CC}$ = 6.0V, Ta = 25°C)

Total characteristics

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Operating Voltage | $V_{opr}$ | — | — | — | 6.0 | 10.0 | V |
| Quiescent Current | $I_{CC}$ | — | All blocks are active<br>$R_{L(A)} = R_{L(R)} = 100k\Omega$ | 340 | 630 | 870 | μA |

Regulators (Tr. 2SA1204-Y)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Quiescent Current | $I_{CC(REG)}$ | — | $I_{OUT}$ = 0mA | 70 | 130 | 180 | μA |
| Tr. Base Sink Current | $I_B$ | — | $V_{TRB}$ = 6.0V | 0.4 | 1.3 | — | mA |
| Tr. Base Leak Current | $I_{LEAK}$ | — | $V_{TRB}$ = 6.0V,<br>Battery saving mode | — | 0 | 5 | μA |
| Output Voltage | $V_{REG}$ | — | $I_{OUT}$ = 30mA | 4.58 | 4.80 | 5.02 | V |
| Load Regulation | $\Delta V_{REG1}$ | — | $I_{OUT}$ = 0~50mA | — | 10 | — | mV |
| Power Supply Regulation | $\Delta V_{REG2}$ | — | $V_{CC}$ = 5.4~10V,<br>$I_{OUT}$ = 30mA | — | 5 | — | mV |

Alarm

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Quiescent Current | $I_{CC(A)}$ | — | Alarm block only,<br>$R_{L(A)} = 100k\Omega$ | 80 | 130 | 180 | μA |
| Alarm Detection Voltage (H) | $V_{TH-H(A)}$ | — | — | — | 5.3 | 5.45 | V |
| Alarm Detection Voltage (L) | $V_{TH-L(A)}$ | — | — | 4.95 | 5.2 | — | V |
| Hysteresis Range | $V_{HYS(A)}$ | — | — | — | 100 | — | mV |
| Output Sink Current | $I_{SINK(A)}$ | — | $V_{ALM}$ = 0.2V | 100 | 440 | — | μA |
| Output Leak Current | $I_{LEAK(A)}$ | — | $V_{ALM}$ = 4.8~10V,<br>$V_{CC}$ = 6.0V | — | 0 | 5 | μA |

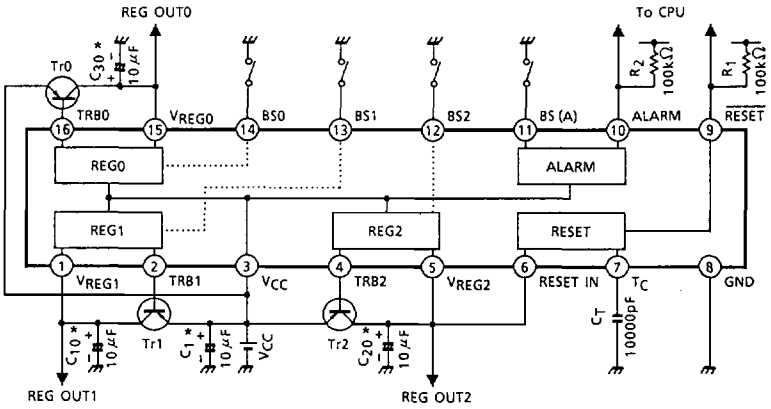
Reset

| CHARACTERISTIC | SYMBOL | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|---|
| Quiescent Current | $I_{CC}$ (R) | — | Reset block only, $R_L$ (R) = 100kΩ | 50 | 110 | 150 | μA |
| Reset Detection Voltage (H) | $V_{TH-H}$ (R) | — | — | — | 4.4 | 4.6 | V |
| Reset Detection Voltage (L) | $V_{TH-L}$ (R) | — | — | 4.1 | 4.3 | — | V |
| Hysteresis Range | $V_{HYS}$ (R) | — | — | — | 100 | — | mV |
| Output Sink Current | $I_{SINK}$ (R) | — | $V_{RST}$ = 0.2V, $V_{RESET\ IN}$ = 4.0V | 100 | 480 | — | μA |
| Output Leak Current | $I_{LEAK}$ (R) | — | $V_{RST}$ = 4.8~10V, $V_{RESET\ IN}$ = 4.8V | — | 0 | 5 | μA |
| CT Charge Current | $I_{CT}$ | — | — | 0.8 | 1.5 | 3.0 | μA |
| Power On Reset Time | $T_{PR}$ | — | $C_T$ = 10000pF | — | 16 | — | ms |

Switches

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Battery Save Threshold 1 | $V_{BS0\sim2}$ | — | — | — | 0.1 | 0.2 | V |
| Battery Save Threshold 2 | $V_{BS\ (A)}$ | — | — | — | 0.1 | 0.2 | V |

**APPLICATION CIRCUIT**




Tr 0~2 2SA1204-Y

*) If oscillation occurs in the low temperature, please use tantalum capacitor. Capacitors ($C_{10}$, $C_{20}$, $C_{30}$) of REG output are the nearest collector of transistor, and please shorten a wiring between capacitors and ground.