# SAI Series Surface-Mount, Separate Excitation Step-down Switching Mode Regulator ICs

## ■Features

- Surface-mount power package
- Output current: 0.4 to 0.5A
- High efficiency: 75 to 88%
- Requires only 4 discrete components
- Internally-adjusted phase correction and output voltage
- Built-in reference oscillator (60kHz)
- Built-in overcurrent and thermal protection circuits

## ■Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies

## ■Line up

| Part Number | SAI01 | SAI02 | SAI03 |
|---|---|---|---|
| $V_O$(V) | 5.0 | 3.3 | 12.0 |
| $I_O$(A) | 0.5 | | 0.4 |

## ■Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|---|---|---|---|
| DC Input Voltage | $V_{IN}$ | 35 | V |
| Power Dissipation | $P_D$ | 0.75 | W |
| Junction Temperature | $T_j$ | +125 | °C |
| Storage Temperature | $T_{stg}$ | –40 to +125 | °C |
| Thermal Resistance(junction to case) | $\theta_{j\text{-}c}$ | 20 | °C/W |

## ■Recommended Operating Conditions

| Parameter | Symbol | Ratings | | | Unit |
|---|---|---|---|---|---|
| | | SAI01 | SAI02 | SAI03 | |
| DC Input Voltage Range | $V_{IN}$ | 7 to 33 | 5.3 to 28 | 15 to 33 | V |
| Output Current Range | $I_O$ | 0 to 0.5 | | 0 to 0.4 | A |
| Operating Junction Temperature Range | $T_{jop}$ | –30 to +125 | | | °C |

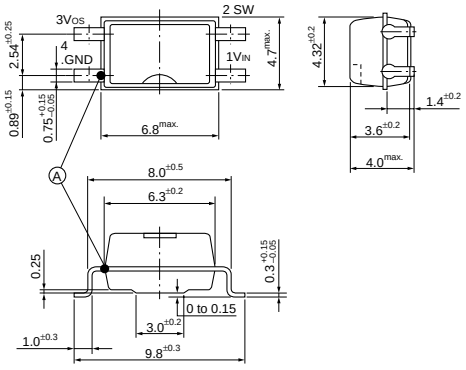
## ■Electrical Characteristics

($T_a$=25°C)

| Parameter | Symbol | Ratings | | | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SAI01 | | | SAI02 | | | SAI03 | | | |
| | | min. | typ. | max. | min. | typ. | max. | min. | typ. | max. | |
| Output Voltage | $V_O$ | 4.80 | 5.00 | 5.20 | 3.17 | 3.30 | 3.43 | 11.40 | 12.00 | 12.60 | V |
| | Conditions | $V_{IN}$=20V, $I_O$=0.3A | | | $V_{IN}$=15V, $I_O$=0.3A | | | $V_{IN}$=24V, $I_O$=0.3A | | | |
| Efficiency | $\eta$ | | 80 | | | 75 | | | 88 | | % |
| | Conditions | $V_{IN}$=20V, $I_O$=0.3A | | | $V_{IN}$=15V, $I_O$=0.3A | | | $V_{IN}$=24V, $I_O$=0.3A | | | |
| Oscillation Frequency | f | | 60 | | | 60 | | | 60 | | kHz |
| | Conditions | $V_{IN}$=20V, $I_O$=0.3A | | | $V_{IN}$=15V, $I_O$=0.3A | | | $V_{IN}$=24V, $I_O$=0.3A | | | |
| Line Regulation | $\Delta V_{OLINE}$ | | 80 | 100 | | 60 | 80 | | 100 | 130 | mV |
| | Conditions | $V_{IN}$=10 to 30V, $I_O$=0.3A | | | $V_{IN}$=8 to 28V, $I_O$=0.3A | | | $V_{IN}$=18 to 30V, $I_O$=0.3A | | | |
| Load Regulation | $\Delta V_{OLOAD}$ | | 30 | 40 | | 20 | 30 | | 70 | 95 | mV |
| | Conditions | $V_{IN}$=20V, $I_O$=0.1 to 0.4A | | | $V_{IN}$=15V, $I_O$=0.1 to 0.4A | | | $V_{IN}$=24V, $I_O$=0.1 to 0.4A | | | |
| Temperature Coefficient of Output Voltage | $\Delta Vo/\Delta Ta$ | | ±0.5 | | | ±0.5 | | | ±1.5 | | mV/°C |
| Ripple Rejection | $R_{REJ}$ | | 45 | | | 45 | | | 45 | | dB |
| | Conditions | f=100 to 120Hz | | | f=100 to 120Hz | | | f=100 to 120Hz | | | |
| Overcurrent Protection Starting Current | $I_{S1}$ | 0.55 | | | 0.55 | | | 0.45 | | | A |
| | Conditions | $V_{IN}$=10V | | | $V_{IN}$=8V | | | $V_{IN}$=18V | | | |

## ■External Dimensions (PS4)

(unit : mm)

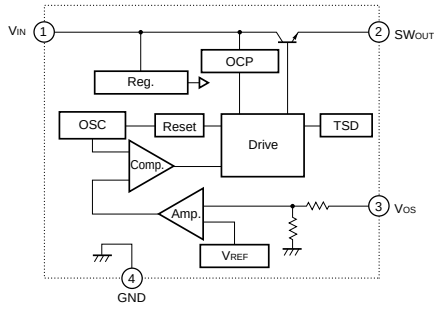



Ⓐ Case Temperature Measuring Point

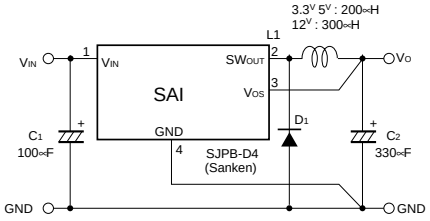
Pin Assignment
① $V_{IN}$
② $SW_{OUT}$
③ $V_{OS}$
④ GND

Plastic Mold Package Type
Flammability: UL94V-0
Product Mass: Approx. 0.22g

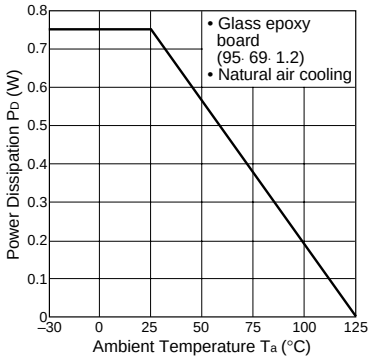
## ■Block Diagram




## ■Typical Connection Diagram




## ■$T_a$-$P_D$ Characteristics




$$P_D=V_O \cdot I_O \left(\frac{100}{\eta\chi}-1\right) - V_F \cdot I_O \left(1-\frac{V_O}{V_{IN}}\right)$$

The efficiency depends on the input voltage and the output current. Therefore, obtain the value from the efficiency graph and substitute the percentage in the formula above.

$V_O$ : Output voltage
$I_O$ : Output current
$\eta\chi$ : Efficiency (%)
$V_F$ : Diode $D_1$ forward voltage
SJPB-D4-0.3V

Thermal design for $D_1$ must be considered separately.