Ordering number : EISB0006A

SANYO SiP (System in Package) technology

ISB
(Integrated System in Board)

# ISB-E48-0, ISB-E48-1

Ultrathin Miniature Package

# Charger Circuit Voltage Sensor + 3 P-channel MOSFETs

## Overview

The ISB-E48-0, ISB-E48-1 incorporates in its power input block a high-precision voltage detector that provides protection against overvoltage. The ISB-E48-0, ISB-E48-1 also includes three P-channel MOSFET chips and allows for easy implementation of a charger circuit for cell phones and other portable equipment by incorporating the IC in a current interrupting switch activated by a voltage-detector or in an output block of a charger control IC.

## Application

- Battery charger for portable equipment including cell phones.

## Features

- On-chip high-precision voltage detector and three P-channel MOSFET chips.
- Miniature package makes this IC ideal for miniaturization of electronic devices and high-density mounting on printed circuit boards.


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SANYO Semiconductor Co., Ltd.
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Internal Device | Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|---|
| IC | Input voltage | $V_{IN}$ | | 12 | V |
| | Output current | $I_{OUT}$ | | 50 | mA |
| | Output voltage | $V_{OUT}$ | | $V_{SS}$-0.3 to $V_{IN}$+0.3 | V |
| | Allowable power dissipation | $P_D$-IC | When mounted on a specified board * | 0.65 | W |
| TR1 | Drain-to-source voltage | $V_{DSS}$ | | -20 | V |
| | Gate-to-source voltage | $V_{GSS}$ | | ±10 | V |
| | Drain current | $I_D$ | | -2.0 | A |
| | Allowable power dissipation | $P_D$-T | When mounted on a specified board * | 1.4 | W |
| TR2 and TR3 | Drain-to-source voltage | $V_{DSS}$ | | -20 | V |
| | Gate-to-source voltage | $V_{GSS}$ | | ±10 | V |
| | Drain current | $I_D$ | | -4 | A |
| | Allowable power dissipation | $P_D$-T | When mounted on a specified board * | 1.5 | W |
| Operating ambient temperature | | Topr | | -30 to +85 | °C |
| Storage ambient temperature | | Tstg | | -40 to +125 | °C |

* Specified board: 40mm×25mm×0.8mm FR4 board

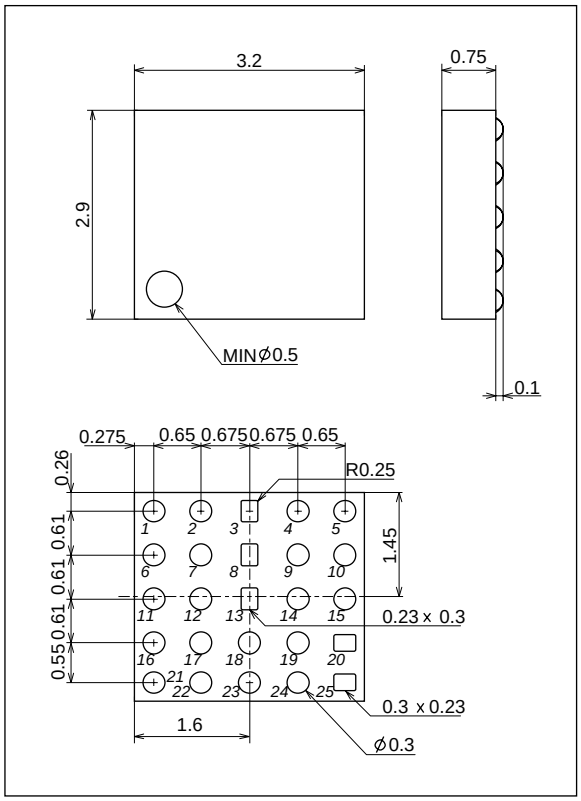
## Electrical Characteristics

### Overall Operating Characteristics at Ta = 25°C, with a dedicated test circuit

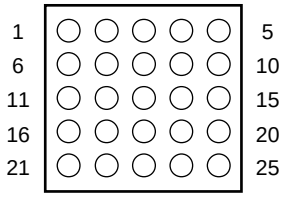
| Internal Device | Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | min | typ | max | |
| IC | Detecting voltage | $V_{DF}$ | ISB-E48-0 | 2.646 | 2.7 | 2.754 | V |
| | | | ISB-E48-1 | 3.234 | 3.3 | 3.366 | V |
| | Current consumption | $I_{SS}$ | $V_{IN}$=3.0V | | 0.9 | 3.0 | μA |
| | Output current | $I_{OUT}1$ | ISB-E48-0<br>Nch$V_{DS}$=0.5V,$V_{IN}$=2.0V | 3.0 | 7.7 | | mA |
| | | | ISB-E48-1<br>Nch$V_{DS}$=0.5V,$V_{IN}$=3.0V | 5.0 | 10.1 | | mA |
| | | $I_{OUT}2$ | Pch$V_{DS}$=2.1V, $V_{IN}$=8.0V | | -10.0 | -2.0 | mA |
| TR1 | Drain-to-source breakdown voltage | $V_{DSS}$ | $I_D$=-1mA, $V_{GS}$=0V | -20 | | | V |
| | Drain-to-source cutoff current | $I_{DSS}$ | $V_{DS}$=-20V, $V_{GS}$=0V | | | -10 | μA |
| | Gate-to-source leakage current | $I_{GSS}$ | $V_{GS}$=±8V, $V_{DS}$=0V | | | ±10 | μA |
| | Gate-to-source cutoff voltage | $V_{GS}$(off) | $V_{DS}$=-10V, $I_D$=-1mA | -0.3 | | -1.0 | V |
| | Drain-to-source on resistance | $R_{DS}$(on)1 | $I_D$=-1A, $V_{GS}$=-4V | | 125 | 165 | mΩ |
| | | $R_{DS}$(on)2 | $I_D$=-0.5A, $V_{GS}$=-2.5V | | 155 | 220 | mΩ |
| | | $R_{DS}$(on)3 | $I_D$=-0.1A, $V_{GS}$=-1.8V | | 195 | 280 | mΩ |
| TR2 and TR3 | Drain-to-source breakdown voltage | $V_{DSS}$ | $I_D$=-1mA, $V_{GS}$=0V | -20 | | | V |
| | Drain-to-source cutoff current | $I_{DSS}$ | $V_{DS}$=-20V, $V_{GS}$=0V | | | -1.0 | μA |
| | Gate-to-source leakage current | $I_{GSS}$ | $V_{GS}$=±8V, $V_{DS}$=0V | | | ±10 | μA |
| | Gate-to-source cutoff voltage | $V_{GS}$(off) | $V_{DS}$=-10V, $I_D$=-1mA | -0.4 | | -1.3 | V |
| | Drain-to-source on resistance | $R_{DS}$(on)1 | $I_D$=-2A, $V_{GS}$=-4.5V<br>* Design guaranteed value | | | 63 | mΩ |
| | | $R_{DS}$(on)2 | $I_D$=-1A, $V_{GS}$=-2.5V<br>* Design guaranteed value | | | 96 | mΩ |

## Package Dimensions

unit : mm



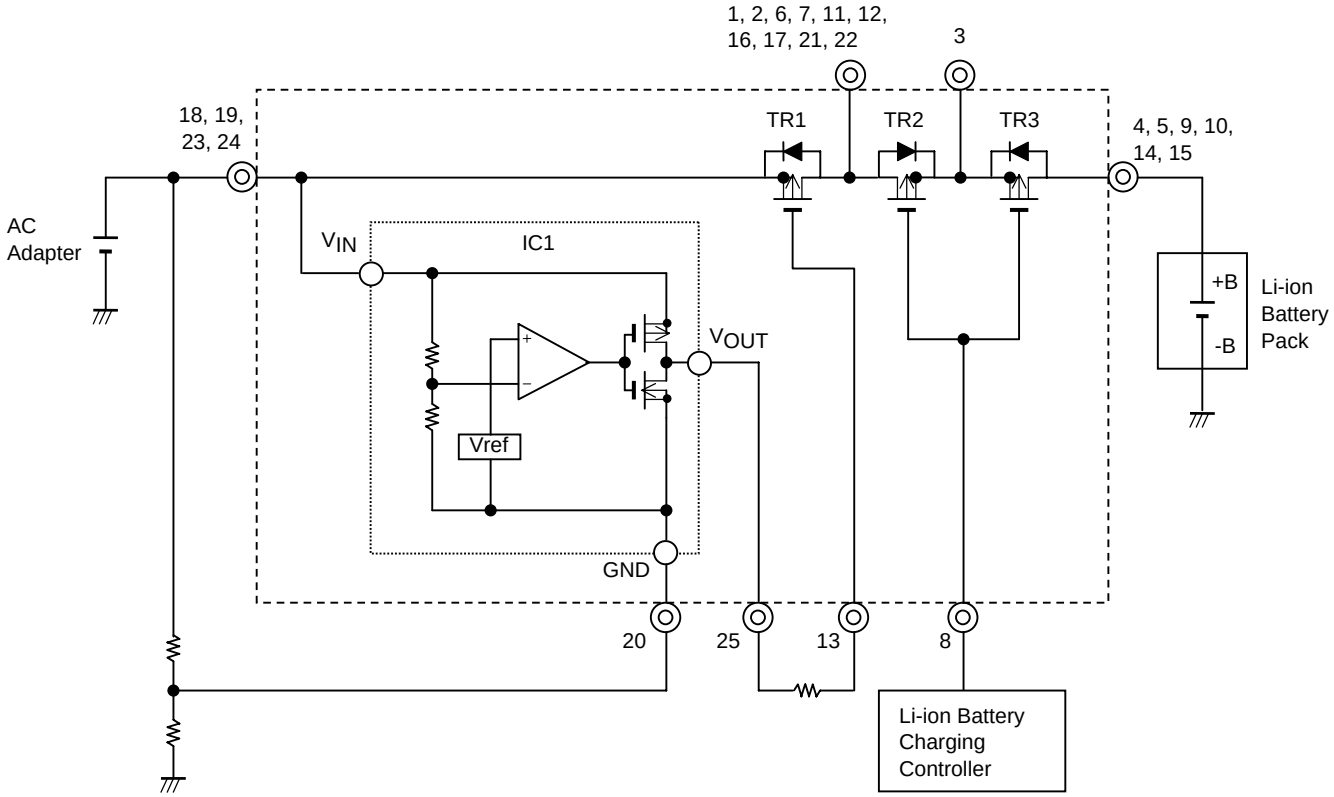

## Pin Assignments Diagram



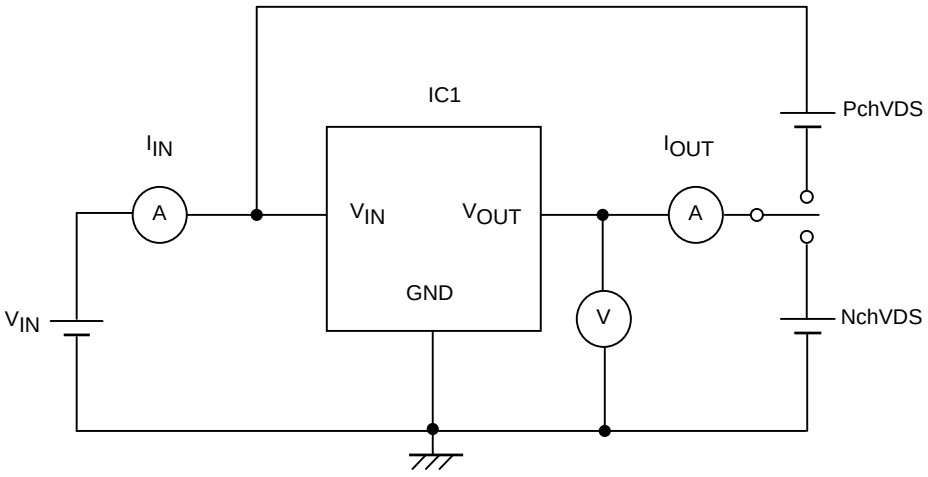

(Bottom view)

| | | | | | |
|---|---|---|---|---|---|
| 1 | TR1, 2 Drain | TR1, 2 Drain | TR2, 3 Source | TR3 Drain | TR3 Drain | 5 |
| 6 | TR1, 2 Drain | TR1, 2 Drain | TR2, 3 Gate | TR3 Drain | TR3 Drain | 10 |
| 11 | TR1, 2 Drain | TR1, 2 Drain | TR1 Gate | TR3 Drain | TR3 Drain | 15 |
| 16 | TR1, 2 Drain | TR1, 2 Drain | IC $V_{IN}$ TR1 Source | IC $V_{IN}$ TR1 Source | IC GND | 20 |
| 21 | TR1, 2 Drain | TR1, 2 Drain | IC $V_{IN}$ TR1 Source | IC $V_{IN}$ TR1 Source | IC $V_{OUT}$ | 25 |

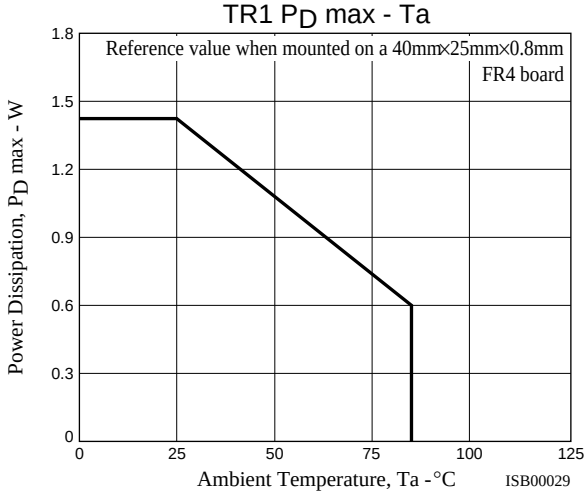
## Internal Equivalent Circuit and Sample Peripheral Circuit



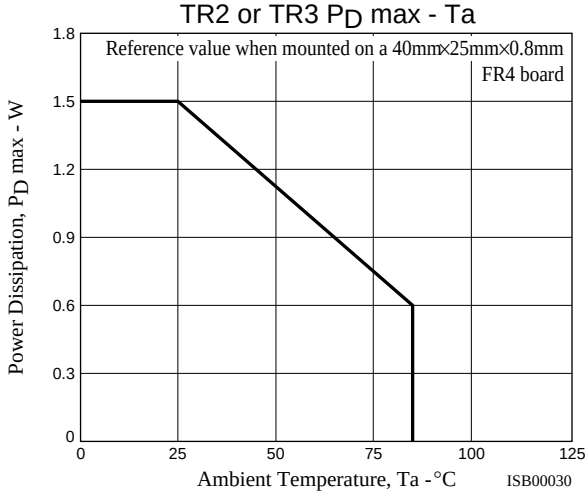

## IC Test Circuit



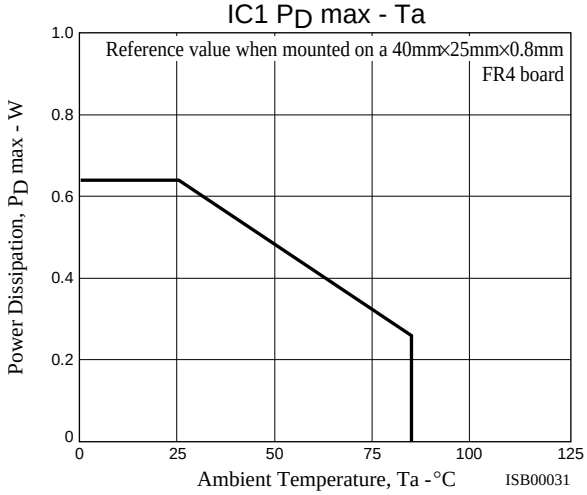
TR1 $P_D$ max - Ta




TR2 or TR3 $P_D$ max - Ta




IC1 $P_D$ max - Ta



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