The S-19253xxxH Series developed by using high-withstand voltage CMOS process technology, is a positive voltage regulator with high-accuracy output voltage and high output current. A built-in overcurrent protection circuit to limit overcurrent of the output transistor and a built-in thermal shutdown circuit to limit heat are included. Also, the S-19253xxxH Series includes the soft-start function to adjust the output voltage rising time at power-on or at the time when the ON / OFF pin is set to ON.

ABLIC Inc. offers a "thermal simulation service" which supports the thermal design in conditions when our power management ICs are in use by customers. Our thermal simulation service will contribute to reducing the risk in the thermal design at customers' development stage.

ABLIC Inc. also offers FIT rate calculated based on actual customer usage conditions in order to support customer functional safety design.

Contact our sales representatives for details.

Caution This product can be used in vehicle equipment and in-vehicle equipment. Before using the product for these purposes, it is imperative to contact our sales representatives.

Features

- Output voltage: 1.0 V to 5.5 V, selectable in 0.05 V step
- Input voltage: 2.5 V to 6.5 V
- Output voltage accuracy: ±3.0% (Tj = −40°C to +105°C)
- Dropout voltage: 0.09 V typ. (2.6 V output product, at IOUT = 200 mA)
- Current consumption:
  - During operation: 120 μA typ., 150 μA max. (Tj = −40°C to +105°C)
  - During power-off: 0.1 μA typ., 4.5 μA max. (Tj = −40°C to +105°C)
- Output current: Possible to output 500 mA (at VIN ≥ VOUT(S) + 1.0 V)\(^1\)
- Ripple rejection: 60 dB typ. (at f = 1.0 kHz)
- Built-in overcurrent protection circuit: Limits overcurrent of output transistor.
- Built-in thermal shutdown circuit: Detection temperature 170°C typ.
- Built-in soft-start circuit: Adjusts output voltage rising time at power-on or at the time when ON / OFF pin is set to ON.
- Adjustable type: tSS = 6.0 ms typ. (CSS = 10 nF)
- Built-in ON / OFF circuit: Ensures long battery life.
- Operation temperature range: Ta = −40°C to +105°C
- Lead-free (Sn 100%), halogen-free
- AEC-Q100 qualified\(^2\)

\(^1\) Please make sure that the loss of the IC will not exceed the power dissipation when the output current is large.

\(^2\) Contact our sales representatives for details.

Applications

- Constant-voltage power supply for electrical application for vehicle interior
- Constant-voltage power supply for home electric appliance
- For automotive use (accessory, car navigation system, car audio system, etc.)

Package

- SOT-89-5
**Block Diagram**

- **ON / OFF logic**: Active "H"
- **Discharge shunt function**: Available
- **Pull-down resistor**: Available
- **Soft-start time**: Changeable by capacitor (C_ss)

*1. Parasitic diode

**Figure 1**
■ AEC-Q100 Qualified

This IC supports AEC-Q100 for operation temperature grade 2. Contact our sales representatives for details of AEC-Q100 reliability specification.

■ Product Name Structure

Users can select the output voltage for the S-19253xxxH Series. Refer to "1. Product name" regarding the contents of product name, "2. Package" regarding the package drawings and "3. Product name list" for details of product names.

1. Product name

S-19253 xx H - U5T1 U

Environmental code
U: Lead-free (Sn 100%), halogen-free

Package abbreviation and IC packing specifications*1
U5T1: SOT-89-5, Tape

Operation temperature
H: Ta = −40°C to +105°C

Output voltage*2
10 to 55
(e.g., when the output voltage is 1.0 V, it is expressed as 10.)

Product type
E

*1. Refer to the tape drawing.
*2. Contact our sales representatives when the product which has 0.05 V step is necessary.

2. Package

Table 1 Package Drawing Codes

<table>
<thead>
<tr>
<th>Package Name</th>
<th>Dimension</th>
<th>Tape</th>
<th>Reel</th>
</tr>
</thead>
<tbody>
<tr>
<td>SOT-89-5</td>
<td>UP005-A-P-SD</td>
<td>UP005-A-C-SD</td>
<td>UP005-A-R-SD</td>
</tr>
</tbody>
</table>

3. Product name list

Table 2

<table>
<thead>
<tr>
<th>Output Voltage</th>
<th>SOT-89-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 V ± 3.0%</td>
<td>S-19253E12H-U5T1U</td>
</tr>
<tr>
<td>1.8 V ± 3.0%</td>
<td>S-19253E18H-U5T1U</td>
</tr>
<tr>
<td>3.3 V ± 3.0%</td>
<td>S-19253E33H-U5T1U</td>
</tr>
<tr>
<td>5.0 V ± 3.0%</td>
<td>S-19253E50H-U5T1U</td>
</tr>
</tbody>
</table>

Remark Please contact our sales representatives for products other than the above.
Pin Configuration

1. SOT-89-5

Pin Configuration

Figure 2

Table 3

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ON / OFF</td>
<td>ON / OFF pin</td>
</tr>
<tr>
<td>2</td>
<td>VSS</td>
<td>GND pin</td>
</tr>
<tr>
<td>3</td>
<td>SSC*1</td>
<td>Soft-start pin</td>
</tr>
<tr>
<td>4</td>
<td>VIN</td>
<td>Input voltage pin</td>
</tr>
<tr>
<td>5</td>
<td>VOUT</td>
<td>Output voltage pin</td>
</tr>
</tbody>
</table>

*1. Connect a capacitor between the SSC pin and the VSS pin.
The soft-start time at power-on and at the time when the ON / OFF pin is set to ON can be adjusted according to the capacitance.
## Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Absolute Maximum Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>$V_{IN}$</td>
<td>$V_{SS} - 0.3$ to $V_{SS} + 7$</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{ON/OFF}$</td>
<td>$V_{SS} - 0.3$ to $V_{IN} + 0.3 \leq V_{SS} + 7$</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_{SSC}$</td>
<td>$V_{SS} - 0.3$ to $V_{IN} + 0.3 \leq V_{SS} + 7$</td>
<td>V</td>
</tr>
<tr>
<td>Output voltage</td>
<td>$V_{OUT}$</td>
<td>$V_{SS} - 0.3$ to $V_{IN} + 0.3 \leq V_{SS} + 7$</td>
<td>V</td>
</tr>
<tr>
<td>Output current</td>
<td>$I_{OUT}$</td>
<td>550</td>
<td>mA</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_J$</td>
<td>-40 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Operation ambient temperature</td>
<td>$T_{opr}$</td>
<td>-40 to +105</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>-40 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

## Thermal Resistance Value

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction-to-ambient thermal resistance*1</td>
<td>$\theta_{JA}$</td>
<td>SOT-89-5</td>
<td>Board A</td>
<td>–</td>
<td>119</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Board B</td>
<td>–</td>
<td>84</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Board C</td>
<td>–</td>
<td>–</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Board D</td>
<td>–</td>
<td>46</td>
<td>°C/W</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Board E</td>
<td>–</td>
<td>35</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

*1. Test environment: compliance with JEDEC STANDARD JESD51-2A

Remark: Refer to "Power Dissipation" and "Test Board" for details.
## Electrical Characteristics

### Table 6 (1 / 2)

(Tj = −40°C to +105°C unless otherwise specified)

<table>
<thead>
<tr>
<th>Item</th>
<th>Symbol</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
<th>Test Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output voltage</strong>(^1)</td>
<td>V(_{OUT(E)})</td>
<td>(V_{IN} = 2.5) V, (I_{OUT} = 100) mA</td>
<td>(V_{OUT(S)} &lt; 1.5) V</td>
<td>(V_{OUT(S)} \times 0.970)</td>
<td>(V_{OUT(S)} \times 1.030)</td>
<td>V</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{IN} = V_{OUT(S)} + 1.0) V, (I_{OUT} = 100) mA</td>
<td>(1.5) V ≤ (V_{OUT(S)})</td>
<td>(V_{OUT(S)} \times 0.970)</td>
<td>(V_{OUT(S)} \times 1.030)</td>
<td>V</td>
<td>1</td>
</tr>
<tr>
<td><strong>Output current</strong>(^2)</td>
<td>I(_{OUT})</td>
<td>(V_{IN} = 2.5) V</td>
<td>(V_{OUT(S)} &lt; 1.5) V</td>
<td>500(^{\circ})</td>
<td>–</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{IN} \geq V_{OUT(S)} + 1.0) V</td>
<td>(1.5) V ≤ (V_{OUT(S)})</td>
<td>500(^{\circ})</td>
<td>–</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td><strong>Dropout voltage</strong>(^3)</td>
<td>V(_{drop})</td>
<td>(I_{OUT} = 200) mA, (T_a = +25^\circ)C</td>
<td>(1.0) V ≤ (V_{OUT(S)} &lt; 2.0) V</td>
<td>–</td>
<td>*4</td>
<td>V</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.0) V ≤ (V_{OUT(S)} &lt; 2.6) V</td>
<td>–</td>
<td>0.52</td>
<td>V</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.6) V ≤ (V_{OUT(S)} &lt; 5.5) V</td>
<td>–</td>
<td>0.09</td>
<td>V</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Line regulation</strong>(^4)</td>
<td>(\Delta V_{OUT1} / \Delta V_{IN} \times V_{OUT})</td>
<td>(2.5) V ≤ (V_{IN} \leq 6.5) V, (I_{OUT} = 100) mA, (T_a = +25^\circ)C</td>
<td>(V_{OUT(S)} &lt; 2.0) V</td>
<td>–</td>
<td>0.05</td>
<td>0.2</td>
<td>%/V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{OUT(S)} + 0.5) V ≤ (V_{IN} \leq 6.5) V, (I_{OUT} = 100) mA, (T_a = +25^\circ)C</td>
<td>(2.0) V ≤ (V_{OUT(S)})</td>
<td>–</td>
<td>0.05</td>
<td>0.2</td>
<td>%/V</td>
</tr>
<tr>
<td><strong>Load regulation</strong>(^5)</td>
<td>(\Delta V_{OUT2})</td>
<td>(V_{IN} = 2.5) V, (1) mA ≤ (I_{OUT} \leq 200) mA, (T_a = +25^\circ)C</td>
<td>(V_{OUT(S)} &lt; 1.5) V</td>
<td>–</td>
<td>15</td>
<td>30</td>
<td>mV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{IN} = V_{OUT(S)} + 1.0) V, (1) mA ≤ (I_{OUT} \leq 200) mA, (T_a = +25^\circ)C</td>
<td>(1.5) V ≤ (V_{OUT(S)})</td>
<td>–</td>
<td>15</td>
<td>30</td>
<td>mV</td>
</tr>
<tr>
<td><strong>Current consumption during operation</strong></td>
<td>I(_{SS1})</td>
<td>(V_{IN} = 2.5) V, ON / OFF pin = ON, no load</td>
<td>(V_{OUT(S)} &lt; 1.5) V</td>
<td>–</td>
<td>120</td>
<td>150</td>
<td>(\mu)A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{IN} = V_{OUT(S)} + 1.0) V, ON / OFF pin = ON, no load</td>
<td>(1.5) V ≤ (V_{OUT(S)})</td>
<td>–</td>
<td>120</td>
<td>150</td>
<td>(\mu)A</td>
</tr>
<tr>
<td><strong>Current consumption during power-off</strong></td>
<td>I(_{SS2})</td>
<td>(V_{IN} = 2.5) V, ON / OFF pin = OFF, no load</td>
<td>(V_{OUT(S)} &lt; 1.5) V</td>
<td>–</td>
<td>0.1</td>
<td>4.5</td>
<td>(\mu)A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{IN} = V_{OUT(S)} + 1.0) V, ON / OFF pin = OFF, no load</td>
<td>(1.5) V ≤ (V_{OUT(S)})</td>
<td>–</td>
<td>0.1</td>
<td>4.5</td>
<td>(\mu)A</td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
<td>V(_{IN})</td>
<td>–</td>
<td>2.5</td>
<td>–</td>
<td>6.5</td>
<td>V</td>
<td>–</td>
</tr>
<tr>
<td>Item</td>
<td>Symbol</td>
<td>Condition</td>
<td>Min.</td>
<td>Typ.</td>
<td>Max.</td>
<td>Unit</td>
<td>Test Circuit</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>-----------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>--------------</td>
</tr>
<tr>
<td>ON / OFF pin input voltage &quot;H&quot;</td>
<td>( V_{SH} )</td>
<td>( V_{IN} = 2.5 , V, , R_L = 1 , k\Omega, ) determined by ( V_{OUT} ) output level</td>
<td>( V_{OUT(S)} &lt; 1.5 , V )</td>
<td>2.1</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{IN} = V_{OUT(S)} + 1.0 , V, ) ( R_L = 1 , k\Omega, ) determined by ( V_{OUT} ) output level</td>
<td>1.5 ( V ) ( \leq V_{OUT(S)} )</td>
<td>2.1</td>
<td>–</td>
<td>–</td>
<td>V</td>
</tr>
<tr>
<td>ON / OFF pin input voltage &quot;L&quot;</td>
<td>( V_{SL} )</td>
<td>( V_{IN} = 2.5 , V, , R_L = 1 , k\Omega, ) determined by ( V_{OUT} ) output level</td>
<td>( V_{OUT(S)} &lt; 1.5 , V )</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{IN} = V_{OUT(S)} + 1.0 , V, ) ( R_L = 1 , k\Omega, ) determined by ( V_{OUT} ) output level</td>
<td>1.5 ( V ) ( \leq V_{OUT(S)} )</td>
<td>–</td>
<td>–</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>ON / OFF pin input current &quot;H&quot;</td>
<td>( I_{SH} )</td>
<td>( V_{IN} = 6.5 , V, , V_{ON/OFF} = 6.5 , V )</td>
<td>0.8</td>
<td>2.5</td>
<td>7.8</td>
<td>( \mu A )</td>
<td>4</td>
</tr>
<tr>
<td>ON / OFF pin input current &quot;L&quot;</td>
<td>( I_{SL} )</td>
<td>( V_{IN} = 6.5 , V, , V_{ON/OFF} = 0 , V )</td>
<td>–0.1</td>
<td>–</td>
<td>0.1</td>
<td>( \mu A )</td>
<td>4</td>
</tr>
<tr>
<td>Ripple rejection</td>
<td>(</td>
<td>RR</td>
<td>)</td>
<td>( V_{IN} = 3.0 , V, , f = 1 , kHz, ) ( \Delta V_{r} = 0.5 , V_{rms}, ) ( I_{OUT} = 100 , mA )</td>
<td>( 1.0 , V \leq V_{OUT(S)} &lt; 1.5 , V )</td>
<td>60</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( 1.5 , V \leq V_{OUT(S)} &lt; 2.0 , V )</td>
<td>–</td>
<td>55</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{IN} = V_{OUT(S)} + 1.0 , V, ) ( f = 1 , kHz, ) ( \Delta V_{r} = 0.5 , V_{rms}, ) ( I_{OUT} = 100 , mA )</td>
<td>( 2.0 , V \leq V_{OUT(S)} &lt; 2.6 , V )</td>
<td>–</td>
<td>55</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( 2.6 , V \leq V_{OUT(S)} \leq 5.5 , V )</td>
<td>–</td>
<td>50</td>
<td>–</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Short-circuit current</td>
<td>( I_{short} )</td>
<td>( V_{IN} = 2.5 , V, ) ( ON/OFF ) pin = ON, ( V_{OUT} = 0 , V, , Ta = +25°C )</td>
<td>( V_{OUT(S)} &lt; 1.5 , V )</td>
<td>–</td>
<td>240</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{IN} = V_{OUT(S)} + 1.0 , V, ) ( ON/OFF ) pin = ON, ( V_{OUT} = 0 , V, , Ta = +25°C )</td>
<td>( 1.5 , V \leq V_{OUT(S)} )</td>
<td>–</td>
<td>240</td>
<td>–</td>
<td>mA</td>
</tr>
<tr>
<td>Thermal shutdown detection temperature</td>
<td>( T_{SD} )</td>
<td>Junction temperature</td>
<td>–</td>
<td>170</td>
<td>–</td>
<td>°C</td>
<td>–</td>
</tr>
<tr>
<td>Thermal shutdown release temperature</td>
<td>( T_{SR} )</td>
<td>Junction temperature</td>
<td>–</td>
<td>135</td>
<td>–</td>
<td>°C</td>
<td>–</td>
</tr>
<tr>
<td>Discharge shunt resistance during power-off</td>
<td>( R_{LOW} )</td>
<td>( V_{IN} = 6.5 , V, , V_{OUT} = 0.1 , V )</td>
<td>–</td>
<td>100</td>
<td>–</td>
<td>Ω</td>
<td>6</td>
</tr>
<tr>
<td>ON / OFF pin pull-down resistance</td>
<td>( R_{PD} )</td>
<td>–</td>
<td>1.3</td>
<td>4.0</td>
<td>12</td>
<td>MΩ</td>
<td>4</td>
</tr>
</tbody>
</table>

*1. \( V_{OUT(S)} \): Set output voltage \( V_{OUT(E)} \): Actual output voltage

Output voltage when fixing \( I_{OUT} = 100 \, mA \) and inputting 2.5 \( V \) or \( V_{OUT(S)} + 1.0 \, V \).

*2. The output current at which the output voltage becomes 95% of \( V_{OUT(E)} \) after gradually increasing the output current.

*3. \( V_{drop} = V_{IN1} - (V_{OUT3} \times 0.98) \)

\( V_{IN1} \) is the input voltage at which the output voltage becomes 98% of \( V_{OUT3} \) after gradually decreasing the input voltage.

\( V_{OUT3} \) is the output voltage when \( V_{IN} = V_{OUT(S)} + 1.0 \, V \) and \( I_{OUT} = 200 \, mA \).

*4. The dropout voltage is limited by the difference between the input voltage (min. value) and the set output voltage.

In case of 1.0 \( V \leq V_{OUT(S)} < 1.5 \, V \): 2.5 \( V \) \( - V_{OUT(S)} = V_{drop} \)

In case of 1.5 \( V \leq V_{OUT(S)} < 2.0 \, V \): \( (V_{OUT(S)} + 1.0 \, V) - V_{OUT(S)} = 1.0 \, V \)

*5. Due to limitation of the power dissipation, this value may not be satisfied. Attention should be paid to the power dissipation when the output current is large.

This specification is guaranteed by design.
Test Circuits

Figure 3  Test Circuit 1

Figure 4  Test Circuit 2

Figure 5  Test Circuit 3

Figure 6  Test Circuit 4
Figure 7  Test Circuit 5

Figure 8  Test Circuit 6
### Standard Circuit

![Diagram of Standard Circuit](image)

- **C\text{IN}**
- **C\text{L}**
- **C\text{SS}**

1. **C\text{IN}** is a capacitor for stabilizing the input.
2. **C\text{L}** is a capacitor for stabilizing the output.
3. **C\text{SS}** is a capacitor for soft-start.

**Warning** The above connection diagram and constants will not guarantee successful operation. Perform thorough evaluation including the temperature characteristics with an actual application to set the constants.

### Condition of Application

- **Input capacitor (C\text{IN})**: A ceramic capacitor with capacitance of 2.2 μF or more is recommended.
- **Output capacitor (C\text{L})**: A ceramic capacitor with capacitance of 2.2 μF or more is recommended.

**Warning** Generally, in a voltage regulator, an oscillation may occur depending on the selection of the external parts. Perform thorough evaluation including the temperature characteristics with an actual application using the above capacitors to confirm no oscillation occurs.

### Selection of Input Capacitor (C\text{IN}) and Output Capacitor (C\text{L})

The S-19253xxxH Series requires **C\text{L}** between the VOUT pin and the VSS pin for phase compensation. The operation is stabilized by a ceramic capacitor with capacitance of 2.2 μF or more. When using an OS capacitor, a tantalum capacitor or an aluminum electrolytic capacitor, the capacitance also must be 2.2 μF or more. However, an oscillation may occur depending on the equivalent series resistance (ESR).

Moreover, the S-19253xxxH Series requires **C\text{IN}** between the VIN pin and the VSS pin for a stable operation. Generally, an oscillation may occur when a voltage regulator is used under the condition that the impedance of the power supply is high.

**Note** that the output voltage transient characteristics vary depending on the capacitance of **C\text{IN}** and **C\text{L}** and the value of ESR.

**Warning** Perform thorough evaluation including the temperature characteristics with an actual application to select **C\text{IN}** and **C\text{L}**.

### Selection of Capacitor for Soft-start (C\text{SS})

The S-19253xxxH Series requires the capacitor for soft-start (C\text{SS}) between the SSC pin and the VSS pin. Over the entire temperature range, the S-19253xxxH Series operates stably with a ceramic capacitor of 0.68 nF or more. According to C\text{SS} capacitance, the rising speed of the output voltage is adjustable. The time that the output voltage rises to 99% is 6.0 ms typ. at C\text{SS} = 10 nF. The recommended value for applications is 0.68 nF ≤ C\text{SS} ≤ 168 nF; however, define the values by sufficient evaluation including the temperature characteristics under the usage condition.
Explanation of Terms

1. **Low dropout voltage regulator**
   This is a voltage regulator which made dropout voltage small by its built-in low on-resistance output transistor.

2. **Output voltage (V_{OUT})**
   This voltage is output at an accuracy of ±3.0% when the input voltage, the output current and the temperature are in a certain condition*1.

   *1. Differs depending on the product.

   **Caution** If the certain condition is not satisfied, the output voltage may exceed the accuracy range of ±3.0%. Refer to "Electrical Characteristics" and "Characteristics (Typical Data)" for details.

3. **Line regulation**
   
   Indicates the dependency of the output voltage against the input voltage. That is, the value shows how much the output voltage changes due to a change in the input voltage after fixing output current constant.

4. **Load regulation (ΔV_{OUT2})**
   Indicates the dependency of the output voltage against the output current. That is, the value shows how much the output voltage changes due to a change in the output current after fixing input voltage constant.

5. **Dropout voltage (V_{drop})**
   Indicates the difference between input voltage (V_{IN}) and the output voltage when the output voltage becomes 98% of the output voltage value (V_{OUT3}) at V_{IN} = V_{OUT3} + 1.0 V after the input voltage (V_{IN}) is decreased gradually.

   \[ V_{\text{drop}} = V_{\text{IN}} - (V_{\text{OUT3}} \times 0.98) \]
Operation

1. Basic operation

Figure 10 shows the block diagram of the S-19253xxxH Series to describe the basic operation. The error amplifier compares the feedback voltage \( V_{fb} \) whose output voltage \( V_{OUT} \) is divided by the feedback resistors \( (R_s \text{ and } R_f) \) with the reference voltage \( V_{ref} \). The error amplifier controls the output transistor, consequently, the regulator starts the operation that keeps \( V_{OUT} \) constant without the influence of the input voltage \( V_{IN} \).

![Figure 10](image)

2. Output transistor

In the S-19253xxxH Series, a low on-resistance P-channel MOS FET is used between the VIN pin and the VOUT pin as the output transistor. In order to keep \( V_{OUT} \) constant, the on-resistance of the output transistor varies appropriately according to the output current \( I_{OUT} \).

Caution Since a parasitic diode exists between the VIN pin and the VOUT pin due to the structure of the transistor, the IC may be damaged by a reverse current if \( V_{OUT} \) becomes higher than \( V_{IN} \). Therefore, be sure that \( V_{OUT} \) does not exceed \( V_{IN} + 0.3 \) V.
3. ON / OFF pin

The ON / OFF pin controls the internal circuit and the output transistor in order to start and stop the regulator. When the ON / OFF pin is set to OFF, the internal circuit stops operating and the output transistor between the VIN pin and the VOUT pin is turned off, reducing current consumption significantly.

Note that the current consumption increases when a voltage of 0.6 V to VIN - 0.3 V is applied to the ON / OFF pin.

The ON / OFF pin is configured as shown in Figure 11. Since the ON / OFF pin is internally pulled down to the VSS pin in the floating status, the VOUT pin is set to the VSS level. Refer to “Electrical Characteristics” for the ON / OFF pin current.

<table>
<thead>
<tr>
<th>ON / OFF Pin</th>
<th>Internal Circuit</th>
<th>VOUT Pin Voltage</th>
<th>Current Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;H&quot;: ON</td>
<td>Operate</td>
<td>Constant value*1</td>
<td>I_S1*2</td>
</tr>
<tr>
<td>&quot;L&quot;: OFF</td>
<td>Stop</td>
<td>Pulled down to VSS*3</td>
<td>I_S2</td>
</tr>
</tbody>
</table>

*1. The constant value is output due to the regulating based on the set output voltage value.

*2. Note that the IC’s current consumption increases as much as current flows into the pull-down resistor when the ON / OFF pin is connected to the VIN pin and the S-19253xxxH Series is operating (refer to Figure 11).

*3. The VOUT pin voltage is pulled down to VSS due to combined resistance (R_LOW = 100 Ω typ.) of the discharge shunt circuit and the feedback resistors, and a load.

Figure 11
4. Discharge shunt function

The S-19253xxxH Series has a built-in discharge shunt circuit to discharge the output capacitance. The output capacitance is discharged as follows so that the VOUT pin reaches the VSS level.

1. The ON / OFF pin is set to OFF level.
2. The output transistor is turned off.
3. The discharge shunt circuit is turned on.
4. The output capacitor discharges.

The S-19253xxxH Series allows the VOUT pin to reach the VSS level rapidly due to the discharge shunt circuit.

![Figure 12](image)

*1. Parasitic diode

5. Pull-down resistor

The ON / OFF pin is internally pulled down to the VSS pin in the floating status, so the VOUT pin is set to the VSS level.

Note that the IC's current consumption increases as much as current flows into the pull-down resistor of 4.0 MΩ typ. when the ON / OFF pin is connected to the VIN pin.
6. Overcurrent protection circuit

The S-19253xxxH Series has a built-in overcurrent protection circuit to limit the overcurrent of the output transistor. When the VOUT pin is shorted to the VSS pin, that is, at the time of the output short-circuit, the output current is limited to 240 mA typ. due to the overcurrent protection circuit operation. The S-19253xxxH Series restarts regulating when the output transistor is released from the overcurrent status.

Caution This overcurrent protection circuit does not work as for thermal protection. For example, when the output transistor keeps the overcurrent status long at the time of output short-circuit or due to other reasons, pay attention to the conditions of the input voltage and the load current so as not to exceed the power dissipation.

7. Thermal shutdown circuit

The S-19253xxxH Series has a built-in thermal shutdown circuit to limit overheating. When the junction temperature increases to 170°C typ., the thermal shutdown circuit becomes the detection status, and the regulating is stopped. When the junction temperature decreases to 135°C typ., the thermal shutdown circuit becomes the release status, and the regulator is restarted.

If the thermal shutdown circuit becomes the detection status due to self-heating, the regulating is stopped and V_{OUT} decreases. For this reason, the self-heating is limited and the temperature of the IC decreases. The thermal shutdown circuit becomes release status when the temperature of the IC decreases, and the regulating is restarted after the soft-start operation is finished, thus the self-heating is generated again. Repeating this procedure makes the waveform of V_{OUT} into a pulse-like form. This phenomenon continues unless decreasing either or both of the input voltage and the output current in order to reduce the internal power consumption, or decreasing the ambient temperature. Note that the product may suffer physical damage such as deterioration if the above phenomenon occurs continuously.

Caution When the heat radiation of the application is not in a good condition, the self-heating cannot be limited immediately, and the IC may suffer physical damage. Perform thorough evaluation with an actual application to confirm no problems happen.

<table>
<thead>
<tr>
<th>Thermal Shutdown Circuit</th>
<th>VOUT Pin Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release: 135°C typ.(^1)</td>
<td>Constant value(^2)</td>
</tr>
<tr>
<td>Detection: 170°C typ.(^1)</td>
<td>Pulled down to V_{SS}(^3)</td>
</tr>
</tbody>
</table>

\(^{1}\) Junction temperature
\(^{2}\) The constant value is output due to the regulating based on the set output voltage value.
\(^{3}\) The VOUT pin voltage is pulled down to V_{SS} due to the feedback resistors (R_s and R_f) and a load.
8. Soft-start function

The S-19253xxxH Series has the built-in soft-start circuit to suppress the inrush current and overshoot of the output voltage generated at power-on or at the time when the ON / OFF pin is set to ON. The soft-start time \( t_{SS} \) is the time period from when the output voltage rises slowly immediately after power-on or when the ON / OFF pin is set to ON until when the output voltage rises to 99%.

\[
V_{OUT(E)} = V_{OUT(E)} \times 0.99
\]

Figure 13

8.1 Soft-start time

\( t_{SS} \) can be adjusted by the external capacitor \( C_{SS} \) connected between the SSC pin and the VSS pin, and is calculated by using the following calculation.

\[
t_{SS} \ [\text{ms}] = \text{Soft-start coefficient}^1 \ [\text{ms} / \text{nF}] \times C_{SS} \ [\text{nF}] + t_{D0}^2 \ [\text{ms}]
\]

*1. It is determined by charging the built-in constant current (approx. 2.1 \( \mu \)A) to \( C_{SS} \).

*2. The delay time of internal capacitance.

When the \( C_{SS} \) value is sufficiently large, the \( t_{D0} \) value can be disregarded. When the ON / OFF pin is set to OFF, the electrical charge charged in \( C_{SS} \) is discharged by the transistor of the discharge shunt circuit.

<table>
<thead>
<tr>
<th>Operation Temperature</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( T_j = +105°C )</td>
<td>0.398</td>
<td>0.539</td>
<td>0.690</td>
</tr>
<tr>
<td>( T_j = +25°C )</td>
<td>0.436</td>
<td>0.574</td>
<td>0.704</td>
</tr>
<tr>
<td>( T_j = -40°C )</td>
<td>0.467</td>
<td>0.604</td>
<td>0.717</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation Temperature</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( T_j = -40°C ) to ( +105°C )</td>
<td>0.032 ms</td>
<td>0.047 ms</td>
<td>0.108 ms</td>
</tr>
</tbody>
</table>

Caution  
The above calculation will not guarantee successful operation. Perform thorough evaluation using the actual application including the temperature characteristics under the actual usage conditions to determine \( C_{SS} \) capacitance. Refer to “\( \bullet \) Condition of Application” and “\( \bullet \) Characteristics (Typical Data)” for details.
Precautions

- Generally, when a voltage regulator is used under the condition that the load current value is small (1 mA or less), the output voltage may increase due to the leakage current of an output transistor.

- Generally, when a voltage regulator is used under the condition that the temperature is high, the output voltage may increase due to the leakage current of an output transistor.

- Generally, when the ON / OFF pin is used under the condition of OFF, the output voltage may increase due to the leakage current of an output transistor.

- Generally, when a voltage regulator is used under the condition that the impedance of the power supply is high, an oscillation may occur. Perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$.

- Generally, in a voltage regulator, an oscillation may occur depending on the selection of the external parts. The following use conditions are recommended in the S-19253xxxH Series; however, perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$ and $C_L$.

- Input capacitor ($C_{IN}$): A ceramic capacitor with capacitance of 2.2 $\mu$F or more is recommended.

- Output capacitor ($C_L$): A ceramic capacitor with capacitance of 2.2 $\mu$F or more is recommended.

- Generally, in a voltage regulator, the values of an overshoot and an undershoot in the output voltage vary depending on the variation factors of input voltage start-up, input voltage fluctuation, load fluctuation etc., or the capacitance of $C_{IN}$ or $C_L$ and the value of the equivalent series resistance (ESR), which may cause a problem to the stable operation. Perform thorough evaluation including the temperature characteristics with an actual application to select $C_{IN}$ and $C_L$.

- Generally, in a voltage regulator, an overshoot may occur in the output voltage momentarily if the input voltage steeply changes when the input voltage is started up, the soft-start operation is performed, the input voltage fluctuates, etc. Perform thorough evaluation including the temperature characteristics with an actual application to confirm no problems happen.

- Generally, in a voltage regulator, if the VOUT pin is steeply shorted with GND, a negative voltage exceeding the absolute maximum ratings may occur in the VOUT pin due to resonance phenomenon of the inductance and the capacitance including $C_L$ on the application. The resonance phenomenon is expected to be weakened by inserting a series resistor into the resonance path, and the negative voltage is expected to be limited by inserting a protection diode between the VOUT pin and the VSS pin.

- If the input voltage is started up steeply under the condition that the capacitance of $C_L$ is large, the thermal shutdown circuit may be in the detection status by self-heating due to the charge current to $C_L$.

- Make sure of the conditions for the input voltage, output voltage and the load current so that the internal loss does not exceed the power dissipation.

- Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in electrostatic protection circuit.

- When considering the output current value that the IC is able to output, make sure of the output current value specified in Table 6 in "Electrical Characteristics" and footnote "5" of the table.

- Wiring patterns on the application related to the VIN pin, the VOUT pin and the VSS pin should be designed so that the impedance is low. When mounting $C_{IN}$ between the VIN pin and the VSS pin and $C_L$ between the VOUT pin and the VSS pin, connect the capacitors as close as possible to the respective destination pins of the IC.

- In the package equipped with heat sink of backside, mount the heat sink firmly. Since the heat radiation differs according to the condition of the application, perform thorough evaluation with an actual application to confirm no problems happen.

- ABLIC Inc. claims no responsibility for any disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.
■ Characteristics (Typical Data)

1. Output voltage vs. Output current (When load current increases) (Ta = +25°C)

1.1 $V_{OUT} = 1.0 \, \text{V}$

![Graph 1.1](image)

1.2 $V_{OUT} = 3.0 \, \text{V}$

![Graph 1.2](image)

Remark: In determining the output current, attention should be paid to the following.

1. The minimum output current value and footnote *5 of Table 6 in "Electrical Characteristics".
2. Power dissipation.

2. Output voltage vs. Input voltage (Ta = +25°C)

2.1 $V_{OUT} = 1.0 \, \text{V}$

![Graph 2.1](image)

2.2 $V_{OUT} = 3.0 \, \text{V}$

![Graph 2.2](image)

3. Dropout voltage vs. Output current

3.1 $V_{OUT} = 3.0 \, \text{V}$

![Graph 3.1](image)

4. Dropout voltage vs. Junction temperature

4.1 $V_{OUT} = 3.0 \, \text{V}$

![Graph 4.1](image)
5. Dropout voltage vs. Set output voltage (Ta = +25°C)

![Dropout voltage graph](image)

6. Output voltage vs. Junction temperature

6.1 \( \text{V}_{\text{OUT}} = 1.0 \text{ V} \)

![Output voltage graph](image)

6.2 \( \text{V}_{\text{OUT}} = 3.0 \text{ V} \)

![Output voltage graph](image)

7. Current consumption during operation vs. Input voltage (When ON / OFF pin is ON, no load)

7.1 \( \text{V}_{\text{OUT}} = 1.0 \text{ V} \)

![Current consumption graph](image)

7.2 \( \text{V}_{\text{OUT}} = 3.0 \text{ V} \)

![Current consumption graph](image)

8. Current consumption during operation vs. Junction temperature

8.1 \( \text{V}_{\text{OUT}} = 1.0 \text{ V} \)

![Current consumption graph](image)

8.2 \( \text{V}_{\text{OUT}} = 3.0 \text{ V} \)

![Current consumption graph](image)
9. Current consumption during operation vs. Output current (Ta = +25°C)

9.1 \( V_{\text{OUT}} = 1.0 \text{ V} \)

\[ V_{\text{IN}} = 2.5 \text{ V} \]

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
I_{\text{OUT}} [\text{mA}] & 0 & 100 & 200 & 300 & 400 & 500 & 600 \\
\hline
I_{\text{SS}} [\mu\text{A}] & 0 & 50 & 100 & 150 & 200 & 250 & 300 \\
\hline
\end{array}
\]

9.2 \( V_{\text{OUT}} = 3.0 \text{ V} \)

\[ V_{\text{IN}} = 4.0 \text{ V} \]

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
I_{\text{OUT}} [\text{mA}] & 0 & 100 & 200 & 300 & 400 & 500 & 600 \\
\hline
I_{\text{SS}} [\mu\text{A}] & 0 & 50 & 100 & 150 & 200 & 250 & 300 \\
\hline
\end{array}
\]

10. Ripple rejection (Ta = +25°C)

10.1 \( V_{\text{OUT}} = 1.0 \text{ V} \)

\[ V_{\text{IN}} = 3.0 \text{ V}, C_L = 2.2 \mu\text{F} \]

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{Frequency [Hz]} & 10 & 100 & 1k & 10k & 100k & 1M \\
\hline
\text{Ripple Rejection [dB]} & 0 & 20 & 40 & 60 & 80 & 100 \\
\hline
\end{array}
\]

10.2 \( V_{\text{OUT}} = 3.0 \text{ V} \)

\[ V_{\text{IN}} = 4.0 \text{ V}, C_L = 2.2 \mu\text{F} \]

\[
\begin{array}{|c|c|c|c|c|c|c|}
\hline
\text{Frequency [Hz]} & 10 & 100 & 1k & 10k & 100k & 1M \\
\hline
\text{Ripple Rejection [dB]} & 0 & 20 & 40 & 60 & 80 & 100 \\
\hline
\end{array}
\]
Reference Data

1. Characteristics of input transient response (Ta = +25°C)

1.1 $V_{OUT} = 1.0\,V$

$I_{OUT} = 100\,mA$, $C_L = 2.2\,\mu F$, $V_IN = 2.5\,V \leftrightarrow 3.5\,V$, $t_r = t_f = 5.0\,\mu s$

1.2 $V_{OUT} = 3.0\,V$

$I_{OUT} = 100\,mA$, $C_L = 2.2\,\mu F$, $V_IN = 4.0\,V \leftrightarrow 5.0\,V$, $t_r = t_f = 5.0\,\mu s$

2. Characteristics of load transient response (Ta = +25°C)

2.1 $V_{OUT} = 1.0\,V$

$V_IN = 2.5\,V$, $C_L = 2.2\,\mu F$, $I_{OUT} = 50\,mA \leftrightarrow 100\,mA$

2.2 $V_{OUT} = 3.0\,V$

$V_IN = 4.0\,V$, $C_L = 2.2\,\mu F$, $I_{OUT} = 50\,mA \leftrightarrow 100\,mA$

ABLIC Inc.
3. Transient response characteristics of ON / OFF pin (Ta = +25°C)

3.1 \( \text{V}_{\text{OUT}} = 1.0 \text{ V} \)
\( \text{V}_{\text{IN}} = 2.5 \text{ V}, \text{C}_{\text{IN}} = \text{C}_{\text{L}} = 2.2 \mu\text{F}, \)
\( \text{I}_{\text{OUT}} = 100 \text{ mA}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow 2.5 \text{ V} \)

3.2 \( \text{V}_{\text{OUT}} = 3.0 \text{ V} \)
\( \text{V}_{\text{IN}} = 4.0 \text{ V}, \text{C}_{\text{IN}} = \text{C}_{\text{L}} = 2.2 \mu\text{F}, \)
\( \text{I}_{\text{OUT}} = 100 \text{ mA}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow 4.0 \text{ V} \)

4. Soft-start time vs. Characteristics of operation ambient temperature
\( \text{V}_{\text{IN}} = 2.5 \text{ V}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow 2.5 \text{ V} (\text{V}_{\text{OUT(S)}} < 1.5 \text{ V}), \)
\( \text{V}_{\text{IN}} = \text{V}_{\text{OUT}} + 1.0 \text{ V}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow \text{V}_{\text{OUT}} + 1.0 \text{ V} (1.5 \text{ V} \leq \text{V}_{\text{OUT(S)}}), \)
\( \text{C}_{\text{IN}} = \text{C}_{\text{L}} = 2.2 \mu\text{F}, \text{CSS} = 10 \text{ nF} \)

5. Soft-start time vs. Characteristics of soft-start capacitance (Ta = +25°C)
\( \text{V}_{\text{IN}} = 2.5 \text{ V}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow 2.5 \text{ V} (\text{V}_{\text{OUT(S)}} < 1.5 \text{ V}), \)
\( \text{V}_{\text{IN}} = \text{V}_{\text{OUT}} + 1.0 \text{ V}, \text{V}_{\text{ON} / \text{OFF}} = 0 \text{ V} \rightarrow \text{V}_{\text{OUT}} + 1.0 \text{ V} (1.5 \text{ V} \leq \text{V}_{\text{OUT(S)}}), \)
\( \text{C}_{\text{IN}} = \text{C}_{\text{L}} = 2.2 \mu\text{F} \)
6. Inrush current characteristics (Ta = +25°C)

6.1 \( V_{\text{OUT}} = 1.0 \text{ V} \)

\[
\begin{align*}
V_{\text{IN}} &= 2.5 \text{ V}, \quad I_{\text{OUT}} = 100 \text{ mA}, \quad C_L = 2.2 \mu\text{F}, \quad C_{SS} = 1 \text{ nF} \\
V_{\text{IN}} &= 2.5 \text{ V}, \quad I_{\text{OUT}} = 100 \text{ mA}, \quad C_L = 2.2 \mu\text{F}, \quad C_{SS} = 10 \text{ nF}
\end{align*}
\]

6.2 \( V_{\text{OUT}} = 3.0 \text{ V} \)

\[
\begin{align*}
V_{\text{IN}} &= 4.0 \text{ V}, \quad I_{\text{OUT}} = 100 \text{ mA}, \quad C_L = 2.2 \mu\text{F}, \quad C_{SS} = 1 \text{ nF} \\
V_{\text{IN}} &= 4.0 \text{ V}, \quad I_{\text{OUT}} = 100 \text{ mA}, \quad C_L = 2.2 \mu\text{F}, \quad C_{SS} = 10 \text{ nF}
\end{align*}
\]
7. Output capacitance vs. Characteristics of discharge time (Ta = +25°C)

\[ V_{IN} = 2.5 \text{ V}, \quad V_{ON/OFF} = 2.5 \text{ V} \rightarrow VSS \quad (V_{OUT(S)} < 1.5 \text{ V}) \]
\[ V_{IN} = V_{OUT} + 1.0 \text{ V}, \quad V_{ON/OFF} = V_{OUT} + 1.0 \text{ V} \rightarrow VSS \quad (1.5 \text{ V} \leq V_{OUT(S)}) \]
\[ I_{OUT} = 1 \text{ mA}, \quad t = 1 \mu\text{s} \]

**Figure 14** With Discharge Shunt Function

8. Example of equivalent series resistance vs. Output current characteristics (Ta = +25°C)

**Figure 16**

\[ C_{IN} = C_L = 2.2 \mu\text{F} \]

**Figure 17**

*1. C_L: TDK Corporation CGA6M2X8R1E225K (2.2 \mu\text{F})
**Power Dissipation**

**SOT-89-5**

![Power Dissipation Graph](image)

<table>
<thead>
<tr>
<th>Board</th>
<th>Power Dissipation ($P_D$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.05 W</td>
</tr>
<tr>
<td>B</td>
<td>1.49 W</td>
</tr>
<tr>
<td>C</td>
<td>–</td>
</tr>
<tr>
<td>D</td>
<td>2.72 W</td>
</tr>
<tr>
<td>E</td>
<td>3.57 W</td>
</tr>
</tbody>
</table>
### SOT-89-5 Test Board

#### Item Specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size [mm]</td>
<td>114.3 x 76.2 x t1.6</td>
</tr>
<tr>
<td>Material</td>
<td>FR-4</td>
</tr>
<tr>
<td>Number of copper foil layer</td>
<td>2</td>
</tr>
<tr>
<td>Copper foil layer [mm]</td>
<td>1 Land pattern and wiring for testing: t0.070</td>
</tr>
<tr>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4 74.2 x 74.2 x t0.070</td>
</tr>
<tr>
<td>Thermal via</td>
<td>-</td>
</tr>
</tbody>
</table>

#### Item Specification

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<td>2 74.2 x 74.2 x t0.035</td>
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<td></td>
<td>3 74.2 x 74.2 x t0.035</td>
</tr>
<tr>
<td></td>
<td>4 74.2 x 74.2 x t0.070</td>
</tr>
<tr>
<td>Thermal via</td>
<td>-</td>
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#### Item Specification

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<tr>
<th>Item</th>
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<tr>
<td>Size [mm]</td>
<td>114.3 x 76.2 x t1.6</td>
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<tr>
<td>Material</td>
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<tr>
<td>Number of copper foil layer</td>
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<tr>
<td>Copper foil layer [mm]</td>
<td>1 Pattern for heat radiation: 2000mm² t0.070</td>
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<tr>
<td></td>
<td>2 74.2 x 74.2 x t0.035</td>
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<tr>
<td></td>
<td>3 74.2 x 74.2 x t0.035</td>
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<tr>
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<td>4 74.2 x 74.2 x t0.070</td>
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<td>Diameter: 0.3 mm</td>
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No. SOT895-A-Board-SD-1.0

ABLIC Inc.
No. UP005-A-C-SD-2.0

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<th>TITLE</th>
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ABLIC Inc.
Enlarged drawing in the central part

No. UP005-A-R-SD-1.1

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