The R1155x is a CMOS-based 24 V input voltage regulator featuring 150 mA output that provides high output voltage accuracy and low supply current. Internally, the R1155x consists of a voltage reference unit, an error amplifier, and a resistor net for setting output voltage. As protection circuits, the R1155x contains a current limit circuit, a fold-back protection circuit, a thermal shutdown circuit and a reverse current protection circuit.

The R1155x is available in the fixed output voltage type (R1155xxxxB), and the adjustable output voltage type (R1155x001C). The output voltage accuracy for the fixed output voltage type is as high as ±2.0%. The R1155x is offered in a 5-pin SOT-89-5 package and a 5-pin SOT-23-5 package.

**FEATURES**

- Supply Current ·········································· Typ. 7.5 µA (VIN = 6.0 V or 3.0 V)
- Standby Current ··········································· Typ. 0.1 µA
- Output Current ··········································· Min. 150 mA (VIN = 6.0 V or 3.0 V)
- Output Voltage Accuracy ······························· ±2.0%
- Package ····················································· SOT-23-5, SOT-89-5
- Input Voltage Range ····································· Max. 24.0 V
- Output Voltage Range ····································· Fixed Output Voltage Type: 2.5 V to 12.0 V
  Adjustable Output Voltage Type: 2.5 V, 2.5 V to 23.0 V using external resistor
- Fold-back Protection Circuit ··············································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································································
SELECTION GUIDE

The output voltage, the output voltage type, and the package type for the ICs are user-selectable options.

**Selection Guide**

<table>
<thead>
<tr>
<th>Product Name</th>
<th>Package</th>
<th>Quantity per Reel</th>
<th>Pb Free</th>
<th>Halogen Free</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1155Nxxx**-TR-FE</td>
<td>SOT-23-5</td>
<td>3,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>R1155Hxxx**-T1-FE</td>
<td>SOT-89-5</td>
<td>1,000 pcs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**xxx**: Designation of the output voltage ($V_{SET}$)
- For Fixed Output Voltage Type: 2.5 V (025) to 12 V (120) in 0.1 V steps
- For Adjustable Output Voltage Type: 2.5 V (001) only

****: Designation of the output voltage type
- (B) Fixed Output Voltage Type
- (C) Adjustable Output Voltage Type

---

**BLOCK DIAGRAMS**

R1155xxxxB Block Diagram
(Fixed Output Voltage Type)

R1155x001C Block Diagram
(Adjustable Output Voltage Type)
### PIN DESCRIPTION

**SOT-23-5 Pin Configuration**

![SOT-23-5 Pin Configuration](image)

**SOT-89-5 Pin Configuration**

![SOT-89-5 Pin Configuration](image)

#### SOT-23-5 Pin Description

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VOUT</td>
<td>VR Output Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
<tr>
<td>4</td>
<td>TP$^1$</td>
<td>R1155NxxxB</td>
</tr>
<tr>
<td></td>
<td>VFB$^2$</td>
<td>R1155N001C$^3$</td>
</tr>
<tr>
<td>5</td>
<td>CE</td>
<td>Chip Enable Pin, Active-high</td>
</tr>
</tbody>
</table>

#### SOT-89-5 Pin Description

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VOUT</td>
<td>VR Output Pin</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground Pin</td>
</tr>
<tr>
<td>3</td>
<td>CE</td>
<td>Chip Enable Pin, Active-high</td>
</tr>
<tr>
<td>4</td>
<td>TP$^1$</td>
<td>R1155HxxxB</td>
</tr>
<tr>
<td></td>
<td>VFB$^2$</td>
<td>R1155H001C$^3$</td>
</tr>
<tr>
<td>5</td>
<td>VDD</td>
<td>Input Pin</td>
</tr>
</tbody>
</table>

---

1. The TP pin must be connected to GND.
2. A 24 MΩ or less voltage setting resistor must be connected to the VFB pin.
3. As for the adjustable output voltage type (R1155N001C), please refer to **ADJUSTABLE OUTPUT VOLTAGE TYPE SETTING**.
PIN EQUIVALENT CIRCUIT DIAGRAMS

VOUT Pin Equivalent Circuit Diagram

VFB Pin Equivalent Circuit Diagram

TP Pin Equivalent Circuit Diagram (R1155xxxxB)

VFB Pin Equivalent Circuit Diagram (R1155x001C)
ABSOLUTE MAXIMUM RATINGS

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIN</td>
<td>Input Voltage</td>
<td>−0.3 to 26</td>
<td>V</td>
</tr>
<tr>
<td>VCE</td>
<td>Input Voltage (CE Pin)</td>
<td>−0.3 to VIN +0.3</td>
<td>V</td>
</tr>
<tr>
<td>VOUT</td>
<td>Output Voltage</td>
<td>−0.3 to 26</td>
<td>V</td>
</tr>
<tr>
<td>VVFB</td>
<td>Output Voltage (VFB Pin)</td>
<td>−0.3 to 26</td>
<td>V</td>
</tr>
<tr>
<td>IOUT</td>
<td>Output Current</td>
<td>350</td>
<td>mA</td>
</tr>
<tr>
<td>PD</td>
<td>Power Dissipation (Standard Land Pattern)</td>
<td>SOT-23-5 420</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOT-89-5 900</td>
<td></td>
</tr>
<tr>
<td>Tj</td>
<td>Junction Temperature</td>
<td>−40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</td>
<td>Storage Temperature Range</td>
<td>−55 to 125</td>
<td>°C</td>
</tr>
</tbody>
</table>

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING CONDITIONS

Recommended Operating Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ta</td>
<td>Operating Temperature Range</td>
<td>−40 to 105</td>
<td>°C</td>
</tr>
<tr>
<td>VIN</td>
<td>Input Voltage</td>
<td>3.5 to 24</td>
<td>V</td>
</tr>
</tbody>
</table>

RECOMMENDED OPERATING RATINGS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating ratings. The semiconductor devices cannot operate normally over the recommended operating ratings, even if when they are used over such ratings by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating ratings.

1 Refer to POWER DISSIPATION in SUPPLEMENTARY ITEMS for detail information.
**R1155x**

NO.EA-270-150702

**ELECTRICAL CHARACTERISTICS**

\( V_{IN} = V_{CE} = V_{SET} + 3.0 \, \text{V}, \, C_{OUT} = 4.7 \, \mu \text{F}, \, I_{OUT} = 1 \, \text{mA}, \) unless otherwise noted.

The specifications surrounded by \( [\text{ }] \) are guaranteed by Design Engineering at \(-40^\circ \text{C} \leq T_a \leq 105^\circ \text{C}\).

### R1155xxxxB, R1155x001C Electrical Characteristics (\( T_a = 25^\circ \text{C} \))

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I(_{LIM})</td>
<td>Output Current</td>
<td>( V_{IN} = V_{SET} + 4 , \text{V} )</td>
<td>150</td>
<td>mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V(_{OUT})</td>
<td>Output Voltage (Low Power Mode)</td>
<td>( I_{OUT} = 1 , \text{mA} )</td>
<td>( Ta = 25^\circ \text{C} ) ( x0.98 )</td>
<td>V ( -40^\circ \text{C} \leq Ta \leq 105^\circ \text{C} ) ( x1.02 )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I(_{SS1})</td>
<td>Supply Current (Low Power Mode)</td>
<td>( I_{OUT} = 0 , \text{mA} )</td>
<td>2.5 ( \leq V_{SET} \leq 4.2 , \text{V} )</td>
<td>7.5</td>
<td>( \mu \text{A} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.2 ( &lt; V_{SET} \leq 8.4 , \text{V} )</td>
<td>8.6</td>
<td>( \mu \text{A} )</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.4 ( &lt; V_{SET} \leq 12 , \text{V} )</td>
<td>9.5</td>
<td>( \mu \text{A} )</td>
<td></td>
</tr>
<tr>
<td>I(_{SS2})</td>
<td>Supply Current (Fast Mode)</td>
<td>( I_{OUT} = 10 , \text{mA} )</td>
<td>65</td>
<td>( \mu \text{A} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I(_{standby})</td>
<td>Standby Current</td>
<td>( V_{IN} = 24 , \text{V}, , V_{CE} = 0 , \text{V} )</td>
<td>0.1</td>
<td>( \mu \text{A} )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta V_{OUT})</td>
<td>Output Voltage Deviation When Switching Mode</td>
<td>( 1 , \text{mA} \leq I_{OUT} \leq 6 , \text{mA} )</td>
<td>-1.5</td>
<td>0</td>
<td>1.5</td>
<td>%</td>
</tr>
<tr>
<td>( \Delta V_{OUT} / \Delta I_{OUT})</td>
<td>Load Regulation (Fast Mode)</td>
<td>6 ( \text{mA} \leq I_{OUT} \leq 150 , \text{mA} )</td>
<td>2.5 ( \leq V_{SET} \leq 5 , \text{V} )</td>
<td>30</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 ( &lt; V_{SET} \leq 12 , \text{V} )</td>
<td>30</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>( \Delta V_{OUT} / \Delta V_{IN})</td>
<td>Line Regulation (Low Power Mode)</td>
<td>( V_{SET} + 0.2 , \text{V} \leq V_{IN} \leq 24 , \text{V} )</td>
<td>( I_{OUT} = 1 , \text{mA} )</td>
<td>0.3</td>
<td>1.3</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>Line Regulation (Fast Mode)</td>
<td>( V_{SET} + 0.2 , \text{V} \leq V_{IN} \leq 24 , \text{V} )</td>
<td>( I_{OUT} = 10 , \text{mA} )</td>
<td>1.2</td>
<td>2.4</td>
<td>%</td>
</tr>
<tr>
<td>V(_{DIF})</td>
<td>Dropout Voltage</td>
<td>( I_{OUT} = 150 , \text{mA} )</td>
<td>2.5V ( \leq V_{SET} &lt; 3.3 , \text{V} ) &amp; 1.6</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.3V ( \leq V_{SET} &lt; 5 , \text{V} ) &amp; 0.96</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 ( \leq V_{SET} \leq 12 , \text{V} ) &amp; 0.55</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RR</td>
<td>Ripple Rejection (Fast Mode)</td>
<td>( f = 1 , \text{kHz}, , 0.5 , \text{Vp-p} )</td>
<td>( I_{OUT} = 10 , \text{mA} )</td>
<td>2.5 ( \leq V_{SET} \leq 5 , \text{V} ) &amp; 60</td>
<td>dB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 ( \leq V_{SET} \leq 12 , \text{V} ) &amp; 50</td>
<td>dB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \Delta V_{OUT} / \Delta T_a)</td>
<td>Output Voltage Temperature Coefficient</td>
<td>( I_{OUT} = 1 , \text{mA}, , -40^\circ \text{C} \leq Ta \leq 105^\circ \text{C} )</td>
<td>±100</td>
<td>ppm/°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I(_{OUTH})</td>
<td>Fast Mode Switching Current</td>
<td>( I_{OUT} = \text{Light Load} \rightarrow \text{Heavy Load} )</td>
<td>2.4</td>
<td>4.5</td>
<td>8.5</td>
<td>mA</td>
</tr>
<tr>
<td>I(_{OUTL})</td>
<td>Low Power Mode Switching Current</td>
<td>( I_{OUT} = \text{Heavy Load} \rightarrow \text{Light Load} )</td>
<td>3.6</td>
<td>1.5</td>
<td>2.4</td>
<td>mA</td>
</tr>
<tr>
<td>I(_{SC})</td>
<td>Short Current Limit</td>
<td>( V_{OUT} = 0 , \text{V} )</td>
<td>30</td>
<td>mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V(_{CEH})</td>
<td>CE Input Voltage “H”</td>
<td></td>
<td>1.35</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V(_{CEL})</td>
<td>CE Input Voltage “L”</td>
<td></td>
<td>0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T(_{TSD})</td>
<td>Thermal Shutdown Temperature</td>
<td>Junction Temperature</td>
<td>145</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T(_{TSR})</td>
<td>Thermal Shutdown Released Temperature</td>
<td>Junction Temperature</td>
<td>120</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All test items listed under **ELECTRICAL CHARACTERISTICS** are done under the pulse load condition (\( T_j \approx Ta = 25^\circ \text{C} \)) except for Ripple Rejection and Output Voltage Temperature Coefficient.
ELECTRICAL CHARACTERISTICS (continued)

VIN = VCE = VSET + 3.0 V, COUT = 4.7 μF, IOUT = 1 mA, unless otherwise noted.

The specifications surrounded by are guaranteed by Design Engineering at −40°C ≤ Ta ≤ 105°C.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Item</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IREV</td>
<td>Reverse Current Limit</td>
<td>CE = GND, VIN = VSET + 0.02 V</td>
<td>2.5 ≤ VSET &lt; 5 V</td>
<td>1.0</td>
<td>3.5</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 ≤ VSET ≤ 12 V</td>
<td>2.0</td>
<td>6.0</td>
<td>μA</td>
</tr>
<tr>
<td>VREV_DET</td>
<td>Reverse Current Protection Mode Detection Offset1</td>
<td>VREV = VDD - VOUT</td>
<td>0 ≤ VIN ≤ 24.0 V, VOUT ≥ 2.0 V</td>
<td>20</td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>VREV_REL</td>
<td>Reverse Current Protection Mode Release Offset1</td>
<td>0 ≤ VIN ≤ 24.0 V, VOUT ≥ 2.0 V</td>
<td></td>
<td>220</td>
<td></td>
<td>mV</td>
</tr>
</tbody>
</table>

All test items listed under ELECTRICAL CHARACTERISTICS are done under the pulse load condition (Tj ≈Ta = 25°C) except for Ripple Rejection and Output Voltage Temperature Coefficient.

---

1 The operation of reverse current protection circuit is guaranteed when VOUT ≥ 2.0 V. The reverse current protection mode is always turned on when VIN = 0 V.
THEORY OF OPERATION

Power Activation

When starting up the IC using the input voltages of the VDD and CE pins simultaneously with no load, the both pin voltages have to be 0.06 V/ ms or faster. When starting up the IC using the both pin voltages at 0.06 V/ ms or slower with no load, the VDD pin has to be started up before the CE pin.

Thermal Shutdown Circuit

The R1155x contains a thermal shutdown circuit, which stops regulator operation if the junction temperature of the R1155x becomes higher than 145°C (Typ.). Additionally, if the junction temperature after the regulator being stopped decreases to a level below 120°C (Typ.), it restarts regulator operation. As a result the operation of the thermal shutdown circuit causes the regulator repeatedly to turn off and on until the causes of overheating are removed. As a consequence a pulse shaped output voltage occurs.

Reverse Current Protection Circuit

The R1155x includes a reverse current protection circuit, which stops the reverse current flowing from the VOUT to VDD pins or to GND pin when VOUT becomes more than VIN. Usually, the LDO using Pch output transistor contains a parasitic diode between VDD pin and VOUT pin. Therefore, if VOUT is more than VIN, the parasitic diode becomes forward direction. As a result, the current flows from VOUT pin to VDD pin.

The R1155x switches the mode to the reverse current protection mode before VIN becomes smaller than VOUT by connecting the parasitic diode of Pch output transistor to the backward direction, and connecting the gate to VOUT pin. As a result, the Pch output transistor is turned off and the all the current pathways from VOUT pin to GND pin are shut down to maintain the reverse current lower than [IREV] of the Electrical Characteristics.

Switching to either the normal mode or to the reverse current protection mode is determined by the magnitude of VIN voltage and VOUT voltage. For the stable operation, offset and hysteresis are set as the threshold. The detection/ release thresholds of both normal and reverse current protection modes are specified by [VREV_DET] and [VREV_REL] of the Electrical Characteristics. Therefore, the minimum dropout voltage under the small load current condition is restricted by the value of [VREV_REL].

Figure 7 and Figure 8 show the normal operation mode and reverse current protection mode, respectively. Figure 9 shows the detection/ release timing of reverse current protection function. When giving the VOUT pin a constant-voltage and decreasing the VIN voltage, the dropout voltage will become lower than the [VREV_DET]. As a result, the reverse current protection starts to function to stop the load current. By increasing the dropout voltage more than the [VREV_REL], the protection mode will be released to let the load current to flow. If the dropout voltage to be used is smaller than [VREV_REL], the detection and the release may be repeated.

The operation coverage of the reverse current protection circuit is VOUT ≥ 1.5 V. However, under the condition of VIN = 0 V, always the reverse current protection mode is operating.
Normal Operation Mode

Reverse Current Protection Mode

Detection/Release Timing of Reverse Current Protection Function
APPLICATION INFORMATION

Technical Notes on the Components Selection

- In the R1155x, phase compensation is provided to secure stable operation even when the load current is varied. For this purpose, use a 4.7 μF or more output capacitor (C_OUT) with good frequency characteristics and proper ESR (Equivalent Series Resistance). In case of using a tantalum type capacitor and the ESR value of the capacitor is large, the output might be unstable. Evaluate the circuit including consideration of frequency characteristics.

- Ensure the VDD and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect C_OUT with suitable values between the VOUT and GND pins, and as close as possible to the pins. Please refer to Figure 5 and Figure 6 below.
Adjustable Output Voltage Type Setting (R1155x001C)

The output voltage of the R1155x001C can be adjusted up to 23 V by using the external divider resistors (R1, R2). The resistance value for R2 should be set to 24 MΩ or less. By using the following equations, the output voltage can be determined. $V_{FB}$ voltage which is fixed inside the IC is described as $setV_{FB}$. $setV_{FB}$ is 2.5 V. When using the R1155x001C with 2.5 V, please connect the VOUT pin to the VFB pin.

![Output Voltage Adjustment Using External Divider Resistors](image)

Output Voltage Adjustment Using External Divider Resistors

\[ I_1 = I_{IC} + I_2 \] \hspace{1cm} (1)

\[ I_2 = \frac{setV_{FB}}{R_2} \] \hspace{1cm} (2)

Thus,

\[ I_1 = I_{IC} + \frac{setV_{FB}}{R_2} \] \hspace{1cm} (3)

Therefore,

\[ V_{OUT} = setV_{FB} + R_1 \times I_1 \] \hspace{1cm} (4)

Insert Equation (3) into Equation (4), so

\[ V_{OUT} = setV_{FB} + \frac{R_1 \times (I_{IC} + \frac{setV_{FB}}{R_2})}{R_2} \]

\[ = setV_{FB} \times (1 + \frac{R_1}{R_2}) + \frac{R_1 \times I_{IC}}{R_2} \] \hspace{1cm} (5)

In Equation (5), $R_1 I_{IC}$ is the error-causing factor in $V_{OUT}$.

As for $I_{IC}$,

\[ I_{IC} = \frac{setV_{FB}}{R_{IC}} \] \hspace{1cm} (6)

Therefore, the error-causing factor $R_1 I_{IC}$ can be described as follows.

\[ R_1 \times I_{IC} = R_1 \times \frac{setV_{FB}}{R_{IC}} \]

\[ = setV_{FB} \times \frac{R_1}{R_{IC}} \] \hspace{1cm} (7)

For better accuracy, choosing $R_1 << R_{IC}$ reduces this error.

Without the error-causing factor $R_1 I_{IC}$, the output voltage can be calculated by the following equation.

\[ V_{OUT} = setV_{FB} \times \left(\frac{R_1 + R_2}{R_2}\right) \] \hspace{1cm} (8)

$R_{IC}$ of the R1155x001C is approximately Typ.8.4 MΩ ($Ta = 25°C$, guaranteed by Design Engineering).

$R_{IC}$ could be affected by the temperature, therefore evaluate the circuit taking the actual conditions of use into account when deciding the resistance values for R1 and R2.
Equivalent Series Resistance (ESR) vs. Output Current (I\textsubscript{OUT})

It is recommended that a ceramic type capacitor be used for the R1155x. However, other types of capacitors having lower ESR can also be used. The relation between the output current (I\textsubscript{OUT}) and the ESR of output capacitor is shown below.

**Measurement Conditions:**
- Noise Frequency Band: 10 Hz to 2 MHz
- Measurement Temperature: −40°C to +105°C
- Hatched Area: Noise level is 40 µV (avg.) or below.
- C\textsubscript{IN}: 0.1 µF
- C\textsubscript{OUT}: 4.7 µF
TYPICAL CHARACTERISTICS

Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (C_{IN} = 0.1 \mu F, C_{OUT} = 4.7 \mu F, Ta = 25^\circ C)

R1155x025B/R1155x001C

2) Output Voltage vs. Input Voltage (C_{IN} = 0.1 \mu F, C_{OUT} = 4.7 \mu F, Ta = 25^\circ C)

R1155x025B/R1155x001C
3) Dropout Voltage vs. Output Current \((C_{IN} = 0.1 \mu F, \ C_{OUT} = 4.7 \mu F)\)

4) Dropout Voltage vs. Set Output Voltage
\((C_{IN} = 0.1 \mu F, \ C_{OUT} = 4.7 \mu F, \ Ta = 25^\circ C)\)
5) Ripple Rejection vs. Frequency (CIN = none, COUT = 4.7 μF, Ripple = 0.2 V P-P, Ta = 25°C)

- **R1155x025B**: 
  - $V_{IN} = 5.5V$
  - IOUT = 1mA, 30mA, 150mA

- **R1155x050B**: 
  - $V_{IN} = 8V$
  - IOUT = 1mA, 30mA, 150mA

- **R1155x120B**: 
  - $V_{IN} = 14V$
  - IOUT = 1mA, 30mA, 150mA
6) Output Voltage vs. Operating Temperature (C\textsubscript{IN} = 0.1 μF, C\textsubscript{OUT} = 4.7 μF, Ta = 25°C, I\textsubscript{OUT} = 1 mA)

R1155x025B/R1155x001C

R1155x050B

7) Supply Current vs. Input Voltage (C\textsubscript{IN} = 0.1 μF, C\textsubscript{OUT} = 4.7 μF, Ta = 25°C)

R1155x025B/R1155x001C

R1155x050B
8) Supply Current vs. Operating Temperature (C\text{IN} = 0.1 \, \mu\text{F}, C\text{OUT} = 4.7 \, \mu\text{F})
9) Supply Current vs. Output Current \((C_{IN} = 0.1 \ \mu F, \ C_{OUT} = 4.7 \ \mu F, \ Ta = 25^\circ C)\)

R1155x025B/R1155x001C

- Supply Current \(I_{SS}\) vs. Output Current \(I_{OUT}\) for different operating conditions.

R1155x050B

- Mode Switching Current \(I_{OUTH}\) vs. Operating Temperature \(Ta\) for different operating conditions.

R1155x120B

- Supply Current \(I_{SS}\) vs. Output Current \(I_{OUT}\) for different operating conditions.

10) Mode Switching Current vs. Operating Temperature \((C_{IN} = 0.1 \ \mu F, \ C_{OUT} = 4.7 \ \mu F)\)

R1155x025B/R1155x001C

- Mode Switching Current \(I_{OUTH}\) vs. Operating Temperature \(Ta\) for different operating conditions.

R1155x050B

- Mode Switching Current \(I_{OUTH}\) vs. Operating Temperature \(Ta\) for different operating conditions.
11) Input Transient Response (C_{OUT} = 4.7 \mu F, Ta = 25°C)

**R1155x120B**

![Graph showing input and output voltage over time](image)

**R1155x025B**

![Graph showing input and output voltage over time](image)

**R1155x050B**

![Graph showing input and output voltage over time](image)
12) Load Transient Response (C_{out} = 4.7 \ \mu F, \ Ta = 25^\circ C)

**R1155x120B**

- TR=TF=5\mu s, \ I_{out} = 1mA

**R1155x120B**

- TR=TF=5\mu s, \ I_{out} = 20mA

**R1155x025B**

- TR=TF=0.5\mu s, \ V_{in} = 5.5V

**R1155x025B**

- TR=TF=0.5\mu s, \ V_{in} = 5.5V

**R1155x050B**

- TR=TF=0.5\mu s, \ V_{in} = 8V

**R1155x050B**

- TR=TF=0.5\mu s, \ V_{in} = 8V
13) CE Input Voltage vs. Output Voltage vs. Inrush Current ($C_{IN} = 0.1 \mu F$, $C_{OUT} = 4.7 \mu F$, $T_a = 25^\circ C$)

R1155x120B

R1155x120B

R1155x25B

R1155x50B

R1155x120B

R1155x120B

R1155x120B

R1155x120B

R1155x120B

R1155x120B
Power Dissipation (Pd) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement. This data is taken from SOT-23-6.

**Measurement Conditions**

<table>
<thead>
<tr>
<th>Environment</th>
<th>Standard Land Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Mounting on Board (Wind Velocity = 0 m/s)</td>
</tr>
<tr>
<td>Board Material</td>
<td>Glass Cloth Epoxy Plastic (Double-sided)</td>
</tr>
<tr>
<td>Board Dimensions</td>
<td>40 mm x 40 mm x 1.6 mm</td>
</tr>
<tr>
<td>Copper Ratio</td>
<td>Top-side: Approx. 50%, Back-side: Approx. 50%</td>
</tr>
<tr>
<td>Through-holes</td>
<td>φ 0.5 mm x 44 pcs</td>
</tr>
</tbody>
</table>

**Measurement Result**

<table>
<thead>
<tr>
<th></th>
<th>Standard Land Pattern</th>
<th>Free Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>420 mW</td>
<td>250 mW</td>
</tr>
<tr>
<td>Thermal Resistance</td>
<td>$\theta_ja = (125 - 25^\circ C) / 0.42 W = 238^\circ C/W$</td>
<td>400^\circ C/W</td>
</tr>
</tbody>
</table>

---

**Power Dissipation (mW) vs. Temperature (°C)**

---

**Measurement Board Pattern**

---

**IC Mount Area (Unit: mm)**
SOT-23-5 Package Dimensions

(Unit: mm)
Power Dissipation (P_0) of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

### Measurement Conditions

<table>
<thead>
<tr>
<th></th>
<th>High Wattage Land Pattern</th>
<th>Standard Land Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Mounting on Board (Wind Velocity = 0 m/s)</td>
<td>Mounting on Board (Wind Velocity = 0 m/s)</td>
</tr>
<tr>
<td>Board Material</td>
<td>Glass Cloth Epoxy Plastic (Double-sided)</td>
<td>Glass Cloth Epoxy Plastic (Double-sided)</td>
</tr>
<tr>
<td>Board Dimensions</td>
<td>30 mm x 30 mm x 1.6 mm</td>
<td>50 mm x 50 mm x 1.6 mm</td>
</tr>
<tr>
<td>Copper Ratio</td>
<td>Top-side: Approx. 20%, Back-side: Approx. 100%</td>
<td>Top-side: Approx. 10%, Back-side: Approx. 100%</td>
</tr>
<tr>
<td>Through-hole</td>
<td>φ0.85 mm x 10 pcs</td>
<td>-</td>
</tr>
</tbody>
</table>

### Measurement Result

(Ta = 25°C, Tjmax = 125°C)

<table>
<thead>
<tr>
<th></th>
<th>High Wattage Land Pattern</th>
<th>Standard Land Pattern</th>
<th>Free Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Dissipation</td>
<td>1300 mW</td>
<td>900 mW</td>
<td>500 mW</td>
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<tr>
<td>Thermal Resistance</td>
<td>77°C/W</td>
<td>111°C/W</td>
<td>200°C/W</td>
</tr>
</tbody>
</table>

**Power Dissipation (mW) vs. Temperature (°C)**

**Measurement Board Pattern**
SOT-89-5 Package Dimensions

(Unit: mm)
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