

# HA17800V/VP/VPJ Series

## 3-terminal Fixed Voltage Regulators

# HITACHI

ADE-204-053 (Z)

Rev. 0

Dec. 2000

### Description

HA17800V series is positive output 1 A three-terminal regulator IC. Which features are as follows. It is designed to suit to the power supply of various equipments and to stabilize the multi switching regulator voltage, and to supply power to some kind of control devices.

### Features

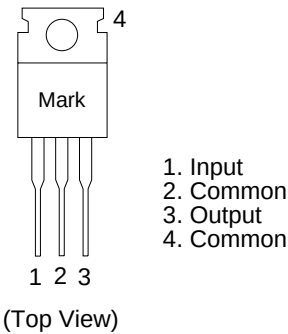
- High ripple rejection ratio up to high frequency  
(f 20 kHz): 60 dB(in the case of HA17805V/VP/VPJ)
- Protected against oscillation
- Regulated output voltage against temperature  
(0 Ta 125°C, 80 ppm/°C typ)
- Hard to breakdown against irrelevant connection
- Built-in circuits as over current control circuit, temperature protection circuit, and area of safety operation control circuit

### Ordering Information

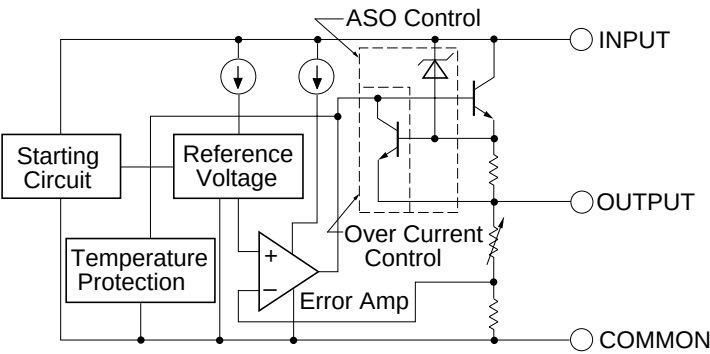
| Output Voltage (V) | Automotive Use | Industrial Use | Commercial Use | Package    |
|--------------------|----------------|----------------|----------------|------------|
| 5                  | HA17805VPJ     | HA17805VP      | HA17805V       | TO - 220AB |
| 6                  | HA17806VPJ     | HA17806VP      | HA17806V       |            |
| 7                  | HA17807VPJ     | HA17807VP      | HA17807V       |            |
| 8                  | HA17808VPJ     | HA17808VP      | HA17808V       |            |
| 12                 | HA17812VPJ     | HA17812VP      | HA17812V       |            |
| 15                 | HA17815VPJ     | HA17815VP      | HA17815V       |            |
| 18                 | HA17818VPJ     | HA17818VP      | HA17818V       |            |
| 24                 | HA17824VPJ     | HA17824VP      | HA17824V       |            |

# HA17800V/VP/VPJ Series

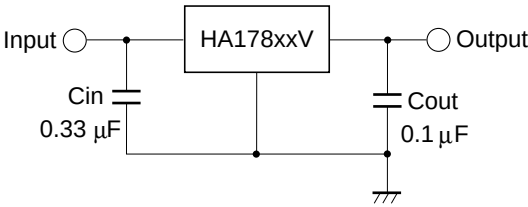
## Pin Arrangement



## Block Diagram



## Standard Circuit

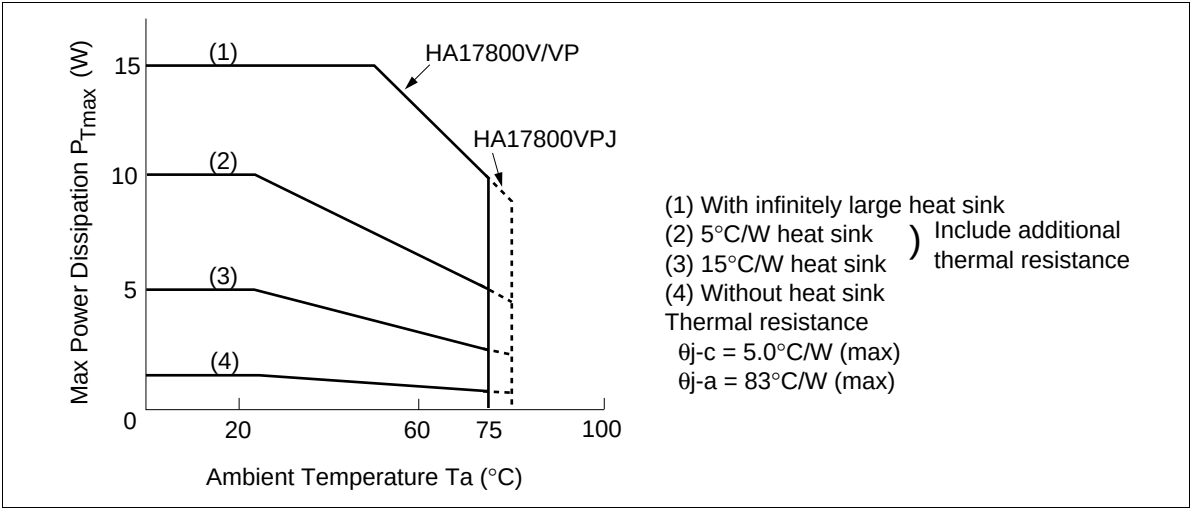


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Absolute Maximum Ratings (Ta = 25°C)

| Item                           | Symbol          | Ratings     |             | Unit | Notes |
|--------------------------------|-----------------|-------------|-------------|------|-------|
|                                |                 | HA17800V/VP | HA17800VPJ  |      |       |
| Input voltage                  | V <sub>IN</sub> | 35          | 35          | V    | 1     |
| Power dissipation              | P <sub>T</sub>  | 15          | 15          | W    | 2     |
| Operating ambient temperature  | Topr            | −20 to +75  | −40 to +85  | °C   |       |
| Storage temperature            | Tstg            | −55 to +125 | −50 to +125 | °C   |       |
| Operating junction temperature | Tj              | −20 to +125 | −40 to +125 | °C   |       |

Notes: 1. HA17824V/VP/VPJ, 40 V  
2. Follow derating curve



HA17805V/VP/VPJ Electrical Characteristics

(V<sub>IN</sub> = 10 V, I<sub>OUT</sub> = 500 mA, 0°C ≤ T<sub>j</sub> ≤ 125°C, C<sub>IN</sub> = 0.33 μF, C<sub>OUT</sub> = 0.1 μF)

| Item                                      | Symbol                             | Min  | Typ  | Max  | Unit  | Test Conditions                                                                         |
|-------------------------------------------|------------------------------------|------|------|------|-------|-----------------------------------------------------------------------------------------|
| Output voltage                            | V <sub>OUT1</sub>                  | 4.8  | 5.0  | 5.2  | V     | T <sub>j</sub> = 25°C                                                                   |
|                                           | V <sub>OUT2</sub>                  | 4.75 | —    | 5.25 | V     | 7 V ≤ V <sub>IN</sub> ≤ 20 V,<br>5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A, P <sub>T</sub> ≤ 15 W |
| Line regulation                           | ΔV <sub>OLine1</sub>               | —    | 30   | 100  | mV    | T <sub>j</sub> = 25°C, 7 V ≤ V <sub>IN</sub> ≤ 25 V                                     |
|                                           | ΔV <sub>OLine2</sub>               | —    | 10   | 50   | mV    | T <sub>j</sub> = 25°C, 8 V ≤ V <sub>IN</sub> ≤ 12 V                                     |
| Load regulation                           | ΔV <sub>OLoad1</sub>               | —    | 30   | 100  | mV    | T <sub>j</sub> = 25°C, 5 mA ≤ I <sub>OUT</sub> ≤ 1.5 A                                  |
|                                           | ΔV <sub>OLoad2</sub>               | —    | 10   | 50   | mV    | T <sub>j</sub> = 25°C, 250 mA ≤ I <sub>OUT</sub> ≤ 750 mA                               |
| Quiescent current                         | I <sub>Q</sub>                     | 0.8  | 3.5  | 7.0  | mA    | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 0                                             |
| Quiescent current change                  | ΔI <sub>Q1</sub>                   | —    | —    | 1.3  | mA    | 7 V ≤ V <sub>IN</sub> ≤ 25 V                                                            |
|                                           | ΔI <sub>Q2</sub>                   | —    | —    | 0.5  | mA    | 5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A                                                         |
| Voltage drop                              | V <sub>drop</sub>                  | —    | 2.0  | 2.5  | V     | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 1.0 A                                         |
| Ripple rejection ratio                    | R <sub>REJ</sub>                   | —    | 60   | —    | dB    | T <sub>j</sub> = 25°C, f = 10 kHz                                                       |
| Temperature coefficient of output voltage | ΔV <sub>OUT</sub> /ΔT <sub>a</sub> | —    | −0.5 | —    | mV/°C | I <sub>OUT</sub> = 5 mA                                                                 |
| Output noise voltage                      | V <sub>n</sub>                     | —    | 120  | —    | μVrms | T <sub>j</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz                                              |
| Output short circuit current              | I <sub>OS</sub>                    | —    | 1.25 | —    | A     | T <sub>j</sub> = 25°C                                                                   |
| Peak output current                       | I <sub>op</sub>                    | —    | 2.2  | —    | A     | T <sub>j</sub> = 25°C                                                                   |

**HA17806V/VP/VPJ Electrical Characteristics**

( $V_{IN} = 11\text{ V}$ ,  $I_{OUT} = 500\text{ mA}$ ,  $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

| Item                                      | Symbol                      | Min  | Typ  | Max  | Unit                | Test Conditions                                                                                                      |
|-------------------------------------------|-----------------------------|------|------|------|---------------------|----------------------------------------------------------------------------------------------------------------------|
| Output voltage                            | $V_{OUT1}$                  | 5.75 | 6.00 | 6.25 | V                   | $T_j = 25^\circ\text{C}$                                                                                             |
|                                           | $V_{OUT2}$                  | 5.7  | —    | 6.3  | V                   | $8\text{ V} \leq V_{IN} \leq 21\text{ V}$ ,<br>$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ , $P_T \leq 15\text{ W}$ |
| Line regulation                           | $\delta V_{OLine1}$         | —    | 36   | 120  | mV                  | $T_j = 25^\circ\text{C}$ , $8\text{ V} \leq V_{IN} \leq 25\text{ V}$                                                 |
|                                           | $\delta V_{OLine2}$         | —    | 12   | 60   | mV                  | $T_j = 25^\circ\text{C}$ , $9\text{ V} \leq V_{IN} \leq 13\text{ V}$                                                 |
| Load regulation                           | $\delta V_{OLoad1}$         | —    | 36   | 120  | mV                  | $T_j = 25^\circ\text{C}$ , $5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$                                              |
|                                           | $\delta V_{OLoad2}$         | —    | 12   | 60   | mV                  | $T_j = 25^\circ\text{C}$ , $250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$                                           |
| Quiescent current                         | $I_Q$                       | 0.8  | 3.5  | 7.0  | mA                  | $T_j = 25^\circ\text{C}$ , $I_{OUT} = 0$                                                                             |
| Quiescent current change                  | $\delta I_{Q1}$             | —    | —    | 1.3  | mA                  | $8\text{ V} \leq V_{IN} \leq 25\text{ V}$                                                                            |
|                                           | $\delta I_{Q2}$             | —    | —    | 0.5  | mA                  | $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$                                                                         |
| Voltage drop                              | $V_{drop}$                  | —    | 2.0  | 2.5  | V                   | $T_j = 25^\circ\text{C}$ , $I_{OUT} = 1.0\text{ A}$                                                                  |
| Ripple rejection ratio                    | $R_{REJ}$                   | —    | 60   | —    | dB                  | $T_j = 25^\circ\text{C}$ , $f = 10\text{ kHz}$                                                                       |
| Temperature coefficient of output voltage | $\delta V_{OUT}/\delta T_a$ | —    | −0.5 | —    | mV/°C               | $I_{OUT} = 5\text{ mA}$                                                                                              |
| Output noise voltage                      | $V_n$                       | —    | 120  | —    | $\mu\text{V}_{rms}$ | $T_j = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                                                 |
| Output short circuit current              | $I_{OS}$                    | —    | 1.2  | —    | A                   | $T_j = 25^\circ\text{C}$                                                                                             |
| Peak output current                       | $I_{op}$                    | —    | 2.2  | —    | A                   | $T_j = 25^\circ\text{C}$                                                                                             |

HA17800V/VP/VPJ Series

HA17807V/VP/VPJ Electrical Characteristics

(V<sub>IN</sub> = 12.5 V, I<sub>OUT</sub> = 500 mA, 0°C ≤ T<sub>j</sub> ≤ 125°C, C<sub>IN</sub> = 0.33 μF, C<sub>OUT</sub> = 0.1 μF)

| Item                                      | Symbol                             | Min  | Typ  | Max  | Unit              | Test Conditions                                                                         |
|-------------------------------------------|------------------------------------|------|------|------|-------------------|-----------------------------------------------------------------------------------------|
| Output voltage                            | V <sub>OUT1</sub>                  | 6.72 | 7.00 | 7.28 | V                 | T <sub>j</sub> = 25°C                                                                   |
|                                           | V <sub>OUT2</sub>                  | 6.65 | —    | 7.35 | V                 | 9 V ≤ V <sub>IN</sub> ≤ 22 V,<br>5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A, P <sub>T</sub> ≤ 15 W |
| Line regulation                           | ΔV <sub>OLine1</sub>               | —    | 45   | 140  | mV                | T <sub>j</sub> = 25°C, 9 V ≤ V <sub>IN</sub> ≤ 25 V                                     |
|                                           | ΔV <sub>OLine2</sub>               | —    | 15   | 70   | mV                | T <sub>j</sub> = 25°C, 10 V ≤ V <sub>IN</sub> ≤ 15 V                                    |
| Load regulation                           | ΔV <sub>OLoad1</sub>               | —    | 45   | 140  | mV                | T <sub>j</sub> = 25°C, 5 mA ≤ I <sub>OUT</sub> ≤ 1.5 A                                  |
|                                           | ΔV <sub>OLoad2</sub>               | —    | 15   | 70   | mV                | T <sub>j</sub> = 25°C, 250 mA ≤ I <sub>OUT</sub> ≤ 750 mA                               |
| Quiescent current                         | I <sub>Q</sub>                     | 0.8  | 3.5  | 7.0  | mA                | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 0                                             |
| Quiescent current change                  | ΔI <sub>Q1</sub>                   | —    | —    | 1.3  | mA                | 9 V ≤ V <sub>IN</sub> ≤ 25 V                                                            |
|                                           | ΔI <sub>Q2</sub>                   | —    | —    | 0.5  | mA                | 5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A                                                         |
| Voltage drop                              | V <sub>drop</sub>                  | —    | 2.0  | 2.5  | V                 | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 1.0 A                                         |
| Ripple rejection ratio                    | R <sub>REJ</sub>                   | —    | 58   | —    | dB                | T <sub>j</sub> = 25°C, f = 10 kHz                                                       |
| Temperature coefficient of output voltage | ΔV <sub>OUT</sub> /ΔT <sub>a</sub> | —    | −0.6 | —    | mV/°C             | I <sub>OUT</sub> = 5 mA                                                                 |
| Output noise voltage                      | V <sub>n</sub>                     | —    | 140  | —    | μV <sub>rms</sub> | T <sub>j</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz                                              |
| Output short circuit current              | I <sub>OS</sub>                    | —    | 1.1  | —    | A                 | T <sub>j</sub> = 25°C                                                                   |
| Peak output current                       | I <sub>op</sub>                    | —    | 2.2  | —    | A                 | T <sub>j</sub> = 25°C                                                                   |

**HA17808V/VP/VPJ Electrical Characteristics**

( $V_{IN} = 14\text{ V}$ ,  $I_{OUT} = 500\text{ mA}$ ,  $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

| Item                                      | Symbol                      | Min  | Typ  | Max  | Unit                | Test Conditions                                                                                                         |
|-------------------------------------------|-----------------------------|------|------|------|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| Output voltage                            | $V_{OUT1}$                  | 7.70 | 8.00 | 8.30 | V                   | $T_j = 25^\circ\text{C}$                                                                                                |
|                                           | $V_{OUT2}$                  | 7.6  | —    | 8.4  | V                   | $10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$ ,<br>$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ , $P_T \leq 15\text{ W}$ |
| Line regulation                           | $\delta V_{OLine1}$         | —    | 58   | 160  | mV                  | $T_j = 25^\circ\text{C}$ , $10.5\text{ V} \leq V_{IN} \leq 25\text{ V}$                                                 |
|                                           | $\delta V_{OLine2}$         | —    | 20   | 80   | mV                  | $T_j = 25^\circ\text{C}$ , $11\text{ V} \leq V_{IN} \leq 17\text{ V}$                                                   |
| Load regulation                           | $\delta V_{OLoad1}$         | —    | 58   | 160  | mV                  | $T_j = 25^\circ\text{C}$ , $5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$                                                 |
|                                           | $\delta V_{OLoad2}$         | —    | 20   | 80   | mV                  | $T_j = 25^\circ\text{C}$ , $250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$                                              |
| Quiescent current                         | $I_Q$                       | 0.8  | 3.5  | 7.0  | mA                  | $T_j = 25^\circ\text{C}$ , $I_{OUT} = 0$                                                                                |
| Quiescent current change                  | $\delta I_{Q1}$             | —    | —    | 1.0  | mA                  | $10.5\text{ V} \leq V_{IN} \leq 25\text{ V}$                                                                            |
|                                           | $\delta I_{Q2}$             | —    | —    | 0.5  | mA                  | $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$                                                                            |
| Voltage drop                              | $V_{drop}$                  | —    | 2.0  | 2.5  | V                   | $T_j = 25^\circ\text{C}$ , $I_{OUT} = 1.0\text{ A}$                                                                     |
| Ripple rejection ratio                    | $R_{REJ}$                   | —    | 58   | —    | dB                  | $T_j = 25^\circ\text{C}$ , $f = 10\text{ kHz}$                                                                          |
| Temperature coefficient of output voltage | $\delta V_{OUT}/\delta T_a$ | —    | -0.6 | —    | mV/°C               | $I_{OUT} = 5\text{ mA}$                                                                                                 |
| Output noise voltage                      | $V_n$                       | —    | 150  | —    | $\mu\text{V}_{rms}$ | $T_j = 25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                                                    |
| Output short circuit current              | $I_{OS}$                    | —    | 1.0  | —    | A                   | $T_j = 25^\circ\text{C}$                                                                                                |
| Peak output current                       | $I_{op}$                    | —    | 2.2  | —    | A                   | $T_j = 25^\circ\text{C}$                                                                                                |

HA17812V/VP/VPJ Electrical Characteristics

( $V_{IN} = 19\text{ V}$ ,  $I_{OUT} = 500\text{ mA}$ ,  $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

| Item                                            | Symbol                      | Min  | Typ  | Max  | Unit                | Test Conditions                                                                                                        |
|-------------------------------------------------|-----------------------------|------|------|------|---------------------|------------------------------------------------------------------------------------------------------------------------|
| Output voltage                                  | $V_{OUT1}$                  | 11.5 | 12.0 | 12.5 | V                   | $T_j = 25^{\circ}\text{C}$                                                                                             |
|                                                 | $V_{OUT2}$                  | 11.4 | —    | 12.6 | V                   | $14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$ ,<br>$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ , $PT \leq 15\text{ W}$ |
| Line regulation                                 | $\delta V_{OLine1}$         | —    | 100  | 240  | mV                  | $T_j = 25^{\circ}\text{C}$ , $14.5\text{ V} \leq V_{IN} \leq 30\text{ V}$                                              |
|                                                 | $\delta V_{OLine2}$         | —    | 33   | 120  | mV                  | $T_j = 25^{\circ}\text{C}$ , $16\text{ V} \leq V_{IN} \leq 22\text{ V}$                                                |
| Load regulation                                 | $\delta V_{OLoad1}$         | —    | 100  | 240  | mV                  | $T_j = 25^{\circ}\text{C}$ , $5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$                                              |
|                                                 | $\delta V_{OLoad2}$         | —    | 33   | 120  | mV                  | $T_j = 25^{\circ}\text{C}$ , $250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$                                           |
| Quiescent current                               | $I_Q$                       | 0.8  | 3.6  | 7.2  | mA                  | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 0$                                                                             |
| Quiescent current<br>change                     | $\delta I_{Q1}$             | —    | —    | 1.0  | mA                  | $14.5\text{ V} \leq V_{IN} \leq 30\text{ V}$                                                                           |
|                                                 | $\delta I_{Q2}$             | —    | —    | 0.5  | mA                  | $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$                                                                           |
| Voltage drop                                    | $V_{drop}$                  | —    | 2.0  | 2.5  | V                   | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 1.0\text{ A}$                                                                  |
| Ripple rejection ratio                          | $R_{REJ}$                   | —    | 58   | —    | dB                  | $T_j = 25^{\circ}\text{C}$ , $f = 10\text{ kHz}$                                                                       |
| Temperature<br>coefficient of<br>output voltage | $\delta V_{OUT}/\delta T_a$ | —    | −0.8 | —    | mV/°C               | $I_{OUT} = 5\text{ mA}$                                                                                                |
| Output noise voltage                            | $V_n$                       | —    | 290  | —    | $\mu\text{V}_{rms}$ | $T_j = 25^{\circ}\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                                                 |
| Output short circuit<br>current                 | $I_{OS}$                    | —    | 0.6  | —    | A                   | $T_j = 25^{\circ}\text{C}$                                                                                             |
| Peak output current                             | $I_{op}$                    | —    | 2.1  | —    | A                   | $T_j = 25^{\circ}\text{C}$                                                                                             |



HA17815V/VP/VPJ Electrical Characteristics

( $V_{IN} = 23\text{ V}$ ,  $I_{OUT} = 500\text{ mA}$ ,  $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

| Item                                            | Symbol                      | Min   | Typ  | Max   | Unit                | Test Conditions                                                                                                         |
|-------------------------------------------------|-----------------------------|-------|------|-------|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| Output voltage                                  | $V_{OUT1}$                  | 14.4  | 15.0 | 15.6  | V                   | $T_j = 25^{\circ}\text{C}$                                                                                              |
|                                                 | $V_{OUT2}$                  | 14.25 | —    | 15.75 | V                   | $17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$ ,<br>$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ , $P_T \leq 15\text{ W}$ |
| Line regulation                                 | $\delta V_{OLine1}$         | —     | 144  | 300   | mV                  | $T_j = 25^{\circ}\text{C}$ , $17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$                                               |
|                                                 | $\delta V_{OLine2}$         | —     | 48   | 150   | mV                  | $T_j = 25^{\circ}\text{C}$ , $20\text{ V} \leq V_{IN} \leq 26\text{ V}$                                                 |
| Load regulation                                 | $\delta V_{OLoad1}$         | —     | 144  | 300   | mV                  | $T_j = 25^{\circ}\text{C}$ , $5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$                                               |
|                                                 | $\delta V_{OLoad2}$         | —     | 48   | 150   | mV                  | $T_j = 25^{\circ}\text{C}$ , $250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$                                            |
| Quiescent current                               | $I_Q$                       | 0.8   | 3.6  | 7.2   | mA                  | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 0$                                                                              |
| Quiescent current<br>change                     | $\delta I_{Q1}$             | —     | —    | 1.0   | mA                  | $17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$                                                                            |
|                                                 | $\delta I_{Q2}$             | —     | —    | 0.5   | mA                  | $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$                                                                            |
| Voltage drop                                    | $V_{drop}$                  | —     | 2.0  | 2.5   | V                   | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 1.0\text{ A}$                                                                   |
| Ripple rejection ratio                          | $R_{REJ}$                   | —     | 58   | —     | dB                  | $T_j = 25^{\circ}\text{C}$ , $f = 10\text{ kHz}$                                                                        |
| Temperature<br>coefficient of<br>output voltage | $\delta V_{OUT}/\delta T_a$ | —     | −0.8 | —     | mV/°C               | $I_{OUT} = 5\text{ mA}$                                                                                                 |
| Output noise voltage                            | $V_n$                       | —     | 300  | —     | $\mu\text{V}_{rms}$ | $T_j = 25^{\circ}\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                                                  |
| Output short circuit<br>current                 | $I_{OS}$                    | —     | 0.4  | —     | A                   | $T_j = 25^{\circ}\text{C}$                                                                                              |
| Peak output current                             | $I_{op}$                    | —     | 2.1  | —     | A                   | $T_j = 25^{\circ}\text{C}$                                                                                              |

HA17818V/VP/VPJ Electrical Characteristics

(V<sub>IN</sub> = 27 V, I<sub>OUT</sub> = 500 mA, 0°C ≤ T<sub>j</sub> ≤ 125°C, C<sub>IN</sub> = 0.33 μF, C<sub>OUT</sub> = 0.1 μF)

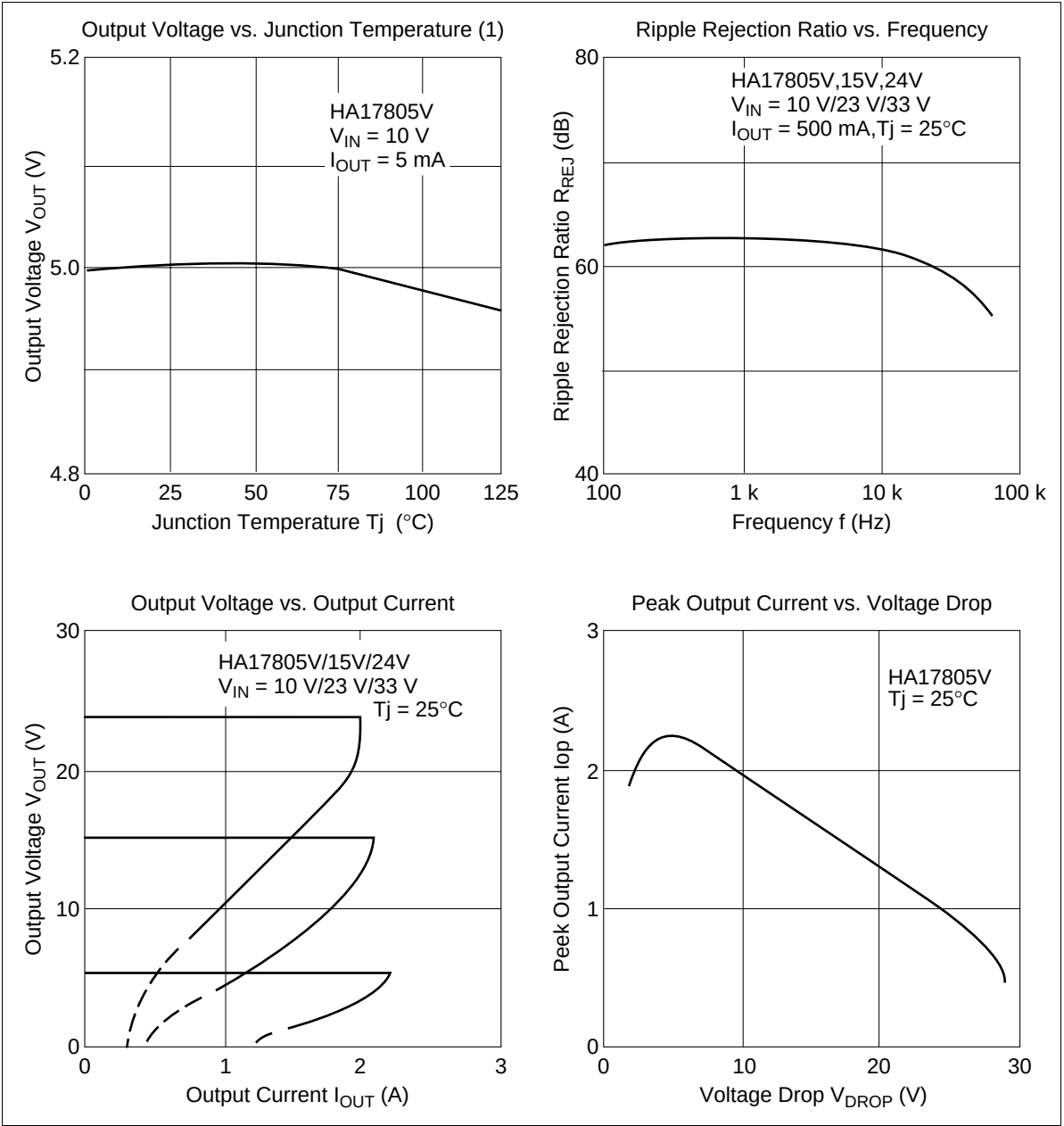
| Item                                      | Symbol                             | Min  | Typ  | Max  | Unit  | Test Conditions                                                                          |
|-------------------------------------------|------------------------------------|------|------|------|-------|------------------------------------------------------------------------------------------|
| Output voltage                            | V <sub>OUT1</sub>                  | 17.3 | 18.0 | 18.7 | V     | T <sub>j</sub> = 25°C                                                                    |
|                                           | V <sub>OUT2</sub>                  | 17.1 | —    | 18.9 | V     | 21 V ≤ V <sub>IN</sub> ≤ 33 V,<br>5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A, P <sub>T</sub> ≤ 15 W |
| Line regulation                           | ΔV <sub>OLine1</sub>               | —    | 195  | 360  | mV    | T <sub>j</sub> = 25°C, 21 V ≤ V <sub>IN</sub> ≤ 33 V                                     |
|                                           | ΔV <sub>OLine2</sub>               | —    | 65   | 180  | mV    | T <sub>j</sub> = 25°C, 24 V ≤ V <sub>IN</sub> ≤ 30 V                                     |
| Load regulation                           | ΔV <sub>OLoad1</sub>               | —    | 195  | 360  | mV    | T <sub>j</sub> = 25°C, 5 mA ≤ I <sub>OUT</sub> ≤ 1.5 A                                   |
|                                           | ΔV <sub>OLoad2</sub>               | —    | 65   | 180  | mV    | T <sub>j</sub> = 25°C, 250 mA ≤ I <sub>OUT</sub> ≤ 750 mA                                |
| Quiescent current                         | I <sub>Q</sub>                     | 0.8  | 3.6  | 7.2  | mA    | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 0                                              |
| Quiescent current change                  | ΔI <sub>Q1</sub>                   | —    | —    | 1.0  | mA    | 21 V ≤ V <sub>IN</sub> ≤ 33 V                                                            |
|                                           | ΔI <sub>Q2</sub>                   | —    | —    | 0.5  | mA    | 5 mA ≤ I <sub>OUT</sub> ≤ 1.0 A                                                          |
| Voltage drop                              | Vdrop                              | —    | 2.0  | 2.5  | V     | T <sub>j</sub> = 25°C, I <sub>OUT</sub> = 1.0 A                                          |
| Ripple rejection ratio                    | R <sub>REJ</sub>                   | —    | 56   | —    | dB    | T <sub>j</sub> = 25°C, f = 10 kHz                                                        |
| Temperature coefficient of output voltage | ΔV <sub>OUT</sub> /ΔT <sub>a</sub> | —    | −0.8 | —    | mV/°C | I <sub>OUT</sub> = 5 mA                                                                  |
| Output noise voltage                      | Vn                                 | —    | 430  | —    | μVrms | T <sub>j</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz                                               |
| Output short circuit current              | I <sub>OS</sub>                    | —    | 0.35 | —    | A     | T <sub>j</sub> = 25°C                                                                    |
| Peak output current                       | Iop                                | —    | 2.1  | —    | A     | T <sub>j</sub> = 25°C                                                                    |

HA17824V/VP/VPJ Electrical Characteristics

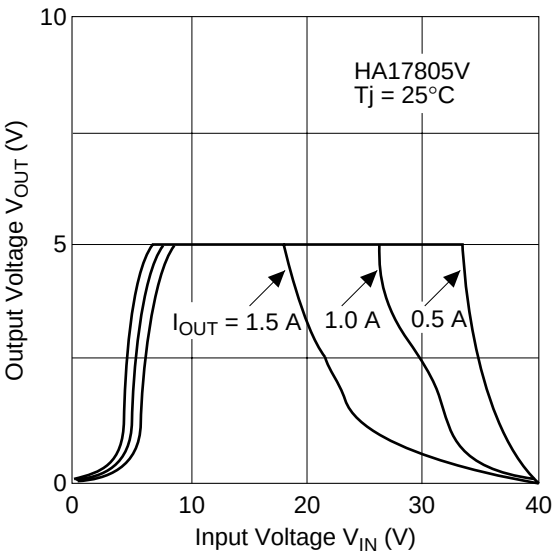
( $V_{IN} = 33\text{ V}$ ,  $I_{OUT} = 500\text{ mA}$ ,  $0^{\circ}\text{C} \leq T_j \leq 125^{\circ}\text{C}$ ,  $C_{IN} = 0.33\text{ }\mu\text{F}$ ,  $C_{OUT} = 0.1\text{ }\mu\text{F}$ )

| Item                                      | Symbol                      | Min  | Typ  | Max  | Unit                   | Test Conditions                                                                                                       |
|-------------------------------------------|-----------------------------|------|------|------|------------------------|-----------------------------------------------------------------------------------------------------------------------|
| Output voltage                            | $V_{OUT1}$                  | 23.0 | 24.0 | 25.0 | V                      | $T_j = 25^{\circ}\text{C}$                                                                                            |
|                                           | $V_{OUT2}$                  | 22.8 | —    | 25.2 | V                      | $27\text{ V} \leq V_{IN} \leq 38\text{ V}$ ,<br>$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ , $P_T \leq 15\text{ W}$ |
| Line regulation                           | $\delta V_{OLine1}$         | —    | 260  | 480  | mV                     | $T_j = 25^{\circ}\text{C}$ , $27\text{ V} \leq V_{IN} \leq 38\text{ V}$                                               |
|                                           | $\delta V_{OLine2}$         | —    | 86   | 240  | mV                     | $T_j = 25^{\circ}\text{C}$ , $30\text{ V} \leq V_{IN} \leq 36\text{ V}$                                               |
| Load regulation                           | $\delta V_{OLoad1}$         | —    | 260  | 480  | mV                     | $T_j = 25^{\circ}\text{C}$ , $5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$                                             |
|                                           | $\delta V_{OLoad2}$         | —    | 86   | 240  | mV                     | $T_j = 25^{\circ}\text{C}$ , $250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$                                          |
| Quiescent current                         | $I_Q$                       | 0.8  | 3.7  | 7.4  | mA                     | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 0$                                                                            |
| Quiescent current change                  | $\delta I_{Q1}$             | —    | —    | 1.0  | mA                     | $27\text{ V} \leq V_{IN} \leq 38\text{ V}$                                                                            |
|                                           | $\delta I_{Q2}$             | —    | —    | 0.5  | mA                     | $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$                                                                          |
| Voltage drop                              | $V_{drop}$                  | —    | 2.0  | 2.5  | V                      | $T_j = 25^{\circ}\text{C}$ , $I_{OUT} = 1.0\text{ A}$                                                                 |
| Ripple rejection ratio                    | $R_{REJ}$                   | —    | 50   | —    | dB                     | $T_j = 25^{\circ}\text{C}$ , $f = 10\text{ kHz}$                                                                      |
| Temperature coefficient of output voltage | $\delta V_{OUT}/\delta T_a$ | —    | -1.2 | —    | mV/ $^{\circ}\text{C}$ | $I_{OUT} = 5\text{ mA}$                                                                                               |
| Output noise voltage                      | $V_n$                       | —    | 570  | —    | $\mu\text{V}_{rms}$    | $T_j = 25^{\circ}\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$                                                |
| Output short circuit current              | $I_{OS}$                    | —    | 0.25 | —    | A                      | $T_j = 25^{\circ}\text{C}$                                                                                            |
| Peak output current                       | $I_{op}$                    | —    | 2.0  | —    | A                      | $T_j = 25^{\circ}\text{C}$                                                                                            |

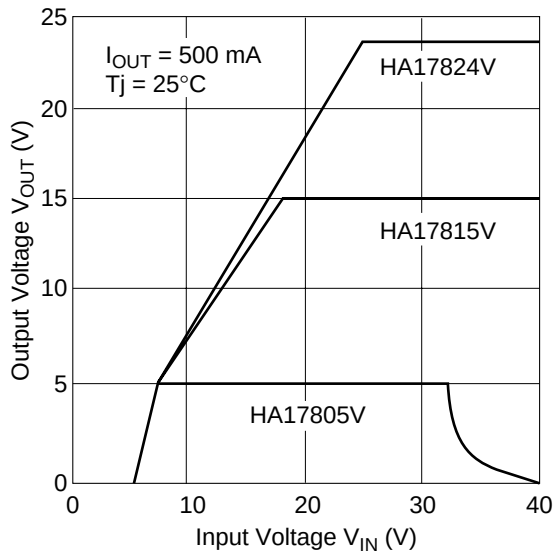
Characteristic Curves



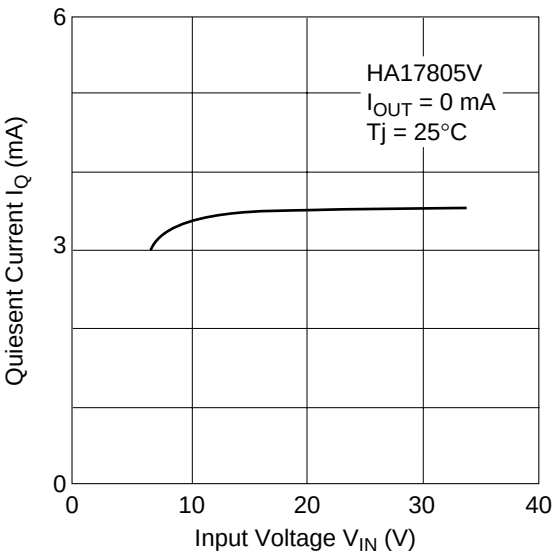
Output Voltage vs. Input Voltage (1)



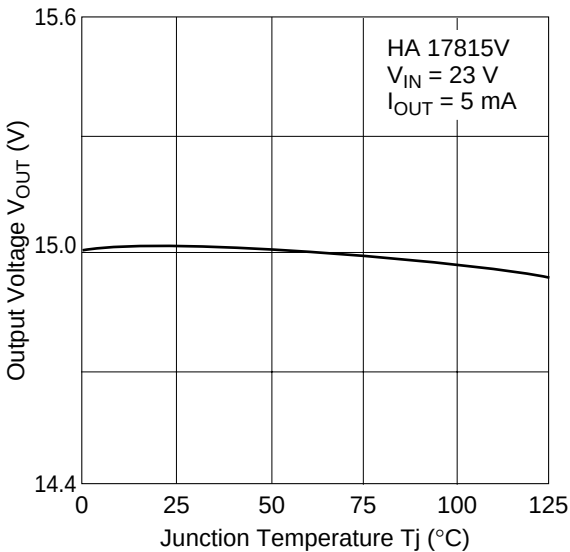
Output Voltage vs. Input Voltage (2)



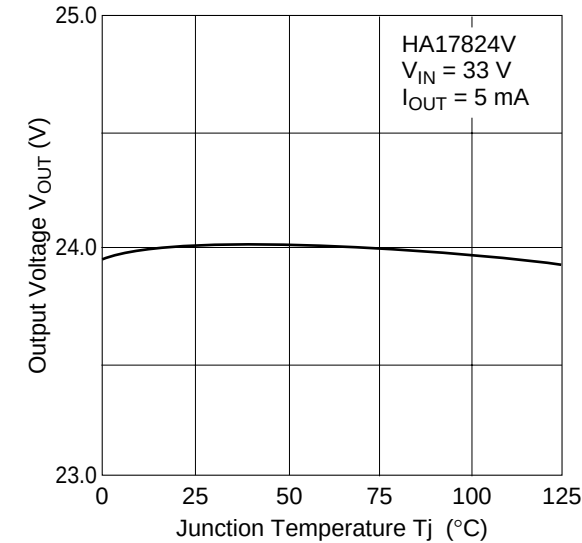
Quiescent Current vs. Input Voltage



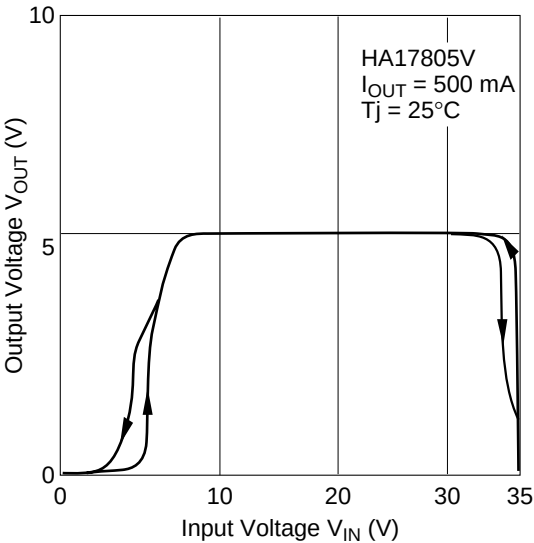
Output Voltage vs. Junction Temperature (2)



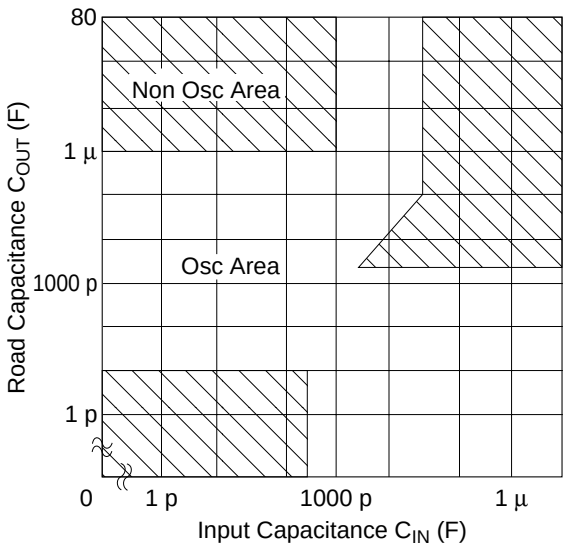
Output Voltage vs. Junction Temperature (3)



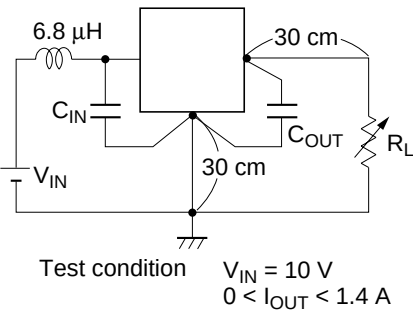
Output Voltage vs. Input Voltage (3)



Oscillation Area

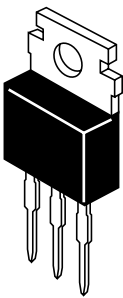
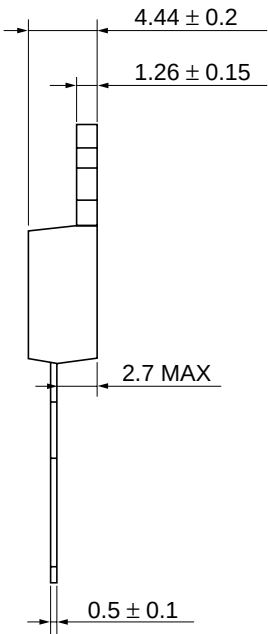
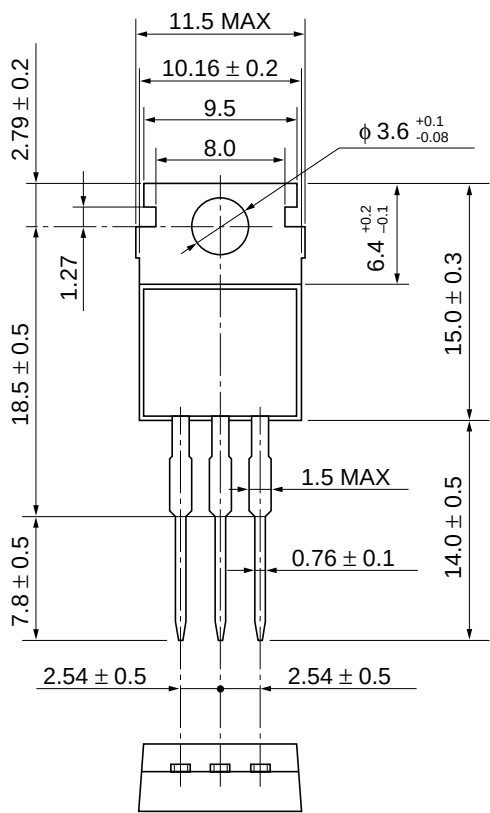


Measurement Circuit



Package Dimensions

Unit: mm



|                        |          |
|------------------------|----------|
| Hitachi Code           | TO-220AB |
| JEDEC                  | Conforms |
| EIAJ                   | Conforms |
| Mass (reference value) | 1.8 g    |

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