



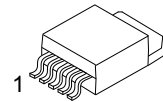
UR10033

LINEAR INTEGRATED CIRCUIT

2 CHANNEL LOW-DROPOUT VOLTAGE REGULATOR

■ FEATURES

- * Dual output: ADJ/1A, 3.3V/1A.
- * Output voltage precision of $\pm 2\%$.
- * Output consists of PNP power transistor with low-dropout voltage.
- * Built-in over current protection circuit (OCP).
- * Built-in thermal shut down circuit (TSD).
- * Ideal for hard disk drives applications.



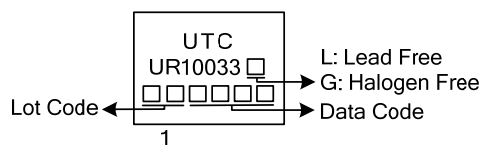
TO-252-5

■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|-----------------|----------------|----------|-----------|
| Lead Free | Halogen Free | | |
| UR10033-TN5-R | UR10033L-TN5-R | TO-252-5 | Tape Reel |

| | | |
|----------------|---|--|
| UR10033L-TN5-R | (1) Packing Type (2) Package Type (3) Green Package | (1) R: Tape Reel (2) TN5: TO-252-5 (3) L: Lead Free, G: Halogen Free and Lead Free |
|----------------|---|--|

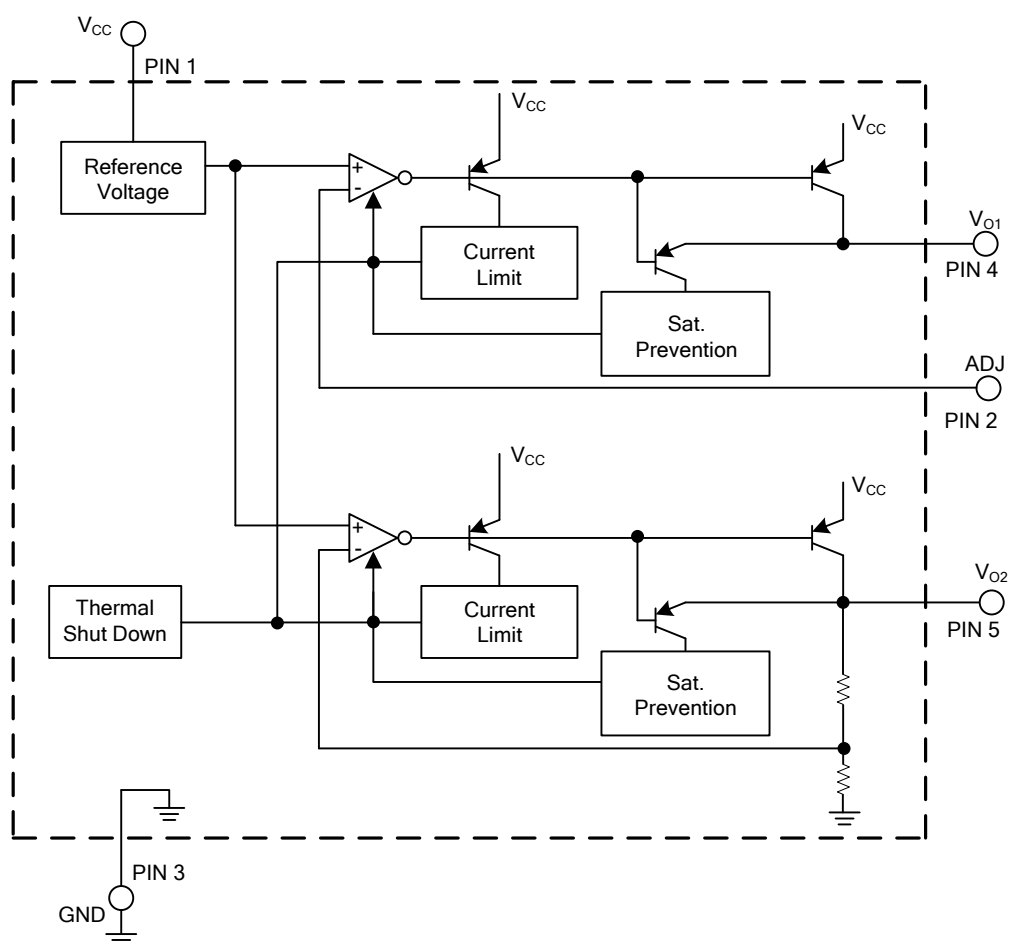
■ MARKING



■ PIN DISCRIPTION

| PIN NO. | PIN NAME | FUNCTION |
|---------|----------|-------------------------------------|
| 1 | V_{CC} | Power Supply |
| 2 | ADJ | ADJ Output Voltage Feedback control |
| 3 | GND | Ground |
| 4 | V_{O1} | ADJ Output |
| 5 | V_{O2} | 3.3V Output |

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|-----------------------------|-----------------------------------|-----------|-----------------|----------------------|
| Supply Voltage | | V_{CC} | 18 | V |
| Power Dissipation | $T_A = 25^\circ\text{C}$ | P_D | 1000 | mW |
| | Derating above 25°C | | 8 | mW/ $^\circ\text{C}$ |
| Junction Temperature | | T_J | 150 | $^\circ\text{C}$ |
| Operating Temperature Range | | T_{OPR} | $-40 \sim +85$ | $^\circ\text{C}$ |
| Storage Temperature Range | | T_{STG} | $-55 \sim +150$ | $^\circ\text{C}$ |

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ OPERATING RATINGS ($T_A = 25^\circ\text{C}$, unless otherwise specified)

| PARAMETER | | SYMBOL | MIN | MAX | UNIT |
|---------------------|--|----------|-----|------|------|
| Input Voltage | | V_{CC} | 4.0 | 16.0 | V |
| ADJ Output current | | I_{O1} | | 1 | A |
| 3.3V Output current | | I_{O2} | | 1 | A |

■ ELECTRICAL CHARACTERISTICS

(Refer to the test circuit, $T_A = 25^\circ\text{C}$, $V_{CC}=6\text{V}$ unless otherwise specified.)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--|--------------------|--|-------|------------|-------|---------------------|
| Bias Current | I_B | $I_{O1}=0\text{mA}$, $I_{O2}=0\text{mA}$ | | 0.8 | 1.5 | mA |
| ADJ Output | | | | | | |
| Feedack Voltage | V_{ADJ} | $I_{O1}=500\text{mA}$ | 1.225 | 1.25 | 1.275 | V |
| Dropout Voltage 1 | ΔV_{D1} | $I_{O1}=500\text{mA}$ | | 0.8 | | V |
| Peak Output Current 1 | I_{O1} | | 1.0 | 1.7 | | A |
| Ripple Rejection 1 | R.R.1 | $f=120\text{Hz}$, $e_{in}=1\text{Vrms}$ $I_{O1}=200\text{mA}$ | 50 | 58 | | dB |
| Line Regulation 1 | ΔV_{LINE1} | $V_{CC}=V_{OUT}+1\text{V} \sim 16\text{V}$, $I_{O1}=500\text{mA}$ | | 25 | | mV |
| Load Regulation 1 | ΔV_{LOAD1} | $I_{O1}=0\text{mA} \sim 1\text{A}$ | | 30 | 75 | mV |
| Temperature Coefficient of Output Voltage 1(Note1) | T_{CVO1} | $I_{O1}=5\text{mA}$, $T_J=0 \sim 125^\circ\text{C}$ | | ± 0.01 | | %/ $^\circ\text{C}$ |
| Short circuit Output Current 1 | I_{OS1} | $V_{CC}=16\text{V}$ | | 200 | | mA |
| 3.3V Output | | | | | | |
| Output Voltage 2 | V_{O2} | $I_{O2}=500\text{mA}$ | 3.234 | 3.30 | 3.366 | V |
| Peak Output Current 2 | I_{O2} | | 1.0 | 1.7 | | A |
| Ripple Rejection 2 | R.R.2 | $f=120\text{Hz}$, $e_{in}=1\text{Vrms}$ $I_{O2}=200\text{mA}$ | 50 | 58 | | dB |
| Line Regulation 2 | ΔV_{LINE2} | $V_{CC}=4\text{V} \sim 16\text{V}$, $I_{O1}=500\text{mA}$ | | 25 | | mV |
| Load Regulation 2 | ΔV_{LOAD2} | $I_{O2}=0\text{mA} \sim 1\text{A}$ | | 30 | 75 | mV |
| Temperature Coefficient of Output Voltage 2(Note1) | T_{CVO2} | $I_{O2}=5\text{mA}$, $T_J=0 \sim 125^\circ\text{C}$ | | ± 0.01 | | %/ $^\circ\text{C}$ |
| Short circuit Output Current 2 | I_{OS2} | $V_{CC}=16\text{V}$ | | 200 | | mA |

Notes: 1. Design Guarantee. (Outgoing inspection is not done on all products.)

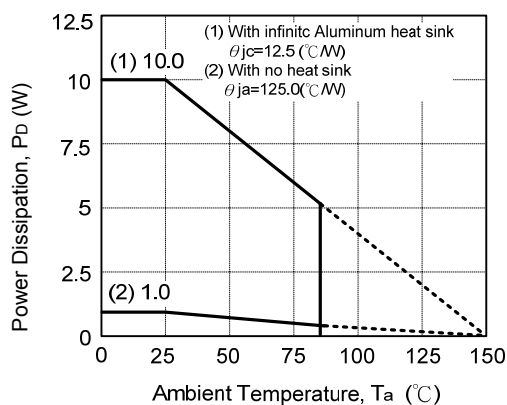
2. This product is not designed for protection against radioactive rays.

3. All characteristic are measured with a capacity across the input (0.33 μF) and the output (22 μF).

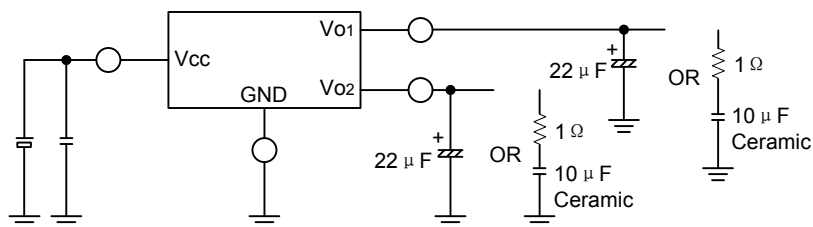
Measurement is done at $T_A = T_J$, and variations in the parameter of all measurement

(except for temperature coefficient of output voltage) caused by temperature change are not considered.

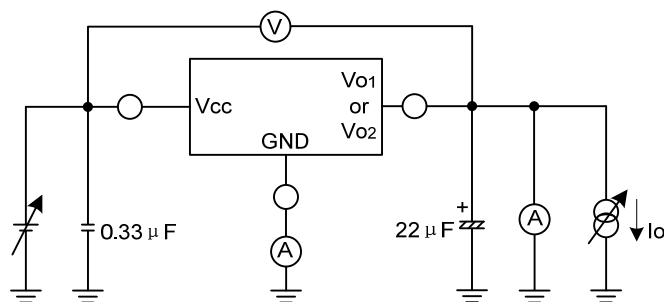
■ POWER DISSIPATION



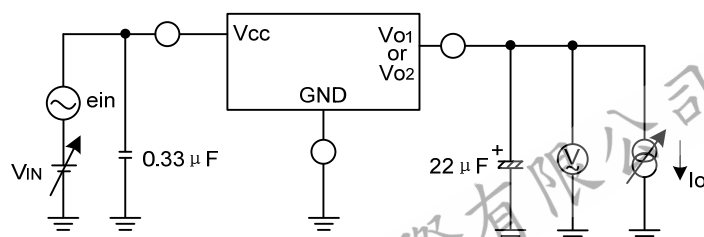
■ STANDARD APPLICATION CIRCUIT



■ TEST CIRCUIT FOR EACH CONDITION



■ TEST CIRCUIT FOR RIPPLE REJECTION RATIO

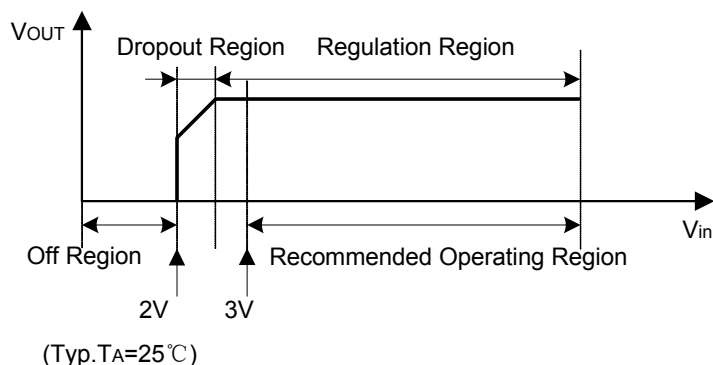


■ APPLICATION INFORMATION

Operation Supply Voltage Range

The circuit functionality is guaranteed within operation of ambient temperature range, as long as it is within operation supply voltage range. The standard electrical characteristic values are guaranteed at the test circuit voltage of $V_{CC}=V_O+1V$. The cannot be guaranteed at other voltages in the operating range of $V_O+1V \sim 16.0V$, however, the variation will be small.

Input /Output Characteristic



For proper regulation, this device must be operated in the Recommended Operating Region shown above.

Power Dissipation

Refer to the thermal duration characteristics shown in Fig.3. Also, be sure to use this IC within a power dissipation range allowing enough margins.

Output and Bypass Capacitor

To prevent oscillations, place the output capacitor between the output pin and GND for both channel. There is a possibility for oscillation if capacitor's value changes due to temperature, voltage, etc. More than $22\mu F$ electrolytic capacitor is recommended. If an extremely large value of (over $1000\mu F$) is used, it may cause oscillations at low frequency. In case of using ceramic capacitor (it is recommended more than $10\mu F$) connect with 1Ω resistance serially as ESR. For the bypass capacitor, a $0.33\mu F$ capacitor placed as close to V_{CC} pin and GND pin as possible is recommended.

Over- Current Protection Circuit

The over-current protection circuits are built in at the outputs. They protect the IC from being damaged when the load is short-circuited or subjected to an over current condition. This protection circuits perform holdback current limiting.

■ APPLICATION INFORMATION(Cont.)

Thermal Protection Circuit

A thermal shut down circuit (T.S.D.) is built into the IC to prevent damage due to overheating. Therefore, all the outputs are turned off when the T.S.D. circuit is activated and are turned on when the temperature recedes to the specified level. However, the T.S.D. circuit is only for extreme conditions and the regulator circuit should still be designed for the IC not to exceed $T_{J(max)}=150^{\circ}\text{C}$.

Grounding

It is recommended that every capacitor (bypass and output capacitors) is grounded to PIN3 using single-point connections.

Electromagnetic Fields

The IC is susceptible to strong electromagnetic fields and may cause malfunction. Therefore, caution should be used when placing it on the PCB.

Protection Diodes

It is recommended that protection diodes be used when the output is connected to an inductive load.

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