

**TL432****LINEAR INTEGRATED CIRCUIT**

# 1.25V PRECISION ADJUSTABLE SHUNT REFERENCE REGULATORS

## DESCRIPTION

The UTC **TL432** is a three-terminal adjustable shunt regulator highly accurate 1.25V band gap reference with 0.5%, 1% tolerance. The device offers thermal stability, wide operating current (50mA) and an extended temperature range of 0° to 85°C for operation in power supply applications. The UTC **TL432** offers a wide operating voltage range of up to 12V and is an excellent choice for voltage reference requirements in an isolated feedback circuit for 3.0V ~ 3.3V switching mode power supplies. The tight tolerance guarantees a lower design cost for the power supply manufacturer by virtually eliminating the need for an extra power supply manufacturing process of the power supply.

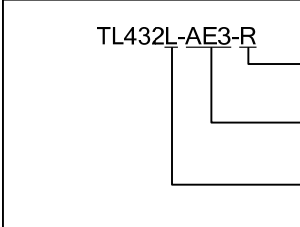
## FEATURES

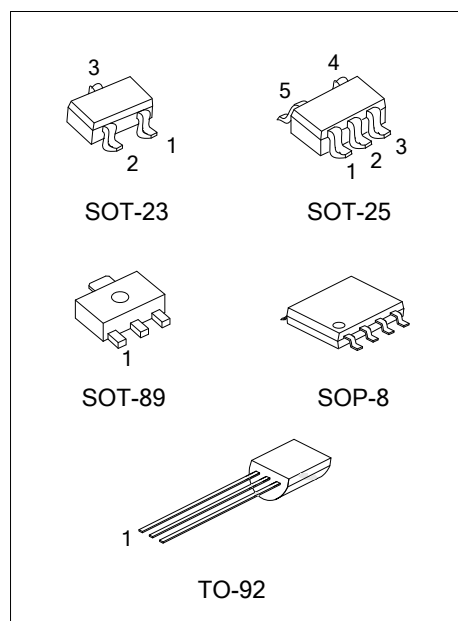
- \*Temperature-Compensated: 50ppm/°C
- \*Internal amplifier with 50mA capability
- \*Nominal temperature range extended to 85°C
- \*Low frequency dynamic output impedance: <150Ω
- \*Low output noise

## ORDERING INFORMATION

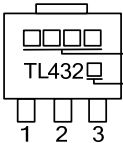
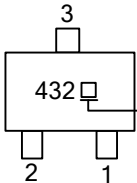
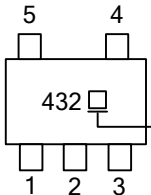
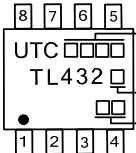
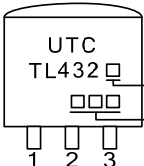
| Ordering Number |              | Package | Pin Assignment |   |   |   |   |   |   |   | Packing   |
|-----------------|--------------|---------|----------------|---|---|---|---|---|---|---|-----------|
| Lead Free       | Halogen Free |         | 1              | 2 | 3 | 4 | 5 | 6 | 7 | 8 |           |
| TL432L-AE3-R    | TL432G-AE3-R | SOT-23  | K              | R | A | - | - | - | - | - | Tape Reel |
| TL432L-AB3-R    | TL432G-AB3-R | SOT-89  | R              | A | K | - | - | - | - | - | Tape Reel |
| TL432L-AF5-R    | TL432G-AF5-R | SOT-25  | X              | X | K | R | A | - | - | - | Tape Reel |
| TL432L-T92-B    | TL432G-T92-B | TO-92   | R              | A | K | - | - | - | - | - | Tape Box  |
| TL432L-T92-K    | TL432G-T92-K | TO-92   | R              | A | K | - | - | - | - | - | Bulk      |
| TL432L-S08-R    | TL432G-S08-R | SOP-8   | K              | A | A | X | X | A | A | R | Tape Reel |

Note: Pin Code: K: Cathode A: Anode R: Reference X: No Connection

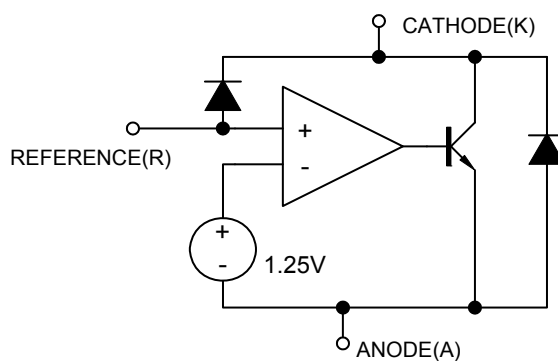
|                                                                                                                                                                              |                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>TL432L-AE3-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Lead Free</p> | <p>(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube</p> <p>(2) AE3: SOT-23, AB3: SOT-89, AF5: SOT-25, T92: TO-92 S08: SOP-8</p> <p>(3) L: Lead Free, G: Halogen Free</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



## ■ MARKING INFORMATION

| PACKAGE | MARKING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SOT-89  |  <p>Diagram of SOT-89 package marking. The package is a small rectangle with three leads at the bottom labeled 1, 2, and 3. On the top surface, there are four small squares. The first three squares are labeled 'Data Code' with an arrow. The fourth square is labeled 'TL432' with an arrow. Below the package, there are three small squares labeled 'L: Lead Free' and 'G: Halogen Free' with an arrow.</p>                                                                                |
| SOT-23  |  <p>Diagram of SOT-23 package marking. The package is a small rectangle with three leads at the bottom labeled 2, 1, and 3. On the top surface, there are two small squares. The first square is labeled '432' with an arrow. The second square is labeled 'L: Lead Free' and 'G: Halogen Free' with an arrow.</p>                                                                                                                                                                               |
| SOT-25  |  <p>Diagram of SOT-25 package marking. The package is a small rectangle with five leads at the bottom labeled 1, 2, 3, 4, and 5. On the top surface, there are two small squares. The first square is labeled '432' with an arrow. The second square is labeled 'L: Lead Free' and 'G: Halogen Free' with an arrow.</p>                                                                                                                                                                          |
| SOP-8   |  <p>Diagram of SOP-8 package marking. The package is a small rectangle with eight leads at the bottom labeled 1 through 8. On the top surface, there are four small squares. The first three squares are labeled 'Date Code' with an arrow. The fourth square is labeled 'UTC' with an arrow. Below the package, there are four small squares labeled 'L: Lead Free' and 'G: Halogen Free' with an arrow. Below the package, there are four small squares labeled 'Lot Code' with an arrow.</p> |
| TO-92   |  <p>Diagram of TO-92 package marking. The package is a small rectangle with three leads at the bottom labeled 1, 2, and 3. On the top surface, there are four small squares. The first three squares are labeled 'UTC' with an arrow. The fourth square is labeled 'TL432' with an arrow. Below the package, there are three small squares labeled 'L: Lead Free' and 'G: Halogen Free' with an arrow. Below the package, there are three small squares labeled 'Data Code' with an arrow.</p> |

### ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                       | SYMBOL    | RATING     | UNIT |
|---------------------------------|-----------|------------|------|
| Cathode-Anode Reverse Breakdown | $V_{KA}$  | 15         | V    |
| Anode-Cathode Forward Current   | $I_{AK}$  | 1          | A    |
| Operating Cathode Current       | $I_{KA}$  | 50         | mA   |
| Reference Input Current         | $I_{REF}$ | 1          | mA   |
| Junction Temperature            | $T_J$     | +125       | °C   |
| Operating Temperature           | $T_{OPR}$ | -40 ~ +85  | °C   |
| Storage Temperature             | $T_{STG}$ | -40 ~ +150 | °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.

### ■ THERMAL DATA

| PARAMETER           | SYMBOL       | RATING | UNIT |
|---------------------|--------------|--------|------|
| Junction to Ambient | SC-59/SOT-25 | 350    | °C/W |
|                     | TO-92        | 100    | °C/W |
|                     | SOP-8        | 150    | °C/W |
|                     | SOT-89       | 220    | °C/W |

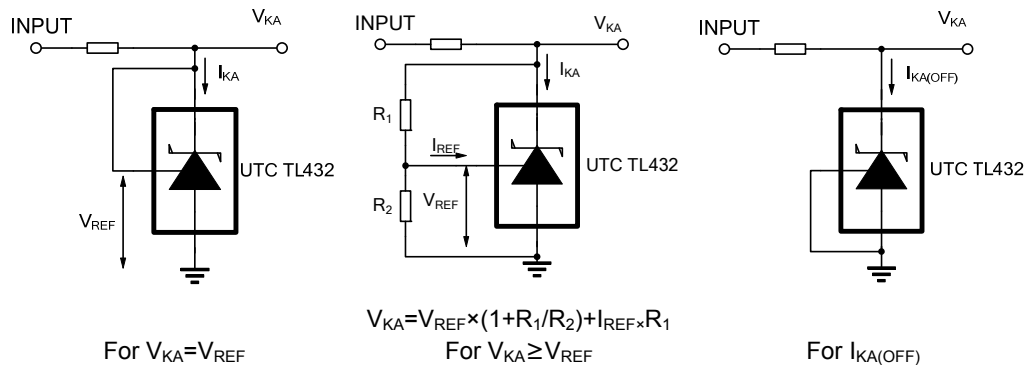
### ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER       | SYMBOL   | MIN       | TYP | MAX | UNIT |
|-----------------|----------|-----------|-----|-----|------|
| Cathode Voltage | $V_{KA}$ | $V_{REF}$ |     | 15  | V    |
| Cathode Current | $I_K$    | 5         | 10  |     | mA   |

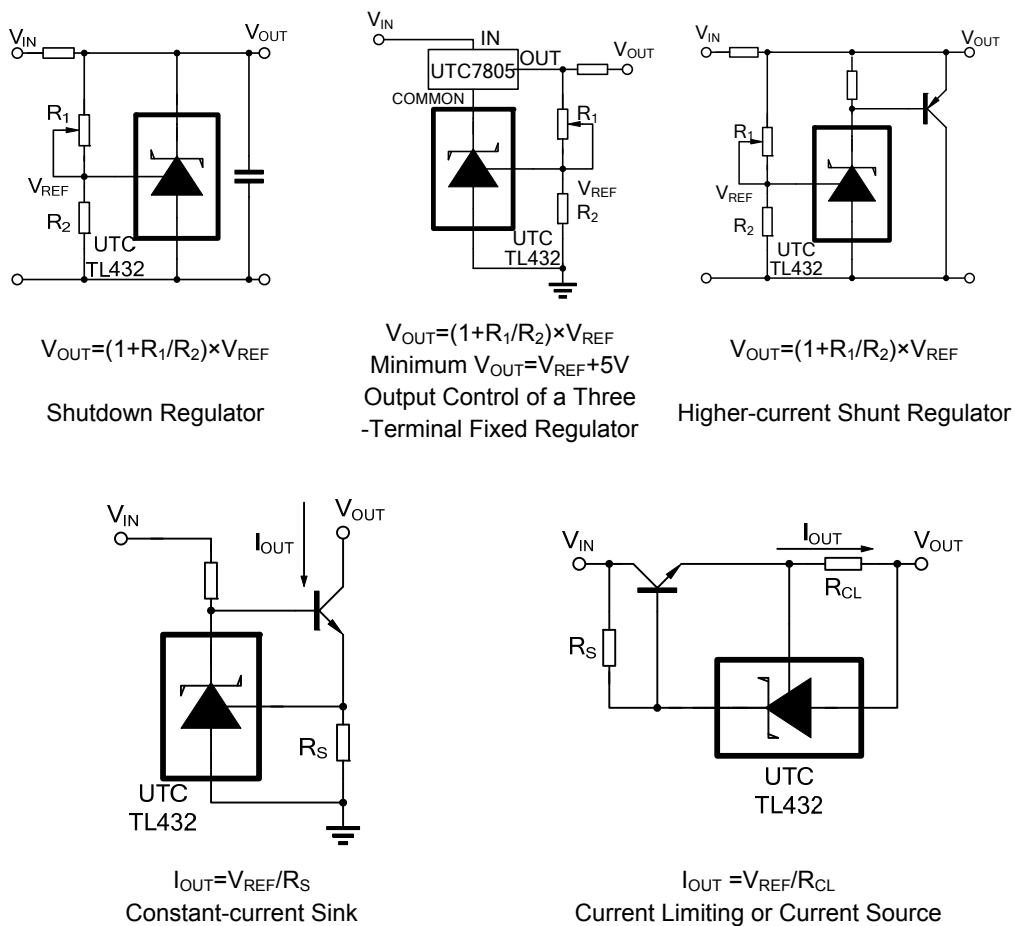
### ■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , $V_{KA}=V_{REF}$ , $I_K=10\text{mA}$ , unless otherwise specified.)

| PARAMETER                                       | SYMBOL           | TEST CONDITIONS                           | MIN   | TYP   | MAX   | UNIT          |
|-------------------------------------------------|------------------|-------------------------------------------|-------|-------|-------|---------------|
| Refer Input Voltage                             | TL432-A          | $I_K=10\text{mA}$ , $V_K=V_{REF}$         | 1.243 | 1.250 | 1.256 | V             |
|                                                 | TL432-1          |                                           | 1.237 | 1.250 | 1.263 | V             |
|                                                 | TL432-2          |                                           | 1.225 | 1.250 | 1.275 | V             |
| Line Regulation                                 | $\Delta V_{REF}$ | $V_K=1.25 \sim 15\text{V}$                |       | 10    | 26    | mV            |
| Load Regulation                                 | $\Delta V_{REF}$ | $I_K=5 \sim 50\text{mA}$                  |       | 6     | 15    | mV            |
| Temperature Deviation                           | $\Delta V_{REF}$ | $0 < T_J < 85^\circ\text{C}$              |       | 2     | 6     | mV            |
| Reference Input Current                         | $I_{REF}$        |                                           |       | 3     | 6     | $\mu\text{A}$ |
| Reference Input Current Temperature Coefficient | $\Delta I_{REF}$ | $0 < T_J < 85^\circ\text{C}$              |       | 0.3   | 0.6   | $\mu\text{A}$ |
| Minimum Cathode Current for Regulation          | $I_{K(MIN)}$     |                                           |       | 0.6   | 1     | mA            |
| Off State Leakage                               | $I_{KA(OFF)}$    | $V_{REF}=0\text{V}$ , $V_{KA}=15\text{V}$ |       |       | 500   | nA            |

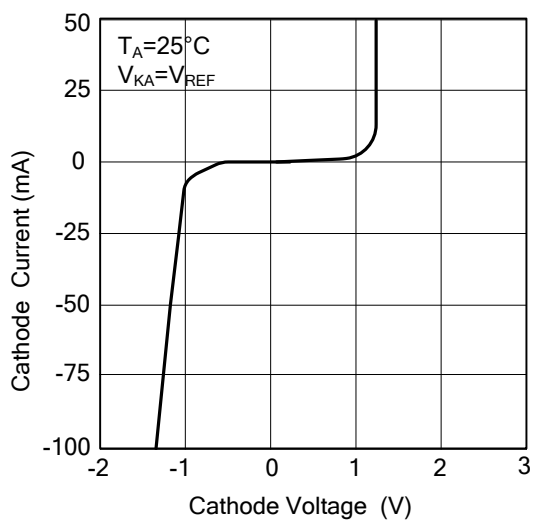
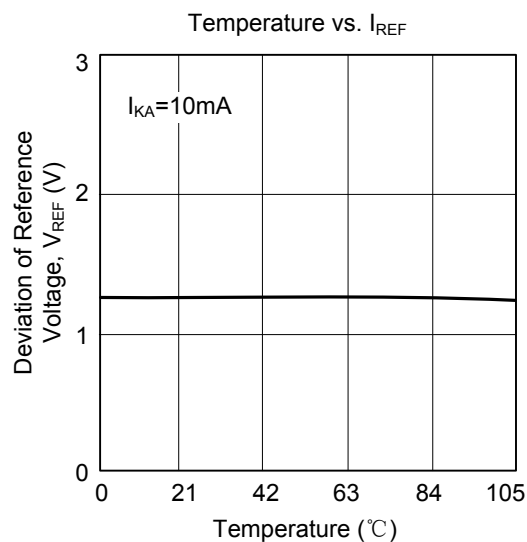
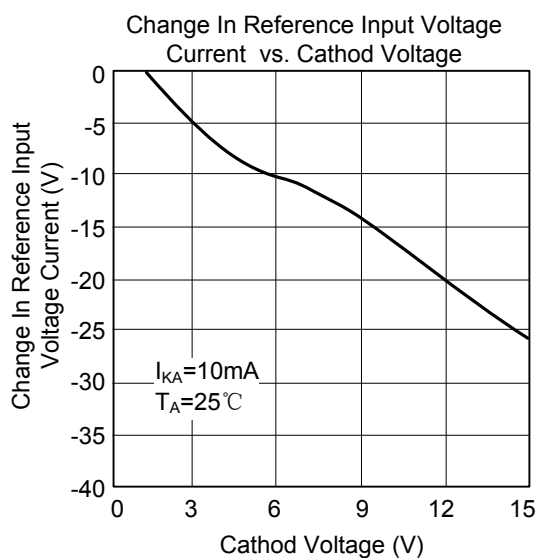
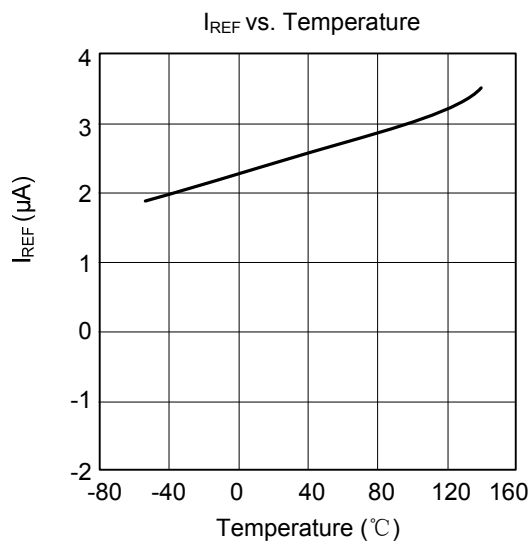
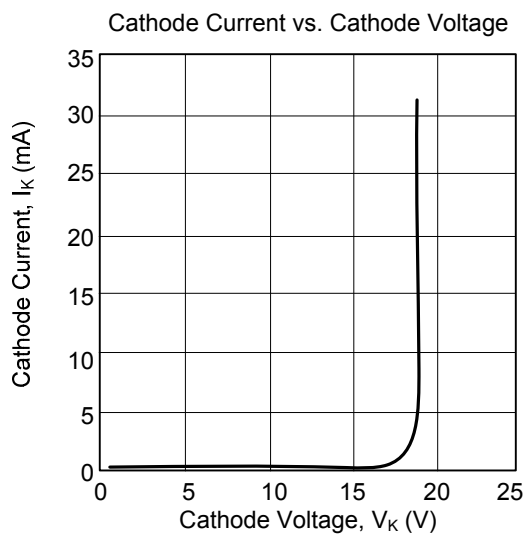
## ■ TEST CIRCUIT



## ■ APPLICATION CIRCUIT



### ■ TYPICAL CHARACTERISTICS



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