



## LP2950/2951

## LINEAR INTEGRATED CIRCUIT

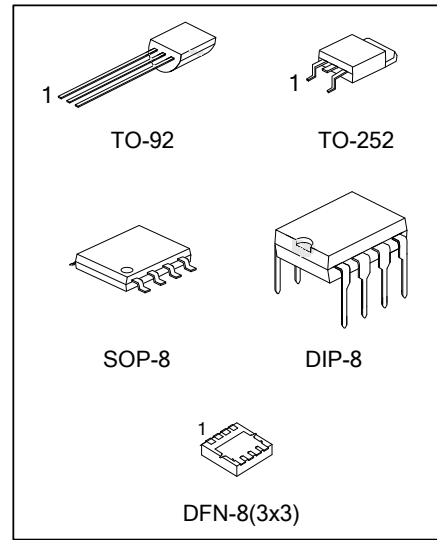
### 100 mA LOW-DROPOUT VOLTAGE REGULATOR

#### DESCRIPTION

The UTC **LP2950/2951** are monolithic integrated voltage regulators with low dropout voltage, and low quiescent current. It includes many features that suitable for different applications.

#### FEATURES

- \* Fixed output versions, 2.5V, 3V, 3.3V, 3.6V and 5V, are available.
- \* High accuracy output voltage.
- \* Extremely low quiescent current and dropout voltage.
- \* Extremely tight load and line regulation.
- \* Current and thermal limiting.
- \* Very low temperature coefficient.
- \* Logic controlled shutdown and err flog available for 8 pin package.
- \* Output voltage programmable for LP2951.



#### ORDERING INFORMATION

| Ordering Number  |                       | Package    | Packing   |
|------------------|-----------------------|------------|-----------|
| Lead Free        | Halogen Free          |            |           |
| LP2950L-xx-D08-T | LP2950G-xx-D08-T      | DIP-8      | Tube      |
|                  | LP2950G-xx-S08-R      | SOP-8      | Tape Reel |
| LP2950L-xx-T92-B | LP2950G-xx-T92-B      | TO-92      | Tape Box  |
| LP2950L-xx-T92-K | LP2950G-xx-T92-K      | TO-92      | Bulk      |
| LP2950L-xx-TN3-R | LP2950G-xx-TN3-R      | TO-252     | Tape Reel |
| -                | LP2950G-xx-K08-3030-R | DFN-8(3x3) | Tape Reel |
| LP2951L-D08-T    | LP2951G-D08-T         | DIP-8      | Tube      |
| -                | LP2951G-S08-R         | SOP-8      | Tape Reel |
| -                | LP2951G-K08-3030-R    | DFN-8(3x3) | Tape Reel |

Note: Pin Assignment: I:  $V_{IN}$  O:  $V_{OUT}$  G: GND

|  |  |
|--|--|
| <p>LP2950L-xx-D08-T</p> <p>(1)Packing Type<br/>(2)Package Type<br/>(3)Output Voltage Code<br/>(4)Green Package</p> | <p>(1) B: Tape Box, K: Bulk, R: Tape Reel, T: Tube<br/>(2) D08: DIP-8, S08: SOP-8, T92: TO-92, TN3: TO-252<br/>K08-3030: DFN-8(3x3)<br/>(3) xx: refer to Output Voltage Code<br/>(4) L: Lead Free, G: Halogen Free and Lead Free</p> |
|--|--|

### MARKING INFORMATION

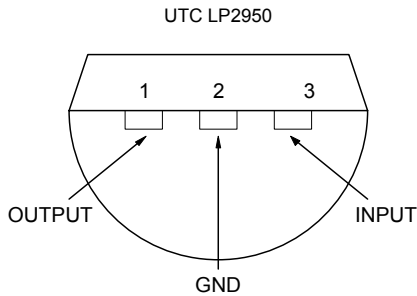
| PACKAGE    | VOLTAGE CODE                                 | MARKING  |  |
|------------|--|--|--|
| DIP-8      | 25: 2.5V<br>33: 3.3V<br>36: 3.6V<br>50: 5.0V | <p>Diagram showing marking on a DIP-8 package for LP2950. The top row of pins (8, 7, 6, 5) contains 'UTC' and a date code. The bottom row (1, 2, 3, 4) contains 'LP2950' and a lot code. A 'Voltage Code' is indicated on the left. Legend: L: Lead Free, G: Halogen Free.</p> | <p>Diagram showing marking on a DIP-8 package for LP2951. The top row of pins (8, 7, 6, 5) contains 'UTC' and a date code. The bottom row (1, 2, 3, 4) contains 'LP2951' and a lot code. A 'Voltage Code' is indicated on the left. Legend: L: Lead Free, G: Halogen Free.</p> |
| SOP-8      |  | <p>Diagram showing marking on an SOP-8 package for LP2950G. The top row of pins (8, 7, 6, 5) contains 'UTC' and a date code. The bottom row (1, 2, 3, 4) contains 'LP2950G' and a lot code. A 'Voltage Code' is indicated on the left.</p>                                     | <p>Diagram showing marking on an SOP-8 package for LP2951G. The top row of pins (8, 7, 6, 5) contains 'UTC' and a date code. The bottom row (1, 2, 3, 4) contains 'LP2951G' and a lot code. A 'Voltage Code' is indicated on the left.</p>                                     |
| TO-92      |  | <p>Diagram showing marking on a TO-92 package for LP2950. The top contains 'UTC'. The middle contains 'LP2950' and a date code. The bottom contains 'XX' and a lot code. A 'Voltage Code' is indicated on the left. Legend: L: Lead Free, G: Halogen Free.</p>                 |  |
| TO-252     |  | <p>Diagram showing marking on a TO-252 package for LP2950. The top contains 'UTC'. The middle contains 'LP2950' and a date code. The bottom contains 'XX' and a lot code. A 'Voltage Code' is indicated on the left. Legend: L: Lead Free, G: Halogen Free.</p>                |  |
| DFN-8(3x3) |  | <p>Diagram showing marking on a DFN-8(3x3) package for LP2950. The top contains 'LP' and a voltage code. The bottom contains '2950' and a date code.</p>   | <p>Diagram showing marking on a DFN-8(3x3) package for LP2951. The top contains 'LP' and a voltage code. The bottom contains '2951' and a date code.</p>   |



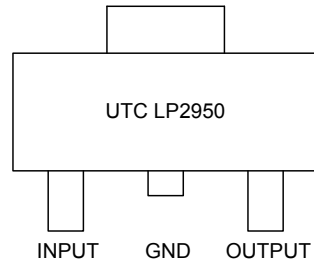
LP2950/2951

LINEAR INTEGRATED CIRCUIT

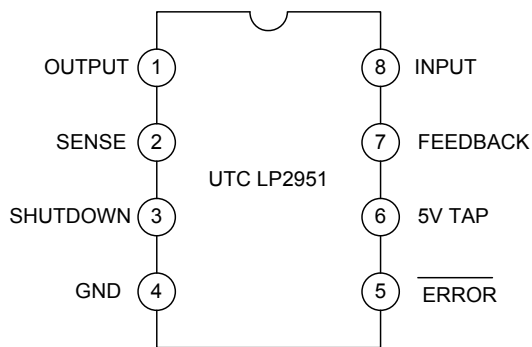
PIN CONFIGURATIONS



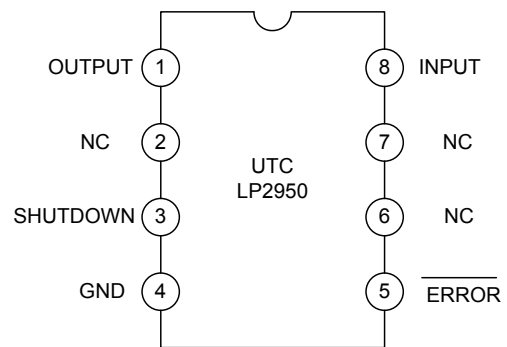
TO-92 Plastic Package Bottom View



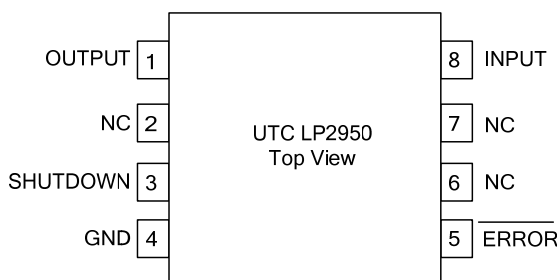
SOT-252 Package



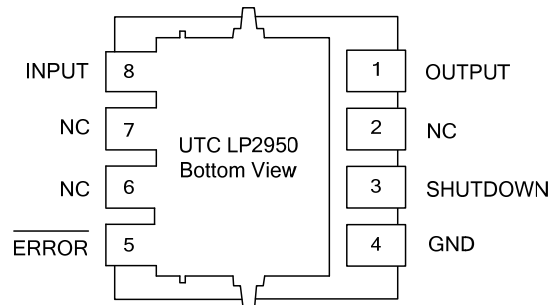
SOP-8 OR DIP-8 PACKAGE FOR UTC LP2951



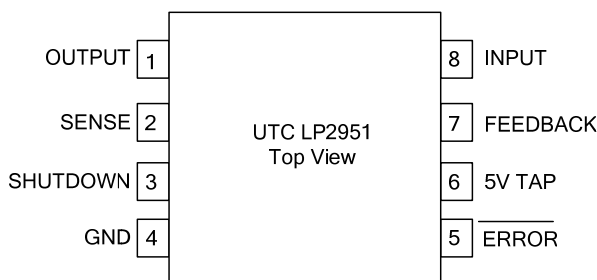
SOP-8 OR DIP-8 PACKAGE FOR UTC LP2950



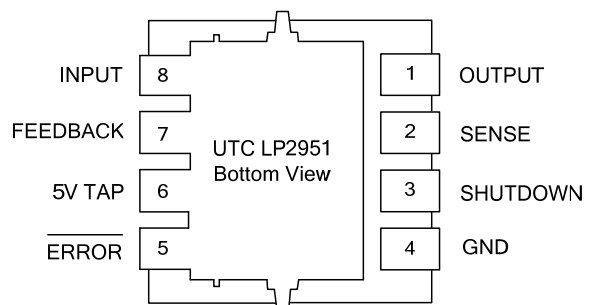
DFN-8(3x3) Plastic Package Top View



DFN-8(3x3) Plastic Package Bottom View



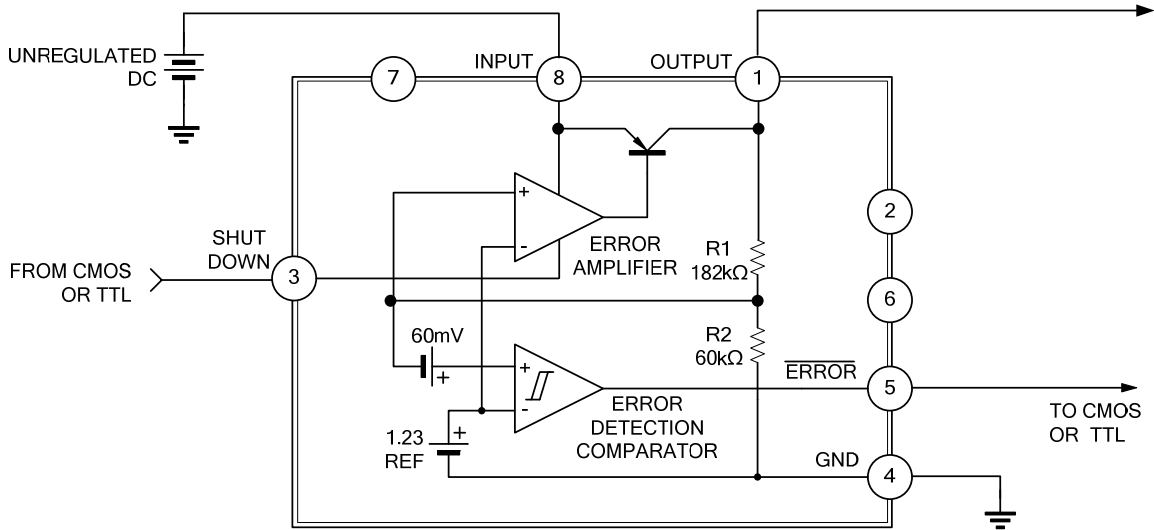
DFN-8(3x3) Plastic Package Top View



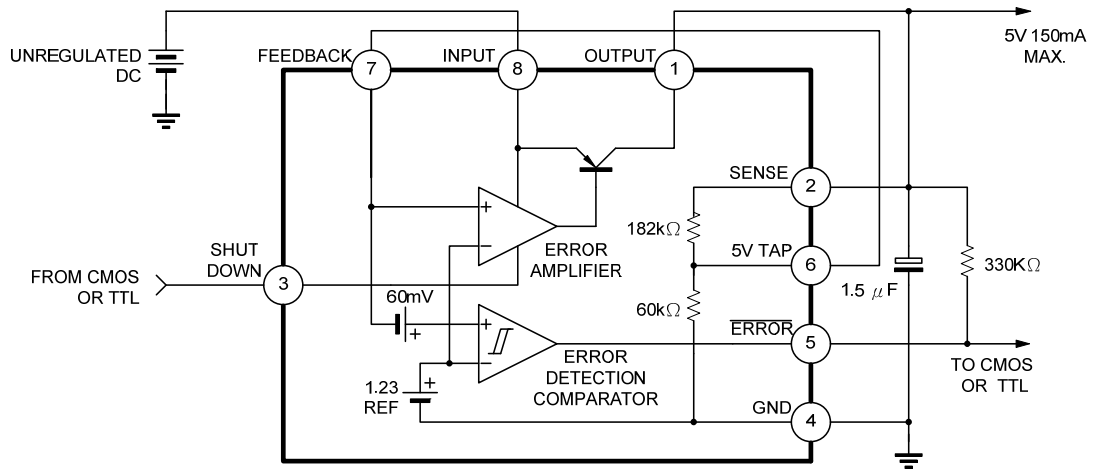
DFN-8(3x3) Plastic Package Bottom View

## ■ BLOCK DIAGRAM

### FOR LP2950



### FOR LP2951



### ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                      | SYMBOL     | RATINGS            | UNIT |
|--------------------------------|------------|--------------------|------|
| Supply Voltage                 | $V_{CC}$   | -0.3 ~ +30         | V    |
| Feedback Voltage               | $V_{FB}$   | -1.5 ~ +30         | V    |
| Shutdown Voltage               | $V_{SHDN}$ | -0.3 ~ +30         | V    |
| Power Dissipation              | $P_D$      | Internally Limited | W    |
| Operation Junction Temperature | $T_J$      | -40 ~ +125         | °C   |
| Storage Temperature            | $T_{STG}$  | -65 ~ +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 | TO-92       | 160    | °C/W |
|                     | TO-252      | 92     |      |
|                     | SOP-8       | 90     |      |
|                     | DIP-8       | 105    |      |
|                     | DFN-8(3×3)  | 59     |      |
| Junction-to-Case    | TO-92       | 83     | °C/W |
|                     | TO-252      | 6      |      |
|                     | SOP-8/DIP-8 | 45     |      |
|                     | DFN-8(3×3)  | 10     |      |

### ■ ELECTRICAL CHARACTERISTICS ( $T_J=25^\circ\text{C}$ , $V_{IN}=6\text{V}$ , $I_L=100\mu\text{A}$ , $C_L=1\mu\text{F}$ , unless otherwise specified.)

#### For All Version:

| PARAMETER   | SYMBOL           | TEST CONDITION  | MIN                   | TYP       | MAX                   | UNIT          |
|---|------------------|---|-----------------------|-----------|-----------------------|---------------|
| Output Voltage  | $V_{OUT}$        | $T_J=25^\circ\text{C}$ (Note 1)                                     | $V_{OUT} \times 0.98$ | $V_{OUT}$ | $V_{OUT} \times 1.02$ | V             |
|   |                  | $-25^\circ\text{C} \leq T_J \leq +85^\circ\text{C}$ (Note 1)        | $V_{OUT} \times 0.98$ | $V_{OUT}$ | $V_{OUT} \times 1.02$ | V             |
| Output Voltage  | $V_{OUT}$        | $100\mu\text{A} \leq I_L \leq 100\text{mA}$ , $T_J \leq T_{J(max)}$ | $V_{OUT} \times 0.98$ | $V_{OUT}$ | $V_{OUT} \times 1.02$ | V             |
| Output Voltage Temperature Coefficient  | $TcV_o$          |   | 20                    |           | 100                   | ppm/°C        |
| Line Regulation   | $\Delta V_{OUT}$ | $6\text{V} \leq V_{IN} \leq 30\text{V}$                             | 0.03                  | 0.1       | 0.2                   | %             |
| Load Regulation   | $\Delta V_{OUT}$ | $100\mu\text{A} \leq I_L \leq 100\text{mA}$                         | 0.04                  | 0.1       | 0.2                   | %             |
| Dropout Voltage   | $V_D$            | $I_L=100\mu\text{A}$  | 50                    | 80        | 150                   | mV            |
|   |                  | $I_L=100\text{mA}$ (Note 2)   | 380                   | 450       | 600                   |               |
| Ground Current  | $I_G$            | $I_L=100\mu\text{A}$  | 75                    | 120       | 140                   | $\mu\text{A}$ |
|   |                  | $I_L=100\text{mA}$  | 8                     | 12        | 14                    | mA            |
| Dropout Ground Current  |                  | $V_{IN}=4.5\text{V}$ , $I_L=100\mu\text{A}$                         | 110                   | 170       | 200                   | $\mu\text{A}$ |
| Current Limit   | $I_{LIMIT}$      | $V_{OUT}=0$   | 160                   | 215       | 250                   | mA            |
| Output Noise (10Hz ~ 100KHz)<br>(Bypass=0.01 $\mu\text{F}$ pins 7 to 1<br>(LP2951)) | eN               | $C_L=1\mu\text{F}$  |                       |           | 430                   | $\mu\text{V}$ |
|   |                  | $C_L=200\mu\text{F}$  |                       |           | 160                   |               |
|   |                  | $C_L=3.3\mu\text{F}$  |                       |           | 100                   |               |

### ■ ELECTRICAL CHARACTERISTICS(Cont.)

#### For UTC LP2951 8-Pin Version Only

| PARAMETER                                     | SYMBOL        | TEST CONDITION   | MIN           | TYP   | MAX  | UNIT    |         |
|---|---------------|--|---------------|-------|------|---------|---------|
| Reference Voltage                             | $V_{REF}$     |  | 1.22          | 1.235 | 1.25 | V       |         |
| Reference Voltage                             | $V_{REF}$     | Over temperature(Note 4)   | 1.19          |       | 1.27 | V       |         |
| Feedback pin Bias Current                     | $I_{FB}$      |  |               | 20    | 40   | nA      |         |
| Reference Voltage Temperature Coefficient     | $V_{REF(TC)}$ |  |               | 50    |      | ppm/°C  |         |
| Feedback Bias Current Temperature Coefficient | $I_{FB(TC)}$  |  |               | 0.1   |      | nA/°C   |         |
| <b>Error Comparator</b>                       |               |  |               |       |      |         |         |
| Output Leakage Current                        | $I_{O(LEAK)}$ | $V_{OH}=30V$   |               |       | 1    | $\mu A$ |         |
| Output Low Voltage                            | $V_{OL}$      | $V_{IN}=4.5V, I_{OL}=400\mu A$   |               |       | 250  | mV      |         |
| Threshold Voltage                             | Upper         | $V_{THU}$ (Note 3)   | 3.2           |       |      | %VO     |         |
|   | Lower         | $V_{THL}$ (Note 3)   |               |       | 7.6  | %VO     |         |
| Hysteresis                                    | $V_{HYS}$     | (Note 3)   |               | 15    |      | mV      |         |
| <b>Shutdown Input</b>                         |               |  |               |       |      |         |         |
| Input Logic Voltage                           | Low           | $V_{IL}$   | Regulator ON  |       | 1.3  | 0.70    | V       |
|   | High          | $V_{IH}$   | Regulator OFF | 2.0   |      |         |         |
| Shutdown Pin Input Current                    | $I_{SHDN}$    | $V_{SHDN}=2.4V$  |               |       | 30   | 50      | $\mu A$ |
|   |               | $V_{SHDN}=30V$   |               |       | 450  | 600     | $\mu A$ |
| Regulator Output Current Shutdown             | $I_{DFF}$     | $V_{SHDN} \geq 2V, V_{IN} \leq 30V, V_{OUT}=0$<br>Feedback pin tied to 5V Tap. |               |       | 3    | 10      | $\mu A$ |

Note: 1. Additional conditions for 8-pin versions are FB pin tied to  $5V_{TAP}$ , Output tied to Sense ( $V_{OUT}=5V$ ) and  $V_{SHDN} \leq 0.8V$ .

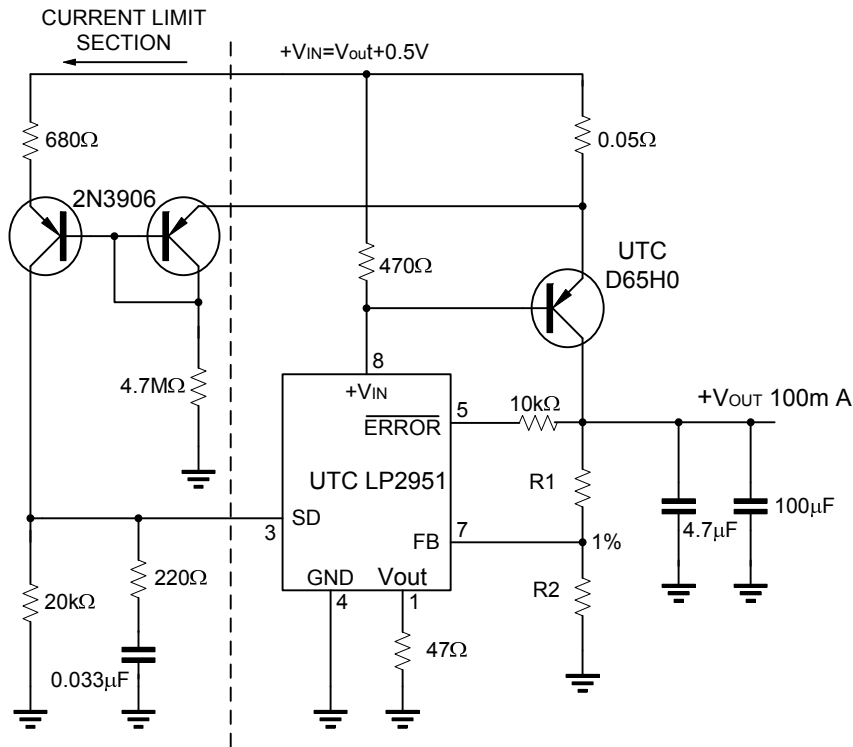
2. Dropout Voltage is defined as the input to output differential at which the output voltage drops 100mV below its nominal value measured at 1V differential.

3. Comparator thresholds are expressed in terms of percentage value of voltage output.

4.  $V_{REF} \leq V_{OUT} \leq (V_{IN}-1V)$ ,  $2.3V \leq V_{IN} \leq 30V$ ,  $100\mu A \leq I_L \leq 100mA$ ,  $T_J \leq T_{J(MAX)}$

■ TYPICAL APPLICATION CIRCUIT

10 Ampere Low Dropout Regulator



$$V_{OUT} = 1.23V * (1 + R1/R2)$$

For 5V output use internal resistors. Wire pin 6 to 7 and wire pin 2 to +Vout

Fig.1

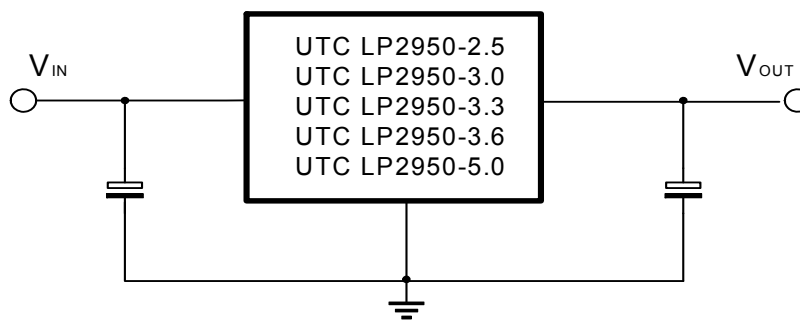
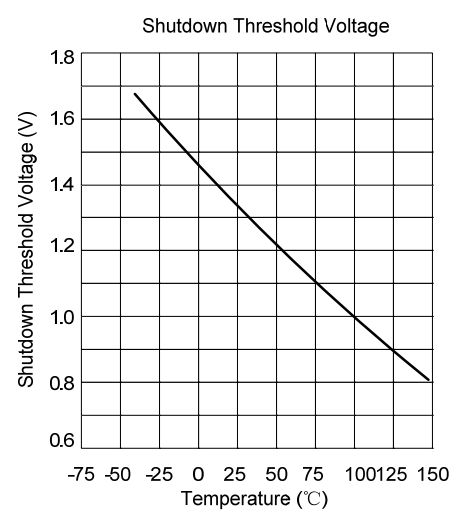
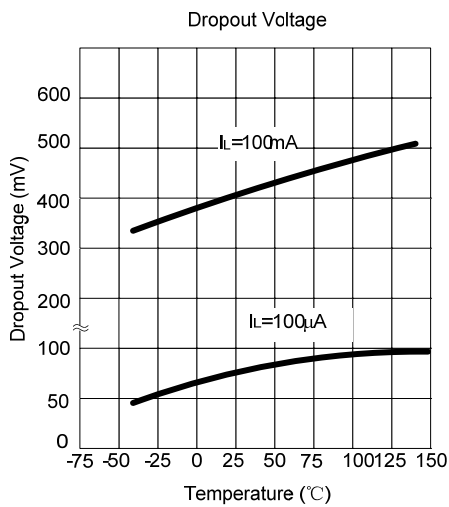
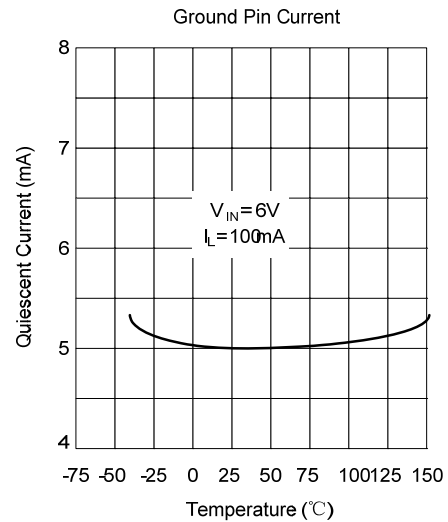
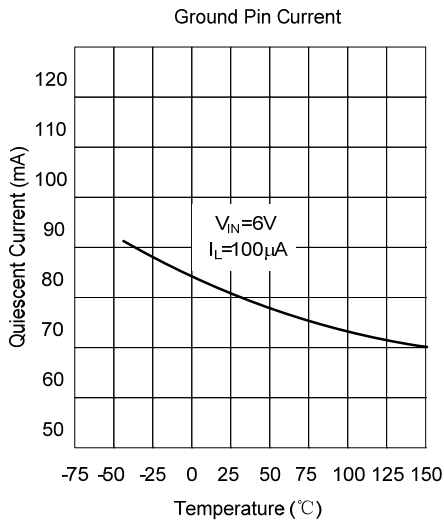
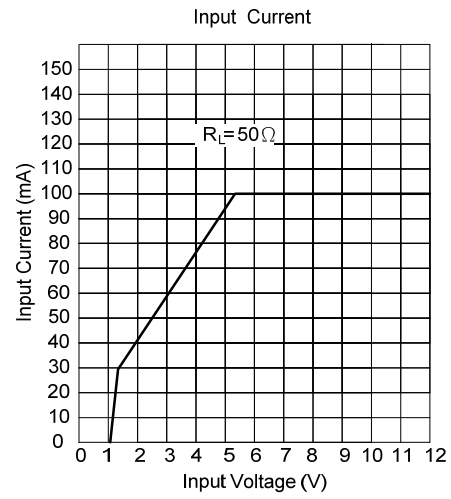
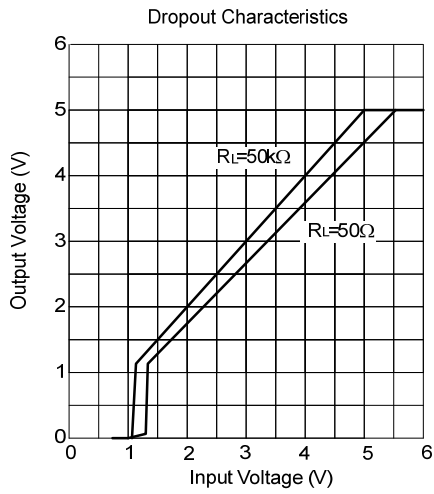


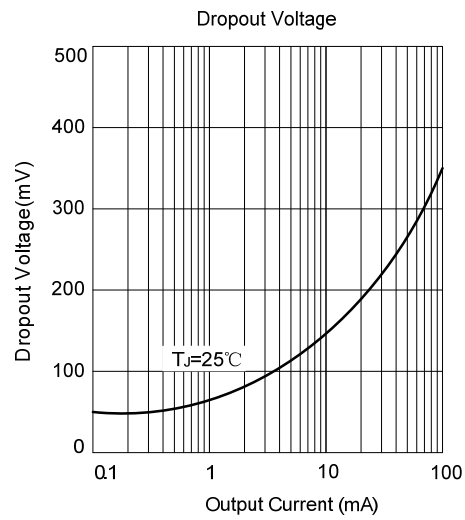
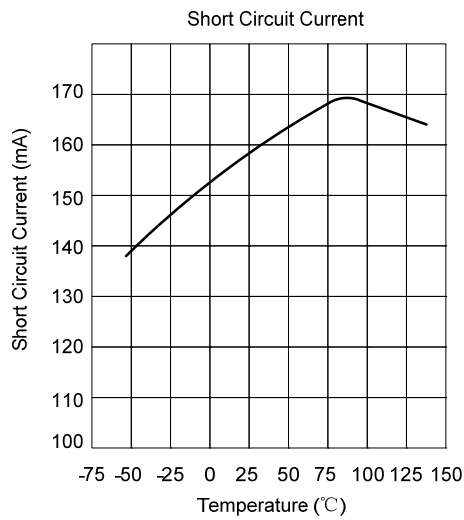
Fig.2

## ■ TYPICAL CHARACTERISTICS





■ TYPICAL CHARACTERISTICS(Cont.)



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