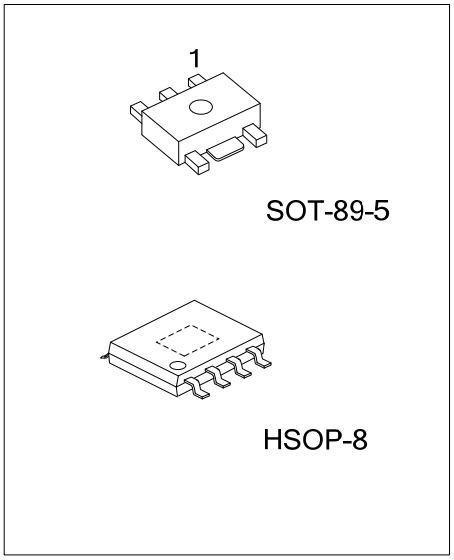
# R1MX55

**LINEAR INTEGRATED CIRCUIT**

## VOLTAGE REGULATOR




### ■ DESCRIPTION

As the UTC linear intergrated LDO, the **R1MX55** shows a high current, high accuracy, low-dropout voltage. The feature are: low dropout voltage, very low ground current. Cause the series have been designed for high current loads, so they are also used in lower current, extremely low dropout-critical systems (in which their tiny dropout voltage and ground current values are important attributes).

The **R1MX55** is stable with ceramic capacitors. It requires a 1μF or greater capacitor for stability.

### ■ FEATURES

* Available and fixed output versions 1.5V, 1.8V, 2.5V, 3.3V, 5V
* Built-in ON/OFF function
* Over current protection function
* Over heat protection function
* Adjustable DC output voltage

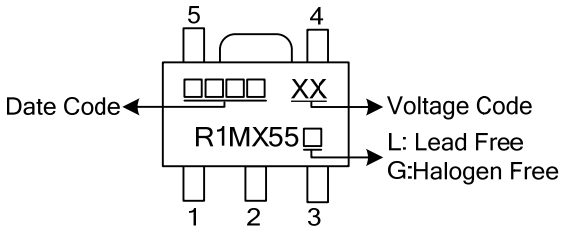
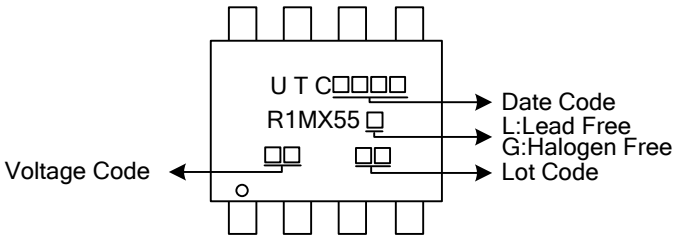
### ■ ORDERING INFORMATION

| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| R1MX55L-xx-AB5-R | R1MX55G-xx-AB5-R | SOT-89-5 | Tape Reel |
| R1MX55L-xx-SH2-R | R1MX55G-xx-SH2-R | HSOP-8 | Tape Reel |
| R1MX55L-xx-SH2-T | R1MX55G-xx-SH2-T | HSOP-8 | Tube |

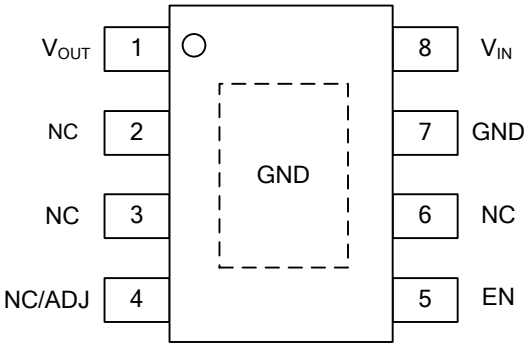
R1MX55L-xx-AB5-R
(1)Packing Type
(2)Package Type
(3)Output Voltage Code
(4)Lead Free

(1) R: Tape Reel, T: Tube
(2) AB5: SOT-89-5, SH2: HSOP-8
(3) xx: refer to Marking Information
(4) G: Halogen Free, L: Lead Free

## ■ MARKING INFORMATION

| PACKAGE | VOLTAGE CODE | MARKING |
|---|---|---|
| SOT-89-5 | 15: 1.5V<br>18: 1.8V<br>25: 2.5V |  |
| HSOP-8 | 33: 3.3V<br>50: 5.0V<br>AD: ADJ |  |

## ■ PIN CONFIGURATION




FOR HSOP-8

## ■ PIN DESCRIPTIONS

**FOR ADJUSTABLE VERSION**

| PIN NO. | PIN NAME | FUNCTION |
|---|---|---|
| **SOT89-5 PACKAGE** | | |
| 1 | $V_{ADJ}$ | Output voltage adjustment |
| 2 | GND | Ground |
| 3 | $V_C$ | ON/OFF control |
| 4 | $V_{IN}$ | DC input |
| 5 | $V_{OUT}$ | DC output |
| **HSOP-8 PACKAGE** | | |
| 1 | $V_{OUT}$ | DC output |
| 2, 3, 6 | NC | No Connection |
| 4 | ADJ | Output voltage adjustment |
| 5 | EN | Enable pin, Logic Low=Shutdown; Logic High= Enable |
| 7 | GND | Ground |
| 8 | $V_{IN}$ | DC input |

## ■ PIN DESCRIPTIONS(Cont.)

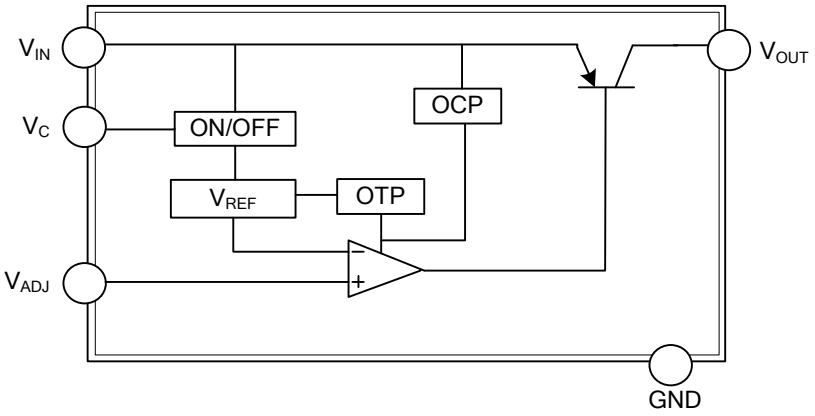
**FOR FIXED VERSION**

| PIN NO | PIN NAME | DESCRIPTION |
|---|---|---|
| **SOT89-5 PACKAGE** | | |
| 1 | NC | No Connection |
| 2 | GND | Ground |
| 3 | $V_C$ | ON/OFF control |
| 4 | $V_{IN}$ | DC input |
| 5 | $V_{OUT}$ | DC output |
| **HSOP-8 PACKAGE** | | |
| 1 | $V_{OUT}$ | DC output |
| 2, 3, 6 | NC | No Connection |
| 4 | NC | No Connection |
| 5 | EN | Enable pin, Logic Low=Shutdown; Logic High= Enable |
| 7 | GND | Ground |
| 8 | $V_{IN}$ | DC input |

## ■ BLOCK DIAGRAM

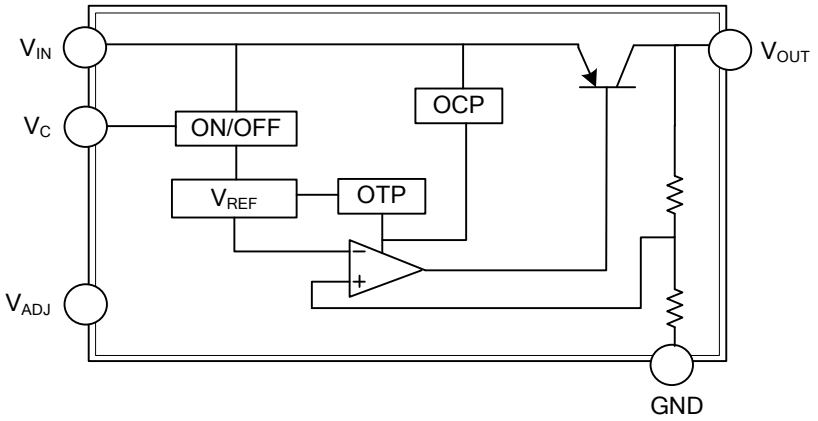
For Adjustable Version

Block For Adjustable Version




For Fixed Version

Block For Fixed Version



## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATINGS | UNITS |
|---|---|---|---|
| **FOR SOT-89-5** | | | |
| Input Voltage (Note 2) | $V_{IN}$ | 15 | V |
| ON/OFF Control Voltage (Note 2) | $V_C$ | 15 | V |
| Output Adiustment pin Voltage (Note 2) | $V_{ADJ}$ | 15 | V |
| Output Current | $I_{OUT}$ | 500 | mA |
| Power Dissipation | $P_D$ | 900 | mW |
| Junction Temperature | $T_J$ | 150 | °C |
| Operating Temperature | $T_{OPR}$ | -40 ~ +85 | °C |
| Storage Temperature | $T_{STG}$ | -55 ~ +150 | °C |
| **FOR HSOP-8** | | | |
| Input Voltage | $V_{IN}$ | 15 | V |
| Enable Voltage | $V_C$ | 15 | V |
| Power Dissipation | $P_D$ | 1100 | mW |
| Junction Temperature | $T_J$ | +125 | °C |
| Storage Temperature | $T_{STG}$ | -55 ~ +150 | °C |

Notes: 1. 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.
2. All are open except GND and applicable terminals.

## ■ ELECTRICAL CHARACTERISTICS ($T_A$=25°C, unless otherwise specified)

**FOR SOT-89-5** ($V_{IN}$=3.5V, $V_{OUT}$=2.44V ($R_1$=$R_2$=100KΩ), $I_{OUT}$=30mA, $V_C$=1.8V)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | | 2.6 | | 9.0 | V |
| Output Voltage | $V_{OUT}$ | | 1.3 | | 5.0 | V |
| Load Regulation | $\Delta V_{OUT}$ | $I_{OUT}$=5~500mA | | 10 | 100 | mV |
| Line Regulation | $\Delta V_{OUT}$ | $V_{IN}$=3.5~8.5V | | 6 | 20 | mV |
| Ripple Rejection | RR | | | 55 | | dB |
| Dropout Voltage | $V_D$ | $I_{OUT}$=500mA | | | 0.7 | V |
| Reference Voltage | $V_{REF}$ | | 1.196 | 1.22 | 1.244 | V |
| Temperature Coefficient of Output Voltage | $T_CV_{OUT}$ | $T_J$=25 ~ 75°C, $I_{OUT}$=10mA | | ±0.1 | | mV/°C |
| Output Noise Voltage | $V_{NO(RMS)}$ | $10H_Z$ < f < $100kH_Z$ | | 100 | | μV |
| On-State Voltage for Control | $V_{C(ON)}$ | (Note) | 1.8 | | | V |
| On-State Current for Control | $I_{C(ON)}$ | $V_C$=1.8V | | 20 | 70 | μA |
| Off-State Voltage for Control | $V_{C(OFF)}$ | | | | 0.4 | V |
| Quiescent Current | $I_Q$ | $I_{OUT}$=0A | | 0.8 | 1.2 | mA |
| Output Off-State Consumption Current | $I_{QS}$ | $V_C$=0.2V | | | 1 | μA |

Note: In case that the control terminal (3th pin) is non-connection, output voltage should be OFF state.

## ■ ELECTRICAL CHARACTERISTICS(Cont.)

**FOR HSOP-8** (Unless otherwise specified, $V_{IN}$=3.0V, $I_O$=30mA, $V_C$=1.8V, $T_A$=25°C (1.5V,1.8V))
(Unless otherwise specified, $V_{IN}$=$V_{O(TYP.)}$+1.0V, $I_O$=30mA, $V_C$=1.8V, $T_A$=25°C (2.5V,3.3V,5V))

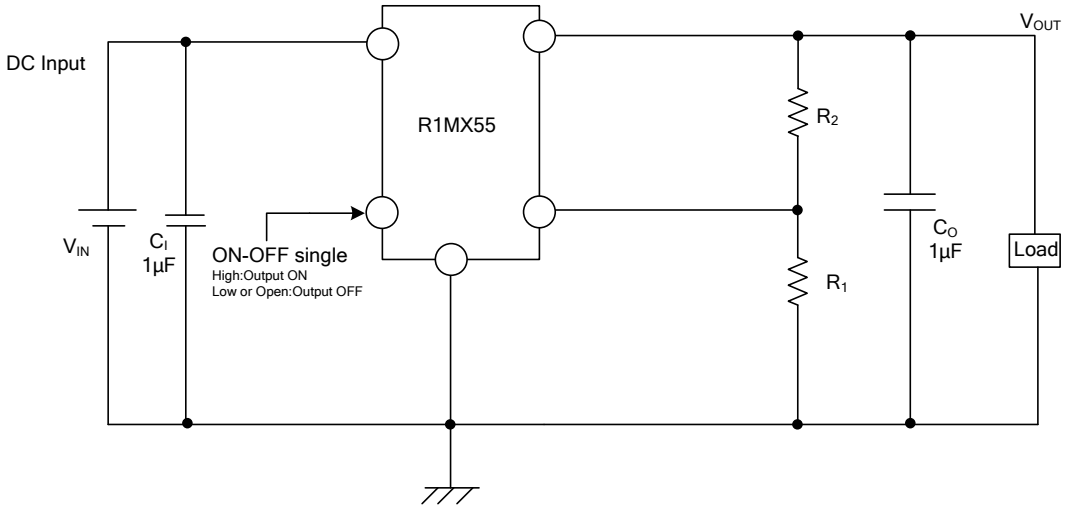
| PARAMETER | | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Output Voltage | 1.5V | $V_O$ | | 1.44 | 1.5 | 1.56 | V |
| | 1.8V | | | 1.74 | 1.8 | 1.86 | |
| | 2.5V | | | 2.440 | 2.5 | 2.560 | |
| | 3.3V | | | 3.234 | 3.3 | 3.366 | |
| | 5.0V | | | 4.900 | 5.0 | 5.100 | |
| Load Regulation | | $REG_{LOAD}$ | $I_O$=5mA~500mA | | 60 | 200 | mV |
| Line Regulation | 1.5V | $REG_{LINE}$ | $V_{IN}$=3.0V~7.5V | | 3.0 | 20 | mV |
| | 1.8V | | $V_{IN}$=3.0V~7.8V | | | | |
| | 2.5V/3.3V | | $V_{IN}$=$V_{O(TYP.)}$+1V to $V_{O(TYP.)}$+6V(MAX9V) | | | | |
| Temperature coefficient of output voltage | | $T_CV_O$ | 10kHz<f<100kHz, $C_N$=0.1μF, $I_O$=30mA | | 0.1 | | mV/°C |
| Ripple rejection | | RR | Refer to Fig below | | 65 | | dB |
| Output noise voltage | | $V_{NO(RMS)}$ | | | 30 | | μV |
| Dropout Voltage | | $V_{DROP}$ | $I_{OUT}$=500mA | | 400 | 700 | mV |
| ON-state voltage for control | | $V_{C(ON)}$ | | 1.8 | | | V |
| ON-state current for control | | $I_{C(ON)}$ | $V_C$=1.8V | | 20 | 70 | μA |
| OFF-state voltage for control | | $V_{C(OFF)}$ | | | | 0.4 | V |
| Quiescent Current | | $I_Q$ | $I_O$=0mA | | 0.6 | 1 | mA |
| Output OFF-state dissipation current | | $I_{QS}$ | $V_C$=0.2V | | | 1 | μA |

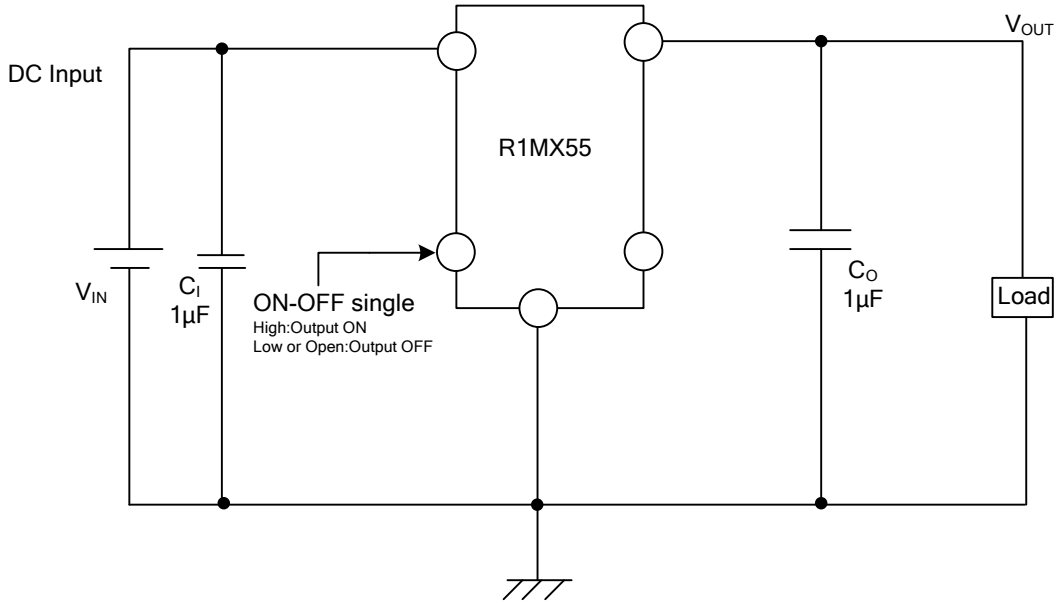
Note: In case that the control terminal (3th pin) is non-connection, output voltage should be OFF state.

**FOR HSOP-8 ADJ** ($V_{IN}$= $V_O$ +2.5V, $V_{OUT}$=1.8V, $V_{EN}$= $V_{IN}$, $T_A$=25°C, unless otherwise specified)

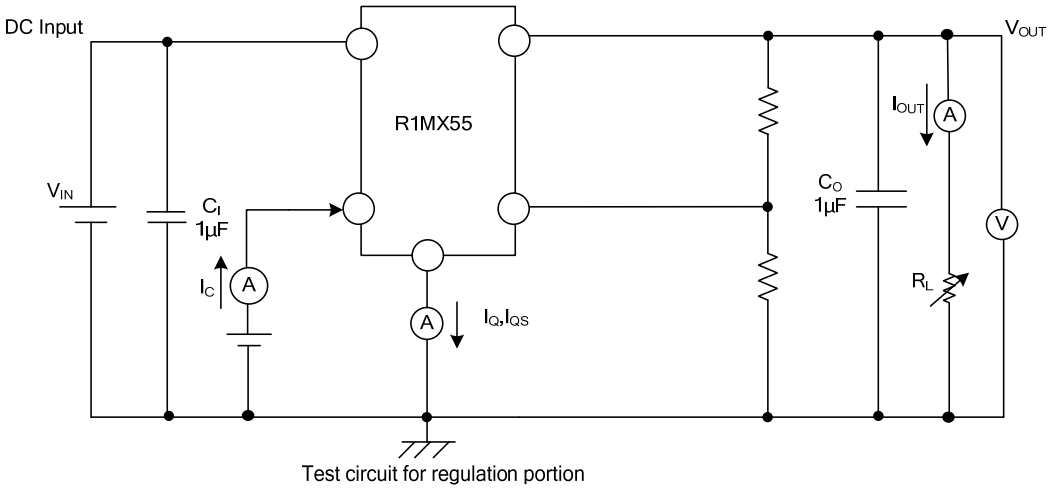
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | | 2.6 | | 15 | V |
| Output Voltage Accuracy | $V_{OUT}$ | | -2 | | +2 | % |
| Quiescent Current | $I_Q$ | $I_{OUT}$=0.1mA | | 0.85 | | mA |
| | | $I_{OUT}$=50mA | | 1.26 | | |
| | | $I_{OUT}$=100mA | | 1.67 | | |
| | | $I_{OUT}$=150mA | | 2.05 | 5 | |
| Reference Voltage | $V_{REF}$ | | -2% | 1.2 | +2% | V |
| Line Regulation | $REG_{LINE}$ | $V_{OUT}$+2.5V<$V_{IN}$<15V,$I_{OUT}$=1mA | | 0.5 | | % |
| Load Regulation | $REG_{LOAD}$ | 0.1mA<$I_{OUT}$<150mA | | 0.5 | 1 | % |
| Dropout Voltage | $V_{DROP}$ | $I_{OUT}$=0.1mA | | 10 | 100 | mV |
| | | $I_{OUT}$=50mA | | 40 | 100 | |
| | | $I_{OUT}$=100mA | | 70 | 150 | |
| | | $I_{OUT}$=150mA | | 100 | 200 | |
| Maximum Output Current | $I_{O(MAX)}$ | $V_{IN}$ =$V_{OUT}$ +2.5V | 250 | | | mA |
| **PROTECTION** | | | | | | |
| Over Temperature Shutdown | OTS | | | 140 | | °C |
| Over Temperature Shutdown Hysteresis | | | | 30 | | °C |
| **SHUTDOWN** | | | | | | |
| Input High Voltage | $V_{EN}$ | | 2.0 | | | V |
| Input Low Voltage | | | | | 0.4 | |
| Shutdown Supply Current | $I_{Q(SHDN)}$ | EN=Low, $V_{IN}$=15V | | 0.1 | 10 | μA |

## ■ TYPICAL APPLICATION CIRCUIT

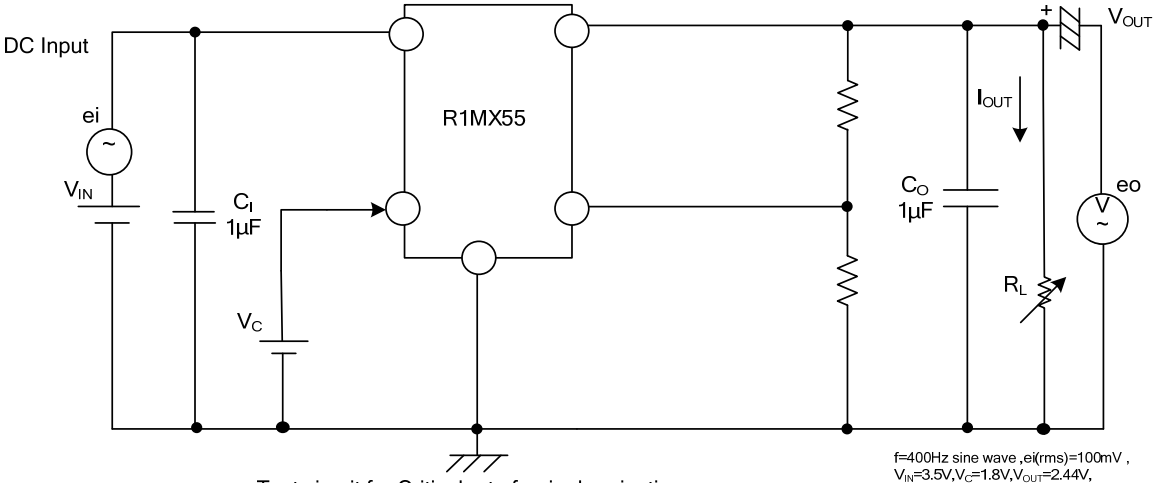


## ■ ELECTRICAL CHARACTERISTICS MEASURING CIRCUIT(FOR SOT-89-5)




Test circuit for regulation portion

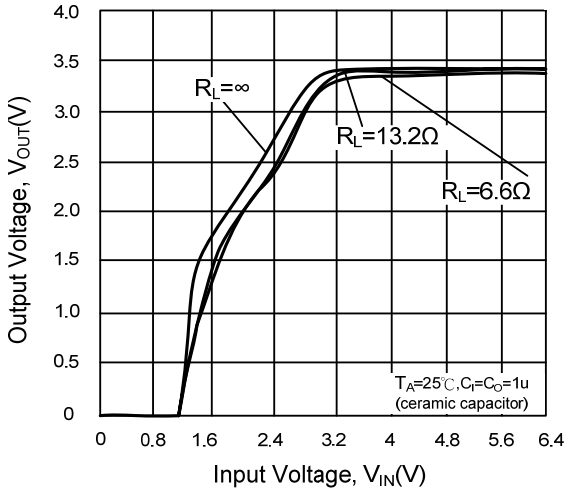



Test circuit for Critical rate for ripple rejection

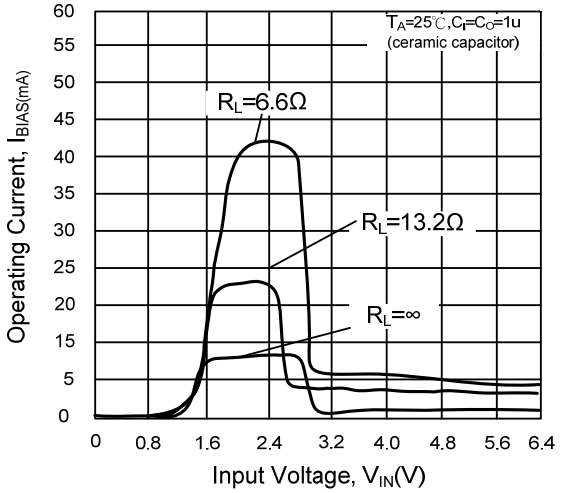
f=400Hz sine wave ,ei(rms)=100mV ,
$V_{IN}$=3.5V,$V_C$=1.8V,$V_{OUT}$=2.44V,
$I_{OUT}$=0.03A,RR=20log{ei(rms)/eo(rms)}

## ■ TYPICAL CHARACTERISTICS(FOR SOT-89-5)

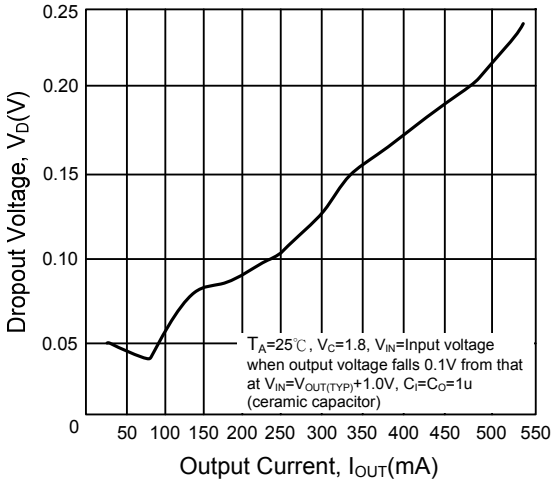
Output Voltage vs.
Input Voltage (Typical Values)



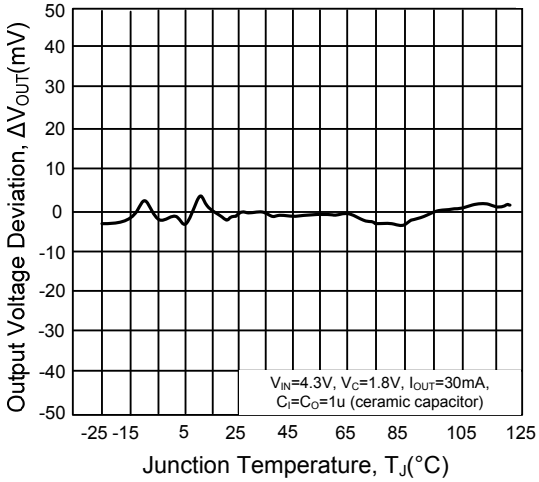

Circuit Operating Current vs.
Input Voltage (Typical Values)



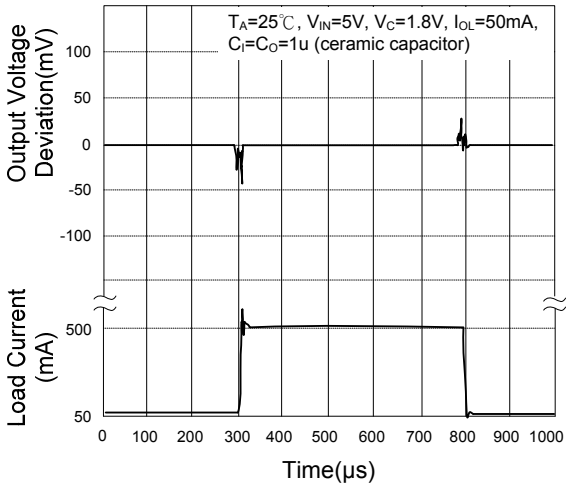

Dropout Voltage vs.
Output Current (Typical Values)



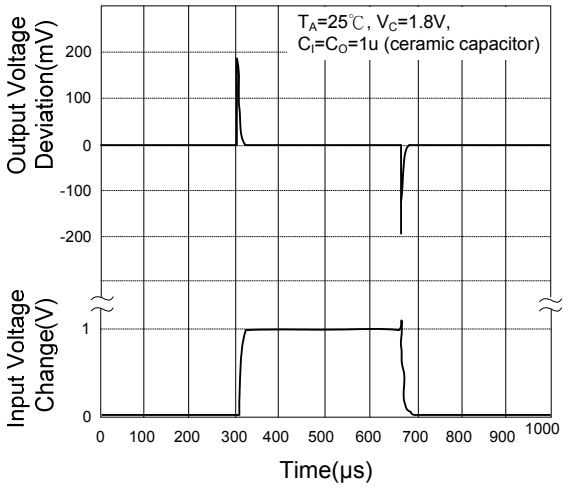

Output Voltage Deviation vs.
Junction Temperature (Typical Values)




Load Transient Response




Line Transient Response



## ■ TYPICAL CHARACTERISTICS(Cont.)