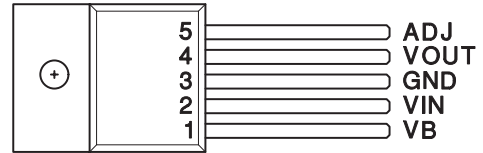


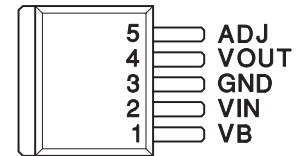


- Fast Transient Response
- 10-mA to 5-A Load Current
- Short Circuit Protection
- Maximum Dropout of 500-mV at 5-A Load Current
- Separate Bias (VB) and VIN Pins
- Available in Adjustable or Fixed Output Voltages
- 5-Pin Package Allows Kelvin Sensing of Load Voltage
- Reverse Current Protection

5-PIN TO-220  
T PACKAGE (TOP VIEW)



5-PIN TO-263  
TD PACKAGE  
(TOP VIEW)



Note: Tab = Ground

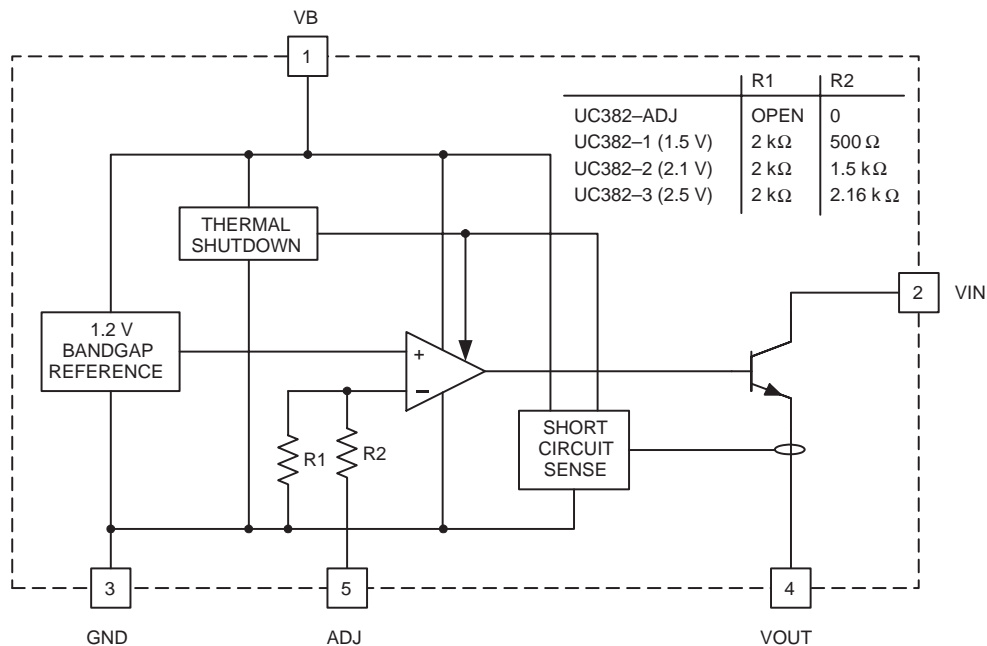
## description

The UC385 is a low dropout linear regulator providing a quick response to fast load changes. Combined with its precision on-board reference, the UC385 excels at driving GTL and BTL buses. Due to its fast response to load transients, the total capacitance required to decouple the regulator's output can be significantly decreased when compared to standard LDO linear regulators.

Dropout voltage (VIN to VOUT) is only 490 mV maximum and 350 mV typical at 5-A load (0°C to 100°C).

The on-board bandgap reference is stable with temperature and scaled for a 1.2 V input to the internal power amplifier. The UC385 is available in fixed output voltages of 1.5 V, 2.1 V, or 2.5 V. The output voltage of the adjustable version can be set with two external resistors. If the external resistors are omitted, the output voltage defaults to 1.2 V.

## block diagram



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Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



# UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ

## FAST TRANSIENT RESPONSE 5-A

### LOW-DROPOUT REGULATOR

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#### absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

V <sub>IN</sub> .....	7.5 V
Output Voltage .....	1.2 V to –6.0 V
Storage Temperature .....	–65°C to 150°C
Junction Temperature .....	–55°C to 150°C
Lead Temperature (Soldering, 10 seconds) .....	300°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

#### AVAILABLE OPTIONS

T <sub>J</sub>	PACKAGED DEVICES							
	TO-220 (T)				TO-263 (TD)			
	OUTPUT VOLTAGE				OUTPUT VOLTAGE			
	1.5 V	2.1 V	2.5 V	1.2 V or ADJ	1.5 V	2.1 V	2.5 V	1.2 V or ADJ
–40°C to 100°C	285T-1	285T-2	285T-3	285T-ADJ	285TD-1	285TD-2	285TD-3	285TD-ADJ
0°C to 100°C	385T-1	385T-2	385T-3	385T-ADJ	385TD-1	385TD-2	385TD-3	385TD-ADJ

electrical characteristics unless otherwise stated, these parameters apply for T<sub>A</sub> = –40 C to 100 C for the UC285-x series and 0 C to 100 C for the UC385-x, V<sub>B</sub> = 5 V; V<sub>IN</sub> = 3.3 V, V<sub>OUT</sub> = 2.5 V, T<sub>A</sub> = T<sub>J</sub>.

PARAMETER	TEST CONDITION		MIN	TYP	MAX	UNIT
<b>UC385-3 Fixed 2.5 V, 5-A Family</b>						
Output voltage	UC385-3	I <sub>VOUT</sub> = 100 mA	2.475	2.5	2.525	V
	UC285-3	I <sub>VOUT</sub> = 100 mA	2.45	2.5	2.525	V
Load regulation	I <sub>VOUT</sub> = 10 mA to 5 A			0.5	4	mV
V <sub>IN</sub> PSRR			80	110		dB
V <sub>B</sub> PSRR			50	65		dB
V <sub>IN</sub> dropout voltage (V <sub>IN</sub> - V <sub>OUT</sub> )	I <sub>VOUT</sub> = 5 A, T <sub>J</sub> = 25°C			350	425	mV
	UC385-3	I <sub>VOUT</sub> = 5 A		350	490	mV
	UC285-3	I <sub>VOUT</sub> = 5 A		350	500	mV
V <sub>B</sub> dropout (V <sub>B</sub> - V <sub>OUT</sub> )	UC385-3	I <sub>VOUT</sub> = 5 A		1.8	2.1	V
	UC285-3	I <sub>VOUT</sub> = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
V <sub>B</sub> current	I <sub>VOUT</sub> = 10 mA			8	15	mA
	I <sub>VOUT</sub> = 5 A			40	100	mA
V <sub>IN</sub> current	I <sub>VOUT</sub> = 5 A		4.9	4.96		A
<b>UC385-2 Fixed 2.1 V, 5-A Family</b>						
Output voltage	UC385-2	I <sub>VOUT</sub> = 100 mA	2.079	2.1	2.121	V
	UC285-2	I <sub>VOUT</sub> = 100 mA	2.058	2.1	2.121	V
Load regulation	I <sub>VOUT</sub> = 10 mA to 5 A			0.5	4	mV
V <sub>IN</sub> PSRR			80	110		dB
V <sub>B</sub> PSRR			50	67		dB



# UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ FAST TRANSIENT RESPONSE 5-A LOW-DROPOUT REGULATOR

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electrical characteristics unless otherwise stated, these parameters apply for  $T_A = -40\text{ C}$  to  $100\text{ C}$  for the UC285-x series and  $0\text{ C}$  to  $100\text{ C}$  for the UC385-x,  $V_B = 5\text{ V}$ ;  $V_{IN} = 3.3\text{ V}$ ,  $V_{OUT} = 2.5\text{ V}$ ,  $T_A = T_J$ .

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
<b>UC385–2 Fixed 2.1 V, 5-A Family (continued)</b>						
VIN dropout voltage (VIN - VOUT)		I <sub>VOUT</sub> = 5 A, T <sub>J</sub> = 25°C		350	425	mV
	UC385-2	I <sub>VOUT</sub> = 5 A		350	490	mV
	UC285-2	I <sub>VOUT</sub> = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-2	I <sub>VOUT</sub> = 5 A		1.8	2.1	V
	UC285-2	I <sub>VOUT</sub> = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current	I <sub>VOUT</sub> = 10 mA			8	15	mA
	I <sub>VOUT</sub> = 5 A			40	100	mA
VIN current		I <sub>VOUT</sub> = 5 A	4.9	4.96		A
<b>UC385–1 Fixed 1.5 V, 5-A Family</b>						
Output voltage	UC385-1	I <sub>VOUT</sub> = 100 mA	1.485	1.5	1.515	V
	UC285-1	I <sub>VOUT</sub> = 100 mA	1.470	1.5	1.515	V
Load regulation		I <sub>VOUT</sub> = 10 mA to 5 A		0.5	4	mV
VIN PSRR			80	110		dB
VB PSRR			50	65		dB
VIN dropout voltage (VIN - VOUT)		I <sub>VOUT</sub> = 5 A, T <sub>J</sub> = 25°C		350	425	mV
	UC285-1	I <sub>VOUT</sub> = 5 A		350	490	mV
	UC285-2	I <sub>VOUT</sub> = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-1	I <sub>VOUT</sub> = 5 A		1.8	2.1	V
	UC285-1	I <sub>VOUT</sub> = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current	I <sub>VOUT</sub> = 10 mA			8	15	mA
	I <sub>VOUT</sub> = 5 A			40	100	mA
VIN = current		I <sub>VOUT</sub> = 5 A	4.9	4.96		A
<b>UC385-ADJ Adjustable, 5-A Family</b>						
ADJ voltage	UC385-ADJ	I <sub>VOUT</sub> = 100 mA	1.188	1.2	1.212	V
	UC285-ADJ	I <sub>VOUT</sub> = 100 mA	1.176	1.2	1.212	V
Load regulation		I <sub>VOUT</sub> = 10 mA to 5 A		0.5	4	mV
VIN PSRR		V <sub>OUT</sub> programmed for 2.5 V	80	110		dB
VB PSRR V <sub>OUT</sub>		Programmed for 2.5 V	50	65		dB
VIN dropout voltage (VIN - VOUT)		I <sub>VOUT</sub> = 5 A, T <sub>J</sub> = 25°C		350	425	mV
	UC385-ADJ	I <sub>VOUT</sub> = 5 A		350	490	mV
	UC285-ADJ	I <sub>VOUT</sub> = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-ADJ	I <sub>VOUT</sub> = 5 A		1.8	2.1	V
	UC285-ADJ	I <sub>VOUT</sub> = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current	I <sub>VOUT</sub> = 10 mA			8	15	mA
	I <sub>VOUT</sub> = 5 A			40	100	mA
VIN current		I <sub>VOUT</sub> = 5 A	4.9	4.96		A



# UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ

## FAST TRANSIENT RESPONSE 5-A

### LOW-DROPOUT REGULATOR

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#### pin descriptions

**ADJ:** In the adjustable version, the user programs the output voltage with two external resistors. The resistors should be 0.1% for high accuracy. The output amplifier is configured as a non-inverting operational amplifier. The resistors should meet the criteria of  $R3 \parallel R4 < 100 \Omega$ . Connect ADJ to VOUT for an output voltage of 1.2 V. Note that the point at which the feedback network is connected to the output is the Kelvin sense point.

**GND:** For accurate results, the GND pin should be referenced to the load ground.

**VB:** Supplies power to all circuits of the regulator except the output power transistor. The 2-V headroom from VB to VOUT allows the use of a Darlington output stage for inherently low output impedance and fast response. (Dropout is derated for junction temperatures below 0°C.)

**VIN:** Supplies the current to the collector of the output power transistor only. The dropout ( $V_{IN}-V_{OUT}$ ) is under 100 mV for light loads; maximum dropout is 490 mV at 5 A for  $T_J = 0^\circ\text{C}$  to  $100^\circ\text{C}$ . (Dropout is derated for junction temperatures over  $100^\circ\text{C}$ .)

**VOUT:** This pin should be connected to the load via a low impedance path. Avoid connectors which add significant inductance and resistance. Note that even though a Kelvin sense is available through a 5-pin package, care must be taken since voltage drops along wire traces add to the dropout voltage.

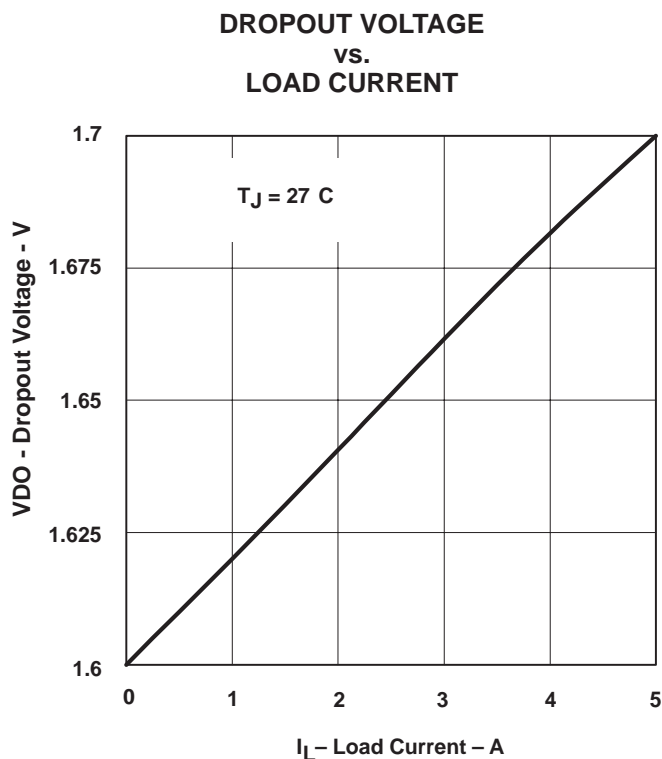


Figure 1

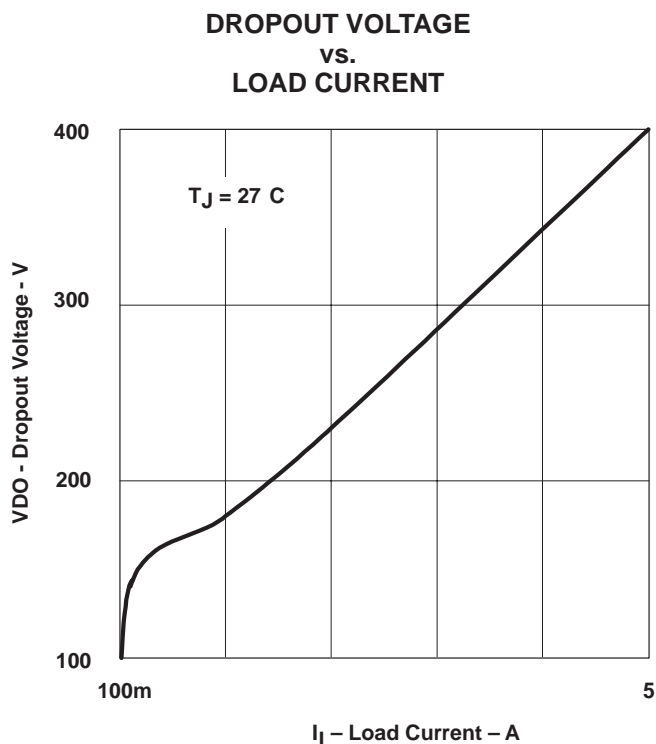


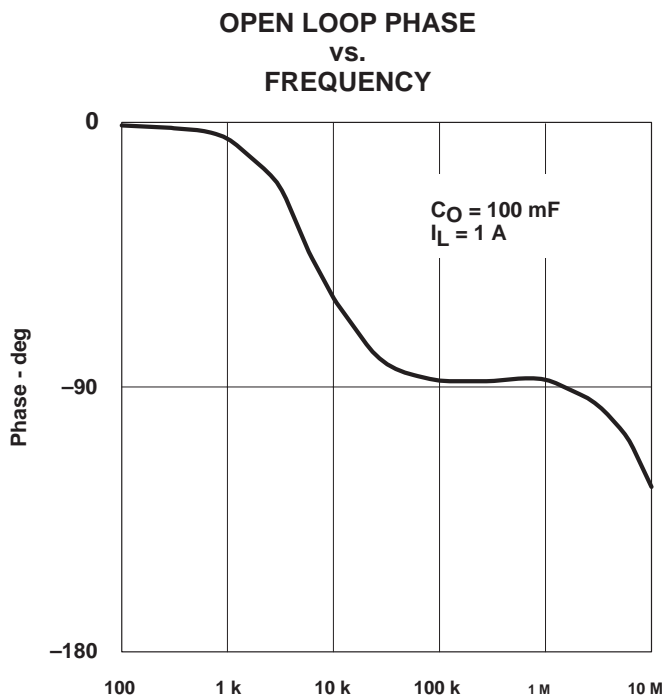
Figure 2

**APPLICATION INFORMATION**

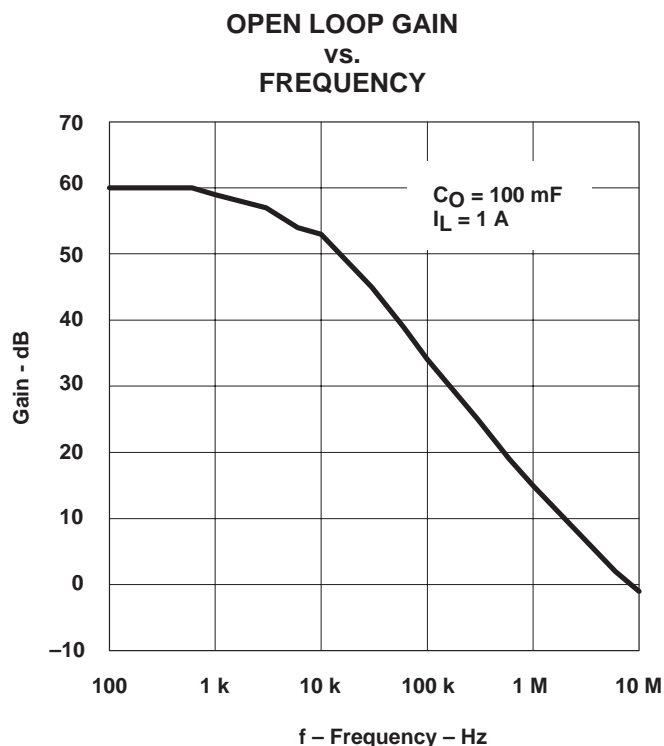
The UC385 is easy to use. The adjustable version requires two resistors to set the output voltage. The fixed versions of the UC385 require no external resistors. All versions of the UC385 require decoupling capacitors on the input and output. In a typical application,  $V_B$  and  $V_{IN}$  are driven from switching power supplies which may have large filter capacitors at their outputs. If the UC385 is further than 12 inches from the power supply, it is recommended to add local decoupling as close as possible to the linear regulator.

Decouple the output of the UC385 with at least 100  $\mu\text{F}$  of high quality tantalum or Sanyo OSCON capacitors close to the  $V_{OUT}$  pin for maximum stability. Many applications involving ultra fast GTL or BTL applications require additional capacitance close to the load. The exact amount will vary according to speed and magnitude of the load transients and the tolerance allowed for transients on  $V_{OUT}$ . When specifying the decoupling capacitors, the series resistance of the capacitor bank is an important factor in its ability to filter load transients.

The UC385 allows for Kelvin sensing the voltage at the load. This improves regulation performance and eliminates the voltage drops due to wire trace resistance. This voltage drop must be added to the headroom ( $V_{IN}$  to  $V_{OUT}$  and  $V_B$  to  $V_{OUT}$ ). The dropout of 350 mV is measured at the pins and does not include additional drops due to trace resistance.



f – Frequency – Hz  
**Figure 3**



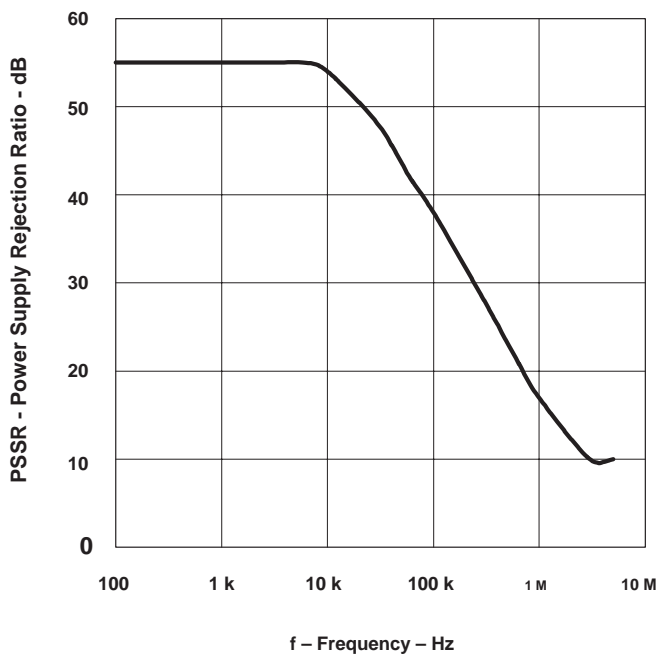
f – Frequency – Hz  
**Figure 4**

**UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ**  
**FAST TRANSIENT RESPONSE 5-A**  
**LOW-DROPOUT REGULATOR**

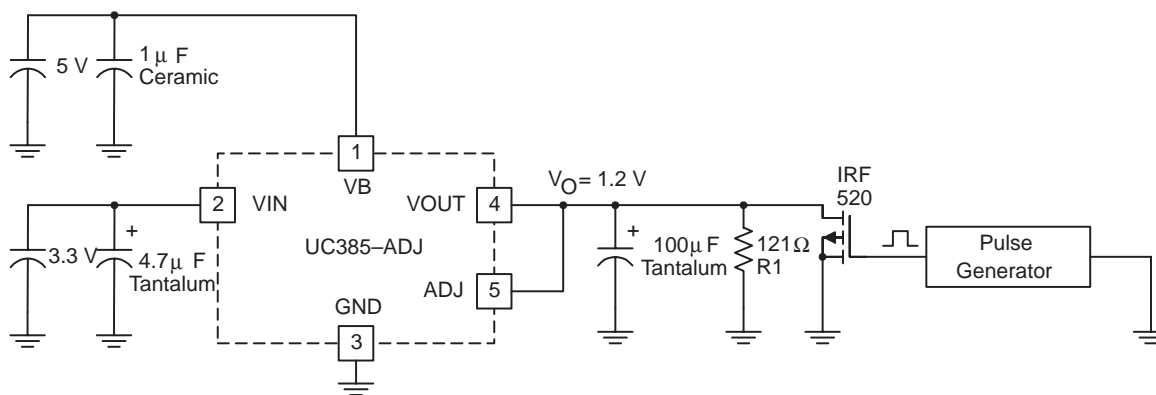
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**APPLICATION INFORMATION**

**POWER SUPPLY REJECTION RATIO  
 vs.  
 FREQUENCY**



**Figure 5**



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**Figure 6. Transient Test Circuit**

APPLICATION INFORMATION

10 mA to 3 A/ s Load Transient Response

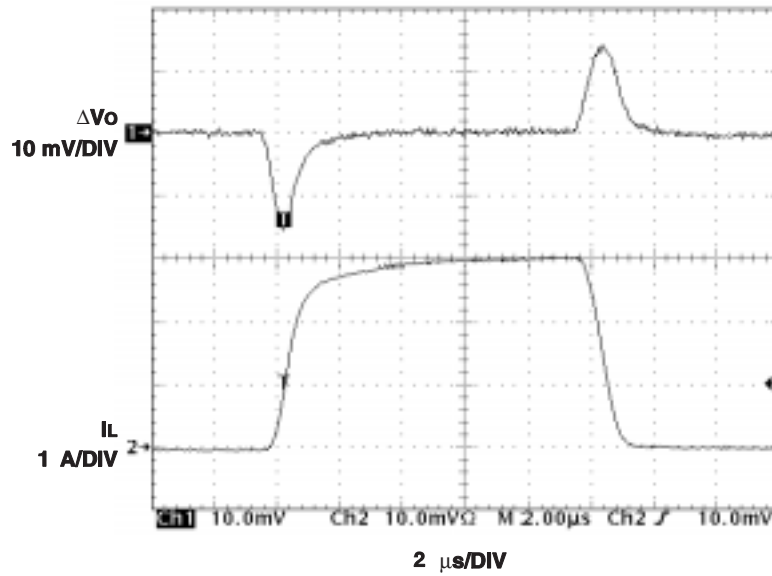
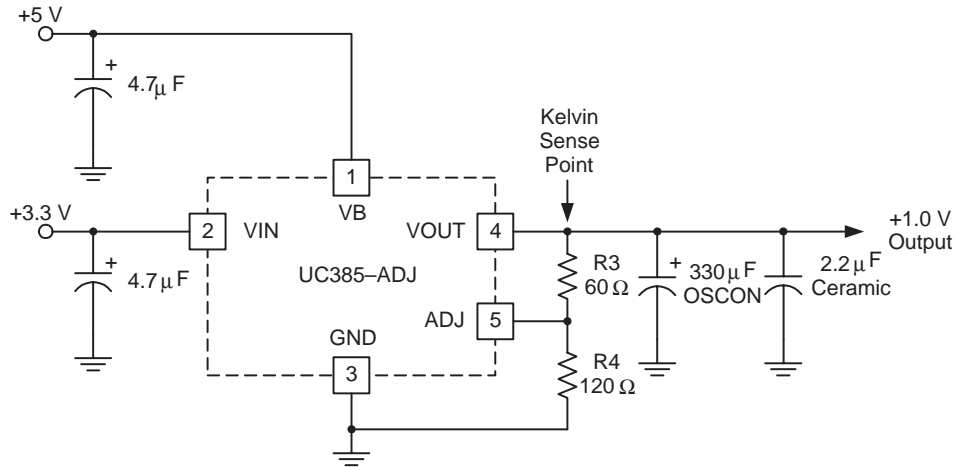


Figure 7



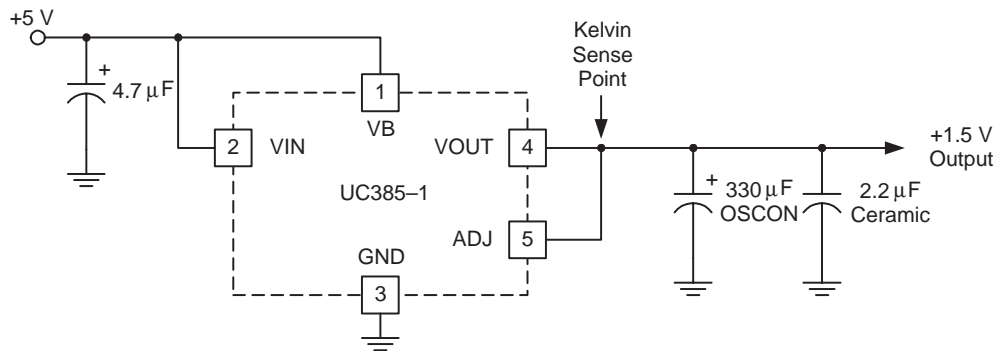
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Figure 8. Typical UC385-ADJ Application

# UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ FAST TRANSIENT RESPONSE 5-A LOW-DROPOUT REGULATOR

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## APPLICATION INFORMATION



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Figure 9. Typical UC385-1, -2, or -3 Application



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