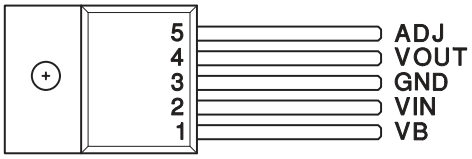
UC282-1, UC282-2, UC282-3, UC282-ADJ, UC382-1, UC382-2, UC382-3, UC382-ADJ
FAST LDO LINEAR REGULATOR

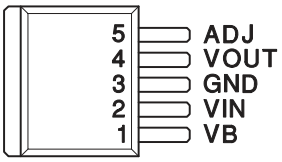
SLUS317B − JANUARY 2000 − REVISED FEBRUARY 2004

- **Fast Transient Response**
- **10-mA to 3-A Load Current**
- **Short Circuit Protection**
- **Maximum Dropout of 450-mV at 3-A Load Current**
- **Separate Bias 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

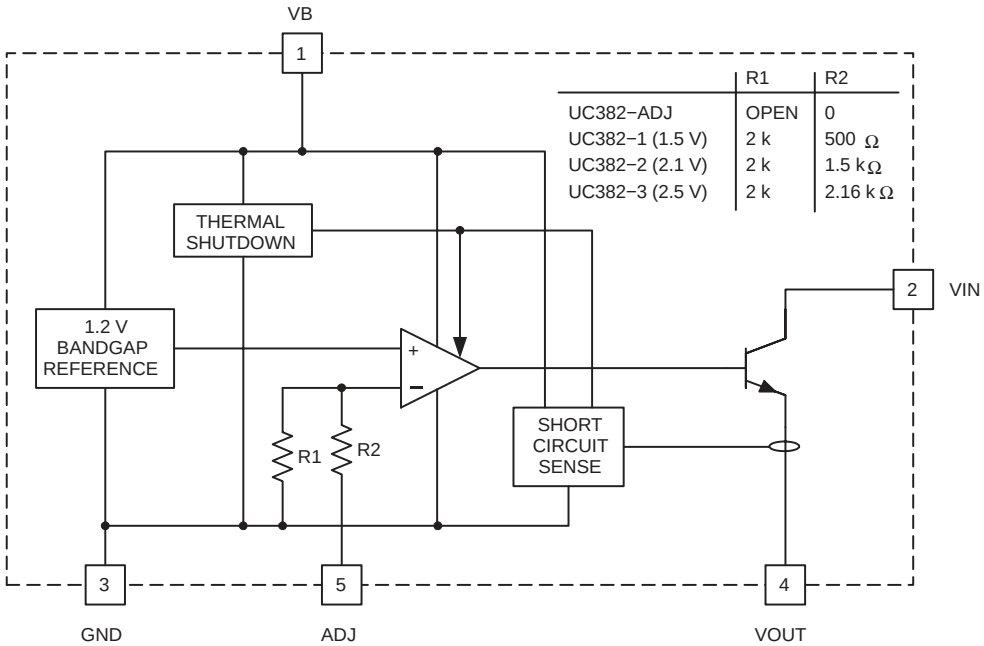
description

The UC382 is a low-dropout-linear regulator providing a quick response to fast load changes. Combined with its precision onboard reference, the UC382 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 450 mV maximum at 100°C and 350 mV typical at 3-A load.

The onboard bandgap reference is stable with temperature and scaled for a 1.2-V input to the internal-power amplifier. The UC382 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



UDG-00080

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

VB . . . . . 13 V
VIN . . . . . 7.5 V
Output voltage . . . . . 1.2 V to 6.0 V
Storage temperature, T_{stg} . . . . . −65°C to 150°C
Junction temperature, T_J . . . . . −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.

‡ Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Databook for thermal limitations and considerations of packages.

AVAILABLE OPTIONS(1)

T_J	PACKAGED DEVICES							
	TO-220 (T)				TO−263 (TD)(2)			
	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	282T-1	282T-2	282T-3	282T-ADJ	282TD-1	282TD-2	282TD-3	282TD-ADJ
0°C to 100°C	382T-1	382T-2	382T-3	382T-ADJ	382TD-1	382TD-2	382TD-3	382TD-ADJ

1. For more package and ordering information, see the Package Option Addendum located at the end of this data sheet.
2. For 50 piece reel, add KTTT (e.g., UC282TDKTTT−1); for 500 piece reel, add TR (e.g., UC282TDTR−1).

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-3 fixed 2.5 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-3		2.475	2.500	2.525	V
	UC282-3		2.450	2.500	2.525	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			50	60		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-3		350	450	mV
	I_{VOUT} = 3 A,	UC282-3		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-3		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-3		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-2 fixed 2.1 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-2		2.079	2.100	2.121	V
	UC282-2		2.058	2.100	2.121	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			52	62		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-2		350	450	mV
	I_{VOUT} = 3 A,	UC282-2		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-2		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-2		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

UC382-1 fixed 1.5 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-1		1.485	1.500	1.515	V
	UC282-1		1.470	1.500	1.515	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			55	65		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-1		350	450	mV
	I_{VOUT} = 3 A,	UC282-1		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-1		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-1		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-ADJ adjustable, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
ADJ voltage (I_{VOUT} = 100 mA)	UC382-ADJ		1.188	1.200	1.212	V
	UC282-ADJ		1.176	1.200	1.212	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR	VOUT programmed for 2.5 V		80	100		dB
VB PSSR	VOUT programmed for 2.5 V		50	60		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-ADJ		350	450	mV
	I_{VOUT} = 3 A,	UC282-ADJ		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-ADJ		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-ADJ		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

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 || R4 < 100 Ω. 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. For -1, -2, and -3 versions, ADJ pin is tied to VOUT to obtain specified output voltage.

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 collector of 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 (VIN−VOUT) is under 100 mV for light loads; maximum dropout is 450 mV at 3 A for T_J = 0°C to 100°C. (Dropout is derated for junction temperatures over 100°C.) At full load, the majority of the VB current is going to the load.

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.

pin descriptions (continued)

DROPOUT VOLTAGE ($V_B - V_{OUT}$) vs LOAD CURRENT

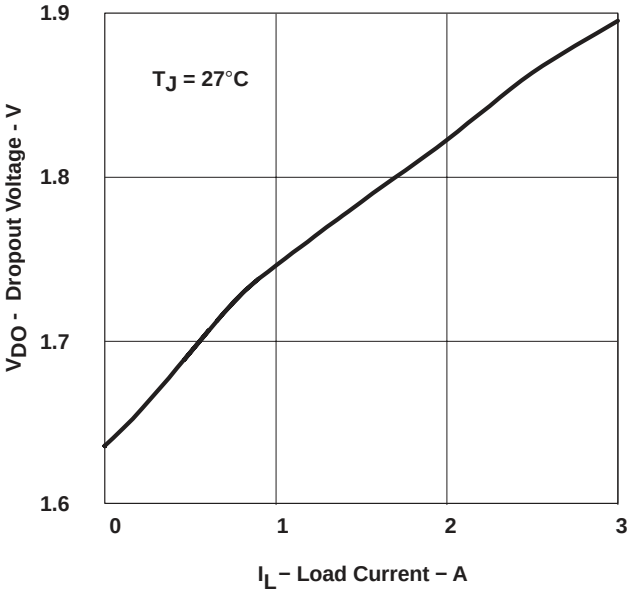

Figure 1

DROPOUT VOLTAGE ($V_{IN} - V_{OUT}$) vs LOAD CURRENT

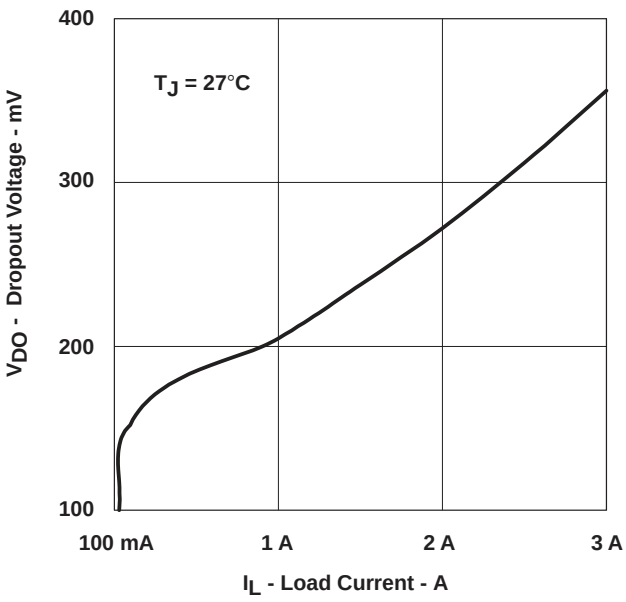

Figure 2

APPLICATION INFORMATION

The UC382 is easy to use. The adjustable version requires two 0.1% resistors to set the output voltage. The fixed versions of the UC382 require no external resistors. All versions of the UC382 require decoupling capacitors on the input and output. In a typical application, VB and VIN are driven from switching power supplies which may have large filter capacitors at their outputs. If the UC382 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 UC382 with at least 100 µF of high-quality tantalum or Sanyo OSCON capacitors close to the VOUT 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 VOUT. When specifying the decoupling capacitors, the series resistance of the capacitor bank is an important factor in its ability to filter load transients.

The UC382 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 (VIN to VOUT and VB to VOUT). The dropout of 450 mV is measured at the pins and does not include additional drops due to trace resistance. The minimum load current is 10 mA.

Two or more UC382's may be used in parallel. While stable, this arrangement does degrade the transient response.

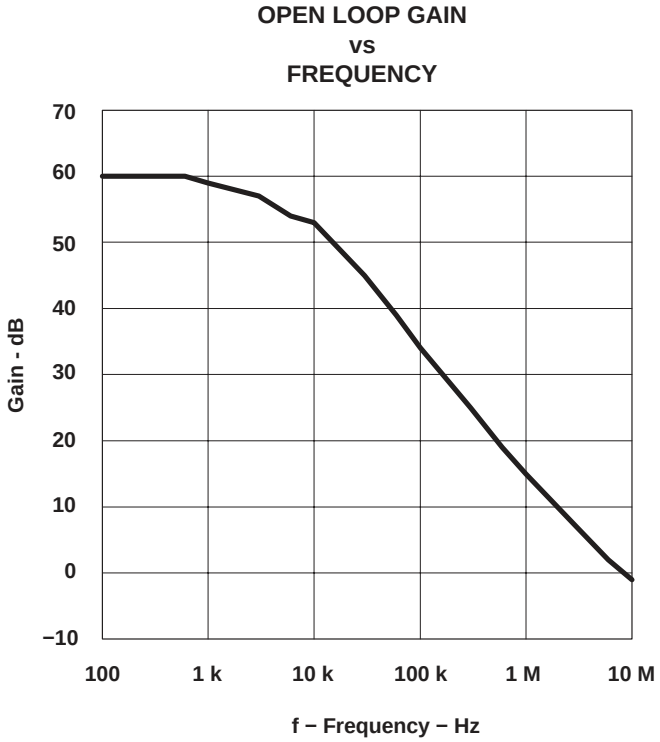

Figure 3

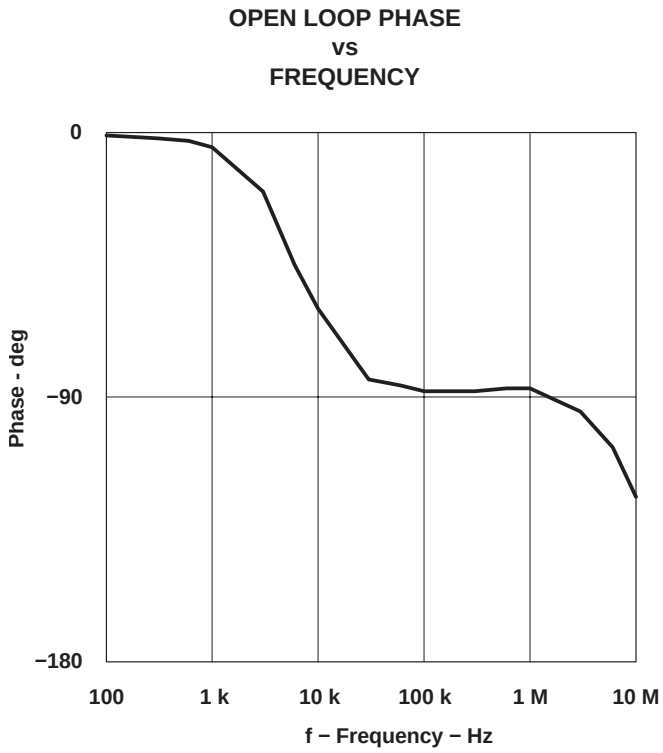

Figure 4

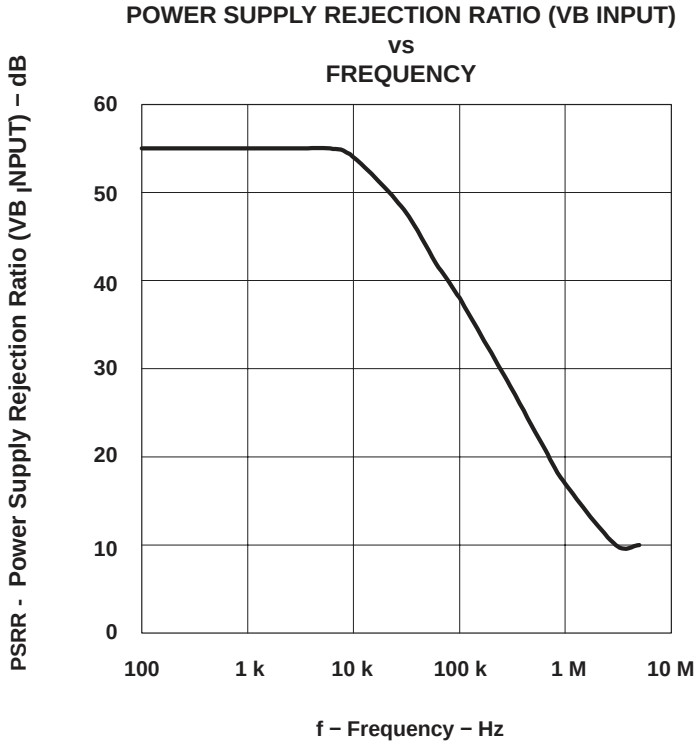

Figure 5

APPLICATION INFORMATION

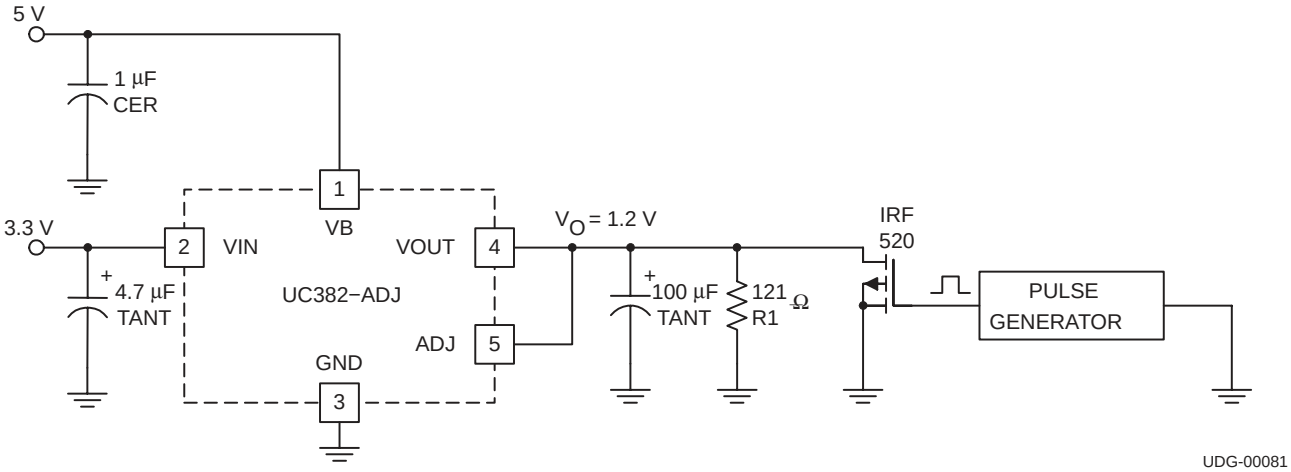

Figure 6. Transient Test Circuit

10 mA to 3 A/µs Load Transient Response

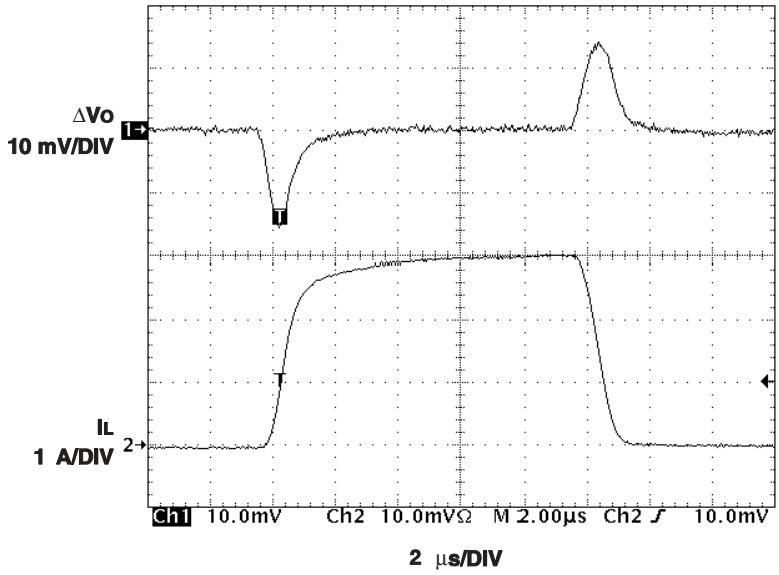

Figure 7

APPLICATION INFORMATION

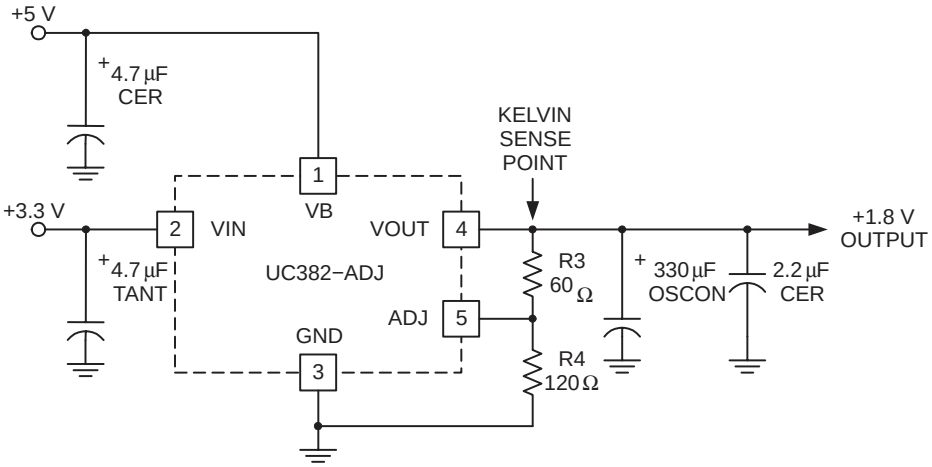

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Figure 8. Typical UC382-ADJ Application

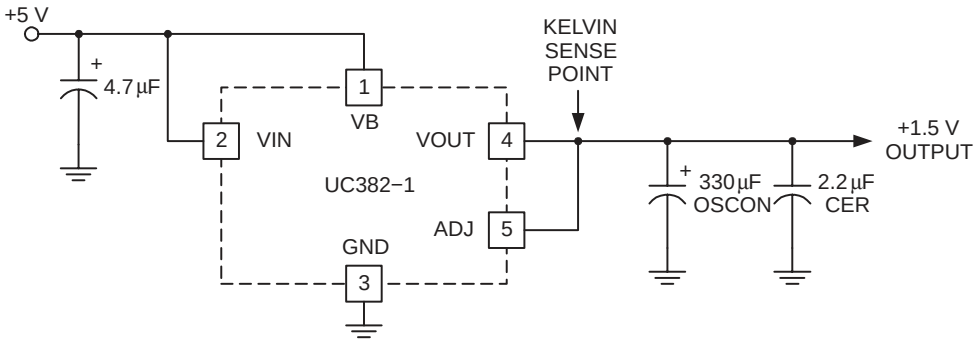

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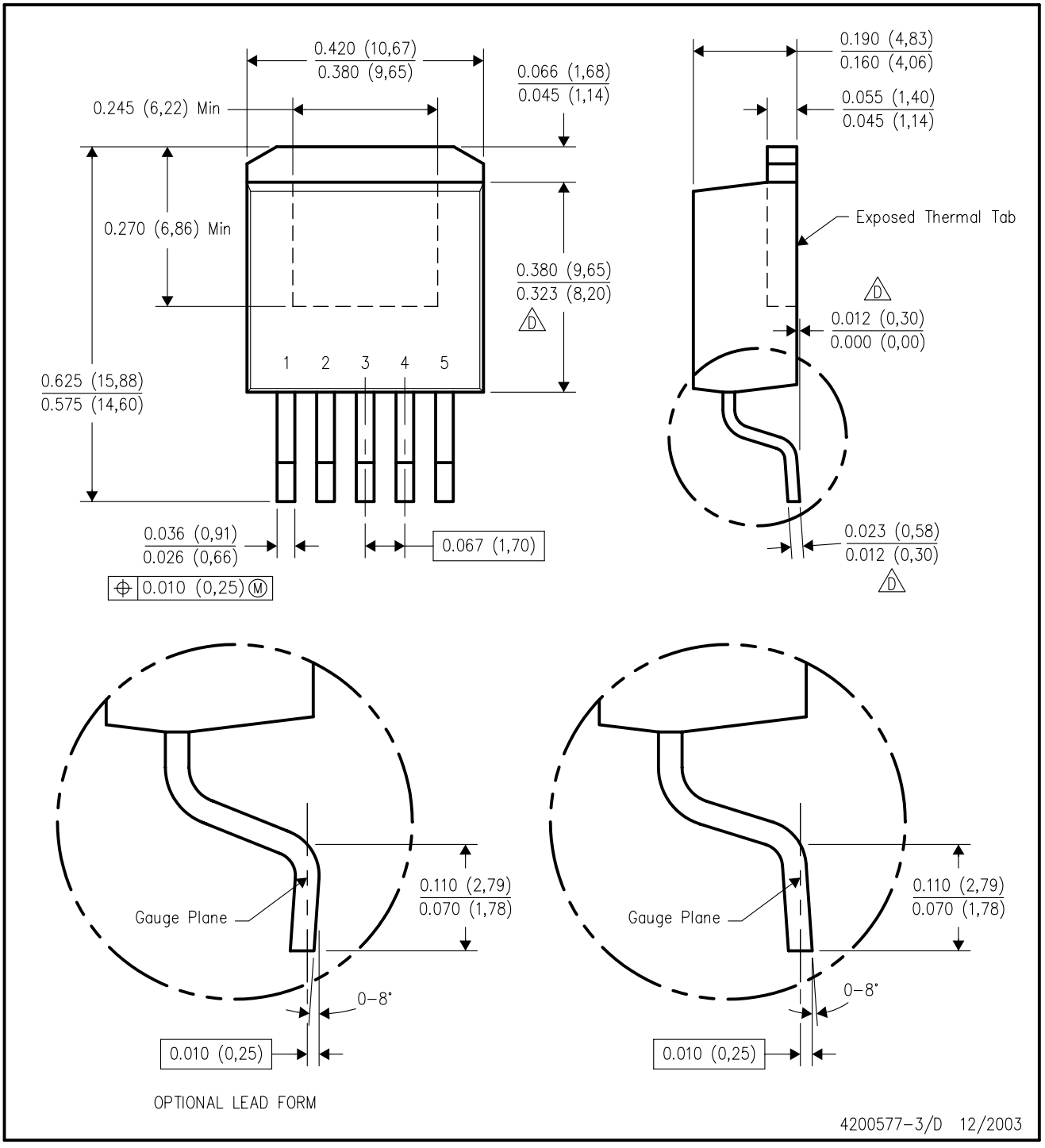
Figure 9. Typical UC382-1, -2, or -3 Application

PACKAGING INFORMATION

ORDERABLE DEVICE	STATUS(1)	PACKAGE TYPE	PACKAGE DRAWING	PINS	PACKAGE QTY
UC282T-1	ACTIVE	TO/SOT	KC	5	50
UC282T-2	ACTIVE	TO/SOT	KC	5	50
UC282T-3	ACTIVE	TO/SOT	KC	5	50
UC282T-ADJ	ACTIVE	TO/SOT	KC	5	1000
UC282TD-1	OBSOLETE	PFM	KTT	5	
UC282TD-2	OBSOLETE	PFM	KTT	5	
UC282TD-3	OBSOLETE	PFM	KTT	5	
UC282TD-ADJ	OBSOLETE	PFM	KTT	5	
UC282TDKTTT-1	ACTIVE	PFM	KTT	5	50
UC282TDKTTT-2	ACTIVE	PFM	KTT	5	50
UC282TDKTTT-3	ACTIVE	PFM	KTT	5	50
UC282TDKTTT-ADJ	ACTIVE	PFM	KTT	5	50
UC282TDTR-1	ACTIVE	PFM	KTT	5	500
UC282TDTR-2	ACTIVE	PFM	KTT	5	500
UC282TDTR-3	ACTIVE	PFM	KTT	5	500
UC282TDTR-ADJ	ACTIVE	PFM	KTT	5	500
UC382T-1	ACTIVE	TO/SOT	KC	5	50
UC382T-2	ACTIVE	TO/SOT	KC	5	50
UC382T-3	ACTIVE	TO/SOT	KC	5	50
UC382T-ADJ	ACTIVE	TO/SOT	KC	5	50
UC382TD-1	OBSOLETE	PFM	KTT	5	
UC382TD-2	OBSOLETE	PFM	KTT	5	
UC382TD-3	OBSOLETE	PFM	KTT	5	
UC382TD-ADJ	OBSOLETE	PFM	KTT	5	
UC382TDKTTT-1	ACTIVE	PFM	KTT	5	50
UC382TDKTTT-2	ACTIVE	PFM	KTT	5	50
UC382TDKTTT-3	ACTIVE	PFM	KTT	5	50
UC382TDKTTT-ADJ	ACTIVE	PFM	KTT	5	50
UC382TDTR-1	ACTIVE	PFM	KTT	5	500
UC382TDTR-2	ACTIVE	PFM	KTT	5	500
UC382TDTR-3	ACTIVE	PFM	KTT	5	500
UC382TDTR-ADJ	ACTIVE	PFM	KTT	5	500

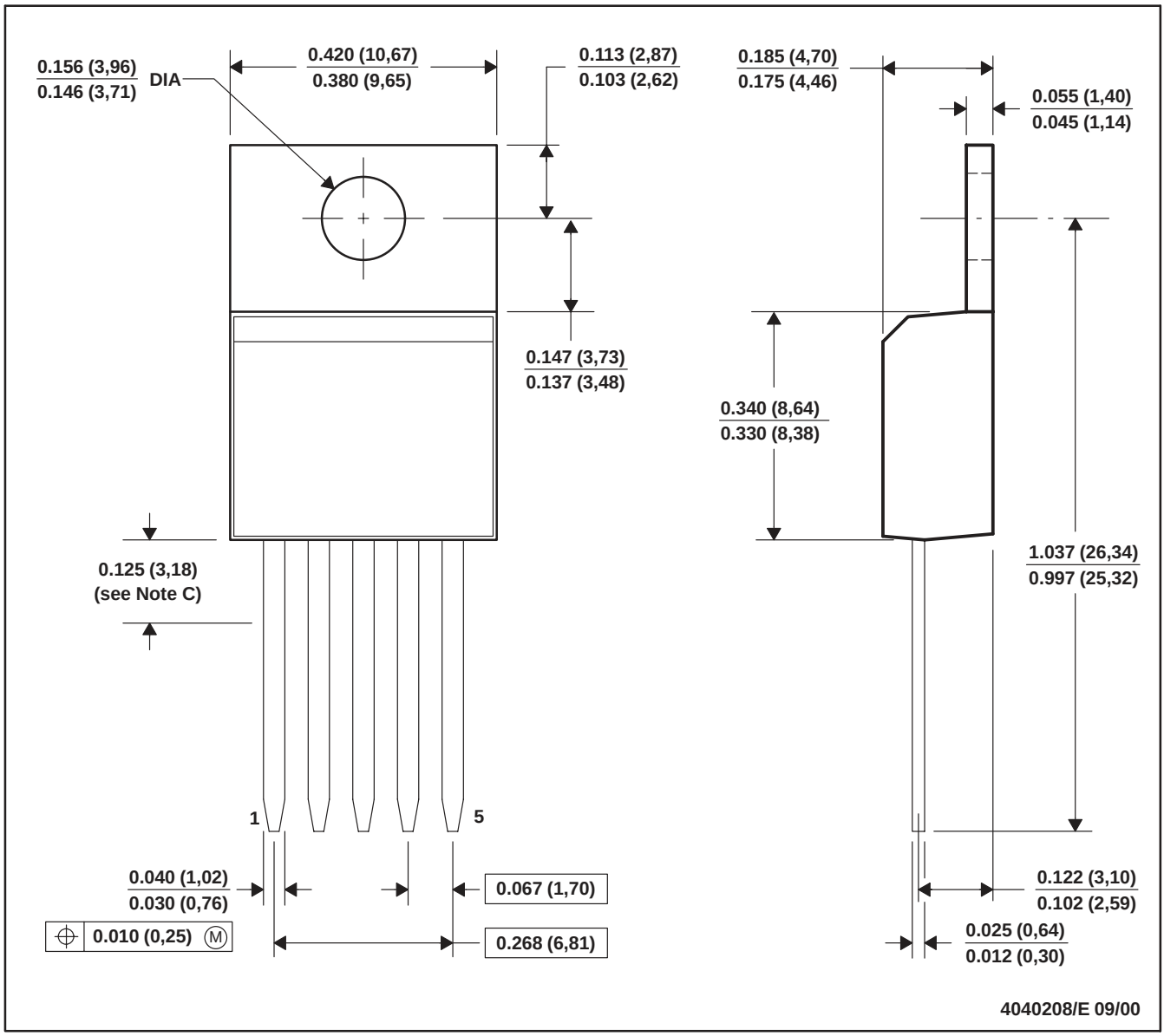
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

KTT (R–PSFM–G5) PLASTIC FLANGE–MOUNT PACKAGE



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Dimensions do not include mold protrusions, not to exceed 0.006 (0,15).
D. Falls within JEDEC TO–263 variation BA, except minimum lead thickness, maximum seating height, and minimum body length.

KC (R-PSFM-T5) **PLASTIC FLANGE-MOUNT**



NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Lead dimensions are not controlled within this area.
D. All lead dimensions apply before solder dip.
E. The center lead is in electrical contact with the mounting tab.

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