INTEGRATED CIRCUITS
UNITRODE

UC1835 UC1836
UC2835 UC2836
UC3835 UC3836

High Efficiency Regulator Controller

FEATURES

- Complete Control for a High Current, Low Dropout, Linear Regulator
- Fixed 5V or Adjustable Output Voltage
- Accurate 2.5A Current Limiting with Foldback
- Internal Current Sense Resistor
- Remote Sense for Improved Load Regulation
- External Shutdown
- Under-Voltage Lockout and Reverse Voltage Protection
- Thermal Shutdown Protection
- 8 Pin Mini-Dip Package (Surface Mount also Available)

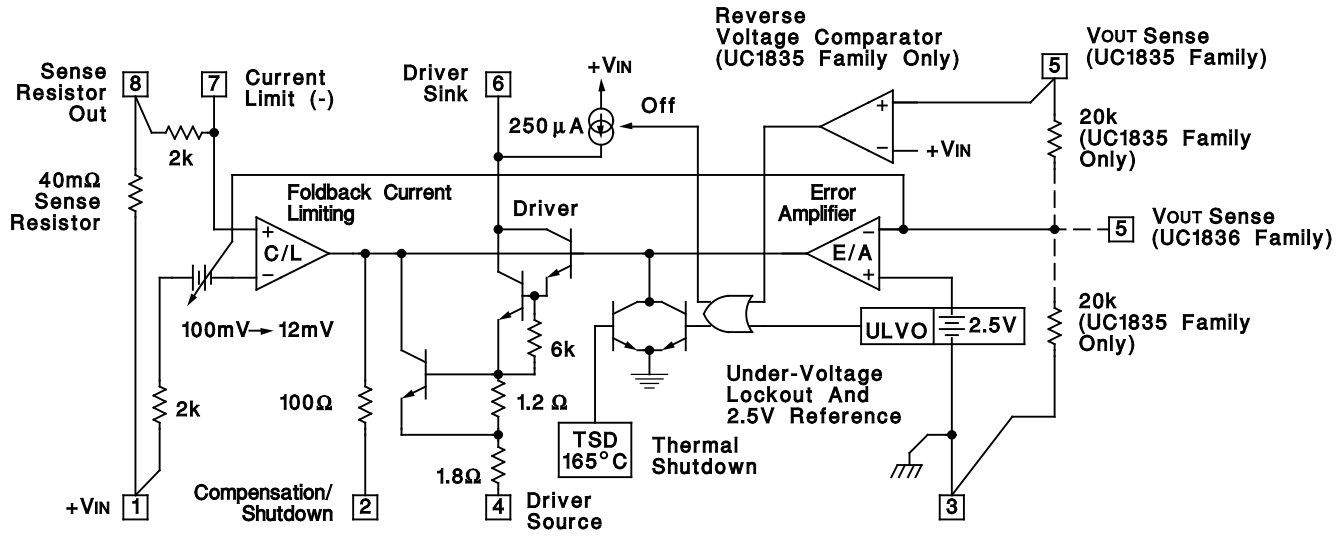
DESCRIPTION

The UC1835/6 families of linear controllers are optimized for the design of low cost, low dropout, linear regulators. Using an external pass element, dropout voltages of less than 0.5V are readily obtained. These devices contain a high gain error amplifier, a 250mA output driver, and a precision reference. In addition, current sense with foldback provides for a 2.5A peak output current dropping to less than 0.5A at short circuit.

These devices are available in fixed, 5V, (UC1835), or adjustable, (UC1836), versions. In the fixed 5 volt version, the only external parts required are an external pass element, an output capacitor, and a compensation capacitor. On the adjustable version the output voltage can be set anywhere from 2.5V to 35V with two external resistors.

Additional features of these devices include under-voltage lockout for predictable start-up, thermal shutdown and short circuit current limiting to protect the driver device. On the fixed voltage version, a reverse voltage comparator minimizes reverse load current in the event of a negative input to output differential.

BLOCK DIAGRAM



Note: Pin numbers refer to 8-Pin DIL Package

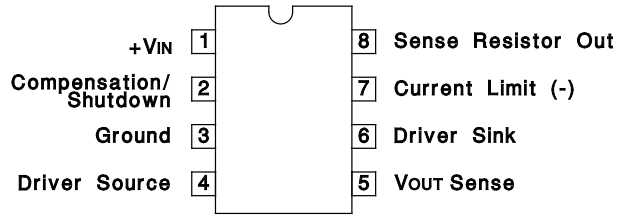
ABSOLUTE MAXIMUM RATINGS (Note 1)

Input Supply Voltage (+V_{IN}) . . . . . –1.0V to + 40V
Driver Output Current (Sink or Source) 600mA
Driver Source to Sink Voltage . . . . . + 40V
Maximum Current Through Sense Resistor. 4A
V_{OUT} Sense Input Voltage . . . . . –.3V to + 40V
Power Dissipation at T_A = 25°C (Note 2) 1000mW
Power Dissipation at T_C = 25°C (Note 2) 2000mW
Operating Junction Temperature . . . . . -55°C to +150°C
Storage Temperature . . . . . -65°C to +150°C
Lead Temperature (Soldering, 10 Seconds) . . . . . 300°C

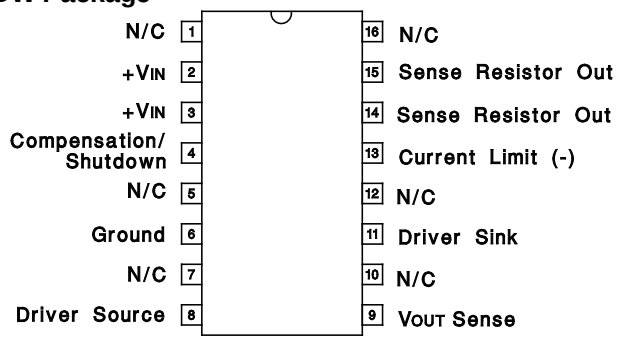
Note 1: Voltages are referenced to ground, (Pin 3). Currents are positive into, negative out of, the specified terminals. Consult Packaging Section of Databook for thermal considerations and limitations of packages.

CONNECTION DIAGRAMS

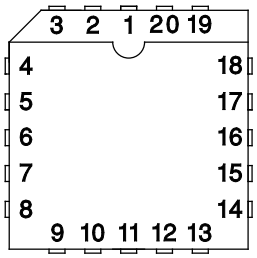
DIL-8, SOIC-8 (TOP VIEW)
N or J Package, D Package



SOIC-16 (TOP VIEW)
DW Package



PLCC-20, LCC-20
(TOP VIEW)
Q, L Packages



PACKAGE PIN FUNCTION	
FUNCTION	**PIN**
N/C	1
+V_{IN}	2
+V_{IN}	3
N/C	4
Compensation/ Shutdown	5
N/C	6
Ground	7
N/C	8
N/C	9
Driver Source	10
N/C	11
V_{OUT} Sense	12
N/C	13
N/C	14
Driver Sink	15
N/C	16
Current Limit (-)	17
N/C	18
Sense Resistor Out	19
Sense Resistor Out	20

ELECTRICAL CHARACTERISTICS:

Unless otherwise stated, specifications hold for T_A = 0°C to + 70°C for the UC3835/6, –25°C to + 85°C for the UC2835/6, and –55°C to +125°C for the UC1835/6, +V_{IN} = 6V, Driver Source= 0V, Driver Sink = 5V, T_A = T_J.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Supply					
Supply Current	+V_{IN} = 6V		2.75	4.0	mA
	+V_{IN} = 40V		3.75	6.0	mA
UVLO Threshold	+V_{IN} Low to High, V_{OUT} Sense = 0V	3.9	4.4	4.9	V
Threshold Hysteresis			0.1	0.35	V
Reverse Current	+V_{IN} = -1.0V, Driver Sink Open		6.0	20	mA
Regulating Voltage and Error Amplifier (UC1835 Family Only)					
Regulating Level at V_{OUT} Sense (V_{REG})	Driver Current = 10mA, T_J = 25°C	4.94	5.0	5.06	V
	Over Temperature	4.9		5.1	V
Line Regulation	+V_{IN} = 5.2V + 35V		15	40	mV
Load Regulation	Driver Current = 0 to 250mA		6.0	25	mV
Bias Current at V_{OUT} Sense	V_{OUT} Sense = 5.0V	75	125	210	µA
Error Amp Transconductance	±100µA at Compensation/Shutdown Pin	0.8	1.3	2.0	mS
Maximum Compensation Output Current	Sink or Source, Driver Source Open	90	200	260	µA

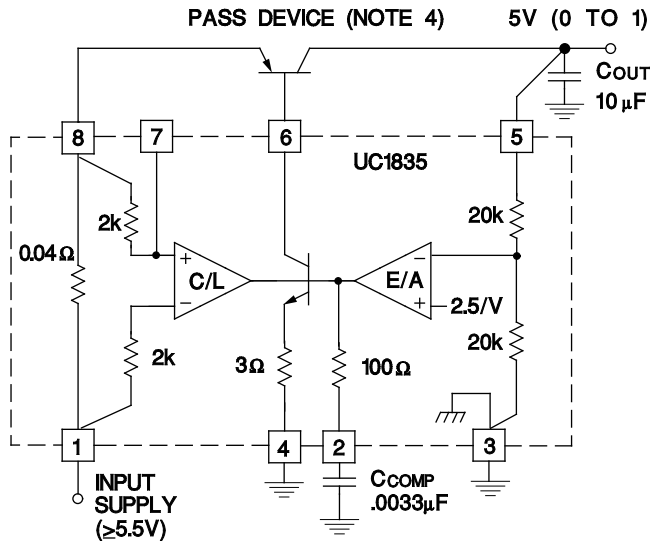
ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for T_A = 0°C to + 70°C for the UC3835/6, –25°C to + 85°C for the UC2835/6, and –55°C to +125°C for the UC1835/6, +V_{IN} = 6V, Driver Source= 0V, Driver Sink = 5V, T_A = T_J.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Regulating Voltage and Error Amplifier (UC1836 Family Only)					
Regulating Level at V_{OUT} Sense (V_{REG})	Driver Current = 10mA, T_J = 25°C	2.47	2.5	2.53	V
	Over Temperature	2.45		2.55	V
Line Regulation	+V_{IN} = 5.2V to 35V		6.0	20	mV
Load Regulation	Driver Current = 0 to 250mA		3.0	15	mV
Bias Current at V_{OUT} Sense	V_{OUT} Sense =2.5V	-1.0	-0.2		µA
Error Amp Transconductance	±100µA at Compensation/Shutdown Pin	0.8	1.3	2.0	mS
Maximum Compensation Output Current	Sink or Source, Driver Source Open	90	200	260	µA
Driver					
Maximum Current		250	500		mA
Saturation Voltage	Driver Current = 250mA, Driver Sink		2.0	2.8	V
Pull-Up Current at Driver Sink	Compensation/Shutdown=0.45V	140	250	300	µA
Driver Sink Leakage	In UVLO			10	µA
	In Reverse Voltage (UC1835 Family Only)			10	µA
Thermal Shutdown			165		°C
Foldback Current Limit					
Current Limit Levels at Sense Resistor Out	V_{OUT} Sense = (0.99) V_{REG}	2.2	2.5	2.8	A
	V_{OUT} Sense = (0.5) V_{REG}	1.3	1.5	1.7	A
	V_{OUT} Sense = 0V	0.25	0.4	0.55	A
Current Limit Amp Tansconductance	±100µA at Compensation/Shutdown, V_{OUT} Sense = (0.9) V_{REG}	12	24	42	mS
Limiting Voltage at Current Limit (-) (Note 2)	V_{OUT} Sense = (0.9) V_{REG} Volts Below +V_{IN}, T_J = 25°C	80	100	140	mV
Sense Resistor Value (Note 3)	V_{OUT} Sense = (0.9) V_{REG}, I_{OUT} = I_A, T_J = 25°C		40		mΩ

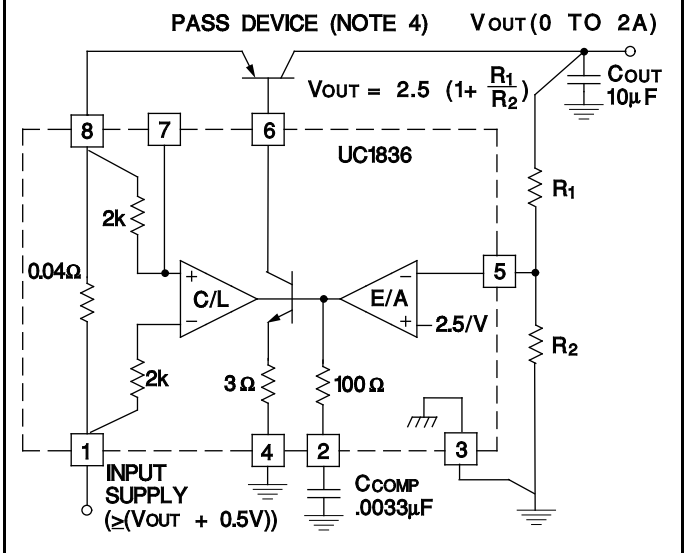
Note 2: This voltage has a positive temperature coefficient of approximately 3500ppm/°C.
Note 3: This resistance has a positive temperature coefficient of approximately 3500ppm/°C. The total resistance from Pin 1 to Pin 8 will include an additional 60 to 100mΩ of package resistance.

APPLICATION AND OPERATION INFORMATION

UC 1835 – Typical configurations for a 2A, Low Dropout 5V Regulator



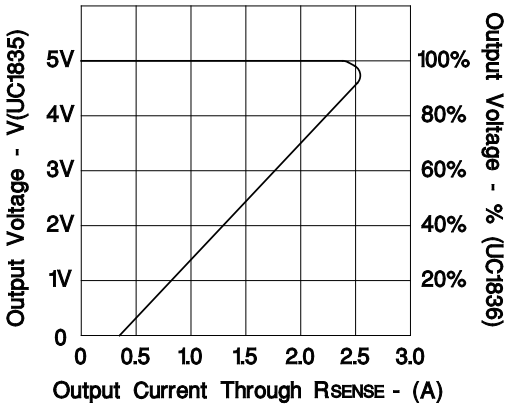
UC1836 – Typical Configuration for a 2A, Low Dropout Adjustable Regulator



Note 4: Suggested Pass devices are TIP 32B. (Dropout Voltage≤0.75V) or, D45H, (Dropout Voltage≤0.5V), or equivalents.

APPLICATION AND OPERATION INFORMATION (cont.)

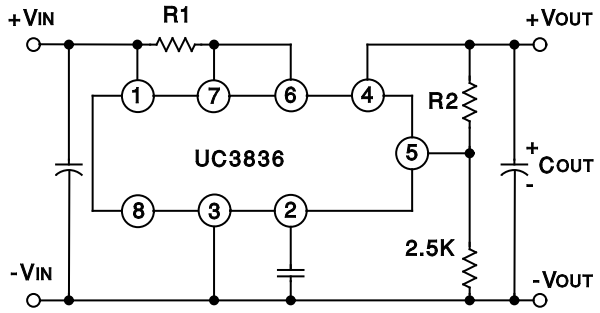
UC1835/6 Foldback Current Limiting



UC3835/36 TYPICAL APPLICATIONS

Low Current Application

using the UC3836 internal drive transistor



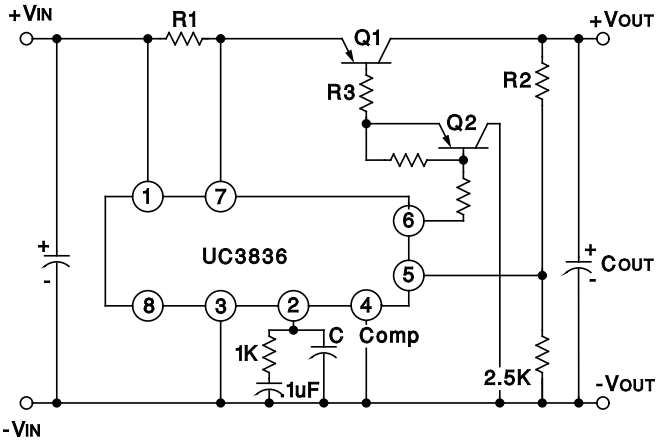
Typical Output Current vs VIN and VOUT

of the UC3836 internal drive transistor
for PDISS = 0.5W (approx.)

		VIN					
	Volts	5	9	12	15	18	24
VOUT	2	150	60	40	30	20	12
	5		105	55	35	25	15
	9			130	60	35	20
	12				120	55	25
	15	Current in mA				110	30

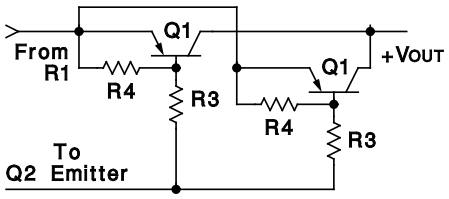
High Current Application

using drive transistor Q2 to increase Q1 base drive
and reduce UC3836 power dissipation



Parallel Pass Transistors

can be added for high current or
high power dissipation applications



EQUATIONS:

$R_1 = 0.100\ V/I_{OUT}$ (MAX)

$R_2 = (V_{OUT} - 2.5V/1mA)$

$R_3 = ((V_{IN} - V_{BE} - V_{SAT})*BETA(min))/I_{OUT}$ (max)

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
5962-9065002PA	ACTIVE	CDIP	JG	8	1	TBD	A42 SNPB	N / A for Pkg Type
UC1835J	OBSOLETE	CDIP	JG	8		TBD	Call TI	Call TI
UC1835J883B	OBSOLETE	CDIP	JG	8		TBD	Call TI	Call TI
UC1835L883B	OBSOLETE	LCCC	FK	20		TBD	Call TI	Call TI
UC1836J	ACTIVE	CDIP	JG	8		TBD	A42 SNPB	N / A for Pkg Type
UC1836J883B	ACTIVE	CDIP	JG	8		TBD	A42 SNPB	N / A for Pkg Type
UC1836L	OBSOLETE	TO/SOT	L	20		TBD	Call TI	Call TI
UC1836L883B	OBSOLETE	TO/SOT	L	20		TBD	Call TI	Call TI
UC2835D	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2835J	OBSOLETE	CDIP	JG	8		TBD	Call TI	Call TI
UC2835N	ACTIVE	PDIP	P	8		Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type
UC2836D	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2836DTR	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2836DTRG4	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2836DW	OBSOLETE	SOIC	DW	16		TBD	Call TI	Call TI
UC2836DWTR	ACTIVE	SOIC	DW	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2836DWTRG4	ACTIVE	SOIC	DW	16		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC2836N	ACTIVE	PDIP	P	8		Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type
UC2836NG4	ACTIVE	PDIP	P	8		Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type
UC3835N	ACTIVE	PDIP	P	8		Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type
UC3836D	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC3836DG4	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC3836DTR	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC3836DTRG4	ACTIVE	SOIC	D	8		Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR
UC3836N	ACTIVE	PDIP	P	8		Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type

(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.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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