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 finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9065002PA	ACTIVE	CDIP	JG	8	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9065002PA UC1836	Samples
UC1836J	ACTIVE	CDIP	JG	8	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	UC1836J	Samples
UC1836J883B	ACTIVE	CDIP	JG	8	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9065002PA UC1836	Samples
UC2835D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2835D	Samples
UC2836D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2836D	Samples
UC2836DG4	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2836D	Samples
UC3836D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3836D	Samples
UC3836DG4	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3836D	Samples

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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OTHER QUALIFIED VERSIONS OF UC1836, UC3836 :

- Catalog : UC3836
- Military : UC1836

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TUBE

*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
UC2835D	D	SOIC	8	75	506.6	8	3940	4.32
UC2836D	D	SOIC	8	75	506.6	8	3940	4.32
UC2836DG4	D	SOIC	8	75	506.6	8	3940	4.32
UC3836D	D	SOIC	8	75	506.6	8	3940	4.32
UC3836DG4	D	SOIC	8	75	506.6	8	3940	4.32

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