

# 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)

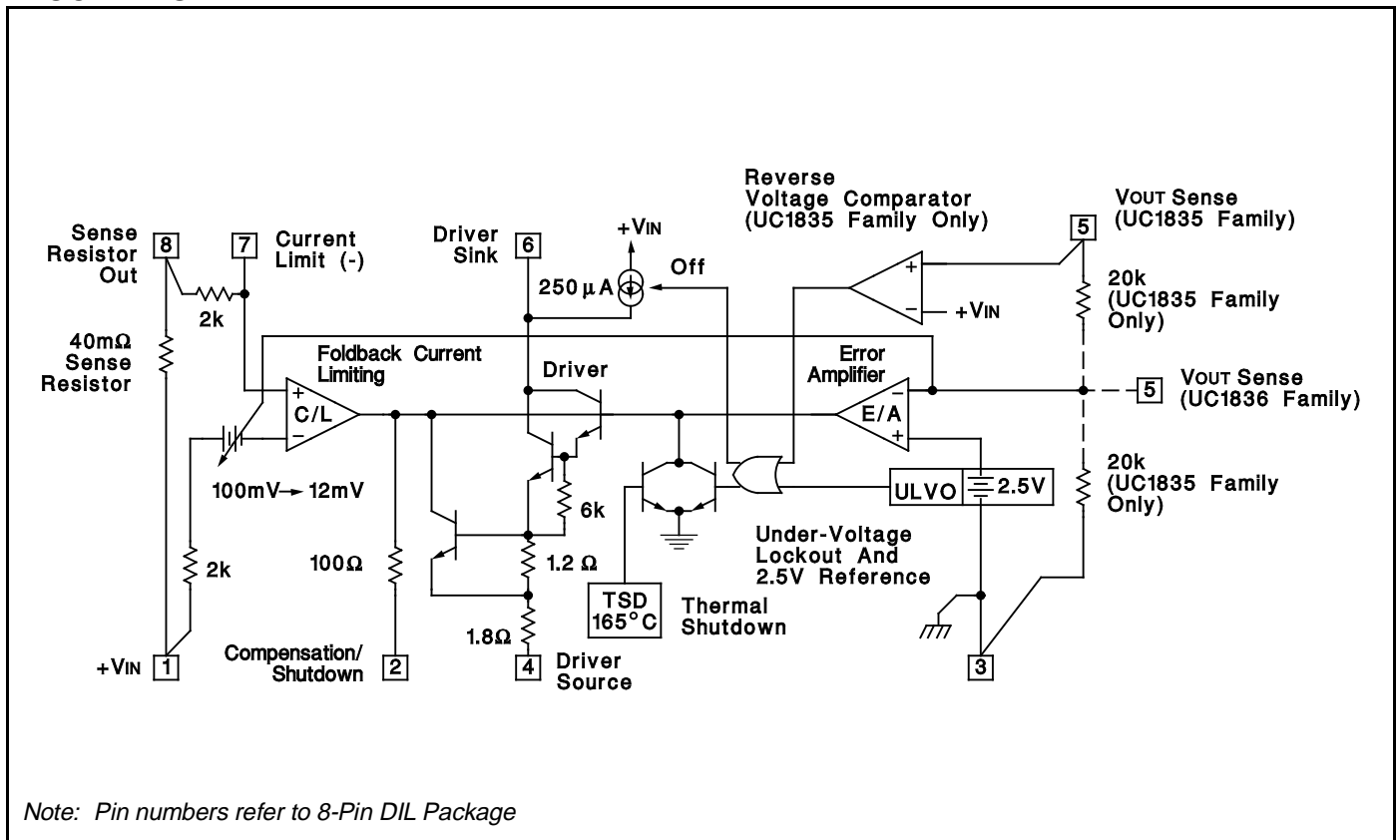
## DESCRIPTION

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



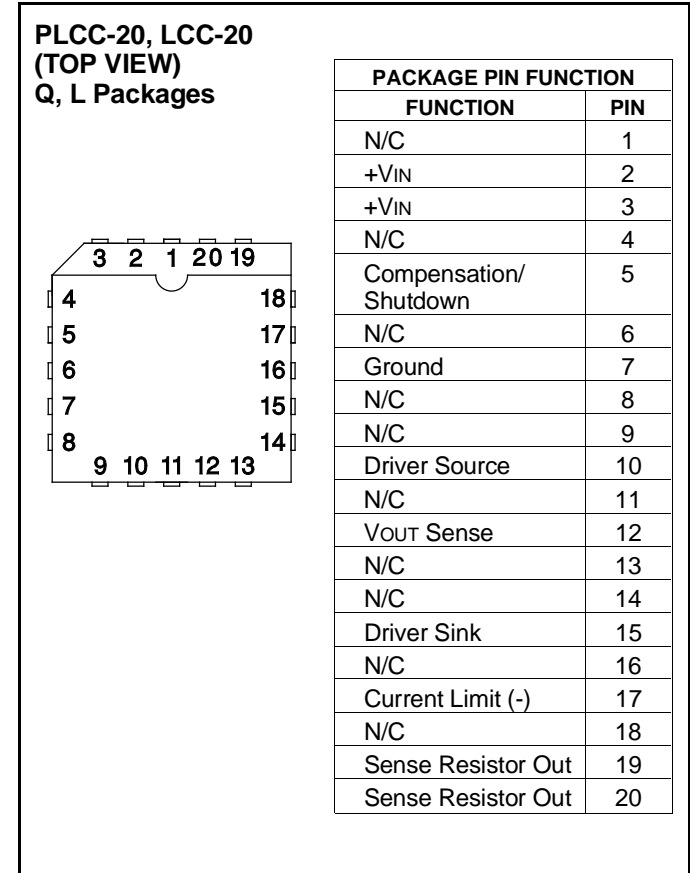
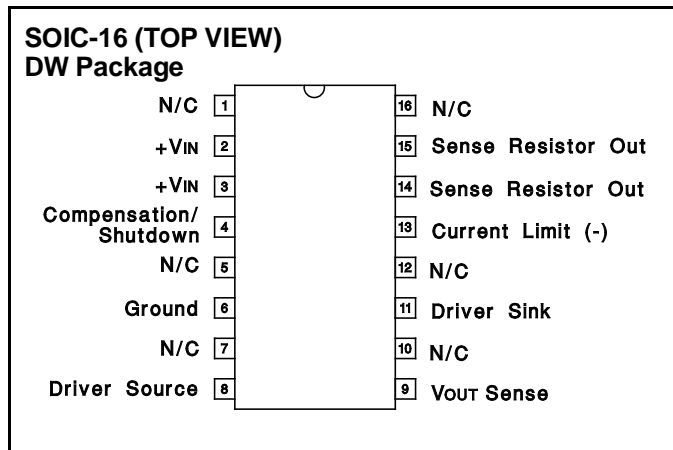
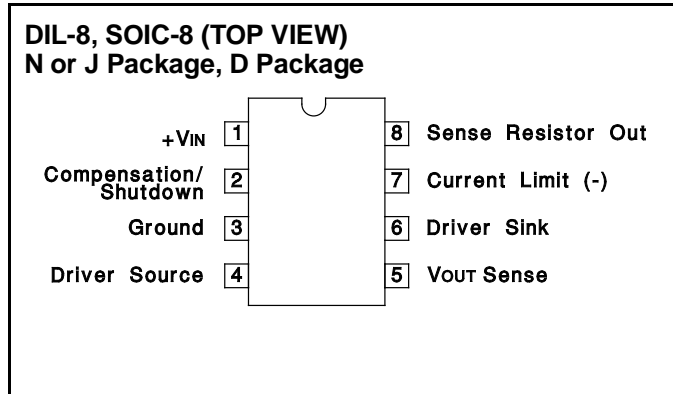
**ABSOLUTE MAXIMUM RATINGS (Note 1)**

Input Supply Voltage (+VIN) . . . . . -1.0V to +40V  
 Driver Output Current (Sink or Source) . . . . . 600mA  
 Driver Source to Sink Voltage . . . . . +40V  
 Maximum Current Through Sense Resistor. . . . . 4A  
 VOUT Sense Input Voltage . . . . . -3V to +40V  
 Power Dissipation at TA = 25°C (Note 2) . . . . . 1000mW  
 Power Dissipation at Tc = 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**



**ELECTRICAL CHARACTERISTICS:** Unless otherwise stated, specifications hold for TA = 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, +VIN = 6V, Driver Source= 0V, Driver Sink = 5V, TA = TJ.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
<b>Input Supply</b>					
Supply Current	+VIN = 6V		2.75	4.0	mA
	+VIN = 40V		3.75	6.0	mA
UVLO Threshold	+VIN Low to High, VOUT Sense = 0V	3.9	4.4	4.9	V
Threshold Hysteresis			0.1	0.35	V
Reverse Current	+VIN = -1.0V, Driver Sink Open		6.0	20	mA
<b>Regulating Voltage and Error Amplifier (UC1835 Family Only)</b>					
Regulating Level at VOUT Sense (VREG)	Driver Current = 10mA, TJ = 25°C	4.94	5.0	5.06	V
	Over Temperature	4.9		5.1	V
Line Regulation	+VIN = 5.2V + 35V		15	40	mV
Load Regulation	Driver Current = 0 to 250mA		6.0	25	mV
Bias Current at VOUT Sense	VOUT 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  $T_A = 0^\circ\text{C}$  to  $+70^\circ\text{C}$  for the UC3835/6,  $-25^\circ\text{C}$  to  $+85^\circ\text{C}$  for the UC2835/6, and  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$  for the UC1835/6,  $+V_{IN} = 6\text{V}$ , Driver Source =  $0\text{V}$ , Driver Sink =  $5\text{V}$ ,  $T_A = T_J$ .

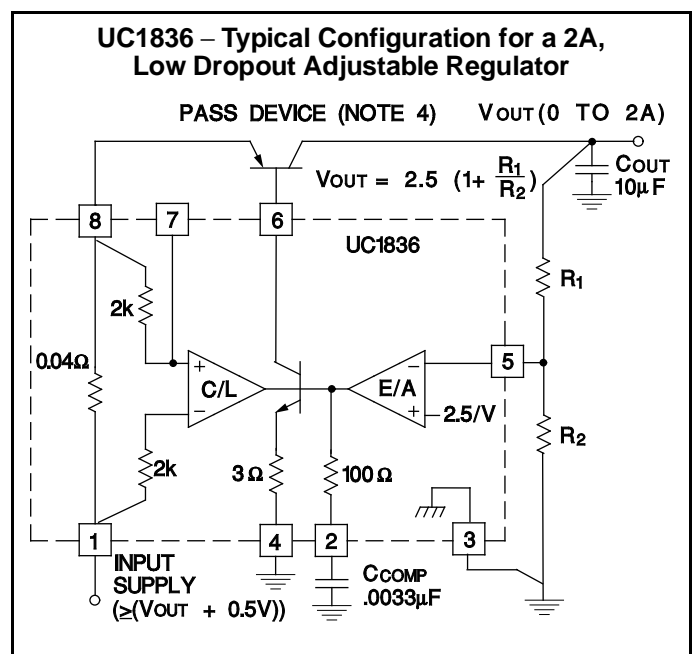
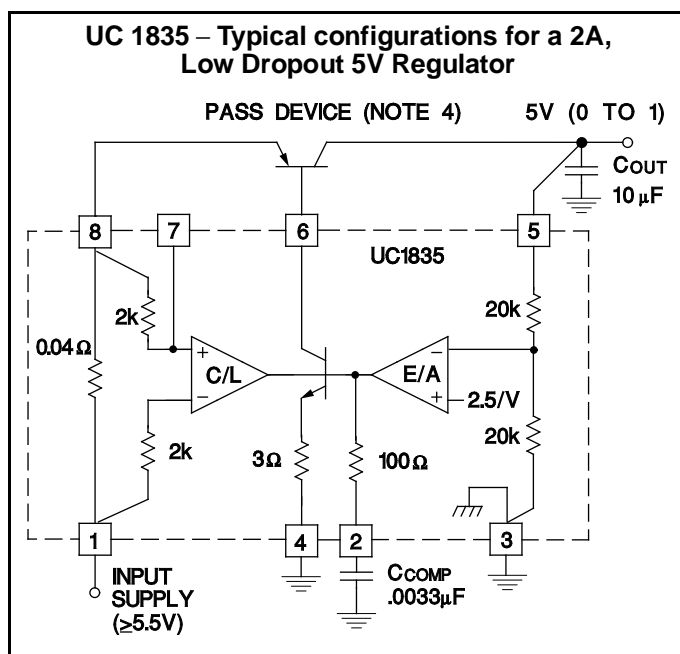
PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
<b>Regulating Voltage and Error Amplifier (UC1836 Family Only)</b>					
Regulating Level at $V_{OUT}$ Sense ( $V_{REG}$ )	Driver Current = $10\text{mA}$ , $T_J = 25^\circ\text{C}$	2.47	2.5	2.53	V
	Over Temperature	2.45		2.55	V
Line Regulation	$+V_{IN} = 5.2\text{V}$ to $35\text{V}$		6.0	20	mV
Load Regulation	Driver Current = $0$ to $250\text{mA}$		3.0	15	mV
Bias Current at $V_{OUT}$ Sense	$V_{OUT}$ Sense = $2.5\text{V}$	-1.0	-0.2		$\mu\text{A}$
Error Amp Transconductance	$\pm 100\mu\text{A}$ at Compensation/Shutdown Pin	0.8	1.3	2.0	mS
Maximum Compensation Output Current	Sink or Source, Driver Source Open	90	200	260	$\mu\text{A}$
<b>Driver</b>					
Maximum Current		250	500		mA
Saturation Voltage	Driver Current = $250\text{mA}$ , Driver Sink		2.0	2.8	V
Pull-Up Current at Driver Sink	Compensation/Shutdown = $0.45\text{V}$	140	250	300	$\mu\text{A}$
Driver Sink Leakage	In UVLO			10	$\mu\text{A}$
	In Reverse Voltage (UC1835 Family Only)			10	$\mu\text{A}$
Thermal Shutdown			165		$^\circ\text{C}$
<b>Foldback Current Limit</b>					
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 = $0\text{V}$	0.25	0.4	0.55	A
Current Limit Amp Transconductance	$\pm 100\mu\text{A}$ 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 $+V_{IN}$ , $T_J = 25^\circ\text{C}$	80	100	140	mV
Sense Resistor Value (Note 3)	$V_{OUT}$ Sense = $(0.9) V_{REG}$ , $I_{OUT} = I_A$ , $T_J = 25^\circ\text{C}$		40		$\text{m}\Omega$

Note 2: This voltage has a positive temperature coefficient of approximately  $3500\text{ppm}/^\circ\text{C}$ .

Note 3: This resistance has a positive temperature coefficient of approximately  $3500\text{ppm}/^\circ\text{C}$ .

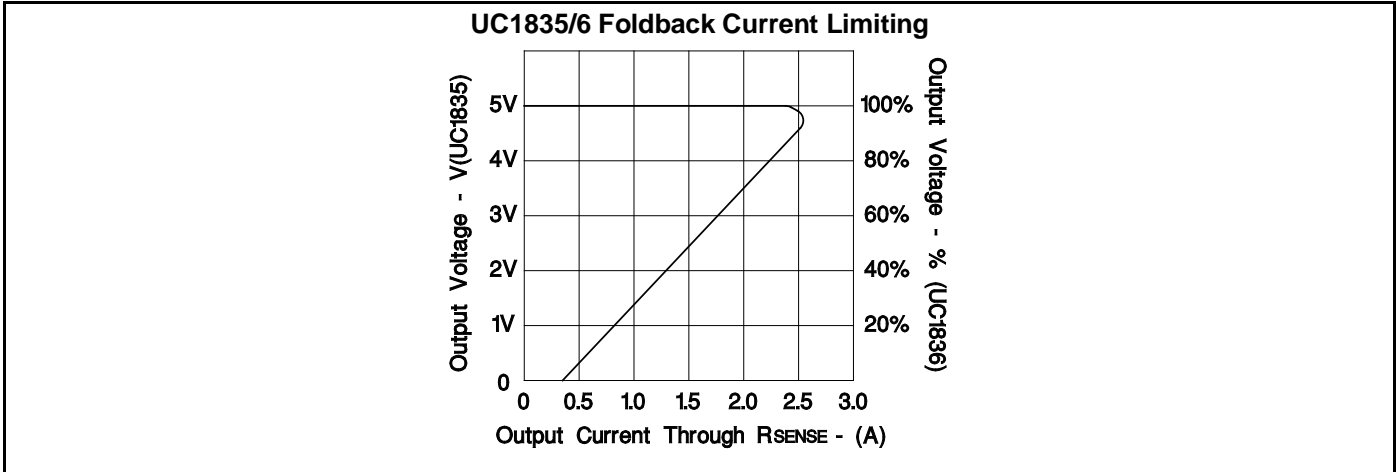
The total resistance from Pin 1 to Pin 8 will include an additional  $60$  to  $100\text{m}\Omega$  of package resistance.

## APPLICATION AND OPERATION INFORMATION



Note 4: Suggested Pass devices are TIP 32B. (Dropout Voltage  $\leq 0.75\text{V}$ ) or, D45H, (Dropout Voltage  $\leq 0.5\text{V}$ ), or equivalents.

**APPLICATION AND OPERATION INFORMATION (cont.)**



**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:**

$R1 = 0.100 V/I_{OUT} (MAX)$

$R2 = (V_{OUT} - 2.5V/1mA)$

$R3 = ((V_{IN} - V_{BE} - V_{SAT}) * BETA(min)) / I_{OUT} (max)$

**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	<a href="#">Samples</a>
UC1836J	ACTIVE	CDIP	JG	8	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	UC1836J	<a href="#">Samples</a>
UC1836J883B	ACTIVE	CDIP	JG	8	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	9065002PA UC1836	<a href="#">Samples</a>
UC2835D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2835D	<a href="#">Samples</a>
UC2836D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2836D	<a href="#">Samples</a>
UC2836DG4	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-25 to 85	UC2836D	<a href="#">Samples</a>
UC3836D	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3836D	<a href="#">Samples</a>
UC3836DG4	ACTIVE	SOIC	D	8	75	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3836D	<a href="#">Samples</a>

(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.

**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**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

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (<https://www.ti.com/legal/termsofsale.html>) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2021, Texas Instruments Incorporated