

## 600mA CMOS LDO

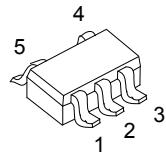
## ■ DESCRIPTION

The UTC **L1186** is a CMOS positive linear regulator. One of its features is the very low quiescent current typical as low as 30 $\mu$ A and its dropout voltage is extremely low with 600mA output current.

The internal circuit includes thermal shutdown and current fold-back to prevent device failure when the circuit is operated in the bad conditions.

In application, the UTC **L1186** needs a low noise, regulated supply. For stable operation, the output capacitance value should be 2.2 $\mu$ F or more.

The UTC **L1186** is an ideal for battery applications, such as instrumentations, portable electronics, wireless devices, cordless phones, PC peripherals, and battery powered widgets.



SOT-25

## ■ FEATURES

- \* Accurate to within 1.5%
- \* Quiescent current: 30 $\mu$ A
- \* Internal over-temperature shutdown
- \* With current limiting
- \* Internal short circuit current fold-back
- \* With noise reduction bypass capacitor
- \* Has power-saving shutdown mode
- \* Very low temperature coefficient
- \* Halogen Free

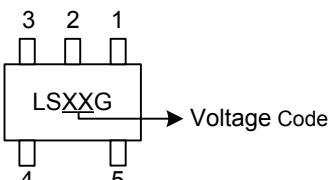
## ■ ORDERING INFORMATION

Ordering Number	Package	Packing
L1186G-xx-AF5-R	SOT-25	Tape Reel

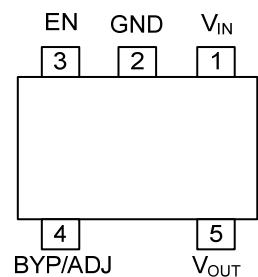
Note: xx: Output Voltage, refer to Marking Information.

L1186G- xx-AF5-R	(1)Packing Type (2)Package Type (3)Output Voltage Code (4)Halogen Free	(1) R: Tape Reel (2) AF5: SOT-25 (3) xx: Refer to Marking Information (4) G: Halogen Free
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### ■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-25	15 :1.5V 28 :2.8V AD:ADJ	 <p>The marking diagram shows a rectangular package with five pins. Pins 1, 2, and 3 are at the top, and pins 4 and 5 are at the bottom. Pin 1 is labeled 'LSXXG'. An arrow points from the text 'Voltage Code' to the bottom of pin 5.</p>

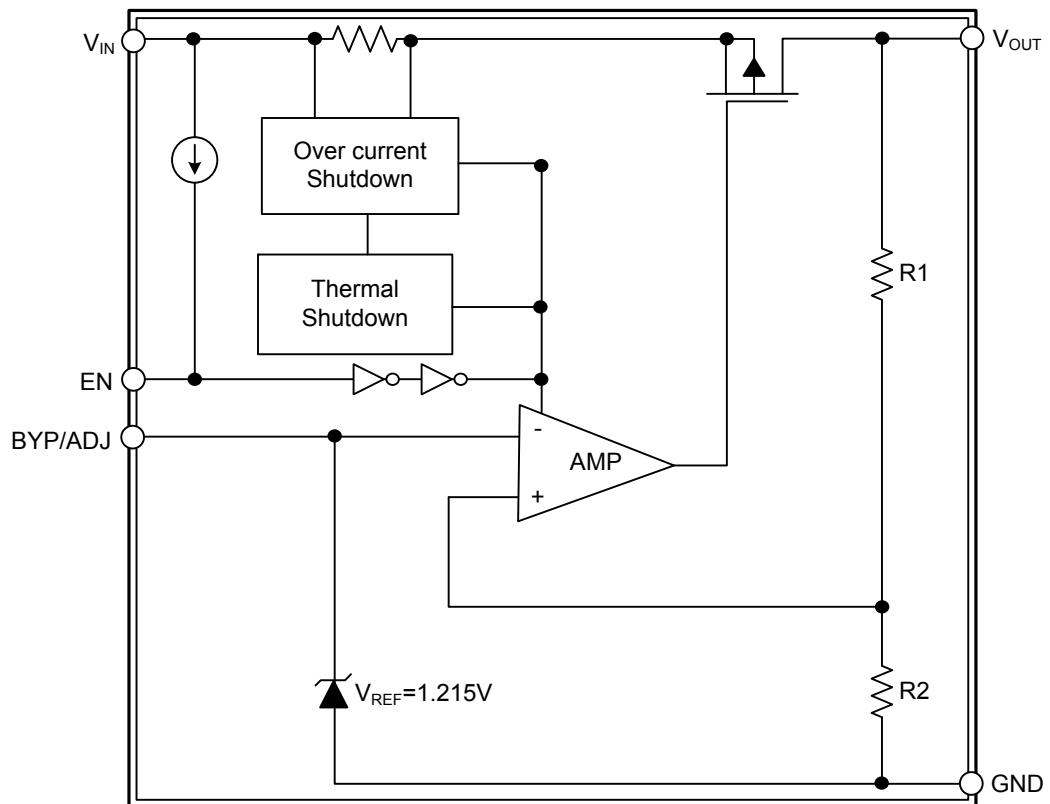
### ■ PIN CONFIGURATION



### ■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	V <sub>IN</sub>	Input for voltage input.
2	GND	Ground.
3	EN	Enable pin.
4	BYP/ADJ	Noise Reduction Bypass Capacitor/ Adjusted Voltage
5	V <sub>OUT</sub>	Output voltage pin

## ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V <sub>IN</sub>	8	V
Output Voltage	V <sub>OUT</sub>	GND-0.3 ~ V <sub>IN</sub> +0.3	V
Output Current	I <sub>OUT</sub>	P <sub>D</sub> V <sub>IN</sub> -V <sub>OUT</sub>	A
Power Dissipation	P <sub>D</sub>	400	mW
Junction Temperature	T <sub>J</sub>	150	°C
Operating Temperature	T <sub>OPR</sub>	-40~+85	°C
Storage Temperature	T <sub>STG</sub>	-65~+150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

### ■ THERMAL DATA

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Junction to Ambient	θ <sub>JA</sub>			260	°C/W
Junction to Case (Note)	θ <sub>JC</sub>			81	°C/W

Note: θ<sub>JC</sub> on center of molding compound if IC has on tab

### ■ ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25°C, unless otherwise noted.)

#### Fixed Voltage

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	V <sub>IN</sub>			Note1		7	V
Output Voltage Accuracy	V <sub>OUT</sub>	I <sub>OUT</sub> =1mA		-1.5		1.5	%
Line Regulation	ΔV <sub>OUT</sub>	I <sub>OUT</sub> =1mA	1.4V < V <sub>OUT</sub> ≤ 2.0V	-0.15		0.15	%
	V <sub>OUT</sub>	V <sub>IN</sub> =V <sub>OUT</sub> +1~V <sub>OUT</sub> +2	2.0V < V <sub>OUT</sub> < 4.0V	-0.1	0.02	0.1	%
Load Regulation	ΔV <sub>OUT</sub>	I <sub>OUT</sub> =1mA~600 mA			0.2	1	%
Output Current	I <sub>OUT</sub>			600			mA
Current Limit	I <sub>LIMIT</sub>	V <sub>OUT</sub> >1.2V		600	800		mA
Short Circuit Current	I <sub>SC</sub>	V <sub>OUT</sub> <0.8V		300	600		mA
Quiescent Current	I <sub>Q</sub>	I <sub>OUT</sub> =0mA		30	50		μA
Ground Pin Current	I <sub>GND</sub>	I <sub>OUT</sub> =1mA~600mA		35			μA
Dropout Voltage	V <sub>D</sub>	I <sub>OUT</sub> =600mA	1.4V < V <sub>O(NOM)</sub> ≤ 2.0V			1400	mV
		V <sub>OUT</sub> =V <sub>O(NOM)</sub> -2.0%	2.0V < V <sub>O(NOM)</sub> ≤ 2.8V			800	mV
Over Temperature Shutdown	OTS				150		°C
Over Temperature Hysteresis	OTH				30		°C
Temperature Coefficient of Output Voltage	T <sub>c</sub> V <sub>O</sub>				30		ppm/°C
Power Supply Rejection	PSRR	I <sub>OUT</sub> =100mA	f=1kHz		75		dB
		C <sub>OUT</sub> =2.2μF ceramic	f=10kHz		55		dB
		C <sub>BYP</sub> =0.01μF	f=100kHz		30		dB
Output Voltage Noise	eN	f=10Hz~100kHz, I <sub>OUT</sub> =10mA			30		μVrms
EN Input Threshold	V <sub>EH</sub>	V <sub>IN</sub> =2.7V~7V		2.0		V <sub>IN</sub>	V
	V <sub>EL</sub>	V <sub>IN</sub> =2.7V~7V		0		0.4	V
EN Input Bias Current	I <sub>EH</sub>	V <sub>EN</sub> =V <sub>IN</sub> , V <sub>IN</sub> =2.7V~7V			0.1		μA
	I <sub>EL</sub>	V <sub>EN</sub> =0V, V <sub>IN</sub> =2.7V~7V			0.5		μA
Shutdown Supply Current	I <sub>SD</sub>	V <sub>IN</sub> =5V, V <sub>OUT</sub> =0V, V <sub>EN</sub> <V <sub>EL</sub>		0.5	1		μA
PG Leakage Current	I <sub>LC</sub>	V <sub>PG</sub> =7V			1		μA

## ■ ELECTRICAL CHARACTERISTICS(Cont)

## Adjusted Voltage

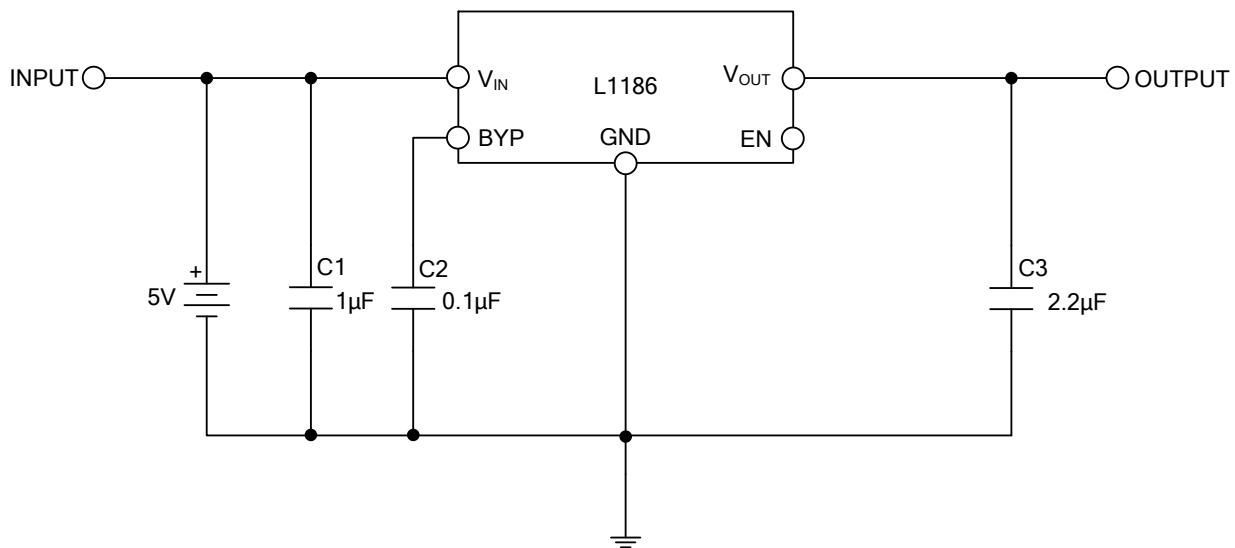
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	$V_{IN}$			Note1		7	V
Reference Voltage	$V_{REF}$			1.196	1.215	1.234	V
Output Voltage Accuracy	$V_{OUT}$	$I_{OUT}=1\text{mA}$		-1.5		1.5	%
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$V_{IN}=V_{OUT}+V_D \sim 7V, I_{OUT}=1\text{mA}$		-0.15		0.15	%
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$V_{IN}=V_{OUT}+V_D, I_{OUT}=1\text{mA} \sim 600\text{ mA}$			0.2	1	%
Output Current	$I_{OUT}$	$V_{OUT}>1.3V$		600			mA
Current Limit	$I_{LIMIT}$	$V_{OUT}>1.3V$		600	800		mA
Short Circuit Current	$I_{SC}$	$V_{OUT}<0.8V$			300	600	mA
Adjusted Current	$I_{ADJ}$	$I_{OUT}=0\text{mA}$			30	50	$\mu\text{A}$
Ground Pin Current	$I_{GND}$	$I_{OUT}=1\text{mA} \sim 600\text{mA}$			35		$\mu\text{A}$
Dropout Voltage	$V_D$	$V_{OUT}=V_{O(NOM)}-2.0\%, I_{OUT}=600\text{mA}$				600	mV
Over Temperature Shutdown	OTS				150		$^{\circ}\text{C}$
Over Temperature Hysteresis	OTH				30		$^{\circ}\text{C}$
Temperature Coefficient of Output Voltage	$T_c V_O$				30		$\text{ppm}/^{\circ}\text{C}$
Power Supply Rejection	PSRR	$I_{OUT}=100\text{mA}$	$f=1\text{kHz}$		40		dB
		$C_{OUT}=2.2\mu\text{F}$ ceramic	$f=10\text{kHz}$		20		dB
		$C_{BYP}=0.01\mu\text{F}$	$f=100\text{kHz}$		15		dB
Output Voltage Noise	eN	$f=10\text{Hz} \sim 100\text{kHz}, I_{OUT}=10\text{mA}$			30		$\mu\text{VRms}$
EN Input Threshold	$V_{EH}$	$V_{IN}=2.7V \sim 7V$		2.0		$V_{IN}$	V
	$V_{EL}$	$V_{IN}=2.7V \sim 7V$		0		0.4	V
EN Input Bias Current	$I_{EH}$	$V_{EN}=V_{IN}, V_{IN}=2.7V \sim 7V$				0.1	$\mu\text{A}$
	$I_{EL}$	$V_{EN}=0V, V_{IN}=2.7V \sim 7V$				0.5	$\mu\text{A}$
Shutdown Supply Current	$I_{SD}$	$V_{IN}=5V, V_{OUT}=0V, V_{EN}<V_{EL}$			0.5	1	$\mu\text{A}$
PG Leakage Current	$I_{LC}$	$V_{PG}=7V$				1	$\mu\text{A}$

Notes: 1.  $V_{IN(MIN)}=V_{OUT}+V_D$ 

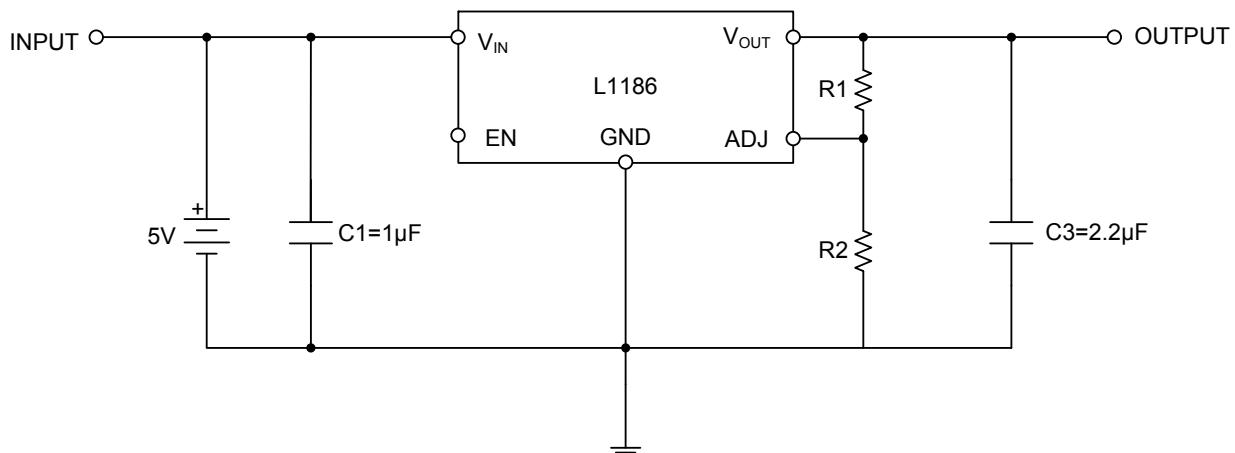
2. To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

■ TYPICAL APPLICATION CIRCUIT

**Fixed Voltage**



**Adjusted Voltage**



$$R1 = R2 \left[ \frac{V_{OUT}}{1.215} - 1 \right]$$

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