



600mA CMOS LDO

DESCRIPTION

The UTC **L1186** is a COMS positive linear regulator. One of its features is the very low quiescent current typical as low as 30 μ 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 μ 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.

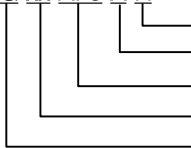
FEATURES

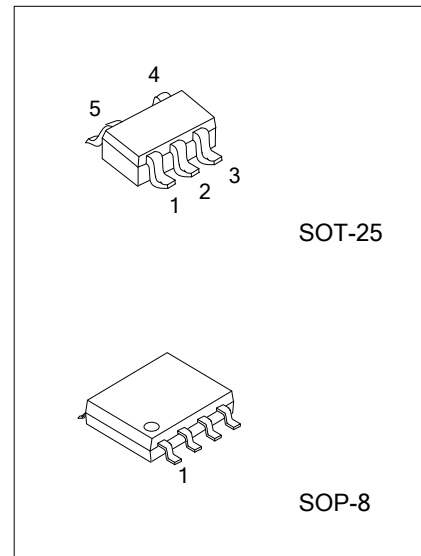
- * Accurate to Within 1.5%
- * Quiescent Current: 30 μ A
- * Internal Over-Temperature Shutdown
- * With Current Limiting
- * Internal Short Circuit Current Fold-Back
- * With Noise Reduction Bypass Capacitor
- * Has Power-Saving Shutdown Mode
- * Very Low Temperature Coefficient

ORDERING INFORMATION

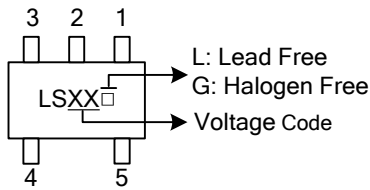
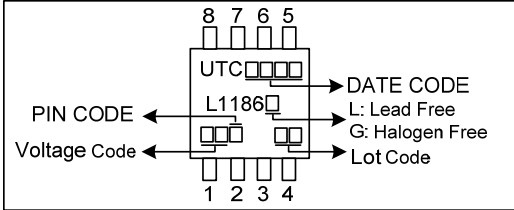
Ordering Number		Package	Packing
Lead Free	Halogen Free		
L1186L-xx-AF5-R	L1186G-xx-AF5-R	SOT-25	Tape Reel
L1186L-xx-S08-A-R	L1186G-xx-S08-A-R	SOP-8	Tape Reel
L1186L-xx-S08-B-R	L1186G-xx-S08-B-R	SOP-8	Tape Reel

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

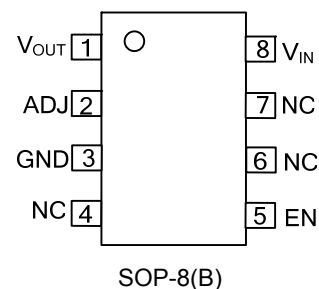
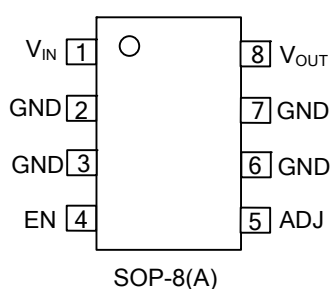
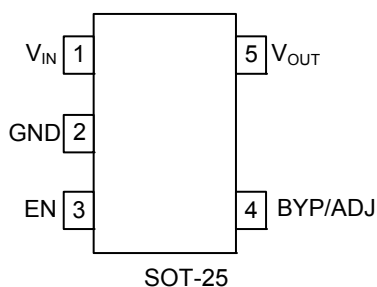
<p>L1186G-xx-AF5-X-R</p> 		<p>(1) R: Tape Reel (2) refer to Pin Assignment (FOR SOP-8) (3) AF5: SOT-25, S08: SOP-8 (4) xx: Refer to Marking Information (5) L: Lead Free G: Halogen Free</p>
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MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-25	15 :1.5V 28 :2.8V AD:ADJ	 <p>L: Lead Free G: Halogen Free Voltage Code</p>
SOP-8		 <p>DATE CODE L: Lead Free G: Halogen Free Lot Code</p> <p>PIN CODE Voltage Code</p>

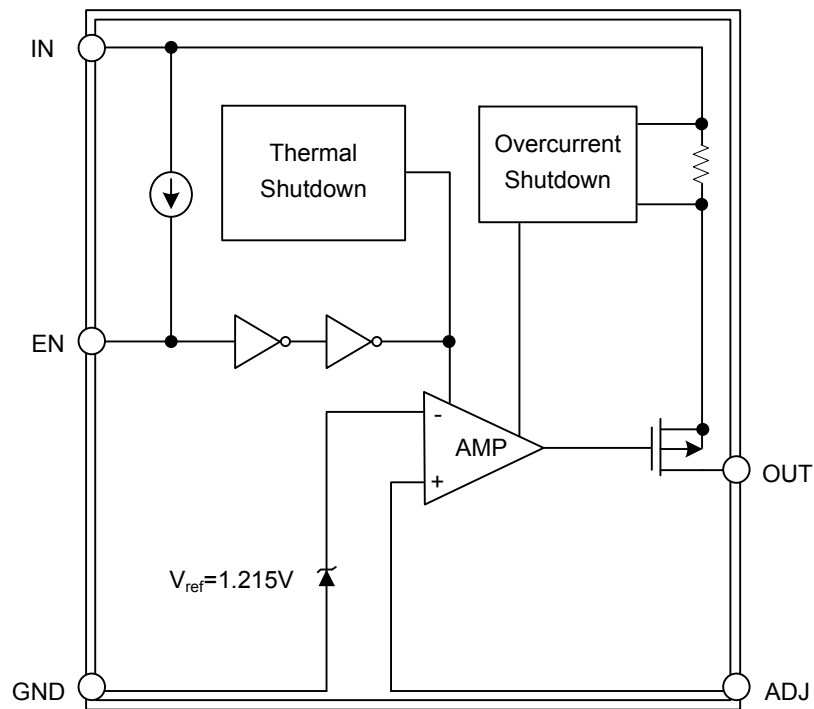
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO			PIN NAME	DESCRIPTION
SOT-25	SOP-8(A)	SOP-8(B)		
1	1	8	V _{IN}	Input for voltage input.
2	2,3,6,7	3	GND	Ground.
3	4	5	EN	Enable pin.
4	5	2	BYP/ADJ	Noise Reduction Bypass Capacitor/ Adjusted Voltage
5	8	1	V _{OUT}	Output voltage pin
--	--	4,6,7	NC	No connection

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage		V_{IN}	8	V
Output Voltage		V_{OUT}	GND-0.3 ~ $V_{IN}+0.3$	V
Output Current		I_{OUT}	$\frac{P_D}{V_{IN} - V_{OUT}}$	A
Power Dissipation	SOT-25	P_D	400	mW
	SOP-8		600	
Junction Temperature		T_J	150	°C
Operating Temperature		T_{OPR}	-40~+85	°C
Storage Temperature		T_{STG}	-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	RATINGS	UNIT
Junction to Ambient	SOT-25	θ_{JA}	260	°C/W
	SOP-8		200	
Junction to Case (Note)	SOT-25	θ_{JC}	81	°C/W
	SOP-8		65	

Note: θ_{JC} on center of molding compound if IC has on tab

■ ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$, unless otherwise noted.)

Fixed Voltage

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	V_{IN}			Note1		7	V
Output Voltage Accuracy	V_{OUT}	$I_{OUT}=1\text{mA}$		-1.5		1.5	%
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$I_{OUT}=1\text{mA}$ $V_{IN}=V_{OUT}+1-V_{OUT}+2$	$1.4\text{V} < V_{OUT} \leq 2.0\text{V}$	-0.15		0.15	%
			$2.0\text{V} < V_{OUT} < 4.0\text{V}$	-0.1	0.02	0.1	%
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$I_{OUT}=1\text{mA} \sim 600\text{mA}$			0.2	1	%
Output Current	I_{OUT}	$V_{OUT} > 1.2\text{V}$		600			mA
Current Limit	I_{LIMIT}	$V_{OUT} > 1.2\text{V}$		600	800		mA
Short Circuit Current	I_{SC}	$V_{OUT} < 0.8\text{V}$			300	600	mA
Quiescent Current	I_Q	$I_{OUT}=0\text{mA}$			30	50	μA
Ground Pin Current	I_{GND}	$I_{OUT}=1\text{mA} \sim 600\text{mA}$			35		μA
Dropout Voltage	V_D	$I_{OUT} = 600\text{mA}$ $V_{OUT} = V_{O(NOM)} - 2.0\%$	$1.4\text{V} < V_{O(NOM)} \leq 2.0\text{V}$			1400	mV
			$2.0\text{V} < V_{O(NOM)} \leq 2.8\text{V}$			800	mV
Over Temperature Shutdown	OTS				150		°C
Over Temperature Hysteresis	OTH				30		°C
Temperature Coefficient of Output Voltage	$T_C V_O$				30		ppm/°C
Power Supply Rejection	PSRR	$I_{OUT} = 100\text{mA}$ $C_{OUT} = 2.2\mu\text{F}$ ceramic $C_{BYP} = 0.01\mu\text{F}$	$f = 1\text{kHz}$		75		dB
			$f = 10\text{kHz}$		55		dB
			$f = 100\text{kHz}$		30		dB
Output Voltage Noise	eN	$f = 10\text{Hz} \sim 100\text{kHz}$, $I_{OUT} = 10\text{mA}$ $C_{OUT} = 2.2\mu\text{F}$, $C_{BYP} = 0.1\mu\text{F}$			30		μV_{rms}
EN Input Threshold	V_{EH}	$V_{IN} = 2.7\text{V} \sim 7\text{V}$		2.0		V_{IN}	V
	V_{EL}	$V_{IN} = 2.7\text{V} \sim 7\text{V}$		0		0.4	V
EN Input Bias Current	I_{EH}	$V_{EN} = V_{IN}$, $V_{IN} = 2.7\text{V} \sim 7\text{V}$				0.1	μA
	I_{EL}	$V_{EN} = 0\text{V}$, $V_{IN} = 2.7\text{V} \sim 7\text{V}$				0.5	μA
Shutdown Supply Current	I_{SD}	$V_{IN} = 5\text{V}$, $V_{OUT} = 0\text{V}$, $V_{EN} < V_{EL}$			0.5	1	μA
PG Leakage Current	I_{LC}	$V_{PG} = 7\text{V}$				1	μA

■ ELECTRICAL CHARACTERISTICS (Cont.)

Adjusted Voltage

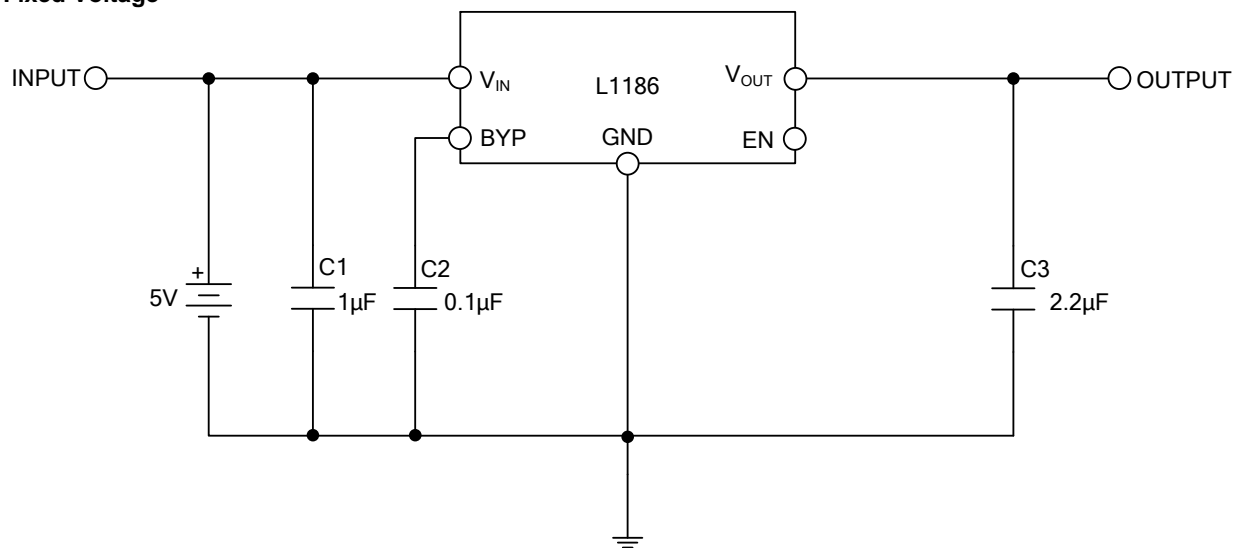
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	V_{IN}		Note1		7	V
Reference Voltage	V_{REF}		1.196	1.215	1.234	V
Output Voltage Accuracy	V_{OUT}	$I_{OUT}=1mA$	-1.5		1.5	%
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	$V_{IN}=V_{OUT}+V_D, I_{OUT}=1mA$	-0.15		0.15	%
Load Regulation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

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

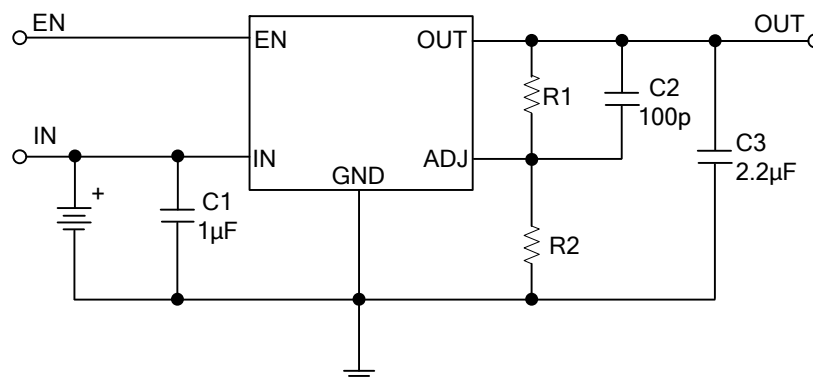
2. To prevent the Short Circuit Current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

TYPICAL APPLICATION CIRCUIT

Fixed Voltage



Adjusted Voltage



$$V_{OUT} = 1.215 (R1/R2 + 1)$$

C2 is unnecessary if $R1$ or $R2 < 20 \text{ K}\Omega$

$R1$ and $R2$ use resistance value within 1% accuracy for correct for correct V_{OUT}

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