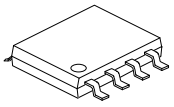
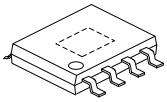
P1686

LINEAR INTEGRATED CIRCUIT

600KHZ, 3A STEP-DOWN CURRENT MDOE SWITCHING REGULATOR



SOP-8



HSOP-8

■ DESCRIPTION

As a current mode switching regulator with an integrated switch, the UTC **P1686** is operating at 600kHz with separate sync and enable functions. In order to avoid frequency beating in noise sensitive applications the sync function allows customers to synchronize to a faster clock. Cost effective low power solutions is considered in the integrated switch ,and so peak switch current 3 amps. Very small passive components is considered in High frequency of operation. Current mode operation: fast dynamic response and instantaneous duty cycle adjustment as the input changes, as a ideal for CPE applications where the input is a wall plug power.

The low shutdown current as ideal for portable applications when battery life is important.

The UTC **P1686** is synchronizable to a frequency from 750kHz to 1.2MHz.

■ FEATURES

* Integrated 3 Amp switch
* 600kHz frequency of operation
* Current mode controller
* Synchronizable to higher frequency up to 1.2MHz
* 6μA low shutdown current

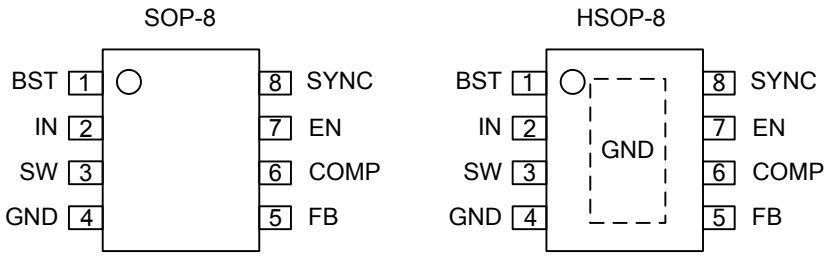
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Normal	Lead Free Plating		
P1686-S08-R	P1686L-S08-R	SOP-8	Tape Reel
P1686-S08-T	P1686L-S08-T	SOP-8	Tube
P1686-SH2-R	P1686L-SH2-R	HSOP-8	Tape Reel
P1686-SH2-T	P1686L-SH2-T	HSOP-8	Tube

P1686L-S08-R
(1)Packing Type
(2)Package Type
(3)Lead Plating

(1) R: Tape Reel, T: Tube
(2) S08: SOP-8, SH2: HSOP-8
(3) L: Lead Free Plating, Blank: Pb/Sn

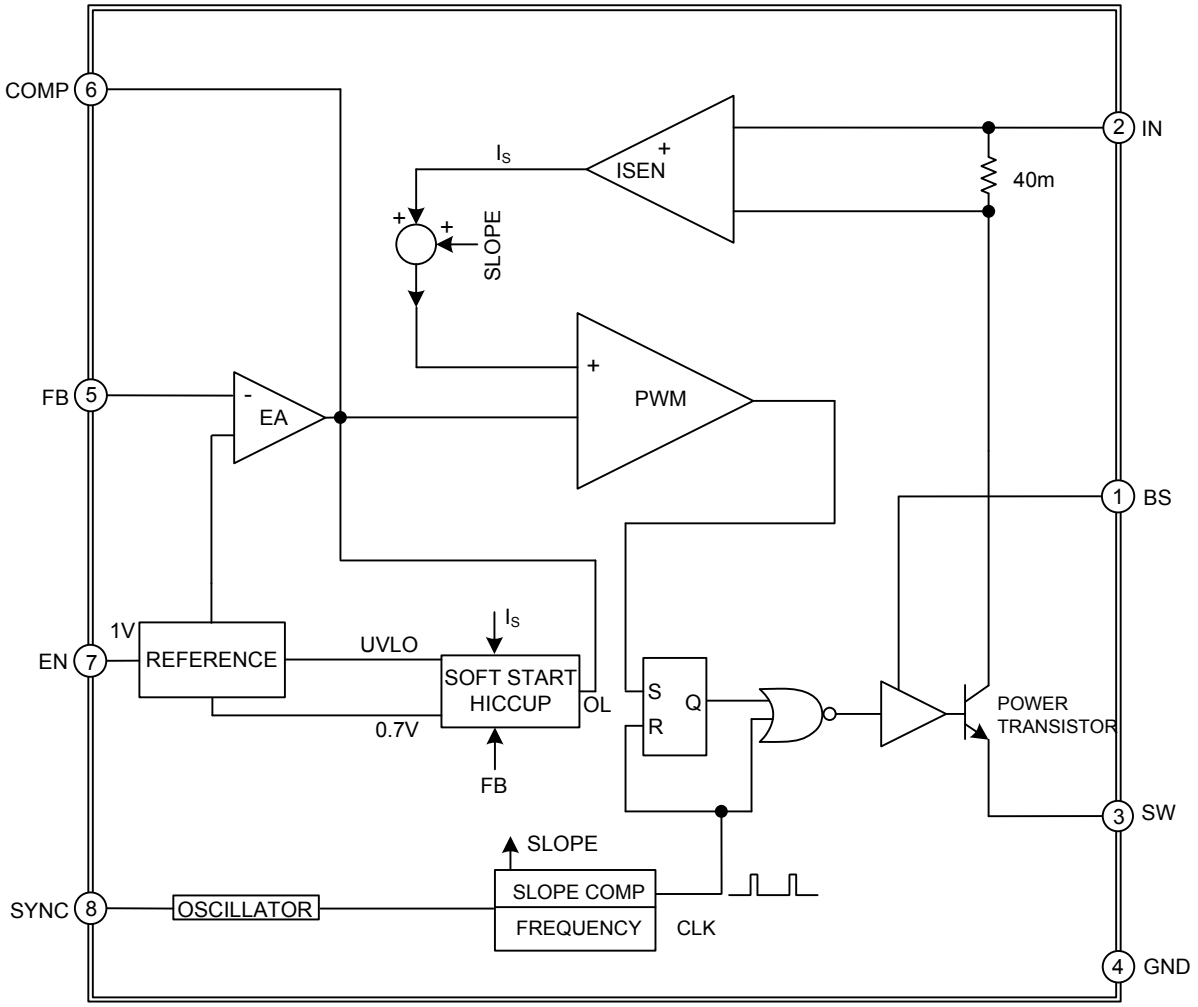
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	PIN FUNCTION
1	BST	Providing power to the internal NPN switch. To turn on for this switch the lowest voltage is 2.7V.
2	IN	This PIN delivers all control and power circuitry's power, and sees high di/dt during switching. A decoupling capacitor is better to be attached to this pin very closely.
3	SW	This PIN is the emitter of the internal switch and should be connected with the external freewheeling diode very closely.
4	GND	Almost all voltages are measured with respect to this pin. The decoupling capacitor and the freewheeling diode is better to be connected to this PIN as short as possible.
5	FB	Input of feedback for adjustable output controllers.
6	COMP	Output of the internal error amplifier and also input of the peak current comparator. To achieve the specified performance a compensation network is connected to this pin.
7	EN	Chip enable input. EN is high: the regulator switched on; EN is low: off. EN is low: the regulator is in standby mode, and the input supply current is reduced to a few microamperes.
8	SYNC	Synchronous control pin used to synchronize the internal oscillator to an external pulse control signal. But it should be connected to GND when not used.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNITS
Input Supply Voltage	V_{IN}	-0.3 ~ +28	V
Boost Pin Above V_{SW}	(V_{BST} -V_{SW})	16	V
Boost Pin Voltage	V_{BST}	-0.3 ~ +32	V
EN Pin Voltage	V_{EN}	-0.3 ~ +16	V
FB Pin Voltage	V_{FB}	-0.3 ~ +6	V
FB Pin Current	I_{FB}	1	mA
SYNC Pin Current	I_{SYNC}	1	mA
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	UNITS
Junction to Ambient	θ_{JA}	36.5	°C/W

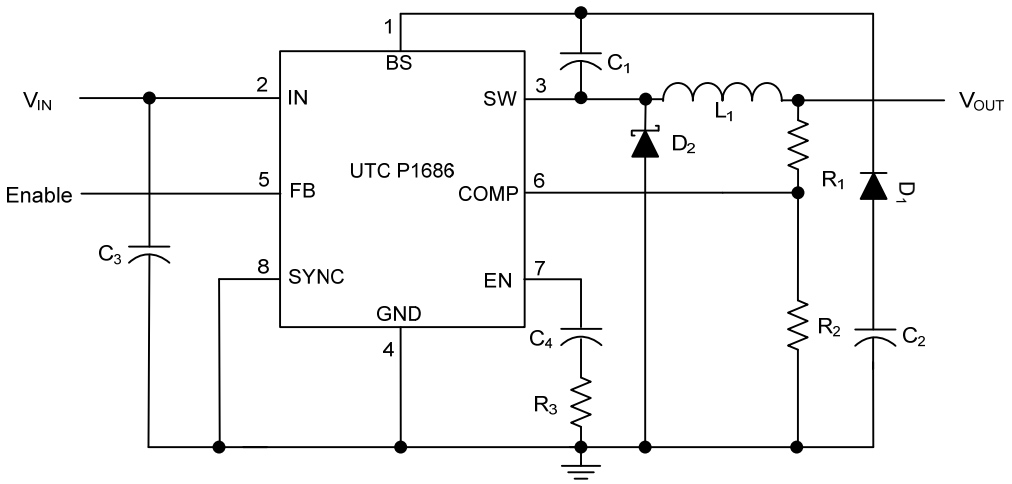
■ ELECTRICAL CHARACTERISTICS

(V_{IN} = 12V, V_{COMP} = 0.8V, V_{BS} = V_{IN} + 5V, EN = tied to V_{IN}, SYNC = 0, SW = open. T_A = T_J = -40°C ~ 85°C.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Operating Input Voltage (Note 1)	V_{IN}				16	V
Maximum Switch Current Limit	I_{SW}			3.0		A
Oscillator Frequency	f_{OSC}		550	600	750	kHz
Switch On Voltage Drop	$V_{D(SW)}$	I_{SW} = 3A		330		mV
V_{IN} Undervoltage Lockout	V_{UVLO}	T_A = 25°C		2.60	3	V
V_{IN} Supply Current	I_Q	V_{FB} = $V_{OUT(NOM)}$ + 17%		1.0	5	mA
Standby Current	$I_{Q(OFF)}$	V_{EN} = 0V, V_{IN} = V_{BOOST} = 16V, V_{SW} = 0V		5	45	μA
FB Input Current	I_{FB}			-0.25	-0.50	μA
Feedback Voltage			1.176	1.2	1.224	V
Feedback Voltage Line Regulation		3V < V_{IN} < 16V (Note 2)		+3		mV/V
FB to V_{COMP} Voltage Gain (Note 3)		0.4V ≤ V_{COMP} ≤ 0.9V	150	350		
FB to V_{COMP} Transconductance (Note 3)		Δ I_{COMP} = ± 10μA	500	850	1300	μMho
V_{COMP} Pin Source Current		V_{FB} = $V_{OUT(NOM)}$ -17%		70	110	μA
V_{COMP} Pin Sink Current		V_{FB} = $V_{OUT(NOM)}$ + 17%		70	110	μA
V_{COMP} Pin to Switch Current Trans conductance				2.5		A/V
V_{COMP} Pin Maximum Switching Threshold		Duty cycle = 0%		0.35		V
V_{COMP} Pin Threshold		I_{SW} = 3A		0.9		V
Maximum Switch Duty Cycle		V_{COMP} = 1.2V, I_{SW} = 400mA	85			%
Minimum Boost Voltage Above Switch (Note 3)	V_{BOOST}	I_{SW} = 3A, 0°C ≤ T_A ≤ 85°C I_{SW} =2.5A, T_A < 0°C		1.8	2.7	V
Boost Current	I_{BOOST}	I_{SW} = 1A		10	15	mA
		I_{SW} = 3A, 0°C ≤ T_A ≤ 85°C I_{SW} =2.5A, T_A < 0°C		30	45	
Enable Input Threshold Voltage	V_{IH}		3			V
	V_{IL}				0.4	V
Enable Input Bias Current	I_{IL}	EN = 60mV above threshold		2.5		μA
	I_{IH}	EN = 100mV below threshold		5	15	μA
SYNC Threshold Voltage				1.5		V
SYNC Input Frequency (Note 4)			750		1200	kHz
SYNC Pin Resistance		V_{SYNC} = 0.5V		20		kΩ

Note: 1. The device may not function properly outside its operating input voltage range.
2. The required minimum input voltage for a regulated output depends on the output voltage and load condition.
3. Guaranteed by design.
4. For SYNC applications, please contact factory.

■ TYPICAL APPLICATION CIRCUIT



■ APPLICATION CIRCUIT

Design Example: 16V to 5V at 2A