# UNISONIC TECHNOLOGIES CO., LTD

P1986

PWM CONTROL 3A STEP-DOWN CONVERTER

SOP-8

■ DESCRIPTION

The UTC **P1986** consists of 3A step-down switching regulator with PWM control which includes a reference voltage source, oscillation circuit, error amplifier, internal PMOS and etc.

The UTC **P1986** can provide low-ripple power, high efficiency, and perfect transient characteristics. The duty ratio varies linearly from 0% to 100% in the PWM control. The error amplifier circuit and soft-start circuit included in this device can prevent overshoot at startup. Internally, the build-in compensation block can reduce external component count. An enable function, an over current protect (OCP) function and short circuit protect (SCP) are also build inside, and when OCP happens, the operation frequency will be reduced.

In application, the UTC **P1986** is suitable for portable devices when it works as an ideal power supply in SOP-8L package. There is an internal P-channel power MOS, a coil, capacitors inside and a diode connected externally that makes these ICs step-down switching regulators.
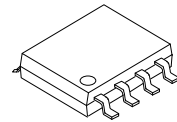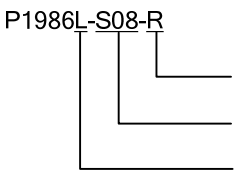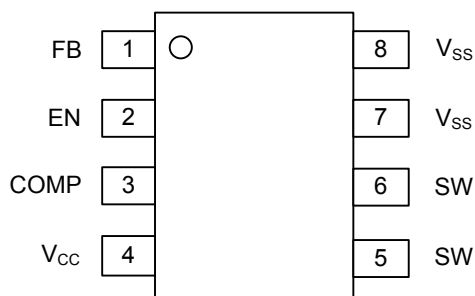
■ FEATURES

* Input voltage varies from 3.6V to 28V
* Output voltage varies from 0.8V to V_{CC}
* Duty ratio varies from 0% to 100% PWM control
* With 330kHz typical oscillation frequency
* Thermal shutdown and SCP function and soft-start, current limit, enable function
* Low ESR output capacitor(Multi-layer chip capacitor) application
* Built-in switch P-channel power MOS
* Halogen Free

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
P1986L-S08-R	P1986G-S08-R	SOP-8	Tape Reel

P1986L-S08-R

(1) Packing Type
(2) Package Type
(3) Lead Free

(1) R: Tape Reel

(2) S08: SOP-8

(3) G: Halogen Free, L: Lead Free

■ **PIN CONFIGURATION**

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        ┌──────────────┐
 FB  │1│ ○          │8│  V_SS
        │              │
 EN  │2│            │7│  V_SS
        │              │
COMP │3│            │6│  SW
        │              │
 V_CC│4│            │5│  SW
        └──────────────┘
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■ **PIN DESCRIPTION**

PIN NO.	PIN NAME	DESCRIPTION
1	FB	Feedback pin
2	EN	Power-off pin H: normal operation (Step-down) L: Step-down operation stopped (All circuits deactivated)
3	COMP	Compensation pin
4	V_{CC}	IC power supply pin
5	SW	Switch pin. Connect external inductor/diode here.
6	SW	Switch pin. Connect external inductor/diode here.
7	V_{SS}	GND pin
8	V_{SS}	GND pin

■ **BLOCK DIAGRAM**
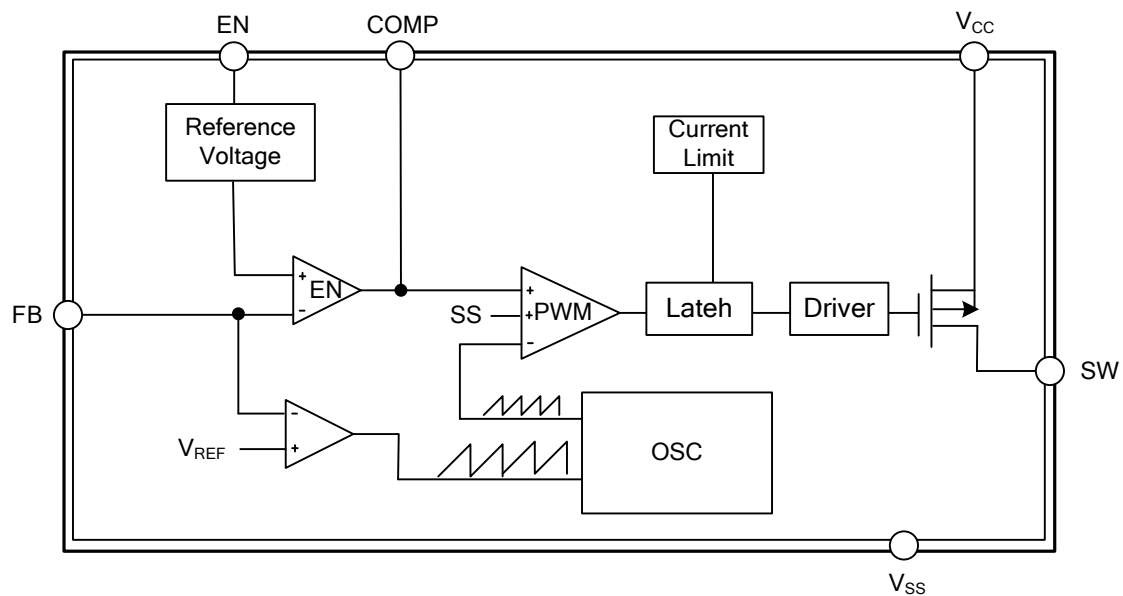
■ **ABSOLUTE MAXIMUM RATING** (Ta=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
V_{CC} Pin Voltage	V_{CC}	V_{SS} -0.3 ~V_{SS} +30	V
Feedback Pin Voltage	V_{FB}	V_{SS} -0.3 ~ V_{CC}	V
ON/OFF Pin Voltage	V_{EN}	V_{SS} - 0.3 ~ V_{CC}+ 0.3	V
Switch Pin Voltage	V_{SW}	V_{SS} - 0.3 ~ V_{CC}+ 0.3	V
Operating Supply Voltage	V_{OP}	+3.6 ~ 28	V
Power Dissipation	P_D	Internally limited	mW
Storage Temperature	T_{STG}	-40 ~ +150	°C
Operating Temperature	T_{OPR}	-20 ~ +125	°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	θ_{JA}	70	°C/W
Junction to Case	θ_{JC}	25	°C/W

Notes: θ_{JA} is measured with the PCB copper area(need connect to SW pins) of approximately 1 in2(Multi-layer)
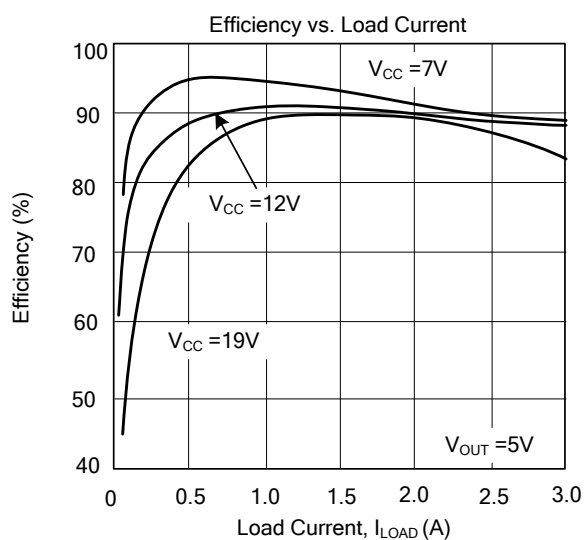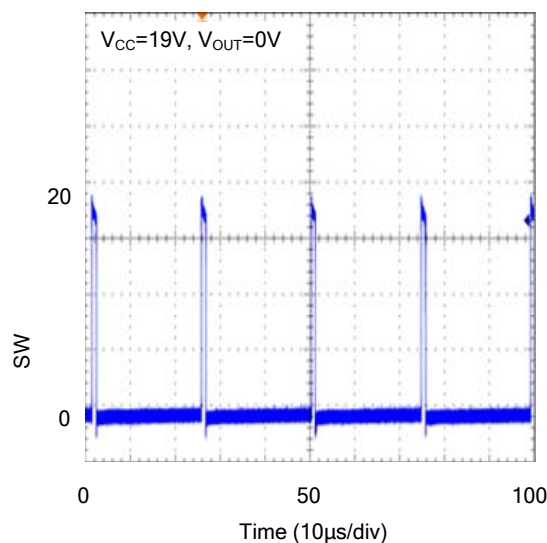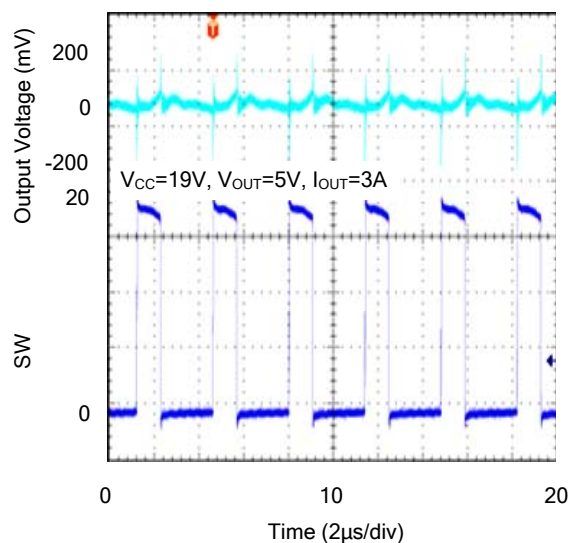
■ **ELECTRICAL CHARACTERISTICS** (V_{IN} = 12V, Ta= 25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Feedback Voltage	V_{FB}	I_{OUT}=0.2A	0.784	0.80	0.816	V
Feedback Bias Current	$I_{FB(BIAS)}$	I_{OUT}=0.1A		0.1	0.5	μA
Switch Current	I_{SW}	Pear current, No outside circuit V_{FB}=0V Force driver on		4		A
Standby Current	I_{STN-BY}	V_{EN}=0V No outside circuit V_{FB}=0V Force driver on		2	10	μA
Quiescent Current	I_Q	V_{FB}=1.2V Force driver off		3	5	mA
Oscillation Frequency	f_{OSC}	Measure waveform at SW Pin	260	330	400	KHz
Frequency of Current Limit or Short Circuit Protect	f_{OSC1}	Measure waveform at SW Pin	40			KHz
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	V_{CC}=5V-28V, I_{OUT}=0.2A		0.4		%
Load Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}}$	I_{OUT}=0.2A-3A		0.3		%
EN Pin Input Current	I_{SH}	V_{EN}=2.5V(ON)		5		μA
	I_{SL}	V_{EN}=0.3V(OFF)		0		μA
Soft-Start Time	T_{SS}		0.3	3.5	8	ms
Internal MOSFET $R_{DS(ON)}$	$R_{DS(ON)}$	V_{CC}=5V,V_{FB}=0V		130	150	mΩ
		V_{CC}=12V,V_{FB}=0V		80	100	mΩ
EN Pin Logic input threshold voltage	V_{SH}	High(regulator ON)	1.6			V
	V_{SL}	Low(regulator OFF)			0.8	V
Thermal shutdown Temp	TSD			140		°C

■ **TYPICAL APPLICATION CIRCUIT**

MLCC
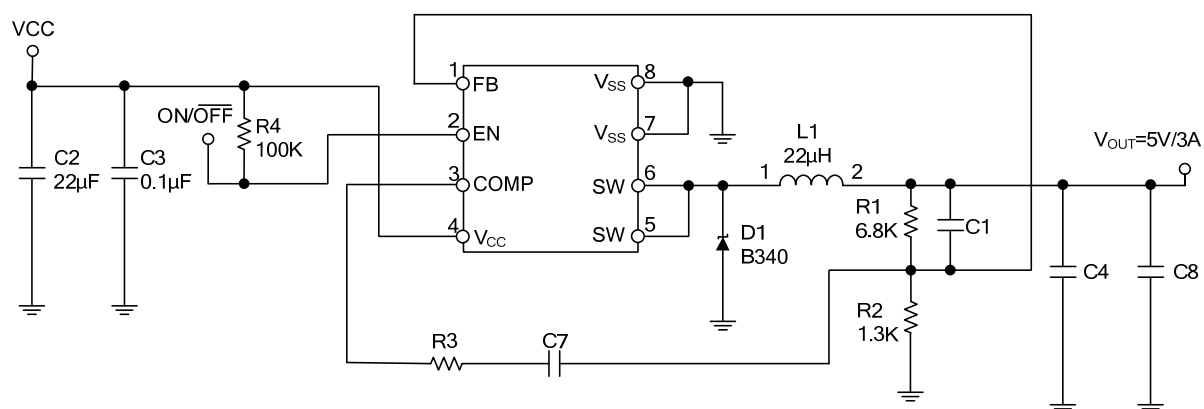
V_{CC} (V)	C1 (nF)	C4 (µF)	C7 (nF)	C8 (µF)	R3 (KΩ)
7	1	33	2.2	0.1	10.3
12	1	33	2.2	0.1	10.96
19	1	33	10	0.1	5.94

■ **TYPICAL CHARACTERISTICS**

Efficiency vs. Load Current