



P1580

Preliminary

LINEAR INTEGRATED CIRCUIT

380KHz, 2.5A STEP-DOWN SWITCHING REGULATOR

DESCRIPTION

The UTC P1580 is a current mode, PWM controller with 380kHz fixed frequency. It achieves 2.5A continuous output current over a wide input supply range with excellent load and line regulation. By using an external compensation pin, this device offers user flexibility in determining loop dynamic.

The UTC P1580 integrates control, monitor and protection functions to provide a low cost and perfect power solution. The device provides 3.5 to 28V wide range operating input and high-efficiency up to 90%.

An Under- Voltage-Lock-Output (UVLO) circuit monitors the supply voltage to prevent from wrong logic control. An internal 1.222V reference voltage provides low output voltage down to 1.22V for further applications. The over-current protection of controller monitors the output current by using the voltage drop across a current sensing resistor. Additional under voltage protection monitors the voltage on FB pin for short-circuits protection.

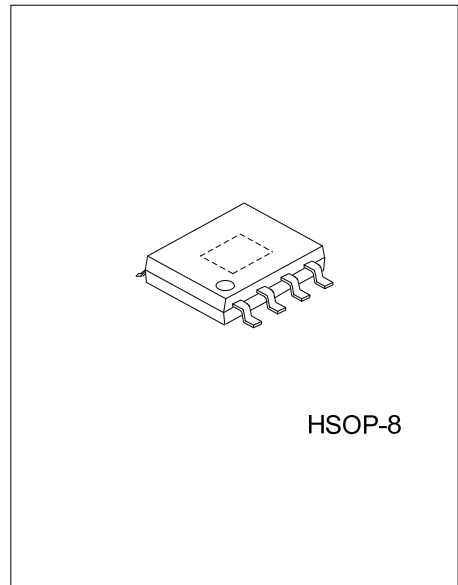
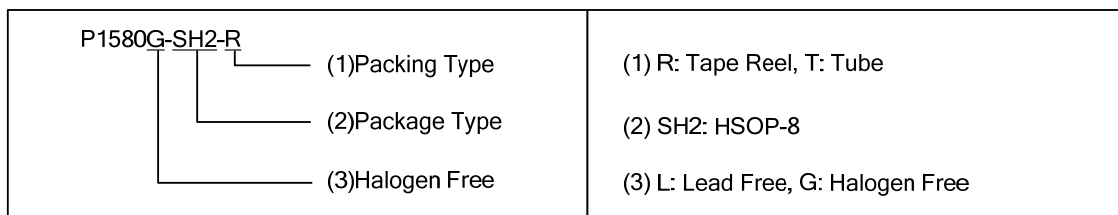
The UTC P1580 provides fast transient response and requires very few external devices for operation.

FEATURES

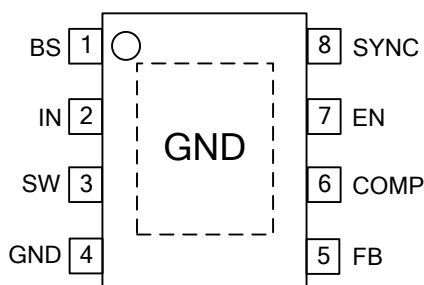
- \* 2.5A Output Current
\* 380kHz Frequency of Operation
\* 3.5V to 28V Input Voltage Range
\* 5µA Shutdown Supply Current
\* Output Adjustable From 1.22 to 21
\* Frequency Feedback at Short Circuit
\* Thermal Shutdown
\* Under Voltage Lock Output
\* Current Mode With Low ESR Output Ceramic Capacitors
\* Up to 90% Efficiency
\* Frequency Synchronization Input

ORDERING INFORMATION

Table with 4 columns: Ordering Number (Lead Free, Halogen Free), Package, Packing. Rows include P1580L-SH2-R, P1580G-SH2-R, P1580L-SH2-T, P1580G-SH2-T.



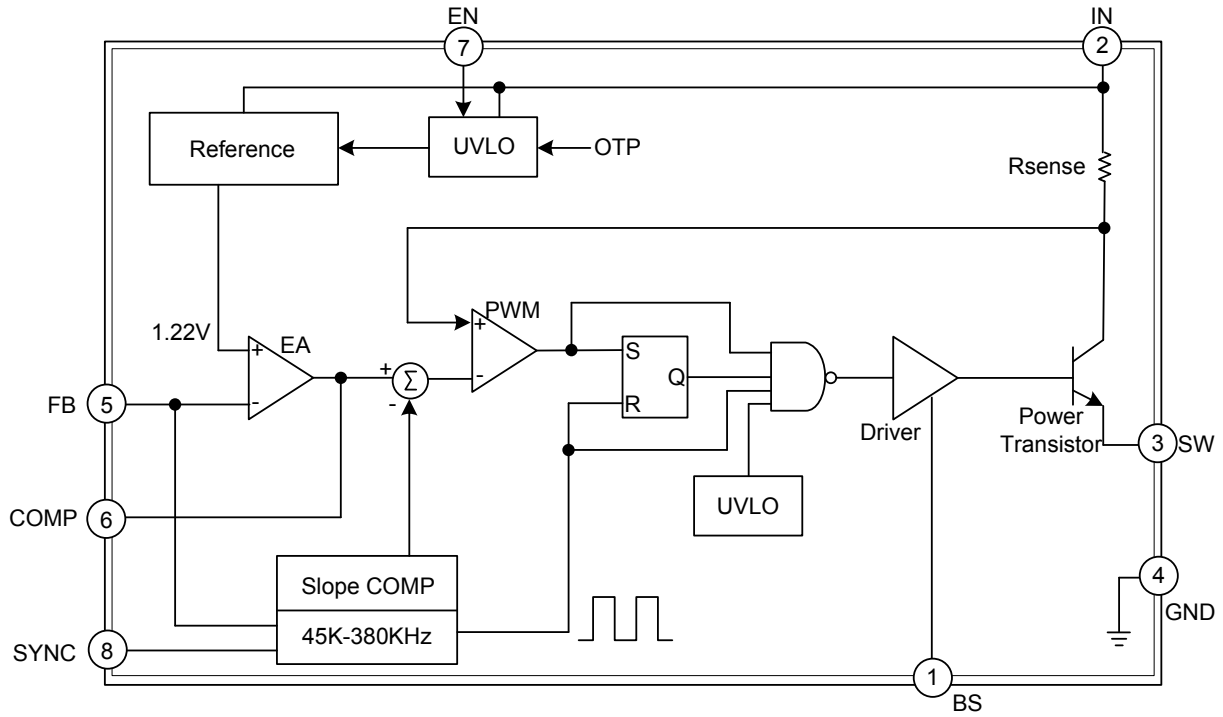
■ **PIN CONFIGURATION**



■ **PIN DESCRIPTION**

PIN NO.	PIN NAME	DESCRIPTION
1	BS	Supply pin to the power transistor driver. Tie to external circuit to generate a local supply voltage higher than the input voltage in order to fully turn on the internal power transistor.
2	IN	Power Supply pin.
3	SW	Power Switch Output pin.
4	GND	Ground pin.
5	FB	The output voltage feedback pin. It is also the inverting input of the error amplifier.
6	COMP	Compensation pin. It is also the output of the internal error amplifier. (1). A RC network at this pin compensates the control loop. (2). The voltage at this pin controls the peak current of the internal switch.
7	EN	Regulator On/Off Control pin. Leave EN unconnected if unused. A low input at EN turns on the converter, and a high input turns it off.
8	SYNC	Synchronization Input - The sync pin is used to synchronize the internal oscillator to an external signal.

■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING (Note 3)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{IN}$	28	V
Switch Voltage	$V_{SW}$	$-1 \sim V_{IN}+1$	V
Boost Voltage	$V_{BS}$	$V_{SW}+6$	V
Feedback Voltage	$V_{FB}$	$-0.3 \sim 6$	V
Enable/UVLO Voltage	$V_{EN}$	$-0.3 \sim 6$	V
Compensation Voltage	$V_{COMP}$	$-0.3 \sim 6$	V
Synchronization Voltage	$V_{SYNC}$	$-0.3 \sim 6$	V
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	$-65 \sim +150$	°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.

### ■ RECOMMENDED OPERATING CONDITIONS (Note 1)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	$V_{IN}$	3.5~28	V
Ambient Operating Temperature	$T_A$	$-40 \sim +125$	°C

Note: The device is not guaranteed to function outside its operating rating.

### ■ THERMAL DATA (Note 1)

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	105	°C/W
Junction to Case	$\theta_{JC}$	50	°C/W

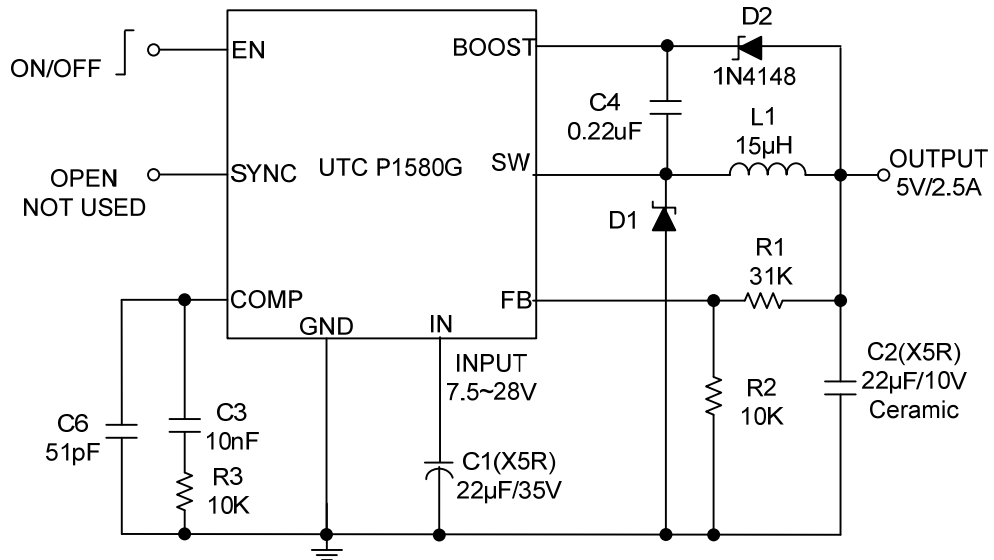
Note: Measured on approximately 1" square of 1 oz. Copper surrounding device leads.

### ■ ELECTRICAL CHARACTERISTICS ( $V_{IN}=12V$ , $T_A=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Feedback Voltage	$V_{FB}$	$7V \leq V_{IN} \leq 25V$ , $V_{COMP} < 2V$	1.198	1.222	1.246	V
Upper Switch Leakage		$V_{EN}=0V$ , $V_{SW}=0V$		0.1	10	$\mu A$
Current Limit	$I_{LIMIT}$		3.1	3.3	3.3	A
Current Limit Gain. Output Current to Comp Pin Voltage	$G_{COMP}$			2.2		A/V
Error Amplifier Voltage Gain	$A_{VEA}$			400		V/V
Error Amplifier Transconductance	$G_{EA}$	$\Delta I_C = \pm 10 \mu A$	680	770	1000	$\mu A/V$
Oscillator Frequency	$F_{OSC}$		342	380	418	KHz
Short Circuit Frequency	$F_{SC}$	$V_{FB}=0V$	40	46	54	KHz
Synchronization Frequency	$F_{SYNC}$	Sync Drive $0 \sim 2.7V$	370		660	KHz
Duty Cycle	Maximum	$D_{MAX}$	$V_{FB}=1.0V$		90	%
	Minimum	$D_{MIN}$	$V_{FB}=1.5V$		0	%
Switch $V_{CESAT}$		$I_{SW}=2A$		400		mV
Enable Threshold	$V_{EN}$	$I_{CC} > 100 \mu A$	0.9	1.1	1.3	V
Enable Pull Up Current	$I_{EN}$	$V_{EN}=0V$		0.1		$\mu A$
Supply Current	Shutdown	$I_{SHDN}$	$V_{EN} \leq 0.4V$		5	$\mu A$
	Quiescent	$I_Q$	$V_{EN} \geq 2.6V$ ; $V_{FB}=1.4V$		1.7	mA
Current of Short Circuit	$I_{SC}$	$V_{IN}=10V$		1.8		A
Thermal Shutdown	$T_{OTP}$			160		°C

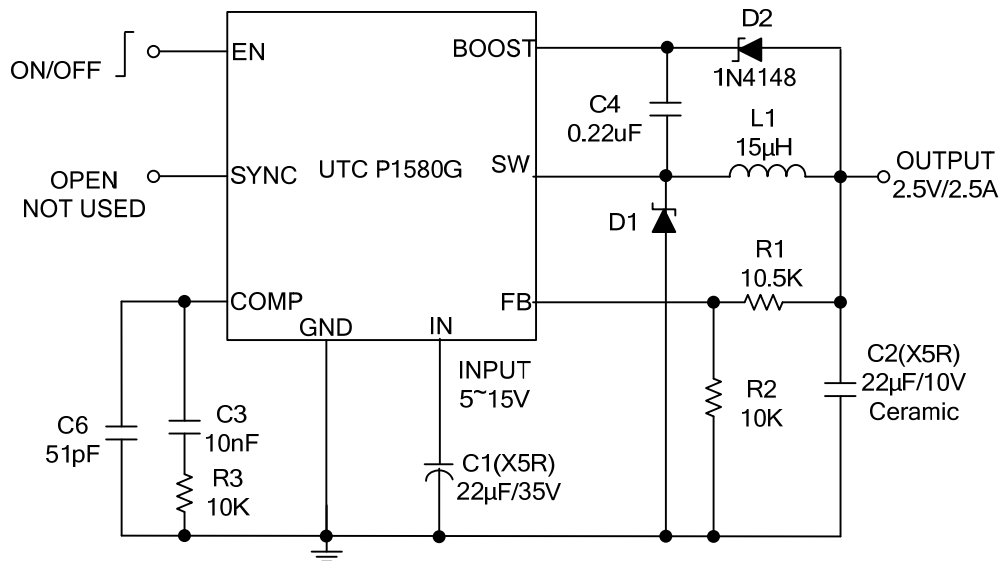
Note: If the  $V_{IN}$  voltage exceeding 23V under short circuit condition, there will be some risk.

■ **TYPICAL APPLICATION CIRCUIT**



UTC **P1580** with 5V Output Voltage and 22 $\mu$ F / 10V Ceramic Output Capacitor

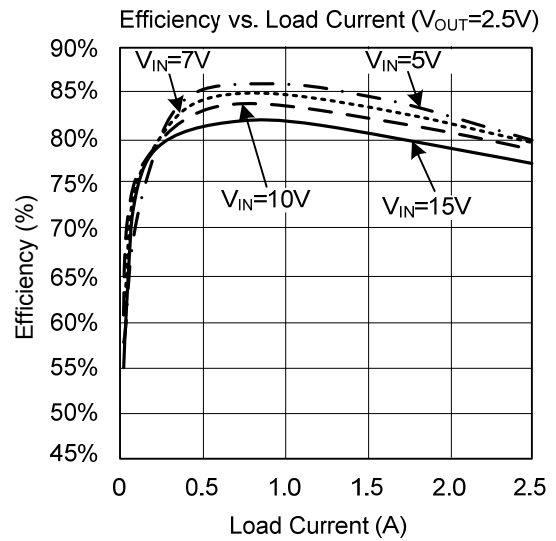
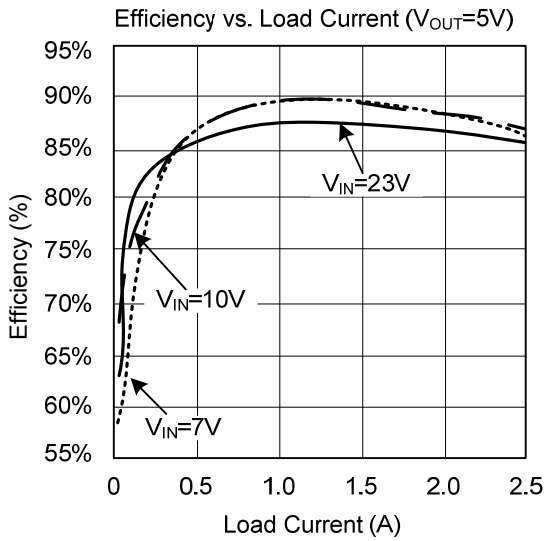
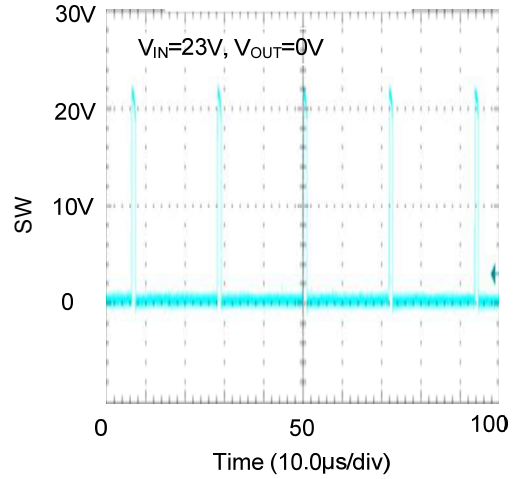
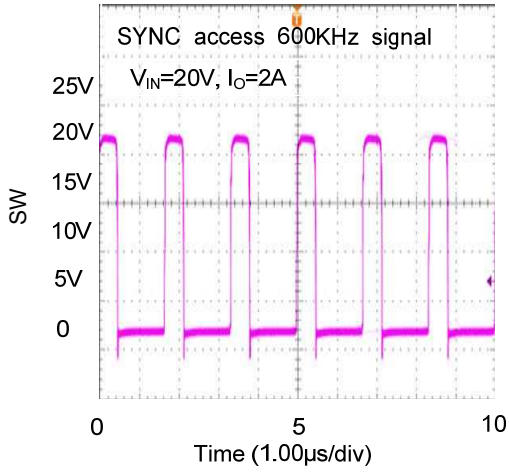
If the load current is applied in 2A, the input voltage can range from 7 to 28V.



UTC **P1580** with 2.5V Output Voltage and 22 $\mu$ F / 10V Ceramic Output Capacitor

If the load current is applied in 2A, the input voltage can range from 4.4 to 28V.

■ TYPICAL CHARACTERISTICS



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