



## P4596

Preliminary

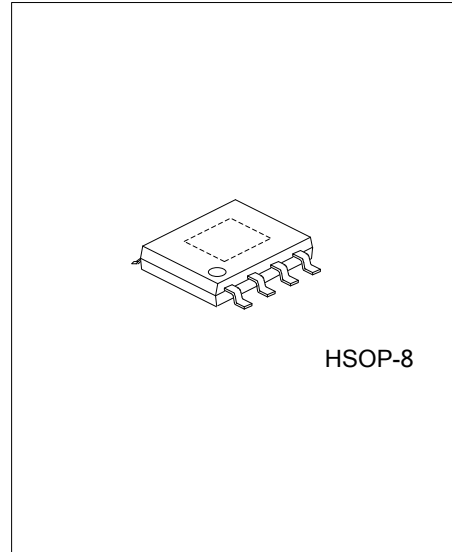
LINEAR INTEGRATED CIRCUIT

# PWM CONTROL 3A STEP-DOWN CONVERTER

### DESCRIPTION

The UTC **P4596** 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 **P4596** can provide low-ripple power, high efficiency, and excellent transient characteristics and an enable function, an over current protect function and a short circuit protect function are built inside. And the PWM control circuit can vary the duty ratio linearly from 100 down to 0%. This converter also includes an error amplifier circuit as well as a soft-start circuit that prevents overshoot at startup. These ICs can work as step-down switching regulators with the addition of an internal P-channel Power MOS, a coil and a diode connected externally. They provide such outstanding features: low current consumption. It is also suitable for the operation via an AC adapter because this converter can accommodate an input voltage up to 40V.



HSOP-8

### FEATURES

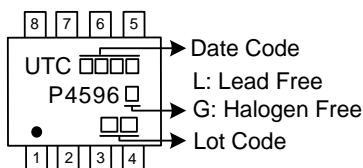
- \* Input voltage : 8V~40V
- \* Duty ratio : 0%~100% PWM control
- \* Enable with Soft-Start function
- \* Oscillation frequency can be set by outside resistance
- \* Current Limit, SCP and OTP

### ORDERING INFORMATION

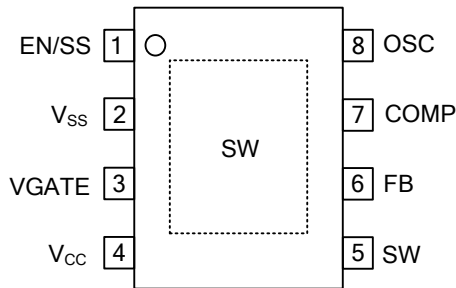
| Ordering Number |              | Package | Packing   |
|-----------------|--------------|---------|-----------|
| Lead Free       | Halogen Free |         |           |
| P4596L-SH2-R    | P4596G-SH2-R | HSOP-8  | Tape Reel |

|   |  |
|---|--|
| <p>P4596G-SH2-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul> | <ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) SH2: HSOP-8</li> <li>(3) G: Halogen Free and Lead Free, L: Lead Free</li> </ul> |
|---|--|

### MARKING



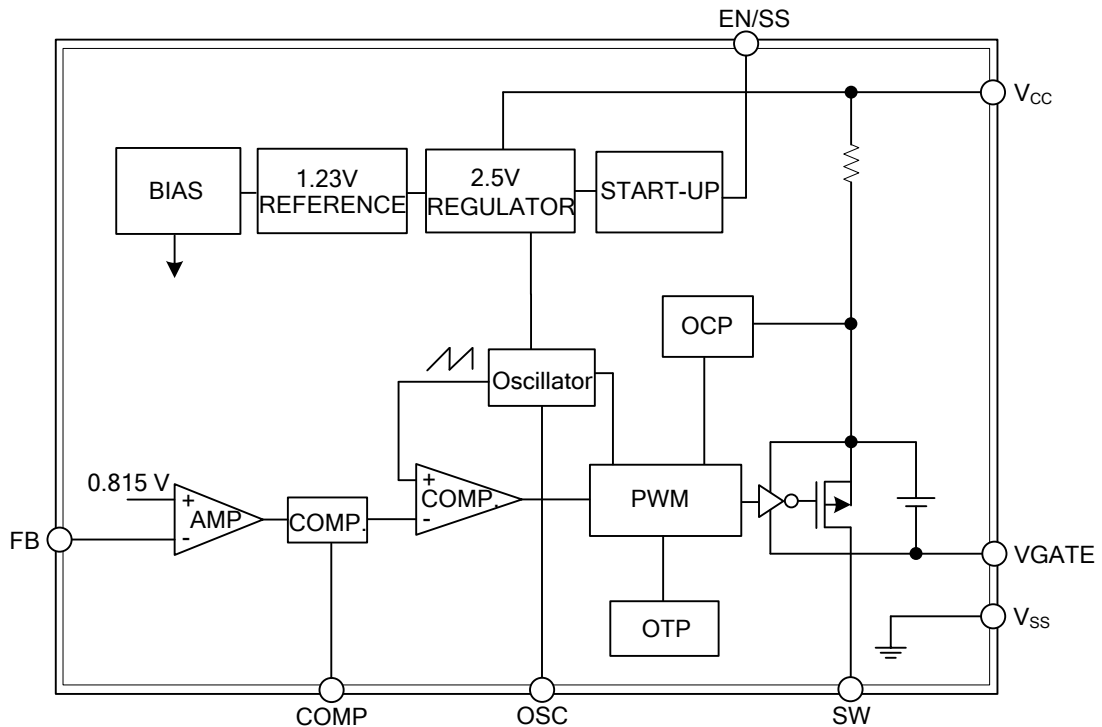
■ PIN CONFIGURATION



■ PIN DESCRIPTION

| PIN NO. | PIN NAME        | DESCRIPTION               |
|---------|-----------------|---------------------------|
| 1       | EN/SS           | Enable and Soft-start pin |
| 2       | V <sub>SS</sub> | Ground                    |
| 3       | VGATE           | Driver GATE clamping pin. |
| 4       | V <sub>CC</sub> | IC power supply pin       |
| 5       | SW              | Switch pin.               |
| 6       | FB              | Feedback voltage          |
| 7       | COMP            | Compensation pin          |
| 8       | OSC             | Frequency Set Pin.        |

■ BLOCK DIAGRAM



■ **ABSOLUTE MAXIMUM RATING** ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

| PARAMETER                | SYMBOL      | RATINGS                          | UNIT             |
|--------------------------|-------------|----------------------------------|------------------|
| VCC Pin Voltage          | $V_{CC}$    | $V_{SS}-0.3 \sim V_{SS}+40$      | V                |
| Feedback Pin Voltage     | $V_{FB}$    | $V_{SS}-0.3 \sim 6$              | V                |
| EN/SS Pin Voltage        | $V_{EN/SS}$ | $V_{SS}-0.3 \sim 6$              | V                |
| OSC Pin Voltage          | $V_{OSC}$   | $V_{SS}-0.3 \sim 3$              | V                |
| COMP Pin Voltage         | $V_{COMP}$  | $V_{SS}-0.3 \sim 6$              | V                |
| VGATE Pin Voltage        | $V_{GATE}$  | $V_{SS}-0.3 \sim V_{CC}$         | V                |
| Switch Pin Voltage       | $V_{SW}$    | $V_{SS} - 0.3 \sim V_{CC} + 0.3$ | V                |
| Power Dissipation        | $P_D$       | 0.7                              | W                |
| Operating Supply Voltage | $V_{OP}$    | 8 ~ 40                           | V                |
| Junction Temperature     | $T_J$       | -40 ~ +125                       | $^\circ\text{C}$ |
| Storage Temperature      | $T_{STG}$   | -65 ~ +150                       | $^\circ\text{C}$ |

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**

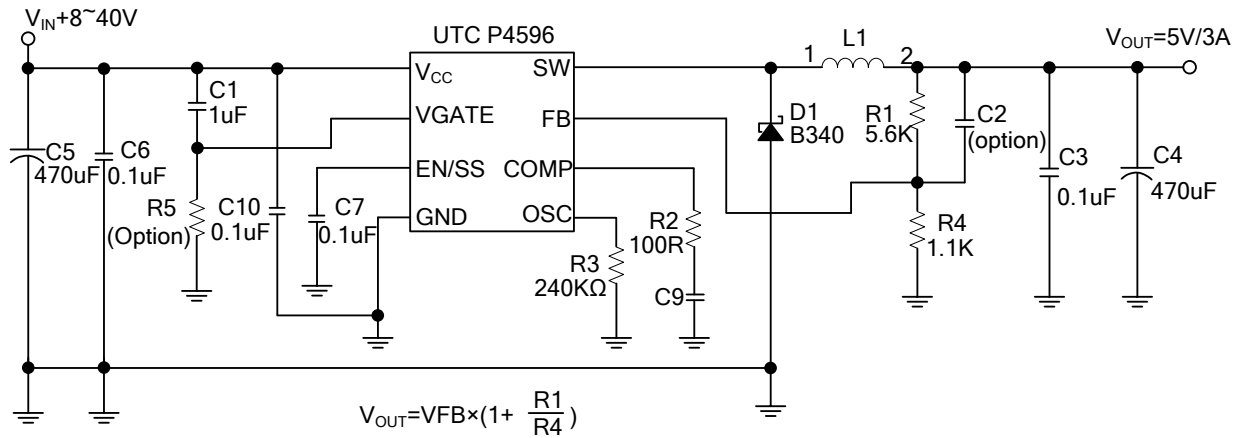
| PARAMETER           | SYMBOL        | RATING | UNIT               |
|---------------------|---------------|--------|--------------------|
| Junction to Ambient | $\theta_{JA}$ | 143    | $^\circ\text{C/W}$ |
| Junction to Case    | $\theta_{JC}$ | 45     | $^\circ\text{C/W}$ |

Note: Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board.

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

| PARAMETER  | SYMBOL       | TEST CONDITIONS   | MIN   | TYP   | MAX   | UNIT          |
|--|--------------|---|-------|-------|-------|---------------|
| Feedback Voltage                                 | $V_{FB}$     | $V_{CC}=10\text{V}\sim 30\text{V}$ , $I_{OUT}=0\sim 2\text{A}$<br>$T_J=-20^\circ\text{C}\sim 125^\circ\text{C}$ | 0.790 | 0.815 | 0.840 | V             |
| Quiescent Current                                | $I_{CCQ}$    | $V_{FB}=1\text{V}$  |       | 3     | 6     | mA            |
| Feedback Bias Current                            | $I_{FB}$     |   |       | 0.1   |       | $\mu\text{A}$ |
| Shutdown Supply Current                          | $I_{SD}$     | $V_{EN/SS}=0\text{V}$   | 10    | 56    | 300   | $\mu\text{A}$ |
| Current Limit                                    | $I_{CL}$     |   | 3.5   |       |       | A             |
| Adjustable Frequency Range                       | $F_{OSC}$    | $R3=240\text{K}\Omega$  |       | 200   |       | KHz           |
| Short Frequency                                  | $F_{OSC1}$   | $V_{CC}=10\text{V}\sim 30\text{V}$  |       | 50    |       | KHz           |
| EN/SS Pin Shutdown Logic Input Threshold Voltage | $V_{ENL}$    |   |       |       | 0.8   | V             |
| EN/SS Pull High Current                          | $I_{EN/SS}$  | $V_{EN/SS}=0\text{V}$   |       | 8     |       | $\mu\text{A}$ |
| Internal MOSFET $R_{DS(ON)}$                     | $R_{DS(ON)}$ | $V_{CC}=12\text{V}$ , $V_{FB}=0\text{V}$  |       | 80    | 180   | m $\Omega$    |

■ TYPICAL APPLICATION CIRCUIT



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