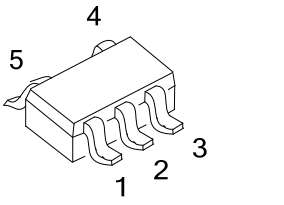
# 1A, HIGH-EFFICIENCY 1.5MHz/1MHz SYNCHRONOUS STEP-DOWN CONVERTER




SOT-25

## ■ DESCRIPTION

The UTC **UD05103** is a high-frequency, synchronous, rectified, step-down, switch-mode converter with internal power MOSFETs.

It offers a very compact solution to achieve a 1A continuous output current over from 2.5V to 5.5V input supply range, with excellent load and line regulation.

The UTC **UD05103** is ideally suited for portable electronic devices that are powered from 1-cell Li-ion battery or from other power sources such as cellular phones, PDAs, handheld devices, game console and related accessories.

The output voltage is adjustable from 0.6V to the input voltage. During shutdown, the input is disconnected from the output and the shutdown current is less than 1μA. Other key features include over-temperature and short circuit protection, and under-voltage lockout to prevent deep battery discharge.

The UTC **UD05103** at 1A maximum output current while consuming only 40μA of no-load quiescent current. Ultra-low $R_{DS(ON)}$ integrated MOSFETs and 100% duty cycle operation make the UTC **UD05103** an ideal choice for high-output voltage, high-current applications which require a low dropout threshold.

## ■ FEATURES

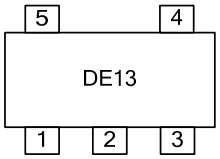
* Output Current : Up to 1 A
* Output Voltage : 0.6V to $V_{IN}$
* Input Voltage : 2.5V to 5.5V
* Low-$R_{DS(ON)}$ Internal Power MOSFETs.
* High-Efficiency Synchronous-Mode Operation, up to 95%
* 40μA (typ.) No Load Quiescent Current
* Shutdown Current < 1μA
* 100% Duty Cycle Operation
* Fixed 1.0MHz Switching Frequency.
* Current Mode Operation
* Internal Soft-Start.
* Current Limit Protection
* Over-temperature Protection.
* Input Under Voltage Lockout (UVLO)

## ■ ORDERING INFORMATION

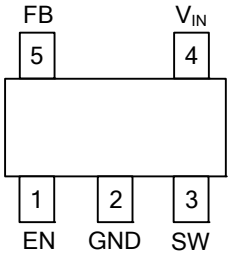
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| UD05103L-AF5-R | UD05103G-AF5-R | SOT-25 | Tape Reel |

| | |
|---|---|
| UD05103G-AF5-R<br>(1)Packing Type<br>(2)Package Type<br>(3)Green Package | (1) R: Tape Reel<br>(2) AF5: SOT-25<br>(3) G: Halogen Free and Lead Free, L: Lead Free |

## ■ MARKING



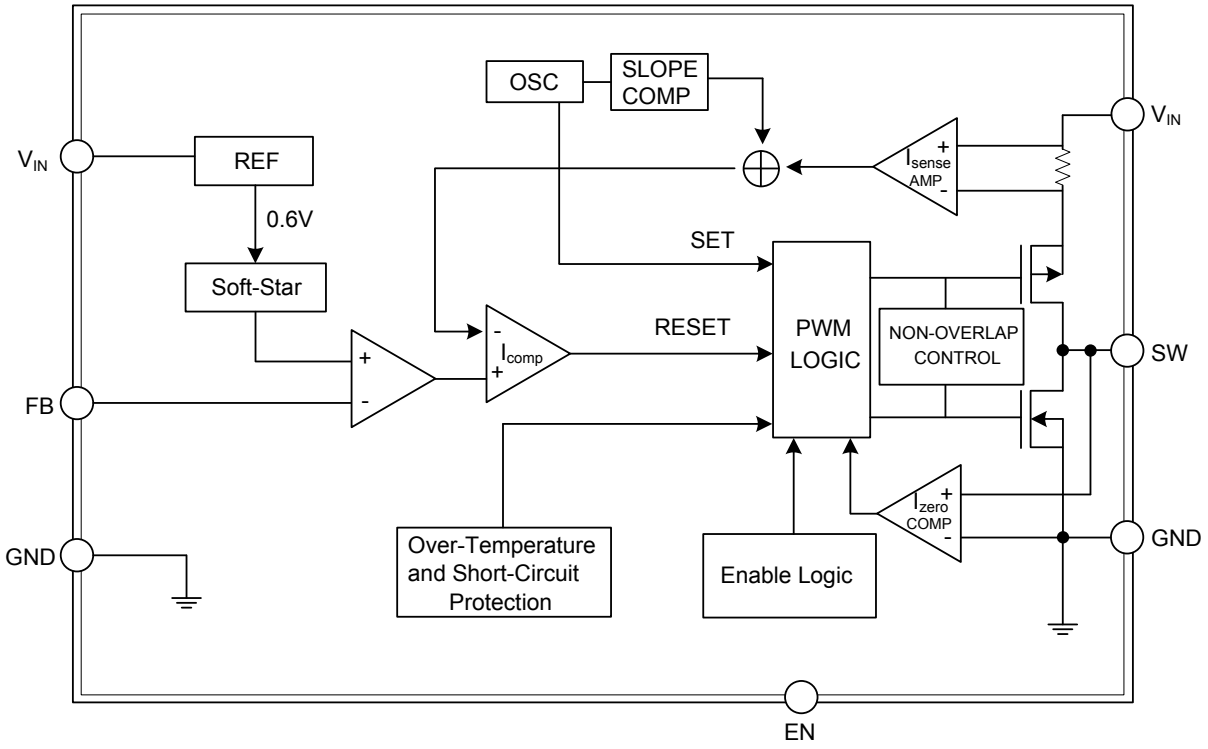
## ■ PIN CONFIGURATION




## ■ PIN DESCRIPTION

| PIN NO. | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | EN | Enable control. Pull high to turn on. Do not float. |
| 2 | GND | Ground pin |
| 3 | SW | Inductor pin. Connect this pin to the switching node of inductor |
| 4 | $V_{IN}$ | Input pin. Decouple this pin to GND pin with at least 1uF ceramic cap. |
| 5 | FB | Output Feedback Pin. Connect this pin to the center point of the output resistor divider to program the output voltage: $V_{OUT}$=0.6×(1+R1/R2). |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATING ($T_A$= 25°C, unless otherwise specified)

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Supply Input Voltage | | $V_{IN}$ | 6.0 | V |
| SW Pin Voltage | | $V_{SW}$ | $V_{IN}$+0.3 | V |
| FB Pin Voltage | | $V_{FB}$ | $V_{IN}$+0.3 | V |
| EN Pin Voltage | | $V_{EN}$ | + 6.0 | V |
| Power Dissipation | $T_A$=25°C (Note 5) | $P_D$ | 0.38 | W |
| Maximum Junction Temperature Range | | $T_J$ | +125 | °C |
| Storage Temperature Range | | $T_{STG}$ | -65 ~ +150 | °C |

Notes: 1. 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.
2. Stresses exceed those ratings may damage the device.

## ■ RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Supply Input Voltage | $V_{IN}$ | 3.0 ~ 5.5 | V |
| Output Voltage | $V_{OUT}$ | 0.6 ~ $V_{IN}$ | V |
| Operating Junction Temperature Range | $T_J$ | -40 ~ +125 | °C |
| Operating Ambient Temperature Range | $T_A$ | -40 ~ +85 | °C |

## ■ THERMAL CHARACTERISTICS

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 170 | °C/W |
| Junction to Case | $\theta_{JC}$ | 130 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS

($V_{IN}$=5.0V, $V_{OUT}$ = 2.5V, $C_{IN}$ = 33μF, $C_{OUT}$ = 10μF, L = 2.2μH, $T_A$=25°C unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| Input Voltage Range | $V_{IN}$ | | 3.0 | | 5.5 | V |
| Quiescent Current | $I_Q$ | $V_{EN}$ = 2V, $V_{FB}$ = 1.0V, No Load | | 600 | | μA |
| Shutdown Current | $I_{SHDN}$ | $V_{EN}$ = 0V. | | 0.1 | 1 | μA |
| HS Switch-On Resistance (Note 1, 2) | $HS_{RDS-ON}$ | $I_{SW}$ = 0.2A | | 260 | | mΩ |
| LS Switch-On Resistance (Note 1, 2) | $LS_{RDS-ON}$ | $I_{SW}$ = 0.2A | | 170 | | mΩ |
| HS Switch Current Limit (Note 1, 2) | $I_{LIMIT(HS)}$ | | 1.3 | | | A |
| Oscillation frequency | $F_{SW}$ | $I_{OUT}$ = 200mA | | 1.5 | | MHz |
| Feedback Voltage | $V_{FB}$ | $T_A$ = 25°C | 0.588 | 0.6 | 0.612 | V |
| EN Rising Threshold | $V_{EN\_RISING}$ | | 1.5 | | | V |
| EN Falling Threshold | $V_{EN\_FALLING}$ | | | | 0.4 | V |
| $V_{IN}$ UVLO Threshold-Rising | $V_{UVLO-H}$ | $V_{IN}$ Rising | | | 2.9 | V |
| $V_{IN}$ UVLO Threshold Hysteresis | $V_{UVLO-HYS}$ | | | 0.1 | | V |
| Min ON Time | | | | 80 | | nS |
| Max Duty Cycle | | | 100 | | | % |
| Soft-Start Period (Note 1, 2) | $T_{SS}$ | From enable to output regulation | | 1 | | mS |
| Thermal Shutdown (Note 1) | $T_{SD}$ | | | 160 | | °C |

Notes: 1. Guaranteed by design.
2. Not tested in production and guaranteed by over-temperature correlation.

## ■ TYPICAL APPLICATION CIRCUIT