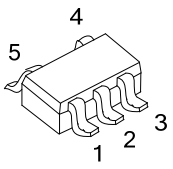
# US201/A/B/C

**CMOS IC**

## HIGH-SIDE POWER SWITCHES WITH FLAG




SOT-25

## ■ DESCRIPTION

The UTC **US201/A/B/C** series are 80mΩ high-side power switches. There's internal single low voltage N-Channel MOSFET which makes it an ideal for all USB applications. This MOSFET should be driven by a charge pump circuitry inside. Its switch on resistance is as low as 80mΩ which we know specially meets the drop voltage for USB applications.

The flag pin can output an open-drain fault flag to next controller.

There're lots internal special ways for protecting the chip's operation.

When in hot-plug events, there's large current which can create the upstream voltage droop to match the USB's voltage droop requirements and soft-start for isolating the power source.

As soon as the die temperature is higher than 130℃, the internal shutdown circuit will work.

Only when there's a normal input voltage in the $V_{IN}$ pin, the UVLO (under-voltage lockout, 1.3V/2.5V typ.) can make sure the chip is till in the off state.

Because of the requirement of USB power the fault current should be ensured less than 0.6A/1.1A (UTC **US201/A**, single port) and 1.3A /1.5A (UTC **US201B/C**, dual ports).

## ■ FEATURES

* 80mΩ(Typ) N-Channel MOSFET
* Supply Current:
  – Switch On : 25μA(Typ)
  – Switch Off : 1μA (Typ)
* Load Current 500mA for US201 and 1.0A for US201A/B/C
* Input Voltage from 2V ~ 5.5V
* In Off-State: Output Voltage can be Higher than Input

## ■ ORDERING INFORMATION

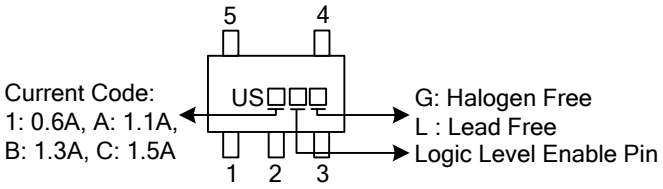
| Ordering Number | | Package | Packing |
|---|---|---|---|
| Lead Free | Halogen Free | | |
| US201XXL-AF5-R | US201XXG-AF5-R | SOT-25 | Tape Reel |

US201XXL-AF5-R
- (1)Packing Type
- (2)Package Type
- (3)Lead Free
- (4) Logic Level Enable Pin
- (5)Current Code

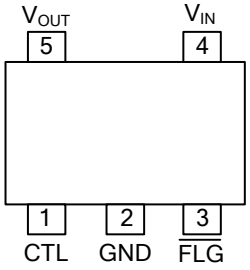
(1) R: Tape Reel
(2) AF5: SOT-25
(3) G: Halogen Free, L: Lead Free
(4) H: Active High, L: Active Low
(5) Blank: 0.6A, A: 1.1A , B: 1.3A, C: 1.5A


Copyright © 2013 Unisonic Technologies Co., Ltd

## ■ MARKING



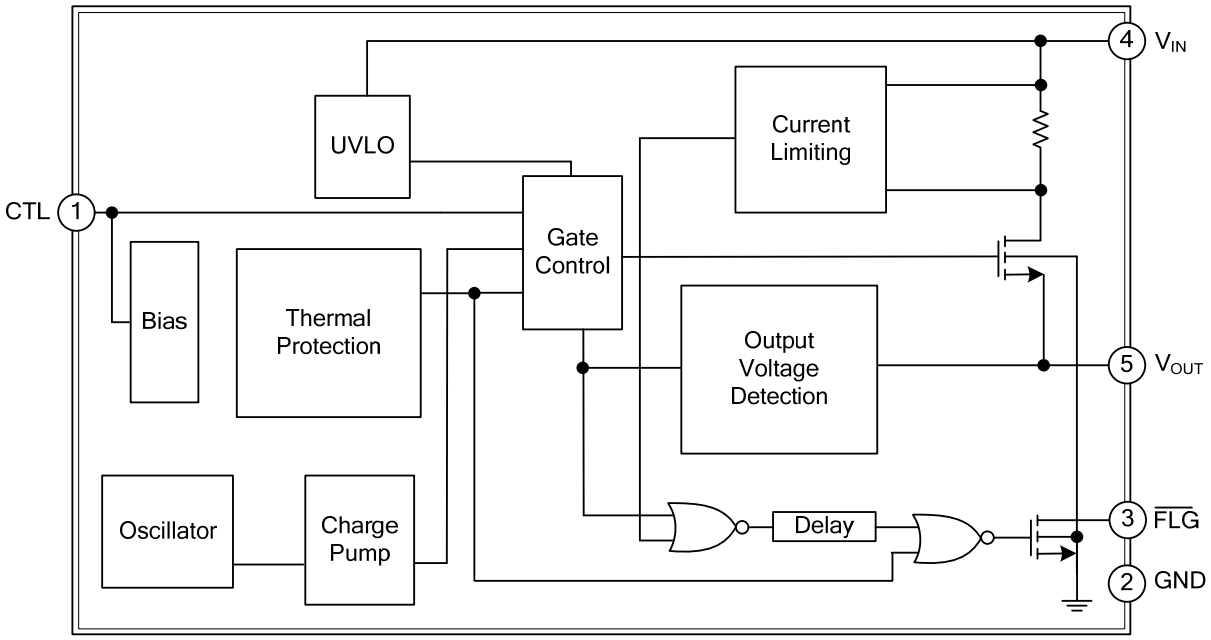

## ■ PIN CONFIGURATION




## ■ PIN DESCRIPTION

| PIN NO | PIN NAME | DESCRIPTION |
|---|---|---|
| 1 | CTL | Enable Input pin, H: High active, L: Low active |
| 2 | GND | Ground |
| 3 | FLG | Open-drain fault flag output |
| 4 | $V_{IN}$ | Power input voltage |
| 5 | $V_{OUT}$ | Output voltage |

## ■ BLOCK DIAGRAM



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

| PARAMETER | | SYMBOL | RATINGS | UNIT |
|---|---|---|---|---|
| Supply Voltage | | $V_{CC}$ | 6.5 | V |
| | | | +2 ~ +5.5 (Note 2) | V |
| Input/Output Pins | VCTL | $V_{CTL}$ | -0.3~ +6.5 | V |
| | | | 0 ~ +5.5 (Note 2) | V |
| | V$\overline{FLG}$ | $V_{\overline{FLG}}$ | 6.5 | V |
| Junction Temperature | | $T_J$ | 150 | ℃ |
| | | | -20 ~ +100 (Note 2) | ℃ |
| Storage Temperature | | $T_{STG}$ | -65 ~ +150 | ℃ |

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. The device is not guaranteed to function when it's beyond its operating conditions.

## ■ THERMAL DATA

| PARAMETER | SYMBOL | RATINGS | UNIT |
|---|---|---|---|
| Junction to Ambient | $\theta_{JA}$ | 260 | ℃/W |
| Junction to Case | $\theta_{JC}$ | 81 | ℃/W |

## ■ ELECTRICAL CHARACTERISTICS

| PARAMETER | | SYMBOL | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|
| **ENABLE INPUT** | | | | | | | | |
| CTL Threshold | Low | $V_{IL}$ | $V_{IN}$=2V~5.5V, Switch OFF | | | | 0.8 | V |
| | High | $V_{IH}$ | $V_{IN}$=2V~5.5V, Switch ON | | 2.0 | | | V |
| CTL Input Current | | $I_{I(CTL)}$ | $V_{CTL}$=0V~5.5V | | | 0.01 | | μA |
| **UNDER VOLTAGE LOCK** | | | | | | | | |
| Under-Voltage Lockout | | $V_{UVLO}$ | $V_{IN}$ increasing | US201/ US201A | 1.0 | 2.1 | 2.9 | V |
| | | | | US201B/ US201C | | 2.5 | | |
| Under-Voltage Hysteresis | | $\Delta V_{UVLO}$ | $V_{IN}$ decreasing | | | 0.1 | | V |
| **SUPPLY CURRENT** | | | | | | | | |
| Supply Current | | $I_{SW(ON)}$ | Switch on, $V_{OUT}$=OPEN | | | 25 | 45 | μA |
| | | $I_{SW(OFF)}$ | Switch off, $V_{OUT}$=OPEN | | | 0.1 | 1 | μA |
| Output Leakage Current | | $I_{O(LEAK)}$ | $V_{CTL}$=0V, $R_{LOAD}$=0Ω | | | 0.5 | 10 | μA |
| **CURRENT LIMIT** | | | | | | | | |
| Current Limit | | $I_{LIMIT}$ | | US201 | 0.6 | 0.8 | 1.1 | A |
| | | | | US201A | 1.1 | 1.5 | 1.9 | A |
| | | | | US201B | 1.3 | 1.7 | 2.1 | A |
| | | | | US201C | 1.5 | 2.0 | 2.4 | A |
| Short Circuit Fold-Back Current | | $I_{SC(FB)}$ | $V_{OUT}$=0V, measured prior to thermal shutdown | US201 | | 0.8 | | A |
| | | | | US201A | | 1.0 | | A |
| | | | | US201B | | 1.0 | | A |
| | | | | US201C | | 1.3 | | A |
| **POWER SWITCH** | | | | | | | | |
| Switch ON Resistance | | $R_{DS(ON)}$ | $I_{OUT}$= 500mA | US201 | | 80 | 110 | mΩ |
| | | | $I_{OUT}$=1.0A | US201A/B/C | | 80 | 110 | mΩ |
| Output Turn-ON Rise Time | | $t_{ON(RISE)}$ | 10% ~ 90% of $V_{OUT}$ rising | | | 400 | | μs |
| **OVER CURRENT FLAG** | | | | | | | | |
| FLAG OFF Current | | $I_{\overline{FLG}(OFF)}$ | $V_{\overline{FLG}}$ =5V | | | 0.01 | 1 | μA |
| FLAG Output Resistance | | $R_{\overline{FLG}}$ | $I_{SINK}$=1mA | | | 20 | 400 | Ω |
| FLAG Delay Time | | $t_D$ | From fault condition to $\overline{FLG}$ assertion | | 2 | 10 | 15 | ms |
| **THERMAL SHUTDOWN** | | | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Thermal Shutdown Protection | $T_{SD}$ | | | 130 | | ℃ |
| Thermal Shutdown Hysteresis | $\Delta T_{SD}$ | | | 20 | | ℃ |

## ■ TEST CIRCUIT

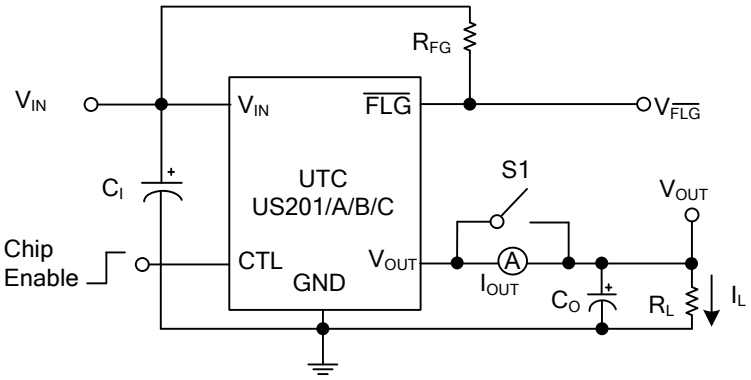



Fig.1 Turn-On & Off Response, Flag Response

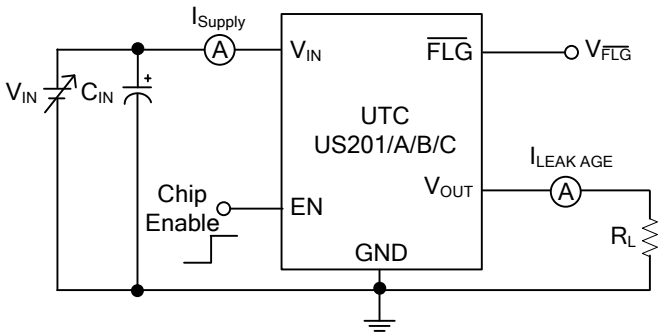



Fig.2 Supply Current

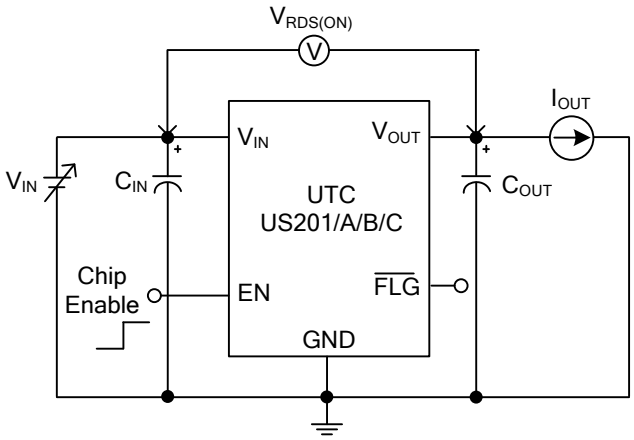



Fig.3 On-Resistance

## ■ TEST CIRCUIT

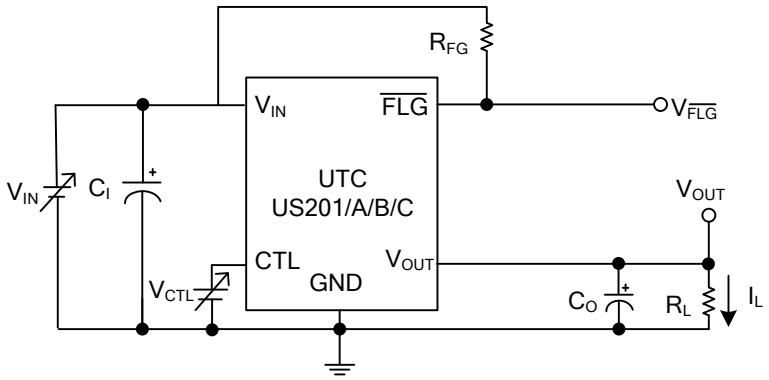



Fig.4 UVLO at Rising & Falling

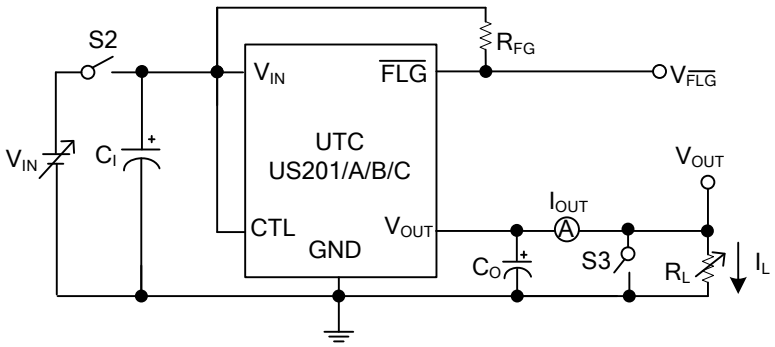



Fig.5 Current Limit vs. Input Voltage, Inrush Current Response,
Current Limit Transient Response

Note: Above test circuits reflected the graphs shown on “Typical Operating Characteristics” are as follows:

Fig.1 Turn-On Rising & Falling Time vs. Temperature, Turn-On & Off Response, Flag Response.

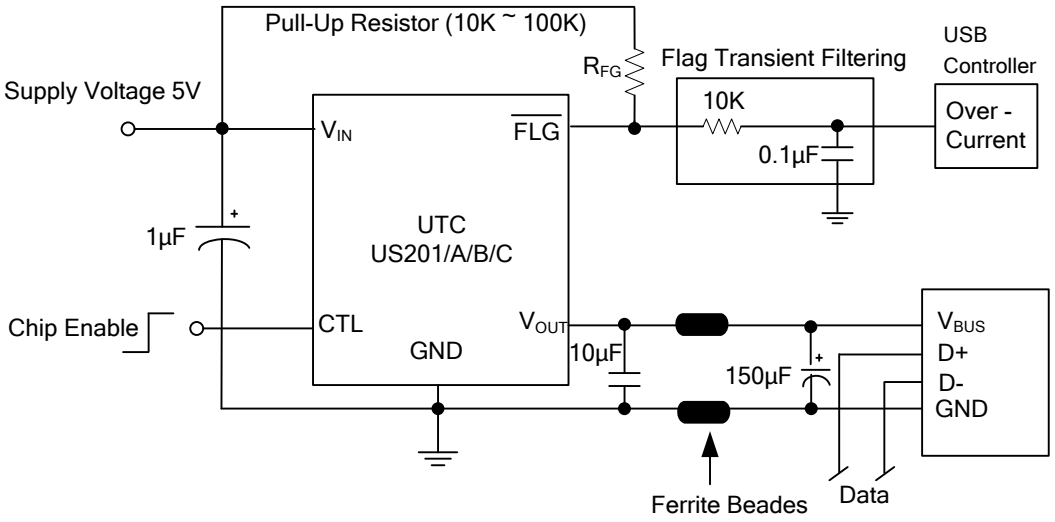
Fig.2 Supply Current vs. Input Voltage & Temperature, Switch Off Supply Current vs. Temperature, Turn-Off Leakage Current vs. Temperature.

Fig.3 On-Resistance vs. Input Voltage & Temperature.

Fig.4 EN Threshold Voltage vs. Input Voltage & Temperature, Flag Delay Time vs. Input Voltage & Temperature, UVLO Threshold vs. Temperature, UVLO at Rising & Falling.

Fig.5 Current Limit vs. Input Voltage/Temperature, Short Circuit Current Response, Short Circuit Current vs. Temperature, Inrush Current Response, Soft-start Response, Ramped Load Response, Current Limit Transient Response, Thermal Shutdown Response.

## ■ TYPICAL APPLICATION CIRCUIT




Note. A low-ESR 150µF aluminum electrolytic or tantalum between $V_{OUT}$ and GND is strongly recommended to meet the 330mV maximum droop requirement in the hub $V_{BUS}$.

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.