



### 100mΩ, 1/1.5A HIGH-SIDE POWER SWITCHES WITH FLAG

#### DESCRIPTION

The UTC **US204** series are 100mΩ high-side power switches. There are internal dual low voltage N-Channel MOSFETS which is ideal for all USB applications. These MOSFETS are driven by a charge pump circuitry inside, these switches on resistance are as low as 100mΩ which and meet the drop voltage for USB applications.

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

There are lots of internal special ways for protecting the chip's operation. There are also built-in protection circuits to ensure the chips function normally.

When in hot-plug events, there's a 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°C, the internal shutdown circuit will work.

Only when there's a normal input voltage in the V<sub>IN</sub> pin, the UVLO (under-voltage lockout, 2.1V typ.) can make sure the chip is in the off state.

Because of the requirement of USB power, the fault current should be ensured to be less than 1.5A for UTC **US204AH/AL** and 1.0A for UTC **US204CH/CL**.

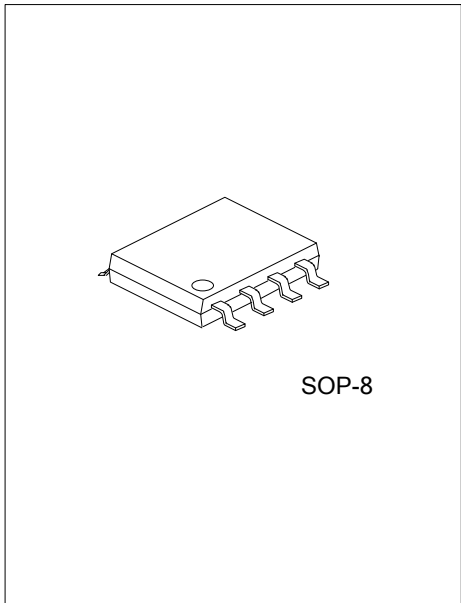
#### FEATURES

- \* 100mΩ(Typ) N-Channel MOSFET
- \* Supply Current:
  - Switch On : 60μA (Typ)
  - Switch Off : 1μA (Typ)
- \* Load Current 1.5A for US204AH/AL and 1.0A for US204CH/CL
- \* Input Voltage from 2V ~ 5.5V
- \* In Off-State: Output Voltage can be Higher than Input

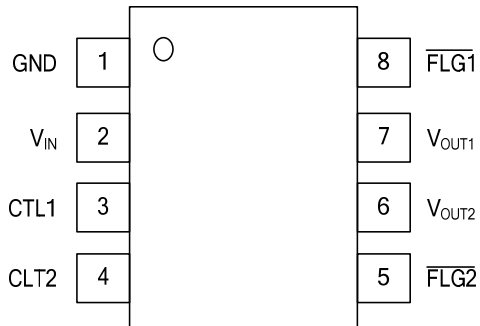
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
US204XXL-S08-R	US204XXG-S08-R	SOP-8	Tape Reel

<p>US204XXL-S08-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Lead Free</li> <li>(4) Output Current / EN Function</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) S08: SOP-8</li> <li>(3) G: Halogen Free, L: Lead Free</li> <li>(4) AH: 1.5A/Active High, AL: 1.5A/Active Low, CH: 1A/Active High, CL: 1A/Active Low</li> </ul>
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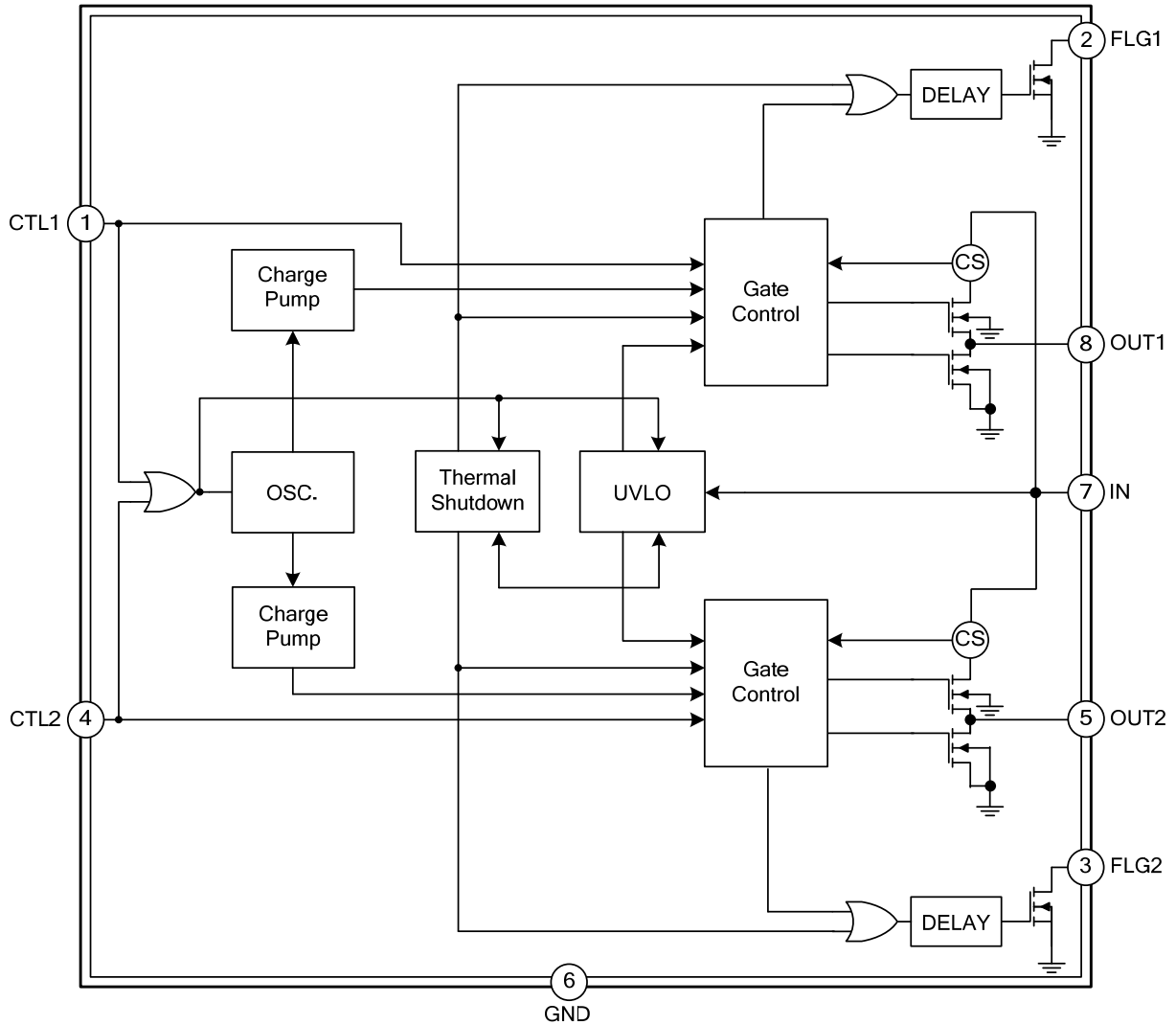
## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTION

PIN NO	PIN NAME	DESCRIPTION
1	GND	Ground
2	$V_{IN}$	Power input voltage
3	CTL1	Chip Enable turns on power switch in $V_{OUT1}$ .
4	CTL2	Chip Enable turns on power switch in $V_{OUT2}$ .
5	$\overline{FLG2}$	Over current or over temperature status output, open-drain output, active low, in $V_{OUT2}$ .
6	$V_{OUT2}$	Power-Switch Output, in $V_{OUT2}$ .
7	$V_{OUT1}$	Power-Switch Output, in $V_{OUT1}$ .
8	$\overline{FLG1}$	Over current or over temperature status output, open-drain output, active low, in $V_{OUT1}$ .

■ BLOCK DIAGRAM



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

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V <sub>CC</sub>	6.0	V
			+2 ~ +5.5 (Note 2)	V
Input/Output Pins		V <sub>CTL</sub>	-0.3~ +6.0	V
			0 ~ +5.5 (Note 2)	V
	CTL	V <sub>CTL</sub>		
	FLG	V <sub>FLG</sub>	6.0	V
Power Dissipation (Ta=25°C)		P <sub>D</sub>	0.3	W
Junction Temperature		T <sub>J</sub>	150	°C
			-20 ~ +100 (Note 2)	°C
Storage Temperature		T <sub>STG</sub>	-65 ~ +150	°C

Notes:1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

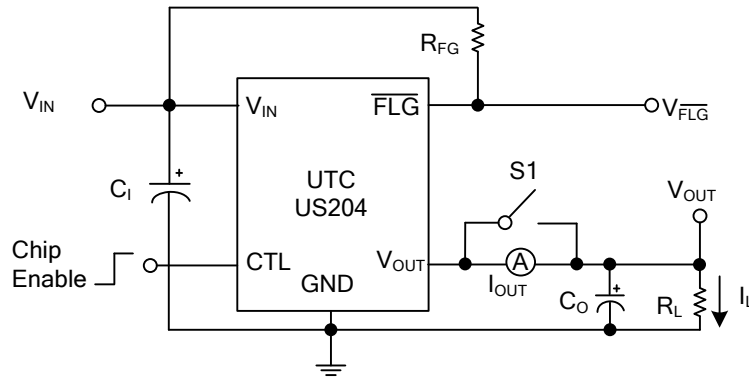
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

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

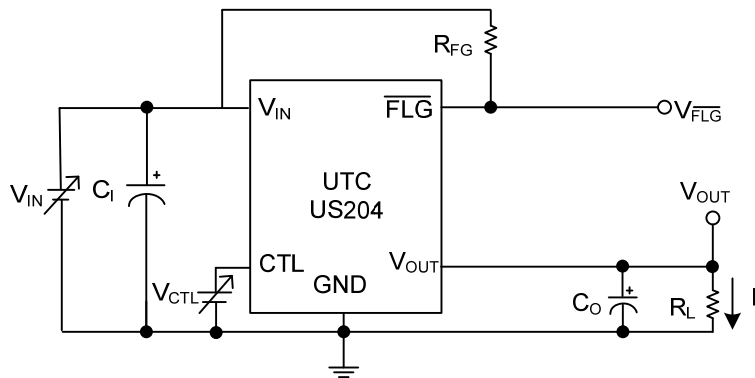
■ **ELECTRICAL CHARACTERISTICS**

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>ENABLE INPUT</b>							
CTL Threshold	Low	V <sub>IL</sub>	V <sub>IN</sub> =2V~5.5V, Switch OFF			0.8	V
	High	V <sub>IH</sub>	V <sub>IN</sub> =2V~5.5V, Switch ON	2.0			V
CTL Input Current		I <sub>I(CTL)</sub>	V <sub>CTL</sub> =0V~5.5V		0.01		μA
<b>UNDER VOLTAGE LOCK</b>							
Under-Voltage Lockout		V <sub>UVLO</sub>	V <sub>IN</sub> increasing		2.1		V
Under-Voltage Hysteresis		ΔV <sub>UVLO</sub>	V <sub>IN</sub> decreasing		0.1		V
<b>SUPPLY CURRENT</b>							
Supply Current		I <sub>SW(ON)</sub>	Switch on, V <sub>OUT</sub> =OPEN		65	90	μA
		I <sub>SW(OFF)</sub>	Switch off, V <sub>OUT</sub> =OPEN		0.1	1	μA
Output Leakage Current		I <sub>O(LEAK)</sub>	V <sub>CTL</sub> =0V, R <sub>LOAD</sub> =0Ω		0.5	1	μA
<b>CURRENT LIMIT</b>							
Current Limit		I <sub>LIMIT</sub>	V <sub>OUTX</sub> =4V	1.5	2.0	2.8	A
				1.1	1.5	2.1	A
Short Circuit Fold-Back Current		I <sub>SC(FB)</sub>	V <sub>OUT</sub> =0V, measured prior to thermal shutdown		1.4		A
					1.0		A
<b>POWER SWITCH</b>							
Switch ON Resistance		R <sub>DS(ON)</sub>	I <sub>OUT</sub> =1.3A, V <sub>IN</sub> =5V, Each Channel		100	110	mΩ
			I <sub>OUT</sub> = 1A, V <sub>IN</sub> =5V, Each Channel		100	110	mΩ
Output Turn-ON Rise Time		t <sub>ON(RISE)</sub>	10% ~ 90% of V <sub>OUT</sub> rising		400		μs
<b>OVER CURRENT FLAG</b>							
FLAG OFF Current		I <sub>FLG(OFF)</sub>	V <sub>FLG</sub> =5V		0.01	1	μA
FLAG Output Resistance		R <sub>FLG</sub>	I <sub>SINK</sub> =1mA		20	400	Ω
FLAG Delay Time		t <sub>D</sub>	From fault condition to $\overline{\text{FLG}}$ assertion	5	12	15	ms
<b>THERMAL SHUTDOWN</b>							
Thermal Shutdown Protection		T <sub>SD</sub>			130		°C
Thermal Shutdown Hysteresis		ΔT <sub>SD</sub>			20		°C

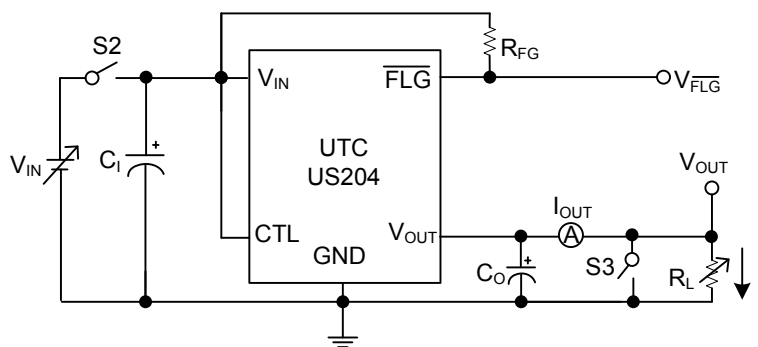
■ TEST CIRCUIT



Turn-On & Off Response, Flag Response

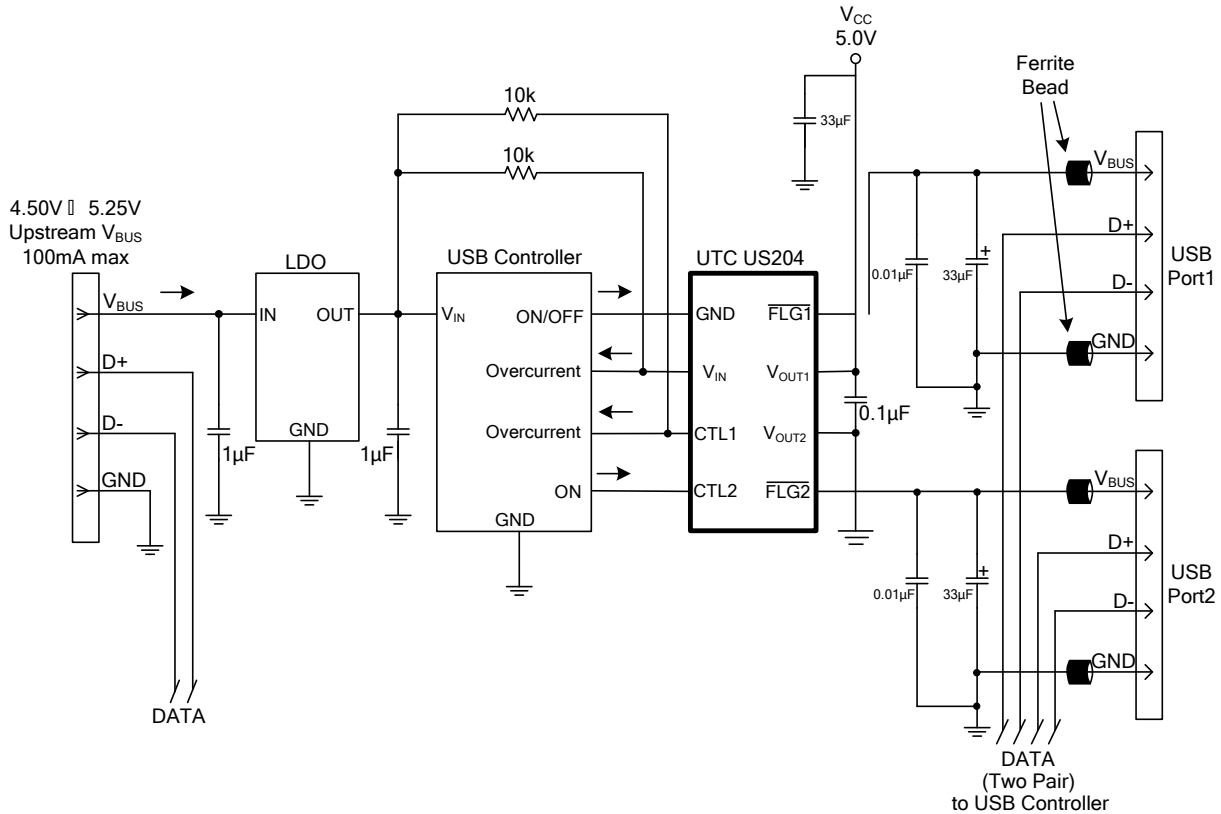


UVLO at Rising & Falling



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

■ TYPICAL APPLICATION CIRCUIT



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