



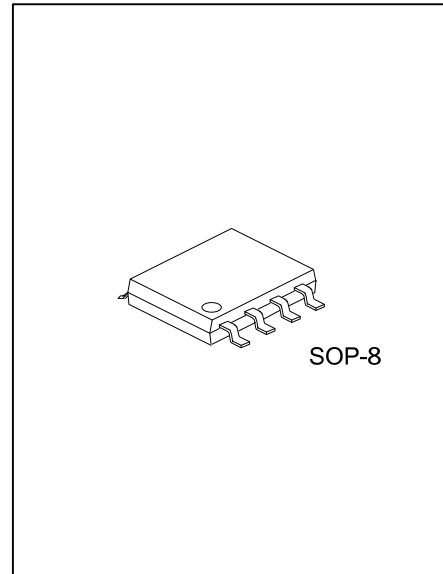
### 100mΩ, 2A SLEW RATE CONTROLLED LOAD SWITCH

#### DESCRIPTION

The UTC **US205** is a cost-effective, low-voltage, low switch-on resistance (typ. 100mΩ) high-side Power Switch IC. It has a 20μA low quiescent supply current that meets the requirements of battery-powered portable equipment.

The UTC **US205** incorporates protection circuits, such as an over-current protection circuit, a short fold back circuit, a thermal shutdown circuit and an under-voltage lockout circuit for overall protection. Besides, a slew rate controlled function is embedded for turn-on rising time control.

The UTC **US205** can be used in applications, such as Cellular Phones, Digital still Camera, Hot swap Supplies, Notebook Computers, Personal Communication Devices, Personal Digital Assistants and so on.



#### FEATURES

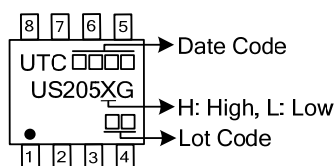
- \* High-Side NMOSFET: 100mΩ (TYP)
- \* Input Voltage Varies From 2.7V to 5.5V
- \* Low Supply Current: 20μA
- \* Over Current Protection
- \* Short Circuit Protection
- \* Under Voltage Lockout
- \* Thermal Protection with Foldback
- \* Slew Rate Limited Turn-On Time 3ms (5V)
- \* Reverse Blocking Current
- \* RoHS Compliant

#### ORDERING INFORMATION

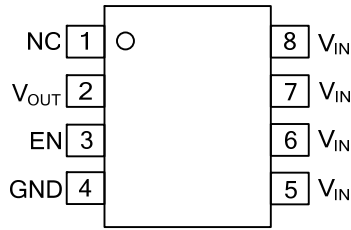
Ordering Number	Package	Packing
US205XG-S08-R	SOP-8	Tape Reel

<p>US205XG-S08-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> <li>(4) Logic Level Enable Pin</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 and Lead Free</li> <li>(4) H: Active High, L: Active Low</li> </ul>
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#### MARKING



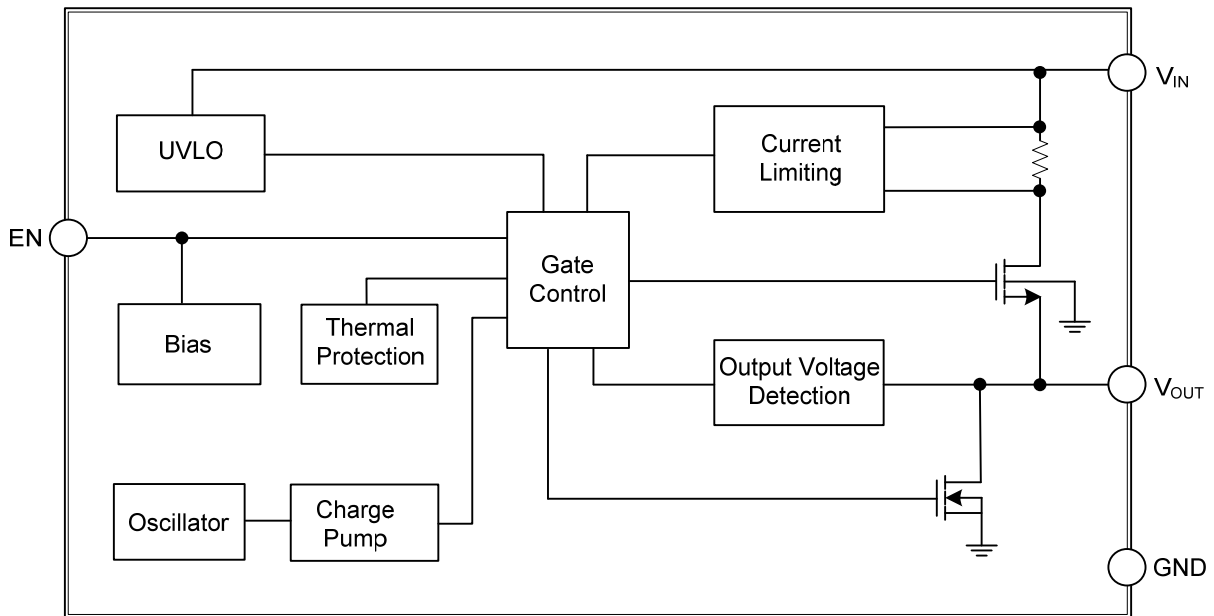
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	NC	No Internal Connection.
2	V <sub>OUT</sub>	Power-Switch Output.
3	EN	Chip Enable (Active High).
4	GND	Ground. The exposed pad must be soldered to a large PCB and connected to GND for maximum power dissipation.
5, 6, 7, 8	V <sub>IN</sub>	Power Input Voltage.

■ BLOCK DIAGRAM



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

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{IN}$	6	V
Enable Input Voltage	EN	-0.3~6	V
Power Dissipation, @ $T_A=25^{\circ}\text{C}$	$P_D$	0.3	W
Junction Temperature	$T_J$	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.

■ **RECOMMENDED OPERATING CONDITIONS** ( $T_A=25^{\circ}\text{C}$ , unless otherwise specified) (Note)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{IN}$	2.7~5.5	V
Enable Input Voltage	EN	0~5.5	V
Junction Temperature	$T_J$	-40~100	$^{\circ}\text{C}$
Ambient Temperature	$T_A$	-40~85	$^{\circ}\text{C}$

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

■ **ELECTRICAL CHARACTERISTICS**

( $V_{IN}=5\text{V}$ ,  $C_{IN}=1\mu\text{F}$ ,  $C_{OUT}=0.1\mu\text{F}$ ,  $T_A=25^{\circ}\text{C}$ , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Operation Voltage	$V_{IN}$		2.7		5	V
Under Voltage Lookout	$V_{UVLO}$	$V_{IN}$ Falling	1.3	1.7	2.1	V
Under Voltage Lookout Hysteresis	$\Delta V_{UVLO}$			50		mV
Quiescent Current	$I_Q$	EN=High		20	70	$\mu\text{A}$
Off Supply Current	$I_{SHDN}$	EN=Low, $V_{OUT}$ =Open			1	$\mu\text{A}$
Off Switch Current	$I_{LEAKAGE}$	EN=Low, $V_{OUT}=0$			1	$\mu\text{A}$
On-Resistance	$R_{DS(ON)}$	$V_{IN}=3.3\text{V}$ , $I_{OUT}=1.3\text{A}$		100	120	m $\Omega$
Current Limiting	$I_{LIM}$	$V_{IN}=3.3\text{V}$ , $V_{OUT}=2.3\text{V}$	1.5	2	2.5	A
Short Circuit Current	$I_{SC\_FB}$	$V_{OUT}=0\text{V}$ , Measured Prior to Thermal Shutdown	0.4	0.8	1.5	A
Thermal shutdown Threshold	$T_{SD}$			130		$^{\circ}\text{C}$
Thermal shutdown Hysteresis	$\Delta T_{SD}$			20		$^{\circ}\text{C}$
EN Threshold	Low	$V_{IL}$	$V_{IN}=2.7\text{V} \sim 5.5\text{V}$		0.8	V
	High	$V_{IH}$	$V_{IN}=2.7\text{V} \sim 5.5\text{V}$		2	V
Enable Input Leakage	$I_{EN}$	$V_{EN}=5.5\text{V}$			1	$\mu\text{A}$
Output Turn-On Delay Time	$T_{D\_ON}$	$V_{IN}=5\text{V}$ , $R_{LOAD}=10\Omega$		60	100	$\mu\text{s}$
Output Turn-On Rise Time	$T_{ON}$	$V_{IN}=5\text{V}$ , $R_{LOAD}=10\Omega$	1	3		ms
Output Turn-Off Fall Time	$T_{D\_OFF}$	$V_{IN}=5\text{V}$ , $R_{LOAD}=10\Omega$		4	10	$\mu\text{s}$
Output Pull-Down Resistance During OFF	$R_{DISCHARGE}$	EN=Low		150		$\Omega$

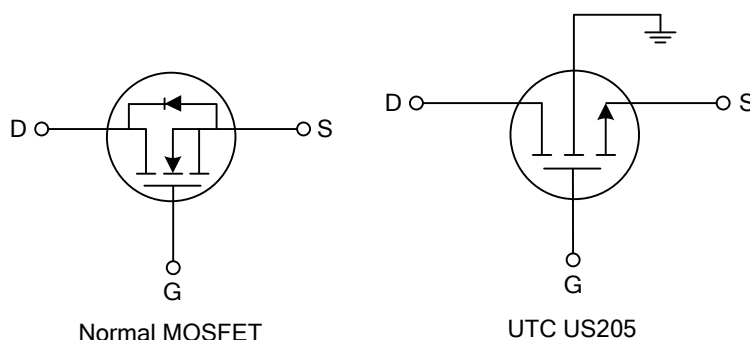
## ■ APPLICATION INFORMATION

The UTC **US205** is an enable input single N-MOSFET high-side power switches, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications. A charge pump circuitry is contained to drive the internal MOSFET switch, the switch on resistance is 100mΩ, meets USB voltage droop requirements.

### Input and Output

$V_{IN}$  (Input) is both the power supply connection for the internal circuitry driving the switch and the input (Drain connection) of the power MOSFET switch.  $V_{OUT}$  (Output) is the Source connection of the MOSFET and supplies power to the load. In a typical circuit, current flows from  $V_{IN}$  to  $V_{OUT}$  toward the load. Since the switch is bidirectional when enabled, if  $V_{OUT}$  is greater than  $V_{IN}$ , current will flow through the switch from  $V_{OUT}$  to  $V_{IN}$ .

There is no parasitic body diode between drain and source of the MOSFET, prevents reverse current flow if  $V_{OUT}$  is externally forced to a higher voltage than  $V_{IN}$  when the chip is disabled ( $V_{EN} < 0.8V$ ).



### Chip Enable Input

If the EN pin is in a logic low condition the UTC **US205** switch will be disabled. During this case, MOSFET and the internal circuitry will be turned off, and the supply current is reduced to 0.1uA typical. When the EN is floating, unpredictable operation may be caused. EN goes negative with respect to GND should not be allowed. The EN pin can be directly tied to  $V_{IN}$ .

### Soft Start for Hot Plug-In Applications

The UTC **US205** “soft-start” feature eliminates the upstream voltage droop caused by the large inrush current during hot-plug events, and effectively isolates the power source from extremely large capacitive load, meets the USB voltage droop requirements.

### Under-Voltage Lockout

The UTC **US205** internal Under-voltage lockout (UVLO) circuit prevents the MOSFET switch from turning on until the input voltage exceeds approximately 1.75V. The internal MOSFET switch will be turned off if input voltage drops below approximately 1.7V. Under-voltage detection functions only when the chip is enabled.

### Current Limiting and Short-Circuit Protection

The UTC **US205** protects the power supply and the load from damage by the current limit circuitry, but can deliver load current up to the current limit threshold (typically 2A). If an enabled switch encounters a heavy load or short circuit case, a large transient current may flow until the current limit circuitry responds. Once this current limit threshold level is exceeded, the device enters constant current mode until the fault is removed or thermal shutdown occurs.

### Supply Filter/Bypass Capacitor

To prevent the input voltage drooping during hot-plug events, a 1uF low-ESR ceramic capacitor from  $V_{IN}$  to GND is strongly recommended. But higher capacitor values will further reduce the voltage droop on the input. Furthermore, without the bypass capacitor, an output short may cause sufficient ringing on the input (from source lead inductance) to destroy the internal circuitry. The input voltage transient must not exceed the absolute maximum supply voltage 6V even for a short duration.

## ■ APPLICATION INFORMATION(Cont.)

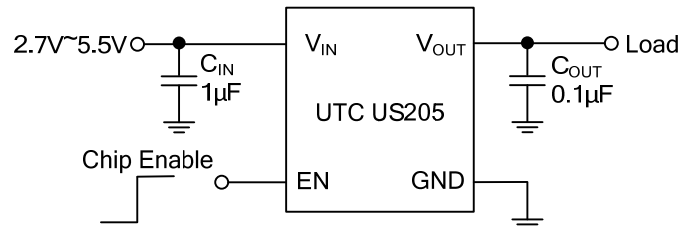
### Output Filter Capacitor

A low-ESR 150 $\mu$ F aluminum electrolytic or tantalum between  $V_{OUT}$  and GND is strongly recommended to meet the 330mV maximum droop requirement in the hub  $V_{BUS}$  (Per USB 2.0, output ports must have a minimum 120 $\mu$ F of low-ESR bulk capacitance per hub). The bypass capacitor itself should have a low dissipation factor to allow decoupling at higher frequencies.

### Thermal Shutdown

Thermal shutdown is used to turn off the output MOSFET when the if the temperature is higher than 130°C, 20°C of hysteresis prevents the switch turn on until the die temperature drops to 110°C.

## ■ TYPICAL APPLICATION CIRCUIT



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