



## US251

Preliminary

CMOS IC

### CURRENT-LIMITED, POWER-DISTRIBUTION SWITCHES

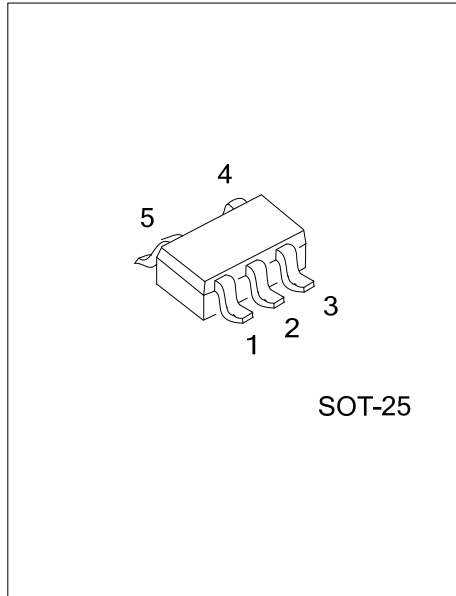
#### DESCRIPTION

The UTC **US251** is a power distribution switch. It is intended for applications such as USB where heavy capacitive loads and short-circuits are likely to be encountered. This family offers multiple devices with fixed current-limit thresholds for applications between 0.5A and 2A.

The  $R_{DS(ON)}$  of the MOSFET switch is as low as 80mΩ.  $\overline{OC}$  is open-drain output report over-current or over-temperature event which has deglitch typical 9ms timeout period typically 9ms.

The UTC **US251** incorporates protection circuits including current limiting circuit with foldback function, thermal shutdown circuit designed to prevent catastrophic switch failure due to increasing power dissipation when continuous heavy loads or short circuit occurs. Besides, a built-in charge pump is used to drive the N-channel MOSFET that is free of parasitic body diode to eliminate any reversed current flow across the switch when it is powered off.

The UTC **US251** is applied in high-side power protection switch, USB power management, USB host and self-powered hubs, USB bus-powered hubs, hot plug-in power supplies, battery-charger circuits.



SOT-25

#### FEATURES

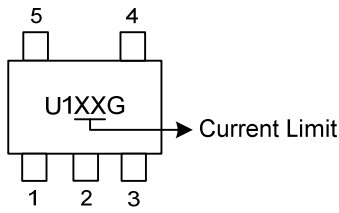
- \* Single Power Switch Family
- \* 80-mΩ High-Side MOSFET
- \* Rated currents of 0.5 A, 1 A, 1.5 A, 2 A
- \* Accurate, Fixed, Constant Current Limit
- \* Deglitched Fault Reporting
- \* Output Discharge When Disabled
- \* Reverse Current Blocking
- \* Built-in Softstart

#### ORDERING INFORMATION

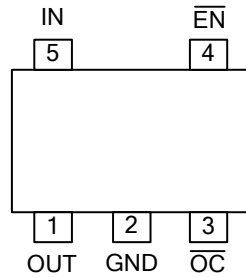
Ordering Number	Package	Packing
US251G-xx-AF5-R	SOT-25	Tape Reel

<p>US251G-xx-AF5-R</p> <p>(1)Packing Type (2)Package Type (3)Current Limit (4)Green Package</p>	<p>(1) R: Tape Reel (2) AF5: SOT-25 (3) 08: 0.8mA, 16: 1.6mA, 22: 2.2mA, 29: 2.9mA (4) G: Halogen Free and Lead Free</p>
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MARKING



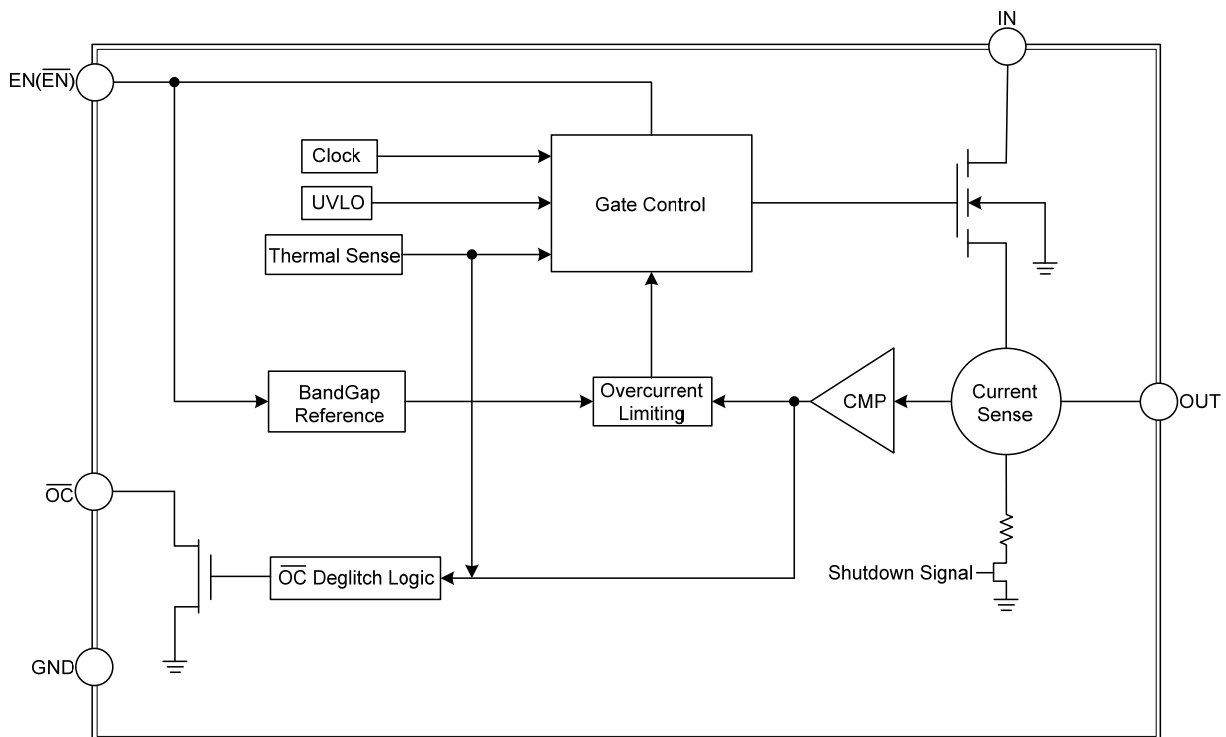
PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	OUT	Output MOSFET Source of switch.
2	GND	Ground
3	$\overline{OC}$	Open-Drain $\overline{OC}$ output.
4	EN or $\overline{EN}$	Enable input. Make sure EN pin never floating.
5	IN	Power Input Voltage

BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	$V_{IN}$	-0.3 ~ 6	V
Enable Input Voltage	$V_{EN}$	-0.3 ~ 6	V
Flag Voltage	$V_{EN}$	-0.3 ~ 6	V
Output Voltage	$V_{OUT}$	-0.3 ~ 6	V
Output Current	$I_{OUT}$	Internally Limited	A
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	-65~ +150	°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	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	250	°C/W

■ RECOMMENDED OPERATING CONDITIONS

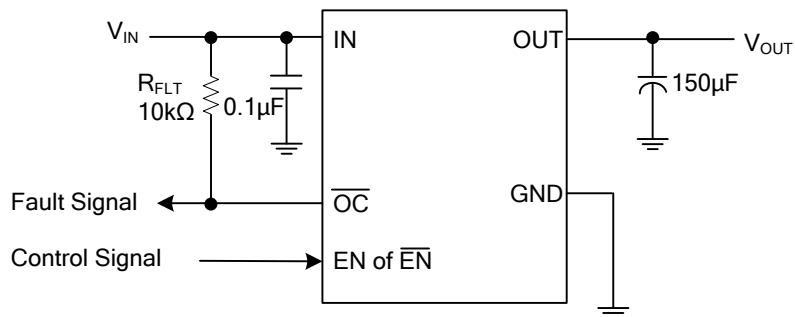
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage, IN	$V_{IN}$		3.5		5.5	V
Input Voltage, EN or $\overline{EN}$	$V_{EN}$		0		5.5	V
Operating Junction Temperature	$T_J$		-40		125	°C
Sink Current Into $\overline{FLT}$	$I_{\overline{FLT}}$		0		5	mA

## ■ ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>ENABLE INPUT</b>							
CTL Threshold	Low	$V_{IL}$	$V_{IN}=3.5V\sim 5.5V$ , Switch OFF		0.8	V	
	High	$V_{IH}$	$V_{IN}=3.5V\sim 5.5V$ , Switch ON		2.0	V	
CTL Input Current	$I_{I(CTL)}$	$V_{CTL}=0V\sim 5.5V$		0.01		$\mu A$	
<b>UNDER VOLTAGE LOCK</b>							
Under-Voltage Lockout	$V_{UVLO}$	$V_{IN}$ increasing		2.8		V	
Under-Voltage Hysteresis	$\Delta V_{UVLO}$	$V_{IN}$ decreasing		0.1		V	
<b>SUPPLY CURRENT</b>							
Supply Current	$I_{SW(ON)}$	Switch on, $V_{OUT}=OPEN$		55	70	$\mu A$	
	$I_{SW(OFF)}$	Switch off, $V_{OUT}=OPEN$		0.1	1	$\mu A$	
Output Leakage Current	$I_{O(LEAK)}$	$V_{CTL}=0V$ , $R_{LOAD}=0\Omega$		0.5	10	$\mu A$	
Reverse Leakage Current	$I_{REV}$	$V_{OUT}=5V$ , $V_{IN}=0V$ , measure $I_{VOUT}$		0.1	1	$\mu A$	
		$-40^\circ C \leq (T_J, T_A) \leq 85^\circ C$ , $V_{OUT}=5V$ , $V_{IN}=0V$ , measure $I_{VOUT}$			5	$\mu A$	
<b>CURRENT LIMIT</b>							
Current Limit	$I_{LIMIT}$		US251-08	0.6	0.8	1.1	A
			US251-16	1.2	1.6	1.9	A
			US251-22	1.6	2.2	2.7	A
			US251-29	2.3	2.9	3.6	A
Short Circuit Fold-Back Current	$I_{SC(FB)}$	$V_{OUT}=0V$ , measured prior to thermal shutdown	US251-08		1		A
			US251-16		1		A
			US251-22		1		A
			US251-29		1		A
<b>POWER SWITCH</b>							
Switch ON Resistance	$R_{DS(ON)}$	$I_{OUT}=0.5A$	US251-08		80	110	$m\Omega$
		$I_{OUT}=1.0A$	US251-16		80	110	$m\Omega$
		$I_{OUT}=1.5A$	US251-22		80	110	$m\Omega$
		$I_{OUT}=2.0A$	US251-29		80	110	$m\Omega$
Output Turn-ON Rise Time	$t_{ON(RISE)}$	10% ~ 90% of $V_{OUT}$ rising		400		$\mu s$	
<b>OVER CURRENT FLAG</b>							
FLAG OFF Current	$I_{FLG(OFF)}$	$V_{FLG}=5V$		0.01	1	$\mu A$	
FLAG Output Resistance	$R_{FLG}$	$I_{SINK}=1mA$		20	400	$\Omega$	
FLAG Delay Time	$t_D$	From fault condition to $\overline{FLG}$ assertion		10		ms	
<b>THERMAL SHUTDOWN</b>							
Thermal Shutdown Protection	$T_{SD}$			130		$^\circ C$	
Thermal Shutdown Hysteresis	$\Delta T_{SD}$			20		$^\circ C$	
<b>Output Discharge</b>							
Output Pull-Down Resistance	$R_{PD}$	$V_{IN}=V_{OUT}=5.0V$ , disabled		400	800	$\Omega$	

## ■ TYPICAL APPLICATION CIRCUIT



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