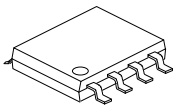
ULTRA SMALL, LOW INPUT VOLTAGE, LOW R_{ON}, LOAD SWITCHES



SOP-8

■ DESCRIPTION

UTC **US2236032DB** is ultra-small, low ON resistance (R_{ON}) load switches with controlled turn on. The devices contain a P-channel MOSFET that operates over an input voltage range of 1.0~3.6V. The switch is controlled by an on/off input (ON), which is capable of interfacing directly with low-voltage control signals.

■ FEATURES

* Integrated P-Channel Load Switch
* Input Voltage: 1.0V to 3.6V
* 1 A Maximum Continuous Switch Current
* On-Resistance (Typical Values)
  R_{ON} = 75 mΩ at V_{IN} = 3.6V
  R_{ON} = 80 mΩ at V_{IN} = 2.5V
  R_{ON} = 90 mΩ at V_{IN} = 1.8V
  R_{ON} = 112 mΩ at V_{IN} = 1.2V
* Maximum Quiescent Current = 1 μA
* Maximum Shutdown Current = 1 μA
* Low Control Input Thresholds Enable Use of 1.2V, 1.8V, 2.5V and 3.3V Logic
* Controlled Slew Rate to Avoid Inrush Currents: t_R = 105μs at V_{IN} = 3.6V

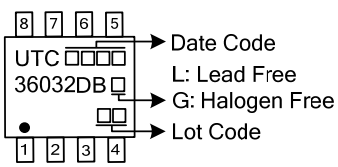
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
US2236032DBL-S08-R	US2236032DBG-S08-R	SOP-8	Tape Reel

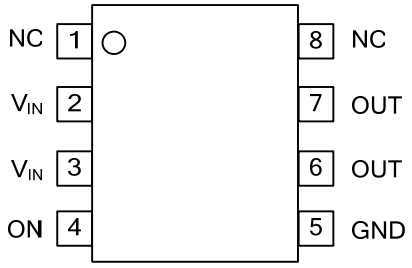
US2236032DBG-S08-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) S08: SOP-8
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



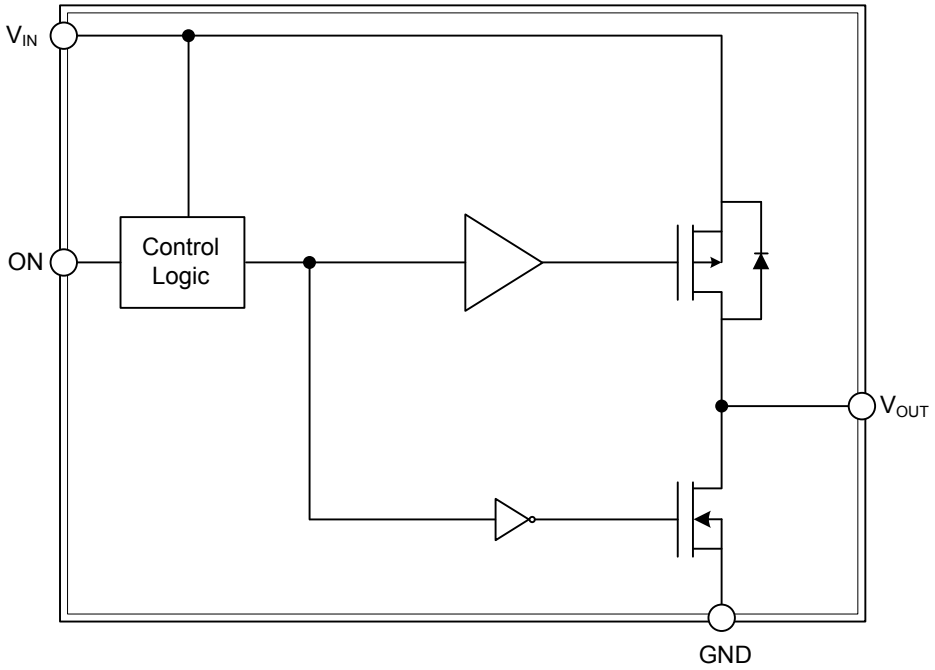
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1, 8	NC	
2, 3	V_{IN}	Switch input, bypass this input with a ceramic capacitor to ground
4	ON	Switch control input, active high
5	GND	Ground
6, 7	V_{OUT}	Switch output

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage Range	V_{IN}	4	V
Output Voltage Range	V_{OUT}	V_{IN} +0.3	V
Input Voltage Range	V_{ON}	4	V
Power Dissipation at T_A=25°C	P	0.48	W
Maximum Continuous Switch Current for V_{IN}>=1.2V	I_{MAX}	1	A
Maximum Continuous Switch Current at V_{IN}=1.0V		0.6	A
Maximum junction Temperature	T_J	+125	°C
Operating Temperature Range	T_{OPR}	-40 ~ +85	°C
Storage Temperature Range	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	θ_{JA}	205	°C/W

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}	1.0		3.6	V
ON Voltage Range	V_{ON}	0		3.6	V
Output Voltage Range	V_{OUT}			V_{IN}	
High-Level Input Voltage, ON	V_{IH}	0.85		3.6	V
Low-Level Input Voltage, ON	V_{IL}			0.4	V
Input Capacitor	C_{IN}	1.0			μF

Note: Refer to application section.

■ ELECTRICAL CHARACTERISTICS

Unless otherwise noted the specification applies over the operating ambient temp T_A=25°C. Typical values are for V_{IN}=3.6V, and T_A=25°C unless otherwise noted.

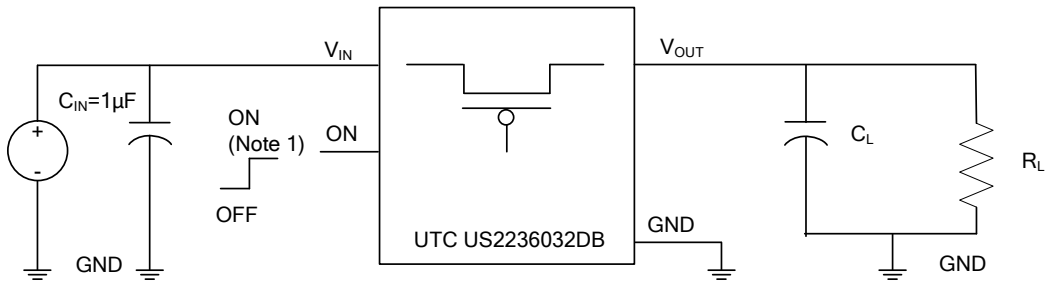
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
POWER SUPPLIES AND CURRENTS							
Quiescent Current	I_{IN}	I_{OUT}=0, V_{IN}=V_{ON}			0.19	1	μA
OFF-State Supply Current	$I_{IN\ (OFF)}$	V_{ON}=0V, V_{OUT}=Open			0.12	1	μA
OFF-State Supply Current	$I_{IN\ (LEAK)}$	V_{ON}=0V, V_{OUT}=0V			0.12	1	μA
ON Pin Input Leakage Current	I_{ON}	V_{ON}=1.1V~3.6V			0.01	1	μA
RESISTANCE AND SWITCH CHARACTERISTICS							
ON-State Resistance	R_{ON}	I_{OUT}=-200mA	V_{IN}=3.6V		75	115	mΩ
			V_{IN}=2.5V		80	120	
			V_{IN}=1.8V		90	130	
			V_{IN}=1.2V		112	155	
			V_{IN}=1.0V		160	200	
Output Pulldown Resistance	R_{PD}	V_{IN}=3.3V, V_{ON}=0, I_{OUT}=30mA			80	100	Ω

■ SWITCHING CHARACTERISTICS (V_{IN}=3.6V, T_A=25°C unless otherwise noted)

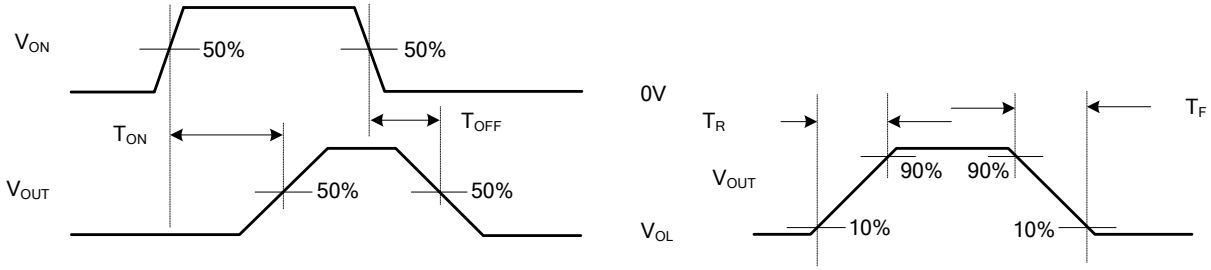
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Turn-ON Time	T_{ON}	R_L=10Ω, C_L=0.1μF		110		μs
Turn-OFF Time	T_{OFF}	R_L=10Ω, C_L=0.1μF		10		
V_{OUT} Rise Time	T_R	R_L=10Ω, C_L=0.1μF		105		
V_{OUT} Fall Time	T_F	R_L=10Ω, C_L=0.1μF		15		

■ TEST CIRCUIT AND T_{ON}/T_{OFF} WAVEFORMS

TEST CIRCUIT

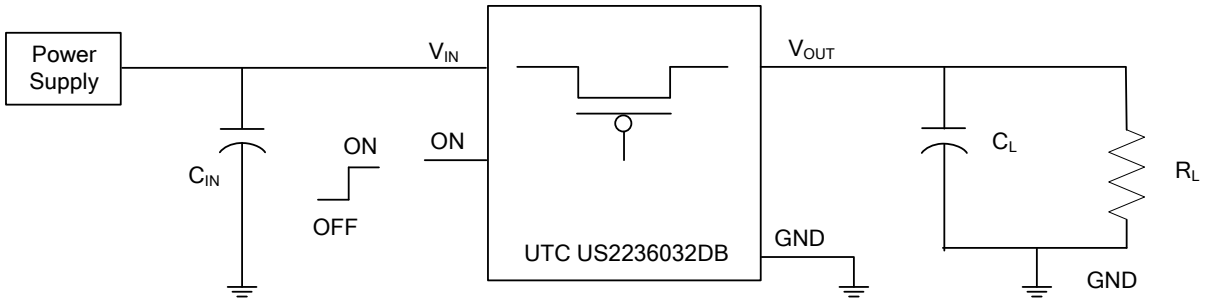


T_{ON}/T_{OFF} WAVEFORMS



Note 1. Rise and fall times of the control signal is 100ns.

■ TYPICAL APPLICATION CIRCUIT



■ APPLICATION INFORMATION

ON/OFF Control

The ON pin controls the state of the switch. Activating ON continuously holds the switch in the on state so long as there is no fault. ON is active-high and has a low threshold, making it capable of interfacing with low voltage signals. The ON pin is compatible with standard GPIO logic threshold. It can be used with any microcontroller with 1.2V, 1.8V, 2.5V or 3.3V GPIOs.

Input Capacitor

To limit the voltage drop on the input supply caused by transient in-rush currents when the switch turns on into a discharged load capacitor or short-circuit, a capacitor needs to be placed between V_{IN} and GND. A 1.0μF ceramic capacitor, C_{IN}, place close to the pins is usually sufficient. Higher values of C_{IN} can be use to further reduce the voltage drop during high current application. When switching heavy loads, it is recommended to have an input capacitor about 10 times higher than the output capacitor, this in order to avoid excessive voltage drop.

Output Capacitor

Due to the integral body diode in the PMOS switch, a C_{IN} greater than C_L is highly recommended. A C_L greater than C_{IN} can cause V_{OUT} to exceed V_{IN} when the system supply is removed. This could result in current flow through the body diode from V_{OUT} to V_{IN}.

Board Layout

For best performance, all traces should be as short as possible. To be most effective, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN}, V_{OUT}, and GND helps minimize the parasitic electrical effects along with minimizing the case-to-ambient thermal impedance.