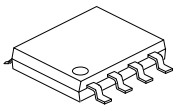
ULTRA SMALL, LOW INPUT VOLTAGE, LOW R_{ON}, LOAD SWITCHES



SOP-8

■ DESCRIPTION

The UTC **US2236095DB** 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 V to 3.6 V. The switch is controlled by an on/off input (ON), which is capable of interfacing directly with low-voltage control signals. In UTC **US2236095DB**, a 120-Ω on-chip load resistor is added for output quick discharge when the switch is turned off.

■ FEATURES

* Low Input Voltage: 1.0V~3.6V
* Ultra-Low ON Resistance
  R_{ON} = 78 mΩ at V_{IN} = 3.6V
  R_{ON} = 93 mΩ at V_{IN} = 2.5V
  R_{ON} = 109 mΩ at V_{IN} = 1.8V
  R_{ON} = 146 mΩ at V_{IN} = 1.2V
* 500mA Maximum Continuous Switch Current
* Ultra Low Quiescent Current: 82nA at 1.8V
* Ultra Low Shutdown Current: 44nA at 1.8V
* Low Control Input Thresholds Enable Use of 1.2-V/1.8-V/2.5-V/3.3-V Logic
* Controlled Slew Rate to Avoid Inrush Currents: 220-μs t_r

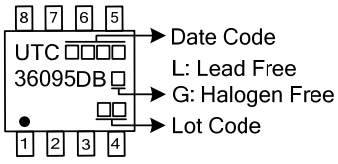
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
US2236095DBL-S08-R	US2236095DBG-S08-R	SOP-8	Tape Reel

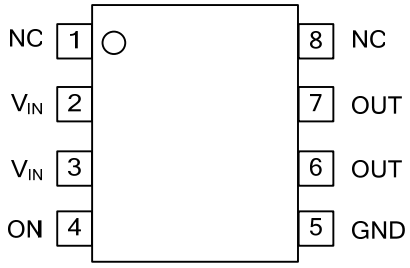
US2236095DBG-S08-R

(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



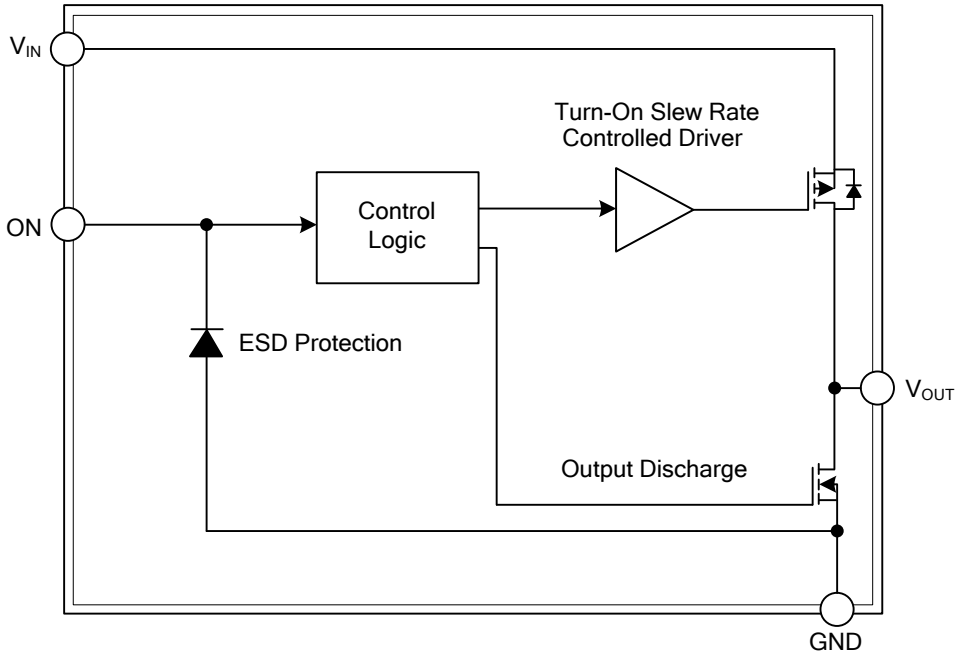
■ PIN CONFIGURATION



■ 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



FUNCTION TABLE

ON (Control Input)	V_{IN} to V_{OUT}	V_{OUT} to GND
L	OFF	ON
H	ON	OFF

■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage Range	V_{IN}	4.0	V
Output Voltage Range	V_{OUT}	V_{IN} +0.3	V
Input Voltage Range	V_{ON}	4.0	V
Maximum Continuous Switch Current	I_{MAX}	500	mA
Power Dissipation at T_A=25°C	P_D	0.48	W
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
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

■ ELECTRICAL CHARACTERISTICS (V_{IN}=1.0V~3.6V, T_A=25°C unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP (Note)	MAX	UNIT
Quiescent Current	I_{IN}	I_{OUT}=0, V_{IN}=V_{ON}	V_{IN}=1.1V		37	120	nA
			V_{IN}=1.8V		82	235	nA
			V_{IN}=3.6V		204	880	nA
OFF-State Supply Current	$I_{IN(OFF)}$	V_{ON}=GND, OUT=Open	V_{IN}=1.1V		22	210	nA
			V_{IN}=1.8V		44	260	nA
			V_{IN}=3.6V		137	700	nA
OFF-State Switch Current	$I_{IN(LEAKAGE)}$	V_{ON}=GND, V_{OUT}=0	V_{IN}=1.1V		22	140	nA
			V_{IN}=1.8V		45	230	nA
			V_{IN}=3.6V		137	610	nA
ON-State Resistance	R_{ON}	I_{OUT}=-200mA	V_{IN}=3.6V		78	95	mΩ
			V_{IN}=2.5V		93	110	mΩ
			V_{IN}=1.8V		109	130	mΩ
			V_{IN}=1.2V		146	200	mΩ
			V_{IN}=1.1V		174	330	mΩ
Output Pulldown Resistance	R_{PD}	V_{IN}=3.3V, V_{ON}=0, I_{OUT}=30mA			88	120	Ω
ON Input Leakage Current	I_{ON}	V_{ON}=1.1V~3.6V or GND				25	nA

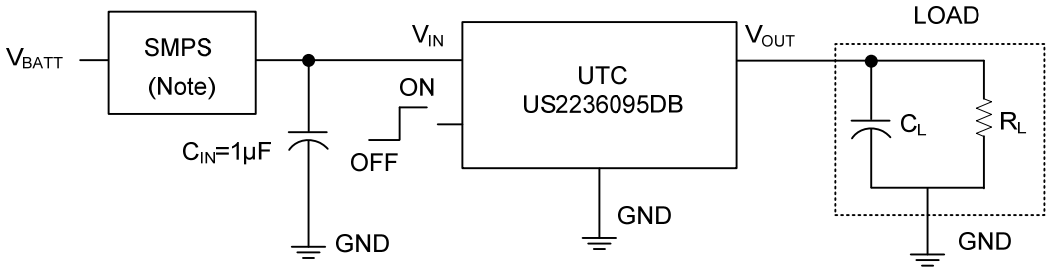
Note: Typical values are at the specified V_{IN} and T_A=25°C.

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Turn-ON Time	t_{ON}	R_L=500Ω	C_L=0.1μF		166		μs
			C_L=1μF		183		μs
			C_L=3.3μF		201		μs
Turn-OFF Time	t_{OFF}	R_L=500Ω	C_L=0.1μF		7		μs
			C_L=1μF		45		μs
			C_L=3.3μF		155		μs
V_{OUT} Rise Time	t_r	R_L=500Ω	C_L=0.1μF		146		μs
			C_L=1μF		146		μs
			C_L=3.3μF		156		μs
V_{OUT} Fall Time	t_f	R_L=500Ω	C_L=0.1μF		17		μs
			C_L=1μF		161		μs
			C_L=3.3μF		475		μs

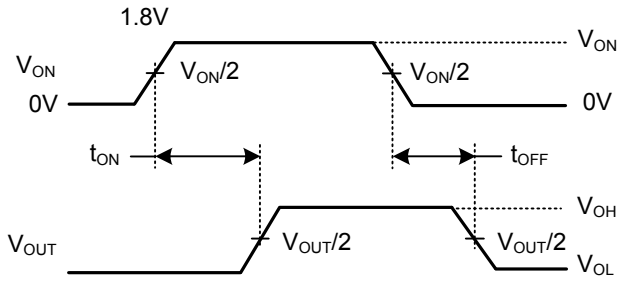
Note: R_L_Chip =120Ω.

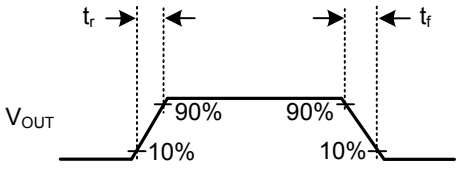
■ TEST CIRCUIT AND WAVEFORMS



Note: Switched mode power supply

TEST CIRCUIT





t_{ON}/t_{OFF} WAVEFORMS

■ 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.