SINGLE-CHANNEL, ULTRA-Low RESISTANCE LOAD SWITCH

DFN2020-8

■ DESCRIPTION

The UTC **ULS5422** device is a small, ultra-low RON, single-channel load switch with controlled turnon. The device contains an N-channel MOSFET that can operate over an input voltage range of 0.8V to 5.5V and can support a maximum continuous current of 4A. The switch is controlled by an on/off input (ON), which can interface directly with low-voltage control signals. In the UTC **ULS5422**, a 225Ω pulldown resistor is added for quick output discharge when the switch is turned off.

The UTC **ULS5422** is available in a small, space-saving 2mm × 2mm 8pin WSON package (DSG) with integrated thermal pad allowing for high power dissipation.

■ FEATURES

* Integrated Single-Channel Load Switch
* Input Voltage Range: 0.8 V~5.5V
* Low RON Resistance
  R_{ON}=22mΩ at V_{IN}=5V (V_{BIAS}=5V)
  R_{ON}=22mΩ at V_{IN}=3.6V (V_{BIAS}=5V)
  R_{ON}=22mΩ at V_{IN}=1.8V (V_{BIAS}=5V)
* Low Quiescent Current (50μA)
* Low Control Input Threshold Enables Use of 1.2V, 1.8V, 2.5V, and 3.3V Logic
* Configurable Rise Time
* Quick Output Discharge (QOD)

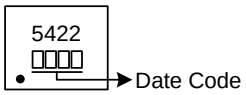
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULS5422L-K08-2020-R	ULS5422G-K08-2020-R	DFN2020-8	Tape Reel

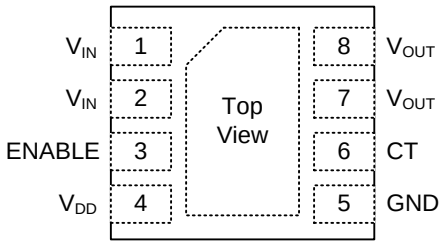
ULS5422G-K08-2020-R

(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) K08-2020: DFN2020-8
(3)Green Package	(3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



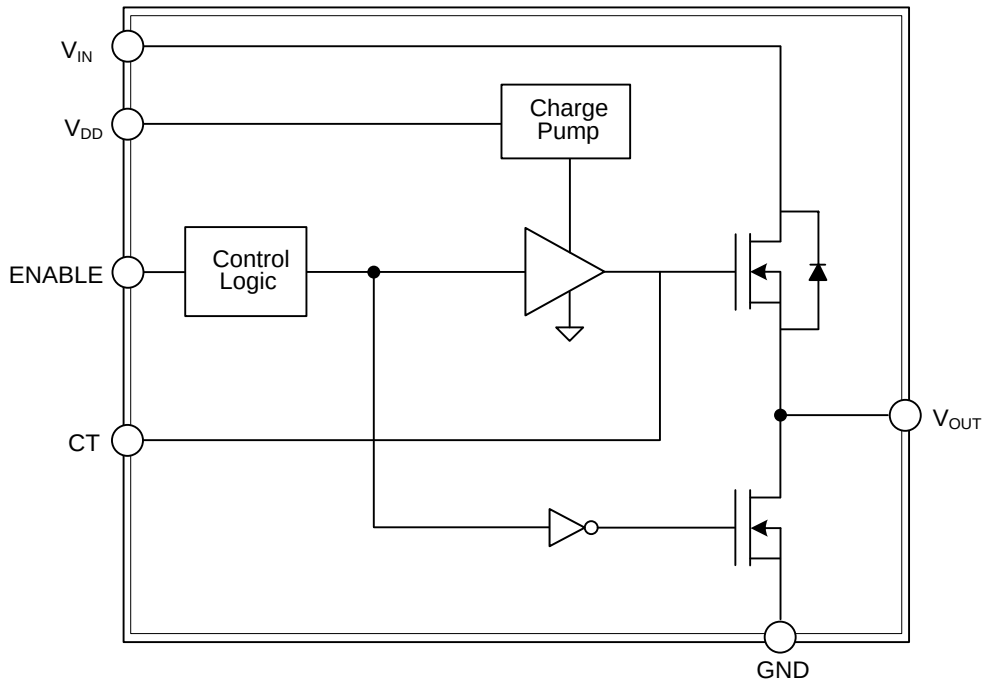
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1, 2	V_{IN}	Switch input. Input capacitor recommended for minimizing V_{IN} dip. Recommended voltage range for this pin for optimal R_{ON} performance is 0.8 V to V_{BIAS}.
3	ENABLE	Active high switch control input. Do not leave floating.
4	VDD	Bias voltage. Power supply to the device. Recommended voltage range for this pin is 2.5 V to 5.5 V. See Application Information section for more information.
5	GND	Device ground.
6	CT	Switch slew rate control. Can be left floating.
7, 8	V_{OUT}	Switch output.

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING Over operating free-air temperature range (unless otherwise noted)

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	6	V
Output Voltage	V_{OUT}	6	V
Bias Voltage	V_{BIAS}	6	V
ON Voltage	V_{ON}	6	V
Maximum Pulsed Switch Current, Pulse <300μs, 2% Duty Cycle	I_{PLS}	4	A
Operating Free-Air Temperature	T_A	-40 ~ +85	°C
Maximum Junction Temperature	T_J	+125	°C
Storage Temperature	T_{STG}	-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. All voltage values are with respect to network ground terminal.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT
Input Voltage		V_{IN}	0.8		V_{BIAS}	V
Bias Voltage		V_{BIAS}	2.5		5.5	V
ON Voltage		V_{ON}	0		5.5	V
Output Voltage		V_{OUT}			V_{IN}	V
High-Level Input Voltage, ON	V_{BIAS}=2.5V~5.5V	V_{IH}	1.2		5.5	V
Low-Level Input Voltage, ON	V_{BIAS}=2.5V~5.5V	V_{IL}	0		0.5	V
Input Capacitor		C_{IN}	1			μF

■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ_{JA}	65.3	°C/W
Junction to Case	θ_{JC}	12.8	°C/W

■ ELECTRICAL CHARACTERISTICS (V_{BIAS}=5V)

(Unless otherwise noted, the specification in the following table applies over the operating ambient temperature -40°C ≤T_A ≤85°C (Full) and V_{BIAS}=5V. Typical values are for T_A=25°C.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
POWER SUPPLIES AND CURRENTS							
V_{BIAS} Quiescent Current	$I_{IN(VBIAS-ON)}$	I_{OUT}=0, V_{IN}=V_{ON}=V_{BIAS}=5V			50	75	μA
V_{BIAS} Shutdown Current	$I_{IN(VBIAS-OFF)}$	V_{ON}=GND, V_{OUT}=0V				2	μA
V_{IN} Off-State Supply Current	$I_{IN(VIN-OFF)}$	V_{ON}=GND, V_{OUT}=0V	V_{IN}=5V		0.2	8	μA
			V_{IN}=3.3V		0.02	3	μA
			V_{IN}=1.8V		0.01	2	μA
			V_{IN}=0.8V		0.005	1	μA
ON pin Input Leakage Current	I_{ON}	V_{ON}=5.5V				0.5	μA
RESISTANCE CHARACTERISTICS							
ON-State Resistance	R_{ON}	I_{OUT}=-200mA, V_{BIAS}=5V	V_{IN}=5V		22	33	mΩ
			V_{IN}=3.3V		22	33	mΩ
			V_{IN}=1.8V		22	33	mΩ
			V_{IN}=1.5V		22	33	mΩ
			V_{IN}=1.2V		22	33	mΩ
			V_{IN}=0.8V		22	33	mΩ
Output Pulldown Resistance	R_{PD}	V_{IN}=5.0V, V_{ON}=0V, I_{OUT}=15mA			225	325	Ω

■ ELECTRICAL CHARACTERISTICS (V_{BIAS}=2.5V)

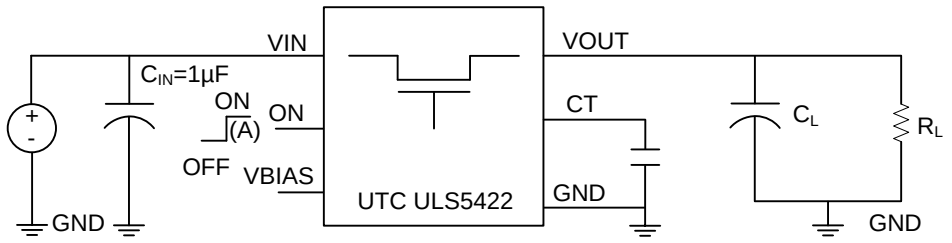
Unless otherwise noted, the specification in the following table applies over the operating ambient temperature -40°C ≤T_A ≤85°C (Full) and V_{BIAS}=2.5V. Typical values are for T_A=25°C.

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
POWER SUPPLIES AND CURRENTS							
V_{BIAS} Quiescent Current	$I_{IN(VBIAS-ON)}$	I_{OUT}=0, V_{IN}=V_{ON}=V_{BIAS}=2.5V			20	30	μA
V_{BIAS} Shutdown Current	$I_{IN(VBIAS-OFF)}$	V_{ON}=GND, V_{OUT}=0V				2	μA
V_{IN} Off-State Supply Current	$I_{IN(VIN-OFF)}$	V_{ON}=GND, V_{OUT}=0V	V_{IN}=2.5V		0.01	3	μA
			V_{IN}=1.8V		0.01	2	μA
			V_{IN}=1.2V		0.005	2	μA
			V_{IN}=0.8V		0.003	1	μA
ON pin Input Leakage Current	I_{ON}	V_{ON}=5.5V				0.5	μA
RESISTANCE CHARACTERISTICS							
ON-State Resistance	R_{ON}	I_{OUT}=-200mA, V_{BIAS}=2.5V	V_{IN}=2.5V		26	38	mΩ
			V_{IN}=1.8V		26	38	mΩ
			V_{IN}=1.5V		25	38	mΩ
			V_{IN}=1.2V		24	38	mΩ
			V_{IN}=0.8V		24	38	mΩ
Output Pulldown Resistance	R_{PD}	V_{IN}=2.5V, V_{ON}=0V, I_{OUT}=1mA			275	325	Ω

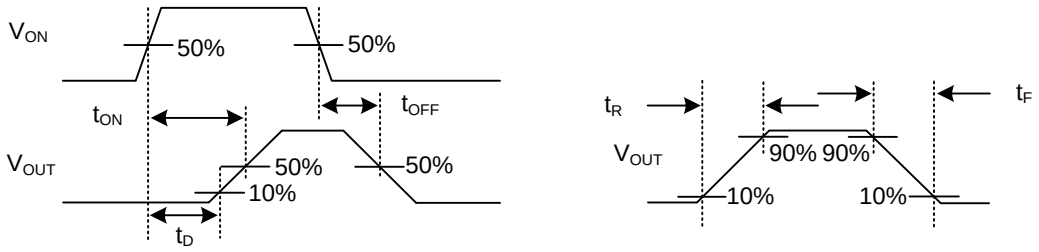
■ SWITCHING CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IN}=V_{ON}=V_{BIAS}=5V, T_A=25ºC (UNLESS OTHERWISE NOTED)						
Turn on Time	t_{ON}	R_L=10Ω, C_L=0.1μF, C_T=1000pF		1325		μs
Turn off Time	t_{OFF}			10		μs
V_{OUT} Rise Time	t_R			1625		μs
V_{OUT} Fall Time	t_F			3.5		μs
ON Delay Time	t_D			500		μs
V_{IN}=0.8V, V_{ON}=V_{BIAS}=5V, T_A=25ºC (UNLESS OTHERWISE NOTED)						
Turn on Time	t_{ON}	R_L=10Ω, C_L=0.1μF, C_T=1000pF		600		μs
Turn off Time	t_{OFF}			80		μs
V_{OUT} Rise Time	t_R			300		μs
V_{OUT} Fall Time	t_F			5.5		μs
ON Delay Time	t_D			460		μs
V_{IN}=2.5V, V_{ON}=5V, V_{BIAS}=2.5V, T_A=25ºC (UNLESS OTHERWISE NOTED)						
Turn on Time	t_{ON}	R_L=10Ω, C_L=0.1μF, C_T=1000pF		2200		μs
Turn off Time	t_{OFF}			9		μs
V_{OUT} Rise Time	t_R			2275		μs
V_{OUT} Fall Time	t_F			3.1		μs
ON Delay Time	t_D			1075		μs
V_{IN}=0.8V, V_{ON}=5V, V_{BIAS}=2.5V, T_A=25ºC (UNLESS OTHERWISE NOTED)						
Turn on Time	t_{ON}	R_L=10Ω, C_L=0.1μF, C_T=1000pF		1450		μs
Turn off Time	t_{OFF}			60		μs
V_{OUT} Rise Time	t_R			875		μs
V_{OUT} Fall Time	t_F			5.5		μs
ON Delay Time	t_D			1010		μs

■ TEST CIRCUIT AND TIMING WAVEFORMS



TEST CIRCUIT



t_{ON}/t_{OFF} WAVEFORMS

■ TYPICAL APPLICATION CIRCUIT