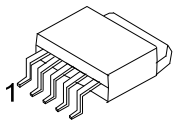
5-V LOW-DROPOUT VOLTAGE REGULATOR



TO-263-5

■ DESCRIPTION

The UTC **ULE4275** is a monolithic integrated low-dropout voltage regulator. The device regulates an input voltage up to 45V to V_{OUT} = 5V (typical). The device can drive loads up to 450mA. It also provides overcurrent protection and overtemperature protection for control of the state of the output voltage. The device generates a reset signal for an output voltage, $V_{OUT,rt}$, of 4.65V (typical). By the use of an external delay capacitor, one can program the reset delay time.

The input capacitor, C_{IN}, compensates for line fluctuation. Using a resistor of approximately 1Ω in series with C_{IN} dampens the oscillation of input inductance and input capacitance. The output capacitor, C_{OUT}, stabilizes the regulation circuit. The specification for stability is at C_{OUT} ≥ 22μF and ESR ≤ 5Ω, within the operating temperature range. Stability for electrolytic capacitors specifically is at C_{OUT} ≥ 68μF within the operating temperature range.

The control amplifier compares a reference voltage to a voltage that is proportional to the output voltage and drives the base of the series transistor through a buffer. Saturation control as a function of the load current prevents any oversaturation of the power element. The device also incorporates a number of internal circuits for protection against: overload, overtemperature, and reverse polarity.

■ FEATURES

* Qualified for Automotive Applications
* Output Voltage 5V ± 2%
* Very Low Current Consumption
* Power-On and Undervoltage Reset
* Reset Low-Level Output Voltage<1V
* Very Low Dropout Voltage
* Internal Short-Circuit Current Limiting
* Reverse-Polarity Proof

■ ORDERING INFORMATION

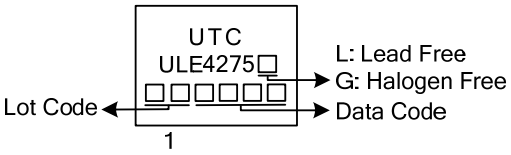
Ordering Number		Package	Packing
Lead Free	Halogen Free		
ULE4275L-TQ5-T	ULE4275G-TQ5-T	TO-263-5	Tube
ULE4275L-TQ5-R	ULE4275G-TQ5-R	TO-263-5	Tape Reel

ULE4275L-TQ5-T

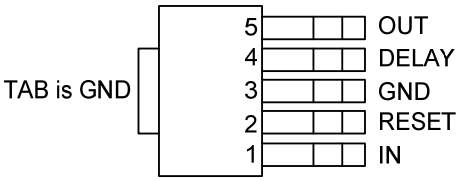
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) TQ5: TO-263-5
(3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING



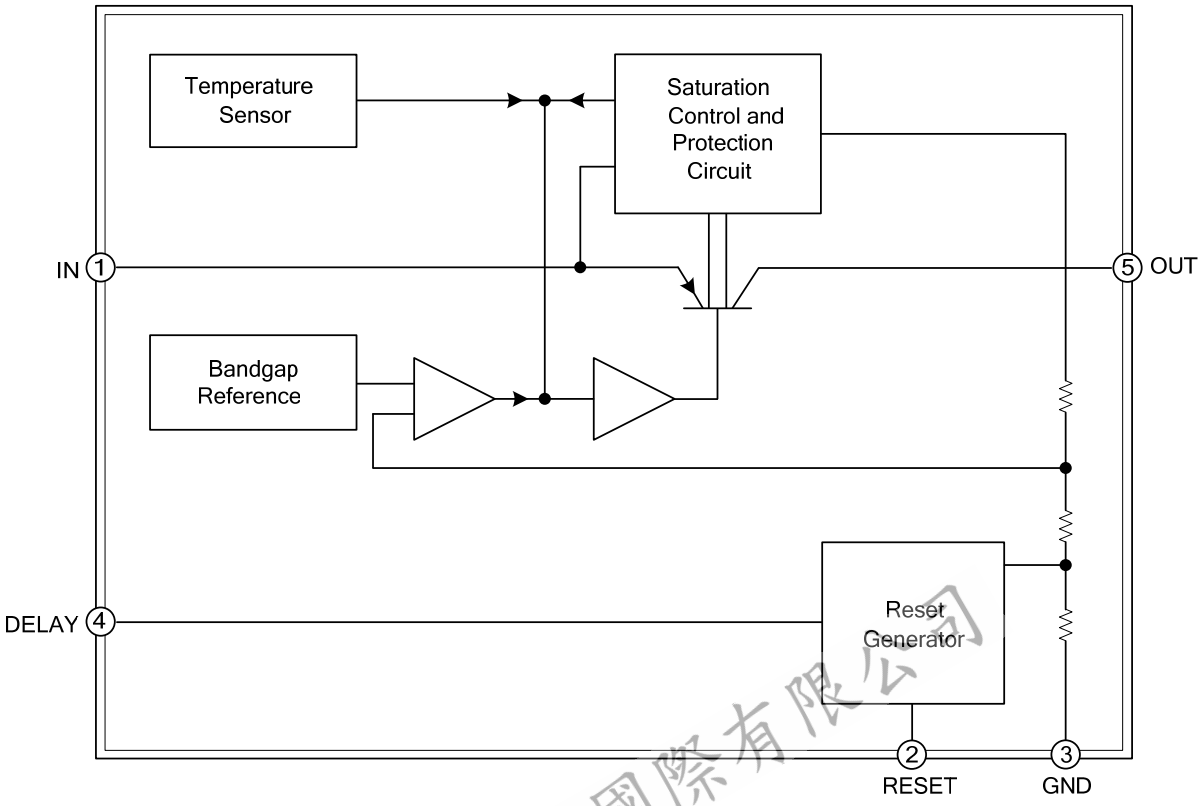
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	IN	Input. Connect to ground as close to device as possible, through a ceramic capacitor.
2	RESET	Reset output. Open-collector output
3	GND	Ground. Internally connected to heatsink
4	DELAY	Reset delay. Connect to ground with a capacitor to set delay time.
5	OUT	Output. Connect to ground with≥22μF capacitor, ESR<5Ω at 10kHz.

■ BLOCK DIAGRAM



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

PARAMETER		SYMBOL	RATINGS	UNIT
Input Voltage Range (Note 1)	IN	V_I	-42~45	V
	DELAY		-0.3~7	V
Output Voltage Range	OUT	V_O	-1~16	V
	RESET		-0.3~25	V
Input Current	DELAY	I_I	±2	mA
Output Current		I_O	±5	mA
Operating Junction Temperature		T_J	-40~150	°C
Storage Temperature		T_{STG}	-65~150	°C
Electrostatic Discharge	Human body model (HBM)	$V_{(ESD)}$	6000	V
	Machine model (MM)		400	V

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 the network ground terminal.

■ RECOMMENDED OPERATING CONDITIONS

(over operating free-air temperature range (unless otherwise noted))

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Voltage	V_I	5.5		42	V
Junction Temperature	T_J	-40		150	°C

■ THERMAL RESISTANCES CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction-to-Ambient Thermal Resistance	θ_{JA}	32.8	°C/W
Junction-to-Case	θ_{JC}	38	°C/W

■ ELECTRICAL CHARACTERISTICS

(over recommended operating free-air temperature range, V_I=13.5V, T_J=-40°C~150°C (unless otherwise noted) (see Test Circuit))

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage	V_O	I_O=5mA~400mA, V_I=6V~28V		4.9	5	5.1	V
		I_O=5mA~200mA, V_I=6V~40V		4.9	5	5.1	V
Output Current Limit	I_O			350	700	950	mA
Current Consumption, I_q=I_I-I_O	I_Q	I_O=1mA	T_J=25°C		150	200	μA
			T_J≤85°C		150	220	μA
		I_O=250mA			7.5	18	mA
		I_O=400mA			12	22	mA
Dropout Voltage (Note)	V_{DO}	I_O=300mA, V_{do}=V_I-V_O			250	500	mV
Load Regulation		I_O=5mA~400mA			15	30	mV
Line Regulation		ΔV_I=8V~32V, I_O=5mA		-15	5	15	mV
Power-Supply Ripple Rejection	PSRR	f_r=100Hz, V_r=0.5V_{pp}			60		dB
Temperature Output-Voltage Drift	$\frac{\Delta V_O}{\Delta T}$				0.5		mV/K
RESET Switching Threshold	$V_{O,rt}$			4.5	4.65	4.8	V
RESET Output Low Voltage	V_{ROL}	R_{ext}≥5kΩ, V_O>1V			0.2	0.4	V
RESET Output Leakage Current	I_{ROH}	V_{ROH}=5V			0	10	μA
RESET Charging Current	$I_{D,c}$	V_D=1V		3	5.5	9	μA
RESET Upper Timing Threshold	V_{DU}			1.5	1.8	2.2	V
RESET Lower Timing Threshold	V_{DRL}			0.2	0.4	0.7	V

Note: Measured when the output voltage V_O has dropped 100 mV from the nominal value obtained at V_I=13.5V.

■ SWITCHING CHARACTERISTICS

(over operating free-air temperature range (unless otherwise noted) (see Figure 1))

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
RESET Delay Time	t_{rd}	C_D=47nF	10	16	22	ms
RESET Reaction Time	t_{rr}	C_D=47nF		0.5	2	μs

■ TIMING DIAGRAM

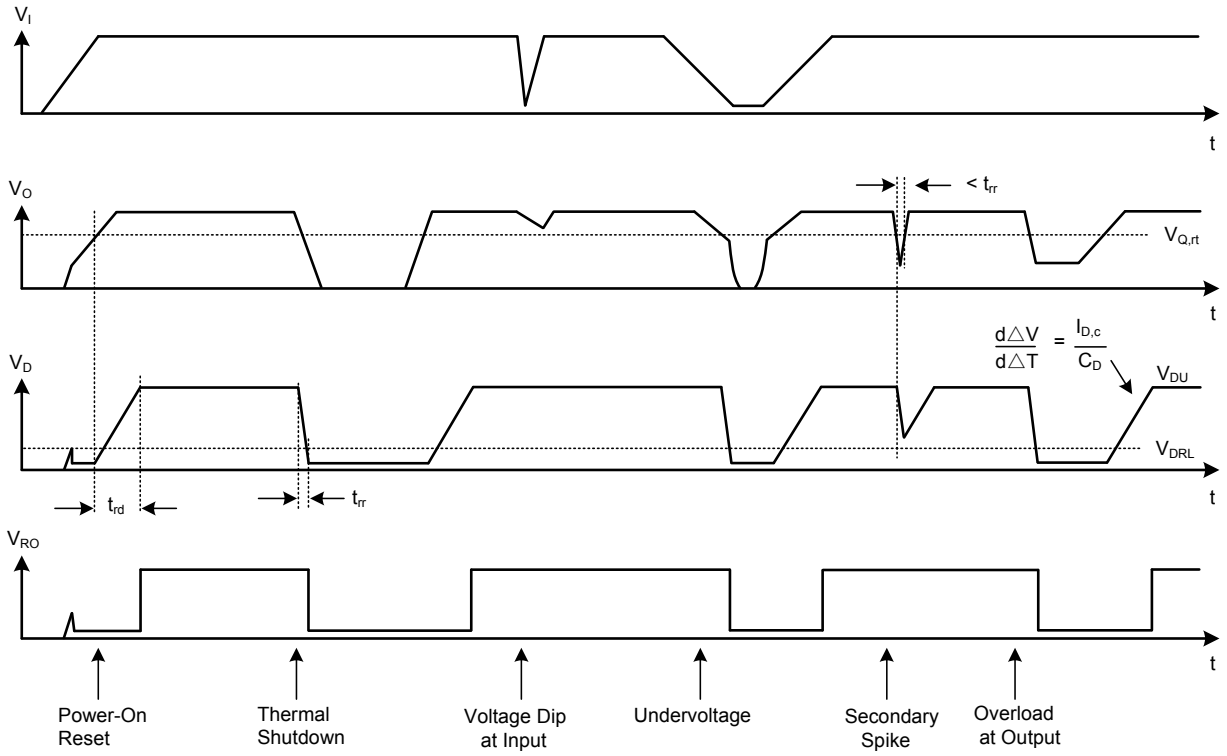
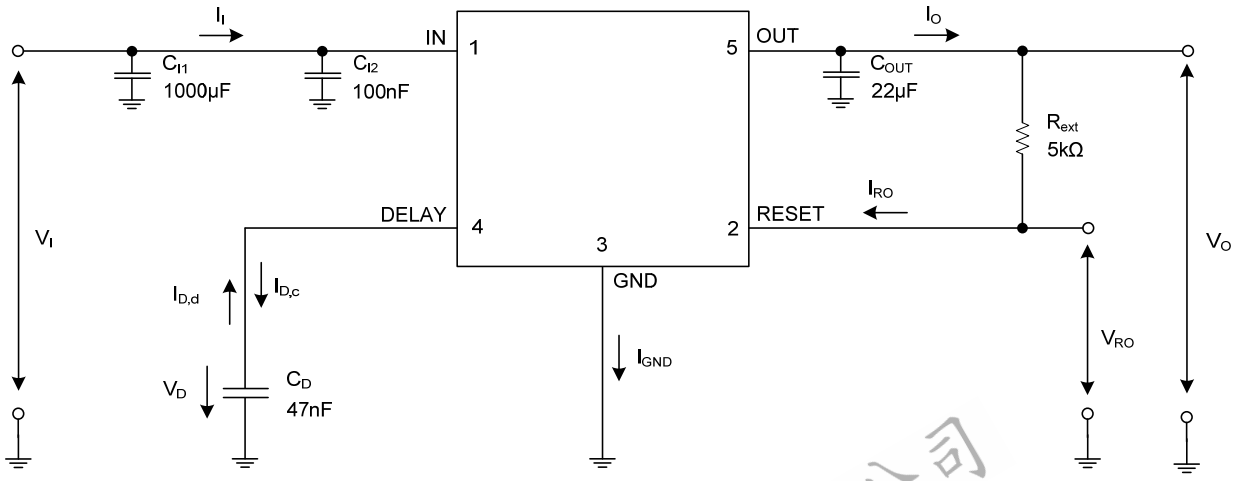


Figure 1. Reset Timing Diagram

■ TEST CIRCUIT



■ TYPICAL APPLICATION CIRCUIT