# UNISONIC TECHNOLOGIES CO., LTD

**ULE4275** 

**Preliminary** 

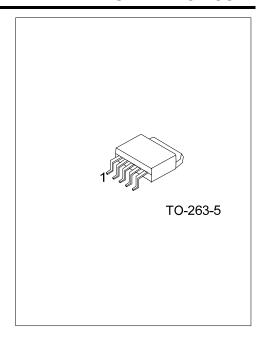
# LINEAR INTEGRATED CIRCUIT

# 5-V LOW-DROPOUT VOLTAGE REGULATOR

#### 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,  $C_{\text{IN}}$ , compensates for line fluctuation. Using a resistor of approximately  $1\Omega$  in series with  $C_{\text{IN}}$  dampens the oscillation of input inductance and input capacitance. The output capacitor,  $C_{\text{OUT}}$ , stabilizes the regulation circuit. The specification for stability is at  $C_{\text{OUT}} \ge 22\mu\text{F}$  and  $\text{ESR} \le 5\Omega$ , within



the operating temperature range. Stability for electrolytic capacitors specifically is at  $C_{OUT} \ge 68 \mu F$  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.

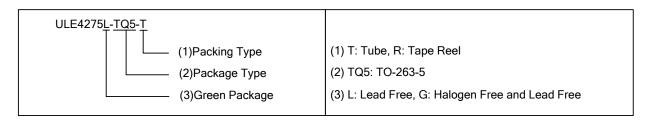
#### **■ FEATURES**

- \* 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

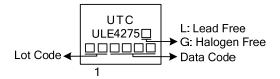
#### ■ ORDERING INFORMATION

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

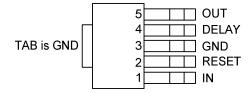


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#### ■ MARKING



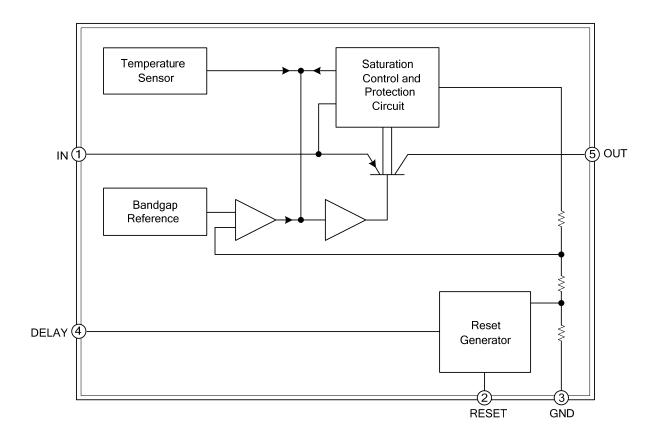
## **■ PIN CONFIGURATION**



#### **■ 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 IN		\/	-42~45	V
(Note 1)	DELAY	V <sub>I</sub>	-0.3~7	V
Output Voltage OUT		\/	-1~16	V
Range	RESET	Vo	-0.3~25	V
Input Current	DELAY	l <sub>l</sub>	±2	mA
Output Current		Io	±5	mA
Operating Junction Temperature		TJ	-40~150	°C
Storage Temperature		T <sub>STG</sub>	-65~150	°C
Electrostatic	Human body model (HBM)	.,,	6000	V
Discharge	Machine model (MM)	$V_{(ESD)}$	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.

## **■ RECOMMENDED OPERATING CONDITIONS**

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

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Voltage	Vı	5.5		42	V
Junction Temperature	T.i	-40		150	°C

## **■ THERMAL RESISTANCES CHARACTERISTICS**

PARAMETER	SYMBOL	RATINGS	UNIT
Junction-to-Ambient Thermal Resistance	$\theta_{JA}$	32.8	°C/W
Junction-to-Case	θ.ιс	38	°C/W

<sup>2.</sup> All voltage values are with respect to the network ground terminal.

#### **ELECTRICAL CHARACTERISTICS**

(over recommended operating free-air temperature range, V<sub>I</sub>=13.5V, T<sub>J</sub>=-40°C~150°C (unless otherwise noted) (see Test Circuit))

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Voltage	W	I <sub>O</sub> =5mA~400mA, V <sub>I</sub> =6V~28V		4.9	5	5.1	V
Output Voltage	Vo	I <sub>O</sub> =5mA~200mA, V <sub>I</sub> =	I <sub>O</sub> =5mA~200mA, V <sub>I</sub> =6V~40V		5	5.1	V
Output Current Limit	I <sub>0</sub>			350	700	950	mA
		I <sub>O</sub> =1mA	T <sub>J</sub> =25°C		150	200	μΑ
Current Consumption 1 -1.1-			TJ≤85°C		150	220	μΑ
Current Consumption, I <sub>q</sub> =I <sub>I</sub> -I <sub>O</sub>	ΙQ	I <sub>O</sub> =250mA			7.5	18	mA
		I <sub>O</sub> =400mA			12	22	mA
Dropout Voltage (Note)	$V_{DO}$	I <sub>O</sub> =300mA, V <sub>do</sub> =V <sub>I</sub> -V <sub>O</sub>			250	500	mV
Load Regulation		I <sub>O</sub> =5mA~400mA			15	30	mV
Line Regulation		$\Delta V_1$ =8V~32V, I <sub>O</sub> =5m.	A	-15	5	15	mV
Power-Supply Ripple Rejection	PSRR	$f_r$ =100Hz, $V_r$ =0.5 $V_{pp}$			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 <sub>ext</sub> ≥5kΩ, V <sub>O</sub> >1V			0.2	0.4	V
RESET Output Leakage Current	I <sub>ROH</sub>	V <sub>ROH</sub> =5V			0	10	μΑ
RESET Charging Current	$I_{D,c}$	V <sub>D</sub> =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<sub>O</sub> has dropped 100 mV from the nominal value obtained at V<sub>I</sub>=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 <sub>D</sub> =47nF	10	16	22	ms
RESET Reaction Time	t <sub>rr</sub>	C <sub>D</sub> =47nF		0.5	2	μs

#### **■ TIMING DIAGRAM**

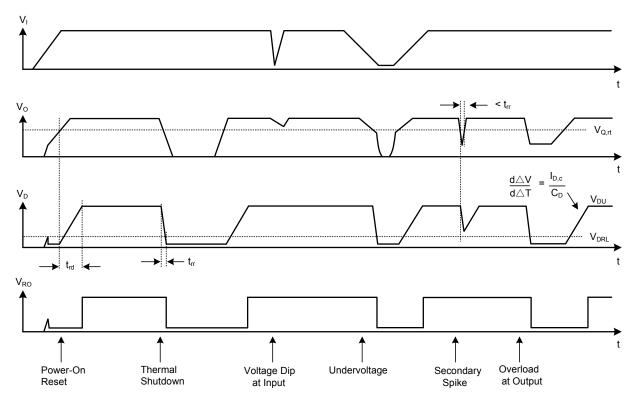
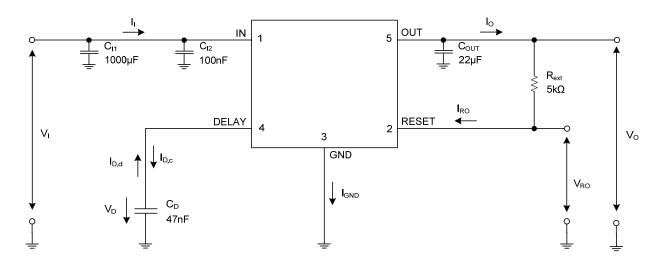
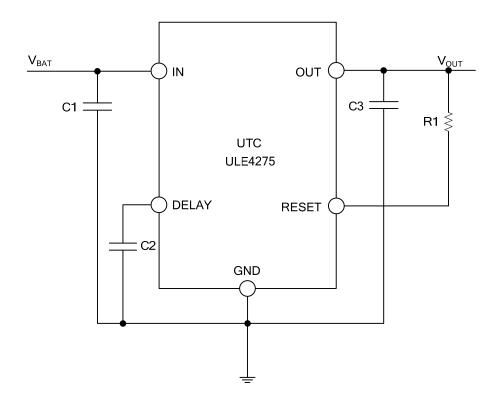


Figure 1. Reset Timing Diagram

# **■ TEST CIRCUIT**



#### **■ TYPICAL APPLICATION CIRCUIT**



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