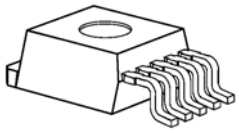
IC OF 5 V/550MA POWER VOLTAGE REGULATOR WITH LOW RESIDUAL VOLTAGE (ANALOG OF TLE4270G BY SIEMENS)

ILE4270G (analog TLE4270G by Siemens) – an integrated circuit of 5V/550 mA power voltage regulator with low residual voltage, implemented in 5-pin plastic package of P-TO263-5-1 type in accordance with Siemens specification.

IC of 5V/550 mA power voltage regulator is purposed for producing 5V constant voltage with 2% accuracy with residual voltage less than 0.7V at load current 550 mA and input voltage up to 26V.

It is suitable for use in power supply in electronic equipment including automotive electronics. Maximum input voltage is 42V. IC has a protection against overvoltage of positive and negative polarity, internal limitation of max load current with temperature reset of output voltage. It has a reset function.

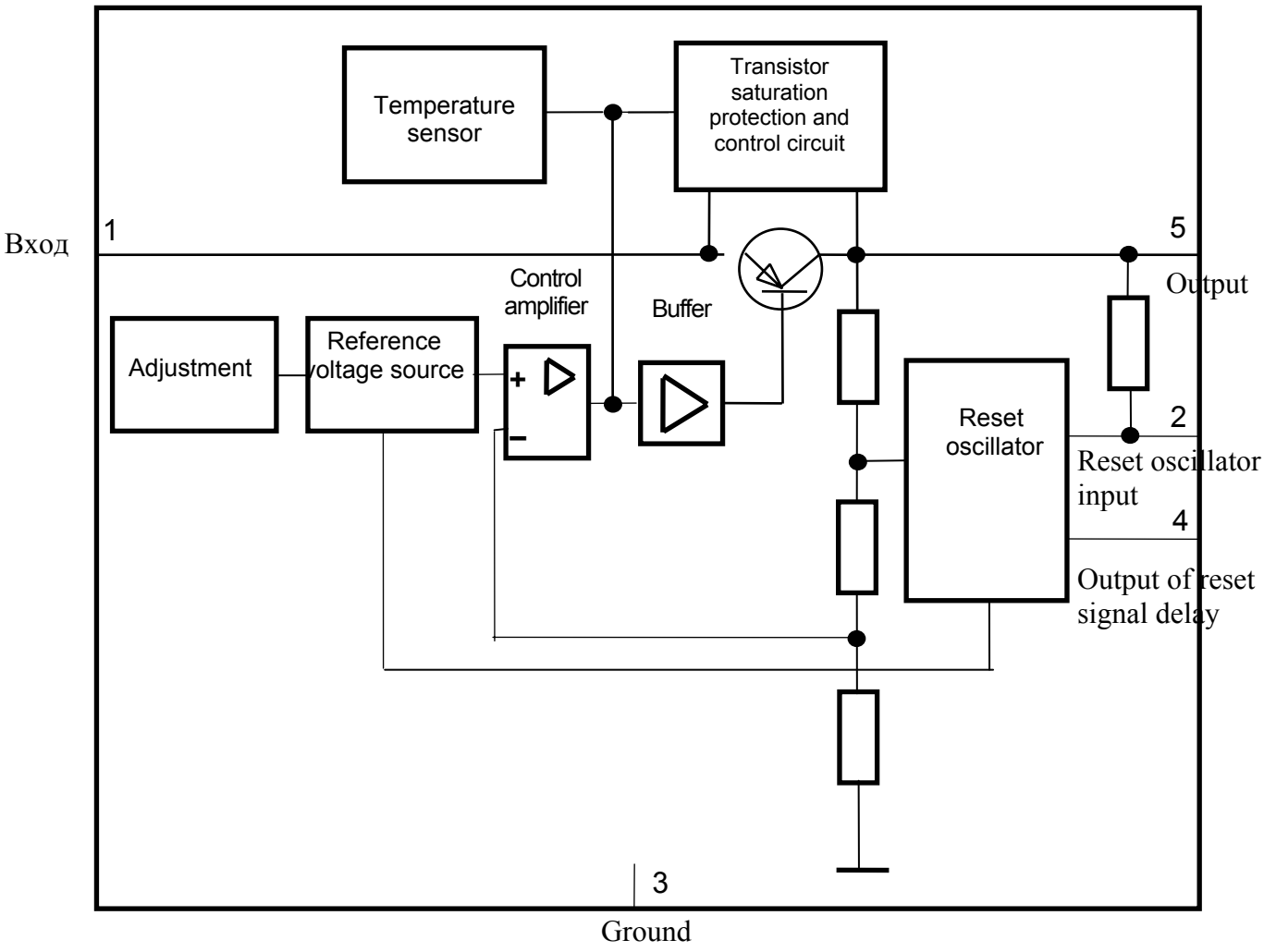


P-TO263-5-1
(P-TO220-5-8)

Features:

- High precision of output voltage 5V ± 2%
- Low residual voltage
- Imbedded overtemperature protection
- Reverse polarity protection
- Very low consumption current
- Input voltage up to 42V
- Overvoltage protection up to 65V (≤400mc)
- Short-circuit proof
- Suitable for use in automotive electronics
- Junction temperature range from minus 40 to +125°C
- Adjustable reset time

ILE4270G IC BLOCK DIAGRAM



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Pin definitions

Pin №	Symbol	Description	Function
1	I	Input	Input
2	RO	Reset Output	Reset oscillator output
3	GND	Ground	Common
4	D	Reset delay	Output of reset signal delay
5	Q	5-V Output	Output

TYPICAL ELECTRICAL CHARACTERISTICS (U_I =13.5V, -40 °C ≤ T_J ≤ 125 °C, unless otherwise specified)

Parameter, unit	Symbol	Test conditions	Typical value
Switching delay time, mc	t_d	C_d = 100 nF	13
Low reset voltage, mV	U_{ROL}	R_{intern} = 30 kOhm 1.0 V ≤ U_Q ≤ 4.5 V	60
Pulsation smoothing rate, dB	PSRR	f_r = 100 Hz, U_r = 0.5 U_{SS}	54
Notes: Testing of electrical characteristics is carried out in compliance with connection circuit given in Annex A			

ABSOLUTE MAXIMUM RATINGS

Parameter	Unit	Limit ratings		Maximum ratings	
		min	max	min	max
Die temperature, T_J	°C	-40	125	-	150
Storage temperature, T_{stg}	°C	-	-	-50	150
Input voltage, U_I	B	U_Q + 0.7	46	-42	46
Input voltage, U_I	B	-	-	-	65**
Input current, I_I	A	-	Internally limited	-	Internally limited
Output voltage, U_Q,	B	4.9	5.1	-1.0	16
Output current, I_Q	A	-	Internally limited	-	Internally limited
Current on output "Ground", I_M	мA	-	-	-0.5	–
Voltage on output Reset Output, U_R	B	0	-	-0.3	7
Current on output Reset Output, I_R	A	-	Internally limited	-	Internally limited
Reset Delay, U_D	B	-	-	-0.3	7
Voltage of reset delay output Reset Delay, U_D	B	-	-	-0.3	7
Current of reset delay output Reset Delay, I_D	A	-	Internally limited	-	Internally limited
Thermal resistance junction-ambient, $R_{th\ ja}$	°C/Вт	-	70*	-	70*
Thermal resistance junction-case, R_{thjc} (P-TO-263-5-1 / P-TO-220-5-12)	°C/Вт	-	3*	-	3*

Note – Absolute maximum power P_{tot},W, dissipated by IC at the ambient temperature T_A, is to be determined as

$$P_{tot} = (125 - T_A) / R_{th\ ja}\ , \qquad (1)$$

where 125 – junction absolute maximum operating temperature, °C

* $R_{th\ ja}$ - thermal resistance "junction – ambient" (for IC without additional external heat sink), °C /W. Rating of this parameter in analog IC makes $R_{th\ ja}$ = 70 °C /W (according to the data by "Siemens"). For IC with additional external heat sink

$$R_{th\ ja} = R_{th\ jc} + R_{th\ ca}\ , \qquad (2)$$

where $R_{th\ jc}$ – IC thermal resistance "junction-case", °C /W. Rating of this parameter in analog IC makes $R_{th\ jc}$ = 3 °C /W (according to the data by "Siemens"). Thermal $R_{th\ jc}$ and $R_{th\ ja}$ of the IC is determined in the course of experimental development.

Thermal resistance "case-ambient" $R_{th\ ca}$ of the designed IC is determined by the design of heat sink and specified by IC consumer.

Used heat sink, switching mode (consumed power) and ambient temperature have to ensure junction temperature nor more than $T_J \le +125$ °C.

** Effect time t ≤ 400 mc

ELECTRICAL PARAMETERS

Table 1 – Electrical parameters (U_I=13.5V, -40 °C ≤ T_J ≤ 125 °C , unless otherwise specified)

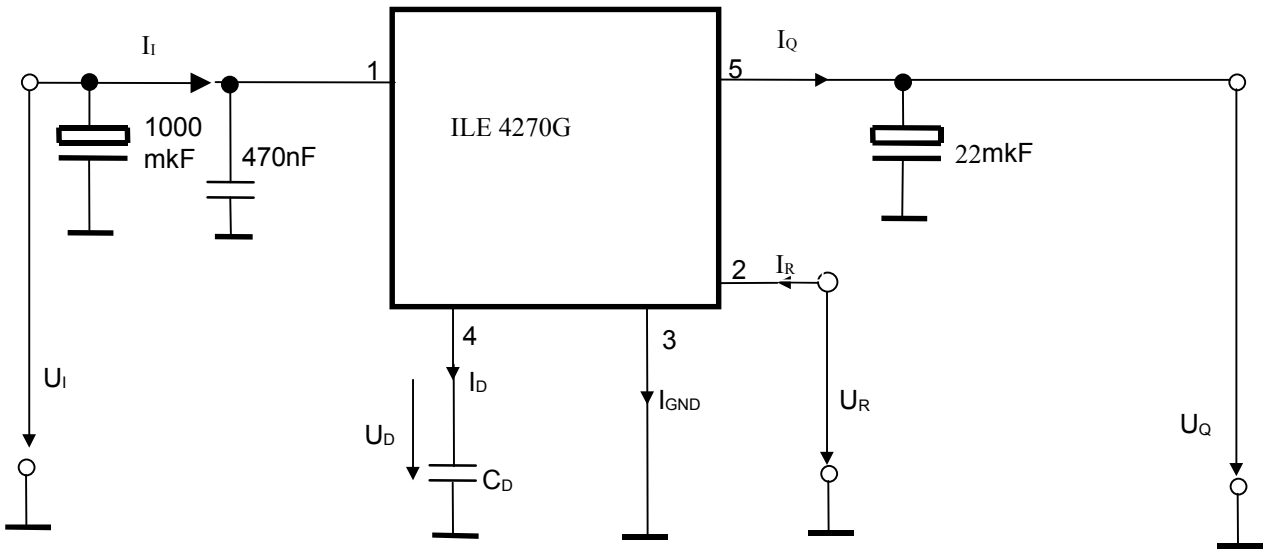
Parameter, unit	Symbol	Test conditions	Target	
			min	max
Output voltage, V	U_Q	5 mA ≤ I_Q ≤ 550 mA 6 V ≤ U_I ≤ 26 V	4.9	5.1
		I_Q ≤ 300 mA 26 V ≤ U_I ≤ 36 V	4.9	5.1
Maximum output current, mA	$I_{Q\ max}$	U_Q = 0 V	650	–
Consumption current, mA $I_q = I_I - I_Q$	I_q	I_Q = 5 mA	–	1.5
		I_Q = 550 mA	–	75
		I_Q = 550 mA; U_I = 5 V	–	90
Residual voltage, mV	U_{dr}	I_Q = 550 mA	–	700
Output voltage versus load current, mV	$\Delta U_{Q(I)}$	5mA ≤ I_Q ≤ 550mA U_I = 6 V	–	50
Output voltage versus input voltage, mV	$\Delta U_{Q(U)}$	6V≤ U_I ≤ 26V I_Q=5mA	–	25
Reset oscillator parameters				
Switching threshold voltage, V	U_{RT}		4.5	4.8
High reset voltage, V	U_{ROH}		4.5	–
Low reset voltage, mV	U_{ROL}	I_R = 3 mA U_Q = 4.4 B	–	400
Circuit resistance, kOhm	R	Connection directly to Q	18	46
Switching threshold of "Reset" output into low level, V	U_{DRL}	$U_Q < U_{RT}$	0.2	0.8
Switching threshold of "Reset" output into high level, V	U_{DU}		1.4	2.3
Charge current, mkA	I_d	U_D = 1.0 V	8	25
"Reset" output actuation time, mks	t_{RR}	C_D = 100 nF	–	3
Overvoltage protection				
Switching voltage, V	$U_{I,\ OV}$	–	42	46

Notes

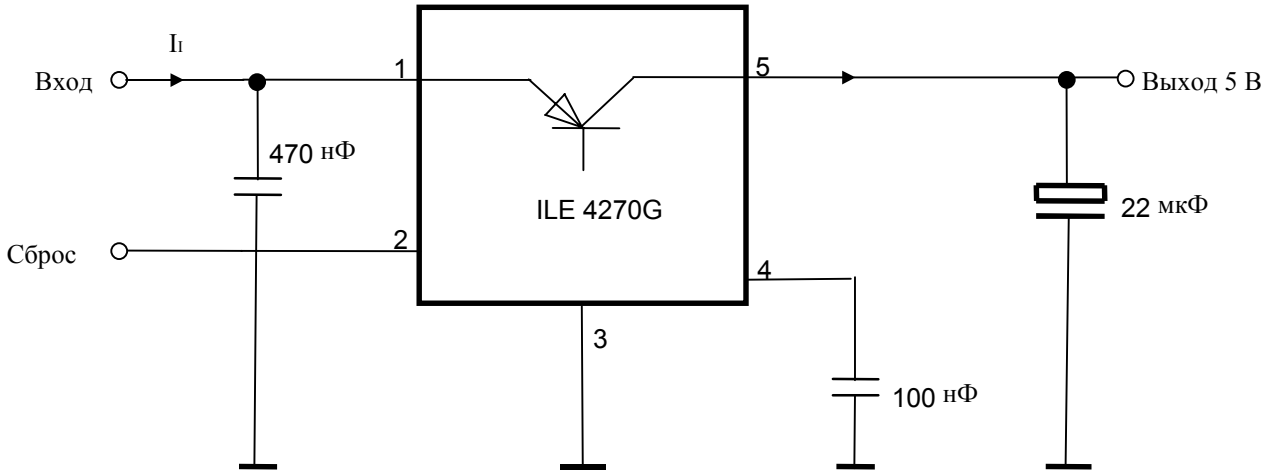
1 Measurement of electrical parameters is carried out with connection of input capacitors C_I = 1000 mkF, C_2 = 470 nF and output capacitor C_Q = 22 mkF.

2 Parameters specified in Table 1 are guaranteed for the constant junction temperature Tj. Measurement of parameters should be conducted by means of pulse technique.

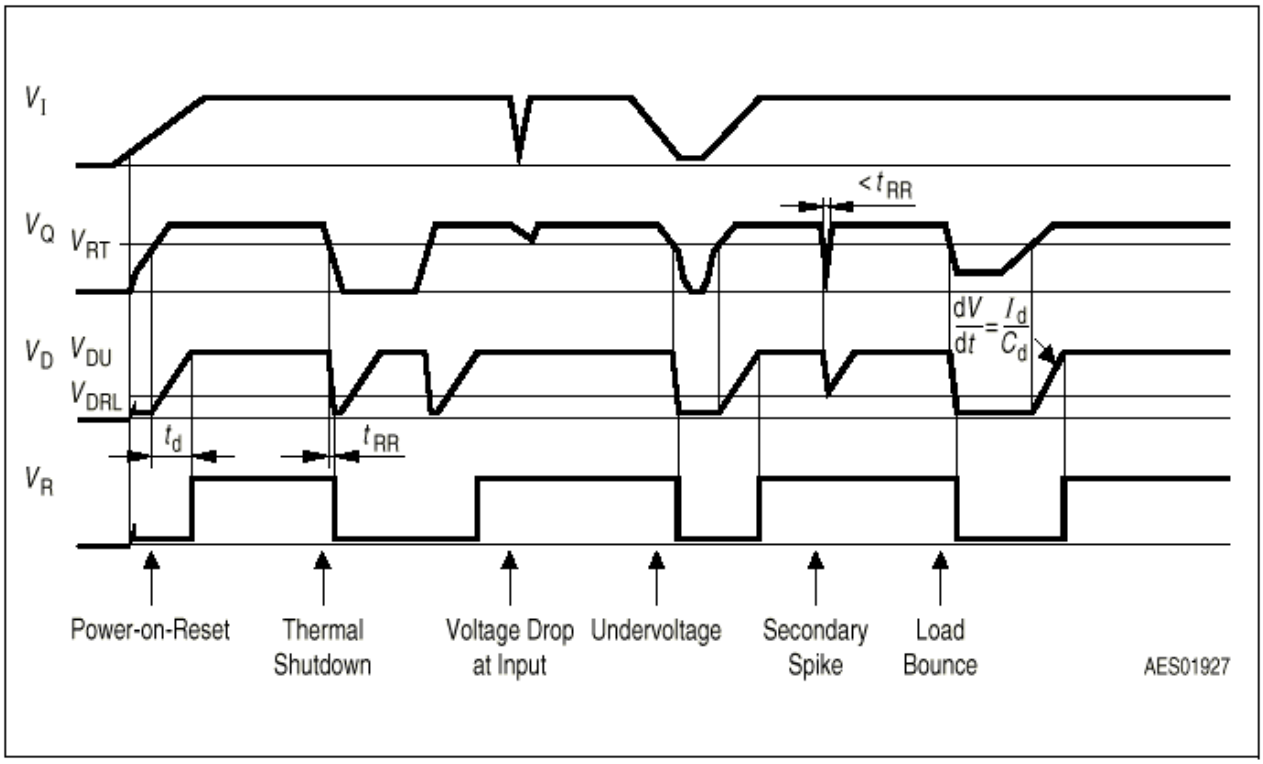
IC CONNECTION CIRCUIT WHEN TESTING ELECTRICAL PARAMETERS



IC ILE4270G APPLICATION BLOCK DIAGRAM



TIMING DIAGRAM OF IC LE4270G FUNCTION



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