IL52XXG *FAMILY OF LOW DROP VOLTAGE REGULATORS OF POSITIVE POLARITY (7 FIXED AND 1 ADJUSTABLE)*

IIL5200G - adjustable voltage regulator of positive polarity

IL5212G, IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G - fixed voltage regulators of positive polarity

Voltage regulators of positive polarity is able to provide output current up to 800 mA, including adjustable version (U_{ref}=1.25 V) There are offered the following output voltages in fixed versions: 1,2 V (IL5212G); 1,8 V (IL5218G); 2,5 V (IL5225G); 2,85 V (IL5228G); 3,0 V (IL5230G); 3,3 V (IL5233G), и 5,0 V(IL5250G).

The device is supplied in SOT-223 surface mount package. The only a common capacitor (10μF minimum) is needed for stability. On chip trimming allows the regulator to reach high accuracy of output voltage, within ± 1% at 25°C.

The circuit has internal limitation of output current with thermal shutdown of output voltage.

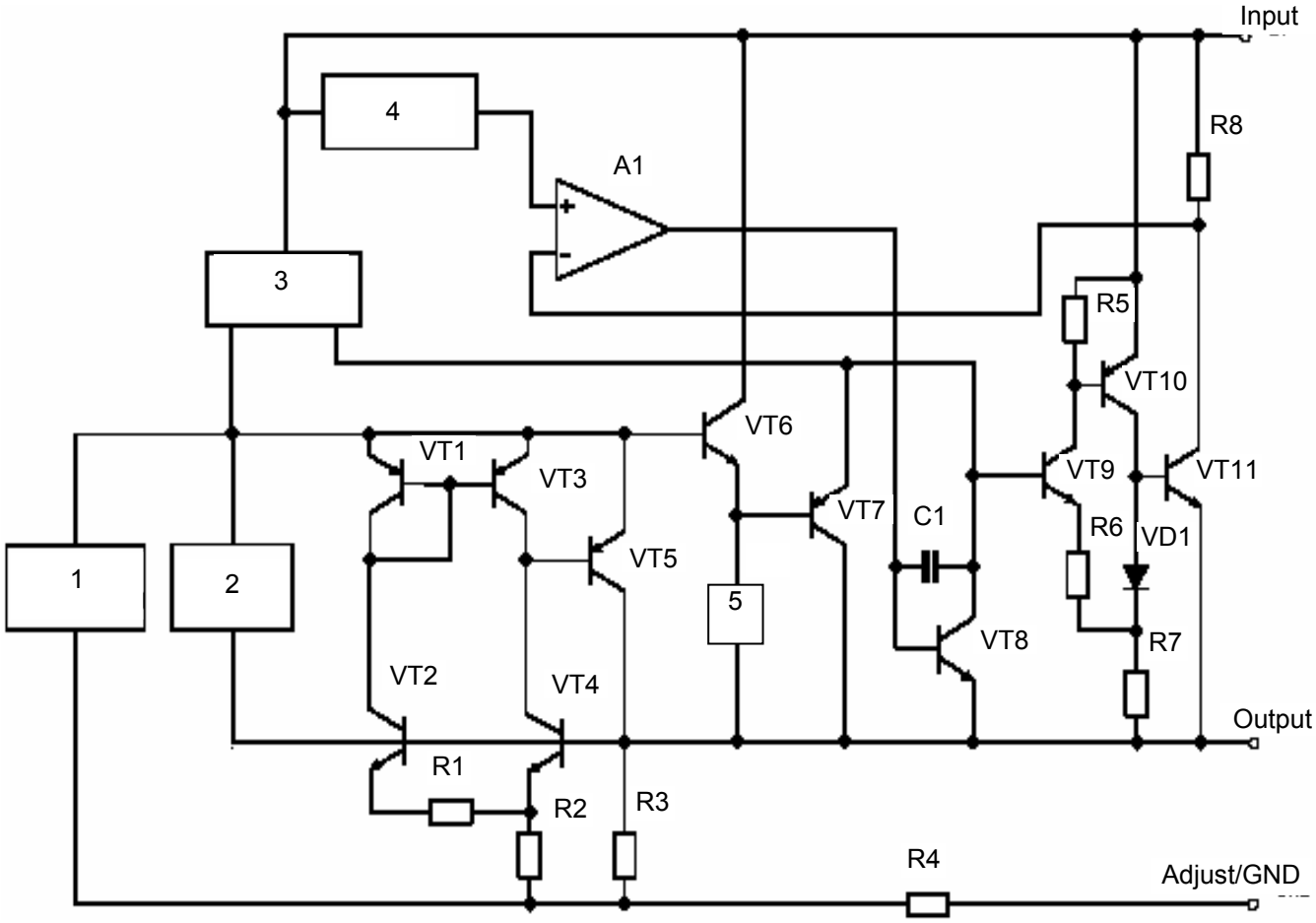
Fig. 1 – Integrated circuit in SOT-223 case

Features:

- low dropout voltage – not more1,2 V ;
- 2.85 V device is perfect for interface device;
- output current up to 0,8 A;
- fixed output voltages: 1.2V, 1.8V, 2.5V, 2.85V, 3.0V, 3.3V, 5.0V;
- adjustable version of voltage regulator (U_{rel}=1.25V);
- internal current and thermal protection;
- output voltage accuracy ± 1% (at 25°c), ± 2% in full temperature range for output current up to 0,8 A and ± 3% in full temperature range output current up to 1 A;
- input voltage ripple rejection: not less 60db;
- thermal resistance junction-case R_{TJC}, not more 20^{o}C/W;
- thermal resistance junction-ambient R_{TJA}, not more 220^{o}C/W(without external heal-sink).

Table 1 – Pin description table for IL5200G, IL5212G, IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G

Pin number	Symbol	Functional purpose
01	Adj (IL5200G)	Adjustment (for IL5200G)
	GND (for rest (fixed) versions)	Common (for rest (fixed) versions)
02, 04	Output	Output
03	Input	Input



1 – thermal compensation circuit;
2 – overheating protection circuit;
3, 5 – current generators;
4 – voltage generator;
A1 – amplifier;
C1 – capacitor;
R1 – R8 – resistors;
VD1 – diode;
VT1 – VT11 - transistors

Fig. 2 –Block diagram

Table 2 Maximum ratings

Symbol	Parameter	Rating		Unit
		Min.	Max.	
U_I	Input voltage	-	16	V

Table 3 Recommended operating conditions

Symbol	Parameter		Rating		Unit
			Min.	Max.	
U_I	Input voltage				
		IL5200G	2,475	15	
		IL5212G	2,46	15	V
		IL5218G	3,04	8	
		IL5225G	3,75	10	
		IL5228G	4,11	10	
		IL5230G	4,26	12	
		IL5233G	4,565	15	
		IL5250G	6,3	15	

Note - Maximum permissible power P_{tot}, W, dissipated by IC for ambient temperature T_A, °C, is calculated by formula:

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

125 – is maximum permissible operating junction temperature, °C

R_{TJA} – thermal resistance junction-ambient of the device (not more 220 °C/W), °C/W

For the device with additional external heat sink thermal resistance junction-ambient R_{TJA}, °C/W is calculated by formula:

$$R_{TJA} = R_{TJC} + R_{TCA}, \qquad (2)$$

R_{TJC} – thermal resistance junction-case of the device(not more 20 °C/W), °C/W,

R_{TCA} – thermal resistance case-ambient of the device, °C/W

Thermal resistance case-ambient R_{TCA} depends on heat sink features and determines by device customer

Used heat sink (it can be metal line on PCB), mode of application (power consumption) & ambient temperature have to provide junction temperature not more than $T_J \leq 125$ °C

Table 4 – Electric parameters

Symbol	Parameter	Measurement mode	Value		Junction temperature °C	Unit
			Min.	Max.		
IL5200G						
U_{ref}	Reference voltage	$U_I - U_O$ = 2,0 V I_O = -10 mA	1,238	1,262	25±10	V
		1,5 V ≤ (U_I-U_O) ≤ 10 V -10 mA≤ I_O≤ -0,8 A	1,225	1,275	0 ÷ 125	
		1,5 V ≤ (U_I-U_O) ≤ 10 V -0,8 A < I_O≤ -1,0 A	1,225	1,275	25±10	
		1,5 V ≤ (U_I-U_O) ≤ 10 V -0,8 A < I_O≤ -1,0 A	1,212	1,288	0; 125	
$\Delta U_{ref(U)}$	Line regulation	I_O = -10 mA 1,5 V ≤ (U_I-U_O) ≤ 13,75 V	-	0,2	25±10; 0; 125	%
$\Delta U_{ref(I)}$	Load regulation	$U_I - U_O$ = 3,0 V -10 mA ≤ I_O ≤ -800 mA	-	0,4		
		$U_I - U_O$ = 3,0 V -10 mA ≤ I_O ≤ -1 A	-	10		mV
U_{ds}	Drop-out voltage	I_O = -100 mA		1,1		V
		I_O = -500 mA	-	1,15		
		I_O = -800 mA		1,2		
		I_O = -1 A		1,3		
I_{Omax}	Maximum output current	$U_I - U_O$ = 5 V	1,0	-	25±10	A
I_{Omin}	Minimum output current	U_I = 15 V	-	5	25±10; 0; 125	mA
I_{Adj}	Adjustment current	U_I ≤ 15 V, I_O = -5 mA	-	120		μA
ΔI_{Adj}	Adjustment current change	1,5 V ≤ (U_I-U_O) ≤ 10 V -10 mA ≤ I_O ≤ -1 A	-	5,0		μA
SVR	Supply voltage ripple rejection	$U_I - U_O$ = 3 V, I_O = -40 mA f=120 Hz U_r = 1 V[1), 2)]	60	-	25±10	dB
Regterm	Thermostability	t = 30 ms	-	0,1	25±10	%/W
IL5212G						
U_O	Output voltage	U_I = 3,2 V I_O = -10 mA	1,188	1,212	25±10	V
		1,5 V ≤ (U_I-U_O) ≤ 10 V -10 mA ≤ I_O≤ -1,0 A	1,140	1,260	0 ÷ 125	
$\Delta U_{O(U)}$	Line regulation	I_O = -10 mA 1,5 V ≤ (U_I-U_O) ≤ 13,75 V	-	0,2	25±10; 0; 125	%
$\Delta U_{O(I)}$	Load regulation	$U_I – U_O$ = 3,0 V, -10 mA ≤ I_O ≤ -800 mA	-	0,4		
		$U_I – U_O$ = 3,0 V, -10 mA ≤ I_O ≤ -1 A	-	10		mV

Table 4 –continued

Symbol	Parameter	Measurement mode	Value		Junction temperature °C	Unit
			Min.	Max.		
U_{ds}	Drop-out voltage	I_O = -100 mA		1,1	25±10; 0; 125	V
		I_O = -500 mA	-	1,15		
		I_O = -800 mA		1,2		
		I_O = -1 A		1,3		
I_{Omax}	Maximum output current	$U_I - U_O$ = 5 V	1,0	-	25±10	A
I_{Omin}	Minimum output current	U_I = 15 V	-	5	25±10; 0; 125	mA
I_{Adj}	Adjustment current	$U_I \leq$ 15 V, I_O = -5 mA	-	120		μA
ΔI_{Adj}	Adjustment current change	1,5 V $\leq (U_I-U_O) \leq$ 10 V -10 mA $\leq I_O \leq$ -1 A	-	5,0		μA
SVR	Supply voltage ripple rejection	$U_I - U_O$ = 3 V, I_O = -40 mA f=120 Hz U_r = 1 V[1), 2)]	60	-	25±10	dB
Regterm	Thermostability	t = 30 ms	-	0,1	25±10	%/W

Table 4 –continued

Symbol	Parameter	Measurement mode	Value		Junction temperature °C	Unit
			Min.	Max.		
IL5218G, IL5225G, IL5228G, IL5230G,IL5233G, IL5250G						
U_O	**Output voltage**					V
	IL5218G	U_I = 3,8 V; I_O = -10 mA	1,78	1,82	25±10	
		3,3 V ≤ U_I ≤ 8,0 V 0 mA≤ I_O≤ -0,8 A	1,76	1,84	0 ÷ 125	
		3,3 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	1,76	1,84	25±10	
		3,3 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	1,746	1,854	0; 125	
	IL5225G	U_I = 4,5 V; I_O = -10 mA	2,475	2,525	25±10	
		3,9 В ≤ U_I ≤ 10 В 0 мА≤ I_O≤ -800 мА	2,45	2,55	0 ÷ 125	
		3,9 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,45	2,55	25±10	
		3,9 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,425	2,575	0; 125	
	IL5228G	U_I = 4,85 V; I_O = -10 mA	2,82	2,88	25±10	
		4,25 В ≤ U_I ≤ 10 В 0 мА≤ I_O≤ -800 мА	2,79	2,91	0 ÷ 125	
		4,25 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,79	2,91	25±10	
		4,25 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,764	2,936	0; 125	
	IL5230G	U_I = 5,0 V; I_O = -10 mA	2,97	3,03	25±10	
		4,5 В ≤ U_I ≤ 10 В 0 мА≤ I_O≤ -800 мА	2,94	3,06	0 ÷ 125	
		4,5 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,94	3,06	25±10	
		4,5 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	2,91	3,09	0; 125	
	IL5233G	U_I = 5,3 V; I_O = -10 mA	3,267	3,333	25±10	
		4,75 В ≤ U_I ≤ 10 В 0 мА≤ I_O≤ -800 мА	3,235	3,365	0 ÷ 125	
		4,75 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	3,235	3,365	25±10	
		4,75 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	3,201	3,399	0; 125	
	IL5250G	U_I = 7,0 V; I_O = -10 mA	4,95	5,05	25±10	
		6,5 В ≤ U_I ≤ 10 В 0 мА≤ I_O≤ -800 мА	4,9	5,1	0 ÷ 125	
		6,5 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	4,9	5,1	25±10	
		6,5 V ≤ U_I ≤ 8,0 V -0,8 A < I_O≤ -1,0 A	4,85	5,15	0; 125	

Table 4 –continued

Symbol	Parameter	Measurement mode	Value		Junction temperature °C	Unit
			Min.	Max.		
$\Delta U_{O(U)}$	Line regulation				25±10; 0; 125	mV
	IL5218G	3,3 V≤ U_I ≤ 8,0 V; I_O = 0 mA	-	6,0		
	IL5225G	3,9 V≤ U_I ≤ 10 V; I_O = 0 mA	-	6,0		
	IL5228G	4,25 V≤ U_I ≤ 10 V; I_O = 0 mA	-	6,0		
	IL5230G	4,5 V≤ U_I ≤ 12 V; I_O = 0 mA	-	6,0		
	IL5233G	4,75 V≤ U_I ≤ 15 V; I_O = 0 mA	-	6,0		
	IL5250G	6,5 V≤ U_I ≤ 15 V; I_O = 0 mA	-	10		
$\Delta U_{O(I)}$	**Load regulation**				25±10; 0; 125	mV
	IL5218G	U_I = 3,3 V; 0 mA≤ I_O≤ -800 mA	-	10		
		U_I = 3,3 В; 0 мА≤ I_O≤ -1 А	-	15		
	IL5225G	U_I = 3,9 V; 0 mA≤ I_O≤ -800 mA	-	10		
		U_I = 3,9 В; 0 мА≤ I_O≤ -1 А	-	15		
	IL5228G	**U_I = 4,25 V;0 mA≤ I_O≤ -800 mA**	-	10		
		U_I = 4,25 В; 0 мА≤ I_O≤ -1 А	-	15		
	IL5230G	U_I = 4,5 V; 0 mA≤ I_O≤ -800 mA	-	10		
		U_I = 4,5 В; 0 мА≤ I_O≤ -1 А	-	15		
	IL5233G	U_I = 4,75 V; 0 mA≤ I_O≤ -800 mA	-	10		
		U_I = 4,75 В; 0 мА≤ I_O≤ -1 А	-	15		
	IL5250G	U_I = 6,5 V; 0 mA≤ I_O≤ -800 mA	-	15		
		U_I = 6,5 В; 0 мА≤ I_O≤ -1 А	-	25		
U_{ds}	**Drop-out voltage**	I_O = -100 mA	-	1,1		V
		I_O = -500 mA	-	1,15		
		I_O = -800 mA	-	1,2		
		I_O = -1 A	-	1,3		
I_{Omax}	**Maximum output current**				25±10	A
	IL5218G	U_I = 6,8 V	1,0	-		
	IL5225G	U_I = 7,5 V	1,0	-		
	IL5228G	U_I = 7,85 V	1,0	-		
	IL5230G	U_I = 8,0 V	1,0	-		
	IL5233G	U_I = 8,3 V	1,0	-		
	IL5250G	U_I = 10 V	1,0	-		
I_d	Supply (consumption) current				25±10; 0; 125	mA
	IL5218G	U_I ≤ 8,0 V	-	10		
	IL5225G	U_I ≤ 10 V	-	10		
	IL5228G	U_I ≤ 10 V	-	10		
	IL5230G	U_I ≤ 12 V	-	10		
	IL5233G	U_I ≤ 15 V	-	10		
	IL5250G	U_I ≤ 15 V	-	10		

Table 4 –continued

Symbol	Parameter	Measurement mode	Value		Junction temperature °C	Unit
			Min.	Max.		
SVR	Supply voltage ripple rejection	I_O = -40 mA, f=120 Hz, Ur = 1 V[2), 3)]	60	-	25±10	dB
	IL5218G	U_I = 4,8 V				
	IL5225G	U_I = 5,5 V				
	IL5228G	U_I = 5,85 V				
	IL5230G	U_I = 6,0 V				
	IL5233G	U_I = 6,3 V				
	IL5250G	U_I = 8,0 V				
Regterm	Thermostability	t = 30 ms			25±10	%/W
	IL5218G		-	0,1		
	IL5225G		-	0,1		
	IL5228G		-	0,1		
	IL5230G		-	0,1		
	IL5233G		-	0,1		
	IL5250G		-	0,1		

Note

1. For measurement of electric parameters for junction temperature T_J =125°C, ambient temperature has to be provided T_A =125°C. It is necessary to meet following conditions:

- duration of test mode with load current more than 5 mA is less than 30ms, measurement of correspondent parameter must be processed during this time;

- ratio of time of test mode with load current more than 5 mA and interval time between tests is not less 1/10. For this interval load current has to be switched-off.

For case of mentioned requerments cann't be provided ambient temperature T_A has to be established under results of measurement R_{TJA} according formula

$$T_A = 125 - I_O \bullet (U_I - U_O) \bullet R_{TJA} \quad , \qquad (3)$$

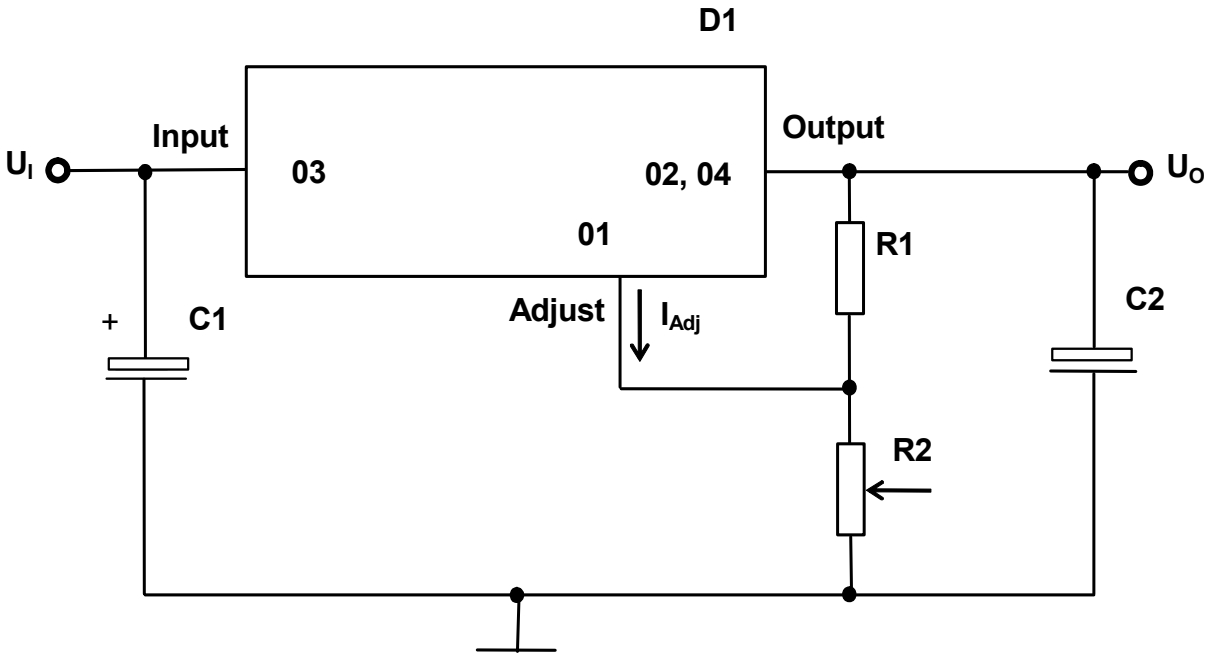
125 – is maximum permissible operating junction temperature, °C
I_O – load (output) current
U_I - Input voltage, V;
U_O – output voltage, V;
R_{TJA} – thermal resistance junction-ambient of the device, °C/W .

2. Mark "minus" before value of a current means only its direction (an output current). Absolute value of indicated on a current measuring device is accepted as value of a current

1) It is permitted to measure SVR at U_r = 3 V.
2) U_r - peek-to-peek value

Table 5 – Typical values of electric parameters

Symbol	Parameter	Measurement mode	Typical value	Unit
TS	**Temperature coefficient of voltage non-stability**			%
	IL5212G	$T_J = 0 \div 125\ ^{O}C$	1,0	
	IL5200G, IL5218G, IL5225G		0,5	
	IL5228G, IL5230G, IL5233G, IL5250G		1,5	
S	**Time coefficient of output voltage non-stability**	1000 Hours $T_J = 125\ ^{O}C$ (for check-out)	0,3	%
U_{nrms}	Output noise voltage IL5212G, IL5200G	$T_J = 25\ ^{o}C$ 10 Hz ≤ f ≤ 10 kHz	0,003	%
	IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G		100	μV



C1 –electrolytic capacitor10 μF

C2 - electrolytic capacitor 10 μF

D1 –integrated circuit

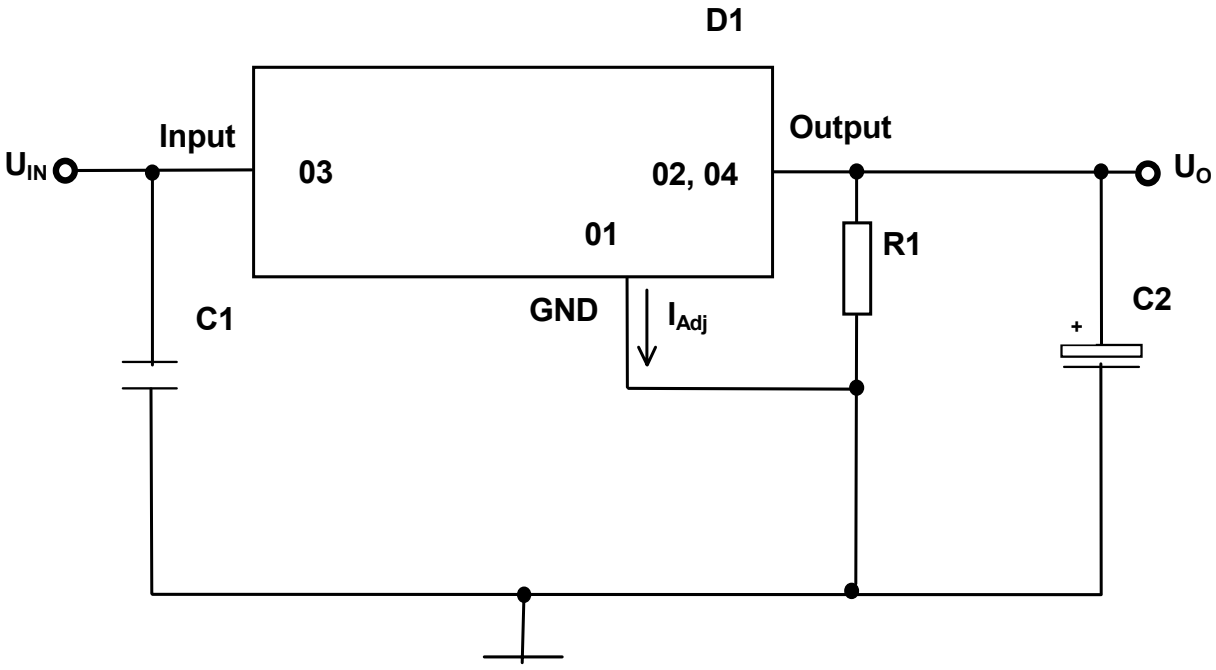
R1 –resistor120 Ω ± 1%
R2 - trimmer resistor with accuracy ± 1 %.
Output voltage U_O , V, is calculated by formula:

$$U_O = U_{ref}(1 + \frac{R2}{R1}) + I_{Adj}R2 \ , \qquad (4)$$

U_{ref} - reference voltage, V,

I_{Adj} - adjustment current, μA.

Fig 3 - IL5200G application diagram



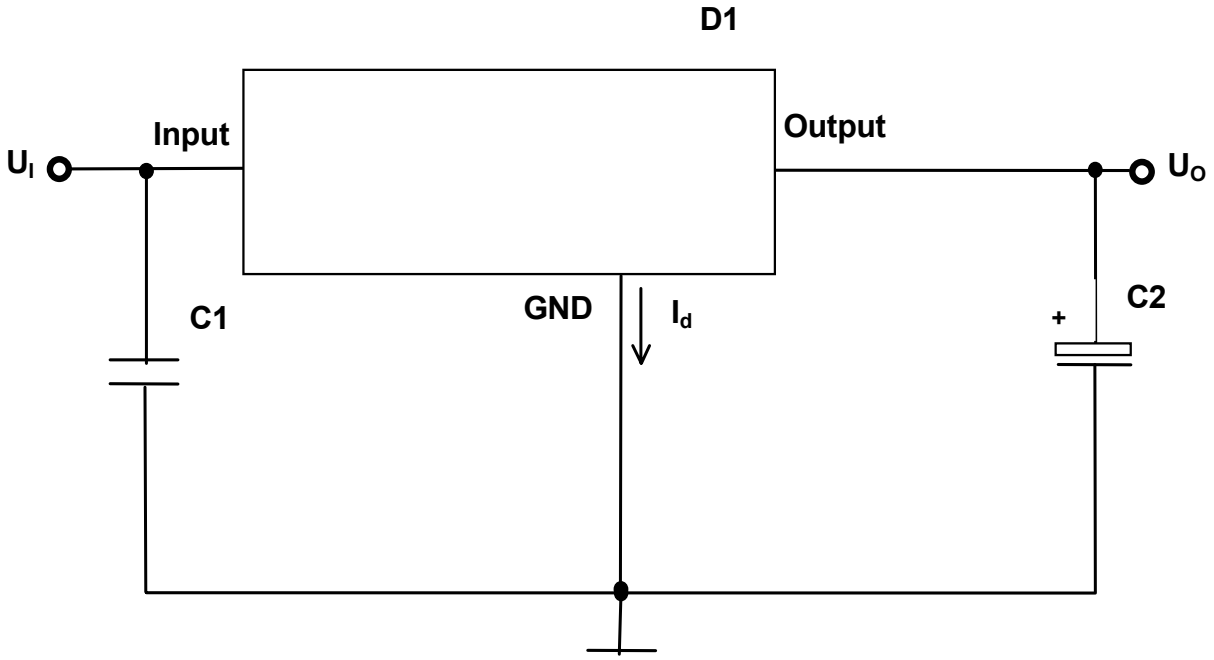
C1 – capacitor 100 nF

C2 - electrolytic capacitor 10 μF

D1 – integrated circuit

R1 – resistor 120 Ω ± 1%

Fig 4 - IL5212G application diagram



C1 – capacitor 100 nF

C2 - electrolytic capacitor 10 μF

D1 – integrated circuit

Fig 5 - IL5218G, IL5225G, IL5228G, IL5230G, IL5233G, IL5250G application diagram

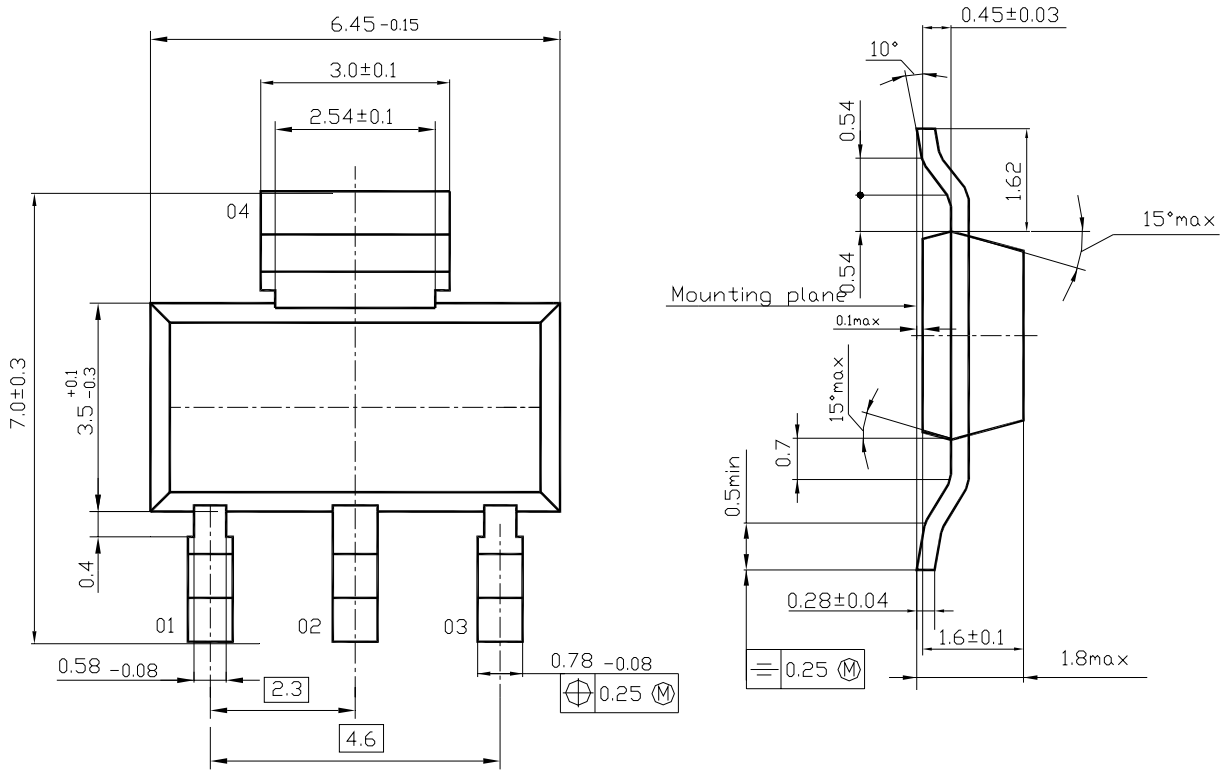
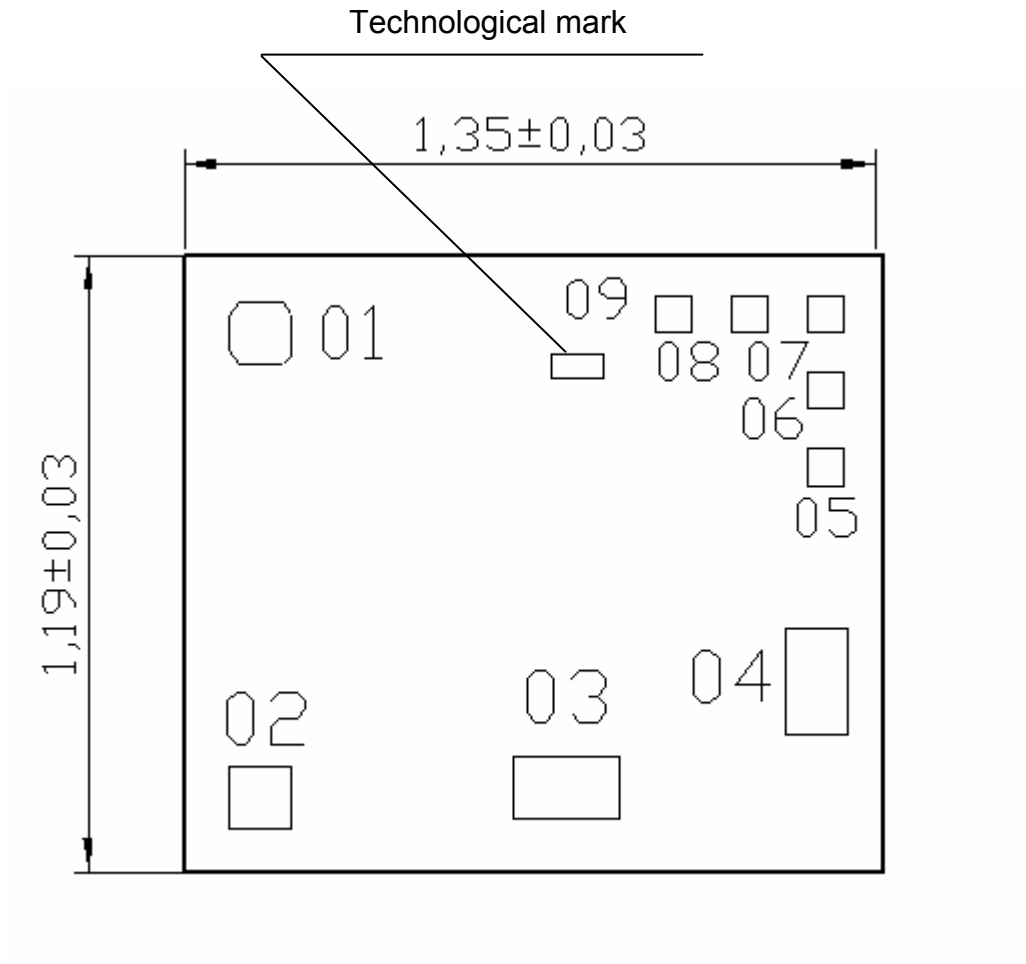


Fig. 6 – Package dimension



Contact pad coordinates are shown in table 6

Technological mark coordinates : left bottom corner x = 0,7315 , y = 0,990 (shown in table 7).

Die thickness 0,35±0,02 mm.

Fig. 7 – Chip diagram and contact pad location

Table 6

Contact pad number	Coordinates (left bottom corner), mm		Contact pad size, mm
	X	Y	
01	0,085	0,984	0,120x0,120
02	0,085	0,085	0,120x0,120
03	0,6345	0,1035	0,206x0,120
04	1,160	0,2665	0,120x0,206
05	1,205	0,748	0,070x0,070
06	1,205	0,8965	0,070x0,070
07	1,205	1,045	0,070x0,070
08	1,0565	1,045	0,070x0,070
09	0,908	1,045	0,070x0,070
Note: Contact pad coordinates are indicated under «Passivation» layer			

Table 7

Integrated circuit	Technological mark
IL5200G	5200
IL5212G	5212
IL5218G	5218
IL5225G	5225
IL5228G	5228
IL5230G	5230
IL5233G	5233
IL5250G	5250

Table 8 - Pad description

Pad number	**Symbol**	**Functional purpose**
01	Adj (IL5200G)	Adjustment (for IL5200G)
	GND (for rest (fixed) versions)	Common (for rest (fixed) versions)
02	Output	Output
03		
04	Input	Input
05-09	-	Not bonded