Low-power voltage repeater with ±0,5 % accuracy with low drop voltage

(FUNCTIONAL EQUIVALENT OF TLE4250 INFINEON)

ILE4250G, ILE4250S - are integrated circuits of low-power voltage repeater (adapter) with ±0,5 % accuracy, load capacity up to 50 mA and with low-drop voltage. ICs realized in 5-pin plastic packages ILE4250G - P-TO263-5-1, ILE4250S – P-TO220-5-12.

Integrated circuits of low-power voltage repeater (adapter) are purposed to transfer voltage with ±0,5 % accuracy (for load current 1…50mA) at a range of input voltages from 6 to 28 V, with ±0,5 % accuracy (for load current 1…10mA) at a range of input voltages from 6 to 40 V, and with ±0,1 % accuracy (for load current 1…10mA) at a range of input voltages from 6 to 16 V.

Drop voltage is less 0,3 at load current 10 mA. The ICs are tolerant to over voltage of both polarities (positive & negative). Adjustment pin input voltage ICs is in range from 2 to 36 V

The ICs are used in power supply units of electronic devices, especially in automotive electronics.

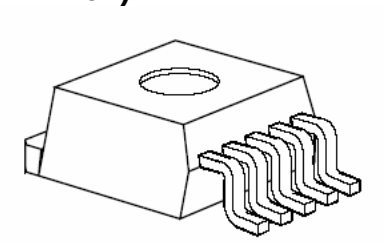


Fig. 1 – View of IC in P-TO263-5-1 package

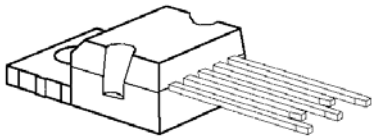


Fig. 2 – View of IC in P-TO220-5-12 package

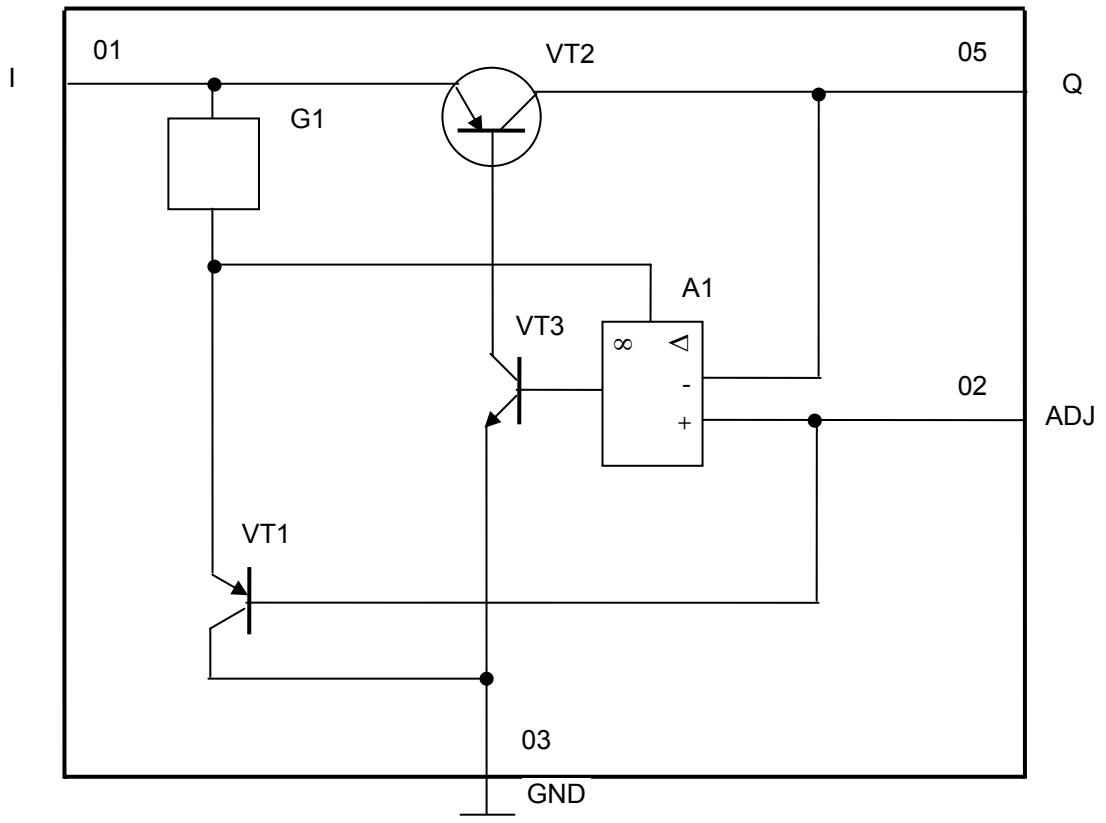
Main features

- o High accuracy of the output voltage ± 0,5%;
- o Low-drop voltage ;
- o Buit in overheating protection;
- o Reverse polarity proof;
- o Low consumption current;
- o Input voltage from3 to 40 V;
- o Suitable for use in automotive electronics;
- o Wide junction temperature range -40 … +150°C;

Permissible value of ESD potential 1000V

Table 1 Pins description

Package pin number	Chip pad number	Symbol	Function
01	01	I	Input
02	02	ADJ	Adjustment/disable input
03	03	GND	Common pin (Ground)
04	-	NC	Not connected pin
05	04	Q	Output



A1 –amplifier;
G1 – current source;
VT1 – VT3 - transistors

Fig. 3 – Electric block diagram

Table 2 Absolute Maximum Ratings

Symbol	Parameters	Norm		Unit
		min.	max.	
T_J	Junction temperature	-40*	150	^oC
T_{stg}	Storage temperature	-50	150	^oC
U_I	Input voltage	-42	45	V
U_Q	Output voltage	-1**	40**	V
U_{ADJ}	Adjustment/disable pin voltage	-0,3**	40**	

* Ambient temperature is indicated.
** Voltage is not applied to input I

Table 3 – Recommended operation modes

Symbol	Parameter	Norm		Unit
		Min.	Max.	
T_J	Junction temperature	-40*	150	^oC
U_I	Input voltage	3	40	V
U_{ADJ}	Adjustment/disable pin voltage	2	36	V

Note:
Maximum power P_{tot},W, dissipated by IC at ambient temperature T_A , is calculated by formula:

$$P_{tot} = (150 - T_A) / R_{th\ j\text{-}a} , \quad (1)$$

150 – maximum permissible operating junction temperature, ^oC.
$R_{th\ j\text{-}a}$ - thermal resistance junction ambient, ^oC /W,
for ILE4250G without heat sink $R_{th\ ja}$ is equal 80 ^oC /W
for ILE4250S without heat sink $R_{th\ ja}$ is equal 65 ^oC /W

for IC with heat sink $R_{th\ ja}$ is calculated by formula

$$R_{th\ j\text{-}a} = R_{th\ j\text{-}c} + R_{th\ c\text{-}a} , \quad (2)$$

$R_{th\ j\text{-}c}$ - thermal resistance junction case, ^oC /W. $R_{th\ jc}$ = 4 ^oC/W.
Thermal resistance case-ambient $R_{th\ c\text{-}a}$ is determined by heat sink design and is selected by IC customer.
Application circuit and heat sink and ambient temperature have to provide junction temperature not more $T_J \leq 150\ ^oC$.

* Ambient temperature is indicated.

Table 4 – Electric parameters
(U_I = 13,5 V, U_{ADJ} > 2,0 V, -40 °C ≤ T_J ≤ 150 °C unless otherwise specified)

Symbol	Parameter	Mode of measurement	Norm		Unit
			Min.	Max.	
ΔU_Q	Voltage repeating accuracy	6 V ≤ U_I ≤ 28 V -1 mA ≤ I_Q ≤ -50 mA	- 0,5	0,5	%
		6 V ≤ U_I ≤ 40 V -1 mA ≤ I_Q ≤ -10 mA	- 0,5	0,5	
		6 V ≤ U_I ≤ 16 V -1 mA ≤ I_Q ≤ -10 mA	- 0,1	0,1	
U_{dr}	Drop voltage	I_Q = -10 mA, U_{ADJ} > 4.0 V Note 2	-	0,3	V
I_q	Consumption current $I_q = I_I - I_Q$	I_Q ≤ -30 mA	-	3,0	mA
		I_Q ≤ -1 mA	-	0,15	
		U_{ADJ} = 0 V, T_J < 85 °C	-	0,02	
		U_{ADJ} =U_I=5 V,I_Q =0 mA	-	3,0	
I_{Qmax}	Maximum output current	T_J ≤ 125 °C Note 2	50	-	mA
$\Delta U_{Q(U)}$	Supply (input) voltage regulation of output voltage	6 V ≤ U_I ≤ 40 V I_Q = -10 mA	-10	10	мV
$\Delta U_{Q(I)}$	Load current regulation of output voltage	-1 mA ≤ I_Q ≤ -30 mA	- 15	15	мV
Adjustment/disable input parameters					
I_{ADJ}	Adjustment/disable pin current	U_{ADJ} = 5 V T_J < 125 °C	-	0,5	мкA
$U_{ADJ\ off}$	Adjustment /disable pin switching off voltage	IC is off T_J < 125 °C	0,8	-	V
U_{ADJ}	Adjustment range	$\|U_Q - U_{ADJ}\|$ < 0,5%, $U_I \geq U_Q$ +0,3 V, T_J < 125 °C	2,0	36	V

Notes
1. Measurement of electric parameters is processed with connected input capacities C_{I1} = 100 μF, and output capacity C_Q = 2,2 μF.
2. Parameter is measured, when the output voltage V_Q has dropped 100 mV from the nominal value obtained at U_I = 13.5 V.

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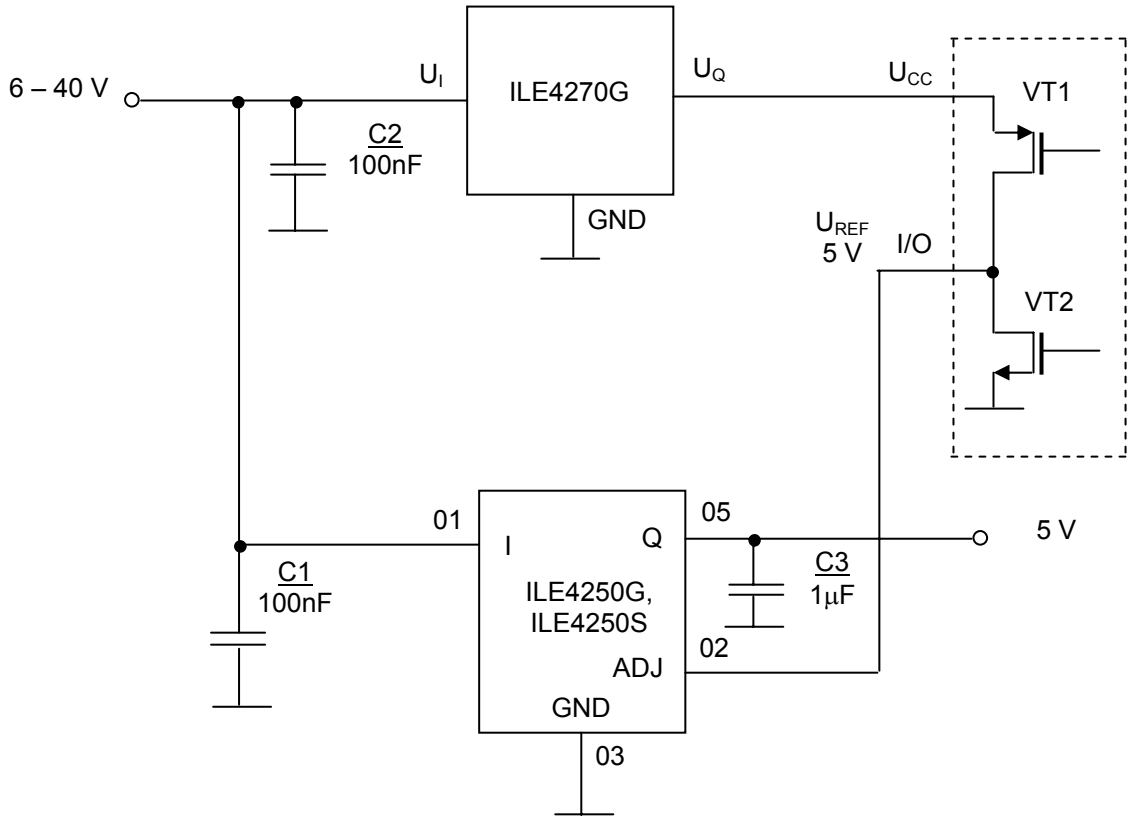
* Ambient temperature is indicated.

Table 5 – Typical electric parameters
(U_I = 13,5 V, U_{ADJ} > 2,0 V, -40 °C ≤ T_J ≤ 150 °C unless otherwise specified)

Symbol	Parameter	Mode of measurement	Typical value	Unit
PSRR	Ripple rejection ratio	f_r = 100 Hz, I_Q = -100 mA U_r = 0,5** V (p - p)	60	dB

* Ambient temperature is indicated.
** It is permitted to measure at $U_{r(p-p)}$ = 3 V, but for that PSRR norm to be revised



VT1, VT2 – transistors

Fig 4 – Typical application diagram

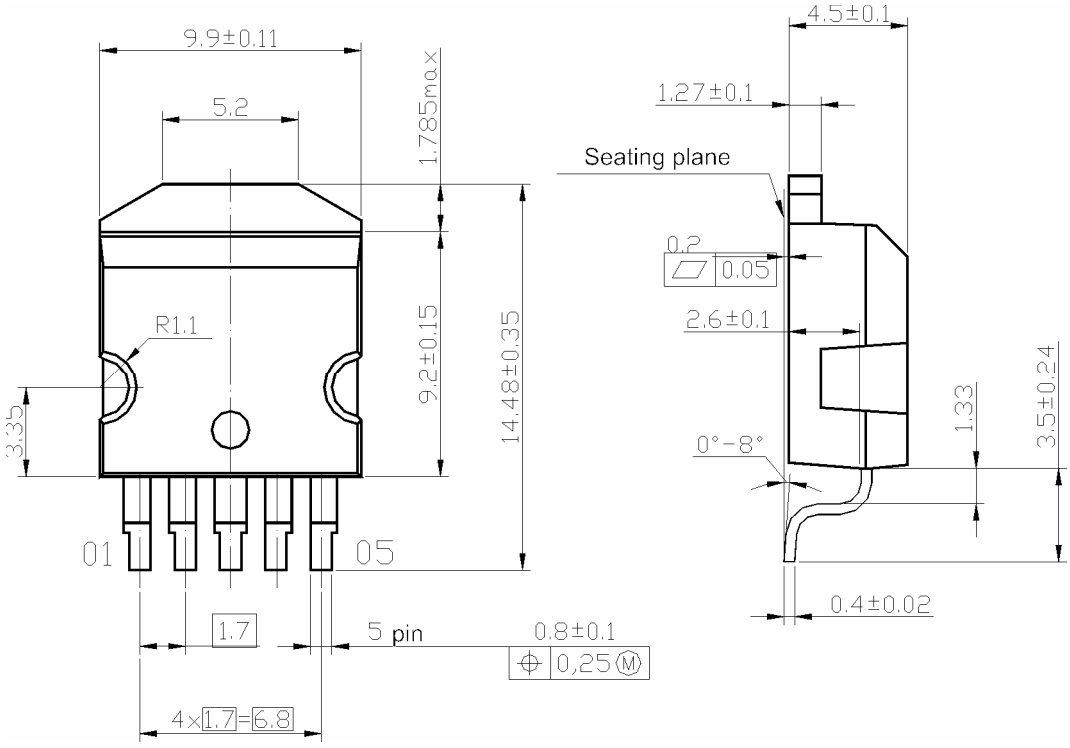


Fig 5 – P-TO263-5-1 package outline

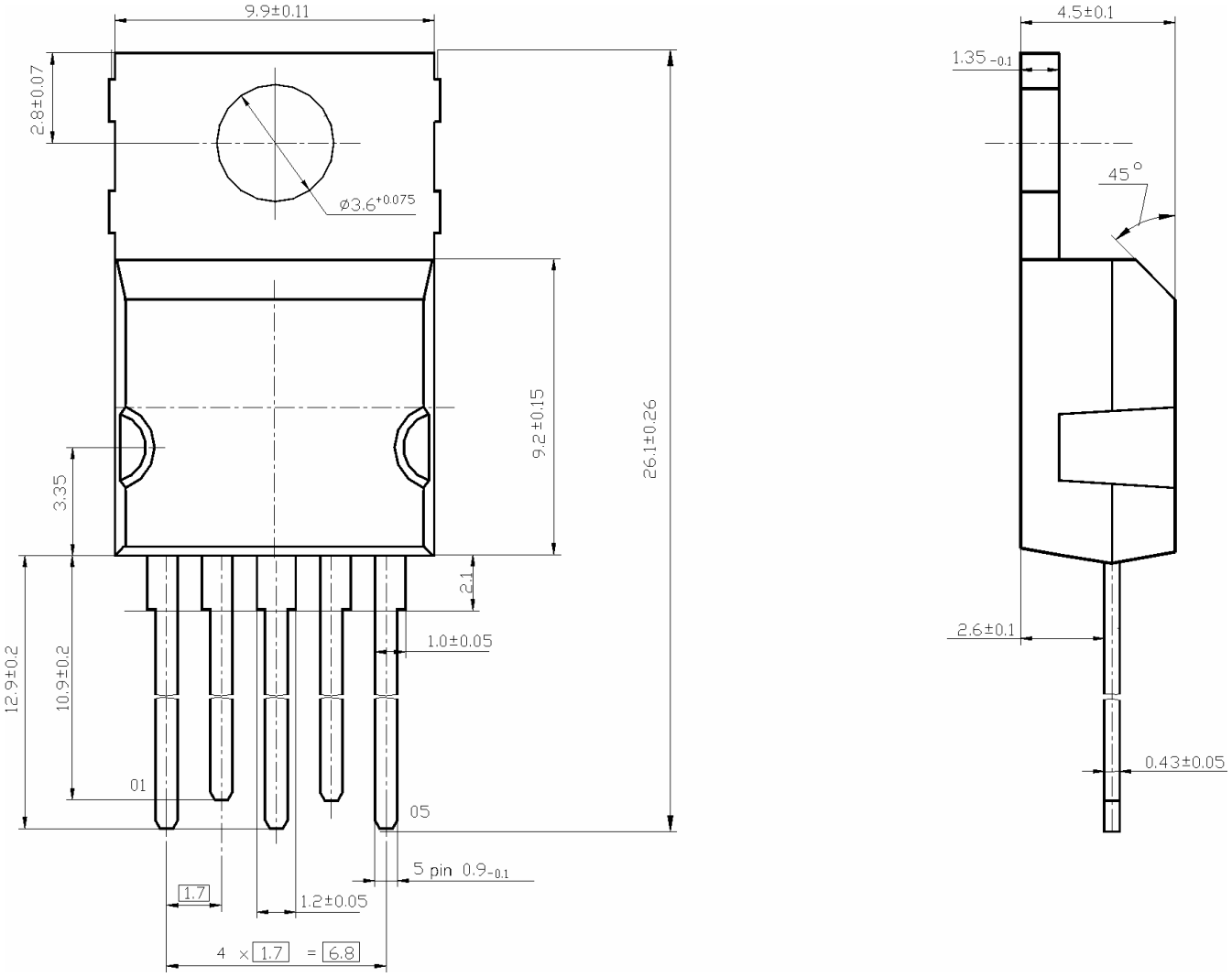
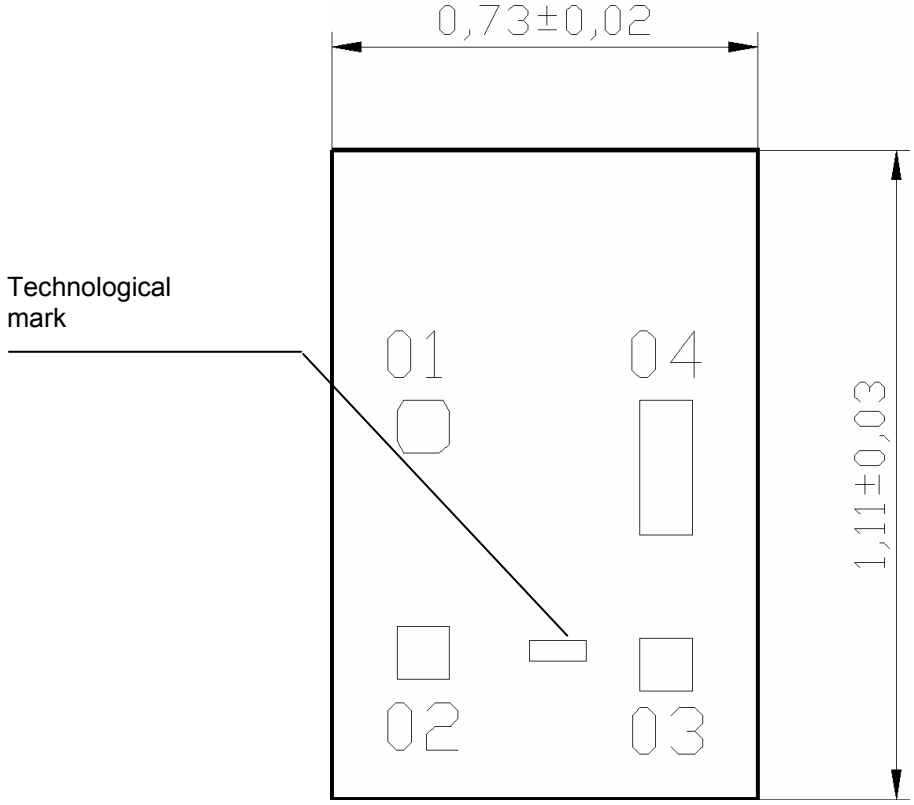


Fig. 6 – P-TO220-5-12 package outline



Contact pad coordinates are indicated in the table 6.

Technological mark on chip «4250.» has coordinates, mm: left bottom corner x = 0,340 , y = 0,210 .

Chip thickness is 0,35±0,02.

Fig. 7– Chip outline drawing

Table 6 Contact pad location table

Contact pad number	Coordinates (Left bottom corner), mm	
	X	Y
01	0,112	0,593
02	0,112	0,206
03	0,528	0,186
04	0,528	0,453

Notes

1. Coordinates and size of the contact pads are given by the layer «Passivation»

2 Sizes of contact pads are

pads 01-03 - 0,090 x 0,090 mm,

pad 04 - 0,090 x 0,230 мм.

3 Bevel of two corners of the first contact pad (24 ± 2) μm