IC of low power voltage regulator 5V/400mA with low drop voltage

(FUNCTIONAL EQUIVALENT OF TLE4275 INFINEON)

ILE4275G, ILE4275S - are integrated circuits of voltage regulator 5V/400 mA with low-drop voltage. ICs realized in 5-pin plastic packages ILE4250G - P-TO263-5-1, ILE4250S – P-TO220-5-12.
ICs of voltage regulator 5V/400 mA are purposed to supply DC voltage 5V with 2% accuracy at a range of input voltages from 5,6 to 40 V , with drop voltage 0,5V at load current 300 mA. ICs are used in power supply units of electronic devices, including automotive electronics. Maximum input voltage is 45 V. The ICs are tolerant to over voltage of both polarities (positive & negative), provide internal current limitation and output voltage thermal shutdown. Reset function is available.

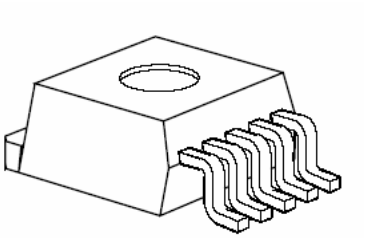


Fig. 1 – View of IC in P-TO263-5-1 package

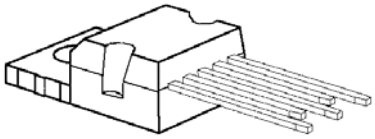


Fig. 2 – View of IC in P-TO220-5-12 package

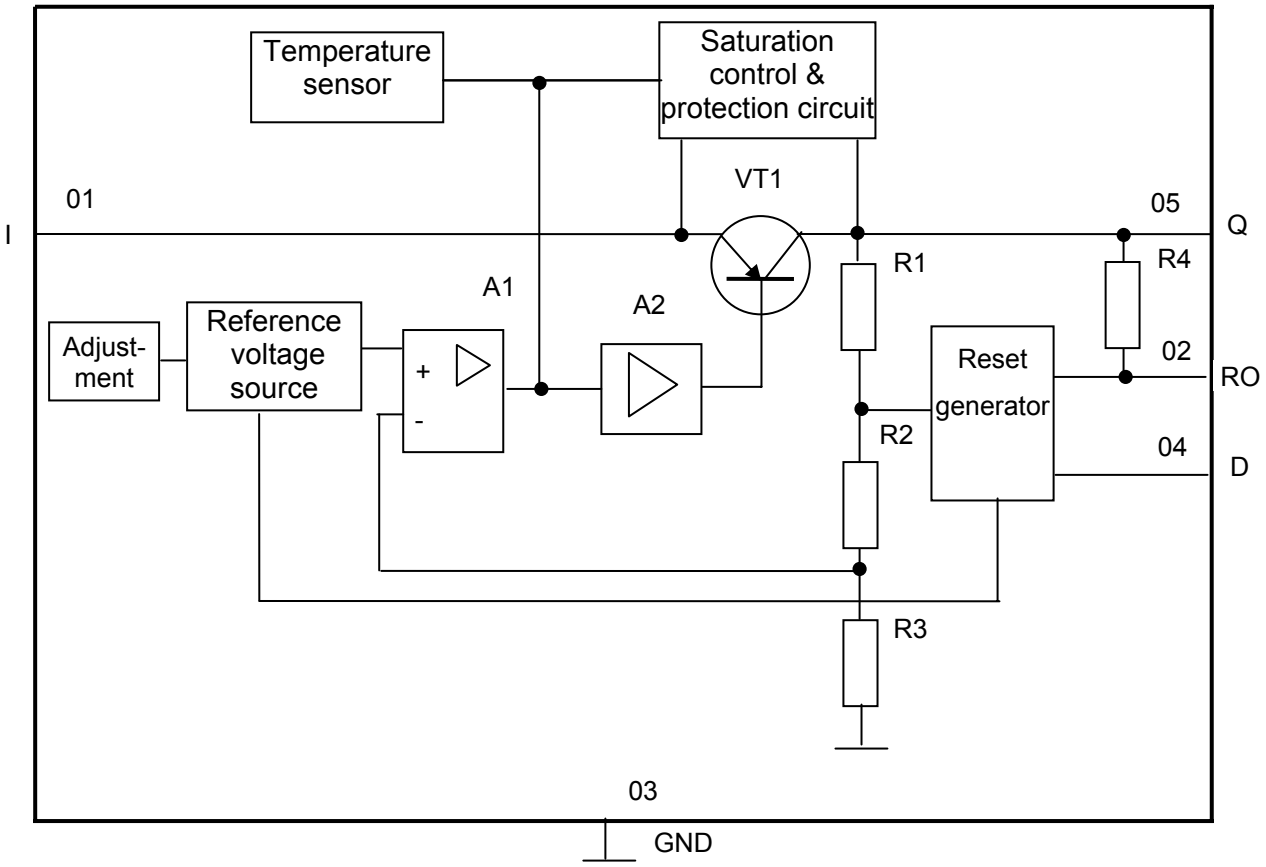
Main features

- o High accuracy of the output voltage 5 V ± 2%;
- o Low-drop voltage ;
- o Built-in overheating protection;
- o Reverse polarity proof;
- o Low consumption current;
- o Input voltage up to 45 V;
- o Suitable for use in automotive electronics;
- o Wide junction temperature range -40 … +150°C;
- o Reset function.

Permissible value of ESD potential 1000V

Table 1 Pins description

Chip pad number	Package pin number	Symbol	Function
01	01	I	Input
02	02	RO	Reset output
03	03	GND	Common pin (Ground)
04	04	D	Reset delay pin
05, 06	05	Q	Output
07 - 10	-	-	Not bonded (not used)



A1 – control amplifier;
A2 – buffer;
R1 – R4 –resistors;
VT1 - transistor

Fig. 3 – Electric block diagram

Table 2 Absolute Maximum Ratings

Symbol	Parameters	Norm		Unit
		min.	max.	
T_J	Junction temperature	-40*	150	°C
T_{stg}	Storage temperature	-50	150	°C
U_I	Input voltage	-42	45	V
U_D	Reset delay pin voltage	-0.3**	7**	V
I_D	Reset delay pin current	-2	2	mA
U_R	Reset pin voltage	-0,3**	25**	V
I_{RO}	Reset pin current	-5	5	mA
U_Q	Output voltage	-1,0**	16**	V

* 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	°C
U_I	Input voltage	5,6	40	V
U_Q	Output voltage	4,9	5,1	V

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

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

150 – maximum permissible operating junction temperature, °C.
$R_{th\ j\text{-}a}$ - thermal resistance junction ambient (for IC without heat sink), °C /W,
for ILE4275G without heat sink $R_{th\ ja}$ is equal 80 °C /W
for ILE4275S without heat sink $R_{th\ ja}$ is equal 65 °C /W

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

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

$R_{th\ j\text{-}c}$ - thermal resistance junction case, °C /W. $R_{th\ jc}$ = 4 °C/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 $T_J \leq 150$ °C.

* 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.	
I_q	Consumption current $I_q = I_I - I_Q$	I_Q = -1 mA, T_J = 25 °C	-	0,2	mA
		I_Q = -1 mA, T_J < 85 °C	-	0,22	
		I_Q = -250 mA	-	10	
		I_Q = -400 mA	-	22	
I_{Qmax}	Maximum output current	-	450	-	mA
U_{dr}	Drop voltage	I_Q = -300 mA Note 2	-	0.5	V
U_Q	Output voltage	6 V ≤ U_I ≤ 28 V -5 mA ≤ I_Q ≤ -400 mA	4.9	5.1	V
		6 V ≤ U_I ≤ 40 V -5 mA ≤ I_Q ≤ -200 mA	4.9	5.1	
$\Delta U_{Q(U)}$	Supply (input) voltage regulation of output voltage	8 V ≤ U_I ≤ 32 V I_Q = -5 mA	-15	15	mV
$\Delta U_{Q(I)}$	Load current regulation of output voltage	-5 mA ≤ I_Q ≤ -400 mA	-	30	mV
Reset generator parameters					
U_{RT}	Reset generator switching threshold voltage	-	4.5	4.8	V
I_{ROH}	Reset output leakage current	U_{ROH} = 5 V	-	10	μA
U_{ROL}	Reset output low level voltage	R_{ext} ≥ 5 kΩ, U_Q > 1 V	-	0,4	V
U_{DL}	RO output switching to low threshold voltage	-	0,2	0,7	V
U_{DU}	RO output switching to high threshold voltage	-	1,5	2,2	V
I_d	Charge current	U_D = 1 V	3,0	9,0	μA
t_d	Reset delay time	C_D = 47 nF	10	22	ms
t_{RR}	Reset reaction time	C_D = 47 nF	-	2	μs

Notes

1. Measurement of electric parameters is processed with connected input capacities C_{I1} = 100 μF, C_{I2} = 100 nF and output capacity C_Q = 22 μF.
2. Drop voltage $U_{dr} = U_I - U_Q$ is measured, when the output voltage U_Q has dropped 100mV from the nominal value obtained at U_I = 13.5 V.

* Ambient temperature is indicated.

Table 5 – Typical electric parameters
(U_I = 13,5 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 Hzц, I_Q = -100 mA U_r = 0,5** V (p - p)	60	dB
dU_Q/dT	Temperature factor of output voltage	-	0,5	mV/ °C

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

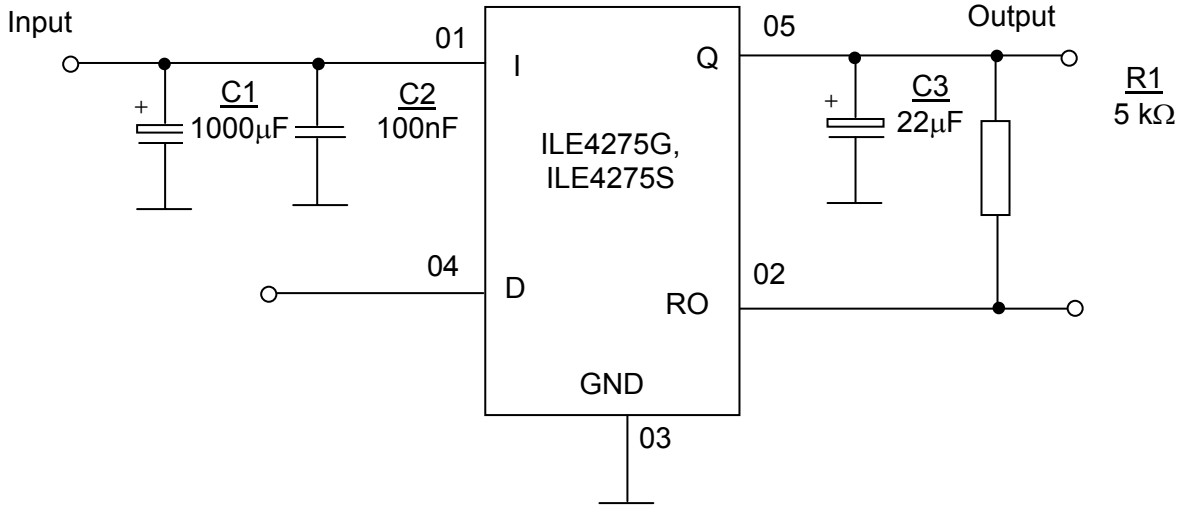


Fig 4 – Typical application diagram

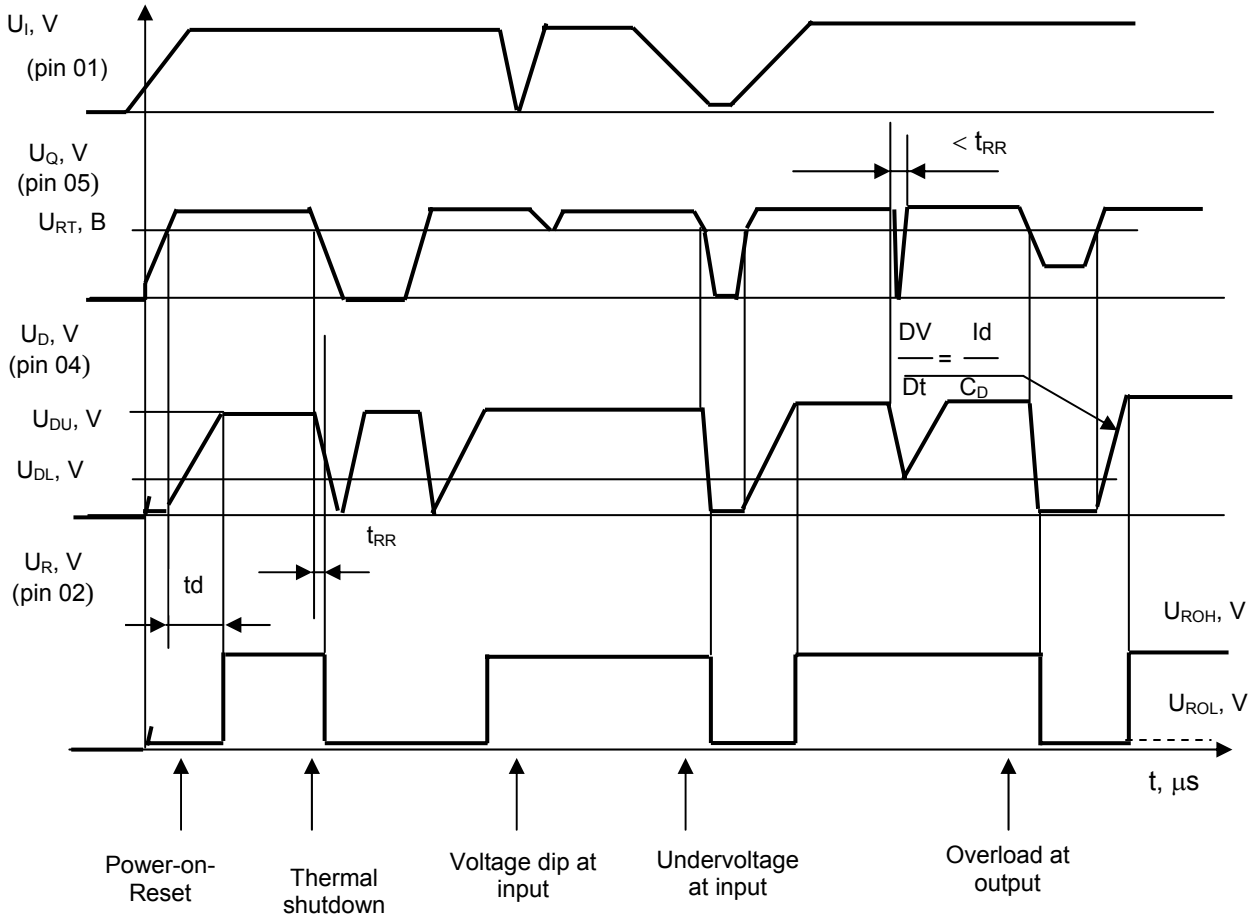


Fig 5 – Operation timing diagram

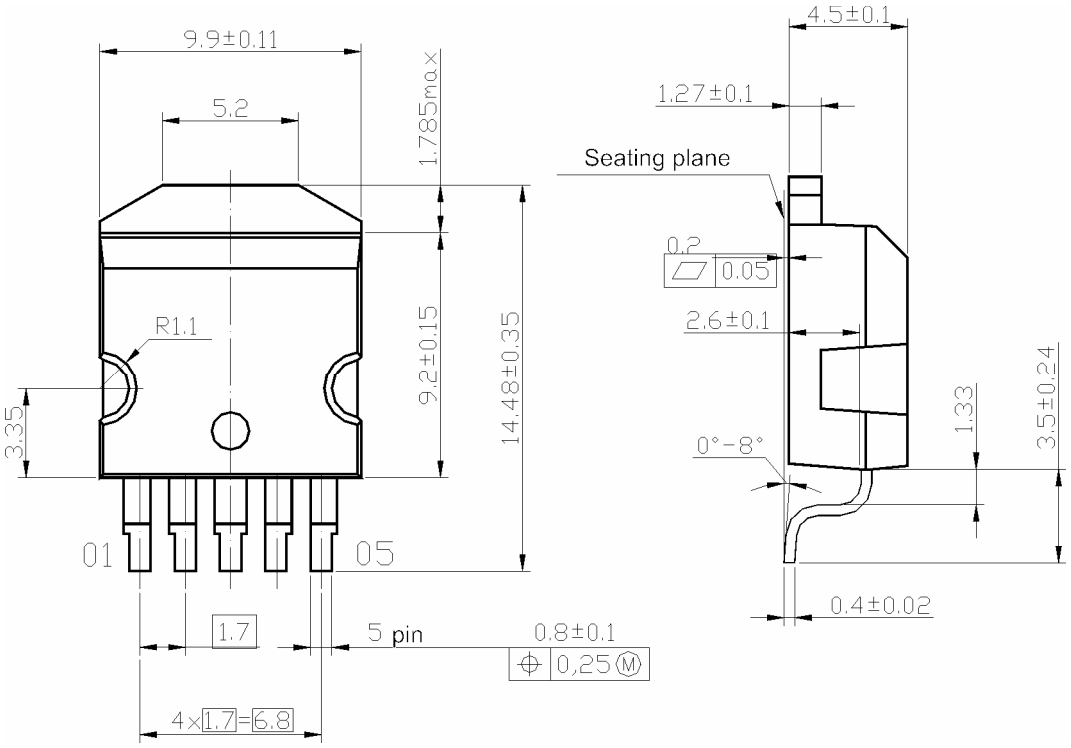


Fig 6 – P-TO263-5-1 package outline

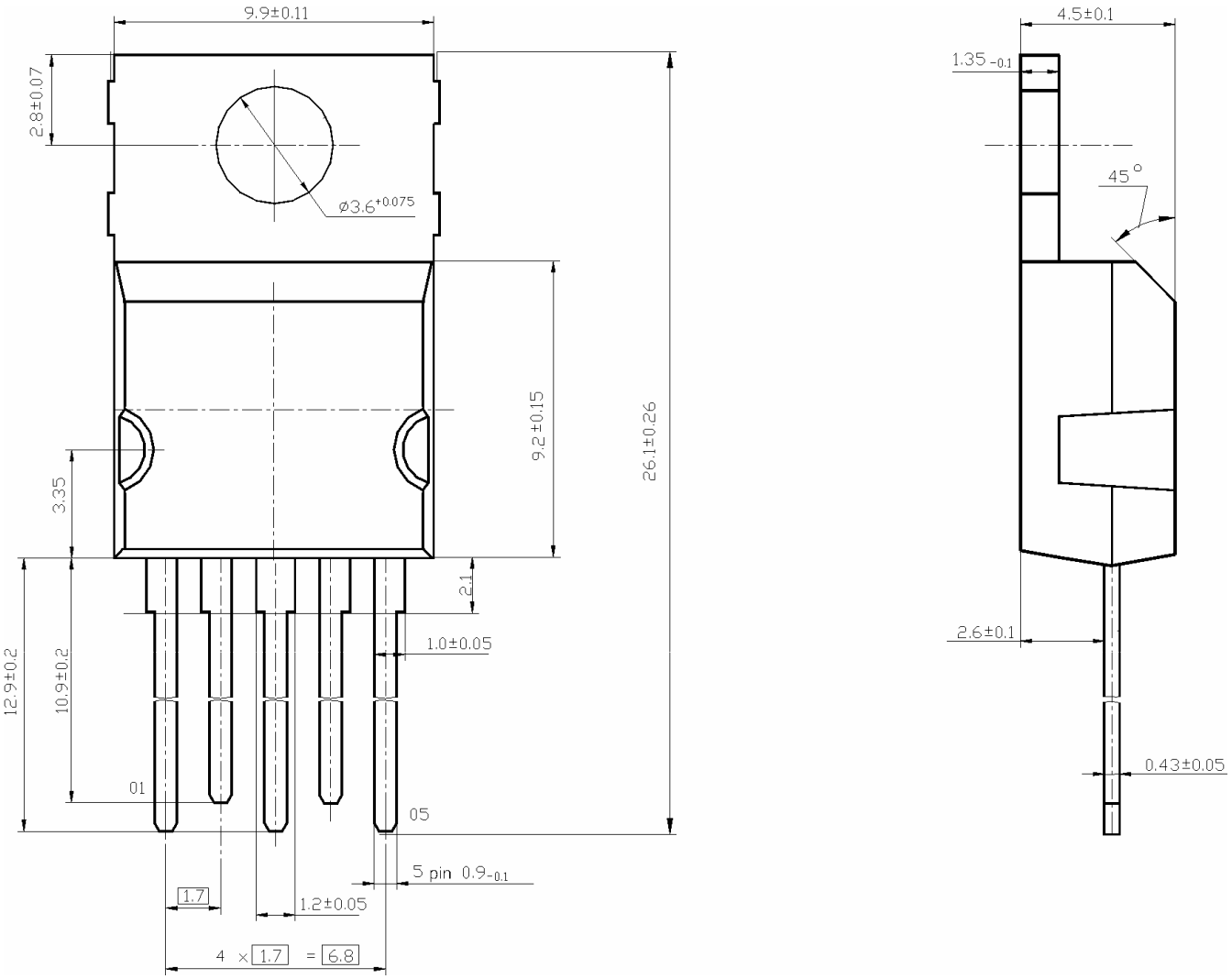
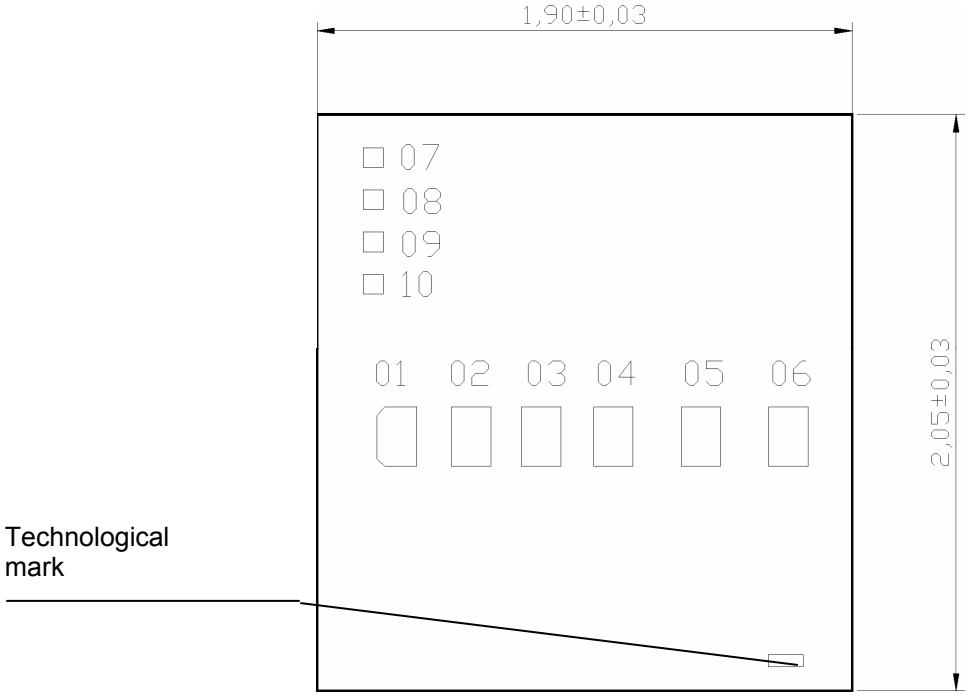


Fig. 7 – P-TO220-5-12 package outline



Contact pad coordinates are indicated in the table 6.

Technological mark on chip «4275» has coordinates, mm: left bottom corner x = 1,6755 , y = 0,1055 .

Chip thickness is 0,35±0,02.

Fig. 8– Chip outline drawing

Table 6 Contact pad location table

Contact pad number	Coordinates (Left bottom corner), mm	
	X	Y
01	0,213	0,797
02	0,477	0,797
03	0,7255	0,797
04	0,9815	0,797
05	1,2925	0,797
06	1,6035	0,797
07	0,164	1,862
08	0,164	1,712
09	0,164	1,562
10	0,164	1,412

Notes

1. Coordinates and size of the contact pads are given by the layer «Passivation»
2 Sizes of contact pads are
01 – 06 - 0,140 x 0,140 mm,
07 - 10 - 0,070 x 0,070 mm
3 Bevel of two corners of the first contact pad (24 ± 2) μm