

Application note

Space-saving 4-resistor arrays in 0804 package



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SUMMARY

Phycomp has recently introduced a new surface-mount 8-pin isolated resistor array that integrates four size 0402 resistors in a single size 0804 package. The new array takes up significantly less board space than a network based on discrete resistors whilst offering the bonuses of low inductance and excellent high-frequency behaviour. Moreover using the new array, equipment manufacturers are able to save significantly on assembly costs.

As today's applications move toward ever-higher processing speeds and levels of miniaturization, board space becomes more and more critical for layout design. This means that components need to be smaller and pack in more functionality than ever before.

Phycomp's new 4-resistor arrays provide the solution

To meet these requirements, Phycomp has recently introduced a new surface-mount 8-pin isolated resistor array that integrates four size 0402 resistors in a single size 0804 package. The array therefore takes up significantly less board space than a network based on discrete resistors (see Fig. 1) whilst offering the bonuses of low inductance and excellent high-frequency behaviour. Moreover, using the new array, equipment manufacturers are able to save significantly on assembly costs and on expensive investment in surface-mounting systems.

The new array extends Phycomp's growing range of integrated components aimed at supporting equipment manufacturers in their ongoing drive for miniaturization.

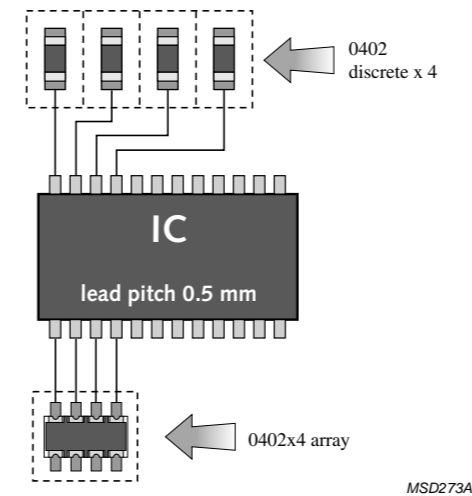


Fig. 1 Phycomp's new 4-resistor arrays use only 60% of the board space needed by discrete resistors

Advantages offered by Phycomp's new resistor arrays

- **Narrow termination pitch compatible with the fine (0.5 mm) pitch of today's ICs**, helping to reduce board space and improve wiring layout
- **Rugged 0.5 mm thick package** for reliable surface-mount assembly
- **Integrates four size 0402 resistors into a single 0804 package** greatly simplifying surface-mounting operations
- **High power dissipation** of up to 1/16 W at 50 V, equivalent to an 0603 discrete resistor
- **Total cost saving greater than 40% in customer application** (Fig. 2).

These advantages make the new isolated resistor arrays attractive for use in a broad range of modern equipment including notebook/desktop/Handy computers (where they find application in motherboards and hard disk drive circuitry), mobile phones and digital consumer equipment (e.g. DVD players, camcorders and advanced pagers).

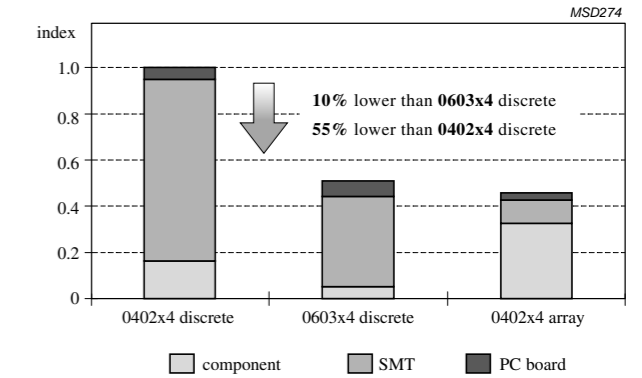


Fig. 2 Total cost savings greater than 40% is just one of the benefits offered by Phycomp's new 4-resistor array

Specifications and mechanical details

The new arrays are available in a choice of terminations: concave or convex.

Table 1 Resistor array specifications

	concave terminations	convex terminations
Size	0804 (0402 x 4)	
Resistance range	10 to 1MΩ; E24 series	
Resistance tolerance	±5% 1%	
Number of resistors	4	
Number of terminals	8	
TCR	±200 ppm/K	±300 ppm/K
Abs.max. dissipation at T _{amb} = 70 °C	1/16 W	
Maximum permissible voltage	50 V (DC or RMS)	
Operating temperature	-55 to +125 °C	
Stability after:		
• load, 1000 hours at T _{amb} = 70 °C	ΔR/R max. ±3.00% + 0.10 Ω	
• climatic tests	ΔR/R max. ±3.00% + 0.10 Ω	
• soldering	ΔR/R max. ±1.00% + 0.05 Ω	
• short time overload, 100V max.	ΔR/R max. ±2.00% + 0.05 Ω	

Mechanical data

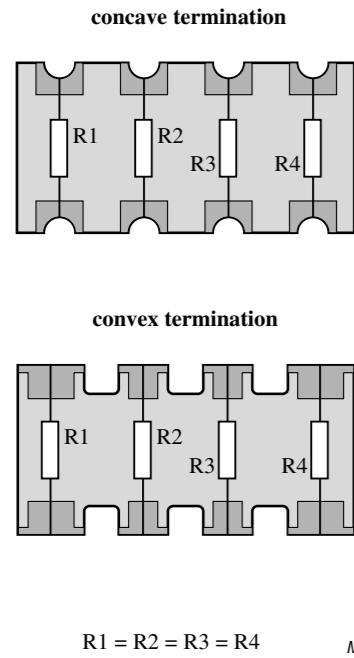


Fig. 3 Internal construction of Phycomp's 4-resistor array

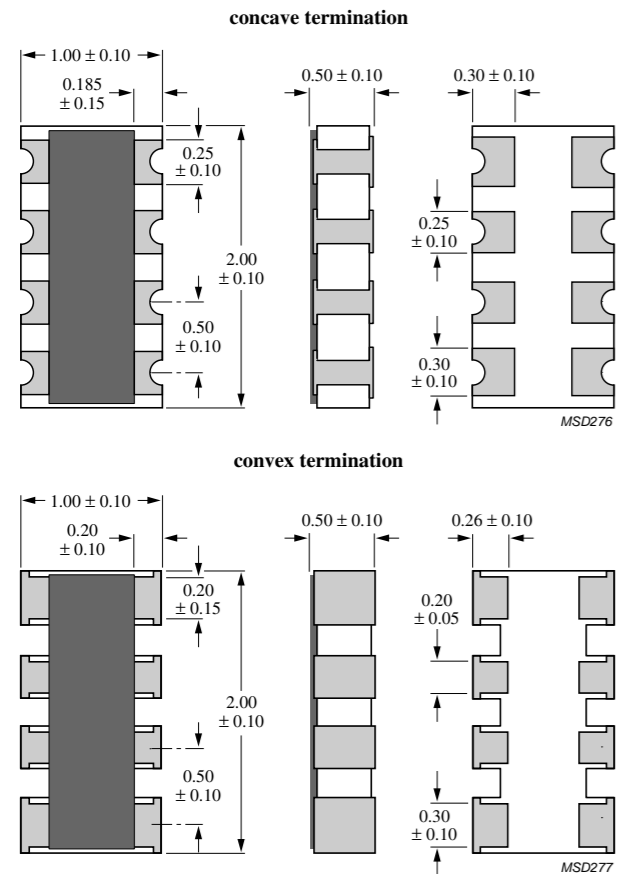


Fig. 4 Size 0804 resistor array (dimensions in mm)

High-frequency performance

Figure 5 compares the variation of impedance with frequency for an isolated resistor array and an 0603 discrete resistor. Both show that the normalized impedance ($|Z|/R$) varies with frequency and rapidly diverges from its ideal value of 1 due to the presence of parasitic inductances and capacitances. The figures also show, however, that this diversion from unity is greater for the 0603 resistor, showing that the HF performance of Phycomp's new resistor array is superior.

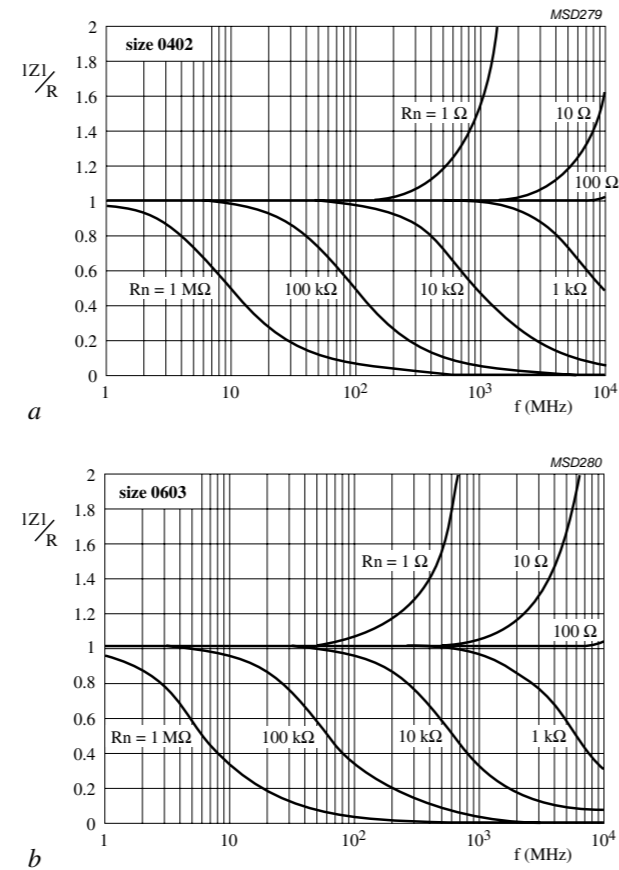


Fig. 5 Impedance as a function of frequency for (a) 4-resistor array and (b) discrete 0603 resistor

Typical applications

Figure 6 shows a basic application example for space saving and reducing wiring distance. In general, Phycomp's new 0804 isolated resistor array is ideal for use in pull-up/pull-down circuits, damping circuits, bridge networks, voltage (current) offset circuits and digital-to-analog converters.



Fig. 6 Pull-up and damping circuits are just two of the application areas for Phycomp's 4-resistor arrays

Component soldering

Reflow soldering

- Print solder paste to a thickness of 100 to 150 μm
- Use rosin-based flux, do not use activated flux (containing, for example, more than 0.2% by weight of chlorine)
- Use solder consisting of Sn/Pb in the proportions 63/37 or 60/40 or Sn/Pb/Ag in the proportion 62/36/2

Solder footprint

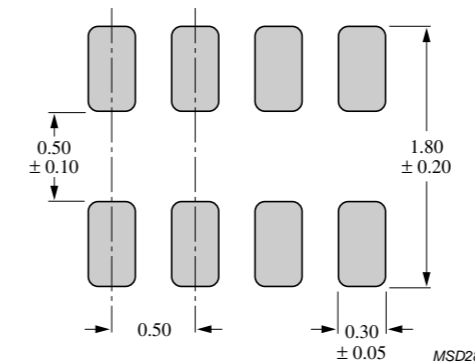


Fig. 7 Solder footprint (dimensions in mm)

Soldering conditions

Surface-mount resistors are tested for solderability at a temperature of 235 °C for 2 seconds. A typical example of a soldering process that provides reliable joints without any damage is given in Fig. 8.

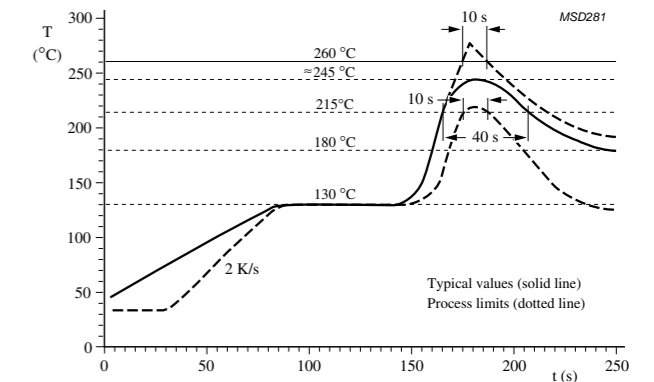


Fig. 8 Soldering conditions (infrared soldering)

Handling precautions

Soldering precautions

- Note that this product will be easily damaged by rapid heating, rapid cooling or local heating
- Do not subject the product to thermal shock by the use of soldering temperatures greater than 100 °C. We recommend the use of preheating and annealing (gradual cooling) stages during the soldering cycle
- Wave soldering of this product is not recommended since this can lead to the formation of solder bridging due to the narrow pitch of the product.

Solder gun precautions

Note the following precautions when using a solder gun for replacement:

- The tip temperature must not exceed 280 °C for 3 s.
- To ensure this, use a solder gun with a power of less than 30 W
- The solder gun tip must not come into direct contact with the product.

Substrate handling precautions

- Ensure that the PC board is not flexed excessively after the product and other components have been soldered. If necessary, use a support pin to prevent excessive flexing on the PC board
- Mount the products as far as possible from the break line of the PC board and from any line of large holes on the board
- Ensure that the PC board is not flexed excessively when other components are added. If necessary, use a support pin to prevent flexing
- Do not break the PC board by hand. We recommend the use of a machine or jig to break the board.

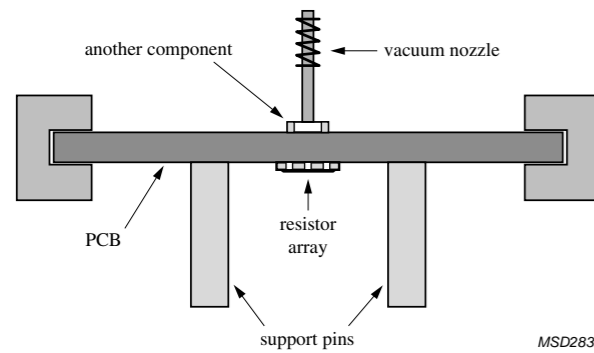


Fig. 9 Precautions when handling substrate

Storage conditions

Note the following precautions when storing the product:

- Avoid high-temperature, high-humidity and dusty environments and atmospheres containing corrosive gases (e.g. hydrogen chloride, sulphuric acid gas, hydrogen sulphide) since these can degrade terminal solderability
- Keep the storage temperature less than 40 °C, relative humidity less than 70% and, if possible, do not keep in storage longer than 6 months
- Avoid direct heat and sunshine to prevent the packaging tape from melting and sticking to the product.

More information

For more information and data contact your local Phycomp sales representative (address on the back cover) or visit our web site on <http://www.phycomp-components.com>.

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