

## Features

- Lead free
- RoHS compliant\*
- Multiple isolated resistors
- Stable thin-film-on-silicon technology
- Ultra-miniature packages to JEDEC standards



Models 2QSP-XX1 and 2NBS-XX1 are obsolete and not recommended for new designs.

## Applications

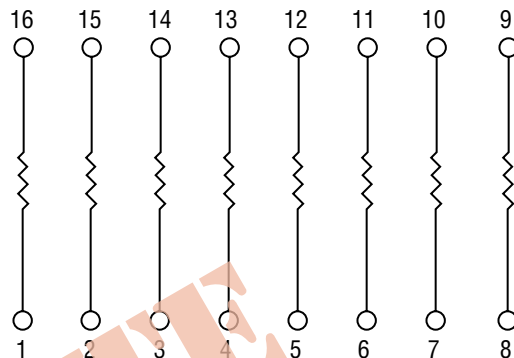
- Series bus resistance
- Pull-up/pull-down
- Ideal for space-constrained applications

# Thin Film on Silicon 2QSP / 2NBS -XX1 Isolated Resistors

### General Information

Isolated resistor networks are commonly used in digital circuits where series resistors are required on the system bus. Fabricated with Tantalum Nitride and Nickel Chromium technology on Silicon, these resistors feature excellent stability, TCR and tracking performance. This product series is available in a range of miniature package types conforming to JEDEC standards.

### Package Schematic



### Electrical & Environmental Characteristics

| Electrical Characteristics                         | Symbol    | Minimum     | Nominal | Maximum   | Unit                    |
|--|-----------|-------------|---------|-----------|-------------------------|
| Resistance Range                                   | R         | 10          |         | 100 K     | $\Omega$                |
| Tolerance:   |           |             |         |           |                         |
| Absolute   |           | $\pm 0.5\%$ |         | $\pm 5\%$ | $\Omega$                |
| Ratio  |           | $\pm 0.1\%$ |         | $\pm 2\%$ | $\Omega$                |
| TCR:   |           |             |         |           |                         |
| Absolute   |           |             | 100     | 150       | ppm/ $^{\circ}\text{C}$ |
| Tracking   |           |             |         | 25        | ppm/ $^{\circ}\text{C}$ |
| Operating Voltage                                  |           |             |         | 50        | V                       |
| <b>Environmental Characteristics</b>               |           |             |         |           |                         |
| ESD  |           | 2 K         |         |           | V                       |
| Operating Temperature                              | $T_J$     | -55         |         | +125      | $^{\circ}\text{C}$      |
| Storage Temperature                                | $T_{stg}$ | -65         |         | +150      | $^{\circ}\text{C}$      |
| Power Rating per Resistor @ 70 $^{\circ}\text{C}$  |           |             |         | 0.1       | Watt                    |
| Power Rating per Package @ 70 $^{\circ}\text{C}$ : |           |             |         |           |                         |
| QSOP: 16 Pin                                       |           |             |         | 0.75      | Watt                    |
| 20, 24 Pin   |           |             |         | 1.00      | Watt                    |
| 28 Pin   |           |             |         | 1.12      | Watt                    |
| NBSOIC: 8 Pin                                      |           |             |         | 0.60      | Watt                    |
| 14, 16 Pin   |           |             |         | 1.00      | Watt                    |

\*RoHS Directive 2002/95/EC Jan 27, 2003 including Annex

Specifications are subject to change without notice.

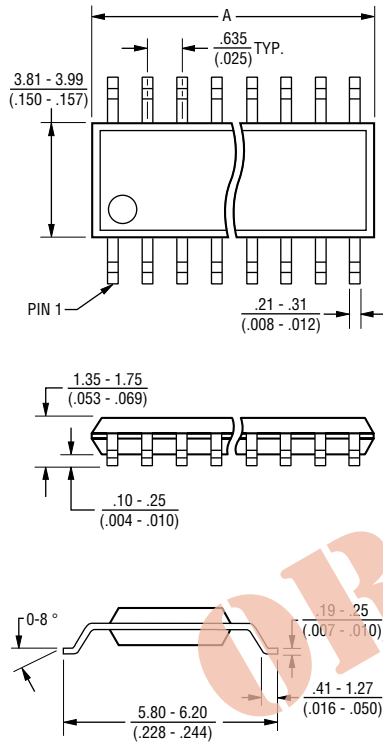
Customers should verify actual device performance in their specific applications.

# Thin Film on Silicon 2QSP / 2NBS -XX1 Isolated Resistors



## Mechanical Characteristics

### QSOP Package Dimensions

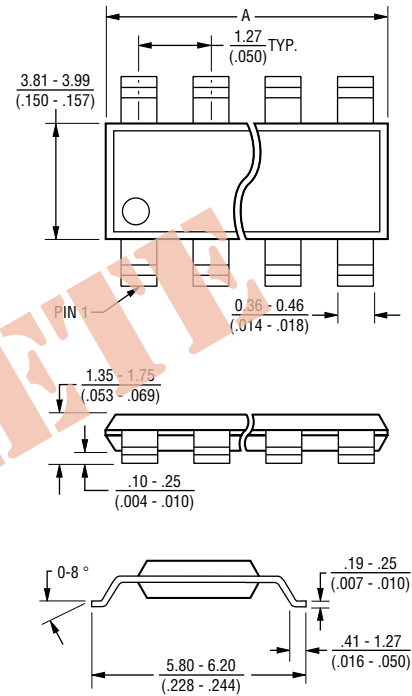


| Model  | A                         |
|--------|---------------------------|
| 2QSP16 | 4.80 - 4.98 (.189 - .196) |
| 2QSP20 | 8.56 - 8.74 (.337 - .344) |
| 2QSP24 | 8.56 - 8.74 (.337 - .344) |
| 2QSP28 | 9.80 - 9.98 (.386 - .393) |

Governing dimensions are in mm. Dimensions in parentheses are in inches and are approximate.

JEDEC Reference Number MO-137.

### Narrow-Body SOIC Package Dimensions



| Model  | A                         |
|--------|---------------------------|
| 2NBS08 | 4.80 - 4.98 (.189 - .196) |
| 2NBS14 | 8.56 - 8.74 (.337 - .344) |
| 2NBS16 | 9.80 - 9.98 (.386 - .393) |

Governing dimensions are in mm. Dimensions in parentheses are in inches and are approximate.

JEDEC Reference Number MS-012.

Specifications are subject to change without notice. Customers should verify actual device performance in their specific applications.

# Thin Film on Silicon 2QSP / 2NBS -XX1 Isolated Resistors



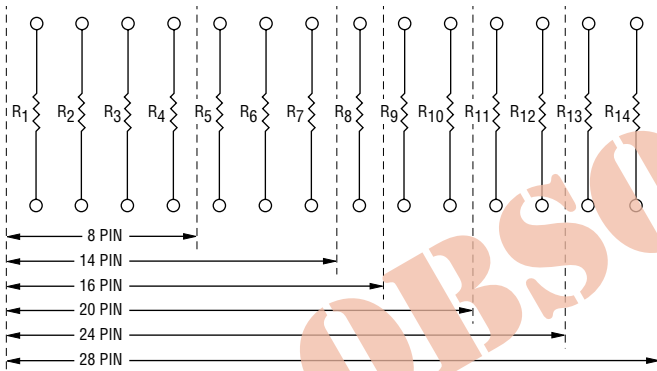
QSOP Package Power Temperature Derating Curve



Narrow-Body SOIC Package Power Temperature Derating Curve



Schematic

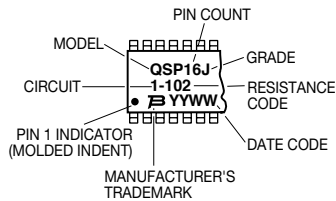


Standard Resistance Values

| Resistance (ohms) | Resistance Code |
|-------------------|-----------------|
| 10                | 100             |
| 22                | 220             |
| 33                | 330             |
| 39                | 390             |
| 47                | 470             |
| 51                | 510             |
| 68                | 680             |
| 120               | 121             |
| 220               | 221             |
| 270               | 271             |
| 330               | 331             |
| 470               | 471             |
| 510               | 511             |
| 680               | 681             |
| 1 K               | 102             |
| 2.2 K             | 222             |
| 4.7 K             | 472             |
| 5 K               | 502             |
| 8.2 K             | 822             |
| 10 K              | 103             |
| 18 K              | 183             |
| 20 K              | 203             |
| 47 K              | 473             |
| 50 K              | 503             |
| 100 K             | 104             |

Typical Part Marking

Represents total content. Layout may vary.



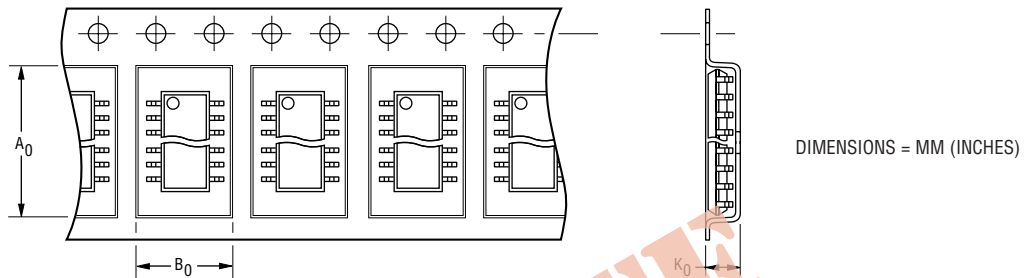
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# Thin Film on Silicon 2QSP / 2NBS -XX1 Isolated Resistors

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## Dispensing

For large quantities, the product will be dispensed in Tape and Reel (see diagram below).



| Package       | A <sub>0</sub> | B <sub>0</sub> | K <sub>0</sub> | Width      | Pitch     | No. of Pieces per 13 reel | No. of Pieces per tube |
|---------------|----------------|----------------|----------------|------------|-----------|---------------------------|------------------------|
| <b>QSOP</b>   |                |                |                |            |           |                           |                        |
| 16 Pin        | 6.4 (0.252)    | 5.2 (0.205)    | 2.1 (0.083)    | 12 (0.472) | 8 (0.315) | 3,500                     | 98                     |
| 20, 24 Pin    | 6.5 (0.256)    | 9.0 (0.354)    | 2.1 (0.083)    | 16 (0.630) | 8 (0.315) | 3,500                     | 56                     |
| 28 Pin        | 6.5 (0.256)    | 10.3 (0.406)   | 2.1 (0.083)    | 16 (0.630) | 8 (0.315) | 3,500                     | 49                     |
| <b>NBSOIC</b> |                |                |                |            |           |                           |                        |
| 8 Pin         | 6.4 (0.252)    | 9.0 (0.354)    | 2.1 (0.083)    | 12 (0.472) | 8 (0.315) | 3,500                     | 98                     |
| 14 Pin        | 6.5 (0.256)    | 9.0 (0.354)    | 2.1 (0.083)    | 16 (0.630) | 8 (0.315) | 3,500                     | 56                     |
| 16 Pin        | 6.5 (0.256)    | 9.0 (0.354)    | 2.1 (0.083)    | 16 (0.630) | 8 (0.315) | 3,500                     | 49                     |

## How To Order

**2 QSP 16 - T J 1 - 472 LF**

Product Class \_\_\_\_\_  
Thin-Film-on-Silicon

Standard Package Style \_\_\_\_\_  
QSP = QSOP  
NBS = Narrow-Body SOIC

Pin Count \_\_\_\_\_  
QSP = 16, 20, 24, 28  
NBS = 8, 14, 16

Dispensing \_\_\_\_\_  
R = Reel  
T = Tube

Standard Grade \_\_\_\_\_  
Tolerance  
J = ±5 %  
G = ±2 %  
F = ±1 %

Circuit \_\_\_\_\_  
1 = Isolated

Resistance Value Code \_\_\_\_\_  
1st two digits are significant,  
3rd digit = number of zeros to follow to give resistance value in ohms.

Terminations \_\_\_\_\_  
LF = 100 % Sn (lead free)



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