

## Features

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



Models 2QSP-XX2 and 2NBS-XX2 are obsolete and not recommended for new designs.

## Applications

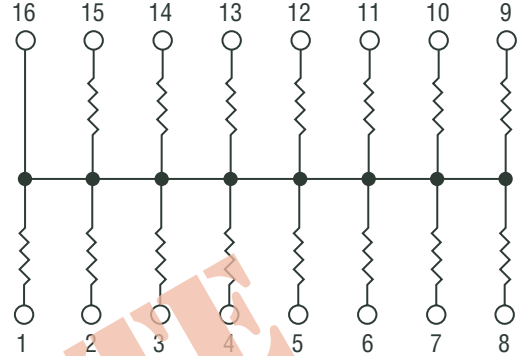
- Bus termination
- Pull-up/pull-down
- Ideal for space-constrained applications

# Thin Film on Silicon 2QSP / 2NBS-XX2 Bussed Resistors

### General Information

Bussed Resistor networks are typically used in DC pull-up and pull-down applications where system data or control lines must be tied to a fixed potential. Fabricated with a Tantalum Nitride and Nickel Chromium on Silicon process, these resistors feature excellent stability, TCR and tracking performance. Bussed Resistor Networks are 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         | 100         |         | 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.

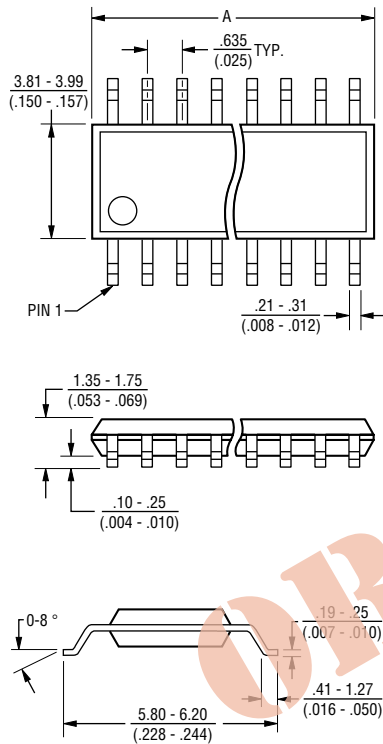
Customers should verify actual device performance in their specific applications.

# Thin Film on Silicon 2QSP / 2NBS -XX2 Bussed Resistors



## Mechanical Characteristics

### QSOP Package Dimensions

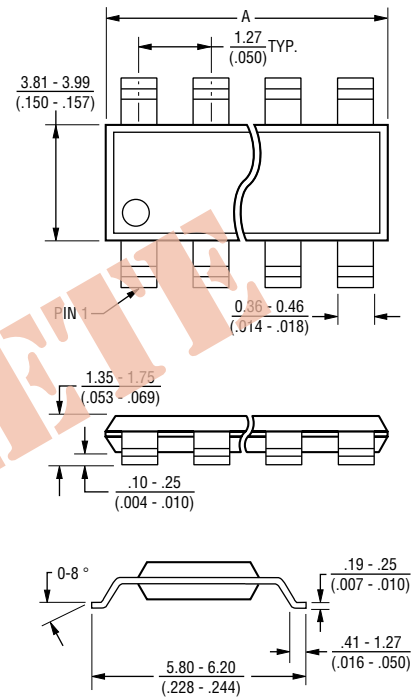


| Model  | A                         |
|--------|---------------------------|
| 2QSP16 | 4.80 - 4.98 (.189 - .196) |
| 2QSP20 | 8.56 - 8.74 (.337 - .344) |
| 2QSP24 | 8.56 - 8.74 (.337 - .344) |
| 2QSP28 | 9.80 - 9.98 (.386 - .393) |

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.

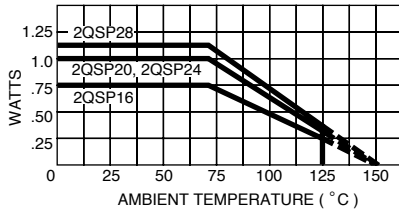
JEDEC Reference Number MS-012.

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

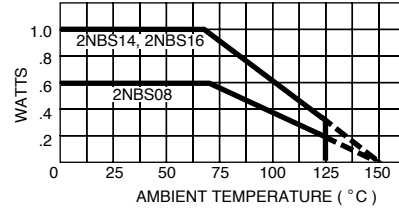
# Thin Film on Silicon 2QSP / 2NBS -XX2 Bussed Resistors

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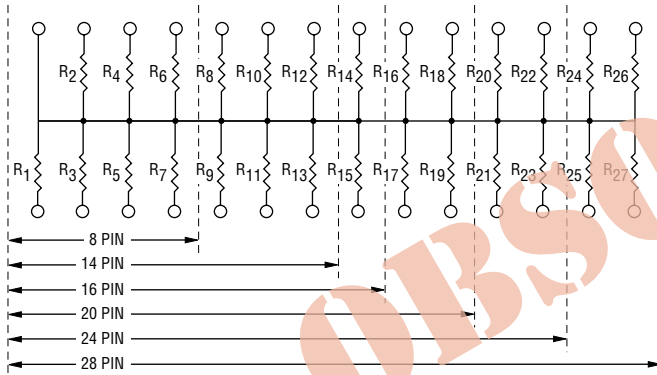
QSOP Package Power Temperature Derating Curve



Narrow-Body SOIC Package Power Temperature Derating Curve



Schematic

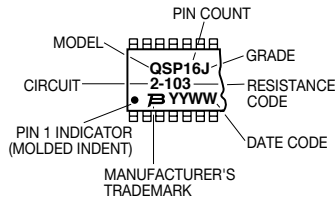


Standard Resistance Values

| Resistance (ohms) | Resistance Code |
|-------------------|-----------------|
| 100               | 101             |
| 120               | 121             |
| 220               | 221             |
| 270               | 271             |
| 330               | 331             |
| 390               | 391             |
| 470               | 471             |
| 510               | 511             |
| 680               | 681             |
| 1 K               | 102             |
| 1.5 K             | 152             |
| 2 K               | 202             |
| 2.2 K             | 222             |
| 2.7 K             | 272             |
| 3.3 K             | 332             |
| 4.7 K             | 472             |
| 5.1 K             | 512             |
| 10 K              | 103             |
| 20 K              | 203             |
| 27 K              | 273             |
| 47 K              | 473             |
| 51 K              | 513             |
| 75 K              | 753             |
| 82 K              | 823             |
| 100 K             | 104             |

Typical Part Marking

Represents total content. Layout may vary.

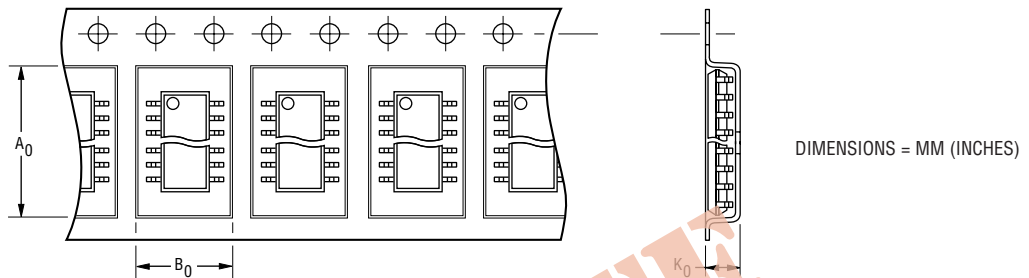


# Thin Film on Silicon 2QSP / 2NBS -XX2 Bussed Resistors



## Dispensing

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



DIMENSIONS = MM (INCHES)

| 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 20 - T J 2 - 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 \_\_\_\_\_  
2 = Bussed

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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