

## Features

- Lead free
- RoHS compliant\*
- Resistor ladder in 1:2 ratio
- Stable thin-film-on-silicon technology
- Ultra-miniature packages to JEDEC standards



Models 2QSP-XX6 and 2NBS-XX6 are obsolete and not recommended for new designs.

## Applications

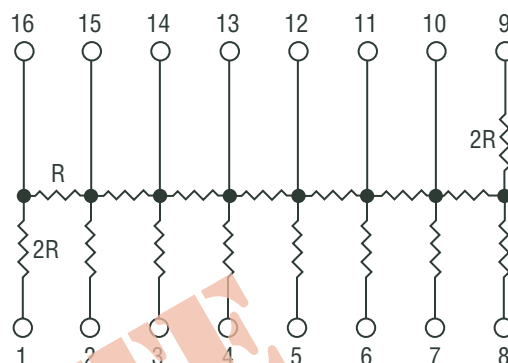
- Digital to analog converters
- Successive approximation ADCs
- Ideal for space-constrained applications

# Thin Film on Silicon 2QSP / 2NBS-XX6 R2R Ladder

### General Information

The R2R Ladder Network is used in Digital to Analog and Analog to Digital conversion. Binary weighted currents, flowing in the individual ladder segments, depend on the integrity of the R:2R relationship for an accurate conversion result. Fabricated with Tantalum Nitride on Silicon, these resistors feature excellent stability, TCR and tracking performance. R2R Ladder Networks are available in a range of miniature packages conforming to JEDEC standards.

### Package Schematic



### Electrical & Environmental Characteristics

Electrical Characteristics	Symbol	Minimum	Nominal	Maximum	Unit
Resistance Range	R	10		50 K	$\Omega$
Tolerance:					
Absolute		$\pm 1\%$		$\pm 5\%$	$\Omega$
Ratio		$\pm 0.5\%$			$\Omega$
TCR:					
Absolute			100		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.

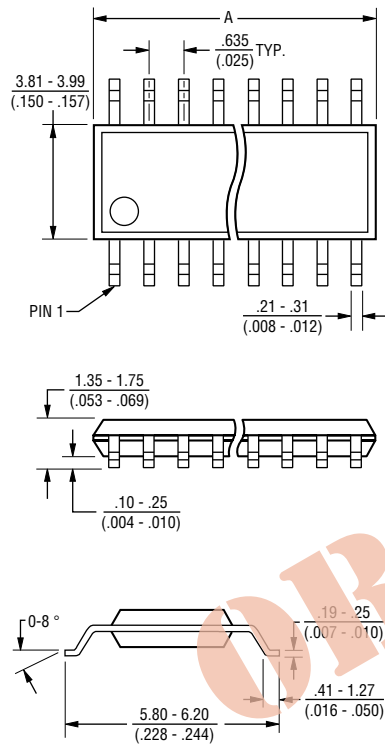
Customers should verify actual device performance in their specific applications.

# Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

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## Mechanical Characteristics

### QSOP Package Dimensions

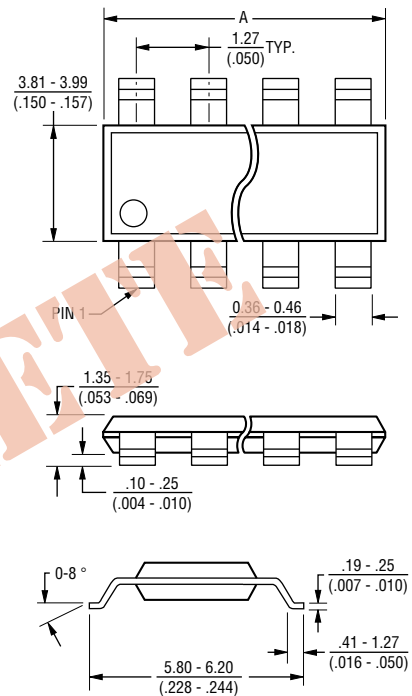


Model	A
2QSP16	4.80 - 4.98 (.189 - .196)
2QSP20	8.56 - 8.74 (.337 - .344)
2QSP24	8.56 - 8.74 (.337 - .344)
2QSP28	9.80 - 9.98 (.386 - .393)

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.

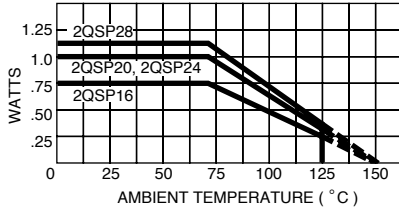
JEDEC Reference Number MS-012.

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

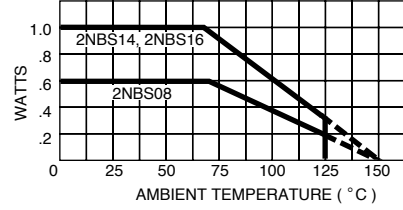
# Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

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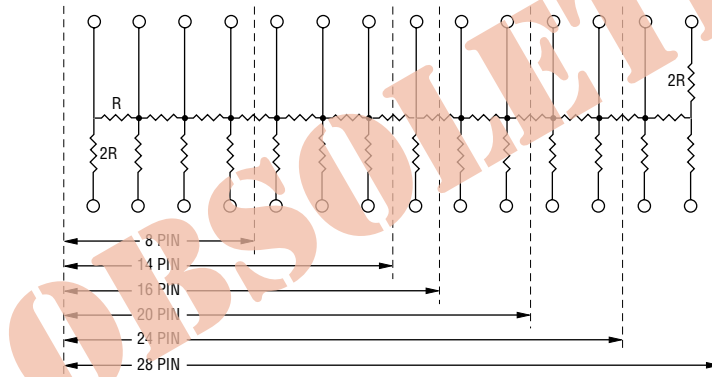
QSOP Package Power Temperature Derating Curve



Narrow-Body SOIC Package Power Temperature Derating Curve

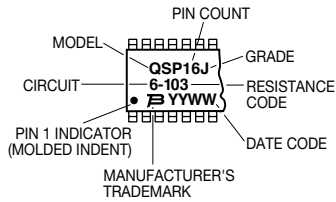


## Schematic



## Typical Part Marking

Represents total content. Layout may vary.



## Standard Resistance Values

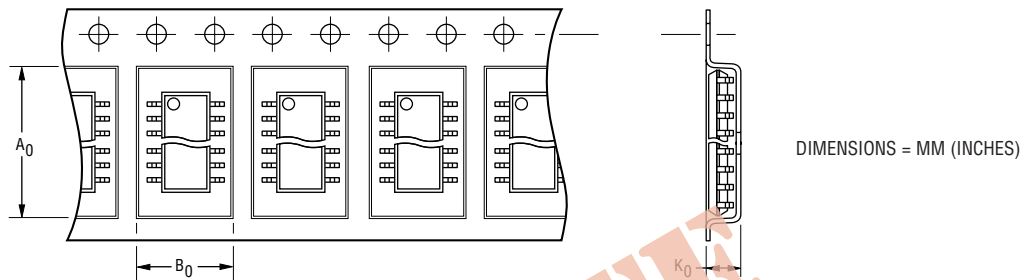
R1 Value (ohms)	R2 Value (ohms)	Resistance Code
10 K	20 K	103
25 K	50 K	253

# Thin Film on Silicon 2QSP / 2NBS -XX6 R2R Ladder

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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 20 - T J 6 - 103 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 \_\_\_\_\_  
6 = R/2R Ladder

Resistance Value Code \_\_\_\_\_  
1st three digits specify R1 resistance code.

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



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