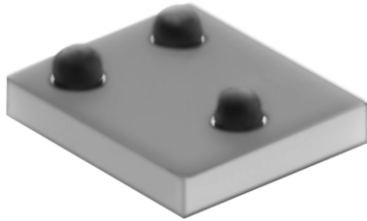


## Ultra High Precision Z-Foil BGA Surface Mount Voltage Divider with 0.1 ppm/°C TCR Tracking, 0.01 % Tolerance Match and Power Coefficient Tracking of 5 ppm at Rated Power



**Any value and any ratio available within resistance range**

### INTRODUCTION

Bulk Metal<sup>®</sup> Z-Foil Technology out-performs all other resistor technologies available today for applications that require ultra-high precision and ultra-high stability. The Z-Foil technology provides a significant reduction of the resistive element's sensitivity to ambient temperature variations (TCR) and to self heating when power is applied (power coefficient).

Model VFB1012D offers low TCR (both absolute and tracking), low PCR (both absolute and tracking), excellent load life stability, tight tolerance, excellent ratio stability, and low current noise, all in one package. 0.05 ppm/°C absolute TCR removes errors due to temperature gradients.

The VFB1012D Ball Grid Array (BGA) surface mount divider provides tight tolerance matching and TCR tracking between 2 resistors simultaneously etched on one piece of foil on a common substrate. The electrical specifications of this integrated construction offers improved performances and better real estate utilization over discrete resistors and matched pairs.

Our Application Engineering Department is available to advise and make recommendations. For non-standard technical requirements and special applications, please contact us.

TABLE 1 - RANGE OF RESISTANCES			
PARAMETER		FROM	TO
Total Resistance	$R_1 + R_2$	2K	20K
Individual Resistor	$R_1$ or $R_2$	1K	10K
Ratio	$R_1/R_2$	1/10	1/1

\* Pb containing terminations are not RoHS compliant, exemptions may apply

### FEATURES

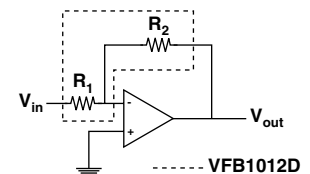
- Temperature Coefficient of Resistance (TCR):  
Absolute:  
± 0.05 ppm/°C typical (0 °C to + 60 °C)  
± 0.2 ppm/°C typical (- 55 °C to + 125 °C, + 25 °C Ref.)  
Tracking: 0.1 ppm/°C typical
- Power Coefficient Tracking "ΔR due to self heating": 5 ppm at Rated Power
- Power Rating: Entire Package: 0.2 W at 70 °C, Divided between the two Resistors proportionally to their Value
- Resistance Tolerance Match: 0.01 %
- Ratio Stability: 0.005 % (0.2 W at 70 °C, 2000 hours)
- Large Variety of Resistance Ratios: 1K to 10K
- Electrostatic Discharge (ESD) above 25 000 Volts
- Short Time Overload ≤ 0.005 %
- Non Inductive, Non Capacitive Design
- Rise Time: 1 ns without ringing
- Current Noise: < - 40 dB
- Voltage Coefficient: < 0.1 ppm/V
- Non Inductive: < 0.08 μH
- Non Hot Spot Design
- Terminal (solder ball) available: Lead (Pb)-free  
Tin/Lead Alloy
- Maximum Working Voltage for each Element: 32 Volts
- For better performances please contact us



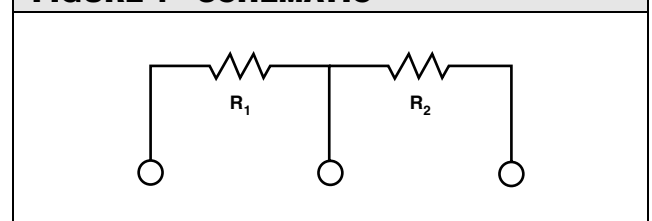
**RoHS\***  
COMPLIANT

### APPLICATIONS

- Instrumentation Amplifiers
- Bridge Networks
- Differential Amplifiers
- Ratio Arms in Bridge Circuits
- Medical and Test Equipment
- Military
- Airborne etc.



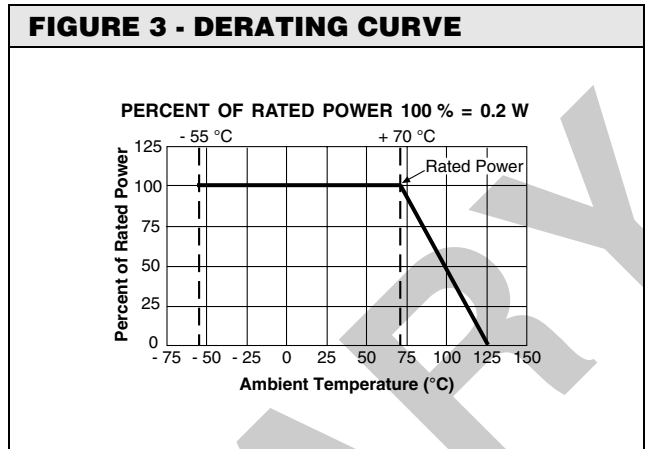
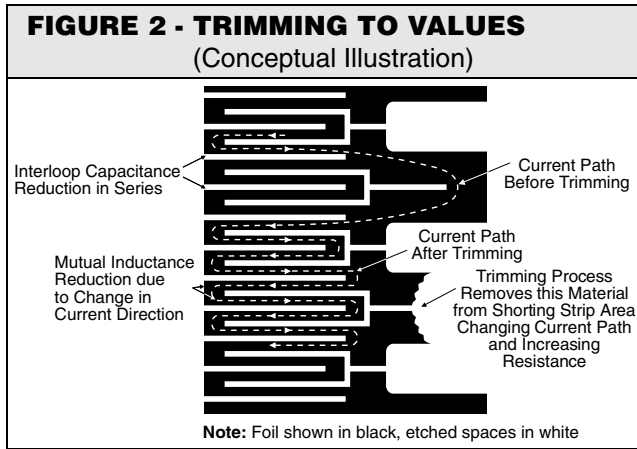
**FIGURE 1 - SCHEMATIC**



# VFB1012D (Z-Foil)



Vishay Foil Resistors Ultra High Precision Z-Foil BGA Surface Mount Voltage Divider with 0.1 ppm/°C TCR Tracking, 0.01 % Tolerance Match and Power Coefficient Tracking of 5 ppm at Rated Power

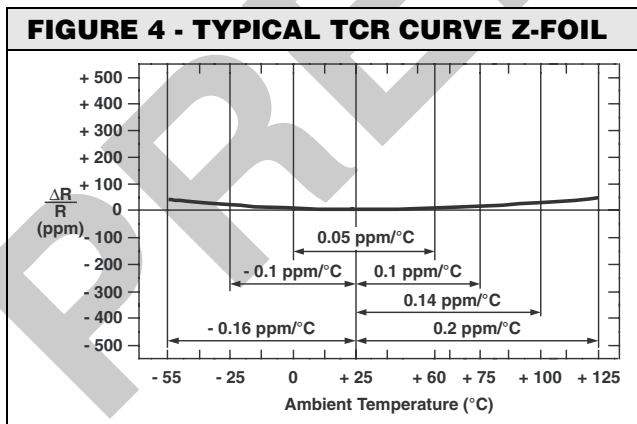


**TABLE 2 - RESISTANCE CHARACTERISTICS**  
(For other values and ratios contact Application Engineering)

VALUES AVAILABLE	RESISTANCE VALUE CODE	RATIO R <sub>1</sub> /R <sub>2</sub>	TCR Max. (- 55 °C to + 125 °C, + 25 °C Ref.)		TIGHTEST TOLERANCE <sup>1)</sup>	
			ABSOLUTE	TRACKING	ABSOLUTE	MATCHING
10K/10K	V0001	1	1.0 ppm/°C	0.5 ppm/°C	± 0.01 %	0.01 %
3K/3K	V0256					
2K5/2K5	V0257					
2K/2K	V0059					
1K/1K	V0004	2	1.0 ppm/°C	0.5 ppm/°C	± 0.01 %	0.01 %
10K/5K	V0082					
8K/4K	V0258	2.5	1.0 ppm/°C	0.5 ppm/°C	± 0.01 %	0.01 %
10K/4K	V0259					
10K/2K5	V0246	4	1.0 ppm/°C	1.0 ppm/°C	± 0.02 %	0.02 %
10K/1K	V0071	10				

**Notes**

1. Other available tolerances - see table 4



**TABLE 3 - TYPICAL PERFORMANCE**

TEST	ΔRATIO <sup>1)</sup>
Thermal Shock	0.005 % (50 ppm)
Low Temperature Operation	0.005 % (50 ppm)
Short Time Overload	0.005 % (50 ppm)
High Temperature Exposure	0.005 % (50 ppm)
Resistance to Soldering Heat	0.005 % (50 ppm)
Moisture Resistance	0.005 % (50 ppm)
Load Life (Ratio Stability), + 70 °C for 2000 h	0.005 % (50 ppm)
Weight: 17 mg	

**Note**

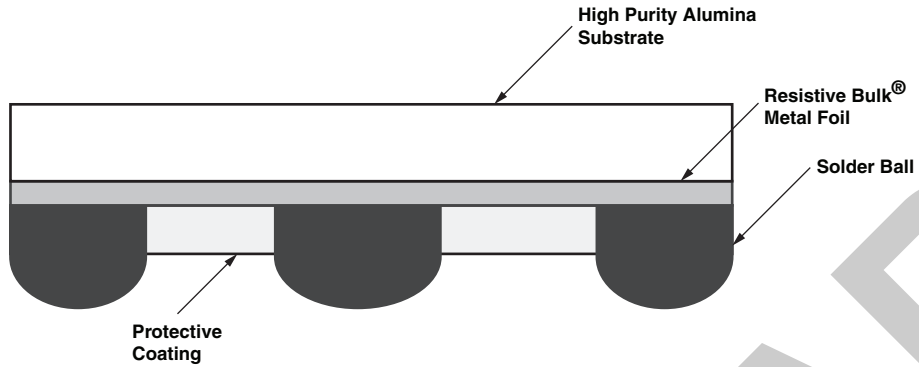
1. As shown + 0.01 Ω measurement error



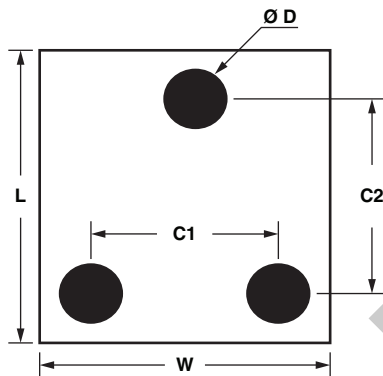
# VFB1012D (Z-Foil)

Ultra High Precision Z-Foil BGA Surface Mount Voltage Divider Vishay Foil Resistors  
 with  $0.1 \text{ ppm}/^\circ\text{C}$  TCR Tracking,  $0.01 \%$  Tolerance Match and  
 Power Coefficient Tracking of  $5 \text{ ppm}$  at Rated Power

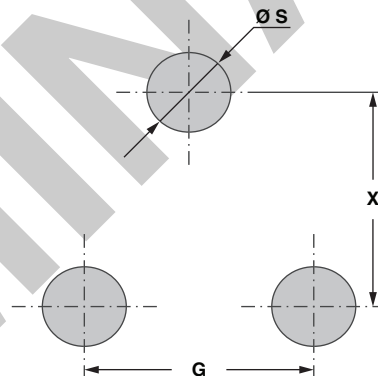
## CHIP CONFIGURATION



### CHIP DIMENSIONS



### RECOMMENDED SOLDER PAD DIMENSIONS



DIMENSIONS in inches (millimeters)					
L	W	D	C1	C2	THICKNESS (with balls)
$0.122 \pm 0.005$ ( $3.10 \pm 0.13$ )	$0.102 \pm 0.005$ ( $2.59 \pm 0.13$ )	$0.020 \pm 0.002$ ( $0.51 \pm 0.05$ )	$0.055 \pm 0.003$ ( $1.40 \pm 0.08$ )	$0.075 \pm 0.003$ ( $1.91 \pm 0.08$ )	$0.032 \pm 0.003$ ( $0.81 \pm 0.08$ )

RECOMMENDED SOLDER PAD DIMENSIONS in inches (millimeters)		
X	G	S
0.075 (1.91)	0.055 (1.40)	0.022 (0.56)

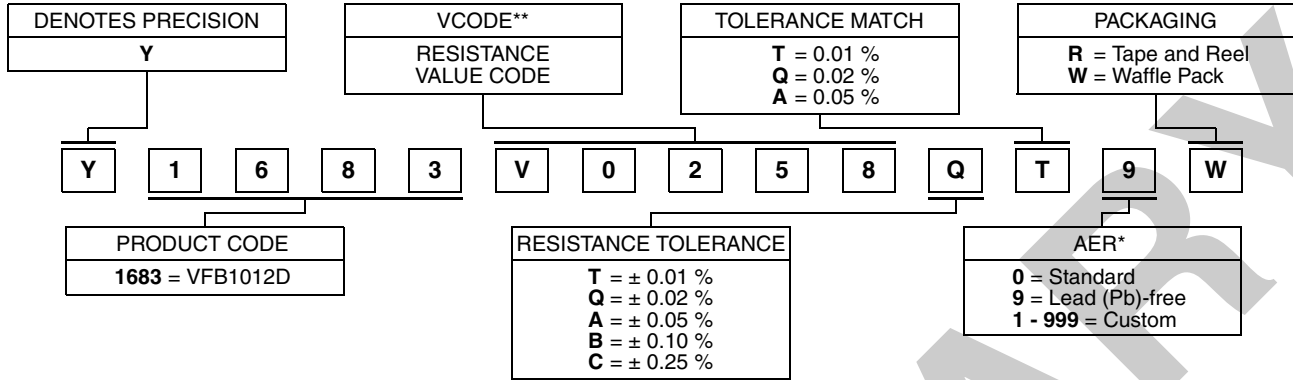
# VFB1012D (Z-Foil)



Vishay Foil Resistors Ultra High Precision Z-Foil BGA Surface Mount Voltage Divider  
with 0.1 ppm/°C TCR Tracking, 0.01 % Tolerance Match and  
Power Coefficient Tracking of 5 ppm at Rated Power

**TABLE 4 - GLOBAL PART NUMBER INFORMATION**

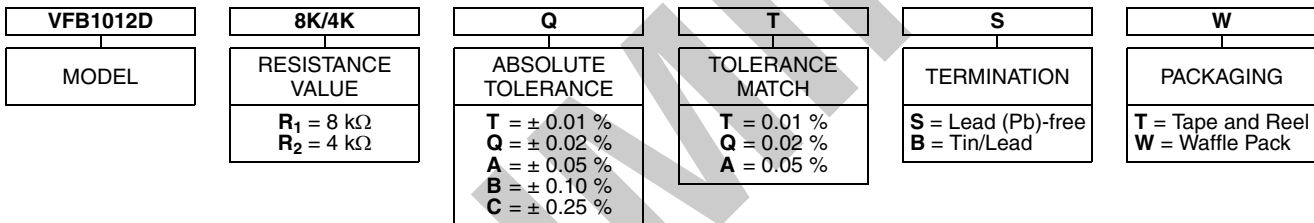
NEW GLOBAL PART NUMBER: Y1683V0258QT9W (preferred part number format)



FOR EXAMPLE: ABOVE GLOBAL ORDER Y1683 V0258 Q T 9 W:

TYPE: VFB1012D  
VALUES: 8K/4K  
ABSOLUTE TOLERANCE: ± 0.02 %  
TOLERANCE MATCH: 0.01 %  
TERMINATION: Lead (Pb)-free  
PACKAGING: Waffle Pack

HISTORICAL PART NUMBER: VFB1012D 8K/4K Q T S W (will continue to be used)



**Notes**

- \* For non-standard requests, please contact Application Engineering.
- \*\* For list of value codes see table 2 (additional values are available on request).



## Disclaimer

All product specifications and data are subject to change without notice.

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