



Product and Capabilities Overview

Fixed Film Resistors
Magnetics

Microcircuits & Modules
Variable Resistors & Sensors

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It began with a single innovation. The helical potentiometer we created in 1940 was so ingenious it is still in use today. This ability to anticipate and service customer needs has been the source of our reputation for more than 60 years. The concept shines bright today and is an essential component of our Customer First Philosophy.



BI Technologies is a global manufacturer of trimming and precision potentiometers, position sensors, turns-counting dials, chip resistor arrays, resistor networks, integrated passive networks, transformers, inductors, hybrid microcircuits and custom integration products for communication, computer, automotive and industrial applications. Every day, around the globe, BI components are used in every conceivable application; home computers to super computers, medical equipment, process equipment, control and avionics for the aerospace and military markets.

Dynamic, focused, and rich in heritage, BI Technologies continues its evolution, driven by customer need and the technology that serves those needs.



BI Technologies and our 2000+ dedicated employees worldwide are proud to join the TT electronics family of companies. BI Technologies is a respected, worldwide resource for technologically-advanced products and services. In the pages ahead, you will see the product selection that has made BI a first choice of leading-edge companies all around the globe.

To receive more information or insightful answers to tough product or design questions, please visit our web site at www.bitechnologies.com or contact our nearest office. For a list of our global offices see the back cover of this catalog. For quality, selection and service, we're the complete package.



—The BI Technologies Team



Fullerton, California

Located 40 miles south-east of Los Angeles, this facility serves as a design and manufacturing center and headquarters for corporate/worldwide logistics support. Applied engineering and development for sensors, pots and trimmers, thick and thin film materials and microelectronics takes place here—along with the manufacture of precision potentiometers. Substrates and critical subcomponents for thin film resistor networks and trimming potentiometer products are also produced.



Mexicali, Mexico

BI recently expanded into a new and highly-automated manufacturing and assembly plant in Mexicali. Here we manufacture and assemble trimming and precision potentiometers and design/fabricate state-of-the-art automation equipment for internal use. We utilize flexible cell manufacturing and employ a computer scheduling system, which enables rapid and efficient response to a customer's scheduling needs. These systems working together comprise our Customer Driven Manufacturing concept.



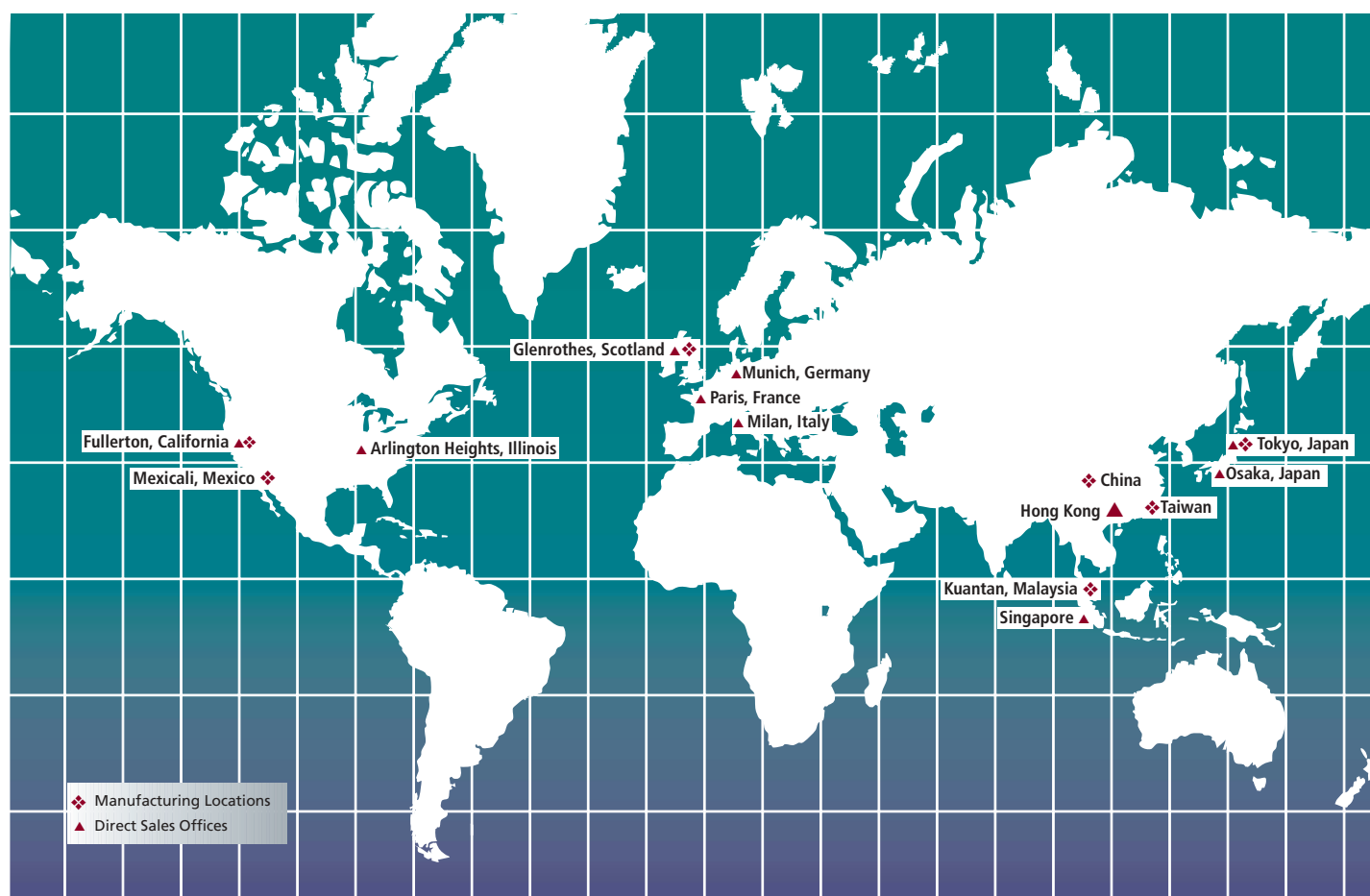
Glenrothes, Scotland

BI established its Scotland facility in 1958. Today we continue to better serve our European customers by maintaining a strong manufacturing and support presence. At our plant in Eastfield Industrial Estate, located 30 miles north of Edinburgh in Glenrothes, we design, develop and manufacture thick film products, and assemblies. Warehousing, customer support and advanced product development are also among the plant's integral activities.



Kuantan, Malaysia

Our Kuantan manufacturing plant is situated on Malaysia's eastern coast, approximately 40 minutes by air from Kuala Lumpur and Singapore. An ultra-efficient, continuous flow manufacturing facility, Kuantan is very well suited for large-volume manufacture of custom and standard magnetic components. Kuantan provides an extensive array of design and manufacturing support services to assist customers worldwide.



BI Technologies is Organized to Service the Entire Global Electronics Community.

California

- Trimming Potentiometer Element Manufacturing
- Trimming Potentiometer Assembly
- Precision Potentiometer Element Manufacturing
- Precision Potentiometer Manufacturing
- Thin Film Production
- High Volume Ceramic Screening
- Microcircuit Module Design and Manufacturing
- Magnetics Design Center
- Research and Development for all Product Lines
- Automated Equipment Development and Fabrication
- Integrated Passive Design
- Sensor Design Center

Mexico

- Trimming Potentiometer Assembly
- Trimming Potentiometer Element Manufacturing
- Precision Potentiometer Assembly
- Inductor and Transformer Manufacturing
- Automotive Sensor Manufacturing
- Automated Equipment Design and Fabrication
- High Volume Assemblies

Scotland

- Design and Manufacturing of Thick Film Passive Components
- Dual In Line Networks
- Molded Surface Mount Networks
- Single In Line Networks
- Chip Arrays
- Integrated RC Networks
- Planar Power Resistors
- Surge Resistors
- High Voltage Resistors
- High Volume Thick Film Substrates
- Customer Specific Thick Film Passive Components

Malaysia

- International Purchasing Operations
- Magnetics Design Center
- Inductor and Transformer Manufacturing
- Signal and Telecom Magnetics

China

- Wound Magnetics Production

Taiwan

- Screened Inductor Production
- LAN Filter Magnetics

Japan

- Thick Film Network Production
- Trimmer Production

Quality

Our Philosophy

Building trust, delivering on promises and maintaining long-term customer satisfaction are cornerstones of BI Technologies' corporate philosophy. We achieve these through careful planning, continuous training and above all, personal commitment—something you see evidenced throughout our worldwide organization.

Planning & Quality Assurance

Years of experience and meticulous quality control planning earned BI facilities ISO QS 9000 and MIL-PRF-38534 certifications. We also employ Failure Mode and Effects Analysis (FMEA) in our product development cycle to help identify and correct problems before they impact operations. BI maintains excellence in all its standards through a team of process control and QA experts who routinely oversee every aspect of production planning and development—from automated equipment design to production floor layout and process flows.

Organization

To continuously improve our responsiveness, we employ advanced information systems technologies. Offices are linked globally—in real time—to assure

customer access to vital product inventory, order status and shipping activity information.

Quality In, Quality Out

Quality products require quality-minded suppliers. At BI, we are committed to the continuous improvement of all our materials' providers with companies required to demonstrate their commitment through innovation, continuous improvement and a cost effective producer philosophy. This ongoing vendor-focused approach to quality has earned BI an excellent reputation for global quality and reliability.

Always Improving

Company-wide training and a global communications network are central to our quality assurance process. Production and administrative staff receive regular training, coaching and mentoring as a means of maintaining quality and service levels.

Global Logistics & Support

In our global commerce, controlling critical logistics processes is integral to our success. We manage international time and distance challenges through direct local sales and applications engineering support along with strategic location of

customer service. We repeatedly ask questions of customers and vendors that assist us to implement systems that effectively anticipate and solve problems. Our services and support includes:

- Strategic stocking locations—for filling orders quickly and efficiently
- Experienced freight carriers and forwarders—to ensure timely, reliable deliveries
- Convenient service locations—to reduce response times & improve support
- Electronic data interchange (EDI)
- Worldwide distribution and OEM sales network

Global Customer Service & Support

Worldwide Locations

BI currently maintains five fully-staffed stocking locations. Each is electronically controlled with inventories carefully managed to support customers' needs for both standard and custom products.

Locations include:

- Glenrothes, Scotland
- Milan, Italy
- Fullerton, California
- Tokyo, Japan
- Singapore

The Heritage of Innovation

1940 First Helical potentiometer invented.	1951 High speed continuous winders developed.	1958 Opening of our Scotland manufacturing facility.	1962 First Cermet trimming potentiometer introduced.	1964 Introduction of the RESNET®. (resistor network)	1970 Resistor networks introduced in 14 pin DIP packages.
1944 "A" pot introduced—still in use today.	1956 First "Cermet" processes developed for use in pots and trimmers. (Cermet—a contraction of the words ceramic and metal)	1959 First turns counting dials introduced.	1963 Introduction of Thick Film Microcircuits.	1969 First hybrid element potentiometer introduced.	1971 Introduction of the Teflon rotor, "Zero Backlash."
			1964 Introduction of conductive plastic elements.		1974 Introduction of Thin Film Precision networks.

Effective Communications

Worldwide electronic mail and globally-networked inventory-control systems are the centerpiece of our logistics operation. Every location can access inventory and shipping records from any site in the world. In a continuing manner we will implement an upgrade and expansion of our computer system and technology—another tool to support and manage our customers' evolving needs.

Beginning from the belief that a quantity of one is the most efficient production lot size, BI manages all manufacturing to a Customer Driven Manufacturing philosophy. Piloted in our Mexicali, Mexico facility five years ago, this is now practiced at our worldwide facilities. Central to this practice is manufacturing to order in optimized quantities. This enables us to flexibly accommodate many different product variations and orders in any given time frame.

Our advanced computer and software systems drive daily manufacturing based on orders received and prioritizes customer requirements based on delivery and quantity. We continuously monitor system effectiveness to ensure reduction in order lead times and manufacturing cycle times.

The ongoing evolution of electronics technology requires us to constantly engineer new methods and solutions. Today, discrete components are rapidly evolving to the integrated passive, wound transformers are evolving to screened magnetics and variable resistors are evolving to position sensors. These are typical product examples that demonstrate the need to adapt quickly to customer and market needs. To be customer driven we must adapt our core capabilities to solve our customer's packaging and performance requirements.

Leveraging Off of Our Core Technologies

At BI, we believe our core strengths and technologies provide such adaptability. The capabilities listed below offer solutions to your packaging and performance requirements:

Deposited Films

- Thin film resistors on ceramic and silicon

Screened Films on Ceramic or Plastic

- Thick film fixed resistors, capacitors and inductors
- Variable trimming potentiometers
- Variable precision potentiometers
- Sensors

Wound Magnetics Design & Manufacture

- Surface mount inductors and transformers of ferrite, powdered iron, and other advanced magnetic materials
- Through-hole coils and transformers of ferrite, powdered iron, and other magnetic materials

Microcircuit Module Design/Manufacture

- Chip and wire on alumina or direct bonded copper substrates
- Surface mount on alumina or direct bonded copper substrates
- Encapsulated power modules

It takes more than raw technology to manufacture millions of pieces per day. Delivering a wide assortment of packages competitively requires integrated packaging design and automated assembly.

1977
Opening of sales office in Tokyo, Japan.

1980
Opening of Mexicali, Mexico facility.

1984
BI becomes affiliated with Emerson Electric Co.

1986
Introduction of surface mount molded networks.

1987
Introduction of wound transformers and inductors for the power conversion market.

1989
Emerson Electric acquires minority interest in Astec (BSR) Plc. BI becomes subsidiary of Astec (BSR) Plc.

1991
Implementation of customer driven manufacturing.

1994
Introduction of 4mm Square Sealed SMD Trimmers.

1995
Introduction of RC Chip Arrays.

1996
Opening of new Scotland factory.

1997
Opening of new Kuantan, Malaysia magnetics factory.

1998
Opening of new Mexicali, Mexico factory.

2000
TT electronics acquires BI Technologies.

2004
Open facility in China

Thick Film Power Resistors



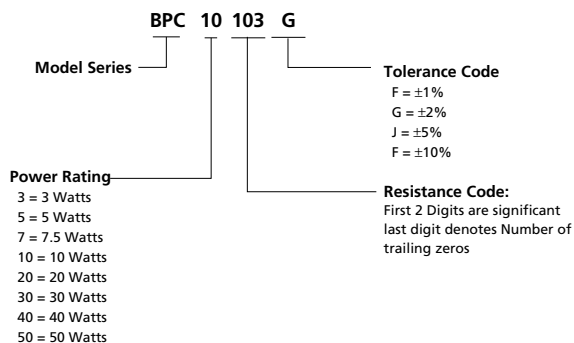
Through Hole

Model	BPC	BPR	BHP	MHP	SMHP
Number of Leads	2	2	2	2	2
Dimensions, Inches					
Body Length, Max.	1.015	0.650 to 2.250	0.415	0.415	0.420
Mounted Ht., Max.	1.090	0.670 to 2.100	0.815	0.833	0.181
Body Width, Max.	0.801	0.255	0.100	0.190	0.625
Resistance					
Range, Ohms	0.200 to 200K	0.200 to 200K	1.00 to 10K	0.01 to 100K	0.01 to 100K
Tolerance	10% Optional 1%, 2%, 5%	5% Optional 1%, 2%	5% Optional 1%, 2%	5% Optional 1%, 2%	5% Optional 1%, 2%
Temp Coefficient, ppm/°C	±100	±100 Below 0.100: Consult Factory	±100 Below 0.100Ω: Consult Factory	0.100 to 100KΩ: ±100 Below 0.100Ω: Consult Factory	0.100 to 100KΩ: ±100 Below 0.100Ω: Consult Factory
Power Rating, Watts	3 to 10 2W in air @ 25°C	3 to 50 2.25W in air @ 25°C	20W at 25°C Case Temp	20W at 25°C Case Temp 2.25W in air @ 25°C	20W at 25°C Case Temp 2.25W in air @ 25°C
Operating Voltage Max.	500V	500V	250V	300V	300V
Operating Temp. Range	-55°C to +125°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C	-55°C to +155°C
Peak Current	20 x Rated up to 8ms	15 x Rated up to 8ms	15 x Rated up to 8ms	15 x Rated up to 8ms	15 x Rated up to 8ms
Dielectric Strength	750V	750V	750V	1500V	1500V
Packaging Options					
Tubes			50		
Tray	50	20 to 50		50	50

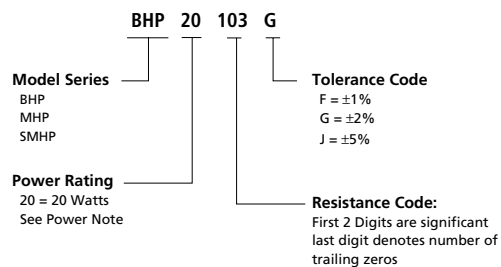
Specifications subject to change without notice.

Ordering Information

BPC/BPR

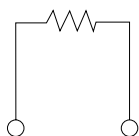


BHP/MHP/SMHP

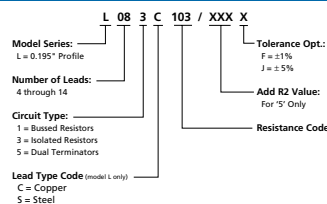


Schematics

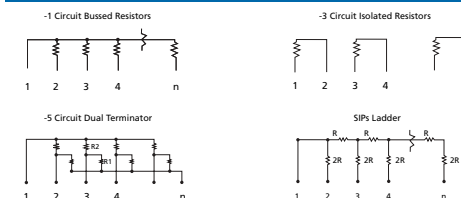
BPC/BPR/BHP/MHP/SMHP



L/M/BH



L/M/BH



Thick Film Resistor Networks



Surface Mount



628 Ladder



627T/V



Through Hole



High Voltage

Model	627/628	628 Ladder	627T/V	L/M/BH	BHV
Number of Leads	14/16	16	14	4 thru 14	2/3/4
Dimensions, Inches					
Body Length, Maximum	0.395/0.445	0.445	0.395	0.1 x no. of leads	2.0
Height Off Board, Maximum	0.090	0.090	0.090	0.195	0.5
Body Style/Width	(SO-M) 0.220	(SO-M) 0.220	(SO-M) 0.220	0.095	0.030
Resistance					
Range, Ohms	10 to 1 Meg	1K to 100K	50 to 142Ω	22 to 1 Meg	1 Giga Ohm, Max.
Tolerance	±2% (5% for J Circuits)	±2%	±2%	±2% (±1% Optional)	±5%, ±10%
Operating Temperature Range °C	-55/125	-55/125	-55/125		
Temp. Coefficient, ppm/°C	±100 (Below 100R, 250)	±100	±250	±100 (<100Ω = ±250)	±150
Temp. Coefficient Tracking, ppm/°C	±50		±50	±50	
Ladder Accuracy		8 Bit: 1/2 LSB			
Power Rating, Watts at 70°C					
Resistor Power	Schematic A: 0.32 Schematics B & J: 0.16	0.04	0.250	0.125 Bussed 0.200 Isolated	0.8 to 3.0
Package Power	1.28	0.64 W/Pkg.	1.28		
Packaging Options					
Tubes	50	50	50		
Tape & Reel: 7"					
Tape & Reel: 13"	2000	2000	2000		

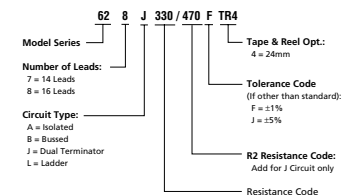
Specification subject to change without notice.

Consult factory for custom products

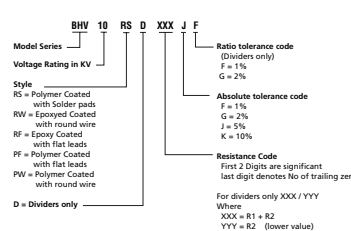
Also available: 627/628 Jumpers

Ordering Information

627/628/628 Ladder

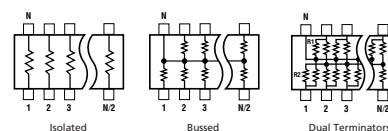


BHV

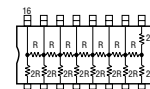


Schematics

627/628



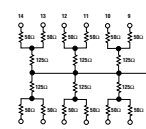
628 Ladder



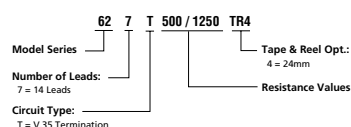
BHV



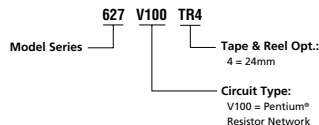
627T



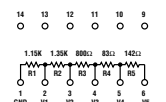
627T



627V100



627V100



Thin Film Resistor Networks

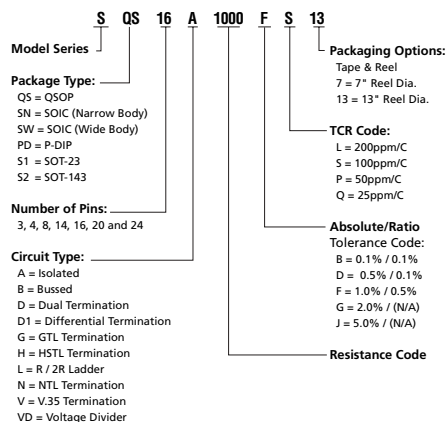


Thin Film - Ceramic

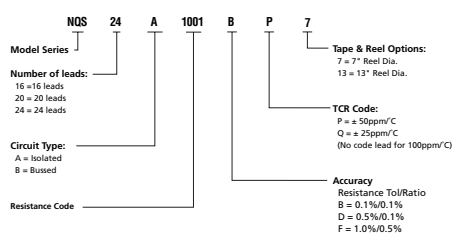
Model	NQS	664/667/668	688	694/698/699
Number of Leads	16/20/24	8/14/16	16	8/16/14
Available Circuit Type	A, B	A, B	A, B	-3, -1
Dimensions, Inches				
Body Length, Maximum	0.197	0.196/0.344/0.393	0.413	0.375/0.760/0.760
Height Off Board, Maximum	0.068	0.068	0.104	0.2
Body Style/Width	(QSOP) 0.157	(SO-N) 0.157	(SO-W) 0.300	(PDIP) 0.300
Resistance				
Range (Ω)	10 to 140k	10 to 275k	10 to 275k	10 to 275k
Tolerance (%)	$\pm 0.1\%$	$\pm 0.10\%$	$\pm 0.10\%$	$\pm 0.10\%$
Temp. Coefficient, ppm/ $^{\circ}\text{C}$	± 25	± 25	± 25	± 25
Temp. Coefficient Tracking, ppm/ $^{\circ}\text{C}$	± 5	± 5	± 5	± 5
Power Rating, Watts at 70 $^{\circ}\text{C}$				
Per Resistor	0.1	0.1	0.1	0.1
Per Package	NQS16 = 0.8 NQS20/24 = 1.0	664 = 0.4 667/668 = 0.8	1	694 = 0.4 698/699 = 0.6
Packaging Options				
Tubes	NQS20/24 = 50 NQS16 = 100	664 = 100 667/668 = 50	50	694 = 50 698/699 = 25
Tape & Reel: 7"	1000	664 = 1000 667/668 = 500	500	
Tape & Reel: 13"	2500	2500	1500	
Vial				

Ordering Information

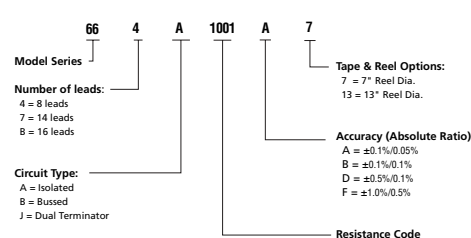
Part Number Diagram



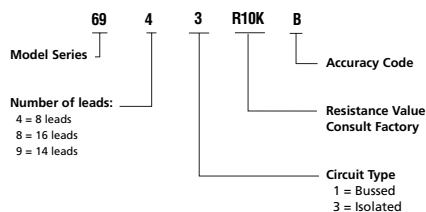
NQS



664/667/668/688



694/698/699



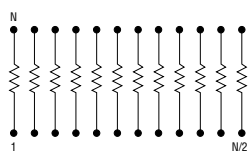


Thin Film - Silicon

SQS	SSN	SSW	SPD	SS1/SS2
16,20,24	8,14,16	16,18,20	8,14,16	3, 4
A, B, D, D1, G, H, L, N, V	A, B, D, D1, L, N, V	A, B, D, D1, L, V	A, B, L	VD
0.196/0.344/0.344	0.196/0.344/0.393	0.406/0.459/0.506	0.375/0.760/0.760	0.119
0.068	0.068	0.104	0.2	0.044
(QSOP) 0.157	(SO-N) 0.157	(SO-W) 0.300	(PDIP) 0.300	(SOT23, SOT 143) 0.096
10 to 250k	10 to 250k	10 to 250k	10 to 250k	1k to 50k
±0.1%	±0.1%	±0.1%	±0.1%	±0.1%
±25	±25	±25	±25	±25
±5	±5	±5	±5	±5
0.1	0.1	0.1	0.1	0.1
SQS16 = 0.8 SQS20/24 = 1.0	SSN8 = 0.4 SSN14/16 = 0.8	1.0	SPD8 = 0.4 SPD14/16 = 0.6	0.2
100/50/50	100/50/50	50	50/25/25	
1000	1000/500/500	500		
2500	2500	1500		
				500

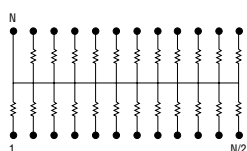
Schematics

Isolated Resistors



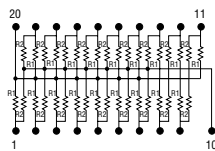
Resistance Code: First 3 digits are significant. Fourth digit denotes number of trailing zeros.

Bussed Resistors



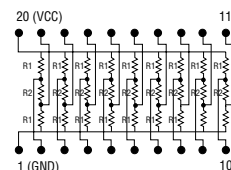
Resistance Code: First 3 digits are significant. Fourth digit denotes number of trailing zeros.

Dual Terminator/SCSI



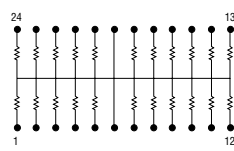
Resistance Code (R1/R2Ω):
01 = 220/330

Differential Ended SCSI Termination



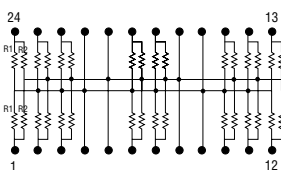
Resistance Code (R1/R2/R1Ω): 01 = 330/150/330

GTL Termination



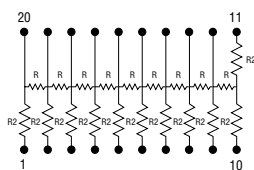
Resistance Code: First 3 digits are significant. Fourth digit denotes number of trailing zeros.

HSTL Termination



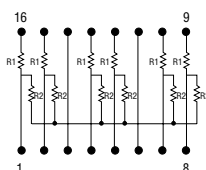
Resistance Code (R1/R2Ω):
01 = 94/94, 02 = 100/100, 03 = 112/112,
04 = 136/136

R/2R Ladder



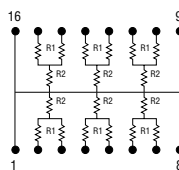
Resistance Codes Ω: 01 = 25k/50k,
02 = 10k/20k, 03 = 50k/100k

NTL Termination



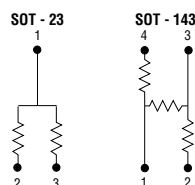
Resistance Codes (R1/R2):
01 = 22/90

V.35 Termination



Resistance Codes
(R1/R2Ω): 01 = 50/125

Voltage Divider



Consult Factory for resistance codes.

Thick Film Chip Resistors



Network Arrays

Model	BCN 10 4	BCN 16 4	BCN 16 8
Industry Style, Inches (mm)	0804 " (2010mm)	1206 " (3216mm)	1206 " (3216mm)
Surge Capability, Maximum @ 250 Volts			
Standard Resistance Range, Ohms	10 to 1 Meg Ω	10 to 1 Meg Ω	100 to 1 Meg Ω
Standard Tolerance	$\pm 5\%$	$\pm 5\%$ ($\pm 1\%$, $\pm 2\%$ Optional)	$\pm 5\%$
Temp. Coefficient of Resistance, ppm/ $^{\circ}\text{C}$	± 250	± 250	± 200
Operating Voltage	25Vdc	50Vdc	25Vdc
Power Rating at 25 $^{\circ}\text{C}$ per Resistor per Package	31mW 125mW	63mW 250mW	32mW 250mW
Operating Temp.	-55 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$	-55 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$	-55 $^{\circ}\text{C}$ to +125 $^{\circ}\text{C}$
Termination Options	Convex	Convex/Concave	Convex
Edge Options	Square	Square/Scalloped	Square
Packaging Options (Quantity/Reel)			
Tape & Reel: 7 "	Paper: 10K	Paper: 5K	Paper: 5K
Tape & Reel: 13 "	Paper: 40K	Paper: 20K	Paper: 20K

Ordering Information

BCN

Model Series

Width:

10 = 1.0mm
16 = 1.6mm
21 = 2.1mm
31 = 3.1mm

No of Resistors:

BCN 10 = 4 Resistors
BCN 16 = 4A Resistors
BCN 16 8R or 8S = 8 Resistors
BCN 21 = 8 Resistors
BCN 31 8R or 8S = 8 Resistors

Circuit Configuration:

A = Isolated (BCN 10, BCN 16 4A)
R = Bussed (Reversed)
(BCN 16, 8R or BCN 31 8R)
S = Bussed (Standard)
(BCN 16 8S or BCN 21 8S)

BCN 16 4 A B I 102 J 7

Package Option:
(see Table A)

Tolerance:
F = 1% (BCN 4D, BCN 16 4, BCN 31 8RB/8SB only)
G = 2% (BCN 16 4, BCN 31 8RB/8SB only)
J = 5% (Standard)
(Use JP for Jumper Chip Array, BNC16 4, BNC 31)

Resistance Code:
3 Digits for E6, E12, E24 series, all tolerances
4 Digits for E96 series, 1% tolerance

Termination Code:
I = Interior (concave) Termination
No code used for exterior termination (Standard)
All interior terminations require 'B' for square edge
(BCN 16 4ABI, BCN 31 8RBI, BCN 31 8SBI)

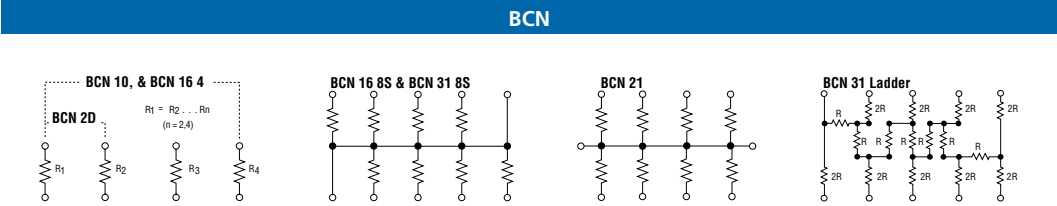
Edge Option: (B = Square edge)
Scalloped Edge - No code used (Standard)
Square Edge Only - Use Code 'B'

Table A

	7" Reel Diameter		13" Reel Diameter	
	Paper	Embossed	Paper	Embossed
BCN 10	10k		40k	
BCN 16 4	5k		20k	
BCN 16 8	5k		20k	
BCN 21		4k		16k
BCN 31		4k		16k

See 'Model Styles' for Available Options:
Note: Tape & Reel dimensions per EIA-481.

Schematics Available



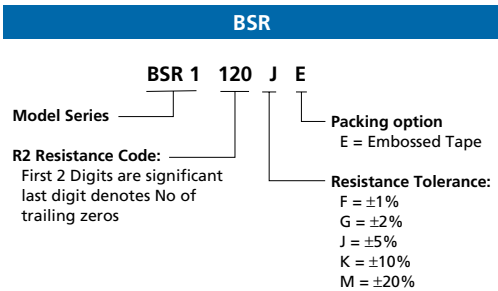


Surge Resistors

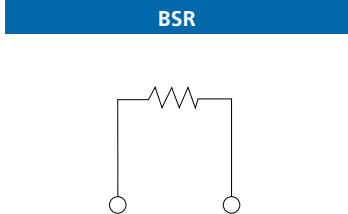
Model	BCN 21 8	BCN 31 8	BCN 31 Ladder	BSR Surge Resistors
Industry Style, Inches (mm)	1608" (4021mm)	2512" (6531mm)	2512" (6531mm)	2512" (6531mm)
Surge Capability, Maximum @ 250 Volts				1.2/50µs; 10/700µs
Standard Resistance Range, Ohms	68 to 220KΩ	22 Ohm to 1 Meg Ω	1k to 100KΩ	10 to 100Ω
Standard Tolerance	±5%	±5% (±1%, ±2% Optional)	±2%	±2%, ±5%, ±10%, ±20%
Temp. Coefficient of Resistance, ppm/°C	±200	±200	±100	±100
Operating Voltage	25Vdc	50Vdc	50Vdc	10Vdc
Power Rating at 25°C per Resistor per Package	63mW 500mW	63mW 500mW	25mW 400mW	1 W/Pkg.
Operating Temp.	-55°C to +125°C	-55°C to +125°C	-40°C to +125°C	-55°C to +125°C
Termination Options	Concave	Convex/Concave	Convex	
Edge Options	Square	Square	Square	
Packaging Options (Quantity/Reel)	Embossed: 4K	Embossed: 4K	Embossed: 4K	Embossed: 4K
Tape & Reel:	Embossed: 16K	Embossed: 16	Embossed: 16K	
Tape & Reel:				

Specifications subject to change without notice.

Ordering Information



Schematic



Integrated Passives

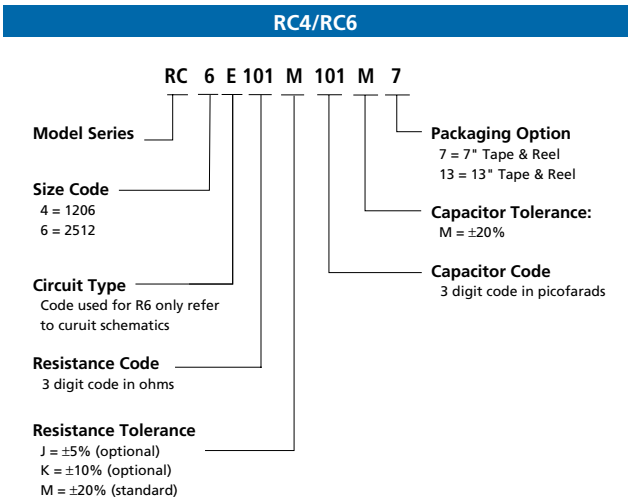


Resistor - Capacitor Networks

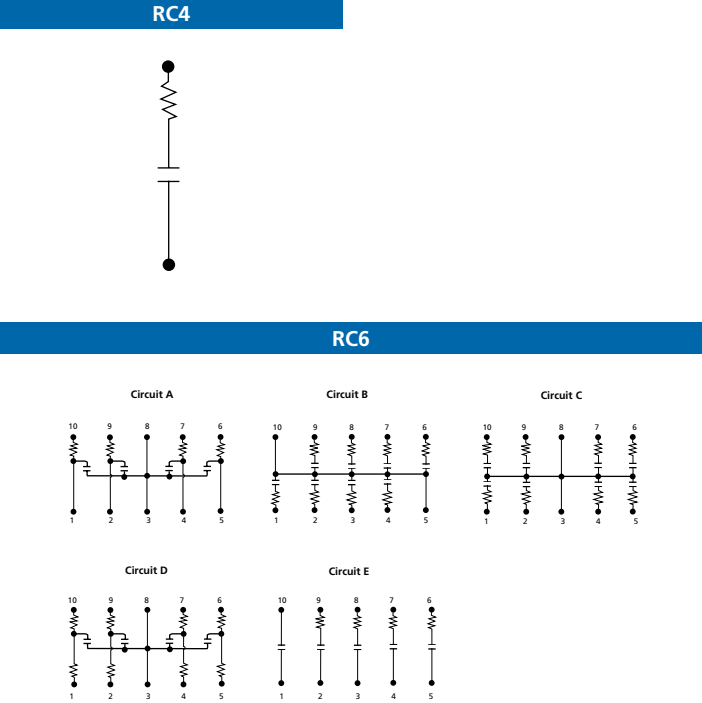
Model	RC4	RC6
Industry Style, Inches (mm)	1206 " (3216mm)	2512 " (6531mm)
Surge Capability, Maximum @ 250 Volts		
Standard Resistance Range, Ohms	10 to 1 Meg	10 to 1 Meg
Standard Resistance Tolerances	20%	20%
Temp. Coefficient of Resistance, ppm/°C	±200	±200
Power Rating	63mW/Pkg	63mW/resistor, 1W/Pkg
Operating Voltage, Max	50	50
Capacitance Range, pF (at 1KHz)	10 to 220	10 to 220
Capacitor Characteristic	X7R	X7R
Capacitor Tolerance	20%	20%
Capacitor Voltage Rating	50	50
Capacitor Dissipation Factor, Maximum	2.50%	2.50%
Dielectric Withstanding Voltage, 50mA Chrg.	125Vdc, 5 Sec.	125Vdc, 5 Sec.
Operating Temp. Range °C	-55/125	-55/125
Packaging Options (Quantity/Reel) Tape & Reel: 7"	Paper Tape: 5K	Embossed: 4K
Tape & Reel: 13"	Paper Tape: 20K	Embossed: 16K

Specification subject to change without notice

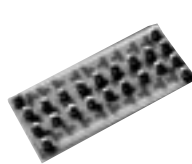
Ordering Information



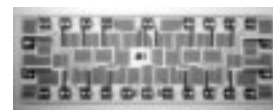
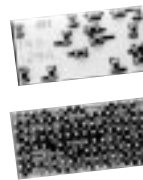
Schematics



BGA Products



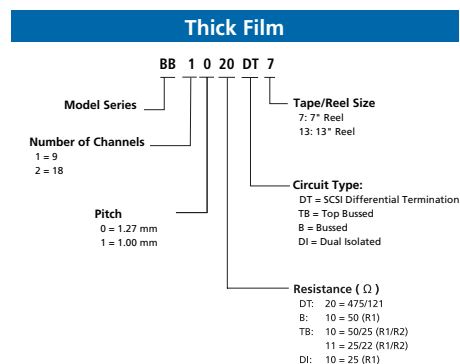
Network Thick Film



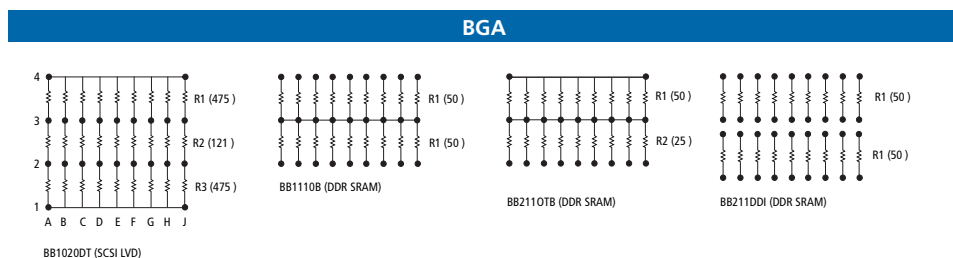
Network Thin Film

Model	BB	Custom Thick Film	Custom Thin Film
Resistance Nominal (Ω)	10 to 10M	10 to 10M	25 to 1M
Ball Size (mm)	0.64/0.76	Application Dependent	Application Dependent
Pitch (mm)	1.27, 1	Application Dependent	Application Dependent
Absolute Tolerance (%)	± 1	± 1	± 0.1
Ratio Tolerance (%)	± 1	± 1	± 0.05
Temperature Coefficient of Resistance (ppm/ $^{\circ}\text{C}$)	± 100	± 200	± 25
Temperature Coefficient of Resistance Tracking			± 5
Operating Temperature ($^{\circ}\text{C}$)	-55 to 125	-55 to 125	-55 to 125
Interlead Capacitance (pF)	< 0.1	< 0.1	< 0.1
Application	SCSI LVD, DDR SRAM	High Speed Line Termination	Precision Analog

Ordering Information



Schematics



Custom Networks

If your exact requirements for thick or thin film resistor networks are not listed in this guide, simply contact us. BI Technologies specializes in producing custom resistor and resistor-capacitor networks, engineered to meet your exact requirements.

Custom Precision Thick Film Networks

- Absolute tolerances to $\pm 0.25\%$. Don't over specify; $\pm 2\%$ generally provides the most economic solution.
- Ratio matching of $\pm 0.1\%$ can be achieved for resistors with 5 to 1 or smaller ratios. Specify a reference resistor and use groups of small number of resistors rather than one large group with many ratio matches.
- Absolute T.C.R. to $\pm 50\text{ppm}/^{\circ}\text{C}$.
- T.C.R. tracking to $\pm 15\text{ppm}/^{\circ}\text{C}$.
- Resistance range of 2Ω to 10 Megohm.
- Limit the number of circuit crossovers.

Custom Precision Thin Film Networks

- Available in absolute tolerances to $\pm 0.1\%$. For the most cost-effective solution, specify the widest tolerances possible ($\pm 0.5\%$ is ideal).
- Ratio matching is available to $\pm 0.01\%$. If possible, specify ratio matches in multiple groups, rather than one large group (yields are better for groups containing only a few ratio matched resistors). Use the lowest value resistor within a group as the reference resistor. Ideal resistance values for accurate ratio matches are in the $2\text{K}\Omega$ to $100\text{K}\Omega$ range.
- For best results, limit total package resistance to less than 3 Megohm for 14 or 16 pin through-hole DIPs and 1 Megohm for 8 pin DIP and surface mount.
- T.C.R. tracking of $\pm 1\text{ppm}/^{\circ}\text{C}$ is possible for resistors with nearly equal values.

Power Magnetics

Surface Mount Inductors and Ferrite Beads



Model	BCL 3225/4532/5650	BML/BMC	BMB/BMB High Current	HM61
Industry Style	1210/1812/2220	0402 to 1206 Inductor	0402 to 1812/0603 to 1812 Chip Beads	Surface Mount Inductor
Inductance Range	0.1μH to 10000μH	1.5mH to 33μH	1μH to 2700μH	
Impedance Range			7Ω to 2,200Ω/50Ω to 600Ω	
DC Resistance	0.03Ω to 150mΩ	0.10Ω to 2.75Ω	0.05Ω to 1.0Ω/0.01Ω to 0.3Ω	0.065Ω to 10.5Ω
Current Rating	25mA to 1800mA	1mA to 300mA	50mA to 600mA 0.5A to 6A	0.16A to 4.0A
Voltage Rating				
Core Type	Drum	Monolithic	Monolithic	Drum
Operating Case Temp. Range	-40°C to +100°C	-40°C to +125°C	-25°C to +85°C	-40°C to +180°C
Packaging Options	Tape & Reel	Tape & Reel	Tape & Reel	Tape & Reel

Through-Hole Inductors



Model	HM11	HM15	HM53	HM55
Industry Style	Rod Core Inductor	Encapsulated Inductor	Output Indicator	Power Inductor
Inductance Range	0.21μH to 28μH	150μH to 1,000μH	1.4μH to 1000μH	0.4μH to 6.0μH
DC Resistance	0.9mΩ to 43mΩ	0.5Ω to 1.7Ω	2.6mΩ to 680mΩ	0.8M to 7mΩ
Current Rating	5.5A to 31A	0.5A to 1.7A	1.9A to 29.5A	9A to 40A
Voltage Rating				
Core Type	Ferrite Rod	Toroid	Toroid	Shielded Drum
Operating Case Temp. Range	-25°C to +105°C	-40°C to +125°C	-40°C to +155°C	
Packaging Options	Bulk	Tray	Tray	Tray

Specifications subject to change without notice. For Custom Applications Please Contact Us.

Selecting Minimum Inductance For A Buck Or Boost Converter:

Example #1, Step-Down (Buck) Converter

Input Voltage (V_{IN}):	+22V to +26V	Output Voltage (V_O):	+5V
Switching Frequency (F):	50KHz		
Maximum DC Output Current ($I_{DC MAX.}$):	2.5A	Minimum DC Output Current ($I_{DC MIN.}$):	0.5A
Voltage Drop Across Switcher (V_{SW}):	0.5V	Voltage Drop Across Diode (V_D):	0.5V

1. Determine the minimum on time of the transistor switch. $T_{ON (MIN.)} = \frac{V_O + V_D}{F \times E_{IN (MAX.)}} = \frac{5 + 0.5}{50000 \times 26} = 4.23\mu s$
2. Assume the peak to peak ripple current, ΔI_L , equal to twice the min. value of DC output current.
3. Calculate the minimum inductance. $L_{MIN.} = \frac{[E_{IN (MAX.)} - V_O - V_D] T_{ON (MIN.)}}{\Delta I_L} = \frac{(26 - 5 - 0.5) (4.23 \times 10^{-6})}{2 \times 0.5} = 86.7\mu H$
4. Refer to our catalog and select the smallest part meeting min. I_{DC} and inductance requirement.



HM71	HM77	HM78	HM66	HM68
Surface Mount Inductor	Surface Mount Inductor	Surface Mount Inductor	Surface Mount Inductor	Button Inductor
1.0μH to 1,000μH	1μH to 1,070μH	10μH to 1,000μH	1μH to 330μH	2.2μH to 47μH
0.01Ω to 13.8Ω	4.56mΩ to 1,480mΩ	5.2mΩ to 5.2Ω	0.008 to 1.54Ω	0.081Ω to 2.34Ω
0.1A to 20A	0.71A to 13.3A	0.2A to 12A	0.22A to 10.0A	0.48A to 1.9A
Drum	Toroid	Shielded Drum Core	Shielogo Drum	Drum
-40°C to +85°C	-40°C to +105°C	-40°C to +85°C	-40°C to +85°C	-40°C to +100°C
Tape & Reel	Tape & Reel/Tube	Tape & Reel	Tape & Reel	Tape & Reel



Common mode chokes



HM73	HM67	HM19	HM28
Surface Mount Inductor	Surface Mount C.M.	Toroid Style	Buckle Style
.01μH to 10μH	5μH to 4.7MH	1mH to 16mH	0.45mH to 120mH
0.5M to 23.1mΩ	0.09Ω to 0.67Ω	0.02Ω to 0.24Ω	0.08Ω to 2.7Ω
5.6A to 40A	0.2A to 1.0A	1.8A to 7.5A	0.5A to 4A
	300T	250V	250V
ER	Toroid	Toroid	Buckle
-40C to 135°C	-40°C to +155°C	-25°C to +105°C	-25°C to +105°C
Tape & Reel	Tape & Reel	Tray	Tray/Tube

Example #2, Step-Up (Boost) Converter

Input Voltage (V_{IN}):	+12V to +15V	Output Voltage (V_O):	+24V
Switching Frequency (F):	50KHz		
Maximum DC Output Current ($I_{DC\ MAX.}$):	1.5A		
Voltage Drop Across Switcher (V_{SW}):	0.5V	Voltage Drop Across Diode (V_D):	0.5V

1. Assume a maximum ripple current of 12.5% of inductor current. $I_{L(AVE)}$
2. Determine the minimum on time of the switcher. $T_{ON(MIN)} = \frac{[V_O - E_{IN(MAX)} + V_D]}{F V_O} = \frac{24 - 15 + 0.5}{50000 \times 24} = 7.92\mu s$
3. Determine the average current through inductor. $I_{L(AVE)} = \frac{1.05 (V_O + V_D) I_{DC}}{E_{IN}} = \frac{1.05 (24 + 0.5) 1.5}{15} \approx 2.57A$
4. Determine peak to peak ripple current. $\Delta I_L = 2 (P/100) I_{L(AVE)} = 2 \times 12.5\% \times 2.57 = 0.643$
5. Calculate the minimum inductance. $L_{MIN} = \frac{[E_{IN(MAX)} - V_{SW}] T_{ON(MIN)}}{\Delta I_L} = \frac{(15 - 0.5) (7.92 \times 10^{-6})}{0.643} = 179\mu H$
6. Refer to our catalog and select the smallest part meeting Min. L_{DC} and inductance requirement.

Power Magnetics



Transformers

Model	HM31	HM32	HM33	HM41	HM80
Industry Style	Current Sense	Current Sense	Current Sense	Gate Drive	ISDN Isolation
Inductance Range	1.3mH to 195mH	0.2mH to 85mH	180μH to 980μH	138μH to 860μH	2.7mH to 27mH
Turns Ratio	1:25 to 1:300	1:10 to 1:200	1:30 to 1:70	1:0.67 to 1:2	1:0.6 to 1:2.5
Operating Frequency	20KHz plus	20KHz plus	250KHz plus	20KHz to 300KHz	Supports ISDN 192kbps
DC Resistance Range	0.7Ω to 11.0Ω	0.2Ω to 4.5Ω	1.0Ω to 4.75Ω	0.072 to 0.156Ω	0.9Ω to 15Ω
Core Type	Toroid	Toroid	EE	Toroid	Varies
Operating Case Temp. Range	-25°C to +105°C	-25°C to +105°C	-25°C to +105°C	-25°C to +85°C	0°C to +85°C
Packaging Options	Bulk	Bulk	Tape & Reel	Bulk	Tape & Reel/Bulk

Specifications subject to change without notice.

We are capable of any core type.

Custom Capability/Application Summary

	A. Power								B. Data/Telcom	
	Main Line Xfmr		Inductor		EMI Filter		Gate Drive		Current Sense	
	Power	Distrib.	Power	DC-DC Diff	Com.	MdXfmr (Mosfet)	Ind.	Xfmr	LAN Xfmr	Telecom Xfmr
Application Related										
Line Input (70-400V)	•									
Operating Frequency (20-300KHz)	•	•					•	•	•	
Digital Application									•	•
Internal Safety Standards	•		•				•	•	•	•
Core: Material & Configuration										
Ferrite: EE	•	•	•				•			
ETD	•	•								
EC	•	•								
Buckle						•				
PQ	•	•								
POT		•							•	•
RM		•							•	
UU							•	•		
Slug			•		•					
Drum			•	•	•	•				
Toroid*		•				•	•	•	•	•
Powder Iron: Toroid*			•	•	•					
Package										
SMD		•	•	•	•		•	•	•	•
Through-Hole	•	•	•	•	•	•	•	•	•	•
Catalog Equivalent (HM, HS, HT)	Custom	11, 12, 13, 15, 76, 77, 78			18	19, 28	41	41	32	91, 92, 93 80, 81, 82, 83

* Also available in molypermalloy powder iron and tape wound amorphous metal materials.

If your circuit performance dictates specific parameters not listed, please contact BI Technologies engineering. We would need the following to assist you in your design:

- Operating frequency
- Turns ratio
- Withstanding voltage
- Output power in watts
- Size/shape restrictions or limits
- Impedances
- Circuit topology
- Duty cycle

Signal Magnetics

lan/wan/isdn



Model	HS91	HS92	HS93
Industry Style	Single Port 100/1000MB	10Base-T Ethernet AUI Transformer	T1/CEPT/ISDN Transformer
Turns Ratio (Chip to Media Side)	1:1, $\sqrt{2}$:1	1:1, 1ct:2ct	1:1:1, 1:2ct, 1ct:2ct, 1:2
Operating Temp. Range	0°C to +70°C	0°C to +70°C	0°C to +70°C
Insertion Loss	-1.0 Typ. 1 to 100MHz		
Rise Time	2.5ns, Typ.		
Return Loss	-11 to -18dB, 0.1 to 100MHz		
Common Mode Rejection	-35 to -45dB, 0.1 to 100MHz		
Cross Talk	-38 to -40dB, 0.1 to 100MHz		
Insulation Voltage, Minimum	1,500Vrms	2,000Vrms	2,000Vrms
Inductance	350 μ H @ 100KHz	90 to 140 μ H @ 100KHz	1.2 to 22mH @ 100KHz
Leakage Inductance		0.1 to 0.2 μ H @ 100KHz	0.5 to 11 μ H @ 100KHz
Interwinding Capacitance		10 to 12pF @ 100KHz	35 to 100pF @ 100KHz
DC Resistance		0.3 to 0.6 Ω	0.7 to 2.4 Ω
Mounting Style	Surface Mount	Surface Mount	Surface Mount/Through-Hole

DSL Coupling Transformer



Model	HT81	HT82	HT83
Industry Style	HDSL Transformer	VDSL Transformer	Common Mode Choke*
Turns Ratio (Chip to Media Side)	1ct, 2ct:1.8ct, 2st	1:1, 1:1:1	
Insertion Loss	1.0dB Max. @ 40KHz	0.5 to 0.8dB @ .2 to 30MHz	
Return Loss	16.5 to 20dB @ Mid. Band	10 to 22dB @ .2 to 30MHz	
Longitudinal Balance	50 to 55dB @ 5 to 320KHz	30 to 40dB @ .2 to 3MHz	
THD	-70 to -75dB	-70dB	
Inductance @ 10KHz	2 to 3mH	175 to 250 μ H	24 μ H to 4mH
Cross Talk	-38 to -40dB, 0.1 to 100MHz		
Common Mode Attenuation			20 to 45dB
Parallel Impedance @ 10KHz			7.5k Ω
Mounting Style	Through-Hole	Surface Mount/Through-Hole	Surface Mount/Through-Hole

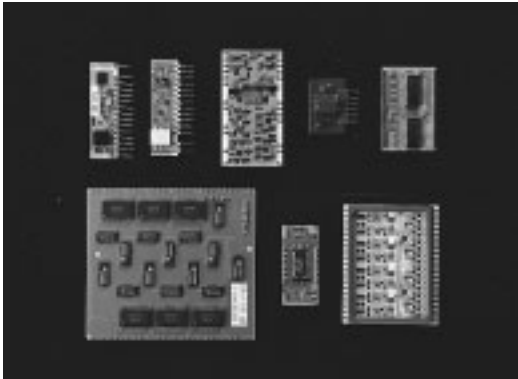
Specifications subject to change without notice.

* For applications up to 25.92 mbs.

Custom Microcircuits & Modules

Assemblies

Microcircuit module assemblies are being used in an increasing number of applications. Our Power Modules focus on applications requiring power and thermal management of large semiconductor components. The Military and Commercial hybrids accommodate a wide variety of analog and digital control circuits. In small to mid-size assemblies, our ceramic substrate based modules offer price competitive solutions along with quality and design advantages.



Model	Military & Commercial Hybrid	Power Modules
Typical Product Specifications	Integral Thick Film Resistors to 1% Absolute, 0.5% Matching	Assembly Includes Power Semiconductors in Die Form
	Assembly Includes ICs of All Types in Die Form (Military)	Surface Mount Thermistors and Capacitors
	Assembly Includes ICs of All Types in SMT Form (Commercial)	
	Surface Mount Capacitors and Inductors	
Average Complexity	>50 Resistors, >10 Capacitors, >20 Active Components Power Up to 15 Watts. Currents Up to 5 Amps	5 to 20 Semiconductors Power Up to 5,000 Watts. Currents Up to 30 Amps
Typical Circuit Applications	Signal Conditioning	Power Factor Correction
	Motor Drivers	Power Amplification
	Analog, Digital & Mixed	Bridge Rectifier
	Active Filters	Motor Drive
	Linear Amplifiers	H-Bridge
	Sensor Circuits	
	Voltage Regulators	
	Data Converters	
	DC-DC Converters	
	Multiplexers	
	Telecommunication Systems	Telecommunication Systems
	Power Supplies	Power Supplies
Typical Customer Applications	Industrial Control Systems	Industrial Control Systems
	Computer and Workstation Applications	Computer and Workstation Applications
	Avionics	Avionics
	Instrumentation	Instrumentation
	Automotive	Automotive

Subassemblies



Model	Military 165-X	Power 170-X	Commercial 143-X
Microelectronics Specialist in your Military Grade, Power and Commercial Electronic Subassemblies	BI Technologies has extensive circuit knowledge and over 30 years of design experience with military grade hybrid products	BI Technologies maintains dedicated production lines for both commercial and industrial high power or modules	Whether you are upgrading "through-hole" circuit board to surface mount technology or developing a new design, BI Technologies provides the solution
Features	Multi-layer Thick Film on Alumina	Direct Bonded Copper on Alumina Substrates	Multi-layer construction
	Custom Thin Film Subassemblies	Automatic Large Diameter Aluminum Bonding	Surface Mount Components on Ceramic Substrates
	Integral Thick Film Resistors	Versatile Molded Packaging	Chip on Board Capability
	Chip and Wire Construction	Directly Mountable to Heat Sink	Integral Thick Film Resistors
	Metal, Ceramic and Cofired Ceramic Packaging	High Voltage and High Current Designs	Versatile Lead Configuration
	MIL-STD-883 Screening	Fully Isolated Heat Sink	One and Two Sided Designs
	Surface Mount or Plug-in Style		Encapsulation Options
Benefits	Listed in QML-38534	Standard Power Factor Correction Modules to 5000 Watts	Low Cost Assembly Technique
	MIL-PRF-38534 Certified Facility	Improved Thermal Management	U.S. or Offshore Assembly in ISO/QS 9000 Certified Facilities
	ISO-9001 Certified Facility	Reduced Stray Inductance	U.S. Design and Management
			Reduced Board Size

A Commitment To Microcircuits

BI Technologies is the preferred choice for companies seeking custom, high-reliability microcircuits which meet exacting performance, cost and schedule requirements. With 30 years of experience in thick and thin film design and manufacturing, BI Technologies offers the strength of experience, large company resources and a small company orientation. All factors combined give us the ability to rapidly respond to our customer needs.

Microcircuits & Modules

Standard Power Modules/
Power factor correction



Model	7700B	7700-2A	7720-1A	7720-2A	7720-3A
Output Power, Watts	1,500 to 3,000	2,000 to 4,000	1,500 to 3,000	1,000 to 2,250	500 to 1,500
FET, Max.	0.1 Ohms 500 Volts	67 mOhms 500 Volts, Low Charge	0.1 Ohms 500 Volts	0.13 Ohms 500 Volts	0.2 Ohms 500 Volts
Output Diodes, Max.	2.8 Volts @ 24 Amps 600 Volts Hyperfast	2.8 Volts @ 50 Amps 600 Volts Hyperfast	2.8 Volts @ 25 Amps 600 Volts Hyperfast	2.8 Volts @ 25 Amps 600 Volts Hyperfast	2.8 Volts @ 18 Amps 600 Volts Hyperfast
Bridge	1.2 Volts @ 25 Amps 600 Volts, w / SCRs	1.2 Volts @ 40 Amps 800 Volts, w / SCRs	1.2 Volts @ 25 Amps 600 Volts	1.2 Volts @ 25 Amps 600 Volts	1.2 Volts @ 18 Amps 600 Volts
Thermistor (NTC)	25K Ohms	25K Ohms	25K Ohms	25K Ohms	25K Ohms
Operating Temp. Range	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C

Designed to optimally facilitate a boost type power factor correction (PFC) system for designs with up to 25Arms input current. Standard applications include switching power supplies from 500 to 4,000 watts with line voltages from 84 to 265Vrms.

Ordering Information

7700

77002A

Model
Package Size

Power Level:
B = 1,500 to 3,000W
2A = 2,000 to 4,000W
Circuit Function:
0 = PFC

7720

77201A

Model
Package Size

Power Level:
1A = 1,500 to 3,000W
2A = 1,000 to 2,250W
3A = 500 to 1,500W
Circuit Function:
0 = PFC

7721

77211A

Model
Package Size

Power Level:
1A = 22A
2A = 32A
Circuit Function:
1 = H Bridge

830-004V05V

Model
Voltage Prefix

Mounting Style:
V = Vertical, Through-Hole
H = Horizontal, Through-Hole
S = Horizontal, Surface Mount
Output Voltage: 5 to 24 Volts

System Diagrams

7700

Pin 1: AC1
Pin 2: AC2
Pin 3: Bridge Output
Pin 4: SCR Gates
Pin 5: Ground
Pin 6: Ground
Pin 7: FET Drain
Pin 8: Ultrafast Anode
Pin 9: Ultrafast Cathode
Pin 10: Gate Ground
Pin 11: Gate Drive
Pin 12: N.C.
Pin 13: TH1
Pin 14: TH2

Dotted line denotes BI Model 7700 and associated pins.

7720

Pin 1: AC1
Pin 2: +
Pin 3: Drain
Pin 4: Drain
Pin 5: Anode
Pin 6: Cathode
Pin 7: TH1
Pin 8: TH2
Pin 9: Gate
Pin 10: Source
Pin 11: Source
Pin 12: -
Pin 13: AC2

Dotted line denotes BI Model 7720 and associated pins.



Power Modules
H-Bridge



DC-DC Wide input
Power Supply

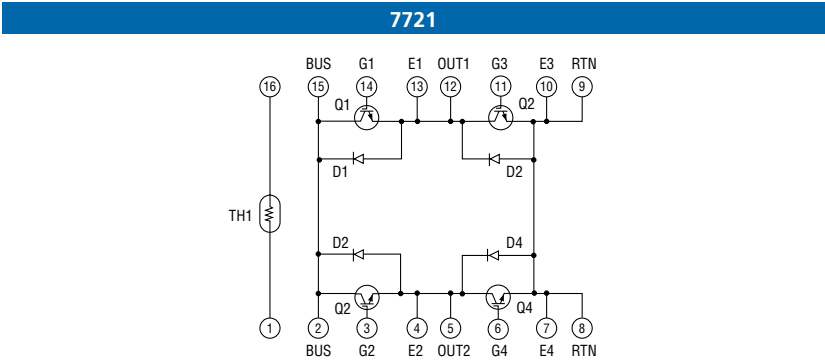
Model	7721-1A	7721-2A
IGBT, Max.	3.0 Volts @ 22 Amps 500 Volts	2.5 Volts @ 32 Amp 600 Volts
Diodes, Max.	2.8 Volts @ 24 Amps 600 Volts Ultrafast	2.8 Volts @ 50 Amps 600 Volts Hyperfast
Thermistor (NTC)	25K Ohms	25K Ohms
Operating Temp. Range	-40°C to +125°C	-40°C to +125°C

Applications: Motor Drive/Controls; DC-DC Converter; Audio Amplifier.

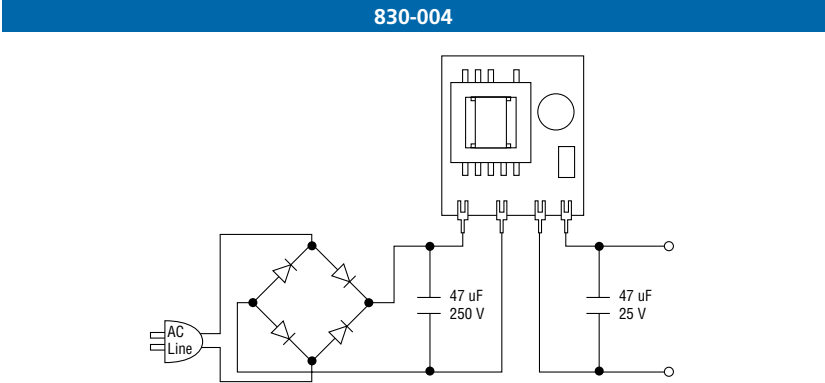
Model	830-004
Output Power	6 Watts
Output Voltage	5Vdc to 24Vdc
Input Voltage	110Vdc to 375Vdc
Output Tolerance	5% @ 50% Rated Power
Load Regulation	8%
Line Regulation	1%
Output Ripple	250mVpp
Efficiency	75% at Full Power
Operating Frequency	500KHz
Insulation Voltage	2,500 Volts
Operating Temp. Range	-0°C to +70°C

Applications: Auxiliary Power Supply; Battery Charger; Portable Electronics.

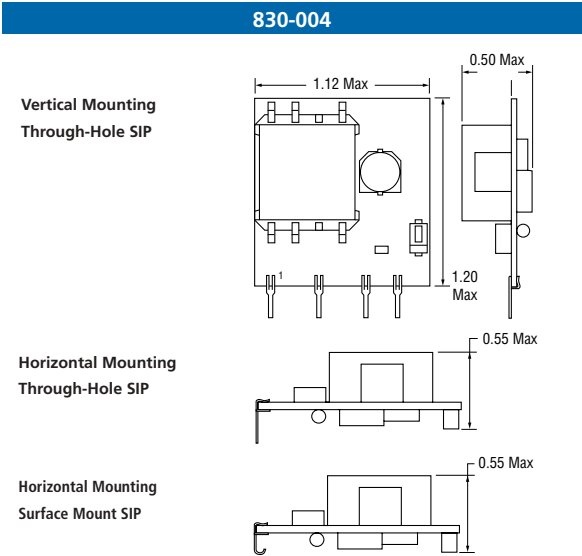
Functional Diagram



Application Diagram



Styles



Cermet Trimming Potentiometers

Single Turn/
Through-Hole



Model	24	25	62	72 ^{Note B}	82
Size ^{Note A}	.157" (4mm)	1/4" (6.35mm)	1/4" (6.35mm)	3/8" (9.53mm)	1/4" (6.35mm)
Electrical Travel	190°	210°	220°	244°	220°
Resistance					
Range, Ohms	10 to 1 Meg	10 to 2 Meg	10 to 2 Meg	10 to 2 Meg	10 to 2 Meg
Tolerance	±20%	±20%	±10%	±10%	±10%
	(±10% Available)	(±10% Available)	(<100Ω = ±20%)	(<100Ω = ±20%)	(<100Ω = ±20%)
Temp. Coefficient, ppm/°C	±100 (<200Ω = ±250)	±100 (<200Ω = ±250)	±100 (<100Ω = ±250)	±100 (<100Ω = ±250)	±100 (<100Ω = ±250)
Contact Resistance Variance, Max.	2% (<200Ω = 3Ω)	1% (<100Ω = 1Ω)	1% (<100Ω = 1Ω)	1% (<100Ω = 1Ω)	1% (<100Ω = 1Ω)
Seal	85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®
Adjustment Style					
Top	24U ³ 24W ⁹	25P ² 25U ³ 25W ⁹	62P ⁹ , PF 62M ²	72P, PT ² , RP 72PL ³ 72PM ⁴ 72PX, RPX ¹	82M ² 82P ⁹ , PF 82W ³
Side, Edge Mount	24S ⁹	25S ² 25V ³ 25X ²		72RX, X, XT ² 72RW, XL, RXL ³ 72XW, RXW ¹	82PA ²
Bottom			62B ⁸		
Packaging Options					
Bulk	Standard	NA	Standard	Standard	Standard
Tubes	N/A	Standard		P, PM, X, XL, XW, RW	M, P, PA, W
Tape & Reel	U	U, V	N/A	RWF ^{Note C}	WF ^{Note C}
Ammo Pack	N/A	U, V	N/A	RWF ^{Note C}	WF ^{Note C}

Specifications subject to change without notice.
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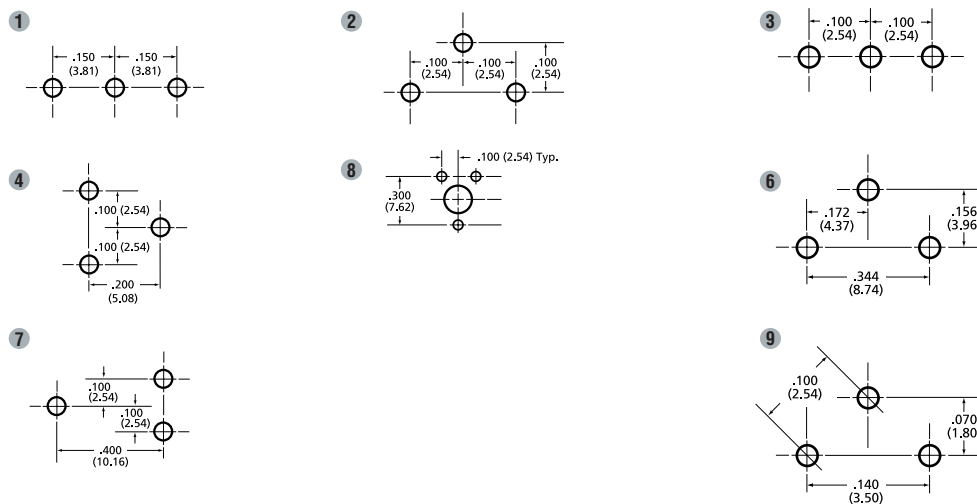
Note A Dimensions shown are for popular pin styles. Consult data sheet for complete information.

Note B Optional adjustment knob version available (Models 72PT & 72XT).

Note C "F" is added to pin style for tape & reel and ammo pack.

PC Board Patterns

Through-Hole—Inches (mm)





Single Turn/
Surface Mount

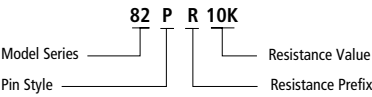


91	93
3/8 " (9.53mm)	1/2 " (12.70mm)
174°	270°
10 to 2 Meg	10 to 2 Meg
±20%	±10%
	(<100Ω = ±20%)
±100	±100
(<100Ω = ±250)	(<100Ω = ±250)
1% (<100Ω = 1Ω)	1% (<100Ω = 1Ω)
Dust Cover	85°C Fluorinert®
91A ③	93P ②
91B ②	
91C ⑥	
91E ⑦	
91T, X ②	
91V ⑥	
91W ③	
Standard	Standard
N/A	N/A
N/A	N/A
N/A	N/A

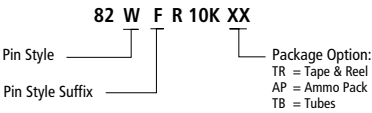
22	23
.118 " (3mm)	.157 " (4mm)
220°	200° / 210°
100 to 1 Meg	10 to 2 Meg
±20%	±20%
±100	±100
(<200Ω = ±250)	(<200Ω = ±250)
3%	2% (<200Ω = 3Ω)
85°C Fluorinert®	85°C Fluorinert®
22A ⑤	23A ③
22B ⑥	23B
	23S ③
Standard	N/A
N/A	N/A
A, B	Standard
N/A	N/A

Ordering Information

Standard

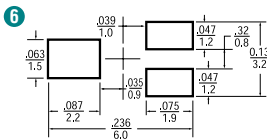
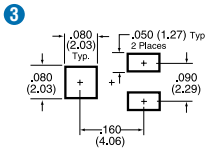


Special Package Options



PC Board Patterns

Surface Mount—Inches (mm)



Cermet Trimming Potentiometers

Multiturns/
Through-Hole

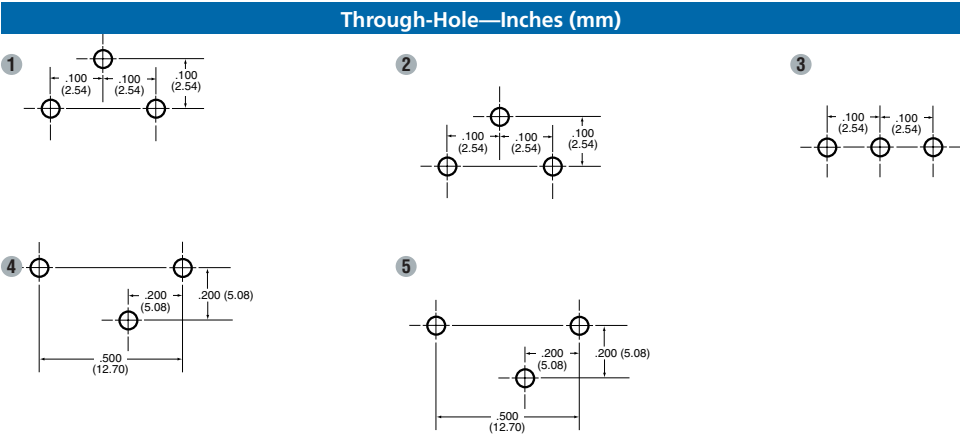


Model	64	67	68	89/90
Size ^{Note A}	1/4" (6.35mm)	3/8" (9.53mm)	3/8" (9.53mm)	3/4" (19.05mm) ^{Note B}
Electrical Travel	12 Turns	20 Turns	20 Turns	20 Turns
Resistance				
Range, Ohms	10 to 2 Meg	10 to 2 Meg	10 to 2 Meg	10 to 2 Meg
Tolerance	±10%	±10% (<100Ω = ±20%)	±10% (<100Ω = ±20%)	±10% (<100Ω = ±20%)
Temp. Coefficient, ppm/°C	±100 1% (<100Ω = 1Ω)	±100 1% (<100Ω = 1Ω)	±100 1% (<100Ω = 1Ω)	±100 1% (<100Ω = 1Ω)
Contact Resistance Variance, Max.	1%			
Seal	85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®
Adjustment Style				
Top	64W ² 64Y ³	67W ³ 67Y ²	68W ³	89P, 89PH ⁴ , 90P ^{Note F}
Side, Edge Mount	64X ² 64Z ³	67X ³ 67Z ²	68X ³	89W, 89WH ⁵ 89X, 89XH ¹
Side, Flat Mount	64P ²	67P ²	68P ²	
Packaging Options				
Bulk	N/A	Standard	Standard	Standard
Tubes	Standard	P, W, X, Y, Z	P, W, X	P, X, W, PH, WH, XH
Tape & Reel ^{Note E}	YF, ZF ^{Note E}	WF, XF ^{Note E}	WF, XF ^{Note E}	N/A
Ammo Pack ^{Note E}	YF, ZF ^{Note E}	WF, XF ^{Note E}	WF, XF ^{Note E}	N/A

Specifications subject to change without notice.
Fluorinert® is a registered trademark of 3M Company.

PC Board Patterns

- Note A
- Dimensions shown are for popular pin styles.
Consult data sheet for complete information.
- Note B
- High profile (.34") version available,
Models 89PH, WH, XH.
- Note C
- Termination style is flexible leads.
- Note D
- Termination style is J-Hooks.
- Note E
- "F" is added to pin style for tape & reel and
ammo pack.
- Note F
- Model 90P features Transparent Housing.



Multiturns/
surface mount


44	45	84
.157" (4mm)	.157" (4mm)	1/4" (6.35 mm)
9 Turns	15 Turns	12 Turns
10 to 2 Meg	10 to 2 Meg	10 to 2 Meg
±10%	±10%	±10%
(<100Ω = ±20%)	(<100Ω = ±20%)	
±100	±100	±100
(<100Ω = ±250)	(<100Ω = ±250)	(<100Ω = ±250)
1%	1%	1% (<100Ω = 1Ω)
85°C Fluorinert®	85°C Fluorinert®	85°C Fluorinert®
44W ③	44W ③	84W ①
44J ④	44J ④	84X ①
44G ⑤	44G ⑤	
		84P ②
N/A	N/A	N/A
G, J, W	G, J, W	Standard
Standard	Standard	P, W, X
N/A	N/A	N/A

Ordering Information

Standard

Model Series **67 P R 10K** Resistance Value
Pin Style Resistance Prefix

Special Package Options

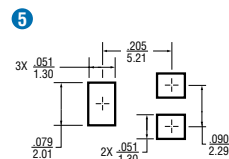
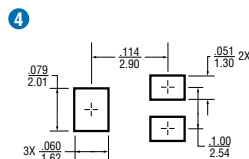
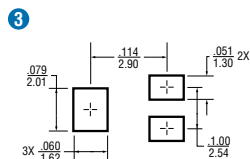
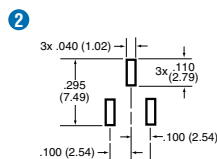
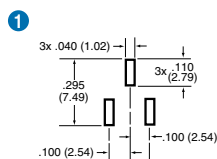
Pin Style **67 W F R 10K XX** Package Option:
Pin Style Suffix TR = Tape & Reel
AP = Ammo Pack
TB = Tubes

Custom Trimmers

Special electrical and mechanical features are available for specific customer applications. For additional information and complete product specifications, contact your local BI Technologies representative.

PC Board Patterns

Surface Mount—Inches (mm)



Precision Potentiometers



Position Sensors—single turns

Model	3381	6163	6173	6187 Note 1
Resistor Element Type	Conductive Plastic	Conductive Plastic	Conductive Plastic	Conductive Plastic
Diameter, Inches	1-5/16"	7/8"	7/8"	7/8"
Mounting Style	Bushing	Servo	Servo	Bushing
Resistance Range, Ohms	1K to 300K	1K to 100K	1K to 100K	1K to 100K
Independent Linearity, Standard	±0.5%	±1.0%	±0.5%	±1.0%
Power Rating, Watts	2.0 at 70°C	1.0 at 70°C	1.0 at 70°C	1.0 at 70°C
Rotational Life, Revolutions	10 Mil.	25 Mil.	25 Mil.	5 Mil.

Note 1 Low profile versions available



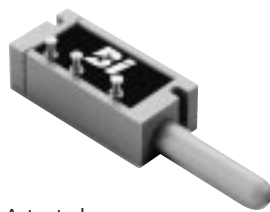
Position Sensors—Multiturns

Model	A	C	7246	7276 (plastic shaft & bushing)
Resistor Element Type	Wirewound	Wirewound	Wirewound	Wirewound
Number of Turns	10	3	10	10
Diameter, Inches	1-13/16"	1-13/16"	7/8"	7/8"
Mounting Style	Bushing	Bushing	Bushing	Bushing
Resistance Range, Ohms	10 to 500K	5 to 100K	10 to 125K	100 to 100K
Independent Linearity, Standard*	±0.25% (<300Ω = ±0.50%)	±0.50%	±0.25%	±0.25%
Power Rating, Watts	5.0 at 40°C	3.0 at 40°C	2.0 at 25°C	2.0 at 25°C
Rotational Life, Revolutions	2 Mil.	2 Mil.	1 Mil.	500K

Specifications subject to change without notice.
*Non-standard linearities available. Consult factory.

Typical Special Features: (Consult your factory representative for details and applicability.)

- Special Resistance Value and Tolerance
 - Special Linearity
 - Center Tap
 - Rear Shaft Extension
 - Shaft Flat
- Slotted Shaft
 - Shaft Lock
 - Special Testing
 - Mechanical Stops (Standard on all Multiturn)



Linear Actuated

6671/6673	5611/5613
Conductive Plastic	Wirewound
2"	2"
Bushing/Servo	Bushing/Servo
1K to 300K	15 to 80K
±0.25%	±0.5% ($<50\Omega = \pm 1.0\%$)
3.5 at 70°C	3.5 at 70°C
25 Mil.	1 Mil.

Model 404
Conductive plastic
Bracket/Servo
1K-150K
±190 .25@70°C
5 Mil.



7283/7286	7383/7386	7483/7486	8136 (plastic shaft & bushing)	8143/8146
Wirewound	Wirewound	Wirewound	Hybrid	Hybrid
10	3	5	10	10
7/8"	7/8"	7/8"	7/8"	7/8"
Servo/Bushing	Servo/Bushing	Servo/Bushing	Bushing	Servo/Bushing
100 to 100K	100 to 30K	100 to 50K	1K to 100K	1K to 100K
±0.25%	±0.25% ($<500\Omega = \pm 0.30\%$)	±0.25%	±0.25%	±0.25%
2.0 at 70°C	1.5 at 70°C	1.5 at 70°C	2.0 at 25°C	2.0 at 70°C
1 Mil.	300K	500K	1 Mil.	5 Mil.

Ordering Information

Standard				
7286	R	10K	L.25	FS
Model Series	Resistance Prefix	Resistance Value	Linearity	Special Features

Special Design Capability

An extensive variety of special feature options are available for the standard models shown above. Your local BI Technologies representative can provide design assistance and recommendations. Factory application engineering support is also available to provide custom solutions for special requirements.

Turns Counting Dials



Analog Dials

Digital Dials

Model	RB	2601	2606/2646 Note A,B	2126 Note C
Counting Capacity, Maximum Turns	15	15	20	10
Dimensions, Nominal	1-13/16" Diameter	7/8" Diameter	7/8" Diameter	1" Diameter
For Shaft Diameter	1/4"	1/8"	1/4"	1/4"
For Bushing Diameter	3/8"	1/4"	3/8"	3/8"
Depth, Max. From Face of Panel	1.02"	0.82"	0.90"	0.65"
Locking Mechanisms	Positive Action	Positive Action	Positive Action with Detent	Brake

Specifications subject to change without notice.

- Note A Available in 15 turns—Model 2606S. Available with 2 set screws—Model 2607.
Note B Available with 2 set screws—Model 2647.
Note C For 6.00mm diameter shaft, use 2126M.



BI Technologies offers one of the broadest lines of precision potentiometers in the industry. In addition to the products featured in this Product & Capabilities Overview, numerous additional models, including linear motion potentiometers and motor driven potentiometers are available.

BI Technologies is a leader in the design and manufacture of custom potentiometers, providing innovative sensing and control solutions for over 50 years.

Our professional and technical staff will team with your company to design and produce the custom sensor or control required for your application. Allow us to employ our decades of experience to develop a solution to your aircraft, aerospace, instrumentation, automotive or industrial application.

Contact our applications engineering professionals for recommendations on electrical and mechanical specifications.



Sensors for Transportation & Industrial Markets

BI Technologies has a 40 year heritage of providing innovative designs and high quality production for the electronics industry. Our original technologies were wirewound precision potentiometers and trimming potentiometers. Today we produce components and subsystems in thick films, thin films, wound magnetics, and hybrid circuit technologies.

Our technology and products have included many industry firsts over

the years, including the first resistor network, the first cermet trimming element, the first integrated thick film resistor capacitor on a chip. Most recently, BI's position and torque sensors for drive-by-wire steering have ramped into full production.

Our automotive products focus is apparent in each of our nine global locations. Currently, BI has manufacturing facilities in Mexico, Scotland, Malaysia, and California. The global design and business

development organization operates offices in nine countries with headquarters and primary research facilities in Fullerton, California. Each facility is ISO 9000 and QS9000 certified. The skills base in engineering, manufacturing, program management and supply logistics is organized for and tuned to support the challenging automotive business.

Typical Applications

Steering
Memory Seat
Pedal Position
TPS
Height Leveling
Smart Cruise Control
Temperature
Lumbar Support
Brake
EGR



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