Mini-Systems Thin Film Division

PERFORMANCE –

- Knowledgeable service, sales, and engineering support
- Dock-to-stock quality
- Quick response to critical requirements and questions
- Customized solutions to your thin film requirements
- Highly trained, dedicated staff

PRECISION –

- Controlled environment ensures top quality precision devices
- Innovative standard designs with tight tolerances and low T.C.R.'s
- Resistor networks feature tight ratio tolerances (±0.005%) and excellent TC tracking (±1ppm/°C)
- Photo patterned geometries down to < 2μ-inch lines and spaces
- Automated die inspection and handling systems provide greater efficiency
- Standard NiCr TCR ±25ppm/°C
- Standard Absolute Tolerances start at 0.01%

DELIVERY –

- Most standard parts in 4 weeks or less
- Enhanced order entry and tracking systems insure schedules are met
- Specialized Substrate Metallization

RELIABILITY –

- SPC enhanced processing
- Complete MIL-PRF-55342 testing in-house
- QPL Resistors qualified to "R" Failure Rate in July 1999
- Element evaluation per MIL-H-38534 for Class H and K

APPLICATIONS –

- Military
- Medical / Implantables
- Aerospace
- Commercial
- Telecommunications, Microwave
- Thin film / Thick film hybrids

M S I

MINI-SYSTEMS, INC.

THIN FILM DIVISION
20 David Road, P.O. Box 69, North Attleboro, MA 02761-0069
508-695-0203 Fax: 508-695-6076 E-mail: msithin@mini-systemsinc.com

ISO 9001:2000 CERTIFIED Thin Film Division

THICK FILM DIVISION
20 David Road, P.O. Box 69, North Attleboro, MA 02761-0069
508-695-0203 Fax: 508-695-6076 E-mail: msithick@mini-systemsinc.com

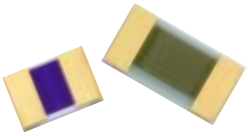
ISO 9001:2000 CERTIFIED Thick Film Division

ELECTRONIC PACKAGE DIVISION
168 E. Bacon Street, P.O. Box 1597, Plainville, MA 02762-0597
508-695-2000 Fax: 508-695-8758 E-mail: msipkg@mini-systemsinc.com

www.Mini-SystemsInc.com

Hi-Meg Resistors

Chip Resistors



Microwave & RF Resistors

Chip Attenuators

Passive Components

RC Networks

CHIP RESISTORS

- Silicon, Alumina, BeO, Quartz, Glass, Aluminum Nitride Substrates
- Absolute T.C.R.'s to ±2ppm
- Resistance range from 0.050 Ω (50m Ω) to 300M Ω
- Excellent resistor stability
- Wire bondable and surface mount terminations
- Power through 40 Watts
- QPL surface mount resistors

MICROWAVE PRODUCTS

- Chip resistors and terminations
- Chip attenuators
- Frequency through 40 GHz

METALLIZED SUBSTRATES

- TaN, NiCr, SiCr, Pd, TiW, Ni, Al, and Au
- Consult Sales Department for custom requirements

NETWORKS

- Tight tolerance conductor lines and spaces
- Plated thru holes
- Low matching ratios and T.C.R./TC tracking
- RSMT, RSMT-23, RSMA and hermetic flatpack packaged resistors
- RC Networks
- SMT Networks

CHIP CAPACITORS

- Dielectric: Silicon Dioxide
- Bond Pads: Aluminum or Gold
- Single and binary styles

Mini-Systems, Inc. has provided microelectronic leadership since 1968. For more information about our newest products, technical assistance on your next Thin Film application, please call, fax, or e-mail. We invite you to visit our Web site at ***www.Mini-SystemsInc.com***

Recipient of Corporate Achievement Award

You may charge your order on VISA or MASTERCARD.

Introducing the SMALLEST chip resistor 12 x 9 mils, where size is CRITICAL!

DCNTF-129-E-0306

INDEX OF THIN FILM PRODUCTS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-6076 FAX: 508-695-6076
DCN TF 135-F-0306

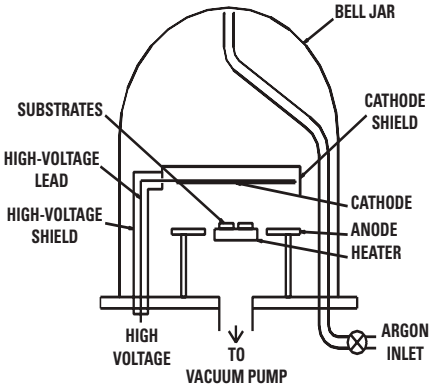
PROCESS CAPABILITIES

COMPANY PROFILE

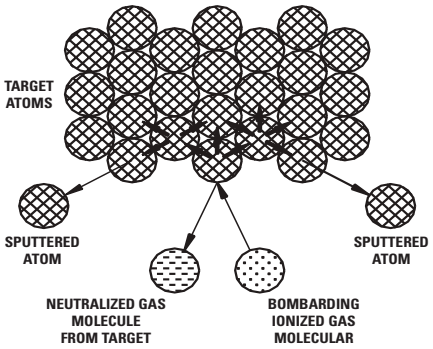
MINI-SYSTEMS, INC. WAS FOUNDED IN 1968 BY GLEN E. ROBERTSON. OUR PRIMARY GOAL IS TO MANUFACTURE PRECISION, HIGH RELIABILITY COMPONENTS FOR THE HYBRID AND MICROELECTRONICS INDUSTRY.

MINI-SYSTEMS, INC. IS COMPRISED OF THREE DIVISIONS:

- THICK FILM DIVISION: THICK FILM PRECISION CHIP RESISTORS, QPL RESISTORS
- ELECTRONIC PACKAGE DIVISION: GLASS WALL AND MICROWAVE PACKAGES
- THIN FILM DIVISION: THIN FILM PASSIVE COMPONENTS



CROSSSECTION OF A SIMPLE SPUTTERING APPARATUS



SPUTTERING COLLISION PROCESS

GLOW DISCHARGE SPUTTERING FIRST OBSERVED IN THE MID 1800'S

THIN FILM PRODUCTS

- CHIP RESISTORS; SINGLE, BACK CONTACT, CENTER TAP, DUAL, MULTITAPS, ARRAYS AND NETWORKS
- MICROWAVE RESISTORS, TERMINATIONS, AND ATTENUATORS
- MOS, BINARY CHIP CAPACITORS AND RC NETWORKS
- PACKAGED RESISTORS; RSMT, RSMA & CSMA STYLES
- METALLIZED SUBSTRATES; SINGLE OR DOUBLE SIDED, POLISHED OR AS FIRED
- CUSTOM RESISTOR NETWORKS, CAPACITOR NETWORKS, PATTERNED SUBSTRATES AND CIRCUITS
- SMT RESISTORS AND RESISTOR ARRAYS
- CHIP JUMPERS, INDUCTORS

*NOTE: ARRAY COMBINATIONS AVAILABLE FOR ALL STYLES

APPLICATIONS

- HIGH RELIABILITY MICROELECTRONICS
- MILITARY
- SPACE
- SATELLITE
- MEDICAL IMPLANTABLE
- BIOTELEMETRY
- MICROWAVE
- SURFACE MOUNT
- HYBRID
- RESEARCH
- COMMUNICATIONS
- MCM'S
- CRYOGENICS

METALLIZATION & SUBSTRATES

DEPOSITION

NICHROME	TITUNGSTEN
TANTALUM NITRIDE	NICKEL
SICHROME	ALUMINUM
PALLADIUM	GOLD

FILM THICKNESSES:	FROM 50Å TO 50KÅ
FILM RESISTIVITIES:	FROM 1Ω /Sq. TO 10KΩ / Sq.
RESISTIVE TCR:	TO < 5ppm/°C

SUBSTRATE

STANDARD	CUSTOM
SILICON	BeO
ALUMINA	LTCC
QUARTZ	
GLASS	
ALUMINUM NITRIDE	

SIZES:	TO 4" X 4" STANDARD
SURFACE FINISHES:	FROM POLISHED TO 20 µ-inches

THRU-HOLE AND FILLED VIAS AVAILABLE
PREFERRED VIA DIAMETER TO SUBSTRATE THICKNESS RATIO IS 1:1

EQUIPMENT

SPUTTERING

RF DIODE AND DC MAGNETRON SPUTTERING
PE CVD (SiO_2) DEPOSITION
OXIDATION FURNACE

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

PROCESS CAPABILITIES

EQUIPMENT

PHOTOLITHOGRAPHY

PHOTORESIST SYSTEMS
- NEGATIVE AND POSITIVE PHOTORESIST SYSTEMS
- LARGE PANEL (UP TO 24" X 24") ALIGNMENT
- PATTERN PLATING, WET AND DRY ETCH FABRICATION TECHNIQUES

LINE WIDTH DEFINITION
- RESISTOR PATTERNING TO 2 MICRONS
- CONDUCTOR LINE WIDTHS - 100 µ" OF GOLD; 0.5 mils (20 MICRONS) ±0.05 mils

PHOTO MASK
- PREFERRED MASK SIZE 5" X 5", UP TO 12" X 12" CUSTOM
- MASK TONES PREFERRED
  - RESISTOR LEVEL MASK TONE DARK IMAGE / CLEAR FIELD
  - CONDUCTOR LEVEL MASK TONE DARK FIELD / CLEAR IMAGE
  - GLASSIVATION LEVEL MASK TONE DARK IMAGE / CLEAR FIELD

LASER TRIMMING
- ESI MODEL 44 THIN FILM LASER TRIMMERS
- TRIM TOLERANCES TO 0.01% OR 2 MILLIOHMS RESOLUTION

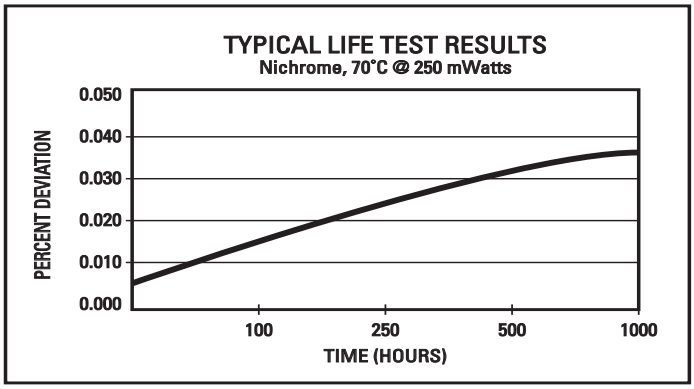
SEPARATION
- DIAMOND SAW SEPARATION OF SILICON, ALUMINA, AND QUARTZ
- LASER MACHINING AVAILABLE

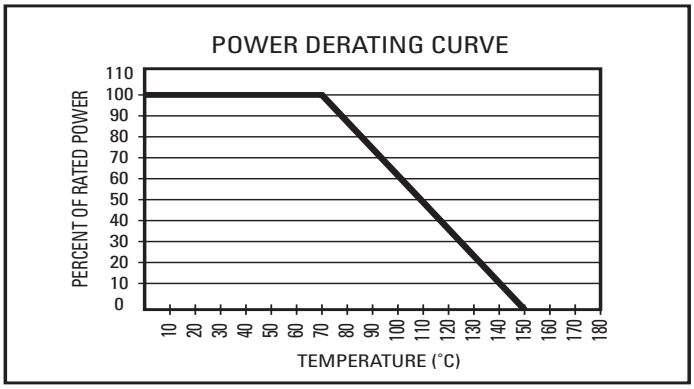
DIE HANDLING AND SORTING
- AUTOMATIC TEST AND INK MARKING SYSTEM
- AUTOMATIC AND SEMI-AUTOMATIC TAPE TO WAFFLE PACK DIE PICKERS
- HIGH POWER METALLURGICAL INSPECTION MICROSCOPES
- TAPE AND REEL, WAFFLE PACK, GEL PACK
- VISUAL INSPECTION PER CLASS K, H OR COMMERCIAL (-Z OPTION IN PART NUMBER)

QA SYSTEMS
- ISO 9001:2000 CERTIFIED
- 100% VISUAL AND DC ELECTRICAL INSPECTION PER MIL-STD-883
- COMPLETE MIL-PRF-55342 TESTING CAPABILITIES
- ELEMENT EVALUATION PER MIL-H-38534, CLASS H AND K
- SPC PROCESS MONITORING, PFMEA
- MINI-SYSTEMS, INC. RELIABILITY PROGRAM, MSIRP ™

ENGINEERING SYSTEMS
- AUTOCAD, FILE FORMATS HANDLED INCLUDE DXF & IGES.
- COMPREHENSIVE DESIGN REVIEW AND TESTING

ELECTRICAL PERFORMANCE





CONSULT SALES WITH YOUR SPECIAL REQUIREMENTS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 120-C-0306

MSIRP™ Reliability Program

The reliability program will provide customers with real-time data on similar products. Samples are selected at random by inspectors in the production line and sent to MSI's Quality Assurance department for testing.
When requested, the data will accompany a certificate of conformance (at no charge to the customer) when no other testing is required. The data will be displayed in a graphical representation and plotted against military standard criteria.

SAMPLES BEING SELECTED

- SAMPLES ARE SELECTED AT RANDOM
- SAMPLES ARE EITHER MSTF-2 OR MSTF-3 SERIES PARTS
- SUBSTRATE MATERIAL IS EITHER SILICON OR CERAMIC
- DATA IS ALSO TAKEN FROM PARTS THAT ARE CURRENTLY BEING TESTED AND MEET THE PREVIOUS REQUIREMENTS

APPLICABLE MILITARY STANDARDS

- MIL-PRF-55342, CHARACTERISTIC "H"
- MIL-STD-202, METHOD 108 & 2011

TESTS BEING PERFORMED

• LIFE TEST	1000 HOURS (+72/-24 HRS), 70°C (±5°C), 250mW ΔR REQUIREMENTS ±.50%, FAILURE RATE R
• THERMAL SHOCK TEST	5 CYCLES, -65°C (+0/-10°C) TO 150°C (+10/-0°C) ΔR REQUIREMENTS ±.25%
• HIGH TEMPERATURE EXPOSURE	100 HOURS (±4 HRS) AT 150°C (±5°C) ΔR REQUIREMENTS ±.20%
• WIREBOND EVALUATION	THERMOSONIC, 1 MIL GOLD WIRE 3 GRAMS MINIMUM BOND PULL

DATA

- DATA WILL BE SUPPLIED WITH A CERTIFICATE OF CONFORMANCE FOR ORDERS THAT DO NOT REQUIRE TESTING
- THIS DATA IS FOR TANTALUM AND NICHROME RESISTORS
- CHARTS ARE UPDATED PERIODICALLY AND ARE AVAILABLE ON THE WEB PAGE

FOR MORE INFORMATION CONTACT THE MSI THIN FILM QUALITY ASSURANCE DEPARTMENT:

MINI-SYSTEMS, INC. THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
PHONE: (508) 695-0203 FAX: (508) 695-6076
E-MAIL: MSITHIN@MINI-SYSTEMSINC.COM
WEB PAGE: www.Mini-SystemsInc.com

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 140-B-0306

MSIRP™ Reliability Program

Front page of a Certificate of Conformance Signed by the Q.A. Manager

Custom layouts available with alternate information available by request

Back page of a Certificate of Conformance, containing data on either Tantalum Nitride or Nichrome

Data is continuously updated, and referenced by date code, so that the most recent point is placed at the begining of the graph

MINI-SYSTEMS INC.
THIN FILM DIVISION
20 DAVID ROAD
NORTH ATTLEBORO, MA. 02761
TELEPHONE: (508) 695-0203
FAX: (508) 695-6076

ISO 9001 Certified

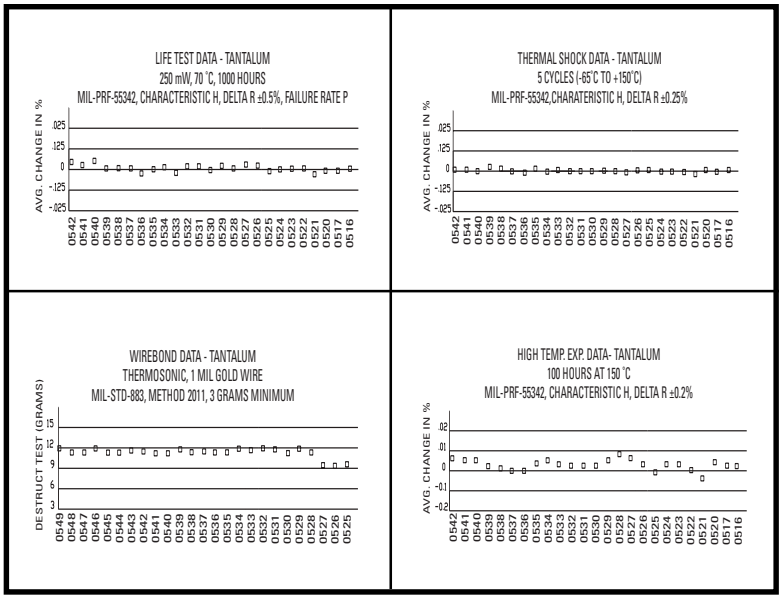
CERTIFICATE OF CONFORMANCE / COMPLIANCE

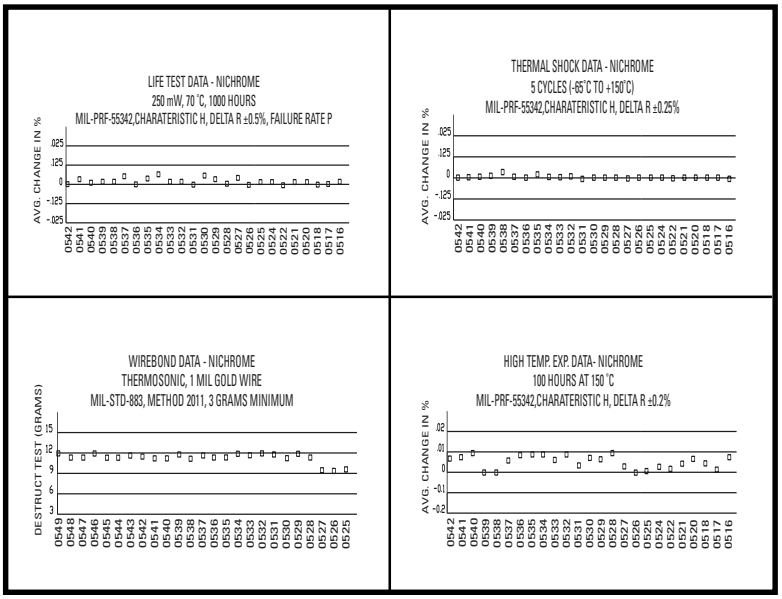
CUSTOMER _____ DATE _____

PURCHASE ORDER NO. _____ MSI ORDER NO. _____

ITEM NO.	ORDER QTY	PART NUMBER / DESCRIPTION	QTY SHIPPED	QTY B/O	LOT NUMBER	DATE CODE

IT IS HEREBY CERTIFIED THAT ALL ITEMS FURNISHED IN SAID QUANTITIES ON REFERENCED PURCHASE ORDER CONFORM TO THE REQUIREMENTS OF PURCHASE ORDER, SPECIFICATIONS, DRAWINGS, AND CONTRACT TERMS. THE ITEMS WERE INSPECTED/TESTED TO ASSURE THE MATERIALS AND FINISHED ARTICLE COMPLY TO ALL REQUIREMENTS. THE ITEMS WERE MANUFACTURED IN THE UNITED STATES OF AMERICA BY MINI SYSTEMS INC. INSPECTION/TEST DATA RECORDS TRACEABLE TO THIS PRODUCT ORDER ARE ON FILE AND WILL BE MADE AVAILABLE FOR REVIEW BY BUYER AND/OR GOVERNMENT REPRESENTATIVE UPON REQUEST.





" When absolute quality is a must, and proof is required, ask for MSIRP™ . . . . only at Mini-Systems is actual data provided to the customer on a weekly basis "

Periodic updates are available on the web at www.Mini-SystemsInc.com

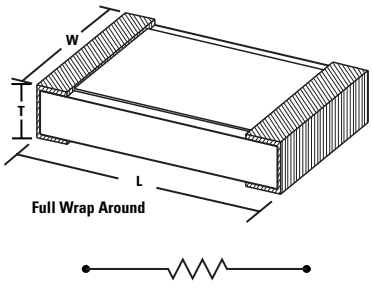
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

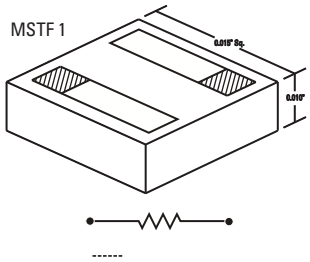
DCN TF 148-B-0306

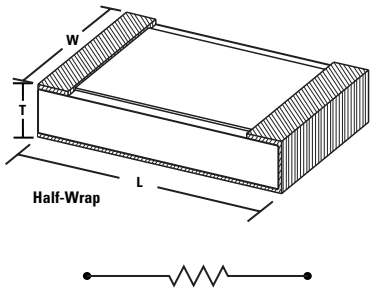
CHIP RESISTORS

In This Section...

Thin Film Part Number Series ~





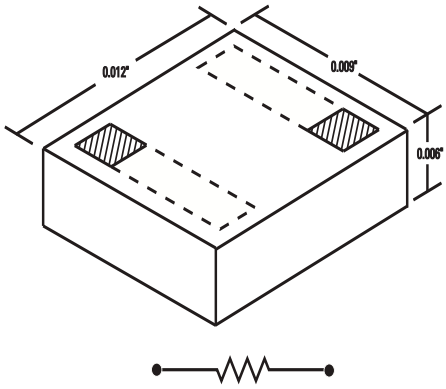


NEXT SECTION: MICROWAVE & RF CHIP RESISTORS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 149-A-0306

THIN FILM CHIP RESISTOR



---- Layout varies with value

MSMR1 SERIES

CHIP RESISTORS

MECHANICAL DATA

SIZE	0.012" x 0.009" x 0.006" (±0.001")
SUBSTRATE	(S)SILICON, (A)ALUMINA, (Q)QUARTZ, OR (G)GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BONDING PADS	15,000 Å MINIMUM GOLD 10,000 Å MINIMUM: ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL

ELECTRICAL DATA

	NICHROME	TANTALUM NITRIDE
RESISTANCE RANGE		
SILICON, QUARTZ, GLASS	2Ω TO 75KΩ*	2Ω TO 75KΩ*
ALUMINA	2Ω TO 15KΩ	2Ω TO 15KΩ
TOLERANCES	0.01% TO 10% (Value Dependent)	0.01% TO 10% (Value Dependent)
T.C.R.	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C (S, Q, G)	±150ppm/°C STANDARD OPTIONAL TO ±10ppm/°C (S, Q, G) OPTIONAL TO ±25ppm/°C (A)

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.*
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	50 mW (70°C DERATED LINEARLY TO 150°C) P = √ (E*R)
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: 0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSMR1 — X — X — XXXXX — X — X

SERIES	SUBSTRATE	RESISTIVE FILM	OHMIC VALUE	TOLERANCE	OPTION DESIGNATOR (If Required)
	A = Alumina G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01%* Q = 0.05%* B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%	A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads GB = Gold Backside F = ±100ppm/°C G = Gold Pads (always used when no other option is required)

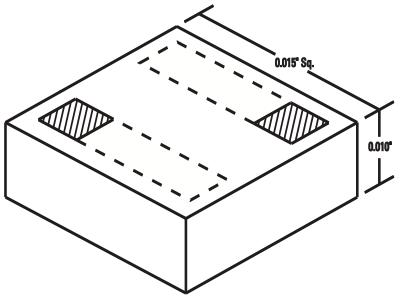
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 146-B-0306

EXAMPLE: MSMR 1SN-50R00F-BGB = 0.012" x 0.009", Silicon Substrate, Nichrome Resistor, 50Ω, ±1% Tol., ±25ppm/°C, Gold Backside.

*Consult Sales for available values

THIN FILM CHIP RESISTOR



---- Layout varies with value

— — —

Minimum bonding area
for < 100Ω Resistance.

MSTF 1 SERIES

MECHANICAL DATA

SIZE	0.015" x 0.015" x 0.010" (±0.003")
SUBSTRATE	(S)SILICON, (A)ALUMINA, (Q)QUARTZ, OR (G)GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BONDING PADS	15,000 Å MINIMUM GOLD 10,000 Å MINIMUM: ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL

ELECTRICAL DATA

	NICHROME	TANTALUM NITRIDE
RESISTANCE RANGE		
SILICON, QUARTZ, GLASS	2Ω TO 150KΩ*	2Ω TO 150KΩ*
ALUMINA	2Ω TO 33KΩ	2Ω TO 33KΩ
TOLERANCES	0.01% TO 10% (Value Dependent)	0.01% TO 10% (Value Dependent)
T.C.R.	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C (S, Q, G)	±150ppm/°C STANDARD OPTIONAL TO ±10ppm/°C (S, Q, G) OPTIONAL TO ±25ppm/°C (A)

SERIES DATA

CURRENT NOISE	101Ω TO TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.*
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	50 mW (70°C DERATED LINEARLY TO 150°C) P = √ (E*R)
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: 0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSTF 1	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE A = Alumina G = Glass Q = Quartz S = Silicon	RESISTIVE FILM N = Nichrome T = Tantalum Nitride		OHMIC VALUE 5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	TOLERANCE S = 0.01%* Q = 0.05%* B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%		OPTION DESIGNATOR (If Required) A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads GB = Gold Backside F = ±100ppm/°C G = Gold Pads (always used when no other option is required)

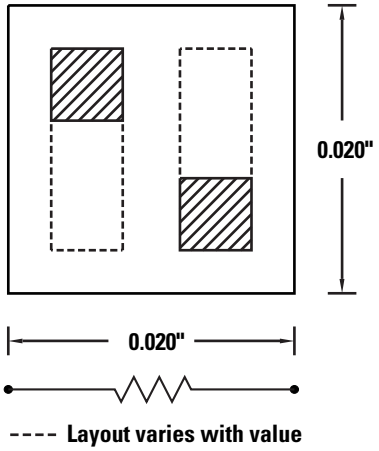
EXAMPLE: MSTF 1SN-50R00F-BGB = 0.015" x 0.015", Silicon Substrate, Nichrome Resistor, 50Ω, ±1% Tol., ±25ppm/°C, Gold Backside.

*Consult Sales for available values

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM CHIP RESISTORS

MSTF 2 SERIES



CHIP RESISTORS

MECHANICAL DATA

SIZE	0.020" x 0.020" (±0.003") x 0.010" (±0.003")
SUBSTRATE	(S)SILICON, (A)ALUMINA, (Q)QUARTZ, OR (G)GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS	15,000 Å MINIMUM GOLD 10,000 Å MINIMUM ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL

ELECTRICAL DATA

	NICHROME	TANTALUM NITRIDE
RESISTANCE RANGE		
SILICON, QUARTZ, GLASS	2Ω TO 1.5MΩ	2Ω TO 1.5MΩ
ALUMINA*	2Ω TO 250KΩ	2Ω TO 250KΩ
ABSOLUTE TOLERANCE	0.1%, 0.5%, 1%, 2%, 5%, 10% TO 0.01% AVAILABLE	0.1%, 0.5%, 1%, 2%, 5%, 10% TO 0.01% AVAILABLE
T.C.R.	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C (S, Q, G)	±150ppm/°C STANDARD OPTIONAL TO ±10ppm/°C (S, Q, G) OPTIONAL TO ±25ppm/°C (A)

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	
SILICON, ALUMINA	250mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
QUARTZ, GLASS	50mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSTF 2	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION
	A = Alumina G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01%* X = 0.02%* Q = 0.05%* B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C † D = ±5ppm/°C † E = Aluminum Bond Pads F = ±100ppm/°C G = Gold Bond Pads Std.** GB = Gold Backside

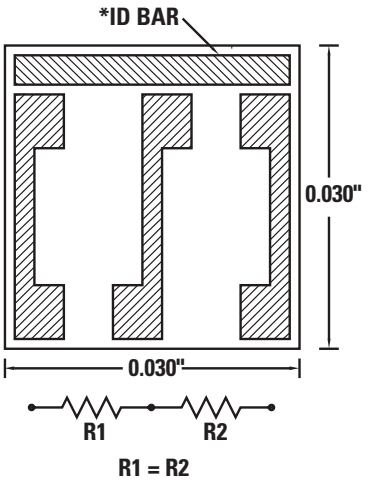
EXAMPLE: MSTF 2SN-50R00F-GB = 0.020" x 0.020", Silicon Substrate, Nichrome Resistor, 50Ω, ±1% Tol., ±50ppm/°C, Gold Backside.

† Not Available on Alumina
* Value dependent on Alumina. Consult Sales.
**Always used when no other option is required.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

CENTER TAPPED CHIP RESISTORS

MSTF 3 SERIES



R1 = R2

Layout varies with value.

MECHANICAL DATA

SIZE	0.030" x 0.030" (±0.003") x 0.010" (±0.003")
SUBSTRATE	(S)SILICON, (A)ALUMINA, (Q)QUARTZ, OR (G)GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS	15,000 Å MINIMUM GOLD 10,000 Å MINIMUM ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL

ELECTRICAL DATA

	NICHROME	TANTALUM NITRIDE
RESISTANCE RANGE / Per Side		
SILICON, QUARTZ, GLASS	1Ω TO 1MΩ	1Ω TO 1MΩ
ALUMINA*	1Ω TO 125KΩ	1Ω TO 125KΩ
TOLERANCES	0.1%, 0.5%, 1%, 2%, 5%, 10% TO 0.01% AVAIL. (R1 & R2 trimmed to absolute tolerance when total tolerance <0.100Ω)	0.1%, 0.5%, 1%, 2%, 5%, 10% TO 0.01% AVAIL. (R1 & R2 trimmed to absolute tolerance when total tolerance <0.100Ω)
CENTER TAP RATIO	±1% STANDARD; AVAIL. TO 0.01%	±1% STANDARD; AVAIL. TO 0.01%
T.C.R.	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C (S, Q, G)	±150ppm/°C STANDARD OPTIONAL TO ±10ppm/°C (S, Q, G) OPTIONAL TO±25ppm/°C (A)
T.C. TRACKING	±2ppm/°C STANDARD***	±2ppm/°C STANDARD***

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	
SILICON, ALUMINA	250 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
QUARTZ, GLASS	50 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSTF 3	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR
	A = Alumina G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01%* X = 0.02%* Q = 0.05%* B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C † D = ±5ppm/°C † E = Aluminum Bond Pads F = ±100ppm/°C G = Gold Bond Pads Std.** GB = Gold Backside RB = ±0.05% Ratio RC = ±0.1% Ratio RD = ±0.5% Ratio

EXAMPLES: MSTF 3SN-50R00F-GB = 0.030" x 0.030", Silicon Substrate, Nichrome Resistor, 50Ω, ±1% Tol., ±50ppm/°C, Gold Backside.

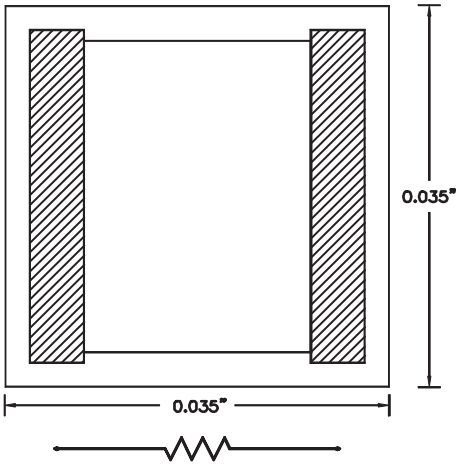
† Not Available on Alumina
* Value dependent on Alumina. Consult Sales.
** Always used when no other option is required.
*** Consult Sales for TC Tracking to ±0.5ppm/°C. Value Dependent

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 102-G-0306

THIN FILM RESISTORS

MSTF 35 WIRE BONDABLE



MECHANICAL DATA

SIZE	0.035" x 0.035" x 0.010" (±0.003")
SUBSTRATE	99.6% ALUMINA, QUARTZ, GLASS (BeO OR AIN AVAILABLE)
RESISTOR	NICHROME, TANTALUM NITRIDE, SICHROME
BOND PADS	15,000 Å MINIMUM GOLD
BOND PAD SIZE	0.009" x 0.025" TYPICAL; SUITABLE FOR MULTIPLE TIE POINTS
BACKSIDE SURFACE	BARE SUBSTRATE; GOLD BACK OPTIONAL

ELECTRICAL DATA

RESISTANCE RANGE	
ALUMINA	2Ω TO 150KΩ STANDARD RANGE; TO 10MΩ IN SiCr AVAILABLE
QUARTZ, GLASS	2Ω TO 2MΩ STANDARD RANGE; TO 25MΩ IN SiCr AVAILABLE
TOLERANCES	0.01%, 0.05%, 0.1%, 0.5%, 1%, 2%, 5%, 10%
T.C.R.	
NICHROME	±25ppm/°C STANDARD; ±5ppm/°C OPTIONAL *
TANTALUM NITRIDE	±150ppm/°C STANDARD; ±50ppm/°C, ±25ppm/°C OPTIONAL
SICHROME	±300ppm/°C STANDARD; ±250ppm/°C, ±100ppm/°C OPTIONAL

CHIP RESISTORS

SERIES DATA

CURRENT NOISE	101Ω TO TO 250KΩ: -40dB
	≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	
ALUMINA	250 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
QUARTZ / GLASS	50 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED	
CAPACITANCE	
ALUMINA	0.06pF
QUARTZ	0.02pF

ARRAY DATA

ISOLATED OR COMMON BUSSED SERIES RESISTOR PAIR AND MULTIPLE CONFIGURATIONS

TC TRACKING	±3ppm/°C MAX. STANDARD; ±1ppm/°C AVAILABLE
RATIO MATCHING	±1% STANDARD; TO ±0.01% Available
STABILITY RATIO	±0.1% MAX ΔR/R STANDARD; ±0.05% ΔR/R OPTIONAL
FREQUENCY	TO 20 GHz; (RESISTOR GEOMETRY DEPENDENT)

PART NUMBER DESIGNATION

MSTF 35	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR
MSHR 35 (SiCr only)	A = Alumina G = Glass Q = Quartz	N = Nichrome T = Tantalum Nitride S = Sichrome		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01% ** Q = 0.05% ** B = 0.1% ** D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C*** D = ±5ppm/°C * E = Aluminum Bond Pads GB = Gold Backside F = ±100ppm/°C G = Gold Bond Pads (always used when no other option is required)

EXAMPLES: MSTF 35 AT-10001F-G = 10KΩ, ±1% STANDARD T.C.R.

* Available on Glass or Quartz only

** Value Dependent, please consult Sales

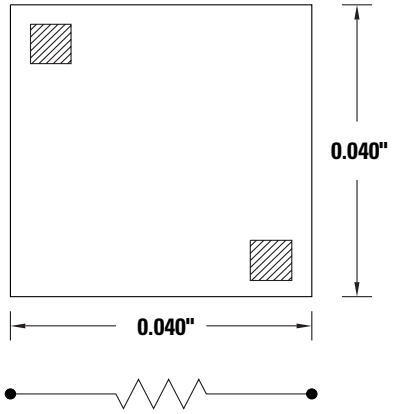
*** Not available on Alumina

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

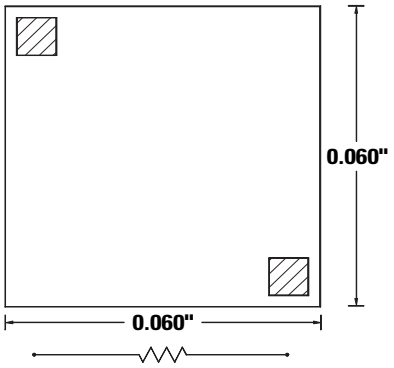
DCN TF 106-F-0306

MEGOHM CHIP RESISTORS

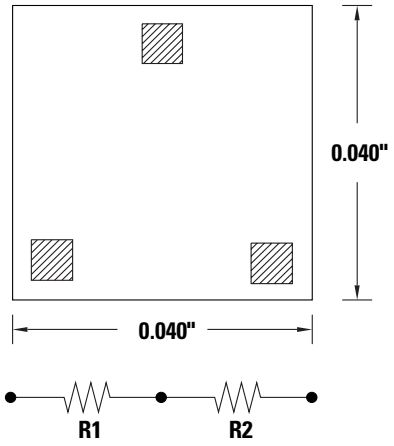
MSTF 4



MSTF 6



MSDR 4



R1 = R2
R1 + R2 = Rt

Note: If R1 ≠ R2, then custom design required.

MSTF 4 SERIES

SIZE	0.040" x 0.040" x .010" ±0.003"
RESISTANCE RANGE	1MΩ TO 15MΩ

MSTF 6 SERIES

SIZE	0.060" x 0.060" x .010" ±0.003"
RESISTANCE RANGE	2MΩ TO 35MΩ

MSDR 4 SERIES

SIZE	0.040" x 0.040" x .010" ±0.003"
RESISTANCE RANGE	1MΩ TO 10MΩ
RESISTANCE RATIO	±1% STANDARD; OPTIONAL TO ±0.1%

COMMON SERIES DATA

SUBSTRATE MATERIAL	SILICON, QUARTZ, OR GLASS
BOND PADS	GOLD (15,000 Å MIN.), OPTIONAL: ALUMINUM (10,000 Å MIN.)
BACKSIDE SURFACE	BARE SUBSTRATE OR GOLD BACK OPTIONAL
TOLERANCES	0.5%, 1%, 2%, 5%, 10%; TO ±0.1% AVAILABLE**
T.C.R.	
NICHROME	±25ppm/°C STANDARD; OPTIONAL TO ±5ppm/°C
TANTALUM NITRIDE	±150ppm/°C STANDARD; OPTIONAL TO ±10ppm/°C
CURRENT NOISE	-20dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	$10^{12}\Omega$ MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) $P = E^2 / R$
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R
STABILITY	1000 HRS., 70°C, 100% Power, ±0.5% MAX. ΔR/R
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

XXXXX	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		TOTAL OHMIC VALUE	TOLERANCE **		OPTION DESIGNATOR (If Required)
MSTF4 MSTF6 MSDR4	G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads GB = Gold Backside F = ±100ppm/°C G = Gold Bond Pads (Always used when no other option is required) RC = ±0.1% Ratio* RD = ±0.5% Ratio* * MSDR-4 ONLY

EXAMPLES: MSTF4SN-10003F-G = 0.040" x 0.040", Silicon Substrate, Nichrome Resistor, 1MΩ, ±1% Tol., Gold Bond Pads.

MSTF6ST-10004F-FGB = 0.060" x 0.060", Silicon Substrate, Tantalum Nitride Resistor, 10MΩ, ±1% Tol., ±100ppm/°C Gold Backside

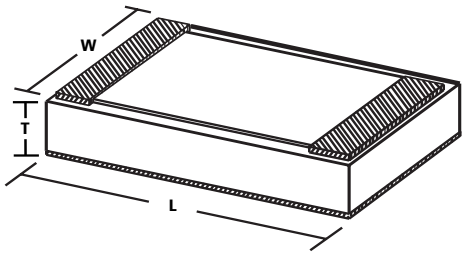
MSDR4SN-10004F-RCE = 0.040" x 0.040", Silicon Substrate, Nichrome Resistor, 10MΩ, ±1% Tol., ±0.1% Ratio, Aluminum Bond Pads.

**Consult Sales department for tolerances <0.5%.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

NON-MICROWAVE CHIP RESISTORS

MSTF SERIES



Shown with optional Gold Back

MECHANICAL DATA

SERIES	L		W		T	TOLERANCE
MSTF 21	0.020"	x	0.010"	x	0.010"	(±0.003")
MSTF 110	0.037"	x	0.017"	x	0.010"	(±0.003")
MSTF 112	0.050"	x	0.050"	x	0.010"	(±0.003")
MSTF 115	0.050"	x	0.025"	x	0.010"	(±0.003")
MSTF 118	0.021"	x	0.017"	x	0.010"	(±0.003")
MSTF 120	0.100"	x	0.050"	x	0.010"	(±0.003")
MSTF 121	0.100"	x	0.100"	x	0.010"	(±0.003")
MSTF 122	0.020"	x	0.016"	x	0.010"	(±0.003")
MSTF 124	0.150"	x	0.085"	x	0.010"	(±0.003")

ELECTRICAL DATA

SERIES	RESISTANCE RANGE SILICON	RESISTANCE RANGE ALUMINA	POWER RATING @ 70°C
MSTF 21	2Ω – 150KΩ	2Ω – 20KΩ	50mW
MSTF 110	2Ω – 1MΩ	2Ω – 200KΩ	125mW
MSTF 112	2Ω – 1MΩ	2Ω – 400KΩ	125mW
MSTF 115	2Ω – 1MΩ	2Ω – 250KΩ	125mW
MSTF 118	2Ω – 500KΩ	2Ω – 100KΩ	125mW
MSTF 120	5Ω – 2MΩ	5Ω – 1MΩ	125mW
MSTF 121	10Ω – 3MΩ	10Ω – 1.5MΩ	500mW
MSTF 122	2Ω – 500KΩ	2Ω – 100KΩ	125mW
MSTF 124	10Ω – 3MΩ	10Ω – 1.5MΩ	500mW

ABSOLUTE TOLERANCE: 0.01%, 0.02%, 0.05%, 0.1%, 0.5%, 1%, 2%, 5%, 10%

T.C.R.: ±25ppm/°C STANDARD (NiCr); ±150ppm/°C STANDARD (TaN)

CONSULT SALES FOR OTHER VALUES / TOLERANCES

SERIES DATA

SUBSTRATE MATERIAL	99.6% ALUMINA STANDARD, QUARTZ** OPTIONAL, SILICON
CURRENT NOISE	-20dB TYPICAL
OPERATING VOLTAGE	100 V MAX.
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STORAGE TEMP	+150°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSTF — XX — XXXXX — X — X

MSTF	XX SUBSTRATE / RESISTIVE FILM	XXXXX OHMIC VALUE	X TOLERANCE	X OPTION
21	AT = Alumina / TaN	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01%	C = ±10ppm/°C
110, 112	AN = Alumina / NiCr		X = 0.02%	D = ±5ppm/°C
115, 118	QT = Quartz / TaN		Q = 0.05%	F = ±100ppm/°C
120, 121	QN = Quartz / NiCr		B = 0.1%	G = Gold Bond Pads Std.*
122, 124	PT = Polished / TaN		D = 0.5%	GB = Gold Backside
	PN = Polished / NiCr		F = 1%	T = With Solder Bumps
	SN = Silicon / NiCr		G = 2%	T3 = Lead-free Solder Bumps
	ST = Silicon / TaN		J = 5%	
			K = 10%	

EXAMPLE: MSTF 110AN-10001F-GB = 110 Series, Alumina Substrate, 10KΩ, ±1% Tol., ±25ppm/°C, Nichrome, Gold Backside.

*Always used when no other option is required.

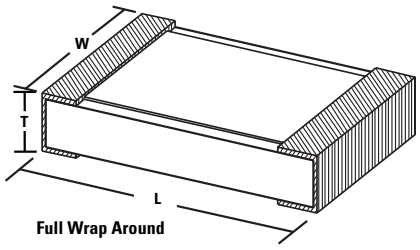
**Consult Sales for power capabilities on Quartz substrate

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

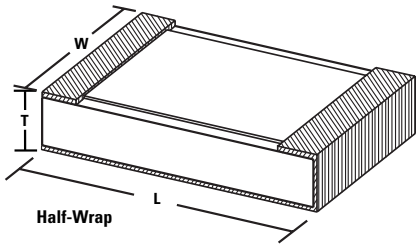
DCN TF 141-C-0306

THIN FILM SURFACE MOUNT RESISTORS

WATF SERIES



Full Wrap Around



Half-Wrap

MECHANICAL DATA

SERIES	L		W		T	TOLERANCE
WATF - 1	0.040"	x	0.020"	x	0.010"	(±0.003")
WATF - 2	0.035"	x	0.035"	x	0.010"	(±0.003")
WATF - 3	0.075"	x	0.050"	x	0.010"	(±0.003")
WATF - 4	0.050"	x	0.050"	x	0.010"	(±0.003")
WATF - 5	0.126"	x	0.063"	x	0.010"	(±0.003")
WATF - 6	0.100"	x	0.050"	x	0.010"	(±0.003")
WATF - 7	0.020"	x	0.020"	x	0.010"	(±0.003")
WATF - 8	0.055"	x	0.025"	x	0.010"	(±0.003")
WATF - 9	0.153"	x	0.050"	x	0.010"	(±0.003")
WATF -21	0.020"	x	0.010"	x	0.010"	(±0.003")

SUBSTRATE	99.6% ALUMINA, ALUMINUM NITRIDE
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS & WRAPAROUND TERMINATIONS	GOLD WITH NICKEL BARRIER STANDARD. OPTIONAL WITH SOLDER; OR HALF-WRAP TERMINATION

ELECTRICAL DATA

SERIES	OHMIC VALUE	POWER RATING @ 70°C
WATF - 1	2Ω – 18KΩ	125mW
WATF - 2	2Ω – 150KΩ	250mW
WATF - 3	2Ω – 400KΩ	250mW
WATF - 4	2Ω – 400KΩ	250mW
WATF - 5	2Ω – 700KΩ	500mW
WATF - 6	2Ω – 625KΩ	250mW
WATF - 7	2Ω – 51KΩ	125mW
WATF - 8	2Ω – 100KΩ	250mW
WATF - 9	2Ω – 1MΩ	500mW
WATF -21	2Ω – 20KΩ	50mW

ABSOLUTE TOLERANCE	0.1%, 0.5%, 1%, 2%, 5%, 10%
T.C.R.	±25ppm/°C STANDARD (NiCr); ±150ppm/°C STANDARD (TaN) OPTIONAL TO ±25ppm/°C

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
FREQUENCY	DC THROUGH 20 GHz
STRAY DISTRIBUTED CAPACITANCE	0.06pF

PART NUMBER DESIGNATION

WATF X X — XXXXX X — X

SERIES	SUBSTRATE	RESISTIVE FILM	OHMIC VALUE	TOLERANCE	OPTION
1, 2	A = Alumina	N = Nichrome	5-Digit Number:	B = 0.1%*	A = ±50ppm/°C
3, 4	N = Aluminum Nitride	T = Tantalum Nitride	1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	D = 0.5%*	B = ±25ppm/°C
5, 6				F = 1%	HWU = Half-Wrap Untinned
7, 8				G = 2%	*** T = With SN62 Solder
9, 21				J = 5%	*** T3 = Leadfree Solder
				K = 10%	**** TR = Tape and Reel
					U = Untinned**
					HWT = Half-Wrap Tinned.
					HWT3 = Half-Wrap Leadfree Tinned

Consult Sales for power capabilities on Aluminum Nitride.

*Value Dependent
**For Conductive Epoxy Mount.
***For Solder Mount.
****Consult Sales for Availability.
(Solder option applies to all Conductor Surfaces)

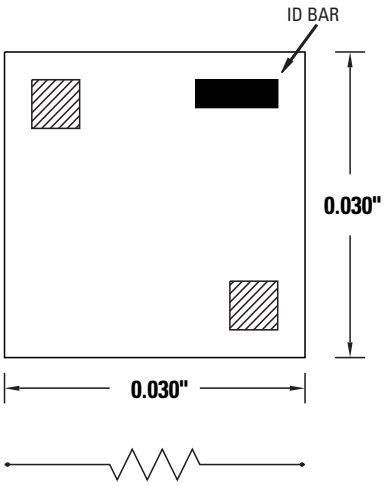
EXAMPLE: WATF 1AN-50R00F-T = 0.040" x 0.020" x 0.010", Alumina Substrate, Nichrome Resistor, 50Ω, ±1% Tol., ±25ppm/°C, w/ Solder. Full Wrap Around.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

MSSR SERIES

MSSR-3

MSSR-3



SIZE	0.030" x 0.030" x 0.010" (±0.003")
RESISTANCE RANGE	2Ω TO 3MΩ

NUMERIC LASER CODE. CONSULT SALES FOR DETAILS

COMMON SERIES DATA

SUBSTRATE MATERIAL	SILICON
BOND PADS	GOLD (15,000 Å MIN.), OPTIONAL: ALUMINUM (10,000 Å MIN.)
BACKSIDE SURFACE	BARE OR GOLD BACK OPTIONAL
TOLERANCES	0.01%, 0.05%, 0.1%, 0.5%, 1%, 2%, 5%, 10%, 20%
T.C.R.	
NICHROME	±25ppm/°C STANDARD; OPTIONAL TO ±5ppm/°C
TANTALUM NITRIDE	±150ppm/°C STANDARD; OPTIONAL TO ±10ppm/°C
CURRENT NOISE	-20dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) $P = E^2 / R$
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF

PART NUMBER DESIGNATION

MSSR 3	S	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR (If Required)
3	S = Silicon	N = Nichrome T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01% Q = 0.05% B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10% M = 20%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads GB = Gold Backside F = ±100ppm/°C G = Gold Bond Pads (Always used when no other option is required)

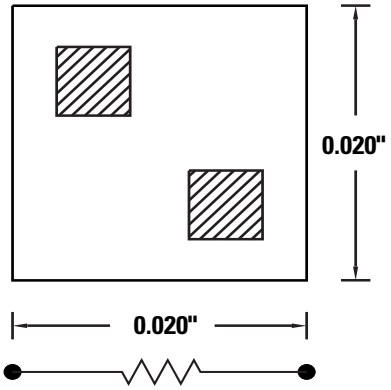
EXAMPLES: MSSR 3SN-50R00F-GB = 0.020" x 0.020", Silicon Substrate, Nichrome Resistor, 50Ω, ±1% Tol., Gold Backside.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 130-C-0306

HIGH VALUE CHIP RESISTORS

SICHROME MSHR SERIES



MSHR-2

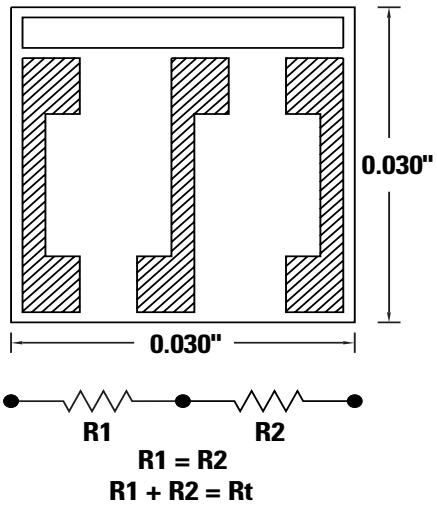
SIZE	0.020" x 0.020" x 0.010" (±0.003")
RESISTANCE RANGE	1.2MΩ TO 15MΩ

MSHR-3

SIZE	0.030" x 0.030" x 0.010" (±0.003")
RESISTANCE RANGE	2MΩ TO 25MΩ

MSHR-4

SIZE	0.040" x 0.040" x 0.010" (±0.003")
RESISTANCE RANGE	10MΩ TO 150MΩ

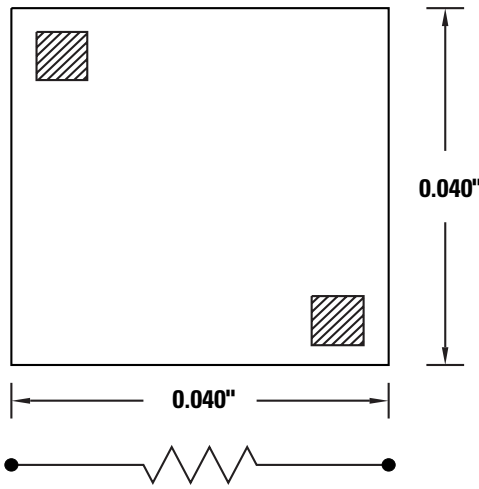


COMMON SERIES DATA

SUBSTRATE TYPE	SILICON
RESIDTOR	SICHROME
BOND PADS	ALUMINUM (10,000 Å MIN.), OPTIONAL: GOLD (15,000 Å MIN.)
BACKSIDE SURFACE	BARE SUBSTRATE OR GOLD BACK OPTIONAL
TOLERANCES	1%, 2%, 5%, 10%, 20%
T.C.R.	STANDARD (±300ppm/°C), OPTIONAL (±100ppm/°C)
CURRENT NOISE	-20dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	$10^{12}\Omega$ MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) $P = E^2/R$
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R
STABILITY	1000 HRS., 70°C, 100% Power, ±0.5% MAX. ΔR/R
OPERATING TEMP RANGE	-55°C TO +150°C

PART NUMBER DESIGNATION

MSHR X	SS	—	XXXXX	X	—	X
SERIES	SUBSTRATE/ RESISTOR		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR (If Required)
2 3 4	SS = Silicon/ Sichrome		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	F = 1% G = 2% J = 5% K = 10% M = 20%		GB = Gold Backside F = ±100ppm/°C G = Gold Bond Pads E = Aluminum Bond Pads (Always used when no other option is required)



EXAMPLES: MSHR2SS -15003F-E = 0.020" x 0.020", Silicon Substrate Sichrome Resistor, 1.5 MΩ, ±1% Tol., Aluminum Bond Pads.

MSHR3SS-20005F-RCE = 0.030" x 0.030", Silicon Substrate, Sichrome Resistor, 20MΩ, ±1% Tol., ±0.1% Ratio, Aluminum Bond Pads.

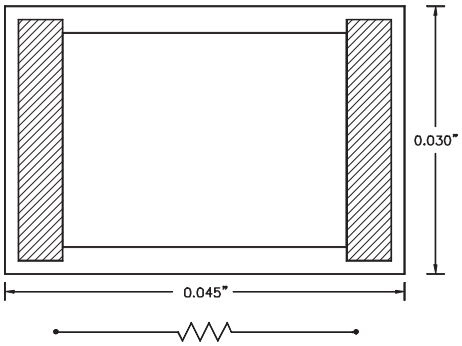
**Consult Sales department for tolerances <0.5%.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 104-G-0306

THIN FILM POWER RESISTORS

MSPR 1 SERIES; 500mWATT POWER RATING



MECHANICAL DATA

SIZE	0.045" x 0.030" x 0.010" (±0.003")
SUBSTRATE	SILICON
RESISTOR	NICHROME or TANTALUM NITRIDE
BOND PADS	15,000 Å MINIMUM GOLD 10,000 Å MINIMUM ALUMINUM
BOND PAD SIZE	0.005" x 0.026" TYPICAL; SUITABLE FOR MULTIPLE TIE POINTS
BACKSIDE SURFACE	BARE SUBSTRATE; GOLD BACK OPTIONAL

ELECTRICAL DATA

RESISTANCE RANGE	2Ω TO 250KΩ STANDARD RANGE
TOLERANCES	0.1%, 0.5%, 1%, 2%, 5%, 10%
T.C.R.	±150ppm/°C STANDARD OPTIONAL TO ±25ppm/°C - TaN OPTIONAL TO ±5ppm/°C - NiCr

SERIES DATA

CURRENT NOISE	101Ω TO TO 50KΩ: -40dB ≤ 100Ω: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	500 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% power , ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED CAPACITANCE	2pF

CHIP RESISTORS

PART NUMBER DESIGNATION

MSPR 1	S	T	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR
	S = Silicon A = Alumina	N = Nichrome Tantalum T = Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	B = 0.1% D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads F = ±100ppm/°C GB = Gold Backside Gold Pads G = (always used when no other option is required)

EXAMPLES: MSPR1 ST-10001F-E = 10KΩ, ±1%, Aluminum Pads Standard T.C.R.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

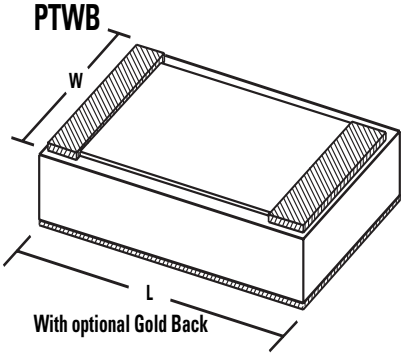
DCN TF 128-E-0306

RESISTIVE POWER TERMINATORS

PTSM, PTWB SERIES

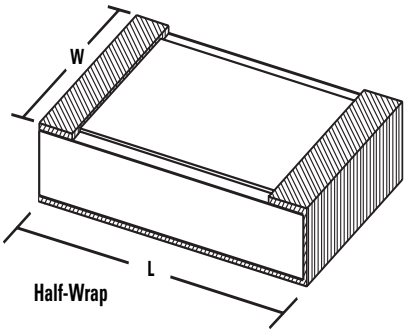
The PTSM and PTWB series of Thin Film high power resistor terminators provide operating power to 2 Watts. This is accomplished with Mini-Systems proprietary high current density Tantalum Nitride resistor film. Offered in top contact, surface mountable half wrap, and full wrap terminations.

PTWB



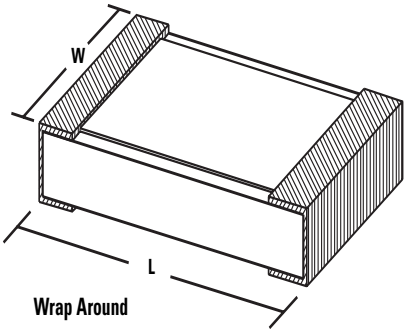
With optional Gold Back

PTSM



Half-Wrap

PTSM



Wrap Around

PTWB SERIES WIRE BONDABLE

SERIES	L		W	TOLERANCE	OHMIC VALUE	POWER RATING @ 70°C; ALUMINA
PTWB 110	0.037"	x	0.017"	±0.003"	2Ω - 1KΩ	500mW
PTWB 112	0.050"	x	0.050"	±0.003"	2Ω - 1KΩ	1W
PTWB 115	0.050"	x	0.025"	±0.003"	2Ω - 1KΩ	500mW
PTWB 120	0.100"	x	0.050"	±0.003"	2Ω - 1KΩ	2W
PTWB 121	0.100"	x	0.100"	±0.003"	2Ω - 1KΩ	2W
PTWB 122	0.020"	x	0.016"	±0.003"	2Ω - 1KΩ	250mW

PTSM SERIES SURFACE MOUNT

SERIES	L		W	TOLERANCE	OHMIC VALUE	POWER RATING @ 70°C; ALUMINA
PTSM 1	0.040"	x	0.020"	±0.003"	2Ω - 1KΩ	500mW
PTSM 2	0.035"	x	0.035"	±0.003"	2Ω - 1KΩ	1W
PTSM 3	0.075"	x	0.050"	±0.003"	2Ω - 1KΩ	1W
PTSM 4	0.050"	x	0.050"	±0.003"	2Ω - 1KΩ	1W
PTSM 5	0.126"	x	0.063"	±0.003"	2Ω - 1KΩ	2W
PTSM 6	0.100"	x	0.050"	±0.003"	2Ω - 1KΩ	2W
PTSM 7	0.020"	x	0.020"	±0.003"	2Ω - 1KΩ	250mW

COMMON SERIES DATA

SUBSTRATE MATERIAL	99.6% ALUMINA STD.; BeO OPTIONAL FOR HIGHER POWER
TOLERANCES	1%, 2%, 5%, 10%
T.C.R.	±150ppm (TaN)
CURRENT NOISE	-20dB TYPICAL
OPERATING VOLTAGE	100 V MAX.
SHORT TERM OVERLOAD	2.5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: 0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
FREQUENCY	DC THRU 20 GHz
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

PART NUMBER DESIGNATION

XXXX — X — AT — XXXXX — X — X

SERIES	STYLE	MATERIAL	OHMIC VALUE	TOLERANCE	OPTION DESIGNATOR (If Required)
PTWB	110, 112 115, 120 121, 122	AT = Alumina / TaN BT = BeO / TaN	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	F = 1% G = 2% J = 5% K = 10%	***G = Gold Bond Pads. **GB = Gold Back **T = Solder Tinned ** T3 = Leadfree Solder Tinned *HWU= Half-Wrap No Solder *WAU= Wrap Around No Solder *HWT= Half-Wrap Solder Tinned *HWT3= Half-Wrap Leadfree Solder Tinned *WAT= Wrap Around Solder Tinned *WAT3= Wrap Around Leadfree Solder Tinned
PTSM	1,2 3,4 5,6 7				

EXAMPLES: PTWB 110AT-100R0F-GB = 100Ω, ±1% Tol., Gold Back, Wire Bondable.
PTSM 1AT-2R000K-HWT = 2Ω, ±10% Tol., Half-Wrap, Solder Tinned.

* PTSM Style only.
** PTWB Style only.
*** To be used when no other option is required. PTWB only. Solder option applies to all conductor surfaces

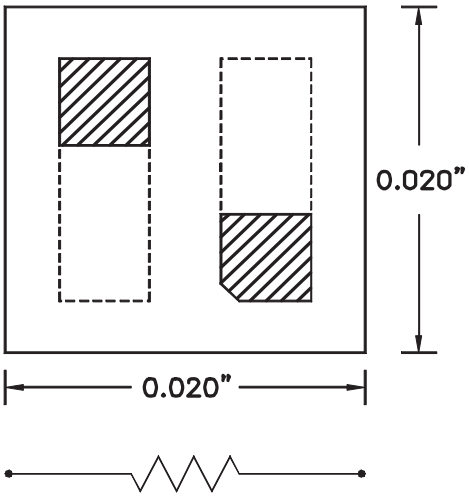
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 131-D-0306

THIN FILM BACK CONTACT RESISTORS

MSBC SERIES

The MSBC series back contact chip resistor offers a space-saving design in a 0.020" x 0.020" size that requires only one wire bond. The chip backside provides the other contact with eutectic or conductive epoxy attachment to the substrate. Wire bonding is made to the notched pad on top of the chip; the rectangular pad is a contact via to the backside connection. MSBC's offer the high stability, low noise, and low T.C.R. of thin film while providing greater flexibility in hybrid designs.



Layout varies with value.

MECHANICAL DATA

SIZE	0.020" x 0.020" x 0.010" (±0.003")
SUBSTRATE	SILICON
RESISTOR	TANTALUM NITRIDE
BOND PADS	15,000 Å ALUMINUM TYPICAL (NOTCHED BOND PAD INDICATES WIRE BOND LOCATION)
BACKSIDE SURFACE	GOLD STANDARD; Suitable for eutectic or conductive epoxy bonding

ELECTRICAL DATA

RESISTANCE RANGE	5Ω TO 1.2MΩ
TOLERANCES	0.05%, 0.1%, 0.25%, 0.5% 1%, 2%, 5%, 10% (RESISTOR VALUE DEPENDENT)
T.C.R.	±150ppm STANDARD; ±100ppm Available 10Ω – 200KΩ

SERIES DATA

CURRENT NOISE	-35dB MAX. 100Ω TO 250KΩ TYPICAL -20dB MAX. < 100Ω OR > 250KΩ
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW TOTAL (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% power, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED CAPACITANCE SILICON	2 pF

CHIP RESISTORS

PART NUMBER DESIGNATION

MSBC 2	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION
	S = Silicon	T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When required. 5th Digit Represents Number of Zeros.	Q = 0.05% ** B = 0.10% ** C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%		E = Aluminum Bond Pads Std. F = ±100ppm/°C

EXAMPLES: MSBC 2ST-10001F-E = 10KΩ, ±1% STANDARD T.C.R.

** Consult Sales for available values

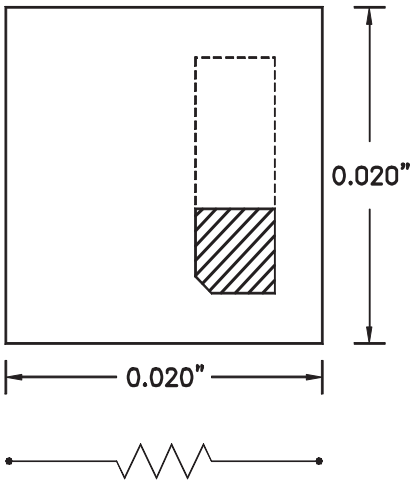
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM EMSBC SERIES

CHIP RESISTORS

EMSBC SERIES

The EMSBC series back contact chip resistor offers a space-saving design in a 0.020" x 0.020" size that requires only one wire bond. The chip backside provides the other contact with eutectic or conductive epoxy attachment to the substrate. Wire bonding is made to the notched pad on top of the chip. EMSBC's offer the high stability, low noise, and low T.C.R. of thin film while providing greater flexibility in hybrid designs. Excellent for use in Vision Recognition Systems.



Layout varies with value.

MECHANICAL DATA

SIZE	0.020" x 0.020" x 0.010" (±0.003")
SUBSTRATE	SILICON
RESISTOR	TANTALUM NITRIDE
BOND PADS	15,000 Å ALUMINUM TYPICAL (GOLD BOND PADS OPTIONAL)
BACKSIDE SURFACE	GOLD; Suitable for eutectic or conductive epoxy bonding

ELECTRICAL DATA

RESISTANCE RANGE	5Ω TO 1.2MΩ
TOLERANCES	0.05%, 0.1%, 0.25%, 0.5% 1%, 2%, 5%, 10% (RESISTOR VALUE DEPENDENT)
T.C.R.	±250ppm STANDARD; ±100ppm Available ≥ 500Ω, ≤ 250KΩ

SERIES DATA

CURRENT NOISE	-35dB MAX. 100Ω TO 250KΩ TYPICAL -20dB MAX. < 100Ω OR > 250KΩ
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW TOTAL (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STRAY DISTRIBUTED CAPACITANCE SILICON	2pF

PART NUMBER DESIGNATION

EMSBC 2	X	X	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION
	S = Silicon	T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When required. 5th Digit Represents Number of Zeros.	Q = 0.05%** B = 0.10%** C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%		E = Aluminum Bond Pads Std. F = ±100ppm/°C G = Gold Bond Pads Optional

EXAMPLES: EMSBC 2ST-10001F-E = 10KΩ, ±1% STANDARD T.C.R.

** Consult Sales for available values

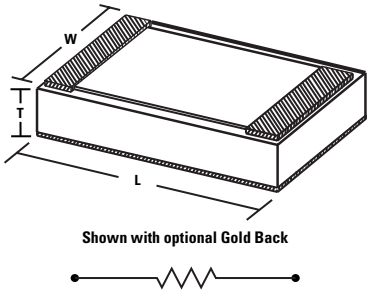
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

MICROWAVE & RF RESISTORS

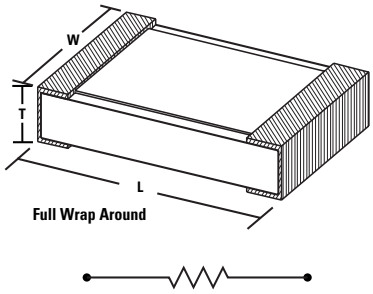
In This Section...

Thin Film Part Number Series ~

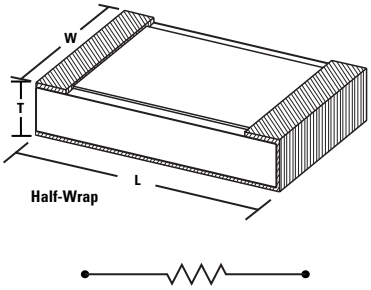
MSMW Series ~ Microwave Chip Resistors
WAMT Series ~ Microwave Chip Terminations



Shown with optional Gold Back



Full Wrap Around



Half-Wrap

NEXT SECTION: CHIP ATTENUATORS

PREVIOUS SECTION: CHIP RESISTORS

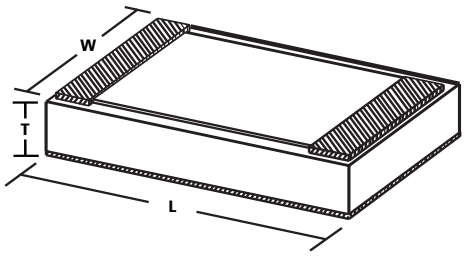
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 150-A-0306

MICROWAVE CHIP RESISTORS

MSMW SERIES

All MSMW parts can be Wire-Bonded, Ribbon-Bonded and offered with Solder Bumps. Parts are manufactured using specialized Laser Trimming for Optimal Performance over Operating Frequency Range.



Shown with optional Gold Back

MECHANICAL DATA

SERIES	L		W		T	TOLERANCE
MSMW 21	0.020"	x	0.010"	x	0.010"	(±0.003")
MSMW 110	0.037"	x	0.017"	x	0.010"	(±0.003")
MSMW 112	0.050"	x	0.050"	x	0.010"	(±0.003")
MSMW 115	0.050"	x	0.025"	x	0.010"	(±0.003")
MSMW 118	0.021"	x	0.017"	x	0.010"	(±0.003")
MSMW 120	0.100"	x	0.050"	x	0.010"	(±0.003")
MSMW 121	0.100"	x	0.100"	x	0.010"	(±0.003")
MSMW 122	0.020"	x	0.016"	x	0.010"	(±0.003")
MSMW 124	0.150"	x	0.085"	x	0.010"	(±0.003")

ELECTRICAL DATA

SERIES	OHMIC VALUE	POWER RATING @ 70°C
MSMW 21	2Ω – 400Ω	50mW
MSMW 110	2Ω – 1KΩ	125mW
MSMW 112	2Ω – 3KΩ	125mW
MSMW 115	2Ω – 2KΩ	125mW
MSMW 118	2Ω – 300Ω	125mW
MSMW 120	5Ω – 5KΩ	125mW
MSMW 121	10Ω – 5KΩ	500mW
MSMW 122	2Ω – 360Ω	125mW
MSMW 124	10Ω – 5KΩ	500mW
ABSOLUTE TOLERANCE	1%, 2%, 5%, 10%	
T.C.R.	±25ppm/°C STANDARD (NiCr); ±150ppm/°C STANDARD (TaN)	
	CONSULT SALES FOR OTHER VALUES / TOLERANCES	

SERIES DATA

SUBSTRATE MATERIAL	99.6% ALUMINA STANDARD, QUARTZ** OPTIONAL
CURRENT NOISE	-20dB TYPICAL
OPERATING VOLTAGE	100 V MAX.
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STORAGE TEMP	+150°C
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSMW — XX — XXXXX — X — X

MSMW	XX	XXXXX	X	X
	SUBSTRATE / RESISTIVE FILM	OHMIC VALUE	TOLERANCE	OPTION
21	AT = Alumina / TaN	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	F = 1%	F = ±100ppm/°C
110, 112	AN = Alumina / NiCr		G = 2%	G = Gold Bond Pads Std.*
115, 118	QT = Quartz / TaN		J = 5%	GB = Gold Backside
120, 121	QN = Quartz / NiCr		K = 10%	T = With Solder Bumps
122, 124	PT = Polished / TaN			T3 = With Leadfree Solder Bumps
	PN = Polished / NiCr			

EXAMPLE: MSMW 110AN-10000F-GB = 110 Series, Alumina Substrate, 1KΩ, ±1% Tol., ±25ppm/°C, Nichrome, Gold Backside.

*Always used when no other option is required.
**Consult Sales for power capabilities on Quartz substrate

MICROWAVE & RF RESISTORS

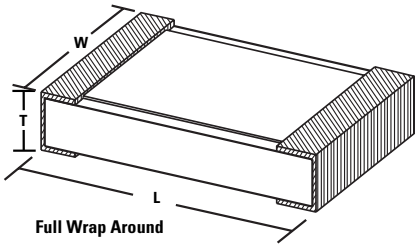
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 109-G-0306

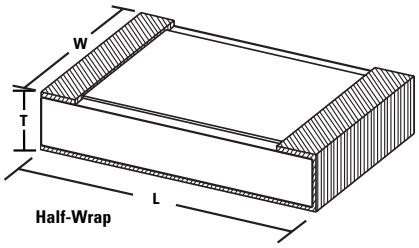
MICROWAVE TERMINATIONS

WAMT SERIES

WAMT Series offers special resistor patterning to enhance RF performance. Half-Wrap or Full-Wrap Terminations offer maximum flexibility in microwave applications. These resistors are constructed using our proven proprietary thin film processes.



Full Wrap Around



Half-Wrap

MECHANICAL DATA

SERIES	L		W		T	TOLERANCE
WAMT - 1	0.040"	x	0.020"	x	0.010"	(±0.003")
WAMT - 2	0.035"	x	0.035"	x	0.010"	(±0.003")
WAMT - 3	0.075"	x	0.050"	x	0.010"	(±0.003")
WAMT - 4	0.050"	x	0.050"	x	0.010"	(±0.003")
WAMT - 5	0.126"	x	0.063"	x	0.010"	(±0.003")
WAMT - 6	0.100"	x	0.050"	x	0.010"	(±0.003")
WAMT - 7	0.020"	x	0.020"	x	0.010"	(±0.003")
WAMT - 8	0.055"	x	0.025"	x	0.010"	(±0.003")
WAMT - 21	0.020"	x	0.010"	x	0.010"	(±0.003")

SUBSTRATE	99.6% ALUMINA, ALUMINUM NITRIDE
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS AND WRAPAROUND TERMINATIONS	GOLD WITH NICKEL BARRIER STANDARD. OPTIONAL WITH SOLDER; OR HALF-WRAP TERMINATION

ELECTRICAL DATA

SERIES	OHMIC VALUE	POWER RATING @ 70°C
WAMT - 1	6Ω – 1KΩ	125mW
WAMT - 2	25Ω – 1KΩ	250mW
WAMT - 3	25Ω – 1KΩ	250mW
WAMT - 4	25Ω – 1KΩ	250mW
WAMT - 5	25Ω – 1KΩ	500mW
WAMT - 6	25Ω – 1KΩ	250mW
WAMT - 7	25Ω – 1KΩ	125mW
WAMT - 8	25Ω – 1KΩ	250mW
WAMT - 21	2Ω – 400Ω	50mW

ABSOLUTE TOLERANCE	1%, 2%, 5%, 10%
T.C.R.	±25ppm/°C STANDARD (NiCr) ±150ppm/°C STANDARD (TaN); TO ±50ppm/°C AVAILABLE CONSULT SALES FOR OTHER VALUES

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB; ≤ 100Ω, ≥ 250KΩ: -30dB
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
FREQUENCY	DC THROUGH 20 GHz
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

PART NUMBER DESIGNATION

WAMTX — X — X — XXXXX — X — X

SERIES	SUBSTRATE	RESISTIVE FILM	OHMIC VALUE	TOLERANCE	OPTION
1, 2 3, 4 5, 6 7, 8 21	A = Alumina N = Aluminum Nitride	N = Nichrome T = Tantalum Nitride	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	F = 1% G = 2% J = 5% K = 10%	A = ±50ppm/°C F = ±100ppm/°C HWU = Half-Wrap Untinned T = With SN62 Solder ** T3 = Leadfree Solder TR = Tape and Reel *** U = Untinned* HWT = Half-Wrap Tinned. HWT3 = Half-Wrap Leadfree Tinned

Consult Sales for power capabilities on Aluminum Nitride.

* For Conductive Epoxy Mount.
** For Solder Mount.
*** Consult Sales for Availability.

EXAMPLE: WAMT1 AT-50R00F-T = 0.040" x 0.020" x 0.010", Alumina Substrate, 50Ω, ±1% Tol., ±150ppm/°C, w/ Solder. Full Wrap Around. Solder option applies to all Conductor Surfaces

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

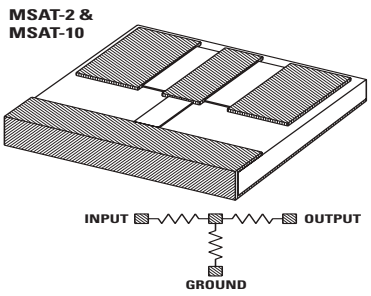
DCN TF 119-D-0306

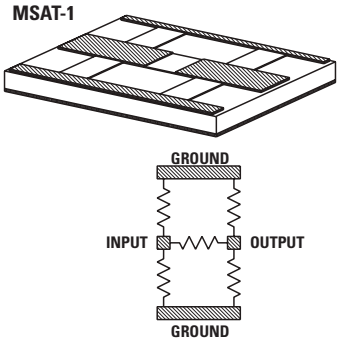
CHIP ATTENUATORS

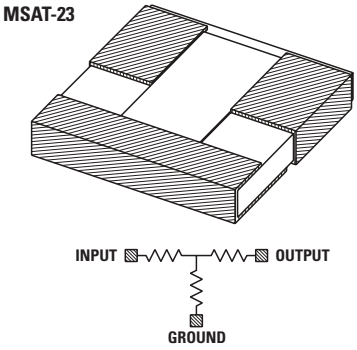
In This Section...

Thin Film Part Number Series ~

MSAT 1, 2, 3, 10 Series
MSAT 5, 6, 7 Series ~ Power
MSAT 21, 22, 23 Series ~ Power







NEXT SECTION: CHIP CAPACITORS

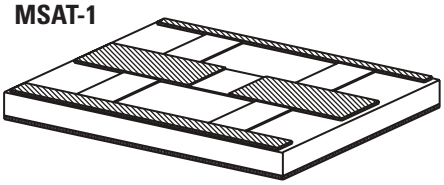
PREVIOUS SECTION: MICROWAVE & RF RESISTORS

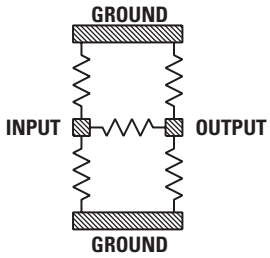
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 151-A-0306

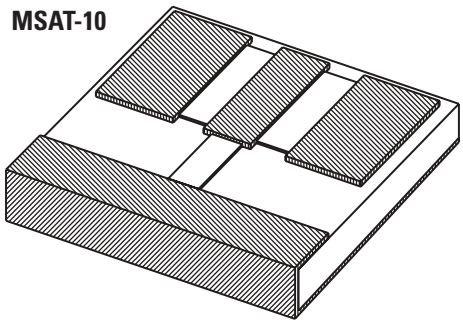
THIN FILM CHIP ATTENUATORS

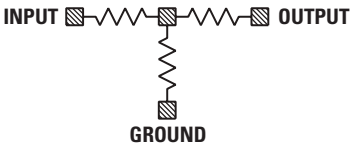
MSAT-1



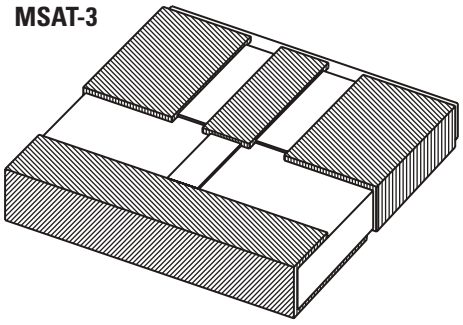


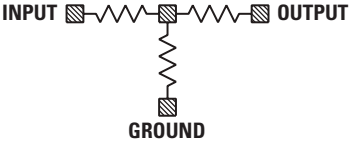
MSAT-2 &
MSAT-10





MSAT-3





MSAT-1, MSAT-2, MSAT-3, MSAT-10 SERIES

The MSAT series Thin Film chip attenuators provide attenuation accuracy for frequencies through 20 GHz. They offer the low noise, low stray capacitance and tight tolerance of Thin Film in compact sizes that make them ideal for smaller microwave and stripline applications.

MSAT-1 TOP CONTACT WITH GOLD BACK

SIZE	0.100" x 0.080" (±0.003") x 0.010" (±0.001")
SUBSTRATE	QUARTZ
BOND PADS	25K Å MIN. GOLD, WIRE OR RIBBON BONDABLE
BACKSIDE SURFACE	GOLD
RESISTOR MATERIAL	TANTALUM NITRIDE
T.C.R.	±150ppm/°C
ATTENUATION RANGES	-1dB THROUGH -24dB; (0.5 dB STEPS AVAILABLE)
ATTENUATION ACCURACY	±0.2dB
FREQUENCY RANGE	DC THROUGH 20 GHz
IMPEDANCE	50Ω
VSWR	1.5:1 MAX.
CURRENT NOISE	-20dB TYPICAL
POWER RATING	125mW (70°C DERATED LINEARLY TO 150°C); P = E²/R
STRAY DISTRIBUTED CAPACITANCE	
QUARTZ	0.02pF

MSAT-2 & MSAT-10 SERIES WITH WRAPAROUND GROUND

SIZE	0.050" x 0.050" (±0.003")
MSAT-2	0.020" (±0.003") THICK
MSAT-10	0.010" (±0.003") THICK
SUBSTRATE	99.6% ALUMINA
BOND PADS	25K Å MIN. GOLD, WRAPAROUND GROUND
BACKSIDE SURFACE	GOLD
RESISTOR MATERIAL	TANTALUM NITRIDE
T.C.R.	±150ppm/°C
ATTENUATION RANGES	-1dB THROUGH -24dB; (0.5 dB STEPS AVAILABLE)
ATTENUATION ACCURACY	±0.2dB
FREQUENCY RANGE	DC THROUGH 20 GHz
IMPEDANCE	50Ω
VSWR	1.5:1 MAX.
CURRENT NOISE	-20dB TYPICAL
POWER RATING	250mW (70°C DERATED LINEARLY TO 150°C); P = E²/R
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

MSAT-3 SERIES FULLY SURFACE MOUNTABLE

SIZE	0.050" x 0.050" (±0.003") x 0.020" (±0.003")
SUBSTRATE	99.6% ALUMINA
BOND PADS	25 Å MIN. GOLD, FULLY SURFACE MOUNTABLE
BACKSIDE SURFACE	GOLD
RESISTOR MATERIAL	TANTALUM NITRIDE
T.C.R.	±150ppm/°C
ATTENUATION RANGES	-1dB THROUGH -24dB; (0.5 dB STEPS AVAILABLE)
ATTENUATION ACCURACY	±0.2dB
FREQUENCY RANGE	DC THROUGH 20 GHz
IMPEDANCE	50Ω
VSWR	1.5:1 MAX.
CURRENT NOISE	-20dB TYPICAL
POWER RATING	250mW (70°C DERATED LINEARLY TO 150°C); P = E²/R
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

PART NUMBER DESIGNATION

MSAT	—	XG	—	dB
SERIES		1, 2 3, 10		

EXAMPLE: MSAT 2G-01dB (MSAT 2 Series: -1dB)
Consult Sales For Other Configurations And Impedances

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

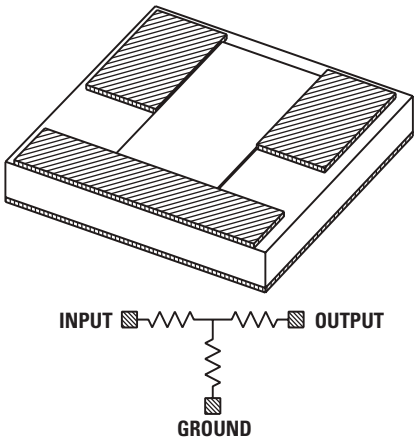
DCN TF 110-F-0306

POWER THIN FILM ATTENUATORS

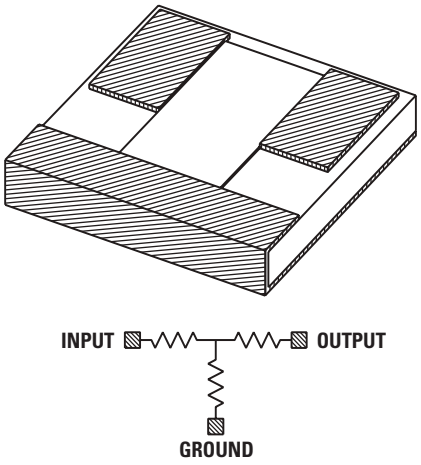
MSAT-5, MSAT-6, MSAT-7 SERIES

The MSAT series Thin Film Power chip attenuators provide attenuation accuracy for frequencies through 20 GHz. They offer the low noise, low stray capacitance and tight tolerance of Thin Film in compact sizes that make them ideal for smaller microwave and stripline applications at operating powers to 2 Watts.

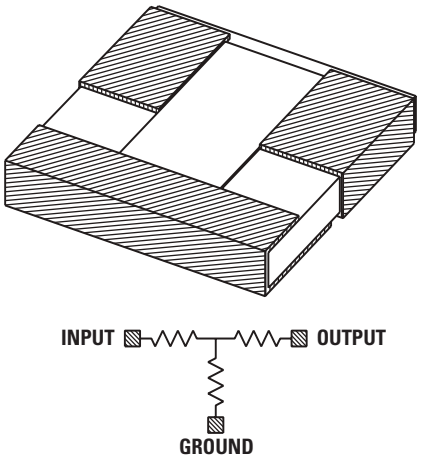
MSAT-5
TOP CONTACT W/ GOLD BACK



MSAT-6
TOP CONTACT W/ WRAPAROUND GROUND



MSAT-7
FULLY SURFACE MOUNTABLE



MECHANICAL DATA

SIZE	0.148" x 0.122" (±0.003") x 0.025" (±0.003")
SUBSTRATE	99.6% ALUMINA
BOND PADS	25K Å MIN. GOLD; WIRE OR RIBBON BONDABLE, OR SOLDERABLE.
BACKSIDE SURFACE	GOLD
RESISTOR MATERIAL	TANTALUM NITRIDE

ELECTRICAL DATA

ATTENUATION RANGE	-1dB THROUGH -24dB; (0.5dB STEPS AVAILABLE)
ATTENUATION ACCURACY	±0.2dB
FREQUENCY RANGE	DC THROUGH 20 GHz
IMPEDANCE	50Ω
VSWR	1.5:1 MAX.

COMMON SERIES DATA

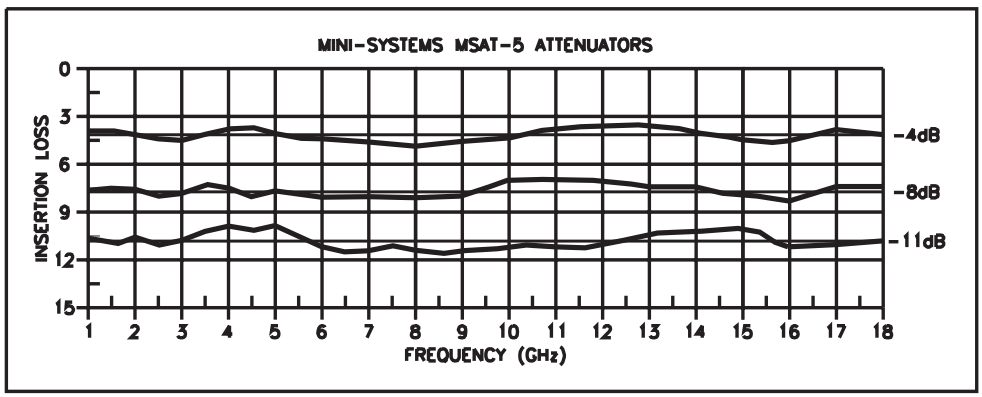
CURRENT NOISE	-20dB TYPICAL
POWER RATING	2 WATTS, (70°C DERATED LINEARLY TO 150°C) P = E^2/R
T.C.R.	±150ppm/°C
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

PART NUMBER DESIGNATION

MSAT — XG — dB

SERIES	5
	6
	7

EXAMPLE: MSAT 7G-03dB (MSAT 7 Series: -3dB)

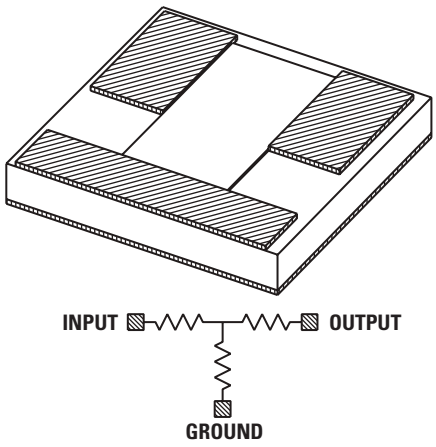


MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

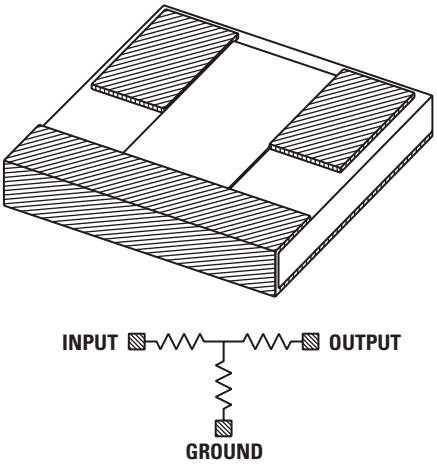
POWER THIN FILM ATTENUATORS

MSAT-21, MSAT-22, MSAT-23 SERIES

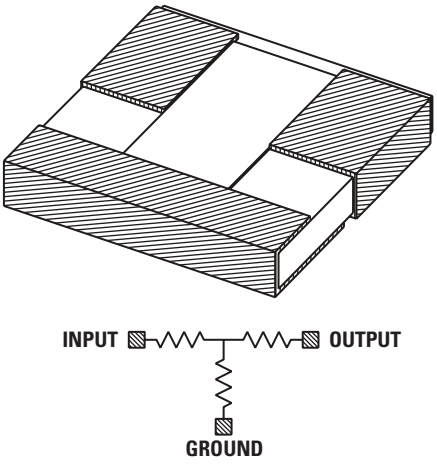
MSAT-21
TOP CONTACT W/ GOLD BACK



MSAT-22
TOP CONTACT W/ WRAPAROUND GROUND



MSAT-23
FULLY SURFACE MOUNTABLE



The MSAT series Thin Film Power chip attenuators provide attenuation accuracy for frequencies through 20 GHz. They offer the low noise, stray capacitance and tight tolerance of Thin Film in compact sizes that make them ideal for smaller microwave and stripline applications at operating powers to 250mW.

MECHANICAL DATA

SIZE	0.077" x 0.061" (±0.003") 0.015" (±0.003") THICK
SUBSTRATE	99.6% ALUMINA
BOND PADS	25K Å MIN. GOLD; WIRE OR RIBBON BONDABLE, OR SOLDERABLE.
BACKSIDE SURFACE	GOLD
RESISTOR MATERIAL	TANTALUM NITRIDE

ELECTRICAL DATA

ATTENUATION RANGE	-1dB THROUGH -24dB; (0.5dB STEPS AVAILABLE)
ATTENUATION ACCURACY	±0.2dB
FREQUENCY RANGE	DC THROUGH 20 GHz
IMPEDANCE	50Ω
VSWR	1.5:1 MAX.

COMMON SERIES DATA

CURRENT NOISE	-20dB TYPICAL
POWER RATING	250mW, (70°C DERATED LINEARLY TO 150°C) P = E^2/R
T.C.R.	±150ppm/°C
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C
STRAY DISTRIBUTED CAPACITANCE	
ALUMINA	0.06pF

PART NUMBER DESIGNATION

MSAT	—	XG	—	dB
SERIES		21 22 23		03

EXAMPLE: MSAT 23G-03dB (MSAT 23 Series: -3dB)

CHIP ATTENUATORS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

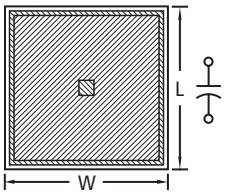
CHIP CAPACITORS

In This Section...

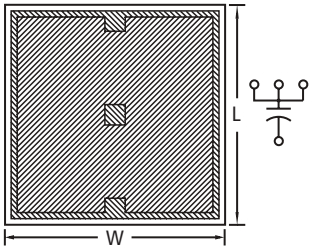
Thin Film Part Number Series ~

MSCC Series ~ MOS Chip Capacitors
MSBIN Series ~ Binary Chip Capacitors

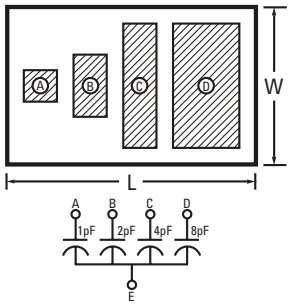
MSCC 2 - MSCC 4



MSCC 5



MSBIN-1, MSBIN-2



NEXT SECTION: NETWORKS & ARRAYS

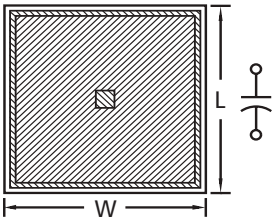
PREVIOUS SECTION: CHIP ATTENUATORS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

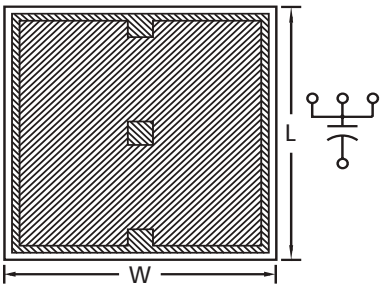
DCN TF 152-A-0306

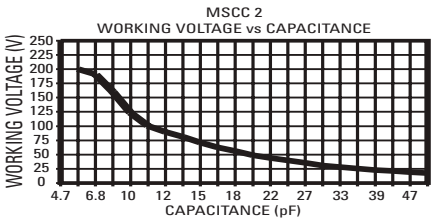
MOS STYLE CHIP CAPACITORS

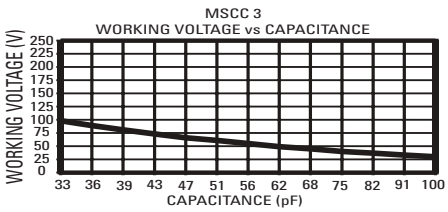
MSCC 2 - MSCC 4

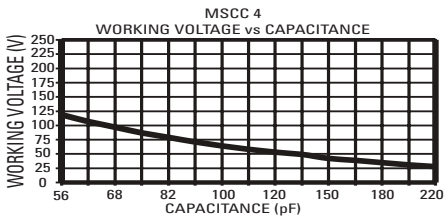


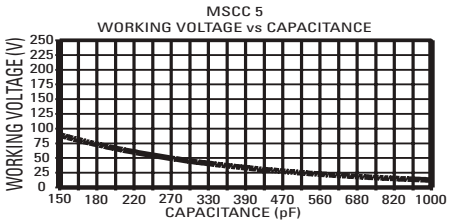
MSCC 5











MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 114-F-0306

MSCC SERIES

MSCC-2

SIZE	0.020" x 0.020" (±0.003") x 0.010" (±0.001")					
CAPACITANCE VALUES (pF)	4.7	5.6	6.8	8.2	10	11
	12	13	15	16	18	20
	22	24	27	30	33	36
	39	43	47	51		

TOLERANCES	pF	TOLERANCE(S)
	4.7 - 10	±0.5pF
	11 - 20	5%, 10%, 20%
	21 - 51	2.5%, 5%, 10%, 20%

MSCC-3

SIZE	0.030" x 0.030" (±0.003") x 0.010" (±0.001")						
CAPACITANCE VALUES (pF)	33	36	39	43	47	51	56
	62	68	75	82	91	100	

TOLERANCES	pF	TOLERANCE(S)
	33 - 100	2.5%, 5%, 10%, 20%

MSCC-4

SIZE	0.040" x 0.040" (±0.003") x 0.010" (±0.001")					
CAPACITANCE VALUES (pF)	56	62	68	75	82	91
	100	110	120	130	150	160
	180	200	220			

TOLERANCES	pF	TOLERANCE(S)
	56 - 220	2.5%, 5%, 10%, 20%

MSCC-5

SIZE	0.055" x 0.055" (±0.003") x 0.010" (±0.001")					
CAPACITANCE VALUES (pF)	150	160	180	200	220	240
	270	300	330	360	390	430
	470	510	560	620	680	750
	820	910	1000			

TOLERANCES	pF	TOLERANCE(S)
	150 - 1000	2.5%, 5%, 10%, 20%

COMMON SERIES DATA

SUBSTRATE	SILICON
DIELECTRIC	SILICON OXIDE
BOND PAD	GOLD STANDARD; ALUMINUM OPTIONAL
BACKSIDE	GOLD, SUITABLE FOR EUTECTIC OR CONDUCTIVE EPOXY ATTATCH
T.C.C.	+45ppm/°C, ±25ppm/°C
OPERATING TEMPERATURE RANGE	-55°C TO +150°C
DISSIPATION FACTOR	1KHz, 1Vrms, 25°C, 0.1%
Q	1MHz, 50Vrms, 25°C, 1000 MIN.
INSULATION RESISTANCE	@ WORKING VOLTAGE, $10^9\ \Omega$
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, Δ C: ±1pF OR 2% Δ C MAX., WHICHEVER IS GREATER
THERMAL SHOCK	MIL-STD 202, METHOD 107F, Δ C: ±0.5pF MAX., MSI TYPICAL ±0.1pF
HIGH TEMPERATURE EXPOSURE	150°C, 100 HRS., Δ C: ±0.5pF OR 1% Δ C MAX., WHICHEVER IS GREATER
SHORT TERM OVERLOAD	1.5X WORKING VOLTAGE, 5 SEC., Δ C: ±0.5pF OR 1% Δ C MAX., WHICHEVER IS GREATER
STABILITY	1000 HRS., 70°C, @ WORKING VOLTAGE Δ C: ±2.5pF OR ±2.5% MAX. Δ C, WHICHEVER IS GREATER

CHIP CAPACITORS

PART NUMBER DESIGNATION

MSCC	X	SA	—	XXXXX	X	—	X
SERIES	SIZE	TYPE		CAPACITANCE VALUE	TOL.		OPTION
	2			5-Digit Number: First 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	*A = ±0.5pF H = 2.5% J = 5% K = 10% M = 20%		E = Aluminum Pads G = Gold Pads
	3						
	4						
	5						

* Use for MSCC-2 4.7pF to 10pF

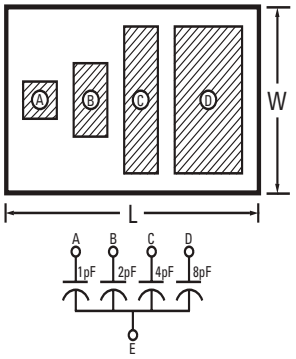
EXAMPLE: MSCC5SA-510R0H-E = 0.055" x 0.055", Silicon Substrate, 510pF, ±2.5% Tol., Aluminum Pads

BINARY MOS CAPACITORS

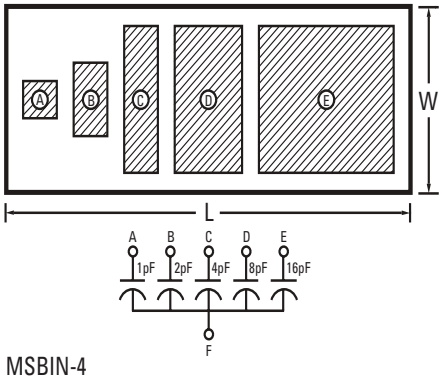
MSBIN SERIES

MSBIN Thin Film BINARY Capacitors have been designed to established industry standards. They offer great flexibility in capacitance value selection for Hybrid and Microwave circuits.

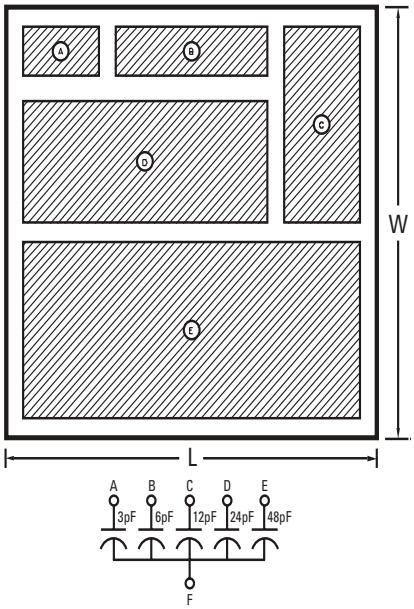
MSBIN-1, MSBIN-2



MSBIN-3



MSBIN-4



MSBIN-1

SIZE	0.019" x 0.030" (±0.003") x 0.010" (±0.001")
TOTAL CAPACITANCE	3.75pF
WORKING VOLTAGE	100 V DC
CAPACITANCE VALUES	0.25pF, 0.50pF, 1.0pF, 2.0pF
TOLERANCE	25%

MSBIN-2

SIZE	0.019" x 0.030" (±0.003") x 0.010" (±0.001")
TOTAL CAPACITANCE	15pF
WORKING VOLTAGE	30 V DC
CAPACITANCE VALUES	1pF, 2pF, 4pF, 8pF
TOLERANCE	10%, 20%

MSBIN-3

SIZE	0.019" x 0.048" (±0.003") x 0.010" (±0.001")
TOTAL CAPACITANCE	31pF
WORKING VOLTAGE	75 V DC
CAPACITANCE VALUES	1pF, 2pF, 4pF, 8pF, 16pF
TOLERANCE	10%, 20%

MSBIN-4

SIZE	0.044" x 0.044" (±0.003") x 0.010" (±0.001")
TOTAL CAPACITANCE	93pF
WORKING VOLTAGE	75 V DC
CAPACITANCE VALUES	3pF, 6pF, 12pF, 24pF, 48pF
TOLERANCE	10%, 20%

COMMON SERIES DATA

SUBSTRATE	SILICON
DIELECTRIC	SILICON OXIDE
BOND PAD	GOLD STANDARD; ALUMINUM OPTIONAL
BACKSIDE	GOLD, SUITABLE FOR EUTECTIC OR CONDUCTIVE EPOXY ATTATCH
T.C.C.	+45ppm/°C, ±25ppm/°C
OPERATING TEMPERATURE RANGE	-55°C TO +150°C
DISSIPATION FACTOR	1KHz, 1Vrms, 25°C, 0.1%
Q	1MHz, 50Vrms, 25°C, 1000 MIN.
INSULATION RESISTANCE	@ WORKING VOLTAGE, 10^9 Ω
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, Δ C: ±1pF OR 2% Δ C MAX., WHICHEVER IS GREATER
THERMAL SHOCK	MIL-STD 202, METHOD 107F, Δ C: ±0.5pF MAX., MSI TYPICAL ±0.1pF
HIGH TEMPERATURE EXPOSURE	150°C, 100 HRS., Δ C: ±0.5pF OR 1% Δ C MAX., WHICHEVER IS GREATER
SHORT TERM OVERLOAD	1.5X WORKING VOLTAGE, 5 SEC., Δ C: ±0.5pF OR 1% Δ C MAX., WHICHEVER IS GREATER
STABILITY	1000 HRS., 70°C, @ WORKING VOLTAGE Δ C: ±2.5pF OR ±2.5% MAX. Δ C, WHICHEVER IS GREATER

PART NUMBER DESIGNATION

MSBIN	X	SA	—	XXXXX	X	—	X
SERIES	SIZE	TYPE		CAPACITANCE VALUE	TOL.		OPTION
	1			3R750 = 3.75pF MSBIN1	K = 10%		E = Aluminum Pads
	2			15R00 = 15pF MSBIN2	M = 20%		G = Gold Pads
	3			31R00 = 31pF MSBIN3	P = 25%		
	4			93R00 = 93pF MSBIN4			

EXAMPLE: MSBIN4SA-93R00M-G = 0.044" x 0.044", Silicon Substrate, 93pF, ±20% Tol., Gold Pads

CHIP CAPACITORS

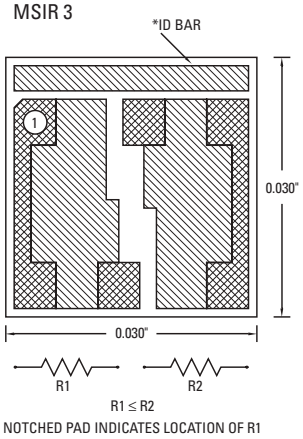
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

NETWORKS & ARRAYS

In This Section...

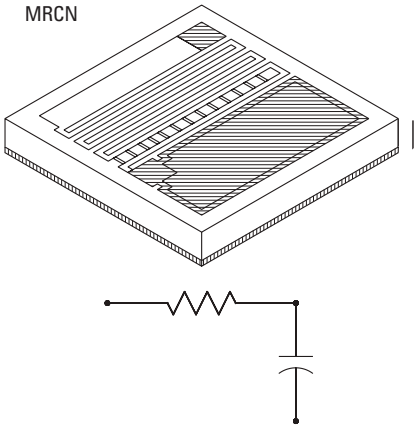
Thin Film Part Number Series ~

MSIR 3

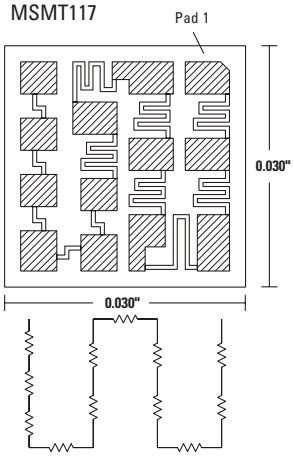


NOTCHED PAD INDICATES LOCATION OF R1

MRCN



MSMT117



NEXT SECTION: PACKAGED RESISTORS

PREVIOUS SECTION: CHIP CAPACITORS

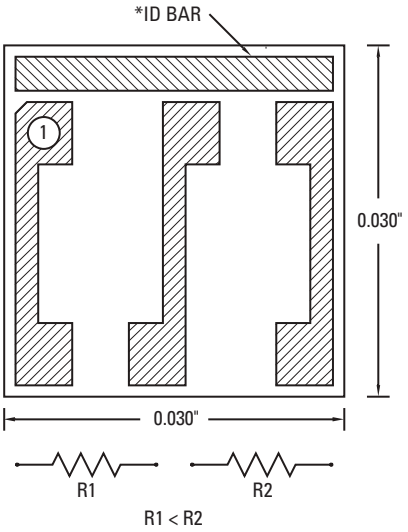
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 153-A-0306

THIN FILM DUAL RESISTOR NETWORKS

MSDR 3 SERIES

The MSDR series dual center-tapped chip resistor offers the high stability, low noise, and low T.C.R./T.C. tracking of thin film while providing greater flexibility in hybrid designs.



R1 < R2

NOTCHED PAD INDICATES LOCATION OF R1

MECHANICAL DATA

SIZE	0.030" x 0.030" x 0.010" (±0.003")
SUBSTRATE	SILICON, ALUMINA, QUARTZ, OR GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS	15K Å MINIMUM GOLD STANDARD.; ALUMINUM AVAILABLE
BACKSIDE SURFACE	BARE SUBSTRATE; GOLD BACK OPTIONAL

ELECTRICAL DATA

RESISTANCE RANGE (Silicon, Quartz, and Glass)	VALUES FROM 1Ω TO 1MΩ PER SIDE; CONSULT SALES FOR SPECIFIC COMBINATIONS OR FOR HIGHER VALUES
ALUMINA	1Ω TO 125KΩ/SIDE
TOLERANCES	0.01%, 0.02%, 0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%, 5%, 10% (R1 & R2 trimmed to absolute tolerance when total tolerance <0.100Ω) R1 & R2 TRIMMED TO ABSOLUTE MINIMUM
CENTER TAP RATIO	±1% STD.; AVAIL. TO ±0.01%
T.C.R.	NICHROME: ±25ppm STD.; ±10ppm, ±5ppm OPTIONAL TANTALUM NITRIDE : ±150ppm STD.; ±50ppm, ±25ppm, ±10ppm OPTIONAL
T.C. TRACKING	TO ±2ppm/°C; VALUE DEPENDENT

SERIES DATA

CURRENT NOISE	-20dB TYPICAL
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	
SILICON & ALUMINA	250 mW TOTAL (70°C DERATED LINEARLY TO 150°C). P = E^2/R
QUARTZ & GLASS	50 mW TOTAL (70°C DERATED LINEARLY TO 150°C). P = E^2/R
SHORT TIME OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
HIGH TEMP. EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: 0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
OPERATING TEMP. RANGE	-55°C TO +125°C
STABILITY RATIO	0.1% MAX. ΔR/R STANDARD: 0.05% MAX. ΔR/R OPTIONAL
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSDR 3 — X — X — XXXXX / XXXXX — X/X — X

SERIES	SUBSTRATE	RESISTIVE FILM	OHMIC CODES R1 / R2	TOLERANCE CODES R1 < R2	OPTION DESIGNATOR (If Required)
	A = Alumina G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When required. 5th Digit Represents Number of Zeros. EXAMPLES: 300R0F/500R0F 25000B/10001B	S = 0.01% X = 0.02% Q = 0.05% B = 0.1% C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%	A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C † D = ±5ppm/°C † E = Aluminum Bond Pads F = ±100ppm/°C **G = Gold Bond Pads GB = Gold Backside RB = 0.05% RATIO RC = 0.1% RATIO RD = 0.5% RATIO

EXAMPLES: MSDR 3ST-300R0B/500R0B-A = Silicon/Tantalum Nitride with R1 = 300Ω; R2 = 500Ω, ±0.1% Tol., ±50ppm/°C T.C.R., w/ Gold Bond Pads

† Not Available on Alumina

* PART MARKING AVAILABLE, CONSULT SALES.

** STD. IF NO OTHER OPTION REQUIRED.

NETWORKS & ARRAYS

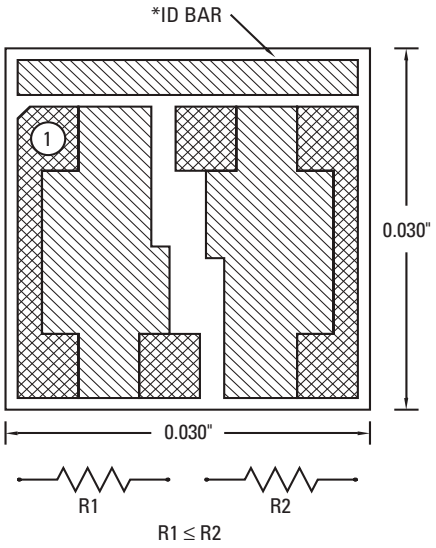
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 108-G-0306

DUAL ISOLATED THIN FILM NETWORKS

MSIR 3 SERIES

The MSIR series dual isolated chip resistor offers greater flexibility for the hybrid designer seeking resistor pairs with excellent T.C.R./T.C. tracking between resistors.



NOTCHED PAD INDICATES LOCATION OF R1

MECHANICAL DATA

SIZE	0.030" x 0.030" x 0.010" (±0.003")
SUBSTRATE	SILICON, ALUMINA, QUARTZ, OR GLASS
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS	15KÅ MINIMUM GOLD STANDARD; ALUMINUM AVAILABLE
BACKSIDE SURFACE	BARE SUBSTRATE; GOLD BACK OPTIONAL

ELECTRICAL DATA

RESISTANCE RANGE	VALUES FROM 1Ω TO 1MΩ PER SIDE; CONSULT SALES FOR SPECIFIC COMBINATIONS OR FOR HIGHER VALUES
TOLERANCES	0.01%, 0.02%, 0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%, 5%, 10%
RESISTANCE RATIO	±1% STD.; AVAIL. TO ±0.01%
T.C.R.	NICHROME: ±25ppm STD.; ±10ppm, ±5ppm OPTIONAL TANTALUM NITRIDE : ±150ppm STD.; ±50ppm, ±25ppm, ±10ppm OPTIONAL
T.C. TRACKING	TO ±2ppm/°C; VALUE DEPENDENT

SERIES DATA

CURRENT NOISE	-20dB TYPICAL
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	
SILICON & ALUMINA	250 mW TOTAL (70°C DERATED LINEARLY TO 150°C). P = E^2/R
QUARTZ & GLASS	50 mW TOTAL (70°C DERATED LINEARLY TO 150°C). P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: 0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: 0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: 0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C
STABILITY RATIO	0.1% MAX. ΔR/R STANDARD: 0.05% MAX. ΔR/R OPTIONAL
STRAY DISTRIBUTED CAPACITANCE	
SILICON	2pF
ALUMINA	0.06pF
QUARTZ	0.02pF

PART NUMBER DESIGNATION

MSIR 3	X	X	—	XXXXX / XXXXX	X / X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC CODES R1 / R2	TOLERANCE CODES R1 ≤ R2		OPTION DESIGNATOR (If Required)
	A = Alumina G = Glass Q = Quartz S = Silicon	N = Nichrome T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When required. 5th Digit Represents Number of Zeros. R1 ≤ R2 300R0F/500R0F 25000B/10001B	S = 0.01% X = 0.02% Q = 0.05% B = 0.1% C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C † D = ±5ppm/°C † E = Aluminum Bond Pads F = ±100ppm/°C **G = Gold Bond Pads GB = Gold Backside RB = 0.05% RATIO RC = 0.1% RATIO RD = 0.5% RATIO

EXAMPLES: MSIR 3ST-300R0B/500R0B-A = Silicon/Tantalum Nitride with R1 = 300Ω, ±0.1%, R2 = 500Ω, ±0.1% Tol., ±50ppm/°C T.C.R., w/ Gold Bond Pads

† Not Available on Alumina
* PART MARKING AVAILABLE, CONSULT SALES.
** STD. IF NO OTHER OPTION REQUIRED.

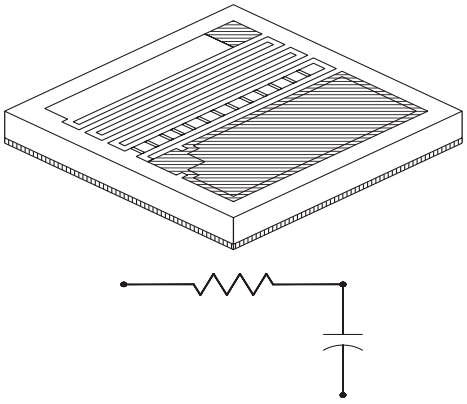
NETWORKS & ARRAYS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 109-G-0306

THIN FILM RC NETWORKS

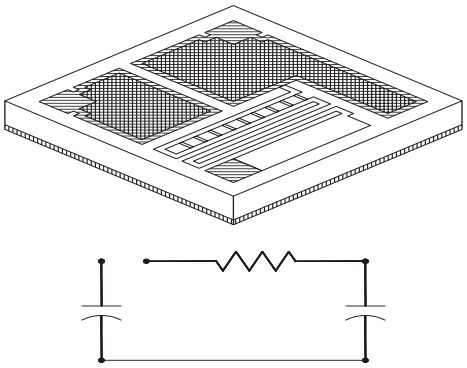
MRCN SERIES



The MRCN series offers the high stability, low noise, and low T.C.R./T.C.C. tracking of thin film resistors combined with MOS capacitors. This combination provides greater flexibility to the hybrid designer.

MECHANICAL DATA

SUBSTRATE	SILICON
DIELECTRIC	SILICON OXIDE
RESISTOR	TANTALUM NITRIDE
BOND PADS	10,000 Å MINIMUM: ALUMINUM OR 15,000 Å MINIMUM: GOLD
BACKSIDE SURFACE	GOLD; SUITABLE FOR EUTECTIC OR CONDUCTIVE EPOXY ATTACH



ELECTRICAL DATA

	RESISTORS	CAPACITORS
VALUES	2Ω TO 1.2MΩ	4.7pF TO 1000pF
TOLERANCES	0.1%, 0.5%, 1%, 2%,	5%, 10%, 20%
RATIO TOLERANCE	AVAILABLE TO ±0.1%	(±0.5pF < 20pF)
T.C.R.	±150ppm/°C STANDARD	----------
	OPTIONAL TO ±100ppm/°C	----------
T.C. TRACKING	±2ppm/°C	----------
T.C.C.	----------	+45ppm/°C, ±25ppm/°C

Consult sales for other values and tolerances.

SERIES DATA

OPERATING TEMP RANGE	-55°C TO +125°C
RESISTORS	
CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
CAPACITORS	
INSULATION RESISTANCE	@ WORKING VOLTAGE, 10^9Ω
SHORT TERM OVERLOAD	1.5X WORKING VOLTAGE, 5 SEC., ΔC:±0.5pF OR 1% ΔC MAX WHICH EVER IS GREATER
HIGH TEMP EXPOSURE	150°C, 100 HRS., ΔC: ±0.5pF OR ±1% ΔC MAX., WHICH EVER IS GREATER
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ΔC: ±0.5pF MAX., ±0.1pF MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ΔC: ±1pF OR ±2% ΔC MAX., WHICH EVER IS GREATER
STABILITY	1000 HRS., 70°C, @ WORKING VOLTAGE, ΔC; ±2.5pF OR ±2.5% MAX., WHICH EVER IS GREATER
DISSIPATION FACTOR	1KHz, 1Vrms, 25°C, 0.1%
Q	1MHz, 50Vrms, 25°C, 1000 MIN.

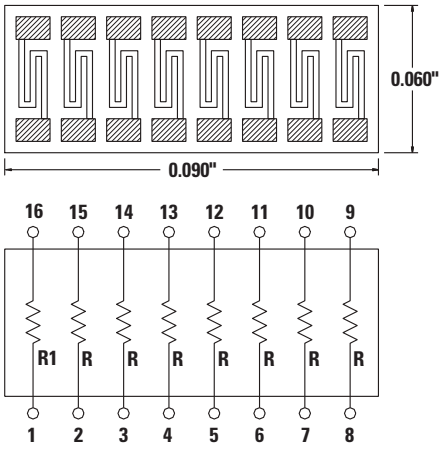
Consult Sales for part numbers.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

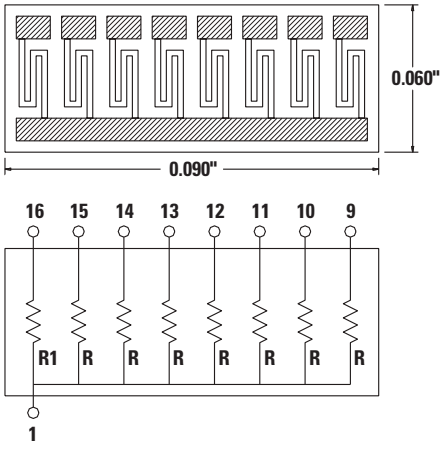
THIN FILM RESISTOR ARRAYS

MSRA / MSRB / MSRC SERIES

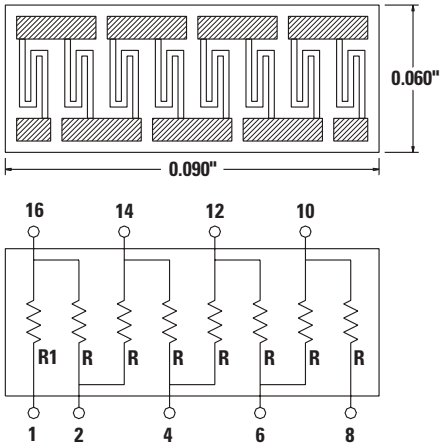
MSRA



MSRB



MSRC



The MSRA Series, isolated connection resistor array, MSRB Series, common connection resistor array, and MSRC Series, series connection resistor array, all with 10 mil centers, are ideal for the hybrid designer seeking a SIP or DIP configuration in chip form. All three series are designed with eight resistors of the same value and tolerance. They feature excellent T.C.R. tracking and are of optimum use when space is a premium. Different arrays from 3-12 resistors are also available.

MECHANICAL DATA

SIZE	0.090" x 0.060" x 0.010" (±0.003") (for the 8-resistor array)
SUBSTRATE	SILICON
RESISTOR	NICHROME OR TANTALUM NITRIDE
BOND PADS	15,000 Å MINIMUM GOLD; 10,000 Å MINIMUM: ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL

ELECTRICAL DATA

RESISTANCE RANGE	10Ω TO 1MΩ
TOLERANCE	0.01%, 0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%, 5%, 10%
RATIO TOLERANCE	EQUAL TO ABSOLUTE TOLERANCE OR ±1%, WHICHEVER IS LESS; TO ±0.05% AVAILABLE
T.C.R.	±50ppm (NiCr) to ±5ppm OPTIONAL; ±150ppm (TaN) to ±10ppm OPTIONAL
T.C. TRACKING	±5ppm/°C to ±2ppm/°C
CURRENT NOISE	-20dB TYPICAL
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	50 mW PER RESISTOR. (70°C DERATED LINEARLY TO 150°C). P=E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ABSOLUTE ±0.5% MAX. ΔR/R; RATIO ±0.1% MAX ΔR/R; ±0.1% ABS. MSI TYPICAL

PART NUMBER DESIGNATION

MSRX — X — X — X — XXXXX — X — X

SERIES	# OF RES.	SUBSTRATE	RESISTIVE FILM	OHMIC VALUE	TOLERANCE	OPTION
A B C	3-12 RESISTORS AVAILABLE	S = Silicon	N = Nichrome T = Tantalum Nitride	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	S = 0.01%* Q = 0.05%* B = 0.1% C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%	A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C E = Aluminum Bond Pads F = ±100ppm/°C G = Gold Bond Pads GB = Gold Backside RA = ±0.01% RATIO RB = ±0.05% RATIO RC = ±0.1% RATIO RE = ±0.25% RATIO RD = ±0.5% RATIO

EXAMPLES: MSRA-8-SN-10001F-AE = 8 Resistors - 10KΩ each, ±1% Tol., ±50ppm/°C TCR, Aluminum Bond Pads. Isolated Resistor Configuration

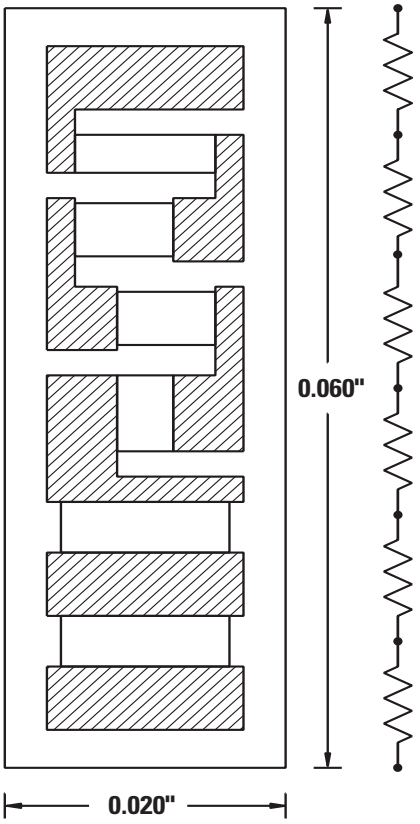
* Consult Sales for available value
Custom configurations available upon request. Consult Sales for ohmic values > 1MΩ

NETWORKS & ARRAYS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM MULTI-TAP RESISTORS

MSMT 116 SERIES LOG RESISTOR



MECHANICAL DATA

SIZE	0.060" x 0.020" x 0.010" (±0.003")
SUBSTRATE	SILICON OR ALUMINA
RESISTOR	TANTALUM NITRIDE
BOND PADS	25,000 Å MINIMUM GOLD
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL. SUITABLE FOR EUTECTIC DIE ATTACH

ELECTRICAL DATA

RESISTANCE RANGE	240Ω TOTAL (SIX RESISTIVE ELEMENTS, 10Ω, 10Ω, 20Ω, 50Ω, 50Ω, AND 100Ω)
TOLERANCE	5% OR 10% (APPLIES TO INDIVIDUAL RESISTIVE ELEMENTS)
T.C.R.	±150ppm/°C STANDARD
NOISE	-20dB MAX
POWER RATING TO 70°C	125mW
OPERATING VOLTAGE	100V MAX
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP. EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP. RANGE	-55°C TO +125°C

PART NUMBER DESIGNATION

MSMT	X	—	T	—	XXXXX	X	—	X
SERIES	SUBSTRATE		RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR
116	A = Alumina S = Silicon		T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	J = 5% K = 10%		GB = Gold Backside G = Gold Bond Pads

EXAMPLES: MSMT 116AT-240R0J-GB = 240Ω, ±5%
Alumina Substrate, Gold Backside.

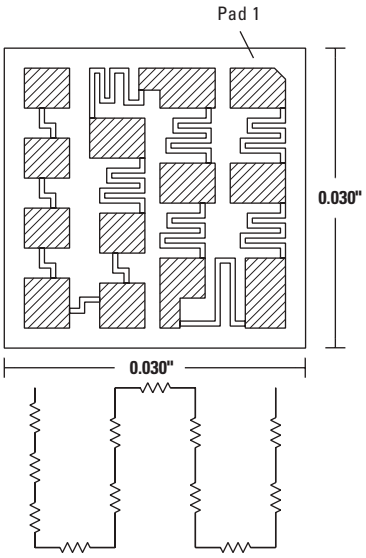
Consult Sales for other values / configurations

NETWORKS & ARRAYS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM MULTI-TAP RESISTORS

MSMT 117 SERIES



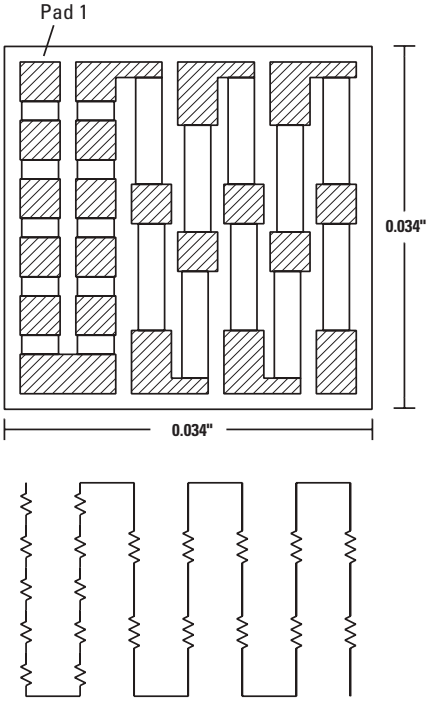
MECHANICAL DATA

SIZE	0.030" x 0.030" x 0.010" (±0.003")
SUBSTRATE	SILICON
RESISTOR	TANTALUM NITRIDE
BOND PADS	25,000 Å MINIMUM GOLD; ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE STANDARD GOLD BACK OPTIONAL. SUITABLE FOR EUTECTIC DIE ATTACH

ELECTRICAL DATA

RESISTANCE RANGE	80Ω – 160KΩ
OTHER VALUES AVAILABLE, PLEASE CONSULT SALES	(THE SEVEN RESISTORS BETWEEN PADS 1 AND 8 ARE EACH 12.5% OF THE TOTAL RESISTANCE VALUE; THE FIVE RESISTORS BETWEEN PADS 8 AND 13 ARE EACH 2.5% OF THE TOTAL RESISTANCE VALUE.)

MSMT 125 SERIES



MECHANICAL DATA

SIZE	0.034" x 0.034" x 0.010" (±0.003")
SUBSTRATE	SILICON
RESISTOR	TANTALUM NITRIDE
BOND PADS	25,000 Å MINIMUM GOLD; ALUMINUM OPTIONAL
BACKSIDE SURFACE	BARE SUBSTRATE GOLD BACK OPTIONAL. SUITABLE FOR EUTECTIC DIE ATTACH

ELECTRICAL DATA

RESISTANCE RANGE	550Ω - 275KΩ

$$\text{1st 10 Resistors} = \frac{\text{TOTAL RESISTANCE}}{110} \qquad \text{2nd 10 Resistors} = \frac{\text{TOTAL RESISTANCE}}{11}$$

OTHER VALUES AVAILABLE, PLEASE CONSULT SALES

117 / 125 COMMON SERIES DATA

TOLERANCES	5%, 10% (APPLIES TO INDIVIDUAL RESISTIVE ELEMENTS)
T.C.R.	±150ppm/°C STANDARD
CURRENT NOISE	-30dB MAX
POWER RATING	250 mW MAX. (70°C DERATED LINEARLY TO 150°C) $P = E^2/R$
OPERATING VOLTAGE	100V MAX
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +125°C

PART NUMBER DESIGNATION

MSMT XXX	—	X	X	—	XXXXX	X	—	X
SERIES		SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION
117 125		S = Silicon	T = Tantalum Nitride		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	J = 5% K = 10%		E = Aluminum Bond Pads GB = Gold Backside G = Gold Bond Pads

EXAMPLE: MSMT 125-550R0K-G = 125 Series, 550Ω Total Res. Value, ±10% Tol., Gold Bond Pads Bare Backside

NETWORKS & ARRAYS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

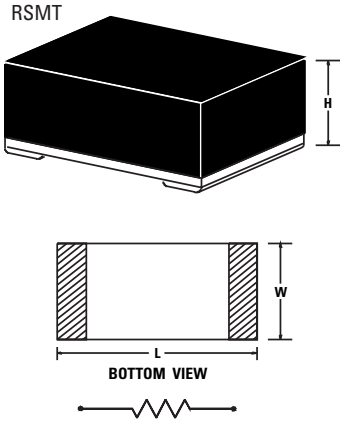
DCN TF 113-G-0306

PACKAGED RESISTORS

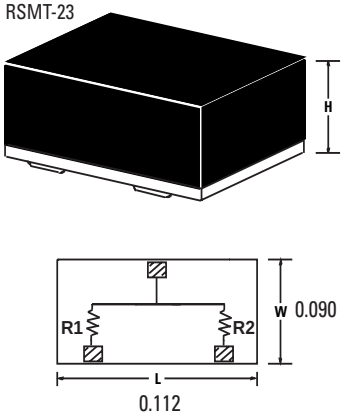
In This Section...

Thin Film Part Number Series ~

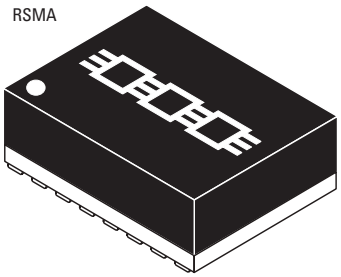
RSMT



RSMT-23



RSMA



NEXT SECTION: JUMPERS, KITS & SUBSTRATES

PREVIOUS SECTION: NETWORKS & ARRAYS

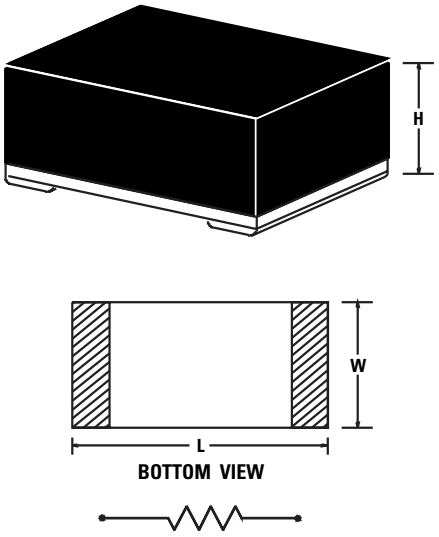
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 154-A-0306

THIN FILM SURFACE MOUNT RESISTORS

MINI-SMT™ RSMT SERIES RESISTORS

MINI-SMT™ thin film resistors offer maximum benefits in ohmic value ranges from 1Ω through 100MΩ. T.C.R.'s to ±5ppm/°C - and absolute tolerances to 0.05%. Available in 0505, 0805, 1206 and 0603 sizes, these resistors provide proven thin film performance in a surface mount solderable style.



MECHANICAL DATA

SIZE: 0505	0.050" x 0.050" (±0.003") x 0.050" NOM.
0805	0.080" x 0.050" (±0.003") x 0.050" NOM.
1206	0.120" x 0.060" (±0.003") x 0.050" NOM.
0603	0.060" x 0.030" (±0.003") x 0.050" NOM.
SUBSTRATE	ALUMINA
RESISTOR	PROPRIETARY
BONDING MATERIAL	PALLADIUM SILVER OR SOLDER, GOLD OPTIONAL
BOND PAD SIZE	
0505	0.015" x 0.050" ±0.005"
0805	0.015" x 0.050" ±0.005"
1206	0.020" x 0.060" ±0.005"
0603	0.010" x 0.030" ±0.005"

ELECTRICAL DATA

RESISTANCE RANGE	1Ω TO 100MΩ
TOLERANCES	0.1%, 0.5%, 1%, 2%, 5%, 10%: TO 0.05% AVAILABLE
T.C.R.	
1Ω TO 50MΩ	±150ppm/°C STANDARD: OPTIONAL TO ±5ppm/°C
50MΩ TO 100MΩ	±300ppm/°C STANDARD: OPTIONAL TO ±100ppm/°C

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C

PART NUMBER DESIGNATION

RSMT X	A	P	—	XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE	TOLERANCE		OPTION DESIGNATOR (If Required)
1:(0505) 2:(1206) 3:(0805) 4:(0603)	A = Alumina	P = Proprietary		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	Q = 0.05%** B = 0.1%** D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C** C = ±10ppm/°C** D = ±5ppm/°C** F = ±100ppm/°C T = Solder Terminations T3 = Leadfree Solder Terminations U = Untinned TR = Tape & Reel* PS = Pd Silver Bond Pads G = Gold Bond Pads

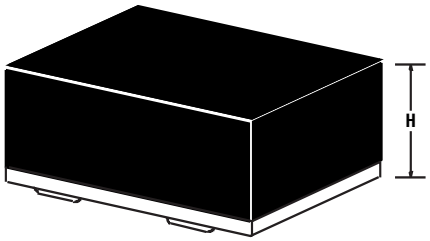
EXAMPLES: RSMT 1 AP-50003B-CT = 0505, 5MΩ, ±0.1% Tol., 10ppm/°C with Solder Termination.

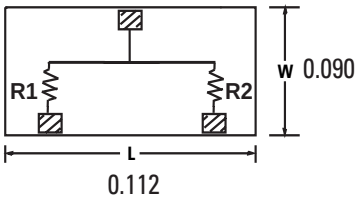
* CONSULT SALES FOR AVAILABILITY
** VALUE DEPENDENT

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM SURFACE MOUNT RESISTORS

RSMT-23
(23:) Direct Replacement for SOT-23





MINI-SMT™ RSMT-23 SERIES RESISTOR

MINI-SMT-23™ thin film resistors offer maximum benefits in ohmic value ranges from 1Ω through 500MΩ. T.C.R.'s to ±5ppm/°C - and absolute tolerances to 0.05%. These packaged resistors provide proven thin film performance in a surface mount solderable style.

MECHANICAL DATA

SIZE: RSMT(23)	0.112" x 0.090" (±0.005") x 0.050"MAX NOM.
SUBSTRATE	ALUMINA
RESISTOR	PROPRIETARY
BONDING MATERIAL	GOLD OR SOLDER, PALLADIUM SILVER OPTIONAL
BOND PAD SIZE (23)	0.018" x 0.020" ±0.003"

ELECTRICAL DATA

RESISTANCE RANGE	1Ω TO 500MΩ
TOLERANCES	0.1%, 0.5%, 1%, 2%, 5%, 10%: TO 0.05% AVAILABLE
T.C.R.	
1Ω TO 50MΩ	±150ppm/°C STANDARD: OPTIONAL TO ±5ppm/°C
50MΩ TO 500MΩ	±300ppm/°C STANDARD: OPTIONAL TO ±100ppm/°C

SERIES DATA

CURRENT NOISE	101Ω TO 250KΩ: -40dB ≤ 100Ω, ≥ 250KΩ: -30dB
DIELECTRIC BREAKDOWN	400 V MIN.
INSULATION RESISTANCE	10^{12}Ω MIN.
OPERATING VOLTAGE	100 V MAX.
POWER RATING	250 mW (70°C DERATED LINEARLY TO 150°C) P = E^2/R
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
STABILITY	1000 HRS., 70°C, 125mW, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP RANGE	-55°C TO +150°C

PART NUMBER DESIGNATION

RSMT 23	A	P	—	XXXXX/XXXXX	X	—	X
SERIES	SUBSTRATE	RESISTIVE FILM		OHMIC VALUE R1 / R2	TOLERANCE		OPTION DESIGNATOR (If Required)
(23): 0.112x 0.090x0.050	A = Alumina	P = Proprietary		5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros.	Q = 0.05%** B = 0.1%** D = 0.5% F = 1% G = 2% J = 5% K = 10%		A = ±50ppm/°C B = ±25ppm/°C** C = ±10ppm/°C** D = ±5ppm/°C** F = ±100ppm/°C T = Solder Terminations T3 = Leadfree Solder Terminations U = Untinned TR = Tape & Reel* PS = Pd Silver Bond Pads G = Gold Bond Pads RA = ±0.01% RATIO RB = ±0.05% RATIO RC = ±0.1% RATIO RE = ±0.25%RATIO RD = ±0.5% RATIO

EXAMPLES: RSMT 23 AP-50003B-CT = 0505, 5MΩ, ±0.1% Tol., ±10ppm/°C with Solder Termination.

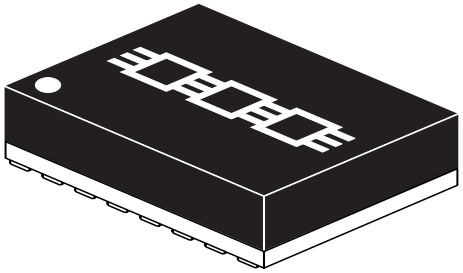
*CONSULT SALES FOR AVAILABILITY
**VALUE DEPENDENT

PACKAGED RESISTORS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

MINI SURFACE MOUNT NETWORKS

RSMA Mini-Surface Mount Resistor Networks



RSMA Style mini-SMT thin film resistor networks. They feature Mini-Systems' exceptional electrical characteristics and are available in 8, 14 and 16 lead configurations.

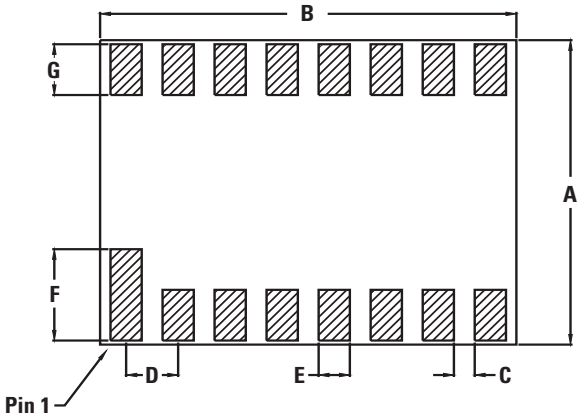
MECHANICAL DATA

PACKAGE STYLE	SMT, EPOXY COATED
PACKAGE CONFIGURATION	8, 14 OR 16 LEADS
LEAD PITCH	25 or 50 MILS
LEAD MATERIAL	PALLADIUM SILVER OR SOLDER TINNED

ELECTRICAL DATA

RESISTANCE RANGE	10Ω TO 1MΩ; RESISTOR ELEMENTS TO 100MΩ AVAILABLE. CONSULT SALES
T.C.R.	±150ppm/°C STANDARD; TO ±5ppm/°C AVAILABLE; VALUE DEPENDENT
T.C. TRACKING	±2ppm/°C STANDARD; TO ±1ppm/°C AVAILABLE
ABSOLUTE TOLERANCE	0.05%, 0.1%, 0.25%, 0.5%, 1%, 2%, 5%, 10%; VALUE DEPENDENT
RATIO TOLERANCE	±1% STANDARD; AVAILABLE TO ±0.05%; VALUE DEPENDENT
CURRENT NOISE	<-30dB TYPICAL
OPERATING VOLTAGE	100 V MAX.
POWER RATING	50 mW/RESISTOR (70°C DERATED LINEARLY TO 150°C); $P=E^2/R$
PACKAGE POWER	400 mW* (70°C DERATED LINEARLY TO 150°C); $P=E^2/R$
SHORT TERM OVERLOAD	5X RATED POWER, 25°C, 5 SEC., ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
HIGH TEMP EXPOSURE	150°C, 100 HRS., ±0.25% MAX. ΔR/R: ±0.03% MSI TYPICAL
THERMAL SHOCK	MIL-STD 202, METHOD 107F, ±0.25% MAX. ΔR/R: ±0.1% MSI TYPICAL
MOISTURE RESISTANCE	MIL-STD 202, METHOD 106, ±0.5% MAX. ΔR/R: ±0.1% MSI TYPICAL
OPERATING TEMP. RANGE	-55°C TO +150°C
STABILITY	1000 HRS., 70°C, 100% POWER, ±0.5% MAX ΔR/R; ±0.1% MSI TYPICAL

DIMENSIONS



RSMA25

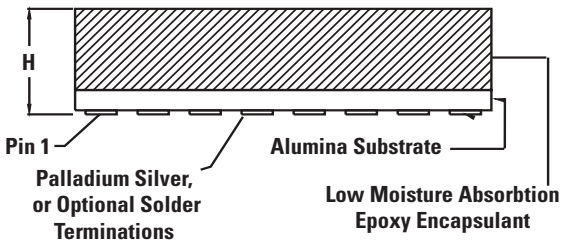
	8 LEAD	14 LEAD	16 LEAD
A	150 ± 5	150 ± 5	150 ± 5
B	150 ± 5	175 ± 5	200 ± 5
C	10	10	10
D	25	25	25
E	15 ± 2	15 ± 2	15 ± 2
F	45	45	45
G	25	25	25
H	50 ± 5	50 ± 5	50 ± 5

ALL DIMENSIONS IN MILS

RSMA50

	8 LEAD	14 LEAD	16 LEAD
A	240 ± 5	240 ± 5	240 ± 5
B	190 ± 5	340 ± 5	390 ± 5
C	35	35	35
D	50	50	50
E	15 ± 2	15 ± 2	15 ± 2
F	45	45	45
G	30	30	30
H	50 ± 5	50 ± 5	50 ± 5

ALL DIMENSIONS IN MILS



SHOWN ABOVE IS RSMA50-16 or RSMA25-16

Consult Sales For Custom Configurations.
*Package Power for (8) Resistors.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

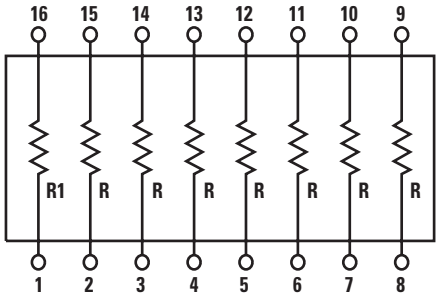
DCN TF 145-B-0306

MINI SURFACE MOUNT NETWORKS

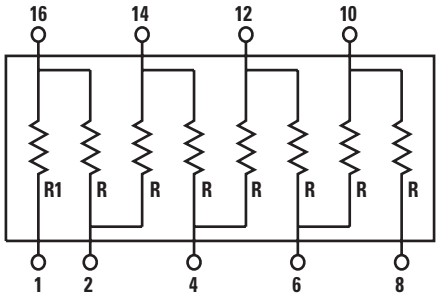
RSMA Mini-Surface Mount Resistor Networks

SCHEMATICS

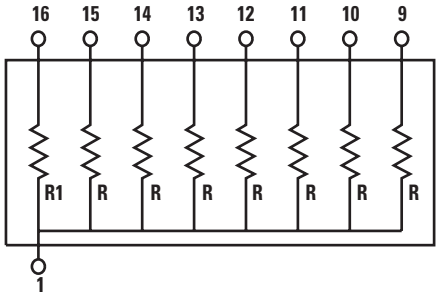
STYLE "SA" ISOLATED



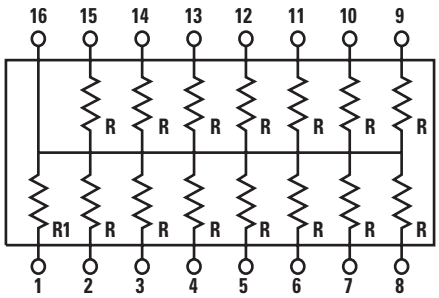
STYLE "SC" SERIES



STYLE "SB" COMMON



STYLE "SD" DIVIDER



PART NUMBER DESIGNATION

RSMAXX — X — SX — XXXXX — X — X

SERIES	#LEADS	STYLE	VALUE/ RESISTOR	TOLERANCE	OPTION
25 50	8 14 16	SA = Isolated SB = Common SC = Series SD = Divider	5-Digit Number: 1st 4 Digits Are Significant With "R" As Decimal Point When Required. 5th Digit Represents Number of Zeros. EXAMPLE: 10001 = 10K	Q = 0.05% B = 0.1% C = 0.25% D = 0.5% F = 1% G = 2% J = 5% K = 10%	A = ±50ppm/°C B = ±25ppm/°C C = ±10ppm/°C D = ±5ppm/°C RB = 0.05% Ratio RC = 0.1% Ratio RD = 0.5% Ratio RE = 0.25% Ratio T = Solder Tinned T3 = Leadfree Tinned U = Untinned. Std. Z = Commercial Inspection (Always used when no other option is req.)

EXAMPLE: RSMA50-16-SA-10002F-ARD = 16 Lead Pkg., 8 - 100KΩ Resistors, Isolated Connections, ±1% Tol., ±50ppm/°C, ±0.5% Ratio, Untinned.

PACKAGED RESISTORS

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

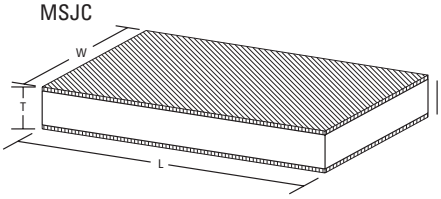
JUMPERS, SUBSTRATES & KITS

In This Section...

Thin Film Part Number Series ~

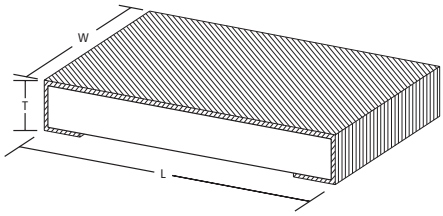
MSJC & WAJC Series ~ Chip Jumpers
CUSTOM PATTERNED Substrates
KITS ~ WATF Series ~ Surface Mount Chips
KITS ~ MSTF & MSCC Series ~ Surface Mount Resistor Networks

MSJC



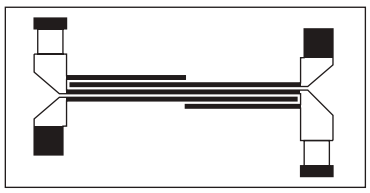
SHOWN WITH OPTIONAL GOLD BACK

WAJC

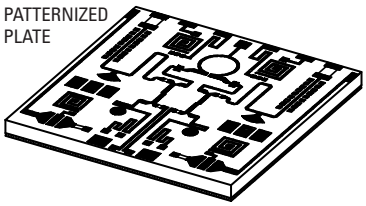


WRAPAROUND

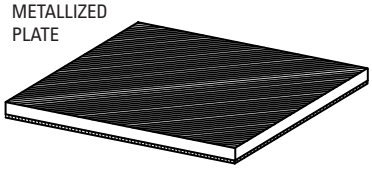
COUPLER



PATTERNIZED PLATE



METALLIZED PLATE



MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 155-A-0306

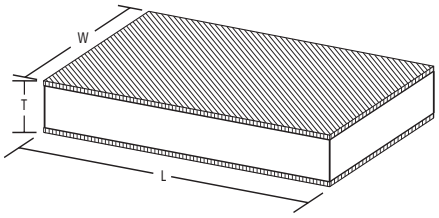
PREVIOUS SECTION: PACKAGED RESISTORS

THIN FILM CHIP JUMPERS

MSJC & WAJC SERIES

MSJC and WAJC Series Chip Jumpers can be used as zero ohm jumpers, bonding islands, and stand offs for specific applications. Available in a variety of standard sizes, as well as special sizes for your custom applications.

MSJC



SHOWN WITH OPTIONAL GOLD BACK

MSJC SERIES

SERIES	L	W	TOLERANCE
MSJC - 1	0.010"	0.010"	±0.003"
MSJC - 2	0.020"	0.020"	±0.003"
MSJC - 3	0.030"	0.030"	±0.003"
MSJC - 4	0.040"	0.040"	±0.003"
MSJC - 5	0.050"	0.050"	±0.003"
MSJC - 10	0.100"	0.100"	±0.003"
MSJC - 35	0.035"	0.035"	±0.003"
MSJC - 75	0.075"	0.050"	±0.003"

CUSTOM SIZES AVAILABLE, CONSULT SALES

SUBSTRATE	99.6% ALUMINA; OTHER SUBSTRATE MATERIALS AVAILABLE UPON REQUEST
METALLIZATION	GOLD, 25K Å NOMINAL
THICKNESSES	0.010", 0.015", 0.020", 0.025"
RESISTANCE	10 MILLIOHMS PER SQUARE, TYPICAL

PART NUMBER DESIGNATION

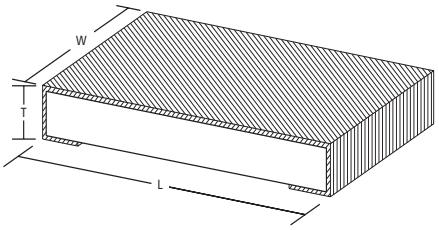
MSJC — X — AT — X

SIZE	MATERIAL	OPTION AND SUBSTRATE THICKNESS
1	AT = ALUMINA SUBSTRATE	G10 = One Side Gold, 0.010"
2		G15 = One Side Gold, 0.015"
3		G20 = One Side Gold, 0.020"
4		G25 = One Side Gold, 0.025"
5		GB10 = With Gold Back, 0.010"
10		GB15 = With Gold Back, 0.015"
35		GB20 = With Gold Back, 0.020"
75		GB25 = With Gold Back, 0.025"

EXAMPLE: MSJC 10-AT-GB10 = 0.100" X 0.100" X 0.010" JUMPER WITH GOLD BACK

WAJC SERIES

WAJC



WRAPAROUND

SERIES	L	W	TOLERANCE
WAJC - 1	0.040"	0.020"	±0.003"
WAJC - 2	0.035"	0.035"	±0.003"
WAJC - 3	0.075"	0.050"	±0.003"
WAJC - 4	0.050"	0.050"	±0.003"
WAJC - 5	0.126"	0.063"	±0.003"
WAJC - 6	0.100"	0.050"	±0.003"
WAJC - 7	0.020"	0.020"	±0.003"
WAJC - 8	0.055"	0.025"	±0.003"
WAJC - 9	0.153"	0.050"	±0.003"

CUSTOM SIZES AVAILABLE, CONSULT SALES

SUBSTRATE	99.6% ALUMINA; OTHER SUBSTRATE MATERIALS AVAILABLE UPON REQUEST
METALLIZATION	GOLD, 25K Å NOMINAL
THICKNESSES	0.010", 0.015", 0.020", 0.025"
RESISTANCE	10 MILLIOHMS PER SQUARE, TYPICAL

PART NUMBER DESIGNATION

WAJC — X — AT — X

SIZE	MATERIAL	OPTION AND SUBSTRATE THICKNESS
1	AT = ALUMINA SUBSTRATE	G10 = Gold, 0.010"
2		G15 = Gold, 0.015"
3		G20 = Gold, 0.020"
4		G25 = Gold, 0.025"
5		T10 = SN62 Solder, 0.010"
6		T15 = SN62 Solder, 0.015"
7		T20 = SN62 Solder, 0.020"
8		T25 = SN62 Solder, 0.025"
9		T310 = Leadfree Solder, 0.010"
		T315 = Leadfree Solder, 0.015"
		T320 = Leadfree Solder, 0.020"
Solder option applies to all conductor surfaces		T325 = Leadfree Solder, 0.025"

EXAMPLE: WAJC 6-AT-G10 = 0.100" X 0.050" X 0.010" WRAPAROUND JUMPER

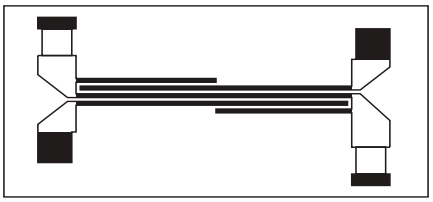
MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

DCN TF 121-C-0306

CUSTOM PATTERNED SUBSTRATES

Advanced manufacturing methods insure superior sheet Rho uniformity, gold thickness control, and metallization adhesion. Our custom manufacturing capabilities allow us to meet and exceed the most demanding custom applications.

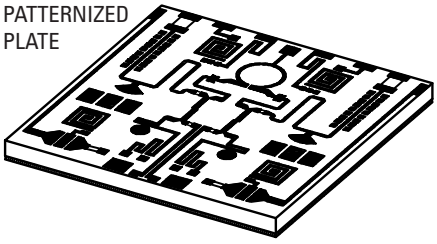
COUPLER



MECHANICAL DATA

SUBSTRATE	ALUMINA 99.6%, QUARTZ, ALUMINUM NITRIDE, BeO, GLASS, SILICON
SIZE	TO 4" x 4"
THICKNESS	0.010", 0.015", 0.020", 0.025"; STANDARD
SURFACE FINISH	AS FIRED 2 - 3 µ"; POLISHED < 2 µ"
LINE WIDTH DEFINITION	RESISTOR PATTERNING TO 2 MICRONS CONDUCTOR - 100 µ" OF GOLD; 0.5 MILS (20 MICRONS) ±0.05 MILS
SPECIALTY MATERIALS	ONE, TWO, OR SIX-SIDED METALLIZATIONS, THROUGH-HOLES, AND EDGE WRAPS, CUSTOM LASER CUTOUTS.

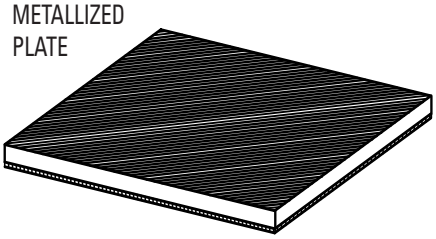
PATTERNIZED PLATE



ELECTRICAL DATA

SHEET Rho	5 Ω / Sq. TO 200 Ω / Sq.	
TaN	5 Ω / Sq. TO 200 Ω / Sq.	
NiCr		
RESISTOR	±1% STANDARD	
TOLERANCE	OPTIONAL TO ±0.01%	
RATIO	AVAILABLE TO ±0.01%	
T.C.R.	NICHROME	TANTALUM NITRIDE
SILICON, QUARTZ, GLASS, BeO, ALUMINUM NITRIDE	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C	±25ppm/°C STANDARD OPTIONAL TO ±10ppm/°C
ALUMINA	±25ppm/°C STANDARD OPTIONAL TO ±5ppm/°C	±25ppm/°C STANDARD OPTIONAL TO ±10ppm/°C
T.C. TRACKING	TO ±2ppm/°C STANDARD	
OTHER METALS	NICHROME, TANTALUM, SICHROME, PALLADIUM, TITUNGSTEN, GOLD, NICKEL, ALUMINUM	

METALLIZED PLATE



Custom Part Numbers Will be Assigned.
Consult Engineering for further information.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM CHIP RESISTOR KITS

SURFACE MOUNT CHIP RESISTOR KITS

WATF-1 KITS & WATF-8 KITS (39 OHMIC VALUES)

2	3	4	5	6	7
8	9	10	12	15	18
20	22	27	33	39	42
50	68	72	83	91	100
120	150	180	200	220	270
330	390	420	500	680	720
830	910	1K			

WATF-2 KITS & WATF-7 KITS (65 OHMIC VALUES)

2	5	10	12	15	18
20	22	27	33	39	42
50	68	72	83	91	100
120	150	180	200	220	270
330	390	420	500	680	720
830	910	1K	1.2K	1.5K	1.8K
2K	2.2K	2.7K	3.3K	3.9K	4.2K
5K	6.8K	7.2K	8.3K	9.1K	10K
12K	15K	18K	20K	22K	27K
33K	39K	42K	50K	68K	72K
83K	91K	100K	120K	150K	

WATF-3 KITS & WATF-4 KITS (71 OHMIC VALUES)

SAME VALUES AS WATF-2 KIT WITH THESE ADDITIONAL VALUES

180K	200K	220K	270K	330K	390K

WATF-5 KITS & WATF-6 KITS (74 OHMIC VALUES)

SAME VALUES AS WATF-3 KIT WITH THESE ADDITIONAL VALUES

420K	500K	680K

WATF-9 KITS (78 OHMIC VALUES)

SAME VALUES AS WATF-5 KIT WITH THESE ADDITIONAL VALUES

720K	830K	910K	1M

STANDARD TOLERANCE IS 1% FOR ALL KITS.

PART NUMBERING SYSTEM:

KIT PART NUMBER

WATF-X — A — X — KIT — X

SERIES
1, 2
3, 4
5, 6
7, 8
9

RESISTIVE
N = Nichrome
T = Tantalum Nitride

QTY
A = 10 PCS. EA. VALUE
B = 25 PCS. EA. VALUE
C = 50 PCS. EA. VALUE
D = 100 PCS. EA. VALUE

EXAMPLE: WATF-4-A-N-KIT-A; CONSISTS OF 10 PCS. EACH VALUE NICHROME RESISTOR FOR WATF-4 STYLE KIT

WEIGHTED KITS AVAILABLE. PLEASE CONSULT SALES.
SPECIAL KITS ARE AVAILABLE; MUST HAVE AT LEAST 25 VALUES;
KITS ARE PACKAGED WITH INDIVIDUAL VALUES IN WAFFLE PACKS.
WATF KITS HAVE SOLDER TERMINATIONS. PLEASE SPECIFY IF PARTS ARE REQUIRED WITHOUT SOLDER.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076

THIN FILM CHIP RESISTOR KITS

WIRE BONDABLE CHIP RESISTOR KITS

KITS ARE COMPRISED OF 80 STANDARD RETMA VALUES (IN OHMS)

10	12	15	18	20	22
27	33	39	42	50	68
72	83	91	100	120	150
180	200	220	270	330	390
420	500	680	720	830	910
1.0K	1.2K	1.5K	1.8K	2.0K	2.2K
2.7K	3.3K	3.9K	4.2K	5.0K	6.8K
7.2K	8.3K	9.1K	10 K	12 K	15 K
18 K	20 K	22 K	27 K	33 K	39 K
42 K	50 K	68 K	72 K	83 K	91 K
100K	120K	150K	180K	200K	220K
270K	330K	390K	420K	500K	680K
720K	830K	910K	1.0M	1.2M	1.5M
1.8M*	2.0 M*				

*NOTE: FOR MSTF-2 KITS, 1.8MΩ, and 2MΩ VALUES ARE NOT AVAILABLE.
5Ω, AND 51Ω VALUES ARE SUBSTITUTED.

STANDARD TOLERANCE IS 1% FOR ALL KITS.

PART NUMBERING SYSTEM:

KIT PART NUMBER — DESCRIPTION

MSTF-X — X — X — KIT — X

SERIES	SUBSRATE	RESISTOR	QTY
2	S = Silicon	N = Nichrome	A = 10 PCS. EA. VALUE
3		T = Tantalum Nitride	B = 25 PCS. EA. VALUE
			C = 50 PCS. EA. VALUE
			D = 100 PCS. EA. VALUE

EXAMPLE: MSTF-2-S-N-KIT-A; CONSISTS OF 10 PCS. EACH VALUE NICHROME RESISTOR FOR MSTF-2 STYLE KIT
SPECIAL KITS ARE AVAILABLE; MUST HAVE AT LEAST 25 VALUES;
KITS ARE PACKAGED WITH INDIVIDUAL VALUES IN WAFFLE PACKS.

THIN FILM MOS CAPACITOR KITS

KITS ARE COMPRISED OF THE FOLLOWING (65 VALUES IN pF):

MSCC-2:

4.7	5.6	6.8	8.2	10	11
12	13	15	16	18	20
22	24	27	30	33	36
39	43	47	51		

MSCC-3:

33	36	39	43	51	56
62	68	75	82	91	100

MSCC-4:

56	62	68	75	82	91
100	110	120	130	150	160
180	200	220			

MSCC-5:

240	270	300	330	360	390
430	470	510	560	620	680
750	820	910	1000		

STANDARD TOLERANCE IS 10% FOR ALL KITS.
BOND PADS ARE GOLD

PART NUMBERING SYSTEM:

KIT PART NUMBER — DESCRIPTION

MSCC99 SA — KIT — X

A = 10 PCS. EA. VALUE
B = 25 PCS. EA. VALUE
C = 50 PCS. EA. VALUE
D = 100 PCS. EA. VALUE

KITS ARE PACKAGED WITH INDIVIDUAL VALUES IN WAFFLE PACKS.

MINI-SYSTEMS, INC.
THIN FILM DIVISION
20 DAVID ROAD, N. ATTLEBORO, MA 02760
508-695-0203 FAX: 508-695-6076