



VISHAY INTERTECHNOLOGY, INC.

INTERACTIVE

data book

RESISTOR ARRAYS AND NETWORKS

VISHAY DALE

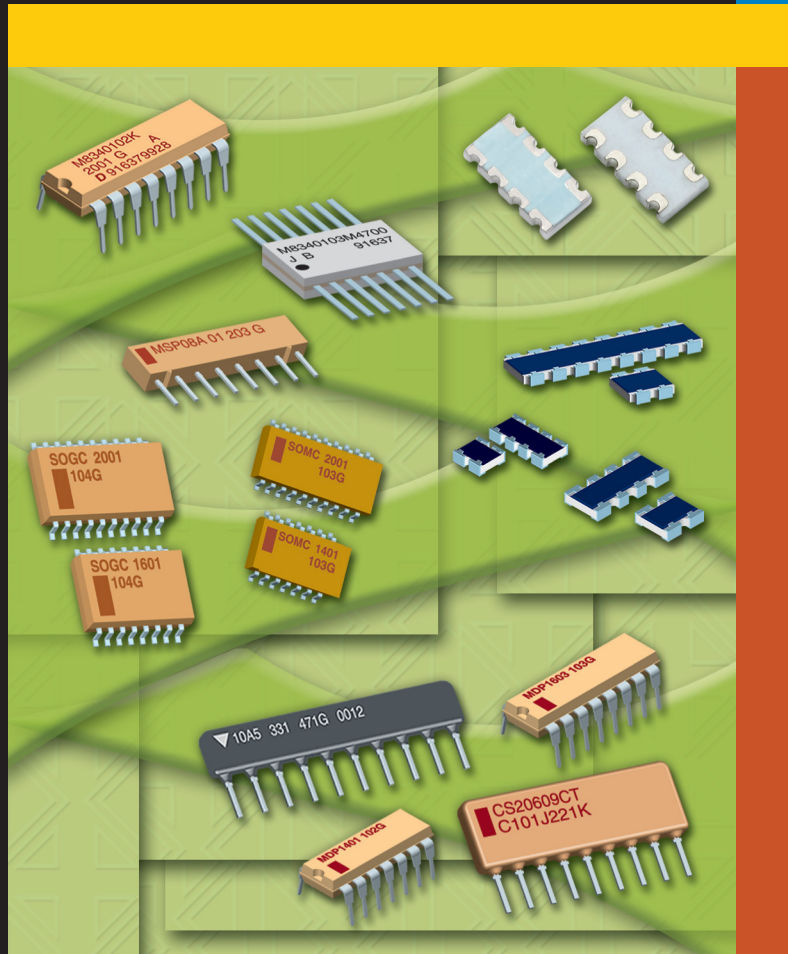
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1. To navigate:
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 - b) Click on the products within the Table of Contents to go directly to the datasheet.
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VISHAY INTERTECHNOLOGY, INC.



RESISTOR ARRAYS AND NETWORKS

Resistor Arrays

Surface Mount Networks

Through-Hole Resistor Networks

Military Resistor Networks

Customized Resistor Networks

VISHAY INTERTECHNOLOGY, INC.

DISCRETE SEMICONDUCTORS

RECTIFIERS	Schottky (single, dual) Standard, Fast and Ultra-Fast Recovery (single, dual) Clamper/Damper Bridge Superectifier® Sinterglass Avalanche Diodes
SMALL-SIGNAL DIODES	Schottky and Switching (single, dual) Tuner/Capacitance (single, dual) Bandswitching PIN
ZENER & SUPPRESSOR DIODES	Zener Diodes (single, dual) TVS (TransZorb®, Automotive, ESD, Arrays)
MOSFETs	Power MOSFETs JFETs
RF TRANSISTORS	Bipolar Transistors (AF and RF) Dual Gate MOSFETs MOSMICs®
OPTOELECTRONICS	IR Emitters, Detectors and IR Receiver Modules Opto Couplers and Solid State Relays Optical Sensors LEDs and 7 Segment Displays Infrared Data Transceiver Modules Custom products
ICs	Power ICs Analog Switches

PASSIVE COMPONENTS

CAPACITORS	Tantalum Capacitors Solid Tantalum Capacitors Wet Tantalum Capacitors Ceramic Capacitors Multilayer Chip Capacitors Disc Capacitors Film Capacitors Power Capacitors Heavy Current Capacitors Aluminum Capacitors Silicon Capacitors
RESISTIVE PRODUCTS	Foil Resistors Film Resistors Thin Film Resistors Thick Film Resistors Metal Oxide Film Resistors Carbon Film Resistors Wirewound Resistors Variable Resistors Cermet Variable Resistors Wirewound Variable Resistors Conductive Plastic Variable Resistors Networks/Arrays Non-Linear Resistors NTC Thermistors PTC Thermistors Varistors
MAGNETICS	Inductors Transformers

INTEGRATED MODULES

DC/DC CONVERTERS	
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STRAIN SENSORS AND TRANSDUCERS

STRAIN GAGES AND INSTRUMENTS	
PHOTOSTRESS® INSTRUMENTS	
TRANSDUCERS	Load Cells Weighing Systems

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DISCRETE SEMICONDUCTORS AND PASSIVE COMPONENTS

Arrays and Networks

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Warning Regarding Life Support Applications

Not all products listed in this catalog are generally recommended for use in life support systems where a failure or malfunction of the component may directly threaten life or cause injury.

The user of products in such applications assumes all risks of such use and will agree to hold Vishay Intertechnology, Inc. and all the companies whose products are represented in this catalog, harmless against all damages.



RESISTOR ARRAYS AND NETWORKS

Table of Contents	1
Alphabetical Product Listing	2

RESISTOR ARRAYS

Standard (Thick Film)

CRA04S	Thick Film Standard	4
CRA06E & S	Thick Film Standard	6
CRA06P	Thick Film Standard	8
CRA12E & S	Thick Film Standard	10

Standard (Thin Film)

ACAC 0612	Professional Thin Film Array	12
ACAC 0612	Precision Thin Film Array	18
TRA06E	Thin Film Precision	24

Resistor/Capacitor

CRCA	Thick Film Resistor / Capacitor Array	26
------	---------------------------------------------	----

Attenuator

CZA	Surface Mount Chip Attenuator	28
-----	-------------------------------------	----

INDUSTRIAL SMD RESISTOR NETWORKS

Dual-In-Line

SOGC-01, -03, -05	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	32
SOGC-45, -46	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	36
SOMC	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	38

Flatpack

DFP	Thick Film Resistor Network, Flat pack	40
-----	----------------------------------------------	----

INDUSTRIAL THROUGH-HOLE RESISTOR NETWORKS

Dual-In-Line

MDP 01, 03, 05	Thick Film Resistor Network, Dual-in-line, Molded DIP	44
MDP 45, 46	Thick Film Resistor Network, Dual-in-line, Molded DIP	48

Single-In-Line

CSC	Thick Film Resistor Network, Single-in-line, Coated SIP	50
MSP	Thick Film Resistor Network, Single-in-line, Molded SIP	54

Resistor/Capacitor

CS201	Capacitor Networks, Single-in-line, Coated SIP, "D" profile	58
CS206	Resistor/Capacitor Networks, Single-in-line, Coated SIP, ECL Terminators and Line Terminator	60
MDRC	Resistor/Capacitor Networks. Dual-in-line, Molded DIP	62

MILITARY QUALIFIED RESISTOR NETWORKS

Flatpack

DFM	Flatpack, MIL-PRF-83401, Type RZ	68
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Dual-In-Line

MDM 14, 16	Dual-in-line, Molded Package, MIL-PRF-83401, Type RZ	72
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Single-In-Line

MSM	Single-in-line, Molded Package, MIL-PRF-83401, Type RZ	76
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CUSTOM RESISTOR NETWORKS

Product Design Capabilities	Multicomps, Custom Networks and Screened Substrates	82
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RELATED DOCUMENTS

Packaging	84
MIL Identification and Ordering Examples	84



RESISTOR ARRAYS AND NETWORKS

ACAC 0612	Professional Thin Film Array	12
ACAC 0612	Precision Thin Film Array	18
CRA04S	Thick Film Standard	4
CRA06E & S	Thick Film Standard	6
CRA06P	Thick Film Standard	8
CRA12E & S	Thick Film Standard	10
CRCA	Thick Film Resistor / Capacitor Array	26
CS201	Capacitor Networks, Single-in-line, Coated SIP, "D" profile	58
CS206	Resistor/Capacitor Networks, Single-in-line, Coated SIP, ECL Terminators and Line Terminator	60
CSC	Thick Film Resistor Network, Single-in-line, Coated SIP	50
CZA	Surface Mount Chip Attenuator	28
DFM	Flatpack, MIL-PRF-83401, Type RZ	68
DFP	Thick Film Resistor Network, Flat pack	40
MDM 14, 16	Dual-in-line, Molded Package, MIL-PRF-83401, Type RZ	72
MDP 01, 03, 05	Thick Film Resistor Network, Dual-in-line, Molded DIP	44
MDP 45, 46	Thick Film Resistor Network, Dual-in-line, Molded DIP	48
MDRC	Resistor/Capacitor Networks. Dual-in-line, Molded DIP	62
MIL	Identification and Ordering Examples.....	84
MSM	Single-in-line, Molded Package, MIL-PRF-83401, Type RZ	76
MSP	Thick Film Resistor Network, Single-in-line, Molded SIP	54
Packaging	84
Product Design Capabilities	Multicomps, Custom Networks and Screened Substrates	82
SOGC-01, -03, -05	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	32
SOGC-45, -46	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	36
SOMC	Thick Film Resistor Network, Dual-in-line, Small Outline, Molded DIP	38
TRA06E	Thin Film Precision	24



Resistor Arrays

Resistor or Resistor/Capacitor
Configurations

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Several Devices in one Package

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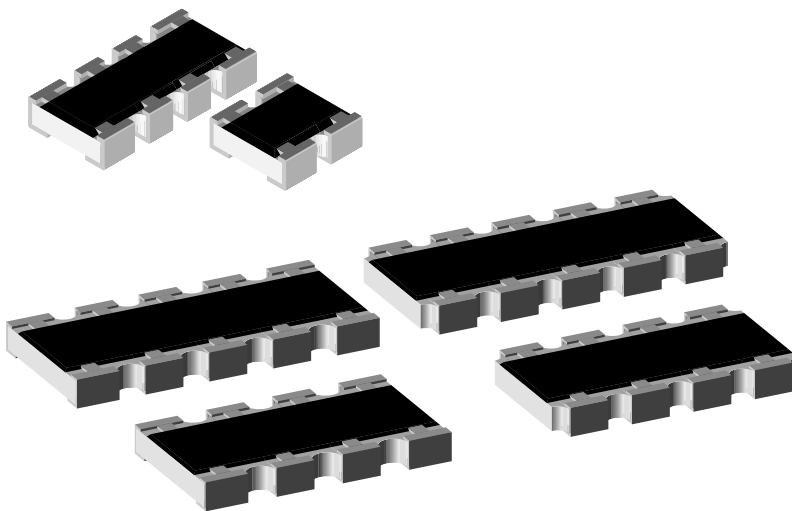
Commoned, Isolated and Line Terminator
Schematics

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Design Flexibility

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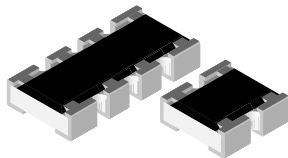
High Packaging Density



Model Numbers

CRA04S	4
CRA06E & S	6
CRA06P	8
CRA12E & S	10
ACAC0612 (Professional)	12
ACAC0612 (Precision)	18
TRA06E	24
CRCA	26
CZA	28

Thick Film, Resistor Array



FEATURES

- Convex terminal array with square corners
- 4 or 8 terminal package with isolated resistors
- Single component reduces board space and component counts
- Automatic placement capability
- Wave and solder paste reflow compatible
- Thick film resistance element
- Solderable wrap around termination
- Nickel barrier for inner electrode protection
- Standard E-24 resistance values
- Operating temperature range of - 55°C to + 150°C
- Consult factory for additional schematics, values, etc

STANDARD ELECTRICAL SPECIFICATIONS							
MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	CIRCUIT	LIMITING ELEMENT VOLTAGE MAX. V_{\cong}	TEMPERATURE COEFFICIENT ppm/°C	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
CRA04S	0.063	03	50	200	5	1R0 – 1M0	24
				100	2	10R – 1M0	24
				Jumper: Zero-Ohm-Resistor on request			

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Ask about extended value ranges.
- Packaging: according to EIA 481
- Contact factory for tighter tolerance.

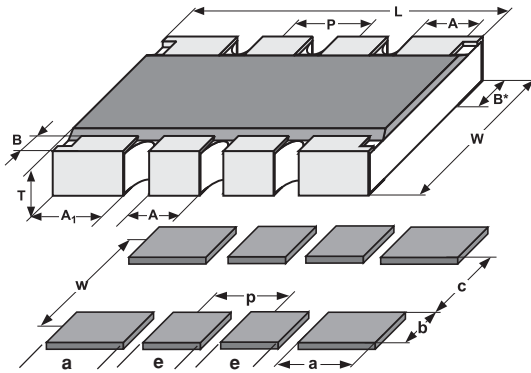
TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	CRA04S
Rated Dissipation at 70°C	W	0.063
Limiting Element Voltage ¹⁾	V_{\cong}	50
Insulation Voltage (1min)	$V_{dc/ac\ peak}$	100
Category Temperature Range	°C	- 55 / + 150
Insulation Resistance	Ω	> 10 ⁹

¹⁾Rated voltage: $\sqrt{P \times R}$

ORDERING INFORMATION					
CRA04S	08	03	473	J	RT7
MODEL	TERMINAL COUNT	CIRCUIT TYPE	RESISTANCE VALUE Ω	TOLERANCE \pm %	PACKAGING
	04, 08	03 only	First two digits (three for 1%) are significant. Last digit is the multiplier	J = \pm 5% G = \pm 2% Z = 0 Ω Jumper	Paper tape 10000pcs

8-Terminal device

S – Version



SOLDER PAD DIMENSIONS [in millimeters]						
	c	w	p	a	b	e
WAVE	0.45	1.0	0.5	0.4	0.5	0.3

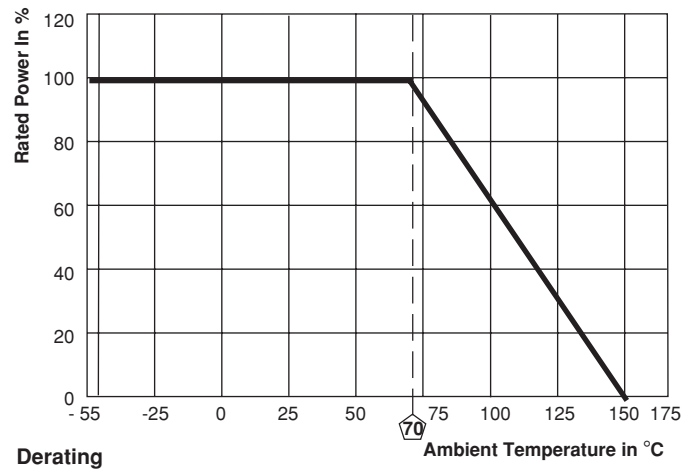
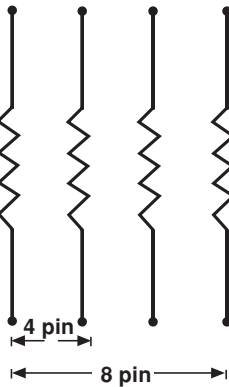
P dimension for the 4 pin is 0.65

The dimensions shown are for a 8 pin part. For parts with different pin numbers use the same pitch and add or subtract pads as required.

PIN NO#	DIMENSIONS [in millimeters]							
	L	A	A ₁	B	B*	P _{NOM}	T	W
4	1.0 ± 0.1	-	0.33	0.15	0.25	0.65	0.35	1.0
8	2.0 ± 0.2	0.30	0.4	0.15	0.25	0.50	0.35	1.0
TOL		± 0.15	± 0.15	± 0.10	± 0.1		± 0.1	± 0.15

CIRCUIT SCHEMATICS

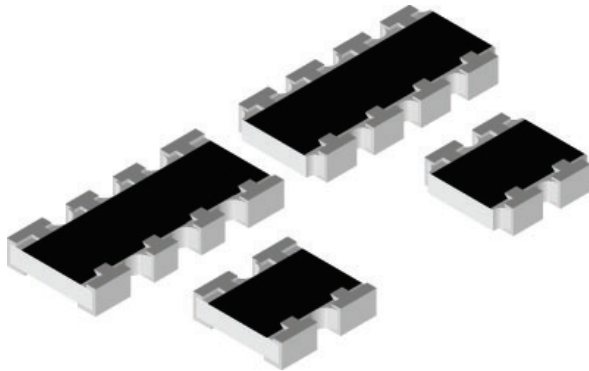
03 Circuit CRA04S



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Endurance Test at 70°C per EIA 575-3.14	1000 hours at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	± 1.5%
Overload per EIA 575-3.6	Short time overload	± 0.5%
Thermal Shock	per EIA 575-3.5	± 0.5%
Moisture Resistance	per EIA 575-3.10	± 1.0%
Resistance to Soldering Heat EIA 575 3.8	10 seconds at 260°C solder bath temperature	± 2.0%
High Temperature Exposure	per EIA 575-3.7	± 1.0%
Low Temperature Operations	per EIA 575-3.6	± 0.5%
Solderability & Leaching	EIA 575-3.12	95% Coverage



Thick Film, Resistor Array



FEATURES

- Convex terminal array available with either scalloped corners (E version) or square corners (S version)
- 4, 8, or 10 terminal package with either isolated resistors or bussed resistors
- Single component reduces board space and component counts
- Automatic placement capability
- Wave and solder paste reflow compatible
- Thick film resistance element
- Solderable wrap around termination
- Nickel barrier for inner electrode protection
- Standard E-24 ($\pm 2\%$ and $\pm 5\%$) and E-96 ($\pm 1\%$) resistance values
- Operating temperature range of -55°C to $+150^{\circ}\text{C}$
- Consult factory for additional schematics, values, etc

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	CIRCUIT	LIMITING ELEMENT VOLTAGE MAX. V_{\cong}	TEMPERATURE COEFFICIENT ppm/ $^{\circ}\text{C}$	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
CRA06S	0.063	02, 20	50	250	5	22R-1M0	24
CRA06E & S	0.063	03	50	100	1	10R-1M0	24-96
				200	2, 5	10R-1M0	24

Jumper: Zero-Ohm-Resistor on Request

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Operating temperature Range: -55°C to $+150^{\circ}\text{C}$
- Ask about further value ranges
- Packaging: according to EIA 481

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CRA06S	CRA06E & S
		02, 20 CIRCUIT	03 CIRCUIT
Rated Dissipation at 70°C	W	0.063	0.063
Limiting Element Voltage ¹⁾	V_{\cong}	50	50
Insulation Voltage (1min)	$V_{\text{dc/ac peak}}$	100	100
Category Temperature Range	$^{\circ}\text{C}$	$-55 / +150$	$-55 / +150$
Insulation Resistance	Ω	$> 10^{10}$	$> 10^{10}$

¹⁾Rated voltage: $\sqrt{P \times R}$

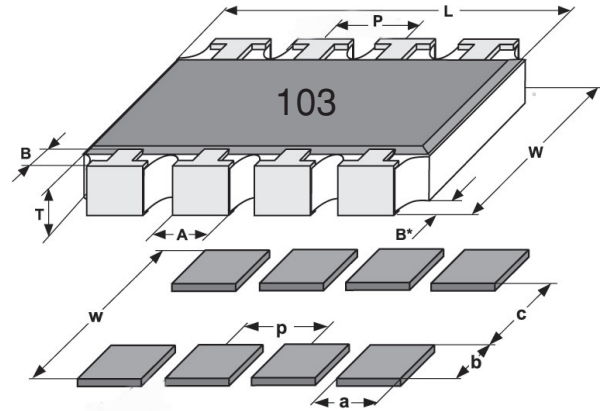
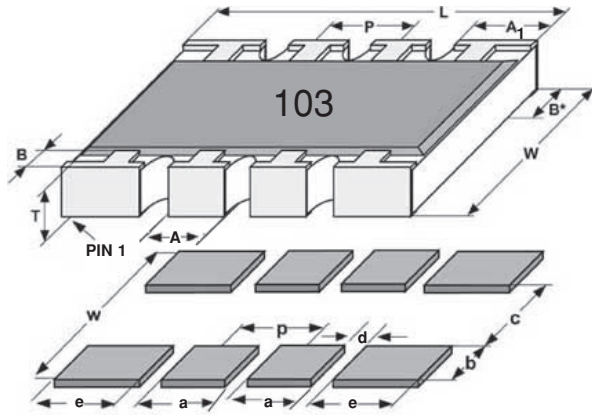
ORDERING INFORMATION

CRA06S	08	03	473	J	RT1
MODEL	TERMINAL COUNT	CIRCUIT TYPE	R-VALUE Ω	TOLERANCE $\pm \%$	PACKAGING
CRA06S	04, 08	03	First two digits (three for 1%)	F = $\pm 1\%$	Papertape 5000pcs
CRA06S	10	02, 20	are significant. Last digit is the	G = $\pm 2\%$	
CRA06E	08	03	multiplier	J = $\pm 5\%$	
			473 = 47K	Z = 0Ω Jumper	
			4702 = 47K		
			100 = 10Ω		
			10R0 = 10Ω		
			000 = 0Ω Jumper		

8-Terminal device

S - Version

E - Version

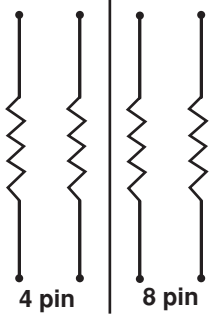


MODEL	PIN NO#	DIMENSIONS [in millimeters]							
CRA		L	A	A ₁	B	B*	P	T	W
06S	4	1.6	0.38	0.61	0.3	0.3	0.8	0.4	1.5
06E	8	3.2	0.38	-	0.3	0.3	0.8	0.4	1.5
06S	8	3.2	0.38	0.61	0.3	0.3	0.8	0.4	1.5
06S	10	3.2	0.34	0.49	0.3	0.2	0.64	0.5	1.6
	Tol	± 0.15	± 0.15	± 0.15	± 0.15	± 0.15	± 0.1	± 0.05	± 0.15

SOLDER PAD DIMENSIONS [in millimeters]								
MODEL	PINS	c	w	d	p	a	b	e
CRA06S	4	0.8	3.1	0.36		0.44	1.15	
CRA06E + S	8	0.8	3.1	0.36	0.8	0.44	1.15	0.63
CRA06S	10	0.8	3.1	0.30	0.64	0.34	1.15	0.45

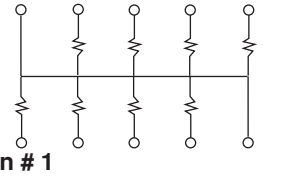
CIRCUIT SCHEMATIC

03 CIRCUIT

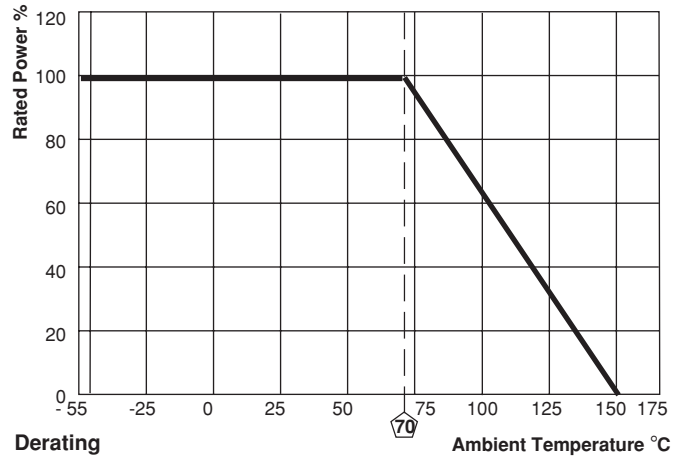
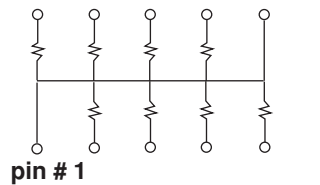


(CRA06S only)

02 CIRCUIT

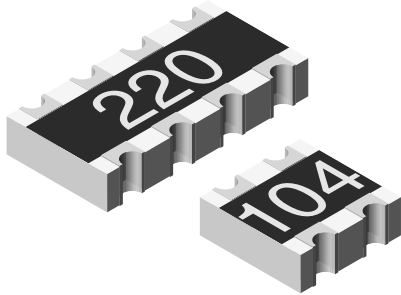


20 CIRCUIT



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Endurance Test at 70°C per EIA 575	1000 hour at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	±1.0%
Overload per EIA 575	Short time overload 2.5 x rated continuous working voltage for 5 seconds. Not to exceed 2 x max operating voltage	± 0.5%
Thermal Shock	per EIA 575-3.5	± 0.5%
Moisture Resistance	per EIA 575-3.10	± 1.0%
Resistance to Soldering Heat EIA 575	10 seconds at 260°C solder bath temperature	± 2.0%
High Temperature Exposure	per EIA 575-3.7	± 1.0%
Low Temperature Operations	per EIA-575-3.6	± 0.5%
Solderability & Leaching	EIA 575-3.12	95% Coverage

Thick Film Resistor Array



FEATURES

- Concave terminal array with square corners
- 8 terminal package with isolated resistors
- Single component reduces board space and component counts
- Automatic placement capability
- Wave and solder paste reflow compatible
- Thick film resistance element
- Solderable wrap around termination
- Nickel barrier for inner electrode protection
- Standard E-24 ($\pm 2\%$ and 5%) and E-96 ($\pm 1\%$) resistance values
- Operating temperature range of -55°C to $+150^{\circ}\text{C}$
- Consult factory for additional schematics, values, etc

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	CIRCUIT	LIMITING ELEMENT VOLTAGE MAX. V_{\cong}	TEMPERATURE COEFFICIENT ppm/ $^{\circ}\text{C}$	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
CRA06P	0.0625	03	50	200	2, 5	10R-1M0	24
Jumper: Zero-Ohm-Resistor on Request				100	1	10R-1M0	24-96

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Operating temperature Range: -55°C to $+150^{\circ}\text{C}$
- Maximum Working Voltage: 50 volts. Rated continuous working voltage (RCWV) shall be determined from $\text{RCWV} = \text{square root of Rated Power, Resistance Value or 50 volts whichever is less.}$
- Ask about extended value ranges
- Packaging: according to EIA 481

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CRA06P 03 CIRCUIT
Rated Dissipation at 70°C	W	0.0625
Limiting Element Voltage ¹⁾	V_{\cong}	50
Insulation Voltage (1min)	$V_{\text{dc/ac peak}}$	100
Category Temperature Range	$^{\circ}\text{C}$	$-55 / +150$
Insulation Resistance	Ω	$> 10^{10}$

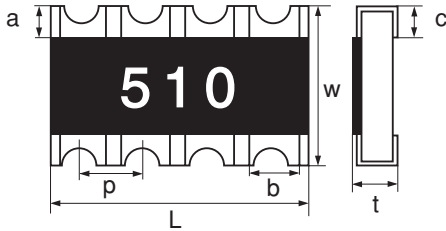
¹⁾Rated voltage: $\sqrt{P \times R}$

ORDERING INFORMATION

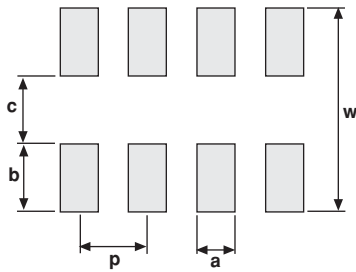
CRA06P MODEL	08 TERMINAL COUNT	03 CIRCUIT TYPE	105 RESISTANCE VALUE	J TOLERANCE	RT1 PACKAGING
	08	03 Isolated only.	First 2 digits are significant figures, the last digit is the multiplier.	J = $\pm 5\%$ G = $\pm 2\%$ F = $\pm 1\%$ Z = 0Ω Jumper	Paper tape. 5000 piece reels.

DIMENSIONS in inches [millimeters]

4-Resistor Device



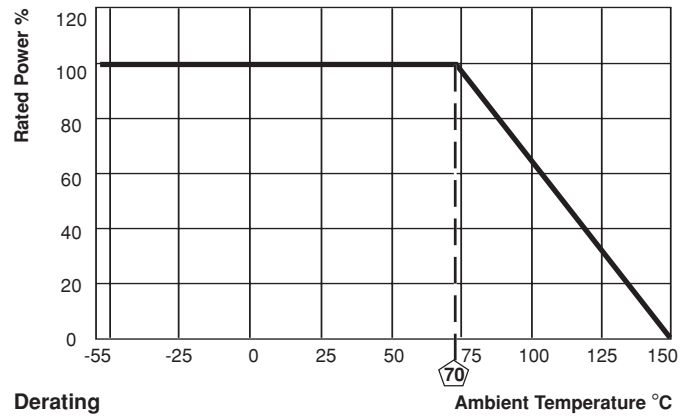
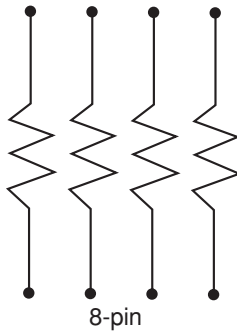
8 PIN	DIMENSIONS						
	L	A	B	C	P	T	W
mm	3.20	0.30	0.40	0.40	0.80	0.60	1.6
Tol	± 0.20	± 0.20	± 0.15	± 0.20	-	± 0.10	± 0.15



SOLDER PAD DIMENSIONS [in millimeters]					
	c	w	p	a	b
WAVE	0.8	2.6	0.8	0.4	0.9

CIRCUIT SCHEMATICS

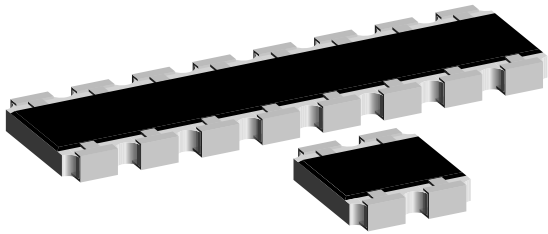
03 Circuit CRA06P



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Endurance Test at 70°C per EIA 575-3.14	1000 hours at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	± 1.0%
Overload per EIA 575-3.6	Short time overload	± 0.5%
Thermal Shock	per EIA 575-3.5	± 0.5%
Moisture Resistance	per EIA 575-3.10	± 1.0%
Resistance to Soldering Heat EIA 575 3.8	10 seconds at 260°C solder bath temperature	± 1.0%
High Temperature Exposure	per EIA 575-3.7	± 1.0%
Low Temperature Operation	per EIA-/ IS-30A-3.6	± 0.5%
Solderability & Leaching	EIA 575-3.12	95% Coverage



Thick Film, Resistor Array



FEATURES

- Convex terminal array available with either scalloped corners (E version) or square corners (S version)
- 4, 8, 10, or 16 terminal package with either isolated resistors or bussed resistors
- Single component reduces board space and component counts
- Automatic placement capability
- Wave and solder paste reflow compatible
- Thick film resistance element
- Solderable wrap around termination
- Nickel barrier for inner electrode protection
- Standard E-24 ($\pm 2\%$ and $\pm 5\%$) and E-96 ($\pm 1\%$) resistance values
- Operating temperature range of -55°C to $+150^{\circ}\text{C}$
- Consult factory for additional schematics, values, etc

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	CIRCUIT	LIMITING ELEMENT VOLTAGE MAX V_{\cong}	TEMPERATURE COEFFICIENT ppm/ $^{\circ}\text{C}$	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
CRA12E & S	0.100	01, 02, 20	50	200	2, 5	10R – 1M Ω	24
	0.125	03		100	1	10R – 1M Ω	24 – 96
Jumper: Zero Ohm Resistor on Request							

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Operating temperature Range: -55°C to $+150^{\circ}\text{C}$
- Ask about further value ranges
- Packaging: according to EIA 481
- 100ppm TC is standard with 1% values and 200ppm TC is standard for 5% values

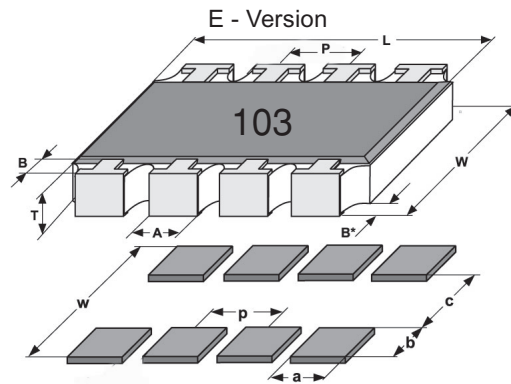
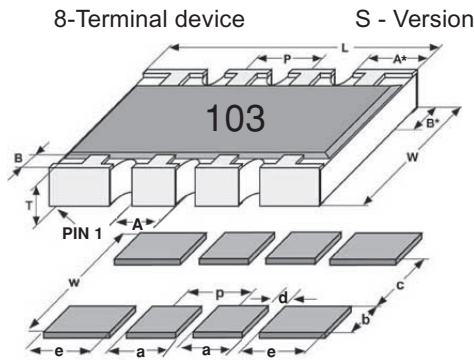
TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CRA12E & S 01 / 02 / 20 CIRCUIT	CRA12E & S 03 CIRCUIT
Rated Dissipation at 70°C	W	0.1	0.125
Limiting Element Voltage ¹⁾	V_{\cong}	50	
Insulation Voltage (1min)	$V_{\text{dc/ac peak}}$	100	
Category Temperature Range	$^{\circ}\text{C}$	$-55 / +150$	
Insulation Resistance	Ω	$> 10^9$	

¹⁾Rated voltage: $\sqrt{P \times R}$

ORDERING INFORMATION

CRA12E	04	01	105	G	RB8
MODEL	TERMINAL COUNT	CIRCUIT TYPE	R-VALUE Ω	TOLERANCE $\pm\%$	PACKAGING
CRA12E	04, 08, 10, 16	01, 02, 03, 20	First two digits (three for 1%)	F = $\pm 1\%$	Paper tape 2000pcs
CRA12S	08, 10	01, 02, 03, 20	multiplier	are significant. Last digit is the J = $\pm 5\%$ Z = 0Ω Jumper	G = $\pm 2\%$

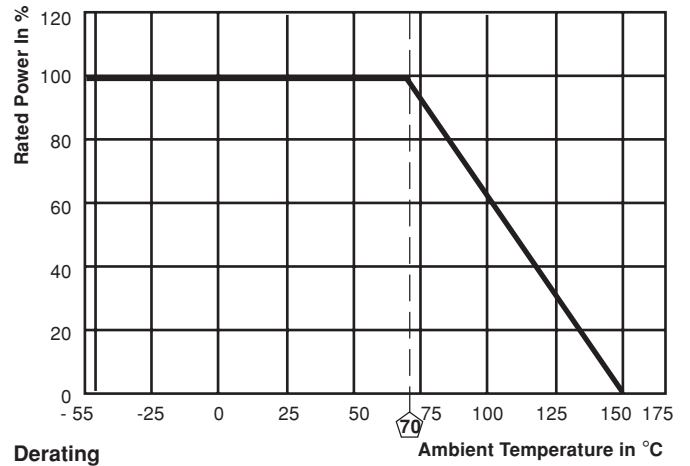
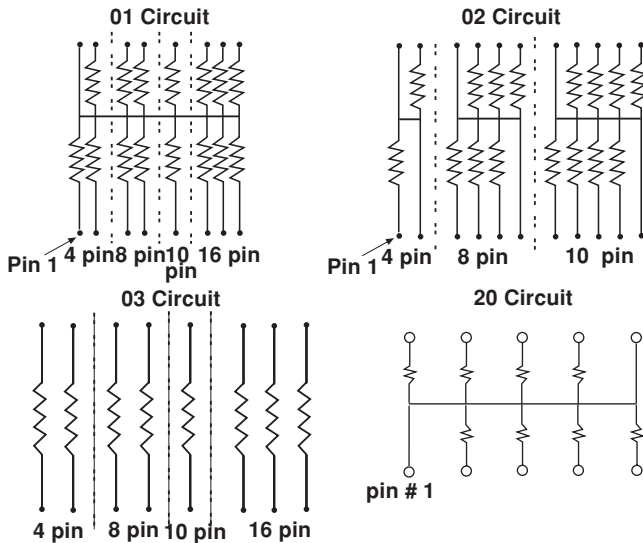


MODEL	PIN NO#	DIMENSIONS [in millimetres]							
		L	A	A*	B	B*	P	T	W
12E	4	2.54	0.79	-	0.51	0.38	1.27	0.53	3.05
12E	8	5.08	0.79	-	0.51	0.38	1.27	0.53	3.05
12S	8	5.08	0.79	0.89	0.51	0.38	1.27	0.53	3.05
12E	10	6.40	0.79	-	0.51	0.38	1.27	0.53	3.05
12S	10	6.40	0.79	0.89	0.51	0.38	1.27	0.53	3.05
12E	16	10.30	0.79	-	0.51	0.38	1.27	0.53	3.05
	Tol	- 0.15	- 0.15	- 0.15	- 0.25	- 0.2	- 0.1	- 0.1	- 0.15

	SOLDER PAD DIMENSIONS [in millimetres]						
	c	w	d	p	a	b	e
WAVE	2.2	4.3	0.57	1.27	0.71	1.05	1.09
REFLOW	2.2	3.9	0.57	1.27	0.71	0.86	1.09

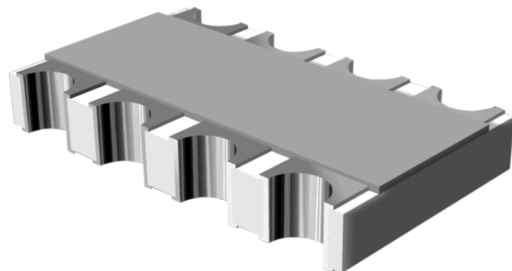
The dimensions shown are for 8 pin part. For parts with different pin numbers use the same pitch and add or subtract pads as required.

CIRCUIT SCHEMATICS



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Endurance Test at 70°C per EIA 575-3.14	1000 hours at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	± 1.0%
Overload per EIA 575-3.6	Short time overload 2.5 x rated continuous working voltage for 5 seconds. Not to exceed 2 x max operating voltage	± 0.5%
Thermal Shock	per EIA 575-3.5	± 0.5%
Moisture Resistance	per EIA 575-3.10	± 1.0%
Resistance to Soldering Heat EIA 575-3.8	10 seconds at 260°C solder bath temperature	± 2.0%
High Temperature Exposure	per EIA 575-3.7	± 1.0%
Low Temperature Operations	per EIA 575-3.6	± 0.5%
Solderability & Leaching	EIA 575-3.12	95% Coverage

Professional Flat Chip Resistor Array



ACAC 0612 flat chip resistor array combines the proven reliability of professional MFC products with the advantages of a chip array. A small package enables the design of high density circuits in combination with reduction of assembly costs. Different resistance values can be realized on one substrate.

FEATURES

- Advanced thin film technology
- Superior overall stability
- Case sizes:
 - Imperial: 0612
 - Metric: RR 1632M
- Four resistors on one substrate
- Tight T.C. of ± 50 ppm/K
- Tolerance of ± 1 %
- Different resistance values are possible with a maximum ratio of 1:10 R_{min}/R_{max}
- Green product, supports lead-free soldering.

APPLICATIONS

- Bus terminations
- Voltage divider
- Feedback circuits
- Signal conditioning.

TECHNICAL SPECIFICATIONS	
DESCRIPTION	ACAC 0612
EIA size	0612
Metric size	RR 1632M
Configuration, isolated	4 x 0603
Design:	
all equal	AE
two pairs	TP
different values	DF
Resistance values	100 Ω to 221 k Ω ⁽¹⁾
Tolerance:	
absolute	± 1 %
Temperature coefficient:	
absolute	± 50 ppm/K (± 25 ppm/K on request)
Max. resistance ratio R_{min}/R_{max}	1:10 ⁽²⁾
Climatic category (LCT/UCT/days)	55/125/56
Rated dissipation: P_{70} ⁽³⁾	
element	0.1 W
package	0.3 W
Operating voltage	75 V
Film temperature	125 °C
Insulation voltage (U_{ins}) against ambient and between isolated resistors, continuous	75 V

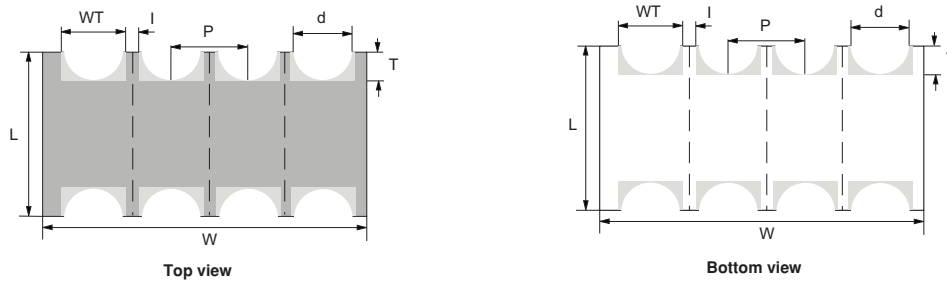
Notes

1. Resistance values to be selected from E24 and E96.
2. Higher ratio on request.
3. The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded.

ORDERING INFORMATION - type description and ordering code						
A	C	A	C	1234	TP	P5
TYPE	PRODUCT CODE	SIZE CODE	TERMINATION	DESIGN NUMBER	DESIGN	PACKAGING
A = Array	C = Flat chip	A = 0612	C = Concave	4-Digits	AE = All Equal TP = Two Pairs DF = Different Values	P5 = 5 000 units in paper tape on reel PW = 10 000 units in paper tape on reel

Note : We recommend that the clear text ordering code is used to minimize the possibility of errors in order handling.

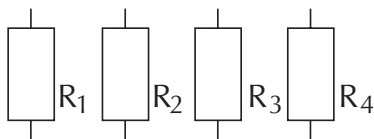
DIMENSIONS



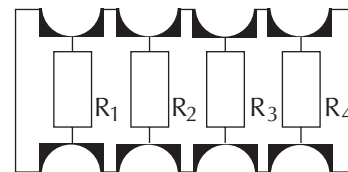
DIMENSIONS - CHIP resistor array top view, mass and relevant physical dimensions									
TYPE	L (mm)	W (mm)	H (mm)	P (mm)	W _T (mm)	T (mm)	D (mm)	I (mm)	MASS (mg)
ACAC 0612	1.6 ± 0.15	3.2 ± 0.15	0.55 ± 0.1	0.8 ± 0.1	0.6 ± 0.15	0.3 ± 0.15	0.3 ± 0.1	min. 0.15	9.41

DIMENSIONS - CHIP resistor array bottom view, mass and relevant physical dimensions									
TYPE	L (mm)	W (mm)	H (mm)	P (mm)	W _T (mm)	T (mm)	D (mm)	I (mm)	MASS (mg)
ACAC 0612	1.6 ± 0.15	3.2 ± 0.15	0.55 ± 0.1	0.8 ± 0.1	0.6 ± 0.15	0.4 ± 0.15	0.3 ± 0.1	min. 0.25	9.41

APPLICATION INFORMATION



Equivalent circuit.



Array configuration.



DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a super high grade (96 % Al₂O₃) ceramic substrate and conditioned to achieve the desired temperature coefficient. Specially designed inner contacts are deposited on both sides. A special laser is used to achieve the target value by smoothly cutting a meander groove in the resistive layer without damaging the ceramics.

The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure and optical inspection performed on 100 % of the individual chip resistors. Only accepted products are laid directly into the paper tape in accordance with **EN 60 286-3**.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems and for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The resistors are lead (Pb)-free, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing. All products comply with the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances.

This includes full compatibility with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

Solderability is specified for 2 years after production or re-qualification. The permitted storage time is 20 years.

APPROVALS

Where applicable, the resistors are tested in accordance with **EN 140 401-801** (superseding **CECC 40401-801**) which refers to **EN 140 000 (EN 60 115-1)** and **EN 140 400 (IEC 60 115-8)**.



TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the following specifications:

EN 140 000 / EN 60 115-1, Generic specification (includes tests)

EN 140 400 / EN 60 115-1, Sectional specification (includes schedule for qualification approval)

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60 068 and under standard atmospheric conditions according to IEC 60 068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar).

The components are mounted for testing on boards in accordance with EN 60 115-1, 4.31 unless otherwise specified.

In the Test Procedures and Requirements table below, only the tests and requirements are listed with reference to the relevant clauses of EN 60 115-1 and IEC 60 068-2; a short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS⁽¹⁾ PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types: ACAC 0612	100 Ω to 221 kΩ
4.5	–	resistance	–	± 1 %
4.8.4.2	–	temperature coefficient	at 20 / LCT / 20 °C and 20 / UCT / 20 °C	± 50 ppm/K
4.25.1	–	endurance	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1.5 h on; 0.5 h off; 70 °C; 1 000 h	± (0.25 %R + 0.05Ω)
4.25.3	–	endurance at upper category temperature	125 °C; 1 000 h	± (0.5 %R + 0.05Ω)
4.24	78 (Cab)	damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (0.5 %R + 0.05Ω)

TEST PROCEDURES AND REQUIREMENTS - continued				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS ⁽¹⁾ PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types: ACAC 0612	100 Ω to 221 k Ω
4.13	–	short time overload ⁽²⁾	$U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{\max}$; 5 s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.19	14 (Na)	rapid change of temperature	30 min. at LCT and 30 min. at UCT; 5 cycles	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.18.2	58 (Tb)	resistance to soldering heat	(260 \pm 5) $^{\circ}\text{C}$; (10 \pm 1) s	$\pm (0.25 \% R + 0.01 \Omega)$ no visible damage
4.17.2	58 (Ta)	solderability	solder bath method; (215 \pm 3) $^{\circ}\text{C}$; (3 \pm 0.3) s	good tinning (\geq 95 % covered); no visible damage
4.32	21 (Ue ₃)	shear (adhesion)	RR 1632 M; 45 N	no visible damage
4.7	–	voltage proof	$U_{\text{rms}} = U_{\text{ns}}$; 60 \pm 5 s; against ambient, between adjacent resistors	no flashover or breakdown

Notes

- Figures are given for equal values.
- For a single element.



ORDERING INFORMATION

Components may be ordered by using either a simple clear text ordering code, see "Type description and ordering code" or Vishay BCcomponents' unique 12NC.

Numeric Ordering code (12NC)

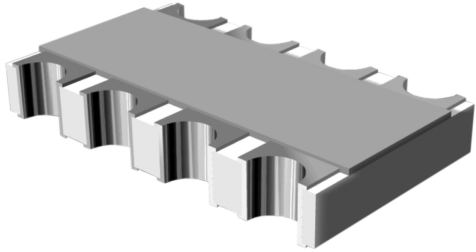
- The arrays have a 12-digit ordering code starting with 2312.
- The subsequent 3 digits indicate the array package and body size; see the 12NC Ordering Code table .
- The last 5 digits indicate the termination and individual array design number (last 4 digits).

12NC ORDERING CODE - resistor array type and packaging						
DESCRIPTION					ORDERING CODE 2312	
					AE (ALL EQUAL)	TP (TWO PAIRS)
TYPE	T.C.	TOL.	R1; R4	R2; R3	P5 5 000 UNITS	P5 5 000 UNITS
ACAC 0612	± 50 ppm/K	± 1 %	1 kΩ	1 kΩ	441 09011	–
			10 kΩ	10 kΩ	441 09012	–
			100 kΩ	100 kΩ	441 09013	–
			1 kΩ	2 kΩ	–	441 19014
			10 kΩ	20 kΩ	–	441 19015
			1 kΩ	3 kΩ	–	441 19016
			10 kΩ	30 kΩ	–	441 19017

Note

1. 12NC Ordering Code Indicating Resistor Array Type and Packaging table shows standard array types with a resistance divider ratio up to 1:3. Please consult Vishay Beyschlag for specific divider ratio, temperature coefficient, tolerance and ohmic values.

Flat Chip Resistor Array



ACAC 0612 flat chip resistor array combines the proven reliability of precision MFC products with the advantages of a chip array. The possibility of tolerance matching and T.C. tracking makes this product perfectly suited for applications with outstanding requirements towards stable fixed resistor ratios. A small package enables the design of high density circuits in combination with reduction of assembly costs. Different resistance values can be realized on one substrate.

FEATURES

- Advanced thin film technology
- Superior overall stability
- Case sizes:
 - Imperial: 0612
 - Metric: RR 1632M
- Four resistors on one substrate
- Tight T.C. of ± 25 ppm/K and T.C. tracking of 15 ppm/K, (10 ppm/K on request)
- Tolerance of ± 0.25 % and matched tolerance of 0.1 %
- Different resistance values are possible with a maximum ratio of 1:5 R_{\min}/R_{\max}
- Green product, supports lead-free soldering.

APPLICATIONS

- Precision analogue circuits
- Voltage divider
- Feedback circuits
- Signal conditioning.

TECHNICAL SPECIFICATIONS	
DESCRIPTION	ACAC 0612
EIA size	0612
Metric size	RR 1632M
Configuration, isolated	4 × 0603
Design: all equal two pairs different values	AE TP DF
Resistance values	100 Ω to 221 k Ω ⁽¹⁾
Tolerance: absolute matching	± 0.25 % 0.1 %
Temperature coefficient: absolute tracking	± 25 ppm/K 15 ppm/K
Max. resistance ratio R_{\min}/R_{\max}	1:5
Climatic category (LCT/UCT/days)	55/125/56
Rated dissipation: P_{T0} ⁽²⁾ element package	0.1 W 0.3 W
Operating voltage	75 V
Film temperature	125 °C
Insulation voltage (U_{ins}) against ambient and between isolated resistors, continuous	75 V

Note

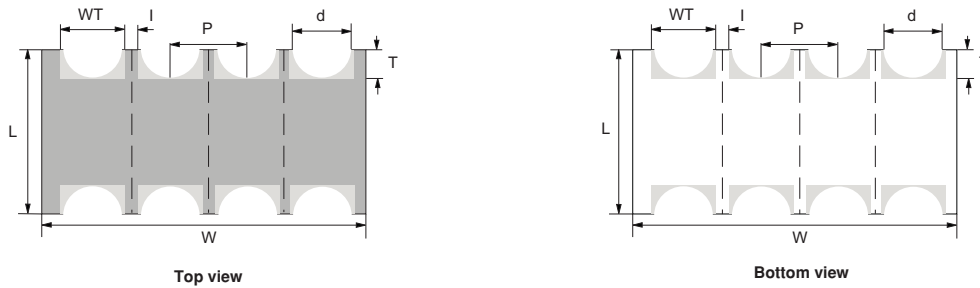
1. Resistance values to be selected from E24 and E96.
2. The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded.



ORDERING INFORMATION - type description and ordering code						
A	C	A	C	1234	TP	P5
TYPE	PRODUCT	SIZE	TERMINATION	DESIGN	DESIGN	PACKAGING
A = Array	CODE	CODE	C = Concave	NUMBER	AE = All Equal	P5 = 5 000 units in paper tape on reel
	C = Flat Chip	A = 0612		4-Digits	TP = Two Pairs	PW = 10 000 units in paper tape on reel
					DF = Different Values	

Note: We recommend that the clear text ordering code is used to minimize the possibility of errors in order handling.

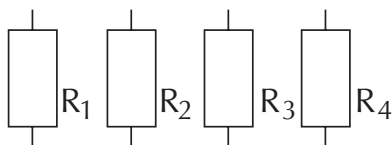
DIMENSIONS



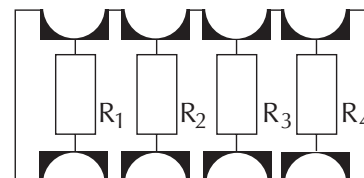
DIMENSIONS - CHIP resistor array top view, mass and relevant physical dimensions									
TYPE	L (mm)	W (mm)	H (mm)	P (mm)	WT (mm)	T (mm)	d (mm)	I (mm)	mass (mg)
ACAC 0612	1.6 ± 0.15	3.2 ± 0.15	0.55 ± 0.1	0.8 ± 0.1	0.6 ± 0.15	0.3 ± 0.15	0.3 ± 0.1	min. 0.15	9.41

DIMENSIONS - CHIP resistor array bottom view, mass and relevant physical dimensions									
TYPE	L (mm)	W (mm)	H (mm)	P (mm)	WT (mm)	T (mm)	d (mm)	I (mm)	mass (mg)
ACAC 0612	1.6 ± 0.15	3.2 ± 0.15	0.55 ± 0.1	0.8 ± 0.1	0.6 ± 0.15	0.4 ± 0.15	0.3 ± 0.1	min. 0.25	9.41

APPLICATION INFORMATION



Equivalent circuit.



Array configuration.



DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a super high grade (96 % Al₂ O₃) ceramic substrate and conditioned to achieve the desired temperature coefficient. Specially designed inner contacts are deposited on both sides. A special laser is used to achieve the target value by smoothly cutting a meander groove in the resistive layer without damaging the ceramics.

The resistor elements are covered by a protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating.

The result of the determined production is verified by an extensive testing procedure and optical inspection performed on 100 % of the individual chip resistors. Only accepted products are laid directly into the paper tape in accordance with **EN 60 286-3**.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems and for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The resistors are lead (Pb)-free, the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing. All products comply with the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances:

This includes full compatibility with the following directives:

- 2000/53/EC End of Vehicle life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

Solderability is specified for 2 years after production or re-qualification. The permitted storage time is 20 years.

APPROVALS

Where applicable, the resistors are tested in accordance with **EN 140 401-801** (superseding **CECC 40401-801**) which refers to **EN 140 000 (EN 60 115-1)** and **EN 140 400 (IEC 60 115-8)**.



TESTS AND REQUIREMENTS

Essentially all tests are carried out in accordance with the following specifications:

EN 140 000 / EN 60 115-1, Generic specification (includes tests)

EN 140 400 / EN 60 115-1, Sectional specification (includes schedule for qualification approval)

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60 068 and under standard atmospheric conditions according to IEC 60 068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1 060 mbar).

The components are mounted for testing on boards in accordance with EN 60 115-1, 4.31 unless otherwise specified.

In the following table only the tests and requirements are listed with reference to the relevant clauses of EN 60 115-1 and IEC 60 068-2; a short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS ⁽¹⁾ PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types: ACAC 0612	100 Ω to 221 k Ω
4.5	–	resistance	–	$\pm 0.25 \%$
4.8.4.2	–	temperature coefficient	at 20 / LCT / 20 °C and 20 / UCT / 20 °C	± 25 ppm/K
4.25.1	–	endurance	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1.5 h on; 0.5 h off; 70 °C; 1 000 h	$\pm (0.25 \% R + 0.05 \Omega)$
4.25.3	–	endurance at upper category temperature	125 °C; 1 000 h	$\pm (0.5 \% R + 0.05 \Omega)$
4.24	78 (Cab)	damp heat, steady state	(40 \pm 2) °C; 56 days; (93 \pm 3) % RH	$\pm (0.5 \% R + 0.05 \Omega)$



TEST PROCEDURES AND REQUIREMENTS - continued				
EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS ⁽¹⁾ PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types: ACAC 0612	100 Ω to 221 k Ω
4.13	–	short time overload ⁽²⁾	$U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{\max}$; 5 s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.19	14 (Na)	rapid change of temperature	30 min. at LCT and 30 min. at UCT; 5 cycles	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.18.2	58 (Tb)	resistance to soldering heat	reflow method 2 (IR / forced gas convention); (260 \pm 5) $^{\circ}\text{C}$; (10 \pm 1) s	$\pm (0.1 \% R + 0.01 \Omega)$ no visible damage
4.17.2	58 (Ta)	solderability	solder bath method; (215 \pm 3) $^{\circ}\text{C}$; (3 \pm 0.3) s	good tinning (\geq 95 % covered); no visible damage
4.32	21 (Ue ₃)	shear (adhesion)	RR 1632M; 45 N	no visible damage
4.7	–	voltage proof	$U_{\text{rms}} = U_{\text{ns}}$; 60 \pm 5 s; against ambient, between adjacent resistors	no flashover or breakdown

Note

- Figures are given for equal values.
- For a single element.



ORDERING INFORMATION

Components may be ordered by using either a simple clear text ordering code, see "Type description and ordering code" or Vishay BCcomponents' unique 12NC.

Numeric ordering code (12NC)

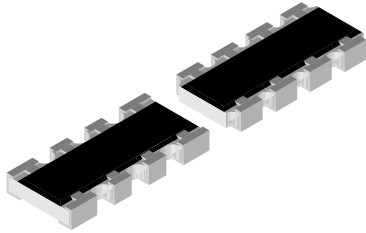
- The arrays have a 12-digit ordering code starting with 2312.
The subsequent 3 digits indicate the array package and body size; see the 12NC Ordering Code table.
The last 5 digits indicate the termination and individual array design number (last 4 digits).

Table with 7 columns: TYPE, T.C., TOL., R1; R4, R2; R3, AE (ALL EQUAL), TP (TWO PAIRS). It details resistor array types and packaging for ACAC 0612.

Note

- 12NC Ordering Code Indicating Resistor Array Type and Packaging table shows standard array types with a resistance divider ratio up to 1:3. Please consult Vishay BEYSCHLAG for specific divider ratio, temperature coefficient, tolerance and ohmic values.

Thin Film, Resistor Array



FEATURES

- Flow solderable
- Automatic placement capability
- Inner electrode protection
- Wrap around termination
- Low noise, high frequency applications

STANDARD ELECTRICAL SPECIFICATIONS

MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	CIRCUIT	LIMITING ELEMENT VOLTAGE MAX. V_{\cong}	TEMPERATURE COEFFICIENT ppm/°C	TOLERANCE %	RESISTANCE RANGE Ω	E-SERIES
TRA06E	0.063	03	50	25 50 100	0.1, 0.5, 1 0.5, 1 0.5, 1	100R - 33K 10R - 91R 36K - 330K	24

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- TC temperature range: - 55°C to + 125°C
- Packaging: according to EIA 481

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	TRA06E SCHEMATIC 03
Rated Dissipation at 70°C	W	0.063
Limiting Element Voltage ¹⁾	V_{\cong}	50
TCR Tracking Absolute	ppm/°C	± 10 ± 50 to ± 100
Category Temperature Range	°C	- 55 / + 150
Voltage Coefficient	ppm/Volt	< 0.1

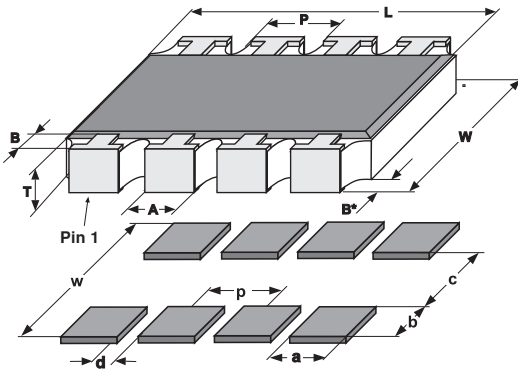
¹⁾Rated voltage: $\sqrt{P \times R}$

ORDERING INFORMATION

TRA06E	08	03	101	F	RT1
MODEL	TERMINAL COUNT	CIRCUIT TYPE	R-VALUE Ω	TOLERANCE \pm %	PACKAGING Papertape 5000pcs
	08	03	First two digits (three for 1%) are significant. Last digit is the multiplier	B = 0.1% D = \pm 0.5% F = \pm 1%	

DIMENSIONS

8-Terminal device E - Version

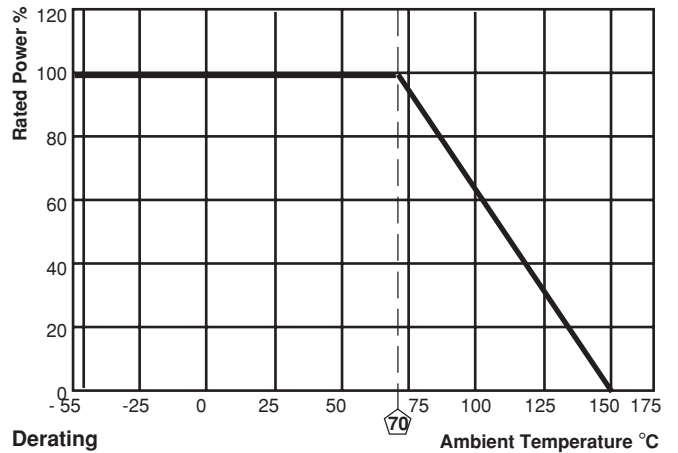
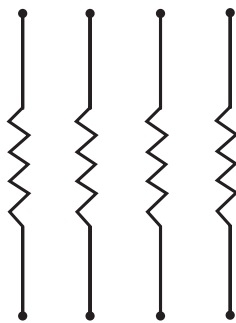


PIN NO:#	DIMENSIONS [in millimeters]					
	L	A	B	P	T	W
8	3.2 ± 0.3	0.5 ± 0.1	0.3 ± 0.2	0.8 ± 0.1	0.4 ± 0.1	1.6 ± 0.15

PIN NO:#	SOLDER PAD DIMENSIONS [in millimeters]					
	c	w	d	p	a	b
8	0.8	3.1	0.36	0.8	0.44	1.15

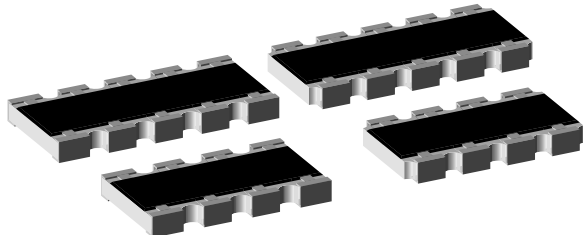
CIRCUIT SCHEMATIC

03 Circuit



PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Endurance Test at 70°C per EIA 575-3.14	1000 hours at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	± 3.0%
Overload per EIA 575-3.6	Short time overload	± 2.0%
Thermal Shock	per EIA 575-3.5	± 1.0%
Moisture Resistance	per EIA 575-3.10	± 1.0%
Resistance to Soldering Heat EIA 575-3.8	10 seconds at 260°C solder bath temperature	± 2.0%
High Temperature Exposure	per EIA 575-3.7	± 3.0%
Low Temperature Operations	per EIA-575-3.6	± 1.0%
Solderability & Leaching	EIA 575-3.12	95% Coverage

Thick Film Array, Resistor / Capacitor



FEATURES

- Single component reduces board space and component counts
- Choice of dielectric characteristics X7R or Y5U
- Wrap around termination
- Thick film R/C element
- Inner electrode protection
- Flow & Reflow solderable
- Automatic placement capability, standard size
- 8 or 10 pin configurations

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	RESISTOR				CAPACITOR				
	POWER RATING $P_{70^{\circ}\text{C}}$ W	TEMPERATURE COEFFICIENT ppm/ $^{\circ}\text{C}$	TOLERANCE %	VALUE RANGE Ω	DIELECTRIC	TEMPERATURE COEFFICIENT %	TOLERANCE %	VOLTAGE RATING VDC	VALUE RANGE pF
CRCA12E CRCA12S	0.125	200	5	10R – 1M Ω	X7R	± 15	20	50	10 - 270
CRCA12E CRCA12S	0.125	200	5	10R – 1M Ω	Y5U	+ 20, - 56	20	50	270 - 1800

RESISTOR

- Operating Temperature Range: - 55 $^{\circ}\text{C}$ to + 125 $^{\circ}\text{C}$
- Technology: Thick Film

CAPACITOR

- Operating Temperature Range: X7R - 55 $^{\circ}\text{C}$ to + 125 $^{\circ}\text{C}$
Y5U - 30 $^{\circ}\text{C}$ to + 85 $^{\circ}\text{C}$
- Maximum Dissipation Factor: 2.5%
- Dielectric Withstanding Voltage: 125V_{dc}, 5 sec, 50mA Charge

- Ask about extended value ranges
- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Packaging: according to EIA 481

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	RESISTOR	X7R CAPACITOR	Y5U CAPACITOR
Rated Dissipation at 70 $^{\circ}\text{C}$ (CECC 40401 EIA 575)	W	0.125	-	-
Capacitor Voltage Rating	V	-	50	50
Dielectric Withstanding Voltage (5 sec, 50mA Charge)	V _{dc}	-	125	125
Category Temperature Range	$^{\circ}\text{C}$	- 55 / + 155	- 55 / + 125	- 30 / + 85
Insulation Resistance	Ω		> 10 ¹⁰	

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CRCA12E081472220R (preferred part numbering format)

C R C A 1 2 E 0 8 1 4 7 2 2 2 0 R

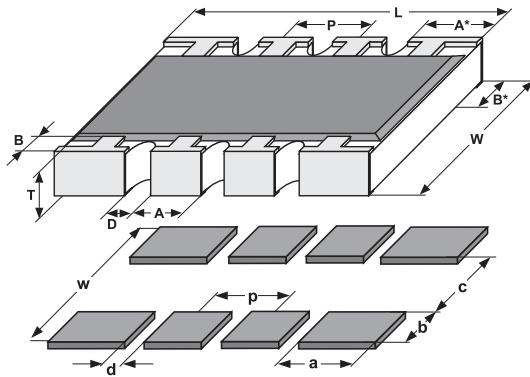
MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	CAPACITANCE VALUE	PACKAGING	SPECIAL
CRCA12E CRCA12S	08 = 8 Pin 10 = 10 Pin	1 = 01 2 = 02 3 = 03 0 = Special	2 digit significant figure, followed by a multiplier 100 = 10 Ω 683 = 68K Ω 105 = 1.0M Ω (Tolerance = $\pm 5\%$)	2 digit significant figure, followed by a multiplier 100 = 10pF 271 = 270pF 182 = 1800pF (Tolerance = $\pm 20\%$)	E = Lead Free, T/R (2000pcs) R = Tin/Lead, T/R (2000pcs)	(Dash Number) (up to 1 digit) Blank = Standard

Historical Part Number example: CRCA12E0801472J220MRB8 (will continue to be accepted)

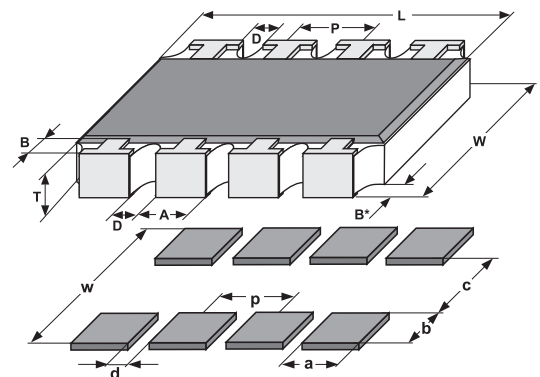
CRCA12E	08	01	472	J	220	M	RB8
MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	TOLERANCE	CAPACITANCE VALUE	TOLERANCE	PACKAGING

DIMENSIONS

8-Terminal device S-Version



E-Version



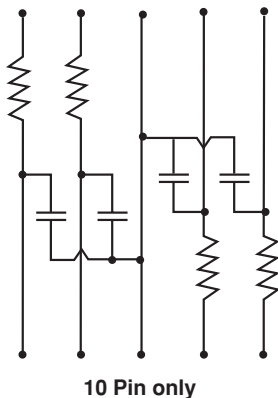
GLOBAL MODEL	PIN NO#	SIZE		DIMENSIONS [in millimeters]								
		INCH	METRIC	L	W	T	B	B*	A	A*	D _{NOM}	P _{NOM}
CRCA12E	8	2012	5032	5.1 ± 0.15	3.05 ± 0.15	0.61 ± 0.10	0.51 ± 0.25	0.38 ± 0.2	0.79 ± 0.15	–	0.25	1.27
CRCA12S	8	2012	5032	5.1 ± 0.15	3.05 ± 0.15	0.61 ± 0.10	0.51 ± 0.25	0.38 ± 0.2	0.79 ± 0.15	0.89 ± 0.15	0.25	1.27
CRCA12E	10	2512	6432	6.4 ± 0.15	3.05 ± 0.15	0.61 ± 0.10	0.51 ± 0.25	0.38 ± 0.2	0.79 ± 0.15	–	0.25	1.27
CRCA12S	10	2512	6432	6.4 ± 0.15	3.05 ± 0.15	0.61 ± 0.10	0.51 ± 0.25	0.38 ± 0.2	0.79 ± 0.15	0.89 ± 0.15	0.25	1.27

SOLDER PAD DIMENSIONS [in millimeters]											
WAVE SOLDERING						REFLOW SOLDERING					
c	w	d	p	a	b*	c	w	d	p	a	b*
2.2	4.3	0.57	1.27	0.71	1.05	2.2	3.9	0.57	1.27	0.71	0.86

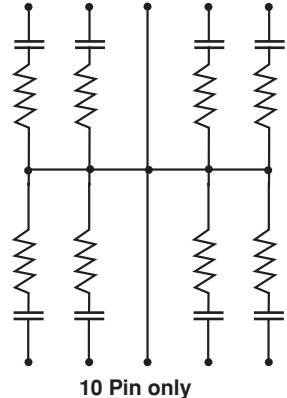
* For layouts to accept both the edge type and pull through type terminations add 0.25mm to the b-dimension and c = 1.7mm

PERFORMANCE: see CRCC1206

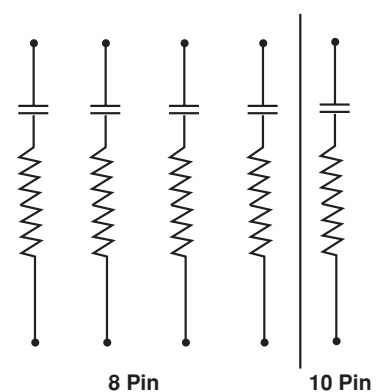
01 Circuit CRCA12E & S



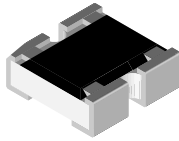
02 Circuit CRCA12E & S



03 Circuit CRCA12E & S



Surface Mount Chip Resistor Attenuator



FEATURES

- Single component reduces board space and component counts - replaces 3 or more components
- Tolerance matching and temperature tracking superior to individual components
- Maximum power dissipation: 0.075 Watts for CZA06S; 0.040 Watts for CZA04S
- Consult factory for extended values, non-standard tolerances, impedance matching and other attenuation values
- Frequency range: DC to 3GHz

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING $P_{70^{\circ}\text{C}}$ W	IMPEDANCE Ω	ATTENUATION RANGE AND TOLERANCE	
			$\pm 0.3 \text{ dB (L)}$	$\pm 0.5 \text{ dB (H)}$
CZA04S	0.040	50	1 - 5 dB	6 - 20 dB
CZA06S	0.075	50 / 75 / 100 / 300 / 600	1 - 5 dB	6 - 20 dB

• Power rating depends on the maximum temperature at the solder point, the component placement density and the substrate material

IMPEDANCE	50 Ω	75 Ω	100 Ω	300 Ω	600 Ω
Attenuation in dB	1	1	1	1	1
	1.5	1.5	1.5	1.5	1.5
	2	2	2	2	2
	3	3	3	3	3
	4	4	4 <td 4	4	
	5	5	5	5	5
	6	6	6	6	6
	10	10	10	10	10
	11	11	11	11	11
	12	12	12	12	12
	13	13	13	13	13
	14	14	14	14	14
	15	15	15	15	15
	16	16	16	16	16
	17	17	17	17	17
	18	18	18	18	18
	19	19	19	19	19
	20	20	20	20	20

4-PIN CIRCUIT

CZA04S:
(Marking)

Unbalanced π Type

CZA06S:
(Marking)

Unbalanced π Type

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CZA04S	CZA06S
Rated Dissipation at 70°C	W	0.040	0.075
VSWR		1.2 max.	1.2 max.
Category Temperature Range	°C	- 55 / + 125	- 55 / + 150
Frequency Range		DC to 3GHz	DC to 3GHz

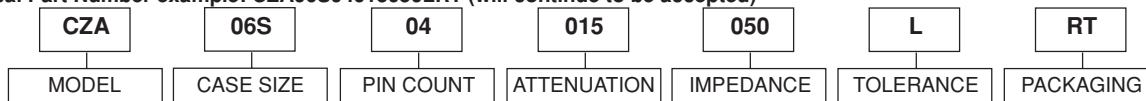
GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: CZA06S04015050LRT (preferred part numbering format)

C Z A 0 6 S 0 4 0 1 5 0 5 0 L R T

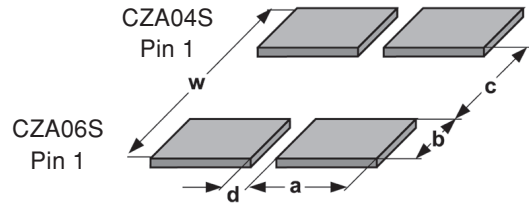
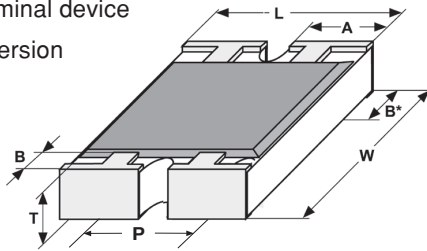
MODEL	PIN COUNT	ATTENUATION	IMPEDANCE	TOLERANCE	PACKAGING	SPECIAL
CZA04S CZA06S	04 = 4 Pin	010 = 1.0dB 015 = 1.5dB 020 = 2.0dB 150 = 15.0dB 000 = 0 Ω Jumper	050 = 50 Ω 075 = 75 Ω 100 = 100 Ω 000 = 0 Ω Jumper	H = ± 0.5 dB L = ± 0.3 dB Z = 0 Ω Jumper	EA = Lead Free, T/R (All) TD = Tin/Lead, T/R (04 only) RT = Tin/Lead, T/R (06 only)	(Dash Number) (up to 1 digit) Blank = Standard

Historical Part Number example: CZA06S04015050LRT (will continue to be accepted)

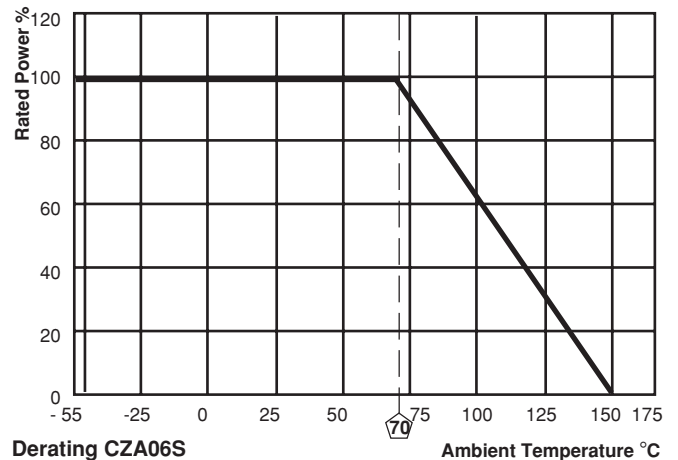
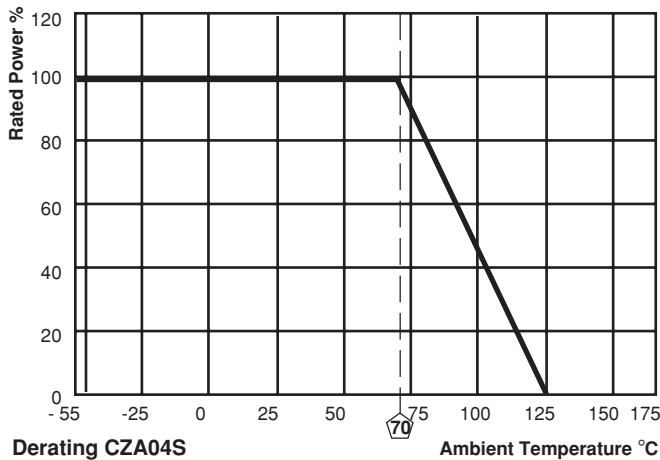


DIMENSIONS

4-Terminal device
S – Version



GLOBAL MODEL	DIMENSIONS in inches (millimeters)						
	L	W	T	A	P	B	B*
CZA04S	0.039 ± 0.004 [1.00 ± 0.10]	0.039 ± 0.006 [1.00 ± 1.15]	0.014 ± 0.004 [0.36 ± 0.10]	0.13 ± 0.006 [0.33 ± 0.15]	0.026 [0.65]	0.006 ± 0.004 [0.15 ± 0.10]	0.010 ± 0.004 [0.25 ± 0.10]
CZA06S	0.063 ± 0.006 [1.60 ± 0.15]	0.059 ± 0.006 [1.50 ± 1.15]	0.020 ± 0.004 [0.51 ± 0.10]	0.024 ± 0.006 [0.61 ± 0.15]	0.031 [0.80]	0.012 ± 0.006 [0.30 ± 0.15]	0.012 ± 0.006 [0.30 ± 0.15]
SOLDER PAD DIMENSIONS in inches (millimeters)							
	c	w	d	a	b		
CZA04S	0.018 [0.45]	0.083 [2.10]	0.083 [0.20]	0.018 [0.45]	0.032 [0.82]		
CZA06S	0.031 [0.80]	0.122 [3.10]	0.014 [0.36]	0.024 [0.63]	0.045 [1.15]		



PERFORMANCE			
TEST	CONDITIONS OF TEST	TEST RESULTS	
		0.5dB to 5dB	6dB to 20dB
Endurance Test at 70°C per EIA 575-3.14	1000 hours at 70°C, 1.5 hours "ON", 0.5 hours "OFF"	± 0.2dB	± 0.3dB
Overload per EIA 575-3.6	Short time overload	± 0.2dB	± 0.3dB
Thermal Shock	per EIA 575-3.5	± 0.2dB	± 0.3dB
Moisture Resistance	per EIA 575-3.10	± 0.2dB	± 0.3dB
Resistance to Soldering Heat	10 seconds at 260°C solder bath temperature EIA 575 3.8	± 0.2dB	± 0.3db
High Temperature Exposure	per EIA 575-3.7	± 0.2dB	± 0.3dB
Low Temperature Operations	per EIA-575-3.6	± 0.2dB	± 0.3dB
Solderability & Leaching	EIA 575-3.12	95% Coverage	





Model Numbers	
SOGC 01,03,05 ..	32
SOGC 45,46	36
SOMC	38
DFP	40

Surface Mount Resistor Networks

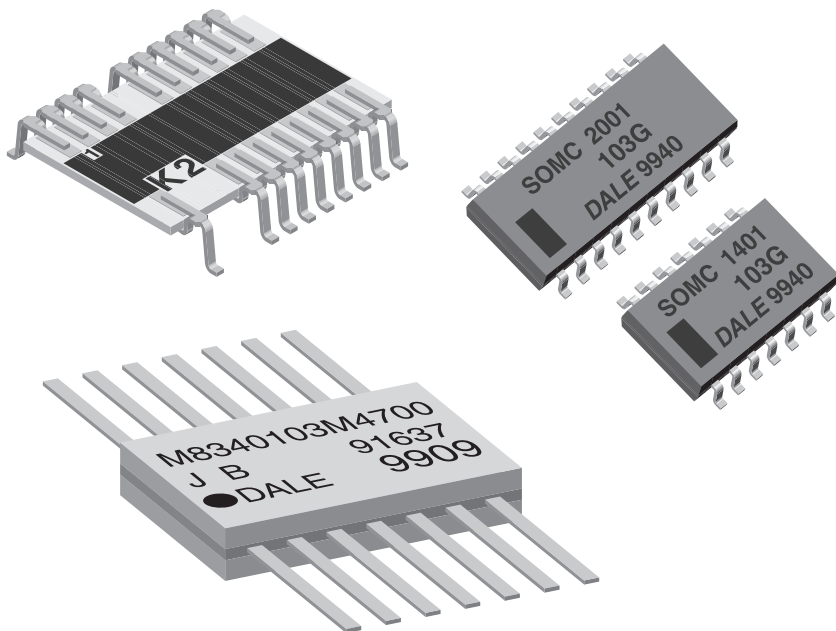
SIL, DIL or Custom Configurations



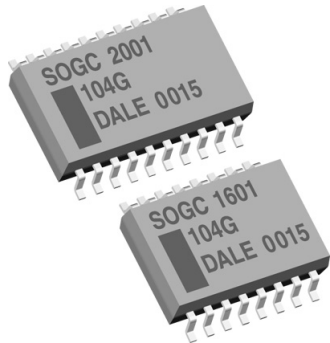
Isolated, Bussed or TTL-Terminator Circuits



High Packaging Density



Thick Film Resistor Networks, Dual-In-Line Small Outline Molded Dip, 01, 03, 05 Schematics



FEATURES

- 0.110" [2.79mm] maximum seated height
- Rugged, molded case construction
- 0.050" [1.27mm] lead spacing
- Reduces total assembly costs
- Compatible with automatic surface mounting equipment
- Uniform performance characteristics
- Meets EIA PDP 100, SOGN-0003 outline dimensions
- Available in tube pack or tape and reel pack

STANDARD ELECTRICAL SPECIFICATIONS							
GLOBAL MODEL	SCHEMATIC	RESISTOR CIRCUIT W @ 70°C	PACKAGE POWER W @ 70°C	TOLERANCE ± %	RESISTANCE RANGE Ω	OPERATING VOLTAGE VDC	TEMPERATURE COEFFICIENT ppm/°C
SOGC16	01	0.1	1.6	2 (1, 5*)	10-1M0	50 max	100
	03	0.19	1.6	2 (1, 5*)	10-1M0	50 max	100
	05	0.1	1.6	2 (5*)	10-1M0	50 max	100
SOGC20	01	0.1	2.0	2 (1, 5*)	10-1M0	50 max	100
	03	0.19	2.0	2 (1, 5*)	10-1M0	50 max	100
	05	0.1	2.0	2 (5*)	10-1M0	50 max	100

*Tolerances in brackets available upon request.
• 100 milliohm maximum on zero ohm jumper

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: SOGC200310K0GDC (preferred part numbering format)

S O G C 2 0 0 3 1 0 K 0 G D C

GLOBAL MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
SOGC	16 20	01 = Bussed 03 = Isolated 00 = Special	R = Decimal K = Thousand M = Million 10R0 = 10Ω 680K = 680KΩ 1M00 = 1.0MΩ	F = ± 1% G = ± 2% J = ± 5% S = Special Z = 0Ω Jumper	EJ = Lead Free, Tube EA = Tin/Lead, Tape & Reel DC = Tin/Lead, Tube RZ = Tin/Lead, Tape & Reel	Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable

Historical Part Number example: SOGC2003103G (will continue to be accepted)

SOGC 20 03 103 G D02
HISTORICAL MODEL PIN COUNT SCHEMATIC RESISTANCE VALUE TOLERANCE CODE PACKAGING

New Global Part Numbering: SOGC1605131AGRZ (preferred part numbering format)

S O G C 1 6 0 5 1 3 1 A G R Z

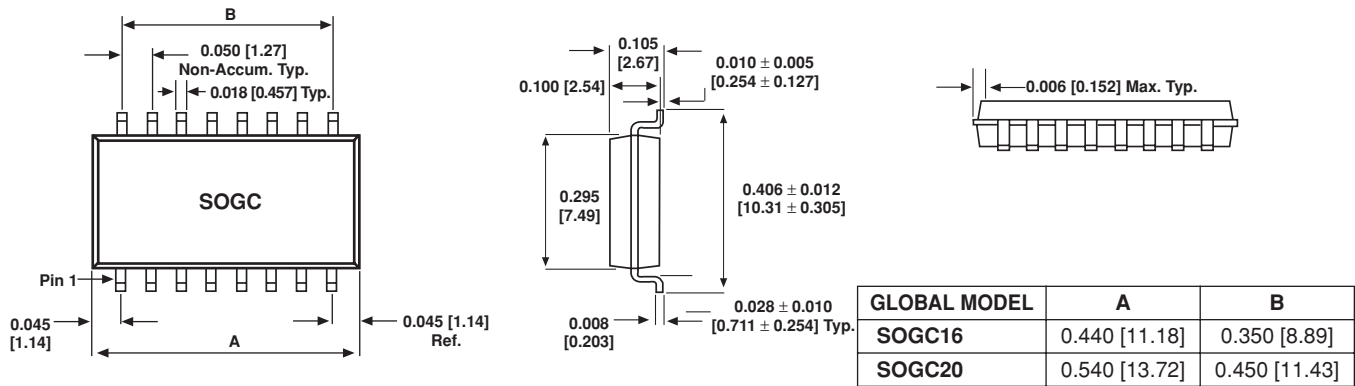
GLOBAL MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
SOGC	16 20	05 = Dual Terminator	3 digit Impedance code, followed by Alpha modifier (see Impedance Codes table)	F = ± 1% G = ± 2% J = ± 5%	EJ = Lead Free, Tube EA = Tin/Lead, Tape & Reel DC = Tin/Lead, Tube RZ = Tin/Lead, Tape & Reel	Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable

Historical Part Number example: SOGC1605221331G (will continue to be accepted)

SOGC 16 05 221 331 G R61
HISTORICAL MODEL PIN COUNT SCHEMATIC RESISTANCE VALUE 1 RESISTANCE VALUE 2 TOLERANCE CODE PACKAGING



DIMENSIONS in inches [millimeters]

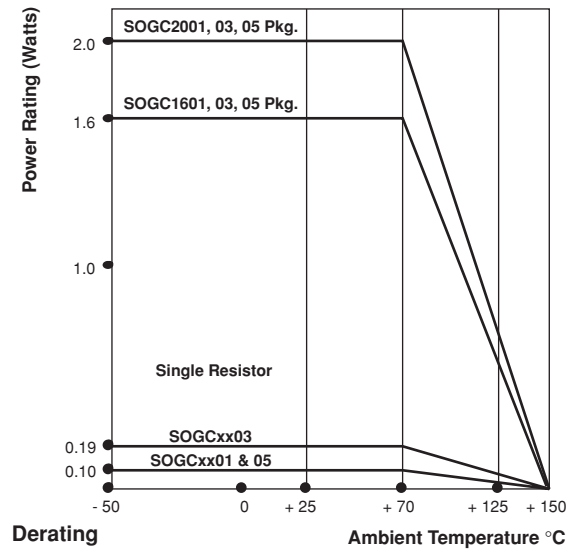


TECHNICAL SPECIFICATIONS			
PARAMETER	UNIT	SOGC16	SOGC20
Package Power Rating (max. at + 70°C)	W	1.6	2.0
TC Tracking (- 55°C to + 125°C)	ppm/°C	± 50	
Voltage Coefficient of Resistance:	ppm/V	< 50 typical	
Maximum Operating Voltage:	VDC	50	
Operating Temperature Range:	°C	- 55 to + 125.	
Storage Temperature Range:	°C	- 55 to + 150	

MECHANICAL SPECIFICATIONS	
Marking:	Model number, schematic number, value tolerance, pin 1 indicator, date code.
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Maximum Solder Reflow Temperature:	+ 255°C
Solderability:	Per MIL-STD-202, Method 208E.
Terminals:	Copper alloy. Solder dipped terminal
Body:	Molded epoxy.

IMPEDANCE CODES					
CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
500B	82	130	141A	270	270
750B	120	200	181A	330	390
800C	130	210	191A	330	470
990A	160	260	221B	330	680
101C	180	240	281B	560	560
111C	180	270	381B	560	1.2K
121B	180	390	501C	620	2.7K
121C	220	270	102A	1.5K	3.3K
131A	220	330	202B	3K	6.2K

CIRCUIT APPLICATIONS	
<p>01 Schematic</p>	<p>15 or 19 resistors with one pin common</p> <p>The SOGCxx01 circuit provides a choice of 15 or 19 nominally equal resistors, each connected between a common lead (16 or 20) and a discrete PC board pin. Commonly used in the following applications:</p> <ul style="list-style-type: none"> • MOS/ROM Pull-up/Pull-down • Open Collector Pull-up • "Wired OR" Pull-up • Power Driven Pull-up • TTL Input Pull-down • Digital Pulse Squaring • TTL Unused Gate Pull-up • High Speed Parallels Pull-up
<p>03 Schematic</p>	<p>8 or 10 isolated resistors</p> <p>The SOGCxx03 circuit provides a choice of 8 or 10 nominally equal resistors with each resistor isolated from all others and wired directly across. Commonly used in the following applications:</p> <ul style="list-style-type: none"> • "Wired OR" Pull-up • Power Driven Pull-up • Powergate Pull-up • Line Termination • Long-line Impedance Balancing • LED Current Limiting • ECL Output Pull-down • TTL Input Pull-down
<p>05 Schematic</p>	<p>TTL dual-line terminator; pulse squaring, 14 or 18 pairs of resistors (R₁ Resistors are common to leads 16 or 20) (R₂ Resistors are common to leads 8 or 10)</p> <p>The SOGCxx05 circuit contains 14 or 18 pairs of resistors. Each pair is connected between ground and a common line. The junctions of these resistor pairs are connected to the input leads.</p> <p>The 05 circuits are designed for TTL dual-line termination and pulse squaring.</p>



PERFORMANCE	
TEST	MAX. ΔR (TYPICAL TEST LOTS)
Power Conditioning	± 0.50% ΔR
Thermal Shock	± 0.50% ΔR
Short Time Overload	± 0.25% ΔR
Low Temperature Operation	± 0.25% ΔR
Moisture Resistance	± 0.50% ΔR
Resistance to Soldering Heat	± 0.25% ΔR
Shock	± 0.25% ΔR
Vibration	± 0.25% ΔR
Load Life	± 0.50% ΔR
Terminal Strength	± 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)

Thick Film Resistor Networks, Dual-In-Line Small Outline Molded Dip 45 & 46 Schematics



FEATURES

- 0.110" [2.79] maximum seated height
- Rugged, molded case construction
- 0.050" [1.27] lead spacing
- Reduces total assembly costs
- Compatible with automatic surface mounting equipment
- Uniform performance characteristics
- Meets EIA PDP 100, SOGN-0003 outline dimensions
- Available in tube pack or tape and reel pack

STANDARD ELECTRICAL SPECIFICATIONS							
GLOBAL MODEL	CIRCUIT SCHEMATIC	RESISTOR CIRCUIT W @ 70°C	PACKAGE POWER W @ 70°C	TOLERANCE ± %	RESISTANCE VALUES Ω	OPERATING VOLTAGE VDC	TEMPERATURE COEFFICIENT ± ppm/°C
SOGC16	45	0.1	1.6	2	180, 270, 820	50 max	100
	46	0.1	1.6	2	330, 150, 330	50 max	100
SOGC20	45	0.1	2.0	2	180, 270, 820	50 max	100
	46	0.1	2.0	2	330, 150, 330	50 max	100

TECHNICAL SPECIFICATIONS			
PARAMETER	UNIT	SOGC16	SOGC20
Package Power Rating: (Maximum at + 70°C)	W	1.6	2.0
TC Tracking: (- 55°C to + 125°C)	ppm/°C	± 50	
Voltage Coefficient of Resistance:	ppm/V	< 50 typical.	
Maximum Operating Voltage:	VDC	50	
Operating Temperature Range:	°C	- 55 to + 125	
Storage Temperature Range:	°C	- 55 to + 150	

MECHANICAL SPECIFICATIONS	
Marking	Model number, schematic number, value, tolerance, pin 1 indicator, date code.
Marking Resistance to Solvents	Permanency testing per MIL-STD-202, Method 215
Maximum Solder Reflow Temperature	+ 255°C
Solderability	Per MIL-STD-202, Method 208E
Terminals	Copper alloy. Solder dipped terminal
Body:	Molded epoxy

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: SOGC1646DC (preferred part numbering format)

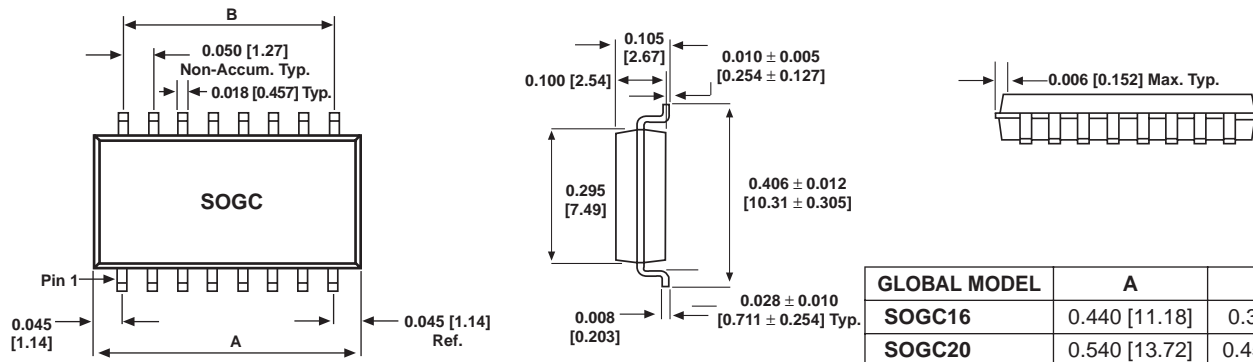
S	O	G	C	1	6	4	6	D	C			
---	---	---	---	---	---	---	---	---	---	--	--	--

GLOBAL MODEL SOGC	PIN COUNT 16 20	SCHEMATIC 45 = TTL/ECL Translator 46 = Signal Terminator	PACKAGING EJ = Lead Free, Tube EA = Lead Free, Tape & Reel DC = Tin/Lead, Tube RZ = Tin/Lead, Tape & Reel	SPECIAL Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable
-----------------------------	------------------------------	-----------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------

Historical Part Number example: SOGC1646 (will continue to be accepted)

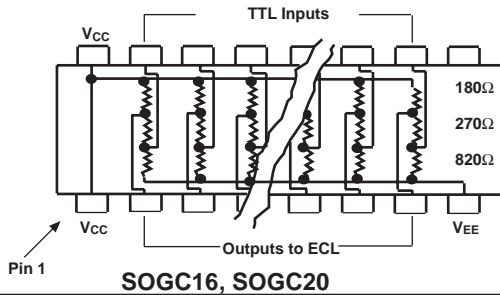
SOGC	16	46	D02
HISTORICAL MODEL	PIN COUNT	SCHEMATIC	PACKAGING

DIMENSIONS in inches [millimeters]



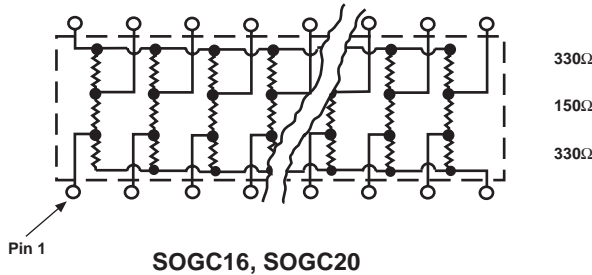
CIRCUIT APPLICATIONS

45 Schematic

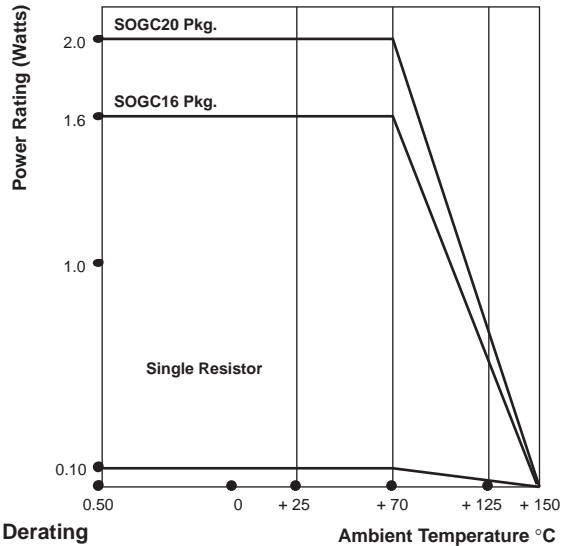


TTL to ECL translator
 The SOGCxx45 network consists of resistors of 3 different values, internally divided into 6 or 8 identical three (3) resistor sections for TTL to ECL translation.

46 Schematic



SCSI-BUS signal terminator
 The SOGCxx46 network consists of resistors of 2 different values, internally divided into 7 or 9 identical three (3) resistor sections for SCSI-BUS terminator applications.

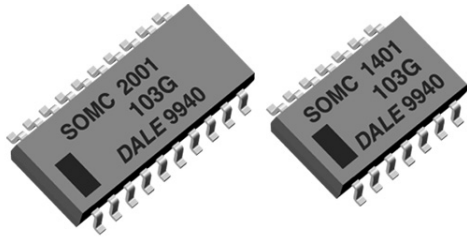


PERFORMANCE

TEST	MAX. ΔR (TYPICAL TEST LOTS)
Power Conditioning	$\pm 0.50\% \Delta R$
Thermal Shock	$\pm 0.50\% \Delta R$
Short Time Overload	$\pm 0.25\% \Delta R$
Low Temperature Operation	$\pm 0.25\% \Delta R$
Moisture Resistance	$\pm 0.50\% \Delta R$
Resistance to Soldering Heat	$\pm 0.25\% \Delta R$
Shock	$\pm 0.25\% \Delta R$
Vibration	$\pm 0.25\% \Delta R$
Load Life	$\pm 0.50\% \Delta R$
Terminal Strength	$\pm 0.25\% \Delta R$
Insulation Resistance	10,000 Megohm (minimum)
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)

* Test methods per MIL-STD-202.

Thick Film, Dual-in-Line Resistor Networks



FEATURES

- 14, 16 or 20 terminal package
- Isolated, bussed or TTL-terminator circuits
- Molded case construction
- Highly stable thick film elements
- Reflow solderable
- Compatible with automatic surface mounting equipment
- Reduces total assembly costs
- For wave flow soldering contact factory

STANDARD ELECTRICAL SPECIFICATIONS										
GLOBAL MODEL	ELEMENT $P_{70^{\circ}\text{C}}$ W	PACKAGE POWER RATING $P_{70^{\circ}\text{C}}$ W			CIRCUIT	LIMITING ELEMENT VOLTAGE MAX.	TEMPERATURE COEFFICIENT ¹⁾ ppm/°C	TOL. %	RESISTANCE RANGE Ω	E-SERIES
		14	16	20						
SOMC	0.08	1.05	1.20	1.52	01	50	100	1, 2, 5 1, 2, 5 1, 2, 5	10R – 1M	24
	0.16	1.125	1.28	1.60	03					
	0.08	1.05	1.20	1.52	05					

¹⁾Temperature Range: - 55°C to + 125°C

- Power rating depends on the max. temperature at the solder point, the component placement density and the substrate material
- Jumper: Zero-Ohm-Resistor on request (100m Ω)
- Packaging: according to EIA; see appropriate catalog or web page

TECHNICAL SPECIFICATIONS				
PARAMETER	UNIT	01 CIRCUIT	03 CIRCUIT	05 CIRCUIT
Rated Dissipation at 70°C per Element	W	0.08	0.16	0.08
Limiting Element Voltage ²⁾	V \cong		50	
Voltage Coefficient	ppm/V		< 50	
Insulation Voltage (1min)	V _{dc/ac} peak		200	
Category Temperature Range	°C		- 55 / + 150	
Insulation Resistance	Ω		> 10 ¹⁰	
TC Tracking (- 55°C to + 125°C)	ppm/°C		50	

²⁾Rated voltage: $\sqrt{P \times R}$

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: SOMC16011K00GDC (preferred part numbering format)

S	O	M	C	1	6	0	1	1	K	0	0	G	D	C			
GLOBAL MODEL	PIN COUNT	SCHEMATIC		RESISTANCE VALUE			TOLERANCE CODE		PACKAGING			SPECIAL					
SOMC	14 16 20	01 = Bussed 03 = Isolated 00 = Special	R = Decimal K = Thousand M = Million 10R0 = 10 Ω 680K = 680K Ω 1M00 = 1.0M Ω			F = \pm 1% G = \pm 2% J = \pm 5% S = Special		EJ = Lead Free, Tube EA = Lead Free, Tape & Reel DC = Tin/Lead, Tubel RZ = Tin/Lead, Tape & Reel			Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable						

Historical Part Number example: SOMC1601102G (will continue to be accepted)

SOMC	16	01	102	G	D02
HISTORICAL MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING

New Global Part Numbering: SOMC2005500BGRZ (preferred part numbering format)

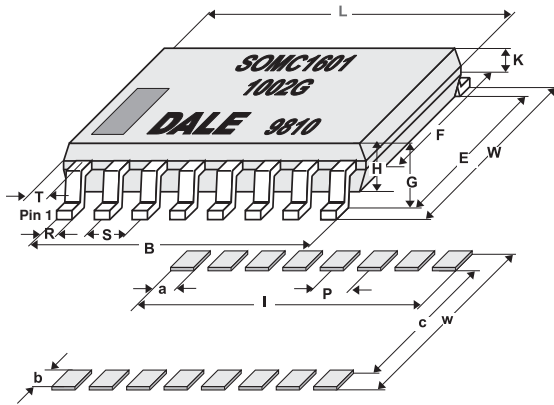
S	O	M	C	2	0	0	5	5	0	0	B	G	R	Z			
GLOBAL MODEL	PIN COUNT	SCHEMATIC		RESISTANCE VALUE			TOLERANCE CODE		PACKAGING			SPECIAL					
SOMC	14 16 20	05 = Dual Terminator		3 digit Impedence code, followed by Alpha modifier (see Impedence table)			F = \pm 1% G = \pm 2% J = \pm 5%		EJ = Lead Free, Tube EA = Lead Free, Tape & Reel DC = Tin/Lead, Tubel RZ = Tin/Lead, Tape & Reel			Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable					

Historical Part Number example: SOMC2005820131G (will continue to be accepted)

SOMC	20	05	810	131	G	R61
HISTORICAL MODEL	PIN COUNT	SCHEMATIC VALUE 1	RESISTANCE VALUE 2	RESISTANCE	TOLERANCE CODE	PACKAGING



DIMENSIONS

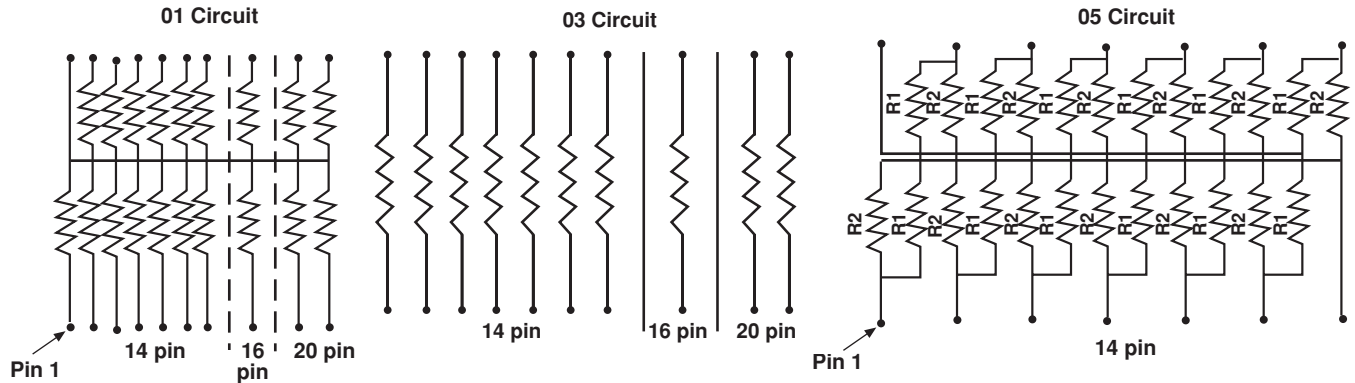


SOLDER PAD DIMENSIONS in inches [millimeters]						
	a	b	c	l	p	w
WAVE	0.64	1.91	5.34	9.53	1.27	9.15
REFLOW	0.64	1.91	5.34	9.53	1.27	9.15

The dimensions shown are for 16 pin part. For parts with different pin numbers use the same pitch and add or subtract pads as required.
Note: Maximum solder reflow temperature + 255°C

DIMENSIONS [in millimeters]											
PIN NO#	L	W	B	E	F	G	H	K	R	S	T
14	9.91	7.62	7.62	6.20	5.59	2.16	2.03	0.914	0.457	1.27	1.14
16	11.18	7.62	8.89	6.20	5.59	2.16	2.03	0.914	0.457	1.27	1.14
20	13.72	7.62	11.43	6.20	5.59	2.16	2.03	0.914	0.457	1.27	1.14
Tol	± 0.254	± 0.381	± 0.254	± 0.381	± 0.127	± 0.127	± 0.127			± 0.254	

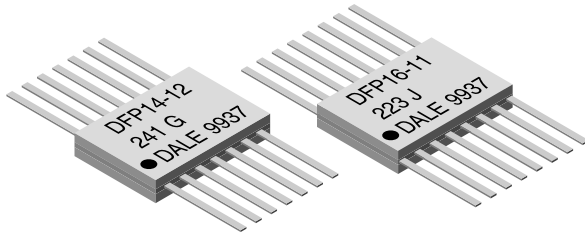
CIRCUIT SCHEMATICS



IMPEDANCE CODES					
CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
500B	82	130	141A	270	270
750B	120	200	181A	330	390
800C	130	210	191A	330	470
990A	160	260	221B	330	680
101C	180	240	281B	560	560
111C	180	270	381B	560	1.2K
121B	180	390	501C	620	2.7K
121C	220	270	102A	1.5K	3.3K
131A	220	330	202B	3K	6.2K

PERFORMANCE		
TEST	CONDITIONS OF TEST	TEST RESULTS
Power Conditioning	MIL STD-202	± 0.5%
Load Life at 70°C	MIL STD-202	± 0.5%
Short Time Overload	MIL STD-202	± 0.25%
Thermal Shock	MIL STD-202	± 0.5%
Moisure Resistance	MIL STD-202	± 0.5%
Resistance to Soldering Heat	MIL STD-202	± 0.25%
Low Temperature Operation	MIL STD-202	± 0.25%
Vibration	MIL STD-202	± 0.25%
Shock	MIL STD-202	± 0.25%
Terminal Strength	MIL STD-202	± 0.25%

Thick Film Resistor Networks Flat Pack, 11, 12 Schematics



FEATURES

- 11 and 12 Schematics
- 0.065" [1.65 mm] height for high density packaging
- Low temperature coefficient (- 55 °C to + 125 °C) ± 100 ppm/°C
- Hot solder dipped leads
- Highly stable thick film
- Wide resistance range
- All devices are capable of passing the MIL-STD-202, Method 210, Condition C "Resistance to Soldering Heat" test

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	POWER RATING		CIRCUIT SCHEMATIC	LIMITING ELEMENT VOLTAGE MAX. V _≡	TEMPERATURE ¹⁾ COEFFICIENT ppm/°C	STANDARD ²⁾ TOLERANCE %	RESISTANCE RANGE Ω	TEMPERATURE COEFFICIENT TRACKING ppm/°C
	P _{25 °C} ELEMENT W	P _{25 °C} PACKAGE W						
DFP	0.25	0.65	11	75	± 100	2	10 - 1M	50
	0.15	0.65	12	75	± 100	2	10 - 1M	50

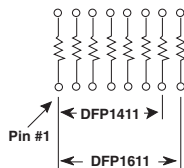
Notes

1. Temperature Range: - 55 °C to + 125 °C
2. ± 1 % and ± 5 % tolerance available

- Consult factory for stocked values

TECHNICAL SPECIFICATIONS

11 Schematic

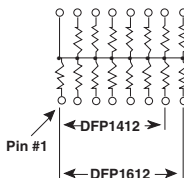


7 or 8 isolated resistors

The DFPxx11 provides the user with 7 or 8 nominally equal resistors with each resistor isolated from all others. Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Driven Pull-up
- Power Gate Pull-up
- Line Termination
- Long-line Impedance Balancing
- LED Current Limiting
- ECL Output Pull-down
- TTL Input Pull-down

12 Schematic



13 or 15 resistors with one pin common

The DFPxx12 provides the user with a choice of 13 or 15 nominally equal resistors, each connected to a common pin (14 or 16). Commonly used in the following applications:

- MOS/ROM Pull-up/Pull-down
- Open Collector Pull-up
- "Wired OR" Pull-up
- Power Driven Pull-up
- TTL Input Pull-down
- Digital Pulse Squaring
- TTL Unused Gate Pull-up
- High Speed Parallel Pull-up

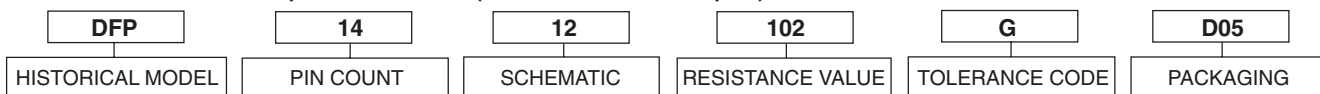
GLOBAL PART NUMBER INFORMATION

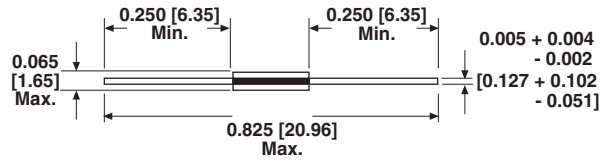
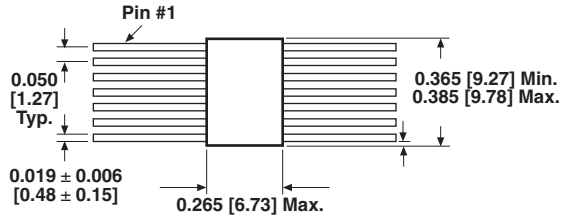
New Global Part Numbering: DFP14121K00GD05 (preferred part numbering format)



GLOBAL MODEL	PIN COUNT	SCHEMATIC	RESISTANCE VALUE	TOLERANCE CODE	PACKAGING	SPECIAL
DFP	14 16	11 = Isolated 12 = Bussed	R = Decimal K = Thousand M = Million 10R0 = 10 Ω 680K = 680 kΩ 1M00 = 1.0 MΩ	F = ± 1 % G = ± 2 % J = ± 5 %	E05 = Lead (Pb)-free, Tube D05 = Tin/Lead, Tube	Blank = Standard (Dash Number) (up to 3 digits) From 1-999 as applicable

Historical Part Number example: DFP1412102G (will continue to be accepted)

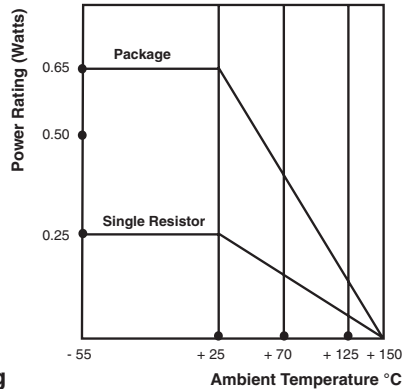
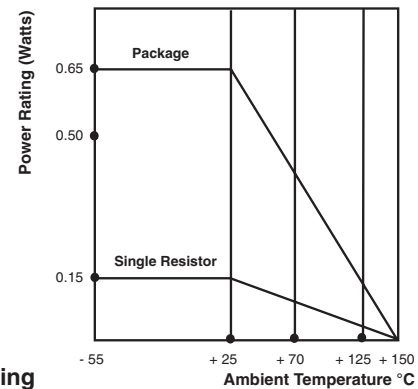


DIMENSIONS in inches [millimeters]


GLOBAL MODEL	DIMENSION A
DFP14	0.037 ± 0.010 [0.94 ± 0.25]
DFP16	0.012 ± 0.010 [0.30 ± 0.25]

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	DFP14/16
Isolation Resistance 11 Schematic	MΩ	> 100
Voltage Coefficient of Resistance	ppm/V	< 50 typical
Maximum Operating Voltage	VDC	75
Operating Temperature Range	°C	- 55 to + 125
Storage Temperature Range	°C	- 55 to + 150

MECHANICAL SPECIFICATIONS	
Marking	Model number, schematic number, value tolerance, pin 1 indicator, date code.
Marking Resistance to Solvents	Permanency testing per MIL-STD-202 Method 215.
Solderability	Per MIL-STD-202, Method 208E.
Terminals	Per MIL-STD-1276 DFPxx11, DFPxx12 = Type G (hot solder dipped). Hot solder dipped leads supplied as standard finish.
Body	Epoxy filled ceramic sandwich

11 Schematic

Derating
12 Schematic

Derating

PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 x rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours ± 4 hours at + 25 °C ambient temperature	± 0.50 % ΔR
Thermal Shock	5 cycles between - 65 °C and + 125 °C	± 0.50 % ΔR
Short Time Overload	2.5 x rated working voltage, 5 seconds	± 0.25 % ΔR
Low Temperature Operation	45 minutes at full rated working voltage at - 65 °C	± 0.25 % ΔR
Moisture Resistance	240 hours with humidity ranging from 80 % RH to 98 % RH	± 0.50 % ΔR
Resistance to Soldering Heat	Leads immersed in + 260 ° ΔC solder to within 1/16" of body for 10 seconds	± 0.25 % ΔR
Shock	Total of 18 shocks at 100 g's	± 0.25 % ΔR
Vibration	12 hours at maximum of 20 g's between 10 and 2000 Hz	± 0.25 % ΔR
Load Life	1000 hours at + 70 °C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period. Derated according to the curve.	± 0.50 % ΔR
Terminal Strength	1.5 pound pull for 30 seconds	± 0.25 % ΔR
Insulation Resistance	10 000 Megohm (minimum)	-
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	-



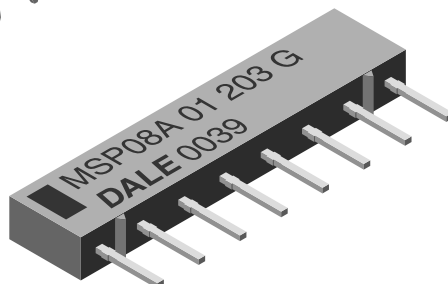
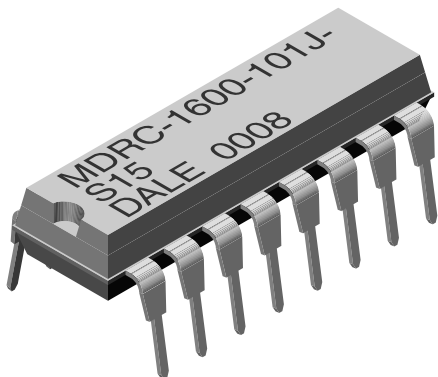
Through-Hole Resistor Networks

SIL, DIL Configurations

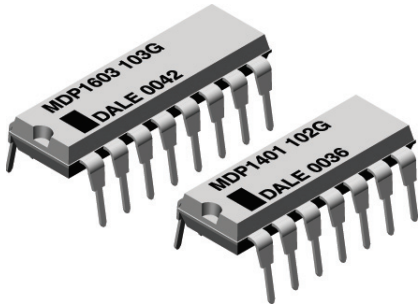
Isolated, Bussed or TTL-Terminator Circuits

High Packaging Density

Model Numbers	
MDP-01,03,05 ...	44
MDP-45,46	48
CSC	50
MSP	54
CS201	58
CS206	60
MDRC	62



Thick Film Resistor Networks, Dual-In-Line, Molded DIP, 01, 03, 05 Schematics



FEATURES

- 0.160" [4.06mm] maximum seated height and rugged, molded case construction.
- Highly stable thick film
- Low temperature coefficient (- 55°C to + 125°C) ± 100ppm/°C
- Reduces total assembly costs
- Compatible with automatic inserting equipment
- Wide resistance range
- Uniform performance characteristics
- Available in tube pack

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL/ NO. OF PINS	SCHEMATIC	RESISTOR POWER RATING Max. @ 70°C* W	RESISTANCE RANGE Ω	STANDARD TOLERANCE %	TEMPERATURE COEFFICIENT (- 55°C to + 125°C) ppm/°C	TCR TRACKING** (- 55°C to + 125°C) ppm/°C	WEIGHT g
MDP 14	01 03 05	0.125 0.250 0.125	10 - 2.2M 10 - 2.2M Consult factory	± 2 (± 1, ± 5)***	± 100	± 50 ± 50 ± 100	1.3
MDP 16	01 03 05	0.125 0.250 0.125	10 - 2.2M 10 - 2.2M Consult factory	± 2 (± 1, ± 5)***	± 100	± 50 ± 50 ± 100	1.5

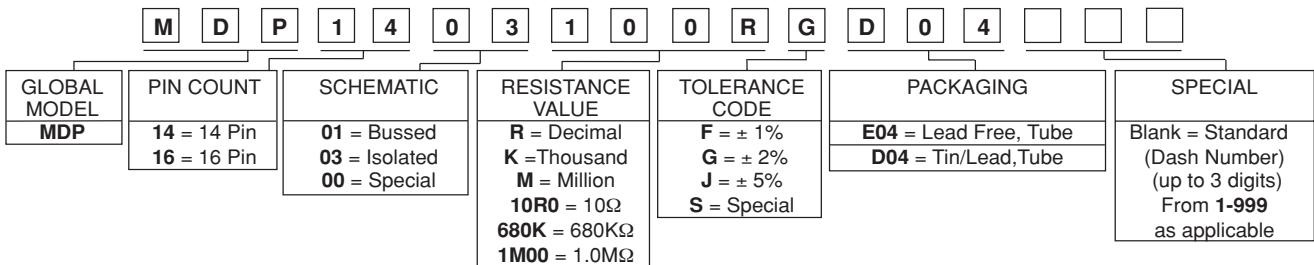
*For resistor power ratings @ + 25°C see derating curves.

**Tighter tracking available.

***± 1% and ± 5% tolerances available on request.

GLOBAL PART NUMBER INFORMATION

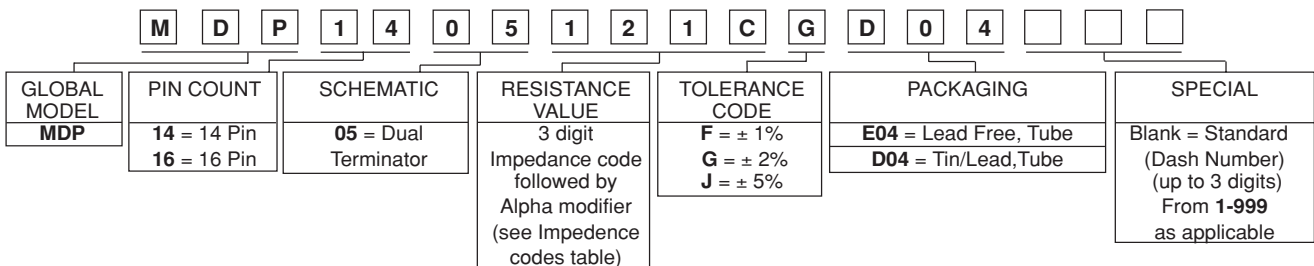
New Global Part Numbering: MDP1403100RGD04 (preferred part numbering format)



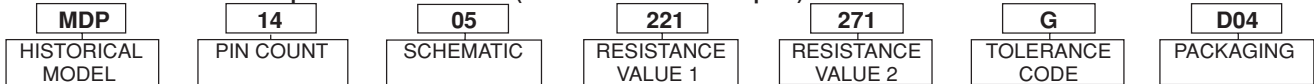
Historical Part Number example: MDP1403101G (will continue to be accepted)



New Global Part Numbering: MDP1405121CGD04 (preferred part numbering format)

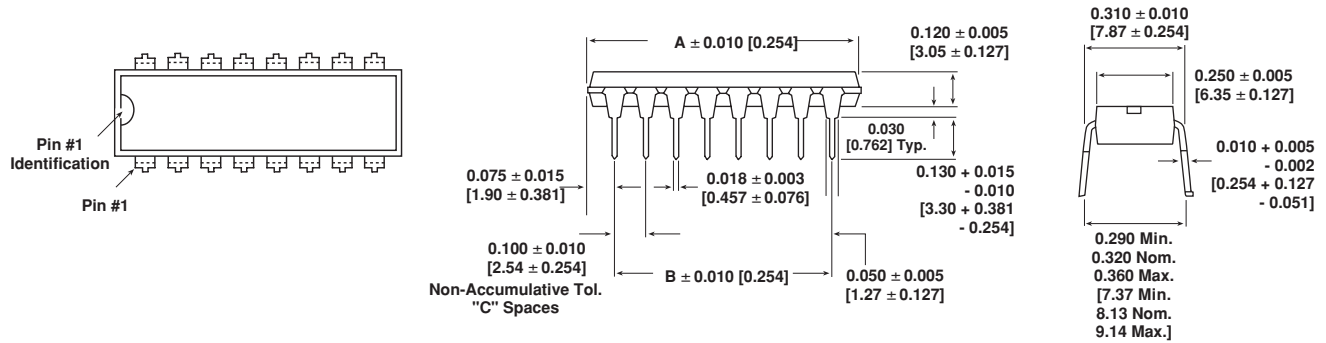


Historical Part Number example: MDP1405221271G (will continue to be accepted)





DIMENSIONS in inches [millimeters]



GLOBAL MODEL	A	B	C
MDP 14	0.750 [19.05]	0.600 [15.24]	6
MDP 16	0.850 [21.59]	0.700 [17.78]	7

TECHNICAL SPECIFICATIONS			
PARAMETER	UNIT	MDP14	MDP16
Package Power Rating (Maximum at + 70°C)	W	1.73	1.92
Voltage Coefficient of Resistance	V _{eff}	< 50ppm typical	
Dielectric Strength	VAC	200	
Insulation Resistance	Ω	> 10,000M minimum	
Operating Temperature Range	°C	- 55 to + 125	
Storage Temperature Range:	°C	- 55 to + 150	

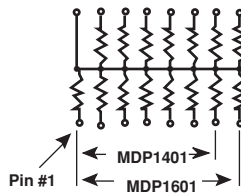
MECHANICAL SPECIFICATIONS	
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E.
Body:	Molded epoxy.
Terminals:	Solder plated leads.
Weight:	14 pin = 1.3 grams; 16 pin = 1.5 grams

IMPEDANCE CODES

CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
500B	82	130	141A	270	270
750B	120	200	181A	330	390
800C	130	210	191A	330	470
990A	160	260	221B	330	680
101C	180	240	281B	560	560
111C	180	270	381B	560	1.2K
121B	180	390	501C	620	2.7K
121C	220	270	102A	1.5K	3.3K
131A	220	330	202B	3K	6.2K

CIRCUIT APPLICATIONS

01 Schematic

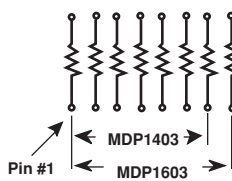


13 and 15 resistors with one pin common

The MDPXX01 circuit provides a choice of 13 and 15 nominally equal resistors, each connected between a common pin (14 and 16) and a discrete PC board pin. Commonly used in the following applications:

- MOS/ROM Pull-up/Pull-down
- Open Collector Pull-up
- "Wired OR" Pull-up
- Power Driven Pull-up
- TTL Input Pull-down
- Digital Pulse Squaring
- TTL Unused Gate Pull-up
- High Speed Parallel Pull-up

03 Schematic

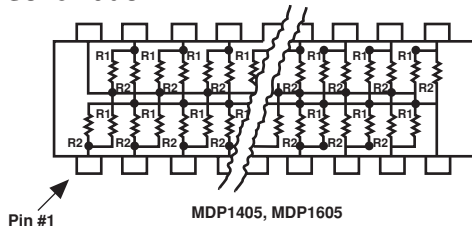


7 and 8 isolated resistors

The MDPXX03 provides a choice of 7 and 8 nominally equal resistors, each resistor isolated from all others and wired directly across. Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Driven Pull-up
- Powergate Pull-up
- Line Termination
- Long-line Impedance Balancing
- LED Current Limiting
- ECL Output Pull-down
- TTL Input Pull-down

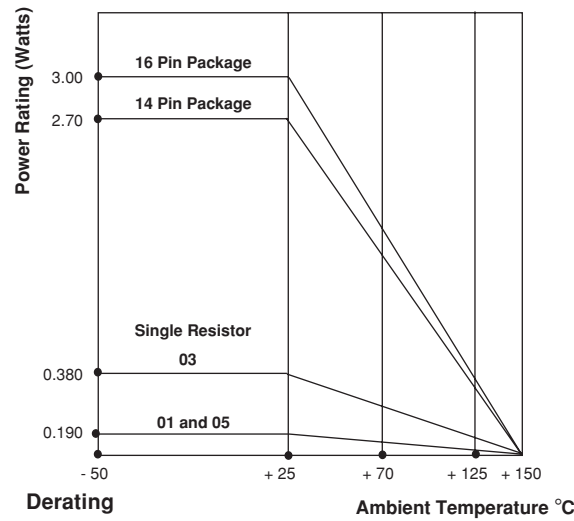
05 Schematic



TTL dual-line terminator; pulse squaring

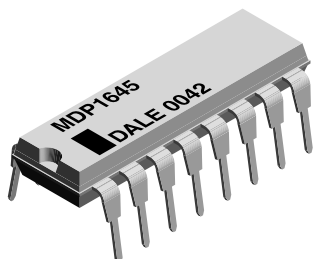
The MDPXX05 circuit contains 12 and 14 series pair of resistors. Each series pair is connected between ground and a common line. The junction of these resistor pairs is connected to the input terminals. The 05 circuits are designed for TTL dual-line termination and pulse squaring.

Standard E-24 resistance values stocked. Consult factory



PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours ± 4 hours at + 25°C ambient temperature	± 0.50% ΔR
Thermal Shock	5 cycles between - 65°C and + 125°C	± 0.50% ΔR
Short Time Overload	2.5 x rated working voltage 5 seconds	± 0.25% ΔR
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	± 0.25% ΔR
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	± 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 350°C solder to within 1/16" of device body for 3 seconds	± 0.25% ΔR
Shock	Total of 18 shocks at 100 G's	± 0.25% ΔR
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	± 0.25% ΔR
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON, 0.5 hour "OFF" for full 1000 hour period. Derated according to the curve.	± 1.00% ΔR
Terminal Strength	4.5 pound pull for 30 seconds	± 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 VRMS for 1 minute)	—

Thick Film Resistor Networks, Dual-In-Line, Molded DIP



FEATURES

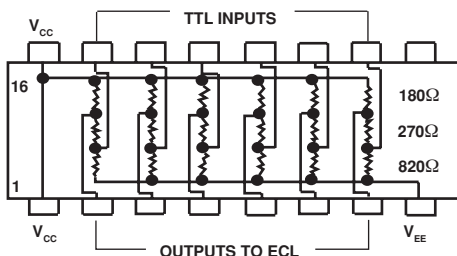
- 0.190" [4.83mm] maximum seated height
- Rugged, molded case construction
- Low temperature coefficient (- 55°C to + 125°C), MDP 1645: ± 100ppm/°C, MDP 1646: ± 250ppm/°C
- Compatible with automatic insertion equipment
- Highly stable thick film
- Reduces PC board space and reduces total assembly costs
- Available in tube pack

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL/ PIN NO.	RESISTOR POWER RATING Max. @ 70°C W	PACKAGE POWER RATING Max. @ 70°C W	STANDARD TOLERANCE ± %	TEMPERATURE COEFFICIENT (- 55°C to + 125°C) ppm/°C	TEMPERATURE COEFFICIENT TRACKING ppm/°C	WEIGHT g
MDP1645	0.125	2.0	2	± 100 Typical	± 150	1.5
MDP1646	0.125	2.0	5	± 250 Typical	± 150	1.5

CIRCUIT APPLICATIONS

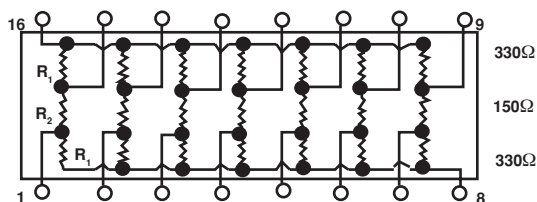
MDP1645 Schematic



TTL to ECL translator

The MDP1645 network consists of 18 resistors of 3 different values, internally divided into six (6) identical three (3) resistor sections for TTL to ECL translation.

MDP1646 Schematic

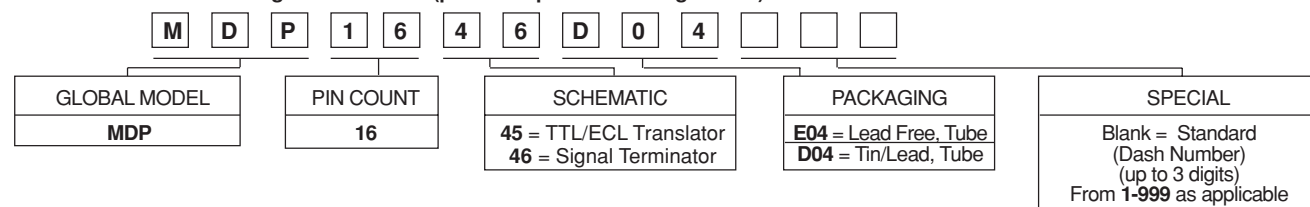


SCSI-BUS signal terminator

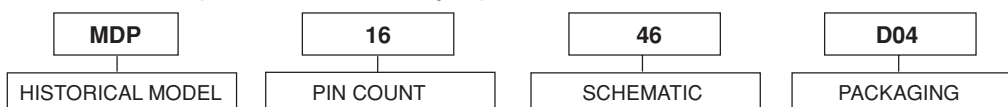
The MDP1646 network consists of 21 resistors of 2 different values, internally divided into seven (7) identical three (3) resistor sections for SCSI-BUS terminator applications.

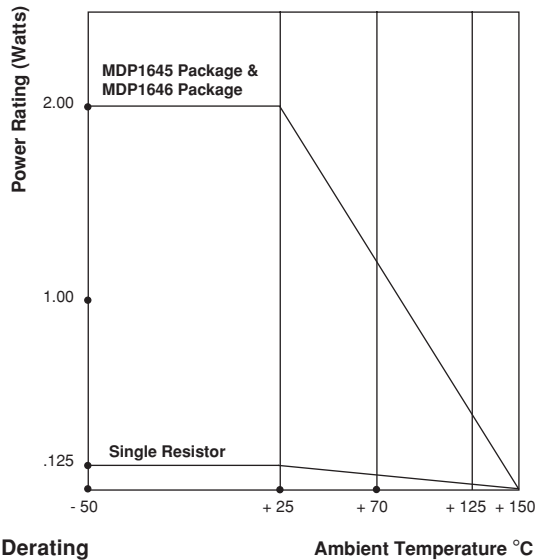
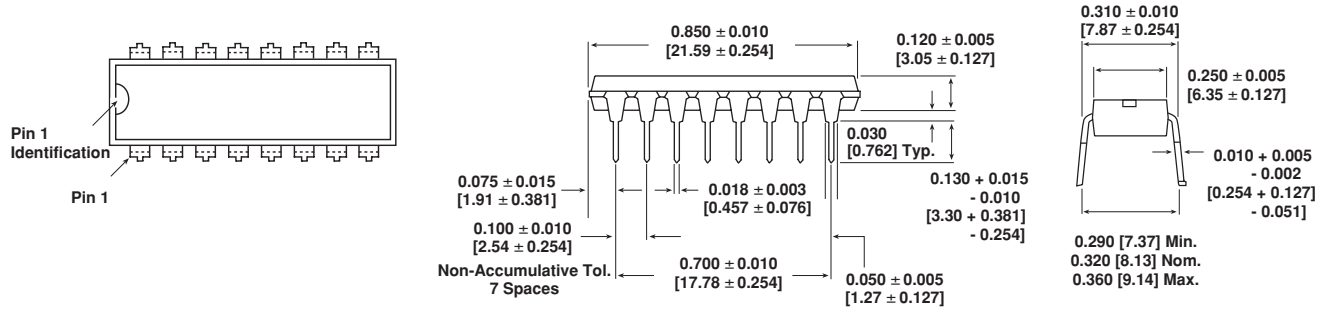
GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: MDP1646D04 (preferred part numbering format)



Historical Part Number: MDP1646 (will continue to be accepted)



DIMENSIONS in inches [millimeters]

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	MDP Series
Maximum Operating Voltage	VDC	100
Voltage Coefficient of Resistance (Typical)	V_{eff}	< 50 ppm/°C
Operating Temperature Range	°C	- 55 to + 125
Storage Temperature Range	°C	- 55 to + 150

MECHANICAL SPECIFICATIONS

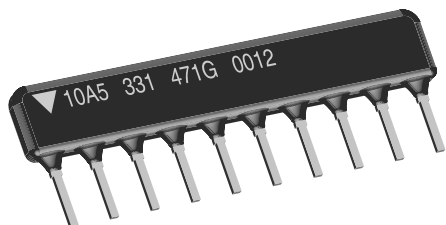
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E.
Terminals:	Copper alloy, solder plated.
Body:	Molded epoxy.
Weight:	1.5 grams.

PERFORMANCE

TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Thermal Shock	5 cycles between - 65°C and + 125°C	± 0.50% ΔR
Short Time Overload	2.5 x rated working voltage 5 seconds	± 0.25% ΔR
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	± 0.25% ΔR
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	± 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 260°C solder to within 1/16" of body for 10 seconds	± 0.25% ΔR
Shock	Total of 18 shocks at 100 g's	± 0.25% ΔR
Vibration	12 hours at maximum of 20 g's between 10 and 2,000 Hz	± 0.25% ΔR
Load Life	1,000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period. Derated according to the curve.	± 0.50% ΔR
Terminal Strength	4 1/2 pound pull for 30 seconds	± 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	—

Thick Film Resistor Networks

Single-In-Line, Coated SIP 01, 03, 05 Schematics



FEATURES

- 0.195" [4.95mm] "A", 0.250" [6.35mm] "B"
- "A" profile standard in 4 thru 12 pins
- Highly stable thick film
- Low temperature coefficient (- 55°C to + 125°C) ± 100ppm/°C
- Reduces total assembly costs
- Resistor elements protected by tough epoxy conformal coating
- Wide resistance range
- Available in bag pack or tube pack

STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL/ SCHEMATIC	PROFILE	RESISTOR POWER RATING Max. @ 70°C*	RESISTANCE RANGE Ω	STANDARD TOLERANCE %	TEMPERATURE COEFFICIENT (- 55°C to + 125°C)	TCR TRACKING (- 55°C to + 125°C)	OPERATING VOLTAGE VDC Max.
CSCxxx01	A B	0.20 W 0.25 W	10 - 2.2M	± 2 (1%*)	± 100ppm/°C	± 50ppm/°C	100
CSCxxx03	A B	0.30 W 0.40 W	10 - 2.2M	± 2 (1%*)	± 100ppm/°C	± 50ppm/°C	100
CSCxxx05	A B	0.20 W 0.25 W	10 - 2.2M	± 2 (1%*)	± 100ppm/°C	± 150ppm/°C	100

* For resistor power ratings @ + 25°C see derating curves.

• See derating curves for Package Power Rating. Higher power rated "C" Profile available.

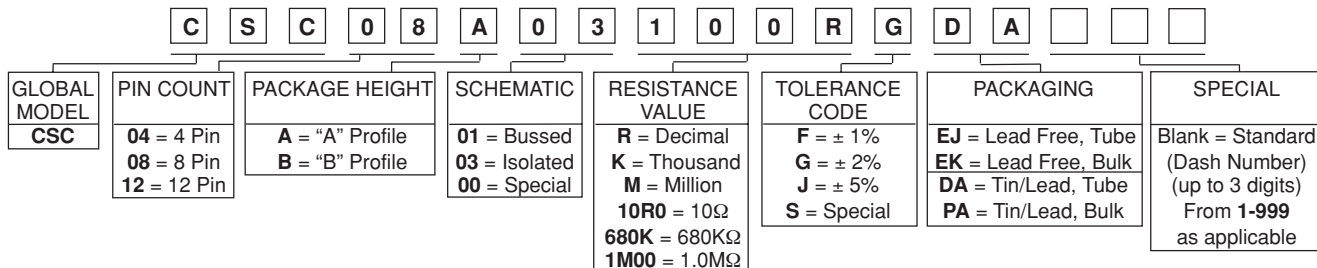
* Contact factory for 1%

TECHNICAL SPECIFICATIONS

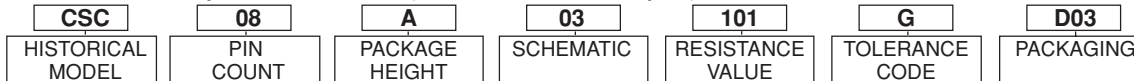
PARAMETER	UNIT	CSC Series
Voltage Coefficient of Resistance	V _{eff}	< 50ppm typical
Dielectric Strength	VAC	200
Isolation Resistance (03 Schematic)	Ω	> 100M
Operating Temperature Range	°C	- 55 to + 125

GLOBAL PART NUMBER INFORMATION

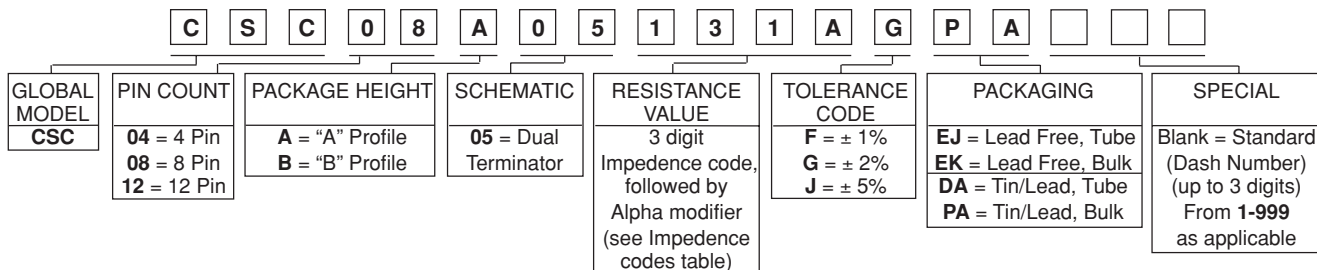
New Global Part Numbering: CSC08A03100RGDA (preferred part numbering format)



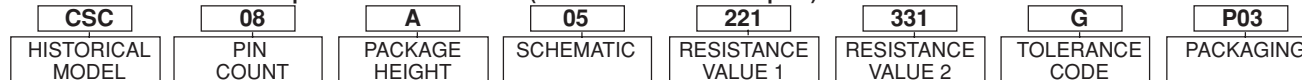
Historical Part Number example: CSC08A03101G (will continue to be accepted)

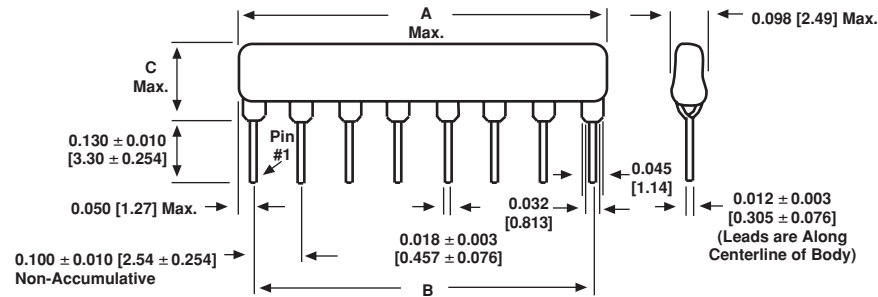


New Global Part Numbering: CSC08A05131AGPA (preferred part numbering format)



Historical Part Number example: CSC08A05221331G (will continue to be accepted)



DIMENSIONS in inches [millimeters]


01 Schematic	GLOBAL MODEL	NUMBER OF RESISTORS	A (Maximum)	B	C (Maximum)
	CSC04	3	0.390 [9.90]	0.300 [7.62]	"A" Profile = 0.195 [4.95] "B" Profile = 0.250 [6.35]
	CSC05	4	0.490 [12.45]	0.400 [10.16]	
	CSC06	5	0.590 [14.99]	0.500 [12.70]	
	CSC07	6	0.690 [17.53]	0.600 [15.24]	
	CSC08	7	0.790 [20.07]	0.700 [17.78]	
	CSC09	8	0.890 [22.61]	0.800 [20.32]	
	CSC10	9	0.990 [25.15]	0.900 [22.86]	
	CSC11*	10	1.09 [27.69]	1.00 [25.40]	
	CSC12*	11	1.19 [30.23]	1.100 [27.94]	
03 Schematic	GLOBAL MODEL	NUMBER OF RESISTORS	A (Maximum)	B	C (Maximum)
	CSC04	2	0.390 [9.90]	0.300 [7.62]	"A" Profile = 0.195 [4.95] "B" Profile = 0.250 [6.35]
	CSC06	3	0.590 [14.99]	0.500 [12.70]	
	CSC08	4	0.790 [20.07]	0.700 [17.78]	
	CSC10	5	0.990 [25.15]	0.900 [22.86]	
	CSC12*	6	1.19 [30.23]	1.100 [27.94]	
05 Schematic	GLOBAL MODEL	NUMBER OF RESISTORS	A (Maximum)	B	C (Maximum)
	CSC04	4	0.390 [9.90]	0.300 [7.62]	"A" Profile = 0.195 [4.95] "B" Profile = 0.250 [6.35]
	CSC05	6	0.490 [12.45]	0.400 [10.16]	
	CSC06	8	0.590 [14.99]	0.500 [12.70]	
	CSC07	10	0.690 [17.53]	0.600 [15.24]	
	CSC08	12	0.790 [20.07]	0.700 [17.78]	
	CSC09	14	0.890 [22.61]	0.800 [20.32]	
	CSC10	16	0.990 [25.15]	0.900 [22.86]	
	CSC11*	18	1.09 [27.69]	1.00 [25.40]	
	CSC12*	20	1.19 [30.23]	1.100 [27.94]	

* "B" Profile only.

MECHANICAL SPECIFICATIONS	
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E, RMA flux.
Body:	High alumina, epoxy coated.
Terminals:	Solder plated leads.

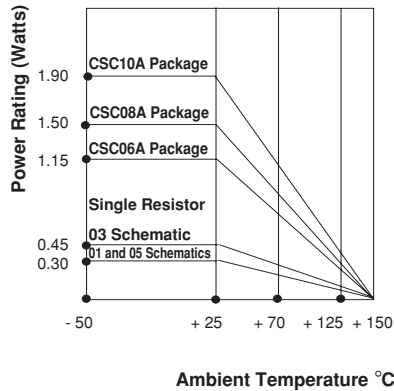
STOCKED RESISTANCE VALUES IN OHMS ("G" TOLERANCE)

Standard E-24 resistance values stocked. Consult factory.

Many dual terminator resistance values stocked. Consult factory

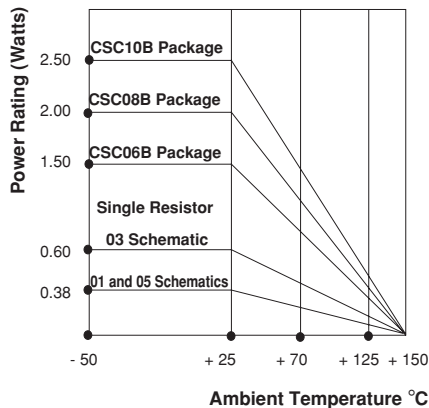
IMPEDANCE CODES					
CODE	$R_1(\Omega)$	$R_2(\Omega)$	CODE	$R_1(\Omega)$	$R_2(\Omega)$
500B	82	130	141A	270	270
750B	120	200	181A	330	390
800C	130	210	191A	330	470
990A	160	260	221B	330	680
101C	180	240	281B	560	560
111C	180	270	381B	560	1.2K
121B	180	390	501C	620	2.7K
121C	220	270	102A	1.5K	3.3K
131A	220	330	202B	3K	6.2K

"A" Profile



"A" PROFILE + 70°C PACKAGE RATINGS	
CSC12A	1.5 watts
CSC11A	1.37 watts
CSC10A	1.25 watts
CSC09A	1.12 watts
CSC08A	1.00 watts
CSC07A	0.87 watts
CSC06A	0.75 watts
CSC05A	0.62 watts
CSC04A	0.40 watts

"B" Profile



"B" PROFILE + 70°C PACKAGE RATINGS	
CSC12B	1.90 watts
CSC11B	1.75 watts
CSC10B	1.60 watts
CSC09B	1.45 watts
CSC08B	1.30 watts
CSC07B	1.15 watts
CSC06B	1.00 watts
CSC05B	0.80 watts
CSC04B	0.60 watts

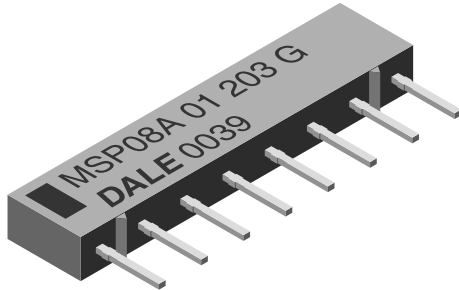
CIRCUIT APPLICATIONS	
<p>01 Schematic</p>	<p>"A" Profile = 3, 5, 7, 9 and 11 resistors with one pin common</p> <p>The CSCxxx01 single-in-line resistor networks provide the user with nominally equal resistors, each connected to a common pin (Pin No. 1). Commonly used in the following applications:</p> <ul style="list-style-type: none"> • "Wired OR" Pull-up • Power Gate Pull-up • MOS/ROM Pull-up/Pull-down • Open Collector Pull-up • TTL Input Pull-down • TTL Unused Gate Pull-up <p>* "B" Profile available. Odd pin available in 5, 7, 9, and 11.</p>
<p>03 Schematic</p>	<p>"A" Profile = 2 through 6 isolated resistors</p> <p>The CSCxxx03 single-in-line resistor networks provide the user with nominally equal resistors. Each resistor is isolated from all others. Commonly used in the following applications:</p> <ul style="list-style-type: none"> • "Wired OR" Pull-up • Power Driven Pull-up • Power Gate Pull-up • Line Termination • Long-Line Impedance Balancing • LED Current Limiting • ECL Output Pull-down • TTL Input Pull-down <p>* "B" Profile available.</p>
<p>05 Schematic</p>	<p>Pulse squaring and TTL dual-line terminators</p> <p>The CSCxxx05 circuits contain series pairs of resistors. Each series pair is connected between two common lines. The junction of these resistor pairs is connected to the input terminals. The 05 circuits are designed for TTL dual-line termination and pulse squaring.</p> <p>* "B" Profile available. Odd pin available in 5, 7, 9 and 11.</p>

PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Thermal Shock	5 cycles between - 65°C and + 125°C	$\pm 0.50\% \Delta R$
Short Time Overload	2.5 x rated working voltage, 5 seconds	$\pm 0.25\% \Delta R$
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	$\pm 0.25\% \Delta R$
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	$\pm 1.00\% \Delta R$
Resistance to Soldering Heat	Leads immersed in + 350°C solder to within 1/16" of body for 3 seconds	$\pm 0.25\% \Delta R$
Shock	Total of 18 shocks at 100 G's	$\pm 0.25\% \Delta R$
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	$\pm 0.25\% \Delta R$
Load Life	1,000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period. Derated according to the curve.	$\pm 1.00\% \Delta R$
Terminal Strength	4.5 pound pull for 30 seconds	$\pm 0.25\% \Delta R$
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	—

Thick Film Resistor Networks

Single-In-Line, Molded SIP; 01, 03, 05 Schematics

6, 8, 9 or 10 Pin "A" Profile and 6, 8 or 10 Pin "C" Profile



FEATURES

- 0.195" [4.95mm] "A" or 0.350" [8.89mm] "C" maximum seated height
- Highly stable thick film
- Low temperature coefficient (- 55°C to + 125°C) ± 100ppm/°C
- Rugged, molded case construction
- Reduces total assembly costs
- Compatible with automatic insertion equipment and reduces PC board space
- Wide resistance range
- Available in tube pack or side-by-side pack

STANDARD ELECTRICAL SPECIFICATIONS

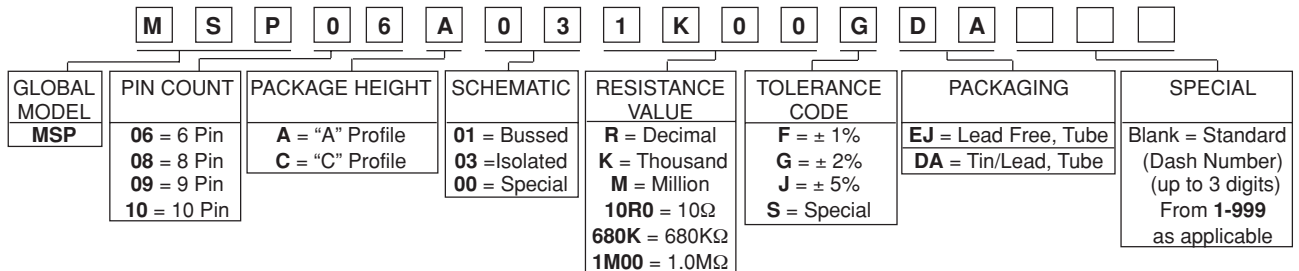
GLOBAL MODEL/ SCHEMATIC	PROFILE	RESISTOR POWER RATING Max. @ 70°C* W	RESISTANCE RANGE Ω	STANDARD TOLERANCE %	TEMPERATURE COEFFICIENT (- 55°C to + 125°C) ppm/°C	TCR TRACKING* (- 55°C to + 125°C) ppm/°C	OPERATING VOLTAGE Max. VDC
MSPxxx01	A C	0.20 0.25	10 - 2.2M	± 2 Standard (1, 5)**	± 100	± 50ppm/°C	100
MSPxxx03	A C	0.30 0.40	10 - 2.2M	± 2 Standard (1, 5)**	± 100	± 50ppm/°C	100
MSPxxx05	A C	0.20 0.25	10 - 2.2M	± 2 Standard (± 5%)**	± 100	± 150ppm/°C	100

* Tighter tracking available

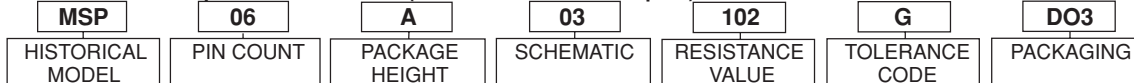
** Tolerances in brackets available on request

GLOBAL PART NUMBER INFORMATION

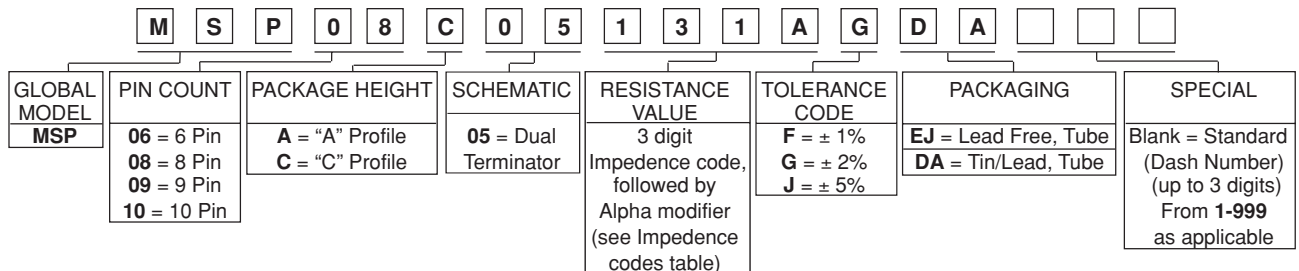
New Global Part Numbering: MSP06A031K00GDA (preferred part numbering format)



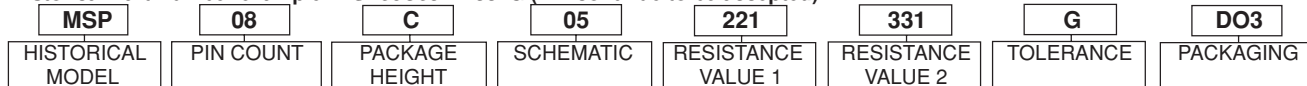
Historical Part Number example: MSP06A03102G (will continue to be accepted)



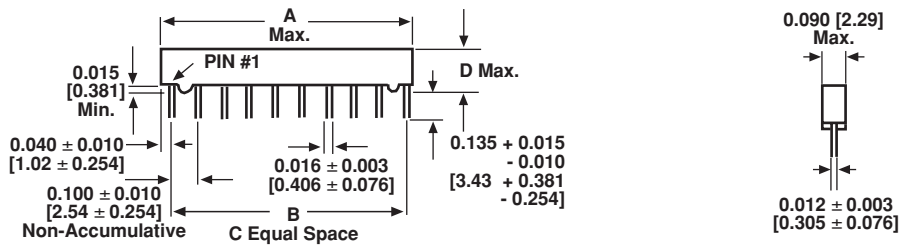
New Global Part Numbering: MSP08C05131AGDA (preferred part numbering format)



Historical Part Number example: MSP08C05221331G (will continue to be accepted)



DIMENSIONS in inches [millimeters]



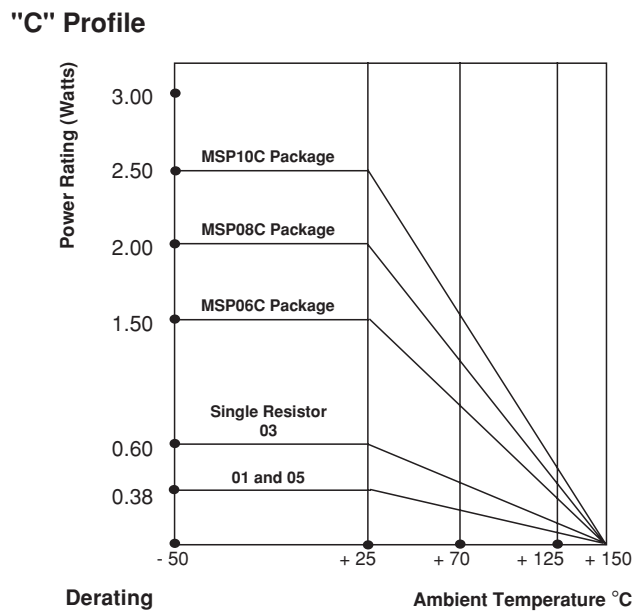
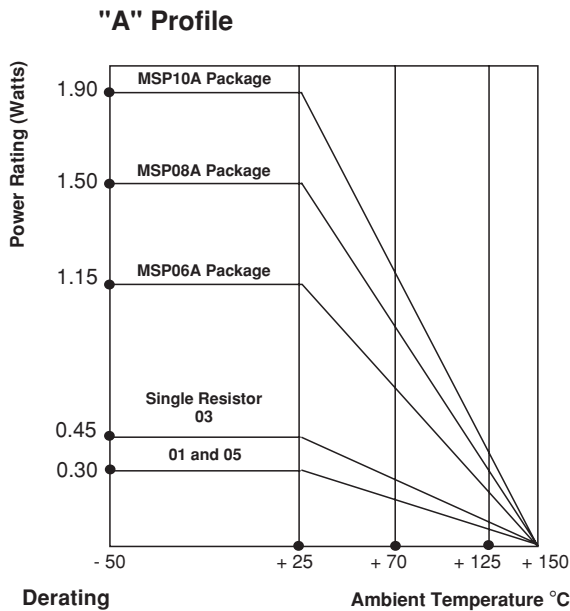
GLOBAL MODEL	A (Max.)	B	C	D (Max.)
MSP06	0.590 [14.99]	0.500 [12.70]	5	MSPxxA = 0.195 [4.95] MSPxxC = 0.350 [8.89]
MSP08	0.790 [20.07]	0.700 [17.78]	7	
MSP10	0.990 [25.15]	0.900 [22.86]	9	
MSP09	0.890 [22.61]	0.800 [20.32]	8	0.195 [4.95] ONLY

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	MSP SERIES
Package Power Rating (Maximum at + 25°C and + 70°C)		See Derating Curves
Voltage Coefficient of Resistance	V _{eff}	< 50ppm typical
Dielectric Strength	VAC	200
Isolation Resistance (03 Schematic)	Ω	> 100M
Operating Temperature Range	°C	- 55 to + 125
Storage Temperature Range	°C	- 55 to + 150

MECHANICAL SPECIFICATIONS	
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E, RMA flux.
Body:	Molded epoxy.
Terminals:	Copper alloy, solder plated.
Weight:	MSP06A = 0.4 gram MSP06C = 0.7 gram MSP08A = 0.5 gram MSP08C = 0.9 gram MSP09A = 0.55 gram MSP10C = 1.1 gram MSP10A = 0.6 gram

IMPEDANCE CODES					
CODE	$R_1(\Omega)$	$R_2(\Omega)$	CODE	$R_1(\Omega)$	$R_2(\Omega)$
500B	82	130	141A	270	270
750B	120	200	181A	330	390
800C	130	210	191A	330	470
990A	160	260	221B	330	680
101C	180	240	281B	560	560
111C	180	270	381B	560	1.2K
121B	180	390	501C	620	2.7K
121C	220	270	102A	1.5K	3.3K
131A	220	330	202B	3K	6.2K

CIRCUIT APPLICATIONS	
<p>01 Schematic</p>	<p>5, 7, 8* or 9 resistors with one pin common</p> <p>The MSPxxx01 circuit contains 5, 7, 8* or 9 nominally equal resistors, each connected between a common pin (Pin No. 1) and a discrete PC board pin. Commonly used in the following applications:</p> <ul style="list-style-type: none"> • "Wired OR" Pull-up • Power Gate Pull-up • TTL Input Pull-down • MOS/ROM Pull-up/Pull-down • Open Collector Pull-up • TTL Unused Gate Pull-up <p>* Available in "A" Profile only Standard E-24 resistance values stocked. Consult factory.</p>
<p>03 Schematic</p>	<p>3, 4 or 5 isolated resistors</p> <p>The MSPxxx03 circuit contains 3, 4 or 5 resistors of nominally equal value in a compact package. Each resistor is connected to two discrete PC pins.</p> <p>Standard E-24 resistance values stocked. Consult factory.</p>
<p>05 Schematic</p>	<p>Pulse squaring and TTL dual-line terminators</p> <p>The MSPxxx05 circuits contain 4, 6, 7* or 8 series pair of resistors. Each series pair is connected between two common lines. The junction of these resistor pairs is connected to the input terminals.</p> <p>The 05 circuits are designed for TTL dual-line termination and pulse squaring.</p> <p>* Available in "A" Profile only Many dual terminator resistance values stocked. Consult factory.</p>



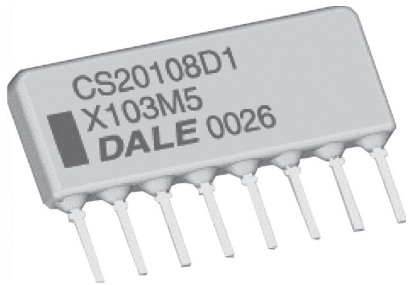
"A" PROFILE + 70°C PACKAGE RATINGS	
MSP10A	1.25 watts
MSP09A	1.12 watts
MSP08A	1.00 watts
MSP06A	0.75 watts

"C" PROFILE + 70°C PACKAGE RATINGS	
MSP10C	1.60 watts
MSP08C	1.30 watts
MSP06C	1.00 watts

Higher power ratings available. Contact factory.

PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 x rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours ± 4 hours at + 25°C ambient temperature	± 0.50% ΔR
Thermal Shock	5 cycles between - 65°C and + 125°C	± 0.50% ΔR
Short Time Overload	2.5 x rated working voltage 5 seconds	± 0.25% ΔR
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	± 0.25% ΔR
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	± 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 260°C solder to within 1/16" of device body for 10 seconds	± 0.25% ΔR
Shock	Total of 18 shocks at 100 G's	± 0.25% ΔR
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	± 0.25% ΔR
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1,000 hour period. Derated according to the curve.	± 1.00% ΔR
Terminal Strength	4.5 pound pull for 30 seconds	± 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage		—

Capacitor Networks, Single-In-Line, Coated SIP, "D" Profile



FEATURES

- X7R and COG capacitors available
- Multiple isolated capacitors
- Multiple capacitors, common ground
- Custom design capability
- "D" 0.300" [7.62mm] package height (maximum)

STANDARD ELECTRICAL SPECIFICATIONS

VISHAY DALE MODEL	PROFILE	SCHEMATIC	CAPACITANCE RANGE		CAPACITANCE TOLERANCE (-55°C to +125°C) %	CAPACITOR VOLTAGE @ 85°C VDC
			COG*	X7R		
CS201	D	1	33pF-3900pF	470pF-0.1μF	± 10 (K), ± 20 (M)	50 (5)
CS201	D	3	33pF-3900pF	470pF-0.1μF	± 10 (K), ± 20 (M)	50 (5)
CS201	D	4	33pF-3900pF	470pF-0.1μF	± 10 (K), ± 20 (M)	50 (5)

*COG capacitors may be substituted for X7R capacitors

TECHNICAL SPECIFICATIONS

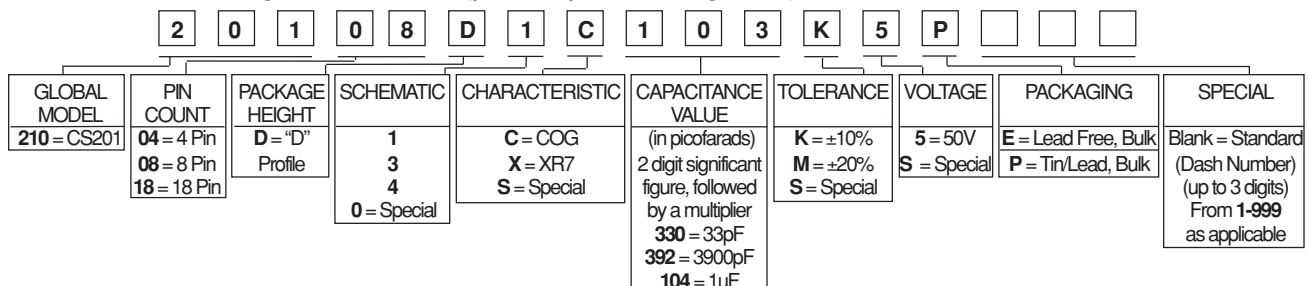
PARAMETER	UNIT	CS201	
		COG	X7R
Temperature Coefficient (-55°C to +125°C)	ppm/°C or %	± 30 ppm/°C	± 15%
Dissipation Factor (maximum)	± %	0.15	2.5

MECHANICAL SPECIFICATIONS

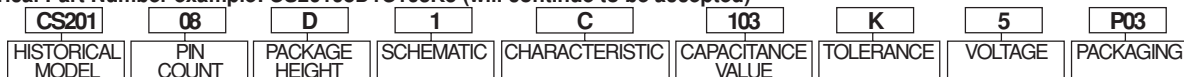
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E.
Body:	High alumina, epoxy coated. (Flammability UL94 V-0.)
Terminals:	Phosphorus-bronze, solder plated.
Marking:	Pin #1 identifier, DALE or D, Part number (abbreviated as space allows), Date code.

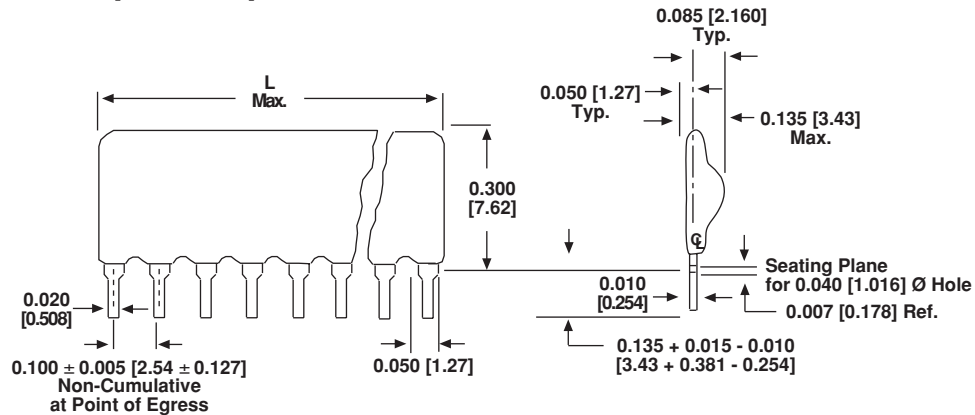
GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: 20108D1C103K5P (preferred part numbering format)



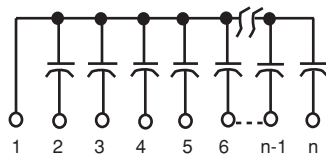
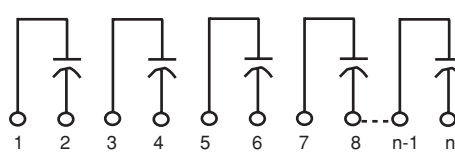
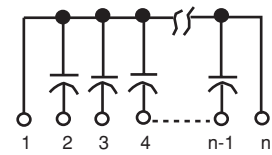
Historical Part Number example: CS20108D1C103K5 (will continue to be accepted)



DIMENSIONS in inches [millimeters]


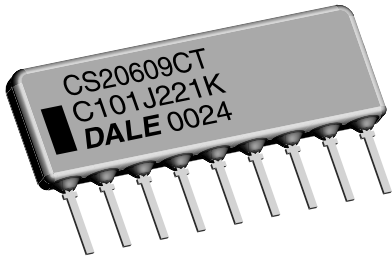
Pin #1 is extreme left-hand terminal on side with marking.

NUMBER OF PINS	L MAXIMUM	NUMBER OF PINS	L MAXIMUM	NUMBER OF PINS	L MAXIMUM
4 pin	0.400 [10.16]	9 pin	0.900 [22.86]	14 pin	1.400 [35.56]
5 pin	0.500 [12.70]	10 pin	1.000 [25.40]	15 pin	1.500 [38.10]
6 pin	0.600 [15.24]	11 pin	1.100 [27.94]	16 pin	1.600 [40.64]
7 pin	0.700 [17.78]	12 pin	1.200 [30.48]	17 pin	1.700 [43.18]
8 pin	0.800 [20.32]	13 pin	1.300 [33.02]	18 pin	1.800 [45.72]

SCHEMATICS
Schematic 1

Common Bus - 1 Ground Lead
Schematic 3

Isolated Capacitor Sections
Schematic 4

Common Bus - 2 Ground Leads

Resistor/Capacitor Networks

ECL Terminators and Line Terminator, Conformal Coated, SIP



FEATURES

- 4 to 18 pins available
- X7R and COG capacitors available
- Low cross talk
- Custom design capability
- "B" 0.250" [6.35mm], "C" 0.350" [8.89mm] and "E" 0.325" [8.26mm] maximum seated height available, dependent on schematic
- 10k ECL terminators, Circuits E and M. 100k ECL terminators, Circuit A. Line terminator, Circuit T.

STANDARD ELECTRICAL SPECIFICATIONS

VISHAY DALE MODEL	PROFILE	SCHEMATIC	RESISTOR CHARACTERISTICS					CAPACITOR CHARACTERISTICS	
			POWER RATING P _{70°C} W	RESISTANCE RANGE Ω	RESISTANCE TOLERANCE ± %	TEMP. COEFF. ± ppm/°C	T.C.R. TRACKING ± ppm/°C	CAPACITANCE RANGE	CAPACITANCE TOLERANCE ± %
CS206	B M	E	0.125	10-1M	2, 5	200	100	0.01µF	10(K), 20(M)
CS206	C	T	0.125	10-1M	2, 5	200	100	33pF to 0.1µF	10(K), 20(M)
CS206	E	A	0.125	10-1M	2, 5	200	100	0.01µF	10(K), 20(M)

TECHNICAL SPECIFICATIONS

PARAMETER	UNIT	CS206
Operating Voltage (at + 25°C)	VAC	50 maximum
Dissipation Factor (maximum)	%	COG = 0.15; X7R = 2.5
Insulation Resistance (at + 25C /rated voltage)	MΩ	100,000
Dielectric Test	V	2.5 x rated voltage
Operating Temperature Range	°C	- 55 to + 125°C

Capacitor Temperature Coefficient:

COG maximum 0.15%, X7R maximum 2.5%

Package Power Rating (maximum at 70°C):

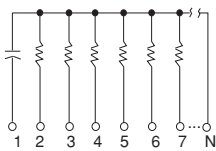
8 PINS = 0.80 Watt
 9 PINS = 0.90 Watt
 10 PINS = 1.00 Watt

EIA Characteristics:

COG and X7R (COG capacitors may be substituted for X7R capacitors).

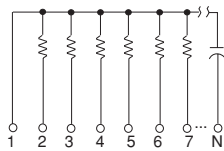
SCHEMATICS in inches [millimeters]

0.250" [6.35] High ("B" Profile)



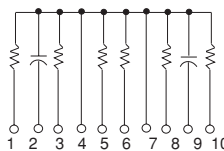
Circuit E

0.250" [6.35] High ("B" Profile)



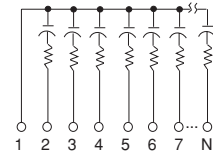
Circuit M

0.325" [8.26] High ("E" Profile)



Circuit A

0.350" [8.89] High ("C" Profile)



Circuit T

GLOBAL PART NUMBER INFORMATION

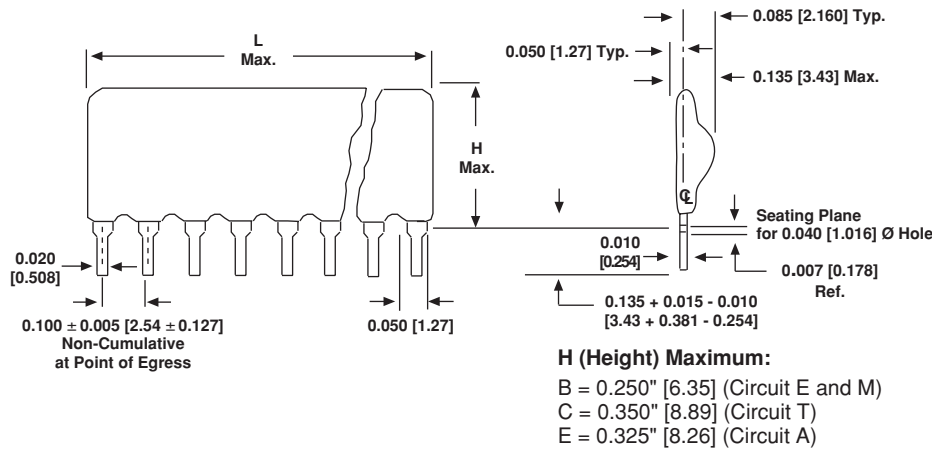
New Global Part Numbering: 20608EC103G471KP (preferred part numbering format)



GLOBAL MODEL	PIN COUNT	PACKAGE/SCHEMATIC	CHARACTERISTIC	RESISTANCE HEIGHT	RES. TOLERANCE	CAPACITANCE VALUE	CAP. TOLERANCE	PACKAGING	SPECIAL
206 = CS206	04 = 4 Pin 08 = 8 Pin 18 = 18 Pin	E = BE M = BM A = EA T = CT S = Special	C = COG X = XR7 S = Special	2 digit significant figure, followed by a multiplier 100 = 10Ω 333 = 33KΩ 105 = 1MΩ	G = ± 2% J = ± 5% S = Special	(in picofarads) 2 digit significant figure, followed by a multiplier 330 = 33pF 392 = 390pF 104 = 1µF	K = ±10% M = ±20% S = Special	E = Lead Free, Bulk P = Tin/Lead, Bulk	Blank = Standard (Dash Number) (up to 2 digits)

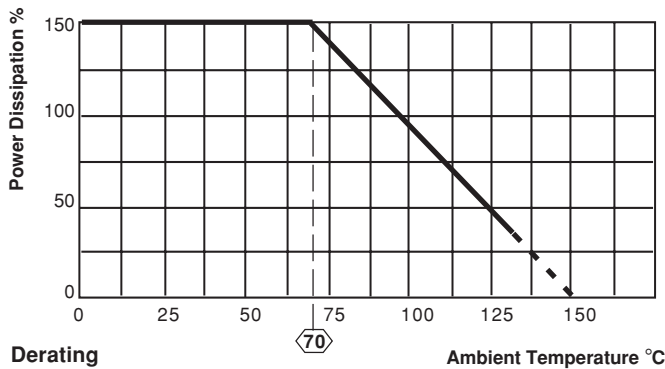
Historical Part Number example: CS20608BEC103G471KP03 (will continue to be accepted)

CS206	08	B	E	C	103	G	471	K	P03
HISTORICAL MODEL	PIN COUNT	PACKAGE HEIGHT	SCHEMATIC	CHARACTERISTIC	RESISTANCE VALUE	RES. TOLERANCE	CAPACITANCE VALUE	CAP. TOLERANCE	PACKAGING

DIMENSIONS in inches [millimeters]


Pin #1 is extreme left-hand terminal on side with marking.

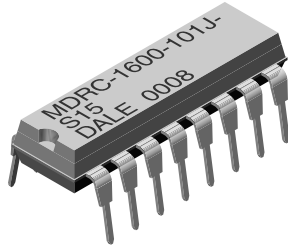
NUMBER OF PINS	L MAXIMUM
4 pin	0.400 [10.16]
5 pin	0.500 [12.70]
6 pin	0.600 [15.24]
7 pin	0.700 [17.78]
8 pin	0.800 [20.32]
9 pin	0.900 [22.86]
10 pin	1.000 [25.40]
11 pin	1.100 [27.94]
12 pin	1.200 [30.48]
13 pin	1.300 [33.02]
14 pin	1.400 [35.56]
15 pin	1.500 [38.10]
16 pin	1.600 [40.64]
17 pin	1.700 [43.18]
18 pin	1.800 [45.72]



MATERIAL SPECIFICATIONS	
Flammability:	UL 94V-0.
Lead Material:	Phosphorus-bronze, solder plated.
Body Material:	Epoxy coated.
Solderability:	Per MIL-STD-202, Method 208E.
Part Marking:	Pin #1 identification, part number (abbreviated as space allows), DALE® or D, date code
Moisture Resistance:	Meets requirements of MIL-STD-202, Method 106.

PERFORMANCE		
TEST	CONDITION	MAX. ΔR (Typical Test Lots)
Thermal Shock	Subject to 5 cycles from - 65°C to + 125°C.	± 0.5% ΔR
Short Time Overload	2.5 x rated working voltage for 5 seconds at + 25°C.	± 0.25% ΔR
Moisture Resistance	Cycle from + 25°C to + 65°C to + 25°C over 8 hours at 90 - 98% relative humidity, with 10% of rated power applied, for 20 cycles. Stop cycling after an even number of cycles and stabilize networks at high humidity for 1 to 4 hours. Condition networks at -10°C for 3 hours, then return to temperature cycling. On completion of cycling condition networks at + 25°C at 50% r.h. for 22 to 24 hours.	± 0.5% ΔR
Resistance to Soldering Heat	Immerse pins in melted solder to the lead standoffs at + 350°C for 3 seconds max.	± 0.25% ΔR
Mechanical Shock	18 shocks of 100 G and 6 ms.	± 0.25% ΔR
Vibration	12 cycles varied logarithmically from 10Hz to 2000Hz to 10Hz over 20 minutes.	± 0.25% ΔR
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON, 0.5 hour "OFF".	± 1.0% ΔR
Resistance to Solvents	Immerse and scrub samples with isopropyl alcohol, trichlorethylene and Freon TMC.	Marking remains legible
Solderability	Immerse leads in 60/40 tin-lead solder using R flux at + 245°C for 5 seconds maximum.	Minimum 95% solder coverage
Terminal Strength	Withstand 2.2 kg pull 1 minute.	± 0.25% ΔR
Case Insulation Resistance	100 V applied between case and terminals tied together.	IR = 10,000 Megohm minimum

Resistor/Capacitor Networks, Dual-In-Line, Molded DIP, 16 Pin



FEATURES

- 0.190" [4.83mm] maximum seated height
- Rugged molded case construction
- Highly stable thick film
- Reduces total assembly cost
- Low temperature coefficient (- 30°C to + 85°C) ± 100ppm/°C
- Compatible with automatic insertion equipment
- Reduces PC board space

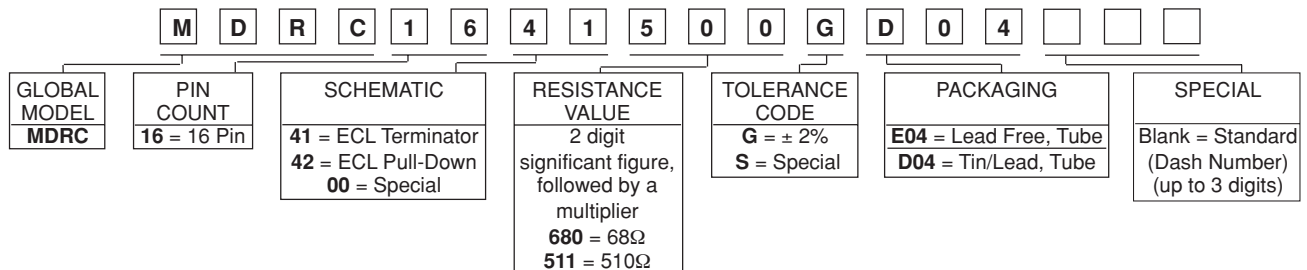
STANDARD ELECTRICAL SPECIFICATIONS

GLOBAL MODEL	SCHEMATIC	POWER RATING $P_{25^{\circ}\text{C}}$ W	RESISTOR CHARACTERISTICS				CAPACITOR CHARACTERISTICS	
			PACKAGE POWER RATING W @ + 25°C	RESISTANCE TOLERANCE ± %	TEMPERATURE COEFFICIENT (- 20°C to + 85°C) Typical	T.C.R. TRACKING ± ppm/°C	CAPACITANCE TOLERANCE	CAPACITANCE VOLTAGE RATING V Max.
MDRC	1641	0.15 max.	2.0 max.	± 2, or 2Ω*	± 100ppm/°C	50	0.1μF + 40%, - 20%	25
MDRC	1642	0.15 max.	2.0 max.	± 2, or 2Ω*	± 100ppm/°C	50	0.1μF + 40%, - 20%	25
MDRC	1643	0.20 max.	2.0 max.	± 2, or 2Ω*	± 100ppm/°C	50	0.1μF + 40%, - 20%	25

* Whichever is greater

GLOBAL PART NUMBER INFORMATION

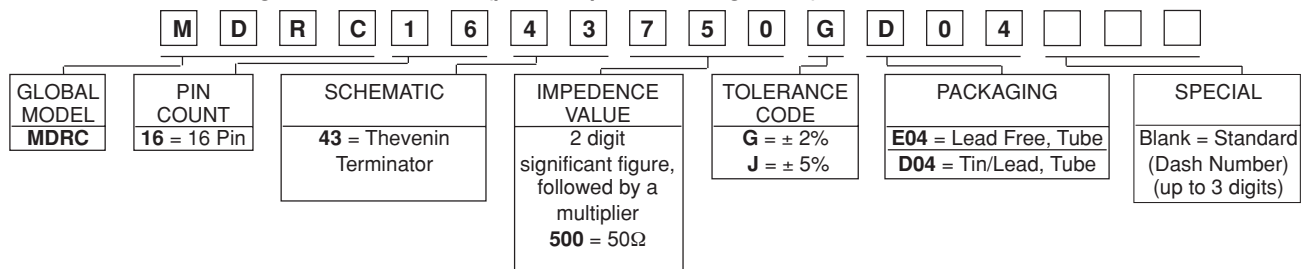
New Global Part Numbering: MDRC1641500GD04 (preferred part numbering format)



Historical Part Number example: MDRC1641500G (will continue to be accepted)



New Global Part Numbering: MDRC1643750GD04 (preferred part numbering format)

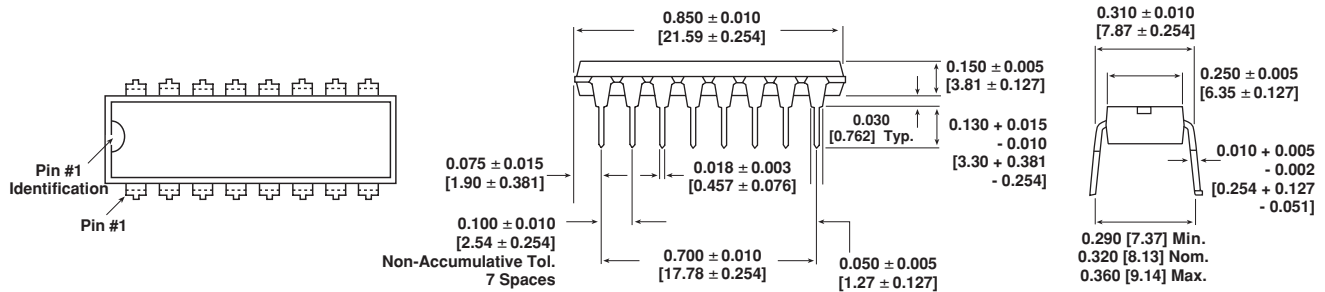


Historical Part Number example: MDRC1643750G (will continue to be accepted)





DIMENSIONS in inches [millimeters]



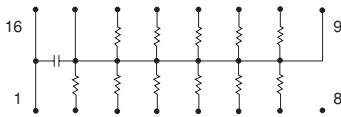
RESISTANCE VALUE IN OHMS (G Tolerance)			
MDRC1641 50, 68, 75, 100	MDRC1643		
	R ¹	R ²	Z ₀
	81	130	50
MDRC1642 510	121	195	75
	162	260	100

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	MDRC
Operating Voltage (at + 25°C)	VAC	50 maximum
Capacitor Dissipation Factor	%	< 3
Voltage Coefficient of Resistance (typical)	ppm/V	< 50
Operating Temperature Range	°C	- 30 to + 85°C
Storage Temperature Range	°C	- 30 to + 85°C

MECHANICAL SPECIFICATIONS	
Marking Resistance to Solvents:	Permanency testing per MIL-STD-202, Method 215.
Solderability:	Per MIL-STD-202, Method 208E.
Terminals:	Copper alloy, solder plated.
Body:	Molded epoxy.
Weight:	1.5 grams.

CIRCUIT APPLICATIONS

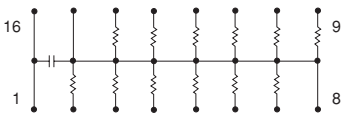
MDRC1641 Schematic



- 2.0 and - 5.2 Volt ECL Terminator

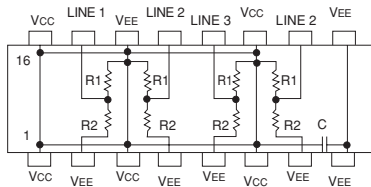
The MDRC1641 circuit contains 11 resistors of nominally equal value and a .01 microfarad decoupling capacitor. The MDRC-1641 is designed for ECL Line Termination to a - 2.0 volt buss. The .01 microfarad decoupling capacitor is for bypassing transients between supply voltages.

MDRC1642 Schematic



The MDRC1642 circuit contains 12 resistors of 510 ohm each and a .01 microfarad decoupling capacitor. The MDRC-1642 is designed for ECL Pull-down to a - 5.2 volt buss. The .01 microfarad decoupling capacitor is for bypassing voltage transients on the voltage buss.

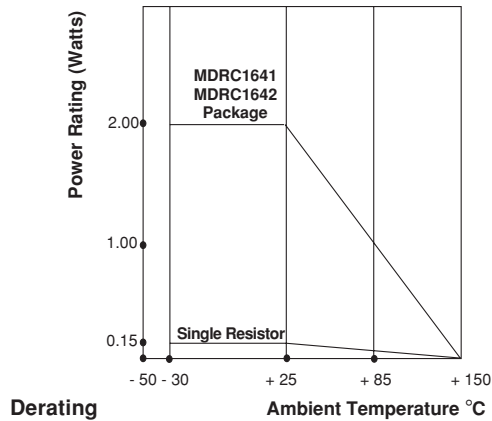
MDRC1643 Schematic



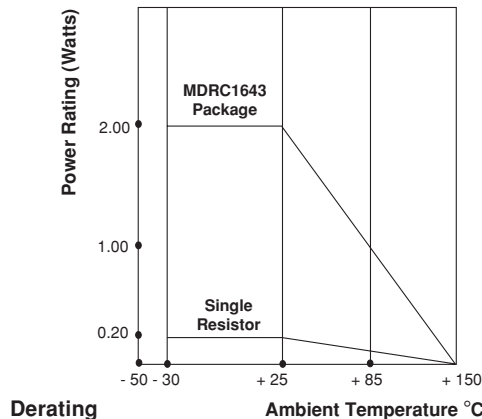
Thevenin Equivalent Terminator

The MDRC1643 contains four pair of series resistors. The circuit is compatible with ECL pin configurations. Each terminator section (series pair) contains a voltage divider between VCC (0 volt) and VEE (- 5.2 volt) providing a Thevenin equivalent voltage of - 2.0 volts. A .01 microfarad decoupling capacitor bypasses the VEE buss.

MDRC1641 and MDRC1642



MDRC1643





PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Thermal Shock	MDRC1641 and MDRC1642, 5 cycles between - 30°C and + 85°C MDRC1643, 5 cycles between - 65°C and + 125°C	$\pm 0.50\% \Delta R$
Short Time Overload	2.5 x rated working voltage 5 seconds	$\pm 0.25\% \Delta R$
Low Temperature Operation	MDRC1641 and MDRC1642, 45 minutes at full rated working voltage at - 30°C MDRC1643, 45 minutes at full rated working voltage at - 65°C	$\pm 0.25\% \Delta R$
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	$\pm 0.50\% \Delta R$
Resistance to Soldering Heat	Leads immersed in + 350°C solder to within 1/16" of device body for 3 seconds	$\pm 0.25\% \Delta R$
Shock	Total of 18 shocks at 100 G's	$\pm 0.25\% \Delta R$
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	$\pm 0.25\% \Delta R$
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period. Derated according to the curve.	$\pm 0.50\% \Delta R$
Terminal Strength	4.5 pound pull for 30 seconds	$\pm 0.25\% \Delta R$
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	(200 V RMS for 1 minute)	—

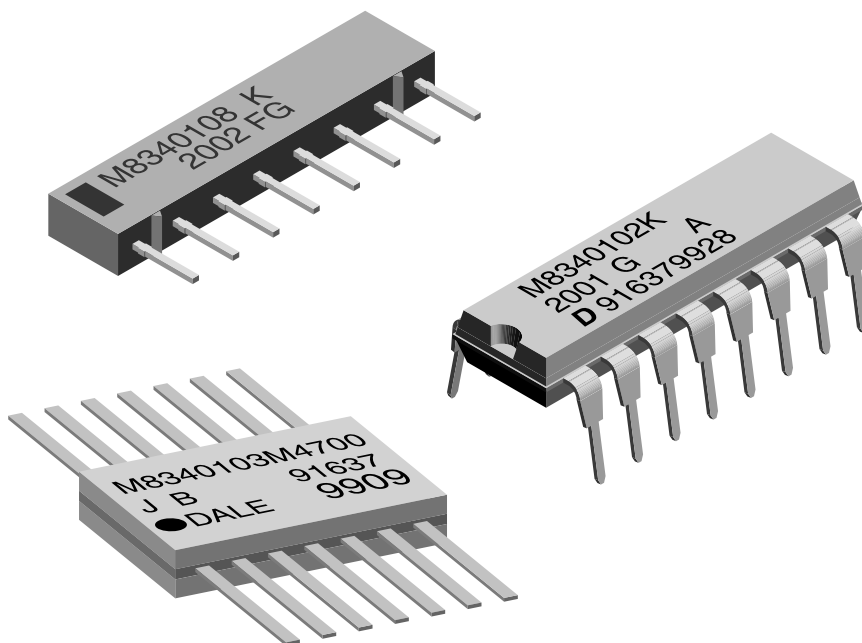


MIL Resistor Networks

SIL, DIL or Custom Configurations

•
Isolated, Bussed or TTL-Terminator Circuits

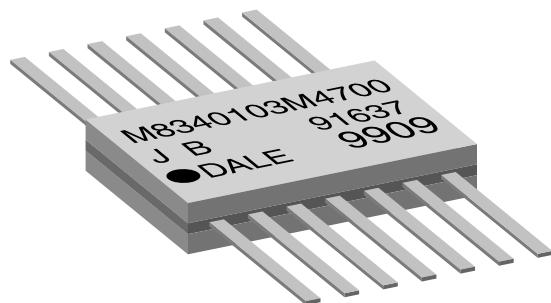
•
High Packaging Density



Model Numbers

DFM.....	68
MDM14, 16.....	72
MSM.....	76

Thick Film Resistor Networks, Military, MIL-PRF-83401 Qualified, Type RZ030, Schematics A (11), B (12), J (15)



FEATURES

- 11, 12, 15 Schematics; hot-solder dipped
- MIL-PRF-83401 qualified
- Highly stable thick film
- TCR available in "K" ($\pm 100\text{ppm}/^\circ\text{C}$) or "M" ($\pm 300\text{ppm}/^\circ\text{C}$) characteristic
- 100% screen tested per Group A, Subgroup 1 of MIL-PRF-83401
- 0.065" [1.65mm] height for high density packaging

STANDARD ELECTRICAL SPECIFICATIONS

VISHAY DALE MODEL	POWER RATING		CIRCUIT SCHEMATIC	LIMITING ELEMENT VOLTAGE MAX. V_{\cong}	TEMPERATURE COEFFICIENT ¹⁾ (-55°C to + 125°C)	STANDARD ²⁾ TOLERANCE %	RESISTANCE RANGE Ω
	P _{70°C} ELEMENT W	P _{70°C} PACKAGE W					
DFM	0.050	0.350	11	50	K, M	2	10R0 – 1M0
	0.025	0.325	12	50	K, M	2	10R0 – 1M0
	0.015	0.350	15	50	K, M	2	see table

¹⁾ K = $\pm 100\text{ppm}/^\circ\text{C}$; M = $\pm 300\text{ppm}/^\circ\text{C}$

²⁾ $\pm 1\%$ and $\pm 5\%$ tolerance available

• Consult factory for stocked values

GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: M8340103M6801GAD05 (preferred part numbering format)

M 8 3 4 0 1 0 3 M 6 8 0 1 G A D 0 5

MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING
M83401	03	K = 100ppm M = 300ppm	3 digit significant figure, followed by a multiplier 10R0 = 10 Ω 3302 = 33K Ω 1004 = 1M Ω	F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	A = Isolated B = Bussed	D05 = Tin/Lead, Tube

Historical Part Number example: M8340103M6801GA (will continue to be accepted)

M83401	03	M	6801	G	A	D05
MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING

New Global Part Numbering: M8340103KA001GJD05 (preferred part numbering format)

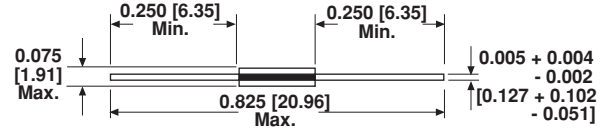
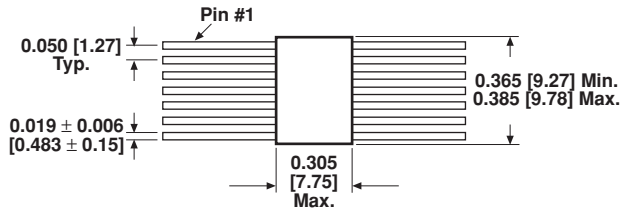
M 8 3 4 0 1 0 3 K A 0 0 1 J A D 0 5

MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING
M83401	03	K = 100ppm M = 300ppm	Per std. Mil. Spec (see Impedance Codes table)	F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	J = Dual Terminator	D05 = Tin/Lead, Tube

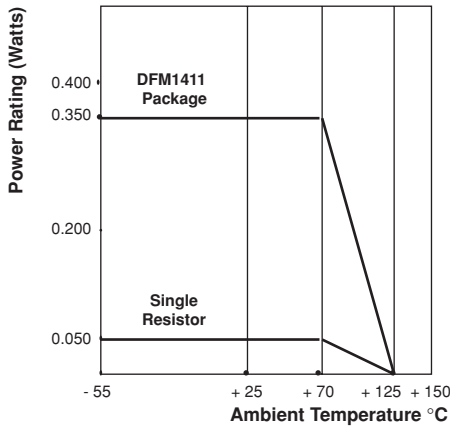
Historical Part Number example: M8340103KA001GJ (will continue to be accepted)

M83401	03	K	A001	G	J	D05
MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING

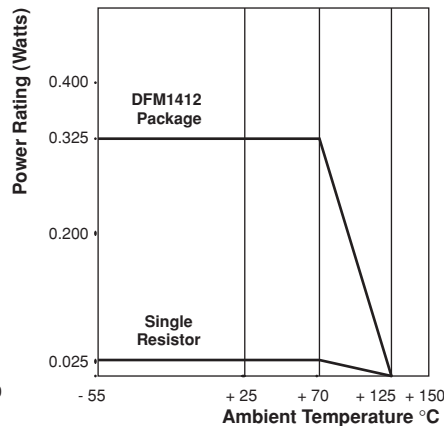
DIMENSIONS in inches [millimeters]



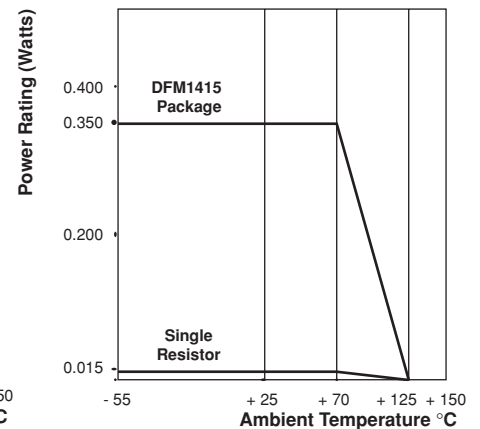
11 Schematic



12 Schematic



15 Schematic



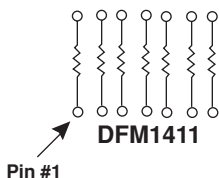
Derating

MECHANICAL SPECIFICATIONS	
Marking Resistance to Solvents	Permanency testing per MIL-PRF-83401
Solderability	Per MIL-PRF-83401.
Terminals	Per MIL-STD-1276 DFM1411, DFM1412 and DFM1415 = Type G (hot solder dipped) Hot solder dipped leads supplied as standard finish.
Body	Epoxy filled ceramic sandwich

IMPEDANCE CODES					
CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
A001	82	130	A010	330	470
A002	120	200	A011	330	680
A003	130	210	A012	1.5K	3.3K
A004	160	260	A013	3K	6.2K
A005	180	240	A014	180	270
A006	180	390	A015	270	270
A007	220	270	A016	560	560
A008	220	330	A017	560	1.2K
A009	330	390	A018	620	2.7K

CIRCUIT APPLICATIONS

11 Schematic



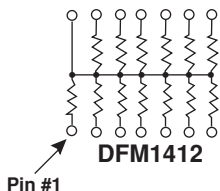
DFM1411 (M8340103xxxxxA)

7 isolated resistors

The DFM1411 provides the user with 7 nominally equal resistors with each resistor isolated from all others. Commonly used in the following applications:

- "Wired OR" Pull-up
- Line Termination
- LED Current Limiting
- Power Driven Pull-up
- ECL Output Pull-down
- Power Gate Pull-up
- TTL Input Pull-down
- Long-line Impedance balancing

12 Schematic



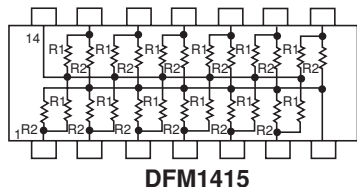
DFM1412 (M8340103xxxxxB)

13 resistors with one pin common

The DFM1412 provides the user with a choice of 13 nominally equal resistors, each connected to a common pin. Commonly used in the following applications:

- MOS/ROM Pull-up/ Pull-down
- "Wired OR" Pull-up
- Digital Pulse Squaring
- Open Collector Pull-up
- Power Driven Pull-up
- TTL Input Pull-down
- High Speed Parallel Pull-up
- TTL Unused Gate Pull-up

15 Schematic



DFM1415 (M8340103xxxxxJ)

12 pairs of resistors

The DFM1415 provides the user with a choice of 12 pairs of R1/R2 resistor values for pulse squaring and TTL dual-line terminating requirements.

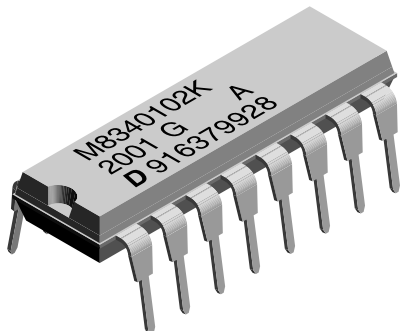


PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 x rated power, applied 1.5 hours "ON" and 0.5 hours "OFF" for 100 hours \pm 4 hours at + 25°C ambient temperature	\pm 0.50% ΔR
Thermal Shock	5 cycles between - 65°C and + 125°C	\pm 0.50% ΔR
Short Time Overload	2.5 x rated working voltage, 5 seconds	\pm 0.25% ΔR (Char. K) \pm 0.50% ΔR (Char. M)
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	\pm 0.25% ΔR (Char. K) \pm 0.50% ΔR (Char. M)
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	\pm 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 260°C solder to within 1/16" of body for 10 seconds	\pm 0.25% ΔR
Shock	Total of 18 shocks at 100 g's	\pm 0.25% ΔR
Vibration	12 hours at maximum of 20 g's between 10 and 2,000 Hz	\pm 0.25% ΔR
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period	\pm 0.50% ΔR (Char. K) \pm 2.0% ΔR (Char. M)
Terminal Strength	1.5 pound pull for 30 seconds	\pm 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	-
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	-

Thick Film Resistor Networks

Military, MIL-PRF-83401 Qualified, Type RZ

Dual-In-Line Package, 01, 03, 05 Schematics



FEATURES

- MIL-PRF-83401 qualified
- Epoxy molded construction
- All device leads are hot-solder dipped
- Available in tube pack
- TCR available in "K" ($\pm 100\text{ppm}/^\circ\text{C}$) or "M" ($\pm 300\text{ppm}/^\circ\text{C}$) depending on style
- 100% screen tested per Group A, Subgroup 1 of MIL-PRF-83401
- All devices are capable of passing the MIL-STD-202, Method 210, Condition D, "Resistance to Soldering Heat" test

STANDARD ELECTRICAL SPECIFICATIONS

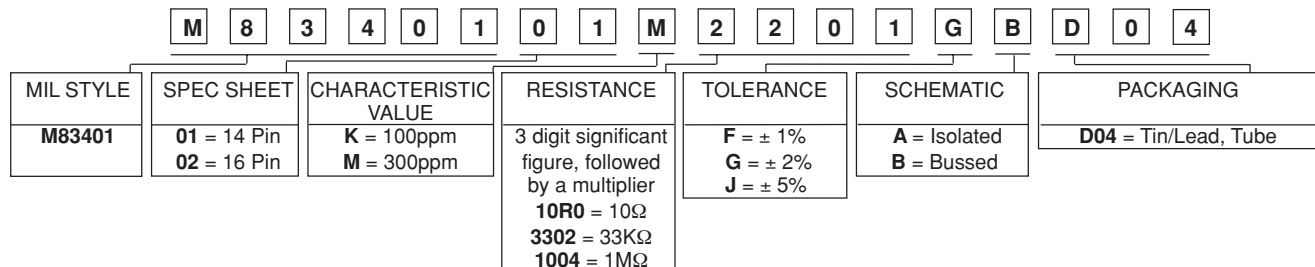
VISHAY DALE MODEL/PIN NO./	SCHEMATIC	RESISTOR POWER RATING Max. @ 70°C W	PACKAGE POWER RATING Max. @ 70°C W	RESISTANCE RANGE Ω	STANDARD TOLERANCE %	TEMPERATURE COEFFICIENT* (- 55°C to + 125°C)	WEIGHT g
MDM 14	01	0.10	1.30	10 - 1M	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.3
MDM 14	03	0.20	1.40	10 - 1M	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.3
MDM 14	05	0.05	1.20	Consult factory	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.3
MDM 16	01	0.10	1.50	10 - 1M	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.5
MDM 16	03	0.20	1.60	10 - 1M	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.5
MDM 16	05	0.05	1.40	Consult factory	$\pm 2 (\pm 1, \pm 5)^{**}$	K, M	1.5

* K = $\pm 100\text{ppm}/^\circ\text{C}$; M = $\pm 300\text{ppm}/^\circ\text{C}$

** $\pm 1\%$ and $\pm 5\%$ tolerances available on request.

GLOBAL PART NUMBER INFORMATION

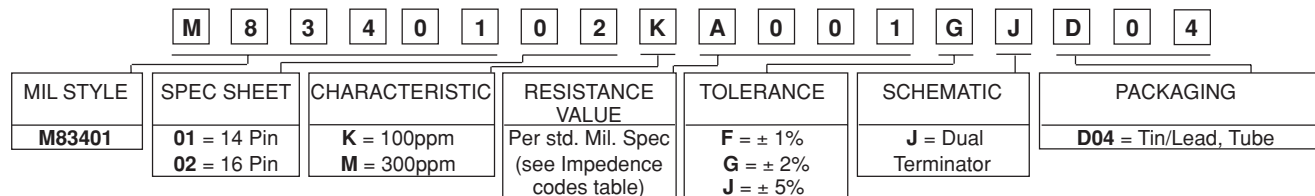
New Global Part Numbering: M8340101M2201GBD04 (preferred part numbering format)



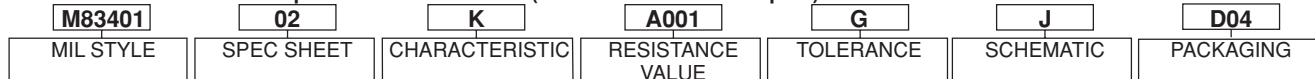
Historical Part Number example: M8340101M2201GB (will continue to be accepted)



New Global Part Numbering: M8340102KA001GJD04 (preferred part numbering format)

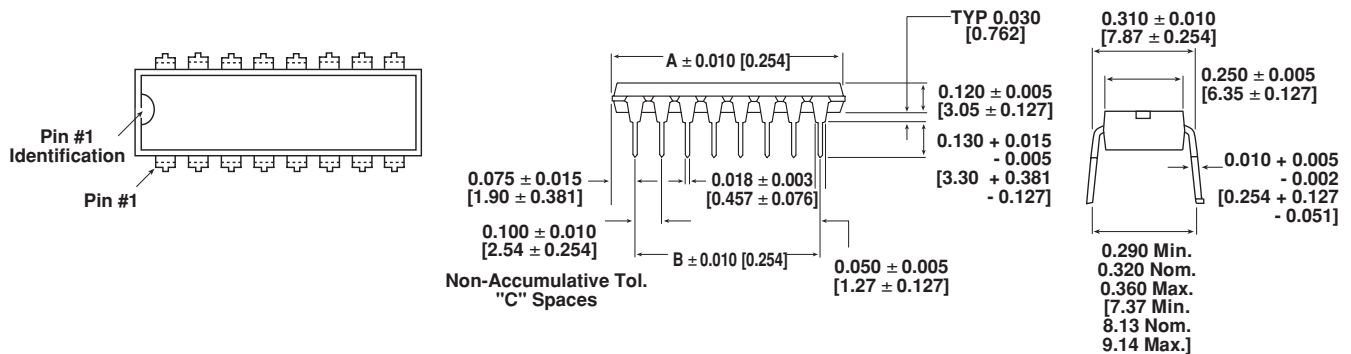


Historical Part Number example: M8340102KA001GJ (will continue to be accepted)





DIMENSIONS in inches [millimeters]



VISHAY DALE MODEL	A	B	C
MDM14	0.750 [19.05]	0.600 [15.24]	6
MDM16	0.850 [21.59]	0.700 [17.78]	7

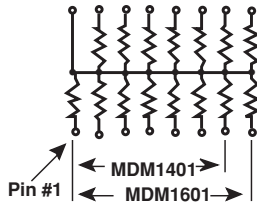
IMPEDANCE CODES					
CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
A001	82	130	A010	330	470
A002	120	200	A011	330	680
A003	130	210	A012	1.5K	3.3K
A004	160	260	A013	3K	6.2K
A005	180	240	A014	180	270
A006	180	390	A015	270	270
A007	220	270	A016	560	560
A008	220	330	A017	560	1.2K
A009	330	390	A018	620	2.7K

TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	MDM Series
Maximum Operating Voltage	VDC	100
Voltage Coefficient of Resistance	V _{eff}	< 50ppm
Dielectric Strength	VAC	200 per min.
Insulation Resistance	Ω	10,000M
Operating Temperature Range	°C	- 55 to + 125
Storage Temperature Range	°C	- 55 to + 150

MECHANICAL SPECIFICATION	
Marking Resistance to Solvents:	Permanency testing per MIL-PRF-83401.
Solderability:	Per MIL-PRF-83401.
Body:	Molded epoxy.
Terminals:	Copper alloy, hot-solder dipped.

CIRCUIT APPLICATIONS

01 Schematic



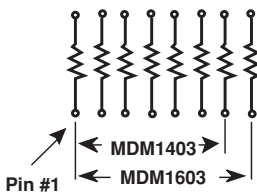
MDM1401 (M8340101xxxxxB)
MDM1601 (M8340102xxxxxB)

13 or 15 resistors with one pin common

The MDMxx01 provides the user with a choice of 13 or 15 nominally equal resistors, each connected to a common pin. Commonly used in the following applications:

- MOS/ROM Pull-up/Pull-down
- Open Collector Pull-up
- "Wired OR" Pull-up
- Power Driven Pull-up
- TTL Input Pull-down
- Digital Pulse Squaring
- TTL Unused Gate Pull-up
- High Speed Parallel Pull-up

03 Schematic



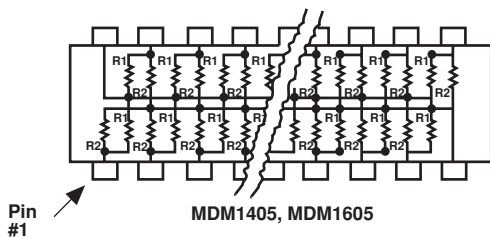
MDM1403 (M8340101xxxxxA)
MDM1603 (M8340102xxxxxA)

7 or 8 isolated resistors

The MDMxx03 provides the user with a choice of 7 or 8 nominally equal resistors, with each resistor isolated from all others. Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Driven Pull-up
- Power Gate Pull-up
- Line Termination
- Long-line Impedance Balancing
- LED Current Limiting
- ECL Output Pull-down
- TTL Input Pull-down

05 Schematic

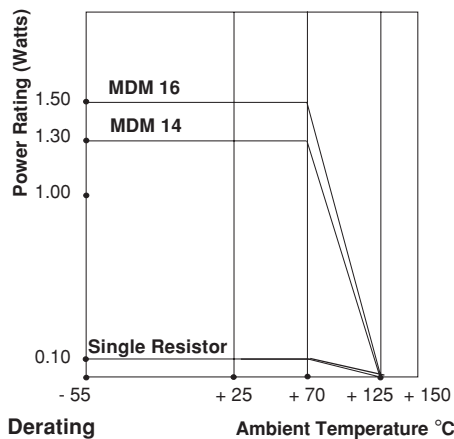


MDM1405 (M8340101xxxxxJ)
MDM1605 (M8340102xxxxxJ)

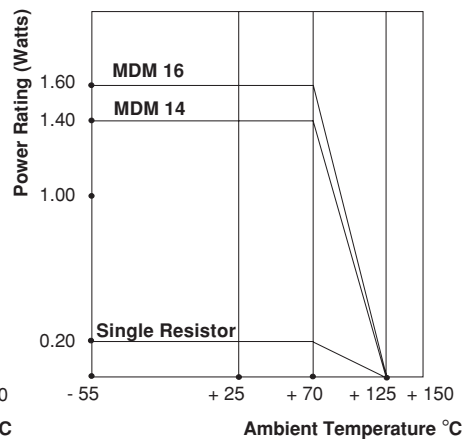
12 or 14 resistor pairs

The MDMxx05 provides the user with a choice of 12 or 14 pairs of R1/R2 resistor values for pulse squaring and TTL dual-line terminating requirements.

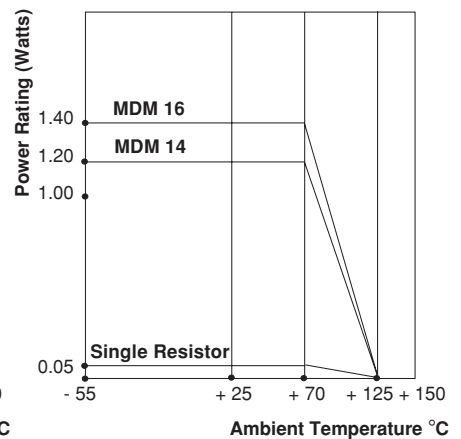
01 Schematic



03 Schematic



05 Schematic



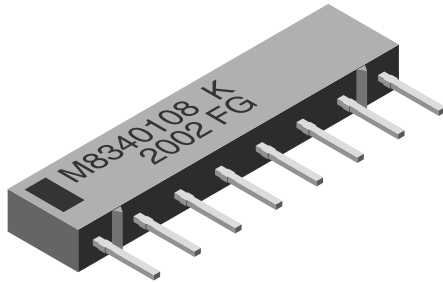


PERFORMANCE		
TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 x rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours \pm 4 hours at + 25°C ambient temperature	\pm 0.50% ΔR
Thermal Shock	5 cycles between - 65°C and + 125°C	\pm 0.50% ΔR
Short Time Overload	2.5 x rated working voltage 5 seconds	\pm 0.25% ΔR (Char. K) \pm 0.50% ΔR (Char. M)
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	\pm 0.25% ΔR (Char. K) \pm 0.50% ΔR (Char. M)
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	\pm 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 260°C solder to within 1/16" of body for 10 seconds	\pm 0.25% ΔR
Shock	Total of 18 shocks at 100 G's	\pm 0.25% ΔR
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	\pm 0.25% ΔR
Load Life	1,000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period	\pm 0.50% ΔR (Char. K) \pm 2.00% ΔR (Char. M)
Terminal Strength	4.5 pound pull for 30 seconds	\pm 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	—

Thick Film Resistor Networks

Military, MIL-PRF-83401 Qualified, Type RZ

Single-In-Line, Molded SIP; 01, 03, 05 Schematics



FEATURES

- MIL-PRF-83401 qualified
- 0.195" [4.95mm] "A" and 0.350" [8.89mm] "C" maximum seated heights
- Highly stable thick film
- TCR available in "K" ($\pm 100\text{ppm}/^\circ\text{C}$) or "M" ($\pm 300\text{ppm}/^\circ\text{C}$) characteristic
- All device leads are hot-solder dipped
- Rugged molded case construction
- Compatible with automatic insertion equipment
- 100% screen tested per Group A, Subgroup 1 of MIL-PRF-83401
- All devices are capable of passing the MIL-STD-202, Method 210, Condition D "Resistance to Soldering Heat" test
- Available in tube pack

STANDARD ELECTRICAL SPECIFICATIONS							
VISHAY DALE MODEL/ PIN NO/ PROFILE	SCHEMATIC	RESISTOR POWER RATING Max. @ 70°C W	PACKAGE POWER RATING Max. @ 70°C W	RESISTANCE RANGE Ω	STANDARD TOLERANCE*	TEMPERATURE COEFFICIENT** (- 55°C to + 125°C)	WEIGHT g
MSM06A	01	0.12	0.60	10 - 1M	± 2	K, M	0.4
MSM08A	01	0.12	0.84				0.5
MSM10A	01	0.12	1.08				0.6
MSM06A	03	0.12	0.36	10 - 1M	± 2	K, M	0.4
MSM08A	03	0.12	0.48				0.5
MSM10A	03	0.12	0.60				0.6
MSM06A	05	0.07	0.60	Consult factory	± 2	K, M	0.4
MSM08A	05	0.07	0.84				0.5
MSM10A	05	0.07	1.08				0.6
MSM06C	01	0.20	1.00	10 - 1M	± 2	K, M	0.7
MSM08C	01	0.20	1.40				0.9
MSM10C	01	0.20	1.80				1.1
MSM06C	03	0.20	0.60	10 - 1M	± 2	K, M	0.7
MSM08C	03	0.20	0.80				0.9
MSM10C	03	0.20	1.00				1.1
MSM06C	05	0.11	0.88	Consult factory	± 2	K, M	0.7
MSM08C	05	0.11	1.32				0.9
MSM10C	05	0.11	1.80				1.1

* $\pm 1\%$ and $\pm 5\%$ available

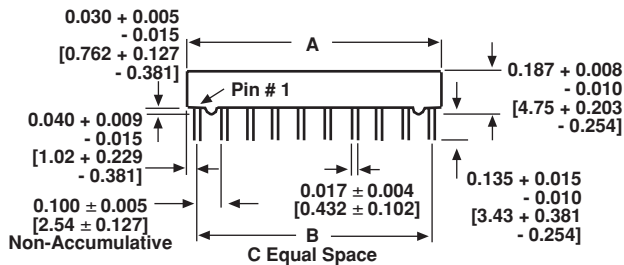
** K = $\pm 100\text{ppm}/^\circ\text{C}$; M = $\pm 300\text{ppm}/^\circ\text{C}$

GLOBAL PART NUMBER INFORMATION						
New Global Part Numbering: M8340107K1003GCD03 (preferred part numbering format)						
<div style="display: flex; justify-content: space-around; font-weight: bold; font-size: 1.2em;"> M8340107K1003GCD03 </div>						
MIL STYLE M83401	SPEC SHEET 04 = 6 Pin, "C" Profile 05 = 8 Pin, "C" Profile 06 = 10 Pin, "C" Profile 07 = 6 Pin, "A" Profile 08 = 8 Pin, "A" Profile 09 = 10 Pin, "A" Profile	CHARACTERISTIC K = 100ppm M = 300ppm	RESISTANCE VALUE 3 digit significant figure, followed by a multiplier 10R0 = 10 Ω 3302 = 33K Ω 1004 = 1M Ω	TOLERANCE F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	SCHEMATIC C = Bussed G = Isolated	PACKAGING D03 = Tin/Lead, Tube
Historical Part Number example: M8340107K1003GC (will continue to be accepted)						
M83401	07	K	1003	G	C	D03
MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING
New Global Part Numbering: M8340104KA001GHD03 (preferred part numbering format)						
<div style="display: flex; justify-content: space-around; font-weight: bold; font-size: 1.2em;"> M8340104KA001GHD03 </div>						
MIL STYLE M83401	SPEC SHEET 04 = 6 Pin, "C" Profile 05 = 8 Pin, "C" Profile 06 = 10 Pin, "C" Profile 07 = 6 Pin, "A" Profile 08 = 8 Pin, "A" Profile 09 = 10 Pin, "A" Profile	CHARACTERISTIC K = 100ppm M = 300ppm	RESISTANCE VALUE Per std. Mil. Spec (see Impedance Codes table)	TOLERANCE F = $\pm 1\%$ G = $\pm 2\%$ J = $\pm 5\%$	SCHEMATIC H = Dual Terminator	PACKAGING D03 = Tin/Lead, Tube
Historical Part Number example: M8340104KA001GH (will continue to be accepted)						
M83401	04	K	A001	G	H	D03
MIL STYLE	SPEC SHEET	CHARACTERISTIC	RESISTANCE VALUE	TOLERANCE	SCHEMATIC	PACKAGING

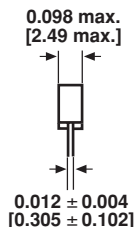
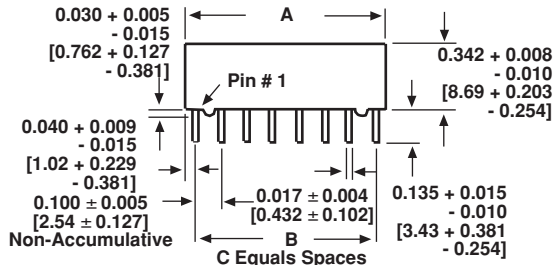


DIMENSIONS in inches [millimeters]

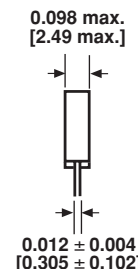
"A" Profile



"C" Profile



VISHAY DALE MODEL	A	B	C
MSM06	0.583 ± 0.015 [14.81 ± 0.381]	0.500 [12.70]	5
MSM08	0.783 ± 0.015 [19.89 ± 0.381]	0.700 [17.78]	7
MSM10	0.983 ± 0.015 [24.97 ± 0.381]	0.900 [22.86]	9



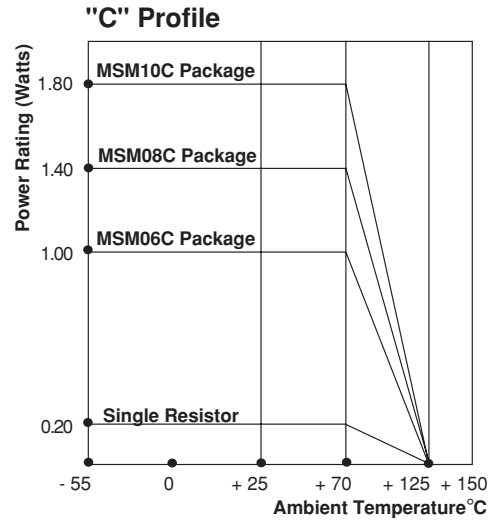
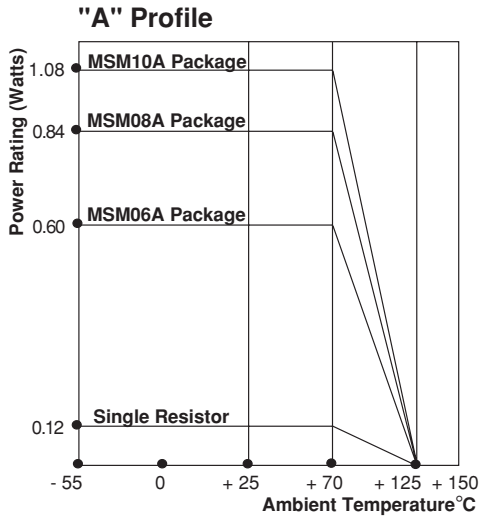
TECHNICAL SPECIFICATIONS		
PARAMETER	UNIT	MSM Series
Maximum Operating Voltage	VDC	50
Voltage Coefficient of Resistance	V _{eff}	< 50ppm
Dielectric Strength	VAC	200 min.
Insulation Resistance	Ω	10,000M
Operating Temperature Range	°C	- 55 to + 125
Storage Temperature Range	°C	- 55 to + 150

MECHANICAL SPECIFICATIONS	
Body:	Molded epoxy.
Terminals:	Copper alloy, hot-solder dipped.
Solderability:	Per MIL-PRF-83401.

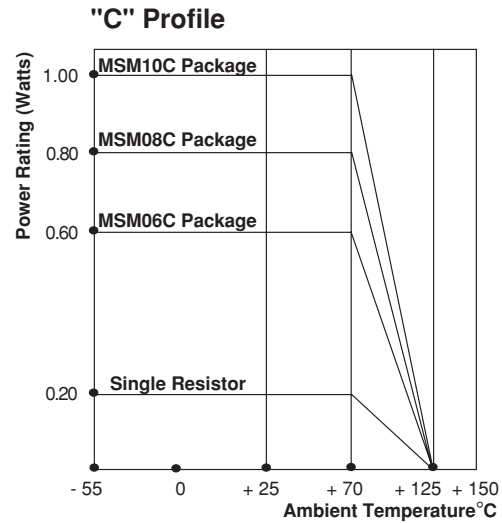
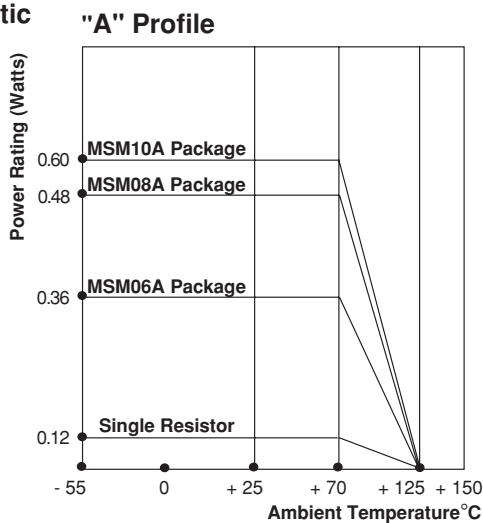
MILITARY IMPEDANCE CODES					
CODE	R ₁ (Ω)	R ₂ (Ω)	CODE	R ₁ (Ω)	R ₂ (Ω)
A001	82	130	A010	330	470
A002	120	200	A011	330	680
A003	130	210	A012	1.5K	3.3K
A004	160	260	A013	3K	6.2K
A005	180	240	A014	180	270
A006	180	390	A015	270	270
A007	220	270	A016	560	560
A008	220	330	A017	560	1.2K
A009	330	390	A018	620	2.7K

Derating

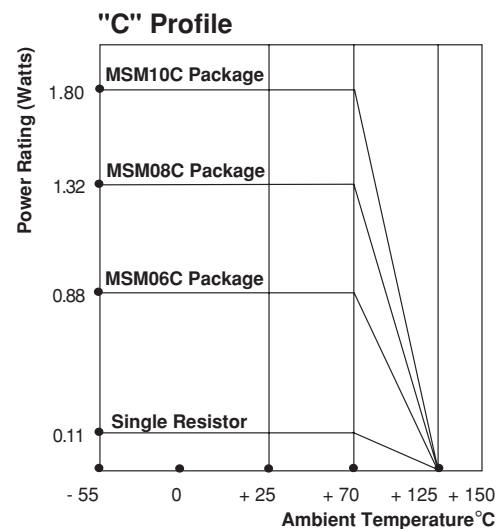
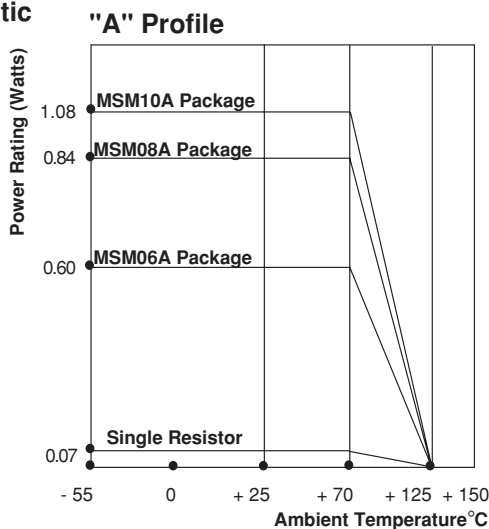
01 Schematic

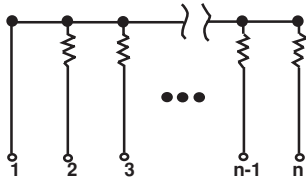


03 Schematic



05 Schematic



CIRCUIT APPLICATION
01 Schematic


5, 7 or 9 resistors with one pin common

"A" Profile

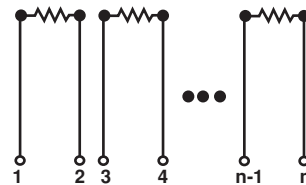
 MSM06A01 (M8340107xxxxxC)
 MSM08A01 (M8340108xxxxxC)
 MSM10A01 (M8340109xxxxxC)

"C" Profile

 MSM06C01 (M8340104xxxxxC)
 MSM08C01 (M8340105xxxxxC)
 MSM10C01 (M8340106xxxxxC)

The MSM06A01, MSM08A01, MSM10A01, MSM06C01, MSM08C01 and MSM10C01 molded single-in-line resistor networks provide the user with a choice of 5, 7 or 9 nominally equal resistors, each connected to a common pin (Pin No. 1). Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Gate Pull-up
- MOS/ROM Pull-up/Pull-down
- Open Collector Pull-up
- TTL Input Pull-down
- TTL Unused Gate Pull-up

03 Schematic


3, 4 or 5 isolated resistors

"A" Profile

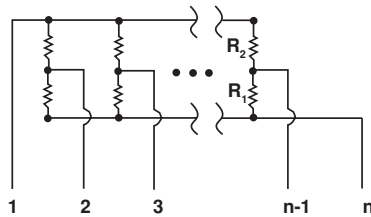
 MSM06A03 (M8340107xxxxxG)
 MSM08A03 (M8340108xxxxxG)
 MSM10A03 (M8340109xxxxxG)

"C" Profile

 MSM06C03 (M8340104xxxxxG)
 MSM08C03 (M8340105xxxxxG)
 MSM10C03 (M8340106xxxxxG)

The MSM06A03, MSM08A03, MSM10A03, MSM06C03, MSM08C03 and MSM10C03 molded single-in-line resistor networks provide the user with a choice of 3, 4 or 5 nominally equal resistors. Each resistor is isolated from all others. Commonly used in the following applications:

- "Wired OR" Pull-up
- Power Driven Pull-up
- Power Gate Pull-up
- Line Termination
- Long-Line Impedance Balance
- LED Current Limiting
- ECL Output Pull-down
- TTL Input Pull-down

05 Schematic


4, 6 or 8 isolated resistors

"A" Profile

 MSM06A05 (M8340107xxxxxH)
 MSM08A05 (M8340108xxxxxH)
 MSM10A05 (M8340109xxxxxH)

"C" Profile

 MSM06C05 (M8340104xxxxxH)
 MSM08C05 (M8340105xxxxxH)
 MSM10C05 (M8340106xxxxxH)

The MSM06A05, MSM08A05, MSM10A05, MSM06C05, MSM08C05 and MSM10C05 molded single-in-line resistor networks provide the user with a choice of 4, 6 or 8 pair of R_1/R_2 resistor values for pulse squaring and TTL dual-line terminating requirements.

PERFORMANCE

TEST	CONDITIONS	MAX. ΔR (Typical Test Lots)
Power Conditioning	1.5 x rated power, applied 1.5 hours "ON" and 0.5 hour "OFF" for 100 hours \pm 4 hours at + 25°C ambient temperature	\pm 0.50% ΔR
Thermal Shock	5 cycles between - 65°C and + 125°C	\pm 0.50% ΔR
Short Time Overload	2.5 x rated working voltage 5 seconds	\pm 0.25% ΔR (Characteristic K) \pm 0.50% ΔR (Characteristic M)
Low Temperature Operation	45 minutes at full rated working voltage at - 65°C	\pm 0.25% ΔR (Characteristic K) \pm 0.50% ΔR (Characteristic M)
Moisture Resistance	240 hours with humidity ranging from 80% RH to 98% RH	\pm 0.50% ΔR
Resistance to Soldering Heat	Leads immersed in + 260°C solder to within 1/16" of body for 10 seconds	\pm 0.25% ΔR
Shock	Total of 18 shocks at 100 G's	\pm 0.25% ΔR
Vibration	12 hours at maximum of 20 G's between 10 and 2,000 Hz	\pm 0.25% ΔR
Load Life	1000 hours at + 70°C, rated power applied 1.5 hours "ON", 0.5 hour "OFF" for full 1000 hour period	\pm 0.50% ΔR (Characteristic K) \pm 2.00% ΔR (Characteristic M)
Terminal Strength	4 1/2 pound pull for 30 seconds	\pm 0.25% ΔR
Insulation Resistance	10,000 Megohm (minimum)	—
Dielectric Withstanding Voltage	No evidence of arcing or damage (200 V RMS for 1 minute)	—



Model Numbers
Design Capabilities .. 82
Packaging
and Mil ID.....84

Customized Resistor Networks

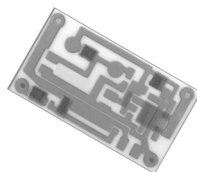
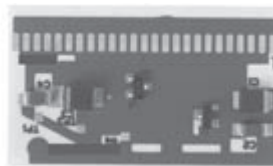
Customer Specified Configurations

•

Isolated, Bussed or TTL-Terminator Circuits

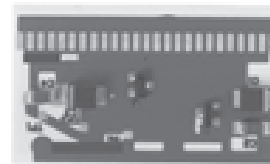
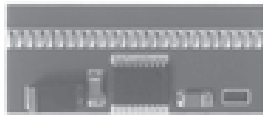
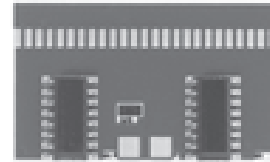
•

High Packaging Density

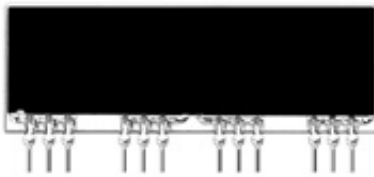


Multicomps, Custom Networks and Screened Substrates

MULTIPLE COMPONENT MODULES (MULTICOMPS)



CUSTOM NETWORKS AND SCREENED SUBSTRATES



APPLICATIONS

- Reduce Component Count
- Simplify Board Layout
- Reduce Cross Talk
- Filtering
- Enhance Motherboard Performance

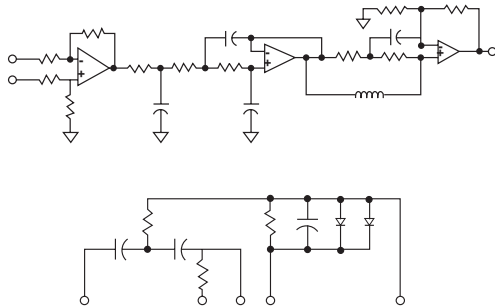
Vishay Dale has the extensive technical capability you need for your custom design requirements.

Since all custom products are unique and actual performance may vary, some examples are given on the next page. When you are ready to submit your custom design for us to review, please call or fax us; or contact your local Vishay Dale representative.

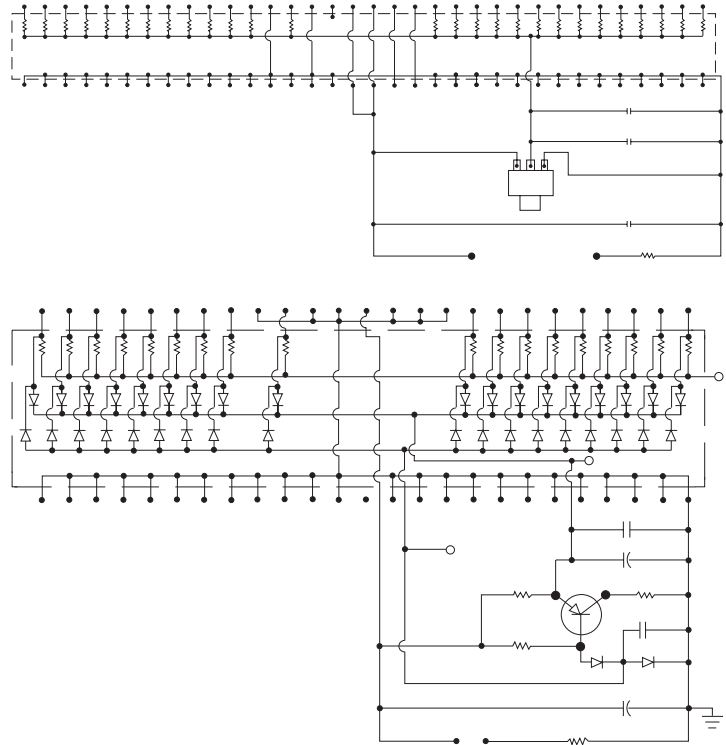


SCHEMATICS

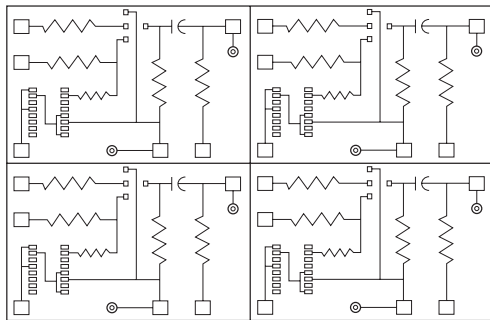
MULTIPLE COMPONENT MODULES (MULTICOMPS)



CUSTOM NETWORKS



SCREENED SUBSTRATES



FEATURES AND TYPICAL SPECIFICATIONS*

Thick Film Materials: Pd/Ag conductors, Ruthenium based cermet resistors, glass glazes, multi-layer dielectric systems, polymer protective coating.

Thick Film Printing Techniques: Multi-layer printing, through-hole metallization, crossovers, double-sided designs.

Substrate Material: 96% alumina.

Substrate Thickness: 0.025" [0.635mm], 0.030" [0.762mm], 0.045" [1.143mm]. Thicker substrates for higher power applications available.

SMT Devices: Inductors, diodes, thermistors, transistors, thin film resistors, integrated circuits.

SMT Capacitors: Ceramic: X7R, COG. Capacitance = 10pF to 0.1µF ± 10% tolerance.

Tantalum: Capacitance = .1µF to 100µF ± 10% tolerance.

Package Configurations:

SIP: 4 - 22 pins. Missing pins available. Maximum length, 2.2" [55.88mm]. Maximum height, 1.0" [25.4mm]. Lead length, 0.185" [4.699mm] maximum.

Lead Spacing: 0.100" [2.54mm], SIP. 0.050" [1.27mm], SMT.

Encapsulation Method: Conformal resin. Screened silicon insulator.

* Consult factory for possible exceptions to listed specifications.

ELECTRICAL SPECIFICATIONS - RESISTORS

Range: 10 ohm to 5 Megohm, standard. < 10 ohm, consult factory.

Tolerance:

100 ohm to 1 Megohm: ± 1%, ± 2%.

< 100 ohm: ± 2% or ± 1 ohm.

> 1 Megohm: ± 5%, standard. Specials: Consult factory.

Ratios: ± 0.5%, ± 1%. Specials: Consult factory.

Temperature Coefficient (absolute): ± 200ppm/°C, standard. ± 100ppm/°C, special.

TCR Tracking: ± 50ppm/°C (like values) and ± 100ppm/°C (mixed values).

Operating Temperature: - 55°C to + 125°C, standard.

- 55°C to + 150°C (consult factory).

ELECTRICAL SPECIFICATIONS - SCREENED CAPACITORS

Capacitance: 33pF to 270pF. Other values, consult factory.

Tolerance: ± 30%, standard. ± 20%, consult factory.

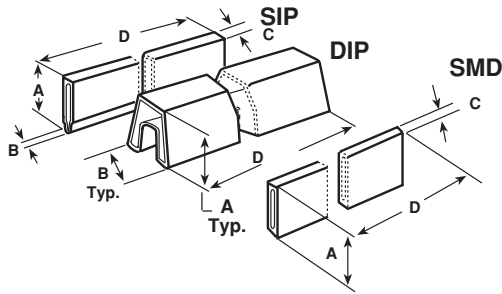
Temperature Coefficient: ± 15%, standard.

Dielectric Breakdown Voltage: 2.5 x rated voltage @ 5 seconds, standard.

Rated Voltage: 25 volts maximum, standard.

Operating Temperature: 0°C to + 70°C, standard.

PACKAGING DIMENSIONS in inches [millimeters]

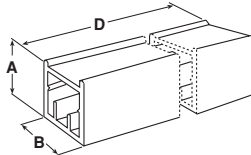


END-TO-END TUBE PACK DIMENSIONS

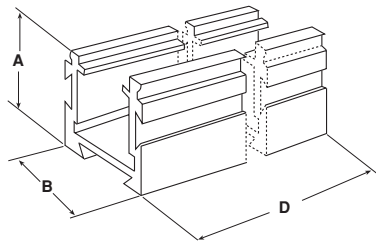
	A	B	C	D
DIP	0.500 [12.70]	0.600 [15.24]	—	22.25 [565.15]
SIP Low Profile	0.430 [10.92]	0.040 [1.02]	0.120 [3.05]	23.50 [596.90]
SIP High Profile	0.605 [15.37]	0.040 [1.02]	0.120 [3.05]	23.50 [596.90]

SIDE-BY-SIDE SIP

Side-By-Side SIP



Flat Pack



10 PIN	0.650 [16.51]	1.10 [27.94]	—	19 [482.60]
8 PIN	0.650 [16.51]	0.860 [21.84]	—	19 [482.60]
6 PIN	0.650 [16.51]	0.700 [17.78]	—	19 [482.60]
4 PIN	0.650 [16.51]	0.500 [12.70]	—	19 [482.60]
FLAT PACK				
DFP	8 [35.05]	1.10 [27.94]	—	19.875 [504.82]
DFM	1.38 [35.05]	1.10 [27.94]	—	19.875 [504.82]

STANDARD (•) AND OPTIONAL (X) PACKAGING

PACKAGING STYLES	DUAL-IN-LINE			FLAT PACKS		SINGLE-IN-LINE				
	MDM	MDP	RC MOLDED	DFM	DFP	CSC	MSM	MSP	RC COATED	RC MOLDED
End-to-End Magazine (Tube)	•	•	•			X	•	•		•
Poly Bag				X	X	•			•	
Side-by-Side Magazine (Tube)				X	X		X	X		
Tape and Reel										

- **End-To-End Magazine (Tube) Pack DIP/SIP:** A magazine pack for single-in-line and dual-in-line resistor networks. Quantity per pack dependent on size of units. Maximum tube length is 23 1/2" [596.90mm]. Width and depth of tube dependent on size of individual resistor network.
 - **Poly Bag:** Units are packaged in poly bags and then packed in boxes.
 - **Magazine (Tube) Pack Flat Pack:** All flat packs are packaged in individual protective carriers that are considered as part of all flat pack units. Flat pack units are then packed in magazines (tubes).
- X Special Packaging:** Military, antistatic and customer special packaging can be provided. Consult factory for information.

MILITARY PART ORDERING EXAMPLES

RESISTOR NETWORKS

MIL-PRF-83401F (Type [RZ])

M8340101 M 1003 G A = Vishay Dale Type MDM 100k 2% A NOTE: M Characteristic.

1. Military Specification
2. Specification Sheet No.
3. Characteristic
4. Resistance Value
5. Tolerance
6. Schematic

Resistance Value Examples

Four Digit Figure

49R9 = 49.9 ohm, 1000 = 100 ohm
1001 = 1k ohm, 1004 = 1 Megohm

Tolerance Examples

F = ± 1.0% G = ± 2.0% J = ± 5.0%





WORLDWIDE SALES CONTACTS

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FAX: +1-402-563-6296

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FAX: +49-9287-70435

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