

**RoHS  
Compliant**

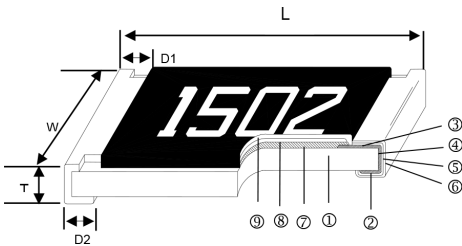


### Features

- Tolerance from  $\pm 0.5\%$ ~ $5\%$
- High power rating
- Excellent pulse withstanding performance
- Improved working voltage ratings
- Standard package sizes of 0402~2512
- Special construction to prevent sulfuration in a sulfur containing environment
- AEC-Q200 Qualified
- 100% CCD inspection

### Applications

- Metering (Testing/Measurement)
- Diagnostic Equipment
- Medical Devices
- Industrial Controls
- Plasma
- LCD Video Monitors



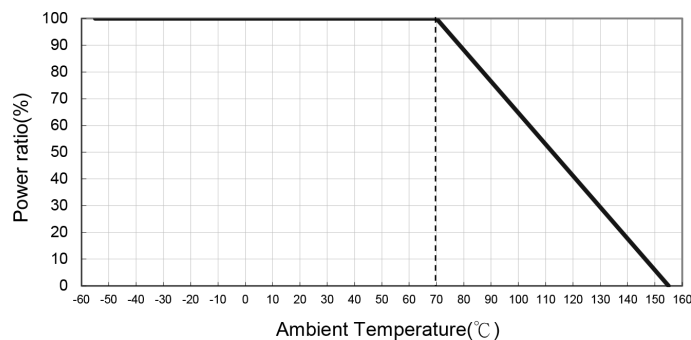
1	Alumina Substrate	4	Edge Electrode	7	Resistor Layer
2	Bottom Electrode	5	Barrier Layer	8	Primary Overcoat
3	Top Electrode	6	External Electrode	9	Secondary Overcoat

Dimensions : Millimetres

### Dimensions

Type	Size (Inch)	L (mm)	W (mm)	T (mm)	D1 (mm)	D2 (mm)	Weight (g) (1000pcs)
MCPWR02	0402	1 $\pm$ 0.05	0.5 $\pm$ 0.05	0.3 $\pm$ 0.05	0.2 $\pm$ 0.1	0.2 $\pm$ 0.1	0.6
MCPWR03	0603	1.6 $\pm$ 0.1	0.8 $\pm$ 0.1	0.45 $\pm$ 0.1	0.3 $\pm$ 0.2	0.3 $\pm$ 0.2	2
MCPWR05	0805	2 $\pm$ 0.1	1.25 $\pm$ 0.1	0.5 $\pm$ 0.1	0.35 $\pm$ 0.2	0.4 $\pm$ 0.2	4.4
MCPWR06	1206	3.1 $\pm$ 0.1	1.55 $\pm$ 0.1	0.55 $\pm$ 0.1	0.5 $\pm$ 0.25	0.5 $\pm$ 0.2	8.9

### Derating Curve



## Standard Electrical Specifications

Item Type	Power Rating at 70°	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
					±0.5% (E24,E96)	±1% (E24,E96)	±5% (E24)	
MCPWR02 (0402)	1/5W	-55 to +155°C	50V	100V	-	1Ω-20Ω		±300
MCPWR03 (0603)	1/6W	-55 to +155°C	75V	150V	100Ω-1MΩ	10Ω-1MΩ		±100
					7.15Ω - 1MΩ			±200
MCPWR05 (0805)	1/5W	-55 to +155°C	100V	200V	10Ω - 294Ω	1Ω - 294Ω		±100
					3Ω - 20MΩ			±200
MCPWR06 (1206)	1/2W	-55 to +155°C	200V	400V	10Ω - 20Ω	1Ω - 20Ω		±100
					5.1Ω - 20MΩ			±200

Item Type	Power Rating at 70°	Operating Temp. Range	Max. Operating Voltage	Max. Overload Voltage	Resistance Range			TCR (PPM/°C)
	Jumper Rated Current				±0.5% (E24,E96)	±1% (E24,E96)	±5% (E24)	
MCPWR03 (0603)	1/3W	-55 to +155°C	75V	150V	10Ω - 294Ω	1Ω - 294Ω		±200
	Jumper: 5A*				7.15Ω- 1MΩ			±100
MCPWR05 (0805)	1/5W	-55 to +155°C	400V	600V	10Ω - 294Ω	1Ω - 294Ω		±200
	Jumper: 6A*				10Ω - 1MΩ			±100
MCPWR06 (1206)	3/4W *	-55 to +155°C	500V	1000V	10Ω - 20Ω	1Ω - 20Ω		±200
	Jumper: 10A*				10Ω - 1MΩ			±100

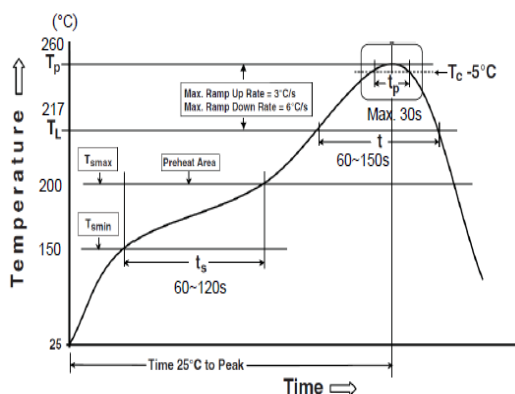
\*: Ultra High Power : double side printed resistor element

Operating Voltage=

Voltage= $\sqrt{P \cdot R}$  ) or Max. Operating Voltage listed above, whichever is lower.

Overload Voltage= $2.5 \cdot \sqrt{P \cdot R}$  or Max. Overload Voltage listed above, whichever is lower.

The power rating depends on the maximum temperature of the resistive element. Due to the power dissipation of the resistor, the temperature of the resistive element will rise depending on the condition of heat dissipation from PCB. The maximum power rating in application only applies if the temperature of the resistive element is not exceed 155°C



Reflow Profiles	
Profile Feature	Pb-Free Assembly
Preheat	
Min. Temperature (T <sub>min</sub> )	150°C
Max Temperature (T <sub>max</sub> )	200°C
Preheating time (t <sub>s</sub> ) from (T <sub>min</sub> to T <sub>max</sub> )	60-120 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3°C/second max.
Liquidous temperature (T <sub>L</sub> )	217°C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60-150 seconds
Min. Peak temperature (T <sub>p</sub> min)	235°C
Max. Peak temperature (T <sub>p</sub> max)	260°C
Time (t <sub>p</sub> ) within 5°C of the specified classification temperature (T <sub>c</sub> )	30 seconds max.
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

## Environmental Characteristics

Item	Requirement		Test Method
	±5% and Below	Jumper	
Temperature Coefficient of Resistance (T.C.R.)	As Spec.		JIS-C-5201-1 4.8 IEC-60115-1 4.8 At 25 At 25°C/ -55°C and 25°C/+125°C, 25°C is the reference temperature
Short Time Overload	±(1.0%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	JIS-C-5201-1 4.13 IEC-60115-1 4.13 RCWV*2.5 or Max. Overload Voltage whichever is lower for 5 seconds Jumper:2*I <sub>max</sub> for 5 seconds
Insulation Resistance	≥10G		JIS-C-5201-1 4.6 IEC-60115-1 4.6 Max. Overload Voltage for 1 minute
Operational Life	±(1.0%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	MIL-STD-202 Method 108 Condition D Steady State TA=125°C at derated power. Measurement at 24±4 hours after test conclusion.
Biased Humidity	±(1.0%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	MIL-STD-202 Method 103 1000 hrs 85°C/85%RH 10% of operating power (≤100V)
High Temperature Exposure	±(1.0%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	MIL-STD-202 Method 108 at +155°C for 1000 hrs
Board Flex	±(1.0%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	AEC-Q200-005 Bending once for 60 seconds 2010, 2512 sizes: 2mm Other sizes: 3mm
Solderability	95% min. Coverage		JIS-C-5201-1 4.17 IEC-60115-1 4.17 245±5°C for 3 seconds
Resistance to Soldering Heat	±(0.5%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	JIS-C-5201-1 4.18 IEC-60115-1 4.18 260±5°C for 10 seconds
Voltage Proof	No breakdown or flashover		JIS-C-5201-1 4.7 IEC-60115-1 4.7 1.42 times Max. Operating Voltage for 1 minute
Leaching	Individual leaching area ≤5% Total leaching area ≤10%		JIS-C-5201-1 4.18 IEC-60068-2-58 8.2.1 260±5°C for 30 seconds
Temperature Cycling	±(0.5%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	JESD22 Method JA-104 -55°C to +125°C, 1000 cycles
Mechanical Shock	±(0.25%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	MIL-STD-202 Method 213 Wave Form: Tolerance for half sine shock pulse. Peak value is 100g's. Normal duration (D) is 6.

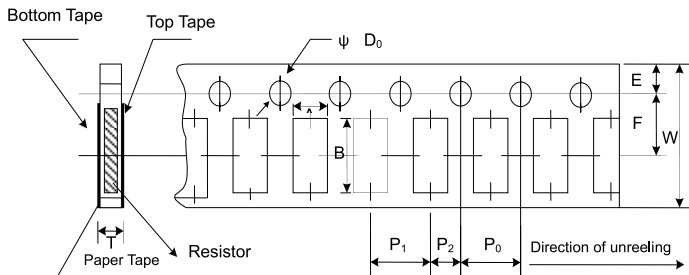
Item	Requirement		Test Method
	±5% and Below	Jumper	
Vibration	±(0.5%+0.05Ω)	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	MIL-STD-202 Method 204 5 g's for 20 min., 12 cycles each of 3 orientations, 10-2000 Hz
ESD	±(3%+0.05Ω)		AEC-Q200-002 Human body model 0402/0603: 1KV 0805 and above: 2KV
Resistance to solvents	No visible damage on appearance and marking.		MIL-STD-202 Method 215 Add Aqueous wash chemical - OKEM Clean or equivalent. Do not use banned solvents.
Terminal Strength	No broken		AEC-Q200-006 Force of 1.8kg for 60 seconds.
Flammability	No ignition of the tissue paper or scorching or the pinewood board		UL-94 V-0 or V-1 are acceptable. Electrical test not required.
Sulfur Test	ΔR±0.1%	0603: ≤8mΩ 0805: ≤5mΩ 1206: ≤5mΩ	EIA-977 (Condition A) 60±2°C, no power rating for 500 hrs.

RCWV(Rated continuous working voltage)=  $\sqrt{P \cdot R}$  or Max. Operating voltage whichever is lower

Storage Temperature: 15°C to 28°C; Humidity < 80%RH

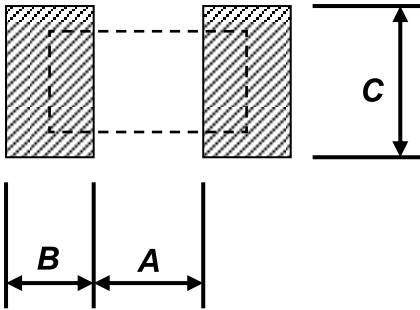
Shelf Life: 2 years from production date.

## Paper Tape Specifications



Dimensions : Millimetres

Type	A mm	B mm	W mm	E mm	F mm	P <sub>0</sub> mm	P <sub>1</sub> mm	P <sub>2</sub> mm	ΦD <sub>0</sub> mm	T mm
MCPWR02	0.65±0.1	1.15±0.1	8±0.2	1.75±0.1	3.5±0.05	4±0.1	2±0.05	2±0.05	1.5+0.1,-0	0.45±0.1
MCPWR03	1.1±0.1	1.9±0.1	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.7±0.1
MCPWR05	1.6±0.1	2.4±0.2	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.85±0.1
MCPWR06	1.9±0.1	3.5±0.2	8±0.2	1.75±0.1	3.5±0.05	4±0.1	4±0.05	2±0.05	1.5+0.1,-0	0.85±0.1



Type	A (mm)	B (mm)	C (mm)
MCPWR02	0.5	0.45	0.6
MCPWR03	0.9	0.6	0.9
MCPWR05	1.2	0.7	1.3
MCPWR06	2	0.9	1.6

## Marking Table

No Marking for 0402

0805~2512 4 digits marking for Example

Resistance	5.6Ω	97.6Ω	100Ω	2.2KΩ	10KΩ	49.9KΩ	100KΩ	1MΩ
marking	5R60	97R6	1000	2201	1002	4992	1003	1004

0603: 3 digits marking in E24

Example: 101=100Ω 102=1KΩ (1<sup>st</sup> and 2<sup>nd</sup> are E24 code and 3rd code is multiplier)

E24 code	10	11	12	13	15	16	18	20	22	24	27	30	33	36	39	43	47	51	56	62	68	75	82	91
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1% for 0603: 3 digits marking in E96 (E96 series except E24 series)



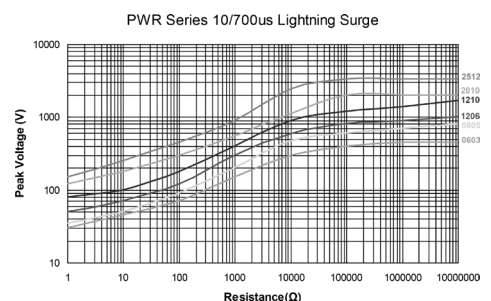
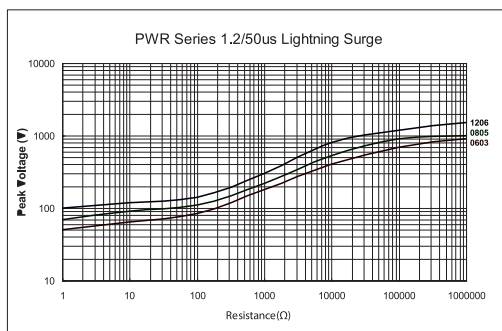
digits marking for Example: 13C=13K3Ω    68B=4K99Ω    68X=49.9Ω

## Marking Table

<b>Code</b>	<b>E96</b>	<b>Code</b>	<b>E96</b>	<b>Code</b>	<b>E96</b>	<b>Code</b>	<b>E96</b>				
02	102	28	191	52	340	75	590				
03	105	29	196	53	348	76	604				
04	107	31	205	54	357	77	619				
06	113	32	210	55	365	78	634				
07	115	33	215	56	374	79	649				
08	118	34	221	57	383	80	665				
09	121	35	226	58	392	81	681				
10	124	36	232	59	402	82	698				
11	127	37	237	60	412	83	715				
13	133	38	243	61	422	84	732				
14	137	39	249	62	432	86	768				
15	140	40	255	63	442	87	787				
16	143	41	261	64	453	88	806				
17	147	42	267	65	464	89	825				
19	154	43	274	66	475	90	845				
20	158	44	280	67	487	91	866				
21	162	45	287	68	499	92	887				
22	165	46	294	69	511	93	909				
23	169	47	301	70	523	94	931				
24	174	48	309	71	536	95	953				
25	178	49	316	72	549	96	976				
26	182	50	324	73	562						
27	187	51	332	74	576						
<b>Code</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>X</b>	<b>Y</b>		
<b>Multiplier</b>	10 <sup>0</sup>	10 <sup>1</sup>	10 <sup>2</sup>	10 <sup>3</sup>	10 <sup>4</sup>	10 <sup>5</sup>	10 <sup>6</sup>	10 <sup>-1</sup>	10 <sup>-2</sup>		

## Lightning Surge

Resistors are tested in accordance with IEC 60115-1 using both 1.2/50us and 10/700 pulse shapes. The limit of acceptance is a shift in resistance of less than 1% from the initial value.



## Part Number Table

Description	Part Number
Pulse WithStanding Chip Resistor 1% 10 Ω	MCPWR02FTEP0100A
Pulse WithStanding Chip Resistor 1% 22 Ω	MCPWR02FTEP0220A
Pulse WithStanding Chip Resistor 1% 33 Ω	MCPWR02FTEP0330A
Pulse WithStanding Chip Resistor 1% 39 Ω	MCPWR02FTEP0390A
Pulse WithStanding Chip Resistor 1% 100 Ω	MCPWR02FTEP1000A
Pulse WithStanding Chip Resistor 1% 10K Ω	MCPWR02FTEP1002A
Pulse WithStanding Chip Resistor 1% 100K Ω	MCPWR02FTEP1003A
Pulse WithStanding Chip Resistor 1% 150 Ω	MCPWR02FTEP1500A
Pulse WithStanding Chip Resistor 1% 220 Ω	MCPWR02FTEP2200A
Pulse WithStanding Chip Resistor 1% 22K Ω	MCPWR02FTEP2202A
Pulse WithStanding Chip Resistor 1% 2.7K Ω	MCPWR02FTEP2701A
Pulse WithStanding Chip Resistor 1% 4.7K Ω	MCPWR02FTEP4701A
Pulse WithStanding Chip Resistor 1% 1 Ω	MCPWR02FTGP0010A
Pulse WithStanding Chip Resistor 1% 1 Ω	MCPWR03FTFO0010A
Pulse WithStanding Chip Resistor 1% 10 Ω	MCPWR05FTEU0100A
Pulse WithStanding Chip Resistor 1% 15 Ω	MCPWR05FTEU0150A
Pulse WithStanding Chip Resistor 1% 22 Ω	MCPWR05FTEU0220A
Pulse WithStanding Chip Resistor 1% 27 Ω	MCPWR05FTEU0270A
Pulse WithStanding Chip Resistor 1% 33 Ω	MCPWR05FTEU0330A
Pulse WithStanding Chip Resistor 1% 100 Ω	MCPWR05FTEU1000A
Pulse WithStanding Chip Resistor 1% 1K Ω	MCPWR05FTEU1001A
Pulse WithStanding Chip Resistor 1% 10K Ω	MCPWR05FTEU1002A
Pulse WithStanding Chip Resistor 1% 100K Ω	MCPWR05FTEU1003A
Pulse WithStanding Chip Resistor 1% 120 Ω	MCPWR05FTEU1200A
Pulse WithStanding Chip Resistor 1% 1.2K Ω	MCPWR05FTEU1201A
Pulse WithStanding Chip Resistor 1% 150 Ω	MCPWR05FTEU1500A
Pulse WithStanding Chip Resistor 1% 220 Ω	MCPWR05FTEU2200A
Pulse WithStanding Chip Resistor 1% 2.2K Ω	MCPWR05FTEU2201A
Pulse WithStanding Chip Resistor 1% 22K Ω	MCPWR05FTEU2202A
Pulse WithStanding Chip Resistor 1% 330 Ω	MCPWR05FTEU3300A
Pulse WithStanding Chip Resistor 1% 33K Ω	MCPWR05FTEU3302A
Pulse WithStanding Chip Resistor 1% 4.7K Ω	MCPWR05FTEU4701A
Pulse WithStanding Chip Resistor 1% 47K Ω	MCPWR05FTEU4702A
Pulse WithStanding Chip Resistor 1% 5.6M Ω	MCPWR05FTEU5604A
Pulse WithStanding Chip Resistor 1% 6.8K Ω	MCPWR05FTEU6801A
Pulse WithStanding Chip Resistor 1% 1 Ω	MCPWR05FTFU0010A
Pulse WithStanding Chip Resistor 1% 2.2 Ω	MCPWR05FTFU2R20A
Pulse WithStanding Chip Resistor 1% 3.3 Ω	MCPWR05FTFU3R30A



# Chip SMD Resistors

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Description	Part Number
Pulse WithStanding Chip Resistor 1% 4.7 $\Omega$	MCPWR05FTFU4R70A
Pulse WithStanding Chip Resistor 5% 0 $\Omega$	MCPWR05JT-UR0R0A
Pulse WithStanding Chip Resistor 0.5% 10M $\Omega$	MCPWR06DTEO1005A
Pulse WithStanding Chip Resistor 1% 10 $\Omega$	MCPWR06FTEQ0100A
Pulse WithStanding Chip Resistor 1% 15 $\Omega$	MCPWR06FTEQ0150A
Pulse WithStanding Chip Resistor 1% 22 $\Omega$	MCPWR06FTEQ0220A
Pulse WithStanding Chip Resistor 1% 27 $\Omega$	MCPWR06FTEQ0270A
Pulse WithStanding Chip Resistor 1% 30 $\Omega$	MCPWR06FTEQ0300A
Pulse WithStanding Chip Resistor 1% 33 $\Omega$	MCPWR06FTEQ0330A
Pulse WithStanding Chip Resistor 1% 39 $\Omega$	MCPWR06FTEQ0390A
Pulse WithStanding Chip Resistor 1% 47 $\Omega$	MCPWR06FTEQ0470A
Pulse WithStanding Chip Resistor 1% 100 $\Omega$	MCPWR06FTEQ1000A
Pulse WithStanding Chip Resistor 1% 1K $\Omega$	MCPWR06FTEQ1001A
Pulse WithStanding Chip Resistor 1% 10K $\Omega$	MCPWR06FTEQ1002A
Pulse WithStanding Chip Resistor 1% 100K $\Omega$	MCPWR06FTEQ1003A
Pulse WithStanding Chip Resistor 1% 120K $\Omega$	MCPWR06FTEQ1200A
Pulse WithStanding Chip Resistor 1% 1.2K $\Omega$	MCPWR06FTEQ1201A
Pulse WithStanding Chip Resistor 1% 150 $\Omega$	MCPWR06FTEQ1500A
Pulse WithStanding Chip Resistor 1% 1.5K $\Omega$	MCPWR06FTEQ1501A
Pulse WithStanding Chip Resistor 1% 180 $\Omega$	MCPWR06FTEQ1800A
Pulse WithStanding Chip Resistor 1% 18K $\Omega$	MCPWR06FTEQ1802A
Pulse WithStanding Chip Resistor 1% 220 $\Omega$	MCPWR06FTEQ2200A
Pulse WithStanding Chip Resistor 1% 2.2K $\Omega$	MCPWR06FTEQ2201A
Pulse WithStanding Chip Resistor 1% 22K $\Omega$	MCPWR06FTEQ2202A
Pulse WithStanding Chip Resistor 1% 270 $\Omega$	MCPWR06FTEQ2700A
Pulse WithStanding Chip Resistor 1% 2.7K $\Omega$	MCPWR06FTEQ2701A
Pulse WithStanding Chip Resistor 1% 330 $\Omega$	MCPWR06FTEQ3300A
Pulse WithStanding Chip Resistor 1% 3.3K $\Omega$	MCPWR06FTEQ3301A
Pulse WithStanding Chip Resistor 1% 33K $\Omega$	MCPWR06FTEQ3302A
Pulse WithStanding Chip Resistor 1% 390 $\Omega$	MCPWR06FTEQ3900A
Pulse WithStanding Chip Resistor 1% 3.9K $\Omega$	MCPWR06FTEQ3901A
Pulse WithStanding Chip Resistor 1% 470 $\Omega$	MCPWR06FTEQ4700A
Pulse WithStanding Chip Resistor 1% 4.7K $\Omega$	MCPWR06FTEQ4701A
Pulse WithStanding Chip Resistor 1% 47K $\Omega$	MCPWR06FTEQ4702A
Pulse WithStanding Chip Resistor 1% 56K $\Omega$	MCPWR06FTEQ5602A
Pulse WithStanding Chip Resistor 1% 6.8K $\Omega$	MCPWR06FTEQ6801A
Pulse WithStanding Chip Resistor 1% 1 $\Omega$	MCPWR06FTFQ0010A
Pulse WithStanding Chip Resistor 1% 2 $\Omega$	MCPWR06FTFQ0020A
Pulse WithStanding Chip Resistor 1% 2.2 $\Omega$	MCPWR06FTFQ2R20A

Newark.com/multicomp-pro  
Farnell.com/multicomp-pro  
Element14.com/multicomp-pro

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# Chip SMD Resistors

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Description	Part Number
Pulse WithStanding Chip Resistor 5% 2.2 $\Omega$	MCPWR06JTFQ2R20A
Pulse WithStanding Chip Resistor 5% 4.7 $\Omega$	MCPWR06JTFQ4R70A
Pulse WithStanding Chip Resistor 5% 5.6 $\Omega$	MCPWR06JTFQ5R60A
Pulse WithStanding Chip Resistor 5% 0 $\Omega$	MCPWR06JT-QR0R0A

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