

**RoHS
Compliant**

Description



The resistors are constructed in a high grade ceramic body (aluminium oxide). Internal metal electrodes are added at each end and connected by a resistive paste that is applied to the top surface of the substrate. The composition of the paste is adjusted to give the approximate resistance required and the value is trimmed to within tolerance by laser cutting of this resistive layer

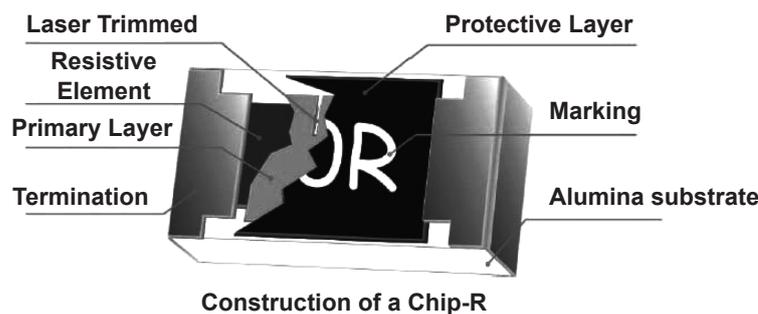
Features

- High reliability and stability $\pm 1\%$
- Sulfuration resistant 1,000ppm
- Automotive grade AEC Q-200 compliant
- 100% CCD inspection
- Lead-free

Applications

- Automotive application
- Consumer electrical equipment
- EDP, computer application
- Telecom application

The resistive layer is covered with a protective coat. Finally, the two external end terminations are added. For ease of soldering the outer layer of these end terminations is a Tin (lead free) alloy



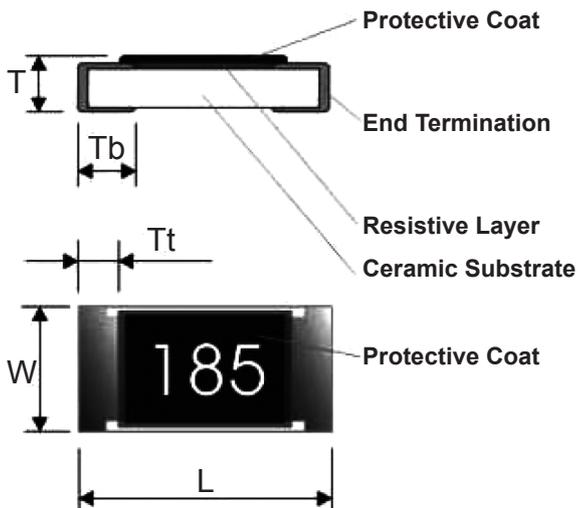
Quick Reference Data

Item	General Specification	
Series no.	MCSR12	
Size code	1206	
Resistance range	1 Ω to 10M Ω ($\pm 5\%$ tolerance), Jumper 1 Ω to 10M Ω ($\pm 1\%$ tolerance)	
Resistance tolerance	$\pm 1\%$ E96 / E24	$\pm 5\%$ E24
TCR (ppm/ $^{\circ}$ C) R > 1M Ω 10 Ω < R \leq 1M Ω R \leq 10 Ω	$\leq +200$ $\leq +100$ -200 to +400	
Maximum dissipation at T _{amb} = 70 $^{\circ}$ C	1/4W	
Maximum operation voltage (DC or RMS)	200V	
Maximum overload voltage (DC or RMS)	400V	
Climatic category (IEC 60068)	55/155/56	

Note:

1. This is the maximum voltage that may be continuously supplied to the resistor element, see “IEC publication 60115-8”
2. Maximum operation voltage : So called RCWV (rated continuous working voltage) is determined by

$$RCWV = \sqrt{\text{Rated Power} \times \text{Resistance Value or maximum RCWV listed above, whichever is lower}}$$
3. The resistance of jumper is defined $< 0.05\Omega$



Dimensions (mm)

MCSR12 (1206)	L	W	T	Tb	Tt
	3.1 ±0.1	1.6 ±0.1	0.6 ±0.15	0.45 ±0.2	0.5 ±0.2

Marking

Size \ No. of Digit of Code \ Tolerance	±5%	±1%
MCSR12 (1206)	3-digits marking	4-digits marking

3-digits marking (±5% : 1206)

Each resistor is marked with a three digits code on the protective coating to designate the nominal resistance value

4-digits marking (±1% : 1206)

Each resistor is marked with a three digits code on the protective coating to designate the nominal resistance value

Example

Resistance	10Ω	12Ω	100Ω	6,800Ω	47,000Ω
3-digits marking (1206 ±5%)	100	120	101	682	473
4-digits marking	10R0	12R0	1000	6801	4702

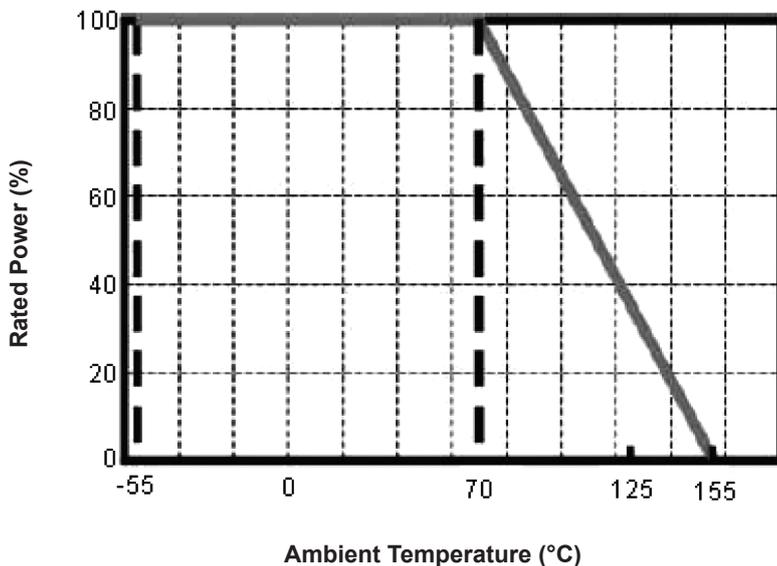
Functional Description

Product characterization

Standard values of nominal resistance are taken from the E24 series for resistors with a tolerance of $\pm 5\%$, and E24+E96 series for resistors with a tolerance of $\pm 1\%$. The values of the E24 / E96 series are in accordance with "IEC publication 60063"

Derating

The power that the resistor can dissipate depends on the operating temperature



Max. dissipation in percentage of rated power as a function of the ambient temperature

Mounting:

Due to their rectangular shapes and small tolerances, surface mountable resistors are suitable for handling by automatic placement systems

Chip placement can be on ceramic substrates and printed-circuit boards (PCBs)

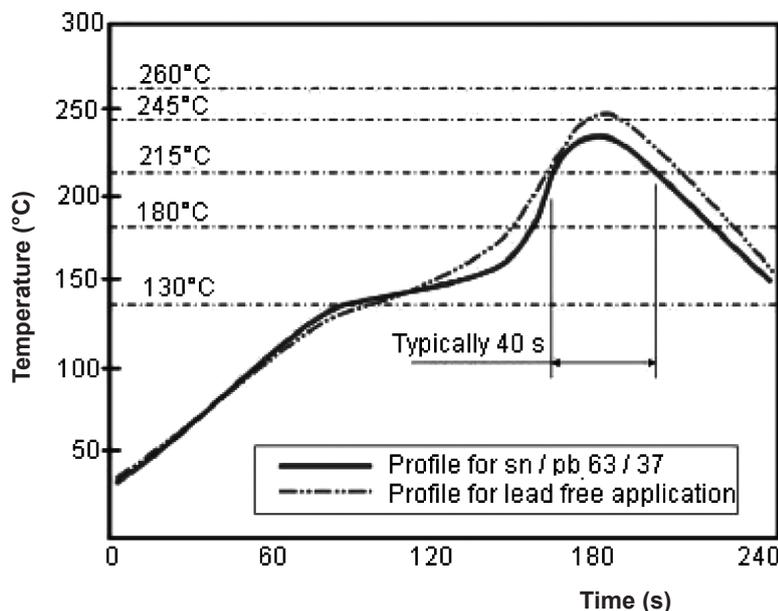
Electrical connection to the circuit is by individual soldering condition

The end terminations guarantee a reliable contact

Soldering Condition

The robust construction of chip resistors allows them to be completely immersed in a solder bath of 260°C for 10 seconds. Therefore, it is possible to mount surface mount resistors on one side of a PCB and other discrete components on the reverse (mixed PCBs)

Surface mount resistors are tested for solderability at 235°C during 2 seconds. The test condition for no leaching is 260°C for 30 seconds. Typical examples of soldering processes that provide reliable joints without any damage are given in below.



Infrared soldering profile for Chip Resistors

Test and Requirements

Essentially all tests are carried out according to the schedule of IEC publication 115-8, category LCT/UCT/56 (rated temperature range : Lower Category Temperature, Upper Category Temperature; damp heat, long term, 56 days). The testing also meets the requirements specified by EIA, EIAJ and JIS

The tests are carried out in accordance with IEC publication 68, "Recommended basic climatic and mechanical robustness testing procedure for electronic components" and under standard atmospheric conditions according to IEC 60068-1, sub-clause 5.3. Unless otherwise specified, the following value supplied :

Temperature : 15°C to 35°C

Relative humidity : 45% to 75%

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

All soldering tests are performed with mildly activated flux

Test and Requirements

Test	Procedure / Test Method	Requirement	
		Resistance ±5%, ±1%	0Ω
Electrical Characteristics JISC5201-1: 1998 Clause 4.8	- DC resistance values measurement - Temperature Coefficient of Resistance (T.C.R) Natural resistance change per change in degree centigrade $\frac{R2 - R1}{R1 (t2 - t1)} \times 10^6 \text{ (ppm/}^\circ\text{C)}$ t1 : 20°C +5°C -1°C R1 : Resistance at reference temperature R2 : Resistance at test temperature	Within the specified tolerance Refer to "Quick Reference Data"	
Resistance to soldering heat (R.S.H) MIL-STD-202 method 210	Un-mounted chips completely immersed for 10 ±1 second in a SAC solder bath at 270°C ±5°C	ΔR/R Max. ± (0.5%+0.05Ω) No visible damage	< 50mΩ
Solderability J-STD-002	a) Bake the sample for 155°C dwell time 4 hours / solder dipping 235°C / 5 s b) Steam the sample dwell time 1 hour/ solder dipping 215°C/ 5 s c) Steam the sample dwell time 1 hour/ solder dipping 260°C / 7 s	95% coverage minimum, good tinning No visible damage	
Temperature cycling JESD22 method JA-104	1,000 cycles, -55°C to +155°C, dwell time 5 to 10mins	ΔR/R Max. ± (0.5%+0.05Ω) No visible damage	< 50mΩ
Moisture Resistance MIL-STD-202 method 106	65 ±2°C, 80 to 100% RH, 10 cycles, 24 hours / cycle	ΔR/R Max. ± (0.5%+0.05Ω) No visible damage	< 50mΩ
Bias Humidity MIL-STD-202 method 103	1,000 +48/-0 hours; 85°C, 85% RH, 10% of operation Power	ΔR/R Max. ± (1%+0.05Ω) No visible damage	< 50mΩ
Operational Life MIL-STD-202 method 108	1,000 +48/-0 hours; 35% of operation power, 125 ±2°C	ΔR/R Max. ± (1%+0.05 Ω) No visible damage	< 50mΩ
High Temperature Exposure MIL-STD-202 method 108	1,000+48/-0 hours; without load in a temperature chamber controlled 155±3°C	ΔR/R Max. ± (1%+0.05 Ω) No visible damage	< 50mΩ
Mechanical Shock MIL-STD-202 method 213	1/2 sine pulse / 1,500 g peak / Velocity 15.4 ft/s	Within the specified tolerance No visible damage	< 50mΩ
Board Flex AEC-Q200-005	Resistors mounted on a 90 mm glass epoxy resin PCB(FR4), bending once 2 mm for 10 s	ΔR/R Max. ± (1%+0.05 Ω) No visible damage	< 50mΩ
Terminal strength AEC-Q200-006	Pressurizing force: 1 Kg, Test time: 60±1 s	No remarkable damage or removal of the terminations	
Vibration MIL-STD-202 method 204	Test 5 g's for 20 minimum, 12 cycles each of 3 orientations	ΔR/R Max. ± (1%+0.05 Ω) No visible damage	< 50mΩ
Thermal shock MIL-STD-202 method 107	Test -55 to 155 / dwell time 15 minimum / maximum transfer time 20 seconds 300 cycles	ΔR/R Max. ± (0.5%+0.05 Ω) No visible damage	< 50mΩ
ESD AEC-Q200-002	Test contact 1 KV (0.5 KV for 0402 only)	ΔR/R Max. ± (1%+0.05 Ω) No visible damage	< 50mΩ

Thick Film Automotive and Anti-Sulfuration Chip Resistor - 1206



Test Condition for Jumper (0Ω)

Item	MCSR12 (1206)
Power rating at +70°C	1/4 W
Resistance	Max. 50mΩ
Rated current	2A
Peak current	5A
Operating temperature	-55°C to +155°C

MCSR12 (1206):

1. Reeled tape packaging : 8 mm width paper taping 5,000 pieces per 7" reel, 10 k pieces per 10" reel, 20 k pieces per 13" reel
2. Bulk packaging : 5,000 pieces per poly-bag

Part Number Table

Description	Part Number
Resistor, 1206, 1R3, 1%, Anti Sulfur	MCSR12W1R30FTL
Resistor, 1206, 1R5, 1%, Anti Sulfur	MCSR12W1R50FTL
Resistor, 1206, 4R7, 1%, Anti Sulfur	MCSR12W4R70FTL
Resistor, 10R, 1206, 5%, Anti Sulfur	MCSR12X100 JTL
Resistor, 1206, 100R, 1%, Anti Sulfur	MCSR12X1000FTL
Resistor, 1206, 1K, 1%, Anti Sulfur	MCSR12X1001FTL
Resistor, 1206, 10K, 1%, Anti Sulfur	MCSR12X1002FTL
Resistor, 1206, 100K, 1%, Anti Sulfur	MCSR12X1003FTL
Resistor, 1206, 1M, 1%, Anti Sulfur	MCSR12X1004FTL
Resistor, 100R, 1206, 5%, Anti Sulfur	MCSR12X101 JTL
Resistor, 1K, 1206, 5%, Anti Sulfur	MCSR12X102 JTL
Resistor, 10K, 1206, 5%, Anti Sulfur	MCSR12X103 JTL
Resistor, 100K, 1206, 5%, Anti Sulfur	MCSR12X104 JTL
Resistor, 1M, 1206, 5%, Anti Sulfur	MCSR12X105 JTL
Resistor, 1206, 10R, 1%, Anti Sulfur	MCSR12X10R0FTL
Resistor, 1206, 110R, 1%, Anti Sulfur	MCSR12X1100FTL
Resistor, 1206, 1K1, 1%, Anti Sulfur	MCSR12X1101FTL
Resistor, 1206, 11K, 1%, Anti Sulfur	MCSR12X1102FTL
Resistor, 1206, 110K, 1%, Anti Sulfur	MCSR12X1103FTL
Resistor, 1206, 11R, 1%, Anti Sulfur	MCSR12X11R0FTL
Resistor, 1206, 120R, 1%, Anti Sulfur	MCSR12X1200FTL
Resistor, 1206, 1K2, 1%, Anti Sulfur	MCSR12X1201FTL
Resistor, 1206, 12K, 1%, Anti Sulfur	MCSR12X1202FTL



Thick Film Automotive and Anti-Sulfuration Chip Resistor - 1206

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Description	Part Number
Resistor, 1206, 120K, 1%, Anti Sulfur	MCSR12X1203FTL
Resistor, 120R, 1206, 5%, Anti Sulfur	MCSR12X121 JTL
Resistor, 1K2, 1206, 5%, Anti Sulfur	MCSR12X122 JTL
Resistor, 1206, 12R, 1%, Anti Sulfur	MCSR12X12R0FTL
Resistor, 1206, 130R, 1%, Anti Sulfur	MCSR12X1300FTL
Resistor, 1206, 1K3, 1%, Anti Sulfur	MCSR12X1301FTL
Resistor, 1206, 13K, 1%, Anti Sulfur	MCSR12X1302FTL
Resistor, 1206, 130K, 1%, Anti Sulfur	MCSR12X1303FTL
Resistor, 1206, 13R, 1%, Anti Sulfur	MCSR12X13R0FTL
Resistor, 15R, 1206, 5%, Anti Sulfur	MCSR12X150 JTL
Resistor, 1206, 150R, 1%, Anti Sulfur	MCSR12X1500FTL
Resistor, 1206, 1K5, 1%, Anti Sulfur	MCSR12X1501FTL
Resistor, 1206, 15K, 1%, Anti Sulfur	MCSR12X1502FTL
Resistor, 1206, 150K, 1%, Anti Sulfur	MCSR12X1503FTL
Resistor, 150R, 1206, 5%, Anti Sulfur	MCSR12X151 JTL
Resistor, 1K5, 1206, 5%, Anti Sulfur	MCSR12X152 JTL
Resistor, 1206, 15R, 1%, Anti Sulfur	MCSR12X15R0FTL
Resistor, 1206, 160R, 1%, Anti Sulfur	MCSR12X1600FTL
Resistor, 1206, 1K6, 1%, Anti Sulfur	MCSR12X1601FTL
Resistor, 1206, 16K, 1%, Anti Sulfur	MCSR12X1602FTL
Resistor, 1206, 160K, 1%, Anti Sulfur	MCSR12X1603FTL
Resistor, 1206, 160R, 1%, Anti Sulfur	MCSR12X16R0FTL
Resistor, 18R, 1206, 5%, Anti Sulfur	MCSR12X180 JTL
Resistor, 1206, 180R, 1%, Anti Sulfur	MCSR12X1800FTL
Resistor, 1206, 1K8, 1%, Anti Sulfur	MCSR12X1801FTL
Resistor, 1206, 18K, 1%, Anti Sulfur	MCSR12X1802FTL
Resistor, 1206, 180K, 1%, Anti Sulfur	MCSR12X1803FTL
Resistor, 1K8, 1206, 5%, Anti Sulfur	MCSR12X182 JTL
Resistor, 1206, 18R, 1%, Anti Sulfur	MCSR12X18R0FTL
Resistor, 1206, 200R, 1%, Anti Sulfur	MCSR12X2000FTL
Resistor, 1206, 2K, 1%, Anti Sulfur	MCSR12X2001FTL
Resistor, 1206, 20K, 1%, Anti Sulfur	MCSR12X2002FTL
Resistor, 1206, 200K, 1%, Anti Sulfur	MCSR12X2003FTL
Resistor, 1206, 20R, 1%, Anti Sulfur	MCSR12X20R0FTL
Resistor, 22R, 1206, 5%, Anti Sulfur	MCSR12X220 JTL
Resistor, 1206, 220R, 1%, Anti Sulfur	MCSR12X2200FTL
Resistor, 1206, 2K2, 1%, Anti Sulfur	MCSR12X2201FTL

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Thick Film Automotive and Anti-Sulfuration Chip Resistor - 1206

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Description	Part Number
Resistor, 1206, 22K, 1%, Anti Sulfur	MCSR12X2202FTL
Resistor, 1206, 220K, 1%, Anti Sulfur	MCSR12X2203FTL
Resistor, 220R, 1206, 5%, Anti Sulfur	MCSR12X221 JTL
Resistor, 2K2, 1206, 5%, Anti Sulfur	MCSR12X222 JTL
Resistor, 220K, 1206, 5%, Anti Sulfur	MCSR12X224 JTL
Resistor, 1206, 22R, 1%, Anti Sulfur	MCSR12X22R0FTL
Resistor, 1206, 2K37, 1%, Anti Sulfur	MCSR12X2371FTL
Resistor, 1206, 240R, 1%, Anti Sulfur	MCSR12X2400FTL
Resistor, 1206, 2K4, 1%, Anti Sulfur	MCSR12X2401FTL
Resistor, 1206, 24K, 1%, Anti Sulfur	MCSR12X2402FTL
Resistor, 1206, 240K, 1%, Anti Sulfur	MCSR12X2403FTL
Resistor, 1206, 24R, 1%, Anti Sulfur	MCSR12X24R0FTL
Resistor, 1206, 270R, 1%, Anti Sulfur	MCSR12X2700FTL
Resistor, 1206, 2K7, 1%, Anti Sulfur	MCSR12X2701FTL
Resistor, 1206, 27K, 1%, Anti Sulfur	MCSR12X2702FTL
Resistor, 1206, 270K, 1%, Anti Sulfur	MCSR12X2703FTL
Resistor, 270R, 1206, 5%, Anti Sulfur	MCSR12X271 JTL
Resistor, 2K7, 1206, 5%, Anti Sulfur	MCSR12X272 JTL
Resistor, 1206, 27R, 1%, Anti Sulfur	MCSR12X27R0FTL
Resistor, 2R2, 1206, 5%, Anti Sulfur	MCSR12X2R2 JTL
Resistor, 1206, 300R, 1%, Anti Sulfur	MCSR12X3000FTL
Resistor, 1206, 3K, 1%, Anti Sulfur	MCSR12X3001FTL
Resistor, 1206, 30K, 1%, Anti Sulfur	MCSR12X3002FTL
Resistor, 1206, 300K, 1%, Anti Sulfur	MCSR12X3003FTL
Resistor, 1206, 30R, 1%, Anti Sulfur	MCSR12X30R0FTL
Resistor, 1206, 330R, 1%, Anti Sulfur	MCSR12X3300FTL
Resistor, 1206, 3K3, 1%, Anti Sulfur	MCSR12X3301FTL
Resistor, 1206, 33K, 1%, Anti Sulfur	MCSR12X3302FTL
Resistor, 1206, 330K, 1%, Anti Sulfur	MCSR12X3303FTL
Resistor, 330R, 1206, 5%, Anti Sulfur	MCSR12X331 JTL
Resistor, 1206, 332K, 1%, Anti Sulfur	MCSR12X3323FTL
Resistor, 33K, 1206, 5%, Anti Sulfur	MCSR12X333 JTL
Resistor, 1206, 33R, 1%, Anti Sulfur	MCSR12X33R0FTL
Resistor, 1206, 360R, 1%, Anti Sulfur	MCSR12X3600FTL
Resistor, 1206, 3K6, 1%, Anti Sulfur	MCSR12X3601FTL
Resistor, 1206, 36K, 1%, Anti Sulfur	MCSR12X3602FTL
Resistor, 1206, 360K, 1%, Anti Sulfur	MCSR12X3603FTL

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Thick Film Automotive and Anti-Sulfuration Chip Resistor - 1206

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Description	Part Number
Resistor, 1206, 36R, 1%, Anti Sulfur	MCSR12X36R0FTL
Resistor, 39R, 1206, 5%, Anti Sulfur	MCSR12X390 JTL
Resistor, 1206, 390R, 1%, Anti Sulfur	MCSR12X3900FTL
Resistor, 1206, 3K9, 1%, Anti Sulfur	MCSR12X3901FTL
Resistor, 1206, 39K, 1%, Anti Sulfur	MCSR12X3902FTL
Resistor, 1206, 390K, 1%, Anti Sulfur	MCSR12X3903FTL
Resistor, 390R, 1206, 5%, Anti Sulfur	MCSR12X391 JTL
Resistor, 1206, 39R, 1%, Anti Sulfur	MCSR12X39R0FTL
Resistor, 3R3, 1206, 5%, Anti Sulfur	MCSR12X3R3 JTL
Resistor, 1206, 430R, 1%, Anti Sulfur	MCSR12X4300FTL
Resistor, 1206, 4K3, 1%, Anti Sulfur	MCSR12X4301FTL
Resistor, 1206, 43K, 1%, Anti Sulfur	MCSR12X4302FTL
Resistor, 1206, 430K, 1%, Anti Sulfur	MCSR12X4303FTL
Resistor, 1206, 43R, 1%, Anti Sulfur	MCSR12X43R0FTL
Resistor, 47R, 1206, 5%, Anti Sulfur	MCSR12X470 JTL
Resistor, 1206, 470R, 1%, Anti Sulfur	MCSR12X4700FTL
Resistor, 1206, 4K7, 1%, Anti Sulfur	MCSR12X4701FTL
Resistor, 1206, 47K, 1%, Anti Sulfur	MCSR12X4702FTL
Resistor, 1206, 470K, 1%, Anti Sulfur	MCSR12X4703FTL
Resistor, 470R, 1206, 5%, Anti Sulfur	MCSR12X471 JTL
Resistor, 4K7, 1206, 5%, Anti Sulfur	MCSR12X472 JTL
Resistor, 1206, 47R, 1%, Anti Sulfur	MCSR12X47R0FTL
Resistor, 4R7, 1206, 5%, Anti Sulfur	MCSR12X4R7 JTL
Resistor, 1206, 510R, 1%, Anti Sulfur	MCSR12X5100FTL
Resistor, 1206, 5K1, 1%, Anti Sulfur	MCSR12X5101FTL
Resistor, 1206, 51K, 1%, Anti Sulfur	MCSR12X5102FTL
Resistor, 1206, 510K, 1%, Anti Sulfur	MCSR12X5103FTL
Resistor, 1206, 51R, 1%, Anti Sulfur	MCSR12X51R0FTL
Resistor, 1206, 523R, 1%, Anti Sulfur	MCSR12X5230FTL
Resistor, 56R, 1206, 5%, Anti Sulfur	MCSR12X560 JTL
Resistor, 1206, 560R, 1%, Anti Sulfur	MCSR12X5600FTL
Resistor, 1206, 5K6, 1%, Anti Sulfur	MCSR12X5601FTL
Resistor, 1206, 56K, 1%, Anti Sulfur	MCSR12X5602FTL
Resistor, 1206, 560K, 1%, Anti Sulfur	MCSR12X5603FTL
Resistor, 560R, 1206, 5%, Anti Sulfur	MCSR12X561 JTL
Resistor, 1206, 56R, 1%, Anti Sulfur	MCSR12X56R0FTL
Resistor, 1206, 56R2, 1%, Anti Sulfur	MCSR12X56R2FTL

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Thick Film Automotive and Anti-Sulfuration Chip Resistor - 1206

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Description	Part Number
Resistor, 1206, 620R, 1%, Anti Sulfur	MCSR12X6200FTL
Resistor, 1206, 6K2, 1%, Anti Sulfur	MCSR12X6201FTL
Resistor, 1206, 62K, 1%, Anti Sulfur	MCSR12X6202FTL
Resistor, 1206, 620K, 1%, Anti Sulfur	MCSR12X6203FTL
Resistor, 1206, 62R, 1%, Anti Sulfur	MCSR12X62R0FTL
Resistor, 1206, 680R, 1%, Anti Sulfur	MCSR12X6800FTL
Resistor, 1206, 6K8, 1%, Anti Sulfur	MCSR12X6801FTL
Resistor, 1206, 68K, 1%, Anti Sulfur	MCSR12X6802FTL
Resistor, 1206, 680K, 1%, Anti Sulfur	MCSR12X6803FTL
Resistor, 6K8, 1206, 5%, Anti Sulfur	MCSR12X682 JTL
Resistor, 68K, 1206, 5%, Anti Sulfur	MCSR12X683 JTL
Resistor, 1206, 68R, 1%, Anti Sulfur	MCSR12X68R0FTL
Resistor, 1206, 750R, 1%, Anti Sulfur	MCSR12X7500FTL
Resistor, 1206, 7K5, 1%, Anti Sulfur	MCSR12X7501FTL
Resistor, 1206, 75K, 1%, Anti Sulfur	MCSR12X7502FTL
Resistor, 1206, 750K, 1%, Anti Sulfur	MCSR12X7503FTL
Resistor, 1206, 75R, 1%, Anti Sulfur	MCSR12X75R0FTL
Resistor, 1206, 820R, 1%, Anti Sulfur	MCSR12X8200FTL
Resistor, 1206, 8K2, 1%, Anti Sulfur	MCSR12X8201FTL
Resistor, 1206, 82K, 1%, Anti Sulfur	MCSR12X8202FTL
Resistor, 1206, 820K, 1%, Anti Sulfur	MCSR12X8203FTL
Resistor, 82K, 1206, 5%, Anti Sulfur	MCSR12X823 JTL
Resistor, 1206, 82R, 1%, Anti Sulfur	MCSR12X82R0FTL
Resistor, 1206, 866R, 1%, Anti Sulfur	MCSR12X8660FTL
Resistor, 1206, 910R, 1%, Anti Sulfur	MCSR12X9100FTL
Resistor, 1206, 9K1, 1%, Anti Sulfur	MCSR12X9101FTL
Resistor, 1206, 91K, 1%, Anti Sulfur	MCSR12X9102FTL
Resistor, 1206, 910K, 1%, Anti Sulfur	MCSR12X9103FTL
Resistor, 1206, 91R, 1%, Anti Sulfur	MCSR12X91R0FTL

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